Knick
INTERFACE

Product Overview
Interface Technology

THE ART
OF MEASURING

Knick's high-voltage transducers, signal conditioners, isolators, and transmitters are a product of over 75 years of experience in reliable galvanic isolation – bringing peace of mind to whatever you are looking to measure in a high-voltage environment.

Why Knick?

Knick electrical measurement solutions are used worldwide in applications where accurate signal transmission and protection from high voltage are required. Knick provides products for up to 6.6 kV of continuous isolation, while delivering reliability, as evidenced by Mean Time Between Failure (MTBF) of up to 2165 years.

Long-term stable transducers and signal conditioners for demanding applications

For reasons of safety and signal quality, the transmission of measurement and control signals requires galvanic isolation.

To minimize the risk of damage, the signal conditioners and measuring transducers used for this purpose must be able to withstand high permanent voltage loads and have safety reserves in terms of isolation and hardware design.

With its comprehensive range of interface components, Knick offers solutions that meet the highest demands for safety, precision, robustness and durability.

This also applies to our latest innovations, which focus on

- high isolation transducers for DC and AC voltages up to (±)4800 V or large DC currents up to approx. (±)20 kA with shunt resistor
- measuring transducers for applications with functional safety up to SIL 4
- signal conditioners for precise measurement of DC currents in normal operation as well as very high currents in case of overload.

In addition, Knick has recently developed highly innovative solutions for functionally safe speed signal duplication.

To ensure maximum fail-safety and reliability, we consistently rely on robust circuit designs, high-quality components and a conservative design of the components used. As a result, some of our products achieve an MTBF (mean time between failure) of well over 2000 years.

Fields of application: where our solutions bring value.
Due to their quality features and reliability, signal conditioners and transducers from Knick are used wherever fail-safe operation and high quality of measured value transmission are required.

Typical applications are found within power plants, energy storage facilities, rail substations, on board heavy vehicles, within electrical machinery, and in industrial manufacturing environments, to name a few.

For example, many of the electric vehicle systems installed by the automotive industry are subjected to very complex test cycles, some of which last for years. Since failures of the measurement technology would lead to immense costs, Knick products are the first choice in many test scenarios.

For many years, Knick has also established itself as a reliable supplier for railroad technology. Whereas our high-voltage isolation amplifiers were previously used primarily in infrastructure such as substations and signaling technology, we now also supply units for onboard installation.

In addition, the expansion of renewable energy and energy storage technology such as battery and hydrogen, is constantly opening up further fields of application for our interface modules:
In photovoltaics, the monitoring of professional installations requires suitable insulation of the measuring systems to protect the operating personnel as well as the control and evaluation systems.

In the energy storage sector, the need for high-performance, highly insulating electrical measurement transducers for monitoring DC currents and voltages seen within battery packs and fuel cells is growing. Here, too, our product range provides a coherent selection of optimal solutions.

International certifications such as UL, CSA, CE, DNV, SIL, KTA, and ATEX enable worldwide use. As a special unique selling point, Knick also offers application-related modifications to its standard modules or carries out customer-specific developments for challenging tasks.

www.knick-international.com/en/interface-technology-solutions

5-year Warranty

If shipped to our factory, deficient products will be repaired or replaced free of charge, if reported to us within 5 years of receipt.

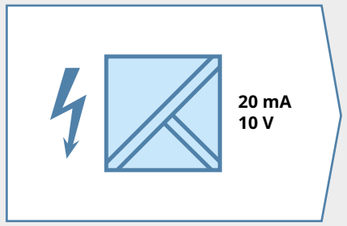
The original warranty period after first delivery applies to repaired or replaced products. Further claims for direct damages or consequential damages are excluded from the warranty.

From high voltage measurement to measured value display:
Knick's product categories at a glance

The common denominators found in all Knick products are precision, thoughtful design, and attention to detail. In addition, the majority of the devices are characterized by adjustable measuring ranges for maximum flexibility of use.

