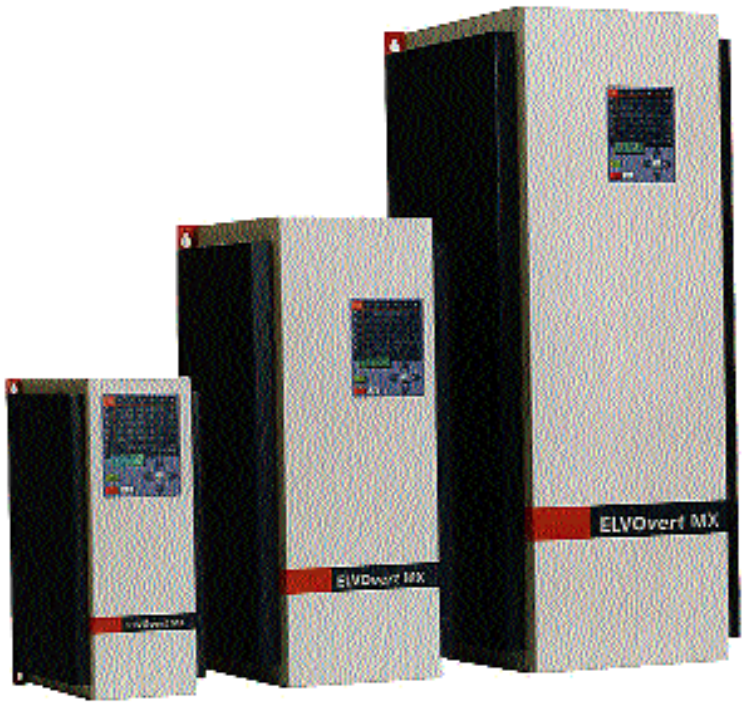
ELIN EBG
Elektronik

ELVOvert MX

Operating instructions



8 074 705.04/07

Safety instructions

The following symbols should assist you in handling the instruction:


General information, note exactly !


Dangerous voltages ! Danger of life !


Measurement, control !


Advise, tip !


Keypad operation !


Example !

The requirements for a successfull commissioning are a correct selection of the unit, projection and mounting. In case of further questions, please contact the supplier or call the manufacturer of the unit directly.

Capacitor discharge !

Before any work on or in the unit, disconnect from the mains and wait at least 5 minutes until the D.C.link capacitors have been fully discharged. Check that the device is no longer alive by measuring the voltage at the D.C.link capacitor.

Automatic restart !

In case of certain parameter adjustments it may happen that the frequency inverter starts up automatically after switching on the mains again. You have to guarantee, that no person and no other equipment is in danger.

Commissioning and service:

Works on or in the unit must only be undertaken by properly qualified staff in full compliance of the appropriate instructions and pertinent regulations. Note that a fault may cause potential-free contacts and/or PCBs to carry mains potential. To avoid any risk to humans, obey the regulations concering "Work on Live Equipment" explicitly.

Delivery conditions:

Our deliveries and services are based on the "General Terms of Delivery of the Austrian Electrical Industries" latest edition.

Specifications in this instruction:

We are constantly striving to improve our products and adapt them to the latest state of technical development. We therefore reserve the right to modify the specifications given in this instruction at any time, particulary those refering to measures and dimensions. All planning hints and connecting samples are non-binding suggestions, for which we are unable to assume any liability, particulary since the regulations to be complied with depend on the type and location of the plant and on the use of the instruments.

Regulations:

It is the users responsibility to ensure that the instrument and ist component parts are used in compliance with applicable regulations.
It is not permitted to use these instruments in residential areas without special measures to supress radio frequency interferences.

Patent and Trade Marks:

Please note that we do not guarantee any connections, instruments or processes described herein to be free from patent or trademark right of third parties.

Keep this instruction near the unit to hand !

Operating instruction

MX Frequency inverter

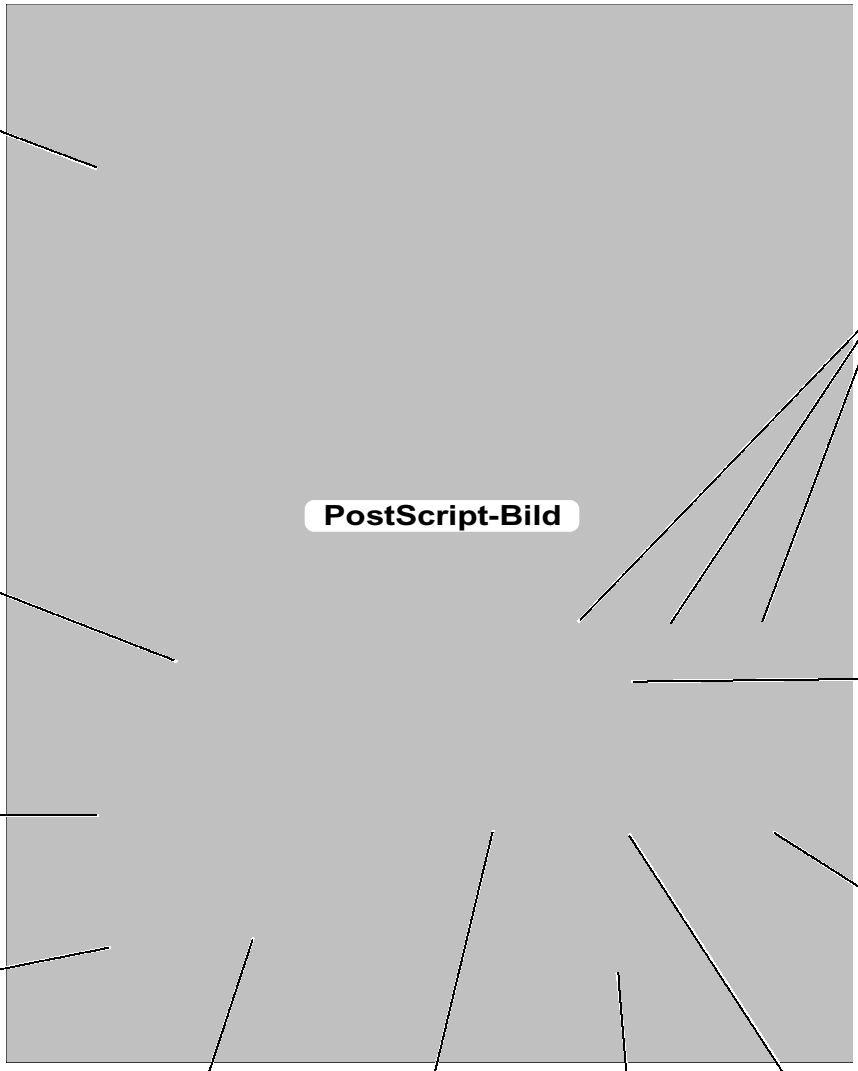
8 074 705.04/07 / February 1998

*Valid for software-version from PSR2 8781791.**04 (03)***
(values in brackets are only valid for PSR2.03)

The documentation covers chapters on operating and parameter setting. Details on projecting, mounting and connecting can be read in the projecting instruction. Informations about connection to a bus-system can be read in the profibus instruction PBO1.

In case of damage or incomplete delivery, please inform the supplier or the insurance company. The manufacturer declines responsibility for faults occurring during transport or unpacking.

The operating panel:



Overview of sorted matrix fields

LED displays for ready, run and trip

UP key for: Movement in the matrix level, scrolling within a matrix field, increasing of numbers; increasing of the reference value in the local mode

Configurable LCD graphics-display with large-scale display

ON key for: Start command in local mode

OFF key for: Stop command in local or remote mode, selectable for reset

RIGHT key for: Movement in the matrix level, cursor movement right; selection of motor clockwise rotation in the local mode

Local/Remote key for: Change over: keypad / terminals

LEFT key for: Movement in the matrix-level, cursor movement left; selection of motor anti-clockwise rotation in the local mode

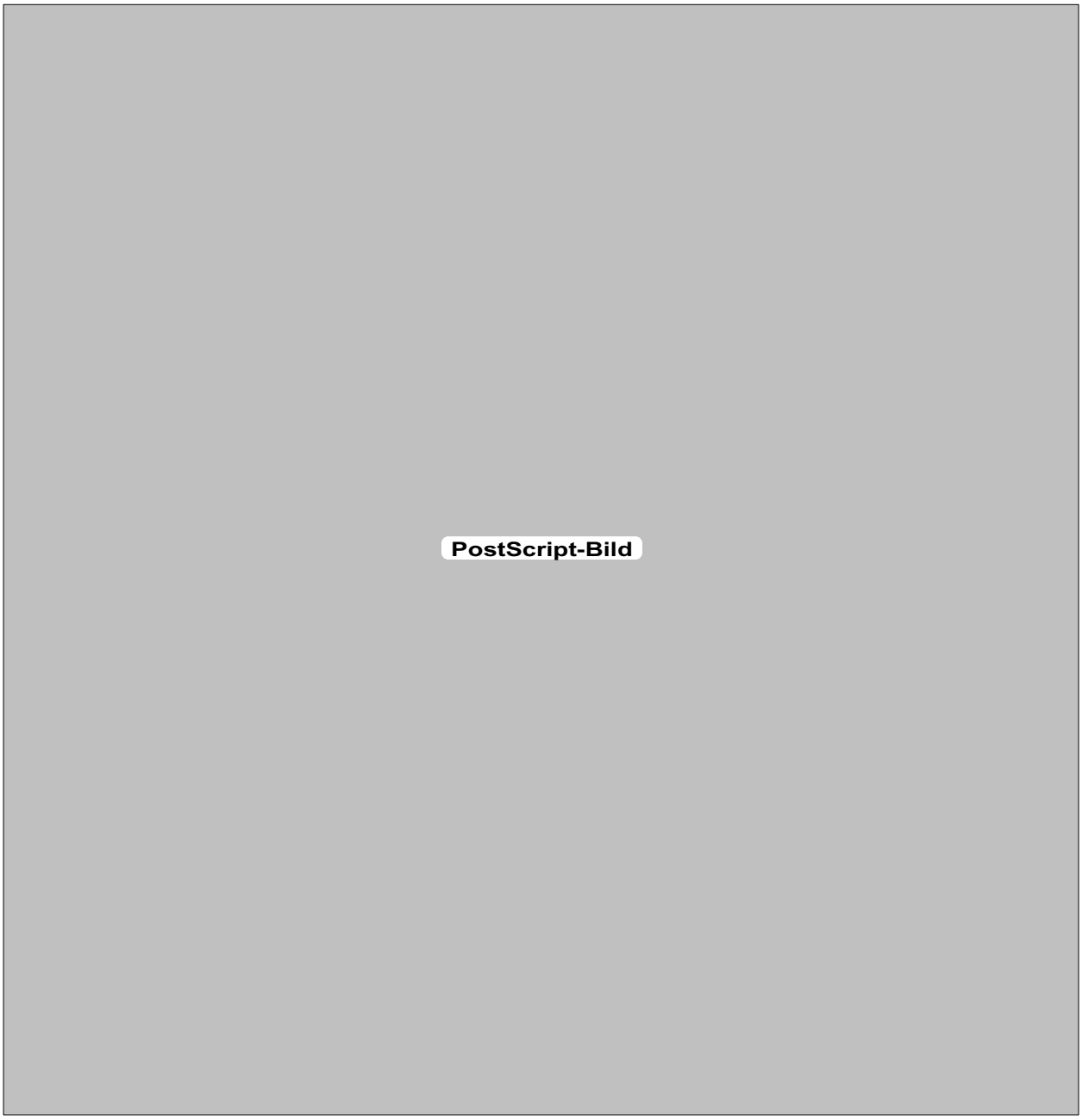
DOWN key for: Movement in the matrix level, scrolling within a matrix field, decreasing of numbers; decreasing of the reference value in the local mode

Matrix/Param. key for: Change over from field selection in the matrix level to parameter selection in a parameter group

The software-version can be read on the flash-EPROM below the foil-keypad or under parameter A3.08 and A3.09. Simply pull- off the keypad, rotate it by 90° and fix it again afterwards. Be carefully by handling the flat-cable !

The matrix philosophy

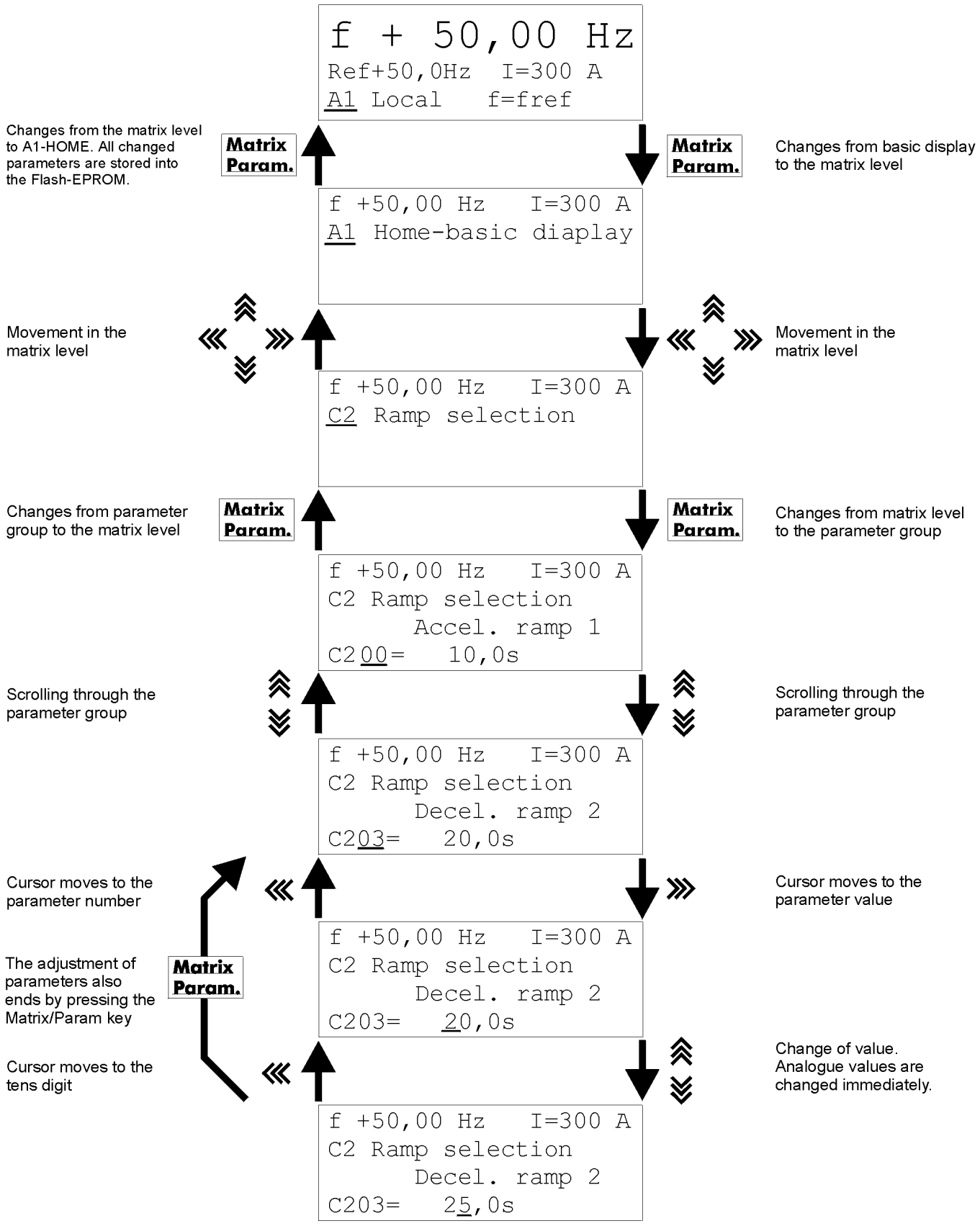
The design of the parameter surface as a matrix gives the possibility to summarize parameters in a lucid way, by using the third dimension.



- ❑ The change-over from moving in the matrix level to the parameter group is done with the "Matrix/Param." key.
- ❑ The matrix field A1-Home has a special function:
  It consists of the basic display for the unit and for parameters which can only be accessed using the „MATRIX" software. By „jumping" into the basic display the storage process of all changed data is automatically triggered.
- ❑ Within the matrix level each field can be selected with the keys UP, DOWN, LEFT or RIGHT.

Only the change from the matrix level to the basic display (A1-HOME) will cause the storage of all changed values into the FLASH-EPROM (long-time memory) !!

Parameter setting:



Short commands:

For faster movement within the matrix level, use the following short keys:

Moving to the upper left field (A1-HOME)	Simultaneous pressing of	⋘ + ⋀⋀
Moving to the upper right field (A6-DISPLAY)	Simultaneous pressing of	⋙ + ⋀⋀
Moving to the lower left field (F1-HELP)	Simultaneous pressing of	⋘ + ⋁⋁
Moving to the lower right field (F6-CODE)	Simultaneous pressing of	⋙ + ⋁⋁

With this commands also the change-over from the matrix level to the parameter group is done.

Local operation:

To operate the frequency inverter from the on-board keypad the LOCAL mode must be activated by pressing the "LOCAL/REMOTE" key in the basic display. In the LOCAL mode the following key functions are available:

Key	Basic display	Matrix level	Group of parameter
I	Start	---	---
O Reset	Stop / Reset	Stop / Reset	Stop / Reset
⋀⋀	Increase of reference value	Movement in the matrix field	Scrolling of parameters or increase of a parameter value
⋁⋁	Decrease of reference value	Movement in the matrix field	Scrolling of parameters or decrease of a parameter value
⋘	REV run	Movement in the matrix field	Cursor left
⋙	FWD run	Movement in the matrix field	Cursor right

If continuous contacts for start FWD or start REV are used via the terminals, the inverter will automatically restart after a failure is repaired and the trip message is resetted !!

The local operation can be locked using the parameters E4.00, E4.01 and E4.03 !!

If the optional card IO1 is used, a pulse release command via DI5 is always necessary to start the inverter !!

Commissioning:

The commissioning is done by going through the matrix fields as follows:

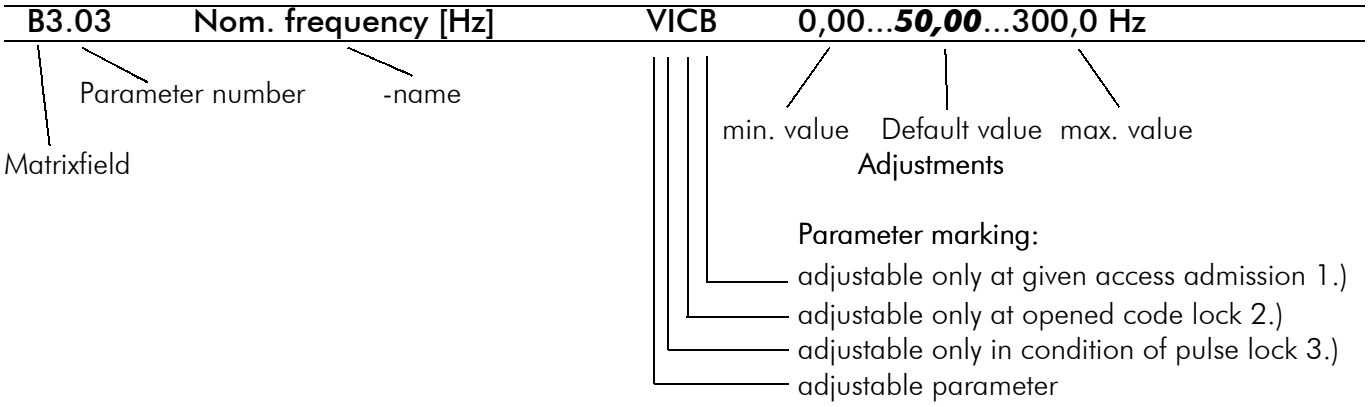
B
Start-Up

B1	Language selection	Choice of a language.
B2	Application macros	Selecting an application macro will configure the terminals and creates a corresponding short menu.
B3	Motor data	Dual-Rating is adjusted with the motor data: Version C - high overload Version P - high continuous load
B4	Autotuning	The routine tunes motor and inverter.
B5	Short menu	Adjustment of parameters in the short menu.
Matrix		If additional parameters are required which are not included in the short menu can be selected via the matrix surface, adjusted with the cursor keys and will be automatically added to the short menu.
B2	Application macro	After commissioning is finished the actual parameter adjustments can be stored into the USER-macro using the parameter B3.01

During commissioning work it is helpfull to supply the inverter via a 24 V auxillary voltage. Therefore it is possible to adjust parameters without mains voltage.

The user interface is fully functional after connecting the auxillary voltage.
Use the commissioning record in appendix A to make a protocol of all parameter adjustments.
Only parameters which are listed in the short menu have to be adjusted, all other ones have the factory default setting.

Parameter description:



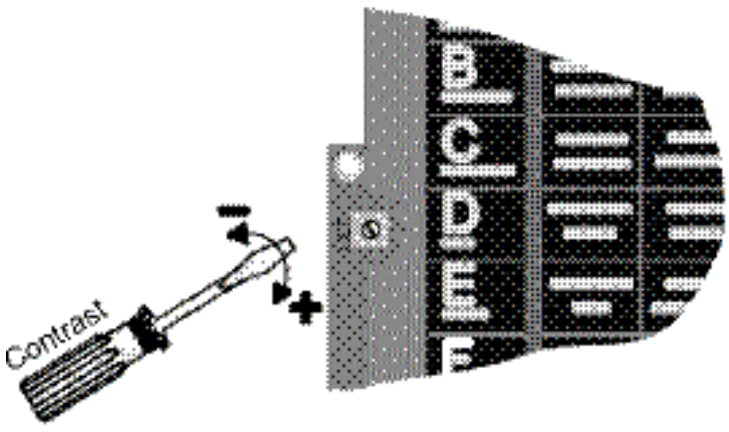
1.) see parameter F6.02

2.) see parameters F6.00 and F6.01

3.) If such parameters will be adjusted, no start command is accepted during adjustment. Impulse contacts and retained commands will be ignored as long as the cursor is on the right side of the "="-symbol.

Adjustment of the contrast of the LCD

In the upper left corner of the PCB a potentiometer for changing the contrast of the display is located.



Chapter A: Displays

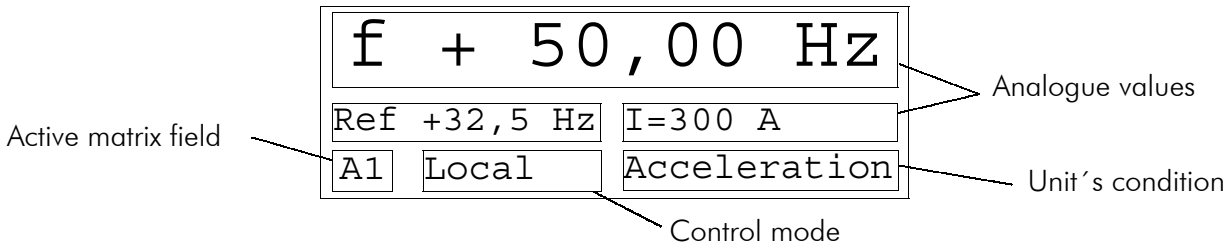
A Anzeige

Display of reference- and actual values
Configuration of the LCD display

A1 Home

Only a change from the matrix level to the basic display (A1-HOME) will cause a storage of all changed values into the FLASH-ROM (long-time memory) !!

This matrix field represents the basic display of the frequency inverter. Three analogue values, the mode of operation, the unit's state and the active matrix field are displayed:



The displayed values are free programmable in the matrix field A6 (Display).
All changed parameter settings are stored into the memory, if the HOME function is activated.

Conditions	Explanation
Pulse.inh.	The motorsided IGBT´s of the rectifiers are locked because, either > a ready condition is present, or > a pulse lock command is released via the terminals, or > the hardware-puls lock via DI5_2 is active, or > no Start FWD or Start REV command is selected
Trip	The inverer has switched off with a trip and shows the cause in the display
Mains off	The inverter´s input terminals L1, L2, L3 are disconnected from the mains by the function „mains contactor control" (C6.01)
Mains disc	A safety-mains disconnection is released by the digital command „Mains ON/OFF" (only with activated function „Mains contactor control")
Locked	The inverter´s electronic is locked for remote operation by the digital command „Cut off". The local operation via the keypad is still possible (This function can only be activated if the mains contactor control is active too !!)
Indications during operation	
Acceleration	• The drive accelerates corresponding to the adjusted acceleration ramp. The reference frequency is still not reached ($f_{REF} > f_{ACT}$) • The frequency is decreased caused by an active limitation (thermal motor model, overload of the frequency inverter a.s.o.) during the motoric operation condition ($f_{REF} > f_{ACT}$) • In case of motoric & torque limited operation ($f_{REF} > f_{ACT}$)

Decelaration	• The drive decelerates corresponding to the adjusted deceleration ramp. The reference frequency is still not reached ($f_{REF} < f_{ACT}$) • The frequency is increased caused by an active limitation (thermal motor model, overload of the frequency inverter a.s.o.) during the generatoric operation condition ($f_{REF} < f_{ACT}$) • In case of generatoric & torque limited operation ($f_{REF} < f_{ACT}$)
$f = f_{REF}$	The actual frequency is the same as the reference frequency.
INT. COM 1:	If this message is displayed in the field „unit status“ during the pulse inhibit condition then the reason is a missing communication connection between User-Interface (UI) and the drive control (AR). This will always be displayed if an inverter is supplied by 24 V (on the UI) and no mains voltage is connected to the input terminals. This is no fault !!.
Indications during parameter setting and their explanation	
Codelock	The user trys to adjust a parameter which is locked via the code lock. Remedy action: Release the code lock F6 !
Para locked	The user trys to adjust a parameter which is locked via the parameter lock. Remedy action: digital input „Para lock“ --> open the contact !
Pulse release	The user trys to adjust a parameter which can only be adjusted if the pulses are inhibited. Remedy action: give a stop-command
Access missing	The user trys to adjust a parameter from a non-authorized control place Remedy action: authorize the control place (select „access admission“ with F6.02)

A2 Act. values motor

Display of motor- and drive specific act. values

A2.00	Speed [rpm]	read only	

Shows the actual motor speed in rounds per minute. It is also displayed in case of pulse inhibit, i.e. if the motor coasts to a stop. A minus symbol represents anti-clockwise rotation.

