SIEMENS

MICROMASTER 410 Inverters
0.12 kW to 0.75 kW

Edition 2001

STANDARD DRIVES

SIEMENS

MICROMASTER 410 Inverters

0.12 kW to 0.75 kW

Edition 2001

The products and systems referred to in this edition are manufactured with a DQS-certified quality-management system in accordance with DIN EN ISO 9001 (certificate registration number: FM 25845). The DQS certificate is recognized in all EQ Net countries (reg. number: FM 25845).

Description

Applications

The MICROMASTER 410 inverters are suitable for a variety of variable-speed drive applications.

They are especially suitable for applications with pumps and fans and as drives in various industry sectors, e.g. food and beverage, textile, packaging as well as applications that use conveyor technology, for factory door and garage door drives and as universal drives for mobile advertising media.

They are the ideal inverter solution with minimized costs in the lower output range of the MICROMASTER product family.

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

They can be used worldwide as it is available in versions for 230 V and 115 V single phase line supplies.

Design

The MICROMASTER 410 has a compact design.

Using a heatsink it is self-cooled – no separate fan is required.

The position of the power terminals is similiar to conventional contactors.

The optional Operator Panel (OP) can be easily fitted without any tools.

Main Characteristics

- Simple selection using minimized type range (only a few options)
- Compact design
- Self-cooled using a heatsink (no fan unit)
- Simple connection based on conventional switching devices (e.g. contactors)
- Version with integrated EMC filter class B
- Fast, simple start-up by having to enter only a few parameters
- Integrated communications interface RS485
- Three freely programmable digital inputs, non isolated (the analog input can be used as 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/2 A, inductive load)
- Silent motor operation is possible when using high switching frequencies
- Complete inverter and motor protection.

Options (Overview)

- Line commutating chokes
- Adapter for standardized DIN rail mounting
- Operator Panel (OP) which allows the inverter to be parameterized in a user-friendly fashion.
- PC-inverter-connection kit
- PC commissioning tool

International Standards

- MICROMASTER 410 complies with the requirements of the Low Voltage Directive and the EMC Directive
- MICROMASTER 410 carries the CE mark.
- Ⓤ and cⓊ listed
- c-tick

Mechanical Features

- Compact design
- Heat dissipation through natural self-cooling
- Operating temperature: –10 °C up to +50 °C
- Simple cable connection, line terminals and motorside terminals are separated and located on opposite sides to ensure optimal EMC performance and easy connection
- Detachable optional operator panel
- Screwless control terminals
- Can be side mounted; allowing installation in shallow cabinets or restricted spaces.

