

SIEMENS

MICROMASTER 440

Operating instructions

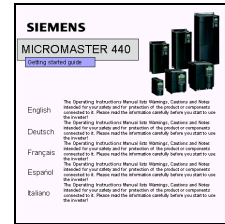
Issue A1



MICROMASTER 440 DOCUMENTATION

Getting Started Guide

Is for quick commissioning with SDP and BOP.



Operating Instructions

Gives information about features of the MM440, Installation, Commissioning, Control modes, System Parameter structure, Troubleshooting, Specifications and available options of the MM440.



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

Converter Type
MICROMASTER 440

Control Version
04.2001

Issue A1

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IMPORTANT NOTICE

Not all inverters currently have UL approval.

UL listing can be determined by examining the inverter's Rating Label.

For UL listed products the following UL mark is used:



Further information can be obtained from Internet website:

<http://www.siemens.de/micromaster>

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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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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.

MICROMASTER documentation is structured within three distinct levels:

- **Getting Started Guide**
The Getting Started Guide is designed to give the user quick access to all the basic information required to install and set up your MICROMASTER 440 for operation.
- **Operating Instructions**
The Operating Instructions provide detailed information for installation and operation of your MICROMASTER 440. The Operating Instructions also provide detailed descriptions of the parameters available for customizing the functions of the MICROMASTER 440.
- **Reference Manual**
The Reference Manual contains in-depth information on all technical issues relating to the MICROMASTER 440 Inverter.
- **Parameter List**
The Parameter List contains a complete detailed listing of all MICROMASTER 440 parameters.

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<http://www.siemens.de/micromaster>

Definitions and Warnings



Danger

For the purpose of this documentation and the product warning labels, "Danger" indicates that death, severe personal injury or substantial damage to property **will** result if proper precautions are not taken.



Warning

For the purpose of this documentation and the product warning labels, "Warning" indicates that death, severe personal injury or substantial damage to property **can** result if proper precautions are not taken.



Caution

For the purpose of this documentation and the product warning labels, "Caution" indicates that minor personal injury or material damage can result if proper precautions are not taken.

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.

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.

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



Warnings

- ◆ 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.

Notes

- ◆ 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 78).
-

Commissioning



Warnings

- ◆ 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 2-4 on page 30, to prevent inductive and capacitive interference from affecting the correct functioning of the inverter.

Operation



Warnings

- ◆ 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 (level 3) and P0335, I²t 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 77*).
 - ◆ This equipment must not be used as an 'emergency stop mechanism' (see *EN 60204, 9.2.5.4*)
-

Repair



Warnings

- ◆ 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

Notes

- ◆ 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.**
-

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1 Overview

This Chapter contains:

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

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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 to install, parameterize and commission
- 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 7th and 8th 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
- I²t 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

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Warnings

- ◆ 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 2-4 on page 30, 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. **It is important that the time of storage is calculated from the time of manufacture and not the time of delivery.** The requirements are listed below.

| Period of Storage | Required Action | Preparation Time |
|-------------------|---|------------------|
| 1 year or less | No reforming required | No preparation |
| 1 to 2 years | Apply power to the inverter for one hour before issuing the run command | 1 hour |
| 2 to 3 years | <ul style="list-style-type: none"> ➤ Use a variable AC supply ➤ Apply 25% of input voltage for 30 minutes ➤ Increase volts to 50% for a further 30 minutes ➤ Increase volts to 75% for a further 30 minutes ➤ Increase volts to 100% for a further 30 minutes Inverter ready for run signal | 2 hours |
| 3 years and over | <ul style="list-style-type: none"> ➤ Use a variable AC supply ➤ Apply 25% of input voltage for 2 hours ➤ Increase volts to 50% for a further 2 hours ➤ Increase volts to 75% for a further 2 hours ➤ Increase volts to 100% for a further 2 hours Inverter ready for run signal | 8 hours |

2.2 Ambient operating conditions

Temperature

| Frame Size | A | B | C | D | E | F |
|------------------------------|-----|-----|-----|-----|-----|-----|
| Min. [° C] | -10 | -10 | -10 | -10 | -10 | -10 |
| Max. [° C] | 50 | 50 | 50 | 50 | 50 | 50 |
| Max. (Variable Torque) [° C] | - | - | 40 | 40 | 40 | 40 |

Note

The variable torque rating is the capability of the inverter to increase the nominal power output for use with pump and fan applications. When variable torque is selected the inverter ceases to have an overload capacity.

Humidity Range

95% Non-condensing

Altitude

If the inverter is to be installed at an altitude > 1000m, derating will be required. (Refer to MM440 Reference Manual)

Shock

Do not drop the inverter or expose to sudden shock.

Vibration

Do not install the inverter in an area where it is likely to be exposed to constant vibration.

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 overheating



Warning

The inverters **MUST** not be mounted in an horizontal position.

Mount the inverter vertically to ensure optimum cooling, see Figure 2-1 on page 23. It is also possible to mount the inverters side-by-side.

Ensure that the inverter's air vents are not obstructed. Allow 100 mm clearance above and below the inverter.

2.3 Mechanical Installation



Warning

THIS EQUIPMENT MUST 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 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.

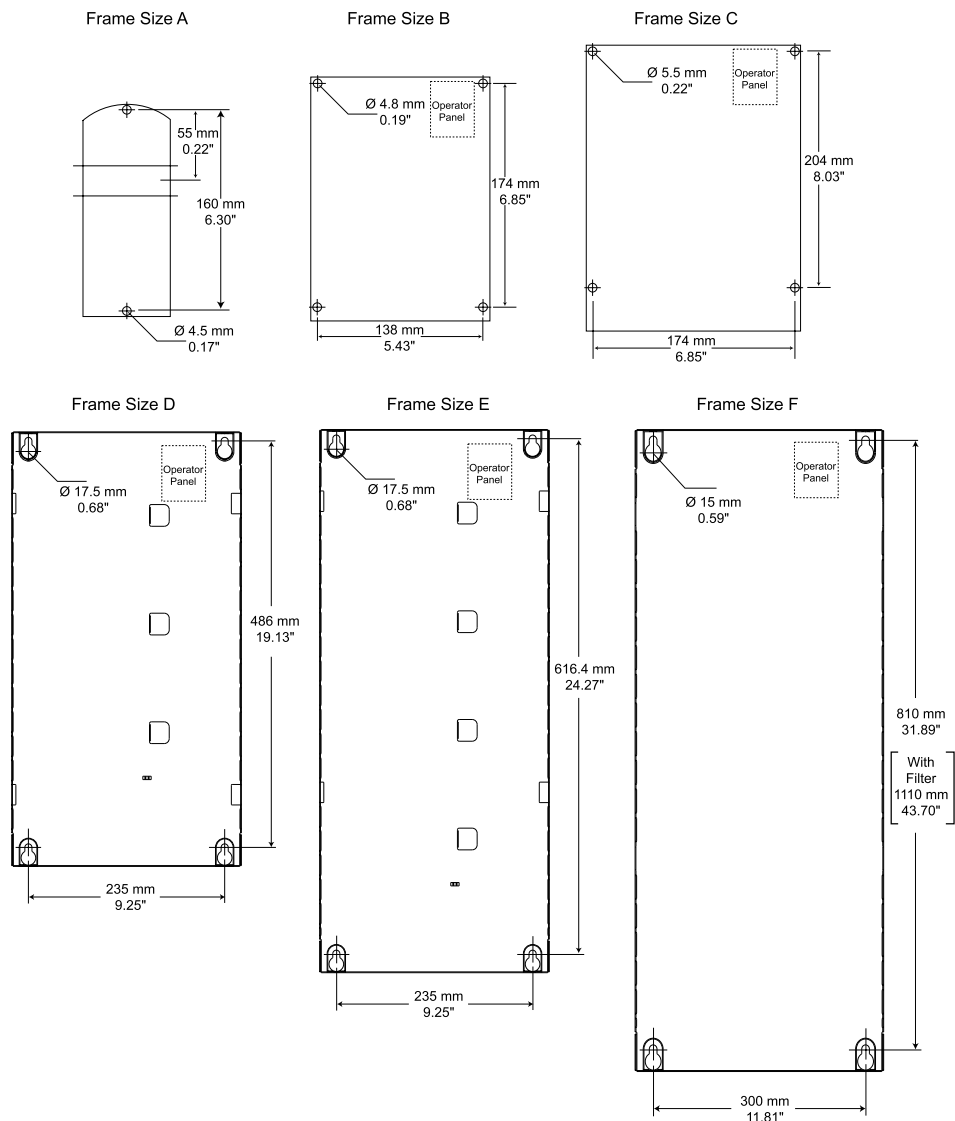


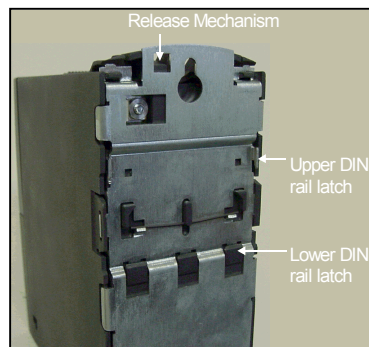
Figure 2-1 Drill pattern for MICROMASTER 440

Table 2-1 Dimensions and Torques of MM440 (all frame sizes)

| Frame-Size | Overall Dimensions | | | Fixing Method | Tightening Torque |
|------------|----------------------------------|--------|--------|---|-------------------------------|
| | Height | Width | Depth | | |
| A | 173 mm | 73 mm | 149 mm | 2 x M4 Bolts 2 x M4 Nuts 2 x M4 Washers Connecting to DIN rail | 2.5 Nm with washers fitted |
| B | 202 mm | 149 mm | 172 mm | 4 x M4 Bolts 4 x M4 Nuts 4 x M4 Washers | 2.5 Nm with washers fitted |
| C | 245 mm | 185 mm | 195 mm | 4 x M5 Bolts 4 x M5 Nuts 4 x M5 Washers | 2.5 Nm with washers fitted |
| D | 520 mm | 275 mm | 245 mm | 4 x M8 Bolts 4 x M8 Nuts 4 x M8 Washers | 3.0 Nm with washers fitted |
| E | 650 mm | 275 mm | 245 mm | 4 x M8 Bolts 4 x M8 Nuts 4 x M8 Washers | 3.0 Nm with washers fitted |
| F | 850 mm with filter 1150 mm | 350 mm | 300 mm | 4 x M8 Bolts 4 x M8 Nuts 4 x M8 Washers | 3.0 Nm with washers fitted |

2.3.1 DIN Rail Mounting Frame Size A

Fitting the Inverter to the DIN Rail



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



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

Removing the Inverter from the DIN Rail



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

2.4 Electrical Installation



Warning

THIS EQUIPMENT MUST 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.
 - ◆ 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 installed in a side-by-side configuration, but a distance of 100 mm (3.94 inches) must be maintained if the inverters are installed on top of each other.
-

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 G, H, I and 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



Caution

The control, power supply and motor leads **must** be laid separately. Do not feed them through the same cable conduit/trunking. Never use high voltage insulation test equipment on cables connected to the inverter.

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

- ◆ 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!

Note

- ◆ Ensure that the appropriate circuit-breakers/fuses with the specified current rating are connected between the power supply and inverter (*see Tables starting on page 77*).
- ◆ Use Class 1 60/75°C copper wire only (for UL compliance). For tightening torque see table *on page 79*.
- ◆ To tighten up the power terminal screws use a 4 - 5 mm cross-tip screwdriver.

Access to the power and motor terminals

The procedure for accessing the power and motor terminals on the MICROMASTER 440 Inverter is illustrated in Appendices. Please also refer to the photographs showing the Power Terminal connections and the Control Terminal connections on the inside of the back cover of this manual.

When the covers have been removed to reveal the terminals, connect the power and motor connections as shown on the next page.

