Parker Servo Drive

Servo Drives

Installation instructions

192-011006N8
2019-07
Up from release R1.7.1

ENGINEERING YOUR SUCCESS.

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We checked the contents of this publication for compliance with the associated hardware and software. We can, however, not exclude discrepancies and do therefore not accept any liability for the exact compliance. The information in this publication is regularly checked, necessary corrections will be part of the subsequent publications.
German Master created.

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Content

1. What is necessary and where to find it?

Software Tool, PSD ServoManager
Field Bus Files, Downloads under http://solutions.parker.com/psd_support
CE declaration of compliance **http://solutions.parker.com/psd_support**

2. Introduction

In this chapter you can read about:

2.1 Device assignment

This manual is valid for the following devices:

- PSD1-SW1200 (2 A)
- PSD1-SW1300 (5 A)
- PSD1-M_1300 (5 A)
- PSD1-M_1400 (8 A)
- PSD1-M_1600 (15 A)
- PSD1-M_1800 (30A)
- PSD1-M_2220 (2 A + 2 A)
- PSD1-M_2330 (5 A + 5 A)
- PSD1-M_2440 (8 A + 8 A)
- PSD1-M_2630 (15 A + 5 A)
- PSD1-M_3222 (2 A + 2 A + 2 A)
- PSD1-M_3433 (8 A + 5 A + 5 A)
- PSD1-MWP010 (Mains module 10 kW)
- PSD1-MWP020 (Mains module 20 kW)

2.2 Scope of delivery

Included in delivery are mating connectors for:

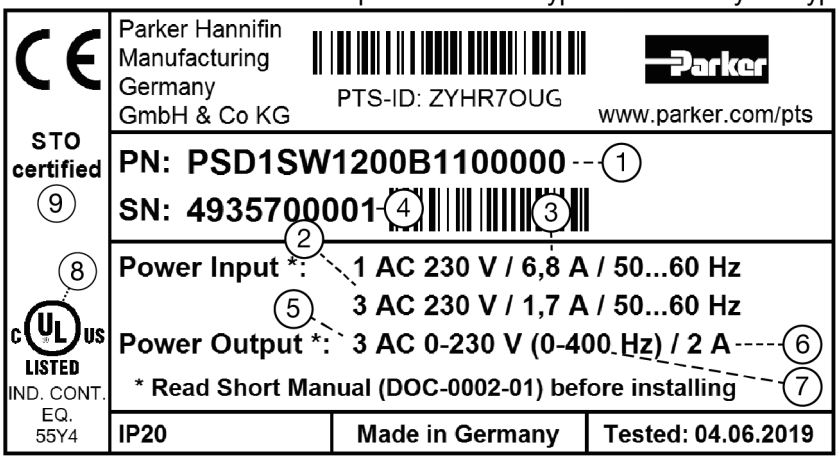
PSD1-S X17 (Push-in)
X51, X52, X63
Cable clamps for the motor cable in sizes D=7,9/9.5/11.1/12.7 mm

PSD1-M: X17 / X21 (Push-in)
X45, X46, X48
Tin angle with screw terminals for motor and feedback cable
(see page 46)

PSD1-M_P: X4 (Push-in)
X9, X40, X41

2.3 Type identification plate PSD1-S and PSD1-M with Safety Option Board

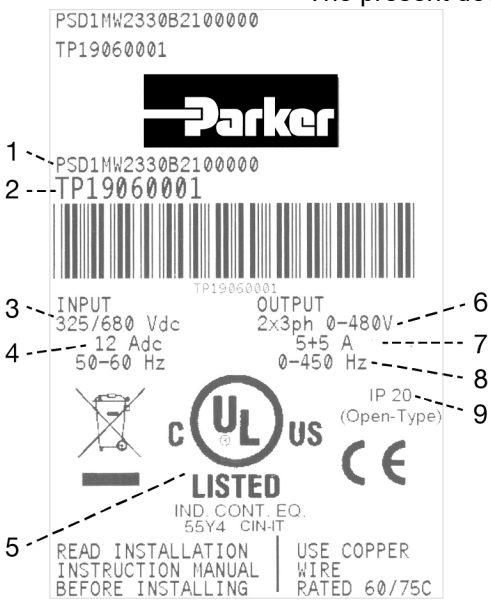
The present device type is defined by the type specification plate (on the housing):



1	Order code of the device
2	Input voltage
3	Input Current
4	Serial Number
5	Output voltage
6	Output current
7	Output frequency
8	UL certification (corresponding to the existing logo)
9	Type of safety certification

2.4 Type identification plate PSD1-M

The present device type is defined by the type specification plate (on the housing):



1	Order code of the device
2	Serial Number
3	Input voltage
4	Input Current
5	UL certification
6	Output voltage
7	Output current
8	Output frequency
9	IP Rating

2.5 Order/ type code PSD

	1	2	3	4	5	6	7	8	9	10	11
Ordering example	PSD1	M	W	3	433	B	1	1	0	0	000

1	**Drive family**	
	PSD1	Parker Servo Drive
2	**Device type**	
	S	Stand-Alone 230 VAC
	M	Multi axis 400 VAC
3	**Mounting type**	
	W	Wall mounting
	C	Cold plate*
	P	IP20 push through [1]
4	**Device type**	
	1	1 performance level
	2	2 performance levels
	3	3 performance levels
	P	Mains modules
5	**Device type**	
	PSD1SW1 Stand-Alone	
	200	2 A
	300	5 A
	PSD1MW1: 1 performance level	
	300	5 A
	400	8 A
	600	15A
	800	30 A
	PSD1MW2: 2 performance levels	
	220	2 + 2 A
	330	5 + 5 A
	440	8 + 8 A
	630	15 + 5 A
	PSD1MW3: 3 performance levels	
	222	2 + 2 + 2 A
	433	8 + 5 + 5 A
	PSD1MWP	
	010	10 kVA
	020	20 kVA
6	**Technology**	
	B	Basis
7	**Interface**	
	1	EtherCAT
	2	Field Bus configurable:[3] PROFINET, EtherCATIN, Ethernet/IP
8	**Feedback**	
	1	Hiperface DSL®
	2	Multi-Feedback configurable:[3] Hiperface DSL®, Resolver, Encoder (1 V_{ss})[2], Encoder A/B (TTL)[2], Analog Hall (1 V_{ss})[2], EnDat 2.2[1], BISS C[1]
9	**Option 1**	
	0	No option
	1	Functional safety over EtherCATIN
10	**Option 2**	
	0	No option
11	**Customized**	
	000	Non customized

[1] In development
[2] in the first expansion stage only forPSD1-S and PSD1MW1...: Multi axes device with one powerstage
[3] configurable in PSD ServoManager

2.6 Designated use

The device is designed for operation in electric power drive systems (EN 50178). Motion sequences can be automated with this device. Several motion sequences can be can combined by interconnecting several of these devices. Mutual interlocking functions must be incorporated for this purpose.
Please respect the **technical data** (see page 93)!
Exceeding / not respecting its intended use or its limits may cause danger.

- Motion sequence may not be carried out correctly which can cause personal injuries or material damages.

- The device might be destroyed what could result in fire.
- The device corresponds to EN 61800-3, i.e. it is subject to limited sale. The device can emit disturbances in certain local environments. In this case, the user is liable to take suitable measures.

2.7 Packaging, transport, storage

Packaging material and transport

⚠CAUTION **Caution!**

The packaging material is inflammable, if it is disposed of improperly by burning, lethal fumes may develop.

The packaging material must be kept and reused in the case of a return shipment. Improper or faulty packaging may lead to transport damages.

Make sure to transport the drive always in a safe manner and with the aid of suitable lifting equipment (**Weight** (see page 93)). Do never use the electric connections for lifting. Before the transport, a clean, level surface should be prepared to place the device on. The electric connections may not be damaged when placing the device.

First device checkup

- Check the device for signs of transport damages.
- Please verify, if the indications on the Type identification plate correspond to your requirements.
- Check if the consignment is complete.

Disposal

This product contains materials that fall under the special disposal regulation from 2010, which corresponds to the EC directory 2008/98/EC for dangerous disposal material. We recommend to dispose of the respective materials in accordance with the respectively valid environmental laws. The following table states the materials suitable for recycling and the materials which have to be disposed of separately.

Material	suitable for recycling	Disposal
metal	yes	no
Plastics	yes	no
Circuit boards	no	yes

Please dispose of the circuit boards according to one of the following methods:

- Burning at high temperatures (at least 1200°C) in an incineration plant licensed in accordance with part A or B of the environmental protection act.
- Disposal via a technical waste dump which is allowed to take on electrolytic aluminium condensers. Do under no circumstances dump the circuit boards at a place near a normal waste dump.

Storage

If you do not wish to mount and install the device immediately, make sure to store it in a dry and clean environment. Make sure that the device is not stored near strong heat sources and that no metal chippings can get into the device.

Please note in the event of storage >1 year:

Forming the capacitors

Forming the capacitors only required with 400 VAC axis controllers and mains module PSD1-M_P

If the device was stored longer than one year, the intermediate capacitors must be re-formed!

Forming sequence:

- Remove all electric connections
- Supply the device with 230VAC single phase for 30 minutes
  - ♦via the L1 and L2 terminals on the device or
  - ♦with multi axis devices via L1 and L2 on the mains module PSD1-M_P.

2.8 For Safety Use

In this chapter you can read about:

2.8.1. Explanation of the safety instructions

⚠DANGER Indicates a potential risk that may result in death or severe injury.

⚠WARNING Indicates a potential medium risk with that may result in death or severe injury.

⚠CAUTION Indicates a potential low risk with that may result in minor or moderate injury.

NOTICE Alerts you to situations that may damage this product or other products.

2.8.2. Working safely / qualification

This device may be operated only by qualified personnel.
Qualified personnel in the sense of these operating instructions consists of:

- Persons who, by virtue to their training, experience and instruction, and their knowledge of pertinent norms, specifications, accident prevention regulations and operational relationships, have been authorized by the officer responsible for the safety of the system to perform the required task and in the process are capable of recognizing potential hazards and avoiding them (definition of technical personnel according to VDE105 or IEC364),
- who have a knowledge of first-aid techniques and the local emergency rescue services,
- who have read and will observe the safety instructions,
- who have read and observe the manual or help (or the sections pertinent to the work to be carried out).

This applies to all work relating to setting up, commissioning, configuring, programming, modifying the conditions of utilization and operating modes, and to maintenance work.
This manual and the help information must be available close to the device during the performance of all tasks.

2.8.3. General hazards

General Hazards on Non-Compliance with the Safety Instructions
The device described in this manual is designed in accordance with the latest technology and is safe in operation. Nevertheless, the device can entail certain hazards if used improperly or for purposes other than those explicitly intended.
Electronic, moving and rotating components can

- constitute a hazard for body and life of the user, and
- cause material damage

2.8.4. Special dangers

⚠DANGER **Danger!**
Due to movable machine parts and high voltages, the device can pose a lethal danger. Danger of electric shock in the case of non-respect of the following instructions. The device corresponds to DIN EN 61800-3, i.e. it is subject to limited sale. The device can emit disturbances in certain local environments. In this case, the user is liable to take suitable measures.

- Check that all live terminals are secured against contact. Dangerous voltages up to 850V occur.
- Do not short-circuit the DC power voltage.

CAUTION: Risk of electric shock

DANGER

Caution - Risk of electric shock!

Before wiring or loosening electrical connections please observe the following:

- Risk of electric shock, disconnect power before removing cover resp. disconnect the devices from the mains supply.
- **Caution!** Dangerous electrical voltage even after turning off the intermediate capacitors:
  Up to 3 minutes with PSD1-S and 10 minutes with PSD1-M **after switching off mains supply, dangerous voltages may still be present.**
  Please check that no voltages are present (<50 V) at the output terminals DC+ and DC- of PSD1-S: X63/3 & X63/5 and with PSD1-M: Bus HV DC - 3 & 5. rail.

- The device must be permanently grounded due to high earth leakage currents. The leakage current is greater than 3.5 mA.
- The drive motor must be grounded with a suitable protective lead.

DANGER

- The devices are equipped with high voltage DC capacitor. Before removing the protective cover, the discharging time must be awaited. After switching off the supply voltage, it may take up to 3 minutes with PSD1-S and 10 minutes with PSD1-M (up to 30 minutes with additional capacitor modules) to discharge the capacitors.
  Danger of electric shock in case of non respect.
- Do never perform resistance tests with elevated voltages (over 690V) on the wiring without separating the circuit to be tested from the drive.
- Please exchange devices only in currentless state and, in an axis system, only in a defined original state.
- If the axis controller is replaced, it is absolutely necessary to transfer the configuration determining the correct operation of the drive to the device before the device is put into operation. Depending on the operation mode, a machine zero run will be necessary.
- The device contains electrostatically sensitive components. Please observe the electrostatic protection measures while working at/with the device as well as during installation and maintenance.

2.8.5. Cautionary Markings

WARNING

Ignoring of the following instructions will result in personal injury or material damage.

- The heat disispator can reach very high temperatures (>70°C)
- Do never perform resistance tests with elevated voltages (over 690V) on the wiring without separating the circuit to be tested from the drive.
- Please exchange devices only in currentless state and, in an axis system, only in a defined original state.
- If the axis controller is replaced, it is absolutely necessary to transfer the configuration determining the correct operation of the drive to the device before the device is put into operation. Depending on the operation mode, a machine zero run will be necessary.
- The device contains electrostatically sensitive components. Please heed the electrostatic protection measures while working at/with the device as well as during installation and maintenance.
- Never carry out high voltage resistance tests at lines without disconnecting the drive from the power supply you need to check.

- Provide protection and/or additional safety systems in order to prevent personal injury and material damage. Always care for sufficient ventilation.
- All control and signal terminals guaranty safe extra-low voltages (SELV), i.e. they are protected by a double isolation. Make sure the complete external wiring is approved for the highest system voltage.
- The user is responsible for protective covers and/or additional safety measures in order to prevent damages to persons and electric accidents.

2.8.6. Responsibility

Fitters and operators of any machine or systems are responsible for ensuring that, in case of failure of a device or component, the drive and therefore the machine or system is rendered safe. In doing so, people must not be endangered.
The here-in described technical data, processes and circuits are merely a general guidance and may not be suitable for the user's specified application. We cannot guaranty the suitability for certain applications of the device described in this manual.

2.9 Warranty conditions

- The device must not be opened.
- No changes may be made to the device; except for the changes described in the manual.
- Make connections to the inputs, outputs and interfaces only in the manner described in the manual.
- Fix the devices according to the **mounting instructions.** (see page 27)
  We cannot provide any guarantee for other mounting methods.

Note on exchange of options

Device options must be exchanged in the factory to ensure hardware and software compatibility.

- When installing the device, make sure the heat dissipators of the device receive sufficient air and respect the recommended mounting distances of the devices with integrated ventilator fans in order to ensure free circulation of the cooling air.
- Make sure that the mounting plate is not exposed to external temperature influences.

2.10 Conditions of utilization

In this chapter you can read about:

2.10.1. Conditions of utilization for CE-conform operation

2.10.1.1 - Industry and trade -

- Industry and trade -

The EC guidelines for electromagnetic compatibility 2014/30/EU and for electrical operating devices for utilization within certain voltage limits 2014/35/EU are fulfilled when the following boundary conditions are observed:

Operation of devices only in the state in which they are delivered.

Contact protection mating plug
In order to ensure contact protection, all mating plugs must be present on the device connections even if they are not wired.

Instructions for this manual
Please respect the specifications of the manual resp. of the help function, especially the technical characteristics (mains connection, circuit breakers, output data, ambient conditions,...).

2.10.1.2 Mains filter for use in industrial areas

The mains supply line requires a mains filter for the PSD1-M in general and for the PSD1-S from a specific motor cable length. Filtering can be provided plant specifically or separately for each device respectively for each axis combination.

Use of the devices in the industrial area (limit values class C3 in accordance with EN 61800-3)
The following mains filters are available for self-sufficient utilization:

Device:	Limit value class	Axis system with motor cable / Single-axis	Mains filter Order No.:
PSD1-M_P010	C3	< 6 x 10 m	**ECP-0003-01** (see page 84)
PSD1-M_P010	C3	< 6 x 50 m	**ECP-0003-02** (see page 84)
PSD1-M_P020	C3	< 6 x 50 m	**ECP-0003-03** (see page 84)
PSD1-S	C3	< 10 m	no mains filter
PSD1-S (single phase supply)	C3	> 10 m	**ECP-0001-01** (see page 83)
PSD1-S (3-phase supply)	C3	> 10 m	**ECP-0002-01** (see page 83)

2.10.1.3 Connection length in-between mains filters & device

In general, the connection mains filter - device shall be as short as possible.
unshielded: < 0.5 m
shielded: < 5 (screen must be connected to ground - e.g. ground - control cabinet)

2.10.1.4 Motor and feedback cable requirements

- Operation of the devices only with motor and feedback cables containing a flat shielding.
- Maintain the shielding as close as possible to the cable-end (max distance 8 cm).
- Ground empty wires in the cable on both sides.
- Please note the **connector descriptions** (see page 35, see page 36, see page 52, see page 53, see page 54)

2.10.1.5 Request for motor cable PSD

<100 m per axis (the cable must not be rolled up!).
The entire length of the motor cable per axis combination may not exceed 300 m.

PSD1-M

For motor cables >20 m a motor output choke is required for PSD1-M devices:
- **ECM-0004-01** (see page 85) (max. 6.3 A nominal motor current)
- **ECM-0001-01** (see page 86) (max. 16 A nominal motor current)
- **ECM-0002-01** (see page 86) (max. 30 A nominal motor current)

PSD1-S

For motor cables >50 m a motor output choke is required for PSD1-S devices:
- **ECM-0005-01** (see page 85) (max. 7 A motor nominal current)

2.10.1.6 Shielding connection of the PSD motor cable

Shielding connection of the motor cable

The outer shielding of the motor cable must be correctly connected to PE both on the **drive side** (see page 46, see page 59, see page 30) as well as on the motor side. Shielding may not be interrupted.

2.10.1.7 Cable installation:

- Signal lines and power lines should be installed as far apart as possible; cross points 90°.
- Signal lines should never pass close to excessive sources of interference (motors, transformers, contactors etc.).
- Do not place mains filter output cable parallel to the load cable.
- Lines must lead along conductive, grounded metal surfaces as closely as possible.

2.10.1.8 Motors

Operation with standard motors.

2.10.1.9 Connecting protective earth

⚠WARNING

Additionally to the ground connection at the power mains connection, establish a ground connection via the **grounding screw** (see page 46, see page 59, see page 30) on the device bottom by means of a copper cable with the same section.
In case there is not earth connection at the mains connection, the wire used must have a minimum diameter of 10 mm^2.
The connection to the central earth rail should be as short as possible. The minimum required width of the central earth rail depends on the length of the grounding cable:

Length [m]	Width [mm]	Strength [mm]
0.5	20	6
1	40	6
1.5	50	6

- Pay close attention to the overall grounding of the complete system.
- With several mounting plates: Ground connection by copper rails or copper strip.
- Ensure ground connection between the control cabinet and machine.
- Earth control transformer thoroughly (for 24 VDC). Use a transformer with tin angles and make conductive contact with the mounting plate.

2.10.1.10 Grounding request

Connect the filter housing and the device to the cabinet frame, making sure that the contact area is adequate and that the connection has low resistance and low inductance by using an 3 mm steel plate (galvanized).
Never mount the filter housing and the device on paint-coated surfaces!

2.10.1.11 Control requirements

Use only with aligned controller (to avoid control loop oscillation).

2.10.1.12 Accessories

Make sure to use only the accessories recommended by Parker.

2.10.1.13 Notes on the use in domestic environments

NOTICE

This is restricted operation category product according to EN 61800-3. This product can cause high-frequency disturbance in domestic areas. Users are asked to take suitable action if this proves to be the case.

2.10.2. CE declaration of conformity PSD1-M

Parker Hannifin Manufacturing S.r.l.
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20092 Cinisello Balsamo (MI) – Italy

EU DECLARATION OF CONFORMITY

Document: **DOC-0004-01-R020**

Manufacturer	**Parker Hannifin Manufacturing S.r.l.**
Address	**Via Gounod, 1** **20092 Cinisello Balsamo (MI)** **ITALY**

declares under sole responsibility compliance of the following products

Product	**Drive**
Product name	**PSD1M series**

with the

Low Voltage Directive 2014/35/EU
Applied harmonized standards
EN 61800-5-1:2007
Adjustable speed electrical power drive systems
Part 5-1: Safety requirements - Electrical, thermal and energy

EMC Directive 2014/30/EU
Applied harmonized standards
EN 61800-3:2004 + A1:2012
Adjustable speed electrical power drive systems
Part 3: EMC product standard including specific test methods.

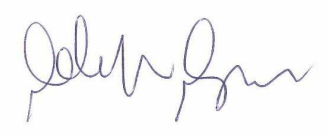
Notes:
These products must be installed and operated with reference to the instructions in the Product Manual.
All instructions, warnings and safety information of the Product Manual must be adhered to.

The products are components to be incorporated into machinery and may not be operated alone. The complete machinery or installation may only be put into service when the safety considerations of the Machinery Directive 2006/42/EC are fully adhered to.

CE mark affixed date: 2015-04

Cinisello Balsamo, 2016-04-20

Giorgio Colnaghi, Operations Manager
Authorized for technical documentation



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2.10.3. CE declaration of conformity PSD1-S

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EU DECLARATION OF CONFORMITY

Document: **DOC-0003-01-R040**

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77656 Offenburg
Deutschland

declares under sole responsibility compliance of the following products

Product **Drive of the series PSD1S**

Product name **PSD1SW1200 and PSD1SW1300**

with the

Low Voltage Directive 2014/35/EU
Applied harmonized standards
EN 61800-5-1:2007
Adjustable speed electrical power drive systems
Part 5-1: Safety requirements- Electrical, thermal and energy

EMC Directive 2014/30/EU
Applied harmonized standards
EN 61800-3:2004 + A1:2012
Adjustable speed electrical power drive systems
Part 3: EMC product standard including specific test methods.

Machinery Directive 2006/42/EC (Appendix IV)
Applied harmonized standards
EN 61800-5-2:2007
Adjustable speed electrical power drive systems
Part 5-2: Safety requirements – Functional
EN ISO 13849-1:2015
Safety of Machinery – Safety-related parts of control systems
Part 1: General principles for design

RoHS Directive 2011/65/EU
Applied harmonized standards
EN 50581:2012
Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances

Notes:
These products must be installed and operated with reference to the instructions in the Product Manual.
All instructions, warnings and safety information of the Product Manual must be adhered to.

The products are components to be incorporated into machinery and may not be operated alone. The complete machinery or installation may only be put into service when the safety considerations of the Machinery Directive 2006/42/EC are fully adhered to.

CE mark affixed date: 2015-06

Offenburg, 2017-07-21

Jürgen Killius, Operations Manager
Person authorized to compile technical file

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Vorsitzender des Aufsichtsrates: Hansgeorg Greuner

2.10.4. Conditions of utilization for the cUL certification of PSD1-M

In this chapter you can read about:

2.10.4.1 UL certification

Category	Specifications
Certified	E-File_No.: E142140 The UL certification is only valid if the type plate of the device shows the "UL" -sign. c UL US LISTED
PSD1-M:	UL508C, 3rd Edition, power supply load revision November 9th, 2010. C22.2 No.274-13, 1st Edition, issued March, 2013

2.10.4.2 Installations- & Environmental Characteristics PSD1-M

- The devices are only to be installed in a pollution degree 2 environment (maximum).
- Maximum Surrounding Air Temperature 40 °C.
- The devices must be appropriately protected (e.g. by a switching cabinet). - Open type equipment.
- Temperature rating of field installed conductors shall be at least 60°C. Do only use copper lines.
  Do only use the Parker cables available under **Accessories** (see page 81) or assemble the cables according to the specified regulations.
- Control voltage supply (24 VDC) only permissible with "class 2" power supply.
- The devices are internally protected against overvoltage in compliance with UL508C.
- The drive modules are equipped with a current limit. Values for maximum device current and maximum motor current can be set via PSD ServoManager (Chapter resp. Menu Limit values & Motor Characteristics).
- PSD1-M is intended for use in motors with internal or external motor protection Integral motor overload protection is not available.
- Motor overheating protection is not supported and must externally be realized.
- Integral solid state short circuit protection does not provide branch circuit protection. Branch circuit protection must be provided in accordance with the Manufacturer Instructions, National Electrical Code and any additional local codes
- Protective earth of the motor must be connected to protective earth of the device. Please observe that ground on PSD1 - motor connector is, according to NEC NFPA 70, a functional earth and not a protective earth.

2.10.4.3 PSD1-M Installations- & Environmental Characteristics

- Please observe that the operation of the PSD1-M axis modules is only permitted via the Parker Power Module PSD1-M_P. Furthermore Power Modules PSD1-M_P must only be used with PSD1-M axis modules.
  The UL certification does not cover individual devices but only the axis system of the PSD1-M_P and PSD1-M_P mains module.
- Dynamic braking unit

Data of the integrated dynamic brake module PSD1-M_P

Category	Specifications			
Mains module	Maximum current		Max. Duty Cycle	Minimum resistance value
	Peak	Duration		
PSD1-M_P010	28.8 A	4.27 A (500 W)	2.2 % (@60 s)	27 Ω
		7.5 A (1500 W)	6.7 % (@60 s)	
PSD1-M_P020	78.0 A	7.06 A (500 W)	0.82 % (@60 s)	10 Ω
		22.3 A (5000 W)	8.2 % (@60 s)	

- Suitable for use on a circuit capable of delivering not more than 5000 rms Symmetrical Amperes, 480 V ac +10 % maximum, when protected by Listed
  - ♦DIVQ Circuit Breakers manufactured by ABB, Stotz-Kontakt GmbH, Mod. No. S203UP-K / 480 Vac, 25 A for PSD1-M_P010
    or
  - ♦R/C (JFHR2/8) Semiconductor Fuse type manufactured by Cooper Bussmann LLC, Mod. No. 170M1366 oder 170M1566D, 690 VAC, 80 A, 200 kA RMS Sym for PSD1-M_P020..
- Power supply units PSD1-M_P need a fusing on the main site (branch circuit protection) as stated below.

PSD1-M_P010

Maximum fuse rating per device	Measure for line and device protection: UL listing (DIVQ) fuses Manufacturer: ABB, Stotz-Kontakt GmbH (E212323) Model No.: S203UP-K, 1 fuse 480 VAC, 3-phase, 25 A, operating temperature 55 °C

PSD1-M_P020

Maximum fuse rating per device **2 special purpose fuses in line are required**	**Cable protection measure:** MCB (K characteristic) with a rating of 50A / 4xxVAC (depending on the input voltage) Recommendation: (ABB) S203U-K50 (440VAC) **Device protection measure:** Circuit breakers 80A / 700VAC per supply leg in accordance with UL category JFHR2 Requirement: Bussmann 170M1366 or 170M1566D

Tightening torque of the wiring terminals

⚠CAUTION Risk of Electric Shock, wait at least 10 minutes before removing cover.

The field wiring terminals should be tightened with the torques mentioned below. Only the supplied mating connectors must be used.

