SIEMENS

MICROMASTER 440

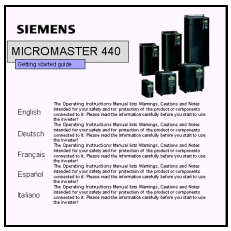
Operating Instructions **Issue B1**

User Documentation

MICROMASTER 440 Documentation

Getting Started Guide

Is for quick commissioning with SDP and BOP.



Operating Instructions

Gives information about features of the MICROMASTER 440, Installation, Commissioning, Control modes, System Parameter structure, Troubleshooting, Specifications and available options of the MICROMASTER 440.

Parameter List

The Parameter List contains the description of all Parameters structured in functional order and a detailed description. The Parameter list also includes a series of function plans.

Reference Manual

The Reference Manual gives detailed information about engineering communication troubleshooting and maintenance.

Catalogues

In the catalogue you will find all the necessary information to select an appropriate inverter, as well as filters, chokes, operator panels and communication options.

SIEMENS

MICROMASTER 440

Operating Instructions
User Documentation

Valid for	**Issue 10/01**
Converter Type	*Control Version*
MICROMASTER 440	1.6

Issue B1

Further information can be obtained from Internet website:

http://www.siemens.de/micromaster

Approved Siemens Quality for Software and Training is to DIN ISO 9001, Reg. No. 2160-01

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Other functions not described in this document may be available. However, this fact shall not constitute an obligation to supply such functions with a new control, or when servicing.

We have checked that the contents of this document correspond to the hardware and software described. There may be discrepancies nevertheless, and no guarantee can be given that they are completely identical. The information contained in this document is reviewed regularly and any necessary changes will be included in the next edition. We welcome suggestions for improvement.

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Document subject to change without prior notice.

Order number: 6SE6400-5AC00-0BP0

Siemens-Aktiengesellschaft

Foreword

User Documentation

WARNING

Before installing and commissioning the inverter, you must read all safety instructions and warnings carefully including all the warning labels attached to the equipment. Make sure that the warning labels are kept in a legible condition and replace missing or damaged labels.

Information is also available from:

Technical Support Nuremberg

Tel: +49 (0) 180 5050 222
Fax: +49 (0) 180 5050 223
Email: techsupport@ad.siemens.de
Monday to Friday: 7:00 am to 5:00 pm (local time)

Internet Home Address

Customers can access technical and general information at:
http://www.siemens.de/micromaster

Contact address

Should any questions or problems arise while reading this manual, please contact the Siemens office concerned using the form provided at the back this manual.

Definitions and Warnings

DANGER

indicates an immiently hazardous situation which, if not avoided, will result in death or serious injury.

WARNING

indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

used with the safety alert symbol indicates a potentially hazardous situationwhich, if not avoided, may result in minor or moderate injury.

CAUTION

used without safety alert symbol indicates a potentially hzardous situation which, if not avoided, may result in a property demage.

NOTICE

indicates a potential situation which, if not avoided, may result in an undesireable result or state.

NOTE

For the purpose of this documentation, "Note" indicates important information relating to the product or highlights part of the documentation for special attention.

Qualified personnel

For the purpose of this Instruction Manual and product labels, a "Qualified person" is someone who is familiar with the installation, mounting, start-up and operation of the equipment and the hazards involved.
He or she must have the following qualifications:

1. Trained and authorized to energize, de-energize, clear, ground and tag circuits and equipment in accordance with established safety procedures.
2. Trained in the proper care and use of protective equipment in accordance with established safety procedures.
3. Trained in rendering first aid.

PE

= Ground

- PE – Protective Earth uses circuit protective conductors sized for short circuits where the voltage will not rise in excess of 50 Volts. This connection is normally used to ground the inverter.
- ⏚ - Is the ground connection where the reference voltage can be the same as the Earth voltage. This connection is normally used to ground the motor.

Use for intended purpose only

The equipment may be used only for the application stated in the manual and only in conjunction with devices and components recommended and authorized by Siemens.

Safety Instructions

The following Warnings, Cautions and Notes are provided for your safety and as a means of preventing damage to the product or components in the machines connected. This section lists Warnings, Cautions and Notes, which apply generally when handling MICROMASTER 440 Inverters, classified as **General**, **Transport & Storage**, **Commissioning**, **Operation**, **Repair** and **Dismantling & Disposal**.

Specific Warnings, Cautions and Notes that apply to particular activities are listed at the beginning of the relevant chapters and are repeated or supplemented at critical points throughout these sections.

Please read the information carefully, since it is provided for your personal safety and will also help prolong the service life of your MICROMASTER 440 Inverter and the equipment you connect to it.

General

WARNING

- This equipment contains dangerous voltages and controls potentially dangerous rotating mechanical parts. Non-compliance with **Warnings** or failure to follow the instructions contained in this manual can result in loss of life, severe personal injury or serious damage to property.
- Only suitable qualified personnel should work on this equipment, and only after becoming familiar with all safety notices, installation, operation and maintenance procedures contained in this manual. The successful and safe operation of this equipment is dependent upon its proper handling, installation, operation and maintenance.
- Risk of electric shock. The DC link capacitors remain charged for five minutes after power has been removed. **It is not permissible to open the equipment until 5 minutes after the power has been removed.**
- **HP ratings are based on the Siemens 1LA motors and are given for guidance only; they do not necessarily comply with UL or NEMA HP ratings.**

CAUTION

- Children and the general public must be prevented from accessing or approaching the equipment!
- This equipment may only be used for the purpose specified by the manufacturer. Unauthorized modifications and the use of spare parts and accessories that are not sold or recommended by the manufacturer of the equipment can cause fires, electric shocks and injuries.

NOTICE

- Keep these operating instructions within easy reach of the equipment and make them available to all users
- Whenever measuring or testing has to be performed on live equipment, the regulations of Safety Code VBG 4.0 must be observed, in particular §8 “Permissible Deviations when Working on Live Parts”. Suitable electronic tools should be used.
- Before installing and commissioning, please read these safety instructions and warnings carefully and all the warning labels attached to the equipment. Make sure that the warning labels are kept in a legible condition and replace missing or damaged labels.

Transport & Storage

WARNING

- Correct transport, storage, erection and mounting, as well as careful operation and maintenance are essential for proper and safe operation of the equipment.

CAUTION

- Protect the inverter against physical shocks and vibration during transport and storage. Also be sure to protect it against water (rainfall) and excessive temperatures (*see table on page 82*).

Commissioning

WARNING

- Work on the device/system by **unqualified** personnel or failure to comply with warnings can result in severe personal injury or serious damage to material. Only suitably qualified personnel trained in the setup, installation, commissioning and operation of the product should carry out work on the device/system.
- Only permanently-wired input power connections are allowed. This equipment must be grounded (IEC 536 Class 1, NEC and other applicable standards).
- If a Residual Current-operated protective Device (RCD) is to be used, it must be an RCD type B. Machines with a three-phase power supply, fitted with EMC filters, must not be connected to a supply via an ELCB (Earth Leakage Circuit-Breaker - *see DIN VDE 0160, section 5.5.2 and EN50178 section 5.2.11.1*).
- The following terminals can carry dangerous voltages even if the inverter is inoperative:
  - the power supply terminals L/L1, N/L2, L3.
  - the motor terminals U, V, W, DC+/B+, DC-, B- and DC/R+
- This equipment must not be used as an 'emergency stop mechanism' *(see EN 60204, 9.2.5.4)*

CAUTION

The connection of power, motor and control cables to the inverter must be carried out as shown in Figure 2-7 on page 31, to prevent inductive and capacitive interference from affecting the correct functioning of the inverter.

Operation

WARNING

- MICROMASTERS operate at high voltages.
- When operating electrical devices, it is impossible to avoid applying hazardous voltages to certain parts of the equipment.
- Emergency Stop facilities according to EN 60204 IEC 204 (VDE 0113) must remain operative in all operating modes of the control equipment. Any disengagement of the Emergency Stop facility must not lead to uncontrolled or undefined restart.
- Wherever faults occurring in the control equipment can lead to substantial material damage or even grievous bodily injury (i.e. potentially dangerous faults), additional external precautions must be taken or facilities provided to ensure or enforce safe operation, even when a fault occurs (e.g. independent limit switches, mechanical interlocks, etc.).
- Certain parameter settings may cause the inverter to restart automatically after an input power failure.
- Motor parameters must be accurately configured for motor overload protection to operate correctly.
- This equipment is capable of providing internal motor overload protection in accordance with UL508C section 42. Refer to P0610 and P0335, i^2t is ON by default. Motor overload protection can also be provided using an external PTC (disabled by default P0601).
- This equipment is suitable for use in a circuit capable of delivering not more than 10,000 symmetrical amperes (rms), for a maximum voltage of 230V/460V/575V when protected by a H or K type fuse (*see Tables starting on page 81).*
- This equipment must not be used as an 'emergency stop mechanism' *(see EN 60204, 9.2.5.4)*

Repair

WARNING

- Repairs on equipment may only be carried out by **Siemens Service**, by repair centers **authorized by Siemens** or by qualified personnel who are thoroughly acquainted with all the warnings and operating procedures contained in this manual.
- Any defective parts or components must be replaced using parts contained in the relevant spare parts list.
- Disconnect the power supply before opening the equipment for access

Dismantling & Disposal

CAUTION

- The inverter's packaging is re-usable. Retain the packaging for future use or return it to the manufacturer.
- Easy-to-release screw and snap connectors allow you to break the unit down into its component parts. You can then re-cycle these component parts, dispose of them in **accordance with local requirements or return them to the manufacturer.**

Table of Contents

List of Illustrations

List of Tables

1 Overview

This Chapter contains:

A summary of the major features of the MICROMASTER 440 range.

1.1 The MICROMASTER 440

The MICROMASTER 440s are a range of frequency inverters for controlling the speed of three phase AC motors. The various models available range from the 120 W single-phase input to the 75 kW three phase input.

The inverters are microprocessor-controlled and use state-of-the-art Insulated Gate Bipolar Transistor (IGBT) technology. This makes them reliable and versatile. A special pulse-width modulation method with selectable Pulse frequency permits quiet motor operation. Comprehensive protective functions provide excellent inverter and motor protection.

The MICROMASTER 440 with its default factory settings is ideal for a large range of simple motor control applications. The MICROMASTER 440 can also be used for more advanced motor control applications via its comprehensive functionality.

The MICROMASTER 440 can be used in both 'stand-alone' applications as well as being integrated into 'Automation Systems'.

1.2 Features

Main Characteristics

- Easy installation
- Easy commissioning
- Rugged EMC design
- Can be operated on IT line supplies
- Fast repeatable response time to control signals
- Comprehensive range of parameters enabling configuration for a wide range of applications
- Simple cable connection
- Output relays
- Analog outputs (0 – 20 mA)
- 6 Isolated and switchable NPN/PNP digital inputs
- 2 Analog inputs:
  - AIN1: 0 – 10 V, 0 – 20 mA and -10 to +10 V
  - AIN2: 0 – 10 V, 0 – 20 mA
- The 2 analog inputs can be used as the 7^{th} and 8^{th} digital inputs
- BiCo technology
- Modular design for extremely flexible configuration
- High switching frequencies for low-noise motor operation
- Detailed status information and integrated message functions
- External options for PC communications, Basic Operator Panel (BOP), Advanced Operator Panel (AOP), PROFIBUS communications module

Performance Characteristics

- Sensorless Vector Control
- Flux Current Control (FCC) for improved dynamic response and motor control
- Fast Current Limitation (FCL) for trip-free operation
- Built-in DC injection brake
- Compound braking to improve braking performance
- Acceleration/deceleration times with programmable smoothing
- Closed-loop control using PID (Proportional, Integral and Differential) control loop function, with auto-tuning
- Built-in braking chopper
- Selectable up and down ramps
- 4-point ramp smoothing
- Multi-point V/f characteristic
- parameter sets which can be switched, allowing one inverter to control several alternative processes

Protection characteristics

- Overvoltage/undervoltage protection
- Overtemperature protection for the inverter
- Ground fault protection
- Short-circuit protection
- i^2t thermal motor protection
- PTC/KTY for motor protection

2 Installation

This Chapter contains:

- General data relating to installation
- Dimensions of Inverter
- Wiring guidelines to minimize the effects of EMI
- Details concerning electrical installation

WARNING

- Work on the device/system by **unqualified** personnel or failure to comply with warnings can result in severe personal injury or serious damage to material. Only suitably qualified personnel trained in the setup, installation, commissioning and operation of the product should carry out work on the device/system.
- Only permanently-wired input power connections are allowed. This equipment must be grounded (IEC 536 Class 1, NEC and other applicable standards).
- If a Residual Current-operated protective Device (RCD) is to be used, it must be an RCD type B. Machines with a three-phase power supply, fitted with EMC filters, must not be connected to a supply via an ELCB (Earth Leakage Circuit-Breaker EN50178 Section 5.2.11.1).
- The following terminals can carry dangerous voltages even if the inverter is inoperative:
  - the power supply terminals L/L1, N/L2, L3.
  - the motor terminals U, V, W, DC+/B+, DC-, B- and DC/R+
- Always wait **5 minutes** to allow the unit to discharge after switching off before carrying out any installation work.
- This equipment must not be used as an 'emergency stop mechanism' *(see EN 60204, 9.2.5.4)*
- The minimum size of the earth-bonding conductor must be equal to or greater than the cross-section of the power supply cables.

CAUTION

The connection of power, motor and control cables to the inverter must be carried out as shown in Figure 2-7 on page 31, to prevent inductive and capacitive interference from affecting the correct functioning of the inverter.

2.1 General

Installation after a Period of Storage

Following a prolonged period of storage, you must reform the capacitors in the inverter. The requirements are listed below.

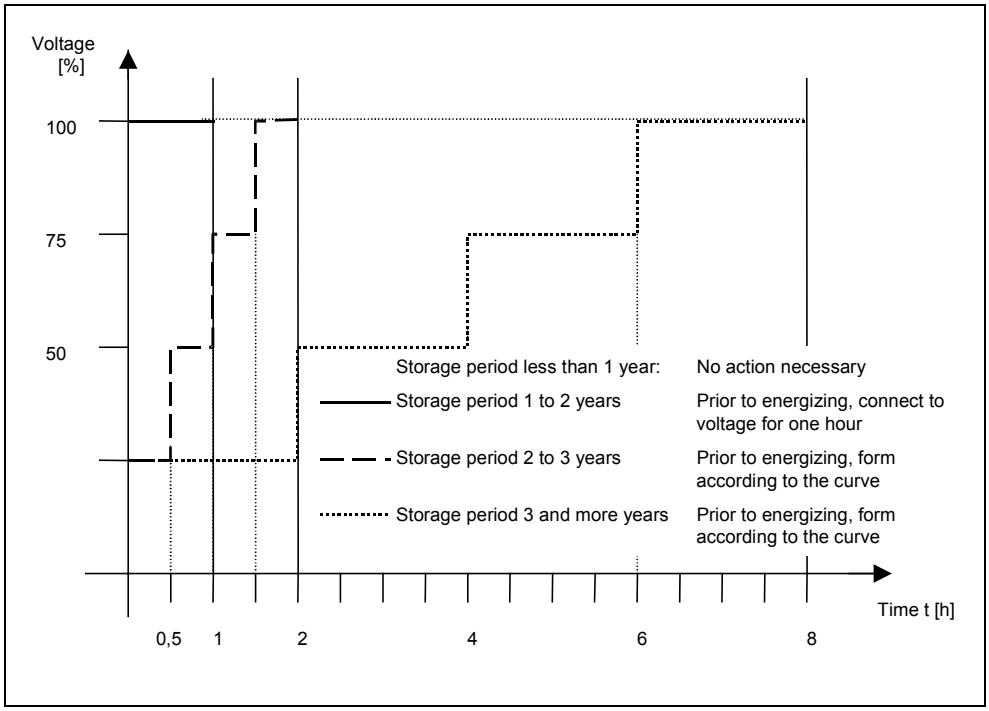


Figure 2-1 Forming

2.2 Ambient operating conditions

Temperature

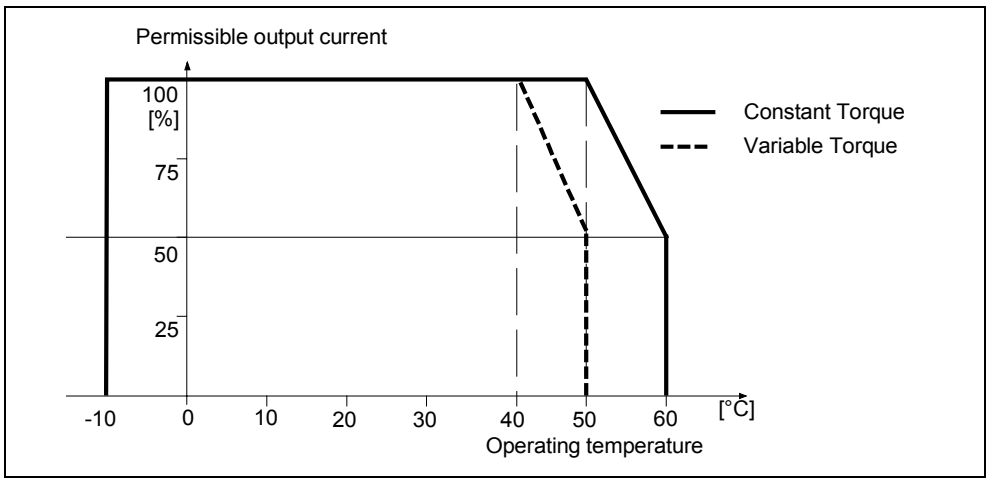


Figure 2-2 Ambient operating temperature

Humidity Range

Relative air humidity ≤ 95 % Non-condensing

Altitude

If the inverter is to be installed at an altitude > 1000 m or > 2000 m above sea level, derating will be required:

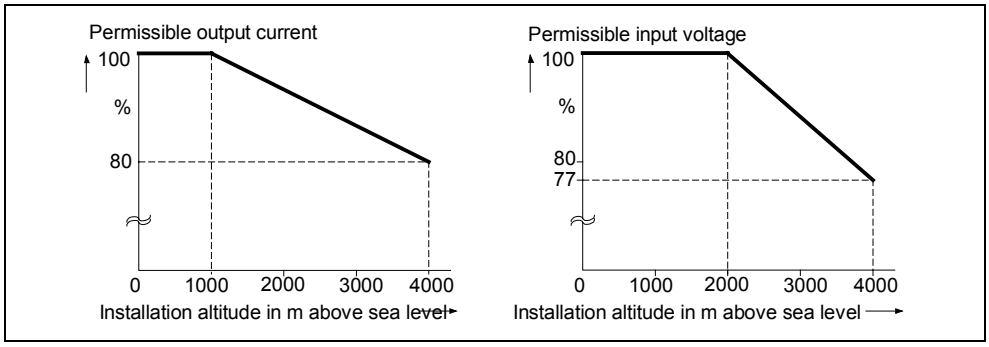


Figure 2-3 Installation altitude

Shock and Vibration

Do not drop the inverter or expose to sudden shock. Do not install the inverter in an area where it is likely to be exposed to constant vibration.

Mechanical strength to DIN IEC 68-2-6

- Deflection: 0.075 mm (10 ... 58 Hz)
- Acceleration: 9.8 m/s^2 (> 58 ... 500 Hz)

Electromagnetic Radiation

Do not install the inverter near sources of electromagnetic radiation.

Atmospheric Pollution

Do not install the inverter in an environment, which contains atmospheric pollutants such as dust, corrosive gases, etc.

Water

Take care to site the inverter away from potential water hazards, e.g. do not install the inverter beneath pipes that are subject to condensation. Avoid installing the inverter where excessive humidity and condensation may occur.

Installation and cooling

CAUTION

The inverters MUST NOT be mounted horizontally.

The inverters can be mounted without any clearance at either side.

Allow 100 mm clearance above and below the inverter. Make sure that the cooling vents in the inverter are positioned correctly to allow free movement of air.

2.3 Mechanical installation

WARNING

- To ensure the safe operation of the equipment, it must be installed and commissioned by qualified personnel in full compliance with the warnings laid down in these operating instructions.
- Take particular note of the general and regional installation and safety regulations regarding work on dangerous voltage installations (e.g. EN 50178), as well as the relevant regulations regarding the correct use of tools and personal protective equipment (PPE).
- The mains input, DC and motor terminals, can carry dangerous voltages even if the inverter is inoperative; wait **5 minutes** to allow the unit to discharge after switching off before carrying out any installation work.
- The inverters can be mounted adjacent to each other. If they are mounted on top of each other, however, a clearance of 100 mm has to be observed.

Table 2-1 Dimensions and Torques of MICROMASTER 440

Frame-Size		Overall Dimensions		Fixing Method	Tightening Torque
A	Width x Height x Depth	mm	73 x 173 x 149	2 x M4 Bolts 2 x M4 Nuts 2 x M4 Washers for fitting on standard rail	2.5 Nm with washers fitted
		inch	2.87 x 6.81 x 5.87		
B	Width x Height x Depth	mm	149 x 202 x 172	4 x M4 Bolts 4 x M4 Nuts 4 x M4 Washers	2.5 Nm with washers fitted
		inch	5.87 x 7.95 x 6.77		
C	Width x Height x Depth	mm	185 x 245 x 195	4 x M5 Bolts 4 x M5 Nuts 4 x M5 Washers	2.5 Nm with washers fitted
		inch	7.28 x 9.65 x 7.68		
D	Width x Height x Depth	mm	275 x 520 x 245	4 x M8 Bolts 4 x M8 Nuts 4 x M8 Washers	3.0 Nm with washers fitted
		inch	10.82 x 20.47 x 9.65		
E	Width x Height x Depth	mm	275 x 650 x 245	4 x M8 Bolts 4 x M8 Nuts 4 x M8 Washers	3.0 Nm with washers fitted
		inch	10.82 x 25.59 x 9.65		
F	Width x Height x Depth	mm	350 x 850 mm x 320 height with filter 1150	4 x M8 Bolts 4 x M8 Nuts 4 x M8 Washers	3.0 Nm with washers fitted
		inch	13.78 x 33.46 x 12.60 height with filter 45.28		

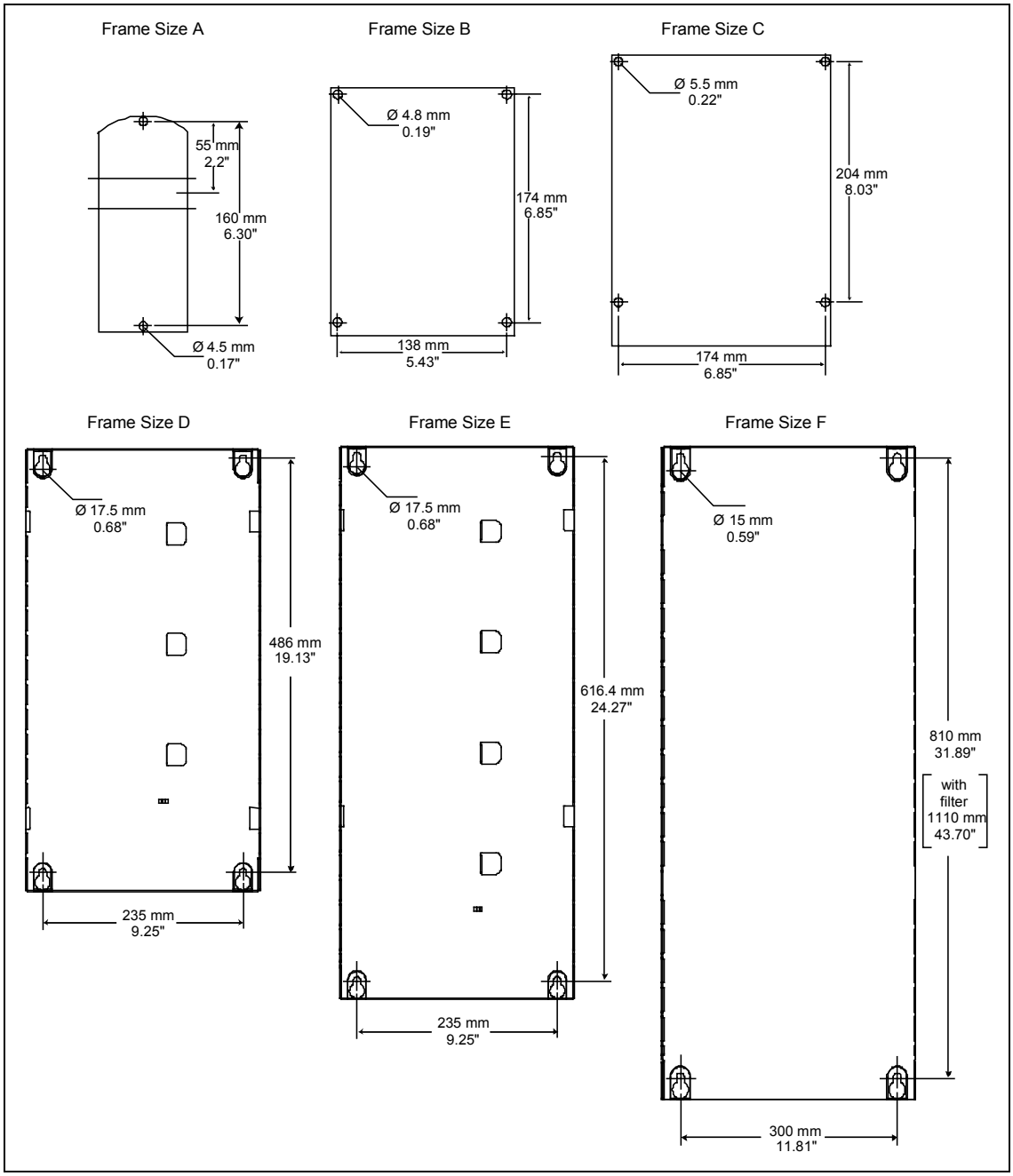
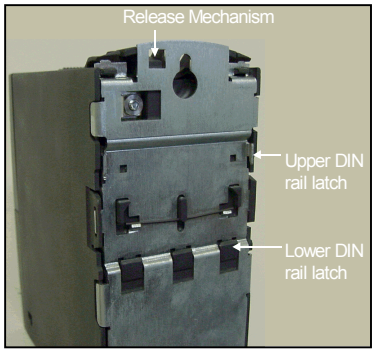


Figure 2-4 Drill pattern for MICROMASTER 440

2.3.1 Mounting on standard rail, Frame Size A

Fitting the Inverter a 35 mm standard rail (EN 50022)



1. Fit the inverter to the rail using the upper rail latch.

2. Push the inverter against the rail and the lower rail latch should click into place.

Removing the Inverter from the rail

1. To disengaged the release mechanism of the inverter, insert a screwdriver into the release mechanism.
2. Apply a downward pressure and the lower rail latch will disengage.
3. Pull the inverter from the rail.

2.4 Electrical installation

WARNING

The inverter must always be grounded.

