Instruction Manual
PSx3xxSE

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Revision overview

Version:	Date:	Author:	Content:
G	20.01.22	Sys	
H	08.08.23	Ts	revise manual, new chapter 2.3 powering device, chapter 2.2 detailed description added.
I	10.08.23	Ts	reference mapping extended p.22, new chapter 3.5 upper mapping end, QR code measurement technology, current consumption "Electrical data" corrected. New chapter Limitation of liability and cross-sections Power supply cables. Reference to axial and radial forces in chap. assembly

Accessoires PSx3xxSE series

We offer you the corresponding supply and data plugs for all unit types. Please contact our sales department, stating the complete type designation, at the following e-mail address

Vertrieb@halstrup-walcher.de

Purpose of instruction manual

This original instruction manual describes the features of the PSx3xxSE positioning system and provides guidelines for its use.

Improper use of these devices or failure to follow these instructions may cause injury or equipment damage. Every person who uses the devices must therefore read the manual and understand the possible risks. The instruction manual, and in particular the safety precautions contained therein, must be followed carefully. **Contact the manufacturer if you do not understand any part of this instruction manual.**

Handle this manual with care:

- It must be readily available throughout the lifecycle of the devices.
- It must be provided to any individuals who assume responsibility for operating the device at a later date.
- It must include any supplementary materials provided by the manufacturer.

The manufacturer reserves the right to continue developing this device model without documenting such development in each individual case. The manufacturer will be happy to determine whether this manual is up-to-date.

Conformity

This device is state of the art. It complies with the legal requirements of EC directives. This is shown by the CE mark.

CE

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1 Safety precautions

1.1 Appropriate use

Positioning systems are especially suitable for automatically setting tools, stops or spindles for wood-processing equipment, packing lines, printing equipment, filling units and other types of special machines.

PSx3xxSE positioning systems are not stand-alone instruments and may only be used if coupled to another machine.

Always observe the operating requirements—particularly the permissible supply voltage—indicated on the rating plate and in the “Technical data” section of this manual.

1.2 Limitation of liability

The device may only be handled in accordance with these operating instructions.
All information and notes in these operating instructions have been compiled taking into account the applicable standards and regulations, the state of the art and our many years of experience and knowledge.

The manufacturer accepts no liability for damage caused by the following circumstances. In this case, the warranty claims also expire:

- non-observance of the operating instructions
- improper use
- non-intended use
- Use of untrained personnel
- Modifications to the unit
- Technical modifications
  Unauthorised modifications

The user is responsible for carrying out commissioning in accordance with the safety regulations of the applicable standards and any other relevant state or local regulations concerning conductor dimensioning and protection, grounding, circuit breakers, overcurrent protection, etc. The person who carried out the assembly or installation is liable for any damage caused during assembly or connection.

1.3 Shipping, assembly, electrical connections and start-up

Assembly and the electrical connections should only be handled by professionals. They should be given proper training and be authorised by the operator of the facility.

The instrument may only be operated by appropriately trained individuals who have been authorized by the operator of the facility.

Specific safety precautions are given in individual sections of this manual.

1.3.1 Minimum cross-sections for connection to the power supply

For power cables mounted on the device, use only the cross-sections listed below. In order to minimize voltage drop on longer cables, we always recommend using the largest available cross-section.

Device	Cable cross-section
PSEx31 / PSx32 / PSx33	min. AWG20 bzw. 0,5 mm^2
PSEx34	min. AWG18 bzw. 1,0 mm^2
Fieldbus connections	min. AWG23 bzw. 0,25 mm^2

If there are concerns about mechanical strength or where cables may be exposed to mechanical damage/stress, they must be protected accordingly. This can be ensured, for example, by a cable duct or a suitable armoured pipe.

If the power supply cables are laid in the immediate vicinity of the drives or other heat sources, make sure that the cables have a temperature resistance of at least 90°C.
With suitable design measures, e.g. sufficient ventilation or cooling, lower temperatures are also permissible. This must be checked and determined by the customer.

Make sure that the flammability class of the cable for the USA is equivalent to UL 2556 VW-1, e.g. according to IEC 60332-1-2 or IEC 60332-2-2 depending on the cross-section. For Canada, the flammability class FT1 is required, FT4 exceeds this and is therefore also permissible. Cables for the North American market often meet both requirements.
However, the flammability class requirements only apply if you do not limit to Class 2 (e.g. certified power supply) or to <150 W according to UL 61010-1
→ **2.3 Powering the device** by means of a suitable fuse.

When installing in North America, please observe the specifications in the National Electrical Code NFPA 70 and the Electrical Standard for Industrial Machinery NFPA 79 (USA) or the Canadian Electrical Code and C22.2 (Canada) in the respective valid version.

Note the limitations of liability → **1.2 Limitation of liability**

1.4 Troubleshooting, maintenance, repairs, disposal

The individual responsible for the electrical connections must be notified immediately if the instrument is damaged or if errors occur.

This individual must take the instrument out of service until the error has been corrected and ensure that it cannot be used unintentionally.

This instrument requires no maintenance.

Only the manufacturer may perform repairs that require the housing to be opened.

The electronic components of the instrument contain environmentally hazardous materials and materials that can be reused. The instrument must therefore be sent to a recycling plant when you no longer wish to use it. The environment codes of your particular country must be complied with.

1.5 Symbols

The symbols given below are used throughout this manual to indicate instances when improper operation could result in the following hazards:

WARNING!
This warns you of a potential hazard that could lead to bodily injury up to and including death if the corresponding instructions are not followed.

CAUTION!
This warns you of a potential hazard that could lead to significant property damage if corresponding instructions are not followed.

INFORMATION!
This indicates that the corresponding information is important for operating the instrument properly.

2 Instrument description

2.1 Functions

The PSx3xxSE positioning system, an intelligent, compact, complete solution for positioning auxiliary and positioning axes, consists of an EC motor, gear power amplifier, control electronics, absolute measuring system and sercos 3 interface. The integrated absolute measuring system eliminates the need for a time-consuming reference run. Connecting to a bus system simplifies the wiring. A hollow shaft with adjustable collar makes assembly quite simple. The positioning system is especially suitable for automatically setting tools, stops or spindles for wood-processing equipment, packing lines, printing equipment, filling units and other types of special machines.
PSx3xxSE positioning systems convert a digital positioning signal into an angle of rotation.

2.2 Assembly

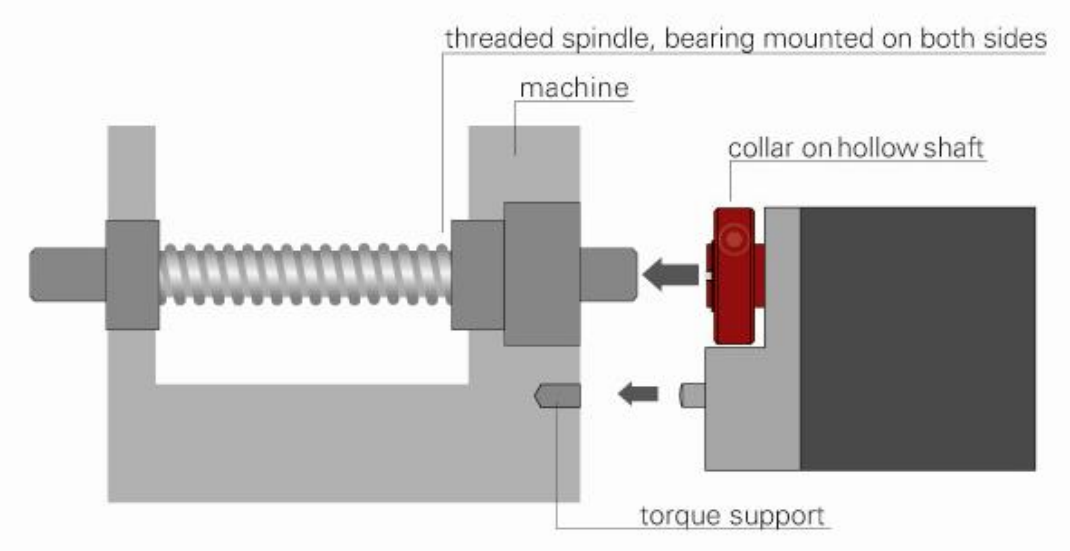
<u>Hollow shaft:</u>

The PSx3xxSE is mounted on the machine by sliding it with the hollow shaft onto the spindle to be driven and fixing it with the clamping ring (recommended shaft diameter 8 h9 or 14 h9; tightening torque of the clamping ring screw with 3 mm hexagon socket: 1.5 Nm).