PSD1-M		2 A ... 15 A
X45 Motor	UL	up to AWG10
	CE	up to 4 mm²
	Tightening torque	0.8 Nm 7 Lb.in
❖	❖	
X46 motor brake	UL	up to AWG14
	CE	up to 1.5 mm²
	Tightening torque	0.22 ... 0.25 Nm 1.95 ... 2.21 Lb.in
PSD1M_1800		**2 A ... 30 A**
X43 Motor	UL	up to AWG20-8
	CE	up to 6 mm²
	Tightening torque	1.1 ... 1.7 Nm 11 ... 15 Lb.in
❖	❖	
X44 motor brake	UL	up to AWG30-14
	CE	up to 1.5 mm²*

	Tightening torque	0.22 ... 0.25 Nm 1.95 ... 2.21 Lb.in
Mains module		
X40: Ballast resistor	**UL**	up to AWG10
	CE	up to 6 mm²
	Tightening torque	0.46 ... 0.57 Nm (M3) 4 ... 5 Lb.in
❖	❖	
X41: Mains connector PSD1-M_P010	**UL**	up to AWG10
	CE	up to 6 mm²
	Tightening torque	1,1 ... 1.7 Nm 11 ... 15 Lb.in
❖	❖	
X41: Mains connector PSD1-M_P020	**UL**	up to AWG6
	CE	up to 16 mm²
	Tightening torque	1.7 Nm 15 Lb.in
❖	❖	
X9: 24 VDC Steuerspannung	**UL**	up to AWG10
	CE	up to 6 mm²
	Tightening torque	1.1 ... 1.7 Nm 11 ... 15 Lb.in
❖	❖	
DC Bus	**UL**	-
	CE	-
	Tightening torque	0.8 Nm 7 Lb.in

* max 0.5mm² ferrule with plastic sleeve

2.10.4.4 Conditions of utilization for CSA certification

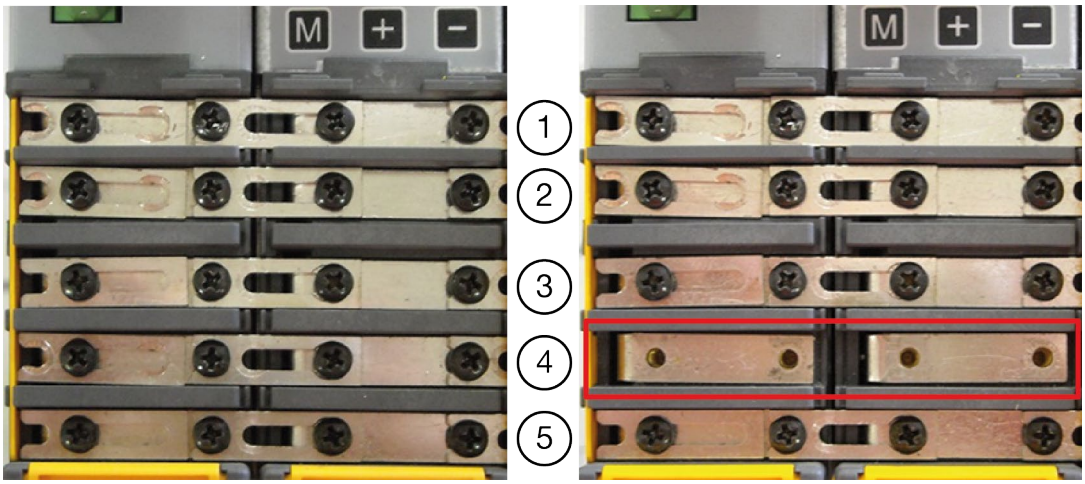
External Overvoltage Protection
External overvoltage protection in accordance with Canadian Standards C22.2-No.274-13 with over-voltage protection device (VZCA2) CSA-certified. Note the following table:

Mains module	**Manufacturer**	**Model No** (Quantity 1)	**Maximum Continuous Operating Voltage (Vac)**	**Voltage Protection Rating (VPR)(Vpk)**	**Category / Nominal earth leakage current**
PSD1-M_P010	ABB Frankreich (E322885)	OVR T2 3N 40-440 P(TS)U	L-GND 420 Veff Max L-L 840 Veff Max	L-GND 1500 V Max L-L 3000 V Max	1 / 10 kA
PSD1-M_P020	Cooper Bussmann LLC (E340782)	BSPM 4480 WY NGR	L-GND 660 Veff Max L-L 770 Veff Max	L-GND 2500 V Max L-L 2500 V Max	1 / 20 kA
	DEHN + SOEHNE GmbH + Co. KG. (E319777)	904 346			

Ground rail not sufficient
For CSA approval, earth rail must be replaced by a direct earth connection.

⚠CAUTION Risk of Electric Shock, wait at least 10 minutes before removing cover.

Removing the earth rail (4) (Right):



1	24 VDC
2	GND 24 VDC
3	DC power supply bus -
4	Protective earth
5	DC power supply bus +

⚠WARNING

Connecting protective earth
Connect protective earth via a copper wire of minimum 10 mm² by means of the provided screws at the bottom of the PSD1M (axis controller) and of the mains module PSD1-M_P:

2.10.5. Conditions of utilization for the cUL certification of PSD1-S

In this chapter you can read about:

2.10.5.1 UL certification

Category	Specifications
Certified	E-File_No.: E142140 The UL certification is only valid if the type plate of the device shows the "UL" -sign. c UL us LISTED
PSD1-S:	UL61800-5-1 1st Edition, issued June, 8th, 2012 C22.2 No.274-13, 1st Edition, issued March, 2013

2.10.5.2 Installations- & Environmental Characteristics PSD1-S

⚠CAUTION Risk of Electric Shock, wait at least 3 minutes with PSD1-S and 10 minutes with PSD1-M before removing cover

- Use in Pollution degree 2 Environment.
- Maximum Surrounding Air Temperature 40 °C.

- The devices must be appropriately protected (e.g. by a switching cabinet). - Open type equipment.
- Use 60/75°C wires only
  Use Copper Conductors Only
  Do only use the Parker cables available under **Accessories** (see page 81) or assemble the cables according to the specified regulations.
- Control voltage supply (24 VDC) only permissible with "class 2" power supply.
- Grounding Terminals - the screw terminals are suitable for Field Wiring Connection only when the wire is provided with Eyelet Tube Terminal.
- Overvoltage category III.
- Short circuit ratings SCCR = 5000 Arms
- The drive modules are equipped with a current limit. Values for maximum device current and maximum motor current can be set via PSD ServoManager (Chapter resp. Menu Limit values & Motor Characteristics).
- Integral motor overload protection is not available.
- The drive does not incorporate internal overload protection for the motor load and this overload protection shall be provided in the end use applications.
- Motor over temperature sensing is not provided by the drive
- Integral solid state short circuit protection does not provide branch circuit protection. Branch circuit protection must be provided in accordance with the Manufacturer Instructions, National Electrical Code and any additional local codes
- Suitable for use on a circuit capable of delivering not more than 5000 rms Symmetrical Amperes, 240 Vac maximum. When protected by Listed – Cartridge Fuses, Non-Renewable (JDDZ), Time-Delay Class-CC Fuses, rated 600 Vac, 3 A or 8A (for model No. PSD1SW1200) / 6 A or 12A (for model No. PSD1SW1300). See table below for the manufacturers, model number and electrical ratings.

External Branch Circuit Protection

Device	Spezification			
	Time-Delay "Class-CC" Fuses Listed – Cartridge Fuses, Non-Renewable manufactured by Cooper Bussmann LLC (E4273) (200 kARMS Symmetrical A.I.C.)			
	Model No.	**Current [Arms]**	**Voltage [VAC]**	**Quantity Phase**
PSD1-S_1200	LP-CC-8	8	600	1 phase
	LP-CC-3	3	600	3 phases
PSD1-S_1300	LP-CC-12	12	600	1 phase
	LP-CC-6	6	600	3 phases

Alternate External Branch Circuit Protection

Device	Spezification			
	Time-Delay "Class-CC" Fuses Listed – Cartridge Fuses, Non-Renewable manufactured by Mersen USA Newburyport-MA LLC (E2137) (200 kARMS Symmetrical A.I.C.)			
	Model No.	**Current [Arms]**	**Voltage [VAC]**	**Quantity Phase**
PSD1-S_1200	ATDR8	8	600	1 phase
	ATDR3	3	600	3 phases
PSD1-S_1300	ATDR12	12	600	1 phase
	ATDR6	6	600	3 phases

For use in Canada:

- External Surge Protection devices (required in the end use instalation) - According to the Canadian Standard C22.2-No.274-13.
- R/C Surge-Protective Device (VZCA2/8) and CSA-Certified transient surge suppression shall be installed on the line side of this equipment and shall be

rated minimum 240 V (phase to ground), suitable for “Overvoltage Category III”, and shall provide protection for a rated Impulse withstand Voltage peak of 4 kV.

2.10.5.3 Tightening torque of the wiring terminals

Connector		Torque	mm²	AWG
X17	Digital I/Os	Push-In	0,2 ... 1,5*	24-16
X51	DSL® feedback / motor brake	Push-In	0,2 ... 1,5*	24-16
X52	Motor	Push-In	0,2 ... 2,5**	26-12
X63	Mains supply / DC power	Push-In	0,2 ... 2,5**	26-12

* max 0,75mm² ferrule with plastic sleeve

** max 1,5mm² ferrule with plastic sleeve

2.10.5.4 Auxiliary connection – electrical ratings

DC Bus Input / Output – X63

400 VDC / D.C. / 7 A

Auxiliary Input Supply – X17

Control Supply - Max 24 VDC ±10% / max 0.5 ADC

Signal I/O’s Ports (PELV circuit) – X51

Signal I/O’s / Communication Ports - max 24 VDC / max 100 mA

2.10.5.5 Data of integrated dynamic brake unit

Internal DBU Ratings

Servo-Drive Model Nos.	Max Current - Amps		Max Duty Cycle - per cent	Internal D.B.U. Resistor Ratings (Ohm)
	Peak	rms		
PSD1SW1200 PSD1SW1300	7.84 A	0.1 A	1.27 % (@60s)	51 Ω (40 W)

External DBU Ratings

Servo-Drive Model Nos.	Max Current - Amps		Max Duty Cycle - per cent	Min Resistance D.B.U. Resistor (Ohm)
	Peak	rms		
PSD1SW1200	7.84 A	0.15 A	1.91 % (@60s)	51 Ω (60 W)
PSD1SW1300	7.84 A	0.45 A	5.73 % (@60s)	51 Ω (180 W)

2.10.5.6 In- / Output Ratings

Input Ratings

Servo-Drive Model Nos.	Input Voltage V AC	Frequency Phase	Maximum Input Current A rms
PSD1SW1200	3AC230 VAC ±10 %	50/60 Hz	1.7
PSD1SW1300			4.2
PSD1SW1200	1AC230 VAC ±10 %	50/60 Hz	6.8
PSD1SW1300			11.0

Output ratings

Device	Range of Output Voltage VAC	Range of Frequency / Phase	Output Current		Max. Continuous Output Power kW
			Nominal A rms (Continuous)	Maximum A rms (Duty Cycle)*	
PSD1SW1200	0-230 VAC	0-400 Hz / Three-Phase	2	6	0.64
PSD1SW1300			5	15	1.1

Note: * "Duty Cycle": 20% @10 s (ON=2.0 s - OFF=8.0 s)

2.10.6. Current on the mains PE (leakage current)

⚠WARNING This product can cause a direct current in the protective lead. If a residual current device (RCD) is used for protection in the event of direct or indirect contact, only a type B (all current sensitive) RCD is permitted on the current supply side of this product . Otherwise, a different protective measure must be taken, such as separation from the environment by doubled or enforced insulation or separation from the mains power supply by means of a transformer. Respect the supplier's instructions.

Mains filters do have high leakage currents due to their internal capacity. An internal mains filter is usually integrated into the servo controllers. Additional discharge currents are caused by the capacities of the motor cable and the motor winding. Due to the high clock frequency of the power output stage, the leakage currents do have high-frequency components. Please check if the FI protection switch is suitable for the individual application.
If an external mains filter is used, an additional leakage current will be produced.
The figure of the leakage current depends on the following factors:

- Length and properties of the motor cable
- Switching frequency
- Operation with or without external mains filter
- Motor cable with or without shield network
- Motor housing grounding (how and where)

Remark:

- The leakage current is important with respect to the handling and usage safety of the device.
- A pulsing leakage current occurs if the supply voltage is switched on.

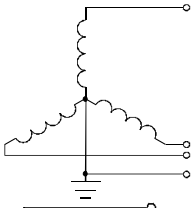
Please note:

The device must be operated with effective grounding connection, which must comply with the local regulations for high leakage currents (>3.5 mA).
Due to the high leakage currents it is not advisable to operate the servo drive with an earth leakage circuit breaker.

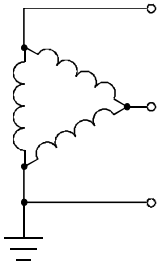
2.10.7. Supply networks

This product is designed for fixed connection to TN networks (TN-C, TN-C-S or TN-S). Please note that the line-earth voltage may not exceed 300VAC.

- When grounding the neutral conductor, mains voltages of up to 480VAC are permitted.



- When grounding an external conductor (delta mains, two-phase mains), mains voltages (external conductor voltages) of up to 240VAC are permitted.



Devices which are to be connected to an IT network must be provided with a separating transformer. Then the devices are operated locally as in a TN network. The secondary sided center of the separating transformer must be grounded and connected to the PE connector of the device.

2.11 Before commissioning the drive, please observe the following:

- Read the safety instructions.
- Make sure that all local electrical regulations are adhered to.
- Inspect the device for any damages.
- Inspect the device within the drive and system for loose ends, blends, grinding- or drilling chips, etc.
- Check all external power circuits of the system: Power supply, control, motor and ground connections.
- Make sure no damages or injuries may occur by a rotating motor. Uncouple the load from the motor shaft.
- Check the condition of the motor thermistor- and brake resistance connections. Make sure that all external set speeds are zero.
- Make sure nobody works with another part of the system which may affect switch-on.
- Make sure that switch-on does not negatively influence other devices.
- Verify if the motor connections are correctly wired.
- Ensure that the STO function is not activated.

3. PSD: PSD -Parker Servo Drive - Overview

Description

The PSD1 is Parker Servo Drive family, available with different power rating from 2 to 30A and form factors. Today the offering contains:
The PSD1-S is a standalone drive which can be connected directly to the main supply.
The PSD1-M is a multi-axis servo system where each axis module can supply up to three servo motors. The base configuration consists of a common DC bus supply and multiples PSD1-M modules, connected through DC bus bars. The modules are available as one, two or three axis versions. This makes the system highly flexible.
PSD1-M servo system is particularly suitable for all centralised automation systems, such as those found in many packaging machines, where large numbers of drives are often required offering significant advantages.

- Packaging machines
- Material forming machines
- Handling machines
- General automation

Common Features

- Hiperface DSL feedback ®
  Reduced cabling; only one cable connection between drive & motor
- EtherCAT - Real time communication as standard
- Quick and simple wiring
- Removable SD card
- Same software functionalities for standalone drive and multi-axis servo system

PSD1-S unique features

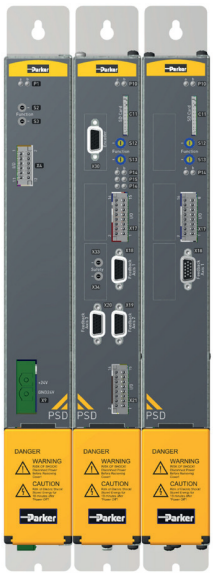
- Single or three phases power supply
- Compact housing
- Particularly suitable for small machines

PSD1-M unique features

- The most compact multi-axis servo system on the market
- One, two or three axis versions combined in one housing
- Common DC bus connection for energy exchange between drives

Technical characteristics - Overview

Standalone axis PSD1 S	Continuous current [A_{rms}]	Peak current A (≤ 2 s)
PSD1 SW1200	2	6
PSD1 SW1300	5	15



Multi axis PSD1 M	Continuous current [A_{rms}]	Peak current A (≤ 2 s)
PSD1 MW1300	5	10
PSD1 MW1400	8	16
PSD1 MW1600	15	30
PSD1 MW1800	30	60
PSD1 MW2220	2 + 2	4 + 4
PSD1 MW2330	5 + 5	10 + 10
PSD1 MW2440	8 + 8	16 + 16
PSD1 MW2630	15 + 5	30 + 10
PSD1 MW3222	2 + 2 + 2	4 + 4 + 4
PSD1 MW3433	8 + 5 + 5	16 + 10 + 10

(additional module on request)

4. Installation of the individual drive PSD1-S

In this chapter you can read about:

4.1 Before commissioning the drive, please observe the following:

CAUTION: Risk of electric shock

⚠DANGER

Caution - Risk of electric shock!

Before wiring or loosening electrical connections please observe the following:

- Risk of electric shock, disconnect power before removing cover resp. disconnect the devices from the mains supply.
- **Caution!** Dangerous electrical voltage even after turning off the intermediate capacitors:
  Up to 3 minutes with PSD1-S and 10 minutes with PSD1-M **after switching off mains supply, dangerous voltages may still be present.**
  Please check that no voltages are present (<50 V) at the output terminals DC+ and DC- of PSD1-S: X63/3 & X63/5 and with PSD1-M: Bus HV DC - 3 & 5. rail.

⚠CAUTION Only qualified electrician may commission the drive. Accident prevention measures must be observed.

⚠CAUTION Please make sure that no small parts (screws, cable remnants, ..) enter the devices.

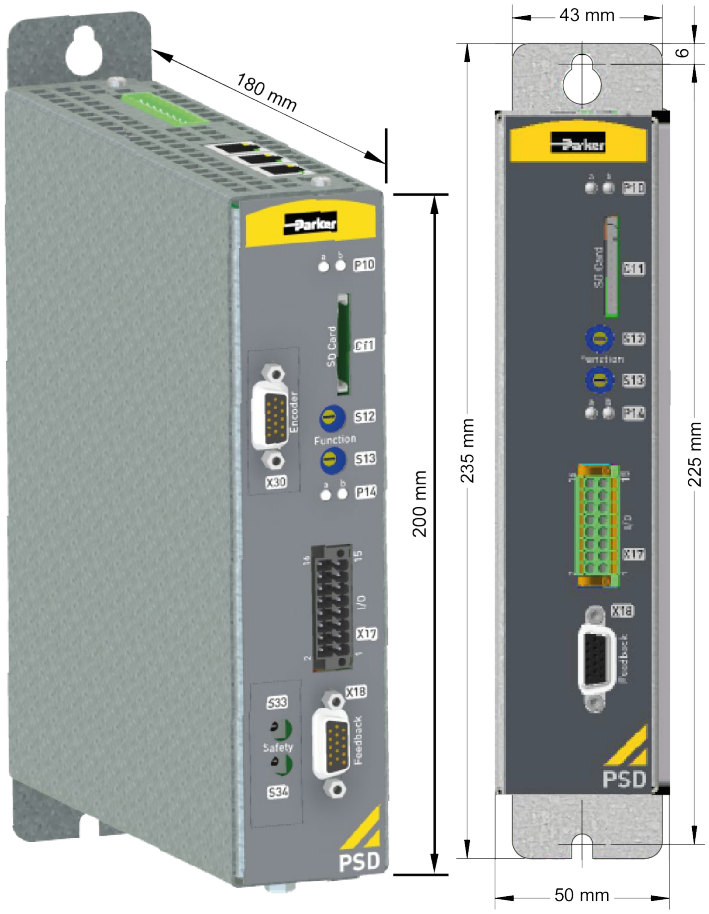
⚠CAUTION **Feedback system can be destroyed if configured incorrectly!**
If you connect a PSD that has already been configured for a specific feedback system to another feedback system, it can be destroyed by too high a voltage.
Procedure when changing the feedback system.

4.2 Mounting and dimensions

⚠CAUTION **Ventilation:**

- During operation, the device radiates heat (heat dissipation). Please provide for a sufficient mounting distance below and above the device (at least 100 mm) in order to ensure free circulation of the cooling air.
- Please do also respect the recommended distances of other devices.
- Make sure that the mounting plate is not exhibited to other temperature influences than that of the devices mounted on this very plate.
- The devices must be mounted vertically on a level surface. Make sure that all devices are sufficiently fixed.

4.2.1. Mounting and dimensions PSD1-S



Mounting:

2 socket head screws M6
Lateral distance of fixing of mounting holes: 50.5 mm
Required mounting distance for heat regulation at the top and below: At least 100mm

⚠CAUTION Please check regularly the firmness of the screw connection!

4.3 Connector overview PSD1-S

In this chapter you can read about:

4.3.1. Front view (PSD1-S)

CAUTION: Risk of electric shock

DANGER

Caution - Risk of electric shock!

Before wiring or loosening electrical connections please observe the following:

- Risk of electric shock, disconnect power before removing cover resp. disconnect the devices from the mains supply.
- **Caution!** Dangerous electrical voltage even after turning off the intermediate capacitors:
  Up to 3 minutes with PSD1-S and 10 minutes with PSD1-M **after switching off mains supply, dangerous voltages may still be present.**
  Please check that no voltages are present (<50 V) at the output terminals DC+ and DC- of PSD1-S: X63/3 & X63/5 and with PSD1-M: Bus HV DC - 3 & 5. rail.

Above
Fieldbus &
Config Interface

P10: Fieldbus LED

C11: SD Slot

Address:
S12: high half byte
S13: low half byte

P14: LED Status Axis

X17: I/Os

X18: Feedback

S33: Safety
S34: Safety

Below
Motor, Brake & DSL

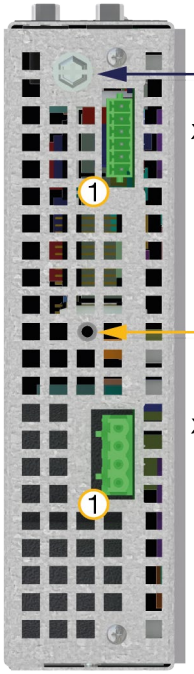
View from above (see page 30)	
P10	Status LEDs for the fieldbus
C11	Slot for SD card (SD card not included in delivery)
S12 (see page 38)	Device address higher value half-byte (accept with power ON)
S13 (see page 38)	Device address low value half-byte (accept with power ON)
P14 (see page 31)	Status LED device
X17 (see page 32)	Digital inputs/outputs
X18 *	Feedback device Male Connector (**Resolver** (see page 101), **Encoder/Hall** (see page 37))
S33	For safety option
S34	For safety option
View from below (see page 30)	

*

NOTICE

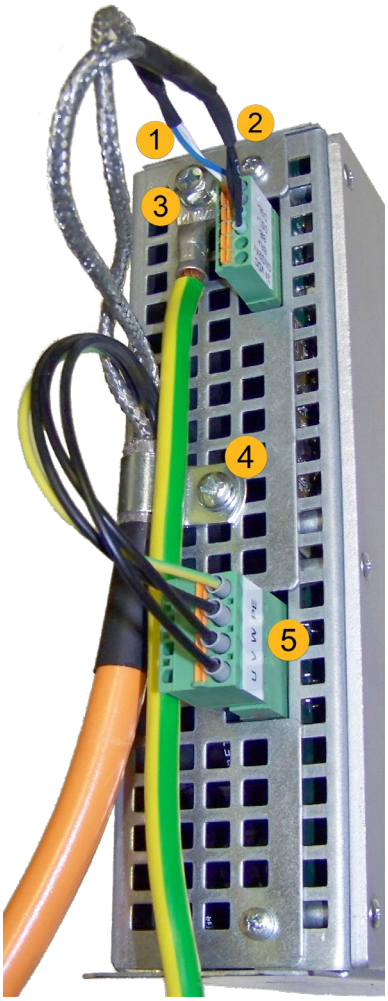
Before connecting a feedback cable, check that the correct feedback system is configured in the device.
Otherwise, destruction of the feedback system is threatened by overvoltage!

4.3.2. View from below (PSD1-S)



View from above (see page 30)	
Central ground connection	Connect ground via ring cable lug with a 10 mm² copper cable to central ground
X51 (see page 36)	To motor • HIPERFACE DSL® Motor feedback • Motor holding brake and 24VDC feeding for the brake
Motor ground connection	Connecting screw for motor earth/ the shielding of the motor cable (see image bellow)
X52 (see page 35)	Connection of motor
Front view (see page 29)	
(1) Shows pin 1 of the connector	

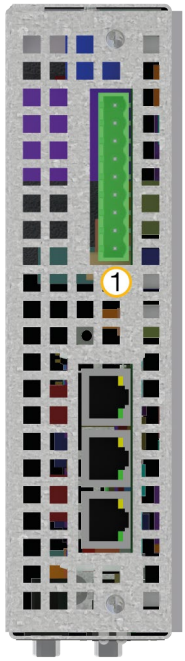
Wiring



Explanation

1 DSL connection
2 Motor brake connection
3 Connect ground via ring cable lug with a 10 mm² copper cable to central ground
4 Mounting of the shield terminal with a flat connection to the motor cable shield
5 Motor connection

4.3.3. View from above (PSD1-S)



Front view (see page 29)	
X60 (see page 39)	PC interface to configure and program servo axes
X61 (see page 39)	Fieldbus Interface output
X62 (see page 38)	Fieldbus Interface input
X63 (see page 33)	Terminals • AC Mains Supply • DC power supply • Connection of braking resistor or **bridge** to activate the internal braking resistor
View from below (see page 30)	
(1) Shows pin 1 of the connector	

4.4 P14: Status LED (PSD1-S)

Status No.	Status of axis	Left LED a (green) (ready)	Right LED b (red) (error)
0	No voltage	off	off
1	Booting of axis, firmware is missing	alternate quick flashing (LEDa green, LEDb rot)	
2	Axis not ready: • Booting of axis • No feedback detected. • IEC61131-3 program not compatible with firmware. • no IEC61131-3 program • Hall signals invalid.	off	flashes quickly (5 HZ)
3	Axis de-energized	flashes slowly	off
4	Axis energized; commutation calibration running	flashes quickly	off
5	Axis energized	on	off
6	Axis in error state / error present / axis energized (error reaction 1)	on	flashes quickly (5 HZ)
7	Axis in error state / error present / axis de-energized (error reaction 2)	off	on
8	Axis faulty: Please contact us	on	on
9	STO active	off	flashes slowly (1 HZ)
10	reserved	flashes quickly	flashes quickly (5 HZ)
11	SD Card detected or restoring from SD card successfully terminated	alternate quick flashing (LEDa green, LEDb green)	
12	SD card not detected or restoring from SD card interrupted	alternate quick flashing (LEDa red, LEDb red)	
13	Axis de-energized	off	Single flash

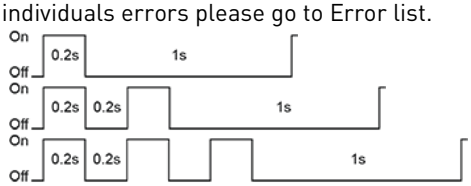
Status No.	Status of axis	Left LED a (green) (ready)	Right LED b (red) (error)
14	Axis energized	on	Single flash
15	Axis de-energized HEDA3 slave not ready	off	Double flash
16	Axis energized HEDA3 Slave not ready	on	Double flash
17	Axis de-energized HEDA3 Master not ready	off	Triple flash
18	Axis energized HEDA3 Master not ready	on	Triple flash
19	Axis de-energized	off	Jitter (10 HZ)
20	Axis energized	on	Jitter (10 HZ)

Error response 1: Ramping with slow ramp; then deactivate control loops.
Error response 2: Ramping with "Stop" ramp, then deactivate control loops.
For the meaning of individuals errors please go to Error list.

Single flash

Double flash

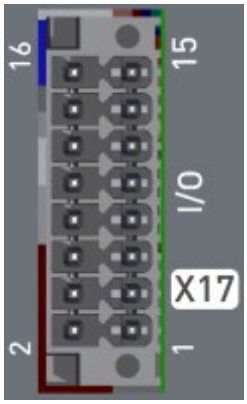
Triple flash



DANGER

Caution - Risk of electric shock!
High voltage supply may be present even with missing voltage supply (both LEDs off)!

4.5 X17: Digital Inputs / outputs (PSD1-S)



Pin X17	Input / Output	
1	Input	+24 VDC Devices - Control voltage
2	Input	GND24V
3	Input	+24 VDC for digital outputs
4	I0	Input 0
5	I1	Input 1
6	I2	Input 2
7	I3	Input 3
8	GND24V	
9	O0	Output 0
10	GND24V	
11	A1	Output 1
12	STOA/	STO Channel A Input
13	factory use	
14	STOGND	STO Ground
15	factory use	
16	STOB/	STO Channel B input

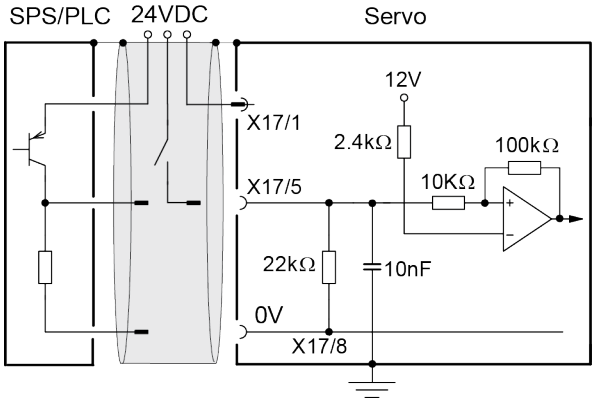
Loading of the outputs: Maximum 200 mA
In case of overload / over-temperature the output is deactivated and reactivated automatically after cooling.
All inputs and outputs do have 24 V level.
Input level:
"0" (low) = Rated Input Voltage ≤ 12.5 V
"1" (high= Rated Input Voltage ≥ 13.5 V
The digital outputs are free for writing via object 0x2079.0x01 or 0x60FE.0x01 via fieldbus.
The status of digital inputs can be read via object 0x2070.0x00 or 0x60FD.0x00 .

