



ProLine P 22400

Functional safety and maximum availability can go together



Passive isolators with a technological advantage: fewer parts mean rare failures.

For measurement and safety reasons, analog signals are routinely isolated in industrial facilities.

The requirements on plant and safety-related circuits are continuously increasing, for instance because of a growing awareness of occupational safety. Thereby, the technical requirements on components are also being raised. However, higher functional safety is often bought by more effort and at the expense of availability. This does not have to be the case, as proven by the new ProLine P 22400 passive isolator for standard signals.

Its operating principle enables the implementation of a product that combines high functional safety with high availability in a unique way – a balancing act that would otherwise be hard to achieve.

SIL 3 even in single-channel structure

ProLine P 22400's safety functionality is the highly precise, linear transmission of 4 ... 20 mA signals.

A high level of functional safety can be achieved even in single-channel structure and without diagnostics. For instance, sensors and actuators in safety circuits can be directly connected, requiring no elaborate evaluation equipment for redundant structures. At the same time, the device has a low total failure rate and provides high availability.

After all, what good is a safety device that will keep turning off (switch to a safe state) and thereby regularly close down the facility it is meant to monitor?

ProLine P 22400 is safe and highly available.

ProLine P 22400

Facts and Features

- **Functional safety up to SIL 3**
acc. to EN 61508 with certificate from an accredited testing body
- **Average failure rate**
MTBF: 965 years
- **Low transmission error**
0.08 % full scale
- **High isolation including protection against electric shock**
by reinforced insulation up to 600 V AC/DC
- **Test voltage 5.4 kV AC**
- **Minimal losses and low installation effort**
thanks to loop-powered operation
- **Robust design**
- **Mechanically stable**
approved by an independent testing laboratory, suitable for marine applications
- **Ambient temperature range during operation: -40 ... +85 °C**
- **Resistant against electromagnetic interferences, meeting stringent SIL requirements**



Product Line

Device	Order no.
Loop-powered isolators for standard signals, 1 channel	P 22401 P1
Loop-powered isolators for standard signals, 2 channels	P 22402 P1
Loop-powered splitter for standard signals	P 22412 P1

Specifications

Input	0(4) ... 20 mA / max. 30.5 V
Min. operating current	Approx. 30 µA (P22412P1: approx. 40 µA)
Voltage drop	Approx. 2.9 V at 20 mA (P22412P1: approx. 5.8 V at 20 mA)
Overload capacity	30 mA, 31 V, max. 1 minute (limited by Z diode) Reverse polarity protection by PTC element, recovery time approx. 1 min.
Output	0(4) ... 20 mA / max. 27.5 V (1375 Ω load at 20 mA) P22412P1: 2 x 0(4) ... 20 mA / total of max. 24 V for both outputs
Overload capacity	30 mA, 30 V, max. 1 minute (limited by Z-diode) reverse polarity protection by PTC element, recovery time approx. 1 min.
Residual ripple	< 10 mV _{rms} at 500 Ω load
Transmission behavior	
Transmission error	< 0.08 % full scale
Load error	< 0.015 % meas.val. / 100 Ω load
Step response (10-90 %)	Approx. 5 ms at 500 Ω load
Temperature influence ¹⁾	TC < 8 ppm / K meas. val. per 100 Ω load (reference temp. 23 °C)

Specifications *(continued)*

Isolation

Test voltage	Input against output: 5.4 kV AC, 50 Hz
	Channels against one another: 3.6 kV AC, 50 Hz

Working voltage (with protection against electric shock)	Up to 600 V AC/DC, protective separation acc. to EN 61140 by reinforced insulation acc. to EN 61010-1: 2010 with overvoltage category III and pollution degree 2
	Up to 600 V AC/DC, protective separation acc. to EN 61140 by reinforced insulation acc. to EN 61010-1: 2010 with overvoltage category II and pollution degree 2 across the channels.
	For applications with high working voltages, take measures to prevent accidental contact and make sure that there is sufficient distance or insulation between adjacent devices.

