SIEMENS

MICROMASTER 410

Operating Instructions **Issue 04/02**

User Documentation
6SE6400-5EA00-0BP0

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Operating Instructions
User Documentation

Valid for	**Issue 04/02**
Converter Type	*Software version*
MICROMASTER 410	V1.6

Issue 04/02

IMPORTANT NOTICE

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

For UL listed products the following UL mark is used:

Further information can be obtained from Internet website:

http://www.siemens.de/micromaster

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

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

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

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Document subject to change without prior notice.

Order number: 6SE6400-5EA00-0BP0

Siemens-Aktiengesellschaft

Foreword

User Documentation

WARNING

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

Information is also available from:

Technical Support Nuremberg

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

Internet Home Address

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

Contact address

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

Definitions and Warnings

DANGER

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

WARNING

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

CAUTION

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

CAUTION

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

NOTICE

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

NOTES

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

Qualified personnel

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

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

PE

= Ground

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

Use for intended purpose only

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

Safety Instructions

The following Warnings, Cautions and Notes are provided for your safety and as a means of preventing damage to the product or components in the machines connected. This section lists Warnings, Cautions and Notes, which apply generally when handling MICROMASTER 410 Inverters, classified as **General**, **Transport & Storage**, **Commissioning**, **Operation**, **Repair** and **Dismantling & Disposal**.

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

Please read the information carefully, since it is provided for your personal safety and will also help prolong the service life of your MICROMASTER 410 Inverter and the equipment you connect to it.

General

WARNING

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

CAUTION

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

NOTES

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

Transport & Storage

WARNING

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

CAUTION

- Protect the inverter against physical shocks and vibration during transport and storage. Also be sure to protect it against water (rainfall) and excessive temperatures (*see table on page 19*).

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.
- The following terminals can carry dangerous voltages even if the inverter is inoperative:
  - the power supply terminals L and N.
  - the motor terminals U, V, W and the terminals DC+ and DC-.
- This equipment must not be used as an 'emergency stop mechanism' *(see EN 60204, 9.2.5.4)*

CAUTION

The connection of power, motor and control cables to the inverter must be carried out as shown in Figure 2-10 on page 30, to prevent inductive and capacitive interference from affecting the correct functioning of the inverter.

Operation

WARNING

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

Repair

WARNING

- Repairs on equipment may only be carried out by **Siemens Service**, by repair centers **authorized by Siemens** or by qualified personnel who are thoroughly acquainted with all the warnings and operating procedures contained in this manual.
- Any defective parts or components must be replaced using genuine Siemens authorised parts.
- Risk of electric shock. **Wait 5 minutes for the DC capacitors to discharge before carrying out any installation work.**

Dismantling & Disposal

NOTES

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

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1 Overview

1.1 The MICROMASTER 410

The MICROMASTER 410s are a range of frequency inverters for controlling the speed of three phase AC motors. The various models available range from 120 W to 750 W single-phase input.

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

The MICROMASTER 410 with its default factory settings is ideal for a large range of simple motor control applications.

The MICROMASTER 410 can be used in both 'stand-alone' applications as well as being integrated into 'Automation Systems'.

1.2 Features

Main Characteristics

- Easy installation
- Easy commissioning
- Rugged EMC design
- Can be operated on IT line supplies
- Fast repeatable response time to control signals
- Comprehensive range of parameters enabling configuration for a wide range of applications
- Simple cable connection
- Relay output
- 3 digital inputs
- 1 Analog input - AIN1: 0 – 10 V
  The analog input can be used as the 4th digital input
- High pulse frequencies for low-noise motor operation
- Status information and alarm messages with the optional Operator Panel
- External options for PC communications, Operator Panel

Performance Characteristics

- Flux Current Control (FCC) for improved dynamic response and motor control
- Fast Current Limitation (FCL) for trip-free operation
- Built-in DC injection brake
- Compound braking to improve braking performance
- Acceleration/deceleration times with programmable smoothing
- Selectable up and down ramps
- 4-point ramp smoothing
- Multi-point V/f characteristic
- 150 % overload for 60 seconds
- Automatic restart after a mains failure
- Start-on-the-fly

Protection Characteristics

- Overvoltage/undervoltage protection
- Overtemperature protection for the inverter
- Ground fault protection
- Short-circuit protection
- I^2t thermal motor protection
- Motor stall prevention

2 Installation

WARNING

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

CAUTION

The connection of power, motor and control cables to the inverter must be carried out as shown in Figure 2-10 on page 30, to prevent inductive and capacitive interference from affecting the correct functioning of the inverter.

2.1 General

Installation after a Period of Storage

Following a prolonged period of storage, you must reform the capacitors in the inverter. **It is important that the time of storage is calculated from the time of manufacture and not the time of delivery.** The requirements are listed below.

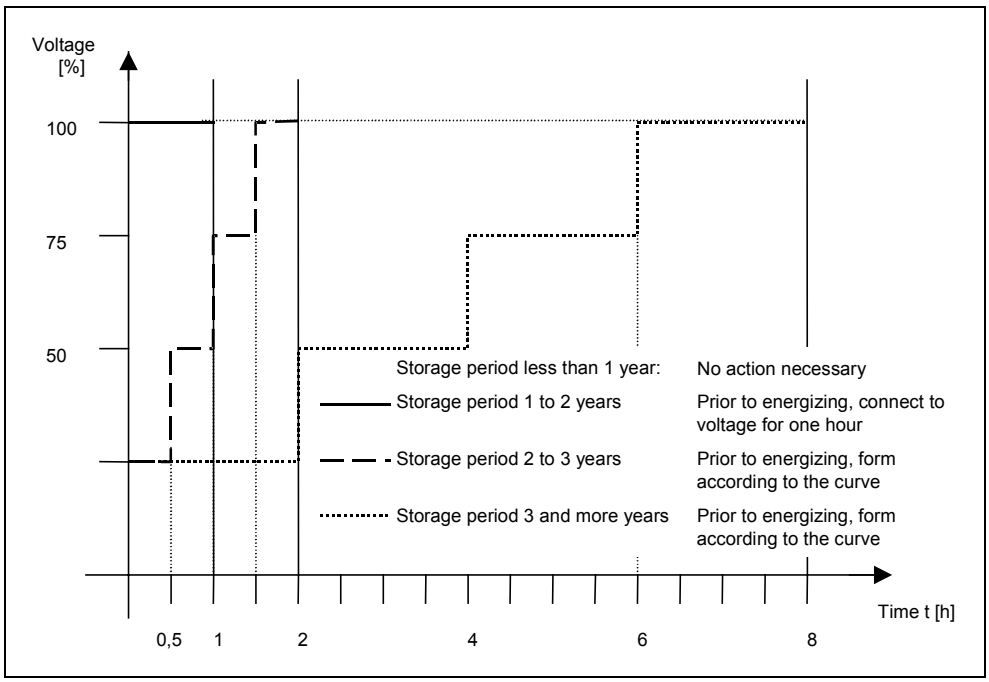


Figure 2-1 Forming

The serial numbers consist 13 characters and contains the date of manufacture, e.g. XAM214-123456

XAM214-123456 Characters 1-2 are the site where the product is built
XA**M**214-123456 Character 3 denotes the year eg. M = 2000
XAM**2**14-123456 Character 4 is the month (1-9 =Jan-Sep, O =Oct, N =Nov, D =Dec)
XAM2**14**-123456 Characters 5-6 are the day of the month
XAM214**-**123456 Character 7 is a seperator
XAM214-**123456** Characters 8-13 are the sequential serial number 1-999999

2.2 Power Losses

Figure 2-2 shows the power loss for the MICROMASTER 410 Inverter. The graph can be used to read the loss at full load of a particular variant.

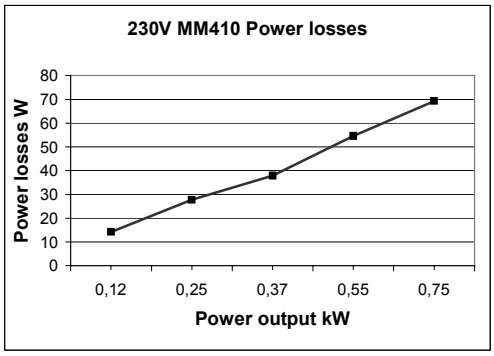


Figure 2-2 Power Losses, 230 V

2.3 Ambient operating conditions

Temperature

Frame Size	AA	AB
Min. [°C]	-10	-10
Max. [°C]	50	50

For UL compliance the maximum surrounding air temperature for 230 V / 750 W and 115 V / 550 W inverters is 40 ºC, for all other inverters 50 ºC.

Humidity Range

Relative air humidity ≤ 95 % Non-condensing

Altitude

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

Figure 2-3 below shows the permissible rated input voltages and output current for inverter installations from 500 m to 4000 m above sea level.

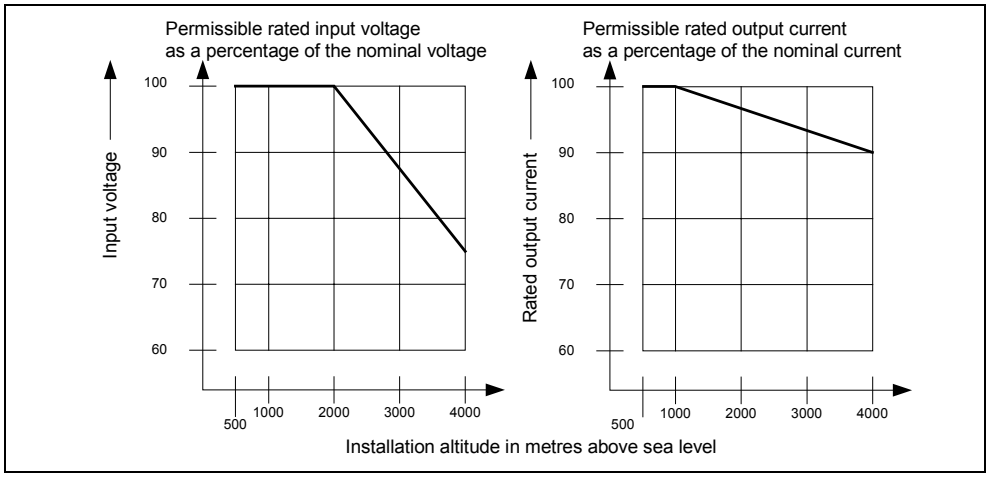


Figure 2-3 Derating for Altitude

Shock

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

Mechanical strength to EN 60721-3-3

- Deflection: 0.075 mm (10 ... 58 Hz)
- Acceleration: 10 m/s^2 (58 ... 200 Hz)

Vibration

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

Electromagnetic Radiation

Do not install the inverter near sources of electromagnetic radiation.

Atmospheric Pollution

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

Water

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

Installation and cooling

CAUTION

The inverter can be front or side mounted, but **MUST** be installed in a vertical position. Mount the inverter vertically to ensure optimum cooling, see Figure 2-5 on page 23.

Ensure that the inverter's air vents are not obstructed. Allow 100 mm clearance above and below the inverter. A clearance of 30 mm on both sides of the inverter is also required.

2.4 Harmonic Currents

Harmonic currents with 1% mains impedance.

Table 2-1 Single Phase 115 V Connection

MLFB	Filter Type	Power CT (kW)	Fundamental Amps	3rd Amps	5th Amps	7th Amps	9th Amps	11th Amps	13th Amps
6SE6410-2UA11-2AA0	UNFILTERED	0,12	2,90	2,80	2,60	2,35	2,00	1,68	1,30
6SE6410-2UA12-5AA0	UNFILTERED	0,25	5,65	5,30	4,68	3,80	2,87	1,98	1,27
6SE6410-2UA13-7AA0	UNFILTERED	0,37	7,94	7,32	6,07	4,57	3,05	1,87	1,24
6SE6410-2UA15-5BA0	UNFILTERED	0,55	11,25	10,10	8,06	5,67	3,50	2,00	1,58

Table 2-2 Single Phase 230 V Connection

MLFB	Filter Type	Power CT (kW)	Fundamental Amps	3rd Amps	5th Amps	7th Amps	9th Amps	11th Amps	13th Amps
6SE6410-2BB11-2AA0	B	0,12	1,34	1,20	0,83	0,45	0,18	0,12	0,06
6SE6410-2UB11-2AA0	UNFILTERED								
6SE6410-2BB12-5AA0	B	0,25	2,90	2,40	1,70	0,95	0,40	0,20	0,20
6SE6410-2UB12-5AA0	UNFILTERED								
6SE6410-2BB13-7AA0	B	0,37	4,10	3,50	2,50	1,40	0,60	0,25	0,25
6SE6410-2UB13-7AA0	UNFILTERED								
6SE6410-2BB15-5BA0	B	0,55	5,30	4,60	3,30	1,80	0,70	0,40	0,40
6SE6410-2UB15-5BA0	UNFILTERED								
6SE6410-2BB17-5BA0	B	0,75	7,30	6,50	4,40	2,50	1,00	0,50	0,50
6SE6410-2UB17-5BA0	UNFILTERED								

2.5 Derating with Pulse Frequencies

Table 2-3 Derating with Pulse Frequencies

Power (kW)	Measured Output Current (A)						
	4 kHz	6 kHz	8 kHz	10 kHz	12 kHz	14 kHz	16 kHz
0.12	0.9	0.9	0.9	0.8	0.7	0.6	0.5
0.25	1.7	1.7	1.7	1.5	1.3	1.1	0.9
0.37	2.3	2.3	2.3	2.0	1.7	1.5	1.3
0.55 (115V,50°C)	3.0	3.0	2.7	2.5	2.2	2.0	1.7
0.55 (115V,40°C)	3.2	3.2	3.2	2.9	2.6	2.3	2.0
0.75	3.9	3.9	3.6	3.2	2.9	2.6	2.3
0.75 (40º C)	4.2	4.2	4.2	3.8	3.4	3.0	2.7

All currents are rated at 50 ºC unless otherwise stated

2.6 Overvoltage and Trip Levels

The inverter will protect itself from both supply overvoltage and undervoltage. Trip levels are show in Table 2-4. Internal overvoltage can occur during braking where internal voltages are forced high by energy from an external load.

Table 2-4 Trip Levels

Input Supplies	Undervoltage trip levels	Overvoltage trip levels
1 Phase 230 V	115 V	290 V
1 Phase 115 V	60 V	145 V

2.7 Mechanical Installation

Warning

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

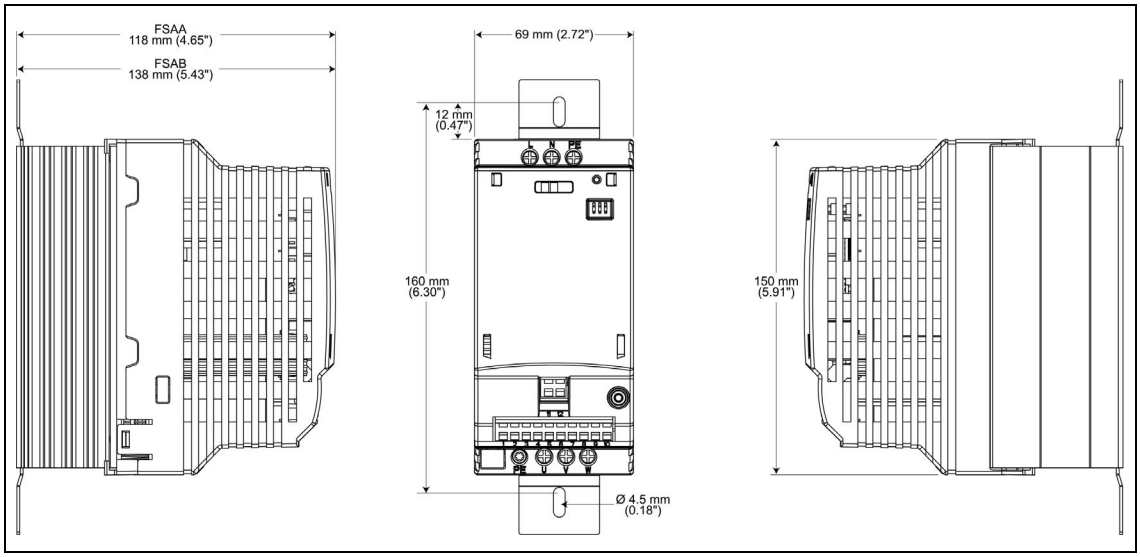


Figure 2-4 Dimensions of the MICROMASTER 410

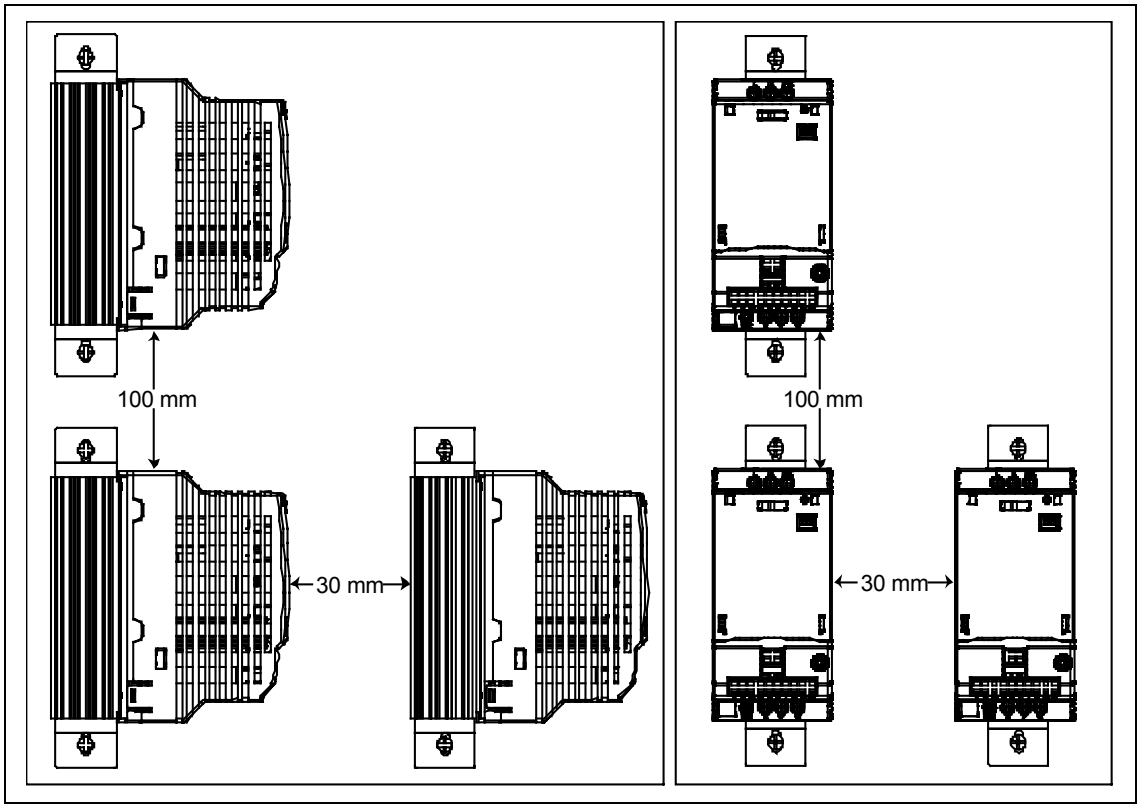


Figure 2-5 Clearance distances for mounting the inverter

For side mounting and UL compliance the ambient temperature should be no greater than 40 ºC. The maximum output current of the 750 W inverter is 3.2 A.

Table 2-5 Dimensions and Torques of MM410

Frame Size	Overall Dimensions			Fixing Method	Tightening Torque of fixings
	Height	Width	Depth		
AA	150 mm (5.91”)	69 mm (2.72”)	118 mm (4.65”)	2 x M4 Bolts* 2 x M4 Nuts* 2 x M4 Washers* or Connecting to DIN rail**	2.5 Nm with washers fitted
AB	150 mm (5.91”)	69 mm (2.72”)	138 mm (5.43”)	2 x M4 Bolts* 2 x M4 Nuts* 2 x M4 Washers* or Connecting to DIN rail**	2.5 Nm with washers fitted

* *Not supplied with the inverter.*

** *The DIN rail mounting kit is an optional extra which must be ordered separately. For details see Section 2.7.2 on page 25.*

2.7.1 Mounting Brackets

The MICROMASTER 410 can be mounted using mounting brackets, which are slotted into the heatsink at the rear of the inverter for normal mounting position (see Figure 2-6 A. For side mounting of the inverter the brackets are slotted into the heatsink as shown in Figure 2-6 B.

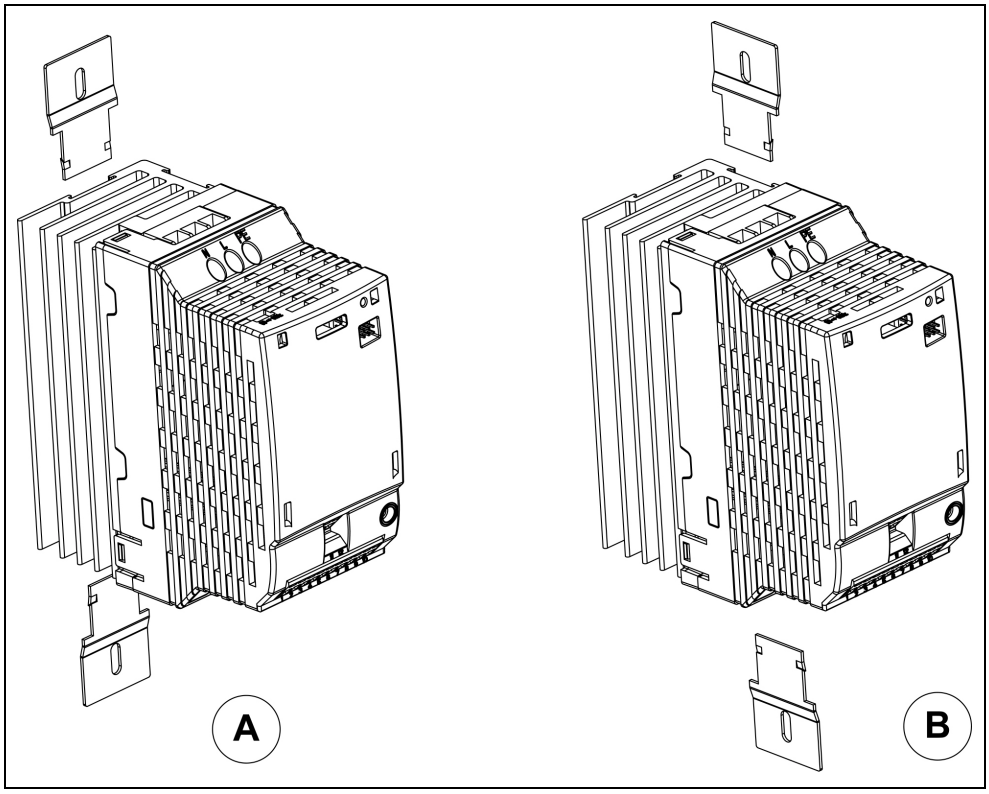
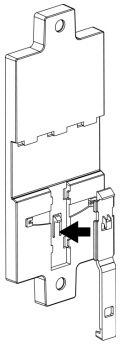


Figure 2-6 Mounting Brackets

2.7.2 DIN Rail Mounting

A



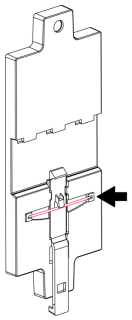
The DIN Rail Mounting Kit consists of the following items:

- 1 x plastic moulded base
- 1 x plastic moulded retaining clip
- 1 x Metal spring

The DIN Rail Mounting Kit is supplied as an option for the inverter. If a mounting kit is required it can be ordered using the following order number:

- 6SE6400-0DR00-0AA0

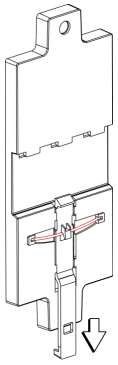
B



In order to fit the DIN Rail Mounting Kit to the inverter, the kit must first be assembled using the following procedure:

1. The retaining clip is fitted into the recess of the plastic moulded base, as shown in Drawing A.
2. The spring is fitted into the base as shown in Drawing B.
3. Ensure that the spring is secured to the retaining clip as shown in Drawing B.
4. Ensure that the retaining clip can be moved in a downward direction, as shown in Drawing C.
   When the retaining clip is released, it should return to its normal position in an upward direction. If it does not, the spring has been fitted incorrectly.

C

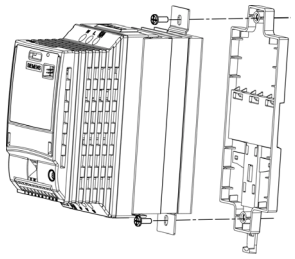


In order to fit the DIN Rail Mounting Kit to the inverter the following procedure should be performed:

1. The base is fitted to the inverter using 2 x M5 screws, as shown in Drawing D.
2. Ensure that the base is securely fastened to the inverter without causing any damage to the moulded plastic base.

Ensure that the base is securely fastened to the inverter without causing any damage to the moulded plastic base.

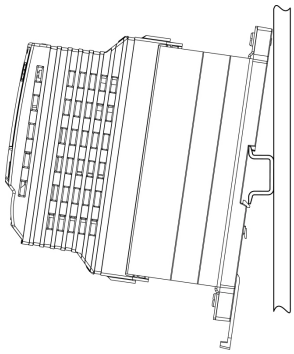
D



1. Clip the top recess of the base onto the DIN rail, as shown in Drawing E.
2. The inverter can now be pushed and locked onto the DIN rail.

The inverter can be removed from the DIN rail by pulling the retaining clip in a downward direction.

E



2.8 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 with a minimum distance of 30 mm (1.18 inches) between units and a distance of 100 mm (3.94 inches) must be maintained if the inverters are installed on top of each other.

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.

2.8.1 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 output phase is shorted to ground.

On ungrounded supplies, it will be necessary to cut the ‘Y’ capacitor link from the inside of the unit. The procedure for removing this capacitor is described on page 28 (Figure 2-7) of this manual.

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 30 mA.
- ☑ The neutral of the supply is grounded.
- ☑ Only one inverter is supplied from each RCD.
- ☑ The output cables are less than 30 m [98.43 ft](screened) or 50 m [164.04 ft] (unscreened).

Operation with long cables

All inverters will operate at full specification with cable lengths up to 30 m [98.43 ft] (screened) or 50 m [164.04 ft] (unscreened).

2.8.2 Power and motor connections

WARNING

- Isolate the mains electrical supply before making or changing connections to the unit.
- Ensure that the inverter is configured for the correct supply voltage: single-phase 230 V MM410 MICROMASTERS must not be connected to a higher voltage supply.
- The 115 V unit MUST only be connected to a 115 V supply.
- When synchronous motors are connected or when connecting several motors in parallel, the inverter must be operated with voltage/frequency control characteristic (P1300 = 0, 2 or 3).

NOTICE

- Ensure that the appropriate circuit-breakers/fuses with the specified current rating are connected between the power supply and inverter *(see Tables starting on page 63*).
- Use Class 1 60/75°C copper wire only (16 AWG minimum for UL compliance). For 115 V units use class 1 75 °C copper wire only. For tightening torque see Table 7-2 on page 64.
- To tighten up the power terminal screws use a 4 - 5 mm cross-tip screwdriver.

Removal of 'Y' Capacitor Link

To use the inverter on ungrounded supplies the 'Y' capacitor (cap) link must be removed as follows:

1. Ensure the inverter has been disconnected from all power supplies.
2. Locate the 'Y' Cap cover on the left side of the unit near the rating label.
3. Carefully remove the 'Y' Cap cover.
4. Cut the 'Y' Cap link with an appropriate pair of wire-cutters.
5. After removal of the cover the degree of protection is IP00.

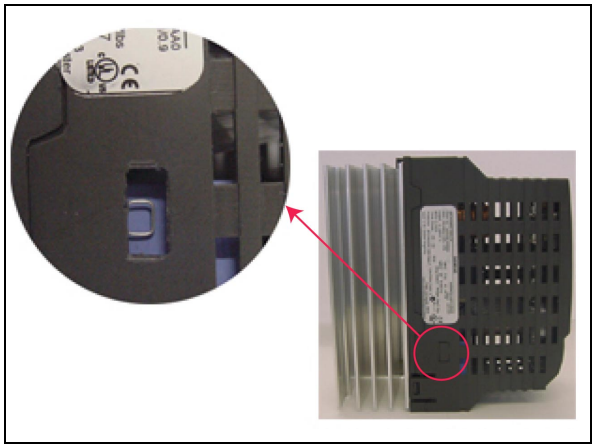


Figure 2-7 Position of 'Y' Capacitor Link

Access to the power and motor terminals

Please refer to the photographs showing the Power Terminal connections and the Control Terminal connections on the inside of the back cover of this manual.

Connect the power and motor connections as shown below.

For access to the DC+/DC- terminals the cut-out cover must be removed. The terminal connection consists of two spades measuring 6.3 mm by 0.8 mm. With the cut-out cover removed and not connections fitted to the spades, the inverter has only IP00 protection.

The connection of the DC link can be used for two inverters, with two motors which work on a revolving advertising media or similar application:
one inverter is in motor mode and the other is in regenerative mode.