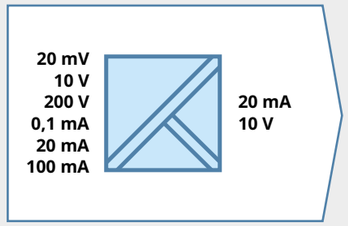
This is what we refer to as THE ART OF MEASURING.

High Voltage Transducers



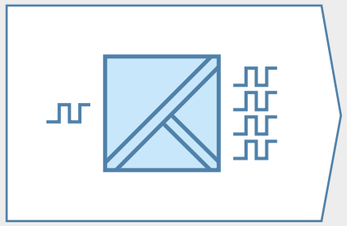
- Highly isolated transducers for measurement of high voltages, currents and temperature
- Isolation up to 6,600 V AC/DC
- Selectable measuring ranges
- MTBF up to 2165 years
- Compliance with high safety standards

Isolated Signal Conditioners



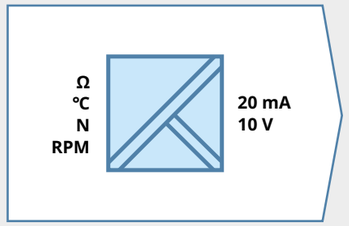
- Flexible conversion of any electrical signal
- Isolation up to 1,650 V
- Extreme long-term stability
- Up to 480 calibrated selectable measuring ranges in one device

Signal Multipliers



- Doublers and quadruplers of standard signals
- Universal speedsignal transmission
- High immunity to EMC influences

Sensor Transmitters

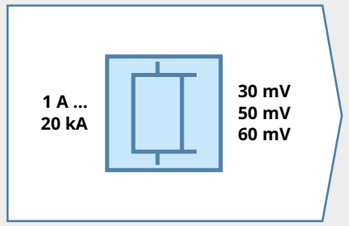


- Transmitters for direct connection of various sensors
- Conversion of measured values into standard signals
- Functional safe signal conditioning

Indicators

- Indicators with 4-digit-display for any measured values
- No power supply required
- For panel mounting or in IP65 housing

Shunt resistors



- Shunt resistors for currents from 1 A to 20 kA
- Shunt voltages of 30 mV, 50 mV and 60 mV
- In accuracy classes 0.2 and 0.5
- Overload capacity up to 500 %

All devices are also available with customized parameters

To provide safety in the environment of high-voltage applications, transducers with high isolation are available for measuring current, voltage, and temperature. Versions are available for both AC and DC applications. Current measurement uses shunt resistors for high accuracy, low influenceability and robust overload capability. Voltage and current transducers are also available in a highly accurate version to measure energy for billing purposes. Voltage presence detectors (VPD) supervise a configurable high voltage input threshold, by way of a solid-state relay output.

Universal isolated signal conditioners providing reliable isolation and flexible conversion of voltage or current signals into selectable standard signals, bringing flexibility in measurement arrangements.

Loop-powered isolators provide a 1:1 transmission of current signals with medium isolation.

Signal multipliers reducing the complexity of measurement arrangements by providing two or four times the input signal at the output, and offering in parallel the possibility to convert the input signals.

A special speed sensor doubler offers signal conversion, high isolation and a high immunity to EMC influences.

Sensor transmitters are available for the conversion of a wide range of sensor signals into standard signals.

Connection is supported for speed sensors, resistance thermometers, thermocouples, potentiometers, shunt resistors, and load cells. These transmitters are available for safety circuits up to SIL 3.

High-precision 4-digit universal digital indicators for physical property (temperature, pressure, level, flow, weight ...), requiring no external power source – perfect for use in difficult environmental conditions.

Compact set-point alarm relay with changeover output contacts for monitoring and controlling of process variables with maximum reliability.

The shunt resistors and the associated transducers achieve very good long-term stability, so that the specified accuracy is guaranteed over normal application periods of many years.

In addition to shunt resistors with measuring voltages of 50 mV and 60 mV, we are also one of the first suppliers to sell particularly economical versions with shunt voltages of 30 mV.