4.5.1. Control Voltage 24 VDC PSD1-S

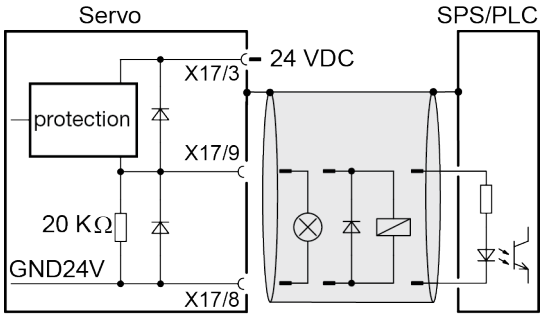
Category	Specifications
Voltage operating range	21.6 - 27.0 VDC (24 VDC -10% +12.5%)
Ripple	0.5 Vss
Requirement according to safe extra low voltage (PELV)	yes (class 2 mains module)
Electric current drain	0.5 A + Output current of digital output currents (fed via connectors X17/2, 3) + Output current of motor brakes (fed via connectors X51/1 & 2)) + Current requirements of optional boards

4.6 Wiring of the digital inputs and outputs

Wiring of digital inputs



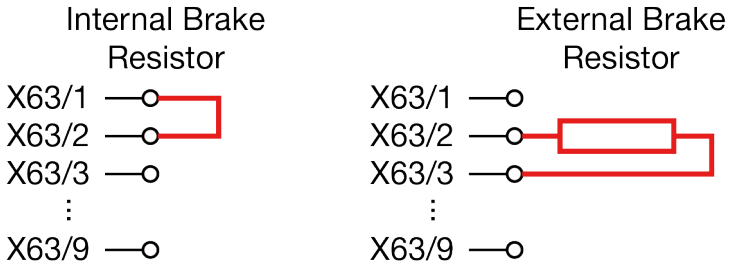
Wiring of digital outputs



4.7 X63: AC Mains Supply, DC voltage supply & Connection of braking resistor (PSD1-S)

Pin	Designation	Description	
1	Rin	Internal Braking Resistor *	
2	-R	Output for **braking resistor** (see page 89) connection -	
3	+R	Output for braking resistor connection +	
4	DC+	Power direct current +	
5	DC-	Power direct current -	
6	L3	Phase 3 (mains supply)	factory use
7	L2	Phase 2 (Mains Supply)	N (Single Phase)
8	L1	Phase 1 (Mains Supply)	L (Single Phase)
9	PE	Earth conductor	

* The internal braking resistor is connected via bridge X63/1 and X63/2:



⚠WARNING **Device protection**
By cyclically switching on and off the power voltage, the input current limitation can be overloaded, which may cause damage to the device.
Wait at least one minute between two switching on processes!

NOTICE **Please note!**
If neither a braking resistor nor a bridge are connected, the intermediate circuit voltage is 0.

4.7.1. Mains connection PSD1-S

Category	Specifications	
PSD1-S	**PSD1-S_1200**	**PSD1-S_1300**
Mains voltage	3 phases 3* 230 VAC ±10% 30 ... 253 VAC / 50-60 Hz or Single Phase 230 VAC ±10% 30 ... 253 VAC / 50-60 Hz	
Input Current	1AC230V: 6.8 Arms 3AC230V: 1.7 Arms	1AC230V: 11 Arms 3AC230V: 4.2 Arms
Maximum fuse per device*	Single phase: 8 A Three phases: 3 A Fuse Class: gS (gRL), Time-delay	Single phase: 12 A Three phases: 6 A Fuse Class: gS (gRL), Time-delay
Earth leakage current	**Current on the mains PE** (see page 24) (>3,5 mA)	
Supply networks	**Possible supply networks** (see page 24): TN	

* Circuit breakers for operation according to CE.
Circuit breakers for UL und CSA see **Chapter UL** (see page 18, see page 21).

Please observe the notes in chapter "Operating conditions for CE-conform operation **(see page 13)".**

4.7.2. Braking operation PSD1-S

Category	Specifications	
Controller type	**PSD1-S_1200 (2 A)**	**PSD1-S_1300 (5 A)**
Capacity/ storable energy	760 µF / 15 Ws	1140 µF / 23 Ws
Minimum braking resistance	51 Ω	51 Ω
Maximum current	7.84 A	7.84 A

Data of the integrated braking resistor PSD1-S

Category	Specifications			
Device	Maximum current		Max. Duty Cycle	Minimum resistance value
	Peak	Duration		
PSD1-SW1200 PSD1-SW1300	7.84 A	0.1 A	1.27% @ 60 s	51 Ω (40W)

External ballast resistors from Parker (see page *89*).

4.8 X52: Motor connection (PSD1-S)

Pin	Designation	Motor cable lead designation*		
1	U	U / L1	1	U1
2	V	V / L2	2	U2
3	W	W / L3	3	U3
4	FE & PE	YE / GN		

* Depending on cable type.
FE: Functional ground
PE: Protective earth

Shielding connection of the motor cable The outer shielding of the motor cable must be correctly connected to PE both on the **drive side** (see page 46, see page 59, see page 30) as well as on the motor side. Shielding may not be interrupted.

Please observe the notes in chapter "**Operating conditions for CE-conform operation** (see page 13)".

4.8.1. Motor connection with self-made motor cable

NOTICE

Please consider special features of the **DSL** motor connection with:
- EX motors,
- EY motors,
- NK motors,
- NV motors and
- NX motors!

With these motors with DSL feedback, the outputs U & V are reversed in the PSD via the motor configuration

This has no effect on the wiring with Parker motor cables, you can connect them as shown in the table.
For EX motors, EY motors, NK motors, NV motors and NX motors:

Pin	Designation	Motor cable lead designation*			Motor side: EX, EY, NK, NV, NX
1	U	U / L1	1	U1	U
2	V	V / L2	2	U2	W
3	W	W / L3	3	U3	V
4	FE & PE	YE / GN			

4.8.2. Output data PSD1-S 1/3*230 VAC

Category		Specifications	
Device type		**PSD1-S_1200 (2 A)**	**PSD1-S_1300 (5 A)**
Output voltage		3 x 0 ... 230 V ±10 %	
Output current*:			
$I_{Nominal}$ [Arms]	**4 kHz**	2	5
I_{peak} (2 s) [Arms]	**4 kHz**	6	15
$I_{Nominal}$ [Arms]	**8kHz**	**2**	**5**
I_{peak} (2 s) [Arms]	**8kHz**	**6**	**15**
$I_{Nominal}$ [Arms]	**16 kHz**	1.332	3.33
I_{peak} (2 s) [Arms]	**16 kHz**	3.996	9.99
Power at continuous operation		0.64kW (3-phases mains supply) 0.64 kW (1-phase mains supply)	1.6 kW (3-phases mains supply) 1.6 kW (1-phase mains supply)
Switching frequency of the motor current		8 kHz	8 kHz
Heat dissipation for In		13 W	35 W

* Output current bei verschiedenen switching frequency. The default settings of the currents und switching frequencies are grayed out & in bold..

4.9 Motor feedback

In this chapter you can read about:

In this chapter you can read about:

⚠CAUTION

Feedback system can be destroyed if configured incorrectly!
If you connect a PSD that has already been configured for a specific feedback system to another feedback system, it can be destroyed by too high a voltage.
Procedure when changing the feedback system.

4.9.1. X51: Motor holding brake and HIPERFACE DSL® Connection

Pin	Designation	Description
1	DC 24 V	Input power supply brake 24 VDC
2	GND24V	Input power supply brake GND24V
3	Br +	Motor holding brake output + (max 1.0 A)
4	Br -	Motor holding brake output - (connected with GND24V)
5	DSL+	Feedback
6	DSL-	Feedback

Electrical connection on device (see page 46, see page 59, see page 30)

NOTICE

We recommend the operation with Parker **HIPERFACE DSL® cables!** (see page 82)
Note the following, if no Parker PSD DSL motor cable is used:
The internal shielding of the Hiperface DSL® signal line must be connected (braided or soldered) to the outer motor cable shielding (and thus to PE). Up from this connection point, the internal shielding of the Hiperface DSL® line must be guided up to the Hiperface DSL® connection terminal of the PSD servo amplifier.

NOTICE

Please observe the following if you want to disconnect the DSL lines with an additional plug:

- No other lines must be wired between DSL+ and DSL-.
- The DSL lines must be twisted and separately shielded.
- A flat shielding must be guaranteed across the plug connection (recommendation: Harting Han-Modular plug with “Han-Quintax” or “Hand MegaBit” module).
- The shield of the DSL lines must be connected to PE/earth with low impedance. In the simplest case, this can be done by connectig the DSL shield with the overall shield of the cable at the cable end (on the controller side).

4.9.2. X18: Connector assignment with configured resolver feedback

Assignment with multi feedback option with configured resolver

Pin	Feedback High Density /Sub D
1	factory use
2	factory use
3	factory use
4	REF-Resolver+ (8 kHz / max. 9.5 V_{ss})
5	+3.3 V (for temperature sensor)
6	factory use
7	SIN- (max. 4.7 V_{ss} differential)
8	SIN+ (max. 4.7 V_{ss} differential)
9	factory use
10	Tmot*
11	COS- (max. 4.7 V_{ss} differential)
12	COS+ (max. 4.7 V_{ss} differential)
13	factory use
14	factory use
15	REF-Resolver-

*Pin10 Tmot must not be connected to X48 (see page 54) (to PSD-1M) with PSD1-M at the same time as the connections for temperature sensors.

Category	Specifications
Resolution of the motor position	• Position resolution: 16.6 Bits (= 0.005°) • Absolute accuracy: ±0.167°
Resolver supported	• **LTN**: RE-21-1-A05, RE-15-1-B04 • **Tamagawa:** TS2610N171E64, TS2620N21E11, TS2640N321E64, TS2660N31E64 • **Tyco (AMP):** V23401-T2009-B202
Resolver data supported	• Transformation ratio: 0.25... 1 (typical 0.5) • Exciting frequency 8kHz • Amplitude of the excitation signal: max. 9.5 V_{ss}. (The resolver must be approved for at least this value).

Accuracy

The exactitude of the position signal is above all determined by the exactitude of the feedback system used.

4.9.3. X18: Assignment with configured incremental encoder or analogue Hall

Incremental encoder / analogue & digital HALL sensor with analogue Sin/Cos signals with $1V_{ss}$

Pin	Feedback option/ high density/sub D		
	Encoder 1 V_{ss}	Encoder A/B	Analogue Hall sensor
1	Sense -*		
2	Sense +*		
3	Hall 1 (digital)		factory use
4	Vcc (+5 V) max. 350 mA load		
5	+3.3V (for temperature sensor)		
6	Hall 2 (digital)		factory use
7	Sine -	A-	Sine -
8	Sine +	A+	Sine +
9	Hall 3 (digital)		factory use
10	Tmot**		
11	Cosine -	B-	Cosine -
12	Cosine +	B+	Cosine +
13	N+, Z+, Ref + (encoder reference mark or index pulse +)		factory use
14	N+, Z+, Ref + (encoder reference mark or index pulse -)		factory use
15	GND (Vcc)		

*+5V (Pin 4) is measured and controlled directly at the end of the line via Sense+ and Sense-.
Maximum cable length: 100 m with 0.5 mm^2.
Pin10 Tmot may not be connected to pins 1...6 at the same time as **X48 (see page 54) (PSD1-M).

Category	Specifications
Incremental encoder (see page 37) * (square wave or Sine/ Cosine signal)	• Linear or rotary • Signal ♦ Sin/Cos signal: max. 5 VSS; typical 1 VSS; 90° offset, max. 400 kHz or ♦ A/B pluses; 90 ° electrical phase shift (max 5 MHz) with the following commutation options: • Automatic commutation or • U, V, W or R, S, T commutation signals (NPN open collector) e.g. digital hall sensors, incremental encoders made by Hengstler (F series with electrical ordering variant 6)
Analogue Hall sensor (see page 37) *	• Linear or rotary • Sin/Cos signal: max. 5 VSS; typical 1 VSS; 90° offset, max. 400 kHz

* in the first expansion stage only for PSD1-S and PSD1MW1 Multi axes device with one powerstage.

4.10 X60: PC-/Diagnostic interface

Wiring with Ethernet Crossover cable Cat5e; for this, we offer our **CBD000C0-T00-T0** (see page 93) interface cable.
Standard Ethernet Address of the PSD:192.168.10.x
The final position (x) is set via the address adder S12 (higher value byte) & S13 (low value byte) and accepted by Power On.

Address setting

Settings:

S12: Device address high order half-byte (accept with power ON)
S13: Device address low value half-byte (accept with power ON)
Example: S12=2, S13=1
Address= 0x21: S12*16 + S13 = 33
Addressing 1 ... 240 (0xF0) possible; Values 241 ... 255 reserved!
After switching on PSD, the IP address is set to the value "192.168.100.S12_S13".
If the IP address has been changed and is not longer known, it can be reset with S12_S13 = 253 (0xF9) to:
- IP address = 192.168.10.2
- SubNetmask = 255.255.0.0
- Gateway_IP = 192.168.10.254
- Host name = PSD1-002

The complete IP address can be redefined via the objects 0x2605.5 & 0x2605.01 .

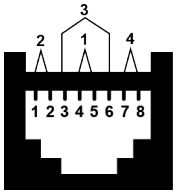
Addresses 0 and 241 ... 255 are not possible.
Connection is configured in PSD ServoManager.

4.11 Communication interfaces

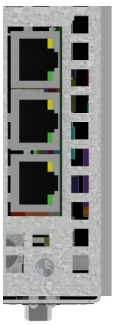
In this chapter you can read about:

4.11.1. X61, X62 Ethernet Connection

RJ45-Socket: Assignment



Pin	Wire pair No.	RJ45 (X61) out	RJ45 (X62) in
1	2	Tx +	Tx +
2	2	Tx -	Tx -
3	3	Rx +	Rx +
4	1	-	factory use
5	1	-	factory use
6	3	Rx -	Rx -
7	4	-	factory use
8	4	-	factory use



Wiring with Ethernet Crossover cable Cat5e (from X61 to X62 of the next device without termination); for this, we offer our **CBD000C0-T00-T0** (see page 93) interface cable.

NOTICE

Please use shielded cables:
- SF/UTP: Cable shielded in total or
- S / STP, S / FTP: additional shielding around the 4 wire pairs.

Place the shield flat on the plug!

5. Installation of the multi-axis system PSD1-M

The PSD1 multi-axis system consist of a power module (PSD1-M_P) und the axis modules (PSD1-M_x).
The axis module drives 1 to 3 motors, depending on the type (x=1, 2 or 3).
Please observe that the operation of the axis modules is only permitted via the Parker Power Module PSD1-M_P.

In this chapter you can read about:

5.1 Before commissioning the drive, please observe the following:

CAUTION: Risk of electric shock

⚠DANGER

Caution - Risk of electric shock!

Before wiring or loosening electrical connections please observe the following:

- Risk of electric shock, disconnect power before removing cover resp. disconnect the devices from the mains supply.
- **Caution!** Dangerous electrical voltage even after turning off the intermediate capacitors:
  Up to 3 minutes with PSD1-S and 10 minutes with PSD1-M **after switching off mains supply, dangerous voltages may still be present.**
  Please check that no voltages are present (<50 V) at the output terminals DC+ and DC- of PSD1-S: X63/3 & X63/5 and with PSD1-M: Bus HV DC - 3 & 5. rail.

⚠CAUTION Only qualified electrician may commission the drive.
Accident prevention measures must be observed.

⚠CAUTION Please make sure that no small parts (screws, cable remnants, ..) enter the devices.

⚠CAUTION **Feedback system can be destroyed if configured incorrectly!**
If you connect a PSD that has already been configured for a specific feedback system to another feedback system, it can be destroyed by too high a voltage.
Procedure when changing the feedback system.

5.2 Mounting and dimensions

⚠CAUTION **Ventilation:**

- During operation, the device radiates heat (heat dissipation). Please provide for a sufficient mounting distance below and above the device (at least 100 mm) in order to ensure free circulation of the cooling air.
- Please do also respect the recommended distances of other devices.
- Make sure that the mounting plate is not exhibited to other temperature influences than that of the devices mounted on this very plate.
- The devices must be mounted vertically on a level surface. Make sure that all devices are sufficiently fixed.

5.2.1. Mounting and dimensions PSD1-M size 1

The devices are force-ventilated via a ventilator fan fixed to the lower part of the heat dissipator!

Mounting spacing: At the top and below: at least 100mm

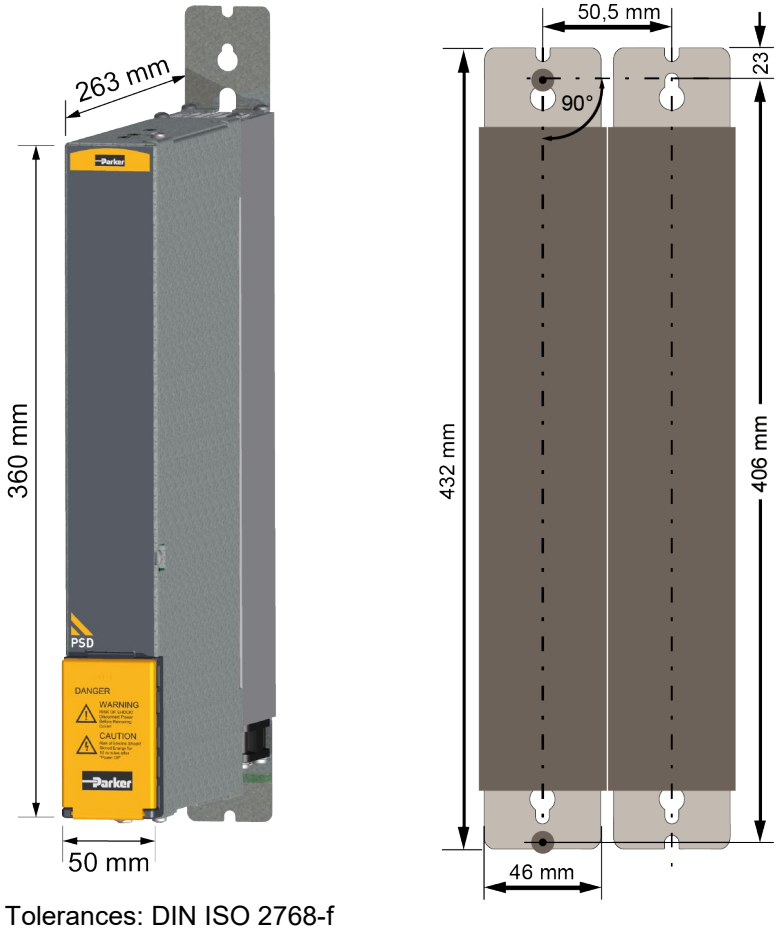
Information on

PSD1-M Size 1
- Multi axes servo drives and
- Mains Module PSD1-M_P010

Mounting:

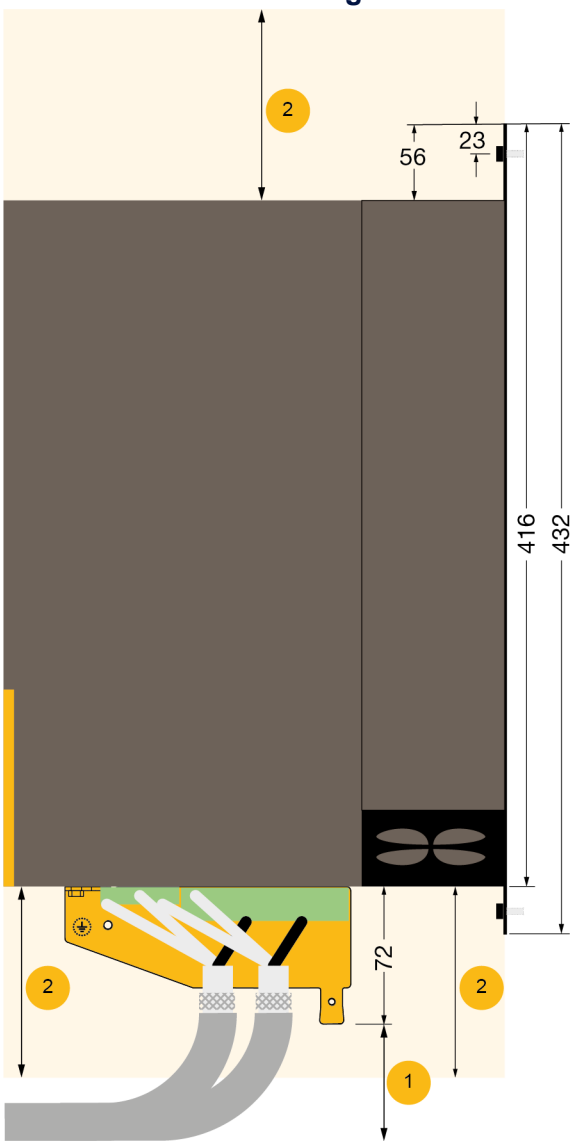
2 socket head screws M6
Lateral distance of fixing of mounting holes: 50.5 mm
Required mounting distance for heat regulation at the top and below: At least 100mm

⚠CAUTION Please check regularly the firmness of the screw connection!



Tolerances: DIN ISO 2768-f

5.2.1.1 Mounting distances PSD1-M size 1



1 Additional mounting distance corresponding to the minimum bending radius of the cables

2 At least 100mm distance for free circulation of cooling air.

5.2.2. Mounting and dimensions PSD1-M size 2

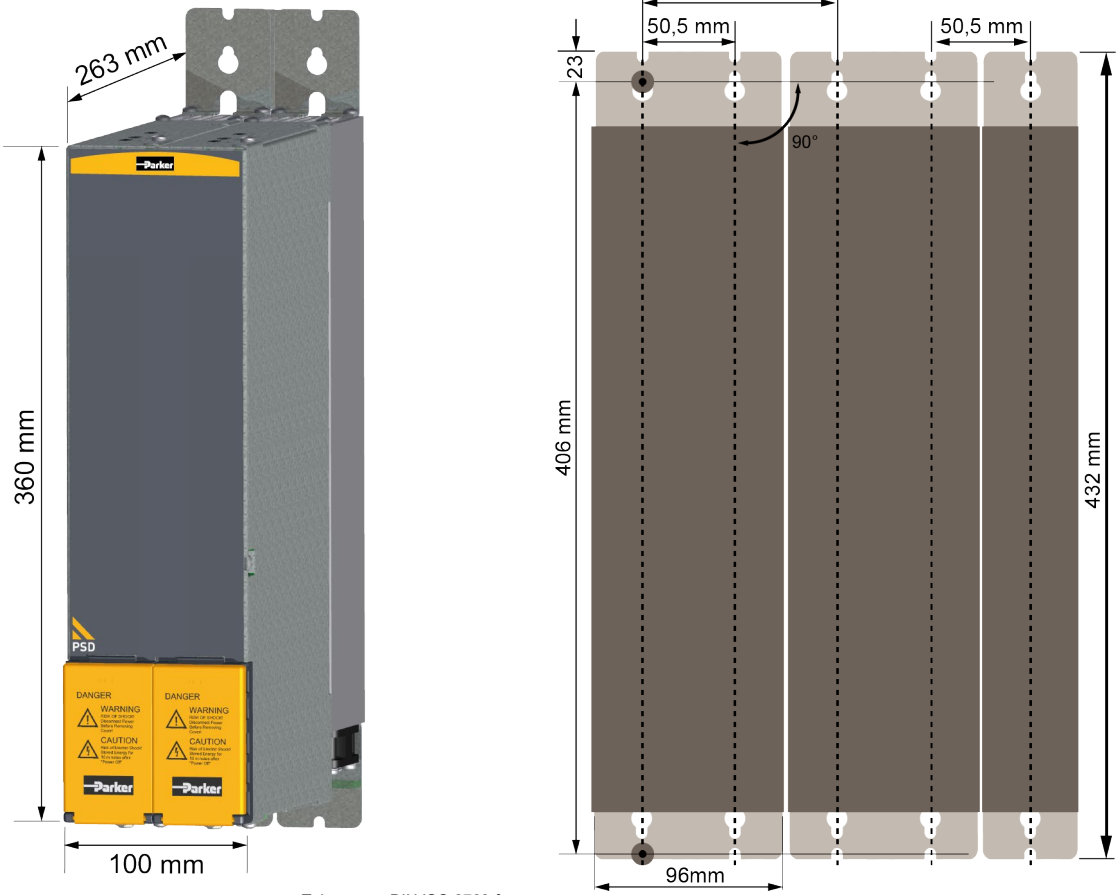
Information on

PSD1-M Size 2
Multi axis Servo Drives (30 A) and
Mains Module PSD1-M_P020

Required mounting distance for heat regulation at the top and below: At least 100mm

Mounting:

4 socket head screws M5



Tolerances: DIN ISO 2768-f

5.3 Connector overview PSD1-M

In this chapter you can read about:

5.3.1. Front view (PSD1-M)

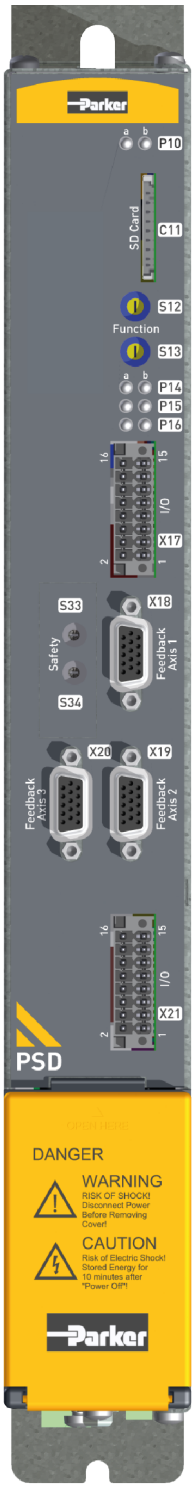
CAUTION: Risk of electric shock

DANGER

Caution - Risk of electric shock!

Before wiring or loosening electrical connections please observe the following:

- Risk of electric shock, disconnect power before removing cover resp. disconnect the devices from the mains supply.
- **Caution!** Dangerous electrical voltage even after turning off the intermediate capacitors:
  Up to 3 minutes with PSD1-S and 10 minutes with PSD1-M **after switching off mains supply, dangerous voltages may still be present.**
  Please check that no voltages are present (<50 V) at the output terminals DC+ and DC- of PSD1-S: X63/3 & X63/5 and with PSD1-M: Bus HV DC - 3 & 5. rail.



Above
Fieldbus &
Config Interface

P10: Fieldbus LED

C11: SD Slot

Address:
S12: high half byte
S13: low half byte

P14: LED Status Axis 1
P15: LED Status Axis 2
P16: LED Status Axis 3

X17: I/Os Axis 1 & 3

S33: Safety
S34: Safety
X18: Feedback Axis 1

X19: Feedback Axis 2
X20: Feedback Axis 3

X21: I/Os Axis 2 & 3

24 VDC & DC Power

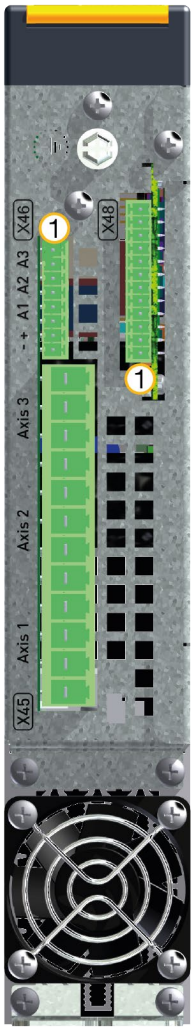
Below
Motor, Brake & DSL

View from above (see page 47)	
P10	Status LEDs for the fieldbus
C11	Slot for SD card (SD card not included in delivery)
S12 (see page 38)	Device address higher value half-byte (accept with power ON)
S13 (see page 38)	Device address low value half-byte (accept with power ON)
P14 (see page 47)	Status LED axis 1
P15 (see page 47)	Status LED axis 2
P16 (see page 47)	Status LED axis 3
X17 (see page 49)	Digital inputs/outputs axis 1 & 3
X18 *	Feedback sensor Axis 1: **Resolver** (see page 55), **Encoder/Hall** (see page 55)
X19 *	Feedback sensor Axis 2: **Resolver** (see page 55), **Encoder/Hall** (see page 55)
X20 *	Feedback sensor Axis 3: **Resolver** (see page 55), **Encoder/Hall** (see page 55)
S33	For safety option
S34	For safety option
X21 (see page 49)	Digital inputs/outputs axis 2 & 3
24 VDC & DC power (see page 61)	Behind the yellow protective covers you can find the rails for the supply voltage connection to the **mains module PSD1-M_P**. • 24 VDC power supply • DC power voltage supply
View from below (see page 46)	

*

NOTICE Before connecting a feedback cable, check that the correct feedback system is configured in the device.
Otherwise, destruction of the feedback system is threatened by overvoltage!

