

# PSD1 Parker Servo Drive

Standalone Servo Drive and Multi-axis Servo System



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# Parker Servo Drive - PSD

## 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.



PSD1-S unique features

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

Standalone axis PSD1 S	Continuous current [A <sub>rms</sub> ]	Peak current A (≤ 2 s)
PSD1 SW1200	2	6
PSD1 SW1300	5	15

**The PSD servo drive is available in two versions:**

- **Basic: Used as fieldbus slave**
- **Programmable:**
  - Intelligent standalone drive
  - Runtime based on CODESYS V3
  - IEC 61131-3
  - PLCopen function blocks

### Common Features

**The PSD servo drives support the following feedback systems (chosen by configuration):**

- DSL (Single or Multiturn) Single cable solution
- Resolver
- 1 Vpp Rotary and Linear Encoders
- Incremental TTL Encoders
- **EtherCAT / PROFINET / Ethernet/IP**
- **Quick and simple wiring**
- **Removable SD card**
- **Same software functionalities for standalone drive and multi-axis servo system**

### Applications

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



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**

Multi axis PSD1 M	Continuous current [A <sub>rms</sub> ]	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 MW3222	2 + 2 + 2	4 + 4 + 4
PSD1 MW3433	8 + 5 + 5	16 + 10 + 10

(additional module on request)

## PSD Overview

### Communications

The support of all common Fieldbus interfaces is an essential feature of open systems. The PSD is based on the modern Ethernet based interfaces such as EtherCAT, PROFINET and Ethernet IP.

### Feedback Systems

The PSD servo drives support the following feedback systems:

- DSL (Single or Multiturn) Single cable solution
- Resolver
- 1 Vpp Rotary and Linear Encoders
- Incremental TTL Encoders
- Analog hall

All different Feedbacks can be used on identical hardware, kind of feedback can be chosen just simple configuration

Note: On all single axis devices the full set of feedback is possible, and can be chosen by configuration. On double and triple axis modules either DSL or resolver can be configured.

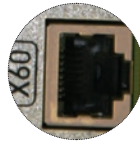
The PSD is available in two versions:  
**B: Basic**

The drive is used as slave on various field busses communicating via state machines

**C: Programmable**

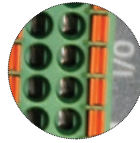
This drive version is fully programmable via IEC 61131 and offers the full set of programming languages and a complete set of function blocks incl DS402 and Profidrive state machine

EtherCAT®



### High speed communication

- Communication over Ethernet
- Onboard connection



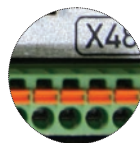
### Inputs / Outputs

- PSD offers 4 fast digital inputs and 2 digital outputs per axis.
- Connection via fast and simple push-in direct plug-in technology.



### Motor Feedback

- Resolver, 1Vpp, TTL



### Quick and Simple Wiring

- Single cable connection between drive and SMH motor
- Reduction in wiring costs
- Increase reliability



### Reduce machine footprint

- Up to 3 axis in one single housing
- Reduce the size of the cabinet
- Electronics footprint is up to 40 % smaller than traditional solutions



**High Performance and customization capabilities**

- Autotuning
- Observer technology
- Anti resonance adjustments, vibration suppression, notch-filter...
- Fast control loops (sample times):
  - Current control 62,5  $\mu$ s,
  - Speed control 125  $\mu$ s,
  - Position control 125  $\mu$ s



**Removable SD card**

- Easy exchange between drives less than 1 minute
- Software upgrade
- Parameters and application memory



**STO Safety Functions reduce time and cost, no need additional cabling**

- 2 Safety Torque Off (STO) circuits for 3 axis module (one for axis 1 and one for axis 2,3).
- 2 independent Safety Torque Off circuits for 2 axis module
- 1 Safety Torque Off circuit for 1 axis module
- Optional Safety Functions over EtherCAT FSoE



**DC Bus energy saving**

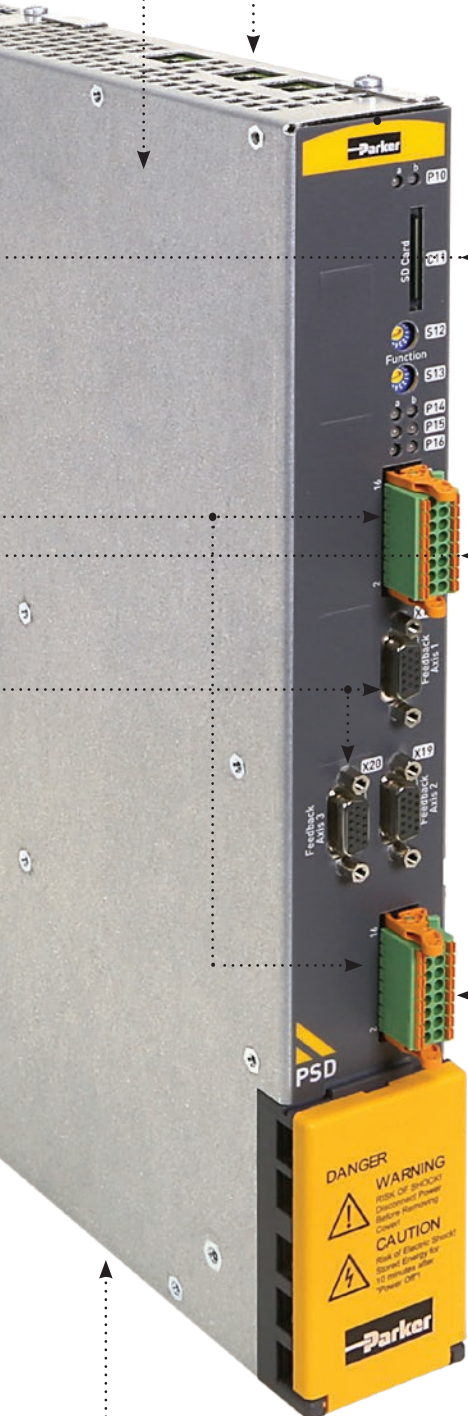
- Energy exchange between drives
- No accessories required