The depth of the hollow bore is 20 mm. For optimum operation, the pin of the shaft to be driven should correspond to this depth. Depending on the operating situation, significantly shorter pins (< 16 mm) may cause damage to the PSx3xx. When mounting the PSx3xx, it should only be pushed on until the foam rubber plate lies evenly on the bottom of the machine or is compressed to approx. half its thickness. Under no circumstances may the PSx3xx "hard" be screwed to the machine without an air gap.

The rotation lock is made via the pin (in the picture below the hollow shaft) into a suitable bore as rotary torque support. This hole must be slightly larger than the diameter 6 h9 of the pin. An oblong hole or slot with a slightly larger width (recommended: 6.05...6.10 mm) than the dimension of the pin diameter is optimal. The backlash when changing the direction of rotation has a direct influence on the positioning accuracy and can lead to damage to the PSx3xx with very large backlash (a few mm) due to the impact load

The PSx3xx must have a little gap on all sides when mounted, as it can move axially and/or radially during positioning if the hollow shaft and solid shaft are not 100% aligned. This "staggering" is not a defect of the PSx3xx and also has no influence on the function, as long as it can move freely. Please note the maximum permissible radial force and axial force in chapter → **4.3 Physical data.**



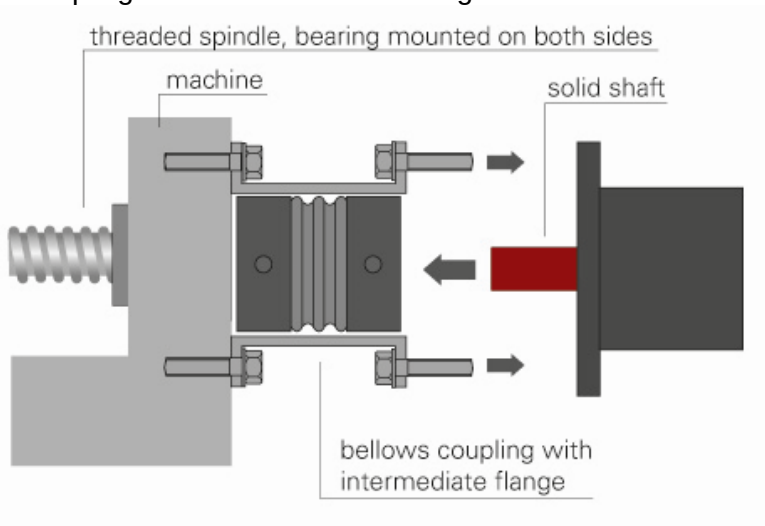
Versions with higher torques (from 10 Nm):
Here the force connection is made via a feather key DIN 6885-A5x5x12.
The clamping ring is not freely rotatable but consists of two halves, the fixed part of the hollow shaft and the loose clamping clamp. The keyway is located in the half that is fixed to the output shaft. When sliding onto the shaft to be driven with the key inserted, its angular position must be aligned with the keyway in the PSx3xx. After pushing on, the PSx3xx is fixed with the 2 screws in the flexible clamping ring half. Make sure that both screws are tightened as equally as possible (tightening torque of the screws with 3 mm hexagon socket: 1.5 Nm).

The information on torque support applies in the same way as described above.

For PSE30x-14, PSE32x-14, PSS30x-14 and PSS32x-14, the position of the anti-rotation lock can be set at greater distances by unscrewing the base cover, turning it 180° and then screwing it back on. When screwing on, make sure that the seal is correctly inserted in the floor.
For torques > 5 Nm we recommend to choose the greater distance.

Solid shaft:

The PSx3xxSE is installed on the machine by mounting the drive to the axis to be driven using a coupling and an intermediate flange.



Under no circumstances may the housing cover be used for the purpose of the transmission of force.

Never apply force to the housing cover, e.g., for supporting weight.

Never run the PSx3xxSE in reverse (i.e. do not apply external force to the output shaft in order to turn it).

2.3 Powering the device

For motor power use a single fuse with max. 3,5 A for each PSx3xx.
For motor power use a single fuse with max. 10 A for each PSE34xx.
For control power you can use a fuse with max. 2,0 A, so it is possible to power up to 10 units parallel with one fuse.

It is strongly recommended to separate power cables to the PSx3xx from other power cables that might have dangerous voltage.

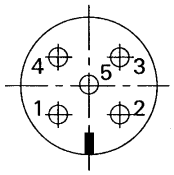
Underwater usage of the PSW is not allowed

Please consider that the device might have
a hot surface during operation!

2.4 Pin assignment

For the supply voltage either a Binder series 713/763 (A-coded) round, 5-pin plug for PSE and PSS devices or a 5-pin Harting plug with protective sleeve (HAN4A) for the PSE34xx devices is located in the housing cover of the PSx3xxSE.
Two round 4-pin sockets, Binder series 825 (D-coded) are provided for connection to the bus.

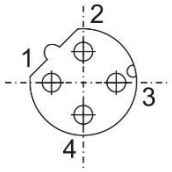
2.4.1 Supply voltage connector (24VDC)



1. +24V motor
2. ground (motor)
3. +24V control unit
4. ground (control unit)
5. housing/pressure balance

To prevent the ingression of fluids into the PSW-housing during cooldown, use a special cable with an airtube for pressure balancing of your PSW.

2.4.2 Sockets for the bus (Bus1 and Bus2)



1. TD+ (WH/GN, white/green)
2. RD+ (WH/OG, white/orange)
3. TD- (GN, green)
4. RD- (OG, orange)

Due to the use of 4-pin sockets, only four-wire cables should be used.

2.4.3 Electrical grounding (Chassis)

Next to the connecting plugs there is a M4 stud bolt. It is recommended to connect the positioning system with a cable as short as possible to the machine base. The minimum wire cross section therefor is 1.5mm².

2.5 Setting the device address

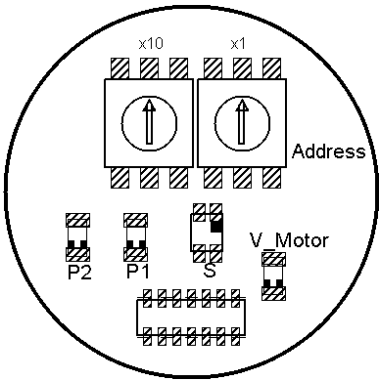
In its delivery state, the PSx3xxSE has the address 1. A different address can be assigned using the parameter S-0-1040 or via the optional address switches. If the switches are resting in the position 00 or not available, the address is set using S-0-1040. The change in address is saved automatically and therefore continues to be available after the device is restarted.
If you set the address using the switches (i.e. switches set to > 00) you cannot change this value using the bus.

