ARTDrive

Vector AC Drives V2 series
400Vac Class
575Vac Class

ARTDrive

...... Instruction Manual

GEFRAN SIEI

Thank you for choosing this SIEI product.

We will be glad to receive any possible information which could help us improving this manual. The e-mail address is the following: **techdoc@siei.it.**
Before using the product, read the safety instruction section carefully.
Keep the manual in a safe place and available to engineering and installation personnel during the product functioning period.

GEFRAN S.p.A has the right to modify products, data and dimensions without notice.
The data can only be used for the product description and they can not be understood as legally stated properties.

This manual is updated according to software version 2.2XX.
Variation of the number replacing “X” have no influence on the functionality of the device.
The identification number of the software version can be read on the inverter nameplate or on the label on the FLASH memories mounted on the regulation card.

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Safety Symbol Legend - Légende des Signes de Sécurité

Warning

Commands attention to an operating procedure, practice, condition, or statement which, if not strictly observed, could result in personal injury or death.
Attire l'attention sur les modes d'utilisation et les procédés et conditions d'exploitation qui, en cas d'inobservation, pourraient entraîner des blessures corporelles ou la mort.

Caution

Commands attention to an operating procedure, practice, condition, or statement which, if not strictly observed, could result in damage or destruction of equipment.
The seriousness of the injuries and of the damages which could be caused by the non- observance of such indications, depends on the different conditions. Anyway, the instructions given below should always be followed with the highest attention.
Attire l'attention sur les modes d'utilization et les procédés et conditions d'exploitation qui, en cas d'inobservation, pourraient entraîner la détérioration ou la destruction des appareils.
La gravité des blessures et des dommages matériels possibles dépendent de différent facteurs. Toutefois, les instructions mentionées ci-dessous devraient être toujours suivies avec la plus grande attention.

NOTE!

Commands attention to an operating procedure, practice, condition, or statement that must be highlighted.
Attire l'attention sur les modes d'utilization et les procédés et conditions d'exploitation qui présentent un intéret particulier.

Chapter 0 - Safety Precautions / Precautions de Sécurité

NOTE! The terms “Inverter”, “Controller” and “Drive” are sometimes used interchangably throughout the industry. We will use the term “Drive” in this document.
Les mots “Inverter”, “Controller” et “Drive” sont interchangeables dans le domaine industriel. Nous utiliserons dans ce manuel seulement le mot “Drive”.

Warning

- **According to the EEC standards the ARTDrive and accessories must be used only after checking that the machine has been produced using those safety devices required by the 89/392/EEC set of rules.**
  Drive systems cause mechanical motion. It is the responsibility of the user to insure that any such motion does not result in an unsafe condition. Factory provided interlocks and operating limits should not be bypassed or modified.
- **Never open the device or covers while the AC Input power supply is switched on. Minimum time to wait before working on the terminals or internal devices is listed in section 4.11 on Quick Start Up Guide.**
- **If the front plate has to be removed because the ambient temperature is higher than 40 degrees, the user has to ensure that no occasional contact with live parts will occur.**
- **Always connect the Drive to the protective ground (PE) via the marked connection terminals (PE2) and the housing (PE1). Adjustable Frequency Drives and AC Input filters have ground discharge currents greater than 3.5 mA. EN 50178 specifies that with discharge currents greater than 3.5 mA the protective conductor ground connection (PE1) must be fixed type and doubled for redundancy.**
- **The drive may cause accidental motion in the event of a failure, even if it is disabled, unless it has been disconnected from the AC input feeder.**

- *Selon les normes EEC, les drives ARTDrive et leurs accessoires doivent être employés seulement après avoir verifié que la machine ait été produit avec les même dispositifs de sécurité demandés par la réglementation 89/392/EEC concernant le secteur de l’industrie.*
  Les systèmes provoquent des mouvements mécaniques. L’utilisateur est responsable de la sécurité concernant les mouvements mécaniques. Les dispositifs de sécurité prévues par l’usine et les limitations operationelles ne doivent être dépassés ou modifiés.
- *Ne jamais ouvrir l’appareil lorsqu’il est suns tension. Le temps minimum d’attente avant de pouvoir travailler sur les bornes ou bien à l’intérieur de l’appareil est indiqué dans la section 4.11 (Quick Start Up Guide).*
- *Si la plaque frontale doit être enlevée pour un fonctionnement avec la température de l’environnement plus haute que 40°C, l’utilisateur doit s’assurer, par des moyens opportuns, qu’aucun contact occasionnel ne puisse arriver avec les parties sous tension.*
- *L’appaeil peut rédémarrer de façon accidentel en cas d’anomalie, sauf s’il a été déconnecté du reseau.*
- *Effectuer toujours des connexions de terre (PE) par le biais des bornes (PE2) et du chassis (PE1). Le courant de dispersion vers la terre est supérieur à 3,5 mA. Selon EN 50178 il faut prévoir dans ces cas une double connexion à terre.*

<u>Electrical Shock and Burn Hazard:</u>
When using instruments such as oscilloscopes to work on live equipment, the oscilloscope's chassis should be grounded and a differential amplifier input should be used. Care should be used in the selection of probes and leads and in the adjustment of the oscilloscope so that accurate readings may be made. See instrument manufacturer's instruction book for proper operation and adjustments to the instrument.

<u>Décharge Èlectrique et Risque de Brúlure :</u>
Lors de l'utilisation d'instruments (par example oscilloscope) sur des systémes en marche, le chassis de l'oscilloscope doit être relié à la terre et un amplificateur différentiel devrait être utilisé en entrée.
Les sondes et conducteurs doivent être choissis avec soin pour effectuer les meilleures mesures à l'aide d'un oscilloscope. Voir le manuel d'instruction pour une utilisation correcte des instruments.

<u>Fire and Explosion Hazard:</u>
Fires or explosions might result from mounting Drives in hazardous areas such as locations where flammable or combustible vapors or dusts are present. Drives should be installed away from hazardous areas, even if used with motors suitable for use in these locations.

<u>Risque d'incendies et d'explosions:</u>
L'utilisation des drives dans des zônes à risques (présence de vapeurs ou de poussières inflammables), peut provoquer des incendies ou des explosions. Les drives doivent être installés loin des zônes dangeureuses, et équipés de moteurs appropriés.

Warning

<u>Strain Hazard:</u>
Improper lifting practices can cause serious or fatal injury. Lift only with adequate equipment and trained personnel.

<u>Attention à l'Élévation:</u>
Une élévation inappropriée peut causer des dommages sérieux ou fatals. Il doit être élevé seulement avec des moyens appropriés et par du personnel qualifié.

<u>Electric Shock Hazard:</u>
- **Drives and motors must be ground connected according to the NEC.**
- **Replace all covers before applying power to the Drive. Failure to do so may result in death or serious injury.**
- **Adjustable frequency drives are electrical apparatus for use in industrial installations. Parts of the Drives are at high voltage during operation. The electrical installation and the opening of the device should therefore only be carried out by qualified personnel. Improper installation of motors or Drives may therefore cause the failure of the device as well as serious injury to persons or material damage. Follow the instructions given in this manual and observe the local and national safety regulations applicable.**

<u>Cas de Décharge Èlectrique:</u>
- *Tous les moteurs et les drives doivent être mis à la terre selon le Code Electrique National ou équivalent.*
- *Remettre tous les capots avant de mettre sous tension le drive. Des erreurs*

peuvent provoquer de sérieux accidents ou même la mort.

- *Les drives à fréquence variable sont des dispositifs électriques utilisés dans des installations industriels. Une partie des drives sont sous tension pendant l'operation. L'installation électrique et l'ouverture des drives devrait être executé uniquement par du personel qualifié. De mauvaises installations de moteurs ou de drives peuvent provoquer des dommages materiels ou blesser des personnes.On doit suivir les instructions donneés dans ce manuel et observer les régles nationales de sécurité.*

Warning

Power supply and grounding

In case of a three phase supply not symmetrical to ground, an insulation loss of one of the devices connected to the same network can cause functional problem to the drive, if the use of a delta /star transformer is avoided.

1 GEFRAN-SIEI drives are designed to be powered from standard three phase lines that are electrically symmetrical with respect to ground (TN or TT network).

2 In case of supply with IT network, the use of wye/delta transformer is mandatory, with a secondary three phase wiring referred to ground.

Please refer to the following connection sample.

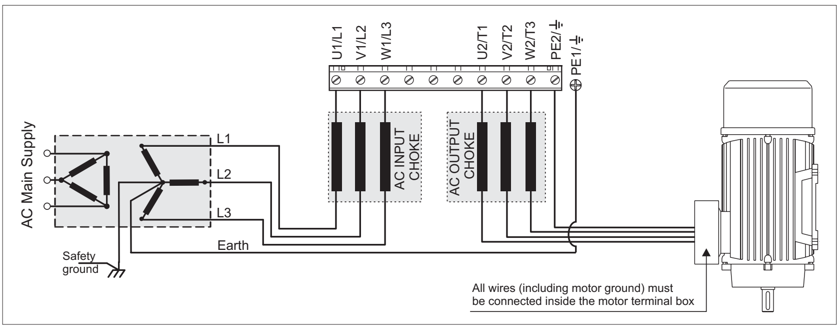
Alimentation puissance et mise à la terre

Si le réseau n'est pas équilibré par rapport à la terre et qu'il n'y a pas de transformateur raingle/étoile, une mauvaise isolation d'un appareil électrique connecté au même réseau que le variateur peut lui causer des troubles de fonctionnement.

1 Les variateurs GEFRAN-SIEI sont prévus pour être alimentés par un réseau triphasé équilibré avec un régime de neutre standard (TN ou TT).

2 Si le régime de neutre est IT, nous vous recommendons d'utiliser un tranformateur triangle/étoile avec point milieu ramené à la terre

Vous pouvez trouver ci-après des exemples de câblage.



Caution

- **Do not connect power supply voltage that exceeds the standard specification voltage fluctuation permissible. If excessive voltage is applied to the Drive, damage to the internal components will result.**
- **Do not operate the Drive without the ground wire connected. The motor chassis should be grounded to earth through a ground lead separate from all other equipment ground leads to prevent noise coupling.**
- **The grounding connector shall be sized in accordance with the NEC or Canadian Electrical Code. The connection shall be made by a UL listed or CSA certified closed-loop terminal connector sized for the wire gauge involved. The connector is to be fixed using the crimp tool specified by the connector manufacturer.**
- **Do not perform a megger test between the Drive terminals or on the control circuit terminals.**
- **Because the ambient temperature greatly affects Drive life and reliability, do not install the Drive in any location that exceeds the allowable temperature. Leave the ventilation cover attached for temperatures of 104° F (40° C) or below.**
- **If the Drive's Fault Alarm is activated, consult the chapter 8, TROUBLESHOOTING, and after correcting the problem, resume operation. Do not reset the alarm automatically by external sequence, etc.**
- **Be sure to remove the desicant dryer packet(s) when unpacking the Drive. (If not removed these packets may become lodged in the fan or air passages and cause the Drive to overheat).**
- **The Drive must be mounted on a wall that is constructed of heat resistant material. While the Drive is operating, the temperature of the Drive's cooling fins can rise to a temperature of 194° F (90°C).**
- **Do not touch or damage any components when handling the device. Changing of isolation gaps or removing the isolation covers is not permissible.**
- **Protect the device from disallowed environmental conditions (temperature, humidity, shock etc.)**
- **No voltage should be connected to the output of the frequency inverter (terminals U2, V2 W2). The parallel connection of several frequency inverters via the outputs and the direct connection of the inputs and outputs (bypass) are not permissible.**
- **A capacitative load (e.g. Var compensation capacitors) should not be connected to the output of the frequency inverter (terminals U2, V2, W2).**
- **The electrical commissioning should only be carried out by qualified personnel, who are also responsible for the provision of a suitable ground connection and a protected power supply feeder in accordance with the local and national regulations. The motor must be protected against overloads.**
- **No dielectric tests should be carried out on parts of the frequency inverter. A suitable measuring instrument (internal resistance of at least 10 kΩ/V) should be used for measuring the signal voltages.**

- *Ne pas raccorder de tension d'alimentation dépassant la fluctuation de tension permise par les normes.*
  Dans le cas d' une alimentation en tension excessive, des composants internes peuvent être endommagés.

Caution

- *Ne pas faire fonctionner le drive sans prise de terre. Le chassis du moteur doit être mis à la terre à l'aide d'un connecteur de terre separé des autres pour éviter le couplage des perturbations. Le connecteur de terre devrait être dimensionné selon la norme NEC ou le Canadian Electrical code. Le raccordement devrait être fait par un connecteur certifié et mentionné à boucle fermé par les normes CSA et UL et dimensionné pour l'épaisseur du cable correspondant. Le connecteur doit être fixé a l'aide d'un instrument de serrage specifié par le producteur du connecteur.*
- *Ne pas exécuter un test megger entre les bornes du drive ou entre les bornes du circuit de contrôle.*
- *Étant donné que la température ambiante influe sur la vie et la fiabilité du drive, on ne devrait pas installer le drive dans des places ou la temperature permise est dépassée. Laisser le capot de ventilation en place pour températures de 104°F (40°C) ou inférieures.*
- *Si la Fault Alarm du drive est activée, consulter la section 8 du manuel concernant les défauts et après avoir corrigé l'erreur, reprendre l'opération. Ne pas réiniliatiser l'alarme automatiquement par une séquence externe, etc….*
- *Lors du déballage du drive, retirer le sachet déshydraté. (Si celui-ci n'est pas retiré, il empêche la ventilation et provoque une surchauffe du drive).*
- *Le drive doit être monté sur un mur construit avec des matériaux résistants à la chaleur. Pendant le fonctionnement du drive, la température des ailettes du dissipateur thermique peut arriver à 194°F (90°).*
- *Manipuler l'appareil de façon à ne pas toucher ou endommager des parties. Il n'est pas permis de changer les distances d'isolement ou bien d'enlever des matériaux isolants ou des capots.*
- *Protéger l'appareil contre des effets extérieurs non permis (température, humidité, chocs etc.).*
- *Aucune tension ne doit être appliquée sur la sortie du convertisseur (bornes U2, V2 et W2). Il n'est pas permis de raccorder la sortie de plusieurs convertisseurs en parallèle, ni d'effectuer une connexion directe de l'entrée avec la sortie du convertisseur (Bypass).*
- *Aucune charge capacitive ne doit être connectée à la sortie du convertisseur (bornes U2, V2 et W2) (par exemple des condensateurs de mise en phase).*
- *La mise en service électrique doit être effectuée par un personnel qualifié. Ce dernier est responsable de l'existence d'une connexion de terre adéquate et d'une protection des câbles d'alimentation selon les prescriptions locales et nationales. Le moteur doit être protégé contre la surcharge*
- *Il ne faut pas éxécuter de tests de rigidité diélectrique sur des parties du convertisseurs. Pour mesurer les tensions, des signaux, il faut utiliser des instruments de mesure appropriés (résistance interne minimale 10 kΩ/V).*

Note! **If the Drives have been stored for longer than two years, the operation of the DC link capacitors may be impaired. Before commissioning devices that have been stored for long periods, connect them to a power supply for two hours with no load connected in order to regenerate the capacitors, (the input voltage has to be applied without enabling the inverter).**

En c*as de stockage des convertisseurs pendant plus de deux ans, il faut tenir compte du fait que les condensateurs du circuit intermédiaire gardent leurs caractéristiques d'origine seulement s'ils sont alimentés avant deux ans, à partir de leur date de fabrication. Avant la mise en service des appareils, qui sont restés stockés aussi longtemps, il est conseillé d'alimenter les convertisseurs pendant au moins deux heures, pour récupérer les caractéristiques d'origine des condensateurs : appliquer une tension d'entrée san*s activer le convertisseur (Disable).

Chapter 1 - Function and Feature (Overview)

The ARTDrive is a field-oriented vector Drive with excellent speed control properties and a high torque.

Available control modes are:
- Field oriented with speed sensor
- Field oriented without speed sensor (Sensorless vect mode)
- V/f control

Space vector modulation keeps the noise level to a minimum.
- Output voltage up to 98% of input voltage
- Self tuning procedure for current, and speed regulators

The Drives are fitted with IGBTs (insulated gate bipolar transistors).
The output is protected against ground fault and phase to phase output short.
Regulator power supply via switched-mode power supply unit from the DC Bus circuit. Power supply backed-up in the event of short-term voltage dips.
Galvanic isolation between control section and command terminals.
Analog inputs designed as differential inputs.

Simple operation of the drive:
- via the terminal strip
- via the user-friendly keypad
- via the PC configuration tool supplied and the RS485 serial interface
- via a fieldbus connection (optional): PROFIBUS-DP, CANopen/DeviceNet.

Fault register storing the last ten fault alarms with the associated lifetime.
Overload control
Engaging a running motor
Three freely configurable analog inputs + two analog outputs on the standard device
Expansion of the analog / digital outputs and analog / digital inputs via option cards
Speed and torque current regulation possible
Adaptive speed regulation
Speed-related alarms
Motor potentiometer function (Increase/Decrease speed by command)
Jog operation
8 internal speed reference values
4 internal accel/decel/emergency ramps
2-wires/3-wires control
Local/Remote control
PID control
Controlled stop in case of AC mains power loss.
Active ride-through of AC line power dips
Configurable commands interface: edge sensitive; pulse start/stop.
Function block scheme execution available as standard (supported by PC configuration tool function block editor)
Diagnostic capture buffer

Chapter 2 - Inspection Procedure, Component Identification and Standard Specification

2.1 Upon Delivery Inspection Procedures

2.1.1 General

A high degree of care is taken in packing the AVy Drives and preparing them for delivery. They should only be transported with suitable transport equipment (see weight data on tables 3.1.1 and 3.1.2). Observe the instructions printed on the packaging. This also applies when the device is unpacked and installed in the control cabinet.

Upon delivery, check the following:

- the packaging for any external damage
- whether the delivery note matches your order.

Open the packaging with suitable tools. Check whether:

- any parts were damaged during transport
- the device type corresponds to your order

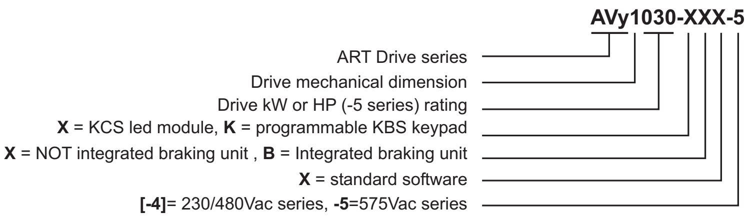
In the event of any damage or of an incomplete or incorrect delivery please notify the responsible sales offices immediately.
The devices should only be stored in dry rooms within the specified temperature ranges .

NOTE! A certain degree of moisture condensation is permissible if this arises from changes in temperature (see section 2.3.1, "Permissible Environmental Conditions"). This does not, however, apply when the devices are in operation. Always ensure that there is no moisture condensation in devices that are connected to the power supply!

2.1.2 Inverter Type Designation

The technical specification of the AVy Drive is stated in the type code. Example:

Figure 2.1.2.1: Inverter Type Designation



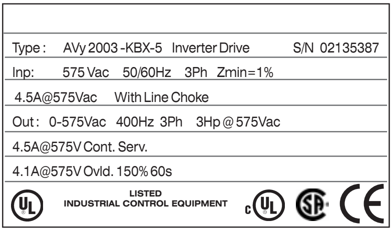
The AVy Drive selected depends on the rated current of the motor. The rated output current at the appropriate service conditions must be greater than or equal to the motor current required.
The speed of the three-phase motor is determined by the number of pole pairs and the frequency (nameplate, data sheet) of the motor concerned. Operation above the rated frequency and speed of the motor must take into account the

specifications given by the manufacturer losses (bearings, unbalance etc.). This also applies to temperature specifications for continuous operation under 20 Hz (poor motor ventilation, not applicable to motors with external ventilation).

2.1.3 Nameplate

Check that all the data stated in the nameplate enclosed to the inverter correspond to what has been ordered.

Figure 2.1.3.1: Identification Nameplate



Type: Inverter model S/N: Serial number

Inp: Power supply voltage - AC Input current -

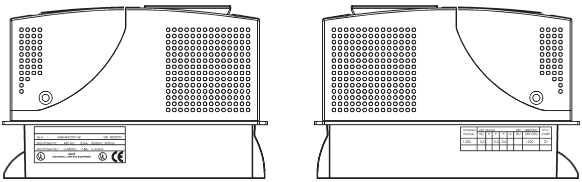
Out: Output voltage - Output current - Output frequency

NOTE! CSA approval for AVy-...-5 series only !

Figure 2.1.3.2: Firmware & Card Revision Level Nameplate

Firmware Release	HW release						S/N 0062330	Prod.
	D	F	P	R	S	BU	SW. CFG	CONF
2.200	0.A		0.A	0.A			1.000	D1

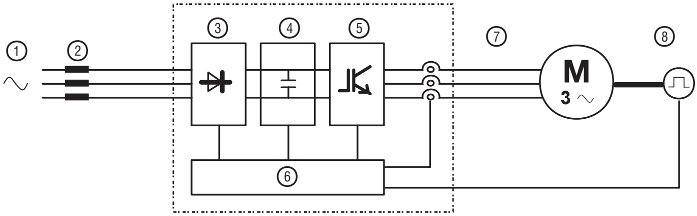
Figure 2.1.3.3: Nameplates Position



2.2 Component Identification

An AVy Drive converts the constant voltage and frequency of a three-phase power supply into a direct voltage and then converts this direct voltage into a new three-phase power supply with a variable voltage and frequency. This variable three-phase power supply can be used for the infinitely variable adjustment of the speed of three-phase asynchronous motors.

Figure 2.2.1: Basic Setup of Frequency Inverter



1	AC Input supply voltage	
2	AC Mains choke	(see section 4.7.1)
3	Three-phase rectifier bridge	Converts the alternating current into direct current using a three phase full wave bridge.
4	DC intermediate circuit	With charging resistor and smoothing capacitor. Direct voltage (U_{DC}) = √2 x Mains voltage (U_{LN})
5	IGBT inverter	Converts direct voltage to a variable three-phase alternating voltage with variable frequency.
6	Configurable control section	Modules for open-loop and closed-loop control of the power section. This is used for processing control commands, reference values and actual values.
7	Output voltage:	Three-phase, variable alternating voltage.
8	Encoder	For speed feedback (see section 3.4.2)

2.3 Standard Specifications

2.3.1 Permissible Environmental Conditions

ENVIRONMENT

T_A Ambient temperature [°C]	0 … +40; +40…+50 with derating
T_A Ambient temperature [°F]	32 … +104; +104…+122 with derating
Installation location	Pollution degree 2 or better (free from direct sunlight, vibration, dust, corrosive or inflammable gases, fog, vapour oil and dripped water, avoid saline environment)
Degree of protection	IP20 IP54 for the cabinet with externally mounted heatsink for size type 1007 to 3150 (230/480Vac series) and 2002 to 3020 (575Vac series)
Installation altitude	Up to 2000 m (6560 feet) above sea level; over 1000 m (3280 feet) a current reduction of 1.2% for every 100 m (328 feet) of additional height applies .
Temperature:	
operation [1]	0…40°C (32°…104°F)
operation [2]	0…50°C (32°…122°F)
storage	-25…+55°C (-13…+131°F), class 1K4 per EN50178 -20…+55°C (-4…+131°F), for devices with keypad
transport	-25…+70°C (-13…+158°F), class 2K3 per EN50178 -20…+60°C (-4…+140°F), for devices with keypad
Air humidity:	
operation	5 % to 85 %, 1 g/m³ to 25 g/m³ without moisture condensation or icing (Class 3K3 as per EN50178)
storage	5% to 95 %, 1 g/m³ to 29 g/m³ (Class 1K3 as per EN50178)
transport	95 % [3], 60 g/m³ [4]
Air pressure:	
operation	[kPa] 86 to 106 (class 3K3 as per EN50178)
storage	[kPa] 86 to 106 (class 1K4 as per EN50178)
transport	[kPa] 70 to 106 (class 2K3 as per EN50178)

STANDARD

Climatic conditions	IEC 68-2 Part 2 and 3
Clearance and creepage	EN 50178, UL508C, UL840 degree of pollution 2
Vibration	IEC68-2 Part 6
EMC compatibility	EN61800-3 (see “EMC Guidelines” instruction book)
Approvals	CE, UL, cUL, CSA (for AVy-...-5 series only).

1) Parameter **Ambient temp** = 40°C (104°)
Ambient temp = 0 ... 40°C (32°...104°F)
Over 40°C: - current reduction of 2% of rated output current per K
- remove front plate (better than class 3K3 as per EN50178)

2) Parameter **Ambient temp** = 50°C (122°F)
Ambient temp = 0 ... 50°C (32°...122°F)
Current derated to 0.8 rated ouput current
Over 40°C (104°): removal of the top cover (better than class 3K3 as per EN50178)

3) Greatest relative air humidity occurs with the temperature @ 40°C (104°F) or if the temperature of the device is brought suddenly from -25 ...+30°C (-13°...+86°F).

4) Greatest absolute air humidity if the device is brought suddenly from 70...15°C (158°...59°F).

Disposal of the Device

The AVy Drive can be disposed as electronic scraps in accordance with the currently valid national regulations for the disposal of electronic parts.
The plastic covering of the Drives, up to sizes 3150 (230/480Vac series) and 2002 to 3020 (575Vac series), are recyclable: the material used is >ABS+PC<.

2.3.2 AC Input/Output Connection

- AVy...-4 (230/480Vac)
Suitable for use on a circuit capable of delivering not more than (*) rms (see table below) Symmetrical Amperes, 400 Vac +10% maximum:

Models		*Max input short circuit current*
1007 to 4370	(*) :	5000 A
5450 to 71320	(*) :	10000 A
81600	(*) :	18000 A

- AVy...-5 (575Vac)
Suitable for use on a circuit capable of delivering not more than (*) rms (see table below) Symmetrical Amperes, 575 Vac +10% maximum:

Models		*Max input short circuit current*
2002 to 4040	(*) :	5000 A
5050 to 7150	(*) :	10000 A
8200	(*) :	18000 A

Also the insertion of a Mains inductance should be take into account (see chapter 4.7.1).
No external connection of the regulator power supply to the existing AC Input supply is required since the power supply is taken from the DC Link circuit. However, a 24V backup input for the regulator power supply can be used if it is desired to monitor status and diagnostic information across a power failure.

When commissioning, set the **B0B.00 - Mains voltage** parameter to the value of the AC Input voltage concerned. This automatically sets the threshold for the Undervoltage and Overvoltage alarms to the appropriate levels.

NOTE! A "*Sequencer reset*" command is required to restart the drive when input voltage is restored.

NOTE! In some cases AC Input chokes, and possibly noise suppression filters should be fitted on the AC Input side of the device in order to operate the AVy Drive. See chapter "Chokes/Filters".

Adjustable Frequency Drives and AC Input filters have ground discharge currents greater then 3.5 mA. EN 50178 specifies that with discharge currents greater than 3.5 mA the protective conductor ground connection (PE1) must be fixed type.

Table 2.3.2.1-A: AC Input/Output Specifications for 230/480Vac series

	Type		1007	1015	1022	1030	2040	2055	2075	3110	3150	4220	4300	4370	5450	5550	6750	7900	71100	71320	81600
OUTPUT	Inverter Output (IEC 146 class1), Continuous service	[kVA]	1.6	2.7	3.8	5	6.5	8.5	12	16.8	22.4	32	42	55	64	79	98	128	145	173	224
	Inverter Output (IEC 146 class2),150% overload for 60s	[kVA]	1.4	2.4	3.4	4.5	5.9	7.7	10.9	15.3	20.3	29	38.2	50	58.3	72	89.2	116.5	132	157.5	204
	P_N mot (recommended motor output):																				
	@ U_{LN}=230Vac; f_{SW}=default; IEC 146 class 1	[kW]	0.37	0.75	1.1	1.5	2.2	3	4	5.5	7.5	11	18.5	22	22	30	37	55	55	75	90
	@ U_{LN}=230Vac; f_{SW}=default; IEC 146 class 2	[kW]	0.37	0.75	1.1	1.5	2.2	3	4	5.5	7.5	11	15	18.5	22	30	37	45	55	55	90
	@ U_{LN}=400Vac; f_{SW}=default; IEC 146 class 1	[kW]	0.75	1.5	2.2	3	4	5.5	7.5	11	15	22	30	37	45	55	75	90	110	132	160
	@ U_{LN}=400Vac; f_{SW}=default; IEC 146 class 2	[kW]	0.75	1.5	2.2	3	4	5.5	7.5	11	15	22	30	37	45	55	55	90	90	110	160
	@ U_{LN}=460Vac; IEC 146 class 1	[Hp]	1	2	3	3	5	7.5	10	15	20	30	40	50	60	75	100	125	150	150	200
	@ U_{LN}=460Vac; IEC 146 class 2	[Hp]	0.75	1.5	2	3	5	7.5	10	15	20	25	30	40	50	60	75	100	125	150	200
	U_2 Max output voltage	[V]	0.98 x U_{LN} (AC Input voltage)																		
	f_2 Max output frequency	[Hz]	500												200						
	I_{2N} Rated output current :																				
	@ U_{LN}=230-400Vac; f_{SW}= default; IEC 146 class 1	[A]	2.4	4	5.6	7.5	9.6	12.6	17.7	24.8	33	47	63	79	93	114	142	185	210	250	324
	@ U_{LN}=230-400Vac; f_{SW}=default; IEC 146 class 2	[A]	2.2	3.6	5.1	6.8	8.7	11.5	16.1	22.5	30	43	58	72	85	104	129	169	191	227	295
	@ U_{LN}=460Vac; f_{SW}=default; IEC 146 class 1	[A]	2.1	3.5	4.9	6.5	8.3	11	15.4	21.6	28.7	40	54	68	81	99	124	160	183	217	282
	@ U_{LN}=460Vac; f_{SW}=default; IEC 146 class 2	[A]	1.9	3.2	4.4	5.9	7.6	10	14	19.6	26	36	50	62	74	90	112	146	166	198	256
	f_{SW} switching frequency (Default)	[kHz]	8												4						
	f_{SW} switching frequency (Higher)	[kHz]	16									16			8						--
	Iovld (short term overload current, 200% of I_{2N} for 0.5s on 60s)	[A]	4.4	7.2	10.2	13.6	17.4	23	32.2	45	60	86	116	144	170	208	258	338	382	454	n.a.
	Derating factor:																				
	K_V at 460/480Vac		0.87					0.96	0.87	0.93	0.90	0.87									
	K_T for ambient temperature		0.8 @ 50°C (122°F)																		
	K_F for switching frequency		0.7 for higher f_{SW}																		
INPUT	U_{LN} AC Input voltage	[V]	230 V -15% ... 480 V +10%, 3Ph																		
	AC Input frequency	[Hz]	50/60 Hz ±5%																		
	I_N AC Input current for continuous service : - Connection with 3-phase reactor																				
	@ 230Vac; IEC 146 class1	[A]	1.7	2.9	4	5.5	7	9.5	14	18.2	25	39	55	69	84	98	122	158	192	220	n.a.
	@ 400Vac; IEC 146 class1	[A]	1.9	3.3	4.5	6.2	7.9	10.7	15.8	20.4	28.2	44	62	77	94	110	137	177	216	247	309
	@ 460Vac; IEC 146 class1	[A]	1.7	2.9	3.9	5.4	6.7	9.3	13.8	17.8	24.5	37	53	66	82	96	120	153	188	214	268
	- Connection without 3-phase reactor																				
	@ 230Vac; IEC 146 class1	[A]	3.6	4.4	6.8	7.9	11	15.5	21.5	27.9	35.4	For these types an external inductance is recommended									
	@ 400Vac; IEC 146 class1	[A]	3.9	4.8	7.4	9	12	16.9	24.2	30.3	40										
	@ 460Vac; IEC 146 class1	[A]	3.4	4.2	6.4	7.8	10.4	14.7	21	26.4	34.8										
	Max short circuit power without line reactor (Zmin=1%)	[kVA]	160	270	380	500	650	850	1200	1700	2250	3200	4200	5500	6400	7900	9800	12800	14500	17300	22400
	Overvoltage threshold	[V]	820 V_{DC}																		
	Undervoltage threshold	[V]	230 V_{DC} (for 230 V_{AC} mains), 400 V_{DC} (for 400V_{AC} mains), 460 V_{DC} for 460 V_{AC} mains)																		
	Braking IGBT Unit (standard drive)		Standard internal (with external resistor); Braking torque 150%									Option internal (with external resistor); Braking torque 150%					External braking unit (optional)				

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Table 2.3.2.1-B: AC Input/Output Specifications for 575Vac series

	Type		2002	2003	2005	3007	3010	3015	3020	4025	4030	4040	5050	5060	5075	6100	7125	7150	8200
	Mechanical dimension L x H x D (mm)		151.5 x 306.5 x 199.5			208 x 323 x 240				350 x 569 x 268		350 x 569 x	418 x 605 x 320			509 x 921 x 297.5	509 x 1113 x 297.5		t.b.d.
OUTPUT	Inverter Output (IEC 146 class1), Continuous service	[kVA]	3.8	4.5	7.0	10.8	13.7	18.6	24.1	30	36	46	58	69	86	109	136	157	210
	Inverter Output (IEC 146 class2), 150% overload for 60s	[kVA]	3.4	4.1	6.3	9.8	12.5	16.9	21.9	27	33	42	53	63	78	99	124	143	191
	P_N mot (recommended motor output):																		
	@ U_{LN}=575Vac; f_{SW}=default; IEC 146 class 1	[Hp]	2	3	5	7.5	10	15	20	25	30	40	50	60	75	100	125	150	200
	@ U_{LN}=575Vac; f_{SW}=default; IEC 146 class 2	[Hp]	2	3	5	7.5	10	15	20	25	30	40	50	60	75	100	125	150	200
	U_2 Max output voltage	[V]	0.98 x U_{LN} (AC Input voltage)																
	f_2 Max output frequency (*)	[Hz]	400						200										
	I_{2N} Rated output current :																		
	@ U_{LN}=575Vac; f_{SW}= default; IEC 146 class 1	[A]	3.8	4.5	7.0	10.8	13.8	18.7	24.2	30	36	46	58	69	86	109	137	158	211
	@ U_{LN}=575Vac; f_{SW}=default; IEC 146 class 2	[A]	3.4	4.1	6.4	9.8	12.6	17.0	22.0	27	33	42	53	63	78	99	125	144	192
	f_{SW} switching frequency (Default)	[kHz]	8						4									2	
	f_{SW} switching frequency (Higher)	[kHz]	16						8							4			2
	Iovld (short term overload current, 200% of I_{2N} for 0.5s on 60s)	[A]	7.0	8.2	12.8	19.6	25.2	34.0	44.0	54	66	84	106	126	156	198	249	288	384
	Derating factor:																		
	K_T for ambient temperature		0.8 @ 50°C (122°F)																
	K_F for switching frequency		0.7 for higher f_{SW}						0.87	0.7 for higher f_{SW}					0.64	t.b.d.		0.87	t.b.d.
INPUT	U_{LN} AC Input voltage	[V]	500 -10% / 575V +10%...- 10% , 3Ph																
	AC Input frequency	[Hz]	50/60 Hz ±5%																
	I_N AC Input current for continuous service :																		
	- Connection with 3-phase reactor																		
	@ 575Vac; IEC 146 class1	[A]	3.8	4.7	7.4	11.7	15	19.8	25.9	31	35	46	60	68	85	114	146	163	220
	- Connection without 3-phase reactor																		
	@ 575Vac; IEC 146 class1	[A]	5.3	6.1	9.9	17	20.7	27.6	33.9	For these types DC choke is inside									
	Max short circuit power without line reactor (Zmin=1%)	[kVA]	380	450	700	1080	1370	1860	2410	3000	3600	4600	5800	6900	8600	10900	13700	15700	21000
	Overvoltage threshold	[V]	1000 V_{DC}																
	Undervoltage threshold	[V]	565 V_{DC} (for 575 V_{AC} mains)																
	Braking IGBT Unit (standard drive)		Standard internal (with external resistor); Braking torque 150%							Opt. Int. (with ext. res); Br. trq 150%		External braking unit (optional)							

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2.3.3 AC Input Current

NOTE! The Input current of the Drive depends on the operating state and the service conditions of the connected motor, and the use of input reactors. The table 2.3.2.1 shows the values corresponding to rated continuous service (IEC 146 class 1), taking into account typical output power factor for each size.

2.3.4 AC Output

The output of the AVy Drive is ground fault and phase to phase output short protected. The switching frequency is constant in the speed range and depends on the drive size.

NOTE! The connection of an external voltage to the output terminals of the Drive is not permitted! It is possible to disconnect the motor from the Drive output, after the Drive has been disabled.

The value for the continuous output current rating (I_{CONT}) depends on AC Input voltage (K_V), Ambient temperature (K_T) and Switching frequency (K_F):

$I_{CONT} = I_{2N} \times K_V \times K_T \times K_F$ (Values of derating factor are the listed on table 2.3.2.1)

with an overload capacity $I_{MAX} = 1.36 \times I_{CONT}$ for 60 seconds

The applicable deratings are automatically set when selecting the appropriate values of AC Input voltage, Ambient temperature and Switching frequency.

Recommended motor outputs

The coordination of the motor rated power with the Drive type, presented in the table below, refers to the use of standard 4 poles motors with a rated voltage equal to the rated voltage of the input supply. As for those motors with different voltages, the type of Drive to use is determined by the rated current of the motor.

Motor nominal current cannot be lower than 1/3 rated output current [0.3 x I_{2N}].

Magnetizing motor current must not be higher of I_{CONT}.

NOTE! For service conditions with overload higher than 150%, the nominal current must be derated.

Table 2.3.3.1 shows nominal current values for typical service profiles (Ambient temperature =40°C [104°F], standard switching frequency). For cycles with nominal current applied after the overload, the minimum duration is also specified. For cycles shorter than the minimum duration specified, the current following the overload should be reduced to a level lower than the nominal, so that the RMS average over the cycle does not exceed the continuous current, I_{CONT}.

Similar criteria apply for operation with additional derating factors.

Table 2.3.4.1: Nominal Drive Current

AVy-…-4 (230…480Vac)		1007	1015	1022	1030	2040	2055	2075	3110	3150	4220	4300	4370	5450	5550	6750	7900	71100	71320	81600
- I_{2N} Rated output current (@ U_{LN}=230-400Vac) :																				
Continuous service, no overload (IEC 146 class 1)	[A]	2.4	4	5.6	7.5	9.6	12.6	17.7	24.8	33	47	63	79	93	114	142	185	210	250	324
Overload service 150%x60s followed by In , min. cycle time 360s (IEC 146 class2)	[A]	2.2	3.6	5.1	6.8	8.7	11.5	16.1	22.5	29.9	42.6	57.1	71.6	84.3	103.4	128.7	167.7	190.4	227	293.8
Overload service 200%x10s followed by In , min. cycle time 30s	[A]	1.6	2.7	3.8	5.1	6.5	8.6	12.0	16.9	22.4	32	42.8	53.7	63.2	77.5	96.6	125.8	142.8	170	220.3
Overload service 200%x60s followed by In , min. cycle time 160s	[A]	1.6	2.7	3.8	5.1	6.5	8.6	12.0	16.9	22.4	32	42.8	53.7	63.2	77.5	96.6	125.8	142.8	170	220.3
Overload service 250%x10s followed by In , min. cycle time 25s	[A]	1.3	2.2	3.0	4.1	5.2	6.8	9.6	13.5	18	25.6	34.3	43	50.6	62	77.2	100.6	114.2	136	176.3
Overload service 300%x10s followed by In , min. cycle time 25s	[A]	1.1	1.8	2.5	3.4	4.3	5.7	8.0	11.2	15	16	21.4	27	31.6	38.8	48.3	63	71.4	85	110.2
Overload service 300%x60s followed by In , min.cycle time 130s	[A]	1.1	1.8	2.5	3.4	4.3	5.7	8.0	11.2	15	16	21.4	27	31.6	38.8	48.3	63	71.4	85	110.2
- I_{2N} x K_V Rated output current (@ U_{LN}=460/480Vac) :																				
Continuous service, no overload (IEC 146 class 1)	[A]	2.1	3.5	4.9	6.5	8.3	11	15.4	21.6	28.7	40	54	68	81	99	124	160	183	217	282
Overload service 150%x60s followed by I_n , min. cycle time 360s (IEC 146 class2)	[A]	1.9	3.2	4.4	5.9	7.6	10	14	19.6	26	36.3	49	61.7	73.4	89.8	112.4	145.1	166	196.7	255.7
Overload service 200%x10s followed by I_n , min. cycle time 30s	[A]	1.4	2.4	3.3	4.4	5.6	7.5	10.5	14.7	19.5	27.2	36.7	46.2	55.1	67.3	84.3	108.8	124.4	147.6	191.8
Overload service 200%x60s followed by I_n , min. cycle time 160s	[A]	1.4	2.4	3.3	4.4	5.6	7.5	10.5	14.7	19.5	27.2	36.7	46.2	55.1	67.3	84.3	108.8	124.4	147.6	191.8
Overload service 250%x10s followed by I_n , min. cycle time 25s	[A]	1.1	1.9	2.7	3.5	4.5	6.0	8.4	11.7	15.6	21.8	29.4	37	44	54	67.5	87	99.6	118	153.4
Overload service 300%x10s followed by I_n , min. cycle time 25s	[A]	0.9	1.6	2.2	2.9	3.8	5.0	7.0	9.8	13	13.6	18.4	23.1	27.5	33.7	42.2	54.4	62.2	73.8	95.9
Overload service 300%x60s followed by I_n , min. cycle time 130s	[A]	0.9	1.6	2.2	2.9	3.8	5.0	7.0	9.8	13	13.6	18.4	23.1	27.5	33.7	42.2	54.4	62.2	73.8	95.9

AVy-…-5 (575Vac)		2002	2003	2005	3007	3010	3015	3020	4025	4030	4040	5050	5060	5075	6100	7125	7150	8200		
- I_{2N} x K_V Rated output current (@ U_{LN}=575Vac) :																				
Continuous service, no overload (IEC 146 class 1)	[A]	3.8	4.5	7.0	10.8	13.8	18.7	24.2	30	36	46	58	69	86	109	137	158	211		
Overload service 150% x 60s followed by In, min.cycle time 360s (IEC 146 class2)	[A]	3.5	4.1	6.4	9.8	12.6	17.0	22.0	27	33	42	53	63	78	99.2	124.7	144	192		
Overload service 200% x 10s followed by In, min.cycle time 30s	[A]	2.6	3.1	4.8	7.4	9.5	12.8	16.5	20.3	24.8	31.5	39.8	47.3	58.5	74.1	93.2	107.4	143.5		
Overload service 200% x 60s followed by In, min.cycle time 160s	[A]	2.6	3.1	4.8	7.4	9.5	12.8	16.5	20.3	24.8	31.5	39.8	47.3	58.5	74.1	93.2	107.4	143.5		
Overload service 250% x 10s followed by In, min.cycle time 25s	[A]	2.1	2.5	3.8	5.9	7.6	10.2	13.2	16.2	19.8	25.2	31.8	37.8	46.8	59.3	74.6	85.9	114.8		
Overload service 300% x 10s followed by In, min.cycle time 25s	[A]	1.8	2.1	3.2	4.9	6.3	8.5	11.0	13.5	16.5	21.0	26.5	31.5	39.0	49.4	62.1	71.6	95.6		
Overload service 300% x 60s followed by In, min.cycle time 130s	[A]	1.8	2.1	3.2	4.9	6.3	8.5	11.0	13.5	16.5	21.0	26.5	31.5	39.0	49.4	62.1	71.6	95.6		

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2.3.5 I/O and Encoder Specifications

I/O

Enable inputs	0 / 15...30 V	3.2...6.4 mA	(5 mA @ 24 V)
Analog inputs	Selectable	0... ± 10 V	0.25mA max
	0...20 mA	10V max	
	4...20 mA	10 V max	
	Max common mode voltage: 0...± 10 V		
Analog outputs	0...± 10 V	5 mA max per output	
Digital inputs	0 / 15...30 V	3.2...6.4 mA	(5 mA @ 24 V)
Digital outputs	Supply	+ 15...35 V	
	Signals	+ 15...35 V	40 mA max per output

Int. voltage supply

Load capacity	+ 5 V, 160 mA	Plug connector
	+ 10 V, 10 mA	Terminal 7
	- 10 V, 10 mA	Terminal 8
	+ 24 V, 120 mA	Terminal 19
Tolerance	+ 10 V	± 3 % [1)]
	- 10 V	± 3 % [1)]
	+ 24 V	+ 20 ... 30 V, not stabilized
	XE for digital encoder, PIN 7/9	

[1)] The tolerance between positive and negative amplitudes is ± 0.5%

2.3.6 Performance

Table 2.3.6.1: Maximum Output Frequency

Regulation mode	Output frequency (Hz)					
	Maximum				Minimum (*)	Resolution
	Switching frequency (kHz)					
	2	4	8	16		
Field oriented	200	200	400	400	0	0.005
Sensorless vect	200	200	200	200	6 Hz	
V/f control	200	300	600	600	2 x motor slip freq	

(*) 1,5 x Rated motor torque capability

Table 2.3.6.2: Speed Feedback Resolution

Regulation mode	FSS (B01.00-Full scale speed)	Speed reference res. (rpm)	Speed feedback resolution (rpm)			Limit speed (rpm)
			Enc Sin	Enc Dig Fmode	Enc Dig Fpmode	
Field oriented	≤2048 2048<FSS≤4096 4096<FSS≤8192 8132<FSS≤16384	0.125 0.25 0.5 1	Highest value of either [60000/(256 x ppr] or Spd Ref. Resol.	Highest value of either (60000/(40 x ppr) or Spd Ref. Resol.	Spd Ref. Resol.	4096 8192 16384 32768
Sensorless vect	≤2048 2048<FSS≤4096 4096<FSS≤8192 8132<FSS≤16384	0.125 0.25 0.5 1	Highest value of either 0.3 or Spd Ref. Resol.			4096 8192 16384 32768
V/f control	≤2048 2048<FSS≤4096 4096<FSS≤8192 8132<FSS≤16384	0.125 0.25 0.5 1	N/A			4096 8192 16384 32768

Table 2.3.6.3: Speed Regulator Bandwidth

Regulation mode	Spd Control range	Max Spd reg bandwidth (rad/sec)			Typ Spd Reg Accuracy (**) [%]
		Enc Sin	Std dig enc mode=F	Std dig enc mode=FP	
Field oriented	>10000:1	300	100	300 (Spd>15rpm for ppr=1024)	0.01
Sensorless vect	>10:1	100 (Spd>FSS/100)			0.5@FSS
V/f control	>100:1	N/A			1%

Table 2.3.6.4: Torque Current Specifications

Regulation mode	Torque ref. resolution	Typ Torque Reg Accuracy (***)[%]	Trq Control range	Typ Trq Rise time [ms]
Field oriented	>1:1000	4	>20:1	0.8
Sensorless vect	>1:1000	8	>20:1	0.8
V/f control	N/A	N/A	N/A	N/A

(**) Full scale speed FSS=1500rpm=100%

(***) Mot nom torque=100%, Spd range (FSS, to FSS/10), Trq range (Motor nameplate trq, to Motor nameplate trq/10)

Chapter 3 - Installation Guidelines

3.1 Mechanical Specification

Figure 3.1.1: Drive Dimensions, Sizes 1007 up to 3150(230...480Vac) and 2002 up to 3020 (575Vac)

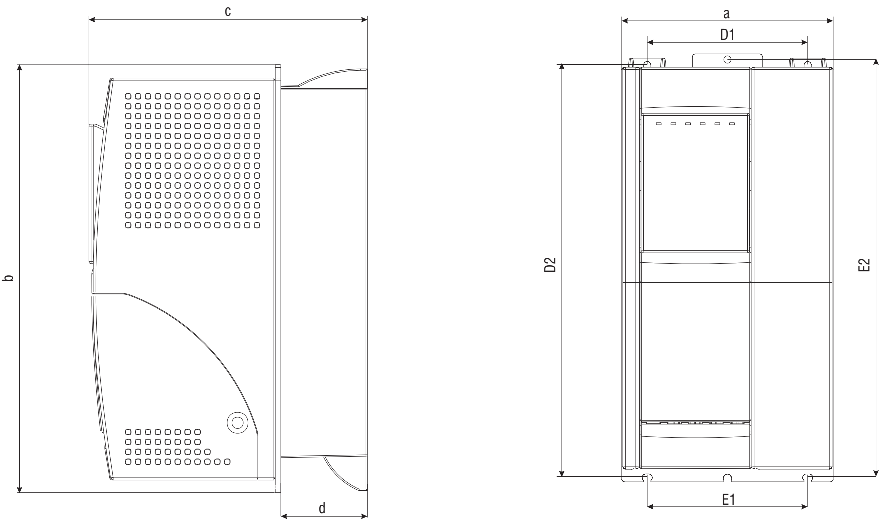

Table 3.1.1: Drive Dimensions and Weights Sizes 1007 up to 3150(230...480Vac) and 2002 up to 3020 (575Vac)

<table>
<tr><th rowspan="2"></th><th rowspan="2">Type</th><th colspan="8">Drive dimensions: mm (inch)</th><th>Weight</th></tr>
<tr><th>a</th><th>b</th><th>c</th><th>d</th><th>D1</th><th>D2</th><th>E1</th><th>E2</th><th>kg (lbs)</th></tr>
<tr><td rowspan="9">AVy…-4 (230V…480V)</td><td>1007</td><td rowspan="4">105.5 (4.1)</td><td rowspan="7">306.5 (12.0)</td><td rowspan="7">199.5 (7.8)</td><td rowspan="7">62 (2.4)</td><td rowspan="4">69 (2.7)</td><td rowspan="7">296.5 (11.6)</td><td rowspan="4">69 (2.7)</td><td rowspan="7">299.5 (11.7)</td><td>3.5 (7.7)</td></tr>
<tr><td>1015</td><td>3.6 (7.9)</td></tr>
<tr><td>1022</td><td rowspan="2">3.7 (8.1)</td></tr>
<tr><td>1030</td></tr>
<tr><td>2040</td><td rowspan="3">151.5 (5.9)</td><td rowspan="3">115 (4.5)</td><td rowspan="3">115 (4.5)</td><td rowspan="3">4.95 (10.9)</td></tr>
<tr><td>2055</td></tr>
<tr><td>2075</td></tr>
<tr><td>3110</td><td rowspan="2">208 (8.2)</td><td rowspan="2">323 (12.7)</td><td rowspan="2">240 (9.5)</td><td rowspan="2">84 (3.3)</td><td rowspan="2">168 (6.6)</td><td rowspan="2">310.5 (12.2)</td><td rowspan="2">164 (6.5)</td><td rowspan="2">315 (12.4)</td><td rowspan="2">8.6 (19)</td></tr>
<tr><td>3150</td></tr>
<tr><td rowspan="7">AVy…-5 (575V)</td><td>2002</td><td rowspan="3">151.5 (5.9)</td><td rowspan="3">306.5 (12.0)</td><td rowspan="3">199.5 (7.8)</td><td rowspan="3">62 (2.4)</td><td rowspan="3">115 (4.5)</td><td rowspan="3">296.5 (11.6)</td><td rowspan="3">115 (4.5)</td><td rowspan="3">299.5 (11.7)</td><td rowspan="2">4.6 (10.1)</td></tr>
<tr><td>2003</td></tr>
<tr><td>2005</td><td>4.8 (10.6)</td></tr>
<tr><td>3007</td><td rowspan="4">208 (8.2)</td><td rowspan="4">323 (12.7)</td><td rowspan="4">240 (9.5)</td><td rowspan="4">84 (3.3)</td><td rowspan="4">168 (6.6)</td><td rowspan="4">310.5 (12.2)</td><td rowspan="4">164 (6.5)</td><td rowspan="4">315 (12.4)</td><td rowspan="2">8.2 (18)</td></tr>
<tr><td>3010</td></tr>
<tr><td>3015</td><td rowspan="2">8.8 (19.4)</td></tr>
<tr><td>3020</td></tr>
</table>

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Figure 3.1.2: Mounting Methods, Sizes 1007 up to 3150(230...480Vac) and 2002 up to 3020 (575Vac)

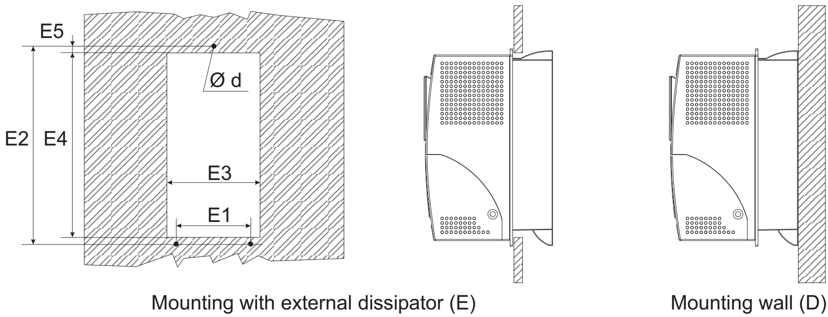

Table 3.1.2: Mounting Methods, Sizes 1007 up to 3150(230...480Vac) and 2002 up to 3020 (575Vac)

	Type	Drive dimensions: mm (inch)					
		E1	E2	E3	E4	E5	Ø d
AVy...-4 (230V...480V)	**1007**	69 (2.7)	299.5 (11.7)	99.5 (3.9)	284 (11.2)	9 (0.35)	M5
	1015						
	1022						
	1030						
	2040	115 (4.5)		145.5 (5.7)			
	2055						
	2075						
	3110	164 (6.5)	315 (12.4)	199 (7.8)	299.5 (11.8)		
	3150						
AVy...-5 (575V)	**2002**	115 (4.5)	299.5 (11.7)	145.5 (5.7)	284 (11.2)	9 (0.35)	
	2003						
	2005						
	3007	164 (6.5)	315 (12.4)	199 (7.8)	299.5 (11.8)		
	3010						
	3015						
	3020						

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Figure 3.1.3: Drive Dimensions, Sizes 4220 up to 81600 (230...480Vac) and 4025 up to 8200 (575Vac)

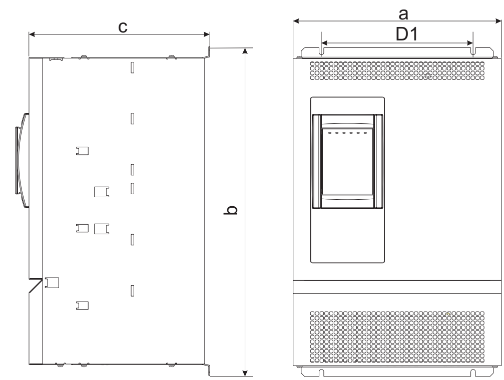

Figure 3.1.4: Mounting Methods, Sizes 4220 up to 81600 (230...480Vac) and 4025 up to 8200 (575Vac)

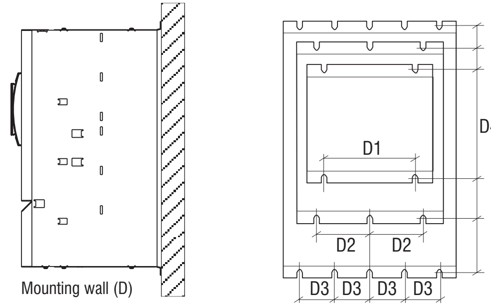

Table 3.1.2: Drive Dimensions and Weights Sizes 4220 up to 81600 (230...480Vac) and 4025 up to 8200 (575Vac)

Type		Weight	Drive dimensions: mm (inch)							
		kg (lbs)	a	b	c	D1	D2	D3	D4	Ø
AVy...-4 (230V...480V)	4220	18 (39.6)	309 (12.1)	489 (19.2)	268 (10.5)	225 (8.8)	-	-	475 (18.7)	M6
	4300	22 (48.59)			308 (12.1)					
	4370	22.2 (48.9)								
	5450	34 (74.9)	376 (14.7)	564 (22.2)		-	150 (5.9)		550 (21.6)	
	5550									
	6750	59 (130)	509 (20)	741 (29.2)	297.5 (11.7)	-	-	100 (3.9)	725 (28.5)	
	7900	75.4 (166.1)		909 (35.8)					891 (35)	
	71100	80.2 (176.7)								
	71320	86.5 (190.6)								
	81600	109 (240.3)		965 (38)	442 (17.4)				947 (37.3)	
AVy...-5 (575V)	4025	28.6 (63.1)	350 (13.8)	569 (22.4)	268 (10.5)	-	150 (15.91)	-	555 (21.2)	
	4030									
	4040	31.6 (67.9)			320 (12.6)					
	5050	47 (103.6)	418 (16.4)	605 (23.8)					590 (23.2)	
	5060									
	5075									
	6100	83 (183)	509 (20)	921 (36.2)	297.5 (11.7)	-	-	100 (3.9)	903 (35.5)	
	7125	118 (260.1)		1113 (43.8)					1095 (43.1)	
	7150									
	8200			1183 (46.6)					1165 (45.9)	

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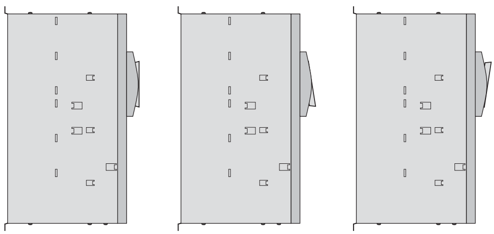
Figure 3.1.5: Keypad Positioning



To allow a confortable viewing angle, the keypad can be oriented on three different position.

3.2 Watts Loss, Heat Dissipation, Internal Fans and Minimum Cabinet Opening Suggested for Cooling

The heat dissipation of the Drives depends on the operating state of the connected motor. The table below shows values that refer to operation at default switching frequency (see section 2.3.4, "AC Output"), Tamb ≤40°C, typ. motor power factor and nominal continuous current.

Table 3.2.1: Heat Dissipation and Required Air Flow

AVy…-4 (230…480Vac)	Heat Dissipation @U_{LN}=230Vac [W]	@U_{LN}=400Vac [W]	@U_{LN}=460Vac [W]	Airflow of fan Internal fan [m^3/h]	Heatsink fans [m^3/h]
1007	38	48.2	45.0	11	-
1015	62	77.5	72.0	11	30
1022	83	104.0	96.3	11	30
1030	110	138.3	126.7	11	30
2040	144	179.5	164.1	11	2x30
2055	184	233.6	215.6	11	2x30
2075	264	327.4	300.8	11	2x30
3110	304	373	340	30	2x79
3150	416	512	468	30	2x79
4220	526	658	582		80
4300	691	864	780		170
4370	880	1100	1000		170
5450	1000	1250	1100		340
5550	1264	1580	1390		340
6750	1560	1950	1750		650
7900	1952	2440	2200		975
71100	2280	2850	2560		975
71320	2720	3400	3050		975
81600	N.A.	4400	3950		1820

AVy…-5 (575Vac)	Heat Dissipation U_{LN} = 575Vac [W]	Airflow of fan Internal fan [m^3/h]	Heatsink fans [m^3/h]
2002	75	11	30
2003	80	11	30
2005	128	11	2x30
3007	215	30	2x79
3010	266	30	2x79
3015	338	30	2x79
3020	453	30	2x79
4025	515		2x80
4030	620		2x80
4040	810		170
5050	1070		340
5060	1155		340
5075	1480		340
6100	2150		650
7125	2760		975
7150	2760		975
8200	3250		975

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NOTE!
- f_{SW}=default; I_2=I_{2N}
- All AVy drives have internal fans.
- Heat dissipation losses refer to default switching frequency.

Table 3.2.2: Minimum Cabinet Opening Suggested for the Cooling

AVy…-4 (230…480Vac)	Minimum cooling opening (cm^2) [sq.inch]	
	Control section	**Heatsink**
1007	31 (4.8)	36 (5.6)
1015		
1022		
1030		
2040		72 (11.1)
2055		
2075		
3110	36 (5.6)	128 (19.8)
3150		
4220	2x150 (2x 23.5)	
4300	2x200 (2x31)	
4370		
5450	2x370 (2x57.35)	
5550		
6750	2x620 (2x96.1)	
7900		
71100		
71320		
81600	2 x 1600 (2 x 248)	

AVy…-5 (575Vac)	Minimum cooling opening (cm^2) [sq.inch]	
	Control section	**Heatsink**
2002	31 [4.8]	72 [11.1]
2003		
2005		
3007	36 [5.6]	128 [19.8]
3010		
3015	2 x 150 [2 x 23.5]	
3020	2x200 (2x31)	
4025		
4030	2 x 370 [2 x 57.35]	
4040		
5050		
5060		
5075		
6100	2x620 (2x96.1)	
7125		
7150		
8200		

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3.2.1 Cooling Fans Power Supply

Sizes 1007 to 5550 (230...480Vac) and 2002 to 5075 (575Vac)

Power supply (+24VAC) for these fans are provided from the internal drive power supply unit.

Sizes 6750 to 81600 (230...480Vac) and 6100 to 8200 (575Vac)

Power supply for these fans have to be provided as follow:

- AVy6750 (230...480Vac) and AVy6100 (575Vac):
  0.8A@115V/60Hz, 0.45A@230V / 50Hz
- AVy7900 ... AVy71320 (230...480Vac) and AVy7125...Avy8200 (575Vac):
  1.2A@115V/60Hz, 0.65A@230V/50Hz
- AVy81600: 1.65A@115V/60Hz, 0.70A@230V / 50Hz

Figure 3.2.1: UL type fans connections on AVy7900, AVy71100 and AVy71320 sizes (230...480Vac) and 7125 to 8200 (575Vac)

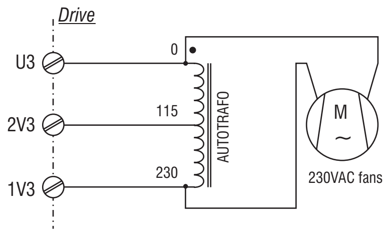


Figure 3.2.2: UL type fans connections on AVy6750, AVy81600 sizes and AVy6100 (575Vac)

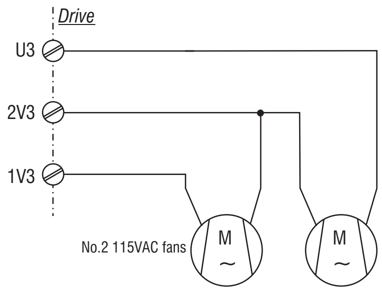
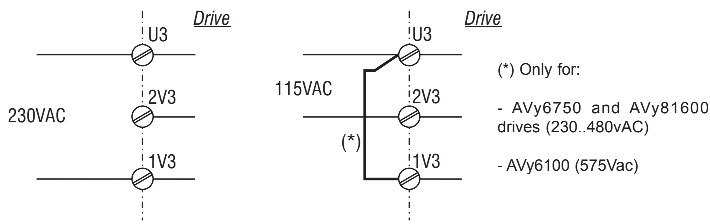


Figure 3.2.3: Example for external connection



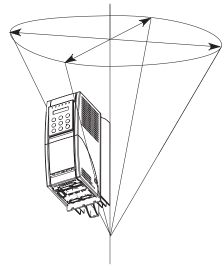
Note! - An internal fuse (2.5A 250VAC slo-blo) for AVy7900 ... AVy71320 sizes (230...480Vac) and AVy7125 ... AVy8200 sizes (575Vac) is provided.

- On AVy6750 and AVy81600 sizes the fuse must be mounted externally.

3.3 Installation Mounting Clearance

NOTE! The dimensions and weights specifed in this manual should be taken into consideration when the device is mounted. The technical equipment required (carriage or crane for large weights) should be used. Improper handling and the use of unsuitable tools may cause damage.

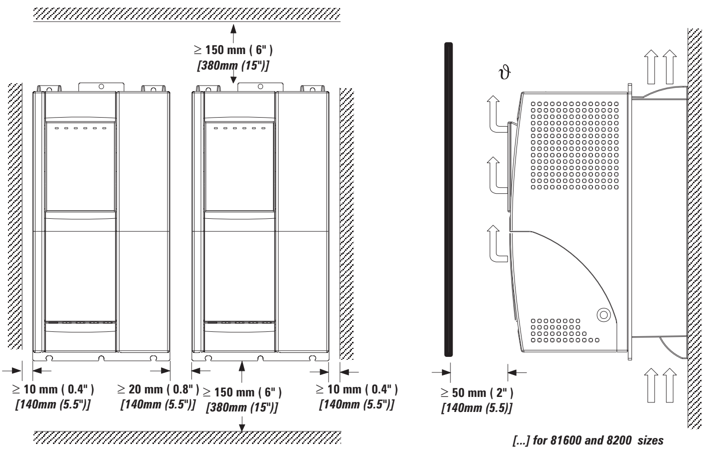
Figure 3.3.1: Max. Angle of Inclination



the maximum angle of inclination is 30°

NOTE! The Drive must b\e mounted in such a way that the free flow of air is ensured. The clearance to the device must be at least 150 mm (6 inches). A space of at least 50 mm (2 inches) must be ensured at the front.
On sizes 81600 (AVy...-4, 230...480Vac) and 8200(AVy...-5, 575Vac) the top and bottom clearance must be at least 380 mm (15 inches), on front and sides must be ensured a space of at least 140 mm (5.5 inches). Devices that generate a large amount of heat must not be mounted in the direct vicinity of the frequency inverter.

Figure 3.3.2: Mounting Clearance



NOTE! Fastening screws should be re-tightened after a few days of operation.

3.4 Motors and Encoders

The AVy Drives are designed for the field oriented regulation of standard three-phase induction AC motors. A sinusoidal encoder or digital encoder can be used for feedback in proportion to speed.

3.4.1 Motors

3.4.1.1 AC Induction Motors

FOR BEST RESULTS:
Select a inverter duty single cage induction motor with a minimum slip of 3-5%.

a) **Minumum motor size:** motor amps no less than 30% of drive rated amps at 400 Vac (for AVy... - 230...480Vac) or 575 Vac (for AVy...-5, 575Vac)continuous rating.
b) **Rated volts/rated frequency:** the motor nameplate should be no less than a 400 Vac/30 Hz ratio (for AVy... - 230...480Vac) or 575 Vac/30 Hz ratio (for AVy...-5, 575Vac).
c) **Flux range:** (thought as weak field range for hi speed motors) no more than 4:1
d) **General purpose motors** can be used but require additional **AC output chokes**
e) **Inverter duty motors** are desirable and **do not require output chokes**
f) **Hight efficiency motors** are acceptable in V/Hz and FOC operation. Do not use for encoderless vector (SLS) operation
g) **Avoid double cage low slip (<3%) motors if possible, but do not use these motors with encoderles vector SLS regulation.**

The electrical and mechanical data of standard three-phase motors refers to a particular operating range. The following points should be noted when these motors are connected to an AC Drive:
Is it possible to use standard induction motors?
With the AVy Drives it is possible to use standard induction motors. Some features of the motor have a great influence on the obtained performances. Notice also what is stated in section 2.3.4, “AC Output”, about the voltages and the motor power.

Cooling
The cooling of three-phase motors is normally implemented by means of a fan that is mounted on the motor shaft. Remember that the output of the fan is reduced when the motor is running at lower speeds, which in certain circumstances may mean that the cooling is insufficient for the motor. Check with the motor manufacturer whether an external fan is required and the motor speed range in the application concerned.

Operation above the rated speed
Due to the mechanical factors involved (bearings, unbalance of rotor) and due to the increased iron losses, consult the manufacturer of the motor if this is operated above the rated speed . Contact the motor manufacture for information.

What motor data is required for connecting the frequency inverter?
Nameplate specifications
- Motor rated voltage
- Motor rated current

- Motor rated frequency
- Motor rated speed at full load
- Power factor

The other data required for vector control is calculated inside the inverter.

Motor protection

Thermistors

PTC thermistors according to DIN 44081 or 44082 fitted in the motor can be connected directly to the frequency inverter via terminals 78 and 79. In this case the resistor (1Kohm) mounted between the terminals 78 and 79 has to be removed.

Temperature-dependent contacts in the motor winding

Temperature-dependent contacts, “Klixon” type, can disconnect the drive via the external control or can be reported as an external fault on the frequency inverter (programmable terminal).They can also be connected to the terminals 78 and 79 in order to have a specific error signal. In this case connect the existing 1 Kohm resistor in series to the wiring. Note that one side of it must be connected directly to terminal 79.

NOTE! The motor PTC interface circuit (or klixon) has to be considered and treated as a signal circuit. The connections cables to the motor PTC must be made of twisted pairs with a shield, the cable route should not be parallel to the motor cable or at least 20 cm. away.

Current limitation of the frequency inverter

The current limitation can protect the motor from impermissible overloads. For this the current limitation and the motor overload control function of the Drive (**B0H.00 - Motor OL control**) must be set so that the current is kept within the permissible range for the motor concerned.

NOTE! Remember that the current limitation can control an overheating of the motor only due to overload, not due to insufficient ventilation. When the drive is operated at low speeds the additional use of PTC resistors or temperature-dependent contacts in the motor windings is recommended, unless separate forced ventilation is available.

Output chokes

When using general purpose standard motors, output chokes are recommended to protect winding isolation in some cases. See section 4.7.2, “ Output chokes”.

3.4.2 Encoders

One of four types of encoder may be connected to the XE connector (high density 15-pole socket, fitted on device), see the table 3.4.2.2 for the jumper settings

- **DE:** 5V digital incremental encoder with A / Ā, B / B̄, C / C̄
- **SE**: 5V sinusoidal incremental encoder with A / Ā, B / B̄, C / C̄
- **DEHS**: 5V digital incremental encoder with A / Ā, B / B̄, C / C̄ and three Hall sensor digital position signals (for AC Brushless motors special software required - contact your sales representative)
- **SESC**: 5V sinusoidal incremental encoder with A / Ā, B / B̄, C / C̄ and and two sin/cos traces for absolute position (for AC Brushless motors or positioning - contact your sales representative)
- **SEHS**: 5V sinusoidal incremental encoder with A / Ā, B / B̄, C / C̄ and three Hall sensor digital position signals (for AC Brushless motors special sofware required - contact your sales representative)

Encoders are used to feedback a speed signal to the regulator. The encoder should be coupled to the motor shaft with a backlash free connection.
Optimal regulation results are ensured when using sinusoidal encoders. Digital encoders (rotary encoders) may also be used. See section 2.3.6, "Performance".
The encoder cable can be made of twisted pairs with a global shield, which connect to ground on the Drive side. Avoid connecting the shield on the motor side. In particular cases where the cable length is more than 328 feet (100 meters), (high electromagnetic noise), it may useful to use a cable with a shield on each conductor pair, which can be connected to the common point (0V). The global shield must always be grounded. Some types of sinusoidal encoders may require installation with galvanic isolation from the motor frame and shaft.

Table 3.4.2.1: Maximum Cable Length for Encoder Terminals

Cable section [mm^2]	0.22	0.5	0.75	1	1.5
Max Length m [feet]	27 [88]	62 [203]	93 [305]	125 [410]	150 [492]

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Table 3.4.2.2: Encoders Setting via S11...S23 Jumpers

Encoder / Jumpers setting	S11	S12	S13	S14	S15	S16	S17	S18	S19	S20	S21	S22	S23
DE	OFF	OFF	OFF	OFF	OFF	OFF	ON (*)	-	-	-	-	-	-
SE	ON	ON	ON	ON	ON	ON	-	-	-	-	-	-	-
SESC	ON	ON	ON	ON	ON	ON	-	A	A	A	A	A	A
DEHS	OFF	OFF	OFF	OFF	OFF	OFF	ON (*)	B	B	B	B	B	B
SEHS	ON	ON	ON	ON	ON	ON	-	B	B	B	B	B	B

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Jumper S17 selects the reading or the ignoting of the channel C pulses. It must be set correctly in order to detect the encoder loss alarm.
S17 ON : channel C (index) monitoring=ON
S17 OFF: channel C (index) monitoring=OFF

(*) If the encoder is not provided of the zero channel : S17=OFF

Table 3.4.2.3: Encoders Connections

Encoder type	Shielded cable	XE CONNECTOR PIN														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		B-	+8V	C+	C-	A+	A-	0V	B+	+5V	E+	E-	F+	F-	G+	G-
Internal +5V Encoder Power Supply																
DE	8 pole	●		●	●	●	●	●	●	●						
SE	8 pole	●		●	●	●	●	●	●	●						
SESC	12 pole	●		●	●	●	●	●	●	●	●	●	●	●		
DEHS	14 pole	●		●	●	●	●	●	●	●	●	●	●	●	●	●
SEHS	14 pole	●		●	●	●	●	●	●	●	●	●	●	●	●	●
Internal +8V Encoder Power Supply																
DE	8 pole	●	●	●	●	●	●	●	●							
SE	8 pole	●	●	●	●	●	●	●	●							
SESC	12 pole	●	●	●	●	●	●	●	●		●	●	●	●		
DEHS	14 pole	●	●	●	●	●	●	●	●		●	●	●	●	●	●
SEHS	14 pole	●	●	●	●	●	●	●	●		●	●	●	●	●	●

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Table 3.4.2.4: Assignment of the High Density XE Connector for a Sinusoidal or a Digital Encoder

Designation		Function	I/O	Max. voltage	Max. current
PIN 1	**ENC B-**	Channel B- Incremental encoder signal B negative	I	5 V digital or 1 V pp analog	10 mA digital or 8.3 mA analog
PIN 2		+8V Encoder supply voltage (see table 3.4.2.3)	O	+8 V	200 mA
PIN 3	**ENC C+**	Channel C+ Incremental encoder signal Index positive	I	5 V digital or 1 V pp analog	10 mA digital or 8.3 mA analog
PIN 4	**ENC C-**	Channel C- Incremental encoder signal Index negative	I	5 V digital or 1 V pp analog	10 mA digital or 8.3 mA analog
PIN 5	**ENC A+**	Channel A+ Incremental encoder signal A positive	I	5 V digital or 1 V pp analog	10 mA digital or 8.3 mA analog
PIN 6	**ENC A-**	Channel A- Incremental encoder signal A negative	I	5 V digital or 1 V pp analog	10 mA digital or 8.3 mA analog
PIN 7	**GND**	Reference point for +5V encoder supply voltage	O	–	–
PIN 8	**ENC B+**	Channel B+ Incremental encoder signal B positive	I	5 V digital or 1 V pp analog	10 mA digital or 8.3 mA analog
PIN 9	**AUX+**	+5V encoder supply voltage (see table 3.4.2.3)	O	+5 V	200 mA
PIN 10	**HALL 1+/SIN+**	Channel HALL1 + / SIN+ Hall 1 positive / Analog encoder Sin positive	I	5 V digital or 1 V pp analog	10 mA digital or 8.3 mA analog
PIN 11	**HALL 1-/SIN-**	Channel HALL 1- / SIN- Hall 1 negative / Analog encoder Sin negative	I	5 V digital or 1 V pp analog	10 mA digital or 8.3 mA analog
PIN 12	**HALL 2+/COS+**	Channel HALL 2+ / COS+ Hall 2 positive / Analog encoder Cos positive	I	5 V digital or 1 V pp analog	10 mA digital or 8.3 mA analog
PIN 13	**HALL 2-/COS-**	Channel HALL 2- / COS- Hall 2 negative / Analog encoder Cos negative	I	5 V digital or 1 V pp analog	10 mA digital or 8.3 mA analog
PIN 14	**HALL 3+**	Channel HALL 3 + Hall 3 positive	I	5 V digital or 1 V pp analog	10 mA digital
PIN 15	**HALL 3-**	Channel HALL 3 - Hall 3 negative	I	5 V digital or 1 V pp analog	10 mA digital

ai3140

Requirements:

Sinusoidal encoders (XE connector on Regulation card)

max. frequency	80 KHz (select the appropriate number of pulses depending on required max. speed)
Number of pulses per revolution	min 512, max 9999 (see table below)
Channels	two-channel, differential
Input Voltage	1 V pp
Power supply	+ 5 V / +8V (Internal supply) *
Load capacity	> 8.3 mA pp per channel (input resistance = 124 Ohms).
Cable max.	500 feet (150 m), screened, 4 twisted pairs.

Configure drive software for the signal amplitude range of the encoder in use (**STARTUP / Drv & Mot config / Encoders** menu, **B0G.03 - Std sin enc Vp** parameter)

Speed D reference resolution (rpm)	Recommended min number of encoder pulses (ppr)						Max number of encoder pulses (ppr)
0.125	1024	1024	1024	1024	1024	1024	80kHz* 60/FSS
0.25	512	512	512	1024	1024	1024	
0.5	512	512	512	1024	1024	1024	
1	512	512	512	1024	1024	1024	
Mot.pole pairs (rpm@50Hz)	**1(3000)**	**2(1500)**	**3(1000)**	**4(750)**	**5(600)**	**6(500)**	
Mot.pole pairs (rpm@60Hz)	**1(3600)**	**2(1800)**	**3(1200)**	**4(900)**	**5(720)**	**6(600)**	(FSS=Full scale speed)

Digital encoders (XE connector on Regulation card)

Type	standard and inverted signal
Max. frequency	150 kHz (select the appropriate number of pulses depending on required max. speed)
Number of pulses per revolution	min 512, max 9999 (see table below)
Channels	- two-channel, differential A+ / A-, B+ / B-, C+ / C-. An encoder loss detection is possible via firmware setting. - two channel, (A,B). Encoder loss detection is not possible.
Input Voltage	5V
Power supply	+ 5 V / +8V (Internal supply) *
Load capacity	> 4.5 mA / 6.8 ... 10 mA per channel

* Via keypad (**STARTUP / Drv & Mot config / Encoders** menu), it is possible to select 4 different values of internal encoder supply voltage to compensate the voltage reduction due to encoder cable length and load current encoder.
Selection available are:
0=5.41V, 1=5.68V, 2=5.91V, 3=6.18V via **B0G.02 - Std enc supply** parameter.

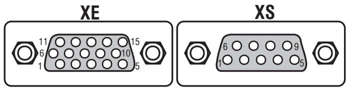
Speed D reference resolution (rpm)	Recommended min number of encoder pulses (ppr)						Max number of encoder pulses (ppr)
0.125	256	512	512	1024	1024	1024	150kHz* 60/FSS
0.25	256	512	512	1024	1024	1024	
0.5	256	512	512	1024	1024	1024	
1	256	512	512	1024	1024	1024	
Mot.pole pairs (rpm@50Hz)	**1(3000)**	**2(1500)**	**3(1000)**	**4(750)**	**5(600)**	**6(500)**	
Mot.pole pairs (rpm@60Hz)	**1(3600)**	**2(1800)**	**3(1200)**	**4(900)**	**5(720)**	**6(600)**	(FSS=Full scale speed)

Encoder power supply test (if the internal supply +5V is used)

During the start up of the drive:
- verify the encoder power supply to the encoders terminals with all the encoders channels connected
- via **B0G.02 - Std enc supply** parameter set the appropriate voltage if the encoder supply characteristic (example: +5V, ±5%) is out of range.

Terminals for external encoder connections

Male terminals type: ______________ 15 poles high density (VGA type)
Connector cover: ________________ Standard 9 poles low profile (Example manufacturer code: AMP 0-748676-1, 3M 3357-6509)



The connection with the drive is through a 15 poles high density sub-D connector (VGA type). Please note that it is mandatory to use a shielded cable with al least 80 % coverage. The shield should be connected to ground on both sides.

See table 3.4.2.4 Assignment of the High Density XE Connector for a Sinusoidal or a Digital Encoder

Note! For synchronous brushless firmware it is possible to use only encoder having pulses per revolution equal to number what is power of 2.
Example: 512 ppr, 1024 ppr, 2048 ppr, etc.

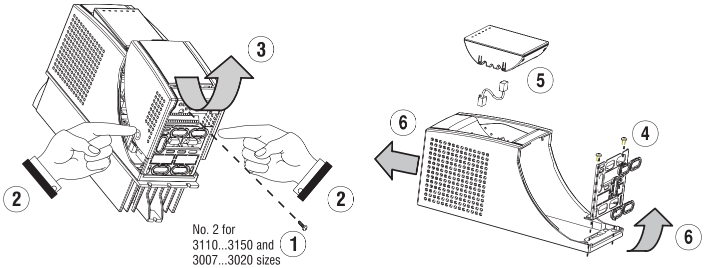
Chapter 4 - Wiring Procedure

4.1 Accessing the Connectors

4.1.1 Removing the Covers

NOTE! Observe the safety instructions and warnings given in this manual. The devices can be opened without the use of force. Only use the tools specified.

Figure 4.1.1: Removing the Coversfrom 1007 to 3150 (230...480Vac) and 2002 to 3020 (575Vac)



Sizes 1007...2075 (230...480Vac) and 2002...2005 (575Vac)

The terminal cover and cable entry plate of the device must be removed in order to fit the electrical connections:

- unscrew the screw (1), remove the cover of devices (2) by pressing on both sides as shown on the above figure (3).
- unscrew the two screws (4) to remove the cable entry plate.

The top cover must be removed in order to mount the option card and change the internal jumper settings:

- remove the keypad and disconnect the connector (5)
- lift the top cover on the bottom side (over the connector level) and then push it to the top (6).

Sizes 3110...3150 (230...480Vac) and 3007...3020 (575Vac)

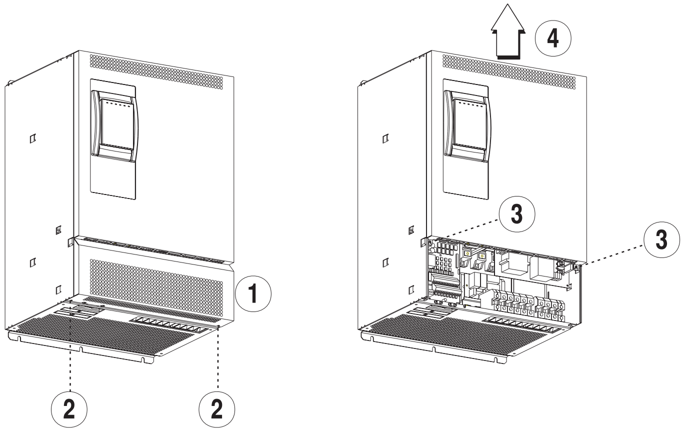
The terminal cover and cable entry plate of the device must be removed in order to fit the electrical connections:

- unscrew the two screw (1) and remove the cover of devices
- unscrew the two screws (4) to remove the cable entry plate.

The top cover must be removed in order to mount the option card and change the internal jumper settings:

- remove the keypad and disconnect the connector (5)
- lift the top cover on the bottom side (over the connector level) and then push it to the top (6).

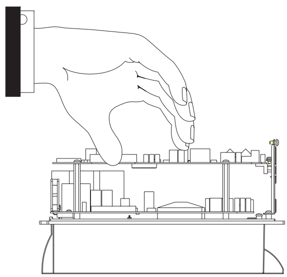
Figure 4.1.2: Removing the Covers for sizes 4220...81600 (230...480Vac) and 4025...8200 (575Vac)



Sizes 4220...81600 (230...480Vac) and 4025...8200 (575Vac)

The terminal cover of the device must be removed in order to fit the electrical connections: unscrews the two screws (2) and remove the cover (1)

The top cover must be removed in order to mount the option card and change the internal jumper settings: unscrew the two screws (3) and remove the top cover by lifting it as indicated on figure (4)



In order to avoid damages to the device, it is not permissable to transport it by griping its cards!

4.2 Power Section

Please note that a wrong connection on motor phases can cause the motor to move without control and can destroy the drive.

Please check that motor phases are connected in the right sequence before enabling the drive.

4.2.1 Terminal Assignment on Power Section / Cable Cross-Section

Table 4.2.1.1: Power Section Terminals from 1007 to 3150 (230...480Vac) and 2002 to 3020 (575Vac)

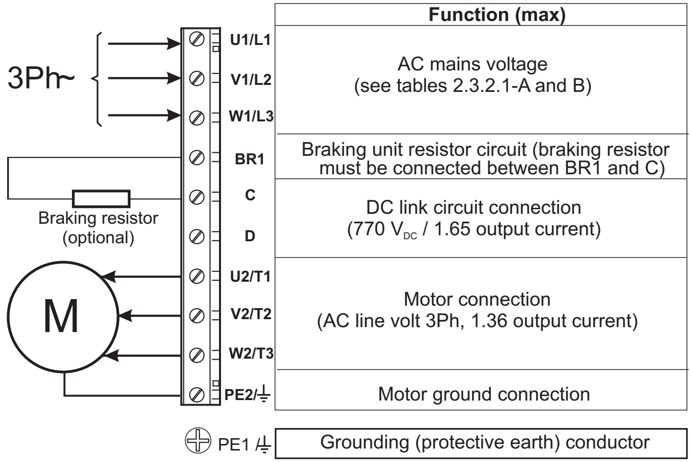
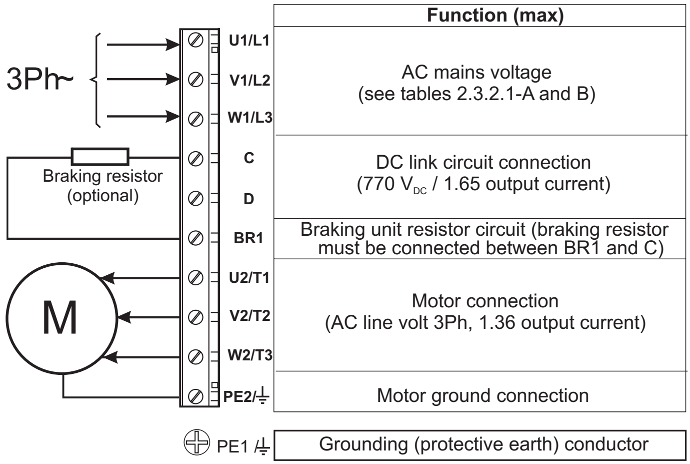


Table 4.2.1.2: Power Section Terminals from 4220 to 81600 (230...480Vac) and 4025 to 8200(575Vac)



Power terminals lay-out

Sizes 1007 to 3150 (230...480Vac) and 2002 to 3020 (575Vac):

the terminals of the devices are made accessible by removing the cover and the cable entry plate (see section 4.1, “Accessing to the connectors”). All the power terminals are located on the power card.
The terminal strip itself is a removable connector.

Sizes 4220 to 81600 (230...480Vac) and 4025 to 8200 (575Vac):

the terminals of the devices are made accessible by removing the cover (see section 4.1, “Accessing to the connectors”).

Maximum Cable Cross Section for Power Terminals

AC input wiring is connected to a disconnected switch, which limits the size to the following ranges:

AVy…-4 (230…480Vac) type		1007	1015	1022	1030	2040	2055	2075	3110	3150	4220	4300
U1,V1,W1,U2,V2,W2,C,D terminals	AWG	14				12	10		8	6		4
	[mm2]	2				4			8	10	16	25
Tightening torque	[Nm]	0.5 to 0.6							1.2 to 1.5		2	3
BR1 terminals	AWG	14				12	10		8	6	10	8
	[mm2]	2				4			8	10	6	10
Tightening torque	[Nm]	0.5 to 0.6							1.2 to 1.5		0.9	1.6
PE1, PE2 terminals	AWG	14				12	10		8	6		6
	[mm2]	2				4			8	10	16	16
Tightening torque	[Nm]	0.5 to 0.6							1.2 to 1.5		2	3

AVy…-4 (230…480Vac) type		4370	5450	5550	6750	7900	71100	71320	81600	
U1,V1,W1,U2,V2,W2,C,D terminals	AWG	2		1/0	2/0	4/0	300*	350*	4xAWG2	* = kcmils
	[mm2]	35		50	70	95	150	185	4x35	
Tightening torque	[Nm]	4			12		10-30			
BR1 terminals	AWG	8	6		terminals not available					
	[mm2]	10	16							
Tightening torque	[Nm]	1.6	3							
PE1, PE2 terminals	AWG	6		2						
	[mm2]	16		50						
Tightening torque	[Nm]	3	4							

AVy…-5 (575Vac) Type				2002	2003	2005	3007	3010	3015	3020	4025	4030
U1,V1,W1,U2,V2,W2,C,D terminals	AWG	14					10		8			
	[mm²]	2					4		8			
Tightening torque	[Nm]	0.5 to 0.6					1.2 to 1.5				2	
BR1 terminals	AWG	14					10		8		10	
	[mm²]	2					4		8		6	
Tightening torque	[Nm]	0.5 to 0.6					1.2 to 1.5				0.9	
PE1, PE2 terminals	AWG	14					10		8		6	
	[mm²]	2					4		8		16	
Tightening torque	[Nm]	0.5 to 0.6					1.2 to 1.5				2	

AVy…-5 (575Vac) type		4040	5050	5060	5075	6100	7125	7150	8200	
U1,V1,W1,U2,V2,W2,C,D terminals	AWG	6	4	2		1/0	2/0	4/0	350*	* = kcmils
	[mm²]	16	25	35		50	70	95	185	
Tightening torque	[Nm]	2	4			4	12	12	10-30	
BR1 terminals	AWG	10	6			6	terminals not available			
	[mm²]	6	16			16				
Tightening torque	[Nm]	0.9	2			3				
PE1, PE2 terminals	AWG	6				2				
	[mm²]	16				50				
Tightening torque	[Nm]	2				4				avy4040

NOTE! Use 60°C / 75°C copper (CU) conductor only.

4.3 Regulation Section

4.3.1 RV33 Regulation Card

Figure 4.3.1.1: RV33-1 Regulation Card Switch & Jumpers

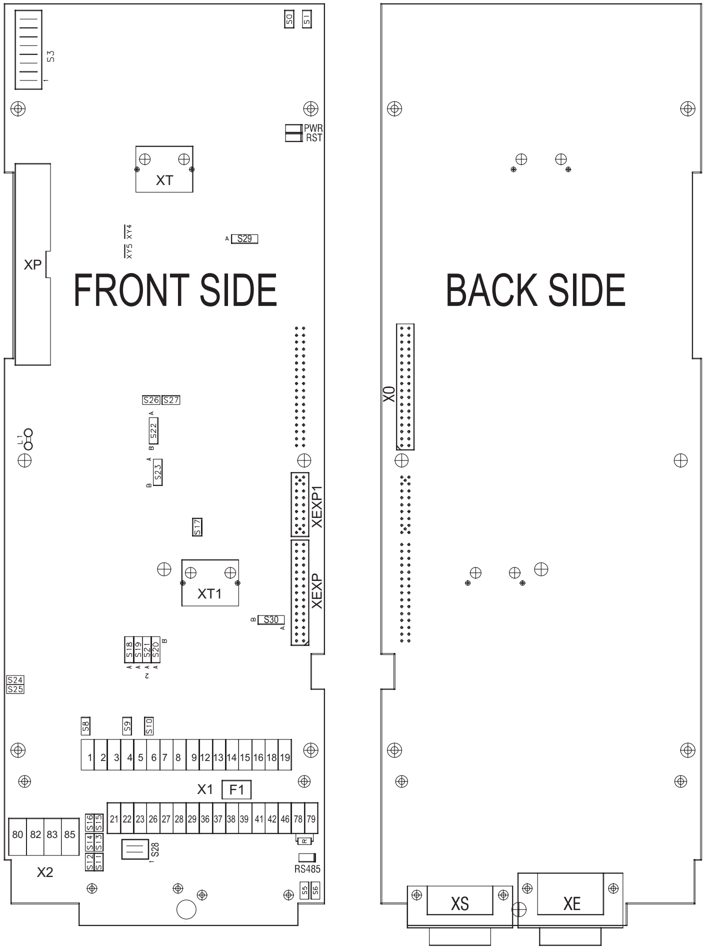


Table 4.3.1.1: LEDs on Regulation Card

Designation	Color	Function
RST	red	LED lit during the Hardware Reset
PWR	green	LED lit when the voltage +5V is present and at correct level
RS485	green	LED is lit when RS485 interface is supplied

ai4050g

Table 4.3.1.2: Test Points on Regulation Card RV33

Designation	Function
XY4	Phase current signal (U) (see table 4.3.1.4)
XY5	Reference point

ai4070

Table 4.3.1.3: Jumpers on Regulation Card RV33

Designation	Function	Factory setting
S0	The setting must not be changed	OFF
S1	The setting must not be changed	ON
S3	Factory use, the setting must not be changed	-
S5 - S6	Terminating resistor for the serial interface RS485 ON= Termination resistor IN OFF= No termination resistor	ON (*)
S8	Adaptation to the input signal of analog input 1 (terminals 1 and 2) ON=0...20 mA / 4...20 mA OFF=0...10 V / -10...+10 V	OFF
S9	Adaptation to the input signal of analog input 2 (terminals 3 and 4) ON=0...20 mA / 4...20 mA OFF=0...10 V / -10...+10 V	OFF
S10	Adaptation to the input signal of analog input 3 (terminals 5 and 6) ON=0...20 mA / 4...20 mA OFF=0...10 V / -10...+10 V	OFF
S11 - S12 - S13 S14 - S15 - S16 (**)	Encoder setting (jumpers on kit EAM_1618 supplied with the drive) ON=Sinusoidal SE or SESC encoder OFF=Digital DE or DEHS encoder	OFF
S17 (**)	Monitoring of the C-channel of the digital encoder ON=C-Channel monitored OFF=C-Channel not monitored (required for single-ended channels)	OFF
S18 - S19 S20 - S21 (**)	Encoder setting Pos. B=digital DEHS encoder Pos. A= sinusoidal SESC encoder	B
S22 - S23 (**)	Analog input 3 enabling (alternative with SESC encoder) Pos. A= if SESC encoder is used Pos. B=analog input 3 enabled Pos. OFF= resolver	B
S24	Jumper to disconnect 0 V (of 24 V) from ground ON=0 V connected to ground OFF=0 V disconnected from ground	ON
S25	Jumper to disconnect 0 V (regulation section) from ground ON=0 V connected to ground OFF=0 V disconnected from ground	ON
S26 - S27 (**)	Resover use enabling Pos. ON=when resolver is not used Pos. OFF=resolver	ON
S28	Encoder Internal power supply selection ON / ON = +5 V OFF / OFF = +8 V	ON/ON
S29	Internal use	A
S30	Second encoder qualifier input A=from EXP-… board B=from digital input "6" on RV33-3	A

ay4060

NOTES!

(*) on multidrop connection the jumper must be ON only for the last drop of a serial line.

(**) see table 3.4.2.2 for more details on S11 ... S23 jumper settings.

Caution

The devices are factory set accordingly.
When fitting a regulation card as a spare, remember to set again the encoders jumpers.

Table 4.3.1.4: Amps/Volts Ratio on Current Test Point XY4 / XY5

Drive size	Hall CT ratio / (n. turns x burden resistor ohms x ampl.gain)					
			AVy (230…480Vac)			
1007	500 / (1 x 154 x 1)	= 3.24	**4300**	1000 / (1 x 13 x 1)	= 76.92
1015	500 / (1 x 95.3 x 1)	= 5.25	**4370**	1000 / (1 x 10 x 1)	= 100
1022	500 / (1 x 66.5 x 1)	= 7.5	**5450**	2000 / (1 x 15.8 x 1)	= 126.58
1030	500 / (1 x 49.9 x 1)	= 10.02	**5550**	2000 / (1 x 13 x 1)	= 153.85
2040	1000 / (1 x 78.7 x 1)	= 12.7	**6750**	2000 / (1 x 11 x 1)	= 181.82
2055	1000 / (1 x 59 x 1)	= 16.95	**6900**	2000 / (1 x 7.87 x 1)	= 254.13
2075	1000 / (1 x 42.2 x 1)	= 23.7	**6110**	2000 / (1 x 7.87 x 1)	= 254.13
3110	2000 / (1 x 60.4 x 1)	= 9.01	**71320**	2000 / (1 x 5.9 x 1)	= 338.98
3150	2000 / (1 x 45.3 x 1)	= 46.2	**81600**	4000 / (1 x 9.31 x 1)	= 429.65
4220	1000 / (1 x 15.8 x 1)	= 63.29			

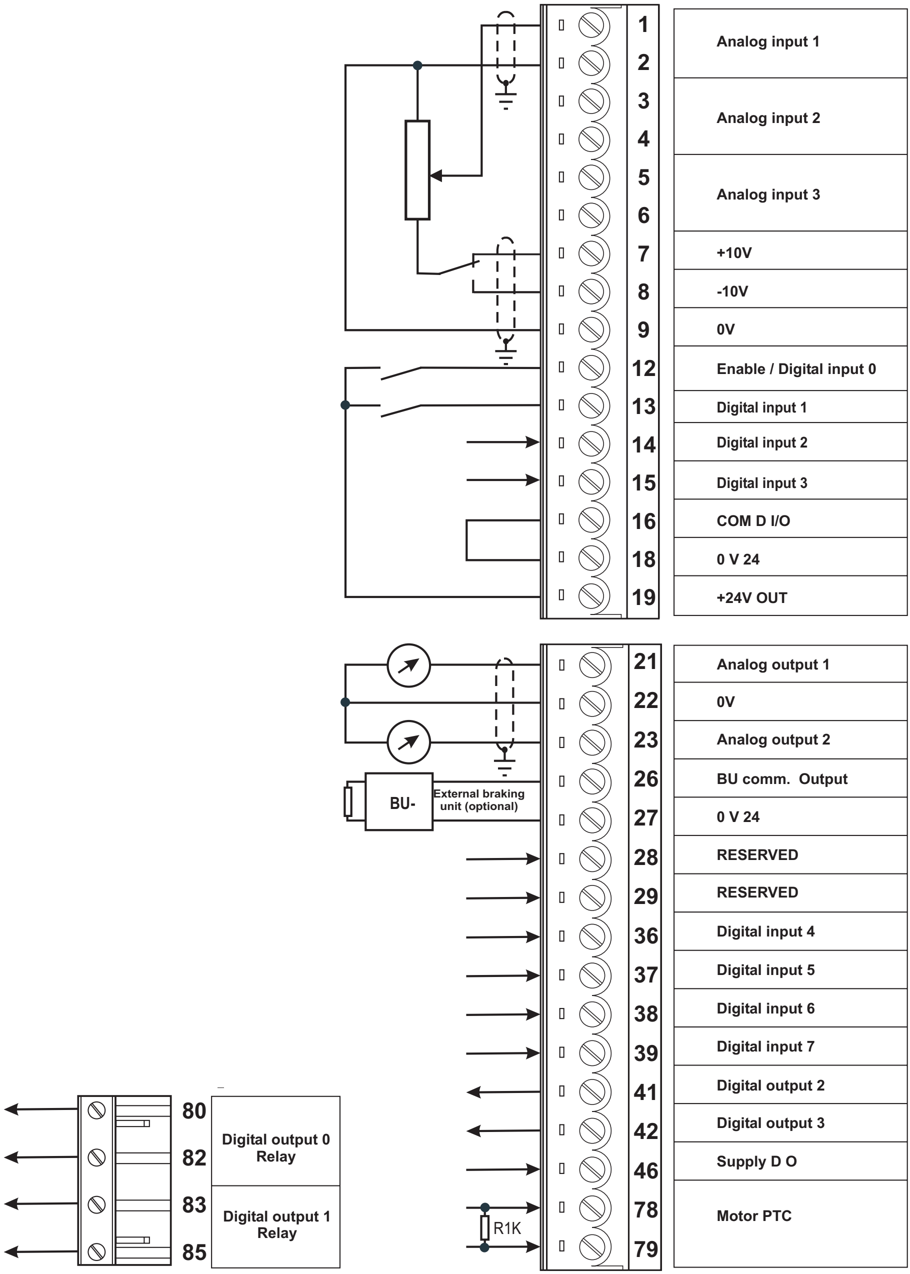
			AVy (575Vac)		
2002	500 / (1 x 102 x 1)	= 4.90	**4040**	1000 / (1 x 15.8 x 1)	= 63.3
2003	500 / (1 x 86.6 x 1)	= 5.77	**4050**	1000 / (1 x 13.7 x 1)	= 73.0
2005	500 / (1 x 56.2 x 1)	= 8.9	**5060**	1000 / (1 x 11 x 1)	= 90.1
3007	1000 / (1 x 73.2 x 1)	= 13.7	**5075**	1000 / (1 x 9.5 x 1)	= 105.3
3010	1000 / (1 x 57.6 x 1)	= 17.4	**6100**	2000 / (1 x 14.3 x 1)	= 139.9
3015	2000 / (1 x 84.5 x 1)	= 23.7	**7125**	2000 / (1 x 11 x 1)	= 181.8
3020	2000 / (1 x 64.9 x 1)	= 30.8	**7150**	2000 / (1 x 10 x 1)	= 200.0
4025	2000 / (1 x 56.2 x 1)	= 35.6	**8200**	2000 / (1 x 7.15 x 1)	= 279.7
4030	2000 / (1 x 44.2 x 1)	= 45.3			

avy54122

Example: AVy 1015 size, 1V = 5.25 A (peak current), Amps rms = Amps peak x 2^(1/2)

4.3.2 Terminal Assignments on Regulation Section

Table 4.3.2.1: Plug-in Terminal Strip Assignments



no.	Strip X1	Function	max
1 - 2	Analog input 1	Programmable/configurable analog differential input. Signal: terminal 1. Reference point: terminal 2. **D00.00 - Ramp ref 1 src =** *001 - AI 1 output (default)*	±10V / 0.25mA (20mA when current loop input)
3 - 4	Analog input 2	Programmable/configurable analog differential input. Signal: terminal 3. Reference point: terminal 4. Default setting: none	
5 - 6	Analog input 3	Programmable/configurable analog differential input. Signal: terminal 5. Reference point: terminal 6. Default setting: none. (1)	
7	+10V	Reference voltage +10V; Reference point: terminal 9	+10V/10mA
8	-10V	Reference voltage -10V; Reference point: terminal 9	-10V/10mA
9	0V	Internal 0V and reference point for±10V	-
12	Enable / Digital input 0	Inverter enable, active=high. Concurrently, it can be used as a programmable input. (Default none)	+30V 3.2mA @ 15V 5mA @ 24V 6.4mA @ 30V
13	Digital input 1	Programmable input: **C00.07** - **ForwardStart src =** *003 - DI 1 mon* (default)	
14	Digital input 2	Programmable input: **C00.08** - **Reverse src =** *004 - DI 2 mon* (default)	
15	Digital input 3	Programmable input: **C00.09** - **Stop src =** *005 - DI 3 mon* (default)	
16	COM D I/O	Reference point for digital inputs and outputs, term.12...15, 36...39, 41...42	-
18	0 V 24	Reference point for + 24V OUT supply, terminal 19	-
19	+24V OUT	+24V supply output. Reference point: terminal 18 or 27 or 28	+22…28V / 120mA @ 24V

no.	Strip X1	Function	max
21	Analog output 1	Programmable analog output: **C08.00 - AO 1 src** = *000 - NULL* (default)	±10V/5mA
22	0V	Internal 0V and reference point for terminals 21 and 23	-
23	Analog output 2	Programmable analog output: **C09.00 - AO 2 src** = *000 - NULL* (default)	±10V/5mA
26	BU comm. Output	VeCon controlled BU-... braking units command. Ref. point: term.27.	+28V/15mA
27	0 V 24	Reference point for BU-... command, terminal 26	-
28	RESERVED		
29	RESERVED		
36	Digital input 4	Programmable digital inputs; default setting: none	+30V 3.2mA @ 15V 5mA @ 24V 6.4mA @ 30V
37	Digital input 5	Programmable digital inputs; default setting: none	
38	Digital input 6	Progr. digital input; def. setting: none. Configurable as 2nd encoder index qualifier (setting via S30 jumper, ”Digital input 6” parameter must be set as not used)	
39	Digital input 7	Programmable digital input; default setting: none. Configurable as 1st encoder index qualifier (”Digital input 7” parameter must be set as not used).	
41	Digital output 2	Programmable digital outputs: **C19.02 - DO 2 src** = *000 - NULL* (default)	+30V/40mA
42	Digital output 3	Programmable digital outputs: **C19.03 - DO 3 src** = *000 - NULL* (default)	+30V/40mA
46	Supply D O	Supply input for digital outputs on terminals 41/42. Ref. point: term.16.	+30V/80mA
78 - 79	Motor PTC	Motor PTC sensing for overtemperature (cutoff R1k if used)	1.5mA

no.	Strip X2	Function	max
80 - 82	Digital output 0 Relay	Potential- free relay contact, programmable output: **C19.00 - DO 0 src** = *008 - Drive OK* (default) when closed	250V AC / 1A
83 - 85	Digital output 1 Relay	Potential- free relay contact, programmable output: **C19.01 - DO 1 src** = *029 - Spd is zero* (default) when closed	250V AC / 1A

Caution

+24Vdc voltage, which is used to externally supply the regulation card has to be stabilized and with a maximum ±10% tolerance. The maximum absorption is 1A. It is not suitable to power supply the regulation card only through a unique rectifier and capacitive filter.

Maximum Cable Sizes for Control Terminals

Table 4.3.2.2: Maximum Permissible Cable Cross-section on the Plug-in Terminals of the Regulator Section

Terminals	Maximum Permissible Cable Cross-Section [mm^2]			Tightening torque [Nm]
	flexible	multi-core	AWG	
1 ... 79	0.14 ... 1.5	0.14 ... 1.5	28 ... 16	0.4
80 ... 85	0.14 ... 1.5	0.14 ... 1.5	28 ... 16	0.4

ai4090

The use of a 75 x 2.5 x 0.4 mm (3 x 0.1 x 0.02 inch) flat screwdriver is recommended. Remove 6.5 mm (0.26 inch) of the insulation at the cable ends.

NOTE! Terminal board points are intended for 1 wire/point. Daisy chains and multiple wires/point are better done with a panel monted terminal board.

Maximum Cable Length

Table 4.3.2.3: Maximum Control Cable Lengths

Cable section [mm^2]	0.22	0.5	0.75	1	1.5
Max Length m [feet]	27 [88]	62 [203]	93 [305]	125 [410]	150 [492]

avy3130

4.3.3 Potentials of the Control Section

The potentials of the regulation section (refer to 24V and ±10V) are isolated from each other and can be disconnected via jumpers from ground. The connections between each potential are shown in Figure 4.3.2.1

The analog inputs are designed as differential amplifiers.

The digital inputs are optocoupled with the control circuit. The digital inputs (terminals 12 to 15 and 36 to 39) and digital outputs have terminal 16 as a common reference point.