**Parker Servo Manager**

The set-up and commissioning of the drive can be done easily using the wizard based configuration tool. Parker motors will be recognized by a electronic nameplate.




- **Wizard-guided configuration and parametrization**
- **Graphical diagnostics / maintenance / service**
  - Setup mode (absolute / relative movements, homing, jog, ...)
  - Adjustable four channel oscilloscope (single / normal / auto / roll)
  - Export as image or table (CSV format)
  - Autotuning via automated inertia identification
  - Enhanced optimization possibilities
  - Configurable status overview




# Technical Characteristics


## Technical Data


### PSD1 SW Standalone Axis

	<b>Type</b>		<b>Standalone Axis</b>			
	<b>Input voltage</b>	VAC	3*230 VAC ±10 % 50...60 Hz 1*230 VAC ±10 % 50...60 Hz 30...253 VAC			
	<b>PWM Frequency nom.</b>	kHz	8		8	
	<b>Possible PWM frequency</b>	kHz	4 / 8 / 16		4 / 8 / 16	
	<b>Continuous current</b>	A	2		5	
	<b>Peak current (≤ 2 s)</b>	A	6		15	

### PSD1 MW Multi-Axis Module

	<b>Type</b>		<b>Single Axis</b>			
	<b>DC Bus voltage</b>	VDC	325...680 VDC ±10 % (Rated voltage 560 VDC)			
	<b>PWM Frequency nom.</b>	kHz	8	8	4	4
	<b>Possible PWM frequency</b>	kHz	4 / 8 / 16	4 / 8 / 16	4 / 8 / 16	4 / 8 / 16
	<b>Continuous current</b>	A	5	8	15	30
	<b>Peak current (≤ 2 s)</b>	A	10	16	30	60

	<b>Type</b>		<b>Twin Axis</b>			
	<b>DC Bus voltage</b>	VDC	325...680 VDC ±10 % (Rated voltage 560 VDC)			
	<b>PWM Frequency nom.</b>	kHz	8	8	8	
	<b>Possible PWM frequency</b>	kHz	4 / 8 / 16	4 / 8 / 16	4 / 8 / 16	
	<b>Continuous current*</b>	A	2 + 2	5 + 5	8 + 8	
	<b>Peak current (≤ 2 s)</b>	A	4 + 4	10 + 10	16 + 16	

	<b>Type</b>		<b>Triple Axis</b>			
	<b>DC Bus voltage</b>	VDC	325...680 VDC ±10 % (Rated voltage 560 VDC)			
	<b>PWM Frequency nom.</b>	kHz	8		8	
	<b>Possible PWM frequency</b>	kHz	4 / 8 / 16		4 / 8 / 16	
	<b>Continuous current*</b>	A	2 + 2 + 2		8 + 5 + 5	
	<b>Peak current (≤ 2 s)</b>	A	4 + 4 + 4		16 + 10 + 10	

\*with an continuous limit current at 16A max. by module

### PSD1-MW-P - Power Supply Unit

#### Mains Supply

Type	Unit	PSD1 MW P010			with IND-0001-02*			PSD1 MW P020			with IND-0002-0x*		
<b>Input Voltage</b>		3*230 ... 480 VAC ±10 % 50...60 Hz (Rated voltage 3*400 VAC)											
<b>Output Voltage</b>		325...680 VDC ±10 % (Rated voltage 560 VDC)											
<b>Supplied Voltage</b>	[VAC]	230	400	480	230	400	480	230	400	480	230	400	480
<b>Output Power</b>	[kVA]	6	10	10	9	15	15	12	20	20	19	30	30
<b>Peak Output Power (&lt;5 s)</b>	[kVA]	12	20	20	18	30	30	24	40	40	36	60	60

#### Control Supply

<b>Rated Input Voltage</b>		24 VDC ±10 %											
<b>Maximum Ripple</b>		1 V <sub>pkpk</sub>											
<b>Supply Current</b>	[A]	0.2 A			0.8 A			0.3 A			0.3 A		

(\*) Operation of the P010 and P020 power supplies with additional line choke (to be ordered separately).