5.3.2. View from below (PSD1-M)



X46: Mechanical Motorbrake Axis 1 ... 3

X48: DSL Feedback Axis 1 ... 3

X45: Motor connection Axis 1 ... 3

View from above (see page 47)	
X45 (see page 52) X43 (see page 53) with PSD1M_1800	Motor connections: Axis 1 ... 3 (dependng on the device)
X46 (see page 56) X44 (see page 57) with PSD1M_1800	Motor brake connections: Axis 1 ... 3 (dependng on the device)
X48 (see page 54)	Connection of HIPERFACE DSL® motor feedback systems and motor temperature sensor Axis 1 ... 3 (dependng on the device)
Front view (see page 44)	
(1) Shows pin 1 of the connector	

Tin angle for motor and feedback cable

(does not apply to PSD1M_1800; this is wired similar as PSD1-S)

Mounting:

- Fix cables with clamp collars on the corresponding tin bar (3)
- Connect plug
- Screw on tin angle

Explanation

1 Fixing screw for tin angle (included with delivery)

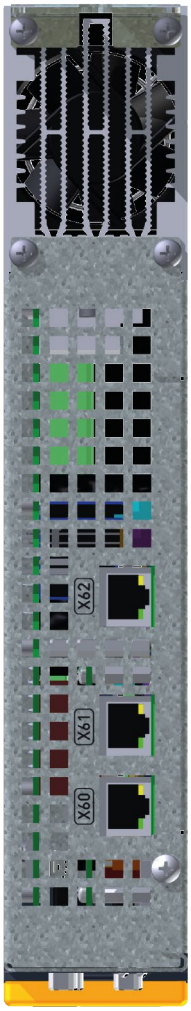
2 Tin angle for cable guiding with earthing screw

3 Mounting of cable, flat shielding

4 Central ground connection

Tin angles and clamp collars are all included.

5.3.3. View from above (PSD1-M)



X62: Fieldbus interface in

X61: Fieldbus interface out

X60: PC interface

Front view (see page 44)	
X60	PC Interface to configure and program servo axes
X61 (see page 39)	Fieldbus Interface output
X62 (see page 39)	Fieldbus Interface input
View from below (see page 46)	

5.4 P14 ... P16: Status LEDs of the individual axes (PSD1-M)

- P14: Status Axis 1
- LEDs P15: Status Axis 2
- LEDs P16: Status Axis 3

Status No.	Status of axis	Left LED a (green) (ready)	Right LED b (red) (error)
0	No voltage	off	off
1	Booting of axis, firmware is missing	alternate quick flashing (LEDa green, LEDb rot)	
2	Axis not ready: • Booting of axis • No feedback detected. • IEC61131-3 program not compatible with firmware. • no IEC61131-3 program • Hall signals invalid.	off	flashes quickly (5 HZ)
3	Axis de-energized	flashes slowly	off
4	Axis energized; commutation calibration running	flashes quickly	off
5	Axis energized	on	off

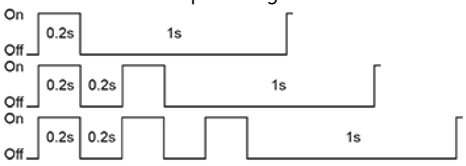
Status No.	Status of axis	Left LED a (green) (ready)	Right LED b (red) (error)
6	Axis in error state / error present / axis energized (error reaction 1)	on	flashes quickly (5 HZ)
7	Axis in error state / error present / axis de-energized (error reaction 2)	off	on
8	Axis faulty: Please contact us	on	on
9	STO active	off	flashes slowly (1 HZ)
10	reserved	flashes quickly	flashes quickly (5 HZ)
11	SD Card detected or restoring from SD card successfully terminated	alternate quick flashing (LEDa green, LEDb green)	
12	SD card not detected or restoring from SD card interrupted	alternate quick flashing (LEDa red, LEDb red)	
13	Axis de-energized	off	Single flash
14	Axis energized	on	Single flash
15	Axis de-energized HEDA3 slave not ready	off	Double flash
16	Axis energized HEDA3 Slave not ready	on	Double flash
17	Axis de-energized HEDA3 Master not ready	off	Triple flash
18	Axis energized HEDA3 Master not ready	on	Triple flash
19	Axis de-energized	off	Jitter (10 HZ)
20	Axis energized	on	Jitter (10 HZ)

Error response 1: Ramping with slow ramp; then deactivate control loops.
Error response 2: Ramping with "Stop" ramp, then deactivate control loops.
For the meaning of individuals errors please go to Error list.

Single flash

Double flash

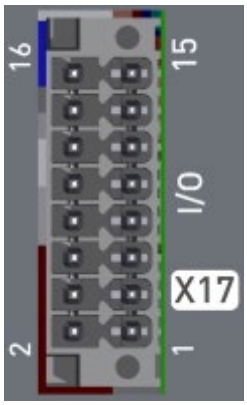
Triple flash



DANGER

Caution - Risk of electric shock!
High voltage supply may be present even with missing voltage supply (both LEDs off)!

5.5 X17: Digital Inputs / outputs Axis 1 & 3 (PSD1-M)

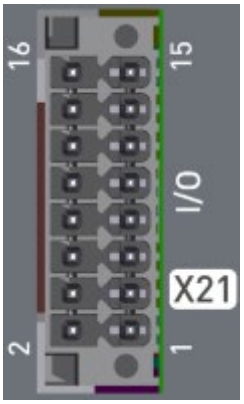


Pin X17	Input / Output	Axis	
1	Output	1 ... 3	+24 VDC
2	Output	1 ... 3	GND24V
3	Input	1 ... 3	+24 VDC Power supply for digital outputs
4	I0_1	1	Input 0 Axis 1
5	I1_1	1	Input 1 Axis 1
6	I2_1	1	Input 2 Axis 1
7	I3_1	1	Input 3 Axis 1
8	GND24V	1 ... 3	
9	O0_1	1	Output 0 Axis 1
10	GND24V	1 ... 3	
11	O1_1	1	Ouptu 1 Axis 1
12	STOA1/	1	STO input A Axis 1
13	I0_3	3	Input 0 Axis 3
14	STOGND1	1	STO Ground
15	I1_3	3	Input 1 Axis 3
16	STOB1/	1	STO input B Axis 1

Loading of the outputs: Maximum 350 mA
In case of overload / over-temperature of an output, all outputs are deactivated and reactivated automatically after cooling.

All inputs and outputs do have 24 V level.
Input level:
"0" (low) = Rated Input Voltage ≤ 12.5 V
"1" (high= Rated Input Voltage ≥ 13.5 V
The digital outputs are free for writing via object 0x2079.0x01 or 0x60FE.0x01 via fieldbus.
The status of digital inputs can be read via object 0x2070.0x00 or 0x60FD.0x00 .

5.6 X21: Digital Inputs / outputs Axis 2 & 3 (PSD1-M)



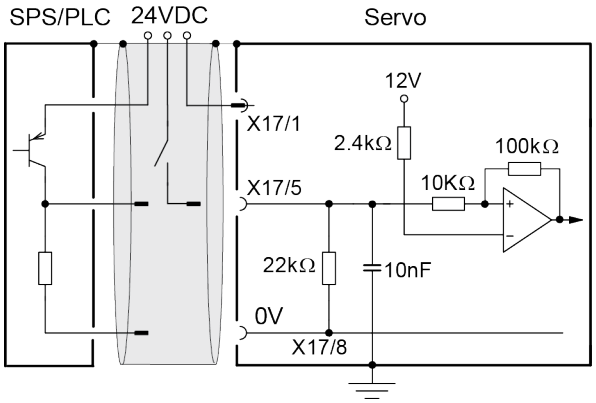
Pin X21	Input / Output	Axis	
1	I2_3	3	Input 2 Axis 3
2	GND24V	1...3	
3	I3_3	3	Input 3 Axis 3
4	I0_2	2	Input 0 Axis 2
5	I1_2	2	Input 1 Axis 2
6	I2_2	2	Input 2 Axis 2
7	I3_2	2	Input 3 Axis 2
8	GND24V	1...3	
9	O0_2	2	Output 0 Axis 2
10	GND24V	1...3	
11	O1_2	2	Output 1 Axis 2
12	STOA2/		STO input A Axis 2/3
13	O0_3	3	Ouput 0 Axis 3
14	STOGND2	1...3	STO Ground
15	O1_3	3	Output 1 Axis 3
16	STOB2/		STO Input B axis 2/3

Loading of the outputs: Maximum 350 mA

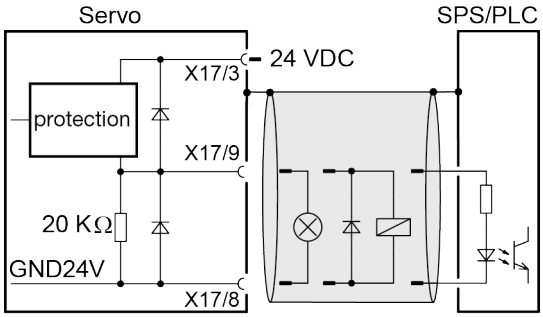
In case of overload / over-temperature of an output, all outputs are deactivated and reactivated automatically after cooling.
All inputs and outputs do have 24 V level.
Input level:
"0" (low) = Rated Input Voltage ≤ 12.5 V
"1" (high= Rated Input Voltage ≥ 13.5 V
The digital outputs are free for writing via object 0x2079.0x01 or 0x60FE.0x01 via fieldbus.
The status of digital inputs can be read via object 0x2070.0x00 or 0x60FD.0x00 .

5.7 Wiring of the digital inputs and outputs

Wiring of digital inputs



Wiring of digital outputs



5.8 Motor connection / Output data

In this chapter you can read about:

5.8.1. Output data servo modules PSD1-M 3*400 VAC

Category	Specifications [1]		
Controller type	Number of power output stage	Rated Output Current [A_{rms}]	Pulse current for 2 s [A_{rms}]
PSD1-M_1300	1	5	10
PSD1-M_1400	1	8	16
PSD1-M_1600	1	15	30 [2]
PSD1-M_1800	1	30	60 [2]
PSD1-M_2220	2	2 + 2	4 + 4
PSD1-M_2330	2	5 + 5	10 + 10
PSD1-M_2440	2	8 + 8	16 + 16
PSD1-M_2630	2	15 + 5 [3]	30 [2] + 10
PSD1-M_3222	3	2 + 2 + 2	4 + 4 + 4
PSD1-M_3433	3	8 + 5 + 5 [3]	16 + 10 + 10

[1] At **default setting of the switching frequency** (see page 51).

[2] **Minimum rotating field frequency for peak current at 15 A & 30 A output stages: f > 3 Hz; with a rotating field frequency of f <3 Hz the maximum peak current duration is 100 ms**

[3] Maximum total output current per device: 16 A.

5.8.2. Output data of the PSD1-M power output stages

Category		Specifications				
Power output stage		2 A	5 A	8 A	15 A [2]	30A [2]
Input voltage		300 ... 750 VDC				
Output voltage		3x 0-400 V (0...450 Hz)				
Power at continuous operation [1]		1.2 kVA	3 kVA	4.8 kVA	9 kVA	18 kVA
Power dissipiation [1]		20 W	45 W	75 W	105 W	220 W
Output currents [3]		With 400 VAC at the power module				
$I_{Nominal}$ [Arms]	4 kHz	2	5	8	**15**	**30**
I_{peak} (2 s) [Arms]	4 kHz	4	10	16	**30**	**60**
$_{Nominal}$ [Arms]	8kHz	**2**	**5**	**8**	10	20
$_{I\ peak}$ (2 s) [Arms]	8kHz	**4**	**10**	**16**	20	40
$_{Nominal}$ [Arms]	16 kHz	1.33	3.33	5.33	5	11
$_{I\ peak}$ (2 s) [Arms]	16 kHz	2.67	6.66	10.66	10	22
Output currents [3]		At 480 VAC at the power module				
$I_{Nominal}$ [Arms]	4 kHz	2	5	8	**12.5**	**25**
I_{peak} (2 s) [Arms]	4 kHz	4	10	16	**25**	**50**
$I_{Nominal}$ [Arms]	8kHz	**1.8**	**4.5**	**7.2**	8	15
I_{peak} (2 s) [Arms]	8kHz	**3.6**	**10**	**14.4**	16	30
$I_{Nominal}$ [Arms]	16 kHz	1.07	2.67	4.27	4	8.5
I_{peak} (2 s) [Arms]	16 kHz	2.13	5.33	8.53	8	17

[1] For continuous operation with a mains supply of 400 VAC at the mains module.

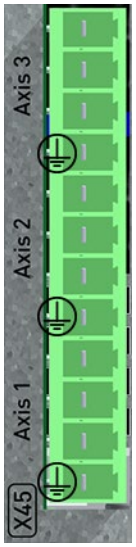
2) **Minimum rotating field frequency for peak current at 15 A & 30 A output stages: f > 3 Hz; with a rotating field frequency of f <3 Hz the maximum peak current duration is 100 ms**

3) Output current bei verschiedenen switching frequency. The default settings of the currents und switching frequencies are grayed out & in bold.

5.8.3. X45: Motor connection (PSD1-M)

Motor connection for 3 axes

The respective pins are not assigned with 1- or 2-axis devices!



Designation	Axis	Motor cable lead designation*		
CU	3	U / L1	1	U1
CV	3	V / L2	2	U2
CW	3	W / L3	3	U3
FE & PE	3	YE / GN		
BU	2	U / L1	1	U1
BV	2	V / L2	2	U2
BW	2	W / L3	3	U3
FE & PE	2	YE / GN		
AU	1	U / L1	1	U1
AV	1	V / L2	2	U2
AW	1	W / L3	3	U3
FE & PE	1	YE / GN		

* Depending on cable type.
FE: Functional ground
PE: Protective earth

Shielding connection of the motor cable

The outer shielding of the motor cable must be correctly connected to PE both on the **drive side** (see page 46, see page 59, see page 30) as well as on the motor side. Shielding may not be interrupted.

Please observe the notes in chapter "**Operating conditions for CE-conform operation** (see page 13)".

5.8.3.1 Motor connection with self-made motor cable

NOTICE

Please consider special features of the **DSL** motor connection with:

- EX motors,
- EY motors,
- NK motors,
- NV motors and
- NX motors!

With these motors with DSL feedback, the outputs U & V are reversed in the PSD via the motor configuration

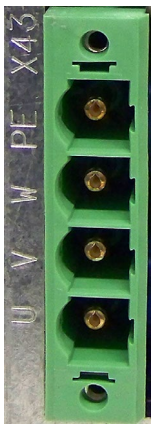
This has no effect on the wiring with Parker motor cables, you can connect them as shown in the table.

For EX motors, EY motors, NK motors, NV motors and NX motors:

Designation	Axis	Motor cable lead designation*			Motor side: EX, EY, NK, NV, NX
CU	3	U / L1	1	U1	U
CV	3	V / L2	2	U2	W
CW	3	W / L3	3	U3	V
FE & PE	3	YE / GN			PE
BU	2	U / L1	1	U1	U
BV	2	V / L2	2	U2	W
BW	2	W / L3	3	U3	V
FE & PE	2	YE / GN			PE
AU	1	U / L1	1	U1	U
AV	1	V / L2	2	U2	W
AW	1	W / L3	3	U3	V
# FE & PE	1	YE / GN			PE

5.8.4. X43: Motor connection (PSD1M_1800)

Motor connection for PSD1M_1800 (30 A)



Designation	Axis	Motor cable lead designation*		
U	1	U / L1	1	U1
V	1	V / L2	2	U2
W	1	W / L3	3	U3
FE & PE	1	YE / GN		

* Depending on cable type.
FE: Functional ground
PE: Protective earth

Shielding connection of the motor cable

The outer shielding of the motor cable must be correctly connected to PE both on the **drive side** (see page 46, see page 59, see page 30) as well as on the motor side. Shielding may not be interrupted.

Please observe the notes in chapter "**Operating conditions for CE-conform operation** (see page 13)".

5.8.4.1 Motor connection with self-made motor cable

NOTICE

Please consider special features of the **DSL** motor connection with:

- EX motors,
- EY motors,
- NK motors,
- NV motors and
- NX motors!

With these motors with DSL feedback, the outputs U & V are reversed in the PSD via the motor configuration

This has no effect on the wiring with Parker motor cables, you can connect them as shown in the table.

For EX motors, EY motors, NK motors, NV motors and NX motors:

Designation	Axis	Motor cable lead designation*			Motor side EX, EY, NK, NV, NX
U	1	U / L1	1	U1	U
V	1	V / L2	2	U2	W
W	1	W / L3	3	U3	V
FE & PE	1	YE / GN			

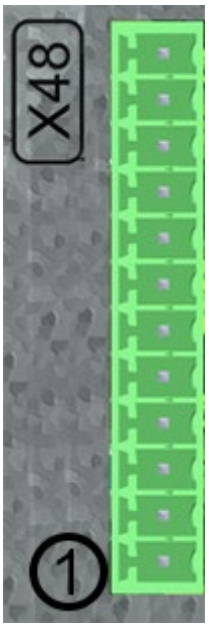
5.9 Motor feedback

⚠CAUTION **Feedback system can be destroyed if configured incorrectly!**
If you connect a PSD that has already been configured for a specific feedback system to another feedback system, it can be destroyed by too high a voltage.
Procedure when changing the feedback system.

5.9.1. X48: HIPERFACE DSL® & motor temperature sensor (PSD1-M)

HIPERFACE DSL® feedback and motor temperature sensor connection for 3 axes

The respective pins are not assigned with 1- or 2-axis devices!



Pin	Designation	Axis	
1	PTC+	1	Temperature sensor + motor 1
2	PTC-	1	Temperature sensor - motor 1
3	PTC+	2	Temperature sensor + motor 2
4	PTC-	2	Temperature sensor - motor 2
5	PTC+	3	Temperature sensor + motor 3
6	PTC-	3	Temperature sensor - motor 3
7	DSL+	1	
8	DSL-	1	
9	DSL+	2	
10	DSL-	2	
11	DSL+	3	
12	DSL-	3	

Connection on the device (see page 46, see page 59, see page 30).

NOTICE We recommend the operation with Parker **HIPERFACE DSL® cables!** (see page 82)
Note the following, if no Parker PSD DSL motor cable is used:
The internal shielding of the Hiperface DSL® signal line must be connected (braided or soldered) to the outer motor cable shielding (and thus to PE). Up from this connection point, the internal shielding of the Hiperface DSL® line must be guided up to the Hiperface DSL® connection terminal of the PSD servo amplifier.

NOTICE

Please observe the following if you want to disconnect the DSL lines with an additional plug:

- No other lines must be wired between DSL+ and DSL-.
- The DSL lines must be twisted and separately shielded.
- A flat shielding must be guaranteed across the plug connection (recommendation: Harting Han-Modular plug with “Han-Quintax” or “Hand MegaBit” module).
- The shield of the DSL lines must be connected to PE/earth with low impedance. In the simplest case, this can be done by connectig the DSL shield with the overall shield of the cable at the cable end (on the controller side).

5.9.2. X18, X19, X20 Connector assignment with configured resolver

Assignment with multi feedback option with configured resolver

Pin	Feedback High Density /Sub D
1	factory use
2	factory use
3	factory use
4	REF-Resolver+ (8 kHz / max. 9.5 V_{ss})
5	+3.3 V (for temperature sensor)
6	factory use
7	SIN- (max. 4.7 V_{ss} differential)
8	SIN+ (max. 4.7 V_{ss} differential)
9	factory use
10	Tmot*
11	COS- (max. 4.7 V_{ss} differential)
12	COS+ (max. 4.7 V_{ss} differential)
13	factory use
14	factory use
15	REF-Resolver-

*Pin10 Tmot must not be connected to **X48** (see page 54) (to PSD-1M) with PSD1-M at the same time as the connections for temperature sensors.

Category	Specifications
Resolution of the motor position	• Position resolution: 16.6 Bits (= 0.005°) • Absolute accuracy: ±0.167°
Resolver supported	• **LTN**: RE-21-1-A05, RE-15-1-B04 • **Tamagawa:** TS2610N171E64, TS2620N21E11, TS2640N321E64, TS2660N31E64 • **Tyco (AMP):** V23401-T2009-B202
Resolver data supported	• Transformation ratio: 0.25... 1 (typical 0.5) • Exciting frequency 8kHz • Amplitude of the excitation signal: max. 9.5 V_{ss}. (The resolver must be approved for at least this value).

Accuracy

The exactitude of the position signal is above all determined by the exactitude of the feedback system used.

5.9.3. X18, X19, X20: Assignment with configured incremental encoder or analogue Hall

X18: Axis 1/ single axis devices
X19: Axis 2: not implemented
X20: Axis 3: not implemented

Incremental encoder / analogue & digital HALL sensor with analogue Sin/Cos signals with 1V_{ss}

Pin	Feedback option/ high density/sub D		
	Encoder 1 V_{ss}	Encoder A/B	Analogue Hall sensor
1	Sense -*		
2	Sense +*		
3	Hall 1 (digital)		factory use
4	Vcc (+5 V) max. 350 mA load		
5	+3.3V (for temperature sensor)		
6	Hall 2 (digital)		factory use
7	Sine -	A-	Sine -
8	Sine +	A+	Sine +
9	Hall 3 (digital)		factory use
10	Tmot**		
11	Cosine -	B-	Cosine -
12	Cosine +	B+	Cosine +
13	N+, Z+, Ref + (encoder reference mark or index pulse +)		factory use
14	N+, Z+, Ref + (encoder reference mark or index pulse -)		factory use
15	GND (Vcc)		

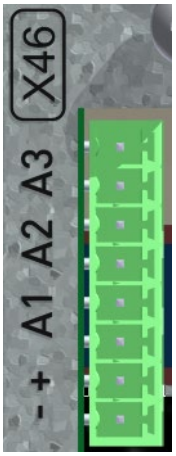
*+5V (Pin 4) is measured and controlled directly at the end of the line via Sense+ and Sense-.
Maximum cable length: 100 m with 0.5 mm^2.
Pin10 Tmot may not be connected to pins 1...6 at the same time as **X48 (see page 54) (PSD1-M).

Category	Specifications
Incremental encoder (see page 37) * (square wave or Sine/ Cosine signal)	• Linear or rotary • Signal ♦ Sin/Cos signal: max. 5 VSS; typical 1 VSS; 90° offset, max. 400 kHz or ♦ A/B pluses; 90 ° electrical phase shift (max 5 MHz) with the following commutation options: • Automatic commutation or • U, V, W or R, S, T commutation signals (NPN open collector) e.g. digital hall sensors, incremental encoders made by Hengstler (F series with electrical ordering variant 6)
Analogue Hall sensor (see page 37) *	• Linear or rotary • Sin/Cos signal: max. 5 VSS; typical 1 VSS; 90° offset, max. 400 kHz

* in the first expansion stage only for PSD1-S and PSD1MW1 Multi axes device with one powerstage.

5.10 X46: Connection of motor brake (PSD1-M)

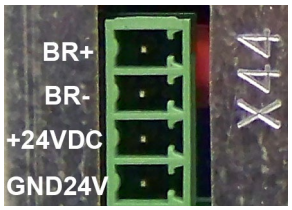
Connection for 3 axes
The respective pins are not assigned with 1- or 2-axis devices!



Pin		Designation	Axis	Motor cable lead designation*		
1	A3	Motor holding brake +**	3	WH	4	Br1
2	A3	Motor holding brake -**	3	BK	5	Br2
3	O2	Motor holding brake +**	2	WH	4	Br1
4	O2	Motor holding brake -**	2	BK	5	Br2
5	O1	Motor holding brake +**	1	WH	4	Br1
6	O1	Motor holding brake -**	1	BK	5	Br2
7	+	Input power supply brake 24 VDC	1 ... 3			
8	-	GND24 VDC	1 ... 3			

* Depending on cable type.
**1.6 A max.

5.11 X44: Connection of motor brake (PSD1M_1800)



Pin		Designation	Motor cable lead designation*		
1	O1	Motor holding brake +**	WH	4	Br1
2	O1	Motor holding brake -**	BK	5	Br2
3	+	Input power supply brake 24 VDC			
4	-	GND24 VDC			

* Depending on cable type.
**1.6 A max.

5.12 Mains module PSD1-M_P

In this chapter you can read about:

5.12.1. Connector overview PSD1-M_P (Mains module)

In this chapter you can read about:

5.12.1.1 Front view (PSD1-M_P Mains Module)

CAUTION: Risk of electric shock

DANGER

Caution - Risk of electric shock!

Before wiring or loosening electrical connections please observe the following:

- Risk of electric shock, disconnect power before removing cover resp. disconnect the devices from the mains supply.
- **Caution!** Dangerous electrical voltage even after turning off the intermediate capacitors:
  Up to 3 minutes with PSD1-S and 10 minutes with PSD1-M **after switching off mains supply, dangerous voltages may still be present.**
  Please check that no voltages are present (<50 V) at the output terminals DC+ and DC- of PSD1-S: X63/3 & X63/5 and with PSD1-M: Bus HV DC - 3 & 5. rail.

P1: Device Status LED

S2: Operation Mode

S3: Power Voltage

X4: Inputs / Outputs

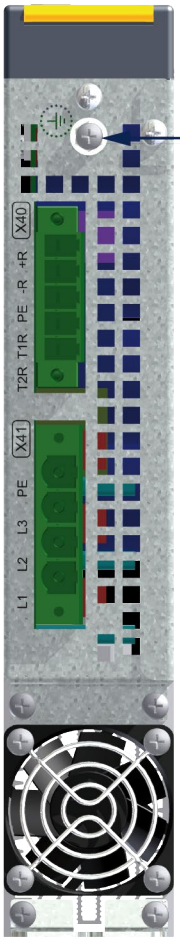
X9: 24 VDC Control Voltage

24 VDC & DC Power

Below Mains supply, Ballast Resistor, Central Ground

P1	Status LEDs
S2 (see page 60)	Modes switch
S3 (see page 60)	Power supply requirements setting
X4 (see page 65)	Digital Inputs / Outputs
X9 (see page 61)	Control Voltage 24 VDC
24 VDC & DC power (see page 61)	Behind the yellow protective covers you can find the rails for the supply voltage connection. • 24 VDC-Power supply • DC Power Voltage Supply
View from below (see page 59)	

5.12.1.2 View from below (PSD1-M mains module)



Front view (see page 57)	
X40 (see page 64)	Brake resistor
X41 (see page 62)	Power supply
Central ground connection	Connect ground via ring cable lug with a 10 mm² copper cable to central ground

5.12.2. P1: Status - LEDs - indication (Mains module)

P1 status	Green LED a (left)	Red LED b (right)	Status of the outputs X4
24 VDC control voltage missing or out of range	off	off	All Outputs = Low
Device ready	on	off	Ready A0 = high Warning A1 = High
One or multiple errors occurred (Error number to be displayed after 5 s)*	off	power on (5s)	Ready A0 = Low Warning A1 = High
Intermediate circuit is loaded, Control voltage OK, Drive Healthy	flashes quickly	off	Ready A0 = Low Warning A1 = High
Error digital outputs	off	flashes quickly	Ready A0 = Low Warning A1 = High
Error over-temperature or overloads	off	flashes slowly	Ready A0 = Low Warning A1 = Low
Pre-warning active	on	flashes slowly	Ready A0 = high Warning A1 = Low
Device in “bootloader" status	flashes slowly	flashes slowly	All Outputs = Low
Waiting for release by input 0 = High (enable)	flashes slowly	off	Ready A0 = Low Warning A1 = High

***Display of error numbers by flash sequence**

Green LED: Decimal
1 flash = 10; 2 flashes = 20; 3 flashes = 30; ...

Red LED: Single figure
1 flash = 1; 2 flahes = 2; 3 flashes = 3; ...
Adding both values results in the error number.

Display sequence:
- Green LED = OFF, red LED on for 5 s
- Green LED 1 … 9 flashes, depending on the error number.
- Red LED 1 … 9 flashes, depending on the error number.
- Green LED off and red LED off for 1 s).