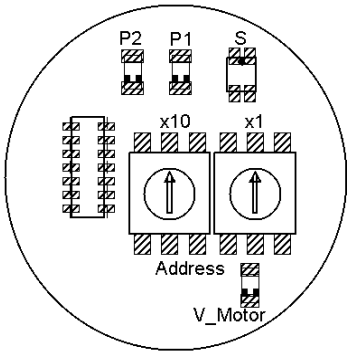
2.6 LEDs and address switches

The following LEDs are located under the transparent sealing plug:
P1/P2: Green link LEDs for ports 1 and 2
S: sercos LED (see sercosIII specifications)

V-Motor: The LED is illuminated yellow when power is available to the motor.

OFF	→Motor power supply is too high or low
ON	→Motor power supply ok
flashing	→Motor power supply ok, PSx in delivery state





Address switch:
The rotary switches indicate the tens and ones places of the address selected. If the switches are resting in the position 00 or are not available, the address is set using S-0-1040.
The delivery setting is 00, the PSE reports to the bus with the address 1.
If you set the address using the switches (i.e. switches set to > 00) you cannot change this value using the bus.

2.7 sercosIII cycle data

The IO-profile is used with a fixed configuration (SCP_FixCFG). When configuring the connections, you must be aware of the following:
S-0-1050.0.x are the settings for the AT (producer)
S-0-1050.1.x are the settings for the MDT (consumer)
The command and/or status bytes 'Connection Control', 'Positioning Control' and 'Producer RTB word container' are initialised with 0 during the change from CP3 to CP4.

2.7.1 Master to PSx3xxSE (MDT)

Bit	Byte	Meaning	Corresponding IDN
0-15	0-1	Connection control	S-0-1050.1.08
16-31	2-3	I/O Control	S-0-1500.00.01
32-47	4-5	Positioning control	S-0-0346
48-79	6-9	Positioning command value	S-0-0282

Connection Control
Bit 15-12: Counter
Bit 1: New Data
Bit 0: Producer ready
A run command will only accepted if this bit is set.

I/O Control
Bit15: Output operation state
A run command will only accepted if this bit is set.

Positioning control (control word)
Bit 2-1: Positioning modes
00: Positioning → Drive moves to the transferred target value
01: Jogging + → Drive moves to the upper limit switch
10: Jogging - → Drive moves to the lower limit switch
11: Positioning Halt → Drive brakes with the specified deceleration ramp (can also be used in jogging mode)
Bit 0: Toggle
Must be toggled if a run command is to be accepted.

2.7.2 PSx3xxSE to Master (AT)

Bit	Byte	Meaning	Corresponding IDN
0-15	0-1	Connection control	S-0-1050.0.08
16-31	2-3	I/O status	S-0-1500.00.02
32-47	4-5	Producer RTB word container	S-0-0144
48-63	6-7	Torque feedback value	S-0-0084
64-95	8-11	Velocity feedback value 1	S-0-0040
96-127	12-15	Position feedback value 1	S-0-0051

Connection Control
Bit 15-12: Counter
Bit 1: New data
Bit 0: Producer ready
I/O status
Bit 15: Outputs ready to operate
is set as soon as bit 15 is set in the I/O control
Bit 14: Inputs valid
always 1
Bit 13: Error of resource I/O (C1D)
Error code is in S-0-0390 and diagnosis text in S-0-0095
Bit 12: Warning of resource I/O (C2D)
Error code is in S-0-0390 and diagnosis text in S-0-0095
Producer RTB word container (status word)
Bit 3: Positioning halt
Drive was stopped (by 'positioning halt' command in the control word)
Bit 2: In position (S-0-0336, bit 0)
Drive is within the positioning window
Bit 1: Status command value processing (S-0-0135, bit 3)
Drive is running
Bit 0: Takeover positioning command value (S-0-0419, bit 0)
Accept target value (is toggled)

2.8 Parameters

2.8.1 Read only parameters

Name, designation	IDN	Function	Unit	Byte count/ data type
Actual rpm	S-0-0040	Current rpm	1/min	4 / signed decimal
Actual position	S-0-0051	Current position	*	4 / signed decimal
Actual torque	S-0-0084	Current torque value	cNm	2 / signed decimal
In position	S-0-0336	Drive is in the positioning window	-	2 / binary
Motor supply voltage	S-0-0380	Current supply voltage for the motor	V	2 / unsigned decimal
Temperature	S-0-383	Internal temperature of the device	°C	2 / unsigned decimal
Error text	S-0-0095	Error in text form	-	Full text
Diagnosis code	S-0-0390	Code for errors and/or warnings (see Section 0)	-	4 / hexadecimal
Vendor code	S-0-1300.0.3	sercosIII Vendor code (10)	-	2 / unsigned decimal
Device type	S-0-1300.0.5	PSE3xx-xx bzw. PSE3xxVG-xx	-	Full text
Software version	S-0-1300.0.9	x.xx	-	Full text
Serial number	S-0-1300.0.12	Device serial number	-	Full text
Production date	S-0-1300.0.13	YYYY-MM-DDTHH:MM:SSZ	-	Full text
Maximum torque	P-0-0084	Maximum torque value during the last run, not valid in the acceleration and deceleration phase	cNm	2 / signed decimal
Control unit voltage	P-0-0380	Current supply voltage for control unit	V	2 / unsigned decimal

* The units are dependent on the scale (S-0-0079 and P-0-0079).

2.8.2 Writable parameters

Name, designation	IDN	Function	Byte / Type
Upper limit	S-0-0049	Maximum permitted target position Unit: * Min.: lower limit Max.: positioning range – 3 rotations Default setting: 101200 Changes only possible when at a standstill	4 / sd
Lower limit	S-0-0050	Minimum permissible target position Unit: * Min.: positioning range – 253 rotations Max.: upper limit Default setting: 1200 Changes only possible when at a standstill	4 / sd
Referencing of the position	S-0-0052	Writing causes the current position to be "referenced" onto the transferred value The limit switch and the positioning range are also shifted. The difference is found in S-0-0175. Unit: * Min./Max.: Any desired value Default setting: 0 Changes only possible when at a standstill	4 / sd
Direction of rotation	S-0-0055	When looking at the output shaft: 16: clockwise 23: counter clockwise Default setting: 16 Changes only possible when at a standstill	2 / bin
Positioning window	S-0-0057	Permissible difference between target and actual values for the "in position" bit (S-0-0336) Unit: * Min.: 1* Max.: 100* Default setting: 2 Changes only possible when at a standstill	4 / ud
Loop length	S-0-0058	Number of increments, which the drive runs to a target in a specified direction. Run without loop with value 0 Unit: * Min.: -400* Max.: 400* Default setting: -250 Changes only possible when at a standstill	4 / sd
Scale for positional data	S-0-0079	Increments per revolution, e.g. spindle pitch 1.5 mm with resolution 1/100 mm → 150 Min.: 1 Max.: 10000 Default setting: 400 Changes only possible when at a standstill	4 / ud
Maximum torque	S-0-0092	Max. permissible torque during the run Unit: cNm Default setting: **	2 / ud