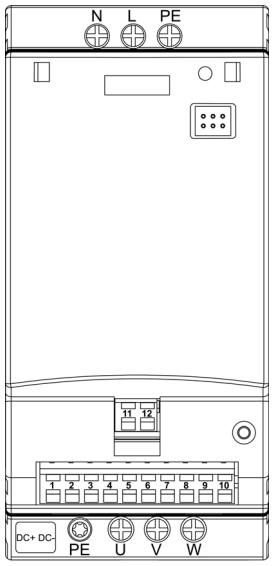


Figure 2-8 MICROMASTER 410 Connection Terminals

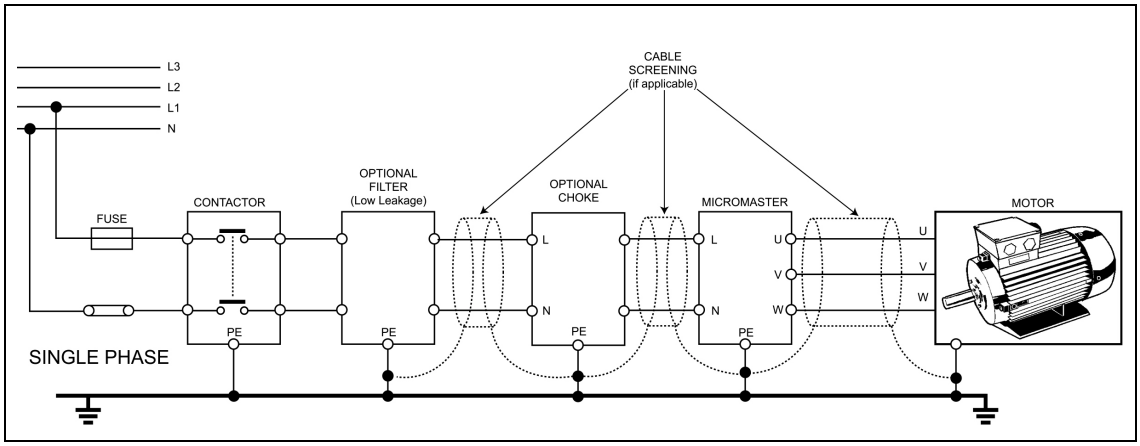


Figure 2-9 Motor and Power Connections

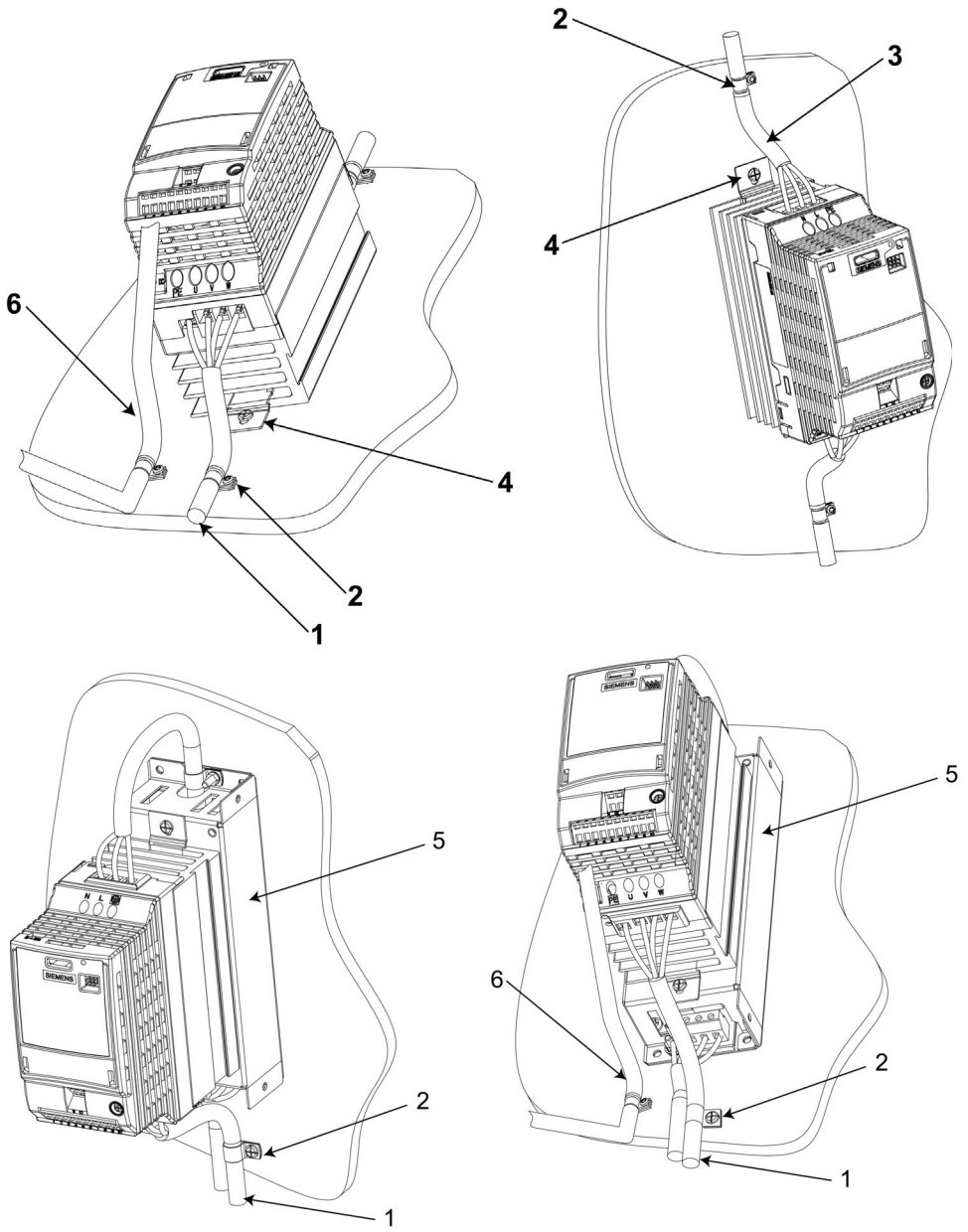
2.8.3 Avoiding Electro-Magnetic Interference (EMI)

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

Action to Take

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

The inverter can be screened using the methodology shown in Figure 2-10.



Legend

1 Motor cable
2 Use suitable clips to fix motor and control cable screens securely to metal back plate
3 Mains power cable
4 Metal mounting brackets
5 Line commutating Choke
6 Control cable

Figure 2-10 Wiring Guidelines to Minimize the Effects of EMI

3 Commissioning

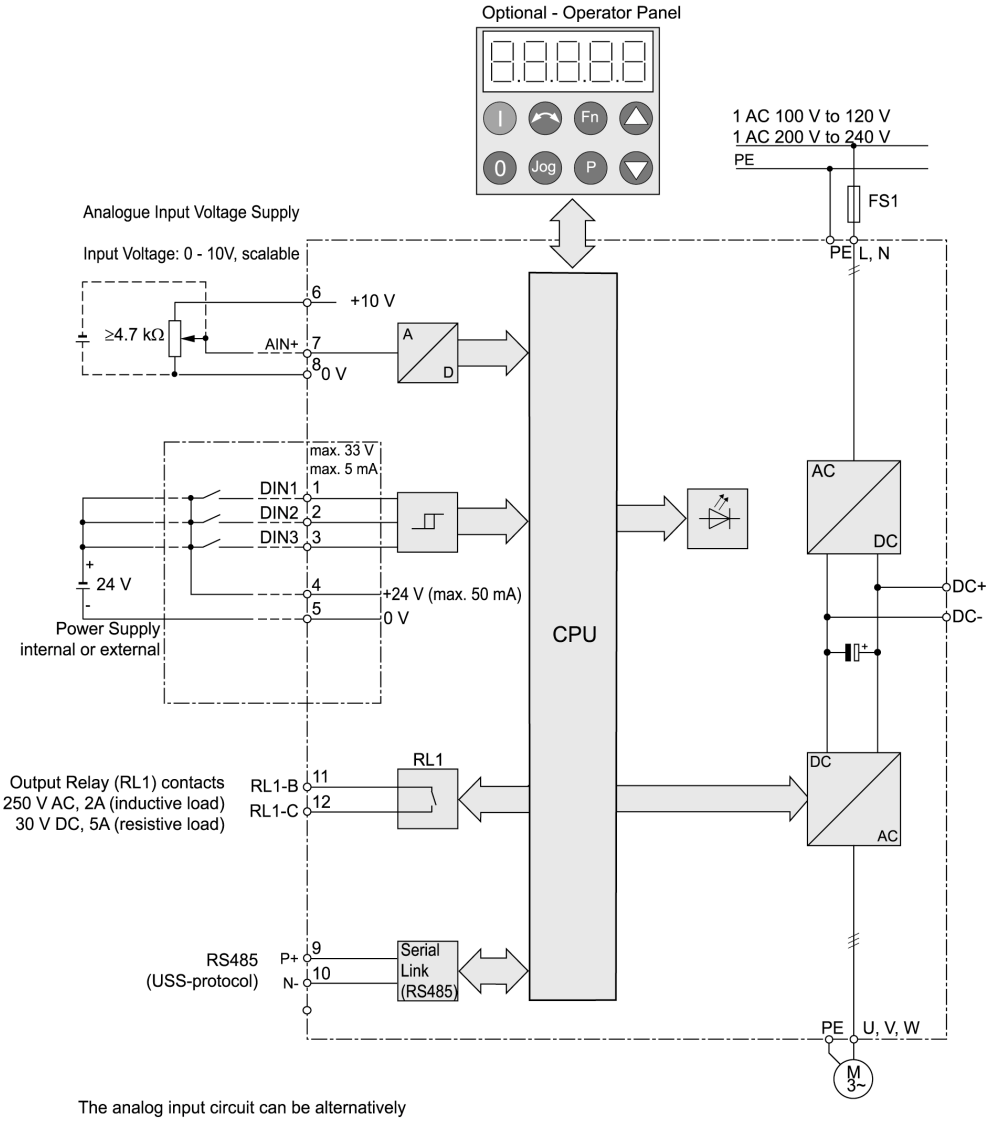
WARNING

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

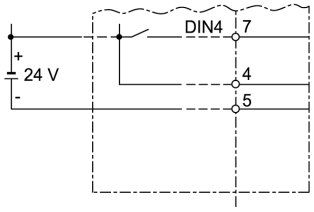
CAUTION

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

3.1 Block Diagram



The analog input circuit can be alternatively configured to provide an additional digital input (DIN4) as shown:



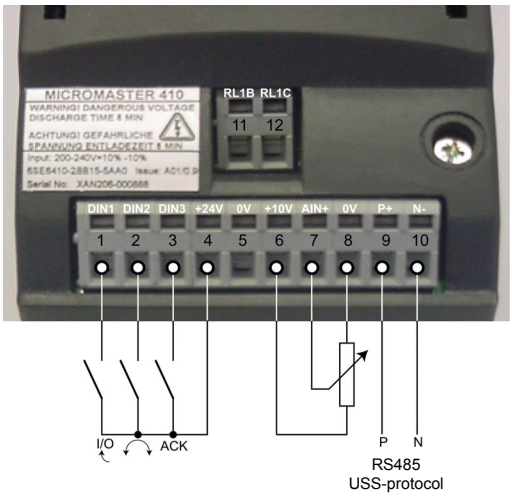


Figure 3-1 Inverter block diagram

3.2 Commission Modes

The MICROMASTER 410 is supplied with default parameter settings cover the following:

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

If more complex application settings are required, please refer to the Parameter List.

Front Panels for the MICROMASTER 410

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

To change the parameters of the inverter you will require the optional Operator Panel. To assist in the quick and efficient changing of parameters, commissioning software tools such as DriveMonitor can be used; this software is supplied on the CD-ROM and can also be downloaded from the Internet.

To allow the parameters to be changed using the software tools, the PC to Inverter Connection Kit is required.

Operator Panel (Option)

Figure 3-2 Operator Panel for the MICROMASTER 410 Inverter

3.2.1 Commissioning without an Operator Panel

The inverter is supplied with an LED to indicate the operation state of the unit.

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

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

Table 3-1 Default settings for operation using the standard inverter

	Terminals	Parameter Default	Default Operation
Digital Input 1	1	P0701 = '1'	ON/OFF1
Digital Input 2	2	P0702 = '12'	Reverse
Digital Input 3	3	P0703 = '9'	Fault Acknowledge

Warnings and faults states on the Inverter

The LED indicates the operating status of the inverter. The LED also indicate various warnings or fault states. In section 6.1 on page 57 the inverter states, indicated by the LED are explained.

3.2.2 Basic operation

With the default settings of the inverter the following is possible:

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

Controlling the speed of the motor is accomplished by connecting the analog inputs as shown in the Figure 3-3 (Switches and potentiometers are not supplied with the inverter).

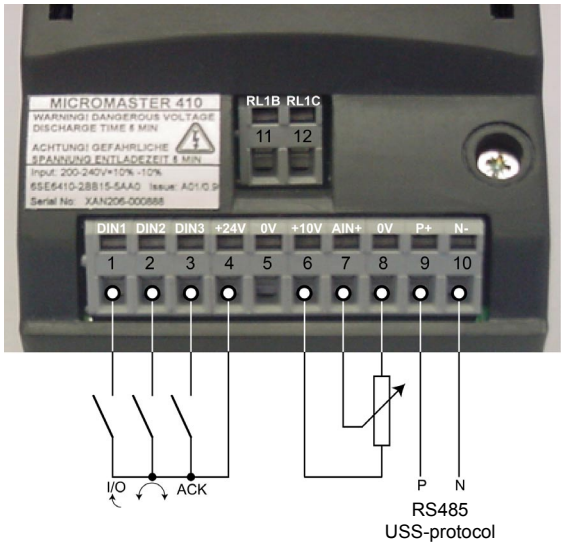


Figure 3-3 Basic operation

3.2.3 Changing the Line Supply Frequency

The supply frequency of the inverter can be changed using either the Operator Panel or by physically cutting the Supply Frequency Link as shown in Figure 3-4:

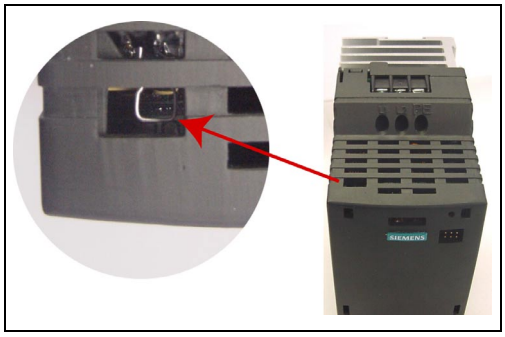


Figure 3-4 Changing the Line Supply Frequency

Cutting the supply link

The line supply frequency can be set by cutting the supply link (see inset)

1. Ensure inverter is disconnected from power supply.
2. Carefully cut the link with an appropriate pair of wire-cutters.
3. Inverter is now set for 60 Hz.

The inverter can be set back to 50 Hz, by setting P0100 = 0.

Using the Operator Panel

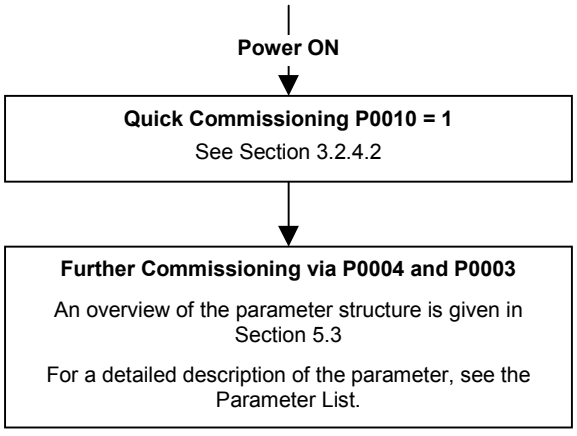
The supply frequency can be set by the following parameters:

- Set P0100 = 0 (50 Hz) default
- Set P0100 = 1 (60 Hz)

3.2.4 Commissioning Overview with the optional Operator Panel

Prerequisites

Mechanical and electrical Installation are completed.



NOTE

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

3.2.4.1 Commissioning with the Operator Panel

The Operator Panel (OP) provides access to the inverter parameters and enables the user to customize the settings of your MICROMASTER 410. The OP can be used to configure several MICROMASTER 410 Inverters. This is accomplished by using the OP to set the required parameters and once the process is complete, then the OP can be removed.

The OP contains a five-digit display that allows the user to read and change parameter values. The OP does not have the capability to store parameter information.

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

Notes

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

Table 3-2 Default settings for operation using the OP

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

Buttons on the Operator Panel

Panel/Button	Function	Effects
	Indicates Status	The LCD displays the settings currently used by the converter.
	Start motor	Pressing the button starts the converter. This button is disabled by default. To enable this button set P0700 = 1.
	Stop motor	OFF1 Pressing the button causes the motor to come to a standstill at the selected ramp down rate. Disabled by default; to enable set P0700 = 1. OFF2 Pressing the button twice (or once long) causes the motor to coast to a standstill. This function is always enabled.
	Change direction	Press this button to change the direction of rotation of the motor. Reverse is indicated by a minus (-) sign or a flashing decimal point. Disabled by default, to enable set P0700 = 1.
	Jog motor	Pressing this button while the inverter has no ON command causes the motor to start and run at the preset jog frequency. The motor stops when the button is released. Pressing this button when the motor is running has no effect.
	Functions	This button can be used to view additional information. Pressing and holding the button for 2 seconds from any parameter during operation, shows the following: 1. DC link voltage (indicated by d – units V). 2. Output frequency (Hz) 3. Output voltage (indicated by o – units V). 4. The value selected in P0005 Additional presses will toggle around the above displays. A short press of the button will 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.
	Access parameters	Pressing this button allows access to the parameters.
	Increase value	Pressing this button increases the displayed value.
	Decrease value	Pressing this button decreases the displayed value.

Figure 3-5 Buttons on the Operator Panel

Changing parameters with the Operator Panel

The procedure for changing the value of parameter P0004 is described below. Modifying the value of an indexed parameter is illustrated using the example of P2011. Follow exactly the same procedure to alter other parameters that you wish to set via the OP.

Changing P0004 – parameter filter function

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

Changing P2011 an indexed parameter Setting USS address

	Step	Result on display
1	Press P to access parameters	r0000
2	Press ▲ until P2011 is displayed	P(2) P2011
3	Press P to access the parameter value level	P(2) in000
4	Press P to display current set value	P(2) 0
5	Press ▲ or ▼ to the required value	P(2) 3
6	Press P to confirm and store the value	P(2) P2011
7	Press ▼ until r0000 is displayed	r0000
8	Press P to return the display to the standard drive display (as defined by the customer)	

Figure 3-6 Changing parameters via the OP

NOTE

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

Changing single digits in Parameter values

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

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

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

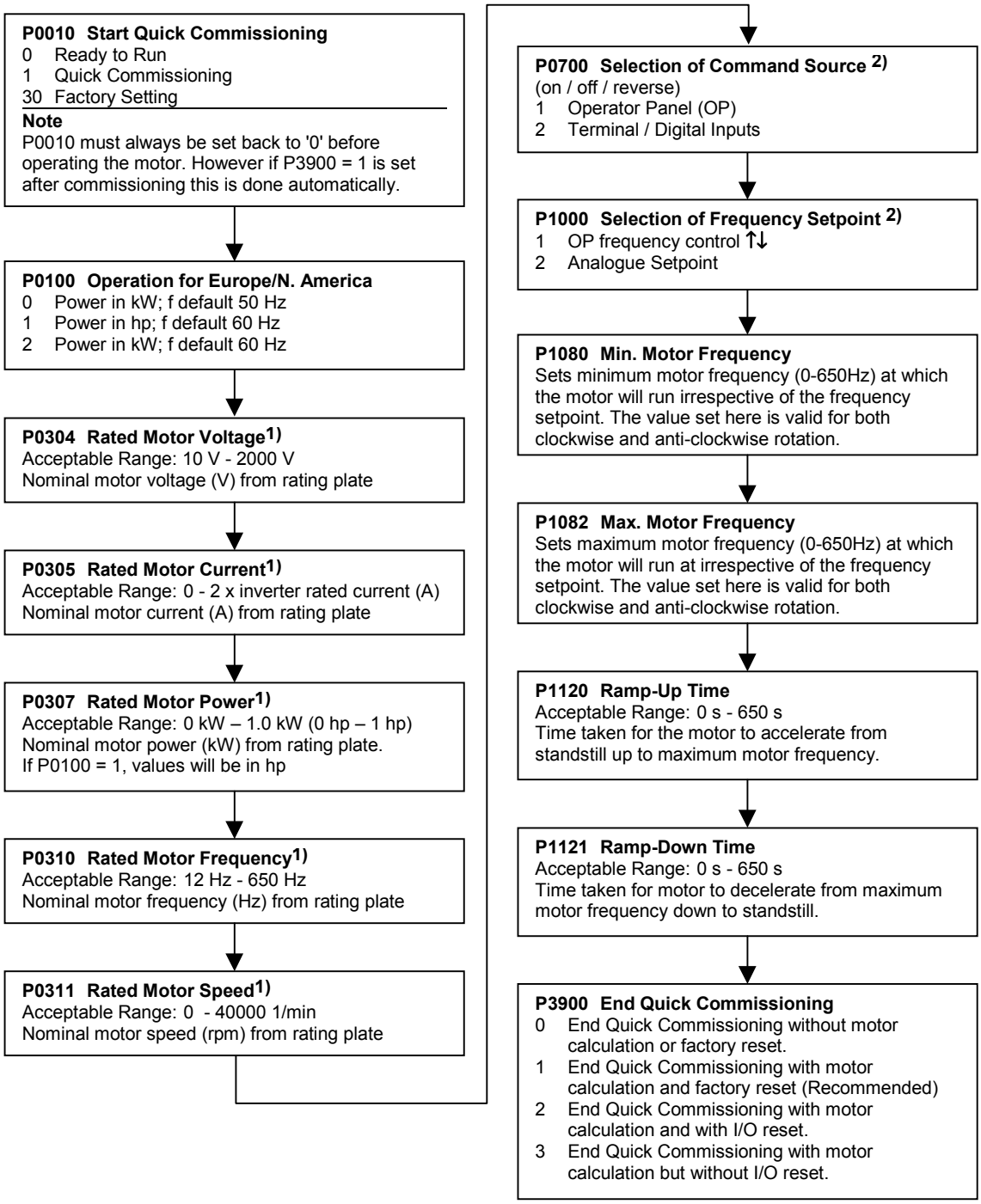
NOTE

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

3.2.4.2 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.

Flow chart Quick Commissioning (Level 1 Only)



1) Motor related parameters – please refer to motor rating plate.

2) Denotes parameters that contain more detailed lists of possible settings for use in specific applications. Please refer to the Parameter List

Motor data for parameterization

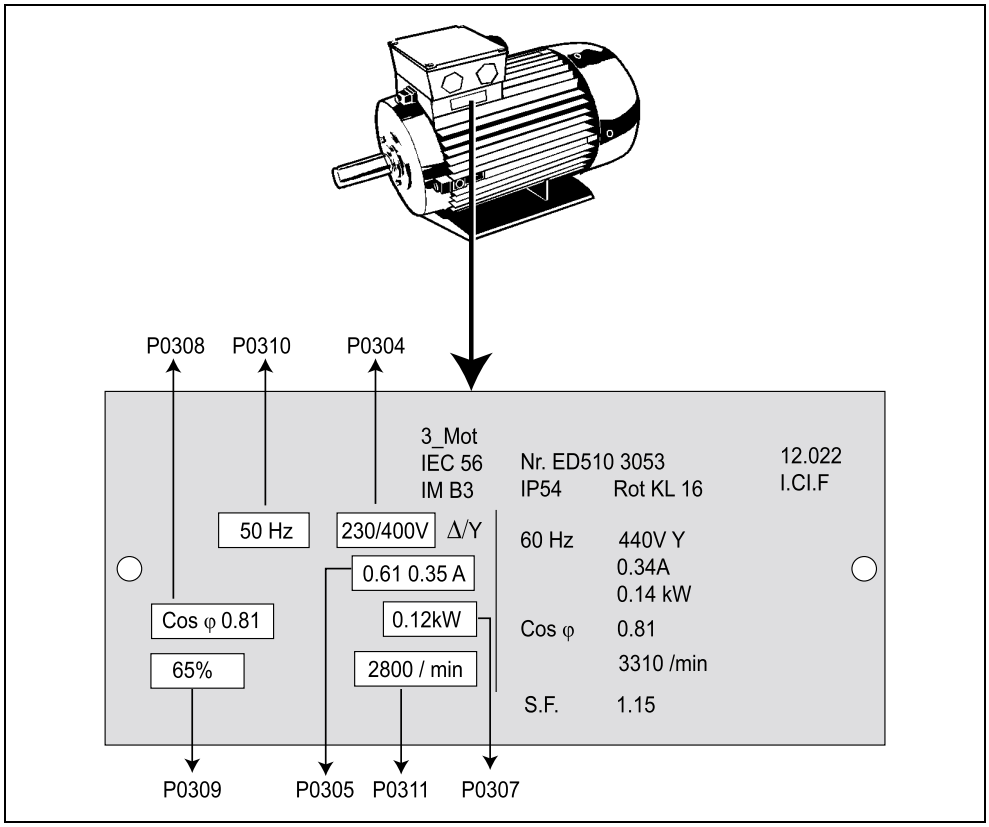


Figure 3-7 Typical Motor Rating Plate Example

NOTE

- P0308 & P0309 are only visible if P0003 = 3. Only one of the parameters is shown depending on the settings of P0100.
- P0307 indicates kW or hp depending upon the setting of P0100. For detailed information, please see the Parameter List.
- Changing motor parameters is not possible unless P0010 = 1.
- Ensure that the motor is configured correctly to the inverter (star/delta connection).

3.2.4.3 Reset to Factory default

To reset all parameters to the factory default settings; the following parameters should be set as follows (the operator panel option is required):

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

NOTE

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

3.3 General operation

For a full description of Level 1 to Level 3 parameters, please refer to the Parameter List.

NOTICE

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

Basic operation with the OP

Prerequisites

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

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

External motor thermal overload protection

When operated below rated speed, the cooling effect of fans fitted to the motor shaft is reduced. Consequentially, most motors require de-rating for continuous operation at low frequencies. To ensure that the motors are protected against overheating under these conditions, a PTC temperature sensor must be fitted to the motor and connected to the inverter control terminals as shown in Figure 3-8.

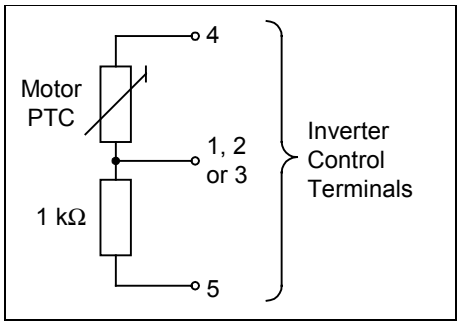


Figure 3-8 Motor Overload PTC Connection

NOTE

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

4 Using the MICROMASTER 410

WARNING

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

4.1 Frequency Setpoint (P1000)

- Default: Terminal 7 (AIN, 0…10 V corresponds to 0…50/60 Hz)
- Other settings: see P1000

4.2 Command Sources (P0700)

NOTICE

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

Starting the motor

- Default: Terminal 1 (DIN 1, high)
- Other settings: see P0700 to P0704

Stopping the motor

There are several ways to stop the motor:

- Default:
  - OFF1 Terminal 1 (DIN 1, low)
  - OFF2 Off button on Operator Panel, pressing the Off button once long (two seconds) or twice (with default settings)
  - OFF3 no standard setting
- Other settings: see P0700 to P0704

Reversing the motor

- Default: Terminal 2 (DIN 2, high)
- Other settings: see P0700 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-down time see P1121

NOTICE

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

4.3.2 OFF2

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

NOTICE

The OFF2 command can have one or more sources. By default the OFF2 command is set to Operator Panel. This source still exists even if other sources are defined by **one** of the following parameters, P0700 to P0704 inclusive.

4.3.3 OFF3

An OFF3 command causes the motor to decelerate rapidly.

If a digital input is used as a source for OFF3, the digital input has to be closed (high) in order to start the motor. If OFF3 is high, the motor can be started resp. stopped by re-setting OFF1 or OFF2.

If OFF3 is low the motor cannot be started.

- Ramp down time: see P1135

NOTICE

OFF3 can be combined with DC braking 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 after the end of the braking period.

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

NOTICE

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

4.3.5 Compound Braking

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

Set the braking current: see P1236

4.4 Control Modes (P1300)

The various modes of operation of the MICROMASTER 410 control the relationship between the speed of the motor and the voltage supplied by the inverter. A summary of the control modes available are listed below:

- **Linear V/f control, P1300 = 0**
  Can be used for variable and constant torque applications, such as conveyors and positive displacement pumps.
- **Linear V/f control with FCC (Flux Current Control), P1300 = 1**
  This control mode can be used to improve the efficiency and dynamic response of the motor.
- **Quadratic V/f control P1300 = 2**
  This mode can be used for variable torque loads, such as fans and pumps.
- **Multi-point V/f control P1300 = 3**
  For information regarding this mode of operation, please consult the MM410 Parameter List.

4.5 Faults and Alarms

Standard Inverter

If an Operator Panel is not fitted, the fault states and warnings are indicated by the LED on the panel, see section 6.1 on page 57 for further information.

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

- Flashing Yellow (1000 ms on / 1000 ms off) = Ready to run
- Continuous Yellow = Run

Operator Panel Fitted

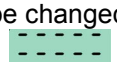
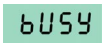
If an Operator Panel is fitted, the fault states (P0947) and warnings (P2110) are displayed should a fault condition occur. For further details, please refer to the Parameter List.

5 System Parameters

5.1 Introduction to MICROMASTER System Parameters

The parameters can only be changed by using the Operator Panel (OP) or the Serial Interface.

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

- **r**xxxx indicates a display parameter, **P**xxxx a setting parameter.
- P0010 initiates “quick commissioning”.
- The inverter will not run unless P0010 is set to 0 after it has been accessed. This function is automatically performed 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 OP shows  for maximum of five seconds. This means the inverter is busy with tasks of higher priority.

5.1.1 Access Levels

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

The number of parameters that appear within each functional group (selected by P0004) depends on the access level set in parameter P0003. For further details regarding parameters, see the Parameter List.

