
Instruction Manual

PSx3xxIO



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Purpose of instruction manual

This instruction manual describes the features of PSx3xxIO positioning systems and provides guidelines for their use.

Improper use of these devices or failure to follow these instructions may cause injury or equipment damage. All individuals responsible for operating these devices must therefore be properly trained and aware of the hazards. 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 corresponds to the state of the art and meets all legal requirements set forth in EC directives as evidenced by the CE label.



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The manufacturer owns the copyright to this instruction manual. This manual contains data, instructions and drawings pertaining to the features and usage of these devices; copying this manual in part or in full or distributing it to third parties is prohibited.

1 Safety precautions

1.1 Appropriate use

The positioning systems are particularly suitable for automatic adjustment of tools, attachments or spindles for wood processing machines, packaging machines, printing machines, filling systems and special machines.

The PSx3xxIO positioning systems are not stand-alone devices 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.

The device may only be handled as indicated in this manual. Modifications to the device are prohibited. The manufacturer is not liable for damages caused by improper use or failure to follow these instructions. Violations of this type render all warranty claims null and void.

1.2 Shipping, assembly, electrical connections and start-up

Only technical personnel who are appropriately trained and authorized by the operator of the facility may assemble the device and set up its electrical connections.

The device 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 Troubleshooting, maintenance, repairs, disposal

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

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

This device requires no maintenance.

The electronic components of the device contain environmentally hazardous materials and materials that can be reused. For this reason the device must be recycled in accordance with the environmental guidelines of the jurisdiction in question once it has been taken permanently out of service.

1.4 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.



WARNING: 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 device properly.

2 Device description

2.1 Functional description

The PSx3xxIO 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 IO-Link 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.

PSx3xxIO positioning systems convert a digital positioning signal into an angle of rotation.

2.2 Installation

Hollow shaft:

The PSx3xxIO is mounted onto the machine by sliding the hollow shaft of the positioning gear onto the axis to be driven and then securing it with an adjustable collar (recommended diameter of the axis is either 8h9 or 14h9; wrench torque for screw: 1.5Nm). The adjustable collar should be tightened only just to the point where it can no longer rotate freely.

Securing the pin under the hollow shaft into an appropriate bore will prevent further rotation. (see drawing)

Solid shaft:

The PSx3xxIO is mounted on the machine by fixing the solid shaft with coupling and intermediate flange to the axis of the machine.



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



Driving the PSx3xxIO rearward is prohibited (e.g. it's not allowed to turn the output shaft by an external force).



If the diameter of the drive shaft (-8, -14) is **not** specified with the device name, the information applies for **all** drive shafts (applies for the entire document).

x in the device name stands for a digit in the range 0..9. 'xx' in the device name stands for a number in the range 10..999.

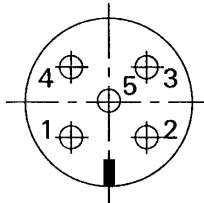
2.3 Pin assignment

In the housing cover of the PSx3xxIO, there is a 5-pin circular plug of the series 713/763 (A-coded) from Binder (**IO-Link Class B port**) present for the connection of supply voltage and for communication via IO-Link.

For PSE34xx, in the housing cover, there is a 5-pin Harting grommet plug HAN4A for the motor supply and a 5-pin circular plug of the Series 713/763 (A-coded) from Binder for the control voltage and IO-Link.

A 4-pin plug of the series 718 from Binder serves for the connection of tip buttons (optional).

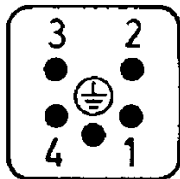
Connector pin assignment for the power supply and IO-Link for PSx3xxIO



(Top view from the outside)

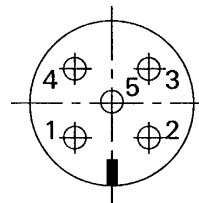
- 1. +24V control unit
- 2. +24V motor
- 3. GND control unit
- 4. I/O-Link C/Q
- 5. GND motor

Connector pin assignment for the power supply and IO-Link for PSE34xxIO



(Top view from the outside)

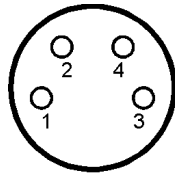
- 1. +24V motor
- 2. GND motor
- 3. -
- 4. -
- 5. Housing



(Top view from the outside)

- 1. +24V control unit
- 2. -
- 3. GND control unit
- 4. I/O-Link C/Q
- 5. -

Connector pin assignment for jog keys (optional)



(Top view from the outside)

1. +24V (output)
2. forward key
3. reverse key
4. ground

2.4 Meaning of the LED's

The following LED's are under the transparent sealing plug:

- Green LED = RUN LED in accordance with IO-Link:
 - off: IO-Link communication not available
 - 90% on; 10% off: IO-Link communication available
- Orange LED = time stamp function
 - off: Process output data consist of control word and target position
 - on: Process output data contain time stamp (for an open C/Q-pin)
- Yellow LED = Display actuator voltage
 - off: no motor voltage present
 - Continuous lights: motor voltage present

2.5 Commissioning

After applying the supply voltage the PSx3xxIO may perform **no** initial reference loop before the first positioning. A positioning or manual drive order may be commenced immediately.

Process of the positioning operation (with loop)

The PSx3xxIO distinguishes between the following cases in a positioning process (assumption: The direction in which each target position is approached is forwards):

1. New position value is greater than current one: The position is approached directly.
2. New position value is less than current one: There is a reverse of 5/8 rotations and the exact position is approached in forward motion.
3. New position value is greater than the current one, but was previously a reverse without loop drive (e.g. a manual drive): Since the loop length > 0, the drive moves the position in all cases with a forward movement, whose length is at least the same as the loop length. In order to achieve this, the drive, if necessary, initially goes in the reverse direction, i.e. in the opposite direction to the desired direction of travel. The maximum length of this route is the loop length.

After reaching the target position, this position is compared with the internal absolute encoder position. In the event of a deviation, the status bit "ERROR" is set (Bit 9 in the status word).

In the delivery condition, the loop length is > 0, i.e. each target position is approached in forward direction.



A positioning on the upper limit (ISDU 129) with a loop length < 0 is not possible because the drive would have to overrun the end limit to achieve this. The same applies to the lower limit (ISDU 130) for a loop length > 0 .



Operation of the PSW is not permitted underwater.

Process of the positioning operation without loop

The “positioning without loop” mode is used primarily for moving the small distances involved in fine adjustments. In this case, each position is approached directly. This does NOT eliminate any play present in the spindle in question. The PSx3xxMod internal gear backlash does not play a role in this case, as position data are acquired directly at the output shaft.



Drives which entail a block drive (e.g. reference drives to block) may only be started with a reduced torque (max. driving torque is a maximum of 10% of the rated torque or the smallest possible value).

2.6 IO-Link

For the IO-Link interface, IEC 61131-9 Version 1.1.2 is used as the SDCI protocol.

The format of the output data can be optionally constructed according to the time stamp specification from the company Sick (consisting of a time stamp and two control bits), or consist of a control word and target value (process data; this is the delivery condition).