The analog outputs are designed as non differential amplifiers and have common reference point (terminals 22 and 9).

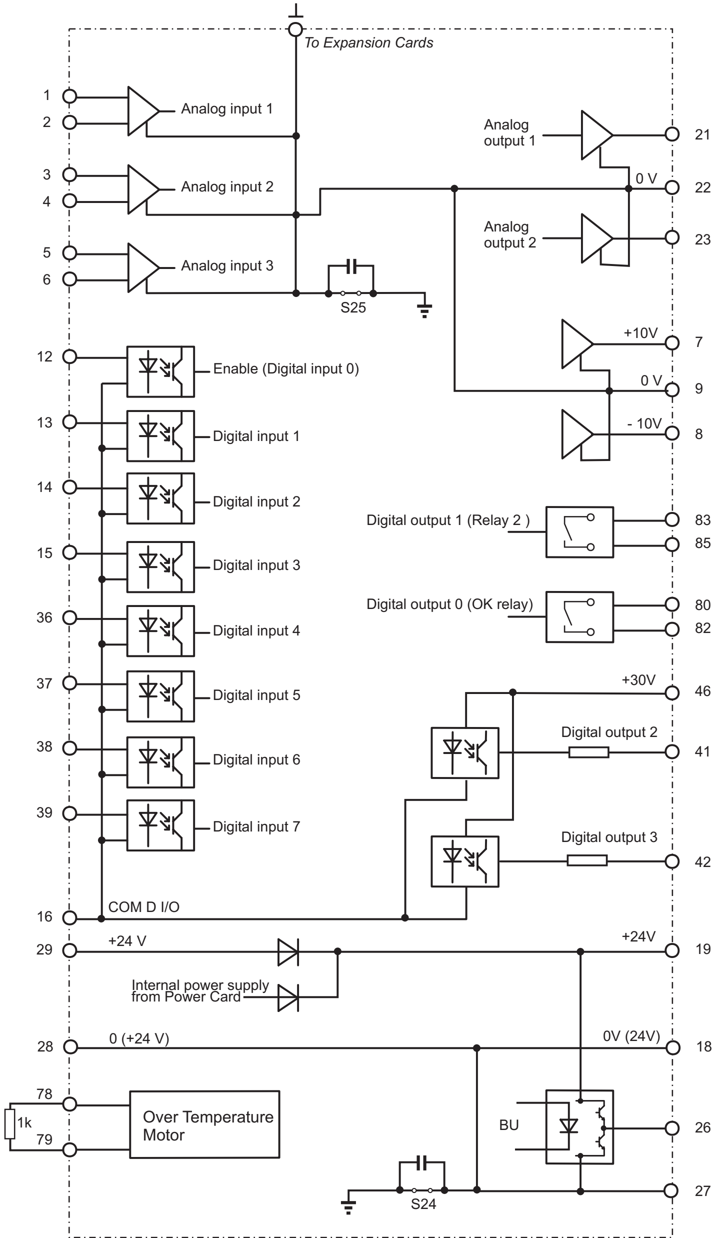
The analog outputs and the ±10V reference point have same potential (terminal 22 and 9).

The digital outputs are optocoupled with the control circuit. The terminals 41 to 42 have terminal 16 as a common reference point and terminal 46 as common supply.

It is recommended, in order to reduce the interferences on the input/output signals, to not remove the ground connection jumpers S24 and S25.

The brake unit command has reference point (terminal 27) connected to reference point +24V (terminal 18).

Figure 4.3.3.1: Potentials of the Control Section



4.4 Serial Interface

4.4.1 Serial Interface Description

The RS 485 serial interface enables data transfer via a loop made of two symmetrical, twisted conductors with a common shield. The maximum transmission distance is 1200 m (3936 feet) with a transfer rate of 9.6 KBaud. The transmission is carried out via a differential signal. RS 485 interfaces are bus-compatible in half-duplex mode, i.e. sending and receiving take place in sequence. Up to 31 AVy devices (up to 128 address selectable) can be networked together via the RS 485 interface. Address setting is carried out via the **M00.00 - Slave address** parameter (**COM / RS485** menu).

The serial protocol can be set via **M00.02 - Protocol type** parameter (**COM / RS485** menu), which allows to set following types: SLINK 4 (default), Modbus RTU and Jbus.

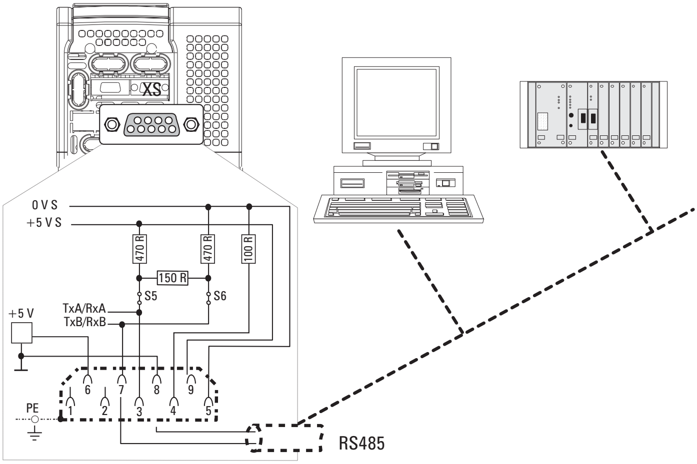


Figure 4.4.1.1: RS485 Serial Interface

The RS 485 on the AVy series device is located on the Regulation card in the form of a 9-pole SUB-D socket connector (XS).The communication may be with or without galvanic isolation: by using galvanic isolation an external power supply is necessary (+5V). Communication without galvanic isolation are suggested only if making a temporary connection to one drive. The differential signal is transferred via PIN 3 (TxA/RxA) and PIN 7 (TxB/RxB). Bus terminating resistors must be connected at the physical beginning and end of an RS 485 bus in order to prevent signal reflexion. The bus terminating resistors on AVy series devices are connected via jumpers S5 and S6. This enables a direct point-to-point connection with a PLC or PC.

Note! Ensure that only the first and last drop of an RS 485 bus have a bus terminating resistor (S5 and S6 mounted). In all other cases (within the line) jumpers S5 and S6 must not be mounted.

A connection point to point can be done using “PCI” option interface , without jumper setting.
For multidrop connection (two or more drives) use an external power supply is necessary (pin 5 / 0V and pin 9 / +5V). Pins 6 and 8 are reserved for use with the “service” interface card.

When connecting the serial interface ensure that:
- only shielded cables are used
- power cables and control cables for contactors/relays are routed separately

4.4.2 RS 485 Serial Interface Connector Description

Table 4.4.2.1: Assignment of the Plug XS Connector for the RS 485 Serial Interface

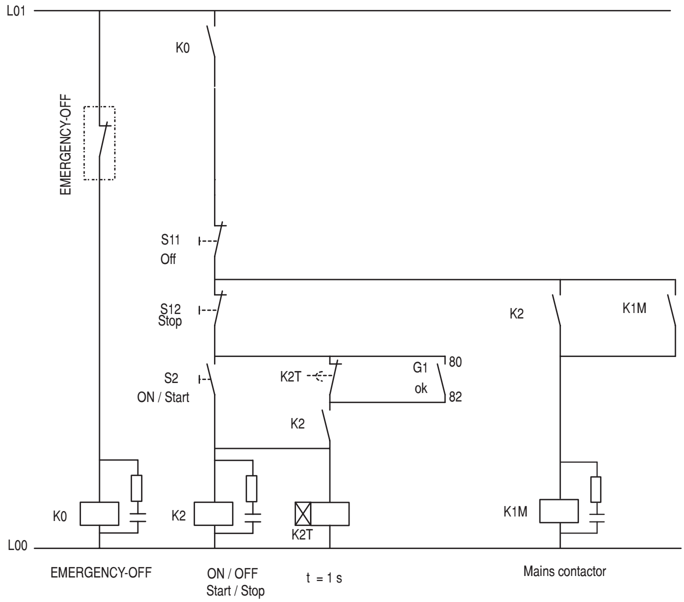
Designation	Function	I/O	Elec. Interface
PIN 1	Internal use	–	–
PIN 2	Internal use	–	–
PIN 3	RxA/TxA	I/O	RS485
PIN 4	Internal use	–	–
PIN 5	0V (Ground for 5 V)	–	Power supply
PIN 6	Internal use	–	–
PIN 7	RxB/TxB	I/O	RS 485
PIN 8	Internal use	–	–
PIN 9	+5 V	–	Power supply

I = Input O = Output ai4110

4.5 Standard Connection Diagram

4.5.1 ARTDrive Connections

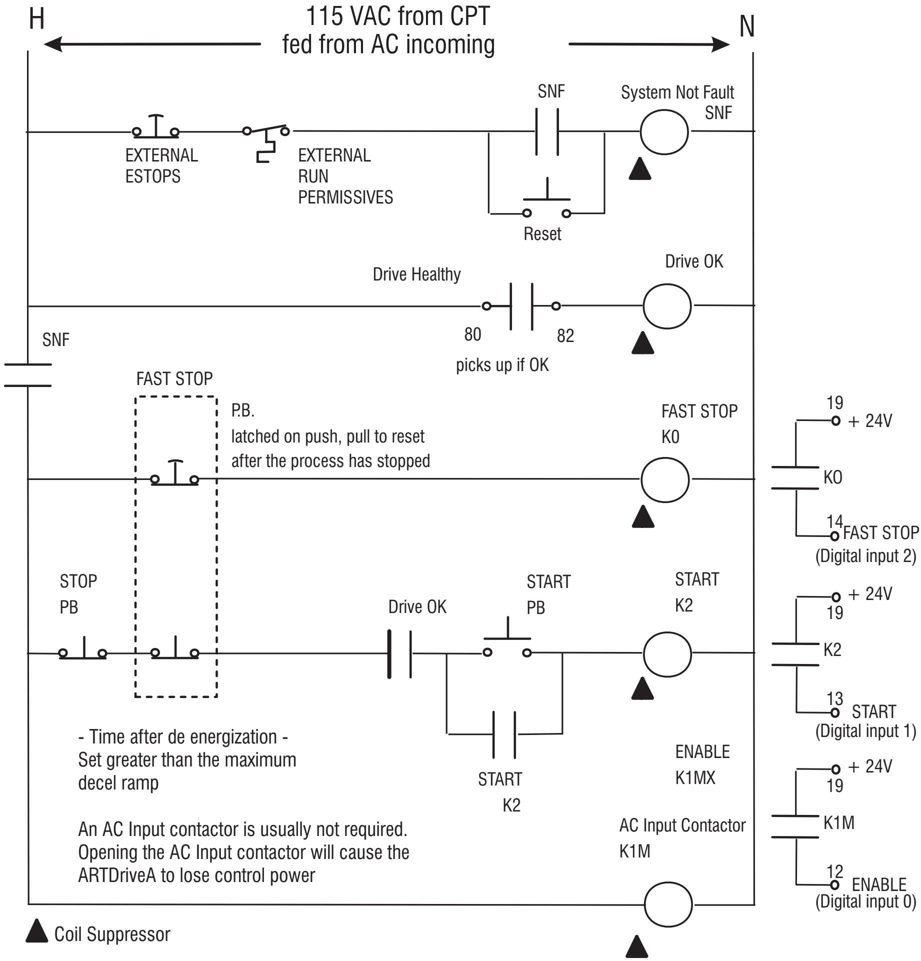
*Figure 4.5.1.1: Example Relay Logic Using **C00.00 - Term strstp src** Command and a Contactor*



NOTE! **C19.00 - DO0 src** parameter must be configured as “Drive OK” for this circuit (Factory configuration).

The connection diagram reported in the figure 4.5.1.1 (Control sequencing) is valid only when the configuration of Digital input 1 is set as: **C00.00 - Term Str Stp src** = *DI 1 mon.*

Figure 4.5.1.2: Example for Relay Interface



NOTE!

1 - ENABLE must remain energized during a normal STOP or FAST STOP for the ARTDrive to decel on a ramp.
ENABLE may be de energized after zero speed is achieved.

2 - ENABLE must be de energized to power up and to reset a fault or alarm.

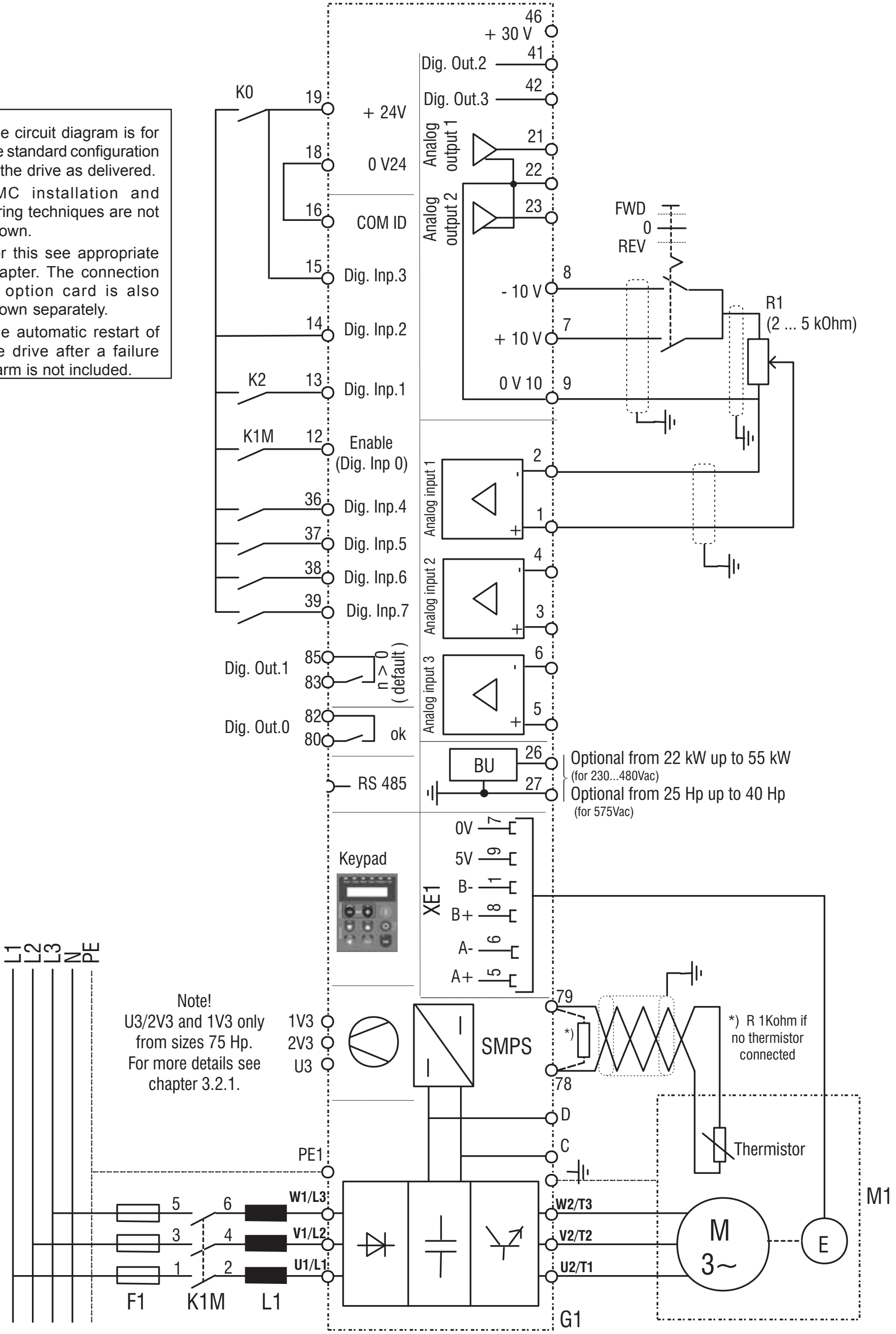
3 - FAST STOP command is necessary to set:
C00.06 - Fast Stop src = *DI 2 mon.*

4 - STOP command is necessary to set:
C00.00 - Term Str Stp src = *DI 1 mon.*

5 - Opening the input will cause labeled drive reaction.

Figure 4.5.1.3: Typical Connection

The circuit diagram is for the standard configuration of the drive as delivered.
EMC installation and wiring techniques are not shown.
For this see appropriate chapter. The connection of option card is also shown separately.
The automatic restart of the drive after a failure alarm is not included.

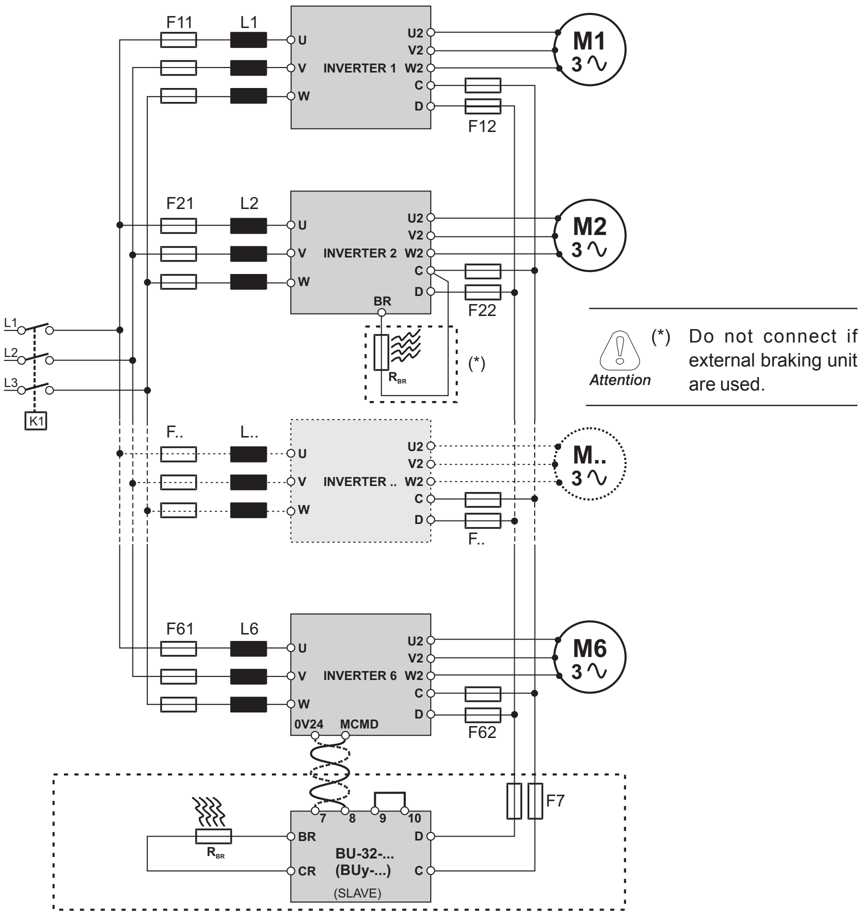


4.5.2 Parallel Connection on the AC (Input) and DC (Intermediate Circuit) Side of Several Inverters

Features and Limits:

1. The inverters used have to be all the same size.
2. AC input chokes (see chapter 5.7.1) have to be the same (provided by the same supplier).
3. The mains power supply has to be simultaneous for all inverters, i.e. a single switch /line contactor has to be used.
4. Such connection is suitable for a maximum of 6 inverters.
5. If necessary dissipate braking energy; a single internal braking unit (with external resistor) has to be used or one (or several) external braking unit ("BU32-.., BUy-...") configured with the inverter or a BU as master (all the other connected BUs are configured as slaves).
6. Fast fuses (F12...F62) have to be fitted on the dc-link side (C and D terminals) of each inverters (see chapter 4.6.2).

Figure 4.5.2.1: Parallel Connection on the AC and DC Side of Several Inverters



4.6 Circuit Protection

4.6.1 External Fuses of the Power Section

The inverter must be fused on the AC Input side. Fuses, using Semiconductor grade fuses as per table 4.6.1.1. **Use fast fuses only.**

Connections with three-phase inductance on AC input will improve the DC link capacitors life time.

Table 4.6.1.1: External Fuse Types for AC Input Side

	Drive type	DC link capacitors life time [h]	F1 - Fuses type (code)			
			Europe	America		
			Connections without three-phase reactor on AC input			
AVy...-4 (230V...480V)	1007	25000	GRD2/10 (F4D13) or Z14GR10 (F4M03)	A70P10	FWP10	(S7G49)
	1015					
	1022	25000	GRD2/16 (F4D14) or Z14GR16 (F4M05)	A70P20	FWP20	(S7G48)
	1030	10000				
	2040	25000	GRD2/20 (F4D15) or Z14GR20 (F4M07)	A70P20	FWP20	(S7G48)
	2055	25000	GRD2/25 (F4D16) or Z14GR25 (F4M09)	A70P25	FWP25	(S7G51)
	2075	10000	GRD3/35 (F4D20) or Z22GR40	A70P35	FWP35	(S7G86)
	3110	25000	GRD3/50 (F4D21) or Z22GR40	A70P40	FWP40	(S7G52)
	3150	10000	GRD3/50 (F4D21) or Z22GR50 (F4M15)	A70P40	FWP40	(S7G52)
	4220 … 71320	10000	For these types an external reactor is mandatory if the AC input impedence is equal or less than 1%			
			Connections with three-phase reactor on AC input			
	1007	50000	GRD2/10 (F4D13) or Z14GR10 (F4M03)	A70P10	FWP10	(S7G49)
	1015	50000				
	1022	50000		A70P10	FWP10	(S7G49)
	1030	50000	GRD2/16 (F4D14) or Z14GR16 (F4M05)	A70P20	FWP20	(S7G48)
	2040	50000				
	2055	50000	GRD2/20 (F4D15) or Z14GR20 (F4M07)	A70P20	FWP20	(S7G48)
	2075	50000	GRD2/25 (F4D16) or Z14GR25 (F4M09)	A70P25	FWP25	(S7G51)
	3110	50000	GRD3/50 (F4D21) or Z22GR40	A70P35	FWP35	(S7G86)
	3150	50000	GRD3/50 (F4D21) or Z22GR50 (F4M15)	A70P40	FWP40	(S7G52)
	4220	25000	GRD3/50 (F4D21) or Z22GR50	A70P50	FWP50	(S7G53)
	4300	25000	S00C+üf1/80/80A/660V (F4EAF) or Z22gR80	A70P80	FWP80	(S7G54)
	4370	25000	S00C+üf1/80/100A/660V (F4EAG) or M00üf01/100A/660V	A70P100	FWP100	(S7G55)
	5450	25000	S00C+üf1/80/160A/660V or M00üf01/160A/660V (F4EAL)	A70P175	FWP175	(S7G57)
	5550	25000				
	6750	25000	S1üf1/110/250A/660V or M1üf1/250A/660V (F4G28)	A70P300	FWP300	(S7G60)
	7900	25000				
	71100	25000	S2üf1/110/400A/660V or M2üf1/400A/660V (F4G34)	A70P400	FWP400	(S7G62)
	71320	25000				
	81600	25000				
			Connections with and/or without three-phase reactor on AC input			
AVy...-5 (575V)	2002	25000 (*)	GRD2/10 (F4D13) or Z14GR10 (F4M03)	A70P10	FWP10A14F	(S7G49)
	2003	25000 (*)				
	2005	25000 (*)	GRD2-16 (F4D14)	A70P15	FWP15	(S848B)
	3007	25000 (*)	GRD2/25 (F4D16) or Z14GR25 (F4M09)	A70P25	FWP25	(S7G51)
	3010	25000 (*)	Z14GR32 (F4M11)	A70P30-1	FWP30A14F	(S7I50)
	3015	25000 (*)	GRD3/50 (F4D21) o Z22GR54 (F4M13)	A70P40	FWP40	(S7G52)
	3020	25000 (*)	GRD3/50 (F4D21) or Z22GR50 (F4M15)	A70P50	FWP50	(S7G53)
	4025	50000				
	4030	50000				
	4040	50000	Z22GR63 (F4M17)	A70P60-4	FWP60B	(S7I34)
	5050	50000	S00C+üf1/80/80A/660V (F4EAF) or Z22gR80	A70P80	FWP80	(S7G54)
	5060	50000	S00C+üf1/80/100A/660V (F4EAG) or M00üf01/100A/660V	A70P100	FWP100	(S7G55)
	5075	50000	S00C+üf1/80/125A/660V (F4EAJ) or M00üf01/125A/660V	A70P125	FWP125	(S849B)
	6100	50000	S00C+üf1/80/160A/660V (F4EAL) or M00üf01/160A/660V	A70P150		(S7G56)
	7125	50000	S1üf1/110/250A/660V or M1üf1/250A/660V (F4G28)	A70P200	FWP200	(S7G58)
	7150	50000	S1üf1/110/250A/660V or M1üf1/250A/660V (F4G28)	A70P250	FWP250	(S7G59)
	8200	50000	S2üf1/110/400A/660V or M2üf1/400A/660V (F4G34)	A70P400	FWP400	(S7G62)

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(*) 50000 [h] only with **input** choke

Fuse manufacturers:

Type	Type GRD2... (E27), GRD3... (E33), M... (blade fuses), Z14... 14 x 51 mm, Z22... 22 x 58 mm, S....	Jean Müller, Eltville
	A70...	Gould Shawmut
	FWP...	Bussmann

Note! The technical data of the fuses, e.g. dimensions, weights, heat dissipation, auxiliary contactors, are reported in the corresponding data sheets.

Note! Use specified fuse or CSA certified equivalent

4.6.2 External Fuses of the Power Section DC Input Side

Use the following fuses when the drive is powered from a common DC bus.

Table 4.6.2.1: External Fuses Type for DC Input Side

	Drive type	Europe		America		
		Fuses type	code	Fuses type		code
AVy...-4 (230V...480V)	1007	Z14GR6	F4M01	A70P10	FWP10A14F	S7G49
	1015	Z14GR10	F4M03	A70P10	FWP10A14F	S7G49
	1022					
	1030	Z14GR16	F4M05	A70P20-1	FWP20A14F	S7G48
	2040					
	2055	Z14GR20	F4M07	A70P20-1	FWP20A14F	S7G48
	2075	Z14GR32	F4M11	A70P30-1	FWP30A14F	S7I50
	3110	Z14GR40	F4M13	A70P40-4	FWP40B	S7G52
	3150	Z22GR63	F4M17	A70P60-4	FWP60B	S7I34
	4220	S00C+üF1/80/80A/660V	F4EAF	A70P80	FWP80	S7G54
	4300	S00C+üF1/80/100A/660V	F4EAG	A70P100	FWP100	S7G55
	4370	S00C+üF1/80/125A/660V	F4EAJ	A70P150	FWP150	S7G56
	5450	S00C+üF1/80/160A/660V	F4EAL	A70P175	FWP175	S7G57
	5550	S00üF1/80/200A/660V	F4G23	A70P200	FWP200	S7G58
	6750	S1üF1/110/250A/660V	F4G28	A70P250	FWP250	S7G59
	7900	S1üF1/110/315A/660V	F4G30	A70P350	FWP350	S7G61
	71100	S1üF1/110/400A/660V	F4G34	A70P400	FWP400	S7G62
	71320	S1üF1/110/500A/660V	F4E30	A70P500	FWP500	S7G63
	81600	S1üF1/110/500A/660V	F4E30	A70P500	FWP500	S7G63

	Drive type	Europe		America		
		Fuses type	code	Fuses type		code
AVy...-5 (575V)	2002	-		A100P15	-	S85A0
	2003	-		A100P15	-	S85A0
	2005	-		A100P20	-	S85A1
	3007	-		A100P30	-	S85A2
	3010	-		A100P35	FWJ35	S85A3
	3015	-		A100P50	FWJ50	S85A4
	3020	-		A100P60	FWJ60	S85A5
	4025	-		A100P60	FWJ60	S85A5
	4030	-		A100P70	FWJ70	S85A6
	4040	-		A100P80	FWJ80	S85A7
	4050	-		A100P100	FWJ100	S85A8
	5060	-		A100P125	FWJ125	S85A9
	5075	-		A100P150	FWJ150	S85B0
	7100	-		A100P200	FWJ200	S85B1
	7125	-		A100P250	FWJ250	S85B2
	7150	-		A100P250	FWJ250	S85B2
	8200	-		A100P400	FWJ400	S85B4

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Fuse manufacturers:	Type Z14..., Z22, S00 ..., S1..., S2...	Jean Müller, Eltville
	A70P...	Gould Shawmut
	FWP...	Bussmann

Note! The technical data of the fuses, e.g. dimensions, weights, heat dissipation, auxiliary contactors, are reported in the corresponding data sheets.

Note! If external units are connected to the terminals of the DC Link circuit, then separate semiconductor fuses (DC) must be used for each external unit and they must be sized to protect each external unit.

4.6.3 Internal Fuses

Table 4.6.3.1: Internal Fuses

Drive type	Designation	Protection of	Fuse (source)	Fitted on:
AVy…-4 (230…480Vac):				
4220 to 81600	F1	+24V	2A fast 5 x 20 mm (Bussmann: SF523220 or Schurter: FSF0034.1519 or Littlefuse: 217002)	Power card PV33-4-D and higher Power card PV33-5-B and higher
1007 to 81600	F1	+24V	Resettable fuse	Regulation card RV33-1 rev.C and higher
7900 to 71320	F3	Fans transformer	2.5A 6.3x32 (Bussmann: MDL 2.5, Gould Shawmut: GDL1-1/2, Siba: 70 059 76.2,5 , Schurter: 0034.5233)	Bottom cover (power terminals side)
AVy… -5 (575Vac):				
4025 to 8200	F1	+24V	2A fast 5 x 20 mm (Bussmann: SF523220 or Schurter: FSF0034.1519 or Littlefuse: 217002)	Power card PV33-4N-A and higher Power card PV33-5N-A and higher
2002 to 8200	F1	+24V	Resettable fuse	Regulation card RV33-1 rev.C and higher
7125 to 8200	F3	Fans transformer	2.5A 6.3x32 (Bussmann: MDL 2.5, Gould Shawmut: GDL1-1/2, Siba: 70 059 76.2,5 , Schurter: 0034.5233)	Bottom cover (power terminals side)

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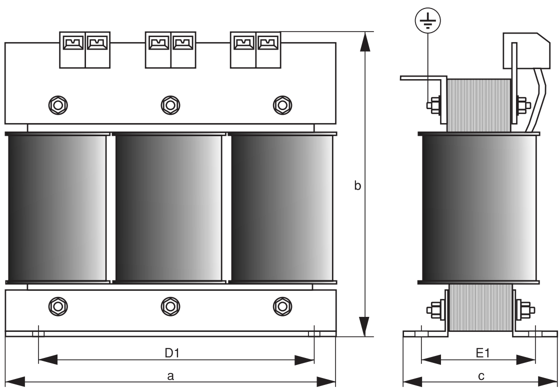
4.7 Chokes / Filters

NOTES! A three-phase inductance should be connected on the AC Input side in order to limit the input RMS current of AVy series Drives. The required inductance can be provided by an AC Input choke or an AC Input transformer.

NOTES! For the use of output sinusoidal filters, please contact the nearest GEFRAN-SIEI office.

Figure 5.7.1: Input / output chokes dimensions



4.7.1 AC Input Chokes

Table 4.7.1.1: 3-Phase AC Input Chokes

	Drive type	Mains inductance [mH]	Rated current [A]	Saturation current [A]	Freq. [Hz]	Model	code	Weight kg (lbs)	Dimensions : mm (inch) a	b	c	D1	E1
AVy…-4 (230V…480V)	1007	6.1	2.5	5	50/60	LR3y-1007	S7AAD	1.8 (3.9)	120 (4.72)	125 (4.92)	65 (2.56)	100 (3.94)	45 (1.77)
	1015	3.69	3.7	7.4	50/60	LR3y-1015	S7AAE						
	1022	2.71	5.5	11	50/60	LR3y-1022	S7AAF	1.9 (4.2)					
	1030	2.3	6.7	14	50/60	LR3y-1030	S7AB3						
	2040	1.63	8.7	18	50/60	LR3y-2040	S7AAG	2 (4.4)					
	2055	1.29	11.8	24.5	50/60	LR3y-2055	S7AB5	2.2 (4.4)	120 (4.7)	125 (4.9)	75 (2.6)	100 (3.9)	55 (2.2)
	2075	0.89	17.4	36.5	50/60	LR3y-2075	S7AB6	4.9 (10.8)	150 (5.9)	155 (6.1)	79 (3.1)	90 (3.5)	54 (2.1)
	3110	0.68	22.4	46.5	50/60	LR3y-3110	S7AB7	5 (11)	150 (5.9)	155 (6.1)	79 (3.1)	90 (3.5)	54 (2.1)
	3150	0.51	30	61	50/60	LR3y-3150	S7AB8	6.2 (13.7)	150 (5.9)	169 (6.7)	85 (3.3)	90 (3.5)	56 (2.2)
	4220	0.35	41	83	50/60	LR3-022	S7FF4	7.8 (17.2)	180 (7.1)	182 (7.2)	130 (5.1)	150 (5.9)	74 (2.9)
	4300	0.24	58	120	50/60	LR3-030	S7FF3	9.5 (20.9)	180 (7.1)	165 (6.5)	160 (6.3)	150 (5.9)	74 (2.9)
	4370	0.18	71	145	50/60	LR3-037	S7FF2	9.5 (20.9)	180 (7.1)	160 (6.3)	180 (7.1)	150 (5.9)	80 (3.1)
	5450	0.13	102	212	50/60	LR3-055	S7FF1	12.5 (27.6)	180 (7.1)	168 (6.6)	180 (7.1)	150 (5.9)	94 (3.7)
	5550	0.13	102	212	50/60								
	6750	0.148	173	350	50/60	LR3-090	S7D19	55 (121.3)	300 (11.8)	265 (10.4)	210 (8.3)	250 (9.8)	85 (3.3)
	7900	0.148	173	350	50/60								
	71100	0.085	297	600	50/60	LR3-160	S7D40	44 (97.0)	300 (11.8)	270 (10.6)	260 (10.2)	250 (9.8)	120 (4.7)
	71320	0.085	297	600	50/60								
	81600	0.085	297	600	50/60								
AVy…-5 (575V)	2002	4.5	4.2	8.4	50/60	LR3y-5-002	S7AD0	2 (4.4)	120 (4.7)	125 (4.9)	75 (2.6)	100 (3.9)	42 (1.6)
	2003	3.8	5.2	10.4	50/60	LR3y-5-003	S7AD2	2 (4.4)	120 (4.7)	125 (4.9)	75 (2.6)	100 (3.9)	42 (1.6)
	2005	2.3	8.1	16.2	50/60	LR3y-5-005	S7AD3	2.7 (6)	120 (4.7)	125 (4.9)	85 (3.3)	100 (3.9)	52 (2)
	3007	1.5	12.9	25.8	50/60	LR3y-5-007	S7AC7	5 (11)	150 (5.9)	152 (6)	80 (3.1)	90 (3.5)	55 (2.2)
	3010	1.2	16.5	33.0	50/60	LR3y-5-010	S7AC8	5 (11)	150 (5.9)	152 (6)	80 (3.1)	90 (3.5)	55 (2.2)
	3015	0.9	21.8	43.6	50/60	LR3y-5-015	S7AC9	5.5 (12.1)	150 (5.9)	164 (6.4)	96 (3.8)	90 (3.5)	60 (2.4)
	3020	0.7	28.5	57	50/60	LR3y-5-020	S7AD1	6.2 (13.7)	150 (5.9)	164 (6.4)	106 (4.2)	90 (3.5)	70 (2.8)

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For sizes up to 20Hp, an input choke is strongly reccomended in order to:

- prolong the life time of the DC link capacitors and the reliability of the input rectifier.
- reduce the AC line harmonic distortion
- reduce problems due to low impedence AC line (≤ 1%).

NOTE! The current rating of these chokes (reactors) is based on nominal current of standard motors, listed in table 2.3.4.1 in section 2.3.4, “AC Output”.

NOTE! The 4025 … 8200 sizes of AVy-5 series (575Vac), integrate as standard the input choke on intermediate circuit (DC-Link). With this configuration the three phase input choke it is NOT required.

4.7.2 Output Chokes

The AVy Drive can be used with general purpose standard motors or with motors specially designed for Drive use. The latter usually have a higher isolation rating to better withstand PWM voltage.

Motors designed for use with Adjustable Frequency Drives do not require any specific filtering of the voltage waveform from the Drive.

For general purpose motors, especially with long cable runs (typically over 100 m [328 feet]), an output choke is recommended to maintain the voltage waveform within the specified limits.

The choke must be installed as close as possible to the drive side end of the cable run.

Suggested choke ratings and part numbers are listed in table 4.7.2.1.

The rated current of the filters should be approx. 20% above the rated current of the frequency Drive in order to take into account additional losses due to PWM waveform.

Table 4.7.2.1: Recommended Values for Output Chokes

	Drive type	Three-phases choke										
		Mains inductance [mH]	Rated current [A]	Saturation current [A]	Model	code	Weight kg (lbs)	Dimensions : mm (inch) a	b	c	D1	E1
AVy…-4 (230V…480V)	**1007**	1.4	9.5	20	**LU3-003**	S7FG2	5.2 (11.5)	180 (7.1)	170 (6.7)	110 (4.3)	150 (5.9)	60 (2.4)
	1015											
	1022											
	1030											
	2040	0.87	16	34	**LU3-005**	S7FG3	5.8 (12.8)	180 (7.1)	170 (6.7)	110 (4.3)	150 (5.9)	60 (2.4)
	2055											
	2075	0.51	27	57	**LU3-011**	S7FG4	8 (17.6)	180 (7.1)	180 (7.1)	130 (5.1)	150 (5.9)	70 (2.8)
	3110											
	3150	0.43	32	68	**LU3-015**	S7FM2	7.5 (16.5)	180 (7.1)	160 (6.3)	170 (6.7)	150 (5.9)	70 (2.8)
	4220	0.33	42	72	**LU3-022**	S7FH3	8 (17.6)	180 (7.1)	160 (6.3)	170 (6.3)	150 (5.9)	70 (2.8)
	4300	0.24	58	100	**LU3-030**	S7FH4	9.5 (20.9)	180 (7.1)	160 (6.3)	180 (7.1)	150 (5.9)	80 (3.1)
	4370	0.18	76	130	**LU3-037**	S7FH5	9.7 (21.4)	180 (7.1)	160 (6.3)	180 (7.1)	150 (5.9)	80 (3.1)
	5450	0.12	110	192	**LU3-055**	S7FH6	14 (30.9)	240 (9.4)	210 (8.3)	180 (7.1)	200 (7.9)	80 (3.1)
	5550											
	6750	0.07	180	310	**LU3-090**	S7FH7	18.5 (40.8)	240 (9.4)	210 (8.3)	200 (7.9)	200 (7.9)	80 (3.1)
	7900											
	71100	0.041	310	540	**LU3-160**	S7FH8	27.5 (60.6)	300 (11.8)	260 (10.2)	240 (9.4)	250 (9.8)	90 (3.5)
	71320											
	81600											
AVy…-5 (575V)	**2002**	3	4.5	8.5	**LU3-5-003**	S7FI2	2 (4.4)	120 (4.7)	125 (4.9)	75 (2.6)	100 (3.9)	42 (1.6)
	2003											
	2005	1.9	7	13	**LU3-5-005**	S7FI3	2 (4.4)	120 (4.7)	125 (4.9)	75 (2.6)	100 (3.9)	42 (1.6)
	3007	1	13,8	25.3	**LU3-5-010**	S7FI4	5 (11)	150 (5.9)	152 (6)	80 (3.1)	90 (3.5)	55 (2.2)
	3010											
	3015	0.64	24,2	44.3	**LU3-5-020**	S7FI5	6.2 (13.7)	150 (5.9)	164 (6.4)	106 (4.2)	90 (3.5)	70 (2.8)
	3020											
	4025	0.51	30	54.9	**LU3-5-025**	S7FI6	6.2 (13.7)	150 (5.9)	164 (6.4)	106 (4.2)	90 (3.5)	70 (2.8)
	4030	0.43	36	65.9	**LU3-5-030**	S7FI7	6.8 (15)	180 (7.1)	182 (7.2)	122 (4.8)	150 (5.9)	64 (2.5)
	4040	0.34	46	84.2	**LU3-5-040**	S7FI8	10 (22)	180 (7.1)	165 (6.5)	170 (6.7)	150 (5.9)	84 (3.3)
	4050	0.27	58	106.1	**LU3-5-050**	S7FI9	12 (26.5)	180 (7.1)	165 (6.5)	170 (6.7)	150 (5.9)	84 (3.3)
	5060	0.22	69	126.3	**LU3-5-060**	S7FL0	12 (26.5)	180 (7.1)	165 (6.5)	170 (6.7)	150 (5.9)	84 (3.3)
	5075	0.18	86	157.4	**LU3-5-075**	S7FL1	12 (26.5)	180 (7.1)	165 (6.5)	170 (6.7)	150 (5.9)	84 (3.3)
	6100	0.14	109	200	**LU3-5-100**	S7FL4	please contact the nearest GEFRAN-SIEI office					
	7125	0.11	158	290	**LU3-5-150**	S7FL5						
	7150	0.11	158	290	**LU3-5-150**	S7FL5						
	8200	0.070	220	403	**LU3-5-200**	S7FL6						

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Notes! When the Drive is operated at the rated current and at 50 Hz, the output chokes cause a voltage drop of approx. 2% of the output voltage at rated load.
Choke current ratings are based on the drive constant torque ratings.

Inverter output, 400V and 575V, 150% overload for 60s, (constant torque) applications
Rated output current of the drive (variable torque) is greater than the rated current of these output chokes.

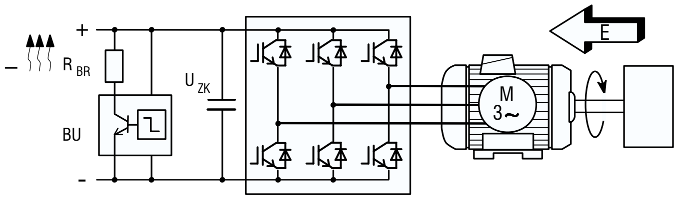
4.7.3 Interference Suppression Filters

The inverters of AVy series must be equipped with an external EMI filter in order to reduce the radiofrequency emissions on the AC input line. The filter selection is dependent on the drive size and the installation environment. For this purpose see the “EMC Guidelines” instruction book. In the Guide, it is described how to install the cabinet (connection of filter and mains reactors, cable shield, grounding, etc.) in order to make it EMC compliant according the EMC Directive 89/336/EEC.

4.8 Braking Units

In oversynchronous or regenerative operation, the frequency-controlled three-phase motor feeds energy back to the DC link circuit via the Drive. This leads to an increase in the intermediate circuit voltage. Braking units (BU) are therefore used in order to prevent the DC voltage rising to an impermissible value. When used, these activate a braking resistor that is connected in parallel to the capacitors of the intermediate circuit. The feedback energy is converted to heat via the braking resistor (R_{BR}), thus providing very short deceleration times and restricted four-quadrant operation.

Figure 4.8.1: Operation with Braking Unit (Principle)



AVy...-4 (230...480Vac)
Drive models 1007 to 3150 have an internal braking unit as standard (external resistor required).
Drive models 4220 to 5550 have an internal braking unit as optional.

AVy...-5 (575Vac)
Drive models 2002 to 3020 have an internal braking unit as standard (external resistor required).
Drive models 4025 to 5075 have an internal braking unit as optional.

All standard ARTDrive devices can be connected via terminals C and D with an external braking unit (BU-32, BUy-...).

Warning

The braking resistors can be subject to unforeseen overloads due to possible failures.
The resistors have to be protected using thermal protection devices. Such devices do not have to interrupt the circuit where the resistor is inserted but their auxiliary contact must interrupt the power supply of the drive power section.
In case the resistor foresees the precence of a protection contact, such contact has to be used together with the one belonging to the thermal protection device.

NOTE! For braking resistor connection (terminals BR1 and C) a twisted cable has to be used.
In case the braking resistor is supplied with thermal protection (klixon), it may be connected to the "External fault" drive input.

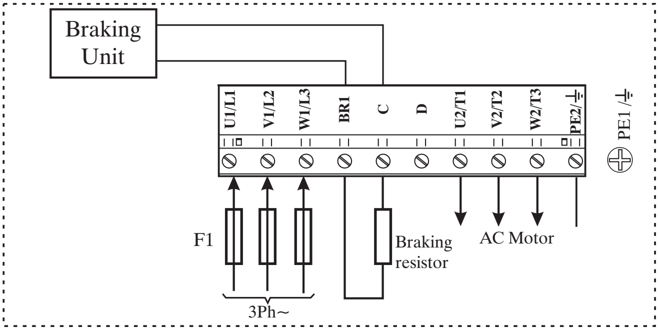
4.8.1 Internal Braking Unit

An external braking resistor is required (not included).

For parameter setting refer to **STARTUP / Drv & Mot config / BUconfig** menu (chapter 7).

The figure below shows the configuration for internal brake unit operation.

Figure 4.8.1.1: Connection with Internal Braking Unit and External Braking Resistor



4.8.2 External Braking Resistor

Table 4.8.2.1: Lists and Technical Data of the External Standard Resistors for 1007 to 5550 (230..480Vac) and 2002 to 5075 (575Vac) inverter sizes

	Drive Type	P_{NBR} [kW]	R_{BR} [Ohm]	E_{BR} [kJ]	Resistor Type	code	Weight kg (lbs)	Dimensions : mm (inch) a	b	c	a1	b1
AVy…-4 (230V…480V)	1007 … 2040	0.6	100	22	MRI/T600 100R	S8SS3	1.5 (3.3)	320 (12.6)	120 (4.7)	100 (3.9)	360 (14.2)	
	2055 … 2075	0.9	68	33	MRI/T900 68R	S8SS2	2.7 (6.0)	320 (12.6)	160 (6.3)	120 (4.7)	380 (15.0)	
	3110	1.3	49	48	MRI/T1300 49R	S8ST4	3.7 (8.2)	320 (12.6)	320 (12.6)	120 (4.7)	380 (15.0)	
	3150	2.1	28	90	BR T2K0-28R	S8T00F	6.2 (13.7)	625 (24.6)	100 (3.9)	250 (9.8)	605 (23.8)	40 (1.6)
	4220	4	15.4	180	BR T4K0-15R4	S8T00G	7.0 (15.4)	625 (24.6)	100 (3.9)	250 (9.8)	605 (23.8)	40 (1.6)
	4300…4370	4	11.6	180	BR T4K0-11R6	S8T00H	7.0 (15.4)	625 (24.6)	100 (3.9)	250 (9.8)	605 (23.8)	40 (1.6)
	5450…5550	8	7.7	360	BR T8K0-7R7	S8T00I	11.5 (25.)	625 (24.6)	160 (6.3)	250 (9.8)	605 (23.8)	60 (2.4)
AVy…-5 (575V)	2002…2005	0.6	140	22	MRI/T600 140R	S8SY7	1.5 (3.3)	320 (12.6)	120 (4.7)	100 (3.9)	360 (14.2)	
	3007…3010	0.9	100	33	MRI/T900 100R	S8SY8	2.7 (6.0)	320 (12.6)	160 (6.3)	120 (4.7)	380 (15.0)	
	3015	1.3	74	48	MRI/T1300 74R	S8SY9	3.7 (8.2)	320 (12.6)	205 (8.7)	120 (4.7)	380 (15.0)	
	3020	2.1	42	90	BR T2K0-42R	S8T00M	6.2 (13.7)	625 (24.6)	100 (3.9)	250 (9.8)	605 (23.8)	40 (1.6)
	4025…4030	4	23	180	BR T4K0-23R	S8T00N	7.0 (15.4)	625 (24.6)	100 (3.9)	250 (9.8)	605 (23.8)	40 (1.6)
	4040…4050	4	18	180	BR T4K0-18R	S8T00O	7.0 (15.4)	625 (24.6)	100 (3.9)	250 (9.8)	605 (23.8)	40 (1.6)
	5060…5075	8	11.6	180	BR T8K0-11R6	S8T00R	11.5 (25.)	625 (24.6)	160 (6.3)	250 (9.8)	605 (23.8)	60 (2.4)

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Parameters description:

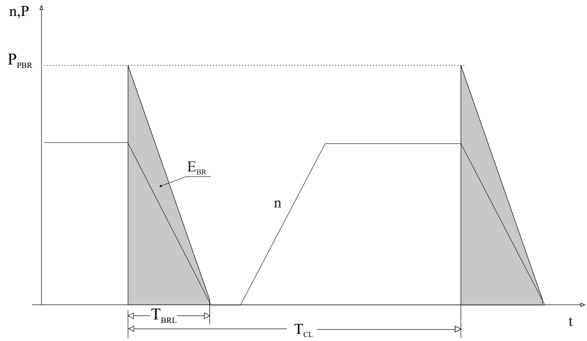
P_{NBR}	Rated power of the braking resistor
R_{BR}	Braking resistor value
E_{BR}	Max surge energy which can be dissipated by the resistor
P_{PBR}	Peak power applied to the braking resistor

T_{BRL} Maximum braking time in condition of limit operating cycle (braking power = **P_{PBR}** with typical triangular profile*)

$$T_{BRL} = 2\,\frac{E_{BR}}{P_{PBR}} = [s]$$

* triangular power profile occurs when stopping an inertia load on a speed ramp profile

Figure 4.8.2.1: Limit Operating Braking Cycle with Typical Triangular Power Profile



T_{CL} Minimum cycle time in condition of limit operating cycle (braking power = **P_{PBR}** with typical triangular profile)

$$T_{CL} = \frac{1}{2}\,T_{BRL}\,\frac{P_{PBR}}{P_{NBR}} = [s]$$

The **BU overload** alarm occurs if the duty cycle exceeds the maximum data allowed in order to prevent possible damage to the resistor.

Resistor model: Standard resistor data

Example code: MRI/T900 68R

MRI = resistor type

900 = rated power (900 W)

T= with safety thermostat

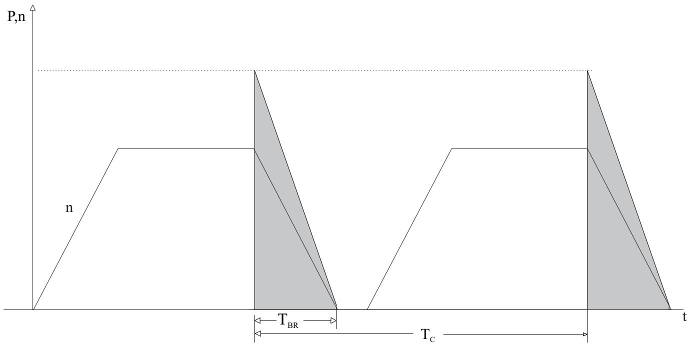
68R = resistor value (68 Ω)

NOTE! The suggested match of resistor-model and inverter-size, allows a braking stop at rated torque with duty cycle **T_{BR} / T_C** = 20%

Where: **T_{BR}** = Braking time

T_C = Cycle time

Figure 4.8.2.2: Braking Cycle with $T_{BR} / T_C = 20\%$



The standard resistor can be used for couplings, different from the ones above. The peak over load which is applied when the braking chopper is in steady state is:

$$P_{PBR} = \frac{V_{BR}^{2}\,[V]}{R_{BR}\,[ohm]} = [w]$$

Where: $\mathbf{V_{BR}}$ = braking unit threshold (see table 4.8.2.2)
With reference to the figure 4.8.2.3, where the power profile is the typical triangular one, the following example can be taken into consideration (see also table 4.8.2.1).

Resistor model: MRI/T600 100R

Rated power $\mathbf{P_{NBR}}$ = 600 [W]

Maximum energy $\mathbf{E_{BR}}$ = 22kJ

Inverter mains supply = 460V

From table 4.8.2.2: $\mathbf{V_{BR}}$ =780V

$$P_{PBR} = \frac{V_{BR}^{2}}{R_{BR}} = \frac{780^{2}}{100} = 6084\ [W] \qquad T_{BRL} = 2\frac{E_{BR}}{P_{PBR}} = 2\ \frac{24000}{6084} = 7.8[s]$$

CASE A) If $\mathbf{T_{BR} \leq E_{BR} / P_{NBR}}$ the following conditions must be met:

1) $\mathbf{P_{MB} \leq 2 . E_{BR} / T_{BR}}$
   Where: $\mathbf{P_{MB}}$ is the peak power of the cycle (see.fig. 4.8.2.3)

2) $$\frac{\mathbf{P_{MB}\ x\ T_{BR}}}{\mathbf{2T_C}} \leq \mathbf{P_{NBR}}$$

The average power of the cycle must not be higher than the rated power of the resistor.

CASE B) If $\mathbf{T_{BR} > E_{BR} / P_{NBR}}$ that is to say, in case of very long braking time, it must be dimensioned $\mathbf{P_{MB} \leq P_{NBR}}$

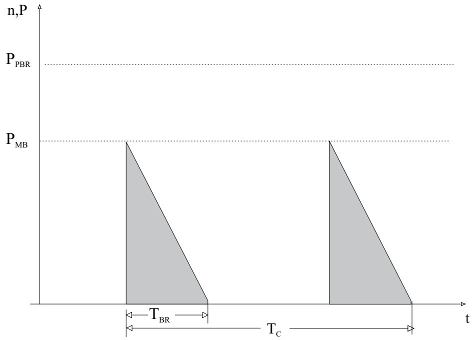


Figure 4.8.2.3: Generic Braking Cycle with Triangular Profile

If none of the rules are met, it is necessary to increase the rated power of the resistor, respecting the limit of the internal braking unit (reported in table 4.8.2.3), or an external BU if necessary.

In order to protect these resistors from dangerous overload, software overload control logic is also available (**STARTUP / Drv & Mot config / BUconfig** menu).

The default parameters in this menu match the recommended resistor pairing as per table 4.8.2.1.

See chapter 7, **STARTUP / Drv & Mot config / BUconfig** menu, to set values for a non-standard pairing.

Table 4.8.2.2: Braking Thresholds

Mains voltage	**Braking threshold V_{BR} [V]**
230Vac	400
400Vac	680
460Vac / 480 Vac	780
575 Vac	965

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When the duty cycle exceeds the data entered, the **BU overload** alarm automatically occurs in order to prevent possible damages to the resistor.

The following table can be used to choose an external resistor, different from the standard series.

Table 4.8.2.3: Technical Data of the Internal Braking Units

	Inverter type	I_{RMS} [A]	I_{PK} [A]	T [s]	Minimum R_{BR} [ohm]
AVy…-4 (230V…480V)	**1007 … 2040**	4.1	7.8	19	100
	2055 … 2075	6.6	12	16	67
	3110	12	22	17	36
	3150	17	31	16	26
	4220	18	52	42	15
	4300	37	78	23	10
	4370	29		37	
	5450 … 5550	50	104	22	7.5
	6750 … 81600	External braking unit (optional)			
AVy…-5 (575V)	**2002**	3.1	6.9	19	140
	2003				
	2005				
	3007	4.4	9.7	16	100
	3010				
	3015	5.8	13	17	74
	3020	10.3	23	16	42
	4025	19	42	42	23
	4030	19	42	23	23
	4040	24	54	37	18
	5050	24	54	37	18
	5060	37	84	22	11,6
	5075	37	84	22	11,6
	7100 … 8200	External braking unit (optional)			

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I_{RMS} : Rated current of the braking unit

I_{PK} : Peak current deliverable for 60 seconds max.

T : Minimum cycle time when I_{PK} is defined for 10 seconds

Generally the following condition must be satisfed:

$$I_{RMS} \geq \sqrt{\frac{1}{2} \cdot \frac{P_{PBR}}{R_{BR}} \cdot \frac{T_{BR}}{T_C}}$$

Each drive is able, by using terminals 26 and 27, to control one or more external braking units. The drive will act as Master and the external brake units must be configured as Slave.

In this way it will be possible to utilize the internal I^2t protection (see chapter 6, B0I STARTUP / Drv & Mot config / BU olvd menu).

If more than one BU is used, each BU shall be connected to a single resistor. All braking units shall be the same models and have same type resistors.

4.9 Buffering the Regulator Supply

The power supply of the control section is provided by a switched mode power supply unit (SMPS) from the DC Link circuit. The Drive is disabled as soon as the voltage of the DC Link circuit is below the threshold value (U_{Buff}). The regulator supply is buffered by the energy of the DC Link circuit until the limit value (U_{min}) is reached. The buffer time is determined by the capacitance of the DC Link capacitors. The minimum values are shown in the table below. The buffer time (t_{Buff}) can be extended by connecting external capacitors in parallel (on terminal C and D).

Table 4.9.1: DC Link Buffer Time

Inverter type	Internal capacitance	Buffer time t_{Buff} (minimum value) with the internal capacitance at : AC Input voltage =			Maximum permissible external capacitance	Maximum power required by switched mode power supply
	Cstd [μF]	400Vac [s]	460Vac [s]	575Vac [s]	C_{ext} [μF]	P_{SMPS} [W]
AVy …-4 (230…480Vac)						
1007	220	0.165	0.25		0	65
1015	220	0.165	0.25		0	65
1022	330	0.24	0.37		0	65
1030	330	0.24	0.37		0	65
2040	830	0.62	0.95		0	65
2055	830	0.62	0.95		0	65
2075	830	0.62	0.95		0	65
3110	1500	1.12	1.72		1500	65
3150	1500	1.12	1.72		1500	65
4220	1800	1.54	2.3		4500	70
4300	2200	1.88	2.8		4500	70
4370	3300	2.83	4.2		4500	70
5450	4950	4.24	6.3		4500	70
5550	4950	4.24	6.3		4500	70
6750	6600	5.6	8.1		0	70
7900	6600	5.6	8.1		0	70
71100	9900	8.4	12.1		0	70
71320	14100	12.8	17.2		0	70
81600	14100	12.8	17.2		0	70
AVy …-5 (575Vac)						
2002	157			0.31	0	65
2003	157			0.31	0	65
2005	313			0.62	0	65
3007	666			1.32	666	65
3010	666			1.32	666	65
3015	1000			1.97	1000	65
3020	1000			1.97	1000	65
4025	1100			2.02	1300	70
4030	1100			2.02	1300	70
4040	1566			2.87	1300	70
4050	2200			4.03	2500	70
5060	2200			4.03	2500	70
5075	3133			5.75	1500	70

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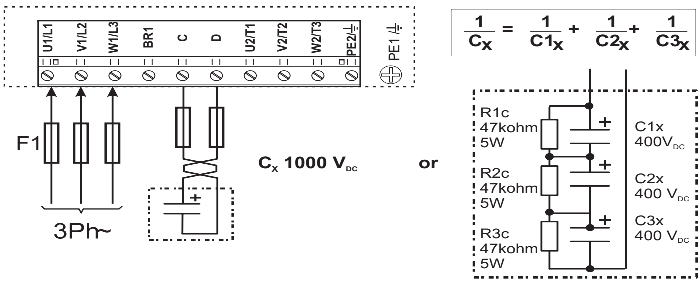
SMPS = Switched Mode Power Supply

Alternatively the control function “Power Loss Ridethru” may be used to provide active buffering of the regulator supply by regeneration (see chapter 7, **FUNCTION / PLR THR** menu).

AVy... (230...480Vac)

Figure 4.9.1-A: Buffering the Regulator Supply by Means of Additional Intermediate Circuit Capacitors (for 230...480Vac)



NOTE! When connecting the intermediate circuit terminals C and D the AC Input side **must** be protected with superfast semiconductor fuses!

Formula for calculating the size of the external capacitors:

$$C_{ext} = \frac{2 \cdot P_{SMPS} \cdot t_{Buff} \cdot 10^{6}}{U^2_{Buff} - U^2_{min}} - C_{std}$$

C_{ext}, C_{std}	[µF]	
P_{SMPS}	[W]	U_{Buff} = 400 V at U_{LN} = 400 V
t_{Buff}	[s]	U_{Buff} = 460 V at U_{LN} = 460 V
U_{Buff}, U_{min}	[V]	U_{min} = 250 V

Calculation example

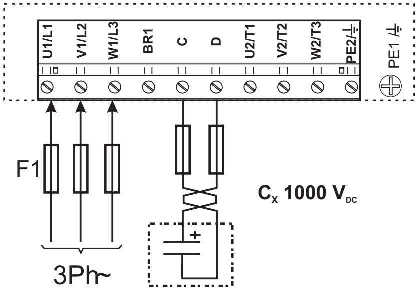
An AVy4220 Drive is operated with an AC Input supply U_{LN} = 400 V.
A voltage failure buffer is required for max. 1.5 s.

P_{SMPS}	70 W	t_{Buff}	1.5 s
U_{Buff}	400 V	U_{min}	250 V
C_{std}	1800 µF		

$$C_{ext} = \frac{2 \cdot 70\ W \cdot 1.5\ s \cdot 10^{6} \mu F / F}{(400\ V)^2 - (250\ V)^2} - 1800\ \mu F = 2154\ \mu F - 1800\ \mu F = 354\ \mu F$$

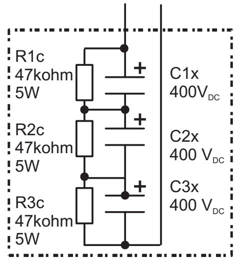
AVy...-5 (575Vac)

Figure 4.9.1-B: Buffering the Regulator Supply by Means of Additional Intermediate Circuit Capacitors (for 575Vac)



or

$$\frac{1}{C_x} = \frac{1}{C1_x} + \frac{1}{C2_x} + \frac{1}{C3_x}$$



NOTE! When connecting the intermediate circuit terminals C and D the AC Input side **must** be protected with superfast semiconductor fuses!

Formula for calculating the size of the external capacitors:

$$C_{ext} = \frac{2 \cdot P_{SMPS} \cdot t_{Buff} \cdot 10^{6}}{U^2_{Buff} - U^2_{min}} - C_{std}$$

C_{ext}, C_{std} [µF]
P_{SMPS} [W]
U_{Buff} = 565 V at U_{LN} = 565 V
t_{Buff} [s]
U_{Buff}, U_{min} [V]
U_{min} = 250 V

Calculation example

An AVy4220 Drive is operated with an AC Input supply U_{LN} = 575 V.
A voltage failure buffer is required for max. 3.0 s.

P_{SMPS}	70 W	t_{Buff}	3.0 s
U_{Buff}	565 V	U_{min}	250 V
C_{std}	1100 µF		

$$C_{ext} = \frac{2 \cdot 70\ W \cdot 3.0\ s \cdot 10^{6} \mu F / F}{(565\ V)^2 - (250\ V)^2} - 1100\ \mu F = 1636\ \mu F - 1100\ \mu F = 536\ \mu F$$

4.10 Power Dip Ride Through Data and Restart Setup

The ARTDrive has a 3-phase full-wave rectifier feeding the DC link.

If the DC link reaches the Undervoltage threshold for its voltage input (see table 4.10.1), the ARTDrive will disable the Drive, and generate an undervoltage alarm.

The undervoltage alarm can latch & trip the drive immediately, or be programmed to reset itself and restart. The undervoltage alarm settings define how many restarts are permitted. There is a 'restart time' parameter that sets how long the undervoltage condition can exist before the ARTDrive gives up on the reset.

The DC link feeds the ARTDrive power supply. If the DC link goes below 250 VDC the electronics reset as if just powered up. The capacity of the DC link between the undervoltage shutdown of the Drivesection, the 250 VDC power supply threshold, and the power draw of the ARTDrive electronics & cooling fan determine how long the drive stays up under power dips or power loss.

The DC link can have extra capacitance added externally to the DC link to add time to keep the DC link above 250 VDC as long as possible. The following tables calculate how long the Drive can keep the power above 250 VDC for control power if the maximum amount of capacitance is added externally. Remember, adding capacitance holds in the power supply longer, but also takes longer to recharge.

The survival of an input power dip without shutting down the Drive section depends on the relative load (energy) that the DC bus has to output, and the magnitude and duration of the power dip. A power dip needs to be below the DC undervoltage threshold before the drive would even see any trip condition from it.

Without external capacitors, as an estimate, a power dip of 1 cycle (16.6ms @ 60Hz) when the motor is at full load will cause an undervoltage trip.

The undervoltage trip time can be calculated by means of the following formula:

$$t = \frac{(U_{dc}^2 - U_{Buff}^2) \cdot (C_{std} + C_{ext})}{2P_{am} \cdot 10^6}$$

where:

t:	undervoltage trip time [ms]
U_{dc}:	DC link voltage [V]
U_{buff}:	trip threshold voltage [V]
C_{Std}:	DC link capacitance [μF]
C_{ext}:	external capacitance [μF]
P_{am}:	motor power consumption [W]

P_{am} depends on the motor load conditions:

- at full load, it can be calculated as follows: $P_{am} = \frac{P_m}{\eta_m}$ fA028

where:

P_m: motor rated power

η_m: motor rated efficiency

- at no load, it depends on the iron losses, on mechanical losses, and stator joule losses. The sum of these terms is about 50% of the full load losses.

Full load losses P_{lfl} are:

$$P_{lfl} = P_m \cdot \frac{1 - \eta_m}{\eta_m}$$

Maximum power supply drop out time (Buffer time/voltage failure buffer) of ARTDrive is achieved by adding the maximum recommended capacitance to the DC bus.

The following table show the maximum power supply drop out time for different Undervoltage thresholds and inverter sizes. The meaning of the symbols in the colums is as follows:

C_{std} = internal capacitance in μF,
C_{ext} max = external total capacitance in μF,
T_{buff} = max drop out time in sec.,
P_{SMPS} = power supply watts,
U_{buff} = volts threshold to disable drive operation,
U_{min} = min DC volts that will support the power supply

Where T_{buff} is defined by the formula:

$$T_{buff} = \frac{(C_{std} + C_{ext}\ max)\ (U_{buff}^2 - U_{min}^2)}{2 \cdot P_{SMPS}\ 10^6}$$

Table 4.10.1: Drive Trip Times, 230-V Threshold

Size	Psmps [W]	C_{std} [μF]	C_{ext} max [μF]	U_{buff} [V]	U_{min} [V]	T_{buff} [sec.]
4220	70	1800	4500	230	200	0.58
4300	70	2200	4500	230	200	0.62
4370	70	3300	4500	230	200	0.72
5450	70	4950	4500	230	200	0.87
5550	70	4950	4500	230	200	0.87
6750	70	6600	0	230	200	0.61
7900	70	6600	0	230	200	0.61
71100	70	9900	0	230	200	0.91
71320	70	14100	0	230	200	1.3
81600	70	14100	0	230	200	1.3

avy4225

Table 4.10.2: Drive Trip Times, 400-V Threshold

Size	Psmps [W]	C_{std} [µF]	C_{ext} max [µF]	U_{buff} [V]	U_{min} [V]	T_{buff} [sec.]
1007	65	220	0	400	250	0.165
1015	65	220	0	400	250	0.25
1022	65	330	0	400	250	0.24
1030	65	330	0	400	250	0.24
2040	65	830	0	400	250	0.62
2055	65	830	0	400	250	0.62
2075	65	830	0	400	250	0.62
3110	65	1500	1500	400	250	2.25
3150	65	1500	1500	400	250	2.25
4220	70	1800	4500	400	200	5.4
4300	70	2200	4500	400	200	5.74
4370	70	3300	4500	400	200	6.68
5450	70	4950	4500	400	200	8.1
5550	70	4950	4500	400	200	8.1
6750	70	6600	0	400	200	5.65
7900	70	6600	0	400	200	5.65
71100	70	9900	0	400	200	8.48
71320	70	14100	0	400	200	12.08
81600	70	14100	0	400	200	12.08

avy4230

Table 4.10.3: Drive Trip Time, 460-V Threshold

Size	Psmps [W]	C_{std} [µF]	C_{ext} max [µF]	U_{buff} [V]	U_{min} [V]	T_{buff} [sec.]
1007	65	220	0	460	250	0.25
1015	65	220	0	460	250	0.25
1022	65	330	0	460	250	0.37
1030	65	330	0	460	250	0.37
2040	65	830	0	460	250	0.95
2055	65	830	0	460	250	0.95
2075	65	830	0	460	250	0.95
3110	65	1500	1500	460	250	3.45
3150	65	1500	1500	460	250	3.45
4220	70	1800	4500	460	200	7.72
4300	70	2200	4500	460	200	8.21
4370	70	3300	4500	460	200	9.56
5450	70	4950	4500	460	200	11.58
5550	70	4950	4500	460	200	11.58
6750	70	6600	0	460	200	8.04
7900	70	6600	0	460	200	8.09
71100	70	9900	0	460	200	12.13
71320	70	14100	0	460	200	17.28
81600	70	14100	0	460	200	17.28

avy4240

Table 4.10.4: Drive Trip Time, 575-V Threshold

Size	Psmps [W]	C_{std} [µF]	C_{ext} max [µF]	U_{buff} [V]	U_{min} [V]	T_{buff} [sec.]
2002	65	157	0	565	250	0.31
2003	65	157	0	565	250	0.31
2005	65	313	0	565	250	0.62
3007	65	666	666	565	250	1.32
3010	65	666	666	565	250	1.32
3015	65	1000	1000	565	250	1.97
3020	65	1000	1000	565	250	1.97
4025	70	1100	1300	565	250	2.02
4030	70	1100	1300	565	250	2.02
4040	70	1567	1300	565	250	2.87
4050	70	2200	2500	565	250	4.03
5060	70	2200	2500	565	250	4.03
5075	70	3130	1500	565	250	5.75
6100	70	4700	0	565	250	8,62
7125	70	6266	0	565	250	11,5
7150	70	6266	0	565	250	11,5
8200	70	9066	0	565	250	16,6

avy4245

4.11 Discharge Time of the DC-Link

Table 4.11.1: DC Link Discharge Times

	Type	I_{2N}	Time (seconds)
AVy…-4 (230V…480V)	**1007**	2.1	90
	1015	3.5	
	1022	4.9	150
	1030	6.5	
	2040	8.3	205
	2055	11	
	2075	15.4	
	3110	21.6	220
	3150	28.7	
	4220	40	60
	4300	54	60
	4370	68	90
	5450	81	120
	5550	99	
	6750	124	
	7900	160	
	71100	183	
	71320	217	
	81600	282	

	Type	I_{2N}	Time (seconds)
AVy…-5 (575V)	**2002**	3.8	100
	2003	4.5	
	2005	7.0	200
	3007	10.8	250
	3010	13.8	
	3015	18.7	
	3020	24.2	
	4025	30	230
	4030	36	230
	4040	46	230
	4050	58	300
	5060	69	300
	5075	86	300
	6100	109	300
	7125	137	300
	7150	158	300
	8200	218	300

avy0708

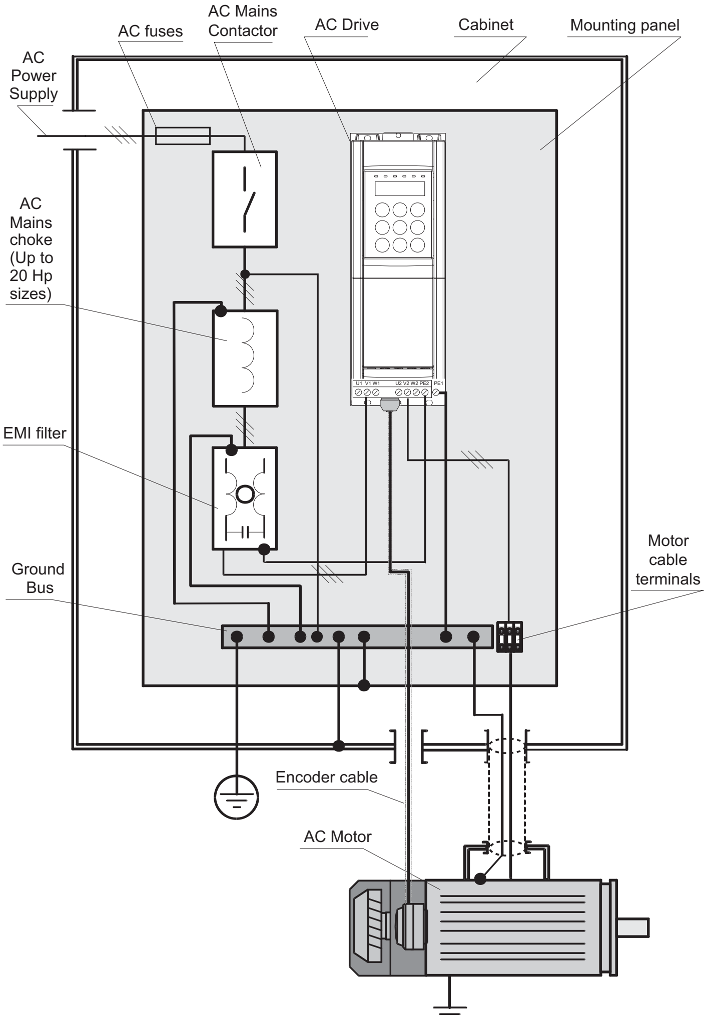
This is the minimum time that must be elapsed since an AVy Drive is disconnected from the AC Input before an operator may service parts inside the Drive to avoid electric shock hazard.

CONDITION : These values consider a turn off for a Drive supplied at 480Vac +10% (for AVy...-4, 230...480Vac) or 575Vac +10% (for AVy...-5, 575Vac), without any option, (the charge for the switching supply is the regulation card, the keypad and the 24Vdc fans “if mounted”).

The Drive is disabled. This represents the worst case condition.

Chapter 5 - Quick Start Up Guide

5.1 Functional Connection Diagram



Note! PE1 is the drive safety ground. If PE2 is used to connect the motor ground, EMI filter ground must be connected to PE1.

5.2 Overview

This guide assumes a standard start up using the keypad for a drive and motor that is to be run in any of the available regulation modes. It is also assumed that a standard scheme is to be used for control. In other words, that the drive will be run from pushbuttons (or contacts) and the speed will be set from either the keypad or a pot input (or 0 to 10 vdc source). While the drive has more modes of operation and dozens of combinations of configurations, this guide will cover most applications that are not being started up by a service engineer.

The instruction book can be used to make more complex changes to standard configuration beyond this set up.

Standard Wiring scheme: see chapter 4, Wiring Procedure.

5.3 Pre-power Checks

The following should be checked before switching the Drive ON :

Grounds / Grounding

- Verify ground connections drive to motor
- Verify AC Inputs, AC Outputs and control wiring are clear of grounds
- Drive power supply may be intentionally grounded

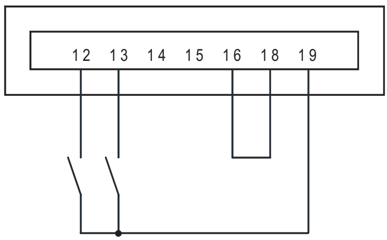
Connections

- Check AC Inputs (U1/L1, V1/L2, W1/L3), AC Outputs (U2/T1, V2/T2, W2/T3) for tightness and good connections
- DC connection with an optional external Braking Unit (C,D)
- Motor thermistor (**78**,**79**)
- “Digital Output 0” Relay (**80**,**82** n.o), “Digital Output 1” Relay (**83**,**85** n.o)
- Regulation Board connections:

1.........46	on connectors XS, XE
12	ENABLE Drive (close to active)
13	Digital input 1
16	Common for terminal board
18	+ 24V Common
19	+ 24VDC (internal)

- Any option board connections

Figure 5.3.1: Terminal connections



- Encoder connections (if used)
- Record Motor Name Plate Data, encoder infomation and mechanical data.

Motor Data

Table 5.3.1: Motor Data

HP (kW)		Cos phi (power factor)	
Amps		Tach type	
Volts		Tach PPR	
Hz		Motor rotation for machine fwd direction [CW/CCW]	
Rpm		Gearbox ratio	

5.4 Keypad Operation

The keypad (Fig. 5.4.1) is made of a LCD display with two 16-digit lines, seven LEDs and nine function keys. It is used:

- to start and stop the drive (this function can be disabled)
- to increase/decrease speed and jog
- to display the speed, voltage, diagnostics etc. during the operation
- to set parameters and enter commands

The LED module is made of 6 LEDs. It is used to display status and diagnostic information during the operation. Keypad and LED module can be installed or removed also while the drive is running.

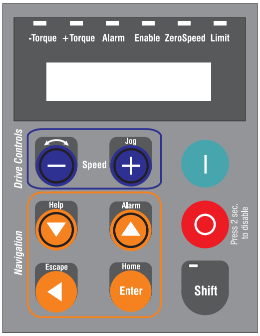


Figure 5.4.1: Keypad

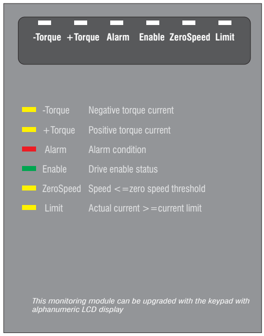


Figure 5.4.2: LED Module

NOTE! A replacement keypad cable longer than 20 cm must be shielded.

5.4.1 LEDs & Keys

The LEDs present on the keypad are used to quickly diagnose the operating state of the drive.

Designation	Color	Function
-Torque	yellow	the LED is lit when the drive operates with a negative torque
+Torque	yellow	the LED is lit when the drive operates with a positive torque
ALARM	red	the LED is lit when the drive signals a trip
ENABLE	green	the LED is lit when the drive is enabled
Zero speed	yellow	the LED is lit when motor speed is zero
Limit	yellow	the LED is lit when the drive operates at a current limit
Shift	yellow	the LED is lit when the keypad second functions are enabled

ts030g

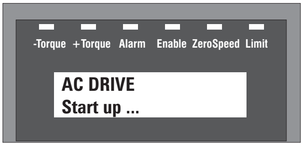
Control keys	[Text reference] - Function
	**[START]** Start key command used to start the drive via keypad; **C00.20 - Commands select** = *[4] I/O keys* parameter setting and +24V between 12 & 13 terminals are always required to initiate a start/stop command from keypad.
	**[STOP]** Stop key command used to stop the drive via keypad; **C00.20 - Commands select** = *[4] I/O keys* parameter setting and +24V between 12 & 13 terminals are always required to initiate a start/stop command from keypad. Pressing this key for 2 sec, the drive will be disabled. **STOP** key also resets the sequencer after an alarm event. The action of the **STOP** key can be programmed with **C00.24 - Stop key mode** parameter, which depending by the setting of **C00.20** parameter too: **C00.20** = *[4]*: (default configuration) main commands are coming from keypad. Therefore, the **STOP** key will cause a normal stop of the motor. - **C00.20** ≠ *[4]* and **C00.24** = *[0]*, pressing the **STOP** key will have no effect. - **C00. 20** ≠ *[4]* and **C00.24** = *[1]*, pressing the **STOP** key, the motor will execute an Emergency stop, following the ramp programmed by **B03.02** (or **D02.02**). After the speed reaches the zero values, the drive will trip with the dedicated alarm " Key Em Stp fault". An alarm reset will be needed to restore drive operations.
	**[Increase] / [Jog]** Plus key increases the speed reference for Motor pot function. After pressing shift key, holding this key causes the drive to Jog (default direction = forward = CW).
	**[Decrease] / [Rotation control]** Minus key decreases the speed reference for Motor pot function. After pressing shift key, this key toggles motor rotation direction in Jog mode and Motor pot function.
	**[Down arrow] / [Help]** Used to scroll down menu items in menu navigation, picklists in selectors, or digit values in numeric editing. After pressing shift key, an item-specific information menu is entered when applicable. Help menu can be browsed with up/down arrows. Left arrow returns to normal mode.
	**[Up arrow] / [Alarm]** Used to scroll up menu items in menu navigation, picklists in selectors, or digit values in numeric editing. After pressing Shift key, the Alarm list display mode is entered. Active alarms and Alarms pending for acknowledge can be browsed with up/downs arrows. Alarms can be acknowledged whit the Enter key. Left arrow returns to normal mode.
	**[Left arrow] / [Escape]** Used to go up one level in menu navigation; to scroll digits in numeric edit mode, to return to normal mode from alarm list or help modes. After pressing shift key, it is used to Escape out of numeric edit or selection with no change.
	**[Enter] / [Home]** Used to go down one level in menu navigation; to enter selections or numeric values after editing, to issue commands, to acknowledge alarms in the Alarm list mode. Home second function is not implemented.
	**[Shift]** Shift button enables the keypad second functions (Rotation control, Jog, Help, Alarm, Escape, Home).

5.4.2 Power Up

Power up the drive.

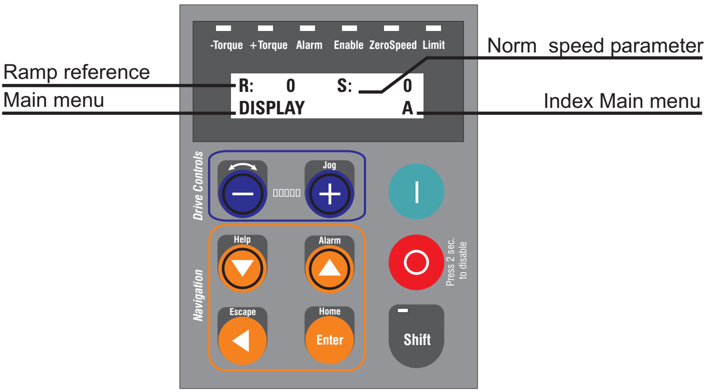
The drive will begin a self test and initialization procedure which will take approximately **10 seconds**. During this period, the display will cycle through various indications.

During this process, the below message will appear on the display and all LED's will simultaneously blink one time:



Note! During this operation "Drive OK" relay (teminals 80-82 on regulation board) is not active. The self test and initialization must be complete before the status of the relay is correct.

After the **10 seconds**, the keypad will display the following:

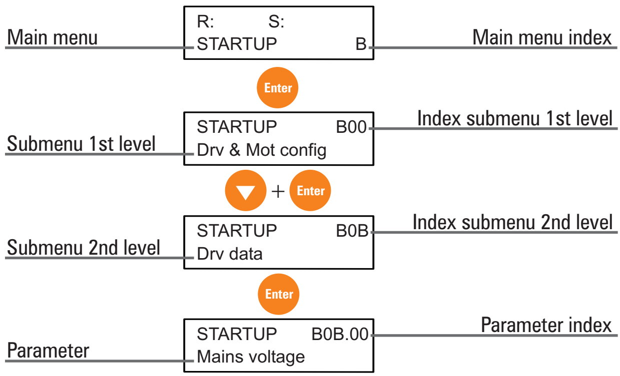


The field indicated by the "**R**:" is used to show the Ramp reference value (**D07.20 - Ramp out mon**) once the motor is running.

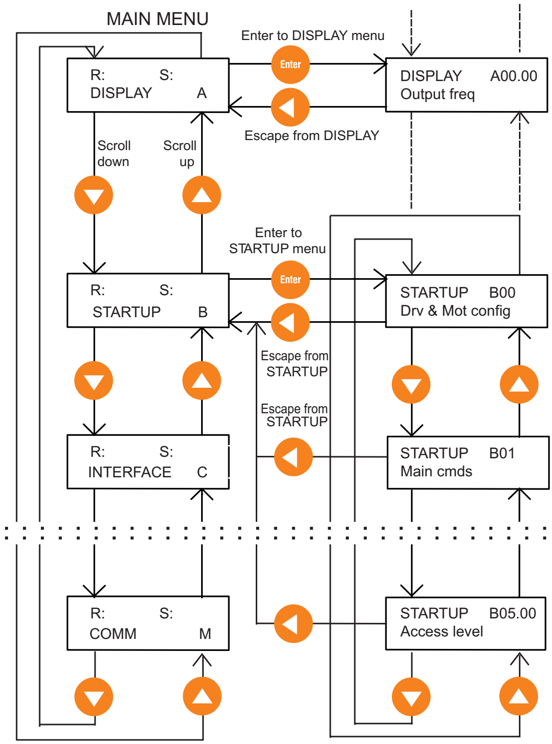
The field indicated by the "**S**:" is used to show the motor speed in RPM (**A07.00 - Actual speed**) once the motor is running.

Note! If the drive is connected to a 230V input, the red "Alarm" LED will blink indicating an UNDERVOLTAGE condition since the drive is factory configured for 400V. Proceed to the Drive initial setup procedure in section 5.5 for instructions on completing the configuration and startup.

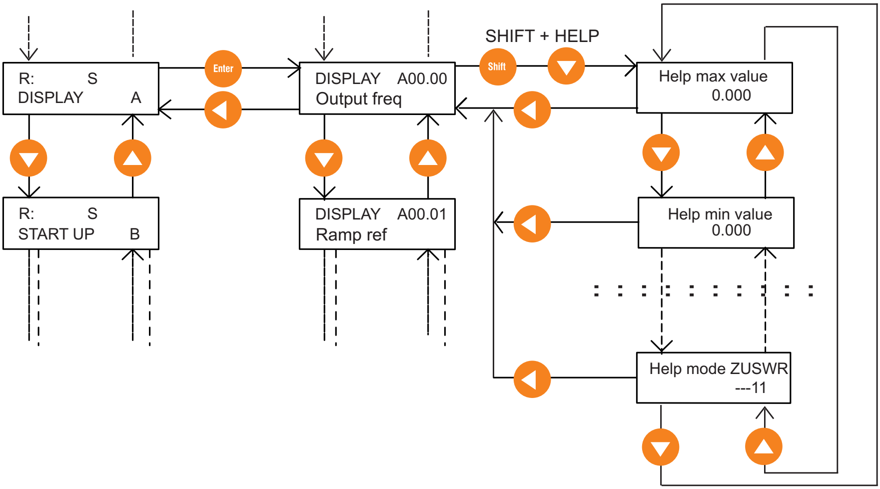
5.4.3 Menu & Parameter Index Displaying



5.4.4 Moving Inside a Menu



5.4.5 Using Keypad Help (Help is not avaible for some menu entries



5.4.6 Drive Menu - Main Level

The menu visualisation is available in two mode set by **B05.00 - Access level** parameter (**STARTUP** menu):

- Easy (default) only main parameters are shown
- Full include all parameters

R: S: DISPLAY A	Drive display variables
R: S: STARTUP B	Initial commissioning configurations
R: S: INTERFACE C	Commands and Input / Output configurations
R: S: REF & RAMP D	Ramp setpoint, Ramp, Multipspeed, Jog, Motopot configurations
R: S: REG PARAM E	Regulator gains & control parameters
R: S: SPEED REG F	Speed setpoint & speed configurations
R: S: TORQUE G	Torque current limit & torque functions
R: S: FLUX H	Flux configurations
R: S: FUNCTION I	DC braking & power loss functions
R: S: ALARM CFG L	Alarm configurations
R: S: COM M	Serial link, communication cards & ISBus configurations
R: S: APC CARD N	APC 100 card configurations
R: S: APPL CFG O	PID control configurations
R: S: CUSTOM P	Signal compare blocks & Playground PAD configurations
R: S: SERVICE Q	Service purpose menu with password

= Menu not available in Easy Access Level

5.5 Quick Start-up Procedure

Step	Operation	Description
1	Go to the menu **B STARTUP**	Scroll drive menus using t key, until **STARTUP** menu.
2	**If required:** set drive regulation mode (defult is *[1] V/f control*)	**B STARTUP / B00 Drv & Mot config** Enter the **B0A.00 - Regulation mode** parameter to set a different regulation mode: [1] *V/f control, [2] FOC control* and *[3] SLS control* .
3	**If required:** set the drive main voltage Default are: - [5] 460V for AVy...-4A - [6] 575V for AVy...-5	**B STARTUP / B0B Drv data** Enter the **B0B.00 - Mains voltage** parameter to set the drive main voltage (*[0] 230V, [1] 380V, [2] 400V, [3] 415V, [4] 440V, [5] 460V and [6] 575V*).
4	Set the drive maximum reference speed	**B STARTUP / B00 Drv & Mot config / B0C Full scale speed** Enter the **B0C.00 - Full scale speed** parameter, which defines the 100% of the application speed referenced. Absolute speed handling range is ±200% of **B0C.00**.
5	Set the motor rated voltage	**B STARTUP / B00 Drv & Mot config / B0D Mot data** Enter the **B0D.00 - Motor rated volt** parameter to set the motor rated voltage (*).
6	Set the motor rated frequency	**B STARTUP / B00 Drv & Mot config / B0D Mot data** Enter the **B0D.01 - Motor rated freq** parameter to set the motor rated frequency (*).
7	Set the motor rated current	**B STARTUP / B00 Drv & Mot config / B0D Mot data** Enter the **B0D.02 - Motor rated curr** parameter to set the motor rated current (*).
8	Set the motor rated speed	**B STARTUP / B00 Drv & Mot config / B0D Mot data** Enter the **B0D.03 - Motor rated speed** parameter to set the motor rated speed (*): if Slip data is available(*) **B0D.03** = Synchronous speed - Slip
9	Set the motor rated power (kW)	**B STARTUP / B00 Drv & Mot config / B0D Mot data** Enter the **B0D.04 - Motor reted power** parameter to set the motor rated power (*). ***Note!*** kW = Motor Hp rating * 0.736
10	Set the motor power factor (cosphi)	**B STARTUP / B00 Drv & Mot config / B0D Mot data** Enter the **B0D.05 - Motor power fact** parameter to set the motor power factor (*).
		(*): nameplate data

Step	Operation	Operation
11	Run Motor autotune (Motor parameters measurement)	**B STARTUP / B00 Drv & Mot config / B0E Autotune** Select one of two Autotune procedures available: • **B0E.00 - Complete rot** : complete self-tuning of drive current and flux loops with moving motor shaft. • **B0E.01 - Complete still** : complete self-tuning of drive current and flux loops with stopped motor shaft. ***Note!*** When motor is coupled to gearbox and load on the motor shaft is installed, use **Complete still**. When motor is uncoupled or gearbox does not represent more than 10% of load and motor shaft is unloaded, use **Complete rot**. Press **[Enter]** and **[I]**" keys to run the procedure (12 drive terminal must be cycle to +24Vdc). Wait up to "Autotune End" message will be displayed, then press three times **[Escape]** key.
12	**If required:** set the motor V/f curve	**B STARTUP / B00 Drv & Mot config / B0F V/f cfg** Enter the parameters: • **B0F.00 - V/f voltage** to set the V/f base voltage • **B0F.01 - V/f frequency** to set the V/f base frequency • **B0F.02 - Voltage boost** to set the torque boost.
13	**If required:** set the encoder parameters	**B STARTUP / B00 Drv & Mot config / B0G Encoders** Enter the parameters: • **B0G.00 - Std enc type** to set the fbk encoder type. • **B0G.01 - Std enc pulses** to set the encoder pulses. • **B0G.02 - Std enc supply** to set the encoder supply voltage.
14	Set the drive main command	**B STARTUP / B01 Main cmds** Enter the **B01.00 - Commands select** parameter to control the drive via: • *[0] TerminalLevel* terminal strip using a Level sensitive signals • *[1] TerminalEdge* terminal strip using a Edge sensitive signals • *[2] DigitalLevel* dedicated for application card • *[3] DigitalEdge* dedicated for application card • *[4] I O keys* keyboard using the **[I], [O]** keys; terminal 12 to and terminal 13 to 24Vdc are required
15	**If required:** select Local / Remote command source	**B STARTUP / B01 Main cmds** Enter the **B01.01 - Term Local src** parameter select the Local/Remote command through digital input desired. For more details see paragraph 7.3, Index **B01.01.**

Step	Operation	Operation
16	Set the drive main reference	**B STARTUP / B02 Ref src** Enter the **B02.00 - Ramp ref 1 src** parameter to select from the list displayed the source of drive speed reference; selection example: • *004 - AI 1 output* Analog input 1 reference (default) • *000 - DigRampRef 1* Digital reference 1 value, settable through **B02.01 - Dig ramp ref 1** parameter (see **B02 Ref src** menu)
17	Set the drive acceleration and deceleration ramps time	**B STARTUP / B03 Acc/Dec** Enter the parameters: • **B03.00 - Accel time 1** to set acceleration time (5 sec = default) • **B03.01 - Decel time 1** to set deceleration time (5 sec = default)
18	Save the drive parameters	**[Escape]** all drive menu up to **B - STARTUP**, than press **[Escape]** again to display the Save parameters command, so press **[Enter]** to confirm the save execution.
	Note!	To perform speed loop gain of the speed regulator, see chapter 7.4.

5.5.1 Motor Potentiometer and Jog

Run the motor using Motopot function

This function is enabled in the standard settings with a Speed Reference value = 1000rpm.

Note! Verify **B STARTUP / B01 Main cmds / B01.00 - Command select** = *[4] I/O keys*.

To run the motor using Motopot function connect terminal 12 (Enable), terminal 13 (Start), to terminal 19 (+24VDC) through relays or local switch and follow the steps in the table below:

Control buttons	Sequencing	Display example after pressing
	Press START button to command the Drive to the Enable and Run state	**R: 0 S: 0** **STATUS**
	Press STOP button commands to stop the Drive from the Run state	**R: 0 S: 0** **STATUS**
	Press to display the speed reference value and to increase the reference value and accelerate the drive.	**Mpot output mon** **320 rpm**
	Press to decrease the reference value and decelerate the drive.	**Mpot output mon** **-150 rpm**
	Press SHIFT and [-] to change the motor shaft rotation	**Mpot output mon** **150 rpm**

How to use Jog function

This function is enabled in the standard setting with a speed reference value = 100 rpm.

Connect terminal 12 (Enable) and 13 (Start) to terminal 19 (+24VDC) through relays or local switch.

Press **[SHIFT]** and **[+]** to run, the speed will be displayed
Press **[-]** to change the motor shaft rotation
Press **[Jog]** to run the other direction
Press **[Left]** to exit from jog operation

To change the jog speed reference, edit the reference in the following menu path:

D REF&RAMP / D10 Jog / D10.10 - Jog speed 1

Note! "Full" Access level to the drive parameters is required

Press  to save the settings if required.

5.6 Additional Information (Configuration of the OK Relay)

5.6.1 Analog Input Tuning

On the regulation card, the following configuration can be set:

Analog inputs	Input signal	
	-10V…+10V	0-20mA
	0-10V	4-20 mA
Analog input 1	S8 = OFF	S8 = ON
Analog input 2	S9 = OFF	S9 = ON
Analog input 3	S10 = OFF	S10 = ON

tab 561

ON Jumper OFF Jumper

NOTE! It is important to remember that the hardware configuration on the regulation card has to be set according to the selected input.

- 10V… +10V

The input allows a maximum voltage of +/-10V.

The motor rotation direction is obtained according to the signal polarity. Input voltage > 10V or >-10V cause saturation of the count value.

0–10V, 0–20mA

The input allows a maximum voltage of +10V or 0…20mA current signal. If used as reference, the signal must be always positive sign. Through **AI 1 sgn src** it is possible to change the motor rotation.

4 –20 mA

The input allows to connect 4… 20mA current signal.

If used as reference, the signal must be always positive sign. Through **AI 1 sgn src** it is possible to change the motor rotation.

Through the **An inp X <thr** output it is possible to monitor the state of the input current signal. If the current is lower than the value set in the **An inp 1 thr** parameter, an output signal is supplied (error signal). This signal can also be defined as digital output.

How to perform the **self-tuning procedure** of the Analog input 1, if the input is **- 10V… +10V** (factory).

Tune Analog input 1 offset

C INTERFACE / C01 An Inp 1

Refer to 0 the position of the potentiometer connected to Analog input 1 terminals.

Enter the **C01.18 - AI 1 offs tune** parameter: "Start…" message will be displayed, than press **[Enter]** key to run the procedure.

Wait up to "Autotune End" message will be displayed, than press three time **[Escape]** key.

Tune Analog input 1 gain

C INTERFACE / C01 An Inp 1

Refer to maximum the position of the potentiometer connected to Analog input 1 terminals.

Enter the **C01.19 - AI 1 gain tune** parameter: "Start…" message will be displayed, than press **[Enter]** key to run the procedure.

Wait up to "Autotune End" message will be displayed, than press three time **[Escape]** key.

5.6.2 Configuration of the OK Relay

Digital output 0 programming

C INTERFACE / C19 DO config

C19.00 - DO 0 src parameter defines the closing condition of the relay contact on terminals 80-82.

The "OK relay" can be selected as:

- *008 - Drive OK*

  The contact closes when the drive is powered up with no failure alarms (factory setting).
- *003 - Drive Ready*

  The contact closes when the following conditions are fulfilled:

  - The drive is powered up

  - There are no failure alarms present

  - The drive is enabled. The enable operation is defined by

  C00.20 - Command select and

  C00.21 - En/disable mode parameters

  - The magnetizing procedure has been completed. (Drive is ready to deliver torque)

NOTE! The contact opens immediately on a drive failure, or when the drive is disabled. To change factory setting from *008 - Drive OK* to *003 - Drive Ready*:

Enter **C19.00 - DO 0 src** parameter, scroll up to *003 - Drive Ready* selection, than press **[Enter]** to confirm the new setting.

5.7 Encoder Verification

Set the Drive in V/f control and run the motor, enable and start the drive and set a positive reference. The motor should be turning clockwise, looking at the driving shaft pointing at you.

Monitor the encoder measurement in the following menu path:

Encoder speed displaying

A DISPLAY / A13 Adv Dsply

Enter **A13.02 - Act Std enc spd** parameter to read encoder speed

The speed should be positive. If it is negative, then A and A- or B and B- should be interchanged on the encoder.

5.8 I/O Configuration

The standard drive has three analog inputs, two analog outputs as well as seven digital inputs and four digital outputs(two relay outputs + 2 opto-coupler outputs) which are configurable.

In addition, a set of LAN cards and a coprocessor card are available. All analog, digital and LAN channel outputs are configured from the I/O CONFIG menu. Every output channel has a “source” parameter that can be assigned with one signal out of a picklist. All analog, digital and LAN channel inputs can be tied to the appropriate regulation or control input by editing a “source” parameter for the regulation/control input and assigning it with one input out of a picklist. To set up the drive for two analog outputs (one for speed and one for load) for metering or other purposes, do the following:

Motor speed on Analog output 1

C INTERFACE / C08 An Out 1

Enter **C08.00 - AO 1 src** parameter, than scroll down the list up to

[019] - Actual speed selection.

Refer to the paragraph 4.3.2, Terminal Assignments on Regulation Section, showing a description of the connection of the regulation section and how to make them. A more detailed description and discussion of the I/O are shown in the section 1.5 of User’s Guide. The analog outputs are defaulted to a scale of 1, which means 10 volts out at max parameter value. For example, if analog output 1 is set to **A07.00 - Actual speed** then speed will be scaled 10 Vdc (maximum output voltage available) at **B0E.00 - Full scale speed** (found in startup config.). If you wanted 5 volts out at **Full scale speed** then set the scale to 0.5. If the output was set to **A05.00 - Torque ref** then 10 Vdc would be motor rated torque. If you wanted the output to be 10 Vdc at 150% then the scale would be 0.66.

Chapter 6 - Parameter Description

6.1 General Considerations

The menu visualization is available in two mode set by **Access level** parameter (**STARTUP** menu):

- **Easy** (default) only main parameters are shown
- **Full** include all parameters (Easy + Full)

See Level column on chapter X, Parameters:

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
A08.00	**Speed ref** Drive speed reference	**[rpm]**	**R**	**0.00**	**0.00/0.00**	**PV**	**V-F-S**	**Easy**	**3210**
A09.00	**Enable SM mon** It shows the drive Enable state 0 OFF 1 ON	**N/A**	**R**	**0**	**0/1**	**DV**	**V-F-S**	**Full**	**162**

The drive control diagram is made of functional Blocks each representing a part of the total function. For example speed regulator, ramp etc., each containing some Variables, the gains, the ramp times, the limits etc. The input and / or output of Blocks are interconnected to make the complete system function. Such interconnections are called SIGNALS.
The setting of the Drive parameters/variables can be performed via the keypad or a PC Configurator.

The parameter functions is the following:

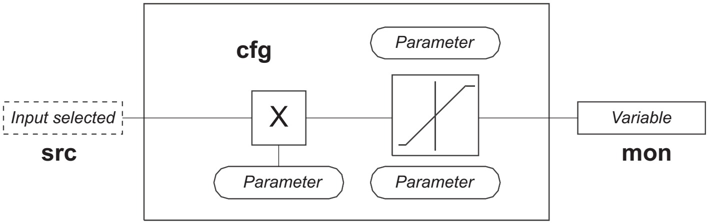
src (Source)
These are parameters that select where an input comes from. The selections are from a pick-list.
The source is aimed at controlling (or enabling) the Block inputs.

cfg (Configuration)
These are parameters that define how the function or parameter acts. For example: Ramp times, internal references adjustments.

mon (Monitor)
These parameters are variables. They are read only, and show the value or state of a signal.

The three above elements are inside a menu, as needed by each single Block.

Example Block:



This chapter describes:
- Variable connection methods
- Block functions
- Signal normalization

6.1.1 Variable Connection Methods

The **source** allows you to assign the signal for the input Block.
Thanks to a predefined list, **Pick List**, the user can select the signal origin by connecting it to the input Block.
The signal selected will be assigned to the source. This signal controls the Block Function and is therefore defined as a control signal. The signals come from different points of the control system.

The connection points can derive from:

1 - Physical terminal board
analog and digital signals from the drive terminal strip and from the EXP expansion cards.

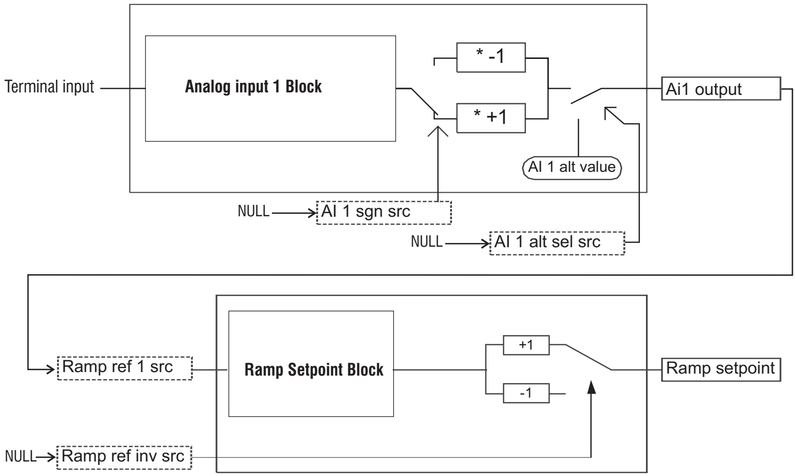
2 - Analog and digital signals
from DGFC or APC option cards, Field Bus, keypad.

3 - Drive internal variables
using keypad or toolbox.

The control signal is always connected on the Source of each Block. The state of this signal depends on the Block Function.

I.e.:
- the Ramp Setpoint Block which generates the ramp reference, defaults **D00.00 - Ramp ref 1 src** source from the Analog input 1 output signal (the Block output on the analog Input 1).
This signal is in the pick-list of the **D00.00 - Ramp ref 1 src** (Pick List 07), and can be changed. I.e.: *000-DigRampRef 1* (Ramp setpoint block internal value).

- the analog Input Block, connects on its **C01.00 - AI 1 sgn src** source (which inverts the output reference signal) the *000-NULL* signal.
If the user wants to enable the specific function, he has to make a selection inside the pick-list of the **C01.00 - AI 1 sgn src** (Pick List 03). I.e.: *001-ONE*, *002-DI 0 En mon*, etc. .



NOTE! **C01.00 - AI 1 alt sel src** source allows you to select the signal to enable an alternative output reference.
C01.11 - AI 1 alt value parameter determines the value of the alternative output reference.
D00.03 - Ramp ref inv src allows you to select the signal for inverting the final output setpoint.

6.1.2 Block Functions

Here is an example referring to the setting of a digital signal (**D07.01 - Ramp output = 0**) and of an analog signal (**F00.00 - Speed ref 1 src**).

NOTE! The points …………, refer to other possibilities parameters in the menus.

Digital signal

Let’s consider a section of the Ramp Block.
In Ramp funct menu, the source **D07.01 - Ramp output = 0** allows the output of the RampBlock to be set to zero.
By editing (for example via the keypad by pressing **“Enter”**) the source **D07.01 - Ramp output = 0**, the Pick List 3 of the possible signal sources of control is displayed.

The selected signal on the source, will be enable the **D07.01 - Ramp output = 0** function.

D07 REF&RAMP / RampFunct

D07.00-Ramp input = 0
D07.01-Ramp output=0
…………

The following commands are available in the source **D07.01 - Ramp output = 0** (it is standard connected to *000-Null*), see Pick List 03:

000-Null	it connects the signal to Zero, Non-active
001-One	it connects the signal to One, Active
…………	…………
003-DI 1 mon	it connects the signal to the standard digital input 1, being active or non-active is a function of the digital input state
…………	…………
015-DI 0X mon	it connects the signal to the expanded dgt 0 input
…………	…………
027-B0 W0 decom	it connects the signal to a digital bit derived from a complete word.

D07 REF&RAMP / RampFunct

D07.12 - Ramp shape

The **Ramp shape** configuration allows to select the Ramp:

0- Linear	it sets the Linear Ramp
1- S-Shaped	it sets the S Ramp

D07 REF&RAMP / RampFunct

D07.20 - Ramp out mon

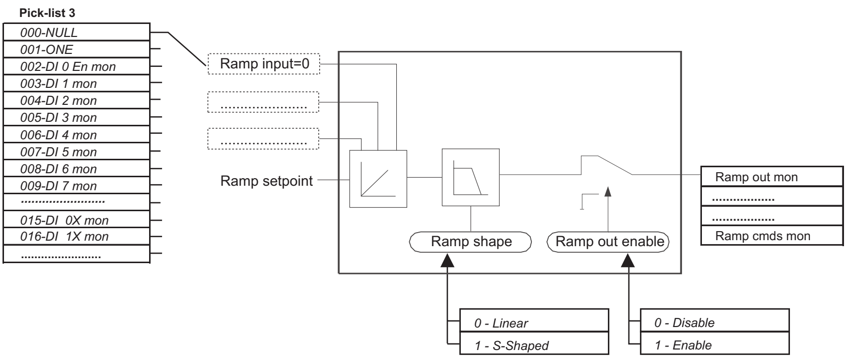
It is possible to monitor:

Ramp out mon	Output Ramp monitor
…………	

D07.24 - Ramp cmds mon
It is possible to monitor:

Ramp cmds mon	Ramp Block command monitor

Ramp function Block example



NOTE! Ramp out enable parameter allows to enable or disable the Ramp output .

Analog signal

Let's consider a section of the Speed Block. In **SPEED REG / Speed ref** menu the source **F00.00 - Speed ref 1 src** selects the signal origin to the Speed block input.
Creating the Speed reference. By editing the source the pick-list of the signal possible sources is displayed.