A2.01	Torque [Nm]	read only	

The display is done "quadrant-correct". Display accuracy: ±5 %

A2.02	Motor charge [%]	read only	

100 % correspond to the motor nominal current. Display accuracy: ±1 %

A2.03	Motor current [A]	read only	

Motor apparent current in ampere. Display accuracy: ±1 %

A2.04	Shaft power [kW]	read only	

Display accuracy: ±5 %

A2.05	Apparent power [kVA]	read only	

Display accuracy: ±5 %

A2.06	Motor voltage [V]	read only	

Display accuracy: ±1 %

A2.07	Slip frequency [Hz]	read only	

Shows the slipping frequency calculated from the motor nominal data and the actual load situation.

A2.08	Speed prcs. [m/s]	read only	

Gives the possibility to display the velocity of the complete drive (motor + inverter) in m/s.
The therefore needed calculation factor can be adjusted with parameter A2.10.
A2.08 = A2.00 x A2.10.

A2.09	Speed prcs. [rpm]	read only	

Gives the possibility to display the speed of the complete drive (motor + inverter) in rounds per minute. The gear ratio factor can be adjusted with parameter A2.11.
A2.09 = A2.00 x A2.11.

A2.10	Calc. factor v	VCB	-10,00...***0,000***...10,00
A2.11	Calc. factor n	VCB	-10,00...***0,000***...10,00

A3 Act. values inverter

Display of inverter specific actual values

A3.00	Output freq. [Hz]	read only

Resolution: 0,01 Hz

A3.01	Inverter charge [%]	read only

100 % correspond to the inverter nominal current (version "C"). Display accuracy: ±1 %

A3.02	DC - voltage [VDC]	read only

Shows the actual D.C. link voltage. Display accuracy: ±1 %.
Dependent on the load the value is between 540 and 565 V DC at a 400 V mains supply.

A3.03	Heatsink temp. [°C]	read only

Display accuracy: ±5 % (max. heatsink temperature: 81°C - 92°C, depends on the inverter size).
Exceeding the limits will cause
1.) a reduction of the switching frequency (see E6)
2.) a reduction of the motor current.
An overtemperature switch-off only occurs in case of technical faults or essential too high ambient temperature.

A3.04	Act. pulse freq. [kHz]	read only
A3.05	Invertertype	read only
A3.06	Nom. current "C" [A]	read only
A3.07	Hardware vers.	read only

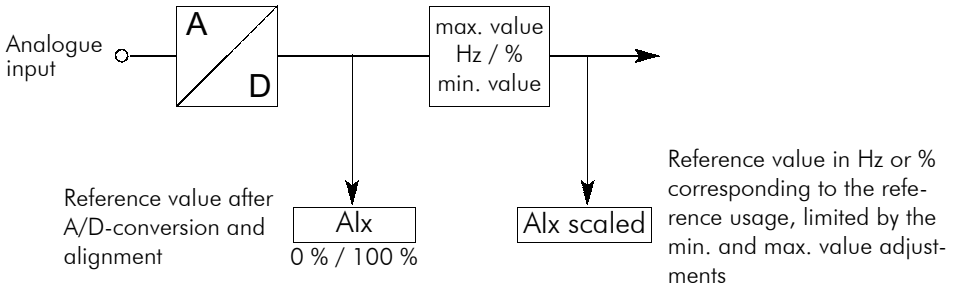
Shows the modification index of the built-in power part
(at PSR2.03 this parameter shows the code number of the unit).

A3.08	Software-name	read only
A3.09	Software-Version	read only
A3.10	Serial No.	read only
A3.11	Inverter stat. W	read only

The indication of the units´s conditions is done corresponding to the MX-state machine.
See documentation „Option Profibus“.

A4 Ref. values inverter

Display of the reference values



A4.00	AIV 0...10 V [%]	read only

Reference value on the analogue input terminal AIV (0-10 V = 0 % - 100 %).

A4.01	AIV scaled [Hz] ([%])	read only

Scaled reference value of AIV.

A4.02	AIC 0(4)...20 mA [%]	read only

Reference value on the analogue input terminal AIC (0-20 mA = 0 % - 100 %).

A4.03	AIC scaled [Hz] ([%])	read only

Scaled reference value of AIC.

A4.04	AI_2 0(4)...20 mA [%]	read only

Reference value on the analogue input terminals (AI+ and AI-) of IO1 (option connector X2). (0-20 mA = 0 % - 100 %).

A4.05	AI_2 scaled [Hz] ([%])	read only

Scaled reference value of AI_2.

A4.06	AI_3 0(4)...20 mA [%]	read only

Reference value on the analogue input terminals (AI+ and AI-) of IO1 (option connector X3). (0-20 mA = 0 % - 100 %).

A4.07	AI_3 scaled [Hz] ([%])	read only

Scaled reference value of AI_3.

A4.08	Pre-set ref. [Hz] ([%])	read only

Actual preset speed value.

A4.09	LOC-MP ref.val. [Hz] ([%])	read only

Ref. value from local motorpotentiometer. (UP, DOWN keys on keypad.)

A4.10	REM-MP ref.val. [Hz] ([%])	read only

Ref. value from remote motorpotentiometer (digital inputs MP-up, MP-down.)

A4.11	Int. f-Ref b.acc	read only

Actual frequency reference value before entering the acceleration-integrator.

A4.12	Int. f-Ref a.acc	read only

Actual frequency reference value after passing the acceleration-integrator.

A4.13	Int. T-limit.ref [%]	read only

Actual used torque limitation reference value.

A4.14	Inverter cont. W	read only

This parameter shows the unit´s internal effective control word, derived from the bus-control word and eventually commands on the terminals. With the Inverter control word the MX-state machine is controlled. The indication in done in hexadecimal units.
Detailed remarks can be read in the instruction for the option profibus (PBO1).

A4.15	BUS-ref1 scaled	read only
A4.16	BUS-ref2 scaled	read only
A4.17	BUS-ref3 scaled	read only
A4.18	BUS-ref4 scaled	read only
A4.19	BUS-ref5 scaled	read only

The parameters A4.15 to A4.19 are showing the bus reference values (PZD2 to PZD6) in standarized units given by the usage of reference values. Detailed remarks can be read in the instruction for the option profibus (PBO1).

A5 Time/kWh

Operating hour counter
Real power counter

A5.00	Operating hours [h]	read only

This counter records the time of the inverter when it is working (pulses are released; i.e. the motor is under voltage).

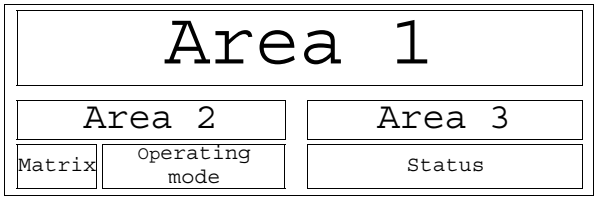
A5.01	kWh - meter [MWh]	read only

The kWh meter records the real-energy consumed on the motor side.

The operating hour counter and the real power counter cannot be resetted by parameter setting !!!

A6 Display

Configuration of the basic display A1



Corresponding to the following selection list the fields 1, 2 and 3 can be assigned with one analogue reference or actual value each.

A6.00	Selection area 1	VCB	Outp. freq.
A6.01	Selection area 2	VCB	int. f-Ref
A6.02	Selection area 3	VCB	Motorcurrent

0 . . . Output frequency	*Hz •*	*corresp. A3.00*
1 . . . Inverter load	*% of inverter nom. current „C"*	*corresp. A3.01*
2 . . . Motor load	*% of motor nom. current*	*corresp. A2.02*
3 . . . Torque	*Nm*	*corresp. A2.01*
4 . . . Motor voltage	*V*	*corresp. A2.06*
5 . . . Motor current	*A •*	*corresp. A2.03*
6 . . . Shaft power	*kW*	*corresp. A2.04*
7 . . . Apparent power	*kVA*	*corresp. A2.05*
8 . . . Motor speed	*rpm*	*corresp. A2.00*
9 . . . Prcs. rate [v]	*m/s*	*corresp. A2.08*
10 . . Prcs. speed [n]	*rpm*	*corresp. A2.09*
11 . . Int. f-ref	*Hz •*	*corresp. A4.11*
12 . . Int. T-ref	*%*	*corresp. A4.13*
13 . . Nom.val.-PID	*%*	*corresp. C4.00*
14 . . Act.val.-PID	*%*	*corresp. C4.01*
15 . . PID-divergen %	*corresp. C4.02*	
16 . . DC-voltage	*V*	*corresp. A3.02*
17 . . Operating hours	*h*	*corresp. A5.00*
18 . . kWh - meter	*MWh*	*corresp. A5.01*

Chapter B: Start-Up

B Start-Up

Selection of language and application macro, motor data recording via autotuning, parameter adjustment in the short menu

B1 Language selection

Selection of language

B1.00	Language selection	VCB	German

0 . . . German •
1 . . . English
2 . . . French

B2 Applicat. macros

Selection of the application macros

B2.00	Macro selection	VICB	Conveyor

0 . . . Conveyor	*Parameter description & terminal assignment see M1, page 20*
1 . . . Piston pump	*Parameter description & terminal assignment see M1, page 20*
2 . . . Centrifugal pump	*Parameter description & terminal assignment see M2, page 22*
3 . . . Master/Slave	*Parameter description & terminal assignment see M4, page 26*
4 . . . Test-bench	*Parameter description & terminal assignment see M4, page 26*
5 . . . Pump + PID	*Parameter description & terminal assignment see M3, page 24*
6 . . . Exhaust fan	*Parameter description & terminal assignment see M2, page 22*
7 . . . Fan	*Parameter description & terminal assignment see M2, page 22*
8 . . . Separator	*Parameter description & terminal assignment see M1, page 20*
9 . . . USER macro	*U-M*
10 . . no change	*Exits the parameter without any change*

To make the adaptation of the frequency inverter to your application as easy as possible, various application macros are stored in the library. Selecting a macro will cause corresponding functions to be automatically activated, parameters to be optimized and the terminals to be configured. Simultaneously a "short menu" is created, where all parameters which are necessary for this application are stored. Details see B5.

B2.01	Store USER-Mac.	VCB	Routine

0 . . . Start 0 ⇨ 1 *By changing to row 1 the storage-routine starts.*
1 . . . Storage UM
2 . . . Stored

All parameter changes can be stored in the customer-specific "USER macro" (user programmable default values). In many cases it is helpful to store the parameter changes in steps, to make the commissioning of the inverter or the drive easier.
The motor data will not be stored !!

B3 Motor-data

Input of the motor data (see name plate)

B3.00	Nominal power [kW]	VICB	0...***Default***...2500 kW
B3.01	Nominal current [A]	VICB	0...***Default***...2500 A
B3.02	Nominal voltage [V]	VICB	0...***Default***...1000 V
B3.03	Nominal frequency [Hz]	VICB	25...***Default***...300 Hz
B3.04	Nominal speed [rpm]	VICB	0...***Default***...18000 rpm

This parameters have a factory default setting which corresponds to a 4pole standard motor with a power rating equal to the inverter (version "C"). By using a motor with varying electrical data, the parameters have to be adjusted (e.g. use of the inverter for version "P" - high continuous load).

e.g. for a motor (230 V / 400 V, 22 kW, 50 Hz) used in Δ with constant torque up to 87 Hz the parameters have to be adjusted as shown:

B3.00 = $P_{N,Motor}$. √3 = 22 kW . √3 = 38,1 kW
B3.01 = $I_{N\Delta\ (230\ V)}$ = 80 A
B3.02 = U_{NY} = 400 V
B3.03 = f_N . √3 = 50 Hz . √3 = 87 Hz
B3.04 = n_N . √3 = 1460 rpm . √3 = 2530 rpm

B3.05	Sin. Motorfilter	VICB	not used

0 . . . not used •
1 . . . used

If the option SMF (Sinus-Motorfilter) is used, the parameter B3.05 has to be adjusted to "used" before the autotuning routine is started !!

B4 Auto-tuning

Exact tuning: Inverter-Motor

Only a change from the matrix level to the basic display (A1-HOME) will cause a storage of all changed values into the FLASH-ROM (long-time memory) !!

B4.00	Start tuning	VICB	Routine

0 . . . Start 0 ⇨ 1	*Starts the tuning by changing to row 1.*
1 . . . AT running	*Tuning (part 1) in progress*
2 . . . AT running	*Tuning (part 2) in progress*
3 . . . AT OK	*Autotuning was successfully finished*
4 . . . AT ERROR	*Autotuning dedected wrong motor data*

Activating the autotuning function means, that, dependent on parameter C1.00, various voltages and currents are applied to the motor, but it **will not start rotating**.
During this process some special measurements are realized and the results are stored. The autotuning routine takes up to 6 minutes.
The autotuning should be done with a cold motor.
- During the routine is running it is necessary to have pulse-release !!
- During the routine is running it is not allowed that the motor rotates !!

If the option SMF (Sinus-Motorfilter) is used, the links X16 and X18 between inverter and SMF have to be disconnected during the autotuning routine !!

If the Autotuning routine detects an error, this can be caused by:
a.) There is no pulse release signal on the terminals (digital input DI5, option IO1) or
b.) Some of the motor data (B3.00 to B3.04) are adjusted wrong

If the motor does not run sufficient enough (e.g. very little motors or special machines) there is the possibility to reset to the factory default autotuning data:
1.) Store the adjusted general parameter with B2.01 into the user-macro
2.) Select factory default setting with F2.00 (the user-macro will not be influenced !!)
3.) Load the user-macro again with B2.00 = 9
4.) Adjust the motor data once more with B3.00 to B3.05
5.) Check the drives performance without autotuning

B5 Short menu

Adjustment of parameters in the short menu

Dependent on the choosen macro a selection of necessary parameters, which are significant for the application, is displayed in the matrix field.
In many cases the parameter setting of the inverter will be finished by selecting a macro.
Additional functions, i.e. use of optional cards, can be realized by selecting the corresponding parameter in the matrix surface and changing it. After this, the additional parameters are also included into the short menu.
Caused by the automatically extension of the short menu, it is possible to give a summarized overview of the parameter settings in a lucid form. All parameters which are not shown in the short menu have their factory default value.

B5 - Short menu
C1.00 T-Start...
C1.13 Economy...
C2.00 Accel. ramp...
C2.01 Decel. ramp...
C3.00 Min. freq...

i.e. Change of parameter C1.02

C1.02 Stop mode	Decel ramp

⇨ 0 free run-out
1 Decel. ramp
2 Quick-stop

changes the short menu to:

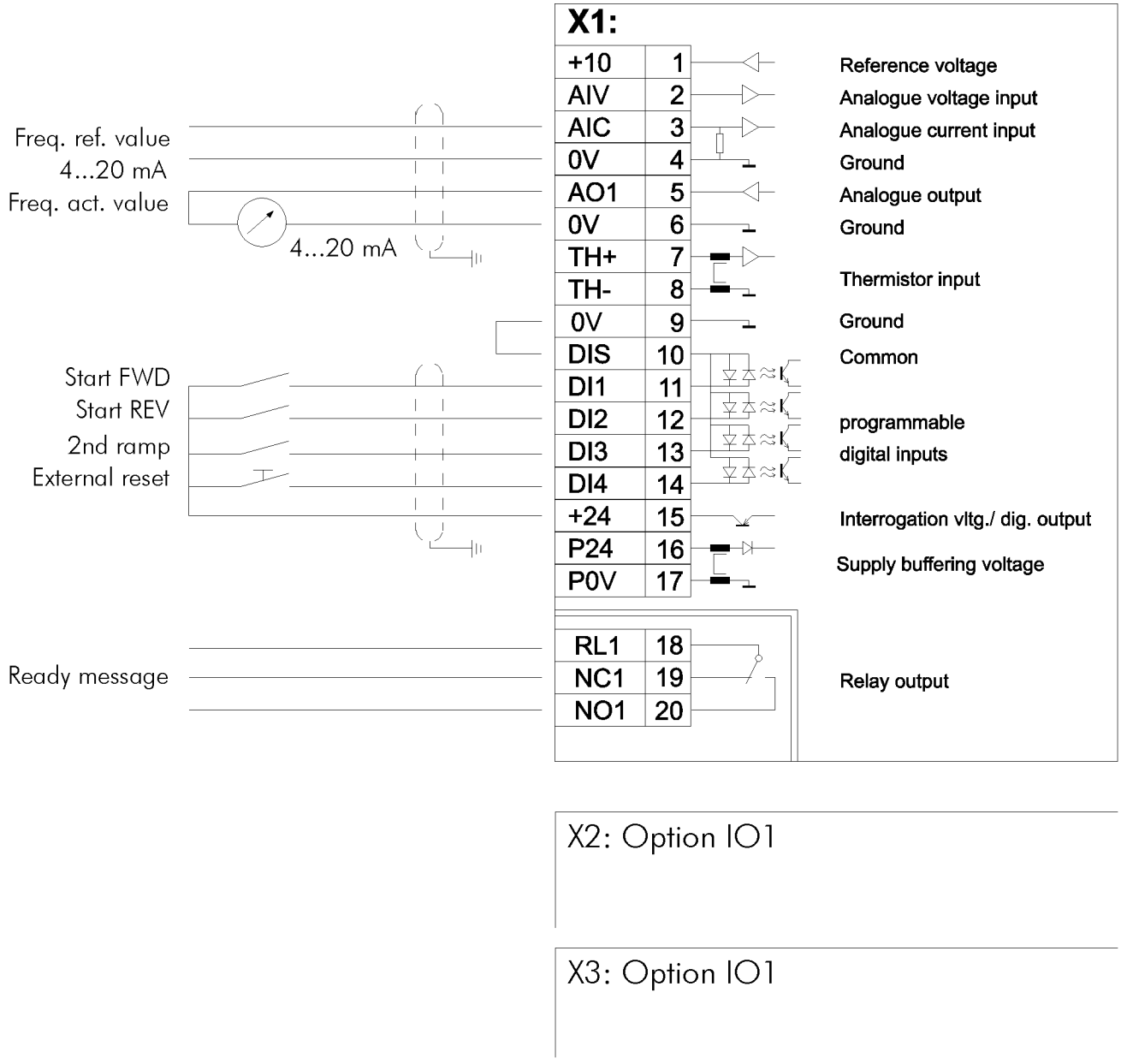
B5 - Short menu
C1.00 T-Start...
C1.02 Stop mode..
C1.13 Economy...
C2.00 Accel. ramp...
C2.01 Decel. ramp....
C3.00 Min. freq...

Macro M1 - drives with high overload (factory default)

Belt conveyors
Plunger pumps
Centrifuges and separators a.s.o.

For heavy loads the starting torque can be increased up to max. 180 %.
The reference value comes from a 4-20 mA remote signal, the local signal via the on-board keypad.
The control is done with two switches (start FWD and start REV), in addition the terminal functions 2nd ramp and external reset are programmed.
Further drive-specific adaptations have to be done with the corresponding parameters in the matrix field.
Changes can be stored in the USER macro. All additional changed parameters are automatically stored in the short menu.

Wiring diagram



Short menu for macro M1

Parameter-number	Name	Adjustment	Remark
B2.00	Macro selection	Conveyor	or: piston pump, separator
C2.00	Accel. ramp 1	0...**5**...160 s	Adjustment in s/motor nom. freq.
C2.01	Decel. ramp 1	0...**5**...160 s	Adjustment in s/motor nom. freq.
C3.00	Minimum frequency	0,00...**0,00**...300 Hz	Adjustment of lower freq. limit
C3.01	Maximum frequency	25,00...**50,00**...300 Hz	Adjustment of upper freq. limit
C3.02	Rotation	FWD and REV	FWD run and REV run released
D1.04	AIC-destination	f-ref AUTO	Freq. ref. value on analogue input AIC (mA)
D1.06	AIC-value 0 %	-300,0...**0,00**...300,0 Hz	Determines the frequency range for
D1.07	AIC-value 100 %	-300,0...**50,00**...300,0 Hz	the analogue signal 4-20 mA
D2.00	DI1-dest.	Start FWD	Start/Stop FWD run
D2.01	DI2-dest.	Start REV	Start/Stop REV run
D2.02	DI3-dest.	2nd ramp	Switch over to 2nd Accel/Decel ramp
D2.03	DI4-dest.	Ext. reset	Includes an external reset
D3.00	AO1-selection	f-output (ABS)	Analogue output 1 - freq. act. value (4-20 mA = 0 - f_{MAX})
D4.01	Relay output 1	Ready + Run	Ready signal on digital output RL1 (at PSR2.03 only „ready“ is adjusted)
E2.00	Thermistor input	not active	
E2.02	I_{MAX} at 0 Hz	0...**50**...150 %	Definition of the motor protection.
E2.03	I_{MAX} at f_{NOM}	0...**100**...150 %	Currents in % related to $I_{NOM,MOTOR}$
E2.05	Motor time constant	0...**5**...3200 min	>5 min: 24 V buffering voltage is necessary !

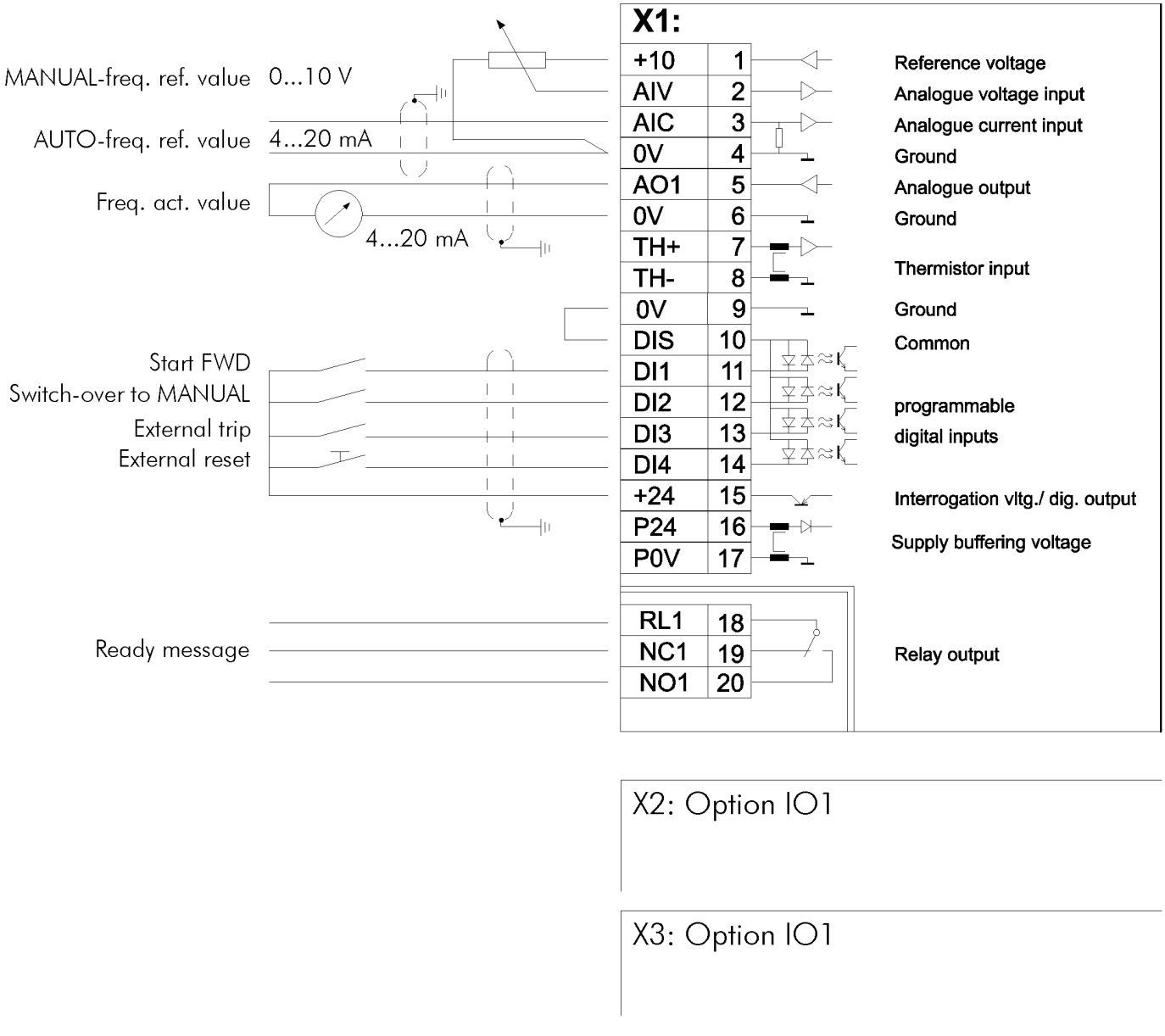
All motor data (matrix field B3) will be indicated in the short menu !!

Macro M2 - drives with high continuous load

Centrifugal pumps
Induced draughts
fans, a.s.o.

The energy conservation mode is activated at level 1. The frequency reference comes from 2 analogue inputs. The 0-10 V input is active, if the selection switch MANUAL(AUTO) is closed.
If not, the reference value comes from the current input AIC.
The control of the unit is done with "Start FWD", the anti-clockwise direction of rotation is locked. In addition the terminal functions external trip and external reset are programmed.
Further drive-specific adaptations have to be done with the corresponding parameters in the matrix field.
Changes can be stored in the USER macro. All additional changed parameters are automatically listed in the short menu.