High Voltage Transducers

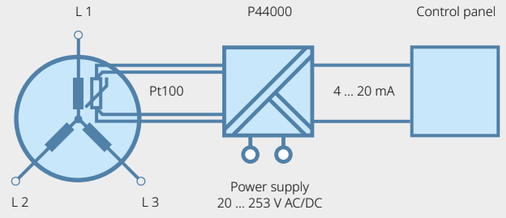
Voltage, current, and temperature measurement with high isolation.

	Voltage measurement		Voltage measurement		
	P52000 P52000VPD	**P45000**	**P42000 P42000 TRMS**	**P29000**	**BL590**
Input	0 ... (±)100 V ... 0 ... (±)4800 V max. 4800 V DC or AC peak (VPD) (VPD: 50 V ... 4200 V)	0 ... (±)500 V 0 ... (±)750 V 0 ... (±)1000 V 0 ... (±)1500 V 0 ... (±)2000 V 0 ... (±)2800 V 0 ... (±)3000 V overrange up to 150 %	0 ... (±)100 V ... 0 ... (±)3600 V	0 ... (±)100 V ... 0 ... (±)1000 V	0 ... (±)50 V ... 0 ... (±)500 V
Output	4 ... 20 mA or 0 ... (±)20 mA or 0 ... (±)5 V or 0 ... (±)10 V Solid-state relay, power good signal (VPD)	0 ... (±50) mA or 10 ... 50 mA	4 ... 20 mA or 0 ... (±)20 mA or 0 ... (±)10 V, peak or TRMS values (TRMS)	4 ... 20 mA or 0 ... (±)20 mA or 0 ... (±)10 V or passive 4 ... 20 mA	4 ... 20 mA or 0 ... (±)20 mA or 0 ... (±)10 V or passive 4 ... 20 mA
Isolation AC/DC	up to 4,800 V	up to 3,600 V AC & 4,800 V DC	up to 3,600 V (D3) & 2,200 V (D2)	up to 1,000 V	up to 500 V
Test voltage	12/18 kV AC	10/18 kV AC	10/15 kV AC	5.4 kV AC	3.6 kV AC
Power supply	24 ... 230 V AC/DC	±15 ... ±24 V DC	22 ... 230 V AC/DC	24 ... 230 V AC/DC	24 V DC 100 ... 230 V AC
Cutoff frequency	Switchable cutoff frequency 9 kHz (P52x00) and 10 Hz, other cutoff frequency on request	Cutoff frequency 10 kHz, lower cutoff frequency on request	Cutoff frequency 5 kHz, lower cutoff frequency on request	Switchable cutoff frequency 10 kHz or 10 Hz, other cutoff frequency on request	Switchable cutoff frequency 5 kHz or 10 kHz
Ambient operating temperature	-40 ... 85 °C	-40 ... 85 °C	-10 ... 70 °C (-40 ... 75/85 °C)	-25 ... 70 °C	-25 ... 70 °C
Dimensions (W x L x H)	72.5 x 182 x 116 mm	28 x 148 x 128.5 mm	67.5 (D3)/45 (D2) x 90 x 118 mm	17.5 x 99 x 114.5 mm	17.5 x 99 x 114.5 mm
Special features	– For use on rolling stock (EN 50155) – Energy metering (EN 50463) – Diagnostics of input/output circuits and device function – 10 thresholds adjustable via rotary switch for VPD – Diagnostics of input/output circuits and device function	– For use in SIL2 systems and, redundantly, SIL3 (IEC 61508) – For use on rolling stock (EN 50155) – Very compact – Stackable – Optimized for low space demand – DIN rail and wall mounting options – HV input with fixed cables or screw terminals	– High isolation in a compact housing – Exceptionally high MTBF of 2165 years (Mean Time Between Failures), based on field data – Switchable (16 input/output signal combinations) or customized versions (D2)	– Measuring ranges adjusted via DIP switches, a passive current output allows for connection to active PLC inputs	– Measuring ranges adjusted via DIP switches – A passive current output allows for connection to active PLC inputs