F00 SPEED REG / Speed ref

F00.00 - Speed ref 1 src

The items of the **Speed ref 1 src** source (see Pick List 09) are :

000-DigSpd Ref 1	it connects the signal to the Int speed ref 1. This variable allows the value digital setting, set internally by keypad or toolbox.
…………	
005-AI 2 output	connects the signal to the analog input 2 output. Block to the standard analog input 2.
…………	
011-AI 1X output	it connects the signal to the expanded analog input 1.
…………	
015-SBIDrvW0 mon	it connects the signal to the W0 monitor deriving from the SBI.
…………	
025-ISBusDrvW4 m	it connects the signal to the W4 monitor deriving from ISBus.

………

F00 SPEED REG / Speed ref

F00.10 - Dig speed ref 1

It is possible to configure (see Pick List 09):

000-DigSpd Ref 1	it states the reference value

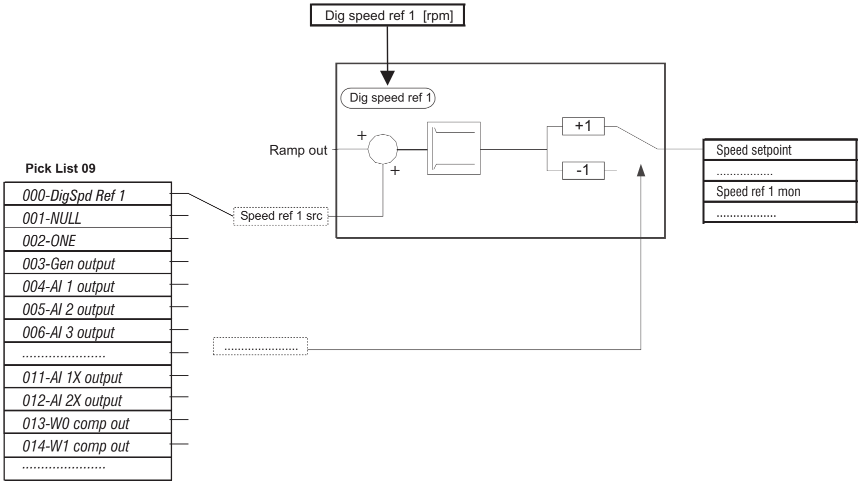
F00 SPEED REG / Speed ref

F00.30 - Speed ref 1 mon

It is possible to monitor:

Speed ref 1 mon	it states the reference value

Speed setpoint Block example



6.1.3 Signal Normalization

This paragraph describes the relationship between the physical units (rpm, Nm, A etc) and the Drive internal values. The different values which can be read via process channels are stated through an internal value (Count value) and the corresponding physical unit or parameter containing the reference value (Parameter name or Physical unit value). Sometimes the paragraph makes reference to tables listed in the following pages.

The conversion type, always linear, is stated for an internal use.
The code N/A (Not allowed) refers to a one to one conversion.
Ipa = Parameter number

Parameter Name	Ipa	Normalized	Normalized Physical value
NULL	4000		N/A
ONE	4001		N/A
Output volt	3060	16384	Table2 last column
Output curr	3070	16384	Table1 last column
Output freq	3080	16384	Table4 last column
DCLink volt	3100	16384	500V
Magnetiz curr	3110	16384	Table1 last column
Torque curr	3120	16384	Table1 last column
MagnCurr ref	3130	16384	Table1 last column
TrqCurr ref	3140	16384	Table1 last column
Curr phase U	3150	16384	Table1 last column
Curr phase V	3160	16384	Table1 last column
Curr phase W	3170	16384	Table1 last column
Flux ref	3180	16384	2Wb for 575V, 1Wb for 230-460
Flux	3190	16384	2Wb for 575V, 1Wb for 230-460
Ramp ref	3200	16384	Full scale speed
Speed ref	3210	16384	Full scale speed
Speed	3220	16384	Table3 last column
Actual Speed	3221	16384	Full scale speed
Fault Pin	9098		N/A
Norm Std enc spd	3222	16384	Full scale speed
Exp enc spd	3223	16384	Full scale speed
DrvOL accum %	1540	16384	100%
MotOL accum %	1670	16384	100%
BU OL accum %	1781	16384	100%
Drive ready	161		N/A
EnableSM mon	162		N/A
Start SM mon	163		N/A
FStop SM mon	164		N/A
ALM Sequencer	9096		N/A
Drive OK	9097		N/A
Jog state	8013		N/A
Gen output	2760		N/A
AI 1 output	5009	16384	10V or 20mA
AI 2 output	5029	16384	10V or 20mA
AI 3 output	5049	16384	10V or 20mA
AI 1X output	5067	16384	10V or 20mA
AI 2X output	5087	16384	10V or 20mA

tab613-1

Parameter Name	Ipa	Normalized	Normalized Physical value
W0 comp out	2116		N/A
W1 comp out	9356		N/A
Ramp setpoint	7034	16384	Full scale speed
Ramp out mon	8022	16384	Full scale speed
Speed setpoint	7047	16384	Full scale speed
Speed Draw out	7099	16384	Full scale speed
Jog output	8012	16384	Full scale speed
Mlt spd out	7070	16384	Full scale speed
Mpot output	7090	16384	Full scale speed
Torque ref	2450	8192	Motor nominal torque
Tcurr lim +	1210	16384	Table1 last column
Tcurr lim -	1220	16384	Table1 last column
InuseTcurrL+	1250	16384	Table1 last column
InuseTcurrL-	1260	16384	Table1 last column
InuseOutvltR	1180	16384	Table2 last column
PL next fact	2282	16384	100%
PID FF mon	7217	16384	100%
PID input	7256	16384	100%
PID PI out	7294	16384	100%
Last PI out	7295	16384	100%
PID PD out	7343	16384	100%
PID out mon	7352	16384	100%
PID outS mon	7353	16384	100%
Std enc pos	9553		Std enc ppr * 4
Exp enc pos	9554		Exp enc ppr * 4
H Index reg	9555		N/A
L Index reg	9556		N/A

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Table 1: Current Scale values (Amps = 16384 count)			
400V series		**575V series**	
Drive size	**Current = 16384 count**	**Drive size**	**Current = 16384 count**
0.75 kW - 0.75 Hp	3.82 A		
1.5 kW - 1.5 Hp	6.18 A		
2.2 kW - 2.0 Hp	8.86 A	575V - 2.0 Hp	5.777
3.0 kW - 3.0 Hp	11.8 A	575V - 3.0 Hp	6.804
4.0 kW - 5.0 Hp	14.97 A	575V - 5.0 Hp	10.485
5.5 kW - 7.5 Hp	19.97 A	575V - 7.5 Hp	16.100
7.5 kW - 10 Hp	27.92 A	575V - 10 Hp	20.460
11 kW - 15 Hp	39.02 A	575V - 15 Hp	27.894
15 kW - 20 Hp	52.03 A	575V - 20 Hp	36.318
22 kW - 25 Hp	74.58 A	575V - 25 Hp	41.940
30 kW - 30 Hp	90.65 A	575V - 30 Hp	53.326
37 kW - 40 Hp	117.85 A	575V - 40 Hp	74.589
45 kW - 50 Hp	149.17 A	575V - 50 Hp	86.023
55 kW - 60 Hp	181.3 A	575V - 60 Hp	107.137
75 kW - 75 Hp	214.27 A	575V - 75 Hp	124.054
90 kW - 100 Hp	299.49 A	575V - 100Hp	164.827
110 kW - 125 Hp	299.49 A	575V - 125Hp	214.275
132 kW - 150 Hp	399.49 A	575V - 150Hp	235.702
160 kW - 200 Hp	417.17 A		
250 kW - 350 Hp	597.62 A		
315 kW - 450 Hp	669.61 A		

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Table 2 : Voltage Scale values (Volts = 16384 count)	
Mains voltage	**Voltage = 16384 count**
230 V	217.5 V
380 V	378.3 V
400 V	378.3 V
415 V	378.3 V
440 V	435.1 V
460 V	435.1 V
575 V (only for 575V series)	543.91 V

Table 3: Speed Reference	
	Speed = 16384 count
Full Scale Speed <= 2048 rpm	2048 rpm
Full Scale Speed <= 4096 rpm	4096 rpm
Full Scale Speed <= 8192 rpm	8192 rpm
Full Scale Speed <= 16384 rpm	16384 rpm

Table 4: Regulation Mode-Switching Frequency Scale	
Switching Frequency	**Frequency = 16384 count**
V/f Control = 2 KHz	1000 Hz
Field Oriented = 2 KHz	125 Hz
Sensorless vect = 2 KHz	62.5 Hz
V/f Control = 4, 8, 16 KHz	2000 Hz
Field Oriented = 4, 8, 16 KHz	250 Hz
Sensorless vect = 4, 8, 16 KHz	125 Hz

tab 613-4

6.2 Parameter Legend

Index (1)	MENU (2) Parameter Name (3) Description (4)	[Unit] (5)	Access (6)	Default (7)	Min/Max (8)	Format (9)	Reg.Mode (10)	Level (11)	Ipa (12)
A	DISPLAY (13)								
(14)	This menu displays a series of variables useful to check the Drive state. The variable function is clearly explained by the variable name. Some of them are not applicable to all the different regulation modes. In this case the display does not show the variable. The status variables are noted with a letter to show any ties to a specific regulation mode: V (V/f) - F (Field oriented) - S (Sensorless).								
A12	DISPLAY / IO Dsply (15)								
A12.00	DI 7654321E (3)	N/A	R	0	0/1	DP	V-F-S	Easy	4028
	Standard digital inputs status, from 0 to 7; E (Enable) = Digital Input 0								
B00	STARTUP / Drv & Mot config (15)								
B0A	STARTUP / Drv & Mot config / Regulation mode (16)								

1	**Index**	Parameter Code, showed on display.
2	**MENU**	Menu name. see 13, 14 and 15.
3	**Parameter Name**	Parameter Name, showed on display.
4	**Description**	Parameter description.
5	**[Unit]**	Parameter unit of measure. N/A=not applicable.
6	**Access**	Access mode parameter: R=read only, W=write type, S=saved in flash, Z=accessible with drive disabled
7 8	**Default /Min/Max**	Parameter value: Calc=value calculated in function of other parameter, D.Size=value determined by drive size, Intmin/Intmax= ?? , PList=Pick List code (see chapter 9, Pick Lists).
9	**Format**	Point type: AB A can to be: F=float type, P=float type, D=digital type (Integer with 16 bits) B can to be P=parameter, V=variable, K=constant PIN: The parameter type is enumerative. It has, therefore, a list of possible values (for example it is a source)
10	**Reg.Mode**	Regulation modes: V=V/f, F=Field oriented, S=Sensorless, B=Brushless.
11	**Level**	Access level: Easy=parameter include in Easy mode, Full=Full mode include all parameters (see chapter 5.4.6)
12	**Ipa**	Parameter sw number, used via serial.
13	**Menu 1st level**	First level menu name.
14		Menu or function description.
15	**Menu 2nd level**	Second level menu name.
16	**Menu 3rd level**	Third level menu name.

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa

A DISPLAY

This menu displays a series of variables useful to check the Drive state. The variable function is clearly explained by the variable name.
Some of them are not applicable to all the different regulation modes. In this case the display does not show the variable.
The status variables are noted with a letter to show any ties to a specific regulation mode: V (V/f) - F (Field oriented) - S (Sensorless)

Index	Parameter Name / Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
A00.00	**Output freq** Drive output frequency.	**[Hz]**	**R**	**0.00**	**0.00/0.00**	**PV**	**V-F-S**	**Easy**	**3080**
A01.00	**Ramp ref** Drive ramp reference.	**[rpm]**	**R**	**0.00**	**0.00/0.00**	**PV**	**V-F-S**	**Easy**	**3200**
A02.00	**Output curr** Current on the drive output terminals.	**[A]**	**R**	**0.00**	**0.00/0.00**	**PV**	**V-F-S**	**Easy**	**3070**
A03.00	**Output volt** Voltage on the drive output terminals.	**[V]**	**R**	**0.00**	**0.00/0.00**	**PV**	**V-F-S**	**Easy**	**3060**
A04.00	**DC link volt** Drive DC link voltage.	**[V]**	**R**	**0.00**	**0.00/0.00**	**PV**	**V-F-S**	**Easy**	**3100**
A05.00	**Torque ref** Overall Torque reference.	**[Nm]**	**R**	**0.00**	**0.00/0.00**	**PV**	**V-F-S**	**Easy**	**9406**
A06.00	**Output pwr** Drive output power.	**[kW]**	**R**	**0.00**	**0.00/0.00**	**PV**	**V-F-S**	**Easy**	**3090**
A07.00	**Actual speed** Motor Speed.	**[rpm]**	**R**	**0.00**	**0.00/0.00**	**PV**	**V-F-S**	**Easy**	**9405**
A08.00	**Speed ref** Drive speed reference	**[rpm]**	**R**	**0.00**	**0.00/0.00**	**PV**	**V-F-S**	**Easy**	**3210**
A09.00	**Enable SM mon** Drive Enable status. 0 OFF 1 ON	**N/A**	**R**	**0**	**0/1**	**DV**	**V-F-S**	**Full**	**162**

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
A10.00	**Start SM mon**	**N/A**	**R**	**0**	**0/1**	**DV**	**V-F-S**	**Full**	**163**
	Drive Start status. 0 OFF 1 ON								
A11.00	**FStop SM mon**	**N/A**	**R**	**0**	**0/1**	**DV**	**V-F-S**	**Full**	**164**
	Drive FastStop status 0 OFF 1 ON								
A12	DISPLAY / IO Dsply								
A12.00	**DI 7654321E**	**N/A**	**R**	**0**	**0/1**	**DP**	**V-F-S**	**Easy**	**4028**
	Standard digital inputs status, from 0 to 7; E (Enable) = Digital Input 0								
A12.01	**DO 3210**	**N/A**	**R**	**0**	**0/ 1**	**DP**	**V-F-S**	**Easy**	**4064**
	Standard digital outputs status, from 0 to 3								
A12.02	**DIX BA9876543210**	**N/A**	**R**	**0**	**0/1**	**DP**	**V-F-S**	**Full**	**4057**
	Expanded digital inputs status, from 0 to 11; A = Digital InputX 10, B = Digital InputX 11 (X suffix means expanded)								
A12.03	**DOX 76543210**	**N/A**	**R**	**0**	**0/1**	**DP**	**V-F-S**	**Full**	**4078**
	Expanded digital outputs status, from 0 to 7 (X suffix means expanded)								
A13	DISPLAY / Adv Dsply								
A13.00	**Magnetiz curr**	**[A]**	**R**	**0.00**	**0.00/0.00**	**PV**	**V-F-S**	**Easy**	**3110**
	Drive magnetizing current								
A13.01	**Torque curr**	**[A]**	**R**	**0.00**	**0.00/0.00**	**PV**	**V-F-S**	**Easy**	**3120**
	Drive torque current								
A13.02	**Std Enc Spd**	**[rpm]**	**R**	**0.00**	**0.00/0.00**	**PV**	**V-F-S**	**Easy**	**3222**
	Encoder speed of standard feedback (connector “XE”on RV33 regulation board)								
A13.03	**Exp Enc Spd**	**[rpm]**	**R**	**0.00**	**0.00/0.00**	**PV**	**V-F-S**	**Easy**	**3223**
	Encoder speed of expanded feedback (encoder connector on expansion optional boards).								
A13.04	**HT sensor temp**	**[°C]**	**R**	**0.00**	**0.00/0.00**	**PV**	**V-F-S**	**Easy**	**9072**
	Drive Heatsink temperature								

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
A13.05	**RG sensor temp**	**[°C]**	**R**	**0.00**	**0.00/0.00**	**PV**	**V-F-S**	**Easy**	**9073**
	Temperature on the RV33 regulation card								
A13.06	**IA sensor temp**	**[°C]**	**R**	**0.00**	**0.00/0.00**	**PV**	**V-F-S**	**Easy**	**9095**
	Temperature of the heatsink incoming air (available for 22kW/25Hp and higher)								
A13.07	**Sequencer status**	**N/A**	**R**	**0**	**0/16**	**DV**	**V-F-S**	**Easy**	**9090**
	Sequencer status of drive State Machine. It controls the drive running and starting, accounting for protection & alarming, command sequence, and reset status. **State Sequencer status:** 1 Magnetization running 2 Magnetization completed, Stop 3 Start 4 Fast stop, Stop 5 Fast stop, Start 9 No alarm, drive is ready to accept all commands 10 Magnetization running and Start command already present 12 Alarm active 16 Alarm not active, waiting for reset								
A13.08	**Magn Curr ref**	**[A]**	**R**	**0.00**	**0.00/0.00**	**PV**	**F-S**	**Full**	**3130**
	Drive magnetizing current reference								
A13.09	**Trq Cur ref**	**[A]**	**R**	**0.00**	**0.00/0.00**	**PV**	**F-S**	**Full**	**3140**
	Drive torque current reference								
A13.10	**Flux ref**	**[Wb]**	**R**	**0.00**	**0.00/0.00**	**PV**	**F-S**	**Full**	**3180**
	Drive flux reference								
A13.11	**Flux**	**[Wb]**	**R**	**0.00**	**0.00/0.00**	**PV**	**F-S**	**Full**	**3190**
	Drive flux								
A13.12	**Mot OL accum %**	**[%]**	**R**	**0.00**	**0.00/0.00**	**PV**	**V-F-S**	**Full**	**1670**
	Motor I2t overload accumulator. When 100% is reached Mot overload alarm is generated and output inverter current is reduced to motor continuous current .								
A13.13	**BU OL accum %**	**[%]**	**R**	**0.00**	**0.00/0.00**	**PV**	**V-F-S**	**Full**	**1781**
	Braking Unit I2t overload accumulator. When 100% is reached BU overload alarm is								

Index	MENU Parameter Name Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
	generated.								
A13.14	**Drv OL accum %**	[%]	R	0.00	0.00/0.00	PV	V-F-S	Full	1540
	Drive Unit I2t overload accumulator. When 100% is reached Drv overload alarm is generated and output inverter current is reduced to drive continuous current.								
A13.15	**Std enc pos**	[cnt]	R	0.00	0.00/0.00	PV	F	Full	9553
	Raw accumulated encoder pulses of the standard encoder, measured in ppr x 4								
A13.16	**Exp enc pos**	[cnt]	R	0.00	0.00/0.00	PV	F	Full	9554
	Raw accumulated encoder pulses of the expanded encoder, measured in ppr x 4								
A13.17	**Std sin enc mod**	[cnt]	R	0.00	0.00/0.00	PV	F	Full	9204
	Module of “A” and “B” trace of sinusoidal encoder on std port. Encoder peak voltage is constantly monitored and the alarm Speed feedback loss is generated if it is outside the range: min=IPA 1902/5, max=IPA 1902 * 2.								
A13.18	**CPU1 runtime**	[%]	R	0.00	0.00/0.00	PV	V-F-S	Full	3230
	Time needed by the CPU1 (microprocessor)								
A13.19	**CPU2 runtime**	[%]	R	0.00	0.00/0.00	PP	V-F-S	Full	3240
	Time needed by the CPU2 (microprocessor)								
A14	DISPLAY / Drive IDs								
A14.00	**Drive cont curr**	[A]	RW	CALC	0.00/0.00	FK	V-F-S	Easy	1460
	Drive maximum continuos current rating; its default value depends on the drive size and applicable derating factors.								
A14.01	**Drive size**	N/A	R	D.Size	0/20	DK	V-F-S	Easy	114
	Drive size rating in kW (ULN = 400Vac, IEC 146 Class 1) of Hp (ULN = 460Vac / 575Vac, IEC 146 Class 2):								

400/460Vac Series	575Vac Series
[0] 0.75kW-0.75Hp	[2] 575V - 2.0Hp
[1] 1.5kW - 1.5Hp	[3] 575V - 3.0Hp
[2] 2.2kW - 2.0Hp	[4] 575V - 5.0Hp
[3] 3.0kW - 3.0Hp	[5] 575V - 7.5Hp
[4] 4.0kW - 5.0Hp	[6] 575V - 10Hp
[5] 5.5kW - 7.5Hp	[7] 575V - 15Hp
[6] 7.5kW - 10Hp	[8] 575V - 20Hp
[7] 11kW - 15Hp	[9] 575V - 25Hp

Index	MENU Parameter Name Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
	[8] 15kW - 20Hp [9] 22kW - 25Hp [10] 30kW - 30Hp [11] 37kW - 40Hp [12] 45kW - 50Hp [13] 55kW - 60Hp [14] 75kW - 75Hp [15] 90kW - 100Hp [16] 110kW- 125Hp [17] 132kW- 150Hp [18] 160kW- 200Hp [19] 250kW- 300Hp [20] 315kW- 450Hp [21] 500kW- 600Hp [22] 160kW-200Hp [23] 400kW- 500Hp	[10] 575V - 30Hp [11] 575V - 40Hp [12] 575V - 50Hp [13] 575V - 60Hp [14] 575V - 75Hp [16] 575V - 100Hp [17] 575V - 125Hp [18] 575V - 150Hp							
A14.02	**Life time**	[hrs]	R	0.00	0.00/0.00	PV	V-F-S	Easy	99
	Drive life time accumulated with power on.								
A14.03	**Sys time-ddmmyy**	[h/m/s]	R	0.00	0.00/0.00	PV	V-F-S	Easy	98
	Time and date setting from PC configurator or serial communications. Clock is active only when the Drive is powered on. ***Note!*** On a new regulation card the variable takes value: 00:00:00 (time) 010170 (date)								
A14.04	**Software version**								
	Drive software version (factory installed), example: V 2.20.								
A14.05	**Drive type**	N/A	R	-	0/0	DK	V-F-S	Easy	300
	32 36 37	400Vac drive parameters default 460Vac drive parameters default 575Vac drive parameters default							
A14.06	**Drive name**	N/A	RWS	0.00	0.00/0.00	FK	V-F-S	Full	115
	Parameter accessible via PC tool; a drive name can be assigned.								
A14.07	**Software status**	N/A	R	DrvVer	0/0	DV	V-F-S	Full	111
	Software state factory use.								
A14.08	**Software type**	N/A	R	DrvVer	0/0	DV	V-F-S	Full	110
	Software type factory use								

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
A15	DISPLAY / Alarm log								
	This function provides a list of last 30 drive trips or various system error messages. Together with cause indications also time and data information is provided. Alarm log message is referred to “Sys time - dd mm yy” variable. Example: 01:02:36 01 02 00 Undervoltage 01:02:36 time of alarm 02 02 00 date of alarm Undervoltage alarm description								

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa

B STARTUP

The drive can control the motor in three different ways: V/f (VF), Field Oriented (FOC) and Sensorless vect (SLS).

Start the process for the motor data automatic measuring.

- Automatic calculation of the flux and current loop gains according to the performed measuring processes.
- Setting of the information about:
  - maximum speed
  - configuration of the V/f mode.
  - drive parameters (mains voltage, ambient temperature, etc.)
  - motor parameters
  - inverter main commands
  - inverter main reference
  - motor/inverter ramp times
  - encoder features, if used.
  - parameters of the I2t protections.

Such settings can be changed only with a disabled drive. While in this operation mode (Configuration) the data updating on the terminal strip and on the option cards is stopped.

B00 STARTUP / Drv & Mot config

After downloading drive parameters from a file, or entering the **STARTUP / Drv & Mot config** menu through the keypad, the drive restart is only permitted after:

a) cycling drive power

or:

b) when **Commands** select = *Terminal level,* cycling input DI0,
when **Commands** select = *Terminal edge*, cycling input DI0, and the digital input selected by **Term strstp src**,
when **Commands** select = *Digital level*, cycling the digital signals selected by **Digital strstp src** and **Digital enable src**
when commands select = *Digital edge*, cycle input DI0 or the digital input **Digital enable src** (if not selected to ONE), and the digital signal selected by **Digital strstp src**.

It allows to select the desired regulation mode. After choosing the setting, the Drive carries out the restart phase by setting the selected regulation mode.

B0A STARTUP / Drv & Mot config / Regulation mode

Index	Parameter Name	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
B0A.00	**Regulation mode**	**N/A**	**R**	**0**	**0/7**	**DK**	**V-F-S**	**Easy**	**100**

It allows to select the desired regulation mode. When the **Regulation mode** parameter is selected, the active regulation mode is displayed; in order to change it to a new mode press “Enter”; then scroll the list:

[1] V/f control	V/f scalar control
[2] FOC control	Field Oriented control
[3] SLS control	Sensorless control

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
B0B	**STARTUP / Drv & Mot config / Drv data**								
B0B.00	**Mains voltage**	**[V]**	**RW**	**(*)**	**0/7**	**DK**	**V-F-S-B**	**Easy**	**380**
	The Voltage selections available are: [0] 230 V [1] 380 V [2] 400 V (*) Default for 400V Europe [3] 415 V [4] 440 V [5] 460 V (*) Default for 460V American [6] 575 V (*) Default for 575V American Drive power supply voltage. Select supply voltage parameter accurately, according to actual drive supply voltage. After changing this parameter, selftune data are initialized to default, self-tuning must be repeated !								
B0B.01	**Switching freq**	**[kHz]**	**RW**	**D.Size**	**0/3**	**DK**	**V-F-S-B**	**Easy**	**170**
	[0] 2 kHz [1] 4 kHz [2] 8 kHz [3] 16 kHz Drive PWM switching frequency. Selecting higher switching frequency then default, results in drive derating, see table 2.3.2.1-A or 2.3.2.1-B. Selecting lower value results in higher continuous output current. After changing this parameter, selftune data are initialized to default, self-tuning must be repeated !								
B0B.02	**Ambient temp**	**[°C]**	**RW**	**0**	**0/1**	**DK**	**V-F-S-B**	**Full**	**1350**
	[0] 40°C [1] 50°C Drive ambient temperature. Selecting 50°C will result in drive derating, see paragraph 2.3.1. After changing this parameter selftune data are initialized to default, self-tuning must be repeated !								
B0C	**STARTUP / Drv & Mot config / Full scale speed**								
B0C.00	**Full scale speed**	**[rpm]**	**RW**	**1500**	**Calc/Calc**	**PV**	**V-F-S-B**	**Easy**	**1885**
	It defines the 100% of the application speed referenced. The absolute speed handling range is ± 200% Full scale speed. For all application set this parameter to maximum allowed motor speed, typically rated speed of the motor. This parameter will also set the limit on all multispeed values. ***Note!*** If the parameter setting changes exceed one of the interval listed below, Motor Autotune procedure must be repeated.								

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa

Example:
if Full scale speed parameter changes from 1500rpm to 3000 rpm, Autotune must be repated.

Interval	Range
1	0 ... 2048
2	2049 ... 4096
3	4097 ... 8192
4	8193 ... 16384

B0D STARTUP / Drv & Mot config / Mot data

Index	Parameter Name	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
B0D.00	**Motor rated volt**	**[V]**	**RW**	**D.Size**	**Calc/Calc**	**FK**	**V-F-S-B**	**Easy**	**670**

Motor rated voltage

Index	Parameter Name	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
B0D.01	**Motor rated freq**	**[Hz]**	**RW**	**D.Size**	**Calc/Calc**	**FK**	**V-F-S**	**Easy**	**680**

Motor rated frequency.

Index	Parameter Name	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
B0D.02	**Motor rated curr**	**[A]**	**RW**	**D.Size**	**Calc/Calc**	**FK**	**V-F-S-B**	**Easy**	**690**

Motor rated current.

Note! The value should be not less then approx 0.3 times the drive rated current (output current Class 1 @ 400V on the motor nameplate).

Index	Parameter Name	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
B0D.03	**Motor rated spd**	**[rpm]**	**RW**	**D.Size**	**Calc/Calc**	**FK**	**V-F-S-B**	**Easy**	**700**

Motor full load speed at the rated frequency.
If Slip is available on the motor nameplate data, set the parameter value as following:
Mot rated speed = Synchronous speed - Slip

Index	Parameter Name	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
B0D.04	**Motor rated pwr**	**[kW]**	**RW**	**D.Size**	**Calc/Calc**	**FK**	**V-F-S**	**Easy**	**710**

Motor rated power.

Note! For a motor nameplate rated in Hp, set **Motor rated power** [kW] = Motor Hp rating * 0.736

Index	Parameter Name	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
B0D.05	**Motor power fact**	**N/A**	**RW**	**D.Size**	**Calc/Calc**	**FK**	**V-F-S**	**Easy**	**720**

Motor rated power factor.

Index	Parameter Name	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
B0D.06	**Motor efficiency**	**N/A**	**RW**	**D.Size**	**Calc/Calc**	**FK**	**V-F-S**	**Full**	**730**

Motor Efficiency (if not available, leave the default data).

Index	Parameter Name	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
B0D.07	**Load default mot**							**Full**	

It selects and loads the motor standard parameters:

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa

For AVy... (230...480Vac):
[0] Standard 400V
[1] Standard 460V

For AVy...-5 (575Vac):
[0] Standard 575V
[1] Standard 575V

NOTE! By selecting one of the two options, the motor standard parameters with 400V (or 460V) are loaded making reference to the used Drive size.
Through this process, motor data is overwritten.

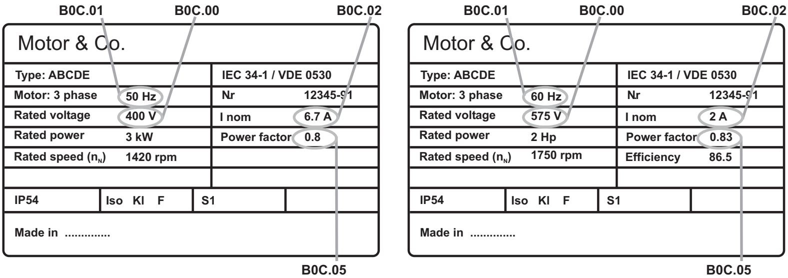


Figure B0D.07*: Motor Nameplate (Example: kW rating for 400V motor and Hp rating for 575V motor)*

B0E STARTUP / Drv & Mot config / Autotune

Index	Parameter	Level
B0E.00	**Complete rot** Complete self -tuning of current and flux loop with a moving rotor “Press **[I]** key” enable data detection command (12 drive terminal must be cycle to +24Vdc).	**Easy**
B0E.01	**Complete still** Complete self-tuning of current and flux loop with a stopped rotor “Press **[I]** key” enable data detection command (12 drive terminal must be cycle to +24Vdc).	**Easy**
B0E.02	**CurrReg** Self-tuning of current loop only with stopped motor “Press **[I]** key”enable data detection command (12 drive terminal must be cycle to +24Vdc).	**Easy**
B0E.03	**FluxReg rot** Self-tuning of flux loop with a moving rotor only “Press **[I]** key” enable data detection command (12 drive terminal must be cycle to +24Vdc).	**Full**
B0E.04	**FluxReg still** Self-tuning of flux loop with a stopped rotor only “Press **[I]** key” enable data detection command (12 drive terminal must be cycle to +24Vdc).	**Full**

Index	MENU Parameter Name Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
BOE.05	**Autotune Result**								
BOE.5A	**Measured Rs**	**[ohm]**	**RW**	**Calc**	**Calc/Calc**	**FK**	**V-F-S-B**	**Full**	**2780**
	Value of the phase resistance detected on the stator of the motor.								
BOE.5B	**Measured DTL**	**[V]**	**RW**	**Calc**	**0/50**	**FK**	**V-F-S-B**	**Full**	**2790**
	IGBT dead time limit.								
BOE.5C	**Measured DTS**	**[ohm]**	**RW**	**Calc**	**0/100**	**FK**	**V-F-S-B**	**Full**	**2800**
	IGBT dead time slope.								
BOE.5D	**Measured LsSigma**	**[H]**	**RW**	**Calc**	**Calc/Calc**	**FK**	**V-F-S-B**	**Full**	**2810**
	Value of inductance detected on the stator of the motor.								
BOE.5E	**Measured Rr**	**[ohm]**	**RW**	**Calc**	**0.55/7.501**	**FK**	**V-F-S**	**Full**	**2820**
	Value of resistance detected on the rotor of the motor.								
BOE.5F	**Rr before clamp**	**[ohm]**	**RW**	**Calc**	**0.55/43.99**	**FK**	**V-F-S**	**Full**	**2831**
	Value of resistance.								
BOE.5G	**Measured P1 flux**	**N/A**	**RW**	**Calc**	**0.00/1.000**	**FK**	**V-F-S**	**Full**	**2840**
	P1 coefficient of the Flux curve measured.								
BOE.5H	**Measured P2 flux**	**N/A**	**RW**	**Calc**	**3/18**	**FK**	**V-F-S**	**Full**	**2850**
	P2 coefficient of the Flux curve measured.								
BOE.5I	**Measured P3 flux**	**N/A**	**RW**	**Calc**	**0.00/1.00**	**FK**	**V-F-S**	**Full**	**2860**
	P3 coefficient of the Flux curve measured.								
BOE.5J	**Measured Im Nom**	**[A]**	**RW**	**Calc**	**0.00 -**	**FK**	**V-F-S**	**Full**	**2870**
	Value of the rated magnetizing current.								
BOE.5K	**Measured Im Max**	**[A]**	**RW**	**Calc**	**0.00 -**	**FK**	**V-F-S**	**Full**	**2880**
	Value of the maximum magnetizing current .								
BOE.5L	**Measured Flux Nom**	**[Wb]**	**RW**	**Calc**	**0.00 -**	**FK**	**V-F-S**	**Full**	**2890**
	Value of the rated Flux.								

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
B0E.5M	**Measured Flux Max**	**[Wb]**	**RW**	**Calc**	**0.00 -**	**FK**	**V-F-S**	**Full**	**2900**
	Value of the maximum Flux.								
B0F	**STARTUP / Drv & Mot config / V/f cfg**								
B0F.00	**V/f voltage**	**[V]**	**RWZ**	**Motr**	**Calc/Calc**	**FK**	**V**	**Easy**	**3420**
	Base voltage for the V/f mode. This parameter is set according to motor nominal voltage, but can be changed to modify V/f characteristic.								
B0F.01	**V/f frequency**	**[Hz]**	**RWZ**	**Motr**	**5/Calc**	**FK**	**V**	**Easy**	**3430**
	Base frequency for the V/f mode. This parameter is set according to motor nominal frequency, but can be changed to modify V/f characteristic.								
B0F.02	**Voltage boost**	**[%]**	**RWS**	**Calc**	**0.00/0.00**	**PV**	**V**	**Easy**	**3400**
	Torque boost at low speed. It allows to increase the output voltage at zero Hz. Initialized by autotune procedure								

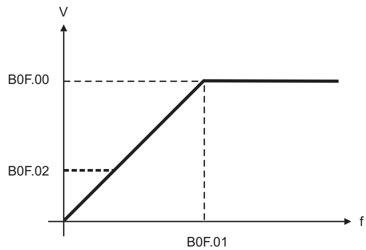


***Figure B0F.02**: V/f characteristic*

Index	Parameter Name	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
B0F.03	**V/f shape**	**N/A**	**RWZ**	**0**	**0/3**	**DP**	**V**	**Easy**	**3410**
	It allows to define the V/f curve shape; it can be selected among:								
	[0]V = freq ^ 1.0	Constant torque requirement accross the whole speed range							
	[1]V = freq ^ 1.5	Mixed load between type 0 and 3							
	[2]V = freq ^ 1.7	Mixed load between type 0 and 3							
	[3]V = freq ^ 2.0	Load where the torque is proportional to the speed squared, for example fans and pumps							
B0F.04	**Slip comp**	**[rpm]**	**RWS**	**Calc**	**0.00/Calc**	**PV**	**V**	**Easy**	**3531**
	Compensation of speed drop due to load. Initialized by autotune procedure. Low values of **Slip comp** parameter may cause instability.								
B0F.05	**Slip comp filter**	**[sec]**	**RWS**	**1**	**Calc/10**	**PP**	**V**	**Easy**	**3541**
	Slip compensation filter.								

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa

B0G STARTUP / Drv & Mot config / Encoders

Motor Encoder Setup

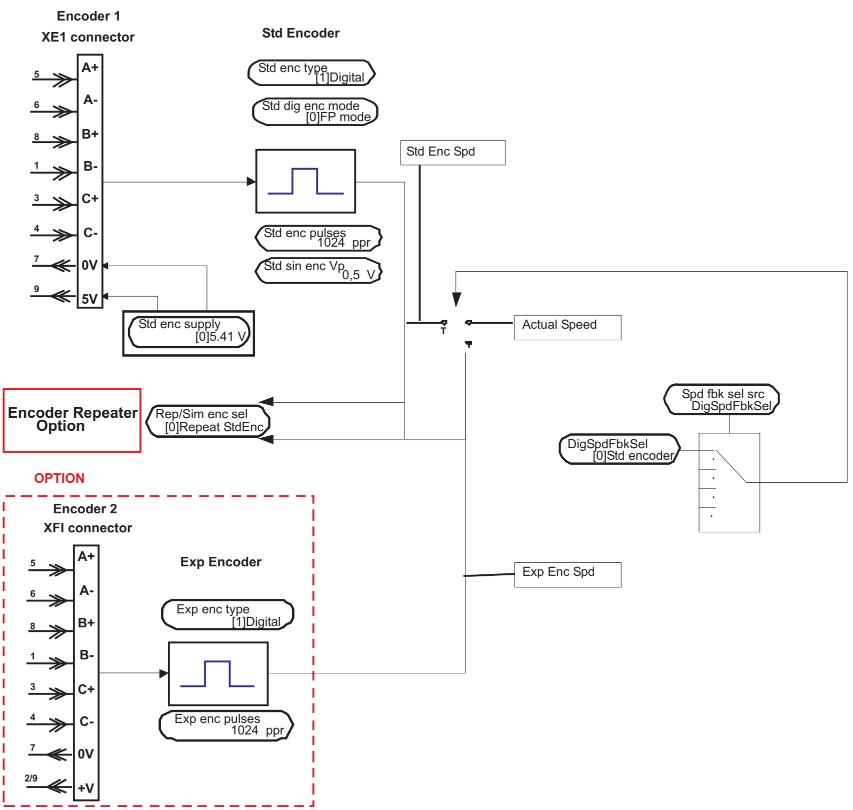


***Figure B0G.**: Speed feedback*

B0G.00	**Std enc type**	**N/A**	**RWZ**	**0**	**0/2**	**DK**	**V-F-B**	**Easy**	**1925**

Encoder type connected to the standard XE port input of RV33 card:

[0]Sinusoidal	+5V Sinusoidal encoder input (select the correct jumper settings on the RV33 regulation card)
[1]Digital	+5V Digital encoder input (select the correct jumper settings on the RV33 regulation card)
[2]Frequency inp	Digital single channel frequency input: channel A. Signal +5V must be connected between A and power supply common.

B0G.01	**Std enc pulses**	**[ppr]**	**RWZ**	**1024**	**Calc/Calc**	**FK**	**V-F-S-B**	**Easy**	**1890**

Encoder pulses per revolution (ppr) value of the standard XE port input of RV33 card.

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
B0G.02	**Std enc supply**	**N/A**	**RWZ**	**0**	**0/3**	**DP**	**V-F-S-B**	**Easy**	**1927**

[0] 5.41 / 8.16 V
[1] 5.68 / 8.62 V
[2] 5.91 / 9.00 V
[3] 6.16 / 9.46 V

Selection between 5V / 8V range is done through dip-switch S28.
Power supply voltage of the standard Encoder input. Increase this value in case of long encoder cable.
It is possible to select 4 different values of internal encoder supply voltage to compensate the voltage reduction due to encoder cable length and load current encoder.
Selection available, according to S28 jumper, are: 5.41V, 5.68V, 5.91V, 6.18V and 8.16V, 8.62V, 9.00V, 9.46V via Std enc supply parameter.

B0G.03	**Std sin enc Vp**	**[V]**	**RW**	**0.5**	**0/1.5**	**FK**	**V-F-B**	**Full**	**1902**

Peak voltage value of the sinusoidal encoder connected to the standard input.

B0G.04	**Std dig enc mode**	**N/A**	**RWZ**	**0**	**0/ 1**	**DP**	**V-F-S-B**	**Full**	**1931**

[0] FP mode — Frequency and period measuring mode
[1] F mode — Frequency measuring mode

Measuring method of the digital encoder speed connected to the standard input.

B0G.05	**Exp enc type**	**N/A**	**RW**	**1**	**1/2**	**DK**	**V-F-B**	**Easy**	**1926**

Encoder type connected to the expanded input port of expansion card installed:
[1]Digital — +5V Digital encoder input (select the correct jumper settings on the RV33 regulation card)
[2]Frequency inp — Digital single channel frequency input: channel A. Signal +5V must be connected between A and power supply common.

B0G.06	**Exp enc pulses**	**[ppr]**	**RWZ**	**1024**	**Calc/Calc**	**FK**	**V-F-B**	**Easy**	**1900**

Encoder pulses per revolution (ppr) value of the expanded input port of expansion card installed.

B0G.07	**Dig spd Fbk Sel**	**N/A**	**RW**	**0**	**0/1**	**DV**	**V-F-B**	**Easy**	**1940**

It allows to switch the feedback between the encoder standard port “XE” (on RV33 regulation card) and the encoder expanded (from encoder optional cards: EXP-F2E and EXP-D14A4F):

[0] Std encoder — Standard encoder input of “XE” port
[1] Exp encoder — Expanded encoder input of optional card installed

B0G.08	**Speed fbk sel**	**N/A**	**RW**	**0**	**0/1**	**DV**	**V-F-B**	**Full**	**7058**

Command source for the selection of the encoder used for speed feedback; factory

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
	setting: **B0G.07 - Dig spd Fbk Sel** (Ipa 1940). **Pick List 22**								
B0G.09	**Rep/Sim enc sel**	**N/A**	**RWZ**	**0**	**0/1**	**DK**	**V-F**	**Full**	**1962**

Selection of the encoder to be repeated using the optional card EXP-F2E:

[0] Repeat StdEnc	Repeat standard encoder
[1] Repeat ExpEnc	Repeat expanded encoder
[2] Simulate std	Simulate digital incremental encoder in case of SinCos or Resolver selections as feedback devices in **B0G.00 - Std enc type** parameter.

Index	Parameter Name	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
B0G.10	**Index storing en**	**N/A**	**RWSZ**	**0**	**0/3**	**DV**	**F-B**	**Full**	**9550**

Index storing function. The encoder counts can be latched allowing the user to determine the position of the encoder relative to an absolute position.

[0] Off	Function disabled.
[1] Storing en	It enables the capturing of the encoder count as described by the setting of the control word. The control word is the value of **B0G.11 - Int IS ctrl** or the word selected by **B0G.12 - IS ctrl src**.
[2] Ctrl std enc	It constantly reads all the generated pulses on the std encoder
[3] Ctrl exp enc	It constantly reads all the generated pulses on the exp encoder

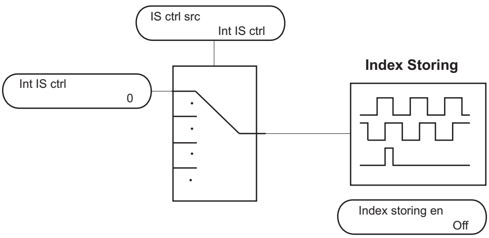


Figure B0G.10: *index storing block*

Index	Parameter Name	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
B0G.11	**Int IS ctrl**	**N/A**	**RWS**	**0**	**0/0X0000**	**D**	**V F-B**	**Full**	**9551**

Fixed programming at Index Storing Function according to following table.

Index	Parameter Name	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
B0G.12	**IS ctrl src**	**N/A**	**RWSZ**	**Ipa9551**	**PList 39**	**PIN**	**F-B**	**Full**	**9557**

B0G.11 - Int IS ctrl (Ipa 9551) = Default.

It allows to select the origin of the signal for "Index storing function" command.
For example a SBI word or DGFC word.

Pick List 39

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa

Note! Digital inputs 6 and 7 (terminals 38 and 39) are dedicated to the use of the "Index Qualifier" (home position switch) when Index storing is enabled.

In the next table are showed the values of **B0G.12 - IS ctrl src** from SBI word, APC word or **B0G.12 - Int IS ctrl** if: **B0G.12 - IS ctrl src = B0G.11 - Int IS ctrl** (Ipa 9551)

No. bit	Name	Description	Access (Read/ Write)	Default
0-1	-	Not used	-	-
2	POLNLT	It indicates the encoder index edge polarity: 0= rising edge 1= falling edge	R/W	0
3	-	Not used	-	-
4-5	ENNQUAL	It sets the qualifier input state to activate the encoder index reading: =0, switched off when dig.input 7 = 0 =1, switched off when dig.input 7 = 1 =2, through signal = 0 =3, through signal = 1	W	0
6	Target Enc Num	It points out for which encoder the values of this parameter are reported: =0, operations requested on the Std Encoder input =1, operations requested on the Exp Encoder input	R/W	0
7	-	Not used	-	-
8-9	ENNLT	Control function of the encoder index reading =0, swtched off, function disabled =1, once, enables the reading of the first index signal edge only. =2, continuous, enables the reading of the index signal	R/W	0

tab_B08-12-1

For the Index storing function, the status Registers are not available via keypad and are to be used for the configuration and the data reading.

These are: L index register IPA9556
H index register IPA9555

In the next table are showed the registers values:

Ipa	No. bit	Name	Description	Access (Read/ Write)	Default
9556	0	Source Enc Num	It indicates to which encoder is used for index storing: =0, register data are referred to the Std Encoder input =1, register data are referred to the Exp Encoder input	R	0
	1	MP_IN	Actual Qualifier input value (digital input 7): =0, qualifier input level is low =1, qualifier input level is high	R	0
	2-3	STATNLT	Status of the acquisition function; as: 0=OFF 1=Once, storing is not executed yet 2=Once, storing is already executed 3=Continuous	R	0
9555	0-15	CNTNLT	Position counter value corresponding to the index. Value is only valid when STANLT is equal to 2 or 3	R	0

tab_B08-12-2

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
B0H	**STARTUP / Drv & Mot config / Mot ovld**								
B0H.00	**Mot service fact**	**N/A**	**RW**	**1**	**0.5/1.5**	**FK**	**V-F-S-B**	**Easy**	**1611**
	Service factor. Some motors have a motor continuous current (Ic) higher than the rated current (In). The service factor makes reference to the Ic/In ratio.								
B0H.01	**Motor OL factor**	**N/A**	**RW**	**2**	**1.2/5**	**FK**	**V-F-S-B**	**Easy**	**1610**
	Allowed motor overload factor referring to the Motor rated current * Service factor.								
B0H.02	**Motor OL time**	**[sec]**	**RW**	**30**	**10/Calc**	**FK**	**V-F-S-B**	**Easy**	**1650**

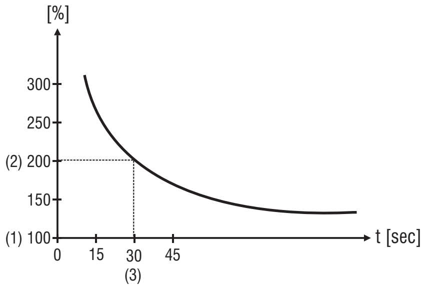
Allowed overload time with overload level equal to **B0H.01 - Motor OL factor**.
The integrator state is given by:

Mot OL accum % it gives the percentage state of the **Rms current integration**. 100 % = I2t alarm level. It is available as a digital signal in the Pick List selections.

Mot OL trip It states that the trip condition of I2t has been reached. Possible or non-possible overload.

The intervention time depends on the value of the motor current as follows:

$$\text{Overload time} = \frac{(\text{Motor Rated current * Service factor * Motor OL factor })\text{^}2\text{* Motor OL time}}{(\text{Motor current})\text{^}2}$$



(1) Rated current • Service factor = 100%
(2) Motor OL factor
(3) Motor OL time

Figure B0h.03: *Motor overload*

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa

STARTUP / Drv & Mot config / BU olvd

The function protects braking resistor by monitoring current in the resistor according to I2t characteristic. When the protection becomes active,
it is possible to generate an alarm condition. According to the different cases it is possible to use the device internal IGBT (Internal-External).

B0I STARTUP / Drv & Mot config / BU olvd

Index	Parameter Name	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
B0I.00	**BU control**	**N/A**	**RWZ**	**0**	**0/2**	**DP**	**V-F-S-B**	**Easy**	**1700**

The parameter enables the Braking Unit function.

Note! The internal BU works in both case with Enable drive ON/OFF (**BU control** parameter must be set internal).

[0] Off	Function disabled (Default)
[1] Internal	Enabling internal braking unit device
[2] External	Enabling external braking unit device (Buy or BU32)

Index	Parameter Name	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
B0I.01	**BU resistance**	**[ohm]**	**RWZ**	**D.Size**	**Calc/10000**	**FK**	**V-F-S-B**	**Easy**	**1740**

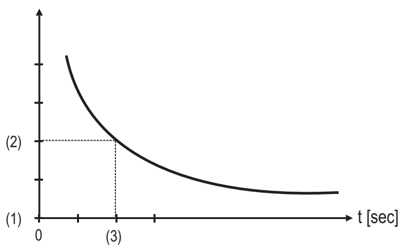
Braking Unit resistance value, mounted optional on the power section terminals or external (C & BR1).

Index	Parameter Name	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
B0I.02	**BU res cont pwr**	**[kW]**	**RWZ**	**D.Size**	**0/0**	**FK**	**V-F-S-B**	**Easy**	**1710**

Braking Unit resistance continuous power.

Index	Parameter Name	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
B0I.03	**BU res OL time**	**[sec]**	**RWZ**	**D.Size**	**1/1000**	**FK**	**V-F-S-B**	**Easy**	**1720**

Allowed overload factor referring to the overload power of the braking resistance.
Overload factor = overload Power/ rated Power.



(1) BU res cont power
(2) BU res OL factor
(3) BU res OL time

***Figure B0i.03**: BU overload*

<u>Example:</u>

DB resistance	= 50 Ω
Resistor continuos Amp rating	= 15A
Rated for 5 X Amps for 15 secs	

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa

Resistor short time overload rating = 5 time quarter minute (5 time continuous amps for 15 secs)

Set parameters:

Bu resistance	=	50	I^2 * R
Bu res cont pwr	=	11.25 kW (15^2 * 50)	
Bu res OL time	=	15 secs	
Bu res OL factor	=	25 (power = 12 R, 5 times overload current squared = 25)	

Index	Parameter Name	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
B0I.04	**BU res OL factor**	**N/A**	**RWZ**	**D.Size**	**1.2/20**	**FK**	**V-F-S-B**	**Easy**	**1730**

Resistance allowed overload time referring to the overload power. The control of the external braking unit and of the resistance I2t protection is independent of BU type (BU digital output command, is available, on the regulation card terminals).

B0J STARTUP / Drv & Mot config / SpdReg G

NOTE! Menu accessible with Access Level = FULL.

It allows to perform the speed regulator gain calculation. Inertia must be entered throught the **B0J.01 - Calc Inertia** parameter or specifying parameters.

Index	Parameter Name	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
B0J.00	**Calc method**	**N/A**	**RWZ**	**0**	**0/1**	**DK**	**F-S-B**	**Full**	**2048**

With **Calc method** two gain calculation methods can be selected:

[0] VariableBandw	Speed regulation bandwidth is internally selected according to the principle that bandwidth is decreased as inertia is increased
[1] FixedBandw	Speed regulation bandwidth is specified by **B0J.02 - Bandwidth** parameter

NOTE! **BOJ.00 - Calc method** and **0J.02 - Bandwidt** parameters are also valid for Speed Regulator Auto tune procedure.

Index	Parameter Name	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
B0J.01	**Calc Inertia**	**[kgm2]**	**RWZ**	**D.Size**	**0/0**	**FK**	**F-S-B**	**Full**	**2610**

Inertia of the load in kg * m^2.

Index	Parameter Name	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
B0J.02	**Bandwidth**	**[rad/s]**	**RWZ**	**50**	**1/300**	**FK**	**F-S-B**	**Full**	**2049**

Speed regulator bandwidth. Higher bandwidth value makes motor respond faster and overall result is more stiff control.

B0K.00

Index	Parameter Name	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
B0K.00	**Abort ?**							**Full**	

Reload of last saved database. The data set after saving process are not stored.
It is advisable to carry out a **Save** parameters befor entering the **Startup / Drv & mot config** menu.

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
B01	STARTUP / Main cmds								
B01.00	**Commands select**	**N/A**	**RWS**	**2**	**0/4**	**DV**	**V-F-S-B**	**Easy**	**4002**

[0] TerminalLevel — The drive is controlled via terminal strip using Level sensitive signals
[1] TerminalEdge — The drive is controlled via terminal strip using Edge sensitive signals
[2] DigitalLevel — The drive is controlled from a communication or application card using level sensitive signals
[3] DigitalEdge — The drive is controlled from a communication or application card using edge sensitive signals
[4] I O keys — The drive is controlled from the keyboard using the I O keys; terminal 12 (Enable) to 24Vdc are required

Note! Setting of this parameter is not allowed while terminal enable is active.

Index	Parameter Name	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
B01.01	**Term Local src**	**N/A**	**RWS**	**Ipa4000**	**Plist 16**	**PIN**	**V-F-S-B**	**Easy**	**9212**

Ipa 4000 - NULL = Default

It allows to select the signal to obtain the local commands by keypad.

Pick List 16

Local/Remote command through digital input

The following picture shows the selection logic for the source of START and STOP commands:

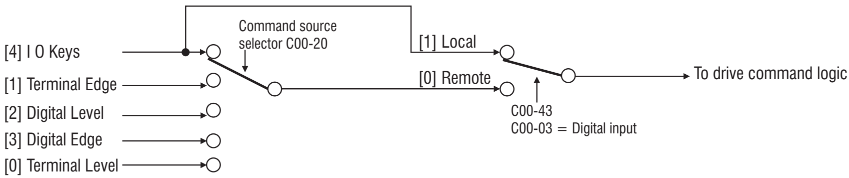


***Figure B01.01**: Command selection*

When the selector (dedicated digital input) is 0 (Remote), *Start* and *Stop* commands come from the source specified by parameter **B01.00.**
When the selector (dedicated digital input) is 1 (Local), *Start* and *Stop* commands come from the keypad, regardless what is set into parameter **B01.00**.
The status of the digital selector is read by the drive only when the output of the inverter bridge is disabled. As a result, it is not possible to switch between local and remote source for main commands while the motor is running.

Note! Normally the Stop key acts as Emergency stop, when the source of main commands is not the keypad.

For more details, see P.005 parameter description below.

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
B01.02	**Stop key mode**	**N/A**	**RWS**	**(*)**	**0/1**	**DP**	**V-F-S-B**	**Easy**	**3998**

Stop key configuration:

[0] Inactive — (*): Default for Europe
Standard configuration, where main commands are coming from keypad. Therefore, the STOP key will cause a normal stop of the motor.

[1] EmgStop & Al — (*): Default for American
Pressing the Stop key, the motor will execute an Emergency stop, following the ramp programmed by Fast Stop deceleration time selected. After the speed reaches zero, the drive will trip with the dedicated alarm "Key Em Stp fault". An alarm reset will be needed to restore drive operations.

See **C00.24** parameter description for more details.

B02 STARTUP / Ref src

Index	Parameter Name	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
B02.00	**Ramp ref 1 src**	**N/A**	**RWS**	**Ipa5009**	**PList 7**	**PIN**	**V-F-S-B**	**Easy**	**7035**

Ipa 5009 - AI 1 output = Default

It select the souce of the signal of Ramp reference 1 signal, which define the main speed reference of the inverter.

Pick List 7

Index	Parameter Name	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
B02.01	**Dig ramp ref 1**	**[rpm]**	**RWS**	**0**	**Calc/Calc**	**PV**	**V-F-S-B**	**Easy**	**7030**

Digital ramp reference 1 value.

B03 STARTUP / Acc/Dec

Index	Parameter Name	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
B03.00	**Accel time 1**	**[sec]**	**RWS**	**10**	**0.5/10000**	**PP**	**V-F-S-B**	**Easy**	**8041**

Acceleration ramp time 1.

Index	Parameter Name	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
B03.01	**Decel time 1**	**[sec]**	**RWS**	**10**	**0.5/10000**	**PP**	**V-F-S-B**	**Easy**	**8043**

Deceleration ramp time 1.

Index	Parameter Name	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
B03.02	**Fdec time 1**	**[sec]**	**RWS**	**10**	**0.5/10000**	**PP**	**V-F-S-B**	**Easy**	**8045**

Fast Stop deceleration ramp time 1.

B04 LOADDEF

Index	Parameter Name	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
B04.00	**Load default ?**							**Easy**	

Drive reset with default parameter values in the selected regulation mode only.

Note! "*Load default ?*" command does not reset **SETUP MODE** with default parameter values; Drive, Motor data and Autotune values are mantained.

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
B05.00									
B05.00	**Access level**	**N/A**	**RWS**	**0**	**0/1**	**DK**	**V-F-S**	**Easy**	**113**
	It allows the Easy or Full parameter inverter menu/parameters visualization: [0] Easy — Partially inverter menu/parameters visualization [1] Full — Totally inverter menu/parameters visualization								

Index	MENU Parameter Name Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa

C INTERFACE

INTERFACE / Commands

For starting, the drive always requires the Enable command, Start command and Fast stop when enabled. The above different commands affect the drive rotation:

Enable This command unlocks power converter firing. It is made of a terminal wired permissive that affects firing hardware directly. In addition, this can be optionally ANDed with a boolean input "Digital enable" from an external source (communication, application card).
Enable command can also be "gated" by the "En/Disable control function" as described below.
Enable unsuicides the drive regulators and current can circulate.
See Diagram Block chapter , "Commands - Enable logic".

Start/Stop This command unlocks the reference to the regulation chain: Ramp, speed regulator or torque regulator, depending on which is enabled.
When the command is asserted (0 to 1 transition) it is said that the drive is being "started", when the command is negated (1 to 0 transition) it is said that the drive is being stopped".

The Command select parameter defines the use of Enable drive and start/stop of the drive. It may have different source:

- **Terminal**: Enable and Start and Stop commands are active from programmable digital input terminals. Enable has a dedicated input, Start is programmed as default as Term Str/Stp src (Start & Stop can also be separate commands from PB inputs). If the command source is *Digital* or *I O Keys*, terminals are acting as permissive inputs.
- **Digital**: The commands come as boolean input "Dig Str/Stp" from a communication or application card. (Terminals are acting as level sensitive permissive inputs)
- **[I]** and **[O]** keys on the keyboard/display module. (Enable terminal are acting as level sensitive permissive inputs)

Through "Terminal" and "Digital" can be select an "edge-sensitive" section, which is meant for manual control from an operator, or automatic control from a PLC, and a "level-sensitive" section, which is meant for wired control in an unmanned installation where automatic restart after power fault is desired.
For unmanned installations requiring the drive to restart after a power fault without any external sequencer logic, the edge sensitive section may be bypassed by setting parameter Command select = "Terminal Level". See Diagram Block chapter , "Commands - Start Stop logic".

NOTE! With **Command select** = "I O Keys", the **[O]** key on the keyboard/display module (if present) can be used to stop the drive. In this case, to resume normal operation, the **[I]** key must be pressed, alternatively power must be cycled in orded to clear the sequencer. The keyboard/display module can be used as a monitor device with the different selection of **Command select** parameter.

Index	MENU Parameter Name Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa

Fast stop Usage of this command is optional. This command is used when the drive is operated with Ramp and speed regulation. When the command is active, the Ramp input reference is zeroed and the ramp operates on a specific deceleration slope that can be set independently from the standard deceleration slope. The command can be accessed either from a communication source or a programmable digital input terminal.

NOTE! when Fast stop command is negated, the drive will restart unless also *Start/Stop* command has been negated. The exception is when **En/Disable control** parameter is programmed as "Stop/Fs&Spd=0". In this case the *Start* command must be recycled after Fast stop is no more active in order to let the drive to start again.

Jog This command provides momentary rotation of the drive with ramp and speed reference settings independent of the ones defined for operation with *Start/Stop* command.

NOTE! *Start/Stop* command takes priority over the *Jog* command. The *Jog* command can be activated by concurrent sources: the [+/Jog] key on the keyboard, and a boolean source that can be either a communication or application card or a programmable digital input. The *Jog* command is complemented by a toggle command for rotation direction inversion. The source of inversion may also be a dedicated key on the keyboard/display module or a configurable source, both sources may be concurrently active.

NOTE! Due to the double function of the keys, it is initially necessary to hit **[Shift]** and **[+/Jog]** in order to turn the keyboard section into jog mode.
After that, the simple pressure of **[+/Jog]** key will cause the drive to jog, and the pressure of the **[-/<->]** key will cause inversion of the rotation. To exit keyboard jog mode press **[</Escape].**

Figure C00 note:

	I O KEYS	- DI0 & TermStrStp src are required=1 to run
	DIGITAL EDGE	- Terminals src inputs are level sensitive run interlocks
	DIGITAL LEVEL	- All signals are level triggered, terminals are run interlocks
(1)	EGDE SELECTION	- Inputs are processed with Edge sensitive logic
	LEVEL SELECTION	- Inputs are processed with Level sensitive logic

(2) Emergency Stop with alarm Emg Stp at Speed 0

Index	MENU Parameter Name Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa

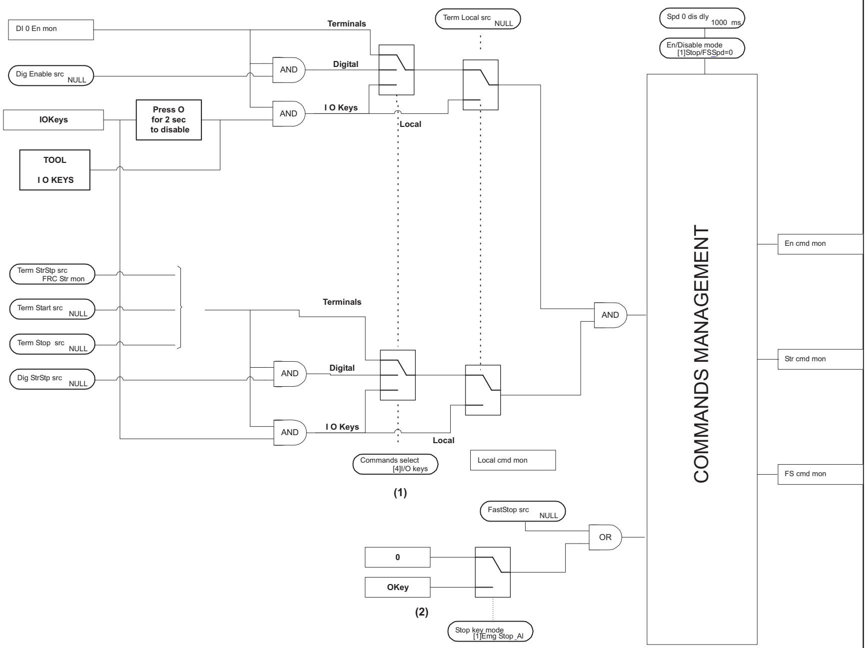


***Figure C00**: Commands block*

C00 INTERFACE / Commands

C00.00	**Term StrStp src**	**N/A**	**RWS**	**(*)**	**PList 16**	**PIN**	**V-F-S-B**	**Easy**	**153**

(*) Ipa 4001 - ONE = Default (Europe)
Ipa 8086 - FRC start mon = Default (American)

It allows to select the signal to generate the Start (1) command and of the terminal strip Stop (0) command.

Pick List 16

C00.01	**Term Start src**	**N/A**	**RWS**	**Ipa4000**	**PList 16**	**PIN**	**V-F-S-B**	**Full**	**9210**

Ipa 4000 - NULL = Default

It allows to select the signal to generate the terminal strip Start command.

Pick List 16

Note! Signal active only when “C00.20 - Commands select = [1] TerminalEdge”

Index	MENU Parameter Name Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
C00.02	Term Stop src	N/A	RWS	Ipa4000	PList 16	PIN	V-F-S-B	Full	9211

Ipa 4000 - NULL = Default

It allows to select the signal to generate the terminal strip Stop command.

Pick List 16

Note! Signal active only when “**C00.20 - Commands select =** [1] TerminalEdge

The *Start* and *Stop* commands can be controlled, as an alternative, via:

- **a single terminal**
  in this case (+24V) 1 refers to the Start and (open) 0 to the Stop

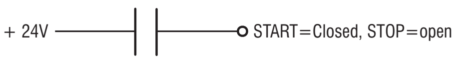


Figure C00.02-1*: Start/Stop controlled via single terminal*

- **two terminals connected with buttons**
  in this case the change of state is caused by the positive edge (0 to1) on the terminal.

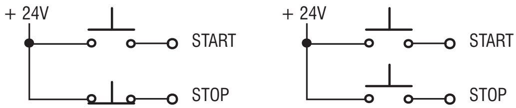


Figure C00.02-2*: Start/Stop controlled via two terminals with buttons*

Index	Parameter Name	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
C00.03	Term Local src	N/A	RWS	Ipa4000	Plist 16	PIN	V-F-S-B	Easy	9212

Ipa 4000 - NULL = Default

It allows to select the signal to obtain the local commands by keypad.

Pick List 16

The following picture shows the selection logic for the source of *Start* and *Stop* commands:

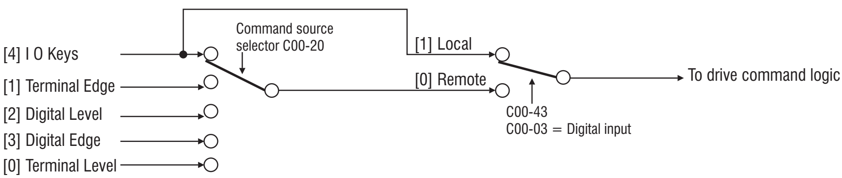


Figure C00.03*: Command selection*

When the selector (dedicated digital input) is 0 (Remote), *Start* and *Stop* commands come from the source specified by parameter C00.20.
When the selector (dedicated digital input) is 1 (Local), *Start* and *Stop* commands come from the keypad, regardless what is set into parameter C00.20.

Index	MENU Parameter Name Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
	The status of the digital selector is read by the drive only when the output of the inverter bridge is disabled. As a result, it is not possible to switch between local and remote source for main commands while the motor is running. *NOTE!* Normally the Stop key acts as Emergency stop, when the source of main commands is not the keypad. For more details, see **C00-24** parameter description below.								
C00.04	**Dig Enable src**	**N/A**	**RWS**	**Ipa4000**	**PList 17**	**PIN**	**V-F-S-B**	**Full**	**156**
	Ipa 4000 - NULL = Default It allows to select the signal to generate a digital Enable command. Pick List 17								
C00.05	**Dig StrStp src**	**N/A**	**RWS**	**Ipa4000**	**PList 17**	**PIN**	**V-F-S-B**	**Full**	**157**
	Ipa 4000 - NULL = Default It allows to select the signal to generate the a digital Start (1) command and a digital Stop (0) command. Pick List 17								
C00.06	**FastStop src**	**N/A**	**RWS**	**Ipa4000**	**PList 18**	**PIN**	**V-F-S-B**	**Easy**	**154**
	Ipa 4000 - NULL = Default It allows to select the signal to generate the FastStop command. Pick List 18								
C00.07	**ForwardStart src**	**N/A**	**RWS**	**(*)**	**Plist 03**	**PIN**	**V-F-S-B**	**Easy**	**8083**
	(*) Ipa 4001 - [1] ONE = Default (Europe) Ipa 4021 - [2] DI 1 mon = Default (American) It allows to select the signal of Forward command of 2-wires and FRC or Start command of 3-wires; see **C00.25 - FRC cmd mode** description below. Pick List 3								
C00.08	**Reverse src**	**N/A**	**RWS**	**(*)**	**Plist 03**	**PIN**	**V-F-S-B**	**Easy**	**8084**
	(*) Ipa 4001 - ONE = Default (Europe) Ipa 4022 - DI 2 = Default (American) It allows to select the signal of Reverse command; see “ C00.25 - FRC cmd mode” description below.								

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
	Pick List 3								
C00.09	**Stop src**	**N/A**	**RWS**	**(*)**	**Plist 03**	**PIN**	**V-F-S-B**	**Easy**	**8085**
	(*) Ipa 4001 - ONE = Default (Europe) Ipa 4023 - DI 3 = Default (American) It allows to select the signal Stop command of 3-wires; see **C00.25 - FRC cmd mode** description below. Pick List 3								
C00.20	**Commands select**	**N/A**	**RWS**	**2**	**0/4**	**DV**	**V-F-S-B**	**Easy**	**4002**
	[0] TerminalLevel — The drive is controlled via terminal strip using Level sensitive signals [1] TerminalEdge — The drive is controlled via terminal strip using Edge sensitive signals [2] DigitalLevel — The drive is controlled from a communication or application card using level sensitive signals [3] DigitalEdge — The drive is controlled from a communication or application card using edge sensitive signals [4] I O keys — The drive is controlled from the keyboard using the I O keys; terminal 12 (Enable) to 24Vdc are required Setting of this parameter is not allowed while terminal enable is active.								
C00.21	**En/Disable mode**	**N/A**	**RWS**	**0**	**0/3**	**DP**	**V-F-S-B**	**Easy**	**4004**
	[0] Off — Not active [1] Stop/FS&Spd=0 — Stop / Fast stop & Speed equal to zero [2] Stop&Spd=0 — Stop & Speed equal to zero [3] FS&Spd=0 — Fast stop & Speed equal to zero It controls the action time of the stop condition.The drive can act: - With the enable and start/stop commands controlled independently by the operator (**C00.21=**[0]) - With just the start/stop command, while the enable and disable command is controlled by the drive. In this case with the start command the drive enables itself. When the stop command is generated (and/or fast stop according to the **C00.21 - En/Disable mode** selection), the Drive reaches a zero speed and after a **C00.22 - Spd 0 dis dly**, it disables itself automatically. ***Note!*** Setting of this parameter is not allowed while terminal enable is active.								
C00.22	**Spd 0 dis dly**	**[ms]**	**RWS**	**1000**	**16/10000**	**PP**	**V-F-S-B**	**Easy**	**4006**
	Delay time between the zero speed and the disabling procedure								

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
C00.24	**Stop key mode**	**N/A**	**RWS**	**(*)**	**0/1**	**DP**	**V-F-S-B**	**Easy**	**3998**

Stop key configuration (valid for Command select ≠ [I-O] keys only) :

[0] Inactive — (*): Default for Europe
Standard configuration, where main commands are coming from keypad. Therefore, the STOP key will cause a normal stop of the motor.

[1] EmgStop & AI — (*): Default for American
Pressing the Stop key, the motor will execute an Emergency stop, following the ramp programmed by Fast Stop deceleration time selected. After the speed reaches the zero, the drive will trip with the dedicated alarm "Key Em Stp fault". An alarm reset will be needed to restore drive operations.

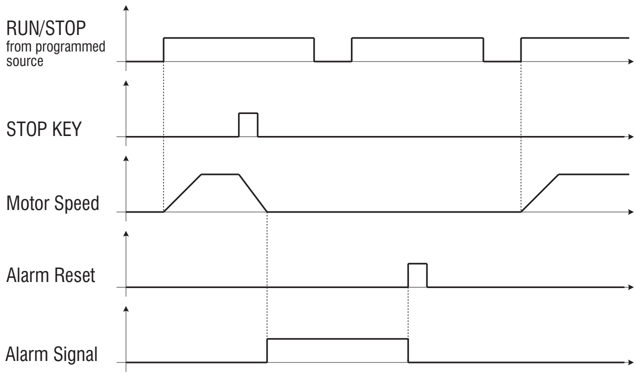


***Figure C00.24**: Stop Key Mode sequences*

Index	Parameter Name	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
C00.25	**FRC cmd mode**	**N/A**	**RWS**	**(*)**	**0/2**	**DP**	**V-F-S-B**	**Easy**	**8087**

Definition of Forward Reverse Control inverter commands:

[0] Normal — (*): Default for Europe. FRC (Forward Reverse Control) function as standard: it allows a protection in case of a sudden failure of the Forward or Reverse command, therefore a protection on the rotation direction. The Block has two inputs, Forward src and Reverse src, and two outputs FRC invers and FRC alarm. The output can be connected where necessary, for example on the Ramp or Speed Blocks.

[1] Two wires — (*): Default for American. 2-Wires control commands

[2] Three wires — 3-Wires control commands

NOTE! To activate 2-Wires or 3-Wires control, the following parameters have to be set:

C00.00 - Term StrStp src = FRC str mon (Ipa 8086)
D00.03 - Ramp ref inv src = FRC reverse (Ipa 8081)

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa

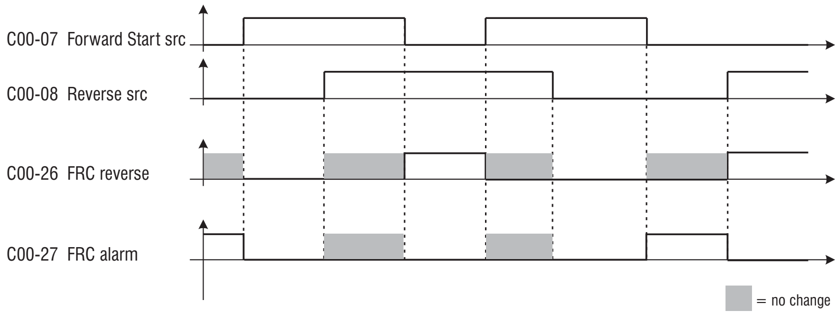


Figure C00.25-1*: C.00.25= [0] FRC control: Run command and Reverse command*

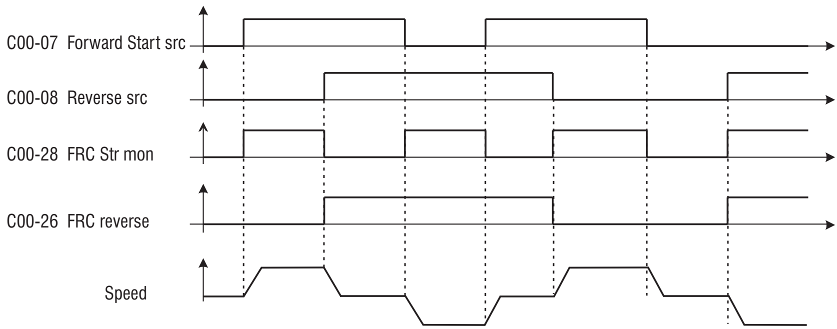


Figure C00.25-2*: C.00.25= [0] 2-wires control: Run forward command and Run Reverse command*

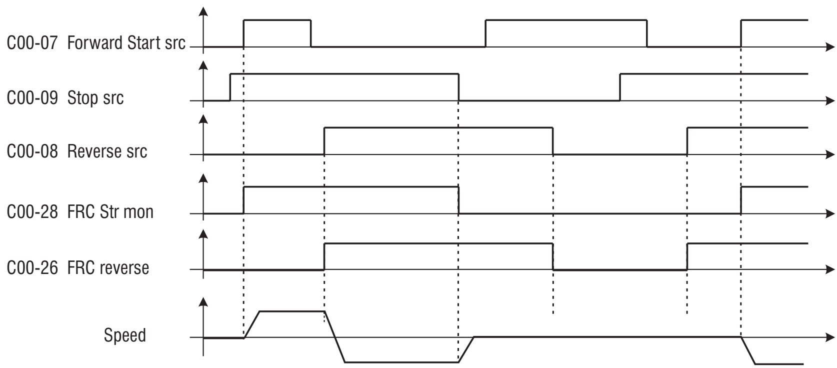


Figure C00.25-3*: C.00.25= [0] 2-wires control: Run command, Stop command and Reverse command*

Note! Ramp inversion parameter command source, **D00.03 - Ramp ref inv src,** can have different default settings:

- FRC inversion (Ipa 8081) for American drive default settings, which allows 2-wires or 3-wires
- NULL (Ipa 4000) for European drive default settings

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
C00.26	**FRC reverse**	**N/A**	**R**	**0**	**0/1**	**DV**	**V-F-S-B**	**Easy**	**8081**
	It displays the output reverse signal of FRC block								
C00.27	**FRC alarm**	**N/A**	**R**	**0**	**0/1**	**DV**	**V-F-S-B**	**Easy**	**8082**
	It displays the output Alarm signal of FRC block								
C00.28	**FRC Start mon**	**N/A**	**R**	**0**	**0/1**	**DV**	**V-F-S-B**	**Easy**	**8086**
	It displays the output Start signal of FRC block								
C00.29	**FRC cmd mon**	**N/A**	**R**	**0**	**0/1**	**DV**	**V-F-S-B**	**Full**	**8080**
	It displays the Forward Reverse Control command signal; if **C00.25** = [0] normal FWD is LSB; Rev is MSB								
C00.40	**EnableSM mon**	**N/A**	**R**	**0**	**0/1**	**DV**	**V-F-S-B**	**Full**	**150**
	It displays the Enable command state								
C00.41	**Start SM mon**	**N/A**	**R**	**0**	**0/1**	**DV**	**V-F-S-B**	**Full**	**151**
	It displays the Start command state								
C00.42	**FStop SM mon**	**N/A**	**R**	**0**	**0/1**	**DV**	**V-F-S-B**	**Full**	**152**
	It displays the FastStop command state								
C00.43	**Local cmd mon**	**N/A**	**R**	**0**	**0/1**	**DV**	**V-F-S-B**	**Full**	**166**
	It displays the Local command signal; see “C00.03 - Term Local src” description above.								

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa

INTERFACE / Analog Inputs

The Drive, in its standard version on the regulation card, provides the following analog/ digital I/Os:

- 3 analog inputs (terminals: 1-2, 3-4, 5-6), configured as voltage or current differential inputs.
- 2 voltage analog outputs (terminals: 21-22-23), with a common reference potential.
- 8 digital inputs (terminals: 12-13-14-15, 36-37-38-39), with a common reference potential and a galvanic isolation.
- 4 digital outputs (terminals: 41-42, 80-82, 83-85), with a common reference potential, a common power supply and galvanic isolation.

Note! See chapters 4.3.2 and 4.3.3 in the Quick Start Up Guide. Other analog and digital I/Os are available by using the EXP.. expansion cards, referred with the "X" suffix.

C01 INTERFACE / An Inp 1

The 2 Block sources allow to select the origin of the command signals for the following functions:

- "AI 1 sign src" allows the inversion of the output signal
- "AI 1 alt sel src" allows the selection of an alternative output reference.

The upper and lower limit of the output signal can be set via the **C01.17 - AI 1 hi lim** and **C01.16 - AI 1 lo lim** parameters. This function is shown in the following figure.

The Block has a sampling time of 2 msec. The resolution is: 10V=2047 counts.

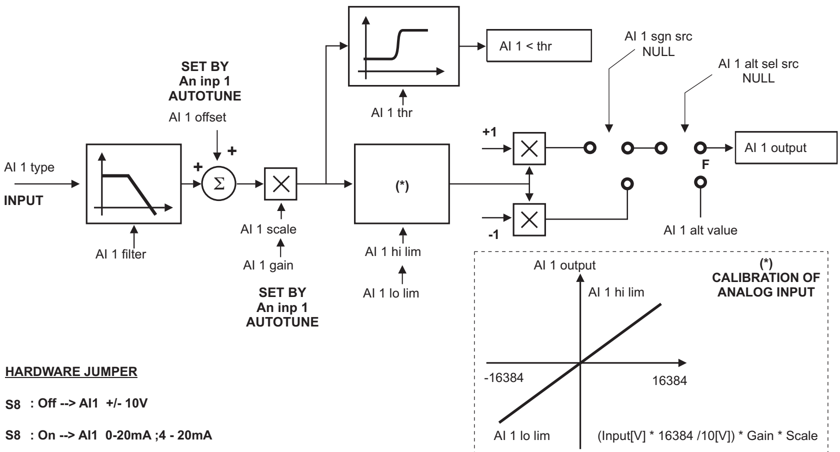


Figure C01: *Analog input block diagram*

C01.00	**AI 1 sgn src**	**N/A**	**RWS**	**Ipa4000**	**PList 3**	**PIN**	**V-F-S-B**	**Full**	**5011**

Ipa 4000 - NULL = Default

It connects the selected signal to the selector of the multiplier input: if the signal is 0, multiply by +1, or if the signal is 1, multiply by -1. The multiplier allows to invert Analog

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
	Input 1 signal. Pick List 3								
C01.01	**AI 1 alt sel src**	**N/A**	**RWS**	**Ipa4000**	**PList 3**	**PIN**	**V-F-S-B**	**Full**	**5012**

Ipa 4000 - NULL = Default

It connects the selected signal to the selector of the alternative reference for An. Inp. 1 block.

Pick List 3

Index	Parameter Name	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
C01.10	**AI 1 type**	**N/A**	**RWS**	**0**	**0/2**	**DP**	**V-F-S-B**	**Easy**	**5000**

[0] -10V .. +10V	Input connects a signal with a maximum voltage of +/-10V. (The change in the motor rotation direction is obtained according to the signal polarity). Input voltage > 10V or >-10V cause saturation of the count value.
[1] 0.20mA,0.10V	On the input it's possible to connect a max voltage of +10V or a 0…20mAcurrent signal. The signal must always have a positive sign, through which, if used as a reference, it is possible to change the motor rotation direction via "AI 1 sgn src"
[2] 4..20mA	On the input it is possible to connect a 4… 20mA current signal. The signal must always have a positive sign through which, if used as a reference, it is possible to change the motor rotation direction via "AI 1 sgn src". Through the An inp X <thr output it is possible to state if the current signal is lower than the one of the set threshold. If the current is <= 4mA , the output supplies a signal (error signal). This, for example, can be combined with a digital output

NOTE! "An inp 1 type" selection requires a correct jumpers configuration of RV33 regulation card:

-10V...+10V & 0..10V	S8=OFF – S9=OFF – S10=OFF
0..20mA & 4..20mA	S8=ON – S9= ON – S10= ON

Index	Parameter Name	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
C01.11	**AI 1 alt value**	**[cnt]**	**RWS**	**0**	**-32767/32767**	**PV**	**V-F-S-B**	**Full**	**5002**
	Alternative reference value in count for Analog input 1.								
C01.12	**AI 1 thr**	**[%]**	**RWS**	**20**	**-100/100**	**PP**	**V-F-S-B**	**Easy**	**5003**
	Analog Input 1 threshold value 100% is equal to 10V or 20mA.								
C01.13	**AI 1 scale**	**N/A**	**RWS**	**1**	**-16/16**	**PP**	**V-F-S-B**	**Easy**	**5004**
	Analog Input 1 scale factor.								

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
C01.14	**AI 1 offset**	**[%]**	**RWS**	**0**	**-100/100**	**PP**	**V-F-S-B**	**Easy**	**5001**
	Analog Input 1 offset count value 100% is equal to 10V or 20mA.								
C01.15	**AI 1 filter**	**[sec]**	**RWS**	**0.0064**	**0.00/4.096**	**PP**	**V-F-S-B**	**Full**	**5006**
	Time constant of the Analog Input 1 filter.								
C01.16	**AI 1 low lim**	**[cnt]**	**RWS**	**-16384**	**-32768/32767**	**PP**	**V-F-S-B**	**Full**	**5007**
	Lower limit of the Analog Input 1 block output in count (see ***Figure C.01***) .								
C01.17	**AI 1 hi lim**	**[cnt]**	**RWS**	**16383**	**-32768/32767**	**PP**	**V-F-S-B**	**Full**	**5008**
	Upper limit of the Analog Input 1 block output in count (see figure above).								
C01.18	**AI 1 offs tune / Start?**								
	Autotune command for the Analog Input 1 offset. Input automatic fine-tuning. To run the autotune, put the input signal to its minimum value and execute “Start ?” command.								
C01.19	**AI 1 gain tune / Start?**								
	Autotune command for the Analog Input 1 gain. Conditions containing an offset can be compensated. To run the autotune, put the input signal to its maximum value and execute “Start ?” command.								
C01.20	**AI 1 output**	**[cnt]**	**R**	**0.00**	**-32768/32767**	**PV**	**V-F-S-B**	**Easy**	**5009**
	Analog Input 1 output count displaying.								
C01.21	**AI 1 < thr**	**N/A**	**R**	**0**	**0/1**	**DV**	**V-F-S-B**	**Full**	**5010**
	Display of threshold compensator state of Analog Input 1 (1 = the condition is true).								

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
C01.22	**AI 1 gain**	**N/A**	**RWS**	**1**	**-16/16**	**PP**	**V-F-S-B**	**Full**	**5005**

Analog Input 1 gain count value displaying.

How to perform the self-tuning procedure of the Analog input 1, if the input is -10V/ +10V (factory).

Tune Analog input 1 offset

C INTERFACE / C01 An Inp 1

Refer to 0 the position of the potentiometer connected to Analog input 1 terminals.

Enter the **C01.18 - AI 1 offs tune** parameter: "Start…" message will be displayed, than press [Enter] key to run the procedure.
Wait up to "Autotune End" message will be displayed, than press three time **[Escape]** key.

Tune Analog input 1 gain

C INTERFACE / C01 An Inp 1

Refer to maximum the position of the potentiometer connected to Analog input 1 terminals.

Enter the **C01.19 - AI 1 gain tune** parameter: "Start…" message will be displayed, than press **[Enter]** key to run the procedure.
Wait up to "Autotune End" message will be displayed, than press three time **[Escape]** key.

Index	MENU Parameter Name Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
C02	INTERFACE / An Inp 2								
	See Analog Input 1 diagram and description details above.								
C02.00	**AI 2 sgn src**	N/A	RWS	Ipa4000	PList 3	PIN	V-F-S-B	Full	5031
	Ipa 4000 - NULL = Default It connects the selected signal to the selector of the multiplier input: if the signal is 0, multiply by +1, or if the signal is 1, multiply by -1. The multiplier allows to invert Analog Input 2 signal. **Pick List 3**								
C02.01	**AI 2 alt sel src**	N/A	RWS	Ipa4000	PList 3	PIN	V-F-S-B	Full	5032
	Ipa 4000 - NULL = Default It connects the selected signal to the selector of the alternative reference for An. Inp. 2 block. **Pick List 3**								
C02.10	**AI 2 type**	N/A	RWS	0	0/2	DP	V-F-S-B	Easy	5020
	[0] -10V .. +10V — As for " AI 1 type" parameter description above [1] 0.20mA,0.10V — As for " AI 1 type" parameter description above [2] 4..20mA — As for " AI 1 type" parameter description above ***NOTE!*** "An inp 2 type" selection requires a correct jumpers configuration of RV33 regulation card: -10V...+10V & 0..10V — S8=OFF – S9=OFF – S10=OFF 0..20mA & 4..20mA — S8=ON – S9= ON – S10= ON								
C02.11	**AI 2 alt value**	[cnt]	RWS	0	-32767/32767	PV	V-F-S-B	Full	5022
	Alternative reference value in count for Analog input 2.								
C02.12	**AI 2 thr**	[%]	RWS	20	-100/100	PP	V-F-S-B	Easy	5023
	Analog Input 2 threshold value 100% is equal to 10V or 20mA.								
C02.13	**AI 2 scale**	N/A	RWS	1	-16/16	PP	V-F-S-B	Easy	5024
	Analog Input 2 scale factor.								
C02.14	**AI 2 offset**	[%]	RWS	0	-100/100	PP	V-F-S-B	Full	5021
	Analog Input 2 offset count value 100% is equal to 10V or 20mA.								

Index	MENU Parameter Name Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
C02.15	**AI 2 filter**	[sec]	RWS	0.0064	0.00/4.096	PP	V-F-S-B	Full	5026
	Time constant of the Analog Input 2 filter.								
C02.16	**AI 2 low lim**	[cnt]	RWS	-16384	-32768/32767	PP	V-F-S-B	Full	5027
	Lower limit of the Analog Input 2 block output in count (see figure of Analog Input 1).								
C02.17	**AI 2 hi lim**	[cnt]	RWS	16383	-32768/32767	PP	V-F-S-B	Full	5028
	Upper limit of the Analog Input 2 block output in count (see figure of Analog Input 1).								
C02.18	**AI 2 offs tune / Start?**								
	Autotune command for the Analog Input 2 offset. Input automatic fine-tuning. To run the autotune, put the input signal to its minimum value and execute "*Start* ?" command.								
C02.19	**AI 2 gain tune / Start?**								
	Autotune command for the Analog Input 2 gain. Conditions containing an offset can be compensated. To run the autotune, put the input signal to its maximum value and execute "*Start* ?" command.								
C02.20	**AI 2 output**	[cnt]	R	0.00	-32768/32767	PV	V-F-S-B	Easy	5029
	Analog Input 2 output count displaying.								
C02.21	**AI 2 < thr**	N/A	R	0	0/1	DV	V-F-S-B	Full	5030
	Display of threshold compensator state of Analog Input 2 (1 = the condition is true).								
C02.22	**AI 2 gain**	N/A	RWS	1	-16/16	PP	V-F-S-B	Full	5025
	Analog Input 2 gain count value displaying.								
C03	INTERFACE / An Inp 3								
	See Analog Input 1 diagram and description details above.								
C03.00	**AI 3 sgn src**	N/A	RWS	Ipa4000	PList 3	PIN	V-F-S-B	Full	5051
	Ipa 4000 - NULL = Default It connects the selected signal to the selector of the multiplier input: if the signal is 0, multiply by +1, or if the signal is 1, multiply by -1. The multiplier allows to invert Analog Input 3 signal. Pick List 3								

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
C03.01	**AI 3 alt sel src**	**N/A**	**RWS**	**Ipa4000**	**PList 3**	**PIN**	**V-F-S-B**	**Full**	**5052**
	Ipa 4000 - NULL = Default It connects the selected signal to the selector of the alternative reference for An. Inp. 3 block. Pick List 3								
C03.10	**AI 3 type**	**N/A**	**RWS**	**0**	**0/2**	**DP**	**V-F-S-B**	**Easy**	**5040**
	[0] -10V .. +10V — As for " AI 1 type" parameter description above [1] 0.20mA,0.10V — As for " AI 1 type" parameter description above [2] 4..20mA — As for " AI 1 type" parameter description above ***Note!*** "An inp 3 type" selection requires a correct jumpers configuration of RV33 regulation card: -10V...+10V & 0..10V — S8=OFF – S9=OFF – S10=OFF 0..20mA & 4..20mA — S8=ON – S9= ON – S10= ON								
C03.11	**AI 3 alt value**	**[cnt]**	**RWS**	**0**	**32767/-32767**	**PV**	**V-F-S-B**	**Full**	**5042**
	Alternative reference value in count for Analog input 3								
C03.12	**AI 3 thr**	**[%]**	**RWS**	**20**	**-100/100**	**PP**	**V-F-S-B**	**Easy**	**5043**
	Analog Input 3 threshold value 100% is equal to 10V or 20mA.								
C03.13	**AI 3 scale**	**N/A**	**RWS**	**1**	**-16/16**	**PP**	**V-F-S-B**	**Easy**	**5044**
	Analog Input 3 scale factor.								
C03.14	**AI 3 offset**	**[%]**	**RWS**	**0**	**-100/100**	**PP**	**V-F-S-B**	**Full**	**5041**
	Analog Input 3 offset count value 100% is equal to 10V or 20mA.								
C03.15	**AI 3 filter**	**[sec]**	**RWS**	**0.0064**	**0.00/4.096**	**PP**	**V-F-S-B**	**Full**	**5046**
	Time constant of the Analog Input 3 filter.								
C03.16	**AI 3 low lim**	**[cnt]**	**RWS**	**-16384**	**-32768/32767**	**PP**	**V-F-S-B**	**Full**	**5047**
	Lower limit of the Analog Input 3 block output in count (see figure of Analog Input 1).								
C03.17	**AI 3 hi lim**	**[cnt]**	**RWS**	**16383**	**-32768/32767**	**PP**	**V-F-S-B**	**Full**	**5048**
	Upper limit of the Analog Input 3 block output in count (see figure of Analog Input 1).								

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
C03.18	**AI 3 offs tune / Start?** Autotune command for the Analog Input 3 offset. Input automatic fine-tuning. To run the autotune, put the input signal to its minimum value and execute "*Start* ?" command								
C03.19	**AI 3 gain tune / Start?** Autotune command for the Analog Input 3 gain. Conditions containing an offset can be compensated. To run the autotune, put the input signal to its maximum value and execute "*Start* ?" command.								
C03.20	**AI 3 output** Analog Input 3 output count displaying.	**[cnt]**	**R**	**0.00**	**-32768/32767**	**PV**	**V-F-S-B**	**Easy**	**5049**
C03.21	**AI 3 < thr** Display of threshold compensator state of Analog Input 3 (1 = the condition is true).	**N/A**	**R**	**0**	**0/1**	**DV**	**V-F-S-B**	**Full**	**5050**
C03.22	**AI 3 gain** Analog Input 3 gain count value displaying.	**N/A**	**RWS**	**1**	**-16/16**	**PP**	**V-F-S-B**	**Full**	**5045**
C04.00									
C04.00	**Exp AI enable** It enables Expanded Analog Inputs: [0] Disabled [1] Enabled	**N/A**	**RWS**	**0**	**0/1**	**DV**	**V-F-S-B**	**Full**	**3900**

Index	MENU Parameter Name Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa

C05 INTERFACE / An Inp 1X

This Block refers to possible Option Expansion cards. See the considerations listed in the previous paragraph, including the parameter description.

The points of difference are:

- No input filter is present
- No alternative reference can be selected (the “AI 1X alt sel src” is missing)
- The Block has a sampling time of 8 msec

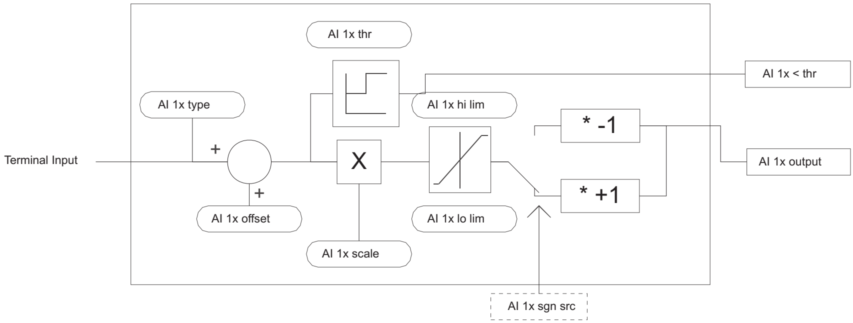


***Figure C05**: Expanded analog input block*

Index	Parameter Name	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
C05.00	**AI 1X sgn src**	**N/A**	**RWS**	**Ipa4000**	**PList 3**	**PIN**	**V-F-S-B**	**Full**	**5069**

Ipa 4000 - NULL = Default

It connects the selected signal to the selector of the multiplier input: if the signal is 0, multiply by +1, or if the signal is 1, multiply by -1. The multiplier allows to invert Analog Input 1X signal.

Pick List 3

Index	Parameter Name	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
C05.10	**AI 1X type**	**N/A**	**RWS**	**0**	**0/2**	**DP**	**V-F-S-B**	**Full**	**5060**

[0] -10V .. +10V	As for “ AI 1 type” parameter description above
[1] 0.20mA,0.10V	As for “ AI 1 type” parameter description above
[2] 4..20mA	As for “ AI 1 type” parameter description above

Note! “An inp 1X type” selection requires a correct jumpers configuration of “EXP..” expansion regulation card installed.

Index	Parameter Name	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
C05.11	**AI 1X thr**	**[%]**	**RWS**	**20**	**-100/100**	**PP**	**V-F-S-B**	**Full**	**5062**

Analog Input 1X threshold value 100% is equal to 10V or 20mA.

Index	Parameter Name	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
C05.12	**AI 1X scale**	**N/A**	**RWS**	**1**	**-16/16**	**PP**	**V-F-S-B**	**Full**	**5063**

Analog Input 1X scale factor.

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
C05.13	**AI 1X offset**	**[%]**	**RWS**	**0**	**-100/100**	**PP**	**V-F-S-B**	**Full**	**5061**
	Analog Input 1X offset count value 100% is equal to 10V or 20mA.								
C05.14	**AI 1X low lim**	**[cnt]**	**RWS**	**-16384**	**-32768/32767**	**PP**	**V-F-S-B**	**Full**	**5065**
	Lower limit of the Analog Input 1X block output in count (see figure of Analog Input 1 description above)								
C05.15	**AI 1X hi lim**	**[cnt]**	**RWS**	**16383**	**-32768/32767**	**PP**	**V-F-S-B**	**Full**	**5066**
	Upper limit of the Analog Input 1X block output in count (see figure of Analog Input 1X).								
C05.16	**AI 1X offs tune / Start?**								
	Autotune command for the Analog Input 1X offset. Input automatic fine-tuning. To run the autotune, put the input signal to its minimum value and execute "*Start ?*" command.								
C05.17	**AI 1X gain tune / Start?**								
	Autotune command for the Analog Input 1X gain. Conditions containing an offset can be compensated. To run the autotune, put the input signal to its maximum value and execute "*Start ?*" command								
C05.20	**AI 1X output**	**[cnt]**	**R**	**0.00**	**-32768/32767**	**PV**	**V-F-S-B**	**Full**	**5067**
	Analog Input 1X output count displaying								
C05.21	**AI 1X < thr**	**N/A**	**R**	**0**	**0/1**	**DV**	**V-F-S-B**	**Full**	**5068**
	Display of threshold compensator state of Analog Input 1X (1 = the condition is true)								
C05.23	**AI 1X gain**	**N/A**	**RWS**	**1**	**-16/16**	**PP**	**V-F-S-B**	**Full**	**5064**
	Analog Input 1X gain count value displaying								
C06	INTERFACE / An Inp 2X								
	See Analog Input 1X diagram and description details above.								
C06.00	**AI 2X sgn src**	**N/A**	**RWS**	**Ipa4000**	**PList 3**	**PIN**	**V-F-S-B**	**Full**	**5089**
	Ipa 4000 - NULL = Default It connects the selected signal to the selector of the multiplier input: if the signal is 0, multiply by +1, or if the signal is 1, multiply by -1. The multiplier allows to invert Analog Input 2X signal. **Pick List 3**								

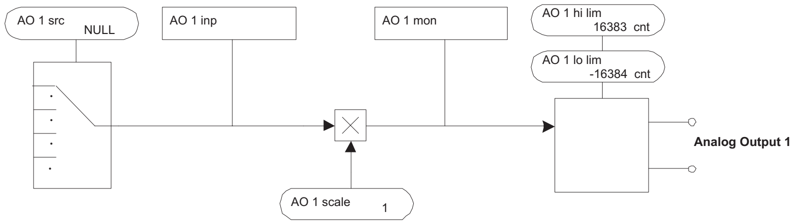
Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
C06.10	**AI 2X type**	**N/A**	**RWS**	**0**	**0/2**	**DP**	**V-F-S-B**	**Full**	**5080**
	[0] -10V .. +10V — As for " AI 1 type" parameter description above [1] 0.20mA,0.10V — As for " AI 1 type" parameter description above [2] 4..20mA — As for " AI 1 type" parameter description above ***Note!*** "An inp 2X type" selection requires a correct jumpers configuration of "EXP.." expansion regulation card installed.								
C06.11	**AI 2X thr**	**[%]**	**RWS**	**20**	**-100/100**	**PP**	**V-F-S-B**	**Full**	**5082**
	Analog Input 2X threshold value 100% is equal to 10V or 20mA.								
C06.12	**AI 2X scale**	**N/A**	**RWS**	**1**	**-16/16**	**PP**	**V-F-S-B**	**Full**	**5083**
	Analog Input 2X scale factor.								
C06.13	**AI 2X offset**	**[%]**	**RWS**	**0**	**-100/100**	**PP**	**V-F-S-B**	**Full**	**5081**
	Analog Input 2X offset count value 100% is equal to 10V or 20mA.								
C06.14	**AI 2X low lim**	**[cnt]**	**RWS**	**-16384**	**-32768/32767**	**PP**	**V-F-S-B**	**Full**	**5085**
	Lower limit of the Analog Input 2X block output in count (see figure of Analog Input 1X).								
C06.15	**AI 2X hi lim**	**[cnt]**	**RWS**	**16383**	**-32768/32767**	**PP**	**V-F-S-B**	**Full**	**5086**
	Upper limit of the Analog Input 2X block output in count (see figure of Analog Input 1X).								
C05.16	**AI 2X offs tune / Start?**								
	Autotune command for the Analog Input 2X offset. Input automatic fine-tuning. To run the autotune, put the input signal to its minimum value and execute "*Start ?*" command.								
C06.17	**AI 2X gain tune / Start?**								
	Autotune command for the Analog Input 2X gain. Conditions containing an offset can be compensated. To run the autotune, put the input signal to its maximum value and execute "Start ?" command								
C06.20	**AI 2X output**	**[cnt]**	**R**	**0.00**	**-32768/32767**	**PV**	**V-F-S-B**	**Full**	**5087**
	Analog Input 2X output count displaying.								
C06.21	**AI 2X < thr**	**N/A**	**R**	**0**	**0/1**	**DV**	**V-F-S-B**	**Full**	**5088**
	Display of threshold compensator state of Analog Input 2X (1 = the condition is true).								

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
C06.23	**AI 2X gain**	**N/A**	**RWS**	**1**	**-16/16**	**PP**	**V-F-S-B**	**Full**	**5084**
	Analog Input 2X gain count value displaying.								
C07	INTERFACE / AI dest								
	"Analog Inputs destinations" is a read-only menu, which allows the user to see where the analog inputs are connected. If more then one source is connected to an Analog Input, only one is shown. If no sources are connected the message "Not used" is displayed.								
C07.00	**AI 1 dest**								**5009**
	It displays the Analog Input 1 destination								
C07.01	**AI 2 dest**								**5029**
	It displays the Analog Input 2 destination								
C07.02	**AI 3 dest**								**5049**
	It displays the Analog Input 3 destination								
C07.03	**AI 1X dest**							**Full**	**5067**
	It displays the Analog Input 1X destination								
C07.04	**AI 2X dest**							**Full**	**5087**
	It displays the Analog Input 2X destination.								

Index	MENU Parameter Name Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa

INTERFACE / Analog Outputs

Drive has 2 standard voltage outputs and 4 expanded analog outputs (1x and 2x = voltage outputs, 3x and 4x=current outputs).
The Blocks of the analog outputs allow to turn an internal signal into a voltage signal (or a current signal if the EXP-D20A6 option card is used) available on the terminal strip.



CALIBRATION TO +/-10 V OUTPUT
An out 1 mon (in counts) * An out 1 scale = An out 1 hi lim (in counts) = 10 V
An out 1 mon (in counts) * An out 1 scale = An out 1 lo lim (in counts) = -10 V

Figure C08*: Analog outputs block*

C08	INTERFACE / An Out 1								
C08.00	**AO 1 src** Ipa 4000 - NULL = Default It allows to connect the selected signal to the Analog output 1. **Refer to signals List 2 of Pick List section.**	**N/A**	**RWS**	**Ipa4000**	**PList 2**	**PIN**	**V-F-S-B**	**Easy**	**3570**
C08.10	**AO 1 scale** Scale or multiplicative factor of Analog output 1.	**N/A**	**RWS**	**1 -10**	**1/0**	**PP**	**V-F-S-B**	**Easy**	**6012**
C08.11	**AO 1 hi lim** Analog output 1 count value aimed at obtaining +10V. Value must be higher than zero.	**[cnt]**	**RWS**	**16383**	**0/32767**	**PP**	**V-F-S-B**	**Full**	**6010**
C08.13	**AO 1 low lim** Analog output 1 count value aimed at obtaining -10V. Value must be higher than zero.	**[cnt]**	**RWS**	**-16384**	**-32768/0**	**PP**	**V-F-S-B**	**Full**	**6011**
C08.20	**AO 1 inp** Analog output 1 count value displaying.	**[cnt]**	**R**	**0**	**-32768/32767**	**PP**	**V-F-S-B**	**Easy**	**6013**
C08.21	**AO 1 mon** Analog output 1 value displaying 100% is equal to 10V.	**[%]**	**R**	**0**	**-100/100**	**PP**	**V-F-S-B**	**Easy**	**6014**

Index	MENU Parameter Name Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
C09	INTERFACE / An Out 2								
	See Analog Otuput 1 diagram and description details above.								
C09.00	AO 2 src	N/A	RWS	Ipa4000	PList 2	PIN	V-F-S-B	Easy	3580
	Ipa 4000 - NULL = Default It allows to connect the selected signal to the Analog output 2. Pick List 2								
C09.10	AO 2 scale	N/A	RWS	1 -10	1/0	PP	V-F-S-B	Easy	6017
	Scale or multiplicative factor of Analog output 1.								
C09.11	AO 2 high lim	[cnt]	RWS	16383	0/32767	PP	V-F-S-B	Full	6015
	Analog output 2 count value aimed at obtaining +10V. Value must be higher than zero								
C09.12	AO 2 low lim	[cnt]	RWS	-16384	-32768/0	PP	V-F-S-B	Full	6016
	Analog output 2 count value aimed at obtaining -10V. Value must be higher than zero								
C09.20	AO 2 inp	[cnt]	R	0	-32768/32767	PP	V-F-S-B	Easy	6018
	Analog output 2 count value displaying.								
C09.21	AO 2 mon	[%]	R	0	-100/100	PP	V-F-S-B	Easy	6019
	Analog output 2 value displaying 100% is equal to 10V.								
C10.00									
C10.00	Exp AO Enable	N/A	RWS	0	0/1	DV	V-F-S-B	Full	3901
	It enables the expanded analog outputs: [0] Disabled [1] Enabled								
C11	INTERFACE / An Out 1X								
	See Analog Output 1 diagram and description details above.								
C11.00	AO 1X src	N/A	RWS	Ipa4000	PList 2	PIN	V-F-S-B	Full	4090
	Ipa 4000 - NULL = Default It allows to connect the selected signal to the Analog output 1X. Pick List 2								

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
C11.10	**AO 1X scale**	**N/A**	**RWS**	**1 -10**	**1/0**	**PP**	**V-F-S-B**	**Full**	**6022**
	Scale or multiplicative factor of Analog output 1X								
C11.11	**AO 1X high lim**	**[cnt]**	**RWS**	**16383**	**0/32767**	**PP**	**V-F-S-B**	**Full**	**6020**
	Analog output 1X count value aimed at obtaining +10V. Value must be higher than zero.								
C11.12	**AO 1X low lim**	**[cnt]**	**RWS**	**-16384**	**-32768/0**	**PP**	**V-F-S-B**	**Full**	**6021**
	Analog output 1X count value aimed at obtaining -10V. Value must be higher than zero.								
C11.20	**AO 1X inp**	**[cnt]**	**R**	**0**	**-32768/32767**	**PP**	**V-F-S-B**	**Full**	**6023**
	Analog output 1X count value displaying.								
C11.21	**AO 1X mon**	**[%]**	**R**	**0**	**-100/100**	**PP**	**V-F-S-B**	**Full**	**6024**
	Analog output 1X value displaying 100% is equal to 10V.								
C12	INTERFACE / An Out 2X								
	See Analog Output 1 diagram and description details above.								
C12.00	**AO 2X src**	**N/A**	**RWS**	**Ipa4000**	**PList 2**	**PIN**	**V-F-S-B**	**Full**	**4091**
	Ipa 4000 - NULL = Default It allows to connect the selected signal to the Analog output 2X. Pick List 2								
C12.10	**AO 2X scale**	**N/A**	**RWS**	**1 -10**	**1/0**	**PP**	**V-F-S-B**	**Full**	**6027**
	Scale or multiplicative factor of Analog output 2X.								
C12.11	**AO 2X high lim**	**[cnt]**	**RWS**	**16383**	**0/32767**	**PP**	**V-F-S-B**	**Full**	**6025**
	Analog output 2X count value aimed at obtaining +10V. Value must be higher than zero.								
C12.12	**AO 2X low lim**	**[cnt]**	**RWS**	**-16384**	**-32768/0**	**PP**	**V-F-S-B**	**Full**	**6026**
	Analog output 2X count value aimed at obtaining -10V. Value must be higher than zero.								
C12.20	**AO 2X inp**	**[cnt]**	**R**	**0**	**-32768/32767**	**PP**	**V-F-S-B**	**Full**	**6028**
	Analog output 2X count value displaying.								
C12.21	**AO 2X mon**	**[%]**	**R**	**0**	**-100/100**	**PP**	**V-F-S-B**	**Full**	**6029**
	Analog output 2X value displaying 100% is equal to 10V.								