Performance Features

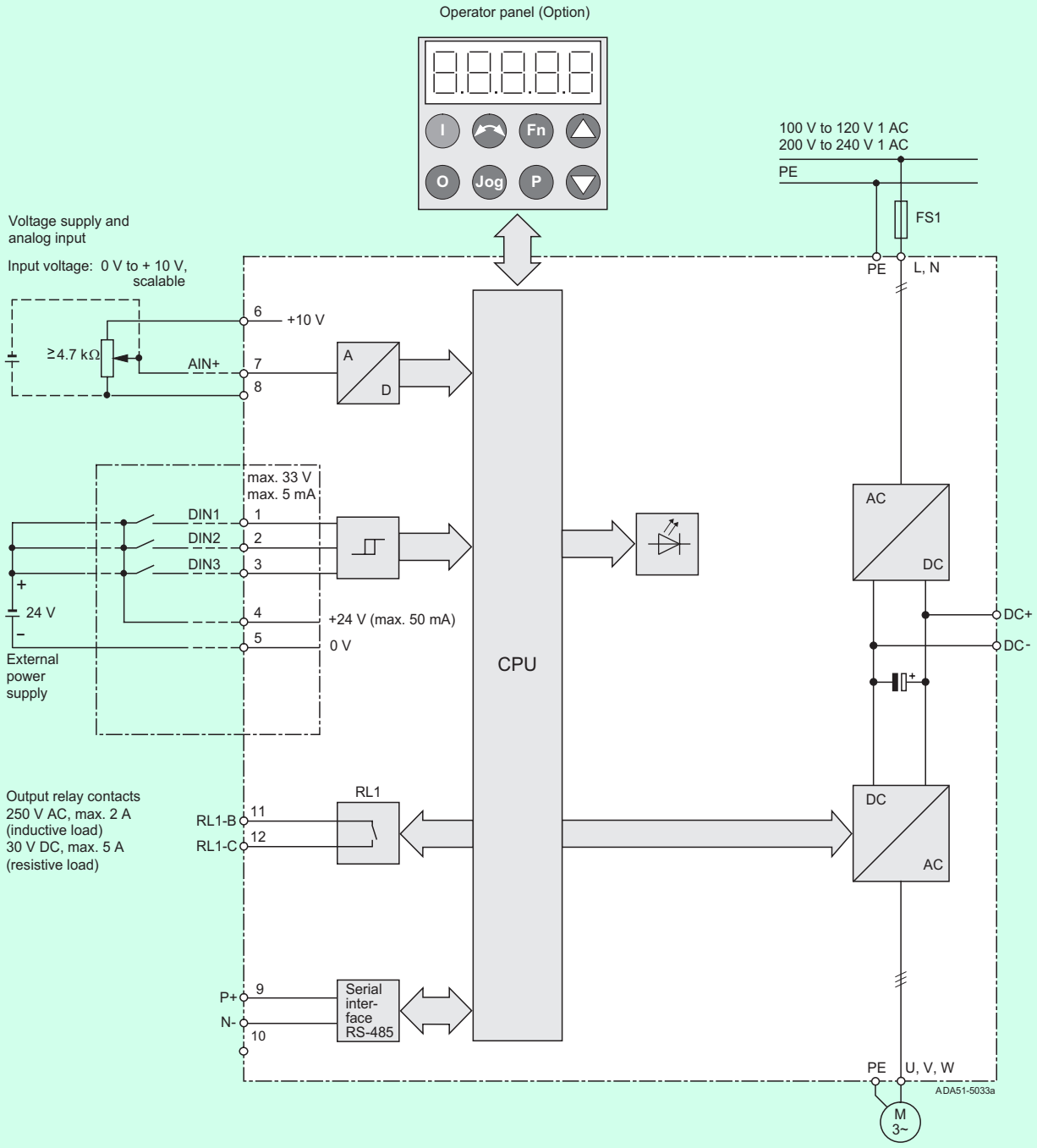
- Latest IGBT technology
- Digital microprocessor control
- Linear *V/f* characteristic, with parameterizable voltage boost
- Parabolic *V/f* characteristic
- Multipoint *V/f* characteristic
- Flying restart
- Automatic restart facility following power failure or fault
- Flexible ramp function generator (0 up to 650 sec) with smoothing feature
- Fast Current Limitation for trouble-free operation
- Fast, high constant reproducible response to the signals from digital inputs
- Accurate setpoint spezification thanks to high resolution 10-bit analog input
- One skip frequency range
- Removable Y capacitor for operation on ungrounded supplies (IT line supply)
- Serial communication interface RS 485 with USS protocol
- One LED for status information
- Variant with integrated EMC filter class B.

Protection Features

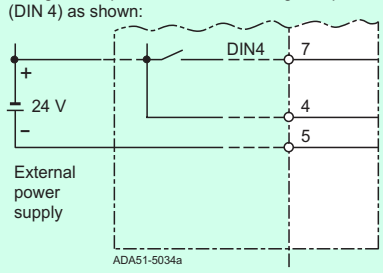
- Overload capability up to 150 % of rated output current for 60 s, followed by 85 % for 240 s, cycle time 300 s
- Overvoltage/undervoltage protection
- Inverter overtemperature protection
- Earth fault protection
- Short circuit protection
- I^2t thermal motor protection
- Stall prevention.