## Environmental Characteristics

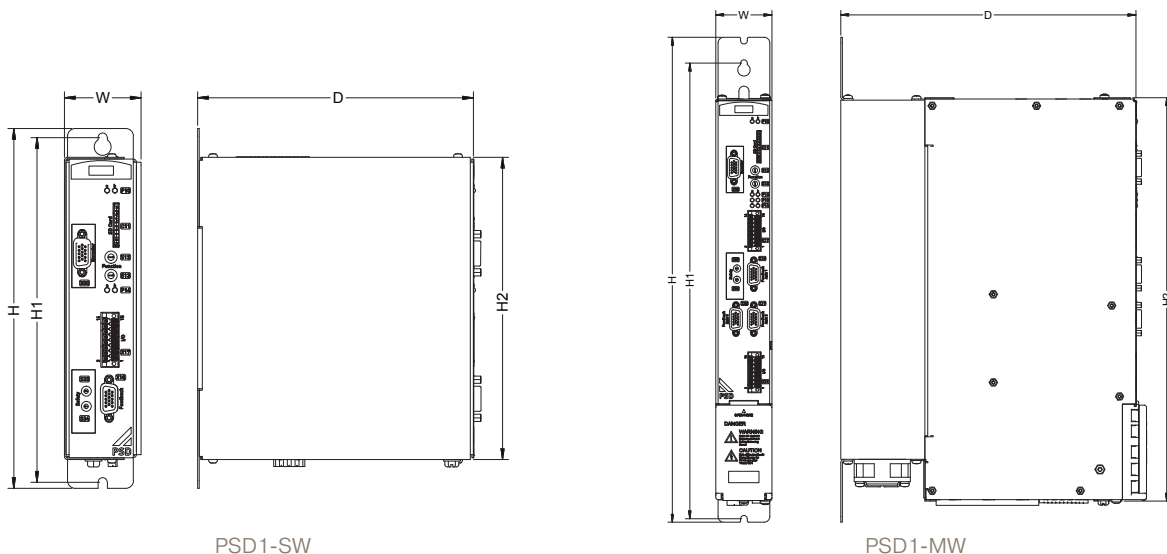
<b>Operating Temperature</b>	0...+40 °C
<b>Storage Temperature</b>	-25 °C...+70 °C
<b>Shipping Temperature</b>	-25 °C...+70 °C
<b>Product Enclosure Rating</b>	IP20 (only in closed electrical cabinet) UL open type equipment
<b>Altitude</b>	1000 m ASL. Derate output current by 1.0 % per 100 m to a maximum of 2000 m
<b>Operating Humidity</b>	Class 3K3 - Maximum 85 % non-condensing
<b>Storage Humidity</b>	Class 1K3 - Maximum 95 % non-condensing
<b>Shipping Humidity</b>	Class 2K3 - Maximum 95 % at 40 °C
<b>Operating Vibration</b>	IEC60068-2-6 10...57 Hz width 0.075 mm 57...150 Hz accel. 9.81 m/s <sup>2</sup>

## Standards & Conformance

<b>2006/95/EC</b>	Low voltage directive
<b>EN 60204-1</b>	Safety of machinery - Electrical equipment of machines - Part 1: General requirements
<b>EN 61800-5-1</b>	Adjustable speed electrical power drive systems - safety requirements, thermal and energy
<b>UL</b>	Power Conversion Equipment UL508C
<b>2004/108/EC</b>	EMC directive
<b>EN 61800-3</b>	Adjustable speed electrical power drive systems - Part 3: EMC product standard including specific test method
<b>STO</b>	Performance Level PL=e according to EN ISO 13849

## Dimensions

Type	H [mm]	H1 [mm]	H2 [mm]	W [mm]	D [mm]	Weight [kg]
<b>PSD1-SW</b>	235	225	200	50	180	1.8
<b>PSD1-MW 1/2/3 axes</b>	432	405	360	50	263	4.3
<b>PSD1-MW Single axis 30 A</b>	432	405	360	100	263	8.6
<b>PSD1-MW-P-010</b>	432	405	360	50	263	3.6
<b>PSD1-MW-P-020</b>	432	405	360	100	263	5.4



# Specific Functionalities

## Input & Output Option Board

With the additional I/O option board, the Parker Servo Drives are suitable for an even wider range of applications. The numerous in- and outputs can be used for a direct connection of sensors (e.g. for internal load control) or as setpoint input (e.g. for current or velocity). The multifunctional encoder interface meets the requirements for a second encoder input or an encoder emulation as an output.

