The Art of Measuring. Knick

More is Less.

Doubling Signals – Saving Speed Sensors

- Reduces Procurement, Installation and Maintenance Costs
- Highest Reliability and Availability

Safety Integrity Level
SIL 3
IEC 61508

SIL3 Pulse Frequency Conditioners

ProLine P 16000

The ProLine P 16000 receives signals from speed sensors and transmits and converts them into electrically isolated analog standard signals.

5-year warranty!

The input is designed in a way that it can "tap" signals from existing circuits without disturbing the original signal. This absence of interaction complies with the SIL 3 integrity level according to EN 61508. Even a safety-oriented signal from a sensor can be duplicated and transmitted to a second controller without any interaction.

The product is resistant against the harsh environmental conditions typical of heavy industrial plants, power generation facilities and rolling stock applications. The device functionality is not affected by electromagnetic interferences, extreme ambient temperatures or vibration and shock. The latest fire safety regulations for rail vehicles are met.

Standards

Use on rolling stock	EN 50155
Power supply	EN 50155 (S2), RIA12/1984
Fire protection (HL3)	EN 45545-2
Functional safety	EN 61508
Reliability (MTBF)	EN 61709
Protection against electric shock	EN 61140
Vibration / Shock (Category 1, Class B)	EN 61373 (IEC 61373)
EMC—railway applications	EN 50121-1, EN 50121-3-2
EMC—industrial applications	EN 61326-1
Temperature class TX (-40...+85 °C)	EN 50155 / EN 50125-1 and EN 50125-2
Altitude class AX (2000 m or 4000 m AMSL)	EN 50155 / EN 50125-1 and EN 50125-2
Insulation coordination for railway and industry	EN 50124-1, EN 61010-1
Electrical safety and fire protection USA	UL 61010-1

Facts and Features

- Pulse frequency measurement, e.g., of speed sensors / rotary encoders for safe detection of the train's speed or stand-still; galvanic isolation and conversion into standard signals; measuring ranges: 0 ... 500 Hz to 0 ... 20 kHz.
- Converting the pulse frequency into a standard signal eliminates the need for pulse counting inputs at the control unit.
- Safety-related signals from existing circuits can be duplicated without interaction and can be transmitted to another subsystem.
- The absence of interaction is designed to be functionally safe and achieves SIL 3.

