SIEMENS

SED2

Operation & Maintenance Manual

SED2
Siemens Easy Drive

SIEMENS

SED2 Operation & Maintenance Manual

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NOTICE

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WARNING

This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instructions manual, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area may cause interference in which case users at their own expense will be required to take whatever measures may be required to correct the interference.

SERVICE STATEMENT

Control devices are combined to make a system. Each control device is mechanical in nature and all mechanical components must be regularly serviced to optimize their operation. All Siemens Building Technologies, Inc. branch offices and authorized distributors offer Technical Support Programs that will ensure your continuous, trouble-free system performance.

For further information, contact your nearest Siemens Building Technologies, Inc. representative.

CREDITS

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TO THE READER

Your feedback is important to us. If you have comments about this manual, please submit them to technical.editor@sbt.siemens.com.

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Table of Contents

Chapter 1 — How To Use This Manual

This manual is written for installers, technicians, service engineers, operators, and users of Siemens Building Technologies SED2 Variable Frequency Drives ("SED2 or SED2 drives"). This manual contains information to mount, install, set parameters, and commission SED2 drives so they provide effective and trouble-free operation.

Manual Organization

This manual contains the following chapters:

- *Chapter 1, How to Use this Manual*, describes the organization of this manual, its notations, and lists reference documents.
- *Chapter 2, Safety Instructions*, presents general safety regulations, guidelines, and recommendations.
- *Chapter 3, Mechanical Installation*, provides information for mounting and installing a SED2 drive.
- *Chapter 4, Electrical Installation & Wiring*, provides information to install and terminate SED2 wiring.
- *Chapter 5, Commissioning*, describes how to commission and start up a SED2 drive.
- *Chapter 6, Programming*, describes SED2 parameters and how to use them for typical applications.
- *Chapter 7, Troubleshooting*, lists SED2 fault codes, and warning messages.
- *Chapter 8, Technical Data*, lists SED2 specifications and options.
- *Chapter 9, Communications*, describes the interface between a SED2 drive and a P1 (or N2) communications bus.
- *Appendix A: Parameter Reference List,* provides a condensed listing of the SED2 parameters.

Manual Notations

Notation	Symbol	Meaning
DANGER:		Indicates that personal injury or loss of life may occur if you do not perform a procedure as specified.
WARNING:		Indicates that equipment damage, or loss of data may occur if you do not perform a procedure as specified.
CAUTION:		Indicates that equipment damage, or loss of data may occur if you do not perform a procedure as specified.
NOTES:	(no symbol)	Provides other important information or helpful hints.

Where To Send Comments

Your feedback is important to us. If you have comments about this manual, please submit them to *technical.editor@sbt.siemens.com*.

Reference Documents

The following SED2 documentation is available from your local Siemens Building Technologies representative:

- *Installation & Startup Guide* (125-3201), a brief guide to operation offers fast access to all basic information necessary to install, set up, commission, and operate a SED2 drive.
- *SED2 Technical Overview* (153-026P25), a summary of the SED2 product line and accessories, a brief description of SED2 features and functions, and a list of technical data.
- *Bypass Technical Overview* (153-170P25), a summary of the SED2 Bypass product line and technical data.
- *SED2 Submittal Sheet* (154-042), a two-page synopsis of the SED2 product line, accessories and technical data.
- *Bypass Submittal Sheet* (154-044), a synopsis of the SED2 Bypass product line and technical data.
- *SED2 Operation & Maintenance Manual Addendum* (125-3205), additional operation and maintenance information for the SED2 including filters, EMC compatibility, and connection of multiple motors.
- *SED2 AOP Operating Instructions* (125-3206), operating instructions and procedures for the SED2 Advanced Operator Panel (AOP).

Chapter 2 — Safety Instructions

General

The following general guidelines are provided for your safety, to prevent damage, and to extend the service life of the SED2 product and any connected equipment. *Read this information carefully*. Specific Warnings, Cautions, and Notes are provided in the relevant sections of this manual.

WARNING:

- The SED2 uses hazardous 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/equipment.
- Only authorized personnel should work on this equipment, and only after becoming familiar with all local regulations and ordinances; safety notices; and installation, operation, and maintenance procedures in this manual. Successful and safe operation of this equipment depends upon its proper handling, installation, operation, and maintenance.
- Before carrying out any installation and commissioning procedures, you must read all safety instructions and warnings, including all warning labels attached to the equipment. Make sure that the warning labels are kept in a legible condition and ensure missing or damaged labels are replaced.
- Observe the regulations of Safety Code VBG 4.0 (in particular, “Permissible Deviations when Working Live Parts”) whenever measuring or testing is performed on live equipment. Also, use suitable electronic tools.
- Only use this equipment 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.
- Prevent children and the general public from accessing or approaching this equipment.

NOTE: Keep this Operations & Maintenance Manual near the equipment and available to all users.

Repair

Only Siemens service departments, repair centers authorized by Siemens Building Technologies, or authorized personnel who are fully acquainted with the SED2 may repair this equipment. Replace defective parts or components using original manufacturer parts.

DANGER:
Always disconnect the power source before opening the SED2.

Environmental Compatibility and Disposal

The SED2 drives are developed and manufactured using materials and processes which take full account of environmental issues and which comply with environmental standards. For disposal at the end of the SED2 drive service life or in the event of its replacement, note the following:

- For disposal purposes, this product is defined as waste derived from electrical and electronic equipment (“electronic waste”) and must not be disposed of as household waste. This applies particularly to the PCB assembly.
- Always use the most environmentally compatible method of disposal, in line with the latest developments in environmental protection, recycling, and waste management. *Observe all local legislation and applicable laws.*
- Always aim for maximum re-use of the basic materials, and minimum environmental stress. Observe any notes about materials and disposal that may be attached to individual components.
- Use local depots and waste management companies, or See your supplier or manufacturer to return used products or to obtain further information on environmental compatibility and waste disposal.
- Special handling of components such as electrolytic capacitors and LCD panels may in some cases be compulsory by law or environmentally desirable.
- The SED2 is delivered in re-usable packaging. Please retain the packaging for later use or in case you need to return the product to the manufacturer.

Chapter 3 — Mechanical Installation

Installation after Extended Storage

After an extended period of storage, recharge the capacitors in the SED2. Calculate the storage time from the *date of manufacture*, and not from the date of delivery. The recharge procedure varies according to the storage period as follows:

Period of Storage	Required Action	Preparation Time
1 year or less	Recharging not required.	No preparation
1 to 2 years	Before issuing the "run" command, connect the SED2 to the mains for one hour.	1 hour
2 to 3 years	Use a variable AC power source as follows: • Apply 25% of the input voltage for 30 minutes. • Increase the voltage to 50% for an additional 30 minutes. • Increase the voltage to 75% for an additional 30 minutes. • Increase the voltage to 100% for an additional 30 minutes. The SED2 is then ready for operation.	2 hours
3 or more years	Use a variable AC power source as follows: • Apply 25% of the input voltage for 2 hours. • Increase the voltage to 50% for an additional 2 hours. • Increase the voltage to 75% for an additional 2 hours. • Increase the voltage to 100% for an additional 2 hours. The SED2 is then ready for operation.	8 hours

Environmental Conditions

Temperature:
Maximum operating temperature: +104°F (+40°C) *
Minimum operating temperature: +14°F (-10°C)

* Be aware of the potential increase in temperature inside a control cabinet (derating is required).

Humidity: Maximum 95% rh noncondensing

Height Above Sea Level: If installing the SED2 at an altitude of higher than 3280 ft (1000 m), derating is required.

Overheating/Ventilation: Install the SED2 vertically for optimum ventilation. Do not obstruct the SED2 vents. Additional ventilation may be required if the drive is mounted horizontally.

If installing SED2 drives one above the other, the necessary clearance varies according to the size and protection standard of the drives. See the *Mounting* section in this manual for clearance data.

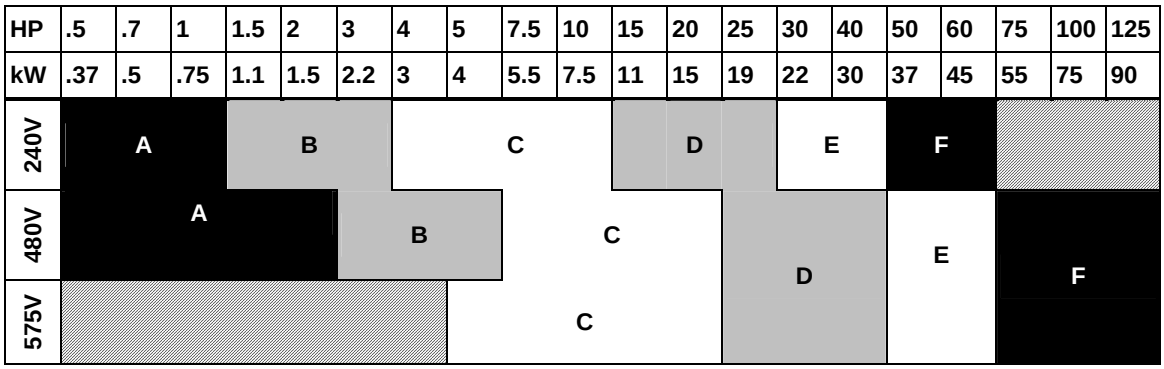
Electromagnetic Radiation: Do not install the SED2 near powerful sources of electromagnetic radiation.

Atmospheric Pollution: Do not install the SED2 in an environment with atmospheric pollutants such as dust and corrosive gases. SED2 drives (IP20) need additional protection from dust, atmospheric pollutants, and water.

Shock: Do not install the SED2 in a location that is exposed to repeated shock or vibration.

Frame Sizes and Power Ranges

The following chart shows SED2 frame sizes and power ranges.

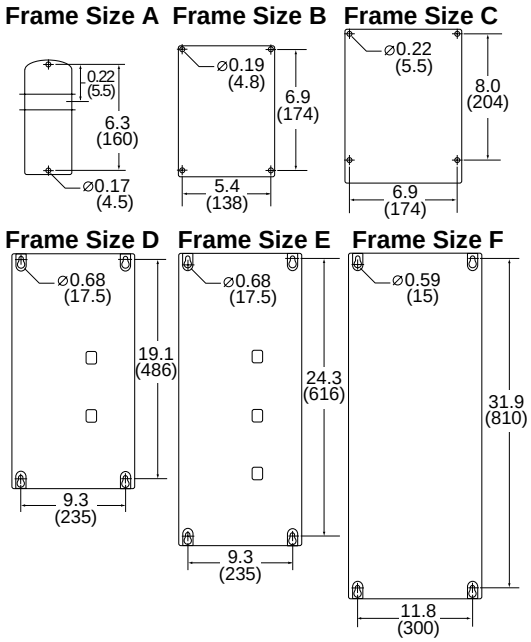


Mounting

Dimensions and Mounting for SED2 Drives (IP20)

Table 1. Overall Dimensions of SED2 (IP20). Dimensions in Inches (Millimeters).

Frame Size	Height	Width	Depth	Mounting Specification	Tightening Torque lb-in (Nm)	Weight lb (kg)
A	6.8 (173)	2.9 (73)	5.9 (149)	2 x M4 Bolts, Nuts, and Washers, or Connecting to DIN rail	22 (2.5)	2.9 (1.3)
B	8.0 (202)	5.9 (149)	6.8 (172)	4 x M4 Bolts, Nuts, and Washers	22 (2.5)	7.5 (3.4)
C	9.6 (245)	7.3 (185)	7.7 (195)	4 x M5 Bolts, Nuts, and Washers	26 (3.0)	12.1 (5.5)
D	20.5 (520)	10.8 (275)	9.6 (245)	4 x M8 Bolts, Nuts, and Washers	115 (13)	35.3 (16)
E	25.6 (650)	10.8 (275)	9.6 (245)	4 x M8 Bolts, Nuts, and Washers	115 (13)	44.1 (20)
F	33.5 (850)	13.8 (350)	12.6 (320)	4 x M8 Bolts, Nuts, and Washers	221 (25)	123.5 (56)



Mounting Clearance: Leave 4 inches (102 mm) of space at top and bottom for equipment access. (If fitted with a protective shield, allow 12 inches [305 mm] of space between the sides of each VFD to allow for sufficient heat dissipation.)

Figure 1. Mounting Dimensions of SED2 (IP20). Dimensions in Inches (Millimeters).

Dimensions and Mounting for SED2 Drives (NEMA Type 1)

Table 2. Overall Dimensions of SED2 (NEMA Type 1) Drives Assembled with a Protective Shield and a Gland Plate. Dimensions in Inches (Millimeters).

Frame Size	Height	Width	Depth	Weight lb (kg)
A	9.1 (231)	2.9 (73)	5.9 (149)	3.2 (1.5)
B	11.8 (300)	5.9 (149)	6.8 (172)	8.3 (3.8)
C	13.8 (351)	7.3 (185)	7.7 (195)	13.6 (6.2)
D	24.6 (625)	10.8 (275)	9.6 (245)	37.5 (17.1)
E	29.7 (754)	10.8 (275)	9.6 (245)	46.4 (21.1)
F	54.5 (1384)	24.0 (610)	15.0 (381)	200 (91)

Dimensions and Mounting for SED2 Drives (IP54, NEMA Type 12)

Table 3. Overall Dimensions and Mounting Clearances for SED2 (IP54, NEMA Type 12). Dimensions in Inches (Millimeters).

Frame Size	Overall Dimensions			Mounting Clearance			Mounting Specification	Tightening Torque lb-in (Nm)
	Height	Width	Depth	Top	Bottom	Sides		
B	15.2 (385)	10.6 (270)	10.6 (268)	5.9 (150)	5.9 (150)	3.9 (100)	4 x M6 Bolts, Nuts, and Washers	44 (5)
C	23.9 (606)	13.8 (350)	11.2 (284)	5.9 (150)	5.9 (150)	3.9 (100)	4 x M6 Bolts, Nuts, and Washers	44 (5)
D	27.0 (685)	14.2 (360)	13.9 (353)	7.9 (200)	7.9 (200)	5.9 (150)	4 x M8 Bolts, Nuts, and Washers	115 (13)
E	34.8 (885)	14.2 (360)	17.8 (453)	7.9 (200)	7.9 (200)	5.9 (150)	4 x M8 Bolts, Nuts, and Washers	115 (13)
F	45.3 (1150)	17.7 (450)	18.6 (473)	11.8 (300)	9.8 (250)	5.9 (150)	4 x M8 Bolts, Nuts, and Washers	177 (20)

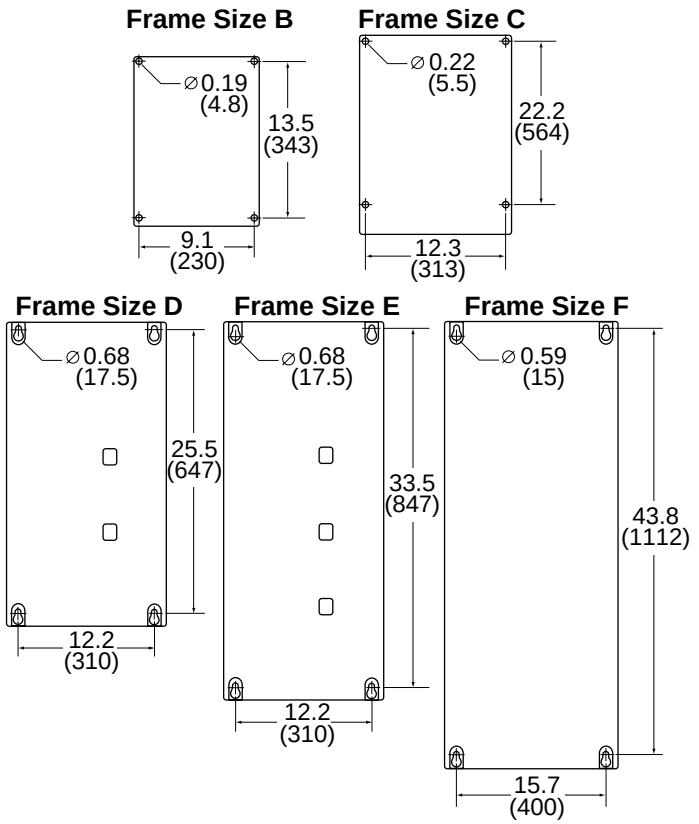


Figure 2. Mounting Dimensions of SED2 (IP54, NEMA Type 12). Dimensions in Inches (Millimeters).

Chapter 4 – Electrical Installation

DANGER:

- To ensure safe operation of the equipment, *authorized* persons must install and commission it in full compliance with the warnings, cautions, and notes in this manual. Authorized persons must also follow general and regional installation and safety regulations regarding work on sites with hazardous voltages (EN 50178) and relevant regulations for the correct use of tools and personal protective equipment.

- **The SED2 must be grounded** (per IEC 536, Class 1, NEC and other relevant industry standards). Extremely hazardous conditions can occur if the SED2 is not correctly grounded.

- The SED2 is suitable for use in a circuit capable of delivering not more than 10,000 symmetrical amperes (ms), for a maximum voltage of 240/480/575V when protected by a time delay Type J, H, or K fuse.

- Only hard-wired mains connections are permissible. Use Class 1 60/75° copper wire only.

- The cross-section of the ground-bonding conductor must be at least equal to that of the power cables.

- The following terminals can carry hazardous voltages even when the SED2 drive is not running:

  – Mains power terminals: L/L1, N/L2, L3

  – Motor terminals: U, V, W

  – Link terminals: DC-, DC+/B+, DC/R+, B-

- The DC link capacitors of all SED2 drives remain charged with dangerous voltages for 5 minutes after all supplies have been disconnected. **Therefore, after disconnecting the SED2 from the power source, always wait 5 minutes before carrying out any work.**

- The SED2 is capable of providing internal motor overload protection in accordance with UL508C, Section 42. Accurately configure motor parameters for motor overload protection to operate correctly. See Motor I2t Temperature Reaction parameter P0610; I2T is on by default. Motor overload protection also can be provided using an external PTC temperature sensor (disabled by default via Motor Temperature Sensor parameter P0601).

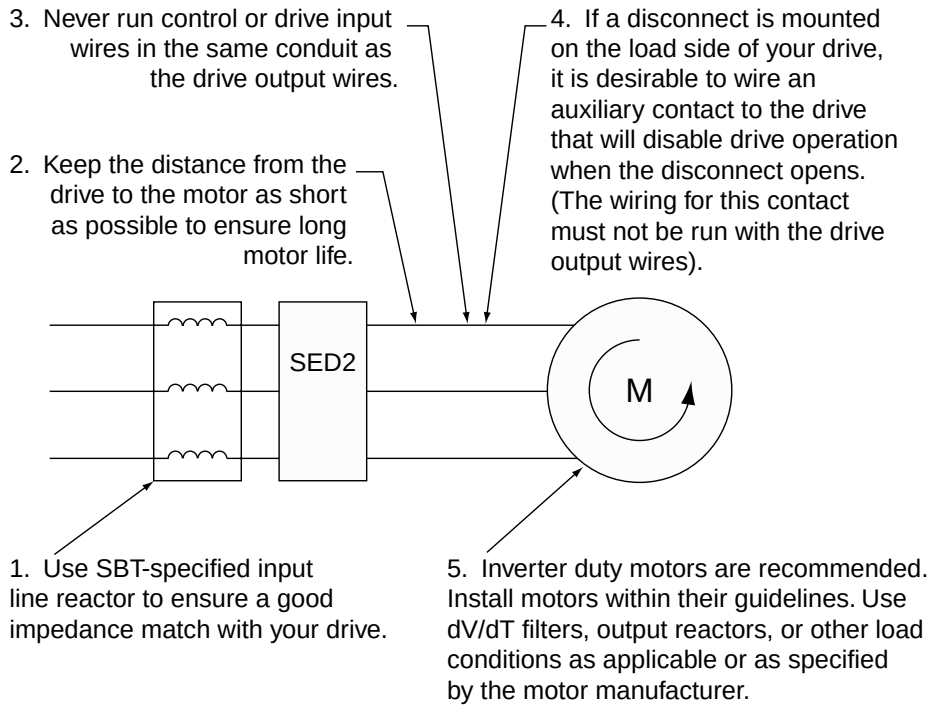
Motor Cable Length

Maximum motor cable length is as follows:

- 328 ft (100 m) for shielded cables
- 164 ft (50 m) for unshielded cables

NOTES:

1. For SED2 drives with EMC filters, the maximum cable length is 82 ft (25 m). For cables shorter than 82 ft (25 m), the EMC guideline for filtered devices does not apply.
2. If connecting multiple motors to one SED2, the total length of the individual motor cables must not exceed the maximum motor cable length.
3. Motor cable length is given to ensure performance of only the drive, not the suitability of the motor when connected to a drive at this distance.
4. The following figure shows installation notes:



Operation in Ungrounded Systems

IP20: SED2 drives (IP20) can operate in ungrounded systems, and remain in operation when an input phase connects to ground. In the event of an output phase with a ground fault, the SED2 switches off and displays fault code F0001.

NOTE: Operation in ungrounded systems is possible only using the SED2 (IP20) without filter.

IP54: SED2 drives (IP54) cannot operate in ungrounded systems.

Ungrounded Systems and Y Capacitor

In ungrounded systems, remove or disconnect the Y capacitor (and integrate an output choke) per Figure 3.

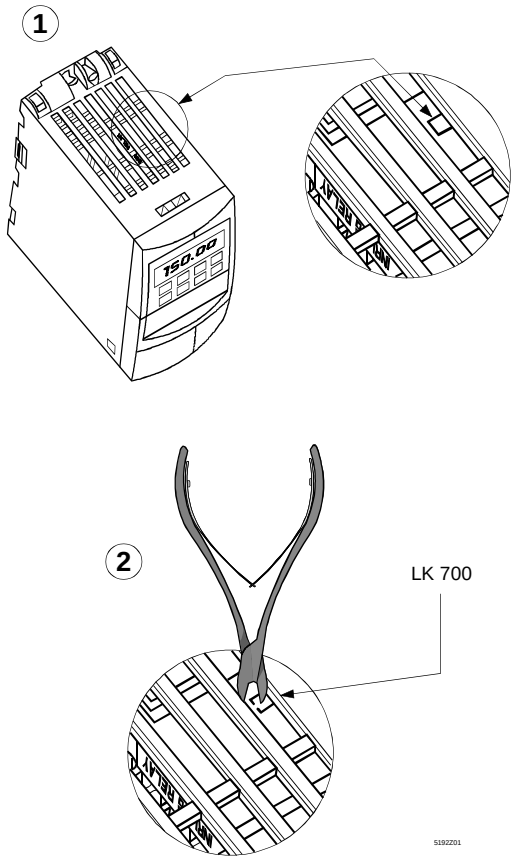


Figure 3. Disconnecting Y Capacitor in SED2 Frame Size A.

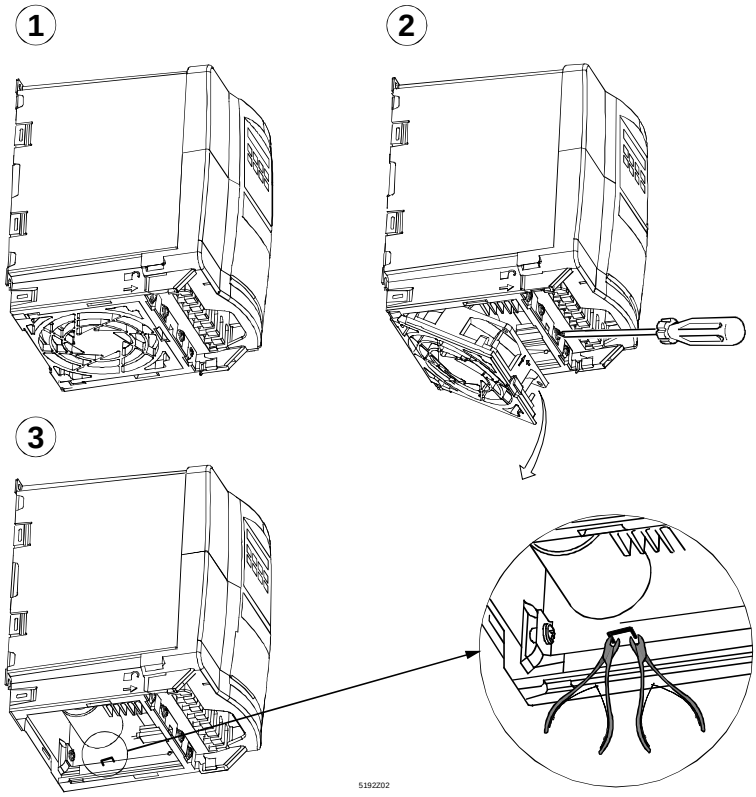


Figure 4. Disconnecting Y Capacitor in SED2 Frame Size B and C.

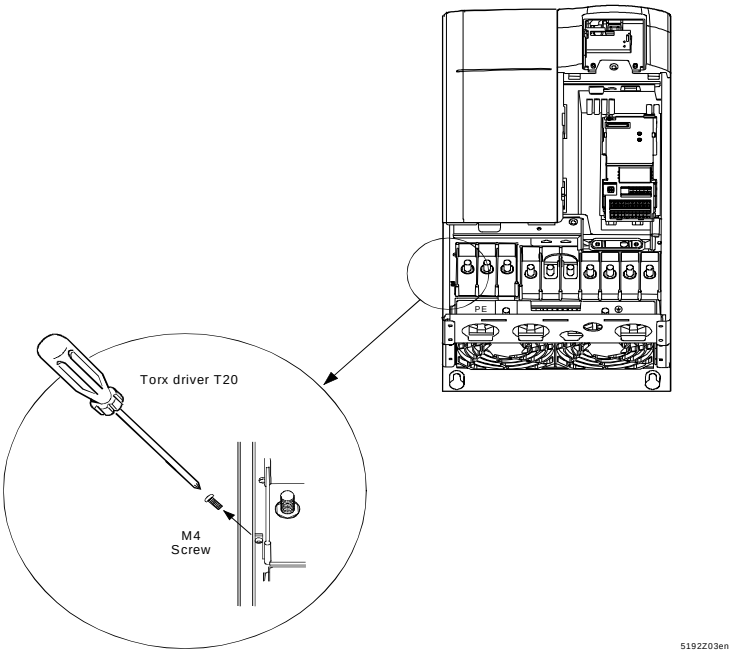


Figure 5. Disconnecting Y Capacitor in SED2 Frame Size D and E.

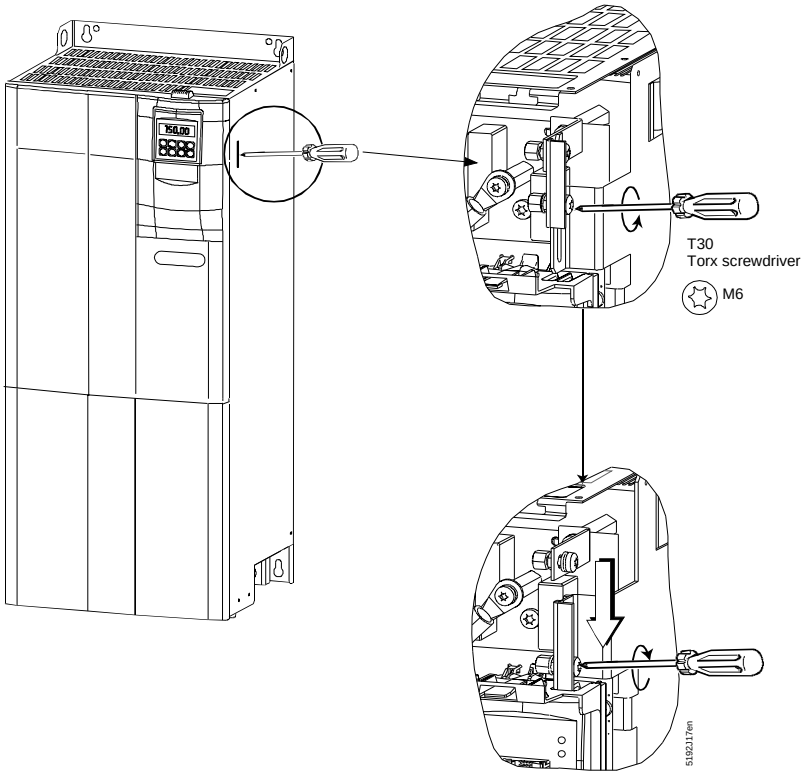


Figure 6. Disconnecting Y Capacitor in SED2 Frame Size F.

Power and Motor Connections

Warning and Safety Instructions

DANGER:

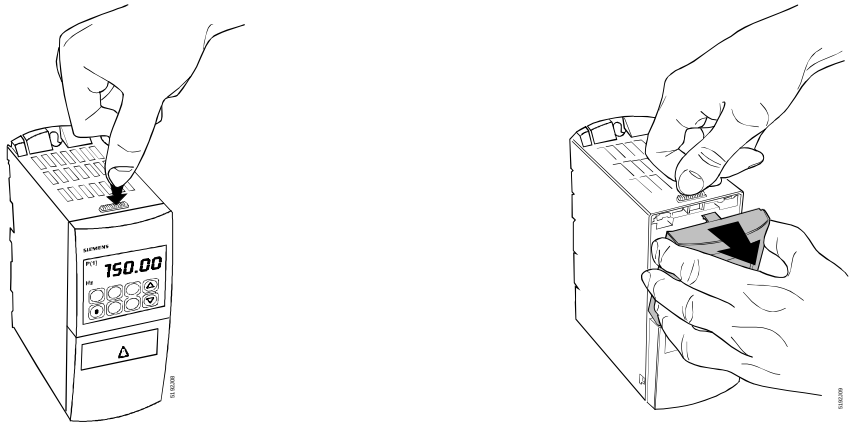
- Always isolate the power cables before connecting them to the SED2.
- Never switch on the SED2 with the cover open.
- Always use insulated tools when working on the power and motor terminals.
- Ensure that the terminal cover is replaced properly after connecting the power and motor cables.

WARNING:

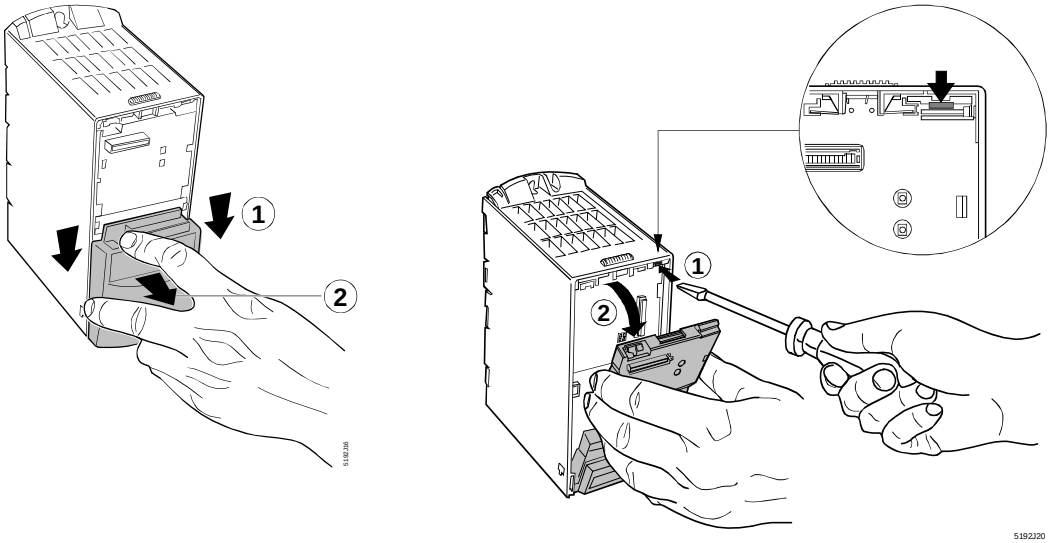
- Verify that the SED2 and motor are correctly sized for the mains voltage. Ensure that the SED2 is suited for the motor output.
- Check that the mains cables are correctly sized for the anticipated use.
- Confirm that appropriate circuit breakers or fuses have been installed between the mains supply and the SED2.
- Never use high-voltage insulation test equipment on any cables connected to the SED2.

Access to Connection Terminals

To access the mains power and motor terminals, remove the operator panel, cover, and I/O module.



Removing Operator Panel (BOP or AOP).



Removing Terminal Cover. **Removing I/O Module.**

Figure 7. Access to Connection Terminals for SED2 Frame Size A.

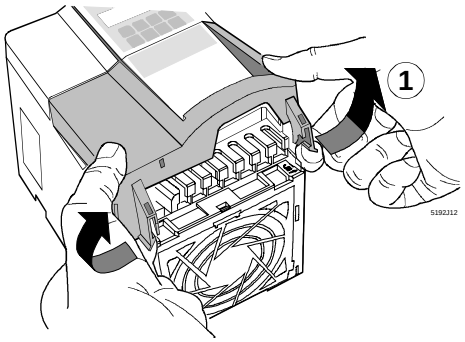


Figure 8. Access to Connection Terminals for SED2 Frame Size B and C.

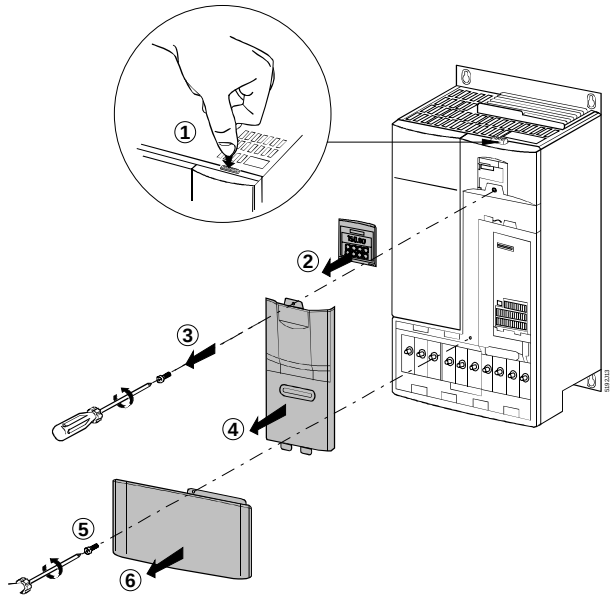


Figure 9. Access to Connection Terminals for SED2 Frame Size D and E.

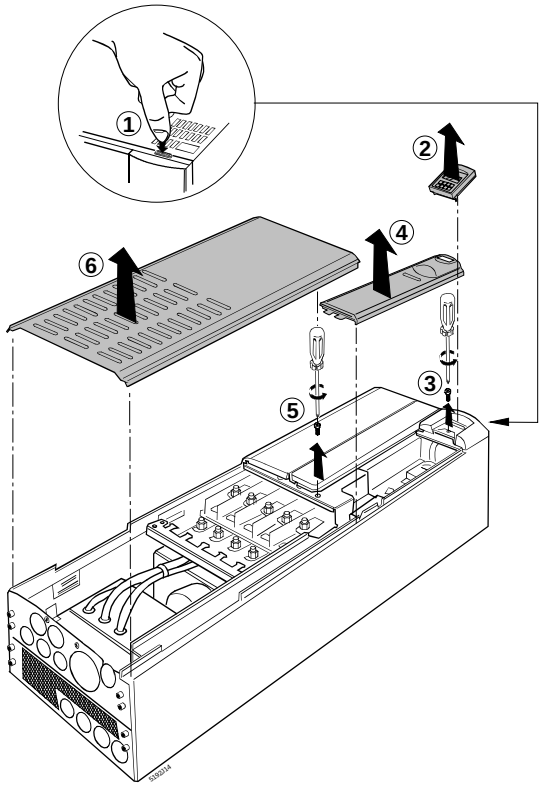


Figure 10. Access to Connection Terminals for SED2 Frame Size F.

Power and Motor Terminal Layout

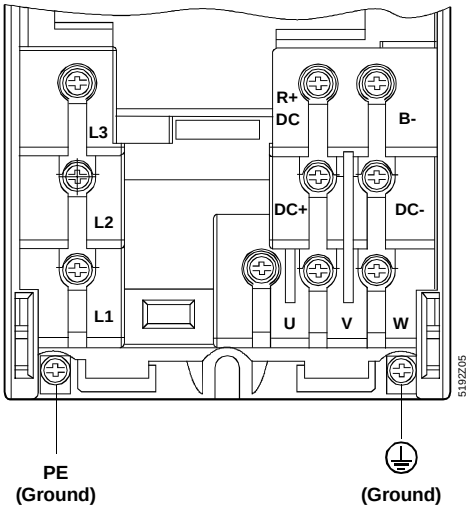


Figure 11. Power and Motor Terminal Layout for SED2 Frame Size A.

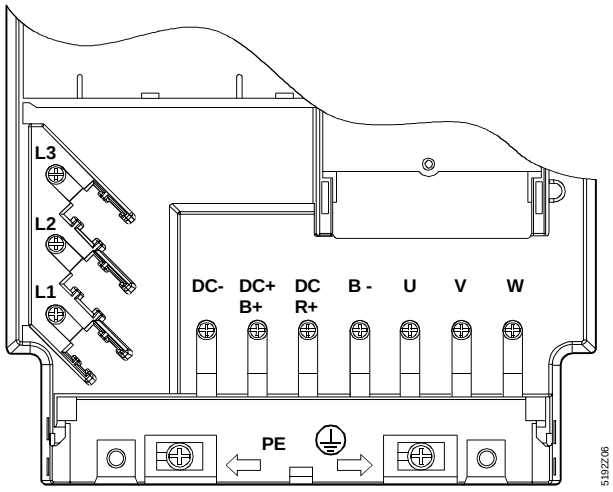


Figure 12. Power and Motor Terminal Layout for SED2 Frame Size B and C.

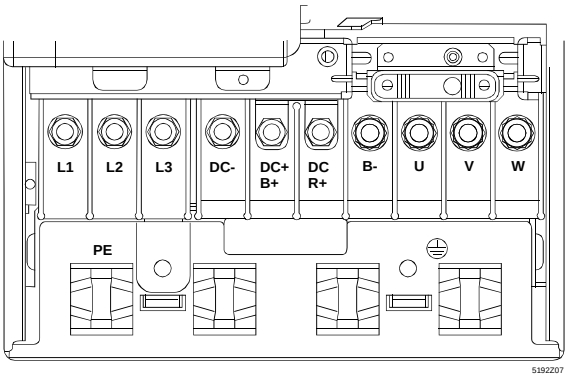


Figure 13. Power and Motor Terminal Layout for SED2 Frame Size D and E.

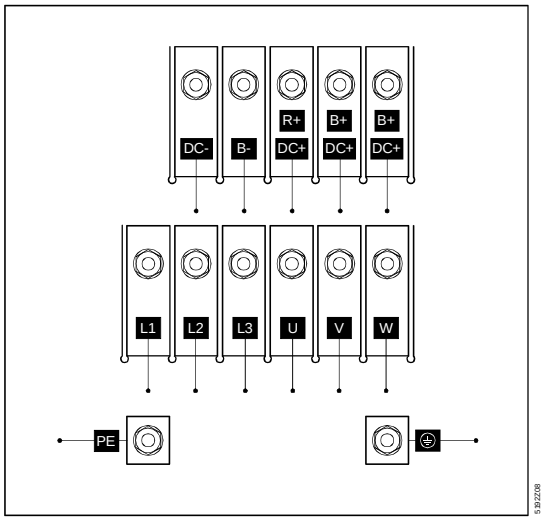


Figure 14. Power and Motor Terminal Layout for SED2 (IP20) Frame Size F with Built-in EMC Filter.

Tightening Torque for Connection Terminals

Frame size	A	B	C	D	E	F
Tightening torque lb-in (Nm)	9.7 (1.1)	13.3 (1.5)	19.9 (2.25)	88.5 (10) max.	88.5 (10) max.	442 (50)

Cable Cross-Sections for Power and Motor Cables

Table 4. Cable Cross-Sections for input Voltage Range 3 AC 200V through 240V.

Output rating kW (hp)	Min. cross-section of supply cable AWG (mm^2)	Max. cross-section of supply cable AWG (mm^2)	Min. cross-section of motor cable AWG (mm^2)	Max. cross-section of motor cable AWG (mm^2)
0.37 (.50)	17 (1)	13 (2.5)	17 (1)	13 (2.5)
0.55 (.75)	17 (1)	13 (2.5)	17 (1)	13 (2.5)
0.75 (1.0)	17 (1)	13 (2.5)	17 (1)	13 (2.5)
1.1 (1.5)	17 (1)	9 (6)	17 (1)	9 (6)
1.5 (2.0)	15 (1.5)	9 (6)	17 (1)	9 (6)
2.2 (3.0)	13 (2.5)	9 (6)	17 (1)	9 (6)
3 (4.0)	11 (4)	7 (10)	15 (1.5)	7 (10)
4 (5.0)	11 (4)	7 (10)	11 (4)	7 (10)
5.5 (7.5)	11 (4)	7 (10)	11 (4)	7 (10)
7.5 (10)	7 (10)	2 (35)	7 (10)	2 (35)
11 (15)	5 (16)	2 (35)	16 (5)	2 (35)
15 (20)	5 (16)	2 (35)	5 (16)	2 (35)
18.5 (25)	3 (25)	2 (35)	5 (16)	2 (35)
22 (30)	2 (35)	2 (35)	2 (35)	2 (35)
30 (40)	0 (50)	-5 (150)	0 (50)	-5 (150)
37 (50)	-2 (70)	-5 (150)	-2 (70)	-5 (150)
45 (60)	-2 (70)	-5 (150)	-3 (95)	-5 (150)

Table 5. Cable Cross-Sections for input Voltage Range 3 AC 380V through 480V.

Output rating kW	Min. cross-section of supply cable AWG (mm^2)	Max. cross-section of supply cable AWG (mm^2)	Min. cross-section of motor cable AWG (mm^2)	Max. cross-section of motor cable AWG (mm^2)
0.37 (.50)	17 (1)	13 (2.5)	17 (1)	13 (2.5)
0.55 (.75)	17 (1)	13 (2.5)	17 (1)	13 (2.5)
0.75 (1.0)	17 (1)	13 (2.5)	17 (1)	13 (2.5)
1.1 (1.5)	17 (1)	13 (2.5)	17 (1)	13 (2.5)
1.5 (2.0)	17 (1)	13 (2.5)	17 (1)	13 (2.5)
2.2 (3.0)	17 (1)	9 (6)	17 (1)	9 (6)
3 (4.0)	17 (1)	9 (6)	17 (1)	9 (6)
4 (5.0)	17 (1)	9 (6)	17 (1)	9 (6)
5.5 (7.5)	13 (2.5)	7 (10)	13 (2.5)	7 (10)
7.5 (10)	11 (4)	7 (10)	11 (4)	7 (10)

Table 5. Cable Cross-Sections for input Voltage Range 3 AC 380V through 480V.