Index	MENU Parameter Name Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
C13	INTERFACE / An Out 3X								
	See Analog Output 1 diagram and description above. *NOTE!* This output is current type.								
C13.00	**AO 3X src**	N/A	RWS	Ipa4000	PList 2	PIN	V-F-S-B	Full	4092
	Ipa 4000 - NULL = Default It allows to connect the selected signal to the Analog output 3X. Pick List 2								
C13.10	**AO 3X type**	N/A	RWS	0	0/1	DP	V-F-S-B	Full	6034
	It allows to select the Analog output 3X type (EXP-D20A6 optional card is required); below are shown the selections: [0] 0..20 mA [1] 4..20 mA								
C13.11	**AO 3X scale**	N/A	RWS	1 -10	1/0	PP	V-F-S-B	Full	6032
	Scale or multiplicative factor of Analog output 2X.								
C13.12	**AO 3X high lim**	[cnt]	RWS	16383	0/32767	PP	V-F-S-B	Full	6030
	Analog output 3X count value aimed at obtaining +10V. Value must be higher than zero.								
C13.13	**AO 3X low lim**	[cnt]	RWS	-16384	-32768/0	PP	V-F-S-B	Full	6031
	Analog output 3X count value aimed at obtaining -10V. Value must be higher than zero.								
C13.20	**AO 3X inp**	[cnt]	R	0	-32768/32767	PP	V-F-S-B	Full	6033
	Analog output 3X count value displaying.								
C13.21	**AO 3X mon**	[%]	R	0	-100/100	PP	V-F-S-B	Full	6008
	Analog output 3X value 100% is equal to 20mA.								
C14	INTERFACE / An Out 4X								
	See Analog Output 1 diagram and description above. *NOTE!* This output is current type.								
C14.00	**AO 4X src**	N/A	RWS	Ipa4000	PList 2	PIN	V-F-S-B	Full	4093
	Ipa 4000 - NULL = Default It allows to connect the selected signal to the Analog output 4X.								

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
	Pick List 2								
C14.10	**AO 4X type**	**N/A**	**RWS**	**0**	**0/1**	**DP**	**V-F-S-B**	**Full**	**6039**
	It allows to select the Analog output 4X type (EXP-D20A6 optional card is required); below are shown the selections: [0] 0..20 mA [1] 4..20 mA								
C14.11	**AO 4X scale**	**N/A**	**RWS**	**1 -10**	**1/0**	**PP**	**V-F-S-B**	**Full**	**6037**
	Scale or multiplicative factor of Analog output 2X.								
C14.12	**AO 4X high lim**	**[cnt]**	**RWS**	**16383**	**0/32767**	**PP**	**V-F-S-B**	**Full**	**6035**
	Analog output 4X count value aimed at obtaining +10V. Value must be higher than zero.								
C14.13	**AO 4X low lim**	**[cnt]**	**RWS**	**-16384**	**-32768/0**	**PP**	**V-F-S-B**	**Full**	**6036**
	Analog output 4X count value aimed at obtaining -10V. Value must be higher than zero.								
C14.20	**AO 4X inp**	**[cnt]**	**R**	**0**	**-32768/32767**	**PP**	**V-F-S-B**	**Full**	**6038**
	Analog output 4X count value displaying.								
C14.21	**AO 4X mon**	**[%]**	**R**	**0**	**-100/100**	**PP**	**V-F-S-B**	**Full**	**6009**
	Analog output 4X value 100% is equal to 20mA.								

INTERFACE / Digital Inputs

The Blocks of the digital inputs allow to turn a signal available on the terminal strip into an internal signal.
As described before, the output of the blocks is included in the lists for the selection of the different sources (src).
The Block function allows to invert the signal on the terminal strip. For example, if the potential available on the terminal strip is +24V, and the inversion is disabled (not inverted) the input state is 1 (one), standard configuration; if the inversion is enabled (inversion) the input state is 0 (null).
The Drive is supplied with 8 standard digital programmable inputs.
The Drive ENABLE is set on the Digital input 0; such condition can not be changed as it is performed via the hardware. Its function, anyway, can be combined with a command signal in the sources of the other Blocks. For example, with the Drive Enable it is possible to set at zero the Ramp output. In the list of the control signals for the Ramp control block (Ref & Ramp \ Ramp funct), it is possible to connect to Ramp input = 0 the Digital Input 0 Enable mon (the Drive enable set on Digital input 0). During the Drive enabling phase, therefore, by making the ENABLE active, the Ramp output is set at zero.
With the expansion cards it is possible to obtain 12 expanded digital programmable inputs, referred with a “X” suffix.

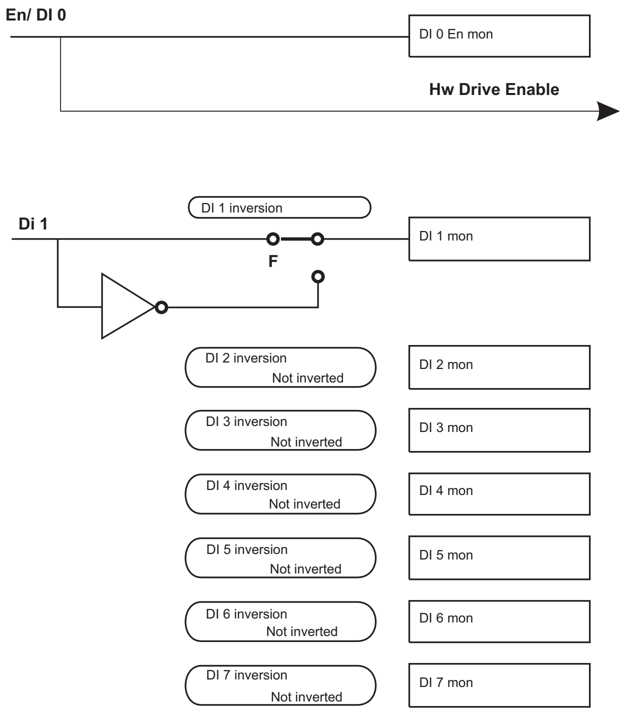


***Figura C05**: Digital inputs block*

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
C15	INTERFACE / DI Cfg								
C15.00	**DI 1 inversion** [0] Not inverted [1] Inverted	**N/A**	**RWS**	**0**	**0/1**	**DP**	**V-F-S-B**	**Easy**	**4011**
C15.01	**DI 2 inversion** [0] Not inverted [1] Inverted	**N/A**	**RWS**	**0**	**0/1**	**DP**	**V-F-S-B**	**Easy**	**4012**
C15.02	**DI 3 inversion** [0] Not inverted [1] Inverted	**N/A**	**RWS**	**0**	**0/1**	**DP**	**V-F-S-B**	**Easy**	**4013**
C15.03	**DI 4 inversion** [0] Not inverted [1] Inverted	**N/A**	**RWS**	**0**	**0/1**	**DP**	**V-F-S-B**	**Easy**	**4014**
C15.04	**DI 5 inversion** [0] Not inverted [1] Inverted	**N/A**	**RWS**	**0**	**0/1**	**DP**	**V-F-S-B**	**Easy**	**4015**
C15.05	**DI 6 inversion** [0] Not inverted [1] Inverted	**N/A**	**RWS**	**0**	**0/1**	**DP**	**V-F-S-B**	**Easy**	**4016**
C15.06	**DI 7 inversion** [0] Not inverted [1] Inverted	**N/A**	**RWS**	**0**	**0/1**	**DP**	**V-F-S-B**	**Easy**	**4017**
C15.07	**DI 7654321E** Standard digital inputs displaying. Under each number the logical state of each single input is displayed.	**N/A**	**R**	**0**	**0 -**	**DP**	**V-F-S-B**	**Easy**	**4028**
C16.00									
C16.00	**Exp DI Enable** It enables the expanded digital inputs: [0] Disabled [1] Enabled	**N/A**	**RWS**	**0**	**0/1**	**DV**	**V-F-S-B**	**Full**	**3902**

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
C17	INTERFACE / DI ExpCfg								
	See Digital inputs diagram and description above.								
C17.00	**DI 0X inversion** [0] Not inverted [1] Inverted	**N/A**	**RWS**	**0**	**0/1**	**DP**	**V-F-S-B**	**Full**	**4030**
C17.01	**DI 1X inversion** [0] Not inverted [1] Inverted	**N/A**	**RWS**	**0**	**0/1**	**DP**	**V-F-S-B**	**Full**	**4031**
C17.02	**DI 2X inversion** [0] Not inverted [1] Inverted	**N/A**	**RWS**	**0**	**0/1**	**DP**	**V-F-S-B**	**Full**	**4032**
C17.03	**DI 3X inversion** [0] Not inverted [1] Inverted	**N/A**	**RWS**	**0**	**0/1**	**DP**	**V-F-S-B**	**Full**	**4033**
C17.04	**DI 4X inversion** [0] Not inverted [1] Inverted	**N/A**	**RWS**	**0**	**0/1**	**DP**	**V-F-S-B**	**Full**	**4034**
C17.05	**DI 5X inversion** [0] Not inverted [1] Inverted	**N/A**	**RWS**	**0**	**0/1**	**DP**	**V-F-S-B**	**Full**	**4035**
C17.06	**DI 6X inversion** [0] Not inverted [1] Inverted	**N/A**	**RWS**	**0**	**0/1**	**DP**	**V-F-S-B**	**Full**	**4036**
C17.07	**DI 7X inversion** [0] Not inverted [1] Inverted	**N/A**	**RWS**	**0**	**0/1**	**DP**	**V-F-S-B**	**Full**	**4037**
C17.08	**DI 8X inversion** [0] Not inverted [1] Inverted	**N/A**	**RWS**	**0**	**0/1**	**DP**	**V-F-S-B**	**Full**	**4038**

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
C17.09	**DI 9X inversion** [0] Not inverted [1] Inverted	**N/A**	**RWS**	**0**	**0/1**	**DP**	**V-F-S-B**	**Easy**	**4039**
C17.10	**DI 10X inversion** [0] Not inverted [1] Inverted	**N/A**	**RWS**	**0**	**0/1**	**DP**	**V-F-S-B**	**Easy**	**4040**
C17.11	**DI 11X inversion** [0] Not inverted [1] Inverted	**N/A**	**RWS**	**0**	**0/1**	**DP**	**V-F-S-B**	**Easy**	**4041**
C17.12	**DIX BA9876543210** Expansion digital inputs displaying. Under each number the logical state of each single input is displayed.	**N/A**	**R**	**0**	**0 -**	**DP**	**V-F-S-B**	**Easy**	**4057**

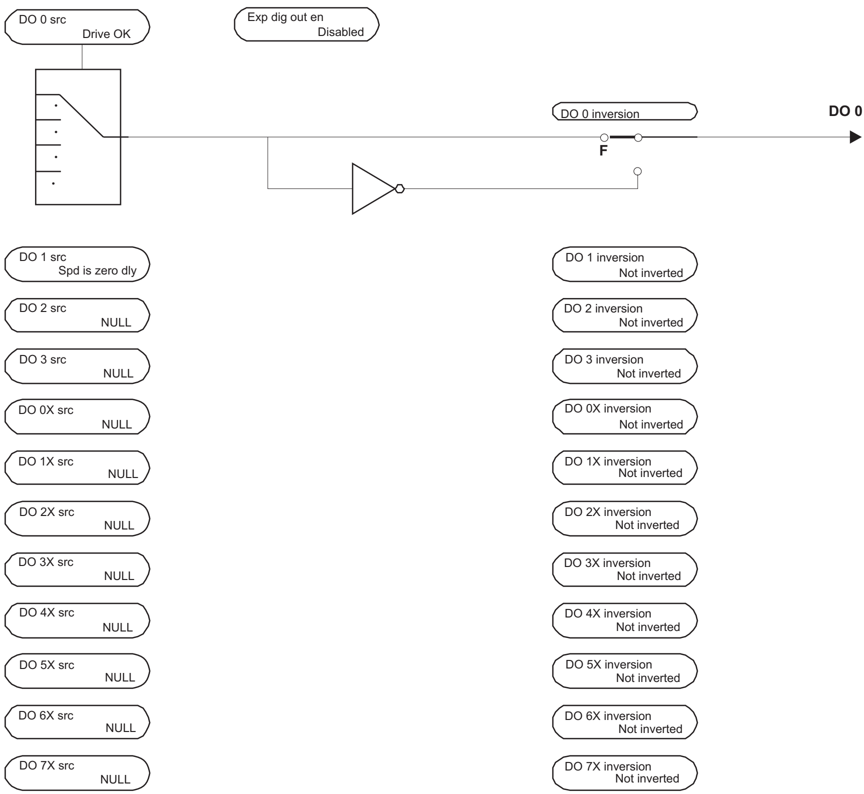
Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
	INTERFACE / Digital inputs destination This read-only menu allows the user to see where the Digital inputs are connected. If more then one source is connected to the Digital Input, only first one is shown. If no sources are connected the message "Not used" is displayed.								
C18	INTERFACE / DI dest								
C18.00	**DI 0 Enable dest** It displays the Digital Input 0 (Enable) destination.								**4020**
C18.01	**DI 1 dest** It displays the Digital Input 1 destination.								**4021**
C18.02	**DI 2 dest** It displays the Digital Input 2 destination.								**4022**
C18.03	**DI 3 dest** It displays the Digital Input 3 destination.								**4023**
C18.04	**DI 4 dest** It displays the Digital Input 4 destination.								**4024**
C18.05	**DI 5 dest** It displays the Digital Input 5 destination.								**4025**
C18.06	**DI 6 dest** It displays the Digital Input 6 destination.								**4026**
C18.07	**DI 7 dest** It displays the Digital Input 7 destination.								**4027**
C18.08	**DI 0X dest** It displays the Digital Input 0X destination.							**Full**	**4045**
C18.09	**DI 1X dest** It displays the Digital Input 1X destination.							**Full**	**4046**

Index	MENU Parameter Name Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
C18.10	**DI 2X dest** It displays the Digital Input 2X destination.								4047
C18.11	**DI 3X dest** It displays the Digital Input 3X destination.								4048
C18.12	**DI 4X dest** It displays the Digital Input 4X destination.								4049
C18.13	**DI 5X dest** It displays the Digital Input 5X destination.								4050
C18.14	**DI 6X dest** It displays the Digital Input 6X destination.								4051
C18.14	**DI 7X dest** It displays the Digital Input 7X destination.								4052
C18.15	**DI 8X dest** It displays the Digital Input 8X destination.								4053
C18.16	**DI 9X dest** It displays the Digital Input 9X destination.								4054
C18.17	**DI 10X dest** It displays the Digital Input 10X destination.								4055
C18.18	**DI 11X dest** It displays the Digital Input 11X destination.								4056

Index	MENU Parameter Name Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa

INTERFACE / Digital outputs

The blocks of the digital outputs allow to turn an internal signal into a signal available on the terminal strip.



C19 INTERFACE / DO Cfg

Index	Parameter Name	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
C19.00	**DO 0 src**	**N/A**	**RWS**	**Ipa9097**	**PList 1**	**PIN**	**V-F-S-B**	**Easy**	**4065**

Ipa 9097 - [8] Drive OK = Default

It allows to connect the selected signal to the Digital output 0. **Refer to signals of Pick List 1** below, and it can also defines the conditions that the relay contacts will close.

For example:

Drive OK The contact closes when the drive is powered up with no failure alarms.
Drive Ready The contact closes when the following conditions are fulfilled:

- The drive is powered up

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa

- There are no failure alarms present
- The drive is enabled. The enable operation is defined by parameters **En/disable mode** & **Commands sel**
- The magnetizing procedure has been completed (Drive is ready to deliver torque)

Note! The contact opens immediately on a drive failure, or when the drive is disabled.

Pick List 1

[0] NULL (Ipa 4000)
[1] ONE (Ipa 4001)
[2] Vlt search m (Ipa 3572)
[3] Drive ready (Ipa 161)
[4] Enable SM m (Ipa 162)
[5] Start SM mon (Ipa 163)
[6] FS SM mon (Ipa 164)
[7] AL Sequencer (Ipa 9096)
[8] Drive OK (Ipa 9097)
[9] Jog state (Ipa 8013)
[10] En cmd mon (Ipa 150)
[11] Str cmd mon (Ipa 151)
[12] FS cmd mon (Ipa 152)
[13] AI 1 < thr (Ipa 5010)
[14] AI 2 < thr (Ipa 5030)
[15] AI 3 < thr (Ipa 5050)
[16] DI 0 En mon (Ipa 4020)
……(all DI)……
[35] DI 11X mon (Ipa 4056)
[36] FRC reverse (Ipa 8081)
[37] RampAcc stat (Ipa 8023)
[38] RampDec stat (Ipa 8024)
[39] RampOut != 0 (Ipa 8025)
[40] Spd lim stat (Ipa 7049)
[41] Spd is zero (Ipa 3728)
[42] Ref is zero (Ipa 3729)
[43] Spd is 0 dly (Ipa 3730)
[44] Ref is 0 dly (Ipa 3731)
[45] TcurLim stat (Ipa 2445)
[46] SpdTrq ctrl (Ipa 2446)
[47] DCbrake stat (Ipa 1837)
[48] PLR active (Ipa 2284)
[49] PLS active (Ipa 2275)
[50] PLS Tout act (Ipa 2276)
[51] Drv OL trip (Ipa 1570)
[52] Drv OL warn (Ipa 1580)
[53] Mot OL trip (Ipa 1680)
[54] BU OL trip (Ipa 1782)
[56] ActSpdFbkSel (Ipa 1941)
[57] Std enc fail (Ipa 3224)
[58] Exp enc fail (Ipa 3225)
[59] Alm W1 S1 (Ipa 9630)
..(all AL status)..
[64] Alm W3 S2 (Ipa 9636)
[65] Compare1 out (Ipa 6048)
[66] Compare2 out (Ipa 6063)
[67] AI 1X < thr (Ipa 5068)
[68] AI 2X < thr (Ipa 5088)
[69] B0 W0 decomp (Ipa 2123)
..(all Bits W0)..
[84] B15 W0 decom (Ipa 2138)
[85] B0 W1 decomp (Ipa 9363)
..(all Bits W1)..
[99] B15 W1 decom (Ipa 9378)
[100] PL next act (Ipa 2283)
[101] DiamCalc act (Ipa 7367)
[102] Dig pad 0 (Ipa 9116)
..(all Dig PAD)..
[117] Dig pad 15 (Ipa 9131)
[118] Mlt par stat (Ipa 8102)
[119] Mlt p actsel (Ipa 8104)

Index	MENU Parameter Name Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
C19.01	DO 1 src	N/A	RWS	Ipa3728	PList 1	PIN	V-F-S-B	Easy	4066
	Ipa 3730 - [43] Spd is dly = Default It allows to connect the selected signal to the Digital output 1. Pick List 1								
C19.02	DO 2 src	N/A	RWS	Ipa4000	PList 1	PIN	V-F-S-B	Easy	4067
	Ipa 4000 - NULL = Default It allows to connect the selected signal to the Digital output 2. Pick List 1								
C19.03	DO 3 src	N/A	RWS	Ipa4000	PList 1	PIN	V-F-S-B	Easy	4068
	Ipa 4000 - NULL = Default It allows to connect the selected signal to the Digital output 3. Pick List 1								
C19.10	DO 0 inversion	N/A	RWS	0	0/1	DP	V-F-S-B	Easy	4060
	[0] Not inverted [1] Inverted								
C19.11	DO 1 inversion	N/A	RWS	0	0/1	DP	V-F-S-B	Easy	4061
	[0] Not inverted [1] Inverted								
C19.12	DO 2 inversion	N/A	RWS	0	0/1	DP	V-F-S-B	Easy	4062
	[0] Not inverted [1] Inverted								
C19.13	DO 3 inversion	N/A	RWS	0	0/1	DP	V-F-S-B	Easy	4063
	[0] Not inverted [1] Inverted								
C19.14	DO 3210	N/A	RWS	0	0 -	DP	V-F-S-B	Easy	4064
	The digital output logical state is displayed under each number.								

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
C20.00									
C20.00	**Exp DO enable**	**N/A**	**RWS**	**0**	**0/1**	**DV**	**V-F-S-B**	**Full**	**3903**
	It enables the expanded digital outputs: [0] Disabled [1] Enabled								
C21	INTERFACE / DO ExpCfg								
	See Digital outputs diagram and description above.								
C21.00	**DO 0X src**	**N/A**	**RWS**	**Ipa4000**	**PList 1**	**PIN**	**V-F-S-B**	**Full**	**4080**
	Ipa 4000 - NULL = Default It allows to connect the selected signal to the Digital output 0X. Pick List 1								
C21.01	**DO 1X src**	**N/A**	**RWS**	**Ipa4000**	**PList 1**	**PIN**	**V-F-S-B**	**Full**	**4081**
	Ipa 4000 - NULL = Default It allows to connect the selected signal to the Digital output 1X. Pick List 1								
C21.02	**DO 2X src**	**N/A**	**RWS**	**Ipa4000**	**PList 1**	**PIN**	**V-F-S-B**	**Full**	**4082**
	Ipa 4000 - NULL = Default It allows to connect the selected signal to the Digital output 2X. Pick List 1								
C21.03	**DO 3X src**	**N/A**	**RWS**	**Ipa4000**	**PList 1**	**PIN**	**V-F-S-B**	**Full**	**4083**
	Ipa 4000 - NULL = Default It allows to connect the selected signal to the Digital output 3X . Pick List 1								
C21.04	**DO 4X src**	**N/A**	**RWS**	**Ipa4000**	**PList 1**	**PIN**	**V-F-S-B**	**Full**	**4084**
	Ipa 4000 - NULL = Default It allows to connect the selected signal to the Digital output 4X. Pick List 1								

Index	MENU Parameter Name Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
C21.05	**DO 5X src**	**N/A**	**RWS**	**Ipa4000**	**PList 1**	**PIN**	**V-F-S-B**	**Full**	**4085**
	Ipa 4000 - NULL = Default It allows to connect the selected signal to the Digital output 5X. Pick List 1								
C21.06	**DO 6X src**	**N/A**	**RWS**	**Ipa4000**	**PList 1**	**PIN**	**V-F-S-B**	**Full**	**4086**
	Ipa 4000 - NULL = Default It allows to connect the selected signal to the Digital output 6X. Pick List 1								
C21.07	**DO 7X src**	**N/A**	**RWS**	**Ipa4000**	**PList 1**	**PIN**	**V-F-S-B**	**Full**	**4087**
	Ipa 4000 - NULL = Default It allows to connect the selected signal to the Digital output 7X . Pick List 1								
C21.10	**DO 0X inversion**	**N/A**	**RWS**	**0**	**0/1**	**DP**	**V-F-S-B**	**Full**	**4070**
	[0] Not inverted [1] Inverted								
C21.11	**DO 1X inversion**	**N/A**	**RWS**	**0**	**0/1**	**DP**	**V-F-S-B**	**Full**	**4071**
	[0] Not inverted [1] Inverted								
C21.12	**DO 2X inversion**	**N/A**	**RWS**	**0**	**0/1**	**DP**	**V-F-S-B**	**Full**	**4072**
	[0] Not inverted [1] Inverted								
C21.13	**DO 3X inversion**	**N/A**	**RWS**	**0**	**0/1**	**DP**	**V-F-S-B**	**Full**	**4073**
	[0] Not inverted [1] Inverted								
C21.14	**DO 4X inversion**	**N/A**	**RWS**	**0**	**0/1**	**DP**	**V-F-S-B**	**Full**	**4074**
	[0] Not inverted [1] Inverted								

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
C21.15	**DO 5X inversion** [0] Not inverted [1] Inverted	**N/A**	**RWS**	**0**	**0/1**	**DP**	**V-F-S-B**	**Full**	**4075**
C21.16	**DO 6X inversion** [0] Not inverted [1] Inverted	**N/A**	**RWS**	**0**	**0/1**	**DP**	**V-F-S-B**	**Full**	**4076**
C21.17	**DO 7X inversion** [0] Not inverted [1] Inverted	**N/A**	**RWS**	**0**	**0/1**	**DP**	**V-F-S-B**	**Full**	**4077**
C21.18	**DOX 76543210** The digital output logical state (of expansion board) is displayed under each number.	**N/A**	**R**	**0**	**0 -**	**DP**	**V-F-S-B**	**Full**	**4078**

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa

INTERFACE / Bit->Word

The Word Composing Block, “Bits->Word”, is useful to communicate, for example, between Drive and APC option card or Drive and Field Bus option card.
This block allows the user to compose a word made of Drive ready, Drive ok, Ref is zero, Speed is zero, by communicating on a single word.
The Bits->Word n Block has 16 inputs, where each of them can be connected to a signal; the output of the Word compn Block contains the packed input bits.
Two “Bits->Word” blocks are available.

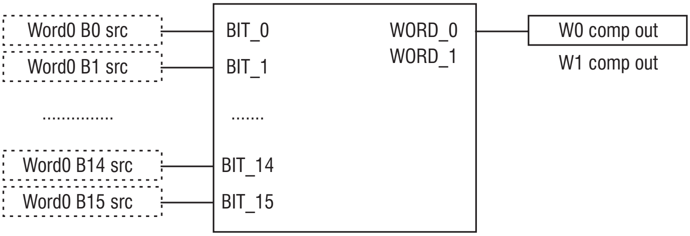


***Figure C22**: Bits->Wordn Block*

C22	INTERFACE / Bit->Word								
C22.00	**Word0 B0 src**	**N/A**	**RWS**	**Ipa4000**	**PList 1**	**PIN**	**V-F-S-B**	**Full**	**2100**
	Ipa 4000 - NULL = Default It allows to connect the Bit 0 signal selected to the Word 0. **Pick List 1**								
C22.01	**Word0 B1 src**	**N/A**	**RWS**	**Ipa4000**	**PList 1**	**PIN**	**V-F-S-B**	**Full**	**2101**
	Ipa 4000 - NULL = Default It allows to connect the Bit 1 signal selected to the Word 0 **Pick List 1**								
C22.02	**Word0 B2 src**	**N/A**	**RWS**	**Ipa4000**	**PList 1**	**PIN**	**V-F-S-B**	**Full**	**2102**
	Ipa 4000 - NULL = Default It allows to connect the Bit 2 signal selected to the Word 0. **Pick List 1**								

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
C22.03	**Word0 B3 src**	N/A	RWS	Ipa4000	PList 1	PIN	V-F-S-B	Full	2103
	Ipa 4000 - NULL = Default It allows to connect the Bit 3 signal selected to the Word 0. Pick List 1								
C22.04	**Word0 B4 src**	N/A	RWS	Ipa4000	PList 1	PIN	V-F-S-B	Full	2104
	Ipa 4000 - NULL = Default It allows to connect the Bit 4 signal selected to the Word 0. Pick List 1								
C22.05	**Word0 B5 src**	N/A	RWS	Ipa4000	PList 1	PIN	V-F-S-B	Full	2105
	Ipa 4000 - NULL = Default It allows to connect the Bit 5 signal selected to the Word 0. Pick List 1								
C22.06	**Word0 B6 src**	N/A	RWS	Ipa4000	PList 1	PIN	V-F-S-B	Full	2106
	Ipa 4000 - NULL = Default It allows to connect the Bit 6 signal selected to the Word 0. Pick List 1								
C22.07	**Word0 B7 src**	N/A	RWS	Ipa4000	PList 1	PIN	V-F-S-B	Full	2107
	Ipa 4000 - NULL = Default It allows to connect the Bit 7 signal selected to the Word 0. Pick List 1								
C22.08	**Word0 B8 src**	N/A	RWS	Ipa4000	PList 1	PIN	V-F-S-B	Full	2108
	Ipa 4000 - NULL = Default It allows to connect the Bit 8 signal selected to the Word 0. Pick List 1								

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
C22.09	**Word0 B9 src**	**N/A**	**RWS**	**Ipa4000**	**PList 1**	**PIN**	**V-F-S-B**	**Full**	**2109**
	Ipa 4000 - NULL = Default It allows to connect the Bit 9 signal selected to the Word 0. **Pick List 1**								
C22.10	**Word0 B10 src**	**N/A**	**RWS**	**Ipa4000**	**PList 1**	**PIN**	**V-F-S-B**	**Full**	**2110**
	Ipa 4000 - NULL = Default It allows to connect the Bit 10 signal selected to the Word 0. **Pick List 1**								
C22.11	**Word0 B11 src**	**N/A**	**RWS**	**Ipa4000**	**PList 1**	**PIN**	**V-F-S-B**	**Full**	**2111**
	Ipa 4000 - NULL = Default It allows to connect the Bit 11 signal selected to the Word 0. **Pick List 1**								
C22.12	**Word0 B12 src**	**N/A**	**RWS**	**Ipa4000**	**PList 1**	**PIN**	**V-F-S-B**	**Full**	**2112**
	Ipa 4000 - NULL = Default It allows to connect the Bit 12 signal selected to the Word 0. **Pick List 1**								
C22.13	**Word0 B13 src**	**N/A**	**RWS**	**Ipa4000**	**PList 1**	**PIN**	**V-F-S-B**	**Full**	**2113**
	Ipa 4000 - NULL = Default It allows to connect the Bit 13 signal selected to the Word 0. **Pick List 1**								
C22.14	**Word0 B14 src**	**N/A**	**RWS**	**Ipa4000**	**PList 1**	**PIN**	**V-F-S-B**	**Full**	**2114**
	Ipa 4000 - NULL = Default It allows to connect the Bit 14 signal selected to the Word 0. **Pick List 1**								

Index	MENU Parameter Name Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
C22.15	**Word0 B15 src**	**N/A**	**RWS**	**Ipa4000**	**PList 1**	**PIN**	**V-F-S-B**	**Full**	**2115**
	Ipa 4000 - NULL = Default It allows to connect the Bit 15 signal selected to the Word 0. **Pick List 1**								
C22.20	**W0 comp out**	**N/A**	**R**	**0**	**0 -**	**DV**	**V-F-S-B**	**Full**	**2116**
	Monitor for the hexadecimal output value of composed “Word 0”								
C22.30	**Word1 B0 src**	**N/A**	**RWS**	**Ipa4000**	**PList 1**	**PIN**	**V-F-S-B**	**Full**	**9340**
	Ipa 4000 - NULL = Default It allows to connect the Bit 0 signal selected to the Word 1. **Pick List 1**								
C22.31	**Word1 B1 src**	**N/A**	**RWS**	**Ipa4000**	**PList 1**	**PIN**	**V-F-S-B**	**Full**	**9341**
	Ipa 4000 - NULL = Default It allows to connect the Bit 1 signal selected to the Word 1. **Pick List 1**								
C22.32	**Word1 B2 src**	**N/A**	**RWS**	**Ipa4000**	**PList 1**	**PIN**	**V-F-S-B**	**Full**	**9342**
	Ipa 4000 - NULL = Default It allows to connect the Bit 2 signal selected to the Word 1. **Pick List 1**								
C22.33	**Word1 B3 src**	**N/A**	**RWS**	**Ipa4000**	**PList 1**	**PIN**	**V-F-S-B**	**Full**	**9343**
	Ipa 4000 - NULL = Default It allows to connect the Bit 3 signal selected to the Word 1. **Pick List 1**								
C22.34	**Word1 B4 src**	**N/A**	**RWS**	**Ipa4000**	**PList 1**	**PIN**	**V-F-S-B**	**Full**	**9344**
	Ipa 4000 - NULL = Default It allows to connect the Bit 4 signal selected to the Word 1. **Pick List 1**								

Index	MENU Parameter Name Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
C22.35	**Word1 B5 src**	N/A	RWS	Ipa4000	PList 1	PIN	V-F-S-B	Full	9345
	Ipa 4000 - NULL = Default It allows to connect the Bit 5 signal selected to the Word 1. Pick List 1								
C22.36	**Word1 B6 src**	N/A	RWS	Ipa4000	PList 1	PIN	V-F-S-B	Full	9346
	Ipa 4000 - NULL = Default It allows to connect the Bit 6 signal selected to the Word 1. Pick List 1								
C22.37	**Word1 B7 src**	N/A	RWS	Ipa4000	PList 1	PIN	V-F-S-B	Full	9347
	Ipa 4000 - NULL = Default It allows to connect the Bit 7 signal selected to the Word 1. Pick List 1								
C22.38	**Word1 B8 src**	N/A	RWS	Ipa4000	PList 1	PIN	V-F-S-B	Full	9348
	Ipa 4000 - NULL = Default It allows to connect the Bit 8 signal selected to the Word 1. Pick List 1								
C22.39	**Word1 B9 src**	N/A	RWS	Ipa4000	PList 1	PIN	V-F-S-B	Full	9349
	Ipa 4000 - NULL = Default It allows to connect the Bit 9 signal selected to the Word 1. Pick List 1								
C22.40	**Word1 B10 src**	N/A	RWS	Ipa4000	PList 1	PIN	V-F-S-B	Full	9350
	Ipa 4000 - NULL = Default It allows to connect the Bit 10 signal selected to the Word 1. Pick List 1								

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
C22.41	**Word1 B11 src**	N/A	RWS	Ipa4000	PList 1	PIN	V-F-S-B	Full	9351
	Ipa 4000 - NULL = Default It allows to connect the Bit 11 signal selected to the Word 1. Pick List 1								
C22.42	**Word1 B12 src**	N/A	RWS	Ipa4000	PList 1	PIN	V-F-S-B	Full	9352
	Ipa 4000 - NULL = Default It allows to connect the Bit 12 signal selected to the Word 1. Pick List 1								
C22.43	**Word1 B13 src**	N/A	RWS	Ipa4000	PList 1	PIN	V-F-S-B	Full	9353
	Ipa 4000 - NULL = Default It allows to connect the Bit 13 signal selected to the Word 1. Pick List 1								
C22.44	**Word1 B14 src**	N/A	RWS	Ipa4000	PList 1	PIN	V-F-S-B	Full	9354
	Ipa 4000 - NULL = Default It allows to connect the Bit 14 signal selected to the Word 1. Pick List 1								
C22.45	**Word1 B15 src**	N/A	RWS	Ipa4000	PList 1	PIN	V-F-S-B	Full	9355
	Ipa 4000 - NULL = Default It allows to connect the Bit 15 signal selected to the Word 1. Pick List 1								
C22.50	**W1 comp out**	N/A	R	0	0 -	DV	V-F-S-B	Full	9356
	Monitor for the hexadecimal output value of composed "Word 1".								

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa

INTERFACE / Word->Bit

The Word Decomposing Block, “Word->Bits”, allows to set some signals on a digital word; each signal composing the word, on the Block input, can be combined with an output channel. It is useful to communicate, for example, between APC option card and or Field Bus option card and Drive.
The “Wordn->Bits” block has an input word and 16 Bx Wn decomp output bits.
Two “Word->Bits” blocks are available.

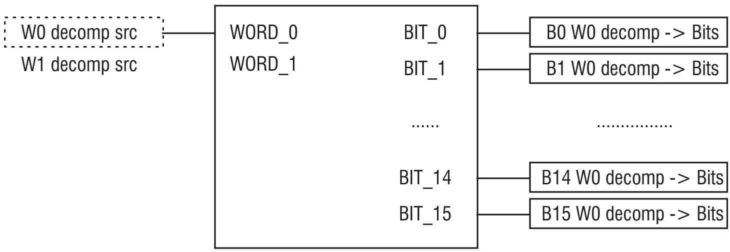


***Figure C23:** Word->Bit block*

C23 INTERFACE / Word->Bit

Index	Parameter Name	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
C23.00	**W0 decom src**	**N/A**	**RWS**	**Ipa2121**	**PList 26**	**PIN**	**V-F-S-B**	**Full**	**2120**
	Ipa 2121 - W0 decomp inp = Default It allows to connect the word that will be input to decomposing block. Pick List 26								
C23.01	**W0 decom inp**	**N/A**	**RWS**	**0X0000**	**- -**	**DV**	**V-F-S-B**	**Full**	**2121**
	It allows to set the “W0 decomp inp” value.								
C23.10	**W0 decom mon**	**N/A**	**R**	**0**	**0 -**	**DP**	**V-F-S-B**	**Full**	**2122**
	Monitor of the hexadecimal input value of the Word 0 decomposed.								
C23.20	**B0 W0 decom**	**N/A**	**R**	**0**	**0/1**	**DV**	**V-F-S-B**	**Full**	**2123**
	Bit 0 of Word 0 decomposed displaying.								
C23.21	**B1 W0 decom**	**N/A**	**R**	**0**	**0/1**	**DV**	**V-F-S-B**	**Full**	**2124**
	Bit 1 of Word 0 decomposed displaying.								

Index	MENU Parameter Name Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
C23.22	**B2 W0 decom** Bit 2 of Word 0 decomposed displaying.	**N/A**	**R**	**0**	**0/1**	**DV**	**V-F-S-B**	**Full**	**2125**
C23.23	**B3 W0 decom** Bit 3 of Word 0 decomposed displaying.	**N/A**	**R**	**0**	**0/1**	**DV**	**V-F-S-B**	**Full**	**2126**
C23.24	**B4 W0 decom** Bit 4 of Word 0 decomposed displaying.	**N/A**	**R**	**0**	**0/1**	**DV**	**V-F-S-B**	**Full**	**2127**
C23.25	**B5 W0 decom** Bit 5 of Word 0 decomposed displaying.	**N/A**	**R**	**0**	**0/1**	**DV**	**V-F-S-B**	**Full**	**2128**
C23.26	**B6 W0 decom** Bit 6 of Word 0 decomposed displaying.	**N/A**	**R**	**0**	**0/1**	**DV**	**V-F-S-B**	**Full**	**2129**
C23.27	**B7 W0 decom** Bit 7 of Word 0 decomposed displaying.	**N/A**	**R**	**0**	**0/1**	**DV**	**V-F-S-B**	**Full**	**2130**
C23.28	**B8 W0 decom** Bit 8 of Word 0 decomposed displaying.	**N/A**	**R**	**0**	**0/1**	**DV**	**V-F-S-B**	**Full**	**2131**
C23.29	**B9 W0 decom** Bit 9 of Word 0 decomposed displaying.	**N/A**	**R**	**0**	**0/1**	**DV**	**V-F-S-B**	**Full**	**2132**
C23.30	**B10 W0 decom** Bit 10 of Word 0 decomposed displaying	**N/A**	**R**	**0**	**0/1**	**DV**	**V-F-S-B**	**Full**	**2133**
C23.31	**B11 W0 decom** Bit 11 of Word 0 decomposed displaying.	**N/A**	**R**	**0**	**0/1**	**DV**	**V-F-S-B**	**Full**	**2134**
C23.32	**B12 W0 decom** Bit 12 of Word 0 decomposed displaying.	**N/A**	**R**	**0**	**0/1**	**DV**	**V-F-S-B**	**Full**	**2135**
C23.33	**B13 W0 decom** Bit 13 of Word 0 decomposed displaying.	**N/A**	**R**	**0**	**0/1**	**DV**	**V-F-S-B**	**Full**	**2136**

Index	MENU Parameter Name Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
C23.34	**B14 W0 decom** Bit 14 of Word 0 decomposed displaying.	**N/A**	**R**	**0**	**0/1**	**DV**	**V-F-S-B**	**Full**	**2137**
C23.35	**B15 W0 decom** Bit 15 of Word 0 decomposed displaying.	**N/A**	**R**	**0**	**0/1**	**DV**	**V-F-S-B**	**Full**	**2138**
C23.40	**W1 decom src** Ipa 9360 - W1 decomp inp = Default It allows to connect the word that will be input to decomposing block. Pick List 27	**N/A**	**RWS**	**Ipa9360**	**PList 27**	**PIN**	**V-F-S-B**	**Full**	**9361**
C23.41	**W1 decom inp** It allows to set the "W1 decomp inp" value.	**N/A**	**RWS**	**0X0000**	**- -**	**DV**	**V-F-S-B**	**Full**	**9360**
C23.50	**W1 decom mon** Monitor of the hexadecimal input value of the Word 1 decomposed.	**N/A**	**R**	**0**	**0 -**	**DP**	**V-F-S-B**	**Full**	**9362**
C23.60	**B0 W1 decom** Bit 0 of Word 1 decomposed displaying.	**N/A**	**R**	**0**	**0/1**	**DV**	**V-F-S-B**	**Full**	**9363**
C23.61	**B1 W1 decom** Bit 1 of Word 1 decomposed displaying.	**N/A**	**R**	**0**	**0/1**	**DV**	**V-F-S-B**	**Full**	**9364**
C23.62	**B2 W1 decom** Bit 2 of Word 1 decomposed displaying.	**N/A**	**R**	**0**	**0/1**	**DV**	**V-F-S-B**	**Full**	**9365**
C23.63	**B3 W1 decom** Bit 3 of Word 1 decomposed displaying.	**N/A**	**R**	**0**	**0/1**	**DV**	**V-F-S-B**	**Full**	**9366**
C23.64	**B4 W1 decom** Bit 4 of Word 1 decomposed displaying.	**N/A**	**R**	**0**	**0/1**	**DV**	**V-F-S-B**	**Full**	**9367**
C23.65	**B5 W1 decom** Bit 5 of Word 1 decomposed displaying.	**N/A**	**R**	**0**	**0/1**	**DV**	**V-F-S-B**	**Full**	**9368**

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
C23.66	**B6 W1 decom** Bit 6 of Word 1 decomposed displaying.	**N/A**	**R**	**0**	**0/1**	**DV**	**V-F-S-B**	**Full**	**9369**
C23.67	**B7 W1 decom** Bit 7 of Word 1 decomposed displaying.	**N/A**	**R**	**0**	**0/1**	**DV**	**V-F-S-B**	**Full**	**9370**
C23.68	**B8 W1 decom** Bit 8 of Word 1 decomposed displaying.	**N/A**	**R**	**0**	**0/1**	**DV**	**V-F-S-B**	**Full**	**9371**
C23.69	**B9 W1 decom** Bit 9 of Word 1 decomposed displaying.	**N/A**	**R**	**0**	**0/1**	**DV**	**V-F-S-B**	**Full**	**9372**
C23.70	**B10 W1 decom** Bit 10 of Word 1 decomposed displaying.	**N/A**	**R**	**0**	**0/1**	**DV**	**V-F-S-B**	**Full**	**9373**
C23.71	**B11 W1 decom** Bit 11 of Word 1 decomposed displaying.	**N/A**	**R**	**0**	**0/1**	**DV**	**V-F-S-B**	**Full**	**9374**
C23.72	**B12 W1 decom** Bit 12 of Word 1 decomposed displaying.	**N/A**	**R**	**0**	**0/1**	**DV**	**V-F-S-B**	**Full**	**9375**
C23.73	**B13 W1 decom** Bit 13 of Word 1 decomposed displaying.	**N/A**	**R**	**0**	**0/1**	**DV**	**V-F-S-B**	**Full**	**9376**
C23.74	**B14 W1 decom** Bit 14 of Word 1 decomposed displaying.	**N/A**	**R**	**0**	**0/1**	**DV**	**V-F-S-B**	**Full**	**9377**
C23.75	**B15 W1 decom** Bit 15 of Word 1 decomposed displaying.	**N/A**	**R**	**0**	**0/1**	**DV**	**V-F-S-B**	**Full**	**9378**

D REF&RAMP

REF&RAMP / Ramp ref

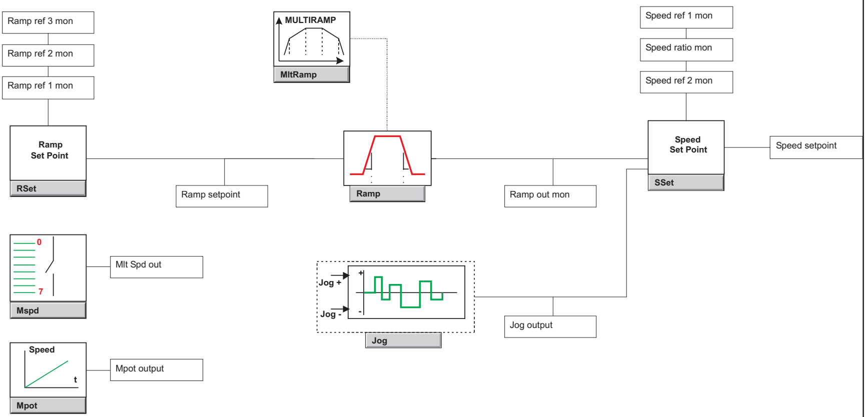
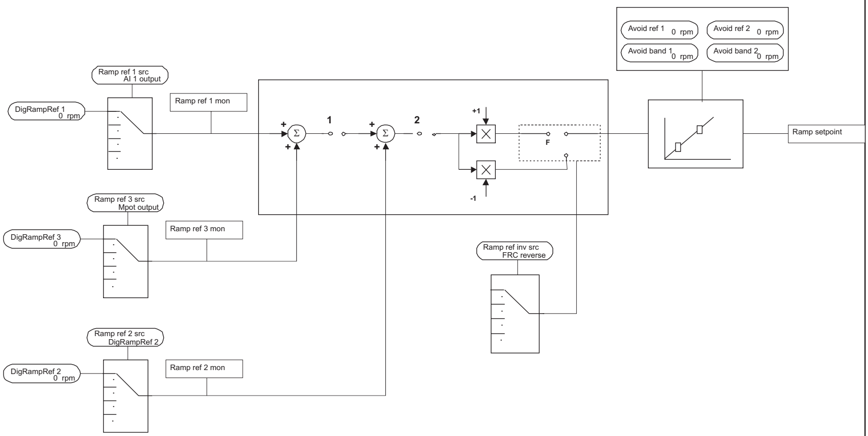


Figure D00-A: *Speed reference generation*

The function of this block is to generate the speed setpoint reference for the ramp block. By algebracally adding its inputs, the block generates the output Setpoint. On the input the block allows to select the origin of the sources: **D00.00 - Ramp Ref 1 src** and **D00.02 - Ramp Ref 2 src** are two selectable references. The internal value can be allocated in the Block configurations through the **D00.10 - Dig ramp ref 1** and **D00.01 - Dig ramp ref 2** parameters.
D00.02 - Ramp Ref 3 src will be added to **D00.00 - Ramp Ref 1 src**. Defaul setting is connected to Motopotentiometer output.
D00.03 - Ramp Ref inv src allows to invert the whole output setpoint. The output state is determined by a multiplier according to the state of the connected signal. The following references are connected together with the signals of the three input Sources: the output reference of the Motopotentiometer block and the output reference of the Multi speed block.

NOTE! **D00.21 - Ramp ref 2 mon** must be zero for the drive to stop without opening the enable input.

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa



1. Switch is closed if Ramp out enable = Enabled & Start
   Switch is closed if Ramp out enable = Enabled & Stop
2. Switch is closed if Ramp out enable = Enabled & (!FastStop)
   Switch is closed if Ramp out enable = Enabled & (FastStop)

Both switches are closed if Ramp out enable = Disabled

Figure D01-B: *Ramp setpoint*

D00 REF&RAMP / Ramp ref

D00.00	**Ramp ref 1 src**	**N/A**	**RWS**	**Ipa5009**	**PList 7**	**PIN**	**V-F-S-B**	**Easy**	**7035**
	Ipa 5009 - AI 1 output = Default It select the origin of the signal of Ramp ref 1. Pick List 7								
D00.01	**Ramp ref 2 src**	**N/A**	**RWS**	**Ipa7031**	**PList 8**	**PIN**	**V-F-S-B**	**Easy**	**7036**
	Ipa 7031 - Dig ramp ref 2 = Default It select the origin of the signal of Ramp ref 2. Pick List 8								
D00.02	**Ramp ref 3 src**	**N/A**	**RWS**	**Ipa7038**	**PList 45**	**PIN**	**V-F-S-B**	**Full**	**7029**
	Ipa 7038 - Dig ramp ref 3 = Default It select the origin of the signal of Ramp ref 3. Pick List 45								

Index	MENU Parameter Name Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
D00.03	**Ramp ref inv src**	N/A	RWS	Ipa4000	PList 3	PIN	V-F-S-B	Easy	7037
	Ipa 4000 - NULL = Default It connects the selected signal to the selector of the multiplier input: if the signal is 0, multiply by +1, or if the signal is 1, multiply by –1. The multiplier allows to invert Ramp reference signal Pick List 3								
D00.10	**Dig ramp ref 1**	[rpm]	RWS	0	Calc/Calc	PV	V-F-S-B	Easy	7030
	Value of the Digital ramp reference 1 variable, selectable through Pick List 17 of **D00.00 - Ramp ref 1 src**.								
D00.11	**Dig ramp ref 2**	[rpm]	RWS	0	Calc/Calc	PV	V-F-S-B	Easy	7031
	Value of the Digital ramp reference 2 variable, selectable through Pick List 8 of **D00.01 - Ramp ref 2 src**. .								
D00.12	**Dig ramp ref 3**	[rpm]	RWS	0	Calc/Calc	PV	V-F-S-B	Full	7038
	Value of the Digital ramp reference 3 variable, selectable through Pick List 45 of **D00.03 - Ramp ref 3 src**.								
D00.20	**Ramp ref 1 mon**	[rpm]	R	0.00	0.00/0.00	PP	V-F-S-B	Full	7032
	Displaying of the Ramp ref 1 signal								
D00.21	**Ramp ref 2 mon**	[rpm]	R	0.00	0.00/0.00	PP	V-F-S-B	Full	7033
	Displaying of the Ramp ref 2 signal								
D00.22	**Ramp ref 3 mon**	[rpm]	R	0.00	0.00/0.00	PP	V-F-S-B	Full	7039
	Displaying of the Ramp ref 3 signal								
D00.23	**Ramp setpoint**	[rpm]	R	0.00	0.00/0.00	PV	V-F-S-B	Easy	7034
	Displaying of the Ramp setpoint output signal								

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa

REF&RAMP / MRamp src

This Block allows to select 4 different sets of the Ramp times. Each ramp time set allows to set the acceleration and deceleration times of the Ramp and of the S-Ramp and the deceleration time of the Fast Stop. The Block has two input sources: **Multi Ramp s0 src** and **Multi ramp s1 src**.
According to the state of the signals connected to the sources, it is possible to select one of the output Multi Ramp Sets.

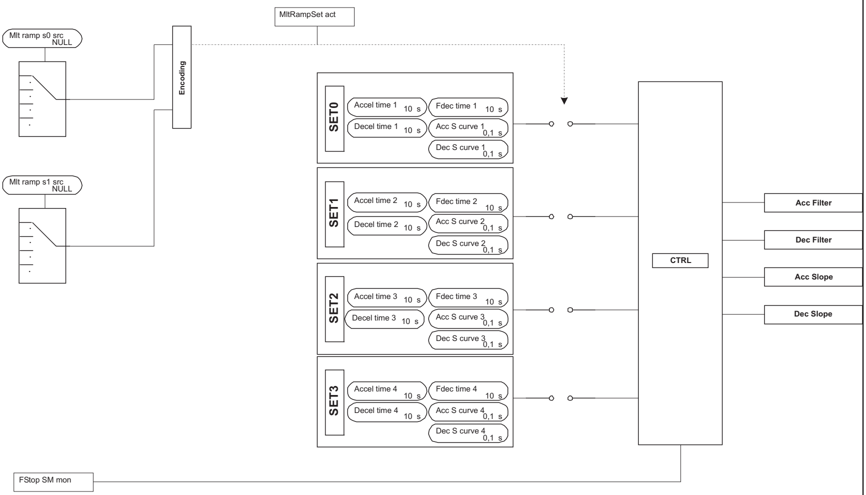


***Figure D01:** Multiramp block*

The ramp control can be set for a programmable delay for the acceleration and deceleration times of the drive reference. This delay time will have to be set on the final system (motor and load), being strictly dependant from the inertia of the load machine. The time values are expressed in seconds.
The ramps time delay are calculated in accordance with the **B0E.00 - Full scale speed** parameter.

D01 REF&RAMP / MRamp src

D01.00	Mlt ramp s0 src	N/A	RWS	Ipa4000	PList 3	PIN	V-F-S-B	Easy	8090

Ipa 4000 - NULL = Default

Multi ramp selector 0 source: it allows to select the origin of the signals stating the input combination.

Pick List 3

Index	MENU Parameter Name Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
D01.01	Mlt ramp s1 src	N/A	RWS	Ipa4000	PList 3	PIN	V-F-S-B	Easy	8091

Ipa 4000 - NULL = Default

Multi ramp selector 1 source: it allows to select the origin of the signals stating the input combination.

Pick List 3

Mlt Ramp s1 src	Mlt Ramp s0 src	ACTIVE SET
0	0	MRamp set 1
0	1	MRamp set 2
1	0	MRamp set 3
1	1	MRamp set 4

tab_D01-01

***Table D01.01:** Multi ramp setting*

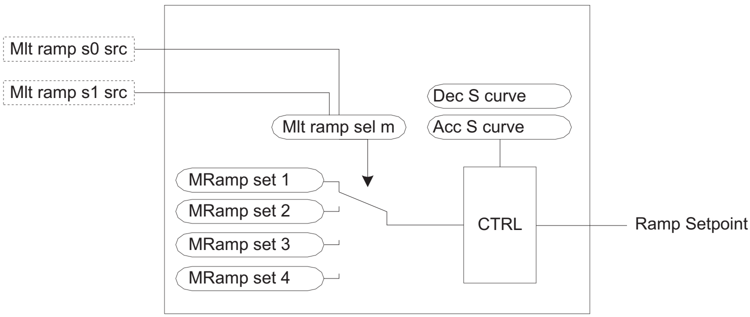


***Figure D01.01-1:** Multi ramp block*

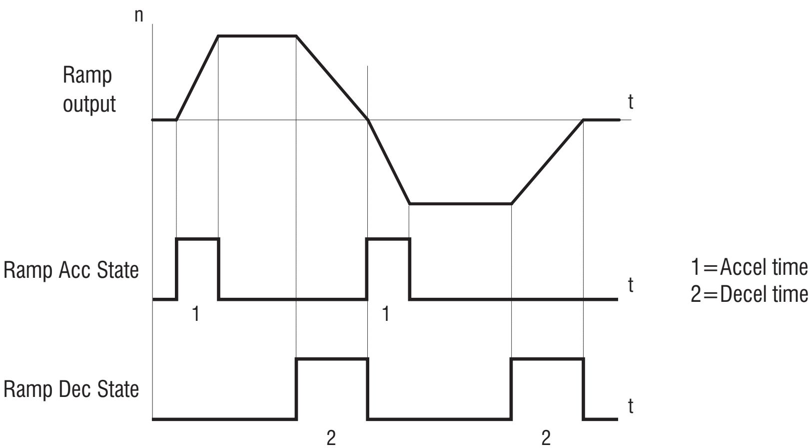


***Figure D01.01-2**: Acceleration and Deceleration Ramps*

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
D02	**REF&RAMP / MRampSet1**								
D02.00	**Accel time 1** Acceleration ramp time 1.	**[sec]**	**RWS**	**10**	**0.5/10000**	**PP**	**V-F-S-B**	**Easy**	**8041**
D02.01	**Decel time 1** Deceleration ramp time 1.	**[sec]**	**RWS**	**10**	**0.5/10000**	**PP**	**V-F-S-B**	**Easy**	**8043**
D02.02	**F dec time 1** Fast Stop deceleration ramp time 1.	**[sec]**	**RWS**	**10**	**0.5/10000**	**PP**	**V-F-S-B**	**Easy**	**8045**
D02.03	**Acc S curve 1** Acceleration half-adjust time for Ramp-S 1.	**[sec]**	**RWS**	**0.1**	**Calc/Calc**	**PP**	**V-F-S-B**	**Easy**	**8046**
D02.04	**Dec S curve 1** Deceleration half-adjust time for Ramp-S 1.	**[sec]**	**RWS**	**0.1**	**Calc/Calc**	**PP**	**V-F-S-B**	**Easy**	**8047**
D03	**REF&RAMP / MRampSet2**								
D03.00	**Accel time 2** Acceleration ramp time 2.	**[sec]**	**RWS**	**10**	**0.5/10000**	**PP**	**V-F-S-B**	**Easy**	**8051**
D03.01	**Decel time 2** Deceleration ramp time 2 .	**[sec]**	**RWS**	**10**	**0.5/10000**	**PP**	**V-F-S-B**	**Easy**	**8053**
D03.02	**F dec time 2** Fast Stop deceleration ramp time 2.	**[sec]**	**RWS**	**10**	**0.5/10000**	**PP**	**V-F-S-B**	**Easy**	**8055**
D03.03	**Acc S curve 2** Acceleration half-adjust time for Ramp-S 2.	**[sec]**	**RWS**	**0.1**	**Calc/Calc**	**PP**	**V-F-S-B**	**Easy**	**8056**
D03.04	**Dec S curve 2** Deceleration half-adjust time for Ramp-S 2	**[sec]**	**RWS**	**0.1**	**Calc/Calc**	**PP**	**V-F-S-B**	**Easy**	**8057**
D04	**REF&RAMP / MRampSet3**								
D04.00	**Accel time 3** Acceleration ramp time 3.	**[sec]**	**RWS**	**10**	**0.5/10000**	**PP**	**V-F-S-B**	**Easy**	**8061**
D04.01	**Decel time 3** Deceleration ramp time 3.	**[sec]**	**RWS**	**10**	**0.5/10000**	**PP**	**V-F-S-B**	**Easy**	**8063**

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
D04.02	**F dec time 3**	**[sec]**	**RWS**	**10**	**0.5/10000**	**PP**	**V-F-S-B**	**Easy**	**8065**
	Fast Stop deceleration ramp time 3.								
D04.03	**Acc S curve 3**	**[sec]**	**RWS**	**0.1**	**Calc/Calc**	**PP**	**V-F-S-B**	**Easy**	**8066**
	Acceleration half-adjust time for Ramp-S 3.								
D04.04	**Dec S curve 3**	**[sec]**	**RWS**	**0.1**	**Calc/Calc**	**PP**	**V-F-S-B**	**Easy**	**8067**
	Deceleration half-adjust time for Ramp-S 3.								
D05	REF&RAMP / MRampSet4								
D05.00	**Accel time 4**	**[sec]**	**RWS**	**10**	**0.5/10000**	**PP**	**V-F-S-B**	**Easy**	**8071**
	Acceleration ramp time 4.								
D05.01	**Decel time 4**	**[sec]**	**RWS**	**10**	**0.5/10000**	**PP**	**V-F-S-B**	**Easy**	**8073**
	Deceleration ramp time 4.								
D05.02	**F dec time 4**	**[sec]**	**RWS**	**10**	**0.5/10000**	**PP**	**V-F-S-B**	**Easy**	**8075**
	Fast Stop deceleration ramp time 4.								
D05.03	**Acc S curve 4**	**[sec]**	**RWS**	**0.1**	**Calc/Calc**	**PP**	**V-F-S-B**	**Easy**	**8076**
	Acceleration half-adjust time for Ramp-S 4.								
D05.04	**Dec S curve 4**	**[sec]**	**RWS**	**0.1**	**Calc/Calc**	**PP**	**V-F-S-B**	**Easy**	**8077**
	Deceleration half-adjust time for Ramp-S 4.								
D06.00									
D06.00	**MtlRampSet act**	**N/A**	**R**	**0**	**0/3**	**DP**	**V-F-S-B**	**Easy**	**8078**
	Displaying of the Multi ramp set active.								

Index	MENU Parameter Name Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa

REF&RAMP / RampFunct

The Function of this Block is to generate the Ramped Speed reference. Such signal is generated by tracking the reference of the Ramp setpoint block with the Ramp times defined in the Multi ramp block.
It allows to select the source origin on the input:
Ramp input = 0 which allows to obtain the input zero setting, **Ramp output** = 0 which allows to obtain the output zero setting, **Ramp freeze** which maintains on the output the reference value independently of the possible variations on the input.
Furthermore, among the parameters it is possible to configure: with **Ramp shape** the ramp type, if a Linear or an S-shaped, with **Ramp out enable** it is possible to disable the **Ramp output** only as a reference, that is blocking the output by keeping the signal active.
When the Drive is enabled, the Block has at its disposal the Catch on the fly function, capturing a rotating motor.
The function allows to detect the motor speed and to set the output of the Ramp Block at the same speed as the motor one.
The main application fields are: the reinsertion after an alarm intervention or during the capturing of a motor already started by a load, etc.
It is possible to monitor the output signal, the output state (if enabled or disabled), the ramp acceleration or deceleration state and the command state.

D07	REF&RAMP / RampFunct								
D07.00	**Ramp input=0**	**N/A**	**RWS**	**Ipa4000**	**PList 3**	**PIN**	**V-F-S-B**	**Full**	**8027**
	Ipa 4000 - NULL = Default It select the origin of the signal, which allows to force Ramp input = 0. Pick List 3								
D07.01	**Ramp output!=0**	**N/A**	**RWS**	**Ipa4000**	**PList 3**	**PIN**	**V-F-S-B**	**Full**	**8028**
	Ipa 4000 - NULL = Default It select the origin of the signal, which allows to force Ramp output = 0. Pick List 3								
D07.02	**Ramp freeze**	**N/A**	**RWS**	**Ipa4000**	**PList 3**	**PIN**	**V-F-S-B**	**Full**	**8029**
	Ipa 4000 - NULL = Default It select the origin of the signal, which allows to force Ramp freeze. Pick List 3								

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
D07.10	**Ramp out enable** [0] Disabled [1] Enabled Ramp function enabling	**N/A**	**WSZ**	**1**	**0/1**	**DP**	**V-F-S-B**	**Easy**	**8031**
D07.11	**Ramp shape** [0] Linear [1] S-Shaped Ramp selection. Linear or S-shaped ramp	**N/A**	**RWS**	**1**	**0/1**	**DV**	**V-F-S-B**	**Easy**	**8021**
D07.20	**Ramp out mon** Displaying of the Ramp output signal	**[rpm]**	**R**	**0.00**	**0.00/0.00**	**PV**	**V-F-S-B**	**Easy**	**8022**
D07.21	**Ramp Acc state** Displaying of the Ramp acceleration state signal: 0= Not acceleration 1 = Acceleration	**N/A**	**R**	**0**	**0/1**	**DV**	**V-F-S-B**	**Full**	**8023**
D07.22	**Ramp Dec state** Displaying of the Ramp deceleration state signal: 0= Not deceleration 1 = Deceleration	**N/A**	**R**	**0**	**0/1**	**DV**	**V-F-S-B**	**Full**	**8024**
D07.23	**Ramp out = 0** Ramp output signal different from zero: 0 = Ramp enabled 1 = Ramp disabled	**N/A**	**R**	**0**	**0/1**	**DV**	**V-F-S-B**	**Full**	**8025**
D07.24	**Ramp cmds mon** Command monitor for the ramp block: Bit 0 -> Ramp output = 0, if ONE the value is 1 Bit 1 -> Ramp input = 0, if ONE the value is 2 Bit 2 -> Ramp freeze, if ONE the value is 4 Bit 3 -> Ramp out enable	**N/A**	**R**	**0**	**0/15**	**DP**	**V-F-S-B**	**Full**	**8026**

REF&RAMP / Mlt speed

This Block allows to set up to 8 Internal Speed references, one of which is supplied with the Speed 0 reference function.
Three selection inputs allow to activate on the output the desired Speed.
Through the **D08.00 - MltSpd sel 0 src**, **D08.01 - MltSpd sel 1 src**, **D08.02 - MltSpd sel 2 src** sources, it is possible to select the origin of the signals stating the input combination (they are standard connected to NULL).
The **D08.03 - MltSpd 0 src** and **D08.04 - MltSpd 1 src** sources states the origin of the Speed 0 and Speed 1 reference signal (it is standard connected to Mlt spd 0 and to Mlt spd 1).
The 8 chosen speeds can be set in the configurations via **Mlt spd 0 .. 7**.
The following table lists the possible combinations of the three inputs stating the active Speed (0-7):

MltSpd sel 2 src	MltSpd sel 1 src	MltSpd sel 0 src	ACTIVE SPEED
0	0	0	Multi speed 0
0	0	1	Multi speed 1
0	1	0	Multi speed 2
0	1	1	Multi speed 3
1	0	0	Multi speed 4
1	0	1	Multi speed 5
1	1	0	Multi speed 6
1	1	1	Multi speed 7

tab_D08

***Table D08:** Multi speed combinations*

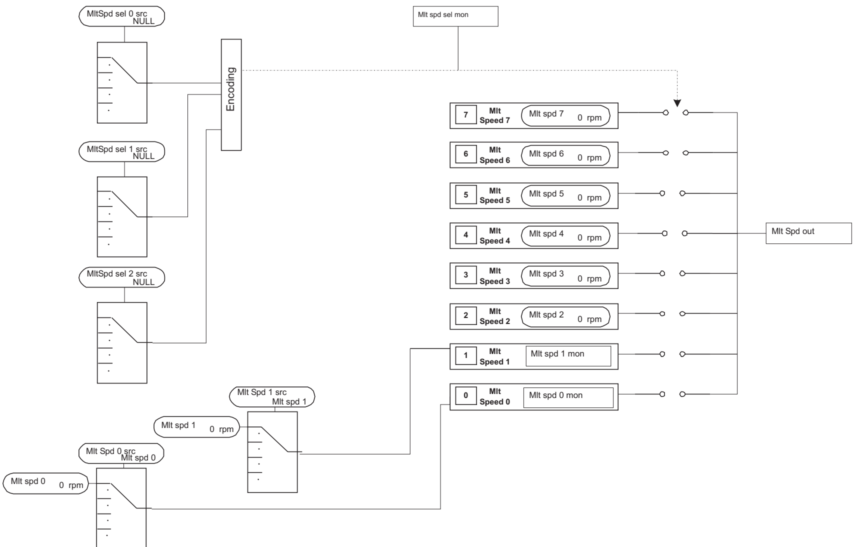


***Figure D08:** Multi speed block*

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
D08	REF&RAMP / Mlt speed								
D08.00	**MltSpd sel 0 src**	**N/A**	**RWS**	**Ipa4000**	**PList 3**	**PIN**	**V-F-S-B**	**Easy**	**7072**
	Ipa 4000 - NULL = Default Multi speed 1 selector source: it allows to select the origin of the signals stating the input combination. Pick List 3								
D08.01	**MltSpd sel 1 src**	**N/A**	**RWS**	**Ipa4000**	**PList 3**	**PIN**	**V-F-S-B**	**Easy**	**7073**
	Ipa 4000 - NULL = Default Multi speed 2 selector source: it allows to select the origin of the signals stating the input combination. Pick List 3								
D08.02	**MltSpd sel 2 src**	**N/A**	**RWS**	**Ipa4000**	**PList 3**	**PIN**	**V-F-S-B**	**Full**	**7074**
	Ipa 4000 - NULL = Default Multi speed 3 selector source: it allows to select the origin of the signals stating the input combination. Pick List 3								
D08.03	**Mlt spd 0 src**	**N/A**	**RWS**	**Ipa7060**	**PList 11**	**PIN**	**V-F-S-B**	**Easy**	**7071**
	Ipa 7060 - Mlt spd 0 = Default Multi speed 0 source: it allows to select the origin of the signals of Multi speed 0 set. Pick List 11								
D08.04	**Mlt spd 1 src**	**N/A**	**RWS**	**Ipa7061**	**PList 11**	**PIN**	**V-F-S-B**	**Easy**	**7076**
	Ipa 7061 - Mlt spd 1 = Default Multi speed 1 source: it allows to select the origin of the signals of Multi speed 1 set. Pick List 46								
D08.10	**Mlt spd 0**	**[rpm]**	**RWS**	**0.00**	**Calc/Calc**	**PV**	**V-F-S-B**	**Easy**	**7060**
	Digital Multi Speed 0 value								

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
D08.11	**Mlt spd 1** Digital Multi Speed 1 value	**[rpm]**	**RWS**	**0.00**	**Calc/Calc**	**PV**	**V-F-S-B**	**Easy**	**7061**
D08.12	**Mlt spd 2** Multi Speed 2 value.	**[rpm]**	**RWS**	**0.00**	**Calc/Calc**	**PV**	**V-F-S-B**	**Easy**	**7062**
D08.13	**Mlt spd 3** Multi Speed 3 value.	**[rpm]**	**RWS**	**0.00**	**Calc/Calc**	**PV**	**V-F-S-B**	**Easy**	**7063**
D08.14	**Mlt spd 4** Multi Speed 4 value.	**[rpm]**	**RWS**	**0.00**	**Calc/Calc**	**PV**	**V-F-S-B**	**Full**	**7064**
D08.15	**Mlt spd 5** Multi Speed 5 value.	**[rpm]**	**RWS**	**0.00**	**Calc/Calc**	**PV**	**V-F-S-B**	**Full**	**7065**
D08.16	**Mlt spd 6** Multi Speed 6 value.	**[rpm]**	**RWS**	**0.00**	**Calc/Calc**	**PV**	**V-F-S-B**	**Full**	**7066**
D08.17	**Mlt spd 7** Multi Speed 7 value.	**[rpm]**	**RWS**	**0.00**	**Calc/Calc**	**PV**	**V-F-S-B**	**Full**	**7067**
D08.20	**Mlt spd 0 mon** It displays Multi speed 0 value.	**[rpm]**	**R**	**0.00**	**0.00/0.00**	**PP**	**V-F-S-B**	**Easy**	**7068**
D08.21	**Mlt spd 1 mon** It displays Multi speed 1 value.	**[rpm]**	**R**	**0.00**	**0.00/0.00**	**PP**	**V-F-S-B**	**Easy**	**7075**
D08.22	**Mlt spd sel mon** Active selection displaying (Multi speed 0, Multi speed 1, etc.).	**N/A**	**R**	**0**	**0/7**	**DP**	**V-F-S-B**	**Easy**	**7069**
D08.23	**Mlt spd out** It displays Multi speed block output signal.	**[rpm]**	**R**	**0.00**	**0.00/0.00**	**PV**	**V-F-S-B**	**Easy**	**7070**

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa

REF&RAMP / Motopot

The Motopotentiometer function is enabled in the standard settings.
Furthermore, through the **D09.00 - Mpot up src** and **D09.01 - Mpot down src** sources it is possible to select the origin of the Speed increase and decrease and of the command signals. The Block offers also the possibility to invert the output reference. The **D09.02 - Mpot invers src** source selects the inversion command. The speed preset source, **D09.03 - Mpot preset src**, allows to select the preset command.
Such function can activate a series of settings active on the input and/or output reference. In the Block configurations it is possible to set, with **D09.10 - Mpot lower lim** and **D09.11 - Mpot upper lim**, the speed upper and lower limit (in rpm and standard configured with 0 and 1500A (default for 230-480Vac), 1800A default for 575Vac).
The Motopotentiometer acceleration and deceleration ramps are independent from those of the Ramp block.
This Block, therefore, with **D09.12 - Mpot Acc Time** and **D09.13 - Mpot Dec Time**, allows to set the Motopotentiometer ramp.
D09.14 - Mpot init cfg allows to set the function stating the Motopotentiometer reference value when the Drive is started.
Furthermore, **D09.15 - Mpot preset cfg** states the function of the Preset command.

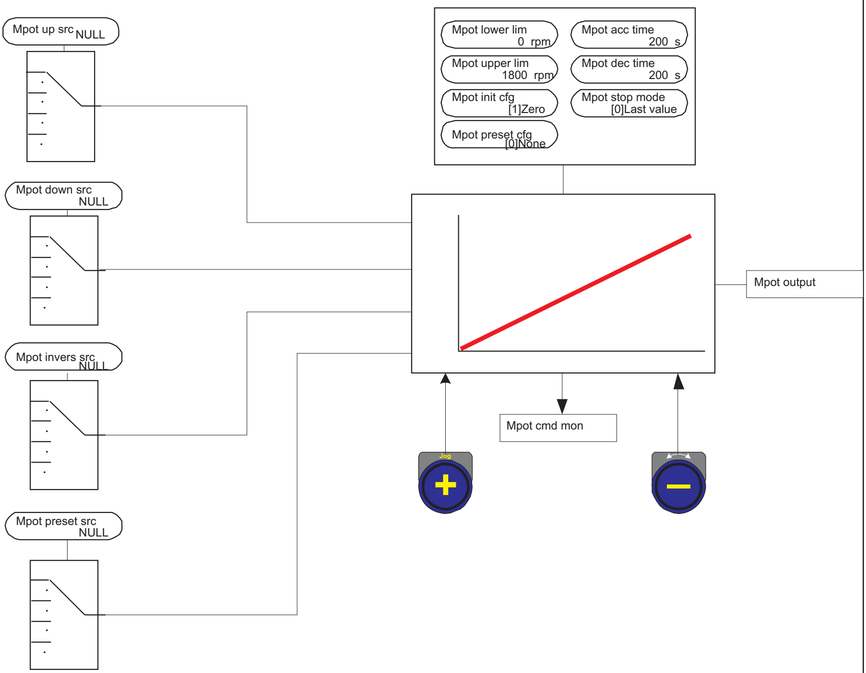


***Figure D09:** Motor potentiometer*

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
D09	REF&RAMP / Motopot								
D09.00	**Mpot up src**	**N/A**	**RWS**	**Ipa4000**	**PList 3**	**PIN**	**V-F-S-B**	**Easy**	**7091**
	Ipa 4000 - NULL = Default It allows to select the origin of the signals of Motopot up command. Pick List 3								
D09.01	**Mpot down src**	**N/A**	**RWS**	**Ipa4000**	**PList 3**	**PIN**	**V-F-S-B**	**Easy**	**7092**
	Ipa 4000 - NULL = Default It allows to select the origin of the signals of Motopot down command. Pick List 3								
D09.02	**Mpot invers src**	**N/A**	**RWS**	**Ipa4000**	**PList 3**	**PIN**	**V-F-S-B**	**Easy**	**7093**
	Ipa 4000 - NULL = Default It allows to select the origin of the signals to invert the Motopot reference signal. Pick List 3								
D09.03	**Mpot preset src**	**N/A**	**RWS**	**Ipa4000**	**PList 3**	**PIN**	**V-F-S-B**	**Easy**	**7094**
	Ipa 4000 - NULL = Default It allows to select the origin of the preset command. Pick List 3								
D09.10	**Mpot lower lim**	**[rpm]**	**RWS**	**0.00**	**0.00/0.00**	**PP**	**V-F-S-B**	**Easy**	**7080**
	Motopot reference lower (minimum) limit								
D09.11	**Mpot upper lim**	**[rpm]**	**RWS**	**(*)**	**0.00/0.00**	**PP**	**V-F-S-B**	**Easy**	**7081**
	(*) 1500(Europe) 1800(American) Motopot reference upper (maximum) limit								
D09.12	**Mpot Acc Time**	**[sec]**	**RWS**	**5**	**0.01/10000**	**PV**	**V-F-S-B**	**Easy**	**7083**
	Motopot acceleration ramp time								
D09.13	**Mpot Dec Time**	**[sec]**	**RWS**	**5**	**0.01/10000**	**PV**	**V-F-S-B**	**Easy**	**7085**
	Motopot deceleration ramp time								

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
D09.14	**Mpot init cfg**	**N/A**	**RWS**	**1**	**0/3**	**DP**	**V-F-S-B**	**Easy**	**7086**
	Motopot initial configuration: [0] Power off — Value at turning off [1] Zero — Zero rpm [2] Lower limit — Lower limit value [3] Upper limit — Upper limit value								
D09.15	**Mpot preset cfg**	**N/A**	**RWS**	**0**	**0/11**	**DP**	**V-F-S-B**	**Easy**	**7087**
	Motopot preset configuration: [0] None — No operation [1] Inp = 0 — The input state is set at zero [2] Inp = low lim — Low limit it sets on the input the Mpot lower limit [3] Inp & Ref=0 — It sets at zero the input and reference state [4] Inp & Ref=low — It sets on the input and on the reference the Mpot lower limit [5] Out=0 — It sets at zero the output state [6] Out = lowlim — It sets on the output the Mpot lower limit [7] Out & Ref=0 — It sets at zero the output and reference state [8] Out & Ref=low — It sets on the output and on the reference the Mpot lower limit [9] Inp = upp lim — It sets on the input the Mpot upper limit [10] Inp&Ref=upp — It sets on the input and on the reference the Mpot upper limit [11] Freeze input — It freezes the input reference independently of the following variations								
D09.16	**Mpot Stop mode**	**N/A**	**RWS**	**0**	**0/1**	**DP**	**V-F-S-B**	**Easy**	**7101**
	Behavior of the Motorpotentiometer reference after a Stop command: [0] Last value — Motorpotentiometer reference remains fixed to its current value. [1] Follow ramp — Motorpotentiometer reference ramps down to zero. When a Stop command is given, motorpotentiometer reference follows the deceleration ramp in use.								
D09.20	**Mpot cmd mon**	**N/A**	**R**	**0**	**0/15**	**DP**	**V-F-S-B**	**Full**	**7089**
	It displays Motopot command activated.								
D09.21	**Mpot output**	**[rpm]**	**R**	**0.00**	**0.00/0.00**	**PV**	**V-F-S-B**	**Easy**	**7090**
	It displays Motopot block output signal.								

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa

REF&RAMP / Jog

This block states the Speed reference of the Jog Function. It is possible to set 4 Jog speeds: Jog 0, Jog 1, Jog 2 and Jog 3.
The output desired speed can be activated according to the state of the selection inputs **D10.00 - Jog sel 0 src** and **D10.02 - Jog sel 1 src**.
On the Block input it is possible to select via **D10.04 - Jog invers src** a signal which, through an internal multiplier, is able to state the output inversion (Jog output).
Furthermore with **D10.00 - Jog sel 0 src** it is possible to select the reference signal of Jog 0 (Jog 0 standard configuration); with **D10.01 - Jog cmd src** it is possible to select the command for the activation of the Jog Block (NULL standard configuration).
In the Block configurations, together with the setting of the 4 different speeds, it is possible to state the ramp times (acceleration and deceleration) of the Jog Function.

Jog sel 1 src	Jog sel 0 src	ACTIVE JOG
0	0	Jog 0
0	1	Jog 1
1	0	Jog 2
1	1	Jog 3

tab D10

Table D10: *Jog setting*

The usually active Speed is that of JOG 0. Through Jog sel mon it is possible to monitor which speed is active on the output. The Jog 0 reference value, the Block state and the Block output (in rpm) can be monitored too.

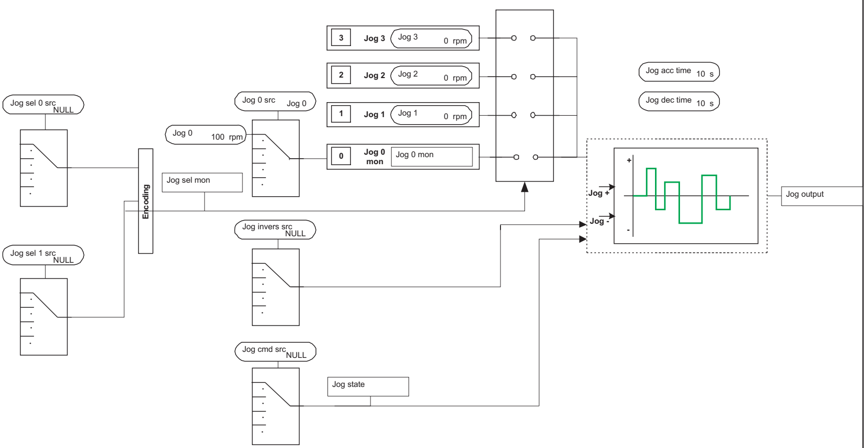


Figure D10: *Jog block*

Index	MENU Parameter Name Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
D10	REF&RAMP / Jog								
D10.00	**Jog sel 0 src**	N/A	RWS	Ipa8000	PList12	PIN	V-F-S-B	Easy	8014
	Ipa 8000 - Jog 0 = Default It allows to select the origin of Jog 0 speed reference value. Pick List 12								
D10.01	**Jog cmd src**	N/A	RWS	Ipa4000	PList3	PIN	V-F-S-B	Easy	8015
	Ipa 4000 - NULL = Default It allows to select the origin of Jog command. Pick List 3								
D10.02	**Jog sel 0 src**	N/A	RWS	Ipa4000	PList3	PIN	V-F-S-B	Full	8016
	Ipa 4000 - NULL = Default It allows to select the origin of Jog selector 1. Pick List 3								
D10.03	**Jog sel 1 src**	N/A	RWS	Ipa4000	PList3	PIN	V-F-S-B	Full	8017
	Ipa 4000 - NULL = Default It allows to select the origin of Jog selector 2. Pick List 3								
D10.04	**Jog invers src**	N/A	RWS	Ipa4000	PList3	PIN	V-F-S-B	Easy	8018
	Ipa 4000 - NULL = Default It allows to select the origin of Jog inversion signal. Pick List 3								
D10.10	**Jog 0**	[rpm]	RWS	100.00	0.00/-	PV	V-F-S-B	Easy	8000
	Digital Jog speed 1 value.								
D10.11	**Jog 1**	[rpm]	RWS	100.00	0.00/-	PV	V-F-S-B	Full	8001
	Digital Jog speed 2 value.								
D10.12	**Jog 2**	[rpm]	RWS	100.00	0.00/-	PV	V-F-S-B	Full	8002
	Digital Jog speed 3 value.								

Index	MENU Parameter Name Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
D10.13	**Jog 3** Digital Jog speed 4 value	[rpm]	RWS	100.00	0.00/-	PV	V-F-S-B	Full	8003
D10.14	**Jog acc Time** Acceleration Jog ramp time.	[sec]	RWS	10	0.5/10000	PV	V-F-S-B	Easy	8005
D10.15	**Jog dec Time** Deceleration Jog ramp time.	[sec]	RWS	10	0.5/10000	PV	V-F-S-B	Easy	8007
D10.20	**Jog 0 mon** It displays Jog 0 reference value.	[rpm]	R	0.00	0.00/0.00	PP	V-F-S-B	Full	8010
D10.21	**Jog sel mon** It displays the active Jog speed selected.	N/A	R	0	0/3	DP	V-F-S-B	Full	8011
D10.22	**Jog output** It displays Jog block output signal	[rpm]	R	0.00	0.00/0.00	PP	V-F-S-B	Easy	8012
D10.23	**Jog state** It displays Jog block state.	N/A	R	0	0/3	DV	V-F-S-B	Full	8013

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa

REF&RAMP / Jump Ref

The block function operates the motor while avoiding resonance caused by characteristic frequency references in the customer system machine.
Parameters function allow to set two jump reference frequencies in rpm, with their related jump bandwidth in rpm too. During motor running at constant-speed, operation within jump reference frequency [rpm] range is prohibited.

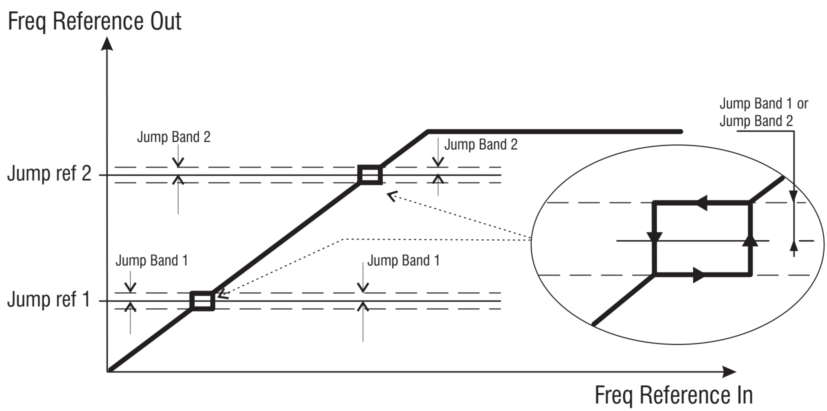


***Figure D11:** Jump frequencies*

D11	REF&RAMP / Jump Ref								
D11.00	**Jump Ref 1**	**[rpm]**	**RWS**	**0**	**0/FSS**	**PP**	**V-F-S-B**	**Easy**	**345**
	Jump reference 1 frequency in rpm. Maximum value setting allowed is equal to **B01.00 - Full scale speed** (Ipa 1885)								
D11.01	**Jump Band 1**	**[rpm]**	**RWS**	**0**	**0/(**)**	**PP**	**V-F-S-B**	**Easy**	**346**
	Jump bandwidth 1 frequency in rpm. (**) Maximum value setting allowed is equal to: a) 100 if Full Scale Speed >100 b) FSS if Full Scale Speed <100 FSS = **B01.00 - Full scale speed** (Ipa 1885)								
D11.02	**Jump Ref 2**	**[rpm]**	**RWS**	**0**	**0/FSS**	**PP**	**V-F-S-B**	**Easy**	**347**
	Jump reference 2 frequency in rpm. Maximum value setting allowed is equal to **B01.00 - Full scale speed** (Ipa 1885).								

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
D11.03	**Jump Band 2**	**[rpm]**	**RWS**	**0**	**0/(**)**	**PP**	**V-F-S-B**	**Easy**	**346**

Jump bandwidth 2 frequency in rpm.

(**) Maximum value setting allowed is equal to:
a) 100 if FSS>100
b) FSS if FSS<100

FSS = **B01.00 - Full scale speed** (Ipa 1885).

Index	MENU Parameter Name Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa

E REG PARAM

According to the chosen regulation mode, some control loops could be inactive.
The following table states (with X) which are the active loops corresponding to each different mode:

Mode	Speed loop (Spd)	Current loop (Curr)	Flux loop (Flx)	Voltage loop (Vlt)
V/f		*		
Sensorless (SLS)	X	X	X	X
Field Oriented (FOC)	X	X	X	X

tab par E00

***Table E00**: Control loops settting*

* A pseudo-regulator, that is a circuit allowing some of the regulator protective functions, is active for the current loop with a V/f mode.

As for the manual tuning of the different loops, if required, see chapter 7, Manual Tunings of Regulator Loops.
The settings of the percentage gains are carried out according to the Basic values stated inside the specific menu.

E00 REG PARAM / Spd Reg

Index	Parameter Name	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
E00.00	**Spd P1 gain %**	**[%]**	**RWS**	**Calc**	**0.00/100**	**PP**	**F-S-B**	**Easy**	**3700**
	Proportional gain of speed loop.								
E00.01	**Spd I1 gain %**	**[%]**	**RWS**	**Calc**	**0.00/100**	**PP**	**F-S-B**	**Easy**	**3701**
	Integral gain of speed loop.								
E00.02	**Test torque ref**	**[Nm]**	**RWS**	**Calc**	**0.00/-**	**FK**	**F-S-B**	**Easy**	**9500**
	Torque reference applicable during the self-tuning procedure [Nm].								
E00.03	**SpdReg autotune**							**Easy**	
	Waiting start...								
	Speed Regulator autotune: enabling command of the data detection phase.								
E00.04	**Measured Inertia**	**[kgm²]**	**RWS**	**0.00**	**0.00/Calc**	**FK**	**F-S-B**	**Full**	**9501**
	Measured Inertia value of the measured inertia [Kg * m²].								
E00.05	**Measured Frict**	**[Nm]**	**RWS**	**0.00**	**0.00/Calc**	**FK**	**F-S-B**	**Full**	**9502**
	Measured Frict value of the measured friction [Nm].								

Index	MENU Parameter Name Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
E00.06	**Spd P base value**	[A/rpm]	RWS	Calc	0.00/Calc	FK	F-S-B	Full	2075
	Basic value of the proportional gain of speed loop.								
E00.07	**Spd I base value**	[A/rpm/s]	RWS	Calc	0.00/Calc	FK	F-S-B	Full	2077
	Basic value of the proportional gain of speed loop.								
E00.08	**InUse Spd P gain%**	[%]	R	10	0/100	PV	F-S-B	Easy	2063
	In use value of the Proportional gain.								
E00.09	**InUse Spd I gain%**	[%]	R	10	0/100	PV	F-S-B	Easy	2065
	In use value of the Integral gain.								
E01	REG PARAM / Curr Reg								
E01.00	**CurrP gain %**	[%]	RWS	Calc	0.00/100	PP	V-F-S-B	Easy	1999
	Proportional gain of current loop.								
E01.01	**CurrI gain %**	[%]	RWS	Calc	0.00/100	PP	V-F-S-B	Easy	2000
	Integral gain of current loop.								
E01.02	**CurrP base value**	[V/A]	RWS	Calc	0.00/Calc	FK	V-F-S-B	Full	2005
	Basic value of the proportional gain of current loop.								
E01.03	**CurrI base value**	[V/A/s]	RWS	Calc	0.00/Calc	FK	V-F-S-B	Full	2007
	Basic value of the integral gain of current loop.								
E02	REG PARAM / Flux Reg								
	Note! Menu accessible with Access Level = FULL.								
E02.00	**Flx P gain %**	[%]	RWS	Calc	0/100	PP	F-S	Full	2013
	Proportional gain of flux loop.								
E02.01	**Flx I gain %**	[%]	RWS	Calc	0/100	PP	F-S	Full	2015
	Integral gain of flux loop.								
E02.02	**Flx P base value**	[A/Wb]	RWS	Calc	0.00/Calc	FK	F-S	Full	2021
	Basic value of the proportional gain of flux loop.								

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
E02.03	**Flx I base value**	**[A/Wb/s]**	**RWS**	**Calc**	**0.00/Calc**	**FK**	**F-S**	**Full**	**2022**
	Basic value of the integral gain of flux loop.								
E03	REG PARAM / Volt Reg								
	Note! Menu accessible with Access Level = FULL.								
E03.00	**Vlt P gain %**	**[%]**	**RWS**	**Calc**	**0.00/100**	**PP**	**F-S-B**	**Full**	**2031**
	Proportional gain of voltage loop.								
E03.01	**Vlt I gain %**	**[%]**	**RWS**	**Calc**	**0.00/100**	**PP**	**F-S-B**	**Full**	**2033**
	Integral gain of voltage loop.								
E03.02	**Vlt P base value**	**[A/V]**	**RWS**	**Calc**	**0.00/0.00**	**FK**	**F-S-B**	**Full**	**2039**
	Basic value of the proportional gain of voltage loop.								
E03.03	**Vlt I base value**	**[A/V/s]**	**RWS**	**Calc**	**0.00/0.00**	**FK**	**F-S-B**	**Full**	**2041**
	Basic value of the integral gain of voltage loop.								

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa

REG PARAM / DeadTime

Note! Menu accessible with Access Level = FULL

The Dead time comp function allows for compensation of the output voltage distortion due to IGBT voltage drop and its switching characteristics.
Distortion of output voltage may cause non uniform, non smooth shaft rotation in open loop **V/f control** or in a closed loop **Sensorless Vector** control mode errors in speed estimation especially at very low speeds.
Through the two parameters it is possible to set a voltage value and the compensation variation, called Gradient.

Note! Both parameters are automatically measured during autotune procedure.

If required, it is possible to follow a procedure that allowos to compensate the IGBT voltage output distortion; see section 7.3, IGBT Voltage Output Distortion.

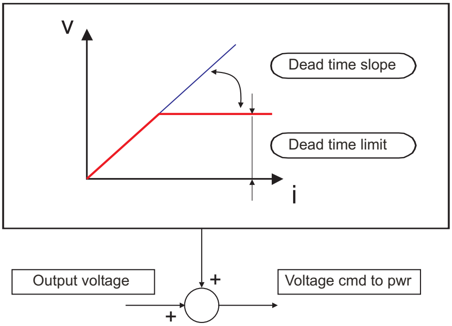


***Figure E04**: Dead time compensation*

E04	REG PARAM / DeadTime								
E04.00	**Dead time limit** Value of the voltage compensation.	**[V]**	**RWS**	**Calc**	**0.00/50**	**PP**	**V-F-S-B**	**Full**	**530**
E04.01	**Dead time slope** Compensation Gradient.	**[V/A]**	**RWS**	**Calc**	**0.00/100**	**PP**	**V-F-S-B**	**Full**	**540**

Index	MENU Parameter Name Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa

REG PARAM / V/f Reg

When the motor is loaded, the mechanical speed changes according to the applied load. In order to reduce the speed error, it is possible to compensate for the motor slip.

The function parameterization allows:
- to increase the output voltage with low frequencies (voltage Boost)
- to compensate the speed change due to a load increase
- to parameterize a filter on the compensation
- to damp the DC link oscillations.

The V/f mode has no current regulator. A pseudo-regulator changes the output frequency in order to prevent the current from overcoming the set current limit.

Index	Parameter Name	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
E05	REG PARAM / V/f Reg								
E05.00	**Voltage boost**	[%]	RWS	Calc	0.00/0.00	PV	V	Easy	3400
	Torque boost at low speed. It allows to increase the output voltage at zero Hz. It is Initialized by autotune procedure.								
E05.01	**Slip comp**	[rpm]	RWS	Calc	0.00/Calc	PV	V	Easy	3531
	Compensation of speed drop due to load. Initialized by autotune procedure. In general parameter must be increased to about 1/3 - 1/2 of rated motor speed. Low values of “Slip comp” parameter may cause instability.								
E05.02	**Slip comp filter**	[sec]	RWS	1	Calc/10	PP	V	Easy	3541
	Slip compensation filter.								
E05.03	**Antioscill gain**	[%]	RWS	0	0/100	PP	V	Easy	3585
	It allows to damp the current oscillations between the motor and the DC link, which could be developed in the middle range of the rated speed.								
E05.04	**V/f ILim P gain**	[rpm_A]	RWS	Calc	Calc/Calc	PP	V	Easy	3520
	Proportional gain of the pseudo current loop regulator in V/f mode.								
E05.05	**V/f ILim I gain**	[rpm_A]	RWS	Calc	Calc/Calc	PP	V	Easy	3530
	Integral gain of the pseudo current loop regulator in V/f mode.								

Index	MENU Parameter Name Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa

REG PARAM / V/f SaveE

The function allows to reduce the motor Flux in order to reduce the losses.
As a consequence it is possible to obtain an energy saving when the load requires a reduced torque as compared to the rated one (save energy).
Through the input sources it is possible to select the origin of the save energy command signal and of the signal stating the flux level.

The sources are:
- **E06.00 - SE cmd src** save energy command source
- **E06.01 - SE flx level src** source of the flux level value during the save energy

In the configurations it is possible to set via **E06.02 - Dig SE flx level** a digital percentage value stating the flux level and via **E06.03 - SE flx ramp time** a ramp time on the level.

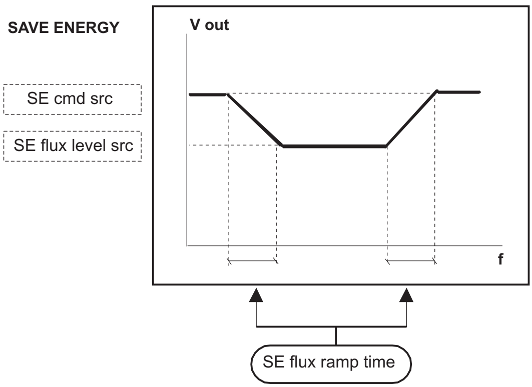


Figure E06: *Save energy block*

E06	REG PARAM / V/f SaveE								
E06.00	**SE cmd src**	**N/A**	**RWS**	**Ipa4000**	**PList 3**	**PIN**	**V**	**Easy**	**3538**

Ipa 4000 - NULL = Default

It select the origin of the signal of V/f Save Energy command.

Pick List 3

E06.01	**SE flx level src**	**N/A**	**RWS**	**Ipa3536**	**PList 23**	**PIN**	**V**	**Easy**	**3539**

Ipa 3536 - Dig SE flx level = Default

It select the origin of the signal of V/f Save Energy Flux Level.

Pick List 23

Index	MENU Parameter Name Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
E06.02	Dig SE flx level	[%]	RWS	100	10/100	PV	V	Easy	3536
	Digital value of V/f Save Energy Flux.								
E06.03	SE flx ramp time	[sec]	RWS	10	0/100	PP	V	Easy	3537
	V/f Save Energy Flux Level ramp time value								
E07	REG PARAM / VFAutCapt								
	The function allows the Drive to catch an already rotating motor, “Autocapture”. An automatic restart of the drive is possible after a “Retrying” temporary alarm condition. Through the **E07.00 - V/f catch cmd** source it is possible to select the origin of the command signal enabling the function. In the configurations the function can be parameterized according to the application.								
E07.00	V/f catch cmd	N/A	RWS	Ipa4000	PList3	PIN	V	Easy	3582
	Ipa 4000 - NULL = Default It select the origin of the signal of V/f Auto Capture command. Pick List 3								
E07.01	Spd search time	[sec]	RWS	10	0.05/20	PP	V	Easy	3545
	It states the change of the Drive output frequency. It shows the time needed to perform a frequency change from zero to the motor rated one if the output current is equal to the motor rated one.								
E07.02	Vlt search time	[sec]	RWS	1	0.01/20	PP	V	Easy	3550
	It states the machine flux change. It shows the time needed to perform a flux change from zero to the motor rated one, if the output current is equal to the motor rated one.								
E07.03	Catch init spd	[rpm]	RWS	Calc	0.00/-	PP	V	Easy	3555
	It states the starting speed for the synchronism search.								
E07.04	Catch demag dly	[sec]	RWS	3	0/10	PP	V	Easy	3560
	Delay time for the motor demagnetization before performing the synchronism search (in case the “Autocapture” function is present).								
E07.05	Catch retry dly	[sec]	RWS	3	0/10	PP	V	Easy	3565
	Delay time for the motor demagnetization (with the “Retrying” function).								

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
E07.06	**Vlt search m**	**N/A**	**R**	**0**	**0/3**	**PP**	**V**	**Easy**	**3572**
	Displaying of the Voltage search state signal: 0 = Wait start function 1 = Wait demagnetization end 2 = Search in progress 3 = End search								

Index	MENU Parameter Name Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa

REG PARAM / VFAutCapt

Automatic Restart after a Temporary Alarm "Retrying"

Before the autocapture process starts, it is necessary to wait for the motor to be demagnetized in order to avoid high current transient due to the E.M.F. (electromotive force) which causes Overcurrent alarms.
The demagnetizing time can be set in ms via the **E07.05 - Catch retry dly** parameter.
In general: the bigger the motor, the longer the time.
Too low values of **E07.05 - Catch retry dly** cause high insertion currents. After the demagnetizing time, the speed autocaputure phase starts.
This function is influenced by the **E07.01 - Spd search time** and **E07.02 - Vlt search time** parameters. The process starts by supplying the motor with a frequency equal to the one supplied by the inverter before the alarm intervention; the machine flux is afterwards increased thus making it equal to the corresponding output frequency value (V/f feature). If during this phase the output current is higher than the motor rated one, the output frequency is decreased and the flux increasing speed is made slower.

REG PARAM / VFAutCapt

Catch on the Fly Process "Autocapture"

The procedure is similar to the above-mentioned one; the demagnetizing time is set via the "Catch demag dly" parameter while the synchronism search starting speed via "Catch init speed" in rpm.

Example: switching of a mains (AC lines) connected motor (4 poles) (AC 50Hz) on the inverter.

- Set Catch init speed = 1500
- Inverter in a STOP condition
- Disconnect the motor from the mains and switch it on the inverter

No voltage can be applied on the inverter output (terminals U2, V2, W2). No direct connection between input and output is allowed (Bypass).

Pay particular attention to the sequences of the switching contacts between the network and the inverter.

- Give the START command to the inverter

Act on the **E07.01 - Spd search time** and **E07.02 - Vlt search time** parameters as stated before.
When this function is selected and if the power or the alarm have been reset, the drive automatically starts its normal functioning procedure. This function must be used only with applications which do not put in danger people or things during their automatic reset. Anyway, the enforced safety rules have to be taken into consideration.

Index	MENU	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
	Parameter Name Description								

REG PARAM / SLS FGain

Note! Menu accessible with Access Level = FULL

The function is active only with a Sensorless mode. With a Sensorless mode the motor speed is estimated.
The gains of this observer depend on the speed, on Motoring or Regen.
It is possible to set a Profile for the gains. In both operating areas (quadrants).

Each Profile is defined by three segments:

H = High - **M** = MedPoint - **L** = Low

For each segment it is possible to state the **% Proportional Integral gain** of the speed.
Each segment is linearly connected by two Bands from **H** to **M**, from **M** to **L**, and by two Levels from **H** to **M**, from **M** to **L**.
In the configurations it is possible to set for each Profile (Motoring gains & Regen gains) the gain values and the Band and Level values common to both Profiles.

Furthermore, in order to smooth the transition between Motoring and Regen, other two parameters are used:

- **E08.34 - Sls 0 tran bnd**
  Band in the speed 0 neighborhood, connecting the profiles linearly; the band smoothes the change between one Profile
- **E08.40 - Observer filter**
  Constant of the first-order Filter on both gains.

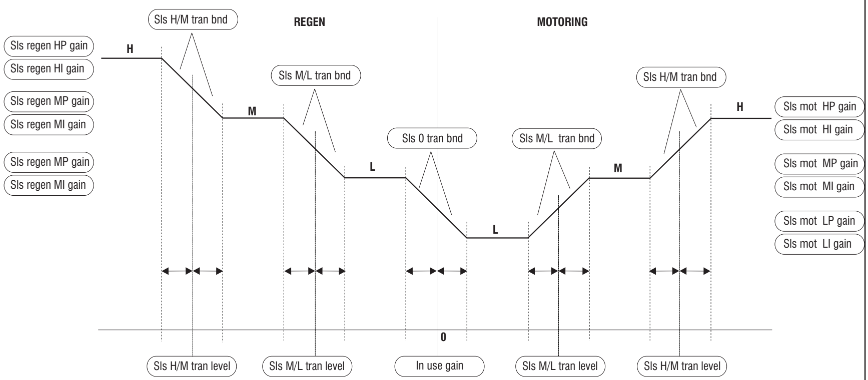


Figure E08: Gain Profiling Speed Feedback block

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
E08	REG PARAM / SLS Fgain								
E08.00	**Sls mot HPgain** Motor Proportional High gain.	[%]	**RWS**	**5**	**0/100**	**PP**	**S**	**Full**	**1090**
E08.01	**Sls mot HIgain** Motor Integral High gain.	[%]	**RWS**	**5**	**0/100**	**PP**	**S**	**Full**	**1091**
E08.02	**Sls mot Mpgain** Motor Proportional Medium gain.	[%]	**RWS**	**5**	**0/100**	**PP**	**S**	**Full**	**1092**
E08.03	**Sls mot MIgain** Motor Integral Medium gain.	[%]	**RWS**	**0**	**0/100**	**PP**	**S**	**Full**	**1093**
E08.04	**Sls mot LPgain** Motor Proportional Low gain.	[%]	**RWS**	**1**	**0/100**	**PP**	**S**	**Full**	**1094**
E08.05	**Sls mot LIgain** Motor Integral Low gain.	[%]	**RWS**	**0**	**0/100**	**PP**	**S**	**Full**	**1095**
E08.10	**Sls regen HPgain** Regen Proportional High gain.	[%]	**RWS**	**5**	**0/100**	**PP**	**S**	**Full**	**1101**
E08.11	**Sls regen HIgain** Regen Integral High gain.	[%]	**RWS**	**5**	**0/100**	**PP**	**S**	**Full**	**1102**
E08.12	**Sls regen MPgain** Regen Proportional Medium gain.	[%]	**RWS**	**5**	**0/100**	**PP**	**S**	**Full**	**1103**
E08.13	**Sls regen MIgain** Regen Integral Medium gain.	[%]	**RWS**	**0**	**0/100**	**PP**	**S**	**Full**	**1104**
E08.14	**Sls regen LPgain** Regen Proportional Low gain.	[%]	**RWS**	**1**	**0/100**	**PP**	**S**	**Full**	**1105**
E08.15	**Sls regen LIgain** Regen Integral Low gain.	[%]	**RWS**	**0**	**0/100**	**PP**	**S**	**Full**	**1106**

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
E08.20	**Sls catch Pgain** Proportional speed feedback Sls gain during magnetization.	**[%]**	**RWS**	**50**	**0/100**	**PP**	**S**	**Full**	**1181**
E08.21	**Sls catch Igain** Integral speed feedback Sls gain during magnetization.	**[%]**	**RWS**	**0**	**0/-**	**PP**	**S**	**Full**	**1182**
E08.30	**Sls H/M tran lev** Transition level from High to Medium profile.	**[rpm]**	**RWS**	**Calc**	**0.00/Calc**	**PP**	**S**	**Full**	**1096**
E08.31	**Sls M/L tran lev** Transition level from Medium to Low profile.	**[rpm]**	**RWS**	**Calc**	**0.00/Calc**	**PP**	**S**	**Full**	**1097**
E08.32	**Sls H/M tran bnd** Transition band from High to Medium profile.	**[rpm]**	**RWS**	**Calc**	**0.00/Calc**	**PP**	**S**	**Full**	**1098**
E08.33	**Sls M/L tran bnd** Transition band from Medium to Low profile.	**[rpm]**	**RWS**	**Calc**	**0.00/Calc**	**PP**	**S**	**Full**	**1099**
E08.34	**Sls 0 tran bnd** Speed 0 transition band (Motoring/Regen/Motoring).	**[rpm]**	**RWS**	**Calc**	**0.00/Calc**	**PP**	**S**	**Full**	**1107**
E08.40	**Observer filter** Time constant of the first-order Filter on both gains profile.	**[ms]**	**RWS**	**100**	**Calc/Calc**	**PP**	**S**	**Full**	**1111**
E08.50	**Inuse Sls P gain** In use Proportional gains of speed observer.	**[%]**	**R**	**0.00**	**0.00/0.00**	**PV**	**S**	**Full**	**1085**
E08.51	**Inuse Sls I gain** In use Integral gains of speed observer.	**[%]**	**R**	**0.00**	**0.00/0.00**	**PV**	**S**	**Full**	**1086**
E08.40	**Observer ref mon** Observer adapt gain reference monitor.	**[%]**	**R**	**0.00**	**0.00/0.00**	**PP**	**S**	**Full**	**1112**

Index	MENU Parameter Name Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa

REG PARAM / Tst Gener

Note! Menu accessible with Access Level = FULL

The tuning of the regulators is performed via an internal test signal generator in order to evaluate the regulator response. This operation requires the use of a digital oscilloscope. The “Test generator” generates signal shaped as a rectangular wave with a programmable frequency and amplitude.