(a) Table of the implemented object directory entries

Designation	ISDU Number	Function	Value range	Secured	Delivery	R/W
IO-Link standard variables						
Direct Parameter 1	0	Sub 1: Master command Sub 2: Master cycle time Sub 3: Minimum cycle time Sub 4: M-Sequence Capability Sub 5: IO-Link version ID Sub 6: Process data input length Sub 7: Process data output length Sub 8: Vendor ID 1 Sub 9: Vendor ID 1 Sub 10: Device ID 1 Sub 11: Device ID 2 Sub 12: Device ID 3 Sub 13: reserved Sub 14: reserved Sub 15: reserved Sub 16: Standard command	8 bit 8 bit 8 bit 8 bit 8 bit 8 bit 8 bit 8 bit 8 bit 8 bit 8 bit 8 bit 8 bit 8 bit 8 bit 8 bit		68 43 17 135 16 2 216 0 0 0	W R/W R R R R R R R R R R R R R W
Standard command	2	To trigger specific commands Value Meaning 128 Reset device 130 Restore factory setting 160 Restore factory setting without changing the process data format 161 Save the parameters in EEPROM	8 bit			W

Designation	ISDU Number	Function	Value range	Secured	Delivery	R/W
IO-Link standard variables (continuation)						
Device access locks	12	Bit 0: parameter (write) access lock Bit 1: data storage lock Bit 2: local parameterisation lock Bit 3: local user interface lock	16 bit	yes	0	R/W
Vendor name	16	halstrup-walcher GmbH	String			R
Vendor text	17	www.hwg.eu	String			R
Product name	18	depending on the gearbox type, e.g. "PSE312-8-IO"	String			R
Product-ID	19	"PSE"	String			R
Product text	20	"Positioning system"	String			R
Serial number	21	as a string of 5 characters, e.g. "00042"	String			R
Hardware version	22	e.g. "V1.0"	String			R
Firmware version	23	e.g. "V1.0"	String			R
Application specific. tag	24	any text (max. 16 characters).	String		""	R/W
Status requests						
Status	64	<u>Bit 0</u> : target position reached <u>Bit 1</u> : drag error <u>Bit 2</u> : reverse jog key active <u>Bit 3</u> : forward jog key active <u>Bit 4</u> : motor power present <u>Bit 5</u> : positioning run aborted <u>Bit 6</u> : drive is running <u>Bit 7</u> : temperature exceeded <u>Bit 8</u> : movement opposite loop direction <u>Bit 9</u> : error <u>Bit 10</u> : positioning error (block) <u>Bit 11</u> : manual displacement <u>Bit 12</u> : incorrect target value <u>Bit 13</u> : motor power was missing <u>Bit 14</u> : positive range limit <u>Bit 15</u> : negative range limit	0..FFFFh 16 bit			R
Actual rpm	65	Current speed in rpm	16 bit			R
Set actual value	66	If this par. is set to 0 and the subsequent write command affects the actual position (67), the writing of the actual position is suppressed.	0...1 8 bit	no	0	R/W

Designation	ISDU Number	Function	Value range	Secured	Delivery	R/W
Status requests (continuation)						
Actual value	67	Current actual position, value in 1/100 mm (for default settings of numerator ISDU 124 and denominator ISDU 125 and spindle pitch 4 mm) Writing onto this register causes the current position to be "referenced" onto the transferred value	±31 bit	no		R/W
Actual torque	68	Current torque in cNm	16 bit			R
Maximum torque	69	Maximum torque on the last run (start phase during which the ISDU release torque applies, see ISDU 152/160, as well as brake phase are not taken into account) Value in cNm	16 bit			R
U control	70	Current supply voltage of the control in 0.1 V	16 bit			R
U motor	71	Current supply voltage of the motor in 0.1 V	16 bit			R
Device temperature.	72	Temperature inside the device in °C	16 bit			R
Production date	77	Year and week of manufacture (as integer number)	YYWW 16 bit			R
Serial number	78	Current device serial number	0...65535 16 bit			R
Device model	79	one of the following device types from the PSx range (indicate 5-digit numbers in the last 2 digits of the diameter of the output shaft): PSE and PSS: 30108, 30114, 30208, 30214, 30508, 30514, 31108, 31114, 31208, 31214, 315, 322, 325, 332, 335, 3110, 3125, 3410, 3418 PSW: 36108, 36114 (= 301-8/14) 36208, 36214 (= 302-8/14) 36508, 36514 (= 305-8/14) 37108, 37114 (= 311-8/14) 37208, 37214 (= 312-8/14) 375 (=315-8) 382 (=322-14) 385 (=325-14) 392 (=332-14) 395 (=335-14)	16 bit			R
Software version	80	Software version number	16 bit			R

Designation	ISDU Number	Function	Value range	Secured	Delivery	R/W
Run commands						
Set control word	109	If this par. is set to 0 and the subsequent write command affects the control word (110), the writing of the control word is suppressed.	0...1 8 bit	no	0	R/W
Control word	110	<u>Bit 0</u> : manual run to larger values <u>Bit 1</u> : manual run to smaller values <u>Bit 2</u> : transfer target values (for transferring the target values with the help of the process data, the positioning is only started if this bit is set.) <u>Bit 3</u> : release manual run in jog mode: If the bit is deleted, only individual steps are available in the jog mode <u>Bit 4</u> : release: The axis is only driven when the bit is set (except jog mode with buttons or with Bits 8/9). <u>Bit 5</u> : release jog operation with keys: For an existing IO-Link connection, the external buttons are only active when the bit is set. <u>Bit 6</u> : run without loop <u>Bit 7</u> : run initial reference loop <u>Bit 8</u> : jog to larger values <u>Bit 9</u> : jog to smaller values <u>Bit 10</u> : readjustment <u>Bit 11</u> : execute braking free run <u>Bit 12</u> : run with drag error correction All other bits must be set to 0!	16 bit	no	0	R/W
Set target position	111	If this par. is set to 0 and the subsequent write command affects the target position (112), the writing of the control word is suppressed.	0...1 8 bit	no	0	R/W
Target position	112	Target position to be approached Value in 1/100 mm (for the default values of numerator ISDU 124 and denominator ISDU 125 and spindle pitch 4 mm)	±31 bit	no	0	R/W

Designation	ISDU Number	Function	Value range	Secured	Delivery	R/W
"Bus communication" parameter group						
Process data format	116	0 → with time stamp function 1 → with 6 bytes of output data After saving and restarting, the device reports with the Device ID which corresponds to the gearbox type: with time stamp function → odd ID (e.g. 3120801) with 6 bytes of output data → even ID (e.g. 3120802)	0...1 8 bit	yes	1	R/W
Communication timeout	118	Value in milliseconds If the value is 0, the communication timeout is disabled. A value > 0 defines the time within which the master must send a new message to maintain the connection. A timeout either results in a drive cancellation (value of ISDU 137 = 1) or a drive to the safety position defined by ISDU 138 (value of ISDU 137 = 2).	0... 10000 16 bit	yes	0	R/W
Stack behaviour	119	<u>Bit 0</u> : Device sends diagnostic messages All other bits must be set to 0!	8 bit	yes	1	R/W