### 8 Digital I/Os (switchable)

#### Digital Inputs

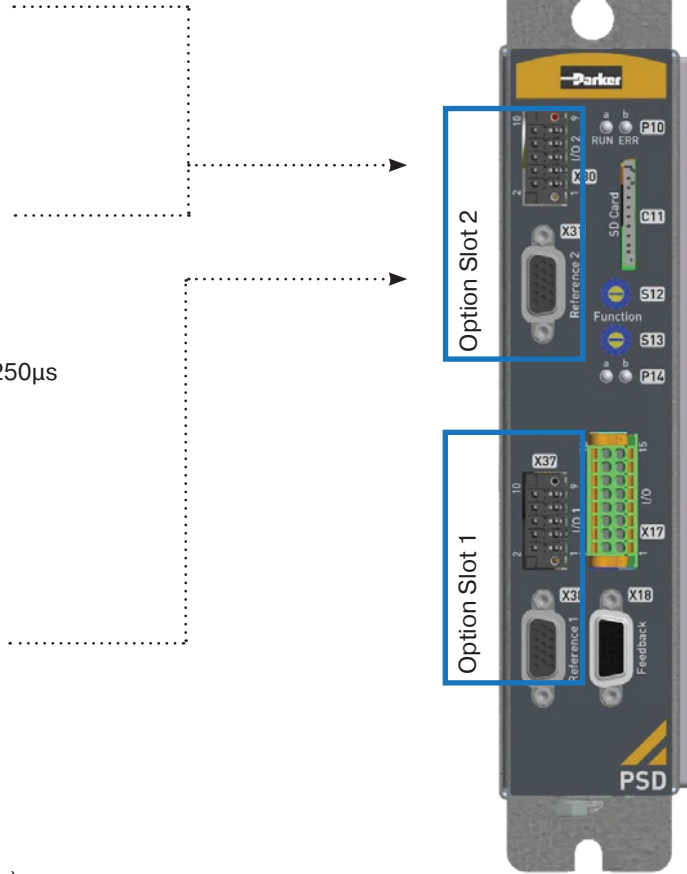
- Inputs according to IEC 61131-2 Type3
- Update rate 125µs

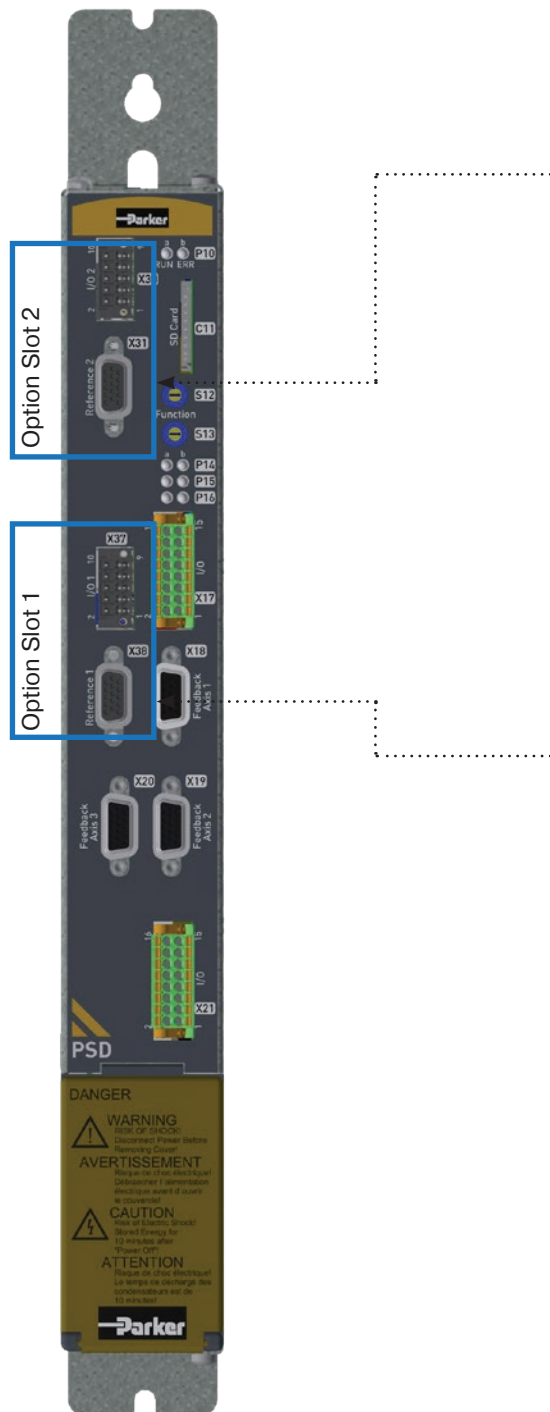
#### Digital Outputs

- High side switch
- Operation Voltage 12..30V
- Iout 70mA
- Short circuit protection to Output signal  $\leq 250\mu\text{s}$

#### 4 Analog Inputs

- Input Signal type
  - $\pm 10\text{V}$
  - 0..10V
  - 0..20mA
  - 4..20mA (Error detection)
- Resolution / Accuracy
  - 14Bit (12Bit ADC + 32x Oversampling)
- Update rate
  - For load control  $T_a \leq 125\mu\text{s}$
  - For setpoint and PLC issues
  - Delay =  $125\mu\text{s} + 62,5\mu\text{s}$





### Encoder Interface

- Encoder Input
  - Physical layer RS422
  - Supported protocols
    - RS422 A/B Encoder with Index
    - RS 422 Step/Direction
  - Power Supply for the external Encoder
    - 5V / 150mA
    - 24V (70mA )
- Encoder Emulation
  - Max Frequency (620kHz 2250rpm@16384inc/U)
  - RS422 as physical layer
  - Supported types:
    - A/B Encoder signal with Zero pulse
    - Step/Direction

