

# Inverter

## MICROMASTER 410



1/2	Description
1/4	Circuit diagrams
1/6	Technical data
1/7	Selection and ordering data
1/8	Options
1/10	Dimension drawings



## Description



Inverter  
Frame size AA



Inverter  
Frame size AB



Inverter  
with flat heat sink

### Application

The MICROMASTER 410 inverter is suitable for a variety of variable-speed drive applications.

It is especially suitable for use with pumps and fans, as a drive in various sectors, e.g. food, textile and packaging industries as well as for conveyor systems, factory gate and garage door drives and as a universal drive for moving billboards.

It is the ideal low-cost frequency inverter solution for the low-end performance range of the MICROMASTER product family.

The inverter is especially characterized by its customer-oriented performance and ease-of-use.

Versions for connecting to 230 V and 115 V single-phase networks enable it to be used all over the world.

### Design

The MICROMASTER 410 inverter has a compact design.

Heatsinks provide natural cooling for the inverter. A fan unit is not used.

The position of the connections has been selected as for conventional contactors.

The operator panel available as an option can be easily fitted without requiring any tools.

The design with flat plate heat-sink offers space-saving and favorable heat dissipation since an additional heatsink can be installed outside the control cabinet.

### Main characteristics

- Simple selection from minimum range of types (only a few options)
- Compact design
- Natural cooling with heat sinks (no fan unit)
- Simple connection similar to conventional switching elements (e.g. contactors)
- Versions with internal EMC filter Class B
- Fast, simple commissioning with input of only a few parameters (fast commissioning mode)
- Integrated RS-485 communications interface
- Three programmable digital inputs, non-floating (the analog input can be used as a fourth binary input)
- One analog input (0 V to 10 V)
- One programmable relay output (30 V DC/5 A resistive load; 250 V AC/2A inductive load)
- Low-noise motor operation resulting from high pulse frequency
- Integrated protection for motor and inverter.

### Options (overview)

- Line commutating chokes
- Adapter for standardized mounting on DIN rails
- OP (Operator Panel) for user-friendly parameterization of an inverter
- Connection kit for PC to inverter
- PC startup program.

### International standards

- The MICROMASTER 410 inverter complies with the requirements of the EU low-voltage guideline
- The MICROMASTER 410 inverter has the **CE** marking
- **®** and **c®** listed (not for versions with flat heat sinks)
- c-tick **C**

#### Note:

See Appendix for standards.

### Mechanical features

- Compact design
- Heat dissipation through self-ventilation (convection)
- Operating temperature –10 °C to +50 °C (+14 °F to +122 °F)
- Easy cable connection, mains and motor connections are separated for optimal electromagnetic compatibility and clear connection
- Detachable, optional operator panels
- Screwless control terminals
- Side mounting possible, thus also usable with low cabinet depth.