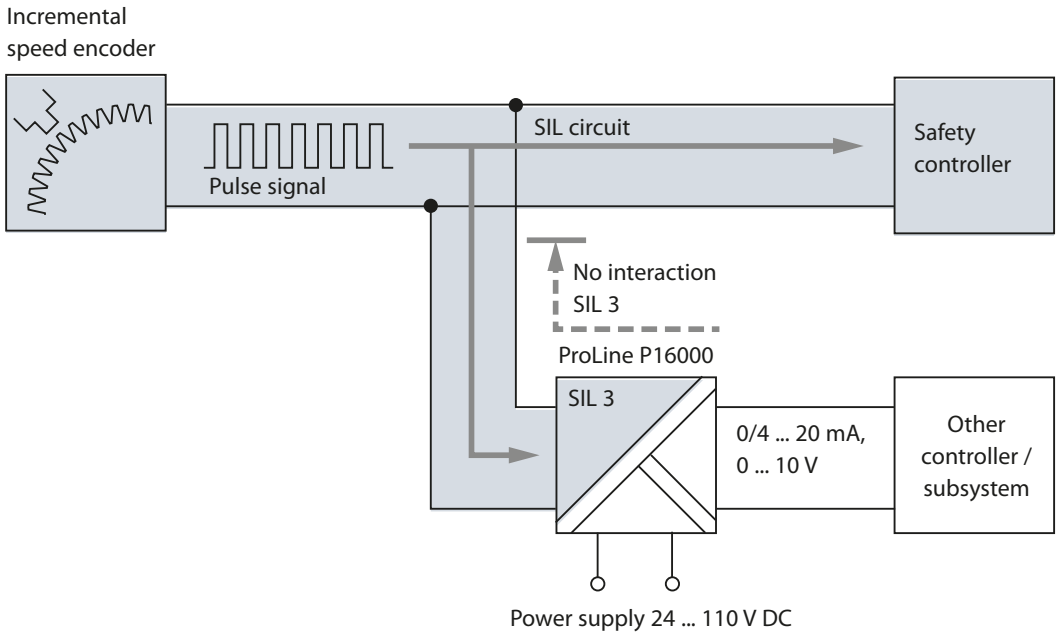
ProLine P 16000

Product Range

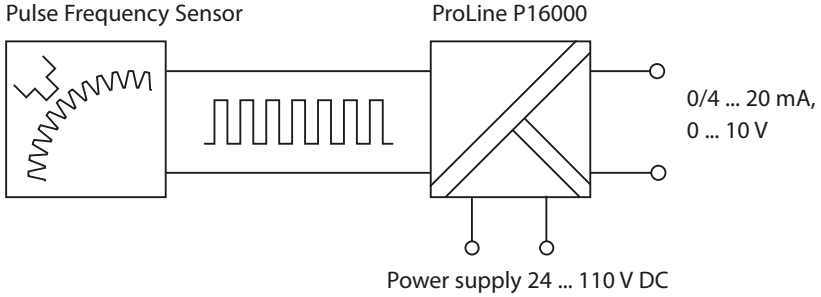
Pulse Frequency Conditioners	P16			P1	–	
Pulse input 0 ... 0,5 kHz		10				
Pulse input 0 ... 1 kHz		20				
Pulse input 0 ... 2 kHz		30				
Pulse input 0 ... 5 kHz		40				
Pulse input 0 ... 10 kHz		50				
Pulse input 0 ... 20 kHz		60				
Standard-signal output 0 ... 20 mA			6			
Standard-signal output 4 ... 20 mA			7			
Standard-signal output 0 ... 10 V			8			
Pulse input TTL series (5 V CMOS logic)					–	TTL
Pulse input HTL series (24 V)					–	HTL

The input/output ranges are factory-set (fixed-range models).

Typical Application – Decoupling of Signals from Safety-Related Circuits (Example)



Typical Application – Conversion of Pulse Frequency into Analog Standard Signals



Specifications

Input Data

	Pulse input	0 ... 0,5 kHz to 0 ... 20 kHz	
	Level TTL series	Low: < 1.5 V	High: > 3.5 V, max. 30 V
	Level HTL series	Low: < 3 V	High: > 8 V, max. 30 V
	Input resistance	60 kΩ ... 100 kΩ	
	Input capacitance	< 100 pF	
	Overload capacity	Max. 110 V	

Output Data

Current output	Max. output range	0 ... 20 mA or 4 … 20 mA	
	Max. output current in the case of input overdrive	< 40 mA	
	Load	≤ 11.55 V (550 Ω at 21 mA)	
	Overload capacity	Max. 30 V DC	external voltage
	Ripple	< 10 mV_{rms} at 500 Ω load	
Voltage output	Max. output range	0 ... 10 V	
	Max. output voltage in the case of input overdrive	< 16 V	
	Load	≤ 10 mA (1 kΩ at 10 V)	
	Overload capacity	Max. 30 V DC	external voltage
	Ripple	< 10 mV_{rms}	
	Short-circuit-proof	Yes	
Transmission Behavior	Measurement error (at drive level < 2 %: additional error + 0.2 %, for model 1610*P1-***: + 0.4 %)	< 0.2 % full scale	
	Linear output range	0 ... 1.05 x full scale	
	Temperature coefficient	≤ 50 ppm/K full scale	T_{ref} = 23 °C
	Response time T_{90}	Up to 5 kHz 10 to 20 kHz	Approx. 800 ms Approx. 35 ms
Power Supply	Broad-range power supply	24 ... 110 V DC	– 30 %, + 40 %; P < 1.5 W
	Highest limit of DC supply (short time)	110 ... 154 V DC / ≤ 100 ms criterion A 125 ... 154 V DC / ≤ 1 s criterion B	
	Lowest limit of DC supply (short time)	14.4 V DC / 100 ms acc. to EN 50155	RIA 12 (brownout)
	Short interruptions	Interruption class S2 (max. 10 ms)	
	Switching class	C1	
	Indication	Green LED for power supply (LED located at center of front face)	
EMC	Interference immunity	Industrial applications Railway applications	EN 61326 EN 50121-1; EN 50121-2-3
	Emitted interference	Industrial applications Railway applications	EN 61326 EN 50121-1; EN 50121-2-3