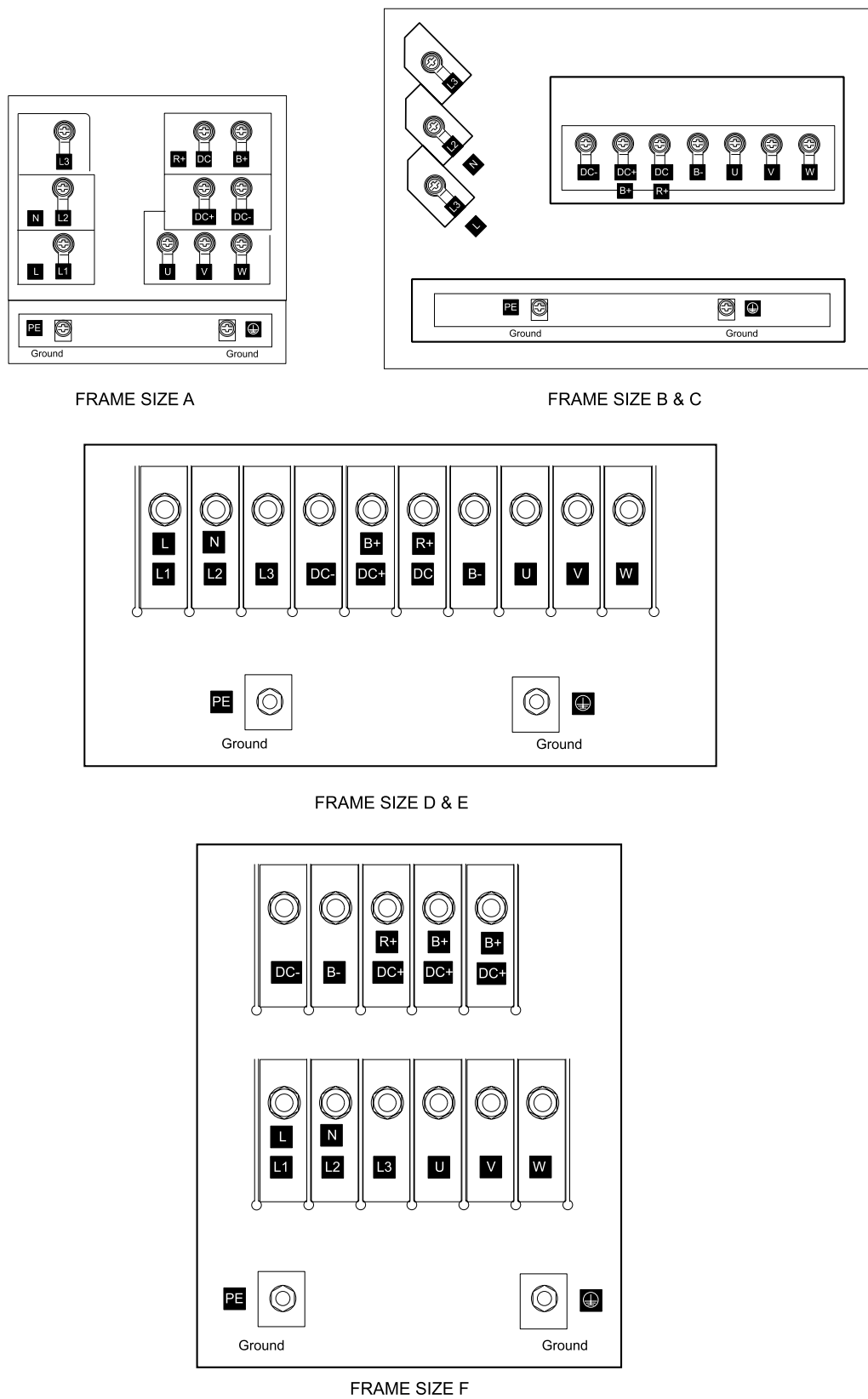


Figure 2-2 MICROMASTER 440 Connection Terminals

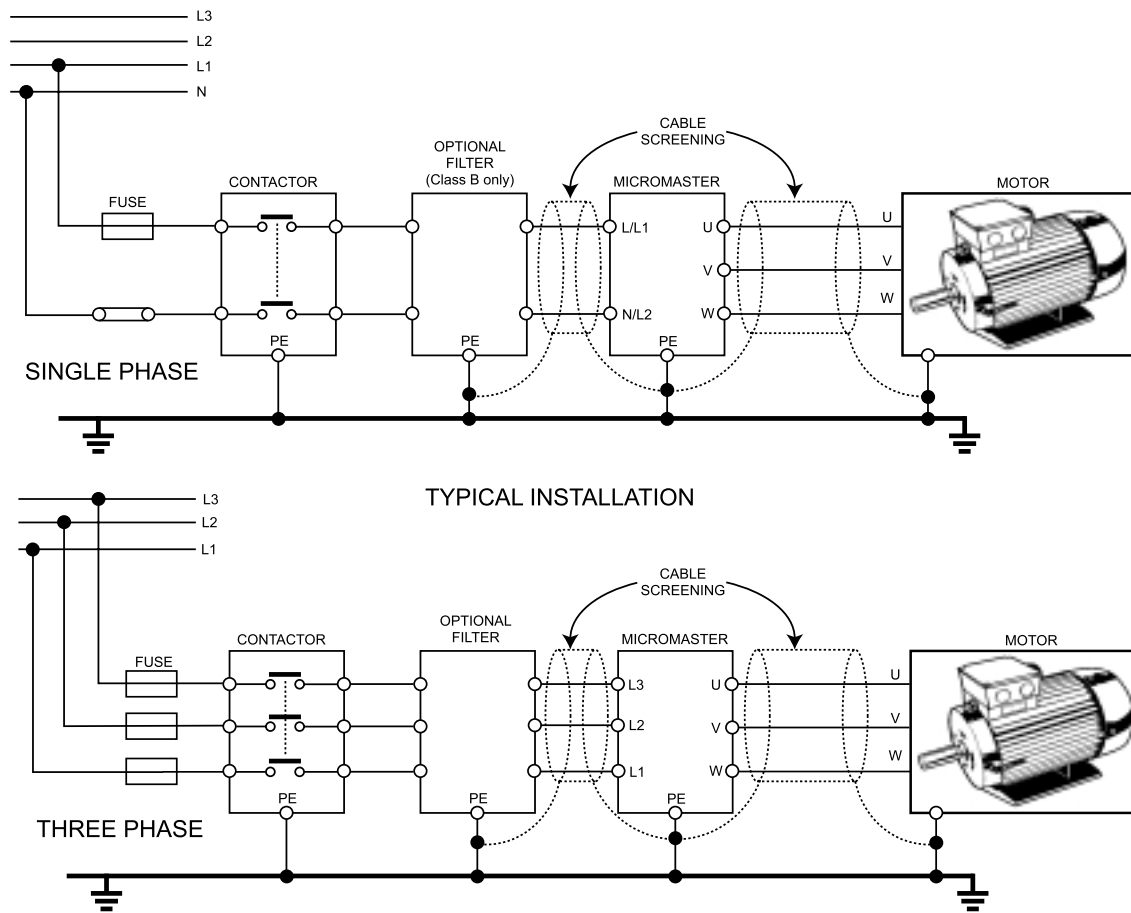


Figure 2-3 Motor and Power Connections

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 90° 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 2-4.

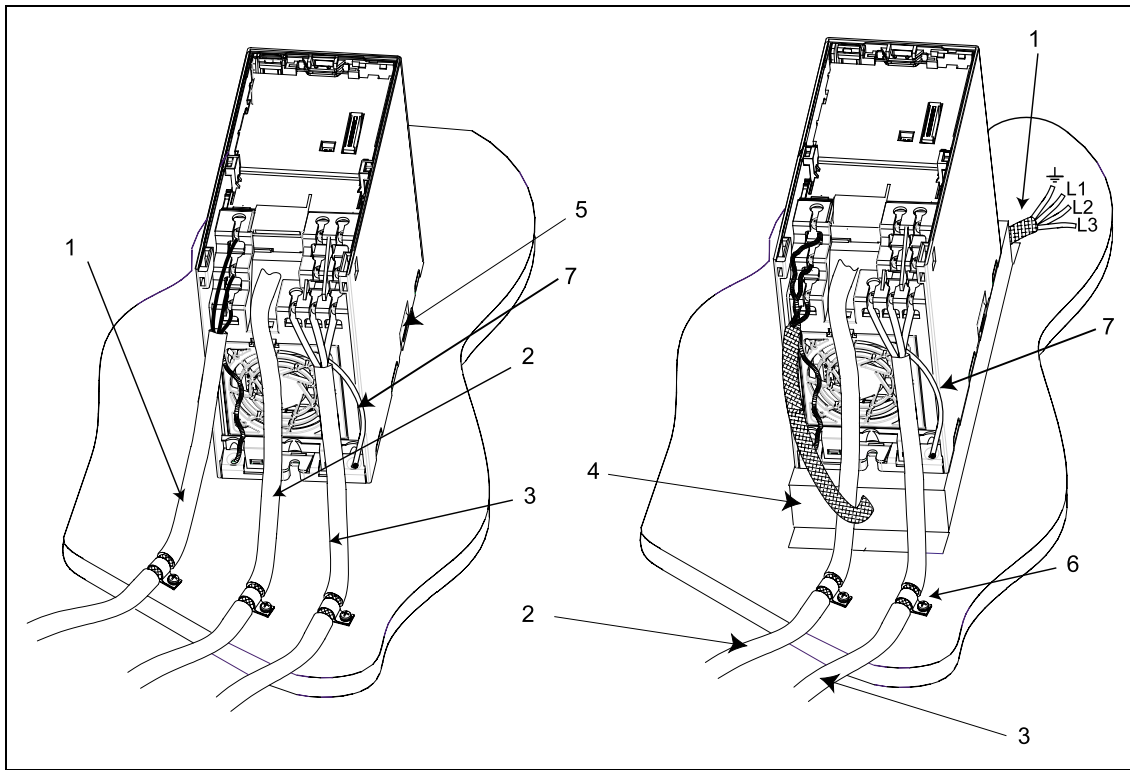


Figure 2-4 Wiring Guidelines to Minimize the Effects of EMI

Legend

- 1 Mains power input
- 2 Control cable
- 3 Motor cable to I/O board
- 4 Footprint filter
- 5 Metal back plate
- 6 Use suitable clips to fix motor and control cable screens securely to metal back plate
- 7 Screen cable

Note

To enhance the screening of the motor and control cables, the optional Gland Plate can be used (not shown in Figure 2-4).

3 Commissioning

This Chapter contains:

- Description of the front panel controls
- A brief description of the optional front panels available and an explanation of the operation of the Basic Operator Panel (BOP)
- An 8-step guide at the end of the Chapter, which provides a simple procedure for changing parameters

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| 3.3 | General operation | 43 |



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 (level 3) and P0335, I²t 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 77*).
 - ◆ 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

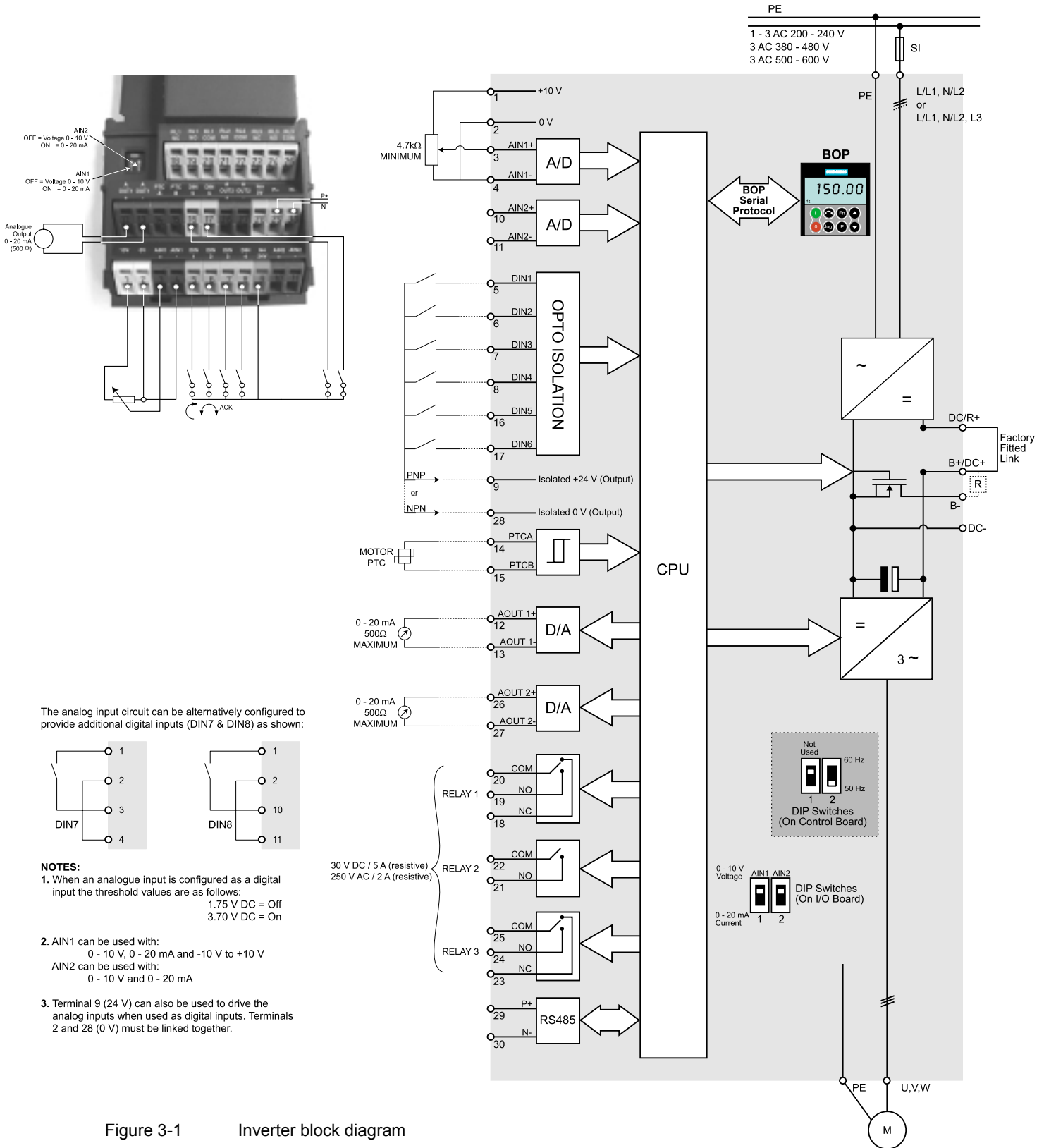


Figure 3-1 Inverter block diagram

3.2 Commission Modes

The MICROMASTER 440 is supplied with a Status Display Panel (SDP) as the standard operator panel. Default parameter settings cover the following requirements:

- The motor rating data; voltage, current and frequency data is keyed into the inverter to ensure that the motor is compatible with the inverter. (A standard Siemens motor is recommended).
- Linear V/f motor speed, controlled by an analogue potentiometer.
- Maximum speed 3000 min^{-1} with 50 Hz (3600 min^{-1} with 60 Hz); controllable using a potentiometer via the inverter's analogue inputs.
- Ramp-up time / Ramp-down time = 10 s.

If more complex application settings are required, please refer to Sections 3.2.4.1 "Quick commissioning (P0010=1)" and 5 "System Parameters" .

Note

Frequency setting; the DIP switch is located on the control board, underneath the I/O board as shown in Figure 3-2 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.

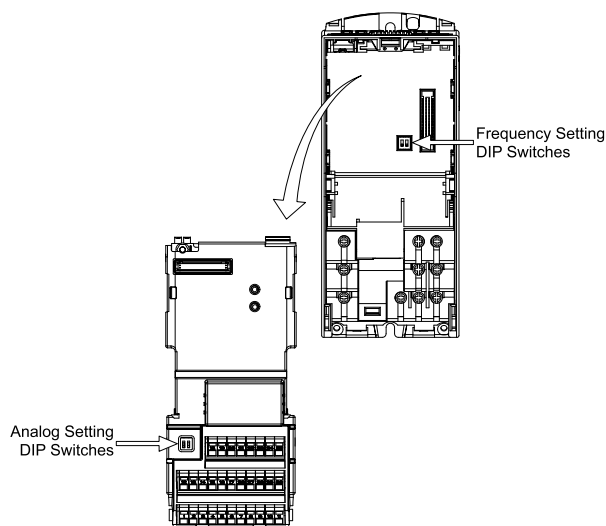


Figure 3-2 DIP locations on I/O board and the Control Board

3.2.1 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.

Front Panels for the MICROMASTER 440

To change the parameters of the inverter you will require one of the optional operator panels, either the "Basic Operator Panel" (BOP) or an "Advanced Operator Panel" (AOP). To assist in the quick and efficient changing of parameters, commissioning software tools such as DriveMonitor can be used; this software is supplied on the Documentation CD-ROM.



Figure 3-3 Panels available for the MICROMASTER 440 Inverter

The parameters can also be changed using one of the communication options. For further information, please refer to the Reference Manual.

For instructions on how to exchange/replace the Operator Panels, please refer to the appropriate Appendices in this manual.

Note

- ◆ The terminal layout for connecting power and control cables is shown in the photograph on the inside of the back cover of this manual.
-

3.2.2 Commissioning with the Status Display Panel (SDP)

The SDP is supplied with your MICROMASTER 440 Inverter as standard. This panel has two LEDs on the front, which indicate the operational status of the inverter.