### Performance features

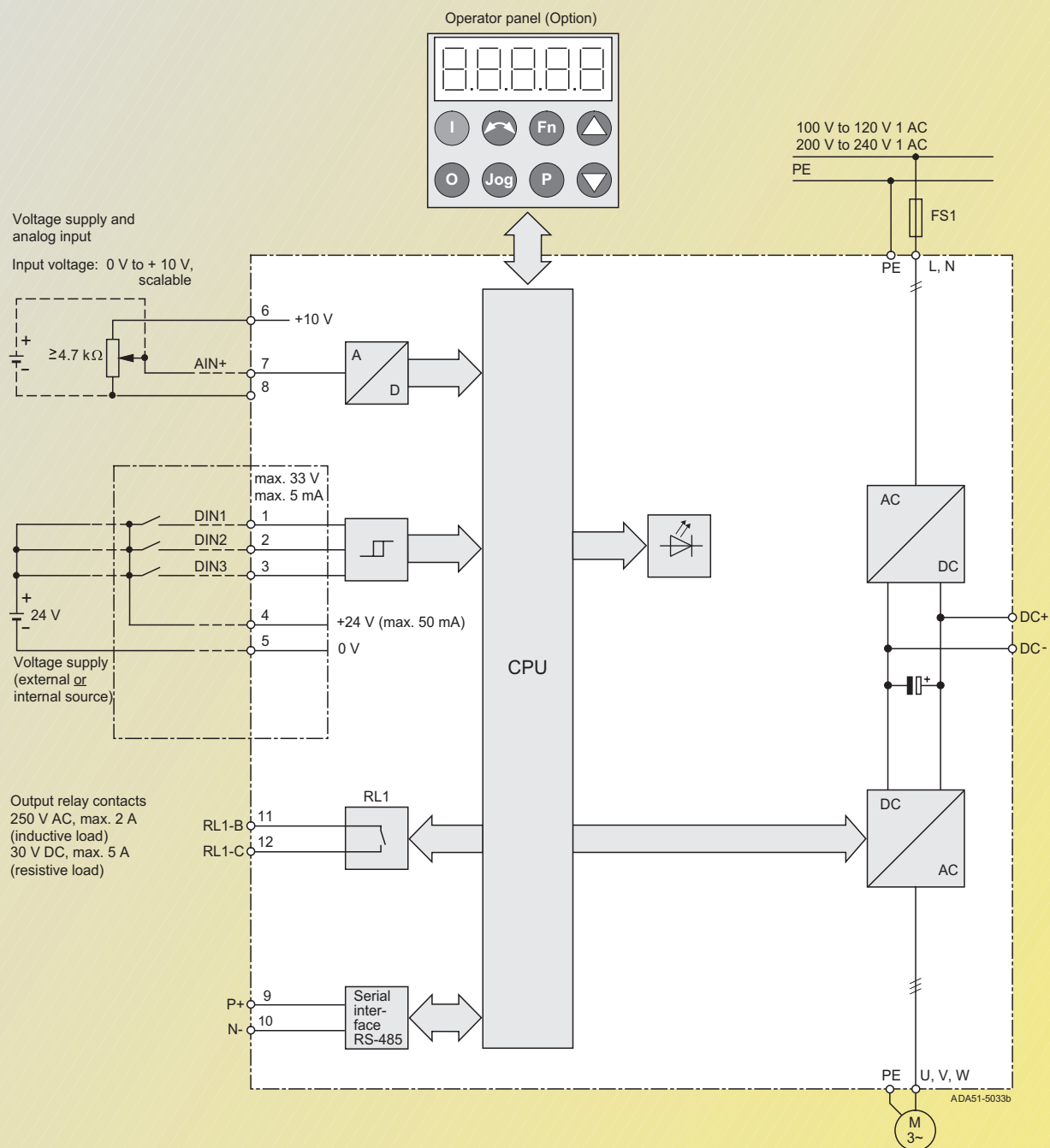
- Latest IGBT technology
- Digital microprocessor control
- Linear  $V/f$  characteristic, with programmable voltage boosting
- Quadratic  $V/f$  characteristic
- Multipoint characteristic (programmable  $V/f$  characteristic)
- Flying restart
- Automatic restart after mains failure or fault
- Programmable ramp generator (0 s to 650 s) with possible rounding
- Fast current limit (FCL) for trip-free operation
- Fast, repeatable digital input response time
- Exact setpoint specification using a high-resolution 10-bit analog input
- One skip frequency range
- Removable Y cap for use in IT systems
- Serial RS-485 interface with USS protocol
- LED for status information
- Versions with internal EMC filter Class B

### Protection features

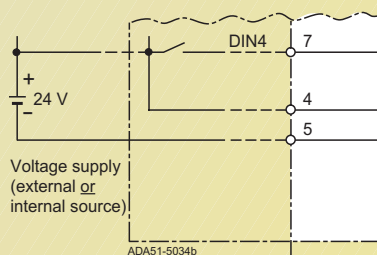
- Overload current 1.5 x rated output current (i.e. 150 % overload capability) for 60 s, then 0.85 x rated output current for 240 s, cycle time 300 s
- Overvoltage/undervoltage protection
- Inverter overtemperature protection
- Earth fault protection
- Short-circuit protection
- $I^2t$  motor thermal protection
- Stall prevention.

