Up to PL e of EN ISO 13849-1
PSWZ X1P



Standstill monitor for safe standstill monitoring

Approvals

	PSWZ X1P
c UL us LISTED	◆
TÜV SÜD	◆
CCC	◆

Unit features

- Positive-guided relay outputs:
  - 2 safety contacts (N/O), instantaneous
  - 1 auxiliary contact (N/C), instantaneous
- LED indicator for:
  - Supply voltage
  - Standstill on channel 1/2
  - Switch status
  - Fault signal if simultaneity time is exceeded
- Semiconductor outputs signal:
  - Error
  - Switch status
- Semiconductor input for reset function
- Measuring inputs for single or three-phase motors
- Measuring voltage selectable
- Feedback loop
- Plug-in connection terminals (either spring-loaded terminal or screw terminal)
- See order reference for unit types

Unit description

The unit is used for safe standstill monitoring. It is designed for use on

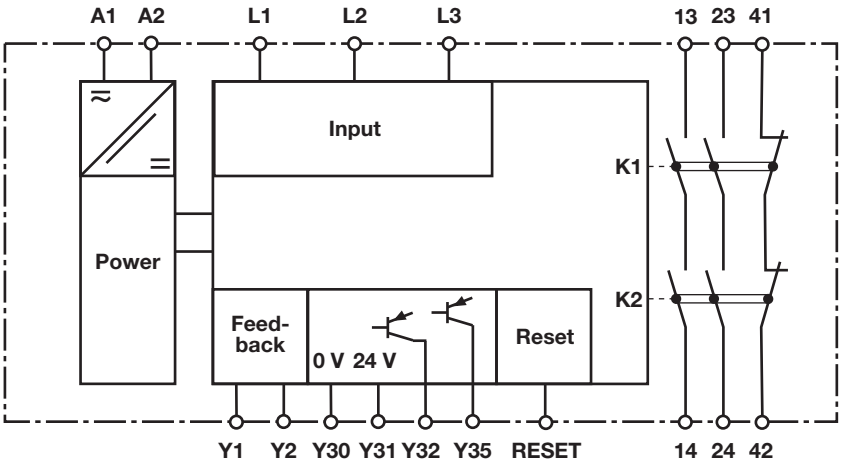
- Standstill monitoring functions on plants with dangerous machine parts or tools (EN 1088 clause 7.4),
- Safety circuits in accordance with EN 60204-1 and IEC 60204-1.

Standstill is only detected on power-free measuring circuits. Residual voltages, induced voltages or drives within the position control will prevent safe standstill detection!

Safety features

- Relays K1 and K2 are interlocked in such a way that the unit cannot be switched back on in the case of contact welding or an open circuit.
- The unit monitors the measuring circuits for open circuit. If an open circuit occurs between the unit and the motor or on the motor itself, the unit immediately switches off.
- The standstill monitor prevents the plant from being enabled in the following cases
  - Power supply failure
  - Component failure
  - Measuring circuits are open circuit
  - Coil defect/open circuit