Designation	ISDU Number	Function	Value range	Secured	Delivery	R/W
"Position values" parameter group						
Direction of rotation	123	0: clockwise (when looking at the output shaft) 1: counter clockwise	0 or 1 8 bit	yes	0	R/W
Actual value assessment, numerator	124	With these values, any user resolution can be mapped on the drive. For a numerator factor 400, the spindle pitch / resolution is in the denominator factor e.g.: Spindle pitch 1.5mm with resolution 1/100 mm: numerator = 400, denominator = 150	1...10000 16 bit	yes	400	R/W
actual value assessment, denominator	125		1...10000 16 bit	yes	400	R/W
Write referencing value	126	If this par. is set to 0 and the subsequent write command affects the referencing value (127), the writing of the referencing value is suppressed.	0...1 8 bit	no	0	R/W
Referencing value	127	Value by which setpoints, actual values and limit values are corrected	±31 bit	yes	0	R/W
Upper mapping end	128	Definition of the positioning range relative to the absolute value encoder permitted values: (1 + referencing value) ... (204800 * denominator/numerator - 1 + ref.value)	±31 bit	yes	102400	R/W
Upper limit	129	maximum permissible target position permitted values: (upper mapping end - 1200..101200 * denominator/numerator)	±31 bit	yes	101200	R/W
Lower limit	130	minimum permissible target position permitted values: (upper mapping end - 1200..101200 * denominator/numerator)	±31 bit	yes	1200	R/W
Positioning window	131	Permissible difference between the target and the actual value for the "Position reached" bit The maximum settable value changes in the same factor as the resolution	1...100 16 bit	yes	2	R/W
Loop length	132	Minimum number of steps in which the drive approaches a target in a predefined direction Value in steps (0 → no loop)	0.025...1 revolution or 0 32 bit	yes	250	R/W
Drag error	133	Maximum drag error before the "drag error" bit is set. Value is expressed in steps (at a resolution of 0.5 mm)	20...1000 16 bit	yes	40	R/W
Loop direction	134	0: with 5/8 turn forwards 1: with 5/8 turn backwards (5/8 revolutions is the default value, p. ISDU 132)	0 or 1 8 bit	yes	0	R/W
Jog increment	135	The number of steps when briefly pressing the external buttons (or briefly activating a jog drive)	1...100 16 bit	yes	1	R/W

Designation	ISDU Number	Function	Value range	Secured	Delivery	R/W
"Position values" parameter group (continuation)						
Number breaking free steps	136	Number of steps for the brake release drive	1...50 16 bit	yes	*)	R/W
Configuration for connection timeout	137	Reaction of the drive to a connection failure 0 → reserved 1 → drive cancellation 2 → Drive to a safe position (see ISDU 138) (a connection failure is only detected for ISDU 118 > 0.)	16 bit	yes	1	R/W
save position for connection timeout	138	If the "Drive to safe position" is configured (see ISDU 137), the drive moves into this position in the event of a connection timeout.	±31 bit	yes	0	R/W
"Speed" parameter group						
Target rpm abs	142	Maximum speed to be used for position drives Value in rpm	*) 16 bit	yes	*)	R/W
Target rpm CCW	143	Value in rpm	*) 16 bit	yes	*)	R/W
Target rpm CW	144	Value in rpm	*) 16 bit	yes	*)	R/W
Target rpm jog	145	Maximum speed to be used for manual drives Value in rpm	*) 16 bit	yes	*)	R/W
Rpm limit abort	146	Speed limit for drive cancellation Value in % of the target speed	30...90 16 bit	yes	60 PSE311 0 and PSE312 5 30 (all others)	R/W
Acceleration	147	Value in rpm per sec.	*) 16 bit	yes	*)	R/W
Deceleration	148	Value in rpm per sec.	*) 16 bit	yes	*)	R/W

*) Values are dependent on the gearbox type (see the following table).

Designation	ISDU Number	Function	Value range	Secured	Delivery	R/W
"Torque" parameter group						
Maximum start torque	152	Value in cNm	*) 16 bit	yes	*)	R/W
Maximum torque	153	Applies after the end of the start-up phase (during the start phase, the value from ISDU 152 applies); value in cNm	*) 16 bit	yes	*)	R/W
Max. holding torque at drive stop	154	Value in cNm	*) 16 bit	yes	*)	R/W
Holding torque	155	Holding torque at standstill in cNm	*) 16 bit	yes	*)	R/W
"Time" parameter group						
time elapsed until speed falls below rpm limit for aborting run	159	Value in milliseconds	50...500 16 bit	yes	200	R/W
time period for start-up torque	160	Value in milliseconds	10...1000 16 bit	yes	200	R/W
duration of maximum holding torque at end of run	161	time period at end of run, in which the 'maximum holding torque at end of run' applies (value in milliseconds)	0..1000 16 bit	yes	200	R/W
idle period for direction change	162	Waiting time in milliseconds for reversal of direction of rotation	10... 10000 16 bit	yes	10	R/W
Wait time for manual drive	163	The time a manual drive button must be pressed (or a jog drive bit must be activated), so that a manual drive begins Value in steps of 5 msec	20...2000 16 bit	yes	200	R/W
Wait time for brake (drive start)	164	Time period prior to the drive start in which the brake can be released without the engine moving (value in milliseconds)	0...2000 16 bit	yes	150	R/W
Wait time for brake (drive end)	165	Period of time after the drive end for which the brake remains released (value in milliseconds)	0...3000 16 bit	yes	1000	R/W
UMot filter	166	Average time for motor voltage measurement in steps of 5 msec	100... 1000 16 bit	yes	100	R/W

*) Values are dependent on the gearbox type (see the following table).

Designation	ISDU Number	Function	Value range	Secured	Delivery	R/W
"Other" parameter group						
General purpose	171-180	10 freely-usable registers	16 bit	yes	0	R/W
UMot limit	181	Voltage limit for Bit 'motor power present' in 0.1 V	180...240 16 bit	yes	185	R/W
Temperature limit	182	Temperature limit °C for overtemperature	10...70 16 bit	yes	70	R/W
Delivery state	193	<p><u>Writing a "-1"</u>: Sets the delivery state, without changing the process data format (starts initial reference loop, positioning on the measuring range middle)</p> <p><u>Writing a "-2"</u>: Sets the delivery state, (process data format, starts initial reference loop, positioning on the measuring range middle) A new process data format is only active after a "Reset" command or a restart!</p> <p><u>Writing a "1"</u>: Saves the parameters in EEPROM</p> <p><u>Writing a "0"</u>: No action</p> <p><u>Writing a "2"</u>: Sets the delivery state, without performing an initial reference loop and without positioning on measuring range centre (process data format ISDU 116 to 1) A new process data format is only active after a "Reset" command or a restart!</p> <p><u>Writing a "3"</u>: Sets the delivery state, without changing the process data format, without performing an initial reference loop and without positioning on the measuring range middle</p> <p><u>Read after booting</u>: 0 → memory contents correct 0 → memory contents incorrect</p> <p><u>Read after saving</u>: 0 → Save successfully completed ≠ 0 → Save is still running or completed with error (saving can take up to 2000ms)</p>	-2...3 (When writing) 0...2 (When reading) ±15 bit	no		R/W