## Circuit diagrams

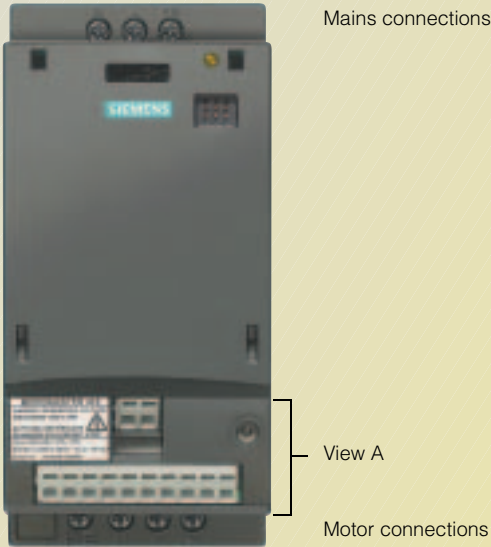
### General circuit diagram



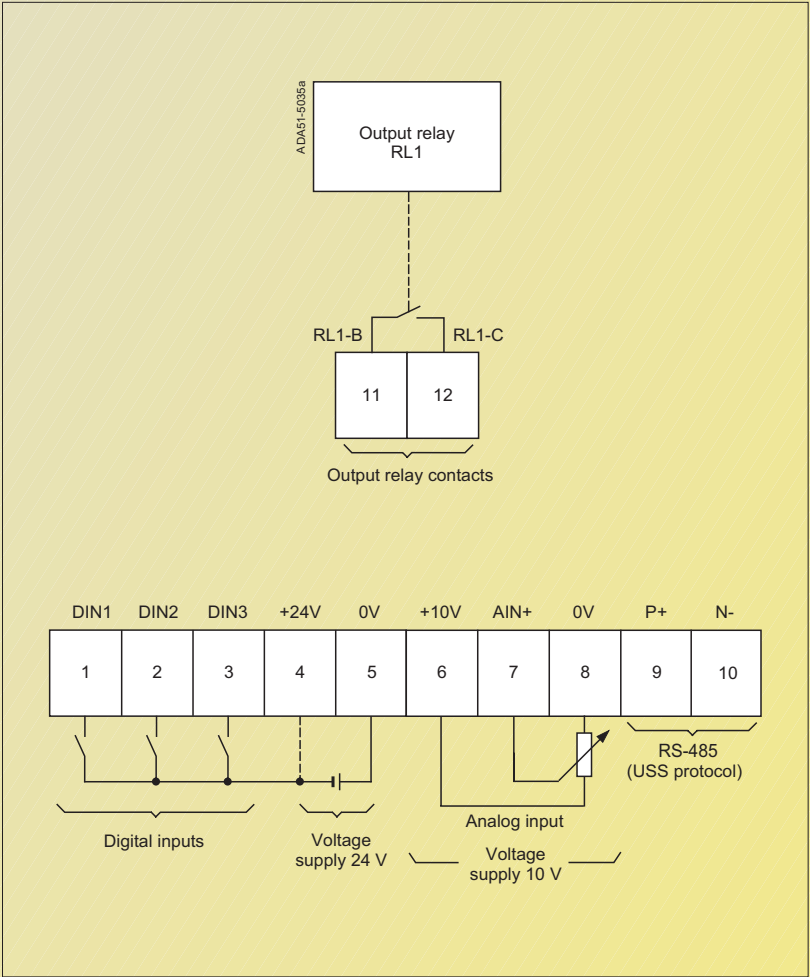
For an additional digital input (DIN 4) external connections should be made:



Terminal connection diagram



View A



# MICROMASTER 410

## Technical data

### MICROMASTER 410 inverter

Input voltages and power ranges	1 AC 200 V to 240 V $\pm$ 10 % 1 AC 100 V to 120 V $\pm$ 10 %	0.12 to 0.75 kW 0.12 to 0.55 kW
Power frequency	47 to 63 Hz	
Output frequency	0 Hz to 650 Hz	
Power factor	$\geq$ 0.95	
Inverter efficiency	96 % to 97 %	
Overload capability	Overload current 1.5 x rated output current (i.e. 150 % overload capability) for 60 s; then 0.85 x rated output current for 240 s, cycle time 300 s	
Precharge current	Not higher than rated input current	
Control method	Linear V/f characteristic; quadratic V/f characteristic; multipoint characteristic (programmable V/f characteristic)	
Pulse frequency	8 kHz (standard)/2 kHz to 16 kHz (in 2 kHz steps)	
Fixed frequencies	3, programmable	
Skip frequency ranges	1, programmable	
Setpoint resolution	10 bit analog/0.01 Hz serial	
Digital inputs	3 programmable digital inputs, non-floating, PNP, SIMATIC-compatible	
Analog input	1, for setpoint (0 V to 10 V, scaleable or for use as 4th digital input)	
Relay outputs	1, programmable, 30 V DC/5 A (resistive load); 250 V AC/2A (inductive load)	
Serial interface	RS-485, for operation with USS protocol	
Motor cable lengths	Max. 30 m (shielded)/max. 50 m (unshielded)	
Electromagnetic compatibility	Inverter available with internal EMC filter to EN 61 800-3 (defined limits to EN 55 011, Class B)	
Braking	DC braking, compound braking	
Degree of protection	IP20	
Operating temperature	-10 °C to +50 °C (+14 °F to +122 °F)	
Storage temperature	-40 °C to +70 °C (-40 °F to +158 °F)	
Relative humidity	95 % (non-condensing)	
Site altitude	Up to 1000 m above sea level without derating	
Protection features for	Undervoltage, overvoltage, overload, earth faults, short circuits, stall prevention, $I^2t$ motor thermal protection, inverter overtemperature	
Typical power losses (heatsink) at full load and maximum operating temperature as specified	20 W (with 0.37 kW inverter with flat plate heatsink) 37 W (with 0.75 kW inverter with flat plate heatsink)	
Line-side and control electronics losses (at 230 V, 50 Hz, 8 kHz)	18 W (with 0.37 kW inverter with flat plate heatsink) 34 W (with 0.75 kW inverter with flat plate heatsink)	
Recommended thermal resistance of heatsink	1.8 K/W (with 0.37 kW inverter with flat plate heatsink) 1.2 K/W (with 0.75 kW inverter with flat plate heatsink)	
Compliance with standards	Ⓜ, cⓂ (not for versions with flat plate heatsink) CE, c-tick	
CE marking	Conformity with low-voltage directive 73/23/EC	
Dimensions and weights (without options)	Frame size (FS) AA AB 0.37 kW inverter with flat plate heatsink 0.75 kW inverter with flat plate heatsink	H x W x D (mm) 150 x 69 x 118 150 x 69 x 138 175 x 69 x 102 175 x 69 x 102 Weight, approx. (kg) 0.8 1.0 0.78 0.8