Block diagram

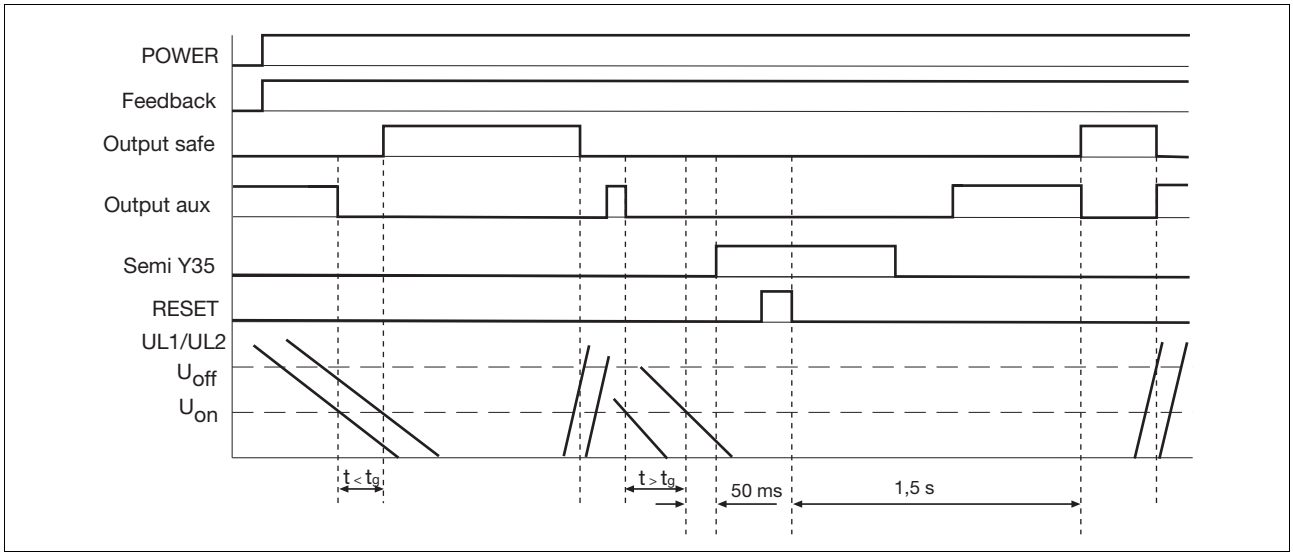


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Function description

The device uses two separate measuring channels to measure the regenerated voltage, induced from the motor during the rundown period or during start-up. If the voltage falls below the set response value (standstill threshold), the standstill monitor enables the monitored plant. If the voltage exceeds the set release value, the standstill monitor disables the monitored plant.
To reactivate, the voltage at both channels must fall below the response value U_{on} within the time t_g (simultaneity monitoring). To do this the feedback loop Y1-Y2 must be closed. If the simultaneity requirement is exceeded, the standstill monitor does not enable the monitored plant. The unit can be reactivated by switching 24 VDC on and off at the RESET input.
The response value U_{on} can be set jointly for both channels in order to suit the motor that is to be monitored. The release value U_{off} (hysteresis) corresponds to twice the response value.
When used with frequency converters, the PSWZ X1P cannot detect standstill until the controller inhibit has been switched off.
After the supply voltage is switched on, the unit performs a self test. The unit simulates a situation in which the release value is exceeded and the measuring circuit has an open circuit. The correct function of the output relay and feedback loop is also tested. The test takes ca. 1.5 s.
Operating modes:
- Single-phase operation:
  - One measuring circuit (calculated at two different measuring points) affects both channels
- Three-phase operation:
  - Two redundant (identical) measuring circuits affect channel 1 and 2
  - Voltages in the measuring circuit are monitored (failsafe in the event of a short circuit)

Timing diagram



Key
- POWER: Supply voltage
- UL1/UL2: Input circuitL1, L2, L3
- Feedback: Feedback loop Y1-Y2
- Output safe: Safety contacts 13-14, 23-24
- Output aux: Auxiliary contact 41-42
- Semi Y35: Semiconductor output for fault signal
- RESET: Reset input RESET
- U_{on}: Response value
- U_{off}: Release value
- t_g: Simultaneity

Wiring

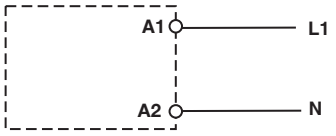
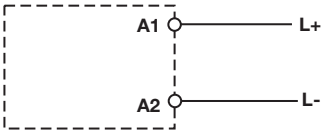
Please note:
- Information given in the “Technical details” must be followed.
- Outputs 13-14, 23-24 are safety contacts, output 41-42 is an auxiliary contact (e.g. for display).
- To prevent contact welding, a fuse should be connected before the output contacts (see technical details).
- Use copper wire that can withstand 60/75 °C.
- When used with converters: Use screened cable for the wiring between the standstill monitor and the motor. Connect the cable screening on the motor.

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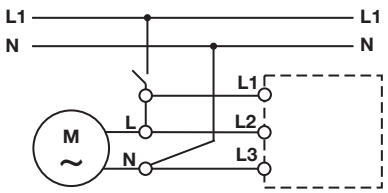
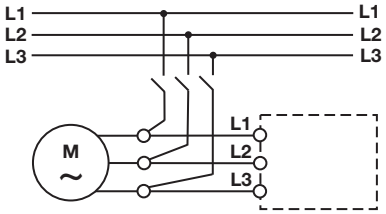
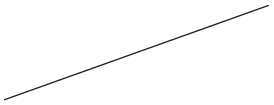
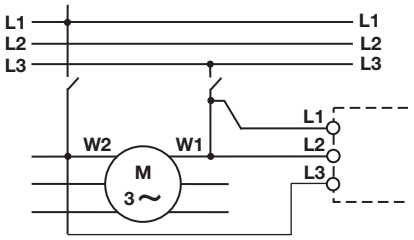
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Preparing for operation