This sequence repeats until the error is reset.
Meaning of the error numbers

11	Phase error
12	Voltage DC bus too low
13	Voltage DC bus too high
21	Temperature in the rectifier too high
22	Braking circuit overloaded
23	Temperature in the braking resistor too high
24	Short-circuit in the braking circuit
25	Rectifier overloaded
31	Voltage DC bus too high
32	Voltage offset DC bus too high
41	Overcurrent at digital output
51	None or wrong EEPROM - Data

⚠DANGER **Caution - Risk of electric shock!**
High voltage supply may be present even with missing voltage supply (both LEDs off)!

5.12.3. S2: Modes switch (Power module)

Switch position	Operating mode
0	standard
1	Increased performance by line choke mode **Warning!** Operating without line choke can destroy the device.
2 ... F	Not defined

Acceptance of the switch position when switching on 24 VDC Control voltage.

5.12.4. S3: Voltage switch (Power Module)

Switch position	Supply-voltage	Load Circuit		Umax
		Turn-on threshold [VDC]	Turn-off threshold [VDC]	[VDC]
0	3AC400V	780	770	810
1	3AC110V	780	770	810
2	3AC230V	780	770	810
3	3AC380V	780	770	810
4	3AC480V	780	770	810
5	3AC230V	390	380	410
6	3AC110V	390	380	410
7	1AC230V*	390	380	410
8	1AC110V*	390	380	410
9 ..F	factory use			

Acceptance of the switch position when switching on 24 VDC Control voltage

NOTICE Operation with switch positions 9 ... F can destroy the device

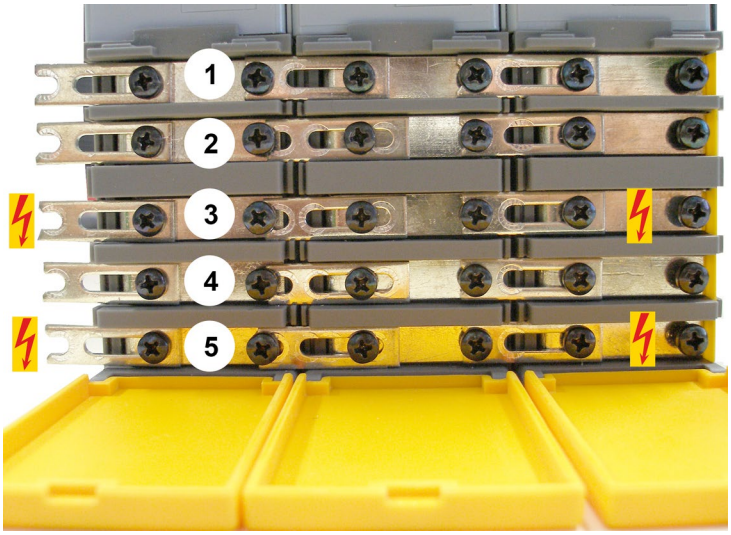
⚠WARNING * Switch positions 7 and 8 are intended solely for commissioning!
Continuous mode in this switch position is not allowed.

5.12.5. Connections of the axis system

The axis controllers are connected to the supply voltages via rails.
- Supply voltage 24VDC
- DC power voltage supply

The rails can be found behind the yellow protective covers. In order to connect the rails of the devices, you may have to remove the yellow plastic device inserted at the side.

⚠DANGER **Caution - Risk of electric shock!**
Always switch off devices before wiring them!
Dangerous voltages are still present until 10min. after switching off the power supply.
Please check that no voltages are present (<50 V) at the output terminals DC+ and DC- (X63/3 & X63/5).



1 24VDC
2 GND24V
3 -HV DC
4 PE
5 +HV DC

Protective seals

⚠DANGER **Caution - Risk of electric shock!**
In order to secure the contact protection against the alive rails, it is absolutely necessary to respect the following:
- Insert the yellow plastic comb at the left and right of the rails.
  Make sure that the yellow plastic combs are placed at the left of the first device and at the right of the last device in the system and have not been removed.
- Setup of the devices only with closed protective covers.

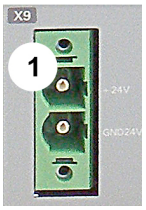
⚠CAUTION External components **may not** be connected to the rail system.

Protective seals

⚠WARNING **Caution!**
The user is responsible for protective covers and/or additional safety measures in order to prevent damages to persons and electric accidents.

5.12.6. X9: Control voltage 24 VDC mains module

Connector X9



Pin	Designation
1	+24V
2	GND24V

Line cross sections:
minimum: 0.5mm² with conductor sleeve
maximum: 6mm² with conductor sleeve
(AWG: 20 ... 10)

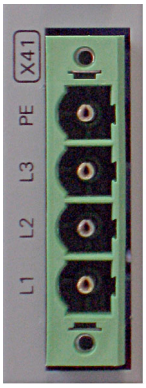
Device type	PSD1-M_P
Voltage operating range	21 - 27VDC
Ripple	0,5Vpp
Requirement according to safe extra low voltage (PELV)	yes (class 2 mains module)
Electric current drain	PSD1-M_P010: 0.2A PSD1-M_P020: 0.3 A

5.12.7. X41 Mains supply (mains module PSD1-M_P)

⚠WARNING

Device protection
By cyclically switching on and off the power voltage, the input current limitation can be overloaded, which may cause damage to the device.
Wait at least one minute between two switching on processes!

5.12.7.1 X41 Mains supply PSD1-M_P connector assignment



Pin	Designation
PE	Earth conductor
L3	Phase 3
L2	Phase 2
L1	Phase 1

⚠WARNING

Only three-phase operation of the PSD1-M_P devices is permitted!

Please observe the notes in chapter "**Operating conditions for CE-conform operation** (see page 13)".

⚠DANGER

Caution - Risk of electric shock!
Always switch off devices before wiring them!
Dangerous voltages are still present until 10min. after switching off the power supply.
Please check that no voltages are present (<50 V) at the output terminals DC+ and DC- (X63/3 & X63/5).

5.12.7.2 Mains Connection Power module PSD1-M_P010 without line choke

Category	Specifications		
PSD1-M_P010	**230 V**	**400 V**	**480 V**
Mains voltage	230 VAC ±10 % 50-60 Hz	400 VAC ±10 % 50-60 Hz	480VAC ±10% 50-60Hz
Rated voltage	3 AC 230 V	3 AC 400 V	3 AC 480 V
Input Current	22 Arms	22 Arms	18 Arms
Output voltage	325 VDC ±10 %	565 VDC ±10 %	680 VDC ±10 %
Output power	6 kW	10 kW	10 kW
Pulse power (<5 s)	12 kW	20 kW	20 kW
Power dissipation	60 W	60 W	60 W
Maximum fuse rating per device	Measure for line and device protection: UL listing (DIVQ) fuses Manufacturer: ABB, Stotz-Kontakt GmbH (E212323) Model No.: S203UP-K, 1 fuse 480 VAC, 3-phase, 25 A, operating temperature 55 °C		

5.12.7.3 Mains connection Power module PSD1-M_P010 with line choke

Increased power by means of a line choke (see page *87*)

Category	Specifications		
PSD1-M_P010 with line choke	**230 V**	**400 V**	**480 V**
Mains voltage	230 VAC ±10 % 50-60 Hz	400 VAC ±10 % 50-60 Hz	480VAC ±10% 50-60Hz
Rated voltage	3 AC 230 V	3 AC 400 V	3 AC 480 V
Input Current	24.5 A	24.5 A	20.4 A
Output voltage	325 VDC ±10 %	565 VDC ±10 %	680 VDC ±10 %
Output power	9 kW	15 kW	15 kW
Pulse power (<5 s)	18 kW	30 kW	30 kW
Power dissipation	70 W	70 W	70 W
Maximum fuse rating per device	Measure for line and device protection: UL listing (DIVQ) fuses Manufacturer: ABB, Stotz-Kontakt GmbH (E212323) Model No.: S203UP-K, 1 fuse 480 VAC, 3-phase, 25 A, operating temperature 55 °C		
Earth leakage current	**Current on the mains PE** (see page 24) (>3,5 mA)		
Supply networks	**Possible supply networks** (see page 24): TN		

⚠WARNING The specified performance data are only valid in connection with line choke **IND-0001-02** (see page 87).

5.12.7.4 Mains Connection Power module PSD1-M_P020 without line choke

Category	Specifications		
PSD1-M_P020	**230 V**	**400 V**	**480 V**
Mains voltage	230 VAC ±10 % 50-60 Hz	400 VAC ±10 % 50-60 Hz	480VAC ±10% 50-60Hz
Rated voltage	3 AC 230 V	3 AC 400 V	3 AC 480 V
Input Current	44 Arms	44 Arms	35 Arms
Output voltage	325 VDC ±10 %	565 VDC ±10 %	680 VDC ±10 %
Output power	12 kW	20 kW	20 kW
Pulse power (<5 s)	24 kW	40 kW	40 kW
Power dissipation	120 W	120 W	120 W
Maximum fuse rating per device **2 special purpose fuses in line are required**	**Cable protection measure:** MCB (K characteristic) with a rating of 50A / 4xxVAC (depending on the input voltage) Recommendation: (ABB) S203U-K50 (440VAC) **Device protection measure:** Circuit breakers 80A / 700VAC per supply leg in accordance with UL category JFHR2 Requirement: Bussmann 170M1366 or 170M1566D		

5.12.7.5 Mains connection Power module PSD1-M_P020 with line choke

Increased power by means of a line choke (see page *87*)

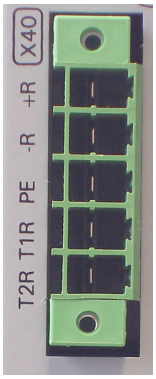
Category	Specifications		
PSD1-M_P020 with line choke	**230 V**	**400 V**	**480 V**
Mains voltage	230 VAC ±10 % 50-60 Hz	400 VAC ±10 % 50-60 Hz	480VAC ±10% 50-60Hz
Rated voltage	3 AC 230 V	3 AC 400 V	3 AC 480 V
Input Current [rms]	44 A	44 A	40 A
Output voltage	325 VDC ±10 %	565 VDC ±10 %	680 VDC ±10 %
Output power	15.5 kW	27 kW	30 kW
Pulse power (<5 s)	31 kW	54 kW	60 kW
Power dissipation	140 W	140 W	140 W

Maximum fuse rating per device **2 special purpose fuses in line are required**	**Cable protection measure:** MCB (K characteristic) with a rating of 50A / 4xxVAC (depending on the input voltage) Recommendation: (ABB) S203U-K50 (440VAC) **Device protection measure:** Circuit breakers 80A / 700VAC per supply leg in accordance with UL category JFHR2 Requirement: Bussmann 170M1366 or 170M1566D
Earth leakage current	**Current on the mains PE** (see page 24) (>3,5 mA)
Supply networks	**Possible supply networks** (see page 24): TN

⚠WARNING The specified performance data are only valid in connection with **line choke** (see page 87) IND-0002-01 or IND-0002-02 (UL).

5.12.8. X40: Braking resistor / Temperature switch PSD1-M_P (Power supply)

The energy generated during braking operation must be dissipated via a **braking resistor** (see page 89).



Pin	Description	
+R	+ Braking resistor	short circuit proof!
-R	- Braking resistor	
PE	PE	
T1R	Temperature switch	
T2R	Temperature switch	

Device type	PSD1-M_P010	PSD1-M_P020
Capacity/ storable energy	550 µF/ 92 Ws at 400 V 53 Ws at 480 V	1175 µF/ 197 Ws at 400 V 114 Ws at 480 V
Minimum braking resistance	27 Ω	10 Ω
Recommended nominal power rating	500 ... 1500 W	500...5000 W
Pulse power for 1s	22 kW	60 kW
Maximum permissible continuous current	13 A	25 A

Maximum capacity in the axis system:

- PSD1-M_P010: 2400 µF
- PSD1-M_P020: 5000 µF

Reference value for the required capacity in an axis system

100 µF per kW of the temporal medium value of the total power (transmissions + power dissipation) in the axis system.

Example: PSD1-M_P020 (1175 µF) with one axis controller (440 µF)
Total power 15 kW, 100 µF/kW => 1500 µF required in the axis system.
Axis system: 1615 µF are sufficient.

Connection of a braking resistor on PSD1-M_P (mains module)

Minimum line cross section:	1.5 mm²
Maximum line length:	2 m
Maximum intermediate circuit voltage:	Depending on the **position of the switches on the power module** (see page 60)
Switch-on threshold:	
Hysteresis:	

5.12.8.1 Temperature switch mains module X40

Connector X40 Pin T1R, T2R

Temperature monitoring:
The temperature switch (normally closed contact) must be connected, unless an error message will be issued.

Temperature switch/relay
No galvanic separation, the temperature sensor (normally closed contact) must comply with the safe separation according to EN 60664.
If there is no temperature monitoring due to the connected braking resistor, the T1R and T2R connections must be connected by a jumper.

⚠CAUTION **Caution!**
Without temperature monitoring, the braking resistor might be destroyed.

5.12.9. X4: Inputs / Outputs of the mains module

Pin	Name	Function
1	24 VDC (output)	+24 VDC output (max. 340 mA)
2	GND24V	GND24V
3	24 VDC Dout (input)	24 VDC supply for outputs 0 ... 3
4	Nc	-
5	Input 0	Enable (High=Enable, Low=Disable)
6	Input 1	Quit (positive edge)
7	Input 2	Not defined
8	Input 3	Not defined
9	Output 0	Ready (High=ready , Low=not ready)
10	Output 1	Warning (High = no warning , low = warning)*
11	Output 2	Not defined
12	Output 3	Not defined
13	factory use	
14	factory use	

NOTICE Axes must only be energized if A0 = ready = high!

* Warning Capacity utilization of DC Bus = 90%
Temperature alarm: Rectifier 5 K to switch-off threshold

5.13 X60: PC-/Diagnostic interface

Wiring with Ethernet Crossover cable Cat5e; for this, we offer our **CBD000C0-T00-T0** (see page 93) interface cable.
Standard Ethernet Address of the PSD:192.168.10.x
The final position (x) is set via the address adder S12 (higher value byte) & S13 (low value byte) and accepted by Power On.

Address setting

Settings:
S12: Device address high order half-byte (accept with power ON)
S13: Device address low value half-byte (accept with power ON)
Example: S12=2, S13=1
Address= 0x21: S12*16 + S13 = 33
Addressing 1 ... 240 (0xF0) possible; Values 241 ... 255 reserved!
After switching on PSD, the IP address is set to the value "192.168.100.S12_S13".
If the IP address has been changed and is not longer known, it can be reset with S12_S13 = 253 (0xF9) to:
- IP address = 192.168.10.2
- SubNetmask = 255.255.0.0
- Gateway_IP = 192.168.10.254
- Host name = PSD1-002

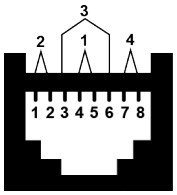
The complete IP address can be redefined via the objects 0x2605.5 & 0x2605.01 .

Addresses 0 and 241 ... 255 are not possible.
Connection is configured in PSD ServoManager.

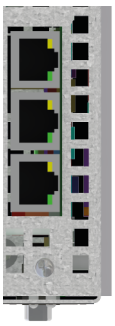
5.14 Communication interfaces

5.14.1. X61, X62 Ethernet Connection

RJ45-Socket: Assignment



Pin	Wire pair No.	RJ45 (X61) out	RJ45 (X62) in
1	2	Tx +	Tx +
2	2	Tx -	Tx -
3	3	Rx +	Rx +
4	1	-	factory use
5	1	-	factory use
6	3	Rx -	Rx -
7	4	-	factory use
8	4	-	factory use



X62: Fieldbus interface in
X61: Fieldbus interface out
X60: PC interface

Wiring with Ethernet Crossover cable Cat5e (from X61 to X62 of the next device without termination); for this, we offer our **CBD000C0-T00-T0** (see page 93) interface cable.

NOTICE

Please use shielded cables:
- SF/UTP: Cable shielded in total or
- S / STP, S / FTP: additional shielding around the 4 wire pairs.

Place the shield flat on the plug!

6. Safe Torque Off (STO) with PSD1

In this chapter you can read about:

6.1 General Description

In this chapter you can read about:

The following documentation is meant to provide the basic information concerning our drive controller and an understanding about the advanced, safety oriented machine construction. References to standards or other regulations are made in a general overview manner. The specific standards or regulations for your installation will vary depending upon the equipment employed and the specifics of your application.
For complementary information, we recommend the respective technical literature.

6.1.1. Important Technical Terms and Explanations

Term	Explanation
Safety category 3 in accordance with EN ISO 13849-1	Definition according to standard: Circuit with built-in protective functions for individual fault conditions. Some, but not all faults will be recognized. The frequent occurrence of fault conditions can lead to a loss of the safety functions. The remainder of the risk must be understood and accepted. The determination for the application of the appropriate safety category requirements, (risk analysis), lies with the installer and operator of the equipment. It can take place according to the method described in EN ISO 13849-1, appendix A.
"Safe torque off" **or abbreviated:** **STO=Safe torque off**	With the "safe torque off", the energy supply of the drive is safely interrupted according to EN 14118, paragraph 4.1. The drive is not to be able to produce a torque and thus dangerous movements (see EN 14118, paragraph 5.3.1.3). The standstill position must not be monitored. If an external force effect, e.g. a drop of hanging loads, is possible with the "safe torque off", additional measures to safely prevent those must be provided (e.g. additional mechanical brakes). The following measures are appropriate for a "safe torque off": Contactor between mains and drive system (mains contactor) Contactor between power section and motor (motor contactor) Safe blocking of the power semiconductor control (start inhibitor)
Start-Up Lockout	Safe blocking of the power semiconductor control. With the aid of this function, you can obtain a "safe torque off".

Stop categories according to EN60204-1 (9.2.2)

Stop-Category	Safety function	Requirement	System Behaviour	Remark
0	Safe Torque Off (STO)	Stopping by immediately switching off the energy supply of the machine drive elements	Uncontrolled stop	Uncontrolled stop is the stopping of a machine movement by switching off the energy of the machine drive elements. Available brakes and/or other mechanical stopping components are applied.
1	Safe stop 1 (SS1)	Stop where the energy of the machine drive elements is maintained in order to reach a stop. The energy supply is only interrupted, if the standstill is attained.	Controlled stop	Controlled stop is the stopping of a machine movement by for instance resetting the electrical command signal to zero, as soon as the stop signal has been detected by the controller, the electrical energy for the machine drive elements remains however during the stopping procedure.
2	Safe stop 2 (SS2)	Stop where the energy to the machine drive elements is maintained.	Controlled stop	This category is not covered.

6.1.2. Applications in accordance with the regulations

The Servo Drive PSD supports the "safe torque off" (STO) safety function, with protection against unexpected startup according to the requirements of EN ISO 13849-1, category 3 to PLe and EN 14118.
Together with the external safety control device, the "safe stop 1" (SS1) safety function according to the requirements of DIN EN 61800-5-2:2008 category 3 can be used. As the function is however realized with the aid of an individually settable time delay on the safety control, it must be taken into account that, due to an error in the drive system during the active braking phase, the motor coasts uncontrolled or may even accelerate actively in the worst case until the expiry of the preset switch-off time.

A risk evaluation which must be carried out according to the machine standard 2006/42/EG resp. EN ISO 12100 and EN ISO 13849-1, the machine manufacturer must project the safety system for the entire machine including all integrated components. This does also include the electrical drives.

6.1.3. Qualified Personnel

Planning, installation and initial system commissioning require a detailed understanding of this description.
Standards and accident prevention regulation associated with the application must be known and respected as well as risks, protective and emergency measures.
The implementation of the safety functions as well as maintenance and service can only be carried out by suitably qualified personnel with many years of experience in the field of machine safety with drives.
We assume that these specialists have a good knowledge of English.
In the case of deviating regulations (in particular work by persons who do not speak English), the machine manufacturer must provide these persons with the necessary information in the national language.

6.1.4. Advantages of using the "safe torque off" safety function" STO

Safety category 3 in accordance with EN ISO 13849-1

Requirements performance features	Use of the safe torque off function	Conventional solution: Use of external switching elements
Reduced switching overhead	Simple wiring, certified application examples Grouping of drive controllers on a mains contactor is possible.	Two safety-oriented power contactors in series connection are required.
Use in the production process High operating cycles, high reliability, low wear	Extremely high operating cycles thanks to almost wear-free technology (low-voltage relay and electronic switch). The "safe torque off" status is attained due to the use of wear-free electronic switches (IGBTs).	This performance feature cannot be reached with conventional technology.
Use in the production process High reaction speed, fast restart	Drive controller remains performance- and control-oriented in connected state. No significant waiting times due to restart.	When using power contactors in the supply, a long waiting time for the energy discharge of the DC link circuit is required. When using two power contactors on the motor side, the reaction times may increase, you must however take into consideration other disadvantages: a) Securing that switching takes only place in powerless state (Direct current! Constant electric arcs must be prevented). b) Increased overhead for EMC conform wiring.
Emergency-stop function	Allowed	Allowed

6.2 STO Operating Principle

In this chapter you can read about:

Principle

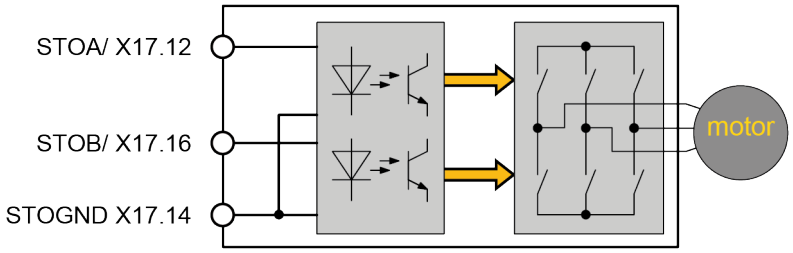
The current flow in the motor windings is controlled by a power semiconductor bridge (6-fold IGBT).
A rotating field is created via the processor by means of the power output stage.
Between control logic and power module, optocouplers are used for potential separation.
The STO input are on the front panel. 2 optocouplers are controlled via 2 STO channels (STOA/ & STOB/). At a STO via external safety control both auxiliary power supplies of the power output stage are switched off via 2 channels. Due to this fact the power semiconductor bridge is blocked and there is no motor current.
The reset procedure of the Safe Torque Off depends on the configurated settings of the object STO_Setup.
At standard settings STO_Setup=0 the motor may be powered as soon as STOA/ and STOB/ inputs are reset to high level.
At settings STO_Setup=1 the generated error 0x5492 needs be acknowledged before the motor can be powered again.

Detection of hardware failure

An internal Hardware monitoring recognizes the failure of the optocoupler by continuously comparing both channels. If the monitoring system recognizes a discrepancy for a defined time (approx. 10 s) the fault is stored in the hardware. This is reported via the error code 0x5493 ?.
The error can only be reset by a hardware reset (switching off and on the servo drive). But before the error must be found and solved by the user.

6.2.1. STO principle with PSD1-S

With the single axis drive PSD1-S STO is activated via 2 channels (STOA/ and STOB/).

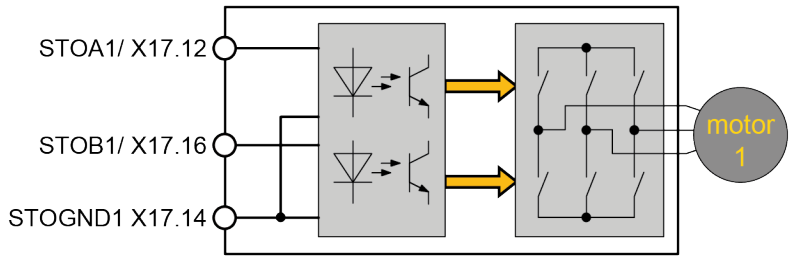


Pin	Name		Description	
X17.12	STOA/*	Input	STOA/ = 0 V	Motor deactivated
X17.16 (see page 32)	STOB/*	Input	STOB/ = 0 V	Motor deactivated
			STOA/ = 24 VDC and STOB/ = 24 VDC	Motor released
X17.14	STOGND*	Input	STO Ground. Ground of the external 24 VDC must be connected to the central ground connection (bottom of the device).	

* The inputs are optically isolated.

6.2.2. STO principle of PSD1-S with one axis module

At the PSD1-M with one axis module, STO is activated via 2 channels (STOA1/ und STOB1/).

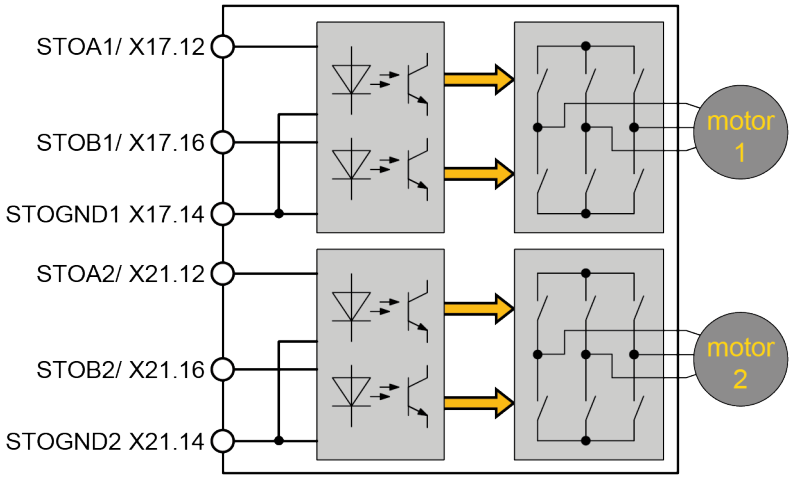


Pin	Name		Description	
X17.12	STOA1/*	Input	STOA1/ = 0 V	Motor deactivated
X17.16 (see page 49)	STOB1/*	Input	STOB1/ = 0 V	Motor deactivated
			STOA1/ = 24 VDC and STOB1/ = 24 VDC	Motor released
X17.14	STOGND1*	input	STO Ground. Ground of the external 24 VDC must be connected to the central ground connection (bottom of the device).	

* The inputs are optically isolated.

6.2.3. STO principle of PSD1-M with two axis modules

At the PSD1-M drive with two axis modules, STO is activated via 2 channels for each motor (STOA1/ and STOB1/ for motor 1 and STOA2/ and STOB2/ for motor 2).

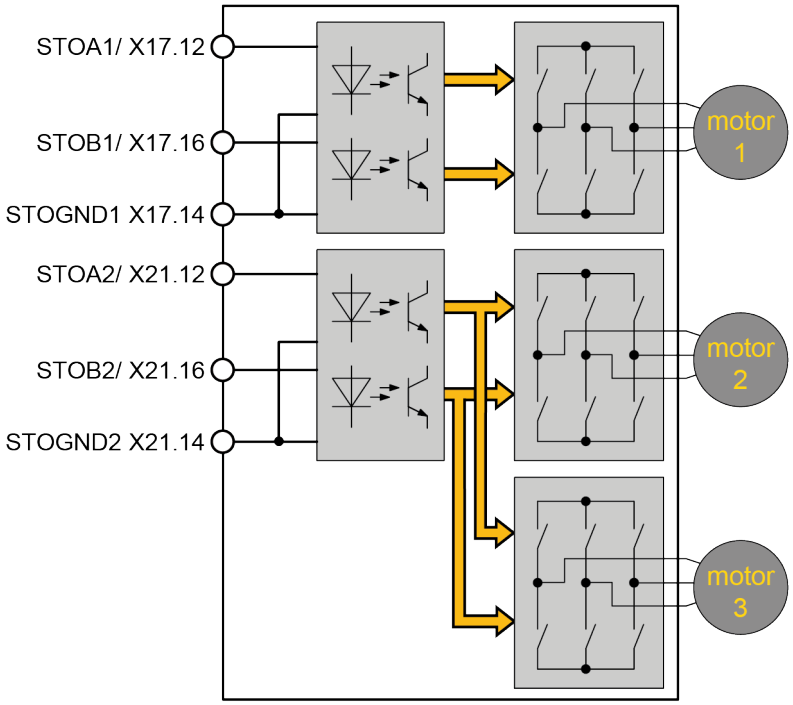


Pin	Name		Description
X17.12 (see page 49)	STOA1/*	Input	STOA1/ = 0 V — Motor 1 deactivated STOB1/ = 0 V — Motor 1 deactivated STOA1/ = 24 VDC and STOB1/ = 24 VDC — Motor 1 released
X17.16	STOB1/*	Input	
X17.14	STOGND1*	Input	STO Ground. Ground of the external 24 VDC must be connected to the central ground connection (bottom of the device).
X21.12 (see page 49)	STOA2/*	Input	STOA2/ = 0 V — Motor 2 deactivated STOB2/ = 0 V — Motor 2 deactivated STOA2/ = 24 VDC and STOB2/ = 24 VDC — Motor 2 released
X21.16	STOB2/*	Input	
X21.14	STOGND2*	input	STO Ground. Ground of the external 24 VDC must be connected to the central ground connection (bottom of the device).

