SIEMENS

MICROMASTER 420

Operating Instructions **Issue A1**

User Documentation

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:

SIEMENS

MICROMASTER 420

Operating Instructions
User Documentation

Valid for Release

Inverter Type	*Control Version*
MICROMASTER 420	September 2000

Issue: A1

Further information is available on the Internet under:
http://www.siemens.de/micromaster

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

MICROMASTER® is a registered trademark of Siemens.

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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Foreword

User Documentation

Warning

Before installing and commissioning, you must read the 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.

MICROMASTER documentation is structured within three distinct levels:

- **Getting Started Guide**
  The Getting Started Guide is designed to give you quick access to all the basic information required to install and set up your MICROMASTER 420 for operation.
- **Operating Instructions**
  The Operating Instructions provide detailed information for installation and operation of your MICROMASTER 420. The Operating Instructions also provide detailed descriptions of the parameters available for customizing the functions of the MICROMASTER 420.
- **Reference Manual**
  The Reference Manual contains in-depth information on all technical issues relating to the MICROMASTER 420 Inverter.

For more detailed information on MICROMASTER 420 publications and for information about other publications in the MICROMASTER range please contact your local Siemens office or refer to our Web Site: 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.

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 420 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 chapters.

Please read the information carefully, since it is provided for your personal safety and will also help prolong the service life of your MICROMASTER 420 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.**

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

Warnings

- 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 95*).

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 6.5*).
- 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+, DC-

Caution

The connection of power, motor and control cables to the inverter must be carried out as shown in Figure 2-4 on page 25, 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.
- This equipment is capable of providing internal motor overload protection in accordance with UL508C section 42. Refer to P0610 (level 3) and P0335. Motor overload protection can also be provided using an external PTC via a digital input.
- 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 230/460V when protected by a time delay fuse (*see Table on Page 93)*
- 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.**

Table of Contents

List of Illustrations

List of Tables

1 Overview

This Chapter contains:

A summary of the major features of the MICROMASTER 420 range.

1.1 The MICROMASTER 420

The MICROMASTER 420s 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 11 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 switching frequency permits quiet motor operation. Comprehensive protective functions provide excellent inverter and motor protection.

The MICROMASTER 420 with its default factory settings, is ideal for a large range of simple motor control applications. The MICROMASTER 420 can also be used for more advanced motor control applications via its comprehensive parameter lists.

The MICROMASTER 420 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
- Fast repeatable response time to control signals
- Comprehensive range of parameters enabling configuration for widest range of applications
- Simple cable connection
- Modular design for extremely flexible configuration
- High switching frequencies for low-noise motor operation
- External options for PC communications, Basic Operator Panel (BOP), Advanced Operator Panel (AOP) and Profibus Communications Module

Performance characteristics

- Flux Current Control (FCC) for improved dynamic response and motor control
- Fast Current Limitation (FCL) for operation with trip-free mechanism
- Built-in DC injection brake
- Compound Braking to improve braking performance
- Acceleration/deceleration times with programmable smoothing
- Closed-loop control using Proportional, Integral (PI) control loop function

Protection characteristics

- Complete protection for motor and inverter
- Overvoltage/undervoltage protection
- Overtemperature protection for the inverter
- Ground fault protection
- Short-circuit protection
- I^2t thermal 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

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+, DC-
- Always wait **5 minutes** to allow the unit to discharge after switching off before carrying out any installation work.

Caution

The connection of power, motor and control cables to the inverter must be carried out as shown in Figure 2-4 on page 25, to prevent inductive and capacitive interference from affecting the correct functioning of the inverter.

2.1 General

Installation after a Period of Storage

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

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	➲ 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	➲ 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

Min. operating = -10°C
Max. operating = 50°C

Humidity Range

95% Non-condensing

Altitude

If the inverter is to be installed at an altitude > 1000m, derating will be required.
(Refer to MM420 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. IP54 and IP56 units offer additional protection.

Overheating

Mount the inverter vertically to ensure optimum cooling. Additional ventilation may be required for horizontal mounting.

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

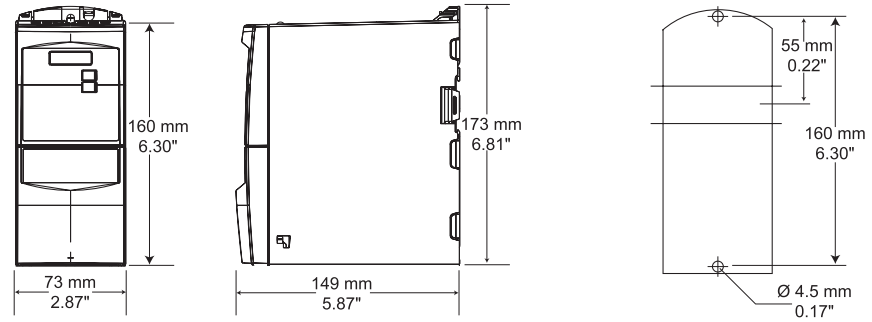
2.3 Mechanical Installation

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 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.

Frame Size A:

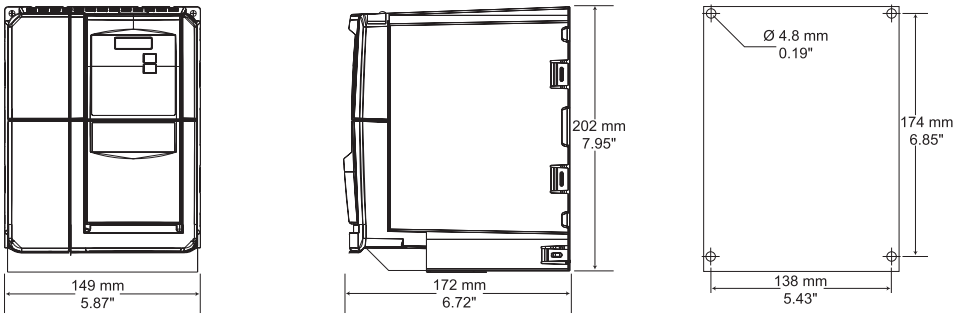


Fixing with
2 bolts M4
2 nuts M4
2 washers M4

Tightening torque (unit to cabinet) with washers fitted: 2.5 Nm

Connecting to DIN rail

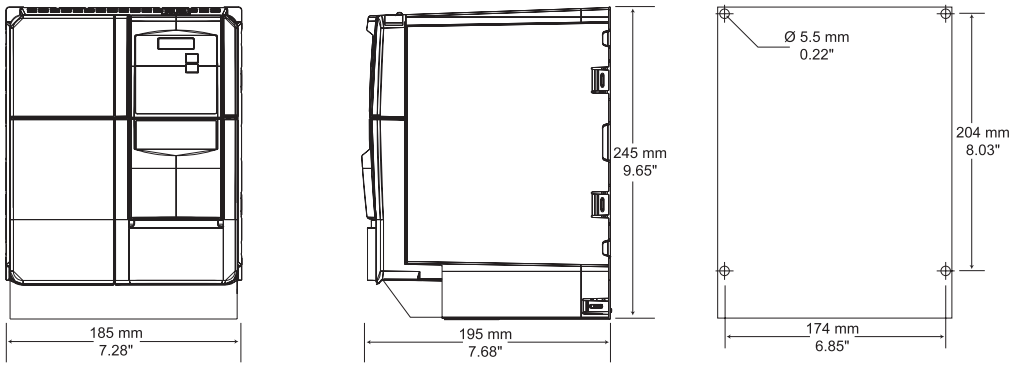
Frame Size B:



Fixing with
4 bolts M4
4 nuts M4
4 washers M4

Tightening torque (unit to cabinet) with washers fitted: 2.5 Nm

Frame Size C:



Fixing with
4 bolts M5
4 nuts M5
4 washers M5

Tightening torque (unit to cabinet) with washers fitted: 3 Nm

Figure 2-1 Drill pattern for MICROMASTER 420

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 E
and F.

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 motor is configured for the correct supply voltage: single / three-phase 230 V MICROMASTERS must not be connected to a 400 V three-phase supply.
- When synchronous machines 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 table on Page 93*).
- Use Class 1 60/75°C copper wire only (for UL compliance). Tightening torque for the power terminals is 1.1 Nm.
- 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 420 Inverter is illustrated in Appendices B and C. 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.

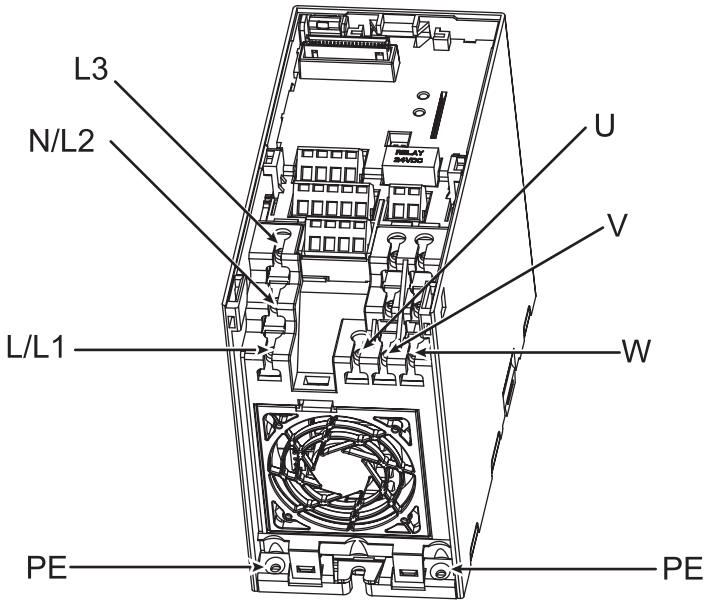


Figure 2-2 MICROMASTER 420 Connection Terminals

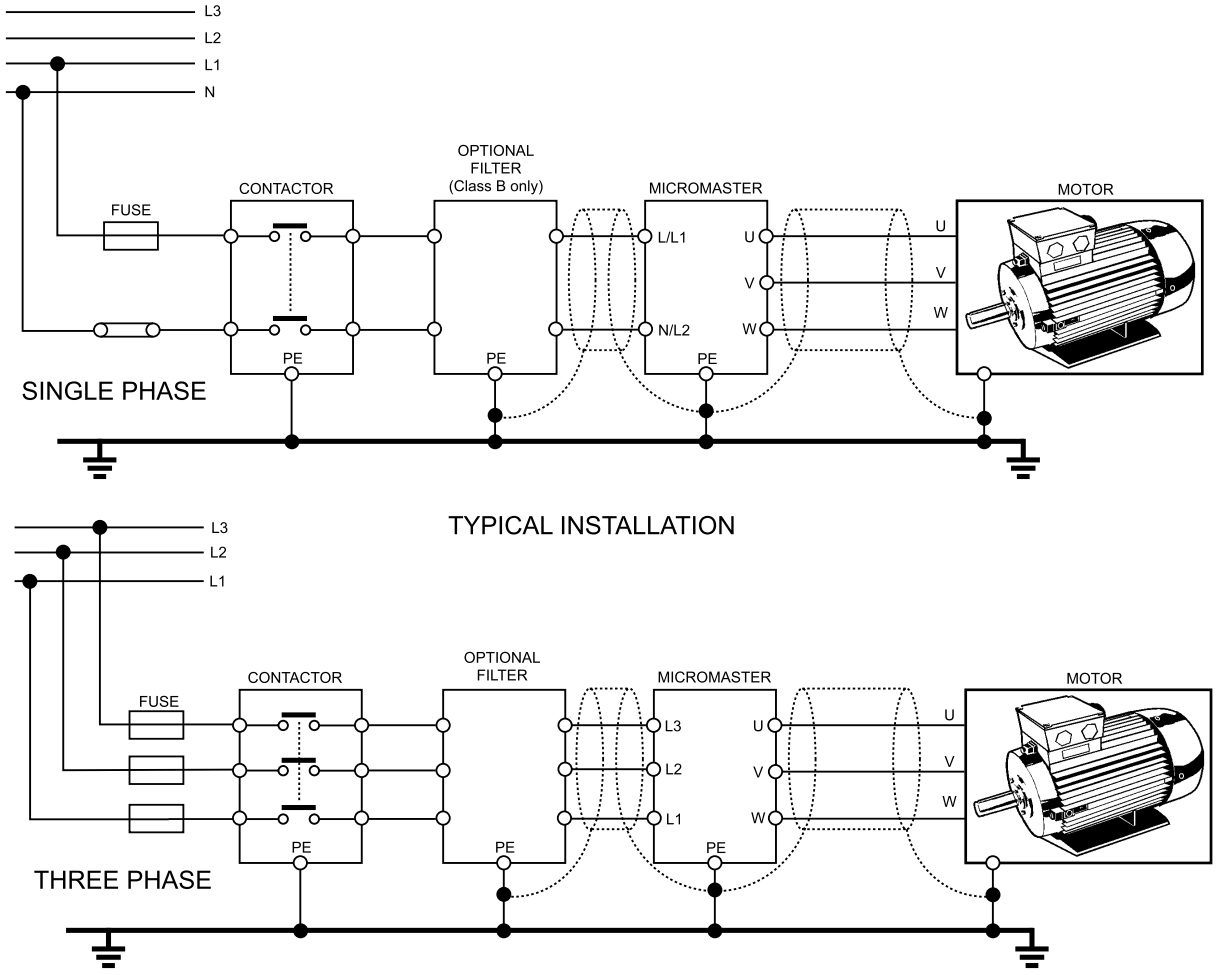


Figure 2-3 Motor and Power Connections

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 connected to the inverter (such as a PLC) 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 connections as much as possible, using separate trunking, if necessary at 90º right angles
- 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 connections 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!

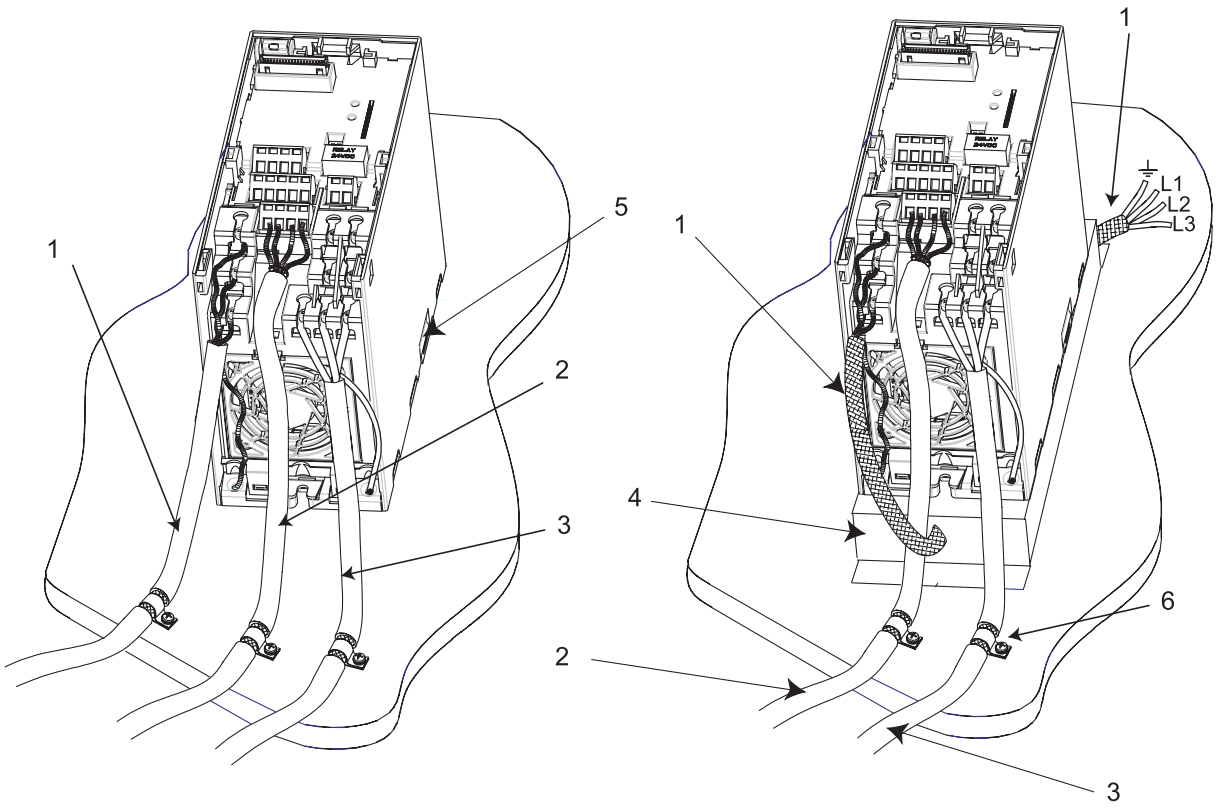


Figure 2-4 Wiring Guidelines to Minimize the Effects of EMI

Key	Meaning in diagrams above
1	Mains power input
2	Control cable
3	Motor cable
4	Footprint filter
5	Metal back plate
6	Use suitable clips to fix motor and control cable screens securely to metal back plate

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

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.
- This equipment is capable of providing internal motor overload protection in accordance with UL508C section 42. Refer to P0610 (level 3) and P0335. Motor overload protection can also be provided using an external PTC via a digital input.
- 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 230/460V when protected by a time delay fuse (*see Table on Page 93)*.
- 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.

The MICROMASTER 420 is supplied with a Status Display Panel (SDP) and default parameter settings that cover the following requirements:

- The motor rating data, Voltage, Current and Frequency are all compatible with the inverter data. (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 the parameter listing in these Operating Instructions.

For changing parameters you will need one of the optional modules "Basic Operator Panel" (BOP) or the "Advanced Operator Panel" (AOP) described below.

Furthermore the parameters can be changed by communication options (refer to the Reference Manual).

For instruction on how to exchange/replace the Operator Panels see Appendix A

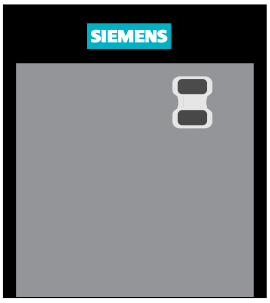
Note

- The same BOP/AOP can be used for each MICROMASTER 420. After changing the parameters replace the BOP/AOP by the SDP.
- The terminal layout for connecting power and control cables is shown in the photograph on the inside of the back cover of this manual.

3.1 Front Panels for the MICROMASTER 420

Front panels

The front panels shown below are available for use with the MICROMASTER 420 Inverters. The panel on the left is supplied with the inverter as standard and is referred to as the Status Display Panel (SDP). The Basic Operator Panel (BOP) and Advanced Operator Panel (AOP) are available as options.



Status Display Panel
(Standard)

Basic Operator Panel
(Option)

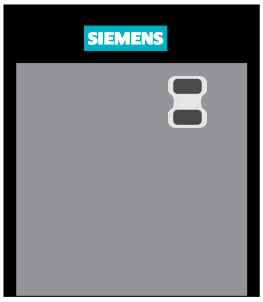
Advanced Operator Panel
(Option)

Figure 3-1 Panels available for the MICROMASTER 420 Inverter

Changing the front panel

The procedure for removing the SDP and fitting the BOP or AOP, which are available as options, is described in Appendix A.

3.1.1 Commissioning with the Status Display Panel (SDP)



The SDP is supplied with your MICROMASTER 420 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, that covers a lot 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.

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

	Terminals	Parameter	Default Operating
Digital Input 1	5	P0701 = ‘1’	ON right
Digital Input 2	6	P0702 = ‘12’	Reverse
Digital Input 3	7	P0703 = ‘9’	Fault Reset
Output Relay	10/11	P0731 = ’52.3’	Fault Identification
Analogue Output	12/13	P0771 = 21	Output Frequency
Analogue input	3/4	P0700 = 0	Frequency Setpoint
	1/2		Analog Input supply

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 6.2 the inverter states, indicated by the two LEDs are explained.

3.1.2 Basic operation with SDP

With the **SDP** fitted, the following is possible:

- Start and stopping the motor
- Reversing the motor
- Fault Reset

Controlling the speed of the motor
Connect the terminals as shown in the figure below.

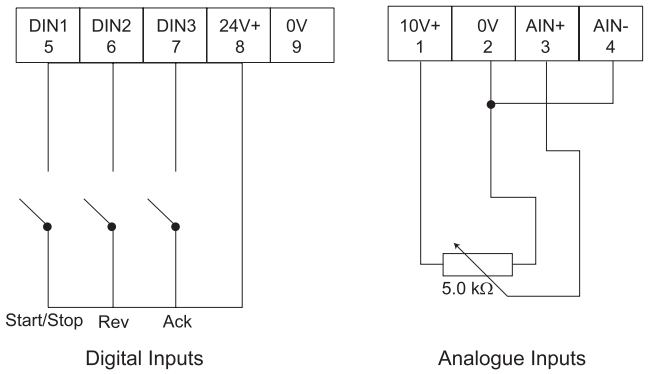


Figure 3-2 Basic operation with SDP

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

3.1.3 Commissioning with the Basic Operator Panel (BOP)

The Basic Operator Panel (BOP), which is available as an option, provides access to the inverter parameters and enables you to customize the settings of your MICROMASTER 420. The BOP can be used to configure several MICROMASTER 420 Inverters. There is no need to purchase a separate BOP for each inverter.

It should be noted that the BOP, by default is disabled. To control the motor via the BOP, parameter P0700 should be set to 1.

Table 3-2 shows the factory default settings for operation via the Basic Operator Panel.

Table 3-3 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)	kW (Hp)
P0310	Rated motor frequency	50 Hz (60 Hz)
P0311	Rated Motor Speed	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 converter	Pressing the button starts the converter. This button is disabled by default. To enable this button set P0700 = 1.
	Stop converter	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.
	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. See also Section 5.1.2 on page 44. It works by pressing and holding the button. It shows the following, starting from any parameter during operation: 1. DC link voltage (indicated by d). 2. output current. (A) 3. output frequency (Hz) 4. output voltage (o). 5. The value (selected in P0005).
	Access parameters	Pressing this button allows access to the parameters.
	Increase value	Pressing this button increases the displayed value. To change the Frequency Setpoint via the BOP set P1000 = 1.
	Decrease value	Pressing this button decreases the displayed value. To change the Frequency Setpoint via the BOP set P1000 = 1.

Figure 3-3 Buttons on the Basic Operator Panel

Changing parameters with the BOP

The following description shows how to change the parameter P1082, use this description as a guide for setting any parameters using the 'BOP'.