**1 or 2 option boards are possible per device.**

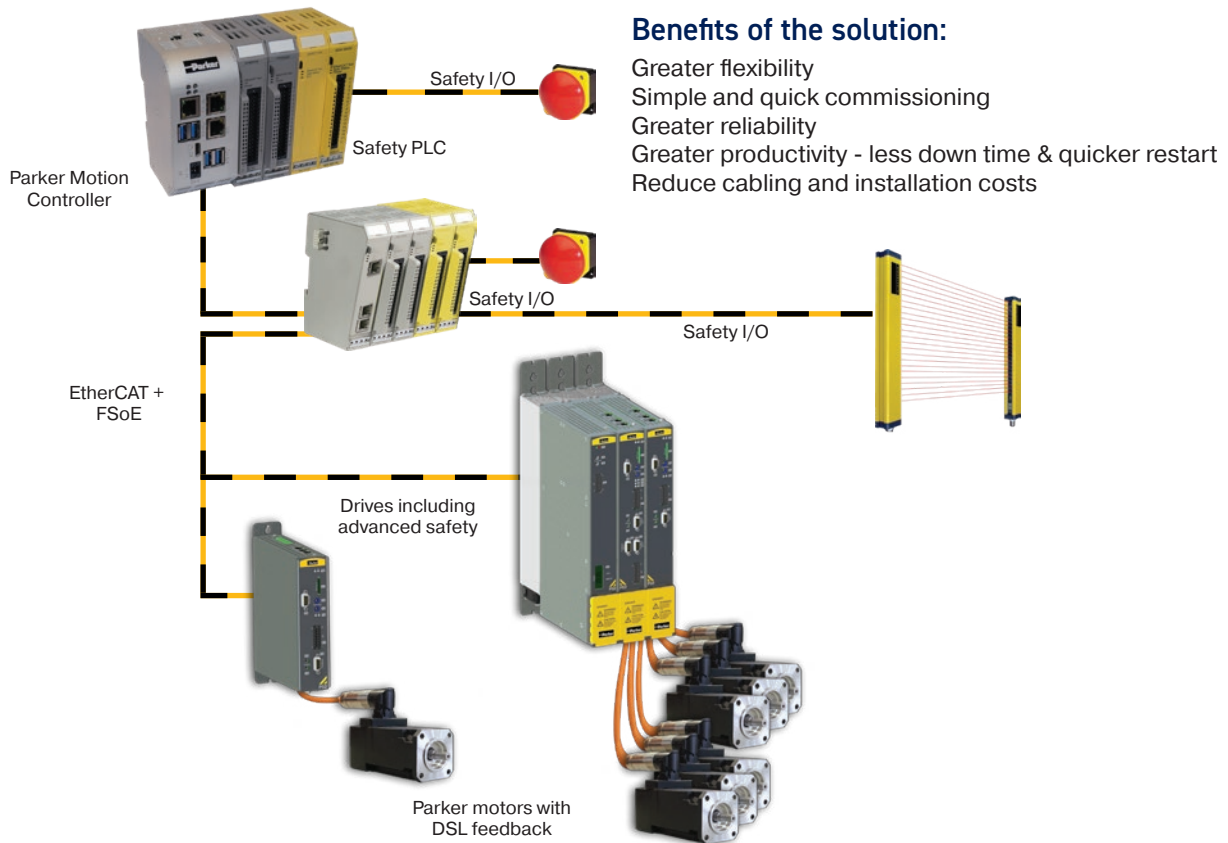
### Benefits:

- **Flexible & Cost-effective:** Wider choice of sensors. Saving costs by using sensors with standard interface instead of usually more expensive sensors with fieldbus interface.
- **Fast operation:** Achieving faster cycle times and less delay with direct connected sensors results in better performance of the closed loop controls.
- **Smart:** Small applications can be realized without external PLC
- **Support** for outdated technologies like PLCs with analog interface as setpoint channel to servo drives.

# Specific Functionalities

## Safety configuration

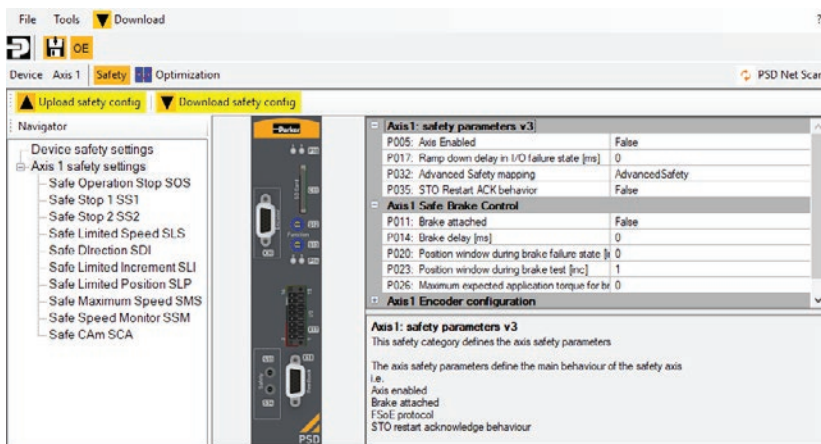
The Parker Servo Drives have featured "Safe Torque Off" (STO) as standard function, helping to protect users and machinery against unexpected motor start-up. Performance Level PL=e according to EN ISO 13849. In order to fulfil the new machinery directive 2006/42/EG, the PSD can be equipped with a safety option board. The system does not need any additional wiring, as the Functional Safety over EtherCAT (FSoE) uses the existing wiring.