5.2 Parameter Overview

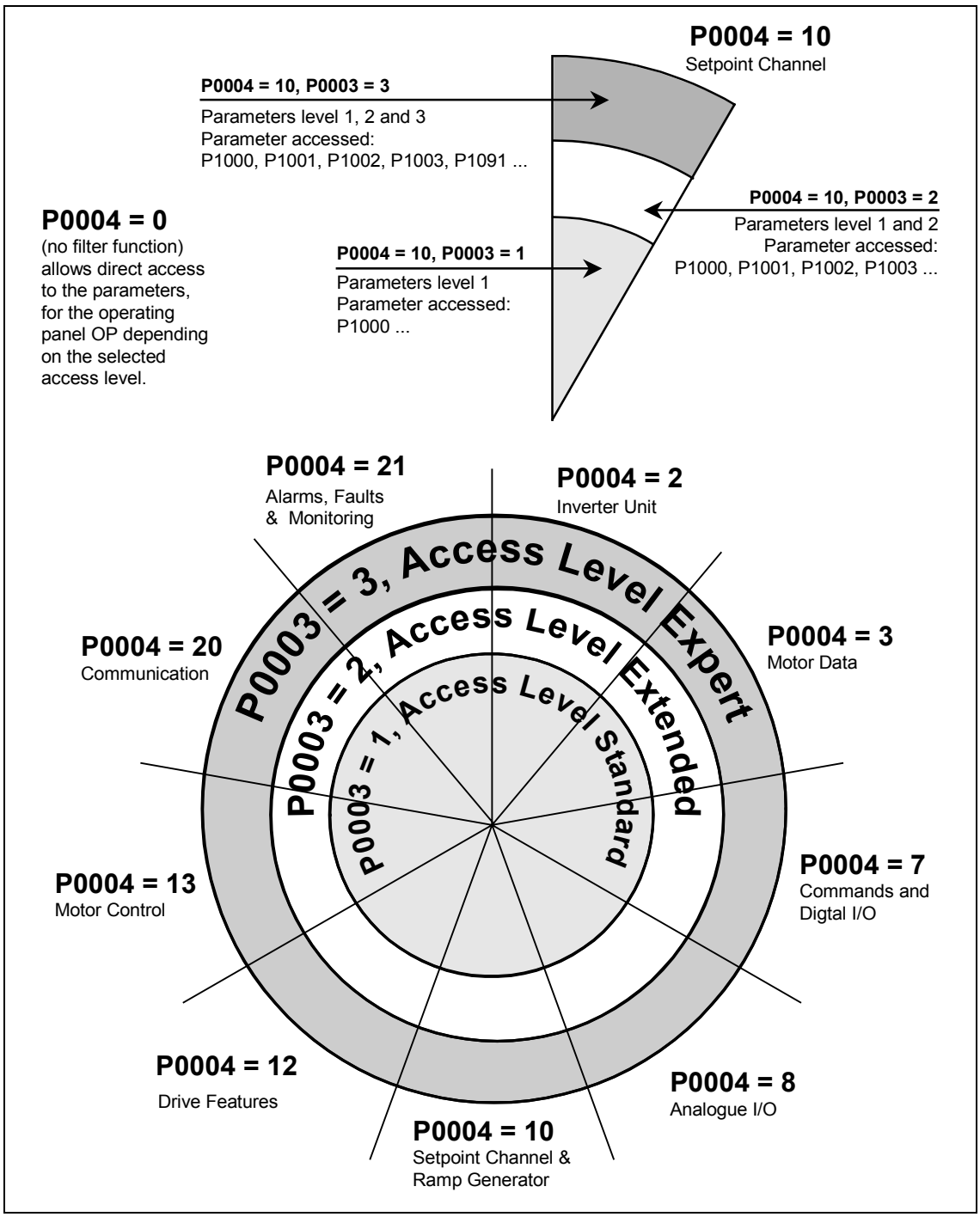


Figure 5-1 Parameter Overview

5.3 Parameter List (short form)

Explanatory information on following table:

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

Always

ParNr	ParText	Default	Acc	DS	QC
r0000	Drive display	-	1	-	-
P0003	User access level	1	1	CUT	N
P0004	Parameter filter	0	3	CUT	N
P0010	Commissioning parameter filter	0	1	CT	N

Quick Commissioning

ParNr	ParText	Default	Acc	DS	QC
P0100	Europe / North America	0	1	C	Q
P0101	Hidden Switch Setting	0	1	C	Q
P3900	End of quick commissioning	0	1	C	Q

Parameter Reset

ParNr	ParText	Default	Acc	DS	QC
P0970	Factory reset	0	1	C	N

Inverter Unit (P0004 = 2)

ParNr	ParText	Default	Acc	DS	QC
r0018	Firmware version	-	3	-	-
r0026	CO: Act. DC-link voltage	-	2	-	-
r0206	Rated inverter power [kW] / [hp]	-	3	-	-
r0207	Rated inverter current	-	3	-	-
r0209	Maximum inverter current	-	3	-	-
P0210	Supply voltage	230	3	CT	N
P0290	Inverter overload reaction	2	3	CT	N
P1800	Pulse frequency	4	3	CUT	N

Motor Data (P0004 = 3)

ParNr	ParText	Default	Acc	DS	QC
r0034	CO: Motor temperature (i^2t)	-	3	-	-
P0300	Select motor type	1	3	C	Q
P0304	Rated motor voltage	230	1	C	Q
P0305	Rated motor current	3.25	1	C	Q
P0307	Rated motor power	0.75	1	C	Q
P0308	Rated motor cosPhi	0.000	3	C	Q
P0309	Rated motor efficiency	0.0	3	C	Q
P0310	Rated motor frequency	50.00	1	C	Q
P0311	Rated motor speed	0	1	C	Q
P0335	Motor cooling	0	3	CT	Q
P0340	Calculation of motor parameters	0	3	CT	N
P0610	Motor I^2t temperature reaction	2	3	CT	N
P0611	Motor I^2t time constant	100	3	CT	N
P0614	Motor I^2t overload warning level	100.0	3	CUT	N
P0640	Motor overload factor [%]	190.0	3	CUT	Q
P1910	Select motor data identification	0	2	CT	Q

Commands and Digital I/O (P0004 = 7)

ParNr	ParText	Default	Acc	DS	QC
r0002	Drive state	-	3	-	-
r0019	CO/BO: BOP control word	-	3	-	-
r0052	CO/BO: Act. Status word 1	-	2	-	-
r0053	CO/BO: Act. Status word 2	-	2	-	-
r0054	CO/BO: Act. Control word 1	-	3	-	-
r0055	CO/BO: Add. Act. Control word	-	3	-	-
P0700	Selection of command source	2	1	CT	Q
P0701	Function of digital input 1	1	2	CT	N
P0702	Function of digital input 2	12	2	CT	N
P0703	Function of digital input 3	9	2	CT	N
P0704	Function of digital input 4	0	2	CT	N
P0719[2]	Selection of cmd. & freq. Setp.	0	3	CT	N
r0722	CO/BO: Binary input values	-	3	-	-
P0724	Debounce time for digital inputs	3	3	CT	N
P0731	BI: Function of digital output 1	52:3	2	CUT	N
r0747	CO/BO: State of digital outputs	-	3	-	-
P0748	Invert digital outputs	0	3	CUT	N
P0810	BI: CDS bit 0 (Local / Remote)	0:0	3	CUT	N

Analogue I/O (P0004 = 8)

ParNr	ParText	Default	Acc	DS	QC
r0752	Act. input of ADC [V]	-	3	-	-
P0753	Smooth time ADC	3	3	CUT	N
r0754	Act. ADC value after scaling [%]	-	2	-	-
P0757	Value x1 of ADC scaling [V]	0	3	CUT	N
P0758	Value y1 of ADC scaling	0.0	3	CUT	N
P0759	Value x2 of ADC scaling [V]	24	3	CUT	N
P0760	Value y2 of ADC scaling	100.0	3	CUT	N
P0761	Width of ADC deadband [V]	0	3	CUT	N

Setpoint Channel and Ramp Generator (P0004 = 10)

ParNr	ParText	Default	Acc	DS	QC
P1000	Selection of frequency setpoint	2	1	CT	Q
P1001	Fixed frequency 1	0.00	2	CUT	N
P1002	Fixed frequency 2	5.00	2	CUT	N
P1003	Fixed frequency 3	10.00	2	CUT	N
r1024	CO: Act. Fixed frequency	-	3	-	-
P1031	Setpoint memory of the MOP	0	2	CUT	N
P1032	Inhibit reverse direction of MOP	1	3	CT	N
P1040	Setpoint of the MOP	5.00	3	CUT	N
P1070	CI: Main setpoint	755:0	3	CT	N
P1071	CI: Main setpoint scaling	1:0	3	CT	N
P1075	CI: Additional setpoint	0:0	3	CT	N
r1078	CO: Total frequency setpoint	-	3	-	-
P1080	Min. frequency	0.00	1	CUT	Q
P1082	Max. frequency	50.00	1	CT	Q
P1091	Skip frequency 1	0.00	3	CUT	N
P1120	Ramp-up time	10.00	1	CUT	Q
P1121	Ramp-down time	10.00	1	CUT	Q
P1130	Ramp-up initial rounding time	0.00	3	CUT	N
P1131	Ramp-up final rounding time	0.00	3	CUT	N
P1132	Ramp-down initial rounding time	0.00	3	CUT	N
P1133	Ramp-down final rounding time	0.00	3	CUT	N
P1134	Rounding type	0	3	CUT	N
P1135	OFF3 ramp-down time	5.00	3	CUT	Q
r1170	CO: Frequency setpoint after RFG	-	3	-	-

Drive Features (P0004 = 12)

ParNr	ParText	Default	Acc	DS	QC
P0005	Display selection	21	2	CUT	N
P1200	Flying start	0	3	CUT	N
P1202	Motor-current: Flying start	100	3	CUT	N
P1203	Search rate: Flying start	100	3	CUT	N
P1210	Automatic restart	1	2	CUT	N
P1215	Holding brake enable	0	3	T	N
P1216	Holding brake release delay	1.0	3	T	N
P1217	Holding time after ramp down	1.0	3	T	N
P1232	DC braking current	100	3	CUT	N
P1233	Duration of DC braking	0	3	CUT	N
P1236	Compound braking current	0	3	CUT	N
P1240	Configuration of Vdc controller	1	3	CT	N

Motor Control (P0004 = 13)

ParNr	ParText	Default	Acc	DS	QC
r0020	CO: Act. frequency setpoint	-	2	-	-
r0021	CO: Act. frequency	-	2	-	-
r0022	Act. rotor speed	-	3	-	-
r0024	CO: Act. output frequency	-	3	-	-
r0025	CO: Act. output voltage	-	3	-	-
r0056	CO/BO: Status of motor control	-	2	-	-
r0067	CO: Act. output current limit	-	3	-	-
P1300	Control mode	0	2	CT	Q
P1310	Continuous boost	50.0	2	CUT	N
P1311	Acceleration boost	0.0	3	CUT	N
P1312	Starting boost	0.0	2	CUT	N
P1316	Boost end frequency	20.0	3	CUT	N
P1320	Programmable V/f freq. coord. 1	0.00	3	CT	N
P1321	Programmable V/f volt. coord. 1	0.0	3	CUT	N
P1322	Programmable V/f freq. coord. 2	0.00	3	CT	N
P1323	Programmable V/f volt. coord. 2	0.0	3	CUT	N
P1324	Programmable V/f freq. coord. 3	0.00	3	CT	N
P1325	Programmable V/f volt. coord. 3	0.0	3	CUT	N
P1333	Start frequency for FCC	10.0	3	CUT	N
P1335	Slip compensation	0.0	3	CUT	N
P1340	Imax controller prop. gain	0.000	3	CUT	N

Communication (P0004 = 20)

ParNr	ParText	Default	Acc	DS	QC
P0927	Parameter changeable via	15	3	CUT	N
r0964[5]	Firmware version data	-	3	-	-
P0971	Transfer data from RAM to EEPROM	0	3	CUT	N
P2000	Reference frequency	50.00	3	CT	N
P2009[2]	USS normalization	0	3	CT	N
P2010[2]	USS baudrate	6	3	CUT	N
P2011[2]	USS address	0	3	CUT	N
P2012[2]	USS PZD length	2	3	CUT	N
P2013[2]	USS PKW length	127	3	CUT	N
P2014[2]	USS telegram off time	0	3	CT	N
r2015[4]	CO: PZD from BOP link (USS)	-	3	-	-
P2016[4]	CI: PZD to BOP link (USS)	52:0	3	CT	N
r2018[4]	CO: PZD from COM link (USS)	-	3	-	-
P2019[4]	CI: PZD to COM link (USS)	52:0	3	CT	N
r2024[2]	USS error-free telegrams	-	3	-	-
r2025[2]	USS rejected telegrams	-	3	-	-
r2026[2]	USS character frame error	-	3	-	-
r2027[2]	USS overrun error	-	3	-	-
r2028[2]	USS parity error	-	3	-	-
r2029[2]	USS start not identified	-	3	-	-
r2030[2]	USS BCC error	-	3	-	-
r2032	BO: CtrlWrd1 from BOP link (USS)	-	3	-	-
r2031[2]	USS length error	-	3	-	-
r2033	BO: CtrlWrd2 from BOP link (USS)	-	3	-	-
r2036	BO: CtrlWrd1 from COM link (USS)	-	3	-	-
r2037	BO: CtrlWrd2 from COM link (USS)	-	3	-	-

Alarms, Faults and Monitoring (P0004 = 21)

ParNr	ParText	Default	Acc	DS	QC
P0952	Total number of faults	0	3	CT	N
r0947[8]	Last fault code	-	2	-	-
r2110[4]	Warning number	-	3	-	-
r2114[2]	Run time counter	-	3	-	-
P2167	Switch-off frequency f_off	1.00	3	CUT	N

6 Troubleshooting

WARNING

- Repairs on equipment may only be carried out by **Siemens Service**, by repair centers **authorized by Siemens** or by qualified personnel who are thoroughly acquainted with all the warnings and operating procedures contained in this manual.
- Any defective parts or components must be replaced using genuine Siemens authorised parts.
- 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.**

6.1 Troubleshooting with the Standard Inverter LED

The following is a description of the fault and warning indications given by the LED on the Standard Inverter:

- Inverter Off/No supply: No LED lit.
- Power On/Ready: 1000 ms On / 1000 ms Off
- Inverter Running OK: Steady LED
- General Warning: 500 ms On / 200 ms Off
- Fault Condition: 100 ms On / 100 ms Off

6.2 Troubleshooting with the Operator Panel (OP)

If the display shows a fault or warning code, please refer to Section 6.3.

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

- Check that P0010 = 0.
- Check that a valid ON signal is present.
- Check that P0700 = 2 (for digital input control) or
  P0700 = 1 (for OP control).
- Check that the setpoint is present (0 to 10V on Terminal 7) or the setpoint has been entered into the correct parameter, depending upon the setpoint source (P1000). See the Parameter List for further details.

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

Now use a switch between cobtrol terminals **1** and **4**. The drive should now run to the defined setpoint by analogue input.

NOTICE

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

6.3 Fault messages

Fault	Possible Causes	Diagnose & Remedy	Reac-tion
F0001 OverCurrent	➢ Motor power (P0307) does not correspond to the inverter power (r0206) ➢ Motor lead short circuit ➢ Earth faults	Check the following: 1. Motor power (P0307) must correspond to inverter power (r0206). 2. Cable length limits must not be exceeded. 3. Motor cable and motor must have no short-circuits or earth faults 4. Motor parameters must match the motor in use 5. Motor must not be obstructed or overloaded. ➢ Increase the ramp time ➢ Reduce the boost level	OFF2
F0002 OverVoltage	➢ Overvoltage can be caused either by too high main supply voltage or if motor is in regenerative mode. ➢ Regenerative mode can be caused by fast ramp downs or if the motor is driven from an active load.	Check the following: 1. Supply voltage (P0210) must lie within limits indicated on the inverter rating plate. 2. DC-link voltage controller must be enabled (P1240) and parameterized properly. 3. Ramp-down time (P1121) must match inertia of load. NOTE Higher inertia requires longer ramp times	OFF2
F0003 UnderVoltage	➢ Main supply failed. ➢ Shock load outside specified limits.	Check the following: 1. Supply voltage (P0210) must lie within limits indicated on the inverter rating plate. 2. Supply must not be susceptible to temporary failures or voltage reductions.	OFF2
F0004 Inverter Over Temperature	➢ Ventilation inadequate ➢ Ambient temperature is too high.	Check the following: 1. Pulse frequency must be set to default value 2. Ambient temperature could be higher than specified for the inverter	OFF2
F0005 Inverter I^2t	➢ Inverter overloaded. ➢ Duty cycle too demanding. ➢ Motor power (P0307) exceeds inverter power capability (r0206).	Check the following: 1. Load duty cycle must lie within specified limits. 2. Motor power (P0307) must match inverter power (r0206)	OFF2
F0011 Motor Over Temperature I^2t	Motor overloaded	Check the following: 1. Load duty cycle must be correct 2. Motor temperatur warning level (P0604) must match.	OFF1
F0041	Stator resistance measurement failure	➢ Check if the motor is connected to the inverter. ➢ Check that the motor data have been entered correctly.	OFF2
F0051 Parameter EEPROM Fault	Read or write failure while saving non-volatile parameter.	Factory Reset and new parameterization Change drive	OFF2
F0052 power stack Fault	Read failure for power stack information or invalid data.	Change drive	OFF2

Fault	Possible Causes	Diagnose & Remedy	Reac-tion
F0060 Asic Timeout	Internal communications failure	If fault persists, change inverter Contact Service Department	OFF2
F0071 USS (BOP-link) setpoint fault	No setpoint values from USS during telegram off time	Check USS master	OFF2
F0072 USS (COMM link) setpoint fault	No setpoint values from USS during telegram off time	Check USS master	OFF2
F0085 External Fault	External fault triggered via terminal inputs	Disable terminal input for fault trigger.	OFF2
F0101 Stack Overflow	Software error or processor failure	➢ Cycle through power (on/off). ➢ Replace drive if fault is not corrected.	OFF2
F0450 BIST Tests Failure **(Service Mode Only)**	Selftest failed	➢ Drive may run but some features will not work properly. ➢ Replace drive.	OFF2

6.4 Alarms

Alarm	Possible Causes	Diagnose & Remedy	Reaction
A0501 Current Limit	➢ Motor power does not correspond to the inverter power ➢ Motor leads are too long ➢ Earth faults	Check the following: 1. Motor power (P0307) must correspond to inverter power (r0206). 2. Cable length limits must not be exceeded. 3. Motor cable and motor must have no short-circuits or earth faults 4. Motor parameters must match the motor in use 5. Motor must not be obstructed or overloaded ➢ Increase the ramp-up-time. ➢ Reduce the boost.	--
A0502 Overvoltage limit	➢ Overvoltage limit is reached. ➢ This warning can occur during ramp down, if the dc-link controller is disabled (P1240 = 0).	If this warning is displayed permanently, check drive input voltage .	--
A0503 UnderVoltage Limit	Main supply failed	Check main supply voltage (P0210).	--
A0504 Inverter Over Temperature	Warning level of inverter heat-sink temperature (P0614) is exceeded, resulting in pulse frequency reduction and/or output frequency reduction (depending on parametrization in (P0610)	Check the following: 1. Ambient temperature must lie within specified limits 2. Load conditions and duty cycle must be appropriate	--
A0505 Inverter I^2t	Warning level exceeded, current will be reduced if parameterized (P0610 = 1)	Check that duty cycle lies within specified limits	--
A0506 Inverter duty cycle	Difference between heatsink and IGBT junction temperature exceeds warning limits	Check that duty cycle and shock loads lie within specified limits	--
A0511 Motor Over Temperature I^2t	➢ Motor overloaded. ➢ Load duty cycle too high.	Check the following: 1. P0611 (motor I^2t time constant) should be set to appropriate value 2. P0614 (Motor I^2t overload warning level) should be set to suitable level	--
A0600 RTOS Overrun Warning	Software problem	Contact Service Department	--
A0910 Vdc-max controller de-activated	➢ Vdc max controller has been de-activated ➢ Occurs if main supply voltage is permanently too high. ➢ Occurs if motor is driven by an active load, causing motor to go into regenerative mode. ➢ Occurs at very high load inertias, when ramping down.	Check the following: 1. Input voltage must lie within range. 2. Load must be matched. 3. In certain cases apply braking resistor.	--
A0911 Vdc-max controller active	Vdc max controller is active; so ramp-down times will be increased automatically to keep DC-link voltage (r0026) within limits	Check the inverter input voltage (P0210)	--

Alarm	Possible Causes	Diagnose & Remedy	Reaction
A0920 ADC parameters not set properly.	ADC parameters should not be set to identical values, since this would produce illogical results.	Check P0757, P0758, P0759 and P0760	--
A0922 No load applied to inverter	No Load is applied to the inverter. As a result, some functions may not work as under normal load conditions.	Check that a load has been applied to the inverter.	--

7 MICROMASTER 410 Specifications

Table 7-1 MICROMASTER 410 Performance Ratings

Feature	Specification
Mains Operating Voltage & Power Ranges	100 to 120 V ± 10% 1AC 0.12 kW – 0.55 kW 200 to 240 V ± 10% 1AC 0.12 kW – 0.75 kW
Input Frequency	47 to 63 Hz
Output frequency	0 Hz - 650 Hz
Power Factor	≥ 0.95
Inverter Efficiency	96 to 97 %
Overload Capability	Up to 150 % of rated output current for 60 seconds followed by 85 % of rated output current for 240 seconds (cycle time 300 seconds)
Inrush Current	Less than rated input current
Control Method	Linear V/f ; Parabolic V/f; Flux Current Control (FCC); Multi-point V/f
Pulse Frequency	2 kHz to 16 kHz (2 kHz steps) 8 kHz Standard
Fixed Frequencies	3; programmable
Skip Frequencies	1; programmable
Setpoint Resolution	0.01Hz digital, 0.01 Hz serial, 10 bit analogue (motor potentiometer 0.1 Hz)
Output Frequency Resolution	0.01 Hz digital, 0.01 Hz serial
Digital Inputs (PNP type)	3; freely programmable, non isolated, SIMATIC compatible
Analog Input	1; for setpoint (0 to 10 V, scalable or for use as 4th digital input)
Relay Output	1; parameterizable, 30 V DC / 5 A (resistive), 250 V AC / 2 A (inductive)
Serial Interface	RS-485, for operation with USS protocol
Electromagnetic Compatibility	Variant with integrated EMC filter according to EN 61800-3
Braking	DC braking and Compound braking
Protection Level	IP20
Operation Temperature	-10 °C to +50 °C
Storage Temperature	-40 °C to +70 °C
Humidity	95 % RH – non-condensing
Operational Altitudes	Up to 1000 m above sea level without derating
Protection Features	Undervoltage, Overvoltage, Overload, Ground Faults, Short circuit, Stall Prevention, Motor Overtemperature, Inverter Overtemperature Protection
Standards	UL, cUL, CE, C-tick
CE Marked	Conformity with EC Low Voltage Directive 73/23/EEC filtered variants are also conform to Electromagnetic Compatibility Directive 89/336/EEC
Design/Manufacture	In accordance with ISO 9001

Table 7-2 Terminal Torques – Field Wiring Connectors

		Motorside PE terminal	All other terminals
Tightening Torque	[Nm]	0.8	1.1
	[lbf.in]	7.1	9.8

Table 7-3 MICROMASTER 410 Specifications

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

Order No.	**6SE6410-**	**2BB11 -2AA0**	**2BB12 -5AA0**	**2BB13 -7AA0**	**2BB15 -5BA0**	**2BB17 -5BA0**
Motor Output Rating	**[kW]** **[hp]**	0.12 0.16	0.25 0.33	0.37 0.5	0.55 0.75	0.75 1.0
Output Current Max.	**[A]**	0.9	1.7	2.3	3.2	4.2
Input Current	**[A]**	1.5	3.0	4.4	5.8	7.8
Recommended Fuse	**[A]**	10 **3NA3803**	10 **3NA3803**	10 **3NA3803**	10 **3NA3803**	16 **3NA3805**
Input Cable Min.	**[mm²]** **[awg]**	1.0 16	1.0 16	1.0 16	1.0 16	1.5 14
Input Cable Max.	**[mm²]** **[awg]**	2.5 12	2.5 12	2.5 12	2.5 12	2.5 12
Output Cable Min.	**[mm²]** **[awg]**	1.0 16	1.0 16	1.0 16	1.0 16	1.0 16
Output Cable Max.	**[mm²]** **[awg]**	2.5 12	2.5 12	2.5 12	2.5 12	2.5 12
Weight	**[kg]** **[lbs]**	0.8 1.8	0.8 1.8	0.8 1.8	1.0 2.2	1.0 2.2
Dimensions	**w [mm]** **h [mm]** **d [mm]**	69.0 150.0 118.0	69.0 150.0 118.0	69.0 150.0 118.0	69.0 150.0 138.0	69.0 150.0 138.0
	w [inches] **h [inches]** **d [inches]**	2.72 5.90 4.65	2.72 5.90 4.65	2.72 5.90 4.65	2.72 5.90 5.43	2.72 5.90 5.43

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

Order No.	6SE6410-	2UB11 -2AA0	2UB12 -5AA0	2UB13 -7AA0	2UB15 -5BA0	2UB17 -5BA0
Motor Output Rating	[kW]	0.12	0.25	0.37	0.55	0.75
	[hp]	0.16	0.33	0.5	0.75	1.0
Output Current Max.	[A]	0.9	1.7	2.3	3.2	4.2
Input Current	[A]	1.5	3.0	4.4	5.8	7.8
Recommended Fuse	[A]	10	10	10	10	16
		3NA3803	3NA3803	3NA3803	3NA3803	3NA3805
Input Cable Min.	[mm^2]	1.0	1.0	1.0	1.0	1.5
	[awg]	16	16	16	16	14
Input Cable Max.	[mm^2]	2.5	2.5	2.5	2.5	2.5
	[awg]	12	12	12	12	12
Output Cable Min.	[mm^2]	1.0	1.0	1.0	1.0	1.0
	[awg]	16	16	16	16	16
Output Cable Max.	[mm^2]	2.5	2.5	2.5	2.5	2.5
	[awg]	12	12	12	12	12
Weight	[kg]	0.8	0.8	0.8	1.0	1.0
	[lbs]	1.8	1.8	1.8	2.2	2.2
Dimensions	w [mm]	69.0	69.0	69.0	69.0	69.0
	h [mm]	150.0	150.0	150.0	150.0	150.0
	d [mm]	118.0	118.0	118.0	138.0	138.0
	w [inches]	2.72	2.72	2.72	2.72	2.72
	h [inches]	5.90	5.90	5.90	5.90	5.90
	d [inches]	4.65	4.65	4.65	5.43	5.43

Input voltage range 1 AC 100 V – 120 V, ± 10 % (Unfiltered)

Order No.	6SE6410-	2UA11 -2AA0	2UA12 -5AA0	2UA13 -7AA0	2UA15 -5BA0
Motor Output Rating	[kW]	0.12	0.25	0.37	0.55
	[hp]	0.16	0.33	0.5	0.75
Output Current Max.	[A]	0.9	1.7	2.3	3.2
Input Current	[A]	4.6	7.5	10.1	13.4
Recommended Fuse	[A]	10	10	16	20
		3NA3803	3NA3803	3NA3805	3NA3807
Input Cable Min.	[mm^2]	1.0	1.0	1.5	2.5
	[awg]	16	16	14	12
Input Cable Max.	[mm^2]	2.5	2.5	2.5	2.5
	[awg]	12	12	12	12
Output Cable Min.	[mm^2]	1.0	1.0	1.0	1.0
	[awg]	16	16	16	16
Output Cable Max.	[mm^2]	2.5	2.5	2.5	2.5
	[awg]	12	12	12	12
Weight	[kg]	0.8	0.8	0.8	1.0
	[lbs]	1.8	1.8	1.8	2.2
Dimensions	w [mm]	69.0	69.0	69.0	69.0
	h [mm]	150.0	150.0	150.0	150.0
	d [mm]	118.0	118.0	118.0	138.0
	w [inches]	2.72	2.72	2.72	2.72
	h [inches]	5.90	5.90	5.90	5.90
	d [inches]	4.65	4.65	4.65	5.43

8 Options

The following accessories are available as options for your MICROMASTER MM410 Inverter. For more details please refer to the catalogue or contact your local Siemens sales office if you require assistance.

8.1 Variant Independent Options

- Operator Panel (OP)
- DIN Rail Mounting Kit
- PC to inverter connection kit
- Software commissioning tools:
  - "DriveMonitor"
  - "Starter"

8.2 Variant Dependent Options

- Low leakage Class B filter
- Line commutating choke

9 Electro-Magnetic Compatibility (EMC)

9.1 Electro-Magnetic Compatibility (EMC)

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

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

9.1.1 Self-Certification

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

9.1.2 Technical Construction File

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

NOTE
However, MICROMASTER 410 is designed to be used only by professional endusers with EMC knowledge. It is not designed for users having no EMC knowledge.

In any case this operating instructions cover sufficient information which enables the professional enduser to implement from his side all measures to ensure electromagnetical compatibility.

9.1.3 EMC Directive Compliance with Harmonics Regulations

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

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

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

For units in this voltage and power range the following warning applies:

"This equipment requires supply authority acceptance for connection to the public supply network". Please refer to EN 61000-3-12 sections 5.3 and 6.4 for further information. Units connected to Industrial Networks[1] do not require connection approval (see EN 61800-3, section 6.1.2.2).