### Derating data

#### Pulse frequency

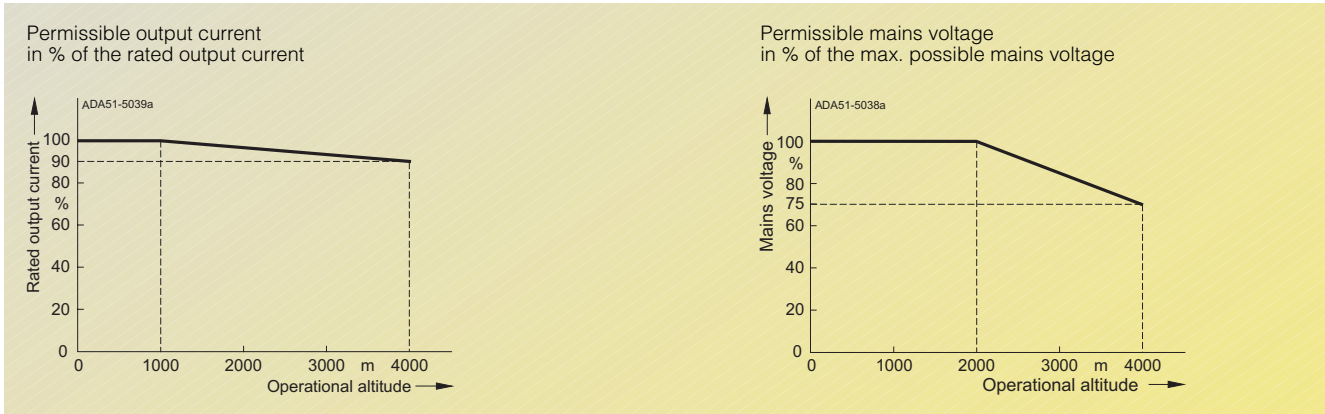
Output kW	Rated output current in A for a pulse frequency of						
	4 kHz	6 kHz	8 kHz	10 kHz	12 kHz	14 kHz	16 kHz
0.12	0.9	0.9	0.9	0.8	0.7	0.6	0.5
0.25	1.7	1.7	1.7	1.5	1.3	1.1	0.9
0.37	2.3	2.3	2.3	2.0	1.7	1.5	1.3
0.55	3.2	3.2	3.2	2.9	2.6	2.3	2.0
0.55, 115 V (at 50 °C/122 °F)	3.0	3.0	2.7	2.5	2.2	2.0	1.7
0.55, 115 V (at 40 °C/104 °F)	3.2	3.2	3.2	2.9	2.6	2.3	2.0
0.75 (at 50 °C/122 °F)	3.9	3.9	3.6	3.2	2.9	2.6	2.3
0.75 (at 40 °C/104 °F)	4.2	4.2	4.2	3.8	3.4	3.0	2.7

The current data apply to an ambient temperature of 50 °C/122 °F unless specified otherwise.



### Derating data (continued)

#### Installation height above sea level



## Selection and ordering data

### MICROMASTER 410 inverter

Output		Rated input current <sup>1)</sup>		Rated output current	Frame size	Order No.	
kW	hp	A		A	(FS)	MICROMASTER 410 without filter <sup>2)</sup>	MICROMASTER 410 with internal filter Class B
<b>Mains voltage 1 AC 100 V to 120 V, output voltage 200 V to 240 V 3-phase</b>							
0.12	0.16	4.6		0.9	AA	6SE6410-2UA11-2AA0	–
0.25	0.33	7.5		1.7	AA	6SE6410-2UA11-2AA0	–
0.37	0.50	10.1		2.3	AA	6SE6410-2UA11-2AA0	–
0.55	0.75	13.4		2.7 (3.2 at 40 °C/104 °F)	AB	6SE6410-2UA11-2AA0	–
<b>Mains voltage 1 AC 200 V to 240 V, output voltage 200 V to 240 V 3-phase</b>							
0.12	0.16	1.5		0.9	AA	6SE6410-2UB11-2AA0	6SE6410-2BB11-2AA0
0.25	0.33	3.0		1.7	AA	6SE6410-2UB12-5AA0	6SE6410-2BB12-5AA0
0.37	0.50	4.4		2.3	AA	6SE6410-2UB13-7AA0	6SE6410-2BB13-7AA0
0.55	0.75	5.8		3.2	AB	6SE6410-2UB15-5BA0	6SE6410-2BB15-5BA0
0.75	1.0	7.8		3.6 (4.2 at 40 °C/104 °F)	AB	6SE6410-2UB17-5BA0	6SE6410-2BB17-5BA0
<b>Inverter with flat plate heatsink</b>							
0.37	0.5	4.4		2.3	AA	6SE6410-2UB13-7AB0	6SE6410-2BB13-7AB0
0.75	1	7.8		4.2 (at 40 °C/104 °F)	AB	6SE6410-2UB17-5BB0	6SE6410-2BB17-5BB0

The current data apply to an ambient temperature of 50 °C/122 °F unless specified otherwise.