Output rating kW	Min. cross-section of supply cable AWG (mm^2)	Max. cross-section of supply cable AWG (mm^2)	Min. cross-section of motor cable AWG (mm^2)	Max. cross-section of motor cable AWG (mm^2)
11 (15)	9 (6)	7 (10)	9 (6)	7 (10)
15 (20)	7 (10)	2 (35)	7 (10)	2 (35)
18.5 (25)	7 (10)	2 (35)	7 (10)	2 (35)
22 (30)	5 (16)	2 (35)	5 (16)	2 (35)
30 (40)	3 (25)	2 (35)	3 (25)	2 (35)
37 (50)	3 (25)	2 (35)	2 (35)	2 (35)
45 (60)	2 (35)	-5 (150)	2 (35)	-5 (150)
55 (75)	-2 (70)	-5 (150)	-2 (70)	-5 (150)
75 (100)	-2 (70)	-5 (150)	-3 (95)	-5 (150)
90 (125)	-2 (70)	-5 (150)	-3 (95)	-5 (150)

Table 6. Cable Cross-Sections for input Voltage Range 3 AC 500V through 600V.

Output rating kW	Min. cross-section of supply cable AWG (mm^2)	Max. cross-section of supply cable AWG (mm^2)	Min. cross-section of motor cable AWG (mm^2)	Max. cross-section of motor cable AWG (mm^2)
0.75 (1.0)	17 (1)	7 (10)	17 (1)	7 (10)
1.1 (1.5)	17 (1)	7 (10)	17 (1)	7 (10)
1.5 (2.0)	17 (1)	7 (10)	17 (1)	7 (10)
2.2 (3.0)	17 (1)	7 (10)	17 (1)	7 (10)
3 (4.0)	17 (1)	7 (10)	17 (1)	7 (10)
4 (5.0)	17 (1)	7 (10)	17 (1)	7 (10)
5.5 (7.5)	15 (1.5)	7 (10)	15 (1.5)	7 (10)
7.5 (10)	13 (2.5)	7 (10)	13 (2.5)	7 (10)
11 (15)	11 (4)	7 (10)	11 (4)	7 (10)
15 (20)	9 (6)	2 (35)	9 (6)	2 (35)
18.5 (25)	9 (6)	2 (35)	9 (6)	2 (35)
22 (30)	7 (10)	2 (35)	7 (10)	2 (35)
30 (40)	5 (16)	2 (35)	5 (16)	2 (35)
37 (50)	3 (25)	2 (35)	5 (16)	2 (35)
45 (60)	3 (25)	-5 (150)	3 (25)	-5 (150)
55 (75)	0 (50)	-5 (150)	2 (35)	-5 (150)
75 (100)	-2 (70)	-5 (150)	0 (50)	-5 (150)
90 (125)	-2 (70)	-5 (150)	0 (50)	-5 (150)

Direction of Rotation

To change the direction of rotation of the motor, cross-connect two of the output conductors on the SED2 (Figure 15).

Reverse Output Phase Sequence parameter P1820 can also reverse the direction of rotation.

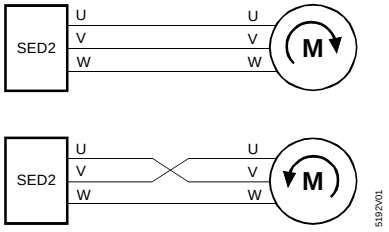


Figure 15. Direction of Motor Rotation.

Star or Delta Motor Connection

The required supply voltage and method of connection are indicated on the motor rating plate. In general, larger motors (400/690V) connect in a delta configuration and smaller motors (230/400V) connect in a star configuration (or wye "Y" configuration). See Figure 16.

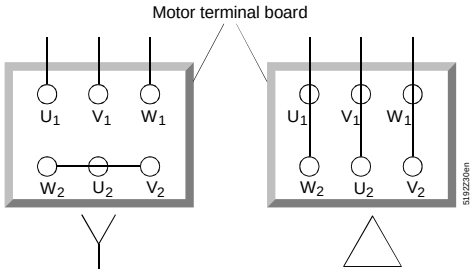


Figure 16. Delta and Star (Wye, Y) Motor Connections.

External Motor Overload Protection

During operation below nominal speed, the cooling effect of the fans mounted to the motor shaft is reduced. Therefore, most motors require derating if operated continuously at low frequencies. To ensure that motors are protected from overheating under these conditions, mount a PTC temperature sensor to the motor and connect it to the control terminals of the SED2.

NOTE: To enable the switch-off function, set Motor Temperature Sensor parameter P0601 to 1 (for PTC thermistor).

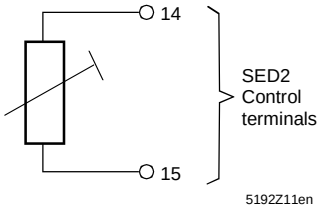


Figure 17. External Motor Overload Protection.

Control Terminal Connections

NOTES:

1. Use only shielded cables for control cables.
2. Route control cables in separate cable trunks at least 7.8 inches (20 cm) away from motor and power cables

The control terminals are located on the I/O module. The I/O module is identical for all models. It is located under the operator panel. See the *Access to Control Terminals* section in this manual.

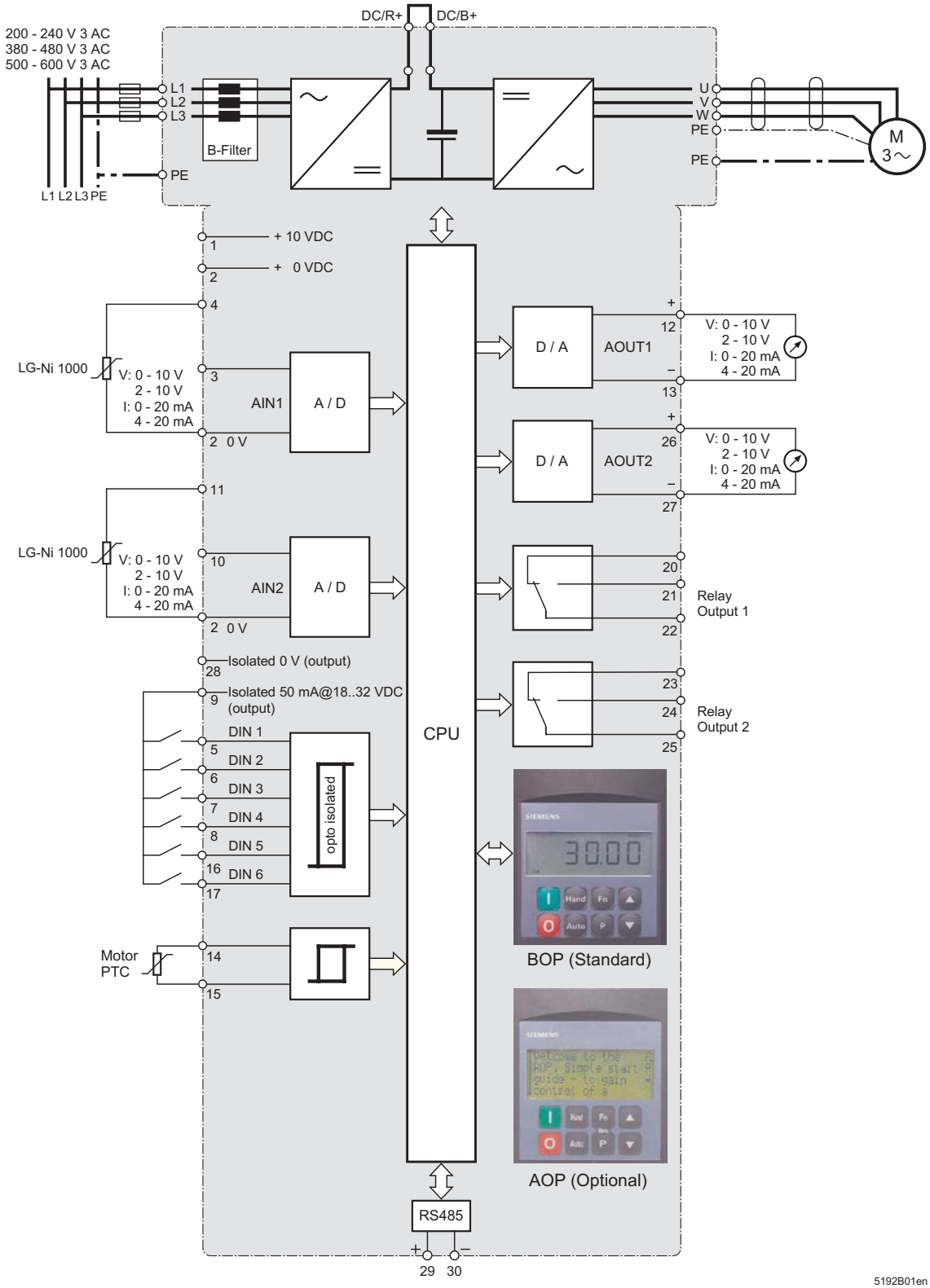


Figure 18. SED2 Control Terminal Block Diagram.

Chapter 5 — Commissioning

WARNING:

- Only authorized personnel trained in the setup, installation, commissioning, and operation of the SED2 may work on the product and plant.
- SED2 drives operate at high voltages. In some components, operation of electrical equipment involves using dangerous voltages.
- In cases where faults in the control equipment could cause significant equipment damage or severe physical injury (such as potentially dangerous short circuits), use external precautions to ensure and to enforce safe operation (such as independent limit switches and mechanical interlocks).
- Emergency stop facilities in accordance with EN 60204, IEC 204 (VDE 0113) must remain functional in all operating modes of the control equipment. Resetting the emergency stop facility must not result in an uncontrolled or undefined restart. Do not use the SED2 drive as an emergency stop mechanism (per EN 60204, section 9.2.5.4).
- The equipment incorporates internal motor overload protection in accordance with UL508C, Section 42. See Motor l2t Temperature Reaction parameter P0610; 1^2 T is ON by default. Motor overload protection can also be provided with an external PTC temperature sensor (disabled by default via Motor Temperature Sensor parameter P0601). For reliable motor overload protection, the motor parameters must be configured accurately.
- Certain parameter settings can cause the SED2 to restart automatically after a fault or a power failure (provided the fault is eliminated/acknowledged or the supply voltage is restored).

DIP Switch Settings

Motor Frequency & Units of Measurement Switches

In all versions of the SED2, the DIP switches for selecting the motor frequency and North American or European units of measurement are located on the control board under the I/O module. (See *Chapter 4, Access to Connection Terminals* for I/O module and control board locations.) The I/O module, located under the operator panel, connects to the operator panel either directly (frame sizes A through C/IP20) or via a cable (frame sizes D through E and all IP54 models).

Analog Input Switches

For all versions of the SED2, the DIP switches used to configure the analog inputs are located on the I/O module. (See *Chapter 4, Access to Connection Terminals* for I/O module locations.) The I/O module, located under the operator panel, connects to the operator panel either directly (frame sizes A through C/IP20) or via a cable (frame sizes D through E and all IP54 models).

DIP Switch	Position	Function	DIP Switch	Position	Function
2	ON	North American operation (60 Hz, hp).	1	OFF	Analog Input 1, voltage 0-10 Vdc, factory default.
	OFF	European operation (50 Hz, kW), factory default.	1	ON	Analog Input 1, current 0-20 mA.
1	OFF	Not for customer use. **NOTE:** This switch must be in the OFF position for correct SED2 operation.	2	OFF	Analog Input 2, voltage 0-10 Vdc, factory default.
			2	ON	Analog Input 2, current 0-20 mA.

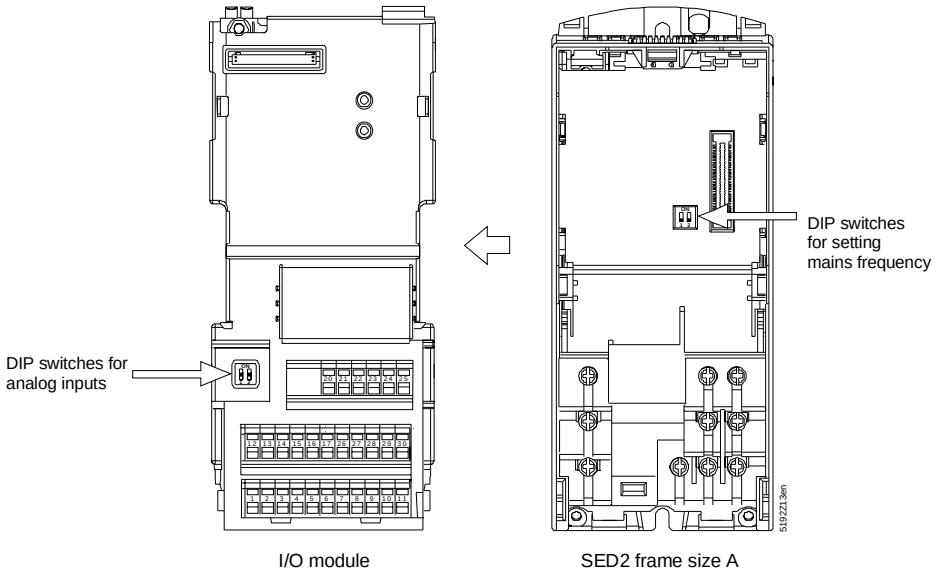


Figure 19. Location of DIP Switches.

Prerequisites

Prerequisites	✓
Is the output of the SED2≥ motor rating?	
Is the operating voltage range OK?	
Is the rated voltage of the SED2 greater than the motor rated voltage?	
Is the cross-section of the mains cable correct?	
Are the cross-section and the length of the motor cables correct, and are they connected properly?	
Are all control lines connected properly?	
Is the motor not blocked mechanically?	
Is the medium (water) available for the pump actuator (No dry run)?	
Is there no pumping or blowing against still open valves or dampers?	
Is the danger zone free of items or personnel?	

SED2 Operator Panels

The SED2 includes the Basic Operator Panel (BOP) mounted as standard. An Advanced Operator Panel (AOP) is available as an option.

Figure 20. Basic Operator Panel.

Figure 21. Advanced Operator Panel.

NOTE: The BOP or AOP can connect to or disconnect from the SED2 without switching off power.

Basic Operator Panel (BOP)

The Basic Operator Panel (BOP) provides access to the parameters of the SED2 and allows for application-specific settings of the SED2.

The parameters and measured values are shown in a 5-digit LCD display. The BOP can mount directly onto the SED2 or, alternatively, it can mount into a control cabinet door using a special installation kit (SED2-DOOR-KIT1 or SED2-DOOR-KIT2).

You cannot store parameter data with the BOP.

For information on setting and modifying parameters, see the *Setting Parameters with the BOP or AOP* section in this manual.

Advanced Operator Panel (AOP)

In addition to the functions of the BOP, the Advanced Operator Panel provides the following functions:

- Displays multi-lingual and multi-line plain text.
- Displays units of measurement for speed, frequency, direction of motor rotation, and current.
- Comments on current parameters, and error messages.
- Communicates via RS-232 or RS-485 interfaces.
- Loads and stores up to ten parameter sets.
- Programmable with a PC without SED2 (PC- AOP kit required).
- Diagnostics menu for troubleshooting.
- Multi-drop capability to control up to 31 SED2 drives.
- Seven-day timer switch with three switching operations per day.
- Main menu can be invoked directly by pressing the **Fn** and **P** keys simultaneously.

For more details, see the *AOP Operating Instructions*.

Buttons on the BOP and AOP

Operator Panel/Button	Function	Description
	Status display	The LCD (five-digit display for BOP; multi-line, clear-text display for AOP) displays the settings presently used by the SED2 or used to set parameters in the SED2.
	Start motor	Press this button to start the SED2. As part of the factory setting, this button is enabled for manual mode.
	Stop motor	OFF1 Press this button to stop the SED2 within the selected ramp-down time. As part of the factory setting, this button is enabled for manual mode. OFF2 Press this button twice (or once with sustained pressure) to cause the motor to coast freely to a standstill. This function is enabled in the manual and automatic operating modes.
	Change to manual control	Places the SED2 VFD in HAND mode.

Operator Panel/Button	Function	Description
	Change to automatic control	Places the SED2 VFD in AUTO mode.
	Increase value	Press this button to increase the current display value during parameter setting. In manual mode, this button increases the speed (internal motor potentiometer).
	Decrease value	Press this button to decrease the current display value during parameter setting. In manual mode, this button decreases the speed (internal motor potentiometer).
	Access to parameters	Press this button to do one of the following: • Access the parameters. • Exit a parameter by accepting its value.
	Functions	Press this button to display additional information. See the *AOP Operating Instructions* for details. **Multiple display mode:** When you press this button for two seconds during operation, the following information displays regardless of the parameter: • DC link voltage (indicated by d – units V) • Output current (A) • Output frequency (Hz) • Output voltage (indicated by o – units V) • The value selected in P0005 (Display Selection for r0000 parameter). If P0005 is configured to display any of these items (1 to 4), the value does not redisplay. Repeatedly press the key to cycle through these display items. Press this key again to exit the multiple display mode. **Jump function:** You can jump from any parameter (rXXXX or PXXXX) directly to r0000 (Drive Display parameter) by briefly pressing the **Fn** button. This allows you to modify another parameter if required. After jumping to r0000, press the **Fn** button again to return to the starting point.
	AOP only	Simultaneously press **Fn** and **P** to open the main menu.

Default Commissioning Settings

Default settings for operation with the BOP are as follows:

Parameter	Description	Default Value for North America (Europe)
P0100	For USA or Europe power setting	0 = 50 Hz, kW (Europe), factory default 1 = 60 Hz, hp (North America) 2 = 60 Hz, kW (North America) The setting of Motor Frequency & Units of Measurement DIP switch 2 overwrites P0100 settings 0 and 1. See the *DIP Switch Settings* section for details. **NOTES:** 1. Stop the drive (that is, disable all pulses) before changing this parameter. 2. Commissioning Parameter Filter P0010=1 (quick commissioning mode) enables changes via P0100. 3. 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).
P0307	Nominal motor power	Value in hp or kW depending on setting of P0100. Default for P0307 is 0.75. P0010=1 (commissioning mode) enables changes via P0307.
P0308 or P0309	Rated motor cosPhi (P0308) or Rated motor efficiency (P0309)	P0308 displays when P0100=0 or 2 and P0307 motor power is entered in kW. Default for P0308 is 0.000. P0309 displays when P0100=1 and P0307 motor power is entered in hp. Default for P0309 is 0.0. **NOTE:** P0309=100% corresponds to superconducting. P0010=1 (commissioning mode) enables changes via P0308 or P0309.
P0310	Nominal motor frequency	60 Hz or 50 Hz (default). Pole pair number is recalculated automatically if the parameter is changed. P0010=1 (commissioning mode) enables changes via P0310.
P0311	Nominal motor speed	1680 (1395) U/min (depends on model); default for P0311 is 0. A setting of 0 causes an internal calculation of the value. Vector control and V/f control with speed controller require this value. Slip compensation in V/f control requires this value for correct operation. Pole pair number is recalculated automatically if the parameter is changed. P0010=1 (commissioning mode) enables changes via P0311.
P0640	Motor overload factor, %	Limited to a maximum inverter current or up to 400% of rated motor current (P0305), whichever is lower. Default for P0640 is 150.0.

Continued

Parameter	Description	Default Value for North America (Europe)	
P0700[0]	Selection of command source Index [0]: IN000=AUTO, 1st command data set Index [1]: IN001=HAND, 2nd command data set	0=Factory default setting 1=BOP (keypad) 2=Terminal	4=USS on BOP link, AOP 5=USS on COM link 6=CB on COM link
		Default for P0700 is 2. **NOTE:** Changing this parameter resets (to default) all setting on the selected item. For example, changing from 1 to 2 resets all digital inputs to default settings.	
P1000	Selection of frequency setpoint Index [0]: IN000=AUTO, 1st command data set Index [1]: IN001=HAND, 2nd command data set	Selects the frequency setpoint source as follows: 1=Motor potentiometer setpoint/BOP keypad 2=Analog input 3=Fixed frequency setpoint	4=USS on BOP Link/AOP 5=USS on COM link 6=Communication board (CB) on COM link/ P1-N2 communications
P1082	Max. motor frequency	60 Hz or 50 Hz (default). This value is limited internally to 200 Hz or five times the rated motor frequency (P0305) when P1300>=20 (control mode=vector control). The value displays in r0209 (maximum frequency).	
P1120	Ramp-up time	Default for P1120 is 10.00. Setting the ramp-up time too short can cause the inverter to trip (overcurrent). If using an external frequency setpoint with set ramp rates (such as from a PLC), achieve optimum drive performance by setting ramp times (P1120 and P1121) slightly shorter than those of the PLC.	
P1121	Ramp-down time	Default for P1121 is 10.00. Setting the ramp-up time too short can cause the inverter to trip (overcurrent, F0001 or overvoltage, F0002). If using an external frequency setpoint with set ramp rates (such as from a PLC), achieve optimum drive performance by setting ramp times (P1120 and P1121) slightly shorter than those of the PLC.	

Commissioning Prerequisites

1. The mechanical and electrical installation procedures must be complete.

2. It is recommended that you use the quick commissioning procedure. However, experienced users may commission the equipment without the P0004 filter functions.

   It is important to use parameter P0010 to commission the SED2, and P0003 to select the number of accessible parameters. Parameter P0010 allows you to select a group of parameters that can be used for quick commissioning. These include parameters for the motor data (Figure 22), and for the motor ramp-up and ramp-down settings.

   At the end of the quick commissioning procedure, select P3900. When set to 1, this parameter performs the necessary motor calculations and sets all remaining parameters (those not included under P0010 = 1) to the default values, including P0010=0 (if P0010=1, the VFD cannot start). This process is only possible in the “quick commissioning” mode.

Motor Data for Commissioning Parameters

Motor parameters can only be modified if Commissioning Parameter Filter P0010=1 (for quick commissioning). The motor control functions of the BOP are disabled by default. Set Selection of Command Source parameter P0700[0]=1 (for BOP) and Selection of Frequency Setpoint P1000[0]=1 (for motor potentiometer setpoint) to enable motor control using the BOP.

If the BOP was configured for I/O control (P0700[0] is set to 1), the motor stops when the BOP is removed.

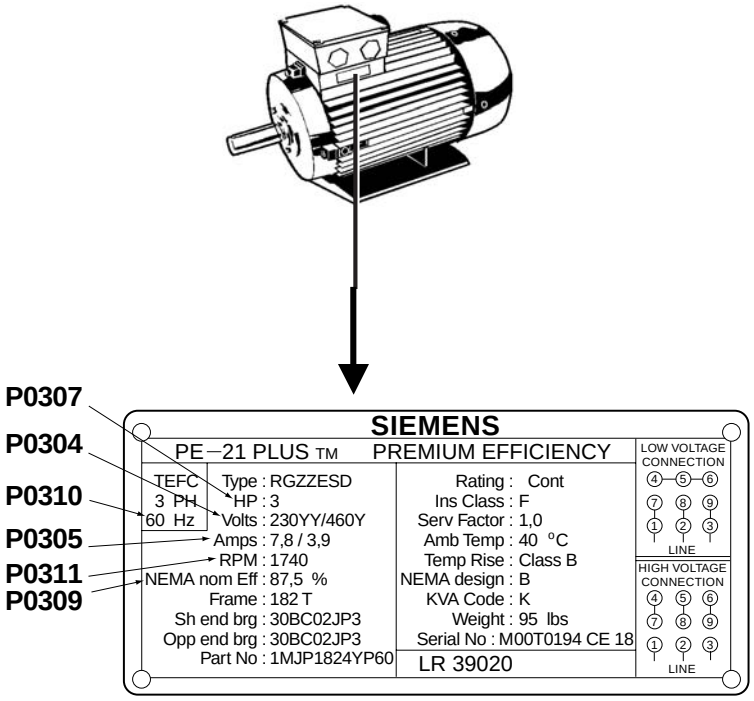


Figure 22. Motor Nameplate Data for Commissioning Parameters.

Quick Commissioning Procedure

P0010 Start Quick Commissioning 0 = Ready to Run 1 = Quick Commissioning 30 = Factory Setting **NOTE:** P0010 *must always* be set back to 0 before operating the motor. However, if P3900 = 1 is set after commissioning, this is done automatically.	**User Setting**
P0100 Operation for Europe/ N. America 0 = Power in kW; *f* default 50 Hz 1 = Power in hp; *f* default 60 Hz 2 = Power in kW; *f* default 60 Hz **NOTE:** DIP switches can permanently select setting 0 or 1.	**User Setting**
*** P0304 Rated Motor Voltage** 10 - 2000V Rated motor voltage (V) from motor nameplate.	**User Setting**
*** P0305 Rated Motor Current** 0.01 - 10000A Rated motor current (A) from motor nameplate.	**User Setting**
*** P0307 Rated Motor Power** 0.01 - 2000 kW or hp Rated motor power (kW or hp) from motor nameplate. If P0100 = 1, values will be in hp.	**User Setting**
*** P0308 Rated motor cosPhi, or** **P0309 Rated motor efficiency** 0.000 to 1.000 (P0308) or 0.0 to 99.9 (P0309) Rated motor motor cosPhi or motor efficiency from motor nameplate. If P0100=0 or 2, P0308 displays; if P0100=1, P0309 displays.	**User Setting**
*** P0310 Rated Motor Frequency** 12 - 650 Hz Rated motor frequency (Hz) from motor nameplate.	**User Setting**
*** P0311 Rated Motor Speed** 0 - 40000 1/min Rated motor speed (rpm) from motor nameplate.	**User Setting**
P0640 Motor Overload Factor 10 - 400% Limited to maximum inverter current or to 400% of rated current (P0305), whichever is lower.	**User Setting**
**** P0700 Selection of Command Source** (on/off/reverse) 0 = Factory Setting 1 = Basic Operator Panel 2 = Terminal/Digital Inputs 6 = P1/N2 Communications	**User Setting**
**** P1000 Selection of Frequency Setpoint** (on/off/reverse) 0 = No Frequency Setpoint 1 = Motor Potentiometer Setpoint 2 = Analog Setpoint 6 = P1/N2 Communications	**User Setting**
P1080 Minimum Motor Frequency Minimum motor frequency (0 - 650 Hz) at which the motor will run irrespective of the frequency setpoint. This value applies to both clockwise and counterclockwise rotation.	**User Setting** **(20-30% Max)**
P1082 Maximum Motor Frequency Maximum motor frequency (0 - 650 Hz) at which the motor will run irrespective of the frequency setpoint. This value applies to both clockwise and counterclockwise rotation.	**User Setting**
P1120 Ramp-up Time 0 - 650s Time taken for the motor to accelerate from standstill up to the maximum motor frequency.	**User Setting** **Recommended: (Fan: 60-120s, Pump: 10-20s)**
P1121 Ramp-down Time 0 - 650s Time taken for the motor to decelerate from the maximum motor frequency down to standstill.	**User Setting** **Recommended: (Fan: 60-120s, Pump: 10-20s)**
P3900 End Quick Commissioning 0 = No quick commissioning (factory setting). 1 = End quick commissioning with motor calculation and resetting all other parameters to the factory setting (recommended without bypass). 2 = End quick commissioning with motor calculation and with I/O reset. 3 = End quick commissioning with motor calculation, but without I/O reset (recommended with bypass option).	**User Setting**

* Motor related parameters.

** Parameters have two settings:
IN000 = AUTO
IN001 = HAND

Setting Parameters with the BOP or AOP

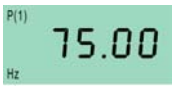
The following table describes the procedure for modifying parameter P1082, Maximum Motor Frequency. Use this table as a guide for setting all other parameters with the BOP.

NOTE: You can change motor data parameters only if P0010=1. To start the motor, reset P0010=0.

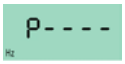
Modify P0004, parameter filter function:

Step	Action	Resulting display
1	Press P to access the parameters.	
2	Repeatedly press ▲ until Parameter Filter P0004 displays.	
3	Press P to access the parameter values level.	
4	Press ▲ or ▼ to display the required value.	
5	Press P to confirm and save the value.	
6	Only the motor parameters display for the user.	

Modify an indexed value under P1082 – Setting the maximum motor frequency:

Step	Action	Resulting display
1	Press P to access the parameters.	
2	Repeatedly press ▲ until Maximum Frequency P1082 displays.	
3	Press P to access the parameter values level.	
4	Press P to display the currently programmed value.	
5	Press ▲ or ▼ to display the required value.	
6	Press P to confirm and save the value.	

Step	Action	Resulting display
7	Press ▼ to return to P0010.	
8	Press P to access the parameter values level.	
9	Press ▼ to restore the value of Commissioning Parameter Filter P0010 to 0 (ready).	
10	Press P to confirm and save the value, and to exit from the parameter values level.	
11	Press ▼ until r0000 displays or press Fn to return to r0000.	
12	Press P to revert to the standard motor display (as defined by the customer).	

NOTE: "Busy Signal" — While changing parameters, the BOP can display  for a maximum of 5 seconds. This means that the SED2 is busy with higher-priority activities.

Changing Individual Parameter Digits

To quickly change the value of a parameter, modify the individual digits in the display as follows:

1. Verify that you are at the parameter modification level (See the *Setting Parameters with a BOP or AOP* section in this manual).
2. Press Fn. The right-most digit starts to flash.
3. Modify the value of this digit with the ▲ and ▼ buttons.
4. Press Fn again. The next digit starts flashing.
5. Repeat steps 2 through 4 until the required value displays.
6. Press P to exit the parameter modification level.

Resetting SED2 Parameters to Factory Defaults

1. Set Parameter Commissioning Parameter Filter P0010=30 (factory setting).
2. Set Parameter Factory Reset parameter P0970=1 (parameter reset).
3. Press P to restore the factory settings of the SED2.

NOTES:

1. The reset process takes approximately 10 seconds.
2. The parameter list in *Appendix A* of this manual provides factory default settings.

SED2 Operation with the BOP

Prerequisites and Notes

1. Set Commissioning Parameter Filter P0010=0 (factory setting) to ensure correct initialization of the RUN command.
   Set Selection of Command Source parameter P0700[0]=1 (BOP) to enable the BOP start/stop button.
   Set Selection of Frequency Setpoint parameter P1000[0]=1 (motor potentiometer) to enable the motor potentiometer setpoints.
2. The SED2 has no mains isolating switch and is live as soon as the mains voltage connect. It remains with the output disabled until you press I, or until it receives a digital ON signal.
3. If display of the output frequency (Display Selection for r0000 parameter P0005= 21, for actual frequency), when using a BOP or AOP the display alternately shows setpoint values and the actual value (0 Hz) for the associated SED2.

Procedure

1. Press I to start the motor.
2. With the motor running, press ▲. The motor speed increases to 60 Hz (50 Hz).
3. When the SED2 reaches 60 Hz (50 Hz), press ▼. The motor speed and the value display decreases.
4. Use Reverse Output Phase Sequence parameter P1820 to change the direction of rotation.

   NOTE: An appropriately configured digital input can also change the direction of rotation.
5. Press 0 to stop the motor.

5 or 10 Hz Test

The 10 Hz test helps check the SED2. It verifies the direction of rotation and the basic functions of the SED2. This test also detects any faults related to power installation.

Testing with the BOP

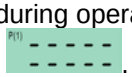
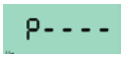
1. Restore the factory settings in the SED2. See the *Resetting SED2 Parameters to Factory Defaults* section in this manual.
2. Press Hand to switch to manual operation.
3. Press I to start the motor.

Testing with the AOP

1. Restore the factory settings in the SED2.
2. Set Selection of Command Source parameter P0700[0] from 1 to 4 (for AOP).
3. Press 0 to stop the motor.
4. Press Hand to switch to manual operation.
5. Press I to switch the device on.

Chapter 6 — Programming

Using the Parameters

- Modify SED2 parameters using the BOP, the AOP, or the serial interface. Use the BOP or AOP to enter and modify parameters that define the required characteristics of the SED2, such as motor data, ramp times, and maximum and minimum frequency.
- Read-only parameters are identified by the letter “r”, programmable parameters are identified by the letter “P”.
- Commissioning Parameter Filter P0010=1 initiates the Quick Commissioning procedure.
- The SED2 runs only if P0010 is set to 0 (factory setting) after access. This function is automatic if P3900 is greater than 0.
- P0004 operates as a filter and allows access to the parameters according to their functionality.
- If you attempt to modify a parameter that cannot be modified under the current conditions (such as, because it cannot be modified during operation or can only be modified in the Quick Commissioning mode), the display reads  .
- Busy Signal — While changing parameters, the BOP can display  for a maximum of 5 seconds. This display means that the SED2 is busy with higher-priority activities.

SED2 Parameter Structure

Figures 23 and 24 shows the structure of the SED2 parameters.

- User Access Level parameter P0003 selects the *access level* for using the parameters (1=standard, 2=extended, or 3=expert). The number of parameters accessible depends on the access level selected via parameter P0003. For most applications, the Standard and Extended levels are sufficient. The factory setting of P0003 is set to 1 (Standard).
- The *filters* of Parameter Filter P0004 categorize the parameters that are available via the access level according to functionality. The filters/categories enable a more focused operational approach. If Parameter P0004 is set to 0 for no filter/category, then all parameters for a selected user access level are available.

  NOTE: Some parameters are intended for *commissioning only* and can be viewed as a function of this filter. In order to set these parameters, P0010 must be set to 1 (quick commissioning).

SED2 Parameter Indices

Certain parameters have indices. The indices provide subsets of a particular parameter function. The indexes group together closely related parameter type information. The *Appendix A: Parameter Reference List* section of this manual lists any indices associated with a parameter. For example, the following indices associated are with P0700, P1000, and digital input and output parameters:

IN000 (AUTO), 1st command data set (CDS)
IN001 (HAND), 2nd command data set (CDS)

The following indices are associated with analog input and output parameters:

IN000, Analog input 1
IN001, Analog input 2

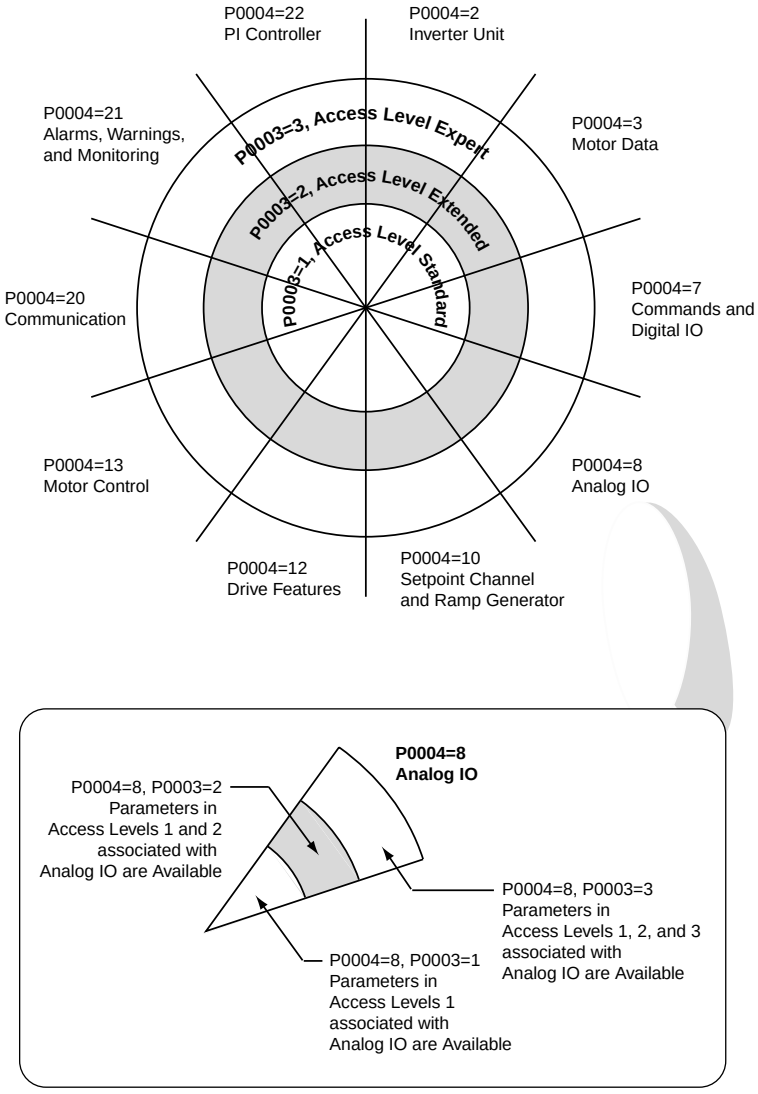


Figure 23. SED2 Parameter Access Levels and Filters.

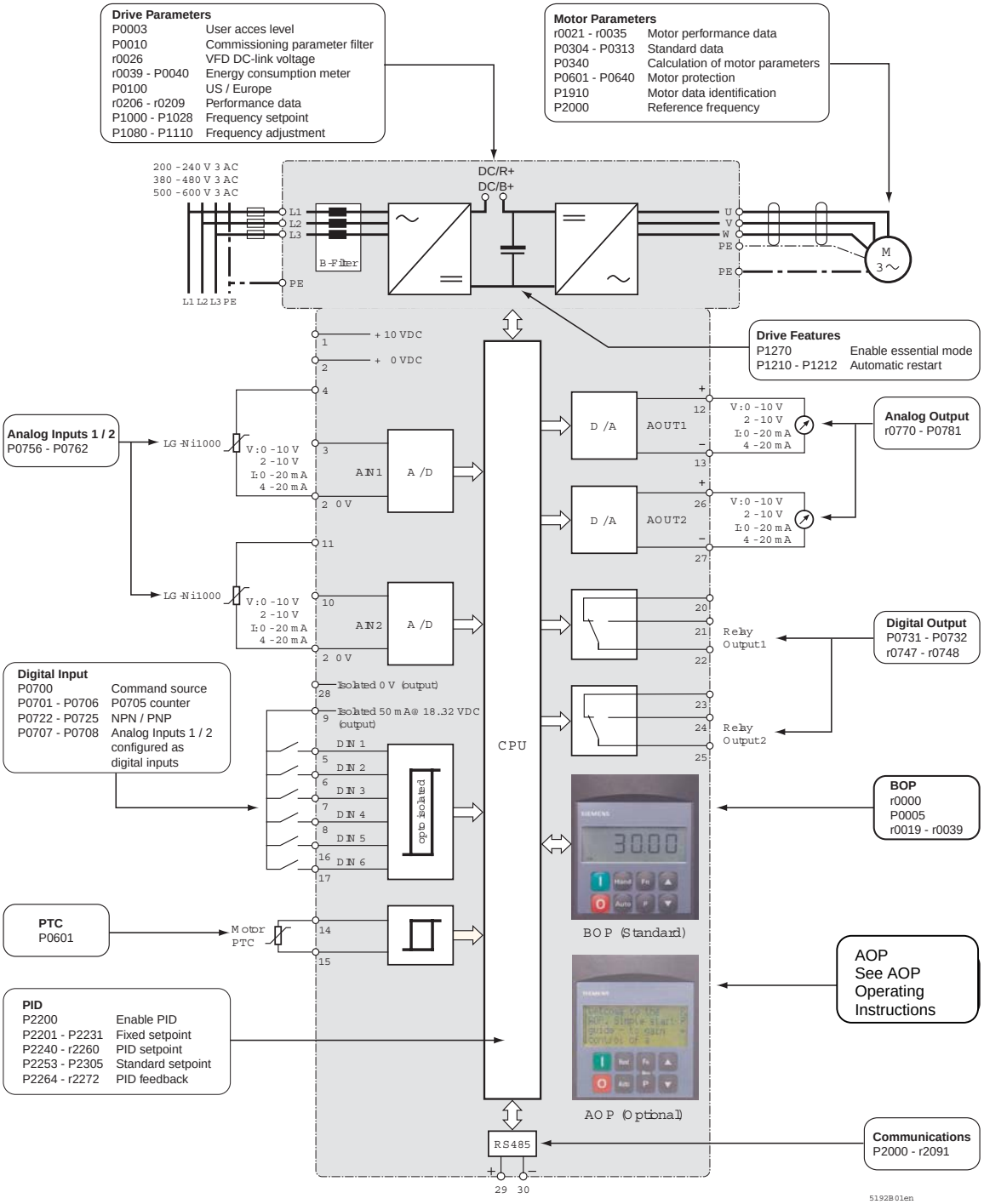


Figure 24. Block Diagram of SED2 Parameters.

SED2 Basic Functions

Digital Inputs

Stand-alone operation of the SED2 requires external switch-on and switch-off arrangements. The SED2 supports six-digital inputs, DIN1 through DIN6 (Figure 25), and can be extended to eight-digital inputs (DIN7 and DIN8) by using two analog inputs (AIN1 and AIN2). You can program the function of the digital inputs as required.

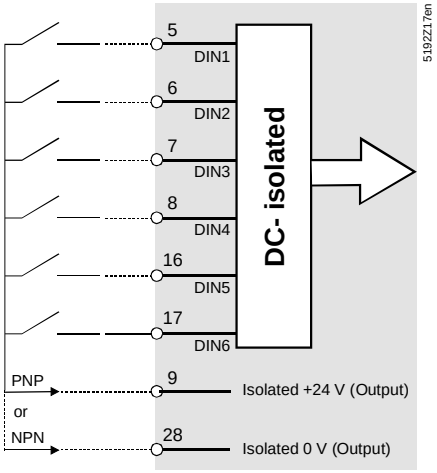
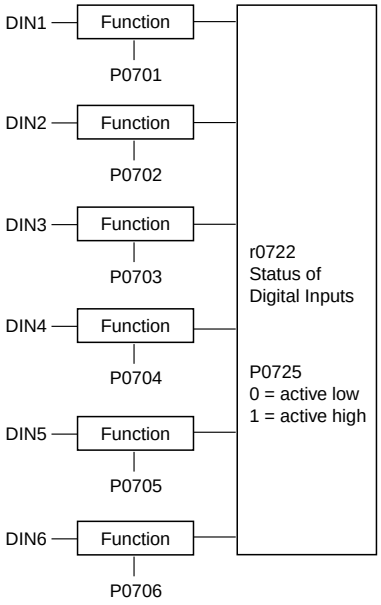


Figure 25. SED2 Digital Inputs 1 through 6.