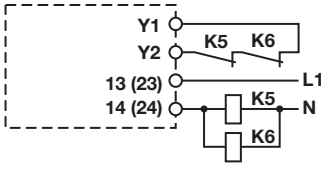
▸ Supply voltage

Supply voltage	AC	DC
		

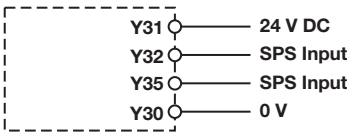
▸ Input circuit

Input circuit	Single-phase motor	Three-phase motor
Single-phase motor = single-phase measurement signal evaluation Three-phase motor = two-phase measurement signal evaluation		
Single-phase measurement signal evaluation		

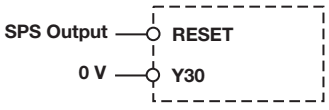
▸ Feedback loop

Contacts from external contactors or link		

▸ Semiconductor output

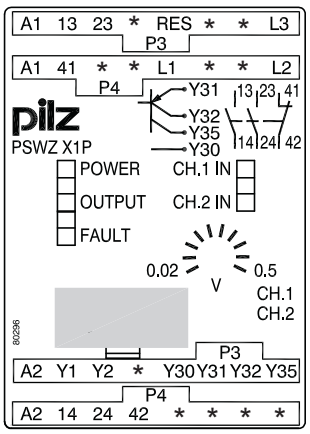
Y32: Semiconductor output for switch status Y35: Semiconductor output for fault signal	

▸ Semiconductor input



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Terminal configuration

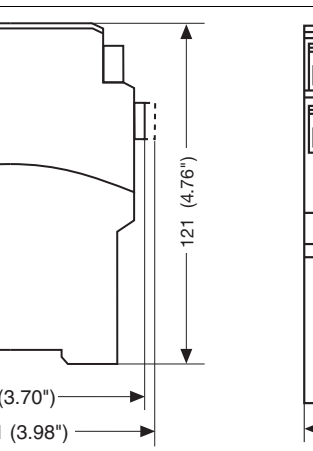


Installation

- The safety relay should be installed in a control cabinet with a protection type of at least IP54.
- Use the notch on the rear of the unit to attach it to a DIN rail.
- Ensure the unit is mounted securely on a vertical DIN rail (35 mm) by using a fixing element (e.g. retaining bracket or an end angle).

Dimensions

* with spring-loaded terminals



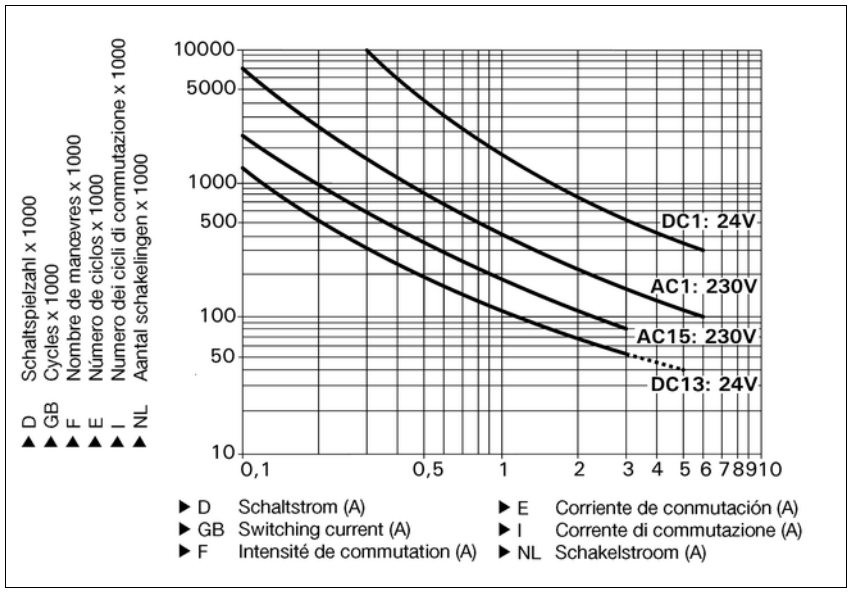
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Notice

This data sheet is only intended for use during configuration. Please refer to the operating manual for installation and operation.