- To ensure the safe operation of the equipment, it must be installed and commissioned by qualified personnel in full compliance with the warnings laid down in these operating instructions.
- Take particular note of the general and regional installation and safety regulations regarding work on dangerous voltage installations (e.g. EN 50178), as well as the relevant regulations regarding the correct use of tools and personal protective gear.
- Never use high voltage insulation test equipment on cables connected to the inverter.
- The mains input, DC and motor terminals, can carry dangerous voltages even if the inverter is inoperative; wait **5 minutes** to allow the unit to discharge after switching off before carrying out any installation work.

CAUTION

The control, power supply and motor leads **must** be laid separately. Do not feed them through the same cable conduit/trunking.

2.4.1 General

WARNING

The inverter must always be grounded. If the inverter is not grounded correctly, extremely dangerous conditions may arise within the inverter which could prove potentially fatal.

Operation with ungrounded (IT) supplies

The MICROMASTER will operate from ungrounded supplies and will continue to operate if an input phase is shorted to ground. If an output phase is shorted to ground, the MICROMASTER will trip and indicate F0001.

On ungrounded supplies, it will be necessary to remove the 'Y' capacitor from the inside of the unit and fit an output choke. The procedure for removing this capacitor is described in Appendices 0 to J.

Operation with Residual Current Device

If an RCD (also referred to as ELCB or RCCB) is fitted, the MICROMASTER inverters will operate without nuisance tripping, provided that:

- ☑ A type B RCD is used.
- ☑ The trip limit of the RCD is 300mA.
- ☑ The neutral of the supply is grounded.
- ☑ Only one inverter is supplied from each RCD.
- ☑ The output cables are less than 50m (screened) or 100m (unscreened).

Operation with long cables

All inverters will operate at full specification with cable lengths up to 50 m screened or 100 m unscreened.

2.4.2 Power and motor connections

WARNING

The inverter must always be grounded.

- Isolate the mains electrical supply before making or changing connections to the unit.
- Ensure that the inverter is configured for the correct supply voltage: single / three-phase 230 V MICROMASTERS must not be connected to a higher voltage supply.
- When synchronous motors are connected or when coupling several motors in parallel, the inverter must be operated with voltage/frequency control characteristic (P1300 = 0, 2 or 3).

CAUTION

After connecting the power and motor cables to the proper terminals, make sure that the covers have been replaced properly before supplying power to the unit!

NOTICE

- Ensure that the appropriate circuit-breakers/fuses with the specified current rating are connected between the power supply and inverter *(see chapter 7, Tables starting on page 83*).
- Use Class 1 60/75°C copper wire only (for UL compliance). For tightening torque see Table 7-2 on page 83.

Access to the power and motor terminals

You can gain access to the mains and motor terminals by removing the covers (see also Appendices 0 to E.

The mains and motor connections must be made as shown in Figure 2-6.

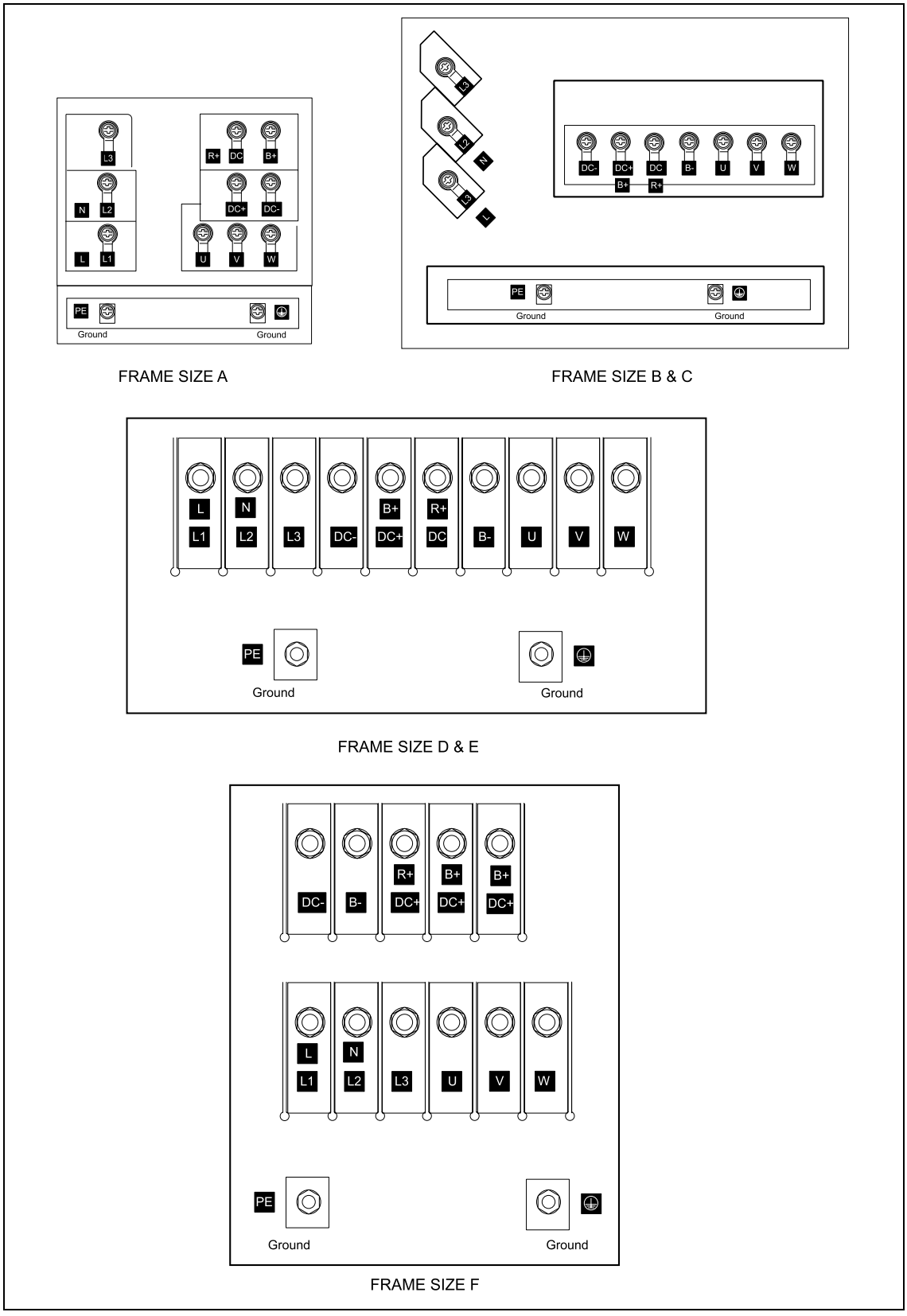


Figure 2-5 MICROMASTER 440 Connection Terminals

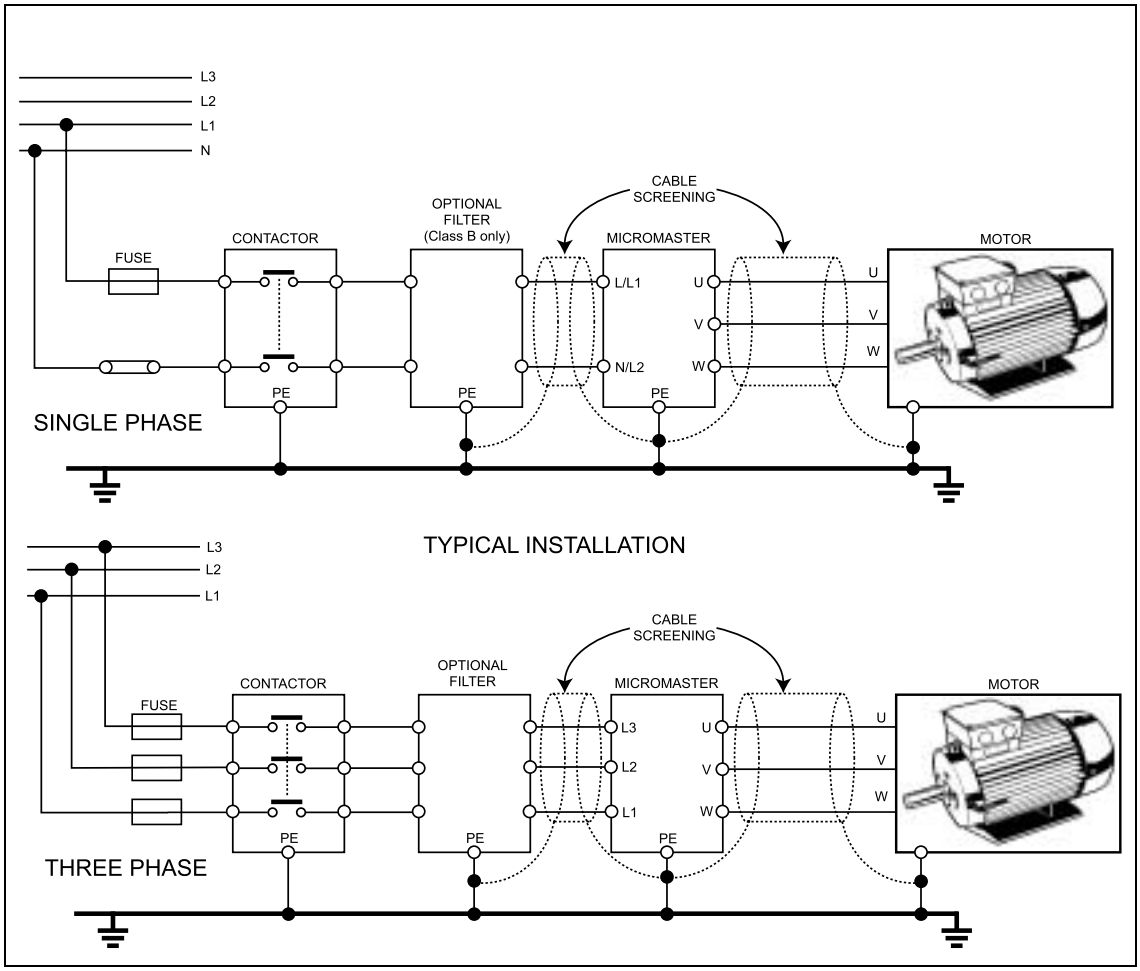


Figure 2-6 Motor and Power Connections

2.4.3 Avoiding Electro-Magnetic Interference (EMI)

The inverters are designed to operate in an industrial environment where a high level of EMI can be expected. Usually, good installation practices will ensure safe and trouble-free operation. If you encounter problems, follow the guidelines stated below.

Action to Take

- Ensure that all equipment in the cubicle is well grounded using short, thick grounding cable connected to a common star point or busbar
- Make sure that any control equipment (such as a PLC) connected to the inverter is connected to the same ground or star point as the inverter via a short thick link.
- Connect the return ground from the motors controlled by the inverters directly to the ground connection (PE) on the associated inverter
- Flat conductors are preferred as they have lower impedance at higher frequencies
- Terminate the ends of the cable neatly, ensuring that unscreened wires are as short as possible
- Separate the control cables from the power cables as much as possible, using separate trunking, if necessary at 90º to each other.
- Whenever possible, use screened leads for the connections to the control circuitry
- Ensure that the contactors in the cubicle are suppressed, either with R-C suppressors for AC contactors or 'flywheel' diodes for DC contactors fitted to the coils. Varistor suppressors are also effective. This is important when the contactors are controlled from the inverter relay
- Use screened or armored cables for the motor connections and ground the screen at both ends using the cable clamps

WARNING

Safety regulations **must not** be compromised when installing inverters!

2.4.4 Screening Methods

Frame Sizes A, B and C

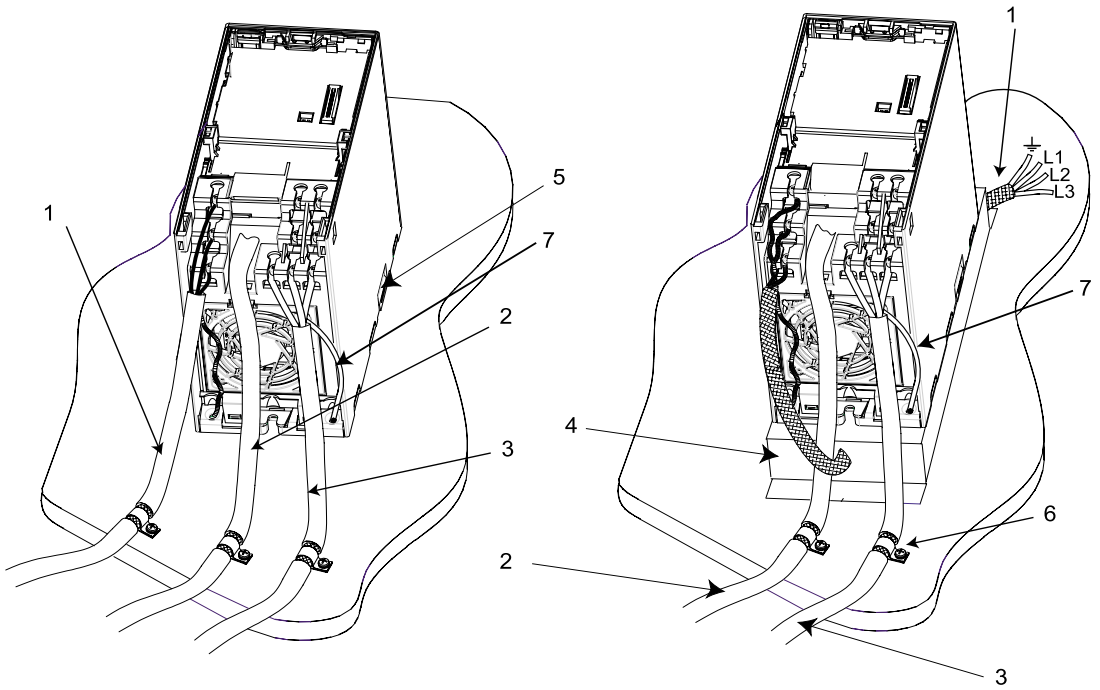
For frame sizes A, B and C the Gland Plate Kit is supplied as an option. It allows easy and efficient connection of the necessary screening. See the Gland Plate Installation Instructions contained on the Document CD-ROM, supplied with the MM440.

Frame Sizes D, E and F

The Gland Plate is factory fitted. The installation of the screening is accomplished using the same methodology as in frame sizes A, B and C.

Screening without a Gland Plate

Should a Gland Plate not be available, then the inverter can be screened using the methodology shown in Figure 2-7.



1 Mains power input
2 Control cable
3 Motor cable
4 Footprint filter
5 Metal back plate
6 Use suitable clips to fix motor and control cable screens securely to metal back plate
7 Screening cables

Figure 2-7 Wiring Guidelines to Minimize the Effects of EMI

NOTES

To enhance the screening of the motor and control cables, the optional Gland Plate can be used (not shown in Figure 2-7).

3 Commissioning

This Chapter contains:

- A schematic diagram of the MICROMASTER 440
- An overview of the commissioning options and the display and operator panels
- An overview of quick commissioing of the MICROMASTER 440

WARNING

- MICROMASTERS operate at high voltages.
- When operating electrical devices, it is impossible to avoid applying hazardous voltages to certain parts of the equipment.
- Emergency Stop facilities according to EN 60204 IEC 204 (VDE 0113) must remain operative in all operating modes of the control equipment. Any disengagement of the Emergency Stop facility must not lead to uncontrolled or undefined restart.
- Wherever faults occurring in the control equipment can lead to substantial material damage or even grievous bodily injury (i.e. potentially dangerous faults), additional external precautions must be taken or facilities provided to ensure or enforce safe operation, even when a fault occurs (e.g. independent limit switches, mechanical interlocks, etc.).
- Certain parameter settings may cause the inverter to restart automatically after an input power failure.
- Motor parameters must be accurately configured for motor overload protection to operate correctly.
- This equipment is capable of providing internal motor overload protection in accordance with UL508C section 42. Refer to P0610 and P0335, i^2t is ON by default. Motor overload protection can also be provided using an external PTC (disabled by default P0601).
- This equipment is suitable for use in a circuit capable of delivering not more than 10,000 symmetrical amperes (rms), for a maximum voltage of 230V/460V/575V when protected by a H or K type fuse (*see Tables starting on page 83)*.
- This equipment must not be used as an ‘emergency stop mechanism’ *(see EN 60204, 9.2.5.4)*

CAUTION

Only qualified personnel may enter settings in the control panels. Particular attention must be paid to safety precautions and warnings at all times.

3.1 Block diagram

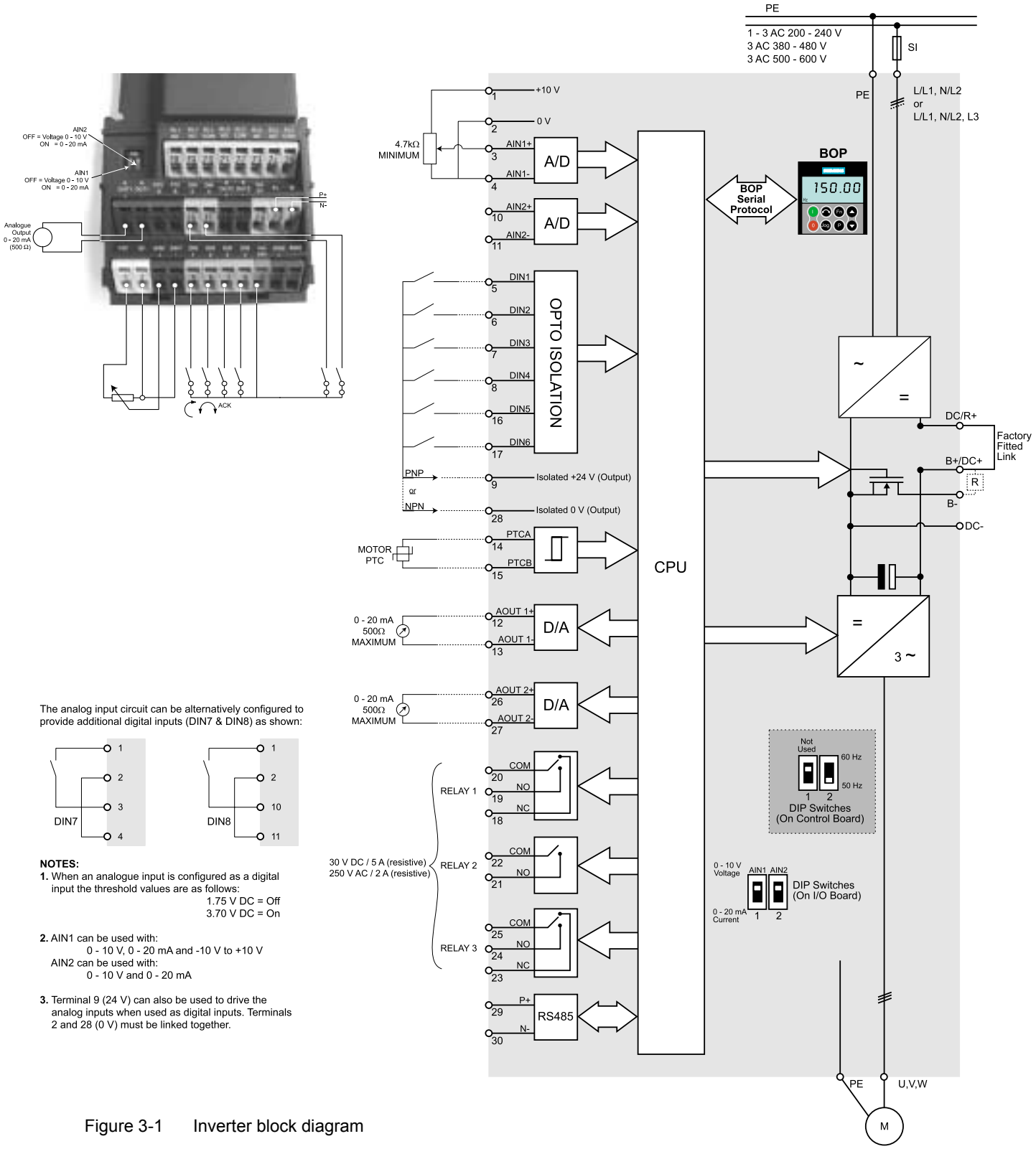


Figure 3-1 Inverter block diagram

3.2 Commission modes

In the standard version, the MICROMASTER 440 is fitted with the Status Display Panel (SDP) (see Figure 3-2) with which it is possible to use the inverter with the pre-assigned factory settings for a large range of applications. If these factory settings are not suitable, you can adapt them to suit your equipment conditions using the Basic Operator Panel (BOP) (see Figure 3-2) or the Advanced Operator Panel (AOP) (see Figure 3-2). The BOP and AOP are available as options. You can also adjust the factory settings using the PC IBN tool "Drive Monitor" or "STARTER". This software is available on the CD ROM which comes with the documentation of the unit.

SDP
Status Display Panel

BOP
Basic Operator Panel

AOP
Advanced Operator Panel

Figure 3-2 Panels available for the MICROMASTER 440 Inverter

For notes on replacing the operator panels please refer to the corresponding annexes 0 to this manual.

NOTICE

Frequency setting; the DIP switch is located on the control board, underneath the I/O board as shown in Figure 3-3 below. The inverter is delivered as follows:

- DIP switch 2:
  - Off position: European defaults (50 Hz, kW etc.)
  - On position: North American defaults (60 Hz, hp etc.)
- DIP switch 1:
  Not for customer use.

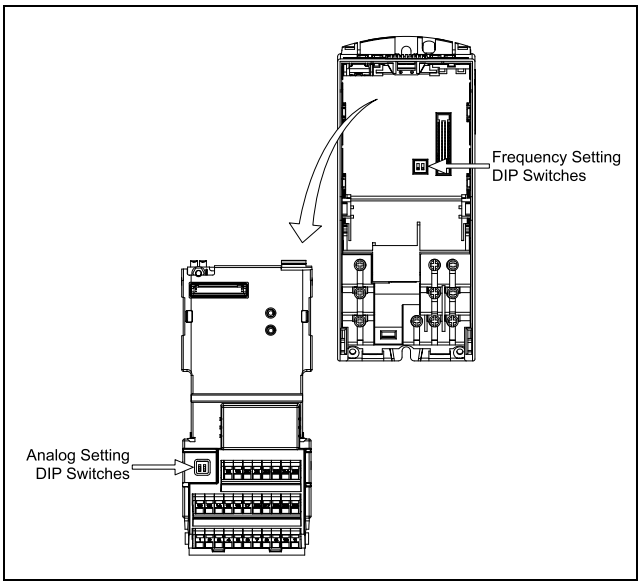
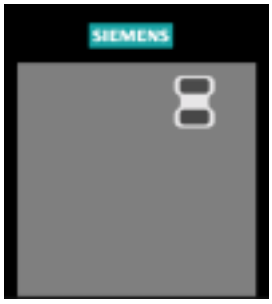


Figure 3-3 DIP switch

3.2.1 Commissioning with the SDP



The SDP has two LEDs on the front which display the current operating status of the inverter (see Section 6.1).

When the SDP is used, the presettings of the inverter must be compatible with the following motor data:

- Rated motor power
- Motor voltage
- Rated motor current
- Rated motor frequency

(A conventional Siemens motor is recommended)

In addition, the following conditions must be met:

- Linear V/f motor speed controlled by an analog potentiometer.
- Maximum speed 3000 rpm at 50 Hz (3600 rpm at 60 Hz); can be controlled by a potentiometer via the analog inputs of the inverter.
- Ramp acceleration time/ramp deceleration time = 10 s

Settings for more complex applications can be found in the parameter list and in Section 3.2.2 "Commission Overview with BOP or AOP".

Table 3-1 Default settings for operation using the SDP

	Terminals	**Parameter**	**Default Operation**
Digital Input 1	5	P0701 = ‘1’	ON right
Digital Input 2	6	P0702 = ‘12’	Reverse
Digital Input 3	7	P0703 = ‘9’	Fault Acknowledge
Digital Input 4	8	P0704 = ‘15’	Fixed Frequency
Digital Input 5	16	P0705 = ‘15’	Fixed Frequency
Digital Input 6	17	P0706 = ‘15’	Fixed Frequency
Digital Input 7	Via AIN1	P0707 = ‘0’	Inactive
Digital Input 8	Via AIN2	P0708 = ‘0’	Inactive

Basic operation with SDP

With the SDP fitted, the following is possible:

- Start and stopping the motor (DIN1 via external switch)
- Reversing the motor (DIN2 via external switch)
- Fault Reset (DIN3 via external switch)

Controlling the speed of the motor is accomplished by connecting the analog inputs as shown in the Figure 3-4.

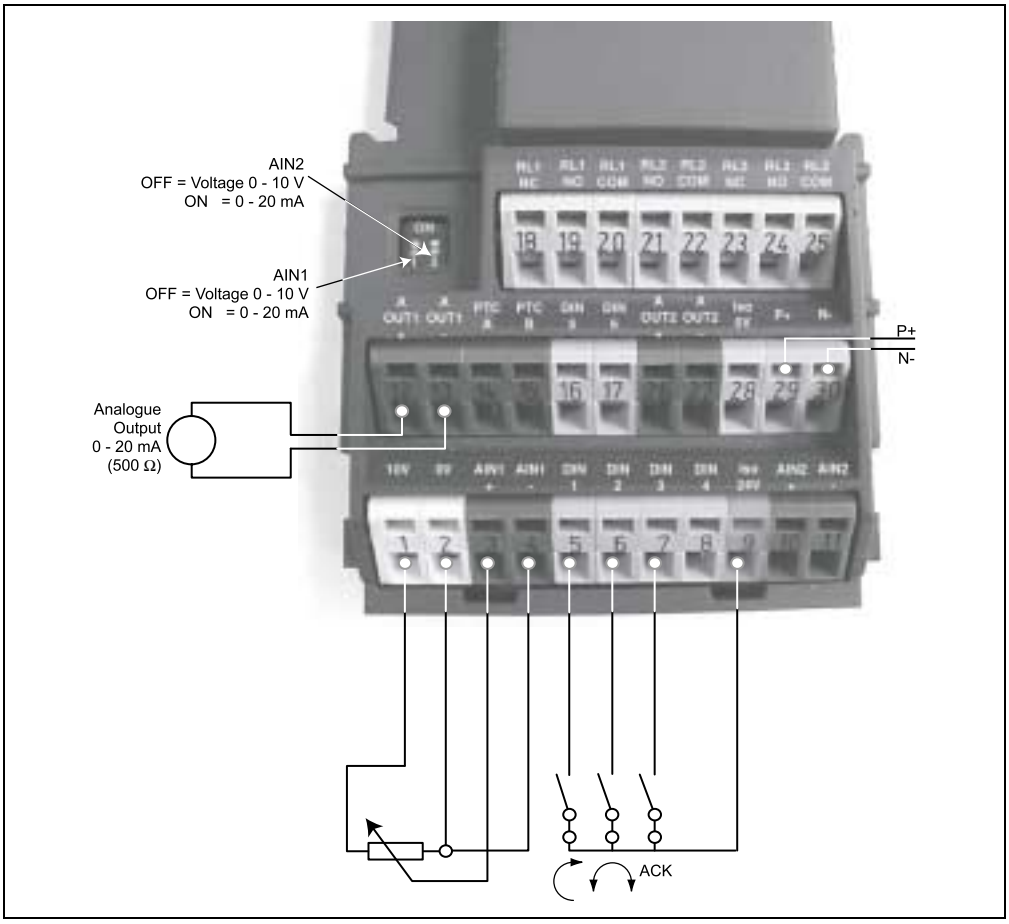
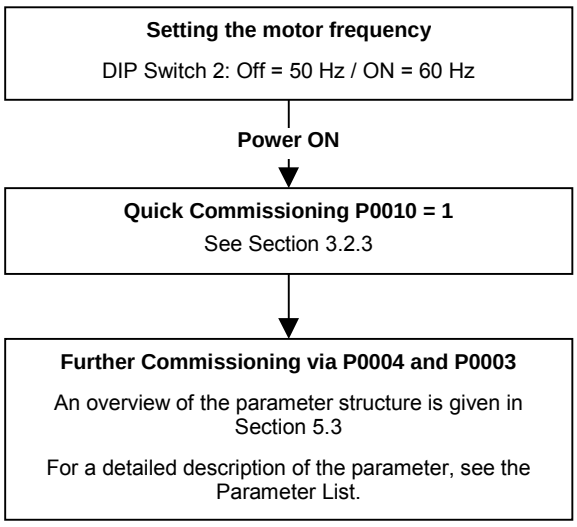


Figure 3-4 Basic operation with SDP

3.2.2 Commission Overview with BOP or AOP

Prerequisites

Mechanical and electrical Installation are completed.



