

Up to PL e of EN ISO 13849-1 P2HZ X1P



Two-hand control unit for press controllers and safety circuits

Approvals

	P2HZ X1P
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Unit features

- ▶ Positive-guided relay outputs:
 - 3 safety contacts (N/O), instantaneous
 - 1 auxiliary contact (N/C), instantaneous
- ▶ 2 semiconductor outputs
- ▶ Connection options for:
 - 2 operator elements (buttons)
- ▶ LED indicator for:
 - Switch status channel 1/2
 - Supply voltage
- ▶ Semiconductor outputs signal:
 - Switch status channel 1/2
 - Supply voltage is present
- ▶ Plug-in connection terminals (either spring-loaded terminal or screw terminal)
- ▶ See order reference for unit types

Unit Description

The two-hand control relay meets the requirements of EN 574 Type IIIC. It forces the operator to keep his hands outside the danger zone area during the hazardous movement. The unit is suitable for use on controllers for metalworking presses as a component for simultaneous switching.

It can be used in applications with

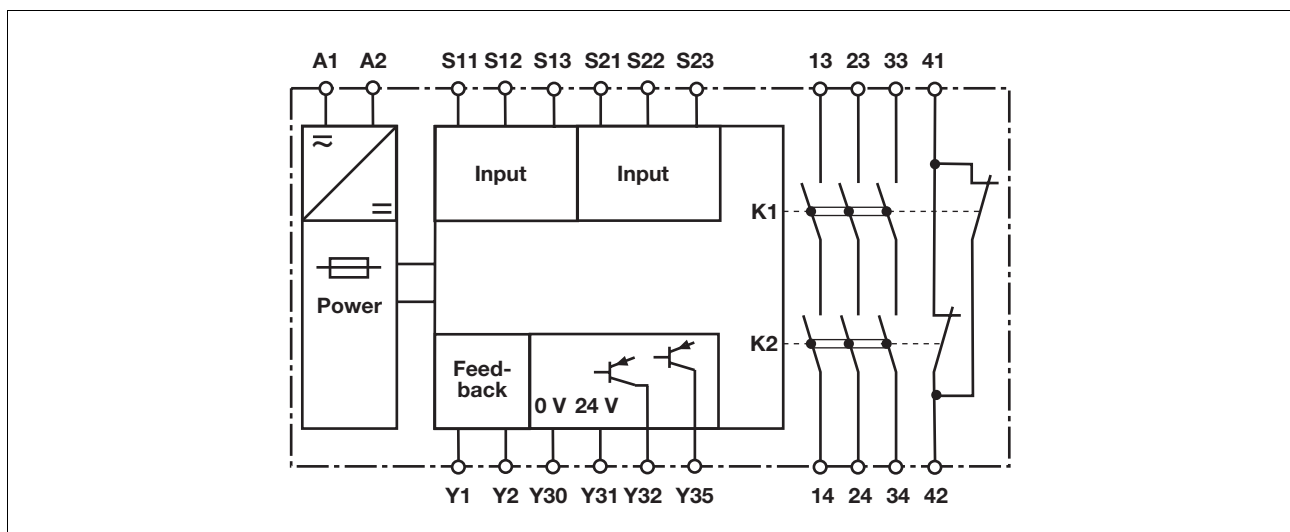
- ▶ Mechanical presses (EN 692)
- ▶ Hydraulic presses (EN 693)
- ▶ Safety circuits in accordance with EN 60204-1

Safety features

The two-hand control relay meets the following safety requirements:

- ▶ The circuit is redundant with built-in self-monitoring
- ▶ The safety function remains effective in the case of a component failure
- ▶ The circuit prevents a further press stroke in the case of:
 - Relay failure
 - Contact welding
 - Coil defect on a relay
 - Open circuit
 - Short circuit

Block diagram



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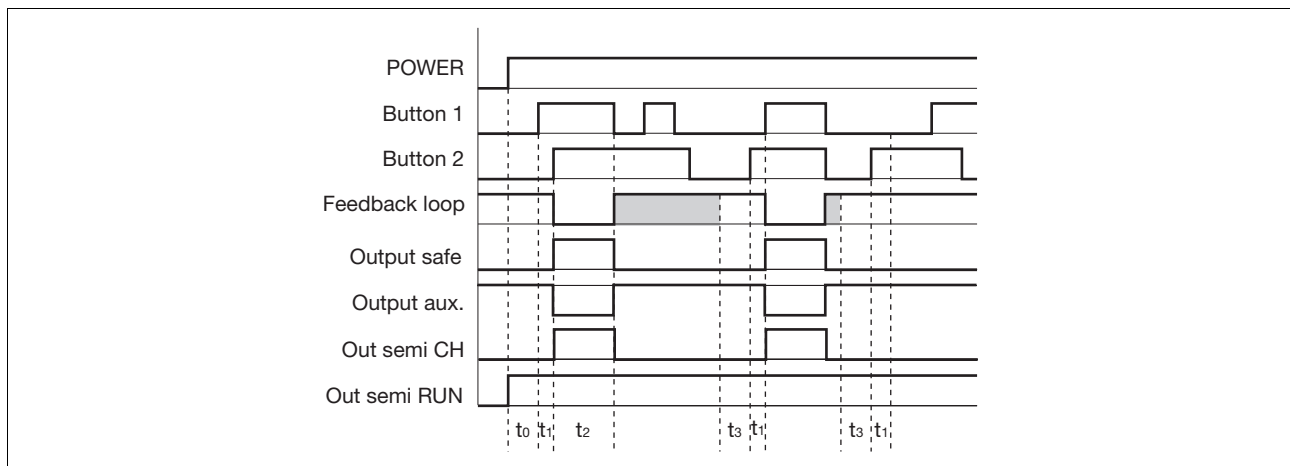
Function description