With the SDP the inverter can be used with its default settings, for a number of applications. The default settings are shown in Table 3-1.

The terminal layout is shown in the photograph of the Control Terminal Connections on the inside of the back cover of this manual.

Warnings and faults states on the Status Display Panel

The two LEDs on the Status Display Panel indicate the operating status of your inverter. These LEDs also indicate various warnings or fault states. In section 6.1 the inverter states, indicated by the two LEDs are explained.

Table 3-1 Default settings for operation using the Status Display Panel

| | 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 |

3.2.3 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.

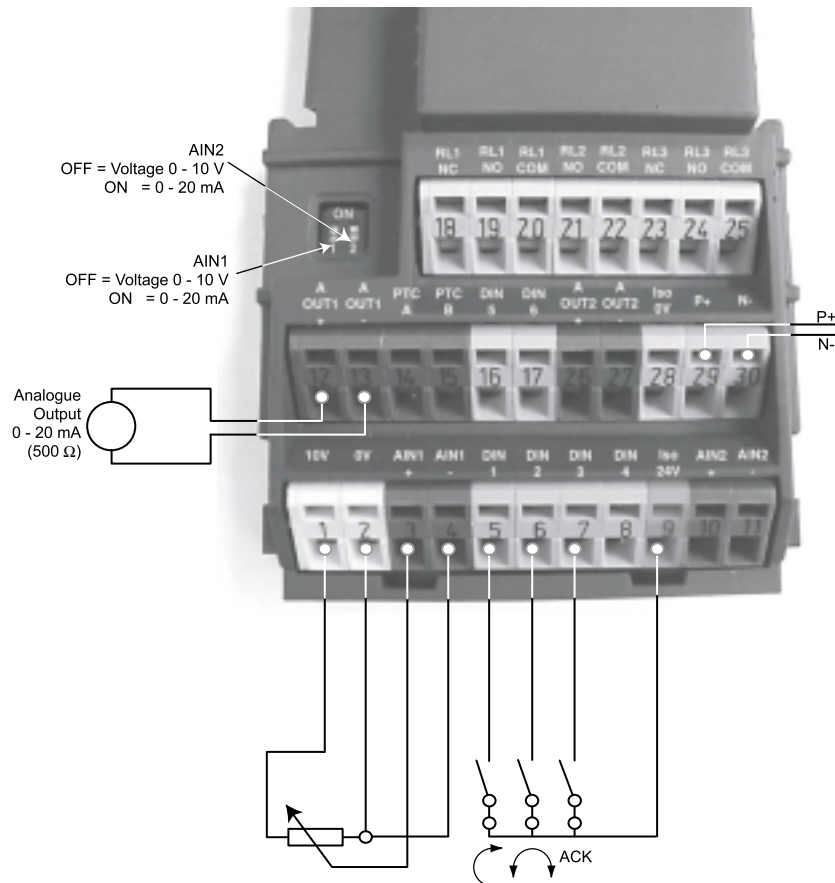
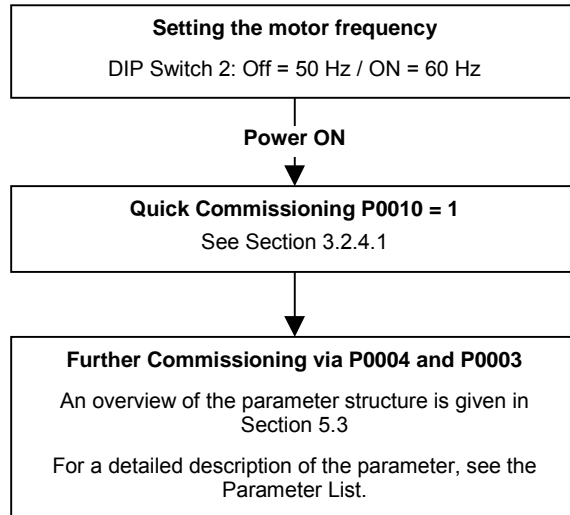


Figure 3-4 Basic operation with SDP

3.2.4 Commission Overview with BOP or AOP

Prerequisites:

Mechanical and electrical Installation are completed.



Note

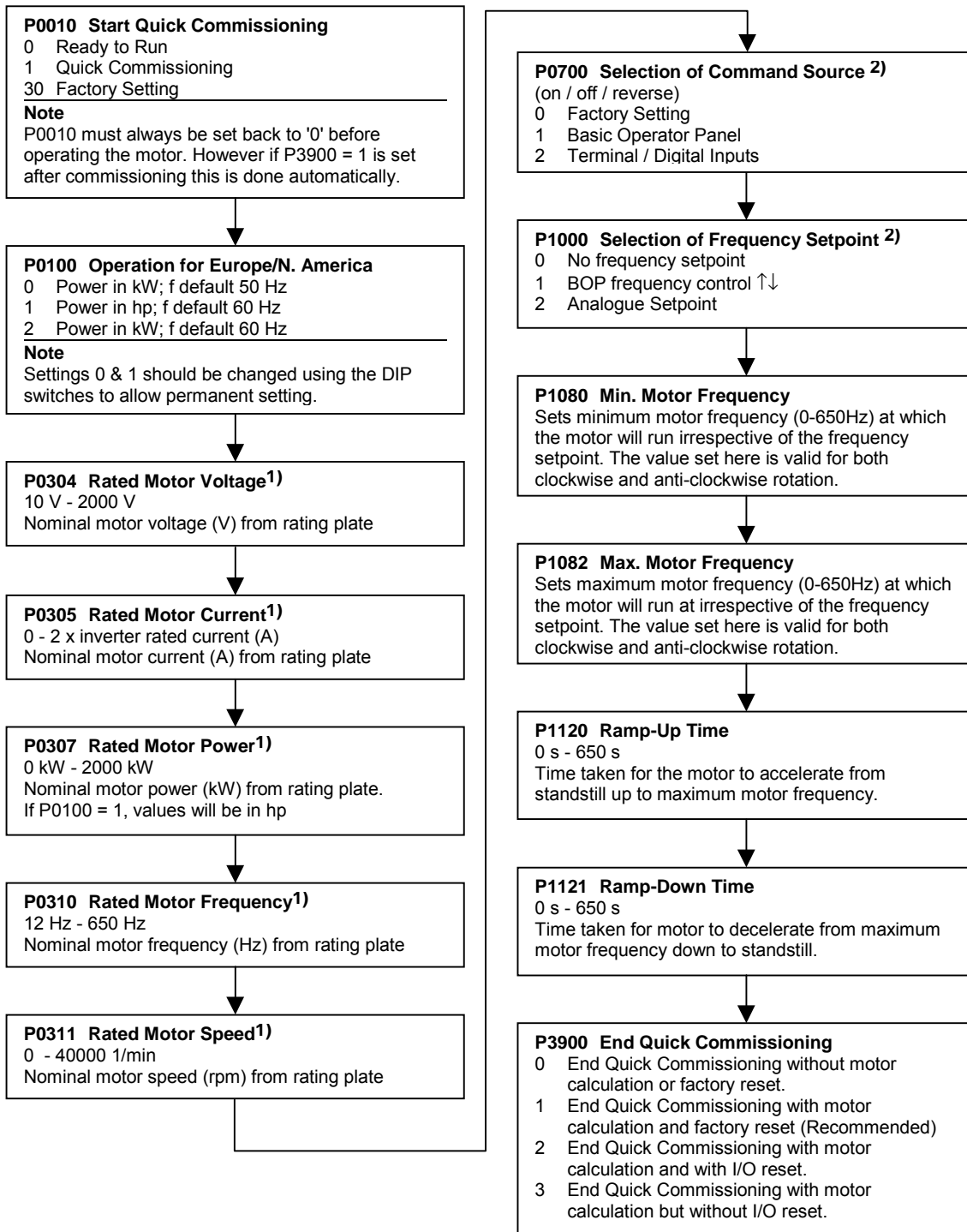
We recommend the commissioning according this scheme. Nevertheless an expert user is allowed to do the commissioning without the filter functions of P0004.

3.2.4.1 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 related parameters – please refer to motor rating plate drawing.

2) Denotes parameters that contain more detailed lists of possible settings for use in specific applications. Please refer to the Reference Manual and Operating Instructions on the CD

3.2.4.2 Commissioning with the Basic Operator Panel (BOP)



The Basic Operator Panel (BOP) provides access to the inverter parameters and enables the user to customize the settings of your MICROMASTER 440. The BOP can be used to configure several MICROMASTER 440 Inverters. This is accomplished by using the BOP to set the required parameters and once the process is complete, then the BOP can be replaced by the SDP.

The BOP contains an five-digit display that allows the user to read the input and output characteristics of any parameter. The BOP does not have the capability to store parameter information.

Table 3-1 shows the factory default settings for operation via the Basic Operator Panel.

Notes

- ◆ 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 3-1 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 Basic Operator Panel



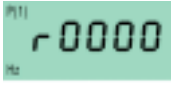



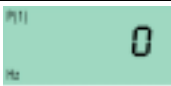




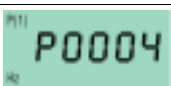
| Panel/Button | Function | Effects |
|---|-------------------|--|
|  | Indicates Status | The LCD displays the settings currently used by the converter. |
| | Start motor | Pressing the button starts the converter. This button is disabled by default. To enable this button set P0700 = 1. |
| | Stop motor | OFF1 Pressing the button causes the inverter 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 inverter stops when the button is released. Pressing this button when the inverter/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 Basic Operator Panel

Changing parameters with the BOP

The following descriptions show how to change the parameters; use this description as a guide for setting any parameters using the 'BOP'.

Changing P0004 – parameter filter function

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

Changing P1082 an indexed parameter – setting maximum motor frequency




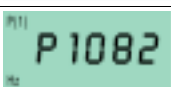

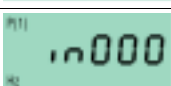

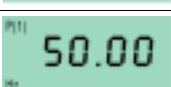


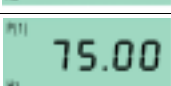



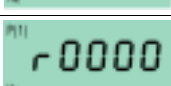

| Step | Result on display |
|--|---|
| 1 Press  to access parameters |  |
| 2 Press  until P1082 is displayed |  |
| 3 Press  to access the parameter value level |  |
| 4 Press  to display current set value |  |
| 5 Press  or  to the required value |  |
| 6 Press  to confirm and store the value |  |
| 7 Press  until r0000 is displayed |  |
| 8 Press  to return the display to the standard drive display (as defined by the customer) | |

Figure 3-6 Changing parameters via the BOP

Note - Busy Message

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

Note

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

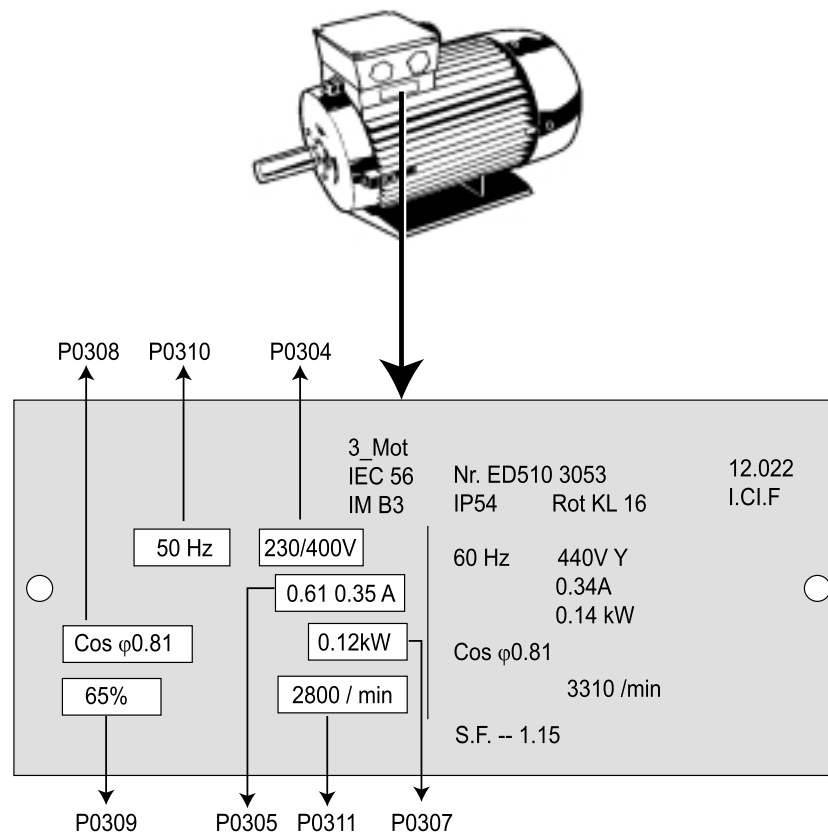
Motor data for parameterization

Figure 3-7 Typical Motor Rating Plate Example

Note

- P0308 & P0309 are only visible if P0003 \geq 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.

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 and P0601 enabled.

3.2.4.3 Commissioning with the Advanced Operator Panel (AOP)

The Advanced Operator Panel (AOP) is available as an option. Its advanced features include the following:

- Multilingual clear text display
- Upload/download of multiple parameter sets
- 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.

3.3 General operation

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

Notes

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.

4 Using the MICROMASTER 440

This Chapter contains:

- An explanation of the various methods of controlling the inverter
- An outline of some of the more commonly used parameters of the MICROMASTER 440 which will allow the user to configure the inverter for a number of applications.
- A brief summary of all the inverter's control modes and an introduction to the inverter's fault and warning reporting capability.
- More detailed information can be found in the Parameter List and the Reference manual associated with the MICROMASTER 440.

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Warnings

- ◆ 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 (level 3) and P0335, I²t 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 77*)
 - ◆ 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)

Notes

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 Terminal 5 (DIN 1, low)
 - ◆ OFF2 Off button on BOP/AOP, pressing the Off button once long (two seconds) or twice (with default settings not possible without BOP/AOP)
 - ◆ OFF3 no standard 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

Notes

- 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).

Note

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

Note

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
-

Note

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 Braking with external braking resistor

Braking with an external resistor is a method of braking that allows a smoothed, controlled reduction in motor speed in a linear manner. The technique is also known as Dynamic braking. 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 I_{max} 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).
- **Sensorless 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 fitted

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 68 for further information.

If the inverter is working correctly, the following LED sequence is visible:

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

BOP fitted

If a BOP is fitted, the fault states (P0947) and warnings (P2110) are displayed should a fault condition occur. For further details, please refer to the Parameter List.