NOTES

We recommend the commissioning according this scheme.

3.2.2.1 Commissioning with the BOP

You can alter parameter values via the BOP. To set parameters on this panel, you must remove the SDP and attach the BOP (see Appendix 0).

The BOP features a five-digit, seven-segment display for showing parameter numbers and values, alarm and fault messages and setpoints and actual values. Parameter information cannot be saved via the BOP.

Table 3-2 shows the factory default settings for operation via the BOP.

NOTICE

- The BOP motor control functions are disabled by default. To control the motor via the BOP, parameter P0700 should be set to 1 and P1000 set to 1.
- The BOP can be fitted to and removed from the inverter whilst power is applied.
- If the BOP has been set as the I/O control (P0700 = 1), the drive will stop if the BOP is removed.

Table 3-2 Default settings for operation using the BOP

Parameter	Meaning	Default Europe (North America)
P0100	Operating Mode Europe/US	50 Hz, kW (60Hz, hp)
P0307	Power (rated motor)	Dimension (kW (Hp)) depending on setting of P0100. [Value depending on variant.]
P0310	Motor frequency rating	50 Hz (60 Hz)
P0311	Motor speed rating	1395 (1680) rpm [depending on variant]
P1082	Maximum Motor Frequency	50 Hz (60 Hz)

Buttons on the BOP

Panel/Button	Function	Effects
	Indicates Status	The LCD displays the settings currently used by the converter.
	Start motor	Pressing the button starts the converter. This button is disabled by default. To enable this button set P0700 = 1.
	Stop motor	OFF1 Pressing the button causes the motor to come to a standstill at the selected ramp down rate. Disabled by default; to enable set P0700 = 1. OFF2 Pressing the button twice (or once long) causes the motor to coast to a standstill. This function is always enabled.
	Change direction	Press this button to change the direction of rotation of the motor. Reverse is indicated by a minus (-) sign or a flashing decimal point. Disabled by default, to enable set P0700 = 1.
	Jog motor	Pressing this button while the inverter has no output causes the motor to start and run at the preset jog frequency. The motor stops when the button is released. Pressing this button when the motor is running has no effect.
	Functions	This button can be used to view additional information. Pressing and holding the button for 2 seconds from any parameter during operation, shows the following: 1. DC link voltage (indicated by d – units V). 2. Output current. (A) 3. Output frequency (Hz) 4. Output voltage (indicated by o – units V). 5. The value selected in P0005 (If P0005 is set to show any of the above (3, 4, or 5) then this will not be shown again). Additional presses will toggle around the above displays. **Jump Function** From any parameter (rXXXX or PXXXX) a short press of the Fn button will immediately jump to r0000, you can then change another parameter, if required. Upon returning to r0000, pressing the Fn button will return you to your starting point.
	Access parameters	Pressing this button allows access to the parameters.
	Increase value	Pressing this button increases the displayed value.
	Decrease value	Pressing this button decreases the displayed value.

Figure 3-5 Buttons on the BOP

Changing parameters with the BOP

The procedure for changing the value of parameter P0004 is described below. Modifying the value of an indexed parameter is illustrated using the example of P0719. Follow exactly the same procedure to alter other parameters that you wish to set via the BOP.

Changing P0004 – parameter filter function

	Step	Result on display
1	Press to access parameters	r0000
2	Press until P0004 is displayed	P0004
3	Press to access the parameter value level	0
4	Press or to the required value	7
5	Press to confirm and store the value	P0004
6	Only the command parameters are visible to the user.	

Changing P0719 an indexed parameter
Selection of command/setpoint source

	Step	Result on display
1	Press to access parameters	r0000
2	Press until P0719 is displayed	P0719
3	Press to access the parameter value level	in000
4	Press to display current set value	0
5	Press or to the required value	12
6	Press to confirm and store the value	P0719
7	Press until r0000 is displayed	r0000
8	Press to return the display to the standard drive display (as defined by the customer)	

Figure 3-6 Changing parameters via the BOP

NOTES

In some cases - when changing parameter values - the display on the BOP shows P----. This means the inverter is busy with tasks of higher priority.

Changing single digits in Parameter values

For changing the parameter value rapidly, the single digits of the display can be changed by performing the following actions:

Ensure you are in the parameter value changing level (see "Changing parameters with BOP").

1. Press Fn (function button), which causes the right hand digit to blink.
2. Change the value of this digit by pressing ▲ / ▼
3. Press Fn (function button) again causes the next digit to blink.
4. Perform steps 2 to 4 until the required value is displayed.
5. Press the P to leave the parameter value changing level.

NOTES

The function button may also be used to acknowledge a fault condition

3.2.2.2 Commissioning with the AOP

The AOP is available as an option. Its advanced features include the following:

- Multilingual clear text display
- Upload/download of multiple parameter sets
- Programmable via PC
- Multidrop capability to drive up to 30 inverters

Please refer to the AOP Manual for details or contact your local Siemens sales office for assistance.

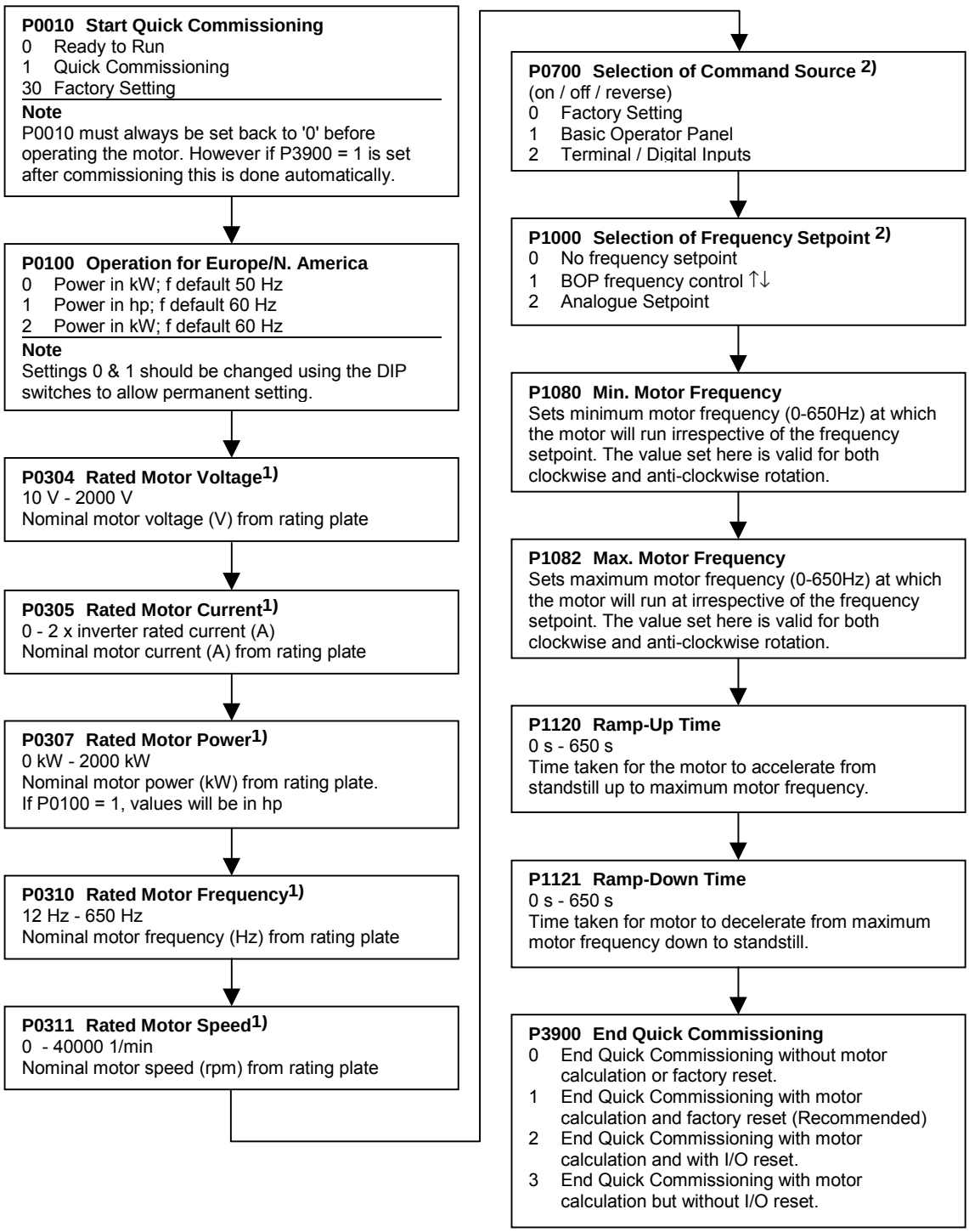
3.2.3 Commissioning functions with BOP / AOP

3.2.3.1 Quick commissioning (P0010=1)

It is **important** that parameter P0010 is used for commissioning and P0003 is used to select the number of parameters to be accessed. This parameter allows a group of parameters to be selected that will enable quick commissioning. Parameters such as Motor settings and Ramp settings are included.

At the end of the quick commissioning sequence, P3900 should be selected, which, when set to 1, will carry out the necessary motor calculations and clear all other parameters (not included in P0010=1) to the default settings. This will only happen in the Quick Commissioning mode.

Flow chart Quick Commissioning (Level 1 Only)



1) Motor-specific parameters – see motor rating plate.

2) The parameters offer more setting options than listed here. See Parameter List for further setting options.

Motor data for parameterization

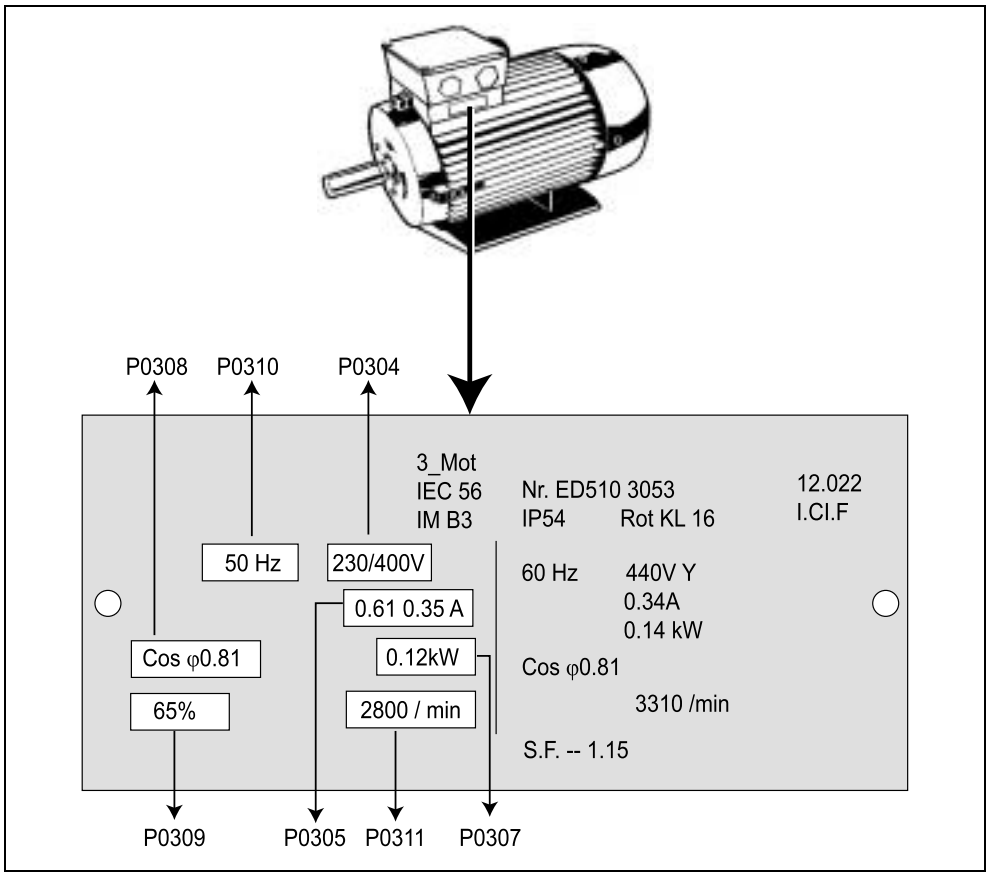


Figure 3-7 Typical Motor Rating Plate Example

NOTICE

- P0308 & P0309 are only visible if P0003 ≥ 2. Only one of the parameters is shown depending on the settings of P0100.
- P0307 indicates kW or HP depending upon the setting of P0100. For detailed information, please see the Parameter List.
- Changing motor parameters is not possible unless P0010=1.
- Ensure that the inverter is configured correctly to the motor, i.e. in the above example delta terminal connection is for 230 V.

3.2.4 Reset to Factory default

To reset all parameters to the factory default settings; the following parameters should be set as follows (BOP, AOP or Communication Option needed):

1. Set P0010=30.
2. Set P0970=1.

NOTE

The reset process can take up to 3 minutes to complete.

3.3 General operation

For a full description of standard and extended parameters, please refer to the Parameter List.

NOTICE

1. The inverter does not have a main power switch and is live when the mains supply is connected. It waits, with the output disabled, until the RUN button is pressed or for the presence of a digital ON signal at terminal 5 (rotate right).
2. If a BOP or an AOP is fitted and the output frequency is selected to be displayed (P0005 = 21) the corresponding setpoint is displayed approximately every 1.0 seconds while the inverter is stopped.
3. The inverter is programmed at the factory for standard applications on Siemens four-pole standard motors that have the same power rating as the inverters. When using other motors it is necessary to enter the specifications from the motor's rating plate. See Figure 3-7 for details on how to read motor data.
4. Changing motor parameters is not possible unless P0010 = 1.
5. You must set P0010 back to 0 in order to initiate a run.

Basic operation with the BOP/AOP

Prerequisites

- P0010 = 0 (in order to initiate the run command correctly).
- P0700 = 1 (enables the start/stop button on the BOP).
- P1000 = 1 (this enables the motor potentiometer setpoints).

1. Press the green Button  to start the motor.
2. Press the Button  while the motor is turning. Motor speed increases to 50 Hz.
3. When the inverter reaches 50 Hz, press the Button  . Motor speed and display is decreased.
4. Change the direction of rotation with the Button  .
5. The red button stops the motor  .

External motor thermal overload protection

When operated below rated speed, the cooling effect of fans fitted to the motor shaft is reduced. Consequentially, most motors require de-rating for continuous operation at low frequencies. To ensure that the motors are protected against overheating under these conditions, a PTC temperature sensor must be fitted to the motor and connected to the inverter control terminals. P0601 must also be set to 1.

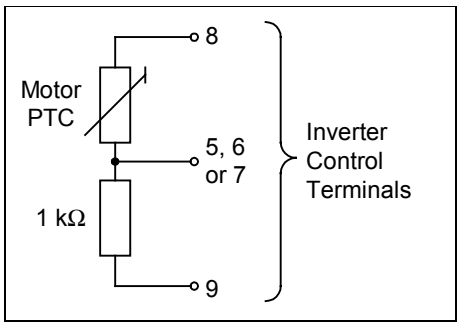


Figure 3-8 Motor Overload PTC Connection

NOTE

To enable the trip function, set parameter P0701, P0702 or P0703 = 29.

4 Using the MICROMASTER 440

This Chapter contains:

- An explanation of the various methods of controlling the inverter
- A summary of the types of control of the inverter

WARNING

- When operating electrical devices, it is impossible to avoid applying hazardous voltages to certain parts of the equipment.
- Emergency Stop facilities according to EN 60204 IEC 204 (VDE 0113) must remain operative in all operating modes of the control equipment. Any disengagement of the Emergency Stop facility must not lead to uncontrolled or undefined restart.
- Wherever faults occurring in the control equipment can lead to substantial material damage or even grievous bodily injury (i.e. potentially dangerous faults), additional external precautions must be taken or facilities provided to ensure or enforce safe operation, even when a fault occurs (e.g. independent limit switches, mechanical interlocks, etc.).
- MICROMASTERS operate at high voltages.
- Certain parameter settings may cause the inverter to restart automatically after an input power failure.
- Motor parameters must be accurately configured for motor overload protection to operate correctly.
- This equipment is capable of providing internal motor overload protection in accordance with UL508C section 42. Refer to P0610 and P0335, i^2t is ON by default. Motor overload protection can also be provided using an external PTC (disabled by default P0601).
- This equipment is suitable for use in a circuit capable of delivering not more than 10,000 symmetrical amperes (rms), for a maximum voltage of 230V/460V/575V when protected by a H or K type fuse (*see Tables starting on page 81)*
- This equipment must not be used as an 'emergency stop mechanism' *(see EN 60204, 9.2.5.4)*

4.1 Frequency setpoint (P1000)

- Default: Terminal 3/4 (AIN+/ AIN -, 0…10 V corresponds to 0…50/60 Hz)
- Other settings: see P1000

NOTES

For USS see Reference Manual, for PROFIBUS see Reference Manual and PROFIBUS Instructions.

4.2 Command sources (P0700)

NOTICE

The ramp times and ramp-smoothing functions also affect how the motor starts and stops. For details of these functions, please refer to parameters P1120, P1121, P1130 – P1134 in the Parameter List.

Starting the motor

- Default: Terminal 5 (DIN 1, high)
- Other settings: see P0700 to P0708

Stopping the motor

There are several ways to stop the motor:

- Default:
  - OFF1 (4.3.1) Terminal 5 (DIN 1, low)
  - OFF2 (4.3.2) Off button on BOP/AOP, pressing the Off button once long (two seconds) or twice (with default settings not possible without BOP/AOP)
  - OFF3 (4.3.3) Not active in the default (factory) setting
- Other settings: see P0700 to P0708

Reversing the motor

- Default: Terminal 6 (DIN 2, high)
- Other settings: see P0700 to P0708

4.3 OFF and braking functions

4.3.1 OFF1

This command (produced by canceling the ON command) causes the inverter to come to a standstill at the selected ramp-down rate.

Parameter to change ramp-down time see P1121

NOTICE

- ON and the following OFF1 command must have the same source.
- If the ON/OFF1 command is set to more than one digital input, only the last set digital input is valid e.g. DIN3 is active.
- OFF1 can be combined with DC braking, Compound braking or dynamic braking.

4.3.2 OFF2

This command causes the motor to coast to a standstill (pulses disabled).

NOTICE

The OFF2 command can have one or more sources. By default the OFF2 command is set to BOP/AOP. This source still exists even if other sources are defined by **one** of the following parameters, P0700 to P0708 inclusive.

4.3.3 OFF3

An OFF3 command causes the motor to decelerate rapidly.

For starting the motor when OFF3 is set, the binary input has to be closed (high). If OFF3 is high, the motor can be started and stopped by OFF1 or OFF2.

If OFF3 is low the motor cannot be started.

- Ramp down time: see P1135

NOTICE

OFF3 can be combined with DC braking, Compound braking or Dynamic braking.

4.3.4 DC braking

DC braking is possible together with OFF1 and OFF3. A DC current is applied to stop the motor quickly and hold the shaft stationary until the end of the braking period.

- Enable DC braking: see P0701 to P0708
- Set DC braking period: see P1233
- Set DC braking current: see P1232
- Set DC braking start frequency: see P1234

NOTICE

If no digital input is set to DC braking and P1233 $\neq$ 0, DC braking will be active after every OFF1 command with the time set in P1233.

4.3.5 Compound Braking

Compound Braking is possible with both OFF1 and OFF3. For Compound Braking a DC component is added to the AC current.

Set the braking current: see P1236

4.3.6 Dynamic braking

Braking with an external resistor is a method of braking that allows a smoothed, controlled reduction in motor speed in a linear manner. For further details please refer to the Applications Handbook.

4.4 Control modes (P1300)

The various modes of operation of the MICROMASTER 440 control the relationship between the speed of the motor and the voltage supplied by the inverter. A summary of the control modes available are listed below:

- **Linear V/f control, P1300 = 0**
  Can be used for variable and constant torque applications, such as conveyors and positive displacement pumps.
- **Linear V/f control with FCC (Flux Current Control), P1300 = 1**
  This control mode can be used to improve the efficiency and dynamic response of the motor.
- **Parabolic V/f control P1300 = 2**
  This mode can be used for variable torque loads, such as fans and pumps.
- **Multi-point V/f control P1300 = 3**
  For information regarding this mode of operation, please consult the MM440 Reference Manual.
- **Linear V/f control with ECO mode P1300 = 4**
  This feature automatically increases and decreases the motor voltage in order to search for the minimum power consumption. It is designed to function when the preset setpoint speed is reached.
- **V/f control for textile applications P1300 = 5**
  There is no slip compensation or resonance damping. The Imax controller refers to the voltage instead of frequency.
- **V/f control with FCC for textile applications P1300 = 6**
  A combination of P1300 = 1 and P1300 = 5.
- **V/f control with independent voltage setpoint P1300 = 19**
  The voltage setpoint can be given using P1330 independent from the Ramp Function Generator (RFG) output frequency
- **Sensorless Vector Control P1300 = 20**
  This feature allows the speed of the motor to be controlled with inherent slip compensation. It allows for high torque, improved transient response, excellent speed holding and improved torque at low frequencies. Allows change from vector control to torque control (see P1501).
- **Sensoless Vector Torque Control P1300 = 22**
  This feature allows the inverter to control the torque of a motor. In an application where a constant torque is required, a torque setpoint can be established and the inverter will vary the current delivered to the motor to maintain the required torque.

4.5 Faults and warnings

SDP

If an SDP is fitted, the fault states and warnings are indicated by the two LEDs on the panel, see section 6.1 on page 72 for further information.

Fault-free operation of the inverter is indicated by the following sequence of LED displays:

- Green and yellow = Ready to run
- Green = Run

BOP

If a BOP is installed, the last 8 fault conditions (P0947) and warnings (P2110) are displayed if a fault condition occurs. For further information, please refer to the Parameter List.

AOP

If the AOP is fitted, the fault and warning codes are displayed on the LCD panel.

5 System parameters

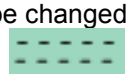
This Chapter contains:

- An overview of the parameter structure of the MICROMASTER 440
- A parameter list in short form

5.1 Introduction to MICROMASTER system parameters

The parameters can only be changed by using the BOP, the Advance Operator Panel (AOP) or the Serial Interface.

Parameters can be changed and set using the BOP to adjust the desired properties of the inverter, such as ramp times, minimum and maximum frequencies etc. The parameter numbers selected and the setting of the parameter values are indicated on the optional five-digit LCD display.

- **r**xxxx indicates a display parameter, **P**xxxx a setting parameter.
- P0010 initiates “quick commissioning”.
- The inverter will not run unless P0010 is set to 0 after it has been accessed. This function is automatically perform if P3900 > 0.
- P0004 acts as a filter, allowing access to parameters according to their functionality.
- If an attempt is made to change a parameter that cannot be changed in this status, for example, cannot be changed whilst running or can only be changed in quick commissioning, then  will be displayed.
- **Busy Message**
  In some cases - when changing parameter values - the display on the BOP shows  for maximum of five seconds. This means the inverter is busy with tasks of higher priority.

5.1.1 Access Levels

There are three access levels available to the user; Standard, Extended and Expert. The level of access is set by parameter P0003. For most applications, Standard (P0003 = 1) or Extended parameters (P0003 = 2) are sufficient.

The number of parameters that appear within each functional group depends on the access level set in parameter P0003. For further details regarding parameters, see the Parameter List on the Documentation CD-ROM.

5.2 Parameter overview

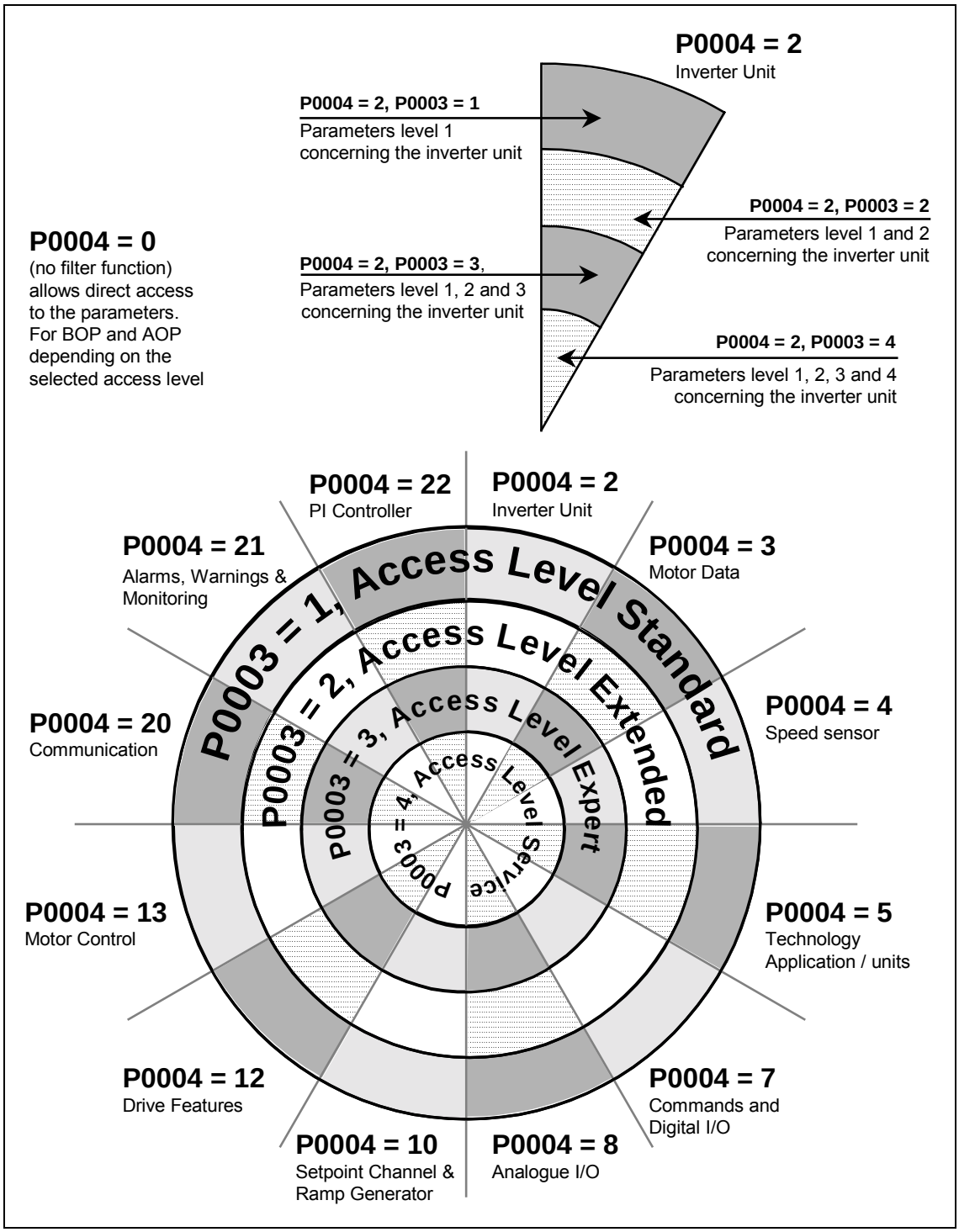


Figure 5-1 Parameter Overview

5.3 Parameter list (short form)

Explanatory information on following table:

- Default: Factory setting
- Level: Access level
- DS Inverter status (Drive State), indicates the inverter state in which a parameter can be modified (see P0010).
  - C Commissioning
  - U Run
  - T Ready to run
- QC Quick Commissioning
  - Q Parameter can be modified in the Quick Commissioning state.
  1. N Parameter cannot be modified in the Quick Commissioning state.