Wiring diagram



Short menu for macro M2

Parameter-number	Name	Adjustment	Remark
B2.00	Macro selection	Centrifugal pump	or: exhaust fan, fan
C1.13	Economymode	level 1	Energy conservation mode level 1
C2.00	Accel. ramp 1	0...**10**...160 s	Adjustment in s/motor nom. freq.
C2.01	Decel. ramp 1	0...**10**...160 s	Adjustment in s/motor nom. freq.
C3.00	Minimum frequency	0,00...**0,00**...300 Hz	Adjustment of lower freq. limit
C3.01	Maximum frequency	25,00...**50,00**...300 Hz	Adjustment of upper freq. limit
D1.00	AIV-dest.	f-SW MANUAL	Manual freq. ref. value as 0-10 V signal on analogue input AIV
D1.01	AIV-value 0 %	0,00...**0,00**...300,0 Hz	Determines the freq. range for the
D1.02	AIV-value 100 %	0,00...**50,00**...300,0 Hz	analogue signal 0-10 V
D1.04	AIC-dest.	f-SW AUTO	Automatic freq. ref. value as 4-20 mA signal on analogue input AIC
D1.06	AIC-value 0 %	-300,0...**0,00**...300,0 Hz	Determines the freq. range for the
D1.07	AIC-value 100 %	-300,0...**50,00**...300,0 Hz	analogue signal 4-20 mA
D2.00	DI1-dest.	Start FWD	Start/Stop (FWD run only)
D2.01	DI2-dest.	MANUAL(AUTO)	Switch over manual ref. value source
D2.02	DI3-dest.	Ext. trip	Includes an external drive trip
D2.03	DI4-dest.	Ext. reset	Includes an external reset
D3.00	AO1-selection	f-output (ABS)	Analogue output 1 - freq. act. value (4-20 mA = 0 - f_{MAX})
D4.01	Relay output 1	Ready + Run	Ready signal on the digital output RL1 (at PSR2.03 only „ready“ is adjusted)
E1.00	Maximum value	**125 %**	I_{MAX} limitation related to $I_{N“C“}$
E2.00	Thermistor input	not active	
E2.03	I_{MAX} at f_{NOM}	0...**100**...150 %	Definition of the motor protection. Currents in % related to $I_{NOM,MOTOR}$
E2.05	Motor time constant	0...**5**...3200 min	>5 min: 24 V buffering voltage is necessary !
E3.02	Ext. trip	N.O. mode	Ext. trip is included with a closing contact and is supervised in the ready condition only

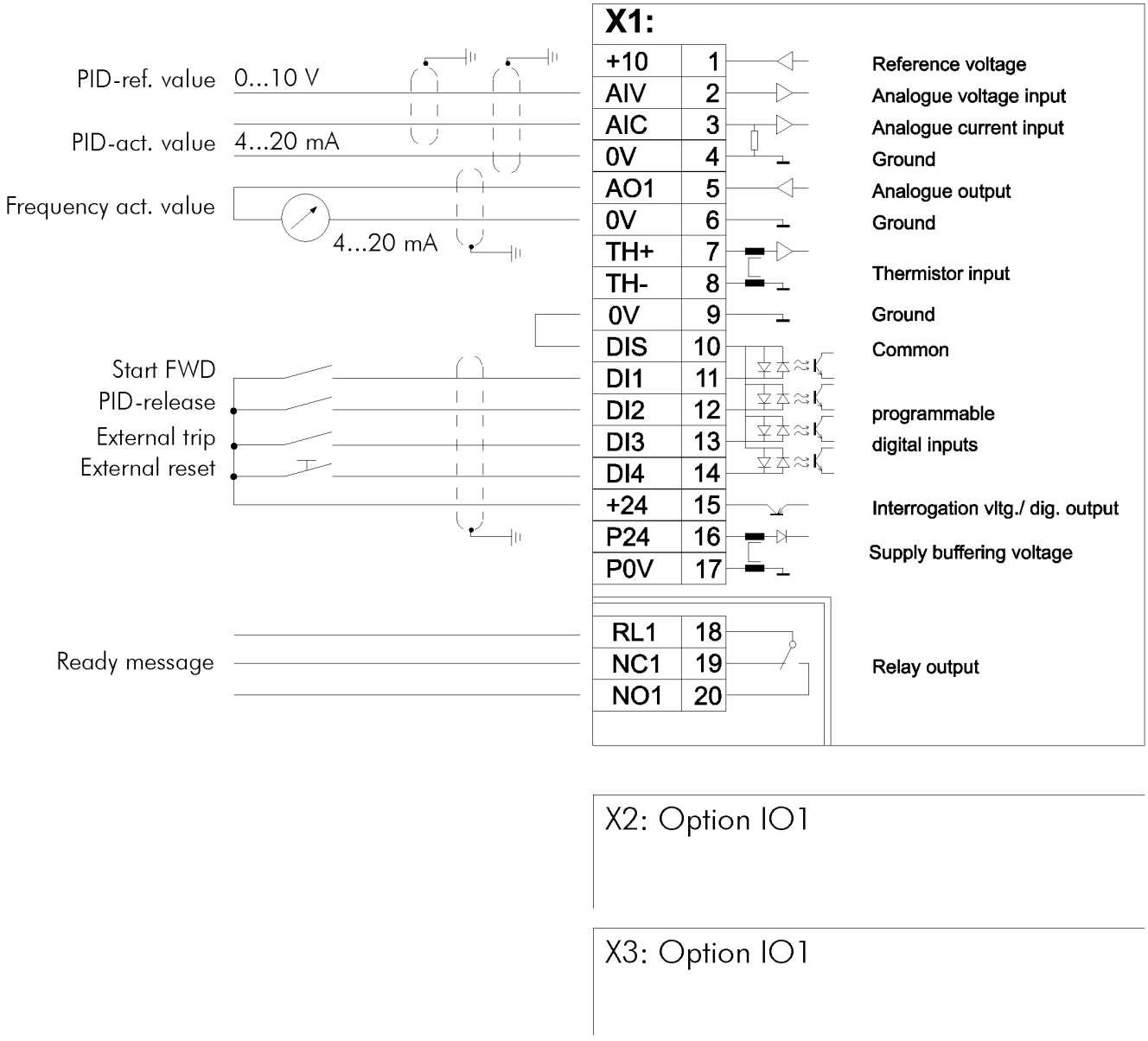
All motor data (matrix field B3) will be indicated in the short menu !!

Macro M3 - drives with squared torque and process control

Pump and fan drives with pressure- level- and amount control a.s.o.

The energy conservation mode is activated at level 1. The process reference value comes from a voltage signal 0-10 V on AIV, the feedback of the actual value comes as a 4-20 mA signal on AIC. The control of the unit is done with "Start FWD", the anti-clockwise direction of rotation is locked. In addition the terminal functions external trip and external reset are programmed.
Further drive-specific adaptations have to be done with the corresponding parameters in the matrix field. Changes can be stored in the USER macro. All additional changed parameters are automatically listed in the short menu.

Wiring diagram



Short menu for macro M3

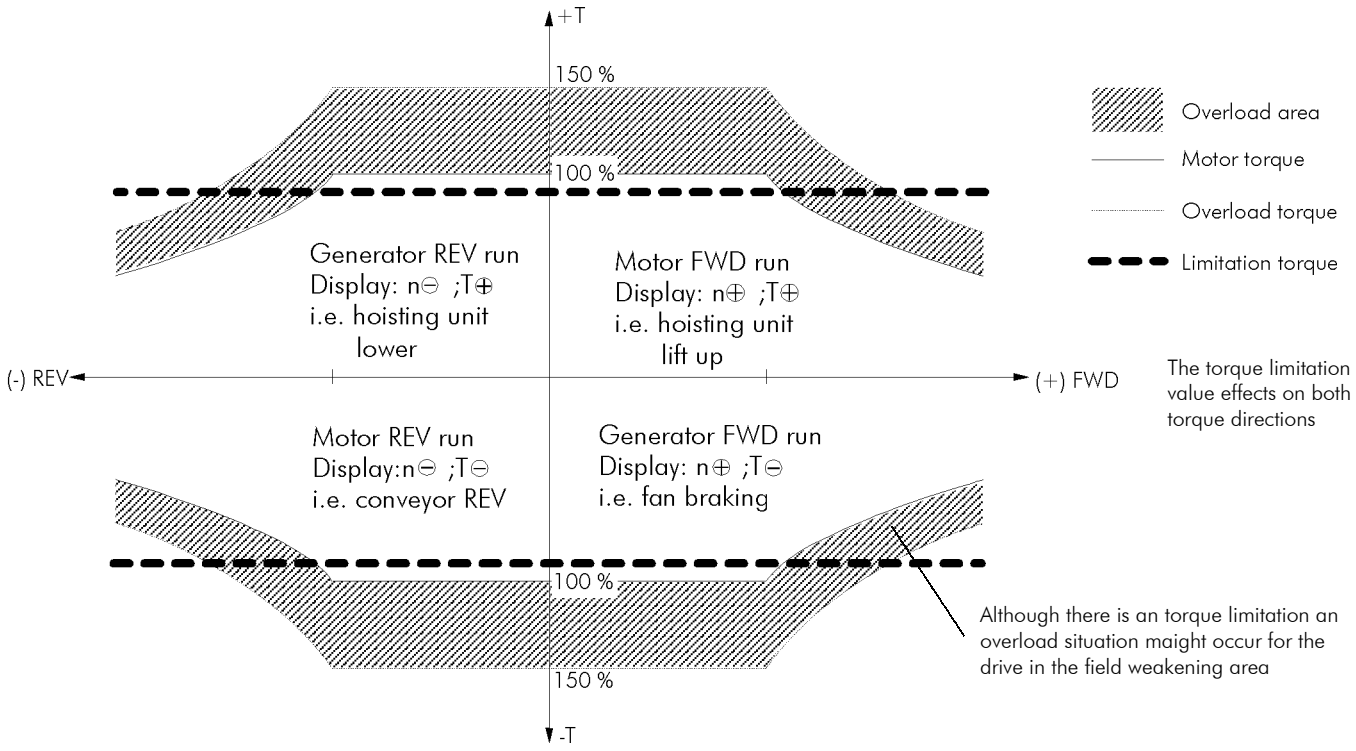
Parameter-number	Name	Adjustment	Remark
B2.00	Macro selection	Pump and PID controller	
C1.13	Economymode	level 1	Energy conservation mode level 1
C3.00	Minimum frequency	0,00...**0,00**...300 Hz	Adjustment of the lower freq. limit
C3.01	Maximum frequency	25,00...**50,00**...300	Adjustment of the upper freq. limit
C4.04	PID-enable	Yes	Activates the PID controller
C4.05	Prop. gain(kp)	0...**20**...3200 %	Controller adjustm.: amplification
C4.06	Integ. time (Tn)	0...**10**...160 s	Controller adjustm.: adjusting time
C4.07	Deriv. time (Tv)	0...**0**...60 s	Controller adjustm.: hold-up time
C4.08	Ref.Accel. ramp	0...**10**...160 s	Adjustment in s/100 %
C4.09	Ref.Decel. ramp	0...**10**...160 s	Adjustment in s/100 %
C4.10	Output scaling -	-300...**+10,00**...+300 Hz	Min. limitation of the controller output
C4.11	Output scaling +	-300...**+50,00**...+300 Hz	Max. limitation of the controller output
D1.00	AIV-dest.	Ref.val.-PID	Ref. value as voltage signal 0-10 V
D1.01	AIV-value 0 %	0...**0**...200 %	Used for reference value
D1.02	AIV-value 100 %	0...**100**...200 %	adaptation
D1.04	AIC-dest.	Act.val.-PID	Actual value as current signal 4-20 mA
D1.06	AIC-value 0 %	0...**0**...200 %	Used for actual value
D1.07	AIC-value 100 %	0...**100**...200 %	adaptation
D2.00	DI1-dest.	Start FWD	Start/Stop (FWD run only)
D2.01	DI2-dest.	PID-release	PID release signal
D2.02	DI3-dest.	Ext. trip	Includes an external drive trip
D2.03	DI4-dest.	Ext. reset	Includes an external reset
D3.00	AO1-selection	f-output (ABS)	Analogue output 1 - freq. act. value (4-20 mA = 0 - f_{MAX})
D4.01	Relay output 1	Ready + Run	Ready signal on digital output RL1 (at PSR2.03 only „ready“ is adjusted)
E1.00	Maximum value	**125 %**	I_{MAX} limitation related to $I_{N“C“}$
E2.00	Thermistor input	Not active	
E2.03	I_{MAX} at f_{NOM}	0...**100**...200 %	Definition of the motor protection. Currents in % related to $I_{NOM,MOTOR}$
E2.05	Motor time constant	0...**5**...3200 min	>5 min: 24 V buffering voltage is necessary !
E3.02	Ext.-trip	N.O. mode	Ext. trip is included as a closing contact and supervised in the ready condition only

All motor data (matrix field B3) will be indicated in the short menu !!

Macro M4 - drives with torque reference signals

Test benches
Master/Slave applications
any kind of winders, a.s.o.

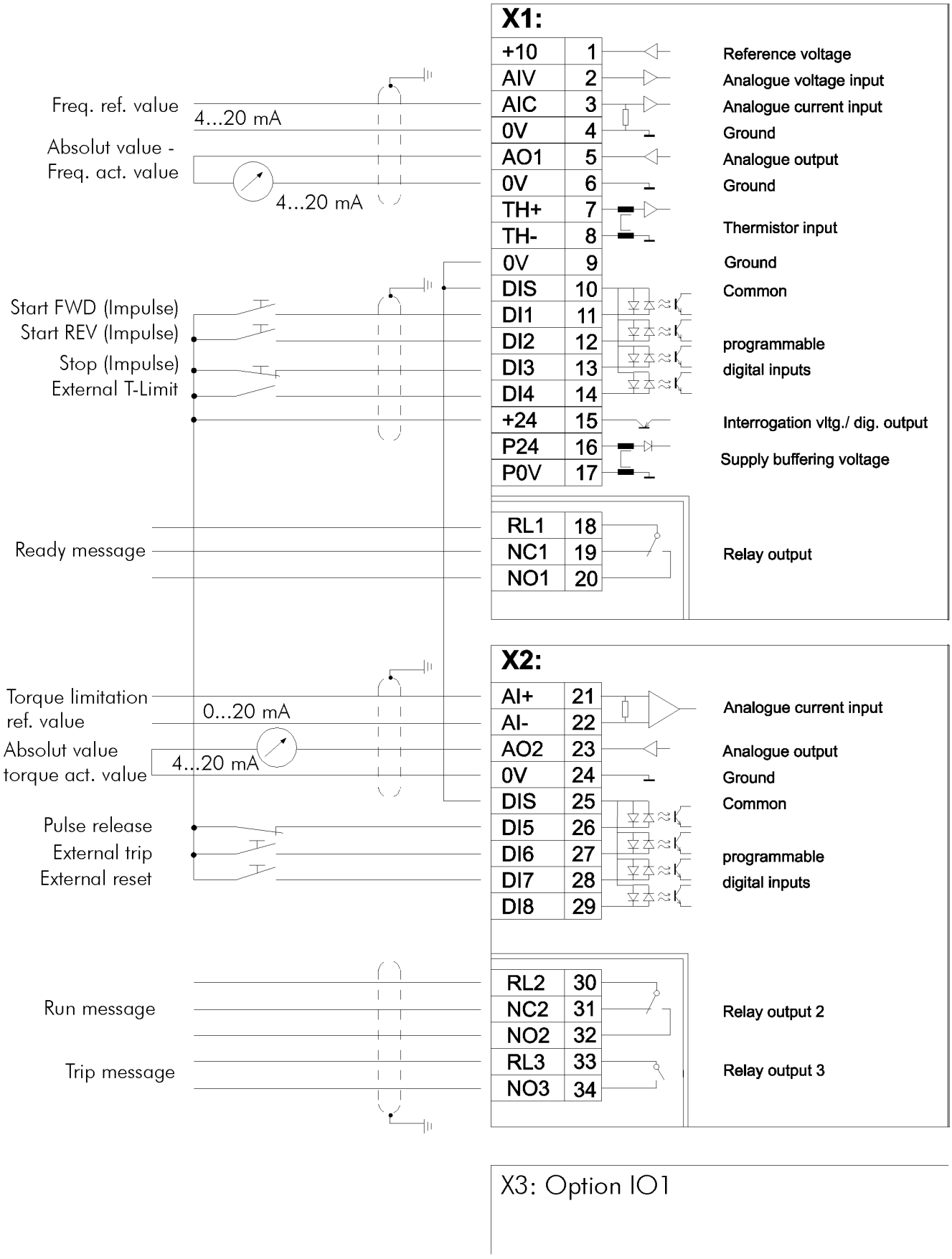
The torque limitation signal and the frequency reference value come from a current signal via the analogue current inputs AI_2 (0...20 mA) and AIC (4...20 mA).
The corresponding active quadrant results from the selected direction of rotation.



In case of a motor overload or a frequency inverter overload the inverter will decrease the speed in a motoric - and increase the speed in a generatoric operation condition.

The control of the unit is done with the push button contacts Start FWD, Start REV and Stop.
To activate the torque limitation function the switch Ext. M-Limit must be closed. The terminal DI5 is hardware configured to pulse-release.
In addition the terminal functions external trip and external reset are programmed.
Further drive-specific adaptations have to be done with the corresponding parameters in the matrix field.
Changes can be stored in the USER macro. All additional changed parameters are automatically stored in the short menu.

Wiring diagram



Short menu for macro M4

Parameter-number	Name	Adjustment	Remark
B2.00	Macro selection	Test-bench	or: master/slave drive
C2.00	Accel. ramp 1	0...**3**...160 s	Adjustment in s/motor nom. freq.
C2.01	Decel. ramp 1	0...**3**...160 s	Adjustment in s/motor nom. freq.
C3.00	Minimum frequency	0,00...**0,00**...300,0 Hz	Adjustment of the lower freq. limit
C3.01	Maximum frequency	25,00...**50,00**...300,0 Hz	Adjustment of the upper freq. limit
C3.02	Rotation	FWD and REV	FWD and REV run possible
D1.04	AIC-dest.	f-SW AUTO	Freq. ref. value on input AIC (mA)
D1.06	AIC-value 0 %	0,00...**0,00**...300,0 Hz	Determines the freq. range for the
D1.07	AIC-value 100 %	0,00...**50,00**...300,0 Hz	4-20 mA signal
D1.09	AI_2-dest.	T-limitation	Torque limitation ref. value as current signal (0-20 mA) in % of T_N
D1.11	AI_2-value 0 %	0,00...**0,00**..200,0 %	of the torque limitation
D1.12	AI_2-value 100 %	0,00...**100,00**...200,0 %	reference value
D2.00	DI1-dest.	Start FWD-I	Start FWD via push button contact
D2.01	DI2-dest.	Start FWD-I	Start REV via push button contact
D2.02	DI3-dest.	Stop-I	Stop via push button contact
D2.03	DI4-dest.	Ext. M-limit	Activates the torque limitation
D2.04	DI6_2-dest.	Ext. trip	Includes an external drive trip
D2.05	DI7_2-dest.	Ext. reset	Includes an external reset
D3.00	AO1-selection	f-output (ABS)	Analogue output 1 - freq. act value (4-20 mA = 0 - f_{MAX})
D3.04	AO2_2-selection	Torque (ABS)	Analogue output 2 - motor torque act. value (4-20 mA = 0 - 1,5xM_N)
D3.07	AO2_2-max. value	0...**150**...200 %	20 mA corresp. to 150% $T_{N,MOTOR}$
D4.01	Relay output 1	Ready	Ready signal on digital output RL1
D4.02	Relay output 2_2	Ready	Ready signal on digital output RL2_2
D4.03	Relay output 3_2	Trip	Trip signal on digital output RL3_2
E2.00	Thermistor input	Not active	
E2.02	I_{MAX} at 0 Hz	0...**50**...150 %	Definition of the motor protection.
E2.03	I_{MAX} at f_{NOM}	0...**100**...150 %	Currents in % related to $I_{NOM,MOTOR}$
E2.05	Motor time constant	0...**5**...3200 min	>5 min: 24 V buffering voltage is necessary !
E3.02	Ext.-trip	N.O. mode	Ext. trip is included as a closing contact and supervised in the ready condition only

All motor data (matrix field B3) will be indicated in the short menu !!

In addition we recommend to adjust parameter C1.02 to 0 "free run-out" !!

B6 Bus-connection

Configuration and Diagnostics of the serial interface

All parameters concerning the profibus-connection on to the frequency inverter MX can be read in the manual „Option Profibus PB01“, Part.No. 8074575.

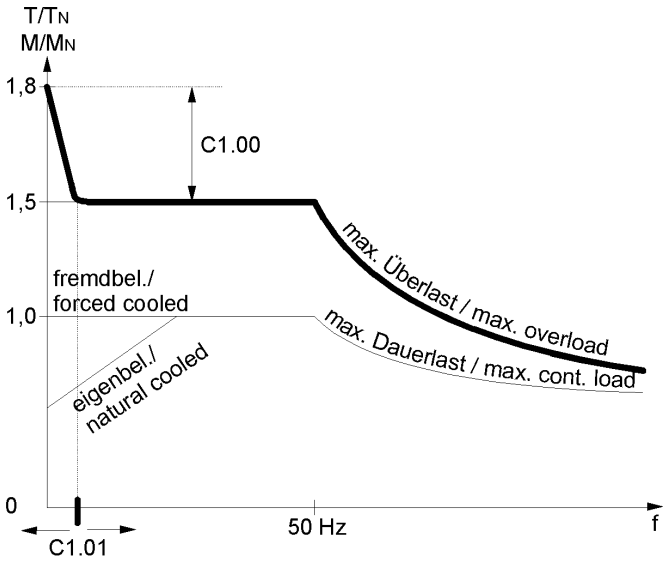
Chapter C: Function

Inverter specific functions

C1 General functions

Starting torque increase, behaviour at stop, preset speeds, economy mode, jog mode, slip compensation

C1.00	Increase start T.	VCB	0...***0***...30 %
C1.01	Increase range	VCB	5...***10***...45 Hz



For applications with a demand on high starting torque, it is possible to increase the standard starting torque from 150 % T_N up to 180 % T_N.

e.g. C1.00 = 0 % corresp. to 150 % T_N
C1.00 = 30 % corresp. to 180 % T_N

It is necessary to adjust C1.00 to higher 1 % before the auto-tuning routine is started!

The range within this increase is valid is adjusted with C1.01.

C1.02	Stop mode	VCB	deceleration ramp

0 . . . Free run-out
1 . . . Deceleration ramp •
2 . . . Quick stop

Free run-out: After a stop command the pulses are inhibited, the motor coasts to stop.

Deceleration ramp: After a stop command the motor decelerates (if possible) on the adjusted deceleration ramp. At 0 Hz the pulses are inhibited.

Quick stop: After a stop command the motor decelerates as fast as possible. At 0 Hz the pulses are inhibited.

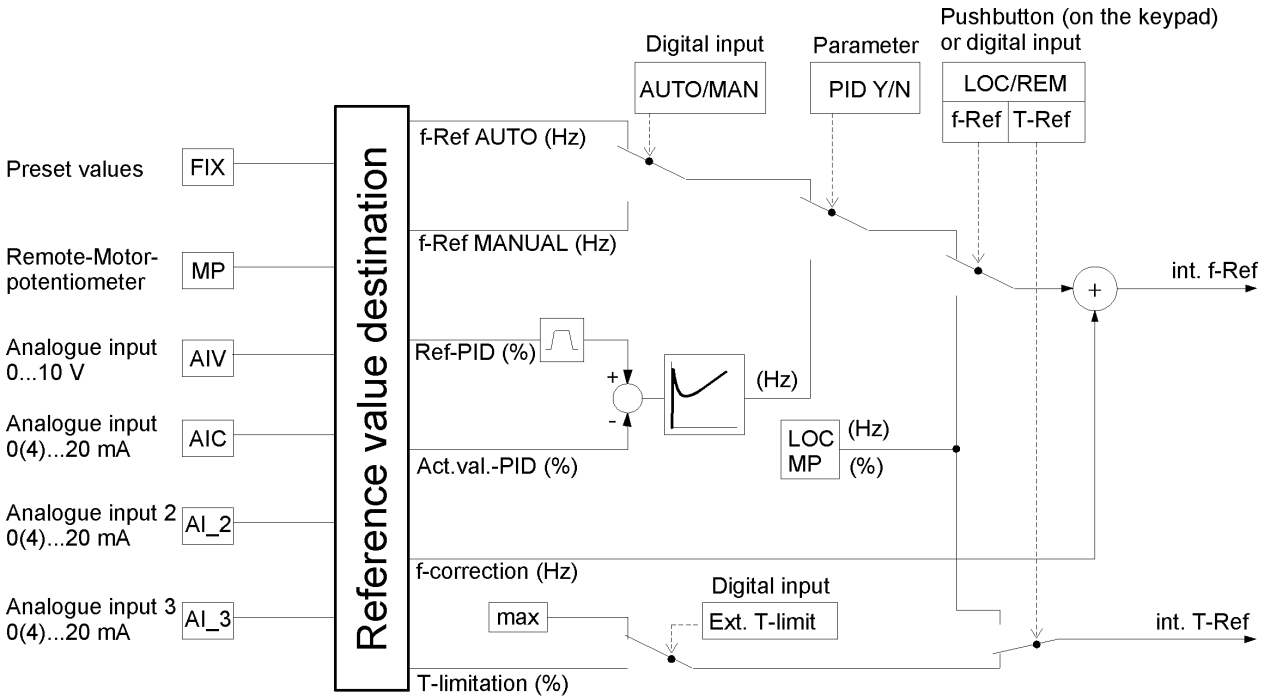
(At PSR2.03 this parameter ist locked in case of pulse-release !!)

C1.03	Preset ref. destination	VICB	not used

0 . . . not used • *Hz*
1 . . . f-Ref MANUAL *Hz*
2 . . . f-Ref AUTO *Hz*
3 . . . f-correction *Hz*
4 . . . T-limitation *%*
5 . . . Ref.-PID *%*

If single adjustments cannot be selected then they are used by one of the other reference sources D1.00, D1.04, D1.09, D1.14, D6.06 or a bus reference value !!

The preset speeds can be used as a source for various reference values.



C1.04	Pre-set ref. 1	VCB	-300,0...***0,00***...300,0 Hz -200,0...***0,00***...200,0 %
C1.05	Pre-set ref. 2	VCB	-300,0...***0,00***...300,0 Hz -200,0...***0,00***...200,0 %
C1.06	Pre-set ref. 3	VCB	-300,0...***0,00***...300,0 Hz -200,0...***0,00***...200,0 %
C1.07	Pre-set ref. 4	VCB	-300,0...***0,00***...300,0 Hz -200,0...***0,00***...200,0 %
C1.08	Pre-set ref. 5	VCB	-300,0...***0,00***...300,0 Hz -200,0...***0,00***...200,0 %
C1.09	Pre-set ref. 6	VCB	-300,0...***0,00***...300,0 Hz -200,0...***0,00***...200,0 %
C1.10	Pre-set ref. 7	VCB	-300,0...***0,00***...300,0 Hz -200,0...***0,00***...200,0 %
C1.11	Pre-set ref. 8	VCB	-300,0...***0,00***...300,0 Hz -200,0...***0,00***...200,0 %

The selection of the preset speeds is done via the digital commands Preset 1, Preset 2 and Preset 3. Corresponding to the amount of necessary preset speeds, zero to three digital inputs have to be assigned with this commands. See D2-digital inputs.

DIx set to Preset 1	DIx set to Preset 2	DIx set to Preset 3	selected value
0	0	0	Preset speed 1
1	0	0	Preset speed 2
0	1	0	Preset speed 3
1	1	0	Preset speed 4
0	0	1	Preset speed 5
1	0	1	Preset speed 6
0	1	1	Preset speed 7
1	1	1	Preset speed 8

For this preset value no digital input must be programmed !!