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

Rating	**Typical Harmonic Current (A)**					**Typical Harmonic Current (%)**					**Typical Voltage Distortion**		
											Distribution Transformer Rating		
											10kVA	100kVA	1MVA
	3rd	5th	7th	9th	11th	3rd	5th	7th	9th	11th	THD (%)	THD (%)	THD (%)
250W 230V 1ac	2.40	1.70	0.95	0.40	0.20	83	59	33	14	7	0.67	0.067	0.0067
370W 230V 1ac	3.50	2.50	1.40	0.60	0.25	85	61	34	15	6	0.97	0.097	0.0097
550W 230V 1ac	4.60	3.30	1.80	0.70	0.40	87	62	34	13	8	1.27	0.127	0.0127

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

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

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

9.1.4 General cases of EMC performance

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

Case 1: General Industrial

Compliance with the EMC Product Standard for Power Drive Systems EN 61800-3 for use in **Second Environment (Industrial)** and **Restricted Distribution**.

Table 9-1 Case 1 - General Industrial

EMC Phenomenon	Standard	Level
Emissions:		
Radiated Emissions	EN 55011	Level group 1, class A
Conducted Emissions	EN 61800-3	Limits are weaker as EN55011, class A, group 1
Immunity:		
Electrostatic Discharge	EN 61000-4-2	8 kV air discharge
Burst Interference	EN 61000-4-4	2 kV power cables (Level 3), 1 kV control (Level 3)
Radio Frequency Electromagnetic Field	EN61000-4-3	26-1000 MHz, 10 V/m

Case 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 61000-6-2.

Table 9-2 Case 2 - Filtered Industrial

EMC Phenomenon	Standard	Level
Emissions:		
Radiated Emissions	EN 55011	Level group 1, class A
Conducted Emissions	EN 61800-3	Level are weaker as EN55011 class A, group 1
Immunity:		
Supply Voltage Distortion	EN 61000-2-4	
Voltage Fluctuations, Dips, Unbalance, Frequency Variations	EN 61000-2-1	
Electrostatic Discharge	EN 61000-4-2	8 kV air discharge
Burst Interference	EN 61000-4-4	2 kV power cables (Level 3), 2 kV control (Level 4)
Radio Frequency Electromagnetic Field, amplitude modulated	EN 61000-4-3	80-1000 MHz, 10 V/m, 80% AM, power and signal lines

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

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

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

EMC Phenomenon	Standard	Level
Emissions:		
Radiated Emissions*	EN 55022	Level for equipment class B
Conducted Emissions	EN 61800-3	category C1: level according EN 55011, class B category C2: level according EN55011, class A
Immunity:		
Supply Voltage Distortion	EN 61000-2-4	
Voltage Fluctuations, Dips, Unbalance, Frequency Variations	EN 61000-2-1	
Electrostatic Discharge	EN 61000-4-2	8 kV air discharge
Burst Interference	EN 61000-4-4	2 kV power cables (Level 3), 2 kV control (Level 4)

* 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.

NOTICE

To achieve these performance levels, you must not exceed the default Pulse frequency nor use cables longer than 5 m (16.40 ft).

Table 9-4 Compliance Table

Model	Remarks
Case 1 – General Industrial	
6SE6410-2U***-**A0	Unfiltered units, all voltages and powers. The product standard EN 61800-3 + A11 for “Adjustable speed electrical power drive systems – Part3: EMC product standard including specific test methods” specifies limits for conducted emissions, which cannot be matched from unfiltered inverters in the 2nd environment. If compliance with the product standard is required, filtered inverters (as described under case 2) have to be installed.
Case 2 – Filtered Industrial	
6SE6410-2B***-**A0	All units with integral filters for screened motor cables up to 10 m (32,80 ft) [Class A]

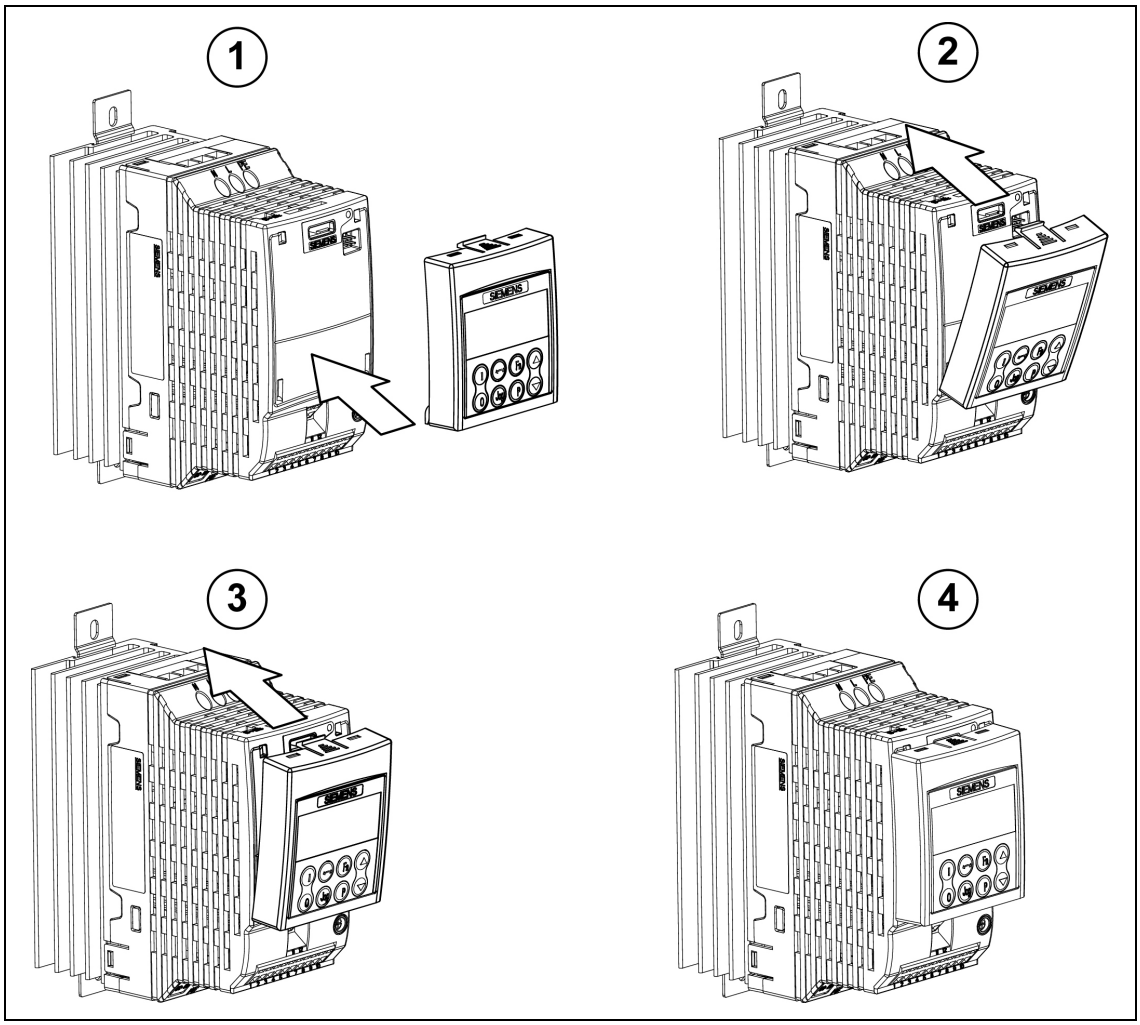
Case 3 – Filtered for residential, commercial and light industry	
6SE6410-2B***-**A0	category C1[2]: All units with integral filters for screened motor cables up to 5 m (16.40 ft) [Class B] category C2[3]: All units with integral filters for screened motor cables up to 10 m (32.80 ft) [Class A In addition a warning label will be required: “This is a product of category C2 according to IEC 61800-3. In a domestic environment this product may cause radio interference in which case mitigation measures may be required.”
* denotes any value is allowed.	

[2] category C1: Power Drive system (PDS) of rated voltage less than 1000V, intended for use in the first environment.

[3] category C2: Power Drive System (PDS) of rated voltage less than 1000V, which when used in the first environment is intended to be installed and commissioned only by a professional.

Appendices

A Fitting the Operator Panel



B 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 50178	Electronic equipment for use in power installations
EN 60204-1	Safety of machinery - Electrical equipment of machines

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.

Notice:

Machinery Directive

The devices are suitable for installation in machines. According to the machinery directive 89/392/EC the compliance requires a separate certificate of conformity. This certificate must be issued by the firm which constructs the plant or puts the machinery on the market.

C List of Abbreviations

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

Index

Suggestions and/or Corrections

<table>
<tr>
<td>To:
Siemens AG
Automation & Drives Group
SD VM 4
P.O. Box 3269

D-91050 Erlangen
Federal Republic of Germany

Email:
Technical.documentation@con.siemens.co.uk</td>
<td>Suggestions

Corrections

For Publication/Manual:

MICROMASTER 410

User Documentation</td>
</tr>
<tr>
<td>From

Name:

Company/Service Department

Address: _____

_____

Telephone: _____ / _____

Telefax: _____ / _____</td>
<td>Operating Instructions

Order Number:
6SE6400-5EA00-0BP0

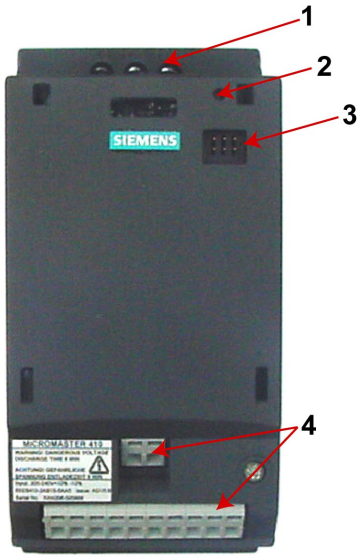
Date of Issue: 04/02

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

Suggestions for improvement are also welcome.</td>
</tr>
</table>

View of Unit

Standard Inverter

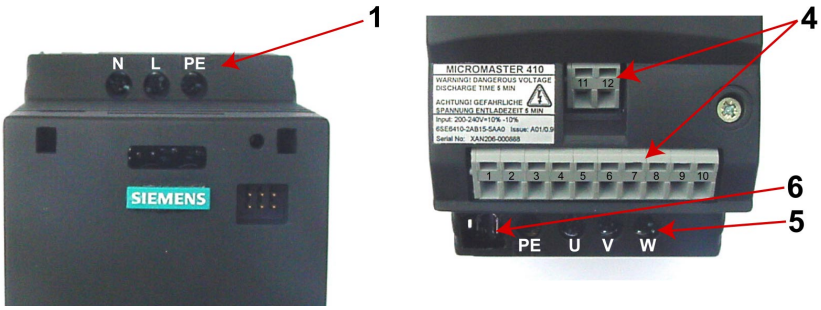


Key:

1. Line Terminals
2. Status LED
3. Operator Panel Connector
4. Control Terminals
5. Motor Terminals
6. DC+/DC- Terminals

Inverter with Optional Operator Panel Fitted

Connections & Terminals



Order Number

6SE6400-5EA00-0BP0

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

Siemens Aktiengesellschaft

Order No.: 6SE6400-5EA00-0BP0
Date: **04/02**

Changing the Parameter Settings for the Siemens Micromaster 410 Frequency Controller

Instructions for changing the parameter settings:

1. Activate the program mode by pressing the **P** button. The display reads **r0000**.
2. Select the desired parameter using the ▲ and ▼ buttons.
3. Press the **P** button to display the settings for the desired parameter.
4. Use the ▲ and ▼ buttons to change the setting.
    a. For Parameters P0304 and P0305 adjust the number in the first decimal position using the ▲ and ▼ buttons.
    b. Press the **Fn** button once to move to the second decimal position and then use the ▲ and ▼ buttons to adjust this number.
5. Press the **P** button to display the parameter.
6. Repeat steps 2 through 5 for each additional parameter to be adjusted.
7. When all settings have been adjusted press the **Fn** button. The display reads **r0000**.
8. Press the **P** button to exit the program mode.
    * It is necessary to go through the entire parameter list prior to exiting the program mode. When the end of the Quick Setup is reached at Parameter P3900 use the ▲ and ▼ buttons to cycle through and change the remaining parameters listed in table below.

Parameter Settings
Below is a listing of each parameter and description with the default setting and what the setting should be changed to.

Parameter	Description	Default Setting	Adjusted Setting
P0010	Quick setup active	0	1
P0100	0 = Europe (50Hz) / 2 = North America (60Hz)	0	0
P0304	Motor voltage	230	230 (V)
P0305	Motor current	2.30	1.63 (A)

Parameter	Description	Default Setting	Adjusted Setting
P0307	Motor power	0.37	0.32 (kW)
P0310	Motor Frequency	50.00	50.00 (Hz)
P0311	Motor rotary frequency	1320	2830 (Min^{-1})
P0700	Select control source: connector block	2	2
P1000	Select controlled frequency value with ▲ or ▼	2	1
P1080	Minimum frequency	0.00	20.00 (Hz)
P1082	Maximum Frequency	50.00	50.00 (Hz)
P1120	Run-up time	10.00	6.00 (s)
P1121	Run-down time	10.00	6.00 (s)
P3900	Quick setup finishIn the display, the message **busY** flashes for 3 seconds	0	1
P0003	Access level	1	3 – Expert Mode
P0701	Digital input 1: On/Off	1	1
P0702	Digital input 2: External control	12	29
P1031	*MOP*-Setting memory: last setting value is saved	0	1
P1040	Start value setting after programming	5.00	50.00 (Hz)
P1070	Change main setting value: *MOP*-Setting value	755	1050
P1210	Automatic restart: after power failure	1	2
P0003	Access level (reset to default)	3	1 – Standard Mode

SIEMENS

MICROMASTER 410

Parameter List **Issue A1**

User Documentation

SIEMENS

MICROMASTER 410

Parameter List
User Documentation

Valid for **Issue A1**

Converter Type
MICROMASTER 410

Warning

Please refer to all Definitiones and Warnings contained in the Operating Instructions.
The operating instrucions can be ordered via your local Siemens sales office under the Order No. 6SE6400-5EA00-0BP0.

Further information can be obtained from Internet website:
http://www.siemens.de/micromaster

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

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.

Siemens handbooks are printed on chlorine-free paper that has been produced from managed sustainable forests. No solvents have been used in the printing or binding process.

Document subject to change without prior notice.

Order number: 6SE6400-5EB00-0BP0
Printed in the Federal of Germany

Siemens-Aktiengesellschaft.

Parameters MICROMASTER 410

This Parameter List must only be used together with the Operating Instructions of the MICROMASTER 410. Please pay special attention to the Warnings, Cautions, Notices and Notes contained in these manuals.

Table of Contents

1 Parameters

1.1 Introduction to MICROMASTER 410 System Parameters

The layout of the parameter description is as follows.

1 Par number [index]	**2 Parameter name**			**9 Min:**	12 Level: **2**
	3 CStat:	**5 Datatype**	**7 Unit:**	**10 Def:**	
	4 P-Group:	**6 active:**	**8 Quick Comm:**	**11 Max:**	
	13	Description:			

1. **Parameter number**
   Indicates the relevant parameter number. The numbers used are 4-digit numbers in the range 0000 to 9999. Numbers prefixed with an “r” indicate that the parameter is a “read-only” parameter, which displays a particular value but cannot be changed directly by specifying a different value via this parameter number (in such cases, dashes “-“ are entered at the points “Unit”, “Min”, “Def” and “Max” in the header of the parameter description.
   All other parameters are prefixed with a “P”. The values of these parameters can be changed directly in the range indicated by the “Min” and “Max” settings in the header.

   [index] indicates that the parameter is an indexed parameter and specifies the number of indices available.

2. **Parameter name**
   Indicates the name of the relevant parameter. Certain parameter names include the following abbreviated prefixes: BI, BO, CI, and CO followed by a colon.

   These abbreviations have the following meanings:

BI	=	Binector input, i.e. parameter selects the source of a binary signal
BO	=	Binector output, i.e. parameter connects as a binary signal
CI	=	Connector input, i.e. parameter selects the source of an analog signal
CO	=	Connector output, i.e. parameter connects as an analog signal
CO/BO	=	Connector/Binector output, i.e. parameter connects as an analog signal and/or as a binary signal

   The BiCo system is not available with the MM410. To be unique with the names of the other inverter types the Parameter names did not change.

3. **CStat**
   Commissioning status of the parameter. Three states are possible:

Commissioning	C
Run	U
Ready to run	T

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

4. **P-Group**
   Indicates the functional group of the particular.

   Note
   Parameter P0004 (parameter filter) acts as a filter and focuses access to parameters according to the functional group selected.

5. **Datatype**
   The data types available are shown in the table below.

Notation	Meaning
U16	16-bit unsigned
U32	32-bit unsigned
I16	16-bit integer
I32	32-bit integer
Float	Floating point

6. **Active**
   Indicates whether
   - Immediately changes to the parameter values take effective immediately after they have been entered, or
   - First confirm the “P” button on the operator panel (OP) must be pressed before the changes take effect.
7. **Unit**
   Indicates the unit of measure applicable to the parameter values
8. **QuickComm**
   Indicates whether or not (Yes or No) a parameter can only be changed during quick commissioning, i.e. when P0010 (parameter groups for commissioning) is set to 1 (quick commissioning).
9. **Min**
   Indicates the minimum value to which the parameter can be set.
10. **Def**
    Indicates the default value, i.e. the value which applies if the user does not specify a particular value for the parameter.
11. **Max**
    Indicates the maximum value to which the parameter can be set.
12. **Level**
    Indicates the level of user access. There are three access levels: Standard, Extended and Expert. The number of parameters that appear in each functional group depends on the access level set in P0003 (user access level).
13. **Description**
    The parameter description consists of the sections and contents listed below. Some of these sections and contents are optional and will be omitted on a case-to-case basis if not applicable.

    Description: Brief explanation of the parameter function.

    Diagram: Where applicable, diagram to illustrate the effects of parameters on a characteristic curve, for example

    Settings: List of applicable settings. These include
    Possible settings, Most common settings, Index and Bitfields

    Example: Optional example of the effects of a particular parameter setting.

    Dependency: Any conditions that must be satisfied in connection with this parameter. Also any particular effects, which this parameter has on other parameter(s) or which other parameters have on this one.

    Warning / Caution / Notice / Note:
    Important information which must be observed to prevent personal injury or damage to equipment / specific information which should be heeded in order to avoid problems / information which may be helpful to the user

    More details: Any sources of more detailed information concerning the particular parameter.

1.2 Quick commissioning (P0010=1)

The following parameters are necessary for quick commissioning (P0010=1).

No	Name	Access level	Cstat
P0100	Europe / North America	1	C
P0300	Select motor type	3	C
P0304	Rated motor voltage	1	C
P0305	Rated motor current	1	C
P0307	Rated motor power	1	C
P0308	Rated motor cosPhi	3	C
P0309	Rated motor efficiency	3	C
P0310	Rated motor frequency	1	C
P0311	Rated motor speed	1	C
P0335	Motor cooling	3	CT
P0640	Motor overload factor [%]	3	CUT
P0700	Selection of command source	1	CT
P1000	Selection of frequency setpoint	1	CT
P1080	Min. Frequency	1	CUT
P1082	Max. Frequency	1	CT
P1120	Ramp-up time	1	CUT
P1121	Ramp-down time	1	CUT
P1135	OFF3 ramp-down time	3	CUT
P1300	Control mode	2	CT
P3900	End of quick commissioning	1	C

When P0010=1 is chosen, P0003 (user access level) can be used to select the parameters to be accessed. This parameter also allows selection of a user-defined parameter list for quick commissioning.

At the end of the quick commissioning sequence, set P3900 = 1 to carry out the necessary motor calculations and clear all other parameters (not included in P0010=1) to their default settings.

Note
This applies only in Quick Commissioning mode.

Reset to Factory default

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

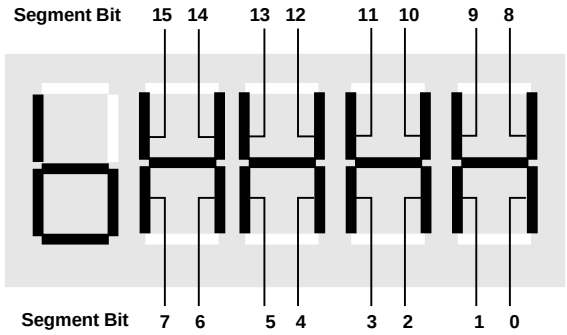
Set P0010=30.

Set P0970=1.

Note
The reset process takes approximately 10 seconds to complete. Reset to Factory default

Seven-segment display

The seven-segment display is structured as follows:



The significance of the relevant bits in the display is described in the status and control word parameters.

1.3 Parameter Description

r0000 **Drive display** Level: **1**

Datatype: U16 **Unit:** - **Min:** - **Def:** - **Max:** -

P-Group: ALWAYS

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 frequency, output voltage, and chosen r0000 setting (defined in P0005).

r0002 **Drive state** Level: **3**

Datatype: U16 **Unit:** - **Min:** - **Def:** - **Max:** -

P-Group: COMMANDS

Displays actual drive state.

Enum:

0 Commissioning mode (P0010 != 0)
1 Drive ready
2 Drive fault active
3 Drive starting (DC-link precharging)
4 Drive running
5 Stopping (ramping down)

Dependency:

State 3 visible only while precharging DC link.

P0003 **User access level** Level: **1**

CStat: CUT **Datatype:** U16 **Unit:** - **Min:** 1 **Def:** 1 **Max:** 4

P-Group: ALWAYS **Active:** First confirm **QuickComm.** No

Defines user access level to parameter sets. The default setting (standard) is sufficient for most simple applications.

Enum:

1 Standard: Allows access into most frequently used parameters.
2 Extended: Allows extended access e.g. to inverter I/O functions.
3 Expert: For expert use only.
4 Reserved

P0004 **Parameter filter** Level: **3**

CStat: CUT **Datatype:** U16 **Unit:** - **Min:** 0 **Def:** 0 **Max:** 21

P-Group: ALWAYS **Active:** First confirm **QuickComm.** No

Filters available parameters according to functionality to enable a more focussed approach to commissioning.

Example:

P0004 = 8 specifies that only ADC parameters will be visible.

Enum:

0 All parameters
2 Inverter
3 Motor
7 Commands, binary I/O
8 ADC
10 Setpoint channel / RFG
12 Drive features
13 Motor control
20 Communication
21 Alarms / warnings / monitoring

Dependency:

Parameters marked "Quick Comm: Yes" in the parameter header can only be set when P0010 = 1 (Quick Commissioning).

Note:

The inverter will start with any setting of P0004.

P0005 **Display selection** Level: **2**

CStat: CUT **Datatype:** U16 **Unit:** - **Min:** 2 **Def:** 21 **Max:** 2294

P-Group: FUNC **Active:** First confirm **QuickComm.** No

Selects display for parameter r0000 (drive display).

Settings:

21 Actual frequency
25 Output voltage
26 DC link voltage

Notice:

These settings refer to read only parameter numbers ("rxxxx").

Details:

See relevant "rxxxx" parameter descriptions.

P0010 **Commissioning parameter filter** Level: **1**

CStat: CT **Datatype:** U16 **Unit:** - **Min:** 0
P-Group: ALWAYS **Active:** First confirm **QuickComm.** No **Def:** 0
Max: 30

Filters parameters so that only those related to a particular functional group are selected.

Enum:

0 Ready
1 Quick commissioning
2 Inverter
29 Download
30 Factory setting

Dependency:

Reset to 0 for inverter to run.

P0003 (user access level) also determines access to parameters.

Note:

If P3900 is not 0 (0 is the default value), this parameter is automatically reset to 0.

r0018 **Firmware version** Level: **3**

Datatype: Float **Unit:** - **Min:** - **Def:** - **Max:** -
P-Group: INVERTER

Displays version number of installed firmware.

r0019 **CO/BO: BOP control word** Level: **3**

Datatype: U16 **Unit:** - **Min:** - **Def:** - **Max:** -
P-Group: COMMANDS

Displays status of operator panel commands.

The settings below are used as the "source" codes for keypad control when connecting to BICO input parameters.

Bitfields:

Bit00	ON/OFF1	0	NO
		1	YES
Bit01	OFF2: Electrical stop	0	YES
		1	NO
Bit08	JOG right	0	NO
		1	YES
Bit11	Reverse (setpoint inversion)	0	NO
		1	YES
Bit13	Motor potentiometer MOP up	0	NO
		1	YES
Bit14	Motor potentiometer MOP down	0	NO
		1	YES

Note:

When BICO technology is used to allocate functions to panel buttons, this parameter displays the actual status of the relevant command.

The following functions can be "connected" to individual buttons:

- ON/OFF1,
- OFF2,
- JOG,
- REVERSE,
- INCREASE,
- DECREASE

r0020 **CO: Act. frequency setpoint** Level: **2**

Datatype: Float **Unit:** Hz **Min:** - **Def:** - **Max:** -
P-Group: CONTROL

Displays actual frequency setpoint (output from ramp function generator).

r0021 **CO: Act. frequency** Level: **2**

Datatype: Float **Unit:** Hz **Min:** - **Def:** - **Max:** -
P-Group: CONTROL

Displays actual inverter output frequency (r0024) excluding slip compensation, resonance damping and frequency limitation.

r0022 **Act. rotor speed** Level: **3**

Datatype: Float **Unit:** 1/min **Min:** - **Def:** - **Max:** -
P-Group: CONTROL

Displays calculated rotor speed based on inverter output frequency [Hz] x 120 / number of poles.

Note:

This calculation makes no allowance for load-dependent slip.

r0024 **CO: Act. output frequency** Level: **3**

Datatype: Float **Unit:** Hz **Min:** - **Def:** - **Max:** -

P-Group: CONTROL

Displays actual output frequency (slip compensation, resonance damping and frequency limitation are included).

r0025 **CO: Act. output voltage** Level: **3**

Datatype: Float **Unit:** V **Min:** - **Def:** - **Max:** -

P-Group: CONTROL

Displays [rms] voltage applied to motor.

r0026 **CO: Act. DC-link voltage** Level: **2**

Datatype: Float **Unit:** V **Min:** - **Def:** - **Max:** -

P-Group: INVERTER

Displays DC-link voltage.

r0034 **CO: Motor temperature (i2t)** Level: **3**

Datatype: Float **Unit:** % **Min:** - **Def:** - **Max:** -

P-Group: MOTOR

Displays calculated motor temperature (I2t model) as [%] of the maximum permissible value.

Note:

A value of 100 % means that the motor has reached its maximum permissible operating temperature. In this case, the converter will attempt to reduce the motor loading as defined in P0610 (motor I2t temperature reaction).

r0052 **CO/BO: Act. status word 1** Level: **2**

Datatype: U16 **Unit:** - **Min:** - **Def:** - **Max:** -

P-Group: COMMANDS

Displays first active status word of inverter (bit format) and can be used to diagnose inverter status. The display segments for the status word are shown in the "Introduction to MICROMASTER 410 System Parameters".

Bitfields:

Bit00	Drive ready	0	NO
		1	YES
Bit01	Drive ready to run	0	NO
		1	YES
Bit02	Drive running	0	NO
		1	YES
Bit03	Drive fault active	0	NO
		1	YES
Bit04	OFF2 active	0	YES
		1	NO
Bit05	OFF3 active	0	YES
		1	NO
Bit06	ON inhibit active	0	NO
		1	YES
Bit07	Drive warning active	0	NO
		1	YES
Bit08	Deviation setp. / act. value	0	YES
		1	NO
Bit09	PZD control	0	NO
		1	YES
Bit10	Maximum frequency reached	0	NO
		1	YES
Bit11	Warning: Motor current limit	0	YES
		1	NO
Bit12	Motor holding brake active	0	NO
		1	YES
Bit13	Motor overload	0	YES
		1	NO
Bit14	Motor runs direction right	0	NO
		1	YES
Bit15	Inverter overload	0	YES
		1	NO

Note:

Output of Bit3 (Fault) will be inverted on digital output (Low = Fault, High = No Fault).

r0053 **CO/BO: Act. status word 2**

Datatype: U16 **Unit:** - **Min:** - **Def:** - **Max:** -

Level: **2**

P-Group: COMMANDS

Displays second status word of inverter (in bit format).

Bitfields:

Bit00	DC brake active	0	NO
		1	YES
Bit01	Act. freq. r0024 > P2167	0	NO
		1	YES
Bit02	Act. freq. r0024 > P1080	0	NO
		1	YES
Bit 05	Reserved		
Bit06	Act. freq. r0024 >= setpoint	0	NO
		1	YES
Bit 07	Reserved		

Details:

See description of seven-segment display given in the "Introduction to MICROMASTER 410 System Parameters" in this manual.

r0054 **CO/BO: Act. control word 1**

Datatype: U16 **Unit:** - **Min:** - **Def:** - **Max:** -

Level: **3**

P-Group: COMMANDS

Displays first control word of inverter and can be used to diagnose which commands are active.

Bitfields:

Bit00	ON/OFF1	0	NO
		1	YES
Bit01	OFF2: Electrical stop	0	YES
		1	NO
Bit02	OFF3: Fast stop	0	YES
		1	NO
Bit03	Pulse enable	0	NO
		1	YES
Bit04	RFG enable	0	NO
		1	YES
Bit05	RFG start	0	NO
		1	YES
Bit06	Setpoint enable	0	NO
		1	YES
Bit07	Fault acknowledge	0	NO
		1	YES
Bit08	JOG right	0	NO
		1	YES
Bit09	JOG left	0	NO
		1	YES
Bit10	Control from PLC	0	NO
		1	YES
Bit11	Reverse (setpoint inversion)	0	NO
		1	YES
Bit13	Motor potentiometer MOP up	0	NO
		1	YES
Bit14	Motor potentiometer MOP down	0	NO
		1	YES
Bit15	Local / Remote	0	NO
		1	YES

Details:

See description of seven-segment display given in the "Introduction to MICROMASTER System Parameters" in this manual.

r0055 **CO/BO: Add. act. control word** Level: **3**

Datatype: U16 **Unit:** - **Min:** - **Def:** - **Max:** -

P-Group: COMMANDS

Displays additional control word of inverter and can be used to diagnose which commands are active.