Always

Par. No.	Parametername	Default	Level	DS	QC
r0000	Drive display	-	1	-	-
P0003	User access level	1	1	CUT	N
P0004	Parameter filter	0	1	CUT	N
P0010	Commissioning parameter filter	0	1	CT	N

Quick Commissioning

Par.-No.	Parametername	Default	Level	DS	QC
P0100	Europe / North America	0	1	C	Q
P3900	End of quick commissioning	0	1	C	Q

Parameter Reset

Par.-No.	Parametername	Default	Level	DS	QC
P0970	Factory reset	0	1	C	N

Inverter Unit (P0004 = 2)

Par. No.	Parametername	Default	Level	DS	QC
r0018	Firmware version	-	1	-	-
r0026[1]	CO: Act. DC-link voltage	-	2	-	-
r0037[2]	CO: Inverter temperature [°C]	-	3	-	-
r0039	CO: Energy consumpt. meter [kWh]	-	2	-	-
P0040	Reset energy consumption meter	0	2	CT	N
r0070	CO: Act. DC-link voltage	-	3	-	-
r0200	Act. power stack code number	-	3	-	-
P0201	Power stack code number	0	3	C	N
r0203	Act. inverter type	-	3	-	-
r0204	Power stack features	-	3	-	-
P0205	Inverter application	0	3	C	Q
r0206	Rated inverter power [kW] / [hp]	-	2	-	-
r0207	Rated inverter current	-	2	-	-
r0208	Rated inverter voltage	-	2	-	-

Par. No.	Parametername	Default	Level	DS	QC
r0209	Maximum inverter current	-	2	-	-
P0210	Supply voltage	230	3	CT	N
r0231[2]	Max. cable length	-	3	-	-
P0290	Inverter overload reaction	2	3	CT	N
P0292	Inverter overload warning	15	3	CUT	N
P1800	Pulse frequency	4	2	CUT	N
r1801	CO: Act. switching frequency	-	3	-	-
P1802	Modulator mode	0	3	CUT	N
P1820[3]	Reverse output phase sequence	0	2	CT	N
P1911	No. of phase to be identified	3	2	CT	N
r1925	Identified on-state voltage	-	2	-	-
r1926	Ident. gating unit dead time	-	2	-	-

Motor Data (P0004 = 3)

Par. No.	Parametername	Default	Level	DS	QC
r0035[3]	CO: Act. motor temperature	-	2	-	-
P0300[3]	Select motor type	1	2	C	Q
P0304[3]	Rated motor voltage	230	1	C	Q
P0305[3]	Rated motor current	3.25	1	C	Q
P0307[3]	Rated motor power	0.75	1	C	Q
P0308[3]	Rated motor cosPhi	0.000	2	C	Q
P0309[3]	Rated motor efficiency	0.0	2	C	Q
P0310[3]	Rated motor frequency	50.00	1	C	Q
P0311[3]	Rated motor speed	0	1	C	Q
r0313[3]	Motor pole pairs	-	3	-	-
P0320[3]	Motor magnetizing current	0.0	3	CT	Q
r0330[3]	Rated motor slip	-	3	-	-
r0331[3]	Rated magnetization current	-	3	-	-
r0332[3]	Rated power factor	-	3	-	-
r0333[3]	Rated motor torque	-	3	-	-
P0335[3]	Motor cooling	0	2	CT	Q
P0340[3]	Calculation of motor parameters	0	2	CT	N
P0341[3]	Motor inertia [kg*m^2]	0.00180	3	CUT	N
P0342[3]	Inertia ratio total/motor	1.000	3	CUT	N
P0344[3]	Motor weight	9.4	3	CUT	N
r0345[3]	Motor start-up time	-	3	-	-
P0346[3]	Magnetization time	1.000	3	CUT	N
P0347[3]	Demagnetization time	1.000	3	CUT	N
P0350[3]	Stator resistance (line-to-line)	4.0	2	CUT	N
P0352[3]	Cable resistance	0.0	3	CUT	N
r0384[3]	Rotor time constant	-	3	-	-
r0395	CO: Total stator resistance [%]	-	3	-	-
r0396	CO: Act. rotor resistance	-	3	-	-
P0601[3]	Motor temperature sensor	0	2	CUT	N
P0604[3]	Threshold motor temperature	130.0	2	CUT	N

P0610[3]	Motor I2t temperature reaction	2	3	CT	N
P0625[3]	Ambient motor temperature	20.0	3	CUT	N
P0640[3]	Motor overload factor [%]	150.0	2	CUT	Q
P1910	Select motor data identification	0	2	CT	Q
r1912[3]	Identified stator resistance	-	2	-	-
r1913[3]	Identified rotor time constant	-	2	-	-
r1914[3]	Ident. total leakage inductance	-	2	-	-
r1915[3]	Ident. nom. stator inductance	-	2	-	-
r1916[3]	Identified stator inductance 1	-	2	-	-
r1917[3]	Identified stator inductance 2	-	2	-	-
r1918[3]	Identified stator inductance 3	-	2	-	-
r1919[3]	Identified stator inductance 4	-	2	-	-
r1920[3]	Identified dyn.leak.induct.	-	2	-	-

Commands and Digital I/O (P0004 = 7)

Par. No.	Parametername	Default	Level	DS	QC
r0002	Drive state	-	2	-	-
r0019	CO/BO: BOP control word	-	3	-	-
r0050	CO: Active command data set	-	2	-	-
r0051[2]	CO: Active drive data set	-	2	-	-
r0052	CO/BO: Act. status word 1	-	2	-	-
r0053	CO/BO: Act. status word 2	-	2	-	-
r0054	CO/BO: Act. control word 1	-	3	-	-
r0055	CO/BO: Add. act. control word	-	3	-	-
P0700[3]	Selection of command source	2	1	CT	Q
P0701[3]	Function of digital input 1	1	2	CT	N
P0702[3]	Function of digital input 2	12	2	CT	N
P0703[3]	Function of digital input 3	9	2	CT	N
P0704[3]	Function of digital input 4	15	2	CT	N
P0705[3]	Function of digital input 5	15	2	CT	N
P0706[3]	Function of digital input 6	15	2	CT	N
P0707[3]	Function of digital input 7	0	2	CT	N
P0708[3]	Function of digital input 8	0	2	CT	N
P0719[3]	Selection of cmd. & freq. setp.	0	3	CT	N
r0720	Number of digital inputs	-	3	-	-
r0722	CO/BO: Binary input values	-	2	-	-
P0724	Debounce time for digital inputs	3	3	CT	N
P0725	PNP / NPN digital inputs	1	3	CT	N
r0730	Number of digital outputs	-	3	-	-
P0731[3]	BI: Function of digital output 1	52:3	2	CUT	N
P0732[3]	BI: Function of digital output 2	52:7	2	CUT	N
P0733[3]	BI: Function of digital output 3	0:0	2	CUT	N
r0747	CO/BO: State of digital outputs	-	3	-	-
P0748	Invert digital outputs	0	3	CUT	N
P0800[3]	BI: Download parameter set 0	0:0	3	CT	N
P0801[3]	BI: Download parameter set 1	0:0	3	CT	N

Par. No.	Parametername	Default	Level	DS	QC
P0809[3]	Copy Command Data Set	0	2	CT	N
P0810	BI: CDS bit 0 (Local / Remote)	0:0	2	CUT	N
P0811	BI: CDS bit 1	0:0	2	CUT	N
P0819[3]	Copy Drive Data Set	0	2	CT	N
P0820[3]	BI: DDS bit 0	0:0	3	CT	N
P0821[3]	BI: DDS bit 1	0:0	3	CT	N
P0840[3]	BI: ON/OFF1	722:0	3	CT	N
P0842[3]	BI: ON/OFF1 reverse	0:0	3	CT	N
P0844[3]	BI: 1. OFF2	1:0	3	CT	N
P0845[3]	BI: 2. OFF2	19:1	3	CT	N
P0848[3]	BI: 1. OFF3	1:0	3	CT	N
P0849[3]	BI: 2. OFF3	1:0	3	CT	N
P0852[3]	BI: Pulse enable	1:0	3	CT	N
P1020[3]	BI: Fixed freq. selection Bit 0	0:0	3	CT	N
P1021[3]	BI: Fixed freq. selection Bit 1	0:0	3	CT	N
P1022[3]	BI: Fixed freq. selection Bit 2	0:0	3	CT	N
P1023[3]	BI: Fixed freq. selection Bit 3	722:3	3	CT	N
P1026[3]	BI: Fixed freq. selection Bit 4	722:4	3	CT	N
P1028[3]	BI: Fixed freq. selection Bit 5	722:5	3	CT	N
P1035[3]	BI: Enable MOP (UP-command)	19:13	3	CT	N
P1036[3]	BI: Enable MOP (DOWN-command)	19:14	3	CT	N
P1055[3]	BI: Enable JOG right	0:0	3	CT	N
P1056[3]	BI: Enable JOG left	0:0	3	CT	N
P1074[3]	BI: Disable additional setpoint	0:0	3	CUT	N
P1110[3]	BI: Inhibit neg. freq. setpoint	0:0	3	CT	N
P1113[3]	BI: Reverse	722:1	3	CT	N
P1124[3]	BI: Enable JOG ramp times	0:0	3	CT	N
P1230[3]	BI: Enable DC braking	0:0	3	CUT	N
P2103[3]	BI: 1. Faults acknowledgement	722:2	3	CT	N
P2104[3]	BI: 2. Faults acknowledgement	0:0	3	CT	N
P2106[3]	BI: External fault	1:0	3	CT	N
P2220[3]	BI: Fixed PID setp. select Bit 0	0:0	3	CT	N
P2221[3]	BI: Fixed PID setp. select Bit 1	0:0	3	CT	N
P2222[3]	BI: Fixed PID setp. select Bit 2	0:0	3	CT	N
P2223[3]	BI: Fixed PID setp. select Bit 3	722:3	3	CT	N
P2226[3]	BI: Fixed PID setp. select Bit 4	722:4	3	CT	N
P2228[3]	BI: Fixed PID setp. select Bit 5	722:5	3	CT	N
P2235[3]	BI: Enable PID-MOP (UP-cmd)	19:13	3	CT	N
P2236[3]	BI: Enable PID-MOP (DOWN-cmd)	19:14	3	CT	N

Analogue I/O (P0004 = 8)

Par. No.	Parametername	Default	Level	DS	QC
P0295	Inverter fan off delay time	0	3	CUT	N
r0750	Number of ADCs	-	3	-	-
r0752[2]	Act. input of ADC [V] or [mA]	-	2	-	-
P0753[2]	Smooth time ADC	3	3	CUT	N
r0754[2]	Act. ADC value after scaling [%]	-	2	-	-
r0755[2]	CO: Act. ADC after scal. [4000h]	-	2	-	-
P0756[2]	Type of ADC	0	2	CT	N
P0757[2]	Value x1 of ADC scaling [V / mA]	0	2	CUT	N
P0758[2]	Value y1 of ADC scaling	0.0	2	CUT	N
P0759[2]	Value x2 of ADC scaling [V / mA]	10	2	CUT	N
P0760[2]	Value y2 of ADC scaling	100.0	2	CUT	N
P0761[2]	Width of ADC deadband [V / mA]	0	2	CUT	N
P0762[2]	Delay for loss of signal action	10	3	CUT	N
r0770	Number of DACs	-	3	-	-
P0771[2]	CI: DAC	21:0	2	CUT	N
P0773[2]	Smooth time DAC	2	3	CUT	N
r0774[2]	Act. DAC value [V] or [mA]	-	2	-	-
P0777[2]	Value x1 of DAC scaling	0.0	2	CUT	N
P0778[2]	Value y1 of DAC scaling	0	2	CUT	N
P0779[2]	Value x2 of DAC scaling	100.0	2	CUT	N
P0780[2]	Value y2 of DAC scaling	20	2	CUT	N
P0781[2]	Width of DAC deadband	0	2	CUT	N

Setpoint Channel and Ramp Generator (P0004 = 10)

Par. No.	Parametername	Default	Level	DS	QC
P1000[3]	Selection of frequency setpoint	2	1	CT	Q
P1001[3]	Fixed frequency 1	0.00	2	CUT	N
P1002[3]	Fixed frequency 2	5.00	2	CUT	N
P1003[3]	Fixed frequency 3	10.00	2	CUT	N
P1004[3]	Fixed frequency 4	15.00	2	CUT	N
P1005[3]	Fixed frequency 5	20.00	2	CUT	N
P1006[3]	Fixed frequency 6	25.00	2	CUT	N
P1007[3]	Fixed frequency 7	30.00	2	CUT	N
P1008[3]	Fixed frequency 8	35.00	2	CUT	N
P1009[3]	Fixed frequency 9	40.00	2	CUT	N
P1010[3]	Fixed frequency 10	45.00	2	CUT	N
P1011[3]	Fixed frequency 11	50.00	2	CUT	N
P1012[3]	Fixed frequency 12	55.00	2	CUT	N
P1013[3]	Fixed frequency 13	60.00	2	CUT	N
P1014[3]	Fixed frequency 14	65.00	2	CUT	N
P1015[3]	Fixed frequency 15	65.00	2	CUT	N
P1016	Fixed frequency mode - Bit 0	1	3	CT	N
P1017	Fixed frequency mode - Bit 1	1	3	CT	N

Par. No.	Parametername	Default	Level	DS	QC
P1018	Fixed frequency mode - Bit 2	1	3	CT	N
P1019	Fixed frequency mode - Bit 3	1	3	CT	N
r1024	CO: Act. fixed frequency	-	3	-	-
P1025	Fixed frequency mode - Bit 4	1	3	CT	N
P1027	Fixed frequency mode - Bit 5	1	3	CT	N
P1031[3]	Setpoint memory of the MOP	0	2	CUT	N
P1032	Inhibit reverse direction of MOP	1	2	CT	N
P1040[3]	Setpoint of the MOP	5.00	2	CUT	N
r1050	CO: Act. Output freq. of the MOP	-	3	-	-
P1058[3]	JOG frequency right	5.00	2	CUT	N
P1059[3]	JOG frequency left	5.00	2	CUT	N
P1060[3]	JOG ramp-up time	10.00	2	CUT	N
P1061[3]	JOG ramp-down time	10.00	2	CUT	N
P1070[3]	CI: Main setpoint	755:0	3	CT	N
P1071[3]	CI: Main setpoint scaling	1:0	3	CT	N
P1075[3]	CI: Additional setpoint	0:0	3	CT	N
P1076[3]	CI: Additional setpoint scaling	1:0	3	CT	N
r1078	CO: Total frequency setpoint	-	3	-	-
r1079	CO: Selected frequency setpoint	-	3	-	-
P1080[3]	Min. frequency	0.00	1	CUT	Q
P1082[3]	Max. frequency	50.00	1	CT	Q
P1091[3]	Skip frequency 1	0.00	3	CUT	N
P1092[3]	Skip frequency 2	0.00	3	CUT	N
P1093[3]	Skip frequency 3	0.00	3	CUT	N
P1094[3]	Skip frequency 4	0.00	3	CUT	N
P1101[3]	Skip frequency bandwidth	2.00	3	CUT	N
r1114	CO: Freq. setp. after dir. ctrl.	-	3	-	-
r1119	CO: Freq. setpoint before RFG	-	3	-	-
P1120[3]	Ramp-up time	10.00	1	CUT	Q
P1121[3]	Ramp-down time	10.00	1	CUT	Q
P1130[3]	Ramp-up initial rounding time	0.00	2	CUT	N
P1131[3]	Ramp-up final rounding time	0.00	2	CUT	N
P1132[3]	Ramp-down initial rounding time	0.00	2	CUT	N
P1133[3]	Ramp-down final rounding time	0.00	2	CUT	N
P1134[3]	Rounding type	0	2	CUT	N
P1135[3]	OFF3 ramp-down time	5.00	2	CUT	Q
r1170	CO: Frequency setpoint after RFG	-	3	-	-

Drive Features (P0004 = 12)

Par. No.	Parametername	Default	Level	DS	QC
P0005[3]	Display selection	21	2	CUT	N
P0006	Display mode	2	3	CUT	N
P0007	Backlight delay time	0	3	CUT	N
P0011	Lock for user defined parameter	0	3	CUT	N
P0012	Key for user defined parameter	0	3	CUT	N
P0013[20]	User defined parameter	0	3	CUT	N
P1200	Flying start	0	2	CUT	N
P1202[3]	Motor-current: Flying start	100	3	CUT	N
P1203[3]	Search rate: Flying start	100	3	CUT	N
r1205	Status flying-start on observer	-	3	-	-
P1210	Automatic restart	1	2	CUT	N
P1211	Number of restart attempts	3	3	CUT	N
P1215	Holding brake enable	0	2	T	N
P1216	Holding brake release delay	1.0	2	T	N
P1217	Holding time after ramp down	1.0	2	T	N
P1232[3]	DC braking current	100	2	CUT	N
P1233[3]	Duration of DC braking	0	2	CUT	N
P1234[3]	DC braking start frequency	0	2	CUT	N
P1236[3]	Compound braking current	0	2	CUT	N
P1237	Dynamic braking	0	2	CUT	N
P1240[3]	Configuration of Vdc controller	1	3	CT	N
r1242	CO: Switch-on level of Vdc-max	-	3	-	-
P1243[3]	Dynamic factor of Vdc-max	100	3	CUT	N
P1245[3]	Switch on level kin. buffering	76	3	CUT	N
P1247[3]	Dyn. factor of kinetic buffering	100	3	CUT	N
P1253[3]	Vdc-controller output limitation	10	3	CUT	N
P1254	Auto detect Vdc switch-on levels	1	3	CT	N
P2354	PID tuning timeout length	240	3	CUT	N

Motor Control (P0004 = 13)

Par. No.	Parametername	Default	Level	DS	QC
r0020	CO: Act. frequency setpoint	-	3	-	-
r0021	CO: Act. frequency	-	2	-	-
r0022	Act. rotor speed	-	3	-	-
r0024	CO: Act. output frequency	-	3	-	-
r0025	CO: Act. output voltage	-	2	-	-
r0027	CO: Act. output current	-	2	-	-
r0029	CO: Flux gen. current	-	3	-	-
r0030	CO: Torque gen. current	-	3	-	-
r0031	CO: Act. torque	-	2	-	-
r0032	CO: Act. power	-	2	-	-
r0038	CO: Act. power factor	-	3	-	-
r0056	CO/BO: Status of motor control	-	3	-	-

Par. No.	Parametername	Default	Level	DS	QC
r0062	CO: Freq. setpoint	-	3	-	-
r0063	CO: Act. frequency	-	3	-	-
r0064	CO: Dev. frequency controller	-	3	-	-
r0065	CO: Slip frequency	-	3	-	-
r0066	CO: Act. output frequency	-	3	-	-
r0067	CO: Act. output current limit	-	3	-	-
r0068	CO: Output current	-	3	-	-
r0071	CO: Max. output voltage	-	3	-	-
r0072	CO: Act. output voltage	-	3	-	-
r0075	CO: Current setpoint Isd	-	3	-	-
r0076	CO: Act. current Isd	-	3	-	-
r0077	CO: Current setpoint Isq	-	3	-	-
r0078	CO: Act. current Isq	-	3	-	-
r0079	CO: Torque setpoint (total)	-	3	-	-
r0086	CO: Act. active current	-	3	-	-
P0095[10]	CI: Display PZD signals	0:0	3	CT	N
r0096[10]	PZD signals	-	3	-	-
r1084	Max. frequency setpoint	-	3	-	-
P1300[3]	Control mode	0	2	CT	Q
P1310[3]	Continuous boost	50.0	2	CUT	N
P1311[3]	Acceleration boost	0.0	2	CUT	N
P1312[3]	Starting boost	0.0	2	CUT	N
P1316[3]	Boost end frequency	20.0	3	CUT	N
P1320[3]	Programmable V/f freq. coord. 1	0.00	3	CT	N
P1321[3]	Programmable V/f volt. coord. 1	0.0	3	CUT	N
P1322[3]	Programmable V/f freq. coord. 2	0.00	3	CT	N
P1323[3]	Programmable V/f volt. coord. 2	0.0	3	CUT	N
P1324[3]	Programmable V/f freq. coord. 3	0.00	3	CT	N
P1325[3]	Programmable V/f volt. coord. 3	0.0	3	CUT	N
P1330[3]	CI: Voltage setpoint	0:0	3	T	N
P1333[3]	Start frequency for FCC	10.0	3	CUT	N
P1335[3]	Slip compensation	0.0	2	CUT	N
P1336[3]	Slip limit	250	2	CUT	N
r1337	CO: V/f slip frequency	-	3	-	-
P1338[3]	Resonance damping gain V/f	0.00	3	CUT	N
P1340[3]	Imax controller prop. gain	0.000	3	CUT	N
P1341[3]	Imax controller integral time	0.300	3	CUT	N
r1343	CO: Imax controller freq. output	-	3	-	-
r1344	CO: Imax controller volt. output	-	3	-	-
P1345[3]	Imax controller prop. gain	0.250	3	CUT	N
P1346[3]	Imax controller integral time	0.300	3	CUT	N
P1350[3]	Voltage soft start	0	3	CUT	N
P1400[3]	Configuration of speed control	1	3	CUT	N
r1407	CO/BO: Status 2 of motor control	-	3	-	-
r1438	CO: Freq. setpoint to controller	-	3	-	-

Par. No.	Parametername	Default	Level	DS	QC
P1452[3]	Filter time for act.speed (SLVC)	4	3	CUT	N
P1470[3]	Gain speed controller (SLVC)	3.0	2	CUT	N
P1472[3]	Integral time n-ctrl. (SLVC)	400	2	CUT	N
P1477[3]	BI: Set integrator of n-ctrl.	0:0	3	CUT	N
P1478[3]	CI: Set integrator value n-ctrl.	0:0	3	UT	N
r1482	CO: Integral output of n-ctrl.	-	3	-	-
P1488[3]	Droop input source	0	3	CUT	N
P1489[3]	Droop scaling	0.05	3	CUT	N
r1490	CO: Droop frequency	-	3	-	-
P1492[3]	Enable droop	0	3	CUT	N
P1496[3]	Scaling accel. precontrol	0.0	3	CUT	N
P1499[3]	Scaling accel. torque control	100.0	3	CUT	N
P1500[3]	Selection of torque setpoint	0	2	CT	Q
P1501[3]	BI: Change to torque control	0:0	3	CT	N
P1503[3]	CI: Torque setpoint	0:0	3	T	N
r1508	CO: Torque setpoint	-	2	-	-
P1511[3]	CI: Additional torque setpoint	0:0	3	T	N
r1515	CO: Additional torque setpoint	-	2	-	-
r1518	CO: Acceleration torque	-	3	-	-
P1520[3]	CO: Upper torque limit	5.13	2	CUT	N
P1521[3]	CO: Lower torque limit	-5.13	2	CUT	N
P1522[3]	CI: Upper torque limit	1520:0	3	T	N
P1523[3]	CI: Lower torque limit	1521:0	3	T	N
P1525[3]	Scaling lower torque limit	100.0	3	CUT	N
r1526	CO: Upper torque limitation	-	3	-	-
r1527	CO: Lower torque limitation	-	3	-	-
P1530[3]	Motoring power limitation	0.75	2	CUT	N
P1531[3]	Regenerative power limitation	-0.75	2	CUT	N
r1538	CO: Upper torque limit (total)	-	2	-	-
r1539	CO: Lower torque limit (total)	-	2	-	-
P1570[3]	CO: Fixed value flux setpoint	110.0	2	CUT	N
P1574[3]	Dynamic voltage headroom	10	3	CUT	N
P1580[3]	Efficiency optimization	0	2	CUT	N
P1582[3]	Smooth time for flux setpoint	15	3	CUT	N
P1596[3]	Int. time field weak. controller	50	3	CUT	N
r1598	CO: Flux setpoint (total)	-	3	-	-
P1610[3]	Continuous torque boost (SLVC)	50.0	2	CUT	N
P1611[3]	Acc. torque boost (SLVC)	0.0	2	CUT	N
P1740	Gain for oscillation damping	0.000	3	CUT	N
P1750[3]	Control word of motor model	0	3	CUT	N
r1751	Status word of motor model	-	3	-	-
r1770	CO: Prop. output of n-adaption	-	3	-	-
r1771	CO: Int. output of n-adaption	-	3	-	-
P1780[3]	Control word of Rs/Rr-adaption	3	3	CUT	N
r1782	Output of Rs-adaptation	-	3	-	-
r1787	Output of Xm-adaption	-	3	-	-

Communication (P0004 = 20)