AOP fitted

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

5 System Parameters

This Chapter contains:

- A functional overview of the parameters available for customizing your MICROMASTER MM440 Inverter
- A list of the parameters used

| | | |
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5.1 Introduction to MICROMASTER System Parameters

The parameters can only be changed by using the Basic Operator Panel (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.

- Read only parameters are indicated with r instead of P.
- 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 P----- 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, the Standard and Extended levels 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

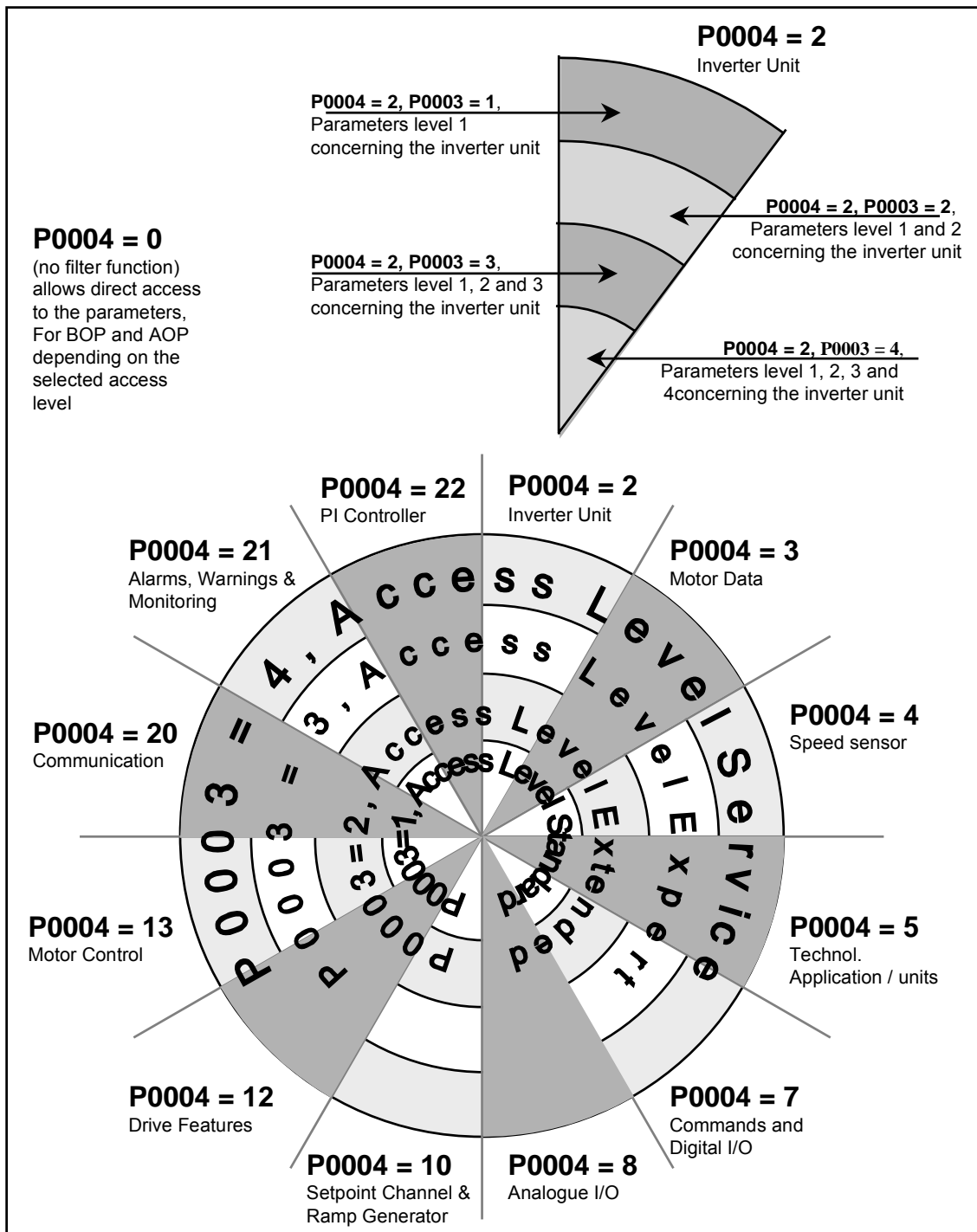


Figure 5-1 Parameter Overview

5.3 Parameter List (short form)

Three states are possible for all the parameters:

- Commissioning C
- Ready to run U
- Run T

This indicates when the parameter can be changed. One, two or all three states may be specified. If all three states are specified, this means that it is possible to change this parameter setting in all three inverter states.

Always

| Par. No. | Parametername | Default | Acc | WS | 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 | WS | 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 | WS | QC |
|----------|---------------|---------|-------|----|----|
| P0970 | Factory reset | 0 | 1 | C | N |

Inverter Unit (P0004 = 2)

| Par. No. | Parametername | Default | Acc | WS | 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 | - | - |
| 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 |

| Par. No. | Parametername | Default | Acc | WS | QC |
|----------|-------------------------------|---------|-----|-----|----|
| 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 | Acc | WS | 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 | Acc | WS | 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 |
| 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 |

| Par. No. | Parametername | Default | Acc | WS | QC |
|----------|----------------------------------|---------|-----|-----|----|
| 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 | Acc | WS | 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 | Acc | WS | 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 | Acc | WS | 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 | Acc | WS | 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 | Acc | WS | 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 | Acc | WS | 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 lsd | - | 3 | - | - |
| r0076 | CO: Act. current lsd | - | 3 | - | - |
| r0077 | CO: Current setpoint lsq | - | 3 | - | - |
| r0078 | CO: Act. current lsq | - | 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] | lmax controller prop. gain | 0.000 | 3 | CUT | N |
| P1341[3] | lmax controller integral time | 0.300 | 3 | CUT | N |
| r1343 | CO: lmax controller freq. output | - | 3 | - | - |
| r1344 | CO: lmax controller volt. output | - | 3 | - | - |
| P1345[3] | lmax controller prop. gain | 0.250 | 3 | CUT | N |
| P1346[3] | lmax 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 | Acc | WS | 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 | Acc | WS | 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 | Acc | WS | 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 | Acc | WS | 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 | Acc | WS | QC |
|----------|---------------------------------|---------|-----|-----|----|
| P2200[3] | Bl: 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] | Cl: PID setpoint | 0:0 | 2 | CUT | N |
| P2254[3] | Cl: 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 | Acc | WS | 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 transducer 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 inverter states indicated by the LEDs on the Status Display Panel supplied as standard with your inverter
- Some general information on a variety of troubleshooting measures.
- A list of the fault codes that may appear on the display of the BOP. The cause and recommended corrective action are indicated for each fault code listed.

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Warnings

- ◆ 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 Status Display Panel

Table 6-1 explains the meaning of the various states of the LEDs on the Status Display Panel (SDP).

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

| LEDs | | Priority Display | Inverter Status Definitions |
|--------------------------------------|---------------|------------------|---|
| Green | Yellow | | |
| OFF | OFF | 1 | Mains not present |
| OFF | ON | 8 | Inverter fault – other than those listed below |
| ON | OFF | 13 | Inverter running |
| ON | ON | 14 | Ready to run – standby |
| OFF | Flashing – R1 | 4 | Fault – Overcurrent |
| Flashing – R1 | OFF | 5 | Fault – Overvoltage |
| Flashing – R1 | ON | 7 | Fault – Motor Overtemperature |
| ON | Flashing – R1 | 8 | Fault – Inverter Overtemperature |
| Flashing – R1 | Flashing – R1 | 9 | Warning Current Limit (both LEDs flashing at the same time) |
| Flashing – R1 | Flashing – R1 | 11 | Other warning (both LEDs alternate flashing) |
| Flashing – R1 | Flashing – R2 | 6/10 | Undervoltage trip/Undervoltage warning |
| Flashing – R2 | Flashing – R1 | 12 | Inverter is not in ready state – display >0 |
| Flashing – R2 | Flashing – R2 | 2 | ROM failure (both LEDs flashing at the same time) |
| Flashing – R2 | Flashing – R2 | 3 | RAM failure (both LEDs alternate flashing) |
| R1 – On time 900 milliseconds | | | R2 – On time 300 milliseconds |

6.2 Troubleshooting with the Basic Operator Panel

If the display shows a fault or warning code, please refer to Reference Manual.

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.

Note

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

6.3 Fault messages

| Fault | Possible Causes | Diagnose & Remedy | Reaction |
|---|---|--|----------|
| F0001 OverCurrent | <ul style="list-style-type: none"> ➤ Motor power (P0307) does not correspond to the inverter power (P0206) ➤ Motor lead short circuit ➤ Earth faults | Check the following: <ol style="list-style-type: none"> 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 | <ul style="list-style-type: none"> ➤ 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: <ol style="list-style-type: none"> 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 | <ul style="list-style-type: none"> ➤ Main supply failed. ➤ Shock load outside specified limits. | Check the following: <ol style="list-style-type: none"> 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 | <ul style="list-style-type: none"> ➤ Ventilation inadequate ➤ Fan inoperative ➤ Ambient temperature is too high. | Check the following: <ol style="list-style-type: none"> 1. Fan must turn when inverter is running 2. Pulse frequency must be set to default value Ambient temperature could be higher than specified for the inverter | Off2 |
| F0005 Inverter I2T | <ul style="list-style-type: none"> ➤ Inverter overloaded. ➤ Duty cycle too demanding. ➤ Motor power (P0307) exceeds inverter power capability (P0206). | Check the following: <ol style="list-style-type: none"> 1. Load duty cycle must lie within specified limits. 2. Motor power (P0307) must match inverter power (P0206) | Off2 |
| F0011 Motor Over Temperature | <ul style="list-style-type: none"> ➤ Motor overloaded | Check the following: <ol style="list-style-type: none"> 1. Load duty cycle must be correct 2. Motor nominal overtemperatures (P0626-P0628) must be correct 3. Motor temperature warning level (P0604) must match | Off1 |
| F0012 Inverter temp. signal lost | <ul style="list-style-type: none"> ➤ Wire breakage of inverter temperature (heatsink) sensor | | Off2 |
| F0021 Earth fault | <ul style="list-style-type: none"> ➤ 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 |

| Fault | Possible Causes | Diagnose & Remedy | Reaction |
|--|--|--|----------|
| F0022 Powerstack fault | <ul style="list-style-type: none"> ➤ 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 | <ul style="list-style-type: none"> ➤ 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 | <ul style="list-style-type: none"> ➤ MM 440 only | | Off2 |
| F0041 Motor Data Identification Failure | <ul style="list-style-type: none"> ➤ 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 $Z_b = V_{mot,nom} / \sqrt{3} / I_{mot,nom}$ | 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 | <ul style="list-style-type: none"> ➤ Read or write failure while saving non-volatile parameter. | Factory Reset and new parameterization Change drive | Off2 |
| F0052 power stack Fault | <ul style="list-style-type: none"> ➤ Read failure for power stack information or invalid data. | Change drive | Off2 |
| F0053 IO Eeprom Fault | <ul style="list-style-type: none"> ➤ Read failure for IO EEPROM information or invalid data. | Check data Change IO module | Off2 |
| F0060 Asic Timeout | <ul style="list-style-type: none"> ➤ Internal communications failure | If fault persists, change inverter Contact Service Department | Off2 |

| Fault | Possible Causes | Diagnose & Remedy | Reaction |
|---|---|--|----------|
| F0070 CB setpoint fault | ➤ No setpoint values from CB (communication board) during telegram off time | Check CB and communication partner | Off2 |
| F0071 USS (BOP-link) setpoint fault | ➤ No setpoint values from USS during telegram off time | Check USS master | Off2 |
| F0072 USS (COMM link) setpoint fault | ➤ No setpoint values from USS during telegram off time | Check USS master | Off2 |
| F0080 ADC lost input signal | ➤ Broken wire ➤ Signal out of limits | | Off2 |
| F0085 External Fault | ➤ External fault triggered via terminal inputs | Disable terminal input for fault trigger. | Off2 |
| F0101 Stack Overflow | ➤ Software error or processor failure | Run self test routines | Off2 |
| F0221 PID Feedback below min. value | ➤ PID Feedback below min. value P545. | Change value of P545.Adjust feedback gain. | Off2 |
| F0222 PID Feedback above max. value | ➤ PID feedback above max. value P544. | Change value of P544.Adjust feedback gain. | Off2 |
| F0450 BIST Tests Failure | ➤ Fault value: ➤ 1. Some power section tests have failed ➤ 2. Some control board tests have failed ➤ 4. Some functional tests have failed ➤ 8. Some IO module tests have failed. (MM 420 only) ➤ 16. Internal RAM failed on power-up check | Drive may run but some features will not work properly. Replace drive. | 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 |
| F0499 Fault Warning Separation | | | Off2 |
| 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 . | -- |

| Fault | Possible Causes | Diagnose & Remedy | Reaction |
|--|--|---|----------|
| A0503 UnderVoltage Limit | <ul style="list-style-type: none"> ➤ Main supply failed ➤ Main supply (P0210) and consequently DC-link voltage (R0026) below specified limit (P2172). | Check main supply voltage (P0210). | -- |
| A0504 Inverter OverTemperature | <ul style="list-style-type: none"> ➤ 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: <ol style="list-style-type: none"> 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 I²T | <ul style="list-style-type: none"> ➤ Warning level exceeded, current will be reduced if parameterized (P0610 = 1) | Check that duty cycle lies within specified limits | -- |
| A0506 Inverter duty cycle | <ul style="list-style-type: none"> ➤ Difference between heatsink and IGBT junction temperature exceeds warning limits | Check that duty cycle and shock loads lie within specified limits | -- |
| A0510 Motor OverTemperature | | | -- |
| A0511 Motor OverTemperature I²T | <ul style="list-style-type: none"> ➤ Motor overloaded. ➤ Load duty cycle too high. | Check the following: <ol style="list-style-type: none"> 1. P0611 (motor I²t time constant) should be set to appropriate value 2. P0614 (Motor I²t overload warning level) should be set to suitable level | -- |
| A0512 Motor temperature signal lost | <ul style="list-style-type: none"> ➤ Wire break to motor temperature sensor. If a wire breakage is detected, temperature monitoring switches over to monitoring with the motor thermal model. | | -- |
| A0535 Braking Resistor Hot | | | -- |
| A0541 Motor Data Identification Active | <ul style="list-style-type: none"> ➤ Motor data identification (P1910) selected or running | | -- |
| A0600 RTOS Overrun Warning | | | -- |
| A0700 CB warning 1 see CB manual for details. | <ul style="list-style-type: none"> ➤ CB (communication board) specific | See CB user manual | -- |
| A0701 CB warning 2 see CB manual for details. | <ul style="list-style-type: none"> ➤ CB (communication board) specific | See CB user manual | -- |
| A0702 CB warning 3 see CB manual for details. | <ul style="list-style-type: none"> ➤ CB (communication board) specific | See CB user manual | -- |
| A0703 CB warning 4 see CB manual for details. | <ul style="list-style-type: none"> ➤ CB (communication board) specific | See CB user manual | -- |
| A0704 CB warning 5 see CB manual for details. | <ul style="list-style-type: none"> ➤ CB (communication board) specific | See CB user manual | -- |
| A0705 CB warning 6 see CB manual for details. | <ul style="list-style-type: none"> ➤ CB (communication board) specific | See CB user manual | -- |
| A0706 CB warning 7 see CB manual for details. | <ul style="list-style-type: none"> ➤ CB (communication board) specific | See CB user manual | -- |