Parameter Settings for DIN1 to 6 (or DIN1 to 8) (Commissioning)

P0701 to P0706, Digital inputs 1 to 6

The available settings for each digital input is as follows:



0 Digital input disabled.
1 ON/OFF1 – Off as defined via Ramp-Down Time parameter P1121.
2 ON + change direction of rotation/OFF1.
3 OFF2 – coast to standstill.
4 OFF3 – faster ramp-down (quick stop = ramp-down at power limit).
9 Fault acknowledgement.
10 JOG right.
11 JOG left.
12 Reverse direction of rotation.
13 Motor potentiometer (MOP) higher (increased frequency).
14 Motor potentiometer (MOP) lower (reduced frequency).
15 Fixed setpoint (direct selection).
16 Fixed setpoint (direct selection + ON).
17 Fixed setpoint (binary-coded selection + ON).
25 Enable DC braking.
26 Enable Essential Service.
27 Enable PID controller.
29 External trip.
33 Disable additional frequency setpoint.
99 Enable BICO parameter setting (see the description of BICO in the *SED2 Operation & Maintenance Manual Addendum*, Document No. 125-3205.)

NOTE: Setting 99 (BICO) is intended for experienced users only.

Factory settings:

P0701	1	ON/OFF1 – Off as defined via Ramp-Down Time parameter P1121.
P0702	12	Reverse (change of rotation).
P0703	9	Fault acknowledgement.
P0704	15	Fixed setpoint (direct selection).
P0705	15	Fixed setpoint (direct selection).
P0706	15	Fixed setpoint (direct selection).

Index: Example for P0701, applies also to parameters P0702 to P0706.

P0701[0]: IN000 (AUTO)=1st command data set (CDS).
P0701[1]: IN001 (HAND)=2nd command data set (CDS).

P0707 to P0708, Analog inputs 1 and 2

If required, Parameters P0707 and P0708 can reconfigure Analog Inputs 1 and 2 as Digital Inputs 7 and 8.

The following limit values apply to analog inputs configured as digital inputs:

≤ 1.6 Vdc = Off, inactive.
≥ 4.0 Vdc = On, active.

Factory setting: 0

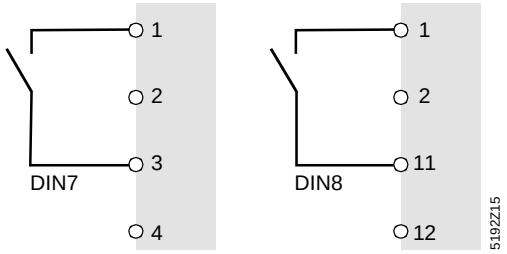


Figure 26. Connection of Analog Inputs 1 and 2 as Digital Inputs 7 and 8.

Index: Example for P0707, applies also to parameter P0708.

P0707[0]: IN000 (AUTO)=1st command data set (CDS).
P0707[1]: IN001 (HAND)=2nd command data set (CDS).

P0725, Operating mode (NPN or PNP) for digital inputs

P0725 determines if a logic 0 or 1 enables digital inputs DIN1 through DIN6 as follows:

0=NPN mode=Active low (logic 0)
1=PNP mode=Active high, (logic 1) factory setting

r0722, Check for signal at digital and analog inputs

Use this parameter to check for the presence of a signal at the digital and analog inputs. When an active signal is present, the associated segment of the display lights. Figure 27 shows the allocation of each of the inputs to a specific display segment. Figure 28 shows an example of the display while testing input signals.

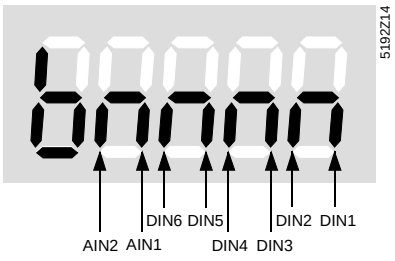


Figure 27. Allocation of Each Input to a Display Segment using Parameter r0722.

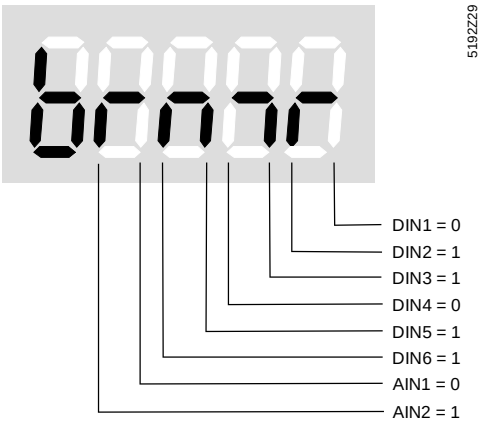


Figure 28. Example of the Display while Testing Input Signals using Parameter r0722.

Digital Outputs

Parameter Settings for DO1 and DO2

P0731 to P0732, Digital outputs 1 and 2

The available settings for each digital output is as follows:

52.0 Drive ready.
52.1 Drive ready to run.
52.2 Drive running.
52.3 Drive fault active.
52.4 OFF2 active.
52.5 OFF3 active.
52.6 Switch on inhibit active.
52.7 Drive warning active.
52.8 Deviation setpoint/actual value.
52.9 PZD control (Process Data Control).
52.A Maximum frequency reached.
52.B Warning: Motor current limit.
52.C Motor holding brake (MHB) active.
52.D Motor overload.
52.E Motor running direction right.
52.F Inverter overload.
53.0 DC brake active.
53.1 Inverter frequency less switch off limit.
53.2 Inverter frequency less minimum frequency.
53.3 Current greater or equal than limit.
53.4 Actual frequency greater comparison frequency.
53.5 Actual frequency less comparison frequency.
53.6 Actual frequency greater/equal setpoint.
53.7 Voltage less than threshold.
53.8 Voltage greater than threshold.
53.A PID output at lower limit (P2292)
53.B PID output at upper limit (P2291)

Factory settings:

P0731	52.3	Drive fault active
P0732	52.7	Drive running

Index: Example for P0731, applies also to parameter P0732.

P0731[0]: IN000 (AUTO)=1st command data set (CDS).
P0731[1]: IN001 (HAND)=2nd command data set (CDS).

r0747, State of digital outputs

Shows the state of the digital outputs as follows:

Bit 00=Digital output 1 energized (0=no, 1=yes)
Bit 01=Digital output 2 energized (0=no, 1=yes)

r0747, Invert digital outputs

Shows the inverted state of the digital outputs as follows:

Bit 00=Invert Digital output 1 (0=no, 1=yes)
Bit 01=Invert Digital output 2 (0=no, 1=yes)

Analog Inputs

The SED2 analog inputs send positioning, control, and feedback signals to the SED2 and convert them to digital signals via A/D converters (ADC).

For accurate and consistent performance of SED2 analog outputs, if you are not connecting a NI 1000 sensor then terminals 10 and 4 (NI 1000) must connect to terminal 2 (0V).

Specify analog inputs AIN1 and AIN2 as follows:

Input level: 0 to 10V, or 0 to 20 mA
Resolution: 10 bit
Read cycle: 10 ms

Set the analog inputs to 0 to 10V, or 0 to 20 mA via the two DIP switches on the I/O module. See the *DIP Switch Settings* section in this manual.

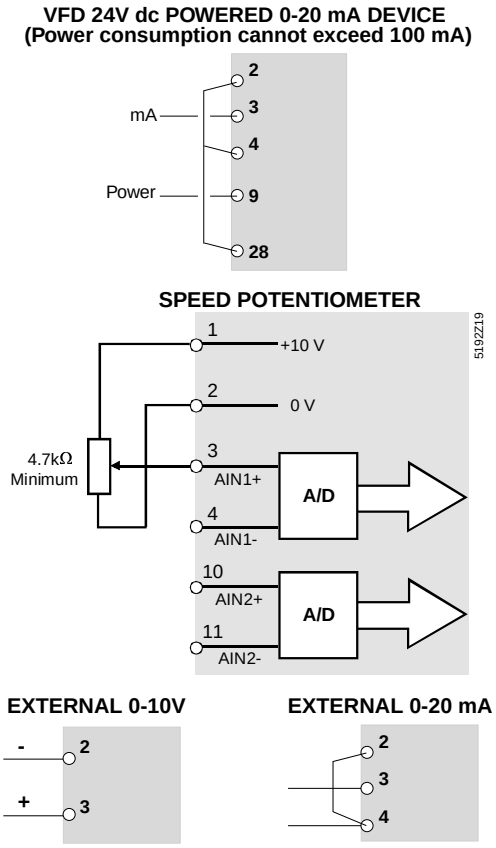
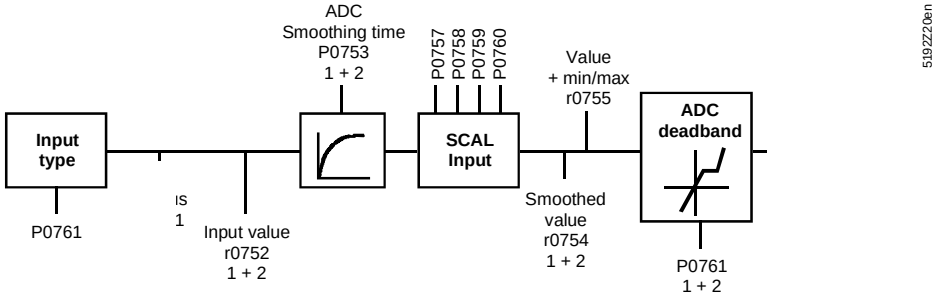


Figure 29. SED2 Analog Inputs 1 and 2.

Parameter Settings for AIN1 and AIN2 (Commissioning)



P0756, Type of analog input

P0756 defines the type of analog input and enables analog input monitoring. Possible settings:

0 Unipolar voltage input (0 to 10V) (factory setting).
1 Unipolar voltage input with monitoring (0 to 10V).
2 Unipolar current input (0 to 20 mA).
3 Unipolar current input with monitoring (0 to 20 mA).
5 Ni 1000 sensor input (–10 to +10V).

NOTE: The parameter setting must match the setting of the two DIP switches on the I/O module.

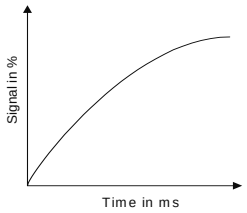
Index:

P0756[0]: IN000=Analog input 1.
P0756[1]: IN001=Analog input 2.

Note on dependency:
This function is disabled if the analog scaling block is programmed for negative output setpoints (see P0757 to P0760).

Note on the monitoring function:
If monitoring is enabled and the deadband is defined (P0761), a fault message appears (F0080) as soon as the analog input voltage drops below 50% of the deadband voltage.

P0753, Analog input filter time



P0753 defines the filter time (PT filter time) in ms for the analog input.

Setting range: 0 to 10,000 ms

Factory setting: 100 ms

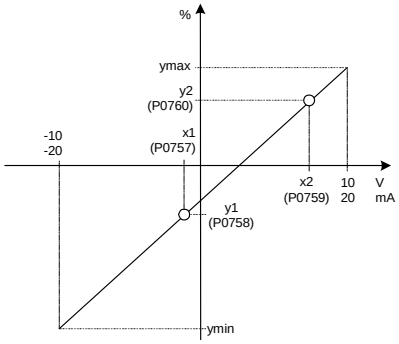
Index:

P0753[0]: IN000=Analog input 1.
P0753[1]: IN001=Analog input 2.

Increasing this time reduces (smoothes) the ripples, but also slows down the response to the analog input.

P0757 – P0760, Input scaling for analog inputs

Parameters P0757 to P0760 configure the input scaling for the analog inputs according to the following curve.



Factory setting: 0V = 0% and 10V = 100%.

Parameter	Unit	Point on x/y-axis	Setting range		Factory Setting
			Min.	Max.	
P0757	V or mA	x1 value	-50.0	150.0	0
P0758	%	y1 value	-99999.9	99999.9	0.0
P0759	V or mA	x2 value	-50.0	150.0	10
P0760	%	y2 value	-99999.9	-99999.9	100.0

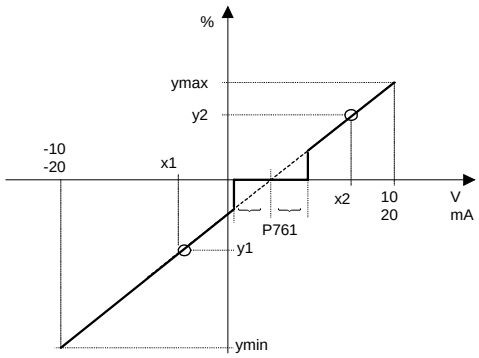
NOTE: Use r0752[0] or [1] to read the *actual* current or voltage.
Use r0754[0] or [1] to read the current or voltage *after scaling*.

Index: Example for P0757, applies also to parameters P0758 through P0760.

P0757[0]: IN000=Analog input 1.
P0757[1]: IN001=Analog input 2.

P0761, Width of deadband (V/mA) for analog inputs

P0761 defines the deadband for the analog inputs.



Setting range: 0 to 10V, or 0 to 20 mA

Factory setting: 0

NOTE: P0761[x] = 0: No enabled dead zone.

The dead zone runs from 0V (or 0 mA) to the value of P0761, if the values of P0758 and P0760 (y-coordinate for analog input scaling) have the same sign. The dead zone is enabled from the intersecting point (x-axis with analog input scaling curve) in both directions, if P0758 and P0760 have different signs.

When using a configuration with neutral point in the center, Fmin (P1080) should be zero. There is no hysteresis at the end of the deadband.

Index:

P0761[0]: IN000=Analog input 1.
P0761[1]: IN001=Analog input 2.

Analog Outputs

SED2 converts status variables such as output frequency, motor voltage, or present motor current via D/A converters (DAC) within a scaleable range. The analog outputs then display their values.

NOTE: For accurate and consistent performance of SED2 analog outputs, if you are not connecting a NI 1000 sensor then terminals 10 and 4 (NI 1000) must connect to terminal 2 (0V).

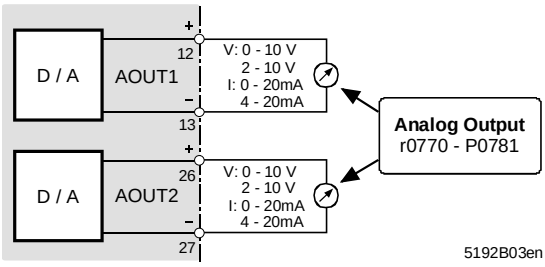
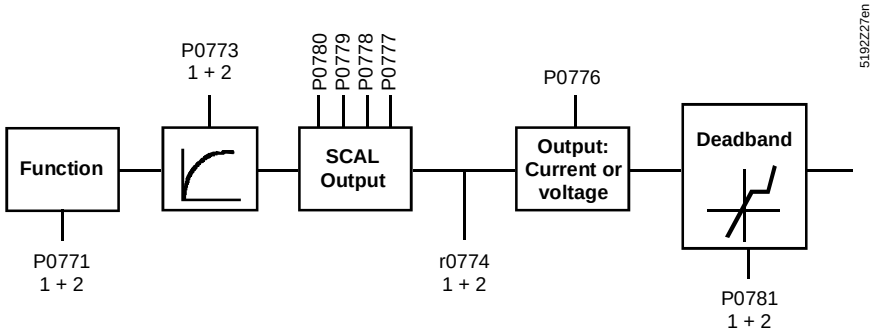


Figure 30. SED2 Analog Outputs 1 and 2.

Parameter Settings for AOUT1 and AOUT2 (Commissioning)



P0771, Physical status variable

Defines the physical status variable to display as an analog signal. Possible settings:

21 Present output frequency (scaled to P2000, Reference Frequency), (factory setting).
24 Present SED2 output frequency (scaled to P2000, Reference Frequency).

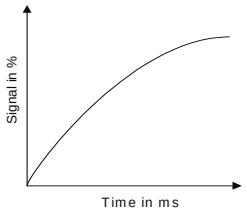
25 Present output voltage (scaled to P2001, Reference Voltage).
26 Present link voltage (scaled to P2001, Reference Voltage).
27 Present output current (scaled to P2002, Reference Current).

Index:

P0771[0]: IN000=Analog output 1.
P0771[1]: IN001=Analog output 2.

P0773, Smoothing time for analog output signals

P0773 enables smoothing for the signal with a PT1 filter and determines the smoothing time in ms for the analog output signals.



Setting range: 0 to 1000 ms

Recommended setting: 100 ms (factory setting)

Index:

P0773[0]: IN000=Analog output 1.
P0773[1]: IN001=Analog output 2.

The filter is disabled for Analog Input Filter Time, P0773=0.

r0774, Show analog output value after filtering/scaling

Shows the analog output value (in V or mA) after filtering and scaling.

Index:

r0774[0]: IN000=Analog output 1.
r0774[1]: IN001=Analog output 2.

P0776, Type of analog output

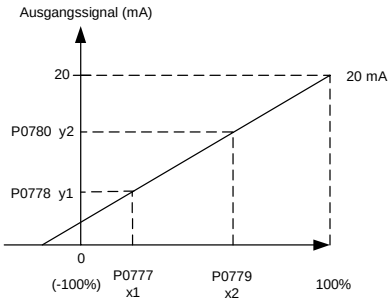
P0776 selects the type of analog output. Possible settings:

0=Current output: 0 to 20 mA (factory setting)
1=Voltage output: 0 to 10V

The analog outputs are designed as current outputs within 0 to 20 mA. Both analog outputs must be configured as the same type. Both outputs are configured, such as either current outputs with range 0 to 20 mA, or as voltage outputs with range 0 to 10V.

P0777 to P0780, Define output characteristic

P0777 to P0780 defines the output characteristic in %. The analog output scaling parameters (P0777 to P0781) set the output characteristics and they are configured according to the following curve.



Points P1 (x1, y1) and P2 (x2, y2) are freely selectable.

P0777: Defines x1 of the output characteristics (factory setting = 0.0).
P0778: Defines y1 of the output characteristics (factory setting = 0).
P0779: Defines x2 of the output characteristics (factory setting = 100).

P0780: Defines y1 of the output characteristics (factory setting = 10).

Example:

The factory-set scaling is as follows:

P1: 0.0 % = 0 mA or 0V
P2: 100.0 % = 20 mA or 10V

Index:

P0777[0]: IN000=Analog output 1.
P0777[1]: IN001=Analog output 2.

P0781, Width of deadband for analog outputs

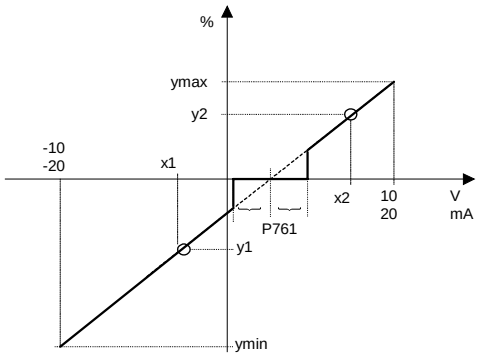
P0781 defines the DAC deadband for the analog outputs.

Setting range: 0 to 20 mA, or 0 to10V

Factory setting: 0

Index:

P0781[0]: IN000=Analog output 1.
P0781[1]: IN001=Analog output 2.



Frequency Setpoint (P1000)

Default setting: Analog input terminal 3/2 (AIN+/AIN–, 0 to 10V corresponds to 0 to 50/60 Hz).

Index:

P1000[0]: IN000 (AUTO)=1st command data set (CDS).
P1000[1]: IN001 (HAND)=2nd command data set (CDS).

Additional settings: See P1000 (in the *Appendix A: Parameter Reference List* section of this document).

Selection of Command Source (P0700)

Possible settings for P0700:

0= Factory setting (BICO reset), resets all digital inputs to the factory settings (possible only if Function of Digital Input 1 parameter P0701=99, Enable BICO parameterization).
1= Operator panel BOP.
2= Control terminal bar (factory setting).
4= USS on BOP link, AOP.
5= USS on COM link.
6= CB on COM link.

Index:

P0700[0]: IN000 (AUTO)=1st command data set (CDS).
P0700[1]: IN001 (HAND)=2nd command data set (CDS).

Start Motor

Default setting: Terminal 5 (DIN 1, high).

Additional settings: See Selection of Command Source parameter P0700 and Function of Digital Inputs 1 to 8 parameters P0701 through P0708.

NOTE: The ramp-up and ramp-down smoothing times influence the motor's start and stop behavior. For more information, see Ramp-Up Time parameter P1120 and Ramp-Down Time parameter P1121 in the *Appendix A: Parameter Reference List section* of this document.

Stop Motor

There are several ways to stop the motor:

Default setting:

OFF1 Terminal 5 (DIN 1, low).
OFF2 OFF button on BOP/AOP; sustained pressing of the OFF button (two seconds) or repeated pressing of the button (in case of default settings not possible without BOP/AOP).

Additional settings: See Selection of Command Source parameter P0700 and Function of Digital Inputs 1 to 8 parameters P0701 through P0708.

Reversal of the Motor's Direction of Rotation

Default setting: Terminal 6 (DIN 2, high).

Additional settings: See Selection of Command Source parameter P0700 and Function of Digital Inputs 1 to 8 parameters P0701 through P0708.

OFF Functions

OFF1

This command (by eliminating the ON command) stops the SED2 within the selected ramp-down time.

See Ramp-Down Time parameter P1121 to change the ramp-down time.

NOTES:

1. The ON and the consecutive OFF1 command must have the same source.

2. If the ON/OFF1 command is set for more than one digital input, only the last set digital input is valid; for example, DIN3 is enabled.

OFF2

This command causes a free coasting of the motor to standstill (impulses for the power section of the SED2 are disabled).

NOTE: The OFF2 command may have one or several sources. By default, the OFF2 command source is set to BOP/AOP. This source remains even if other sources are defined by Selection of Command Source parameter P0700 or Function of Digital Inputs 1 to 8 parameters P0701 through P0708.

OFF3

An OFF3 command causes the motor to decelerate rapidly.

For starting the motor when OFF3 is set, the binary input must be closed (high). If OFF3 is high, the motor can start and stop by OFF1 and OFF2.

If OFF3 is low, the motor cannot be started.

Control Types (P1300)

The different control types of the SED2 control the relationship between the motor speed and the voltage supplied by the SED2. Below is a summary of the available control types:

Linear V/f control, P1300=0
For variable or constant torque applications such as delivery systems and positive displacement pumps.

Linear V/f control with flow control (FCC), P1300=1
This factory-set control mode can improve performance and dynamic behavior of the motor.

Parabolic V/f control, P1300=2
A factory-set control mode for variable torque load such as fans and pumps.

Multi-point V/f control, P1300=3

Linear V/f control with energy saving mode, P1300=4
Automatically increases or decreases the motor voltage to locate the lowest possible energy consumption. As soon as the default setpoint speed is reached, the control mode is enabled.

V/f control for textile applications, P1300=5
For no slip compensation or resonance smoothing. The Imax controller relates to voltage instead of frequency.

V/f control with FCC for textile applications, P1300=6
A combination of P1300 = 1 and P1300 = 5.

Communications

The SED2 includes an integral RS-485 serial interface. The optional door mounting kit for the BOP/AOP includes an integral RS-232 interface. USS, P1, and N2 protocols are implemented as part of the series. See Chapter 9 in this manual for more details.

SED2 HVAC Functions

PID Controller

To achieve independent control in a stand-alone SED2 application, Siemens Building Technologies implemented a PID controller. This controller handles temperature (Ni 1000), pressure, and speed control. Factory settings for the PID controller parameters are for pressure control. For temperature or speed control, adjust the controller time constants for the new control loop.

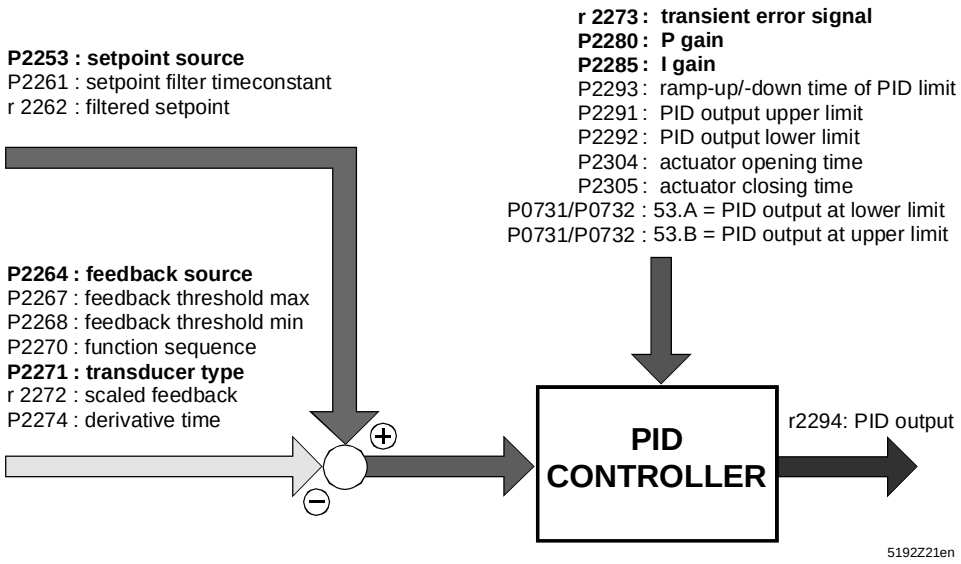


Figure 31. SED2 PID Controller.

Parameter Settings for the PID Controller (Commissioning)

NOTE: The setpoint and the actual signal value display as a percentage (%). Make sure that the two signals match each other.	
FIXED SETPOINTS 1-15: **P2201 – P2215** Enter fixed setpoint. The setpoint is active if switching command ON is sent to Digital Input 1 (DIN1).	**EXTERNAL SETPOINT:** **Analog input** See *Analog Inputs* section for the parameter settings.
PID SETPOINT: **P2253[0]** Set to value **2224**; fixed PI setpoint. **P0701[0]** Enter value **16**; sets Digital Input 1 (DIN1) to ON with fixed setpoint; see *Digital Inputs* section .	**EXTERNAL PID SETPOINT:** **P2253[0]** Set to **755**; setpoint is configured to AIN 1. **P0756[0]** Select the type of Analog Input 1 for the setpoint. **P0757[0] to P0760[0]** Set scaling for Analog Input 1 (AIN1).
P0756[1] Define the type of Analog Input 2 (AIN2) for the actual signal value.	
P0757[1] to P0760[1] Set scaling for Analog Input 2 (AIN2).	
P2264[1] Set to **755[1]**; defines AIN2 as actual value.	
P2306 Define the reaction of the PID controller to the actual values (0=heating, 1=cooling).	
P2200[0] Enable the PID controller (0=disable, 1=enable).	

r2262 Check for setpoint (scaled PID setpoint in %). **NOTE:** SED2 must be set to automatic control; DIN1 must be set to ON.
r2272 Check for actual value (scaled PID actual value in %).
P2280 and P2285 Set and optimize PID proportional gain & PID integration time.
Changeover to automatic control.

Belt Failure Detection without Sensor (P2181)

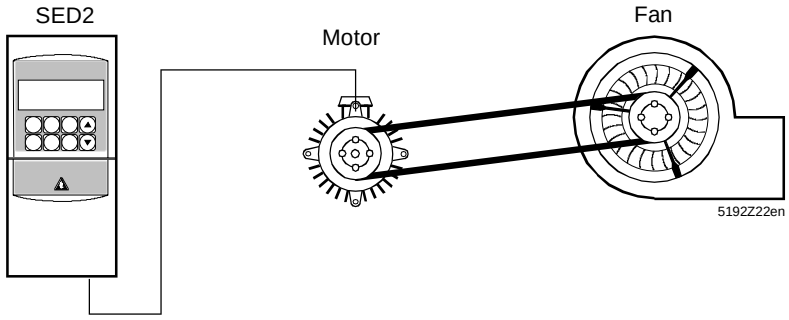


Figure 32. Belt Failure Detection without Sensor (P2181).

This function allows for monitoring power transmission components such as drive belts. The function can also detect motor overload, such as in the case of a jam.

The actual frequency/torque curve is compared to a preprogrammed tolerance band (see P2182 through P2190 in the *Appendix A: Parameter Reference List* of this document) as part of this function. If the actual curve is outside the tolerance band, a warning or error message (F0085) occurs.

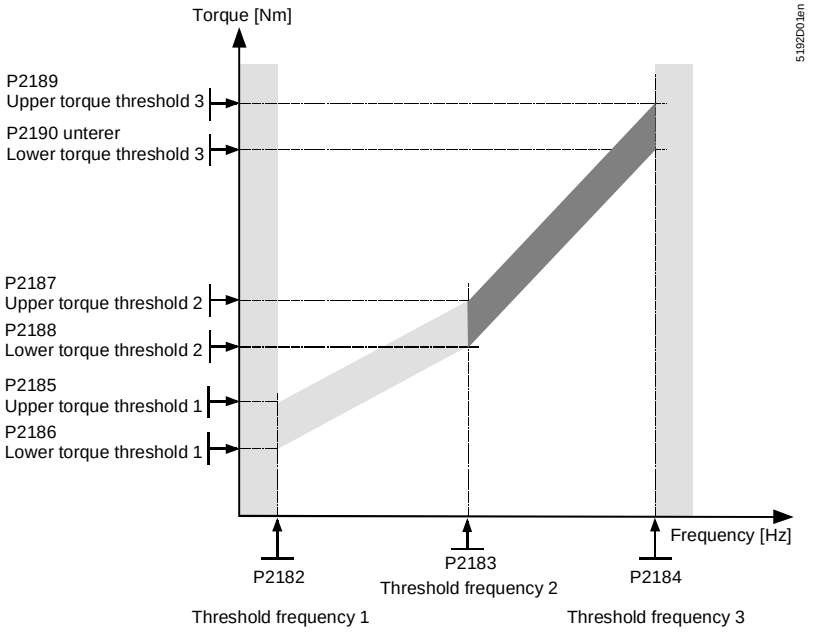


Figure 33. Frequency/Torque Curve.

The zone that is shaded gray shows the permissible frequency/torque area. The frequency limit values 1 to 3 define the areas used to compare the actual torque to the preset torque. Nine parameters define torque monitoring. Belt Threshold Frequency 1-3 parameters P2182 through P2184 define the frequency limit values to be set. Upper and Lower Torque Threshold 1-3 parameters P2185 through P2190 limit the tolerance band compared to the present torque curve.

Parameter Settings for Belt Failure Detection without Sensor (Commissioning)

P2182 to P2184, Frequency limit value

The three frequency limit values F1, F2, and F3 determine a reasonable division across the required torque area. Set the values desired in the manual mode using and and read and write down the corresponding torque values via parameter r0031.

Factory setting: 5, 30, 50 Hz.

P2181, Reaction of drive belt failure detection

P2181 sets the desired reaction of drive belt failure detection. Possible settings:

0=Belt failure detection disabled (factory setting).
1=Warn low torque/speed.
2=Warn high torque/speed.
3=Warn high/low torque/speed
4=Trip low torque/speed.
5=Trip high torque/speed.
6=Trip high/low torque/speed

Set P2181 (not to 0) before setting P2185 through P2190.

P2185 through P2190, Torque limit value

Set the torque limit value parameters as follows:

- Add ±15% to the torque derived from the setting of the frequency limit values to define a permissible tolerance band for the torque values.

Upper Limit Factory setting: 99999.0

Lower Limit Factory setting: 0.0.

P2192, Alarm delay

P2192 allows for setting an alarm delay (between 0 to 65 seconds) before a warning or error message occurs. This parameter helps avoid false alarms caused by temporary transition states. This delay can also be used for belt failure detection via sensor.

Factory setting: 10 seconds

In manual mode, vary the torque frequency in the selected range to check the function. Then, change over to automatic control.

Belt Failure Detection with Sensor (P0400)

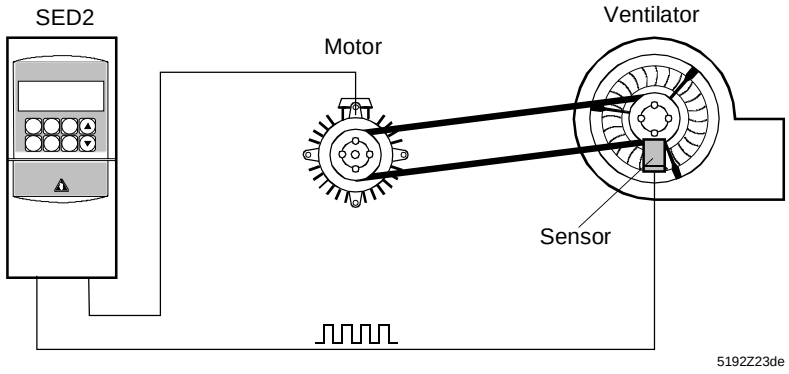


Figure 34. Belt Failure Detection with Sensor (P0400).

A simple sensor (inductive sensor) mounted to the drive unit (such as for a fan) supplies one pulse for each rotation. The pulse train generated this way, which can vary from 1 to 20,000 pulses per minute, is sent to SED2 digital input DIN5. The frequency resulting from the pulse train is compared to the present output frequency of the SED2.

Select Encoder Type parameter P0400 defines the encoder type. If parameter P0400 is set to 0 (factory setting) so belt failure detection is disabled, belt failure detection *without* sensor (P2181) is used instead.

Only DIN5 works with a counter signal.

Parameter Settings for Belt Failure Detection with Sensor (Commissioning)

Determine the speed transformation ratio between the motor and the shaft driven by the belt.

P0400, Encoder type

Define the encoder type using parameter P0400. Possible settings:

0 Disabled (factory setting).
1 Single channel encoder.
2 Quadrature encoder without zero pulse.
3 External pulse train.
12 Quadrature encoder with zero pulse.

P0409, Pulses per Second at Rated Frequency

Use parameter P0409 to set the pulse rate (number of pulses/seconds) generated by the sensor at nominal frequency (nominal speed) by including the determined transmission ratio.

Setting range: 1 to 500

Factory setting: 25

P2181, Belt failure detection mode

Set the desired reaction of drive belt failure detection via parameter P2181. Possible settings:

0 Belt failure detection disabled (factory setting).
1 Warn low torque/speed.
2 Warn high torque/speed.
3 Warn high/low torque/speed.
4 Trip low torque/speed.
5 Trip high torque/speed.
6 Trip high/low torque/speed.

Suggested setting: 1 Warn low torque/speed.

P2191, Belt failure speed tolerance

Use parameter P2191 to set the maximum permissible deviation of the pulse train frequency (actual value) generated by the sensor from the SED2 output frequency (setpoint). If the tolerance band for frequency is exceeded, a warning or trip occurs.

Setting range: 0 to 20 Hz.

Factory setting: 3 Hz.

In manual mode, vary the torque frequency in the selected range to check the function. Then change over to automatic control.

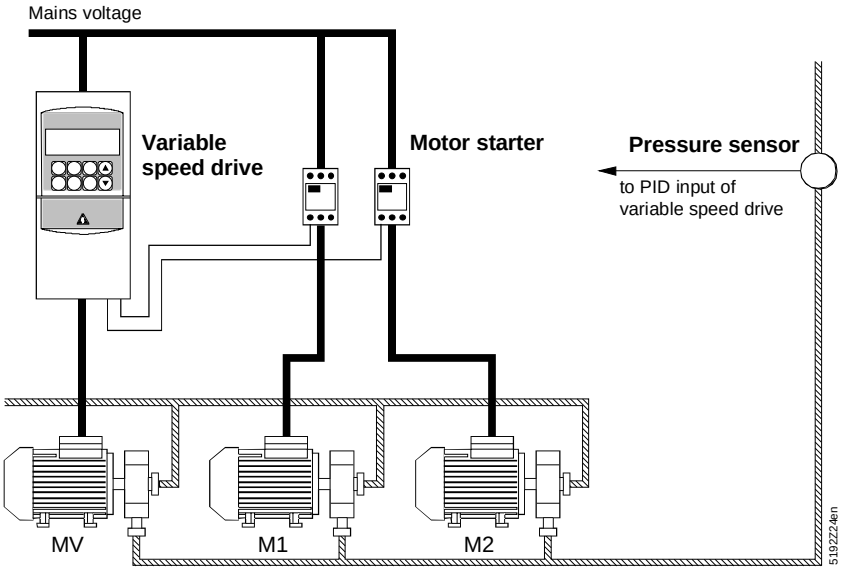
Staging Pumps or Fans

Motor staging controls up to two additional pumps or fans based on the integrated PID control system. The complete system comprises a pump (fan) controlled by the SED2, and up to two additional pumps (fans) switched by contactors or motor starters.

NOTES:

1. Contact speed pumps must be protected per NEC or UL.
2. Contactors or starters are not supplied with the drive.

Relay switching contacts integrated in the SED2 control the contactors or motor starters. Figure 35 shows a typical pump system. A similar system comprised of fans could be used for ventilating systems.



MV: Motor, speed-controlled by SED2.
M1: Motor, controlled by digital output relay 1 DOUT1.
M2: Motor, controlled by digital output relay 2 DOUT2.

Figure 35. Staging Pumps.

If MV runs at maximum frequency and the PID feedback shows that a higher speed is demanded in accordance with the staging, the SED2 switches on one of the relay-controlled motors M1 or M2 (staging). To keep the controlled variable as constant as possible, and to compensate for the difference in output, the SED2 must decrease to minimum frequency (Figure 36). During the staging process, PID control is suppressed.

If MV runs in parallel to M1 and M2 at a minimum frequency, and if the PID feedback demands an even lower speed, the SED2 switches off one of the relay-controlled motors M1 or M2 (destaging). In this case, the SED2 must increase the ramp from the minimum to the maximum frequency. In this phase, PID control is suppressed.

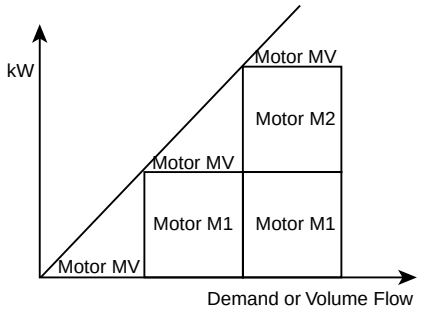


Figure 36. Motor Staging on Output Demand.

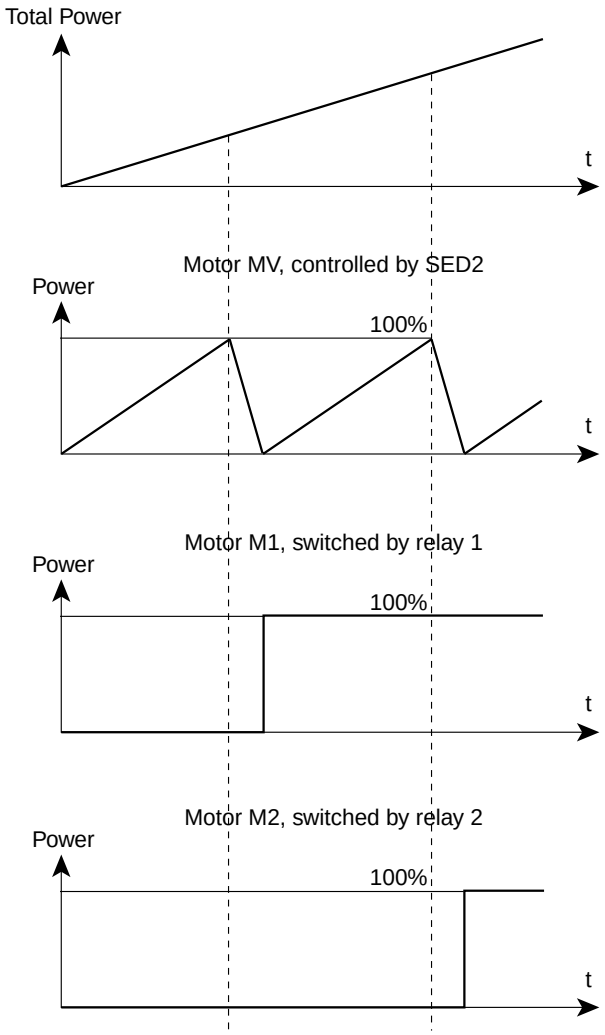


Figure 37. Diagram From Motor Staging.

Parameter Settings for Motor Staging (Commissioning)

In general, the factory settings can be used.

P2371, Selection of external motor configuration

Max. 2 pumps can be added. Possible settings:

0 = Motor staging disabled (factory default)

1 = M1=1X, M2= , M3=

2 = M1=1X, M2=1X, M3=

3 = M1=1X, M2=2X, M3=

4 = M1=1X, M2=1X, M3=1X

5 = M1=1X, M2=1X, M3=2X

6 = M1=1X, M2=2X, M3=3X

7 = M1=1X, M2=1X, M3=3X

8 = M1=1X, M2=2X, M3=3X

P2372, Enable motor cycling

If this parameter is enabled, one or two motors are switched on or off (during staging, in addition to the speed-controlled motor) in a specified sequence based on the motor operating hours (Parameter 2380, Motor hours run).

During staging, the motor having the lowest number of operating hours is first switched on. During destaging, the motor having the highest number of operating hours is first switched off.

If staged motors are different sizes, the motor size promising to best satisfy the demanded output is switched on first, regardless of its operating hours, and then the motor based on run hours.

Factory setting: 0 (disabled).

P2373, Motor staging hysteresis

Error, as a percentage of setpoint, which must be exceeded before staging delay starts.

Setting range: 0 to 200%

Factory setting: 20%

P2374, Delay on motor staging

Time that error (P2373) must exceed hysteresis before staging occurs.

Setting range: 0 to 650 seconds

Factory setting: 30 seconds

P2375, Delay on motor destaging

Time that error (P2374) must exceed hysteresis before staging occurs.