ProLine P 16000

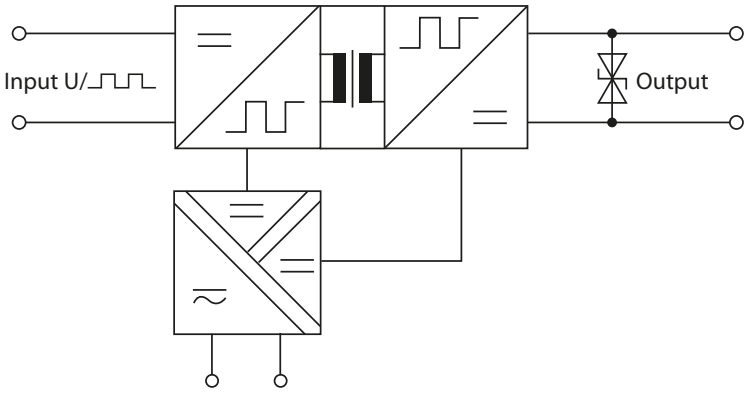
Specifications

Isolation	Test voltages	Type test	3 kV AC, 50 Hz, 1 min
			acc. to IEC/EN/UL 61010-1, Tab. 4
		Routine test	1.9 kV AC, 50 Hz, 2 s
	Working voltage with protection against electric shock	Protective separation according to EN 61140 with reinforced insulation according to EN 50124-1, IEC 62497-1, IEC/EN 61010-1 up to 300 V AC/DC, overvoltage category II and pollution degree 2 (At altitudes > 2000 m, the permissible working voltages are reduced to 150 V AC/DC.)	
Functional Safety	SIL 3 (type A device) acc. to IEC 61508 / EN 61508		
	45 °C average ambient temperature, continuous operation, stationary operation in well-kept rooms, no ventilation, EN 61709 (SN 29500) The safety function for safety-related applications according to EN 61508 up to SIL 3 consists of the absence of interaction of the pulse frequency input as described above.		
	The input is non-interacting.		
	Absence of interaction during normal operation Input impedance > 100 kΩ Interaction < 3 µA Electrically isolated up to 300 V reinforced insulation		
	Absence of interaction during fault conditions Input impedance > 100 kΩ Interaction < 35 µA Electrically isolated up to 300 V reinforced insulation		
Ambient Conditions	Usage	Use in enclosed areas: PD2, weather-protected. Excluded: water or wind-driven precipitation (rain, snow, hail etc.)	
	Ambient temperature during operation	– 40 ... 70 °C	short-time +85 °C / 10 min
	Operating temperature class	OT4 according to EN 50155	
	Switch-on extended operating temperature class	ST1 according to EN 50155	
	Ambient temperature	Transport and storage	– 50 ... 85 °C
	Altitude	Max. 4000 m (AMSL) At altitudes > 2000 m the permissible working voltages are reduced to 150 V AC/DC.	
	Class of altitude range	AX according to EN 50125-1	
	Relative humidity	5 ... 95 %	
	Shock and vibration	Category 1, class B according to IEC/EN 61373	