	Current measurement			Current measurement			Current measurement
	Via shunt resistor			Via shunt resistor		Direct	Shunt resistors
	P51000	**P41000** **P41000 TRMS**	**P41000AG**	**P29001**	**BL591**	**P43000** **P43000 TRMS**	**Mn(X)L / Mn(X)S**
Input	0 ... (±)30 mV ... 0 ... (±)125 V	0 ... (±)50 mV ... 0 ... (±)100 V	0 ... (±)30/330 mV ... 0 ... (±)120/1320 mV	0 ... (±)30 mV ... 0 ... (±)100 V	0 ... (±)30 mV ... 0 ... (±)1000 mV	0 ... (±)0.1 A ... 0 ... (±)5 A	0 ... 1 A ... 0 ... 20 kA
Output	4 ... 20 mA or 0 ... (±)20 mA or 0 ... (±)5 V or 0 ... (±)10 V	4 ... 20 mA or 0 ... (±)20 mA or 0 ... (±)10 V, peak or TRMS values	4 ... 16/24 mA	4 ... 20 mA or 0 ... (±)20 mA or 0 ... (±)10 V or passive 4 ... 20 mA	4 ... 20 mA or 0 ... (±)20 mA or 0 ... (±)10 V or passive 4 ... 20 mA	4 ... 20 mA or 0 ... (±)20 mA or 0 ... (±)10 V, peak or TRMS values	0 ... 30 mV 0 ... 50 mV 0 ... 60 mV
Isolation AC/DC	up to 4,800 V	up to 3,600 V	up to 3,600 V	up to 1,000 V	up to 500 V	up to 3,600 V	N/A
Test voltage	12/18 kV AC	10/15 kV AC	10/15 kV AC	5.4 kV AC	3.6 kV AC	10/15 kV AC	N/A
Power supply	24 ... 230 V AC/DC	22 ... 230 V AC/DC	22 ... 230 V AC/DC	24 ... 230 V AC/DC	24 V DC 100 ... 230 V AC	22 ... 230 V AC/DC	N/A
Cutoff frequency	Switchable cutoff frequency 14 kHz (P51x00) and 10 Hz, other cutoff frequency on request	Cutoff frequency 5 kHz, lower cutoff frequency on request	Cutoff frequency 5 kHz, lower cutoff frequency on request	Switchable cutoff frequency 10 kHz or 10 Hz, other cutoff frequency on request	Switchable cutoff frequency 5 kHz or 10 kHz	Cutoff frequency 5 kHz, lower cutoff frequency on request	N/A
Ambient operating temperature	-40 ... 85 °C	-10 ... 70 °C (-40 ... 75/85 °C)	-10 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C	-10 ... 70 °C (-40 ... 75/85 °C)	-10 ... 55 °C
Dimensions (W x L x H)	72.5 x 182 x 116 mm	22.5 x 90 x 118 mm	22.5 x 90 x 118 mm	17.5 x 99 x 114.5 mm	17.5 x 99 x 114.5 mm	45 x 90 x 118 mm	depending on the input value
Special features	– For use on rolling stock (EN 50155) – Highly accurate version available for energy measurement on board trains (EN 50463) – Diagnostics of input/output circuits and device function	– Switchable (16 input/output signal combinations) or customized versions – Exceptionally high MTBF of 2165 years (Mean Time Between Failures), based on field data	– Adaptive gain for nominal current and overcurrent measuring. – High accuracy in the nominal current range, sufficient accuracy for up to 11 times of nominal current.	– Measuring ranges adjusted via DIP switches – A passive current output allows for connection to active PLC inputs	– Measuring ranges adjusted via DIP switches – A passive current output allows for connection to active PLC inputs	– Switchable or customized versions – Exceptionally high MTBF of 2165 years (Mean Time Between Failures), based on field data	– Available for accuracy class 0.5 and 0.2 – Permanent overload capacity of 120 % full scale – Measurement principle prevents influences from adjacent lines