| Fault | Possible Causes | Diagnose & Remedy | Reaction |
|--|--|---|----------|
| A0707 CB warning 8 see CB manual for details. | <ul style="list-style-type: none"> ➤ CB (communication board) specific | See CB user manual | -- |
| A0708 CB warning 9 see CB manual for details. | <ul style="list-style-type: none"> ➤ CB (communication board) specific | See CB user manual | -- |
| A0709 CB warning 10 see CB manual for details. | <ul style="list-style-type: none"> ➤ CB (communication board) specific | See CB user manual | -- |
| A0710 CB communication error | <ul style="list-style-type: none"> ➤ Communication with CB (communication board) is lost | Check CB hardware | -- |
| A0711 CB configuration error | <ul style="list-style-type: none"> ➤ CB (communication board) reports a configuration error. | Check CB parameters | -- |
| A0910 Vdc-max controller de- activated | <ul style="list-style-type: none"> ➤ Vdc max controller has been de-activated, 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 go into regenerative mode. ➤ Occurs at very high load inertias, when ramping down. | Check the following: 1. Input voltage (P0756) must lie within range. 2. Load must be match. In certain cases apply braking resistor. | -- |
| A0911 Vdc-max controller active | <ul style="list-style-type: none"> ➤ Vdc max controller is active; so ramp-down times will be increased automatically to keep DC-link voltage (r0026) within limits (P2172). | | -- |
| A0912 Vdc-min controller active | <ul style="list-style-type: none"> ➤ 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. | <ul style="list-style-type: none"> ➤ 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 | | -- |
| A0921 DAC parameters not set properly. | <ul style="list-style-type: none"> ➤ 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 | | -- |
| A0922 No load applied to inverter | <ul style="list-style-type: none"> ➤ No Load is applied to the inverter. ➤ As a result, some functions may not work as under normal load conditions. | | -- |

| Fault | Possible Causes | Diagnose & Remedy | Reaction |
|--|--|---|----------|
| A0923 Both JOG Left and JOG Right are requested | <ul style="list-style-type: none"> ➤ Both JOG right and JOG left (P1055/P1056) have been requested. This freezes the RFG output frequency at its current value. | | -- |
| A0924 Belt Failure Detected | <ul style="list-style-type: none"> ➤ Load conditions on motor indicate belt failure or mechanical fault. | Check the following: <ol style="list-style-type: none"> 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. | -- |

7 MICROMASTER 440 Specifications

This Chapter contains:

- In Table 7.1 the common technical data to the MICROMASTER 440 Inverters
- In Table 7.2 the wire sizes and terminal torques
- In Table 7.3 - divided in several tables - an overview of the specific technical data of every MICROMASTER 440 Inverter

Table 7-1 MICROMASTER 440 Performance Ratings

| Feature | | Specification |
|---|----------------------|--|
| Mains Operating Voltage & Power Ranges | | 200 to 240 V \pm 10% 1AC 0.12 kW – 3.0 kW |
| | | 200 to 240 V \pm 10% 3AC 0.12 kW – 45.0 kW |
| | | 380 to 480 V \pm 10% 3AC 0.37 kW – 75.0 kW |
| | | 500 to 600 V \pm 10% 3AC 0.75 kW – 75.0 kW |
| Protection Level | | IP20 |
| Storage Temperature | | -40 °C to +70 °C |
| Humidity | | 95 % RH – non-condensing |
| Operational Altitudes | | Up to 1000 m above sea level without derating |
| Control Method | | Linear V/f ; Flux Current Control (FCC); Quadratic V/f ; Multi-point V/f; Energy Saving; Sensorless Vector; Close Loop Vector; Torque Control. |
| Overload Capability | Constant Torque (CT) | 1.5 * nominal output current for 60 seconds (every 300 seconds) 2.0 * nominal output current for 3 seconds (every 300 seconds) |
| | Variable Torque (VT) | 1.1 * nominal VT output current continuously 2.0 * nominal CT output current for 3 seconds (every 300 seconds) |
| Electromagnetic Compatibility | | Optional EMC filters to EN55011 Class A or B, also Internal Class A filters available selected units |
| Protection Features | | Undervoltage , Overvoltage, Ground Faults, Short circuit, Stall Prevention, Locked Rotor, Motor Overtemperature, Inverter Overtemperature |
| Input Frequency | | 47 to 63 Hz |
| Setpoint Resolution | | 0.01Hz Digital, 0.01 Hz Serial, 10 bit Analogue (motor potentiometer 0.1 Hz [0.1% (in PID mode)]) |
| Output Frequency Resolution | | 0.01 Hz Digital, 0.01 Hz Serial, 10 bit Analogue |
| Pulse Frequency | | 2 kHz to 16 kHz (2 kHz steps) |
| Digital Inputs | | 6 programmable isolated inputs, switchable active high / active low (PNP/NPN) |
| Fixed Frequencies | | 15 programmable |
| Skip Frequencies | | 4 programmable |
| Relay Outputs | | 3 programmable 30 V DC / 5 A (resistive), 250 V AC 2 A (resistive) |
| 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 |
| Analogue Output | | 2 (0/4 to 20 mA) programmable |
| Serial Interface | | RS-232 and RS-485 |
| Design/Manufacture | | In accordance with ISO 9001 |
| Standards | | UL, cUL, CE, C-tick |
| CE Marked | | Conformity with EC Low Voltage Directive 73/23/EEC and Electromagnetic Compatibility Directive 89/336/EEC |
| Power Factor | | \geq 0.7 |
| Inverter Efficiency | | 96 to 97 % |
| Inrush Current | | Less than nominal input current |
| Braking | | DC braking, Compound braking and Dynamic braking |

Table 7-2 Wire Sizes & Terminal Torques – Field Wiring Connectors

| 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 |
| Minimum Cable Cross Section | [mm ²] | 1 | 1.5 | 2.5 | 25 | 35 | 50 |
| | [AWG] | 17 | 16 | 14 | 3 | 2 | 0 |
| Maximum Cable Cross Section | [mm ²] | 2.5 | 6 | 10 | 35 | 35 | 150 |
| | [AWG] | 14 | 10 | 8 | 2 | 2 | -5 |

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 | [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] | 3.0 | 4.0 | 5.5 |
| | [hp] | 4.0 | 5.0 | 7.5 |
| Output | [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 | 25 | 35 |
| | | 3NA3807 | 3NA3810 | 3NA3814 |
| Input Cable Min. | [mm ²] | 1.0 | 2.5 | 4.0 |
| | [awg] | 17.0 | 13.0 | 11.0 |
| Input Cable Max. | [mm ²] | 10.0 | 10.0 | 10.0 |
| | [awg] | 7.0 | 7.0 | 7.0 |
| Output Cable Min. | [mm ²] | 1.5 | 4.0 | 4.0 |
| | [awg] | 15.0 | 11.0 | 11.0 |
| Output Cable Max. | [mm ²] | 10.0 | 10.0 | 10.0 |
| | [awg] | 7.0 | 7.0 | 7.0 |
| Weight | [kg] | 5.7 | 5.7 | 5.7 |
| | [lbs] | 12.5 | 12.5 | 12.5 |
| Dimensions | w [mm] | 185.0 | 185.0 | 185.0 |
| | h [mm] | 245.0 | 245.0 | 245.0 |
| | d [mm] | 195.0 | 195.0 | 195.0 |
| | w [inches] | 7.28 | 7.28 | 7.28 |
| | h [inches] | 9.65 | 9.65 | 9.65 |
| | d [inches] | 7.68 | 7.68 | 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] [hp] | 0.12 0.16 | 0.25 0.33 | 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 |
| Output | [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. | [mm ²] [awg] | 1.0 17 | 1.0 17 | 1.0 17 | 1.0 17 | 1.0 17 | 1.0 17 | 1.5 15 | 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 |
| 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 | 1.5 15 |
| 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 |
| 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 |
| 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 | 2UC34-5FA0 |
|---------------------|--------------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|
| 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 | [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] | 2.2 | 3.0 | 4.0 | 5.5 | 7.5 | 11.0 | 15.0 | 18.5 |
| | [hp] | 3.0 | 4.0 | 5.0 | 7.5 | 10.0 | 15.0 | 20.0 | 25.0 |
| Output | [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] | 1.0 | 1.0 | 1.0 | 2.5 | 4.0 | 6.0 | 10.0 | 10.0 |
| | [awg] | 17 | 17 | 17 | 13 | 11 | 9 | 7 | 7 |
| Input Cable Max. | [mm ²] | 6.0 | 6.0 | 6.0 | 10.0 | 10.0 | 10.0 | 35.0 | 35.0 |
| | [awg] | 9 | 9 | 9 | 7 | 7 | 7 | 2 | 2 |
| Output Cable Min. | [mm ²] | 1.0 | 1.0 | 1.0 | 2.5 | 4.0 | 6.0 | 10.0 | 10.0 |
| | [awg] | 17 | 17 | 17 | 13 | 11 | 9 | 7 | 7 |
| Output Cable Max. | [mm ²] | 6.0 | 6.0 | 6.0 | 10.0 | 10.0 | 10.0 | 35.0 | 35.0 |
| | [awg] | 9 | 9 | 9 | 7 | 7 | 7 | 2 | 2 |
| Weight | [kg] | 3.4 | 3.4 | 3.4 | 5.7 | 5.7 | 5.7 | 17.0 | 17.0 |
| | [lbs] | 7.5 | 7.5 | 7.5 | 12.5 | 12.5 | 12.5 | 37.0 | 37.0 |
| Dimensions | w [mm] | 149.0 | 149.0 | 149.0 | 185.0 | 185.0 | 185.0 | 275.0 | 275.0 |
| | h [mm] | 202.0 | 202.0 | 202.0 | 245.0 | 245.0 | 245.0 | 520.0 | 520.0 |
| | d [mm] | 172.0 | 172.0 | 172.0 | 195.0 | 195.0 | 195.0 | 245.0 | 245.0 |
| | w [inches] | 5.87 | 5.87 | 5.87 | 7.28 | 7.28 | 7.28 | 10.83 | 10.83 |
| | h [inches] | 7.95 | 7.95 | 7.95 | 9.65 | 9.65 | 9.65 | 20.47 | 20.47 |
| | d [inches] | 6.77 | 6.77 | 6.77 | 7.68 | 7.68 | 7.68 | 9.65 | 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 | 2AD37-5FA0 |
|---------------------|--------------------|------------|------------|------------|------------|------------|------------|
| Motor Output Rating | [kW] | 22.0 | 30.0 | 37.0 | 45.0 | 55.0 | 75.0 |
| | [hp] | 30.0 | 40.0 | 50.0 | 60.0 | 75.0 | 100.0 |
| Output | [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] | 16.0 | 25.0 | 25.0 | 35.0 | 70.0 | 70.0 |
| | [awg] | 5 | 3 | 3 | 2 | -2 | -2 |
| Input Cable Max. | [mm ²] | 35.0 | 35.0 | 35.0 | 150.0 | 150.0 | 150.0 |
| | [awg] | 2 | 2 | 2 | -5 | -5 | -5 |
| Output Cable Min. | [mm ²] | 16.0 | 25.0 | 25.0 | 50.0 | 70.0 | 95.0 |
| | [awg] | 5 | 3 | 3 | 0 | -2 | -3 |
| Output Cable Max. | [mm ²] | 35.0 | 35.0 | 35.0 | 150.0 | 150.0 | 150.0 |
| | [awg] | 2 | 2 | 2 | -5 | -5 | -5 |
| Weight | [kg] | 17.0 | 22.0 | 22.0 | 75.0 | 75.0 | 75.0 |
| | [lbs] | 37.0 | 48.0 | 48.0 | 165.0 | 165.0 | 165.0 |
| Dimensions | w [mm] | 275.0 | 275.0 | 275.0 | 350.0 | 350.0 | 350.0 |
| | h [mm] | 520.0 | 650.0 | 650.0 | 1150.0 | 1150.0 | 1150.0 |
| | d [mm] | 245.0 | 245.0 | 245.0 | 320.0 | 320.0 | 320.0 |
| | w [inches] | 10.83 | 10.83 | 10.83 | 13.78 | 13.78 | 13.78 |
| | h [inches] | 20.47 | 25.59 | 25.59 | 45.28 | 45.28 | 45.28 |
| | d [inches] | 9.65 | 9.65 | 9.65 | 12.6 | 12.6 | 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] | 0.37 | 0.55 | 0.75 | 1.1 | 1.5 | 2.2 | 3.0 | 4.0 | 5.5 | 7.5 |
| | [hp] | 0.5 | 0.75 | 1.0 | 1.5 | 2.0 | 3.0 | 4.0 | 5.0 | 7.5 | 10.0 |
| Output | [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] | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 2.5 | 4.0 |
| | [awg] | 17 | 17 | 17 | 17 | 17 | 17 | 17 | 17 | 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 | 10.0 |
| | [awg] | 13 | 13 | 13 | 13 | 13 | 9 | 9 | 9 | 7 | 7 |
| Output Cable Min. | [mm ²] | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 2.5 | 4.0 |
| | [awg] | 17 | 17 | 17 | 17 | 17 | 17 | 17 | 17 | 13 | 11 |
| Output Cable Max. | [mm ²] | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 6.0 | 6.0 | 6.0 | 10.0 | 10.0 |
| | [awg] | 13 | 13 | 13 | 13 | 13 | 9 | 9 | 9 | 7 | 7 |
| Weight | [kg] | 1.3 | 1.3 | 1.3 | 1.3 | 1.3 | 3.3 | 3.3 | 3.3 | 5.5 | 5.5 |
| | [lbs] | 2.9 | 2.9 | 2.9 | 2.9 | 2.9 | 7.3 | 7.3 | 7.3 | 12.1 | 12.1 |
| Dimensions | w [mm] | 73.0 | 73.0 | 73.0 | 73.0 | 73.0 | 149.0 | 149.0 | 149.0 | 185.0 | 185.0 |
| | h [mm] | 173.0 | 173.0 | 173.0 | 173.0 | 173.0 | 202.0 | 202.0 | 202.0 | 245.0 | 245.0 |
| | d [mm] | 149.0 | 149.0 | 149.0 | 149.0 | 149.0 | 172.0 | 172.0 | 172.0 | 195.0 | 195.0 |
| | w [inches] | 2.87 | 2.87 | 2.87 | 2.87 | 2.87 | 5.87 | 5.87 | 5.87 | 7.28 | 7.28 |
| | h [inches] | 6.81 | 6.81 | 6.81 | 6.81 | 6.81 | 7.95 | 7.95 | 7.95 | 9.65 | 9.65 |
| | d [inches] | 5.87 | 5.87 | 5.87 | 5.87 | 5.87 | 6.77 | 6.77 | 6.77 | 7.68 | 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 | [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 | [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 | 10 | 10 | 10 | 16 | 25 | 32 | 35 | 50 |
| | | 3NA3803-6 | 3NA3803-6 | 3NA3803-6 | 3NA3803-6 | 3NA3805-6 | 3NA3810-6 | 3NA3812-6 | 3NA3814-6 | 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] | 185.0 | 185.0 | 185.0 | 185.0 | 185.0 | 185.0 | 185.0 | 275.0 | 275.0 |
| | h [mm] | 245.0 | 245.0 | 245.0 | 245.0 | 245.0 | 245.0 | 245.0 | 520.0 | 520.0 |
| | d [mm] | 195.0 | 195.0 | 195.0 | 195.0 | 195.0 | 195.0 | 195.0 | 245.0 | 245.0 |
| | w [inches] | 7.28 | 7.28 | 7.28 | 7.28 | 7.28 | 7.28 | 7.28 | 10.83 | 10.83 |
| h [inches] | 9.65 | 9.65 | 9.65 | 9.65 | 9.65 | 9.65 | 9.65 | 20.47 | 20.47 | |
| d [inches] | 7.68 | 7.68 | 7.68 | 7.68 | 7.68 | 7.68 | 7.68 | 9.65 | 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 | [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] | 10.0 | 16.0 | 25.0 | 25.0 | 50.0 | 70.0 |
| | [awg] | 7 | 5 | 3 | 3 | 0 | -2 |
| Input Cable Max. | [mm ²] | 35.0 | 35.0 | 35.0 | 150.0 | 150.0 | 150.0 |
| | [awg] | 2 | 2 | 2 | -5 | -5 | -5 |
| Output Cable Min. | [mm ²] | 10.0 | 16.0 | 16.0 | 25.0 | 35.0 | 50.0 |
| | [awg] | 7 | 5 | 5 | 3 | 2 | 0 |
| Output Cable Max. | [mm ²] | 35.0 | 35.0 | 35.0 | 150.0 | 150.0 | 150.0 |
| | [awg] | 2 | 2 | 2 | -5 | -5 | -5 |
| Weight | [kg] | 16.0 | 20.0 | 20.0 | 56.0 | 56.0 | 56.0 |
| | [lbs] | 35.0 | 44.0 | 44.0 | 123.0 | 123.0 | 123.0 |
| Dimensions | w [mm] | 275.0 | 275.0 | 275.0 | 350.0 | 350.0 | 350.0 |
| | h [mm] | 520.0 | 650.0 | 650.0 | 850.0 | 850.0 | 850.0 |
| | d [mm] | 245.0 | 245.0 | 245.0 | 320.0 | 320.0 | 320.0 |
| | w [inches] | 10.83 | 10.83 | 10.83 | 13.78 | 13.78 | 13.78 |
| | h [inches] | 20.47 | 25.59 | 25.59 | 33.46 | 33.46 | 33.46 |
| | d [inches] | 9.65 | 9.65 | 9.65 | 12.6 | 12.6 | 12.6 |