	Step	Result on display
1	Press P to access parameters	r0000
2	Press ▲ until P0010 is displayed	P0010
3	Press P to access P0010 parameter value level	0
4	Press ▲ to set P0010 = 1	1
5	Press P to save and exit parameter value level	P0010
6	Press ▲ until P1082 is displayed	P1082
7	Press P to access P1082 parameter value level	50.00
8	Press ▼ to select desired maximum frequency	35.00
9	Press P to save and exit parameter value level	P1082
10	Press ▼ to return to P0010	P0010
11	Press P to access P0010 parameter value level	1
12	Press ▼ to return value to P0010 = 0	0
13	Press P to save and exit parameter value level	P0010
14	Press ▼ to return to r0000	r0000
15	Press P to exit Parameterization	35.00
	The LCD will alternate between actual frequency and the requested frequency setpoint	00.00

Figure 3-4 Changing parameters via the BOP

The required maximum frequency has now been stored.

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

Motor data for parameterization

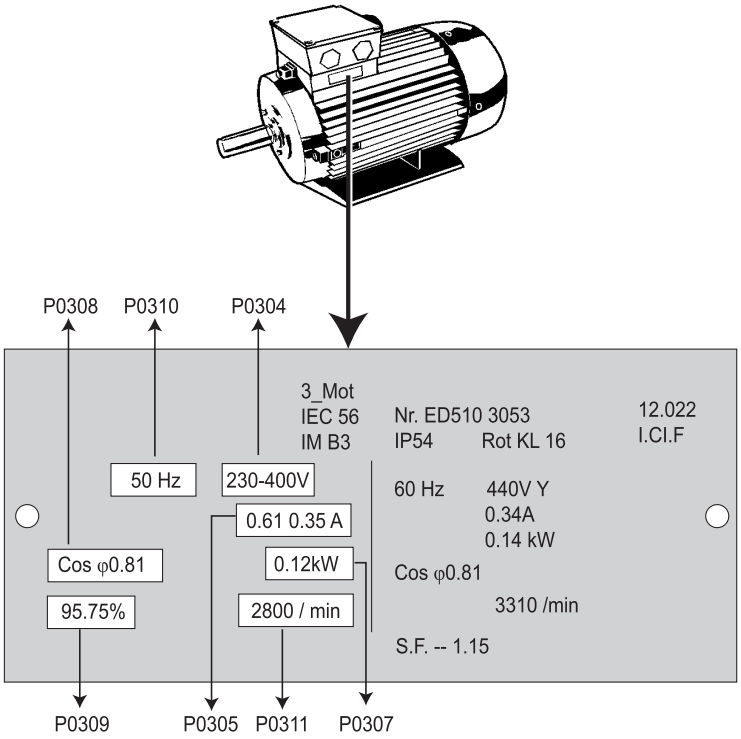
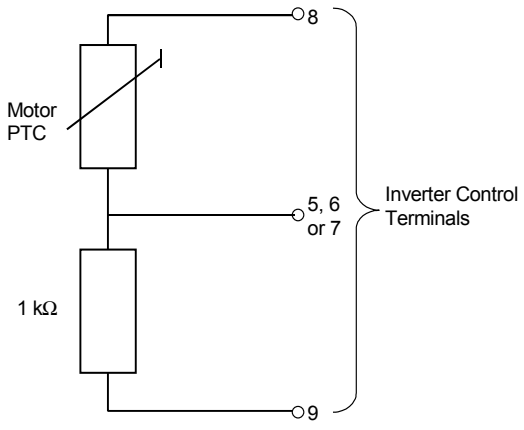


Figure 3-5 Typical Motor Rating Plate Example

Note

- Changing motor parameters is not possible unless P0010=3.
- 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 as shown in Figure 3-6.

Figure 3-6 Motor Overload PTC Connection

Note:

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

3.1.4 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
- ➢ Programmable via PC
- ➢ Multidrop capability to drive up to 30 MICROMASTER 4's

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

3.2 General operation

For a full description of standard and extended parameters, please refer to Section 6.

3.2.1 General

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 3-5 for details on how to read motor data.

Notes

- ♦ Changing motor parameters is not possible unless P0010 = 1.
- ♦ You must set P0010 back to 0 in order to initiate run.

3.2.2 Basic operation with SDP

Prerequisites

- ➢ The terminals are connected like shown in Figure 3-2

- ♦ Start and stop the motor via switch between terminals 5 and 8
- ♦ Reverse the motor via switch between terminals 6 and 8
- ♦ Control the motor speed by the potentiometer, connected to the terminals 1 to 4

3.2.3 Basic operation with the BOP

Prerequisites

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

1. Press the green (RUN) Button to start the motor.
2. Press the 'UP' Button while the motor is turning. Motor speed increases to 50 Hz.
3. When the inverter reaches 50 Hz, press the 'DOWN' Button. Motor speed and display is decreased.
4. Change the direction of rotation with the FORWARD / REVERSE Button.
5. The red button STOPS the motor.

Block Diagram

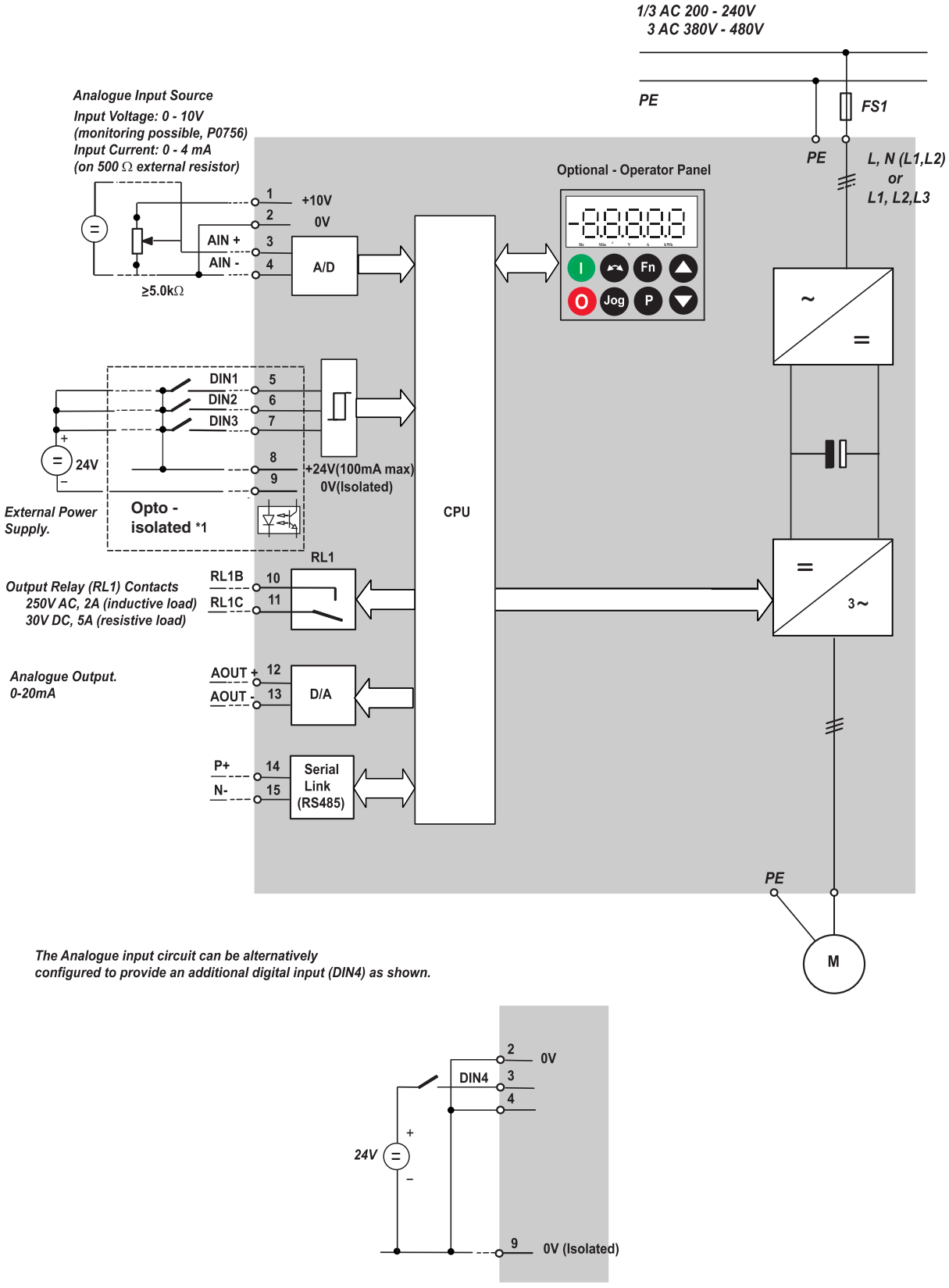


Figure 3-7 Inverter block diagram

4 Using the MICROMASTER 420

This Chapter contains:

- An explanation of the various methods of controlling your inverter

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.
- This equipment is capable of providing internal motor overload protection in accordance with UL508C section 42. Refer to P0610 (level 3) and P0335. Motor overload protection can also be provided using an external PTC via a digital input.
- 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 230/460V when protected by a time delay fuse (*see Table on Page 93)*
- This equipment must not be used as an 'emergency stop mechanism' *(see EN 60204, 9.2.5.4)*

4.1 Frequency Setpoint

- Standard: Terminal 3/4 (AIN+/ AIN -)
- Options 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 System Parameters on page 43.

Starting the motor

- Standard Terminal 5 (DIN 1)
- Options see P0701 to P0704

Stopping the motor

There are several ways to stop the motor:

- Standard
  - OFF1 Terminal 5 (DIN 1)
  - 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
- Options see P0701 to P0704

Reversing the motor

- Standard Terminal 6 (DIN 2)
- Options see P0701 to P0704

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 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 number e.g. DIN3 is active.
- OFF1 can be combined with DC braking or Compound braking

4.3.2 OFF2

This command causes the motor to coast to a standstill.

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, P0701, P0702, P0703 and P0704.

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 or compound 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.

- set DC braking: see P0701 to P0704
- set braking period: see P1233
- set braking current: see P1232

Note

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

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

4.4 Control Modes (P1300)

The various modes of operation of the MICROMASTER 420 control the relationship between the speed of the motor and the voltage supplied by the inverter. There are four modes of operation:

- **Linear V/f control**
  Can be used for variable and constant torque applications, such as conveyors and pumps.
- **Flux Current Control (FCC)**
  This control mode can be used to improve the efficiency and dynamic response of the motor.
- **Quadratic V/f control**
  This mode can be used for variable torque loads, such as fans and pumps.
- **Multi-point V/f control**
  For information regarding this mode of operation, please consult the MM420 Reference Manual.

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 for further information.

BOP fitted

If a BOP is fitted, the fault states and warnings listed in Section 6.3 for further information.

5 System Parameters

This Chapter contains:

- A functional overview of the parameters available for customizing your MICROMASTER MM420 Inverter
- A detailed list of the parameters used (including value range and default setting)
- An in-depth description of what the parameter actually does

5.1 Overview of MICROMASTER System Parameters

5.1.1 Default setup

The MM420 is supplied with a Status Display Panel (SDP). To change parameters it is necessary to use a Basic Operator Panel (BOP), Advanced Operator Panel (AOP) or an external serial interface. The MM420 is therefore delivered with the following default settings:

- Motor Parameters to suit a Siemens 4 pole motor to match the drive power and voltage.
- Setpoint control from the Analog input; 0 – 10V corresponding to 0 to 50 Hz or 0 to 60 Hz (North America).
- Digital inputs:

  DIN 1 Run right
  DIN 2 Reverse
  DIN 3 Fault Reset

- DIP switch 2

  Off position: European defaults (50Hz, kW etc.)
  On position: North American Defaults (60Hz, hp etc.). Refer to P0100 for further details.

- DIP switch 1 is not for customer use.
- Relay – Fault conditions.
- Analogue Output – Output frequency

5.1.2 Basic Operator Panel Function (Fn) Button

Use of Function button.
The Function button is used to view additional information. To view additional information the following actions should be performed:

From any parameter, press and hold the function button during operation.
1. The display will change to show the DC link voltage (indicated by d).
2. Press the function button again to show the output current (A).
3. Press the function button again to show the output frequency (Hz).
4. Press the function button again to show the output voltage (indicated by o).
5. Press the function button again to show the function that has been selected for display in P0005. (If P0005 is set to show any of the above (3,4, or 5) then this will not be shown again.)

Note

Additional presses will toggle around the above displays.

Press and hold the function button at any point in the cycle to display at any point in the cycle; the parameter number you started from (e.g. r0000) and release to return to that display.

Scrolling Function

When the user is required to change a value of a parameter, the button and the button on the BOP are used to increase and decrease the value respectively.

When the user is required to change a value of a parameter, the button and the button on the BOP are used to increase and decrease the value respectively.

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.

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.

5.2 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.

Notes

- If you press the ∆ or ∇ button momentarily, the values change step by step. If you keep the buttons pressed for a longer time, the values scroll through rapidly.
- In the parameter tables:
  - '🔑' Parameters can only be changed during quick commissioning, e.g. if P0010 = 0.
  - '●' Indicates parameters that can be changed during operation.
  - '***' Indicates that the value of this factory setting depends on the rating of the inverter.

  All other parameters can only be changed when the inverter is stopped.
- 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  for maximum of five seconds. This means the inverter is busy with tasks of higher priority.

5.2.1 Access Levels

There are four levels of user access, Standard, Extended, Expert and Service selectable by parameter P0003. For most applications, Standard and Extended parameters are sufficient.

The number of parameters that appear within each functional group depends on the access level set in parameter P0003. This document describes access levels 1 and 2 (standard and extended) other settings are describe in the Reference Manual.

5.2.2 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.

5.2.3 Reset to Factory default

To reset all parameters to the factory default settings; the following parameters should be set as follows:

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

Note
The reset process takes approximately 10 seconds to complete.

5.2.4 Parameter Overview Levels 1 and 2

The following is an overview of Level 1 and 2 parameters. For a complete description of all Level 1 and 2 parameters, see Section 5.3.

Quick Commissioning P0010=1

P	0100	Europe / North America 🗝
P	0300	Select motor type 🗝
P	0304	Rated motor voltage 🗝
P	0305	Rated motor current 🗝
P	0307	Rated motor power 🗝
P	0308	Rated motor cosPhi 🗝
P	0309	Rated motor efficiency 🗝
P	0310	Rated motor frequency 🗝
P	0311	Rated motor speed 🗝
P	0335	Motor cooling 🗝
P	0640	Max. output current
P	0700	Command of PZD via
P	1000	Selection of frequency setpoint
P	1080	Min. frequency
P	1082	Max. frequency
P	1120	Ramp-up time
P	1121	Ramp-down time
P	1135	OFF3 Ramp-down time
P	1300	Control mode
P	3900	Quick parameterization 🗝

Inverter Unit P0004=2

P	0003	BOP/AOP read access level
P	0010	Drive commissioning
r	0018	Firmware version
r	0026	Act. DC-link voltage
r	0039	Power consumption [kWh]
P	0040	Reset power consumption
r	0206	Rated drive power
r	0207	Rated drive current
r	0208	Rated drive voltage
P	1800	Switching frequency
P	1820	Reverse output phase sequence

Motor Data P0004=3

P	0003	BOP/AOP read access level
P	0010	Drive commissioning
r	0034	Motor utilization
P	0300	Select motor type 🗝
P	0304	Rated motor voltage 🗝
P	0305	Rated motor current 🗝
P	0307	Rated motor power (kW or hp) 🗝
P	0308	Rated motor cosPhi 🗝
P	0309	Rated motor efficiency 🗝
P	0310	Rated motor frequency 🗝
P	0311	Rated motor speed 🗝
P	0335	Motor cooling 🗝
P	0340	Calc motor model and control
P	0350	Stator resistance phase-to-phase
P	0611	Motor I^2t time constant
P	0614	Motor I^2t overload warning level
P	0640	Max. output current
P	1910	Select motor data identification
r	1912	Identified stator resistance

Commands and Digital I/O P0004=7

r	0002	Drive state
P	0003	BOP/AOP read access level
P	0010	Drive commissioning
r	0052	Statusword 1
r	0053	Statusword 2
P	0700	Command of PZD via
P	0701	Selection digital input1
P	0702	Selection digital input2
P	0703	Selection digital input3
P	0704	Selection digital input4
r	0722	Binary input values
P	0731	Binary output

Analogue I/O P0004=8

P	0003	BOP/AOP read access level
P	0010	Drive commissioning
r	0752	Analogue input in V
r	0754	Analogue output in %
r	0755	Act. ADC value normalized (4000h)
P	0756	Type of ADC
P	0757	Value x1 of ADC characteristic
P	0758	Value y1 of ADC characteristic
P	0759	Value x2 of ADC-characteristic
P	0760	Value y2 of ADC-characteristic
P	0761	Width of deadband
P	0771	DAC
r	0774	Analog output value
P	0777	Value x1 of DAC-characteristic
P	0778	Value y1 of DAC-characteristic
P	0779	Value x2 of DAC-characteristic
P	0780	Value y2 of DAC-characteristic
P	0781	Analogue output deadband

Setpoint Channel & Ramp Generator P0004=10

P	0003	BOP/AOP read access level
P	0010	Drive commissioning
P	1000	Selection of frequency setpoint
P	1001	Fixed frequency 1
P	1002	Fixed frequency 2
P	1003	Fixed frequency 3
P	1004	Fixed frequency 4
P	1005	Fixed frequency 5
P	1006	Fixed frequency 6
P	1007	Fixed frequency 7
P	1031	Setpoint memory of the MOP
P	1040	Setpoint of the MOP
P	1058	JOG frequency right
P	1059	JOG frequency left
P	1060	JOG ramp-up time
P	1061	JOG ramp-down time
P	1080	Min. frequency
P	1082	Max. frequency
P	1120	Ramp-up time
P	1121	Ramp-down time
P	1130	Initial rounding time for ramp-up
P	1131	Final rounding time for ramp-up
P	1132	Initial rounding time for ramp-down
P	1133	Final rounding time for ramp-down
P	1134	Rounding type

Drive Features P0004=12

P	0003	BOP/AOP read access level
P	0004	Parameter for r0000 display
P	0010	Drive commissioning
P	1200	Start on the fly
P	1210	Automatic restart
P	1215	Mode of the MHB
P	1216	Opentime of the MHB
P	1217	Closetime of the MHB
P	1232	Current of DC braking
P	1233	Duration of DC braking
P	1236	Compound braking current

Motor Control P0004=13

P	0003	BOP/AOP read access level
P	0010	Drive commissioning
r	0021	Act. frequency
r	0025	Act. output voltage
r	0027	Act. output current
r	0056	Statusword 1 for V/F and VC
P	1300	Control mode
P	1310	Continuous boost
P	1311	Acceleration boost
P	1312	Starting boost
P	1333	Start frequency for FCC
P	1335	Slip compensation gain
P	1336	Slip limit

Communication P0010=20

P	0003	BOP/AOP read access level
P	0010	Drive commissioning
P	0918	CB bus address
P	0927	Parameters changeable via
P	2000	Reference frequency
P	2010	USS baud rate
P	2011	USS address

Alarms, Warnings & Monitoring P0010=21

P	0003	BOP/AOP read access level
P	0010	Drive commissioning
r	0947	Fault number
r	2110	Warning number
r	2197	Statusword 1 of monitor

PI Controller P0004=22

P	0003	BOP/AOP read access level
P	0010	Drive commissioning
P	2200	Enable PI controller
P	2201	Fixed setpoint 1
P	2202	Fixed setpoint 2
P	2203	Fixed setpoint 3
P	2204	Fixed setpoint 4
P	2205	Fixed setpoint 5
P	2206	Fixed setpoint 6
P	2207	Fixed setpoint 7
r	2224	Connector: fixed PI setpoint
P	2231	Setpoint memory of the MOP
P	2232	Inhibit keypad setpoint reverse direction
P	2240	Setpoint of the MOP
r	2250	Active digital PI output setpoint
P	2253	Source: PI setpoint
P	2257	Acceleration time for PI setpoint
P	2258	Deceleration time for PI setpoint
r	2260	PI setpoint
P	2264	PI feedback
P	2265	PI feedback filter time constant
r	2266	PI feedback
P	2271	PI transducer type
P	2272	Connector: PI scaled feedback signal
r	2273	PI error
P	2280	PI proportional gain
P	2285	PI integral time
P	2291	PI upper limit
P	2292	PI output lower limit
r	2294	PI output

Factory settings P0010=30

P	0003	BOP/AOP read access level
P	0010	Drive commissioning
P	0970	Factory settings

5.3 System Parameters and Definitions

Parameter Number	Parameter Name	Min Max [Default] Units	♦P0003 User Access Level ♦P0004 Setting ♦Changeable ♦Status
r0000	**Drive Display** Displays the user selected output as defined in P0005. **Note:** Pressing the "Fn" button for 2 seconds allows the user to view the values of DC link voltage, output current, output frequency, output voltage, and chosen r0000 setting (defined in P0005).	- - [-] -	1 7
r0002	**Drive State** Displays the actual drive state. **Possible values:** 0 "Commissioning Mode– (P0010 ≠ 0)" 1 "Ready to Run" 2 "Fault" 3 "Starting – DC Link Precharging" 4 "Running" 5 "Stopping – (ramping down)" **Note**: State 3 will only be visible while precharging DC Link and when externally powered communications board is fitted.	0 5 [-] -	2 7
P0003	**User access level** Defines the access level into parameter sets. For most simple applications the default (standard) setting is sufficient. **Possible Settings:** 0 "User defined parameter list – see P0013 (Level 3) for details on use" 1 "Standard": allows access into most frequently used parameters 2 "Extended": allows extended access to inverter I/O functions 3 "Expert": for expert use only. 4 "Service": only for use by authorized service personnel –password protected.	0 4 [1] -	1 All '●'