1) The values apply to rated mains voltages of 115 V or 230 V.

2) Generally suited to heavy industrial applications. For details please refer to Appendix on page A/4.



See Appendix for note on ordering.

All MICROMASTER 410 inverters are supplied without an Operator Panel (OP). An OP or other options must be ordered separately (see Page 1/9).

### Motors for MICROMASTER 410

Catalog M 11 contains selection and ordering data for motors which are particularly suitable for operation with the MICROMASTER 410 inverters (see Appendix for overview). This catalog is suitable for IEC motors. For motors according to US standards (NEMA) please refer to: <http://www.sea.siemens.com/motors>

## Options Inverter dependent options

### Overview

#### EMC filter, Class B

Variants with **internal** EMC filter Class B are available for inverters with a mains operating voltage of 1 230 V AC.

- The requirements are satisfied using: shielded cables with a max. length of 5 m, or 10 m with a low-capacitance motor cable (core/core < 75 pF/m, core/shield < 150 pF/m). The limits comply with EN 55 011 Class B.

An inverter with internal filter can be used with a 30 mA residual current operated circuit-breaker, and is only suitable for hardwired installation.

A non-filtered inverter together with the optional filter "Filter Class B with low leakage currents" has a leakage current  $\leq 3.5$  mA (shielded motor cable up to 5 m).

#### Line commutating choke

Line commutating chokes are used to smooth voltage peaks or to bridge commutating dips.

In addition, line commutating chokes reduce the effects of harmonics on the inverter and the power supply.

If the ratio of inverter rated power to mains short-circuit

power is less than 1 %, a line commutating choke must be used in order to reduce the current peaks.

The line commutating chokes are designed as footprint chokes and are fitted between the inverter and the mounting plate.


In line with EN 61 000-3-2 regulations "Limits for harmonic currents with device input current  $\leq 16$  A per phase", there are special aspects for drives with 250 W to 550 W and 230 V single-phase supplies which can be used in non-industrial applications (1st environment).


For devices with 250 W and 370 W, it is necessary either to fit the recommended input chokes or to apply to the power utility company for authorization to connect the devices to the public power supply. No limits are currently defined in the EN 61 000-3-2 standard for professionally used devices with a connected load > 1 kW, which means that the inverters with an output power  $\geq 0.75$  kW comply with the EN 61 000-3-2 standard.

### Selection and ordering data

The options listed here (filters, chokes, fuses and circuit-breakers) must be selected to match the inverter.

The inverter and the associated options have the same voltage ratings.

**All variant dependent options and the operator panel are certified to  except fuses. Fuses of Type 3NA3 are recommended for Europe.**

Use in America requires -listed fuses such as the Class NON range from Bussmann.