### Benefits of the solution:

- Greater flexibility
- Simple and quick commissioning
- Greater reliability
- Greater productivity - less down time & quicker restart
- Reduce cabling and installation costs

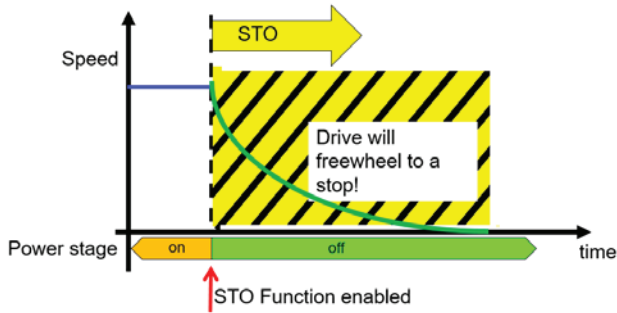
The Safety option board offers following safety functions:



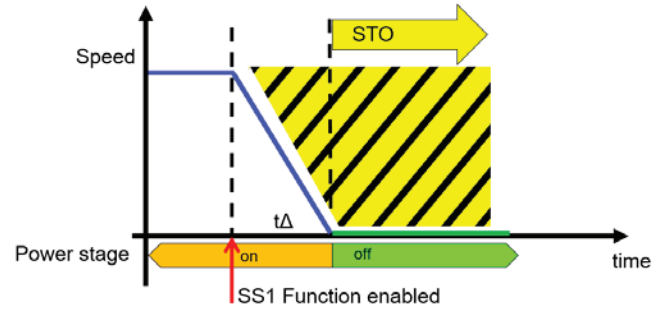
Besides the functionality shown in the picture it is possible to choose the STO either as hardwired input or via FSoE. Safe Brake Control is available as well

A few examples for the safety functions:

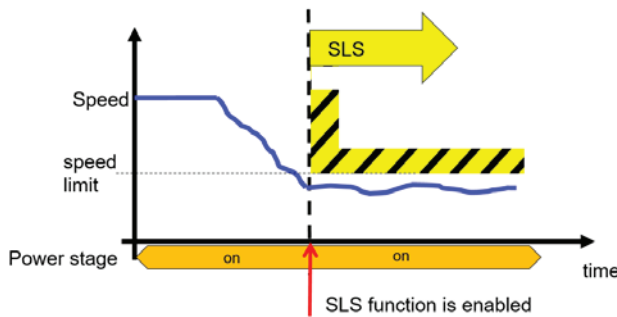
**STO: Safe Torque Off**



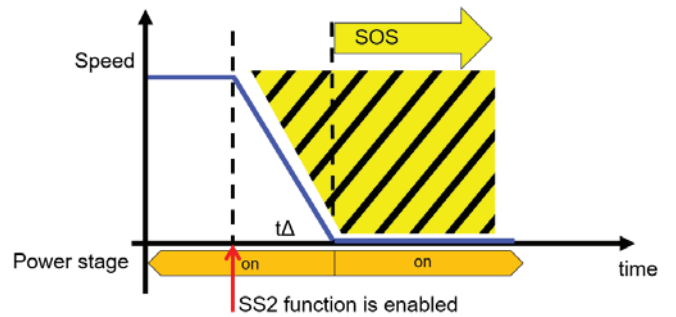
**SS1: Safe Stop 1**



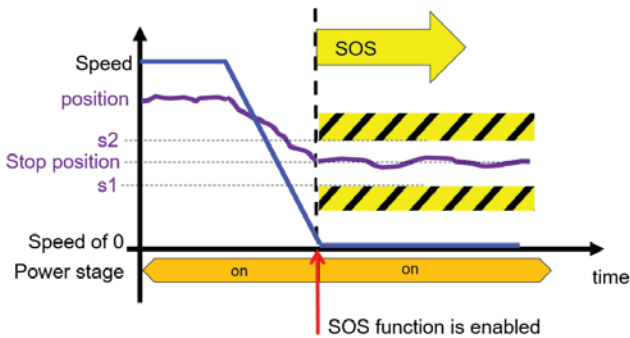
**SLS: Safe Limited Speed**



**SS2: Safe Stop 2**



**SOS: Safe Operating Stop**



## Programmable Version

### Programming

- According to IEC 61131-3
- Using at least CODESYS 3.5.15
- PLC Project management with Parker Servo Manager (Drive cloning, import & export)
- Profile State Machine Function block (Called up in IEC cycle)

### Technical Specifications

- Up to 3 PLC Tasks + one fast PLC Task (500µs)
- 500 \* 16 Bit Variables / BOOL, INT, WORD
- 150 \* 32 Bit Variables / DINT, DWORD, TIME, REAL
- 352 Recipe Variables (axis specific) / 32 columns and 11 rows (3 x LREAL, 4 x DINT, 2 x INT, 1xLINT, 1xSTRING)

### IEC 61131-3 standard modules

- Up to 8 timers (TON, TOF, TP)
- Triggers (R\_TRIG, F\_TRIG)
- Flip-flops (RS, SR)
- Counters (CTU, CTD, CTUD)

### Device specific functions modules

- PSD\_Input: Generates an input process image
- PSD\_Output: Generates an output process image
- PSD\_RecipeTable: Acces to recipe table

### PLCopen function modules

- Positioning: absolute, relative, additive, continuous
- Machine zero
- Stop, energizing the powerstage, reset error
- Position, device status, read axis error
- Electronic gearing (MC\_Gearin)
- Digital I/O control (4I/2O per axis)