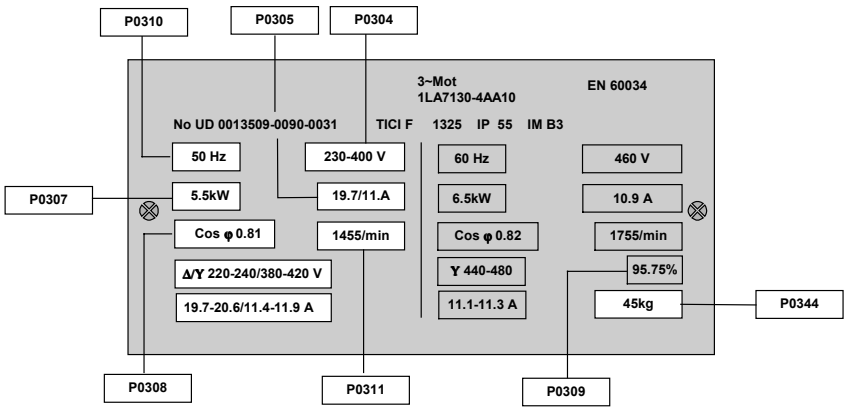
Parameter Number	Parameter Name	Min Max [Default] Units	♦P0003 User Access Level ♦P0004 Setting ♦Changeable ♦Status
P0004	**Parameter Filter** Filters the available parameters by functionality so that a more focussed commissioning approach is possible. For example, with P0004=22, only the PI parameters will be visible. **Possible Settings:** 0 "All parameters" 2 "Inverter" 3 "Motor" 7 "Commands & digital I/O" 8 "Analogue I/O" 10 "Setpoint channel & ramp generator" 12 "Drive features" 13 "Motor control" 20 "Communication" 21 "Alarms, warnings & monitoring" 22 "PI Controller" **Note:** It is possible to start the inverter with any setting of P0004. Some parameters are "Commissioning only" parameters and can be viewed within this "filter" parameter, but these can only be set using P0010=1 (Quick Commissioning). These parameters are defined with the key symbol '🗝' in the right hand column.	0 22 [0] -	1 All '●'
P0005	**Display selection** Selects display for parameter r0000 **Most common settings:** 21 Actual frequency 25 Output voltage 26 DC link voltage 27 Output current **Note:** The settings here refer to read only parameter numbers. Please see the appropriate "rXXXX" parameter descriptions for further details.	0 4000 [0] -	2 12 '●'
P0010	**Parameter groups for commissioning** This setting allows the parameters to be filtered so that only those related to a group of functions are selected, as shown in the table below. **Possible settings:** 0 Ready to Run 1 Quick Commissioning 30 Factory setting **Notes:** **1 This parameter must be reset to 0 before the inverter will run (Automatic when P3900 ≠ 0 (default)).** **2** The accessible parameters are also affected by the User Access Level parameter (P0003).	0 30 [0] -	1 All

Parameter Number	Parameter Name	Min Max [Default] Units	♦P0003 User Access Level ♦P0004 Setting ♦Changeable ♦Status
r0018	**Firmware version** Displays the version number of the installed firmware.	- - [0] -	1 2
r0021	**Inverter output frequency (excluding slip compensation)** 	- - [-] Hz	2 13
r0025	**Inverter output voltage** Displays the rms., voltage applied to the motor.	- - [-] V	2 13
r0026	**DC-Link voltage** 	- - [-] V	2 2
r0027	**Motor current** Displays the rms. value of the motor current (A)	- - [-] A	2 13
r0034	**Motor thermal protection (I^2t)** Displays the calculated motor temperature as a percentage of the maximum allowed value. **Note:** A value of 100% means that the motor has reached its maximum allowed operating temperature. When this occurs the inverter will attempt to reduce the motor loading as defined by parameter P0610 (Level 3).	- - [-] %	2 3
r0039	**Energy consumption meter [kWhours]** Displays the electrical energy used by the drive since the display was last reset (see P0040) **Note:** Value will get reset when P3900=1 (during quick commissioning), or when P0970=1 (factory reset) or by using P0040.	0 - [0] kWhours	2 2
P0040	**Reset energy consumption [kWh] meter** Resets energy consumption display to zero. **Possible Settings**: 0 = No reset 1 = Reset r0039 to 0 **Note:** Reset occurs when “P” is pressed.	0 1 [0] -	2 2

Parameter Number	Parameter Name	Min Max [Default] Units	♦P0003 User Access Level ♦P0004 Setting ♦Changeable ♦Status
r0052	**Status word 1** This parameter displays the first active status word of the inverter (bit format) and can be used to diagnose inverter status. A description of the Status word display segments is given in the Parameter Introduction and can be interpreted as follows. **Possible values:** Bit 0 Drive ready 0 NO / 1 YES Bit 1 Drive ready to run 0 NO / 1 YES Bit 2 Drive running 0 NO / 1 YES Bit 3 Drive fault active 0 YES / 1 NO Bit 4 OFF2 active 0 YES / 1 NO Bit 5 OFF3 active 0 YES / 1 NO Bit 6 Switch on inhibit active 0 NO / 1 YES Bit 7 Drive warning active 0 NO / 1 YES Bit 8 Deviation setpoint/actual value 0 YES / 1 NO Bit 9 PZD control (Process Data Control) 0 NO / 1 YES Bit A Maximum frequency reached 0 NO / 1 YES Bit b Warning: Motor current limit 0 YES / 1 NO Bit C Motor holding brake active 0 YES / 1 NO Bit d Motor overload 0 YES / 1 NO Bit E Motor running direction right 0 NO / 1 YES Bit F Inverter overload 0 YES / 1 NO	- - [-] -	2 7

Parameter Number	Parameter Name	Min Max [Default] Units	♦P0003 User Access Level ♦P0004 Setting ♦Changeable ♦Status
r0053	**Status word 2** This parameter displays the second status word of the inverter (in bit format). It can be used to diagnose the status of the inverter by referring to the information given in the Introduction. **Possible values:** Bit 0 DC brake active: 0 NO, 1 YES Bit 1 Inverter frequency < switch off limit: 0 YES, 1 NO Bit 2 Inverter frequency < minimum frequency: 0 YES, 1 NO Bit 3 Current ≥ limit: 0 NO, 1 YES Bit 4 Actual frequency > reference frequency: 0 NO, 1 YES Bit 5 Actual frequency < reference frequency: 0 NO, 1 YES Bit 6 Actual frequency ≥ setpoint: 0 NO, 1 YES Bit 7 Voltage < threshold: 0 NO, 1 YES Bit 8 Voltage > threshold: 0 NO, 1 YES Bit 9 reserve: 0 NO, 1 YES Bit A PI frequency < threshold: 0 NO, 1 YES Bit b PI saturation: 0 NO, 1 YES	- - [-] -	2 7

Parameter Number	Parameter Name	Min Max [Default] Units	♦P0003 User Access Level ♦P0004 Setting ♦Changeable ♦Status
r0056	**Status word 1 for V/F** Displays Statusword (V/f) in bit format, which can be used to diagnose inverter status. Refer to diagram in r0052 for display layout. **Possible values:** Bit 0 Initialization control finished 0 NO / 1 YES Bit 1 Motor demagnetizing finished 0 NO / 1 YES Bit 2 Pulses enabled 0 NO / 1 YES Bit 3 Voltage soft start select 0 NO / 1 YES Bit 4 Motor excitation finished 0 NO / 1 YES Bit 5 Starting boost active 0 NO / 1 YES Bit 6 Acceleration boost active 0 NO / 1 YES Bit 7 Frequency is negative 0 NO / 1 YES Bit 8 Field weakening active 0 NO / 1 YES Bit 9 Volts setpoint limited 0 NO / 1 YES Bit A Slip frequency limited 0 NO / 1 YES Bit b I-max controller active 0 NO / 1 YES Bit C Vdc-max controller active 0 NO / 1 YES Bit F Vdc-min controller active 0 NO / 1 YES	- - [-] -	2 13
P0100	**Operation for Europe / North America** Determines whether power settings (e.g. nominal rating plate power – P0307) are expressed in kW or hp. The default settings for the nominal rating plate frequency (P0310) and maximum motor frequency (P1082) are also set automatically here, in addition to reference frequency (P2000). **Possible settings:** 0 = Power settings in kW; frequency default 50 Hz (Use DIP Switch 2). 1 = Power settings in hp; frequency default 60 Hz (Use DIP Switch 2) 2 = Power settings in kW; frequency default 60 Hz **Warning**: THE SETTING OF THE kW / HP DIP SWITCH UNDER THE OPERATOR PANEL WILL OVERWRITE SETTINGS 0 OR 1 AT POWER-UP. Setting 2 will not be overwritten. **Note**: This parameter can only be changed when P0010=1 (Commissioning Mode).	0 2 [0] -	1 1 '8🗝'
r0206	**Inverter power rating** Displays the nominal motor power rating, which can be supplied by the inverter. **Note:** The display will be in kW or hp dependent on the setting of P0100	- - [-] -	2 2

Parameter Number	Parameter Name	Min Max [Default] Units	♦P0003 User Access Level ♦P0004 Setting ♦Changeable ♦Status
r0207	**Inverter current rating** Displays the maximum continuous output current of the inverter.	- - [-] A	2 2
r0208	**Nominal inverter input voltage** Displays nominal AC supply voltage of the inverter. **Possible values:** 230 = 200-240V ± 10% 400 = 400-480V ± 10%	- - [-] V	2 2
P0300	**Select motor type** Selects motor type. **Possible settings:** 1 = Asynchronous motor. 2 = Synchronous motor. **Note 1:** This parameter can only be changed when P0010=1 This parameter is required during commissioning to select motor type and optimize inverter performance. Most motors are asynchronous; if in doubt, use the formula below. (P0310 x 60) / P0311 If the result is a whole number, the motor is synchronous. **Note 2:** If synchronous motor is selected, the following functions are not available: Power Factor (P0308), Motor efficiency (P0309), magnetization time (P0346, Level 3), demagnetization time (P0347, Level 3), flying restart (P1200, P1202, Level 3, P1203, Level 3), DC braking (P1230, Level 3, P1232, P1233), slip compensation (P1335), slip limit (P1336).	1 2 [1] -	2 3 '🔑'
P0304	**Rated motor voltage** Nominal motor voltage (V) from rating plate. Following diagram show you where to find the motor data from your motor.  **Note:** This parameter can only be changed when P0010=1.	10 2000 [***] V	1 3 '🔑'

Parameter Number	Parameter Name	Min Max [Default] Units	♦P0003 User Access Level ♦P0004 Setting ♦Changeable ♦Status
P0305	**Rated motor current**	0.12 10000 [***] A	1 3 '🔑'
	Nominal motor current (A) from rating plate – see diagram P0304 **Note:** This parameter can only be changed when P0010=1 Maximum value is defined as 2 * inverter rated current (r0207) Minimum value is defined as 1/32 * inverter rated current (r0207)		
P0307	**Rated motor power**	0.01 2000 [***] -	1 3 '🔑'
	Nominal motor power (kW) from rating plate. If P0100 = 1, values will be in hp - see diagram P0304 **Note:** This parameter can only be changed when P0010=1		
P0308	**Rated motor cos ϕ**	0 1 [0] -	2 3 '🔑'
	Nominal motor power factor (cos ϕ) from rating plate - see diagram P0304		
	Note: This parameter can only be changed when P0010=1 This parameter is only visible when P0100 = 0 or 2, i.e. when the motor power is entered in kW. **Note:** A setting of 0 will cause the value to be calculated internally.		
P0309	**Rated motor efficiency**	0 100 [0] %	2 3 '🔑'
	Nominal motor efficiency (%) from rating plate - see diagram P0304.		
	Note: This parameter can only be changed when P0010=1 This parameter is only visible when P0100 = 1, i.e. when the motor power is entered in hp. **Note:** A setting of 0 will cause the value to be calculated internally.		
P0310	**Rated motor frequency**	12 650 [50] Hz	1 3 '🔑'
	Nominal motor frequency (Hz) from rating plate - see diagram P0304		

Parameter Number	Parameter Name	Min Max [Default] Units	♦P0003 User Access Level ♦P0004 Setting ♦Changeable ♦Status
P0311	**Rated motor speed** **Note 1:** Nominal motor speed (rpm) from rating plate - see diagram P0304 **Note 2:** This parameter can only be changed when P0010=1 **Note 3** This parameter must be correct for slip compensation to function properly. **Note 4:** A setting of 0 will cause the value to be calculated internally.	0 40000 [***] 1/min	1 3 '🔑'
P0335	**Motor cooling** Specifies motor cooling system used **Possible settings:** 0 self-cooled – using shaft mounted fan attached to motor 1 force-cooled – using separately powered cooling fan	0 1 [0] -	2 3
P0340	**Calculation of motor parameters** **Possible settings:** 0 "No calculation" 1 "Calculation of motor parameters from entered rating plate data" Calculates a variety of motor parameters, including P0344 (Level 3) (motor weight), P0350 (stator resistance), P0346 (Level 3) (magnetization time) and P0347 (Level 3) (demagnetization time), P2000 (reference frequency), P2002 (Level 3) (reference current). **Note** This parameter is required during commissioning to optimize the inverter performance.	0 1 [0] -	2 3
P0350	**Stator resistance line-to-line** Stator resistance value in Ohms for the connected motor. There are three methods to determine the value for this parameter: 1. It is possible to calculate this value using P0340 = 1 2. It is possible to measure this value using P1910 = 1 3. Manual measurement using an Ohmmeter. **Note** The value entered in P0350 is the one from the method last used.	0 300 [***] Ohm	2 3 '●'
P0611	**Motor I^2t time constant** Defines motor thermal time constant and is automatically calculated from the motor data (P0340). **Note:** Larger number increases time taken for calculated motor temperature to change.	0 16000 [***] s	2 3

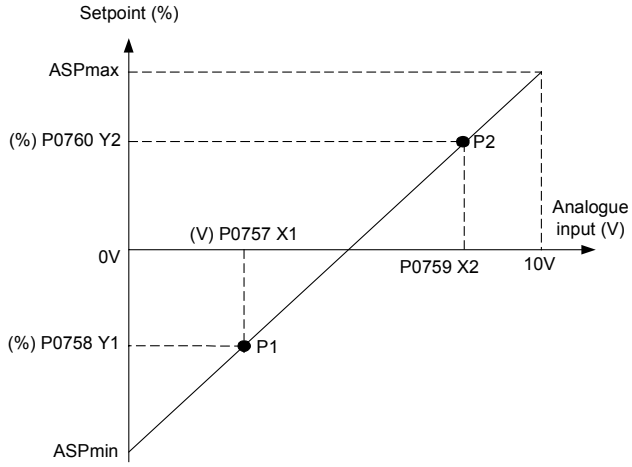
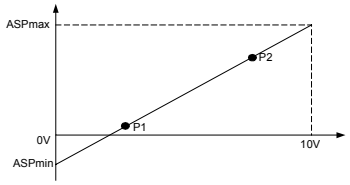
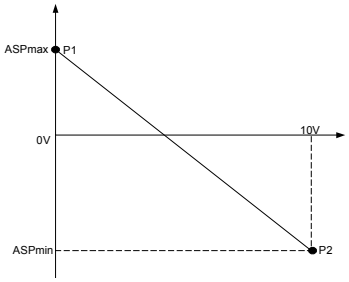
Parameter Number	Parameter Name	Min Max [Default] Units	♦P0003 User Access Level ♦P0004 Setting ♦Changeable ♦Status
P0614	**Motor I^2t overload warning level** The motor I^2t calculation estimates the duration for which the motor can be overloaded without overheating. When the maximum allowed period has been reached the motor I^2t calculation is 100% (see r0034). This parameter defines the calculated I^2t value in % at which a warning (A0511) is generated. **Note:** A motor over-temperature trip (F0011) is produced at 110% of this level.	0 400 [100] %	2 3 '●'
P0640	**Motor overload factor (%)** Defines instantaneous motor current limit as a % of the nominal motor current. This value is limited to 150% of nominal inverter current (r0207) or to 400% of the motor current (whichever is the lower).	0 400 [150] %	2 3 '●'
P0700	**Selection of command source** Parameter for selecting the digital command source. When the parameter is changed, all digital input parameters will be set to reasonable values. **Possible Settings** 0 "Factory default setting" 1 "keypad" (BOP/AOP) 2 "Terminal" 4 "USS1 on BOP-Link" (RS-232) 5 "USS2 on Comm-Link" (RS-485) 6 "PROFIBUS / Fieldbus on Comm-Link" **Note:** Changing this parameter resets the settings to default on the item selected e.g. if you change from setting 1 to setting 2, all digital inputs will now have default settings	0 6 [0] -	1 7
P0701	**Function of digital input 1** Selects function of digital input 1 0 Digital input disabled 1 ON Right 2 ON Left" (ON + Reverse) 3 OFF2 – coast to standstill 4 OFF3 – Quick ramp down (P1135 defines ramp down time) 9 Fault acknowledge 10 JOG right 11 JOG left 12 Reverse 13 Increase frequency (Main/additional setpoint=Keypad (P1000)) 14 Decrease frequency (Main or additional setpoint = Keypad) 15 Fixed frequency 1 (see P1001) 16 Fixed frequency 1 + ON (see P1001) 17 Fixed frequencies 1 to 7 (Binary Coded) (see P1001) 25 DC brake enable (see P1230 to P1233) 29 External trip 33 Disable additional setpoint (defined in P1000) 99 Enable BICO parameterization – for expert use only Can only be reset via P0700 or P3900 = 1, 2 or factory setting P0970 = 1	0 99 [1] -	2 7

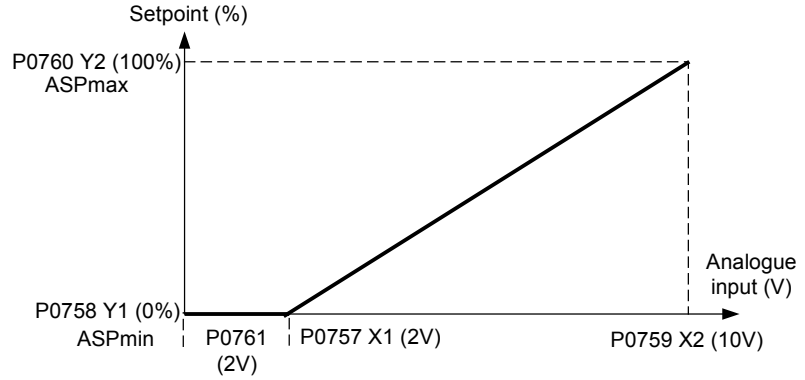
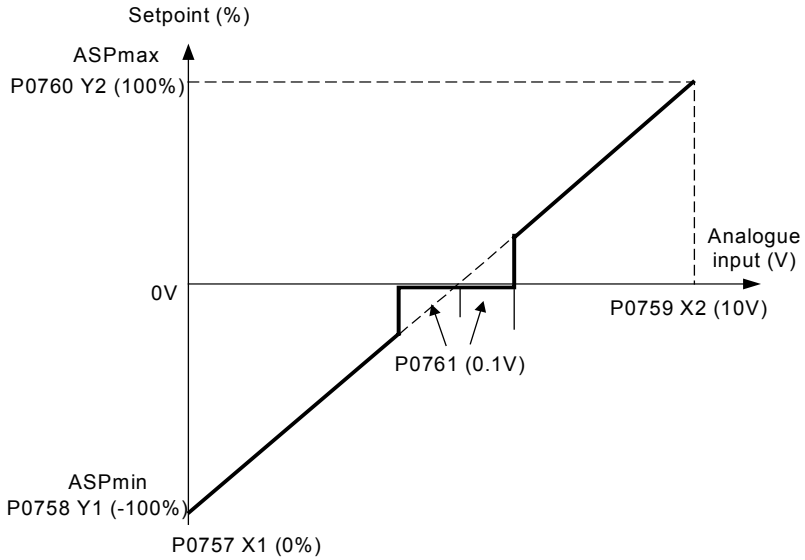
Parameter Number	Parameter Name	Min Max [Default] Units	♦P0003 User Access Level ♦P0004 Setting ♦Changeable ♦Status
P0702	**Function of digital input 2** Selects function on digital input 2. 0 Digital input disabled 1 ON Right 2 ON Left" (ON + Reverse) 3 OFF2 – coast to standstill 4 OFF3 – Quick ramp down (P1135 defines ramp down time) 9 Fault acknowledge 10 JOG right 11 JOG left 12 Reverse 13 Increase frequency (Main/additional setpoint=Keypad (P1000)) 14 Decrease frequency (Main or additional setpoint = Keypad) 15 Fixed frequency 2 (see P1002) 16 Fixed frequency 2 + ON (see P1002) 17 Fixed frequencies 1 to 7 (Binary Coded) (see P1002) 25 DC brake enable (see P1230 to P1233) 29 External trip 33 Disable additional setpoint (defined in P1000) 99 Enable BICO parameterization – for expert use only. Can only be reset via P0700 or P3900 = 1, 2 or factory setting P0970 = 1.	0 99 [12] -	2 7
P0703	**Function of digital input 3** Selects function on digital input 3. 0 Digital input disabled 1 ON Right 2 ON Left" (ON + Reverse) 3 OFF2 – coast to standstill 4 OFF3 – Quick ramp down (P1135 defines ramp down time) 9 Fault acknowledge 10 JOG right 11 JOG left 12 Reverse 13 Increase frequency (Main/additional setpoint=Keypad (P1000)) 14 Decrease frequency (Main or additional setpoint = Keypad) 15 Fixed frequency 3 (see P1003) 16 Fixed frequency 3 + ON (see P1003) 17 Fixed frequencies 1 to 7 (Binary Coded) (see P1003) 25 DC brake enable (see P1230 to P1233) 29 External trip 33 Disable additional setpoint (defined in P1000) 99 Enable BICO parameterization – for expert use only Can only be reset via P0700 or P3900 = 1, 2 or factory setting P0970 = 1.	0 99 [9] -	2 7

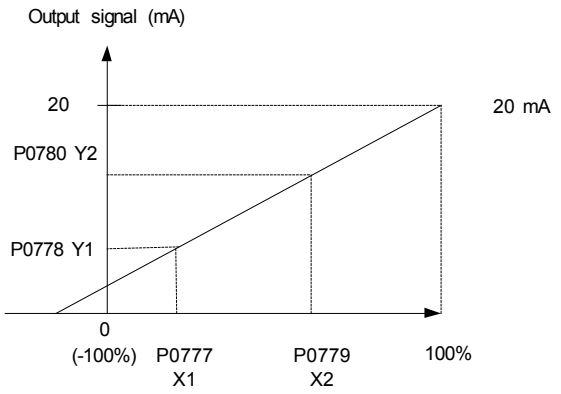
Parameter Number	Parameter Name	Min Max [Default] Units	♦P0003 User Access Level ♦P0004 Setting ♦Changeable ♦Status
P0704	**Function of digital input 4 – via analog input** Selects function on digital input 4 (via analog input) 0 Digital input disabled 1 ON Right 2 ON Left" (ON + Reverse) 3 OFF2 – coast to standstill 4 OFF3 – Quick ramp down (P1135 defines ramp down time) 9 Fault acknowledge 10 JOG right 11 JOG left 12 Reverse 13 Increase frequency (Main/additional setpoint=Keypad (P1000)) 14 Decrease frequency (Main or additional setpoint = Keypad) 25 DC brake enable (see P1230 to P1233) 29 External trip 33 Disable additional setpoint (defined in P1000) 99 Enable BICO parameterization – for expert use only Can only be reset via P0700 or P3900 = 1, 2 or factory setting P0970 = 1. **Note:** signals above 4 V are Active, signals below 1.6 V are Inactive	0 99 [0] -	2 7
r0722	**Digital input values** Bit display-showing status of digital inputs. **Possible values:** Bit 00 "Digital input 1" 0 OFF 1 **Active** Bit 01 "Digital input 2" 0 OFF 1 **Active** Bit 02 "Digital input 3" 0 OFF 1 **Active** Bit 03 "Digital input 4 (Via AIN)" 0 OFF 1 **Active** **Note** When the signal is active the segment is lit.	- - [-] -	2 7