Bitfields:

Bit00	Fixed frequency Bit 0	0	NO
		1	YES
Bit01	Fixed frequency Bit 1	0	NO
		1	YES
Bit02	Fixed frequency Bit 2	0	NO
		1	YES
Bit09	DC brake enabled	0	NO
		1	YES
Bit13	External fault 1	0	YES
		1	NO

Details:

See description of seven-segment display given in the "Introduction to MICROMASTER System Parameters" in this handbook.

r0056 **CO/BO: Status of motor control** Level: **2**

Datatype: U16 **Unit:** - **Min:** - **Def:** - **Max:** -

P-Group: CONTROL

Displays status of motor control (MM410: V/f status), which can be used to diagnose inverter status.

Bitfields:

Bit00	Init. control finished	0	NO
		1	YES
Bit01	Motor demagnetizing finished	0	NO
		1	YES
Bit02	Pulses enabled	0	NO
		1	YES
Bit04	Motor excitation finished	0	NO
		1	YES
Bit05	Starting boost active	0	NO
		1	YES
Bit06	Acceleration boost active	0	NO
		1	YES
Bit07	Frequency is negative	0	NO
		1	YES
Bit08	Field weakening active	0	NO
		1	YES
Bit09	Volts setpoint limited	0	NO
		1	YES
Bit10	Slip frequency limited	0	NO
		1	YES
Bit11	F_out > F_max Freq. limited	0	NO
		1	YES
Bit13	I-max controller active	0	NO
		1	YES
Bit14	Vdc-max controller active	0	NO
		1	YES

Details:

See description of seven-segment display given in the introduction

r0067 **CO: Act. output current limit** Level: **3**

Datatype: Float **Unit:** A **Min:** - **Def:** - **Max:** -

P-Group: CONTROL

Displays valid maximum output current of drive.

This value is influenced by the derating characteristics and the thermal motor and inverter protection.

Dependency:

P0610 (motor I2t temperature reaction) defines reaction when limit is reached.

Note:

Normally, current limit = rated motor current (P0305) x motor current limit (P0640). It is less than or equal to maximum inverter current r0209.

The current limit may be reduced if the motor thermal model calculation indicates that overheating will occur.

P0100 **Europe / North America** **Min:** 0 Level: **1**
CStat: C **Datatype:** U16 **Unit:** - **Def:** 0
P-Group: QUICK **Active:** First confirm **QuickComm.** Yes **Max:** 2

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).

Enum:

0 Europe [kW], frequency default 50 Hz
1 North America [hp], frequency default 60 Hz
2 North America [kW], frequency default 60 Hz

Dependency:

The wire link for the frequency range can also be used to select the default frequency:

wire link	Meaning		P0100 setting	Meaning
Uncut	[kW], frequency default 50 [Hz]	**Can be overridden**	1	[hp], frequency default 60 [Hz]
Cut	[hp], frequency default 60 [Hz]	**Can be overridden**	0	[kW], frequency default 50 [Hz]

Stop drive first (i.e. disable all pulses) before you change this parameter.

P0010 = 1 (commissioning mode) enables changes to be made.

Changing P0100 resets all rated motor parameters as well as other parameters that depend on the rated motor parameters (see P0340 - calculation of motor parameters).

r0200 **Act. power stack code number** **Min:** - Level: **3**
Datatype: U32 **Unit:** - **Def:** -
P-Group: INVERTER **Max:** -

Identifies hardware variant as shown in table below.

Code	Order number	Code	Order number
2001	6SE6410-2UB11-2AA0	2011	6SE6410-2UA11-2AA0
2002	6SE6410-2UB12-5AA0	2012	6SE6410-2UA12-5AA0
2003	6SE6410-2UB13-7AA0	2013	6SE6410-2UA13-7AA0
2004	6SE6410-2UB15-5BA0	2014	6SE6410-2UA15-5BA0
2005	6SE6410-2UB17-5BA0		
2006	6SE6410-2BB11-2AA0		
2007	6SE6410-2BB12-5AA0		
2008	6SE6410-2BB13-7AA0		
2009	6SE6410-2BB15-5BA0		
2010	6SE6410-2BB17-5BA0		

Notice:

Parameter r0200 = 0 indicates that no power stack has been identified.

P0201 **Power stack code number** **Min:** 0 Level: **3**
CStat: C **Datatype:** U16 **Unit:** - **Def:** 0
P-Group: INVERTER **Active:** First confirm **QuickComm.** No **Max:** 65535

Confirms actual power stack identified.

r0206 **Rated inverter power [kW] / [hp]** **Min:** - Level: **3**
Datatype: Float **Unit:** - **Def:** -
P-Group: INVERTER **Max:** -

Displays nominal rated motor power from inverter.

Dependency:

Value is displayed in [kW] or [hp] depending on setting for P0100 (operation for Europe / North America).

r0207 **Rated inverter current** **Min:** - Level: **3**
Datatype: Float **Unit:** A **Def:** -
P-Group: INVERTER **Max:** -

Displays maximum continuous output current of inverter.

r0209 **Maximum inverter current** **Min:** - Level: **3**
Datatype: Float **Unit:** A **Def:** -
P-Group: INVERTER **Max:** -

Displays maximum output current of inverter.

P0210 **Supply voltage** Level: **3**

CStat:	CT	**Datatype:** U16	**Unit:** V	**Min:**	0
P-Group:	INVERTER	**Active:** Immediately	**QuickComm.** No	**Def:**	230
				Max:	1000

Optimizes Vdc controller, which extends the ramp-down time if regenerative energy from motor would otherwise cause DC link overvoltage trips.

Reducing the value enables controller to cut in earlier and reduce the risk of overvoltage.

Dependency:

Cut-in levels for Vdc-controller and compound braking are derived directly from P0210 (supply voltage).

230 V version

Vdc_max switch-on level = $1.15 * \sqrt{2} * V_{mains}$

Compound braking switch-on level = $1.13 * \sqrt{2} * V_{mains}$

115 V version

Vdc_max_on = $1.15 * \sqrt{2} * V_{mains * 2}$

Compound braking switch-on level = $1.13 * \sqrt{2} * V_{mains * 2}$

Note:

If mains voltage is higher than value entered, automatic deactivation of the Vdc controller may occur to avoid acceleration of the motor. An alarm will be issued in this case (A0910).

P0290 **Inverter overload reaction** Level: **3**

CStat:	CT	**Datatype:** U16	**Unit:** -	**Min:**	0
P-Group:	INVERTER	**Active:** First confirm	**QuickComm.** No	**Def:**	2
				Max:	3

Selects reaction of inverter to an internal over-temperature.

Enum:

0 Reduce output frequency (usually only effective on variable torque appl.)
1 Trip (F0004)
2 Reduce pulse frequency and output frequency
3 Reduce pulse frequency then trip (F0004)

Notice:

A trip will always result eventually, if the action taken does not sufficiently reduce internal temperature.

The pulse frequency is normally reduced only if higher than 2 kHz.

P0300 **Select motor type** Level: **3**

CStat:	C	**Datatype:** U16	**Unit:** -	**Min:**	1
P-Group:	MOTOR	**Active:** First confirm	**QuickComm.** Yes	**Def:**	1
				Max:	2

Selects motor type.

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.
(rated motor frequency (P0310) * 60) / rated motor speed (P0311)

If the result is a whole number, the motor is synchronous.

Enum:

1 Asynchronous motor
2 Synchronous motor

Dependency:

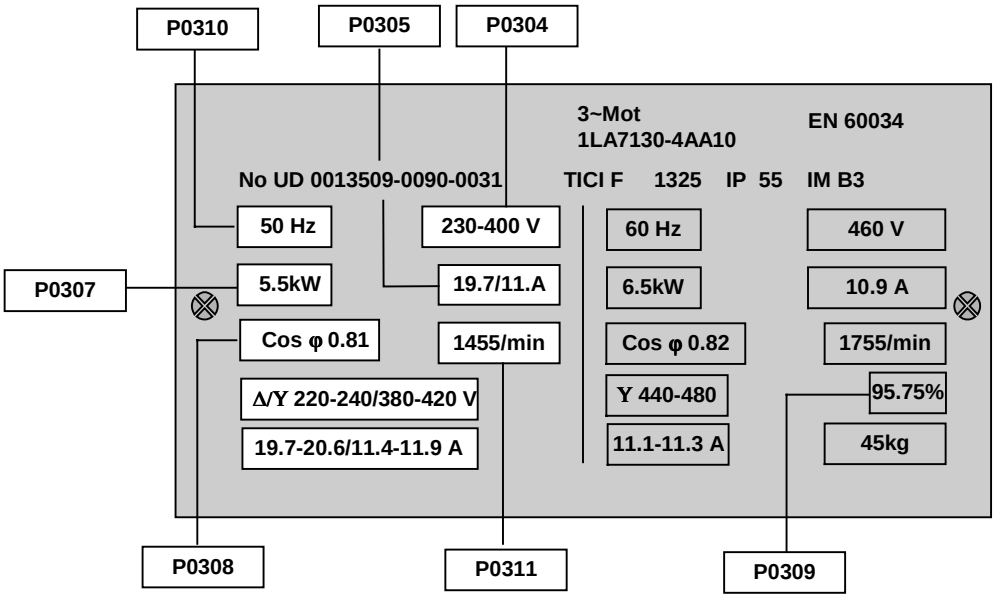
Changeable only when P0010 = 1 (quick commissioning).

If synchronous motor is selected, the following functions are not available:
Power factor (P0308)
Motor efficiency (P0309)
Flying start (P1200, P1202, P1203)
DC braking, P1232, P1233)
Slip compensation (P1335)

P0304 **Rated motor voltage** Level: **1**

CStat:	C	**Datatype:** U16	**Unit:** V	**Min:**	10
P-Group:	MOTOR	**Active:** First confirm	**QuickComm.** Yes	**Def:**	230
				Max:	2000

Nominal motor voltage [V] from rating plate. Following diagram shows a typical rating plate with the locations of the relevant motor data.



Dependency:
Changeable only when P0010 = 1 (quick commissioning).

P0305 **Rated motor current** Level: **1**

CStat:	C	**Datatype:** Float	**Unit:** A	**Min:**	0.01
P-Group:	MOTOR	**Active:** First confirm	**QuickComm.** Yes	**Def:**	3.25
				Max:	10000.00

Nominal motor current [A] from rating plate - see diagram in P0304.

Dependency:
Changeable only when P0010 = 1 (quick commissioning).

Note:
For asynchronous motors, the maximum value is defined as the maximum inverter current (r0209).

For synchronous motors, the maximum value is defined as twice the maximum inverter current (r0209)

The minimum value is defined as 1/32 times inverter rated current (r0207).

P0307 **Rated motor power** Level: **1**

CStat:	C	**Datatype:** Float	**Unit:** -	**Min:**	0.01
P-Group:	MOTOR	**Active:** First confirm	**QuickComm.** Yes	**Def:**	0.75
				Max:	2000.00

Nominal motor power [kW/hp] from rating plate.

Dependency:
If P0100 = 1, values will be in [hp] - see diagram P0304 (rating plate).

Changeable only when P0010 = 1 (quick commissioning).

P0308 **Rated motor cosPhi** Level: **3**

CStat:	C	**Datatype:** Float	**Unit:** -	**Min:**	0.000
P-Group:	MOTOR	**Active:** First confirm	**QuickComm.** Yes	**Def:**	0.000
				Max:	1.000

Nominal motor power factor (cosPhi) from rating plate - see diagram P0304.

Dependency:
Changeable only when P0010 = 1 (quick commissioning).

Visible only when P0100 = 0 or 2, (motor power entered in [kW]).

Setting 0 causes internal calculation of value.

P0309 **Rated motor efficiency** Level: **3**

CStat:	C	**Datatype:** Float	**Unit:** %	**Min:**	0.0
P-Group:	MOTOR	**Active:** First confirm	**QuickComm.** Yes	**Def:**	0.0
				Max:	99.9

Nominal motor efficiency in [%] from rating plate.

Dependency:

Changeable only when P0010 = 1 (quick commissioning).

Visible only when P0100 = 1, (i.e. motor power entered in [hp]).

Setting 0 causes internal calculation of value.

Details:

See diagram in P0304 (rating plate)

P0310 **Rated motor frequency** Level: **1**

CStat:	C	**Datatype:** Float	**Unit:** Hz	**Min:**	12.00
P-Group:	MOTOR	**Active:** First confirm	**QuickComm.** Yes	**Def:**	50.00
				Max:	650.00

Nominal motor frequency [Hz] from rating plate.

Dependency:

Changeable only when P0010 = 1 (quick commissioning).

Pole pair number recalculated automatically if parameter is changed.

Details:

See diagram in P0304 (rating plate)

P0311 **Rated motor speed** Level: **1**

CStat:	C	**Datatype:** U16	**Unit:** 1/min	**Min:**	0
P-Group:	MOTOR	**Active:** First confirm	**QuickComm.** Yes	**Def:**	0
				Max:	40000

Nominal motor speed [rpm] from rating plate.

Dependency:

Changeable only when P0010 = 1 (quick commissioning).

Setting 0 causes internal calculation of value.

Slip compensation in V/f control requires rated motor speed for correct operation.

Pole pair number recalculated automatically if parameter is changed.

Details:

See diagram in P0304 (rating plate)

P0335 **Motor cooling** Level: **3**

CStat:	CT	**Datatype:** U16	**Unit:** -	**Min:**	0
P-Group:	MOTOR	**Active:** First confirm	**QuickComm.** Yes	**Def:**	0
				Max:	1

Selects motor cooling system used.

Enum:

0 Self-cooled: Using shaft mounted fan attached to motor
1 Force-cooled: Using separately powered cooling fan

P0340 **Calculation of motor parameters** Level: **3**

CStat:	CT	**Datatype:** U16	**Unit:** -	**Min:**	0
P-Group:	MOTOR	**Active:** First confirm	**QuickComm.** No	**Def:**	0
				Max:	1

Calculates various motor parameters, including:

Reference frequency P2000

Enum:

0 No calculation
1 Complete parameterization

Note:

This parameter is required during commissioning to optimize inverter performance.

P0350 **Stator resistance (line-to-line)** Level: **3**

CStat:	CUT	**Datatype:** Float	**Unit:** Ohm	**Min:**	0.00001
P-Group:	MOTOR	**Active:** Immediately	**QuickComm.** No	**Def:**	4.0
				Max:	2000.0

Stator resistance value in [Ohms] for connected motor (from line-to-line). The parameter value includes the cable resistance.

There are three ways to determine the value for this parameter:
1. Calculate using P0340 = 1 (data entered from rating plate) or P3900 = 1,2 or 3 (end of quick commissioning)
2. Measure manually using an Ohmmeter.

Note:

Since measured line-to-line, this value may appear to be higher (up to 2 times higher) than expected.

The value entered in P0350 (stator resistance) is the one obtained by the method last used.

P0610 **Motor I2t temperature reaction** Level: **3**

CStat:	CT	**Datatype:** U16	**Unit:** -	**Min:**	0
P-Group:	MOTOR	**Active:** First confirm	**QuickComm.** No	**Def:**	2
				Max:	2

Defines reaction when motor I2t reaches warning threshold.

Enum:

0 No reaction, warning only
1 Warning and Imax reduction (results in reduced output freq.)
2 Warning and trip (F0011)

Dependency:

Trip level = P0614 (motor I2t overload warning level) * 110 %

P0611 **Motor I2t time constant** Level: **3**

CStat:	CT	**Datatype:** U16	**Unit:** s	**Min:**	0
P-Group:	MOTOR	**Active:** Immediately	**QuickComm.** No	**Def:**	100
				Max:	16000

Defines motor thermal time constant and is calculated automatically from the motor data (see P0340). Calculation of r0034 is switched off, if P0611 is set lower than 100

Notice:

A larger number increases the time taken for the calculated motor temperature to change.

P0614 **Motor I2t overload warning level** Level: **3**

CStat:	CUT	**Datatype:** Float	**Unit:** %	**Min:**	0.0
P-Group:	MOTOR	**Active:** First confirm	**QuickComm.** No	**Def:**	100.0
				Max:	400.0

Defines the [%] value at which alarm A0511 (motor overtemperature) is generated.

Motor I2t calculation is used to estimate a maximum tolerable period (i.e. without overheating) for motor overload. The I2t calculation value is deemed = 100 % when this maximum tolerable period is reached (see r0034).

Dependency:

A motor over-temperature trip (F0011) is produced at 110 % of this level.

P0640 **Motor overload factor [%]** Level: **3**

CStat:	CUT	**Datatype:** Float	**Unit:** %	**Min:**	10.0
P-Group:	MOTOR	**Active:** Immediately	**QuickComm.** Yes	**Def:**	150.0
				Max:	400.0

Defines motor overload current limit in [%] relative to P0305 (rated motor current).

Dependency:

Limited to maximum inverter current or to 400 % of rated motor current (P0305), whichever is the lower.

P0700 **Selection of command source** Level: **1**

CStat:	CT	**Datatype:** U16	**Unit:** -	**Min:**	0
P-Group:	COMMANDS	**Active:** First confirm	**QuickComm.** Yes	**Def:**	2
				Max:	5

Selects digital command source.

Enum:

0 Factory default setting
1 BOP (keypad)
2 Terminal
4 USS on BOP link
5 USS on COM link

Note:

Changing this parameter resets (to default) all settings on item selected. For example: Changing form 1 to 2 resets all digital inputs to default settings.

P0701 **Function of digital input 1** Level: **2**

CStat:	CT	**Datatype:** U16	**Unit:** -	**Min:**	0
P-Group:	COMMANDS	**Active:** First confirm	**QuickComm.** No	**Def:**	1
				Max:	99

Selects function of digital input 1.

Enum:

0 Digital input disabled
1 ON/OFF1
2 ON reverse /OFF1
3 OFF2 - coast to standstill
4 OFF3 - quick ramp-down
9 Fault acknowledge
10 JOG right
11 JOG left
12 Reverse
13 MOP up (increase freq.)
14 MOP down (decrease freq.)
15 Fixed setpoint (Direct selection)
16 Fixed setpoint (Direct selection + ON)
21 Local/remote
25 DC brake enable
29 External trip
33 Disable additional freq setpoint
99 Service

Dependency:

Setting 99 service requires P0700 (command source) or P3900 (end of quick commissioning) = 1, 2 or P0970 (factory reset) = 1 in order to reset.

Notice:

Setting 99 for service use only.

P0702 **Function of digital input 2** Level: **2**

CStat:	CT	**Datatype:** U16	**Unit:** -	**Min:**	0
P-Group:	COMMANDS	**Active:** First confirm	**QuickComm.** No	**Def:**	12
				Max:	99

Selects function of digital input 2.

Enum:

0 Digital input disabled
1 ON/OFF1
2 ON reverse /OFF1
3 OFF2 - coast to standstill
4 OFF3 - quick ramp-down
9 Fault acknowledge
10 JOG right
11 JOG left
12 Reverse
13 MOP up (increase freq.)
14 MOP down (decrease freq.)
15 Fixed setpoint (Direct selection)
16 Fixed setpoint (Direct selection + ON)
21 Local/remote
25 DC brake enable
29 External trip
33 Disable additional freq setpoint
99 Service

Details:

See P0701 (function of digital input1).

P0703 **Function of digital input 3**

CStat:	CT	**Datatype:** U16	**Unit:** -	**Min:**	0
P-Group:	COMMANDS	**Active:** First confirm	**QuickComm.** No	**Def:**	9
				Max:	99

Level: **2**

Selects function of digital input 3.

Enum:

0 Digital input disabled
1 ON/OFF1
2 ON reverse /OFF1
3 OFF2 - coast to standstill
4 OFF3 - quick ramp-down
9 Fault acknowledge
10 JOG right
11 JOG left
12 Reverse
13 MOP up (increase freq.)
14 MOP down (decrease freq.)
15 Fixed setpoint (Direct selection)
16 Fixed setpoint (Direct selection + ON)
21 Local/remote
25 DC brake enable
29 External trip
33 Disable additional freq setpoint
99 Service

Details:

See P0701 (function of digital input 1).

P0704 **Function of digital input 4**

CStat:	CT	**Datatype:** U16	**Unit:** -	**Min:**	0
P-Group:	COMMANDS	**Active:** First confirm	**QuickComm.** No	**Def:**	0
				Max:	99

Level: **2**

Selects function of digital input 4 (via analog input).

Enum:

0 Digital input disabled
1 ON/OFF1
2 ON reverse /OFF1
3 OFF2 - coast to standstill
4 OFF3 - quick ramp-down
9 Fault acknowledge
10 JOG right
11 JOG left
12 Reverse
13 MOP up (increase freq.)
14 MOP down (decrease freq.)
21 Local/remote
25 DC brake enable
29 External trip
33 Disable additional freq setpoint
99 Service

Details:

See P0701 (function of digital input 1).

P0719[2] **Selection of cmd. & freq. setp.** Level: **3**

CStat: CT **Datatype:** U16 **Unit:** - **Min:** 0 **Def:** 0 **Max:** 55

P-Group: COMMANDS **Active:** First confirm **QuickComm.** No

Central switch to select control command source for inverter.

Switches command and setpoint source between freely programmable BICO parameters and fixed command/setpoint profiles. Command and setpoint sources can be changed independently.

The tens digit chooses the command source and the units digit chooses the setpoint source.

The two indices of this parameter are used for local/remote switching. The local/remote signal switches between these settings.

The default setting is 0 for the first index (i.e. normal parameterization is active).
The second index is for control via BOP (i.e. activating the local/remote signal will then switch to BOP).

Enum:

0	Cmd = BICO parameter	Setpoint = BICO parameter
1	Cmd = BICO parameter	Setpoint = MOP setpoint
2	Cmd = BICO parameter	Setpoint = Analog setpoint
3	Cmd = BICO parameter	Setpoint = Fixed frequency
4	Cmd = BICO parameter	Setpoint = USS on BOP link
5	Cmd = BICO parameter	Setpoint = USS on COM link
10	Cmd = BOP	Setpoint = BICO parameter
11	Cmd = BOP	Setpoint = MOP setpoint
12	Cmd = BOP	Setpoint = Analog setpoint
13	Cmd = BOP	Setpoint = Fixed frequency
15	Cmd = BOP	Setpoint = USS on COM link
40	Cmd = USS on BOP link	Setpoint = BICO parameter
41	Cmd = USS on BOP link	Setpoint = MOP setpoint
42	Cmd = USS on BOP link	Setpoint = Analog setpoint
43	Cmd = USS on BOP link	Setpoint = Fixed frequency
44	Cmd = USS on BOP link	Setpoint = USS on BOP link
45	Cmd = USS on BOP link	Setpoint = USS on COM link
50	Cmd = USS on COM link	Setpoint = BICO parameter
51	Cmd = USS on COM link	Setpoint = MOP setpoint
52	Cmd = USS on COM link	Setpoint = Analog setpoint
53	Cmd = USS on COM link	Setpoint = Fixed frequency
54	Cmd = USS on COM link	Setpoint = USS on BOP link
55	Cmd = USS on COM link	Setpoint = USS on COM link

Index:

P0719[0] : 1st Control source (Remote)
P0719[1] : 2nd Control source (Local)

Note:

BICO connections made previously remain unchanged.

r0722 **CO/BO: Binary input values** Level: **3**

Datatype: U16 **Unit:** - **Min:** - **Def:** - **Max:** -

P-Group: COMMANDS

Displays status of digital inputs.

Bitfields:

Bit00	Digital input 1	0	OFF
		1	ON
Bit01	Digital input 2	0	OFF
		1	ON
Bit02	Digital input 3	0	OFF
		1	ON
Bit03	Digital input 4 (via ADC)	0	OFF
		1	ON

Note:

Segment is lit when signal is active.

P0724 **Debounce time for digital inputs** Level: **3**

CStat: CT **Datatype:** U16 **Unit:** - **Min:** 0 **Def:** 3 **Max:** 3

P-Group: COMMANDS **Active:** Immediately **QuickComm.** No

Defines debounce time (filtering time) used for digital inputs.

Enum:

0	No debounce time
1	2.5 ms debounce time
2	8.2 ms debounce time
3	12.3 ms debounce time

P0731 **BI: Function of digital output 1**

CStat:	CUT	**Datatype:** U32	**Unit:** -	**Min:**	0:0
P-Group:	COMMANDS	**Active:** First confirm	**QuickComm.** No	**Def:**	52:3
				Max:	4000:0

Level: **2**

Defines source of digital output 1.

Settings:

52.0	Drive ready	0	Closed
52.1	Drive ready to run	0	Closed
52.2	Drive running	0	Closed
52.3	Drive fault active	0	Closed
52.4	OFF2 active	1	Closed
52.5	OFF3 active	1	Closed
52.6	Switch on inhibit active	0	Closed
52.7	Drive warning active	0	Closed
52.8	Deviation setpoint/actual value	1	Closed
52.9	PZD control (Process Data Control)	0	Closed
52.A	Maximum frequency reached	0	Closed
52.B	Warning: Motor current limit	1	Closed
52.C	Motor holding brake (MHB) active	0	Closed
52.D	Motor overload	1	Closed
52.E	Motor running direction right	0	Closed
52.F	Inverter overload	1	Closed
53.0	DC brake active	0	Closed
53.1	Inverter freq. less switch off limit	0	Closed
53.2	Inverter freq. less minimum freq.	0	Closed
53.6	Act. freq. greater/equal setpoint	0	Closed

r0747 **CO/BO: State of digital outputs**

		Datatype: U16	**Unit:** -	**Min:**	-
P-Group:	COMMANDS			**Def:**	-
				Max:	-

Level: **3**

Displays status of digital outputs (also includes inversion of digital outputs via P0748).

Bitfields:

Bit00	Digital output 1 energized	0	NO
		1	YES

Dependency:

Bit 0 0 = relay de-energized / contacts open
1 = relay energized / contacts closed

P0748 **Invert digital outputs**

CStat:	CUT	**Datatype:** U16	**Unit:** -	**Min:**	0
P-Group:	COMMANDS	**Active:** First confirm	**QuickComm.** No	**Def:**	0
				Max:	1

Level: **3**

Defines high and low states of relay for a given function.

Bitfields:

Bit00	Invert digital output 1	0	NO
		1	YES

r0752 **Act. input of ADC [V]**

		Datatype: Float	**Unit:** -	**Min:**	-
P-Group:	TERMINAL			**Def:**	-
				Max:	-

Level: **3**

Displays smoothed analog input value in volts before the characteristic block.

P0753 **Smooth time ADC**

CStat:	CUT	**Datatype:** U16	**Unit:** ms	**Min:**	0
P-Group:	TERMINAL	**Active:** First confirm	**QuickComm.** No	**Def:**	3
				Max:	10000

Level: **3**

Defines filter time (PT1 filter) in [ms] for analog input.

Note:

Increasing this smooth time reduces jitter but slows down response to the analog input.

P0753 = 0 : No filtering

r0754 **Act. ADC value after scaling [%]**

		Datatype: Float	**Unit:** %	**Min:**	-
P-Group:	TERMINAL			**Def:**	-
				Max:	-

Level: **2**

Shows smoothed value of analog input in [%] after scaling block.

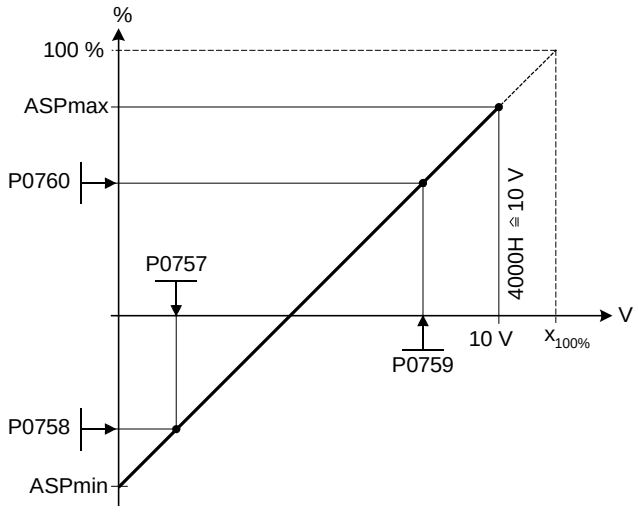
Dependency:

P0757 to P0760 define range (ADC scaling)

P0757	**Value x1 of ADC scaling [V]**			**Min:**	0	Level:
	CStat: CUT	**Datatype:** Float	**Unit:** V	**Def:**	0	**3**
	P-Group: TERMINAL	**Active:** First confirm	**QuickComm.** No	**Max:**	10	

Parameters P0757 - P0760 configure the input scaling as shown in the diagram:

P0761 = 0



Where:
Analog setpoints represent a [%] of the normalized frequency in P2000.
Analog setpoints may be larger than 100 %
ASPmax represents highest analog setpoint (this may be at 10 V).
ASPmin represents lowest analog setpoint (this may be at 0 V).
Default values provide a scaling of 0 V = 0 %, and 10 V = 100 %.

P0758	**Value y1 of ADC scaling**			**Min:**	-99999.9	Level:
	CStat: CUT	**Datatype:** Float	**Unit:** %	**Def:**	0.0	**3**
	P-Group: TERMINAL	**Active:** First confirm	**QuickComm.** No	**Max:**	99999.9	

Sets value of Y1 in [%] as described in P0757 (ADC scaling)

Dependency:

Affects P2000 (reference frequency).