8 Available options

This Chapter contains:

Supplementary information.

| | | |
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|-----|-------------------------|----|

8.1 Available options

The following accessories are available as options for your MICROMASTER MM440 Inverter. For more details please refer to the Reference Manual or contact your local Siemens sales office if you require assistance.

Variant Dependent Options

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

Variant 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" commissioning tool

9 Electro-Magnetic Compatibility (EMC)

This Chapter contains:

EMC information.

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|-----|--|----|

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 EEC/89/336.

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 \leq 16A 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 250W to 550W drives with 230V 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:

| Rating | Typical Harmonic Current (A) | | | | | Typical Harmonic Current (%) | | | | | Typical Voltage Distortion | | |
|---------------|------------------------------|-----------------|-----------------|-----------------|------------------|------------------------------|-----------------|-----------------|-----------------|------------------|---------------------------------|---------|---------|
| | | | | | | | | | | | Distribution Transformer Rating | | |
| | | | | | | | | | | | 10kVA | 100kVA | 1MVA |
| | 3 rd | 5 th | 7 th | 9 th | 11 th | 3 rd | 5 th | 7 th | 9 th | 11 th | THD (%) | THD (%) | THD (%) |
| 250W 230V 1ac | 2.15 | 1.44 | 0.72 | 0.26 | 0.19 | 83 | 56 | 28 | 10 | 7 | 0.77 | 0.077 | 0.008 |
| 370W 230V 1ac | 2.96 | 2.02 | 1.05 | 0.38 | 0.24 | 83 | 56 | 28 | 10 | 7 | 1.1 | 0.11 | 0.011 |
| 550W 230V 1ac | 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 $>1\text{kW}$ are not yet defined. Therefore, any electrical apparatus containing the above drives which has an input power $>1\text{kW}$ 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 550W 230V 1ac units).

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

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

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 9-1 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 9-2 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 9-3 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

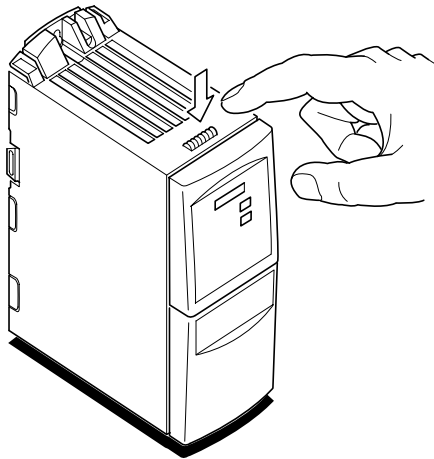
- To achieve these performance levels, you must not exceed the default Pulse frequency nor use cables longer than 25 m.
- The MICROMASTER inverters are intended **exclusively for professional applications**. Therefore, they do not fall within the scope of the harmonics emissions specification EN 61000-3-2.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

Table 9-4 Compliance Table

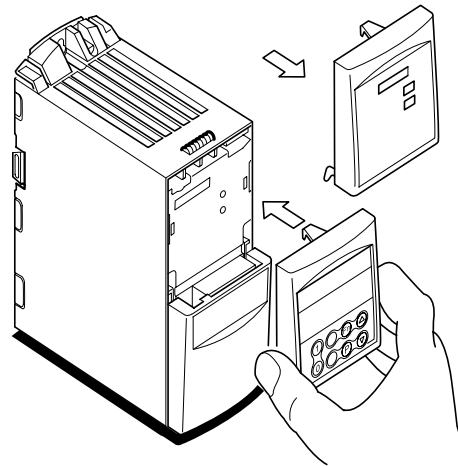
| Model | Remarks |
|--|--|
| Class 1 – General Industrial | |
| 6SE6440-2U***-**A0 | Unfiltered units, all voltages and powers. |
| Class 2 – Filtered Industrial | |
| 6SE6440-2A***-**A0 | All units with integral Class A filters |
| 6SE6440-2A***-**A0 with 6SE6440-2FA00-6AD0 | Frame size A units 400-480 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. | |

A - Changing the Operator Panel

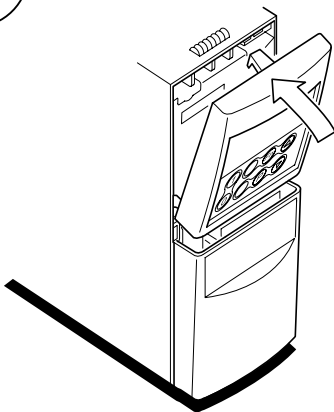
1



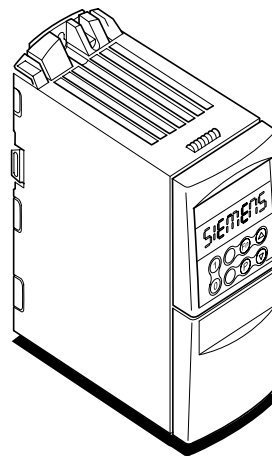
2



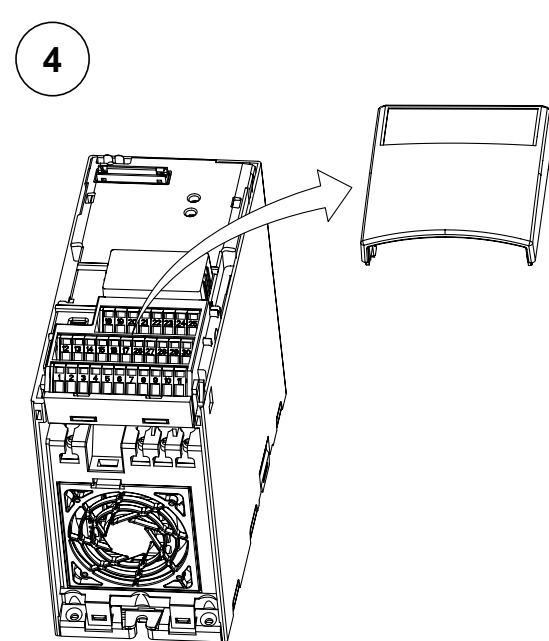
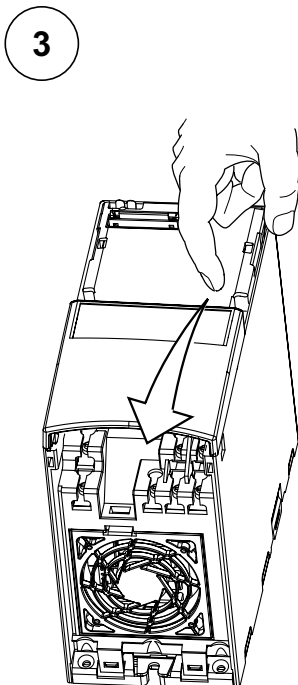
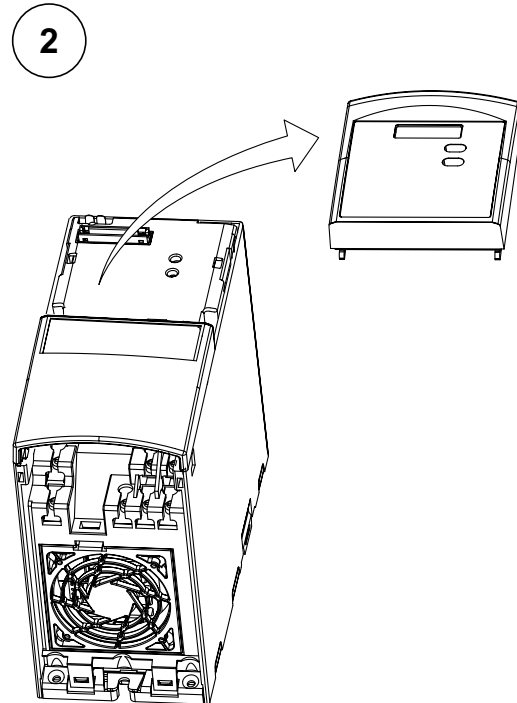
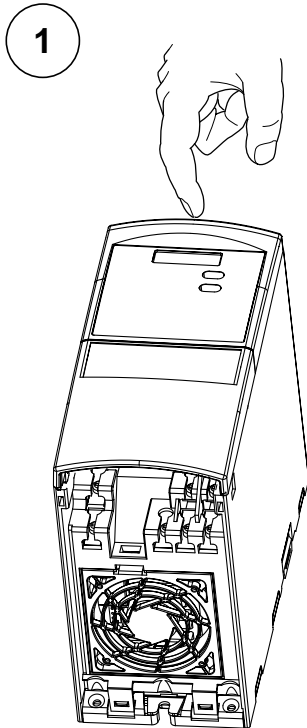
3