Circuit Diagrams

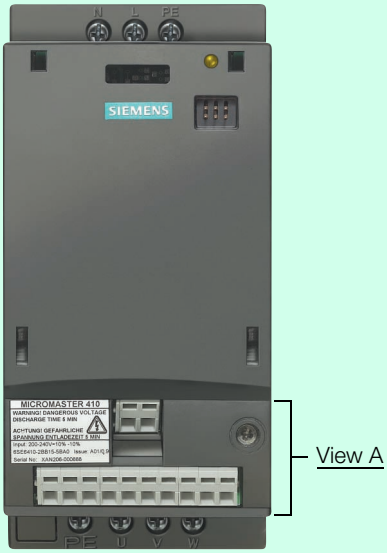
General Circuit Diagram



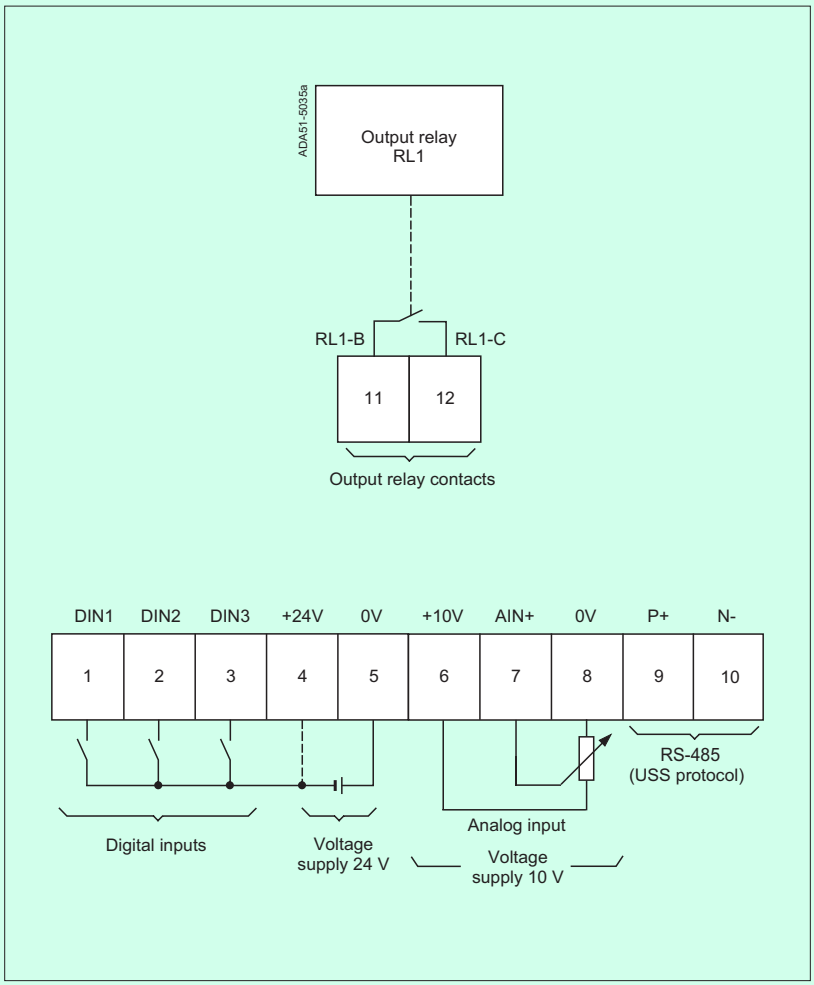
The analog input circuit can be alternatively configured to provide an additional digital input (DIN 4) as shown:



Terminal Connection Diagram



View A



Technical Data

MICROMASTER 410 Inverter

Input voltage and power ranges	1 AC 200 V to 240 V ± 10% 1 AC 100 V to 120 V ± 10%	0.12 to 0.75 kW 0.12 to 0.55 kW	
Input frequency	47 to 63 Hz		
Output frequency	0 Hz to 650 Hz		
Power factor	≥ 0.7		
Inverter efficiency	96 % to 97 %		
Overload capability	up to 150 % of rated output current for 60 s, followed by 85 % for 240 s, cycle time 300 s		
Inrush current	less than rated input current		
Control method	linear *V/f*; parabolic *V/f*; Multipoint *V/f* characteristic		
Pulse frequency	8 kHz (standard) 2 kHz to 16 kHz (in 2 kHz steps)		
Fixed frequencies	3, programmable		
Skip frequency	1, programmable		
Setpoint resolution	10 bit analog 0.01 Hz serial		
Digital inputs	3 freely programmable digital inputs, non isolated; PNP type; SIMATIC compatible		
Analog input	1, for setpoint (0 to 10 V, scalable or for use as 4th digital input)		
Relay output	1, parameterizable, 30 V DC/5 A (resistive load), 250 V AC/2 A (inductive load)		
Serial interface	RS 485, for operation with USS protocol		
Motor cable length	maximum 30 m (shielded) maximum 50 m (unshielded)		
Electromagnetic compatibility	Variant with integrated EMC filter according to EN 61 800-3 (specifies limit values according to EN 55 011 class B)		
Braking	DC Braking, Compound Braking		
Protection level	IP 20		
Operating temperature	–10 °C to +50 °C		
Storage temperature	–40 °C to +70 °C		
Humidity	95% RH – non-condensing		
Operational altitudes	up to 1000 m above sea level without derating		
Protection features	• under-voltage • over-voltage • overload • earth fault • short circuit • stall prevention • motor over-temperature I^2t • inverter over-temperature		
Compliance with standards	UL, cUL, CE, c-tick		
CE mark	Conformity with EC low voltage directive 73/23/EEC and the electromagnetic compability directive 89/336/EEC		
Dimensions and weights	Frame size AA AB	W x H x D (mm) 150 x 69 x 118 150 x 69 x 138	Weight (kg) 0.8 1.0

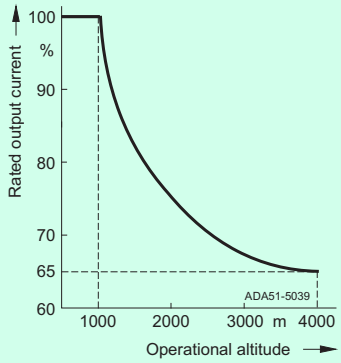
Derating-Data

Pulse frequency

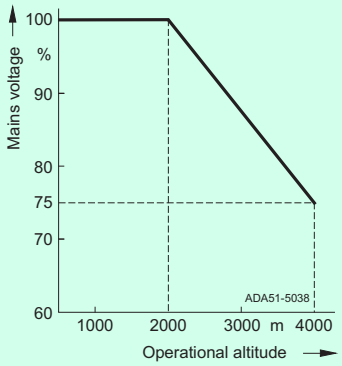
Rated output	**Rated output current in A** at a pulse frequency of						
kW	4 kHz	6 kHz	8 kHz	10 kHz	12 kHz	14 kHz	16 kHz
0.12	0.9	0.9	0.9	0.8	0.7	0.6	0.5
0.25	1.7	1.7	1.7	1.5	1.3	1.1	0.9
0.37	2.3	2.3	2.3	2.0	1.7	1.5	1.3
0.55	3.2	3.2	3.2	2.9	2.6	2.3	2.0
0.75 (at 50 °C)	3.9	3.9	3.6	3.2	2.9	2.6	2.3
0.75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