Setting range: 0 to 650 seconds

Factory setting: 30 seconds

P2376, Delay override on motor staging/destaging

The value of P2376 is set as a percentage of the PID setpoint. If the PID error (P2273) exceeds this value, a motor is switched on or off, regardless of the delay timers (P2374 and P2375).

Setting range: 0 to 200%

Factory setting: 25%

P2377, Delay override lockout timer

This parameter is used to lock the delay override (P2376) after staging or destaging for a specified period of time. This prevents a second staging immediately following the first staging, that could have been triggered by the first staging.

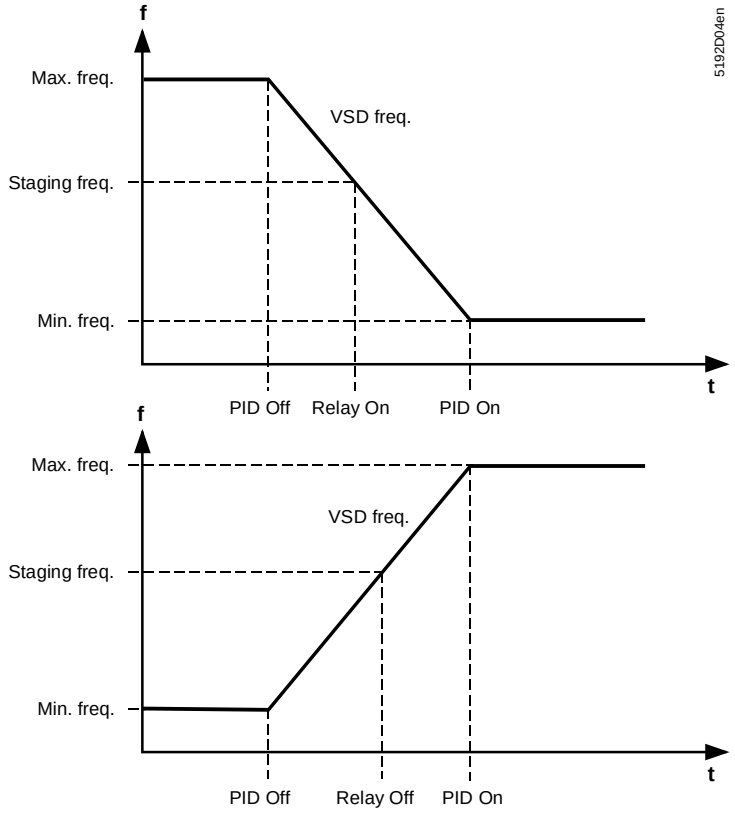
Setting range: 0 to 650 seconds

Factory setting: 30 seconds

P2378, Staging frequency

This parameter is defined as a particular percentage of the maximum output frequency. This determines the frequency used to switch on or off the relay (DOUT1 or DOUT2) during staging or destaging.

Factory setting: = 50% (defined as a percentage = 100%, at fmax = 60 Hz).



P0731, Function of Digital output 1, relay 1 (DOUT1)

Parameter r2379 (relay 1 to motor 1).

Factory setting: 52.3 = SED2 fault enabled

P0732 Digital output 2, relay 2 (DOUT2)

Parameter r2379 (relay 2 to motor 2)

Factory setting: 52.2 = SED2 in operation

Complete parameter setting by changing over to automatic control.

Temperature Control with Ni 1000 Sensor

Use the SED2 to directly measure the temperature by means of a passive temperature Ni 1000 sensor. Simple temperature control is possible. The sensor connects to the SED2. The signal can be scaled according to requirements.

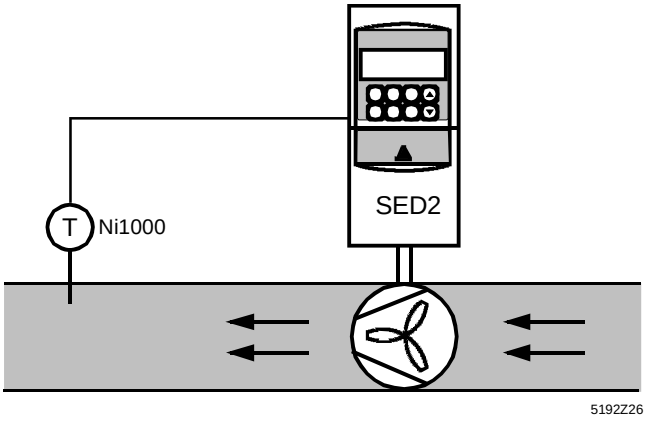


Figure 38. Temperature Control with Ni 1000 Sensor.

Parameter Settings for Temperature Control (Commissioning)

Use the same procedure as for commissioning analog inputs.

The temperature sensor can connect as follows to the analog inputs:

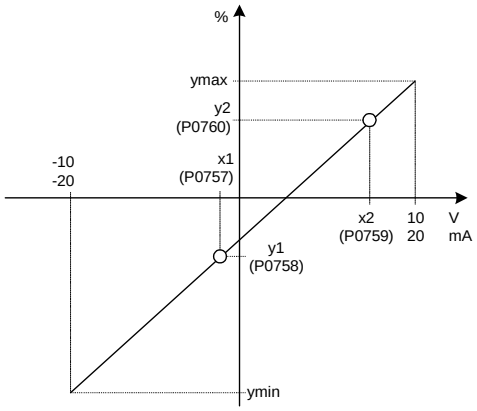
Ni 1000 on AIN 1:
Connection terminals: 2/4

Ni 1000 on AIN 2:
Connection terminals: 2/11

When connecting a Ni 1000 sensor, no other input signal can be processed on the same input, even if terminals 3/10 for an analog signal of 0 to 10V are free.

P0757 to P0760, Analog Input Scaling

Scaling converts the Ni 1000 sensor temperature range of –58°F to 302°F (–50°C to 150°C) to %.



Example: Ni 1000 on AIN1:

P0757[0] = –50°C
P0758[0] = –50%
P0759[0] = 150°C
P0760[0] = 150%

Factory settings:

P0757 = 0
P0758 = 0.0
P0759 = 10
P0760 = 100

Other Typical HVAC Applications

The following table lists commonly defined settings for desired operations:

Parameter	Application
P0718	Selects if Hand or Auto occurs after a power-on.
P0748	Inverts operation of digital outputs.
P1020 – P1028	Fix frequency. See also the Digital Inputs section.
P1040	Change the setting of the speed on the MOP while stopped.
P1091 – P1101	Skip frequency.
P1110	Allows negative speeds (also requires digital input setting).
P1200	Flying start – allows drive to catch a spinning motor without faulting.
P1210 – P1213	Auto restart (requires a constant start command to clear a fault).
P1240	Configuration of Vdc controller—enables the drive to automatically extend the ramp up or down times as required to keep the drive from tripping on a start or stop command.

Chapter 7 — Troubleshooting

Troubleshooting Using the Operator Panel

If the motor does not start with the ON command:

- Check if Commissioning Parameter Filter P0010=0 (factory setting).
- Check if there is a valid ON signal.
- Check if Selection of Command Source parameter P0700=2 (for digital input control) or P0700=1 (for BOP control).

Check if the correct setpoint is available (0 to 10V on terminal 3), or if the setpoint was entered in the correct location in dependence of the setpoint source (Selection of Frequency Setpoint parameter P1000). See the parameter list (see *Appendix A* in this document) for more detailed information.

If the motor does not start after changing the parameters, set Commissioning Parameter Filter P0010=30 (factory setting), set Parameter Reset P0970=1 (factory reset), and press **P** to reset the SED2 to the factory-set parameter default values.

Use a switch between terminals **5** and **8** on the control terminal bar. The drive should now run according to the default setpoint at the analog input.

NOTE: The voltage and current range of the SED2 must match the motor data.

Fault Codes

Error	Cause	Diagnosis/Remedy	Reaction
F0001, Overcurrent	• Motor power (P0307) is greater than SED2 power (P0206). • Motor lead short circuit. • Earth faults.	Check the following: • Motor power (P0307) ≤SED2 power (P0206). • Cable length limits must not be exceeded. • Motor cable and motor must not have short circuits or earth faults. • Motor parameters must match the motor in use. • Value of stator resistance (P0350) must be correct. • The motor must not be obstructed or overloaded. • Increase ramp-up time. • Reduce boost level.	Off2

Error	Cause	Diagnosis/Remedy	Reaction
F0002, Overvoltage	• DC link voltage (r0026) exceeds trip level. • 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: • The supply voltage must lie within the limits indicated on the rating plate. • The DC link voltage controller must be enabled (P1240) and parameterized correctly. • The ramp-down time (P1121) must match the inertia of load. • The required braking power must lie within the specified limits. **NOTE:** Higher inertia requires long ramp-down times; otherwise, apply braking resistor.	Off2
F0003, Undervoltage	• Mains supply failed. • Shock load outside the specified limits.	Check the following: • The supply voltage must lie within the limits indicated on the rating plate. • The supply voltage must not be susceptible to temporary failures or voltage reductions outside tolerance.	Off2
F0004, SED2 Overtemperature	• Ventilation is inadequate. • The fan is inoperative. • The ambient temperature is too high.	Check the following: • The fan must turn when the SED2 is running. • The pulse frequency must be set to a lower value. • The ambient temperature could be higher than specified for the SED2.	Off2
F0005, SED2 I2T	• The SED2 is overloaded. • The duty cycle is outside the tolerance. • The motor power (P0307) exceeds the SED2 power (P0206).	Check the following: • The load cycle must lie within the limits specified. • 2Motor power (P0307) SED2 power (P0206).	Off2
F0011, Motor overtemperature	• The motor is overloaded	Make sure that the load duty cycle (temporary overload) lies within the limits specified.	Off1

Error	Cause	Diagnosis/Remedy	Reaction
F0012, SED2 temperature signal lost	• Wire breakage of the SED2 temperature sensor (heat sink).		Off2
F0015, Motor temperature signal lost	• Breakage or short-circuit of the motor temperature sensor. • If a signal loss is detected, temperature monitoring switches to monitoring the thermic motor image.		Off2
F0020, 1 phase for mains supply missing	• One of the 3 phases for the mains supply voltage is missing.	Check the wiring of the 3 phases at the supply voltage input of the SED2.	Off2
F0021, ground fault	• The ground fault occurs if the sum of the phase currents is higher than 5% of the nominal SED2 current. **NOTE:** This error message occurs on SED2 drives with three current sensors; that is, for SED2 drives of frame sizes D to F.		Off2
F0022, Power stack fault	The fault is caused by the following events: (1) dc link overcurrent =short circuit of IGBT. (2) short circuit of dc link chopper (3) earth fault. Frame sizes A to C = (1),(2),(3). Frame sizes D to E = (1),(2). Frame size F = (2). Since all these faults are assigned to one signal on the power stack, it is not possible to establish which one actually occurred.		Off2
F0023, Fault at SED2 output	• The On-phase is interrupted at the SED2 output.		Off2

Error	Cause	Diagnosis/Remedy	Reaction
F0024, Rectifier overtemperature	• The ventilation is inadequate. • The fan is inoperative. • The ambient temperature is too high.	Check the following: • The fan must turn when the SED2 is running. • The pulse frequency (P1800) must be set to default value 4 kHz.	
F0030, Fan Fault	• The fan no longer works.	The fault cannot be masked while the options module (BOP or AOP) is connected. Replace the fan.	Off2

Error	Cause	Diagnosis/Remedy	Reaction
F0041, Motor data identification failure	• Motor data identification failed • Alarm value = 0: Load is missing • Alarm value = 1: Current limit value reached during identification. • Alarm value = 2: Identified stator resistance less than 0.1% or more than 100%. • Alarm value = 3: Identified rotor resistance less than 0.1% or more than 100%. • Alarm value = 4: Identified stator reactance less than 50% or more than 500%. • Alarm value = 5: Identified main reactance less than 50% or more than 500%. • Alarm value = 6: Identified rotor time constant less than 10 ms or more than 5s. • Alarm value = 7: Identified total leakage reactance less than 5% or more than 50%. • Alarm value = 8: Identified stator leakage reactance less than 25% or more than 250%. • Alarm value = 9: Identified rotor leakage reactance less than 25% or more than 250%. • Alarm value = 20: Identified IGBT ON-voltage less than 0.5 or more than 10V. • Alarm value = 30: Current controller at voltage limit. • Alarm value = 40: Inconsistency of identified data set, at least one identification failed. Percentage values based on impedance Zb = Vmot,nom / sqrt(3) / Imot,nom.	0: Check if the motor is connect to the SED2. 1-40: Check if the motor data in P0304 to P0311 are correct. Check the type of motor wiring required (star, delta).	Off2

Error	Cause	Diagnosis/Remedy	Reaction
F0051, Parameter EEPROM fault	• Read or write failure while saving non-volatile parameter	Reset SED2 to factory setting and re-parameterize	Off2
F0052, Power stack fault	• Read failure for power stack information or invalid data.	Exchange SED2.	Off2
F0053, I/O EEPROM fault	• Read failure for I/O EEPROM information or invalid data.	Check the data. Exchange the I/O module.	Off2
F0054, Wrong I/O print	• I/O print is not connected. • Wrong I/O print is connected. • No ID found on I/O print, no data.	Check data flow. Exchange I/O module.	Off2
F0060, ASIC timeout	• Internal communication error.	If error reappears, exchange SED2. Contact customer service.	Off2
F0070, CB setpoint fault	• No setpoints from CB (communications board) during telegram off time.	Check communications module (CB) and communications partner.	Off2
F0071, USS (BOP link) setpoint fault	• No setpoints from USS during telegram off time.	Check communications to data transmission module. Check USS master.	Off2
F0072, USS (COM link) setpoint fault	• No setpoints from USS during telegram off time	Check USS master.	Off2
F0080, ADC input signal lost	• Broken wire at analog input. • Signal level outside defined limits.		Off2
F0085, External fault	• External fault triggered via input terminals.	Disable input terminals for fault trigger, or eliminate external fault. Check if DIN is set to ON.	Off2
F0101, Stack overflow	• Software or processor error.	Run self-test routines.	Off2
F0221, PID feedback below min. value	• PID feedback below minimum value of P2268, minimum value for PID feedback.	Change value of P2268. Adjust feedback amplification.	Off2
F0222	• PID feedback above maximum value.	PID feedback, maximum value of P2267 (maximum value for PID feedback). Adjust feedback amplification.	Off2

Error	Cause	Diagnosis/Remedy	Reaction
F0450, BIST tests failure	Alarm value: 1. Some power section tests have failed. 2. Some control board tests have failed. 4. Some functional tests have failed. 8. Some I/O module tests have failed. 16. Internal RAM failed on power-up check.	The drive may run, but some functions do not work properly. Replace the drive.	Off2
F0452, Belt failure detected	• Load condition changes at the motor indicate a belt failure or mechanical fault.	Check the following: • Drive belt OK? Is the drive obstructed or seized? • If external speed sensor is used, check proper function. Check the following parameters: -- P0409 (pulses/sec at rated frequency) -- P2191 (belt failure speed tolerance monitoring) -- P2192 (delay time for P2191). • For belt failure detection without sensor, check the following parameters: -- P2182 (threshold frequency f1) -- P2183 (threshold frequency f2) -- P2184 (threshold frequency f3) -- P2185 (upper torque threshold 1) -- P2186 (lower torque threshold 1) -- P2187 (upper torque threshold 2) -- P2188 (lower torque threshold 2) -- P2189 (upper torque threshold 3) -- P2190 (lower torque threshold 3) -- P2192 (delay for belt failure). • Lubricate the drive if necessary.	Off2

Reading Faults

- OK FAULT (r0052, bit 3) is a read-only fault status point (0=OK, 1=Fault).
- LAST FAULT (r0947(0)) shows the code for the most recent fault.

Resetting Faults

- Press Fn to reset a fault condition.
- OK FAULT (r0052, bit 3) is a read-only fault status point (0=OK, 1=Fault). It can be acknowledged with FAULT ACK (r0054, bit 7). Setting FAULT ACK (r0054, bit 7) resets the fault (1=Reset Fault).

NOTE: It is possible that motor performance may be affected at low frequencies if parameter P1310 falls under 50% (default value).

Warning Messages

Error	Cause	Diagnosis and Remedy	Reaction
A0501, Current limit	• Motor power > SED2 power. • Motor cables are too long. • Ground faults.	Check the following: • Motor power (P0307) SED2 power (P0206). • Cable length limits must not be exceeded. • Motor cable and motor must not have short circuits or earth faults. • Motor parameters must match the motor in use. • Value of stator resistance (P0350) must be correct. • The motor must not be obstructed or overloaded. • Increase ramp-up time. • Reduce boost level.	--
A0502, Overvoltage limit	• The overvoltage limit is reached. This warning may appear on ramp-down if the DC link is disabled (P1240 = 0).	If this warning is displayed permanently, check the drive input voltage or extend the ramp-down time for the drive.	--
A0503, Undervoltage limit	• Main power failed. The main power and consequently the DC link voltage (r0026) are below the defined threshold value.	Check the main supply voltage.	--

Error	Cause	Diagnosis and Remedy	Reaction
A0504, SED2 overtemperature	• The warning level of the SED2 heat sink temperature (r0037) is exceeded. This results in a reduced pulse frequency and/or a reduced output frequency (dependent on parameter setting in (P0610).	Check the following: • The ambient temperature must lie within the limits specified. • The load conditions and duty cycle must lie within the specified conditions. • The fan must turn when the SED2 is running.	--
A0505, SED2 I2T	• Warning level exceeded. The current supply is reduced if parameter P0610 is set to 1.	Check that the duty cycle lies within the limits specified. Motor power (P0307) (SED2 power) (P0206).	--
A0506, SED2 duty cycle	• Difference between the heat sink temperature and the IGBT exceeds the warning levels.	Check the following: Make sure that the load duty cycles (temporary overload) lie within the limits specified.	--
A5011, Motor overtemperature I2T	• The motor is overloaded. • The duty cycle is outside the tolerance.		--
A0520, Rectifier overtemperature	• The warning level of the rectifier heat sink temperature is exceeded.	Check the following: • The ambient temperature must lie within the limits specified. • The load conditions and duty cycle must lie within the specified conditions. • The fan must turn when the SED2 is running.	--
A0523, SED2 output fault	• The On-phase is interrupted at the SED2 output.		--
A0541, Motor data identification enabled	• Motor data identification (P1910) selected or running.		--
A0600, RTOS data loss			--

Error	Cause	Diagnosis and Remedy	Reaction
A0910, Vdc (max.) controller disabled	• Vdc maximum controller disabled as not able to keep the DC link voltage (r0026) within threshold limits. • Permanent supply overvoltage. • Occurs if the motor is driven by a load forcing the motor to go into energy recovery operation. • Occurs during ramp-down of very high duty cycles.	Check the following: • Input voltage must lie within specified range. • The load must be adjusted. • In some cases, brake resistance must be applied.	--
A0911, Vdc (max.) controller enabled	• Vdc maximum controller is enabled. The ramp-down times are increased automatically to keep the DC link voltage (r0026) within the limits specified.		--
A0912, Vdc (min) controller enabled	Vdc minimum controller enabled if the DC link voltage (r0026) drops below the minimum value. The motor's kinetic energy is used to buffer the DC link voltage and thus slow the drive. Temporary supply failures do not automatically lead to undervoltage shutdown.		--
A0920, ADC parameters not set properly	• ADC parameters must not be set to identical values, as illogical values would result. • Index 0: Parameter settings for output identical. • Index 1: Parameter settings for input identical. • Index 2: Parameter settings for input do not correspond to ADC type.		--

Error	Cause	Diagnosis and Remedy	Reaction
A0921, DAC parameters not set properly	• DAC parameters must not be set to identical values, as illogical values would result. • Index 0: Parameter settings for output identical. • Index 1: Parameter settings for input identical. • Index 2: Parameter settings for output do not correspond to DAC type.		--
A0922, No load applied to SED2	• No load is applied to the SED2. • Some functions may not work as under normal load conditions.		--
A0923, Both JOG left and JOG right are requested	• Both JOG right and JOG left have been requested. This freezes the RFG output frequency at its current value.		--
A0924, Belt failure detected	• Load conditions at the motor indicate a belt failure or mechanical fault.	Check the following: • No breakage, seizure, or obstruction of drive train. • Correct operation of external speed sensor, if in use.	--

Chapter 8 — Technical Data Specification Options

General Specifications

Specification	Description
Operating temperature ranges	IP20 and NEMA Type 1: 14°F to 104°F (–10°C to 40°C) IP54 and NEMA Type 12: 14°F to 104°F (–10°C to 40°C)
Storage temperature	–40°F to 158°F (–40°C to 70°C)
Humidity	95% relative humidity — non-condensing.
Altitude	Up to 3280 ft (1000 m) above sea level without performance decrease.
Overload capacity	10% periodic overload capacity for 60 seconds within 5 minutes relative to the nominal output current.
Protection functions	Protection against: Undervoltage, overvoltage, ground fault, short-circuit, stall, rotor jam, motor overtemperature, SED2 overtemperature.
Electromagnetic compatibility	Integrated EMC filter as per EN 55011 class B as footprint filter for frame sizes A to C, IP20. The filter is integrated in the SED2 for frame sizes D to F, IP20 and for all IP54 devices. Satisfies the requirements of EMC product standard EN 61800-3.
Input frequency	47 to 63 Hz
Setpoint resolution	0.01 Hz digital, 0.01 Hz serial, 10 bit analog
Switching frequency	4 to 16 kHz (2 kHz steps).
Fixed frequencies	15 programmable
Masking frequencies	4 programmable
Analog inputs	Number: 2 Can be changed over to 0/2 to 10V (programmable scaling) or 0/4 to 20 mA (programmable scaling). Terminals used: 3, 4, 10, 11 Resolution: 10 bits Read cycle: 10 ms. Analog inputs AIN1 and AIN2 are configurable for direct connection of an Ni 1000 temperature sensor.

Specification	Description
Digital inputs	6 (potential-free) inputs (extendable to 8) Freely programmable and possible changeover (sink, source) Terminals used: 5, 6, 7, 8, 16, 17 Min. input current: 6 mA (actual: 8 mA) at ≥15V Logical 0 = <3V, logical 1 = >13V Max. input voltage: 33V
Analog outputs	Number: 2 Can be changed over for 0 to 10V or 0/4 to 20 mA, (programmable scaling/parameter). Factory setting: 0 to 10V. Terminals used: 12, 13, 26, 27 Impedance on configuration 0 to 10V: 1K Ω Read cycle: 10 ms
Relay outputs	2 programmable relays, 6 contacts. Relay 1 Terminals: 18, 19, 20 Relay 2 Terminals: 23, 24, 25 Max. contact rating: DC 30V/5 A, (resistive) AC 250V/2 A (resistive)
Auxiliary supply 24V	Galvanically separated, unregulated auxiliary supply (18 to 32V), 100 mA Terminal 9.
Serial interface	RS-485 (RS-232 optional with converter) Protocols: USS, P1, and N2 Transmission rate: Up to 38.4K Baud (default 9.6K Baud)
Power factor	≥0.7 total PF ≥0.98 displacement
VFD degree of efficiency	96 to 97%
Switch-on current:	Less than nominal input current
Braking	DC braking, dynamic braking
CE conformity	Corresponds to the requirements of the low-voltage guideline 73/23/EEC, supplemented by guideline 98/68/EEC and EMC. If installed according to the recommendations issued in this manual, the SED2 satisfies all EMC guideline requirements as defined in the *EMC Product Standard for Power Drive Systems EN 61800-3*.

Dimensions and Weights

Dimensions and weight (frame sizes A to C, IP20)		
Frame size	**W x H x D Inches (mm)**	**Weight lb (kg)**
A	2.9 (73) x 6.8 (173) x 5.9 (149)	2.9 (1.3)
B	5.9 (149) x 8.0 (202) x 6.8 (172)	7.5 (3.4)
C	7.3 (185) x 9.6 (245) x 7.7 (195)	12 (5.5)
D	10.8 (275) x 20.5 (520) x 9.6 (245)	35 (16)
E	10.8 (275) x 25.6 (650) x 9.6 (245)	44 (20)
F	13.8 (350) x 33.5 (850) x 12.6 (320)	123 (56)

Dimensions and weight (frame sizes B to F, IP54/NEMA 12)		
Frame size	**W x H x D Inches (mm)**	**Weight lb (kg)**
B	10.6 (270) x 15.2 (385) x 10.6 (268)	23 (10.3)
C	13.8 (350) x 23.9 (606) x 11.2 (284)	42 (19.2)
D	14.2 (360) x 27.0 (685) x 13.9 (353)	77 (35)
E	14.2 (360) x 34.8 (885) x 17.8 (453)	106 (48)
F	17.7 (450) x 45.3 (1150) x 18.6 (473)	179 (81)

Unit-specific Data

200V to 240V, ± 10%, 3 phase

Output power (variable torque)		**IP code**	**Max. input current 3 phase**	**Max. output current**	**Frame size**	**Part Number**
kW	hp	IP	A	A		
0.37	0.5	20	2.4	2.3	A	SED2-0.37/22X
0.55	0.75	20	3.1	3	A	SED2-0.55/22X
0.75	1	20	4.3	3.9	A	SED2-0.75/22X
1.1	1.5	20	6.2	5.5	B	SED2-1.1/22X
1.5	2	20	8.3	7.4	B	SED2-1.5/22X
2.2	3	20	11.3	10.4	B	SED2-2.2/22X
3	4	20	15.6	13.6	C	SED2-3/22X
4	5	20	20.1	17.5	C	SED2-4/22X
5.5	7.5	20	26.3	22	C	SED2-5.5/22X

200V to 240V, ± 10%, 3 phase

Output power (variable torque)		IP code	Max. input current 3 phase	Max. output current	Frame size	Part Number
kW	hp	IP	A	A		
7.5	10	20	36.4	28	C	SED2-7.5/22X
11	15	20	46	42	D	SED2-11/22X
15	20	20	60	54	D	SED2-15/22X
18.5	25	20	75	68	D	SED2-18.5/22X
22	30	20	88	80	E	SED2-22/22X
30	40	20	114	104	E	SED2-30/22X
37	50	20	143	130	F	SED2-37/22X
45	60	20	170	154	F	SED2-45/22X

380V to 480V, ± 10%, 3 phase

Output power (variable torque)		IP code	Max. input current 3 phase	Max. output current	Frame size	Part Number
kW	hp	IP	A	A		
0.37	0.5	20	1.6	1.2	A	SED2-0.37/32X
0.55	0.75	20	2.1	1.6	A	SED2-0.55/32X
0.75	1	20	2.8	2.1	A	SED2-0.75/32X
1.1	1.5	20	4.2	3	A	SED2-1.1/32X
1.5	2	20	5.8	4	A	SED2-1.5/32X
2.2	3	20	7.5	5.9	B	SED2-2.2/32X
3	4	20	10	7.7	B	SED2-3/32X
4	5	20	12.8	10.2	B	SED2-4/32X
5.5	7.5	20	16.6	13.2	C	SED2-5.5/32X
7.5	10	20	24	18.4	C	SED2-7.5/32X
11	15	20	33.8	26	C	SED2-11/32X
15	20	20	42	32	C	SED2-15/32X
18.5	25	20	45.7	38	D	SED2-18.5/32X
22	30	20	50	45	D	SED2-22/32X
30	40	20	68	62	D	SED2-30/32X
37	50	20	83	75	E	SED2-37/32X
45	60	20	99	90	E	SED2-45/32X
55	75	20	121	110	F	SED2-55/32X

380V to 480V, ± 10%, 3 phase

Output power (variable torque)		IP code	Max. input current 3 phase	Max. output current	Frame size	Part Number
kW	hp	IP	A	A		
75	100	20	160	145	F	SED2-75/32X
90	125	20	196	178	F	SED2-90/32X
1.1	1.5	54	4.2	3	B	SED2-1.1/35X
1.5	2	54	5.8	4	B	SED2-1.5/35X
2.2	3	54	7.5	5.9	B	SED2-2.2/35X
3	4	54	10	7.7	B	SED2-3/35X
4	5	54	12.8	10.2	B	SED2-4/35X
5.5	7.5	54	16.6	13.2	C	SED2-5.5/35X
7.5	10	54	24	18.4	C	SED2-7.5/35X
11	15	54	33.8	26	C	SED2-11/35X
15	20	54	42	32	C	SED2-15/35X
18.5	25	54	45.7	38	D	SED2-18.5/35X
22	30	54	50	45	D	SED2-22/35X
30	40	54	68	62	D	SED2-30/35X
37	50	54	83	75	E	SED2-37/35X
45	60	54	99	90	E	SED2-45/35X
55	75	54	121	110	F	SED2-55/35X
75	100	54	160	145	F	SED2-75/35X
90	125	54	196	178	F	SED2-90/35X

500V to 600V, ± 10%, 3 phase

Output power (variable torque)		IP code	Max. input current 3 phase	Max. output current	Frame size	Part Number
kW	hp	IP	A	A		
0.75	1	20	2	1.4	C	SED2-0.75/42X
1.1	1.5	20	2.5	2.1	C	SED2-1.1/42X
1.5	2	20	3.2	2.7	C	SED2-1.5/42X
2.2	3	20	4.4	3.9	C	SED2-2.2/42X
3	4	20	6.3	5.4	C	SED2-3/42X
4	5	20	6.9	6.1	C	SED2-4/42X

500V to 600V, ± 10%, 3 phase

Output power (variable torque)		IP code	Max. input current 3 phase	Max. output current	Frame size	Part Number
kW	hp	IP	A	A		
5.5	7.5	20	9.4	9	C	SED2-5.5/42X
7.5	10	20	12.6	11	C	SED2-7.5/42X
11	15	20	18.1	17	C	SED2-11/42X
15	20	20	24.9	22	C	SED2-15/42X
18.5	25	20	30	27	D	SED2-18.5/42X
22	30	20	35	32	D	SED2-22/42X
30	40	20	45	41	D	SED2-30/42X
37	50	20	57	52	E	SED2-37/42X
45	60	20	68	62	E	SED2-45/42X
55	75	20	85	77	F	SED2-55/42X
75	100	20	109	99	F	SED2-75/42X
90	125	20	138	125	F	SED2-90/42X
1.1	1.5	54	2.5	2.1	C	SED2-1.1/45X
1.5	2	54	3.2	2.7	C	SED2-1.5/45X
2.2	3	54	4.4	3.9	C	SED2-2.2/45X
3	4	54	6.3	5.4	C	SED2-3/45X
4	5	54	6.9	6.1	C	SED2-4/45X
5.5	7.5	54	9.4	9	C	SED2-5.5/45X
7.5	10	54	12.6	11	C	SED2-7.5/45X
11	15	54	18.1	17	C	SED2-11/45X
15	20	54	24.9	22	C	SED2-15/45X
18.5	25	54	30	27	D	SED2-18.5/45X
22	30	54	35	32	D	SED2-22/45X
30	40	54	45	41	D	SED2-30/45X
37	50	54	57	52	E	SED2-37/45X
45	60	54	68	62	E	SED2-45/45X
55	75	54	85	77	F	SED2-55/45X
75	100	54	109	99	F	SED2-75/45X
90	125	54	138	125	F	SED2-90/45X

Options

Depending on the application, various options are available for the SED2.

Gland plate (FS A: SED2-GL-A, FS B: SED2-GL-B, FS C: SED2-GL-C):
The gland plate simplifies and improves connection of motor and control cables via conduit. There are different gland plates depending on the frame size of the SED2.

Protective shield (FS A: SED2-DC-A, FS B: SED2-DC-B, FS C: SED2-DC-C, FS D-E: SED2-DC-DE):
Use the protective shield for NEMA Type 1 rating, IP20 VFDs. The protective shield easily mounts on the top of the SED2, frame sizes A through E.

Advanced Operator Panel (AOP) (SED2-AOP1):
Operator panel with multilingual and multi-line clear-text display that can be used instead of the BOP. The AOP can be inserted on the SED2 or integrated in the front plate or the control panel doors by means of a door kit.

BOP/AOP door mounting kit for control of one SED2 drive (SED2-DOOR-KIT1):
Used to mount the BOP or AOP in the control cabinet door. The set contains a BOP/AOP cable adapter PCB, and an adapter for the SED2 that is inserted in the SED2 in place of the BOP or AOP. The RS-232 serial interface and the power cables both connect to the adapters, which have screwless connection terminals. The 4-conductor connection cable is not part of the mounting set.

BOP/AOP door mounting kit for control of multiple SED2 drives (SED2-DOOR-KIT2):
The AOP communicates with several SED2 drives via RS-485 (USS protocol). This mounting set allows for controlling several SED2 drives in a control panel by means of one AOP (mounted in the control cabinet door). Thus, up to 31 SED2 drives can be controlled from one AOP.

The AOP interface PCB also contains a separate RS-232 interface. The SED2 uses this interface to communicate with a PC. The cables are not included in the set.

PC – SED2 connection kit (SED2-PC-KIT):
This kit helps control or program the SED2 from a PC via the RS-232 serial interface by using commissioning software. The set contains an RS-232 adapter card that is snapped on the SED2 in place of the AOP or BOP. The RS-485 interface is not used.

PC – AOP Kit (SED2-PC-AOP-KIT):
Allows for programming the AOP independent of the SED2 from a PC, or to download or upload complete sets of parameters. The kit consists of a 3 m long cable and a power supply unit (to supply power to the AOP). The kit does not include the AOP.

Chapter 9 — SED2 Communications

Overview

The SED2 drives are a family of inverters that are built, sold, and serviced by Siemens Building Technologies, Inc.- Adjustable Frequency Drives Group (SBT-Drives). Siemens Building Technologies has a Protocol 1 (P1) communication driver, FLN connection, and point database that is built into their drives and allows them to coexist on an APOGEE network with other floor level network (FLN) devices.

The Siemens Building Technologies representative is responsible for proper configuration of the drive for its primary application as well as field panel programming, to make use of the drive functionality in the building automation system.

Chapter 9 describes how to access the SED2 from a field panel and how to use a SED2 as part of a larger control scheme.

Using the Serial Interface

The serial interface uses an RS-485 two-wire connection. Up to 30 drives can connect on a single RS-485 link, and drives can be addressed individually or with a broadcast message. This configuration requires a separate master controller and the drives act as slaves.

Using a serial interface has several advantages:

- Wiring can be greatly reduced.
- Control functions can be changed without rewiring.
- Parameters can be set up and changed via the interface.
- Performance can be continuously monitored and controlled.

Working with Serial Communications

Introduction

This section describes the hardware aspects of the serial communications that are used with the SED2. It does not discuss or detail the software protocols that are used or how to debug the software. Software protocols are discussed later in this section.

RS-232 and RS-485 Serial Interfaces

Serial communications use carefully defined hardware and software protocols.

The software protocol defines the baud rate, word length, and meaning of the signal, and can be defined by designers for their particular needs. Standards can also be specially developed, but most users adopt an existing standard. Typical standards are RS-232 and RS-485. These standards define voltages, impedance, etc. but not the software protocol.

RS-232

Personal computers use the RS-232 standard for interfacing to a peripheral. When fully implemented, it uses many interconnecting wires and protocols to exchange data. In its most simple form, it consists of three wires: transmit, Tx; receive, Rx; and ground, GND. It allows communications between two machines only over a short distance. The Tx line of one machine connects to the Rx of another, and vice-versa. Voltage levels are typically +/- 12V.

RS-485

The RS-485 standard allows communications between many machines, has a high noise immunity, and operates over long distances (up to 1000m, 3280 ft). It uses differential voltages, switching between 0 and 5V. All Siemens drives use RS-485 hardware protocol and some offer RS-232 interfaces as well.

Typical RS-485 Multi–drop Interface

Troubleshooting with RS-485

The following notes help understand hardware problems that occur with RS-485 systems and Siemens drives.

- RS-485 is used extensively during the testing of the SED2 in production, and is fully tested before the drive is shipped.
- Hardware problems with RS-485 are often associated with reversed polarity. It is essential to connect P+ and N- correctly in all cases.
- Termination resistors are recommended in industrial environments. A value of 120 ohms between the P+ and N- inputs is recommended, and should mount to the drive farthest from the controller. Occasionally, additional biasing resistors may be placed between P+ and 24V, N- and 0V, but these are not usually necessary as the drives include internal biasing resistors.
- Always test an RS-485 system in the simplest configuration. For example, use a controller with one drive and use the default address and baud rate.
- Look at the bus with an oscilloscope. The drive will always respond to a valid message. This means that the drive listens to the bus at all times, and will reply to all messages with the correct identifier and Cyclic Redundancy Check (CRC). The only exception is the broadcast message, which none of the drives answers.
- Check the drive address. All drives on a bus must have unique addresses, even if they are in local control. The drives will always reply to a valid message, even if serial control is not enabled.

I/O, Point Database, and Parameters

Hardware Inputs and Outputs

For a complete list of SED2 hardware inputs and outputs, see other sections of this manual. The field panel can access selected I/O to the SED2.

Point Database

Table 8 provides point database information for Application 2722. For complete descriptions of these points, see other sections of this Users Manual and the Parameter List.

For more information on installation, start-up, and programming, see other sections in this manual.

Ordering Notes

All SED2 drives come standard with FLN (P1) integration available and no additional parts are required.

FLN Connections:

- P+ = Terminal 29
- N- = Terminal 30
- Do not terminate shield

Setting up Parameters for the SED2

Table 7 lists the parameters required for correct FLN communications and control of the SED2.

CAUTION:

Changes made to the parameters other than what is listed in Table 7 can result in damaging the drive or building equipment.

Table 7. Set-up Parameters.

Parameter Number/Name	Value
P0003: User access Level	Set to **3** to allow access to required parameters.
P2040: CB telegram off time	Set to **0** (watchdog disabled) to tell the SED2 to start looking for communication via the setting of P2041.
P2041 (index 0): CB parameter	Set to **1** for FLN (P1) control. (Set to **2** for FLN (N2) control.)
P0918: CB address	Set to **99** for (P1) addressing of the device. (Set to *3* for (N2) addressing of the device.) Unit must be powered down to establish P1 communications, and then the address is assigned. The address will go back to the default of 99 when the drive is powered down.
P0700 (index 0)	Set to **6** tells the SED2 to look for a start command from P1 in the auto mode.
P1000 (index 0)	Set to **6** tells the SED2 to look for its speed source from P1 in the auto mode.

Since there is a limited life to EEPROM writes, set the Network Fault Indicator to **0** only when troubleshooting a communications problem.

If a factory reset of parameters is desired set P0010 to 30 then set P0970 to 1.

Verifying Parameters

After the SED2 setup, verify the parameters by performing the following steps using the drive keypad:

1. Press **P**.
2. r0000 should display. Use ⇑ and ⇓ to scroll to the appropriate parameter.
3. Press **P** to view the value of the parameter.
4. Use ⇑ and ⇓ to scroll to the appropriate value for the parameter.
5. Return to the display readout by pressing **Fn** and then **P**.

Using the SED2 with SBT (P1)

The SED2 controls the speed of fans, pumps, and other equipment. The following strategies achieve the required control sequence. The field panel commands other tasks and functions specific to the SED2.

Strategies for FLN (P1)

Monitoring – Several SED2 parameters are available for monitoring purposes. These include both binary and analog data.

- FREQ OUTPUT (Point 3); the output frequency of the SED2 in Hz
- SPEED (Point 5); the SED2 output speed in RPM
- CURRENT (Point 6); the output current of the SED2 in amps
- TORQUE (Point 7); torque in percentage of nominal torque
- DC BUS VOLTS (Point 13); the DC bus voltage of the SED2
- RATED POWER (Point 16); the motors rated power
- OUTPUT VOLTS (Point 17); the output voltage applied to the motor
- ENABLED (Point 27); the SED2 is ready to run or disabled
- READY TO RUN (Point 28); the ready status of the SED2
- FREQ REFERENCE (Point 51); percent of the SED2 speed setting
- LAST FAULT (Point 90); last fault code that occurred
- 1st, 2nd & 3rd FAULT (Points 91 to 93); the three faults that occurred before the last fault

In addition to the above, ADDESS (Point 1), APPLICATION (Point 2), TIME (Point 20), DAYNIGHT (Point 29), and OVRD and ERROR STATUS (Point 99) are supported by and comply with FLN requirements.

Unbundle these points for monitoring or use them in various control strategies. For a detailed description of these drive parameters, see other sections in this User Manual.

Additional display points on the SED2 drive that may be of use:

- INVERTER VER (Point 83); the SED2 firmware version number
- DRIVEMODEL (Point 84); the STB drive model number

Supervisory Control – This is the most typical application. The sensor for the control variable (water temperature) is hard-wired to the SED2 and the built-in SED2 control loop (PI loop macro must be enabled during drive setup) modulates the control device (fan). Change Point 64 (Parameter P2200) to 1 to enable PID control. When using the SED2 PID mode, you will need to program other parameters depending on the application circumstances. These parameters include PID system gain, integral, and differential adjustment to stabilize the PID control system for the application. Set these parameters during SED2 commissioning. For examples of the PID loop macro, see other sections in this User Manual.

When using this strategy, the point to unbundle and command for the setpoint is FREQ REF (Point 51). FREQ REF (Point 51) has a slope of 0.006103516, which corresponds to a value of 16384 (4000h)=100%.

Unbundle PI FEEDBACK (Point 60) to monitor the control variable (water temperature). These points are provided with units of percent, where 0% and 100% correspond to the range of the sensor that measures the control variable. Therefore, if you want to read in the proper units of the controlled variable (such as degrees Fahrenheit, WC), unbundle the setpoint with the appropriate slope and intercept from the point database:

$$\text{New Slope} = \frac{(\text{Desired Range}) \times (\text{Slope of Existing Point})}{\text{Range of Existing Point}}$$

$$= \frac{(60 - 0\ \text{HZ}) \times (0.01)}{100 - 0\ \%} = 0.006$$

The new intercept equals the lowest value of the desired range.

Example: The following example illustrates this conversion procedure.

You are controlling water temperature from a cooling tower using the SED2 to control a fan. The temperature sensor has a range of 30 to 250 degrees Fahrenheit.