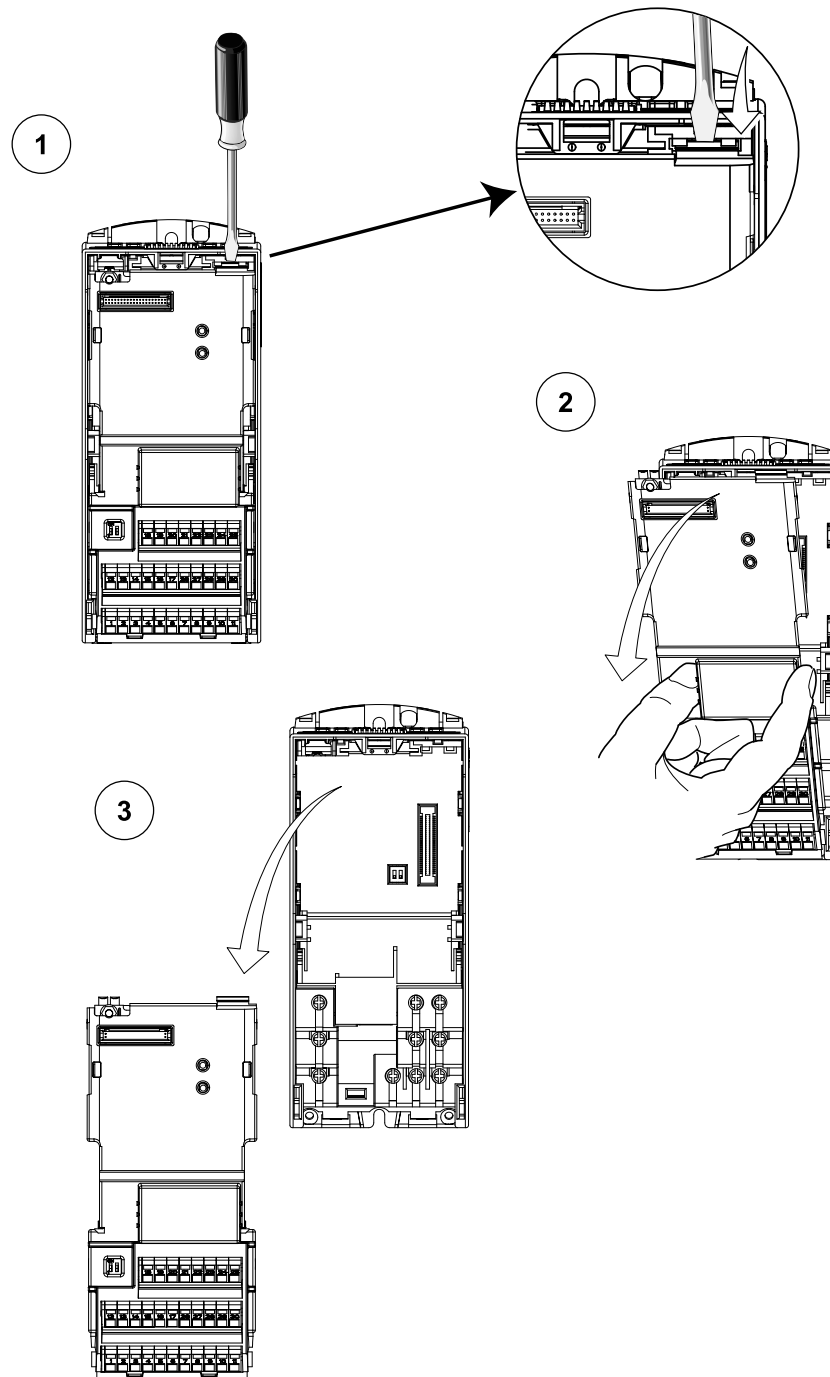
4



B - Removing Covers Frame Size A



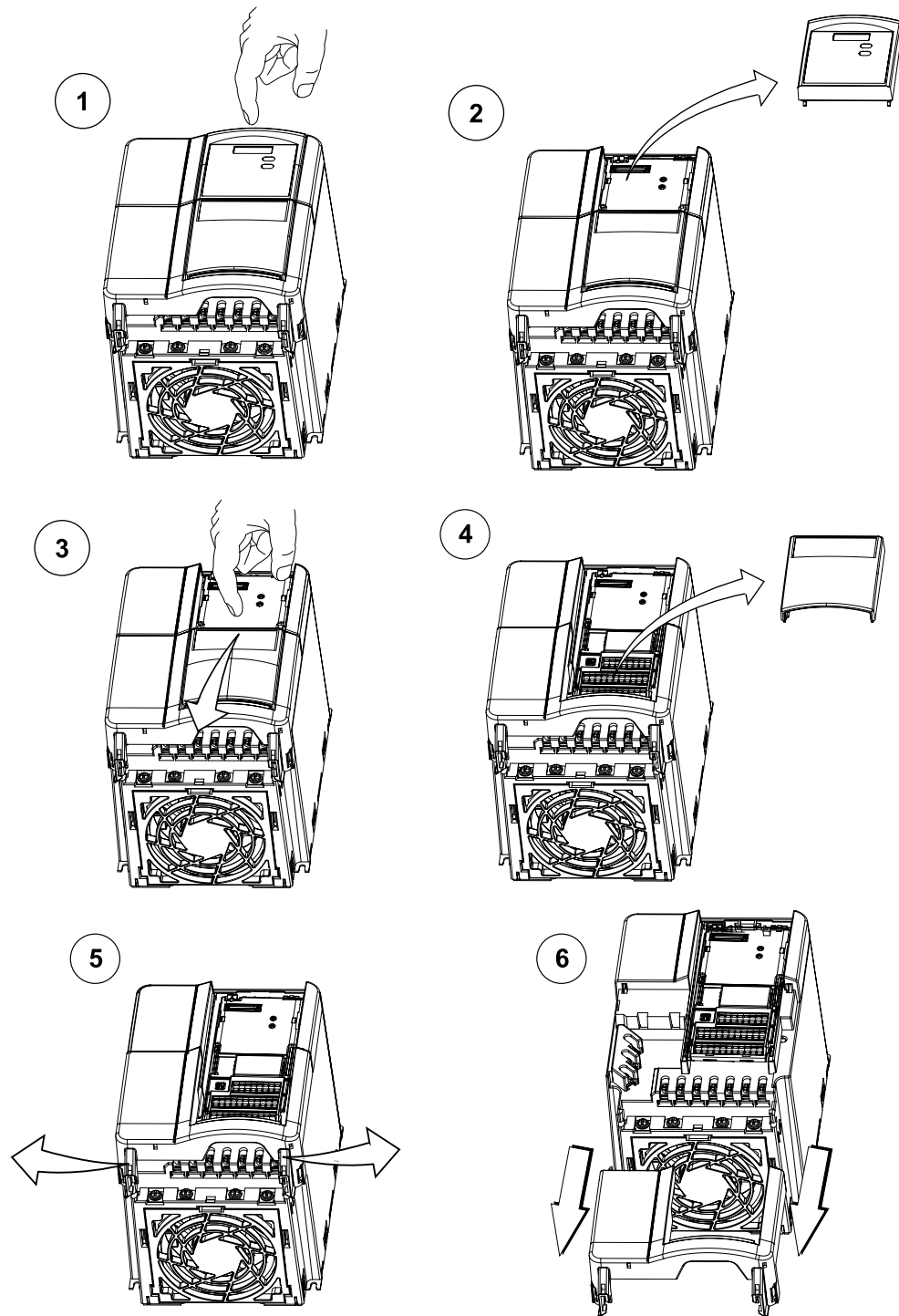
C - Removing the I/O Board



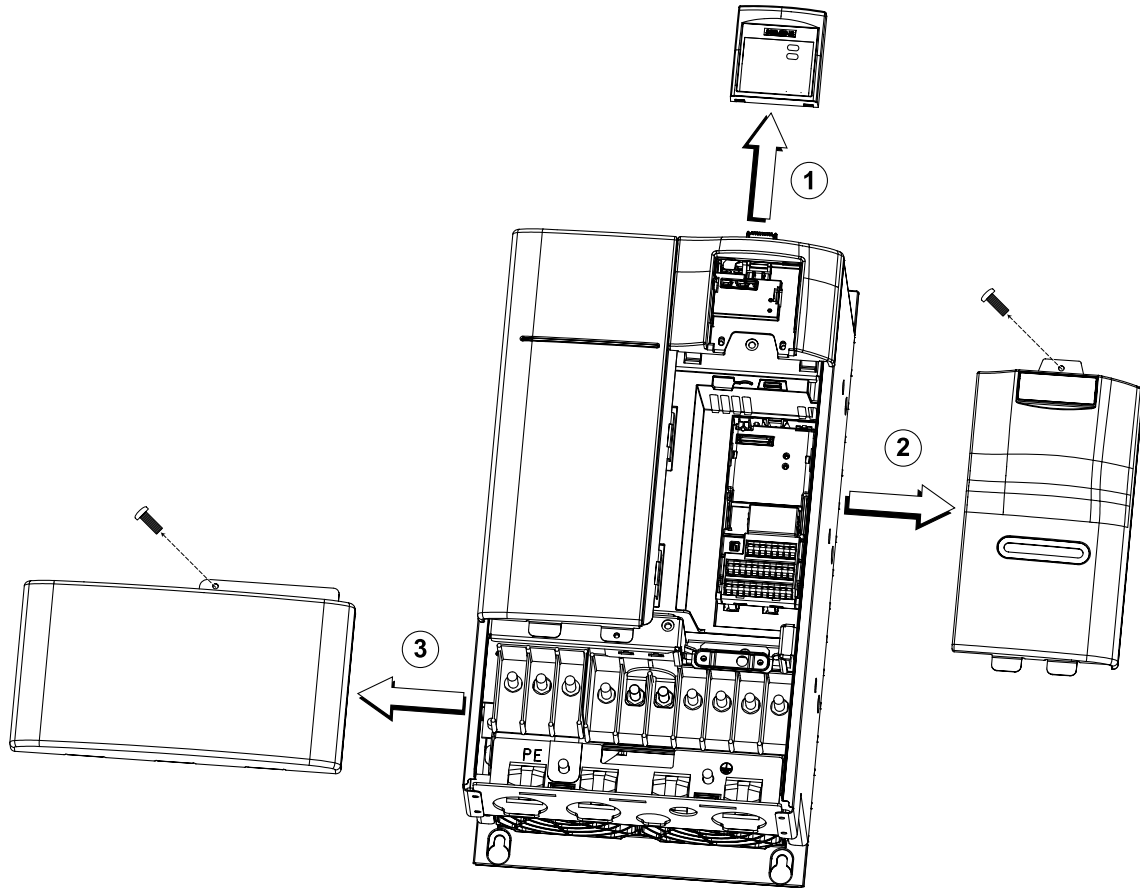
Notes:

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.
-

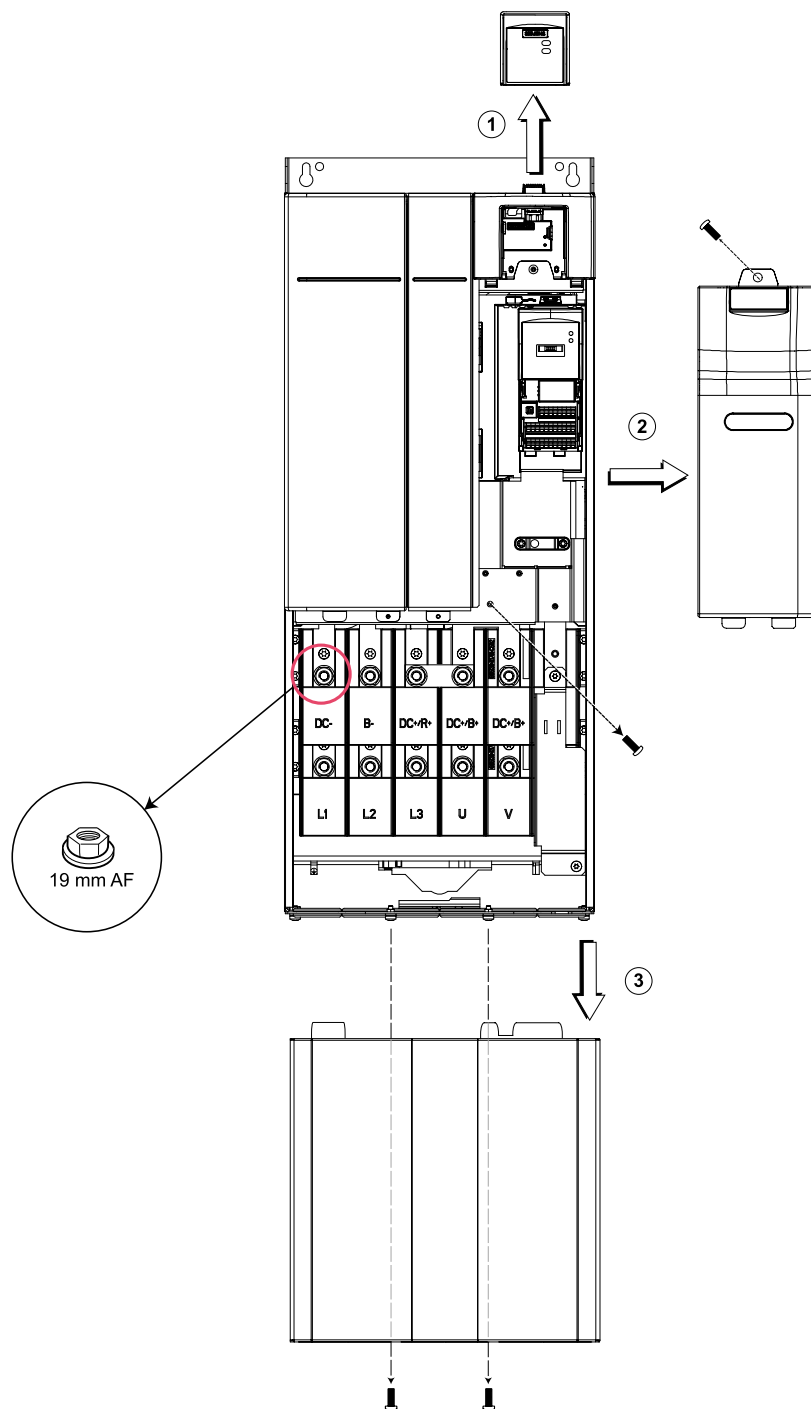
D - Removing Covers Frame Sizes B and C



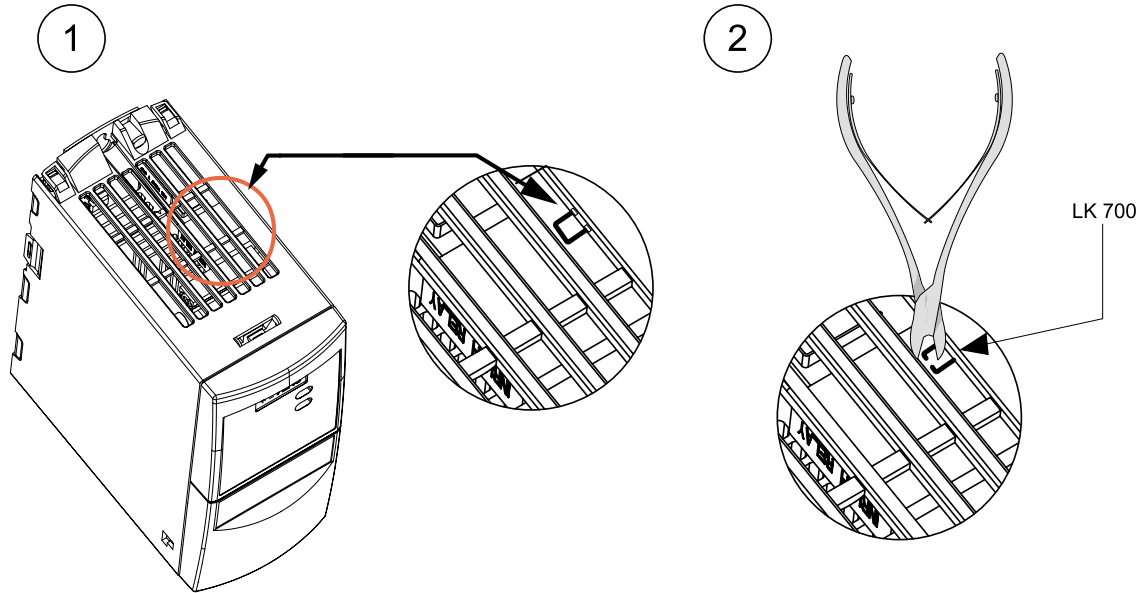
E - Removal of Covers Frame Size D and E