Par. No.	Parametername	Default	Level	DS	QC
P0918	CB address	3	2	CT	N
P0927	Parameter changeable via	15	2	CUT	N
r0964[5]	Firmware version data	-	3	-	-
r0965	Profibus profile	-	3	-	-
r0967	Control word 1	-	3	-	-
r0968	Status word 1	-	3	-	-
P0971	Transfer data from RAM to EEPROM	0	3	CUT	N
P2000[3]	Reference frequency	50.00	2	CT	N
P2001[3]	Reference voltage	1000	3	CT	N
P2002[3]	Reference current	0.10	3	CT	N
P2003[3]	Reference torque	0.75	3	CT	N
r2004[3]	Reference power	-	3	-	-
P2009[2]	USS normalization	0	3	CT	N
P2010[2]	USS baudrate	6	2	CUT	N
P2011[2]	USS address	0	2	CUT	N
P2012[2]	USS PZD length	2	3	CUT	N
P2013[2]	USS PKW length	127	3	CUT	N
P2014[2]	USS telegram off time	0	3	CT	N
r2015[8]	CO: PZD from BOP link (USS)	-	3	-	-
P2016[8]	CI: PZD to BOP link (USS)	52:0	3	CT	N
r2018[8]	CO: PZD from COM link (USS)	-	3	-	-
P2019[8]	CI: PZD to COM link (USS)	52:0	3	CT	N
r2024[2]	USS error-free telegrams	-	3	-	-
r2025[2]	USS rejected telegrams	-	3	-	-
r2026[2]	USS character frame error	-	3	-	-
r2027[2]	USS overrun error	-	3	-	-
r2028[2]	USS parity error	-	3	-	-
r2029[2]	USS start not identified	-	3	-	-
r2030[2]	USS BCC error	-	3	-	-
r2031[2]	USS length error	-	3	-	-
r2032	BO: CtrlWrd1 from BOP link (USS)	-	3	-	-
r2033	BO: CtrlWrd2 from BOP link (USS)	-	3	-	-
r2036	BO: CtrlWrd1 from COM link (USS)	-	3	-	-
r2037	BO: CtrlWrd2 from COM link (USS)	-	3	-	-
P2040	CB telegram off time	20	3	CT	N
P2041[5]	CB parameter	0	3	CT	N
r2050[8]	CO: PZD from CB	-	3	-	-
P2051[8]	CI: PZD to CB	52:0	3	CT	N
r2053[5]	CB identification	-	3	-	-
r2054[7]	CB diagnosis	-	3	-	-
r2090	BO: Control word 1 from CB	-	3	-	-
r2091	BO: Control word 2 from CB	-	3	-	-

Alarms, Warnings and Monitoring (P0004 = 21)

Par. No.	Parametername	Default	Level	DS	QC
r0947[8]	Last fault code	-	2	-	-
r0948[12]	Fault time	-	3	-	-
P0952	Total number of faults	0	3	CT	N
P2100[3]	Alarm number selection	0	3	CT	N
P2101[3]	Stop reaction value	0	3	CT	N
r2110[4]	Warning number	-	2	-	-
P2111	Total number of warnings	0	3	CT	N
r2114[2]	Run time counter	-	3	-	-
P2115[3]	AOP real time clock	0	3	CT	N
P2150[3]	Hysteresis frequency f_hys	3.00	3	CUT	N
P2151[3]	CI: Monitoring speed setpoint	0:0	3	CUT	N
P2152[3]	CI: Act. monitoring speed	0:0	3	CUT	N
P2153[3]	Time-constant speed filter	5	2	CUT	N
P2155[3]	Threshold frequency f_1	30.00	3	CUT	N
P2156[3]	Delay time of threshold freq f_1	10	3	CUT	N
P2157[3]	Threshold frequency f_2	30.00	2	CUT	N
P2158[3]	Delay time of threshold freq f_2	10	2	CUT	N
P2159[3]	Threshold frequency f_3	30.00	2	CUT	N
P2160[3]	Delay time of threshold freq f_3	10	2	CUT	N
P2161[3]	Min. threshold for freq. setp.	3.00	2	CUT	N
P2162[3]	Hysteresis freq. for overspeed	20.00	2	CUT	N
P2163[3]	Entry freq. for perm. deviation	3.00	2	CUT	N
P2164[3]	Hysteresis frequency deviation	3.00	3	CUT	N
P2165[3]	Delay time permitted deviation	10	2	CUT	N
P2166[3]	Delay time ramp up completed	10	2	CUT	N
P2167[3]	Switch-off frequency f_off	1.00	3	CUT	N
P2168[3]	Delay time T_off	10	3	CUT	N
r2169	CO: Act. filtered frequency	-	2	-	-
P2170[3]	Threshold current I_thresh	100.0	3	CUT	N
P2171[3]	Delay time current	10	3	CUT	N
P2172[3]	Threshold DC-link voltage	800	3	CUT	N
P2173[3]	Delay time DC-link voltage	10	3	CUT	N
P2174[3]	Torque threshold T_thresh	5.13	2	CUT	N
P2176[3]	Delay time for torque threshold	10	2	CUT	N
P2177[3]	Delay time for motor is blocked	10	2	CUT	N
P2178[3]	Delay time for motor is stalled	10	2	CUT	N
P2179	Current limit for no load ident.	3.0	3	CUT	N
P2180	Delay time for no load ident.	2000	3	CUT	N
P2181[3]	Belt failure detection mode	0	2	CT	N
P2182[3]	Belt threshold frequency 1	5.00	3	CUT	N
P2183[3]	Belt threshold frequency 2	30.00	2	CUT	N
P2184[3]	Belt threshold frequency 3	50.00	2	CUT	N
P2185[3]	Upper torque threshold 1	99999.0	2	CUT	N
P2186[3]	Lower torque threshold 1	0.0	2	CUT	N

Par. No.	Parametername	Default	Level	DS	QC
P2187[3]	Upper torque threshold 2	99999.0	2	CUT	N
P2188[3]	Lower torque threshold 2	0.0	2	CUT	N
P2189[3]	Upper torque threshold 3	99999.0	2	CUT	N
P2190[3]	Lower torque threshold 3	0.0	2	CUT	N
P2191[3]	Belt failure speed tolerance	3.00	2	CUT	N
P2192[3]	Time delay for belt failure	10	2	CUT	N
r2197	CO/BO: Monitoring word 1	-	2	-	-
r2198	CO/BO: Monitoring word 2	-	2	-	-

PI Controller (P0004 = 22)

Par. No.	Parametername	Default	Level	DS	QC
P2200[3]	BI: Enable PID controller	0:0	2	CT	N
P2201[3]	Fixed PID setpoint 1	0.00	2	CUT	N
P2202[3]	Fixed PID setpoint 2	10.00	2	CUT	N
P2203[3]	Fixed PID setpoint 3	20.00	2	CUT	N
P2204[3]	Fixed PID setpoint 4	30.00	2	CUT	N
P2205[3]	Fixed PID setpoint 5	40.00	2	CUT	N
P2206[3]	Fixed PID setpoint 6	50.00	2	CUT	N
P2207[3]	Fixed PID setpoint 7	60.00	2	CUT	N
P2208[3]	Fixed PID setpoint 8	70.00	2	CUT	N
P2209[3]	Fixed PID setpoint 9	80.00	2	CUT	N
P2210[3]	Fixed PID setpoint 10	90.00	2	CUT	N
P2211[3]	Fixed PID setpoint 11	100.00	2	CUT	N
P2212[3]	Fixed PID setpoint 12	110.00	2	CUT	N
P2213[3]	Fixed PID setpoint 13	120.00	2	CUT	N
P2214[3]	Fixed PID setpoint 14	130.00	2	CUT	N
P2215[3]	Fixed PID setpoint 15	130.00	2	CUT	N
P2216	Fixed PID setpoint mode - Bit 0	1	3	CT	N
P2217	Fixed PID setpoint mode - Bit 1	1	3	CT	N
P2218	Fixed PID setpoint mode - Bit 2	1	3	CT	N
P2219	Fixed PID setpoint mode - Bit 3	1	3	CT	N
r2224	CO: Act. fixed PID setpoint	-	2	-	-
P2225	Fixed PID setpoint mode - Bit 4	1	3	CT	N
P2227	Fixed PID setpoint mode - Bit 5	1	3	CT	N
P2231[3]	Setpoint memory of PID-MOP	0	2	CUT	N
P2232	Inhibit rev. direct. of PID-MOP	1	2	CT	N
P2240[3]	Setpoint of PID-MOP	10.00	2	CUT	N
r2250	CO: Output setpoint of PID-MOP	-	2	-	-
P2253[3]	CI: PID setpoint	0:0	2	CUT	N
P2254[3]	CI: PID trim source	0:0	3	CUT	N
P2255	PID setpoint gain factor	100.00	3	CUT	N
P2256	PID trim gain factor	100.00	3	CUT	N
P2257	Ramp-up time for PID setpoint	1.00	2	CUT	N
P2258	Ramp-down time for PID setpoint	1.00	2	CUT	N
r2260	CO: Act. PID setpoint	-	2	-	-

Par. No.	Parametername	Default	Level	DS	QC
P2261	PID setpoint filter timeconstant	0.00	3	CUT	N
r2262	CO: Act. PID filtered setpoint	-	3	-	-
P2263	PID controller type	0	3	CT	N
P2264[3]	CI: PID feedback	755:0	2	CUT	N
P2265	PID feedback filter timeconstant	0.00	2	CUT	N
r2266	CO: PID filtered feedback	-	2	-	-
P2267	Max. value for PID feedback	100.00	3	CUT	N
P2268	Min. value for PID feedback	0.00	3	CUT	N
P2269	Gain applied to PID feedback	100.00	3	CUT	N
P2270	PID feedback function selector	0	3	CUT	N
P2271	PID tranducer type	0	2	CUT	N
r2272	CO: PID scaled feedback	-	2	-	-
r2273	CO: PID error	-	2	-	-
P2274	PID derivative time	0.000	2	CUT	N
P2280	PID proportional gain	3.000	2	CUT	N
P2285	PID integral time	0.000	2	CUT	N
P2291	PID output upper limit	100.00	2	CUT	N
P2292	PID output lower limit	0.00	2	CUT	N
P2293	Ramp-up /-down time of PID limit	1.00	3	CUT	N
r2294	CO: Act. PID output	-	2	-	-
P2350	PID autotune enable	0	2	CUT	N
P2355	PID tuning offset	5.00	3	CUT	N

6 Troubleshooting

This Chapter contains:

- An overview of the operating statuses of the inverter with the SDP
- Notes on troubleshooting with the BOP
- A list of the alarms and fault messages

WARNING

- Repairs on equipment may only be carried out by **Siemens Service**, by repair centers **authorized by Siemens** or by qualified personnel who are thoroughly acquainted with all the warnings and operating procedures contained in this manual.
- Any defective parts or components must be replaced using parts contained in the relevant spare parts list.
- Disconnect the power supply before opening the equipment for access

6.1 Troubleshooting with the SDP

Table 6-1 explains the meaning of the various states of the LEDs on the SDP.

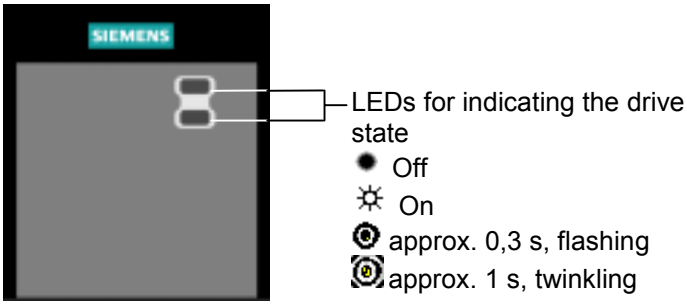


Table 6-1 Inverter conditions indicated by the LEDs on the SDP

● ●	Mains not present
☼ ☼	Ready to run
● ☼	Inverter fault - other than the ones listed below
☼ ●	Inverter running
● ◎	Fault overcurrent
◎ ●	Fault overvoltage
◎ ☼	Fault motor overtemperature
☼ ◎	Fault inverter temperature
◎ ◎	Warning current limit - both LEDs twinkling **same time**
◎ ◎	Other warnings - both LEDs twinkling **alternatively**
◎ ◎	Undervoltage trip / undervoltage warning
◎ ◎	Drive is not in ready state
◎ ◎	ROM failure - Both LEDs flashing **same time**
◎ ◎	RAM failure - Both LEDs flashing **alternatively**

6.2 Troubleshooting with the BOP

Warnings and faults are displayed on the BOP with Axxx and Fxxx respectively. The individual messages are shown in Section 6.3.

If the motor fails to start when the ON command has been given:

- Check that P0010 = 0.
- Check that a valid ON signal is present.
- Check that P0700 = 2 (for digital input control) or
  P0700 = 1 (for BOP control).
- Check that the setpoint is present (0 to 10V on Terminal 3) or the setpoint has been entered into the correct parameter, depending upon the setpoint source (P1000). See the Parameter List for further details.

If the motor fails to run after changing the parameters, set P0010 = 30 then P0970 = 1 and press **P** to reset the inverter to the factory default parameter values.

Now use a switch between terminals **5** and **8** on the control board. The drive should now run to the defined setpoint by analogue input.

NOTICE

Motor data must relate to the inverter data power range and voltage.

6.3 Fault messages

In the event of a failure, the inverter switches off and a fault code appears on the display.

NOTE
To reset the fault code, one of three methods listed below can be used:

1. Cycle the power to the drive.
2. Press the button on the BOP or AOP.
3. Via Digital Input 3 (default setting)

Fault	Possible Causes	Diagnose & Remedy	Reac-tion
F0001 Overcurrent	➢ Motor power (P0307) does not correspond to the inverter power (P0206) ➢ Motor lead short circuit ➢ Earth faults	Check the following: 1. Motor power (P0307) must correspond to inverter power (P0206). 2. Cable length limits must not be exceeded. 3. Motor cable and motor must have no short-circuits or earth faults 4. Motor parameters must match the motor in use 5. Value of stator resistance (P0350) must be correct 6. Motor must not be obstructed or overloaded ➢ Increase the ramp time ➢ Reduce the boost level	OFF2
F0002 Overvoltage	➢ DC-link voltage (r0026) exceeds trip level (P2172) ➢ Overvoltage can be caused either by too high main supply voltage or if motor is in regenerative mode. ➢ Regenerative mode can be cause by fast ramp downs or if the motor is driven from an active load.	Check the following: 1. Supply voltage (P0210) must lie within limits indicated on rating plate . 2. DC-link voltage controller must be enabled (P1240) and parameterized properly. 3. Ramp-down time (P1121) must match inertia of load. 4. Required braking power must lie within specified limits. **Note** Higher inertia requires longer ramp times; otherwise, apply braking resistor.	OFF2
F0003 Undervoltage	➢ Main supply failed. ➢ Shock load outside specified limits.	Check the following: 1. Supply voltage (P0210) must lie within limits indicated on rating plate. 2. Supply must not be susceptible to temporary failures or voltage reductions.	OFF2
F0004 Inverter Over-temperature	➢ Ventilation inadequate ➢ Fan inoperative ➢ Ambient temperature is too high.	Check the following: 1. Fan must turn when inverter is running 2. Pulse frequency must be set to default value 3. Obstruction of air inlet and outlet points Ambient temperature could be higher than specified for the inverter.	OFF2
F0005 Inverter I^2t	➢ Inverter overloaded. ➢ Duty cycle too demanding. ➢ Motor power (P0307) exceeds inverter power capability (P0206).	Check the following: 1. Load duty cycle must lie within specified limits. 2. Motor power (P0307) must match inverter power (P0206)	OFF2
F0011 Motor Over-temperature	➢ Motor overloaded ➢ Motor data incorrect ➢ Long time period operating at low speeds	1. Check motor data 2. Check loading on motor 3. Boost settings too high (P1310, P1311, P1312) 4. Check parameter for motor thermal time constant 5. Check parameter for motor I^2t warning level.	OFF1

Fault	Possible Causes	Diagnose & Remedy	Reac-tion
F0012 Inverter temp. signal lost	Wire breakage of inverter temperature (heatsink) sensor		OFF1
F0015 Motor temperature signal lost	Open or short circuit of motor temperature sensor. If signal loss is detected, temperature monitoring switches over to monitoring with the motor thermal model		OFF2
F0020 Mains Phase Missing	Fault occurs if one of the three input phases is missed and the pulses are enabled and drive is loaded	Check the input wiring of the mains phases	OFF2
F0021 Earth fault	Fault occurs if the sum of the phase currents is higher than 5 % of the nominal inverter current. **Note** This fault only occurs on inverters that have 3 current sensors (Frame sizes D to F)		OFF2
F0022 Powerstack fault	Fault caused by the following events: (1) dc-link overcurrent = short circuit of IGBT (2) short circuit of chopper (3) earth fault ➢ Framesizes A to C (1),(2),(3) ➢ Framesizes D to E (1),(2) ➢ Framesize F (2) Since all these faults are assigned to one signal on the power stack, it is not possible to establish which one actually occurred.		OFF2
F0030 Fan has failed	Fan no longer working	Fault cannot be masked while options module (AOP or BOP) is connected. Need a new fan.	OFF2
F0040 Automatic Calibration Failure			OFF2

Fault	Possible Causes	Diagnose & Remedy	Reaction
F0041 Motor Data Identification Failure	➢ Motor data identification failed. ➢ Alarm value =0: Load missing ➢ Alarm value =1: Current limit level reached during identification. ➢ Alarm value =2: Identified stator resistance less than 0.1% or greater than 100%. ➢ Alarm value =3: Identified rotorresistance less than 0.1% or greater than 100%. ➢ Alarm value =4: Identified stator reactance less than 50% and greater than 500% ➢ Alarm value =5: Identified main reactance less than 50% and greater than 500% ➢ Alarm value =6: Identified rotor time constant less than 10ms or greater than 5s ➢ Alarm value =7: Identified total leakage reactance less than 5% and greater than 50% ➢ Alarm value =8: Identified stator leakage reactance less than 25% and greater than 250% ➢ Alarm value =9: Identified rotor leakage inductance less than 25% and greater than 250% ➢ Alarm value = 20: Identified IGBT on-voltage less than 0.5 or greater than 10V ➢ Alarm value = 30: Current controller at voltage limit ➢ Alarm value = 40: Inconsistence of identified data set, at least one identification failed ➢ Percentage values based on the impedance Zb = Vmot,nom / sqrt(3) / Imot,nom	0: Check that the motor is connected to the inverter. 1-40: Check if motor data in P304-311 are correct. Check what type of motor wiring is required (star, delta).	OFF2
F0051 Parameter EEPROM Fault	Read or write failure while saving non-volatile parameter.	➢ Factory Reset and new parameterization. ➢ Change inverter	OFF2
F0052 Power Stack Fault	Read failure for power stack information or invalid data.	Change inverter	OFF2
F0053 IO Eeprom Fault	Read failure for IO EEPROM information or invalid data	➢ Check data ➢ Change IO module	OFF2
F0054 Wrong IO Board	➢ Wrong IO board is connected. ➢ No ID detected on IO board, No data.	1. Check data 2. Change IO module	OFF2
F0060 Asic Timeout	Communications failure	1. Acknowledge fault 2. Change inverter if repeated	OFF2
F0070 CB setpoint fault	No setpoint received from communications board during telegram off time	1. Check connections to the communications board 2. Check the master	OFF2
F0071 USS (BOP-link) setpoint fault	No response during telegram off time via USS (BOP-link)	1. Check connections to the communications board 2. Check the master	OFF2
F0072 USS (COMM link) setpoint fault	No response during telegram off time via USS (COMM-link)	1. Check connections to the communications board 2. Check the master	OFF2

Fault	Possible Causes	Diagnose & Remedy	Reac-tion
F0080 ADC lost input signal	➢ Broken wire ➢ Signal out of limits	Check connection to analogue input	OFF2
F0085 External Fault	External fault triggered	Disable input for fault trigger	OFF2
F0101 Stack Overflow	Software error or processor failure	1. Run self test routines 2. Change inverter	OFF2
F0221 PID Feedback below min. value	PI Feedback below minimum value P2268	1. Change value of P2268 2. Adjust feedback gain	OFF2
F0222 PID Feedback above max. value	PI Feedback above maximum value P2267	1. Change value of P2267 2. Adjust feedback gain	OFF2
F0450 BIST Tests Failure (Service mode only)	Fault value: 1 Some of the power section tests have failed 2. Some of the control board tests have failed 4 Some of the functional tests have failed 8 Some of the IO module tests have failed 16 The internal RAM has failed its check on power-up	1. Inverter may run but certain actions will not function correctly 2. Replace inverter	OFF2
F0452 Belt Failure Detected	Load conditions on motor indicate belt failure or mechanical fault.	Check the following: 1. No breakage, seizure or obstruction of drive train. 2. Proper operation of external speed sensor, if in use. 3. P0402 (pulse per min at rated speed), P2164 (hysteresis freq. deviation) and P2165 (delay time for permitted deviation) must have correct values. 4. P2155 (threshold frequency f1), P2157 (threshold frequency f2), P2159 (threshold frequency f3), P2174 (upper torque threshold 1), P2175 (lower torque threshold 1), P2176 (delay T_Torque), P2182 (upper torque threshold 2), P2183 (lower torque threshold 2), P2184 (upper torque threshold 3) and P2185 (lower torque threshold 3) must have correct values.	OFF2

6.4 Alarm messages

Fault	Possible Causes	Diagnose & Remedy	Reac-tion
A0501 Current Limit	➢ Motor power does not correspond to the inverter power ➢ Motor leads are too short ➢ Earth faults	Check the following: 1. Motor power (P0307) must correspond to inverter power (P0206). 2. Cable length limits must not be exceeded. 3. Motor cable and motor must have no short-circuits or earth faults 4. Motor parameters must match the motor in use 5. Value of stator resistance (P0350) must be correct 6. Motor must not be obstructed or overloaded ➢ Increase the ramp-up-time. ➢ Reduce the boost	--
A0502 Overvoltage limit	➢ Overvoltage limit is reached. ➢ This warning can occur during ramp down, if the dc-link controller is disabled (P1240 = 0).	If this warning is displayed permanently, check drive input voltage	--
A0503 Undervoltage Limit	➢ Main supply failed ➢ Main supply (P0210) and consequently DC-link voltage (R0026) below specified limit (P2172).	Check main supply voltage (P0210)	--
A0504 Inverter Over-temperature	Warning level of inverter heat-sink temperature (P0614) is exceeded, resulting in pulse frequency reduction and/or output frequency reduction (depending on parametrization in (P0610)	Check the following: 1. Ambient temperature must lie within specified limits 2. Load conditions and duty cycle must be appropriate 3. Fan must turn when drive is running	--
A0505 Inverter I^2t	Warning level exceeded, current will be reduced if parameterized (P0610 = 1)	Check that duty cycle lies within specified limits	--
A0506 Inverter duty cycle	Difference between heatsink and IGBT junction temperature exceeds warning limits	Check that duty cycle and shock loads lie within specified limits	--
A0510 Motor Over-temperature			--
A0511 Motor Over-temperature I^2t	➢ Motor overloaded ➢ Load duty cycle too high	Check the following: 1. P0611 (motor i^2t time constant) should be set to appropriate value 2. P0614 (Motor i^2t overload warning level) should be set to suitable level 3. Are long periods of operation at low speed occuring 4. Check that boost settings are not too high	--
A0512 Motor temperature signal lost	Wire break to motor temperature sensor.	If a wire breakage is be detected, temperature monitoring switches over to monitoring with the motor thermal model.	--
A0535 Braking Resistor Hot			--
A0541 Motor Data Identification Active	Motor data identification (P1910) selected or running	Wait until motor identification is finished	--
A0700 CB warning 1	CB (communication board) specific	See CB user manual	--
A0701 CB warning 2	CB (communication board) specific	See CB user manual	--

Fault	Possible Causes	Diagnose & Remedy	Reaction
A0702 CB warning 3	CB (communication board) specific	See CB user manual	--
A0703 CB warning 4	CB (communication board) specific	See CB user manual	--
A0704 CB warning 5	CB (communication board) specific	See CB user manual	--
A0705 CB warning 6	CB (communication board) specific	See CB user manual	--
A0706 CB warning 7	CB (communication board) specific	See CB user manual	--
A0707 CB warning 8	CB (communication board) specific	See CB user manual	--
A0708 CB warning 9	CB (communication board) specific	See CB user manual	--
A0709 CB warning 10	CB (communication board) specific	See CB user manual	--
A0710 CB communication error	Communication with CB (communication board) is lost	Check CB hardware	--
A0711 CB configuration error	CB (communication board) reports a configuration error.	Check CB parameters	--
A0910 Vdc-max controller deactivated	Vdc max controller has been deactivated, since controller is not capable of keeping DC-link voltage (r0026) within limits (P2172). ➢ Occurs if main supply voltage (P0210) is permanently too high. ➢ Occurs if motor is driven by an active load, causing motor to goes into regenerative mode. ➢ Occurs at very high load inertias, when ramping down.	Check the following: 1. Input voltage (P0756) lies within range? 2. Load must match In certain cases apply braking resistor.	--
A0911 Vdc-max controller active	Vdc max controller is active; so ramp-down times will be increased automatically to keep DC-link voltage (r0026) within limits (P2172).	1. Check parameter inverter input voltage 2. Check ramp-down times	--
A0912 Vdc-min controller active	Vdc min controller will be activated if DC-link voltage (r0026) falls below minimum level (P2172). ➢ The kinetic energy of the motor is used to buffer the DC-link voltage, thus causing deceleration of the drive! ➢ So short mains failures do not necessarily lead to an undervoltage trip.		--
A0920 ADC parameters not set properly	ADC parameters should not be set to identical values, since this would produce illogical results. ➢ Index 0: Parameter settings for output identical ➢ Index 1: Parameter settings for input identical ➢ Index 2: Parameter settings for input do not correspond to ADC type	Analogue input parameters should not be set to the same value as each other	--

Fault	Possible Causes	Diagnose & Remedy	Reaction
A0921 DAC parameters not set properly	DAC parameters should not be set to identical values, since this would produce illogical results. ➢ Index 0: Parameter settings for output identical ➢ Index 1: Parameter settings for input identical ➢ Index 2: Parameter settings for output do not correspond to DAC type	Analogue Output parameters should not be set to the same value as each other	--
A0922 No load applied to inverter	No Load is applied to the inverter. As a result, some functions may not work as under normal load conditions.	1. Check that load is applied to the inverter 2. Check motor parameters correspond to motor attached 3. As a result, some functions may not work correctly, because there is no normal load condition	--
A0923 Both JOG Left and JOG Right are requested	Both JOG right and JOG left (P1055/P1056) have been requested. This freezes the RFG output frequency at its current value.	Make sure that JOG right and JOG left signals are not applied simultaneously	--
A0936 PID Autotuning Active	PID Autotuning (P2350) selected or running		--
A0952 Belt Failure Detected	Load conditions on motor indicate belt failure or mechanical fault	Check the following: 1. No breakage, seizure or obstruction of drive train. 2. If using an external speed sensor, check for correct function. 3. Check parameters: P0409 (pulse per min at rated speed). P2191 (Belt failure speed tolerance). P2192 (delay time for permitted deviation) 4. If using the torque envelope, check parameters: P2182 (threshold frequency f1) P2183 (threshold frequency f2) P2184 (threshold frequency f3) P2185 (upper torque threshold 1) P2186 (lower torque threshold 1) P2187 (upper torque threshold 2) P2188 (lower torque threshold 2) P2189 (upper torque threshold 3) P2190 (lower torque threshold 3) P2192 (delay time for permitted deviation)	--