	Temperature measurement		
	P44000D3	**P44000D1**	**205/206 210/211**
Input	Pt100 resistance thermometer (RTD) with 2/3/4- wire configuration 0 ... 100 °C 0 ... 200 °C 0 ... 300 °C	Pt100 resistance thermometer (RTD) with 2/3/4- wire configuration 0 ... 100 °C 0 ... 200 °C 0 ... 300 °C	Resistance thermometers, thermocouples
Output	4 ... 20 mA	4 ... 20 mA	4 ... 20 mA or 0 ... 20 mA or 0 ... 10 V
Isolation AC/DC	up to 6,600 V	up to 2,000 V	up to 1000 V
Test voltage	15 kV AC	7.5 kV AC	4 kV
Power supply	22 ... 230 V AC/DC	22 ... 230 V AC/DC	24 V DC
Cutoff frequency	Cutoff frequency 5 kHz, lower cutoff frequency on request	Cutoff frequency 5 kHz, lower cutoff frequency on request	1 measurement per second
Ambient operating temperature	-10 ... 70 °C	-10 ... 70 °C	-10 ... 60 °C
Dimensions (W x L x H)	67.5 x 90 x 118 mm	22.5 x 90 x 118 mm	22.5 x 118.2 x 73.5 mm
Special features	– For temperature measurement in high-voltage applications – Low measurement error of typically 0.5 K – Short T90 delay time of 100 ms	– For temperature measurement in high-voltage applications – Low measurement error of typically 0.5 K – Short T90 delay time of 100 ms	– For temperature measurement in high-voltage applications

Condition monitoring of high-voltage motors



Ensuring safety with temperature transmitters containing high electrical isolation

Having an active predictive maintenance campaign in place for large rotating equipment can be a key strategy for maximizing process uptime.

Condition monitoring programs that employ the collection and analysis of temperature and vibration data have become more and more widespread across a number of industries.

Some of this rotating equipment, such as motors and generators, find themselves operating in particularly high-voltage environments.

The P44000 series accurately measures temperature from Pt100 RTDs in high-voltage environments, up to 11kV. The P44000 converts the RTD signal to a standard 4 ... 20 mA output that can be easily read by the majority of control systems.

This measurement and conversion is performed across a high galvanic isolation barrier, where the input, output and power supply channels are safely protected against a potential transfer of dangerous voltage.

Isolated Signal Conditioners

Current and voltage measurement, signal doubling & conditioning.