Parameter Number	Parameter Name	Min Max [Default] Units	♦P0003 User Access Level ♦P0004 Setting ♦Changeable ♦Status
P0731	**Digital output function (relay)** 52.0 Inverter ready — 0 Closed / 1 Open 52.1 Inverter ready to run — 0 Closed / 1 Open 52.2 Inverter running — 0 Closed / 1 Open 52.3 Inverter fault active — 0 Closed / 1 Open 52.4 OFF2 active — 0 Open / 1 Closed 52.5 OFF3 active — 0 Open / 1 Closed 52.6 Switch on inhibit active — 0 Closed / 1 Open 52.7 Inverter warning active — 0 Closed / 1 Open 52.8 Deviation setpoint/actual value — 0 Open / 1 Closed 52.9 PZD control (Process Data Control) — 0 Closed / 1 Open 52.A Maximum frequency reached — 0 Closed / 1 Open 52.b Warning: Motor current limit — 0 Open / 1 Closed 52.C Motor holding brake active — 0 Open / 1 Closed 52.d Motor overload — 0 Open / 1 Closed 52.E Motor running direction right — 0 Closed / 1 Open 52.F Inverter overload — 0 Open / 1 Closed 53.0 DC brake active — 0 Closed / 1 Open 53.1 Inverter freq. less switch off limit (P2167 – level 3) — 0 Closed / 1 Open 53.2 Inverter freq. less minimum freq. — 0 Closed / 1 Open 53.3 Current greater or equal than limit (P2170 – level 3) — 0 Closed / 1 Open 53.4 Act. freq. greater comparison freq. (P2155 – level 3) — 0 Closed / 1 Open 53.5 Act. freq. less comparison freq. (P2155 – level 3) — 0 Closed / 1 Open 53.6 Act. freq. greater/equal setpoint — 0 Closed / 1 Open 53.7 Voltage less than threshold (P2172 – level 3) — 0 Closed / 1 Open 53.8 Voltage greater than threshold (P2172 – level 3) — 0 Closed / 1 Open 53.9 reserve — 0 Closed / 1 Open 53.A Controller output at lower limit (P2292) — 0 Closed / 1 Open 53.b Controller output at lower limit (P2291) — 0 Closed / 1 Open **Note** These are the most common settings. Other settings are possible in Expert mode.	0 2197.F [52.3]-	2 7 '•'
r0752	**Analog input voltage** Displays the smohthed analog input value in volts before the characteristic block	- - [-] V	2 8

Parameter Number	Parameter Name	Min Max [Default] Units	♦P0003 User Access Level ♦P0004 Setting ♦Changeable ♦Status
r0754	**Smoothed analog input value** Shows the smoothed value of the analog input in % after the characteristic block. **Note:** 100% = 10V.	- - [-] %	2 8
r0755	**Analog input value normalized to 16384 (4000 Hexadecimal)** Displays the analog input, scaled using ASPmin and ASPmax. Analog setpoint from the analog scaling function (See parameters P0757 to P0760) can vary from ASPmin to ASPmax as shown in the associated diagram. The largest **magnitude** (value without sign) of ASPmin and ASPmax defines the scaling of 16384. Examples: ASPmin = 300%, ASPmax = 100% then 16384 represents 300%. This parameter will vary from 5461 to 16384 ASPmin = -200%, ASPmax = 100% then 16384 represents 200%. This parameter will vary from –16384 to +8192 **Note:** This value is used as an input to analog **BICO** connectors	- - [-] -	2 8
P0756	**Analog input monitoring** Enables analog input monitoring. **Possible settings:** 0 = Monitoring disabled. 1 = Monitoring enabled When monitoring is enabled and a deadband is defined (P0761), a fault condition will be generated (F0080) when the analog input voltage falls below 50% of the deadband voltage. **Note:** This function is disabled if the analog scaling block (see P0757 – P0760) is programmed to output negative setpoints.	0 1 [0] -	2 8

Parameter Number	Parameter Name	Min Max [Default] Units	♦P0003 User Access Level ♦P0004 Setting ♦Changeable ♦Status
P0757	**Value X1 of analog input scaling** Parameters P0757 – P0760 are used to configure the analog input scaling as shown:  Alternative possibilities are given by the diagrams below.   **Notes:** Analog Setpoints represent a % of the normalized frequency in P2000. Analogue Setpoints may be larger than 100%. ASPmax represents the highest analog setpoint (This may be at 0V). ASPmin represents the lowest analog setpoint (This may be at 10V). Default values provide a scaling of 0V=0%, and 10V=100%**.**	0 10 [0] -	2 8 '●'
P0758	**Value Y1 of analog input scaling** Sets value of Y1 as described in P0757	-99999 99999 [0] %	2 8 '●'
P0759	**Value X2 of analog input scaling** Sets value of X2 as described in P0757	0 10 [10] V	2 8 '●'
P0760	**Value Y2 of analog input scaling** Sets value of Y2 as described in P0757	-99999 99999 [100] %	2 8 '●'

Parameter Number	Parameter Name	Min Max [Default] Units	♦P0003 User Access Level ♦P0004 Setting ♦Changeable ♦Status
P0761	**Width of deadband** Defines width of deadband on analog input. Please see following diagrams for explanations of use; **Example 1 – 2 to 10V 0 to 50Hz**  Th e above example provides a 2 to 10V, 0 to 50Hz analog input. P0757 = 2V P0761 = 2V P2000 = 50Hz **Example 2 – Center Zero (0 to 10V = - 50 to +50Hz)**  The above example provides 0 to 10V, -50Hz to +50Hz with center zero and a “holding point” 0.2V wide. P0758 = -100% P0761 = 0.1 (0.1V either side of center) P2000 = 50Hz **Note:** Fmin (P1080) should be zero when using center zero setup. There is no hysteresis at the end of the dead band	0 10 [0] V	2 8 ''

Parameter Number	Parameter Name	Min Max [Default] Units	♦P0003 User Access Level ♦P0004 Setting ♦Changeable ♦Status
P0771	**Analog output function** Defines function of the 0 –20 mA analog output. **Possible settings:** These are the most common values: 21 Actual frequency (scaled to P2000) 24 Output frequency (scaled to P2000) 25 Output voltage (scaled to 1000 V) 26 DC link voltage (scaled to 1000 V) 27 Output current (scaled to P2002 Level 3) Other values: See individual parameter descriptions	0 2248.0 [21] -	2 8 '•'
r0774	**Analog output value** Shows the value of the analog output in mA.	- - [-] %	2 8
P0777	**Value X1 of analog output characteristics** Defines the x1 output characteristic. The parameters P0777 – P0780 work as follows:  Points (x1, y1) , (x2,y2) can be chosen freely	-99999 99999 [0] %	2 8 '•'
P0778	**Value Y1 of analog output characteristics** Defines y1 of output characteristic	0 4 [0] -	2 8 '•'
P0779	**Value X2 of analog output characteristics** Defines x2 of output characteristic	-99999 99999 [100] %	2 8 '•'
P0780	**Value Y2 of analog output characteristics** Defines y2 of output characteristic	0 20 [20] -	2 8 '•'
P0781	**Analog output deadband** Sets the width of a dead-band in mA for the analog output.	0 20 [0] -	2 8 '•'

<table>
<tr><th>Parameter Number</th><th>Parameter Name</th><th>Min
Max
[Default]
Units</th><th>♦P0003 User Access Level
♦P0004 Setting
♦Changeable
♦Status</th></tr>
<tr><td>P0918</td><td>PROFIBUS address

Defines PROFIBUS address or the address of other option modules. There are two methods of setting the bus address:

1 via the PROFIBUS module DIP switches
2 via a user-entered value

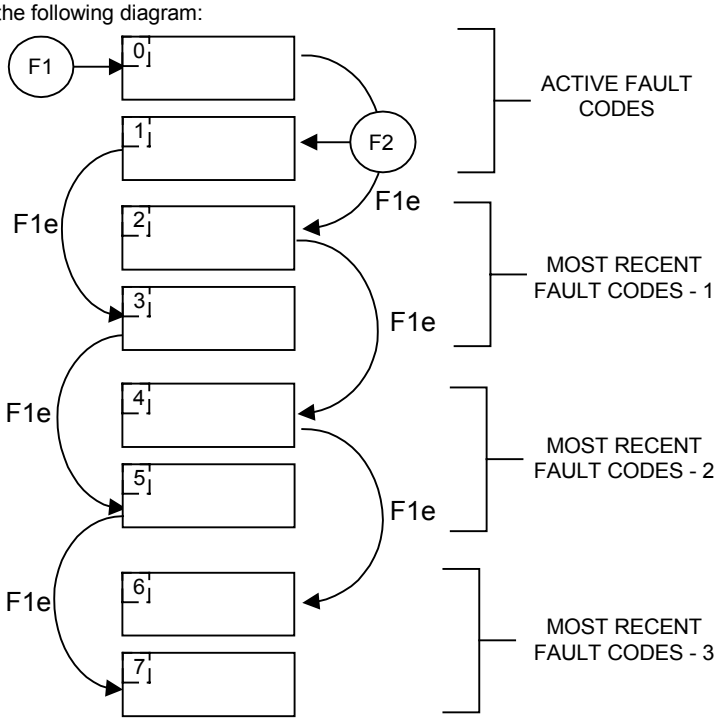
Possible PROFIBUS Settings:
1... 125
0, 126, 127 are not allowed</td><td>0
127
[3]
-</td><td>2
20</td></tr>
<tr><td>P0927</td><td>Parameters changeable via

Defines how the user is able to change parameters.

Possible Settings:

<table>
<tr><th>Setting</th><th>RS485 USS</th><th>RS232 USS</th><th>BOP</th><th>COMMS module</th></tr>
<tr><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>1</td><td>0</td><td>0</td><td>0</td><td>1</td></tr>
<tr><td>2</td><td>0</td><td>0</td><td>1</td><td>0</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>1</td><td>1</td></tr>
<tr><td>4</td><td>0</td><td>1</td><td>0</td><td>0</td></tr>
<tr><td>5</td><td>0</td><td>1</td><td>0</td><td>1</td></tr>
<tr><td>6</td><td>0</td><td>1</td><td>1</td><td>0</td></tr>
<tr><td>7</td><td>0</td><td>1</td><td>1</td><td>1</td></tr>
<tr><td>8</td><td>1</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>9</td><td>1</td><td>0</td><td>0</td><td>1</td></tr>
<tr><td>10</td><td>1</td><td>0</td><td>1</td><td>0</td></tr>
<tr><td>11</td><td>1</td><td>0</td><td>1</td><td>1</td></tr>
<tr><td>12</td><td>1</td><td>1</td><td>0</td><td>0</td></tr>
<tr><td>13</td><td>1</td><td>1</td><td>0</td><td>1</td></tr>
<tr><td>14</td><td>1</td><td>1</td><td>1</td><td>0</td></tr>
<tr><td>15</td><td>1</td><td>1</td><td>1</td><td>1</td></tr>
</table>

Note
This is a binary parameter
E.g. if you want to set value 15, you will need to set the display to indicate 15 in Binary (with the separating bars in-between “b - - n n” or if you wanted to set 11 – “b - - r n” etc.</td><td>0
15
[15]
-</td><td>2
20</td></tr>
</table>

Parameter Number	Parameter Name	Min Max [Default] Units	♦P0003 User Access Level ♦P0004 Setting ♦Changeable ♦Status
r0947	**Last fault code** Displays the fault history In the following diagram:  "F1" is the 1st active fault (not yet acknowledged). "F2" is the 2nd active fault (not yet acknowledged). "F1e" is the occurrence of the fault acknowledgement of F1 & F2 – this moves the values in the 2 indices down to the next pair of indices where they are stored. The most recent fault events are stored in indices 0 and 1. For example: If the inverter trips on undervoltage and then receives an external trip before the undervoltage is acknowledged you will get: Index 0 = 3 Undervoltage Index 1 = 85 External trip Whenever a fault is put into index 1 (F1e) the existing fault history is moved as shown in the diagram. **Note** See list of fault codes list in Section 6 Index 2 is only used if a 2nd fault occurs before the 1st is acknowledged.	- - [-] -	2 21
P0970	**Factory settings** Resets all parameters to their default values. To do this, you need to set P0010=30, then P0970=1 P0100 is set according DIP Switch setting	0 1 [0] -	1 30 ''

<table>
<tr><th>Parameter Number</th><th>Parameter Name</th><th>Min
Max
[Default]
Units</th><th>♦P0003 User Access Level
♦P0004 Setting
♦Changeable
♦Status</th></tr>
<tr><td>P1000</td><td>
Frequency setpoint selection

Selects the frequency setpoint source. In the table of possible settings given below the main setpoint is selected from the least significant digit i.e., 0 to 6 and any additional setpoint from the most significant digit i.e., x0 through to x6. For example, setting 12 selects the main setpoint (2) derived from the analog input with the additional setpoint (1) coming from the keypad.

Single digits are main setpoints only with no additional setpoint.

<table>
<tr><th></th><th colspan="7">Additional setpoint</th></tr>
<tr><th>Main setpoint</th><th>No additional setpoint</th><th>Keypad (Motor pot.) setpoint</th><th>Analogue input</th><th>Fixed frequency</th><th>USS via RS232</th><th>USS via RS485</th><th>Optional communications board</th></tr>
<tr><td>No main setpoint</td><td>0</td><td>10</td><td>20</td><td>30</td><td>40</td><td>50</td><td>60</td></tr>
<tr><td>Keypad (Motor potentiometer) setpoint</td><td>1</td><td>11</td><td>21</td><td>31</td><td>41</td><td>51</td><td>61</td></tr>
<tr><td>Analogue Input</td><td>2</td><td>12</td><td>22</td><td>32</td><td>42</td><td>52</td><td>62</td></tr>
<tr><td>Fixed frequency</td><td>3</td><td>13</td><td>23</td><td>33</td><td>43</td><td>53</td><td>63</td></tr>
<tr><td>USS via RS232</td><td>4</td><td>14</td><td>24</td><td>34</td><td>44</td><td>54</td><td>64</td></tr>
<tr><td>USS via RS485</td><td>5</td><td>15</td><td>25</td><td>35</td><td>45</td><td>55</td><td>65</td></tr>
<tr><td>Optional communications board</td><td>6</td><td>16</td><td>26</td><td>36</td><td>46</td><td>56</td><td>66</td></tr>
</table>

The most common settings are:

1 Keypad (Motor potentiometer) setpoint
2 Analog input
3 Fixed frequency setpoint
4 USS via RS232
5 USS via RS485 terminals
Optional Communication Board

Other settings including an additional setpoint can be selected using the table above.
</td><td>0
66
[2]
-</td><td>1
10</td></tr>
</table>

<table>
<tr><th>Parameter Number</th><th>Parameter Name</th><th>Min
Max
[Default]
Units</th><th>♦P0003 User Access Level
♦P0004 Setting
♦Changeable
♦Status</th></tr>
<tr><td>P1001</td><td>Fixed frequency 1

Defines fixed frequency setpoint 1

How to use fixed frequencies;

To use fixed frequencies it is necessary to select fixed frequency operation using P1000.

Fixed frequencies can be selected using the digital inputs, and can also be combined with an ON command.

There are three types of Fixed Frequencies.

1) Direct selection
2) Direct selection + ON command
3) Binary Coded selection + ON command

1. Direct selection (P0701 – P0703 = 15)
In this mode of operation 1 digital input selects 1 fixed frequency. If several inputs are active together, the selected frequencies are summed. E.g. (FF1 + FF2 + FF3).

Note:
An ON command is also required to start the inverter e.g. from keypad or serial link etc.

2. Direct selection + ON command (P0701 – P0703 = 16)

This fixed frequency selection combines the fixed frequencies with an ON command.

In this mode of operation 1 digital input selects 1 fixed frequency. If several inputs are active together, the selected frequencies are summed. E.g. (FF1 + FF2 + FF3).

3. Binary Coded Selection + ON command (P0701 – P0703 = 17)

Up to 7 fixed frequencies can be selected using this method. The fixed frequencies are selected according to the following table:

<table>
<tr><td></td><td></td><td>DIN3</td><td>DIN2</td><td>DIN1</td></tr>
<tr><td></td><td>OFF</td><td>Inactive</td><td>Inactive</td><td>Inactive</td></tr>
<tr><td>P1001</td><td>FF1</td><td>Inactive</td><td>Inactive</td><td>Active</td></tr>
<tr><td>P1002</td><td>FF2</td><td>Inactive</td><td>Active</td><td>Inactive</td></tr>
<tr><td>P1003</td><td>FF3</td><td>Inactive</td><td>Active</td><td>Active</td></tr>
<tr><td>P1004</td><td>FF4</td><td>Active</td><td>Inactive</td><td>Inactive</td></tr>
<tr><td>P1005</td><td>FF5</td><td>Active</td><td>Inactive</td><td>Active</td></tr>
<tr><td>P1005</td><td>FF6</td><td>Active</td><td>Active</td><td>Inactive</td></tr>
<tr><td>P1007</td><td>FF7</td><td>Active</td><td>Active</td><td>Active</td></tr>
</table>
</td><td>-650
650
[0]
Hz</td><td>2
10
‘●’</td></tr>
<tr><td>P1002</td><td>Fixed frequency 2

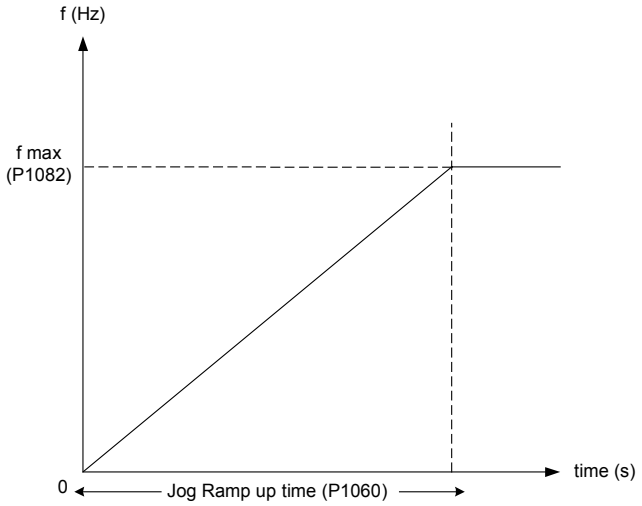
Defines fixed frequency setpoint 2

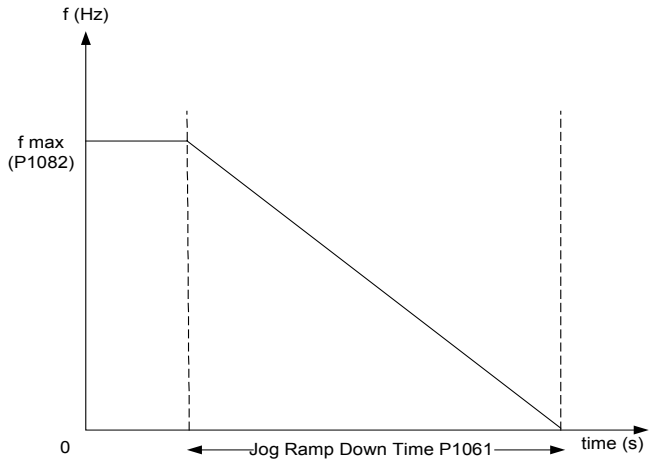
See description for P1001</td><td>-650
650
[5]
Hz</td><td>2
10
‘●’</td></tr>
<tr><td>P1003</td><td>Fixed frequency 3

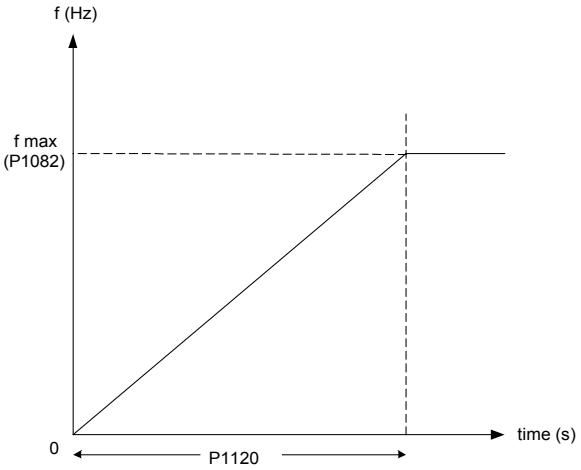
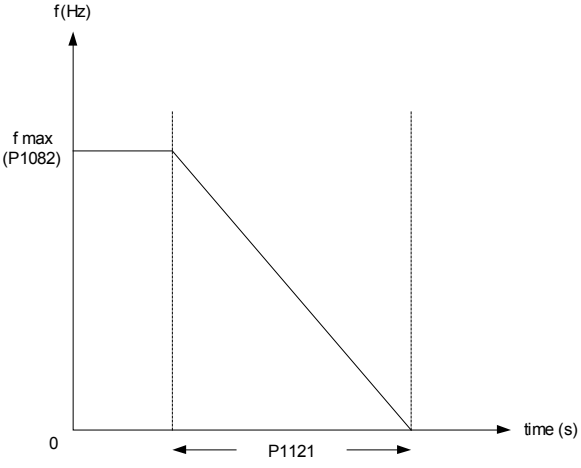
Defines fixed frequency setpoint 3

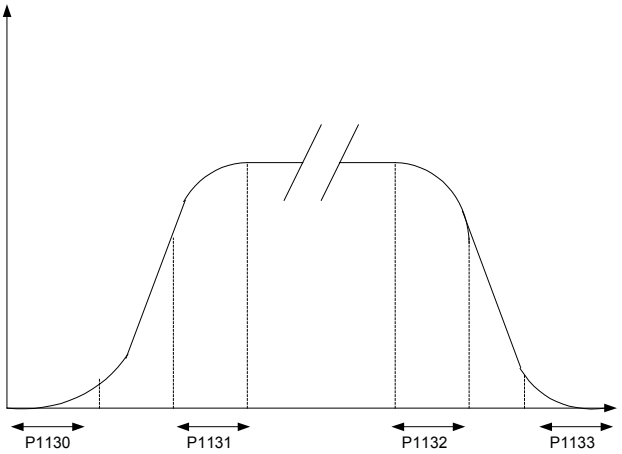
See description for P1001</td><td>-650
650
[10]
Hz</td><td>2
10
‘●’</td></tr>
</table>