Name, designation	IDN	Function	Byte / Type
Drag error	S-0-0159	Max. drag error before a C2D warning is generated Monitoring deactivated with 0. Unit: * Min.: 0 Max.: 1000* Default setting: 0	4 / ud
Reference value	S-0-0175	Correction factor for the target, actual and limit switch values Unit: * Min./Max.: Any desired value Default setting: 0 Changes only possible when at a standstill	4 / sd
Target rpm	S-0-0259	Rpm to be used for positioning runs Unit: 1/min Min./Max.: ** Default setting: **	4 / sd
Acceleration	S-0-0260	Acceleration ramp Unit: rotations/(min * sec) Min./Max.: ** Default setting: **	4 / sd
Positioning range	S-0-0278	Definition of the positioning range relative to the absolute value encoder Unit: * Min.: actual position + 3 rotations Max.: actual position + 253 rotations Default setting: 102400 Changes only possible when at a standstill	4 / sd
Target value	S-0-0282	Specified target position (can be written using SVC in CP2-4), stop by writing the same target value once again Unit: *	4 / sd
Deceleration	S-0-0359	Deceleration ramp Unit: rotations/(min * sec) Min./Max.: ** Default setting: **	4 / sd
Holding torque	S-0-0533	Holding torque at standstill Unit: cNm Min.: 0 Max.: ** Default setting: **	4 / sd
Maximum start-up torque	S-0-0822	Max. permissible torque in the start-up phase Unit: cNm Min./Max.: ** Default setting: **	2 / ud
Time for start-up torque	S-0-0823	Time in which the start-up torque applies Unit: msec Min.: 10 Max.: 1000 Default setting: 200	2 / ud
Address	S-0-1040	sercosIII address Min.: 1 Max.: 511 Default setting: 1	2 / ud

Name, designation	IDN	Function	Byte / Type
Extended scale for positional data	P-0-0079	Used in combination with S-0-0079 to set "unlevel" resolutions Min.: 1 Max.: 10000 Default setting: 400 Changes only possible when at a standstill	4 / ud
Drag error correction factor	P-0-0159	Drag error correction is deactivated with the value 0. Min.: 0 Max.: 10 Default setting: 0 Changes only possible when at a standstill	2 / ud
Holding torque at completion of run	P-0-0822	Holding torque at completion of run Unit: cNm Min.: 0 Max.: ** Default setting: **	2 / ud
Time for holding torque at completion of run	P-0-0823	Time for holding torque at completion of run Unit: cNm Min.: 0 Max.: ** Default setting: **	2 / ud
Adjustment release	P-0-0900	Adjustment with value = 1 (only for PSE without brake) Min.: 0 Max.: 1 Default setting: 0	2 / ud

* * The units and/or values are dependent on the scale (S-0-0079 and P-0-0079).
** The value depends on the type of device (see following table).

2.8.3 Table of type-dependent values

Device type PSE and PSS	301-x 311-x	302-x 312-x	305-x 315-8	322-14 332-14	325-14 335-14
Name, designation IDN	Range of values Delivery state				
Max. torque S-0-0092	2..125 100	10..250 200	50..600 500	10..250 200	20..500 400
Target rpm S-0-0259	15..230 230	10..150 150	3..70 70	20..200 170	10..100 85
Acceleration S-0-0260	97..600 600	50..400 400	23..130 130	97..525 525	50..260 260
Delay S-0-0359	97..600 600	50..400 400	23..130 130	97..525 525	50..260 260
Holding torque S-0-0533	0..90 30	0..150 50	0..300 100	0..100 35	0..200 70
Start-up torque S-0-0822	2..125 125	10..250 250	50..600 600	10..250 250	20..500 500
Holding torque at completion of run P-0-0822	0..180 60	0..300 100	0..600 200	0..200 70	0..400 140

Device type PSW	301-x 311-x	302-x 312-x	305-x 315-8	322-14 332-14	325-14 335-14
Name, designation IDN	Range of values Delivery state				
Max. torque S-0-0092	2..125 100	10..250 200	50..600 500	10..250 200	20..500 400
Target rpm S-0-0259	15..180 180	10..125 125	3..60 60	20..150 125	10..80 60
Acceleration S-0-0260	97..600 600	50..400 400	23..130 130	97..525 525	50..260 260
Delay S-0-0359	97..600 600	50..400 400	23..130 130	97..525 525	50..260 260
Holding torque S-0-0533	0..90 30	0..150 50	0...300 100	0..100 35	0..200 70
Start-up torque S-0-0822	2..125 125	10..250 250	50..600 600	10..250 250	20..500 500
Holding torque at completion of run P-0-0822	0..180 60	0..300 100	0..600 200	0..200 70	0..400 140

Device type PSE	3110-14	3125-14	3410-14	3418-14
Name, designation IDN	Range of values Delivery state			
Max. torque S-0-0092	100..1200 1000	250..3000 2500	200..1200 1000	500..2000 1800
Target rpm S-0-0259	1..30 30	1..12 12	10..100 100	10..90 90
Acceleration S-0-0260	9..50 50	4..20 20	20..350 350	10..315 315
Delay S-0-0359	9..50 50	4..20 20	20..350 350	10..315 315
Holding torque S-0-0533	0..600 200	0..1250 450	0..300 200	0..450 300
Start-up torque S-0-0822	100..1200 1200	250..3000 3000	200..1200 1200	500..2000 2000
Holding torque at completion of run P-0-0822	0..1200 400	0..2500 900	0..600 400	0..900 600

2.8.4 Commands

Name, designation	IDN	Function
Delete error	S-0-0099	Deletes the C1D error
Load default settings	S-0-0262	The default settings are loaded. In order to save these permanently, you must subsequently execute S-0-0264
Save settings	S-0-0264	Saves the parameter in EEPROM

2.9 Error messages

Errors (C1D) and warnings (C2D) are reported using bits 13 and 12 in the I/O status. The diagnosis code is stored in S-0-0390 and the diagnosis text in S-0-0095.

2.9.1 Error (C1D)

The sercos LED is illuminated red when an error occurs.
When an error occurs during the run, the run is aborted. No further run commands will be accepted until the error is deleted. Errors are deleted using IDN S-0-0099. If the error continues, the error message will be displayed again.
The type of error can be found in the diagnosis code (S-0-0390).
0xC00F2019: Internal device temperature exceeds specified limit.
0xC00F2026: Motor voltage too low (voltage < 17.5V).
0xC00F2055: Obstruction (extreme difficulty running, insufficient torque).
0xC00F8022: Error in calculating/determining the absolute position.
This error cannot be deleted. If necessary, restart drive.
0xC00F8025: Motor voltage too high (voltage > 30V).
0xC00F8028: Motor current too high.
0xC10F6320: Incorrect parameters (error in loading or saving).
This error cannot be deleted. Restart the drive and, if the error continues, load the default settings with S-0-0262.

2.9.2 Warnings (C2D)

A warning does not result in a run being aborted. Run commands continue to be accepted when warnings are active. The drive issues the following warnings (S-0-0390):
0xC00E2028: Drag error (see Section 3.5)
A new run command deletes this warning.
0xC00E2053: Invalid target value, target value lies outside the permissible positioning range.
A new run command deletes this warning.
0xC00E6043: Upper limit exceeded.
Warning is deleted as soon as the drive is within the permissible positioning range.
0xC00E6044: Lower limit exceeded.
Warning is deleted as soon as the drive is within the permissible positioning range.

3 Special features

3.1 Start-up

After the supply voltage has been hooked up, a positioning or manual run can begin immediately:

3.2 Positioning

To perform a positioning run, the control word (positioning control) must be written as follows in the MDT: bit 2-1 = 00 and bit 0 must be toggled. When the run command has been successfully accepted, the bit 0 in the status word (Producer RTB word container) is toggled in the AT.
Here are the responses in various situations:

New target value during a run
The new target position is accepted immediately. If a change of direction is required, the drive brakes using the set deceleration ramp and then approaches the new target value.