Service life graph

The service life graphs indicate the number of cycles from which failures due to wear must be expected. The wear is mainly caused by the electrical load; the mechanical load is negligible.



Example
- Inductive load: 0,2 A
- Utilisation category: AC15
- Contact service life: 1,000,000 cycles

Provided the application requires fewer than 1,000,000 cycles, the PFH value (see technical details) can be used in the calculation.

To increase the service life, sufficient spark suppression must be provided on all output contacts. With capacitive loads, any power surges that occur must be noted. With contactors, use freewheel diodes for spark suppression.

Technical details

Electrical data	
Supply voltage	
Supply voltage U_B AC/DC	**24.0 - 240.0 V**
Voltage tolerance	**-15 %/+10 %**
Power consumption at U_B AC	**5.0 VA**
Power consumption at U_B DC	**3.0 W**
Frequency range AC	**50 - 60 Hz**
Residual ripple DC	**160 %**
Voltage and current at	
Feedback loop DC: **24.0 V**	**35.0 mA**
Number of output contacts	
Safety contacts (S) instantaneous:	**2**
Auxiliary contacts (N/C):	**1**

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Electrical data	
Utilisation category in accordance with **EN 60947-4-1**	
Safety contacts: AC1 at **240 V**	I_{min}: **0.01 A** , I_{max}: **6.0 A** P_{max}: **1500 VA**
Safety contacts: DC1 at **24 V**	I_{min}: **0.01 A** , I_{max}: **6.0 A** P_{max}: **150 W**
Auxiliary contacts: AC1 at **240 V**	I_{min}: **0.01 A** , I_{max}: **6.0 A** P_{max}: **1500 VA**
Auxiliary contacts: DC1 at **24 V**	I_{min}: **0.01 A** , I_{max}: **6.0 A** P_{max}: **150 W**
Utilisation category in accordance with **EN 60947-5-1**	
Safety contacts: AC15 at **230 V**	I_{max}: **3.0 A**
Safety contacts: DC13 at **24 V** (6 cycles/min)	I_{max}: **4.0 A**
Auxiliary contacts: AC15 at **230 V**	I_{max}: **3.0 A**
Auxiliary contacts: DC13 at **24 V** (6 cycles/min)	I_{max}: **4.0 A**
Contact material	**AgCuNi + 0.2 µm Au**
External contact fuse protection (I_K = 1 kA) to **EN 60947-5-1**	
Blow-out fuse, quick	
Safety contacts:	**6 A**
Auxiliary contacts:	**6 A**
Blow-out fuse, slow	
Safety contacts:	**4 A**
Auxiliary contacts:	**4 A**
Circuit breaker 24 VAC/DC, characteristic B/C	
Safety contacts:	**4 A**
Auxiliary contacts:	**4 A**
Semiconductor outputs (short circuit proof)	**24.0 V DC**, **50 mA**
External supply voltage	**24.0 V DC**
Voltage tolerance	**-20 %/+20 %**
Semiconductor input	
High	**15 V DC**
Low	**5 V DC**
Input current	**20 mA**
Measuring circuit	
Input voltage L1-L3, L2-L3	**0 - 690 VAC/DC**
Input voltage in accordance with UL	**0 - 600 VAC**
Frequency range AC	**0 - 3000 Hz**
Input impedance	**1,300.0 kOhm**
Switching threshold per channel	
Response value U_{on}	**120 - 3000 mV** No. 777950, 787950 **20 - 500 mV** No. 777949, 777959, 787949 **7.5 - 500 mV** No. 777951, 787951
Release value U_{off}	**2 x Uon**
Max. inrush current	**10.00 A**
Safety-related characteristic data	
PL in accordance with **EN ISO 13849-1: 2006**	**PL e** (**Cat. 4**)
Category in accordance with **EN 954-1**	**Cat. 4**
SIL CL in accordance with **EN IEC 62061**	**SIL CL 3**
PFH in accordance with **EN IEC 62061**	**6.23E-09**
SIL in accordance with **IEC 61511**	**SIL 3**
PFD in accordance with **IEC 61511**	**6.47E-05**
T_M [year] in accordance with **EN ISO 13849-1: 2006**	**20**
Times	
Switch-on delay	
with automatic reset typ.	**1,500 ms**
with automatic reset after power on max.	**2,200 ms**
Delay-on de-energisation after motor on max.	**170 ms**