Using the Test generator function it is possible to carry out the manual tunings of:

- **Current regulator**
- **Flux regulator**
- **Voltage regulator**
- **Speed regulator**.

Refer to the chapter 7, Manual Tunings”.

E09 REG PARAM / Tst Gener

Index	Parameter Name	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
E09.00	**Test gen mode**	**N/A**	**RWS**	**0**	**0/6**	**DK**	**V-F-S-B**	**Full**	**2756**

This parameter defines where the test signal is connected in the control scheme. In order to change it to new mode press **[Enter]**, “Select new mode” will be displayed, then scroll the list.

[0] Off	Function disabled
[1] Ramp ref 1	Ramp reference 1
[2] Speed ref 1	Speed reference 1
[3] Torque ref 2	Torque reference 2
[4] Magncurr ref	Magnetizing current reference
[5] Flux ref	Flux reference
[6] Outvlt lim	Voltage reference

Index	Parameter Name	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
E09.01	**Gen Hi ref**	**[cnt]**	**RWS**	**0**	**-32767/32767**	**PV**	**V-F-S-B**	**Full**	**2745**

Value in count of the higher amplitude signal value.

Index	Parameter Name	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
E09.02	**Gen Low ref**	**[cnt]**	**RWS**	**0**	**-3276/ 32767**	**PV**	**V-F-S-B**	**Full**	**2750**

Value in count of the lower amplitude signal value.

Index	Parameter Name	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
E09.03	**Gen Period**	**[sec]**	**RWS**	**10**	**0/10000**	**PV**	**V-F-S-B**	**Full**	**2755**

Period of the square wave.

Index	Parameter Name	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
E09.04	**Gen output**	**[cnt]**	**R**	**0.00**	**0.00/0.00**	**PV**	**V-F-S-B**	**Full**	**2760**

Monitoring the test generator output signal.

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa

F SPEED REG

SPEED REG / Speed reference

This function generates the reference of speed regulation block.
It is obtained by algebracally adding on the input the references Speed ref 1 and Speed ref 2, the Ramp block output and the Jog block output.
On the input the block allows to connect the following sources: **F00.00 - Speed ref 1 src** and **F00.01 - Speed ref 2 src** allow to select the origin of the speed references.
In a standard condition such sources are connected to **F00.10 - Dig spd ref 1** and **F00.11 - Dig spd ref 2**.
F00.03 - Speed ref inv src allows to invert the whole output Setpoint.
A multiplier determines the output state according to the state of the connected signal.

NOTE! **Ramp ref 2 mon** must be zero for the drive to stop without opening the enable input.

The Speed ratio function is implemented on the block. With such function, given a line reference on several drives, it is possible to regulate the percentage (%) of the local speed reference as compared to the line.
The Function adds to its inputs the Ramp block output, Ramp out mon, with the Speed ref 1 reference. The sum is multiplied by the Speed ratio. The resulting value is referred as **D00.50 - Spd Draw** out (in rpm).
F00.02 - Speed ratio src allows to select the origin of the signals stating the speed ratio, for example the **F02.02 - Dig SpdRatio** with a % value is standard connected and can be configured in the Ratio block.
In the Block configurations, furthermore, together with the already mentioned references, it is also possible to configure the **F00.12 - Speed top** and the **F00.13 - Speed bottom**.
They state the speed upper and lower limit values in rpm.
On the output it is possible to monitor some input signals and the block outputs:
the Speed setpoint reference, the Speed draw output and the Speed limit state, which determines the reaching of the set speed limit.

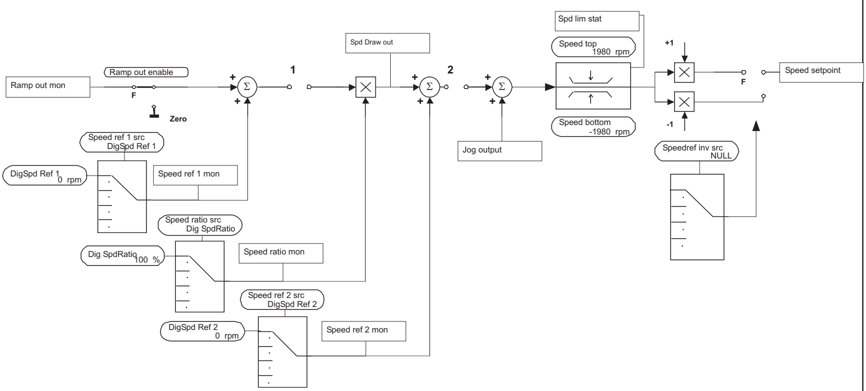


Figure F00: Speed setpoint

1. Switch is closed if Ramp out enable = Disabled & Start

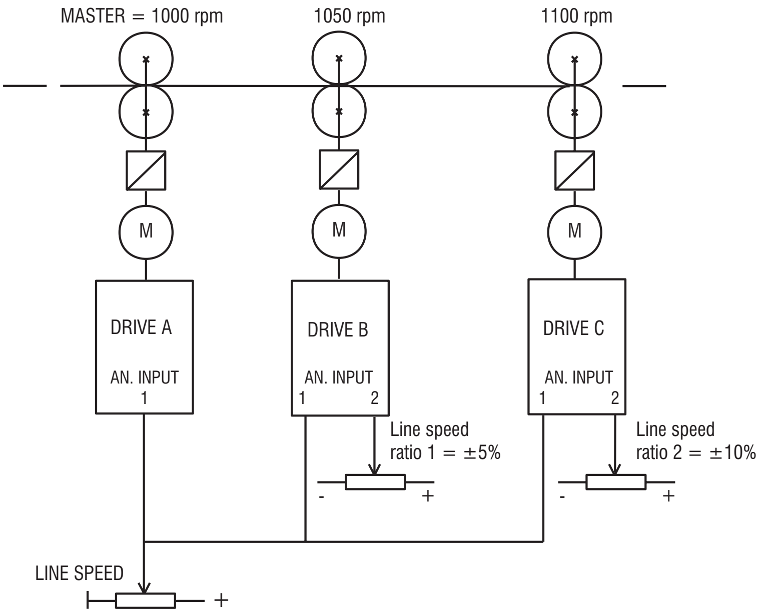
Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
	Switch is closed if Ramp out enable = Disabled & Stop 2. Switch is closed if Ramp out enable = Disabled & (!FastStop) Switch is closed if Ramp out enable = Disabled & (FastStop) Both switches are closed if Ramp out enable = Enabled								
F00	SPEED REG / Speed ref								
F00.00	**Speed ref 1 src**	**N/A**	**RWS**	**Ipa7040**	**PList 9**	**PIN**	**V-F-S-B**	**Full**	**7050**
	Ipa 7040 - Dig spd ref 1 = Default It select the origin of the signal of Speed reference 1. Pick List 9								
F00.01	**Speed ref 2 src**	**N/A**	**RWS**	**Ipa7041**	**PList 10**	**PIN**	**V-F-S-B**	**Full**	**7051**
	Ipa 7041 - Dig spd ref 2 = Default It select the origin of the signal of Speed reference 1. Pick List 10								
F00.02	**Speed ratio src**	**N/A**	**RWS**	**Ipa7044**	**PList 13**	**PIN**	**V-F-S-B**	**Full**	**7052**
	Ipa 7044 - Dig SpdRatio = Default It select the origin of the signal of Speed ratio. Pick List 3								
F00.03	**Speedref inv src**	**N/A**	**RWS**	**Ipa4000**	**PList 3**	**PIN**	**V-F-S-B**	**Full**	**7053**
	Ipa 4000 - NULL = Default It connects the selected signal to the selector of the multiplier input: if the signal is 0, multiply by +1, or if the signal is 1, multiply by -1. The multiplier allows to invert Speed reference signal. Pick List 3								
F00.10	**Dig spd ref 1**	**[rpm]**	**RWS**	**0**	**Calc/Calc**	**PV**	**V-F-S-B**	**Full**	**7040**
	Value of the Digital speed reference 1 variable, selectable through Pick List 9 of **F00.00 - Speed ref 1 src**. Pick List 9								

Index	MENU Parameter Name Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
F00.11	**Dig spd ref 2**	[rpm]	RWS	0	Calc/Calc	PV	V-F-S-B	Full	7041
	Value of the Digital speed reference 2 variable, selectable through Pick List 10 of **F00.01 - Speed ref 2 src**. Pick List 10								
F00.12	**Speed top**	[rpm]	RWS	2000	Calc/Calc	PV	V-F-S-B	Easy	7042
	Maximum limit of drive speed reference.								
F00.13	**Speed bottom**	[rpm]	RWS	-2000	Calc/Calc	PV	V-F-S-B	Easy	7043
	Minimum limit of drive speed reference.								
F00.20	**Ramp out mon**	[rpm]	R	0.00	0.00/0.00	PV	V-F-S-B	Full	8022
	Displaying of Ramp output signal.								
F00.30	**Speed ref 1 mon**	[rpm]	R	0.00	0.00/0.00	PP	V-F-S-B	Full	7045
	It displays of the Speed ref 1 signal.								
F00.31	**Speed ref 2 mon**	[rpm]	R	0.00	0.00/0.00	PP	V-F-S-B	Full	7046
	It displays of the Speed ref 2 signal.								
F00.40	**Jog output**	[rpm]	R	0.00	0.00/0.00	PV	V-F-S-B	Full	8012
	It displays of the Jog output signal.								
F00.50	**Spd Draw out**	[rpm]	R	0.00	0.00/0.00	PV	V-F-S-B	Full	7099
	It displays of the Speed draw output signal.								
F00.51	**Speed lim stat**	N/A	R	0	0/1	PV	V-F-S-B	Full	7049
	It displays of the Speed limit state: 0 = Not active 1 = Active								
F00.52	**Speed setpoint**	[rpm]	R	0.00	0.00/0.00	PV	V-F-S-B	Easy	7047
	It displays of the Speed reference (setpoint) output signal.								

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa

SPEED REG / Speed ref

Rubber Calender application example



<u>Example setting:</u>

DRIVE A (master) Set: **D00.00 - Ramp ref 1 src** = *004-AI 1 output*

DRIVE B Set: Line speed ratio 1 = Line speed ±5%
D00.00 - Ramp ref 1 src = *004-AI 1 output*
F00.02 - Speed ratio src = *005-AI 2 output*
Set in **An Inp 2** submenù:
C02.10 - AI 2 type = [0] -10V ...+10V
C02.16 - AI 2 lo lim = 15564 cnt
C02.17 - AI 2 hi lim = 17203 cnt

DRIVE C Set: Line speed ratio 2 = Line speed ±10%
D00.00 - Ramp ref 1 src = *004-AI 1 output*
F00.02 - Speed ratio src = *005-AI 2 output*
Set in **An Inp 2** submenù:
C02.10 - AI 2 type = [0] -10V ...+10V
C02.16 - AI 2 lo lim = 14745 cnt
C02.17 - AI 2 hi lim = 18072 cnt

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
	For count parameters of **AI X lo lim** e **AI X hi lim** to see chapter 6.1.3 Signal Normalization, or to use: **100% : 16384 = 105% : X** hi lim for Line speed +5% **100% : 16384 = 95% : X** lo lim for Line speed -5%								

Index	MENU Parameter Name Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa

SPEED REG / Speed Regulator Config

The Block Function, Regulator of the **PI Speed** (Proportional Integrative), is only active in a Sensorless and Field Oriented mode.
Among its functions the Block is set to work together with the Speed/Torque regulation Block (OR regulator). Through the input sources it is possible to select the origin of the input signals: **Spd I=0 src** allows to set at zero, temporary, the Integral regulator section, while **Spd PI=0 src** allows to set at zero, temporary, the Proportional Integral regulator section.
It is possible to enable or disable the Block function (enable/disable) via the **Spd reg enable** parameter.
The gains set in the Adaptive block of the speed regulator gains are active in the speed regulator itself.
They are set in the **REG PARAM / Spd Reg** menu where it is possible to set the basic gain of the P and I sections and their respective % gains.

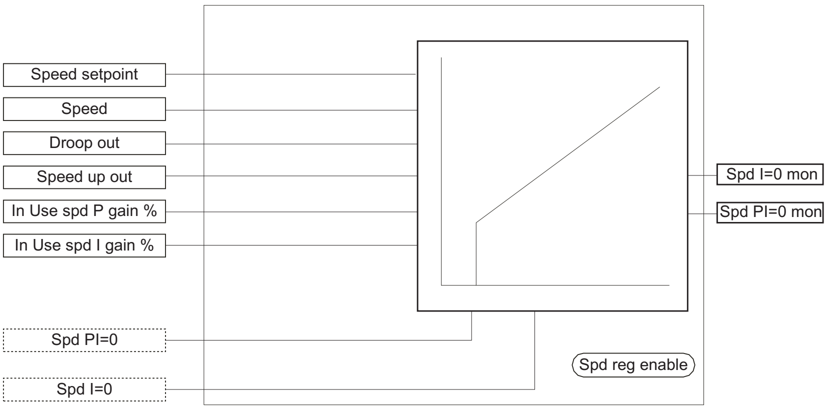


***FIgure F01**: Speed Regulator Config block*

F01	SPEED REG / SpdRegCfg								
F01.00	**Spd I=0 src**	**N/A**	**RWS**	**Ipa4000**	**PList 3**	**PIN**	**F-S-B**	**Easy**	**7054**

Ipa 4000 - NULL = Default

It select the origin of enabling signal of Integral section block. It is set at zero and stops its integrating activity.

Pick List 3

F01.01	**Spd PI=0 src**	**N/A**	**RWS**	**Ipa4000**	**PList 3**	**PIN**	**F-S-B**	**Easy**	**7056**

Ipa 4000 - NULL = Default

It select the origin of enabling signal of Integral and Proportional section block. It is set at

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
	zero and stops its integrating activity. Pick List 3								
F01.10	**Spd reg enable**	**N/A**	**RWSZ**	**1**	**0/1**	**DP**	**V-F-S-B**	**Easy**	**7059**
	Enabling of the speed regulator: [0] Disabled [1] Enabled								
F01.20	**Spd I=0 mon**	**N/A**	**R**	**0**	**0/1**	**PV**	**F-S-B**	**Full**	**7055**
	State monitor for the command Spd I=0.								
F01.21	**Spd PI=0 mon**	**N/A**	**R**	**0**	**0/1**	**PV**	**F-S-B**	**Full**	**7057**
	State monitor for the command Spd PI=0.								
F02	SPEED REG / Spd ratio								
	Note! Menu accessible with Access Level = FULL The block function allows to set the speed ratio value, through **F02.01 - Speed ratio src** source. **F02.02 - Dig spd Ratio** with a % value is standard connected, but, anyway, also the connection of analog and digital signals is possible. Its default value is 100%, corresponding to the multiply 1 factor.								
F02.01	**Speed ratio src**	**N/A**	**RWS**	**Ipa7044**	**Plist13**	**PIN**	**F-S-B**	**Full**	**7052**
	Ipa 7044 - Dig speed ratio = Default It select the origin of the signal of speed ratio value. Pick List 13								
F02.02	**Dig spd Ratio**	**[%]**	**RWS**	**100**	**0/200**	**PV**	**F-S-B**	**Full**	**7044**
	Digital speed ratio value, selectable through Pick List 13 of **F02.01 - Speed ratio src**. Pick List 13								
F02.03	**Speed ratio mon**	**[%]**	**R**	**0.00**	**0.00/0.00**	**PP**	**F-S-B**	**Full**	**7048**
	Displaying of Speed ratio signal.								

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa

SPEED REG / Speed 0 config

Note! Menu accessible with Access Level = FULL

The Function of the Speed 0 block is active only in a Sensorless and Field oriented mode. The Function generates the Speed 0 signal, Spd is zero, and the Reference 0 signal, Ref is zero. It is possible to set: with **F03.13 - Spd 0 speed thr** and **F03.14 - Spd 0 spd delay** the Speed 0 threshold and delay; with **F03.15 - Spd 0 ref thr** and **F03.16 - Spd 0 ref delay** the threshold and the delay of the reference 0.

Furthermore withSpd 0 enable it is possible to enable the gain adaptive function with a Speed 0 value and with **F03.11 - Spd 0 P gain %** and **F03.12 - Spd 0 I gain %** to adapt the Proportional and Integral gain to a Speed 0 value.
The gains become active when both conditions Spd is zero and Ref is zero are true. They are not active when Ref is zero is false.

The Speed 0 signal, "Speed = zero", becomes active when the motor speed is lower than the "Spd 0 speed thr" threshold.
The signal **F03.19 - Spd 0 dly** is delayed by **F03.14 - Spd 0 spd delay**.

The Reference 0 signal, Ref = zero, becomes active when the speed reference connected to **F03.00 - Spd 0 ref src** is lower than the **F03.15 - Spd 0 ref thr** threshold.
The signal **F03.20 - Ref 0 dly** is delayed by **F03.16 - Spd 0 ref delay**.

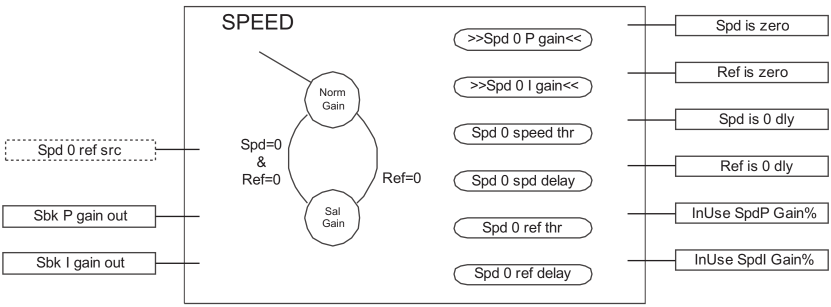


***Figure F03**: Speed 0 Config block*

F03 SPEED REG / Spd 0 cfg

Index	Parameter Name	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
F03.00	**Spd 0 ref src**	**N/A**	**RWS**	**Ipa3210**	**PList20**	**PIN**	**V-F-S-B**	**Full**	**3732**

Ipa 3210 - Speed ref = Default

It select the origin of the signal of speed zero determine ref= 0. It can be selected among Ramp, Speed, Null, Int spd 0 ref.

Pick List 20

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
F03.01	**Spd 0 enable**	**N/A**	**RWS**	**0**	**0/1**	**DP**	**F-S-B**	**Full**	**3720**
	Apart from gain adaptive function, it is possible to have another set of gains when speed reference is below Speed 0 reference threshold parameter. Function must be enabled by this parameter: [0] Disable [1] Enable								
F03.10	**Dig spd 0 ref**	**[cnt]**	**RWS**	**0.00**	**0.00/0.00**	**PV**	**V-F-S-B**	**Full**	**3721**
	Digital speed zero reference value, selectable through Pick List 20 of **F03.00 - Spd 0 ref src**. **Pick List 20**								
F03.11	**Spd 0 P gain %**	**[%]**	**RWS**	**Calc**	**0/100**	**PP**	**F-S-B**	**Full**	**3722**
	Proportional speed 0 regulator gain at zero speed.								
F03.12	**Spd 0 I gain %**	**[%]**	**RWS**	**Calc**	**0/100**	**PP**	**F-S-B**	**Full**	**3723**
	Integral speed 0 regulator gain at zero speed.								
F03.13	**Spd 0 speed thr**	**[rpm]**	**RWS**	**30**	**0/..**	**PP**	**V-F-S-B**	**Full**	**3724**
	Speed 0 speed threshold value.								
F03.14	**Spd 0 spd delay**	**[msec]**	**RWS**	**500**	**0/30000**	**PP**	**V-F-S-B**	**Full**	**3725**
	Speed 0 speed delay value.								
F03.15	**Spd 0 ref thr**	**[rmp]**	**RWS**	**30**	**0/..**	**PP**	**V-F-S-B**	**Full**	**3726**
	Speed 0 reference threshold value.								
F03.16	**Spd 0 ref delay**	**[msec]**	**RWS**	**100**	**0/30000**	**PP**	**V-F-S-B**	**Full**	**3727**
	Speed 0 reference delay value.								
F03.17	**Spd = zero**	**N/A**	**R**	**0**	**0/1**	**DV**	**V-F-S-B**	**Full**	**3728**
	Speed zero state displaying: 0 = speed ≠ 0 1 = speed = 0								
F03.18	**Ref = zero**	**N/A**	**R**	**0**	**0/1**	**DV**	**V-F-S-B**	**Full**	**3729**
	Reference zero state displaying: 0 = Reference ≠ 0 1 = Reference = 0.								

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
F03.19	**Spd 0 dly** Speed zero delay state displaying: 0 = Not active 1 = Active	**N/A**	**R**	**0**	**0/1**	**DV**	**V-F-S-B**	**Full**	**3730**
F03.20	**Ref 0 dly** Reference zero delay state displaying: 0 = Not active 1 = Active	**N/A**	**R**	**0**	**0/1**	**DV**	**V-F-S-B**	**Full**	**3731**
F03.20	**InUse SpdP gain%** In use value of the Proportional speed gain.	**[%]**	**R**	**10**	**0/100**	**PV**	**F-S-B**	**Full**	**2063**
F03.21	**InUse SpdI gain%** In use value of the Integral speed gain.	**[%]**	**R**	**10**	**0/100**	**PV**	**F-S-B**	**Full**	**2065**

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa

SPEED REG / Adaptive Speed

NOTE! Menu accessible with Access Level = FULL

The Adaptive Speed Gain function is active only in a Sensorless and Field Oriented mode. It differents gains of the speed regulator according to the variations in the speed value or another user defined signal (ex. load variations, diameter, PID output, etc).

The block adapts the gains of the speed regulator according to the signal connected to the **F04.00 - Adaptive ref src** source (standard connected to **F04.24 - Adapt DigRef** , block internal value in count) and to the Profile of the set gains.

The Profile of the set gain is stated by:
- three levels of speed Proportional and Integral gain, **SpdPx gain %** and **Spd Ix gain %**
- two thresholds (thr), **F04.20 - Adaptive speed 1** and **F04.21 - Adaptive speed 2**, which define the point of the transitions between the three gain levels (see the figure)
- two transition bands, **F04.22 - Adaptive joint 1** and **F04.23 - Adaptive joint 2**, that define the slope, by straight lines, connecting the gain levels.

Refer to the Speed Gain Profile diagram. It is possible to set the value of the internal reference, **F04.24 - Adapt DigRef** , and its basic value, **F04.25 - Adapt base value**.

ASG function is defaulted for use with Ramp reference, Speed reference or Actual speed. These variable's scaling are 16384 counts, corresponding to the drive **B0E.00 - Full scale speed** parameter .
This is the reason why **F04.25 - Adapt base value** parameter is defaulted to 16384 counts.

F04.25 - Adapt base value parameter can also be changed if gain modification is driven by some variable that has full scale different then 16384 counts. For example 4096 counts, that comes from bus or other variables present in the system.

It is possible to write an independent variable value to **F04.24 - Adapt DigRef** parameter.

NOTE! The selection of base value must be done prior to assigning thresholds and bands. After any change of **F04.25 - Adapt base value**, gains must be reassigned.

Values assigned to thresholds and bands must be in ascending order. The value assigned to **F04.21 - Adaptive speed 1** parameter must be higher then **F04.22 - Adaptive speed 2** parameter .

Bands must be narrower then half the distance between **F04.21 - Adaptive speed 1** and **F04.22 - Adaptive speed 2**.

When the motor is stopped, the gain of the Speed Regulator is set by the **F03.11 - Spd 0 P gain** and **F03.12 - Spd 0 I gain**, if the speed 0 function is enabled.

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa

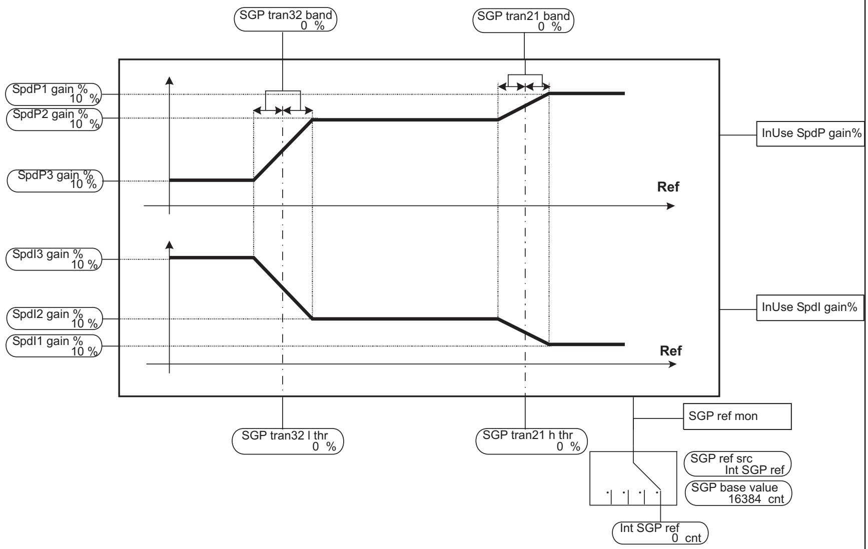


Figure F04: *Gain Adaptive block*

F04 SPEED REG / Adpt Spd

Index	Parameter Name	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
F04.00	**Adaptive ref src**	**N/A**	**RWS**	**Ipa3710**	**PList19**	**PIN**	**V-F-S-B**	**Full**	**3713**

Ipa 3710 - Adaptive dig ref = Default

It select the origin of the signal that determine the adaptive “x” axis.

Pick List 19

Index	Parameter Name	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
F04.10	**Spd P1 gain %**	**[%]**	**RWS**	**10**	**0/100**	**PP**	**F-S-B**	**Full**	**3700**

Proportional speed 1 regulator gain at high speed.

Index	Parameter Name	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
F04.11	**Spd I1 gain %**	**[%]**	**RWS**	**10**	**0/100**	**PP**	**F-S-B**	**Full**	**3701**

Integral speed 1 regulator gain at high speed.

Index	Parameter Name	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
F04.12	**Spd P2 gain %**	**[%]**	**RWS**	**10**	**0/100**	**PP**	**F-S-B**	**Full**	**3702**

Proportional speed 2 regulator gain at medium speed.

Index	Parameter Name	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
F04.13	**Spd I2 gain %**	**[%]**	**RWS**	**10**	**0/100**	**PP**	**F-S-B**	**Full**	**3703**

Integral speed 2 regulator gain at medium speed.

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
F04.14	**Spd P3 gain %**	[%]	RWS	10	0/100	PP	F-S-B	Full	3704
	Proportional speed 3 regulator gain at low speed								
F04.15	**Spd I3 gain %**	[%]	RWS	10	0/100	PP	F-S-B	Full	3705
	Integral speed 3 regulator gain at low speed								
F04.20	**Adaptive speed 1**	[%]	RWS	0.00	0/100	PP	F-S-B	Full	3706
	Adaptive speed transition point from 1 to 2 segment								
F04.21	**Adaptive speed 2**	[%]	RWS	0.00	0/100	PP	F-S-B	Full	3707
	Adaptive speed transition point from 2 to 3 segment.								
F04.22	**Adaptive joint 1**	[%]	RWS	0.00	0/100	PP	F-S-B	Full	3708
	Adaptive joint of the transition from 1 to 2 band.								
F04.23	**Adaptive joint 2**	[%]	RWS	0.00	0/100	PP	F-S-B	Full	3709
	Adaptive joint of the transition from 2 to 3 band.								
F04.24	**Adapt Dig Ref**	[cnt]	RWS	0.00	-32768/32767	PV	F-S-B	Full	3710
	Adaptive digital reference value, selectable through Pick List 19 of **F04.00 - Adaptive ref src**. Pick List 19								
F04.25	**Adapt base value**	[cnt]	RWS	16384	0/16384	PP	F-S-B	Full	3711
	Adaptive basic value corresponding to 100% of the Adaptive reference.								
F04.26	**Adapt ref mon**	[cnt]	R	0.00	0.00/-	PP	F-S-B	Full	3712
	Adaptive reference displaying.								
F04.30	**InUse SpdP gain%**	[%]	R	10	0.00/100	PV	F-S-B	Full	2063
	In use value of the Proportional speed gain.								
F04.31	**InUse SpdI gain%**	[%]	R	10	0.00/100	PV	F-S-B	Full	2065
	In use value of the Integral speed gain.								

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa

SPEED REG / Speed droop

Note! Menu accessible with Access Level = FULL

The Function of the Droop Block is active only in a Sensorless and Field oriented mode.
The Block is made of:

- a comparison node between the torque reference (generated by the speed regulator or by torque ref) and the Droop Comp variable
- a proportional regulator whose output is (added or subtracted) to the overall speed reference. This is supplied with a low passing filter and a limit on the correction to be provided.

This function is used to realize a current scale. It is typically used when two motors are mechanically combined one with the other (ex. they are connected on the same shaft).
They both must rotate at the same speed.
If one of the two motors tends to rotate at a higher speed, the consequence is a difference typical for the control Drives and an overload condition.

The second motor acts as a brake. Such a condition causes an unbalance between the two currents, which can be eliminated via the Droop Function.
By adding a correction term to the Drive speed reference (proportional to the load difference), the two currents on the motors are balanced again.
The **F05.00 - Droop en src** source states the origin of the signal enabling the Droop function. **F05.01 - Droop comp src** allows the connection of the Droop reference signal (standard connected to the Droop comp internal reference).

In the Block configurations it is possible to set: with **F05.10 - Droop gain** the function gain, with **F05.11 - Droop filter** the time constant of the input filter, with **F05.12 - Droop limit** the allowed reference correction limit and with **F05.13 - Droop comp** the value of the internal reference.
It is possible to monitor the block output, **F05.20 - Droop out** (in rpm).

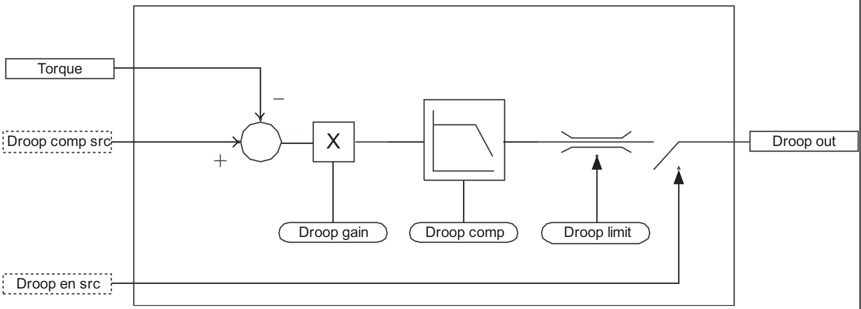


***Figure F08**: Speed Droop block*

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
F05	SPEED REG / Spd droop								
F05.00	**Droop en src** Ipa 4000 - NULL = Default It selects the origin of the signal to enable the Speed Droop function. Pick List 3	**N/A**	**RWS**	**Ipa4000**	**PList3**	**PIN**	**F-S-B**	**Full**	**2470**
F05.01	**Droop comp src** Ipa 2510 - Droop comp = Default It selects the origin of the signal of Droop reference function. Pick List 21	**N/A**	**RWS**	**Ipa2510**	**PList21**	**PIN**	**F-S-B**	**Full**	**2475**
F05.10	**Droop gain** Droop function gain %.	**[%]**	**RWS**	**0.00**	**0.00/100**	**PV**	**F-S-B**	**Full**	**2480**
F05.11	**Droop filter** Filter time constant of Droop function.	**[msec]**	**RWS**	**20**	**Calc/1000**	**PP**	**F-S-B**	**Full**	**2490**
F05.12	**Droop limit** Droop function allowed correction limit.	**[rpm]**	**RWS**	**50**	**0.00/Calc**	**PV**	**F-S-B**	**Full**	**2500**
F05.13	**Droop comp** Internal value of the Droop reference.	**[Nm]**	**RWS**	**0.00**	**0.00/....**	**PV**	**F-S-B**	**Full**	**2510**
F05.20	**Droop out** Block output correction.	**[rpm]**	**R**	**0.00**	**0.00/....**	**PV**	**F-S-B**	**Full**	**2515**

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa

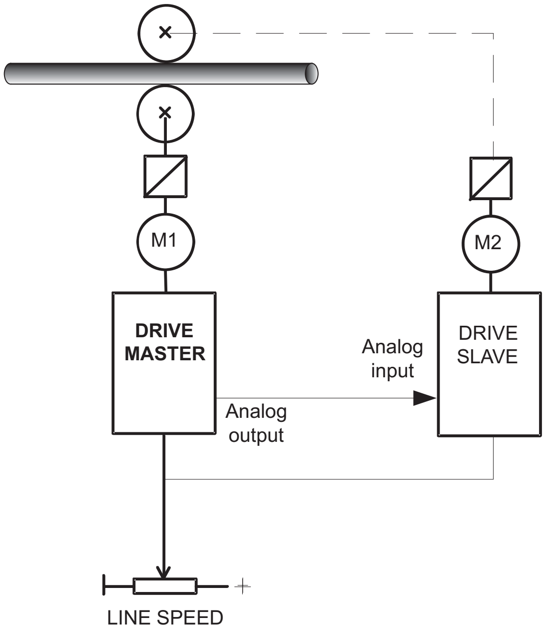


Figure F05-2: *Example - Pipe Mill Machine*

Index	MENU Parameter Name Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa

SPEED REG / Speed Feedback Derivative

Note! Menu accessible with Access Level = FULL

The Function is active only in a Sensorless and Field oriented mode.
The block function, Speed Feedback Derivative, is used to avoid oscillations or provide forcing in case of loads with a high moment of inertia. It is made of a derivative component in the feedback circuit, which is in a position to limit the “Overshoot”.
The function can be used in case of cyclical non-constant loads applied on the motor (ex. cams).

The Derivative component applied to the speed regulator block is made of two components:
- motor speed
- output signal of the Speed-up function

In the Block configurations it is possible with **Sfbk der enable** to enable or disable the function, with **Sfbk der gain** to set the % gain of the function, with **Sfbk der base** to set the basic % gain and with **Sfbk der filter** to set the time constant of the derivative component.

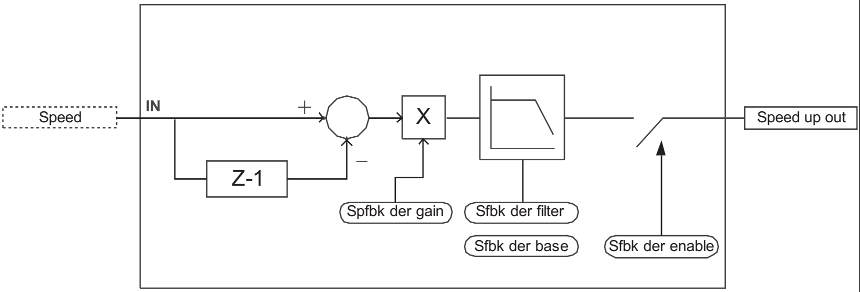


Figure F06*: Speed Feedback Derivative block*

Index	Parameter	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
F06	SPEED REG / SpdFbkDer								
F06.00	**Sfbk der enable** Speed Feedback Derivative function enabling. [0] Disable [1] Enable	**N/A**	**RWSZ**	**0**	**0/1**	**DV**	**F-S-B**	**Full**	**2530**
F06.01	**Sfbk der gain** Speed Feedback Derivative gain value	**[%]**	**RWS**	**0.00**	**-100/100**	**PV**	**F-S-B**	**Full**	**2540**

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
F06.02	**Sfbk der base**	**[msec]**	**RWS**	**1000**	**1/16000**	**FK**	**F-S-B**	**Full**	**2550**
	Basic value for **F06.01 - Sfbk der gain** parameter.								
F06.03	**Sfbk der filter**	**[msec]**	**RWS**	**5**	**0/1000**	**PP**	**F-S-B**	**Full**	**2560**
	Time constant of the Derivative component part.								

Index	MENU Parameter Name Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa

SPEED REG / Inertia Friction

NOTE! Menu accessible with Access Level = FULL

The function is active only in a Sensorless and Field oriented mode. It is to compensate the Inertia and the Frictions caused by the loads during the motor acceleration or deceleration phase.
The function, by calculating the acceleration on the reference, is in a position to supply a Torque FeedForward.

Such condition allows a better regulation in the presence of loads with a high inertia. The parameter calculation is performed during the self-tuning procedure of the speed loop. As an alternative, the user can set the parameters by hands.

The source, **F07.00 - I/F cp en src** allows to select the origin of the to enable or disable the function. **F07.01 - Inertia src** allows to select the origin of the command signal moment of inertia; default this is connected to Int Inertia (stare value) that it possible to set in the configurations.

Morever in the block configurations it is possible with **F07.11 - Dig Friction** to set the friction value and with **F07.12 - Inertia cp flt** to state the time constant of the filter on the compensation.

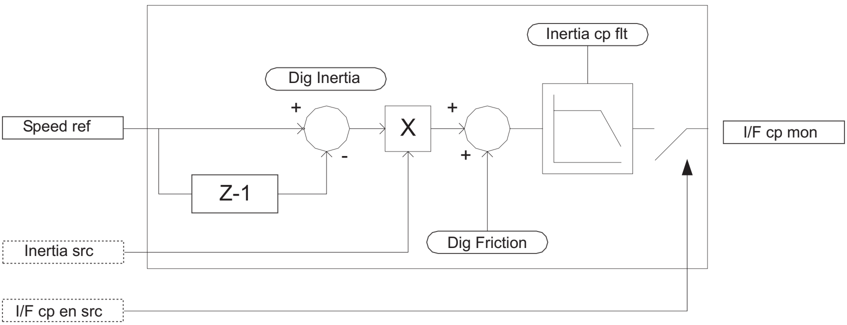


***Figure F07**: Inertia and Friction compensation block*

F07	SPEED REG / In/Frict								
F07.00	**I/F cp en src**	**N/A**	**RWS**	**Ipa4000**	**PList3**	**PIN**	**F-S-B**	**Full**	**2580**

Ipa 4000 - NULL = Default

It select the origin of the signal to enable the Inertia Friction function.

Pick List 3

F07.01	Inertia src	N/A	RWS	Ipa2054	PList25	PIN	F-S-B	Full	2605

Ipa 2054 - Int Inertia = Default

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
	It select the origin of Moment Inertia signal. **Pick List 25**								
F07.10	**Dig Inertia** Moment Inertia digital internal value.	**[kgm²]**	**RWS**	**0.00**	**0.00/Calc**	**PV**	**F-S-B**	**Full**	**2054**
F07.11	**Dig Friction** Friction digital internal value.	**[Nm]**	**RWS**	**0.00**	**0.00/Calc**	**PV**	**F-S-B**	**Full**	**2052**
F07.12	**Inertia cp flt** Inertia compensation filter.	**[msec]**	**RWS**	**30**	**0/1000**	**PP**	**F-S-B**	**Full**	**2590**
F07.20	**I/F cp mon** Displaying of Inertia Friction compensation signal.	**[Nm]**	**R**	**0.00**	**0.00/-**	**PV**	**F-S-B**	**Full**	**2625**

G TORQUE

The block generates the Torque Current Setpoint, which has as inputs:

- the output of the Speed regulator if it is enabled
- the additional Torque setpoint
- the Current limit, which is also controlled, by Drive, the Motor and BU I2t function
- Flux, for flux compensation of the Torque current (Zero Torque control)

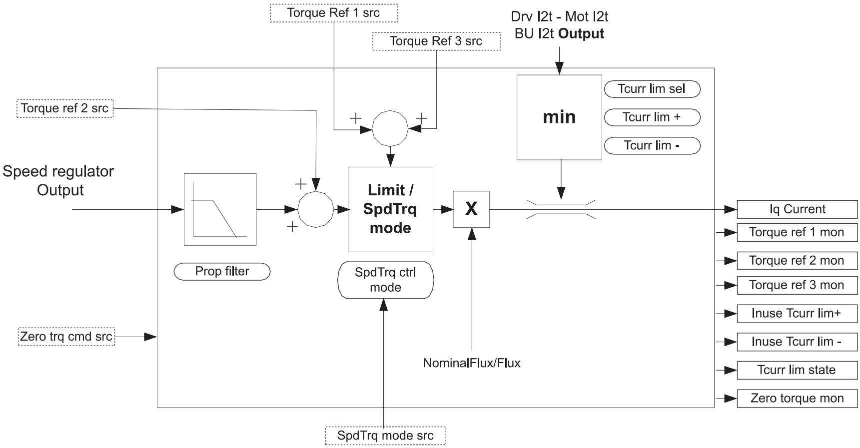


***Figure G00**: Torque block*

TORQUE / Torque Reference

The block add the output of the Speed regulator and the additional Torque reference 2. With SpeedTorque control mode function, it possible to select the behavior of the reference **Torque ref 1** + **Torque ref 3** control over Torque current reference limit; their behavior is:

- OFF
- Limiting the requested
- Torque
- SpeedTorque mode

The **G00.03 - SpdTrq mode src** source selects the origin signal for the SpeedTorque control mode function, which is default connected to **G00.14 - Dig SpdTrq mode**.

NOTE! It is possible to assign **G00.02 - Torque ref 3 src** to Inertia compensation. This allows a user to inertia conpensate a torque regulator internally.

Using **G00.03 - SpdTrq mode src** from another variable other than **G00.14 - Dig Spdtrq mode** requires the variable to write an integer value to select the mode.

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
	Note! During operation it's necessary to disable the Speed regulator output. It is possible to set the Filter time constant on the Speed regulator proportional part, via **G00.13 - Prop filter** parameter.								
G00	TORQUE / TorqueRef								
G00.00	**Torque ref 1 src** Ipa 2430 - Dig torque ref 1= Default It select the origin of the signal of Torque reference , to control the Current limit. **Pick List 14**	**N/A**	**RWS**	**Ipa2430**	**PList 14**	**PIN**	**F-S-B**	**Easy**	**2431**
G00.01	**Torque ref 2 src** Ipa 2440 - Dig torque ref 2 = Default It select the origin of the signal of Torque reference 2 . **Pick List 15**	**N/A**	**RWS**	**Ipa2440**	**PList 15**	**PIN**	**F-S-B**	**Easy**	**2441**
G00.02	**Torque ref 3 src** Ipa 2447 - Dig torque ref 3 = Default It select the origin of the signal of Torque reference 3 , which is adds with Torque reference 1. **Pick List 44**	**N/A**	**RWS**	**Ipa2447**	**PList 44**	**PIN**	**F-S-B**	**Full**	**2449**
G00.03	**SpdTrq mode src** Ipa 2390 - Int SpdTrq mode = Default It select the origin of the signal of Speed Torque mode function, which can be defined according to the settings of **G00.14 - Dig SpdTrq mode** parameter; other signals can be chose through List 43 of Pick List section. **Pick List 43**	**N/A**	**RWS**	**Ipa2447**	**PList 43**	**PIN**	**F-S-B**	**Easy**	**2385**
G00.10	**Dig frq ref 1** Digital value of Torque reference 1.	**[rpm]**	**RWS**	**0.00**	**Calc/Calc**	**PV**	**F-S-B**	**Easy**	**2430**
G00.11	**Dig frq ref 2** Digital value of Torque reference 2.	**[rpm]**	**RWS**	**0.00**	**Calc/Calc**	**PV**	**F-S-B**	**Easy**	**2440**

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
G00.12	**Dig frq ref 3**	**[rpm]**	**RWS**	**0.00**	**Calc/Calc**	**PV**	**F-S-B**	**Easy**	**2447**
	Digital value of Torque reference 3.								
G00.13	**Prop filter**	**[msec]**	**RWS**	**0.2**	**0.15/1000**	**PP**	**F-S-B**	**Full**	**2380**
	Time constant filter of Speed regulator proportional part								
G00.14	**Dig SpdTrq mode**	**N/A**	**RWS**	**0**	**0/5**	**DV**	**F-S-B**	**Easy**	**2390**

It defines the SpeedTorque control mode function behavior:

[0] Off	None
[1] Symm lim	Symmetrical limit
[2] Pos lim	Positive limit
[3] Neg lim	Negative limit
[4] Pos SpdTrq	Positive SpeedTorque
[5] Neg SpdTrq	Negative SpeedTorque

Symmetrical lim, Positive lim and Negative lim

The speed regulator is saturated by the Speed reference selections. UsingTorque ref 1 and/or Torque ref 3 it is possible to regulate the output torque from the maximum to zero. In case of slippage or material break, the speed will increase up to reach the speed reference, or until the net torque ref is below needed load current.

It is possible to select Torque ref 1 + Torque ref 3 to act:

- [1] Symmetrical lim — On positive and negative limits symmetrically (Torque ref sum must be positive; if it's negative the value is clamped to zero)
- [2] Positive lim — Torque ref only modifies the Positive limit (Torque ref sum must be positive; if it.s negative the value is clamped to zero)
- [3] Negative lim — Torque ref only modifies the negative limit (Torque ref sum must be negative; if it.s positive the value is clamped to zero)

Positive SpeedTorque, Negative SpeedTorque

In this case the torque requested by the Speed regulator is compared with the sum of **Torque ref 1** + **Torque ref 3**. If the Net Torque ref is lower in respect to the Speed regulator command, the Torque ref wins and it is given as reference to the Current regulator (Iq Current).

Otherwise the Speed regulator command will produce the reference for the current regulator. It is possible to select **Torque ref 1** + **Torque ref 3** to act:

- [4] Positive SpdTrq — Saturating the speed regulator output positive, the sum of Torque ref 1 + Torque ref 3 can be positive or negative.
  The sum of Torque ref 1 + Torque ref 3 will be Torque ref unless the Speed regulator output is more negative than the sum of Torque ref 1 +Torque ref 3.
  If sum of Torque ref 1 + Torque ref 3 is negative, while the Speed regulator output is positive, an external control may be needed to keep from motor overspeed in the negative direction, during a material break or slippage.

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
	· [5] Negative SpdTrq — Saturating the speed regulator output negative, the sum of Torque ref 1 + Torque ref 3 can be positive or negative. The sum of Torque ref 1 + Torque ref 3 will be Torque ref unless the Speed regulator output is more positive than the sum Torque ref 1 + Torque ref 3. If sum of Torque ref 1 + Torque ref 3 is positive, while the Speed regulator output is negative, an external control may be needed to keep from motor overspeed in the positive direction, during a material break or slippage.								
G00.20	**Torque ref 1 mon** Torque reference 1 signal displaying.	**[Nm]**	**R**	**0.00**	**0.00/-**	**PP**	**F-S-B**	**Full**	**2432**
G00.21	**Torque ref 2 mon** Torque reference 2 signal displaying	**[Nm]**	**R**	**0.00**	**0.00/-**	**PP**	**F-S-B**	**Full**	**2442**
G00.22	**Torque ref 3 mon** Torque reference 3 signal displaying	**[Nm]**	**R**	**0.00**	**0.00/-**	**PP**	**F-S-B**	**Full**	**2443**
G00.23	**Torque ref** Output Torque reference signal displaying	**[Nm]**	**R**	**0.00**	**0.00/-**	**PP**	**F-S-B**	**Easy**	**2450**
G00.24	**SpdTrq ctrl** It displays of the Speed Torque control state: 0 = Speed 1 = Torque	**[Nm]**	**R**	**0**	**0/1**	**DV**	**F-S-B**	**Easy**	**2446**
G00.25	**SpdTrq mode mon** It displays of the Speed Torque mode	**N/A**	**R**	**0**	**0/-**	**DP**	**F-S-B**	**Easy**	**2448**

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa

TORQUE / Torque limit

After Torque control, the Torque Current Limit can modify Torque current reference. Through the **G01.00 - Tcurr lim sel** parameter it is possible to select, into a list, the limit to be controlled:

• OFF	None
• T lim +/-	Positive or negative limit
• T lim mot/gen	Generator motor limit
• T lim gen	Power limit on the generated power (selection not available in V/f control reg. mode)
• T lim Vdc ctrl	Limit on the DC link voltage control (selection not available in V/f control reg. mode)

Furthermore, via the **G01.01 - Tcurr lim +** and **G01.02 - Tcurr lim -** parameters it is possible to set the positive and negative current limit value.

G01 TORQUE / Trq limit

Index	Parameter Name	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
G01.00	**Tcurr lim sel**	**N/A**	**RWS**	**0**	**0/4**	**DV**	**V-F-S-B**	**Easy**	**1190**
	[0] Off [1] Tlim +/- [2] Tlim mot/gen [3] Tlim gen pwr [4] Tlim Vdc ctrl ***NOTE!*** Selection “3” and “4” are not available in V/f control regulation mode.								
G01.01	**Tcurr lim +**	**[A]**	**RWS**	**Calc**	**0.00/Calc**	**PV**	**V-F-S-B**	**Easy**	**1210**
	Positive Torque current limit motor value.								
G01.02	**Tcurr lim -**	**[A]**	**RWS**	**Calc**	**0.00/Calc**	**PV**	**V-F-S-B**	**Easy**	**1220**
	Negative Torque current limit generator value.								
G01.03	**Max regen power**	**[kW]**	**RWS**	**Calc**	**0.00/Calc**	**PV**	**F-S-B**	**Easy**	**1310**
	Maximum regenerating power limit value.								
G01.04	**Inuse Tcurr L+**	**[A]**	**R**	**0.00**	**0.00/-**	**PV**	**V-F-S-B**	**Full**	**1250**
	In use value of positive Torque current limit.								
G01.05	**Inuse Tcurr L-**	**[A]**	**R**	**0.00**	**0.00/-**	**PV**	**V-F-S-B**	**Full**	**1260**
	In use value of negative Torque current limit.								

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
G01.06	**Tcurr lim state** It displays of the Torque current limit state: 0 = Not limit 1 = Limit	**N/A**	**R**	**0**	**0/1**	**DV**	**F-S-B**	**Full**	**2445**

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa

TORQUE / Voltage DC Control Regulator

NOTE! Menu accessible with Access Level = FULL

The function is available only with a Sensorless and Field Oriented regulation mode.
It allows the control:

- of the DC link voltage during regenerating (ex. deceleration), to avoid the Overvoltage alarm trip
  or
- the control of the power recovered on the DC link during regenerating

The two functions are activated by setting the following parameters respectively in the **G01.00 - Tcur lim sel** of the Torque Setpoint:

- *[3] T lim gen pwr* For a control of the recovered power
- *[4] T lim Vdc ctrl* For a control of the DC link voltage

During such phases the **G02.00 - VdcCtrl P gain** and **G02.01 - VdcCtrl I gain** parameters (gains) allow the tuning, if required, of the DC link control.

G02	TORQUE / VdcCtrReg								
G02.00	**VdcCtrl P gain** Proportional gain of Voltage DC Control Regulator.	**[A/V]**	**RWS**	**Calc**	**0/Calc**	**PP**	**F-S-B**	**Full**	**2295**
G02.01	**VdcCtrl I gain** Integral gain of Voltage DC Control Regulator.	**[A/V/s]**	**RWS**	**Calc**	**0/Calc**	**PP**	**F-S-B**	**Full**	**2296**

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa

TORQUE / Torque zero command

NOTE! Menu accessible with Access Level = FULL

The block controls the Zero Torque sets the sum of Speed regulator output + Torque reference to zero. (Torque reference is referred to Torque ref 1, Torque ref 2 and Torque ref 3).
The origin of the zero Torque command signal can be selected via the "Zero trq cmd src" source.
The parameters and the sources included into "Torque" are available only with a Sensorless and Field Oriented mode.

G03 TORQUE / Trq 0 cmd

Index	Parameter Name	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
G04.00	**Zero torque src**	**N/A**	**RWS**	**Ipa4000**	**PList 3**	**PIN**	**F-S-B**	**Full**	**2451**

Ipa 4000 - NULL= Default

It select the origin of the signal of Torque zero command.

Pick List 3

Index	Parameter Name	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
G04.01	**Zero torque mon**	**N/A**	**R**	**0**	**0/1**	**DV**	**F-S-B**	**Full**	**2452**

It displays of the Torque zero command state:

0 = not active
1 = active

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa

H FLUX

FLUX / Flux maximum

Note! Menu accessible with Access Level = FULL

This function allows the user to control the maximum value of the Flux current.

The function is linked to the control of the voltage loop.
In a condition where the Flux is = 0, the voltage regulator prevails by controlling the motor. It means that it is only possible to further limit the requirement of the voltage loop.

In case the drive is active in the constant torque area, it is possible to set an overflux up to 115% of the rated flux.

This is possible, obviously, only if the motor/drive combination is in a position to supply a sufficient magnetizing current.
The **H00.00 - Flux level src** source allows to select the function control signal, which is standard connected to **H00.10 - Dig Flx MaxLim** parameter.

Note! The Function is active only in a Sensorless and Field oriented mode.

H00 FLUX / Flux max

Index	Parameter Name	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
H00.00	**Flux level src**	**N/A**	**RWS**	**Ipa1120**	**Plist24**	**PIN**	**F-S-B**	**Full**	**1121**

Ipa 1120 - Dig Flx MaxLim= Default

It select the origin of the signal that determine the maximum Flux level value.

Pick List 24

Index	Parameter Name	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
H00.10	**Dig Flx MaxLim**	**[%]**	**RWS**	**100**	**60/Calc**	**PV**	**F-S-B**	**Full**	**1120**

Internal digital value of maximum Flux level

Index	Parameter Name	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
H00.11	**Inuse flx maxlim**	**[%]**	**R**	**0.00**	**0.00/-**	**PV**	**F-S-B**	**Full**	**1150**

Displaying of Flux level signal

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa

FLUX / Magnetizing configuration

The function is active only in a Sensorless and Field oriented mode and is useful for undesired motor shaft rotation.
It allows to lock the flux position, Lock flux, and to set a Ramp time of the magnetizing current **H01.00 - Magn ramp time**.

In the configurations it is possible to start the Lock flux function. Via the **H01.01 - Lock flux pos** parameter, it is possible to lock the flux position when the following selected condition is satisfied:

· Off	non-active function
· At magnetization	during magnetization
· At Spd=0	with Speed 0 delay signal
· At magn & Spd=0	during magnetization and with a Speed 0 delay signal
· At magn and Ref=0	during magnetization and Ref 0
· At Ref=0	with Reference 0

Note! In order to have a better performances of Autocapture (Catch on Fly) function, it is recommended to set **H01.01 - Lock flux pos** = At Ref = 0.

Furthermore, in **H01.00 - Magn ramp time** it is possible to set the magnetizing current ramp time in seconds, which can be used:

- To slow down the temporary magnetizing period and avoid a rotation of the motor shaft due to the stator-rotor alignment
- To speed up the magnetizing phase

H01 FLUX / Magn cfg

Index	Parameter Name	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
H01.00	**Magn ramp time**	**[sec]**	**RWS**	**DrvSize**	**0.01/5.00**	**PP**	**F-S-B**	**Easy**	**1810**

Magnetizing current ramp time.

Index	Parameter Name	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
H01.01	**Lock flux pos**	**N/A**	**RWSZ**	**(*)**	**0/5**	**DP**	**F-S-B**	**Easy**	**1815**

It is allows to lock the flux position when the following selected condition is satisfied (see descriptions above):

[0] Off
[1] At Magnetiz
[2] At Spd=0
[3] At Magn&Spd=0
[4] At Magn&Ref=0
[5] At Ref=0

Note! For Autocapture function in Sensorless reg. mode, enabling of Autocapture (Catch on Fly) function if required and **H01.01 - Lock flux pos** parameter must be set at “Ref = 0”

Index	MENU Parameter Name Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa

FLUX / Output Voltage Reference control

NOTE! Menu accessible with Access Level = FULL

The Function allows the regulation of the flux in the constant power area where a voltage margin must be available for the regulation.

This value is usually equal to 2% of the maximum output voltage.
A higher value allows a faster response of the voltage regulator but with a lower amount of available voltage on the output.
A lower value allows a higher output voltage with a decrease of the dynamic performances.

The **H02.00 - Outvlt lim src** source allows to select the function control signal. In the standard configuration the source is connected to **H02.10 - Dig Outvlt lim**, internal value. Via **H02.10 - Dig Outvlt lim** parameter, it is also possible to control the maximum value of the output voltage and to state, therefore, the starting voltage of the discharge point (380V standard). This value can not be higher than the one stated by **H02.12 - Available Outvlt**.
The available voltage margin is stated via the **H02.11 - Dyn vlt margin** parameter.

As for the normalized value see paragraph 6.1.3 Normalizations Signal.

NOTE! The Function is active only in a Sensorless and Field oriented mode.

H02	FLUX / OutVltRef								
H02.00	**Outvlt lim src**	**N/A**	**RWS**	**Ipa1140**	**PList42**	**PIN**	**F-S-B**	**Full**	**1141**

Ipa 1140 - Dig Outvlt lim = Default

It select the origin of Output Voltage Reference control signal.

Pick List 42

H02.10	**Dig Outvlt lim**	**[V]**	**RWS**	**Calc**	**Calc/Calc**	**PV**	**F-S-B**	**Full**	**1140**

Internal digital value of Output Voltage Reference

H02.11	**Dyn vlt margin**	**[%]**	**RWS**	**2**	**1/10**	**PV**	**F-S-B**	**Full**	**1130**

Voltage margin for the flux regulator.

H02.12	**Available Outvlt**	**[V]**	**R**	**0.00**	**0.00/-**	**PV**	**F-S-B**	**Full**	**1170**

Monitor for the maximum available output voltage. It is calculated directly starting from the DC link voltage.

H02.13	**Inuse Outvlt Ref**	**[V]**	**R**	**0.00**	**0.00/-**	**PV**	**F-S-B**	**Full**	**1180**

Limit in use on the output voltage. It is calculated as follows:
- The starting point is the **H02.12 - Available Outvlt**.
- This is limited by the **H02.10 - Dig Outvlt lim**

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
	- The **H02.11 - Dyn vlt margin** is applied on the resulting value								
H02.14	**Magn curr lim** Magnetizing current limit value.	**[A]**	**RW**	**0.00**	**0.00/Calc**	**PP**	**B**	**Full**	**2044**

Index	MENU Parameter Name Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa

I FUNCTION

FUNCTION / DC braking

The Function allows to stop the motor with a direct current braking.

The current injection can be activated via an external command, via the **I00.00 - DCbrake cmd src** source or automatically via an internal command when the stop command is performed.

Such command can be activated by setting **I00.10 - DCbrake mode** = At stop.
It is possible to have simultaneously both the internal and the external command.

They both work on a OR logic. Furthermore, the function is made of:

- a waiting phase between the command emission and the duration of the programmable injection
- a direct current injection phase, whose intensity and duration can be programmed

Via **I00.11 - DCbrake delay** it is possible to set the waiting phase between the command and the injection duration.

Note! If the external command is a pulse shorter than the programmed injection time, the injection phase lasts for the programmed time.
If the external command is a pulse longer than the programmed injection time, the injection phase lasts till the end of the external command.

With **I00.20 -DCBrake duration** it is possible to set the current injection duration while **I00.21 -DCBrake current** allows to set the current intensity.

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa

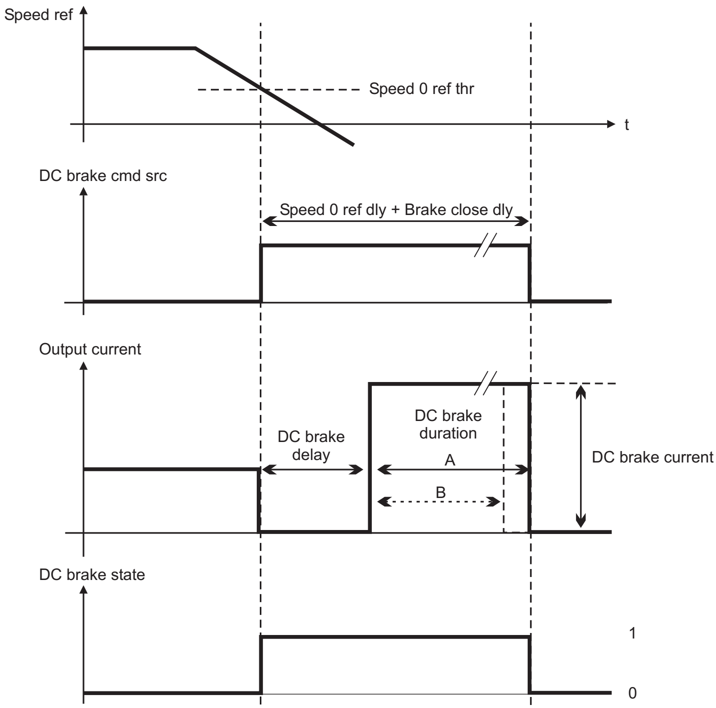


Figure I00*: DC braking sequence*

I00 FUNCTION / DC braking

I00.00	**DCbrake cmd src**	**N/A**	**RWS**	**Ipa4000**	**PList 3**	**PIN**	**V-F-S-B**	**Easy**	**1836**

Ipa 4000 - NULL = Default

It allows to select the origin of the signal to command DC braking function.

Pick List 3

I00.10	**DCbrake mode**	**N/A**	**RWSZ**	**0**	**0/1**	**DP**	**V-F-S-B**	**Easy**	**1832**

[0] Off
[1] At Stop
See description above.

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
I00.11	**DCbrake delay**	**[sec]**	**RWS**	**0.5**	**0.01/30**	**PP**	**V-F-S-B**	**Easy**	**1833**
	Delay between the injection command and the injection of the current itself.								
I00.20	**DCbrake duration**	**[sec]**	**RWS**	**1**	**0.01/30**	**PP**	**V-F-S-B**	**Easy**	**1834**
	Duration of the current injection.								
I00.21	**DCbrake current**	**[%]**	**RWS**	**50**	**0/100**	**PP**	**V-F-S-B**	**Easy**	**1835**
	Braking current as a percentage of Drive continuos current.								
I00.22	**DCbrake state**	**N/A**	**R**	**0**	**0/1**	**DV**	**V-F-S-B**	**Easy**	**1837**
	[0] non-active [1] active State of DC Brake functon.								

Index	MENU Parameter Name Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa

FUNCTION / Power Loss function

When the **PLS timeout** has expired, a **PLS timeout act** alarm is given. Its reset allows the system to restart **Pwrloss stop** function **APPLICATIONS.**
When the DC link voltage goes under the power loss detection threshold, the **Powerloss stop** function gets active. The power loss detection threshold is internally selected in order to be higher than the undervoltage level. The drive has a Speed 0 reference with a ramp defined by the **I01.11 - PL deceleration** parameter.
During this phase, a PI regulator (which can be set via **I03.10 - PLS P gain** and **I03.11 - PLS I gain**) tends to keep the DC link voltage with the **I03.12 - PLS Vdc ref** value.

The control variable is given by the current limit together with the limit set in the **I03.13 - PLS curr lim** parameter . The deceleration depends therefore on the recovery current and on the load inertia (Higher inertia equal to longer stopping times).
The deceleration time is used to make the transition to the function activation smoother.
The DC link voltage is regulated according to the value set by the **I03.12 - PLS Vdc ref** parameter. Its default setting is lower than 5% as compared to the intervention threshold of the braking unit. With applications requiring the use of the braking unit, the **I03.12 - PLS Vdc ref** parameter can be set by hand at a higher level as compared to the braking threshold.

The device takes advantage of the intervention of the braking unit thus reaching a stop condition in a specific period of time. Also the current limit defined by the **PLS curr limit** parameter has to be set in order to meet the requirements of the braking period.
It is possible to monitor the activity of the power loss stop function on a digital output programmed as **I03.21 - PLS active**.
If the Mains Voltage is restored within the period set by the **I03.20 - PLS timeout** parameter, the motor, after reaching the Speed 0, is automatically brought by the Drive to function again with its starting speed and with a ramp acceleration time defined by **I01.10 - PL acceleration**. If the Mains Voltage is restored but **I03.20 - PLS timeout** expires before the motor reaches the zero speed, it is necessary to give to the drive the **PL timeout ack** digital command in order to start the system again and go back to the starting speed.

The **I03.20 - PLS timeout** elapsing time can be monitored on a programmable digital output set as *[038] PLS Tout act* signal.
During the power loss period, it is possible to restart the system before the motor has reached the Speed 0 when the Drive receives a signal stating the Mains Voltage recovery. The signal must be connected to **I03.00 - PLS mains st src**.
Such signal can be supplied, for example, by a line converters.
In a configuration with a multiple drive/motor, where a coordinated stop is usually required, the master drive must have, together with the Enable Master and Enable Slave programming, an analog output set as **I01.21 - PL next fact**.
The **I01.21 - PL next fact** signal sets the ratio between the line speed and the present speed.
It must be connected to the Speed ratio. When the power loss is detected, the master speed decreases according to the ratio calculated between Speed ref and Motor speed. Such ratio states the reference for the slave, in order to decrease the speed in a linear way according to the speed of the master drive.
The motor functioning at a speed controlled by the master can be monitored

on a digital output of the master drive programmed as **I01.20 - PL next act**.
With a configuration for a multiple motor, such function can be performed only with the drives connected on common DC buses.

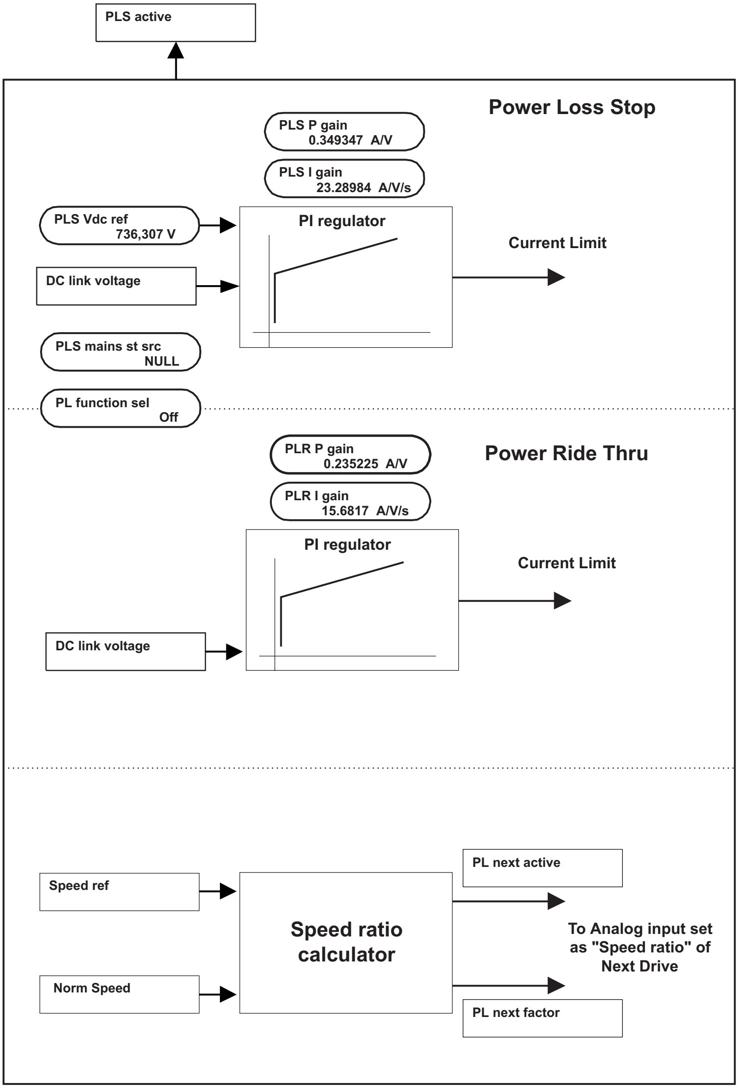


***Figure I00-1**: Power Loss Control Function*

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa

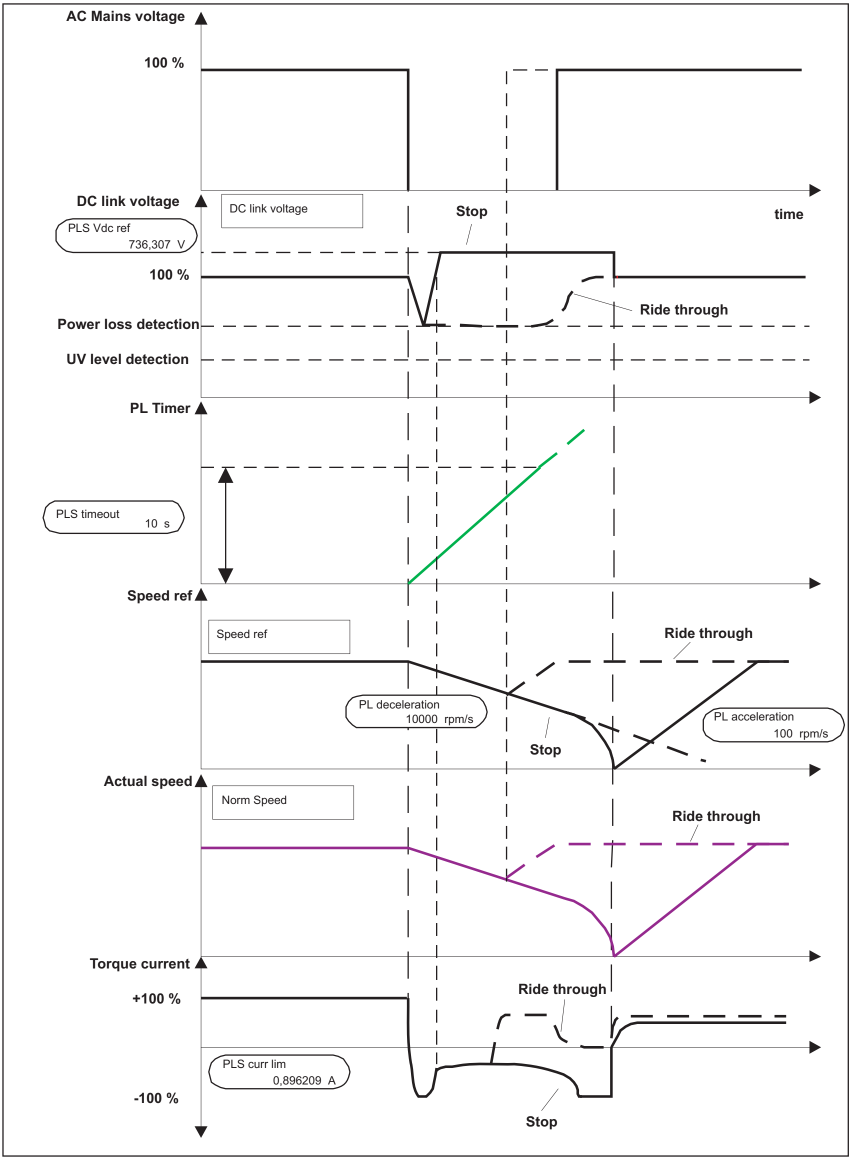


Figure I00-2: Power Loss Stop

Index	MENU Parameter Name Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa

FUNCTION / Power loss ctrl

NOTE! Menu accessible with Access Level = FULL.

The Function allows to control a power loss or a break of the Mains voltage.
In the configurations, via the **I01.00 - PL function sel** parameter, it is possible to set several methods to control a possible power loss:

[0] Off Function is not active

[1] PL stop It is a controlled stop during which, through the energy recovered from the load, the motor is constantly controlled.
The DC link voltage is controlled in order to be kept closed to the **I03.12 - PLS Vdc ref** reference (internal value, it is usually closed to the Overvoltage voltage).
In this case the aim is to try to perform a controlled stop of the machine.
The control variable is the torque current limit.

[2] PL ridethru With this setting it is possible to let the motor shaft rotate as long as possible during some Mains holes.
The DC link voltage is controlled in order to be kept slightly higher than the Undervoltage threshold, thus minimizing the losses. In this case the Mains hole is considered to be temporary and a crossing attempt is performed.
The control variable is an additional reference for the torque current (negative).

A signal, **I01.21 - PL next fact**, supplies the ratio between the motor speed and the speed reference. By connecting it to the speed ratio of the slave drive, it is possible to obtain the line synchronism.

NOTE! This function is not active in case of a functioning condition with a 230Vmain voltage.

I01	FUNCTION / PwrL ctrl								
I01.00	**PL function sel**	**N/A**	**RWSZ**	**0**	**0/2**	**DV**	**V-F-S-B**	**Full**	**2300**

It allows to make a selection among the PL stop, PL ridethru and Off function.
This function has to be enabled only on the line Master drive:

[0] Off
[1] PL stop
[2] PL ridethru

I01.10	**PL acceleration**	**[rpm/s]**	**RWS**	**100**	**1/Calc**	**PV**	**V-F-S-B**	**Full**	**2302**

Setting of the acceleration time when the powerloss stop function is active (standard 100 rpm/s).

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
I01.11	**PL deceleration**	**[rpm/s]**	**RWS**	**10000**	**1/Calc**	**PV**	**V-F-S-B**	**Full**	**2304**
	A gradual deceleration allows to avoid sudden torque changes when the powerloss stop function is active. The ramp, anyway, must be so fast as to allow the intervention of the function itself (standard 10000 rpm/s).								
I01.20	**PL next act**	**N/A**	**R**	**0**	**0/0**	**DV**	**V-F-S-B**	**Full**	**2283**
	It states that the slave motor speed is equal to the master motor speed.								
I01.21	**PL next fact**	**N/A**	**R**	**0.00**	**0.00/-**	**PV**	**V-F-S-B**	**Full**	**2282**
	Relationship between Ramp ref / Speed ref and Motor speed. It is the slave reference in order to decrease the speed, in a linear way, according to the master drive speed.								

FUNCTION / Power Loss Ridethru

Note! Menu accessible with Access Level = FULL

When the DC link voltage reaches the starting threshold, the function gets active.
The DC link setpoint is set with a value higher than 12% as compared to the Undervoltage threshold.
The PI regulator controls a negative torque current (recovery) in order to keep the DC link at a constant level. When the Mains voltage is restored, the system allows a delay on the line speed with the set acceleration time.

I02	FUNCTION / PLR thru								
I02.00	**PLR P gain**	**[A/V]**	**RWS**	**Calc**	**0.00/Calc**	**PP**	**F-S-B**	**Full**	**2270**
	Proportional gain in A/V of Power Loss Ridethru function								
I02.01	**PLR I gain**	**[A/V/s]**	**RWS**	**Calc**	**0.00/Calc**	**PP**	**F-S-B**	**Full**	**2280**
	Integral gain in A/V/s of Power Loss Ridethru function								
I02.10	**PLR active**	**N/A**	**R**	**0**	**0/1**	**FK**	**F-S-B**	**Full**	**2284**
	It states the function state: 0 = not active 1 = active								

Index	MENU / Parameter Name / Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa

FUNCTION / Power Loss Stop

Note! Menu accessible with Access Level = FULL.

Through the PSL mains st src source, the function allows the selection of the command signal, which can state the Mains recovery (for example via a programmed digital input). The aim is to restart the motor before it reaches a Speed 0. In the configurations it is possible to set the gain of the internal PI regulator, the DC link reference threshold with **I03.12 - PLS Vdc ref**, the torque current limit with **I03.13 - PLS curr lim** and with **I03.20 - PLS timeout** a maximum period after which no automatic restart is possible.

Index	Parameter Name	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
I03	FUNCTION / PwrL stop								
I03.00	**PLS mains st src**	**N/A**	**RWS**	**Ipa4000**	**PList 3**	**PIN**	**V-F-S-B**	**Full**	**2312**

Ipa 4000 - NULL = Default

The drive is informed about the restore of the Mains voltage in order to restart the motor before it reaches the zero speed.
The command can be given via the keypad, a programmable digital input, the serial line or the Bus (standard NULL).

Pick List 3

Index	Parameter Name	Level	Ipa
I03.10	**PLS P gain**	**Full**	**2360**

Proportional gain in A/V of the PI regulator for the power loss stop function.

Index	Parameter Name	Level	Ipa
I03.11	**PLS I gain**	**Full**	**2370**

Integral gain in A/V/s of the PI regulator for the power loss stop function

Index	Parameter Name	Level	Ipa
I03.12	**PLS Vdc ref**	**Full**	**2340**

Reference for the DC link voltage during the activity period of the power loss stop function. If the braking unit is used to obtain shorter stopping times, the parameter setting has then to be higher than the value of the ON threshold on the braking unit. The value, in any case, has not to be higher than the threshold of the Overvoltage alarm.

Index	Parameter Name	Level	Ipa
I03.13	**PLS curr lim**	**Full**	**2330**

Setting of the torque current limit used during the activity period of the power loss stop function.
When the function is active, the parameter has the priority on T curr lim.

Index	Parameter Name	Level	Ipa
I03.20	**PLS timeout**	**Full**	**2320**

Period of time after wich no automatic restart is possible.

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
I03.21	**PLS active** It shows the function state: 0 = Not active 1 = Active							**Full**	**2275**

Index	MENU Parameter Name Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa

L ALARM CFG

Alarms

The word “alarms” refers to two different error families, which are:
- Errors due to a wrong setting of the drive parameters
- Intervention of the Drive protection systems

The former occur during the drive configuration phase and state, for example, the presence of parameter sets which can not be combined or which overcome the Drive limits. The solution is checking the entered parameters and resetting them if possible.
The latter are indications about the intervention of protection systems, which could cause the Drive stop. In this case the alarm cause has to be found and reset.

Alarm State
The alarm cause can be:
- Active
- Non-active

The alarms have displayed via the Alarm List . It shows all the occurred alarms, both if they are due to protections and to errors on the overcome limit values.
In order to disappear from the alarm list, alarm have to be acknowledged.
The acknowledgement is possible only if the alarm is no longer active. The alarms are automatically acknowledged after two minutes.

NOTE! Pressing Enter will acknowledge the alarm.
Acknowledging the alarm will only remove it from the active alarm list.
If the alarm condition also resulted in a drive trip, the sequence will also need to be reset. This can be done by pressing the **[O]** key.
The drive cannot be re-enabled or started after a trip condition unless the drive sequencer is reset.
The drive State Machine, controls the drive running and starting, accounting for protection & alarming, command sequence, and reset status.

The table below displays various operation states by **Sequencer** status number:

1 Magnetization running
2 Magnetization completed, Stop
3 Start
4 Fast stop, Stop
5 Fast stop, Start
9 No alarm, drive is ready to accept all commands
10 Magnetization running and Start command already present
12 Alarm active
16 Alarm not active, waiting for reset

NOTE! Sequencer status : 6..8, 11,13..15 and 17..21 are only for internal use.

The Sequencer status of the State Machine are showed in the **DISPLAY/Advanced status** menu, through Sequencer status parameter.

Index	MENU Parameter Name Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa

Alarm List and Alarm Recognition

When a new regulation alarm is active, the red led “Alarm” blinks on the display.

By pressing **Shift** + **Alarm** it is possible to reach the “Alarm list” page, which lists the intervened and not yet recognized but also the recognized and still active alarms.

In case a regulation alarm intervenes with Restart=Off (that is without an automatic restart after the alarm has been reset), also the Sequencer (Statemachine) alarm gets active.

The alarm recognition can be performed by reaching the “Alarm list”, selecting the alarm to be recognized and pressing Enter. If the alarm is recognized and inactive, it is canceled from the list. When all the alarms have been recognized, the red led “Alarm” on the display il lighted (the Sequencer alarm of the State Machine remains active). The Red led is lighted till all the alarms become inactive and the user resets the State Machine (such command can be given, for example, via the keypad with the “red” stop button).

If all the alarms on the drive have been recognized (the red led is lighted) and a new regulation alarm intervenes, such condition is reported with the blinking of the red led on the display.

NOTE! It is possible to reset the regulation alarms without recognizing them. In this case the Drive is active and the Red led blinks (no action in the alarm list has to be performed).

Alarm Log

This is the historic register Log, stating what happened on the Drive.

It records those Drive alarms considered to be significant. The alarm register is in the **DISPLAY** menu. It has 30 entry.

Alarm configurations

In the Alarm config menu it is possible to configure the different alarms (xxx) on the following points:

xxx activity Activity to be performed in case an alarm occurs
xxx restart Restart enabling
xxx restart time Restart time
xxx hold off Hold off time

Table L22-1: Alarm List table, states the possible settings referring to each alarm type.

Alarm configurations : Activity

With this parameter it is possible to set the action to be performed after the alarm intervention.

0 =>	Only msg alarmq	Actions: msg
1 =>	Ignore	Actions: none
2 =>	Disable drive	Actions: msg . commands for SM . Status
3 =>	Stop	Actions: msg . commands for SM . Status
4 =>	Fast stop	Actions: msg . commands for SM . Status
5 =>	Curr limstop	Actions: msg . commands for SM . Status
6 =>	Warning	Actions: msg . Status
7 =>	Not allowed	Actions: msg . Status

Index	MENU Parameter Name Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa

msg : The message has been sent to the alarm list and to the alarm config list.

State Machine commands : A change in the drive state has been forced (alarm intervention).

Status: The active alarm signal is immediately set; it is reset when the alarm is nmore present and the state machine is not in an alarm condition.

Alarm configurations : Restart
With this parameter it is possible to enable the automatic start after the alarm cause has been removed.
0 => Off
1 => On

Alarm configurations : Restart Time
With this parameter it is possible to set a period of time, within which the alarm state has to be removed, in order to perform an automatic start.

Alarm configurations : Hold Off Time
With this parameter it is possible to set the period of time, in which a specific situation has to remain active (it has to persist) in order to be considered an alarm situation.
It is possible to set a millisecond period of time, in which the Drive does not recognize the alarm state. Therefore, the alarm is recognized only if it persists for a period longer than the set “Hold off time”.

Regulation Alarm Reset
When a regulation alarm intervenes, the Drive reaches the alarm state. Such alarm state can be reset when the alarms are no more active and the user performs a Reset Alarm. command Transition 0=>1.
By using the Fault reset src source, it is possible to select the origin of the “reset” command signal (for example a command via the terminal strip through a digital Input).

How to perform a “*Reset Alarm*” command:
> Via the keypad: by pressing the red key
> Via the terminal strip: connect the **Fault reset src** Pin to a digital input, transition 0=>1.
> Via Digital (Serial . Bus . Dgfc/APC): connect the **Fault reset src** pin to a bit of the decomposed word and set the decomposed word, transition 0=>1.

Note! If the **Fault reset src** pin is connected to a digital input, such input has to be kept at a low logic state. If such state is high, the first “*Fault reset*” command via the red key has no effect.

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
L00	ALARM CFG / Fault reset								
L00.00	**Fault reset src** Ipa 4000 - NULL = Default It allows to select the Fault reset command signal . Pick List 41	**N/A**	**RWS**	**Ipa4000**	**PList 41**	**PIN**	**V-F-S-B**	**Easy**	**9076**
L01	ALARM CFG / UV cfg								
	It trips when the voltage on the drive DC link is lower than the minimum threshold according to the Mains voltage setting.								
L01.00	**UV restart** Undervoltage restart: [0] off [1] on	**N/A**	**RWS**	**1**	**0/1**	**DP**	**V-F-S-B**	**Easy**	**9050**
L01.01	**UV restart time** Undervoltage restart time	**[ms]**	**RWS**	**1000**	**0/30000**	**PP**	**V-F-S-B**	**Easy**	**9051**
L02	ALARM CFG / OV cfg								
	It trips when the voltage on the drive DC link is higher than the maximum threshold according to the Mains voltage setting.								
L02.00	**OV restart** Overvoltage restart: [0] off [1] on	**N/A**	**RWS**	**0**	**0/1**	**DP**	**V-F-S-B**	**Easy**	**9052**
L02.01	**OV restart time** Overvoltage restart time	**[ms]**	**RWS**	**1000**	**0/30000**	**PP**	**V-F-S-B**	**Easy**	**9053**
L03	ALARM CFG / IGBT des								
	NOTE! Menu accessible with Access Level = FULL. It trips when the IGBT instantaneous overcurrent is detected by gate desaturation sensing circuit.								
L03.00	**DS restart** IGBT desaturation restart: [0] off [1] on	**N/A**	**RWS**	**0**	**0/1**	**DP**	**V-F-S-B**	**Full**	**9046**

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
L03.01	**DS restart time** IGBT desaturation restart time.	**[ms]**	**RWS**	**1000**	**0/30000**	**PP**	**V-F-S-B**	**Full**	**9047**
L04	ALARM CFG / Inst IOC								
	It trips when the IGBT instantaneous overcurrent is detected by output current sensor.								
L04.00	**IOC restart** Instantaneous overcurrent restart: [0] off [1] on	**N/A**	**RWS**	**0**	**0/1**	**DP**	**V-F-S-B**	**Easy**	**9063**
L04.01	**IOC restart time** Instantaneous overcurrent restart time.	**[ms]**	**RWS**	**1000**	**0/30000**	**PP**	**V-F-S-B**	**Easy**	**9064**
L05	ALARM CFG / Ground								
	It trips when the output phase discharge to ground: Ground fault								
L05.00	**GF activity** Ground fault activity: [1] Ignore [2] Warning [3] Disable drive [4] Stop [5] Fast stop [6] Curr limstp	**N/A**	**RWS**	**2**	**1/6**	**DP**	**V-F-S-B**	**Easy**	**9640**
L05.01	**GF threshold** Ground fault threshold	**[A]**	**RWS**	**D.Size**	**Calc/D.Size**	**PP**	**V-F-S-B**	**Easy**	**9641**
L06	ALARM CFG / EF cfg								
	It trips when the External fault input is active.								
L06.00	**EF src** Ipa 4000 NULL = Default It allows to connect the External fault input terminal strip. Pick List 3	**N/A**	**RWS**	**Ipa4000**	**PList 3**	**PIN**	**V-F-S-B**	**Easy**	**9075**

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
L06.01	**EF activity** External fault activity: [2] Warning [3] Disable drive [4] Stop [5] Fast stop [6] Curr limstp	**N/A**	**RWS**	**3**	**2/6**	**DP**	**V-F-S-B**	**Easy**	**9060**
L06.02	**EF restart** External fault restart: [0] off [1] on	**N/A**	**RWS**	**0**	**0/1**	**DP**	**V-F-S-B**	**Easy**	**9061**
L06.03	**EF restart time** External fault restart time	**[ms]**	**RWS**	**1000**	**0/30000**	**PP**	**V-F-S-B**	**Easy**	**9062**
L06.04	**EF hold off** External fault hold off	**[ms]**	**RWS**	**0**	**0/30000**	**PP**	**V-F-S-B**	**Easy**	**9600**
L07	ALARM CFG / Motor OT								
	Motor Over-Temperature indicated via thermal contact or PTC thermistor on 78-79 drive regulation board terminals.								
L07.00	**MOT activity** Motor Over-Temperature activity: [2] Warning [3] Disable drive [4] Stop [5] Fast stop [6] Curr limstp	**N/A**	**RWS**	**2**	**2/6**	**DP**	**V-F-S-B**	**Easy**	**9065**
L07.01	**MOT restart** Motor Over-Temperature restart: [0] off [1] on	**N/A**	**RWS**	**0**	**0/1**	**DP**	**V-F-S-B**	**Easy**	**9066**
L07.02	**MOT restart time** Motor Over-Temperature restart time	**[ms]**	**RWS**	**1000**	**0/30000**	**PP**	**V-F-S-B**	**Easy**	**9067**

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
L07.03	**MOT hold off**	**[ms]**	**RWS**	**1000**	**0/30000**	**PP**	**V-F-S-B**	**Easy**	**9603**
	Motor Over-Temperature hold off								
L08	ALARM CFG / Hsink OT								
	Heatsink Sensor Over-Temperature (detected by a sensor).								
L08.00	**HTS activity**	**N/A**	**RWS**	**3**	**2/6**	**DP**	**V-F-S-B**	**Easy**	**9054**
	Heatsink Sensor Over-Temperature activity: [2] Warning [3] Disable drive [4] Stop [5] Fast stop [6] Curr limstp								
L08.01	**HTS restart**	**N/A**	**RWS**	**0**	**0/1**	**DP**	**V-F-S-B**	**Easy**	**9055**
	Heatsink Sensor Over-Temperature restart: [0] off [1] on								
L08.02	**HTS restart time**	**[ms]**	**RWS**	**1000**	**0/30000**	**PP**	**V-F-S-B**	**Easy**	**9056**
	Heatsink Sensor Over-Temperature restart time								
L08.03	**HTS hold off**	**[ms]**	**RWS**	**1000**	**0/30000**	**PP**	**V-F-S-B**	**Easy**	**9604**
	Heatsink Sensor Over-Temperature hold off								
L09	ALARM CFG / Reg OT								
	Regulation card Sensor Over-Temperature								
L09.00	**RGS activity**	**N/A**	**RWS**	**3**	**2/6**	**DP**	**V-F-S-B**	**Easy**	**9057**
	Regulation card Sensor Over-Temperature activity: [2] Warning [3] Disable drive [4] Stop [5] Fast stop [6] Curr limstp								

Index	MENU Parameter Name Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
L09.01	**RGS restart**	N/A	RWS	0	0/1	DP	V-F-S-B	Easy	9058
	Regulation card Sensor Over-Temperature restart: [0] off [1] on								
L09.02	**RGS restart time**	[ms]	RWS	1000	0/30000	PP	V-F-S-B	Easy	9059
	Regulation card Sensor Over-Temperature restart time								
L09.03	**RGS hold off**	[ms]	RWS	10000	0/30000	PP	V-F-S-B	Easy	9605
	Regulation card Sensor Over-Temperature hold off								
L10	ALARM CFG / Intake OT								
	Intake air Sensor Over-Temperature (only for model AVy 4220 and over)								
L10.00	**IAS activity**	N/A	RWS	3	2/6	DP	V-F-S-B	Easy	9087
	Intake air Sensor Over-Temperature activity: [2] Warning [3] Disable drive [4] Stop [5] Fast stop [6] Curr limstp								
L10.01	**IAS restart**	N/A	RWS	0	0/1	DP	V-F-S-B	Easy	9088
	Intake air Sensor Over-Temperature restart: [0] off [1] on								
L10.02	**IAS restart time**	[ms]	RWS	1000	0/30000	PP	V-F-S-B	Easy	9089
	Intake air Sensor Over-Temperature restart time								
L10.03	**IAS hold off**	[ms]	RWS	10000	0/30000	PP	V-F-S-B	Easy	9606
	Intake air Sensor Over-Temperature hold off								
L11	ALARM CFG / ISBus F								
	Note! Menu accessible with Access Level = FULL It trips when LAN communication is interrupted: ISBus Fault (LAN communication between drive and ISBus optional card)								

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
L11.00	**ISB activity**	**N/A**	**RWS**	**3**	**2/6**	**DP**	**V-F-S-B**	**Full**	**9068**
	ISBus Fault alarm activity: [2] Warning [3] Disable drive [4] Stop [5] Fast stop [6] Curr limstp								
L11.01	**ISB restart**	**N/A**	**RWS**	**0**	**0/1**	**DP**	**V-F-S-B**	**Full**	**9069**
	ISBus Fault alarm restart: [0] off [1] on								
L11.02	**ISB restart time**	**[ms]**	**RWS**	**1000**	**0/30000**	**PP**	**V-F-S-B**	**Full**	**9070**
	ISBus Fault alarm restart time								
L12	ALARM CFG / Comm F								
	It trips when LAN communication is interrupted (LAN communication between drive and Field Bus optional card)								
L12.00	**CCF activity**	**N/A**	**RWS**	**3**	**2/6**	**DP**	**V-F-S-B**	**Easy**	**9074**
	Comm card fault activity: [2] Warning [3] Disable drive [4] Stop [5] Fast stop [6] Curr limstp								
L12.01	**CCF restart**	**N/A**	**RWS**	**0**	**0/1**	**DP**	**V-F-S-B**	**Easy**	**4200**
	Comm card fault restart: [0] off [1] on								
L12.02	**CCF restart time**	**[ms]**	**RWS**	**1000**	**0/30000**	**PP**	**V-F-S-B**	**Easy**	**4201**
	Comm card fault restart time								
L13	ALARM CFG / APC F								
	It trips when optional coprocessor communication is interrupted (coprocessor communication between drive and APC 100 optional card).								

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
L13.00	**ACF activity** Appl card fault activity: [2] Warning [3] Disable drive [4] Stop [5] Fast stop [6] Curr limstp	**N/A**	**RWS**	**3**	**2/6**	**DP**	**V-F-S-B**	**Full**	**9049**
L14	ALARM CFG / Drive OL								
	It trips when Drive overload accumulator exceeded trip threshold.								
L14.00	**DOL activity** Drive overload activity: [1] Ignore [2] Warning [3] Disable drive [4] Stop [5] Fast stop [6] Curr limstp	**N/A**	**RWS**	**1**	**1/6**	**DP**	**V-F-S-B**	**Easy**	**9040**
L15	ALARM CFG / Motor OL								
	It trips when Motor overload accumulator exceeded trip threshold.								
L15.00	**MOL activity** Motor overload activity: [1] Ignore [2] Warning [3] Disable drive [4] Stop [5] Fast stop [6] Curr limstp	**N/A**	**RWS**	**2**	**1/6**	**DP**	**V-F-S-B**	**Easy**	**9041**
L16	ALARM CFG / BU OL								
	It trips when Brake resistor overload accumulator exceeded trip threshold.								
L16.00	**BUOL activity** Braking Unit overload activity: [2] Warning [3] Disable drive [4] Stop [5] Fast stop [6] Curr limstp	**N/A**	**RWS**	**3**	**2/6**	**DP**	**V-F-S-B**	**Easy**	**9071**

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
L17	**ALARM CFG / FwRevCtrl**								
	It trips when the Forward Reverse control "truth table" is not satisfied; see **C00.25 - FRC cmd mode** description in the INTERFACE menu section.								
L17.00	**FRC activity** Forward Reverse control activity: [1] Ignore [2] Warning [3] Disable drive [4] Stop [5] Fast stop [6] Curr limstp	**N/A**	**RWS**	**3**	**1/6**	**DP**	**V-F-S-B**	**Easy**	**9086**
L17.01	**FRC hold off** Forward Reverse control hold off	**[ms]**	**RWS**	**32**	**0/30000**	**PP**	**V-F-S-B**	**Easy**	**9607**
L18	**ALARM CFG / Over Spd**								
	It trips when the speed of the motor exceeded speed limit threshold.								
L18.00	**OS activity** Overspeed activity: [2] Warning [3] Disable drive [4] Stop [5] Fast stop [6] Curr limstp	**N/A**	**RWS**	**3**	**2/6**	**DP**	**V-F-S-B**	**Easy**	**9220**
L18.01	**OS threshold** Overspeed threshold.	**[rmp]**	**RWS**	**Calc**	**0.00/Calc**	**PP**	**V-F-S-B**	**Easy**	**9221**
L18.02	**OS hold off** Overspeed hold off.	**[ms]**	**RWS**	**0**	**0/30000**	**PP**	**V-F-S-B**	**Easy**	**9608**
L19	**ALARM CFG / SFbk loss**								
	It trips when the speed feedback is not detected or encoder supply failed.								
L19.00	**SFL activity** Spd fbk loss activity: [1] Ignore [2] Warning [3] Disable drive	**N/A**	**RWS**	**3**	**1/6**	**DP**	**V-F-S-B**	**Easy**	**9042**

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
	[4] Stop [5] Fast stop [6] Curr limstp								
L20	**ALARM CFG / UV rep**								
	It trips when more than a programmable number, with **L20.00 - UVR attempts** parameter, of Undervoltage faults are detected in 4 minutes (time programmable with **L20.01 - UVR delay** parameter)								
L20.00	**UVR attempts**	**N/A**	**RWS**	**5**	**1/1000**	**PP**	**V-F-S-B**	**Easy**	**9043**
	It determines the number of Undervoltage faults accepted.								
L20.01	**UVR delay**	**[sec]**	**RWS**	**240**	**1/262.14**	**PP**	**V-F-S-B**	**Easy**	**9044**
	It determines the time window of **L20.00 - UVR attempts** parameter.								
L21	**ALARM CFG / Hw fault**								
	It trips when the communication between drive regulation card and one of its option cards is not detected.								
L21.00	**Hw fault mon**	**N/A**	**R**	**0**	**0/1**	**DP**	**V-F-S-B**	**Easy**	**4202**
	[0] Communication OK [1] Communication failed								

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa

ALARM CFG / Alarms status

Note! Menu accessible with Access Level = FULL

The alarm state can be reported via three Words. Each bit determines an alarm state.
It is therefore possible to determine the state of 48 alarms. Each single bit can be controlled if the corresponding bit of a specific mask is set with 1, otherwise their setting is always 0.
When an alarm becomes active, the word corresponding bit is set with 1.
Its setting remains equal to 1 till the alarm becomes inactive and the "**State Machine** or **Sequencer**" is not in an alarm condition. If the state of a single alarm has to be controlled via an output, then only the mask needed bit has to be set with 1.
If the state of several alarms has to be controlled via an output, then the mask corresponding bits have to be set with 1.
The alarms have to be controlled by the Word itself.

I.e.: the state of the External fault alarm has to be read.
Mask W1 S1 = 0x0100 => 0000 0001 0000 0000
Mask W2 S1 = 0x0000 => 0000 0000 0000 0000
Mask W3 S1 = 0x0000 => 0000 0000 0000 0000
DO 0 src = Select ipa Alm W1 S1.

The state of the Undervoltage and Overvoltage alarm has to be read.
Mask W1 S1 = 0x0100 => 0000 0000 0000 0110
Mask W2 S1 = 0x0000 => 0000 0000 0000 0000
Mask W3 S1 = 0x0000 => 0000 0000 0000 0000
DO 0 src = Select ipa Alm W1 S1.

The state of the External fault and F_R_C alarm has to be read.
Mask W1 S1 = 0x0100 => 0000 0001 0000 0000
Mask W2 S1 = 0x0000 => 0000 0000 1000 0000
DO 0 src = Select ipa Alm W1 S1.
DO 1 src = Select ipa Alm W2 S1.

See alarm list below.

Index	MENU / Parameter Name	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
L22	ALARM CFG / AL status								
	Alarm status configuration:								
L22.00	**Mask W1 S1**	**N/A**	**RWS**	**0XFFF**	**0 -1**	**DP**	**V-F-S-B**	**Full**	**9610**
L22.01	**Mask W2 S1**	**N/A**	**RWS**	**0XFFF**	**0 -1**	**DP**	**V-F-S-B**	**Full**	**9611**
L22.02	**Mask W3 S1**	**N/A**	**RWS**	**0XFFF**	**0 -1**	**DP**	**V-F-S-B**	**Full**	**9612**

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
L22.03	**Mask W1 S2**	N/A	RWS	0XFFFF	0 -1	DP	V-F-S-B	Full	9614
L22.04	**Mask W2 S2**	N/A	RWS	0XFFFF	0 -1	DP	V-F-S-B	Full	9615
L22.05	**Mask W3 S2**	N/A	RWS	0XFFFF	0 -1	DP	V-F-S-B	Full	9616
L22.06	**Alm W1 S1**	N/A	R	0	0 Calc	DP	V-F-S-B	Full	9630
L22.07	**Alm W2 S1**	N/A	R	0	0 Calc	DP	V-F-S-B	Full	9631
L22.08	**Alm W3 S1**	N/A	R	0	0 Calc	DP	V-F-S-B	Full	9632
L22.09	**Alm W1 S2**	N/A	R	0	0 Calc	DP	V-F-S-B	Full	9634
L22.10	**Alm W2 S2**	N/A	R	0	0 Calc	DP	V-F-S-B	Full	9635
L22.11	**Alm W3 S2**	N/A	R	0	0 Calc	DP	V-F-S-B	Full	9636

ALARM CFG / Alarms status

Table L22-1: *Alarm List table*

ALARM NAME	BIT position in the alarm Word	Description (Cause of fault)	Drive activity after Alarm	HOLD OFF	Restart	Restart time	Acknowledgment request Msg ad alarmq DigOut
Failure supply	1	Failure of power supply	Disable drive	No	No	No	Yes
Undervoltage	2	Vdc Link< UV Thr	Disable drive	No	Yes. logic on n° times	Yes	Yes
Overvoltage	3	Vdc Link> OV Thr	Disable drive	No	Yes	Yes	Yes
IGBT desaturat	4	Too many current on output bridge	Disable drive	No	Yes. logic on 2 alarms in 30 second	Yes	Yes
Inst overcurrent	5	Too many current on output bridge	Disable drive	No	Yes. logic on 2 alarms in 30 second	Yes	Yes
Ground fault	6	Output Phase discharge to ground	Programmable	No	No	No	Yes
Curr fbk loss	7	Loose of the reading of the current sensor	Disable drive	No	No	No	Yes
External fault	8	Input pin. Programmable	Programmable	Yes, Program.	Yes	Yes, Progr.	Yes
Spd fbk loss	9	Loose of the reading of the speed sensor	Programmable	No	No	No	Yes
Module OT	10	Only for size <= 15kW Module Overtemperature	Disable drive	Yes Fixed 10 msec	No	No	Yes
Heatsink OT	11	Only for size > 15kW Heatsink Overtemperature	Disable drive	Yes Fixed 1000 msec			Yes
Motor OT	12	Input Motor Overtemperature	Programmable	Yes, Program.	Yes	Yes, Progr.	Yes
Heatsink S OT	13	Heatsink Overtemperature	Programmable	Yes, Program.	Yes	Yes, Progr.	Yes
Regulation S OT	14	Regulation Overtemperature	Programmable	Yes, Program.	Yes	Yes, Progr.	Yes
Intake air S OT	15	Only > 15Kw Intake air overtemperature	Programmable	Yes, Program.	Yes	Yes, Progr.	Yes
ISBus fault	16	Isbus card	Programmable	No	Yes	Yes, Progr.	Yes
Comm card fault	17	Sbi card	Programmable	No	Yes	Yes, Progr.	Yes
Appl card fault	18	Dgfc card or APC card	Disable drive	No	No	No	Yes
Drive overload	19	Reached Drive Ovld limit	Programmable	No	No	No	Yes
Motor overload	20	Reached Motor Ovld limit	Programmable	No	No	No	Yes
BU overload	21	Reached BU Ovld limit	Programmable	No	No	No	Yes
Data lost	22	Eeprom error	Disable drive	No	No	No	Yes
Fwd Rev Ctrl	23	Fwd and Rev both high	Programmable	No	No	No	Yes
Max time	24	Exceeded max CPU time	Disable drive	No	No	No	Yes
Sequencer	25	State machine error	Disable drive	No	No	No	Yes
PLS timeout	26	Power loss Stop	Disable drive	No	No	No	Yes
Overspeed	27	Actual speed > theshold with drive running.Programmable	Programmable	Yes, Program.	No	No	Yes
UV repetitive	28	In 5 minutes xx UV fault occoured. Xx progammable. If xx is set equal to the maximum the alarm is disable.	Disable drive	No	No	No	Yes
IOC repetitive	29	2 UC fault in 30 second	Disable drive	No	No	No	Yes
IGBTdesat repet	30	2 DES fault in 30 second	Disable drive	No	No	No	Yes
WatchDog user	31	User Watchdog not refreshed	Disable drive	No	No	No	Yes
Hw fail	32	Loose of sincronization with expansion or peripherals	Disable drive	No	No	No	Yes
Key Em Stp fault	33	Emergency stop by keypad	Disable drive	No	No	No	Yes

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa

ALARM CFG / Alarms status: FAULT PIN

The state of those alarms having an activity different from **Ignore** and **Only msg alarmq** is stated on this variable.

No active alarm => 0x0000
One active alarm => Number of the corresponding pin
Several active alarms => Last intervened alarm
Reset alarms => Last intervened alarm.

Set with 0x0000 the "*Alarm Reset*" command.
The variable can be read via the serial line, field bus and Dgfc/APC.

Table L22-2: *Fault Pin table*

ALARM Name	Bit position in the alarm Word	Code in the alarm LIST
Failure supply	1	21
Undervoltage	2	22
Overvoltage	3	23
IGBT desaturat	4	24
Inst overcurrent	5	25
Ground fault	6	26
Curr fbk loss	7	27
External fault	8	28
Spd fbk loss	9	29
Module OT	10	30
Heatsink OT	11	31
Motor OT	12	32
Heatsink S OT	13	33
Regulation S OT	14	34
Intake Air S OT	15	35
ISBus fault	16	36
Comm card fault	17	37
Appl card fault	18	38
Drv overload	19	39
Mot overload	20	40
BU overload	21	41
Data lost	22	42
Fwd Rev Ctrl	23	43
Max time	24	44
Sequencer	25	45
PLS timeout	26	46
Overspeed	27	47
UV repetitive	28	48
IOC repetitive	29	49
IGBTdesat repet	30	50
WatchDog user	31	51
Hw fail	32	52
Key Em Stp fault	33	53

Index	MENU Parameter Name Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa

M COMM

COMM / RS485

The communication protocol can be chosen between Slink4, Modbus or Jbus through the Protocol type parameter. Each of these protocols allow a multipoint network.
See the specific protocol manual for further details.

The Drive address can be defined via the **M00.00 - Slave address** parameter.
The address change is performed by editing parameter **M00.00 - Slave address**, and saving the new value.
The new address becomes active after the Drive has been switched off and then back on.
A temporary address change is also possible when using the Slink4 protocol with an Slink4 command.