The preset values are reference values and need a start/stop command for their correct function.

C1.12 Jog frequency VCB -10,00...***0,00***...10,00 Hz

The jog function is used for checking and adapting the drive. Therefore the command "Jog" (see D2-digital inputs) is used. If the function is activated, the output frequency is increased up to the jog frequency without notice of the adjusted acceleration and deceleration ramps. No additional start/stop command is necessary. The jog mode works in the stop condition only ! After the command jog OFF the drive will still operate at a frequency of 0 Hz for at least 5 s. This is done to maintain the magnetisation of the motor. A regular start command will not be accepted until this time has expired.

C1.13 Economy mode VCB not active see macro

0 . . . not active •
1 . . . Step 1 *(= small decrease)*
2 . . . Step 2 *(= medium decrease)*
3 . . . Step 3 *(= large decrease)*
4 . . . Step 4 *(= extra large decrease)*

For applications with a squared torque (i.e. centrifugal pumps or fans) the magnetisation current in the motor can be decreased in case of decreasing speed.
This will cause a smaller power consumption and therefore an energy conservation.

C1.14 Slip compensation VCB not active

0 . . . not active •
1 . . . active

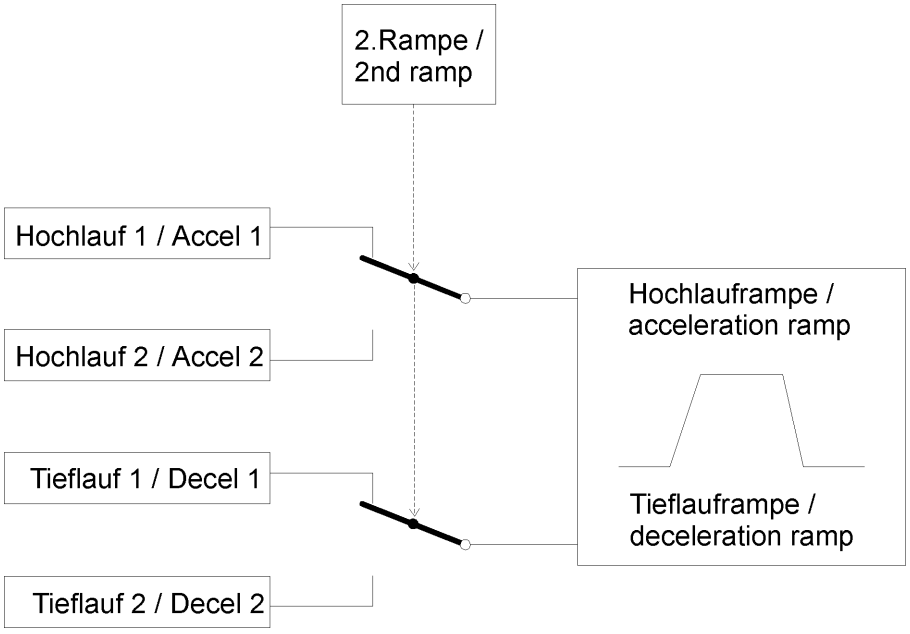
An activated slip compensation will detect the actual load condition on the motor shaft and will then increase the output frequency (or will decrease the output frequency in case of generatoric load condition). It is recommended to increase the frequency limitation C3.01 by the value of the nominal slip.
Activating this function will change the frequency reference to a speed reference.
The nominal slip is automatically calculated from the adjusted nominal speed B3.04.

C2 Ramp selection

Acceleration and deceleration ramps

C2.00	Accel. ramp 1	VCB	0,0...***5,0***...160,0 s	see macro
C2.01	Decel. ramp 1	VCB	0,0...***5,0***...160,0 s	see macro
C2.02	Accel. ramp 2	VCB	0,0...***20,0***...160,0 s	
C2.03	Decel. ramp 2	VCB	0,0...***20,0***...160,0 s	

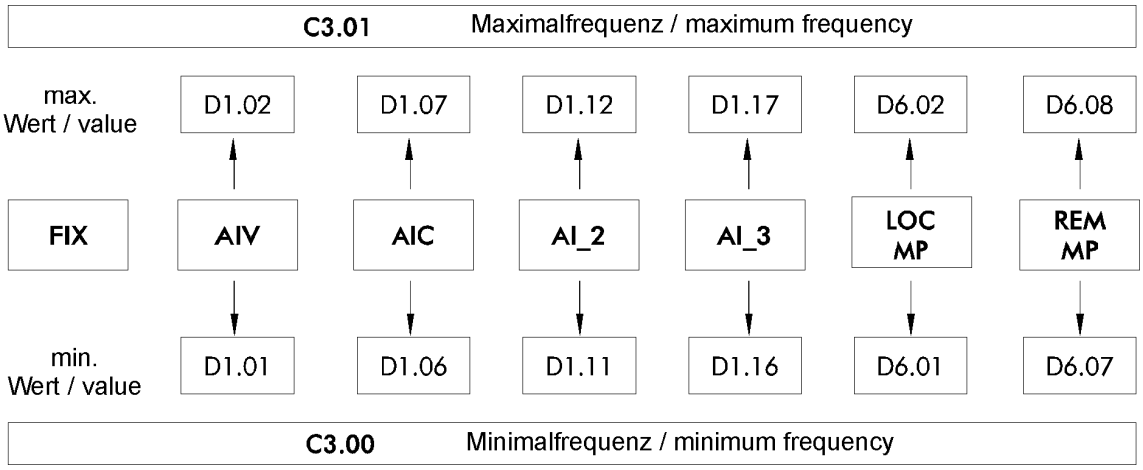
Two sets of acceleration and deceleration ramps are available. The switch over between them is done with the digital command "2nd ramp" (see D2-digital inputs). Use for emergency stop functions and for applications with speed-dependant acceleration and deceleration times. The adjusted acceleration / deceleration time is relating to the motor nominal frequency B3.03.



C3 Speed range

Frequency range and direction of rotation

C3.00	Minimum frequency	VCB	0,00...***0,00***...300,0 Hz
C3.01	Maximum frequency	VICB	25,00...***50,00***...300,0 HZ



For each reference source a min. and a max. value can be assigned.
In addition, the parameters C3.00 and C3.01 adjust an overall min./max. limit.

If both rotation directions are enabled with parameter C3.02 (adjustment: "Enable FWD/REV"), the minimum frequency C3.00 is not active.

If required the corresponding minimum frequency limitations of the reference values can be used.

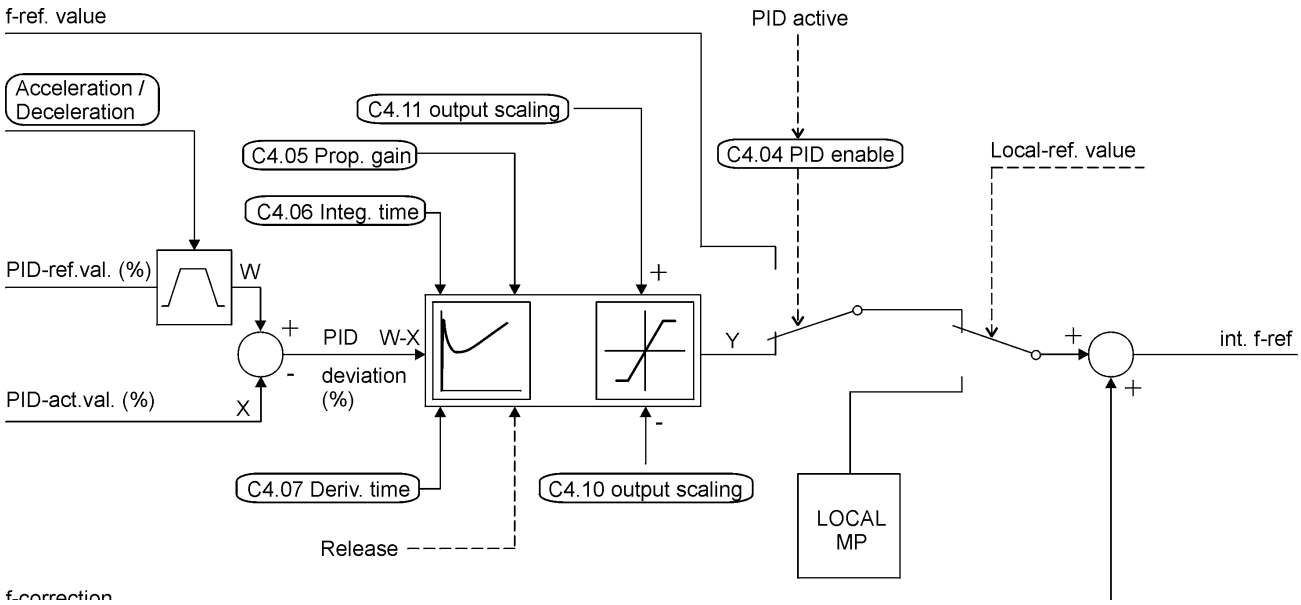
C3.02	Rotation	VCB	Disable REV	see macro

0 . . . Disable REV • *anti-clockwise rotation locked in all conditions*
1 . . . Disable FWD *clockwise rotation locked in all conditions*
2 . . . Enable FWD / REV *both directions of rotation enabled*

C-Function

C4 PID-controller

PID process controller



Reference value:

The reference source can be one of the following:

- external motorpotentiometer	parameter D6.06
- preset speeds	parameter C1.03
- analogue input AIV: 0-10 V	parameter D1.00
- analogue input AIC: 0(4)-20 mA	parameter D1.04
- analogue input AI_2: 0(4)-20 mA	parameter D1.09
- analogue input AI_3: 0(4)-20 mA	parameter D1.14

To optimize the behaviour of the disturbance variable of the controller it is recommended to adjust the acceleration and deceleration ramps (parameter group C2) to zero seconds. For the command variable (PID-reference) a separate ramp time can be adjusted with parameter C4.08, C4.09.

Actual value:

All analogue inputs (AIV, AIC, AI_2 and AI_3) can be used as actual value inputs. The standardisation of the both units PID-reference and -actual value is done in % and must be scaled at the corresponding reference value source.

Control deviation:

The control deviation is the difference between PID-reference value after the accel/decel ramp and the actual value. The difference formation is done independent of the controller usage (C4.04) and the operating condition. Also the processing in the logic blocks (F4) is possible.

Controller:

The PID controller is designed as a process controller with the adjustable unit "Frequency [Hz]". P-gain (k), I-gain (Tn) and D-gain (Tv) are separately adjustable. In addition an external controller release can be assigned to the terminals (see D2). During a controller cut-off the PID-controller output is set to 0 Hz.

Limitation:
The controller output is limited by use of parameters C4.10 and C4.11 (at PSR2.03 the limitation acts only symmetrical). The output of the controller (adjusting unit) is always standardized in Hz and is queued after the active limitation as internal reference frequency in the remote condition.

Controller local mode:
By switching from REMOTE to LOCAL (keypad or terminals) the frequency (Hz) is directly taken from the local motorpotentiometer on the keypad. The switch over to the local mode and back is done without any transition into the following motorpotentiometer value or controller output.

f-correction:
In each condition of operation the actual frequency can be corrected with this function.
i.e. configuration as a correction controller.

Displays:
All controller specific values like reference value, actual value, control deviation and adjusting unit can be displayed as actual value indication in the basic display.

C4.00	Ref.value monitor [%]	read only		

Reference value before acceleration integrator.

C4.01	Act.value monitor [%]	read only		
C4.02	Deviation [%]	read only		
C4.03	PID output [Hz]	read only		
C4.04	PID enable	VICB	no see macro	

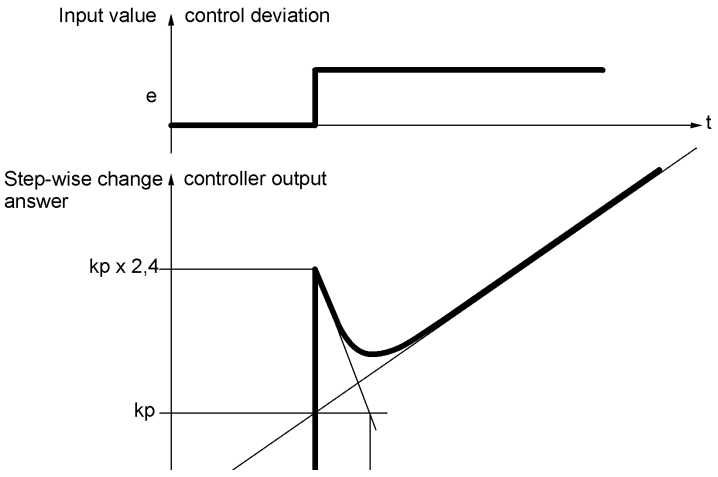
0 . . . no •
1 . . . yes

C4.05	Prop. gain (kp)	VCB	0,0...***0,0***...3200 %	see macro
C4.06	Integ. time (Tn)	VCB	0,00...***0,00***...160,0 s	see macro

An adjustment of Tn=0 will disable the controllers I-gain !!

C4.07	Deriv. time (Tv)	VCB	0,00...***0,00***...60,0 s	
C4.08	Ref. accel ramp	VCB	0,00...***0,00***...160,0 s	see macro
C4.09	Ref. decel ramp	VCB	0,00...***0,00***...160,0 s	see macro
C4.10	Output scaling -	VCB	-300...+***10,00***...+300 Hz	see macro
C4.11	Output scaling +	VCB	-300...+***50,00***...+300 Hz	see macro

Reaction of the controller:

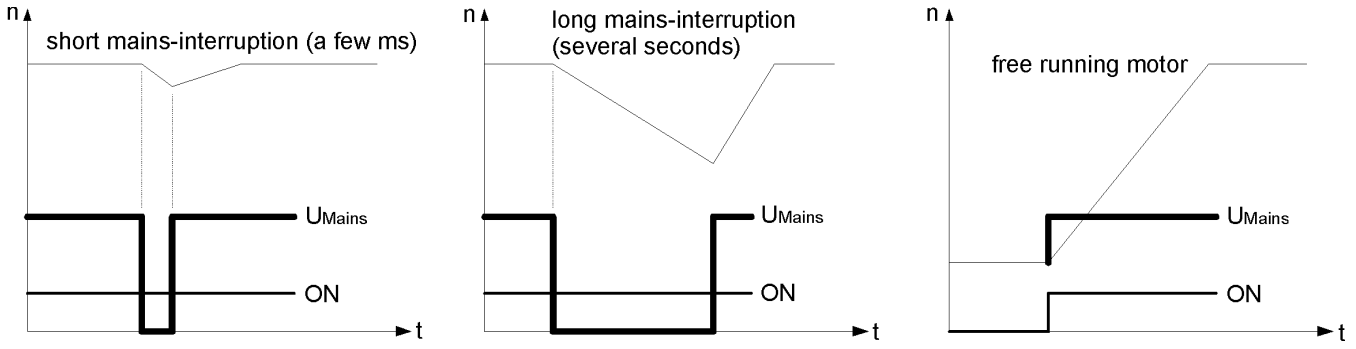


C5 Speed search

Speed search of the running drive

Because of the innovative controlling concept AVC (Auto Vector Control) in combination with the modulation process FMC (Flux Mode Control), the frequency inverter MX is able to „catch" a running motor without any searching process in less than 0,1 s. This is done phase- and speed synchronous. Assumption therefore is an existing connection between inverter and motor.
Independent of the duration of the mains loss (e.g. a few 100 ms to several seconds) or the running condition of the motor, the speed search function guarantees an immediate start beginning with the actual motor speed.

For motors which are switched onto the inverter output the start command (speed search function) should not be activated until a time of 3-5 s has expired.
If the start command is activated earlier, the inverter will decelerate the running motor to approx. zero Hz and will then accelerate the machine up to the desired speed.



C5.00	Speed search	read only

0 . . . not active

1 . . . active

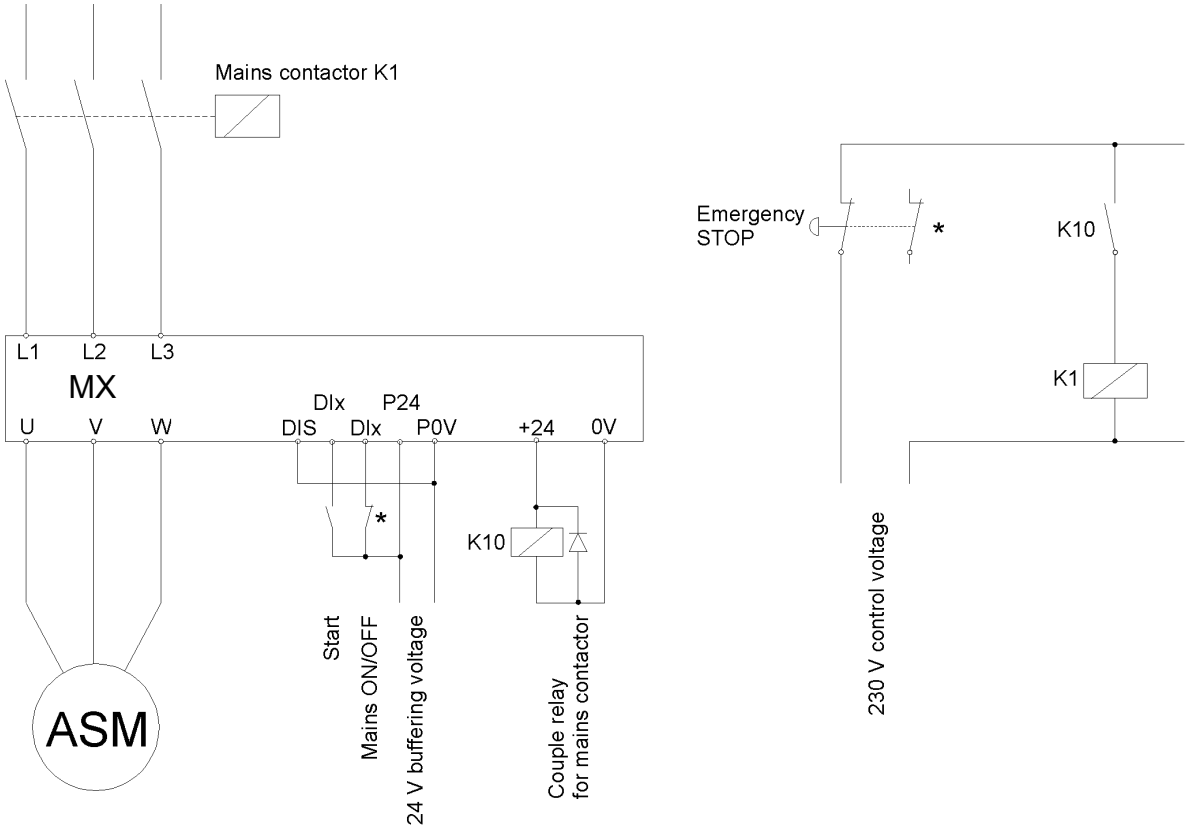
During the speed search process the message "active" is displayed.

Mains contactor control, crane function

C6.00	Contactor CTRL	VICB not active

0 . . . not active •
1 . . . active

If the inverter electronic is supplied by an external 24 V auxillary voltage, it is possible to activate the special function "mains contactor control".
By means of each start command (via keypad or terminal) a selectable digital output is activated, by which the mains contactor can be controlled.
Each pulse inhibit condition (OFF command after deceleration or trip switch-off) will cause the mains contactor to switch the inverters power part free from tension.
In the matrix field HOME (A1) "MAINS OFF" is indicated.



If an external "Emergency STOP" function is required, another digital input has to be assigned with the function "Mains ON/OFF" (see D2). If this input is opened during operation, the pulses are inhibited immediately and a mains switch-off follows.
In the matrix field HOME (A1) "MAINS FREE" is indicated.

* This contact is necessary to cancel the self-holding of the mains contactor !!

C6.01	Crane function	VICB	not active

0 . . . not active •
1 . . . Hoist
2 . . . Trolly

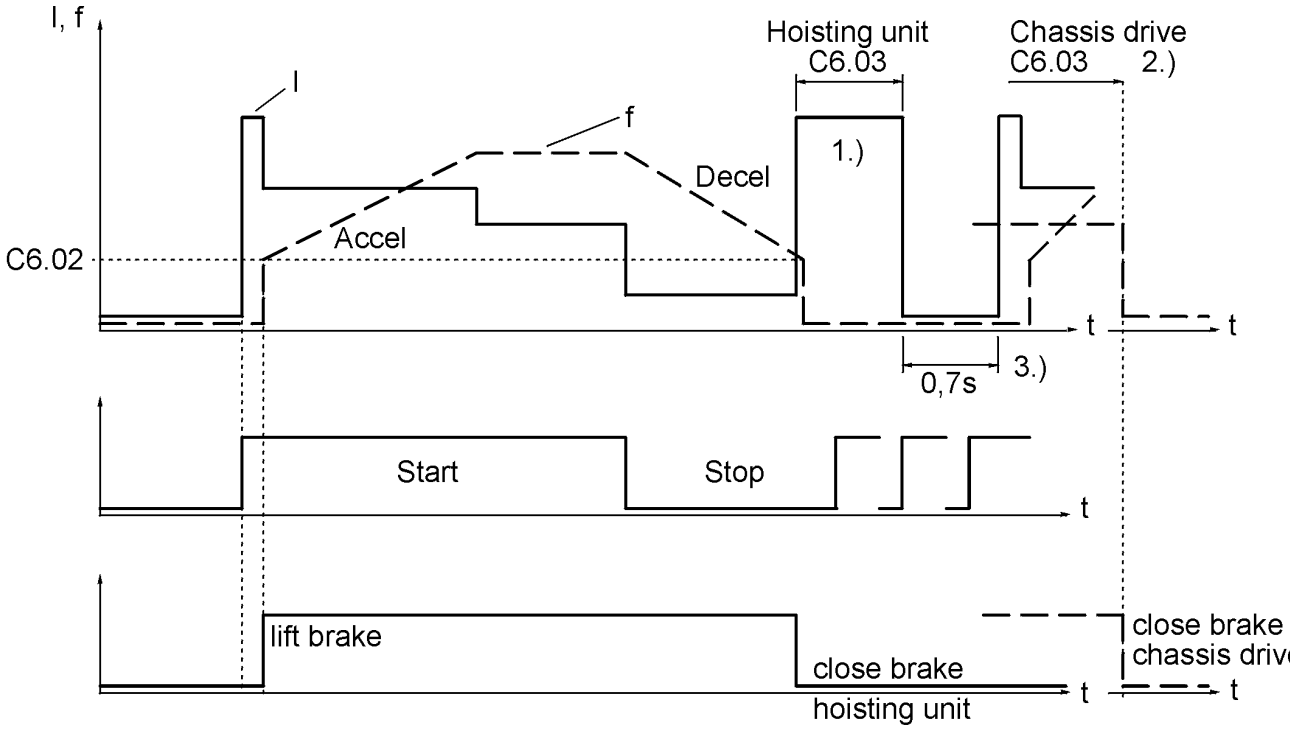
C6.02	Braking freq.	VCB	0,0...***2,0***...20,0 Hz
C6.03	Braking time	VCB	0,0...***0,3***...160,0 s
C6.04	Braking current	VCB	0...***100***...150 %

The brake control which is necessary for a crane function can be selected with parameter C6.01 seperately for hoisting or chassis applications. The signal for controlling the brake is available on the terminals after programming a digital output (D4-take off brake).

Closing a brake will cause mechanical time-delays. To recline them the D.C. braking is activated every time when the output frequency reaches the frequency value "Brake f-level" (parameter C6.02) after a stopping command.

The D.C.braking can be influenced in its effectivity for a "Braking time" (parameter C6.03) with an adjustable "Braking current" (parameter C6.04).

Function diagram:



1.) C6.03 "adjustable braking time" is used for hoisting units to reconsile the closing time of the brake. A restart is only possible after expiration of C6.03 "braking time" and after the 0,7 s lock time (at SFB-option 0,0 s).
2.) C6.03 "adjustable braking time" is used for chassis drives to determine the time between DC braking and mechanical braking.

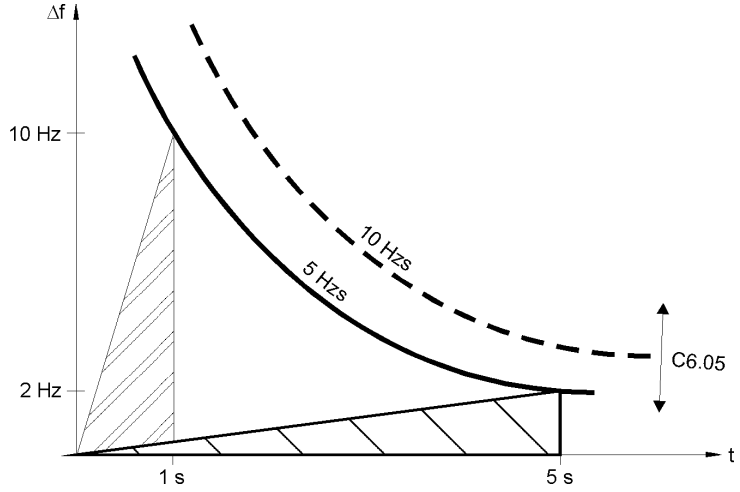
C6.05	Max. n-Diff.	VCB	0...***5***...300

By use of this parameter the sensitiveness of the protective function „crane overload“ can be adjusted.

The protection results from a supervision of a difference of two values - the frequency reference value (after the acceleration integrator) and the real occuring stator frequency relating to the time.

The switch-off criterion is, if the maximum deviation in Hzs - adjusted with parameter C6.05 - is reached. This value corresponds to the plane under the curve in the Δf/t diagram.

The supervision is deactivated if the parameter C6.05 is set to 0.



Remark:
The MX frequency inverter is able to take over the full lifting load out of the brake in a perfect way, whereby the brake is self-controlled via the output „lift brake“ after the magnetic field is build-up.
Merely in the first half second after pulse inhibit there is the danger that the load stalls. This is caused by the magnetisation of the motor due to a wrong position of the wearing off field. To overcome this a further start command should be locked for appr. 1 second (i.e. via an additional IO1-card and the integrated logic block).