P0759	**Value x2 of ADC scaling [V]**			**Min:**	0	Level:
	CStat: CUT	**Datatype:** Float	**Unit:** V	**Def:**	10	**3**
	P-Group: TERMINAL	**Active:** First confirm	**QuickComm.** No	**Max:**	10	

Sets value of X2 as described in P0757 (ADC scaling)

P0760	**Value y2 of ADC scaling**			**Min:**	-99999.9	Level:
	CStat: CUT	**Datatype:** Float	**Unit:** %	**Def:**	100.0	**3**
	P-Group: TERMINAL	**Active:** First confirm	**QuickComm.** No	**Max:**	99999.9	

Sets value of Y2 in [%] as described in P0757 (ADC scaling)

Dependency:

Affects P2000 (reference frequency).

P0761	**Width of ADC deadband [V]**			**Min:**	0	Level:
	CStat: CUT	**Datatype:** Float	**Unit:** V	**Def:**	0	**3**
	P-Group: TERMINAL	**Active:** First confirm	**QuickComm.** No	**Max:**	10	

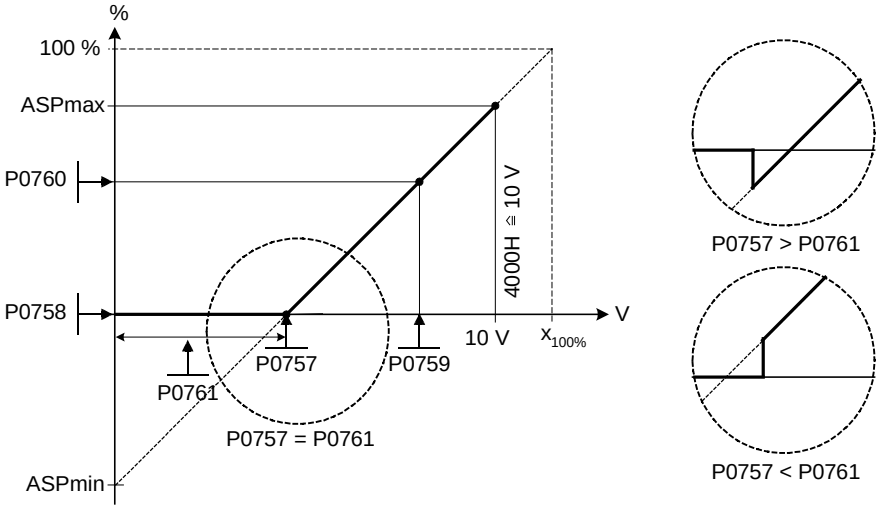
Defines width of deadband on analog input. The diagrams below explain its use

Example:

ADC value 2 to 10 V (0 to 50 Hz)
The below example produces a 2 to 10 V analog input (0 to 50 Hz)
P2000 = 50 Hz
P0759 = 8 V P0760 = 75 %
P0757 = 2 V P0758 = 0 %
P0761 = 2 V

P0761 > 0

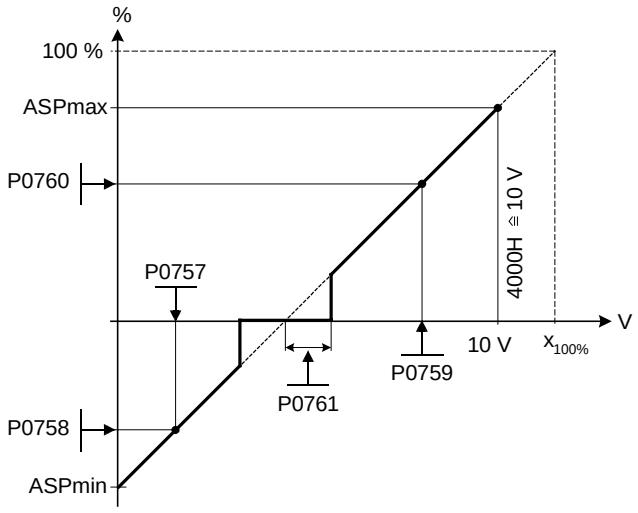
0 < P0758 < P0760 || 0 > P0758 > P0760



ADC value 0 to 10 V (-50 to +50 Hz)
The below example produces a 0 to 10 V analog input (-50 to +50 Hz) with center zero and a "holding point" 0.2 V wide (0.1 V to each side of center).
P2000 = 50 Hz
P0759 = 8 V P0760 = 75 %
P0757 = 2 V P0758 = -75 %
P0761 = 0.1 V

P0761 > 0

P0758 < 0 < P0760



Note:

P0761= 0 : No deadband active.

Notice:

Deadband starts from 0 V to value of P0761, if both values of P0758 and P0760 (y coordinates of ADC scaling) are positive or negative respectively. However, deadband is active in both directions from point of intersection (x axis with ADC scaling curve), if sign of P0758 and P0760 are opposite.

Fmin (P1080) should be zero when using center zero setup. There is no hysteresis at the end of the deadband.

P0810 **BI: CDS bit 0 (Local / Remote)** Level: **3**

CStat:	CUT	**Datatype:** U32	**Unit:** -	**Min:**	0:0
P-Group:	COMMANDS	**Active:** First confirm	**QuickComm.** No	**Def:**	0:0
				Max:	4095:0

Selects command source from which to read Bit 0 for selecting a BICO data set (see control word 1, Bit 15).

Note:

Bit 1 is also relevant for BICO data set selection.

P0927 **Parameter changeable via** Level: **3**

CStat:	CUT	**Datatype:** U16	**Unit:** -	**Min:**	0
P-Group:	COMM	**Active:** First confirm	**QuickComm.** No	**Def:**	15
				Max:	15

Specifies the interfaces which can be used to change parameters.

Example:

"b - - n n" (bits 0, 1, 2 and 3 set) in the default setting means that parameters can be changed via any interface.

"b - - r n" (bits 0, 1 and 3 set) would specify that parameters can be changed via BOP and USS on COM link but not via USS on BOP link.

Bitfields:

Bit00	Not used	0	NO
		1	YES
Bit01	BOP	0	NO
		1	YES
Bit02	USS on BOP link	0	NO
		1	YES
Bit03	USS on COM link	0	NO
		1	YES

Details:

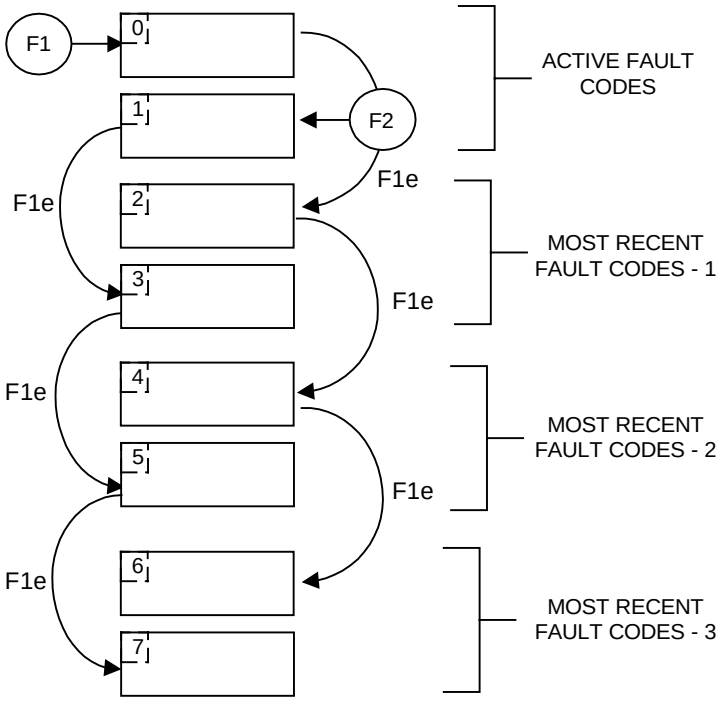
The seven-segment display is explained in the "Introduction to MICROMASTER 410 System Parameters" in this handbook.

r0947[8]	**Last fault code**			**Min:** -	Level:
		Datatype: U16	**Unit:** -	**Def:** -	**2**
	P-Group: ALARMS			**Max:** -	

Displays fault history according to the diagram below

where:
"F1" is the first active fault (not yet acknowledged).
"F2" is the second active fault (not yet acknowledged).
"F1e" is the occurrence of the fault acknowledgement for F1 & F2.

This moves the value in the 2 indices down to the next pair of indices, where they are stored. Indices 0 & 1 contain the active faults. When faults are acknowledged, indices 0 & 1 are reset to 0.



Example:

If the inverter trips on undervoltage and then receives an external trip before the undervoltage is acknowledged, you will obtain:
Index 0 = 3 Undervoltage
Index 1 = 85 External trip

Whenever a fault in index 0 is acknowledged (F1e), the fault history shifts as indicated in the diagram above.

Index:

r0947[0] : Recent fault trip --, fault 1
r0947[1] : Recent fault trip --, fault 2
r0947[2] : Recent fault trip -1, fault 3
r0947[3] : Recent fault trip -1, fault 4
r0947[4] : Recent fault trip -2, fault 5
r0947[5] : Recent fault trip -2, fault 6
r0947[6] : Recent fault trip -3, fault 7
r0947[7] : Recent fault trip -3, fault 8

Dependency:

Index 2 used only if second fault occurs before first fault is acknowledged.

Details:

See "Faults and Warnings".

r0949[8] **Fault value**

Datatype: U16 **Unit:** - **Min:** - **Def:** - **Max:** -

Level: **3**

P-Group: ALARMS

Displays drive fault values. It is for service purposes and indicate the type of fault reported. The values are not documented. They are listed in the code where faults are reported.

Index:

r0949[0] : Recent fault trip --, fault value 1
r0949[1] : Recent fault trip --, fault value 2
r0949[2] : Recent fault trip -1, fault value 3
r0949[3] : Recent fault trip -1, fault value 4
r0949[4] : Recent fault trip -2, fault value 5
r0949[5] : Recent fault trip -2, fault value 6
r0949[6] : Recent fault trip -3, fault value 7
r0949[7] : Recent fault trip -3, fault value 8

r0964[5] **Firmware version data**

Datatype: U16 **Unit:** - **Min:** - **Def:** - **Max:** -

Level: **3**

P-Group: COMM

Firmware version data.

Example:

r0964[0] = 42 "SIEMENS"
r0964[1] = 1001 "MICROMASTER 420"
1002 "MICROMASTER 440"
1003 "MICRO- / COMBIMASTER 411"
1004 "MICROMASTER 410"
1005 "Reserved"
r0964[4] = 507 means 5th July.

Index:

r0964[0] : Company (Siemens = 42)
r0964[1] : Product type
r0964[2] : Firmware version
r0964[3] : Firmware date (year)
r0964[4] : Firmware date (day/month)

P0970 **Factory reset**

CStat: C **Datatype:** U16 **Unit:** - **Min:** 0 **Def:** 0 **Max:** 1

Level: **1**

P-Group: PAR_RESET **Active:** First confirm **QuickComm.** No

P0970 = 1 resets all parameters to their default values.

Enum:

0 Disabled
1 Parameter reset

Dependency:

First set P0010 = 30 (factory settings)

Stop drive (i.e. disable all pulses) before you can reset parameters to default values.

Note:

The following parameters retain their values after a factory reset:

P2010 (USS baud rate) and
P2011 (USS address)

P0971 **Transfer data from RAM to EEPROM**

CStat: CUT **Datatype:** U16 **Unit:** - **Min:** 0 **Def:** 0 **Max:** 1

Level: **3**

P-Group: COMM **Active:** First confirm **QuickComm.** No

Transfers values from RAM to EEPROM when set to 1.

Enum:

0 Disabled
1 Start transfer

Note:

All values in RAM are transferred to EEPROM.

Parameter is automatically reset to 0 (default) after successful transfer.

P1000	**Selection of frequency setpoint**			**Min:**	0	Level:
	CStat: CT	**Datatype:** U16	**Unit:** -	**Def:**	2	**1**
	P-Group: SETPOINT	**Active:** First confirm	**QuickComm.** Yes	**Max:**	55	

Selects frequency setpoint source. In the table of possible settings below, the main setpoint is selected from the least significant digit (i.e., 0 to 5) and any additional setpoint from the most significant digit (i.e., x0 through to x5).

Example:

Setting 12 selects main setpoint (2) derived from analog input with additional setpoint (1) taken from the motor potentiometer.

Settings:

1 Motor potentiometer setpoint
2 Analog input
3 Fixed frequency setpoint
4 USS on BOP link
5 USS on COM link

Other settings including an additional setpoint can be selected using the table below.

Enum:

0	No main setpoint		
1	MOP setpoint		
2	Analog setpoint		
3	Fixed frequency		
4	USS on BOP link		
5	USS on COM link		
10	No main setpoint	+	MOP setpoint
11	MOP setpoint	+	MOP setpoint
12	Analog setpoint	+	MOP setpoint
13	Fixed frequency	+	MOP setpoint
14	USS on BOP link	+	MOP setpoint
15	USS on COM link	+	MOP setpoint
20	No main setpoint	+	Analog setpoint
21	MOP setpoint	+	Analog setpoint
22	Analog setpoint	+	Analog setpoint
23	Fixed frequency	+	Analog setpoint
24	USS on BOP link	+	Analog setpoint
25	USS on COM link	+	Analog setpoint
30	No main setpoint	+	Fixed frequency
31	MOP setpoint	+	Fixed frequency
32	Analog setpoint	+	Fixed frequency
33	Fixed frequency	+	Fixed frequency
34	USS on BOP link	+	Fixed frequency
35	USS on COM link	+	Fixed frequency
40	No main setpoint	+	USS on BOP link
41	MOP setpoint	+	USS on BOP link
42	Analog setpoint	+	USS on BOP link
43	Fixed frequency	+	USS on BOP link
44	USS on BOP link	+	USS on BOP link
45	USS on COM link	+	USS on BOP link
50	No main setpoint	+	USS on COM link
51	MOP setpoint	+	USS on COM link
52	Analog setpoint	+	USS on COM link
53	Fixed frequency	+	USS on COM link
54	USS on BOP link	+	USS on COM link
55	USS on COM link	+	USS on COM link

Note:

Single digits denote main setpoints that have no additional setpoint.

P1001 **Fixed frequency 1** Level: **2**

CStat:	CUT	**Datatype:** Float	**Unit:** Hz	**Min:**	-650.00
P-Group:	SETPOINT	**Active:** Immediately	**QuickComm.** No	**Def:**	0.00
				Max:	650.00

Defines fixed frequency setpoint 1.

There are 2 types of fixed frequencies:
1. Direct selection
2. Direct 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
2. Direct selection + ON command (P0701 - P0703 = 16)
   The 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

Dependency:
Select fixed frequency operation (using P1000).

Inverter requires ON command to start in the case of direct selection (P0701 - P0703 = 15)

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

P1002 **Fixed frequency 2** Level: **2**

CStat:	CUT	**Datatype:** Float	**Unit:** Hz	**Min:**	-650.00
P-Group:	SETPOINT	**Active:** Immediately	**QuickComm.** No	**Def:**	5.00
				Max:	650.00

Defines fixed frequency setpoint 2.

Details:
See parameter P1001 (fixed frequency 1).

P1003 **Fixed frequency 3** Level: **2**

CStat:	CUT	**Datatype:** Float	**Unit:** Hz	**Min:**	-650.00
P-Group:	SETPOINT	**Active:** Immediately	**QuickComm.** No	**Def:**	10.00
				Max:	650.00

Defines fixed frequency setpoint 3.

Details:
See parameter P1001 (fixed frequency 1).

r1024 **CO: Act. fixed frequency** Level: **3**

		Datatype: Float	**Unit:** Hz	**Min:**	-
				Def:	-
P-Group:	SETPOINT			**Max:**	-

Displays sum total of selected fixed frequencies.

P1031 **Setpoint memory of the MOP** Level: **2**

CStat:	CUT	**Datatype:** U16	**Unit:** -	**Min:**	0
P-Group:	SETPOINT	**Active:** Immediately	**QuickComm.** No	**Def:**	0
				Max:	1

Saves last motor potentiometer setpoint (MOP) that was active before OFF command or power down.

Enum:
0 MOP setpoint will not be stored
1 MOP setpoint will be stored (P2240 is updated)

Note:
On next ON command, motor potentiometer setpoint will be the saved value in parameter P1040 (setpoint of the MOP).

P1032 **Inhibit reverse direction of MOP** Level: **3**

CStat:	CT	**Datatype:** U16	**Unit:** -	**Min:**	0
P-Group:	SETPOINT	**Active:** First confirm	**QuickComm.** No	**Def:**	1
				Max:	1

Inhibits reverse setpoint selection

Enum:
0 Reverse direction is allowed
1 Reverse direction inhibited

Dependency:
Motor potentiometer (P1040) must be chosen as main setpoint or additional setpoint (using P1000).

Note:
It is possible to change motor direction using the motor potentiometer setpoint (increase / decrease frequency either by using digital inputs or BOP/AOP keypad up / down).

P1040 **Setpoint of the MOP**

CStat:	CUT	**Datatype:** Float	**Unit:** Hz	**Min:**	-650.00
P-Group:	SETPOINT	**Active:** Immediately	**QuickComm.** No	**Def:**	5.00
				Max:	650.00

Level: **3**

Determines setpoint for motor potentiometer control (P1000 = 1).

Note:

If motor potentiometer setpoint is selected either as main setpoint or additional setpoint, the reverse direction will be inhibited by default of P1032 (inhibit reverse direction of MOP).

To re-enable reverse direction, set P1032 = 0.

P1058 **JOG frequency right**

CStat:	CUT	**Datatype:** Float	**Unit:** Hz	**Min:**	0.00
P-Group:	SETPOINT	**Active:** Immediately	**QuickComm.** No	**Def:**	5.00
				Max:	650.00

Level: **3**

Jogging increases the motor speed by small amounts. The JOG buttons uses a non-latching switch on one of the digital inputs to control the motor speed.

While JOG right is selected, this parameter determines the frequency at which the inverter will run.

Dependency:

P1060 and P1061 set up and down ramp times respectively for jogging.

P1059 **JOG frequency left**

CStat:	CUT	**Datatype:** Float	**Unit:** Hz	**Min:**	0.00
P-Group:	SETPOINT	**Active:** Immediately	**QuickComm.** No	**Def:**	5.00
				Max:	650.00

Level: **3**

While JOG left is selected, this parameter determines the frequency at which the inverter will run.

Dependency:

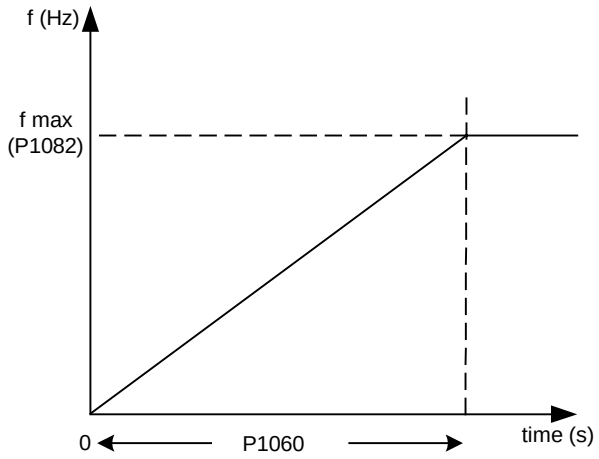
P1060 and P1061 set up and down ramp times respectively for jogging.

P1060 **JOG ramp-up time**

CStat:	CUT	**Datatype:** Float	**Unit:** s	**Min:**	0.00
P-Group:	SETPOINT	**Active:** First confirm	**QuickComm.** No	**Def:**	10.00
				Max:	650.00

Level: **3**

Sets jog ramp-up time. This is the time used while jogging is active.



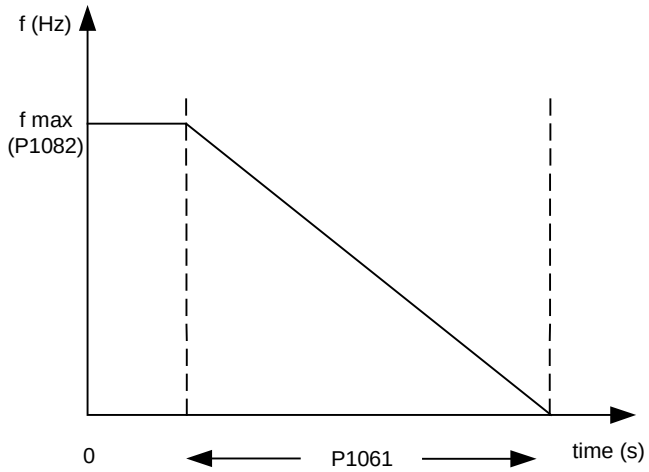
Notice:

Ramp times will be used as follows:
P1060 / P1061 : JOG mode is active
P1120 / P1121 : Normal mode (ON/OFF) is active

P1061 **JOG ramp-down time** Level: **3**

CStat:	CUT	**Datatype:** Float	**Unit:** s	**Min:**	0.00
P-Group:	SETPOINT	**Active:** First confirm	**QuickComm.** No	**Def:**	10.00
				Max:	650.00

Sets ramp-down time. This is the time used while jogging is active.



Notice:

Ramp times will be used as follows:
P1060 / P1061 : JOG mode is active
P1120 / P1121 : Normal mode (ON/OFF) is active

P1070 **CI: Main setpoint** Level: **3**

CStat:	CT	**Datatype:** U32	**Unit:** -	**Min:**	0.00
P-Group:	SETPOINT	**Active:** First confirm	**QuickComm.** No	**Def:**	755:0
				Max:	4000:0

Defines source of main setpoint.

Settings:

755 = Analog input 1 setpoint
1024 = Fixed frequency setpoint
1050 = Motor potentiometer (MOP) setpoint

P1075 **CI: Additional setpoint** Level: **3**

CStat:	CT	**Datatype:** U32	**Unit:** -	**Min:**	0:0
P-Group:	SETPOINT	**Active:** First confirm	**QuickComm.** No	**Def:**	0:0
				Max:	4000:0

Defines source of the additional setpoint (to be added to main setpoint).

Settings:

755 = Analog input 1 setpoint
1024 = Fixed frequency setpoint
1050 = Motor potentiometer (MOP) setpoint

r1078 **CO: Total frequency setpoint** Level: **3**

		Datatype: Float	**Unit:** Hz	**Min:**	-
				Def:	-
P-Group:	SETPOINT			**Max:**	-

Displays sum of main and additional setpoints in [Hz].

P1080 **Min. frequency** Level: **1**

CStat:	CUT	**Datatype:** Float	**Unit:** Hz	**Min:**	0.00
P-Group:	SETPOINT	**Active:** Immediately	**QuickComm.** Yes	**Def:**	0.00
				Max:	650.00

Sets minimum motor frequency [Hz] at which motor will run irrespective of frequency setpoint.

Note:

Value set here is valid both for clockwise and for anticlockwise rotation.

Under certain conditions (e.g. ramping, current limiting), motor can run below minimum frequency.

P1082	**Max. frequency**			**Min:**	0.00	Level:
	CStat: CT	**Datatype:** Float	**Unit:** Hz	**Def:**	50.00	**1**
	P-Group: SETPOINT	**Active:** First confirm	**QuickComm.** Yes	**Max:**	650.00	

Sets maximum motor frequency [Hz] at which motor will run irrespective of the frequency setpoint.

Note:

The value set here is valid for both clockwise and anticlockwise rotation.

The maximum output frequency of inverter can be exceeded if one of the following is active:

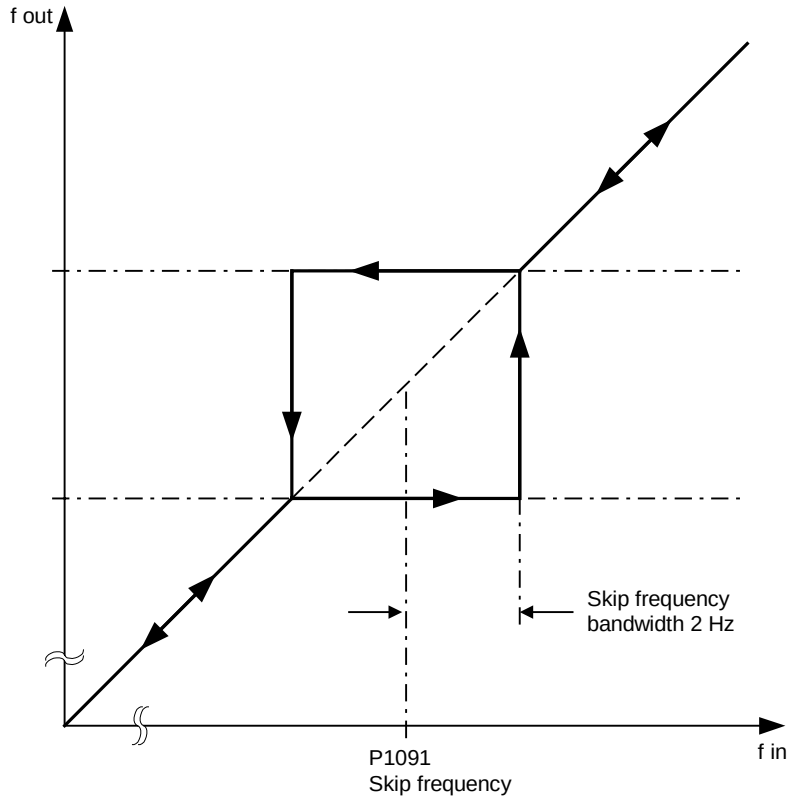
Slip compensation = $f_{max} + f_{slipcompmax}$
or
Flying restart = $f_{max} + f_{slipnom}$

Notice:

Maximum motor speed is subject to mechanical limitations.

P1091	**Skip frequency 1**			**Min:**	0.00	Level:
	CStat: CUT	**Datatype:** Float	**Unit:** Hz	**Def:**	0.00	**3**
	P-Group: SETPOINT	**Active:** Immediately	**QuickComm.** No	**Max:**	650.00	

Defines skip frequency 1 which avoids effects of mechanical resonance and suppresses frequencies within +/- 2Hz (skip frequency bandwidth).



Notice:

Stationary operation is not possible within the suppressed frequency range; the range is merely passed through (on the ramp).

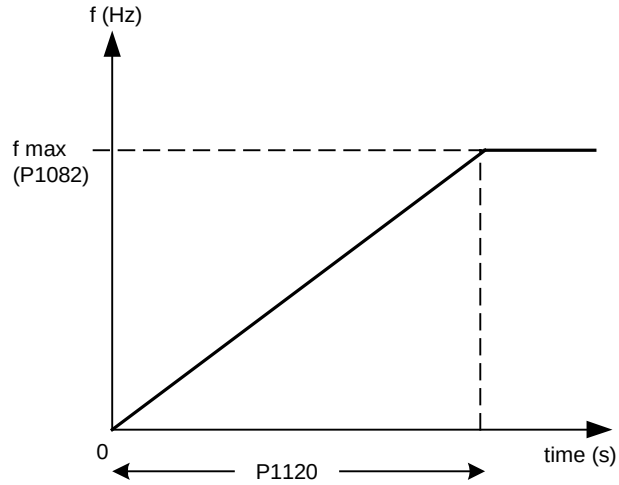
For example, if P1091 = 10 Hz it is not possible to operate continuously between 10 Hz +/- 2 Hz (i.e. between 8 and 12 Hz).

P1120 **Ramp-up time**

CStat:	CUT	**Datatype:** Float	**Unit:** s	**Min:**	0.00
P-Group:	SETPOINT	**Active:** First confirm	**QuickComm.** Yes	**Def:**	10.00
				Max:	650.00

Level: **1**

Time taken for 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).

Note:

If an external frequency setpoint with set ramp rates is used (e.g. from a PLC), the best way to achieve optimum drive performance is to set ramp times in P1120 and P1121 slightly shorter than those of the PLC.

Notice:

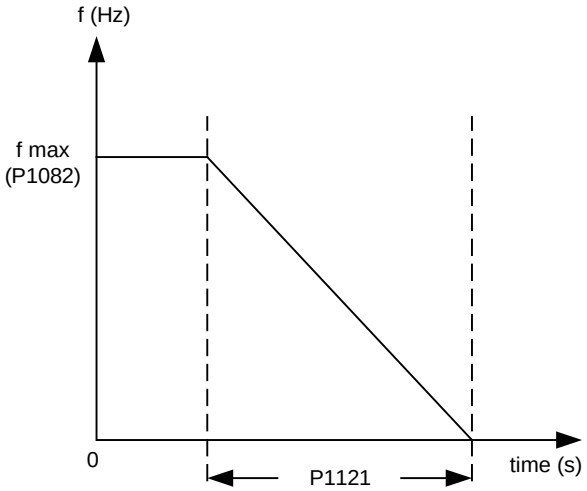
Ramp times will be used as follows:
P1060 / P1061 : JOG mode is active
P1120 / P1121 : Normal mode (ON/OFF) is active

P1121 **Ramp-down time**

CStat:	CUT	**Datatype:** Float	**Unit:** s	**Min:**	0.00
P-Group:	SETPOINT	**Active:** First confirm	**QuickComm.** Yes	**Def:**	10.00
				Max:	650.00

Level: **1**

Time taken for motor to decelerate from maximum motor frequency (P1082) down to standstill when no rounding is used.



Notice:

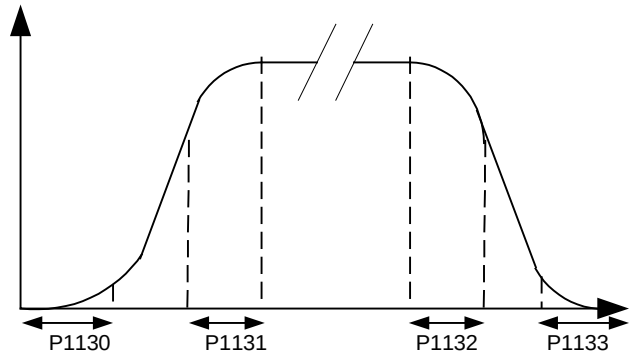
Setting the ramp-down time too short can cause the inverter to trip (overcurrent (F0001) / overvoltage (F0002)).