When using the Slink4 protocol, the RS485 serial line operates in half-duplex, where the data can not be transmitted and received simultaneously.
It is sometimes possible during the transition from transmission to reception modes, the Master (PC or PLC) reaches the reception condition after the drive has already started to send its data package. As a consequence, the package received by the master is not correct. In order to avoid such occurrences, the **M00.01 - Slave res time** parameter can be adjusted to delay the drive response so the Master has ample mode switching time.
This situation does not occur with the Modbus and Jbus protocols as the synchronization pause between messages is specified by the protocol and is guaranteed.

Modbus regs mode parameters allows to set the floating point variables transmission:

MSW:LSW - reg=ipa	MSW first, LSW after - register index = ipa
LSW:MSW - reg=ipa	LSW first, MSW after - register index = ipa
MSW:LSW - reg=2ipa	MSW first, LSW after - register index = ipa * 2
LSW:MSW - reg=2ipa	LSW first, MSW after - register index = ipa * 2

(MSW=More significant word, LSW=Less significant word, register index = ipa).

M00 COMM / RS485

Index	Parameter Name	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
M00.00	**Slave address**	N/A	RWS	1	0/255	DK	V-F-S-B	Easy	105
	It define the drive slave address								
M00.01	**Slave res time**	N/A	RWS	1	0/255	DK	V-F-S-B	Easy	106
	It define the drive slave address time								
M00.02	**Protocol type**	N/A	RWS	0	0/2	DK	V-F-S-B	Easy	104
	It defines the drive communication protocol type: [0] Slink 4 [1] Modbus [2] Jbus								

Index	MENU Parameter Name Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
M00.03	**Modbus regs mode**	N/A	RWS	0	0/3	DK	V-F-S-B	Easy	103

Modbus regs mode parameters allows to set the floating point variables transmission (see above):

[0] MSW:LSW ipa
[1] LSW:MSW ipa
[2] MSW:LSW 2ipa
[3] LSW:MSW 2ipa

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa

COMM / SBI

The communication with the SBI Bus field option cards (Serial Bus Interface) is performed via two channels:

- Synchronous or Process channel (PDC Process Data Channel) for a cyclical value interchange.
- Asynchronous or Configuration channel for a low priority access to all the Drive parameters.

As for the data exchange modes between the SBI card and the Network see the SBI card documentation.

The process data exchange between the Drive and the SBI has the following structure:

> the interface is made of six writing Words and six reading Words
> the source Drive parameter has to be defined for the six Words

Drv -> SBI word transmitting the data from the Drive to the SBI. Six Words move the data from the SBI to the Drive.
SBI -> Drv word these can be found in the source selection lists.

For more information to see the following documents for related information on SBI:
1S5E35 (GB), 1S5E48 (I) for SBIPDP33 Profibus card
1S5E57 (GB), 1S5E64 (I) for SBIDN33 DeviceNet card

M01 COMM / SBI

Note! Menu accessible with Access Level = FULL.

Index	Parameter Name	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
M01.00	**SBI enable**	**N/A**	**RWS**	**0**	**0/1**	**DK**	**V-F-S-B**	**Full**	**8999**

It allows to enable SBI Field Bus option cards:

[0] Disabled
[1] Enabled

Note! SAVE PARAMETERS command and drive recycle power are required.

Index	Parameter Name	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
M01.01	**Last SBI error**	**N/A**	**R**	**0**	**0/2**	**DP**	**V-F-S-B**	**Full**	**8998**

It defines the last found error:

0 = OK (no error)
1 = Hardware fault
2 = Bus Loss

Index	Parameter Name	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
M01.02	**SBI menu**							**Full**	

It allows to access SBI card parameters, when the card is connected.

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
M02	COMM / Drv-SBI								
	Note! Menu accessible with Access Level = FULL								
M02.00	**Drv SBI W0 src**	**N/A**	**RWS**	**Ipa9020**	**PList 40**	**PIN**	**V-F-S-B**	**Full**	**9010**
	Ipa 9020 - Dig Drv SBI W0 = Default It allows to select the origin of Word 0 to be transmitted from Drive to SBI card. Pick List 40								
M02.01	**Drv SBI W1 src**	**N/A**	**RWS**	**Ipa9021**	**PList 40**	**PIN**	**V-F-S-B**	**Full**	**9011**
	Ipa 9021 - Dig Drv SBI W1 = Default It allows to select the origin of Word 1 to be transmitted from Drive to SBI card. Pick List 40								
M02.02	**Drv SBI W2 src**	**N/A**	**RWS**	**Ipa9022**	**PList 40**	**PIN**	**V-F-S-B**	**Full**	**9012**
	Ipa 9022 - Dig Drv SBI W2 = Default It allows to select the origin of Word 2 to be transmitted from Drive to SBI card. Pick List 40								
M02.03	**Drv SBI W3 src**	**N/A**	**RWS**	**Ipa9023**	**PList 40**	**PIN**	**V-F-S-B**	**Full**	**9013**
	Ipa9023 - Dig Drv SBI W3 = Default It allows to select the origin of Word 3 to be transmitted from Drive to SBI card. Pick List 40								
M02.04	**Drv SBI W4 src**	**N/A**	**RWS**	**Ipa9024**	**PList 40**	**PIN**	**V-F-S-B**	**Full**	**9014**
	Ipa 9024 - Dig Drv SBI W4 = Default It allows to select the origin of Word 4 to be transmitted from Drive to SBI card. Pick List 40								
M02.05	**Drv SBI W5 src**	**N/A**	**RWS**	**Ipa9025**	**PList 40**	**PIN**	**V-F-S-B**	**Full**	**9015**
	Ipa 9025 - Dig Drv SBI W5 = Default It allows to select the origin of Word 5 to be transmitted from Drive to SBI card. Pick List 40								

Index	MENU Parameter Name Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
M02.10	**Dig Drv SBI W0**	N/A	RWS	0.00	- -	PV	V-F-S-B	Full	9020
	Digital Word 0 value configuration (default connected to Drv SBI W0 src).								
M02.11	**Dig Drv SBI W1**	N/A	RWS	0.00	- -	PV	V-F-S-B	Full	9021
	Digital Word 1 value configuration (default connected to Drv SBI W1 src).								
M02.12	**Dig Drv SBI W2**	N/A	RWS	0.00	- -	PV	V-F-S-B	Full	9022
	Digital Word 2 value configuration (default connected to Drv SBI W2 src).								
M02.13	**Dig Drv SBI W3**	N/A	RWS	0.00	- -	PV	V-F-S-B	Full	9023
	Digital Word 3 value configuration (default connected to Drv SBI W3 src).								
M02.14	**Dig Drv SBI W4**	N/A	RWS	0.00	- -	PV	V-F-S-B	Full	9024
	Digital Word 4 value configuration (default connected to Drv SBI W4 src).								
M02.15	**Dig Drv SBI W5**	N/A	RWS	0.00	- -	PV	V-F-S-B	Full	9025
	Digital Word 5 value configuration (default connected to Drv SBI W5 src).								
M02.20	**Drv SBI W0 mon**	N/A	R	0.00	- -	PP	V-F-S-B	Full	9030
	Word 0 monitor of the PDC channel on the Drive output.								
M02.21	**Drv SBI W1 mon**	N/A	R	0.00	- -	PP	V-F-S-B	Full	9031
	Word 1 monitor of the PDC channel on the Drive output.								
M02.22	**Drv SBI W2 mon**	N/A	R	0.00	- -	PP	V-F-S-B	Full	9032
	Word 2 monitor of the PDC channel on the Drive output.								
M02.23	**Drv SBI W3 mon**	N/A	R	0.00	- -	PP	V-F-S-B	Full	9033
	Word 3 monitor of the PDC channel on the Drive output.								
M02.24	**Drv SBI W4 mon**	N/A	R	0.00	- -	PP	V-F-S-B	Full	9034
	Word 4 monitor of the PDC channel on the Drive output.								
M02.25	**Drv SBI W5 mon**	N/A	R	0.00	- -	PP	V-F-S-B	Full	9035
	Word 5 monitor of the PDC channel on the Drive output.								

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
M03	**COMM / SBI-Drv**								
	Note! Menu accessible with Access Level = FULL.								
M03.00	**SBI Drv W0 mon** Word 0 monitor of the PDC channel on the Drive input	**N/A**	**R**	**0.00**	**- -**	**PP**	**V-F-S-B**	**Full**	**9000**
M03.01	**SBI Drv W1 mon** Word 1 monitor of the PDC channel on the Drive input	**N/A**	**R**	**0.00**	**- -**	**PP**	**V-F-S-B**	**Full**	**9001**
M03.02	**SBI Drv W2 mon** Word 2 monitor of the PDC channel on the Drive input	**N/A**	**R**	**0.00**	**- -**	**PP**	**V-F-S-B**	**Full**	**9002**
M03.03	**SBI Drv W3 mon** Word 3 monitor of the PDC channel on the Drive input	**N/A**	**R**	**0.00**	**- -**	**PP**	**V-F-S-B**	**Full**	**9003**
M03.04	**SBI Drv W4 mon** Word 4 monitor of the PDC channel on the Drive input	**N/A**	**R**	**0.00**	**- -**	**PP**	**V-F-S-B**	**Full**	**9004**
M03.05	**SBI Drv W5 mon** Word 5 monitor of the PDC channel on the Drive input	**N/A**	**R**	**0.00**	**- -**	**PP**	**V-F-S-B**	**Full**	**9005**

Index	MENU Parameter Name Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa

COMM / ISBus

Configuration for the data exchange with the ISBus card. As for the process channel programming see the description of the Field Bus communication.
The interface is made of 8 writing Words plus 8 reading Words.

NOTE! The ISBus card cannot be used with a APC100 option card since they both occupy the same card mounting space.

The menu contains all the items needed to configure and monitor the drive parameter assignment; the used style is the same as that of the Serial Bus Interface Menu.
In addition, the system provides some ISBus specific items.

M04 COMM / ISBus

NOTE! Menu accessible with Access Level = FULL.

Index	Parameter Name	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
M04.00	**ISBus enable**	**N/A**	**RWS**	**0**	**0/1**	**DK**	**V-F-S-B**	**Full**	**4225**

It allows to enable ISBus option cards:

[0] Disabled
[1] Enabled

This parameter must be set to Enabled in order to let the drive ISBus interface work ; the parameter configuration has to be saved and the drive has to be switched off and on again to allow this parameter to take effect.

Index	Parameter Name	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
M04.01	**ISBus Node ID**	**N/A**	**RWS**	**1**	**1/31**	**DK**	**V-F-S-B**	**Full**	**4226**

Here the node address has to be entered.

Index	Parameter Name	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
M04.02	**Heartbeat time**	**[ms]**	**RWS**	**0.00**	**0.00/10000**	**PP**	**V-F-S-B**	**Full**	**4241**

Through this parameter it is possible to set the Heartbeat alarm timeout which will cause an alarm condition.

Index	Parameter Name	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
M04.03	**ISB Card status**	**N/A**	**R**	**0**	**0/7**	**DP**	**V-F-S-B**	**Full**	**4227**

It is read-only and reports the ISbus current state; to this purpose, the ST register is read.
The states to be displayed as alphanumeric string are:
Reset
Off line
Standby
On Line

Index	Parameter Name	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
M04.04	**Last ISB error**	**N/A**	**R**	**0**	**0/0xffff**	**DP**	**V-F-S-B**	**Full**	**4228**

It is a read-only parameter showing the cause of the last ISBus alarm intervention; the value is reported as an alphanumeric string:

No error	There hasn't been any alarm

Index	MENU Parameter Name Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
	Card missing — No card was found during the initialization (ISBUS enabled) Heartbeat — There has been a heartbeat Timeout								
M04.05	**ISB FAULT memo**	N/A	R	0	0/0xffff	DP	V-F-S-B	Full	4229

This item shows the last asic FAULT register value found different from 0000 (no error); the FAULT register value codes are displayed as hexadecimalnumbers:

0001	Invalid page requested in SCELL packet
0002	Host page FIFO underflow or overflow
0004	Illegal SCELL
0008	Frame overrun
0010	Illegal SCELL
0020	Duplicate node
0040	ACELL no response
0080	SCELL no response
0100	ACELL transmit FIFO underflow/overflow
0200	ACELL receive FIFO underflow /overflow
0400	SCELL transmit FIFO underflow/overflow
0800	ACELL receive FIFO underflow/overflow
1000	Received bad SCELL CRC
2000	Illegal symbol
4000	Bus hog error

Index	Parameter Name	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
M04.06	**ISB FAULT cnt**	N/A	R	0	0/0xffff	DP	V-F-S-B	Full 4240	

This item reports the total number of FAULT register error conditions detected from the start-up.

M05 COMM / Drv-ISBus

NOTE! Menu accessible with Access Level = FULL

Index	Parameter Name	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
M05.00	**Drv ISBus W0src**	N/A	RWS	Ipa9320	PList 28	PIN	V-F-S-B	Full	4230

Ipa 9320 - Dig D- ISBus W0 = Default

Drv ISBus W0src Word 0 channel source on the Drive output.

Pick List 28

Index	Parameter Name	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
M05.01	**Drv ISBus W1src**	N/A	RWS	Ipa9321	PList 28	PIN	V-F-S-B	Full	4231

Ipa 9321 - Dig D- ISBus W1 = Default

Drv ISBus W1src Word 1 channel source on the Drive output.

Pick List 28

Index	MENU Parameter Name Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
M05.02	**Drv ISBus W2src**	N/A	RWS	Ipa9322	PList 28	PIN	V-F-S-B	Full	4232
	Ipa 9322 - Dig D- ISBus W2 = Default **Drv ISBus W2src** Word 2 channel source on the Drive output. Pick List 28								
M05.03	**Drv ISBus W3src**	N/A	RWS	Ipa9323	PList 28	PIN	V-F-S-B	Full	4233
	Ipa 9323 - Dig D- ISBus W3 = Default **Drv ISBus W3src** Word 3 channel source on the Drive output. Pick List 28								
M05.04	**Drv ISBus W4src**	N/A	RWS	Ipa9324	PList 28	PIN	V-F-S-B	Full	4234
	Ipa 9324 - Dig D- ISBus W4 = Default **Drv ISBus W4src** Word 4 channel source on the Drive output. Pick List 28								
M05.05	**Drv ISBus W5src**	N/A	RWS	Ipa9325	PList 28	PIN	V-F-S-B	Full	4235
	Ipa 9325 - Dig D- ISBus W5 = Default **Drv ISBus W5src** Word 5 channel source on the Drive output. Pick List 28								
M05.06	**Drv ISBus W6src**	N/A	RWS	Ipa9326	PList 28	PIN	V-F-S-B	Full	4236
	Ipa 9326 - Dig D- ISBus W6 = Default **Drv ISBus W6src** Word 6 channel source on the Drive output. Pick List 28								
M05.07	**Drv ISBus W7src**	N/A	RWS	Ipa9327	PList 28	PIN	V-F-S-B	Full	4237
	Ipa 9327 - Dig D- ISBus W5 = Default **Drv ISBus W7src** Word 7 channel source on the Drive output. Pick List 28								
M05.10	**Dig D- ISBus W0**	NULL	RWS	0.00	-32768/32767	PV	V-F-S-B	Full	9320
	Dig D- ISBus W0 Internal value configuration (standard connected to W0 src).								

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
M05.11	**Dig D- ISBus W1**	**NULL**	**RWS**	**0.00**	**-32768/32767**	**PV**	**V-F-S-B**	**Full**	**9321**
	Dig D- ISBus W1 Internal value configuration (standard connected to W1 src).								
M05.12	**Dig D- ISBus W2**	**NULL**	**RWS**	**0.00**	**-32768/32767**	**PV**	**V-F-S-B**	**Full**	**9322**
	Dig D- ISBus W2 Internal value configuration (standard connected to W2 src).								
M05.13	**Dig D- ISBus W3**	**NULL**	**RWS**	**0.00**	**-32768/32767**	**PV**	**V-F-S-B**	**Full**	**9323**
	Dig D- ISBus W3 Internal value configuration (standard connected to W3 src).								
M05.14	**Dig D- ISBus W4**	**NULL**	**RWS**	**0.00**	**-32768/32767**	**PV**	**V-F-S-B**	**Full**	**9324**
	Dig D- ISBus W4 Internal value configuration (standard connected to W4 src).								
M05.15	**Dig D- ISBus W5**	**NULL**	**RWS**	**0.00**	**-32768/32767**	**PV**	**V-F-S-B**	**Full**	**9325**
	Dig D- ISBus W5 Internal value configuration (standard connected to W5 src).								
M05.16	**Dig D- ISBus W6**	**NULL**	**RWS**	**0.00**	**-32768/32767**	**PV**	**V-F-S-B**	**Full**	**9326**
	Dig D- ISBus W6 Internal value configuration (standard connected to W6 src).								
M05.17	**Dig D- ISBus W7**	**NULL**	**RWS**	**0.00**	**-32768/32767**	**PV**	**V-F-S-B**	**Full**	**9327**
	Dig D- ISBus W7 Internal value configuration (standard connected to W7 src).								
M05.20	**Drv ISBus W0mon**	**NULL**	**R**	**0.00**	**-32768/32767**	**PP**	**V-F-S-B**	**Full**	**4216**
	Drv ISBus W0mon W0 monitor on the Drive output.								
M05.21	**Drv ISBus W1mon**	**NULL**	**R**	**0.00**	**-32768/32767**	**PP**	**V-F-S-B**	**Full**	**4217**
	Drv ISBus W1mon W1 monitor on the Drive output.								
M05.22	**Drv ISBus W2 mon**	**NULL**	**R**	**0.00**	**-32768/32767**	**PP**	**V-F-S-B**	**Full**	**4218**
	Drv ISBus W2mon W2 monitor on the Drive output.								
M05.23	**Drv ISBus W3mon**	**NULL**	**R**	**0.00**	**-32768/32767**	**PP**	**V-F-S-B**	**Full**	**4219**
	Drv ISBus W3mon W3 monitor on the Drive output.								
M05.24	**Drv ISBus W4mon**	**NULL**	**R**	**0.00**	**-32768/32767**	**PP**	**V-F-S-B**	**Full**	**4220**
	Drv ISBus W4mon W4 monitor on the Drive output.								

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
M05.25	**Drv ISBus W5mon**	NULL	R	0.00	-32768/32767	PP	V-F-S-B	Full	4221
	Drv ISBus W5 mon W5 monitor on the Drive output.								
M05.26	**Drv ISBus W6mon**	NULL	R	0.00	-32768/32767	PP	V-F-S-B	Full	4222
	Drv ISBus W6mon W6 monitor on the Drive output.								
M05.27	**Drv ISBus W7mon**	NULL	R	0.00	-32768/32767	PP	V-F-S-B	Full	4223
	Drv ISBus W7mon W7 monitor on the Drive output.								
M06	COMM / ISBus-Drv								
	Note! Menu accessible with Access Level = FULL.								
M06.00	**ISBus Drv W0 m**	NULL	R	0.00	-32768/32767	PV	V-F-S-B	Full	9300
	W0 mon W0 monitor on the drive input.								
M06.01	**ISBus Drv W1 m**	NULL	R	0.00	-32768/32767	PV	V-F-S-B	Full	9301
	W1 mon W1 monitor on the drive input.								
M06.02	**ISBus Drv W2 m**	NULL	R	0.00	-32768/32767	PV	V-F-S-B	Full	9302
	W2 mon W2 monitor on the drive input.								
M06.03	**ISBus Drv W3 m**	NULL	R	0.00	-32768/32767	PV	V-F-S-B	Full	9303
	W3 mon W3 monitor on the drive input.								
M06.04	**ISBus Drv W4 m**	NULL	R	0.00	-32768/32767	PV	V-F-S-B	Full	9304
	W4 mon W4 monitor on the drive input.								
M06.05	**ISBus Drv W5 m**	NULL	R	0.00	-32768/32767	PV	V-F-S-B	Full	9305
	W5 mon W5 monitor on the drive input.								
M06.06	**ISBus Drv W6 m**	NULL	R	0.00	-32768/32767	PV	V-F-S-B	Full	9306
	W6 mon W6 monitor on the drive input.								
M06.07	**ISBus Drv W7 m**	NULL	R	0.00	-32768/32767	PV	V-F-S-B	Full	9307
	W7 mon W7 monitor on the drive input.								

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa

N APC CARD

The communication between the drive and the APC100 optional card is performed via two channels for each direction.

• Drive -> APC100: Drv-APCS 5 writing Words
Drv-APCA 10 writing Words

As for the Words sending the data from the Drive to the APC it is necessary to define the Drive source parameter.

• APC100 -> Drive: APCS-Drv 5 reading Words
APCA-Drv 10 reading Words

The Words move the data from the APC100 to the drive. They can be found in the source selecting lists.
The communication channels are synchronous (they are divided into synchronous and asynchronous if the previous software version is taken into consideration.
Synchronous channels with 4ms and Asynchronous channels with 16 ms).

APC100 enabling:

APC enable It enables the communication initialization of the card at its starting.
If the drive does not find the APC100 the **Appl card fault** alarm gets active and the regulation execution is not started.

For more information to see the following document for related information on APC100: 1S5E83 (GB-I)

N00 APC CARD / APC en

Note! Menu accessible with Access Level = FULL

Index	Parameter Name	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
N00.00	**APC enable**	**N/A**	**RWS**	**0**	**0/1**	**DK**	**V-F-S-B**	**Full**	**4129**

It allows to enable APC100 option cards:

[0] Disabled
[1] Enabled

Index	Parameter Name	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
N00.01	**APC menu**							**Full**	

It allows to access APC card parameters, when the card is connected.

N01 APC CARD / Drv-APC S

Note! Menu accessible with Access Level = FULL

Index	Parameter Name	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
N01.00	**Drv APC-S W0src**	**N/A**	**RWS**	**Ipa4105**	**PList 29**	**PIN**	**V-F-S-B**	**Full**	**4100**

Ipa 4105 - Dig DrvAPCS W0 = Default

It allows to select the origin of Synchronous Word 0 to be transmitted from drive to

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
	APC100 card. Pick List 29								
N01.01	**Drv APC-S W1src** Ipa 4106 - IDig DrvAPCS W1 = Default It allows to select the origin of Synchronous Word 1 to be transmitted from drive to APC100 card. Pick List 29	**N/A**	**RWS**	**Ipa4106**	**PList 29**	**PIN**	**V-F-S-B**	**Full**	**4101**
N01.02	**Drv APC-S W2src** Ipa 4107 - Dig DrvAPCS W2 = Default It allows to select the origin of Synchronous Word 2 to be transmitted from drive to APC100 card. Pick List 29	**N/A**	**RWS**	**Ipa4107**	**PList 29**	**PIN**	**V-F-S-B**	**Full**	**4102**
N01.03	**Drv APC-S W3src** Ipa 4108 - Dig DrvAPCS W3 = Default It allows to select the origin of Synchronous Word 3 to be transmitted from drive to APC100 card. Pick List 29	**N/A**	**RWS**	**Ipa4108**	**PList 29**	**PIN**	**V-F-S-B**	**Full**	**4103**
N01.04	**Drv APC-S W4src** Ipa 4109 - Dig DrvAPCS W4 = Default It allows to select the origin of Synchronous Word 4 to be transmitted from drive to APC100 card. Pick List 29	**N/A**	**RWS**	**Ipa4109**	**PList 29**	**PIN**	**V-F-S-B**	**Full**	**4104**
N01.10	**Dig DrvAPCS W0** Internal Synchronous Word 0 value configuration (default connected to Drv APC-S W0src)	**N/A**	**RWS**	**0.00**	**- -**	**PV**	**V-F-S-B**	**Full**	**4105**
N01.11	**Dig DrvAPCS W1** Internal Synchronous Word 1 value configuration (default connected to Drv APC-S W1src)	**N/A**	**RWS**	**0.00**	**- -**	**PV**	**V-F-S-B**	**Full**	**4106**

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
N01.12	**Dig DrvAPCS W2**	**N/A**	**RWS**	**0.00**	**- -**	**PV**	**V-F-S-B**	**Full**	**4107**
	Internal Synchronous Word 2 value configuration (default connected to Drv APC-S W2src).								
N01.13	**Dig DrvAPCS W3**	**N/A**	**RWS**	**0.00**	**- -**	**PV**	**V-F-S-B**	**Full**	**4108**
	Internal Synchronous Word 3 value configuration (default connected to Drv APC-S W3src).								
N01.14	**Dig DrvAPCS W4**	**N/A**	**RWS**	**0.00**	**- -**	**PV**	**V-F-S-B**	**Full**	**4109**
	Internal Synchronous Word 4 value configuration (default connected to Drv APC-S W4src).								
N01.20	**Drv APC-S W0mon**	**N/A**	**R**	**0.00**	**- -**	**PP**	**V-F-S-B**	**Full**	**4110**
	Synchronous Word 0 monitor (from drive to APC100).								
N01.21	**Drv APC-S W1mon**	**N/A**	**R**	**0.00**	**- -**	**PP**	**V-F-S-B**	**Full**	**4111**
	Synchronous Word 1 monitor (from drive to APC100).								
N01.22	**Drv APC-S W2mon**	**N/A**	**R**	**0.00**	**- -**	**PP**	**V-F-S-B**	**Full**	**4112**
	Synchronous Word 2 monitor (from drive to APC100).								
N01.23	**Drv APC-S W3mon**	**N/A**	**R**	**0.00**	**- -**	**PP**	**V-F-S-B**	**Full**	**4113**
	Synchronous Word 3 monitor (from drive to APC100).								
N01.24	**Drv APC-S W4mon**	**N/A**	**R**	**0.00**	**- -**	**PP**	**V-F-S-B**	**Full**	**4114**
	Synchronous Word 4 monitor (from drive to APC100).								
N02	APC CARD / APC S-Drv								
	Note! Menu accessible with Access Level = FULL.								
N02.00	**APCS Drv W0m**	**N/A**	**R**	**0.00**	**- -**	**PV**	**V-F-S-B**	**Full**	**4120**
	Synchronous Word 0 monitor (from APC to Drive).								
N02.01	**APCS Drv W1m**	**N/A**	**R**	**0.00**	**- -**	**PV**	**V-F-S-B**	**Full**	**4121**
	Synchronous Word 1 monitor (from APC to Drive).								
N02.02	**APCS Drv W2m**	**N/A**	**R**	**0.00**	**- -**	**PV**	**V-F-S-B**	**Full**	**4122**
	Synchronous Word 2 monitor (from APC to Drive).								

Index	MENU Parameter Name Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
N02.03	**APCS Drv W3m**	**N/A**	**R**	**0.00**	**- -**	**PV**	**V-F-S-B**	**Full**	**4123**
	Synchronous Word 3 monitor (from APC to Drive).								
N02.04	**APCS Drv W4m**	**N/A**	**R**	**0.00**	**- -**	**PV**	**V-F-S-B**	**Full**	**4124**
	Synchronous Word 4 monitor (from APC to Drive).								
N03	APC CARD / Drv-APC A								
	Note! Menu accessible with Access Level = FULL.								
N03.00	**Drv APC-A W0src**	**N/A**	**RWS**	**Ipa4140**	**PList 30**	**PIN**	**V-F-S-B**	**Full**	**4130**
	Ipa 4140 - Dig DrvAPCA W0 = Default. It allows to select the origin of Asynchronous Word 0 to be transmitted from drive to APC100 card. **Pick List 30**								
N03.01	**Drv APC-A W1src**	**N/A**	**RWS**	**Ipa4141**	**PList 30**	**PIN**	**V-F-S-B**	**Full**	**4131**
	Ipa 4141 - Dig DrvAPCA W1 = Default. It allows to select the origin of Asynchronous Word 1 to be transmitted from drive to APC100 card. **Pick List 30**								
N03.02	**Drv APC-A W2src**	**N/A**	**RWS**	**Ipa4142**	**PList 30**	**PIN**	**V-F-S-B**	**Full**	**4132**
	Ipa 4142 - Dig DrvAPCA W0 = Default. It allows to select the origin of Asynchronous Word 2 to be transmitted from drive to APC100 card. **Pick List 30**								
N03.03	**Drv APC-A W3src**	**N/A**	**RWS**	**Ipa4143**	**PList 30**	**PIN**	**V-F-S-B**	**Full**	**4133**
	Ipa 4143 - Dig DrvAPCA W3 = Default. It allows to select the origin of Asynchronous Word 3 to be transmitted from drive to APC100 card. **Pick List 30**								
N03.04	**Drv APC-A W4src**	**N/A**	**RWS**	**Ipa4144**	**PList 30**	**PIN**	**V-F-S-B**	**Full**	**4134**
	Ipa 4144 - Dig DrvAPCA W4 = Default.								

Index	MENU Parameter Name Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
	It allows to select the origin of Asynchronous Word 4 to be transmitted from drive to APC100 card. ↳ Pick List 30								
N03.05	Drv APC-A W5src	N/A	RWS	Ipa4145	PList 30	PIN	V-F-S-B	Full	4135
	Ipa 4145 - Dig DrvAPCA W5 = Default. It allows to select the origin of Asynchronous Word 5 to be transmitted from drive to APC100 card. ↳ Pick List 30								
N03.06	Drv APC-A W6src	N/A	RWS	Ipa4146	PList 30	PIN	V-F-S-B	Full	4136
	Ipa 4146 - Dig DrvAPCA W6 = Default. It allows to select the origin of Asynchronous Word 6 to be transmitted from drive to APC100 card. ↳ Pick List 30								
N03.07	Drv APC-A W7src	N/A	RWS	Ipa4147	PList 30	PIN	V-F-S-B	Full	4137
	Ipa 4147 - Dig DrvAPCA W7 = Default. It allows to select the origin of Asynchronous Word 7 to be transmitted from drive to APC100 card. ↳ Pick List 30								
N03.08	Drv APC-A W8src	N/A	RWS	Ipa4148	PList 30	PIN	V-F-S-B	Full	4138
	Ipa 4148 - Dig DrvAPCA W8 = Default. It allows to select the origin of Asynchronous Word 8 to be transmitted from drive to APC100 card. ↳ Pick List 30								
N03.09	Drv APC-A W9src	N/A	RWS	Ipa4149	PList 30	PIN	V-F-S-B	Full	4139
	Ipa 4149 - Dig DrvAPCA W9 = Default. It allows to select the origin of Asynchronous Word 9 to be transmitted from drive to APC100 card. ↳ Pick List 30								

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
N03.20	**Dig DrvAPCA W0**	**N/A**	**RWS**	**0.00**	**- -**	**PV**	**V-F-S-B**	**Full**	**4140**
	Internal Asynchronous Word 0 value configuration (default connected to Drv APC-A W0src).								
N03.21	**Dig DrvAPCA W1**	**N/A**	**RWS**	**0.00**	**- -**	**PV**	**V-F-S-B**	**Full**	**4141**
	Internal Asynchronous Word 1 value configuration (default connected to Drv APC-A W1src).								
N03.22	**Dig DrvAPCA W2**	**N/A**	**RWS**	**0.00**	**- -**	**PV**	**V-F-S-B**	**Full**	**4142**
	Internal Asynchronous Word 2 value configuration (default connected to Drv APC-A W2src).								
N03.23	**Dig DrvAPCA W3**	**N/A**	**RWS**	**0.00**	**- -**	**PV**	**V-F-S-B**	**Full**	**4143**
	Internal Asynchronous Word 3 value configuration (default connected to Drv APC-A W3src).								
N03.24	**Dig DrvAPCA W4**	**N/A**	**RWS**	**0.00**	**- -**	**PV**	**V-F-S-B**	**Full**	**4144**
	Internal Asynchronous Word 4 value configuration (default connected to Drv APC-A W4src).								
N03.25	**Dig DrvAPCA W5**	**N/A**	**RWS**	**0.00**	**- -**	**PV**	**V-F-S-B**	**Full**	**4145**
	Internal Asynchronous Word 5 value configuration (default connected to Drv DGFC-A W5src).								
N03.26	**Dig DrvAPCA W6**	**N/A**	**RWS**	**0.00**	**- -**	**PV**	**V-F-S-B**	**Full**	**4146**
	Internal Asynchronous Word 6 value configuration (default connected to Drv APC-A W6src).								
N03.27	**Dig DrvAPCA W7**	**N/A**	**RWS**	**0.00**	**- -**	**PV**	**V-F-S-B**	**Full**	**4147**
	Internal Asynchronous Word 7 value configuration (default connected to Drv APC-A W7src).								
N03.28	**Dig DrvAPCA W8**	**N/A**	**RWS**	**0.00**	**- -**	**PV**	**V-F-S-B**	**Full**	**4148**
	Internal Asynchronous Word 8 value configuration (default connected to Drv APC-A W8src).								
N03.29	**Dig DrvAPCA W9**	**N/A**	**RWS**	**0.00**	**- -**	**PV**	**V-F-S-B**	**Full**	**4149**
	Internal Asynchronous Word 9 value configuration (default connected to Drv APC-A W9src).								

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
N03.40	**Drv APC-A W0mon**	**N/A**	**R**	**0.00**	**- -**	**PP**	**V-F-S-B**	**Full**	**4150**
	Asynchronous Word 0 monitor (from drive to APC100).								
N03.41	**Drv APC-A W1mon**	**N/A**	**R**	**0.00**	**- -**	**PP**	**V-F-S-B**	**Full**	**4151**
	Asynchronous Word 1 monitor (from drive to APC100).								
N03.42	**Drv APC-A W2mon**	**N/A**	**R**	**0.00**	**- -**	**PP**	**V-F-S-B**	**Full**	**4152**
	Asynchronous Word 2 monitor (from drive to APC100).								
N03.43	**Drv APC-A W3mon**	**N/A**	**R**	**0.00**	**- -**	**PP**	**V-F-S-B**	**Full**	**4153**
	Asynchronous Word 3 monitor (from drive to APC100).								
N03.44	**Drv APC-A W4mon**	**N/A**	**R**	**0.00**	**- -**	**PP**	**V-F-S-B**	**Full**	**4154**
	Asynchronous Word 4 monitor (from drive to APC100).								
N03.45	**Drv APC-A W5mon**	**N/A**	**R**	**0.00**	**- -**	**PP**	**V-F-S-B**	**Full**	**4155**
	Asynchronous Word 5 monitor (from drive to APC100).								
N03.46	**Drv APC-A W6mon**	**N/A**	**R**	**0.00**	**- -**	**PP**	**V-F-S-B**	**Full**	**4156**
	Asynchronous Word 6 monitor (from Drive to DGFC).								
N03.47	**Drv APC-A W7mon**	**N/A**	**R**	**0.00**	**- -**	**PP**	**V-F-S-B**	**Full**	**4157**
	Asynchronous Word 7 monitor (from drive to APC100).								
N03.48	**Drv APC-A W8mon**	**N/A**	**R**	**0.00**	**- -**	**PP**	**V-F-S-B**	**Full**	**4158**
	Asynchronous Word 8 monitor (from drive to APC100).								
N03.49	**Drv APC-A W9mon**	**N/A**	**R**	**0.00**	**- -**	**PP**	**V-F-S-B**	**Full**	**4159**
	Asynchronous Word 9 monitor (from drive to APC100).								
N04	APC CARD / APC A-Drv								
	Note! Menu accessible with Access Level = FULL								
N04.00	**APCA Drv W0m**	**N/A**	**R**	**0.00**	**- -**	**PV**	**V-F-S-B**	**Full**	**4160**
	Asynchronous Word 0 monitor (from drive to APC100).								

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
N04.01	**APCA Drv W1m**	**N/A**	**R**	**0.00**	**- -**	**PV**	**V-F-S-B**	**Full**	**4161**
	Asynchronous Word 1 monitor (from drive to APC100).								
N04.02	**APCA Drv W2m**	**N/A**	**R**	**0.00**	**- -**	**PV**	**V-F-S-B**	**Full**	**4162**
	Asynchronous Word 2 monitor (from drive to APC100).								
N04.03	**APCA Drv W3m**	**N/A**	**R**	**0.00**	**- -**	**PV**	**V-F-S-B**	**Full**	**4163**
	Asynchronous Word 3 monitor (from drive to APC100).								
N04.04	**APCA Drv W4m**	**N/A**	**R**	**0.00**	**- -**	**PV**	**V-F-S-B**	**Full**	**4164**
	Asynchronous Word 4 monitor (from drive to APC100).								
N04.05	**APCA Drv W5m**	**N/A**	**R**	**0.00**	**- -**	**PV**	**V-F-S-B**	**Full**	**4165**
	Asynchronous Word 5 monitor (from drive to APC100).								
N04.06	**APCA Drv W6m**	**N/A**	**R**	**0.00**	**- -**	**PV**	**V-F-S-B**	**Full**	**4166**
	Asynchronous Word 6 monitor (from drive to APC100).								
N04.07	**APCA Drv W7m**	**N/A**	**R**	**0.00**	**- -**	**PV**	**V-F-S-B**	**Full**	**4167**
	Asynchronous Word 7 monitor (from drive to APC100).								
N04.08	**APCA Drv W8m**	**N/A**	**R**	**0.00**	**- -**	**PV**	**V-F-S-B**	**Full**	**4168**
	Asynchronous Word 8 monitor (from drive to APC100).								
N04.09	**APCA Drv W9m**	**N/A**	**R**	**0.00**	**- -**	**PV**	**V-F-S-B**	**Full**	**4169**
	Asynchronous Word 9 monitor (from drive to APC100).								

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa

O APPL CFG

The PID control is a free standing generic regulator inside the drive software.
It has the flexibility to tie the regulation of any process variable to drive speed or torque control, internal to the drive. Common applications of PID regulation are:

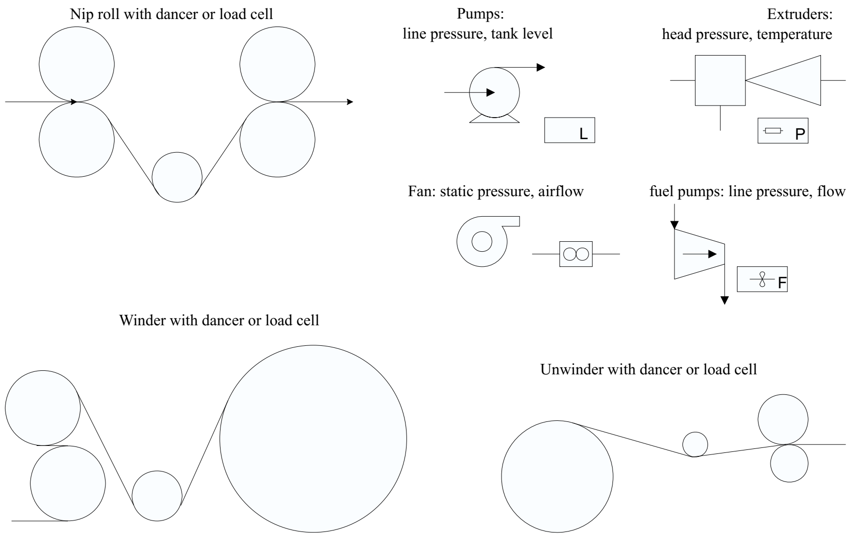


Figure O00*: Common applications of PID regulation*

Parameters for the PID feature are found under the **APPL CFG** menu.

NOTE! The PID function cannot be used at the same time as the Power Loss control feature.

The PID application examples fall under two categories:

1. **Process control**
   The process regulator is dynamic straightforward adjustment of the speed or torque setpoint of the drive to maintain the pressure, position, flow, temperature, etc.as needed by the process. Examples follow in this section.

2. **Winder & Unwinder control**
   The process regulator serves to scale a linespeed reference to account for material build up/ build down, proportional to the material diameter change.

- The PID control allows the preset of the PID starting point for unwinding/ winding rolls of varying sizes.
  The diameter calculator feature, is a command to use the motor rotation and

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa

dancer position change to calculate material diameter before running the drive. This is a diameter preset feature without the need for external diameter sensing devices.

- The PID control provides the flexibility to reset the PID starting point for winding from the same starting size (empty core, mandrel, etc).
- Overwind/Underwind control is provided by detecting the direction of speed reference and inverting the PID correction automatically.
- A diameter hold , using PID enable, can be commanded when transient conditions are known to disrupt the PID regulator, or the feedback is suspected to be incorrect. An example of this would be on a web break, where a dancer or load cell would lose contact with the material.
- Regulator gains can be programmed to be dependant on speed, drive variables, or other external means. This is important to account for varying torque requirements at a speed point where the roll may have no material buildup or a lot of material inertia.
- The PI and PD parts of the PID regulator are capable of being separately enabled.
  Examples follow in this section.

NOTE! **For PID application examples refer to chapter 7.5.**

O00 PID enable

NOTE! Menu accessible with Access Level = FULL

Index	Parameter Name	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
O00.00	**PID enable**	**N/A**	**RWSZ**	**0**	**0/1**	**DV**	**V-F-S-B**	**Full**	**7201**

The function enables the running of the different blocks connected to the PID function:

[0] Disabled
[1] Enabled

Index	MENU Parameter Name Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa

APPL CFG / PID Feed-Forward

Note! Menu accessible with Access Level = FULL

The block function allows to state, if required, the Feed-Forward signal. The **O01.00 - PID inp FF src** selects the reference signal origin on the block input. The feed-forward gain factor is stated via **O01.11 - PID inp FF gain**.
It is possible to select on the source an internal reference signal; such value is defined by **O01.10 - Dig PID inp FF**.

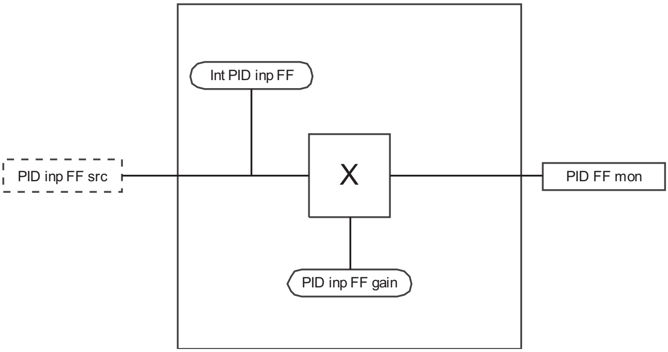


Figure O01: Feed-Forward block

O01	APPL CFG / PID F-F								
O01.00	**PID inp FF src**	**N/A**	**RWS**	**Ipa7211**	**PList 31**	**PIN**	**V-F-S-B**	**Full**	**7210**
	Ipa 7211 - Dig PID inp FF = Default Definition of the feed-forward signal source. **Pick List 31**								
O01.10	**Dig PID inp FF**	**[%]**	**RWS**	**0.00**	**-200/200**	**PV**	**V-F-S-B**	**Full**	**7211**
	Feed-forward internal digital reference.								
O01.11	**PID inp FF gain**	**NULL**	**RWS**	**1.00**	**-16/16**	**PV**	**V-F-S-B**	**Full**	**7212**
	Gain on the feed-forward signal.								
O01.20	**PID inp FF mon**	**[%]**	**R**	**0.00**	**-200/200**	**PP**	**V-F-S-B**	**Full**	**7216**
	Monitor for the feed-forward input value.								
O01.21	**PID FF mon**	**[%]**	**R**	**0.00**	**-200/200**	**PP**	**V-F-S-B**	**Full**	**7217**
	Monitor for the feed-forward output value.								

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa

APPL CFG / PID input

The block calculates the error value of the PID block. Two input references are selected via an internal selector.
On the selected reference it is possible to set a Ramp and to add an additional reference, Pid Draw.
It is also possible to limit the output error value at the machine start and to select a command for the reaction of the PID section.
The **O02.02 - PID set 0 src** and **O02.03 - PID set 1 src** sources select the signal origin of the two input references:
O02.04 - PID seloff 0 src selects the command of the internal selector, **O02.01 - PID draw src** selects the additional reference signal and **O02.00 - PID fbk src** selects the reaction command of the PID section.
In the configurations it is possible to set the variable internal values, with **O02.14 - PID gain draw** to adapt the error gain, with **O02.15 - PID acc time** and **O02.16 - PID dec time** to set the reference ramp and with **O02.18 - PID clamp top** and **O02.17 - PID clamp bot** to set the upper and lower limit (see "Dynamic clamp function" description below).

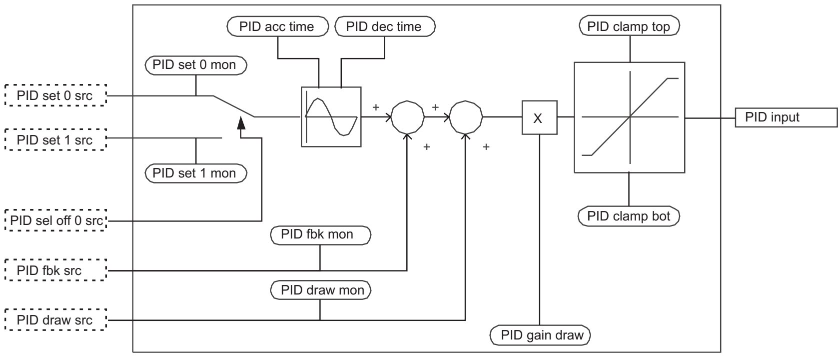


Figure O02: PID Input Block

O02 APPL CFG / PID input

Note! Menu accessible with Access Level = FULL.

Index	Parameter Name	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
O02.00	**PID fbk src**	**N/A**	**RWS**	**Ipa7230**	**PList 32**	**PIN**	**V-F-S-B**	**Full**	**7220**

Ipa 7230 - Int PID fbk = Default

Source selection of the PID section reaction.

Pick List 32

Index	Parameter Name	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
O02.01	**PID draw src**	**N/A**	**RWS**	**Ipa7231**	**PList 33**	**PIN**	**V-F-S-B**	**Full**	**7221**

Ipa 7231 - Int PID draw = Default

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
	Source selection of the Draw (tension) reference. Pick List 33								
002.02	**PID set 0 src** Ipa 7232 - Dig PID set 0 = Default Setpoint 0 (reference) source selection. Pick List 34	**N/A**	**RWS**	**Ipa7232**	**PList 34**	**PIN**	**V-F-S-B**	**Full**	**7222**
002.03	**PID set 1 src** Ipa 7233 - Dig PID set 1 = Default Setpoint 1 (reference) source selection. Pick List 35	**N/A**	**RWS**	**Ipa7233**	**PList 35**	**PIN**	**V-F-S-B**	**Full**	**7223**
002.04	**PID seloff 0 src** Ipa 4000 - NULL = Default. Source selection of the Setpoint selector. Pick List 3	**N/A**	**RWS**	**Ipa4000**	**PList 3**	**PIN**	**V-F-S-B**	**Full**	**7226**
002.10	**Dig PID fbk** Internal digital value of the PID section reaction.	**[%]**	**RWS**	**0.00**	**-200/200**	**PV**	**V-F-S-B**	**Full**	**7230**
002.11	**Dig PID draw** PID Draw digital internal value.	**[%]**	**RWS**	**0.00**	**-200/200**	**PV**	**V-F-S-B**	**Full**	**7231**
002.12	**Dig PID set 0** Digital Setpoint 0 internal value.	**[%]**	**RWS**	**0.00**	**-200/200**	**PV**	**V-F-S-B**	**Full**	**7232**
002.13	**Dig PID set 1** Digital Setpoint 1 internal value.	**[%]**	**RWS**	**0.00**	**-200/200**	**PV**	**V-F-S-B**	**Full**	**7233**
002.14	**PID gain draw** Digital value of the Setpoint adapting gain (feedback).	**NULL**	**RWS**	**1.00**	**-16/16**	**PV**	**V-F-S-B**	**Full**	**7236**

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
002.15	**PID acc time**	**[sec]**	**RWS**	**1.00**	**Calc/900**	**PP**	**V-F-S-B**	**Full**	**7237**
	Acceleration time from 0 to 16384 counts (Normalized internal value).								
002.16	**PID dec time**	**[sec]**	**RWS**	**1.00**	**Calc/900**	**PP**	**V-F-S-B**	**Full**	**7238**
	Deceleration time from 0 to 16384 counts (Normalized internal value).								
002.17	**PID clamp bot**	**[%]**	**RWS**	**-200**	**-200/200**	**PV**	**V-F-S-B**	**Full**	**7239**
	Lower clamp value (see dynamic clamp).								
002.18	**PID clamp top**	**[%]**	**RWS**	**200**	**-200/200**	**PV**	**V-F-S-B**	**Full**	**7240**
	Upper clamp value (see dynamic clamp).								
002.20	**PID fbk mon**	**[%]**	**R**	**0.00**	**-200/200**	**PP**	**V-F-S-B**	**Full**	**7250**
	Monitor for the feedback value (reaction)								
002.21	**PID draw mon**	**[%]**	**R**	**0.00**	**-200/200**	**PP**	**V-F-S-B**	**Full**	**7251**
	Monitor for the active Draw value.								
002.22	**PID set 0 mon**	**[%]**	**R**	**0.00**	**-200/200**	**PP**	**V-F-S-B**	**Full**	**7252**
	Monitor for the digital Setpoint 0 value.								
002.23	**PID set 1 mon**	**[%]**	**R**	**0.00**	**-200/200**	**PP**	**V-F-S-B**	**Full**	**7253**
	Monitor for the digital Setpoint 1 value.								
002.24	**PID input**	**[%]**	**R**	**0.00**	**-200/200**	**PV**	**V-F-S-B**	**Full**	**7256**
	Monitor for the block output value.								

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa

APPL CFG / PID input

Dynamic clamp function

The Clamp value is active only till the error value becomes lower then the set Clamp range. The function is useful, for example, during starting with dancer which is completely sealed. In this case, the limiting of the maximum error limits the system reaction speed thus allowing a dancer smooth positioning.
After positioning the dancer, the Clamp stops being active allowing a normal system control.

APPL CFG / PI control

The function of this block is performed by three strictly combined different blocks. In order to obtain a better working homogeneity, they have been grouped into the same menu. The three Blocks are:

- **PI control block**
  By starting from the line speed reference it states the error sign for the PI Block. It allows to invert the line direction without performing any operation, controls the signals for the temporary gain increase at the starting and controls the Integral section block.
- **PI Gain scheduler**
  It allows to adapt the PI section gains according, for example, to the coil Diameter.
- **PI section**
  It is the Block where the PI regulator is performed. The feature of this regulator is a signal on the output oscillating between two values (Top and Bottom) which can be set. The output is multiplied by the Feed Forward value.
  In case of winders/unwinders, as stated before, the Top limit and Bot limit (Clamp) values are set in order to let this output represent the Minimum_Ray/ Present_Ray ratio.

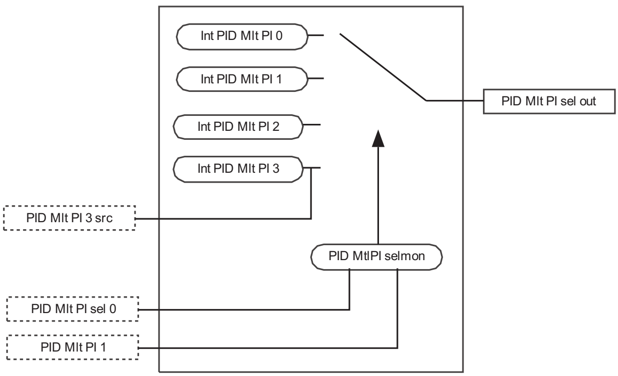


***Figure O03-1**: PI Control block*

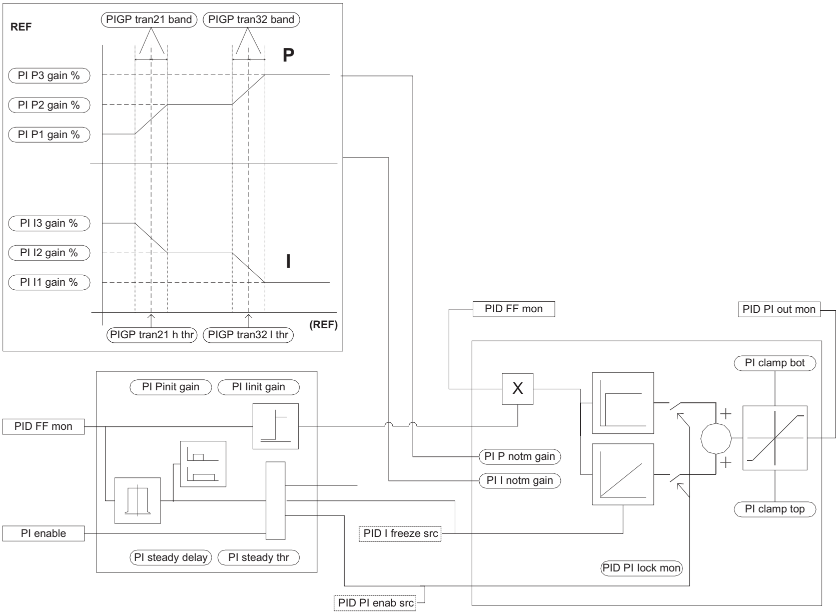


***Figure O03-2**: PI Control block*

The **O03.00 - PID PI enab src** and **O03.01 - PID I freeze src** sources allow to select the origin of the enabling signals (enable/disable) of the PI function and of the freezing signals of the regulator Integral section.
O03.02 - PIGP ref src selects the input signal of the gain Adaptive; the block function allows to set a three-segment Profile. In the Block it is possible to select, via an internal selector, three starting multiplication values: **O03.30 - Dig PID Mtl PI 1**, **O03.31 - Dig PID Mtl PI 2**, **O03.32 - Dig PID Mtl PI 3**, internal values which can be set in the configurations.
The **O03.12 - PID Mtl PI 3 src** source connects standard the value of **O03.32 - Dig PID Mtl PI 3**. **O03.10 - PID Mtl PI sel 0** and **O03.11 - PID Mtl PI sel 1** are the sources selecting the command signals of the internal selector. According to their condition, it is possible to state a combination determining the equivalent output factor.
The following table lists the factors corresponding to each different combination:

PID Mtl PI sel 1	PID Mtl PI sel 0		PID Mtl PI sel mon
0	0	0	*
0	1	1	Dig PID Mtl PI 1
1	0	2	Dig PID Mtl PI 2
1	1	3	**

Tab par O03

* : The last value calculated by the integral component is stoeed
: The factor connected to the **PID Mlt PI 3 src is ACTIVE

***Table O03**: Output factor combination*

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
003	APPL CFG / PI ctrl								
	Note! Menu accessible with Access Level = FULL.								
003.00	**PID PI enab src**	**N/A**	**RWS**	**Ipa4000**	**PList 3**	**PIN**	**V-F-S-B**	**Full**	**7260**
	Ipa 4000 - NULL = Default Source of the PI section enable signal. Pick List 3								
003.01	**PID I freeze src**	**N/A**	**RWS**	**Ipa4000**	**PList 3**	**PIN**	**V-F-S-B**	**Full**	**7261**
	Ipa 4000 - NULL = Default Source of the PI section Freezing signal. Pick List 3								
003.02	**PIGP ref src**	**N/A**	**RWS**	**Ipa7281**	**PList 36**	**PIN**	**V-F-S-B**	**Full**	**7280**
	Ipa 7281 - Dig PIGP ref = Default Source of the gain adaptive signal. Pick List 36								
003.10	**PID Mlt PI sel 0**	**N/A**	**RWS**	**Ipa4000**	**PList 3**	**PIN**	**V-F-S-B**	**Full**	**7320**
	Ipa 4000 - NULL = Default Source of the selector 0 signal of the starting multiplier. Pick List 3								
003.11	**PID Mlt PI sel 1**	**N/A**	**RWS**	**Ipa4000**	**PList 3**	**PIN**	**V-F-S-B**	**Full**	**7321**
	Ipa 4000 - NULL = Default Source of the selector 1 signal of the starting multiplier. Pick List 3								
003.12	**PID Mlt PI 3 src**	**N/A**	**RWS**	**Ipa7326**	**PList 38**	**PIN**	**V-F-S-B**	**Full**	**7322**
	Ipa 7326 - Dig PID Mlt PI 3 = Default Source of the multiplier 3 signal, example diameter sensor. Pick List 38								

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
003.13	**PI steady delay**	[sec]	RWS	1.00	Calc/Calc	PP	V-F-S-B	Full	7263
	Period of time, during which the P and I init gain gains are kept active after the **PI steady thr** threshold has been overcome by the **PID FF mon** reference.								
003.14	**PI steady thr**	[%]	RWS	0.00	0.00/200	PP	V-F-S-B	Full	7264
	Steady State detecting threshold value.								
003.15	**PI P1 gain %**	[%]	RWS	10	0.00/100	PP	V-F-S-B	Full	7270
	Proportional gain segment 1 value								
003.16	**PI I1 gain %**	[%]	RWS	10	0.00/100	PP	V-F-S-B	Full	7271
	Integral gain segment 1 value.								
003.17	**PI P2 gain %**	[%]	RWS	10	0.00/100	PP	V-F-S-B	Full	7272
	Proportional gain segment 2 value.								
003.18	**PI I2 gain %**	[%]	RWS	10	0.00/100	PP	V-F-S-B	Full	7273
	Integral gain segment 2 value.								
003.19	**PI P3 gain %**	[%]	RWS	10	0.00/100	PP	V-F-S-B	Full	7274
	Proportional gain segment 3 value.								
003.20	**PI I3 gain %**	[%]	RWS	10	0.00/100	PP	V-F-S-B	Full	7275
	Integral gain segment 3 value.								
003.21	**PIGP tran21 hthr**	[%]	RWS	0.00	0.00/100	PP	V-F-S-B	Full	7276
	Transition point value from segment 1 to segment 2.								
003.22	**PIGP tran32 lthr**	[%]	RWS	0.00	0.00/100	PP	V-F-S-B	Full	7277
	Transition point value from segment 2 to segment 3.								
003.23	**PIGP tran21 band**	[%]	RWS	5	0.00/100	PP	V-F-S-B	Full	7278
	Width of the transition band from 1 to 2.								
003.24	**PIGP tran32 band**	[%]	RWS	5	0.00/100	PP	V-F-S-B	Full	7279
	Width of the transition band from 2 to 3.								

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
003.25	**Dig PIGP ref** Digital reference for input signal of gain adaptive	**[%]**	**RWS**	**0.00**	**-200/200**	**PP**	**V-F-S-B**	**Full**	**7281**
003.26	**PI Pinit gain** Proportional starting gain PI section.	**[%]**	**RWS**	**10**	**0.00/100**	**PP**	**V-F-S-B**	**Full**	**7290**
003.27	**PI Iinit gain** Integral starting gain PI section.	**[%]**	**RWS**	**10**	**0.00/100**	**PP**	**V-F-S-B**	**Full**	**7291**
003.28	**PI clamp top** PI upper conversion value.	**NULL**	**RWS**	**1.00**	**-16/16**	**PP**	**V-F-S-B**	**Full**	**7292**
003.29	**PI clamp bot** PI lower conversion value.	**NULL**	**RWS**	**-1.00**	**-16/16**	**PP**	**V-F-S-B**	**Full**	**7293**
003.30	**Dig PID Mlt PI 1** Digital value of the Multiplier 1.	**NULL**	**RWS**	**0.00**	**-16/16**	**PP**	**V-F-S-B**	**Full**	**7324**
003.31	**Dig PID Mlt PI 2** Digital value of the Multiplier 2.	**NULL**	**RWS**	**0.00**	**-16/16**	**PP**	**V-F-S-B**	**Full**	**7325**
003.32	**Dig PID Mlt PI 3** Digital value of the Multiplier 3.	**NULL**	**RWS**	**0.00**	**-16/16**	**PP**	**V-F-S-B**	**Full**	**7326**
003.40	**PID PI lock mon** Monitor lock PI section: 0 = Unlack 1 = Lack	**N/A**	**R**	**0**	**0/1**	**DV**	**V-F-S-B**	**Full**	**7265**
003.41	**PIGP ref mon** Reference monitor of the gain adaptive.	**[%]**	**R**	**0.00**	**-200/200**	**PP**	**V-F-S-B**	**Full**	**7282**
003.42	**PI Pnorm gain** Proportional PI gain normalized.	**[%]**	**R**	**0.00**	**0.00/100**	**PP**	**V-F-S-B**	**Full**	**7283**
003.43	**PI Inorm gain** Integral PI gain normalized.	**[%]**	**R**	**0.00**	**0.00/100**	**PP**	**V-F-S-B**	**Full**	**7284**

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
003.44	**PID PI out** Monitor of the PID PI block output.	**NULL**	**R**	**0.00**	**-16/16**	**PV**	**V-F-S-B**	**Full**	**7294**
003.45	**PID Mlt PI 0 mon** Monitor of the multiplier 0 value.	**NULL**	**R**	**0.00**	**-16/16**	**PP**	**V-F-S-B**	**Full**	**7327**
003.46	**PID Mlt PI 3 mon** Monitor of the multiplier 3 value.	**NULL**	**R**	**0.00**	**-16/16**	**PP**	**V-F-S-B**	**Full**	**7328**
003.47	**PID MltPI selmon** Monitor of the selected multiplier..	**N/A**	**R**	**0**	**0/3**	**DV**	**V-F-S-B**	**Full**	**7329**

Index	MENU Parameter Name Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa

APPL CFG / PI control

Setting of the Starting Diameter

By selecting **O03.47 - PID MltPI sel mon** = 0, when the PI block is disabled (**O03.00 - PID PI enab src** = 0), the last value of the calculated integral component is kept into memory. Such integral component is displayed in **O03.44 - PID PI out** (it corresponds to the winder diameter).

When the block is enabled again, the regulation starts from the calculated value.

The same function is foreseen also in case the drive stops.

This operative method can be used, when, by controlling, for example, a winder, it is necessary to stop the machine, to disable the drive or to disconnect the switchboard.

By selecting **O03.47 - PID MltPI selmon** = 1-2-3, when the **PI block** is disabled, the value of the **O03.44 - PID PI out** output is the same as the one of the set parameter.

When the Drive is stopped and then started again, the previously stated value is automatically reset only if , during the power supply, the digital input, set as **O03.00 - PID PI enab src**, is already at a high level.

APPL CFG / PI control

Gain Increase at the Starting

When **O01.21 - PID FF mon** is lower than **O03.14 - PI steady thr**, the integral regulation is frozen and the proportional gain gets the value set in **O03.26 - PI Pinit gain**.

When **O01.21 - PID FF mon** overcomes the threshold, the integral regulation is enabled with the gain set in **O03.27 - PI Iinit gain**.

The PI block keeps the **O03.26 - PI Pinit gain** and **O03.27 - PI Iinit gain** gains for the time set via **O03.13 - PI steady delay**. After this time, the gain values are brought respectively to those generated by the gain adaptive.

APPL CFG / PI control

PI Clamp Top and Bottom Setting

As previously stated, **O03.44 - PID PI out** is used as a multiplicative factor of the feed-forward in order to obtain the motor angular speed reference; in case the PID function is used to control a winder/unwinder, its value is inversely proportional to the winder diameter.

By winding with a constant peripheral speed, it is possible to write that:

$\varpi_0\phi_0 = \varpi_1\phi_1$ where:

ϖ_0 = angular speed with a minimum diameter

ϕ_0 = minimum diameter

ϖ_1 = angular speed with the present diameter

ϕ_1 = present diameter

$\varpi_1 = \varpi_0 \times (\phi_0 / \phi_1)$

By tuning the drive properly, ϖ_0 corresponds to a wrong feed-forward, therefore **O03.44 - PID PI out** depends on (ϕ_0 / ϕ_1). It is possible to write that: **O03.44 - PID PI out** = (ϕ_0 / ϕ_1)

This formula can be used to check the right tuning execution when the system is active or during the procedure for the calculation of the starting diameter.

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa

APPL CFG / PDcontrol

This block performs the Proportional Derivative regulation. The PD block has on the input the PID Input value (output value of the PID Input block), which usually states an error. The output of the block is added to the other corrections in the PID output block.
The **O04.00 - PID PD enab src** source allows to enable the PD function. The gains can be adjusted according to the variable selected on the **O04.01 - PDGP ref src** source.
The Block allows to set a Profile on three segments.

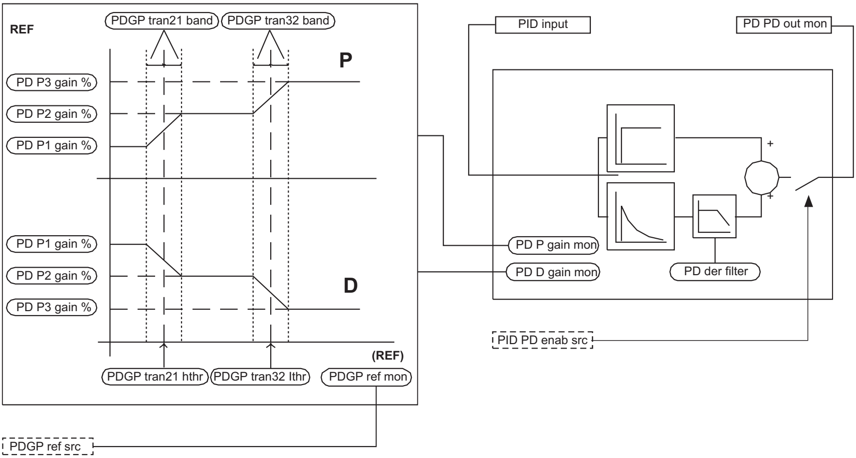


Figure O04: *PD control block*

O04 APPL CFG / PD ctrl

Note! Menu accessible with Access Level = FULL

Index	Parameter Name	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
004.00	**PID PD enab src**	**N/A**	**RWS**	**Ipa4000**	**PList 3**	**PIN**	**V-F-S-B**	**Full**	**7340**

Ipa 4000 - NULL = Default

It allows to enable the PID PD (Proportional Derivative) part.

Pick List 3

Index	Parameter Name	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
004.01	**PDGP ref src**	**N/A**	**RWS**	**Ipa7311**	**PList 37**	**PIN**	**V-F-S-B**	**Full**	**7310**

Ipa 7311 - Int PDGP ref = Default

It allows to select the origin signal of gain adjusting, according to the variable selected on the **PDGP ref src**.

Pick List 37

Index	MENU Parameter Name Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
004.10	**PD P1 gain %**	[%]	RWS	10	0.00/100	PP	V-F-S-B	Full	7300
	PD Proportional 1 gain segment.								
004.11	**PD D1 gain %**	[%]	RWS	10	0.00/100	PP	V-F-S-B	Full	7301
	PD Derivative 1 gain segment.								
004.12	**PD P2 gain %**	[%]	RWS	10	0.00/100	PP	V-F-S-B	Full	7302
	PD Proportional 2 gain segment.								
004.13	**PD D2 gain %**	[%]	RWS	10	0.00/100	PP	V-F-S-B	Full	7303
	PD Derivative 2 gain segment.								
004.14	**PD P3 gain %**	[%]	RWS	10	0.00/100	PP	V-F-S-B	Full	7304
	PD Proportional 3 gain segment.								
004.15	**PD D3 gain %**	[%]	RWS	10	0.00/100	PP	V-F-S-B	Full	7305
	PD Derivative 3 gain segment.								
004.16	**PDGP tran21 hthr**	[%]	RWS	0.00	0.00/100	PP	V-F-S-B	Full	7306
	Segment transition point from 1 to 2.								
004.17	**PDGP tran32 lthr**	[%]	RWS	0.00	0.00/100	PP	V-F-S-B	Full	7307
	Segment transition point from 2 to 3.								
004.18	**PDGP tran21 band**	[%]	RWS	5	0.00/100	PP	V-F-S-B	Full	7308
	Width of the transition band from 1 to 2.								
004.19	**PDGP tran32 band**	[%]	RWS	5	0.00/100	PP	V-F-S-B	Full	7309
	Width of the transition band from 2 to 3.								
004.20	**Dig PDGP ref**	[%]	RWS	0.00	-200/200	PP	V-F-S-B	Full	7311
	Digital internal value od Adaptive signal.								
004.21	**PD der filter**	[ms]	RWS	5	Calc/Calc	PP	V-F-S-B	Full	7342
	PD derivative filter.								

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
004.30	**PID PD out** Monitor of the PID PD block output.	**[%]**	**R**	**0.00**	**-200/200**	**PV**	**V-F-S-B**	**Full**	**7343**
004.31	**PD P gain mon** Monitor for the Proportional gain in use.	**[%]**	**R**	**0.00**	**0/100**	**PV**	**V-F-S-B**	**Full**	**7312**
004.32	**PD D gain mon** Monitor for the Derivative gain in use.	**[%]**	**R**	**0.00**	**0/100**	**PV**	**V-F-S-B**	**Full**	**7313**
004.33	**PDGP ref mon** Value of the present adaptive signal.	**[%]**	**R**	**0.00**	**-200/200**	**PP**	**V-F-S-B**	**Full**	**7314**

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa

APPL CFG / PIDoutput

This Block gathers the following signals:

- Feed forward
- PI block output
- PD block output

As stated before, the FeedForward signal is multiplied by the PI block output.
It is possible to obtain different effects according to this signal configuration.
The signal of the PD Block, on the contrary, is subtracted. In the block configurations it is possible to select the output as Bipolar or Multipolar (only for positive values) via an internal selector. On the block output it is possible to find a direct output, PID out, and an output with a configurable gain, PID outs.

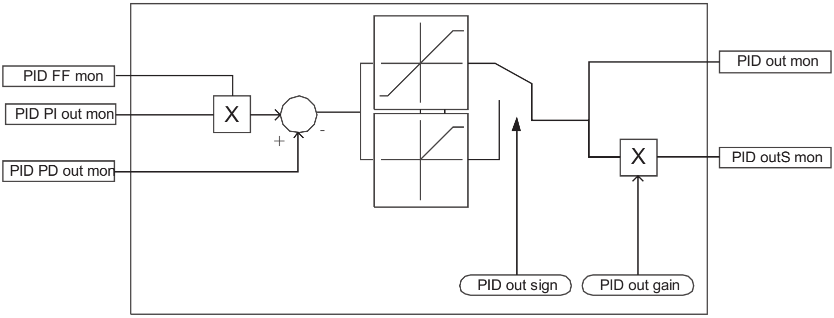


Figure O05: *PID Output block*

O05 APPL CFG / PIDoutput

Note! Menu accessible with Access Level = FULL.

Index	Parameter Name	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
O05.00	**PID out sign**	**N/A**	**RWS**	**0**	**0/1**	**DP**	**V-F-S-B**	**Full**	**7350**
	PID output signal selection: [0] Bipolar [1] Unipolar pos								
O05.01	**PID out gain**	**NULL**	**RWS**	**1.00**	**-16/16**	**PV**	**V-F-S-B**	**Full**	**7351**
	Scale factor output gain of PID output signal.								
O05.02	**PID out mon**	**[%]**	**R**	**0.00**	**-200/200**	**PV**	**V-F-S-B**	**Full**	**7352**
	Direct output displaying.								
O05.03	**PID outS mon**	**[%]**	**R**	**0.00**	**-200/200**	**PV**	**V-F-S-B**	**Full**	**7353**
	Displaying of an output with a scale factor (gain setting).								

APPL CFG / Diameter Calculation

This Function allows to perform a preliminary calculation of a coil diameter before starting the line. It allows to avoid undesired mechanical sealings of the dancer.
The calculation is based on the moving of the dancer from the lower limit switch position to a central position as compared to the winder angular moving during the initial phase.
The function is only available with a dancer reaction.
The calculation result initializes the PI block output.

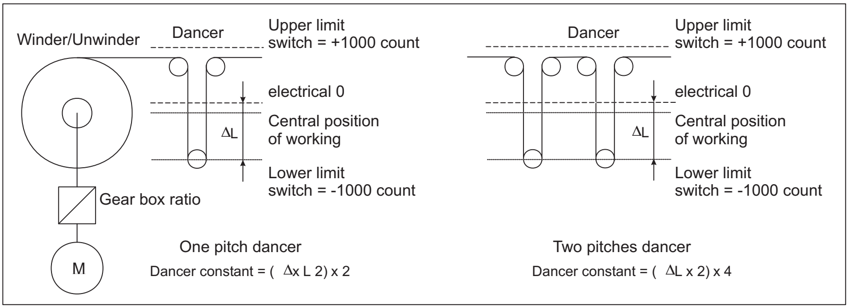


Figure O06: *Diameter Calculation*

Dancer Constant Measurement

With the dancer placed in a lower limit switch position, perform the self-tuning of the analog input connected to **O02.00 - PID fbk src**.
Set the drive keypad on the **O02.20 - PID fbk mon** parameter. Measure and multiply by 2 the distance in mm between the lower mechanical limit switch and the dancer position, where the **O02.20 - PID fbk mon** parameter has a 0 value (electric 0 position).
Multiply the calculated value by 2 if the dancer is made of a single pitch, by 4 if it is made of two pitches etc. etc. as per the above figure.

Calculation of the Starting Diameter

Such calculation is based on the measurement of the dancer moving from its lower limit switch position to its central working position, and on the measurement of the winder angular moving during the initial phase.
For this reason during such period the dragging at the unwinder end or at the winder beginning must be in a position to keep the material blocked.
To this purpose it is necessary to enable the dragging drive regulation with a speed reference = 0.

If also the line nip rolls are controlled by dancers or loading cells, it is necessary to carry out first the diameter calculation with the following winder and unwinder initial phase and afterwards the dragging initial phase.
The **O03.47 - PID MIpPI selmon** parameter must always be equal to 0 in order to avoid that **O03.44 - PID PI out** is set with a predefined value.

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa

By setting the source of **O06.05 - DiaClc start src** to one and if the Drive is enabled, the procedure is started.
During this phase the parameters and the PI and PD regulators are disabled.
The regulation checks the signal coming from the dancer potentiometer.

If this value is higher than the one set in Max deviation, the motor starts rotating with the speed reference set in Positioning spd in order to wind the material on the winder and to bring the dancer into its central working position.

If the regulation checks that the signal coming from the dancer potentiometer is lower than the value set in Max deviation, the motor starts rotating with the speed reference set in Positioning spd in order to unwind the material and to bring the dancer to the point identified by Max deviation.
At this point the reference is inverted till bringing the dancer in its central working position.

When the dancer has reached its central position, the **O03.44 - PID PI out** parameter is initialized with the value of the measured diameter.
The **Diacalc active** variable brings to a high logic level the **Diam Calc act** digital output, stating the end of the diameter calculation phase.
Now, if the PI and/or PD blocks are enabled, the system reaches automatically the regulation mode.
To this purpose the digital inputs programmed as *DiaClc start* for the PI and PD enable are brought simultaneously to a high logic level.
The Diacalc active output signal can be used to reset the *DiaClc start* command (such command is activated on the climbing leading edge of the digital input; for this reason it has to be brought to a high level after power supplying the Drive regulation section and it has to be reset when the starting calculation phase is over).
The value of **O03.44 - PID PI out** is calculated via the following formula:

PID PI out = (Minimum diameter x **PI clamp top**) / value of the calculated diameter

The **O03.28 - PI clamp top** and **O03.28 - PI clamp bot** parameters of the PI controls menu have to be set according to the maximum and minimum winder diameter.

O06 APPL CFG / DiamCalc

Note! Menu accessible with Access Level = FULL.

Index	Parameter Name	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
O06.00	**Max deviation**	**[%]**	**RWS**	**90**	**-200/200**	**PP**	**V-F-S-B**	**Full**	**7360**
	Position of maximum mechanical sealing for the dancer.								
O06.01	**Positioning spd**	**[%]**	**RWS**	**0.00**	**-200/200**	**PP**	**V-F-S-B**	**Full**	**7361**
	Positioning speed.								
O06.02	**Gear box ratio**	**NULL**	**RWS**	**1.00**	**0.001/1.00**	**FK**	**V-F-S-B**	**Full**	**7362**
	Reduction ratio between motor and winder (<=1).								

Index	MENU Parameter Name Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
006.03	**Dancer constant** Measurement of the total material accumulation.	[mm]	RWS	1.00	1.0/10000	FK	V-F-S-B	Full	7363
006.04	**Minimum diameter** Value of the winder minimum diameter.	[mm]	RWS	1.00	1.0/2000	FK	V-F-S-B	Full	7364
006.05	**DiaClc start src** Ipa 4000 - NULL = Default Source of the start Diameter Calculation command. Pick List 3	N/A	RWS	Ipa4000	PList 3	PIN	V-F-S-B	Full	7402
C06.06	**Diameter calc**	Start ?						Full	
006.10	**Diameter** Calculated diameter.	[mm]	RW	1.00	1.00/2000	FK	V-F-S-B	Full	7365
006.11	**Diacal PI out** PI initialization value.	NULL	RW	1.00	-16/16	PP	V-F-S-B	Full	7366
006.12	**DCDelta error** Dancer movement.	[cnt]	R	0.00	0.00/...	PP	V-F-S-B	Full	7370
006.13	**DCDelta pos** Winder movement (encoder pulses).	NULL	R	0.00	0.00/...	PP	V-F-S-B	Full	7371

P CUSTOM

CUSTOM / Compare 1 & 2

The Block supplies two signal Comparators, **Compare 1** and **Compare 2**, with the same features. Each Comparator is in a position to compare two or three input signals (INP0, INP1, INP2). They both have 3 sources, **Cmp x inp 0 src, Cmp x inp 1 src** and **Cmp x inp 2 src**, through which it is possible to select, on the input, the origin of the signals to be compared (“x “ stays for 1 or 2).

Each source is standard connected to an internal variable: **Cmp x inp 0, Cmp x inp 1** and **Cmp x inp 2**, which can be set with a count value in the configurations, where, through **Cmp x function** it is possible to select the comparison to be performed.
Some comparisons allow to set via **Cmp x window** a window, in count, stating an acceptable range among the signals.

Example:
INP0 and INP1 have to be compared as
INP0 = INP1
INP0 = +1000count
INP1 = +1000count
Window = 100count

in this case the equality is true for a maximum overall variation of INP1 between 1100 and 900 counts.

Possible variations:

None	none
I0 == I1	INP0-window ≤ INP1 ≤ INP0+window
I0 != I1	INP1 lower INP0-window, or, INP1 higher INP0+window
I0 < I1	INP0 lower INP1
I0 > I1	INP0 higher INP1
I0 < I1 < I2	INP0<INP1<INP2 (INP1 included between..)
|I0| == |I1|	|INP0| -window ≤ |INP1| ≤ |INP0| +window
|I0| != |I1|	|INP1| lower |INP0| -window, or |INP1| higher |INP0| +window
|I0| < |I1|	|INP0| lower |INP1|
|I0| > |I1|	|INP0| higher |INP1|
|I0| < |I1| < |I2|	|INP0| < |INP1| < |INP2| (|INP1| included between....)

Tab par P00

|INPx| : signal module.

In the configurations it is also possible to set: with **Cmp x delay** a delay in seconds on the comparison transition;with **Cmp x inversion** an inversion of the signal state.
The monitor function displays via **Compare x out** the state of the chosen function:
- if Compare function is TRUE the output is 1
- if Compare function is FALSE the output is 0

<table>
<tr><th>Index</th><th>MENU
Parameter Name
Description</th><th>[Unit]</th><th>Access</th><th>Default</th><th>Min/Max</th><th>Format</th><th>Reg.Mode</th><th>Level</th><th>Ipa</th></tr>
<tr><td colspan="10">P00 CUSTOM / Compare 1</td></tr>
<tr><td></td><td colspan="9">Note! Menu accessible with Access Level = FULL.</td></tr>
<tr><td>P00.00</td><td>Cmp 1 inp 0 src</td><td>N/A</td><td>RWS</td><td>Ipa6041</td><td>PList 5</td><td>PIN</td><td>V-F-S-B</td><td>Full</td><td>6049</td></tr>
<tr><td></td><td colspan="9">Ipa 6041 - Cmp 1 inp 0 = Default
It allows to select the origin of the input signal 0 to be compared of the Compare 1 block.
Pick List 5</td></tr>
<tr><td>P00.01</td><td>Cmp 1 inp 1 src</td><td>N/A</td><td>RWS</td><td>Ipa6042</td><td>PList 5</td><td>PIN</td><td>V-F-S-B</td><td>Full</td><td>6050</td></tr>
<tr><td></td><td colspan="9">Ipa 6042 - Cmp 1 inp 1 = Default
It allows to select the origin of the input signal 1 to be compared of the Compare 1 block.
Pick List 5</td></tr>
<tr><td>P00.02</td><td>Cmp 1 inp 2 src</td><td>N/A</td><td>RWS</td><td>Ipa6043</td><td>PList 5</td><td>PIN</td><td>V-F-S-B</td><td>Full</td><td>6051</td></tr>
<tr><td></td><td colspan="9">Ipa 6043 - Cmp 1 inp 2 = Default
It allows to select the origin of the input signal 2 to be compared of the Compare 1 block.
Pick List 5</td></tr>
<tr><td>P00.10</td><td>Cmp 1 inp 0</td><td>N/A</td><td>RWS</td><td>0.00</td><td>- -</td><td>PV</td><td>V-F-S-B</td><td>Full</td><td>6041</td></tr>
<tr><td></td><td colspan="9">Value of the internal input signal 0, default connected to Cmp 1 inp 0 src.</td></tr>
<tr><td>P00.11</td><td>Cmp 1 inp 1</td><td>N/A</td><td>RWS</td><td>0.00</td><td>- -</td><td>PV</td><td>V-F-S-B</td><td>Full</td><td>6042</td></tr>
<tr><td></td><td colspan="9">Value of the internal input signal 1, default connected to Cmp 1 inp 1 src.</td></tr>
<tr><td>P00.12</td><td>Cmp 1 inp 2</td><td>N/A</td><td>RWS</td><td>0.00</td><td>- -</td><td>PV</td><td>V-F-S-B</td><td>Full</td><td>6043</td></tr>
<tr><td></td><td colspan="9">Value of the internal input signal 2, default connected to Cmp 1 inp 2 src.</td></tr>
<tr><td>P00.20</td><td>Cmp 1 function</td><td>N/A</td><td>RWS</td><td>0</td><td>0/10</td><td>DP</td><td>V-F-S-B</td><td>Full</td><td>6044</td></tr>
<tr><td></td><td colspan="9">[0] None
[1] I0 == I1
[2] I0 != I1
[3] I0 < I1
[4] I0 > I1
[5] I0 < I1 < I2
[6] |I0| == |I1|
[7] |I0| != |I1|
[8] |I0| < |I1|</td></tr>
</table>

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
	[9] |I0| > |I1| [10] |I0|< |I1| <|I2|								
P00.21	**Cmp 1 window**	**[cnt]**	**RWS**	**0.00**	**0.00/-**	**PP**	**V-F-S-B**	**Full**	**6045**
	It allows to set a window stating an acceptable range among the signals of the Compare 1 block.								
P00.22	**Cmp 1 delay**	**[sec]**	**RWS**	**0.00**	**0.00/30**	**PP**	**V-F-S-B**	**Full**	**6046**
	It allows to set a delay in seconds on the comparison transition in the Compare 1 block.								
P00.23	**Cmp 1 inversion**	**N/A**	**RWS**	**0**	**0/1**	**DP**	**V-F-S-B**	**Full**	**6047**
	Set the inversion on the Compare 1 block output signal: [0] Not inverted [1] Inverted								
P00.30	**Compare 1 out**	**N/A**	**R**	**0**	**0/1**	**DV**	**V-F-S-B**	**Full**	**6048**
	It allows to monitor the state of Compare 1 block output signal. [0] FALSE [1] TRUE								
P01	CUSTOM / Compare 2								
	Note! Menu accessible with Access Level = FULL								
P01.00	**Cmp 2 inp 0 src**	**N/A**	**RWS**	**Ipa6056**	**PList 5**	**PIN**	**V-F-S-B**	**Full**	**6064**
	Ipa 6056 - Cmp 2 inp 0 = Default. It allows to select the origin of the input signal 0 to be compared of the Compare 2 block. **Pick List 5**								
P01.01	**Cmp 2 inp 1 src**	**N/A**	**RWS**	**Ipa6057**	**PList 5**	**PIN**	**V-F-S-B**	**Full**	**6065**
	Ipa 6057 - Cmp 2 inp 1 = Default It allows to select the origin of the input signal 1 to be compared of the Compare 2 block. **Pick List 5**								

<table>
<tr><th>Index</th><th>MENU
Parameter Name
Description</th><th>[Unit]</th><th>Access</th><th>Default</th><th>Min/Max</th><th>Format</th><th>Reg.Mode</th><th>Level</th><th>Ipa</th></tr>
<tr><td>P01.02</td><td>Cmp 2 inp 2 src</td><td>N/A</td><td>RWS</td><td>Ipa6058</td><td>PList 5</td><td>PIN</td><td>V-F-S-B</td><td>Full</td><td>6066</td></tr>
<tr><td></td><td colspan="9">Ipa 6058 - Cmp 2 inp 2 = Default

It allows to select the origin of the input signal 2 to be compared of the Compare 2 block.

Pick List 5</td></tr>
<tr><td>P01.10</td><td>Cmp 2 inp 0</td><td>N/A</td><td>RWS</td><td>0.00</td><td>- -</td><td>PV</td><td>V-F-S-B</td><td>Full</td><td>6056</td></tr>
<tr><td></td><td colspan="9">Value of the internal input signal 0, default connected to Cmp 2 inp 0 src</td></tr>
<tr><td>P01.11</td><td>Cmp 2 inp 1</td><td>N/A</td><td>RWS</td><td>0.00</td><td>- -</td><td>PV</td><td>V-F-S-B</td><td>Full</td><td>6057</td></tr>
<tr><td></td><td colspan="9">Value of the internal input signal 1, default connected to Cmp 2 inp 1 src</td></tr>
<tr><td>P01.12</td><td>Cmp 2 inp 2</td><td>N/A</td><td>RWS</td><td>0.00</td><td>- -</td><td>PV</td><td>V-F-S-B</td><td>Full</td><td>6058</td></tr>
<tr><td></td><td colspan="9">Value of the internal input signal 2, default connected to Cmp 2 inp 2 src</td></tr>
<tr><td>P01.20</td><td>Cmp 2 function</td><td>N/A</td><td>RWS</td><td>0</td><td>0/10</td><td>DP</td><td>V-F-S-B</td><td>Full</td><td>6059</td></tr>
<tr><td></td><td colspan="9">[0] None
[1] I0 == I1
[2] I0 != I1
[3] I0 < I1
[4] I0 > I1
[5] I0 < I1 < I2
[6] |I0| == |I1|
[7] |I0| != |I1|
[8] |I0| < |I1|
[9] |I0| > |I1|
[10] |I0|< |I1| <|I2|</td></tr>
<tr><td>P01.21</td><td>Cmp 2 window</td><td>[cnt]</td><td>RWS</td><td>0.00</td><td>0.00/-</td><td>PP</td><td>V-F-S-B</td><td>Full</td><td>6060</td></tr>
<tr><td></td><td colspan="9">It allows to set a window stating an acceptable range among the signals of the Compare 2 block.</td></tr>
<tr><td>P01.22</td><td>Cmp 2 delay</td><td>[sec]</td><td>RWS</td><td>0.00</td><td>0.00/30</td><td>PP</td><td>V-F-S-B</td><td>Full</td><td>6061</td></tr>
<tr><td></td><td colspan="9">It allows to set a delay in seconds on the comparison transition in the Compare 2 block</td></tr>
<tr><td>P01.23</td><td>Cmp 2 inversion</td><td>N/A</td><td>RWS</td><td>0</td><td>0/1</td><td>DP</td><td>V-F-S-B</td><td>Full</td><td>6062</td></tr>
<tr><td></td><td colspan="9">It allows to invert the Compare 2 block output signal:

[0] Not inverted
[1] Inverted</td></tr>
</table>

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
P01.30	**Compare 2 out**	**N/A**	**R**	**0**	**0/1**	**DV**	**V-F-S-B**	**Full**	**6063**
	It allows to monitor the state of Compare 2 block output signal. 0 = FALSE 1 = TRUE								
P02	CUSTOM / Pad word								
	Note! Menu accessible with Access Level = FULL The use variables, "Pads", are used for the data exchange with the option cards.								
P02.00	**Pad 0**	**N/A**	**RWS**	**0**	**- -**	**PV**	**V-F-S-B**	**Full**	**9100**
	Analog Pad 0.								
P02.01	**Pad 1**	**N/A**	**RWS**	**0**	**- -**	**PV**	**V-F-S-B**	**Full**	**9101**
	Analog Pad 1.								
P02.02	**Pad 2**	**N/A**	**RWS**	**0**	**- -**	**PV**	**V-F-S-B**	**Full**	**9102**
	Analog Pad 2.								
P02.03	**Pad 3**	**N/A**	**RWS**	**0**	**- -**	**PV**	**V-F-S-B**	**Full**	**9103**
	Analog Pad 3.								
P02.04	**Pad 4**	**N/A**	**RWS**	**0**	**- -**	**PV**	**V-F-S-B**	**Full**	**9104**
	Analog Pad 4.								
P02.05	**Pad 5**	**N/A**	**RWS**	**0**	**- -**	**PV**	**V-F-S-B**	**Full**	**9105**
	Analog Pad 5.								
P02.06	**Pad 6**	**N/A**	**RWS**	**0**	**- -**	**PV**	**V-F-S-B**	**Full**	**9106**
	Analog Pad 6.								
P02.07	**Pad 7**	**N/A**	**RWS**	**0**	**- -**	**PV**	**V-F-S-B**	**Full**	**9107**
	Analog Pad 7.								
P02.08	**Pad 8**	**N/A**	**RWS**	**0**	**- -**	**PV**	**V-F-S-B**	**Full**	**9108**
	Analog Pad 8.								

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
P02.09	**Pad 9** Analog Pad 9.	**N/A**	**RWS**	**0**	**- -**	**PV**	**V-F-S-B**	**Full**	**9109**
P02.10	**Pad 10** Analog Pad 10.	**N/A**	**RWS**	**0**	**- -**	**PV**	**V-F-S-B**	**Full**	**9110**
P02.11	**Pad 11** Analog Pad 11.	**N/A**	**RWS**	**0**	**- -**	**PV**	**V-F-S-B**	**Full**	**9111**
P02.12	**Pad 12** Analog Pad 12.	**N/A**	**RWS**	**0**	**- -**	**PV**	**V-F-S-B**	**Full**	**9112**
P02.13	**Pad 13** Analog Pad 13.	**N/A**	**RWS**	**0**	**- -**	**PV**	**V-F-S-B**	**Full**	**9113**
P02.14	**Pad 14** Analog Pad 14.	**N/A**	**RWS**	**0**	**- -**	**PV**	**V-F-S-B**	**Full**	**9114**
P02.15	**Pad 15** Analog Pad 15.	**N/A**	**RWS**	**0**	**- -**	**PV**	**V-F-S-B**	**Full**	**9115**
P03	CUSTOM / Pad bit								
	NOTE! Menu accessible with Access Level = FULL								
P03.00	**Dig pad 0** Digital Pad 0.	**N/A**	**RWS**	**0**	**0/1**	**DV**	**V-F-S-B**	**Full**	**9116**
P03.01	**Dig pad 1** Digital Pad 1.	**N/A**	**RWS**	**0**	**0/1**	**DV**	**V-F-S-B**	**Full**	**9117**
P03.02	**Dig pad 2** Digital Pad 2.	**N/A**	**RWS**	**0**	**0/1**	**DV**	**V-F-S-B**	**Full**	**9118**
P03.03	**Dig pad 3** Digital Pad 3.	**N/A**	**RWS**	**0**	**0/1**	**DV**	**V-F-S-B**	**Full**	**9119**

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
P03.04	**Dig pad 4** Digital Pad 4.	**N/A**	**RWS**	**0**	**0/1**	**DV**	**V-F-S-B**	**Full**	**9120**
P03.05	**Dig pad 5** Digital Pad 5.	**N/A**	**RWS**	**0**	**0/1**	**DV**	**V-F-S-B**	**Full**	**9121**
P03.06	**Dig pad 6** Digital Pad 6.	**N/A**	**RWS**	**0**	**0/1**	**DV**	**V-F-S-B**	**Full**	**9122**
P03.07	**Dig pad 7** Digital Pad 7.	**N/A**	**RWS**	**0**	**0/1**	**DV**	**V-F-S-B**	**Full**	**9123**
P03.08	**Dig pad 8** Digital Pad 8.	**N/A**	**RWS**	**0**	**0/1**	**DV**	**V-F-S-B**	**Full**	**9124**
P03.09	**Dig pad 9** Digital Pad 9.	**N/A**	**RWS**	**0**	**0/1**	**DV**	**V-F-S-B**	**Full**	**9125**
P03.10	**Dig pad 10** Digital Pad 10.	**N/A**	**RWS**	**0**	**0/1**	**DV**	**V-F-S-B**	**Full**	**9126**
P03.11	**Dig pad 11** Digital Pad 11.	**N/A**	**RWS**	**0**	**0/1**	**DV**	**V-F-S-B**	**Full**	**9127**
P03.12	**Dig pad 12** Digital Pad 12.	**N/A**	**RWS**	**0**	**0/1**	**DV**	**V-F-S-B**	**Full**	**9128**
P03.13	**Dig pad 13** Digital Pad 13.	**N/A**	**RWS**	**0**	**0/1**	**DV**	**V-F-S-B**	**Full**	**9129**
P03.14	**Dig pad 14** Digital Pad 14.	**N/A**	**RWS**	**0**	**0/1**	**DV**	**V-F-S-B**	**Full**	**9130**
P03.15	**Dig pad 15** Digital Pad 15.	**N/A**	**RWS**	**0**	**0/1**	**DV**	**V-F-S-B**	**Full**	**9131**

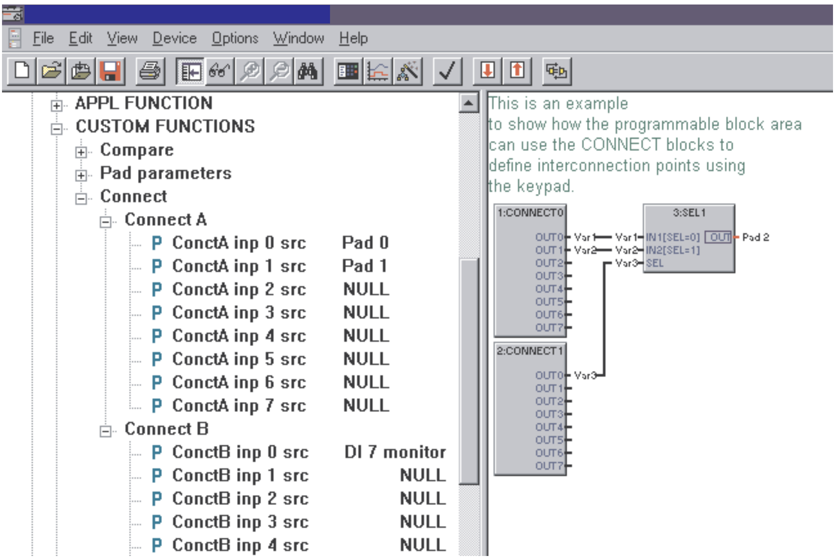
CUSTOM / Connect A & Connect B

Programmable blocks Area

Connections can be made through the Keypad. This block function connects signals to programmable block area, using drive parameters that are accessible through the PC configurator tool or drive keypad menu.

Connect A	It connects up to 7 analog input signals.
Connect B	It connects up to 7 digital signals inputs.

The figure below shows an example of connections.
The programmable block area logic selects between 2 analog values and maps the selected one to PAD 2.
The analog values come from the connect block, which in the example below, are selected as PAD 0 & PAD 1.
The Connect block allows a user to change to other PADs (or any other signal in the picklist) using the keypad or the EasyDrive. Similarly for the selector, it is mapped from the Connect B block input 0.
Connect B input 0 defines the signal for selecting to be digital input 7.
By using the connect block in the user program, the digital input can be changed to another digital input , LAN signal, APC100, or generic bit, in the field from the keypad.



Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
P04	CUSTOM / Connect A								
P04.00	**Conn A inp 0 src** Ipa 4000 - NULL = Default Analog signal selection to input 0	**N/A**	**RWS**	**Ipa4000**	**PList 2**	**PIN**	**V-F-S-B**	**Full**	**6070**
P04.01	**Conn A inp 1 src** Ipa 4000 - NULL = Default Analog signal selection to input 1.	**N/A**	**RWS**	**Ipa4000**	**PList 2**	**PIN**	**V-F-S-B**	**Full**	**6071**
P04.02	**Conn A inp 2 src** Ipa 4000 - NULL = Default Analog signal selection to input 2.	**N/A**	**RWS**	**Ipa4000**	**PList 2**	**PIN**	**V-F-S-B**	**Full**	**6072**
P04.03	**Conn A inp 3 src** Ipa 4000 - NULL = Default Analog signal selection to input 3.	**N/A**	**RWS**	**Ipa4000**	**PList 2**	**PIN**	**V-F-S-B**	**Full**	**6073**
P04.04	**Conn A inp 4 src** Ipa 4000 - NULL = Default Analog signal selection to input 4	**N/A**	**RWS**	**Ipa4000**	**PList 2**	**PIN**	**V-F-S-B**	**Full**	**6074**
P04.05	**Conn A inp 5 src** Ipa4000 NULL = Default Analog signal selection to input 5	**N/A**	**RWS**	**Ipa4000**	**PList 2**	**PIN**	**V-F-S-B**	**Full**	**6075**
P04.06	**Conn A inp 6 src** Ipa 4000 - NULL = Default Analog signal selection to input 6	**N/A**	**RWS**	**Ipa4000**	**PList 2**	**PIN**	**V-F-S-B**	**Full**	**6076**
P04.07	**Conn A inp 7 src** Ipa 4000 - NULL = Default Analog signal selection to input 7	**N/A**	**RWS**	**Ipa4000**	**PList 2**	**PIN**	**V-F-S-B**	**Full**	**6077**

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa
P05	**CUSTOM / Connect B**								
P05.00	**Conn B inp 0 src** Ipa 4000 - NULL = Default Digital signal selection to input 0.	**N/A**	**RWS**	**Ipa4000**	**PList 1**	**PIN**	**V-F-S-B**	**Full**	**6078**
P05.01	**Conn B inp 1 src** Ipa 4000 - NULL = Default Digital signal selection to input 1.	**N/A**	**RWS**	**Ipa4000**	**PList 1**	**PIN**	**V-F-S-B**	**Full**	**6079**
P05.02	**Conn B inp 2 src** Ipa 4000 - NULL = Default Digital signal selection to input 2.	**N/A**	**RWS**	**Ipa4000**	**PList 1**	**PIN**	**V-F-S-B**	**Full**	**6080**
P05.03	**Conn B inp 3 src** Ipa 4000 - NULL = Default Digital signal selection to input 3.	**N/A**	**RWS**	**Ipa4000**	**PList 1**	**PIN**	**V-F-S-B**	**Full**	**6081**
P05.04	**Conn B inp 4 src** Ipa 4000 - NULL = Default Digital signal selection to input 4.	**N/A**	**RWS**	**Ipa4000**	**PList 1**	**PIN**	**V-F-S-B**	**Full**	**6082**
P05.05	**Conn B inp 5 src** Ipa 4000 - NULL = Default Digital signal selection to input 5.	**N/A**	**RWS**	**Ipa4000**	**PList 1**	**PIN**	**V-F-S-B**	**Full**	**6083**
P05.06	**Conn B inp 6 src** Ipa 4000 - NULL = Default Digital signal selection to input 6.	**N/A**	**RWS**	**Ipa4000**	**PList 1**	**PIN**	**V-F-S-B**	**Full**	**6084**
P05.07	**Conn B inp 7 src** Ipa 4000 - NULL = Default Digital signal selection to input 7.	**N/A**	**RWS**	**Ipa4000**	**PList 1**	**PIN**	**V-F-S-B**	**Full**	**6085**

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa

Q SERVICE

Note! Menu accessible with Access Level = FULL

SERVICE menu allows the setting of the password, to enable a menu area reserved for GEFRAN-SIEI personal use only.

To have the access to the menu:

1) edit reserved password into **Insert Password** parameter and confirm it using "**Enter**" button.
2) check the password through **Check password** parameter using "**Enter**" button.

Index	MENU **Parameter Name** Description	[Unit]	Access	Default	Min/Max	Format	Reg.Mode	Level	Ipa

Chapter 7 - Appendix

7.1 Manual Tuning of the Current Regulator

The manual tuning procedure below, can be used to change the standard response time of current regulator.

The following procedure is recomended after executing Current Regulator autotune.

Use a 2 channel digital scope.

Connect the probe of the scope, channel 1(CH1), on the XY4/XY5 test points of the regulation card (see chapter 4.3.1).

Disable the drive: press **[O]** key (red key) for 2 seconds.

In the **REG PARAM / Tst Gen** menu set the following parameters:

E09.00 - Tst gen mode	=	*[4] Magn curr ref*
E09.01 - Gen Hi ref	=	3000
E09.02 - Gen Low ref	=	0
E09.03 - Gen Period	=	0.1 s

NOTE! **Gen hi ref** value is approximate; it depends on the drive size. The setting must correspond to 20% of the Output current (This value can be verified in the **STATUS** menu).

Enable the drive:

Terminal 12 should be active (+24V) and press **[I]** key (green key). Verify and adjust the step response of the current regulator looking the leading edge of the Output current (see figure 7.1.1).

For tuning, follow the steps below:

- In the **REG PARAM / Curr regu** menu, adjust the values of **E01.00 - CurrP gain %** and **E01.01 - CurrI gain %** until the response of current is approximatly **1 ms**, without overshoot (see figure 7.1.2); optimal response time of current regulator.

- Disable the drive: press **[O]** key (red key) for 2 seconds.

- Set **E09.00 - Tst gen mode** = *[0] Off*

- In the **REG PARAM** menu save the settings done via the *SAVE PARAMETERS* command.

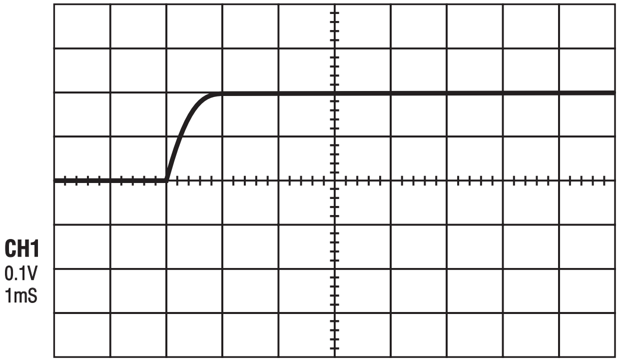


Figure 7.1.1: *Output Current (Reaction Time @ 2ms) Displaying*

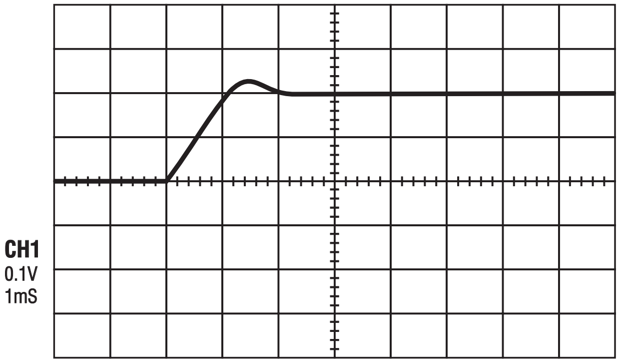


Figure 7.1.2*: Optimal Output Current (Reaction Time @ 1ms) Displaying*

7.2 Manual Tuning of the Flux Regulator

This tuning is necessary only with applications where the use of the field weakening is required.

Use a 2 channel digital scope.

In the **INTERFACE / An Out 1** and **INTERFACE / An Out 2** menues set the analog outputs 1 & 2 (see chapter 6.1.1 how to connect the variables):

- **C08.00 - AO 1 src** sorce connect the Flux ref variable
- **C09.00 - AO 2 src** source connect the Flux variable.

On 21-22 terminals (see chapter 4.3) place channel 1 of the digital scope (CH1) on the Flux ref (flux reference) signal; on 23-22 terminals place channel 2 (CH2) for the Flux signal (actual flux).

Disable the drive: press **[O]** key (red key) for 2 seconds.

In the **TORQUE / Trq cmd** menu, set **G04.00 - Zero torque src** = ONE.
In the **REG PARAM / Tst gen** menu to set the following parameters:

E09.00 - Tst gen mode	=	*[5] Flux ref*
E09.01 - Gen Hi ref	=	Measured FluxNom • 16384 • √2
E09.02 - Gen Low ref	=	Measured FluxNom • 0.8 • 16384 • √2
E09.03 - Gen Period	=	0.1 s

Note! Measured FluxNom is the nominal Flux value calculated by the drive during the “FluxReg autotune” procedure; in the **SETUP MODE/ FluxReg** autotune results it’s possible to read this value.

In the **REG PARAM / Volt Reg** menu, set **E03.02 - Vlt P base value** parameter to its max value. This value depends by the drive size. Pressing “Shift + Help” the max value is displayed.
In the **REG PARAM / Vlt Reg** menu, set **E03.00 - VltP gain %** parameter to 100%.
In the **REG PARAM / Flux Reg**, set to zero the **E02.00 - FlxP gain %** and **E02.01 - FlxI gain %** parameters.

Enable the drive:

Make sure that terminal 12 is active (+24V) and press **[I]** key (green key).
On the channel CH1 the Flux ref will be displayed; on the channel CH2 the Flux signal will be displayed (see figure 7.2.1).

For the tuning follow the steps below:

- Increase the **E02.00 - FlxP gain %** and **E02.01 - FlxI gain %** values until the Flux signal follows the Flux ref displayed (see figure 7.2.2).
- Disable the drive: press **[O]** key (red key) for 2 seconds.
- For **C09.00 - AO 2 src** source connect the *Magn curr ref* variable.
- Enable the drive. On the channel CH1 scope the Flux ref signal will be displayed; on the channel CH2 the Magn current reference signal will be displayed (see figure: 7.2.3).

Note! On the CH2 signal dislayed avoid the overshoots (see figure: 7.2.4), if necessary, decreasing the **E02.00 - FlxP gain %** and **E02.01 - FlxI gain %** gains values.

- Disable the drive: press **[O]** key (red key) for 2 seconds.
- Set **E09.00 - Tst gen mode** = *[0] Off*
- Restore initial values set: **E03.02 - Vlt P base value** to zero, **E03.00 - VltP gain %** to zero and the source **G04.00 - Zero torque src** = NULL.
- In the **REG PARAM** menu save the new settings via the *SAVE PARAMETERS* command.