Table of the speed and torque values for the different gear types

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	328-14
Designation	ISDU No.	Value range delivery					
Target rpm abs	142	15...230 230	10...150 150	3...70 70	20...200 170	10...100 85	5...45 45
Target rpm jog	145	15...230 80	10...150 50	3...70 20	20...200 80	10...100 40	5...45 22
Target rpm CCW	143	15...230 230	10...150 150	3...70 70	20...200 170	10...100 85	5...45 45
Target rpm CW	144	15...230 230	10...150 150	3...70 70	20...200 170	10...100 85	5...45 45
Acceleration	147	97...600 600	50...400 400	23...130 130	97...525 525	50...260 260	22...100 100
Deceleration	148	97...600 600	50...400 400	23...130 130	97...525 525	50...260 260	22...100 100
Maximum torque	153	2...100 100	10...200 200	50...500 500	10...200 200	20...400 400	80...800 800
Maximum start torque	152	2...125 125	10...250 250	50...600 600	10...250 250	20...500 500	80...960 960
Maximum holding torque	155	0...90 30	0...150 50	0...300 100	0...100 35	0...200 70	0...450 150
Max. holding torque at drive stop	154	0...180 60	0...300 100	0...600 200	0...200 70	0...400 140	0...900 300
Number of breaking free steps	136	1...50 4	1...50 4	1...50 3	1...50 4	1...50 4	1...50 3

Device type PSW		301-x 311-x	302-x 312-x	305-x 315-8	322-14 332-14	325-14 335-14	328-14
Designation	ISDU No.	Value range delivery					
Target rpm abs	142	15...180 180	10...125 125	3...60 60	20...150 125	10...80 60	5...35 35
Target rpm jog	145	15...180 80	10...125 50	3...60 20	20...150 80	10...80 40	5...35 22
Target rpm CCW	143	15...180 180	10...125 125	3...60 60	20...150 125	10...80 60	5...35 35
Target rpm CW	144	15...180 180	10...125 125	3...60 60	20...150 125	10...80 60	5...35 35
Acceleration	147	97...600 600	50...400 400	23...130 130	97...525 525	50...260 260	22...100 100
Deceleration	148	97...600 600	50...400 400	23...130 130	97...525 525	50...260 260	22...100 100
Maximum torque	153	2...100 100	10...200 200	50...500 500	10...200 200	20...400 400	80...800 800
Maximum start torque	152	2...125 125	10...250 250	50...600 600	10...250 250	20...500 500	80...960 960
Maximum holding torque	155	0...90 30	0...150 50	0...300 100	0...100 35	0...200 70	0...450 150
Max. holding torque at drive stop	154	0...180 60	0...300 100	0...600 200	0...200 70	0...400 140	0...900 300
Number of breaking free steps	136	1...50 4	1...50 4	1...50 3	1...50 4	1...50 4	1...50 3

Device type PSE		3110	3125	3210 3310	3218
Designation	ISDU No.	Value range delivery			
Target rpm abs	142	1...30 30	1...12 12	5...45 38	3...30 28
Target rpm jog	145	1...30 12	1...12 5	5...45 15	3...30 10
Target rpm CCW	143	1...30 30	1...12 12	5...45 38	3...30 28
Target rpm CW	144	1...30 30	1...12 12	5...45 38	3...30 28
Acceleration	147	9...50 50	4...20 20	20...117 117	11...70 70
Deceleration	148	9...50 50	4...20 20	20...117 117	11...70 70
Maximum torque	153	100...1000 1000	250...2500 2500	100...1000 1000	180...1800 1800
Maximum start torque	152	100...1200 1200	250...3000 3000	100...1200 1200	180...2200 2200
Maximum holding torque	155	0...600 200	0...1250 450	0...500 175	0...900 300
Max. holding torque at drive stop	154	0...1200 400	0...2500 900	0...1000 350	0...1800 600
Number of breaking free steps	136	1...50 3	1...50 3	1...50 3	1...50 3

Special version	PSE	3325	3410	3418	311-8/So
Designation	ISDU No.		Value range delivery		
Target rpm abs	142	2...18 15	10...100 100	5...90 90	30...1000 750
Target rpm jog	145	2...18 6	10...100 40	5...90 30	30...1000 250
Target rpm CCW	143	2...18 15	10...100 100	5...90 90	30...1000 750
Target rpm CW	144	2...18 15	10...100 100	5...90 90	30...1000 750
Acceleration	147	8...45 45	20...350 350	10...315 315	305...1800 1800
Deceleration	148	8...45 45	20...350 350	10...315 315	305...1800 1800
Maximum torque	153	250...2500 2500	100...1000 1000	100...1800 1800	5...50 50
Maximum start torque	152	250...3000 3000	100...1200 1200	100...2000 2000	5...60 60
Maximum holding torque	155	0...1250 450	0...300 200	0...450 300	0...30 10
Max. holding torque at drive stop	154	0...2500 900	0...600 400	0...900 600	0...60 20
Number of breaking free steps	136	1...50 3	1...50 4	1...50 4	1...50 4

(b) Process Data Definition

1) Process **output** data (from the point of view of the IO-Link master)

Assignment for the variant "time stamp function":

Bit	Meaning	
0-1	Control bits	0 → abort run 1 → Manual drive to larger values 2 → Manual drive to smaller values 3 → Positioning drive to the target position previously set with ISDU 112
2-15	Time stamp	Time after which the drive should execute the command (value in 4μs) 0x3FFF = 16383 → No new time stamp

The base time is 4μs, i.e. the relevant time stamp value is calculated as follows from the desired delay time:

$$Timestampvalue = \frac{desired_delaytime [\mu s]}{4\mu s}$$

Since the time stamp value must lie in the range [0...16368], the maximum possible delay time is 65.472ms.

A valid time stamp that is cyclically transmitted creates no response in the drive because the last time stamp becomes invalid when a new one is entered. Therefore, the intended action is only executed if the time stamp is inactive, i.e., accepts the value 16383.

Time stamp values < 2000 are executed immediately, since the delay time is then < 8 ms and is therefore less than the IO-Link cycle time.

The drive acknowledges the triggering of a time stamp with a 250ms-long dark phase of the orange LED. When the orange LED is permanently dark, the drive continuously receives valid time stamps.

Assignment for the variant "6 bytes of output data":

Bit	Byte	Meaning	Corresponding IO-Link parameters
0-15	0.1	Control word	110
16-47	4-7	Target position	112

The desired variant for the process output data is specified by ISDU 116 ("Process Data Format"), the default is "6 bytes of output data".

2) Process **input** data (from the point of view of the IO-Link master)

Assignment:

Bit	Byte	Meaning	Corresponding IO-Link ISDU's
0-15	0.1	Status	64
16-31	2.3	Actual rpm	65
32-63	4-7	Actual value	67

The assignments are not changeable.