Operational altitude

Permissible output current
in % of the rated output current



Permissible mains voltage
in % of the max. permissible mains voltage



Selection and Ordering Data

MICROMASTER 410 Inverter

Rated output		Rated input current	Rated output current	Frame size	Order No.	
kW	hp	A	A		**MICROMASTER 410 without filter**	**MICROMASTER 410 with Class B filter**
Mains operating voltage 100 V to 120 V 1 AC, output voltage 200 V to 240 V three-phase						
0.12	0.16	4.6	0.9	AA	**6SE6410-2UA11-2AA0**	–
0.25	0.33	7.5	1.7	AA	**6SE6410-2UA12-5AA0**	–
0.37	0.50	10.1	2.3	AA	**6SE6410-2UA13-7AA0**	–
0.55	0.75	13.4	3.2	AB	**6SE6410-2UA15-5BA0**	–
Mains operating voltage 200 V to 240 V 1 AC, output voltage 200 V to 240 V three-phase						
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)	AB	**6SE6410-2UB17-5BA0**	**6SE6410-2BB17-5BA0**

All currents refer to a surrounding air temperature of 50 °C if not otherwise stated.

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.

Variant dependent options

EMC filter

Variants with **integrated** EMC filter are obtainable for inverters with 230 V 1 AC line supply.

Being equipped with this filter the inverter complies with the following emission standards:

- EN 61 800-3 (1st environment, general distribution [1])): up to 5 m shielded cable or 10 m with low-capacity motor cable (core/core <75 pF/m, core/screen<150 pF/m). The limits of this standard comply with EN 50 011 class B.

A filtered unit can be operated with a 30 mA residual-current-operated circuit breaker and can be used in permanently wired installations.

Line commutating choke

Line commutating chokes are used to smoothe 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 between the rated inverter apparent power and the system short circuit power is < 1 %, a line commutating choke must be installed in order to reduce the current peaks.

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

In accordance with the regulations laid down in EN 61 000-3-2 "Limit values for harmonic current emissions (equipment input currents ≤ 16 A per phase)", there are special issues for drives with 250 W to 550 W and 230 V single-phase line supplies, which are used in non-industrial applications (1st environment [1])). For the 250 W and 370 W drives, either the input reactor, recommended in the Catalog must be installed, or approval must be obtained from the power supply utility for the drive to be connected to the public line supply. However, electrical equipment, which contains these devices, and attain an input power >1 kW, can be used without any further problems.

Variant Independent Options

Operator Panel (OP)

With the operator panel, individual parameter settings can be made. Values and units are shown on a 5-digit display.

An operator panel can be used for several inverters. It is directly connected to the inverter.

Inverter with operator panel (OP)

PC to inverter connection kit

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

The kit includes an RS485/RS232 interface converter with 9-pin sub-D connector and connecting cable.

Commissioning tool Starter

Starter is the start-up software for guided commissioning for MICROMASTER under Windows NT/2000.

Furthermore, MICROMASTER 410 is included in the "DriveMonitor" start-up tool.

Parameter lists can be read out, modified, stored, entered and printed.

1) **1st environment**
(residential, business and trade environments):
Environments, which include residential areas and, in addition, equipment, which is connected directly to the low-voltage supply without using an intermediate transformer, which is used to supply residential buildings.

General distribution:
Sales channel for which the marketing/sale of the equipment is independent of the EMC knowledge of the customer or user.

Options

Ordering Data for Variant Dependent Options

The options listed here

- Filters
- Chokes
- Fuses
- Circuit breakers

are inverter specific.

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

All options are certified to UL except fuses.

The fuses type 3NA3 are recommended for use in Europe.

Operations in American-based countries require UL approved fuses, e.g. fuses type Class-NON from Bussmann company.