Chapter D: Input/Output

Analogue and digital inputs- and outputs, motorpotentiometer

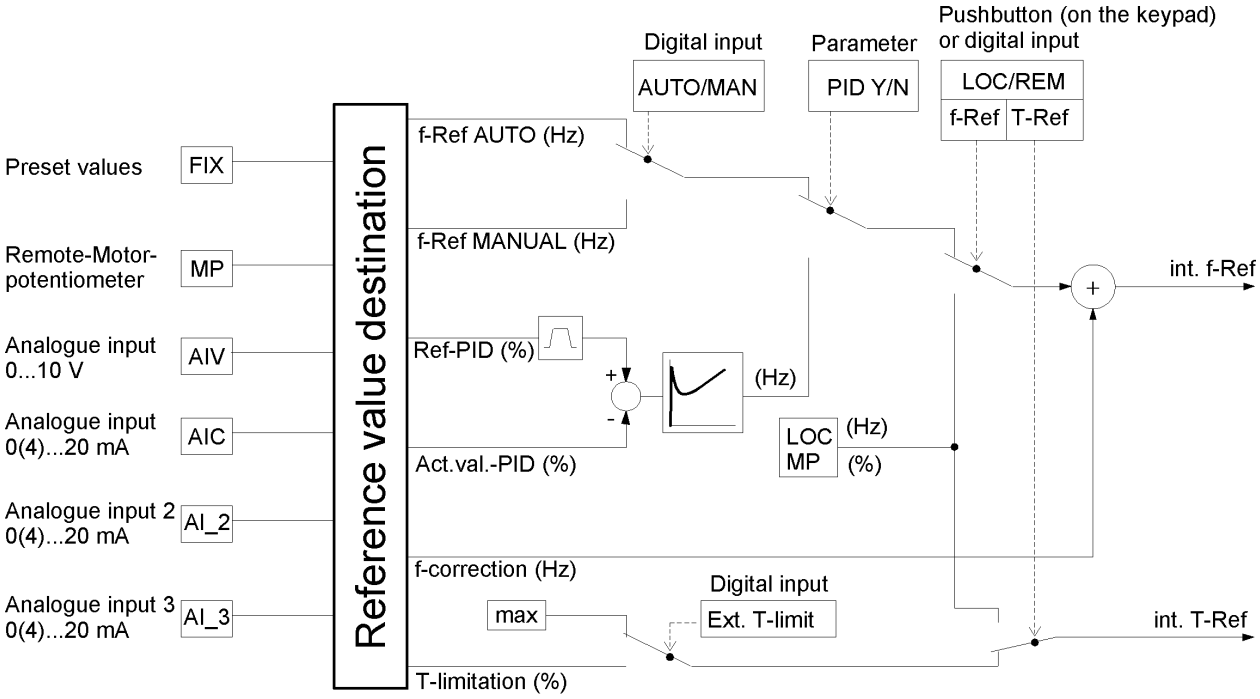
Configuration of the analogue inputs

D1.00	AIV destination	VICB	not used	see macro

0 . . . not used •	*Hz*
1 . . . f-ref MANUAL	*Hz*
2 . . . f-ref AUTO	*Hz*
3 . . . f-correction	*Hz*
4 . . . T-limitation	*%*
5 . . . Nom.val.-PID	*%*
6 . . . Act.val.-PID	*%*

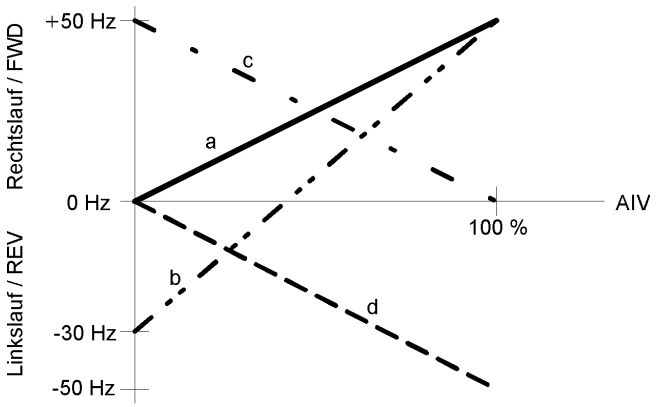
If single adjustments cannot be selected then they are used by one of the other reference sources or a bus-reference value !!

The analogue reference value AIV (0-10 V) is used as source for various ref. values (see picture) Parameter D1.00 assignes the corresponding function to the analogue input.



D1.01	AIV value 0 %	VCB	-300,0...***0,00***...300,0 Hz -200,0...***0,00***...200,0 %	see macro
D1.02	AIV value 100 %	VCB	-300,0...***0,00***...300,0 Hz -200,0...***0,00***...200,0 %	see macro

The parameters AIV-level assign a frequency range to the analogue input signal (0-10 V). Negative values have the meaning of anti-clockwise direction of rotation.



a ... 0-100 % corresponds to 0 to 50 Hz
b ... 0-100 % corresponds to -30 to 50 Hz
c ... 0-100 % corresponds to 50 to 0 Hz
d ... 0-100 % corresponds to 0 to -50 Hz

D1.03	AIV filtertime	VCB	0,00...***0,05***...10,00 s

To avoid high-frequent disturbances the digital reference value filter can be adjusted.

D1.04	AIC destination	VICB	f-ref AUTO see macro

0 . . . not used *Hz*
1 . . . f-ref MANUAL *Hz*
2 . . . f-ref AUTO • *Hz*
3 . . . f-correction *Hz*
4 . . . T-limitation *%*
5 . . . Ref.val.-PID *%*
6 . . . Act.val.-PID *%*

If single adjustments cannot be selected then they are used by one of the other reference sources or a bus-reference value !!

The analogue reference value AIC equals in it´s function to the reference value AIV, with the difference, that is is a current reference value 0(4)-20 mA. Details on adjustment see D1.00.

D1.05	AIC signal	VCB	4-20 mA

0 . . . 0-20 mA
1 . . . 4-20 mA •

The "LiveZero" signal 4-20 mA wire-break supervision can be adjusted with parameter E3.01.

D1.06	AIC value 0 %	VCB VCB	-300,0...***0,00***...300,0 Hz -200,0...***0,00***...200,0 %	see macro
D1.07	AIC value 100 %	VCB VCB	-300,0...***50,00***...300,0 Hz -200,0...***0,00***...200,0 %	see macro
D1.08	AIC filter time	VCB	0,00...***0,05***...10,00 s	

The functionality of the parameters D1.04 to D1.08 is the same as the parameters D1.00 to D1.03. See there for details.

D1.09	AI_2 destination	VICB	not used	see macro

0 . . . not used • *Hz*
1 . . . f-ref MANUAL *Hz*
2 . . . f-ref AUTO *Hz*
3 . . . f-correction *Hz*
4 . . . T-limitation *%*
5 . . . Ref.val.-PID *%*
6 . . . Act.val.-PID *%*

If single adjustments cannot be selected then they are used by one of the other reference sources or a bus-reference value !!

The analogue ref. value AI_2 corresponds to the current ref. value on the differential amplifier input on the option card IO1on the plug X2. It has the same function as AIV, with the difference, that it is a further current input 0(4)-20 mA. Details see D1.00.

D1.10	AI_2 signal	VCB	0-20 mA

0 . . . 0-20 mA •
1 . . . 4-20 mA

The "LiveZero" signal 4-20 mA wire-break supervision can be adjusted with parameter E3.01.

D1.11	AI_2 value 0 %	VCB VCB	-300,0...***0,00***...300,0 Hz -200,0...***0,00***...200,0 %	see macro
D1.12	AI_2 value 100 %	VCB VCB	-300,0...***0,00***...300,0 Hz -200,0...***0,00***...200,0 %	see macro
D1.13	AI_2 filter time	VCB	0,00...***0,05***...10,00 s	

The functionality of the parameters D1.09 to- D1.13 is the same as the parametern D1.00 to D1.03. See there for details.

D1.14	AI_3 destination	VICB	not used

0 . . . not used • *Hz*
1 . . . f-ref MANUAL *Hz*
2 . . . f-ref AUTO *Hz*
3 . . . f-correction *Hz*
4 . . . T-limitation *%*
5 . . . Ref.val.-PID *%*
6 . . . Act.val.-PID *%*

If single adjustments cannot be selected then they are used by one of the other reference sources or a bus-reference value !!

The analogue ref. value AI_3 corresponds to the current ref. value on the differential amplifier input on the optioncard IO1on the plug X3. It has the same function as AIV, with the difference, that it is the 3rd current input 0(4)-20 mA. Details see D1.00.

D1.15	AI_3 signal	VCB	0-20 mA

0 . . . 0-20 mA •
1 . . . 4-20 mA

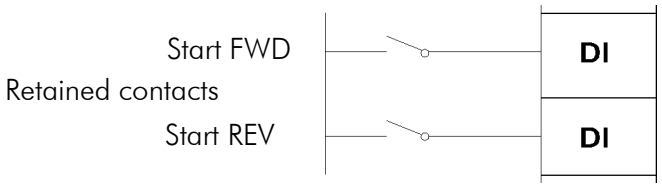
The "LiveZero" signal 4-20 mA wire-break supervision can be adjusted with parameter E3.01.

D1.16	AI_3 value 0 %	VCB VCB	-300,0...***0,00***...300,0 Hz -200,0...***0,00***...200,0 %
D1.17	AI_3 value 100 %	VCB VCB	-300,0...***0,00***...300,0 Hz -200,0...***0,00***...200,0 %
D1.18	AI_3 filter time	VCB	0,00...***0,05***...10,00 s

The functionality of the parameters D1.14 to D1.18 is the same as the parameters D1.00 to D1.03. See there for details.

D2 Digital inputs

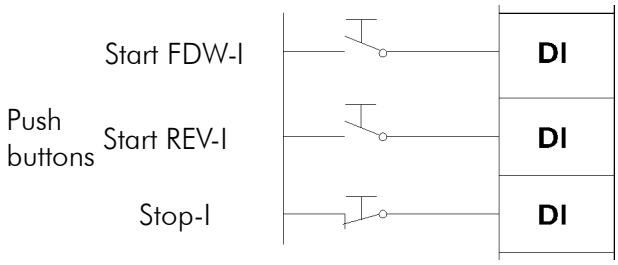
Configuration of digital inputs



Start/Stop via retained contacts:

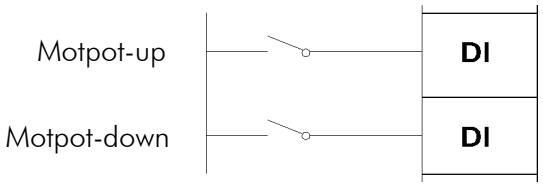
Closing the contact causes a start command in the corresponding direction, opening means a stop command. Simultaneous closing of Start FWD and Start REV will also cause a stop of the motor.

A queued start command will internallynot be influenced ⇨ restart after reset



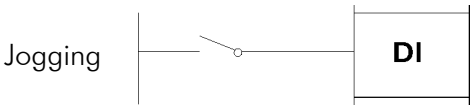
Start/Stop via pushbuttons:

A closing signal causes a start command in the corresponding direction. A opening signal releases a stop command. The start command will be automatically cancelled in case of one of the following situations: switch-off of the pulse release, trip switch-off or an under voltage condition longer than 2 seconds. A new start pulse is necessary.



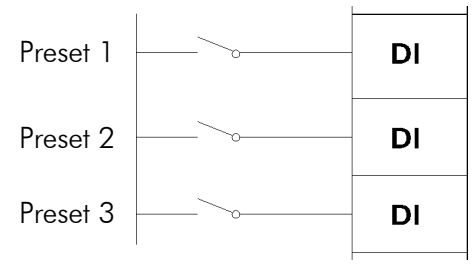
Remote motorpotentiometer:

The reference value setting via the remote motorpotentiometer is done with the retained contacts "Motpot up" and "Motpot down". The frequency is increased / decreased with the adjusted acceleration / deceleration ramp as long as the contact is closed. The motorpotentiometer can be configured in the matrixfield D6.



Jog mode:

If the jog command is assigned, the inverter will accelerate the motor with the fastest possible acceleration time up to the adjusted jog frequency C1.12. The jog function is locked if the inverter is not in the stop condition.

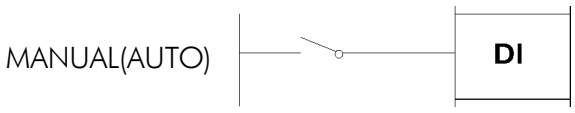


Preset reference values:

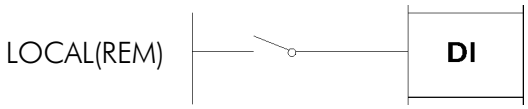
The selection of max. 8 preset reference values is done via the signals Preset 1-3 according to the following table:

Preset 1	Preset 2	Preset 3	Ref. value
0	0	0	1 (C1.04)
1	0	0	2 (C1.05)
0	1	0	3 (C1.06)
1	1	0	4 (C1.07)
0	0	1	5 (C1.08)
1	0	1	6 (C1.09)
0	1	1	7 (C1.10)
1	1	1	8 (C1.11)

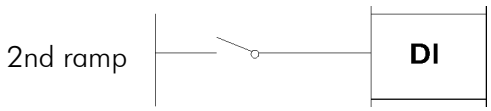
The number of digital inputs which should be programmed depends on the correct number of necessary preset speeds. The preset speed values are adjusted with the matrixfield C1. They are real ref. values and need a start/stop command for their correct function.



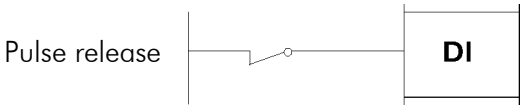
MANUAL(AUTO) switch over:
The command MANUAL(AUTO) switches between the ref.value sources "f-SW MAN" and "f-SW AUTO". If the terminal is not used or the command is not assigned, the automatic ref. value is active.



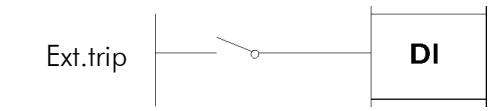
LOCAL(REM) switch over:
This function determines if the control is done via the keypad or the terminals. Factory default is, that the switch over is done with the LOCAL(REM) key on the keypad. If parameter E4.03 is set to "Terminal", the switch over is only possible via the terminals (i.e. for use with a remote switch in the cubicle door). If this function is not assigned or the contact is opened: REM, contact closed: LOCAL



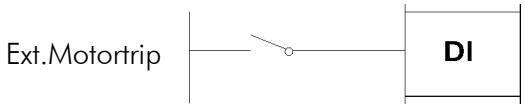
Switch over to 2nd ramps:
There are 2 sets of acceleration- / deceleration ramps available. The switch over from set 1 to set 2 is done with the signal "2nd ramp". The value for the acceleration/deceleration ramps has to be adjusted in the parameter group C2.
Contact closed: 2nd ramp



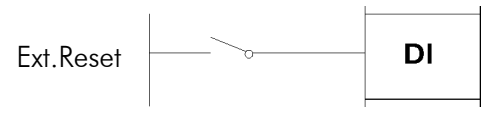
Pulse release:
Opening the switch "Pulse release" via the programmable terminal or via the hardware input DI5_2 will cause an immediate pulse inhibit of the motorsided transistors. If an ON command is assigned at this time it will be cleared. The display shows: PULSE INHIBIT.
Function not programmed or contact closed: Pulse release



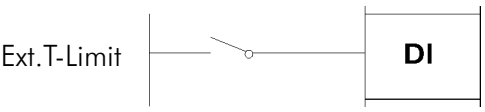
External trip:
If this command is assigned an immediate switch-off with the error code "Ext. trip" is performed. With this function it is possible to include various errors from outside of the frequency inverter. The function can be realized either with an opening or a closing contact (selection see E3.02).



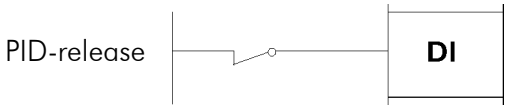
External motor trip:
The functionality equals to the external trip, but the error code indicates a motor fault. This function can be used in combination with bearing temperature measuring instruments, vibration detection units or motor temperature supervision tools like Click-Therms. The function can be realized either with an opening or a closing contact (selection see E2.11).



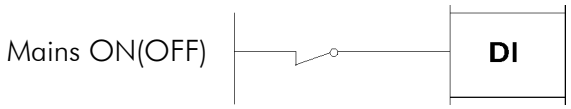
External reset:
Gives the possibility to reset any trip via the terminal. Reset at ON-flank. No effect to an inverter which is in the operating condition



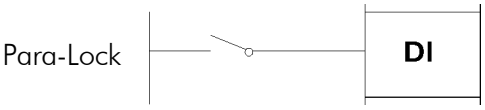
External torque limitation:
If this function is activated, the torque is limited to an external preadjusted value. This value is inputed via an own reference value source (see D1). The function is used for i.e. MASTER/SLAVE applications. Contact opened or command not assigned: not active, Contact closed: ext. T-limit active



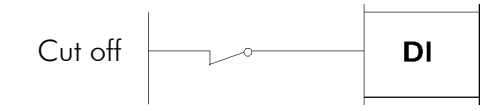
PID controller release:
This function gives the possibility to release the built-in process controller via a terminal. Contact opened: the PID output is set to 0 Hz, Contact closed or not used: PID controller released



Mains switch-off Mains ON(OFF):
In combination with the activated function "mains contactor control" (C6), this function causes an immediate pulse inhibit and therefore a mains switch-off. Used for emergency stop and mains switch-off signals. Contact opened: immediate pulse inhibit and following mains switch-off. The display shows: MAINS FREE.



Parameter lock:
This function activates/deactivates the parameter lock via the terminal. Therefore it is possible to prevent parameters to be changed by unauthorized personnel (i.e. via an external door switch). Contact opened: parameter setting is possible, Contact closed: parameter setting is locked



Cut-off:
This function gives the possibility to lock the operation of the frequency inverter in the remote mode (only in case of activated mains contactor control).
Contact opened: Operation possible in the local mode only (remote -> pulse inhibit and display message: cut-off)
Contact closed: Operation possible in either the local or the remote mode.

D2.00	DI1-destination	VICB	Start FWD	see macro

0 . . . not used
1 . . . Start FWD •
2 . . . Start REV
3 . . . Start FWD-Impulse
4 . . . Start REV-Impulse
5 . . . Stop-Impulse
6 . . . Mot.pot-high
7 . . . Mot.pot-low
8 . . . Jog
9 . . . Pre-set 1
10 . . Pre-set 2
11 . . Pre-set 3
12 . . Manual(Auto) — *Contact closed = manual reference (f-REF MANUAL)*
13 . . Local(Rem) — *Contact closed = local operation via keypad*
14 . . 2. ramp
15 . . Enable
16 . . EXT-trip — *additional selection of corresp. value in E3.02 necessary !*
17 . . EXT-motor trip — *additional selection of corresp. value in E2.11 necessary !*
18 . . EXT-reset
19 . . EXT-T-Limit
20 . . PID enable
21 . . Mains ON(OFF) — *only if mains contactor control function is activated*
22 . . Para-locked — *additional to F6.00*
23 . . Cut-off — *only if mains contactor control function is activated*

D2.01	DI2 destination	VIC	Start REV	see macro
D2.02	DI3 destination	VIC	2. ramp	see macro
D2.03	DI4 destination	VIC	EXT-reset	see macro
D2.04	DI6_2 destination	VIC	not used	see macro
D2.05	DI7_2 destination	VIC	not used	see macro
D2.06	DI8_2 destination	VIC	not used	see macro
D2.07	DI5_3 destination	VIC	not used	
D2.08	DI6_3 destination	VIC	not used	
D2.09	DI7_3 destination	VIC	not used	
D2.10	DI8_3 destination	VIC	not used	

The parameters D2.01 to D2.10 can have any value from the list of D2.00.

Double assignments are not possible.

D3 Analogue outputs

Configuration of the analogue outputs

D3.00	AO1 selection	VCB	f-output (ABS) see macro

0 . . . not used	
1 . . . f-output	*100 % = f_{MAX} (C3.01)*
2 . . . f-output (ABS) •	*100 % = f_{MAX} (C3.01)*
3 . . . Output current	*100 % = Motor nominal current (B3.01)*
4 . . . Torque	*100 % = Motor nominal torque (B3.00, B3.04)*
5 . . . Torque (ABS)	*100 % = Motor nominal torque (B3.00, B3.04)*
6 . . . Power	*100 % = Motor nominal power (B3.00)*
7 . . . Motor voltage	*100 % = Motor nominal voltage (B3.02)*
8 . . . n-output	*100 % = f_{MAX} in rpm (C3.01 x 60 / 2p)*
9 . . . n-output (ABS)	*100 % = f_{MAX} in rpm (C3.01 x 60 / 2p)*
10 . . int f-ref. value	*100 % = f_{MAX} (C3.01), after acceleration, before f_s compensation*
11 . . int T-ref. value	*100 % = Motor nominal torque*
12 . . Test min. value	*corresp. to AO min.val. 0 or 4 mA*
13 . . Test max. value	*corresp. to 20 mA*
14 . . Bus-Ref1	*100 % = 4000 hex*
15 . . Bus-Ref2	*100 % = 4000 hex*
16 . . Bus-Ref3	*100 % = 4000 hex*
17 . . Bus-Ref4	*100 % = 4000 hex*
18 . . Bus-Ref5	*100 % = 4000 hex*

Multi assignments are possible !!
That means that one analogue value can be assigned to several outputs.

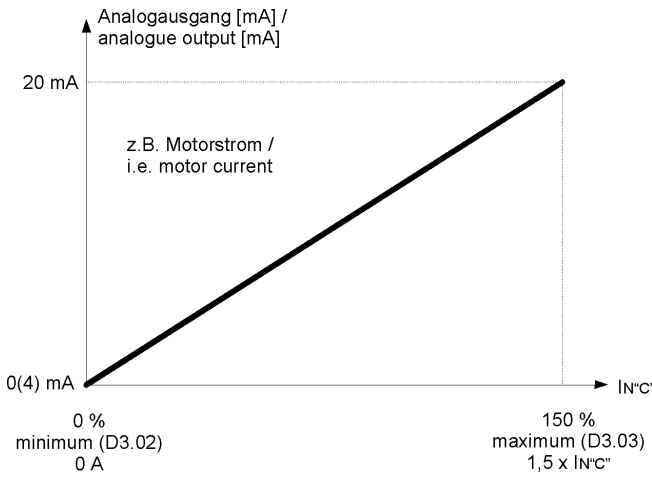
D3.01	AO1 signal	VCB	4-20 mA

0 . . . 0-20 mA
1 . . . 4-20 mA •

D3.02	AO1-min value	VCB	-200,0...***0,0***...200,0 %
D3.03	AO1-max value	VCB	-200,0...***100,0***...200,0 %

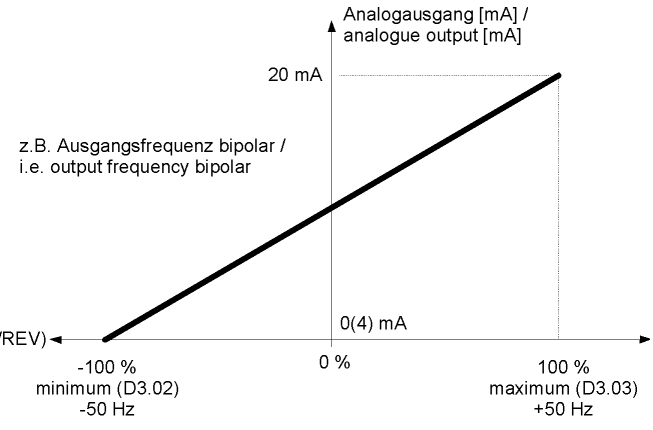
This parameters configures the analogue output. The value selected with D3.00 (pay attention to the corresponding standardization) is available for external display as a 0(4)-20 mA signal. The adjustment of the analogue output is done with the parameters D3.02 = 0(4) mA and D3.03 = 20 mA.

Typical adjustment for: 2; 3; 5; 7; 9



100 % = fMAX = z.B. 50 Hz
minimum = 0(4) mA ≙ 0 % (0 % x IN)
maximum = 20 mA ≙ 150 % (150 % x IN)

Typical adjustment for: 1; 4; 6; 8; 10; 11; 14-18



100 % = fMAX = z.B. 50 Hz
minimum = 0(4) mA ≙ -100 % (-50 Hz)
maximum = 20 mA ≙ 100 % (+50 Hz)

D3.04	AO2_2-selection	VCB	not used see macro
	For adjustment see D3.00. Analogue output of option card IO1 on plug X2.		
D3.05	A02_2-signal	VCB	4-20 mA
	For adjustment see D3.01.		
D3.06	AO2_2-min value	VCB	-200,0...***0,0***...200,0 %
D3.07	AO2_2-max value	VCB	-200,0...***100,0***...200,0 %
	For adjustment see D3.02 and D3.03.		
D3.08	AO2_3-selection	VCB	not used
	For adjustment see D3.00. Analogue output of option card IO1 on plug X3.		
D3.09	A02_3-signal	VCB	4-20 mA
	For adjustment see D3.01.		
D3.10	AO2_3-min value	VCB	-200,0...***0,0***...200,0 %
D3.11	AO2_3-max value	VCB	-200,0...***100,0***...200,0 %
	For adjustment see D3.02 and D3.03.		