(c) Detailed description of the status bits

Bit 0: target position reached

set:

- After a successful arrival to a transferred target position
- If after the initial reference loop the actual value corresponds to the previously transferred target position

reset:

- after transfer of a target position if the difference to the actual value is greater than the positioning window ISDU is (131)
- by a manual run
- for a transfer of an invalid target position
- for manual turning at standstill

- Bit 1:* Drag error
set:
- If the set maximum speed is not reached after the end of the acceleration phase
reset:
- with each new run command
- Bit 2:* Reverse jog key active
set:
- If Pin 3 of the key connector is connected with Pin 1 (+24V),
reset:
- If Pin 3 of the key connector is disconnected with Pin 1 (+24V),
- Bit 3:* Forward jog key active
set:
- If Pin 2 of the key connector is connected with Pin 1 (+24V),
reset:
- If Pin 2 of the key connector is disconnected with Pin 1 (+24V),
- Bit 4:* Motor power present
set:
- If the motor supply voltage is above the Umot limit (ISDU 181) and below 30V
reset:
- If the motor supply voltage is below the Umot limit or above 30V
- Bit 5:* Positioning run aborted
set:
- if a positioning run is cancelled by cancelling the release in the control word
reset:
- when a new run command is sent
- Bit 6:* Drive is running
set:
- with rotating drive
reset:
- at standstill
- Bit 7:* Temperature exceedance
set:
- If the temperature inside the device exceeds the limit value from ISDU 182
~~deleted:~~
- If the temperature inside the device exceeds the limit value by 5°C
- Bit 8:* Movement opposite loop direction
set:
- for manual drive against the positioning direction (a subsequent manual travel in positioning direction no longer deletes this bit)
- during a positioning operation against the loop direction
reset:
- After a successful arrival to a transferred target position in loop direction
- after a initial reference loop
- Bit 9:* Error
set:

- if an internal problem has been detected in the position calculation
If the error bit is set, no drive orders are possible apart from the initial reference loop

reset:

- If a initial reference loop is completed correctly

Bit 10: Positioning error (block)

set:

- If a positioning run has been cancelled as a result of overload (block, strong stiffness)

reset:

- by ordering a positioning order
- after a correctly-completed initial reference loop

Bit 11: Manual displacement

set:

- If the drive, at a standstill, is rotated from the outside by more than the value set in the positioning window

reset:

- by ordering a positioning order
- after a correctly-completed initial reference loop

Bit 12: Incorrect target value

set:

- If a transferred target value is outside of the limit switch limits, also caused e.g. by the act. value of the referencing value (ISDU 127)
- If a transferred target value is within the limit switch limits, but would leave the specified range through a necessary loop drive

reset:

- by sending a valid setpoint value

Bit 13: Motor power was missing

set:

- if the motor voltage is under the ISDU U_{mot} limit (181) or above 30V when ordering a positioning or initial reference loop
- If, during the drive, the motor voltage leaves the specified corridor

reset:

- if the motor voltage is above the ISDU U_{mot} limit (181) or below 30V when ordering a positioning or initial reference loop

Bit 14 / 15: Forward / reverse end limit is approached

set:

- if the end limit value is reached by manual drive (not if this is achieved by positioning drive)
- If an end switch limit is changed so that the current position is outside
- if, during standstill, the drive is moved by an external force to a position outside the range defined by the end switch limits

reset:

- At the start of a positioning, initial reference loop or manual drive

(d) Detailed description of the control bits

- Bit 0:* Manual run to larger values
- Bit 1:* Manual run to smaller values
- Bit 2:* Transfer target values: For transferring a target value with the help of the process data, the positioning is only started if this bit is set.
- Bit 3:* Release for manual run in jog key mode: This bit must be set in order to switch from jog key mode (run activated via the keys, if bit 5 is set; or via command if bit 8 or 9 is set in the control word, if bits 4 and 5 are not set) to manual run mode by holding down a key (or a jog key bit is activated for a longer time). Single increments are the only option in jog key mode if this bit is reset.
- Bit 4:* Release: Run commands are only executed when the bit is set (except jog mode with buttons or with Bits 8/9 of the control word). This bit must be set for positioning runs and manual runs, it may not be set for jog runs. If it is cleared during a run, this is cancelled and status bit 5 is set ("Positioning run aborted").
- Bit 5:* Release jog operation with keys: If there is an existing IO-Link connection, jog mode via buttons is only possible if this bit is set and bit 4 is reset. For jog mode via IO-Link (bits 8 or 9 in the control word), this bit may not be set.
- Bit 6:* Run without loop: If the bit is set, all targets positions are approached directly (without any loop).
- Bit 7:* Initial reference loop: 5/8 turns against loop direction and then 5/8 in loop direction at manual drive speed. This command had to be executed after switch-on in previous versions. This is no longer the case.
- Bit 8:* Jog to larger values: Functionally corresponds to a pressed button forward (Bit 3 in status). Bits 4 and 5 may not be set in this operating mode!
- Bit 9:* Jog to smaller values: Functionally corresponds to a pressed button backward (Bit 2 in status). Bits 4 and 5 may not be set in this operating mode!
- Bit 10:* Release readjustment: The drive only readjusts with a set bit, if it is pushed against the loop position after the end of a drive. If Bit 6 ("Run without loop") is set, the drive readjusts in both directions.
- Bit 11:* Execute braking free run: At the start of the positioning, the brake is initially actuated and the "waiting time for brake (drive start)" is temporised (ISDU 164). In this time, the brake should move into the working position (in this brake position, the engine can move freely). After the end of the waiting period, a certain distance is driven in both directions to release any stuck brakes. This distance ("number of release steps") is set in ISDU 136. Bit 4 must be set at the same time for the execution of the command.
- Bit 12:* Run with drag error correction: With a set bit, the drive attempts, under consideration of the set maximum current, to amend a tracking error that has occurred by controlling the speed at a value which is slightly above or below

the specified target speed (ISDU 142). Drag error correction only takes place for positioning drives, i.e. not for manual or jog drives. It also only takes effect during acceleration or a drive at constant speed, not during deceleration. The speed setpoint for acceleration results from the speed at the start of the positioning as well as from the specified acceleration (ISDU 147).

Bit 13: reserved, must be set to 0!

Bit 14: reserved, must be set to 0!

Bit 15: reserved, must be set to 0!

3 Positioning in "Time stamp" mode



This mode is active when the orange LED is permanently on with the C/Q pin open.

(a) Positioning run

- to control the drive, it must first be switched to the IO-Link status "operate".
- disable time stamp (value 0x3FFF = 16383)
- transfer desired setpoint with ISDU 112
- control bits (from the process output data) at 0x03
- time stamp at the desired value, e.g. 10000 (the master now continuously sends new time stamps, which is why the drive order is never started in this state.)
- disable time stamp (value 0x3FFF = 16383)
 - The last time stamp remains valid.
 - Drive starts to move
- Cancellation of drive by withdrawing the release:
 - Control bits at 0x00 with time stamp 0 → drive cancellation is executed immediately
- if a new target position is transferred during the positioning run, the new destination is approached immediately. If the direction of rotation does not need to be changed, this is done without interruption.
- if a manual run command is sent during a position run, the positioning run is interrupted (speed reduced to slow speed) and continued with the manual run.

(b) Positioning run without loop

The sequence corresponds to a positioning run with loop. To perform a positioning run without a loop, Bit 6 must be set in the control word in addition to the release (Bit 4 in control word; set by the control bits in the process output data) ("Run without loop"). Before the positioning run, set the control word with the help of ISDU 110 to 0x40.

(c) Manual run

- disable time stamp (value 0x3FFF = 16383)
- Transfer manual run: Control bits at 0x01 or 0x02): Drive starts to move
- time stamp at the desired value, e.g. 10000
- disable time stamp (value 0x3FFF = 16383) → Drive starts to move
- Ending of drive by withdrawing the release:
Control bits at 0x00 with time stamp 0 → drive cancellation is executed immediately
- In the case of transfer of a target value during a manual run this is ended and the target position is approached immediately.

If the time stamp is permanently inactive in the process output data (value 0x3FFF - 16383), the drive can be completely controlled with the help of ISDU.