To unbundle the setpoint (FREQ REF), for commanding in degrees Fahrenheit, where 0 to 60 Hz is equal to 30 to 250 degrees Fahrenheit:

New Intercept = 30 (the temperature that corresponds to 0%)

$$\text{New Slope} = \frac{(\text{Desired Range}) \times (\text{Slope of Existing Point})}{\text{Range of Existing Point}}$$

$$= \frac{(250 - 30\ \text{degrees Fahrenheit}) \times (0.006103516)}{100 - 0\%} = 0.01343$$

To unbundle the feedback (PI FEEDBACK) for monitoring in degrees Fahrenheit:

New Intercept = 30

$$\text{New Slope} = \frac{(\text{Desired Range}) \times (\text{Slope of Existing Point})}{\text{Range of Existing Point}}$$

$$= \frac{(250 - 30\ \text{degrees Fahrenheit}) \times (0.01)}{100 - 0\%} = 0.022$$

Slaving the Drive

CAUTION:

This strategy is not normally recommended because you are using the network communications to close the loop. Delays due to network traffic can cause control to be degraded or lost, and depending on the setup of the drive, if there is a problem with the network, the drive may cause physical damage to the HVAC system by winding up to its maximum or dropping off to its minimum speed.

Other Functionality

Enable any of the following functions during SED2 startup.

Enable the drive to run – RUN ENABLE (Point 35) commands the drive to disable or enable operation. If commanded OFF, the drive will coast to a stop. If commanded ON, the drive can turn on. This function is typically used for safety.

NOTE: RUN ENABLE (Point 35) commands the drive to enable or disable operation. READY TO RUN (Point 28) indicates whether the drive is in the Ready or Off state. ENABLED (Point 27) indicates whether drive operation is enabled. To run the motor from P1, enable RUN ENABLE (Point 35), start CMD START (Point 24), and set the drive CONTROL MODE (Point 26) to either the Local or Serial control mode.

Drive speed setting – FREQ REF (Point 51) can be set from 0 to 100 percent of the drive speed. FREQ ACTUAL (Point 52) and FREQ MAX (Point 53) are settings that can be monitored.

Start and stop the drive – CMD STP.STRT (Point 24) commands the drive to start or stop (1=START, 0=STOP). READY TO RUN (Point 28) shows the current status of the drive. STOP RUN (Point 23) monitors the current running status of the motor (0=STOPPED, 1=RUNNING).

WDOGTIME – Sets the time interval in which P1 communication must take place between WDOGTIME (Point 80) of the SED2 and the FLN. If no communication occurs during this time, a WDOGTIME fault registers (F070). Watchdog set to 0 disables the watchdog.

Change drive directions – CMD FWD.REV (Point 22) commands the drive to change direction. FWD.REV (Point 21) shows the current direction of the drive rotation.

CAUTION:

Changing drive directions while the controlled equipment is moving can damage HVAC equipment.

Switch between hand and auto modes – SEL HND.AUTO (Point 34) changes drive operation between hand and auto modes. The actual source in each mode is set in the SED2 programming.

Digital Inputs – Use DIGITAL IN 1 through DIGITAL IN 6 (Points 71 through 76) to monitor the status of the SED2 digital inputs from the field panel. This is useful when the SED2 is programmed for control of drive functions (start/stop, fault reset, off, etc.) via the SED2 control terminal strip. Over the P1 serial link, you can monitor a control sequence that requires receipt of a contact closure on the SED2 terminal strip.

Digital Outputs – RELAY OUT 1 (Point 40) and RELAY OUT 2 (Point 41) are physical DOs on the SED2 and can be monitored to confirm drive status. Their purpose depends on how the drive has been set up. The drive can be programmed so that these points can display various limits, warnings, and status conditions. Some examples include frequency limit, over current, and motor over temperature fault.

Analog Inputs – Use ANALOG IN 1 (Point 45) and Analog IN 2 (Point 46) to monitor the status of the drives analog inputs (4 to 20 mA) from the field panel. For example, the chilled water feedback could be sent to the field panel, calculations performed, and the chilled water valve control command could be sent from the field panel through the drive and control the drive analog output over ANALOG OUT 1 (Point 47).

Analog Outputs – Use ANALOG OUT 1 (Point 47) and ANALOG OUT 2 (Point 48) to control an output (4 to 20 mA) from the field panel.

Loop gains – P GAIN (Point 61), I GAIN (Point 62), and D GAIN (Point 63) are gain parameters similar to the P and I gains in the APOGEE TECs. The Siemens Building Technologies representative must program the actual P and I gain constants through the SED2 drive.

Address limitations – Set CRLR ADDRESS (Point 1) to any value from **0** through **99**. The default value for this point is 99.

Table 8. Point Database for Application 2722.

Point Number	Point Type	Descriptor	Factory Default (SI Units)	Engr. Units (SI Units)	Slope (SI Units)	Intercept (SI Units)	On Text	Off Text
01	LAO	CTLR ADDRESS	99	-	1	0	-	-
02	LAO	APPLICATION	2722	-	1	0	-	-
{03}	LAI	FREQ OUTPUT	0	HZ	.04	-650	-	-
{05}	LAI	SPEED	0	RPM	1	-16250	-	-
{06}	LAI	CURRENT	0	A	0.5	0	-	-
{07}	LAI	TORQUE	0	NM	.02	-3250	-	-
{08}	LAI	ACTUAL POWER	0	HP/KW	.01	0	-	-
{09}	LAI	TOTAL KWH	0	KWH	1	0	-	-
{13}	LAI	DC BUS VOLT	0	V	1	0	-	-
{14}	LAI	REFERENCE	0	HZ	.04	-650	-	-
{16}	LAI	RATED PWR	0	HP/KW	.01	0	-	-
{17}	LAI	OUTPUT VOLTS	0	V	1	0	-	-
20	LAO	OVRD TIME	1	HRS	1	0	-	-
{21}	LDI	FWD.REV	FWD	-	1	0	REV	FWD
{22}	LDO	CMD FWD.REV	FWD	-	1	0	REV	FWD
{23}	LDI	STOP.RUN	STOP	-	1	0	RUN	STOP
{24}	LDO	CMD STP.STRT	STOP	-	1	0	START	STOP
{25}	LDI	AT MAX FREQ	NO	-	1	0	MAX	NO

Table 8. Point Database for Application 2722.

Point Number	Point Type	Descriptor	Factory Default (SI Units)	Engr. Units (SI Units)	Slope (SI Units)	Intercept (SI Units)	On Text	Off Text
{26}	LDI	CONTROL MODE	SERIAL	-	1	0	SERIAL	LOCAL
{27}	LDI	ENABLED	OFF	-	1	0	ENABLED	OFF
{28}	LDI	READY TO RUN	OFF	-	1	0	READY	OFF
{29}	LDO	DAY.NIGHT	DAY	-	1	0	NIGHT	DAY
30	LAO	CURRENT LIM	1400	PCT	.1	10	-	-
31	LAO	ACCEL TIME 1	500	SEC	.02	0	-	-
32	LAO	DECEL TIME 1	500	SEC	.02	0	-	-
34	LDO	SEL HND.AUTO	AUTO	-	1	0	AUTO	HAND
{35}	LDO	RUN ENABLE	ENABLE	-	1	0	ENABLE	OFF
40	LDO	DIGITAL OUT 1	OFF	-	1	0	ON	OFF
41	LDO	DIGITAL OUT 2	OFF	-	1	0	ON	OFF
{45}	LAI	ANALOG IN 1	0	PCT	.1	-300	-	-
{46}	LAI	ANALOG IN 2	0	PCT	.1	-300	-	-
{47}	LAI	ANALOG OUT 1	0	PCT	.1	-100	-	-
{48}	LAI	ANALOG OUT 2	0	PCT	.1	-100	-	-
{51}	LAO	FREQ REF	0	PCT	0.0061	0	-	-
{52}	LA1	FREQ ACTUAL	0	PCT	0.0122	-100	-	-
53	LAO	FREQ MAX	2450	HZ	0.02	1	-	-
{55}	LAO	PID SETP REF	8602	PCT	0.0244	-200	-	-
{56}	LAI	PID SETP OUT	0	PCT	0.0122	-100	-	-
57	LAO	PID UP LMT	12288	PCT	0.0244	-200	-	-
58	LAO	PID LO LMT	8192	PCT	0.0244	-200	-	-
{59}	LAI	PID OUTPUT	0	PCT	0.0122	-100	-	-
{60}	LAI	PI FEEDBACK	0	PCT	0.0122	-100	-	-

Table 8. Point Database for Application 2722.

Point Number	Point Type	Descriptor	Factory Default (SI Units)	Engr. Units (SI Units)	Slope (SI Units)	Intercept (SI Units)	On Text	Off Text
61	LAI	P GAIN	0	PCT	0.002	0	-	-
62	LAI	I GAIN	0	PCT	2	0	-	-
63	LAI	D GAIN	0	PCT	2	0	-	-
64	LDO	ENABLE PID	0	-	1	0	ON	OFF
66	LAI	FEEDBK GAIN	0	PCT	0.02	0	-	-
68	LAI	LOW PASS	0		0.01	0	-	-
{71}	LDI	DIGITAL IN 1	0	-	1	0	ON	OFF
{72}	LDI	DIGITAL IN 2	0	-	1	0	ON	OFF
{73}	LDI	DIGITAL IN 3	0	-	1	0	ON	OFF
{74}	LDI	DIGITAL IN 4	0	-	1	0	ON	OFF
{75}	LDI	DIGITAL IN 5	0	-	1	0	ON	OFF
{76}	LDI	DIGITAL IN 6	0	-	1	0	ON	OFF
80	LAO	WDOG TIME	0		10	0	-	-
83	LAI	INVERTER VER	0	-	0.01	0	-	-
84	LAI	DRIVE MODEL	0	-	1	0	-	-
{90}	LAI	LAST FAULT	0	-	1	0	-	-
{91}	LAI	1ST FAULT	0	-	1	0	-	-
{92}	LAI	2ST FAULT	0	-	1	0	-	-
{93}	LAI	3ST FAULT	0	-	1	0	-	-
{94}	LDI	OKFAULT	0	-	1	0	FAULT	OK
{95}	LDO	FAULT ACK	0	-	1	0	ON	OFF
{96}	LDI	WARNING	0	-	1	0	WARN	OK
{97}	LAI	LAST WARNING	0	-	1	0	-	-
{99}	LAO	ERROR STATUS	0	-	1	0	-	-

1. Points not listed are not used in this application.
2. A single value in a column means that the value is the same in English units and in SI units.
3. Point numbers that appear in brackets { } may be unbundled at the field panel.

Table 9. Point Cross Reference to the SED2 Drive.

Point Number	Descriptor	Parameter
01	CTLR ADDRESS	SBT
02	APPLICATION	SBT
03	FREQ OUTPUT	r0021
05	SPEED	Calculated based on P0311
06	CURRENT	roo27
07	TORQUE	r0031
08	ACTUAL POWER	r0032
09	TOTAL KWH	r0039
13	DC BUS VOLT	r0026
14	REFERENCE	r0020
16	RATED PWR	P0307
17	OUTPUT VOLTS	r0025
21	FWD.REV	r0054 bit 11
22	CMD FWD.REV	P0842(2)
23	STOP.RUN	r0019 bit 1
24	CMD STP.STRT	P0840(2)
26	CONTROL MODE	P0700(2)
27	ENABLED	r0052 bit 0
28	READY TO RUN	r0052 bit 1
29	DAY.NIGHT	SBT
30	CURRENT LIM	r0067
31	ACCEL TIME 1	read P1120
32	DECEL TIME 1	read P1121
34	SEL HND.AUTO(reference)	P1000(2)
35	RUN ENABLE	r0052 bit 0
40	DIGITAL OUT 1	P0731(2) read at r0747
41	DIGITAL OUT 2	P0732(2) read at r0747
45	ANALOG IN 1	r754(0)
46	ANALOG IN 2	r754(1)
51	FREQ REF	r754(0)
52	FREQ ACTUAL	r0754(0)
53	FREQ MAX	P1082
55	PID SETP REF	r754(0)

Table 9. Point Cross Reference to the SED2 Drive.

Point Number	Descriptor	Parameter
56	PID SETP OUT	r2294
57	PID UP LMT	P2291
58	PID LO LMT	P2292
59	PID OUTPUT	r2294
60	PI FEEDBACK	r2272
61	P GAIN	P2280
62	I GAIN	P2285
63	D GAIN	P2274
64	ENABLE PID	P2200
66	FEEDBK GAIN	P2269
71	DIGITAL IN 1	r0722 bit 0
72	DIGITAL IN 2	r0722 bit 1
73	DIGITAL IN 3	r0722 bit 2
74	DIGITAL IN 4	r0722 bit 3
75	DIGITAL IN 5	r0722 bit 4
76	DIGITAL IN 6	r0722 bit 5
83	INVERTER VER	r0018
90	LAST FAULT	r0947(0)
91	1st FAULT	r0947(1)
92	2nd FAULT	r0947(2)
93	3rd FAULT	r0947(3)
94	FAULT	r0052 bit 3
95	FAULT ACK	r0054 bit 7
96	WARNING	r0052 bit 7
97	LAST WARNING	r2110 (0)

N2 Bus Connections

The connections for the N2 network (Table 10) are located on the terminal block.

Table 10. N2 Bus Connections.

Terminal Pin No.	Terminal Name	N2 Bus Connection
29	P+	N2+
30	N-	N2-
28	Iso 0V	Ref

N2 Implementation Notes

1. Overriding of AI and BI points is not supported. Overrides of AI and BI points are acknowledged, but the Override Value is ignored and the Override Flag is not set.

2. Out of range values on Overrides of AO, ADI, and ADF points are NAK'd.

3. Certain ADI and ADF points contain read-only values and cannot be overridden. Table 11 lists these particular points. Overrides of these ADI and ADF points are acknowledged, but the Override Value is ignored and the Override Flag is not set.

4. When an Override is released, the point value remains at the current Override value and does not revert back to its value prior to the Override. This pertains to all point types.

N2 Point Map

Table 11. N2 Point Map.

Point Number	Name	Default Value	Units	Notes	On Text / Off Text / Or Range	SED2 Ref.
AI1	FREQ OUTPUT	0	HZ	No Override	-650.00 to 650.00	r0024
AI2	SPEED	0	RPM	No Override	-16250 to 16250	r0022
AI3	CURRENT	0	A	No Override	0 to 1638.35	r0027
AI4	TORQUE	0	NM	No Override	-3250.0 to 3250.0	r0031
AI5	DC BUS VOLTS	0	V	No Override	0 to 32767	r0026
AI6	REFERENCE	0	HZ	No Override	-650.00 to 650.00	r0020
AI7	OUTPUT VOLTS	0	V	No Override	0 to 32767	r0025
AI8	ANALOG IN 1	0	PCT	No Override	-300.0 to 300.0	r0754/0
AI9	ANALOG IN 2	0	PCT	No Override	-300.0 to 300.0	r0754/1
AI10	PI FEEDBACK	0	PCT	No Override	-100.0 to 100.0	r2266
AI11	ANALOG OUT 1	0	PCT	No Override	-100.0 to 100.0	r0774/0
AI12	ANALOG OUT 2	0	PCT	No Override	-100.0 to 100.0	r0774/1

Table 11. N2 Point Map.

Point Number	Name	Default Value	Units	Notes	On Text / Or Range	Off Text	SED2 Ref.
AI13	PID SETP OUT	0	PCT	No Override	-100.0 to 100.0		r2250
AI14	PID OUTPUT	0	PCT	No Override	-100.0 to 100.0		r2294
AI15	ACTUAL PWR	0	KW	No Override	0 to 327.67		r0032
AI16	TOTAL KWH	0	KWH	No Override	0 to 32767		r0039
AI17	FREQ ACTUAL	0	PCT	No Override	-100.00 to 100.00		HIW
AO1	FREQ REF	0	PCT		0.00 to 100.00		HSW
BI1	ENABLED	0	--	No Override	ON	OFF	ZSW:0
BI2	READY TO RUN	0	--	No Override	READY	OFF	ZSW:1
BI3	STOP RUN	0	--	No Override	RUN	STOP	ZSW:2
BI4	AT MAX FREQ	0	--	No Override	MAX	NO	ZSW:10
BI5	CONTROL MODE	1	--	No Override	SERIAL	LOCAL	ZSW:9
BI6	FAULT	0	--	No Override	FAULT	OK	ZSW:3
BI7	WARNING	0	--	No Override	WARN	OK	ZSW:7
BI8	DIGITAL IN 1	0	--	No Override	ON	OFF	r0722:0
BI9	DIGITAL IN 2	0	--	No Override	ON	OFF	r0722:1
BI10	DIGITAL IN 3	0	--	No Override	ON	OFF	r0722:2
BI11	DIGITAL IN 4	0	--	No Override	ON	OFF	r0722:3
BI12	DIGITAL IN 5	0	--	No Override	ON	OFF	r0722:4
BI13	DIGITAL IN 6	0	--	No Override	ON	OFF	r0722:5
BI14	FWD REV	0	--	No Override	FWD	REV	ZSW:14
BO1	CMD START	0	--		START	STOP	STW:0
BO2	RUN ENABLE	1	--		ENABLE	OFF	STW:3
BO3	FAULT ACK	0	--		ON	OFF	STW:7
BO4	HAND AUTO	0	--		HAND	AUTO	P0718
BO5	DIGITAL OUT 1	0	--		ON	OFF	P0731
BO6	DIGITAL OUT 2	0	--		ON	OFF	P0733
BO7	CMD FWD REV	0	--		REV	FWD	STW:11
BO8	ENABLE PID	0	--		ON	OFF	P2200
ADF1	ACCEL TIME 1	10.00	SEC		0.00 to 650.00		P1120
ADF2	DECEL TIME 1	10.00	SEC		0.00 to 650.00		P1121
ADF3	CURRENT LMT	150.0	PCT		10.0 to 400.0		P0640

Table 11. N2 Point Map.

Point Number	Name	Default Value	Units	Notes	On Text / Off Text / Or Range	SED2 Ref.
ADF4	P GAIN	3.000	--		0.000 to 65.000	P2280
ADF5	I GAIN	0	SEC		0.000 to 60.000	P2285
ADF6	D GAIN	0	--		0.000 to 60.000	P2274
ADF7	FEEDBK GAIN	100.00	PCT		0.00 to 500.00	P2269
ADF8	LOW PASS	0	--		0.00 to 60.00	P2265
ADF9	PID SETP REF	0	PCT		-200.0 to 200.0	P2240
ADF10	PID UP LMT	100.0	PCT		-200.0 to 200.0	P2291
ADF11	PID LO LMT	0	PCT		-200.0 to 200.0	P2292
ADF12	FREQ MAX	50.00	HZ		1.00 to 650.00	P2000
ADF13	RATED PWR	0	KW	Read Only	0 to 327.67	r0206
ADF14	INVERTER VER	0	--	Read Only	0.00 to 327.67	r0018
ADI1	WDOG TIME	0	MS		9999	P2040
ADI2	DRIVE MODEL	0	--	Read Only	0 to 32767	r0200
ADI3	LAST FAULT	0	--	Read Only	0 to 32767	r0947
ADI4	1ST FAULT	0	--	Read Only	0 to 32767	r0947
ADI5	2ND FAULT	0	--	Read Only	0 to 32767	r0947
ADI6	3RD FAULT	0	--	Read Only	0 to 32767	r0947
ADI7	LAST WARNING	0	--	Read Only	0 to 32767	r2110

Appendix A: Parameter Reference List

P0004 Parameter Filters/Categories

Quick Commissioning (P0010=1)

Parameter	Description	Unit	User Setting	Min	Default	Max	Access Level
r0000	Drive display (defined in P0005)	-		-	-	-	X
P0003	User access level to parameters	-		0	1	4	1
P0010	Commissioning parameter filter	-		0	0	30	1
P0100	Europe/North America power settings [kW or hp]	-		0	0	2	1
P0304	Rated motor voltage	V		10	230	2000	1
P0305	Rated motor current	A		0.01	3.25	10000.00	1
P0307	Rated motor power	-		0.01	0.75	2000.00	1
P0308	Rated motor cosPhi	-		0.000	0.000	1.000	2
P0309	Rated motor efficiency	%		0.0	0.0	99.9	2
P0310	Rated motor frequency	Hz		12.00	50.00 or 60.00	650.00	1
P0311	Rated motor speed	1/min		0	0	40000	1
P0640	Motor overload factor [%]	%		10.0	150.0	400.0	2
P0700	Selection of command source	-		0	2	6	1
P1000	Selection of frequency setpoint	-		0	2	77	1
P1080	Min. Frequency	Hz		0.00	0.00	650.00	1
P1082	Max. Frequency	Hz		0.00	50.00	650.00	1
P1120	Ramp-up time	s		0.00	10.00	650.00	1
P1121	Ramp-down time	s		0.00	10.00	650.00	1
P3900	End of quick commissioning	-		0	0	3	1

Inverter Unit (P0004=2)

Parameter	Description	Unit	User Setting	Min	Default	Max	Access Level
r0000	Drive display (defined in P0005)	-		-	-	-	X
P0003	User access level to parameters	-		0	1	4	1
P0004	Parameter filter	-		0	0	22	1
P0010	Commissioning parameter filter	-		0	0	30	1
r0018	Firmware version	-		-	-	-	1
r0026	CO: Act. DC link output voltage	V		-	-	-	2
r0039	CO: Energy consumption meter	kWh		-	-	-	2
P0040	Reset energy consumption meter	-		0	0	1	2
r0200	Act. power stack code number	-		-	-	-	3
r0206	Rated inverter power [kW]/[hp]	-		-	-	-	2
r0207	Rated inverter current	A		-	-	-	2
r0208	Rated inverter voltage	V		-	-	-	2
r0209	Maximum inverter current	A		-	-	-	2
P1800	Pulse frequency	kHz		2	4	16	2
r1801	CO: Act. switching frequency	kHz		-	-	-	3

Parameter	Description	Unit	User Setting	Min	Default	Max	Access Level
P1820	Reverse output phase sequence	-		0	0	1	2

Motor Data (P0004=3)

Parameter	Description	Unit	User Setting	Min	Default	Max	Access Level
r0000	Drive display (defined in P0005)	-		-	-	-	X
P0003	User access level to parameters	-		0	1	4	1
P0004	Parameter filter	-		0	0	22	1
P0010	Commissioning parameter filter	-		0	0	30	1
r0035	CO: Act. Motor temperature	°C		-	-	-	2
P0304	Rated motor voltage	V		10	230	2000	1
P0305	Rated motor current	A		0.01	3.25	10000.00	1
P0307	Rated motor power	-		0.01	0.75	2000.00	1
P0308	Rated motor cosPhi	-		0.000	0.000	1.000	2
P0309	Rated motor efficiency	%		0.0	0.0	99.9	2
P0310	Rated motor frequency	Hz		12.00	50.00 or 60.00	650.00	1
P0311	Rated motor speed	1/min		0	0	40000	1
r0313	Motor pole pairs	-		-	-	-	3
P0340	Calculation of motor parameters	-		0	0	4	2
P0350	Stator resistance (line-to-line)	ohm		0.00001	4.0	2000.0	2
r0395	CO: Total stator resistance [%]	%		-	-	-	3
P0601	Motor temp. sensor	-		0	0	2	3
P0610	Motor I2t temperature reaction	-		0	2	2	3
P0640	Motor overload factor [%]	%		10.0	150.0	400.0	2
P1910	Select motor data identification	ohm		0	0	20	2
r1912	Identified stator resistance	-		-	-	-	2

Commands and Digital I/O (P0004=7)

Parameter	Description	Unit	User Setting	Min	Default	Max	Access Level
r0000	Drive display (defined in P0005)	-		-	-	-	X
r0002	Drive state (actual)	-		-	-	-	2
P0003	User access level to parameters	-		0	1	4	1
P0004	Parameter filter	-		0	0	22	1
P0010	Commissioning parameter filter	-		0	0	30	1
r0019	CO/BO: BOP control word	-		-	-	-	3
r0050	CO: Active command data set	-		-	-	-	2
r0052	CO/BO: Act. status word 1	-		-	-	-	2
r0053	CO/BO: Act. status word 2	-		-	-	-	2
r0054	CO/BO: Act. control word 1	-		-	-	-	3
r0055	CO/BO: Add. act. control word	-		-	-	-	3
P0700	Selection of command source	-		0	2	6	1
P0701	Function of digital input 1	-		0	1	99	2
P0702	Function of digital input 2	-		0	12	99	2
P0703	Function of digital input 3	-		0	9	99	2
P0704	Function of digital input 4	-		0	15	99	2
P0705	Function of digital input 5	-		0	15	99	2

Parameter	Description	Unit	User Setting	Min	Default	Max	Access Level
P0706	Function of digital input 6	-		0	15	99	2
P0707	Function of digital input 7	-		0	0	99	2
P0708	Function of digital input 8	-		0	0	99	2
P0718	CO/BO: Hand/Auto	-		0	0	1	2
r0722	CO/BO: Binary input values	-		-	-	-	2
P0725	PNP/NPN digital inputs	-		0	1	1	3
P0731	BI: Function of digital output 1	-		0.0	52.3	4000.0	2
P0732	BI: Function of digital output 2	-		0.0	52.7	4000.0	2
r0747	CO/BO: State of digital outputs	-		-	-	-	3
P0748	Invert digital outputs	-		0	0	7	3
P0809	Copy Command Data Set	-		0	0	2	2
P0810	BI: CDS bit 0 (Local/Remote)	-		0:0	718:0	4095:0	2
P1020	BI: Fixed freq. selection Bit 0	-		0:0	0:0	4000:0	3
P1021	BI: Fixed freq. selection Bit 1	-		0:0	0:0	4000:0	3
P1022	BI: Fixed freq. selection Bit 2	-		0:0	0:0	4000:0	3
P1023	BI: Fixed freq. selection Bit 3	-		0:0	0:0	4000:0	3
P1026	BI: Fixed freq. selection Bit 4	-		0:0	722:4	4000:0	3
P1028	BI: Fixed freq. selection Bit 5	-		0:0	722:5	4000:0	3
P1110	BI: Inhibit neg. freq. Setpoint	-		0:0	0:0	4000:0	3
P1140	BI: RFG enable	-		0.00	1.0	4000.0	3
P1141	RFG status	-		0.00	1.0	4000.0	3
P1142	RFG enable	-		0.00	1.0	4000.0	3
P1230	BI: Enable DC braking	-		0:0	0:0	4000:0	3
P1270	BI: Enable essential service	-		0:0	0:0	4000:0	2
P2220	BI: Fixed PID setp. select Bit 0	-		0:0	0:0	4000:0	3
P2221	BI: Fixed PID setp. select Bit 1	-		0:0	0:0	4000:0	3
P2222	BI: Fixed PID setp. select Bit 2	-		0:0	0:0	4000:0	3
P2223	BI: Fixed PID setp. select Bit 3	-		0:0	0:0	4000:0	3
P2226	BI: Fixed PID setp. select Bit 4	-		0:0	722:4	4000:0	3
P2228	BI: Fixed PID setp. select Bit 5	-		0:0	722:4	4000:0	3

Analogue I/O (P0004=8)

Parameter	Description	Unit	User Setting	Min	Default	Max	Access Level
r0000	Drive display (defined in P0005)	-		-	-	-	X
P0003	User access level to parameters	-		0	1	4	1
P0004	Parameter filter	-		0	0	22	1
P0010	Commissioning parameter filter	-		0	0	30	1
P0501	Type of sensor	-		0	0	51	2
r0752	Act. input of ADC [V] or [mA]	-		-	-	-	2
P0753	Smooth time ADC	ms		0	3	10000	3
r0754	Act. ADC value after scaling [%]	%		-	-	-	2
r0755	CO: Act. ADC after scaling [4000h]	-		-	-	-	2
P0756	Type of ADC	-		0	0	5	2
P0757	Value x1 of ADC scaling [V/mA]	-		50.0	0	150.0	2
P0758	Value y1 of ADC scaling	%		-99999.9	0.0	99999.9	2
P0759	Value x2 of ADC scaling [V/mA]	-		50.0	150.0	150.0	2
P0760	Value y2 of ADC scaling	%		-99999.9	100.0	99999.9	2
P0761	Width of ADC deadband [V/mA]	-		0	0	150.0	2

Parameter	Description	Unit	User Setting	Min	Default	Max	Access Level
P0771	CI: DAC	-		0:0	21:0	4000:0	2
P0773	Smooth time DAC	ms		0	2	1000	3
r0774	Act. DAC value [V] or [mA]	-		-	-	-	2
P0776	Type of DAC	-		0	1	1	3
P0777	Value x1 of DAC scaling	%		-99999.0	0.0	99999.0	2
P0778	Value y1 of DAC scaling	-		0	0	20	2
P0779	Value x2 of DAC scaling	%		-99999.0	100.0	99999.0	2
P0780	Value y2 of DAC scaling	-		0	20	20	2
P0781	Width of DAC deadband	-		0	0	20	2

Setpoint Channel and Ramp Generator (P0004=10)

Parameter	Description	Unit	User Setting	Min	Default	Max	Access Level
r0000	Drive display (defined in P0005)	-		-	-	-	X
P0003	User access level to parameters	-		0	1	4	1
P0004	Parameter filter	-		0	0	22	1
P0010	Commissioning parameter filter	-		0	0	30	1
P1000	Selection of frequency setpoint	-		0	2	77	1
P1001	Fixed frequency 1	Hz		-650.0	0.00	650.00	2
P1002	Fixed frequency 2	Hz		-650.0	0.00	650.00	2
P1003	Fixed frequency 3	Hz		-650.0	0.00	650.00	2
P1004	Fixed frequency 4	Hz		-650.0	0.00	650.00	2
P1005	Fixed frequency 5	Hz		-650.0	0.00	650.00	2
P1006	Fixed frequency 6	Hz		-650.0	0.00	650.00	2
P1007	Fixed frequency 7	Hz		-650.0	0.00	650.00	2
P1008	Fixed frequency 8	Hz		-650.0	0.00	650.00	2
P1009	Fixed frequency 9	Hz		-650.0	0.00	650.00	2
P1010	Fixed frequency 10	Hz		-650.0	0.00	650.00	2
P1011	Fixed frequency 11	Hz		-650.0	0.00	650.00	2
P1012	Fixed frequency 12	Hz		-650.0	0.00	650.00	2
P1013	Fixed frequency 13	Hz		-650.0	0.00	650.00	2
P1014	Fixed frequency 14	Hz		-650.0	0.00	650.00	2
P1015	Fixed frequency 15	Hz		-650.0	0.00	650.00	2
P1016	Fixed frequency mode-Bit 0	-		1	1	3	3
P1017	Fixed frequency mode-Bit 1	-		1	1	3	3
P1018	Fixed frequency mode-Bit 2	-		1	1	3	3
P1019	Fixed frequency mode-Bit 3	-		1	1	3	3
r1024	CO: Act. fixed frequency	Hz		-	-	-	3
P1025	Fixed frequency mode – Bit 4	-		1	1	3	3
P1027	Fixed frequency mode – Bit 5	-		1	1	3	3
P1031	Setpoint memory of the MOP	-		0	0	1	2
P1032	Inhibit reverse direction of MOP	-		0	1	1	2
P1040	Setpoint of the MOP	Hz		-650.00	5.00	650.00	2
r1050	CO: Act. Output freq. of the MOP	-		-	-	-	3
r1078	CO: Total frequency setpoint	Hz		-	-	-	3
P1080	Min. Frequency	Hz		0.00	0.00	650.00	1
P1082	Max. Frequency	Hz		0.00	50.00	650.00	1
P1091	Skip frequency 1	Hz		0.00	0.00	650.00	3
P1092	Skip frequency 2	Hz		0.00	0.00	650.00	3
P1093	Skip frequency 3	Hz		0.00	0.00	650.00	3
P1094	Skip frequency 4	Hz		0.00	0.00	650.00	3
P1101	Skip frequency bandwidth	Hz		0.00	2.00	10.00	3

Parameter	Description	Unit	User Setting	Min	Default	Max	Access Level
P1120	Ramp-up time	s		0.00	10.00	650.00	1
P1121	Ramp-down time	s		0.00	10.00	650.00	1
P1135	OFF3 ramp-down time	s		0.00	5.00	650.00	2

Drive Features (P0004=12)

Parameter	Description	Unit	User Setting	Min	Default	Max	Access Level
r0000	Drive display (defined in P0005)	-		-	-	-	X
P0003	User access level to parameters	-		0	1	4	1
P0004	Parameter filter	-		0	0	22	1
P0005	Display selection for r0000	-		2	21	2294	2
P0006	Display mode for r0000	-		0	2	4	3
P0010	Commissioning parameter filter	-		0	0	30	1
P0011	Lock for user-defined parameter	-		0	0	65535	3
P0012	Key for user-defined parameter	-		0	0	65535	3
P0013	User-defined parameter	-		0	0	65535	3
P1200	Flying start	-		0	0	6	2
P1202	Motor-current: Flying start	%		50	100	200	3
P1203	Search rate: Flying start	%		50	100	200	3
P1210	Automatic restart	-		0	1	5	2
P1211	Number of restart attempts	-		0	3	10	3
P1212	Time to first restart	s		0	30	1000	2
P1213	Restart time increment	s		0	30	1000	2
P1232	DC braking current	%		0	100	250	2
P1233	Duration of DC braking	s		0	0	250	2
P1236	Compound braking current	%		0	0	250	2
P1240	Configuration of Vdc controller	-		0	1	3	3
P1260	Source of changeover	-		0	0	7	2
P1261	Contactor control word	-		-	-	-	2
P1262	Bypass dead time	-		0	1.000	20.000	2
P1263	De-bypass time	-		0	1.000	300.0	2
P1264	Bypass time	-		0	1.0	300.0	2
P1265	Mains frequency	-		12.00	50.0	650.0	2
P1266	Bypass command	-		0:0	0:0	4000.0	2

Motor Control (P0004=13)

Parameter	Description	Unit	User Setting	Min	Default	Max	Access Level
r0000	Drive display (defined in P0005)	-		-	-	-	X
P0003	User access level to parameters	-		0	1	4	1
P0004	Parameter filter	-		0	0	22	1
P0010	Commissioning parameter filter	-		0	0	30	1
r0020	CO: Act. frequency setpoint	Hz		-	-	-	3
r0021	CO: Act. frequency	Hz		-	-	-	2
r0022	Act. Rotor speed	1/min		-	-	-	3
r0024	CO: Act. output frequency	Hz		-	-	-	3
r0025	CO: Act. output voltage	V		-	-	-	2
r0027	CO: Act. output current	A		-	-	-	2
r0031	Actual torque	-		-	-	-	3

Parameter	Description	Unit	User Setting	Min	Default	Max	Access Level
r0032	Actual power	-		-	-	-	3
r0056	CO/BO: Status of motor control	-		-	-	-	3
r0061	Actual rotor speed	-		-	-	-	3
r0086	CO: Act. active current	A		-	-	-	3
P1300	Control mode	-		0	0	23	2
P1310	Continuous boost	%		0.0	50.0	250.0	2
P1311	Acceleration boost	%		0.0	0.0	250.0	2
P1312	Starting boost	%		0.0	0.0	250.0	2
P1335	Slip compensation	%		0.0	0.0	600.0	2
P1336	Slip limit	%		0	250	600	2
r1337	CO: V/f slip frequency	%		-	-	-	3
P1499	Scaling accel. torque control	%		0.0	100.0	400.0	3

Communication (P0010=20)

Parameter	Description	Unit	User Setting	Min	Default	Max	Access Level
r0000	Drive display (defined in P0005)	-		-	-	-	X
P0003	User access level to parameters	-		0	1	4	1
P0004	Parameter filter	-		0	0	22	1
P0010	Commissioning parameter filter	-		0	0	30	1
P0918	CB address	-		0	3	65535	2
P0927	Parameter changeable via	-		0	15	15	2
r0967	Control word 1	-		-	-	-	3
r0968	Statue word 1	-		-	-	-	3
P0971	Transfer data from RAM to EEPROM	-		0	0	1	3
P2000	Reference frequency	V		1.00	50.00	650.00	2
P2001	Reference voltage	A		10	1000	2000	3
P2002	Reference current	-		0.10	0.10	10000.00	3
P2009	USS normalization	-		0	0	1	3
P2010	USS baud rate	-		4	6	12	2
P2011	USS address	-		0	0	31	2
P2014	USS telegram off time	ms		0	0	65535	3
P2040	CB telegram off time	ms		0	20	65535	3
P2041	CB parameter	-		0	0	65535	3
r2050	CB parameter	-		0	0	65535	3
P2051	CI: PZD to CB	-		0:0	52:0	4000:0	3
r2053	CB identification	-		-	-	-	3
r2054	CB diagnosis	-		-	-	-	3

Alarms, Warnings and Monitoring (P0010=21)

Parameter	Description	Unit	User Setting	Min	Default	Max	Access Level
r0000	Drive display (defined in P0005)	-		-	-	-	X
P0003	User access level to parameters	-		0	1	4	1
P0004	Parameter filter	-		0	0	22	1
P0010	Commissioning parameter filter	-		0	0	30	1
r0947	Last fault code	-		-	-	-	2
r0948	Fault time	-		-	-	-	3
r0949	Fault value	-		-	-	-	3

Parameter	Description	Unit	User Setting	Min	Default	Max	Access Level
P0952	Total number of faults	-		0	0	0	3
P2100	Alarm number selection	-		0	0	65535	3
P2101	Stop reaction value	-		0	0	4	3
r2110	Warning number	-		-	-	-	2
P2111	Total number of warnings	-		0	0	4	3
r2114	Run time counter	-		-	-	-	3
P2115	AOP real time clock	-		0	0	65535	3
P2181	Belt failure detection mode	-		0	0	6	2
P2182	Belt threshold frequency 1	Hz		0.00	5.00	650.00	3
P2183	Belt threshold frequency 2	Hz		0.00	30.00	650.00	2
P2184	Belt threshold frequency 3	Hz		0.00	50.00	650.00	2
P2185	Upper torque threshold 1	Nm		0.0	99999.0	99999.0	2
P2186	Lower torque threshold 1	Nm		0.0	0.0	99999.0	2
P2187	Upper torque threshold 2	Nm		0.0	99999.0	99999.0	2
P2188	Lower torque threshold 2	Nm		0.0	0.0	99999.0	2
P2189	Upper torque threshold 3	Nm		0.0	99999.0	99999.0	2
P2190	Lower torque threshold 3	Nm		0.0	0.0	99999.0	2
P2191	Belt failure speed tolerance	Hz		0.00	3.00	20.00	2
P2192	Time delay for belt failure	s		0	10	65	2
r2197	CO/BO: Monitoring word 1	-		-	-	-	2
r2198	CO/BO: Monitoring word 2	-		-	-	-	2

PI Controller (P0004=22)

Parameter	Description	Unit	User Setting	Min	Default	Max	Access Level
r0000	Drive display (defined in P0005)	-		-	-	-	X
P0003	User access level to parameters	-		0	1	4	1
P0004	Parameter filter	-		0	0	22	1
P0010	Commissioning parameter filter	-		0	0	30	1
P2200	BI: Enable PID controller	-		0:0	0:0	4000:0	2
P2201	Fixed PID setpoint 1	%		-200.00	0.00	200.00	2
P2202	Fixed PID setpoint 2	%		-200.00		200.00	2
P2203	Fixed PID setpoint 3	%		-200.00		200.00	2
P2204	Fixed PID setpoint 4	%		-200.00		200.00	2
P2205	Fixed PID setpoint 5	%		-200.00		200.00	2
P2206	Fixed PID setpoint 6	%		-200.00		200.00	2
P2207	Fixed PID setpoint 7	%		-200.00		200.00	2
P2208	Fixed PID setpoint 8	%		-200.00		200.00	2
P2209	Fixed PID setpoint 9	%		-200.00		200.00	2
P2210	Fixed PID setpoint 10	%		-200.00		200.00	2
P2211	Fixed PID setpoint 11	%		-200.00		200.00	2
P2212	Fixed PID setpoint 12	%		-200.00		200.00	2
P2213	Fixed PID setpoint 13	%		-200.00		200.00	2
P2214	Fixed PID setpoint 14	%		-200.00		200.00	2
P2215	Fixed PID setpoint 15	%		-200.00		200.00	2
P2216	Fixed PID setpoint mode-Bit 0	-		1	1	3	3
P2217	Fixed PID setpoint mode-Bit 1	-		1	1	3	3
P2218	Fixed PID setpoint mode-Bit 2	-		1	1	3	3
P2219	Fixed PID setpoint mode-Bit 3	-		1	1	3	3
r2224	CO: Act. fixed PID setpoint	%		-	-	-	2
P2225	Fixed PID setpoint mode-Bit 4	-		1	1	3	3
P2227	Fixed PID setpoint mode-Bit 5	-		1	1	3	3
P2231	Setpoint memory of PID-MOP	-		0	0	1	2
P2232	Inhibit rev. direct. of PID-MOP	-		0	1	1	2

Parameter	Description	Unit	User Setting	Min	Default	Max	Access Level
P2240	Setpoint of PID-MOP	%		-200.00	10.00	200.00	2
r2250	CO: Output setpoint of PID-MOP	%		-	-	-	2
P2253	CI: PID setpoint	-		0:0	0:0	4000:0	2
P2254	CI: PID trim	-		0:0	0:0	4000:0	3
P2261	PID setpt. filter	-		0.00	0.00	60.00	3
r2262	CO: Act. PID filtered setpoint	%		-	-	-	2
P2264	CI: PID feedback	-		0:0	755:0	4000:0	2
P2265	PID feedback filter timeconstant	s		0.00	0.00	60.00	2
P2267	Max. value for PID feedback	%		-200.00	100.00	200.00	3
P2268	Min. value for PID feedback	%		-200.00	0.00	200.00	3
P2269	Gain applied to PID feedback	-		0.00	100.00	500.00	3
P2270	PID feedback function selector	-		0	0	3	3
P2271	PID transducer type	-		0	0	1	2
r2272	CO: PID scaled feedback	%		-	-	-	2
r2273	CO: PID error	%		-	-	-	2
P2274	PID derive. time	-		0	0	65535	2
P2279	PID neutral zone	-		0.00	0.00	100.00	3
P2280	PID proportional gain	-		0.000	3.000	65.000	2
P2285	PID integral time	s		0.000	0.000	60.000	2
P2291	PID output upper limit	%		-200.00	100.00	200.00	2
P2292	PID output lower limit	%		-200.00	0.00	200.00	2
P2293	PID limit ramp time	-		0.00	0.00	100.00	3
r2294	CO: Act. PID output	%		-	-	-	2
P2303	PID output offset	-		0.00	0.0	4000.0	3
P2304	PID opening time	-		0	60	65535	2
P2305	PID closing time	-		0	60	65535	2
P2306	PID actuator direction	-		0	1	1	2
P2370	Selection of motor staging stop mode	-		0	0	1	2
P2371	Selection of external motor configuration	-		0	0	8	2
P2372	Enable motor cycling	-		0	0	1	2
P2373	Motor staging hysteresis	%		0.0	20.0	200.0	2
P2374	Motor staging delay	s		0	30	650	2
P2375	Motor destaging delay	s		0	30	650	2
P2376	Delay override	%		0.0	25.0	200.0	2
P2377	Delay override lockout timer	s		0	30	650	2
P2378	Staging frequency f, %fMax	%		0.0	50.0	120.0	2
r2379	CO/BO: Status of motor staging	-		-	-	-	2
P2380	Motor hours run	s		0	0	100000	2
P2390	Hibernation frequency	Hz		0	0	650.00	3
P2391	Hibernation timer	s		0	0	650.00	3
P2392	Restart frequency	Hz		0	0	650.00	3

Factory settings (P0010=30)

Parameter	Description	Unit	User Setting	Min	Default	Max	Access Level
P0003	User access level	-		0	1	4	1
P0010	Commissioning Parameter filter	-		0	0	30	1
P0970	Factory reset	-		0	0	1	1

Parameter List

r0000	Drive display (defined in P0005)			
	Min: -	**Def: -**	**Max: -**	**Level X**
Note:	Pressing the "Fn" button for 2 seconds allows you to view the values of DC link voltage, output current, output frequency, and chosen r0000 setting (defined in P0005).			

r0002	Drive state (actual)			
	Min: -	**Def: -**	**Max: -**	**Level 2**
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, and when externally powered communications board is fitted.			