Mains voltage	Output		Inverter without filter	Order No. of the options			
	kW	hp		Filter Class B with low leakage currents	Line commutating choke	Fuse (see Catalog LV 10)	Circuit-breaker (see Catalog LV 10)
<b>1 AC 100 V to 120 V</b>	0.12	0.16	6SE6410-2UA11-2AA0	–	6SE6400-3CC01-0AB3	3NA3803	3RV1021-1GA10
	0.25	0.33	6SE6410-2UA11-2AA0	–			3RV1021-1JA10
	0.37	0.50	6SE6410-2UA13-7AA0 *)	–	6SE6400-3CC02-6BB3	3NA3805	3RV1021-1KA10
	0.55	0.75	6SE6410-2UA15-5BA0 *)	–		3NA3807	3RV1021-4AA10
<b>1 AC 200 V to 240 V</b>	0.12	0.16	6SE6410-2UB11-2AA0	6SE6400-2FL01-0AB0	6SE6400-3CC00-4AB3	3NA3803	3RV1021-1BA10
	0.25	0.33	6SE6410-2UB12-5AA0				3RV1021-1EA10
	0.37	0.50	6SE6410-2UB13-7AA0		6SE6400-3CC01-0AB3		3RV1021-1FA10
	0.55	0.75	6SE6410-2UB15-5BA0				3RV1021-1HA10
	0.75	1.0	6SE6410-2UB17-5BA0			3NA3805	3RV1021-1JA10
	<b>Inverter with flat plate heatsink</b>						
	0.37	0.50	6SE6410-2UB13-7AB0 *)	6SE6400-2FL01-0AB0	6SE6400-3CC01-0AB3	3NA3803	3RV1021-1FA10
	0.75	1.0	6SE6410-2UB17-5BB0 *)			3NA3805	3RV1021-1JA10
	<b>Inverter with internal filter Class B</b>						
	0.12	0.16	6SE6410-2BB11-2AA0	–	6SE6400-3CC00-4AB3	3NA3803	3RV1021-1BA10
<b>1 AC 200 V to 240 V</b>	0.25	0.33	6SE6410-2BB12-5AA0	–			3RV1021-1EA10
	0.37	0.50	6SE6410-2BB13-7AA0	–	6SE6400-3CC01-0AB3		3RV1021-1FA10
	0.55	0.75	6SE6410-2BB15-5BA0	–			3RV1021-1HA10
	0.75	1.0	6SE6410-2BB17-5BA0	–		3NA3805	3RV1021-1JA10
	<b>Inverter with flat plate heatsink</b>						
	0.37	0.50	6SE6410-2BB13-7AB0 *)	–	6SE6400-3CC01-0AB3	3NA3803	3RV1021-1FA10
	0.75	1.0	6SE6410-2BB17-5BB0 *)	–		3NA3805	3RV1021-1JA10

\*) With these inverters, the filter or choke cannot be mounted in the substructure. This option must be mounted upright.



## Overview

### Operator Panel (OP)

With the OP, individual parameter settings can be made.

Values and units are shown on a 5-digit display.

An OP can be used for several inverters. It is directly plugged into the inverter.



Inverter with Operator Panel (OP)

### Connection kit for PC to inverter

For controlling and commissioning an inverter directly from a PC if the appropriate software has been installed (e.g. STARTER).

The connection kit includes an RS-485/RS-232 interface converter with a 9-pin Sub-D connector.

### Start-up tools

- **STARTER**  
is a graphic start-up software for guided start-up for MICROMASTER 410/420/430/440 frequency inverters under Windows NT/2000/XP Professional. Parameter lists can be read out, altered, stored, entered and printed.
- **DriveMonitor**  
is a start-up software for list-oriented programming of frequency inverters. This program executes under Windows 95/98/NT/2000/XP Professional.

## Selection and ordering data

The options listed here are suitable for all MICROMASTER 410 inverters.

Options	Order No.
Operator Panel (OP)	<b>6SE6400-0SP00-0AA0</b>
Connection kit for PC to inverter	<b>6SE6400-0PL00-0AA0</b>
Adapter for mounting on DIN rails	<b>6SE6400-0DR00-0AA0</b>
Start-up tools STARTER and DriveMonitor, as well as multilanguage documentation on CD-ROM	<b>6SE6400-5EA00-1AG0</b>