(d) Positioning drive with inactivated time stamp

- target position transfer (control word, ISDU 110 = 0x10 and target position, ISDU 112): Drive starts to move
- Cancellation of drive by withdrawing the release (send control word = 0x00)
- if a new target position is transferred during the positioning drive, the new destination is approached immediately. If the direction of rotation does not need to be changed, this is done without interruption.
- if a manual run command is sent during a position run, the positioning run is interrupted (speed reduced to slow speed) and continued with the manual run.

The following sequence is also possible:

Initial situation:

- release is not set
- the target position has already been transferred

Set Release (Bit 4 in the control word): Drive starts to move

(e) Positioning run without loop with inactivated time stamp

The sequence corresponds to a positioning run with loop. To perform a positioning run without a loop, Bit 6 ("run without loop") must be set in addition to the release (Bit 4 in control word).

(f) Manual run with inactivated time stamp

- transfer manual run (send control word, ISDU 110 with value 0x11 or 0x12):
Drive starts to move
- Exit the manual run by withdrawing the manual travel command (send control word with the value 0x10) or by cancelling the release (send control word with the value 0x00).
- In the case of transfer of a target value during a manual run, this is ended and the sent position is approached immediately.

4 Positioning in "6 byte output data" mode



This mode is active when the orange LED is permanently dark with the C/Q pin open.

(a) Positioning run

- to control the drive, it must first be switched to the IO-Link status "operate".
- transfer target position:
Control word = 0x14 and the desired target position
→ Drive starts to move
- Cancellation of drive by withdrawing the release:
Control word = 0x00
- if a new target position is transferred during the positioning run, the new destination is approached immediately. If the direction of rotation does not need to be changed, this is done without interruption.
- if a manual run command is sent during a position run, the positioning run is interrupted (speed reduced to slow speed) and continued with the manual run.

The following sequence is also possible:

Initial situation: Release is not set

- transfer target position:
Control word = 0x04 and desired target position
- set release:
Control word = 0x10
→ Drive starts to move

(b) Positioning run without loop

The sequence corresponds to a positioning run with loop. To perform a positioning run without a loop, Bit 6 ("Run without loop") must be set in the in addition to the release (Bit 4) in control word.

(c) Manual run

- transfer manual drive (control word = 0x11 or 0x12): Drive starts to move
- stop the manual run by withdrawing the manual run command (send control word 0x10) or by cancelling the release (send control word 0x00).
- In the case of transfer of a target position during a manual drive this is ended and the sent position is approached immediately (control = and desired target position value).

5 Special features

(a) Speed, acceleration and deceleration

The initial reference loop and the manual run are performed at the maximum speed specified in ISDU 145, positioning runs with the maximum velocity from ISDU 142. For counterclockwise runs the maximum speed from ISDU 143 also applies, for clockwise runs the one from ISDU 144. The maximum acceleration from ISDU 147 and the maximum deceleration from ISDU 148 apply for all runs. At the drive end, the maximum delay is successively reduced during the approach to the destination to realise a harmonious transient response.

(b) Behaviour of the drive in the case of blocking

If, during a run the achievable speed is lower than the limit value of 30% for longer than 200 ms (ISDU 159) of the selected maximum speed (ISDU 146) (these are the default values), a block is detected, the run is aborted and the bit 'positioning error' is set. The drive then waits with the set holding torque (ISDU 155).

New run commands can then be sent without further action i.e. the transfer of a new target position starts a new positioning procedure.

An exception is if the target value is the same as before. In this case, depending on the operating mode, you must proceed as follows:

1) "Time stamp" mode:

- control bits (from the process output data) at 0x00
 - Time stamp at the desired value, e.g. 10000
 - Disable time stamp (value 0x3FFF = 16383)
 - control bits (from the process output data) at 0x03
 - time stamp at the desired value, e.g. 10000
 - Disable time stamp (the value 0x3FFF = 16383)
- Drive starts to move

2) "Time stamp" mode with permanently-inactivated time stamp:

First, the release must be withdrawn and then set again (Bit 4 in control word). The target position must be transferred again (ISDU 112).

→ Drive starts to move

3) "6 bytes of output data" mode:

Withdraw the release and then set again (Bit 4 in control word). Bit 2 ("transfer target values") must also be set when setting the release bit.

(c) Behaviour of the drive during manual displacement (readjustment function)

If the PSx3xxIO at standstill is rotated against the loop direction by an external force after a correctly-completed positioning run (or manual run to a range limit) and the release bit (Bit 4) and the readjustment bit (Bit 10) are set in the control word, it tries to approach the previously-sent target position again (readjustment). When rotating in the loop direction, no adjustment takes place, only Bit 11 in the status word ("manual displacement") is set and Bit 0 ("target position is reached") is reset. If Bit 6 ("run without loop") is set, the drive readjusts in both directions.



If the drive loses its position continuously at a standstill, the adjustment attempt starts precisely when the actual position leaves the positioning window (assuming that all of the above conditions are met). At this point the motor power must be in the permissible range (i.e. Bit 4 is set in the status word). In case of missing motor power, no adjustment starts, instead, Bit 10 ("positioning error") and 13 ("motor power was missing") become active. If the motor voltage comes back into range after the exit of the positioning window, **no** new adjustment attempt starts. This prevents a situation in which a drive suddenly starts a movement when the engine voltage is turned on.

If a positioning or manual run in progress is interrupted by a stop command (release bit in control word at 0) the drive only adjusts when a new run command is sent and is correctly completed.

By removing the release and/or the readjustment bit, the readjustment can be completely prevented.

Drives with brakes have no adjustment function.

(d) Calculation of the physical absolute position

The actuator PSx3xxIO has an absolute measuring system with a measuring range of 250 revolutions. Therefore, the direction of rotation in which part of this 250 revolutions should be traversed can be defined.

The mapping of the desired positioning range to the physical positioning range is done with the help of the parameter "upper mapping end" (ISDU 128).

In the delivery state, the drive is at position 51200, upper limit switch is 101200, lower limit switch is 1200. The result is a traversing range of ± 125 revolutions (± 50000 steps). If the desired traversing range does not exceed ± 125 revolutions none of the measures described below need to be taken in the delivery state to set the traversing range.

For the realization of any desired positioning range independent of the possible positioning range which is defined by the mounting situation (physical positioning range) there are the following two possibilities:

- 1) Move the axle (for example a spindle) to the desired position, then move the drive (with opened collar) to the position value which belongs to the physical position of the axle, only then close the collar.

Examples:

- (a) Move the axle in middle position, then move the drive at no-load (with opened collar) also to middle position (position 51200), then close the collar. The drive is now capable of moving 125 rotations (± 50000 increments by default) in each direction.

- (b) Move the axle completely to the left (resp. bottom), then move the drive at no-load (with opened collar) without loop to the lowest position (position 1200), then close the collar. The drive is now capable of moving 250 rotations (± 100000 increments by default) to the right (resp. top).
 - (c) Move the axle completely to the right (resp. top), then move the drive at no-load (with opened collar) to the highest position (position 101200), then close the collar. The drive is now capable of moving 250 rotations (± 100000 increments by default) to the left (resp. bottom).
- 2) Mount the drive in any position on the axle, close the collar, then adjust the positioning range with the help of ISDU 128. ISDU 128 specifies the upper end of the positioning range. By default, the upper end position is at +256 revolutions (Position 102400). If the positioning range does not match the position currently displayed after the installation of the drive, this can be freely selected between -256 and 512 rotations.