P0003	User access level to parameters			
	Min: 0	**Def: 1**	**Max: 4**	**Level 1**
Enum:	0=User-defined parameter list-see P0013 for details 1=Standard: Access into frequently used parameters. 2=Extended: Access to for example, inverter I/O functions.	3=Expert: For expert use only. 4=Service: Only for use by authorized service personal-password protected.		

P0004	Parameter filter			
	Min: 0	**Def: 0**	**Max: 22**	**Level 1**
Example:	P0004=22 specifies that only PID parameters will be visible.			
Enum:	0=All parameters 2=Inverter 3=Motor 4=Speed sensor	5=Technol. application/units 7=Commands, binary I/O 8=ADC and DAC	10 =Setpoint channel/RFG 12 =Drive features 13 =Motor control	20 =Communication 21 =Alarms/warnings/monitoring 22 =Technology controller (for example, PID)
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 for r0000			
	Min: 2	**Def: 21**	**Max: 2294**	**Level 2**
Enum:	21=Actual frequency	25=Output voltage	26=DC link voltage	27=Output current
Note:	These settings refer to read only parameter numbers ("rxxxx").			
Details:	See relevant "rxxxx" parameter descriptions.			

P0006	Display mode for r0000			
	Min: 0	**Def: 2**	**Max: 4**	**Level 3**
Enum:	0=In Ready state alternate between setpoint and output freq. In run display output freq. 1=In Ready state display setpoint. In run display output freq. 2=In Ready state alternate between P0005 value and r0020 value. In run display P0005 value.	3=In Ready state alternate between r0002 value and r0020 value. In run display r0002 value 4=In all states just display P0005		
Note:	When inverter is not running, the display alternates between the values for "Not Running" and "Running". Per default, the setpoint and actual frequency values are displayed alternately.			

P0010	Commissioning parameter filter			
	Min: 0	**Def: 0**	**Max: 30**	**Level 1**
Enum:	0=Ready 1=Quick commissioning 2=Inverter	29 =Download 30 =Factory setting		
Dependency:	Reset to 0 for interter 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.			

P0011	Lock for user-defined parameter			
	Min: 0	**Def: 0**	**Max: 65535**	**Level 3**
Details:	See P0013 (user-defined parameter).			

P0012	Key for user-defined parameter			
	Min: 0	**Def: 0**	**Max: 65535**	**Level 3**
Details:	See P0013 (user-defined parameter).			

P0013[20]	User-defined parameter			
	Min: 0	**Def: 0**	**Max: 65535**	**Level 3**

Instructions:	1. Step 1: Set P0003=3 (expert user) 2. Step 2: Go to P0013 indices 0 to 16 (user list) 3. Step 3: Enter into P0013 index 0 to 16 the parameters required to be visible in the user-defined list. The following values are fixed and cannot be changed: - P0013 index 19=12 (key for user-defined parameter) - P0013 index 18=10 (commissioning parameter filter) - P0013 index 17= 3 (user access level) 4. Step 4: Set P0003=0 to activate the user-defined parameter.
Dependency:	First, set P0011 ("lock") to a different value than P0012 ("key") to prevent changes to user-defined parameter. Then, set P0003 to 0 to activate the user-defined list. When locked and the user-defined parameter is activated, the only way to exit the user-defined parameter (and view other parameters) is to set P0012 ("key") to the value in P0011 ("lock").
Note:	Alternatively, set P0010=30 (commissioning parameter filter=factory setting) and P0970=1 (factory reset) to perform a complete factory reset. The default values of P0011 ("lock") and P0012 ("key") are the same.

r0018	**Firmware version**			
	Min: -	**Def: -**	**Max: -**	**Level 1**

r0019	**CO/BO: BOP control word**			
	Min: -	**Def: -**	**Max: -**	**Level 3**
Bit Fields:	Bit00 ON/OFF1 0 NO, 1 YES Bit01 OFF2: Electrical stop 0 YES, 1 NO Bit02 OFF3: Fast stop 0 YES, 1 NO Bit08 JOG right 0 NO, 1 YES Bit09 JOG left 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 - JOG - INCREASE - OFF2 - REVERSE - DECREASE			

r0020	**CO: Act. frequency setpoint**			
	Min: -	**Def: -**	**Max: -**	**Level 3**

r0021	**CO: Act. frequency**			
	Min: -	**Def: -**	**Max: -**	**Level 2**

r0022	**Act. rotor speed**			
	Min: -	**Def: -**	**Max: -**	**Level 3**
Note:	This calculation makes no allowance for load-dependent slip.			

r0024	**CO: Act. output frequency**			
	Min: -	**Def: -**	**Max: -**	**Level 3**

r0025	**CO: Act. output voltage**			
	Min: -	**Def: -**	**Max: -**	**Level 2**

r0026[2]	**CO: Act. OuDC linktput voltage**			
	Min: -	**Def: -**	**Max: -**	**Level 2**

r0027	**CO: Act. output current**			
	Min: -	**Def: -**	**Max: -**	**Level 2**

r0031	**CO: Act. Torque**			
	Min: -	**Def: -**	**Max: -**	**Level 3**

r0032	**CO: Act. Power**			
	Min: -	**Def: -**	**Max: -**	**Level 3**
Dependency:	Value is displayed in [kW] or [hp] depending on setting for P0100 (operation for Europe/North America).			

r0035	**CO: Act. Motor temperature**			
	Min: -	**Def: -**	**Max: -**	**Level 2**

r0039	**CO: Energy consumpt. meter [kWh]**			
	Min: -	**Def: -**	**Max: -**	**Level 2**
Dependency:	Value is reset when P3900=1 (end quick commissioning), P0970=1 (factory reset) or P0040=1 (reset energy consumption meter).			

P0040	**Reset energy consumption meter**			
	Min: 0	**Def: 0**	**Max: 1**	**Level 2**
Enum:	0=No reset, 1=Reset r0039 to 0.			
Dependency:	No reset until "P" is pressed.			

r0050	**CO: Active command data set**			
	Min: -	**Def: -**	**Max: -**	**Level 2**
Enum:	0=1st. Command data set (CDS)	1=2nd. Command data set (CDS)	2=3rd. Command data set (CDS)	

r0052	**CO/BO: Act. status word 1**			
	Min: -	**Def: -**	**Max: -**	**Level 2**
Bit Fields:	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=No Fault.			

r0053	**CO/BO: Act. status word 2**			
	Min: -	**Def: -**	**Max: -**	**Level 2**
Bit Fields:	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 Bit03 Act. current r0027 >= P2170 0 NO, 1 YES Bit04 Act. freq. r0024 > P2155 0 NO, 1 YES Bit05 Act. freq. r0024 <= P2155 0 NO, 1 YES Bit06 Act. freq. r0024 >= setpoint 0 NO, 1 YES Bit07 Act. Vdc r0026 < P2172 0 NO, 1 YES Bit08 Act. Vdc r0026 > P2172 0 NO, 1 YES Bit09 Ramping finished 0 NO, 1 YES Bit10 PID output r2294 < P2291 0 NO, 1 YES Bit11 PID output r2294 >= P2291 0 NO, 1 YES Bit14 Download data set 0 from AOP 0 NO, 1 YES Bit15 Download data set 1 from AOP 0 NO, 1 YES			
Details:	See description of seven segment display.			

r0054	CO/BO: Act. control word 1						
	Min: -		Def: -		Max: -		Level 3
Bit Fields:	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	CDS Bit 0 (Local/Remote)	0	NO,	1	YES	
Details:	See description of seven segment display.						

r0055	CO/BO: Add. act. control word						
	Min: -		Def: -		Max: -		Level 3
Bit Fields:	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	
	Bit03	Fixed frequency Bit 3	0	NO,	1	YES	
	Bit08	PID enabled	0	NO,	1	YES	
	Bit09	DC brake enabled	0	NO,	1	YES	
	Bit11	Droop	0	NO,	1	YES	
	Bit12	Torque control	0	NO,	1	YES	
	Bit13	External fault 1	0	YES,	0	NO	
Details:	See description of seven segment display.						

r0056	CO/BO: Status of motor control						
	Min: -		Def: -		Max: -		Level 3
Bit Fields:	Bit00	Init. control finished	0	NO,	1	YES	
	Bit01	Motor demagnetizing finished	0	NO,	1	YES	
	Bit02	Pulses enabled	0	NO,	1	YES	
	Bit03	Voltage soft start select	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	
	Bit12	Phase reversal selected	0	NO,	1	YES	
	Bit13	I-max controller active	0	NO,	1	YES	
	Bit14	Vdc-max controller active	0	NO,	1	YES	
	Bit15	Vdc-min controller active	0	NO,	1	YES	
Details:	See description of seven segment display.						

r0061	CO: Act. rotor speed			
	Min: -	Def: -	Max: -	Level 3

r0086	CO: Act. active current			
	Min: -	Def: -	Max: -	Level 3
Dependency:	Applies when V/f control is selected in P1300 (control mode); otherwise, the display shows the value zero.			

P0100	Europe/North America power settings [kW or hp]			
	Min: 0	**Def: 0**	**Max: 2**	**Level 1**
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 setting of DIP switch 2 under the I/O board determines the validity of settings 0 and 1 for P0100 according to the following table:			

DIP 2 Setting	Meaning		P0100 Setting	Meaning
Off	[kW], frequency default 50 [Hz]	Overwrites	1	[hp], frequency default 60 [Hz]
On	[hp], frequency default 60 [Hz]	Overwrites	0	[kW], frequency default 50 [Hz]

	Stop drive first (that is, 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).
Note:	P0100 setting 2 (==> [kW], frequency default 60 [Hz]) is not overwritten by the setting of DIP switch 2 (see table above).

r0200	Act. power stack code number (per following table)			
	Min: -	**Def: -**	**Max: -**	**Level 3**
Note:	Parameter r0200=0 indicates that no power stack has been identified.			

r0206	Rated inverter power [kW]/[hp]			
	Min: -	**Def: -**	**Max: -**	**Level 2**
Dependency:	Value is displayed in [kW] or [hp] depending on setting for P0100 (operation for Europe/North America).			

r0207	Rated inverter current			
	Min: -	**Def: -**	**Max: -**	**Level 2**

r0208	Rated inverter voltage			
	Min: -	**Def: -**	**Max: -**	**Level 2**
Value:	r0208=230 : 200-240V +/- 10%	r0208=400 : 380-480V +/- 10%	r0208=575 : 500-600V +/- 10%	

r0209	Maximum inverter current			
	Min: -	**Def: -**	**Max: -**	**Level 2**

P0304	Rated motor voltage			
	Min: 10	**Def: 230**	**Max: 2000**	**Level 1**
Dependency:	Changeable only when P0010=1 (quick commissioning).			

P0305	Rated motor current			
	Min: 0.01	**Def: 3.25**	**Max: 10000.00**	**Level 1**
Dependency:	Changeable only when P0010=1 (quick commissioning). Depends also on P0320 (motor magnetization current).			
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			
	Min: 0.01	**Def: 0.75**	**Max: 2000.00**	**Level 1**
Dependency:	If P0100=1 ([kW],frequency default 50 Hz), values will be in [hp]-see diagram P0304 (rating plate). Changeable only when P0010=1 (quick commissioning).			

P0308	Rated motor cosPhi			
	Min: 0.000	**Def: 0.000**	**Max: 1.000**	**Level 2**
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 (see r0332).			

P0309	Rated motor efficiency			
	Min: 0.0	**Def: 0.0**	**Max: 99.9**	**Level 2**
Dependency:	Changeable only when P0010=1 (quick commissioning). Visible only when P0100=1, (that is, motor power entered in [hp]). Setting 0 causes internal calculation of value (see r0332).			
Note:	P0309=100% corresponds to superconducting			

P0310	**Rated motor frequency**			
	Min: 12.00	**Def: 50.00 or 60.00**	**Max: 650.00**	**Level 1**
Dependency:	Changeable only when P0010=1 (quick commissioning). Pole pair number recalculated automatically if parameter is changed.			

P0311	**Rated motor speed**			
	Min: 0	**Def: 0**	**Max: 40000**	**Level 1**
Dependency:	Changeable only when P0010=1 (quick commissioning). Setting 0 causes internal calculation of value. Required for vector control and V/f control with speed controller. Slip compensation in V/f control requires rated motor speed for correct operation. Pole pair number recalculated automatically if parameter is changed.			

r0313	**Motor pole pairs**			
	Min: -	**Def: -**	**Max: -**	**Level 3**
Value:	r0313=1 : 2-pole motor	r0313=2 : 4-pole motor, etc.		
Dependency:	Recalculated automatically when P0310 (rated motor frequency) or P0311 (rated motor speed) is changed.			

P0340	**Calculation of motor parameters**			
	Min: 0	**Def: 0**	**Max: 4**	**Level 2**
Data:	Calculates various motor parameters, including: • Motor weight P0344 (Level 3) • Magnetization time P0346 (Level 3) • Demagnetization time P0347 (Level 3) • Stator resistance P0350 (Level 2) • Reference frequency P2000 (Level 2) • Reference current P2002 (Level 3).			
Enum:	0=No calculation 1=Complete parameterization 2=Calc. equivalent circuit data	3=Calc. V/f and vector control 4=Calc. only controller setting		
Note:	This parameter is required during commissioning to optimize inverter performance.			

P0350	**Stator resistance (line-to-line)**			
	Min: 0.00001	**Def: 4.0**	**Max: 2000.0**	**Level 2**
Data:	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 using P1910=1 (motor data identification-value for stator resistance is overwritten) 3. Measure manually using an Ohmmeter.			
Note:	Since measured line-to-line, this value may appear to be higher (up to two times higher) than expected. The value entered in P0350 (stator resistance) is the one obtained by the method last used.			

r0395	**CO: Total stator resistance [%]**			
	Min: -	**Def: -**	**Max: -**	**Level 3**
Note:	100% means: Z rated motor *	P0304 (rated motor voltage) P0305 (rated motor current)		

P0400	**Select encoder type**			
	Min: 0	**Def: 0**	**Max: 12**	**Level 3**
Settings:	0=Disabled 1=Single channel encoder 2=Quadrature encoder without zero pulse	3=External pulse train 12=Quadrature encoder with zero pulse		
Note:	The term quadrature in settings 2 and 12 refers to 2 periodic functions separated by a quarter cycle or 90 degrees.			

P0409	**Pulses per second at rated frequency**			
	Min: 1	**Def: 1024**	**Max: 20000**	**Level 2**
Enum:	0=Constant torque	1=Pumps and fans		

P0501[2]	**Type of sensor**			
	Min: 0	**Def: 0**	**Max: 51**	**Level 2**
Setting:	0=No sensor selected 1=Sensor type QBE620 P1 2=Sensor type QBE620 P10 3=Sensor type QBE620 P16 4=Sensor type QBE620 P25 5=Sensor type QBE620 P40 6=Sensor type QBE620 P4 7=Sensor type QBE620 P5 8=Sensor type QBE621 P10U 9=Sensor type QBE621 P25U	10=Sensor type QBE63 DP01 11=Sensor type QBE63 DP02 12=Sensor type QBE63 DP05 13=Sensor type QBE63 DP1 14=Sensor type QBE63 DP4 15=Sensor type 0 to 1 INCH WC 16=Sensor type 0 to 2 INCH WC 17=Sensor type 0 to 2.5 INCH WC 18=Sensor type 0 to 3 INCH WC 19=Sensor type 0 to 5 INCH WC	20=Sensor type 0 to 10 INCH WC 21=Sensor type 0 to 10 PSI 22=Sensor type 0 to 15 PSI 23=Sensor type 0 to 25 PSI 24=Sensor type 0 to 30 PSI 25=Sensor type 0 to 50 PSI 26=Sensor type 0 to 60 PSI 27=Sensor type 0 to 100 PSI 28=Sensor type 0 to 150 PSI 29=Sensor type AI Ni 1000: -58 to 302F (-50 to 150C)
Index:	P0501[0] : IN000 Analog input 1.	P0501[1] : IN001 Analog input 2.		

P0506[10]	Parameter List			
	Min: 0	**Def: 754**	**Max: 4000**	**Level 3**
Index:	P0506[0] : Parameter 1 P0506[1] : Parameter 2 P0506[2] : Parameter 3	P0506[3] : Parameter 4 P0506[4] : Parameter 5 P0506[5] : Parameter 6	P0506[6] : Parameter 7 P0506[7] : Parameter 8 P0506[8] : Parameter 9	P0506[9] : Parameter 10

P0507[3]	Scalar values			
	Min: 0	**Def: 1.0**	**Max: 9999.9**	**Level 3**
Index:	P0507[0] :Scalar numerator	P0507[1] : Scalar denominator	P0507[2] : Scalar offset	

P0508[4]	Unit			
	Min: 0	**Def: 0**	**Max: 65535**	**Level 3**
Index:	P0508[0] :Unit character 1	P0508[1] : Unit character 2	P0508[2] : Unit character 3	P0508[3] : Unit character 4

P0509[12]	String			
	Min: 0	**Def: 0**	**Max: 65535**	**Level 3**
Index:	P0509[0] : String char 1 P0509[1] : String char 2 P0509[2] : String char 3	P0509[3] : String char 4 P0509[4] : String char 5 P0509[5] : String char 6	P0509[6] : String char 7 P0509[7] : String char 8 P0509[8] : String char 9	P0509[9] : String char 10 P0509[10] : String char 11 P0509[11] : String char 12

P0601	Motor temperature sensor			
	Min: 0	**Def: 0**	**Max: 2**	**Level 3**
Setting:	0=No sensor	1=PTC thermistor	2=KTY84	
Dependency:	If no sensor is selected, motor temperature monitoring occurs based on the estimated value of the thermal motor model.			

P0610	Motor I2t temperature reaction			
	Min: 0	**Def: 2**	**Max: 2**	**Level 3**
Enum:	0=No reaction, warning only	1=Warning and Imax reduction (results in reduced output freq.)	2=Warning and trip (F0010)	

P0640	Motor overload factor [%]			
	Min: 10.0	**Def: 150.0**	**Max: 400.0**	**Level 2**
Dependency:	Limited to maximum inverter current or to 400% of rated motor current (P0305), whichever is the lower			

P0700[2]	Selection of command source			
	Min: 0	**Def: index dependent**	**Max: 6**	**Level 1**
Enum:	0=Factory default setting 1=BOP (keypad)	2=Terminal 4=USS on BOP link	5=USS on COM link 6=CB on COM link	
Index:	P0700[0] : IN000 (AUTO) 1st. Command data set (CDS)	P0700[1] : IN001 (HAND) 2nd. Command data set (CDS)		
Note:	Changing this parameter resets (to default) all settings on item selected. For example: changing from 1 to 2 resets all digital inputs to default settings.			

P0701[2]	Function of digital input 1			
	Min: 0	**Def: 1**	**Max: 99**	**Level 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) 17 =Fixed setpoint (Binary coded selection+ON)	25 =DC brake enable 26 =Enable Essential Service 27 =Enable PID 29 =External trip 33 =Disable additional freq setpoint 99 =Enable BICO parameterization	
Index:	P0701[0] : IN000 (AUTO) 1st. Command data set (CDS)	P0701[1] : IN001 (HAND) 2nd. Command data set (CDS)		
Dependency:	Setting 99 (enable BICO parameterization) requires P0700 (command source) or P3900 (end of quick commissioning)=1, 2 or P0970 (factory reset)=1 in order to reset.			
Note:	Setting 99 (BICO) for expert use only			

P0702[2]	Function of digital input 2			
	Min: 0	**Def: 12**	**Max: 99**	**Level 2**
Detail:	See P0701 (function of digital input1).			

P0703[2]	Function of digital input 3			
	Min: 0	**Def: 9**	**Max: 99**	**Level 2**
Detail:	See P0701 (function of digital input1).			

P0704[2]	Function of digital input 4			
	Min: 0	**Def: 15**	**Max: 99**	**Level 2**
Detail:	See P0701 (function of digital input1).			

P0705[2]	Function of digital input 5			
	Min: 0	Def: 15	Max: 99	Level 2
Detail:	See P0701 (function of digital input1).			

P0706[2]	Function of digital input 6			
	Min: 0	Def: 15	Max: 99	Level 2
Detail:	See P0701 (function of digital input1).			

P0707[2]	Function of digital input 7			
	Min: 0	Def: 0	Max: 99	Level 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.)	25 =DC brake enable 26 =Enable Essential Service 29 =External trip 33 =Disable additional freq setpoint 99 =Enable BICO parameterization	
Index:	P0707[0] : IN000 (AUTO) 1st. Command data set (CDS)	P0707[1] : IN001 (HAND) 2nd. Command data set (CDS)		
Dependency:	Signals about 4V are active, signals below 1.6V are inactive.			
Details:	See P0701 (function of digital input 1).			

P0708[2]	Function of digital input 8			
	Min: 0	Def: 0	Max: 99	Level 2
Detail:	See P0707 (function of digital input7).			

P0718	CO/BO: Hand/Auto			
	Min: 0	Def: 0	Max: 1	Level 2

r0722	CO/BO: Binary input values			
	Min: -	Def: -	Max: -	Level 2
Bit Fields	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 0 OFF, 1 ON Bit04 Digital input 5 0 OFF, 1 ON Bit05 Digital input 6 0 OFF, 1 ON Bit06 Digital input 7 (via ADC 1) 0 OFF, 1 ON Bit07 Digital input 8 (via ADC 2) 0 OFF, 1 ON			
Note:	Segment is lit when signal is active.			

P0725	PNP/NPN digital inputs			
	Min: 0	Def: 1	Max: 1	Level 3
Value:	NPN: Terminals 5/6/7 must be connected via terminal 9 (0V). PNP: Terminals 5/6/7 must be connected via terminal 8 (24V). If VCB NPN: Terminals 5/6/7/8/16/17 must be connected via terminal 28 (0V). PNP: Terminals 5/6/7/8/16/17 must be connected via terminal 9 (24V).			
Enum:	0=NPN mode ==> low active	1=PNP mode ==> high active		

P0731[2]	BI: Function of digital output 1			
	Min: 0.0	Def: 52.3	Max: 4000.0	Level 2

Settings:					
52.0	Drive ready	0 Closed	52.E	Motor running direction right	0 Closed
52.1	Drive ready to run	0 Closed	52.F	Inverter overload	1 Closed
52.2	Drive running	0 Closed	53.0	DC brake active	0 Closed
52.3	Drive fault active	0 Closed	53.1	Inverter freq. less switch off limit	0 Closed
52.4	OFF2 active	1 Closed	53.2	Inverter freq. less minimum freq.	0 Closed
52.5	OFF3 active	1 Closed	53.3	Current greater or equal than limit	0 Closed
52.6	Switch on inhibit active	0 Closed	53.4	Act. freq. greater comparison freq.	0 Closed
52.7	Drive running	0 Closed	53.5	Act. freq. less comparison freq.	0 Closed
52.8	Deviation setpoint/actual value	1 Closed	53.6	Act. freq. greater/equal setpoint	0 Closed
52.9	PZD control (Process Data Control)	0 Closed	53.7	Voltage less than threshold	0 Closed
52.A	Maximum frequency reached	0 Closed	53.8	Voltage greater than threshold	0 Closed
52.B	Warning: Motor current limit	1 Closed	53.A	PID output at lower limit (P2292)	0 Closed
52.C	Motor holding brake (MHB) active	0 Closed	53.B	PID output at upper limit (P2291)	0 Closed
52.D	Motor overload	1 Closed			

Index:	P0731[0] : IN000 (AUTO) 1st. Command data set (CDS)	P0731[1] : IN001 (HAND) 2nd. Command data set (CDS)

P0732[2]	BI: Function of digital output 2			
	Min: 0.0	Def: 52.7	Max: 4000.0	Level 2
Detail:	See P0731 (function of digital output 1).			

r0747	CO/BO: State of digital outputs			
	Min: -	Def: -	Max: -	Level 3
Bit Fields:	Bit00 Digital output 1 energized 0 NO, 1 YES Bit01 Digital output 2 energized 0 NO, 1 YES			
Dependency:	Bit 0 0=relay de-energized/contacts open 1=relay energized/contacts closed			

P0748	Invert digital outputs			
	Min: 0	Def: 0	Max: 7	Level 3
Bit Fields:	Bit00 Invert digital output 1 0 NO, 1 YES Bit01 Invert digital output 2 0 NO, 1 YES Bit02 Invert digital output 3 0 NO, 1 YES			

r0752[2]	Act. input of ADC [V] or [mA]			
	Min: -	Def: -	Max: -	Level 2
Index:	r0752[0] : IN000 Analog input 1 (ADC 1)	r0752[1] : IN001 Analog input 2 (ADC 2)		

P0753[2]	Smooth time ADC			
	Min: 0	Def: 3	Max: 10000	Level 3
Index:	P0753[0] : IN000 Analog input 1 (ADC 1)	P0753[1] : IN001 Analog input 2 (ADC)		
Note:	Increasing this time (smooth) reduces jitter but slows down response to the analog input. P0753=0 : No filtering			

r0754[2]	Act. ADC value after scaling [%]			
	Min: -	Def: -	Max: -	Level 2
Index:	r0754[0] : IN000 Analog input 1 (ADC 1)	r0754[1] : IN001 Analog input 2 (ADC 2)		
Dependency:	P0757 to P0760 define range (ADC scaling)			

r0755[2]	CO: Act. ADC after scal. [4000h]			
	Min: -	Def: -	Max: -	Level 2
Data:	Analog setpoint (ASP) from the analog scaling block can vary from min. analog setpoint (ASPmin) to a max. analog setpoint (ASPmax) as shown in P0757 (ADC scaling). The largest magnitude (value without sign) of ASPmin and ASPmax defines the scaling of 16384.			
Example:	ASPmin=300%, ASPmax=100% then 16384 represents 300%. This parameter will vary from 5461 to 16364 ASPmin=-200%, ASPmax=100% then 16384 represents 200%. This parameter will vary from -16384 to +8192			
Index:	r0755[0] : IN000 Analog input 1 (ADC 1)	r0755[1] : IN001 Analog input 2 (ADC 2)		
Note:	This value is used as an input to analog BICO connectors. ASPmax represents the highest analog setpoint (this may be at 10V) ASPmin represents the lowest analog setpoint (this may be at 0V)			
Details:	See parameters P0757 to P0760 (ADC scaling)			

P0756[2]	Type of ADC			
	Min: 0	Def: 0	Max: 5	Level 2
Data:	Defines type of analog input and also enables analog input monitoring. #if defined ECB || defined VCB To switch over from voltage to current analog input it is not sufficient to merely modify parameter P0756. Rather, the DIPs on the terminal board must also be set to the correct position. The DIP settings are as follows: - OFF=voltage input (10V) - ON =current input (20 mA) Allocation of DIPs to analog inputs is as follows: - DIP on left (DIP 1)= Analog input 1 - DIP on right (DIP 2)= Analog input 2			
Enum:	0=Unipolar voltage input (0 to +10V) 1=Unipolar voltage input with monitoring (0 to 10V) 2=Unipolar current input (0 to 20 mA)	3=Unipolar current input with monitoring (0 to 20 mA) 4=Bipolar voltage input (-10V to +10V) 5=LG NI1000 sensor input		
Index:	P0756[0] : IN000 Analog input 1 (ADC 1)	P0756[1] : IN001 Analog input 2 (ADC 2)		
Dependency:	Function disabled if analog scaling block programmed to output negative setpoints (see P0757 to P0760).			
Note:	When monitoring is enabled and a deadband defined (P0761), a fault condition will be generated (F0080) if the analog input voltage falls below 50% of the deadband voltage. #if defined ECB || defined VCB On account of h/w restirction it is not possible to select the bipolar voltage (see Enum declaration) for analog input 1 (P0756[1]=4).			
Details:	See P0757 to P0760 (ADC scaling).			

P0757[2]	Value x1 of ADC scaling [V/mA]			
	Min: 50.0	**Def: 0**	**Max: 150.0**	**Level 2**
Data:	Parameters P0757-P0760 configure the input scaling 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 10V). • ASPmin represents lowest analog setpoint (this may be at 0V). • Default values provide a scaling of 0V=0%, and 10V=100%.			
Index:	P0757[0] : IN000 Analog input 1 (ADC 1)		P0757[1] : IN001 Analog input 2 (ADC 2)	

P0758[2]	Value y1 of ADC scaling			
	Min: -99999.9	**Def: 0.0**	**Max: 99999.9**	**Level 2**
Index:	P0758[0] : IN000 Analog input 1 (ADC 1)		P0758[1] : IN001 Analog input 2 (ADC 2)	
Dependency:	Affects P2000 to P2003 (reference frequency, voltage, current or torque) depending on which setpoint is to be generated.			

P0759[2]	Value x2 of ADC scaling [V/mA]			
	Min: 50.0	**Def: 150.0**	**Max: 150.0**	**Level 2**
Index:	P0759[0] : IN000 Analog input 1 (ADC 1)		P0759[1] : IN001 Analog input 2 (ADC 2)	

P0760[2]	Value y2 of ADC scaling			
	Min: -99999.9	**Def: 100.0**	**Max: 99999.9**	**Level 2**
Index:	P0760[0] : IN000 Analog input 1 (ADC 1)		P0760[1] : IN001 Analog input 2 (ADC 2)	
Dependency:	Affects P2000 to P2003 (reference frequency, voltage, current or torque) depending on which setpoint is to be generated.			

P0761[2]	Width of ADC deadband [V/mA]			
	Min: 0	**Def: 0**	**Max: 150.0**	**Level 2**
Index:	P0761[0] : IN000 Analog input 1 (ADC 1)		P0761[1] : IN001 Analog input 2 (ADC 2)	
Note:	P0761[x]=0 : No deadband active. Deadband starts from 0V 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.			

P0771[2]	CI: DAC			
	Min: 0:0	**Def: 21:0**	**Max: 4000:0**	**Level 2**
Settings:	21 CO: Act. frequency (scaled to P2000) 24 CO: Act. output frequency (scaled to P2000) 25 CO: Act. output voltage (scaled to P2001)		26 CO: Act. DC-link voltage (scaled to P2001) 27 CO: Act. output current (scaled to P2002)	
Index:	P0771[0] : IN000 Analog output 1 (DAC 1)		P0771[1] : IN001 Analog output 2 (DAC 2)	

P0773[2]	Smooth time DAC			
	Min: 0	**Def: 2**	**Max: 1000**	**Level 3**
Index:	P0773[0] : IN000 Analog output 1 (DAC 1)		P0773[1] : IN001 Analog output 2 (DAC 2)	
Dependency:	P0773=0: Deactivates filter.			

r0774[2]	Act. DAC value [V] or [mA]			
	Min: -	**Def: -**	**Max: -**	**Level 2**
Index:	r0774[0] : IN000 Analog output 1 (DAC 1)		r0774[1] : IN001 Analog output 2 (DAC 2)	

P0776	Type of DAC			
	Min: 0	**Def: 1**	**Max: 1**	**Level 3**
Setting:	0=Current output		1=Voltage output	
Note:	The analog output is designed as a current output with a range of 0 to 20 mA. The two analog output channels must be of the same type, that is, both channels are current outputs with a range of 0 to 20 mA or both channels are defined as voltage outputs with a range of 0 to 10V.			

P0777[2]	Value x1 of DAC scaling			
	Min: -99999.0	**Def: 0.0**	**Max: 99999.0**	**Level 2**
Data:	Defines x1 output characteristic in [%]. Scaling block is responsible for adjustment of output value defined in P0771 (DAC connector input).			
Index:	P0777[0] : IN000 Analog output 1 (DAC 1)		P0777[1] : IN001 Analog output 2 (DAC 2)	
Dependency:	Affects P2000 to P2003 (referency frequency, voltage, current or torque) depending on which setpoint is to be generated.			

P0778[2]	Value y1 of DAC scaling			
	Min: 0	**Def: 0**	**Max: 20**	**Level 2**
Index:	P0778[0] : IN000 Analog output 1 (DAC 1)		P0778[1] : IN001 Analog output 2 (DAC 2)	

P0779[2]	**Value x2 of DAC scaling**			
	Min: -99999.0	**Def: 100.0**	**Max: 99999.0**	**Level 2**
Index:	P0779[0] : IN000 Analog output 1 (DAC 1)	P0779[1] : IN001 Analog output 2 (DAC 2)		
Dependency:	Affects P2000 to P2003 (referency frequency, voltage, current or torque) depending on which setpoint is to be generated.			

P0780[2]	**Value y2 of DAC scaling**			
	Min: 0	**Def: 20**	**Max: 20**	**Level 2**
Index:	P0780[0] : IN000 Analog output 1 (DAC 1)	P0780[1] : IN001 Analog output 2 (DAC 2)		

P0781[2]	**Width of DAC deadband**			
	Min: 0	**Def: 0**	**Max: 20**	**Level 2**
Index:	P0781[0] : IN000 Analog output 1 (DAC 1)	P0781[1] : IN001 Analog output 2 (DAC 2)		

P0809[3]	**Copy Command Data Set**			
	Min: 0	**Def: 0**	**Max: 2**	**Level 2**
Index:	P0809[0] : Copy from CDS	P0809[1] : Copy to DDS	P0809[2] : Start copy	
Note:	Start value in index 2 is automatically reset to '0' after execution of function			

P0810	**BI: CDS bit 0 (Local/Remote)**			
	Min: 0:0	**Def: 718:0**	**Max: 4095:0**	**Level 2**
Note:	Bit 1 is also relevant for BICO data set selection.			

P0918	**CB address**			
	Min: 0	**Def: 3**	**Max: 65535**	**Level 2**
Data:	Defines address of CB (communication board) or address of the other option modules. There are two ways to set the bus address: 1. via DIP switches on the PROFIBUS module 2. via a user-entered value			
Note:	Possible PROFIBUS settings: 1 ... 125 0, 126, 127 are not allowed The following applies when a PROFIBUS module is used: DIP switch =0 Address defined in P0918 (CB address) is valid DIP switch not=0 DIP switch setting has priority and P0918 indicates DIP switch setting.			

P0927	**Parameter changeable via**			
	Min: 0	**Def: 15**	**Max: 15**	**Level 2**
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 PROFIBUS/CB, BOP and USS on COM link (RS485 USS) but not via USS on BOP link (RS232)			
Bit Fields:	Bit00 PROFIBUS/CB 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 System Parameters*".			

r0947[8]	**Last fault code**			
	Min: -	**Def: -**	**Max: -**	**Level 2**
Data:	Displays fault history, 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 and F2. This moves the value in the 2 indices down to the next pair of indices, where they are stored. Indices 0 and 1 contain the active faults. When faults are acknowledged, indices 0 and 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.			

r0948[12]	Fault time			
	Min: -	Def: -	Max: -	Level 3
Data:	Time stamp to indicate when the fault has occurred. P2114 (run-time counter) or P2115 (real time clock) are the possible sources of the time stamp.			
Example:	The time is taken from P2115 if this parameter has been updated with the real time. If not, P2114 is used			
Index:	r0948[0] : Recent fault trip --, fault time seconds+minutes r0948[1] : Recent fault trip --, fault time hours+days r0948[2] : Recent fault trip --, fault time month+year r0948[3] : Recent fault trip -1, fault time seconds+minutes r0948[4] : Recent fault trip -1, fault time hours+days r0948[5] : Recent fault trip -1, fault time month+year		r0948[6] : Recent fault trip -2, fault time seconds+minutes r0948[7] : Recent fault trip -2, fault time hours+days r0948[8] : Recent fault trip -2, fault time month+year r0948[9] : Recent fault trip -3, fault time seconds+minutes r0948[10] : Recent fault trip -3, fault time hours+days r0948[11] : Recent fault trip -3, fault time month+year‘	
Note:	P2115 can be updated via AOP, Starter, DriveMonitor, etc.			

r0949[8]	Fault value			
	Min: -	Def: -	Max: -	Level 3
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	

P0952	Total number of faults			
	Min: 0	Def: 0	Max: 0	Level 3
Dependency:	Setting 0 resets fault history (changing to 0 also resets parameter P0948-fault time).			

r0967	Control word 1					
	Min: -		Def: -		Max: -	Level 3
Bit Fields:	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	CDS Bit 0 (Local/Remote)	0	NO,	1 YES	

r0968	Statue word 1					
	Min: -		Def: -		Max: -	Level 3
Bit Fields:	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	

P0970	**Factory reset**			
	Min: 0	**Def: 0**	**Max: 1**	**Level 1**
Enum:	0=Disabled	1=Parameter reset		
Dependency:	First set P0010=30 (factory settings) Stop drive (that is, disable all pulses) before you can reset parameters to default values.			
Note:	The following parameters retain their values after a factory reset: P0918 (CB address) P2010 (USS baud rate) P2011 (USS address)			

P0971	**Transfer data from RAM to EEPROM**			
	Min: 0	**Def: 0**	**Max: 1**	**Level 3**
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[2]	**Selection of frequency setpoint**			
	Min: 0	**Def: index dependent**	**Max: 77**	**Level 1**
Data:	Selects frequency setpoint source. In the table of possible settings below, the main setpoint is selected from the least significant digit (that is, 0 to 6) and any additional setpoint from the most significant digit (that is, x0 through to x6).			
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 (keypad) 2 Analog input	3 Fixed frequency setpoint 4 USS on BOP link/AOP	5 USS on COM link 6 Communication board (CB) on COM link/P1-N2 communications	
Enum:	0=No main setpoint 1=MOP setpoint 2=Analog setpoint 3=Fixed frequency 4=USS on BOP link 5=USS on COM link 6=CB on COM link 7=Analog setpoint 2 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 16=CB on COM link + MOP setpoint 17=Analog setpoint 2 + 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 26=CB on COM link + Analog setpoint 27=Analog setpoint 2 + 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 36=CB on COM link + Fixed frequency 37=Analog setpoint 2 + 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 46=CB on COM link + USS on BOP link 47=Analog setpoint 2 + 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 56=CB on COM link + USS on COM link 57=Analog setpoint 2 + USS on COM link 60=No main setpoint + CB on COM link 61=MOP setpoint + CB on COM link 62=Analog setpoint + CB on COM link 63=Fixed frequency + CB on COM link 64=USS on BOP link + CB on COM link 65=USS on COM link + CB on COM link 66=CB on COM link + CB on COM link 67=Analog setpoint 2 + CB on COM link 70=No main setpoint + Analog setpoint 2 71=MOP setpoint + Analog setpoint 2 72=Analog setpoint + Analog setpoint 2 73=Fixed frequency + Analog setpoint 2 74=USS on BOP link + Analog setpoint 2 75=USS on COM link + Analog setpoint 2 76=CB on COM link + Analog setpoint 2 77=Analog setpoint 2 + Analog setpoint 2	
Index:	P1000[0] : IN000 (AUTO) 1st. Command data set (CDS) P1000[1] : IN001 (HAND) 2nd. Command data set (CDS)			
Note:	Single digits denote main setpoints that have no additional setpoint.			

P1001	**Fixed frequency 1**			
	Min: -650.0	**Def: 0.00**	**Max: 650.00**	**Level 2**

Data: There are three types of fixed frequencies:

1. Direct selection (P0701-P0706=15)
   In this mode of operation 1 digital input selects 1 fixed frequency. If several inputs are active together, the selected frequencies are summed, for example, FF1 + FF2 + FF3 + FF4 + FF5 + FF6.
2. Direct selection + ON command (P0701-P0706=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, for example, FF1 + FF2 + FF3 + FF4 + FF5 + FF6.
3. Binary coded selection + ON command (P0701-P0706=17)
   Select up to 16 fixed frequencies using this method. Select the fixed frequencies according to the following table:

		DIN4	**DIN3**	**DIN2**	**DIN1**
	OFF	Inactive	Inactive	Inactive	Inactive
P1001	FF1	Inactive	Inactive	Inactive	**Active**
P1002	FF2	Inactive	Inactive	**Active**	Inactive
P1003	FF3	Inactive	Inactive	**Active**	**Active**
P1004	FF4	Inactive	**Active**	Inactive	Inactive
P1005	FF5	Inactive	**Active**	Inactive	**Active**
P1006	FF6	Inactive	**Active**	**Active**	Inactive
P1007	FF7	Inactive	**Active**	**Active**	**Active**
P1008	FF8	**Active**	Inactive	Inactive	Inactive
P1009	FF9	**Active**	Inactive	Inactive	**Active**
P1010	FF10	**Active**	Inactive	**Active**	Inactive
P1011	FF11	**Active**	Inactive	**Active**	**Active**
P1012	FF12	**Active**	**Active**	Inactive	Inactive
P1013	FF13	**Active**	**Active**	Inactive	**Active**
P1014	FF14	**Active**	**Active**	**Active**	**Active**
P1015	FF15	**Active**	**Active**	**Active**	**Active**

Dependency: Select fixed frequency operation (using P1000).
Inverter requries ON command to start in the case of direct selection (P0701 – P0706=15).