EMC	Product standard EN 61326-1
	Emitted interference Class B
	Immunity to interference Industrial environment

Standards and approvals

Approvals	ATEX Zone 2 nA, IIC, T4 (functional separation) II 3G Ex nA IIC T4 Gc X
	UL (US/Canada) cULus listed open-type process control Equipment also listed proc. contr. Eq. for use in haz. loc. UL OrdLoc listed ANSI/UL 61010-1 UL HazLoc marking: Class I Div. 2 Groups A,B,C,DT4
	GL GL EMC 2 C
RoHS conformity	According to directive 2011/65/EU
Functional safety ²⁾	Suitable up to SIL 3 (see SIL safety manual, from page 13 onwards) Suitable for PL c or PL e (see SIL safety manual, from page 13 onwards)

Further data

MTBF ³⁾	965 years
Ambient temperature	During operation -40 ... +85 °C (-40 ... +185°F) when mounted in row During storage -40 ... +85 °C (-40 ... +185°F)
Ambient conditions	Indoor use ⁴⁾ Relative humidity 5 ... 95 %, no condensation Altitude up to 2000 m (air pressure: 790 ... 1060 hPa) ⁵⁾
Housing	Design Modular housing with pluggable screw terminals Dimensions 99 x 114.5 x 12.5 mm (L x H x W)
Diameter of the test jacks	2.1 mm
Ingress protection	Housing and terminals IP 20
Mounting	For 35-mm DIN rail acc. to EN 60715
Connection	Conductor cross section max. 2.5 mm ² , AWG 20-12, tightening torque: 0.6 Nm
Weight	2 channels: approx. 90 g, 1 channel: approx. 60 g

1) Average TC in specified operating temperature range

2) For SIL applications, the 20 mA signal lines must be galvanically isolated from the mains.

3) Mean time between failures - according to EN 61709 (SN 29500)

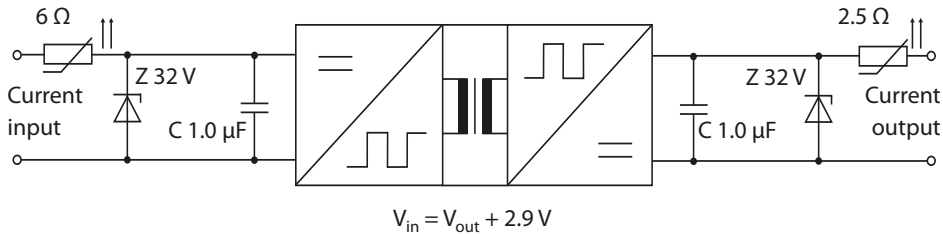
Conditions: stationary operation in well-kept rooms, average ambient temperature 40°C, no ventilation, continuous operation

4) Closed, weather-protected operating areas (stationary operation), water or wind-driven precipitation (rain, snow, hail, etc.) excluded

5) Lower air pressure reduces the allowable working voltages.