- ▶ The two-hand control relay must be activated by simultaneously pressing two buttons within **500 ms**. If

one or both of the buttons are released, the unit interrupts the control command for the hazardous movement.

- ▶ **Reactivation:** The output relays will not re-energise until both operator elements have been released and then re-operated simultaneously.

Timing diagram



Key

- ▶ **POWER:** Supply voltage
- ▶ **Button 1/Button 2:** Input circuits S11-S12-S13, S21-S22-S23
- ▶ **Feedback loop:** Feedback loop Y1-Y2
- ▶ **Output safe:** Safety outputs 13-14, 23-24, 33-34

- ▶ **Output aux.:** Auxiliary contacts 41-42
- ▶ **Out semi RUN:** Semiconductor output for operational readiness Y35
- ▶ **Out semi CH:** Semiconductor output switch status Y32
- ▶ t_0 : Recovery time after power on

- ▶ t_1 : Simultaneity, channel 1 and 2
- ▶ t_2 : Operating cycle ended through button 1 or 2
- ▶ t_3 : Y1-Y2 must be closed before before the button is operated (recovery time)

Shaded area: Status irrelevant

Wiring

Please note:

- ▶ Information given in the "Technical details" must be followed.
- ▶ Outputs 13-14, 23-24, 33-34 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).
- ▶ Calculation of the max. cable runs I_{max} in the input circuit:

$$I_{max} = \frac{R_{I_{max}}}{R_l / km}$$

$R_{I_{max}}$ = max. overall cable resistance (see technical details)

R_l / km = cable resistance/km

- ▶ Use copper wire that can withstand 60/75 °C.

- ▶ Sufficient fuse protection must be provided on all output contacts with capacitive and inductive loads.

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Preparing for operation

▶ Supply voltage

Supply voltage	AC	DC

▶ Input circuit

Input circuit	Single-channel	Dual-channel
Two-hand button with detection of shorts across contacts		

▶ Feedback loop

Feedback loop	
Contacts from external contactors	

▶ Semiconductor output

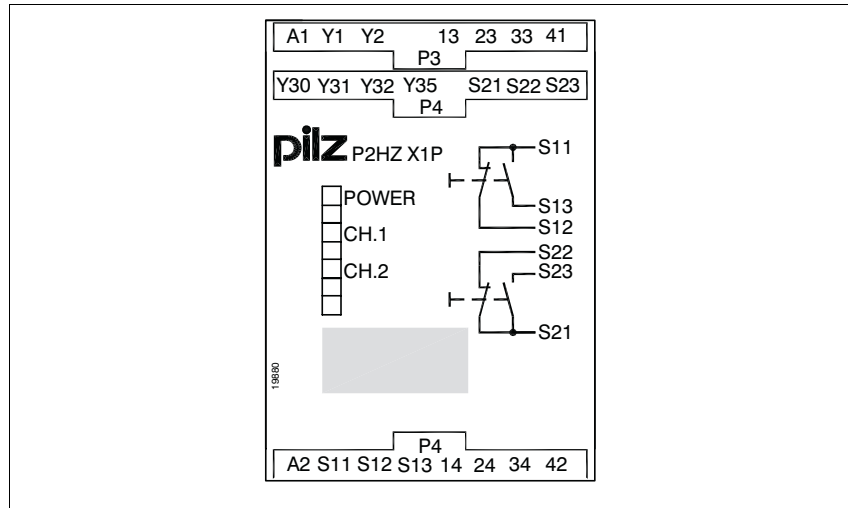
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▶ Key

S1/S2	Two-hand button
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Terminal configuration