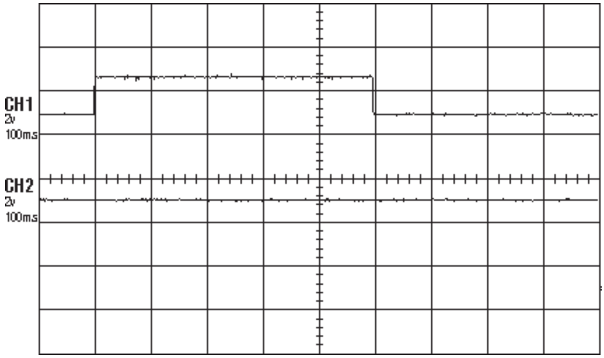


Figure 7.2.1: *Flux Reference (CH1) and Flux (CH2) Displaying*

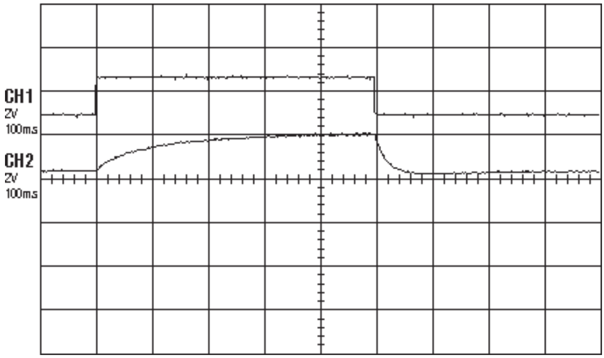


Figure 7.2.2: *Flux Reference (CH1) and Tuning of Flux (CH2) Displaying*

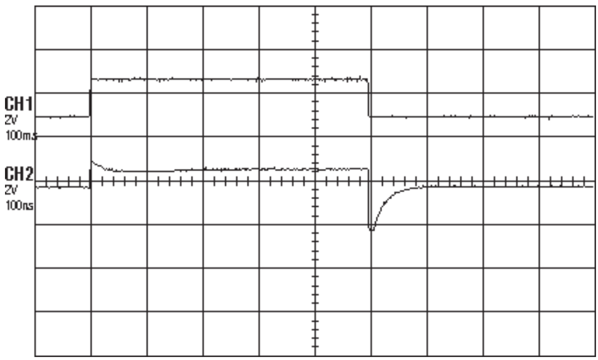


Figure 7.2.3: *Flux Reference (CH1) and Tuning of Magn Current Reference (CH2) Displaying*

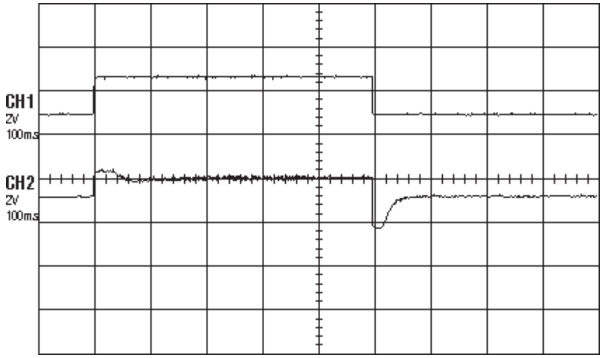


Figure 7.2.4: Flux Reference (CH1) and Magn Current Reference, with Overshoots, (CH2) Displaying

7.3 IGBT Voltage Output Distortion

The procedure shows an example to compensate the output voltage distortion due to IGBT voltage drop and its switching characteristics.

Use a 3 channel digital scope + 1 current probe.

In the **INTERFACE / An Out 1** menu, program the Analog output 1:

- **C08.00 - AO 1 src** connected to *Norm speed* variable
  On the 21-22 drive terminals (Analog output 1), place channel 1 of the digital scope to display the motor speed, (see chapter 4.3).
- Connect the current probe on channel C of the digital scope on one of the motor wires to display the motor current (It's possible to use a differential probe on XY5/XY4 regulation board test points instead of a current probe on the output phases).
- Run the motor at 300 rpm.

<u>Go to menu</u>: **REG PARAM / DeadTime**
<u>Adjust</u>: **E04.01 - Dead time slope** parameter to match the figure 7.3.1.

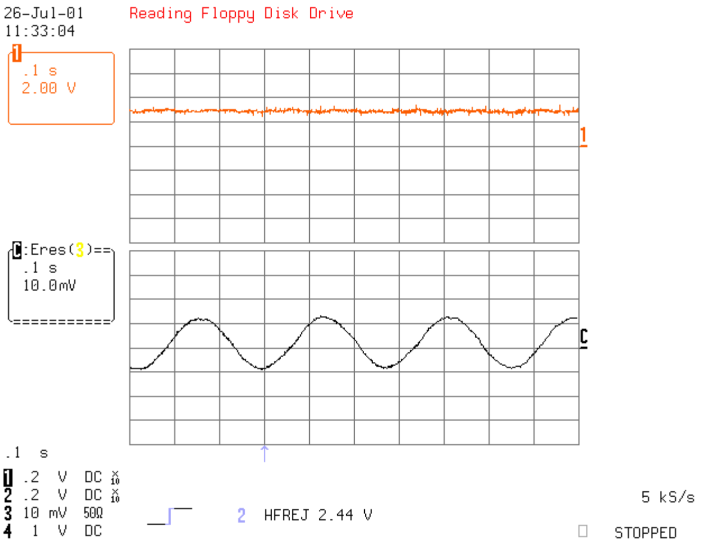


Figure 7.3.1: *IGBT Voltage Output Signals Optmized*

The next figure below shows an example of IGBT output voltage signals not optimized. In this case increase the value of Dead time slope parameter to match the figure 7.3.1.

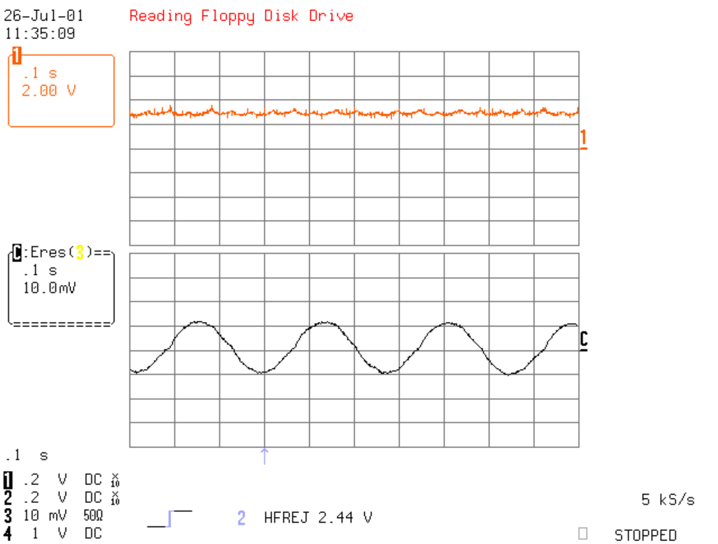


Figure 7.3.2: *IGBT Voltage Output Signal Not Optmized 1*

The next figure below shows an example of IGBT output voltage signals not optimized. In this case decrease the value of Dead time slope parameter to match the figure 7.3.1.

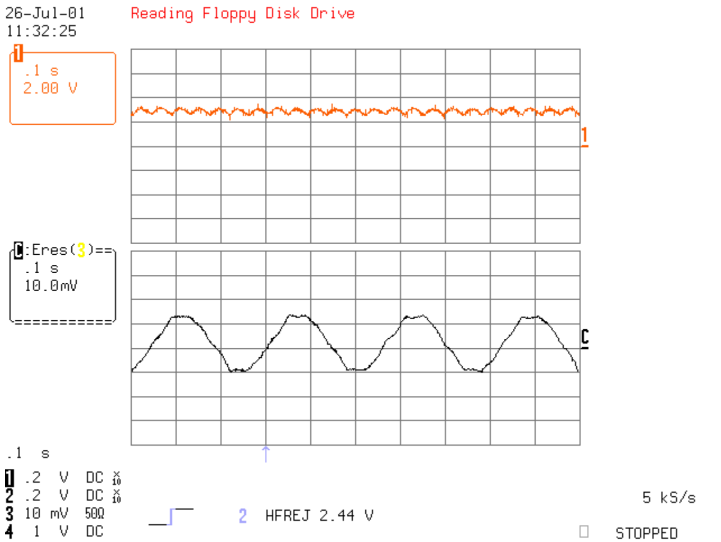


Figure 7.3.3: *IGBT Voltage Output Signal Not Optmized 2*

NOTE! In the same menu, **REG PARAM / DeadTime**, there is also **E04.00 - Dead time limit** parameter. It should be left at its default value, or to the value estimated by self tuning.

Go to the next step to improve the sensorless gains observer, next chapter.

7.3.1 Sensorless Gains Profile Tuning

In the Sensorless regulation mode the motor speed is estimated through an observer algorithm based on a speed gains profile. The procedure below allows the user to improve the gains profile of the observer circuit at low, medium and high Motoring/Regen speed.

Use same scope and connections of point 15;

In the **INTERFACE / An Out 2** drive menu, program the Analog output 2:

- **C09.00 - AO 2 src** connected to *Speed ref 1* variable

On the 23-22 drive terminals place channel 2 to display the speed reference. Run the motor at low rpm up to 1/10 of motor nominal speed.

<u>Go to menu:</u>
REG PARAM / Sls Fgains

Adjust:
E08.04 - Sls mot LPgain and **E08.05 - Sls mot LIgain** gains to match the figure 7.3.1.1.

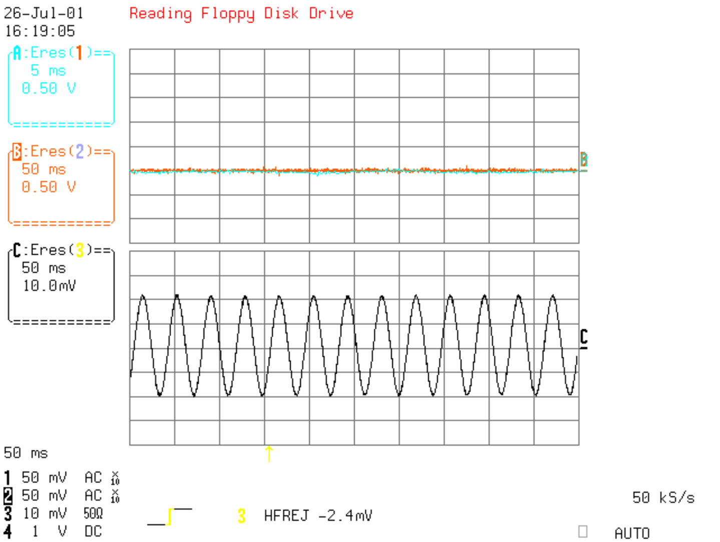


***Figure 7.3.1.1**: SLS Gains Profile Signals Optmized*

The next figure below shows an example of **E08.04 - Sls mot LPgain** and **E08.05 - Sls mot LIgain** gains signals not optimized.
Increase only **E08.04 - Sls mot LPgain** gain to match the figure 7.3.1.1.

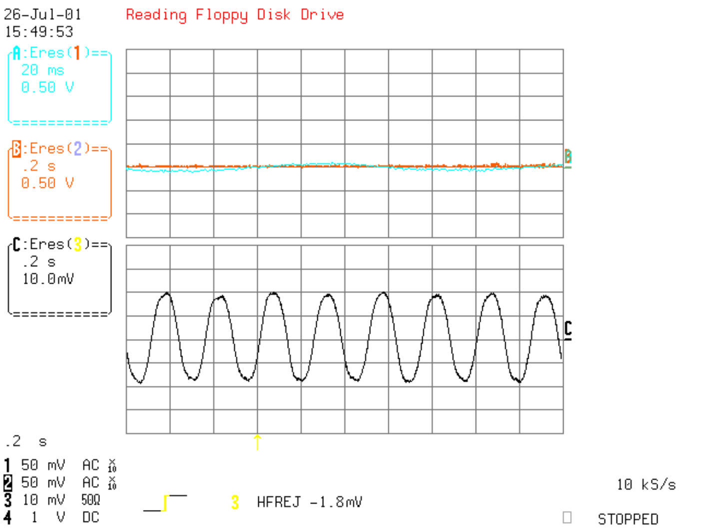


***Figure 7.3.1.2:** SLS Low Gains Signals*

Now run the motor at medium rpm, 1/2 of motor nominal speed.
The next figure below shows an example of **E08.02 - Sls mot MPgain** and **E08.03 - Sls mot MIgain** gains signals not optimized.
Increase both gain values to match the figure 7.3.1.1.

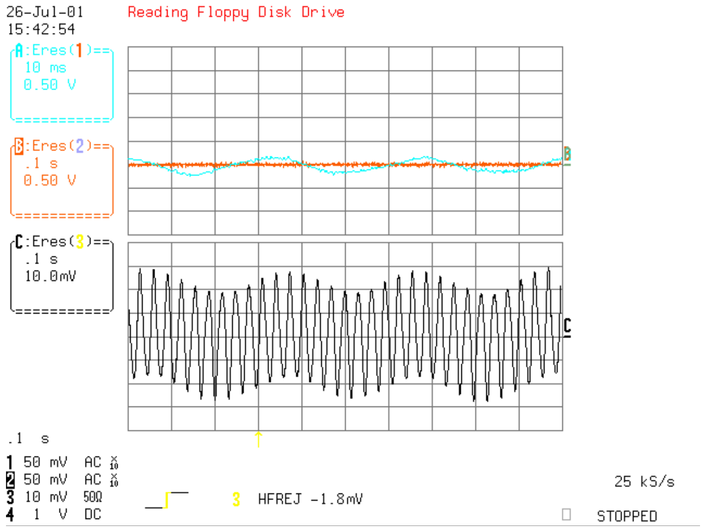


Figure 7.3.1.3: *SLS Medium Gains Signals*

Now run the motor at maximum speed (motor nominal speed).
The next figure below shows an example of **E08.00 - Sls mot HPgain** and **E08.01 - Sls mot HIgain** gain signals not optimized.
Increase only **E08.00 - Sls mot HPgain** gain to match the figure figure 7.3.1.1.

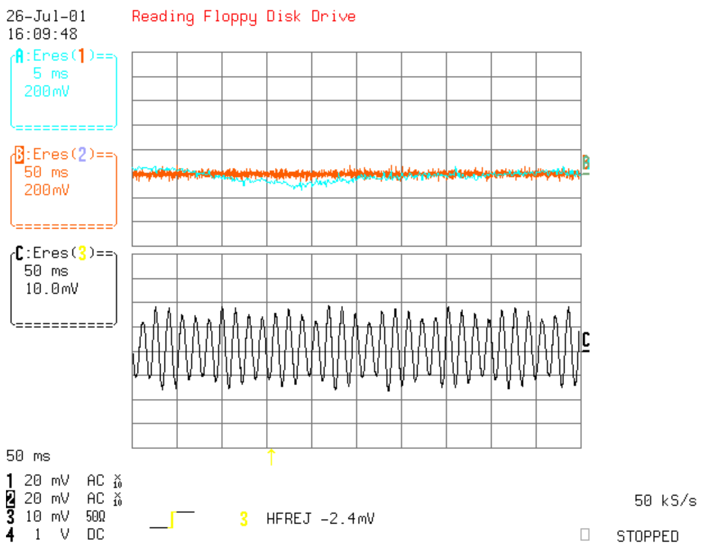


Figure 7.3.1.4: *SLS High Gains Signals*

NOTE! Regen gains (into menu **REG PARAM / Sls Fgains**) can be adjusted using the same criteria described above, with a regenerating load applied. If regenerating load is not available, regen gains can be tuned during dynamic braking.

7.4 How Perform the Speed Loop in Field Oriented or Sensorless Vect

Speep regulatore autotune
Follow this step to measure the load inertia and to perform the Speed regulator autotuning, SpdReg autotune. This is available only for **Regulation mode** = **Field Oriented** and **Regulation mode** = **Sensorless vect**.
If the load has significant inertia, the speed regulator may need to be tuned.

The Speed regulator autotune requires free rotation of the shaft coupled with the load. No Stop switch or other control is handled during the test run, which consists of acceleration under programmable torque limit control. Some applications, especially those which have constraints to the load travel (eg. machine tool or material handling drives) may be incompatible with this. Other applications may be compatible with the test, provided material is not present in the driven process.

<u>Full Access Level</u>

B STARTUP / B05
Enter the **B05.00 - Access Level** parameter to *[1] Full*

<u>Run Speep regulator autotune</u>

E REG PARAM / E00 Spd Reg
Enter the **E00.03 - SpdReg autotune** parameter: “Waiting start…” message will be displayed, than press **[I]** key to run the procedure (12 and 13 drive terminals must be cycle to +24Vdc).

Note! Shaft rotation is activated at this point; procedure can be aborted at any time by pressing “O” key.

Wait up to “Autotune End” message will be displayed, than press three time “Escape” key.

Note! If the procedure generates any errors, “Autotune err#31: Load applied” message will be displayed, clear the message using “Escape” key.

<u>Set Test Torque reference</u>

E REG PARAM / E00 Spd Reg
Enter the **E00.02 - Test Torque ref** parameter at 50% of its value, than repeat Speep regulatore autotune procedure as described above.

Note! Recycle terminal 12 and 13 through relays or local switch.

Configure Speed 0 logic

F SPEED REG / F03 Spd 0 cfg
Enter the **F03.14 - Spd 0 spd delay** parameter to a value of 10 ms
Enter the **F03.16 - Spd 0 ref delay** parameter to a value of 10 ms

NOTE! If the drive application allows changes of Speed 0 threshold:
increase **F03.13 - Spd 0 speed thr** parameter to a value of 150rpm
increase **F03.15 - Spd 0 ref thr** parameter to a value of 150rpm

Improve Speed regulator gains

B STARTUP / B00 Drv & Mot config / B0J SpdReg G
Set **B0J.00 - Calc method** parameter to *[1] FixedBandw*
Set **B0J.01 - Calc Inertia** parameter according to following rules:

a) IF
Motor rating < Drive rating AND Load inertia ≤ Motor inertia
THEN
reduce the default value of Calc Inertia by 50%

b) IF
Load inertia >> Motor inertia
THEN
increase 50% the default value of Calc Inertia
OTHERWISE leave default value

Leave default **B0J.02 - Bandwidth** parameter to 50 rad/S
Escape all the menus to the main STARTUP menu.
During this operation, the parameters determining the gains of the Speed regulator will be calculated.

At this point, try to run the motor.

If the motor does not run correctly:

a) If the drive application allows changes of Speed 0 threshold, increase **Spd 0 speed thr** and **Spd 0 ref thr** parameters to 200 rpm.

NOTE! If the motor behavior is acceptable with the first settings (150 rpm), try to decrease S**pd 0 speed thr** and **Spd 0 ref thr** parameters to 100 rpm.

b) Repeat the procedure of Speed regulator improvements described above increasing the bandwidth:
B0J.02 - Bandwidth = 100 rad/S

c) If the motor does not run correctly, follow “IGBT voltage output distortion” (see details on chapter 7.3)

7.5 - Applications Examples for the PID Function

7.5.1 - Control of Nip Rolls with Dancer

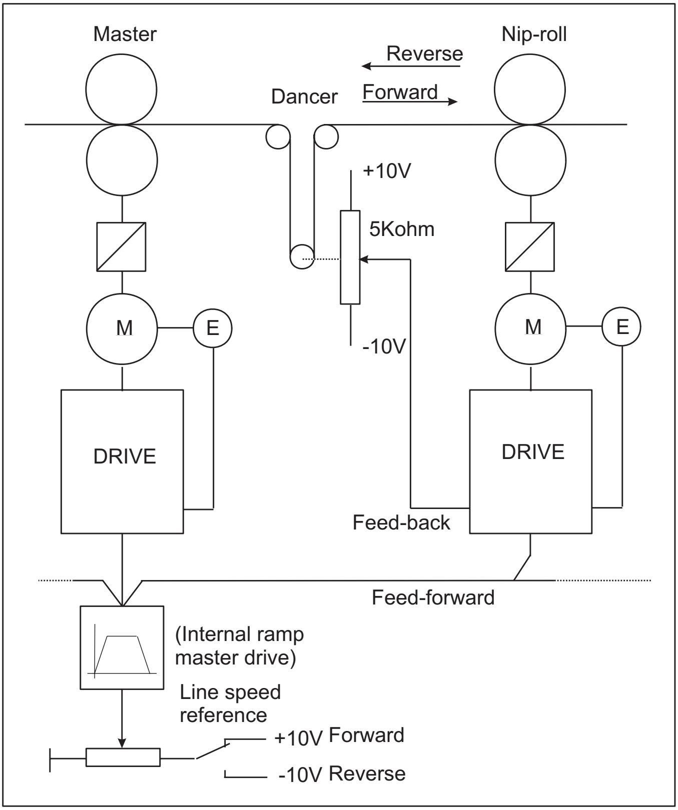


***Figure 7.5-1**: Control of Nip Rolls with Dancer*

7.5.1.1 Machine Data

Rated speed of the Slave motor Vn = 3000rpm
Slave motor speed corresponding to the max. line speed = 85% Vn = 2550rpm
Maximum dancer correction = ±15% of the line speed = ±382.5rpm

The Drive of the Slave nip roll has to receive the analog signals referring to the line speed and to the Dancer position (whose potentiometer will be power supplied at its ends with values included between –10V…+ 10V) and the digital commands referring to the PID control enabling.
The output of the PID regulator is sent to the speed 1 reference.

7.5.1.2 Input/Output

Drive settings: (only those referring to the PID function are described)
Connect to the analog input 1 the dancer cursor.
Select **PID fbk src = An inp 1 output**
Connect to the analog input 2 the line speed reference (feed- forward).
Select **PID inp FF src = An inp 2 output**
Connect to the Digital input 1 the input enabling the PID PI Block
Select **PID PI enab src = DI 1 monitor**

Connect to the Digital input 2 the input enabling the PID PD Block
Select **PID PD enab src = DI 2 monitor**

In case just one contact is required to enable the PI and PD section, it is possible to connect also PID PD enab src on the digital input 1 as described below.
Select **PID PD enab src = DI 1 monitor**

Connect to the speed 1 reference the PID output
Select **Speed ref 1 src = PID out mon**
Set **Ramp out enable** = Disable

7.5.1.3 Parameters

Set **Full scale spd** equal to the motor speed corresponding to 100% of the line speed.
Full scale spd = 2550 rpm

Connect
Mlt PI sel 0 = Null
Mlt PI sel 1 = One

The selection of the PID Mlt PI sel 1 multiplier is therefore active.

Set
PID Mlt PI sel 1 = 1 The starting value is 1

In case the regulator PI Block has performed no correction, the line speed reference (Feed-Forward) has to be multiplied by 1 and sent directly to the Drive regulator speed.
With this application, the regulator usually carries out a proportional control. The correction is stated as a percentage of the line speed, from 0 to the maximum value.
Set **PI clamp top** and **PI clamp bot** so that, with a maximum mechanical sealing of the dancer (maximum value of the analog input 1 connected to the dancer reaction), and by setting the proportional gain of the PI block to 15%, a corresponding proportional correction of the feed-forward is obtained.

Set therefore:
PI clamp top = 10
PI clamp bot = 0.1
Set **PI P1 gain %** = 15% 1 or 3 see error during test
Set **PI I1 gain %** = 0%

With such a configuration and having a proportional correction of the line speed, the PI Block can not position the dancer when the machine is stopped. In order to carry out the initial phase when the machine is stopped, it is necessary to act on the PD block.
Set **PD P1 gain %** with a value allowing to position the dancer without big dynamic stresses.

For example: **PD P1 gain %** = 1%

Use the derivative component as a system “damping” element by setting for example:
PD D1 gain % = 1 %
PD der filter = 20 ms

If it is not needed, leave these parameters = 0.
In case a series of cascade references has to be performed for another possible Drive, set **PID out mon** on an analog output, for example:
An out 1 src = PID out mon

7.5.2 Control of Nip Rolls with Loading Cell

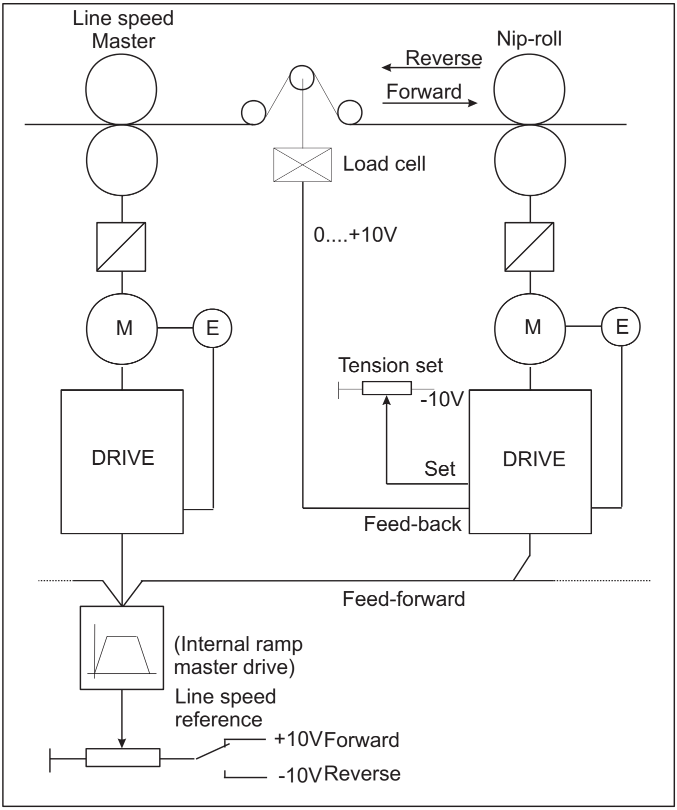


***Figure 7.5.2**: Control of Nip Rolls with Loading Cell*

7.5.2.1 Machine Data

Rated speed of the Slave motor Vn = 3000rpm
Slave motor speed corresponding to the max. line speed = 85% Vn = 2550rpm
Maximum correction of the loading cell = ±20% of the line speed = ± 510rpm
The drive of the Slave nip roll must receive the analog signals referring to the line speed, to the loading cell (0 ...+10V) and to the tension (0 ...-10V), plus the digital commands referring to the PID control enabling.
The regulator output is sent to the speed 1 reference.

7.5.2.2 Input/Output

Drive settings: (only those referring to the PID function are described)

Connect to the analog input 1 the Dancer cursor.
Select **PID fbk src = An inp 1 output**

Connect to the analog input 2 the line speed reference (feed- forward).
Select **PID inp FF src = An inp 2 output**

Connect to the analog input 3 the tension reference.
Select **PID draw src = An inp 3 output**

Connect to the Digital input 1 the input enabling the PID PI Block
Select **PID PI enab src = DI 1 monitor**

Connect to the Digital input 2 the input enabling the PID PD Block
Select **PID PD enab src = DI 2 monitor**

In case just one contact is needed to enable the PI and PD section, it is possible to connect also **PID PD enab src** on the digital input 1 as described below.
Select **PID PD enab src = DI 1 monitor**

Connect to the speed 1 reference the PID output
Select **Speed ref 1 src = PID out mon**
Set **Ramp out enable** = Disable

7.5.2.3 Parameters

Set **Full scale spd** equal to the motor speed corresponding to 100% of the line speed.
Full scale spd = 2550 rpm

Connect :
Mlt PI sel 0 = Null
Mlt PI sel 1 = One
The selection of the **PID Mlt PI sel 1** selector is therefore active

Set:
PID Mlt PI sel 1 = 1 The starting value is 1

Without a correction performed by the regulator PI Block, the line speed reference (Feed-Forward) must be multiplied by 1 and must be sent directly to the Drive speed regulator. The regulator usually carries out a Proportional-Integral control. The correction is stated as a percentage of the line speed, from 0 to the maximum value.

Set :
PI lim top and **PI lim bot** in order to obtain a maximum correction of the **PI Block** equal to 20% of the line speed.
The **PI lim top** and **PI lim bot** parameters can be considered, respectively, as the maximum and minimum multiplicative factor of the feed-forward.

2550rpm of the motor (max. feed-forward) correspond to the max. line speed.
Maximum correction = 2550 x 20% = 510rpm

2550 + 510 = 3060rpm ——> **PI lim top** = 3060 / 2550 = 1.2
2550 - 510 = 2040rpm ——> **PI lim bot** = 2040 / 2550 = 0.80

With such a configuration and with a proportional correction of the line speed, the **PI block** is not in a position to carry out the initial phase when the machine is stopped; it is therefore necessary to act also on the PD Block.
The gains of the different components have to be set, experimentally, with a loaded machine; such tests can be started with the values stated below (default values):
Set **PI P1 gain %** = 2%
Set **PI I1 gain %** = 2%
Set **PD P1 gain %** = 1%

Use the derivative component as a system “damping” element, by setting for example:
PD D1 gain % = 1%
PD der filter = 20ms
If it is not required, leave these parameters = 0.

In case a series of cascade references has to be performed for another possible Drive, set PID out mon on an analog output, for example:
An out 1 src = PID out mon

NOTE! See the “A.1.7, Generic PID” paragraph in case it is necessary to have a system with an integral regulation enabled also with feed-forward = 0 and in a position to carry out the system initial phase without errors even with a stopped machine.

7.5.3 Control of Winders/Unwinders with Dancer

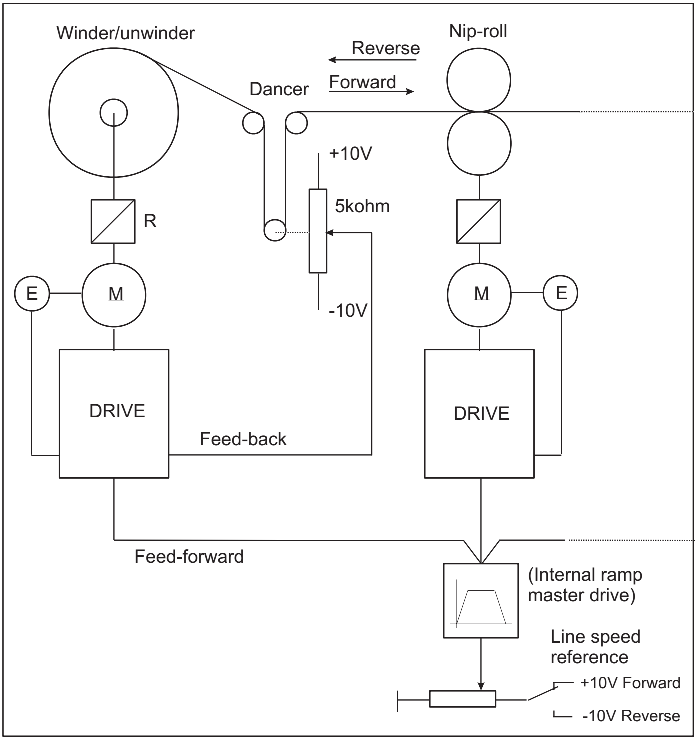


***Figure A.1.3**: Control of Winders/Unwinders with Dancer*

7.5.3.1 Machine Data

Maximum line speed =400m/min
Rated speed of the winder motor Vn = 3000rpm
Winder maximum diameter = 700mm
Winder minimum diameter = 100mm
Motor-winder reduction ratio = 0.5
One-pitch dancer
Dancer stroke from the lower limit switch to the electric 0 position = 160mm

The winder/unwinder Drive must receive the analog signals referring to the line speed and to the dancer position (whose potentiometer is power supplied at its ends with values included between -10... +10V) and the digital commands referring to the PID control enabling.
The regulator output is sent to the speed 1 reference.

7.5.3.2 Input/Output

Drive settings: (only those referring to the PID function are described)
Connect to the analog input 1 the Dancer cursor.
Select **PID fbk src = An inp 1 output**
Connect to the analog input 2 the line speed reference (feed- forward).
Select **PID inp FF src = An inp 2 output**

Connect to the speed 1 reference the PID output
Select **Speed ref 1 src = PID out mon**
Set **Ramp out enable** = Disable

Connect to the Digital input 1 the input enabling the PID PI Block
Select **PID PI enab src = DI 1 monitor**

Connect to the Digital input 2 the input enabling the PID PD Block.
Select **PID PD enab src = DI 2 monitor**

In case just one contact is needed to enable the PI and PD section, it is possible to connect also **PID PD enab src** on the digital input 1 as described below.
Select **PID PD enab src = DI 1 monitor**
Connect to the Digital input 3 the input enabling the diameter calculation Block
Select **DiaClc start src = DI 3 monitor**
Connect to the digital output 0 the signal stating the end of the diameter calculation
Select **DO 0 src = Diacalc active**

7.5.3.3 Parameters

Set **Full scale spd** equal to the motor speed corresponding to 100% of the line speed with a minimum winder diameter (core).
Full scale spd = 2550 rpm

Calculation of the motor speed according to the above stated conditions:

Vp = π x Φmin x ω x R

where:
Vp = winder peripheral speed = line speed
Φmin = winder minimum diameter [m]
ω = motor angular speed [rpm]
R = motor-winder reduction ratio

ω = Vp / π x Φmin x R = 400 / (π x 0.1 x 0.5) = 2546rpm = <u>about 2550rpm</u>

Connect
Mlt PI sel 0 = Null
Mlt PI sel 1 = Null

With this configuration it is possible to carry out, via a suitable procedure, the calculation of the starting diameter. Furthermore the last calculated diameter value is kept into memory both if the machine is stopped and if the switchboard is switched off.
As previously stated, the procedure determines the theoretic multiplicative factor (**PI output PID**) of the feed-forward as compared to the calculated

diameter, in order to send to the Drive the right value of the angular speed.

Note! When **PID MltPI selmon** = 0 and the PI Block is disabled, the system keeps into memory the last calculated value of **PID out mon**. In case the machine is switched off, such value is automatically reset. In case the value of this parameter has to be set in order to have on the output a wrong reference equal to the feed-forward, it is possible to configure a digital input as a correction reset.

It is therefore necessary to:

select	**Mlt PI sel 0**	**= DI 4 monitor**
set	**PID Mlt PI sel 1**	= 1

By bringing the digital input to a high logic level, the value of PID out mon is set at 1.

Set **PI lim top** and **PI lim bot** according to the winder diameter ratio.
The **PI lim top** and **PI lim bot** parameters can be considered, respectively, as a maximum and minimum multiplicative factor of the feed-forward.
Considering that the motor angular speed, and therefore the reference, are inversely proportional to the winding/unwinding diameter, set:
PI lim top = 1
PI lim bot = Φmin / Φmax = 100 / 700 = 0.14

Here following is a description of the above statements.

Calculation of the motor angular speed:

ω max. = Vl / (Φ x Φmin x R)
and
ω min = Vl / (Φ x Φmax. x R)

where:
ω max. = motor angular speed with a minimum diameter [rpm]
ω min = motor angular speed with a maximum diameter [rpm]
Vl = line speed
Φmin = winder minimum diameter [m]
Φmax. = winder maximum diameter [m]
R = motor-winder reduction ratio
Therefore: ω max. / ω min = Φmax. / Φmin
where
ω min = (Φmin / Φmax) x ω max.

Consider that the **PI lim top** and **PI lim bot** parameters can be considered, respectively, as a maximum and minimum multiplicative factor of the feed-forward.
Multiply the feed-forward by **PI lim top** = 1, the result is the maximum speed reference referring to the minimum diameter.
Multiply the feed-forward by **PI lim bot** = 0.14, the result is the minimum speed reference referring to the maximum diameter.
Such application requires a proportional-integral regulation on the side of the system.

The gains of the different components have to be set, experimentally, with a loaded machine; such tests can be started with the values stated below:

Set **PI P1 gain %** = 2%
Set **PI I1 gain %** = 2%
Set **PD P1 gain %** = 1%

Use the derivative component as a system "damping" element, by setting for example:

PD D1 gain % = 1%
PD der filter = 20ms

In case a series of cascade references has to be performed for another possible Drive, set **PID out mon** on an analog output, for example:
An out 1 src = PID out mon

7.5.4 Parameters Referring to the Function for the Calculation of the Starting Diameter

This function is always necessary when an unwinder has to be controlled or when the starting diameter is unknown.

Set **Positioning spd** with the rpm value required to perform the dancer starting positioning.

For example:

Positioning spd = 15rpm

The polarity of the reference assigned to **Positioning spd** is equal (both with a winder or unwinder) to the one functioning as a winder. If for example an unwinder has to be controlled and the functioning speed reference is positive, set **Positioning spd** with a negative value.

Set **Max deviation** with a value slightly lower than the one corresponding to the position of the maximum mechanical sealing allowed by the dancer.

<u>During the commissioning it is always necessary to perform the self-tuning of the drive analog inputs; in particular by self-tuning the analog input 1 with a dancer in a lower limit switch position</u>, this position is automatically set with a 100% value.

Therefore, in order to grant a precise calculation, the value to be set is:

Max deviation = 90 %

Set **Gear box ratio** equal to the reduction ratio between the motor and the winder:

Gear box ratio = 0.5

Set **Dancer constant** with a value in mm corresponding to the total accumulation of the material in the Dancer:

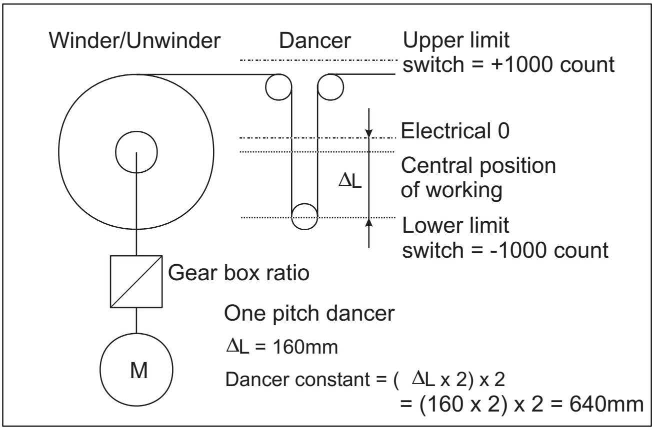


***Figure 7.5.4**: Outlining of the Dancer Constant Measurement*

Dancer constant measurement:
Set the Drive keypad on the **PID feed-back** parameter.
Measure and multiply by 2 the distance in mm between the lower mechanical limit switch and the Dancer position so that the value 0 (electric 0 position) is displayed on the **PID feed-back** parameter. Being that the Dancer is made of a single pitch, multiply by 2 the above calculated value.

In our case set:

Dancer constant = 640mm

Set **Minimum diameter** equal to the value of the winder minimum diameter [cm]:

Minimum diameter = 10cm

7.5.5 Use of the Diameter Sensor

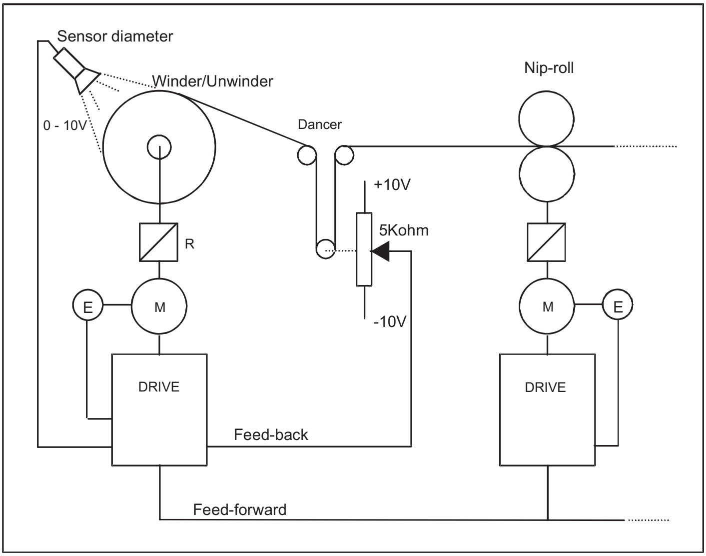


***Figure 7.5.5-1**: Winder/Unwinder Control with Diameter Sensor*

The diameter sensor can be used in case of systems with automatic changing unwinders. In such conditions it is necessary to know the value of the starting diameter in order to calculate the reference of the motor angular speed before carrying out the coil new winding procedure.
The transducer has to be set in order to supply a voltage signal proportional to the winder diameter.

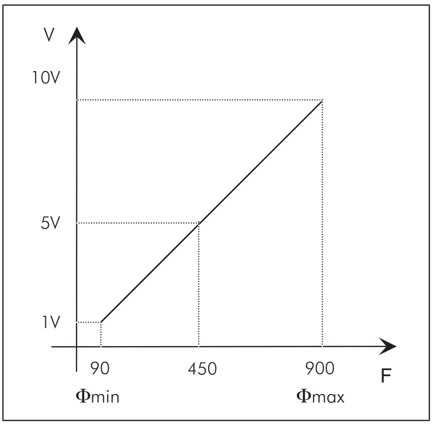


***Figure 7.5.5-2**: Relationship Between the Transducer Signal and the Winder Diameter*

Example:

Φmin	= 90 mm	transducer output	= 1V
Φmax	= 900 mm	transducer output	= 10V
Φ	= 450 mm	transducer output	= 5V

The analog input, which the sensor is connected to, has to be set as a source of **PID Mlt PI 3 sr**c.
The multiplier selector must point to 3, that is:

Mlt PI sel 0 = One
Mlt PI sel 1 = One

The selection of the **PID Mlt PI sel 3** multiplier is therefore active.

When **PID PI enab** = disable, the value of **PID Mlt PI 3** is written in **PID PI out mon** and used as a multiplicative factor of the feed-forward.

As already stated, the setting of **PI output PID** depends on the diameter ratio, therefore the proportional voltage signal towards the diameter is automatically calculated again via the formula:

PID Mlt PI 3 = (Φ_0 / Φ_1)

where: Φ_0 = winder minimum diameter
Φ_1 = winder present diameter

NOTE! During the commissioning, it is necessary to check that the signal coming from the sensor is proportional to the diameter and that 10V corresponds to its maximum value (the analog input self-tuning has to be performed anyway).

Check also that **PI clam top** and **PI clamp bot** have been programmed according to the diameter ratio as stated in the previous examples.

7.5.6 Pressure Control for Pumps and Extruders

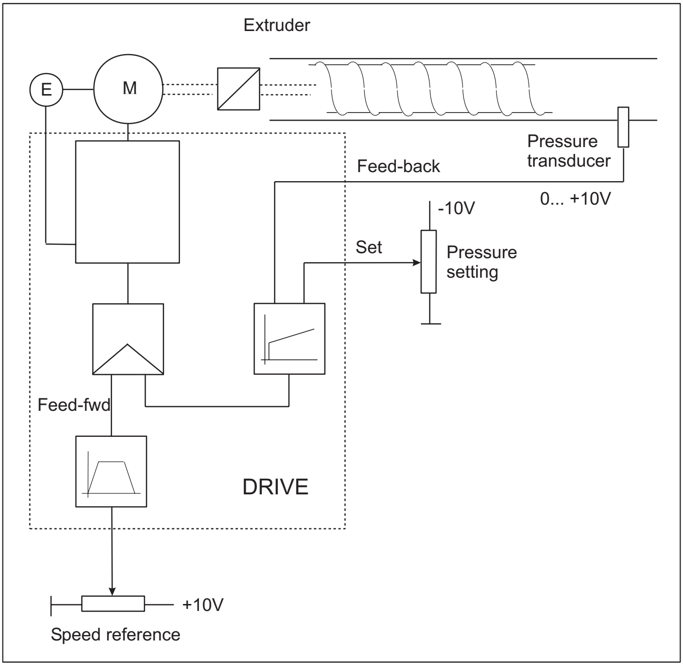


***Figure 7.5.6.1**: Pressure Control for Pumps and Extruders*

7.5.6.1 Machine Data

Rated speed of the extruder motor Vn = 3000rpm
Pressure transducer 0... +10V

The Drive of the Slave extruder must receive the analog signals referring to the speed reference, to the pressure transducer and to the potentiometer for the pressure setting (power supplied at its ends with values included between 0V... -10V) and the digital signals referring to the PID control enabling.
The regulator output is sent to the speed 1 reference.

7.5.6.2 Input/Output

Drive settings: (only those referring to the PID function are described)

Connect to the analog input 1 the pressure transducer.
Select **PID fbk src = An inp 1 output**

Connect to the analog input 2 the signal for the ramp stage. The output of the ramp stage has to be used as a speed reference (feed- forward).
Select **Ramp ref 1 src = An inp 2 output**

Connect as feed- forward the ramp output.

Select **PID inp FF src = Ramp out mon**
Connect to the speed reference 1 the PID output
Select **Speed ref 1 src = PID out mon**
Set **Ramp out enable** = Disable

Connect to the analog input 3 the tension reference.
Select **PID draw src = An inp 3 output**

Connect to the Digital input 1 the input enabling the PID PI Block
Select **PID PI enab src = DI 1 monitor**

Connect to the Digital input 2 the input enabling the PID PD Block
Select **PID PD enab src = DI 2 monitor**

In case just one contact is needed to enable the PI and PD section, it is possible to connect also PID PD enab src on the digital input 1 as described below.

Select **PID PD enab src = DI 1 monitor**

7.5.6.3 Parameters

Set **Full scale spd** equal to the motor maximum speed.
Full scale spd = 3000 rpm

Connect
Mlt PI sel 0 = Null
Mlt PI sel 1 = One
The selection of the **PID Mlt PI sel 1** multiplier is therefore active.

Set
PID Mlt PI sel 1 = 1 The starting value is 1

Without any correction on the side of the regulator PI Block, the reference of the line speed (Feed-forward) has to be multiplied by 1 and sent directly to the Drive speed regulator.
Set **PI lim top** and **PI lim bot** in order to obtain a maximum correction of the PI Block equal to 100% of the line speed.
The **PI lim top** and **PI lim bot** parameters can be considered, respectively, as a maximum and minimum multiplicative factor of the feed-forward.

PI lim top = 1
PI lim bot = 0

With this application the regulator carries out a proportional-integral control. The gains of the different components have to be set, experimentally, with a loaded machine; such tests can be started with the values below (default values):

Set **PI P1 gain %** = 4%
Set **PI I1 gain %** = 4%
Set **PD P1 gain %** = 1%

Use the derivative component as a system "damping" element, by setting for

example:
PD D1 gain % = 1%
PD der filter = 20ms
If it is not required, leave the parameters = 0.

7.5.7 Generic PID

Drive settings: (only those referring to the PID function are described)
Connect to the analog input 1 the reaction signal.
Select **PID fbk src = An inp 1 output**

Connect to the analog input 2 the reference.
Select **PID draw src = An inp 2 output**

Connect the feed forward signal to its internal reference.
Select **PID inp FF src = Int PID inp FF**
Set **Int PID inp FF** to 100%

Connect to the Digital input 1 the input enabling the PID PI Block
Select **PID PI enab src = DI 1 monitor**

Connect to the Digital input 2 the input enabling the PID PD Block
Select **PID PD enab src = DI 2 monitor**

In case just one contact is needed to enable the PI and PD section, it is possible to connect also **PID PD enab src** on the digital input 1 as described below.

Select **PID PD enab src = DI 1 monitor**

Connect to the control variable (**Torque**, **Speed**, etc.) the PID output
Select **Torque ref 1 src** or **Speed ref 1 src**, etc. = **PID out s mon**; the scale factor of **PID out s mon** can be set via the **PID Out gain** parameter according to the different needs.
See chapter 6.1.3, Normalizations signals.

7.5.7.1 Parameters

Set **Full scale spd** equal to the motor speed corresponding to 100% of the line speed.
Full scale spd = 2550 rpm

Connect
Mlt PI sel 0 = Null
Mlt PI sel 1 = One

The selection of the **PID Mlt PI sel 1**multiplier is therefore active.

Set **PID Mlt PI sel 1** = 1 The starting value is 1

Set **PI lim top** and **PI lim bot** in order to obtain a maximum correction of the PI Block equal to +/- 100% of the control variable.
The **PI lim top** and **PI lim bot** parameters can be considered, respectively, as a maximum and minimum multiplicative factor of the feed-forward.

PI lim top = 1
PI lim bot = -1

7.5.8 Application Note: Dynamic Change of the PI Block Integral Gain

The higher the diameter ratio of the controlled winder is, the lower is the value at which the PID integral gain is usually set. A too high value allows a good regulation with low diameters but causes strong system coggings when higher diameters are present.
On the contrary, too low values of the integral gain could cause, with a minimum diameter, a movement of the dancer position, as compared to the electric 0 position, directly proportional to the line speed. It happens because the integral component charge or discharge is performed in a period of time shorter than the diameter changing time.

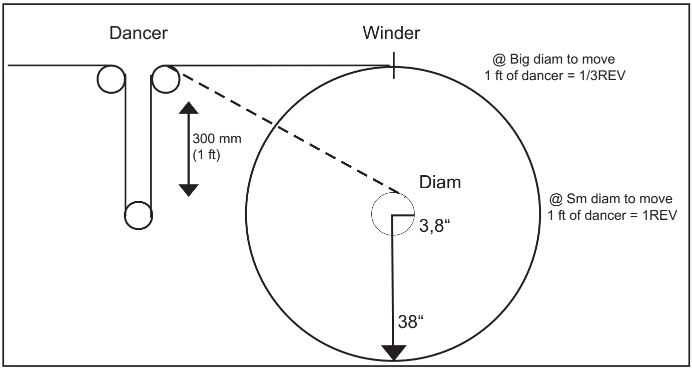


Figure 7.5.8-1*: Example with a Small and Big Diameter*

In case of high diameter ratios, it could be necessary to change dynamically the values of the PI P and I parameters according to the present diameter.

As the output of the PI Block is inversely proportional to the diameter, it must be connected as the abscissa of the PI gain adaptive.

PIGP ref src = PID PI out mon

The thresholds and gains have to be set in order to obtain a gain Profile equal to the one shown in the following figure.
Consider to control a winder with a 1/10 diameter ratio.

The regulator integral component must be inversely proportional to the diameter.
The value of the **PI output PID** parameter is already in compliance with this rule, as it changes according to the ratio

Φ_0 / Φatt.

Where: Φ_0 = winder minimum diameter
Φatt = winder present diameter

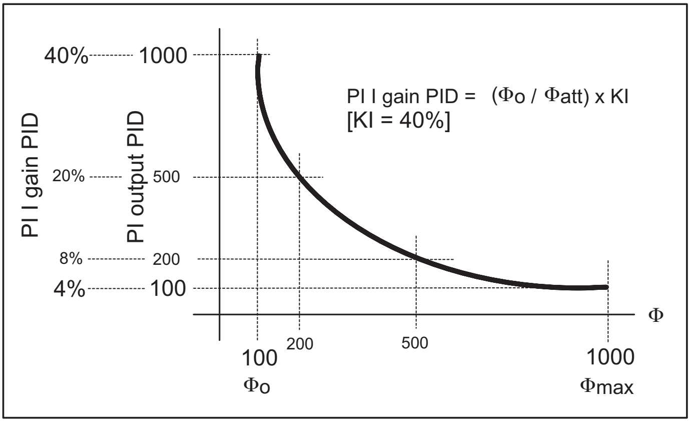


***Figure 7.5.8-2**: PI I Gain PID and PI I Output PID ratio*

Chapter 8 - Throubleshooting

8.1 Using Keypad Alarm List

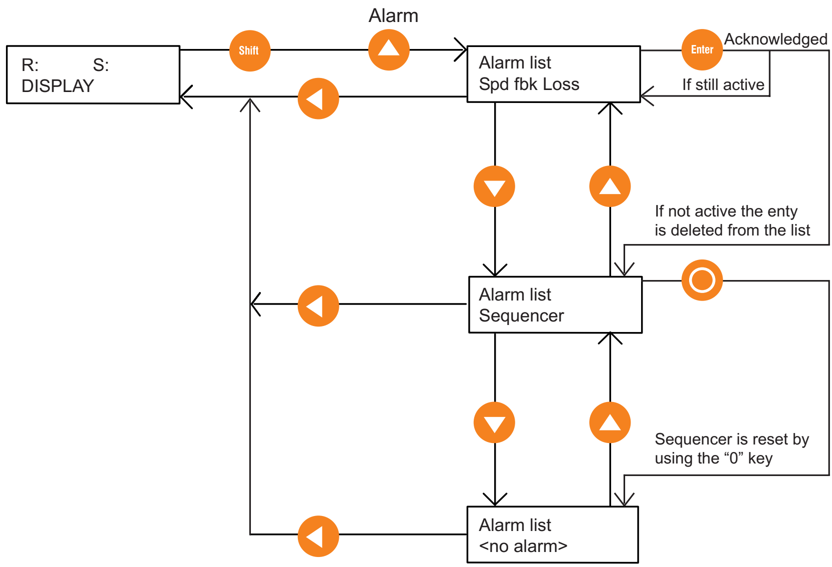
When the red "Alarm" LED blinks, it is indicating one (or more) alarm conditions.

See following steps to reset it:

1) Press **[Shift]** + **[Alarm]**
   The "Alarm list" will be displayed.
2) Press **[Enter]**
   Press **[Enter]** one or more times untill "Sequencer" message appears, to acknowledge the alarms.

NOTE! If the alarm is still active, red LED will blink again. If it not active, red LED will stop.

3) Press **[STOP]** key to reset the Sequencer.



The Alarm List shows all the occurred alarms, both if they are due to protections and to errors when limit values are exceeded.

In order to disappear from the alarm list, alarm have to be acknowledged. The acknowledgement is possible only if the alarm is no longer active. The alarms are automatically acknowledged after two minutes.

NOTE! Pressing **[Enter]** will acknowledge the alarm. Acknowledging the alarm will only remove it from the active alarm list. If the alarm condition also resulted in a drive trip, the sequence will also need to be reset. This can be done by pressing the **[STOP]** key. The drive cannot be re-enabled or started after a trip condition unless the drive sequencer is reset.

The drive State Machine, controls the drive running and starting, accounting for protection & alarming, command sequence, and reset status.

The table below displays various operation states by Sequencer status number:

Sequencer status	State
1	Magnetization running
2	Magnetization completed, Stop
3	Start
4	Fast stop, Stop
5	Fast stop, Start
9	No alarm, drive is ready to accept all commands
10	Magnetization running and Start command already present
12	Alarm active
16	Alarm not active, waiting for reset

TAV3i020

To read the sequencer status of the State Machine, go to menu:

```
R:        S:
DISPLAY                A
```

Enter

```
DISPLAY           A00.00
Output freq            A
```

▲ up to

```
DISPLAY              A13
Adv Dsply              A
```

Press Enter:

```
Adv Dsply         A13.00
Magnetiz Curr          A
```

▲ up to

```
Adv Dsply         A13.07
Sequencer status       A
```

Enter

```
Sequencer status
        12
```

8.2 List of Error Alarm Events

Entering bad data or conflicting data into the drive configuration will cause user errors to be displayed.

These type of errors can be:

- Configuration errors
- Data Base errors (DB errors)

Refer to the following paragraphs for descriptions.

8.2.1 Configuration Errors

Configuration errors can occur by entering incompatible or invalid parameter data.

The error indicates which parameters are causing the problem in the Setup Mode:

- Motor data
- Drive data
- Start Up parameter

The drive reports configuration error by the following example description:

Calc error: 606
Param: 0000

The "Calc error" number denotes the cause of invalid calculation. The error number reported by this process is set in part of the reply signal.

The Calc error numbers is composed as follows:

Calc error = Offset + Error code

The Offset denotes the type error:

0 for specific errors
100 for errors originated by the database calculation (see DB error paragraph)
500 for errors due to floating point calculation (exception, divide by zero etc..)
600 for errors originated by the configuration calculations (range and so on).

The Error code denotes the origin cause of the error (for the Error code values lists see below).

For example, Calc error number ***606*** is a configuration error (600) caused by speed base value (6) out of range.

The "Param" number is not meaningful.

Error code values lists

Error code values for Offset 0 :

0 no error
1 signal not managed in current configurator state
2 cannot stop regulation
3 recipe export error
4 recipe import error
5 error while loading selftune data
6 error while loading motor data

7 reserved
8 error while loading customer specific data
9 error while loading drive size data
10 error while writing file size.ini
11 error while apply database. The operation is refused because errors arised during group calculation. To reset the errors it is necessary re-enter the data, and confirm correctness
12 error while saving too changes

Error code values for Offset 100:

See DB errors, section 8.2.2.

Error code values for Offset 500 (500 + error code):

3 Integer overflow
4 Floating overflow
5 Floating underflow
7 Divide by zero
9 Undefined float
10 Conversion error
11 Floating point stack underflow
12 Floating point stack overflow

Error code values for Offset 600 (600 + error code):

0 no error
1 switching freq. error
2 mains voltage error
3 ambient temperature error
4 regulation mode error
5 take selection error
6 base speed error
7 drive size error

Drive size setting

NOTE! If the User changes the Drive size, the drive will display:
Drv size: new size - old size
For example: ***Drive size: 0 - 1***
For the drive size number the table below:

400/460Vac Series	**575Vac Series**
[0] 0.75kW-0.75Hp	[2] 575V - 2.0Hp
[1] 1.5kW - 1.5Hp	[3] 575V - 3.0Hp
[2] 2.2kW - 2.0Hp	[4] 575V - 5.0Hp
[3] 3.0kW - 3.0Hp	[5] 575V - 7.5Hp
[4] 4.0kW - 5.0Hp	[6] 575V - 10Hp

[5] 5.5kW - 7.5Hp
[6] 7.5kW - 10Hp
[7] 11kW - 15Hp
[8] 15kW - 20Hp
[9] 22kW - 25Hp
[10] 30kW - 30Hp
[11] 37kW - 40Hp
[12] 45kW - 50Hp
[13] 55kW - 60Hp
[14] 75kW - 75Hp
[15] 90kW - 100Hp
[16] 110kW- 125Hp
[17] 132kW- 150Hp
[18] 160kW- 200Hp
[19] 250kW- 300Hp
[20] 315kW- 450Hp
[21] 500kW- 600Hp
[22] 160kW-200Hp
[23] 400kW- 500Hp

[7] 575V - 15Hp
[8] 575V - 20Hp
[9] 575V - 25Hp
[10] 575V - 30Hp
[11] 575V - 40Hp
[12] 575V - 50Hp
[13] 575V - 60Hp
[14] 575V - 75Hp
[16] 575V - 100Hp
[17] 575V - 125Hp
[18] 575V - 150Hp

8.2.2 Database Errors (DB Errors)

DB errors are caused by a incorrect setting in a single parameter. This problem is originated in the database calculation. For example the most common are:

- DB error Limit HIGH
- DB error Limit LOW

The message DB error is displayed by the drive in this format:
DB err IPA: error code

The IPA denotes the parameter number which caused the DB error calculation. The error code denotes the type error.

Example of message DB error displayed:
DB ERR 3420: 5

This means that the DB error is caused by IPA 3420 (**B0F.00 - V/f voltage**) which is below the low limit; Error code 5 denotes the type error (for the DB error code values list see below). To find the low limit, which depends on drive configuration, it is possible to go to the V/f voltage parameter on the keypad.
Press the **[Shift]** key and then the **[Help]** key, the following will be displayed:

Max Value
min Value
Def(ault) Value
unit
raw value
IPA
Description
(Access) mode

In most cases it is enough to set a new value which is within the limits.

DB error code list

0 no error
1 SBI PROBLEM 0x01
2 Generic error
3 Attribute not exist
4 Limit High
5 Limit Low
11 Division by zero
12 Int Overflow
13 Int Undefflow
14 Long Overflow
15 Long Underflow
16 Domain Error
17 Indirection Error
18 Reached wrong eof
19 Dbase not configured
20 Value not valid
21 Process doesn’t reply
22 Wrong record size
23 Attribute read only
24 SBI PROBLEM 0x18
25 Command not yet implemented
26 Command wrong
27 Read file error
28 Header wrong
29 Reserved for internal use
30 Parameter not exist
31 Parameter read only
32 Parameter ”z” only
48 SBI PROBLEM 0x30

8.2.3 List of Error Codes for All Autotune Procedures

The different autotune procedures for Current regulator, Flux regulator, Speed regulator or Analog input calibration may generate error messages that are described in table 8.2.3.1.

Table 8.2.3.1: Error Messages from Autotune Procedures

Error number	Error text	Description
0	No	error
1	Abort	the user entered Escape or O key, or removed enable permissive (term 12 low)
2	DB access <IPA>	an attempt to access the database at the speficied index occurred during autotune procedure
3	No break point	failure in measuring inverter voltage distortion
4	Rs high lim	failure in measuring motor stator Resistance
5	Rs low lim	failure in measuring motor stator Resistance
6	DTL high lim	failure in computing compensation for the inverter voltage distortion
7	DTL low lim	failure in computing compensation for the inverter voltage distortion
8	DTS high lim	failure in computing compensation for the inverter voltage distortion
9	DTS low lim	failure in computing compensation for the inverter voltage distortion
10	LsS high lim	failure in calculating motor leakage inductance
11	LsS low lim	failure in calculating motor leakage inductance
12	ImNom not found	identification of rated magnetizing current failed
13	ImNom not found	identification of maximum magnetizing current failed
14	RrV low lim	Voltage limit exceeded during measurement for the calculation of motor rotor resistance
15	RrV high lim	Voltage limit exceeded during measurement for the calculation of motor rotor resistance
16	Rr high lim	failure in calculating motor rotor resistance
17	Rr low lim	failure in calculating motor rotor resistance
18	AI too high	value of analog input is too high for full scale autocalibration
19	AI too low	value of analog input is too low for full scale autocalibration
20	Rr2 high lim	failure in calculating motor rotor resistance
21	Rr2 low lim	failure in calculating motor rotor resistance
22	Drive disabled	Enable permissive (term 12) was found low when attempting to start autotune procedure
23	Rr timeout	timeout occurred during measurement for the calculation of motor rotor resistance
24	Rr2 timeout	timeout occurred during measurement for the calculation of motor rotor resistance
25	LsS timeout	timeout occurred during measurement for the calculation of motor leakage inductance
26	Drive enabled	Drive was found to be already enabled when attempting to initiate autotune procedure
27	Friction null	Drive was unable to identify a value for load friction
28	Drive stalled	Drive was unable to spin the shaft
29	Max spd exceeded	Drive speed limit for Speed regulator autotune was exceeded
30	Torque too high	Torque setting for Speed regulator autotune was too high
31	Load applied	Load torque was detected on the shaft
32	Calc error	An error occurred when processing measurement data
33	Config error <errcode>	The spedified Configurator error occurred during database configuration based on autotune data
34	Motor is running	Motor speed was found to be non zero when attempting to initiate autotune procedure
35	Cmd not supported	Command not supported in the current state

8.2.4 List of Regulation Alarm Events

Table 8.2.4.1 provides a description of regulation alarm events and information on how to configure the intended drive behaviour on their occurrence (where applicable).

Table 8.2.4.1: Regulation Alarm Events

Alarm name	Description (Cause of fault)	Drive activity After alarm	Hold off	Restart	Restart time	Code in the Alarm list	Bit position in Al.list
Failure supply	One or more of the power supply circuits in the control section failed	Disable drive	No	No	NA	21	1
Undervoltage	Voltage on the drive DC link is lower than the minimum threshold for the given Mains voltage setting	Disable drive	No	Yes. Logic is based on the number of attempts	Yes	22	2
Overvoltage	Voltage on the drive DC link is higher than the maximum threshold for the given Mains voltage setting	Disable drive	No	Yes	Yes	23	3
IGBT desat flt	IGBT instantaneous overcurrent was detected by gate desaturation sensing circuit	Disable drive	No	Yes. No more than 2 attempts in 30 seconds	Yes	24	4
Inst Overcurrent	IGBT instantaneoud overcurrent was detected by output current sensor	Disable drive	No	Yes No more than 2 at./30sec.	Yes	25	5
Ground fault	Output phase discharge to ground (when used on a grounded power system)	Programmable	No	No	Yes	26	6
Curr fbk loss	A failure of current sensor feeedback or power supply was detected	Disable drive	No	No	No	27	7
External fault	External fault input is active	Programmable	Programmable	Yes	Program.	28	8
Spd fbk loss	A failure of the speed feedback sensor or power supply was detected	Programmable	No	No	No	29	9
Module OT	IGBT overtemperature was detected by internal sensor	Disable drive	Constant, 10 msec	No	No	30	10
	For 230 ... 480Vac models: 0,75 kW to 15 kW only. For 575Vac models: 0.75 to 20 Hp only.						
Heatsink OT	Heatsink overtemperature was detected by thermalcontact	Disable drive	Constant, 1000 msec	No	No	31	11
	For 230 ... 480Vac models: 22 kW and over. For 575Vac models: 25 Hp and over.						
Motor OT	Motor overtemperature was detected by thermal contact or PTC thermistor	Programmable	Programmable	Yes	Program.	32	12
Heatsink S OT	Heatsink linear temperature sensor threshold was exceeded	Programmable	Programmable	Yes	Program.	33	13
Regulat S OT	Regulation board linear temperature sensor threshold was exceeded	Programmable	Programmable	Yes	Program.	34	14
Intake Air S OT	Cooling air intake linear temperature sensor threshold was exceeded.	Programmable	Programmable	Yes	Program.	35	15
	For 230 ... 480Vac models: 22 kW and over. For 575Vac models: 25 Hp and over.						

Alarm name	Description (Cause of fault)	Drive activity After alarm	Hold off	Restart	Restart time	Code in the Alarm list	Bit position in Al.list
ISBus fault	Fault of optional ISBus LAN communication	Programmable	No	Yes	Program.	36	16
Comm card fault	Fault of optional LAN communication board	Programmable	No	Yes	Program.	37	17
Appl card fault	Fault of optional application coprocessor board	Disable drive	No	No	No	38	18
Drv overload	Drive overload accumulator exceeded trip threshold	Programmable	No	No	No	39	19
Mot overload	Motor overload accumulator exceeded trip threshold	Programmable	No	No	No	40	20
BU overload	Braking resistor overload accumulator exceeded trip threshold	Programmable	No	No	No	41	21
Data lost	Data corrupted in non-volatile memory	Disable drive	No	No	No	42	22
Fwd Rev Ctrl	Forward and Reverse commands were detected active at the same time	Programmable	No	No	No	43	23
Max time	Software task time overrun was detected	Disable drive	No	No	No	44	24
Sequencer	Command sequencer was tripped by an alarm event	Disable drive	No	No	No	45	25
PLS timeout	The duration of a voltage dip caused Power Loss Stop function restart logic to timeout	Disable drive	No	No	No	46	26
Overspeed	Maximum speed threshold was exceeded while drive in RUN state	Programmable	Programmable	No	No	47	27
UV repetitive	More than a programmable number of UV fault were detected in 5 minutes	Disable drive. If n. of faults is set to max, the Alarm is disabled.	No	No	No	48	28
IOC repetitive	More than 2 OC faults were detected in 30 sec.	Disable drive	No	No	No	49	29
IGBTdesat repet	More than 2 IGBT desat faults were detected in 30 sec.	Disable drive	No	No	No	50	30
WatchDog user	The drive failed to retrigger the communication watchdog within the specified time	Disable drive	No	No	No	51	31
Hw fail	Communication failure between Drive Regulation board and one of its options or I/O expansions.	Disable drive	No	No	No	52	32

8.2.5 Hints on How to Correct Some Regulation Alarms Events

External fault

External failure, acquired from a digital input or communication channel. If using a terminal input:

The signal on the terminal is missing. Make sure to tie common point of digital inputs (term 16) with power supply reference point (term. 18 if using internal power supply).

Failure supply

Caution

Switch off voltage before removing terminal strips. In most cases the cause is in the external wiring. Pull out the plug-in terminal strips of the regulator card and acknowledge the Alarm. If no other faults are indicated, check your wiring for a short-circuit, in some cases with the cable shielding.

If this has not corrected the fault, contact your service representative.

Heatsink OT

- For 230...480Vac models 22kW and higher

- For 575Vac models 25Hp and higher

Temperature of the heatsink too high. Check for failure of a device fan, ambient temperature too high, dirty, heatsink, or cooling opening obstructed.

Heatsink S OT

Ambient temperature too high.

Failure of device fan, dirty heatsink, or cooling opening obstructed.

Intake Air S OT

- For 230...480Vac models 22kW and higher

- For 575Vac models 25Hp and higher

Temperature of the cooling air too high.

IGBT desat flt

Internal Overcurrent failure of IGBT power section

Switch off device and restart . If you are unsuccessful, contact your service representative.

Inst Overcurrent

Overcurrent in the motor circuit.

Short-circuit or ground fault at the output of the drive. Remove power to the main circuit, wait for the prescribed time to discharge DC link and check power connections.

Reapply power and attempt a restart. If still unsuccessful, contact your service representative.

Module OT

- For 230...480Vac models from 0.75 to 15 kW

- For 575Vac models from 2 to 20 HP

Temperature of the IGBT module too high.

Failure of device fan.

Failure in the IGBT module on power section.

Fast overload current duty cycle too high.

Motor OT

Overtemperature of the motor (indicated via thermistor on terminals 78/79)

Cable between thermistor connection on motor and terminals 78 and 79 interrupted.

Overheating of motor:

- Load cycle too heavy
- Ambient temperature at site of motor too high
- Motor has an external fan: fan failed
- Motor does not have an external fan: too large a load at low speed. The cooling effect of the fan on the motor shaft is too low for this load cycle. Change cycle or fit external fan.
- Motor used above its frequency specification, causing extra magnetic losses.

Overvoltage

Overvoltage in intermediate circuit due to energy feedback from the motor

Lengthen deceleration ramp. If not possible, use a braking unit to reduce the energy feedback.

Regulat S OT

Temperature of the Regulation board of the Drive too High.

Ambient temperature too high.

Speed fbk loss

Failure in the speed feedback sensor signals.

Encoder not connected, or incorrectly connected or not supplied:

Check encoder signals as per section 5.7. If the indicated value does not change or random values are shown, check the power supply and the cabling of the encoder.

Parameter and input setting on the regulation card is not consistent with encoder type.

Undervoltage

Mains voltage parameter incorrectly set. Remedy: set parameter correctly and then acknowledge (*) the fault.

The incoming voltage to the power section of the device is too low due to:

- too low an AC input voltage or long voltage dips
- poor cable connections (e.g. terminals on contactor, choke, filter, etc, not properly secured). Check connections.

(*) By default all alarms are auto-acknowledged after a 180 sec timeout. To acknowledge a fault press “Alarm” **[Shift]** +**[Up arrow]**, scroll to the desired Alarm list entry and **[Enter]**.

8.2.6 Hints on How to Correct Other Faulty Conditions

Motor not turning

Failure alarm is displayed: see section 8.2.5.

Once the error has been corrected, acknowlegde the alarm and press the I and O key to reset the command sequencer.

Keypad display is dark: AC voltage supply to terminals U1/V1/W1 missing or Regulation power supply overloaded. Check for short circuit on signal wiring.

Enable terminal permissive missing (Check configuration of the reg. terminals).

Drive not accepting commands: drive in SETUP MODE.

The analog input used for the reference value was not assigned or assigned differently.

Motor turning in the wrong direction

Polarity of the speed reference signal incorrect.

Motor incorrectly connected.

Note for **Regulation mode** = “Field oriented” only:

if the motor lets itself be controlled in the wrong direction the two encoder cables (A+ and A- or B+ and B-) have to be swaped around in addition to two leads of the motor cable.

Motor not reaching nominal speed

Drive is at speed limit. Remedy: check Speed top and Speed bottom.

Drive working at current limit (LED Ilimit) Possible causes:

- Motor overloaded
- Inverter sized too small
- Incorrect **V/f shape** characteristic set
- **Torque reduct** input active

The value entered for the number of encoder pulses is too high.

A correction value reduces the main speed reference value. Remedy: check control pattern configuration

If main speed reference is acquired via analog input, Full scale speed set too low may result in restricting range of analog inputs.

Motor accelerates immediately to maximum speed

Reference value set via terminals: Check whether the value varies from min. to max. value. Potentiometer used for reference value setting: is there a 0V connection present?

Encoder not connected, or incorrectly connected or not supplied:

Check encoder signals as per section 5.7. If the indicated value does not change or random values are shown, check the power supply and the cabling of the encoder. If the indicated value is opposite than the speed reference, reverse the encoder connections (exchange channel A+ and A- or B+ and B-).

Motor accelerates too slowly

Ramp value incorrectly set.

Drive working at current limit (LED Ilimit) Possible causes:

- Motor overloaded

- Drive sized too small
- Incorrect V/f characteristics set

Motor decelerates too slowly

Ramp value incorrectly set

Motor turns slowly, although reference value = Zero

Minimum speed logic active

Unused speed reference configured to an open analog input. Remedy: set source parameters for any unused speed reference to OFF.

Main speed referece source is an analog input: disconnect reference value on used analog input,

- if drive now stands still, the effect is due to the cable resistance of the 0V cable.
- if the drive is still turning: carry out offset compensation of the analog input.

The speed during acceleration with maximum current is not linear

Reduce the Speed integral gain and proportional gain proportionally. If this does not lead to an improvement, retune the speed regulator.

Speed oscillating

Speed regulator integral gain vs proportional gain ratio is too high.

Motor potentiometer function not executed.

When operating with remote keys: **D09.00 - Mpot up src** and/or **D09.01 - Mpot down src** and **D09.02 - Mpot invers src** were not mapped to digital inputs or LAN channel bits.

Jog operation not possible

A start command is still present.

When operating with remote keys: **JD10.01 - Jog cmd src** and/or **D10.04 - Jog invers src** were not mapped to digital inputs or LAN channel bits

Internal speed reference values not actuated

D08.00 - Mlt spd s 0 src, **D08.01 - Mlt spd s 1 src** or **D08.02 - Mlt spd s 2 src** were not mapped to digital inputs or LAN channel bits

Multi-Ramp function not reacting

D01.00 - Mlt ramp s0 src or **D01.01 - Mlt ramp s1 src** were not mapped to digital inputs or LAN channel bits.

Legenda:

Pick List 01	= Pick List Number
[000] NULL 4000	***Pick List Easy mode***
[000]	Index
NULL	Index number
4000	IPA
[054] AI 1X < thr 5068	= *Pick List Full mode*
[054]	Index
AI 1X < thr	Index number
5068	IPA

Pick List 01

Index Name	IPA
[000] NULL	4000
[001] ONE	4001
[002] Vlt search m	3572
[003] Drive ready	161
[004] EnableSM mon	162
[005] Start SM mon	163
[006] FStop SM mon	164
[007] ALMSequencer	9096
[008] Drive OK	9097
[009] Jog state	8013
[010] En cmd mon	150
[011] Str cmd mon	151
[012] FS cmd mon	152
[013] AI 1 < thr	5010
[014] AI 2 < thr	5030
[015] AI 3 < thr	5050
[016] DI 0 En mon	4020
[017] DI 1 mon	4021
[018] DI 2 mon	4022
[019] DI 3 mon	4023
[020] DI 4 mon	4024
[021] DI 5 mon	4025
[022] DI 6 mon	4026
[023] DI 7 mon	4027
[024] FRC reverse	8081
[025] RampAcc stat	8023
[026] RampDec stat	8024
[027] RampOut != 0	8025
[028] Spd lim stat	7049
[029] Spd = zero	3728
[030] Ref = zero	3729
[031] Spd 0 dly	3730
[032] Ref 0 dly	3731
[033] TcurLim stat	2445
[034] SpdTrq ctrl	2446
[035] DCBrake stat	1837
[036] PLR active	2284
[037] PLS active	2275
[038] PLS Tout act	2276
[039] Drv OL trip	1570
[040] Drv OL warn	1580
[041] Mot OL trip	1680
[042] BU OL trip	1782
[043] ActSpdFbkSel	1941
[044] Std enc fail	3224
[045] Exp enc fail	3225
[046] Alm W1 S1	9630
[047] Alm W2 S1	9631
[048] Alm W3 S1	9632
[049] Alm W1 S2	9634
[050] Alm W2 S2	9635
[051] Alm W3 S2	9636
[052] Compare1 out	6048
[053] Compare2 out	6063
[054] AI 1X < thr	5068
[055] AI 2X < thr	5088
[056] DI 0X mon	4045
[057] DI 1X mon	4046
[058] DI 2X mon	4047
[059] DI 3X mon	4048
[060] DI 4X mon	4049
[061] DI 5X mon	4050
[062] DI 6X mon	4051
[063] DI 7X mon	4052
[064] DI 8X mon	4053
[065] DI 9X mon	4054
[066] DI 10X mon	4055
[067] DI 11X mon	4056
[068] B0 W0 decom	2123
[069] B1 W0 decom	2124
[070] B2 W0 decom	2125
[071] B3 W0 decom	2126
[072] B4 W0 decom	2127
[073] B5 W0 decom	2128
[074] B6 W0 decom	2129
[075] B7 W0 decom	2130
[076] B8 W0 decom	2131
[077] B9 W0 decom	2132
[078] B10 W0 decom	2133
[079] B11 W0 decom	2134
[080] B12 W0 decom	2135
[081] B13 W0 decom	2136
[082] B14 W0 decom	2137
[083] B15 W0 decom	2138
[084] B0 W1 decom	9363
[085] B1 W1 decom	9364
[086] B2 W1 decom	9365
[087] B3 W1 decom	9366
[088] B4 W1 decom	9367
[089] B5 W1 decom	9368
[090] B6 W1 decom	9369
[091] B7 W1 decom	9370
[092] B8 W1 decom	9371
[093] B9 W1 decom	9372
[094] B10 W1 decom	9373
[095] B11 W1 decom	9374
[096] B12 W1 decom	9375
[097] B13 W1 decom	9376
[098] B14 W1 decom	9377
[099] B15 W1 decom	9378
[100] PL next act	2283
[101] DiamCalc act	7367
[102] Dig pad 0	9116
[103] Dig pad 1	9117
[104] Dig pad 2	9118
[105] Dig pad 3	9119
[106] Dig pad 4	9120
[107] Dig pad 5	9121
[108] Dig pad 6	9122
[109] Dig pad 7	9123
[110] Dig pad 8	9124
[111] Dig pad 9	9125
[112] Dig pad 10	9126
[113] Dig pad 11	9127
[114] Dig pad 12	9128
[115] Dig pad 13	9129
[116] Dig pad 14	9130
[117] Dig pad 15	9131
[118] Mlt par stat	8102
[119] Mlt par sel	8104

Pick List 02

Index Name	IPA
[000] NULL	4000
[001] ONE	4001
[002] Output volt	3060
[003] Output curr	3070
[004] Output freq	3080
[005] Output pwr	3090
[006] DCLink volt	3100
[007] MagnetizCurr	3110
[008] Torque curr	3120
[009] MagnCurr ref	3130
[010] TrqCurr ref	3140
[011] Curr phase U	3150
[012] Curr phase V	3160
[013] Curr phase W	3170
[014] Flux ref	3180
[015] Flux	3190
[016] Ramp ref	3200
[017] Speed ref	3210
[018] Speed	3220
[019] Actual Speed	3221
[020] Fault Pin	9098
[021] Std Enc Spd	3222
[022] Exp Enc Spd	3223
[023] DrvOL accum%	1540
[024] MotOL accum%	1670
[025] BU OL accum%	1781
[026] Ud	3270
[027] Drive ready	161
[028] EnableSM mon	162
[029] Start SM mon	163
[030] FStop SM mon	164
[031] ALMSequencer	9096
[032] Drive OK	9097
[033] Jog state	8013
[034] Gen output	2760
[035] AI 1 output	5009
[036] AI 2 output	5029
[037] AI 3 output	5049
[038] Ramp out mon	8022
[039] Spd Draw out	7099
[040] Jog output	8012
[041] Mlt Spd out	7070
[042] Mpot output	7090
[043] I/F cp mon	2625
[044] Torque ref	2450
[045] Tcurr lim +	1210
[046] Tcurr lim -	1220
[047] InuseTcurrL+	1250
[048] InuseTcurrL-	1260
[049] InuseOutvltR	1180
[050] Std enc pos	9553
[051] Exp enc pos	9554
[052] H Index reg	9555
[053] L Index reg	9556
[054] AI 1X output	5067
[055] AI 2X output	5087
[056] W0 comp out	2116
[057] W1 comp out	9356
[058] PL next fact	2282
[059] SBIDrvW0 mon	9000
[060] SBIDrvW1 mon	9001
[061] SBIDrvW2 mon	9002
[062] SBIDrvW3 mon	9003
[063] SBIDrvW4 mon	9004
[064] SBIDrvW5 mon	9005
[065] ISBusDrvW0 m	9300
[066] ISBusDrvW1 m	9301
[067] ISBusDrvW2 m	9302
[068] ISBusDrvW3 m	9303
[069] ISBusDrvW4 m	9304
[070] ISBusDrvW5 m	9305
[071] ISBusDrvW6 m	9306
[072] ISBusDrvW7 m	9307
[073] APCSDrv W0m	4120
[074] APCSDrv W1m	4121
[075] APCSDrv W2m	4122
[076] APCSDrv W3m	4123
[077] APCSDrv W4m	4124
[078] APCADrv W0m	4160
[079] APCADrv W1m	4161
[080] APCADrv W2m	4162
[081] APCADrv W3m	4163
[082] APCADrv W4m	4164
[083] APCADrv W5m	4165
[084] APCADrv W6m	4166
[085] APCADrv W7m	4167
[086] APCADrv W8m	4168
[087] APCADrv W9m	4169
[088] PID FF mon	7217
[089] PID input	7256
[090] PID PI out	7294
[091] Last PI out	7295
[092] PID PD out	7343
[093] PID out mon	7352
[094] PID outS mon	7353
[095] Pad 0	9100
[096] Pad 1	9101
[097] Pad 2	9102
[098] Pad 3	9103
[099] Pad 4	9104
[100] Pad 5	9105
[101] Pad 6	9106
[102] Pad 7	9107
[103] Pad 8	9108
[104] Pad 9	9109
[105] Pad 10	9110
[106] Pad 11	9111
[107] Pad 12	9112
[108] Pad 13	9113
[109] Pad 14	9114
[110] Pad 15	9115

Pick List 03

Index Name	IPA
[000] NULL	4000
[001] ONE	4001
[002] DI 0 En mon	4020
[003] DI 1 mon	4021
[004] DI 2 mon	4022
[005] DI 3 mon	4023
[006] DI 4 mon	4024
[007] DI 5 mon	4025
[008] DI 6 mon	4026
[009] DI 7 mon	4027
[010] FRC reverse	8081
[011] Spd = zero	3728
[012] Ref = zero	3729
[013] Spd 0 dly	3730
[014] Ref 0 dly	3731
[015] DI 0X mon	4045
[016] DI 1X mon	4046
[017] DI 2X mon	4047
[018] DI 3X mon	4048
[019] DI 4X mon	4049
[020] DI 5X mon	4050
[021] DI 6X mon	4051
[022] DI 7X mon	4052
[023] DI 8X mon	4053
[024] DI 9X mon	4054
[025] DI 10X mon	4055
[026] DI 11X mon	4056
[027] B0 W0 decom	2123
[028] B1 W0 decom	2124
[029] B2 W0 decom	2125
[030] B3 W0 decom	2126
[031] B4 W0 decom	2127
[032] B5 W0 decom	2128
[033] B6 W0 decom	2129
[034] B7 W0 decom	2130
[035] B8 W0 decom	2131
[036] B9 W0 decom	2132
[037] B10 W0 decom	2133
[038] B11 W0 decom	2134
[039] B12 W0 decom	2135
[040] B13 W0 decom	2136
[041] B14 W0 decom	2137
[042] B15 W0 decom	2138
[043] B0 W1 decom	9363
[044] B1 W1 decom	9364
[045] B2 W1 decom	9365
[046] B3 W1 decom	9366
[047] B4 W1 decom	9367
[048] B5 W1 decom	9368
[049] B6 W1 decom	9369
[050] B7 W1 decom	9370
[051] B8 W1 decom	9371
[052] B9 W1 decom	9372
[053] B10 W1 decom	9373
[054] B11 W1 decom	9374
[055] B12 W1 decom	9375
[056] B13 W1 decom	9376
[057] B14 W1 decom	9377
[058] B15 W1 decom	9378
[059] SBIDrvW0 mon	9000
[060] SBIDrvW1 mon	9001
[061] SBIDrvW2 mon	9002
[062] SBIDrvW3 mon	9003
[063] SBIDrvW4 mon	9004
[064] SBIDrvW5 mon	9005
[065] ISBusDrvW0 m	9300
[066] ISBusDrvW1 m	9301
[067] ISBusDrvW2 m	9302
[068] ISBusDrvW3 m	9303
[069] ISBusDrvW4 m	9304
[070] ISBusDrvW5 m	9305
[071] ISBusDrvW6 m	9306
[072] ISBusDrvW7 m	9307
[073] APCSDrv W0m	4120
[074] APCSDrv W1m	4121
[075] APCSDrv W2m	4122
[076] APCSDrv W3m	4123
[077] APCSDrv W4m	4124
[078] APCADrv W0m	4160
[079] APCADrv W1m	4161
[080] APCADrv W2m	4162
[081] APCADrv W3m	4163
[082] APCADrv W4m	4164
[083] APCADrv W5m	4165
[084] APCADrv W6m	4166
[085] APCADrv W7m	4167
[086] APCADrv W8m	4168
[087] APCADrv W9m	4169
[088] Dig pad 0	9116
[089] Dig pad 1	9117
[090] Dig pad 2	9118
[091] Dig pad 3	9119
[092] Dig pad 4	9120
[093] Dig pad 5	9121
[094] Dig pad 6	9122
[095] Dig pad 7	9123
[096] Dig pad 8	9124
[097] Dig pad 9	9125
[098] Dig pad 10	9126
[099] Dig pad 11	9127
[100] Dig pad 12	9128
[101] Dig pad 13	9129
[102] Dig pad 14	9130
[103] Dig pad 15	9131

Pick List 04

Index Name	IPA
[000] NULL	4000
[001] ONE	4001
[002] Gen output	2760
[003] AI 1 output	5009
[004] AI 2 output	5029
[005] AI 3 output	5049
[006] AI 1X output	5067
[007] AI 2X output	5087
[008] W0 comp out	2116
[009] W1 comp out	9356
[010] SBIDrvW0 mon	9000
[011] SBIDrvW1 mon	9001
[012] SBIDrvW2 mon	9002
[013] SBIDrvW3 mon	9003
[014] SBIDrvW4 mon	9004
[015] SBIDrvW5 mon	9005
[016] ISBusDrvW0 m	9300
[017] ISBusDrvW1 m	9301
[018] ISBusDrvW2 m	9302
[019] ISBusDrvW3 m	9303
[020] ISBusDrvW4 m	9304
[021] ISBusDrvW5 m	9305
[022] ISBusDrvW6 m	9306
[023] ISBusDrvW7 m	9307
[024] APCSDrv W0m	4120
[025] APCSDrv W1m	4121
[026] APCSDrv W2m	4122
[027] APCSDrv W3m	4123
[028] APCSDrv W4m	4124
[029] APCADrv W0m	4160
[030] APCADrv W1m	4161
[031] APCADrv W2m	4162
[032] APCADrv W3m	4163
[033] APCADrv W4m	4164
[034] APCADrv W5m	4165
[035] APCADrv W6m	4166
[036] APCADrv W7m	4167
[037] APCADrv W8m	4168
[038] APCADrv W9m	4169
[039] PID FF mon	7217
[040] PID input	7256
[041] PID PI out	7294
[042] Last PI out	7295
[043] PID PD out	7343
[044] PID out mon	7352
[045] PID outS mon	7353
[046] Pad 0	9100
[047] Pad 1	9101
[048] Pad 2	9102
[049] Pad 3	9103
[050] Pad 4	9104
[051] Pad 5	9105
[052] Pad 6	9106
[053] Pad 7	9107
[054] Pad 8	9108
[055] Pad 9	9109
[056] Pad 10	9110
[057] Pad 11	9111
[058] Pad 12	9112
[059] Pad 13	9113
[060] Pad 14	9114
[061] Pad 15	9115

Pick List 05

Index Name	IPA
[000] Cmp 1 inp 0	6041
[001] Cmp 1 inp 1	6042
[002] Cmp 1 inp 2	6043
[003] NULL	4000
[004] ONE	4001
[005] Output volt	3060
[006] Output curr	3070
[007] Output freq	3080
[008] Output pwr	3090
[009] DCLink volt	3100
[010] MagnetizCurr	3110
[011] Torque curr	3120
[012] MagnCurr ref	3130
[013] TrqCurr ref	3140
[014] Curr phase U	3150
[015] Curr phase V	3160
[016] Curr phase W	3170
[017] Flux ref	3180
[018] Flux	3190
[019] Ramp ref	3200
[020] Speed ref	3210
[021] Speed	3220
[022] Actual Speed	3221
[023] Fault Pin	9098
[024] Std Enc Spd	3222
[025] Exp Enc Spd	3223
[026] DrvOL accum%	1540
[027] MotOL accum%	1670
[028] BU OL accum%	1781
[029] Ud	3270
[030] Drive ready	161
[031] EnableSM mon	162
[032] Start SM mon	163
[033] FStop SM mon	164
[034] ALMSequencer	9096
[035] Drive OK	9097
[036] Jog state	8013
[037] Gen output	2760
[038] AI 1 output	5009
[039] AI 2 output	5029
[040] AI 3 output	5049
[041] Ramp out mon	8022
[042] Spd Draw out	7099
[043] Jog output	8012
[044] Mlt Spd out	7070
[045] Mpot output	7090
[046] I/F cp mon	2625
[047] Torque ref	2450
[048] Tcurr lim +	1210
[049] Tcurr lim -	1220
[050] InuseTcurrL+	1250
[051] InuseTcurrL-	1260
[052] InuseOutvltR	1180
[053] Std enc pos	9553
[054] Exp enc pos	9554
[055] H Index reg	9555
[056] L Index reg	9556
[057] AI 1X output	5067
[058] AI 2X output	5087
[059] W0 comp out	2116
[060] W1 comp out	9356
[061] PL next fact	2282
[062] SBIDrvW0 mon	9000

Index Name	IPA
[063] SBIDrvW1 mon	9001
[064] SBIDrvW2 mon	9002
[065] SBIDrvW3 mon	9003
[066] SBIDrvW4 mon	9004
[067] SBIDrvW5 mon	9005
[068] ISBusDrvW0 m	9300
[069] ISBusDrvW1 m	9301
[070] ISBusDrvW2 m	9302
[071] ISBusDrvW3 m	9303
[072] ISBusDrvW4 m	9304
[073] ISBusDrvW5 m	9305
[074] ISBusDrvW6 m	9306
[075] ISBusDrvW7 m	9307
[076] APCSDrv W0m	4120
[077] APCSDrv W1m	4121
[078] APCSDrv W2m	4122
[079] APCSDrv W3m	4123
[080] APCSDrv W4m	4124
[081] APCADrv W0m	4160
[082] APCADrv W1m	4161
[083] APCADrv W2m	4162
[084] APCADrv W3m	4163
[085] APCADrv W4m	4164
[086] APCADrv W5m	4165
[087] APCADrv W6m	4166
[088] APCADrv W7m	4167
[089] APCADrv W8m	4168
[090] APCADrv W9m	4169
[091] PID FF mon	7217
[092] PID input	7256
[093] PID PI out	7294
[094] Last PI out	7295
[095] PID PD out	7343
[096] PID out mon	7352
[097] PID outS mon	7353
[098] Pad 0	9100
[099] Pad 1	9101
[100] Pad 2	9102
[101] Pad 3	9103
[102] Pad 4	9104
[103] Pad 5	9105
[104] Pad 6	9106
[105] Pad 7	9107
[106] Pad 8	9108
[107] Pad 9	9109
[108] Pad 10	9110
[109] Pad 11	9111
[110] Pad 12	9112
[111] Pad 13	9113
[112] Pad 14	9114
[113] Pad 15	9115

Pick List 06

Index Name	IPA
[000] Cmp 2 inp 0	**6056**
[001] Cmp 2 inp 1	**6057**
[002] Cmp 2 inp 2	**6058**
[003] NULL	**4000**
[004] ONE	**4001**
[005] Output volt	**3060**
[006] Output curr	**3070**
[007] Output freq	**3080**
[008] Output pwr	**3090**
[009] DCLink volt	**3100**
[010] MagnetizCurr	**3110**
[011] Torque curr	**3120**
[012] MagnCurr ref	**3130**
[013] TrqCurr ref	**3140**
[014] Curr phase U	**3150**
[015] Curr phase V	**3160**
[016] Curr phase W	**3170**
[017] Flux ref	**3180**
[018] Flux	**3190**
[019] Ramp ref	**3200**
[020] Speed ref	**3210**
[021] Speed	**3220**
[022] Actual Speed	**3221**
[023] Fault Pin	**9098**
[024] Std Enc Spd	**3222**
[025] Exp Enc Spd	**3223**
[026] DrvOL accum%	**1540**
[027] MotOL accum%	**1670**
[028] BU OL accum%	**1781**
[029] Ud	**3270**
[030] Drive ready	**161**
[031] EnableSM mon	**162**
[032] Start SM mon	**163**
[033] FStop SM mon	**164**
[034] ALMSequencer	**9096**
[035] Drive OK	**9097**
[036] Jog state	**8013**
[037] Gen output	**2760**
[038] AI 1 output	**5009**
[039] AI 2 output	**5029**
[040] AI 3 output	**5049**
[041] Ramp out mon	**8022**
[042] Spd Draw out	**7099**
[043] Jog output	**8012**
[044] Mlt Spd out	**7070**
[045] Mpot output	**7090**
[046] I/F cp mon	**2625**
[047] Torque ref	**2450**
[048] Tcurr lim +	**1210**
[049] Tcurr lim -	**1220**
[050] InuseTcurrL+	**1250**
[051] InuseTcurrL-	**1260**
[052] InuseOutvltR	**1180**
[053] Std enc pos	**9553**
[054] Exp enc pos	**9554**
[055] H Index reg	**9555**
[056] L Index reg	**9556**
[057] AI 1X output	5067
[058] AI 2X output	5087
[059] W0 comp out	2116
[060] W1 comp out	9356
[061] PL next fact	2282
[062] SBIDrvW0 mon	9000
[063] SBIDrvW1 mon	9001
[064] SBIDrvW2 mon	9002
[065] SBIDrvW3 mon	9003
[066] SBIDrvW4 mon	9004
[067] SBIDrvW5 mon	9005
[068] ISBusDrvW0 m	9300
[069] ISBusDrvW1 m	9301
[070] ISBusDrvW2 m	9302
[071] ISBusDrvW3 m	9303
[072] ISBusDrvW4 m	9304
[073] ISBusDrvW5 m	9305
[074] ISBusDrvW6 m	9306
[075] ISBusDrvW7 m	9307
[076] APCSDrv W0m	4120
[077] APCSDrv W1m	4121
[078] APCSDrv W2m	4122
[079] APCSDrv W3m	4123
[080] APCSDrv W4m	4124
[081] APCADrv W0m	4160
[082] APCADrv W1m	4161
[083] APCADrv W2m	4162
[084] APCADrv W3m	4163
[085] APCADrv W4m	4164
[086] APCADrv W5m	4165
[087] APCADrv W6m	4166
[088] APCADrv W7m	4167
[089] APCADrv W8m	4168
[090] APCADrv W9m	4169
[091] PID FF mon	7217
[092] PID input	7256
[093] PID PI out	7294
[094] Last PI out	7295
[095] PID PD out	7343
[096] PID out mon	7352
[097] PID outS mon	7353
[098] Pad 0	9100
[099] Pad 1	9101
[100] Pad 2	9102
[101] Pad 3	9103
[102] Pad 4	9104
[103] Pad 5	9105
[104] Pad 6	9106
[105] Pad 7	9107
[106] Pad 8	9108
[107] Pad 9	9109
[108] Pad 10	9110
[109] Pad 11	9111
[110] Pad 12	9112
[111] Pad 13	9113
[112] Pad 14	9114
[113] Pad 15	9115

Pick List 07

Index Name	IPA
[000] DigRampRef 1	**7030**
[001] NULL	**4000**
[002] ONE	**4001**
[003] Gen output	**2760**
[004] AI 1 output	**5009**
[005] AI 2 output	**5029**
[006] AI 3 output	**5049**
[007] Std Enc Spd	**3222**
[008] Exp Enc Spd	**3223**
[009] Mlt Spd out	**7070**
[010] Mpot output	**7090**
[011] AI 1X output	5067
[012] AI 2X output	5087
[013] W0 comp out	2116
[014] W1 comp out	9356
[015] SBIDrvW0 mon	9000
[016] SBIDrvW1 mon	9001
[017] SBIDrvW2 mon	9002
[018] SBIDrvW3 mon	9003
[019] SBIDrvW4 mon	9004
[020] SBIDrvW5 mon	9005
[021] ISBusDrvW0 m	9300
[022] ISBusDrvW1 m	9301
[023] ISBusDrvW2 m	9302
[024] ISBusDrvW3 m	9303
[025] ISBusDrvW4 m	9304
[026] ISBusDrvW5 m	9305
[027] ISBusDrvW6 m	9306
[028] ISBusDrvW7 m	9307
[029] APCSDrv W0m	4120
[030] APCSDrv W1m	4121
[031] APCSDrv W2m	4122
[032] APCSDrv W3m	4123
[033] APCSDrv W4m	4124
[034] APCADrv W0m	4160
[035] APCADrv W1m	4161
[036] APCADrv W2m	4162
[037] APCADrv W3m	4163
[038] APCADrv W4m	4164
[039] APCADrv W5m	4165
[040] APCADrv W6m	4166
[041] APCADrv W7m	4167
[042] APCADrv W8m	4168
[043] APCADrv W9m	4169
[044] PID FF mon	7217
[045] PID input	7256
[046] PID PI out	7294
[047] Last PI out	7295
[048] PID PD out	7343
[049] PID out mon	7352
[050] PID outS mon	7353
[051] Pad 0	9100
[052] Pad 1	9101
[053] Pad 2	9102
[054] Pad 3	9103
[055] Pad 4	9104
[056] Pad 5	9105
[057] Pad 6	9106
[058] Pad 7	9107
[059] Pad 8	9108
[060] Pad 9	9109
[061] Pad 10	9110
[062] Pad 11	9111
[063] Pad 12	9112
[064] Pad 13	9113
[065] Pad 14	9114
[066] Pad 15	9115

Pick List 08

Index Name	IPA
[000] DigRampRef 2	***7031***
[001] NULL	***4000***
[002] ONE	***4001***
[003] Gen output	***2760***
[004] AI 1 output	***5009***
[005] AI 2 output	***5029***
[006] AI 3 output	***5049***
[007] Std Enc Spd	***3222***
[008] Exp Enc Spd	***3223***
[009] Mlt Spd out	***7070***
[010] Mpot output	***7090***
[011] AI 1X output	*5067*
[012] AI 2X output	*5087*
[013] W0 comp out	*2116*
[014] W1 comp out	*9356*
[015] SBIDrvW0 mon	*9000*
[016] SBIDrvW1 mon	*9001*
[017] SBIDrvW2 mon	*9002*
[018] SBIDrvW3 mon	*9003*
[019] SBIDrvW4 mon	*9004*
[020] SBIDrvW5 mon	*9005*
[021] ISBusDrvW0 m	*9300*
[022] ISBusDrvW1 m	*9301*
[023] ISBusDrvW2 m	*9302*
[024] ISBusDrvW3 m	*9303*
[025] ISBusDrvW4 m	*9304*
[026] ISBusDrvW5 m	*9305*
[027] ISBusDrvW6 m	*9306*
[028] ISBusDrvW7 m	*9307*
[029] APCSDrv W0m	*4120*
[030] APCSDrv W1m	*4121*
[031] APCSDrv W2m	*4122*
[032] APCSDrv W3m	*4123*
[033] APCSDrv W4m	*4124*
[034] APCADrv W0m	*4160*
[035] APCADrv W1m	*4161*
[036] APCADrv W2m	*4162*
[037] APCADrv W3m	*4163*
[038] APCADrv W4m	*4164*
[039] APCADrv W5m	*4165*
[040] APCADrv W6m	*4166*
[041] APCADrv W7m	*4167*
[042] APCADrv W8m	*4168*
[043] APCADrv W9m	*4169*
[044] PID FF mon	*7217*
[045] PID input	*7256*
[046] PID PI out	*7294*
[047] Last PI out	*7295*
[048] PID PD out	*7343*
[049] PID out mon	*7352*
[050] PID outS mon	*7353*
[051] Pad 0	*9100*
[052] Pad 1	*9101*
[053] Pad 2	*9102*
[054] Pad 3	*9103*
[055] Pad 4	*9104*
[056] Pad 5	*9105*
[057] Pad 6	*9106*
[058] Pad 7	*9107*
[059] Pad 8	*9108*
[060] Pad 9	*9109*
[061] Pad 10	*9110*
[062] Pad 11	*9111*
[063] Pad 12	*9112*
[064] Pad 13	*9113*
[065] Pad 14	*9114*
[066] Pad 15	*9115*

Pick List 09

Index Name	IPA
[000] DigSpd Ref 1	***7040***
[001] NULL	***4000***
[002] ONE	***4001***
[003] Gen output	***2760***
[004] AI 1 output	***5009***
[005] AI 2 output	***5029***
[006] AI 3 output	***5049***
[007] Std Enc Spd	***3222***
[008] Exp Enc Spd	***3223***
[009] Mlt Spd out	***7070***
[010] Mpot output	***7090***
[011] AI 1X output	*5067*
[012] AI 2X output	*5087*
[013] W0 comp out	*2116*
[014] W1 comp out	*9356*
[015] SBIDrvW0 mon	*9000*
[016] SBIDrvW1 mon	*9001*
[017] SBIDrvW2 mon	*9002*
[018] SBIDrvW3 mon	*9003*
[019] SBIDrvW4 mon	*9004*
[020] SBIDrvW5 mon	*9005*
[021] ISBusDrvW0 m	*9300*
[022] ISBusDrvW1 m	*9301*
[023] ISBusDrvW2 m	*9302*
[024] ISBusDrvW3 m	*9303*
[025] ISBusDrvW4 m	*9304*
[026] ISBusDrvW5 m	*9305*
[027] ISBusDrvW6 m	*9306*
[028] ISBusDrvW7 m	*9307*
[029] APCSDrv W0m	*4120*
[030] APCSDrv W1m	*4121*
[031] APCSDrv W2m	*4122*
[032] APCSDrv W3m	*4123*
[033] APCSDrv W4m	*4124*
[034] APCADrv W0m	*4160*
[035] APCADrv W1m	*4161*
[036] APCADrv W2m	*4162*
[037] APCADrv W3m	*4163*
[038] APCADrv W4m	*4164*
[039] APCADrv W5m	*4165*
[040] APCADrv W6m	*4166*
[041] APCADrv W7m	*4167*
[042] APCADrv W8m	*4168*
[043] APCADrv W9m	*4169*
[044] PID FF mon	*7217*
[045] PID input	*7256*
[046] PID PI out	*7294*
[047] Last PI out	*7295*
[048] PID PD out	*7343*
[049] PID out mon	*7352*
[050] PID outS mon	*7353*
[051] Pad 0	*9100*
[052] Pad 1	*9101*
[053] Pad 2	*9102*
[054] Pad 3	*9103*
[055] Pad 4	*9104*
[056] Pad 5	*9105*
[057] Pad 6	*9106*
[058] Pad 7	*9107*
[059] Pad 8	*9108*
[060] Pad 9	*9109*
[061] Pad 10	*9110*
[062] Pad 11	*9111*
[063] Pad 12	*9112*
[064] Pad 13	*9113*
[065] Pad 14	*9114*
[066] Pad 15	*9115*

Pick List 10

Index Name	IPA
[000] DigSpd Ref 2	***7041***
[001] NULL	***4000***
[002] ONE	***4001***
[003] Gen output	***2760***
[004] AI 1 output	***5009***
[005] AI 2 output	***5029***
[006] AI 3 output	***5049***
[007] Std Enc Spd	***3222***
[008] Exp Enc Spd	***3223***
[009] Mlt Spd out	***7070***
[010] Mpot output	***7090***
[011] AI 1X output	*5067*
[012] AI 2X output	*5087*
[013] W0 comp out	*2116*
[014] W1 comp out	*9356*
[015] SBIDrvW0 mon	*9000*
[016] SBIDrvW1 mon	*9001*
[017] SBIDrvW2 mon	*9002*
[018] SBIDrvW3 mon	*9003*
[019] SBIDrvW4 mon	*9004*
[020] SBIDrvW5 mon	*9005*
[021] ISBusDrvW0 m	*9300*
[022] ISBusDrvW1 m	*9301*
[023] ISBusDrvW2 m	*9302*
[024] ISBusDrvW3 m	*9303*
[025] ISBusDrvW4 m	*9304*
[026] ISBusDrvW5 m	*9305*
[027] ISBusDrvW6 m	*9306*
[028] ISBusDrvW7 m	*9307*
[029] APCSDrv W0m	*4120*
[030] APCSDrv W1m	*4121*
[031] APCSDrv W2m	*4122*
[032] APCSDrv W3m	*4123*
[033] APCSDrv W4m	*4124*
[034] APCADrv W0m	*4160*
[035] APCADrv W1m	*4161*
[036] APCADrv W2m	*4162*
[037] APCADrv W3m	*4163*
[038] APCADrv W4m	*4164*
[039] APCADrv W5m	*4165*
[040] APCADrv W6m	*4166*
[041] APCADrv W7m	*4167*
[042] APCADrv W8m	*4168*
[043] APCADrv W9m	*4169*
[044] PID FF mon	*7217*
[045] PID input	*7256*
[046] PID PI out	*7294*
[047] Last PI out	*7295*
[048] PID PD out	*7343*
[049] PID out mon	*7352*
[050] PID outS mon	*7353*
[051] Pad 0	*9100*
[052] Pad 1	*9101*
[053] Pad 2	*9102*
[054] Pad 3	*9103*
[055] Pad 4	*9104*
[056] Pad 5	*9105*
[057] Pad 6	*9106*
[058] Pad 7	*9107*
[059] Pad 8	*9108*
[060] Pad 9	*9109*
[061] Pad 10	*9110*
[062] Pad 11	*9111*
[063] Pad 12	*9112*
[064] Pad 13	*9113*
[065] Pad 14	*9114*
[066] Pad 15	*9115*