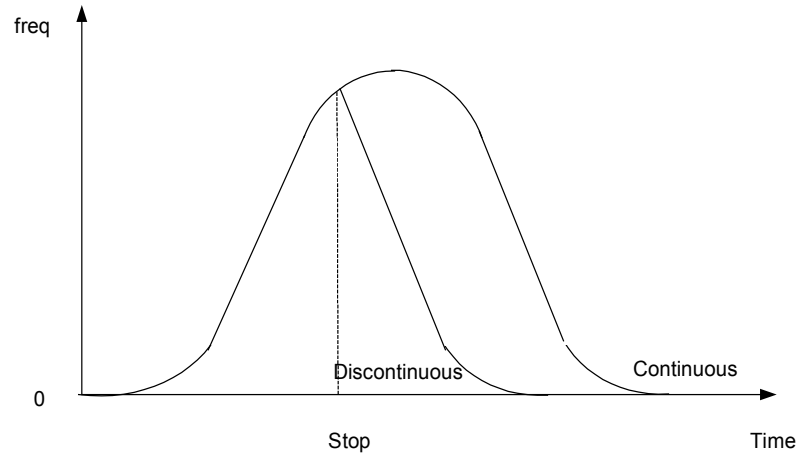
Parameter Number	Parameter Name	Min Max [Default] Units	♦P0003 User Access Level ♦P0004 Setting ♦Changeable ♦Status
P1004	**Fixed frequency 4** Defines fixed frequency setpoint 4 See description for P1001	-650 650 [15] Hz	2 10 '●'
P1005	**Fixed frequency 5** Defines fixed frequency setpoint 5 See description for P1001	-650 650 [20] Hz	2 10 '●'
P1006	**Fixed frequency 6** Defines fixed frequency setpoint 6 See description for P1001	-650 650 [25] Hz	2 10 '●'
P1007	**Fixed frequency 7** Defines fixed frequency setpoint 7 See description for P1001	-650 650 [30] Hz	2 10 '●'
P1031	**Setpoint memory of Keypad (Motor potentiometer)** Saves the last keypad (Motor potentiometer) setpoint that was active before OFF command or power down. **Possible settings:** 0 = Not saved 1 = Saved (P1040 is updated). **Note:** On next ON command, keypad (Motor potentiometer) setpoint will be the saved value in P1040	0 1 [0] -	2 10 '●'
P1032	**Inhibit reverse direction of Keypad (Motor potentiometer)** Inhibits the reverse setpoint selection when keypad (Motor potentiometer) is chosen either as main setpoint or additional setpoint (using P1000) **Possible Settings:** 0 Reverse direction is allowed – it is possible to change motor direction using the keypad (Motor potentiometer) setpoint (increase / decrease frequency either by using digital inputs or keypad up / down buttons) 1 Reverse direction inhibited	0 1 [1] -	2 10

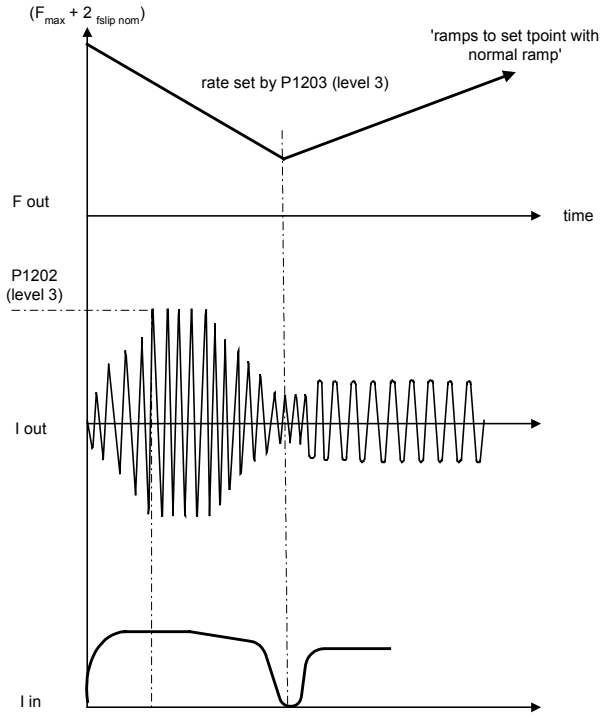
Parameter Number	Parameter Name	Min Max [Default] Units	♦P0003 User Access Level ♦P0004 Setting ♦Changeable ♦Status
P1040	**Setpoint of the Keypad (Motor potentiometer)** Determines Setpoint for Keypad (Motor potentiometer) control (P1000=1). **Note:** If Keypad (Motor potentiometer) setpoint is selected either as Main setpoint or Additional setpoint then the reverse direction will be inhibited by default using P1032. If you want to re-enable reverse direction then set P1032 = 1.	-650 650 [5] Hz	2 10 '●'
P1058	**JOG frequency right** Jogging is used to advance the motor by small amounts. It is controlled via the jog button or using a non-latching switch on one of the digital inputs. While jog right is selected, this parameter determines the frequency at which the inverter will run. The up and down ramp times used while jogging are set in P1060 and P1061 respectively.	0 650 [5] Hz	2 10 '●'
P1059	**JOG frequency left** While jog left is selected, this parameter determines the frequency at which the inverter will run.	0 650 [5] Hz	2 10 '●'
P1060	**JOG ramp-up time** Sets ramp-up time. This is the time used while jogging or when the function "use jog ramp times" is activated.  	0 650 [10] s	2 10 '●'

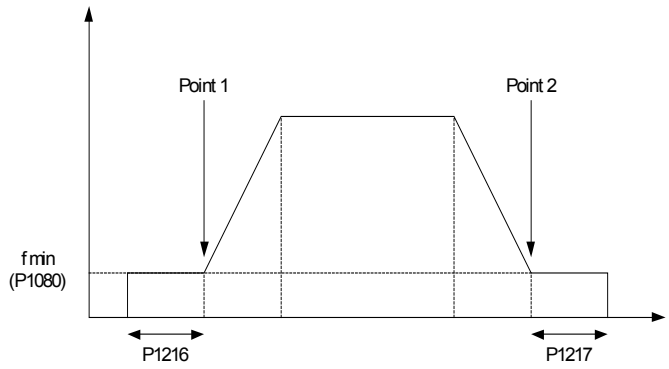
Parameter Number	Parameter Name	Min Max [Default] Units	♦P0003 User Access Level ♦P0004 Setting ♦Changeable ♦Status
P1061	**JOG ramp-down time** Sets ramp-down time (s). This is the time used while jogging or when the function “use jog ramp times” is activated.  	0 650 [10] s	2 10 ‘●’
P1080	**Min. frequency** Sets minimum motor frequency (Hz) at which the motor will run irrespective of the frequency setpoint. The value set here is valid for both clockwise and anti-clockwise rotation. **Note** Under certain conditions (e.g. ramping, current limiting), the inverter can run below the minimum frequency.	0 650 [0] Hz	1 10 ‘●’
P1082	**Max. frequency** Sets maximum motor frequency (Hz) at which the motor will run irrespective of the frequency setpoint. The value set here is valid for both clockwise and anti-clockwise rotation. **Notes** There are mechanical limitations to the maximum speed at which a motor can run. In general, the maximum motor frequency should not exceed 3 x the nominal rating plate motor frequency. The maximum frequency can be exceeded if either of the following is active: Slip compensation (f_{max} + $f_{slip\ comp\ max}$) or Flying restart (f_{max} + $f_{slip\ nom}$)	0 650 [50] Hz	1 10

Parameter Number	Parameter Name	Min Max [Default] Units	♦P0003 User Access Level ♦P0004 Setting ♦Changeable ♦Status
P1120	**Ramp-up time** Time taken for the motor to accelerate from standstill up to maximum motor frequency (P1082) when no rounding is used.  Setting the ramp-up time too short can cause the inverter to trip (overcurrent). **Notes** If you are using an external frequency setpoint which already has set ramp rates (e.g. from a PLC), optimum drive performance is best achieved if the ramp times in P1120 and P1121 are set to values slightly shorter than those of the PLC. Changes to the ramp-up or ramp-down times are not active until confirmed by pressing the **P** key.	0 650 [10] s	1 10 '●'
P1121	**Ramp-down time** Time taken for motor to decelerate from maximum motor frequency (P1082) down to standstill when no rounding is used.  **Notes** Setting the ramp-down time too short can cause the inverter to trip (overvoltage (F0002) / overcurrent (F0001)). Changes to the ramp-up or ramp-down times are not active until confirmed by pressing the **P** key.	0 650 [10] s	1 10 '●'

Parameter Number	Parameter Name	Min Max [Default] Units	♦P0003 User Access Level ♦P0004 Setting ♦Changeable ♦Status
P1130	**Initial rounding time for ramp-up** Defines initial smoothing time in seconds as shown on the diagram below.  where T_{up} total = ½ P1130 + X * P1120 + ½ P1131 T_{down} total = ½ P1132 + X * P1121 + ½ P1133 X is defined as $\Delta f = x * F_{max}$	0 40 [0] s	2 10 '●'
P1131	**Final rounding time for ramp-up** Defines smoothing time at end of ramp-up as shown in P1130.	0 40 [0] s	2 10 '●'
P1132	**Initial rounding time for ramp-down** Defines smoothing time at start of ramp-down as shown in P1130.	0 40 [0] s	2 10 '●'
P1133	**Final rounding time for ramp-down** Defines smoothing time at end of ramp-down as shown in P1130.	0 40 [0] s	2 10 '●'

Parameter Number	Parameter Name	Min Max [Default] Units	♦P0003 User Access Level ♦P0004 Setting ♦Changeable ♦Status
P1134	**Rounding type** Defines continuous smoothing (default) or discontinuous smoothing as a response to OFF commands or setpoint reduction. The total smoothing time must be set > 0s; otherwise this parameter will have no effect. **Possible settings:** 0 = Continuous 1 = Discontinuous  	0 1 [0] -	2 10 '●'

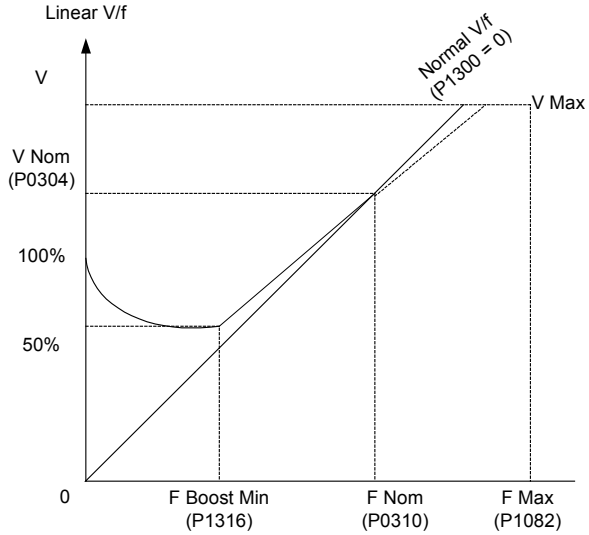
Parameter Number	Parameter Name	Min Max [Default] Units	♦P0003 User Access Level ♦P0004 Setting ♦Changeable ♦Status
P1200	**Start on the fly** Starts inverter onto a spinning motor. If it is possible that the motor is still spinning e.g. after a short mains break, or if the motor can be driven by the load then flying restart must be used – otherwise overcurrent trips will occur. This function is particularly useful for motors with high inertia loads. **Possible Settings:** 0 "flying restart inactive" 1 "flying restart always active", starts in setpoint direction 2 "flying restart on power up, fault, OFF2", starts in setpoint direction 3 "flying restart on fault, Off2", starts in setpoint direction 4 "Flying restart always active. Search ONLY in setpoint direction." 5 "flying restart on power up, fault, OFF2, Search ONLY in setpoint direction 6 " Flying restart on fault, off2, Search ONLY in setpoint direction." 7  It does this by rapidly changing the output frequency of the inverter until the actual motor speed has been found. Once this happens, the motor will run up to its setpoint using the normal ramp time. **Note**: Settings 1 to 3 search in both directions. In order to search only in direction of setpoint it is necessary to set 4 to 6.	0 6 [0] -	2 12 '●'

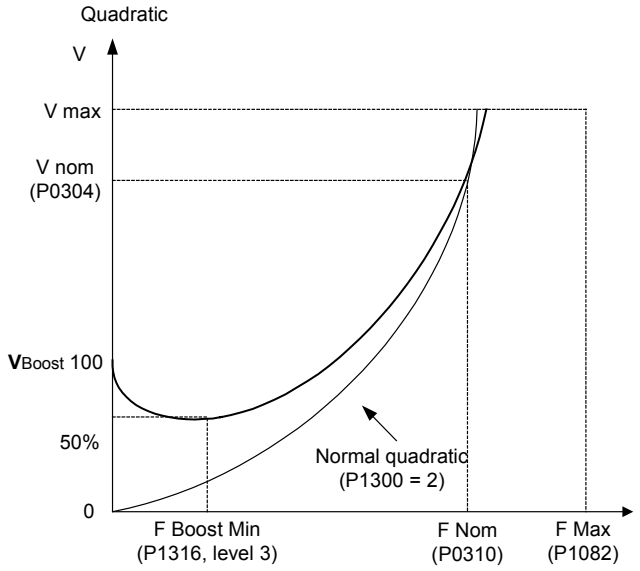
Parameter Number	Parameter Name	Min Max [Default] Units	♦P0003 User Access Level ♦P0004 Setting ♦Changeable ♦Status
P1210	**Automatic restart** Enables restart after a mains break or after a fault. **Possible settings:** 0 = Disabled 1 = Acknowledges faults on power up – inverter is not started. It is necessary to toggle the ON command to start the inverter. 2 = Restart after mains break (blackout) / power on 3 = Restart after fault/mains break (blackout / brownout) 4 = Restart after mains break (blackout / brownout) 5 = Restart after mains break/fault, ignoring previous history **Warning:** **Setting 2 to 5 can cause the motor to restart unexpectedly!** **Note** Auto restart will only work if the ON command remains constantly present. E.g. via a digital input wire link. If the motor could still be turning or is possibly still being driven by the load, flying restart must also be enabled (P1200).	0 5 [1] -	2 12 '●'
P1215	**Holding brake profile enable** Enables/disables holding brake function You can use this function to make the inverter follow the profile below. It is also possible to have a relay switch at point 1 and point 2 if programmed in P0731 = 52.C to control a brake.  **Possible settings:** 0 = Disabled 1 = Enabled **Note** The brake relay opens at Point 1 if enabled using P0731. The brake relay closes at Point 2.	0 1 [0] -	2 12
P1216	**Holding brake release delay** Defines the time at which the inverter runs at f_{min} before ramping up at point 1 (as shown in P1215 diagram).	0 20 [1] s	2 12

Parameter Number	Parameter Name	Min Max [Default] Units	♦P0003 User Access Level ♦P0004 Setting ♦Changeable ♦Status
	Note: The inverter starts at f_{min} on this profile, i.e. it does not use a ramp. If this is being used to hold the motor at a certain frequency against a mechanical brake (i.e. you are using a relay to control a mechanical brake), it is important that $f_{min} < 5$ Hz; otherwise, the current drawn may be too high and the relay may not open as inverter is in current limit. A typical value of f_{min} for this type of application is the slip frequency of the motor. You can calculate the rated slip frequency by using the following formula: $\frac{n_{syn} - n_{rated}}{n_{syn}} \times f_{rated}$		
P1217	**Holding time after ramp down** Defines the time at which the inverter runs at f_{min} after ramping down at point 2 (as shown in P1215 diagram).	0 20 [1] s	2 12
P1232	**DC braking current** Defines level of DC current as a percentage of nominal motor current (P0305).	0 250 [100] %	2 12 '●'
P1233	**Duration of DC braking after OFF1** Defines duration for which DC injection braking is to be active following an OFF1 command. **Possible settings:** 0 = not active following OFF1 1 – 250 = active for the specified duration **Note** The DC braking function causes the motor to stop rapidly by applying a DC braking current (the current applied also holds the shaft stationary). When the DC braking signal is applied, the inverter output pulses are blocked and the DC current is only applied once the motor has been sufficiently demagnetized. (Demagnetization time is automatically calculated from Motor data). **Warning** Frequent use of long periods of DC braking can cause the motor to overheat.	0 250 [0] s	2 12 '●'
P1236	**Compound braking current** Defines DC level superimposed on AC waveform. This form of braking becomes active following an OFF1 / OFF3 command. Increasing the value will generally improve braking performance; however, if you set the value too high, an overvoltage trip may result. **Possible settings:** 0 = Compound braking disabled 1 – 250 = Level of DC braking current defined as a % of motor rated current (P0305)	0 250 [0] %	2 12 '●'

Parameter Number	Parameter Name	Min Max [Default] Units	♦P0003 User Access Level ♦P0004 Setting ♦Changeable ♦Status
P1300	**V/F & FCC Control mode** Controls the relationship between the speed of the motor and the voltage supplied by the inverter. **Possible values** 0 = Linear V/f (default) 1 = FCC(Flux Current Control) – maintains motor flux current for improved efficiency 2 = Quadratic V/f – suitable for centrifugal fans/pumps 3 = Multi-point V/f (programmable – in Expert Mode only.	0 3 [1] -	2 13

Parameter Number	Parameter Name	Min Max [Default] Units	♦P0003 User Access Level ♦P0004 Setting ♦Changeable ♦Status
P1310	**Continuous boost** Defines a level of boost to apply to both linear and quadratic V/f curves according to the following diagram	0 250 [50] %	2 13 '●'



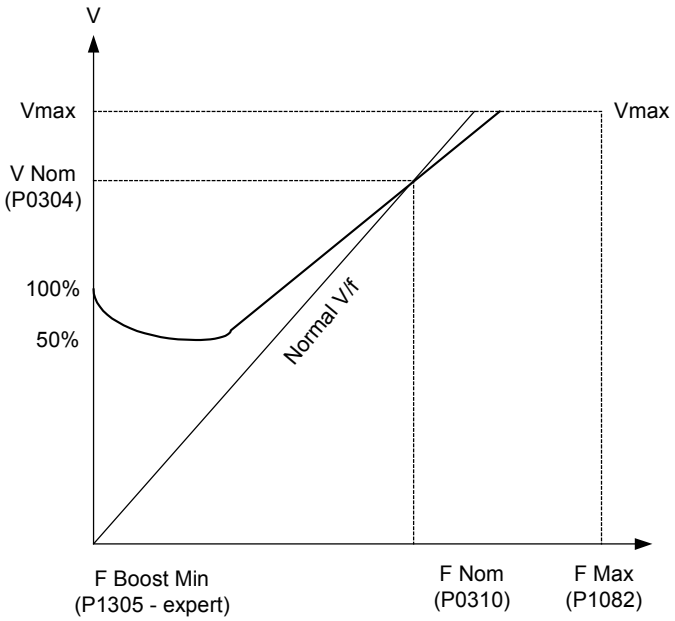
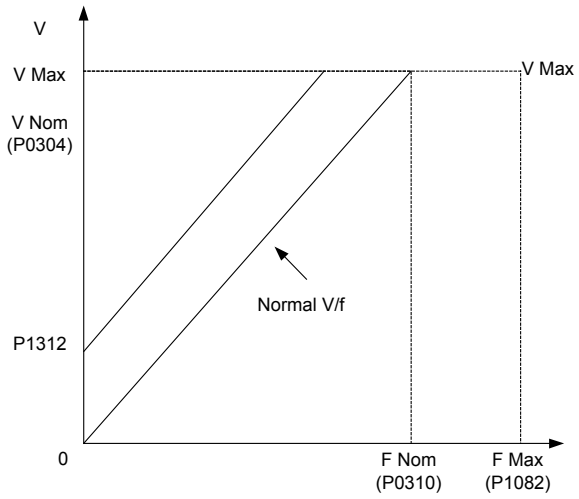


0 $V_{BOOST,100}$ = voltage given by Rated Motor Current (P0305)

1 * Stator Resistance (P0350)

Notes

- When using Continuous Boost P1310 together with other Boost Parameters (Acceleration Boost P1311 & Starting Boost P1312) the Boost values are combined. However priorities are allocated to these parameters as follows :
- P1310 > P1311>P1312
- The achievable boost value is limited by the setting in P0640.
- Increasing the Boost Levels increases the heating of the motor especially at standstill.
- Σ Boosts $\leq 300/I_{mot} * R_S$

Parameter Number	Parameter Name	Min Max [Default] Units	♦P0003 User Access Level ♦P0004 Setting ♦Changeable ♦Status
P1311	**Acceleration boost** Applies boost following a positive setpoint change and drops back out once the setpoint is reached. This can be useful to improve response to small positive setpoint changes.  **Note** • Increasing the Boost Levels increases the heating of the motor. • Refer to note in P1310 with respect to Boost priorities. • The achievable boost value is limited by the setting in P0640. • Σ Boosts ≤ $300/I_{mot}^{*} R_S$	0 250 [0] %	2 13 '●'
P1312	**Starting boost** Applies a constant linear offset to the active V/f curve (either linear or quadratic) after an ON command and is active until setpoint is reached for the 1st time. This is useful for starting loads with high inertia.  	0 250 [0] %	2 13 '●'