D4 Digital outputs

Configuration of the digital outputs

Following digital outputs are available:
1 x 24 V voltage output, max. 150 mA
1 x relay output "both way"
2 x relay output "both way" (option card IO1 on plug X2)
2 x relay output "closer" (option card IO1 on plug X3)

The following functions can be selected with the digital outputs:

Condition	relay is energized...
Ready	... if no error is occured and the drive is not running. (see E3.03)
RUN	... if the inverter has accepted a start command or in case of a controlled deceleration.
Trip	... if a trip occurs and is not reseted
Ready & RUN	... if the inverter is in the ready or the RUN condition (see E3.03)
Warning	... as long as a programmed warning is present (E2.01, E2.09)
Generator RUN	... if the motor is in the generator condition
Mains-ON	... if mains ON is assigned and the "mains contactor control" function (C6.00) is active
LOCAL	... as long as the drive is running in the LOCAL mode
f>fLEVEL	... if the output frequency is higher than "f-Level ON" D4.06 (it is de-energized if the frequency is below "f-Level OFF" D4.07)
Take off brake	... if the mechanical brake should be opened (crane function C6.01 to C6.04)
Outp.-logic 1	... if the conditions of logic block 1 are fullfilled (F4.00 to F4.10)
Outp.-logic 2	... if the conditions of logic block 2 are fullfilled (F4.11 to F4.21)
Thyristor-ON	... if the charging process of the D.C.link is finished (for controlling an external charging circuit or a regenerating unit)
Bus STW. 11	... if the free bit 11 in the bus control word is 1
Bus STW. 12	... if the free bit 12 in the bus control word is 1
Bus STW. 13	... if the free bit 13 in the bus control word is 1
Bus STW. 14	... if the free bit 14 in the bus control word is 1
Bus STW. 15	... if the free bit 15 in the bus control word is 1

D4.00	+24 dig. output	VCB	24 V-int. voltage

0 . . . not used
1 . . . Ready
2 . . . RUN
3 . . . Trip
4 . . . Ready & RUN
5 . . . Warning
6 . . . Generator RUN
7 . . . Mains-ON
8 . . . Local operation
9 . . . f>fLevel
10 . . Take of brake
11 . . Outp. logic 1
12 . . Outp. logic 2
13 . . Thyristor ON
14 . . Bus Cont-W 11
15 . . Bus Cont-W 12
16 . . Bus Cont-W 13
17 . . Bus Cont-W 14
18 . . Bus Cont-W 15

Digital output: 24 V, 150 mA

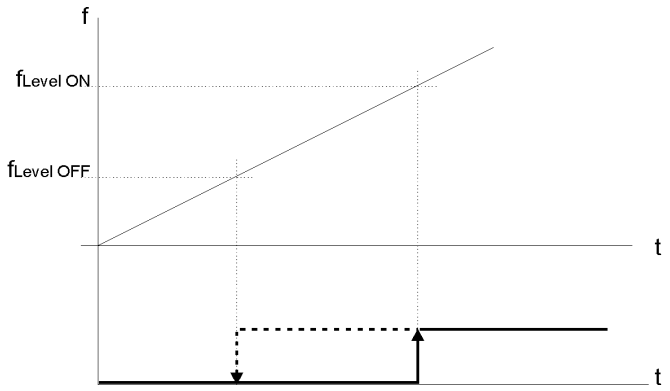
19 . . 24 V-int. voltage • (D4.00) *Auxillary voltage: 24 V, 150 mA*

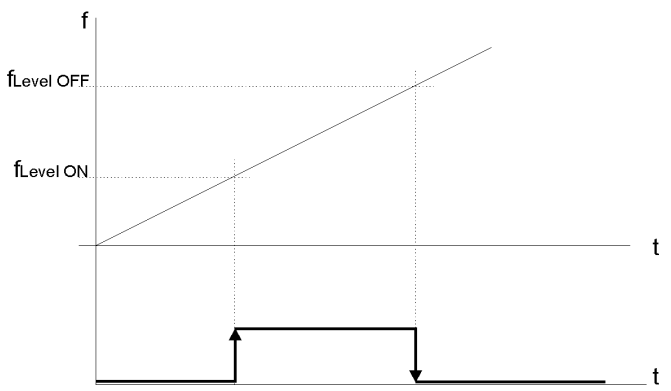
D4.01	Relay output 1	VCB	Ready & Run	see macro
D4.02	Relay output 2_2	VCB	not used	see macro
D4.03	Relay output 3_2	VCB	not used	see macro
D4.04	Relay output 2_3	VCB	not used	
D4.05	Relay output 3_3	VCB	not used	

The adjustments of parameter D4.01 to D4.05 are listed in D4.00.
Multi assignments are possible !! That means: more than one relay can show the same condition.

D4.06	f-Level ON	VCB	0,00...***0,00***...300,0 Hz
D4.07	f-Level OFF	VCB	0,00...***0,00***...300,0 Hz

The limits for the digital message "f>fLevel" are adjusted with these parameters.





D6 Electronic Motorpot.

LOCAL and REMOTE motorpotentiometer

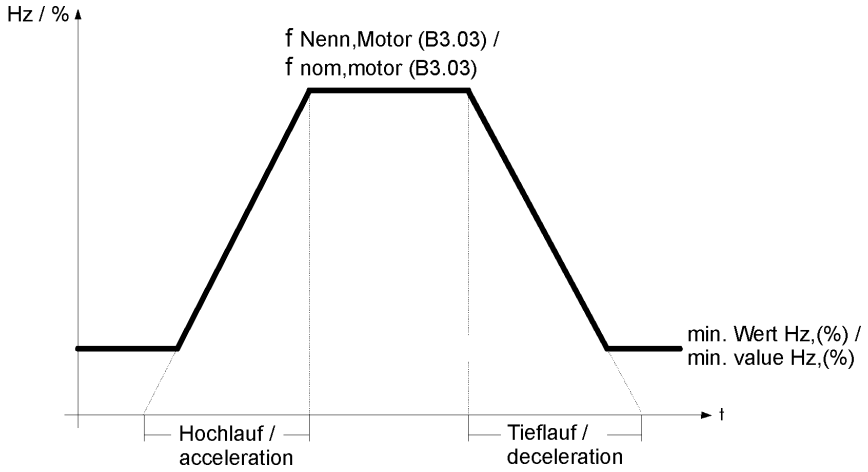
There are the LOCAL motorpotentiometer on the keypad and the REMOTE motorpotentiometer on the terminals available.

D6.00	LOC/MP-destination	VICB	f-ref. value

0 . . . f-ref. value • *Hz*
1 . . . T-ref. value *%*

The local motorpot can be the source for either the frequency ref. value or the torque ref. value. Corresponding to the usage the unit is automatically changed (f-Ref in Hz, T-Ref in %).

D6.01	LOC/MP-min value	VCB	0,00...***0,00***...300,0 Hz 0,00...***0,00***...200,0 %
D6.02	LOC/MP-max value	VCB	0,00...***50,00***...300,0 Hz 0,00...***100,0***...200,0 %
D6.03	LOC/MP-accel time	VCB	0,0...***10,0***...160,0 s
D6.04	LOC/MP-decel time	VCB	0,0...***10,0***...160,0 s



The acceleration and deceleration time is the time (s), which the motorpotentiometer needs to run through the frequency range from 0 Hz to $f_{NOM,MOTOR}$ (B3.03).

D6.05	Loc ref. storage	VCB	not active

0 . . . not active •
1 . . . active

If "SW-storage-active" is selected the adjusted ref.value is stored in case of a stop command and also in case of mains switch off.
This will cause the drive to ramp up to the adjusted reference value after a new start command.

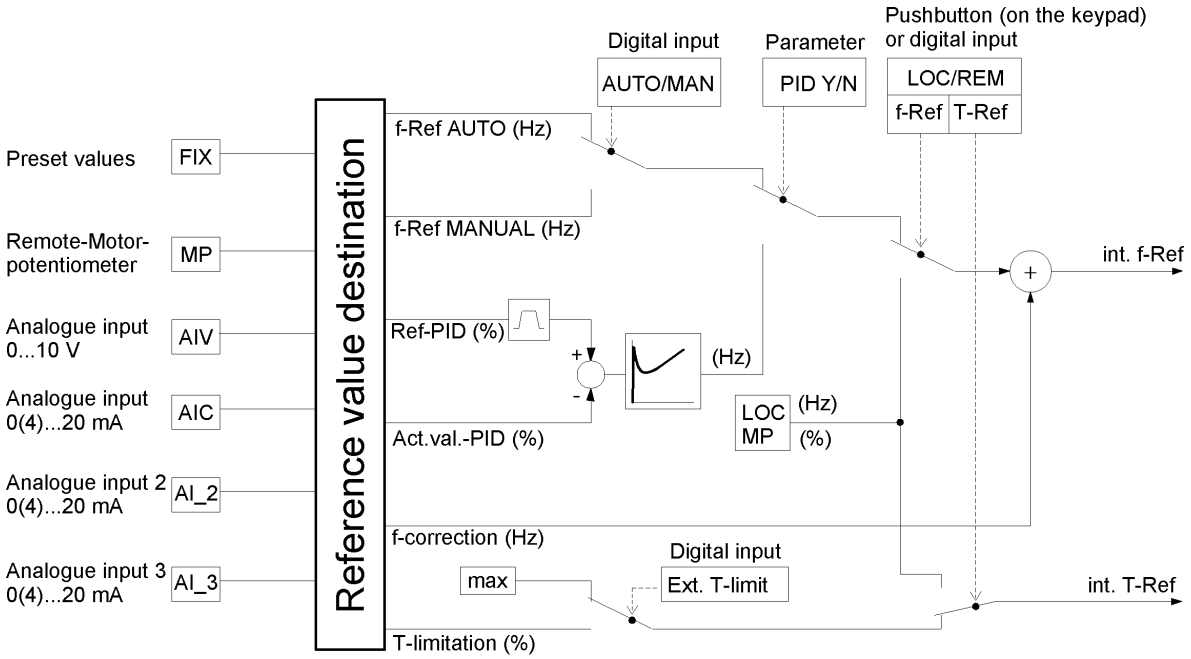
D6.06	REM/MP-destination	VICB	not used

0 . . . not used • *Hz*
1 . . . f-Ref MANUAL *Hz*
2 . . . f-Ref AUTO *Hz*
3 . . . f-correction *Hz*
4 . . . T-limitation *%*
5 . . . Ref.val.-PID *%*

If single adjustments cannot be selected then they are used by one of the other reference sources or a bus-reference value !!

The remote motorpotentiometer can be used as a source for various reference values. Parameter D6.07 assignes a selectable function to the motorpot. To use the motorpot 2 digital inputs have to be set to the functions „motpot-high" and „motpot-low" (see D2.00 to D2.10).

The remote motorpotentiometer can be used as source for either the frequency ref.value, f-correction reference value or torque limitation reference value or PID reference value. Corresponding to the destination the unit has to be changed also (f-Ref.val., f-correction in Hz / T-limitation, PID ref.val. in %).



D6.07	Rem/MP-min value	VCB	0,00...***0,01***...300,0 Hz 0,00...***0,01***...200,0 %
D6.08	Rem/MP-max value	VCB	0,00...***0,01***...300,0 Hz 0,00...***0,01***...200,0 %
D6.09	Rem/MP accel time	VCB	0,00...***10,00***...160,0 s
D6.10	Rem/MP decel time	VCB	0,00...***10,00***...160,0 s

The acceleration and deceleration time is the time (s), which the motorpotentiometer needs to run through the frequency range from 0 Hz to $f_{NOM,MOTOR}$. See parameter D6.03 / D6.04.

D6.11	Rem ref. storage	VCB	not active

0 . . . not active •
1 . . . active
If "Ref.-storage active" is selected the adjusted reference value is stored in case of a stop command and also at mains switch off. This will cause the drive to ramp up to the adjusted reference value after a new start command.

Chapter E: Drive

E1	Overload limitation	Max overload	Page 57
E2	Motor protection	Thermistor input, thermistor protection, electron. motor protection, stall protection, overspeed protection	Page 57
E3	Trip, Reset	Autoreset, 4 mA supervision, external trip, Ready message, undervoltage, reset	Page 60
E4	Release, control	Ref.value source, control source, stop key, LOCAL/REMOTE switch over	Page 61
E5	Frequency lock out	Lock out frequency, hysteresis	Page 62
E6	Pulsefreq.	Min. pulse frequency, max. pulse frequency	Page 63

E Drive

Adaptation of the frequency inverter to the plant concept

E1 Overload limit

Maximum inverter overload

E1.00	Max. value	VCB	10...***150***...150 %	see macro

This parameter sets the maximum current overload capability in % of the inverter nominal current, version "C" (high overload). At maximum heatsink temperature, 150 % of the nominal current are available for 1 in 10 minutes in the frequency range > 10 Hz. For protection of the inverter and to avoid and switch-off, the current is reduced to 120 % $I_{N"C"}$ after the time has expired. In case of lower heatsink temperatures no current limitation will step in. The maximum heatsink temperature depends on the actual pulse frequency (see pulse frequency automaticparameter E6.00, E6.01). If the maximum value (E1.00) is adjusted lower than 120 % $I_{N"C"}$, no further temporal limitation of the load current will be done.

(At PSR2.03 this parameter is locked in case of pulse release !!)

E2 Motor protection

Motor specific protections

E2.00	Thermistor input	VCB	not active

0 . . . not active • *thermistor input not used*
1 . . . Ready / RUN *Thermistor is connected, a fault will be detected during the Ready- and RUN-condition*
2 . . . RUN *a fault will be detected during the RUN-condition only*

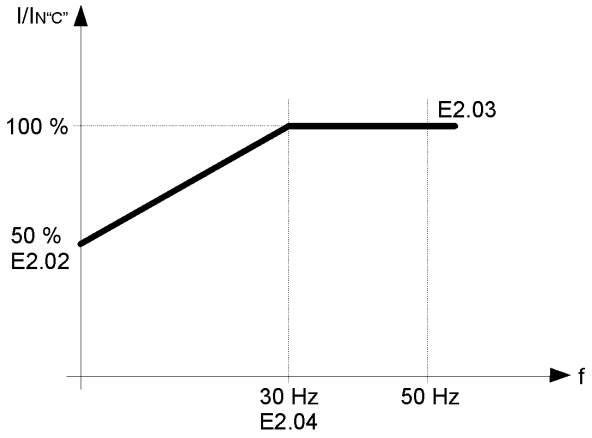
E2.01	Thermistor protection	VCB	Trip

0 . . . Trip •
1 . . . Warning

The supervision of the motor temperature with a thermistoren can be assessed as a trip or a warning. The difference is, that the trip-message will cause the inverter to be switched off and the warning not. A digital output has to be set to „warning" and the information must be processed externaly.

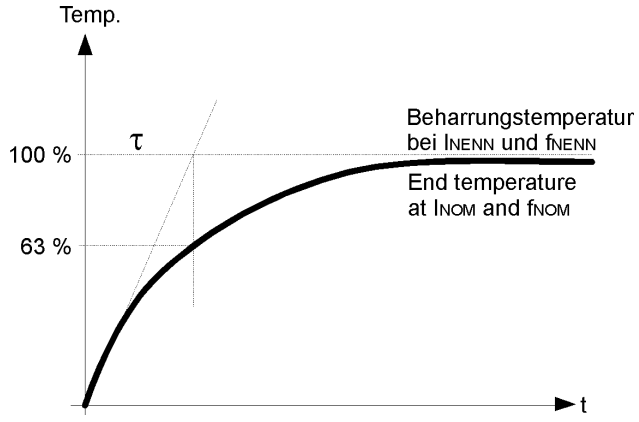
Motor protection - thermal motor model with current limitation

As distinct from the overload limitation (parameter E1.00) which is an overload protection for the inverter, the thermal motor model determines the heating up of the motor. This is done by knowledge of the maximum continuous current in the point of nominal operation and at zero speed under consideration of the thermal time proportion and the actual speed (cooling proportions). In case of an overload the motor current will be reduced onto the value adjusted under paramter E2.03. This will cause a speed reduction and for loads with a squared torque (i.e. pumps and fans) stabilized point of operation. If this will not succeed, i.e. drives with constant torque, the output frequency will be reduced down to 0 Hz. If this condition remains for longer than the adjusted stalling time (parameter E2.06), with a frequency lower than the adjusted stalling frequency (parameter E2.07), the inverter will trip with the indication „motor overload".



Reduced cooling for forced-cooled motors !!
Current-/speed characteristic

E2.02	I max at 0 Hz	VICB	0...***31***...150 %	see macro
E2.03	I max at f nom	VICB	0...***100***...150 %	
	100 % corresponds to the motor nominal current (see B3.01).			
E2.04	Therm. f-limit	VICB	0...***30***...300 Hz	



Thermal motor characteristic

E2.05	Motor time constant	VCB	0...***5***...3200 min	

The thermal motor time constant τ describes the motors behaviour when storing heat. In case of nominal operation (I_N and f_N) it will need appr. 4 to 5 time constants to reach the inertia temperature. The factory default of the time constant is low (5 min) to guarantee a motor protection even in case of regular mains loss. When required please consult your motor supplier for the correct value or take it from the following table as a guide number.

Size of motor / Pole number	160 - 200	225 - 280	315 - 400
2, 4-poled	45 min	50 min	60 min
6, 8-poled	60 min	80 min	100 min

The electronic motor protection will be set back to a „cold motor" if the power supply is switched off.

If the adjustment of parameter E2.05 is increased, it is necessary to supply the inverter electronic by a safe 24 V buffering voltage via the terminals P24 and P0V.

E2.06	Stalling time	VCB	0...***60***...160 s
E2.07	Stalling frequency	VCB	0...***5***...20 Hz
E2.08	Stalling current	VCB	0...***80***...150%

100% corresponds to the motor nominal current (see B3.01). A stalled or highly overloaded motor is detected if it works with an output frequency lower than the stalling frequency, with a current higher than the stalling current and for a working period longer than the stalling time. The inverter switches off with the indication „stalling".

E2.09	n>> protection	VCB	Trip

0 . . . not active
1 . . . Trip •
2 . . . Warning

The overspeed protection can be adjusted either as trip or as warning. It is also possible to monitor the motor speed during the pulse inhibit-condition. (message for active load conditions). The warning signal has a hysteresis of 100 rpm.

E2.10	n max motor	VC	0...***3200***...18000 rpm

Supervised maximum motor speed in revolutions per minute. The factory default of 3200 rpm corresponds to a 2-poled motor running up to 50 Hz. For other pole numbers or higher output frequencies the value has to be changed in a corresponding way !

E2.11	Ext. motor trip	VCB	not active

0 . . . not active •
1 . . . N.O. ready + RUN
2 . . . N.O. RUN
3 . . . N.C. ready + RUN
4 . . . N.C. RUN

For detecting an external motor trip i.e. bearing temperature-measuring units or vibration supervision units can be included via opening- (N.C.) or closing contacts (N.O.). Selecting "ready" causes the message to be displayed in the ready- and RUN condition, selecting "RUN" only in the RUN condition.

E3 Trip, Reset

Various reset functions, drive protection

E3.00	Autoreset 3x	VC	not active

0 . . . not active •
1 . . . active

If autoreset is activated, the inverter automatically trys to restart the drive after a trip event. This process will be repeated 3 times in 5 minutes, then the drive will be switched off.
In case of a queued start command and auto-reset onto a „fleeting" trip automatic restart is performed !!

E3.01	4 mA-supervision	VCB	not active

0 . . . not active •
1 . . . always active
2 . . . Ready + RUN
3 . . . at RUN

Even not used analogue inputs (4...20 mA) are checked !!!

All analogue values with the setting "4-20 mA signal" will be supervised. The supervision is done corresponding to E3.01 in the ready- and RUN condition or in the RUN condition only.

E3.02	Ext-trip	VCB	not active	see macro

0 . . . not active •
1 . . . N.O. ready + RUN
2 . . . N.O. RUN
3 . . . N.C. ready + RUN
4 . . . N.C. RUN

For detecting an external trip i.e. drive specific faults like overpressure can be included via an opening- (N.C.) or closing contact (N.O.). Selecting "ready" causes the message to be displayed in the ready- and RUN condition, selecting "RUN" only in the RUN condition.

E3.03	Ready message	VCB	at mains voltage

0 . . . at mains voltage •
1 . . . at 24 V-voltage

The ready message is displayed if: • the D.C. link is charged (existing mains voltage), • no fault occurs and • no start command is released
Parameter E3.03 can select if the ready message is also displayed, if the 24 V auxillary supply is present without mains voltage (i.e. in case of active mains contactor control function).

E3.04	Undervoltage	VCB	no trip

0 . . . no Trip •
1 . . . Trip during operation

In the factory default setting an undervoltage is not stored as a trip. That means that if the voltage comms back and a start command is queued the inverter will start immediately. Selecting U << = trip means, that the inverter must be resetted before it can be started again. Usage for drives, where it is not allowed to have an automatic start (i.e. human protection).

E3.05	Local reset	VCB	active

0 . . . not active
1 . . . active •

This parameter selects, if the red "stop/reset"-key on the keypad has a reset function or not. Default = active.

E4 Control enabled

Selection of the operating mode

E4.00	Ref.value source	VICB	Local + Remote

0 . . . Local + Remote • *Ref.value via keypad and terminals*
1 . . . Local *Ref.value via keypad only*
2 . . . Remote *Ref.value via terminals only*

With this parameter the following reference value sources can be released for operation:
LOCAL local motorpotentiometer, FWD run, REV run (on the keypad)
REMOTE analogue reference value AIV, AIC, AI_2, AI_3, preset speeds and remote motorpotentiometer

E4.01	Control source	VICB	Local + Remote

0 . . . Local + Remote • *Control signals via keypad and terminals*
1 . . . Local *Control signals via keypad only*
2 . . . Remote *Control signals via terminals only*

With this parameter the various control sources can be released for operation:
LOCAL start-, stop keys, FWD and REV key (on the keypad)
REMOTE start FWD, start REV, start FWD-I, start REV-I and stop-I

The following control possibilities can be realized with E4.00 and E4.01:

Mode of operation	Parameter adjustment		Loc/Rem switch-over
	Ref. source	CTRL source	
Local and Remote operation released	Loc/Rem	Loc/Rem	active
Remote operation released only	Rem	Rem	no effect
Local operation released only	Loc	Loc	no effect
Ref.value via LOC motorpot, Start/Stop via remote terminals	Loc	Rem	no effect *)
Ref.value via remote terminals, Start/Stop via local keypad	Rem	Loc	no effect *)

Other adjustments as mentioned above are not allowed !!
*) The change of the sense of rotation is assigned to the reference value source !!

E4.02	STOP key	VCB	local active only

0 . . . loc. active only •
1 . . . always active

Selecting "Stop key always active" will cause, that the stop key on the keypad is active in each operation mode. Only functional, if an impulse command is assigned.

E4.03	Loc/Rem switch	VICB	keypad

0 . . . Keypad •
1 . . . Terminals

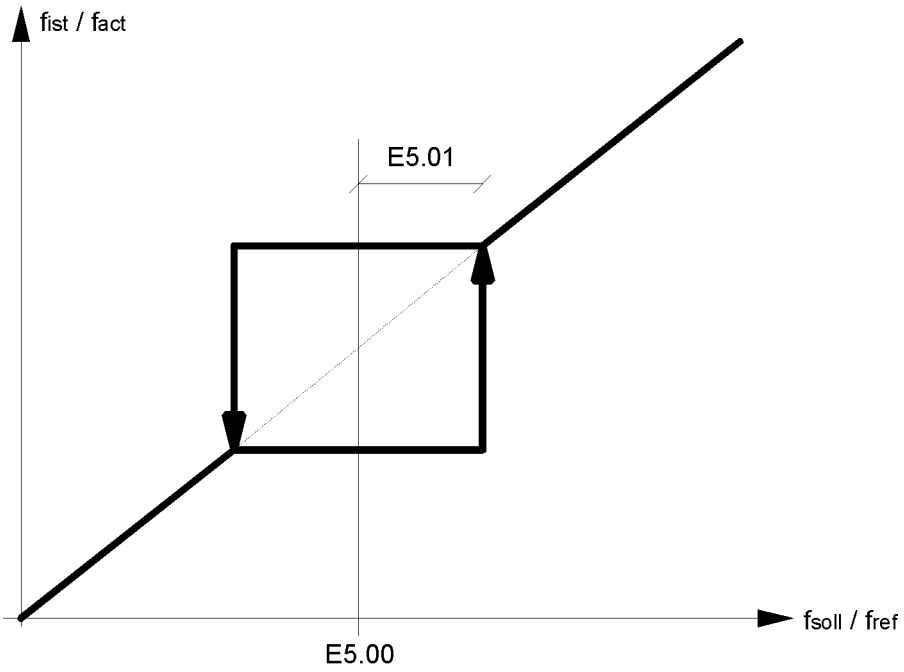
Selecting "Loc/Rem switch over - terminals" will cause, that the Loc/Rem key on the keypad is locked. The switch over can only be performed via a terminal signal (see D2).

E5 Skip frequencies

Avoiding frequency resonances in the drive

E5.00	Skip frequency	VCB	5,00...***5,00***...300,0 Hz
E5.01	Hysteresis	VCB	0,00...***0,00***...4,00 Hz

This parameter adjusts the frequency, where it is not allowed to operate the drive stationary. The adjusted value of the hysteresis determines the locked-out frequency range and is effective symmetrical to the lock out frequency.



E6 Switching frequency

Adaptation of the pulse frequency automatic

E6.00	Min. pulse frequency	VCB	2,5 kHz

0 . . . 2,5 kHz •
1 . . . 5,0 kHz
2 . . . 10,0 kHz

E6.01	Max. pulse frequency	VCB	2,5 kHz

0 . . . 2,5 kHz •
1 . . . 5,0 kHz
2 . . . 10,0 kHz

The inverter has a self-adapting pulse frequency automatic. The pulse frequency will be adjusted dependent on the measured heatsink temperature. In case of high load and simultaneous high heatsink temperature the pulse frequency will be decreased in steps, starting with the maximum value (E6.01) to the minimum value (E6.00). Therefore the unit operates completely failsafe. The motor noises are increased with decreasing pulse frequency. If it is necessary to restrict the allowed pulse frequency or to switch off the automatic, this can be done with the parameters E6.00 and E6.01. To keep the noises onto the motor cable and the thermal load of the options CE-filter and AMF as low as possible the factory default setting is always the lowest pulse frequency.

Chapter F: Service

F Service

Help function , factory default, trip memory, Code lock

F1 Help

Help for occured trips

F1.00	Test - power part	VICB	Routine

0 . . . Start 0 ⇨ 1 *Start of the routine by setting to row "1"*
1 . . . testing
2 . . . No earth fault
3 . . . Earth fault

This routine is used to detect motor-sided earth faults on the frequency inverter. If the routine is activated all three IGBTs of one motor-sided half-bridge are switched on for a short time.
If an overcurrent occurs during the test the inverter will indicate „earth fault". In case of activated mains contactor control function the mains contactor will be switched on for appr. 1 second during the test.

F1.01	Test - control part	VICB	Routine

0 . . . Start 0 ⇨ 1 *Start of the routine by setting to row "1"*
1 . . . testing
2 . . . Fault
3 . . . No fault

The routine will release a self-test of the inverter´s electronic and finally boot it again. Units with charged D.C.link will send data from the drive control (AR) to the user-interface (UI). Also data are transmitted from the UI to the optional PCB PBO1 (profibus connection).

F1.02 to F1.22

The parameters F1.02 to F1.22 contain descriptions and/or remedy measurements for the single trip messages. A complete list of all trip codes can be read in the appendix.

F2 Factory default

Setting of factory default values

If the mains voltage is missing (e.g. activated function „mains contactor control“ C6.00) the autotuning data will not be set back.

F2.00	Factory default	VICB	Routine

0 . . . Deletes all
1 . . . user specific
2 . . . parameter data
3 . . . Start 3->4 Start of the routine by setting to row “4”
4 . . . Factory default
5 . . . O.K.