* The inputs are optically isolated.

6.2.4. STO principle of PSD1-M with three axis modules

At the PSD1-M drive with three axis modules, STO for motor 1 is activated via 2 channels (STOA1/ and STOB1/ and for the motors 2 & 3 via two further channels (STOA2/ & STOB2/).



Pin	Name		Description
X17.12	STOA1/*	Input	STOA1/ = 0 V — Motor 1 deactivated STOB1/ = 0 V — Motor 1 deactivated STOA1/ = 24 VDC and STOB1/ = 24 VDC — Motor 1 released
X17.16 (see page 49)	STOB1/*	Input	
X17.14	STOGND1*	Input	STO Ground. Ground of the external 24 VDC must be connected to the central ground connection (bottom of the device).
X21.12	STOA2/*	Input	STOA2/ = 0 V — Motor 2 & 3 deactivated STOB2/ = 0 V — Motor 2 & 3 deactivated STOA2/ = 24 VDC and STOB2/ = 24 VDC — Motor 2 & 3 released
X21.16 (see page 49)	STOB2/*	Input	
X21.14	STOGND2*	Input	STO Ground. Ground of the external 24 VDC must be connected to the central ground connection (bottom of the device).

* The inputs are optically isolated.

6.3 Notes on the STO function

⚠DANGER

- It should be noted in connection with the STO application examples illustrated here that after the Emergency stop switch has been activated, no galvanic isolation in accordance with EN 60204-1 Section 5.5 is guaranteed. This means that the entire system must be disconnected from the mains power supply with an additional main switch or mains power contactor for repair jobs. Please note in this context, that even after the power is disconnected, dangerous electrical voltages may still be present in the drive for about 10 minutes.
- During the active braking phase of Stop category 1 (controlled bringing to a stop with safely monitored delay time according to EN60204-1) or safe stop 1, faulty function must be expected. If an error in the drive system occurs during the active braking phase, the axis may trundle to an unguided stop or might even actively accelerate until the expiry of the defined switch-off time.
- As soon as Setup-mode is activated in the PSD ServoManager, the Fieldbus - Interface is deactivated. Then it is not possible to set a braking ramp via fieldbus.

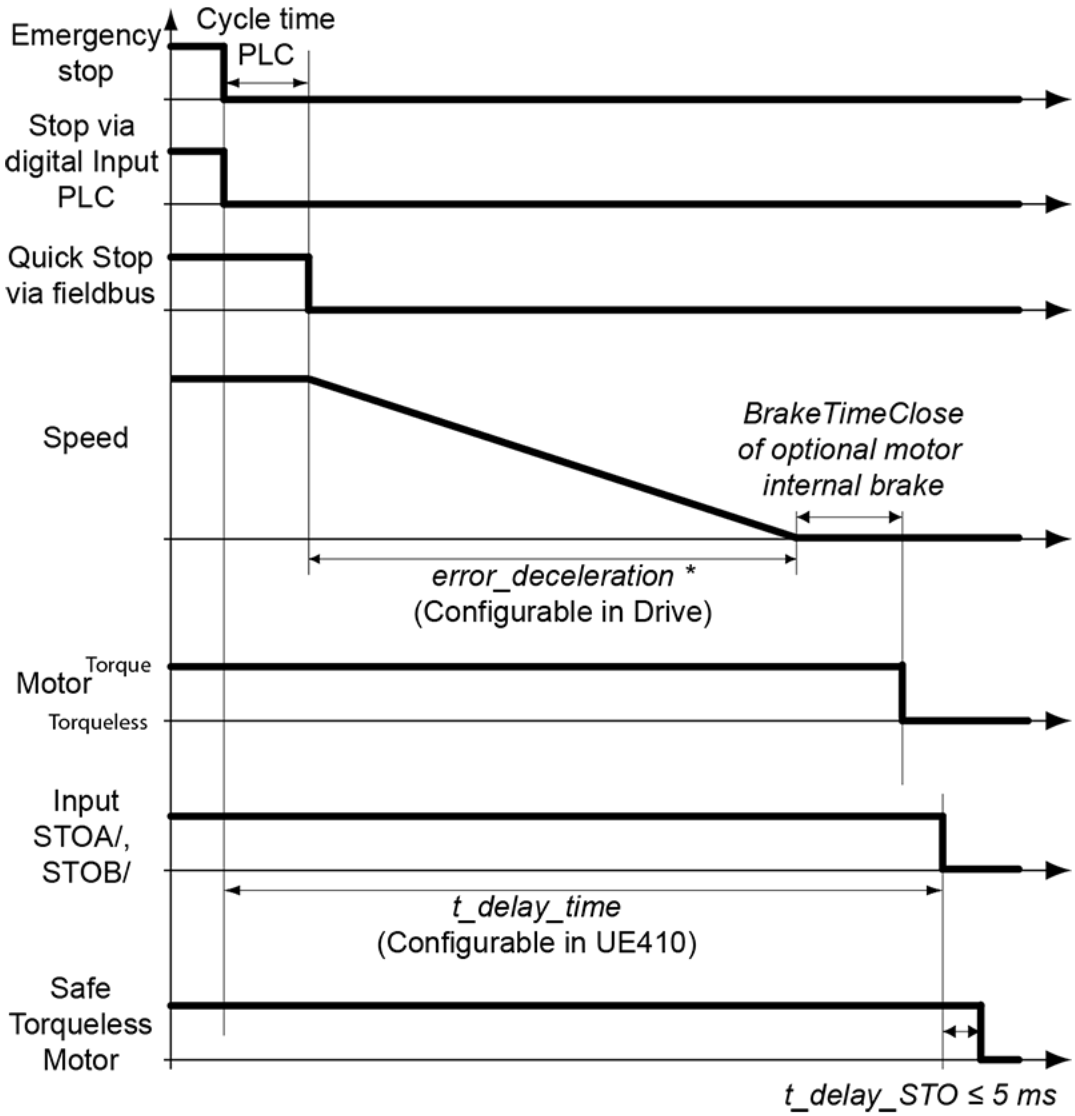
Maintenance

- When using STO a **recorded STO - function test** (see page 78) must be carried out:
  - ♦After commissioning and
  - ♦in defined maintenance intervals.

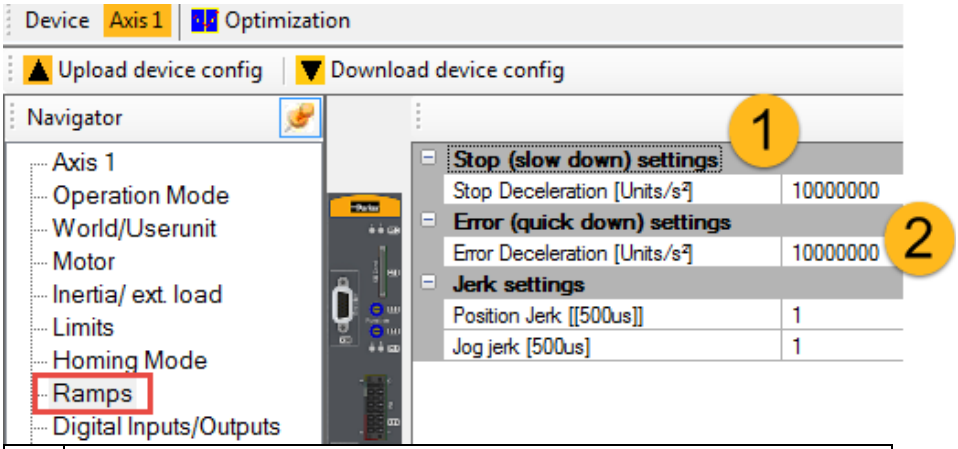
6.4 Conditions of utilization for the STO function

- The STO safety function must be tested and protocoled **as described** (see page 78). The safety function must be requested at least once a week. In safety door applications, the weekly testing interval must not be observed, as you can assume that the safety doors will be opened several times during the operation of the machine.
- The PSD1 with integrated STO safety function as well as the utilized safety switching devices must be mounted protected (IP54 control cabinet).
- Basically there is only a maximum cable lenght of 30 m of STO inputs (X17, X21) alllowed. It's not permitted to route the cables outside.
- Only qualified staff members are permitted to install the STO function and place it in service.
- The X9/2 (GND24V) terminal on the PSD1-M_P mains module respectively the X17.12 (GND24V) terminal on the PSD1-S single device must be connected to the PE protective lead. This is the only way to ensure protection against incorrect operation through earth faults (EN60204-1 Section 9.4.3)!
- When using an external safety control with adjustable delay time, (as illustrated in the STO application example), it must be ensured that the delay time cannot be adjusted by persons not authorized to do so (for example by applying a lead seal). With the UE410-MU safety control, this is not necessary, if the anti manipulation measures are respected.
- The adjustable delay time on the safety control must be set to a value greater than the duration of the braking ramp controlled by the PSD1 with maximum load and maximum speed.
  Otherwise fault 0x5495 may occur.
- All conditions necessary for CE-conform operation must be observed.
- When external forces are applied to the drive axes, additional measures (e.g. additional brakes) are to be taken. Please note in particular the effects of gravity on suspended loads! This must be respected above all for vertical axes without self-locking mechanical devices or weight balance.
- When using synchronous motors, a short movement over a small angle is possible, if two errors occur simultaneously in the power section. This depends on the number of pole pairs of the motor (rotary types: 2 poles = 180°, 4 poles = 90°, 6 poles = 60°, 8 poles = 45 °, Linear motors: 180 ° electric).

6.5 STO delay times



* Complies with der Quick-Stop-Ramp (0x6085.0x00); in PSD ServoManager under



1	= MinSlowDown (0x3428.0x00)
2	= QuickStopDecel (0x6085.0x00)

.

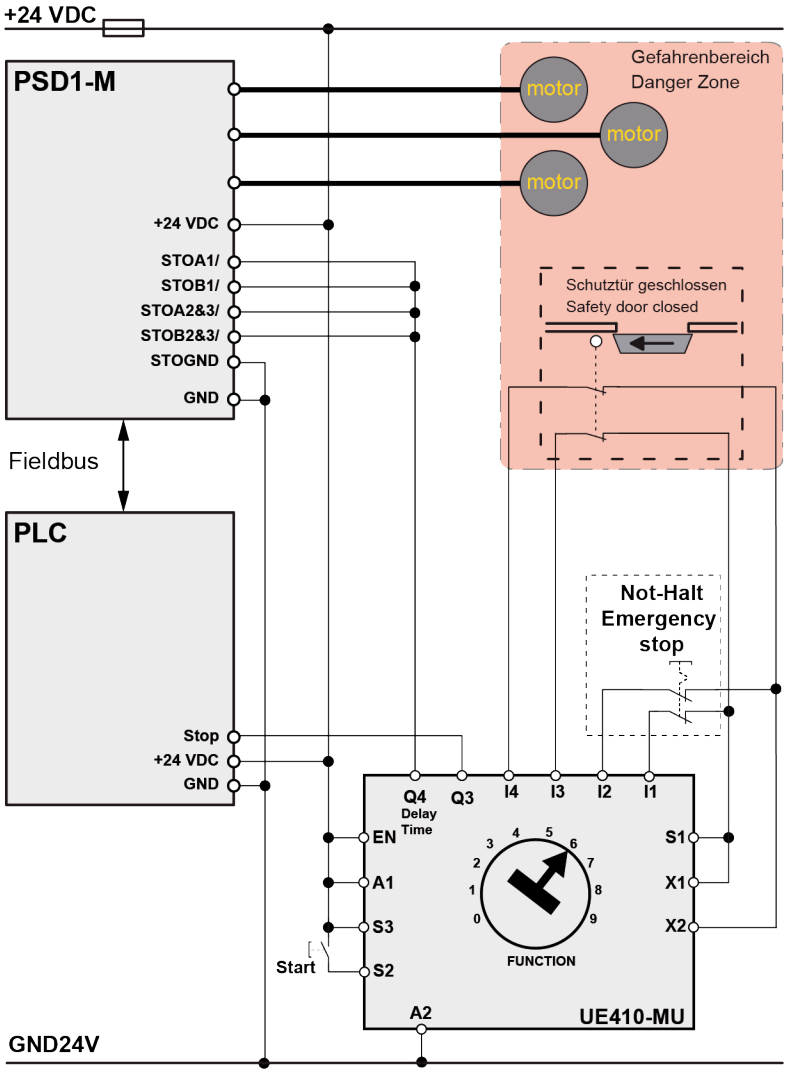
Recommendation: Use the settings (default) then switch off the power.

6.6 STO Application examples

6.6.1. STO and SS1 function with external safety control

In this chapter you can read about:

6.6.1.1 Circuit Diagram



6.6.1.2 Description

The application example demonstrate how a 3-axis PSD1-M servo drive cooperates with the safety control UE410-MU of Sick and with a PLC.
The STO circuit of the 3-axis PSD1-M must support a safe stop 1 of the control with emergency stop (category 3 - PL e). The application example described here corresponds to Stop Category 1 as defined by EN60204-1.
Together with the external safety switching device, the "Safe Stop 1"(SS1) safety function can also be implemented.
A Stop Category 0 in accordance with EN 60204-1 can be implemented, for example by setting the delay time on the safety switching device to 0. The motor torque will then be turned off immediately in 2 channels and will not be able to

generate any more torque. Please take into consideration that the motor will not brake and a coasting down of the motor (trundling) may result in hazards. Additionally the motor fixing brake can be damaged at braking. If this is the case, the STO function in stop category 0 is not permitted.

6.6.1.3 Functional description

- Shut-down of the motor is initiated by:
  - ♦Activating emergency-stop or
  - ♦Opening the safety door
- The safety control UE410-MU requires a stop from PLC via output Q3.
- Via fieldbus the PLC sends a braking ramp/ stop command to the PSD1-M for all 3 motors.
- After a delay time set in the safety control UE410-MU, STO (channel 1 & 2) is released via output Q4.
- Thus all 3 motors are placed in a moment-free condition (STO). Please take care that object STO_Setup=0 (standard settings) in order to prevent that STO is recognized as fault.
- In the Fieldbus, Status Word Bit 15 STO status is displayed as slowly flashing LED.
- The delay time in the safety control must increased in such a way that, as soon as STO is released, the motors stand still by the braking ramp configured in the drive.
- The acknowledgement (start button) via the safety control UE410-MU is only necessary, if after the disabling of the STO function, a danger to any person or to the machine could arise due to automatic start-up.

6.6.1.4 Design Features

- The contacts of the emergency stop buttons and the safety door need to be designed mechanically in accordance with EN 60947-5-1 appendix K.
- Concerning the delayed STO procedure, the risk must be considered by the machine designer.
- Drive and safety control must be wired in the same control cabinet. Wiring must be in accordance with EN 60204-1.
- The operating instructions of the UE410-MU3T5 safety control must be observed.
- We recommend to use a filter > 3 ms for the signal Q3 in the PLC (stop input) as the safety control UET410-MU regularly modulates test signals on the outputs Q3 and Q4.
- Other safety controls may be used if they fulfill all requirements for category 3 PL=e and dispose of a high-quality error detection with dynamic test pulse. The max. test pulse must be <1 ms / actively low.

6.6.1.5 Calculation of the total failure probability

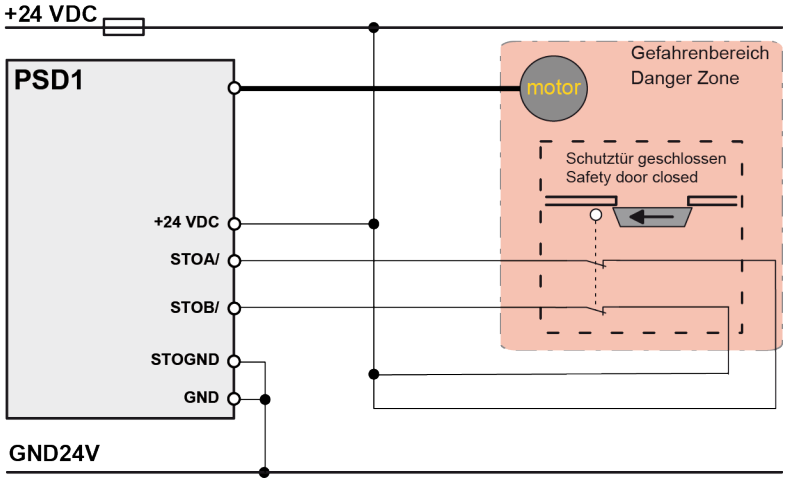
The failure probability of each of the two STO circuits of the servo drive is 1.0E-09 per hour. Thus the probability of a failure of the entire 3-axis servo drive is 2.0E-09 per hour.
The safety control UE410.MU is a certified component. Its failure probability is 6.0E-09 per hour.
At this calculation only the probability of a failure of the emergency stop is considered, not the contact of the safety door. With a B10d value of 100.000 cycles at 240 working days, 16 working hours and at a cycle time of 1 hour, the result for n_{op} is 3840 cycles per year and 260 years for MTTFd. As the safety control disposes of a high-quality error detection with dynamic test pulse for the input signal, a high diagnostic coverage DC for the switches can be set.

According to Sistema the total failure probability is 3.27E-8 per hour (PL=e).

6.6.2. STO function without external safety control

In this chapter you can read about:

6.6.2.1 Circuit Diagram



In this example we show how the contacts of the safety door can be wired to the 1-axis PSD1 without the use of a safety control.
A double-channel safety door monitoring or a double-channel emergency stop can be directly wired to the PSD1.
We do not recommend this type of wiring for vertical axes without self-locking mechanics as it may be damaged at braking with the motor holding brake by motor coasting. If this is the case we recommend to use the previous wiring type with safety control.

6.6.2.2 Functional description

- When opening the safety door, the motor is immediately switched to double-channel, moment-free mode; this complies with Stop Category 0 In accordance with EN 60204-1. In case the motor axis is still energized or moving during the triggering of the STO, error 0x5495 is triggered simultaneously. If not, no error is triggered; unless error 0x5492 is triggered at setting STO_Setup=1. Basically STO status is displayed in the Fieldbus Status Word Bit 15 and as slowly flashing LED.
- During trundling of the motor the motor brakes of the Parker motor must not be activated as otherwise they can be damaged.
- In case error 0x5492 or 0x5495 are triggered then error must be acknowledged in order to reactivate the drive. The acknowledgement is only permissible with category B. It shouldn't been used if there is a possibility to enter the dangerous area. In this case an external acknowledgement device must be used.

6.6.2.3 Design Features

- The contacts of the emergency stop buttons and the safety door need to be designed mechanically in accordance with EN 60947-5-1 appendix K.
- PSD must be located in a protected area (IP54 control cabinet). Outside this protected area, the line guiding to the external switches must be separated channelwise or must be especially protected.

6.6.2.4 Calculation of the total failure probability

The failure probability of each of the two STO circuits of the servo drive is 1.0E-09 per hour. When calculation the overall failure probability further components of the complete machine such as contacts of the safety door must be considered.
Due to the hardware monitoring in the PSD servo drive, only a medium level of diagnostic coverage DC for the external contacts can be set.

6.7 STO function test

The STO function must be checked in the event of:
- Commissioning
- After each exchange of any equipment within the system
- After each intervention into the system wiring
- In defined maintenance intervals (at least once per week) and after a longer standstill of the machine
  If the STO function was triggered by opening a protective door and if this door is opened several times a week, the weekly testing interval is not required.

The check must be made by qualified personnel adhering to all necessary safety precautions.

The following testing steps must be performed:

STO Test	Action, activity	Expected reaction and effect
1	24 VDC voltage on Connect terminal X17.12* and X17.16* Apply 0 VDC voltage to terminal X17.14*	
2	Switch on supply power and 24 VDC supply voltage	No error must be present
3	Configuring the device	No error must be present
4	Testing active STO on terminal X17.12 and X17.16: Simultaneous removing of 24 VDC on terminal X17.12 and X17.16*	Active STO must be displayed via LED or fieldbus.** No error must be present if object STO_Setup=0. Error message 0x5492 if object STO-Setup=1.
5	Apply again 24 VDC voltage to terminal X17.12 and X17.16 and acknowledge STO afterwards*	No error must be present; torque at the motor should be present.
6	Then switch off and on again 24 VDC voltage supply.	No error must be present

* The same test with terminals X21.12 & X21.16 & X21.14 is necessary for two or three axis controllers.
** With two or three axis controllers STO status for all motors should apply.
A manual check of the torqueless drive is here also sufficient.
The triggering of the STO can also be made by actuating the emergency stop switch. During the automated test, the STO can also be triggered via the contacts of an external relay

Following the test steps

Once all of the relevant safety test steps have been accomplished, the actions taken must be documented. A protocol specimen can be found in the following section.
Depending on the machine version, additional or other test steps may be required.

6.7.1. STO test protocol specimen

Project/machine:

Name of the tester: _____

Servo axis: _____

Settings
STO_Setup: _____

STO function test:

STO function test steps 1-6: o successfully tested

Safe stop 1: o successfully tested
o is not used

Initial acceptance on: _____

Signature of the tester

Repeat check on: _____

Signature of the tester

6.8 Technical data STO

Category	Specifications	
STO Certificate (http://www.Parker.com/Literature/Electromechanical Europe/Certificates/DOC-0014-01_PSD_STO_Certificate.pdf)	According to EN ISO13849 Device certified if "STO certified" is stated in type plate (below the CE sign)	
Nominal voltage of the inputs	24 VDC	
Required isolation of the 24V control voltage	Grounded protective extra low voltage, PELV	
Fuse protection	Protection of the STO control voltage: 1 A	
Number of inputs Signal inputs via optocoupler	2 Low = 0 ... 5 V DC or open High = 15 ... 26.4 VDC I_{in} at 24 VDC: 9 mA +/-1 mA	
STO Input A, Level	Low or open = STO activated High = STO deactivated Reaction time max. 5 ms	
STO Input B, Level	Low or open = STO activated High = STO deactivated Reaction time max. 5 ms	
Switch-off time	Switch-off time with unequal input statuses: 10 s (max. error response time) During the inequality, it is ensured within 5 ms that the motor torque is switched off single-channel.	
Maximum tolerable test pulse time	Maximum tolerable test pulse time (low active) for external safety control: 1 ms	
Grouping of safety level	• Category 3 • PL=e • SIL 3 • PFHd=1.00E-9 per STO circuit • Mission time: 20 years • MTTFd = 800 years (when using EN ISO 13849-1 the MTTFd value must be limited to 100 years)	

7. Accessories

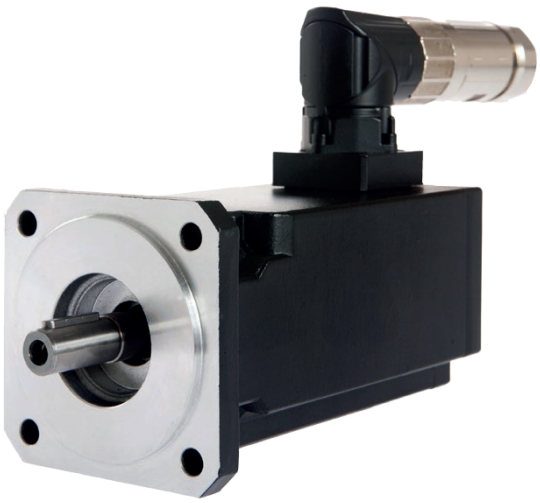
In this chapter you can read about:

7.1 SMH Servo Motors with HIPERFACE DSL® - Feedback

Product Overview

Description

The SMH Series of highly-dynamic brushless servo motors have been design to combine the cuttingedge technology of Parker Hannifin products with extremely high performance.
Thanks to the innovative “salient pole” technology, the motor’s dimensions are considerably reduced with significant advantages in terms of specific torque, overall dimensions and dynamic performance.
Compared to traditional-technology brushless servo motors, the specific torque is approximately 30 % higher, overall dimensions are considerably reduced and, consequently rotor inertias are extremely low.
Thanks to the high quality of Neodymium-Iron-Boron magnets, and also the encapslutation method used to fasten them to the shaft, the SMH motors can achieve very high acceleration and withstand high overloads without risk of demagnetisation or detachement of the magnets.
Specific applications for the SMH Series include all types especially those for the packaging and handling industry, and all those applications where very high dynamic performances and very low inertias are required.