Stop command
To perform a stop command, the control word (positioning control) is written as follows in the MDT: bit 2-1 = 11 and bit 0 must be toggled.

Stop command during a run:
- The drive brakes using the maximum possible deceleration ramp.
- There will be no readjustment of the position (see also readjustment P-0-0900).
- Bit 3 (positioning halt) in the status word (Producer RTB word container) will be set.

Stop command during standstill:
- Bit 2 (in position) in the status word (Producer RTB word container) will be set to 0.
- There will be no readjustment of the position (see also readjustment P-0-0900).

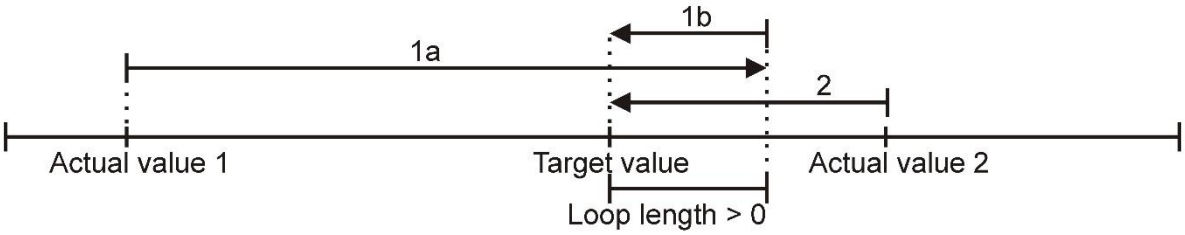
Toggling bit 0 of the control word (positioning control) in the MDT leads to the generation of a run command in the drive even if the drive is already at the target value because the internal resolution is higher. Constant toggling of bit 0 must therefore be avoided.

Runs, which involve a run to an obstruction (e.g. reference runs to a block), may only be started with reduced torque (max. run torque < 10% of nominal torque).

Underwater usage of the PSW is not allowed.

3.2.1 Positioning sequence with loop

The loop length (S-0-0058) has the effect of ensuring that a target value is always approached from the same direction. This allows you, for example, to eliminate the lash in a driven spindle. The diagram below illustrates the function of the loop length:



If the target value is above the current position (actual value 1) and the loop length is > 0, the drive runs past the target value by the specified loop length (run 1a) and then runs to the target value (run 1b).
If the target value is below the current position and the actual value (actual value 2) is outside the loop length, the drive approaches the target value directly (run 2).
If you wish to approach the position from the left, the loop length must be < 0.

It is not possible to perform a positioning run to the upper limit (S-0-0049) with a loop length > 0 because the drive would have to run past the upper limit in order to do so. The same applies to the lower limit (S-0-0050) with a loop length < 0.

3.2.2 Positioning sequence without loop

Positioning runs from both directions are possible without a loop if the loop length (S-0-0058) is set to 0. This does NOT eliminate any lash present in the spindle. The PSx3xxSE internal gear backlash does not play a role in this case, as position data are acquired directly at the output shaft.

3.3 Speed, acceleration and delay

The target speed from S-0-0259, acceleration from S-0-0260 and delay from S-0-0359 apply for all runs. As the drive approaches the target at the end of the run, the delay is successively reduced in order to ensure a harmonious transient response.
If a stop command is executed, the drive brakes with the maximum possible deceleration ramp.

3.4 Response if the drive encounters an obstacle or is turned manually

If during a run the achievable rate of speed falls below the threshold parameter (30% of the target speed) for longer than 200 ms, the instrument registers an obstacle, aborts the run and a C1D error message is generated (diagnosis code: 0xC00F2055). The drive then stands still with the set holding torque (S-0-0533). A new run command will only be accepted when the error has been deleted (see Section 0).
If, when the drive is at a standstill, it is pushed out of the positioning window, the bit 'In Position' (see Section 0) will be deleted. If readjustment is active (S-0-0900), the drive will return to the target value.

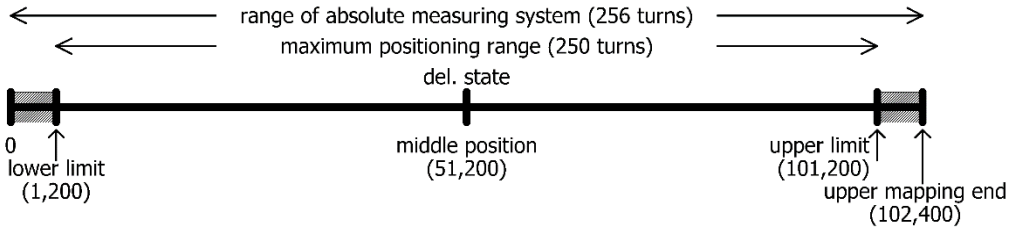
The drive must not be turned into another position with an electric screwdriver

3.5 Use of the “Upper mapping end” parameter

The following chapter illustrates the use of the parameter “upper mapping end” both graphically and by means of examples:

1) Delivery state

In the delivery state (“DS”), the actual position is exactly in the middle of the positioning range. There is a safety margin of three rotations at the output shaft at both the lower and upper ends of the positioning range. Positioning runs that extend into these safety margins are rejected by the device with the error “Incorrect target value”.



In the delivery state, the values from the following table result for the upper mapping end and the lower and upper limits:

Upper mapping end	102,400
Lower limit	1,200
Upper limit	101,200

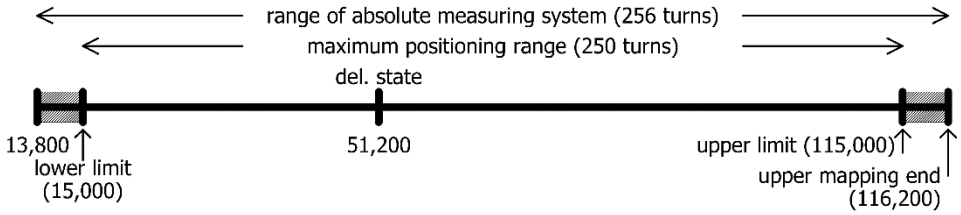
Positioning range <u>symmetrical</u> to 51,200

Starting from this state, the maximum possible positioning range can now be shifted upwards or downwards as required.

It is important to note that after the device has been installed, the available positioning range may not be sufficient in one of the two directions. The parameter “upper mapping end” now allows you to reduce the positioning range in one direction and increase it in the other direction.

2) Shifting the positioning range upwards starting from the delivery state

In the following example, starting from the DS, the maximum possible positioning range is shifted slightly **upwards** using the parameter “upper mapping end”:



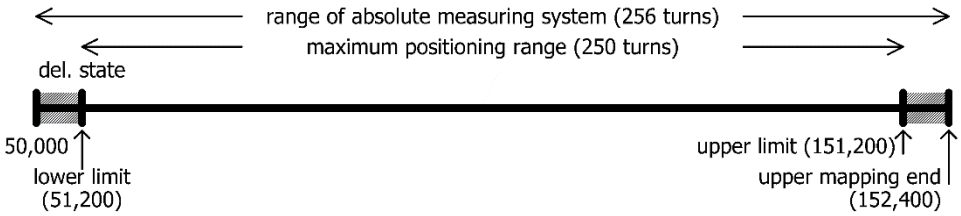
Here, the upper mapping end was increased from the value 102,400 to 116,200. Consequently, a higher proportion of the possible positioning range is above 51,200 and a smaller proportion below 51,200.

A special case is present if the upper mapping end is set so that the entire possible positioning range is at values ≥ 51,200. With standard scaling (numerator = denominator = 400, i.e. 1 step = 0.9°) and referencing value = 0, this special case results if the relevant value from the

following table is selected for the upper mapping end. The device then automatically adjusts the lower and upper limits accordingly.