7 MICROMASTER 440 specifications

This Chapter contains:

- Table 7.1 contains the general technical specifications for the MICROMASTER 440 inverter
- Table 7-2 contains terminal tightening torques
- Table 7-3 includes various tables of specific technical data for individual MICROMASTER 440 inverters

Table 7-1 MICROMASTER 440 Performance Ratings

Feature		Specification		
Mains Operating Voltage & Power Ranges	CT	1 AC 200 to 240 V ± 10 %	0,12 kW – 3,0 kW	(0,16 hp – 4,0 hp)
		3 AC 200 to 240 V ± 10 %	0,12 kW – 45,0 kW	(0,16 hp – 60,0 hp)
	VT		5,50 kW – 45,0 kW	(7,50 hp – 60,0 hp)
	CT	3 AC 380 to 480 V ± 10 %	0,37 kW – 75,0 kW	(0,50 hp – 100 hp)
	VT		7,50 kW – 90,0 kW	(10,0 hp – 120 hp)
	CT	3 AC 500 to 600 V ± 10 %	0,75 kW – 75,0 kW	(1,00 hp – 100 hp)
	VT		1,50 kW – 90,0 kW	(2,00 hp – 120 hp)
Input Frequency		47 to 63 Hz		
Output frequency		0 Hz to 650 Hz		
Power Factor		≥ 0.7		
Inverter Efficiency		96 to 97 %		
Overload Capability for Constant Torque (CT)		50 % for a period of 60 s within 5 min or 100 % for a period of 3 s within 5 min in relation to therated output current		
Inrush Current		Less than rated input current		
Control Method		Linear V/f control, Linear V/f control with FCC, Parabolic V/f control, Multi-point V/f control, Linear V/f control with low-power mode, V/f control for textile applications, V/f control with FCC for textile applications, V/f control with independent voltage setpoint, Sensorless Vector Control, Sensoless Vector Torque Control		
Pulse Frequency		2 kHz to 16 kHz (2 kHz steps)		
Fixed Frequencies		15, programmable		
Skip Frequencies		4, programmable		
Setpoint Resolution		0.01 Hz Digital, 0.01 Hz Serial, 10 bit Analogue (motor potentiometer 0.1 Hz [0.1% (in PID mode)])		
Digital Inputs		6, programmable (isolated), switchable active high / active low (PNP/NPN)		
Analog Input 1		0 - 10 V, 0 - 20 mA and –10 V to +10 V		
Analog Input 2		0 - 10 V and 0 - 20 mA		
Relay Outputs		3, programmable 30 V DC / 5 A (resistive), 250 V AC 2 A (inductive)		
Analogue Output		2, programmable (0 to 20 mA)		
Serial Interface		RS-485, optional RS-232		
Electromagnetic Compatibility		Optional EMC filters to EN55011 Class A or B, also Internal Class A filters available selected units		
Braking		DC braking, Compound braking and Dynamic braking		
Protection Level		IP20		
Temperature range	Constant Torque (CT)	-10 °C to +50 °C (14 °F to 122 °F)		
	Variable Torque (VT)	-10 °C to +40 °C (14 °F to 104 °F)		
Storage Temperature		-40 °C to +70 °C (14 °F to 122 °F)		
Humidity		< 95 % RH – non-condensing		
Operational Altitudes		Up to 1000 m above sea level without derating		
Protection Features		Undervoltage , Overvoltage, Overload, Ground Faults, Short circuit, Stall Prevention, Motor Blocking Protection, Motor Overtemperature, Inverter Overtemperature, Parameter Interlock		
Standards		UL, cUL, CE, C-tick		
CE Marked		Conformity with EC Low Voltage Directive 73/23/EEC and Electromagnetic Compatibility Directive 89/336/EEC		

Table 7-2 Tightening torques for power terminals

Frame Size		**A**	**B**	**C**	**D**	**E**	**F**
Tightening Torque	[Nm]	1.1	1.5	2.25	10 (max)	10 (max)	50
	[lbf.in]	10	13.3	20	87 (max)	87 (max)	435

Table 7-3 MICROMASTER 440 Specifications

In order to have a UL compliant installation fuses from the SITOR range with the appropriate current rating must be used.

Input voltage range **1 AC 200 V – 240 V, ± 10 % (with built in Class A Filter)**

Order No.	**6SE6440-**	**2AB11 -2AA0**	**2AB12 -5AA0**	**2AB13 -7AA0**	**2AB15 -5AA0**	**2AB17 -5AA0**	**2AB21 -1BA0**	**2AB21 -5BA0**	**2AB22 -2BA0**	**2AB23 -0CA0**
Motor Output Rating	**[kW]**	0.12	0.25	0.37	0.55	0.75	1.1	1.5	2.2	3.0
	[hp]	0.16	0.33	0.5	0.75	1.0	1.5	2.0	3.0	4.0
Output Power	**[kVA]**	0.4	0.7	1.0	1.3	1.7	2.4	3.2	4.6	6.0
Output Current Max.	**[A]**	0.9	1.7	2.3	3.0	3.9	5.5	7.4	10.4	13.6
Input Current	**[A]**	1.4	2.7	3.7	5.0	6.6	9.6	13.0	17.6	23.7
Recommended Fuse	**[A]**	10	10	10	16	16	20	20	25	32
		3NA3803	**3NA3803**	**3NA3803**	**3NA3805**	**3NA3805**	**3NA3807**	**3NA3807**	**3NA3810**	**3NA3812**
Input Cable Min.	**[mm^2]**	1.0	1.0	1.0	1.0	1.0	1.0	1.5	2.5	4.0
	[awg]	17	17	17	17	17	17	15	13	11
Input Cable Max.	**[mm^2]**	2.5	2.5	2.5	2.5	2.5	6.0	6.0	6.0	10.0
	[awg]	13	13	13	13	13	9	9	9	7
Output Cable Min.	**[mm^2]**	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.5
	[awg]	17	17	17	17	17	17	17	17	15
Output Cable Max.	**[mm^2]**	2.5	2.5	2.5	2.5	2.5	6.0	6.0	6.0	10.0
	[awg]	13	13	13	13	13	9	9	9	7
Weight	**[kg]**	1.3	1.3	1.3	1.3	1.3	3.4	3.4	3.4	5.7
	[lbs]	2.9	2.9	2.9	2.9	2.9	7.5	7.5	7.5	12.5
Dimensions	**w [mm]**	73.0	73.0	73.0	73.0	73.0	149.0	149.0	149.0	185.0
	h [mm]	173.0	173.0	173.0	173.0	173.0	202.0	202.0	202.0	245.0
	d [mm]	149.0	149.0	149.0	149.0	149.0	172.0	172.0	172.0	195.0
	w [inches]	2.87	2.87	2.87	2.87	2.87	5.87	5.87	5.87	7.28
	h [inches]	6.81	6.81	6.81	6.81	6.81	7.95	7.95	7.95	9.65
	d [inches]	5.87	5.87	5.87	5.87	5.87	6.77	6.77	6.77	7.68

Input voltage range **3 AC 200 V – 240 V, ± 10 % (with built in Class A Filter)**

Order No. 6SE6440-		2AC23-0CA0	2AC24-0CA0	2AC25-5CA0
Motor Output Rating	[kW] [hp]	3.0 4.0	4.0 5.0	5.5 7.5
Output Power	[kVA]	6.0	7.7	9.6
CT Output Cur. Max.	[A]	13.6	17.5	22.0
CT Input Current	[A]	10.5	13.1	17.5
VT Input Current	[A]	10.5	17.6	26.5
VT Output Cur. Max.	[A]	13.6	22.0	28.0
Recommended Fuse	[A]	20 3NA3807	25 3NA3810	35 3NA3814
Input Cable Min.	[mm^2] [awg]	1.0 17.0	2.5 13.0	4.0 11.0
Input Cable Max.	[mm^2] [awg]	10.0 7.0	10.0 7.0	10.0 7.0
Output Cable Min.	[mm^2] [awg]	1.5 15.0	4.0 11.0	4.0 11.0
Output Cable Max.	[mm^2] [awg]	10.0 7.0	10.0 7.0	10.0 7.0
Weight	[kg] [lbs]	5.7 12.5	5.7 12.5	5.7 12.5
Dimensions	w [mm] h [mm] d [mm]	185.0 245.0 195.0	185.0 245.0 195.0	185.0 245.0 195.0
	w [inches] h [inches] d [inches]	7.28 9.65 7.68	7.28 9.65 7.68	7.28 9.65 7.68

Input voltage range **1 AC 3 AC 200 V – 240 V, ± 10 % (Unfiltered)**

Order No.	**6SE6440-**	**2UC11 -2AA0**	**2UC12 -5AA0**	**2UC13 -7AA0**	**2UC15 -5AA0**	**2UC17 -5AA0**	**2UC21 -1BA0**	**2UC21 -5BA0**	**2UC22 -2BA0**	**2UC23 -0CA0**
Motor Output Rating	**[kW]**	0.12	0.25	0.37	0.55	0.75	1.1	1.5	2.2	3.0
	[hp]	0.16	0.33	0.5	0.75	1.0	1.5	2.0	3.0	4.0
Output Power	**[kVA]**	0.4	0.7	1.0	1.3	1.7	2.4	3.2	4.6	6.0
Output Current Max.	**[A]**	0.9	1.7	2.3	3.0	3.9	5.5	7.4	10.4	13.6
Input Current, 3 AC	**[A]**	0.6	1.1	1.6	2.1	2.9	4.1	5.6	7.6	10.5
Input Current , 1 AC	**[A]**	1.4	2.7	3.7	5.0	6.6	9.6	13.0	17.6	23.7
Recommended Fuse	**[A]**	10	10	10	16	16	20	20	25	32
		3NA3803	**3NA3803**	**3NA3803**	**3NA3805**	**3NA3805**	**3NA3807**	**3NA3807**	**3NA3810**	**3NA3812**
Input Cable Min.	**[mm²]**	1.0	1.0	1.0	1.0	1.0	1.0	1.5	2.5	4.0
	[awg]	17	17	17	17	17	17	15	13	11
Input Cable Max.	**[mm²]**	2.5	2.5	2.5	2.5	2.5	6.0	6.0	6.0	10.0
	[awg]	13	13	13	13	13	9	9	9	7
Output Cable Min.	**[mm²]**	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.5
	[awg]	17	17	17	17	17	17	17	17	15
Output Cable Max.	**[mm²]**	2.5	2.5	2.5	2.5	2.5	6.0	6.0	6.0	10.0
	[awg]	13	13	13	13	13	9	9	9	7
Weight	**[kg]**	1.3	1.3	1.3	1.3	1.3	3.3	3.3	3.3	5.5
	[lbs]	2.9	2.9	2.9	2.9	2.9	7.3	7.3	7.3	12.1
Dimensions	**w [mm]**	73.0	73.0	73.0	73.0	73.0	149.0	149.0	149.0	185.0
	h [mm]	173.0	173.0	173.0	173.0	173.0	202.0	202.0	202.0	245.0
	d [mm]	149.0	149.0	149.0	149.0	149.0	172.0	172.0	172.0	195.0
	w [inches]	2.87	2.87	2.87	2.87	2.87	5.87	5.87	5.87	7.28
	h [inches]	6.81	6.81	6.81	6.81	6.81	7.95	7.95	7.95	9.65
	d [inches]	5.87	5.87	5.87	5.87	5.87	6.77	6.77	6.77	7.68

Input voltage range 3 AC 200 V – 240 V, ± 10 % (Unfiltered)

Order No. 6SE6440-		2UC24-0CA0	2UC25-5CA0	2UC27-5DA0	2UC31-1DA0	2UC31-5DA0	2UC31-8EA0	2UC32-2EA0	2UC33-0FA0	2UC33-7FA0	2UC34-5FAO
Motor Output Rating	[kW]	4.0	5.5	7.5	11.0	15.0	18.5	22.0	30.0	37.0	45.0
	[hp]	5.0	7.5	10.0	15.0	20.0	25.0	30.0	40.0	50.0	60.0
Output Power	[kVA]	7.7	9.6	12.3	18.4	23.7	29.8	35.1	45.6	57.0	67.5
CT Output Cur. Max.	[A]	17.5	22.0	28.0	42.0	54.0	68.0	80.0	104.0	130.0	154.0
CT Input Current	[A]	13.1	17.5	25.3	37.0	48.8	61.0	69.4	94.1	110.6	134.9
VT Input Current	[A]	17.6	26.5	38.4	50.3	61.5	70.8	96.2	114.1	134.9	163.9
VT Output Cur. Max.	[A]	22.0	28.0	42.0	54.0	68.0	80.0	104.0	130.0	154.0	178.0
Recommended Fuse	[A]	25	35	50	80	80	100	100	160	200	200
		3NA3810	3NA3814	3NA3820	3NA3824	3NA3824	3NA3830	3NA3830	3NA3836	3NA3140	3NA3140
Input Cable Min.	[mm^2]	2.5	4.0	10.0	16.0	16.0	25.0	25.0	50.0	70.0	70.0
	[awg]	13.0	11.0	7.0	5.0	5.0	3.0	3.0	0.0	-2.0	-2.0
Input Cable Max.	[mm^2]	10.0	10.0	35.0	35.0	35.0	35.0	35.0	150.0	150.0	150.0
	[awg]	7.0	7.0	2.0	2.0	2.0	2.0	2.0	-5.0	-5.0	-5.0
Output Cable Min.	[mm^2]	4.0	4.0	10.0	16.0	16.0	25.0	25.0	50.0	70.0	95.0
	[awg]	11.0	11.0	7.0	5.0	5.0	3.0	3.0	0.0	-2.0	-3.0
Output Cable Max.	[mm^2]	10.0	10.0	35.0	35.0	35.0	35.0	35.0	150.0	150.0	150.0
	[awg]	7.0	7.0	2.0	2.0	2.0	2.0	2.0	-5.0	-5.0	-5.0
Weight	[kg]	5.5	5.5	17.0	16.0	16.0	20.0	20.0	55.0	55.0	55.0
	[lbs]	12.1	12.1	37.0	35.0	35.0	44.0	44.0	121.0	121.0	121.0
Dimensions	w [mm]	185.0	185.0	275.0	275.0	275.0	275.0	275.0	350.0	350.0	350.0
	h [mm]	245.0	245.0	520.0	520.0	520.0	650.0	650.0	850.0	850.0	850.0
	d [mm]	195.0	195.0	245.0	245.0	245.0	245.0	245.0	320.0	320.0	320.0
	w [inches]	7.28	7.28	10.83	10.83	10.83	10.83	10.83	13.78	13.78	13.78
	h [inches]	9.65	9.65	20.47	20.47	20.47	25.59	25.59	33.46	33.46	33.46
	d [inches]	7.68	7.68	9.65	9.65	9.65	9.65	9.65	12.6	12.6	12.6

Input voltage range **3 AC 380 V – 480 V, ± 10 % (with built in Class A Filter), Part 1**

Order No.	**6SE6440-**	**2AD22-2BA0**	**2AD23-0BA0**	**2AD24-0BA0**	**2AD25-5CA0**	**2AD27-5CA0**	**2AD31-1CA0**	**2AD31-5DA0**	**2AD31-8DA0**
Motor Output Rating	**[kW]** **[hp]**	2.2 3.0	3.0 4.0	4.0 5.0	5.5 7.5	7.5 10.0	11.0 15.0	15.0 20.0	18.5 25.0
Output Power	**[kVA]**	4.5	5.9	7.8	10.1	14.0	19.8	24.4	29.0
CT Output Cur. Max.	**[A]**	5.9	7.7	10.2	13.2	18.4	26.0	32.0	38.0
CT Input Current	**[A]**	5.0	6.7	8.5	11.6	15.4	22.5	30.0	36.6
VT Input Current	**[A]**	5.0	6.7	8.5	16.0	22.5	30.5	37.2	43.3
VT Output Cur. Max.	**[A]**	5.9	7.7	10.2	18.4	26.0	32.0	38.0	45.0
Recommended Fuse	**[A]**	16	16	20	20	32	35	50	63
		3NA3005	**3NA3005**	**3NA3007**	**3NA3007**	**3NA3012**	**3NA3014**	**3NA3020**	**3NA3022**
Input Cable Min.	**[mm^2]** **[awg]**	1.0 17	1.0 17	1.0 17	2.5 13	4.0 11	6.0 9	10.0 7	10.0 7
Input Cable Max.	**[mm^2]** **[awg]**	6.0 9	6.0 9	6.0 9	10.0 7	10.0 7	10.0 7	35.0 2	35.0 2
Output Cable Min.	**[mm^2]** **[awg]**	1.0 17	1.0 17	1.0 17	2.5 13	4.0 11	6.0 9	10.0 7	10.0 7
Output Cable Max.	**[mm^2]** **[awg]**	6.0 9	6.0 9	6.0 9	10.0 7	10.0 7	10.0 7	35.0 2	35.0 2
Weight	**[kg]** **[lbs]**	3.4 7.5	3.4 7.5	3.4 7.5	5.7 12.5	5.7 12.5	5.7 12.5	17.0 37.0	17.0 37.0
Dimensions	**w [mm]** **h [mm]** **d [mm]**	149.0 202.0 172.0	149.0 202.0 172.0	149.0 202.0 172.0	185.0 245.0 195.0	185.0 245.0 195.0	185.0 245.0 195.0	275.0 520.0 245.0	275.0 520.0 245.0
	w [inches] **h [inches]** **d [inches]**	5.87 7.95 6.77	5.87 7.95 6.77	5.87 7.95 6.77	7.28 9.65 7.68	7.28 9.65 7.68	7.28 9.65 7.68	10.83 20.47 9.65	10.83 20.47 9.65

Input voltage range 3 AC 380 V – 480 V, ± 10 % (with built in Class A Filter), Part 2

Order No. 6SE6440-		2AD32-2DA0	2AD33-0EA0	2AD33-7EA0	2AD34-5FA0	2AD35-5FA0	2AD37-5FAO
Motor Output Rating	[kW] [hp]	22.0 30.0	30.0 40.0	37.0 50.0	45.0 60.0	55.0 75.0	75.0 100.0
Output Power	[kVA]	34.3	47.3	57.2	68.6	83.8	110.5
CT Output Cur. Max.	[A]	45.0	62.0	75.0	90.0	110.0	145.0
CT Input Current	[A]	43.1	58.7	71.2	85.6	103.6	138.5
VT Input Current	[A]	59.3	71.7	86.6	103.6	138.5	168.5
VT Output Cur. Max.	[A]	62.0	75.0	90.0	110.0	145.0	178.0
Recommended Fuse	[A]	80	100	125	160	160	200
		3NA3024	3NA3030	3NA3032	3NA3036	3NA3036	3NA3140
Input Cable Min.	[mm^2] [awg]	16.0 5	25.0 3	25.0 3	35.0 2	70.0 -2	70.0 -2
Input Cable Max.	[mm^2] [awg]	35.0 2	35.0 2	35.0 2	150.0 -5	150.0 -5	150.0 -5
Output Cable Min.	[mm^2] [awg]	16.0 5	25.0 3	25.0 3	50.0 0	70.0 -2	95.0 -3
Output Cable Max.	[mm^2] [awg]	35.0 2	35.0 2	35.0 2	150.0 -5	150.0 -5	150.0 -5
Weight	[kg] [lbs]	17.0 37.0	22.0 48.0	22.0 48.0	75.0 165.0	75.0 165.0	75.0 165.0
Dimensions	w [mm] h [mm] d [mm]	275.0 520.0 245.0	275.0 650.0 245.0	275.0 650.0 245.0	350.0 1150.0 320.0	350.0 1150.0 320.0	350.0 1150.0 320.0
	w [inches] h [inches] d [inches]	10.83 20.47 9.65	10.83 25.59 9.65	10.83 25.59 9.65	13.78 45.28 12.6	13.78 45.28 12.6	13.78 45.28 12.6

Input voltage range 3 AC 380 V – 480 V, ± 10 % (Unfiltered), Part 1

Order No.	6SE6440-	2UD13-7AA0	2UD15-5AA0	2UD17-5AA0	2UD21-1AA0	2UD21-5AA0	2UD22-2BA0	2UD23-0BA0	2UD24-0BA0	2UD25-5CA0	2UD27-5CA0
Motor Output Rating	[kW] [hp]	0.37 0.5	0.55 0.75	0.75 1.0	1.1 1.5	1.5 2.0	2.2 3.0	3.0 4.0	4.0 5.0	5.5 7.5	7.5 10.0
Output Power	[kVA]	0.9	1.2	1.6	2.3	3.0	4.5	5.9	7.8	10.1	14.0
CT Output Cur. Max.	[A]	1.2	1.6	2.1	3.0	4.0	5.9	7.7	10.2	13.2	18.4
CT Input Current	[A]	1.1	1.4	1.9	2.8	3.9	5.0	6.7	8.5	11.6	15.4
VT Input Current	[A]	1.1	1.4	1.9	2.8	3.9	5.0	6.7	8.5	16.0	22.5
VT Output Cur. Max.	[A]	1.2	1.6	2.1	3.0	4.0	5.9	7.7	10.2	18.4	26.0
Recommended Fuse	[A]	10	10	10	10	10	16	16	20	20	32
		3NA3003	3NA3003	3NA3003	3NA3003	3NA3003	3NA3005	3NA3005	3NA3007	3NA3007	3NA3012
Input Cable Min.	[mm^2] [awg]	1.0 17	1.0 17	1.0 17	1.0 17	1.0 17	1.0 17	1.0 17	1.0 17	2.5 13	4.0 11
Input Cable Max.	[mm^2] [awg]	2.5 13	2.5 13	2.5 13	2.5 13	2.5 13	6.0 9	6.0 9	6.0 9	10.0 7	10.0 7
Output Cable Min.	[mm^2] [awg]	1.0 17	1.0 17	1.0 17	1.0 17	1.0 17	1.0 17	1.0 17	1.0 17	2.5 13	4.0 11
Output Cable Max.	[mm^2] [awg]	2.5 13	2.5 13	2.5 13	2.5 13	2.5 13	6.0 9	6.0 9	6.0 9	10.0 7	10.0 7
Weight	[kg] [lbs]	1.3 2.9	1.3 2.9	1.3 2.9	1.3 2.9	1.3 2.9	3.3 7.3	3.3 7.3	3.3 7.3	5.5 12.1	5.5 12.1
Dimensions	w [mm] h [mm] d [mm]	73.0 173.0 149.0	73.0 173.0 149.0	73.0 173.0 149.0	73.0 173.0 149.0	73.0 173.0 149.0	149.0 202.0 172.0	149.0 202.0 172.0	149.0 202.0 172.0	185.0 245.0 195.0	185.0 245.0 195.0
	w [inches] h [inches] d [inches]	2.87 6.81 5.87	2.87 6.81 5.87	2.87 6.81 5.87	2.87 6.81 5.87	2.87 6.81 5.87	5.87 7.95 6.77	5.87 7.95 6.77	5.87 7.95 6.77	7.28 9.65 7.68	7.28 9.65 7.68

Input voltage range 3 AC 380 V – 480 V, ± 10 % (Unfiltered), Part 2

Order No.	6SE6440-	2UD31-1CA0	2UD31-5DA0	2UD31-8DA0	2UD32-2DA0	2UD33-0EA0	2UD33-7EA0	2UD34-5FA0	2UD35-5FA0	2UD37-5FA0
Motor Output Rating	[kW]	11.0	15.0	18.5	22.0	30.0	37.0	45.0	55.0	75.0
	[hp]	15.0	20.0	25.0	30.0	40.0	50.0	60.0	75.0	100.0
Output Power	[kVA]	19.8	24.4	29.0	34.3	47.3	57.2	68.6	83.8	110.5
CT Output Cur. Max.	[A]	26.0	32.0	38.0	45.0	62.0	75.0	90.0	110.0	145.0
CT Input Current	[A]	22.5	30.0	36.6	43.1	58.7	71.2	85.6	103.6	138.5
VT Input Current	[A]	30.5	37.2	43.3	59.3	71.7	86.6	103.6	138.5	168.5
VT Output Cur. Max.	[A]	32.0	38.0	45.0	62.0	75.0	90.0	110.0	145.0	178.0
Recommended Fuse	[A]	35	50	63	80	100	125	160	160	200
		3NA3014	3NA3020	3NA3022	3NA3024	3NA3030	3NA3032	3NA3036	3NA3036	3NA3140
Input Cable Min.	[mm^2]	6.0	10.0	10.0	16.0	25.0	25.0	35.0	70.0	70.0
	[awg]	9	7	7	5	3	3	2	-2	-2
Input Cable Max.	[mm^2]	10.0	35.0	35.0	35.0	35.0	35.0	150.0	150.0	150.0
	[awg]	7	2	2	2	2	2	-5	-5	-5
Output Cable Min.	[mm^2]	6.0	10.0	10.0	16.0	25.0	25.0	35.0	70.0	95.0
	[awg]	9	7	7	5	3	3	2	-2	-3
Output Cable Max.	[mm^2]	10.0	35.0	35.0	35.0	35.0	35.0	150.0	150.0	150.0
	[awg]	7	2	2	2	2	2	-5	-5	-5
Weight	[kg]	5.5	16.0	16.0	16.0	20.0	20.0	56.0	56.0	56.0
	[lbs]	12.1	35.0	35.0	35.0	44.0	44.0	123.0	123.0	123.0
Dimensions	w [mm]	185.0	275.0	275.0	275.0	275.0	275.0	350.0	350.0	350.0
	h [mm]	245.0	520.0	520.0	520.0	650.0	650.0	850.0	850.0	850.0
	d [mm]	195.0	245.0	245.0	245.0	245.0	245.0	320.0	320.0	320.0
	w [inches]	7.28	10.83	10.83	10.83	10.83	10.83	13.78	13.78	13.78
	h [inches]	9.65	20.47	20.47	20.47	25.59	25.59	33.46	33.46	33.46
	d [inches]	7.68	9.65	9.65	9.65	9.65	9.65	12.6	12.6	12.6