Ramp times will be used as follows:
P1060 / P1061 : JOG mode is active
P1120 / P1121 : Normal mode (ON/OFF) is active

P1130 **Ramp-up initial rounding time** Level: **3**

CStat:	CUT	**Datatype:** Float	**Unit:** s	**Min:**	0.00
P-Group:	SETPOINT	**Active:** First confirm	**QuickComm.** No	**Def:**	0.00
				Max:	40.00

Defines initial rounding time in seconds as shown on the diagram below.



where:

$$T_{up\ total} = \frac{1}{2}P1130 + X * P1120 + \frac{1}{2}P1131$$

$$T_{down\ total} = \frac{1}{2}P1130 + X * P1121 + \frac{1}{2}P1133$$

X is defined as: X = Δf / fmax

i.e. X is the ratio between the frequency step and fmax

Note:
Rounding times are recommended, since they prevent an abrupt response, thus avoiding detrimental effects on the mechanics.

Notice:
Rounding times are not recommended when analog inputs are used, since they would result in overshoot/undershoot in the inverter response.

P1131 **Ramp-up final rounding time** Level: **3**

CStat:	CUT	**Datatype:** Float	**Unit:** s	**Min:**	0.00
P-Group:	SETPOINT	**Active:** First confirm	**QuickComm.** No	**Def:**	0.00
				Max:	40.00

Defines rounding time at end of ramp-up as shown in P1130 (ramp-up initial rounding time).

Note:
Rounding times are recommended, since they prevent an abrupt response, thus avoiding detrimental effects on the mechanics.

Notice:
Rounding times are not recommended when analog inputs are used, since they would result in overshoot/undershoot in the inverter response.

P1132 **Ramp-down initial rounding time** Level: **3**

CStat:	CUT	**Datatype:** Float	**Unit:** s	**Min:**	0.00
P-Group:	SETPOINT	**Active:** First confirm	**QuickComm.** No	**Def:**	0.00
				Max:	40.00

Defines rounding time at start of ramp-down as shown in P1130 (ramp-up initial rounding time).

Note:
Rounding times are recommended, since they prevent an abrupt response, thus avoiding detrimental effects on the mechanics.

Notice:
Rounding times are not recommended when analog inputs are used, since they would result in overshoot/undershoot in the inverter response.

P1133 **Ramp-down final rounding time** Level: **3**

CStat:	CUT	**Datatype:** Float	**Unit:** s	**Min:**	0.00
P-Group:	SETPOINT	**Active:** First confirm	**QuickComm.** No	**Def:**	0.00
				Max:	40.00

Defines rounding time at end of ramp-down as shown in P1130 (ramp-up initial rounding time).

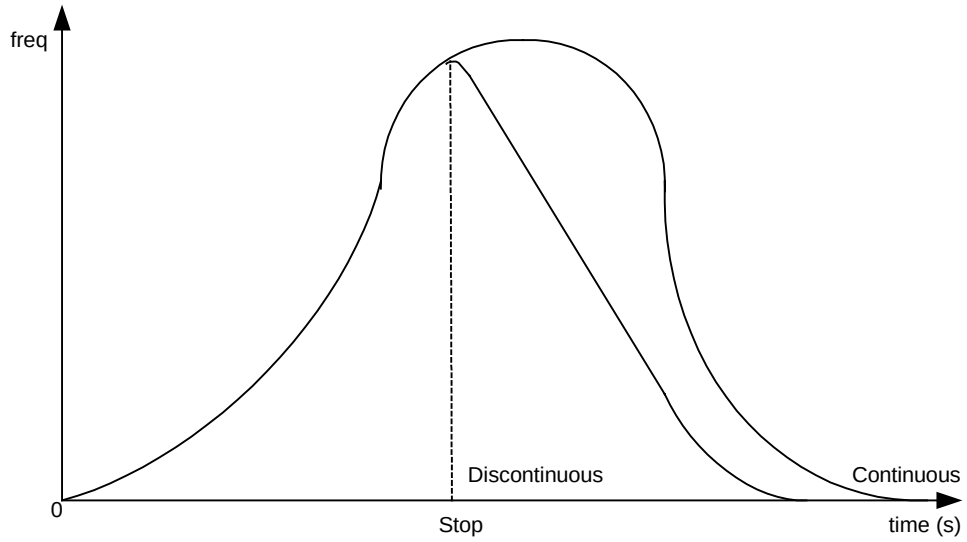
Note:
Rounding times are recommended, since they prevent an abrupt response, thus avoiding detrimental effects on the mechanics.

Notice:
Rounding times are not recommended when analog inputs are used, since they would result in overshoot/undershoot in the inverter response.

P1134 **Rounding type** Level: **3**

CStat:	CUT	**Datatype:** U16	**Unit:** -	**Min:**	0
P-Group:	SETPOINT	**Active:** Immediately	**QuickComm.** No	**Def:**	0
				Max:	1

Defines smoothing response to OFF commands or setpoint reduction.



Enum:

0 Continuous smoothing
1 Discontinuous smoothing

Dependency:

No effect until total rounding time (P1130) > 0 s.

Notice:

Rounding times are not recommended when analog inputs are used, since they would result in overshoot/undershoot in the inverter response.

P1135 **OFF3 ramp-down time** Level: **3**

CStat:	CUT	**Datatype:** Float	**Unit:** s	**Min:**	0.00
P-Group:	SETPOINT	**Active:** First confirm	**QuickComm.** Yes	**Def:**	5.00
				Max:	650.00

Defines ramp-down time from maximum frequency to standstill for OFF3 command.

Note:

This time may be exceeded if the VDC_max. level is reached.

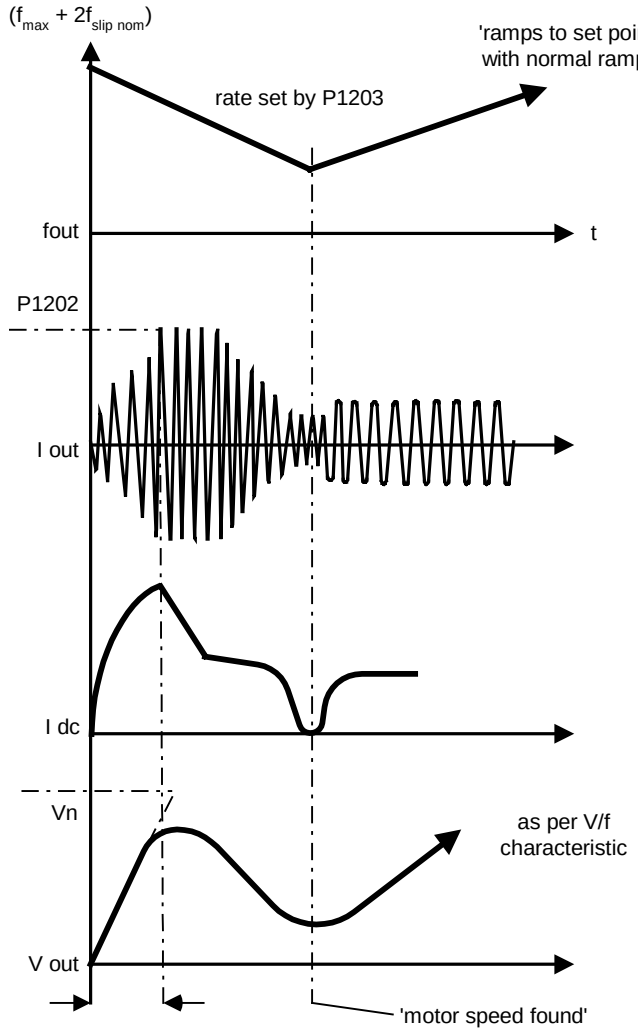
r1170 **CO: Frequency setpoint after RFG** Level: **3**

		Datatype: Float	**Unit:** Hz	**Min:**	-
				Def:	-
P-Group:	SETPOINT			**Max:**	-

Displays overall frequency setpoint after ramp generator.

P1200	**Flying start**			**Min:**	0	Level:
	CStat: CUT	**Datatype:** U16	**Unit:** -	**Def:**	0	**3**
	P-Group: FUNC	**Active:** Immediately	**QuickComm.** No	**Max:**	6	

Starts inverter onto a spinning motor by rapidly changing the output frequency of the inverter until the actual motor speed has been found. Then, the motor runs up to setpoint using the normal ramp time.



Enum:

0	Flying start disabled
1	Flying start is always active, start in direction of setpoint
2	Flying start is active if power on, fault, OFF2, start in direction of setpoint
3	Flying start is active if fault, OFF2, start in direction of setpoint
4	Flying start is always active, only in direction of setpoint
5	Flying start is active if power on, fault, OFF2, only in direction of setpoint
6	Flying start is active if fault, OFF2, only in direction of setpoint

Note:

Useful for motors with high inertia loads.

Settings 1 to 3 search in both directions.
Settings 4 to 6 search only in direction of setpoint.

Notice:

Flying start must be used in cases where the motor may still be turning (e.g. after a short mains break) or can be driven by the load. Otherwise, overcurrent trips will occur.

P1202	**Motor-current: Flying start**			**Min:**	10	Level:
	CStat: CUT	**Datatype:** U16	**Unit:** %	**Def:**	100	**3**
	P-Group: FUNC	**Active:** Immediately	**QuickComm.** No	**Max:**	200	

Defines search current used for flying start.

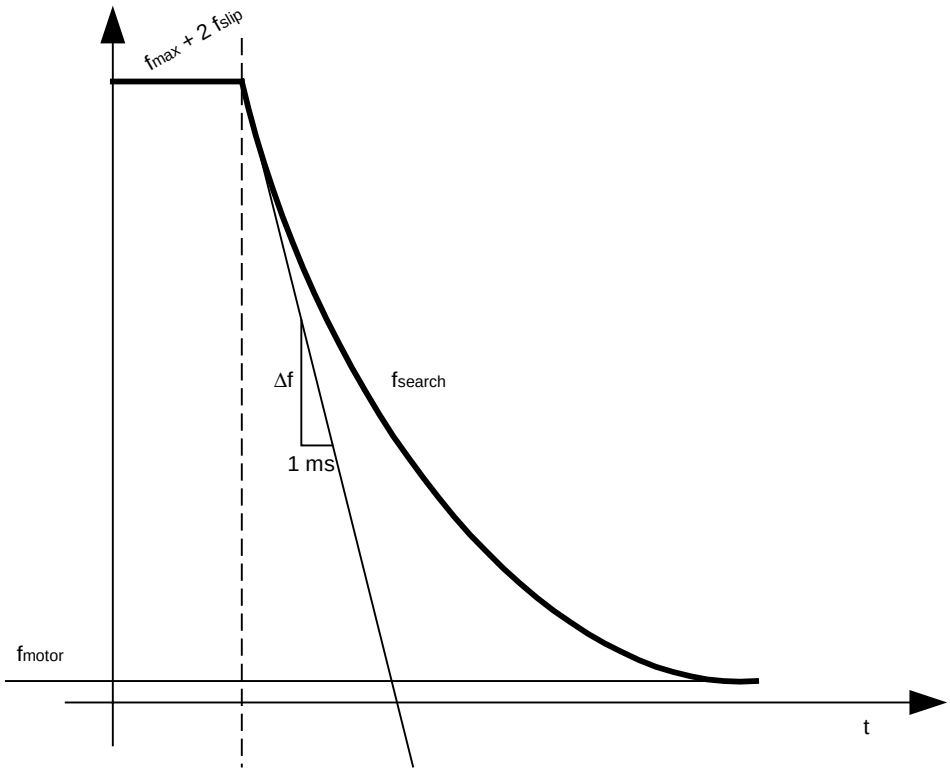
Value is in [%] based on rated motor current (P0305).

Note:

Reducing the search current may improve performance for flying start if the inertia of the system is not very high.

P1203	**Search rate: Flying start**			**Min:**	10	Level:
	CStat: CUT	**Datatype:** U16	**Unit:** %	**Def:**	100	**3**
	P-Group: FUNC	**Active:** Immediately	**QuickComm.** No	**Max:**	200	

Sets factor by which the output frequency changes during flying start to synchronize with turning motor. This value is entered in [%] relative to the default time factor defines the initial gradient in the curve below (and thus influences the time taken to search for the motor frequency):



$$\Delta f = \frac{100\%}{P1203} * 2\% f_{slip}$$

The search time is the time taken to search through all frequencies between f_max + 2 x f_slip to 0 Hz.

P1203 = 100 % is defined as giving a rate of 2 % of f_slip,nom / [ms]
P1203 = 200 % would result in a rate of frequency change of 1 % of f_slip,nom / [ms]

Example:

For a motor with 50 Hz, 1350 rpm, 100 % would produce a maximum search time of 600 ms. If the motor is turning, the motor frequency is found in a shorter time.

Note:

A higher value produces a flatter gradient and thus a longer search time.
A lower value has the opposite effect.

P1210	**Automatic restart**			**Min:**	0	Level:
	CStat: CUT	**Datatype:** U16	**Unit:** -	**Def:**	1	**2**
	P-Group: FUNC	**Active:** Immediately	**QuickComm.** No	**Max:**	5	

Enables restart after a mains break or after a fault.

Enum:

0	Disabled
1	Trip reset after power on
2	Restart mains break; power on
3	Restart after fault/mains break
4	Restart after mains break
5	Restart mains break/fault/power on

Dependency:

Auto restart requires constant ON command (e.g. via a digital input wire link).

Caution1:

Settings 2 to 5 can cause the motor to restart unexpectedly !

Notice:

Flying start must be used in cases where the motor may still be turning (e.g. after a short mains break) or can be driven by the load (P1200).

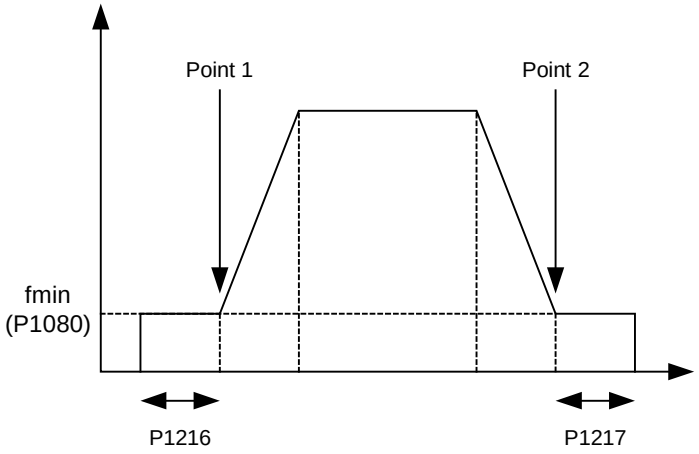
P1215 **Holding brake enable**

CStat:	T	**Datatype:** U16	**Unit:** -	**Min:**	0
P-Group:	FUNC	**Active:** Immediately	**QuickComm.** No	**Def:**	0
				Max:	1

Level: **3**

Enables/disables holding brake function. This function applies the following profile to the inverter:

Relay switching is also possible at point 1 and point 2 (if programmed in P0731 = 52.C) to control a brake.



Enum:

0 Motor holding brake disabled
1 Motor holding brake enabled

Note:

The brake relay opens at point 1, if enabled using P0731 (function of digital output), and closes at point 2.

P1216 **Holding brake release delay**

CStat:	T	**Datatype:** Float	**Unit:** s	**Min:**	0
P-Group:	FUNC	**Active:** Immediately	**QuickComm.** No	**Def:**	1.0
				Max:	20.0

Level: **3**

Defines period during which inverter runs at f_min before ramping up at point 1 (as shown in P1215 - holding brake enable). Inverter starts at f_min on this profile, i.e. it does not use a ramp.

Note:

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:

$$\frac{n_{syn} - n_n}{n_{syn}} * f_n$$

Notice:

If used to hold the motor at a certain frequency against a mechanical brake (i.e. you are using a relay to control mechanical brake), it is important that f_min < 5 Hz; otherwise, the current drawn may be too high and the relay may not open.

P1217 **Holding time after ramp down**

CStat:	T	**Datatype:** Float	**Unit:** s	**Min:**	0
P-Group:	FUNC	**Active:** Immediately	**QuickComm.** No	**Def:**	1.0
				Max:	20.0

Level: **3**

Defines time for which inverter runs at minimum frequency (P1080) after ramping down at point 2.

Details:

See diagram P1215 (holding brake enable)

P1232 **DC braking current**

CStat:	CUT	**Datatype:** U16	**Unit:** %	**Min:**	0
P-Group:	FUNC	**Active:** Immediately	**QuickComm.** No	**Def:**	100
				Max:	250

Level: **3**

Defines level of DC current in [%] relative to rated motor current (P0305).

P1233 **Duration of DC braking**

CStat:	CUT	**Datatype:** U16	**Unit:** s	**Min:**	0
P-Group:	FUNC	**Active:** Immediately	**QuickComm.** No	**Def:**	0
				Max:	250

Level: **3**

Defines duration for which DC injection braking is to be active following an OFF1 command.

Value:

P1233 = 0 : Not active following OFF1.
P1233 = 1 - 250 : Active for the specified duration.

Caution2:

Frequent use of long periods of DC braking can cause the motor to overheat.

Notice:

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 not applied until the motor has been sufficiently demagnetized (demagnetization time is calculated automatically from motor data).

P1236 **Compound braking current** Level: **3**

CStat:	CUT	**Datatype:** U16	**Unit:** %	**Min:**	0
P-Group:	FUNC	**Active:** Immediately	**QuickComm.** No	**Def:**	0
				Max:	250

Defines DC level superimposed on AC waveform after OFF1 / OFF3 command. The value is entered in [%] relative to rated motor current (P0305).

230V type:

Compound braking switch - on level $= 1.13 * \sqrt{2} * V_{mains} = 1{,}13 * \sqrt{2} * P0210$

115V type:

Compound braking switch - on level $= 1.13 * \sqrt{2} * V_{mains} * 2 = 1{,}13 * \sqrt{2} * P0210 * 2$

Value:

P1236 = 0 : Compound braking disabled.
P1236 = 1 - 250 : Level of DC braking current defined as a [%] of rated motor current (P0305).

Dependency:

Active after OFF1 / OFF3 command.

Notice:

Increasing the value will generally improve braking performance; however, if you set the value too high, an overcurrent trip may result.

P1240 **Configuration of Vdc controller** Level: **3**

CStat:	CT	**Datatype:** U16	**Unit:** -	**Min:**	0
P-Group:	FUNC	**Active:** Immediately	**QuickComm.** No	**Def:**	1
				Max:	1

Enables / disables Vdc controller.

The Vdc controller dynamically controls the DC link voltage to prevent overvoltage trips on high inertia systems.

Enum:

0 Vdc controller disabled
1 Vdc-max controller enabled

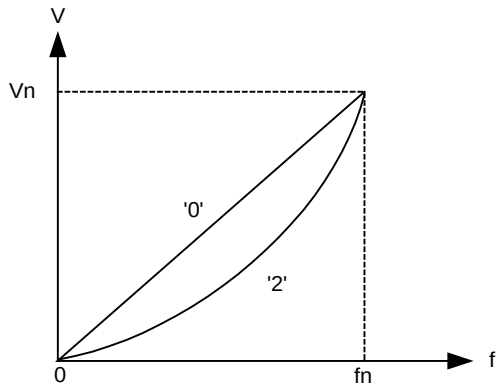
Note:

Vdc max automatically increases ramp-down times to keep the DC-link voltage (r0026) within limits.

P1300 **Control mode** Level: **2**

CStat:	CT	**Datatype:** U16	**Unit:** -	**Min:**	0
P-Group:	CONTROL	**Active:** Immediately	**QuickComm.** Yes	**Def:**	0
				Max:	3

Controls relationship between speed of motor and voltage supplied by inverter as illustrated in the diagram below



Enum:

0 V/f with linear charac.
1 V/f with FCC
2 V/f with parabolic charac.
3 V/f with programmable charac.

Note:

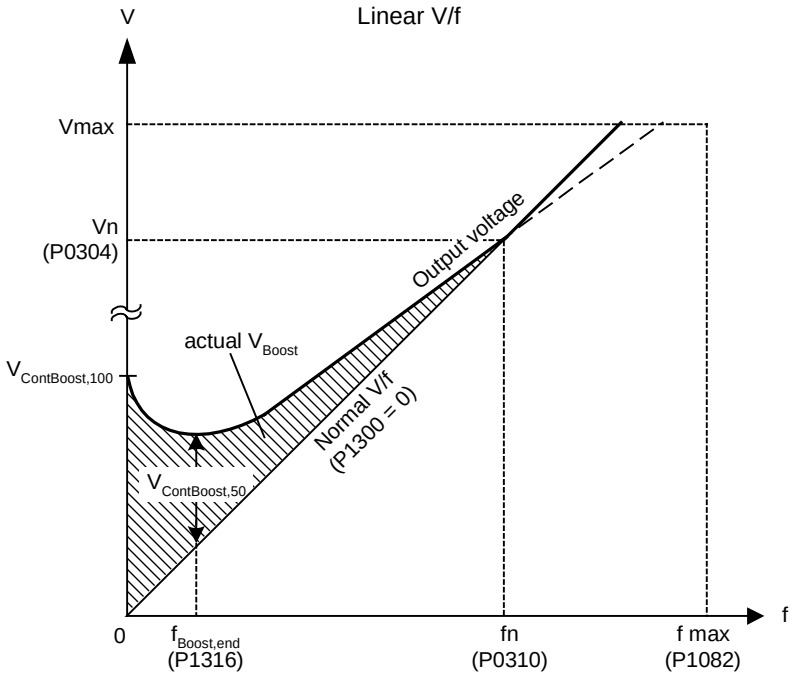
P1300 = 1 : V/f with FCC
* Maintains motor flux current for improved efficiency
* If FCC is chosen, linear V/f is active at low frequencies.

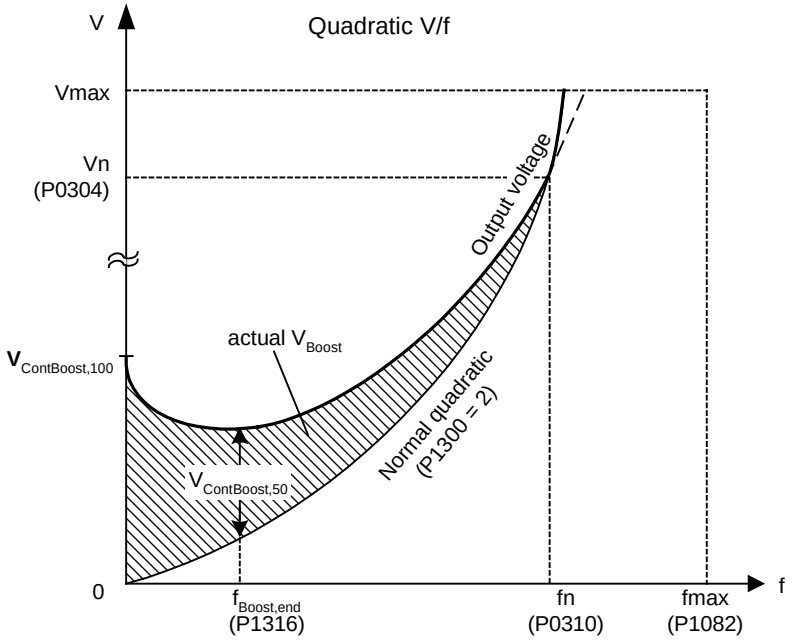
P1300 = 2 : V/f with a quadratic curve
* Suitable for centrifugal fans / pumps

P1310	**Continuous boost**			**Min:**	0.0	Level:
	CStat: CUT	**Datatype:** Float	**Unit:** %	**Def:**	50.0	**2**
	P-Group: CONTROL	**Active:** Immediately	**QuickComm.** No	**Max:**	250.0	

At low output frequencies the output voltage is low to keep the flux level constant. However, the output voltage may be too low
- for magnetisation the asynchronous motor
- to hold the load
- to overcome losses in the system. The output voltage can be increased using parameter P1310.

Defines boost level in [%] relative to P0305 (rated motor current) applicable to both linear and quadratic V/f curves according to the diagram below:





where voltage values are given

V_ConBoost,100 = rated motor current (P0305) * Stator resistance * Continous boost (P1310)
V_ConBoost,50 = V_ConBoost,100 / 2

Dependency:

Setting in P0640 (motor overload factor [%]) limits the boost.

Note:

The boost values are combined when continuous boost (P1310) used in conjunction with other boost parameters (acceleration boost P1311 and starting boost P1312). However priorities are allocated to these parameters as follows:
P1310 > P1311 > P1312

Notice:

Increasing the boost levels increases motor heating (especially at standstill).

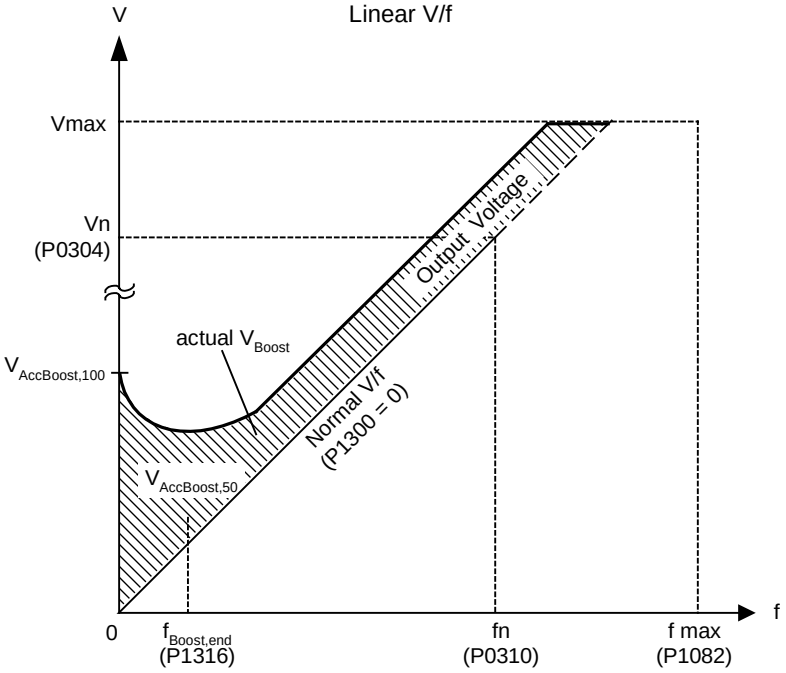
$$\sum \text{Boosts} \leq \frac{300}{I_{mot}} * R_S$$

P1311 Acceleration boost

						Level:
CStat:	CUT	**Datatype:** Float	**Unit:** %	**Min:**	0.0	**3**
P-Group:	CONTROL	**Active:** Immediately	**QuickComm.** No	**Def:**	0.0	
				Max:	250.0	

P1311 will only produce boost during ramping, and is therefore useful for additional torque during acceleration.

Applies boost in [%] relative to P0305 (rated motor current) following a positive setpoint change and drops back out once the setpoint is reached.



where voltage values are given

V_AccBoost,100 = rated motor current (P0305) * Stator resistance * Acceleration boost (P1311)
V_AccBoost,50 = V_AccBoost,100 / 2

Dependency:

Setting in P0640 (motor overload factor [%]) limits boost.

Note:

Acceleration boost can help to improve response to small positive setpoint changes.

$$\sum \text{Boosts} \leq \frac{300}{I_{mot}} * R_S$$

Notice:

Increasing the boost level increases motor heating.

Details:

See note in P1310 for boost priorities.

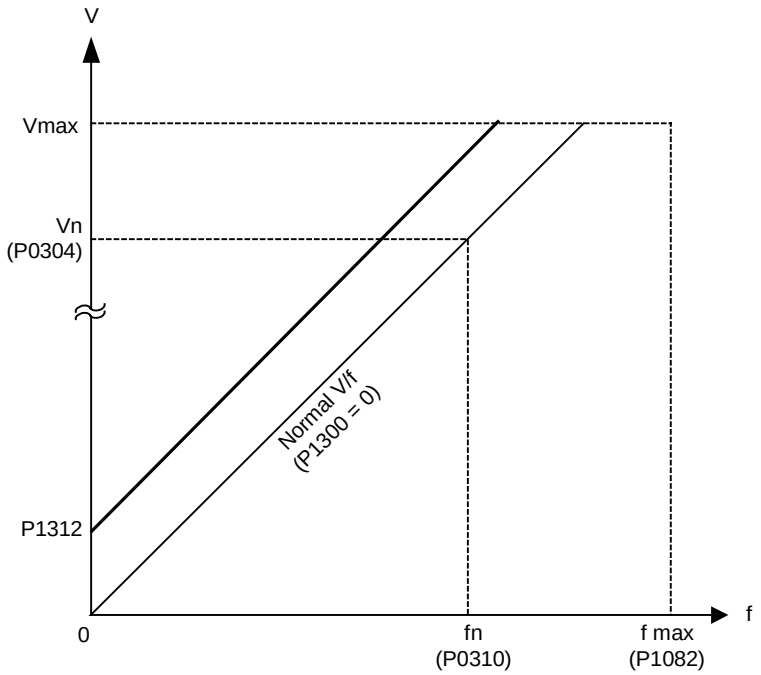
P1312 **Starting boost**

CStat:	CUT	**Datatype:** Float	**Unit:** %	**Min:**	0.0
P-Group:	CONTROL	**Active:** Immediately	**QuickComm.** No	**Def:**	0.0
				Max:	250.0

Level: **2**

Applies a constant linear offset (in [%] relative to P0305 (rated motor current)) to active V/f curve (either linear or quadratic) after an ON command and is active until setpoint is reached for the first time. This is useful for starting loads with high inertia.

Setting the starting boost (P1312) too high will cause the inverter to limit the current, which will in turn restrict the output frequency to below the setpoint frequency.



Dependency:

Setting in P0640 (motor overload factor [%]) limits boost.