Installation

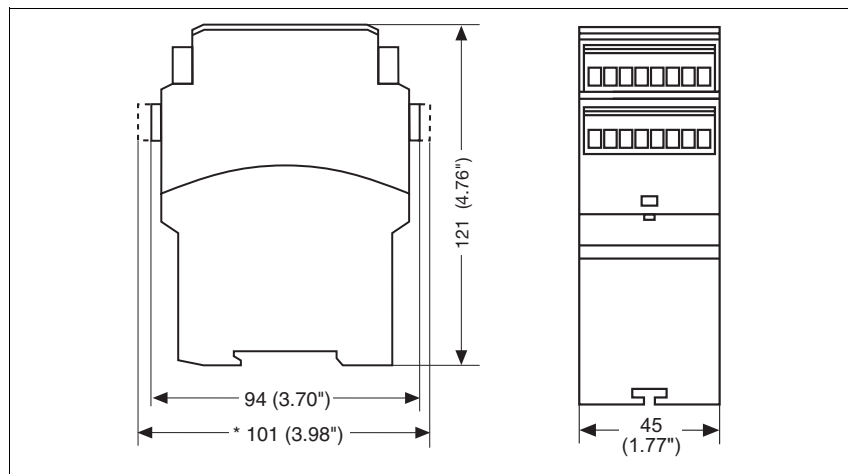
- ▶ The safety relay should be installed in a control cabinet with a protection type of at least IP54.
- ▶ Use the notch on the rear of the unit to attach it to a DIN rail.
- ▶ Ensure the unit is mounted securely on a vertical DIN rail (35 mm) by using a fixing element (e.g. retaining bracket or an end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

Notice

The distance of the button connected to the two-hand relay from the nearest danger zone must be large enough that if one of the buttons is released, the dangerous moment is interrupted before the operator can reach into the danger zone (see EN 999 "The positioning of protective equipment in respect of approach speeds of parts of the human body").

Dimensions

* with spring-loaded terminals



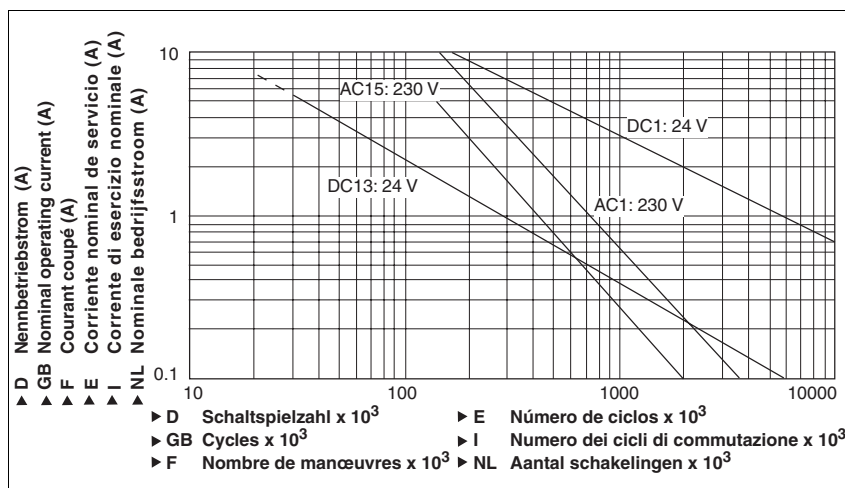
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Notice

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 val-

ue (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.

We recommend you use semiconductor outputs to switch 24 VDC loads.