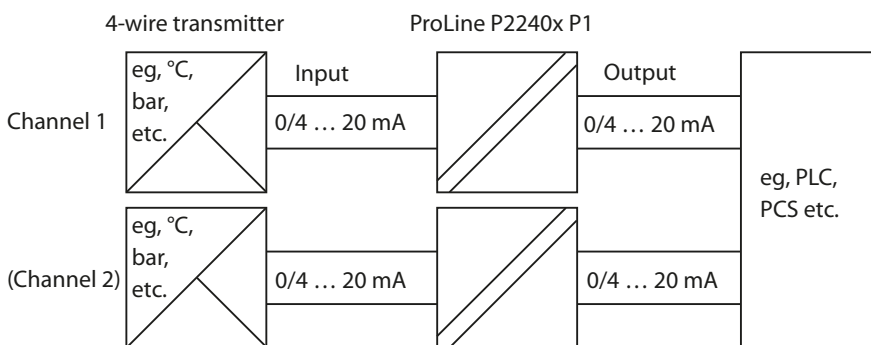
ProLine P 22400

Block Diagram



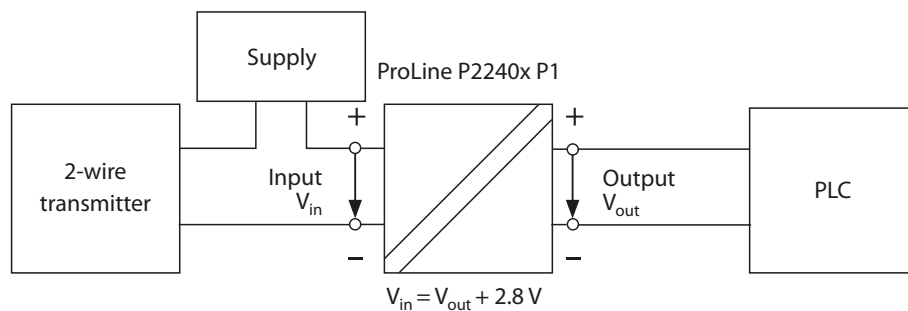
Typical Wirings

Electrical isolation (1 or 2 channels)



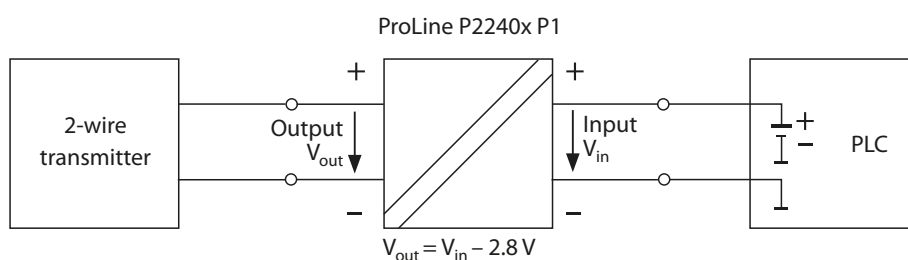
Operation as repeater power supply (1 or 2 channels)

Power supply on the input (non-feeding PLC)



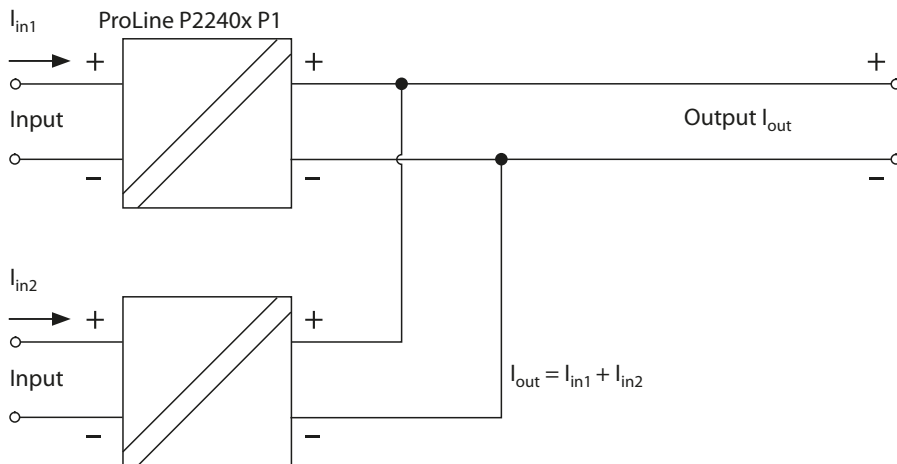
Operation as repeater power supply (1 or 2 channels)

Input and output are connected "in reverse" (feeding PLC)