Examples:

- (a) After assembly, the displayed position is 51200 (which corresponds to the delivery state). The positioning range should show solely to the right (or above) → Set ISDU 128 to 152400.
- (b) After assembly, the displayed position is 100000. The positioning range should show solely to the right (or above) → Set ISDU 128 to 201200.
- (c) After assembly, the displayed position is 2000. The positioning range should show solely to the left (or down) → Set ISDU 128 to 3200.

Comments:

- 1) For the calculation of the upper mapping end (ISDU 128) (as in the above examples) a safety margin of 3 turns (default 1200 steps) must be complied with, because the maximum possible position value is 3 rotations underneath the top end mapping. The smallest possible position value is 253 rpm below the upper end mapping.
- 2) The specified step numbers or position values refer to the following settings, which correspond to the delivery condition:
 - (a) reference value (ISDU 127) = 0
 - (b) actual value assessment, numerator (ISDU 124) = 400
 - (b) actual value assessment, denominator (ISDU 125) = 400
 These 3 ISDUs influence the above step numbers or position values: With the reference value, an offset can be achieved, with the numerator/denominator assessment, a stretch or elongation (see below).
- 3) In the event of a change of the direction of rotation (ISDU 123), the referencing value (ISDU 127), the upper mapping end (ISDU 128) and the upper and lower limit (ISDU 129 and 130) are set to delivery state.
- 4) In the event of a change of the upper mapping end (ISDU 128) the upper and lower limit (ISDU 129 and 130) are set to delivery state.
- 5) When changing the actual value assessment numerator or denominator (ISDU 124 or ISDU 125), the target value, the actual value, the reference value, the upper mapping end, the upper and lower limit, the positioning window and the loop length are re-calculated.
- 6) In the event of a change in the referencing value (ISDU 127), the target position, the actual value, the upper mapping end as well as the upper and lower limits are re-calculated.
- 7) If the user wishes to avoid any automatic adjustment of values in the parameterisation of the drive, the optimal sequence when sending the parameters is the following:
 - (a) direction of rotation (ISDU 123),
actual value assessment, numerator (ISDU 124),
actual value assessment, denominator (ISDU 125)
 - (b) referencing value (ISDU 127)

- (c) upper mapping end (ISDU 128)
 - (d) upper limit (ISDU 129),
lower limit (ISDU 130),
positioning window (ISDU 131)
length of loop (ISDU 132)
- 8) To save the settings permanently in the EEPROM, a "1" must be written in ISDU 193. As soon as the reading of ISDU 193 returns a 0, the save is finished.

Referencing value (ISDU 127)

With the referencing value (ISDU 127), a displacement of the entire value range can be achieved. The referencing affects all of the transferred values, i.e. the target position, the actual value, upper mapping end and upper and lower limits.

The referencing value can be set in two ways:

- 1) directly by writing the referencing value in ISDU 127.
- 2) indirectly by writing an actual value in ISDU 67. This allows any "real" actual value to be assigned to the current physical actual value. The resulting difference is then the referencing value. This value will immediately be included in calculations for each transferred value and can also be read via ISDU 127.

In the event of a change in the referencing value, the target position, the actual value, the upper mapping end as well as the upper and lower limits are automatically re-calculated.



The removal of the **motor** power supply has no influence on the internal measuring system.

(e) Using actual value assessment factors to set the spindle pitch

On ISDU 124 (numerator factor) and 125 (denominator factor), any spindle resolutions can be mapped:

$$\text{Number of steps per revolution} = 400 * (\text{denominator} / \text{numerator})$$

Both factors are set to a value of 400 by default, resulting in a resolution of 0.01 mm at a spindle pitch of 4 mm.

Spindle pitch and resolution can easily be set via the denominator factor. The numerator factor is mainly used to set "manifold" resolutions.

Examples:

Spindle pitch	Resolution	Numerator factor	Denominator factor
4 mm	1/100 mm	400	400
1 mm	1/100 mm	400	100
2 mm	1/10 mm	400	20

The numerator and denominator factor must have a value between 1 and 10000.

(f) Drag error

During a positioning run, the device compares the computed target position with the current actual value. If the difference is greater than the value of the "drag error" (ISDU 133), the corresponding bit is set in the status. This is particularly the case if the speed setpoint cannot be reached due to external influences (required torque, motor voltage too low).

(g) Abort run in the event of failure of the master

If the connection to the master is interrupted during a positioning, a drive that has already started cannot be cancelled by the master.

In this case, there are three possible reactions:

- 1) If a positioning is in progress, the drive should end this positioning **as planned** and then start no new positioning, as long as there is no connection.
→ This behaviour is activated if ISDU 118 ("communication timeout") is at 0.
- 2) If a positioning is in progress, the drive should **end the run** and then start no new positioning, as long as there is no connection.
→ This behaviour is activated if ISDU 118 ("communication timeout") is at a value > 0. The value specifies the time in ms, within which a new master telegram must be received to maintain the link.
In addition, ISDU 137 ("Configuration for connection failure") must be at 1 ("drive cancellation").
- 3) Regardless of whether the drive is at standstill or if a positioning is in progress, the drive should execute the **drive to the safety position**, defined with ISDU 138.
→ This behaviour is activated if ISDU 118 ("communication timeout") is > 0 AND ISDU 137 ("Configuration for connection failure") is 2 ("Travel to safe position").

(h) Optional: Manual drive with external keys (jog mode)

A manual run can be performed with the external keys under the following conditions:

- 1) with interrupted IO-Link connection:
 - always
- 2) with existing IO-Link connection:
 - if control word Bit 5 (release jog mode) is set, Bit 4 (release) is not set

Overall, the following assignment results:

Bus connected	Control word Bit 4	Control word Bit 5	Jog keys
no	X	X	Active
yes	X	0	inactive
yes	1	X	inactive
yes	0	1	active

Bit 5 (enable jog mode) and Bit 4 (release) cannot be set simultaneously. In the event of a change of the release (e.g. From "enable jog mode" to "release"), a drive in the other operating mode is cancelled.

The step width for brief key pressing can be adjusted via ISDU 135. A single step is executed when one of the external buttons is pressed. If the key is released before the single step has been completed, this is nevertheless brought to an end. If the same key remains pressed, a continual manual drive follows the single step after a brief waiting time as long as the key is pressed. This continuous manual drive is always active if the bus is not connected. If the bus is connected, Bit 3 must also be activated in the control word in addition to Bit 5 ("Release manual drive in jog mode"). If Bit 3 is reset, only one individual step is performed each time a key is pressed even if the same key is pressed for longer than the duration of the individual step.

The waiting time until the drive transfers to manual drive is set with ISDU 163. In manual drive, the drive moves to the respective end switch position (ISDU 129 and 130).

If both keys are pressed during a jog drive, the run is immediately cancelled. A new jog drive is only possible again if both keys have been released.

For activation, the respective key contact (Pin 2 or 3 of the 4-pin connector) must be connected with +24V (Pin 1). If the key signal is produced by a source galvanically separated from the control supply, GND (Pin 4) must be connected.