Technical details

Electrical data

Supply voltage	
Supply voltage U_B AC	24 V, 42 V, 48 V, 110 V, 115 V, 120 V, 230 V, 240 V
Supply voltage U_B DC	24 V
Voltage tolerance	-15 %/+10 %
Power consumption at U_B AC	6.0 VA No. 777330, 777331, 777332, 777434, 777435, 777436, 777438, 777439, 787330, 787331, 787332, 787434, 787435, 787436, 787438, 787439
Power consumption at U_B DC	2.5 W No. 777340, 787340
Frequency range AC	50 - 60 Hz
Residual ripple DC	10 %
Voltage and current at n	
Input circuit DC: 24.0 V	
N/O contact	30 mA
N/C contact	20 mA
Feedback loop DC: 24.0 V	45.0 mA
Number of output contacts	
Safety contacts (S) instantaneous:	3
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} : 5.0 A P_{\max} : 1250 VA
Safety contacts: DC1 at 24 V	I_{\min} : 0.01 A , I_{\max} : 5.0 A P_{\max} : 125 W
Auxiliary contacts: AC1 at 240 V	I_{\min} : 0.01 A , I_{\max} : 2.0 A P_{\max} : 500 VA
Auxiliary contacts: DC1 at 24 V	I_{\min} : 0.01 A , I_{\max} : 2.0 A P_{\max} : 50 W
Utilisation category in accordance with EN 60947-5-1	
Safety contacts: AC15 at 230 V	I_{\max} : 2.5 A
Safety contacts: DC13 at 24 V (6 cycles/min)	I_{\max} : 1.5 A
Auxiliary contacts: AC15 at 230 V	I_{\max} : 2.0 A
Auxiliary contacts: DC13 at 24 V (6 cycles/min)	I_{\max} : 1.5 A
Conventional thermal current	5.0 A
Contact material	AgSnO₂ + 0.2 µm Au
External contact fuse protection ($I_k = 1 \text{ kA}$) to EN 60947-5-1	
Blow-out fuse, quick	
Safety contacts:	6 A
Auxiliary contacts:	4 A
Blow-out fuse, slow	
Safety contacts:	4 A
Auxiliary contacts:	2 A
Circuit breaker 24 VAC/DC, characteristic B/C	
Safety contacts:	4 A
Auxiliary contacts:	2 A
Semiconductor outputs (short circuit proof)	24.0 V DC, 20 mA
External supply voltage	24.0 V DC
Voltage tolerance	-15% / +10%
Max. overall cable resistance $R_{l\max}$ per input circuit	14 Ohm
Safety-related characteristic data	
PL in accordance with EN ISO 13849-1	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	3.01E-09
SIL in accordance with IEC 61511	SIL 3
PFD in accordance with IEC 61511	3.24E-06
t_M in years	20
Times	
Delay-on de-energisation (reaction time in accordance with EN 574)	
N/O contact	15 ms
N/C contact	30 ms
Recovery time	250 ms
Simultaneity, channel 1 and 2	500 ms
Environmental data	
EMC	EN 60947-5-1, EN 61000-6-2
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	-25 - 55 °C

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Environmental data	
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 mm ² , 24 - 12 AWG No. 777330, 777331, 777332, 777340, 777434, 777435, 777436, 777438, 777439
2 core, same cross section, flexible:	
with crimp connectors, without insulating sleeve	0.25 - 1.00 mm ² , 24 - 16 AWG No. 777330, 777331, 777332, 777340, 777434, 777435, 777436, 777438, 777439
without crimp connectors or with TWIN crimp connectors	0.20 - 1.50 mm ² , 24 - 16 AWG No. 777330, 777331, 777332, 777340, 777434, 777435, 777436, 777438, 777439
Torque setting with screw terminals	0.50 Nm No. 777330, 777331, 777332, 777340, 777434, 777435, 777436, 777438, 777439
Cross section of external conductors with spring-loaded terminals: Flexible with/without crimp connectors	0.20 - 1.50 mm ² , 24 - 16 AWG No. 787330, 787331, 787332, 787340, 787434, 787435, 787436, 787438, 787439
Spring-loaded terminals: Terminal points per connection	2 No. 787330, 787331, 787332, 787340, 787434, 787435, 787436, 787438, 787439
Stripping length	8 mm No. 787330, 787331, 787332, 787340, 787434, 787435, 787436, 787438, 787439
Dimensions	
Height	101.0 mm No. 787330, 787331, 787332, 787340, 787434, 787435, 787436, 787438, 787439 94.0 mm No. 777330, 777331, 777332, 777340, 777434, 777435, 777436, 777438, 777439
Width	45.0 mm
Depth	121.0 mm
Weight	240 g No. 787340 250 g No. 777340 350 g No. 787330, 787331, 787332, 787434, 787435, 787436, 787438, 787439 360 g No. 777330, 777331, 777332, 777434, 777435, 777436, 777438, 777439

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.

The standards current on 2010-07 apply.

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Order reference

Type	Features	Terminals	Order no.	
P2HZ X1P C	24 VAC	Spring-loaded terminals	787 330	
P2HZ X1P	24 VAC	Screw terminals	777 330	
P2HZ X1P C	42 VAC	Spring-loaded terminals	787 331	
P2HZ X1P	42 VAC	Screw terminals	777 331	
P2HZ X1P C	48 VAC	Spring-loaded terminals	787 332	
P2HZ X1P	48 VAC	Screw terminals	777 332	
P2HZ X1P C	110 VAC	Spring-loaded terminals	787 434	
P2HZ X1P	110 VAC	Screw terminals	777 434	
P2HZ X1P C	115 VAC	Spring-loaded terminals	787 435	
P2HZ X1P	115 VAC	Screw terminals	777 435	
P2HZ X1P C	120 VAC	Spring-loaded terminals	787 436	
P2HZ X1P	120 VAC	Screw terminals	777 436	
P2HZ X1P C	230 VAC	Spring-loaded terminals	787 438	
P2HZ X1P	230 VAC	Screw terminals	777 438	
P2HZ X1P C	240 VAC	Spring-loaded terminals	787 439	
P2HZ X1P	240 VAC	Screw terminals	777 439	
P2HZ X1P C		24 VDC	Spring-loaded terminals	787 340
P2HZ X1P		24 VDC	Screw terminals	777 340