## Documentation

## Selection and ordering data

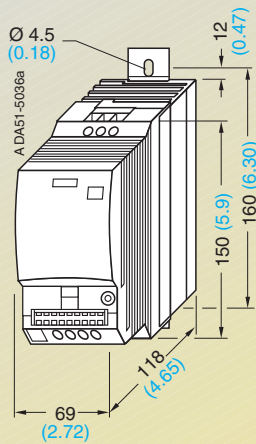
Type of documentation	Language	Order No.
<b>Operating instructions</b> <sup>1)</sup> (paper version)	German	<b>6SE6400-5EA00-0AP0</b>
	English	<b>6SE6400-5EA00-0BP0</b>
	French	<b>6SE6400-5EA00-0DP0</b>
	Italian	<b>6SE6400-5EA00-0CP0</b>
	Spanish	<b>6SE6400-5EA00-0EP0</b>
<b>Parameter list</b> <sup>1)</sup> (paper version)	German	<b>6SE6400-5EB00-0AP0</b>
	English	<b>6SE6400-5EB00-0BP0</b>
	French	<b>6SE6400-5EB00-0DP0</b>
	Italian	<b>6SE6400-5EB00-0CP0</b>
	Spanish	<b>6SE6400-5EB00-0EP0</b>
<b>Getting Started Guide</b> <sup>1)</sup> (paper version), included with every inverter	Multilanguage	–

<sup>1)</sup> Available on the Internet at  
<http://www.siemens.com/micro-master>

# MICROMASTER 410

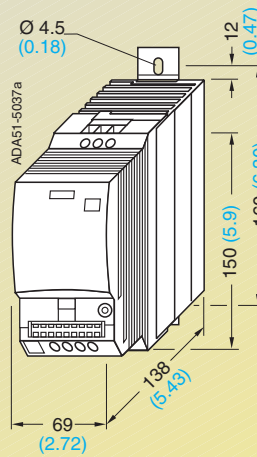
## Dimension drawings

### MICROMASTER 410 inverter



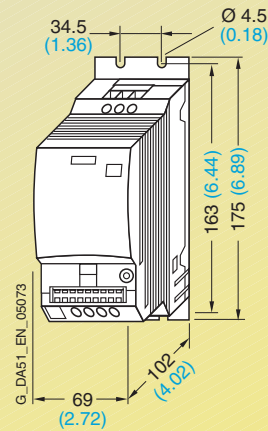
#### Inverter frame size AA

6SE6410-2...11-2AA0  
6SE6410-2...12-5AA0  
6SE6410-2...13-7AA0



#### Inverter frame size AB

6SE6410-2...15-5BA0  
6SE6410-2...17-5BA0

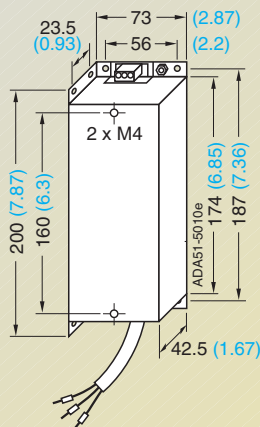


#### Inverter with flat plate heatsink

6SE6410-2...B13-7AB0  
6SE6410-2...B17-5BB0

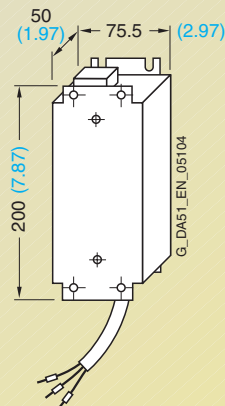
All dimensions in mm (values in brackets are in inches)

### Filters and chokes



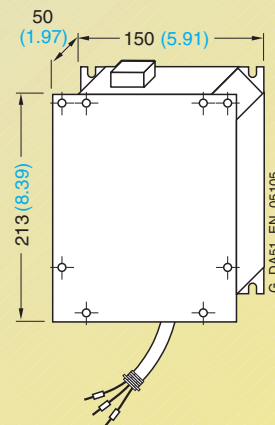
#### Filter

6SE6400-2FL01-0AB0



#### Footprint chokes

6SE6400-3CC00-4AB3  
6SE6400-3CC01-0AB3



#### Choke for upright mounting

6SE6400-3CC02-6BB3

All dimensions in mm (values in brackets are in inches)