	Rated output	Inverter	Order No. of the options			
			Low leakage Class B	**Line commutating choke**	**Fuse** (see Catalog NS K)	**Circuit breaker** (see Catalog NS K)
	kW					
Mains operating voltage 100 V to 120 V 1 AC						
Inverter without filter	0.12	6SE6410-2UA11-2AA0	–	**6SE6400-3CC01-0AB0**	**3NA3803**	**3RV1021-1GA10**
	0.25	6SE6410-2UA12-5AA0	–			**3RV1021-1JA10**
	0.37	6SE6410-2UA13-7AA0 *)	–	**6SE6400-3CC02-6BB0**	**3NA3805**	**3RV1021-1KA10**
	0.55	6SE6410-2UA15-5BA0 *)	–		**3NA3807**	**3RV1021-4AA10**
Mains operating voltage 200 V to 240 V 1 AC						
Inverter without filter	0.12	6SE6410-2UB11-2AA0	**6SE6400-2FL01-0AB0**	**6SE6400-3CC00-4AB0**	**3NA3803**	**3RV1021-1BA10**
	0.25	6SE6410-2UB12-5AA0				**3RV1021-1EA10**
	0.37	6SE6410-2UB13-7AA0		**6SE6400-3CC01-0AB0**		**3RV1021-1FA10**
	0.55	6SE6410-2UB15-5BA0				**3RV1021-1HA10**
	0.75	6SE6410-2UB17-5BA0			**3NA3805**	**3RV1021-1JA10**
Inverter with internal Class B filter	0.12	6SE6410-2BB11-2AA0	–	**6SE6400-3CC00-4AB0**	**3NA3803**	**3RV1021-1BA10**
	0.25	6SE6410-2BB12-5AA0	–			**3RV1021-1EA10**
	0.37	6SE6410-2BB13-7AA0	–	**6SE6400-3CC01-0AB0**		**3RV1021-1FA10**
	0.55	6SE6410-2BB15-5BA0	–			**3RV1021-1HA10**
	0.75	6SE6410-2BB17-5BA0	–		**3NA3805**	**3RV1021-1JA10**

*) With this specific inverter the reactor cannot be mounted between inverter and mounting plate. The reactor must be installed separately in a vertical position.

Ordering Data for Variant Independent Options

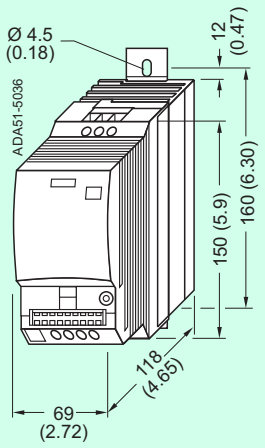
The options listed here are suitable for all MICROMASTER 410 inverters.

Option	Order No.
Operator panel	**6SE6400-0SP00-0AA0**
PC to inverter connection kit	**6SE6400-0PL00-0AA0**
Adapter for DIN rail mounting	**6SE6400-0DR00-0AA0**
Commissioning tools Starter and DriveMonitor on CD-ROM	**6SE6400-5EA00-1AG0**

Documentation

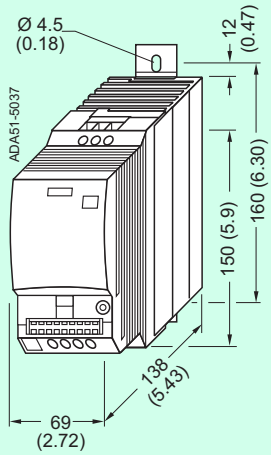
Type of documentation	Language	Order No.
Operating instructions (paper version)	German	**6SE6400-5EA00-0AP0**
	English	**6SE6400-5EA00-0BP0**
	French	**6SE6400-5EA00-0DP0**
	Italian	**6SE6400-5EA00-0CP0**
	Spanish	**6SE6400-5EA00-0EP0**
Parameter list (paper version)	German	**6SE6400-5EB00-0AP0**
	English	**6SE6400-5EB00-0BP0**
	French	**6SE6400-5EB00-0DP0**
	Italian	**6SE6400-5EB00-0CP0**
	Spanish	**6SE6400-5EB00-0EP0**
Getting Started Guide (paper version), supplied with each inverter	multi-language	–