Upper mapping end	152,400
Lower limit	51,200
Upper limit	151,200

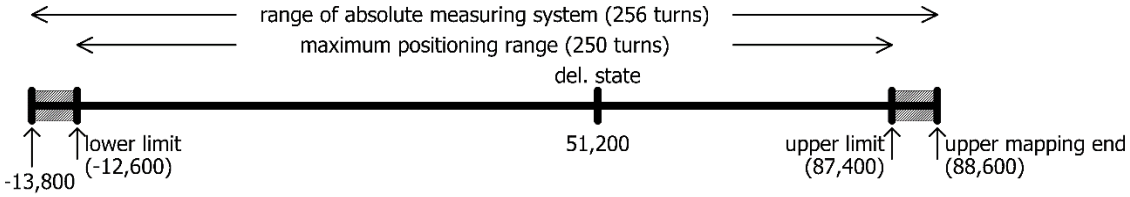
Positioning range starts at 51,200



The numerator factor and denominator factor can be used to map any spindle resolutions. Using the referencing value, you can shift the whole range of values.

3) Shifting the positioning range downwards starting from the delivery state

In the following example, starting from the DS, the maximum possible positioning range is shifted slightly downwards using the parameter “upper mapping end”:

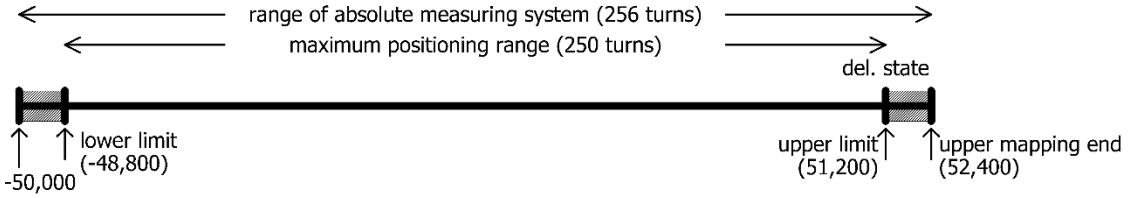


Here, the upper mapping end was decreased from the value 102,400 to 88,600. Consequently, a higher proportion of the possible positioning range is below 51,200 and a smaller proportion above 51,200.

A special case is present if the upper mapping end is set so that the entire possible positioning range is at values ≤ 51,200. With standard scaling (numerator = denominator = 400, i.e. 1 step = 0.9°) and referencing value = 0, this special case results if the relevant value from the following table is selected for the upper mapping end. The device then automatically adjusts the lower and upper limits accordingly.

Upper mapping end	52,400
Lower limit	-48,800
Upper limit	51,200

Positioning range ends at 51,200



4) Shifting the positioning range depending on the actual position

Are (in contrast to the examples above) one or more of the parameters “numerator”, “denominator” and “referencing value” not in the delivery state, these are included in the calculation of the possible value range for the upper mapping end.

Please note that the measurement range of the absolute encoder is 256 rotations at the output shaft.

Starting from the delivery state, the possible positioning range may now be shifted
- by max. 256 rotations upwards
- by max. 256 rotations downwards

On the basis of these considerations the following value range results for the upper mapping end:

Minimum value for upper mapping end = referencing value + 1
*Maximum value for upper mapping end = referencing value + 204,800 * denom. / num. - 1*

The following formulas result for the special case numerator = denominator:

Minimum value for upper mapping end = referencing value + 1
Maximum value for upper mapping end = referencing value + 204,799

(This is the case, e.g. for the delivery state where numerator = denominator = 400.)

Since the upper mapping end is an integer, the minimum and maximum values are obtained by rounding to the nearest integer (applies only to the case numerator ≠ denominator).

If the actual position is no longer in the area
[upper mapping end - 256 rotations … upper mapping end]
after shifting the upper mapping end, the device then automatically adjusts the actual position accordingly. This is done by addition or subtraction of the number of steps which corresponds to 256 rotations. For the special case numerator = denominator this would be 102,400 steps.

Example:

- Spindle with 5 mm pitch, specified unit for target and actual values: 1µm
  → 1 rotation = 5mm = 5,000µm
  → Number of steps per rotation = 5,000
- Using the formula
  *Number of steps per rotation = 400 * denominator / numerator*
  the following result is obtained:
  numerator = 400; denominator = 5,000
- With these settings, the drive is mounted and run using manual positioning commands, to a defined physical position (e.g. a specific mark along the run path) at which the actual position is to assume a specific value, e.g. the value 0.
- In our case, the position after running to this defined physical position shows, for example, the value 300,000. In this position, the actual value is set to zero. The device uses this information to calculate the new referencing value at 300,000.
  → Referencing value = 300,000
- The drive has a positioning range of 250 rotations (see above: Measurement range of the absolute encoder minus a safety margin of three rotations at both ends of the measurement range).
- In our case, these 250 rotations are to be divided in such a way that the drive can run 10 rotations (= 10 * 5,000 steps = 50,000 steps) from the zero position, just defined, to smaller values and 240 rotations (= 240 * 5,000 steps = 1,200,000 steps) to larger values.
- To ensure that the position value 1,200,000 is at the upper end of the maximum possible positioning range, as specified (i.e. at the upper limit), we add the safety margin of three

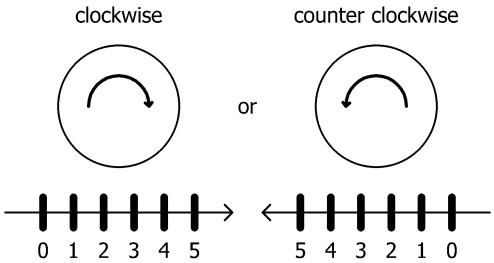
rotations to this value and thus obtain our value for the upper mapping end:
upper mapping end = 1,200,000 + 3 * 5,000 = 1,215,000

- The device then recalculates the positioning range limits:
  lower limit = upper mapping end - 253 * 5,000 = -50,000
  upper limit = upper mapping end - 3 * 5,000 = 1,200,000
- This positioning range can then be restricted as required, i.e. the lower limit can be increased and the upper limit can be reduced.

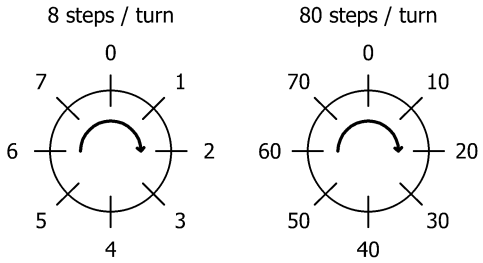
5) Step-by-step instructions for determining the positioning range

The following section describes the procedure for determining those parameters that have an influence on the target and actual position as well as the positioning range. The individual steps must be carried out in the specified order.

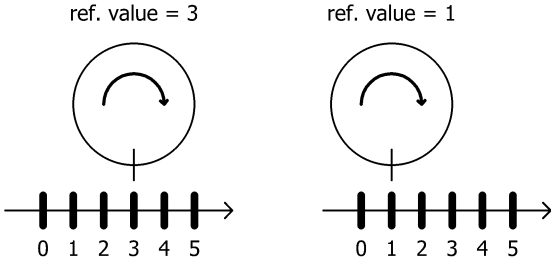
1) Setting the direction of rotation:
   The direction of rotation determines with which direction of rotation of the output shaft the position values increase and with which direction of rotation of the output shaft the position values decrease.