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

P1002-P1015	**Fixed frequency 2 through 15**			
	Min: -650.00	**Def: See Note below**	**Max: 650.00**	**Level 2**

Details: See P1001 (fixed frequency 1).

Note: Default fixed frequency setpoint values are as follows:

Fixed Frequency	**Default**	**Fixed Frequency**	**Default**	**Fixed Frequency**	**Default**
1	0.00	6	25.00	11	50.00
2	5.00	7	30.00	12	55.00
3	10.00	8	35.00	13	60.00
4	15.00	9	40.00	14	65.00
5	20.00	10	45.00	15	65.00

P1016 – P1019	**Fixed frequency mode-Bit 0 through 3**			
	Min: 1	**Def: 1**	**Max: 3**	**Level 3**

Details: Parameter P1016 defines the mode of Bit 0, Parameter P1017 defines the mode of Bit 1, Parameter P1018 defines the mode of Bit 2, and Parameter P1019 defines the mode of Bit 3.

Enum: 1=Direct selection 2=Direct selection + ON command 3=Binary coded selection + ON command

Note: See table in P1001 (fixed frequency 1) for a description of how to use fixed frequencies.

P1020[2] – P1023[2]	**BI: Fixed freq. selection Bit 0**			**Level 3**
	Min: 0:0	**Def: 0:0**	**Max: 4000:0**	

Settings:

P1020= 722.0 ==> Digital input 1	P1022= 722.2 ==> Digital input 3	P1026= 722.4 ==> Digital input 5
P1021= 722.1 ==> Digital input 2	P1023= 722.3 ==> Digital input 4	P1028= 722.5 ==> Digital input 6

Index:

P1020[0] : 1st. Command data set (CDS) for Bit 0	P1020[1] : 2nd. Command data set (CDS) for Bit 0
P1021[0] : 1st. Command data set (CDS) for Bit 1	P1021[1] : 2nd. Command data set (CDS) for Bit 1
P1022[0] : 1st. Command data set (CDS) for Bit 2	P1022[1] : 2nd. Command data set (CDS) for Bit 2
P1023[0] : 1st. Command data set (CDS) for Bit 3	P1023[1] : 2nd. Command data set (CDS) for Bit 3

Dependency: Accessible only if P0701-P0706=99 (function of digital inputs=BICO)

r1024	**CO: Act. fixed frequency**			**Level 3**
	Min: -	**Def: -**	**Max: -**	

P1025	**Fixed frequency mode – Bit 4**			
	Min: 1	**Def: 1**	**Max: 3**	**Level 3**
Enum:	1=Direct selection	2=Direct selection + ON command	3=Binary coded selection + ON command	
Details:	See parameter P1001 for description of how to use fixed frequencies.			

P1026[2]	**BI: Fixed freq. selection Bit 4**			
	Min: 0:0	**Def: 722:4**	**Max: 4000:0**	**Level 3**
Index:	P1026[0] : IN000 (AUTO) 1st. Command data set (CDS)	P1026[1] : IN001 (HAND 2nd. Command data set (CDS)		
Dependency:	Accessible only if P0701-P0706=99 (function of digital inputs=BICO).			
Details:	See P1020 (fixed frequency selection Bit 0) for most common settings.			

P1027	**Fixed frequency mode – Bit 5**			
	Min: 1	**Def: 1**	**Max: 3**	**Level 3**
Enum:	1=Direct selection	2=Direct selection + ON command	3=Binary coded selection + ON command	
Details:	See parameter P1001 for description of how to use fixed frequencies.			

P1028[2]	**BI: Fixed freq. selection Bit 5**			
	Min: 0:0	**Def: 722:5**	**Max: 4000:0**	**Level 3**
Index:	P1028[0] : IN000 (AUTO) 1st. Command data set (CDS)	P1028[1] : IN001 (HAND) 2nd. Command data set (CDS)		
Dependency:	Accessible only if P0701-P0706=99 (function of digital inputs=BICO).			
Details:	See P1020 (fixed frequency selection Bit 0) for most common settings.			

P1031	**Setpoint memory of the MOP**			
	Min: 0	**Def: 0**	**Max: 1**	**Level 2**
Enum:	0=PID-MOP setpoint will not be stored	1=PID-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**			
	Min: 0	**Def: 1**	**Max: 1**	**Level 2**
Enum:	0=Reserve direction is allowed	1=Reserve 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**			
	Min: -650.00	**Def: 5.00**	**Max: 650.00**	**Level 2**
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.			

r1050	**CO: Act. Output freq. of the MOP**			
	Min: -	**Def: -**	**Max: -**	**Level 3**

r1078	**CO: Total frequency setpoint**			
	Min: -	**Def: -**	**Max: -**	**Level 3**

P1080	**Min. Frequency**			
	Min: 0.00	**Def: 0.00**	**Max: 650.00**	**Level 1**
Note:	Value set here is valid both for clockwise and for anticlockwise rotation. Under certain conditions (for example, ramping, current limiting), motor can run below minimum frequency.			

P1082	**Max. Frequency**			
	Min: 0.00	**Def: 50.00**	**Max: 650.00**	**Level 1**
Dependency:	Limited internally to 200 Hz or 5 * rated motor frequency (P0305) when P1300 >= 20 (control mode=vector control). The value is displayed in r0209 (maximum frequency).			
Note:	The value set here is valid for both clockwise and counterclockwise rotation. The maximum output frequency of inverter can be exceeded if one of the following is active: Slip compensation=$f_{max} + f_{slip\ comp\ max}$, or Flying restart=$f_{max} + f_{slip\ nom}$ Maximum motor speed is subject to mechanical limitations.			

P1091 – P1094	Skip frequency 1 through 4			
	Min: 0.00	Def: 0.00	Max: 650.00	Level 3
Details:	Defines the skip frequency which avoids effects of mechanical resonance and suppresses frequencies within +/- P1101 (skip frequency bandwidth). P1091 defines skip frequency 1, P1092 defines skip frequency 2, P1093 defines skip frequency 3, and P1094 defines skip frequency 4.			
Note:	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 and P1101=2 Hz, it is not possible to operate continuously between 10 Hz +/- 2 Hz (that is, between 8 and 12 Hz)			

P1101	Skip frequency bandwidth			
	Min: 0.00	Def: 2.00	Max: 10.00	Level 3
Details:	Delivers frequency bandwidth to be applied to skip frequencies (in [Hz]).			
Note:	See P1091 through P1094 (skip frequencies 1 through 4).			

P1110[2]	BI: Inhibit neg. freq. Setpoint			
	Min: 0:0	Def: 0:0	Max: 4000:0	Level 3
Details:	Inhibits direction reversal, thus preventing a negative setpoint from causing motor from running in reverse. Instead, it will run at minimum frequency (P1080) in the normal direction			
Settings:	0=Disabled		1=Enabled	
Index:	P1110[0] : IN000 (AUTO) 1st. Command data set (CDS)		P1110[1] : IN001 (HAND) 2nd. Command data set (CDS)	
Note:	It is possible to disable all reverse commands (that is, the command is ignored). To do this, set P0719=0 (remote selection of command/setpoint source) and define the command sources (P1113) individually. This function does not disable the "reverse" command function; rather, a reverse command causes motor to run in the normal direction as described above.			

P1120	Ramp-up time			
	Min: 0.00	Def: 10.00	Max: 650.00	Level 1
Details:	Setting the ramp-up time too short can cause the inverter to trip (overcurrent). If an external frequency setpoint with set ramp rates is used (for example, 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.			

P1121	Ramp-down time			
	Min: 0.00	Def: 10.00	Max: 650.00	Level 1
Details:	Setting the ramp-down time too short can cause the inverter to trip (overcurrent (F0001)/overvoltage (F0002)).			

P1135	OFF3 ramp-down time			
	Min: 0.00	Def: 5.00	Max: 650.00	Level 2
Details:	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.			

P1140[2]	BI: RFG enable			
	Min: 0.00	Def: 1.0	Max: 4000.0	Level 3
Index:	P1140[0]: IN000 (AUTO) 1st command data set (CDS)		P1140[1]: IN001 (HAND) 2nd command data set (CDS)	

P1141[2]	BI: RFG start			
	Min: 0.00	Def: 1.0	Max: 4000.0	Level 3
Index:	P1141[0]: IN000 (AUTO) 1st command data set (CDS)		P1141[1]: IN001 (HAND) 2nd command data set (CDS)	

P1142[2]	BI: RFG setpoint			
	Min: 0.00	Def: 1.0	Max: 4000.0	Level 3
Index:	P1142[0]: IN000 (AUTO) 1st command data set (CDS)		P1142[1]: IN001 (HAND) 2nd command data set (CDS)	

P1200	Flying start			
	Min: 0	Def: 0	Max: 6	Level 2
Details:	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. Flying start must be used in cases where the motor may still be turning (for example, after a short mains break) or can be driven by the load. Otherwise, overcurrent trips will occur			

P1202	Motor-current: Flying start			

	Min: 50	**Def: 100**	**Max: 200**	**Level 3**
Details:	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: 50	**Def: 100**	**Max: 200**	**Level 3**
Details:	Sets factor by which output frequency changes during flying start to synchronize with turning motor. Enter this value in [%] relative to default time factor (which defines the initial gradient and influences time taken to search for motor frequency). The search time is the time taken to search through all possible frequencies (between [f_max+2*f_slip] and 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	**Def: 1**	**Max: 5**	**Level 2**
Enum:	0=Disabled 1 =Trip reset after power on: P1211 disabled 2 =Restart mains break; power on: P1211 disabled		3 =Restart after fault/mains break: P1211 enabled 4 =Restart after mains break: P1211 enabled 5 =Restart mains break/fault/power on: P1211 disabled	
Dependency:	Auto restart requires constant ON command (for example, via a digital input wire link).			
Caution:	Settings 2 to 5 can cause the motor to restart unexpectedly			
Note:	Flying start must be used in cases where the motor may still be turning (for example, after a short mains break) or can be driven by the load (P1200).			

P1211	**Number of restart attempts**			
	Min: 0	**Def: 3**	**Max: 10**	**Level 3**

P1212	**Time to first restart**			
	Min: 0	**Def: 30**	**Max: 1000**	**Level 2**

P1213	**Restart time increment**			
	Min: 0	**Def: 30**	**Max: 1000**	**Level 2**

P1230[2]	**BI: Enable DC braking**			
	Min: 0:0	**Def: 0:0**	**Max: 4000:0**	**Level 3**
Details:	Enables DC braking via a signal applied from an external source. Function remains active while external input signal is active. DC braking causes the motor to stop rapidly by applying a DC braking current (current applied also holds shaft stationary). When the DC braking signal is applied, the inverter output pulses are blocked and the DC current is not applied until the motor has been sufficiently demagnetized.			
Settings:	722.0=Digital input 1 (requires P0701 set to 99, BICO) 722.1=Digital input 2 (requires P0702 set to 99, BICO) 722.2=Digital input 3 (requires P0703 set to 99, BICO) 722.3=Digital input 4 (requires P0704 set to 99, BICO) 722.4=Digital input 5 (requires P0705 set to 99, BICO) 722.5=Digital input 6 (requires P0706 set to 99, BICO) 722.6=Digital input 7 (via analog input 1, requires P0707 set to 99) 722.7=Digital input 8 (via analog input 2, requires P0708 set to 99)			
Index:	P1230[0] : IN000 (AUTO) 1st. Command data set (CDS)		P1230[1] : IN001 (HAND) 2nd. Command data set (CDS)	
Caution:	Frequent use of long periods of DC braking can cause the motor to overheat.			
Note:	This delay time is set in P0347 (demagnetization time). If this delay is too short, overcurrent trips can occur.			

P1232	**DC braking current**			
	Min: 0	**Def: 100**	**Max: 250**	**Level 2**

P1233	**Duration of DC braking**			
	Min: 0	**Def: 0**	**Max: 250**	**Level 2**
Value:	P1233=0 : Not active following OFF1.		P1233=1-250 : Active for the specified duration.	
Caution	Frequent use of long periods of DC braking can cause the motor to overheat.			
Note:	The DC braking function causes the motor to stop rapidly by applying a DC braking current (the current applied also holds the shaft stationary). When the DC braking signal is applied, the inverter output pulses are blocked and the DC current not applied until the motor has been sufficiently demagnetized (demagnetization time is calculated automatically from motor data).			

P1236	Compound braking current			
	Min: 0	Def: 0	Max: 250	Level 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.			
Note:	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			
	Min: 0	Def: 1	Max: 3	Level 3
Details:	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		2 =Vdc-min controller (Kinetic buffering) enabled 3 =Vdc-max and Vdc-min controller enabled	
Note:	Vdc max automatically increases ramp-down times to keep the DC-link voltage (r0026) within limits (P2172) Vdc min is activated if DC-link voltage falls below minimum level. The kinetic energy of the motor is then used to buffer the DC-link voltage, thus causing deceleration of the drive.			

P1260	Source of changeover control			
	Min: 0	Def: 0	Max: 7	Level 2
Settings:	0=Bypass disabled 1=Controlled by VFD trip 2=Controlled by DIN – see 1266 3=Controlled by DIN and VFD trip		4=Controlled by VFD frequency 5=Controlled by VFD frequency and VFD trip 6=Controlled by VFD frequency and DIN 7=Controlled by VFD frequency and DIN and VFD trip	

r1261	BO: Contactor control word			
	Min: -	Def: -	Max: -	Level 2
Bit Fields	Bit 00 Motor supplied by drive 0...YES, 1...NO		Bit 01 Motor supplied by mains 0...YES, 1...NO	

P1262	Bypass dead time			
	Min: 0	Def: 1.000	Max: 20.000	Level 2

P1263	De-Bypass time			
	Min: 0	Def: 1.000	Max: 300.0	Level 2

P1264	Bypass time			
	Min: 0	Def: 1.0	Max: 300.0	Level 2

P1265	Mains frequency			
	Min: 12.00	Def: 50.00	Max: 650.00	Level 2

P1266	BI: Bypass command			
	Min: 0:0	Def: 0:0	Max: 4000:0	Level 2

P1270[2]	BI: Enable essential service			
	Min: 0:0	Def: 0:0	Max: 4000:0	Level 2

P1300	Control mode			
	Min: 0	Def: 0	Max: 23	Level 2
Details:	Controls relationship between speed of motor and voltage supplied by inverter.			
Enum:	0 =V/f with linear charac. 1 =V/f with FCC 2 =V/f with parabolic charac. 3 =V/f with programmable charac.	4 =V/f with ECO mode 5 =V/f for textile applications 6 =V/f with FCC for textile applications 19 =V/f control with independent voltage setpoint	20 =Sensorless vector control 21 =Vector control with sensor 22 =Sensorless vector torque-control 23 =Vector torque-control with sensor	
Dependency:	Limited internally to 200 Hz or 5 * rated motor frequency (P0305) when P1300 >= 20 (control mode=vector control). The value is displayed in r0209 (maximum frequency).			
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	**Def: 50.0**	**Max: 250.0**	**Level 2**
Details:	Defines boost level in [%] relative to P0305 (rated motor current) applicable to both linear and quadratic V/f curves.			
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 Increasing the boost levels increases motor heating (especially at standstill).			

P1311	**Acceleration boost**			
	Min: 0.0	**Def: 0.0**	**Max: 250.0**	**Level 2**
Details:	Applies boost in [%] relative to P0305 (rated motor current) following a positive setpoint change and drops back out once the setpoint is reached.			
Dependency:	Setting in P0640 (motor overload factor [%]) limits boost.			
Note:	Acceleration boost can help to improve response to small positive setpoint changes.			

P1312	**Starting boost**			
	Min: 0.0	**Def: 0.0**	**Max: 250.0**	**Level 2**
Details:	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.			
Note:	Increasing the boost levels increases motor heating. Σ *Boosts* ≤ $300/I_{mot} * R_S$ Priorities are allocated to the boost parameters as follows: P1310 > P1311 > P1312			

P1335	**Slip compensation**			
	Min: 0.0	**Def: 0.0**	**Max: 600.0**	**Level 2**
Details:	Dynamically adjusts output frequency of inverter so that motor speed is kept constant independent of motor load.			
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.			
Note:	Gain adjustment enables fine-tuning of the actual motor speed (see P1460-gain speed control). 100%=standard setting for warm stator			

P1336	**Slip limit**			
	Min: 0	**Def: 250**	**Max: 600**	**Level 2**
Details:	Compensation slip limit in [%] relative to r0330 (rated motor slip), which is added to frequency setpoint.			
Dependency:	Slip compensation (P1335) active.			

r1337	**CO: V/f slip frequency**			
	Min: -	**Def: -**	**Max: -**	**Level 3**
Details:	Displays actual compensated motor slip as [%].			
Dependency:	Slip compensation (P1335) active.			

P1499	**Scaling accel. torque control**			
	Min: 0.0	**Def: 100.0**	**Max: 400.0**	**Level 3**
Details:	Enters scaling of acceleration in [%] for sensorless torque control (SLVC) at low frequencies.			

P1800	**Pulse frequency**			
	Min: 2	**Def: 4**	**Max: 16**	**Level 2**
Details:	Sets pulse frequency of power switches in inverter. The frequency can be changed in steps of 2 kHz. Pulse frequencies > 4 kHz selected on 380 to 480V units reduce the maximum continuous motor current.			
Dependency:	Minimum pulse frequency depends on P1082 (maximum frequency) and P0310 (rated motor frequency).			
Note:	At 4 kHz, full output current is obtained up to 50 degrees C (CT mode); over 50 degrees Celsius, full output may be obtained at 8 kHz. 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, Level 3).			

r1801	CO: Act. switching frequency			
	Min: -	Def: -	Max: -	Level 3
Note:	Actual pulse frequency of power switches in inverter. Under certain conditions (inverter overtemperature, see P0290), this can differ from the values selected in P1800 (pulse frequency).			

P1820	Reverse output phase sequence			
	Min: 0	Def: 0	Max: 1	Level 2
Enum:	0=OFF 1=ON			
Dependency:	If positive and negative revolution is enabled, frequency setpoint is directly used. If both positive and negative revolution are disabled, reference value is set to zero.			
Details:	See P1000 (select frequency setpoint).			

P1910	Select motor data identification			
	Min: 0	Def: 0	Max: 20	Level 2
Settings:	P1910=1: All motor data * P0350 stator resistance, * P0354 rotor resistance, * P0356 stator leakage reactance, * P0358 rotor leakage reactance, * P0360 main reactance will be identified and parameter will be changed.		P1910=3: Saturation curve * P0362 ... P0365 magnetizing curve flux 1 .. 4 * P0366 ... P0369 magnetizing curve imag 1 .. 4 will be identified and parameter will be changed.	
Enum:	0=Disabled 1=Identification of all parameters with parameter change 2=Identification of all parameters without parameter change 3=Identification of saturation curve with parameter change 4=Identification of saturation curve without parameter change 5=Identification of XsigDyn (r1920) without parameter change		6=Identification of Tdead (r1926) without parameter change 7=Identification of Rs (r1912) without parameter change 8=Identification of Xs (r1915) without parameter change 9=Identification of Tr (r1913) without parameter change 10 =Identification of Xsigma (r1914) without parameter change 20 =Set voltage vector	
Dependency:	No measurement if motor data incorrect. P1910=1 : Calculated value for stator resistance (see P0350) is overwritten. P1910=2 : Values already calculated are not overwritten.			
Note:	Before selecting motor data identification, "Quick commissioning" has to be performed in advance. Once enabled (P1910=1), A0541 generates a warning that the next ON command will initiate measurement of motor parameters. When choosing the setting for measurement, observe the following: 1. "With parameter change" means that the value is actually adopted as P0350 parameter setting and applied to the control as well as being shown in the read-only parameters below. 2. "Without parameter change" means that the value is only displayed, that is, shown for checking purposes in the read-only parameter r1912 (identified stator resistance). The value is not applied to the control.			

r1912[3]	Identified stator resistance			
	Min: -	Def: -	Max: -	Level 2
Index:	r1912[0] : U_phase	r1912[1] : V_phase	r1912[2] : W_phase	
Note:	This value is measured using P1910=1 or 2 , that is, identification of all parameters with/without change.			

P2000	Reference frequency			
	Min: 1.00	Def: 50.00	Max: 650.00	Level 2

P2001	Reference voltage			
	Min: 10	Def: 1000	Max: 2000	Level 3
Example:	P0201=230 specifies that 4000H received via USS denotes 230V.			

P2002	Reference current			
	Min: 0.10	Def: 0.10	Max: 10000.00	Level 3

r2004	Reference power			
	Min: -	Def: -	Max: -	Level 3

P2009[2]	USS normalization			
	Min: 0	Def: 0	Max: 1	Level 3
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 (for example, 4000H=16384 means 163.84 Hz).			

P2010[2]	**USS baudrate**			
	Min: 4	**Def: 6**	**Max: 12**	**Level 2**
Enum:	4= 2400 baud 5= 4800 baud 6= 9600 baud	7= 19200 baud 8= 38400 baud	9= 57600 baud 10=76800 baud	11=93750 baud 12 =115200 baud
Index:	P2010[0] : Serial interface COM link		P2010[1] : Serial interface BOP link	

P2011[2]	**USS address**			
	Min: 0	**Def: 0**	**Max: 31**	**Level 2**
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 (that is, 31 inverters in total) and control them with the USS serial bus protocol.			

P2014[2]	**USS telegram off time**			
	Min: 0	**Def: 0**	**Max: 65535**	**Level 3**
Index:	P2014[0] : Serial interface COM link		P2014[1] : Serial interface BOP link	
Note:	By default (time set to 0), no fault is generated (that is, watchdog disabled).			

P2040	**CB telegram off time**			
	Min: 0	**Def: 20**	**Max: 65535**	**Level 3**
Dependency:	Setting 0=watchdog disabled			

P2041[5]	**CB parameter**			
	Min: 0	**Def: 0**	**Max: 65535**	**Level 3**
Index:	P2041[0] : CB parameter 0 P2041[1] : CB parameter 1	P2041[2] : CB parameter 2 P2041[3] : CB parameter 3	P2041[4] : CB parameter 4	
Note:	See relevant communication board manual for protocol definition and appropriate settings			

r2050[8]	**CB parameter**			
	Min: 0	**Def: 0**	**Max: 65535**	**Level 3**
Index:	r2050[0] : Received word 0 r2050[1] : Received word 1 r2050[2] : Received word 2	r2050[3] : Received word 3 r2050[4] : Received word 4 r2050[5] : Received word 5	r2050[6] : Received word 6 r2050[7] : Received word 7	
Note:	The control words can be viewed as bit parameters r2032 and r2033.			

P2051[8]	**CI: PZD to CB**			
	Min: 0:0	**Def: 52:0**	**Max: 4000:0**	**Level 3**
Settings:	Status word 1=52 CO/BO: Act. status word 1 (see r0052) Actual value 1= 21 inverter output frequency (see r0021) Other BICO settings are possible			
Index:	P2051[0] : Transmitted word 0 P2051[1] : Transmitted word 1 P2051[2] : Transmitted word 2	P2051[3] : Transmitted word 3 P2051[4] : Transmitted word 4 P2051[5] : Transmitted word 5	P2051[6] : Transmitted word 6 P2051[7] : Transmitted word 7	

r2053[5]	**CB identification**			
	Min: -	**Def: -**	**Max: -**	**Level 3**
Enum:	0=No CB option board 1=PROFIBUS DP		2=DeviceNet 56 not defined	
Index:	r2053[0] : CB type (PROFIBUS=1) r2053[1] : Firmware version r2053[2] : Firmware version detail		r2053[3] : Firmware date (year) r2053[4] : Firmware date (day/month)	

r2054[7]	**CB diagnosis**			
	Min: -	**Def: -**	**Max: -**	**Level 3**
Index:	r2054[0] : CB diagnosis 0 r2054[1] : CB diagnosis 1 r2054[2] : CB diagnosis 2	r2054[3] : CB diagnosis 3 r2054[4] : CB diagnosis 4	r2054[5] : CB diagnosis 5 r2054[6] : CB diagnosis 6	
Note:	See relevant communications board manual.			

P2100[3]	**Alarm number selection**			
	Min: 0	**Def: 0**	**Max: 65535**	**Level 3**
Example:	If you want F0005 to perform an OFF3 instead of an OFF2, set P2100[0]=5, then select the desired reaction in P2101[0] (in this case, set P2101[0]=3).			
Note:	All fault codes have a default reaction to OFF2. Some fault codes caused by hardware trips (for example, overcurrent) cannot be changed from the default reactions.			

P2101[3]	**Stop reaction value**			
	Min: 0	**Def: 0**	**Max: 4**	**Level 3**
Details:	Sets drive stop reaction values for fault selected by P2100 (alarm number stop reaction). This indexed parameter specifies the special reaction to the faults/warnings defined in P2100 indices 0 to 2.			
Enum:	0=No reaction, no display 1=OFF1 stop reaction	2=OFF2 stop reaction 3=OFF3 stop reaction	4=No reaction warning only	
Note:	Settings 0 to 3 only are available for fault codes Settings 0 and 4 only are available for warnings Index 0 (P2101) refers to fault/warning in index 0 (P2100)			

r2110[4]	**Warning number**			
	Min: -	**Def: -**	**Max: -**	**Level 2**
Details	Displays warning information. A maximum of two 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 keypad will flash while a warning is active. The LEDs indicate the warning status in this case. If an AOP is in use, the display will show number and text of the active warning. Indices 0 and 1 are not stored.			

P2111	**Total number of warnings**			
	Min: 0	**Def: 0**	**Max: 4**	**Level 3**
Details:	Displays number of warning (up to 4) since last reset. Set to 0 to reset the warning history.			

r2114[2]	**Run time counter**			
	Min: -	**Def: -**	**Max: -**	**Level 3**
Details:	Displays run time counter. See P-948 (fault time).			

P2115[3]	**AOP real time clock**			
	Min: 0	**Def: 0**	**Max: 65535**	**Level 3**
Details:	Displays run time counter. See P-948 (fault time).			

P2181	**Belt failure detection mode**			
	Min: 0	**Def: 0**	**Max: 6**	**Level 2**
Details:	Sets belt failure detection mode. This function allows detection of mechanical failure of the drive train, for example, a broken drive belt. It can also detect conditions which cause an overload, such as a jam. Two methods are provided of detecting the failure. The fist is achieved by comparing the actual frequency/torque curve with a programmed envelope (see P2182-P2190). If the curve falls outside the envelope, a warning or trip is generated. The second uses a pulse train from a simple sensor on the driven machine connected to the encoder circuit within the drive ASIC via a digital input. The pulse train, normally detecting one pulse per revolution of the drive machine, is converted to a frequency reference and compared with the actual inverter output frequency.			
Enum:	0=Belt failure detection disabled 1=Warn low torque/speed 2=Warn high torque/speed	3=Warn high/low torque/speed 4=Trip low torque/speed	5=Trip high torque/speed 6=Trip high/low torque/speed	

P2182	**Belt threshold frequency 1**			
	Min: 0.00	**Def: 5.00**	**Max: 650.00**	**Level 3**
Details:	Sets a frequency threshold F1 for comparing actual torque to torque the envelope for belt failure detection. The frequency torque envelope is defined by 9 parameters-3 are frequency parameters (P2182-P2184), and the other 6 define the low and high torque limits (P2185-P2190) for each frequency.			
Note:	The torque is unlimited below P2182, and above P2184. Normally P2182 <= lower torque limit (P1521), and P2184 >=upper torque limit (P1520).			

P2183	**Belt threshold frequency 2**			
	Min: 0.00	**Def: 30.00**	**Max: 650.00**	**Level 2**
Details:	Sets a threshold F2 for comparing actual torque to torque the envelope for belt failure detection.			
Note:	See P2182 (belt threshold frequency 1).			

P2184	**Belt threshold frequency 3**			
	Min: 0.00	**Def: 50.00**	**Max: 650.00**	**Level 2**
Details:	Sets a threshold F3 for comparing actual torque to torque the envelope for belt failure detection.			
Note:	See P2182 (belt threshold frequency 1).			

P2185, P2187, P2189	**Upper torque threshold 1, 2, and 3**			**Level 2**
	Min: 0.0	**Def: 99999.0**	**Max: 99999.0**	
Details:	Upper limit threshold value for comparing actual torque.			
Note:	See P2182 (belt threshold frequency).			

P2186, P2188, P2190	**Lower torque threshold 1, 2, and 3**			**Level 2**
	Min: 0.0	**Def: 0.0**	**Max: 99999.0**	
Details:	Lower limit threshold value for comparing actual torque.			
Note:	See P2182 (belt threshold frequency).			

P2191	**Belt failure speed tolerance**			
	Min: 0.00	**Def: 3.00**	**Max: 20.00**	**Level 2**
Details:	P2191 defines the allowed speed variation bandwidth between the inverter frequency, and the speed reference from the pulse train. When the speed of the driven machine varies by more than this amount, a trip or warning is given.			

P2192	**Time delay for belt failure**			
	Min: 0	**Def: 10**	**Max: 65**	**Level 2**
Details:	P2192 defines a delay before warning/trip becomes active. It is used to eliminate events caused by transient conditions. It is used for both methods of fault detection.			

r2197	**CO/BO: Monitoring word 1**			
	Min: -	**Def: -**	**Max: -**	**Level 2**
Bit Fields:	Bit00 Act. freq. r0024 <= P1080 0 NO, 1 YES Bit01 Act. freq. r0024 <= P2155 0 NO, 1 YES Bit02 Act. freq. r0024 > P2155 0 NO, 1 YES Bit03 Act. freq. r0024 > zero 0 NO, 1 YES Bit04 Act. freq. r0024 >= setp. 0 NO, 1 YES Bit05 Act. freq. r0024 <= P2167 0 NO, 1 YES Bit06 Act. freq. r0024 >= P1082 0 NO, 1 YES Bit07 Act. freq. r0024 == setp. 0 NO, 1 YES Bit08 Act. current r0068 >= P2170 0 NO, 1 YES Bit09 Act. unfilt. Vdc < P2172 0 NO, 1 YES Bit10 Act. unfilt. Vdc > P2172 0 NO, 1 YES Bit11 No load condition 0 NO, 1 YES			

r2198	**CO/BO: Monitoring word 2**			
	Min: -	**Def: -**	**Max: -**	**Level 2**
Bit Fields:	Bit00 | n,filtered r2169 | < P2157 0 NO, 1 YES Bit01 | n,filtered r2169 | > P2157 0 NO, 1 YES Bit02 | n,filtered r2169 | < P2159 0 NO, 1 YES Bit03 | n,filtered r2169 | > P2159 0 NO, 1 YES Bit04 | n,set | < P2161 0 NO, 1 YES Bit05 n,set > 0 0 NO, 1 YES Bit06 Motor blocked 0 NO, 1 YES Bit07 Motor stalled 0 NO, 1 YES Bit08 | I,act r0068 | < P2170 0 NO, 1 YES Bit09 |T,act| > P2174 and setpoint reached 0 NO, 1 YES Bit10 | T,act | > P2174 0 NO, 1 YES Bit11 Belt failure warning 0 NO, 1 YES Bit12 Belt failure trip 0 NO, 1 YES			

P2200[2]	**BI: Enable PID controller**			
	Min: 0:0	**Def: 0:0**	**Max: 4000:0**	**Level 2**
Details:	PID mode Allows you to enable/disable the PID controller. Setting to 1 enables the PID closed-loop controller.			
Index:	P2200[0] : IN000 (AUTO) 1st. Command data set (CDS)		P2200[1] : IN001 (HAND) 2nd. Command data set (CDS)	
Dependency:	Setting 1 automatically disables normal ramp times set in P1120 and P1121 and the normal frequency setpoints. Following an OFF1 or OFF3 command, however, the inverter frequency will ramp down to zero using the ramp time set in P1121 (P1135 for OFF3).			
Note:	The PID setpoint source is selected using P2253. The PID setpoint and the PID feedback signal are interpreted as [%] values (not [Hz]). The output of the PID controller is displayed as [%] and then normalized into [Hz] through P2000 (reference frequency) when PID is enabled. In level 3, the PID controller source enable can also come from the digital inputs in settings 722.0 to 722.2 for DIN1 to DIN3 or from any other BiCo source. The minimum and maximum motor frequencies (P1080 and P1082) as well as the skip frequencies (P1091 to P1094) remain active on the inverter output. However, enabling skip frequencies with PID control can produce instabilities.			

P2201 through P2215	**Fixed PID setpoint 1 through 15**			**Level 2**
	Min: -200.00	**Def: See Note Below**	**Max: 200.00**	

Details: Defines Fixed PID Setpoint 1. In addition, you can set any of the digital input parameters to Fixed PID Setpoint via the digital inputs (P0701-P0706).

There are three selection modes for the PID fixed setpoint:

1. Direct selection (P0701=15 or P0702=15, etc.).
   In this mode of operation, 1 digital input selects one PID fixed setpoint.
2. Direct selection with ON command (P0701=16 or P0702=16, etc.).
   Description as for 1), except that this type of selection issues an ON command concurrent with any setpoint selection.
3. 3 Binary Coded Decimal selection (P0701-P0706=17).
   Using this method to select the PID Fixed Setpoint allows you to choose up to 16 different PID setpoints. The setpoints are selected according to the following table:

		DIN4	**DIN3**	**DIN2**	**DIN1**
	OFF	Inactive	Inactive	Inactive	Inactive
P1001	FF1	Inactive	Inactive	Inactive	**Active**
P1002	FF2	Inactive	Inactive	**Active**	Inactive
P1003	FF3	Inactive	Inactive	**Active**	**Active**
P1004	FF4	Inactive	**Active**	Inactive	Inactive
P1005	FF5	Inactive	**Active**	Inactive	**Active**
P1006	FF6	Inactive	**Active**	**Active**	Inactive
P1007	FF7	Inactive	**Active**	**Active**	**Active**
P1008	FF8	**Active**	Inactive	Inactive	Inactive
P1009	FF9	**Active**	Inactive	Inactive	**Active**
P1010	FF10	**Active**	Inactive	**Active**	Inactive
P1011	FF11	**Active**	Inactive	**Active**	**Active**
P1012	FF12	**Active**	**Active**	Inactive	Inactive
P1013	FF13	**Active**	**Active**	Inactive	**Active**
P1014	FF14	**Active**	**Active**	**Active**	**Active**
P1015	FF15	**Active**	**Active**	**Active**	**Active**

Dependency: P2000=1 required in user access level 2 to enable setpoint source.
In mode 1 (above):
ON command required to start motor (enable pulses).
In mode 2 (above):
If inputs programmed to PID fixed setpoint and selected together, the selected setpoints are summed.

Note: You may mix different types of frequencies; however, remember that they will be summed if selected together.
P2201=100% corresponds to 4000 hex.
Default fixed PID setpoint values are as follows:

Fixed PID	**Default**	**Fixed PID**	**Default**	**Fixed PID**	**Default**
1	0.00	6	50.00	11	100.00
2	10.00	7	60.00	12	110.00
3	20.00	8	70.00	13	120.00
4	30.00	9	80.00	14	130.00
5	40.00	10	90.00	15	130.00

P2216, P2217, P2218, P2219	**Fixed PID setpoint mode-Bit 0, Bit 1, Bit 2, and Bit 3**			**Level 3**
	Min: 1	**Def: 1**	**Max: 3**	
Enum:	1=Direct selection	2=Direct selection + ON command	3=Binary coded selection + ON command	

P2220[2]	**BI: Fixed PID setp. select Bit 0**			**Level 3**
	Min: 0:0	**Def: 0:0**	**Max: 4000:0**	

Settings:
722.0=Digital input 1 (requires P0701 set to 99, BICO)
722.1=Digital input 2 (requires P0702 set to 99, BICO)
722.2=Digital input 3 (requires P0703 set to 99, BICO)
722.3=Digital input 4 (requires P0704 set to 99, BICO)
722.4=Digital input 5 (requires P0705 set to 99, BICO)
722.5=Digital input 6 (requires P0706 set to 99, BICO)
722.6=Digital input 7 (via analog input 1, requires P0707 set to 99)
722.7=Digital input 8 (via analog input 2, requires P0708 set to 99)

Index: P2220[0] : IN000 (AUTO) 1st. Command data set (CDS) | P2220[1] : IN001 (HAND) 2nd. Command data set (CDS)

P2221[2]. P2222[2], P2223[2]	BI: Fixed PID setp. select Bit 1, Bit 2, and Bit 3			Level 3
	Min: 0:0	Def: 0:0	Max: 4000:0	
Settings:	722.0=Digital input 1 (requires P0701 set to 99, BICO) 722.1=Digital input 2 (requires P0702 set to 99, BICO) 722.2=Digital input 3 (requires P0703 set to 99, BICO) 722.3=Digital input 4 (requires P0704 set to 99, BICO) 722.4=Digital input 5 (requires P0705 set to 99, BICO) 722.5=Digital input 6 (requires P0706 set to 99, BICO)			
Index:	For P2221:	For P2222:	For P2223:	
	P2221[0]: IN000 (AUTO) 1st command data set (CDS) P2221[1]: IN001 (HAND) 2nd command data set (CDS)	P2222[0]: IN000 (AUTO) 1st command data set (CDS) P2222[1]: IN001 (HAND) 2nd command data set (CDS)	P2223[0]: IN000 (AUTO) 1st command data set (CDS) P2223[1]: IN001 (HAND) 2nd command data set (CDS)	

r2224	CO: Act. fixed PID setpoint			Level 2
	Min: -	Def: -	Max: -	
Note:	r2224=100% corresponds to 4000 hex.			

P2225	Fixed PID setpoint mode-Bit 4			Level 3
	Min: 1	Def: 1	Max: 2	
Enum:	1=Direct selection	2=Direct selection + ON command	3=Binary coded selection + ON command	

P2226[2]	BI: Fixed PID setp. select Bit 4			Level 3
	Min: 0:0	Def: 722:4	Max: 4000:0	
Settings:	722.0=Digital input 1 (requires P0701 set to 99, BICO) 722.1=Digital input 2 (requires P0702 set to 99, BICO) 722.2=Digital input 3 (requires P0703 set to 99, BICO) 722.3=Digital input 4 (requires P0704 set to 99, BICO) 722.4=Digital input 5 (requires P0705 set to 99, BICO) 722.5=Digital input 6 (requires P0706 set to 99, BICO)			
Index:	P2226[0]: IN000 (AUTO) 1st command data set (CDS)	P2226[1]: IN001 (HAND) 2nd command data set (CDS)		

P2227	Fixed PID setpoint mode-Bit 5			Level 3
	Min: 1	Def: 1	Max: 2	
Enum:	1=Direct selection	2=Direct selection + ON command	3=Binary coded selection + ON command	

P2228 [2]	BI: Fixed PID setp. select Bit 5			Level 3
	Min: 0:0	Def: 722:5	Max: 4000:0	
Settings:	722.0=Digital input 1 (requires P0701 set to 99, BICO) 722.1=Digital input 2 (requires P0702 set to 99, BICO) 722.2=Digital input 3 (requires P0703 set to 99, BICO) 722.3=Digital input 4 (requires P0704 set to 99, BICO) 722.4=Digital input 5 (requires P0705 set to 99, BICO) 722.5=Digital input 6 (requires P0706 set to 99, BICO)			
Index:	P2228[0]: IN000 (AUTO) 1st command data set (CDS)	P2228[1]: IN001 (HAND) 2nd command data set (CDS)		

P2231	Setpoint memory of PID-MOP			Level 2
	Min: 0	Def: 0	Max: 1	
Enum:	0=PID-MOP setpoint will not be stored	1=PID-MOP setpoint will be stored (P2240 is updated)		
Dependency:	If 0 is selected, setpoint returns to value set in P2240 (setpoint of PID-MOP) after an OFF command If 1 is selected, active setpoint is 'remembered' and P2240 updated with current value.			
Note:	See P2240 (setpoint of PID-MOP).			

P2232	Inhibit rev. direct. of PID-MOP			Level 2
	Min: 0	Def: 1	Max: 1	
Details:	Inhibits reverse setpoint selection when PID motor potentiometer is chosen either as a main setpoint of additional setpoint (using P1000)			
Enum:	0=Reserve direction is allowed	1=Reserve direction inhibited		
Note:	Setting 0 enables a change of motor direction using the motor potentiometer setpoint (increase/decrease frequency either by using digital inputs or motor potentiometer up/down buttons.			

P2240[2]	Setpoint of PID-MOP			
	Min: -200.00	Def: 10.00	Max: 200.00	Level 2
Settings:	722.0=Digital input 1 (requires P0701 set to 99, BICO) 722.1=Digital input 2 (requires P0702 set to 99, BICO) 722.2=Digital input 3 (requires P0703 set to 99, BICO) 722.3=Digital input 4 (requires P0704 set to 99, BICO) 722.4=Digital input 5 (requires P0705 set to 99, BICO) 722.5=Digital input 6 (requires P0706 set to 99, BICO) 722.6=Digital input 7 (via analog input 1, requires P0707 set to 99) 722.7=Digital input 8 (via analog input 2, requires P0708 set to 99) 19.D =Keypad UP cursor			
Dependency:	To change setpoint: 1. Use UP/DOWN key on BOP or 2. Set P0702/P0703=13/14 (function of digital inputs 2 and 3)			
Note:	P2240=100% corresponds to 4000 hex.			

r2250	CO: Output setpoint of PID-MOP			
	Min: -	Def: -	Max: -	Level 2
Note:	r2250=100% corresponds to 4000 hex.			