This routine sets all parameters back to their factory default value.

All customer specific changes, except the trip memory, the operating hours, the kWh-meter, the language selection and the USER-macro, will be cleared !

F3 Failure memory

Display of last fault and number of faults

F3.00	Trip cause	read only	”last fault”
F3.01	Current number	read only	”fault counter”

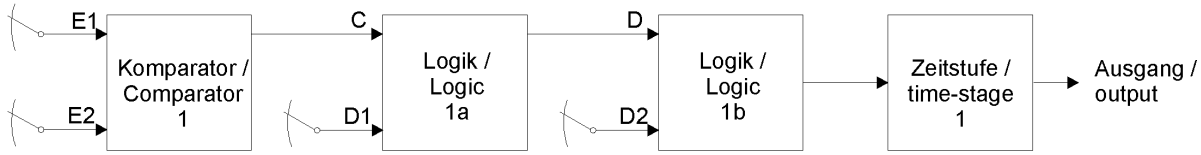
F4 Configu-ration

Logic block 1 and 2

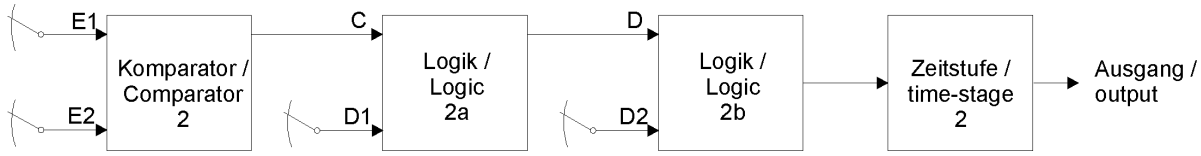
The logic blocks are designed as analogue comparator-stages with 2 digital link functions. The outcoming signal now passes an adjustable time-stage and can be outputted via relays. The logic blocks supply extensive functions for supervision and control of the frequency inverter.

Schematics:

Logikblock 1 / logic block 1 (Parameter F4.00 - F4.10)



Logikblock 2 / logic block 2 (Parameter F4.11 - F4.21)



In the comparator two analogue values are compared corresponding to the adjusted function and then disposed as digital information to the 1st link function (logic a). The logic a now combines the comparator-output signal with the digital signal D1 - again via a programmable function - and disposes the result as input signal to the logic b. A further combination with the digital signal D2 is possible. The output of the digital link function b is assigned via an adjustable time-stage to a digital output (relay) and is now available as digital signal on the terminals. For selection of the relay output the parameters D4.00 to D4.05 are used.

F4.00	Comparator 1 E1	VCB 0,0 %
	0 . . . 0,0 % •	
	1 . . . f-output	*100 % = f_{MAX} (C3.01)*
	2 . . . f-output (ABS)	*100 % = f_{MAX} (C3.01)*
	3 . . . Output current	*100 % = motor nominal current (B3.01)*
	4 . . . Torque	*100 % = motor nominal torque (B3.00, B3.04)*
	5 . . . Torque (ABS)	*100 % = motor nominal torque (B3.00, B3.04)*
	6 . . . Power	*100 % = motor nominal power (B3.00)*
	7 . . . Heatsink Temp.	*100 % = 100° C*
	8 . . . Pulse frequency	*100 % = f_{MAX} in rpm (C3.01 x 60 / 2p)*
	9 . . . Speed	*100 % = f_{MAX} in rpm (C3.01 x 60 / 2p)*
	10 . . Speed (ABS)	*100 % = f_{MAX} in rpm (C3.01 x 60 / 2p)*
	11 . . PID-ctrl deviation	*100 % = 100 %*
	12 . . int f-ref.value	*100 % = f_{MAX} (C3.01), after acceleration, before f_s compensation*
	13 . . int f-ref.val. (ABS)	*100 % = f_{MAX} (C3.01), after acceleration, before f_s compensation*
	14 . . int T-ref.value	*100 % = motor nominal torque (B3.00, B3.04)*
	15 . . AIV	*100 % = 100 % or 100 % = 163,84 Hz (A4.01)*
	16 . . AIC	*100 % = 100 % or 100 % = 163,84 Hz (A4.03)*
	17 . . AI_2	*100 % = 100 % or 100 % = 163,84 Hz (A4.05)*
	18 . . AI_3	*100 % = 100 % or 100 % = 163,84 Hz (A4.07)*

F4.01	Comparator 1 E2	VCB	Reference value
	0 . . . Reference value (%) •	*adjustable with F4.02*	
	1 . . . AIV	*100 % = 100 % or 100 % = 163,84 Hz (A4.01)*	
	2 . . . AIC	*100 % = 100 % or 100 % = 163,84 Hz (A4.03)*	
	3 . . . AI_2	*100 % = 100 % or 100 % = 163,84 Hz (A4.05)*	
	4 . . . AI_3	*100 % = 100 % or 100 % = 163,84 Hz (A4.07)*	
	5 . . . Preset ref.value	*100 % = 100 % or 100 % = 163,84 Hz (A4.08)*	
	6 . . . REM-MP ref.value	*100 % = 100 % or 100 % = 163,84 Hz (A4.10)*	

F4.02	Comp. 1 reference	VCB	-200,0...***0,0***...+200,0 %

Disposes a programmable reference value for the comparator E2.

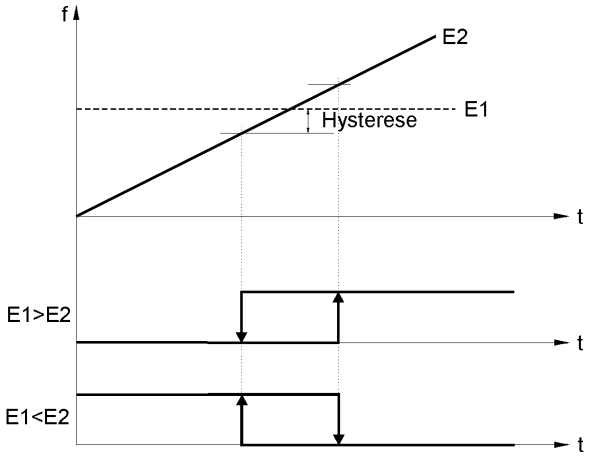
F4.03	Comp. 1 function	VCB	E1 > E2

0 . . . E1 > E2 •
1 . . . E1 < E2
2 . . . E1 = E2
3 . . . E1 ≠ E2

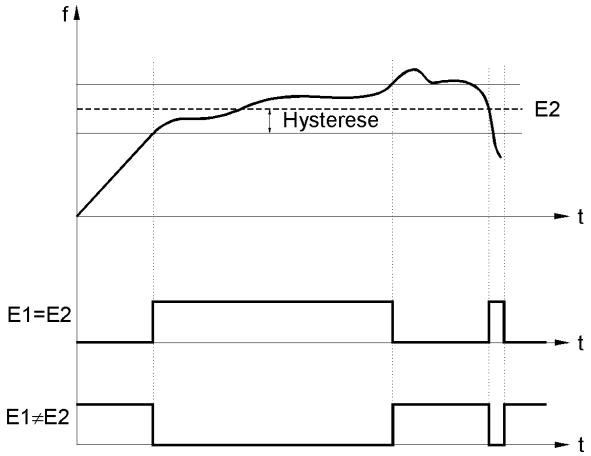
F4.04	Comp. 1 Hyst/Band	VCB	0,0...***5,0***...100,0 %

The comparator function (F4.03) determines the compare criterion of the two analogue input units (E1, E2). By help of the symmetrical working hysteresis / bandwidth (F4.04) the following output conditions are possible.

E1>E2 or E1<E2



E1=E2 or E1≠E2



F4.05	logic block 1a D1	VCB	Logic ZERO
F4.06	logic block 1b D2	VCB	Logic ZERO

	Logic ONE if:
0 . . . Logic ZERO •	*never*
1 . . . Ready	*ready*
2 . . . RUN	*running*
3 . . . Trip	*tripped*
4 . . . Ready + RUN	*ready, running*
5 . . . Warning	*a warning is queued*
6 . . . Generator RUN	*motor runs in generatoric condition*
7 . . . Local operation	*local operation is selected*
8 . . . f = fref	*reference frequency is reached*
9 . . . f > flevel	*see D4.06, D4.07*
10 . . Start pulse	*4 seconds pulse after the start command*
11 . . DI1	*controlled DI1*
12 . . DI2	*controlled DI2*
13 . . DI3	*controlled DI3*
14 . . DI4	*controlled DI4*
15 . . DI5_2	*controlled DI5_2*
16 . . DI6_2	*controlled DI6_2*
17 . . DI7_2	*controlled DI7_2*
18 . . DI8_2	*controlled DI8_2*
19 . . DI5_3	*controlled DI5_3*
20 . . DI6_3	*controlled DI6_3*
21 . . DI7_3	*controlled DI7_3*
22 . . DI8_3	*controlled DI8_3*
23 . . Logic ONE	*ever*
24 . . Lift brake	*take off the brake (see crane function C6.01)*
25 . . Thyristor-ON	*D.C.link is charged*

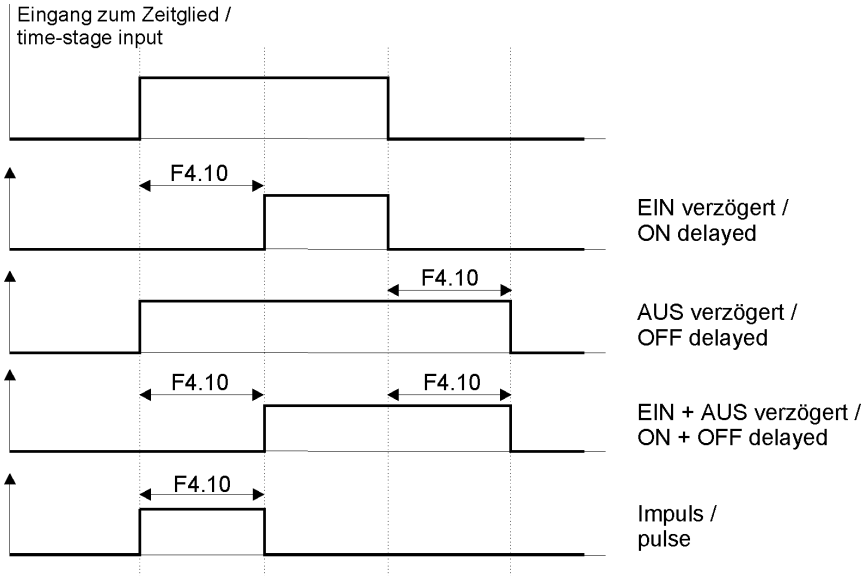
F4.07	Logic 1a function	VCB	AND
F4.08	Logic 1b function	VCB	AND

0 . . . AND •	
1 . . . OR	
2 . . . EQUAL	
3 . . . UNEQUAL	
4 . . . AND - neg	*input D1 (D2) negated !*
5 . . . OR - neg	*input D1 (D2) negated !*
6 . . . EQUAL - neg	*input D1 (D2) negated !*
7 . . . UNEQUAL - neg	*input D1 (D2) negated !*

F4.09	Log 1 time function	VCB	ON + OFF - delayed

0 . . . ON - delayed
1 . . . OFF - delayed
2 . . . ON + OFF - delayed •
3 . . . Impulse

F4.10	Log 1 time parameter	VCB	0,0...***1,0***...160,0 s

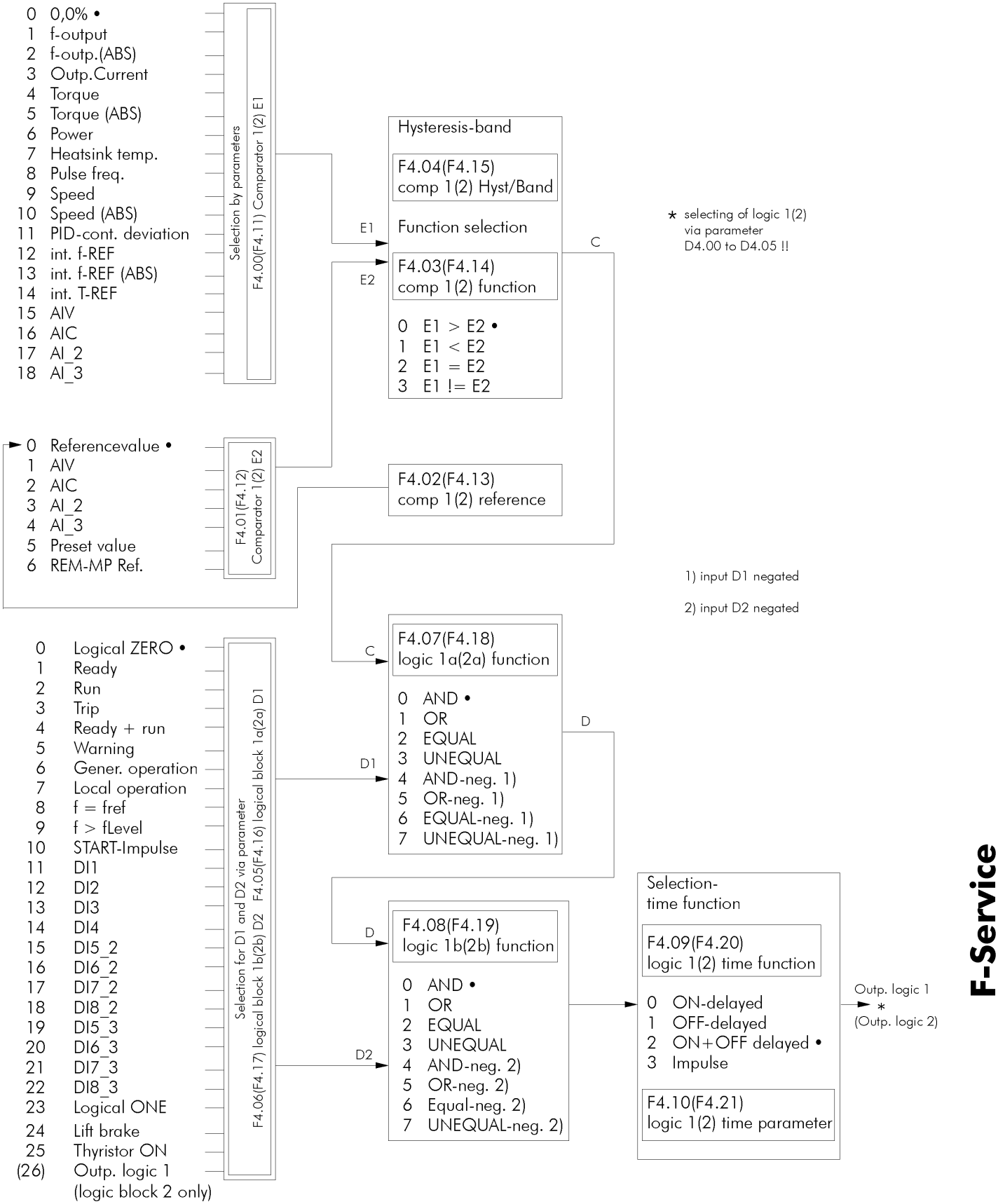


F4.11	Comparator 2 E1	VCB	0,0%
F4.12	Comparator 2 E2	VCB	Reference value
F4.13	Comp. 2 reference	VCB	-200,0...***0,0***...+200,0 %
F4.14	Comp. 2 function	VCB	E1>E2
F4.15	Comp. 2 Hyst/Band	VCB	0,0...***5,0***...100,0 %
F4.16	Logic block 2a D1	VCB	Logic ZERO
F4.17	Logic block 2b D2	VCB	Logic ZERO
F4.18	Logic 2a function	VCB	AND
F4.19	Logic 2b function	VCB	AND
F4.20	Log 2 time function	VCB	ON+OFF-delayed
F4.21	Log 2 time parameter	VCB	0,0...***1,0***...160,0 s

The parameters F4.11 to F4.21 describe the logic block 2. The adjustment possibilities are identical to the logic block 1.

Exeption: The digital inputs to the gate-stages D1 (F4.16) and D2 (F4.17) are expanded by the adjustment „26 Outp. logic 1" to give the possibility of a cascade connection of both logic blocks.
That means that the output of block 1 can be indicated via a relay and simmultaneously internal processed in block 2.

Function scheme of the logic blocks 1 and 2



F5 **Diagnosis, Alignment**

Adjustage of the current transformers at various pulse frequencies

F5.00	Sensor A - offset		read only
F5.01	Sensor B - offset		read only

The parameters F5.00 and F5.01 show the actual offset adjustments of the current transformers. The values can be stored into the corresponding offset parameters F5.02 - F5.06 whenever required. Wait for a stationary condition ~5 min !!

F5.02	Sens.A 5kHz-offset	VCB	-1000...***0***...+1000
F5.03	Sens.B 5kHz-offset	VCB	-1000...***0***...+1000
F5.04	Sens.A 10kHz-offset	VCB	-1000...***0***...+1000
F5.05	Sens.B 10kHz-offset	VCB	-1000...***0***...+1000

Read the remarks in the service instruction !!

F6 Code

Code lock

F6.00	Code	VB	0...***0***...9999
F6.01	Code value	VB	0...***0***...9999

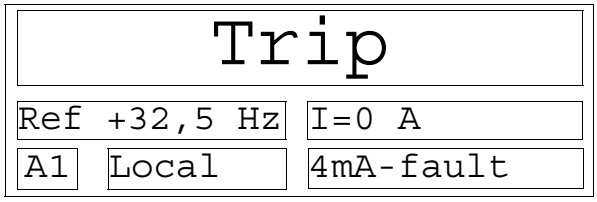
The code lock is the opened if F6.00 and F6.01 have the same value. Each "mains on" command sets the F6.01 parameter back to "0".

F6.02	Access admission	V	Operating panel

0 . . . Operating panel •
1 . . . Fieldbus
2 . . . RS232

Trip messages

If a trip occurs the inverter switches off with pulse inhibit. A stored start command (local control or start pulse contact) will be cleared. The trip message is displayed in the status field. For each trip message the matrixfield F1 (Help) can give detailed informations and suggestions for trouble shooting.



How to reset a trip

An oncoming trip can be resetted as follows:

- By pressing the O/Reset button on the keypad
- By switching off the mains supply
- By using a digital input as reset (see D2.00 to D2.10)
- By activating the auto reset function (see E3.00)
- By using a reset signal via the bus (i.e. profibus)

If continuous contacts for start FWD or start REV are queued
the inverter will automatically restart after a trip has been resetted !!

MATRIX Software

INFORMATION ON INSTALLATION AND USE

1. Necessary equipment

In addition to your computer you need a cable for serial data transport marked CABLE PC-MX. This cable connects the interfaces of your computer with the RJ45 socket situated on the USER-INTERFACE under the key pad.

The PC on which the program is installed, should fulfil the following hardware requirements:

Pentium processor (≥166 MHz recommended), min. 8 MB RAM, enough harddisk space for program and produced data files, two serial connectors COM1: and COM2.

2. Software Installation

The Software operates under WINDOWS 3.1 and WINDOWS 95. For installation place disc no.1 in your discdrive (below it is assumed that the drive bears the letter a:).

Installation under WINDOWS 3.1: Choose in the program manager the option file/execute. Pick search and type a:\setup. By selecting OK the installation will be started.

You are free to choose the directory and the path where the MATRIX software should be installed. The default setting is C:\MATRIX. The installation program will ask you to insert the additional discs into discdrive when necessary.

Installation under WINDOWS95: Choose on the desktop the option START/settings/system control. Select the icon for software and in the following window installation.

The program will ask you to insert the installation disc into your discdrive. Select continue>. In the following window will now be shown: A:\SETUP.EXE. By choosing continue> the installation will be started. You are free to choose the directory and the path where the MATRIX software should be installed. The default setting is C:\MATRIX. The installation program will ask you to insert the additional discs ínto the discdrive when necessary.

If you have loaded the contents of the installation discs from the Internet, the installation can also be done from each other directory on your harddisc. Simply start setup.exe similiar to above description.

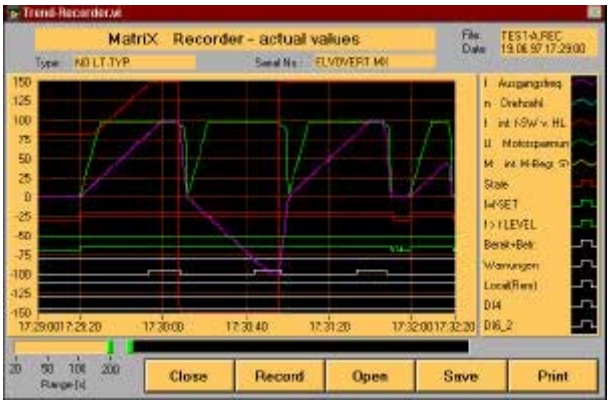
3. Capacities of the Programs

The program MATRIX offers the following functions:

a. Local-Control

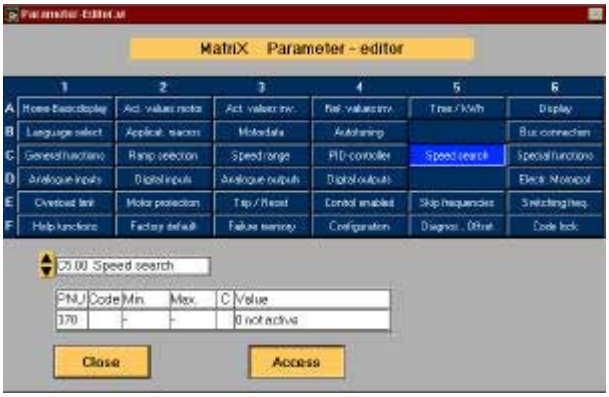
Is used for observation and online-control of a frequency inverter. With the key "local" you can switch between observation mode and control mode.

The contents of the analogue and some digital indications can be changed, if necessary, via the parameter editor (matrixfield B6 "Bus-coupling", parameter group B6.08, B6.10, B6.12, B6.14, B6.16 and B6.23 bis B6.27).



b. Actual-value recorder

Enables to register 5 analogue and 8 digital conditions during operation. The analogue and some of the digital acutal values, which should be recorded, can be changed, if necessary, via the parameter editor (matrix field B6 "Bus-coupling", parameter group B6.08, B6.10, B6.12, B6.14, B6.16 and B6.23 bis B6.27).
Start and end of recording is effected by using the key "record" (max. recording time 200s).
The size of the print-out depends always on the actual zoom window.



c. Parameter-Editor

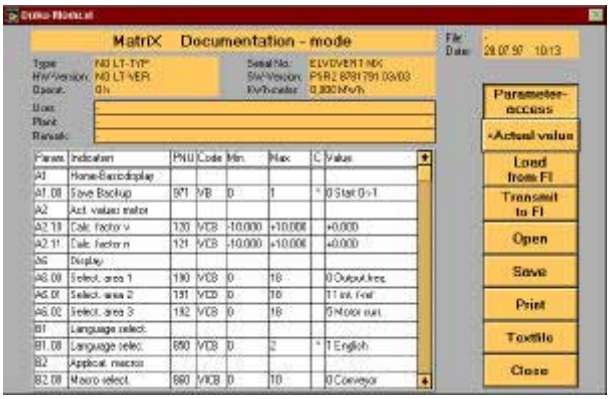
Via the presented matrix all parameters can be enquired online and changed if necessary. Remark: In order not only to be able to inspect the parameters with the editor, but also to change them, access admission is absolutely necessary (select key "access admission").

After execution of routines,

A1.00 Home-Basicdisplay "Save Backup"
B2.01 Applicat. macros "Store USER-Mac."
B4.00 Autotuning "Start tuning"
F1.00 Help-functions "Test power part"
F2.00 Factory default "Factory default"

the appropriate line 0 has to be sent at any rate.

! Changed parameters have to be saved by selecting A1.00 "Save Backup"!



d. Docu-Mode

Serves for saving (saving on hard disc or disc) of actual parameter settings. In addition, saved parameter data can be transferred to an optional number of further converters. Via the key "print", a complete parameter list is printed (optional incl. actual values).

e. Failure-Saving

Not available at the moment .

f. MatriX Server

The server is a proper program which is opened automatically when starting the MATRIX software. At first use key "CON" and choose then the COM-port and the bit-rate (preferably COM1 and 19200 bit/s).

4. Information on operation

The MATRIX software package can only be operated with inverter software-versions from PSR2.02 ! Should your inverter still dispose of an older software-version, you can make an update with the program "FLASHcopy". However, all set parameter values in the inverter are lost and you have to repeat the function "Autotuning".

To ensure a perfect operation we advise to deactivate any running screen savers.

Opening of several windows at the same always results in an increase of the reaction time of the program. Therefore, we advise to close not used windows.

5. Deinstallation

Deinstallation under WINDOWS 3.1: Eliminate the program group MATRIX containing the appropriate software from your Windows surface. Then you eliminate all files contained in the directory chosen by you and all files in the sub-directories PRIVATE and PUBLIC. With this action all files mounted during installation are eliminated from your computer.

Deinstallation under WINDOWS 95: Select on the desktop the option START/setting/system control. Choose the software-icon and follow the instructions for deinstallation of the MATRIX software in the succeeding window.

The following parameters can only be read out or changed by the MATRIX software on the PC. They are assigned to the MATRIX field A1.

A1.00	Save backup	VB	Routine

0 . . . Start 0 ⇨ 1
1 . . . Store
2 . . . Stored

As against to the local operation on the keypad the storage command is not automatically triggered by changing into the basic display (home field). If the MATRIX software is used for setting parameters this has to be done with parameter A1.00.

Routine: 1. Send row 1 „*Store*"
2. Wait until the message 2 „*stored*" is displayed
3. Send row 0 „*Start - 0 ⇨ 1*"

A1.01	Device-mode	read only

0 . . . „ "
1 . . . Pulse inhibit
2 . . . Trip
3 . . . Mains OFF
4 . . . Mains free
5 . . . Cut off

The device-mode corresponds to the indication in the field 1 of the basic display.

A1.02	Operate-mode	read only

0 . . . Remote
1 . . . Rem Loc
2 . . . Loc Rem
3 . . . Local
4 . . . Bus
5 . . . Bus Loc
6 . . . Loc Bus
7 . . . Local

The operate-mode corresponds to the indication in the field „operating mode" of the basic display.