Notice:

Increasing the boost levels increases motor heating.

$$\sum \text{Boosts} \leq \frac{300}{I_{mot}} * R_S$$

Details:

See note in P1310 for boost priorities.

P1316 **Boost end frequency**

CStat:	CUT	**Datatype:** Float	**Unit:** %	**Min:**	0.0
P-Group:	CONTROL	**Active:** Immediately	**QuickComm.** No	**Def:**	20.0
				Max:	100.0

Level: **3**

Defines point at which programmed boost reaches 50 % of its value.

This value is expressed in [%] relative to P0310 (rated motor frequency).

This frequency is defined as follows:

$$f_{Boost\ min} = 2 * \left(\frac{153}{\sqrt{P_{motor}}} + 3 \right)$$

Note:

The expert user may change this value to alter the shape of the curve, e.g. to increase torque at a particular frequency.

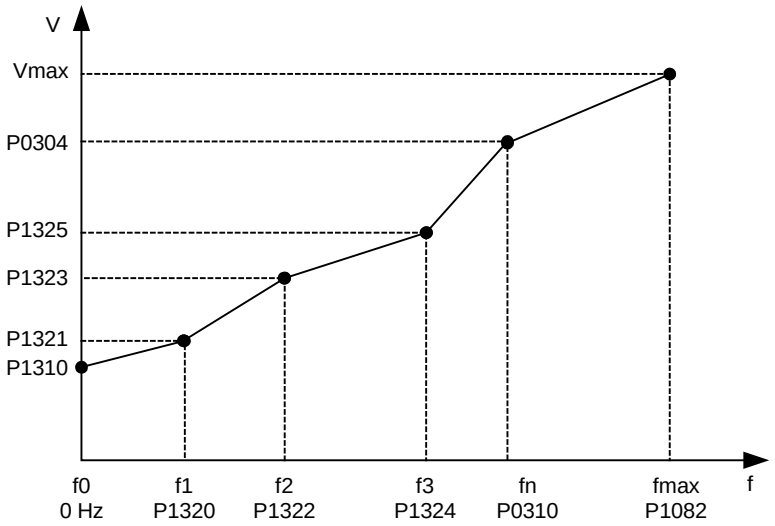
Details:

See diagram in P1310 (continuous boost)

P1320 **Programmable V/f freq. coord. 1** Level: **3**

CStat:	CT	**Datatype:** Float	**Unit:** Hz	**Min:**	0.00
P-Group:	CONTROL	**Active:** Immediately	**QuickComm.** No	**Def:**	0.00
				Max:	650.00

Sets V/f coordinates (P1320/1321 to P1324/1325) to define V/f characteristic.



Example:

This parameter can be used to provide correct torque at correct frequency and is useful when used with synchronous motors.

Dependency:

To set parameter, select P1300 = 3 (V/f with programmable characteristic)

Note:

Linear interpolation will be applied between points set from P1320/1321 to P1324/1325.

V/f with programmable characteristic (P1300 = 3) has 3 programmable points. The two non-programmable points are:
Continuous boost P1310 at 0 Hz
Rated motor voltage P0304 at rated motor frequency P0310

The acceleration boost and starting boost defined in P1311 and P1312 are applied to V/f with programmable characteristic.

P1321 **Programmable V/f volt. coord. 1** Level: **3**

CStat:	CUT	**Datatype:** Float	**Unit:** V	**Min:**	0.0
P-Group:	CONTROL	**Active:** Immediately	**QuickComm.** No	**Def:**	0.0
				Max:	3000.0

See P1320 (programmable V/f freq. coord. 1).

P1322 **Programmable V/f freq. coord. 2** Level: **3**

CStat:	CT	**Datatype:** Float	**Unit:** Hz	**Min:**	0.00
P-Group:	CONTROL	**Active:** Immediately	**QuickComm.** No	**Def:**	0.00
				Max:	650.00

See P1320 (programmable V/f freq. coord. 1).

P1323 **Programmable V/f volt. coord. 2** Level: **3**

CStat:	CUT	**Datatype:** Float	**Unit:** V	**Min:**	0.0
P-Group:	CONTROL	**Active:** Immediately	**QuickComm.** No	**Def:**	0.0
				Max:	3000.0

See P1320 (programmable V/f freq. coord. 1).

P1324 **Programmable V/f freq. coord. 3** Level: **3**

CStat:	CT	**Datatype:** Float	**Unit:** Hz	**Min:**	0.00
P-Group:	CONTROL	**Active:** Immediately	**QuickComm.** No	**Def:**	0.00
				Max:	650.00

See P1320 (programmable V/f freq. coord. 1).

P1325 **Programmable V/f volt. coord. 3** Level: **3**

CStat:	CUT	**Datatype:** Float	**Unit:** V	**Min:**	0.0
P-Group:	CONTROL	**Active:** Immediately	**QuickComm.** No	**Def:**	0.0
				Max:	3000.0

See P1320 (programmable V/f freq. coord. 1).

P1333 **Start frequency for FCC**

CStat:	CUT	**Datatype:** Float	**Unit:** %	**Min:**	0.0
P-Group:	CONTROL	**Active:** Immediately	**QuickComm.** No	**Def:**	10.0
				Max:	100.0

Level: **3**

Defines start frequency at which FCC (flux current control) is enabled as [%] of rated motor frequency (P0310).

Notice:

If this value is too low, the system may become unstable.

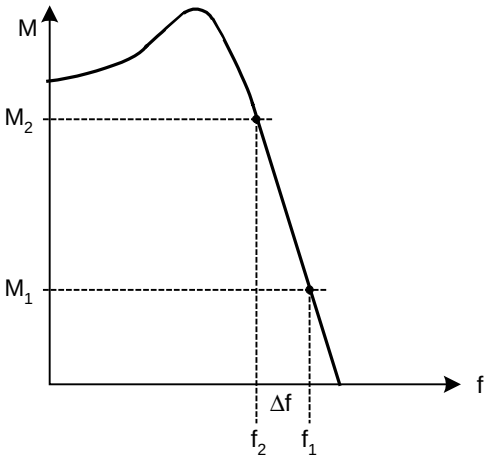
P1335 **Slip compensation**

CStat:	CUT	**Datatype:** Float	**Unit:** %	**Min:**	0.0
P-Group:	CONTROL	**Active:** Immediately	**QuickComm.** No	**Def:**	0.0
				Max:	600.0

Level: **3**

Dynamically adjusts output frequency of inverter so that motor speed is kept constant independent of motor load.

Increasing the load from M1 to M2 (see diagram) will decrease the motor speed from f1 to f2, due to the slip. The inverter can compensate for this by increasing the output frequency slightly as the load increases. The inverter measures the current and increases the output frequency to compensate for the expected slip.



Value:

P1335 = 0 % : Slip compensation disabled.
P1335 = 100 % : This uses the motor data and motor model to add the rated slip frequency rated motor speed and rated motor current.

P1340 **Imax controller prop. gain**

CStat:	CUT	**Datatype:** Float	**Unit:** -	**Min:**	0.000
P-Group:	CONTROL	**Active:** Immediately	**QuickComm.** No	**Def:**	0.000
				Max:	0.499

Level: **3**

Proportional gain of the I_max controller.

Dynamically controls the inverter if the output current exceeds the maximum motor current (r0067). It does this by first limiting the inverter output frequency (to a possible minimum of the nominal slip frequency). If this action does not successfully remove the overcurrent condition, the inverter output voltage is reduced. When the overcurrent condition has been removed successfully, frequency limiting is removed using the ramp-up time set in P1120.

P1800 **Pulse frequency**

CStat:	CUT	**Datatype:** U16	**Unit:** kHz	**Min:**	2
P-Group:	INVERTER	**Active:** Immediately	**QuickComm.** No	**Def:**	4
				Max:	16

Level: **3**

Sets pulse frequency of power switches in inverter. The frequency can be changed in steps of 2 kHz.

Pulse frequencies > 8 kHz reduce the maximum continuous motor current.

Dependency:

Minimum pulse frequency depends on P1082 (maximum frequency) and P0310 (rated motor frequency).

Note:

If silent operation is not absolutely necessary, lower pulse frequencies may be selected to reduce inverter losses and radio-frequency emissions.

Under certain circumstances, the inverter may reduce the switching frequency to provide protection against over-temperature (see P0290).

r1801 **CO: Act. switching frequency** Level: **3**

Datatype: U16 **Unit:** kHz **Min:** - **Def:** - **Max:** -

P-Group: INVERTER

Actual pulse frequency of power switches in inverter.

Notice:

Under certain conditions (inverter overtemperature, see P0290), this can differ from the values selected in P1800 (pulse frequency).

P2000 **Reference frequency**

CStat: CT **Datatype:** Float **Unit:** Hz **Min:** 1.00 **Def:** 50.00

P-Group: COMM **Active:** Immediately **QuickComm.** No **Max:** 650.00

Full-scale frequency setting used by serial link (corresponds to 4000H) and analog I/O.

P2009[2] **USS normalization** Level: **3**

CStat: CT **Datatype:** U16 **Unit:** - **Min:** 0 **Def:** 0

P-Group: COMM **Active:** Immediately **QuickComm.** No **Max:** 1

Enables special normalization for USS.

Enum:

0 Disabled
1 Enabled

Index:

P2009[0] : Serial interface COM link
P2009[1] : Serial interface BOP link

Note:

If enabled, the main setpoint (word 2 in PZD) is not interpreted as 100 % = 4000H, but as "absolute" instead (e.g. 4000H = 16384 means 163.84 Hz).

P2010[2] **USS baudrate** Level: **3**

CStat: CUT **Datatype:** U16 **Unit:** - **Min:** 3 **Def:** 6

P-Group: COMM **Active:** Immediately **QuickComm.** No **Max:** 9

Sets baud rate for USS communication.

Enum:

3 1200 baud
4 2400 baud
5 4800 baud
6 9600 baud
7 19200 baud
8 38400 baud
9 57600 baud

Index:

P2010[0] : Serial interface COM link
P2010[1] : Serial interface BOP link

P2011[2] **USS address** Level: **3**

CStat: CUT **Datatype:** U16 **Unit:** - **Min:** 0 **Def:** 0

P-Group: COMM **Active:** Immediately **QuickComm.** No **Max:** 31

Sets unique address for inverter.

Index:

P2011[0] : Serial interface COM link
P2011[1] : Serial interface BOP link

Note:

You can connect up to a further 30 inverters via the serial link (i.e. 31 inverters in total) and control them with the USS serial bus protocol.

P2012[2] **USS PZD length** Level: **3**

CStat: CUT **Datatype:** U16 **Unit:** - **Min:** 0 **Def:** 2

P-Group: COMM **Active:** Immediately **QuickComm.** No **Max:** 4

Defines the number of 16-bit words in PZD part of USS telegram. The PZD part of the USS telegram is used for the main setpoint, and to control the inverter.

Index:

P2012[0] : Serial interface COM link
P2012[1] : Serial interface BOP link

P2013[2] **USS PKW length** Level: **3**

CStat: CUT **Datatype:** U16 **Unit:** - **Min:** 0
P-Group: COMM **Active:** Immediately **QuickComm.** No **Def:** 127
Max: 127

Defines the number of 16-bit words in PKW part of USS telegram. The PKW part of the USS telegram is used to read and write individual parameter values

Enum:

0 No words
3 3 words
4 4 words
127 Variable

Index:

P2013[0] : Serial interface COM link
P2013[1] : Serial interface BOP link

Notice:

Setting P2013 has implications for the PKW word order.

P2014[2] **USS telegram off time** Level: **3**

CStat: CT **Datatype:** U16 **Unit:** ms **Min:** 0
P-Group: COMM **Active:** Immediately **QuickComm.** No **Def:** 0
Max: 65535

Defines a time T_off after which a fault will be generated (F0070) if no telegram is received via the USS channels.

Index:

P2014[0] : Serial interface COM link
P2014[1] : Serial interface BOP link

Notice:

By default (time set to 0), no fault is generated (i.e. watchdog disabled).

r2015[4] **CO: PZD from BOP link (USS)** Level: **3**

Datatype: U16 **Unit:** - **Min:** -
P-Group: COMM **Def:** -
Max: -

Displays process data received via USS on BOP link.

Index:

r2015[0] : Received word 0
r2015[1] : Received word 1
r2015[2] : Received word 2
r2015[3] : Received word 3

Note:

The control words can be viewed as bit parameters r2032 and r2033.

P2016[4] **CI: PZD to BOP link (USS)** Level: **3**

CStat: CT **Datatype:** U32 **Unit:** - **Min:** 0:0
P-Group: COMM **Active:** Immediately **QuickComm.** No **Def:** 52:0
Max: 4000:0

Selects signals to be transmitted to serial interface via BOP link

Example:

P2016[0] = 52.0 (default). In this case, the value of r0052 (CO/BO: Status word) is transmitted as 1st PZD to the BOP link.

Index:

P2016[0] : Transmitted word 0
P2016[1] : Transmitted word 1
P2016[2] : Transmitted word 2
P2016[3] : Transmitted word 3

r2018[4] **CO: PZD from COM link (USS)** Level: **3**

Datatype: U16 **Unit:** - **Min:** -
P-Group: COMM **Def:** -
Max: -

Displays process data received via USS on COM link

Index:

r2018[0] : Received word 0
r2018[1] : Received word 1
r2018[2] : Received word 2
r2018[3] : Received word 3

Note:

The control words can be viewed as bit parameters r2036 and r2037.

P2019[4] **CI: PZD to COM link (USS)** Level: 3

CStat:	CT	**Datatype:** U32	**Unit:** -	**Min:**	0:0
P-Group:	COMM	**Active:** Immediately	**QuickComm.** No	**Def:**	52:0
				Max:	4000:0

Index:
P2019[0] : Transmitted word 0
P2019[1] : Transmitted word 1
P2019[2] : Transmitted word 2
P2019[3] : Transmitted word 3

Details:
See r2016 (PZD to BOP link)

r2024[2] **USS error-free telegrams** Level: 3

		Datatype: U16	**Unit:** -	**Min:**	-
P-Group:	COMM			**Def:**	-
				Max:	-

Displays number of error-free USS telegrams received.

Index:
r2024[0] : Serial interface COM link
r2024[1] : Serial interface BOP link

r2025[2] **USS rejected telegrams** Level: 3

		Datatype: U16	**Unit:** -	**Min:**	-
P-Group:	COMM			**Def:**	-
				Max:	-

Displays number of USS telegrams rejected.

Index:
r2025[0] : Serial interface COM link
r2025[1] : Serial interface BOP link

r2026[2] **USS character frame error** Level: 3

		Datatype: U16	**Unit:** -	**Min:**	-
P-Group:	COMM			**Def:**	-
				Max:	-

Displays number of USS character frame errors.

Index:
r2026[0] : Serial interface COM link
r2026[1] : Serial interface BOP link

r2027[2] **USS overrun error** Level: 3

		Datatype: U16	**Unit:** -	**Min:**	-
P-Group:	COMM			**Def:**	-
				Max:	-

Displays number of USS telegrams with overrun error.

Index:
r2027[0] : Serial interface COM link
r2027[1] : Serial interface BOP link

r2028[2] **USS parity error** Level: 3

		Datatype: U16	**Unit:** -	**Min:**	-
P-Group:	COMM			**Def:**	-
				Max:	-

Displays number of USS telegrams with parity error.

Index:
r2028[0] : Serial interface COM link
r2028[1] : Serial interface BOP link

r2029[2] **USS start not identified** Level: 3

		Datatype: U16	**Unit:** -	**Min:**	-
P-Group:	COMM			**Def:**	-
				Max:	-

Displays number of USS telegrams with unidentified start.

Index:
r2029[0] : Serial interface COM link
r2029[1] : Serial interface BOP link

r2030[2] **USS BCC error** Level: 3

		Datatype: U16	**Unit:** -	**Min:**	-
P-Group:	COMM			**Def:**	-
				Max:	-

Displays number of USS telegrams with BCC error.

Index:
r2030[0] : Serial interface COM link
r2030[1] : Serial interface BOP link

r2031[2] **USS length error**

Datatype: U16 **Unit:** - **Min:** - **Def:** - **Max:** -

Level: **3**

P-Group: COMM

Displays number of USS telegrams with incorrect length.

Index:

r2031[0] : Serial interface COM link
r2031[1] : Serial interface BOP link

r2032 **BO: CtrlWrd1 from BOP link (USS)**

Datatype: U16 **Unit:** - **Min:** - **Def:** - **Max:** -

Level: **3**

P-Group: COMM

Displays control word 1 from BOP link (word 1 within USS).

Bitfields:

Bit00	ON/OFF1	0	NO
		1	YES
Bit01	OFF2: Electrical stop	0	YES
		1	NO
Bit02	OFF3: Fast stop	0	YES
		1	NO
Bit03	Pulse enable	0	NO
		1	YES
Bit04	RFG enable	0	NO
		1	YES
Bit05	RFG start	0	NO
		1	YES
Bit06	Setpoint enable	0	NO
		1	YES
Bit07	Fault acknowledge	0	NO
		1	YES
Bit08	JOG right	0	NO
		1	YES
Bit09	JOG left	0	NO
		1	YES
Bit10	Control from PLC	0	NO
		1	YES
Bit11	Reverse (setpoint inversion)	0	NO
		1	YES
Bit13	Motor potentiometer MOP up	0	NO
		1	YES
Bit14	Motor potentiometer MOP down	0	NO
		1	YES
Bit15	Local / Remote	0	NO
		1	YES

r2033 **BO: CtrlWrd2 from BOP link (USS)**

Datatype: U16 **Unit:** - **Min:** - **Def:** - **Max:** -

Level: **3**

P-Group: COMM

Displays control word 2 from BOP link (i.e. word 4 within USS)

Bitfields:

Bit00	Fixed frequency Bit 0	0	NO
		1	YES
Bit01	Fixed frequency Bit 1	0	NO
		1	YES
Bit02	Fixed frequency Bit 2	0	NO
		1	YES
Bit09	DC brake enabled	0	NO
		1	YES
Bit13	External fault 1	0	YES
		1	NO

Dependency:

P0700 = 4 (USS on BOP link) and P0719 = 0 (Cmd / Setpoint = BICO parameter).

r2036 **BO: CtrlWrd1 from COM link (USS)** Level: **3**

Datatype: U16 **Unit:** - **Min:** - **Def:** - **Max:** -

P-Group: COMM

Displays control word 1 from COM link (i.e. word 1 within USS)

Bitfields:

Bit00	ON/OFF1	0	NO
		1	YES
Bit01	OFF2: Electrical stop	0	YES
		1	NO
Bit02	OFF3: Fast stop	0	YES
		1	NO
Bit03	Pulse enable	0	NO
		1	YES
Bit04	RFG enable	0	NO
		1	YES
Bit05	RFG start	0	NO
		1	YES
Bit06	Setpoint enable	0	NO
		1	YES
Bit07	Fault acknowledge	0	NO
		1	YES
Bit08	JOG right	0	NO
		1	YES
Bit09	JOG left	0	NO
		1	YES
Bit10	Control from PLC	0	NO
		1	YES
Bit11	Reverse (setpoint inversion)	0	NO
		1	YES
Bit13	Motor potentiometer MOP up	0	NO
		1	YES
Bit14	Motor potentiometer MOP down	0	NO
		1	YES
Bit15	Local / Remote	0	NO
		1	YES

Details:

See r2033 (control word 2 from BOP link)

r2037 **BO: CtrlWrd2 from COM link (USS)** Level: **3**

Datatype: U16 **Unit:** - **Min:** - **Def:** - **Max:** -

P-Group: COMM

Displays control word 2 from COM link (i.e. word 4 within USS)

Bitfields:

Bit00	Fixed frequency Bit 0	0	NO
		1	YES
Bit01	Fixed frequency Bit 1	0	NO
		1	YES
Bit02	Fixed frequency Bit 2	0	NO
		1	YES
Bit09	DC brake enabled	0	NO
		1	YES
Bit13	External fault 1	0	YES
		1	NO

Details:

See r2033 (control word 2 from BOP link)

r2110[4] **Warning number** Level: **3**

Datatype: U16 **Unit:** - **Min:** - **Def:** - **Max:** -

P-Group: ALARMS

Displays warning information.

A maximum of 2 active warnings (indices 0 and 1) and 2 historical warnings (indices 2 and 3) may be viewed.

Index:

r2110[0] : Recent Warnings --, warning 1
r2110[1] : Recent Warnings --, warning 2
r2110[2] : Recent Warnings -1, warning 3
r2110[3] : Recent Warnings -1, warning 4

Note:

The operator panel display will flash while a warning is active. The LED indicates the warning status in this case.

Notice:

Indices 0 and 1 are not stored.

r2114[2] **Run time counter**

Datatype: U16 **Unit:** - **Min:** - **Def:** - **Max:** -

Level: **3**

P-Group: ALARMS

Displays run time counter. It is the total time the drive has been powered up. Every time you do power cycle, it will save the value then restore it and the counter carries on ticking.

Index:

r2114[0] : System Time, Seconds, Upper Word
r2114[1] : System Time, Seconds, Lower Word

P2167 **Switch-off frequency f_off**

CStat: CUT **Datatype:** Float **Unit:** Hz **Min:** 0.00 **Def:** 1.00 **Max:** 10.00

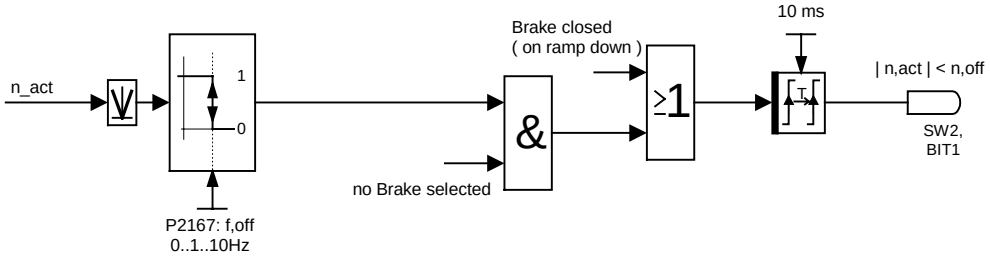
Level: **3**

P-Group: ALARMS **Active:** Immediately **QuickComm.** No

Sets frequency threshold below which inverter switches off.

If the frequency falls below this threshold, bit 1 in status word 2 (r0053)is set.

| n,act | < n,off



Dependency:

Switched off only if OFF1 or OFF3 active.

P3900 **End of quick commissioning**

CStat: C **Datatype:** U16 **Unit:** - **Min:** 0 **Def:** 0 **Max:** 3

Level: **1**

P-Group: QUICK **Active:** Immediately **QuickComm.** Yes

Performs calculations necessary for optimized motor operation.

After completion of calculation, P3900 and P0010 (parameter groups for commissioning) are automatically reset to their original value 0.

Enum:

0 No quick commissioning
1 Start quick commissioning with factory reset
2 Start quick commissioning
3 Start quick commissioning only for motor data

Dependency:

Changeable only when P0010 = 1 (quick commissioning)

Note:

When setting 1 is selected, only the parameter settings carried out via the commissioning menu "Quick commissioning", are retained; all other parameter changes, including the I/O settings, are lost. Motor calculations are also performed.

When setting 2 is selected, only those parameters, which depend on the parameters in the commissioning menu "Quick commissioning" (P0010 = 1) are calculated. The I/O settings are also reset to default and the motor calculations performed.

When setting 3 is selected, only the motor and controller calculations are performed. Exiting quick commissioning with this setting saves time (for example, if only motor rating plate data have been changed).

End of quick comissioning calculates a variety of motor parameters, overwriting previous values including P2000 (reference frequency).

2 Faults and Alarms

2.1 Fault Messages

Fault	Possible Causes	Diagnose & Remedy	Reac-tion
F0001 OverCurrent	➢ Motor power (P0307) does not correspond to the inverter power (r0206) ➢ Motor lead short circuit ➢ Earth faults	Check the following: 1. Motor power (P0307) must correspond to inverter power (r0206). 2. Cable length limits must not be exceeded. 3. Motor cable and motor must have no short-circuits or earth faults 4. Motor parameters must match the motor in use 5. Motor must not be obstructed or overloaded. ➢ Increase the ramp time ➢ Reduce the boost level	Off2
F0002 OverVoltage	➢ Overvoltage can be caused either by too high main supply voltage or if motor is in regenerative mode. ➢ Regenerative mode can be caused by fast ramp downs or if the motor is driven from an active load.	Check the following: 1. Supply voltage (P0210) must lie within limits indicated on inverter rating plate . 2. DC-link voltage controller must be enabled (P1240) and parameterized properly. 3. Ramp-down time (P1121) must match inertia of load. NOTE Higher inertia requires longer ramp times	Off2
F0003 UnderVoltage	➢ Main supply failed. ➢ Shock load outside specified limits.	Check the following: 1. Supply voltage (P0210) must lie within limits indicated on inverter rating plate. 2. Supply must not be susceptible to temporary failures or voltage reductions.	Off2
F0004 Inverter Over Temperature	➢ Ventilation inadequate ➢ Ambient temperature is too high.	Check the following: 1. Pulse frequency must be set to default value 2. Ambient temperature could be higher than specified for the inverter	Off2
F0005 Inverter I^2t	➢ Inverter overloaded. ➢ Duty cycle too demanding. ➢ Motor power (P0307) exceeds inverter power capability (r0206).	Check the following: 1. Load duty cycle must lie within specified limits. 2. Motor power (P0307) must match inverter power (r0206)	Off2
F0011 Motor Over Temperature I^2t	Motor overloaded	Check the following: 1. Load duty cycle must be correct 2. Motor temperatur warning level (P0604) must match.	Off1
F0041	Stator resistance measurement failure	➢ Check if the motor is connected to the inverter. ➢ Check that the motor data have been entered correctly.	Off2
F0051 Parameter EEPROM Fault	Read or write failure while saving non-volatile parameter.	Factory Reset and new parameterization Change drive	Off2
F0052 power stack Fault	Read failure for power stack information or invalid data.	Change drive	Off2
F0060 Asic Timeout	Internal communications failure	If fault persists, change inverter Contact Service Department	Off2

Fault	Possible Causes	Diagnose & Remedy	Reac-tion
F0071 USS (BOP-link) setpoint fault	No setpoint values from USS during telegram off time	Check USS master	Off2
F0072 USS (COMM link) setpoint fault	No setpoint values from USS during telegram off time	Check USS master	Off2
F0085 External Fault	External fault triggered via terminal inputs	Disable terminal input for fault trigger.	Off2
F0101 Stack Overflow	Software error or processor failure	➢ Cycle through power (on/off). ➢ Replace drive if fault is not corrected.	Off2
F0450 BIST Tests Failure **(Service Mode Only)**	Selftest failed	➢ Drive may run but some features will not work properly. ➢ Replace drive.	Off2

2.2 Alarms

Alarm	Possible Causes	Diagnose & Remedy	Reac-tion
A0501 Current Limit	➢ Motor power does not correspond to the inverter power ➢ Motor leads are too long ➢ Earth faults	Check the following: 1. Motor power (P0307) must correspond to inverter power (r0206). 2. Cable length limits must not be exceeded. 3. Motor cable and motor must have no short-circuits or earth faults 4. Motor parameters must match the motor in use 5. Motor must not be obstructed or overloaded ➢ Increase the ramp-up-time. ➢ Reduce the boost.	--
A0502 Overvoltage limit	➢ Overvoltage limit is reached. ➢ This warning can occur during ramp down, if the dc-link con-troller is disabled (P1240 = 0).	If this warning is displayed permanently, check drive input voltage .	--
A0503 UnderVoltage Limit	Main supply failed	Check main supply voltage (P0210).	--
A0504 Inverter Over Temperature	Warning level of inverter heat-sink temperature (P0614) is exceeded, resulting in pulse frequency reduction and/or output frequency reduction (depending on parametrization in (P0610)	Check the following: 1. Ambient temperature must lie within specified limits 2. Load conditions and duty cycle must be appropriate	--
A0505 Inverter I^2t	Warning level exceeded, current will be reduced if parameterized (P0610 = 1)	Check that duty cycle lies within specified limits	--
A0506 Inverter duty cycle	Difference between heatsink and IGBT junction temperature exceeds warning limits	Check that duty cycle and shock loads lie within specified limits	--
A0511 Motor Over Temperature I^2t	➢ Motor overloaded. ➢ Load duty cycle too high.	Check the following: 1. P0611 (motor I^2t time constant) should be set to appropriate value 2. P0614 (Motor I^2t overload warning level) should be set to suitable level	--
A0600 RTOS Overrun Warning	Software problem	Contact Service Department	--

Alarm	Possible Causes	Diagnose & Remedy	Reac-tion
A0910 Vdc-max controller de-activated	➢ Vdc max controller has been de-activated ➢ Occurs if main supply voltage is permanently too high. ➢ Occurs if motor is driven by an active load, causing motor to go into regenerative mode. ➢ Occurs at very high load inertias, when ramping down.	Check the following: 1. Input voltage must lie within range. 2. Load must be matched. 3. In certain cases apply braking resistor.	--
A0911 Vdc-max controller active	Vdc max controller is active; so ramp-down times will be increased automatically to keep DC-link voltage (r0026) within limits	Check the inverter input voltage (P0210)	--
A0920 ADC parameters not set properly.	ADC parameters should not be set to identical values, since this would produce illogical results.	Check P0757, P0758, P0759 and P0760	--
A0922 No load applied to inverter	No Load is applied to the inverter. As a result, some functions may not work as under normal load conditions.	Check that a load has been applied to the inverter.	--

Suggestions and/or Corrections

To
Siemens AG
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Suggestions for technical documentation

Suggestions
Corrections

For Publication/Manual:
MICROMASTER 410
Parameter List

User Documentation

From
Name:

Company/Service Department
Address: _____

_____

Phone: _____ / _____
Fax: _____ / _____

Order number: 6SE6400-5EB00-0BP0
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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.

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Siemens Aktiengesellschaft

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