2) Setting numerator and denominator:
   The numerator and denominator determine the number of steps into which one rotation of the output shaft is divided.

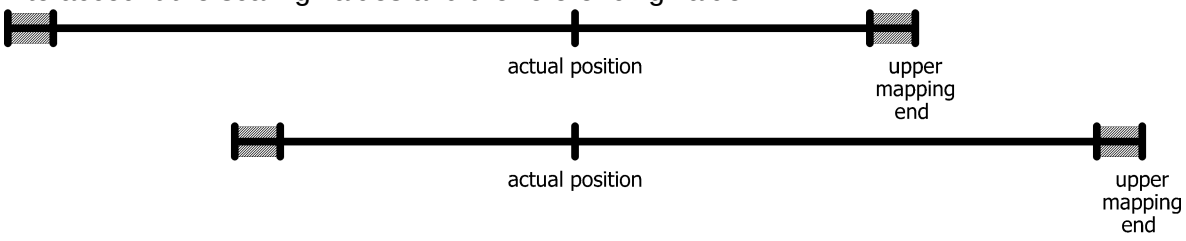


3) Setting referencing value:
The referencing value is used to assign a specific value of the actual position to a specific physical position of the axle.

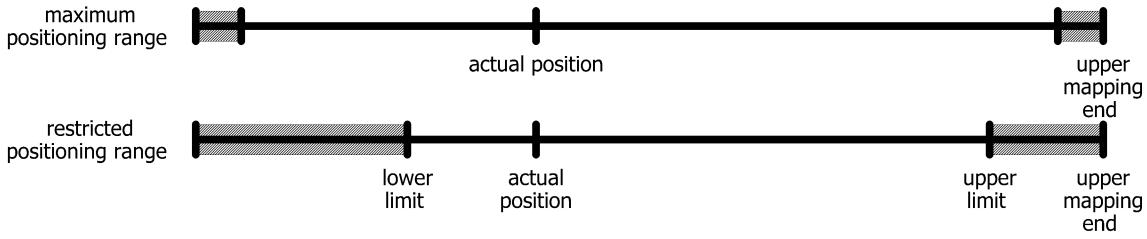


The referencing value is written either directly or by setting the actual position.

4) Setting upper mapping end:
The parameter defines the location of the maximum possible positioning range, taking into account the scaling values and the referencing value.



5) Setting upper and lower limits:
If necessary, the maximum possible positioning range can be restricted to prevent incorrect target positions that lead to a collision.



3.6 Drag error

3.6.1 Monitoring

During a positioning run, the instrument compares the computed target position with the current actual value. If the difference is greater than the value "drag error" (S-0-0159), a warning (C2D) is generated (diagnosis code: 0xC00E2028). This applies in particular if the target speed cannot be achieved due to external influences (required torque, motor voltage too low). Monitoring of the drag error can be deactivated by setting S-0-0159 to 0.

3.6.2 Correction

The drag error correction can be activated with P-0-0159. The target rpm is increased or reduced by the specified factor proportionally to the drag error. It is recommended that you set the parameter to 4.

3.7 Readjustment

When P-0-0900 is set to the value 1, the drive performs a readjustment if it is pushed out of the positioning window after a run has been completed. If the loop length (S-0-0058) is not equal to 0, the drive will only readjust if it is pushed out of position in the direction of the loop. If the loop length = 0, the drive will readjust in both directions.
If a stop command is sent, the drive will only readjust when a new run command is sent.
This function is only available for drives without brake.

3.8 Absolute measuring system

The PSx3xxSE actuator includes an absolute measuring system capable of covering a range of 256 rotations. In order to prevent an overrun if an external force rotates the drive when it is switched off, the drive can be positioned in a range of 250 rotations. The three lower and upper rotations of the measurement range are therefore blocked.

Removal of the supply voltage to the motor has no effect on the internal measurement system.

3.8.1 Positioning range (S-0-0278)

S-0-0278 is used to map the desired positioning range onto the physical range of the machine. In the delivery state, the drive is at position 51200, the upper limit switch is set to 101200 and the lower limit switch is set to 1200, yielding a positioning range of ±125 rotations (±50000 increments). If the desired positioning range does not exceed ±125 rotations, none of the steps described below are required to set the range.

The following two options are available to allow you to realise any desired positioning run distances independently of the run distance set by the mounting orientation of the measurement system (physical positioning range):

1. Bring the axle to be moved (e.g. a spindle) into the desired position, run the drive to the appropriate position with the adjustable collar open and then close the adjustable collar.

   Examples:
   Bring the axle to be positioned into the mid-position, run the drive to the mid-position (position 51200) with the adjustable collar open, then close the adjustable collar. The drive can now run 125 rotations in both directions (default ±50000 increments).

Bring the axle to be positioned all the way to the left (or bottom), run the drive without a loop to the smallest position (position 1200) and with the adjustable collar open, and then close the adjustable collar. The drive can now run 250 rotations to the right (or top) (default ±100000 increments).

Bring the axle to be positioned all the way to the right (or top), run the drive to the largest position (position 101200) with the adjustable collar open, then close the adjustable collar. The drive can now run 250 rotations to the left (or bottom) (default ±100000 increments).

2. Mount the drive in the required position on the axle, close the adjustable collar, then adjust the positioning range using S-0-0278. The parameter sets the upper end of the positioning range. Default setting: upper end at +256 rotations (position 102400). If, after mounting the drive, the positioning range does not match the currently displayed position, you can select the positioning range between +3 …+253 rotations from the current position as required.

   Examples:

After mounting the drive, the position 51200 is displayed (this corresponds to the delivery state). The positioning range should point exclusively to the right (or top) → +253 rotations:

Positioning range = actual position + scale * number of rotations
S-0-0278 = S-0-0051 + (400 * S-0-0079 / P-0-0079) * number of rotations
152400 = 51200 + (400 * 400 / 400) * 253

After mounting the drive, position 100000 is displayed. However, the positioning range should point exclusively to the right (or top) → +253 rotations:
Positioning range = actual position + scale * number of rotations
S-0-0278 = S-0-0051 + (400 * S-0-0079 / P-0-0079) * number of rotations
201200 = 100000 + (400 * 400 / 400) * 253

After mounting the drive, position 2000 is displayed. However, the positioning range should point exclusively to the left (or bottom) → +3 rotations:
Positioning range = actual position + scale * number of rotations
S-0-0278 = S-0-0051 + (400 * S-0-0079 / P-0-0079) * number of rotations
3200 = 2000 + (400 * 400 / 400) * 3

The numbers of increments or position values indicated relate to the following settings, which correspond to the delivery state:
Referencing value (S-0-0175) = 0
Scale for the positional data (S-0-0079 and P-0-0079) = 400
When the positioning range (S-0-0278) is changed, the upper limit is set to the value (positioning range – 3 rotations * scale) and the lower limit to the value (positioning range – 253 rotations * scale). This gives a total positioning range of 250 rotations.

3.8.2 Scale for the positional data (S-0-0079 and P-0-0079)

These parameters influence the number of increments generated per rotation.
The scale can be calculated using the following formula:

$$\frac{increments}{rotation} = \frac{400 * S-0-0079}{P-0-0079}$$

The most advisable approach is to leave P-0-0079 at 400 and then set the increments/rotation using S-0-0079.