A1.03	Triptext	read only

0 . . . „ "
1 . . . n = n_{ref}
2 . . . Acceleration
3 . . . Deceleration
4 . . . „ "
5 . . . UI-Def1
6 . . . UI-Def2
7 . . . UI-Def3
8 . . . UI-Def4
9 . . . UI-Def5
10 . . UI-Def6
11 . . UI-Def7
12 . . Int. Commun. 1

13 . . Int. Commun. 2
14 . . PBO1-Def.
15 . . Bus COM 1
16 . . Bus COM 2
17 . . AR-Def. 2
18 . . Over-current 1
19 . . Over-current 2
20 . . Over-voltage
21 . . Undervoltage 1
22 . . Undervoltage 2
23 . . Crane-overl
24 . . Overtemp.
25 . . Ext. trip
26 . . Mot. trip
27 . . 4mA-fault
28 . . Mot. Temp>
29 . . Therm. KS.
30 . . Mot. overl.
31 . . Stalling protect.
32 . . Mot. overspeed
33 . . ZB Temp>
34 . . LT-defect
35 . . AR-Def. 1
36 . . Int. Commun. 3

A1.04	LED-state	read only

0 . . . not ready
1 . . . Ready
2 . . . RUN
3 . . . Trip

The LED-state corresponds to the unit´s condition indicated by three coloured LEDs on the key-pad. If no LED is illuminated this means „not ready“.

(Priority) Message	Help-F1 Parameter	Description, possible cause
(16) Over-voltage	F1.02	Overvoltage in the D.C.link too short deceleration time, too high mains voltage. is external braking unit connected and o.k. ?
(17) Under-voltage 1 **(18) Under-voltage 2**	F1.03	Undervoltage in the D.C.link is mains voltage present ? are all mains phases present ? are the mains fuses o.k. ? The inverter distinguishes 2 kinds: Undervltg. 1: U<< during operation Undervltg. 2: no mains voltage in spite of switch-ON command via mains contactor control (after 2 sec)
(14) Over-current 1 **(15) Over-current 2**	F1.04	Overcurrent on the inverter output activate power part test-routine ! short circuit ? or earth fault ? The inverter destinguishes 2 kinds: Over current 1: I>>, over current 2: differential I >> (only size 5)
(21) External trip	F1.05	External trip an external trip is released via a terminal function is parameter E3.02 adjusted correctly ?
(23) 4 mA-fault	F1.06	4 mA trip a 4-20 mA ref.value is lower than 3 mA -> wire proof ? E3.01 ?
(24) Mot. Temp>	F1.07	Motor thermistor has released is the motor overloaded ? is the fan o.k ?
(25) Thermistor trip	F1.08	Thermistor short circuit check the thermistor wiring
(22) Ext. motor trip	F1.09	External motor trip an external motor trip is released via a terminal function is parameter E2.11 adjusted correctly ?
(26) Motor overload	F1.10	Motor overload ! the thermic motor model has detected an overload See parameter E2.02 to E2.07 A3.03 > 100°C: Overtemp. or clicktherm short circuit A3.03 < -25°C: Clicktherm wire broken
(27) Stalling protect.	F1.11	Stall protection the motor does not start, is mechanical blocked or high overloaded
(28) Mot. overspeed	F1.12	Overspeed the actual speed is higher than the adjusted maximum value (see parameter E2.09)
(20) Heatsink temp.>	F1.13	Temperature on the heatsink check the unit fan(s) check the cubicle fan(s) and /or filter mat is the ambient temperature too high ? A3.03 > 100°C: Overtemp. or clicktherm short circuit A3.03 < -25°C: Clicktherm wire broken
(29) PCB ZB Temp>	F1.14	Overtemperature on the central board switch on mains voltage -> power part fan is supplied from the D.C.link.
(30) Powerpart fault	F1.15	Defect drive control board or fault in the power part Change the corresponding printed circuit board

(Priority) Message	Help-F1 Parameter	Description, possible cause
(31) AR-Fault 1 **(13) AR-Fault 2**	F1.16	Reference voltage fault on the drive control board Change the printed circuit board The inverter distinguishes 2 kinds: AR-Def. 1: Ref.voltage fault, ext. 24 V buffering voltage too low AR-Def. 2: ASIC fault
(8) Int. Commun. 1 **(9) Int. Commun. 2** **(32) Int. Commun. 3**	F1.17	Fault in the internal communication Reset ? Change the electronic The inverter distinguishes 3 kinds: Int. Commun. 1: control-link fault -> no communication Int. Commun. 2: AR program wrong or faulty transmission Int. Commun. 3: pulse release fault -> supress the input DI5 !!
(1) UI-Fault 1 **(2) UI-Fault 2** **(3) UI-Fault 3** **(4) UI-Fault 4** **(5) UI-Fault 5** **(6) UI-Fault 6** **(7) UI-Fault 7**	F1.18	Fault on the PCB ´User-Interface (UI)´ Perform the test of control part Exchange UI-PCB The inverter distinguishes 7 kinds: UI-Def. 1: processor fault (change UI) UI-Def. 2: code fault (change flash and UI) UI-Def. 3: task overflow (ext. buff. vltg. <<, change flash and UI) UI-Def. 4: backup fault (change flash) UI-Def. 5: LCD fault (change UI) UI-Def. 6: FLASH fault (change flash) UI-Def. 7: fault in the slide register (change UI)
(19) Crane-overload	F1.19	Load too high Defect regeneration Inverter cooling not sufficient
(11) Bus-comm.1	F1.20	Watch Dog fault during serial data exchange between DP-Master and PB01
(12) Bus-comm.2	F1.21	Profibus DP-Master tranceives no „leading ok“ (Bit10=0) in its control word
(10) PB01 fault	F1.22	PB01 cannot be initialized correctly. PB01 defect or wrong built in.

More detailed informations regarding service, like fault diagnostics, trouble-shooting, spare parts a.s.o. can be read in the service instructions.

MX - Frequency inverter
Commissioning record

Type:	❑ 400 V	❑ 500 V				
	❑ MX .../15C18P	❑ MX .../18C22P	❑ MX .../22C30P	❑ MX .../30C37P	❑ MX .../37C45P	❑ MX .../45C55P
	❑ MX .../55C75P	❑ MX .../75C90P	❑ MX .../90C110P	❑ MX .../110C132P	❑ MX .../132C160P	❑ MX .../160C200P
	❑ MX .../200C250P	❑ MX .../250C315P	❑ MX .../315C400P	❑ MX .../400C500P	❑ MX .../500C630P	

Serial number:	Code:
Client / Company:	Supplier / Company:
Date of delivery:	Date of commissioning:

Parameter adjustments

Para.No.	Description	Macro M1 Conveyor, Piston pump, Separator	Macro M2 Centrif. pump, Exhaust fan, Fan	Macro M3 Pump with PID controller	Macro M4 Master/Slave, Test-bench	User Macro
A 2	**Act.value motor**					
A 2 10	Calc. factor v	0,000	0,000	0,000	0,000	
A 2 11	Calc. factor n	0,000	0,000	0,000	0,000	
A 3	**Ref.value inverter**					
A 3 05	Invertertype	Text	Text	Text	Text	
A 3 06	Nom.current "C"	Text	Text	Text	Text	
A 3 07	Hardware version	Text	Text	Text	Text	
A 3 08	Software-name	Text	Text	Text	Text	
A 3 09	Software-Version	Text	Text	Text	Text	
A 3 10	Serial No.	Text	Text	Text	Text	

Para.No.	Description	Macro M1	Macro M2	Macro M3	Macro M4	User Macro
A 6	**Display**					
A 6 00	Selection area 1	Outp.frequ.	Outp.frequ.	Outp.frequ.	Outp.frequ.	
A 6 01	Selection area 2	int. f-ref	int. f-ref	int. f-ref	int. f-ref	
A 6 02	Selection area 3	Motor current	Motor current	Motor current	Motor current	
B 1	**Language selection**					
B 1 00	Language selection	German	German	German	German	
B 2	**Applicat. Macros**					
B 2 00	Macro selection	***Application***	***Application***	***Application***	***Application***	
B 3	**Motordata**					
B 3 00	Nominal power	Default value	Default value	Default value	Default value	
B 3 01	Nominal current	Default value	Default value	Default value	Default value	
B 3 02	Nominal voltage	Default value	Default value	Default value	Default value	
B 3 03	Nominal frequency	Default value	Default value	Default value	Default value	
B 3 04	Nominal speed	Default value	Default value	Default value	Default value	
B 3 05	Sin. Motorfilter	not used	not used	not used	not used	
B 6	**Bus configuration**					
B 6 00	Bus-selection	no bus	no bus	no bus	no bus	
B 6 01	Remote-select	Terminal	Terminal	Terminal	Terminal	
B 6 02	Slave adress	0	0	0	0	
B 6 03	Main-reference 1	not used	not used	not used	not used	
B 6 04	Aux.-reference 2	not used	not used	not used	not used	
B 6 05	Aux.-reference 3	not used	not used	not used	not used	
B 6 06	Aux.-reference 4	not used	not used	not used	not used	
B 6 07	Aux.-reference 5	not used	not used	not used	not used	
B 6 08	Main-Act.val. 1	f-output	f-output	f-output	f-output	
B 6 09	act1 filt. time	0,1 s	0,1 s	0,1 s	0,1 s	
B 6 10	Aux.-act.val. 2	n-Ausgang	n-Ausgang	n-Ausgang	n-Ausgang	
B 6 11	act2 filt. time	0,1 s	0,1 s	0,1 s	0,1 s	

Para.Nr.	Bezeichnung	Makro M1	Makro M2	Makro M3	Makro M4	User Makro
B 6 12	Aux.-act.val. 3	Ausg.Strom	Ausg.Strom	Ausg.Strom	Ausg.Strom	
B 6 13	act3 filt. time	0,1 s	0,1 s	0,1 s	0,1 s	
B 6 14	Aux.-act.val. 4	Torque	Torque	Torque	Torque	
B 6 15	act4 filt. time	0,1 s	0,1 s	0,1 s	0,1 s	
B 6 16	Aux.-act.val. 5	Power	Power	Power	Power	
B 6 17	act5 filt. time	0,1 s	0,1 s	0,1 s	0,1 s	
B 6 18	Bit 11-Contr.-W	not used	not used	not used	not used	
B 6 19	Bit 12-Contr.-W	not used	not used	not used	not used	
B 6 20	Bit 13-Contr.-W	not used	not used	not used	not used	
B 6 21	Bit 14-Contr.-W	not used	not used	not used	not used	
B 6 22	Bit 15-Contr.-W	not used	not used	not used	not used	
B 6 23	Bit 11-Stat.-W	DI1	DI1	DI1	DI1	
B 6 24	Bit 12-Stat.-W	DI2	DI2	DI2	DI2	
B 6 25	Bit 13-Stat.-W	DI3	DI3	DI3	DI3	
B 6 26	Bit 14-Stat.-W	DI4	DI4	DI4	DI4	
B 6 27	Bit 15-Stat.-W	DI6_2	DI6_2	DI6_2	DI6_2	
B 6 31	Communicat. Typ	Typ 2	Typ 2	Typ 2	Typ 2	
C 1	**General functions**					
C 1 00	Increase start torque	0 %	0 %	0 %	0 %	
C 1 01	Increase range	10 Hz	10 Hz	10 Hz	10 Hz	
C 1 02	Stop mode	Decel. ramp	Decel. ramp	Decel. ramp	Decel. ramp	
C 1 03	Preset ref. destination	not used	not used	not used	not used	
C 1 04	Pre-set ref. 1	0,00	0,00	0,00	0,00	
C 1 05	Pre-set ref 2	0,00	0,00	0,00	0,00	
C 1 06	Pre-set ref 3	0,00	0,00	0,00	0,00	
C 1 07	Pre-set ref 4	0,00	0,00	0,00	0,00	
C 1 08	Pre-set ref 5	0,00	0,00	0,00	0,00	
C 1 09	Pre-set ref 6	0,00	0,00	0,00	0,00	
C 1 10	Pre-set ref 7	0,00	0,00	0,00	0,00	

Para.No.	Description	Macro M1	Macro M2	Macro M3	Macro M4	User Macro
C 1 11	Pre-set ref 8	0,00	0,00	0,00	0,00	
C 1 12	Jog frequency	0,00	0,00	0,00	0,00	
C 1 13	Economy mode	not active	**Step 1**	**Step 1**	not active	
C 1 14	Slip compensation	not active	not active	not active	not active	
C 2	**Ramp selection**					
C 2 00	Accel. ramp 1	**5,0 s**	**10,0 s**	0,0 s	**3,0 s**	
C 2 01	Decel. ramp 1	**5,0 s**	**10,0 s**	0,0 s	**3,0 s**	
C 2 02	Accel. ramp 2	20,1	20,1	20,1	20,1	
C 2 03	Decel. ramp 2	20,1	20,1	20,1	20,1	
C 3	**Speed range**					
C 3 00	Minimum frequency	**0,00 Hz**	**0,00 Hz**	**0,00 Hz**	**0,00 Hz**	
C 3 01	Maximum frequency	**50,00 Hz**	**50,00 Hz**	**50,00 Hz**	**50,00 Hz**	
C 3 02	Rotation	**FWD + REV**	Disable REV	Disable REV	**FWD + REV**	
C 4	**PID-controller**					
C 4 04	PID enable	no	no	**yes**	no	
C 4 05	Prop. gain (kp))	0,0 %	0,0 %	**20,0 %**	0,0 %	
C 4 06	Integ. time (Tn)	0,00 s	0,00 s	**10,00 s**	0,00 s	
C 4 07	Deriv. time (Tv)	0,00 s	0,00 s	0,00 s	0,00 s	
C 4 08	Ref. accel. ramp	0,0 s	0,0 s	**10,0 s**	0,0 s	
C 4 09	Ref. decel. ramp	0,0s	0,0 s	**10,0 s**	0,0 s	
C 4 10	Output scaling -	0,0 Hz	0,0 Hz	**10,0 Hz**	0,0 Hz	
C 4 11	Output scaling +	0,0 Hz	0,0 Hz	**50,0 Hz**	0,0 Hz	
C 6	**Special functions**					
C 6 00	Contactor CTRL	not active	not active	not active	not active	
C 6 01	Crane function	not active	not active	not active	not active	
C 6 02	Braking freq.	2,0 Hz	2,0 Hz	2,0 Hz	2,0 Hz	
C 6 03	Braking time	0,3 s	0,3 s	0,3 s	0,3 s	
C 6 04	Braking current	100 %	100 %	100 %	100 %	
C 6 05	Max. n-Diff.	5 Hzs	5 Hzs	5 Hzs	5 Hzs	

Para.No.	Description	Macro M1	Macro M2	Macro M3	Macro M4	User Macro
D 1	**Analogue inputs**					
D 1 00	AIV destination	not used	**f-ref.-MAN**	**Ref.val.-PID**	not used	
D 1 01	AIV value 0%	0,01 Hz	**0,00 Hz**	**0,00 %**	0,01 Hz	
D 1 02	AIV value 100%	0,01 Hz	**50,00 Hz**	**100,0 %**	0,01 Hz	
D 1 03	AIV filtertime	0,05 s	0,05 s	0,05 s	0,05 s	
D 1 04	AIC destination	**f-ref.-AUTO**	**f-ref.-AUTO**	**Act.val.-PID**	**f-ref.-AUTO**	
D 1 05	AIC signal	4-20 mA	4-20 mA	4-20 mA	4-20 mA	
D 1 06	AIC value 0%	**0,00 Hz**	**0,00 Hz**	**0,00 %**	**0,00 Hz**	
D 1 07	AIC value 100%	**50,00 Hz**	**50,00 Hz**	**100,0 %**	**50,00 Hz**	
D 1 08	AIC filtertime	0,05 s	0,05 s	0,05 s	0,05 s	
D 1 09	AI_2 destination	not used	not used	not used	**T-limitation**	
D 1 10	AI_2 signal	0-20 mA	0-20 mA	0-20 mA	0-20 mA	
D 1 11	AI_2 value 0%	0,01 Hz	0,01 Hz	0,01 Hz	**0,00 %**	
D 1 12	AI_2 value 100%	0,01 Hz	0,01 Hz	0,01 Hz	**100,0 %**	
D 1 13	AI_2 filtertime	0,05 s	0,05 s	0,05 s	0,05 s	
D 1 14	AI_3 destination	not used	not used	not used	not used	
D 1 15	AI_3 signal	0-20 mA	0-20 mA	0-20 mA	0-20 mA	
D 1 16	AI_3 value 0%	0,01 Hz	0,01 Hz	0,01 Hz	0,01 Hz	
D 1 17	AI_3 value 100%	0,01 Hz	0,01 Hz	0,01 Hz	0,01 Hz	
D 1 18	AI_3 filtertime	0,05 s	0,05 s	0,05 s	0,05 s	
D 2	**Digital inputs**					
D 2 00	DI1 destination	**Start FWD**	**Start FWD**	**Start FWD**	**Start-FWD-I**	
D 2 01	DI2 destination	**Start REV**	**Man/Aut**	**PID enable**	**Start-REV-I**	
D 2 02	DI3 destination	**2. ramp**	**Ext. trip**	**Ext. trip**	**Stop-Imp**	
D 2 03	DI4 destination	**Ext. reset**	**Ext. reset**	**Ext. reset**	**Ext. T-Limit**	
D 2 04	DI6_2 destination	not used	not used	not used	**Ext. trip**	
D 2 05	DI7_2 destination	not used	not used	not used	**Ext. reset**	
D 2 06	DI8_2 destination	not used	not used	not used	not used	
D 2 07	DI5_3 destination	not used	not used	not used	not used	

Para.No.	Description	Macro M1	Macro M2	Macro M3	Macro M4	User Macro
D 2 08	DI6_3 destination	not used	not used	not used	not used	
D 2 09	DI7_3 destination	not used	not used	not used	not used	
D 2 10	DI8_3 destination	not used	not used	not used	not used	
D 3	**Analogue outputs**					
D 3 00	AO1-selection	**f-output abs.**	**f-output abs.**	**f-output abs.**	**f-output abs.**	
D 3 01	AO1 signal	4-20 mA	4-20 mA	4-20 mA	4-20 mA	
D 3 02	AO1-min value	0 %	0 %	0 %	0 %	
D 3 03	AO1-max value	100 %	100 %	100 %	100 %	
D 3 04	AO2_2-selection	not used	not used	not used	**Torque abs.**	
D 3 05	AO2_2 signal	4-20 mA	4-20 mA	4-20 mA	4-20 mA	
D 3 06	AO2_2-min value	0 %	0 %	0 %	0 %	
D 3 07	AO2_2-max value	100 %	100 %	100 %	**150 %**	
D 3 08	AO2_3-selection	not used	not used	not used	not used	
D 3 09	AO2_3 signal	4-20 mA	4-20 mA	4-20 mA	4-20 mA	
D 3 10	AO2_3-min value	0 %	0 %	0 %	0 %	
D 3 11	AO2_3-max value	100 %	100 %	100 %	100 %	
D 4	**Digital outputs**					
D 4 00	+24 dig. output	24V-int. voltage	24V-int. voltage	24V-int. voltage	24V-int. voltage	
D 4 01	Relay outp. 1	**Ready + Run**	**Ready + Run**	**Ready + Run**	**Ready**	
D 4 02	Relay outp. 2_2	not used	not used	not used	**RUN**	
D 4 03	Relay outp. 3_2	not used	not used	not used	**Trip**	
D 4 04	Relay outp. 2_3	not used	not used	not used	not used	
D 4 05	Relay outp. 3_3	not used	not used	not used	not used	
D 4 06	f-Level ON	0,01 Hz	0,01 Hz	0,01 Hz	0,01 Hz	
D 4 07	f-Level OFF	0,01 Hz	0,01 Hz	0,01 Hz	0,01 Hz	
D 6	**Electr. motorpot**					
D 6 00	Loc/MP destination	Frequ. ref.	Frequ. ref.	Frequ. ref.	Frequ. ref.	
D 6 01	Loc/MP-min.value	0,00 Hz	0,00 Hz	0,00 Hz	0,00 Hz	
D 6 02	Loc/MP-max.value	50,00 Hz	50,00 Hz	50,00 Hz	50,00 Hz	

Para.No.	Destination	Macro M1	Macro M2	Macro M3	Macro M4	User Macro
D 6 03	Loc/MP accel time	10,0 s	10,0 s	10,0 s	10,0 s	
D 6 04	Loc/MP decel time	10,0 s	10,0 s	10,0 s	10,0 s	
D 6 05	Loc ref-storage	not active	not active	not active	not active	
D 6 06	Rem/MP destination	not used	not used	not used	not used	
D 6 07	Rem/MP-min.value	0,01 Hz	0,01 Hz	0,01 Hz	0,01 Hz	
D 6 08	Rem/MP-max.value	0,01 Hz	0,01 Hz	0,01 Hz	0,01 Hz	
D 6 09	Rem/MP accel time	10,0 s	10,0 s	10,0 s	10,0 s	
D 6 10	Rem/MP decel time	10,0 s	10,0 s	10,0 s	10,0 s	
D 6 11	Rem ref.-storage	not active	not active	not active	not active	
E 1	**Overload limit**					
E 1 00	Max. value	150 %	**125 %**	**125 %**	150 %	
E 2	**Motor protection**					
E 2 00	Thermistor input	**not active**	**not active**	**not active**	**not active**	
E 2 01	Thermistor protection	Trip	Trip	Trip	Trip	
E 2 02	I max at 0 Hz	**50 %**	31 %	31 %	**50 %**	
E 2 03	I max at f nom	**100 %**	**100 %**	**100 %**	**100 %**	
E 2 04	Therm. f-limit	30 Hz	30 Hz	30 Hz	30 Hz	
E 2 05	Motor time constant	5 min	5 min	5 min	5 min	
E 2 06	Stalling time	60 s	60 s	60 s	60 s	
E 2 07	Stalling frequency	5 Hz	5 Hz	5 Hz	5 Hz	
E 2 08	Stalling current	80 %	80 %	80 %	80 %	
E 2 09	n>> protection	Trip	Trip	Trip	Trip	
E 2 10	n max motor	3200 rpm	3200 rpm	3200 rpm	3200 rpm	
E 2 11	Ext.motor trip	not active	not active	not active	not active	
E 3	**Trip / Reset**					
E 3 00	Autoreset 3x	not active	not active	not active	not active	
E 3 01	4mA supervision	not active	not active	not active	not active	
E 3 02	EXT - trip	not active	**N.O. run**	**N.O. run**	**N.O. run**	
E 3 03	Ready message	at mains vltg.	at mains vltg.	at mains vltg.	at mains vltg.	

Para.No.	Description	Macro M1	Macro M2	Macro M3	Macro M4	User Macro
E 3 04	Undervoltage	no trip	no trip	no trip	no trip	
E 3 05	Local reset	active	active	active	active	
E 4	**Control enabled**					
E 4 00	Ref.value source	Local+Remote	Local+Remote	Local+Remote	Local+Remote	
E 4 01	Control source	Local+Remote	Local+Remote	Local+Remote	Local+Remote	
E 4 02	STOP key	Loc. active only	Loc. active only	Loc. active only	Loc. active only	
E 4 03	Loc/Rem switch	Keypad	Keypad	Keypad	Keypad	
E 5	**Skip frequencies**					
E 5 00	Skip frequency	0,00 Hz	0,00 Hz	0,00 Hz	0,00 Hz	
E 5 01	Hysteresis	5,00Hz	5,00 Hz	5,00 Hz	5,00 Hz	
E 6	**Pulse frequency**					
E 6 00	Min. pulse frequency	2,5 kHz	2,5 kHz	2,5 kHz	2,5 kHz	
E 6 01	Max. pulse frequency	2,5 kHz	2,5 kHz	2,5 kHz	2,5 kHz	
F 4	**Logikblock 1 und 2**					
F 4 00	Comparator 1 E1	0,0 %	0,0 %	0,0 %	0,0 %	
F 4 01	Comparator 1 E2	Reference value	Reference value	Reference value	Reference value	
F 4 02	Comp 1 reference	0,0 %	0,0 %	0,0 %	0,0 %	
F 4 03	Comp 1 function	E1 > E2	E1 > E2	E1 > E2	E1 > E2	
F 4 04	Comp 1 Hyst/Band	5,0 %	5,0 %	5,0 %	5,0 %	
F 4 05	Logicblock 1a D1	Logic ZERO	Logic ZERO	Logic ZERO	Logic ZERO	
F 4 06	Logicblock 1b D2	Logic ZERO	Logic ZERO	Logic ZERO	Logic ZERO	
F 4 07	Logic 1a function	AND	AND	AND	AND	
F 4 08	Logic 1b function	AND	AND	AND	AND	
F 4 09	Log 1 Time-function	ON+OFF delayed	ON+OFF delayed	ON+OFF delayed	ON+OFF delayed	
F 4 10	Log 1 Time parameter	1,0 s	1,0 s	1,0 s	1,0 s	
F 4 11	Comparator 2 E1	0,0 %	0,0 %	0,0 %	0,0 %	
F 4 12	Comparator 2 E2	Reference value	Reference value	Reference value	Reference value	
F 4 13	Comp 2 reference	0,0 %	0,0 %	0,0 %	0,0 %	
F 4 14	Comp 2 function	E1 > E2	E1 > E2	E1 > E2	E1 > E2	

Para.No.	Description	Macro M1	Macro M2	Macro M3	Macro M4	User Macro
F 4 15	Comp 2 Hyst/Band	5,0 %	5,0 %	5,0 %	5,0 %	
F 4 16	Logic block 2a D1	Logic ZERO	Logic ZERO	Logic ZERO	Logic ZERO	
F 4 17	Logic block 2b D2	Logic ZERO	Logic ZERO	Logic ZERO	Logic ZERO	
F 4 18	Logic 2a function	AND	AND	AND	AND	
F 4 19	Logic 2b function	AND	AND	AND	AND	
F 4 20	Log 2 time function	ON+OFF delayed	ON+OFF delayed	ON+OFF delayed	ON+OFF delayed	
F 4 21	Log 2 time parameter	1,0 s	1,0 s	1,0 s	1,0 s	
F 5	**Diagnosis, Alignment**					
F 5 02	Sensor A 5kHz-offset	0	0	0	0	
F 5 03	Sensor A 5kHz-offset	0	0	0	0	
F 5 04	Sensor A 5kHz-offset	0	0	0	0	
F 5 05	Sensor A 5kHz-offset	0	0	0	0	
FF 6	**Code**					
F 6 00	Code	0	0	0	0	
F 6 01	Code value	0	0	0	0	
F 6 02	Access admission	Keypad	Keypad	Keypad	Keypad	

Data stored into the USER-macro ?

❑ yes

❑ no

Commissioned by: _____Date: _____Signature:_____

Notes

Notes

Notes

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