Specifications

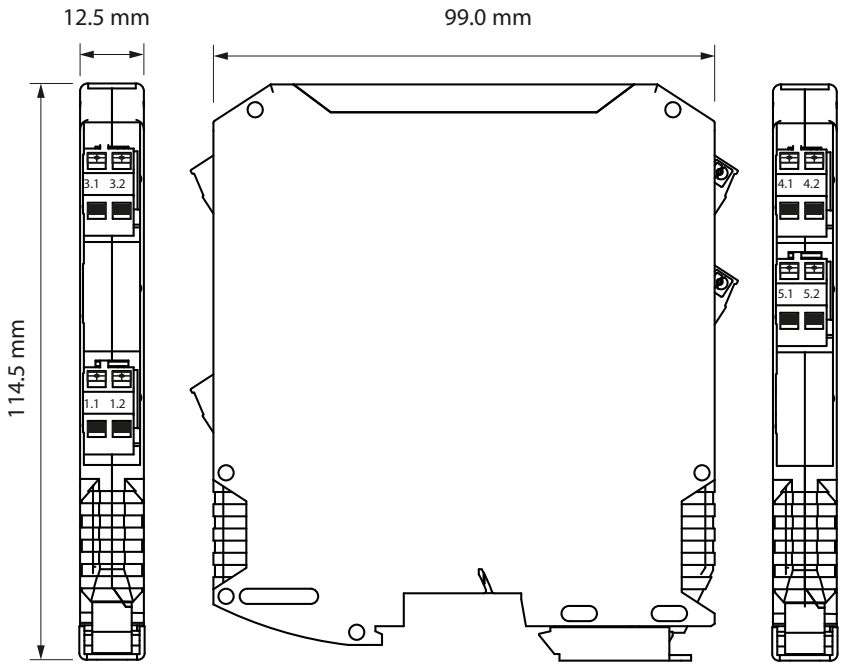
Further Data	MTBF	139.7 years (according to IEC/EN 61709/SN 29500, average ambient temperature 45 °C, continuous operation, stationary operation in well-kept rooms, no ventilation)	
	Housing	Type	Modular housing with push-in terminals
		Dimensions (L x H x W)	99 x 114.5 x 12.5 mm
	Protection	IP 20	
	Mounting	Snap-on mounting for 35 mm DIN rail (without DIN rail bus connector) acc. to IEC/EN 60715	
	Connection	Conductor cross section max. 2.5 mm², AWG 23 ...14	
	Weight	Approx. 90 g	

Schematic Diagram



Power supply 24 ... 110 V DC

Dimension Drawing



Push-In Terminals
Conductor cross-section
0,25 ... 2,5 mm² / AWG 23 ...14

Single cables, stranded or solid,
stranded with ferrule
(with or without collar)

Terminal Assignments

1.1	Power Supply	24 ... 110 V	=
1.2	Power Supply	24 ... 110 V	=
3.1	Output	U/I	+
3.2	Output	U/I	–
4.1	Input	U/⎍⎍⎍	+
4.2	Input	U/⎍⎍⎍	–

Knick

Interface Technology

- Transducers for Railway Applications
- High Voltage Transducers
- Universal Isolated Signal Conditioners
- Isolated Standard Signal Conditioners
- Temperature Transmitters

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Knick
The Art of Measuring

Knick has been among the leading manufacturers of electronic measurement devices for more than 70 years. Signal conditioners from the Berlin company are used successfully throughout the world, e.g., in industrial applications, high voltage motors, substations and other areas of rail infrastructure.

The new ProLine P 16000 pulse frequency conditioners and isolated standard signal conditioners have been specially developed for use in the rolling stock sector. In compliance with all currently applicable railway standards, they ensure safety with their innovative functions in modern electric or diesel-electric locomotives and multiple units.

TP-270.000 P16000 EN 2102