### Programming language

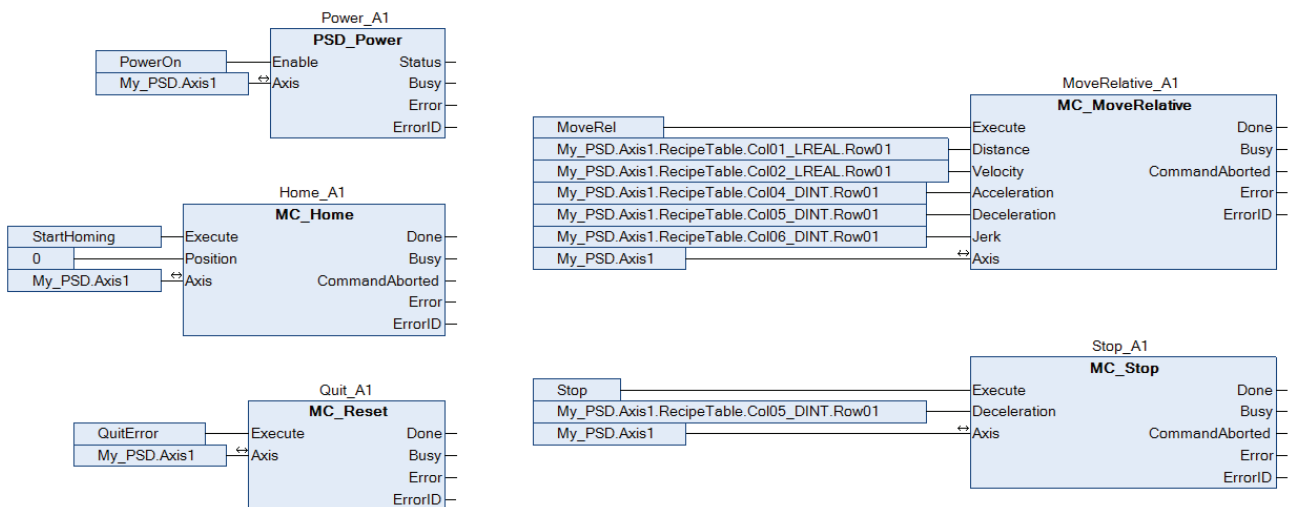
#### Text languages

- Structured text (ST)
- Instruction List (IL)

#### Graphical languages

- Ladder Diagram (LD)
- Function Block Diagram (FBD)
- Sequential Function Chart (SFC)
- Continuous Function Chart (CFC)

### IEC Programme example in CFC



# Order Code

## Parker Servo Drive PSD

	1	2	3	4	5	6	7	8	9	10	11
Order example	<b>PSD1</b>	<b>M</b>	<b>W</b>	<b>3</b>	<b>433</b>	<b>B</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>000</b>

<b>1 Drive Family</b>	<b>PSD1</b>	Parker Servo Drive
<b>2 Device Type</b>	<b>S</b>	Standalone 230VAC
	<b>M</b>	Multi-axis 400VAC
<b>3 Mounting Type</b>	<b>W</b>	Wall mounting
<b>4 Device Type</b>	<b>1</b>	One powerstage
	<b>2</b>	Two powerstages
	<b>3</b>	Three powerstages
	<b>P</b>	Power module
<b>5 Device Type</b>	<b>PSD1SW1 Standalone</b>	
	<b>200</b>	2 Ampere
	<b>300</b>	5 Ampere
	<b>PSD1MW1 One powerstage</b>	
	<b>300</b>	5 Ampere
	<b>400</b>	8 Ampere
	<b>600</b>	15 Ampere
	<b>800</b>	30 Ampere
	<b>PSD1MW2 Two powerstages</b>	
	<b>220</b>	2 + 2 Ampere
	<b>330</b>	5 + 5 Ampere
	<b>440</b>	8 + 8 Ampere
	<b>PSD1MW3 Three powerstages</b>	
	<b>222</b>	2 + 2 + 2 Ampere
	<b>433</b>	8 + 5 + 5 Ampere
	<b>PSD1MWP Passive power supply</b>	
	<b>010</b>	10 kVA
	<b>020</b>	20 kVA

<b>6 Technology</b>	<b>B</b>	Basic
	<b>C</b>	Programmable <sup>3)</sup>
<b>7 Interface</b>	<b>1</b>	EtherCAT
	<b>2</b>	EtherCAT, PROFINET, Ethernet/IP
<b>8 Feedback</b>	<b>1</b>	DSL®
	<b>2</b>	DSL®, Resolver, Encoder (1 Vss) <sup>1)</sup> , Encoder A/B (TTL) <sup>1)</sup> , Analog Hall (1 Vss) <sup>1)</sup> ,
<b>9 Option 1</b>	<b>0</b>	No option
	<b>1</b>	Functional Safety over Ethercat <sup>2)</sup>
	<b>2</b>	Second I/O option board <sup>5)</sup>
<b>10 Option 2</b>	<b>0</b>	No option
	<b>2</b>	I/O option board <sup>4)</sup>
<b>11 Customisation</b>	<b>000</b>	Non customized

<sup>1)</sup> Only for PSD1-S and first power stage of multi-axis unit PSD1MW1 ...