Examples:

- The positional data should be scaled in degrees relating to the output shaft:
  1 rotation = 360° → S-0-0079 = 360; P-0-0079 = 400
- The drive is to be operated on a 4mm spindle with a resolution of 1/100 mm:
  1 rotation = 4 mm= 400 increments → S-0-0079 = 400; P-0-0079 = 400
- The drive is to be operated on a 4mm spindle with a resolution of 1/10 mm:
  1 rotation = 4 mm= 40 increments → S-0-0079 = 400; P-0-0079 = 40
- The drive is to be operated on a 2mm spindle with a resolution of 1/100 mm:
  1 rotation = 2 mm= 200 increments → S-0-0079 = 200; P-0-0079 = 200
- The drive is to count 138.23 increments per rotation:
  1 rotation = 138.23 increments → S-0-0079 = 320; P-0-0079 = 926

When you change the scale for the positional data, the actual value, the referencing value, the positioning range, the upper and lower limits, the positioning window and the loop length are recalculated.

3.8.3 Direction of rotation (S-0-0055)

The direction of rotation allows you to specify in which direction the drive should rotate during runs to larger target values.
When looking at the output shaft, the following values are possible:
16: clockwise
23: counter clockwise
When you change the direction of rotation (S-0-0055), the referencing value (S-0-0175), the positioning range (S-0-0278) and the upper and lower limits (S-0-0049 and S-0-0050) are set to the delivery state.

3.8.4 Referencing (S-0-0175) and/or (S-0-0052)

Using the referencing value (S-0-0175) you can shift the whole range of values. There are two ways of setting the referencing value:
Directly – by writing the referencing value in S-0-0175.
Indirectly – by writing a position value in S-0-0052. This allows any actual value to be assigned to the current actual value. The resulting difference is then the referencing value (in S-0-0175).
A change to the referencing value automatically shifts the actual value, positioning range and the upper and lower limits by the same value.
If the values of the upper mapping end and/or the limit switches (S-0-0049 and S-0-0050) are sent as standard with each upper move of the device, the new referencing value may have to be included in these values. This can be done, for example, by defining base values (which apply in the case of "referencing value = 0"), to which the respective current value of the referencing value is then added.

3.8.5 Setting parameters without automatic adjustment

If the user wants to avoid any automatic adjustment of values when setting the parameters for the drive, the optimum order for sending the parameters is as follows:
Direction of rotation (S-0-0055)
Scale for the positional data (S-0-0079)
Extended scale for the positional data (P-0-0079)
Referencing value (S-0-0175) and/or referencing of the position (S-0-0052)
Positioning range (S-0-0278)
Upper limit (S-0-0049)
Lower limit (S-0-0050)
Positioning window (S-0-0057)
Loop length (S-0-0058)
In order to save the settings permanently in the EEPROM, you must then use S-0-0264 (see Section 2.8.4).

4 Technical data

4.1 Ambient conditions

ambient temperature	0 °C to +45 °C		
storage temperature	-10 °C to +70 °C		
shock resistance according to DIN IEC 68-2-27	50 g 11 msec		
resistance to vibration according to DIN IEC 68-2-6	10 Hz to 55 Hz 1.5 mm 55 Hz to 1000 Hz 10 g 10 Hz to 2000 Hz 5 g		
EMC standards	CE		
conformity	CE declaration of conformity available upon request		
protection class	PSE		IP 54
	PSS		IP 65
	PSW		IP 66 (in operation) IP 68 (at standstill)
duty cycle	Device model	Duty cycle in %	Base time in sec.
	PSE34xx PSE30xx to 33xx PSS PSW	20 30 20 20	300 300 600 600

4.2 Electrical data

Nominal power output	PSx30xSE, PSx31xSE, PSE31xxSE	25 W with 30 % OT
	PSx32xSE, PSx33xSE	35 W with 30 % OT
	PSE34xxSE	100 W with 20 % OT
Supply voltage	24 VDC ±10 % (supply voltages for motor and control unit are galvanically separated) Recommendation: Use a regulated power adapter	
Nominal current, control unit	0.15 A	
Nominal current, motor	PSx30xSE, PSx31xSE, PSE31xxSE	2.4 A
	PSx32xSE, PSx33xSE	3.1 A
	PSE34xxSE	7.8 A
Positioning resolution	0,9°	
Positioning accuracy	0.9°	
Absolute value acquisition	Optical - magnetic	

4.3 Physical data

Positioning range	250 usable rotations, no mechanical limits measuring system has a span of 256 turns, minus 3 turns security stock at upper and lower range limit	
torsional rigidity (angle of rotation when switching from operation without backlash to maximum torque)	max. 0.2°	
gear backlash (without spindle compensation run)	max. 0.5°	
Spindle lash compensation	Automatic reference loop after every positioning run (may be activated or deactivated)	
Output shaft	PSE30xSE-8, PSE31xSE-8	8H9 hollow shaft with adjustable collar
	PSE30xSE-14, PSE31xSE-14, PSE32xSE, PSE33xSE	14H7 hollow shaft with adjustable collar
	PSE31xxSE, PSE34xxSE	14H7 hollow shaft with clamp and feather key
	PSS3xxSE-8 PSW3xxSE-8	8H9 hollow shaft with adj. collar or 8h8 solid shaft
	PSS3xxSE-14 PSW3xxSE-14	14H7 hollow shaft with adj. collar or 14h8 solid shaft
recommended diameter of the spindle head	according to the hollow shaft diameter with an interference fit of h9	
Maximum radial force	40 N	
Maximum axial force	20 N	
Dimensions (l x w x h)	see catalog data on our website	
Weight (approx.)	PSx30xSE-8	650 g
	PSx30xSE-14, PSx32xSE	1200 g
	PSx31xSE-8	700 g
	PSx31xSE-14, PSx33xSE	700 g
	PSE31xxSE	1200 g
	PSE34xxSE	1900 g

For additional specifications and dimension drawings, please visit our website at https://www.halstrup-walcher.de/en/products/drive-technology/

5 Certificate of Conformity

halstrup walcher

CE

EU-Konformitätserklärung
EU Declaration of Conformity

Company	**halstrup-walcher GmbH, Stegener Str. 10, 79199 Kirchzarten** erklärt als Hersteller in alleiniger Verantwortung, dass das Produkt declares as manufacturer under sole responsibility, that the product
Product	**Positionierantriebe Baureihen PSE3xx, PSS3xx, PSW3xx** **Positioning Systems Series PSE3xx, PSS3xx, PSW3xx**
Regulations	den folgenden Europäischen Richtlinien entspricht: conforms to following European Directives: EMC 2014/30/EU RoHS 2011/65/EU
Standards	angewandte harmonisierte Normen: applied harmonized standards: EN IEC 61800-3:2018 EN IEC 63000:2018
Certification	EU Konformitätserklärung ausgestellt von EC Type Examination Certificate issued by

Geschäftsführer — Managing Director

Kirchzarten,

14. Okt. 2020 — 14. Oct. 2020

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Handelsregister Freiburg HRB 2209
Umsatzsteuer-ID-Nr. DE 811169901

halstrup walcher

UK CA

UK Declaration of Conformity

Company **halstrup-walcher GmbH, Stegener Str. 10, 79199 Kirchzarten, Germany**
declares as manufacturer under sole responsibility, that the product

Product **Positioning System Models** **PSE3xx / PSS3xx / PSW3xx**

Regulations is in conformity with relevant statutory requirements:

EMC Electromagnetic Compatibility Regulations 2016 No. 1091
RoHS RoHS Regulations 2012 No. 3032

Standards applied standards:

EN 55011:2016+A1:2017; EN 61000-6-2:2005; EN 61800-3:2004/ A1:2012
EN IEC 63000:2018

Declaration signed for and on behalf of

Geschäftsführer Managing Director

Kirchzarten, 26. Jan. 2022

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Umsatzsteuer-ID-Nr. DE 811169901

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