MICROMASTER 410 Inverter



Inverter frame size AA

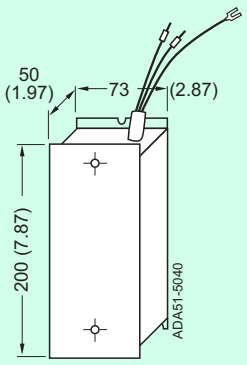
6SE6410-2 . . 11-2AA0
6SE6410-2 . . 12-5AA0
6SE6410-2 . . 13-7AA0



Inverter frame size AB

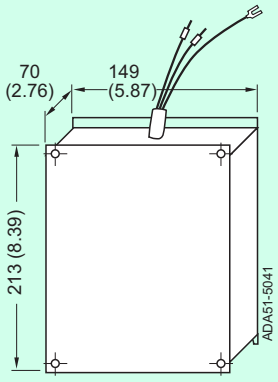
6SE6410-2 . . 15-5BA0
6SE6410-2 . . 17-5BA0

Line commutating chokes



Footprint reactor

6SE6400-3CC00-4AB0
6SE6400-3CC01-0AB0



Reactor for vertical mounting

6SE6400-3CC02-6BB0

Appendix

Environment, Resources and Recycling

Siemens AG feels a responsibility to play a role in protecting our environment and saving our valuable natural resources. This is true for both our production and our products.

Even during development, we consider any possible environment impact of future products/systems. Our aim is to prevent harmful environment effects, or at least to reduce them to an absolute minimum – beyond present regulations and legislation.

The most important activities for protecting our environment are as follows:

- We are constantly endeavouring to reduce the environmental impact of our products, as well as their consumption of energy and resources, over and above the statutory environmental protection regulations.
- We take every possible step to prevent damage to the environment.
- Environmental impact is assessed and considered at the earliest possible stage of product and process planning.
- Our optimized environmental management strategy ensures that our environment policy is put into practice effectively. The necessary technical and organizational procedures are reviewed at regular intervals and continuously updated.
- An awareness for environmental problems is expected of all our employees. Establishing and furthering a sense of responsibility for the environment on all levels represents a permanent challenge for the corporate management.
- We urge our business partners to act according to the same environmental principles as ourselves. We cooperate with the responsible public authorities.
- We inform interested members of the public about the consiquences of our corporate policies for the environment as well as our achievements to the benefit of the environment.
- Our complete documentation is printed on chlorine-free bleached paper.

Certificates ISO 9001

Z E R T I F I K A T

Die
DQS Deutsche Gesellschaft zur Zertifizierung von Managementsystemen mbH
Qualitäts- und Umweltgutachter

bescheinigt hiermit, daß das Unternehmen

Siemens AG
Automatisierungs- und Antriebstechnik
Standardantriebe

Siemensstraße 15
D-97616 Bad Neustadt/Saale

Frauenauracher Straße 80
D-91056 Erlangen

Entwicklung, Produktion, Marketing / Vertrieb und Service von Standardantrieben und kundenspezifischen Ausführungen

ein
Qualitätsmanagementsystem
eingeführt hat und anwendet.

Durch ein Qualitätsaudit, dokumentiert in einem Auditbericht, wurde der Nachweis erbracht, daß dieses Qualitätsmanagementsystem die Forderungen der folgenden Norm erfüllt:

DIN EN ISO 9001
Ausgabe August 1994

Dieses Zertifikat ist gültig bis 2002-07-01
Zertifikat-Registrier-Nr.: 357-05
Frankfurt am Main, Berlin 1999-07-02

Das diesem Zertifikat zugrundeliegende Qualitätsaudit wurde durchgeführt in Zusammenarbeit mit dem VDE Prüf- und Zertifizierungsinstitut - VDE-Verband der Elektrotechnik Elektronik Informationstechnik e.V.