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Times	
Recovery time at max. switching frequency 1/s	
after power failure	**2200 ms**
Simultaneity, channel 1 and 2	**7 s**
Supply interruption before de-energisation	**20 ms**
Environmental data	
EMC	**EN 60947-5-1**, **EN 61000-6-2**, **EN 61000-6-4**
Vibration to **EN 60068-2-6**	
Frequency	**10 - 55 Hz**
Amplitude	**0.35 mm**
Climatic suitability	**EN 60068-2-78**
Airgap creepage in accordance with **EN 60947-1**	
Pollution degree	**2**
Overvoltage category	**III**
Rated insulation voltage	**250 V**
Rated impulse withstand voltage	**4.00 kV**
Ambient temperature	**-10 - 55 °C**
Storage temperature	**-40 - 85 °C**
Protection type	
Mounting (e.g. cabinet)	**IP54**
Housing	**IP40**
Terminals	**IP20**
Mechanical data	
Housing material	
Housing	**PPO UL 94 V0**
Front	**ABS UL 94 V0**
Cross section of external conductors with screw terminals	
1 core flexible	**0.25 - 2.50 mm² , 24 - 14 AWG** No. 777949, 777950, 777951, 777959
2 core, same cross section, flexible:	
with crimp connectors, without insulating sleeve	**0.25 - 1.00 mm² , 24 - 16 AWG** No. 777949, 777950, 777951, 777959
without crimp connectors or with TWIN crimp connectors	**0.50 - 1.50 mm² , 24 - 16 AWG** No. 777949, 777950, 777951, 777959
Torque setting with screw terminals	**0.60 Nm** No. 777949, 777950, 777951, 777959
Cross section of external conductors with spring-loaded terminals: Flexible with/without crimp connectors	**0.20 - 1.50 mm² , 24 - 16 AWG** No. 787949, 787950, 787951
Spring-loaded terminals: Terminal points per connection	**2** No. 787949, 787950, 787951
Stripping length	**8 mm** No. 787949, 787950, 787951
Dimensions	
Height	**101.0 mm** No. 787949, 787950, 787951 **94.0 mm** No. 777949, 777950, 777951, 777959
Width	**45.0 mm**
Depth	**121.0 mm**
Weight	**315 g** No. 787949, 787950, 787951 **320 g** No. 777949, 777950, 777951, 777959

No. stands for order number.

It is essential to consider the relay's service life graphs. The relay outputs' safety-related characteristic data is only valid if the values in the service life graphs are met.

The PFH value depends on the switching frequency and the load on the relay output.
If the service life graphs are not accessible, the stated PFH value can be used irrespective of the switching frequency and the load, as the PFH value already considers the relay's B10d value as well as the failure rates of the other components.

All the units used within a safety function must be considered when calculating the safety characteristic data.

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INFORMATION
A safety function's SIL/PL values are **not** identical to the SIL/PL values of the units that are used and may be different. We recommend that you use the PAScal software tool to calculate the safety function's SIL/PL values.

The standards current on **2008-07** apply.

Order reference

Type	Features		Terminals	Order no.
PSWZ X1P C	24 - 240 VAC/DC	0.02 - 0.5 V U_{on}: 20 - 500 mV	Spring-loaded terminals	787 949
PSWZ X1P	24 - 240 VAC/DC	0,02 - 0,5 V U_{on}: 20 - 500 mV	Screw terminals	777 949
PSWZ X1P C	24 - 240 VAC/DC	0.12 - 3 V U_{on}: 120 - 3,000 mV	Spring-loaded terminals	787 950
PSWZ X1P	24 - 240 VAC/DC	0.12 - 3 V U_{on}: 120 - 3,000 mV	Screw terminals	777 950
PSWZ X1P C	24 - 240 VAC/DC	0.0075 - 0.5 V U_{on}: 7.5 - 500 mV	Spring-loaded terminals	787 951
PSWZ X1P	24 - 240 VAC/DC	0.0075 - 0.5 V U_{on}: 7.5 - 500 mV	Screw terminals	777 951
PSWZ X1P (coated version)	24 - 240 VAC/DC	0.02 - 0.5 V U_{on}: 20 - 500 mV	Screw terminals	777 959

Selection guide: Determine remanence voltage
The remanence voltage has to be within the response range of the device.