Input voltage range **3 AC 500 V – 600 V, ± 10 % (Unfiltered), Part 1**

Order No. 6SE6440 -		2UE17-5CA0	2UE21-5CA0	2UE22-2CA0	2UE24-0CA0	2UE25-5CA0	2UE27-5CA0	2UE31-1CA0	2UE31-5DA0	2UE31-8DA0
Motor Output Rating	[kW] [hp]	0.75 1.0	1.5 2.0	2.2 3.0	4.0 5.0	5.5 7.5	7.5 10.0	11.0 15.0	15.0 20.0	18.5 25.0
Output Power	[kVA]	1.3	2.6	3.7	5.8	8.6	10.5	16.2	21.0	25.7
CT Output Cur. Max.	[A]	1.4	2.7	3.9	6.1	9.0	11.0	17.0	22.0	27.0
CT Input Current	[A]	2.0	3.2	4.4	6.9	9.4	12.3	18.1	24.2	29.5
VT Input Current	[A]	3.2	4.4	6.9	9.4	12.6	18.1	24.9	29.8	35.1
VT Output Cur. Max.	[A]	2.7	3.9	6.1	9.0	11.0	17.0	22.0	27.0	32.0
Recommended Fuse	[A]	10 3NA3803-6	10 3NA3803-6	10 3NA3803-6	10 3NA3803-6	16 3NA3805-6	25 3NA3810-6	32 3NA3812-6	35 3NA3814-6	50 3NA3820-6
Input Cable Min.	[mm^2] [awg]	1.0 17	1.0 17	1.0 17	1.0 17	1.5 15	2.5 13	4.0 11	6.0 9	6.0 9
Input Cable Max.	[mm^2] [awg]	10.0 7	10.0 7	10.0 7	10.0 7	10.0 7	10.0 7	10.0 7	35.0 2	35.0 2
Output Cable Min.	[mm^2] [awg]	1.0 17	1.0 17	1.0 17	1.0 17	1.0 17	2.5 13	4.0 11	4.0 11	6.0 9
Output Cable Max.	[mm^2] [awg]	10.0 7	10.0 7	10.0 7	10.0 7	10.0 7	10.0 7	10.0 7	35.0 2	35.0 2
Weight	[kg] [lbs]	5.5 12.1	5.5 12.1	5.5 12.1	5.5 12.1	5.5 12.1	5.5 12.1	5.5 12.1	16.0 35.0	16.0 35.0
Dimensions	w [mm] h [mm] d [mm]	185.0 245.0 195.0	185.0 245.0 195.0	185.0 245.0 195.0	185.0 245.0 195.0	185.0 245.0 195.0	185.0 245.0 195.0	185.0 245.0 195.0	275.0 520.0 245.0	275.0 520.0 245.0
	w [inches] h [inches] d [inches]	7.28 9.65 7.68	7.28 9.65 7.68	7.28 9.65 7.68	7.28 9.65 7.68	7.28 9.65 7.68	7.28 9.65 7.68	7.28 9.65 7.68	10.83 20.47 9.65	10.83 20.47 9.65

Input voltage range 3 AC 500 V – 600 V, ± 10 % (Unfiltered), Part 2

Order No. 6SE6440-		2UE32-2DA0	2UE33-0EA0	2UE33-7EA0	2UE34-5FA0	2UE35-5FA0	2UE37-5FA0
Motor Output Rating	[kW] [hp]	22.0 30.0	30.0 40.0	37.0 50.0	45.0 60.0	55.0 75.0	75.0 100.0
Output Power	[kVA]	30.5	39.1	49.5	59.1	73.4	94.3
CT Output Cur. Max.	[A]	32.0	41.0	52.0	62.0	77.0	99.0
CT Input Current	[A]	34.7	47.2	57.3	69.0	82.9	113.4
VT Input Current	[A]	47.5	57.9	69.4	83.6	113.4	137.6
VT Output Cur. Max.	[A]	41.0	52.0	62.0	77.0	99.0	125.0
Recommended Fuse	[A]	63	80	80	125	125	160
		3NA3822-6	3NA3824-6	3NA3824-6	3NA3132-6	3NA3132-6	3NA3136-6
Input Cable Min.	[mm^2] [awg]	10.0 7	16.0 5	25.0 3	25.0 3	50.0 0	70.0 -2
Input Cable Max.	[mm^2] [awg]	35.0 2	35.0 2	35.0 2	150.0 -5	150.0 -5	150.0 -5
Output Cable Min.	[mm^2] [awg]	10.0 7	16.0 5	16.0 5	25.0 3	35.0 2	50.0 0
Output Cable Max.	[mm^2] [awg]	35.0 2	35.0 2	35.0 2	150.0 -5	150.0 -5	150.0 -5
Weight	[kg] [lbs]	16.0 35.0	20.0 44.0	20.0 44.0	56.0 123.0	56.0 123.0	56.0 123.0
Dimensions	w [mm] h [mm] d [mm]	275.0 520.0 245.0	275.0 650.0 245.0	275.0 650.0 245.0	350.0 850.0 320.0	350.0 850.0 320.0	350.0 850.0 320.0
	w [inches] h [inches] d [inches]	10.83 20.47 9.65	10.83 25.59 9.65	10.83 25.59 9.65	13.78 33.46 12.6	13.78 33.46 12.6	13.78 33.46 12.6

8 Options

An overview of the options available for the MICROMASTER 420 is given in this section. For further information about options, please refer to the catalog or the documentation CD.

8.1 Device-independent options

- Basic Operator Panel (BOP)
- Advanced Operator Panel (AOP)
- PROFIBUS module
- PC to inverter connection kit
- PC to AOP connection kit
- BOP/AOP door mounting kit for single inverter control
- AOP door mounting kit for multiple inverter control
- “DriveMonitor” and "Starter" commissioning tool

8.2 Device-dependent options

- EMC filter, Class A
- EMC filter, Class B
- Additional EMC filter, Class B
- Low leakage Class B filter
- Line commutating choke
- Output choke
- Gland plate

9 Electro-magnetic compatibility (EMC)

This Chapter contains:

EMC information.

9.1 Electro-magnetic compatibility

(EMC) All manufacturers / assemblers of electrical apparatus which “performs a complete intrinsic function and is placed on the market as a single unit intended for the end user” must comply with the EMC directive 89/336/EEC.

There are three routes for the manufacturer/assembler to demonstrate compliance:

9.1.1 Self-certification

This is a manufacturer's declaration that the European standards applicable to the electrical environment for which the apparatus is intended have been met. Only standards that have been officially published in the Official Journal of the European Community can be cited in the manufacturer's declaration.

9.1.2 Technical construction file

A technical construction file can be prepared for the apparatus describing its EMC characteristics. This file must be approved by a ‘Competent Body’ appointed by the appropriate European government organization. This approach allows the use of standards that are still in preparation.

9.1.3 EC type examination certificate

This approach is only applicable to radio communication transmitting apparatus. All MICROMASTER units are certified for compliance with the EMC directive, when installed in accordance with the recommendations in Section 2.

9.1.4 EMC Directive Compliance with Imminent Harmonics Regulations

From 1st January 2001 all electrical apparatus covered by the EMC Directive will have to comply with EN 61000-3-2 "Limits for harmonic current emissions (equipment input ≤ 16 A per phase)".

All Siemens variable speed drives of the MICROMASTER, MIDIMASTER, MICROMASTER Eco and COMBIMASTER ranges, which are classified as "Professional Equipment" within the terms of the standard, fulfill the requirements of the standard.

Special considerations for 250 W to 550 W drives with 230 V 1ac mains supplies when used in non-industrial applications

Units in this voltage and power range will be supplied with the following warning:

"This equipment requires supply authority acceptance for connection to the public supply network". Please refer to EN 61000-3-12 sections 5.3 and 6.4 for further information. Units connected to Industrial Networks1 do not require connection approval (see EN 61800-3, section 6.1.2.2).

The harmonic current emissions from these products are described in the table below:

Table 9-1 Permissible harmonic current emissions

Rating	**Typical Harmonic Current (A)**					**Typical Harmonic Current (%)**					**Typical Voltage Distortion**		
											Distribution Transformer Rating		
											10 kVA	100 kVA	1 MVA
	3rd	5th	7th	9th	11th	3rd	5th	7th	9th	11th	THD (%)	THD (%)	THD (%)
250 W 1AC 230 V	2.15	1.44	0.72	0.26	0.19	83	56	28	10	7	0.77	0.077	0.008
370 W 1AC 230 V	2.96	2.02	1.05	0.38	0.24	83	56	28	10	7	1.1	0.11	0.011
550 W 1AC 230 V	4.04	2.70	1.36	0.48	0.36	83	56	28	10	7	1.5	0.15	0.015

The allowed harmonic currents for “professional equipment” with an input power > 1 kW are not yet defined. Therefore, any electrical apparatus containing the above drives which has an input power > 1 kW will not require connection approval.

Alternatively, the necessity to apply for connection approval can be avoided by fitting the input chokes recommended in the technical catalogues (except 550 W 230 V 1ac units).

1 Industrial Networks are defined as those which do not supply buildings used for domestic purposes.

9.1.5 Classification of EMC performance

Three General classes of EMC performance are available as detailed below:

9.1.6 Class 1: General Industrial

Compliance with the EMC Product Standard for Power Drive Systems EN 68100-3 for use in **Second Environment (Industrial)** and **Restricted Distribution**.

Table 9-2 Class 1 - General Industrial

EMC Phenomenon	Standard	Level
Emissions:		
Radiated Emissions	EN 55011	Level A1
Conducted Emissions	EN 68100-3	Limits under consideration
Immunity:		
Electrostatic Discharge	EN 61000-4-2	8 kV air discharge
Burst Interference	EN 61000-4-4	2 kV power cables, 1 kV control
Radio Frequency Electromagnetic Field	IEC 1000-4-3	26-1000 MHz, 10 V/m

Class 2: Filtered Industrial

This level of performance will allow the manufacturer/assembler to self-certify their apparatus for compliance with the EMC directive for the industrial environment as regards the EMC performance characteristics of the power drive system. Performance limits are as specified in the Generic Industrial Emissions and Immunity standards EN 50081-2 and EN 50082-2.

Table 9-3 Class 2 - Filtered Industrial

EMC Phenomenon	Standard	Level
Emissions:		
Radiated Emissions	EN 55011	Level A1
Conducted Emissions	EN 55011	Level A1
Immunity:		
Supply Voltage Distortion	IEC 1000-2-4 (1993)	
Voltage Fluctuations, Dips, Unbalance, Frequency Variations	IEC 1000-2-1	
Magnetic Fields	EN 61000-4-8	50 Hz, 30 A/m
Electrostatic Discharge	EN 61000-4-2	8 kV air discharge
Burst Interference	EN 61000-4-4	2 kV power cables, 2 kV control
Radio Frequency Electromagnetic Field, amplitude modulated	ENV 50 140	80-1000 MHz, 10 V/m, 80% AM, power and signal lines
Radio-frequency Electromagnetic Field, pulse modulated	ENV 50 204	900 MHz, 10 V/m 50% duty cycle, 200 Hz repetition rate

Class 3: Filtered - for residential, commercial and light industry

This level of performance will allow the manufacturer / assembler to self-certify compliance of their apparatus with the EMC directive for the residential, commercial and light industrial environment as regards the EMC performance characteristics of the power drive system. Performance limits are as specified in the generic emission and immunity standards EN 50081-1 and EN 50082-1.

Table 9-4 Class 3 - Filtered for Residential, Commercial and Light Industry

EMC Phenomenon	Standard	Level
Emissions:		
Radiated Emissions*	EN 55011	Level B
Conducted Emissions	EN 55011	Level B
Immunity:		
Supply Voltage Distortion	IEC 1000-2-4 (1993)	
Voltage Fluctuations, Dips, Unbalance, Frequency Variations	IEC 1000-2-1	
Magnetic Fields	EN 61000-4-8	50 Hz, 30 A/m
Electrostatic Discharge	EN 61000-4-2	8 kV air discharge
Burst Interference	EN 61000-4-4	2 kV power cables, 2 kV control
Radio Frequency Electromagnetic Field, amplitude modulated	ENV 50 140	80-1000 MHz, 10 V/m, 80% AM, power and signal lines
Radio-frequency Electromagnetic Field, pulse modulated	ENV 50 204	900 MHz, 10 V/m 50% duty cycle, 200 Hz repetition rate

* These limits are dependent on the inverter being correctly installed inside a metallic switchgear enclosure. The limits will not be met if the inverter is not enclosed.

Notes

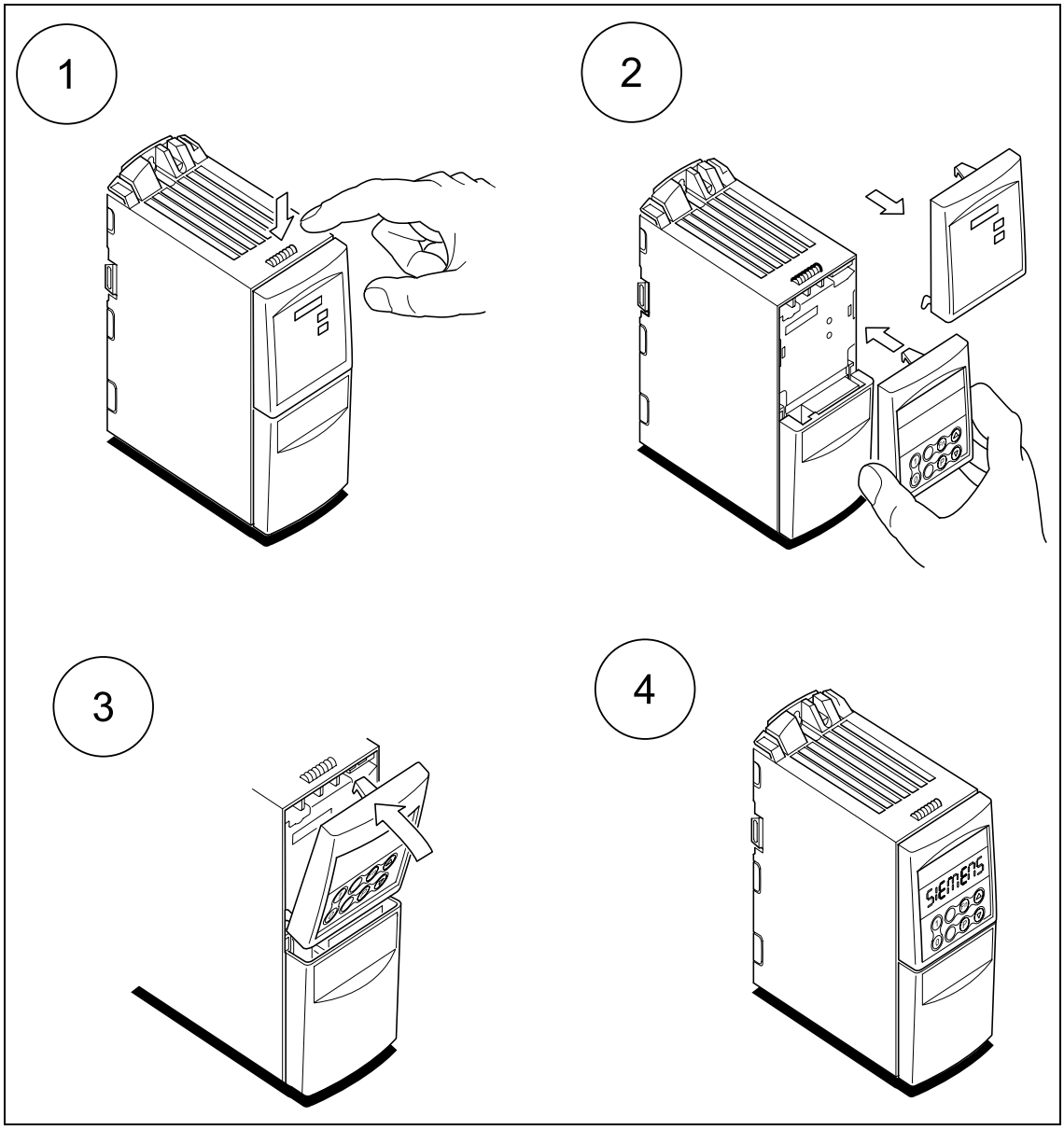
- To achieve these performance levels, you must not exceed the default Pulse frequency nor use cables longer than 25 m.
- The MICROMASTER inverters are intended **exclusively for professional applications**. Therefore, they do not fall within the scope of the harmonics emissions specification EN 61000-3-2.
- Maximum mains supply voltage when filters are fitted is 460 V.

Table 9-5 Compliance Table

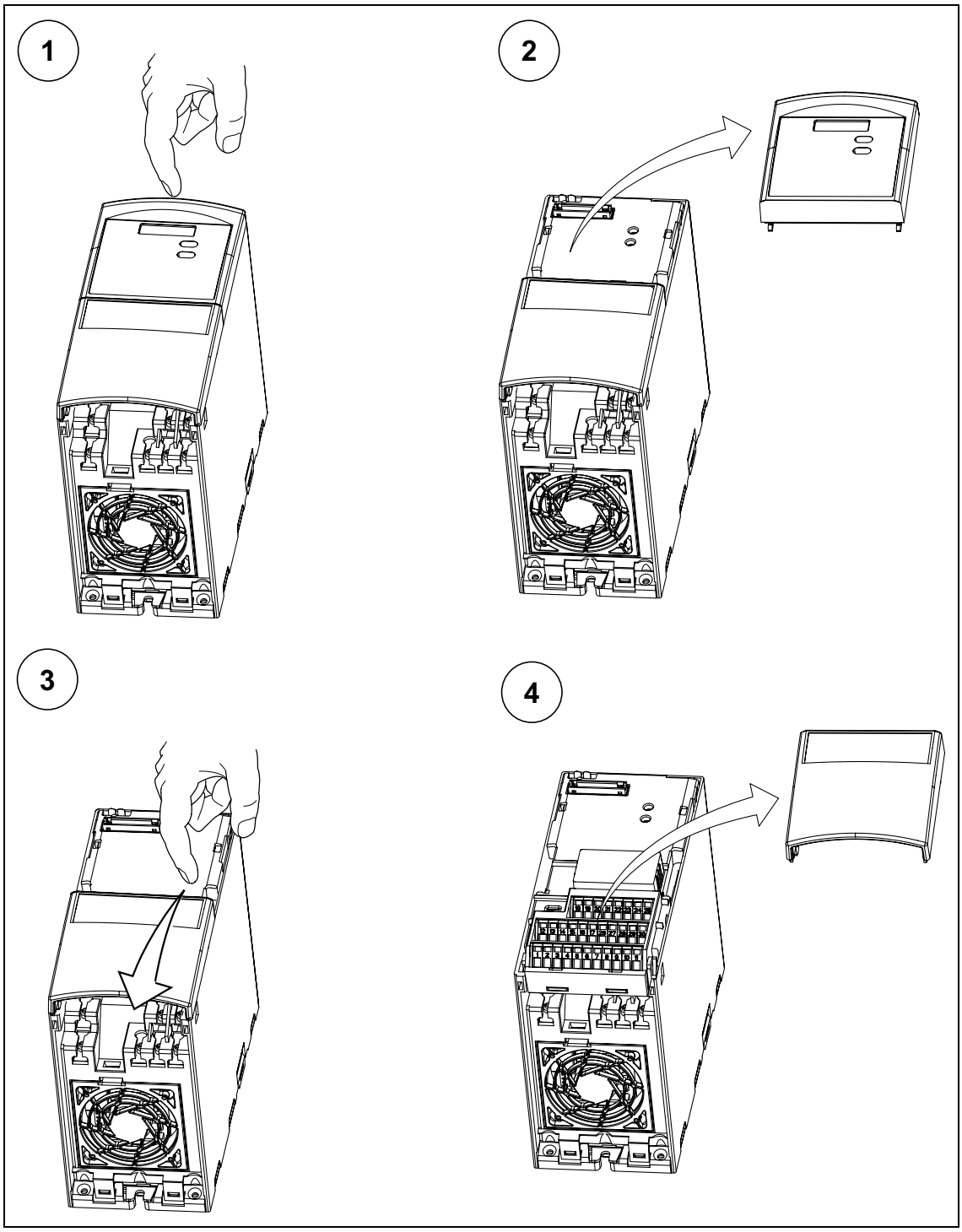
Model	Remarks
Class 1 – General Industrial	
6SE6440-2U***-**A0	Unfiltered units, all voltages and powers.
Class 2 – Filtered Industrial	
6SE6440-2A***-**A0	All units with integral Class A filters
6SE6440-2A***-**A0 with 6SE6440-2FA00-6AD0	Frame size A units 400-480 V with external Class A footprint filters
Class 3 – Filtered for residential, commercial and light industry	
6SE6440-2U***-**A0 with 6SE6400-2FB0*-***0	Unfiltered units fitted with external Class B footprint filters.
* denotes any value is allowed.	