Dr.-Ing. K. Petrick
Dipl.-Ing. J. Parsch
MANAGING DIRECTORS
VDE Institut
Zertifizierungsstelle

DQS is member of IQNet

Geschäftsstellen: D-60433 Frankfurt am Main, August-Schanz-Straße 21
D-10787 Berlin, Burggrafenstraße 6

Deutscher Akkreditierungs Rat
DAR
TGA-ZM-02-95-00
TGA-ZM-53-95-00

Certificate of Registration

BSI
REGISTERED

Certificate Number FM 25845

SIEMENS PLC
SIEMENS HOUSE
EATON BANK INDUSTRIAL ESTATE
VAREY ROAD
CONGLETON
CHESHIRE
CW12 1PH

operate a Quality Management System which complies with the requirements of BS EN ISO 9001:1994

Signed on behalf of BSI

Originally registered 07 October 1993 Amended on 19 April 2000

This certificate remains the property of British Standards Institution and should be returned immediately upon request. This certificate does not expire. To check its validity telephone +44 (0) 181 996 9000. To be read in conjunction with attached Appendix.

The British Standards Institution is incorporated by Royal Charter.

BSI 389 Chiswick High Road London W4 4AL

UKAS QUALITY MANAGEMENT 003

Compliance with standards

CE marked

The MICROMASTER 410 inverters comply with the requirements of the low-voltage directive 73/23/EEC and – if correctly installed – with the EMC directive 89/336/EEC. A declaration can be issued upon request.

The units comply with the following, in the Official Journal of the European Community listed standards.

Low-voltage directive

- **EN 60 204**
  Safety of machinery, electrical equipment of machines
- **EN 50 178**
  Electronic equipment for use in power installations

Machinery directive

The devices are suitable for installation in machines. According to the machinery directive 89/392/EC the compliance requires a separate certificate of conformity.

This certificate must be issued by the firm which constructs the plant or puts the machinery on the market.

EMC Directive

- **EN 61 800-3**
  Adjustable speed electrical power drive systems.
  EMC product standard including specific test methods

Electromagnetic compatibility

Being correctly installed according to the product specific recommendations there will be no inadmissible electromagnetic emissions.

The table below lists the measured results for emissions of and immunity to interference for MICROMASTER 410 inverters. The inverters were installed according to the guidelines with shielded motor cables and shielded control cables.

EMC phenomenon Standard / test		Relevant criteria	Limit value
Emissions EN 61 800-3 (1st environment [1]))	Conducted via mains cable	150 kHz to 30 MHz	Unfiltered – not tested Internal/external filter General distribution [1]): limits comply with EN 55 011 class B Restricted distribution [1]): limits comply with EN 55 011 class A group 1
	Emitted by the drive	30 MHz to 1 GHz	All devices Restricted distribution [1]): limits comply with EN 55 011 class A group 1
ESD immunity test EN 61 000-4-2 ESD through air ESD through direct contact		 Test level 3 Test level 3	 8 kV 6 kV
Electromagnetic field immunity test EN 61 000-4-3 Electrical field applied to unit		Test level 3 26 MHz to 1 GHz	10 V / m
Burst immunity test EN 61 000-4-4 Applied to all cable terminations		Test level 4	4 kV
Surge immunity test EN 61 000-4-5 Applied to all mains cables		Test level 3	2 kV
Immunity to conducted disturbances, induced by radio frequency fields EN 61 000-4-6 Applied to mains, motor and control cables		Test level 4 0.15 MHz to 80 MHz 80 % AM (1 kHz)	10 V

UL Listing

Ⓤ and cⓊ listed power conversion equipment type 5B33 in accordance with UL508C.

For use in pollution degree 2 environment.

1) **1st environment**
(residential, business and trade environments):
Environments, which include residential areas and, in addition, equipment, which is connected directly to the low-voltage supply without using an intermediate transformer, which is used to supply residential buildings.

General distribution:
Sales channel for which the marketing/sale of the equipment is independent of the EMC knowledge of the customer or user.

Restricted distribution:
sales channel for which the marketing/sale of the equipment is limited to distributors, customers or users, who have EMC knowledge each or together.