P2253[2]	CI: PID setpoint			
	Min: 0:0	Def: 0:0	Max: 4000:0	Level 2
Details:	This parameter allows you to select the source of the PID setpoint. Normally, a digital setpoint is selected either using a fixed PID setpoint or an active setpoint.			
Settings:	755= Analog input 1	2224 =Fixed PI setpoint (see P2201 to P2207)	2250 =Active PI setpoint (see P2240)	
Index;	P2253[0] : IN000 (AUTO) 1st. Command data set (CDS)	P2253[1] : IN001 (HAND) 2nd. Command data set (CDS)		

P2254[2]	CI: PID trim source			
	Min: 0:0	Def: 0:0	Max: 4000:0	Level 3
Details:	This parameter allows you to select the source of the PID setpoint. Normally, a digital setpoint is selected either using a fixed PID setpoint or an active setpoint.			
Settings:	755= Analog input 1	2224 =Fixed PI setpoint (see P2201 to P2207)	2250 =Active PI setpoint (see P2240)	
Index:	P2254[0] : IN000 (AUTO) 1st. Command data set (CDS)	P2254[1] : IN001 (HAND) 2nd. Command data set (CDS)		

P2261	PID setpoint filter time constant			
	Min: 0.00	Def: 0.00	Max: 60.00	Level 3
Note:	0=no smoothing			

r2262	CO: Act. PID filtered setpoint			
	Min: -	Def: -	Max: -	Level 2
Details:	Displays PID setpoint in [%] after smoothing.			
Note:	r2262=100% corresponds to 4000 hex.			

P2264[2]	CI: PID feedback			
	Min: 0:0	Def: 755:0	Max: 4000:0	Level 2
Settings:	755= Analog input 1 setpoint	2224 =Fixed PID setpoint	2250 =Output setpoint of PID-MOP	
Index:	P2264[0] : IN000 (AUTO) 1st. Command data set (CDS)	P2264[1] : IN001 (HAND) 2nd. Command data set (CDS)		
Note:	When analog input is selected, offset and gain can be implemented using parameters P0756 to P0760.			

P2265	PID feedback filter timeconstant			
	Min: 0.00	Def: 0.00	Max: 60.00	Level 2

P2267	Max. value for PID feedback			
	Min: -200.00	Def: 100.00	Max: 200.00	Level 3
Note:	P2267=100% corresponds to 4000 hex. When PID is enabled (P2200=1) and the signal rises above this value, the inverter will trip with P0222.			

P2268	Min. value for PID feedback			
	Min: -200.00	Def: 0.00	Max: 200.00	Level 3
Note:	P2268=100% corresponds to 4000 hex. When PID is enabled (P2200=1) and the signal rises above this value, the inverter will trip with P0221.			

P2269	Gain applied to PID feedback			
	Min: 0.00	Def: 100.00	Max: 500.00	Level 3
Note:	Allows you to scale the PID feedback as a percentage value [%]. A gain of 100.0% means that feedback signal has not changed from its default value.			

P2270	PID feedback function selector			
	Min: 0	**Def: 0**	**Max: 3**	**Level 3**
Details:	Applies mathematical functions to the PID feedback signal, allowing multiplication of the result by P2269 (gain applied to PID feedback).			
Enum:	0=Disabled	1=Square root (root(x))	2=Square (x*x)	3=Cube (x*x*x)

P2271	PID transducer type			
	Min: 0	**Def: 0**	**Max: 1**	**Level 2**
Value:	0 : [default] If the feedback signal is less than the PID setpoint, the PID controller will increase motor speed to correct this. 1 : If the feedback signal is greater than the PID setpoint, the PID controller will reduce motor speed to correct this.			
Enum:	0=Disabled	1=Inversion of PID feedback signal		
Note:	It is essential that you select the correct transducer type. If you are unsure whether 0 or 1 is applicable, you can determine the correct type as follows: 1. Disable the PID function (P2200=0). 2. Increase the motor frequency while measuring the feedback signal. 3. If the feedback signal increases with an increase in motor frequency, the PID transducer type should be 0. 4. If the feedback signal decreases with an increase in motor frequency the PID transducer type should be set to 1.			

r2272	CO: PID scaled feedback			
	Min: -	**Def: -**	**Max: -**	**Level 2**
Note:	r2272=100% corresponds to 4000 hex.			

r2273	CO: PID error			
	Min: -	**Def: -**	**Max: -**	**Level 2**
Note:	r2273=100% corresponds to 4000 hex.			

P2274	PID derivative time			
	Min: 0	**Def: 0**	**Max: 65535**	**Level 2**
Note:	Set PID derivative time			

P2279	PID neutral zone			
	Min: 0.00	**Def: 0.00**	**Max: 100.00**	**Level 3**
Note:	Set PID derivative time			

P2280	PID proportional gain			
	Min: 0.000	**Def: 3.000**	**Max: 65.000**	**Level 2**
Details:	Allows you to set proportional gain for standard PID controller. For best results, enable both P and I terms.			
Dependency:	If P term=0, I term acts on the square of the error signal.			
Note:	If the system is prone to sudden step changes in the feedback signal, P term should normally be set to a small value (0.5) with a faster I term for optimum performance. The D term (P2274) multiplies the difference between the present and previous feedback signal thus accelerating the controller reaction to an error that appears suddenly. The D term should be used carefully, since it can cause the controller output to fluctuate as every change in the feedback signal is amplified by the controller derivative action.			

P2285	PID integral time			
	Min: 0.000	**Def: 0.000**	**Max: 60.000**	**Level 2**
Note:	See P2280 (PID proportional gain).			

P2291	PID output upper limit			
	Min: -200.00	**Def: 100.00**	**Max: 200.00**	**Level 2**
Dependency:	If F max (P1082) is greater than P2000 (reference frequency), either P2000 or P2291 (PID output upper limit) must be changed to achieve F max.			
Note:	P2291=100% corresponds to 4000 hex (as defined by P2000 [reference frequency]).			

P2292	PID output lower limit			
	Min: -200.00	**Def: 0.00**	**Max: 200.00**	**Level 2**
Dependency:	A negative value allows bipolar operation of PID controller.			
Note:	P2292=100% corresponds to 4000 hex.			

P2293	Ramp up/-down time of PID limit			
	Min: 0.00	**Def: 0.00**	**Max: 100.00**	**Level 3**
Detail:	Sets maximum ramp rate on output of PID. When PI is enabled, the output limits are ramped up from 0 to the limits set in P2291 (PID output upper limit) and P2292 (PID output lower limit). Limits prevent large setup changes appearing on the output of the PID when the VFD is started. Once the limits have been reached, the PID controller output is instantaneous. These ramp times are used whenever a Run command is issued.			
Note:	If an OFF1 or OFF3 are issued, the VFD output frequency ramps down as set in P1121 (ramp-down time) or P1135 (ramp=down time).			

r2294	CO: Act. PID output			
	Min: -	Def: -	Max: -	Level 2
Note:	r2294=100% corresponds to 4000 hex.			

P2303[2]	CI: PID o/p offset			
	Min: 0:0	Def: 0.0	Max: 4000.0	Level 3
Settings:	755=Analog input 1 setpoint	2224=Fixed PID setpoint	2250=Output setpoint of PID-MOP	
Index:	P2303[0]= IN000 (AUTO) 1st command data set (CDS)	P2303[1]= IN001 (HAND) 2nd command data set (CDS)		
Note:	On selection of an analog input, offset and gain can be implemented using parameters			

P2304	PID Opening time			
	Min: 0	Def: 60	Max: 65535	Level 2
Note:	See P2305 (PID actuator closing time).			

P2305	PID Closing time			
	Min: 0	Def: 60	Max: 65535	Level 2
Note:	See P2304 (PID actuator opening time).			

P2306	PID actuator Dir			
	Min: 0	Def: 1	Max: 1	Level 2
Settings:	0=Indirect Acting (cooling sequence)	1=Direct Acting (heating sequence)		

P2370	Selection of motor staging stop mode			
	Min: 0	Def: 0	Max: 1	Level 2
Enum:	0=Normal stop	1=Sequence stop		

P2371	Selection of external motor configuration			
	Min: 0	Def: 0	Max: 8	Level 2
Enum:	0=Motor staging Disabled 1=M1=1X, M2= , M3 = 2=M1=1X, M2=1X, M3 =	3=M1=1X, M2=2X, M3 = 4=M1=1X, M2=1X, M3=1X 5=M1=1X, M2=1X, M3=2X	6=M1=1X, M2=2X, M3=3X 7=M1=1X, M2=1X, M3=3X 8=M1=1X, M2=2X, M3=3X	

P2372	Enable motor cycling			
	Min: 0	Def: 0	Max: 1	Level 2
Enum:	0=Disabled	1=Enabled		

P2373	Motor staging hysteresis			
	Min: 0.0	Def: 20.0	Max: 200.0	Level 2
Details:	Error as a percentage of setpoint that must be exceeded before staging delay starts.			

P2374	Motor staging delay			
	Min: 0	Def: 30	Max: 650	Level 2
Details:	Time that error must exceed hysteresis before *staging* occurs.			

P2375	Motor destaging delay			
	Min: 0	Def: 30	Max: 650	Level 2
Details:	Time that error must exceed hysteresis before *destaging* occurs.			

P2376	Delay override			
	Min: 0.0	Def: 25.0	Max: 200.0	Level 2
Details:	Error as a percentage of setpoint that if exceeded will begin staging without delay.			

P2377	Delay override lockout timer			
	Min: 0	Def: 30	Max: 650	Level 2
Details:	Time for which delay override is prevented after a motor has been staged or destaged.			

P2378	Staging frequency f, %fMax			
	Min: 0.0	Def: 50.0	Max: 120.0	Level 2
Details:	The frequency as a percentage of fMax at which anexternal motor will be started or stopped			

r2379	CO/BO: Status of motor staging			
	Min: -	Def: -	Max: -	Level 2
Bit Fields:	Bit00 Start motor 1 0 YES, 1 NO Bit01 Start motor 2 0 YES, 1 NO Bit02 Start motor 3 0 YES, 1 NO			

P2380[3]	**Motor hours run**			
	Min: 0	**Def: 0**	**Max: 100000**	**Level 2**
Index:	P2380[0] : Motor 1 hrs run	P2380[1] : Motor 2 hrs run	P2380[2] : Motor 3 hrs run	
Note:	To reset the running hours, set the value to zero, any other value is ignored.			

P2390	**Hibernation frequency**			
	Min: 0	**Def: 0**	**Max: 650.00**	**Level 3**
Details:	Hibernation frequency setpoint (frequency the motor output will turn off).			

P2391	**Hibernation timer**			
	Min: 0	**Def: 0**	**Max: 650.00**	**Level 3**
Details:	Hibernation restart frequency (frequency the motor output will turn on).			

P2392	**Restart frequency**			
	Min: 0	**Def: 0**	**Max: 650.00**	**Level 3**
Details:	Hibernation restart frequency (frequency the motor output will turn on).			

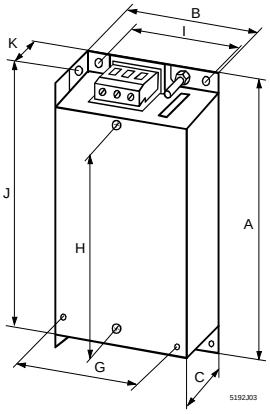
P3900	**End of quick commissioning**			
	Min: 0	**Def: 0**	**Max: 3**	**Level 1**
Details:	Performs calculations necessary for optimized motor operation. After completion of calculation, P3900 and P0010 (parameter groups for commissioning) are automatically reset to their original value 0.			
Enum:	0=No 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). Calculates a variety of motor parameters, overwriting previous values. These include P0344 (Level 3, motor weight), P0350 (Level 3, demagnetization time), P2000 (reference frequency), P2002 (Level 3, reference current).			

SED2 Operation & Maintenance Manual Addendum

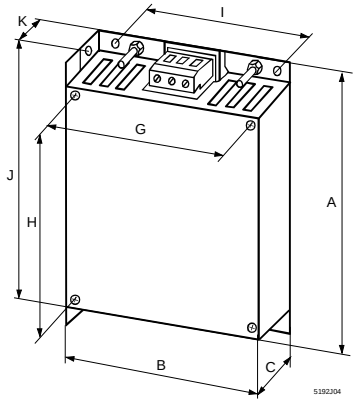
Table of Contents

Chapter 1 - Mechanical Installation

SED2 (IP20) Filters Dimensions



Filter for Frame Size A



Filter for Frame Sizes B and C

Frame Size	A	B	C	G	H	I	J	K
A	7.9 (200)	2.9 (73)	1.7 (44)	2.4 (60)	6.3 (160)	2.2 (56)	7.4 (187)	0.9 (22)
B	8.4 (213)	5.9 (149)	2.0 (51)	5.4 (138)	6.9 (174)	4.7 (120)	7.9 (200)	1.0 (24)
C	9.6 (245)	7.3 (185)	22 (56)	6.9 (174)	8.0 (204)	6.2 (156)	9.1(232)	1.4 (35)

Figure 1. Dimensions of SED2 (IP20) Filters for Frame Sizes A through C.

Dimensions in Inches (Millimeters).

Chapter 2 - Electrical Installation

EMC-Compatibility

NOTE: The Siemens Building Technologies SED2 Variable Frequency Drives are shipped without EMC line filters. (The EMC filter is most commonly used in Europe.) Where local codes or customer/installation requirements dictate, separately orderable line filters are available. More stringent Class B line filters are also available for most models. Installation of these filters satisfies the requirements for the EU's EMC directive.

Installation

The SED2 operates in environments where they may be exposed to high levels of electromagnetic interference (EMI). Normally, good installation practices ensure safe and interference-free operation. However, should problems associated with EMI occur, follow these guidelines:

- Ensure good electrical contact between the mounting plate and the metal housing of the SED2 via the mounting screws.
- Use serrated lock washers and electrically conductive mounting plates.
- If a footprint EMC filter is used, fit it under the SED2 and ground it via the metal backplate. When connecting the EMC filter to the inputs of the SED2, use shielded cables, and ensure that they are correctly grounded using cable clamps (Figure 2).

Wiring

- Ensure that all equipment in the control cabinet is properly grounded. Connect all equipment by short, thick grounding conductors to a common grounding point or bus bar.
- Ensure that any control equipment connected to a SED2 (such as PLC or BACS, programmable logic controller or building automation and control system) connects with a short, thick cable to the same ground or grounding point as the SED2.
- Use shielded cables inside control cabinets. Use only shielded motor and control cables. The shielding must be continuous. Connect motor and control cables to ground at both ends. Avoid pigtails. Use only grounding clamps to bond the shield (Figure 2).
- Lay control, mains, and motor cables separately by routing them in separate cable ducts and maintaining a minimum clearance of 7.8 inches (200 mm). See Figure 3. If you cannot avoid crossing cables, run them at a 90-degree angle.
- Motor cables should be as short as possible and should not exceed 82 ft (25 m). Connect the neutral conductor of all motors controlled by a SED2 drive directly to the ground connection (PE) of the respective SED2.
- Use ribbon cables, as they have lower impedance at high frequencies.

- Check that the contactors in the control cabinet are suppressed, either with RC circuits for AC contactors or flywheel diodes for DC contactors. In both cases, mount the suppressors to the coils. Varistor surge voltage protectors are also effective. This is important when the SED2 relay controls the contactors.

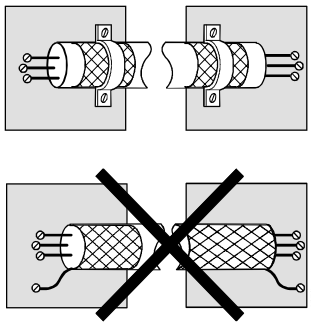


Figure 2. Use Grounding Clamps to Bond the Shield.

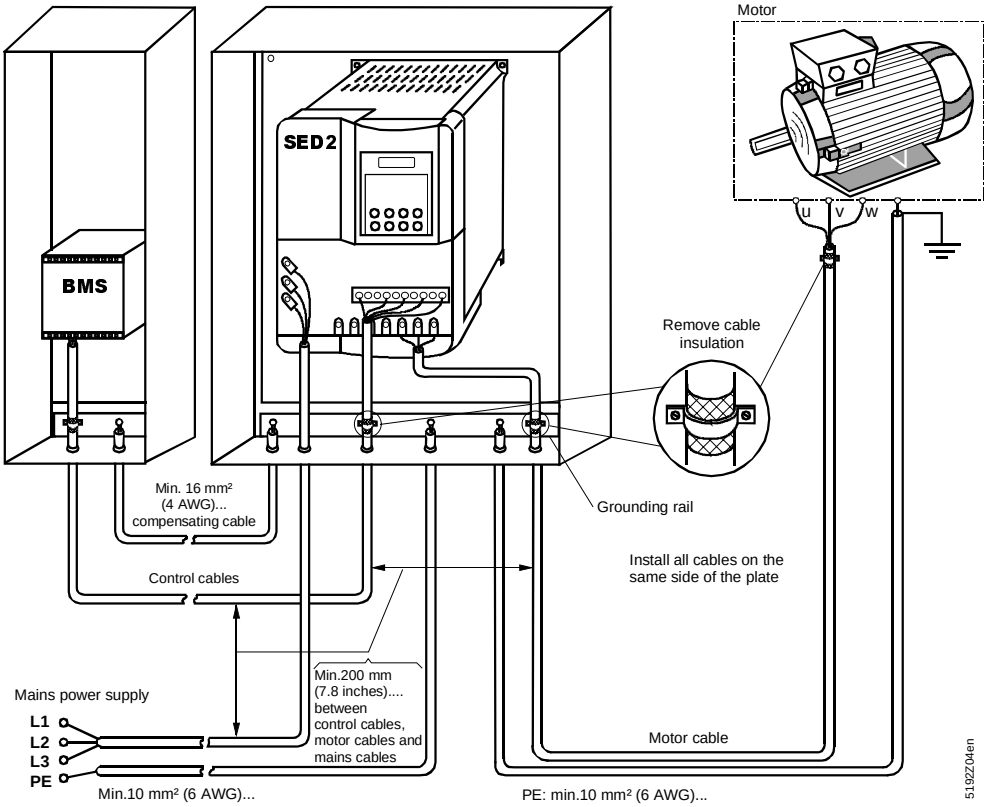
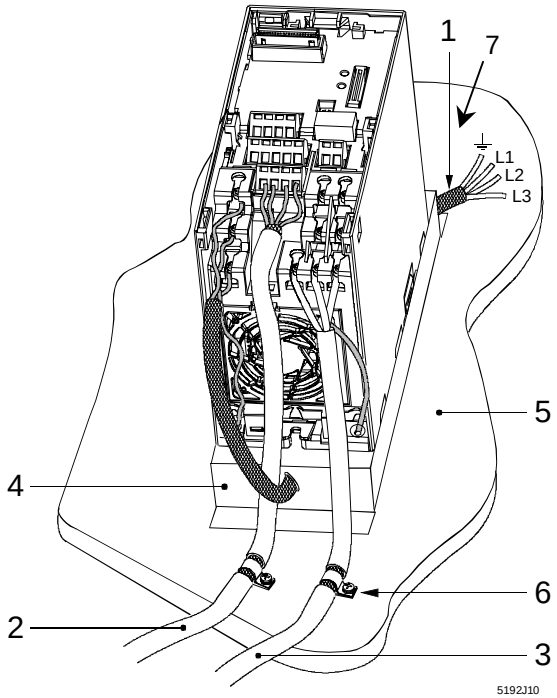


Figure 3. Routing Control, Mains, and Motor Cables.



1. Incoming mains cable
2. Control cable
3. Motor cable
4. Footprint filter
5. Metal backplate
6. Use suitable cable clamps to ensure good conductive contact between the shield of the motor and control cables and the metal backplate.
7. Connect the motor cable shield to ⏚.

Figure 4. Cable Routing for SED2 Frame Size A with Footprint Filter.

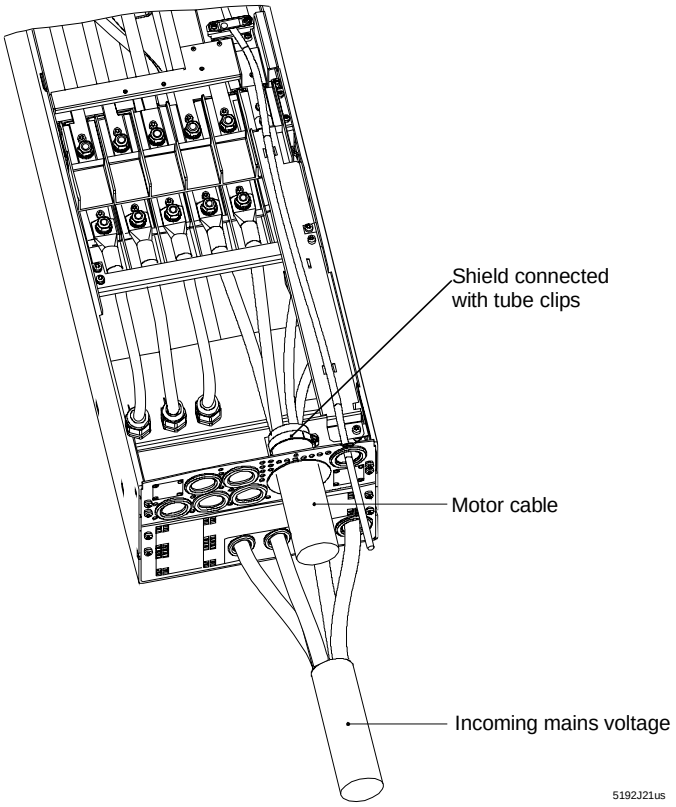


Figure 5. Cable Routing for SED2 (IP20) Frame Size D through F with EMC Filter.

Power Connection for Drives with a Built-in EMC Filter

SED2 drives (frame sizes A, B, and C) can include a built-in, prewired, EMC footprint filter. Route and connect the mains power to the terminals of the footprint filter.

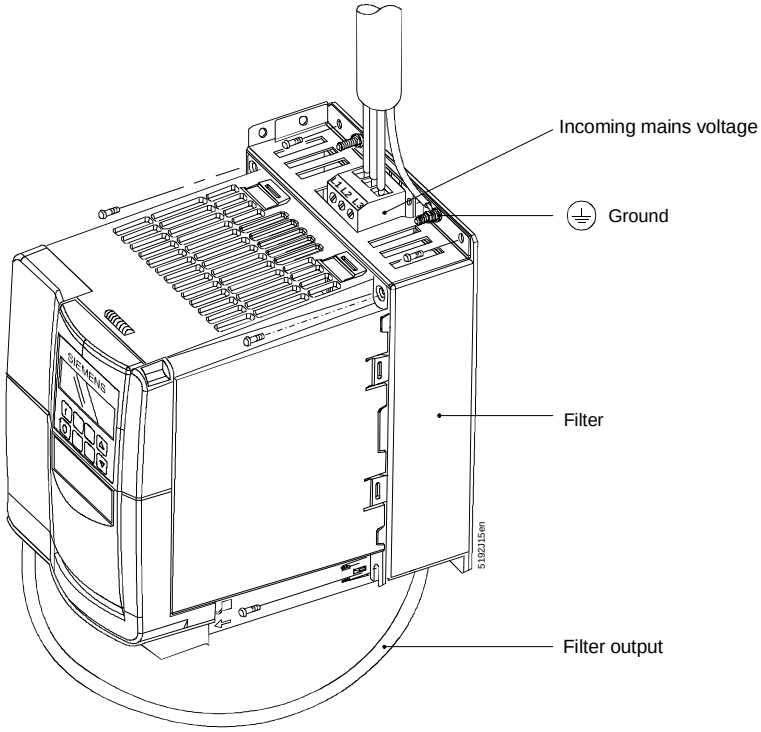


Figure 6. Connecting Mains Power to Footprint Filter for SED2 Frame Sizes A through C.

SED2 drives (frame sizes D, E, and F) include a built-in, prewired, EMC filter. Route and connect the mains power to the terminals of the filter.

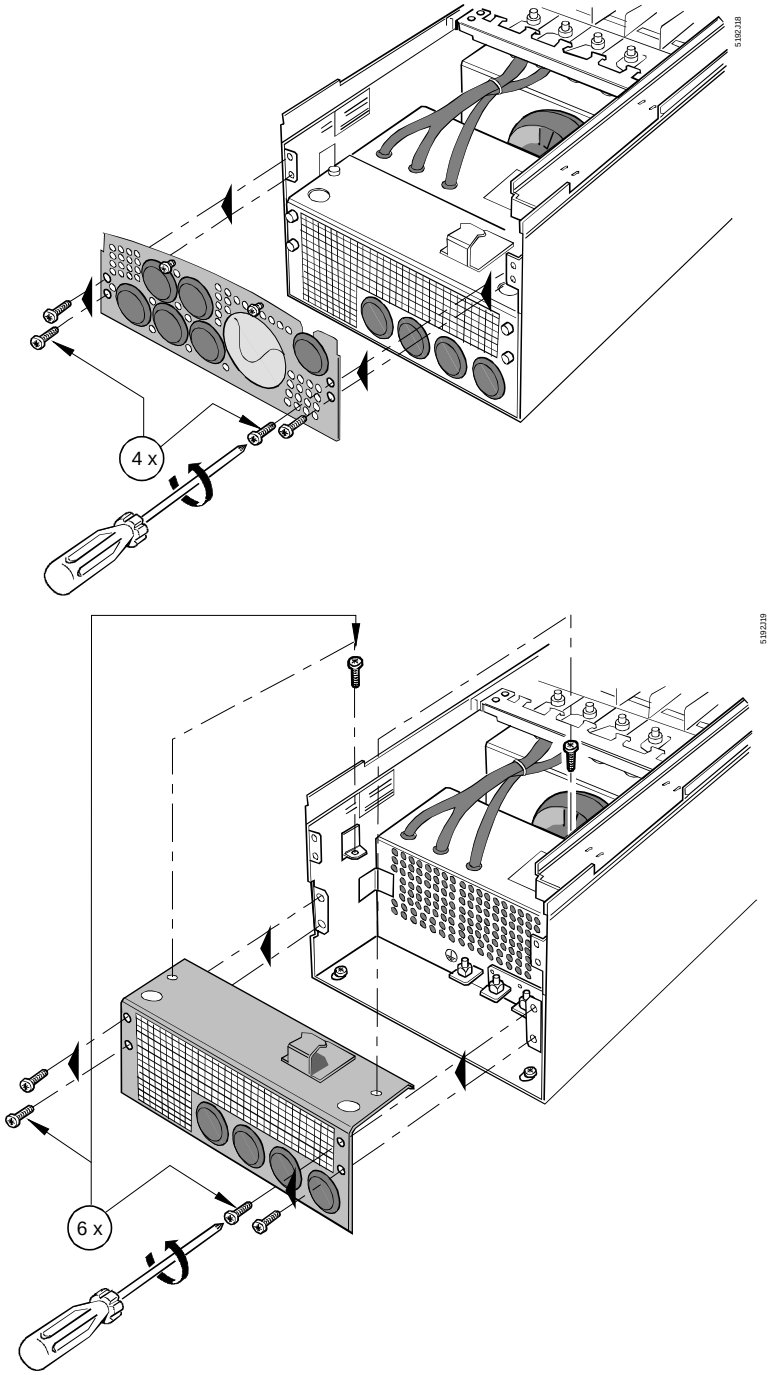


Figure 7. Connecting Mains Power to Filter for SED2 Frame Sizes D through F.

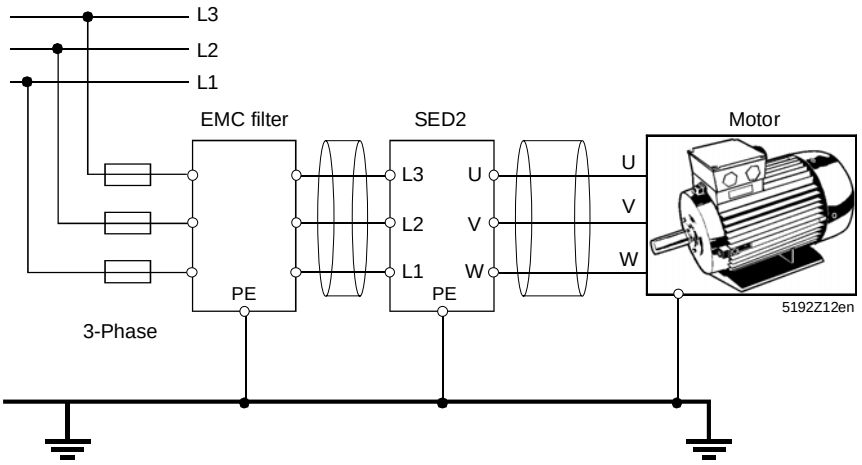


Figure 8. Typical Power Wiring for SED2 with EMC Filter.

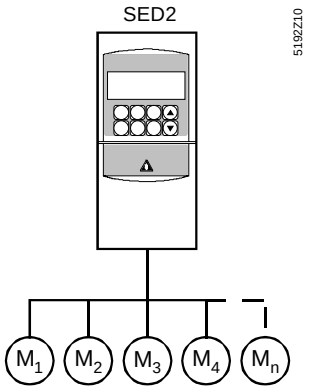
Connecting Multiple Motors

The SED2 can control several motors in parallel as long as all of the motors have the same power rating. When multiple motors connect to the SED2 in parallel, the motors cannot operate individually.

NOTES:

1. When determining the required power, take into account the **total current** from all the motors (or the sum total of all ratings).

2. The sum of all individual motor cable lengths must not exceed the maximum motor cable length. (See the *Motor Cable Length* section in this manual.)



$$\sum I_{M_1..M_n} \leq I_{SED2,\ max.}$$

$$\sum P_{M_1..M_n} \leq P_{SED2,\ max.}$$

Figure 9. Connecting the SED2 to Multiple Motors.

Operation with a Residual Current Device (RCD)

If a residual current device (also called a GLCI or RCCB) is connected, the SED2 operates with no interruptions under the following conditions:

- A RCD, Type B is used.
- The RCD must have a threshold current of 300 mA.
- The neutral conductor in the system must be grounded.
- Each RCD supplies only one SED2 (an no other loads).
- The output cables must not exceed the following:
  - 328 ft (100 m) shielded
  - 164 ft (50 m) unshielded

Do not connect machines with a 3-phase power source fitted with EMC filters to the mains via an earth leakage current circuit breaker (ELCB) or ground fault circuit interrupter (GFCI). (See DIN VDE 0160, Section 6.5.)

Chapter 3 - Programming

Bypassing the SED2

There are applications demanding maximum motor output. Additionally, there are applications requiring a SED2 bypass system for safety reasons. For these cases, the SED2 has an integrated bypass function.

Parameter setup for bypass function (commissioning)

P1260, Source of changeover control

Defines the possible sources for changing over to bypass/contactor operating mode. Possible settings:

0=Bypass disabled (factory setting).

1=Controlled by SED2 trip.

2=Controlled by DIN, see P1266, Bypass command.

3=Controlled by DIN and SED2 trip.

4=Controlled by SED2 frequency.

5=Controlled by SED2 frequency and SED2 trip.

6=Controlled by SED2 frequency and DIN.

7=Controlled by SED2 frequency and DIN and SED2 trip.

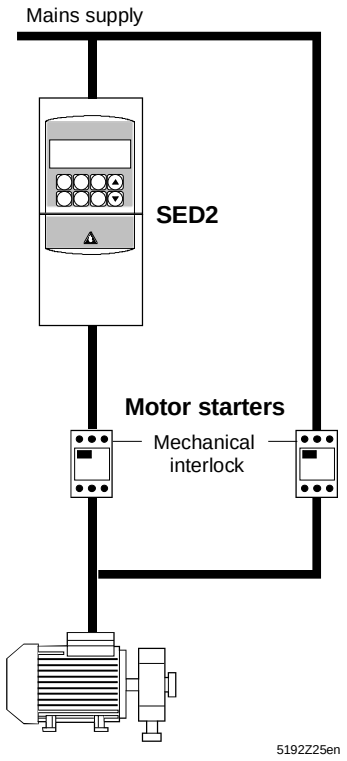


Figure 10. Bypassing the SED2.

r1261, Contactor control word

r1261 is a read parameter for the bypass/contactor function. It shows how the motor is driven as follows:

Bit 00, Motor supplied by Drive:

0=Yes

1=No

Bit 01, Motor supplied by Mains:

0=Yes

1=No

P1262, Bypass dead time

Time delay between switching contactors (SED2 to bypass/contactor and vice versa) to allow motor to demagnetize (Figure 11).

Setting range: 0 to 20 s

Recommended setting: 1 second (default)

P1263, De-bypass time

Defines the time before a request to switch from bypass/contactor to SED2 is executed (Figure 11).

Setting range: 0 to 300 second

Recommended setting: 1 second (default).

P1264, Bypass time

Time delay before a request to switch to mains is executed (Figure 11).

Setting range: 0 to 300 second

Recommended setting: 1 second (default).

Complete parameter setting by changing over to automatic control.

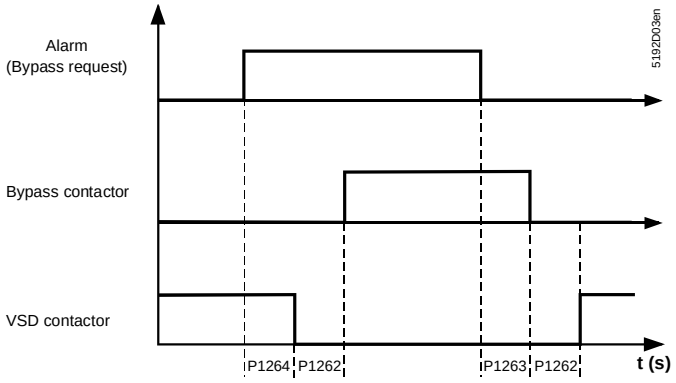


Figure 11. Bypass Timing Diagram.

Hibernation Mode

If the SED2 reaches the hibernation setpoint in PID operating mode, the P2391 hibernation timer starts. After the timer expires, the SED2 drives the output frequency of the ramp to 0 Hz.

T1	Hibernation frequency reached. Start of hibernation timer.
T2	Minimum output frequency reached.
T3	Output frequency decreased according to the set ramp. PID control of the output frequency is interrupted.
T4	Output frequency = zero (motor standstill).
T3 to T5	The PID fault signal [%] is monitored. **NOTES:** Observe polarity of the PID fault signal. Polarity of the PID fault signal must match the sequence of the controlled functions (cooling/heating or vice-versa). The temperature setpoint can be below 0°C. The PID fault signal can be positive or negative.
T5	SED2 output frequency is again increased. PID control of the output frequency is again enabled.

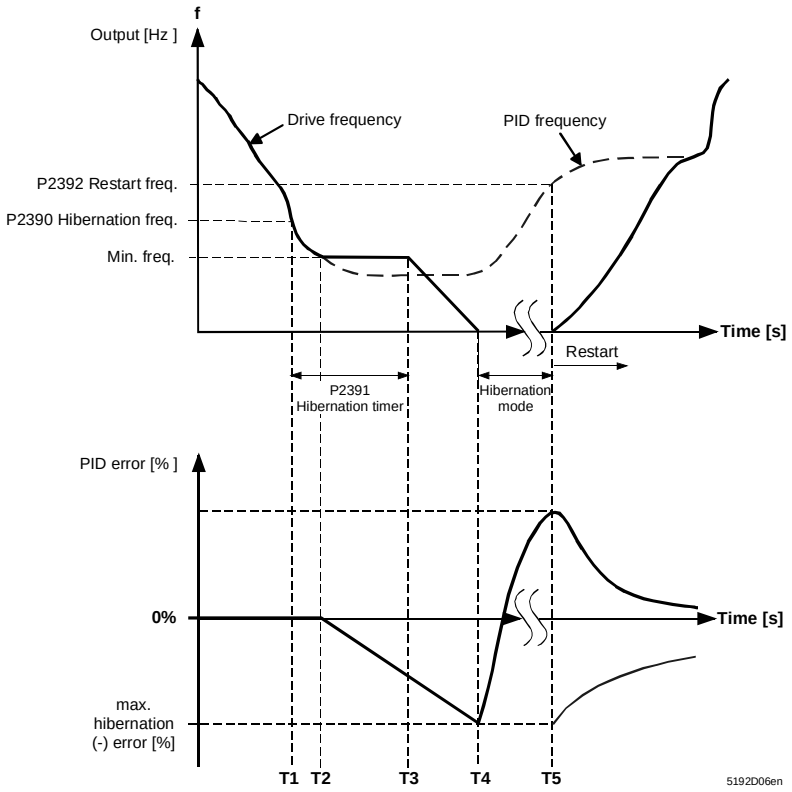


Figure 12. Hibernation Mode.

Parameter Settings for Hibernation Mode (commissioning)

P2390, Hibernation frequency

Hibernation frequency setpoint (frequency that the motor output will turn off).

Setting range: 0 to 200%

Recommended setting: Value 15 to 20% greater than the minimum frequency.

The hibernation function is disabled if the hibernation frequency is set to 0 (factory setting).

P2391, Hibernation timer

Set the desired time T1 to T3, before hibernation mode starts (see Figure 12).

Setting range: 0 to 254 second

P2392, Restart frequency

Hibernation restart frequency (frequency that the motor output will turn on).

Setting range: -200 to 200%

NOTE: The +/- signs vary according to the application (heating or cooling sequence).

Complete parameter setting by changing over to automatic control.

Chapter 4 - BiCo (Binector and Connector) Data Set Functions

Introduction

The SED2 provides user access levels, set by parameter P0003. User access level 1 gives access to the most frequently used parameters. User access level 2 gives access to more advanced parameters. For example, P0701 sets the function of Digital Input 1 with possible values such as:

1=ON right

12=Reverse

15=Fixed frequency, etc .

User access level 3 gives full access to all other parameters. (User access level 4 is for service only.)

To make use of BiCo, use access level 3 with full access to the parameters. This is detailed in the Operations & Maintenance manual. At this level, many new parameter settings are possible, including BiCo functionality. BiCo functionality is a different k more flexible way of setting and combining input and output functions. It can be used (in most cases) with the simple access level 2 parameter settings.

How does BiCo work?

The BiCo system is used on more complex drives such as SED2 and allows complex functions to be programmed so that, for example, Boolean and mathematical relationships can be set up between inputs (digital, analog, serial, etc.) and outputs (inverter current, frequency, analog output, relays, etc.).

The SED2 uses a simplified version of BiCo, which is flexible and can be set up without using additional software or hardware.

Example 1:

Use BiCo parameterization to enable the output relay using digital input 2.

1. Set P0003=3 to access all parameters.
2. Enable BiCo parameterization on digital input 2 by setting P0702=99.

   NOTE: If P0701, P0702, P0703 or P0704 are set to 99, it is not possible to change them to another value and the drive must be reset to factory defaults.
3. Since digital input 2 is "open" to BiCo settings, a new value of 722.1 now appears in P0731. The value 722.1 means "connect to digital input 2" (722.0 = connect to digital input 1, 722.2 = connect to digital input 3, etc.). Set P0731 to 722.1.

4. Run the SED2 using input 1 and operate the value using input 2.

NOTE: BiCo is a 'reverse' connection. That is, the output function connects back to the input; it is not possible to tell from P0702 (99) what the digital input is controlling. However, there are many diagnostic parameters that can assist in setting up BiCo functions (see Examples 2, 3, and 4).

Example 2:

Set P0771 to 37. This setting connects the analog output to the Inverter Temperature parameter r0037 so that the temperature of the inverter can be monitored remotely.

Example 3:

1. Using OFF3 instead of OFF1, set P0701 = 99 to enable the BiCo function.

2. Set P0840 = 722.0 (ON right via digital input 1) and P0848 = 722.0 (OFF3 via digital input 1).

The drive now ramps between setpoints using the normal ramp time as set in P1120 and P1121. However, at switch off from digital input 1, the drive turns off with an OFF3, using the ramp rate set in P1135, which may be different than P1121.

An additional advantage is that the OFF3 function usually requires a second digital input. The BiCo function permits digital input 1 to perform a run right and an OFF3.

Example 4:

This example selects an alternate ramp-up time when a certain fixed frequency is selected. Select three fixed frequencies using three digital inputs. The digital inputs are set for 'ON right'. The third digital input also sets the alternative (JOG) ramp times.

NOTE: This example only enables an alternative ramp-up time. When digital input 3 switches low, it also deselects the alternative ramp time and the normal ramp time is used.

1. Use fixed frequencies and set P1000=3.

2. Enable BiCo functionality by setting P0701, P0702, P0703 = 99.

3. Define the source of the fixed frequencies by setting P1020=722.0, P1021=722.1, P1022=722.2. (This defines the source of each frequency as digital input 1, 2, and 3.)

4. Define the mode of operation by setting P1016, P1017, P1018 = 2. (This sets the mode of operation of fixed frequencies to 'select fixed frequency and ON right command'.

5. Select JOG ramp times instead of normal ramp times by setting P1124 = 722.2. (This enables digital input 3 with this function.)

NOTE: To avoid confusion, Steps 3 and 4 use BiCo functions to set digital inputs 1 and 2. This could also be set using the standard parameterization.

Using Control and Status Words with BiCo

Many SED2 read-only parameters consist of control words. A parameter control word consists of a 16-bit number and each bit represents a particular value.

For example parameter r0052 (status word 1) gives value settings such as "Inverter Ready" (bit 0) or "Motor Current Limit" (bit b). Parameter r0052 displays the status of each bit using the vertical segments of the BOP display.

BiCo can also access these bits using the parameter number and bit state. For example, for a relay to operate at current limit, parameter P0731 is set to 52.b. (This is a level 2 setting; level 3 can select many more settings using BiCo functions.)

Each bit of the control and status words (r0052 to r0056) can connect to several output functions.

Examples:

Setting P0731 to 56.5 indicates that starting boost is active. If Starting Boost parameter P1312 is set to enable a starting boost, the relay is active during the ramping phase as the starting boost is applied.

Similarly, if P0731 is set to 56.6 and P1311 (acceleration boost) is enabled, then the relay is energized any time that the setpoint is increased.

Setting P0731 to 56.12 enables the relay when the voltage controller is active. As this occurs during regeneration, it could indicate excessive load or too fast a ramp-down time.

Siemens Building Technologies, Inc.
1000 Deerfield Parkway
Buffalo Grove, IL 60089-4513
Tel: +1 847-215-1000
Fax +1 847-215-1093

Siemens Building Technologies, Ltd..
2 Kenview Blvd.
Brampton, Ontario
Canada L6T 5E4
Tel: +1 905-799-9937

Siemens Building Technologies AG
Gubelstrasse 22
CH-6301 Zug
Tel: +41 41 724 24 24
Fax +41 41 724 35 22

Siemens Building Technologies Ltd.
16/F, Laford Centre
838 Lai Chi Kok Road
Kowloon, Hong Kong
Tel: +852 2917 5700
Fax +852 2904 1126

www.sbt.siemens.com

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