Jog drives without external jog buttons:

Jog drives are also possible without external jog buttons: For this, Bit 8 ("Jog to larger values") and Bit 9 ("Jog to lower values") serve as the control word, the corresponding key presses simulate these.

Prerequisite: Bits 4 and 5 of the control word must be reset.

(i) Devices with the "holding brake" option

The device types PSx3 0xIO-14, PSx3 1xIO-14, PSx3 2xIO, PSx3 3xIO are optionally available with a holding brake. This brake prevents rotation of the output shaft in the absence of motor power supply or if the motor holding torque is too low, up to a maximum equal to the amount of the nominal torque. A small degree of rotation always occurs at the output, i.e. the brake cannot be used to hold a defined position (for this purpose, the holding torque must be increased with ISDU 155 and ISDU 154).

For drive orders, there is an initial wait for a short time for these devices for the brakes to release (standard time 0.15 sec. before drive start, ISDU 164) and some steps are travelled against the actual drive direction (number of steps: ISDU 136). At the end of each drive, the brake is released (standard time 1 sec. after drive end, ISDU 165). The advantage of this feature is, that in case of many subsequent runs the brake has not to be released each time.

To adjust the position of the drive manually, it is first necessary to remove the rubber-plug in the top cover (see drawings at the end of these instructions). Then release the brake by pressing down and simultaneously turning using a hex wrench NW3 (PSx3 1xIO, PSx3 3xIO) or NW4 (PSx3 0xIO, PSx3 2xIO).

(j) Devices with the "Friction Brake" option

The device type PSE34xxIO is optionally available with a friction brake. This brake prevents rotation of the output shaft in the absence of motor voltage or if the motor holding torque is too low.

A run command is not approached immediately but only after a short idle period to tighten the brake.

The brake releases at the end of every run.

To adjust the drive manually, it is first necessary to remove the corresponding rubber-plug in the top cover. Then the drive can be rotated with a hexagonal key NW4. This is relatively difficult, since in addition to any torque present, the friction brake force also needs to be overcome.

(k) Reference runs

The Positioning System PSx3xxIO is equipped with an absolute measuring system, therefore no reference run is required when the drive is switched on. If, in certain cases, a reference drive to a hard block is still desired (e.g. once in the installation of the drive onto the machine), the procedure should be as follows:

- 1) Before ordering the reference drive, the following settings must be applied:
 - Set max. driving torque (ISDU 153) and maximum release torque (ISDU 152) to a maximum of 10% of the rated torque
 - Set holding torque (ISDU 155) and max. holding torque at drive end (ISDU 154) to 0.
 - Set speed limit for drive cancellation (ISDU 146) to 60.
 - Set time for going under the speed limit for drive cancellation (ISDU 159) to 100 (the period of time during which the drive tries to overcome the block is reduced: With the reduced values, the positioning is cancelled if the speed below 60% of the setpoint speed for more than 100ms. Standard is 200 ms and 30%).
 - Set the relevant end limit (ISDU 129 or 130) so that the block is clearly within the end limits in each case (otherwise there is the danger that the block lies within the positioning window and therefore will not be recognized.)
 - If necessary, reduce the setpoint speed for manual operation (ISDU 145)
- 2) now start the reference run as manual drive (set Bit 0 or 1 in the control word).
- 3) Wait until the drive moves (Bit 6 in the status word is set)
- 4) Wait until the drive is standing and a positioning error has occurred (Bit 6 is reset in the status word, bit 10 is set).
- 5) with the same settings, perform manual drive in the opposite direction (move a piece of the block away so that the drive can move freely).
- 6) now only apply desired settings of the above ISDUs for normal operation.

6 Technical data

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 ms		
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 on request		
Protection class	PSE	IP 54	
	PSS	IP 65	
	PSW	IP 66 (in operation) IP 68 (at a standstill)	
Switch-on time	PSx	ED in %	Base time in sec.
	PSE34xx	20	300
	PSE30xx to 33xx	30	300
	PSS	20	600
	PSW	20	600

Electrical data

Rated output power	PSx30xIO, PSx31xIO, PSE31xxIO	25 W with 30% duty cycle
	PSx32xIO, PSx33xIO	35 W with 30% duty cycle
	PSE34xxIO	100 W with 20 % duty cycle
Supply voltage	24 VDC ± 10% (supply voltage for motor and control unit are galvanically isolated) advice: use regulated power supplies	
Rated current control	0.1 A	
Rated current engine	PSx30xIO, PSx31xIO, PSE31xxIO	2.2 A
	PSx32xIO, PSx33xIO	3.0 A
	PSE34xxIO	7.8 A
Positioning resolution	0.9°	
Positioning accuracy	0.9°	
IO-Link protocol	SDCI in accordance with IEC 61131-9 Version 1.1.2	
Absolute value acquisition	optical - magnetic	

Mechanical data

Positioning range	250 usable revolutions, no mechanical limit The measuring system includes 256 revolutions, minus 3 revolutions security reserve on both range limits	
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 leeway adjustment	Automatic loop drive after each positioning drive (optional)	
Output shaft	PSE30xIO-8 PSE31xIO-8	8H9 Hollow shaft with adjustable collar
	PSE30xIO-14, PSE31xIO14, PSE32xIO, PSE33xIO	14H7 Hollow shaft with adjustable collar
	PSE31xxIO-14 PSE34xxIO	14H7 Hollow shaft with clamp and feather key
	PSS3xxIO-8 PSW3xxIO-8	8H9 Hollow shaft with adj. collar or 8H8 solid shaft
	PSS3xxIO-14 PSW3xxIO-14	14H7 Hollow shaft with adj. collar or 14H8 solid shaft
Recommended spindle stud diameter	according to the hollow shaft diameter with an interference fit of H9	
Max. permissible radial force	40 N	
Max. permissible axial force	20 N	
Dimensions (L x W x H)	See product catalogue online	
Weight (approx.)	PSx30xIO-8	650 g
	PSx30xIO-14, PSx32xIO	1200 g
	PSx31xIO-8	700 g
	PSx31xIO-14, PSx33xIO	700 g
	PSE31xxIO PSE34xxIO	1200 g 1900 g

For additional, please visit our website at

<https://www.halstrup-walcher.de/en/products/positioning-systems/pse-pss-psw-3-series/index.php>

EG-Konformitätserklärung im Sinne der
EG- Richtlinie 2014/30/EU, EMV

Certificate of Conformity based on the
European Standard 2014/30/EU

Der Hersteller
The manufacturer

**halstrup-walcher GmbH
Stegener Straße 10
79199 Kirchzarten
Deutschland**

erklärt, dass die Bauart des Produktes
declares, that the construction of instrument type

Gerätebezeichnung PSE3xx, PSS3xx, PSW3xx
Device designation PSE3xx, PSS3xx, PSW3xx

entwickelt, konstruiert und gefertigt ist in Übereinstimmung mit den EG – Richtlinien
is developed, designed and manufactured in accordance with the EC Directives.

EN 61000-6-2 : 2005
EN 61000-6-4 : 2011

abgegeben durch / stated by:

Sura, Christian
(Nachname, Vorname / Surname, first name)

Geschäftsführer, Managing Director
(Stellung im Betrieb des Herstellers / Position)

Kirchzarten, 10. 10. 2016
(Ort, Datum / City, Date)


(Rechtsgültige Unterschrift/ Signature)