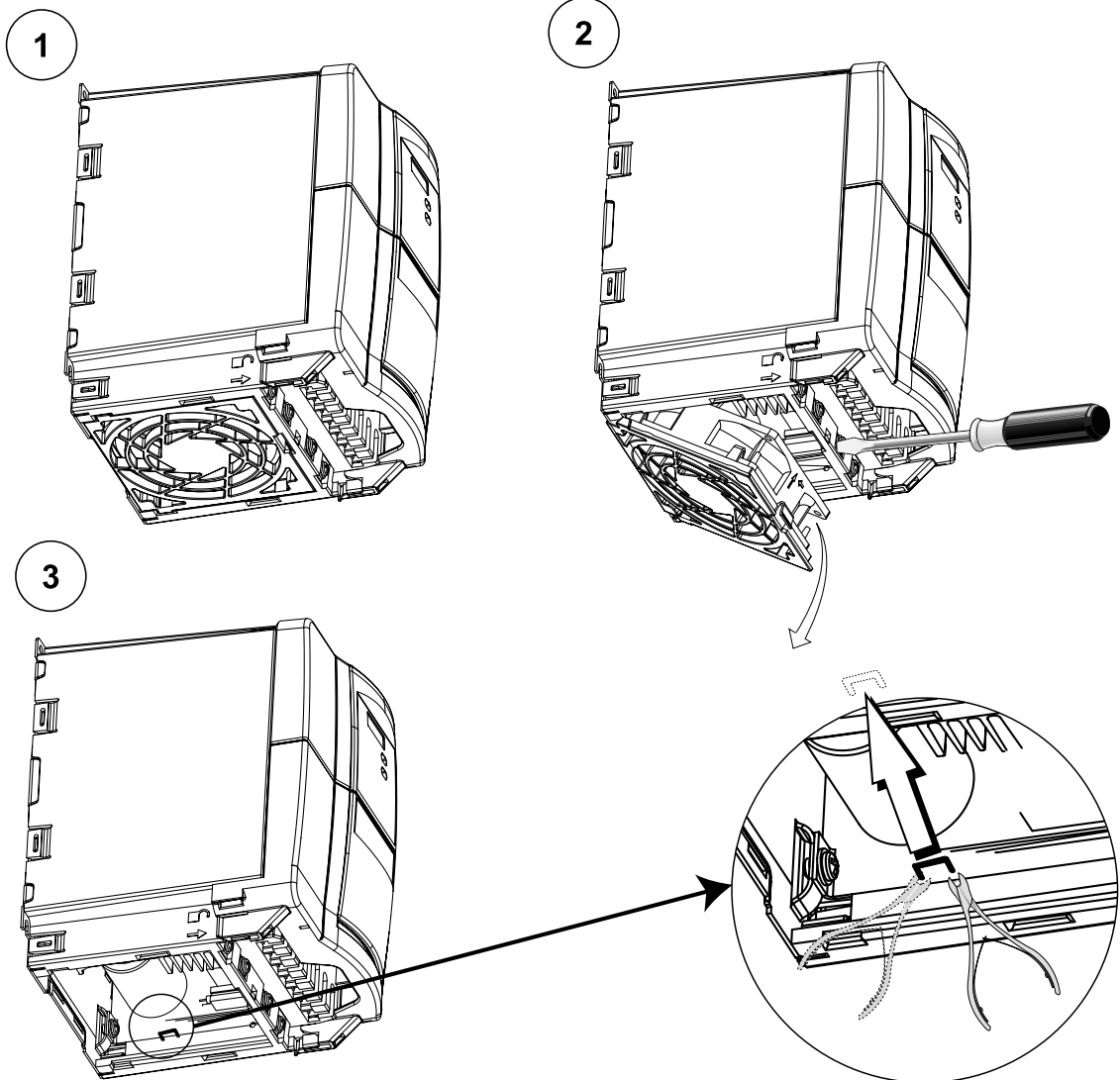
F - Removal of Covers Frame Size F



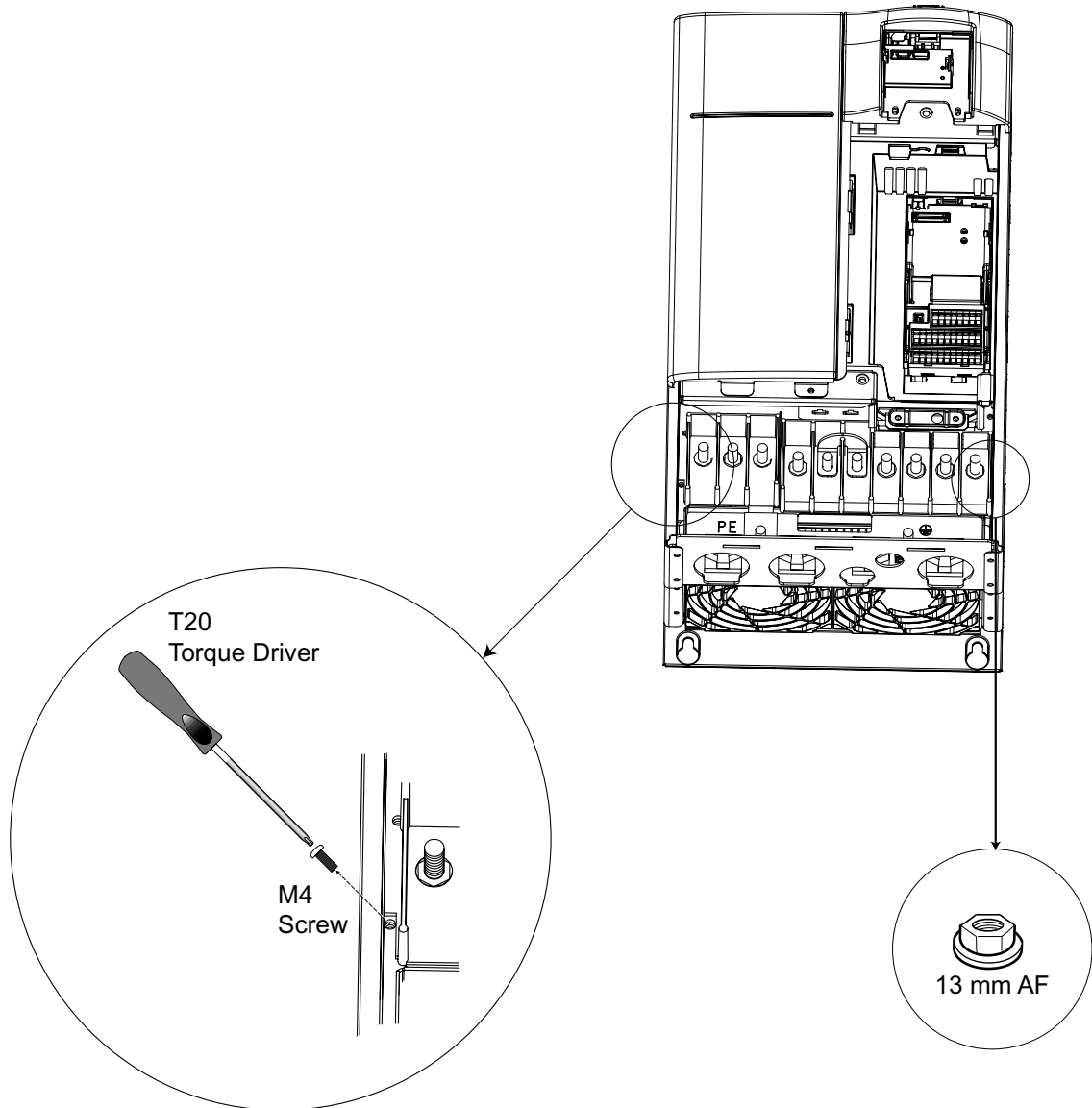
G - Removing 'Y' Cap Link Frame Size A



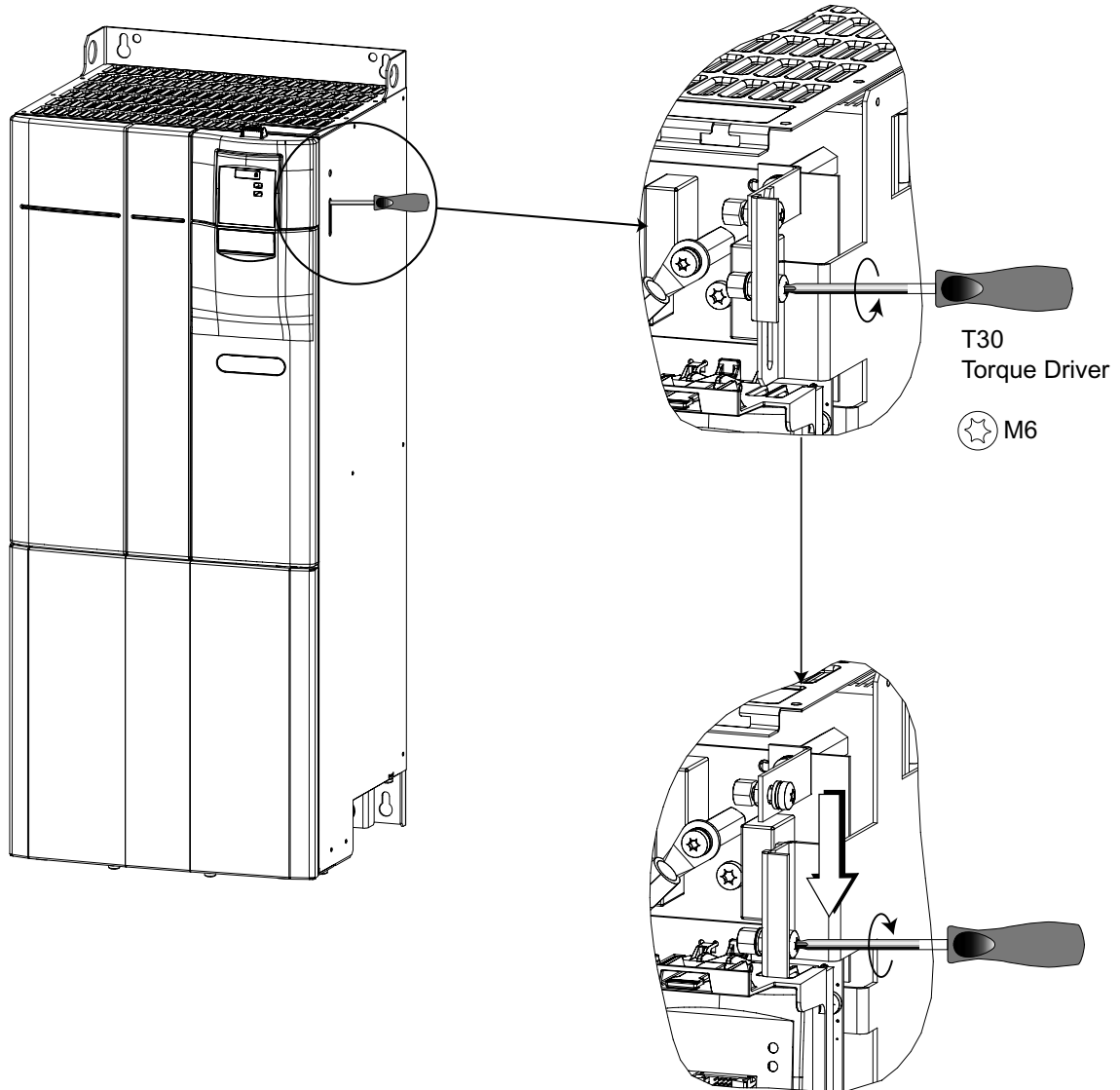
H - Removing 'Y' Cap Link Frame Sizes B and C



I - Removing 'Y' Cap Link Frame Sizes D and E



J - Removing 'Y' Cap Link Frame Sizes F



K - Applicable Standards



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.



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

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

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Suggestions and/or Corrections

| | |
|--|--|
| <p>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</p> | <p>Suggestions</p> <p>Corrections</p> <p>For Publication/Manual: MICROMASTER 440</p> <p>User Documentation</p> |
| <p>From</p> <p>Name:</p> <p>Company/Service Department</p> <p>Address: _____ _____</p> <p>Telephone: _____ / _____</p> <p>Telefax: _____ / _____</p> | <p>Operating instructions</p> <p>Order Number: 6SE6400-5CA00-0BP0</p> <p>Date of Issue: Issue A1</p> <p>Should you come across any printing errors when reading this publication, please notify us on this sheet.</p> <p>Suggestions for improvement are also welcome.</p> |

View of Unit

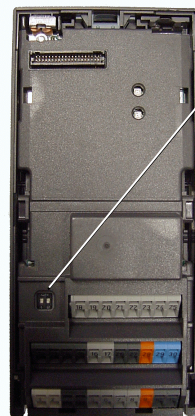
Frame Size A

Frame Size B & C

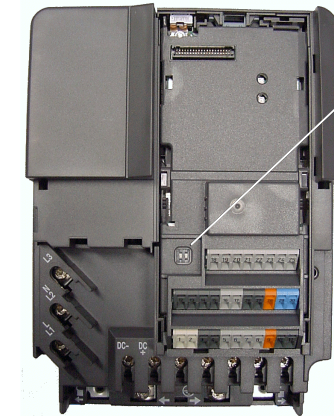
Standard Display Panel fitted



I/O Board



Analog Setting
DIP Switch

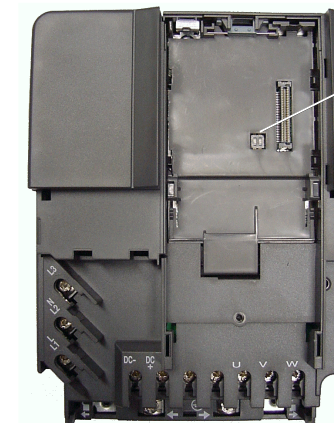


Analog Setting
DIP Switch

Control Board

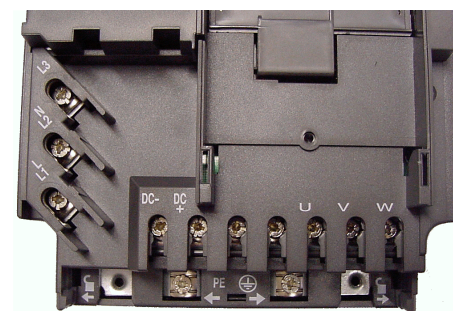


Frequency Setting
DIP Switch



Frequency Setting
DIP Switch

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

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Order No.: 6SE6400-5CA00-0BP0
Date: 04.2001