<table>
<tr><th>Parameter Number</th><th>Parameter Name</th><th>Min
Max
[Default]
Units</th><th>♦P0003 User Access Level
♦P0004 Setting
♦Changeable
♦Status</th></tr>
<tr><td></td><td>Notes
Setting the Starting Boost too high will cause the inverter to go into Current Limit, which in turn restricts the output frequency to below the setpoint frequency.
Increasing the Boost Levels increases the heating of the motor.
Refer to note in P1310 with respect to Boost priorities.
The achievable boost value is limited by the setting in P0640.
Σ Boosts $\leq 300/I_{mot}^{*} R_S$</td><td></td><td></td></tr>
<tr><td>P1335</td><td>Slip compensation
Adjusts the output frequency of the inverter dynamically, so that the motor speed is kept constant independent of the motor load.
0% = Slip compensation disabled
100% = This uses the motor data and motor model such that rated slip frequency is added at rated motor speed and current.
Note
The gain value can be adjusted if necessary to fine-tune the actual motor speed.</td><td>0
600
[0]
%</td><td>2
13
‘•’</td></tr>
<tr><td>P1336</td><td>Slip limit
Limits the compensation slip added to the frequency setpoint when slip compensation is active.</td><td>0
600
[250]
%</td><td>2
13
‘•’</td></tr>
<tr><td>P1800</td><td>Pulse frequency
Sets the pulse frequency of the power switches in the inverter. The frequency can be changed in steps of 2 kHz.
If silent operation is not absolutely necessary, it is possible to reduce inverter losses and radio-frequency emissions by selecting lower pulse frequencies.
The maximum continuous motor current will be reduced if pulse frequencies > 4kHz are selected on 380-480V units. The required derating is shown in the table below.
Maximum continuous motor current (A) for 380-480V units
<table>
<tr><th>Inverter Power</th><th>4 kHz</th><th>6 kHz</th><th>8 kHz</th><th>10 kHz</th><th>12 kHz</th><th>14 kHz</th><th>16 kHz</th></tr>
<tr><td>0.37</td><td>1.2</td><td>1.2</td><td>1.2</td><td>1.2</td><td>1.2</td><td>1.2</td><td>1.1</td></tr>
<tr><td>0.55</td><td>1.6</td><td>1.6</td><td>1.6</td><td>1.6</td><td>1.6</td><td>1.6</td><td>1.1</td></tr>
<tr><td>0.75</td><td>2.1</td><td>2.1</td><td>2.1</td><td>2.1</td><td>1.6</td><td>1.6</td><td>1.1</td></tr>
<tr><td>1.1</td><td>3.0</td><td>3.0</td><td>2.7</td><td>2.7</td><td>1.6</td><td>1.6</td><td>1.1</td></tr>
<tr><td>1.5</td><td>4.0</td><td>4.0</td><td>2.7</td><td>2.7</td><td>1.6</td><td>1.6</td><td>1.1</td></tr>
<tr><td>2.2</td><td>5.9</td><td>5.9</td><td>5.1</td><td>5.1</td><td>3.6</td><td>3.6</td><td>2.6</td></tr>
<tr><td>3</td><td>7.7</td><td>7.7</td><td>5.1</td><td>5.1</td><td>3.6</td><td>3.6</td><td>2.6</td></tr>
<tr><td>4</td><td>10.2</td><td>10.2</td><td>6.7</td><td>6.7</td><td>4.8</td><td>4.8</td><td>3.6</td></tr>
<tr><td>5.5</td><td>13.2</td><td>13.2</td><td>13.2</td><td>13.2</td><td>9.6</td><td>9.6</td><td>7.5</td></tr>
<tr><td>7.5</td><td>18.4</td><td>18.4</td><td>13.2</td><td>13.2</td><td>9.6</td><td>9.6</td><td>7.5</td></tr>
<tr><td>11</td><td>26.0</td><td>26.0</td><td>17.9</td><td>17.9</td><td>13.5</td><td>13.5</td><td>10.4</td></tr>
</table></td><td>2
16
[4]
kHz</td><td>2
2
‘•’</td></tr>
</table>

Parameter Number	Parameter Name	Min Max [Default] Units	♦P0003 User Access Level ♦P0004 Setting ♦Changeable ♦Status
	Note Under certain circumstances, the inverter may reduce the switching frequency to provide protection against over-temperature (see P0290, Level 3). Minimum of pulse frequency depends on P1082 Max. frequncy and P0310 Rated Motor frequency		
P1820	**Reverse output phase sequence** Changes direction of motor rotation without changing setpoint polarity. **Possible values** 0 = Normal 1 = Reverse phase sequence.	0 1 [0] -	2 2
P1910	**Select motor data identification** Performs stator resistance measuring. **Possible values:** 0=No measurement – (P0350 setting will be used) 1=Stator resistance measurement - (Overwrites P0350 setting) 2=Stator resistance measurement. This does not overwrite the values already calculated.– (original P0350 setting will be used) **Notes** Motor data must be correctly entered before stator resistance measurement is initiated. Once enabled (P1910 =1) A0541 will be generated warning that the stator resistance measurement will be performed at next ON command. If setting 1 is selected, the manual/calculated value for the stator resistance (see P0350) is overwritten. If setting 2 is selected, the values already calculated are not overwritten.	0 2 [0] -	2 3
r1912	**Identified stator resistance** Displays measured stator resistance value (line-to-line) in Ohms (measured using P1910 = 1 or 2).	- - [-] Ohms	2 3
P2000	**Reference frequency** Full-scale frequency setting used by serial link, analog I/O. This corresponds to 4000H.	1 650 [***] Hz	2 20

Parameter Number	Parameter Name	Min Max [Default] Units	♦P0003 User Access Level ♦P0004 Setting ♦Changeable ♦Status
P2010	**USS baud rate** Defines baud rate to be used for USS communications. **Index** 0 = USS2 = Comms Link (RS485) (Terminals 14, 15) 1 = USS1 = RS232 (using option) **Possible settings:** **3** = 1200 baud **4** = 2400 baud **5** = 4800 baud **6** = 9600 baud **7** = 19200 baud **8** = 38400 baud **9** = 57600 baud	3 9 [6] -	2 20 '●'
P2011	**USS address** Sets a unique address for inverter. You can connect up to 31 inverters via the serial link and use the USS serial bus protocol to control them. This parameter sets a unique address for the inverter. **Index** 0 = USS2 = Comms Link (RS485) (Terminals 14, 15) 1 = USS1 = RS232 (using option)	0 31 [0] -	2 20 '●'
r2110	**Warning history** Displays warning information. It is possible to view up to 2 active warnings (indices 0and 1 and 2 historical warnings (indices 2 and 3) **Note:** If a warning is active, the keypad will be flashing: the LED's indicate warning status. If an AOP is in use, the display shows active warning number and text. Indices 0 and 1are not stored.	- - [-] -	2 21

Parameter Number	Parameter Name	Min Max [Default] Units	♦P0003 User Access Level ♦P0004 Setting ♦Changeable ♦Status
r2197	**Connector: Statusword 1 of monitor** Displays first active statusword of monitoring functions. **[How to read Bit values on the display]** Bit 1 "| n,filtered | < n,2" 0 NO / 1 YES Bit 2 "| n,filtered | > n,2" 0 NO / 1 YES Bit 3 "| n,filtered | < n,3" 0 NO / 1 YES Bit 4 "| n,filtered | > n,3" 0 NO / 1 YES Bit 5 "| n,set | < n,min" 0 NO / 1 YES Bit 6 "n,set > 0" 0 NO / 1 YES Bit 7 "Motor blocked" 0 NO / 1 YES Bit 8 "Motor stalled" 0 NO / 1 YES Bit 9 "| I,act | < I,thresh" 0 NO / 1 YES Bit A "| T,actNoAcc | > T,thresh" 0 NO / 1 YES Bit b "| T,act | > T,thresh" 0 NO / 1 YES	- - [-] -	2 21
P2200	**BI: Enable PI controller** PI mode Allows the User to Enable/Disable the PI controller **Possible settings:** 0 = Disabled 1 = Enabled **Note 1** The PI closed loop controller can be enabled by the setting 1 with this function. Once the PI controller is enabled, the normal ramp times set in P1120 and P1121 are automatically disabled, as are the normal frequency setpoints. However, following an OFF1 or OFF 3 command the inverter output frequency will be ramped to zero using the ramp time set in P1121 (P1135 for OFF3). **Note 2** The PI setpoint source is selected using P2253. The PI setpoint and PI feedback signal are interpreted as % values (not Hz). The output of the PI controller is displayed as a percentage and then normalized into Hz through P2000 when PI is enabled. **Note 3** The minimum and maximum motor frequencies (P1080 and P1082) as well as the skip frequencies (P1091 to P1094) are still active on the inverter output. However enabling skip frequencies with P1 control can lead to instabilities. **Note 4** In level 3, the PI controller source enable can also come from the digital inputs in settings 722.0 to 722.2 for DIN1 – DIN3 or any other BICO source.	0 2197.F [0] -	2 22 '●'

<table>
<tr><th>Parameter Number</th><th>Parameter Name</th><th>Min
Max
[Default]
Units</th><th>♦P0003 User Access Level
♦P0004 Setting
♦Changeable
♦Status</th></tr>
<tr><td>P2201</td><td>
Fixed PI setpoint 1

Defines the Fixed PI Setpoint 1

In user access level 2 you will need to set P2200 to enable the setpoint source. In addition you can set any of the digital input parameters to fixed PI setpoint via the digital inputs (P0701 – P0703.)

There are three modes of selection for the PI fixed setpoint.
1 Direct selection (P0701 = 15 or P0702 = 15, etc)
In this mode of operation 1 digital input selects 1 fixed PI fixed setpoint.

If several inputs are programmed to PI fixed setpoint and selected together, the selected setpoints are summed.

To start the motor (enable pulses), an ON command is needed either from the keypad or from the digital inputs or USS in this mode.
2 Direct selection with ON Command (P0701 = 16 or P0702 = 16, etc)
Description as for 1), except that this type of selection issues an ON command coincident with any setpoint selection.
Note
You may mix different types of fixed frequencies; remember, however, they will be summed if selected together.

3 Binary Coded Decimal selection P0701 – P0703 = 17

Using this PI fixed point selection method it is possible to choose up to 7 different PI setpoints. The setpoints are selected according to the following table:
<table>
<tr><td></td><td></td><td>DIN3</td><td>DIN2</td><td>DIN1</td></tr>
<tr><td></td><td>OFF</td><td>Inactive</td><td>Inactive</td><td>Inactive</td></tr>
<tr><td>P2201</td><td>FS. 1</td><td>Inactive</td><td>Inactive</td><td>Active</td></tr>
<tr><td>P2202</td><td>FS. 2</td><td>Inactive</td><td>Active</td><td>Inactive</td></tr>
<tr><td>P2203</td><td>FS. 3</td><td>Inactive</td><td>Active</td><td>Active</td></tr>
<tr><td>P2204</td><td>FS. 4</td><td>Active</td><td>Inactive</td><td>Inactive</td></tr>
<tr><td>P2205</td><td>FS. 5</td><td>Active</td><td>Inactive</td><td>Active</td></tr>
<tr><td>P2205</td><td>FS. 6</td><td>Active</td><td>Active</td><td>Inactive</td></tr>
<tr><td>P2207</td><td>FS. 7</td><td>Active</td><td>Active</td><td>Active</td></tr>
</table>
</td><td>-130
130
[0]
%</td><td>2
22
‘●’</td></tr>
<tr><td>P2202</td><td>Fixed setpoint 2

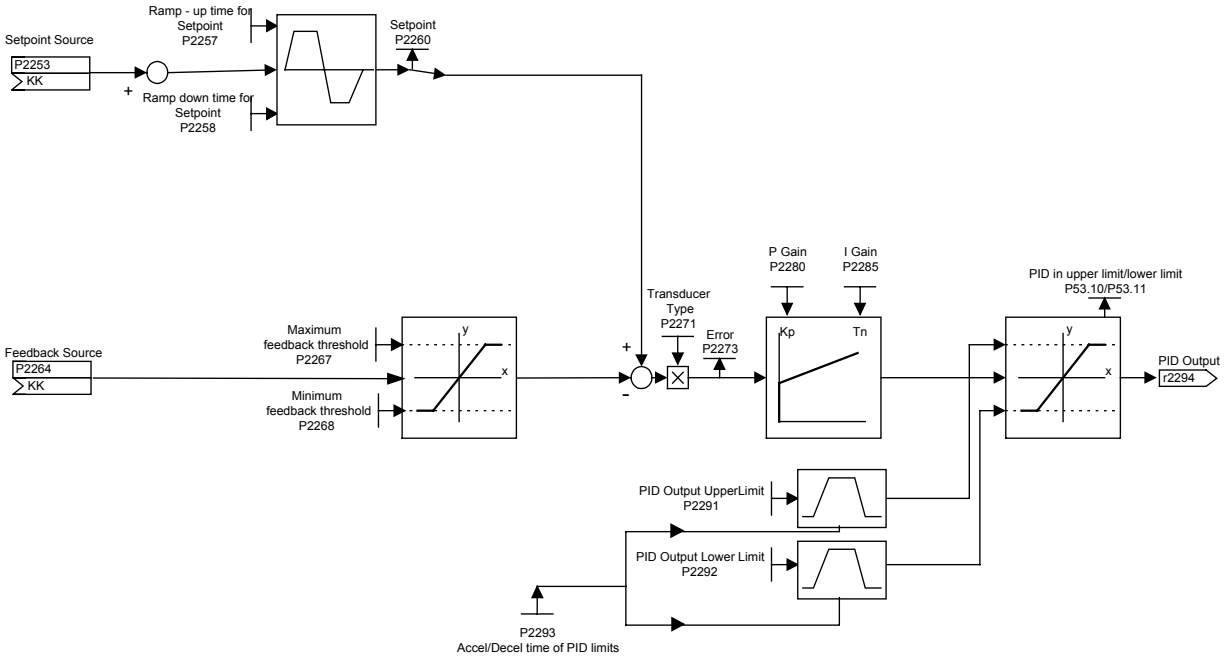
Refer to the description in P2201 for Fixed Setpoint 1.</td><td>-130
130
[10]
%</td><td>2
22
‘●’</td></tr>
<tr><td>P2203</td><td>Fixed setpoint 3

Refer to the description in P2201 for Fixed Setpoint 1.</td><td>-130
130
[20]
%</td><td>2
22
‘●’</td></tr>
<tr><td>P2204</td><td>Fixed setpoint 4

Refer to the description in P2201 for Fixed Setpoint 1.</td><td>-130
130
[30]
%</td><td>2
22
‘●’</td></tr>
</table>

Parameter Number	Parameter Name	Min Max [Default] Units	♦P0003 User Access Level ♦P0004 Setting ♦Changeable ♦Status
P2205	**Fixed setpoint 5** Refer to the description in P2201 for Fixed Setpoint 1.	-130 130 [40] % -	2 22 '●'
P2206	**Fixed setpoint 6** Refer to the description in P2201 for Fixed Setpoint 1.	-130 130 [50] % -	2 22 '●'
P2207	**Fixed setpoint 7** Refer to the description in P2201 for Fixed Setpoint 1.	-130 130 [60] % -	2 22 '●'
r2224	**Connector: Fixed PI Setpoint** Displays the total output of the PI fixed setpoint selection.	-130 130 [60] % -	2 22
P2231	**Setpoint Memory of the Motorized Potentiometer (Keypad Setpoint)** 0 = setpoint memory disabled. 1 = setpoint memory enabled. If 0 is selected, the setpoint returns to the value set in P2240 after an OFF command. If 1 is selected the active setpoint is remembered and P2240 is updated with the current value. Refer to P2240.	0 1 [0] -	2 22 '●'
P2232	**Inhibit keypad (Motorized Potentiometer) setpoint reverse direction** Inhibits the reverse setpoint selection when keypad (Motorized Potentiometer) is chosen either as main setpoint or additional setpoint (using P1000) **Possible settings:** 0 Reverse direction is allowed – it is possible to change motor direction using the keypad (Motorized Potentiometer) setpoint (increase / decrease frequency either by using digital inputs or keypad up / down buttons) 1 Reverse direction inhibited	0 1 [1] -	2 10
P2240	**Keypad (Motorized Potentiometer) Setpoint** Allows the user to set a digital PI setpoint in %. The setpoint can be changed either by using the $\Delta\nabla$ keys on the BOP or by setting P0702 or P0703 to 13 and 14.	-130 130 [10.00] %	2 22 '●'
r2250	**Active Digital PI output setpoint** Displays the active digital PI setpoint in %.	-130 130 [10.00] %	2 22 '●'
P2253	**Source: PI setpoint**	0 2248.0 [0] -	2 22 '●'

Parameter Number	Parameter Name	Min Max [Default] Units	♦P0003 User Access Level ♦P0004 Setting ♦Changeable ♦Status

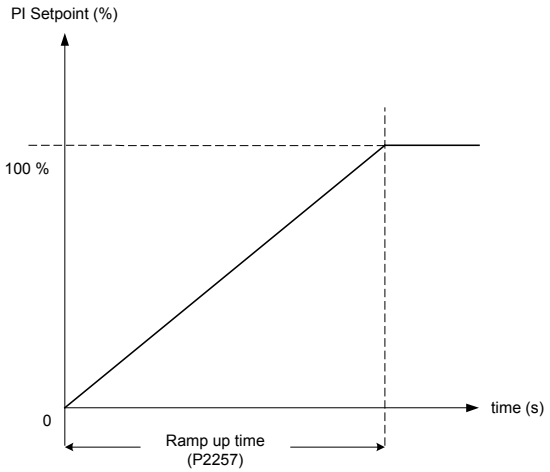


Parameter P2253 allows the user to select the source of the PI setpoint. Normally a digital PI setpoint is selected using either a Fixed PI setpoint or an active setpoint. The most common settings are as follows:

755 = Analog input 1
2224 = Fixed PI setpoint (see P2201 to P2207)
2250 = Active PI setpoint (see P2240)

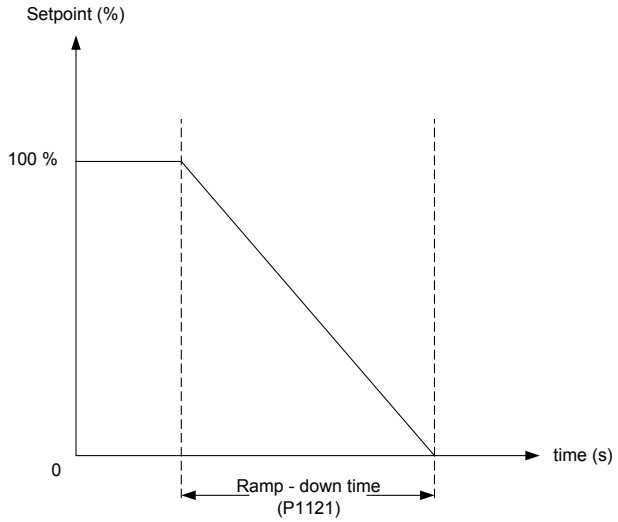
P2257	**Ramp up time for PI setpoint**	0 650 [1] s	2 22 '•'

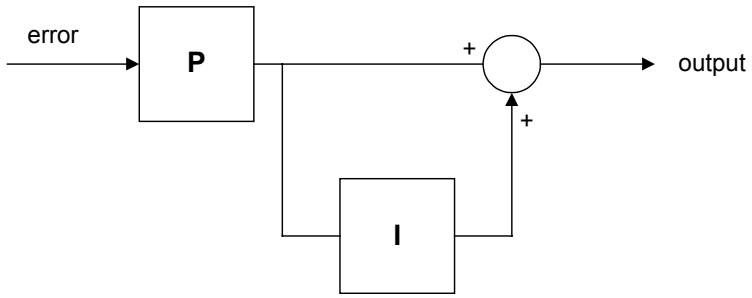
Sets the ramp up time for the PI setpoint.



Setting the ramp – up time too short may cause the inverter to trip, on overcurrent for example.

Note.
If PI control is enabled, the normal ramp-up time (P1120) is disabled.
The PI ramp time is only effective on the PI setpoint and only active when the PI setpoint is changed, or when a RUN command is given (when the PI uses this ramp to reach its value from 0%).

Parameter Number	Parameter Name	Min Max [Default] Units	♦P0003 User Access Level ♦P0004 Setting ♦Changeable ♦Status
P2258	**Ramp down time for PI setpoint** Sets the ramp-down time for the PI setpoint.  Setting the ramp down time too short can cause the inverter to trip on (overvoltage (F0002)/overcurrent (F0001)) **Note** If PI control is enabled, the normal ramp-down time (P1121) is disabled. The PI setpoint ramp is only enabled effective on PI setpoint changes. The ramp times used after OFF1 & OFF3 are defined in P1121 and P1135 respectively	0 650 [1] s	2 22 '•'
r2260	**Connector: PI setpoint** Displays the total active PI setpoint in %.	- - [-] %	2 22
P2264	**Source: PI feedback** Selects the source of the PI feedback signal. The most common settings are as follows: 755 = Analog input 1 **Note 1** When the analog input is selected, it is possible to implement offset and gain using parameters P756 – P760. **Note 2** Refer to "Using **BICO**" description for further details of other settings.	0 2294.0 [755] -	2 22 '•'
P2265	**PI feedback filter time constant** Defines PI feedback filter time constant.	0 60 [0] s	2 22 '•'
r2266	**Connector: PI feedback** Displays PI feedback signal	- - [-] %	2 22

Parameter Number	Parameter Name	Min Max [Default] Units	♦P0003 User Access Level ♦P0004 Setting ♦Changeable ♦Status
P2271	**PI transducer type** Allows the User to select the PI feedback signal Transducer type. 0: = [default] if the feedback signal is less than the PI setpoint the PI controller will increase motor speed to correct this 1: = if the feedback signal is less than the PI setpoint the PI controller will reduce motor speed to correct this **Note** It is very important that the transducer type is correctly selected. If you are unsure that it should be either 0 or 1 you can determine the actual type as follows: Disable the PI function (P2200 = 0). Increase the motor frequency while measuring the feedback signal. If the feedback signal increases with an increase in motor frequency the transducer type should be 0. If the signal decreases with an increase in motor frequency the transducer type should be set to 1.	0 1 [0] -	2 22 '•'
r2272	**Connector: PI Scaled feedback signal**	- - [-] %	2 22
r2273	**Connector: PI error** Displays the PI error (difference) signal between the setpoint and feedback signals in percent.	- - [-] %	2 22
P2280	**PI proportional gain** Allows the User to set the proportional gain of the PI controller. The PI controller on MM420 is implemented using the standard model:  Best results are usually obtained if both P and I terms are enabled. If the system is liable to sudden step changes in feedback signal, the P term should usually be set to a small value (L 0.5) with a faster I term for optimum performance. If the P term is set to 0 the I term acts on the square of the error signal.	0 125 [3] -	2 22 '•'
P2285	**PI integral time** Allows the User to set the PI controller integral time constant. Refer to P2280 above for detail.	0 100 [0] s	2 22 '•'

Parameter Number	Parameter Name	Min Max [Default] Units	♦P0003 User Access Level ♦P0004 Setting ♦Changeable ♦Status
P2291	**PI upper limit** Sets upper limit for the output of the PI controller. **Note** The default figure of 100% is defined by P2000. If F max (P1082) is greater than P2000, either P2000 or P2291 must be changed to achieve F max.	0 200 [100] %	2 22 '●'
P2292	**PI output lower limit** Allows the User to set the lower limit for the output of the PI controller. A negative value allows bipolar operation of the PI controller.	-200 200 [0] %	2 22 '●'
r2294	**Connector: PI output** Displays the output of the PI controller in %.	-250 250 [-] %	2 22
P3900	**End Quick Commissioning** Performs calculations necessary for optimal motor operation **Possible settings:** 0 No Calculation – User MUST manually set P0010=0 1 End Quick Commissioning - with factory reset of parameters and I/O settings not in Quick Commissioning group (P0010=1) - see note 1 2 End Quick Commissioning with reset of I/O settings only – see note 2 below 3 End Quick Commissioning, performing motor calculations only After completion of the Calculations, P3900 is also reset to its original value 0. **Note 1** When setting 1 is selected, it causes the loss of all other parameter changes, except the parameters from the commissioning menu "Quick commissioning" – this includes the I/O settings. Motor calculations are also performed. **Note 2** When setting 2 is selected, only the parameters which depend on the parameters in the commissioning menu "Quick commissioning" (P0010=1) are calculated. Also the I/O settings are reset to default. Motor calculations are also performed. **Note 3** When setting 3 is selected, only the motor parameters are performed as shown in note 5. **Note 4** This parameter can only be changed when P0010=1 **Note 5** Calculates a variety of motor parameters – overwriting previous values, including P0344 (motor weight), P0350 (Level 3) stator resistance), P0346 (Level 3, magnetization time) and P0347 ((Level 3 demagnetization time), P2000 (reference frequency), P2002 (reference current).	0 2 [0] -	1 1 '🔑'

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.