<sup>2)</sup> Only available with Interface 1: EtherCAT and Feedback 1: Hiperface DSL®

<sup>3)</sup> Available with combination 11 (EtherCAT, DSL) and 22 (Multi Fieldbus, Multi Feedback)

<sup>4)</sup> Only available with combination 22 (Multi Fieldbus, Multi Feedback)

<sup>5)</sup> Only available when Option 2 is 2

## Accessories

Braking Resistors	Description	Compatible with
ACB-0004-01	0.1kW	PSD1SW1200/300
ACB-0005-01	0,12kW	PSD1SW1200/300
ACB-0001-01	0.50kW	PSD1MWP010
ACB-0002-01	0.50kW	PSD1MWP020
ACB-0003-01	1.50kW	PSD1MWP020

Motor Choke	Description	Compatible with
ECM-0005-01	1mH; 7A; Motor Cable Length >50m	PSD1SW1200/300
ECM-0004-01	3,6mH; 6,3A; Motor Cable Length >50m	PSD1MW1/2/3
ECM-0001-01	2mH; 16A; Motor Cable Length >50m	PSD1MW1
ECM-0002-01	1,1mH; 30A; Motor Cable Length >50m	PSD1MW1

Mains Filters	Description	Compatible with
ECP-0001-01	Single phase; Motor Cable Length >10m	PSD1SW1200/300
ECP-0002-01	3 phase; Motor Cable Length >10m	PSD1SW1200/300
ECP-0003-01	Motor Cable Length < 6*10m	PSD1MWP010
ECP-0003-02	Motor Cable Length < 6*50m	PSD1MWP010
ECP-0003-03	Motor Cable Length < 6*50m	PSD1MWP020

Fieldbus Accessories	Description	Compatible with
CBD000C0-T00-T00-0002-00	EtherCAT cable	PSD1MWP010
CBD000C0-T00-T00-0005-00	EtherCAT cable	PSD1MWP020
CBD000C0-T00-T00-0010-00	EtherCAT cable	PSD1MWP020

Mains Choke	Description	Compatible with
IND-0001-02	0,86mH; 30A; UL	PSD1MWP010
IND-0002-01	0,45mH; 55A	PSD1MWP020
IND-0002-02	0,45mH; 55A; UL	PSD1MWP020



## Resolver cables

Item number	Description
CBFRE0H0-C06-D03-0030-00	Cable Resolver Highflex 3,0m
CBFRE0H0-C06-D03-0050-00	Cable Resolver Highflex 5,0m
CBFRE0H0-C06-D03-0070-00	Cable Resolver Highflex 7,0m
CBFRE0H0-C06-D03-0100-00	Cable Resolver Highflex 10,0m

## DSL cables

Item number	Description
CBM007HD-C11-D01-____-00	Motor Power Cable DSL [0.75mm <sup>2</sup> ], M15 Motor Connector for PSD1S
CBM007HD-C12-D01-____-00	Motor Power Cable DSL [0.75mm <sup>2</sup> ], M23 Motor Connector for PSD1S
CBM015HD-C12-D01-____-00	Motor Power Cable DSL [1.5mm <sup>2</sup> ], M23 Motor Connector for PSD1S
CBM007HD-C11-D02-____-00	Motor Power Cable DSL [0.75mm <sup>2</sup> ], M15 Motor Connector for PSD1M
CBM007HD-C12-D02-____-00	Motor Power Cable DSL [0.75mm <sup>2</sup> ], M23 Motor Connector for PSD1M
CBM015HD-C12-D02-____-00	Motor Power Cable DSL [1.5mm <sup>2</sup> ], M23 Motor Connector for PSD1M
CBM025HD-C12-D02-____-00	Motor Power Cable DSL [2.5mm <sup>2</sup> ], M23 Motor Connector for PSD1M
CBM040HD-C12-D02-____-00	Motor Power Cable DSL [4.0mm <sup>2</sup> ], M23 Motor Connector for PSD1M
CBM040HD-C13-D01-____-00	Motor Power Cable DSL [4.0mm <sup>2</sup> ], M40 Motor Connector for PSD1M
CBM060HD-C13-D01-____-00	Motor Power Cable DSL [6.0mm <sup>2</sup> ], M40 Motor Connector for PSD1M

## Motor power cables

Item number	Description
CBM015HB-C02-D01-0030-00	Motor Power Cable 1.5mm <sup>2</sup> 3,0m
CBM015HB-C02-D01-0050-00	Motor Power Cable 1.5mm <sup>2</sup> 5,0m
CBM015HB-C02-D01-0070-00	Motor Power Cable 1.5mm <sup>2</sup> 7,0m
CBM015HB-C02-D01-0100-00	Motor Power Cable 1.5mm <sup>2</sup> 10,0m
CBM025HB-C02-D01-0030-00	Motor Power Cable 2.5mm <sup>2</sup> 3,0m
CBM025HB-C02-D01-0050-00	Motor Power Cable 2.5mm <sup>2</sup> 5,0m
CBM025HB-C02-D01-0070-00	Motor Power Cable 2.5mm <sup>2</sup> 7,0m
CBM025HB-C02-D01-0100-00	Motor Power Cable 2.5mm <sup>2</sup> 10,0m

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