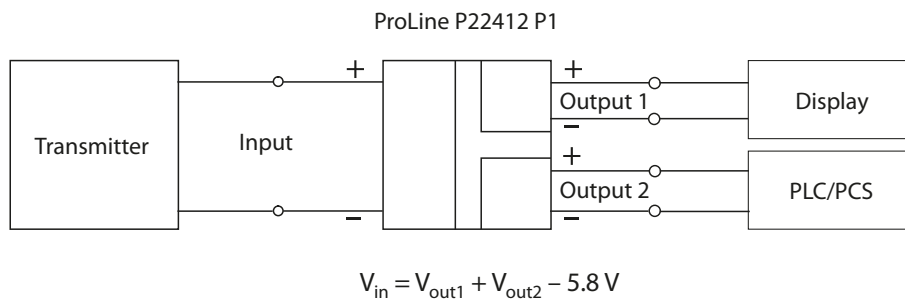


Typical Wirings

Electrical isolation with current addition for impressed currents

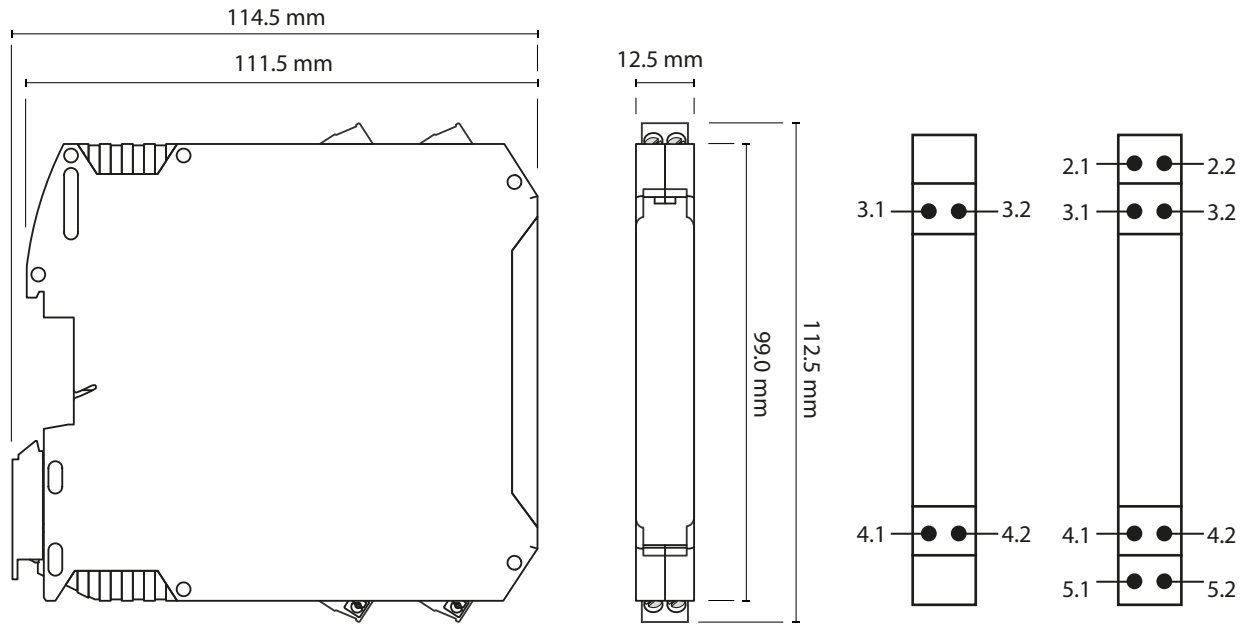


Wiring of signal splitter



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Dimension Drawing and Terminal Assignments



Snap-on mounting on 35-mm DIN rail to EN 60715

Terminal	P22401 P1	P22402 P1	P22411 P1	P22412 P1
● 2.1		CH2 Out +		Out2 +
● 2.2		CH2 Out -		Out2 -
● 3.1	Out +	CH1 Out +	Out +/-	Out1 +
● 3.2	Out -	CH1 Out -	Out 0	Out1 -
● 4.1	In +	CH1 In +	In +/-	In +
● 4.2	In -	CH1 In -	In 0	In -
● 5.1		CH2 In +		
● 5.2		CH2 In -		