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 Section 6.3 and the following MM420 Fault Codes.

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 Section 5.3 on page 66.

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.

6.3 MICROMASTER 420 fault codes

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

Table 6-2 MICROMASTER 420 Fault Codes

Fault Code	Description	Possible Causes	Diagnosis & Remedy
F0001	Overcurrent	1. Motor power does not correspond to the inverter power. 2. Motor lead short circuit 3. Earth fault	1. Check whether the motor power corresponds to the inverter power. 2. Check that the cable length limits have not been exceeded. 3. Check motor cable and motor for short-circuits and earth faults. 4. Check whether the motor parameters correspond with the motor being used. 5. Check the stator resistance (P0350). 6. Increase the ramp-up-time (P1120). 7. Reduce the boost set in (P1310), (P1311) and (P1312). 8. Check whether the motor is obstructed or overloaded.
F0002	Overvoltage	Supply voltage out of tolerance load is regenerating.	1. Check whether the supply voltage is within the limits indicated on the rating plate. 2. Check if dc-link voltage controller (P1240) is enabled and parameterized correctly. 3. Increase the ramp-down time (P1121).
F0003	Undervoltage	Mains supply removed when inverter is running.	1. Check whether the supply voltage is within the limits indicated on the rating plate. 2. Check the supply is not subject to temporary failures or voltage reductions.
F0004	Inverter Overtemperature	Ambient temperature outside of limits, Fan failure	1. Check that the integral fan rotates when drive is running. 2. Check if pulse frequency is set to default value. 3. Ambient temperature could be higher than specified for the inverter. 4. Check that air inlet and outlet points are not obstructed.
F0005	Inverter I^2T	Inverter is overloaded	1. Check if load duty-cycle is within specified limits. 2. Check that motor power corresponds to inverter power
F0011	Motor Overtemperature I^2T	1. Motor overloaded. 2. Motor data incorrect. 3. Check parameter for motor thermal time constant. 4. Check parameter for motor I^2t warning level. 5. Long time period operating at low speeds	1. Check motor data. 2. Check loading on motor. 3. Boost settings too high (P1310, P1311, P1312)
F0041	Stator resistance measurement failure	Stator resistance measurement failure	1. Check if the motor is connected to the inverter 2. Check that the motor data has been entered correctly.

Fault Code	Description	Possible Causes	Diagnosis & Remedy
F0051	Parameter EEPROM Fault	Reading or writing of the non-volatile parameter storage has failed.	1. Factory reset and new parameterization. 2. Change inverter.
F0052	Powerstack Fault	Reading of the powerstack information has failed or the data is invalid	Change inverter.
F0060	Asic Timeout	Software error	1. Acknowledge fault 2. Change inverter if repeated.
F0070	Communications board setpoint error	No setpoint received from communications board during telegram off time	1. Check connections to the communications board. 2. Check the master
F0071	No Data for USS (RS232 link) during Telegramm Off Time	No response during telegram off time	1. Check connections to the communications board. 2. Check the master
F0072	No Data from USS (RS485 link) during Telegram Off Time	No response during telegram off time	1. Check connections to the communications board. 2. Check the master
F0080	Analogue input - lost input signal	Analogue input - lost input signal	Check connection to analogue input
F0085	External Fault	External fault is triggered via terminal inputs	Disable terminal input for fault trigger.
F0101	Stack Overflow	Software error or processor failure	1. Run self test routines. 2. Change inverter
F0221	PI Feedback below minimum value	PI Feedback below minimum value P2268	1. Change value of P2268. 2. Adjust feedback gain.
F0222	PI Feedback above maximum value	PI Feedback above maximum value P2267	1. Change value of P2268. 2. Adjust feedback gain.
F0450 (Service mode only)	BIST Tests Failure	Fault value 1 - Some of the power section tests have failed 2 - Some of the control board tests have failed 4 - Some of the functional tests have failed 8 - Some of the IO module tests have failed. Vector only 16 - The Internal Ram has failed its check on power-up	1. Inverter may run but certain actions will not function correctly. 2. Replace inverter.

Table 6-3 MICROMASTER 420 Warning Codes

Warning Code	Description	Possible Cause	Diagnosis & Remedy
A0501	Current Limit		1. Check whether the motor power corresponds to the inverter power. 2. Check that the cable length limits have not been exceeded. 3. Check motor cable and motor for short-circuits and earth faults. 4. Check whether the motor parameters correspond with the motor being used. 5. Check the stator resistance. 6. Increase the ramp-up-time. 7. Reduce the boost. 8. Check whether the motor is obstructed or overloaded.
A0502	Overvoltage limit	Mains supply too high, Load regenerative Ramp-down time too short	1. Check that mains supply voltage is within allowable range 2. Increase ramp down times Note: Vdc-max controller is active, ramp-down times will be automatically increased.
A0503	UnderVoltage Limit	Mains supply too low Short mains interruption	Ensure that mains supply voltage remains within allowable range
A0504	Inverter Overtemperature	Warning level of inverter heat-sink temperature is exceeded, resulting in pulse frequency reduction and/or output frequency reduction (depending on parameterization)	1. Check if ambient temperature is within specified limits. 2. Check load conditions and duty cycle. 3. Check if fan is turning when drive is running.
A0505	Inverter I^2T	Warning level is exceeded; current will be reduced if parameterized.	Check if duty cycle is within specified limits.
A0506	Inverter Duty Cycle	Heatsink temperature and thermal junction model are outside of allowable range	Check if duty cycle are within specified limits.
A0511	Motor Overtemperature I^2T	Motor ~~possibly~~ overloaded.	1. Check parameter for motor thermal time constant. 2. Check parameter for motor I^2T warning level. 3. Check if long periods of operation at low speed are occuring 4. Check that boost settings are not too high
A0600	Real Time Operating System Overrun Warning	Software error	Contact Siemens
A0700	CB Warning 1 – see CB manual for details	Communication Board specific	See CB User Manual
A0701	CB Warning 2 – see CB manual for details	Communication Board specific	See CB User Manual
A0702	CB Warning 3 – see CB manual for details	Communication Board specific	See CB User Manual
A0703	CB Warning 4 – see CB manual for details	Communication Board specific	See CB User Manual
A0704	CB Warning 5 – see CB manual for details	Communication Board specific	See CB User Manual
A0705	CB Warning 6 – see CB manual for details	Communication Board specific	See CB User Manual

Warning Code	Description	Possible Cause	Diagnosis & Remedy
A0706	CB Warning 7 – see CB manual for details	Communication Board specific	See CB User Manual
A0707	CB Warning 8 – see CB manual for details	Communication Board specific	See CB User Manual
A0708	CB Warning 9 – see CB manual for details	Communication Board specific	See CB User Manual
A0709	CB Warning 10 – see CB manual for details	Communication Board specific	See CB User Manual
A0710	CB Communications Error	Communication with CB (communication board) is lost.	Check CB Hardware.
A0711	CB Configuration Error	CB (communication board) reports configuration error	Check CB parameters.
A0910	Vdc-max Controller De-activated.	Vdc-max controller has been de-activated.	Check parameter inverter input voltage.
A0911	Vdc-max Controller active	Ramp-down times are being extended to prevent overvoltage trips and to keep the DC link voltage within acceptable limits	1. Check parameter inverter input voltage. 2. Check ramp-down times.
A0920	Analogue input parameters are not set correctly.	Incorrect parameterization of analogue input parameters	Analogue input parameters should not be set to the same value as each other.
A0921	Analogue Output Parameters are not set correctly.		Analogue Output parameters should not be set to the same value as each other
A0922	No load applied to inverter.	Output current lower than expected. Low output voltage eg when 0 boost applied at 0Hz	1. Check that load is applied to the inverter. 2. Check motor parameters correspond to motor attached. 3. As a result, some functions may not work correctly, because there is no normal load condition.
A0923	JOG right and JOG left signals active	JOG right and JOG left signals active together	Make sure that JOG right and JOG left signals are not applied simultaneously

7 MICROMASTER 420 Specifications

Table 7-1 MICROMASTER 420 Specifications

230 V Single Phase MICROMASTER Inverters (with built in Class A Filter)

Order No. (6SE6420-2AB)	**11-2AA0**	**12-5AA0**	**13-7AA0**	**15-5AA0**	**17-5AA0**	**21-1BA0**	**21-5BA0**	**22-2BA0**	**23-0CA0**
Input voltage range	1AC 200V - 240V +10% -10%								
Motor output rating kW (hp)	0.12 (0.16)	0.25 (0.33)	0.37 (0.5)	0.55 (0.75)	0.75 (1)	1.1 (1.5)	1.5 (2)	2.2 (3)	3 (4)
Output KVA	0.4	0.7	1	1.3	1.7	2.4	3.2	4.6	6
Output current Max. A	0.9	1.7	2.3	3	3.9	5.5	7.4	10.4	13.6
Input current A	2	4	5.5	7.5	9.9	14.4	19.6	26.4	35.5
Input cable Min. mm² (awg)	1 (17)					2.5 (13)		4 (11)	6 (9)
Input cable Max. mm² (awg)	2.5 (13)					6 (9)			10 (7)
Output cable Min. mm² (awg)	1 (17)								1.5 (15)
Output cable Max. mm² (awg)	2.5 (13)					6 (9)			10 (7)
Dimensions [w x h x d] mm (inches)	73x173x149 (2.87x6.81x5.87)					149x202x172 (5.87x7.95x6.77)			185x245x195 (7.28x9.65x7.68)
Weight kg (lbs)	1.2 (2.6)			1.3 (2.9)		3.3 (7.3)	3.6 (7.9)		5.2 (11.4)

230 V Three Phase MICROMASTER Inverters (with built in Class A Filter)

Order No. (6SE6420-2AC)	**23-0CA0**	**24-0CA0**	**25-5CA0**
Input voltage range	3AC 200V - 240V +10% -10%		
Motor output rating kW (hp)	3 (4)	4 (5)	5.5 (7.5)
Output KVA	6	7.7	9.6
Output current Max. A	13.6	17.5	22
Input current A	15.6	19.7	26.3
Input cable Min. mm² (awg)	2.5 (13)	2.5 (13)	4 (11)
Input cable Max. mm² (awg)	10 (7)	10 (7)	10 (7)
Output cable Min. mm² (awg)	1.5 (15)	2.5 (13)	4 (11)
Output cable Max. mm² (awg)	10 (7)	10 (7)	10 (7)
Dimensions [w x h x d] mm (inches)	185x245x195 (7.28x9.65x7.68)		
Weight kg (lbs)	5.2 (11.4)	5.7 (12.5)	5.7 (12.5)

230 V Single/Three Phase MICROMASTER Inverters (unfiltered)

Order No. (6SE6420-2UC)	**11-2AA0**	**12-5AA0**	**13-7AA0**	**15-5AA0**	**17-5AA0**	**21-1BA0**	**21-5BA0**	**22-2BA0**	**23-0CA0**
Input voltage range	1/3AC 200V - 240V +10% -10%								
Motor output rating kW (hp)	0.12 (0.16)	0.25 (0.33)	0.37 (0.5)	0.55 (0.75)	0.75 (1)	1.1 (1.5)	1.5 (2)	2.2 (3)	3 (4)
Output KVA	0.4	0.7	1	1.3	1.7	2.4	3.2	4.6	6
Output current Max. A	0.9	1.7	2.3	3	3.9	5.5	7.4	10.4	13.6
Input current A	0.7 (2 1AC)	1.7 (4 1AC)	2.4 (5.5 1AC)	3.1 (7.5 1AC)	4.3 (9.9 1AC)	6.2 (14.4 1AC)	8.3 (19.6 1AC)	11.3 (26.4 1AC)	15.6 (35.5 1AC)
Input cable Min. mm² (awg)	1 (17)								2.5 (13)
Input cable Max. mm² (awg)	2.5 (13)					6 (9)			10 (7)
Output cable Min. mm² (awg)	1 (17)								1.5 (15)
Output cable Max. mm² (awg)	2.5 (13)					6 (9)			10 (7)
Dimensions [w x h x d] mm (inches)	73x173x149 (2.87x6.81x5.87)					149x202x172 (5.87x7.95x6.77)			185x245x195 (7.28x9.65x7.68)
Weight kg (lbs)	1.2 (2.6)					2.9 (6.4)	2.9 (6.4)	3.1 (6.8)	5.2 (11.4)

230 V Three Phase MICROMASTER Inverters (unfiltered)

Order No. (6SE6420-2UC)	**24-0CA0**	**25-5CA0**
Input voltage range	3AC 200V - 240V +10% -10%	
Motor output rating kW (hp)	4 (5)	5.5 (7.5)
Output KVA	7.7	9.6
Output current Max. A	17.5	22
Input current A	19.7	26.3
Input cable Min. mm² (awg)	2.5 (13)	4 (11)
Input cable Max. mm² (awg)	10 (7)	10 (7)
Output cable Min. mm² (awg)	2.5 (13)	4 (11)
Output cable Max. mm² (awg)	10 (7)	10 (7)
Dimensions [w x h x d] mm (inches)	185x245x195 (7.28x9.65x7.68)	185x245x195 (7.28x9.65x7.68)
Weight kg (lbs)	5.5 (12.1)	5.5 (12.1)

400 V Three Phase MICROMASTER Inverters (with built in Class A Filter)

Order No. (6SE6420-2AD)	**22-2BA0**	**23-0BA0**	**24-0BA0**	**25-5CA0**	**27-5CA0**	**31-1CA0**
Input voltage range	3AC 380V - 480V +10% -10%					
Motor output rating kW (hp)	2.2 (3)	3 (4)	4 (5)	5.5 (7.5)	7.5 (10)	11 (15)
Output KVA	4.5	5.9	7.8	10.1	14	19.8
Output current Max. A	5.9	7.7	10.2	13.2	18.4	26
Input current A	7.5	10	12.8	17.3	23.1	33.8
Input cable Min. mm² (awg)	1 (17)	1 (17)	1.5 (15)	2.5 (13)	4 (11)	6 (9)
Input cable Max. mm² (awg)	6 (9)			10 (7)		
Output cable Min. mm² (awg)	1 (17)			1.5 (15)	2.5 (13)	4 (11)
Output cable Max. mm² (awg)	6 (9)			10 (7)		
Dimensions [w x h x d] mm (inches)	149x202x172 (5.87x7.95x6.77)			185x245x195 (7.28x9.65x7.68)		
Weight kg (lbs)	3.1 (6.8)	3.3 (7.3)	3.3 (7.3)	5.4 (11.9)	5.7 (12.5)	5.7 (12.5)

400 V Three Phase MICROMASTER Inverters (unfiltered)

Order No. (6SE6420-2UD)	**13-7AA0**	**15-5AA0**	**17-5AA0**	**21-1AA0**	**21-5AA0**	**22-2BA0**	**23-0BA0**	**24-0BA0**	**25-5CA0**	**27-5CA0**	**31-1CA0**
Input voltage range	3AC 380V - 480V +10% -10%										
Motor output rating kW (hp)	0.37 (0.5)	0.55 (0.75)	0.75 (1)	1.1 (1.5)	1.5 (2)	2.2 (3)	3 (4)	4 (5)	5.5 (7.5)	7.5 (10)	11 (15)
Output KVA	0.9	1.2	1.6	2.3	3	4.5	5.9	7.8	10.1	14	19.8
Output current Max. A	1.2	1.6	2.1	3	4	5.9	7.7	10.2	13.2	18.4	26
Input current A	1.6	2.1	2.8	4.2	5.8	7.5	10	12.8	17.3	23.1	33.8
Input cable Min. mm² (awg)	1 (17)							1.5 (15)	2.5 (13)	4 (11)	6 (9)
Input cable Max. mm² (awg)	2.5 (13)					6 (9)			10 (7)		
Output cable Min. mm² (awg)	1 (17)								1.5 (15)	2.5 (13)	4 (11)
Output cable Max. mm² (awg)	2.5 (13)					6 (9)			10 (7)		
Dimensions [w x h x d] mm (inches)	73x173x149 (2.87x6.81x5.87)					149x202x172 (5.87x7.95x6.77)			185x245x195 (7.28x9.65x7.68)		
Weight kg (lbs)	1.3 (2.9)					3.1 (6.8)	3.3 (7.3)	3.3 (7.3)	5.2 (11.4)	5.5 (12.1)	5.5 (12.1)

Notes

a) Siemens 4 pole-motor
b) 3 kW 230 unit requires an external choke (e.g. 4EM6100-3CB) and a 30 A mains fuse to operate on a single phase supply.

Table 7-2 MICROMASTER Performance Ratings

Feature	Specification								
Mains Operating Voltage	200 to 240 V ± 10% 1AC 200 to 240 V ± 10% 3AC 380 to 480 V ± 10% 3AC								
Power Ranges	200 to 240 V ± 10% 1AC 0.12kW – 3.0 kW 200 to 240 V ± 10% 3AC 0.12kW – 5.5 kW 380 to 480 V ± 10% 3AC 0.37kW – 11.0 kW								
Dimensions (Without Gland Plate)	FSA [W*H*D] mm (inches)			FSB [W*H*D] mm (inches)			FSC [W*H*D] mm (inches)		
	73 (2.87)	173 (6.81)	149 (5.87)	149 (5.87)	202 (7.95)	172 (6.77)	185 (7.28)	245 (9.65)	195 (7.68)
Protection Level	IP20								
Temperature Range	-10°C to +50°C								
Storage Temperature	-40°C to +70°C								
Humidity	95% RH – non-condensing								
Operational Altitudes	up to 1000m above sea level without derating								
Control Method	Linear V/f ; Quadratic V/f; Flux Current Control (FCC)								
Overload Capability	1.5 * nominal output current for 60 seconds (every 300 seconds)								
Electromagnetic Compatibility	Optional EMC filters to EN55011 Class A or B, also Internal Class A filters available								
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								
Switching frequency	2kHz to 16kHz (2kHz steps)								
Digital Inputs	3 programmable isolated) inputs, switchable active high / active low (PNP/NPN)								
Fixed frequencies	7 programmable								
Skip Frequencies	4 programmable								
Relay Outputs	1 programmable 30V DC / 5A (resistive), 250V AC 2A (resistive)								
Analogue Input	1 (0/2 to 10V) used for setpoint or PI feedback signal								
Analogue Output	1 (0/4 to 20mA) 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	≥0.7								
Inverter efficiency	96 to 97 %								
Inrush current	Less than nominal input current								
Braking	DC braking, compound braking								

8 Supplementary Information

This Chapter contains:

Supplementary information.

Notes

- 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 460V.

8.1 Available options

The following accessories are available as options for your MICROMASTER MM420 Inverter. For more details please refer to the Reference Manual or contact your local Siemens sales office if you require assistance.

- Additional RFI suppression filter
- Clear Text Display for all languages (AOP)
- PROFIBUS module (PRO)
- DriveMonitor software for control via PC
- Output chokes and line chokes
- IP20 (NEMA 1) Accessory Kit (Only for Frame Size A)

8.2 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:

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.

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.

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.

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 8-1 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 8-2 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 8-3 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

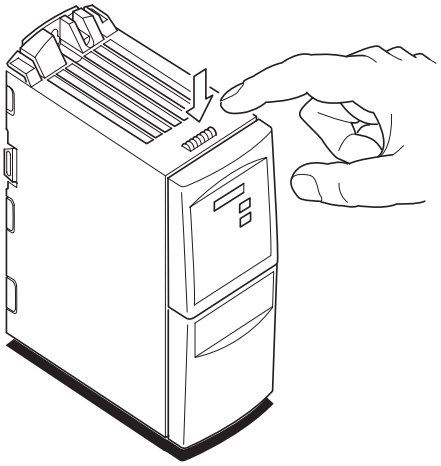
- To achieve these performance levels, you must not exceed the default switching frequency nor use cables longer than 25 m.
- The MICROMASTER inverters are intended **exclusively for professional applications**. Therefore, they do not fall within the scope of the harmonics emissions specification EN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

Table 8-4 Compliance Table

Model	Remarks
Class 1 – General Industrial	
6SE6420-2U***-**A0	Unfiltered units, all voltages and powers.
Class 2 – Filtered Industrial	
6SE6420-2A***-**A0	All units with integral Class A filters
6SE6420-2A***-**A0 with 6SE6400-2FA00-6AD0	Frame size A units 400-480 V with external Class A footprint filters
Class 3 – Filtered for residential, commercial and light industry	
6SE6420-2U***-**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



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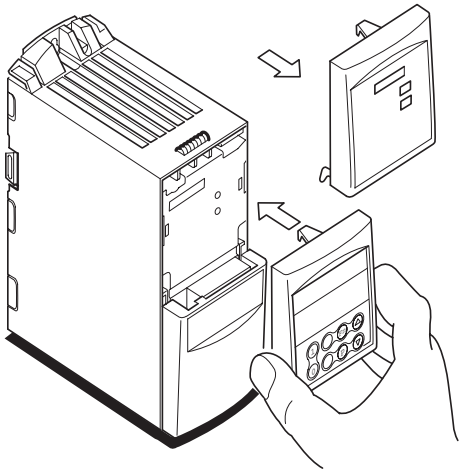

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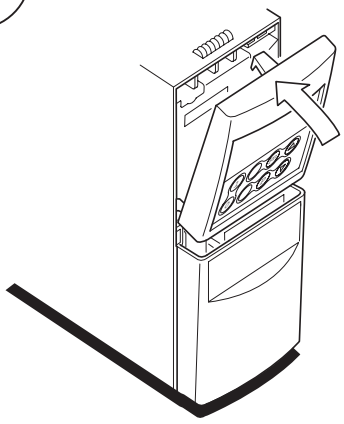