Technical Characteristics - Overview

Motor Type	Permanent magnets synchronous servomotor
Rotor Design	Rotor with surface rare earth magnets
Power Range	0.2...9.4 kW
Torque Range	0.5...60 Nm
Speed Range	0...7500 min^{-1}
Mounting	Flange with smooth holes
Shaft End	Plain keyed shaft Plain smooth shaft (option)
Cooling	Natural ventilation
Protection Level (IEC60034-5)	IP64 IP65 (option)
Feedback sensor	Encoder Hiperface DSL® (option S5, S6)
Other options	Brake Thermal protection (PTC) Increased inertia
Marking	CE / UL
Voltage Supply	230 / 400 VAC other voltage under request
Temperature Class	Class F
Connections	Single rotatable connector

Features

- Single Cable solution (Hiperface DSL® feedback)
- Further Feedback support:
  Resolver, Hiperface and EnDat interface,
  Hall sensors, rotary and linear encoders
- Customised windings/voltages
- Increased Inertia option
- Multiple connection options

Application

- Packaging Machinery
- Food & Beverage
- Pharma
- Material Handling
- Material Forming
- Factory Automation
- In-Plant Automotive
- Robotics
- Printing
- Servo Hydraulic Pumps

7.1.1. Order code of motor cable

	1	2	3	4	5	6	7	8
Ordering example	**CBM**	**015**	**H**	**D**	**M23**	**PSX**	**0150**	**00**

1	**Cables**	
	CBM	Motor cable
2	**Cross-section**	
	007	0.75 mm²
	015	1.5 mm²
	025	2.5 mm²
	040, 060	4 mm², 6 mm²
3	**Cable Type**	
	H	HIPERFACE DSL® highly flexible
4	**Brake wire**	
	D	With brake wire and HIPERFACE DSL®
5	**Assembly of motor side**	
	M15	SpeedTec M15 (for motor connector - Order code YZ)
	M23	SpeedTec M23 (for motor connector - order code IZ)
	M40	SpeedTec M40 (for motor connector - Order code IZ[1)])
	XXX	Terminal Box
6	**Assembly of drive side**	
	PSX	PSD1-S & PSD1MW1800
	PMX	PSD1-M (not PSD1MW1800)
7	**Length [10 cm steps]**	
	0100	Length in 10 cm (max. 50 m) Example: 0025 = 2.5 m, 0205 = 20.5 m, 1020 = 102.0 m Standard length [m]: 3 / 5 / 7 / 10 / 12 / 15 / 20 /25 / 30 / 35 / 40 / 45 / 50
8	**Special design**	
	00	Standard

[1)] is required for Mx 205 series motors and Smx 170 60 Nm motors

7.2 EMC measures

In this chapter you can read about:

7.2.1. Mains filter

In this chapter you can read about:

For radio disturbance suppression and for complying with the emission limit values for CE conform operationwe offer mains filters:
Observe the maximum permitted length of the connection between the mains filter and the device:

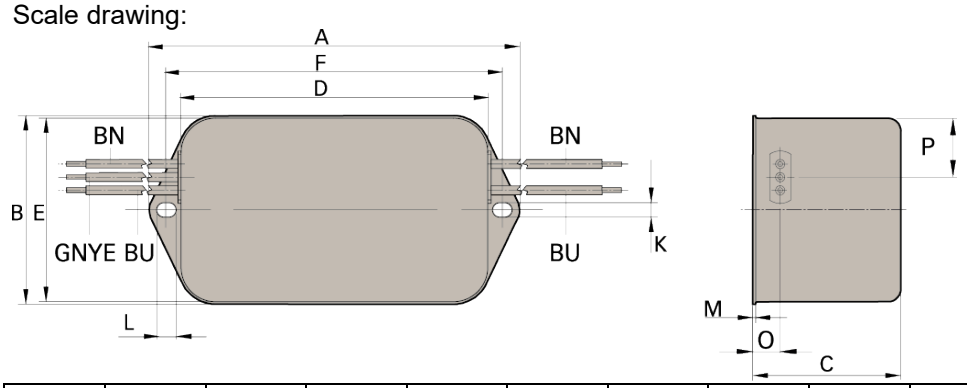
- unshielded <0.5m;
- shielded: <5m (fully shielded on ground e.g. ground of control cabinet)

7.2.1.1 Mains filters for PSD1-S single-phase ECP-0001-01

Mains filters with UL certification for PSD1-S_1200 (2 A) and PSD1-S_1300 (5 A)

Necessary for limit value class C3 (in accordance with EN 61800-3) in single phase operation with motor cable length > 10 m

Scale drawing:



O	B	C	D	E	F	L	M	A	P
156	57.5	45.4	130.5	56	143	6	1	8.4	18

Stated in mm

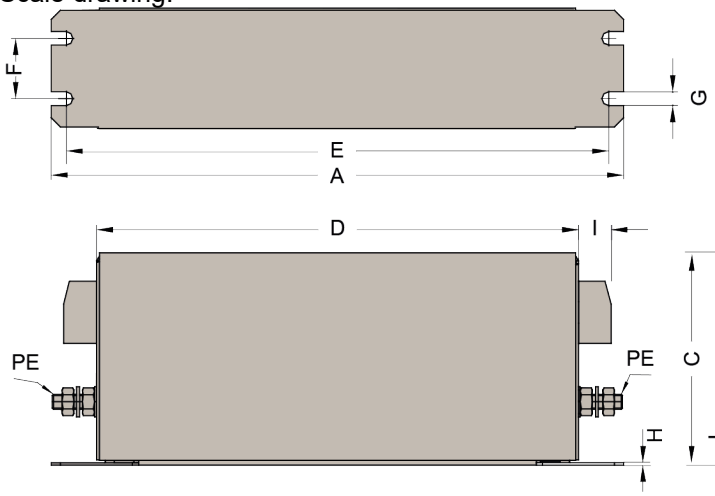
Color code:
BN Brown
BU blue
GNYE green-yellow
Weight: 0.67 kg

7.2.1.2 Mains filters for PSD1-S 3-phases operation ECP-0002-01

Mains filters with UL certification for PSD1-S_1200 (2 A) and PSD1-S_1300 (5 A) for 3-phases operation

Required for limit value class C3 (In accordance with EN 61800-3) in 3-phase operation with motor cable length > 10m

Scale drawing:



O	B	C	D	E	F	G	H	I	PE	K	L
250	45	70	220	235	25	5.4	1	22	M5	22.5	29.5

Stated in mm

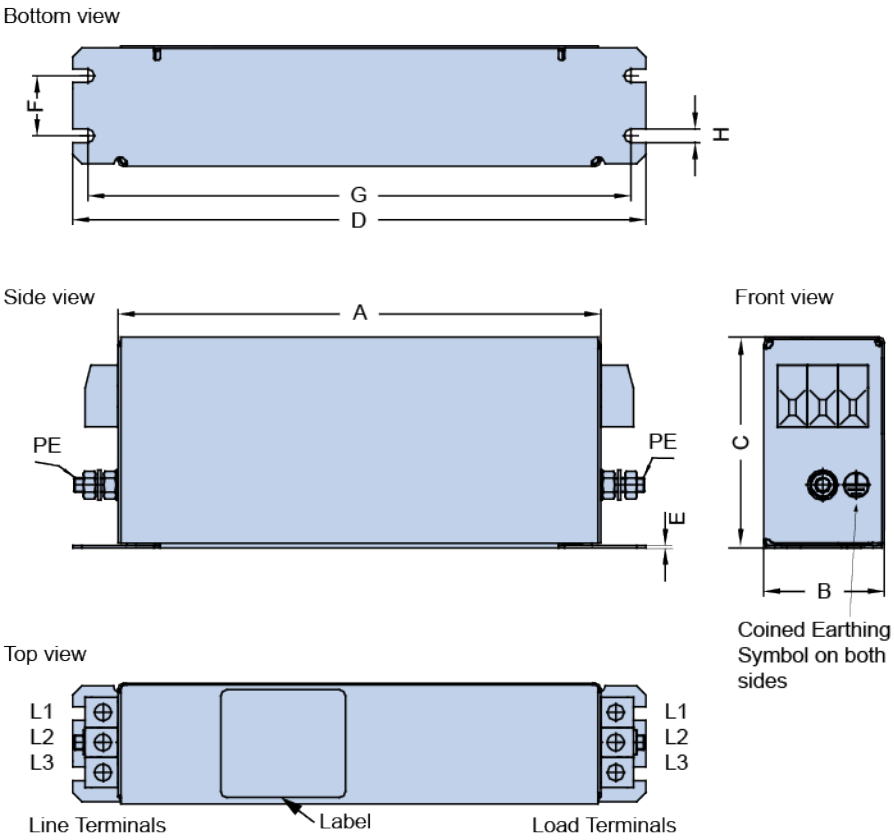
Weight: 0.8 kg
Port Connections: AWG8 (10 mm² rigid, 6 mm² flexible)
tightening torque: 1.5 ... 1.8 Nm

7.2.1.3 Mains filters for PSD1-M_P010 and PSD1-M_P020)

Mains filters with UL certification

- Mains filters ECP-0003-01 for PSD1-M_P010: Axis combination with motor cable up to 6 x 10 m
  (max. 60 m cable length in total)
- Mains filter ECP-0003-02 for PSD1-M_P010: Axis combination with motor cable up to 6 x 50 m
  (max. 300 m cable length in total)
- Mains filters ECP-0003-03 for PSD1-M_P020: Axis combination with motor cable up to 6 x 50 m
  (max. 300 m cable length in total)

Scale drawing:



Filter type	O	B	C	D	E	F	G	H	Weight	GND(I)	Connection clamp
	mm								kg		
ECP-0003-01	240	50	85	270	0.8	30	255	5.4	1.5	M5	10mm²
ECP-0003-02	305	60	150	335		35	320	6.4		M5	10mm²
ECP-0003-03	220	85	90	250	1.0	60	235	5.4	2.4	M6	16 mm²

7.2.2. Motor output chokes

In this chapter you can read about:

We offer motor output chokes for disturbance suppression when the motor connecting cables are long:

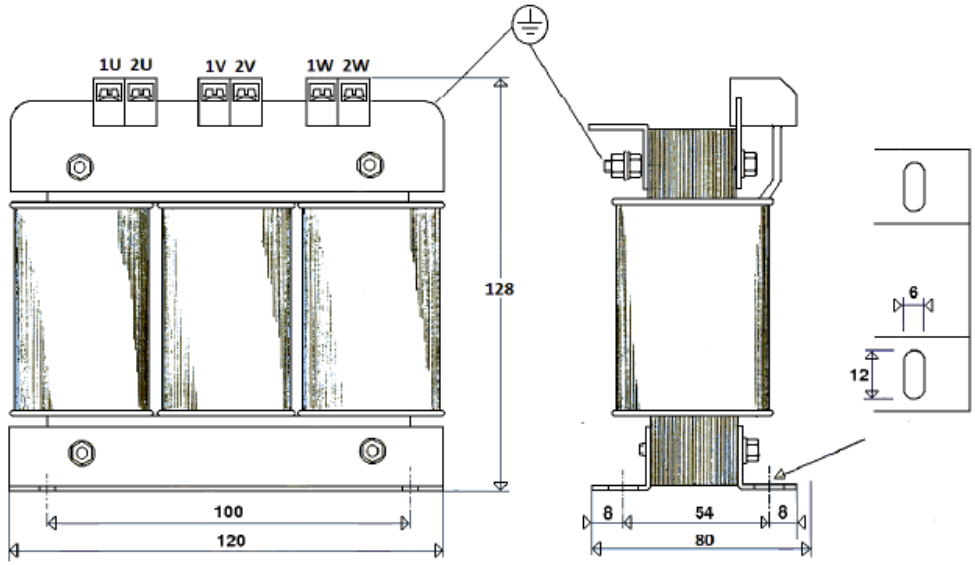
7.2.2.1 Motor output chokes ECM-0005-01 for PSD1-S (up to 7 A/ 1 mH)

For motor cable length > 50m

Inductance	1 mH
Rated current	7 A
Protection class	Not defined
Ambient temperature	0 - 40 °C
Max. Elevation of operating site	1000 m above sea level
Weight	2.5 kg

Up to 7 A nominal motor current (1 mH)

Scale drawing:



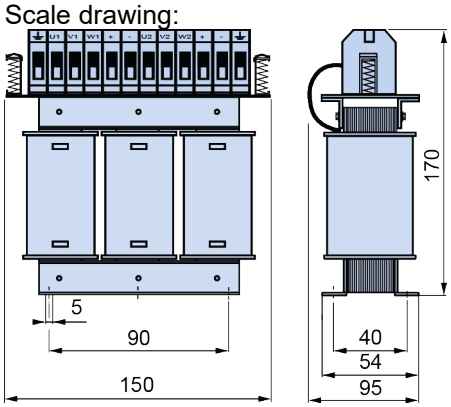
Stated in mm

7.2.2.2 Output motor chokes ECM-0004-01 for PSD1-M (up to 6.3 A/ 3.6 mH)

For motor cable length > 20m

Inductance	3.6 mH
Rated current	6.3 A
Protection	IP00
Ambient temperature	0 -40 °C
Max. Elevation of operating site	1000 m above sea level
Weight	3.2 kg

Scale drawing:



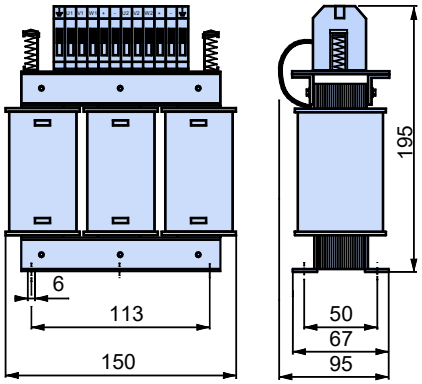
Stated in mm

7.2.2.3 Motor output chokes ECM-0001-01 for PSD1-M (up to 16 A 2 mH)

For motor cable length > 20m

Inductance	2 mH
Rated current	16 A
Protection class	IP00
Ambient temperature	0 -40 °C
Max. Elevation of operating site	1000 m above sea level
Weight	4 kg

Scale drawing:



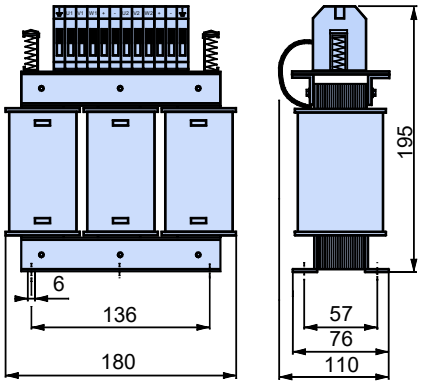
Stated in mm

7.2.2.4 Motor output chokes ECM-0002-01 for PSD1-M (up to 30 A/ 1.1 mH)

For motor cable length > 20m

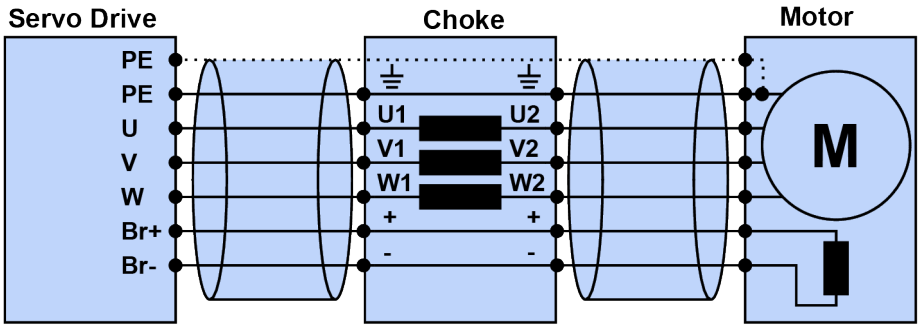
Inductance	1.1 mH
Rated current	30 A
Protection	IP00
Ambient temperature	0 -40 °C
Max. Elevation of operating site	1000 m above sea level
Weight	7 kg

Scale drawing:



Stated in mm

7.2.2.5 **Wiring of the motor output filter**



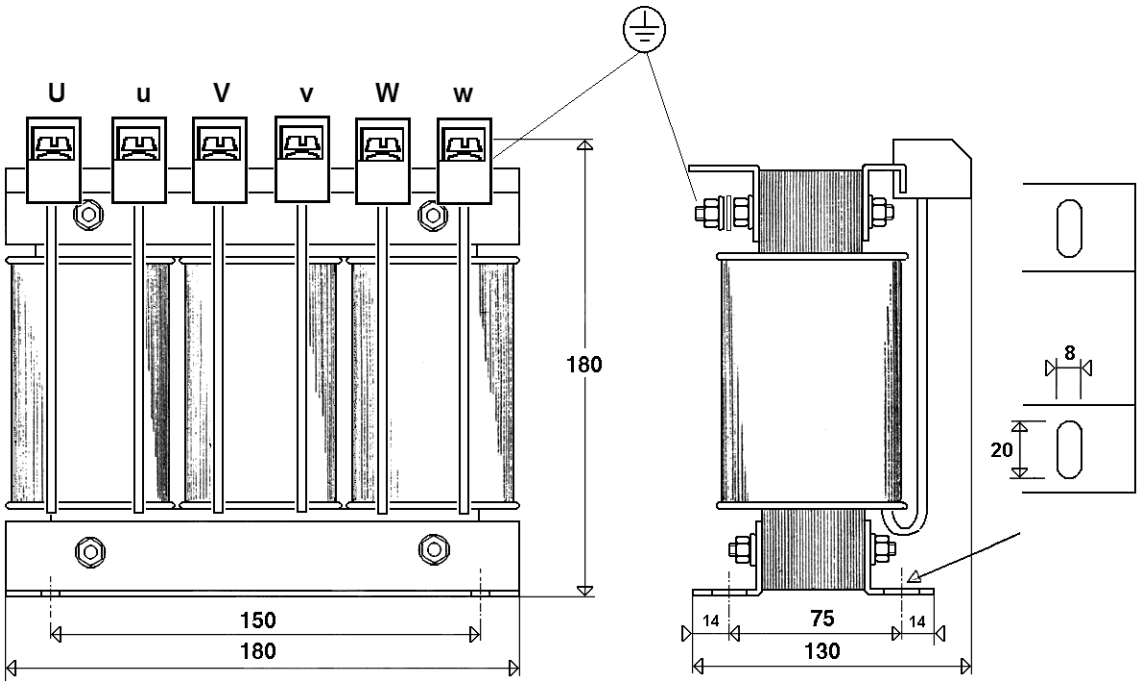
7.3 Line choke

In this chapter you can read about:

7.3.1. Line choke für PSD1-M_P010: 0.86 mH / 30 A

By means of the line choke IND-0001-02 (with UL certification) the output performance of PSD1-M_P010 can be increased by 50 %. Line chokes for reducing the low-frequency interferences on the mains side.
0.86 mH / 30 A

Scale drawing: IND-0001-02



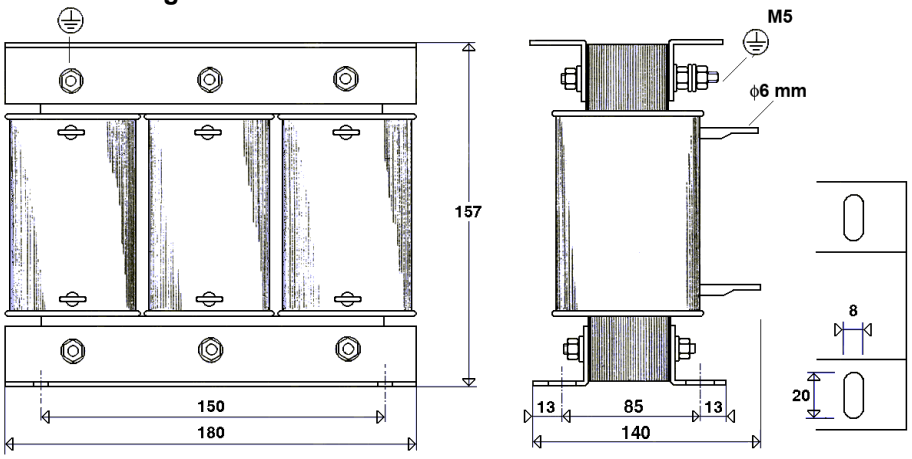
Weight: 8 kg

7.3.2. Line choke for PSD1_M_P020: 0.45 mH / 55 A

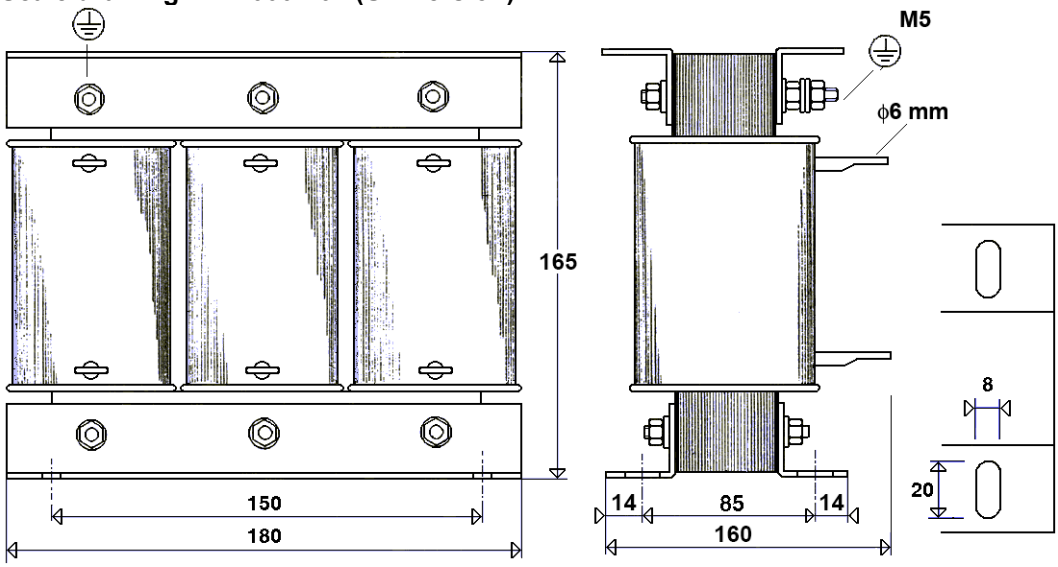
By means of the line choke IND-0002-01 (with UL certification) resp. IND-0002-02 (mit UL certification), the output performance of PSD1-M_P020 can be increased by 50 %. Line chokes for reducing the low-frequency interferences on the mains side.
We offer the following line chokes:

- IND-0002-01: 0.45 mH / 55 A / 10 kg
- IND-0002-02: 0.45 mH / 55 A / 9 kg / UL

Scale drawing: IND-0002-01



Scale drawing: IND-0002-02 (UL-Version)



7.4 External braking resistors

In this chapter you can read about:

⚠DANGER **Hazards when handling ballast resistors!**
Housing temperature up to 200°C!
Dangerous voltage!
The device may be operated only in the mounted state!
The external braking resistors must be installed such that protection against contact is ensured (IP20).
Install the connecting leads at the bottom.
The braking resistors must be grounded.
We recommend to use a thrust washer for the ACB-0001-01 and ACB-0002-01.
Observe the instructions on the resistors (warning plate).

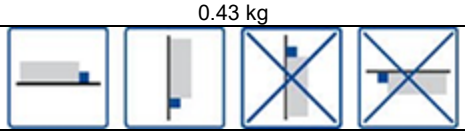
Note that a length of the cable >2 m is not permitted!

⚠WARNING When mounting the brake resistor, please observe the expansion of the housing of max. 0.85 mm / 100 mm due to heating (mounting with fixed and floating bearings).
Mount the resistors in such a way that supply and extract air access is possible in order to avoid heat accumulation. Resistors need to be protected by respective protective measures.
The resistors with the thermal contact surface are to be mounted continuously to a flat clamping area.

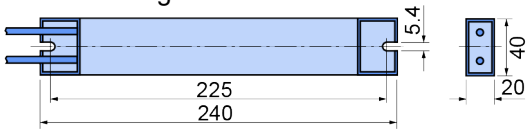
7.4.1. Overview Braking Resistors PSD1

Category	Specifications		
Braking resistor (see page 88)	**Device**	**Nominal power**	**UL certification**
ACB-0004-01 (51 Ω) (see page 89)	PSD1-S_1200 / 1300	100 W	With UL
ACB-0005-01 (56 Ω) (see page 90)	PSD1-S_1200 / 1300	120 W	With UL
ACB-0005-02 (56 Ω) (see page 90)	PSD1-S_1200 / 1300	190 W	With UL
ACB-0001-01 (30 Ω) (see page 90)	PSD1-M_P010 PSD1-M_P020 with 2x30 Ω parallel	400 W 2*400 W	With UL
ACB-0002-01 (15 Ω) (see page 90)	PSD1-M_P010 with 2x15 Ω in series PSD1-M_P020	2*400 W 400 W	With UL
ACB-0003-01 (15 Ω) (see page 91)	PSD1-M_P020	1500 W	Without UL

7.4.2. Braking resistor ACB-0004-01

Pulse power (W) Tu ~ 40 °C *referring to a cycle time of120 s (reference value)	**ED 6 %***	900
	ED 15 %*	500
	ED 25 %*	300
	ED 40 %*	200
Nominal continuous output (W) Ta ~ 40°C		100
Nominal resistance value at 20°C		51 Ω
Nominal tolerance at 20°C		±10%
Type of protection (EN 60529) (in the corresponding bolted state)		IP 65
Max. permitted operation voltage		UL 1000 V
Cooling		Natural convection
Housing temperature at a continuous nominal output Tu ~ 40 °C		approx. 180 °C
Electrical connection		2x AWG 14 / l=25 cm
Operating temperature range		-25 ... +40 °C
Test voltage		2.7 kV AC 1 s
Certification / Marking		UL; CSA
Weight		0.43 kg
Mounting positions		

Scale drawing:

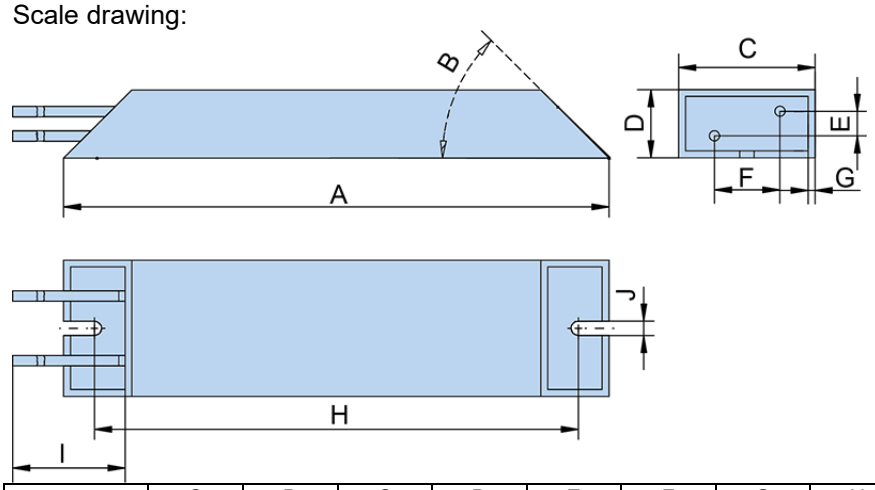


Stated in mm

7.4.3. Braking resistor ACB-0005-01 & ACB-0005-02

	Type:	ACB-0005-01	ACB-0005-02
Pulse power (W) Tu ~ 40 °C *referring to a cycle time of120 s (reference value)	**ED 6 %***	984	1558
	ED 15 %*	504	798
	ED 25 %*	360	570
	ED 40 %*	264	418
Nominal continuous output (W) Ta ~ 40°C		120	190
Nominal resistance value at 20°C		56 Ω	
Nominal tolerance at 20°C		±10%	
Type of protection (EN 60529) (in the corresponding bolted state)		IP 54	
Max. permitted operation voltage		UL 800 V	
Cooling		Natural convection	
Housing temperature at a continuous nominal output Tu ~ 40 °C		approx. 200 °C	
Electrical connection		2x AWG 18/19 / l=50 cm	
Operating temperature range		-30 ... +40 °C > 40 °C 4% reduction per 10 K	
Test voltage		4.2 kV DC	
Certification / Marking		UL; CSA	
Weight		0.34 kg	0.515 kg
Mounting positions			

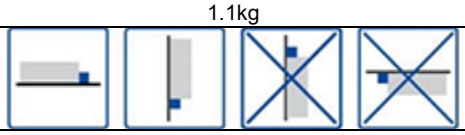
Scale drawing:



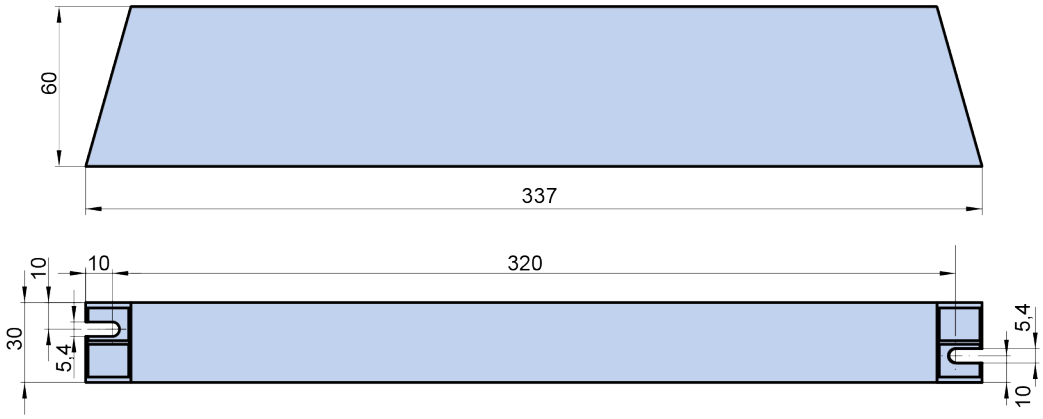
Dimensions	O	B	C	D	E	F	G	H	J
ACB-0005-01	240	45	40	20	6.2	18.2	2	222	4.3
ACB-0005-02	360	45	40	20	6.2	18.2	2	342	4.3

Stated in mm

7.4.4. Braking resistor ACB-0001-1 and ACB-0002-1

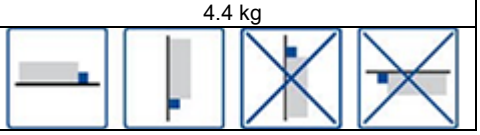
Pulse power (W) Tu ~ 40 °C *referring to a cycle time of120 s (reference value)	**ED 6 %***	3600
	ED 15 %*	2000
	ED 25 %*	1200
	ED 40 %*	800
Nominal continuous output (W) Ta ~ 40°C		400
Nominal resistance value at 20°C		ACB-0001-01: 30 Ω ACB-0002-01: 15 Ω
Nominal tolerance at 20°C		±10%
Type of protection (EN 60529) (in the corresponding bolted state)		IP 54
Max. permitted operation voltage		UL 600 / 1000 V
Cooling		Natural convection
Housing temperature at a continuous nominal output Tu ~ 40 °C		approx. 340 °C
Electrical connection		2x AWG 16 / l=25 cm
Operating temperature range		-25 ... +40 °C
Test voltage		2.7 kV AC 1 s
Certification / Marking		UL; CSA
Weight		1.1kg
Mounting positions		

Scale drawing:

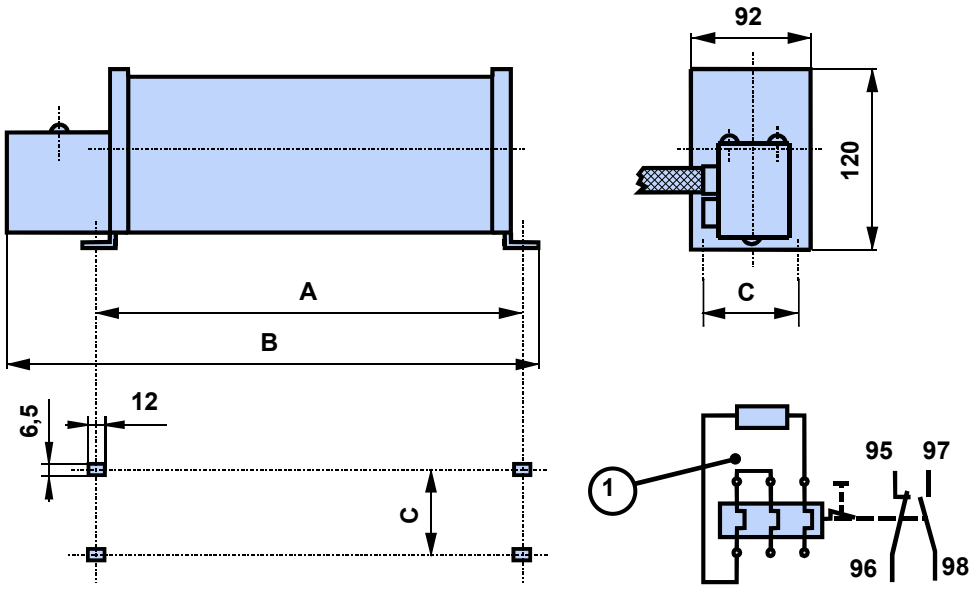


Stated in mm

7.4.5. Braking resistor ACB-0003-01 for PSD1-M_P020

Pulse power (W) Tu ~ 40 °C *referring to a cycle time of120 s (reference value)	**ED 1%***	30.0
	ED 6%*	12.0
	ED 15%*	6.8
	ED 25%*	4.5
	ED 40%*	3.2
	ED 60%*	2.3
Nominal continuous output (W) Ta ~ 40°C		1.5
Nominal resistance value at 20°C		15 Ω
Nominal tolerance at 20°C		±10%
Type of protection (EN 60529) (in the corresponding bolted state)		IP 20
Max. permitted operation voltage		600 VAC or 800 V DC
Cooling		Natural convection
Electrical connection		on the thermal current overload cut-off 2.5 mm²
Operating temperature range		+5 ... +40 °C
Test voltage		2.5 kV AC
Certification / Marking		CE
Weight		4.4 kg
Mounting positions		

Scale drawing:



1: thermal overcurrent relay

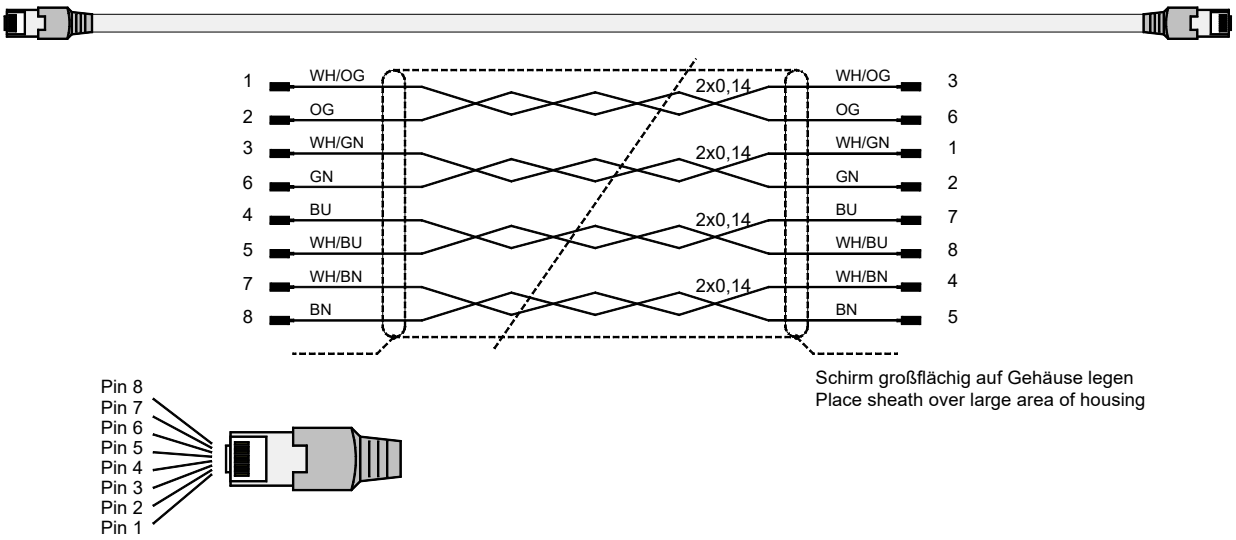
		ACB-0003-01
O	mm	540
B	mm	620
C	mm	64

7.5 Interface Cables

In this chapter you can read about:

7.5.1. Ethernet Cables: CBD000C0-T00-T00-xxxx-00

Ethernet - Crossover - cable Cat5e



Length code des Ethernet - Crossover - cables: CBD000D0-T00-T00-xxxx-00

xxxx = Length code (Active part length in dm)

0.25 m	CBD000D0-T00-T00-0002-00
0.5 m	CBD000D0-T00-T00-0005-00
1 m =	CBD000D0-T00-T00-0010-00

8. Technical data

In this chapter you can read about:

8.1 PSD1-S: Single device

In this chapter you can read about:

8.1.1. Mains connection PSD1-S

Category	Specifications	
PSD1-S	**PSD1-S_1200**	**PSD1-S_1300**
Mains voltage	3 phases 3* 230 VAC ±10% 30 ... 253 VAC / 50-60 Hz or Single Phase 230 VAC ±10% 30 ... 253 VAC / 50-60 Hz	
Input Current	1AC230V: 6.8 Arms 3AC230V: 1.7 Arms	1AC230V: 11 Arms 3AC230V: 4.2 Arms
Maximum fuse per device*	Single phase: 8 A Three phases: 3 A Fuse Class: gS (gRL), Time-delay	Single phase: 12 A Three phases: 6 A Fuse Class: gS (gRL), Time-delay
Earth leakage current	**Current on the mains PE** (see page 24) (>3,5 mA)	
Supply networks	**Possible supply networks** (see page 24): TN	

* Circuit breakers for operation according to CE.
Circuit breakers for UL und CSA see **Chapter UL** (see page 18, see page 21).

Please observe the notes in chapter "Operating conditions for CE-conform operation **(see page 13)".**

8.1.2. Output data PSD1-S 1/3*230 VAC

Category		Specifications	
Device type		**PSD1-S_1200 (2 A)**	**PSD1-S_1300 (5 A)**
Output voltage		3 x 0 ... 230 V ±10 %	
Output current*:			
$I_{Nominal}$ [Arms]	**4 kHz**	2	5
I_{peak} (2 s) [Arms]	**4 kHz**	6	15
$I_{Nominal}$ [Arms]	**8kHz**	**2**	**5**
I_{peak} (2 s) [Arms]	**8kHz**	**6**	**15**
$I_{Nominal}$ [Arms]	**16 kHz**	1.332	3.33
I_{peak} (2 s) [Arms]	**16 kHz**	3.996	9.99
Power at continuous operation		0.64kW (3-phases mains supply) 0.64 kW (1-phase mains supply)	1.6 kW (3-phases mains supply) 1.6 kW (1-phase mains supply)
Switching frequency of the motor current		8 kHz	8 kHz
Heat dissipation for In		13 W	35 W

* Output current bei verschiedenen switching frequency. The default settings of the currents und switching frequencies are grayed out & in bold..

8.1.3. Control Voltage 24 VDC PSD1-S

Category	Specifications
Voltage operating range	21.6 - 27.0 VDC (24 VDC -10% +12.5%)
Ripple	0.5 Vss
Requirement according to safe extra low voltage (PELV)	yes (class 2 mains module)
Electric current drain	0.5 A + Output current of digital output currents (fed via connectors X17/2, 3) + Output current of motor brakes (fed via connectors X51/1 & 2)) + Current requirements of optional boards

8.1.4. Braking operation PSD1-S

Category	Specifications	
Controller type	**PSD1-S_1200 (2 A)**	**PSD1-S_1300 (5 A)**
Capacity/ storable energy	760 µF / 15 Ws	1140 µF / 23 Ws
Minimum braking resistance	51 Ω	51 Ω
Maximum current	7.84 A	7.84 A

Data of the integrated braking resistor PSD1-S

Category	Specifications			
Device	**Maximum current**		**Max. Duty Cycle**	**Minimum resistance value**
	Peak	**Duration**		
PSD1-SW1200 PSD1-SW1300	7.84 A	0.1 A	1.27% @ 60 s	51 Ω (40W)

External ballast resistors from Parker (see page *89*).

8.1.5. Size / weight of PSD1-S

Category	Specifications	
Controller type	**Weight [kg]**	**Dimensions Height x Width x Depth (mm)**
PSD1-S_1200	**1.33**	200 x 50 x 180
PSD1-S_1300		

Mounting (see page 28)

8.2 PSD1-M: Multi-axes system

In this chapter you can read about:

8.2.1. Mains Connection Power module PSD1-M_P010 without line choke

Category	Specifications		
PSD1-M_P010	**230 V**	**400 V**	**480 V**
Mains voltage	230 VAC ±10 % 50-60 Hz	400 VAC ±10 % 50-60 Hz	480VAC ±10% 50-60Hz
Rated voltage	3 AC 230 V	3 AC 400 V	3 AC 480 V
Input Current	22 Arms	22 Arms	18 Arms
Output voltage	325 VDC ±10 %	565 VDC ±10 %	680 VDC ±10 %
Output power	6 kW	10 kW	10 kW
Pulse power (<5 s)	12 kW	20 kW	20 kW
Power dissipation	60 W	60 W	60 W
Maximum fuse rating per device	Measure for line and device protection: UL listing (DIVQ) fuses Manufacturer: ABB, Stotz-Kontakt GmbH (E212323) Model No.: S203UP-K, 1 fuse 480 VAC, 3-phase, 25 A, operating temperature 55 °C		

8.2.2. Mains connection Power module PSD1-M_P010 with line choke

Increased power by means of a line choke (see page *87*)

Category	Specifications		
PSD1-M_P010 with line choke	**230 V**	**400 V**	**480 V**
Mains voltage	230 VAC ±10 % 50-60 Hz	400 VAC ±10 % 50-60 Hz	480VAC ±10% 50-60Hz
Rated voltage	3 AC 230 V	3 AC 400 V	3 AC 480 V
Input Current	24.5 A	24.5 A	20.4 A
Output voltage	325 VDC ±10 %	565 VDC ±10 %	680 VDC ±10 %
Output power	9 kW	15 kW	15 kW
Pulse power (<5 s)	18 kW	30 kW	30 kW
Power dissipation	70 W	70 W	70 W
Maximum fuse rating per device	Measure for line and device protection: UL listing (DIVQ) fuses Manufacturer: ABB, Stotz-Kontakt GmbH (E212323) Model No.: S203UP-K, 1 fuse 480 VAC, 3-phase, 25 A, operating temperature 55 °C		
Earth leakage current	**Current on the mains PE** (see page 24) (>3,5 mA)		
Supply networks	**Possible supply networks** (see page 24): TN		

⚠WARNING The specified performance data are only valid in connection with line choke **IND-0001-02** (see page 87).

8.2.3. Mains Connection Power module PSD1-M_P020 without line choke

Category	Specifications		
PSD1-M_P020	**230 V**	**400 V**	**480 V**
Mains voltage	230 VAC ±10 % 50-60 Hz	400 VAC ±10 % 50-60 Hz	480VAC ±10% 50-60Hz
Rated voltage	3 AC 230 V	3 AC 400 V	3 AC 480 V
Input Current	44 Arms	44 Arms	35 Arms
Output voltage	325 VDC ±10 %	565 VDC ±10 %	680 VDC ±10 %
Output power	12 kW	20 kW	20 kW
Pulse power (<5 s)	24 kW	40 kW	40 kW
Power dissipation	120 W	120 W	120 W

Maximum fuse rating per device **2 special purpose fuses in line are required**	**Cable protection measure:** MCB (K characteristic) with a rating of 50A / 4xxVAC (depending on the input voltage) Recommendation: (ABB) S203U-K50 (440VAC) **Device protection measure:** Circuit breakers 80A / 700VAC per supply leg in accordance with UL category JFHR2 Requirement: Bussmann 170M1366 or 170M1566D

8.2.4. Mains connection Power module PSD1-M_P020 with line choke

Increased power by means of a line choke (see page *87*)

Category	Specifications		
PSD1-M_P020 with line choke	**230 V**	**400 V**	**480 V**
Mains voltage	230 VAC ±10 % 50-60 Hz	400 VAC ±10 % 50-60 Hz	480VAC ±10% 50-60Hz
Rated voltage	3 AC 230 V	3 AC 400 V	3 AC 480 V
Input Current [rms]	44 A	44 A	40 A
Output voltage	325 VDC ±10 %	565 VDC ±10 %	680 VDC ±10 %
Output power	15.5 kW	27 kW	30 kW
Pulse power (<5 s)	31 kW	54 kW	60 kW
Power dissipation	140 W	140 W	140 W

Maximum fuse rating per device **2 special purpose fuses in line are required**	**Cable protection measure:** MCB (K characteristic) with a rating of 50A / 4xxVAC (depending on the input voltage) Recommendation: (ABB) S203U-K50 (440VAC) **Device protection measure:** Circuit breakers 80A / 700VAC per supply leg in accordance with UL category JFHR2 Requirement: Bussmann 170M1366 or 170M1566D
Earth leakage current	**Current on the mains PE** (see page 24) (>3,5 mA)
Supply networks	**Possible supply networks** (see page 24): TN

⚠WARNING The specified performance data are only valid in connection with **line choke** (see page 87) IND-0002-01 or IND-0002-02 (UL).

8.2.5. Output data servo modules PSD1-M 3*400 VAC

Category	Specifications [1]		
Controller type	Number of power output stage	Rated Output Current [A_{rms}]	Pulse current for 2 s [A_{rms}]
PSD1-M_1300	1	5	10
PSD1-M_1400	1	8	16
PSD1-M_1600	1	15	30 [2]
PSD1-M_1800	1	30	60 [2]
PSD1-M_2220	2	2 + 2	4 + 4
PSD1-M_2330	2	5 + 5	10 + 10
PSD1-M_2440	2	8 + 8	16 + 16
PSD1-M_2630	2	15 + 5 [3]	30 [2] + 10
PSD1-M_3222	3	2 + 2 + 2	4 + 4 + 4
PSD1-M_3433	3	8 + 5 + 5 [3]	16 + 10 + 10

[1] At **default setting of the switching frequency** (see page 51).

[2] **Minimum rotating field frequency for peak current at 15 A & 30 A output stages: f > 3 Hz; with a rotating field frequency of f <3 Hz the maximum peak current duration is 100 ms**

[3] Maximum total output current per device: 16 A.

8.2.6. Output data of the PSD1-M power output stages

Category		Specifications				
Power output stage		2 A	5 A	8 A	15 A [2]	30A [2]
Input voltage		300 ... 750 VDC				
Output voltage		3x 0-400 V (0...450 Hz)				
Power at continuous operation [1]		1.2 kVA	3 kVA	4.8 kVA	9 kVA	18 kVA
Power dissipiation [1]		20 W	45 W	75 W	105 W	220 W
Output currents [3]		With 400 VAC at the power module				
$I_{Nominal}$ [Arms]	4 kHz	2	5	8	**15**	**30**
I_{peak} (2 s) [Arms]	4 kHz	4	10	16	**30**	**60**
$_{Nominal}$ [Arms]	8kHz	**2**	**5**	**8**	10	20
$_{I\ peak}$ (2 s) [Arms]	8kHz	**4**	**10**	**16**	20	40
$_{Nominal}$ [Arms]	16 kHz	1.33	3.33	5.33	5	11
$_{I\ peak}$ (2 s) [Arms]	16 kHz	2.67	6.66	10.66	10	22
Output currents [3]		At 480 VAC at the power module				
$I_{Nominal}$ [Arms]	4 kHz	2	5	8	**12.5**	**25**
I_{peak} (2 s) [Arms]	4 kHz	4	10	16	**25**	**50**
$I_{Nominal}$ [Arms]	8kHz	**1.8**	**4.5**	**7.2**	8	15
I_{peak} (2 s) [Arms]	8kHz	**3.6**	**10**	**14.4**	16	30
$I_{Nominal}$ [Arms]	16 kHz	1.07	2.67	4.27	4	8.5
I_{peak} (2 s) [Arms]	16 kHz	2.13	5.33	8.53	8	17

[1] For continuous operation with a mains supply of 400 VAC at the mains module.

[2] **Minimum rotating field frequency for peak current at 15 A & 30 A output stages: f > 3 Hz; with a rotating field frequency of f <3 Hz the maximum peak current duration is 100 ms**

[3] Output current bei verschiedenen switching frequency. The default settings of the currents und switching frequencies are grayed out & in bold.

8.2.7. Control voltage 24 VDC PSD1-M_P (mains module)

Category	Specifications
Voltage operating range	21.6 - 27.0 VDC (24 VDC -10% +12.5%)
Ripple	0.5 Vss
Requirement according to safe extra low voltage (PELV)	yes
Electric current drain	PSD1-M_P010: 0.2 A PSD1-M_P020: 0.3 A ea. PSD1-M Axis: 1.0 A + Output current of digital output currents (fed via connectors X17/2, 3) + Output current of motor brakes (fed via connectors X46/7 & 8; PSD1M_1800 X44/3 & 4) + Current requirements of optional boards

8.2.8. Braking operation PSD1-M

Mains modules

Category	Specifications	
Device type	PSD1-M_P010	PSD1-M_P020
Capacity/ storable energy	550 µF/ 92 Ws at 400 V 53 Ws at 480 V	1175 µF/ 197 Ws at 400 V 114 Ws at 480 V

Servo Drives

Category	Specifications	
Controller type	PSD1-M (unless PSD1-M_1800)	PSD1-M_1800 (30 A)
Capacity / storable energy (±20 %)	220 µF / 37 Ws at 400 V 21 Ws at 480 V	440 µF / 74 Ws at 400 V 42 Ws at 480 V

8.2.9. Dynamic braking module

Data of the integrated dynamic brake module PSD1-M_P

Category	Specifications			
Mains module	Maximum current		Max. Duty Cycle	Minimum resistance value
	Peak	Duration		
PSD1-M_P010	28.8 A	4.27 A (500 W)	2.2 % (@60 s)	27 Ω
		7.5 A (1500 W)	6.7 % (@60 s)	
PSD1-M_P020	78.0 A	7.06 A (500 W)	0.82 % (@60 s)	10 Ω
		22.3 A (5000 W)	8.2 % (@60 s)	

Recommended braking resistors

Category	Specifications	
Mains module	Minimum resistance value	Power
PSD1-M_P010	27 Ω	500 W ... 1500 W
PSD1-M_P020	10 Ω	500 W ... 5000 W

External ballast resistors from Parker (see page 89).

8.2.10. Size / Weight PSD1-M

Category	Specifications	
Controller type	Weight [kg]	Dimensions Height x Width x Depth [mm]
PSD1-M_1300	4	360 x 50 x 270
PSD1-M_1500		
PSD1-M_1600		
PSD1-M_P010		
PSD1-M_2220	4	
PSD1-M_2330		
PSD1-M_2440		
PSD1-M_2630		
PSD1-M_3222	4.2	
PSD1-M_3433		
PSD1-M_1800	6.8	360 x 100 x 270
PSD1-M_P020	6,3	

Mounting (see page 41, see page 43, see page 28)

8.3 Motors/ feedback/ motor holding brake

In this chapter you can read about:

8.3.1. Motor technologies supported

Category	Specifications
Motors **Direct drives** • Linear motors • Torque motors	• Sinusoidally commutated synchronous motors ♦ Maximum rotating field frequency: 590 Hz max. Velocity: 60*590/number of pole pairs in [min^{-1}]. ♦ Maximum number of poles = 1200 • Temperature sensor supported: ♦ KTY84-130(insulated in accordance with EN60664-1 or IEC60664-1) ♦ PTC / NTC switches ♦ KTY83-110 ♦ PT1000 • 3 phase synchronous direct drives

8.3.2. Feedback system HIPERFACE DSL®

	Single Turn	Multiturn
Order Number	ENCODERS5	ENCODERS6
Resolution	18 Bit	18 Bit
Measurement steps per revolution	262144	262144
Captured revolutions	1	4096
Integral non-linearity	± 80 "	± 80 "
Differential non-linearity	± 40 "	± 40 "
Maximum speed	12000 min^{-1}	9000 min^{-1}
Rotor moment of inertia	450 gmm^2	450 gmm^2
Operating Temperature	-20 .. +105 °C	-20 .. +105 °C
Protection class	IP40	IP40
Safety technology (IEC 61508 – EN ISO 13849)	SIL2; PL d	SIL2; PL d

8.3.3. Resolver

Category	Specifications
Resolution of the motor position	• Position resolution: 16.6 Bits (= 0.005°) • Absolute accuracy: ±0.167°
Resolver supported	• **LTN**: RE-21-1-A05, RE-15-1-B04 • **Tamagawa:** TS2610N171E64, TS2620N21E11, TS2640N321E64, TS2660N31E64 • **Tyco (AMP):** V23401-T2009-B202
Resolver data supported	• Transformation ratio: 0.25... 1 (typical 0.5) • Exciting frequency 8kHz • Amplitude of the excitation signal: max. 9.5 V_{ss}. (The resolver must be approved for at least this value).

Accuracy
The exactitude of the position signal is above all determined by the exactitude of the feedback system used.

8.3.4. Incremental encoder / analogue HAL sensor

Category	Specifications
Incremental encoder (see page 37) * (square wave or Sine/ Cosine signal)	• Linear or rotary • Signal ♦ Sin/Cos signal: max. 5 VSS; typical 1 VSS; 90° offset, max. 400 kHz or ♦ A/B pluses; 90 ° electrical phase shift (max 5 MHz) with the following commutation options: • Automatic commutation or • U, V, W or R, S, T commutation signals (NPN open collector) e.g. digital hall sensors, incremental encoders made by Hengstler (F series with electrical ordering variant 6)
Analogue Hall sensor (see page 37) *	• Linear or rotary • Sin/Cos signal: max. 5 VSS; typical 1 VSS; 90° offset, max. 400 kHz

* in the first expansion stage only for PSD1-S and PSD1MW1 Multi axes device with one powerstage.

8.3.5. Motor holding brake output

Category	Specifications
Voltage operating range	21 ... 27 VDC
Maximum output current (short circuit proof)	PSD1-S: 1.0 A PSD1-M: 1.6 A

8.4 Digital inputs / outputs (specifications)

Category	Specifications
Digital inputs	• 4 Digital inputs • Input resistor 22 kΩ All inputs and outputs do have 24 V level. Input level: "0" (low) = Rated Input Voltage ≤ 12.5 V "1" (high= Rated Input Voltage ≥ 13.5 V
Digital outputs	• 2 Digital outputs (4 on mains module) • Load max. 100 mA

8.5 Technical data STO

Category	Specifications	
STO Certificate (http://www.Parker.com/Literature/Electromechanical Europe/Certificates/DOC-0014-01_PSD_STO_Certificate.pdf)	According to EN ISO13849 Device certified if "STO certified" is stated in type plate (below the CE sign)	
Nominal voltage of the inputs	24 VDC	
Required isolation of the 24V control voltage	Grounded protective extra low voltage, PELV	
Fuse protection	Protection of the STO control voltage: 1 A	
Number of inputs Signal inputs via optocoupler	2 Low = 0 ... 5 V DC or open High = 15 ... 26.4 VDC I_{in} at 24 VDC: 9 mA +/-1 mA	
STO Input A, Level	Low or open = STO activated High = STO deactivated Reaction time max. 5 ms	
STO Input B, Level	Low or open = STO activated High = STO deactivated Reaction time max. 5 ms	
Switch-off time	Switch-off time with unequal input statuses: 10 s (max. error response time) During the inequality, it is ensured within 5 ms that the motor torque is switched off single-channel.	
Maximum tolerable test pulse time	Maximum tolerable test pulse time (low active) for external safety control: 1 ms	
Grouping of safety level	• Category 3 • PL=e • SIL 3 • PFHd=1.00E-9 per STO circuit • Mission time: 20 years • MTTFd = 800 years (when using EN ISO 13849-1 the MTTFd value must be limited to 100 years)	

8.6 EC directives and applied harmonized EC norms (PSD1)

Category	Specifications
EU Low Voltage Directive 2014/35/EU	**EN 61800-5-1,** Standard for electric power drives with settable speed; requirements to electric safety **EN 60664-1,** isolation coordinates for electrical equipment in low-voltage systems **EN 60204-1, machinery norm** partly applied
EC-EMC directive 2014/30/EU	**EN 61800-3, EMC standard** Product standard for variable speed drives

8.7 EMC limit values PSD1

Category	Specifications
EMC interference emission	Limit values in accordance with EN 61 800-3, Limit value class C3 with mains filter.
EMC disturbances	Industrial area limit values in accordance with EN 61 800-3

8.8 Insulation requirements PSD1

Category	Specifications
Protection class	Protection class in accordance with EN 60664-1
Protection against human contact with dangerous voltages	In accordance with EN 61800-5-1
Overvoltage Category	Voltage category III in accordance with EN 60664-1

8.9 Environmental requirements PSD1

Category	Specifications
General ambient conditions	According to **EN 60 721-3-3** Climate (temperature/humidity/barometric pressure): Class 3K3
Permissible ambient temperatures:	Mode of operation 0 to +40 °C Class 3K3 Storage –25 to +70 °C Transport –25 to +70 °C
Tolerated humidity:	Operation <= 85% Class 3K3 Storage <= 95 % Transport <= 95 % (Relative humidity)
Elevation of operating site	<=1000m above sea level for 100% load ratings <=2000m above sea level for 1% / 100m power reduction please inquire for greater elevations
Sealing	Type of protection IP20 according to EN 60 529
Mechanic resonances:	With packaging (transport/ storage): 10 m/s²; 9 – 200 Hz Without packaging: 10 m/s²; 57 – 150 Hz
Pollution degree	Degree of contamination 2 in accordance with EN 60664-1 and EN 61800-5-1

8.10 cUL certification

Category	Specifications
PSD1M:	UL508C, 3rd Edition, power supply load revision November 9th, 2010. C22.2 N°.274-13, 12th Edition, last revision March 2013.
PSD1S:	UL61800-5-1 1st Edition, issued June, 8th, 2012 C22.2 No.274-13, 1st Edition, issued March, 2013
Certified	E-File_No.: E142140 The cUL approval is documented by a "UL" logo on the device (type specification plate). c UL us LISTED

8.11 EtherCAT characteristics

Category	Specifications
Profile	Motion Control CiADS402
Baud rate	100 MBits (FastEthernet)
Service data object	SDO
Cycle Time	>=1 ms
Synchronicity accuracy	maximum jitter: +/-25µs

8.12 PROFINET Characteristics

Category	Specifications
Profile	• PROFIdrive profile drive technology V4.2
PROFINET Version	• PROFINET IO (RT)
Transmission mode	• 100BASE-TX (Full Duplex)
Profinet ID	• PSD1-S: 0x5331 PSD1-M: 0x4D78
Device master file	• **PSD1-S http://www.Parker.com/Literature/Electromechanical Europe/Downloads/GSDML-V2.3-Parker-PSD1S.zip** • **PSD1-M http://www.Parker.com/Literature/Electromechanical Europe/Downloads/GSDML-V2.3-Parker-PSD1M.zip**
Realized application class	• AC 3 Positioning

8.13 Ethernet IP characteristics

Category	Specifications
Profile	DS402
Ethernet/IP	• Generic device support for CIP and encapsulated layer
Ethernet	• Several Ehernet interfaces are supported e.g., for devices with embedded switch technology (for the support of linear or ring topology)
Connection established	• Device Level ring (DLR) functionality is supported (announce based ring nod)
Connections	• Simultaneous support for up to 10 I/O connections • Simultaneous support for up to 10 encapsulation sessions • Simultaneous support for up to 2 explicit messaging connections per encapsulation session • Unconnected explicit messaging is supported
Service(s)	• Quality of Service (QoS) supported • UDP for order list services, list targets and list identity for encapsulation protocol available • Pv4 address conflict detection for EtherNet/IP devices
Device master file	• **PSD1 http://solutions.parker.com/psd_support**
Product Code	• PSD1S: 21297 (0x5331) • PSD1M_1: 19761 (0x4D31) (1 power stage) • PSD1M_2: 19762 (0x4D32) (2 power stages) • PSD1M_3: 19763 (0x4D33) (3 power stages)
Vendor code	• 4
Realized object grades	• Identity • Message Router • Assembly • Connection manager • Device level ring • QoS • PSD1 object pool • TCP/IP Interface • Ethernet Link

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