Pick List 11

Index Name	IPA
[000] Mlt spd 0	***7060***
[001] NULL	***4000***
[002] ONE	***4001***
[003] Gen output	***2760***
[004] AI 1 output	***5009***
[005] AI 2 output	***5029***
[006] AI 3 output	***5049***
[007] Std Enc Spd	***3222***
[008] Exp Enc Spd	***3223***
[009] Mlt Spd out	***7070***
[010] Mpot output	***7090***
[011] AI 1X output	*5067*
[012] AI 2X output	*5087*
[013] W0 comp out	*2116*
[014] W1 comp out	*9356*
[015] SBIDrvW0 mon	*9000*
[016] SBIDrvW1 mon	*9001*
[017] SBIDrvW2 mon	*9002*
[018] SBIDrvW3 mon	*9003*
[019] SBIDrvW4 mon	*9004*
[020] SBIDrvW5 mon	*9005*
[021] ISBusDrvW0 m	*9300*
[022] ISBusDrvW1 m	*9301*
[023] ISBusDrvW2 m	*9302*

Index Name	IPA
[024] ISBusDrvW3 m	9303
[025] ISBusDrvW4 m	9304
[026] ISBusDrvW5 m	9305
[027] ISBusDrvW6 m	9306
[028] ISBusDrvW7 m	9307
[029] APCSDrv W0m	4120
[030] APCSDrv W1m	4121
[031] APCSDrv W2m	4122
[032] APCSDrv W3m	4123
[033] APCSDrv W4m	4124
[034] APCADrv W0m	4160
[035] APCADrv W1m	4161
[036] APCADrv W2m	4162
[037] APCADrv W3m	4163
[038] APCADrv W4m	4164
[039] APCADrv W5m	4165
[040] APCADrv W6m	4166
[041] APCADrv W7m	4167
[042] APCADrv W8m	4168
[043] APCADrv W9m	4169
[044] PID FF mon	7217
[045] PID input	7256
[046] PID PI out	7294
[047] Last PI out	7295
[048] PID PD out	7343
[049] PID out mon	7352
[050] PID outS mon	7353
[051] Pad 0	9100
[052] Pad 1	9101
[053] Pad 2	9102
[054] Pad 3	9103
[055] Pad 4	9104
[056] Pad 5	9105
[057] Pad 6	9106
[058] Pad 7	9107
[059] Pad 8	9108
[060] Pad 9	9109
[061] Pad 10	9110
[062] Pad 11	9111
[063] Pad 12	9112
[064] Pad 13	9113
[065] Pad 14	9114
[066] Pad 15	9115

Pick List 12

Index Name	IPA
[000] Jog 0	**8000**
[001] NULL	**4000**
[002] ONE	**4001**
[003] Gen output	**2760**
[004] AI 1 output	**5009**
[005] AI 2 output	**5029**
[006] AI 3 output	**5049**
[007] Std Enc Spd	**3222**
[008] Exp Enc Spd	**3223**
[009] Mlt Spd out	**7070**
[010] Mpot output	**7090**
[011] AI 1X output	5067
[012] AI 2X output	5087
[013] W0 comp out	2116
[014] W1 comp out	9356
[015] SBIDrvW0 mon	9000
[016] SBIDrvW1 mon	9001
[017] SBIDrvW2 mon	9002
[018] SBIDrvW3 mon	9003
[019] SBIDrvW4 mon	9004
[020] SBIDrvW5 mon	9005
[021] ISBusDrvW0 m	9300
[022] ISBusDrvW1 m	9301
[023] ISBusDrvW2 m	9302
[024] ISBusDrvW3 m	9303
[025] ISBusDrvW4 m	9304
[026] ISBusDrvW5 m	9305
[027] ISBusDrvW6 m	9306
[028] ISBusDrvW7 m	9307
[029] APCSDrv W0m	4120
[030] APCSDrv W1m	4121
[031] APCSDrv W2m	4122
[032] APCSDrv W3m	4123
[033] APCSDrv W4m	4124
[034] APCADrv W0m	4160
[035] APCADrv W1m	4161
[036] APCADrv W2m	4162
[037] APCADrv W3m	4163
[038] APCADrv W4m	4164
[039] APCADrv W5m	4165
[040] APCADrv W6m	4166
[041] APCADrv W7m	4167
[042] APCADrv W8m	4168
[043] APCADrv W9m	4169
[044] PID FF mon	7217
[045] PID input	7256
[046] PID PI out	7294
[047] Last PI out	7295
[048] PID PD out	7343
[049] PID out mon	7352
[050] PID outS mon	7353
[051] Pad 0	9100
[052] Pad 1	9101
[053] Pad 2	9102
[054] Pad 3	9103
[055] Pad 4	9104
[056] Pad 5	9105
[057] Pad 6	9106
[058] Pad 7	9107
[059] Pad 8	9108
[060] Pad 9	9109
[061] Pad 10	9110
[062] Pad 11	9111
[063] Pad 12	9112
[064] Pad 13	9113
[065] Pad 14	9114
[066] Pad 15	9115

Pick List 13

Index Name	IPA
[000] Dig SpdRatio	**7044**
[001] NULL	**4000**
[002] ONE	**4001**
[003] Gen output	**2760**
[004] AI 1 output	**5009**
[005] AI 2 output	**5029**
[006] AI 3 output	**5049**
[007] AI 1X output	5067
[008] AI 2X output	5087
[009] W0 comp out	2116
[010] W1 comp out	9356
[011] SBIDrvW0 mon	9000
[012] SBIDrvW1 mon	9001
[013] SBIDrvW2 mon	9002
[014] SBIDrvW3 mon	9003
[015] SBIDrvW4 mon	9004
[016] SBIDrvW5 mon	9005
[017] ISBusDrvW0 m	9300
[018] ISBusDrvW1 m	9301
[019] ISBusDrvW2 m	9302
[020] ISBusDrvW3 m	9303
[021] ISBusDrvW4 m	9304
[022] ISBusDrvW5 m	9305
[023] ISBusDrvW6 m	9306
[024] ISBusDrvW7 m	9307
[025] APCSDrv W0m	4120
[026] APCSDrv W1m	4121
[027] APCSDrv W2m	4122
[028] APCSDrv W3m	4123
[029] APCSDrv W4m	4124
[030] APCADrv W0m	4160
[031] APCADrv W1m	4161
[032] APCADrv W2m	4162
[033] APCADrv W3m	4163
[034] APCADrv W4m	4164
[035] APCADrv W5m	4165
[036] APCADrv W6m	4166
[037] APCADrv W7m	4167
[038] APCADrv W8m	4168
[039] APCADrv W9m	4169
[040] PID FF mon	7217
[041] PID input	7256
[042] PID PI out	7294
[043] Last PI out	7295
[044] PID PD out	7343
[045] PID out mon	7352
[046] PID outS mon	7353
[047] Pad 0	9100
[048] Pad 1	9101
[049] Pad 2	9102
[050] Pad 3	9103
[051] Pad 4	9104
[052] Pad 5	9105
[053] Pad 6	9106
[054] Pad 7	9107
[055] Pad 8	9108
[056] Pad 9	9109
[057] Pad 10	9110
[058] Pad 11	9111
[059] Pad 12	9112
[060] Pad 13	9113
[061] Pad 14	9114
[062] Pad 15	9115

Pick List 14

Index Name	IPA
[000] Dig TrqRef 1	**2430**
[001] NULL	**4000**
[002] ONE	**4001**
[003] Gen output	**2760**
[004] AI 1 output	**5009**
[005] AI 2 output	**5029**
[006] AI 3 output	**5049**
[007] I/F cp mon	**2625**
[008] AI 1X output	5067
[009] AI 2X output	5087
[010] W0 comp out	2116
[011] W1 comp out	9356
[012] SBIDrvW0 mon	9000
[013] SBIDrvW1 mon	9001
[014] SBIDrvW2 mon	9002
[015] SBIDrvW3 mon	9003
[016] SBIDrvW4 mon	9004
[017] SBIDrvW5 mon	9005
[018] ISBusDrvW0 m	9300
[019] ISBusDrvW1 m	9301
[020] ISBusDrvW2 m	9302
[021] ISBusDrvW3 m	9303
[022] ISBusDrvW4 m	9304
[023] ISBusDrvW5 m	9305
[024] ISBusDrvW6 m	9306
[025] ISBusDrvW7 m	9307
[026] APCSDrv W0m	4120
[027] APCSDrv W1m	4121
[028] APCSDrv W2m	4122
[029] APCSDrv W3m	4123
[030] APCSDrv W4m	4124
[031] APCADrv W0m	4160
[032] APCADrv W1m	4161
[033] APCADrv W2m	4162
[034] APCADrv W3m	4163
[035] APCADrv W4m	4164
[036] APCADrv W5m	4165
[037] APCADrv W6m	4166
[038] APCADrv W7m	4167
[039] APCADrv W8m	4168
[040] APCADrv W9m	4169
[041] PID FF mon	7217
[042] PID input	7256
[043] PID PI out	7294
[044] Last PI out	7295
[045] PID PD out	7343
[046] PID out mon	7352
[047] PID outS mon	7353
[048] Pad 0	9100
[049] Pad 1	9101
[050] Pad 2	9102
[051] Pad 3	9103
[052] Pad 4	**9104**
[053] Pad 5	**9105**
[054] Pad 6	**9106**

Index Name	IPA
[055] Pad 7	**9107**
[056] Pad 8	**9108**
[057] Pad 9	**9109**
[058] Pad 10	**9110**
[059] Pad 11	**9111**
[060] Pad 12	**9112**
[061] Pad 13	**9113**
[062] Pad 14	**9114**
[063] Pad 15	**9115**

Pick List 15

Index Name	IPA
[000] Dig TrqRef 2	**2440**
[001] NULL	**4000**
[002] ONE	**4001**
[003] Gen output	**2760**
[004] AI 1 output	**5009**
[005] AI 2 output	**5029**
[006] AI 3 output	**5049**
[007] I/F cp mon	**2625**
[008] AI 1X output	5067
[009] AI 2X output	5087
[010] W0 comp out	2116
[011] W1 comp out	9356
[012] SBIDrvW0 mon	9000
[013] SBIDrvW1 mon	9001
[014] SBIDrvW2 mon	9002
[015] SBIDrvW3 mon	9003
[016] SBIDrvW4 mon	9004
[017] SBIDrvW5 mon	9005
[018] ISBusDrvW0 m	9300
[019] ISBusDrvW1 m	9301
[020] ISBusDrvW2 m	9302
[021] ISBusDrvW3 m	9303
[022] ISBusDrvW4 m	9304
[023] ISBusDrvW5 m	9305
[024] ISBusDrvW6 m	9306
[025] ISBusDrvW7 m	9307
[026] APCSDrv W0m	4120
[027] APCSDrv W1m	4121
[028] APCSDrv W2m	4122
[029] APCSDrv W3m	4123
[030] APCSDrv W4m	4124
[031] APCADrv W0m	4160
[032] APCADrv W1m	4161
[033] APCADrv W2m	4162
[034] APCADrv W3m	4163
[035] APCADrv W4m	4164
[036] APCADrv W5m	4165
[037] APCADrv W6m	4166
[038] APCADrv W7m	4167
[039] APCADrv W8m	4168
[040] APCADrv W9m	4169
[041] PID FF mon	7217
[042] PID input	7256
[043] PID PI out	7294
[044] Last PI out	7295
[045] PID PD out	7343
[046] PID out mon	7352
[047] PID outS mon	7353
[048] Pad 0	9100
[049] Pad 1	9101
[050] Pad 2	9102
[051] Pad 3	9103
[052] Pad 4	9104
[053] Pad 5	9105
[054] Pad 6	9106
[055] Pad 7	9107
[056] Pad 8	9108
[057] Pad 9	9109
[058] Pad 10	9110
[059] Pad 11	9111
[060] Pad 12	9112
[061] Pad 13	9113
[062] Pad 14	9114
[063] Pad 15	9115

Pick List 16

Index Name	IPA
[000] FRC Str mon	**8086**
[001] NULL	**4000**
[002] ONE	**4001**
[003] DI 0 En mon	**4020**
[004] DI 1 mon	**4021**
[005] DI 2 mon	**4022**
[006] DI 3 mon	**4023**
[007] DI 4 mon	**4024**
[008] DI 5 mon	**4025**
[009] DI 6 mon	**4026**
[010] DI 7 mon	**4027**
[011] DI 0X mon	**4045**
[012] DI 1X mon	**4046**
[013] DI 2X mon	**4047**
[014] DI 3X mon	**4048**
[015] DI 4X mon	**4049**
[016] DI 5X mon	**4050**
[017] DI 6X mon	**4051**
[018] DI 7X mon	**4052**
[019] DI 8X mon	**4053**
[020] DI 9X mon	**4054**
[021] DI 10X mon	**4055**
[022] DI 11X mon	**4056**

Pick List 17

Index Name	IPA
[000] NULL	**4000**
[001] ONE	**4001**

Pick List 18

Index Name	IPA
[000] NULL	**4000**
[001] ONE	**4001**
[002] DI 0 En mon	**4020**
[003] DI 1 mon	**4021**
[004] DI 2 mon	**4022**
[005] DI 3 mon	**4023**
[006] DI 4 mon	**4024**
[007] DI 5 mon	**4025**
[008] DI 6 mon	**4026**
[009] DI 7 mon	**4027**
[010] DI 0X mon	**4045**
[011] DI 1X mon	**4046**
[012] DI 2X mon	**4047**
[013] DI 3X mon	**4048**
[014] DI 4X mon	**4049**
[015] DI 5X mon	**4050**
[016] DI 6X mon	**4051**
[017] DI 7X mon	**4052**
[018] DI 8X mon	**4053**
[019] DI 9X mon	**4054**
[020] DI 10X mon	**4055**
[021] DI 11X mon	**4056**
[022] B0 W0 decom	2123
[023] B1 W0 decom	2124
[024] B2 W0 decom	2125
[025] B3 W0 decom	2126
[026] B4 W0 decom	2127
[027] B5 W0 decom	2128
[028] B6 W0 decom	2129
[029] B7 W0 decom	2130
[030] B8 W0 decom	2131
[031] B9 W0 decom	2132
[032] B10 W0 decom	2133
[033] B11 W0 decom	2134
[034] B12 W0 decom	2135
[035] B13 W0 decom	2136
[036] B14 W0 decom	2137
[037] B15 W0 decom	2138
[038] B0 W1 decom	9363
[039] B1 W1 decom	9364
[040] B2 W1 decom	9365
[041] B3 W1 decom	9366
[042] B4 W1 decom	9367
[043] B5 W1 decom	9368
[044] B6 W1 decom	9369
[045] B7 W1 decom	9370
[046] B8 W1 decom	9371
[047] B9 W1 decom	9372
[048] B10 W1 decom	9373
[049] B11 W1 decom	9374
[050] B12 W1 decom	9375
[051] B13 W1 decom	9376
[052] B14 W1 decom	9377
[053] B15 W1 decom	9378
[054] SBIDrvW0 mon	9000
[055] SBIDrvW1 mon	9001
[056] SBIDrvW2 mon	9002
[057] SBIDrvW3 mon	9003
[058] SBIDrvW4 mon	9004
[059] SBIDrvW5 mon	9005
[060] ISBusDrvW0 m	9300
[061] ISBusDrvW1 m	9301
[062] ISBusDrvW2 m	9302
[063] ISBusDrvW3 m	9303
[064] ISBusDrvW4 m	9304
[065] ISBusDrvW5 m	9305
[066] ISBusDrvW6 m	9306
[067] ISBusDrvW7 m	9307
[068] APCSDrv W0m	4120
[069] APCSDrv W1m	4121
[070] APCSDrv W2m	4122
[071] APCSDrv W3m	4123
[072] APCSDrv W4m	4124
[073] APCADrv W0m	4160
[074] APCADrv W1m	4161
[075] APCADrv W2m	4162
[076] APCADrv W3m	4163
[077] APCADrv W4m	4164
[078] APCADrv W5m	4165
[079] APCADrv W6m	4166
[080] APCADrv W7m	4167
[081] APCADrv W8m	4168
[082] APCADrv W9m	4169
[083] DiamCalc act	7367
[084] Dig pad 0	9116
[085] Dig pad 1	9117
[086] Dig pad 2	9118
[087] Dig pad 3	9119
[088] Dig pad 4	9120
[089] Dig pad 5	9121
[090] Dig pad 6	9122
[091] Dig pad 7	9123
[092] Dig pad 8	9124
[093] Dig pad 9	9125
[094] Dig pad 10	9126
[095] Dig pad 11	9127
[096] Dig pad 12	9128
[097] Dig pad 13	9129
[098] Dig pad 14	9130
[099] Dig pad 15	9131

Pick List 19

Index Name	IPA
[000] Adapt DigRef	**3710**
[001] Ramp ref	**3200**
[002] Speed ref	**3210**
[003] NULL	**4000**
[004] ONE	**4001**
[005] Gen output	**2760**
[006] AI 1 output	**5009**
[007] AI 2 output	**5029**
[008] AI 3 output	**5049**
[009] AI 1X output	5067
[010] AI 2X output	5087
[011] W0 comp out	2116
[012] W1 comp out	9356
[013] SBIDrvW0 mon	9000
[014] SBIDrvW1 mon	9001
[015] SBIDrvW2 mon	9002
[016] SBIDrvW3 mon	9003
[017] SBIDrvW4 mon	9004
[018] SBIDrvW5 mon	9005
[019] ISBusDrvW0 m	9300
[020] ISBusDrvW1 m	9301
[021] ISBusDrvW2 m	9302
[022] ISBusDrvW3 m	9303
[023] ISBusDrvW4 m	9304

Index Name	IPA
[024] ISBusDrvW5 m	9305
[025] ISBusDrvW6 m	9306
[026] ISBusDrvW7 m	9307
[027] APCSDrv W0m	4120
[028] APCSDrv W1m	4121
[029] APCSDrv W2m	4122
[030] APCSDrv W3m	4123
[031] APCSDrv W4m	4124
[032] APCADrv W0m	4160
[033] APCADrv W1m	4161
[034] APCADrv W2m	4162
[035] APCADrv W3m	4163
[036] APCADrv W4m	4164
[037] APCADrv W5m	4165
[038] APCADrv W6m	4166
[039] APCADrv W7m	4167
[040] APCADrv W8m	4168
[041] APCADrv W9m	4169
[042] PID FF mon	7217
[043] PID input	7256
[044] PID PI out	7294
[045] Last PI out	7295
[046] PID PD out	7343
[047] PID out mon	7352
[048] PID outS mon	7353
[049] Pad 0	9100
[050] Pad 1	9101
[051] Pad 2	9102
[052] Pad 3	9103
[053] Pad 4	9104
[054] Pad 5	9105
[055] Pad 6	9106
[056] Pad 7	9107
[057] Pad 8	9108
[058] Pad 9	9109
[059] Pad 10	9110
[060] Pad 11	9111
[061] Pad 12	9112
[062] Pad 13	9113
[063] Pad 14	9114
[064] Pad 15	9115

Pick List 20

Index Name	IPA
[000] Dig Spd0 Ref	**3721**
[001] NULL	**4000**
[002] Ramp ref	**3200**
[003] Speed ref	**3210**
[004] Pad 0	9100
[005] Pad 1	9101
[006] Pad 2	9102
[007] Pad 3	9103
[008] Pad 4	9104
[009] Pad 5	9105
[010] Pad 6	9106
[011] Pad 7	9107
[012] Pad 8	9108
[013] Pad 9	9109
[014] Pad 10	9110
[015] Pad 11	9111
[016] Pad 12	9112
[017] Pad 13	9113
[018] Pad 14	9114
[019] Pad 15	9115

Pick List 21

Index Name	IPA
[000] Droop comp	**2510**
[001] NULL	**4000**
[002] ONE	**4001**
[003] Gen output	**2760**
[004] AI 1 output	**5009**
[005] AI 2 output	**5029**
[006] AI 3 output	**5049**
[007] AI 1X output	5067
[008] AI 2X output	5087
[009] W0 comp out	2116
[010] W1 comp out	9356
[011] SBIDrvW0 mon	9000
[012] SBIDrvW1 mon	9001
[013] SBIDrvW2 mon	9002
[014] SBIDrvW3 mon	9003
[015] SBIDrvW4 mon	9004
[016] SBIDrvW5 mon	9005
[017] ISBusDrvW0 m	9300
[018] ISBusDrvW1 m	9301
[019] ISBusDrvW2 m	9302
[020] ISBusDrvW3 m	9303
[021] ISBusDrvW4 m	9304
[022] ISBusDrvW5 m	9305
[023] ISBusDrvW6 m	9306
[024] ISBusDrvW7 m	9307
[025] APCSDrv W0m	4120
[026] APCSDrv W1m	4121
[027] APCSDrv W2m	4122
[028] APCSDrv W3m	4123
[029] APCSDrv W4m	4124
[030] APCADrv W0m	4160
[031] APCADrv W1m	4161
[032] APCADrv W2m	4162
[033] APCADrv W3m	4163
[034] APCADrv W4m	4164
[035] APCADrv W5m	4165
[036] APCADrv W6m	4166
[037] APCADrv W7m	4167
[038] APCADrv W8m	4168
[039] APCADrv W9m	4169
[040] PID FF mon	7217
[041] PID input	7256
[042] PID PI out	7294
[043] Last PI out	7295
[044] PID PD out	7343
[045] PID out mon	7352
[046] PID outS mon	7353
[047] Pad 0	9100
[048] Pad 1	9101
[049] Pad 2	9102
[050] Pad 3	9103
[051] Pad 4	9104
[052] Pad 5	9105
[053] Pad 6	9106
[054] Pad 7	9107
[055] Pad 8	9108
[056] Pad 9	9109
[057] Pad 10	9110
[058] Pad 11	9111
[059] Pad 12	9112
[060] Pad 13	9113
[061] Pad 14	9114
[062] Pad 15	9115

Pick List 22

Index Name	IPA
[000] DigSpdFbkSel	**1940**
[001] NULL	**4000**
[002] ONE	**4001**
[003] DI 0 En mon	**4020**
[004] DI 1 mon	**4021**
[005] DI 2 mon	**4022**
[006] DI 3 mon	**4023**
[007] DI 4 mon	**4024**
[008] DI 5 mon	**4025**
[009] DI 6 mon	**4026**
[010] DI 7 mon	**4027**
[011] FRC reverse	**8081**
[012] Spd = zero	**3728**
[013] Ref = zero	**3729**
[014] Spd 0 dly	**3730**
[015] Ref 0 dly	**3731**
[016] DI 0X mon	4045
[017] DI 1X mon	4046
[018] DI 2X mon	4047
[019] DI 3X mon	4048
[020] DI 4X mon	4049
[021] DI 5X mon	4050
[022] DI 6X mon	4051
[023] DI 7X mon	4052
[024] DI 8X mon	4053
[025] DI 9X mon	4054
[026] DI 10X mon	4055
[027] DI 11X mon	4056
[028] B0 W0 decom	2123
[029] B1 W0 decom	2124
[030] B2 W0 decom	2125
[031] B3 W0 decom	2126
[032] B4 W0 decom	2127
[033] B5 W0 decom	2128
[034] B6 W0 decom	2129
[035] B7 W0 decom	2130
[036] B8 W0 decom	2131
[037] B9 W0 decom	2132
[038] B10 W0 decom	2133
[039] B11 W0 decom	2134
[040] B12 W0 decom	2135
[041] B13 W0 decom	2136
[042] B14 W0 decom	2137
[043] B15 W0 decom	2138
[044] B0 W1 decom	9363
[045] B1 W1 decom	9364
[046] B2 W1 decom	9365
[047] B3 W1 decom	9366
[048] B4 W1 decom	9367
[049] B5 W1 decom	9368
[050] B6 W1 decom	9369
[051] B7 W1 decom	9370
[052] B8 W1 decom	9371
[053] B9 W1 decom	9372
[054] B10 W1 decom	9373
[055] B11 W1 decom	9374
[056] B12 W1 decom	9375
[057] B13 W1 decom	9376
[058] B14 W1 decom	9377
[059] B15 W1 decom	9378
[060] SBIDrvW0 mon	9000
[061] SBIDrvW1 mon	9001
[062] SBIDrvW2 mon	9002
[063] SBIDrvW3 mon	9003
[064] SBIDrvW4 mon	9004
[065] SBIDrvW5 mon	9005
[066] ISBusDrvW0 m	9300
[067] ISBusDrvW1 m	9301
[068] ISBusDrvW2 m	9302
[069] ISBusDrvW3 m	9303
[070] ISBusDrvW4 m	9304
[071] ISBusDrvW5 m	9305
[072] ISBusDrvW6 m	9306
[073] ISBusDrvW7 m	9307
[074] APCSDrv W0m	4120
[075] APCSDrv W1m	4121
[076] APCSDrv W2m	4122
[077] APCSDrv W3m	4123
[078] APCSDrv W4m	4124
[079] APCADrv W0m	4160
[080] APCADrv W1m	4161
[081] APCADrv W2m	4162
[082] APCADrv W3m	4163
[083] APCADrv W4m	4164
[084] APCADrv W5m	4165
[085] APCADrv W6m	4166
[086] APCADrv W7m	4167
[087] APCADrv W8m	4168
[088] APCADrv W9m	4169
[089] Dig pad 0	9116
[090] Dig pad 1	9117
[091] Dig pad 2	9118
[092] Dig pad 3	9119
[093] Dig pad 4	9120
[094] Dig pad 5	9121
[095] Dig pad 6	9122
[096] Dig pad 7	9123
[097] Dig pad 8	9124
[098] Dig pad 9	9125
[099] Dig pad 10	9126
[100] Dig pad 11	9127
[101] Dig pad 12	9128
[102] Dig pad 13	9129
[103] Dig pad 14	9130

Index Name	IPA
[104] Dig pad 15	9131

Pick List 23

Index Name	IPA
[000] Dig SE F lvl	**3536**
[001] NULL	**4000**
[002] ONE	**4001**
[003] Gen output	**2760**
[004] AI 1 output	**5009**
[005] AI 2 output	**5029**
[006] AI 3 output	**5049**
[007] AI 1X output	5067
[008] AI 2X output	5087
[009] W0 comp out	2116
[010] W1 comp out	9356
[011] SBIDrvW0 mon	9000
[012] SBIDrvW1 mon	9001
[013] SBIDrvW2 mon	9002
[014] SBIDrvW3 mon	9003
[015] SBIDrvW4 mon	9004
[016] SBIDrvW5 mon	9005
[017] ISBusDrvW0 m	9300
[018] ISBusDrvW1 m	9301
[019] ISBusDrvW2 m	9302
[020] ISBusDrvW3 m	9303
[021] ISBusDrvW4 m	9304
[022] ISBusDrvW5 m	9305
[023] ISBusDrvW6 m	9306
[024] ISBusDrvW7 m	9307
[025] APCSDrv W0m	4120
[026] APCSDrv W1m	4121
[027] APCSDrv W2m	4122
[028] APCSDrv W3m	4123
[029] APCSDrv W4m	4124
[030] APCADrv W0m	4160
[031] APCADrv W1m	4161
[032] APCADrv W2m	4162
[033] APCADrv W3m	4163
[034] APCADrv W4m	4164
[035] APCADrv W5m	4165
[036] APCADrv W6m	4166
[037] APCADrv W7m	4167
[038] APCADrv W8m	4168
[039] APCADrv W9m	4169
[040] PID FF mon	7217
[041] PID input	7256
[042] PID PI out	7294
[043] Last PI out	7295
[044] PID PD out	7343
[045] PID out mon	7352
[046] PID outS mon	7353
[047] Pad 0	9100
[048] Pad 1	9101
[049] Pad 2	9102
[050] Pad 3	9103
[051] Pad 4	9104
[052] Pad 5	9105
[053] Pad 6	9106
[054] Pad 7	9107
[055] Pad 8	9108
[056] Pad 9	9109
[057] Pad 10	9110
[058] Pad 11	9111
[059] Pad 12	9112
[060] Pad 13	9113
[061] Pad 14	9114
[062] Pad 15	9115

Pick List 24

Index Name	IPA
[000] DigFlxMaxLim	**1120**
[001] NULL	**4000**
[002] ONE	**4001**
[003] Gen output	**2760**
[004] AI 1 output	**5009**
[005] AI 2 output	**5029**
[006] AI 3 output	**5049**
[007] AI 1X output	**5067**
[008] AI 2X output	5087
[009] W0 comp out	2116
[010] W1 comp out	9356
[011] SBIDrvW0 mon	9000
[012] SBIDrvW1 mon	9001
[013] SBIDrvW2 mon	9002
[014] SBIDrvW3 mon	9003
[015] SBIDrvW4 mon	9004
[016] SBIDrvW5 mon	9005
[017] ISBusDrvW0 m	9300
[018] ISBusDrvW1 m	9301
[019] ISBusDrvW2 m	9302
[020] ISBusDrvW3 m	9303
[021] ISBusDrvW4 m	9304
[022] ISBusDrvW5 m	9305
[023] ISBusDrvW6 m	9306
[024] ISBusDrvW7 m	9307
[025] APCSDrv W0m	4120
[026] APCSDrv W1m	4121
[027] APCSDrv W2m	4122
[028] APCSDrv W3m	4123
[029] APCSDrv W4m	4124
[030] APCADrv W0m	4160
[031] APCADrv W1m	4161
[032] APCADrv W2m	4162
[033] APCADrv W3m	4163
[034] APCADrv W4m	4164
[035] APCADrv W5m	4165
[036] APCADrv W6m	4166
[037] APCADrv W7m	4167
[038] APCADrv W8m	4168
[039] APCADrv W9m	4169
[040] PID FF mon	7217
[041] PID input	7256
[042] PID PI out	7294
[043] Last PI out	7295
[044] PID PD out	7343
[045] PID out mon	7352
[046] PID outS mon	7353
[047] Pad 0	9100
[048] Pad 1	9101
[049] Pad 2	9102
[050] Pad 3	9103
[051] Pad 4	9104
[052] Pad 5	9105
[053] Pad 6	9106
[054] Pad 7	9107
[055] Pad 8	9108
[056] Pad 9	9109
[057] Pad 10	9110
[058] Pad 11	9111
[059] Pad 12	9112
[060] Pad 13	9113
[061] Pad 14	9114
[062] Pad 15	9115

Pick List 25

Index Name	IPA
[000] Dig Inertia	**2054**
[001] NULL	**4000**
[002] ONE	**4001**
[003] Gen output	**2760**
[004] AI 1 output	**5009**
[005] AI 2 output	**5029**
[006] AI 3 output	**5049**
[007] AI 1X output	5067
[008] AI 2X output	5087
[009] W0 comp out	2116
[010] W1 comp out	9356
[011] SBIDrvW0 mon	9000
[012] SBIDrvW1 mon	9001
[013] SBIDrvW2 mon	9002
[014] SBIDrvW3 mon	9003
[015] SBIDrvW4 mon	9004
[016] SBIDrvW5 mon	9005
[017] ISBusDrvW0 m	9300
[018] ISBusDrvW1 m	9301
[019] ISBusDrvW2 m	9302
[020] ISBusDrvW3 m	9303
[021] ISBusDrvW4 m	9304
[022] ISBusDrvW5 m	9305
[023] ISBusDrvW6 m	9306
[024] ISBusDrvW7 m	9307
[025] APCSDrv W0m	4120
[026] APCSDrv W1m	4121
[027] APCSDrv W2m	4122
[028] APCSDrv W3m	4123
[029] APCSDrv W4m	4124
[030] APCADrv W0m	4160
[031] APCADrv W1m	4161
[032] APCADrv W2m	4162
[033] APCADrv W3m	4163
[034] APCADrv W4m	4164
[035] APCADrv W5m	4165
[036] APCADrv W6m	4166
[037] APCADrv W7m	4167
[038] APCADrv W8m	4168
[039] APCADrv W9m	4169
[040] PID FF mon	7217
[041] PID input	7256
[042] PID PI out	7294
[043] Last PI out	7295
[044] PID PD out	7343
[045] PID out mon	7352
[046] PID outS mon	7353
[047] Pad 0	9100
[048] Pad 1	9101
[049] Pad 2	9102
[050] Pad 3	9103
[051] Pad 4	9104
[052] Pad 5	9105
[053] Pad 6	9106
[054] Pad 7	9107
[055] Pad 8	9108
[056] Pad 9	9109
[057] Pad 10	9110
[058] Pad 11	9111
[059] Pad 12	9112
[060] Pad 13	9113
[061] Pad 14	9114
[062] Pad 15	9115

Pick List 26

Index Name	IPA
[000] W0 decom inp	**2121**
[001] NULL	**4000**
[002] ONE	**4001**
[003] Output volt	**3060**
[004] Output curr	**3070**
[005] Output freq	**3080**
[006] Output pwr	**3090**
[007] DCLink volt	**3100**
[008] MagnetizCurr	**3110**
[009] Torque curr	**3120**
[010] MagnCurr ref	**3130**
[011] TrqCurr ref	**3140**
[012] Curr phase U	**3150**
[013] Curr phase V	**3160**
[014] Curr phase W	**3170**
[015] Flux ref	**3180**
[016] Flux	**3190**
[017] Ramp ref	**3200**
[018] Speed ref	**3210**
[019] Speed	**3220**
[020] Actual Speed	**3221**
[021] Fault Pin	**9098**
[022] Std Enc Spd	**3222**
[023] Exp Enc Spd	**3223**
[024] DrvOL accum%	**1540**
[025] MotOL accum%	**1670**
[026] BU OL accum%	**1781**
[027] Ud	**3270**
[028] Drive ready	**161**
[029] EnableSM mon	**162**
[030] Start SM mon	**163**
[031] FStop SM mon	**164**
[032] ALMSequencer	**9096**
[033] Drive OK	**9097**
[034] Jog state	**8013**

Index Name	IPA
[035] Gen output	2760
[036] AI 1 output	5009
[037] AI 2 output	5029
[038] AI 3 output	5049
[039] Ramp out mon	8022
[040] Spd Draw out	7099
[041] Jog output	8012
[042] Mlt Spd out	7070
[043] Mpot output	7090
[044] I/F cp mon	2625
[045] Torque ref	2450
[046] Tcurr lim +	1210
[047] Tcurr lim -	1220
[048] InuseTcurrL+	1250
[049] InuseTcurrL-	1260
[050] InuseOutvltR	1180
[051] Std enc pos	9553
[052] Exp enc pos	9554
[053] H Index reg	9555
[054] L Index reg	9556
[055] AI 1X output	5067
[056] AI 2X output	5087
[057] W0 comp out	2116
[058] W1 comp out	9356
[059] PL next fact	2282
[060] SBIDrvW0 mon	9000
[061] SBIDrvW1 mon	9001
[062] SBIDrvW2 mon	9002
[063] SBIDrvW3 mon	9003
[064] SBIDrvW4 mon	9004
[065] SBIDrvW5 mon	9005
[066] ISBusDrvW0 m	9300
[067] ISBusDrvW1 m	9301
[068] ISBusDrvW2 m	9302
[069] ISBusDrvW3 m	9303
[070] ISBusDrvW4 m	9304
[071] ISBusDrvW5 m	9305
[072] ISBusDrvW6 m	9306
[073] ISBusDrvW7 m	9307
[074] APCSDrv W0m	4120
[075] APCSDrv W1m	4121
[076] APCSDrv W2m	4122
[077] APCSDrv W3m	4123
[078] APCSDrv W4m	4124
[079] APCADrv W0m	4160
[080] APCADrv W1m	4161
[081] APCADrv W2m	4162
[082] APCADrv W3m	4163
[083] APCADrv W4m	4164
[084] APCADrv W5m	4165
[085] APCADrv W6m	4166
[086] APCADrv W7m	4167
[087] APCADrv W8m	4168
[088] APCADrv W9m	4169
[089] PID FF mon	7217
[090] PID input	7256
[091] PID PI out	7294
[092] Last PI out	7295
[093] PID PD out	7343
[094] PID out mon	7352
[095] PID outS mon	7353
[096] Pad 0	9100
[097] Pad 1	9101
[098] Pad 2	9102
[099] Pad 3	9103
[100] Pad 4	9104
[101] Pad 5	9105
[102] Pad 6	9106
[103] Pad 7	9107
[104] Pad 8	9108
[105] Pad 9	9109
[106] Pad 10	9110
[107] Pad 11	9111
[108] Pad 12	9112
[109] Pad 13	9113
[110] Pad 14	9114
[111] Pad 15	9115

Pick List 27

Index Name	IPA
[000] W1 decom inp	9360
[001] NULL	4000
[002] ONE	4001
[003] Output volt	3060
[004] Output curr	3070
[005] Output freq	3080
[006] Output pwr	3090
[007] DCLink volt	3100
[008] MagnetizCurr	3110
[009] Torque curr	3120
[010] MagnCurr ref	3130
[011] TrqCurr ref	3140
[012] Curr phase U	3150
[013] Curr phase V	3160
[014] Curr phase W	3170
[015] Flux ref	3180
[016] Flux	3190
[017] Ramp ref	3200
[018] Speed ref	3210
[019] Speed	3220
[020] Actual Speed	3221
[021] Fault Pin	9098
[022] Std Enc Spd	3222
[023] Exp Enc Spd	3223
[024] DrvOL accum%	1540
[025] MotOL accum%	1670
[026] BU OL accum%	1781
[027] Ud	3270
[028] Drive ready	161
[029] EnableSM mon	162
[030] Start SM mon	163
[031] FStop SM mon	164
[032] ALMSequencer	9096
[033] Drive OK	9097
[034] Jog state	8013
[035] Gen output	2760
[036] AI 1 output	5009
[037] AI 2 output	5029
[038] AI 3 output	5049
[039] Ramp out mon	8022
[040] Spd Draw out	7099
[041] Jog output	8012
[042] Mlt Spd out	7070
[043] Mpot output	7090
[044] I/F cp mon	2625
[045] Torque ref	2450
[046] Tcurr lim +	1210
[047] Tcurr lim -	1220
[048] InuseTcurrL+	1250
[049] InuseTcurrL-	1260
[050] InuseOutvltR	1180
[051] Std enc pos	9553
[052] Exp enc pos	9554
[053] H Index reg	9555
[054] L Index reg	9556
[055] AI 1X output	5067
[056] AI 2X output	5087
[057] W0 comp out	2116
[058] W1 comp out	9356
[059] PL next fact	2282
[060] SBIDrvW0 mon	9000
[061] SBIDrvW1 mon	9001
[062] SBIDrvW2 mon	9002
[063] SBIDrvW3 mon	9003
[064] SBIDrvW4 mon	9004
[065] SBIDrvW5 mon	9005
[066] ISBusDrvW0 m	9300
[067] ISBusDrvW1 m	9301
[068] ISBusDrvW2 m	9302
[069] ISBusDrvW3 m	9303
[070] ISBusDrvW4 m	9304
[071] ISBusDrvW5 m	9305
[072] ISBusDrvW6 m	9306
[073] ISBusDrvW7 m	9307
[074] APCSDrv W0m	4120
[075] APCSDrv W1m	4121
[076] APCSDrv W2m	4122
[077] APCSDrv W3m	4123
[078] APCSDrv W4m	4124
[079] APCADrv W0m	4160
[080] APCADrv W1m	4161
[081] APCADrv W2m	4162
[082] APCADrv W3m	4163
[083] APCADrv W4m	4164
[084] APCADrv W5m	4165
[085] APCADrv W6m	4166
[086] APCADrv W7m	4167
[087] APCADrv W8m	4168
[088] APCADrv W9m	4169
[089] PID FF mon	7217
[090] PID input	7256
[091] PID PI out	7294
[092] Last PI out	7295
[093] PID PD out	7343
[094] PID out mon	7352
[095] PID outS mon	7353
[096] Pad 0	9100
[097] Pad 1	9101
[098] Pad 2	9102
[099] Pad 3	9103
[100] Pad 4	9104
[101] Pad 5	9105
[102] Pad 6	9106
[103] Pad 7	9107
[104] Pad 8	9108
[105] Pad 9	9109
[106] Pad 10	9110
[107] Pad 11	9111
[108] Pad 12	9112
[109] Pad 13	9113
[110] Pad 14	9114
[111] Pad 15	9115

Pick List 28

Index Name	IPA
[000] DigD-ISBusW0	9320
[001] DigD-ISBusW1	9321
[002] DigD-ISBusW2	9322
[003] DigD-ISBusW3	9323
[004] DigD-ISBusW4	9324
[005] DigD-ISBusW5	9325
[006] DigD-ISBusW6	9326
[007] DigD-ISBusW7	9327
[008] NULL	4000
[009] ONE	4001
[010] Output volt	3060
[011] Output curr	3070
[012] Output freq	3080
[013] Output pwr	3090
[014] DCLink volt	3100
[015] MagnetizCurr	3110
[016] Torque curr	3120
[017] MagnCurr ref	3130
[018] TrqCurr ref	3140
[019] Curr phase U	3150
[020] Curr phase V	3160
[021] Curr phase W	3170
[022] Flux ref	3180
[023] Flux	3190
[024] Ramp ref	3200
[025] Speed ref	3210
[026] Speed	3220
[027] Actual Speed	3221
[028] Fault Pin	9098
[029] Std Enc Spd	3222
[030] Exp Enc Spd	3223
[031] DrvOL accum%	1540
[032] MotOL accum%	1670
[033] BU OL accum%	1781
[034] Ud	3270
[035] Drive ready	161
[036] EnableSM mon	162
[037] Start SM mon	163
[038] FStop SM mon	164
[039] ALMSequencer	9096
[040] Drive OK	9097
[041] Jog state	8013
[042] Gen output	2760

Index Name	IPA
[043] AI 1 output	5009
[044] AI 2 output	5029
[045] AI 3 output	5049
[046] Ramp out mon	8022
[047] Spd Draw out	7099
[048] Jog output	8012
[049] Mlt Spd out	7070
[050] Mpot output	7090
[051] I/F cp mon	2625
[052] Torque ref	2450
[053] Tcurr lim +	1210
[054] Tcurr lim -	1220
[055] InuseTcurrL+	1250
[056] InuseTcurrL-	1260
[057] InuseOutvltR	1180
[058] Std enc pos	9553
[059] Exp enc pos	9554
[060] H Index reg	9555
[061] L Index reg	9556
[062] AI 1X output	5067
[063] AI 2X output	5087
[064] W0 comp out	2116
[065] W1 comp out	9356
[066] PL next fact	2282
[067] SBIDrvW0 mon	9000
[068] SBIDrvW1 mon	9001
[069] SBIDrvW2 mon	9002
[070] SBIDrvW3 mon	9003
[071] SBIDrvW4 mon	9004
[072] SBIDrvW5 mon	9005
[073] ISBusDrvW0 m	9300
[074] ISBusDrvW1 m	9301
[075] ISBusDrvW2 m	9302
[076] ISBusDrvW3 m	9303
[077] ISBusDrvW4 m	9304
[078] ISBusDrvW5 m	9305
[079] ISBusDrvW6 m	9306
[080] ISBusDrvW7 m	9307
[081] APCSDrv W0m	4120
[082] APCSDrv W1m	4121
[083] APCSDrv W2m	4122
[084] APCSDrv W3m	4123
[085] APCSDrv W4m	4124
[086] APCADrv W0m	4160
[087] APCADrv W1m	4161
[088] APCADrv W2m	4162
[089] APCADrv W3m	4163
[090] APCADrv W4m	4164
[091] APCADrv W5m	4165
[092] APCADrv W6m	4166
[093] APCADrv W7m	4167
[094] APCADrv W8m	4168
[095] APCADrv W9m	4169
[096] PID FF mon	7217
[097] PID input	7256
[098] PID PI out	7294
[099] Last PI out	7295
[100] PID PD out	7343
[101] PID out mon	7352

Index Name	IPA
[102] PID outS mon	7353
[103] Pad 0	9100
[104] Pad 1	9101
[105] Pad 2	9102
[106] Pad 3	9103
[107] Pad 4	9104
[108] Pad 5	9105
[109] Pad 6	9106
[110] Pad 7	9107
[111] Pad 8	9108
[112] Pad 9	9109
[113] Pad 10	9110
[114] Pad 11	9111
[115] Pad 12	9112
[116] Pad 13	9113
[117] Pad 14	9114
[118] Pad 15	9115

Pick List 29

Index Name	IPA
[000] DigDrvAPCSW0	4105
[001] DigDrvAPCSW1	4106
[002] DigDrvAPCSW2	4107
[003] DigDrvAPCSW3	4108
[004] DigDrvAPCSW4	4109
[005] NULL	4000
[006] ONE	4001
[007] Output volt	3060
[008] Output curr	3070
[009] Output freq	3080
[010] Output pwr	3090
[011] DCLink volt	3100
[012] MagnetizCurr	3110
[013] Torque curr	3120
[014] MagnCurr ref	3130
[015] TrqCurr ref	3140
[016] Curr phase U	3150
[017] Curr phase V	3160
[018] Curr phase W	3170
[019] Flux ref	3180
[020] Flux	3190
[021] Ramp ref	3200
[022] Speed ref	3210
[023] Speed	3220
[024] Actual Speed	3221
[025] Fault Pin	9098
[026] Std Enc Spd	3222
[027] Exp Enc Spd	3223
[028] DrvOL accum%	1540
[029] MotOL accum%	1670
[030] BU OL accum%	1781
[031] Ud	3270
[032] Drive ready	161
[033] EnableSM mon	162
[034] Start SM mon	163
[035] FStop SM mon	164
[036] ALMSequencer	9096
[037] Drive OK	9097
[038] Jog state	8013
[039] Gen output	2760

Index Name	IPA
[040] AI 1 output	5009
[041] AI 2 output	5029
[042] AI 3 output	5049
[043] Ramp out mon	8022
[044] Spd Draw out	7099
[045] Jog output	8012
[046] Mlt Spd out	7070
[047] Mpot output	7090
[048] I/F cp mon	2625
[049] Torque ref	2450
[050] Tcurr lim +	1210
[051] Tcurr lim -	1220
[052] InuseTcurrL+	1250
[053] InuseTcurrL-	1260
[054] InuseOutvltR	1180
[055] Std enc pos	9553
[056] Exp enc pos	9554
[057] H Index reg	9555
[058] L Index reg	9556
[059] AI 1X output	5067
[060] AI 2X output	5087
[061] W0 comp out	2116
[062] W1 comp out	9356
[063] PL next fact	2282
[064] SBIDrvW0 mon	9000
[065] SBIDrvW1 mon	9001
[066] SBIDrvW2 mon	9002
[067] SBIDrvW3 mon	9003
[068] SBIDrvW4 mon	9004
[069] SBIDrvW5 mon	9005
[070] ISBusDrvW0 m	9300
[071] ISBusDrvW1 m	9301
[072] ISBusDrvW2 m	9302
[073] ISBusDrvW3 m	9303
[074] ISBusDrvW4 m	9304
[075] ISBusDrvW5 m	9305
[076] ISBusDrvW6 m	9306
[077] ISBusDrvW7 m	9307
[078] APCSDrv W0m	4120
[079] APCSDrv W1m	4121
[080] APCSDrv W2m	4122
[081] APCSDrv W3m	4123
[082] APCSDrv W4m	4124
[083] APCADrv W0m	4160
[084] APCADrv W1m	4161
[085] APCADrv W2m	4162
[086] APCADrv W3m	4163
[087] APCADrv W4m	4164
[088] APCADrv W5m	4165
[089] APCADrv W6m	4166
[090] APCADrv W7m	4167
[091] APCADrv W8m	4168
[092] APCADrv W9m	4169
[093] PID FF mon	7217
[094] PID input	7256
[095] PID PI out	7294
[096] Last PI out	7295
[097] PID PD out	7343
[098] PID out mon	7352

Index Name	IPA
[099] PID outS mon	7353
[100] Pad 0	9100
[101] Pad 1	9101
[102] Pad 2	9102
[103] Pad 3	9103
[104] Pad 4	9104
[105] Pad 5	9105
[106] Pad 6	9106
[107] Pad 7	9107
[108] Pad 8	9108
[109] Pad 9	9109
[110] Pad 10	9110
[111] Pad 11	9111
[112] Pad 12	9112
[113] Pad 13	9113
[114] Pad 14	9114
[115] Pad 15	9115

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Index Name	IPA
[000] DigDrvAPCAW0	4140
[001] DigDrvAPCAW1	4141
[002] DigDrvAPCAW2	4142
[003] DigDrvAPCAW3	4143
[004] DigDrvAPCAW4	4144
[005] DigDrvAPCAW5	4145
[006] DigDrvAPCAW6	4146
[007] DigDrvAPCAW7	4147
[008] DigDrvAPCAW8	4148
[009] DigDrvAPCAW9	4149
[010] NULL	4000
[011] ONE	4001
[012] Output volt	3060
[013] Output curr	3070
[014] Output freq	3080
[015] Output pwr	3090
[016] DCLink volt	3100
[017] MagnetizCurr	3110
[018] Torque curr	3120
[019] MagnCurr ref	3130
[020] TrqCurr ref	3140
[021] Curr phase U	3150
[022] Curr phase V	3160
[023] Curr phase W	3170
[024] Flux ref	3180
[025] Flux	3190
[026] Ramp ref	3200
[027] Speed ref	3210
[028] Speed	3220
[029] Actual Speed	3221
[030] Fault Pin	9098
[031] Std Enc Spd	3222
[032] Exp Enc Spd	3223
[033] DrvOL accum%	1540
[034] MotOL accum%	1670
[035] BU OL accum%	1781
[036] Ud	3270
[037] Drive ready	161
[038] EnableSM mon	162
[039] Start SM mon	163

Index Name	IPA
[040] FStop SM mon	**164**
[041] ALMSequencer	**9096**
[042] Drive OK	**9097**
[043] Jog state	**8013**
[044] Gen output	**2760**
[045] AI 1 output	**5009**
[046] AI 2 output	**5029**
[047] AI 3 output	**5049**
[048] Ramp out mon	**8022**
[049] Spd Draw out	**7099**
[050] Jog output	**8012**
[051] Mlt Spd out	**7070**
[052] Mpot output	**7090**
[053] I/F cp mon	**2625**
[054] Torque ref	**2450**
[055] Tcurr lim +	**1210**
[056] Tcurr lim -	**1220**
[057] InuseTcurrL+	**1250**
[058] InuseTcurrL-	**1260**
[059] InuseOutvltR	**1180**
[060] Std enc pos	**9553**
[061] Exp enc pos	**9554**
[062] H Index reg	**9555**
[063] L Index reg	**9556**
[064] AI 1X output	5067
[065] AI 2X output	5087
[066] W0 comp out	2116
[067] W1 comp out	9356
[068] PL next fact	2282
[069] SBIDrvW0 mon	9000
[070] SBIDrvW1 mon	9001
[071] SBIDrvW2 mon	9002
[072] SBIDrvW3 mon	9003
[073] SBIDrvW4 mon	9004
[074] SBIDrvW5 mon	9005
[075] ISBusDrvW0 m	9300
[076] ISBusDrvW1 m	9301
[077] ISBusDrvW2 m	9302
[078] ISBusDrvW3 m	9303
[079] ISBusDrvW4 m	9304
[080] ISBusDrvW5 m	9305
[081] ISBusDrvW6 m	9306
[082] ISBusDrvW7 m	9307
[083] APCSDrv W0m	4120
[084] APCSDrv W1m	4121
[085] APCSDrv W2m	4122
[086] APCSDrv W3m	4123
[087] APCSDrv W4m	4124
[088] APCADrv W0m	4160
[089] APCADrv W1m	4161
[090] APCADrv W2m	4162
[091] APCADrv W3m	4163
[092] APCADrv W4m	4164
[093] APCADrv W5m	4165
[094] APCADrv W6m	4166
[095] APCADrv W7m	4167
[096] APCADrv W8m	4168
[097] APCADrv W9m	4169
[098] PID FF mon	7217

Index Name	IPA
[099] PID input	7256
[100] PID PI out	7294
[101] Last PI out	7295
[102] PID PD out	7343
[103] PID out mon	7352
[104] PID outS mon	7353
[105] Pad 0	9100
[106] Pad 1	9101
[107] Pad 2	9102
[108] Pad 3	9103
[109] Pad 4	9104
[110] Pad 5	9105
[111] Pad 6	9106
[112] Pad 7	9107
[113] Pad 8	9108
[114] Pad 9	9109
[115] Pad 10	9110
[116] Pad 11	9111
[117] Pad 12	9112
[118] Pad 13	9113
[119] Pad 14	9114
[120] Pad 15	9115

Pick List 31

Index Name	IPA
[000] DigPID inpFF	**7211**
[001] Output volt	**3060**
[002] Output curr	**3070**
[003] Output freq	**3080**
[004] Output pwr	**3090**
[005] DCLink volt	**3100**
[006] MagnetizCurr	**3110**
[007] Torque curr	**3120**
[008] MagnCurr ref	**3130**
[009] TrqCurr ref	**3140**
[010] Curr phase U	**3150**
[011] Curr phase V	**3160**
[012] Curr phase W	**3170**
[013] Flux ref	**3180**
[014] Flux	**3190**
[015] Ramp ref	**3200**
[016] Speed ref	**3210**
[017] Speed	**3220**
[018] Actual Speed	**3221**
[019] Fault Pin	**9098**
[020] Std Enc Spd	**3222**
[021] Exp Enc Spd	**3223**
[022] DrvOL accum%	**1540**
[023] MotOL accum%	**1670**
[024] BU OL accum%	**1781**
[025] Ud	**3270**
[026] NULL	**4000**
[027] ONE	**4001**
[028] Gen output	**2760**
[029] AI 1 output	**5009**
[030] AI 2 output	**5029**
[031] AI 3 output	**5049**
[032] Ramp out mon	**8022**
[033] AI 1X output	5067
[034] AI 2X output	5087
[035] W0 comp out	2116
[036] W1 comp out	9356
[037] SBIDrvW0 mon	9000
[038] SBIDrvW1 mon	9001
[039] SBIDrvW2 mon	9002
[040] SBIDrvW3 mon	9003
[041] SBIDrvW4 mon	9004
[042] SBIDrvW5 mon	9005
[043] ISBusDrvW0 m	9300
[044] ISBusDrvW1 m	9301
[045] ISBusDrvW2 m	9302
[046] ISBusDrvW3 m	9303
[047] ISBusDrvW4 m	9304
[048] ISBusDrvW5 m	9305
[049] ISBusDrvW6 m	9306
[050] ISBusDrvW7 m	9307
[051] APCSDrv W0m	4120
[052] APCSDrv W1m	4121
[053] APCSDrv W2m	4122
[054] APCSDrv W3m	4123
[055] APCSDrv W4m	4124
[056] APCADrv W0m	4160
[057] APCADrv W1m	4161
[058] APCADrv W2m	4162
[059] APCADrv W3m	4163
[060] APCADrv W4m	4164
[061] APCADrv W5m	4165
[062] APCADrv W6m	4166
[063] APCADrv W7m	4167
[064] APCADrv W8m	4168
[065] APCADrv W9m	4169
[066] PID FF mon	7217
[067] PID input	7256
[068] PID PI out	7294
[069] Last PI out	7295
[070] PID PD out	7343
[071] PID out mon	7352
[072] PID outS mon	7353
[073] Pad 0	9100
[074] Pad 1	9101
[075] Pad 2	9102
[076] Pad 3	9103
[077] Pad 4	9104
[078] Pad 5	9105
[079] Pad 6	9106
[080] Pad 7	9107
[081] Pad 8	9108
[082] Pad 9	9109
[083] Pad 10	9110
[084] Pad 11	9111
[085] Pad 12	9112
[086] Pad 13	9113
[087] Pad 14	9114
[088] Pad 15	9115

Pick List 32

Index Name	IPA
[000] Dig PID fbk	**7230**
[001] Output volt	**3060**
[002] Output curr	**3070**
[003] Output freq	**3080**
[004] Output pwr	**3090**
[005] DCLink volt	**3100**
[006] MagnetizCurr	**3110**
[007] Torque curr	**3120**
[008] MagnCurr ref	**3130**
[009] TrqCurr ref	**3140**
[010] Curr phase U	**3150**
[011] Curr phase V	**3160**
[012] Curr phase W	**3170**
[013] Flux ref	**3180**
[014] Flux	**3190**
[015] Ramp ref	**3200**
[016] Speed ref	**3210**
[017] Speed	**3220**
[018] Actual Speed	**3221**
[019] Fault Pin	**9098**
[020] Std Enc Spd	**3222**
[021] Exp Enc Spd	**3223**
[022] DrvOL accum%	**1540**
[023] MotOL accum%	**1670**
[024] BU OL accum%	**1781**
[025] Ud	**3270**
[026] NULL	**4000**
[027] ONE	**4001**
[028] Gen output	**2760**
[029] AI 1 output	**5009**
[030] AI 2 output	**5029**
[031] AI 3 output	**5049**
[032] AI 1X output	5067
[033] AI 2X output	5087
[034] W0 comp out	2116
[035] W1 comp out	9356
[036] SBIDrvW0 mon	9000
[037] SBIDrvW1 mon	9001
[038] SBIDrvW2 mon	9002
[039] SBIDrvW3 mon	9003
[040] SBIDrvW4 mon	9004
[041] SBIDrvW5 mon	9005
[042] ISBusDrvW0 m	9300
[043] ISBusDrvW1 m	9301
[044] ISBusDrvW2 m	9302
[045] ISBusDrvW3 m	9303
[046] ISBusDrvW4 m	9304
[047] ISBusDrvW5 m	9305
[048] ISBusDrvW6 m	9306
[049] ISBusDrvW7 m	9307
[050] APCSDrv W0m	4120
[051] APCSDrv W1m	4121
[052] APCSDrv W2m	4122
[053] APCSDrv W3m	4123
[054] APCSDrv W4m	4124
[055] APCADrv W0m	4160
[056] APCADrv W1m	4161
[057] APCADrv W2m	4162
[058] APCADrv W3m	4163
[059] APCADrv W4m	4164
[060] APCADrv W5m	4165

Index Name	IPA
[061] APCADrv W6m	4166
[062] APCADrv W7m	4167
[063] APCADrv W8m	4168
[064] APCADrv W9m	4169
[065] PID FF mon	7217
[066] PID input	7256
[067] PID PI out	7294
[068] Last PI out	7295
[069] PID PD out	7343
[070] PID out mon	7352
[071] PID outS mon	7353
[072] Pad 0	9100
[073] Pad 1	9101
[074] Pad 2	9102
[075] Pad 3	9103
[076] Pad 4	9104
[077] Pad 5	9105
[078] Pad 6	9106
[079] Pad 7	9107
[080] Pad 8	9108
[081] Pad 9	9109
[082] Pad 10	9110
[083] Pad 11	9111
[084] Pad 12	9112
[085] Pad 13	9113
[086] Pad 14	9114
[087] Pad 15	9115

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Index Name	IPA
[000] Dig PID draw	**7231**
[001] Output volt	**3060**
[002] Output curr	**3070**
[003] Output freq	**3080**
[004] Output pwr	**3090**
[005] DCLink volt	**3100**
[006] MagnetizCurr	**3110**
[007] Torque curr	**3120**
[008] MagnCurr ref	**3130**
[009] TrqCurr ref	**3140**
[010] Curr phase U	**3150**
[011] Curr phase V	**3160**
[012] Curr phase W	**3170**
[013] Flux ref	**3180**
[014] Flux	**3190**
[015] Ramp ref	**3200**
[016] Speed ref	**3210**
[017] Speed	**3220**
[018] Actual Speed	**3221**
[019] Fault Pin	**9098**
[020] Std Enc Spd	**3222**
[021] Exp Enc Spd	**3223**
[022] DrvOL accum%	**1540**
[023] MotOL accum%	**1670**
[024] BU OL accum%	**1781**
[025] Ud	**3270**
[026] NULL	**4000**
[027] ONE	**4001**
[028] Gen output	**2760**
[029] AI 1 output	**5009**

Index Name	IPA
[030] AI 2 output	**5029**
[031] AI 3 output	**5049**
[032] AI 1X output	5067
[033] AI 2X output	5087
[034] W0 comp out	2116
[035] W1 comp out	9356
[036] SBIDrvW0 mon	9000
[037] SBIDrvW1 mon	9001
[038] SBIDrvW2 mon	9002
[039] SBIDrvW3 mon	9003
[040] SBIDrvW4 mon	9004
[041] SBIDrvW5 mon	9005
[042] ISBusDrvW0 m	9300
[043] ISBusDrvW1 m	9301
[044] ISBusDrvW2 m	9302
[045] ISBusDrvW3 m	9303
[046] ISBusDrvW4 m	9304
[047] ISBusDrvW5 m	9305
[048] ISBusDrvW6 m	9306
[049] ISBusDrvW7 m	9307
[050] APCSDrv W0m	4120
[051] APCSDrv W1m	4121
[052] APCSDrv W2m	4122
[053] APCSDrv W3m	4123
[054] APCSDrv W4m	4124
[055] APCADrv W0m	4160
[056] APCADrv W1m	4161
[057] APCADrv W2m	4162
[058] APCADrv W3m	4163
[059] APCADrv W4m	4164
[060] APCADrv W5m	4165
[061] APCADrv W6m	4166
[062] APCADrv W7m	4167
[063] APCADrv W8m	4168
[064] APCADrv W9m	4169
[065] PID FF mon	7217
[066] PID input	7256
[067] PID PI out	7294
[068] Last PI out	7295
[069] PID PD out	7343
[070] PID out mon	7352
[071] PID outS mon	7353
[072] Pad 0	9100
[073] Pad 1	9101
[074] Pad 2	9102
[075] Pad 3	9103
[076] Pad 4	9104
[077] Pad 5	9105
[078] Pad 6	9106
[079] Pad 7	9107
[080] Pad 8	9108
[081] Pad 9	9109
[082] Pad 10	9110
[083] Pad 11	9111
[084] Pad 12	9112
[085] Pad 13	9113
[086] Pad 14	9114
[087] Pad 15	9115

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Index Name	IPA
[000] DigPID set 0	**7232**
[001] Output volt	**3060**
[002] Output curr	**3070**
[003] Output freq	**3080**
[004] Output pwr	**3090**
[005] DCLink volt	**3100**
[006] MagnetizCurr	**3110**
[007] Torque curr	**3120**
[008] MagnCurr ref	**3130**
[009] TrqCurr ref	**3140**
[010] Curr phase U	**3150**
[011] Curr phase V	**3160**
[012] Curr phase W	**3170**
[013] Flux ref	**3180**
[014] Flux	**3190**
[015] Ramp ref	**3200**
[016] Speed ref	**3210**
[017] Speed	**3220**
[018] Actual Speed	**3221**
[019] Fault Pin	**9098**
[020] Std Enc Spd	**3222**
[021] Exp Enc Spd	**3223**
[022] DrvOL accum%	**1540**
[023] MotOL accum%	**1670**
[024] BU OL accum%	**1781**
[025] Ud	**3270**
[026] NULL	**4000**
[027] ONE	**4001**
[028] Gen output	**2760**
[029] AI 1 output	**5009**
[030] AI 2 output	**5029**
[031] AI 3 output	**5049**
[032] AI 1X output	5067
[033] AI 2X output	5087
[034] W0 comp out	2116
[035] W1 comp out	9356
[036] SBIDrvW0 mon	9000
[037] SBIDrvW1 mon	9001
[038] SBIDrvW2 mon	9002
[039] SBIDrvW3 mon	9003
[040] SBIDrvW4 mon	9004
[041] SBIDrvW5 mon	9005
[042] ISBusDrvW0 m	9300
[043] ISBusDrvW1 m	9301
[044] ISBusDrvW2 m	9302
[045] ISBusDrvW3 m	9303
[046] ISBusDrvW4 m	9304
[047] ISBusDrvW5 m	9305
[048] ISBusDrvW6 m	9306
[049] ISBusDrvW7 m	9307
[050] APCSDrv W0m	4120
[051] APCSDrv W1m	4121
[052] APCSDrv W2m	4122
[053] APCSDrv W3m	4123
[054] APCSDrv W4m	4124
[055] APCADrv W0m	4160
[056] APCADrv W1m	4161

Index Name	IPA
[057] APCADrv W2m	4162
[058] APCADrv W3m	4163
[059] APCADrv W4m	4164
[060] APCADrv W5m	4165
[061] APCADrv W6m	4166
[062] APCADrv W7m	4167
[063] APCADrv W8m	4168
[064] APCADrv W9m	4169
[065] PID FF mon	7217
[066] PID input	7256
[067] PID PI out	7294
[068] Last PI out	7295
[069] PID PD out	7343
[070] PID out mon	7352
[071] PID outS mon	7353
[072] Pad 0	9100
[073] Pad 1	9101
[074] Pad 2	9102
[075] Pad 3	9103
[076] Pad 4	9104
[077] Pad 5	9105
[078] Pad 6	9106
[079] Pad 7	9107
[080] Pad 8	9108
[081] Pad 9	9109
[082] Pad 10	9110
[083] Pad 11	9111
[084] Pad 12	9112
[085] Pad 13	9113
[086] Pad 14	9114
[087] Pad 15	9115

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Index Name	IPA
[000] DigPID set 1	**7233**
[001] Output volt	**3060**
[002] Output curr	**3070**
[003] Output freq	**3080**
[004] Output pwr	**3090**
[005] DCLink volt	**3100**
[006] MagnetizCurr	**3110**
[007] Torque curr	**3120**
[008] MagnCurr ref	**3130**
[009] TrqCurr ref	**3140**
[010] Curr phase U	**3150**
[011] Curr phase V	**3160**
[012] Curr phase W	**3170**
[013] Flux ref	**3180**
[014] Flux	**3190**
[015] Ramp ref	**3200**
[016] Speed ref	**3210**
[017] Speed	**3220**
[018] Actual Speed	**3221**
[019] Fault Pin	**9098**
[020] Std Enc Spd	**3222**
[021] Exp Enc Spd	**3223**
[022] DrvOL accum%	**1540**
[023] MotOL accum%	**1670**
[024] BU OL accum%	**1781**
[025] Ud	**3270**

Index Name	IPA
[026] NULL	**4000**
[027] ONE	**4001**
[028] Gen output	**2760**
[029] AI 1 output	**5009**
[030] AI 2 output	**5029**
[031] AI 3 output	**5049**
[032] AI 1X output	5067
[033] AI 2X output	5087
[034] W0 comp out	2116
[035] W1 comp out	9356
[036] SBIDrvW0 mon	9000
[037] SBIDrvW1 mon	9001
[038] SBIDrvW2 mon	9002
[039] SBIDrvW3 mon	9003
[040] SBIDrvW4 mon	9004
[041] SBIDrvW5 mon	9005
[042] ISBusDrvW0 m	9300
[043] ISBusDrvW1 m	9301
[044] ISBusDrvW2 m	9302
[045] ISBusDrvW3 m	9303
[046] ISBusDrvW4 m	9304
[047] ISBusDrvW5 m	9305
[048] ISBusDrvW6 m	9306
[049] ISBusDrvW7 m	9307
[050] APCSDrv W0m	4120
[051] APCSDrv W1m	4121
[052] APCSDrv W2m	4122
[053] APCSDrv W3m	4123
[054] APCSDrv W4m	4124
[055] APCADrv W0m	4160
[056] APCADrv W1m	4161
[057] APCADrv W2m	4162
[058] APCADrv W3m	4163
[059] APCADrv W4m	4164
[060] APCADrv W5m	4165
[061] APCADrv W6m	4166
[062] APCADrv W7m	4167
[063] APCADrv W8m	4168
[064] APCADrv W9m	4169
[065] PID FF mon	7217
[066] PID input	7256
[067] PID PI out	7294
[068] Last PI out	7295
[069] PID PD out	7343
[070] PID out mon	7352
[071] PID outS mon	7353
[072] Pad 0	9100
[073] Pad 1	9101
[074] Pad 2	9102
[075] Pad 3	9103
[076] Pad 4	9104
[077] Pad 5	9105
[078] Pad 6	9106
[079] Pad 7	9107
[080] Pad 8	9108
[081] Pad 9	9109
[082] Pad 10	9110
[083] Pad 11	9111
[084] Pad 12	9112
[085] Pad 13	9113
[086] Pad 14	9114
[087] Pad 15	9115

Pick List 36

[000] Dig PIGP ref	**7281**
[001] Ramp ref	**3200**
[002] Speed ref	**3210**
[003] NULL	**4000**
[004] ONE	**4001**
[005] Gen output	**2760**
[006] AI 1 output	**5009**
[007] AI 2 output	**5029**
[008] AI 3 output	**5049**
[009] AI 1X output	5067
[010] AI 2X output	5087
[011] W0 comp out	2116
[012] W1 comp out	9356
[013] SBIDrvW0 mon	9000
[014] SBIDrvW1 mon	9001
[015] SBIDrvW2 mon	9002
[016] SBIDrvW3 mon	9003
[017] SBIDrvW4 mon	9004
[018] SBIDrvW5 mon	9005
[019] ISBusDrvW0 m	9300
[020] ISBusDrvW1 m	9301
[021] ISBusDrvW2 m	9302
[022] ISBusDrvW3 m	9303
[023] ISBusDrvW4 m	9304
[024] ISBusDrvW5 m	9305
[025] ISBusDrvW6 m	9306
[026] ISBusDrvW7 m	9307
[027] APCSDrv W0m	4120
[028] APCSDrv W1m	4121
[029] APCSDrv W2m	4122
[030] APCSDrv W3m	4123
[031] APCSDrv W4m	4124
[032] APCADrv W0m	4160
[033] APCADrv W1m	4161
[034] APCADrv W2m	4162
[035] APCADrv W3m	4163
[036] APCADrv W4m	4164
[037] APCADrv W5m	4165
[038] APCADrv W6m	4166
[039] APCADrv W7m	4167
[040] APCADrv W8m	4168
[041] APCADrv W9m	4169
[042] PID FF mon	7217
[043] PID input	7256
[044] PID PI out	7294
[045] Last PI out	7295
[046] PID PD out	7343
[047] PID out mon	7352
[048] PID outS mon	7353
[049] Pad 0	9100
[050] Pad 1	9101
[051] Pad 2	9102
[052] Pad 3	9103
[053] Pad 4	9104
[054] Pad 5	9105
[055] Pad 6	9106
[056] Pad 7	9107
[057] Pad 8	9108
[058] Pad 9	9109
[059] Pad 10	9110
[060] Pad 11	9111
[061] Pad 12	9112
[062] Pad 13	9113
[063] Pad 14	9114
[064] Pad 15	9115

Pick List 37

[000] Dig PDGP ref	**7311**
[001] Ramp ref	**3200**
[002] Speed ref	**3210**
[003] NULL	**4000**
[004] ONE	**4001**
[005] Gen output	**2760**
[006] AI 1 output	**5009**
[007] AI 2 output	**5029**
[008] AI 3 output	**5049**
[009] AI 1X output	5067
[010] AI 2X output	5087
[011] W0 comp out	2116
[012] W1 comp out	9356
[013] SBIDrvW0 mon	9000
[014] SBIDrvW1 mon	9001
[015] SBIDrvW2 mon	9002
[016] SBIDrvW3 mon	9003
[017] SBIDrvW4 mon	9004
[018] SBIDrvW5 mon	9005
[019] ISBusDrvW0 m	9300
[020] ISBusDrvW1 m	9301
[021] ISBusDrvW2 m	9302
[022] ISBusDrvW3 m	9303
[023] ISBusDrvW4 m	9304
[024] ISBusDrvW5 m	9305
[025] ISBusDrvW6 m	9306
[026] ISBusDrvW7 m	9307
[027] APCSDrv W0m	4120
[028] APCSDrv W1m	4121
[029] APCSDrv W2m	4122
[030] APCSDrv W3m	4123
[031] APCSDrv W4m	4124
[032] APCADrv W0m	4160
[033] APCADrv W1m	4161
[034] APCADrv W2m	4162
[035] APCADrv W3m	4163
[036] APCADrv W4m	4164
[037] APCADrv W5m	4165
[038] APCADrv W6m	4166
[039] APCADrv W7m	4167
[040] APCADrv W8m	4168
[041] APCADrv W9m	4169
[042] PID FF mon	7217
[043] PID input	7256
[044] PID PI out	7294
[045] Last PI out	7295
[046] PID PD out	7343
[047] PID out mon	7352
[048] PID outS mon	7353
[049] Pad 0	9100
[050] Pad 1	9101
[051] Pad 2	9102
[052] Pad 3	9103
[053] Pad 4	9104
[054] Pad 5	9105
[055] Pad 6	9106
[056] Pad 7	9107
[057] Pad 8	9108
[058] Pad 9	9109
[059] Pad 10	9110
[060] Pad 11	9111
[061] Pad 12	9112
[062] Pad 13	9113
[063] Pad 14	9114
[064] Pad 15	9115

Pick List 38

[000] DigPIDMltPI3	**7326**
[001] Output volt	**3060**
[002] Output curr	**3070**
[003] Output freq	**3080**
[004] Output pwr	**3090**
[005] DCLink volt	**3100**
[006] MagnetizCurr	**3110**
[007] Torque curr	**3120**
[008] MagnCurr ref	**3130**
[009] TrqCurr ref	**3140**
[010] Curr phase U	**3150**
[011] Curr phase V	**3160**
[012] Curr phase W	**3170**
[013] Flux ref	**3180**
[014] Flux	**3190**
[015] Ramp ref	**3200**
[016] Speed ref	**3210**
[017] Speed	**3220**
[018] Actual Speed	**3221**
[019] Fault Pin	**9098**
[020] Std Enc Spd	**3222**
[021] Exp Enc Spd	**3223**
[022] DrvOL accum%	**1540**
[023] MotOL accum%	**1670**
[024] BU OL accum%	**1781**
[025] Ud	**3270**
[026] NULL	**4000**
[027] ONE	**4001**
[028] Gen output	**2760**
[029] AI 1 output	**5009**
[030] AI 2 output	**5029**
[031] AI 3 output	**5049**
[032] AI 1X output	5067
[033] AI 2X output	5087
[034] W0 comp out	2116

Index Name	IPA
[035] W1 comp out	9356
[036] SBIDrvW0 mon	9000
[037] SBIDrvW1 mon	9001
[038] SBIDrvW2 mon	9002
[039] SBIDrvW3 mon	9003
[040] SBIDrvW4 mon	9004
[041] SBIDrvW5 mon	9005
[042] ISBusDrvW0 m	9300
[043] ISBusDrvW1 m	9301
[044] ISBusDrvW2 m	9302
[045] ISBusDrvW3 m	9303
[046] ISBusDrvW4 m	9304
[047] ISBusDrvW5 m	9305
[048] ISBusDrvW6 m	9306
[049] ISBusDrvW7 m	9307
[050] APCSDrv W0m	4120
[051] APCSDrv W1m	4121
[052] APCSDrv W2m	4122
[053] APCSDrv W3m	4123
[054] APCSDrv W4m	4124
[055] APCADrv W0m	4160
[056] APCADrv W1m	4161
[057] APCADrv W2m	4162
[058] APCADrv W3m	4163
[059] APCADrv W4m	4164
[060] APCADrv W5m	4165
[061] APCADrv W6m	4166
[062] APCADrv W7m	4167
[063] APCADrv W8m	4168
[064] APCADrv W9m	4169
[065] PID FF mon	7217
[066] PID input	7256
[067] PID PI out	7294
[068] Last PI out	7295
[069] PID PD out	7343
[070] PID out mon	7352
[071] PID outS mon	7353
[072] Pad 0	9100
[073] Pad 1	9101
[074] Pad 2	9102
[075] Pad 3	9103
[076] Pad 4	9104
[077] Pad 5	9105
[078] Pad 6	9106
[079] Pad 7	9107
[080] Pad 8	9108
[081] Pad 9	9109
[082] Pad 10	9110
[083] Pad 11	9111
[084] Pad 12	9112
[085] Pad 13	9113
[086] Pad 14	9114
[087] Pad 15	9115

Pick List 39

Index Name	IPA
[000] Int IS ctrl	**9551**
[001] NULL	**4000**
[002] ONE	**4001**
[003] Gen output	**2760**
[004] AI 1 output	**5009**
[005] AI 2 output	**5029**
[006] AI 3 output	**5049**
[007] AI 1X output	5067
[008] AI 2X output	5087
[009] W0 comp out	2116
[010] W1 comp out	9356
[011] SBIDrvW0 mon	9000
[012] SBIDrvW1 mon	9001
[013] SBIDrvW2 mon	9002
[014] SBIDrvW3 mon	9003
[015] SBIDrvW4 mon	9004
[016] SBIDrvW5 mon	9005
[017] ISBusDrvW0 m	9300
[018] ISBusDrvW1 m	9301
[019] ISBusDrvW2 m	9302
[020] ISBusDrvW3 m	9303
[021] ISBusDrvW4 m	9304
[022] ISBusDrvW5 m	9305
[023] ISBusDrvW6 m	9306
[024] ISBusDrvW7 m	9307
[025] APCSDrv W0m	4120
[026] APCSDrv W1m	4121
[027] APCSDrv W2m	4122
[028] APCSDrv W3m	4123
[029] APCSDrv W4m	4124
[030] APCADrv W0m	4160
[031] APCADrv W1m	4161
[032] APCADrv W2m	4162
[033] APCADrv W3m	4163
[034] APCADrv W4m	4164
[035] APCADrv W5m	4165
[036] APCADrv W6m	4166
[037] APCADrv W7m	4167
[038] APCADrv W8m	4168
[039] APCADrv W9m	4169
[040] PID FF mon	7217
[041] PID input	7256
[042] PID PI out	7294
[043] Last PI out	7295
[044] PID PD out	7343
[045] PID out mon	7352
[046] PID outS mon	7353
[047] Pad 0	9100
[048] Pad 1	9101
[049] Pad 2	9102
[050] Pad 3	9103
[051] Pad 4	9104
[052] Pad 5	9105
[053] Pad 6	9106
[054] Pad 7	9107
[055] Pad 8	9108
[056] Pad 9	9109
[057] Pad 10	9110
[058] Pad 11	9111
[059] Pad 12	9112
[060] Pad 13	9113
[061] Pad 14	9114
[062] Pad 15	9115

Pick List 40

Index Name	IPA
[000] DigDrvSBI W0	**9020**
[001] DigDrvSBI W1	**9021**
[002] DigDrvSBI W2	**9022**
[003] DigDrvSBI W3	**9023**
[004] DigDrvSBI W4	**9024**
[005] DigDrvSBI W5	**9025**
[006] NULL	**4000**
[007] ONE	**4001**
[008] Output volt	**3060**
[009] Output curr	**3070**
[010] Output freq	**3080**
[011] Output pwr	**3090**
[012] DCLink volt	**3100**
[013] MagnetizCurr	**3110**
[014] Torque curr	**3120**
[015] MagnCurr ref	**3130**
[016] TrqCurr ref	**3140**
[017] Curr phase U	**3150**
[018] Curr phase V	**3160**
[019] Curr phase W	**3170**
[020] Flux ref	**3180**
[021] Flux	**3190**
[022] Ramp ref	**3200**
[023] Speed ref	**3210**
[024] Speed	**3220**
[025] Actual Speed	**3221**
[026] Fault Pin	**9098**
[027] Std Enc Spd	**3222**
[028] Exp Enc Spd	**3223**
[029] DrvOL accum%	**1540**
[030] MotOL accum%	**1670**
[031] BU OL accum%	**1781**
[032] Ud	**3270**
[033] Drive ready	**161**
[034] EnableSM mon	**162**
[035] Start SM mon	**163**
[036] FStop SM mon	**164**
[037] ALMSequencer	**9096**
[038] Drive OK	**9097**
[039] Jog state	**8013**
[040] Gen output	**2760**
[041] AI 1 output	**5009**
[042] AI 2 output	**5029**
[043] AI 3 output	**5049**
[044] Ramp out mon	**8022**
[045] Spd Draw out	**7099**
[046] Jog output	**8012**
[047] Mlt Spd out	**7070**
[048] Mpot output	**7090**
[049] I/F cp mon	**2625**
[050] Torque ref	**2450**
[051] Tcurr lim +	**1210**
[052] Tcurr lim -	**1220**
[053] InuseTcurrL+	**1250**
[054] InuseTcurrL-	**1260**
[055] InuseOutvltR	**1180**
[056] Std enc pos	**9553**
[057] Exp enc pos	**9554**
[058] H Index reg	**9555**
[059] L Index reg	**9556**
[060] AI 1X output	5067
[061] AI 2X output	5087
[062] W0 comp out	2116
[063] W1 comp out	9356
[064] PL next fact	2282
[065] SBIDrvW0 mon	9000
[066] SBIDrvW1 mon	9001
[067] SBIDrvW2 mon	9002
[068] SBIDrvW3 mon	9003
[069] SBIDrvW4 mon	9004
[070] SBIDrvW5 mon	9005
[071] ISBusDrvW0 m	9300
[072] ISBusDrvW1 m	9301
[073] ISBusDrvW2 m	9302
[074] ISBusDrvW3 m	9303
[075] ISBusDrvW4 m	9304
[076] ISBusDrvW5 m	9305
[077] ISBusDrvW6 m	9306
[078] ISBusDrvW7 m	9307
[079] APCSDrv W0m	4120
[080] APCSDrv W1m	4121
[081] APCSDrv W2m	4122
[082] APCSDrv W3m	4123
[083] APCSDrv W4m	4124
[084] APCADrv W0m	4160
[085] APCADrv W1m	4161
[086] APCADrv W2m	4162
[087] APCADrv W3m	4163
[088] APCADrv W4m	4164
[089] APCADrv W5m	4165
[090] APCADrv W6m	4166
[091] APCADrv W7m	4167
[092] APCADrv W8m	4168
[093] APCADrv W9m	4169
[094] PID FF mon	7217
[095] PID input	7256
[096] PID PI out	7294
[097] Last PI out	7295
[098] PID PD out	7343
[099] PID out mon	7352
[100] PID outS mon	7353
[101] Pad 0	9100
[102] Pad 1	9101
[103] Pad 2	9102
[104] Pad 3	9103
[105] Pad 4	9104
[106] Pad 5	9105
[107] Pad 6	9106
[108] Pad 7	9107
[109] Pad 8	9108
[110] Pad 9	9109
[111] Pad 10	9110
[112] Pad 11	9111
[113] Pad 12	9112
[114] Pad 13	9113
[115] Pad 14	9114
[116] Pad 15	9115

Pick List 41

Index Name	IPA
[000] NULL	**4000**
[001] ONE	**4001**

Pick List 42

Index Name	IPA
[000] DigOutvltLim	**1140**
[001] NULL	**4000**
[002] ONE	**4001**
[003] Gen output	**2760**
[004] AI 1 output	**5009**
[005] AI 2 output	**5029**
[006] AI 3 output	**5049**
[007] AI 1X output	5067
[008] AI 2X output	5087
[009] W0 comp out	2116
[010] W1 comp out	9356
[011] SBIDrvW0 mon	9000
[012] SBIDrvW1 mon	9001
[013] SBIDrvW2 mon	9002
[014] SBIDrvW3 mon	9003
[015] SBIDrvW4 mon	9004
[016] SBIDrvW5 mon	9005
[017] ISBusDrvW0 m	9300
[018] ISBusDrvW1 m	9301
[019] ISBusDrvW2 m	9302
[020] ISBusDrvW3 m	9303
[021] ISBusDrvW4 m	9304
[022] ISBusDrvW5 m	9305
[023] ISBusDrvW6 m	9306
[024] ISBusDrvW7 m	9307
[025] APCSDrv W0m	4120
[026] APCSDrv W1m	4121
[027] APCSDrv W2m	4122
[028] APCSDrv W3m	4123
[029] APCSDrv W4m	4124
[030] APCADrv W0m	4160
[031] APCADrv W1m	4161
[032] APCADrv W2m	4162
[033] APCADrv W3m	4163
[034] APCADrv W4m	4164
[035] APCADrv W5m	4165
[036] APCADrv W6m	4166
[037] APCADrv W7m	4167
[038] APCADrv W8m	4168
[039] APCADrv W9m	4169
[040] PID FF mon	7217
[041] PID input	7256
[042] PID PI out	7294
[043] Last PI out	7295
[044] PID PD out	7343
[045] PID out mon	7352
[046] PID outS mon	7353
[047] Pad 0	9100
[048] Pad 1	9101
[049] Pad 2	9102
[050] Pad 3	9103
[051] Pad 4	9104
[052] Pad 5	9105
[053] Pad 6	9106
[054] Pad 7	9107
[055] Pad 8	9108
[056] Pad 9	9109
[057] Pad 10	9110
[058] Pad 11	9111
[059] Pad 12	9112
[060] Pad 13	9113
[061] Pad 14	9114
[062] Pad 15	9115

Pick List 43

Index Name	IPA
[000] DigSpdTrqMod	**2390**
[001] NULL	**4000**
[002] ONE	**4001**
[003] Output volt	**3060**
[004] Output curr	**3070**
[005] Output freq	**3080**
[006] Output pwr	**3090**
[007] DCLink volt	**3100**
[008] MagnetizCurr	**3110**
[009] Torque curr	**3120**
[010] MagnCurr ref	**3130**
[011] TrqCurr ref	**3140**
[012] Curr phase U	**3150**
[013] Curr phase V	**3160**
[014] Curr phase W	**3170**
[015] Flux ref	**3180**
[016] Flux	**3190**
[017] Ramp ref	**3200**
[018] Speed ref	**3210**
[019] Speed	**3220**
[020] Actual Speed	**3221**
[021] Fault Pin	**9098**
[022] Std Enc Spd	**3222**
[023] Exp Enc Spd	**3223**
[024] DrvOL accum%	**1540**
[025] MotOL accum%	**1670**
[026] BU OL accum%	**1781**
[027] Ud	**3270**
[028] Drive ready	**161**
[029] EnableSM mon	**162**
[030] Start SM mon	**163**
[031] FStop SM mon	**164**
[032] ALMSequencer	**9096**
[033] Drive OK	**9097**
[034] Jog state	**8013**
[035] Gen output	**2760**
[036] AI 1 output	**5009**
[037] AI 2 output	**5029**
[038] AI 3 output	**5049**
[039] Ramp out mon	**8022**
[040] Spd Draw out	**7099**
[041] Jog output	**8012**
[042] Mlt Spd out	**7070**
[043] Mpot output	**7090**
[044] I/F cp mon	**2625**
[045] Torque ref	**2450**
[046] Tcurr lim +	**1210**
[047] Tcurr lim -	**1220**
[048] InuseTcurrL+	**1250**
[049] InuseTcurrL-	**1260**
[050] InuseOutvltR	**1180**
[051] Std enc pos	**9553**
[052] Exp enc pos	**9554**
[053] H Index reg	**9555**
[054] L Index reg	**9556**
[055] AI 1X output	5067
[056] AI 2X output	5087
[057] W0 comp out	2116
[058] W1 comp out	9356
[059] PL next fact	2282
[060] SBIDrvW0 mon	9000
[061] SBIDrvW1 mon	9001
[062] SBIDrvW2 mon	9002
[063] SBIDrvW3 mon	9003
[064] SBIDrvW4 mon	9004
[065] SBIDrvW5 mon	9005
[066] ISBusDrvW0 m	9300
[067] ISBusDrvW1 m	9301
[068] ISBusDrvW2 m	9302
[069] ISBusDrvW3 m	9303
[070] ISBusDrvW4 m	9304
[071] ISBusDrvW5 m	9305
[072] ISBusDrvW6 m	9306
[073] ISBusDrvW7 m	9307
[074] APCSDrv W0m	4120
[075] APCSDrv W1m	4121
[076] APCSDrv W2m	4122
[077] APCSDrv W3m	4123
[078] APCSDrv W4m	4124
[079] APCADrv W0m	4160
[080] APCADrv W1m	4161
[081] APCADrv W2m	4162
[082] APCADrv W3m	4163
[083] APCADrv W4m	4164
[084] APCADrv W5m	4165
[085] APCADrv W6m	4166
[086] APCADrv W7m	4167
[087] APCADrv W8m	4168
[088] APCADrv W9m	4169
[089] PID FF mon	7217
[090] PID input	7256
[091] PID PI out	7294
[092] Last PI out	7295
[093] PID PD out	7343
[094] PID out mon	7352
[095] PID outS mon	7353
[096] Pad 0	9100
[097] Pad 1	9101
[098] Pad 2	9102
[099] Pad 3	9103
[100] Pad 4	9104
[101] Pad 5	9105
[102] Pad 6	9106
[103] Pad 7	9107
[104] Pad 8	9108
[105] Pad 9	9109
[106] Pad 10	9110
[107] Pad 11	9111
[108] Pad 12	9112
[109] Pad 13	9113
[110] Pad 14	9114
[111] Pad 15	9115

Pick List 44

Index Name	IPA
[000] Dig TrqRef 3	**2447**
[001] NULL	**4000**
[002] ONE	**4001**
[003] Gen output	**2760**
[004] AI 1 output	**5009**
[005] AI 2 output	**5029**
[006] AI 3 output	**5049**
[007] I/F cp mon	**2625**
[008] AI 1X output	5067
[009] AI 2X output	5087
[010] W0 comp out	2116
[011] W1 comp out	9356
[012] SBIDrvW0 mon	9000
[013] SBIDrvW1 mon	9001
[014] SBIDrvW2 mon	9002
[015] SBIDrvW3 mon	9003
[016] SBIDrvW4 mon	9004
[017] SBIDrvW5 mon	9005
[018] ISBusDrvW0 m	9300
[019] ISBusDrvW1 m	9301
[020] ISBusDrvW2 m	9302
[021] ISBusDrvW3 m	9303
[022] ISBusDrvW4 m	9304
[023] ISBusDrvW5 m	9305
[024] ISBusDrvW6 m	9306
[025] ISBusDrvW7 m	9307
[026] APCSDrv W0m	4120
[027] APCSDrv W1m	4121
[028] APCSDrv W2m	4122
[029] APCSDrv W3m	4123
[030] APCSDrv W4m	4124
[031] APCADrv W0m	4160
[032] APCADrv W1m	4161
[033] APCADrv W2m	4162
[034] APCADrv W3m	4163
[035] APCADrv W4m	4164
[036] APCADrv W5m	4165
[037] APCADrv W6m	4166
[038] APCADrv W7m	4167
[039] APCADrv W8m	4168
[040] APCADrv W9m	4169
[041] PID FF mon	7217
[042] PID input	7256
[043] PID PI out	7294
[044] Last PI out	7295
[045] PID PD out	7343
[046] PID out mon	7352
[047] PID outS mon	7353
[048] Pad 0	9100

Index Name	IPA
[049] Pad 1	9101
[050] Pad 2	9102
[051] Pad 3	9103
[052] Pad 4	9104
[053] Pad 5	9105
[054] Pad 6	9106
[055] Pad 7	9107
[056] Pad 8	9108
[057] Pad 9	9109
[058] Pad 10	9110
[059] Pad 11	9111
[060] Pad 12	9112
[061] Pad 13	9113
[062] Pad 14	9114
[063] Pad 15	9115

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Index Name	IPA
[000] DigRampRef 3	**7038**
[001] NULL	**4000**
[002] ONE	**4001**
[003] Gen output	**2760**
[004] AI 1 output	**5009**
[005] AI 2 output	**5029**
[006] AI 3 output	**5049**
[007] Std Enc Spd	**3222**
[008] Exp Enc Spd	**3223**
[009] Mlt Spd out	**7070**
[010] Mpot output	**7090**
[011] AI 1X output	5067
[012] AI 2X output	5087
[013] W0 comp out	2116
[014] W1 comp out	9356
[015] SBIDrvW0 mon	9000
[016] SBIDrvW1 mon	9001
[017] SBIDrvW2 mon	9002
[018] SBIDrvW3 mon	9003
[019] SBIDrvW4 mon	9004
[020] SBIDrvW5 mon	9005
[021] ISBusDrvW0 m	9300
[022] ISBusDrvW1 m	9301
[023] ISBusDrvW2 m	9302
[024] ISBusDrvW3 m	9303
[025] ISBusDrvW4 m	9304
[026] ISBusDrvW5 m	9305
[027] ISBusDrvW6 m	9306
[028] ISBusDrvW7 m	9307
[029] APCSDrv W0m	4120
[030] APCSDrv W1m	4121
[031] APCSDrv W2m	4122
[032] APCSDrv W3m	4123
[033] APCSDrv W4m	4124
[034] APCADrv W0m	4160
[035] APCADrv W1m	4161
[036] APCADrv W2m	4162
[037] APCADrv W3m	4163
[038] APCADrv W4m	4164
[039] APCADrv W5m	4165
[040] APCADrv W6m	4166
[041] APCADrv W7m	4167
[042] APCADrv W8m	4168
[043] APCADrv W9m	4169
[044] PID FF mon	7217
[045] PID input	7256
[046] PID PI out	7294
[047] Last PI out	7295
[048] PID PD out	7343
[049] PID out mon	7352
[050] PID outS mon	7353
[051] Pad 0	9100
[052] Pad 1	9101
[053] Pad 2	9102
[054] Pad 3	9103
[055] Pad 4	9104
[056] Pad 5	9105
[057] Pad 6	9106
[058] Pad 7	9107
[059] Pad 8	9108
[060] Pad 9	9109
[061] Pad 10	9110
[062] Pad 11	9111
[063] Pad 12	9112
[064] Pad 13	9113
[065] Pad 14	9114
[066] Pad 15	9115

Pick List 46

Index Name	IPA
[000] Mlt spd 1	**7061**
[001] NULL	**4000**
[002] ONE	**4001**
[003] Gen output	**2760**
[004] AI 1 output	**5009**
[005] AI 2 output	**5029**
[006] AI 3 output	**5049**
[007] Std Enc Spd	**3222**
[008] Exp Enc Spd	**3223**
[009] Mlt Spd out	**7070**
[010] Mpot output	**7090**
[011] AI 1X output	5067
[012] AI 2X output	5087
[013] W0 comp out	2116
[014] W1 comp out	9356
[015] SBIDrvW0 mon	9000
[016] SBIDrvW1 mon	9001
[017] SBIDrvW2 mon	9002
[018] SBIDrvW3 mon	9003
[019] SBIDrvW4 mon	9004
[020] SBIDrvW5 mon	9005
[021] ISBusDrvW0 m	9300
[022] ISBusDrvW1 m	9301
[023] ISBusDrvW2 m	9302
[024] ISBusDrvW3 m	9303
[025] ISBusDrvW4 m	9304
[026] ISBusDrvW5 m	9305
[027] ISBusDrvW6 m	9306
[028] ISBusDrvW7 m	9307
[029] APCSDrv W0m	4120
[030] APCSDrv W1m	4121
[031] APCSDrv W2m	4122
[032] APCSDrv W3m	4123
[033] APCSDrv W4m	4124
[034] APCADrv W0m	4160
[035] APCADrv W1m	4161
[036] APCADrv W2m	4162
[037] APCADrv W3m	4163
[038] APCADrv W4m	4164
[039] APCADrv W5m	4165
[040] APCADrv W6m	4166
[041] APCADrv W7m	4167
[042] APCADrv W8m	4168
[043] APCADrv W9m	4169
[044] PID FF mon	7217
[045] PID input	7256
[046] PID PI out	7294
[047] Last PI out	7295
[048] PID PD out	7343
[049] PID out mon	7352
[050] PID outS mon	7353
[051] Pad 0	9100
[052] Pad 1	9101
[053] Pad 2	9102
[054] Pad 3	9103
[055] Pad 4	9104
[056] Pad 5	9105
[057] Pad 6	9106
[058] Pad 7	9107
[059] Pad 8	9108
[060] Pad 9	9109
[061] Pad 10	9110
[062] Pad 11	9111
[063] Pad 12	9112
[064] Pad 13	9113
[065] Pad 14	9114
[066] Pad 15	9115

Index Name	IPA

Chapter 10 - Preventive Maintenance

Warning

This equipment contains a potential hazard of electric shock or burn. Only adequately trained persons who are thoroughly familiar with the equipment and the instructions should maintain this equipment.

To prevent electric shock while servicing the equipment, personnel must understand and follow all safety requirements for working around dangerous voltages.

When de-energizing and re-energizing the drive, refer to the procedures in Figures 10-1 and 10-2.

10.1 Introduction

Periodic preventive maintenance extends equipment-operating life and minimizes downtime. This involves specific power-on and more intensive power-off checks, when permitted. With both checks, necessary repairs should be undertaken when needed.

10.2 Maintenance Schedule

For maximum benefit, preventive maintenance needs to be performed at scheduled intervals by a qualified technician. The required frequency for each procedure depends on:

- How much the equipment is used
- Ambient environmental conditions

The schedule should include an inspection of wiring and components before re-applying power after an overcurrent trip.

10.3 Maintenance Record

Gefran recommends that the customer keep a detailed record of maintenance (such as a logbook) for every drive. This record serves two purposes:

- It verifies that all equipment is routinely checked
- It aids troubleshooting and prevention of equipment failure by providing a history of equipment maintenance and problems

10.4 Equipment/Material Needed

The equipment and material in the following checklists should be available to perform the recommended procedures.

10.5 Safety Equipment

- Safety gear (safety boots, safety glasses, hard-hat, high voltage gloves, face shield)
- High voltage ac/dc detector (using an insulated pole of appropriate length)
- Locks and tags, danger and caution tape
- Protective grounding cables and grounding stick
- Static-charge wrist straps

10.6 Typical Maintenance Tools

- High quality tools, including screwdrivers and pliers, designed specifically for working with electrical wiring systems
- Socket set (metric and standard)
- Hex wrenches (metric and standard)
- 1-inch adjustable wrench
- Torque wrench
- Electrical tape
- Fine file
- Clean dry cloth
- Soft-bristled brush (such as a paintbrush)
- Mild solution of distilled water and household or laboratory detergent
- Isopropyl alcohol
- One megger tester.
- Source of dry, low-pressure compressed air
- Vacuum cleaner with non-metallic nozzle and finely woven, high efficiency filter
- Fuse puller
- Replacement components (if required) including fuses, wiring, cabling, and door filters

10.7 Power-On Checks

No preventive maintenance procedures need to be conducted with power on.

Warning

With power applied, extremely high voltages are present. To prevent accidental injury, do not work on the drive with power applied.

10.8 Power-Off Checks

Power-off checks involve cleaning the equipment, and checking for wear and damage through visual inspection and functional tests.

10.9 Before Starting Maintenance

Warning

Power must be de-energized before performing any adjustments, servicing, or other act requiring physical contact with the electrical components or wiring.

Before starting, de-energize the drive using the instructions in Figure 6-1.

Do not deviate from the stated de-energizing procedures. If you can not completely meet the safety requirements or if you do not understand them **do not work on the equipment**.

De-energizing the Drive

Warning

To prevent potentially hazardous electric shock, power must be properly de-energized before anyone is allowed to make any type of physical contact with the electrical components or wiring of the drive.
When checking for zero ac or dc voltage, the high voltage detector must be rated appropriately for the equipment voltages.

1. Check that the drive is stopped.
2. Open the main circuit breaker (external power) to de-energize the drive, then lock-out and tag-out the external power.
3. Check the load side of the inverter for zero ac voltage.
4. Wait **5 minutes minimum** to discharge the dc capacitors. (Table 4.11.1)

Figure 10-1: Power-Down (De-energizing) Procedures

Re-energizing the Drive

Warning

Power must be properly re-energized to prevent personnel from having potentially hazardous contact with dangerous voltages.

1. Close and secure the drive cabinet doors.
2. Clear all locks and tags from the circuit breaker and drive.
3. Close all disconnects that were opened when de-energizing the drive.

Figure 10-2: Power-Up (Re-energizing) Procedures

10.9.1 Dust Removal

Caution

Build up of dust on electrical components and wiring can damage components and cause mis-operation.

Build-up of dust on components can increase operating temperature, reducing their normal life. On standoff insulators, it can collect enough moisture to produce a current path from bus bars to chassis ground.
Dust (especially metallic dust) on wire surfaces can cause *tracking* between connector pins. Tracking is usually capacitive in nature and involves a build-up of electrical charge along the wire surface.

This can cause intermittent problems that are hard to find. Check for and remove accumulated dust as follows:

1. Clean bus bars and standoff insulators with a clean dry cloth - **do not use any solvents**.

NOTE! Make sure that the air source is directed so that dust and foreign matter is removed rather than relocated.

2. Using a fine-filtered vacuum cleaner with a non-metallic nozzle, remove dust and dirt from wiring and electrical components.
3. Inspect cabinet air filters, if equipped. Shake or vacuum filters clean, or replace, as required.

Caution

Do not use *high-pressure* compressed air, which may damage components.

10.9.2 Loose Connections

Vibration during equipment operation can loosen mechanical and electrical connections and cause intermittent equipment failure. Additionally, dust and moisture in loose connections can cause loss of low-level signals at terminal boards and also thermal runaway at bus connections.

1. Check all hardware and electrical connections, and tighten if needed.
2. Tighten or replace any loosened crimp-style lugs.
3. Tighten or replace all loose or missing hardware.
4. Inspect printed wiring boards for correct seating, and check that any plugs, wiring, and bus connectors are tight.

Caution

To prevent component damage caused by static electricity, treat all boards and devices with static-sensitive handling techniques. Wear a wrist grounding strap when handling boards or components, but only after boards or components have been removed from potentially energized equipment and are at a normally grounded workstation.
To prevent equipment damage, do not remove, insert, or adjust board connections while power is applied to the equipment.

10.9.3 Damaged Insulation

Wires and cables with damaged insulation are dangerous when carrying electricity. They can also intermittently short, causing equipment and functional failure.

1. Check all wires and cables for fraying, chipping, nicks, wear, or rodent damage.
2. Check all wires and cables for signs of overheating or carbonization.
3. Repair minor damage to low voltage insulation with a good grade of electrical tape. If a damaged cable carries high voltages, replace the cable.
4. Replace any cables or wires that have more than mild damage.

Chapter 11 - EMC Directive

EMC Directive

The possible Validity Fields of the EMC Directive (89/336) applied to PDS "CE marking" summarises the presumption of compliance with the Essential Requirements of the EMC Directive, which is formulated in the EC Declaration of Conformity Clauses numbers [.] refer to European Commission document "Guide to the Application of Directive 89/336/EEC" 1997 edition. ISBN 92-828-0762-2

	Validity Field	Description
Relates to PDS or CDM or BDM directly	**-1-** **Finished Product/ Complex component available to general public** [Clauses: 3.7, 6.2.1, 6.2.3.1 & 6.3.1] A PDS (or CDM/BDM) of the Unrestricted Distribution class	Placed on the market as a single commercial unit for distribution and final use. Free movement based on compliance with the EMC Directive **- EC Declaration of conformity required - CE marking required** **- PDS or CDM/BDM should comply with IEC 1800-3/EN 61800-3** The manufacturer of the PDS (or CDM/BDM) is responsible for the EMC behaviour of the PDS (or CDM/ BDM), under specified conditions. EMC measures outside the item are described in an easy to understand fashion and could actually be implemented by a layman in the field of EMC. The EMC responsibility of the assembler of the final product is to follow the manufacturer's recommendations and guidelines. Note: The manufacturer of the PDS (or CDM/BDM) is not responsible for the resulting behaviour of any system or installation which includes the PDS, see Validity Fields 3 or 4.
	-2- **Finished Product/Complex component only for professional assemblers** [Clauses: 3.7, 6.2.1, 6.2.3.2 & 6.3.2] A PDS (or CDM/BDM) of the Restricted Distribution class sold to be included as part of a system or installation	Not placed on the marked as a single commercial unit for distribution and final use. Intended only for professional assemblers who have a level of technical competence to correctly install. **- No EC Declaration of conformity - No CE marking** **- PDS or CDM/BDM should comply with IEC 1800-3/EN 61800-3** The manufacturer of the PDS (or CDM/BDM) is responsible for the provision of installation guidelines that will assist the manufacturer of the apparatus, system or installation to achieve compliance. The resulting EMC behaviour is the responsibility of the manufacturer of the apparatus, system, or installation, for which its own standards may apply.
Relates to application of PDS or CDM or BDM	**-3-** **Installation** [Clause: 6.5] Several combined items of system, finished product or other components brought together at a given place. May include PDSs (CDM or BDM), possibly of different classes - Restricted or Unrestricted	Not intended to be placed on the market as a single functional unit (no free movement). Each system included is subject to the provisions of the EMC Directive. **- No EC Declaration of conformity - No CE marking** **- For the PDSs or CDM/BDMs themselves see Validity Fields 1 or 2** **- Responsibility of the manufacturer of the PDS may include commissioning** The resulting EMC behaviour is the responsibility of the manufacturer of the installation in co-operation with the user (e.g. by following an appropriate EMC plan). Essential protection requirements of EMC Directive apply regarding the neighbourhood of the installation.
	-4- **System** [Clause: 6.4] Ready to use finished item(s). May include PDSs (CDM or BDM), possibly of different classes - Restricted or Unrestricted	Has a direct function for the final user. Placed on the market for distribution as a single functional unit, or as units intended to be easily connected together. **- EC Declaration of conformity required - CE marking required for the system** **- For the PDSs or CDM/BDMs themselves see Validity Fields 1 or 2** The resulting EMC behaviour, under specified conditions is the responsibility of the manufacturer of the system by using a modular or system approach as appropriate. Note: The manufacturer of the system is not responsible for the resulting behaviour of any installation which includes the PDS, see Validity Field 3.

Examples of application in the different Validity Fields:

1 **BDM to be used anywhere:** (example in domestic premises, or BDM available from commercial distributors), sold without any knowledge of the purchaser or the application. The manufacture is responsible that sufficient EMC can be achieved even by any unknown customer or layman (snap-in, switch-on).

2 **CDM/BDM or PDS for general purpose**: to be incorporated in a machine or for industrial application This is sold as a subassembly to a professional assembler who incorporates it in a machine, system or installation. Conditions of use are specified in the manufacturer's documentation. Exchange of technical data allows optimization of the EMC solution.. (See restricted distribution definition).

3 **Installation:** It can consist of different commercial units (PDS, mechanics, process control etc.). The conditions of incorporation for the PDS (CDM or BDM) are specified at the time of the order, consequently an exchange of technical data between supplier and client is possible. The combination of the various items in the installation should be considered in order to ensure EMC. Harmonic compensation is an evident example of this, for both technical and economical reasons. (E.g. rolling mill, paper machine, crane, etc.)

4 **System:** Ready to use finished item which includes one or more PDSs (or CDMs/BDMs); e.g. household equipment, air conditioners, standard machine tools, standard pumping systems, etc.

Chapter 12 - Index

Menues and Parameters

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