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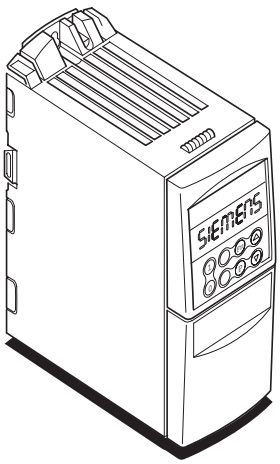
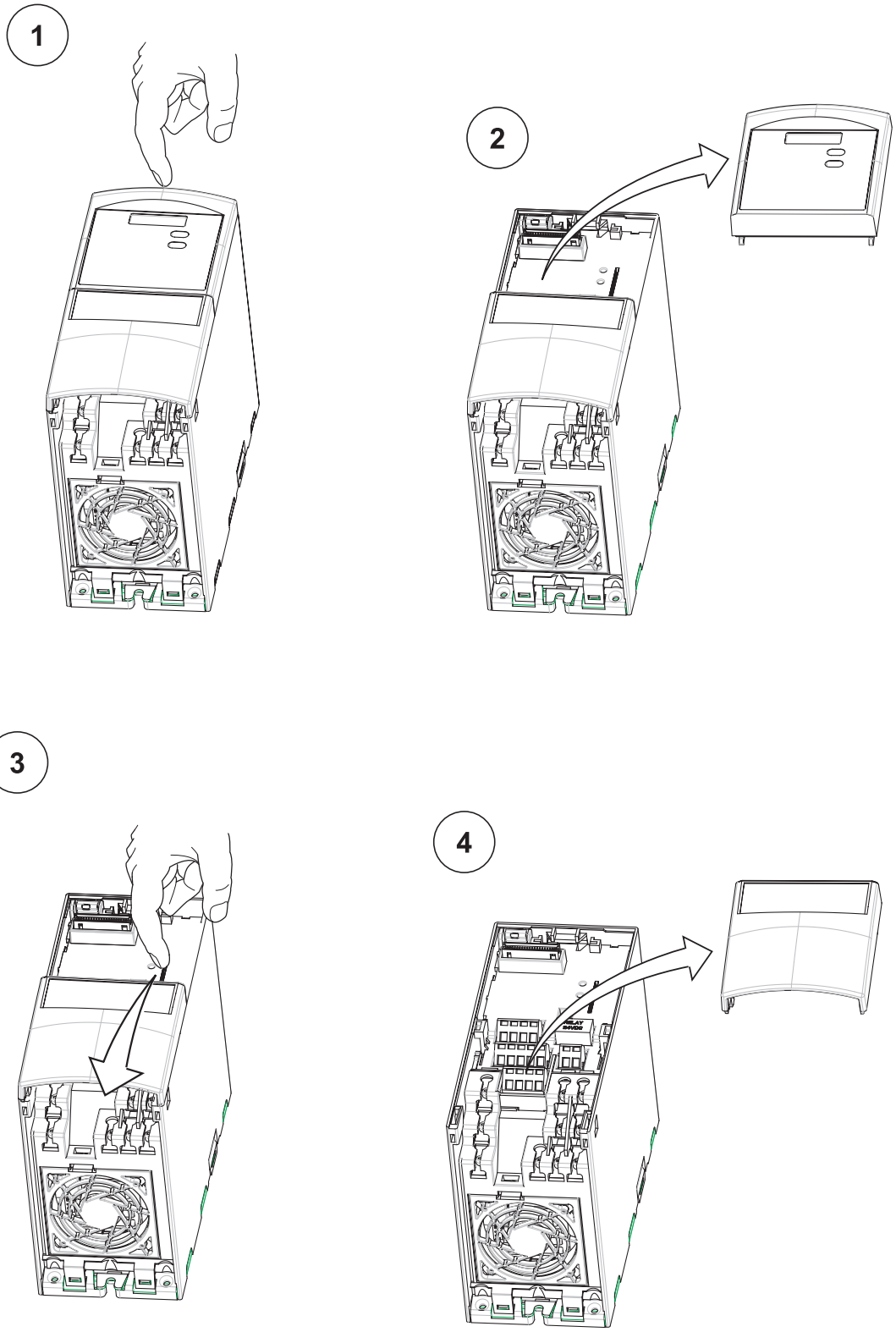
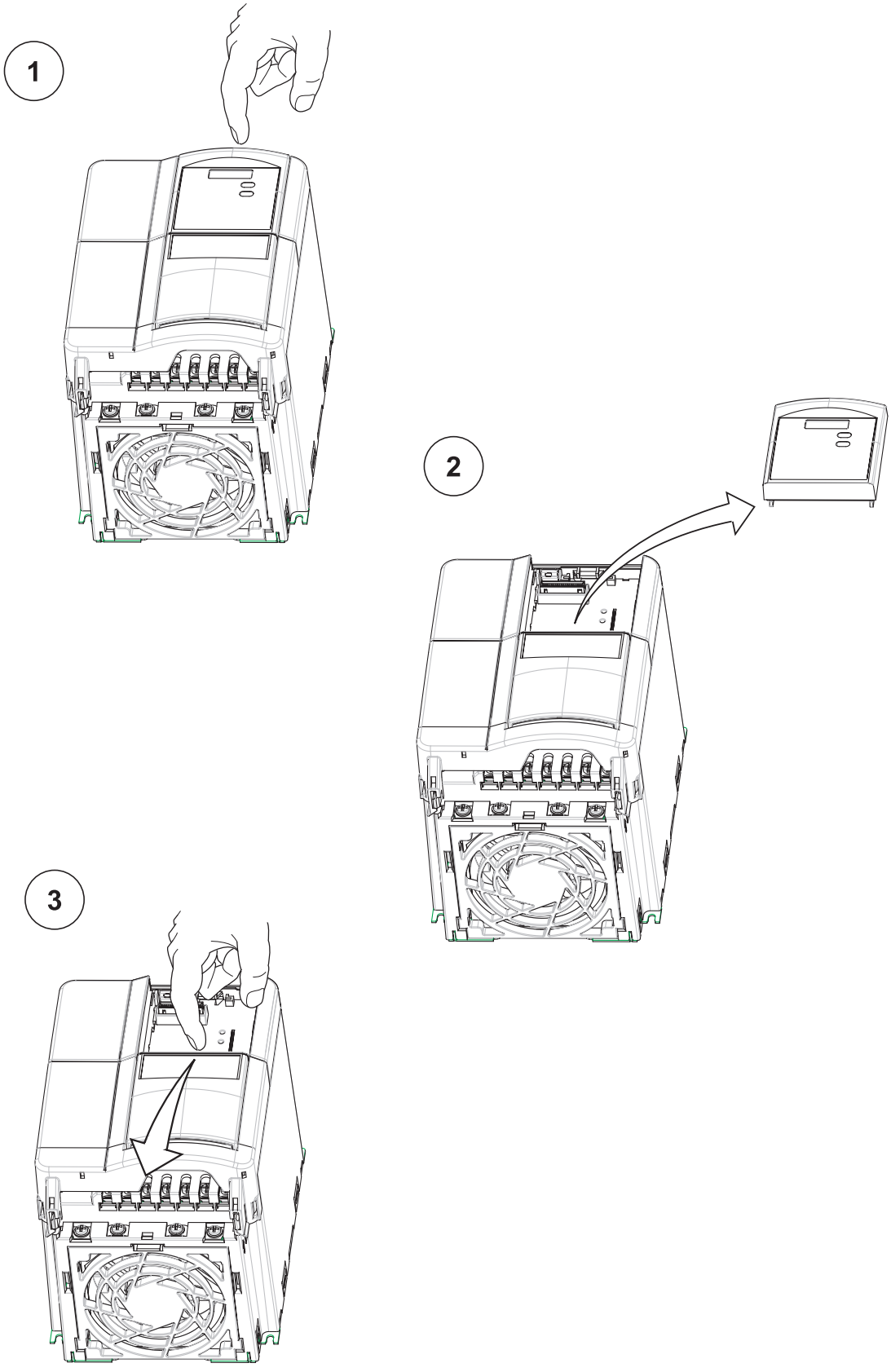
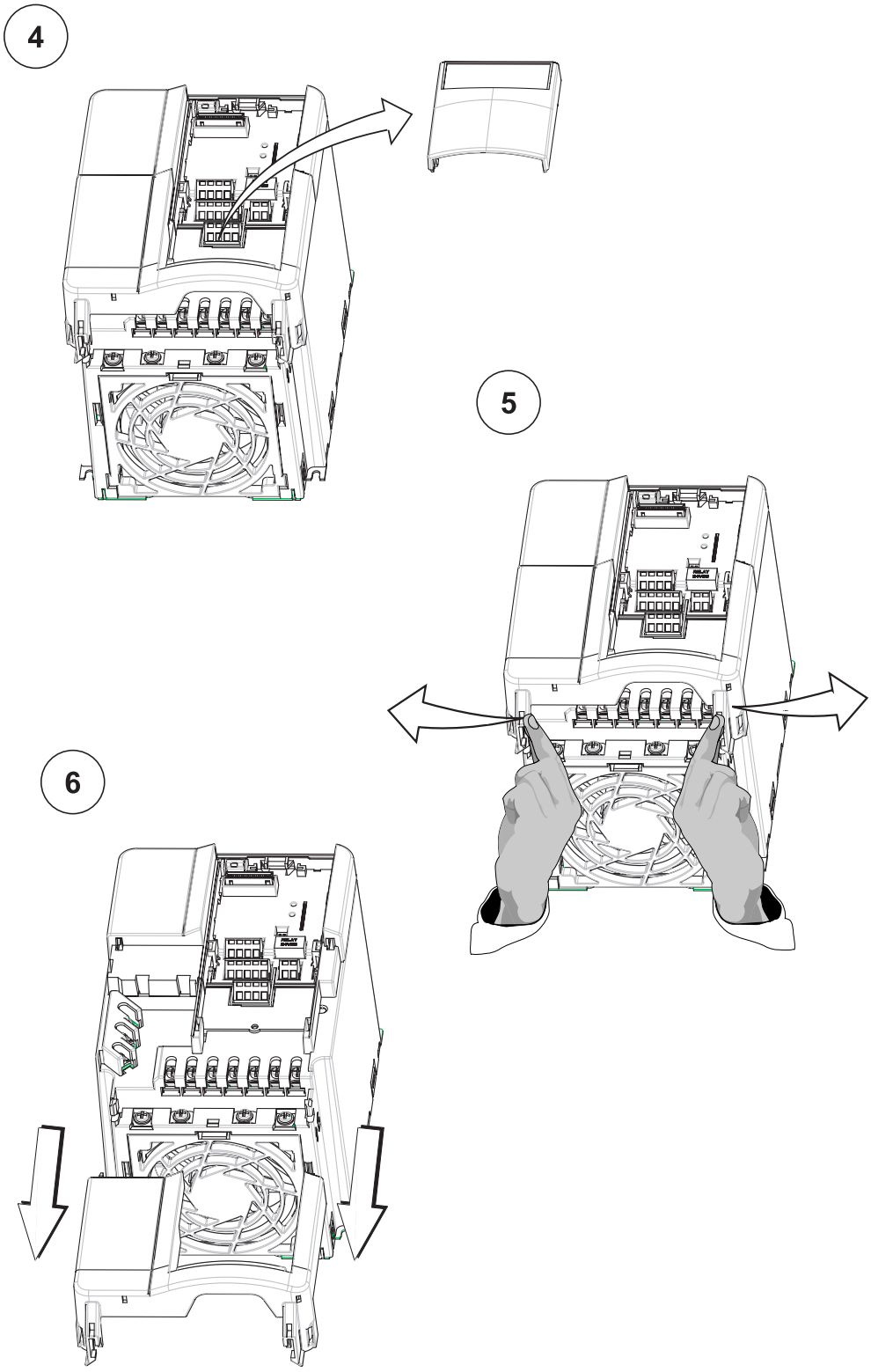


B - Removing Covers Frame Size A



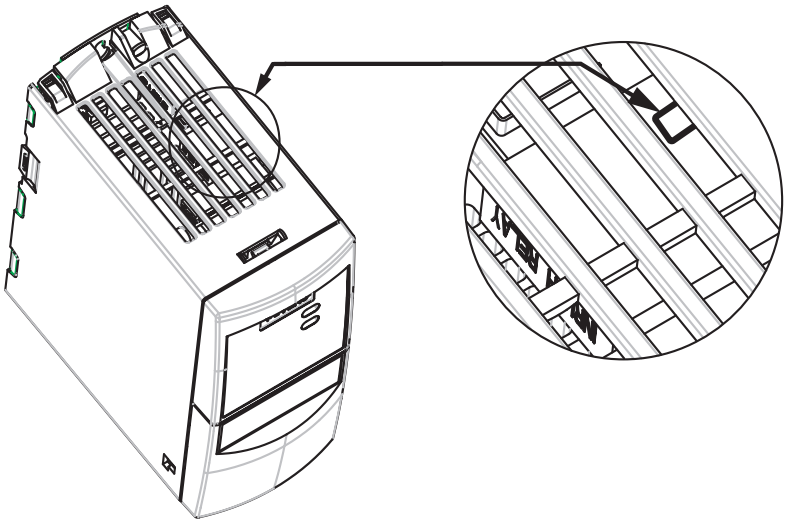
C - Removing Covers Frame Sizes B and C




4
5
6

D - Removing ‘Y’ Cap Frame Size A

1



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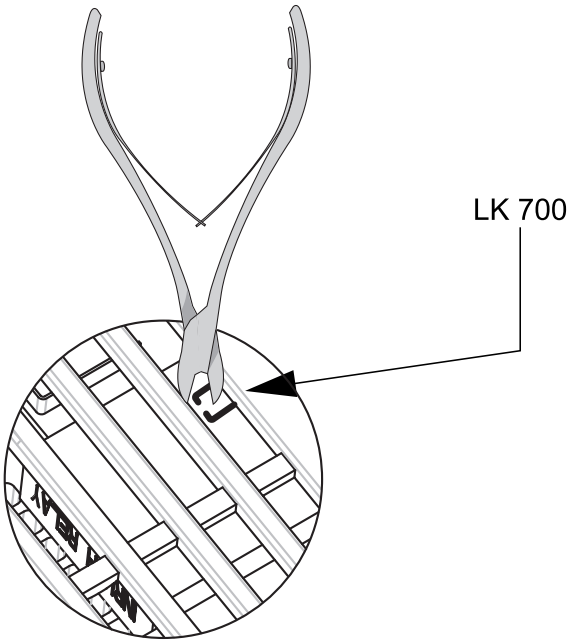
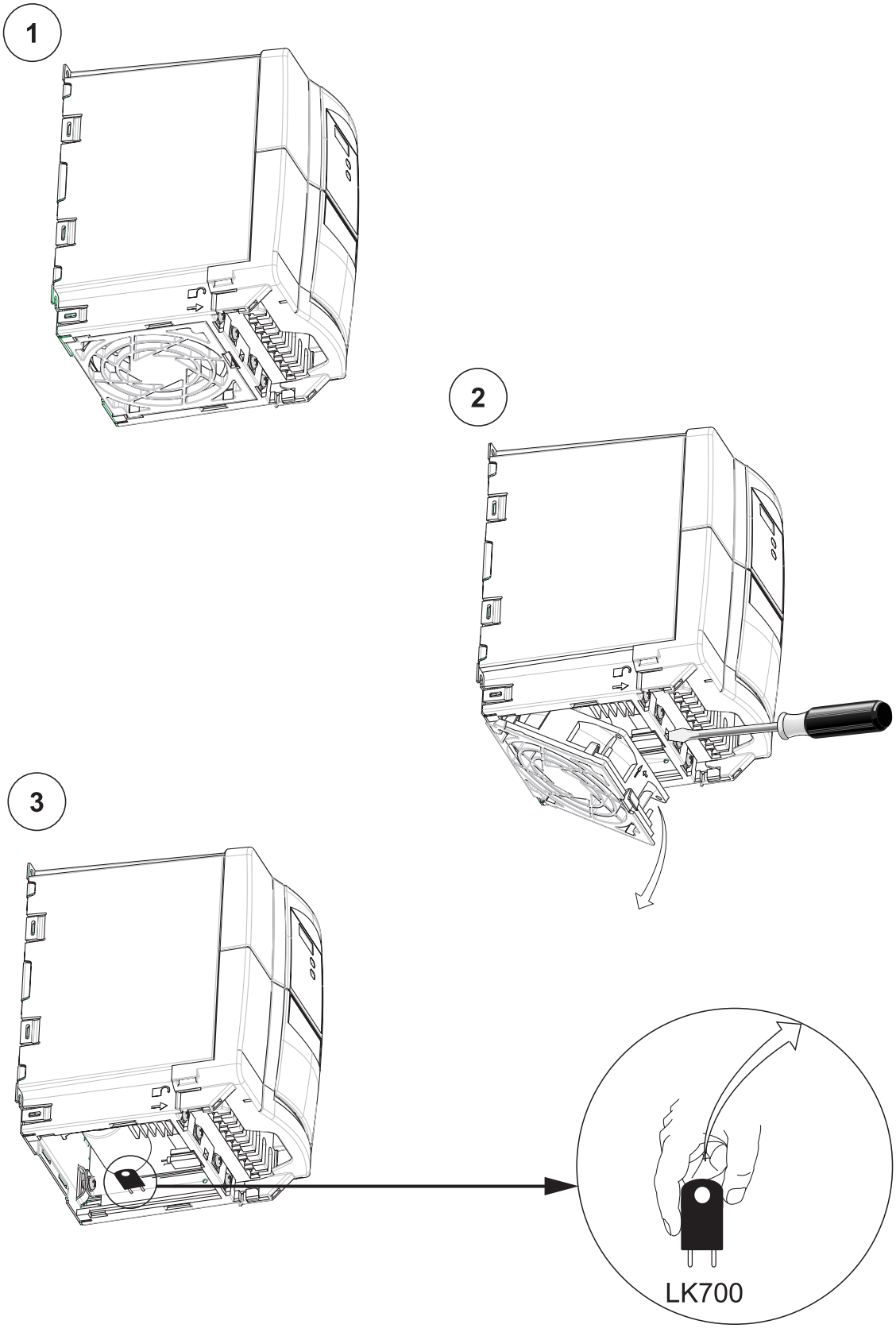


E - Removing 'Y' Cap Frame Sizes B and C



F - User Parameter Settings

Please enter your parameter settings in the following table.

Table E-1 User's Parameters Settings

Parameter Number	User Settings	Default
r0000		-
r0002		-
P0003		1
P0004		0
P0005		21
P0010		0
r0018		-
r0021		-
r0025		-
r0026		-
r0027		-
r0034		-
r0039		-
P0040		0
r0052		-
r0053		-
r0056		-
P0100		0
r0206		-
r0207		-
r0208		-
P0300		1
P0304		***
P0305		***
P0307		***
P0308		0
P0309		0
P0310		50
P0311		0
P0335		0
P0340		0
P0350		***
P0611		100
P0614		100
P0640		150
P0700		2
P0701		1
P0702		12
P0703		9
P0704		0
r0722		-
P0731		52:3
r0752		-
r0754		-
r0755		-
P0756		0
P0757		0
P0758		0
P0759		10
P0760		100
P0761		0
P0771		21

Parameter Number	User Settings	Default
r0774		-
P0777		0
P0778		0
P0779		100
P0780		20
P0781		0
P0918		3
P0927		15
r0947 i 0		-
r0947 i 1		-
r0947 i 2		-
r0947 i 3		-
r0947 i 4		-
r0947 i 5		-
r0947 i 6		-
r0947 i 7		-
P0970		0
P1000		2
P1001		0
P1002		5
P1003		10
P1004		15
P1005		20
P1006		25
P1007		30
P1016		1
P1017		1
P1018		1
P1031		0
P1040		5
P1058		5
P1059		5
P1060		10
P1061		10
P1080		0
P1082		50
P1120		10
P1121		10
P1130		0
P1131		0
P1132		0
P1133		0
P1134		0
P1135		5
P1200		0
P1210		1
P1215		0
P1216		1
P1217		1
P1232		100
P1233		0
P1236		0

Parameter Number	User Settings	Default
P1300		1
P1310		50
P1311		0
P1312		0
P1333		10
P1335		0
P1336		250
P1800		4
P1820		0
P1910		0
r1912		-
P2000		50
P2010 i 0		6
P2010 i 1		6
P2011 i 0		0
P2011 i 1		0
r2110 i 0		-
r2110 i 1		-
r2110 i 2		-
r2110 i 3		-
r2197		-
P2200		0
P2201		0
P2202		10
P2203		20
P2204		30
P2205		40
P2206		50
P2207		60
P2216		1
P2217		1
P2218		1
r2224		-
P2231		0
P2240		10
r2250		-
P2253		0
P2257		1
P2258		1
r2260		-
P2264		755
P2265		0
r2266		-
P2271		0
r2272		-
r2273		-
P2280		3
P2285		0
P2291		100
P2292		0
r2294		-
P3900		0

G - 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.

H - List of Abbreviations

AOP	Advanced Operator Panel
AC	Alternating Current
BI	Binector Input
BO	Binector Output
BOP	Basic Operator Panel
DC	Direct Current
CI	Connector Input
CO	Connector Input
EEC	European Economic Community
ELCB	Earth Leakage Circuit Breaker
EMC	Electro-Magnetic Compatibility
EMI	Electro-Magnetic Interference
FCC	Flux Current Control
FCL	Fast Current Limitation
IGBT	Insulated Gate Bipolar Transistor
LCD	Liquid Crystal Display
LED	Light Emitting Diode
PI	Proportional and Integral
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

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Suggestions and/or Corrections

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Suggestions

Corrections

For Publication/Manual:

MICROMASTER 420

User Documentation

Operating Instructions

Order Number.: 6SE6400-5AA00-0BP0
Date of Issue: Release

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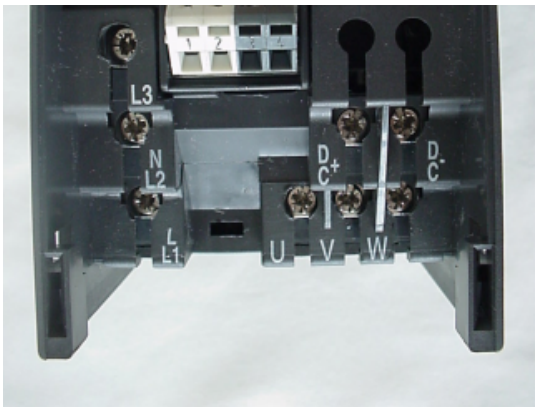
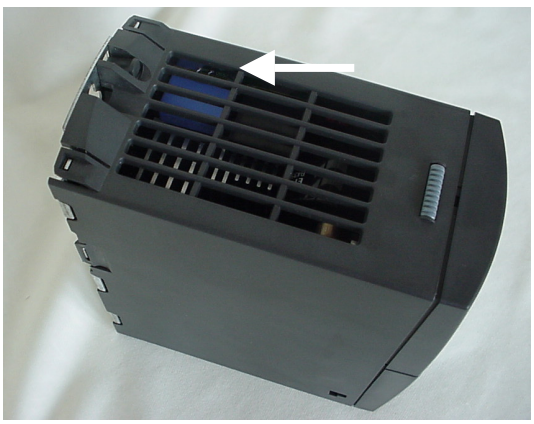
Should you come across any printing errors when reading this publication, please notify us on this sheet.

Suggestions for improvement are also welcome.

View of Unit	Frame Size A	Frame Size B & C
Standard Display Panel fitted		
Power Terminal Connections		
Control Terminal Connections		
Access to “Y Cap“		

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