Appendices

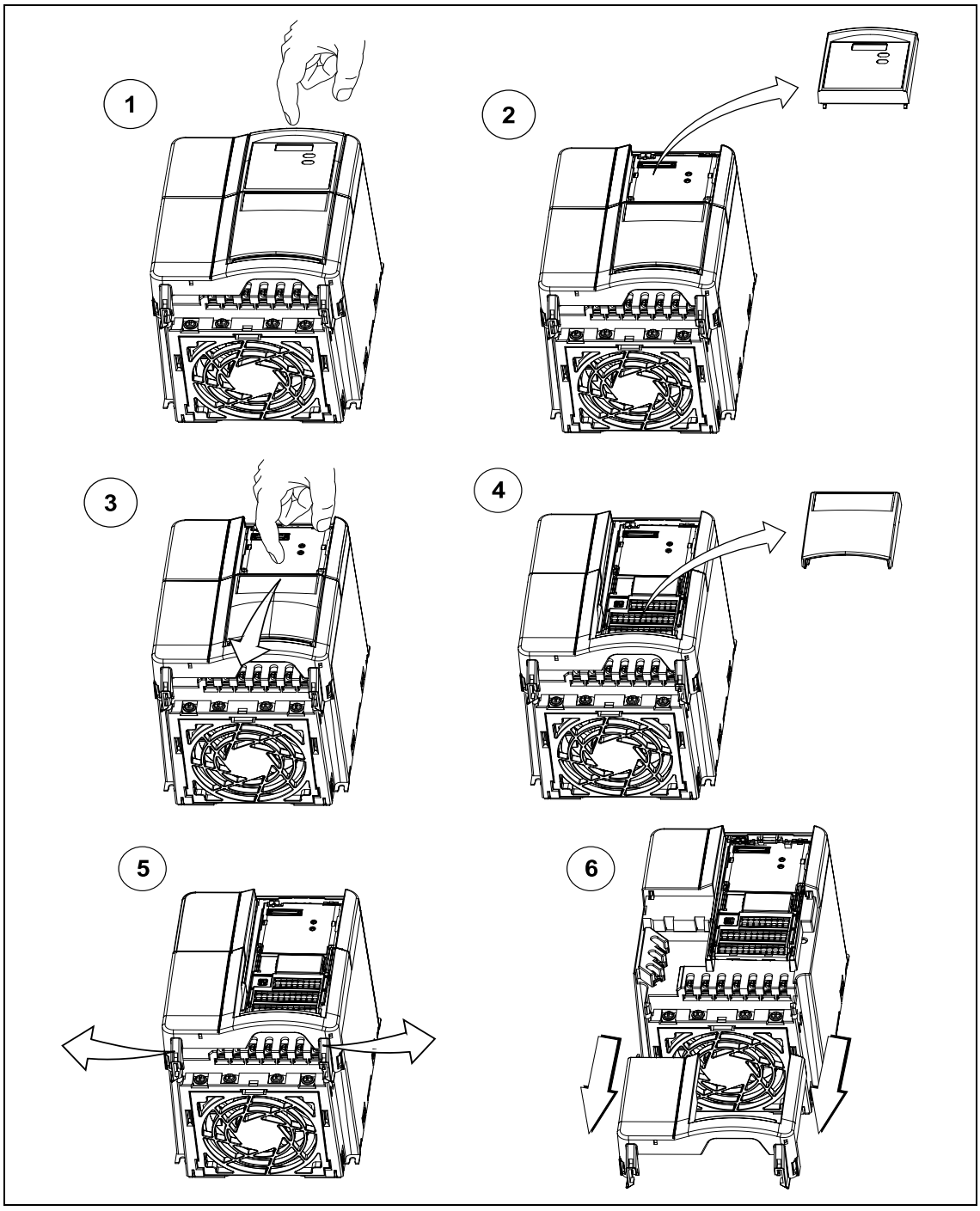
A Changing the Operator Panel



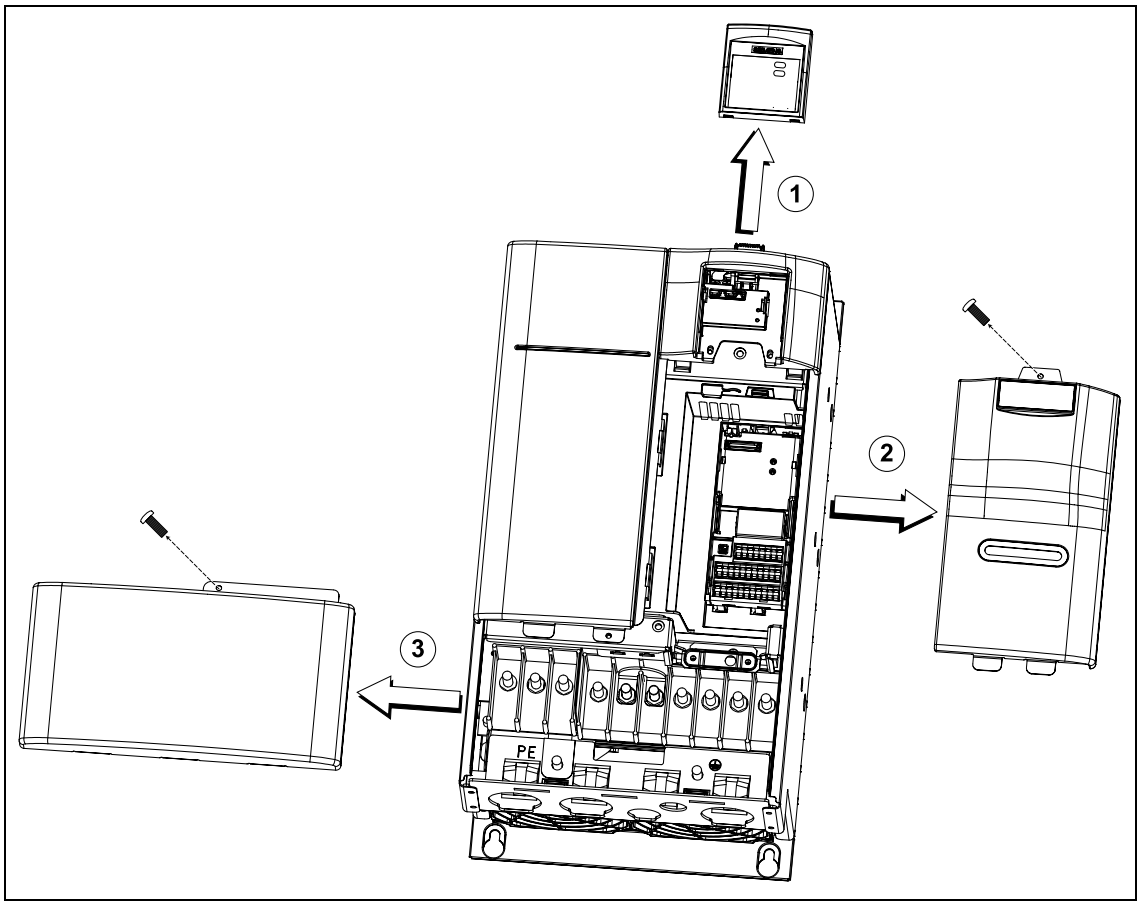
B Removing Covers Frame Size A



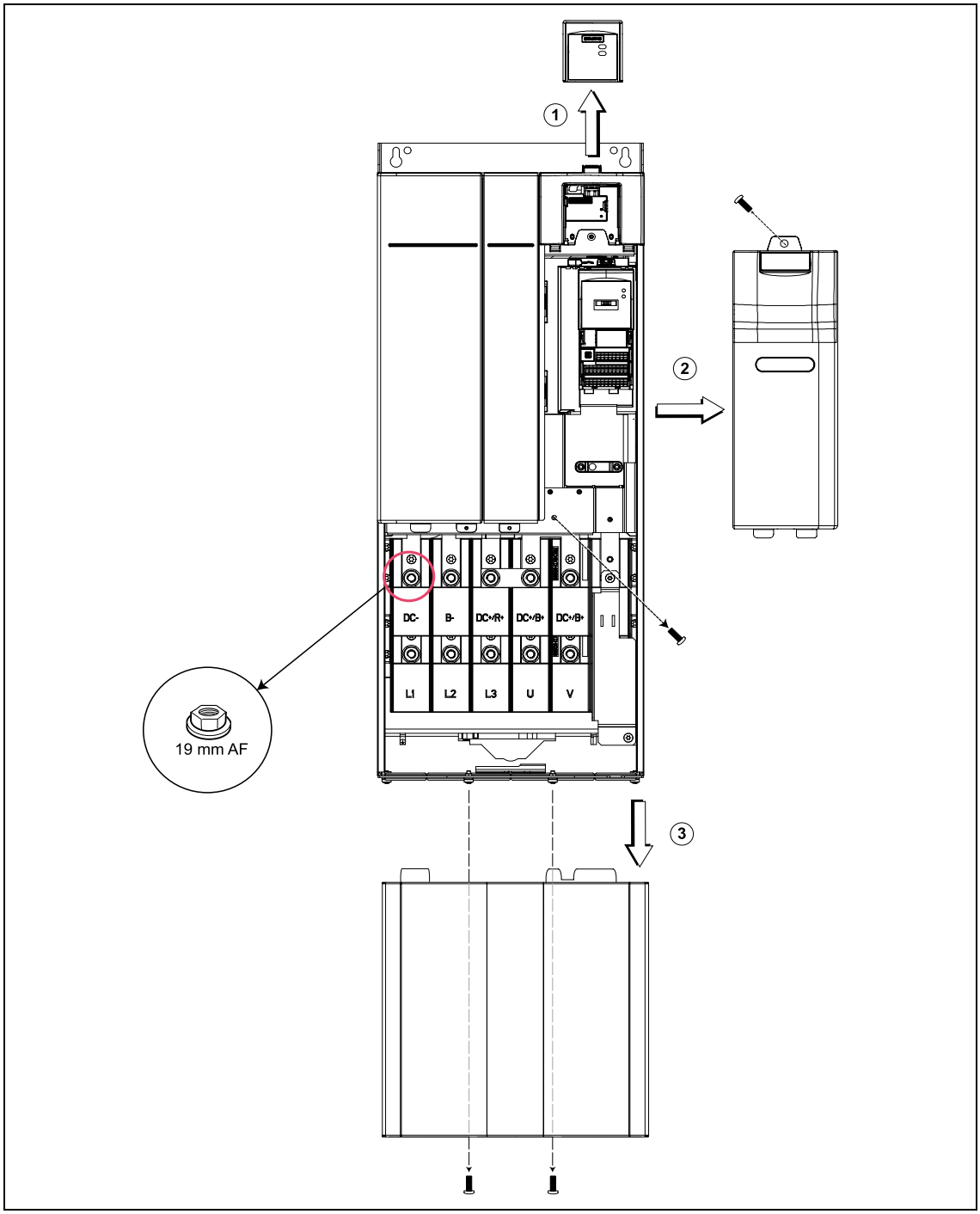
C Removing Covers Frame Sizes B and C



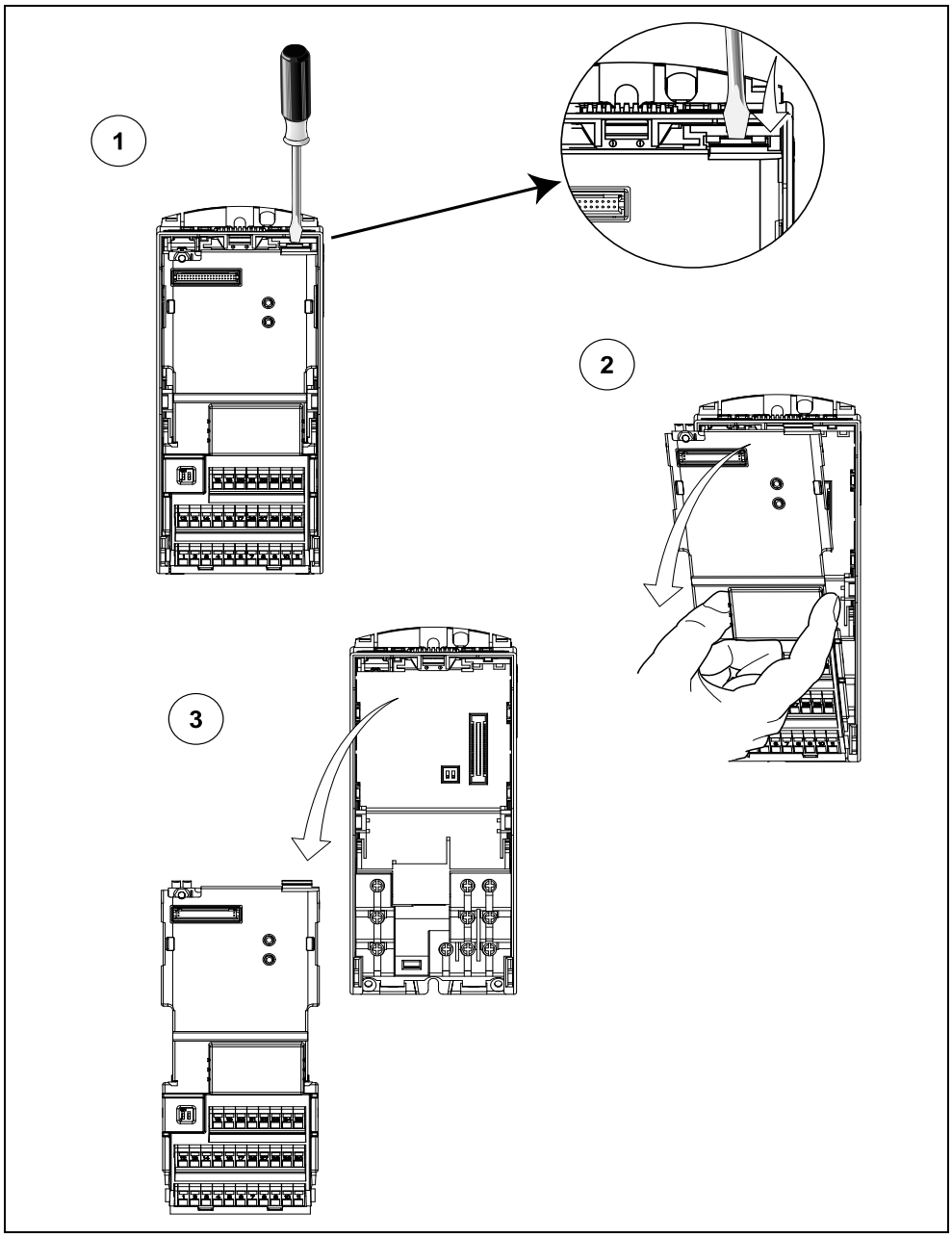
D Removing Covers Frame Sizes D and E



E Removing Covers Frame Size F



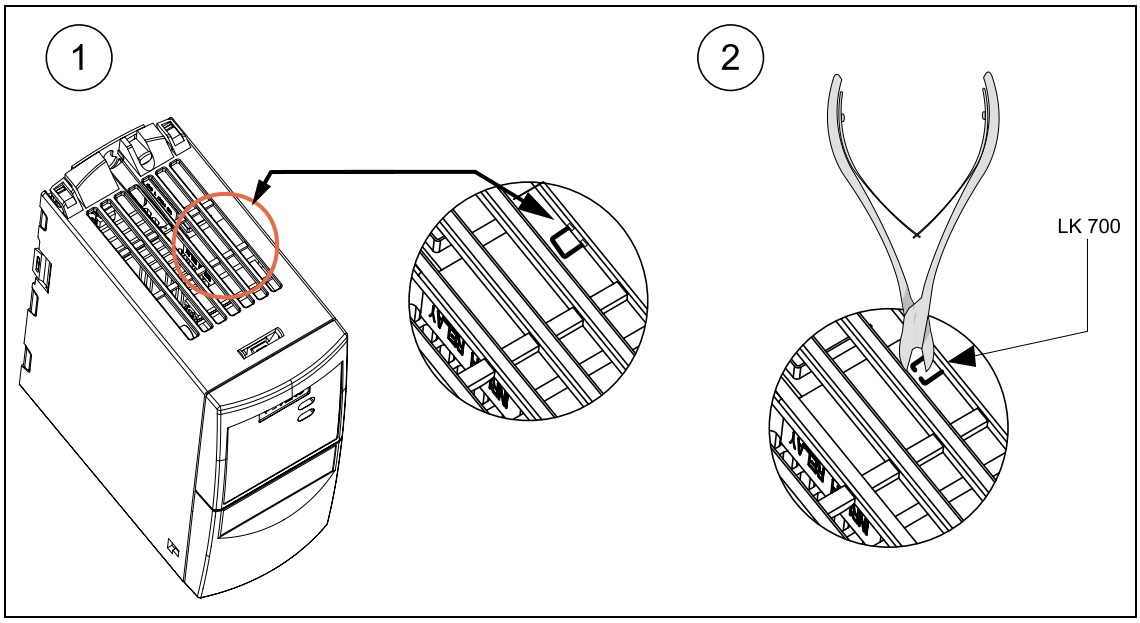
F Removing the I/O Board



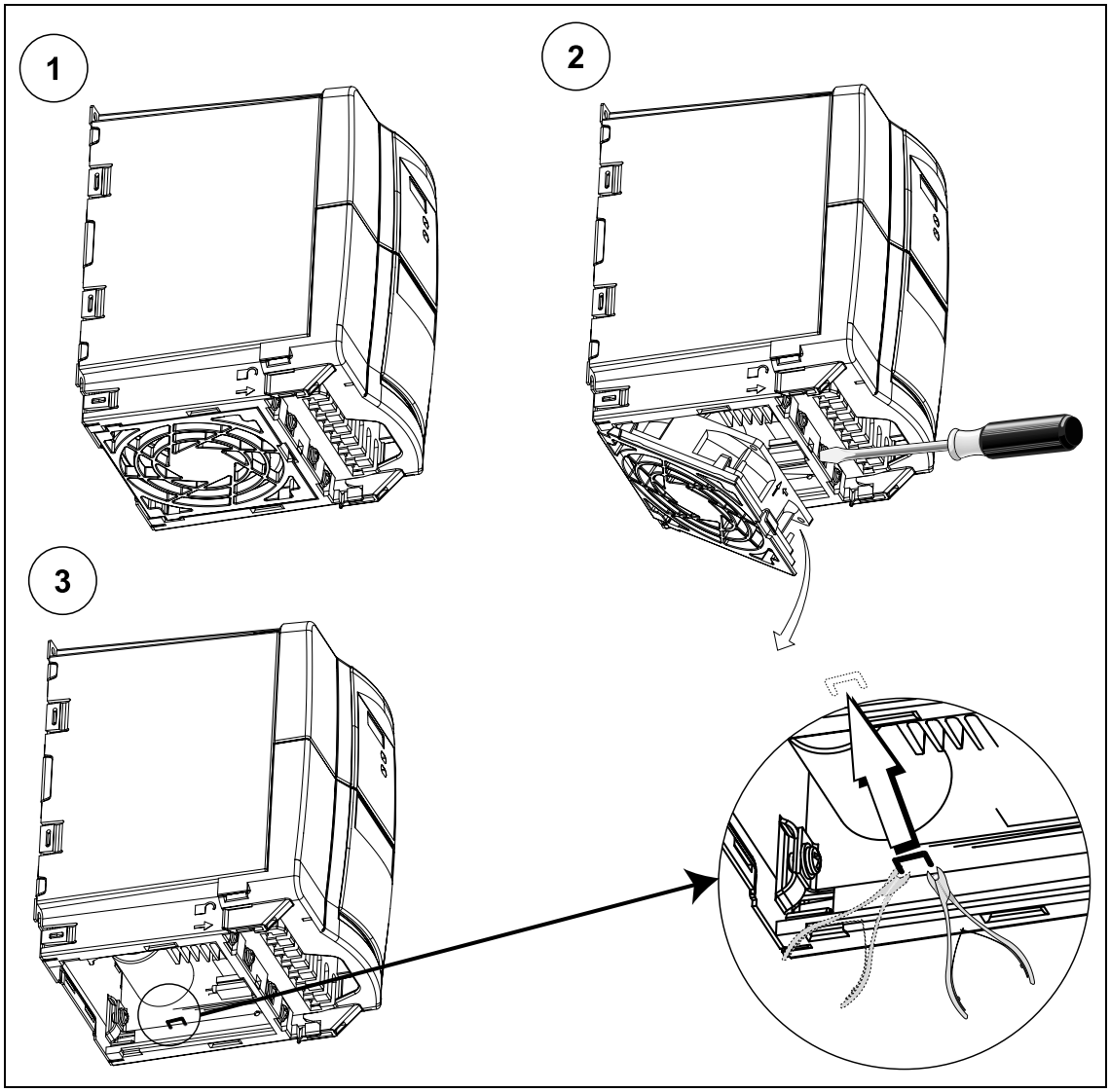
NOTICE

1. Only a small amount of pressure is required to release the I/O Board catch.
2. Currently, the I/O Board is removed using the same technique regardless of frame size.

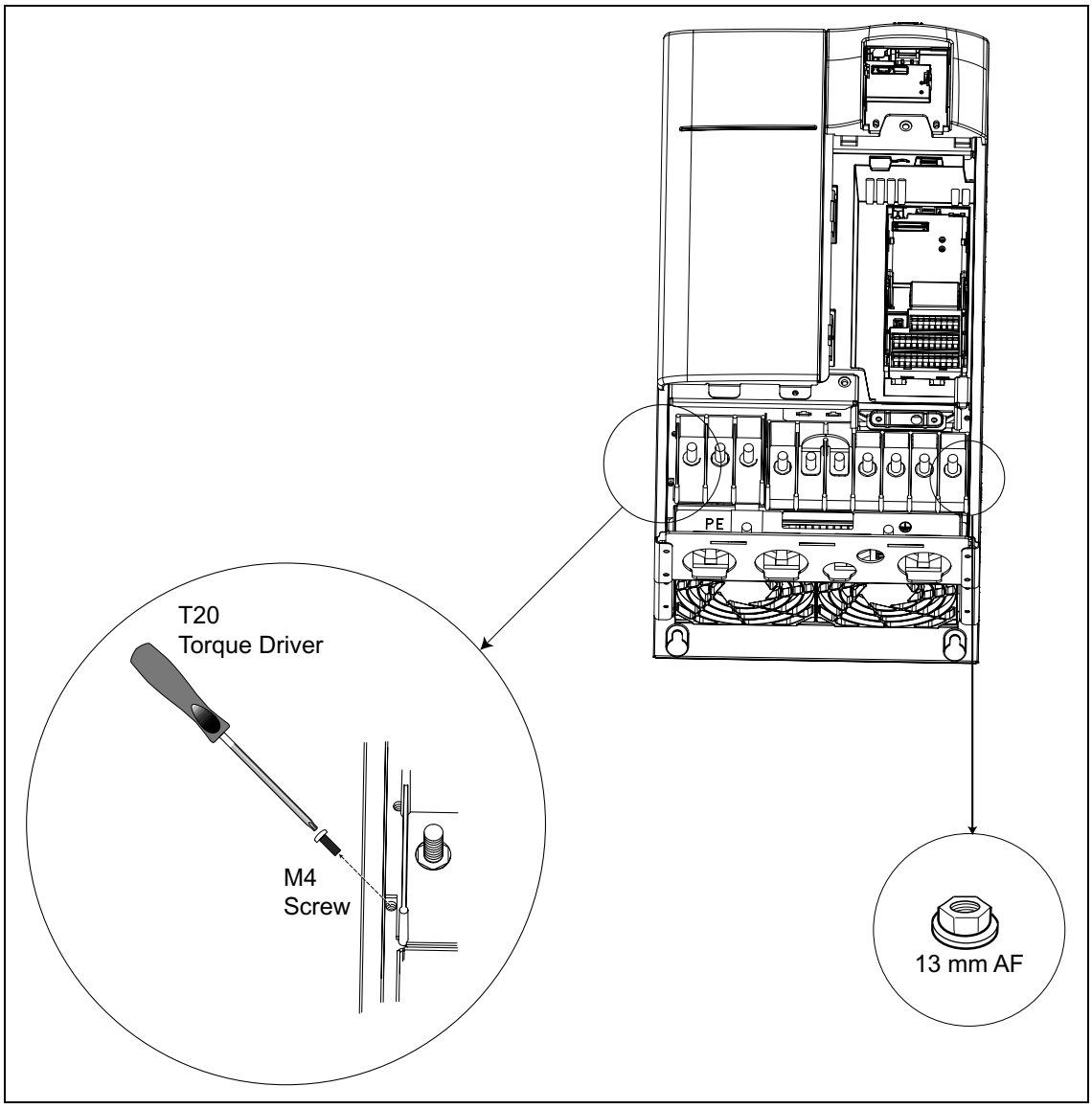
G Removing 'Y' Cap Frame Size A



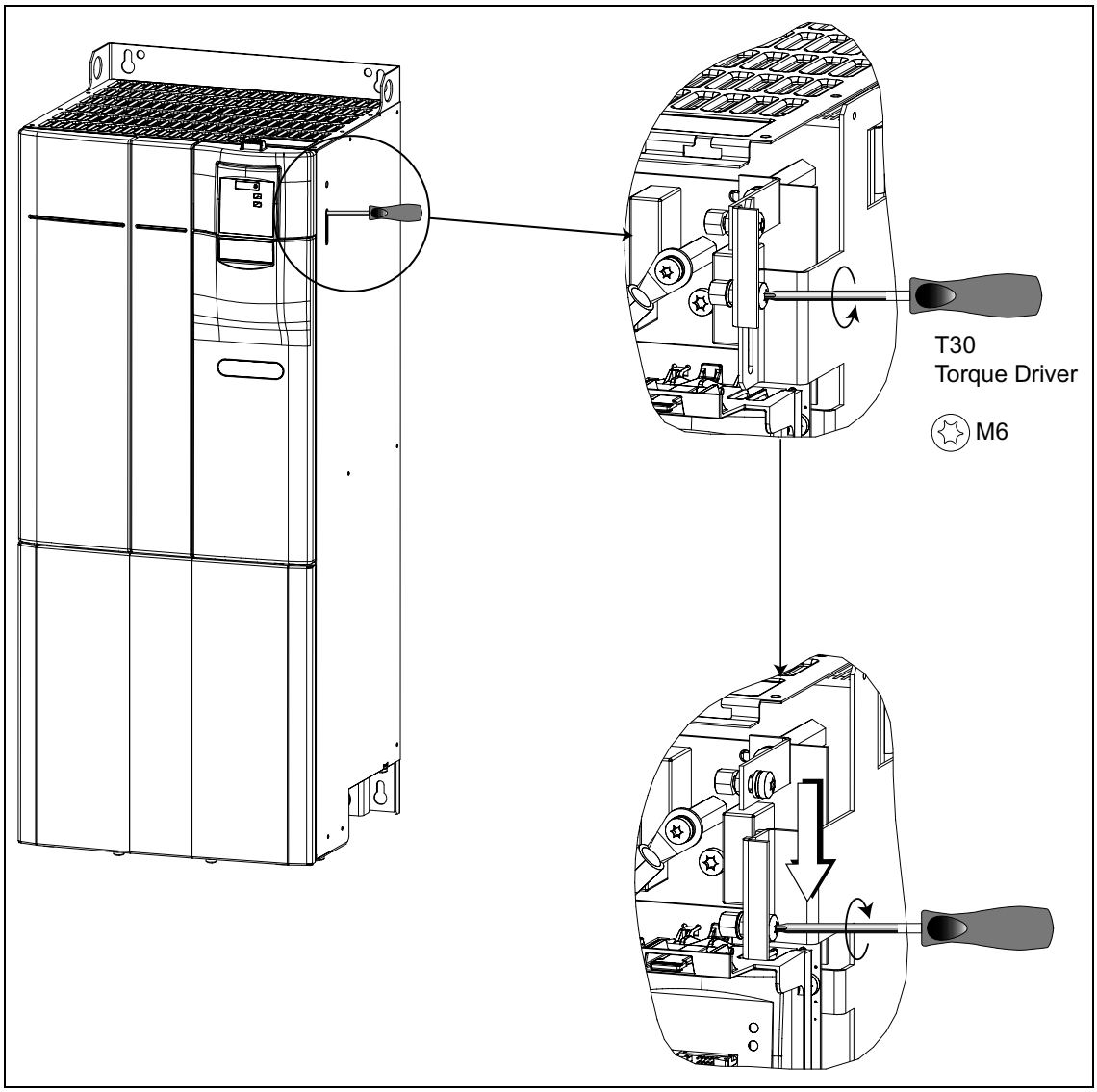
H Removing 'Y' Cap Frame Sizes B and C



I Removing 'Y' Cap Frame Sizes D and E



J Removing 'Y' Cap Frame Sizes F



K Applicable Standards

CE

European Low Voltage Directive

The MICROMASTER product range complies with the requirements of the Low Voltage Directive 73/23/EEC as amended by Directive 98/68/EEC. The units are certified for compliance with the following standards:

EN 60146-1-1	Semiconductor inverters - General requirements and line commutated inverters
EN 60204-1	Safety of machinery - Electrical equipment of machines

European Machinery Directive

The MICROMASTER inverter series does not fall under the scope of the Machinery Directive. However, the products have been fully evaluated for compliance with the essential Health & Safety requirements of the directive when used in a typical machine application. A Declaration of Incorporation is available on request.

European EMC Directive

When installed according to the recommendations described in this manual, the MICROMASTER fulfils all requirements of the EMC Directive as defined by the EMC Product Standard for Power Drive Systems EN61800-3.

c UL us LISTED

Underwriters Laboratories

UL and CUL LISTED POWER CONVERSION EQUIPMENT 5B33 for use in a pollution degree 2

ISO 9001

Siemens plc operates a quality management system, which complies with the requirements of ISO 9001.

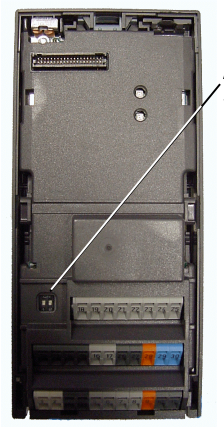
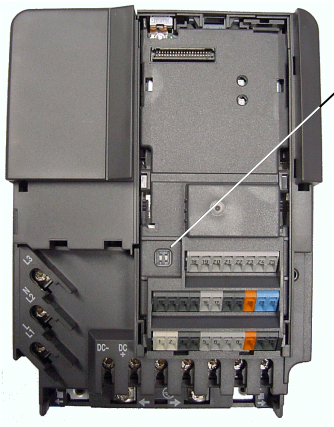
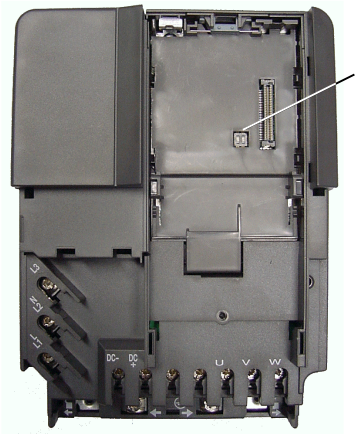
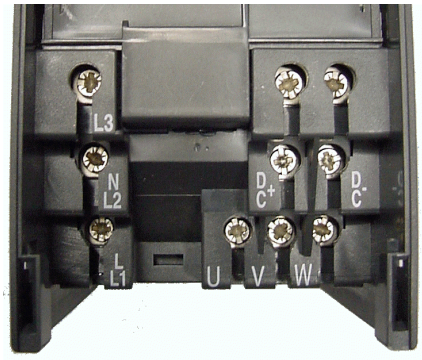
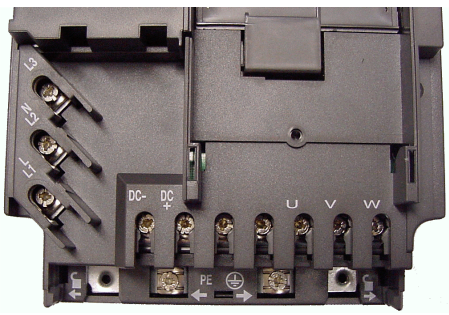
L List of Abbreviations

AC	Alternating Current
AIN	Analog Input
AOP	Advanced Operator Panel
BOP	Basic Operator Panel
CT	Constant Torque
DC	Direct Current
DIN	(Digital Input
DS	Drive State
EEC	European Economic Community
ELCB	Earth Leakage Circuit Breaker
EMC	Electro-Magnetic Compatibility
EMI	Electro-Magnetic Interference
FAQ	Frequently Asked Questions
FCC	Flux Current Control
FCL	Fast Current Limitation
I/O	Input and Output
IGBT	Insulated Gate Bipolar Transistor
LCD	Liquid Crystal Display
LED	Light Emitting Diode
PID	Proportional, Integral und Differential
PLC	Programmable Logic Controller
PTC	Positive Temperature Coefficient
QC	Quick Commissioning
RCCB	Residual Current Circuit Breaker
RCD	Residual Current Device
RPM	Revolutions Per Minute
SDP	Status Display Panel
VT	Variable Torque

Index

Suggestions and/or Corrections

To: Siemens AG Automation & Drives Group SD VM 4 P.O. Box 3269 D-91050 Erlangen Federal Republic of Germany Email: Technical.documentation@con.siemens.co.uk	**Suggestions** **Corrections** For Publication/Manual: MICROMASTER 440 User Documentation
From Name: Company/Service Department Address: _____ _____ Telephone: _____ / _____ Telefax: _____ / _____	Operating Instructions Order Number: 6SE6400-5AC00-0BP0 Date of Issue: 10/01 Should you come across any printing errors when reading this publication, please notify us on this sheet. Suggestions for improvement are also welcome.

View of Unit	**Frame Size A**	**Frame Size B & C**
SDP fitted		
I/O Board		
Control Board		
Power Terminal Connections		

Order Number

6SE6400-5AC00-0BP0

Drawing Number

G85139-K1790-U249-A1

Siemens AG
Bereich Automation and Drives (A&D)
Geschäftsgebiet Standard Drives (SD)
Postfach 3269, D-91050 Erlangen
Federal Republic of Germany

Siemens Aktiengesellschaft

Order No.: 6SE6400-5AC00-0BP0
Date: 04.2001