	Universal signal conditioner		Standard signal conditioner and repeater power supply			
	P27000	**A26000**	**P15000**	**A21000**	**P22400**	**A20400**
Input	0 ... (±)0.1 mA ... 0 ... (±)100 mA or 0 ... (±)20 mV ... 0 ... (±)200 V or 4 ... 20 mA or 0 ... (±)20 mA or 0 ... (±)10 V	0 ... (±)20 mA or 0 ... (±)10 V	0 ... 20 mA or 4 ... 20 mA or 0 ... 10 V	0 ... 20 mA or 4 ... 20 mA or 0 ... 10 V	0 ... 20 mA or 4 ... 20 mA	0 ... 20 mA or 4 ... 20 mA
Output	4 ... 20 mA or 0 ... (±)20 mA or 0 ... (±)10 V	0 ... (±)20 mA or 0 ... (±)10 V	0 ... 20 mA or 4 ... 20 mA or 0 ... 10 V	4 ... 20 mA or 0 ... 20 mA or 0 ... 10 V	Like input 1:1 transmission	Like input 1:1 transmission
Isolation AC/DC	up to 1,000 V	up to 1,000 V	up to 1,000 V	up to 300 V	up to 600 V	up to 600 V
Test voltage	5 kV AC	4 kV AC	4 kV AC	2.5 kV AC	5.4 kV AC	2.5 kV AC
Power supply	22 ... 230 V AC/DC	22 ... 230 V AC/DC	22 ... 230 V AC/DC	24 ... 110 V DC / 110 ... 230 V AC	Loop powered	Loop powered
Cutoff frequency	Switchable cutoff frequency 10 kHz or 10 Hz, other cutoff frequency on request	Cutoff frequency 5 kHz or 10 Hz	Cutoff frequency 10 kHz or 10 Hz, other cutoff frequency on request	100 Hz	approx. 100 Hz	approx. 100 Hz
Ambient operating temperature	-10 ... 70 °C	-10 ... 70 °C	-10 ... 70 °C	0 ... 55 °C	-40 ... 70 °C	-20 ... 65 °C
Dimensions (W x L x H)	12.5 x 99 x 111 mm	12.5 x 99 x 111 mm	12.5 x 99 x 111 mm	6.2 x 93 x 101 mm	12.5 x 99 x 114.5 mm	6.2 x 101 x 93 mm
Special features	– The "Multimeter" among the signal conditioners – Calibrated switching of 480 input and output ranges using DIP switches	– Specifically for precise conversion and galvanic isolation of bipolar signals – Convenient configuration via DIP switches – Even after range switching, the transmission ranges remain calibrated and there is no need for re-adjustment	– The standard-signal pro with high isolation – Almost perfect signal conversion with analog signal processing and transmission – Calibrated, digitally controlled range selection without adjustment after switching – With broad-range power supply for universal, global use	– The first standard-signal conditioner with protective separation and broad-range power supply in the 6 mm class. – Extraordinary operating time and reliability with specially adapted design. MTBF (mean time between failures): 280 years	– For safety circuits up to SIL 3 (EN 61508), up to PL c/PL e (EN 13849-1) – Transformer-based isolation of 0(4) ... 20 mA standard current signals – One or two channels per device – High reliability: MTBF of 1106 years – Also available as a signal splitter with 2 electrically isolated outputs	– The first decoupled passive isolator with load stop function (option) – Extremely reliable: MTBF (mean time between failures) 1031 years – Extremely high component density of 320 channels per meter of mounting rail – Excellent price-performance ratio

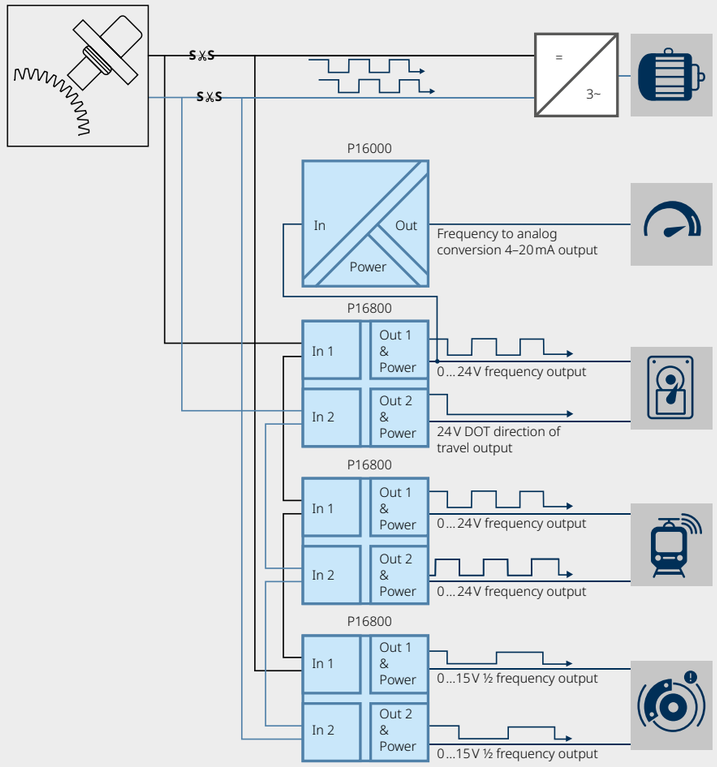
	Standard signal conditioner and repeater power supply			Standard signal conditioner and repeater power supply			
	41	**WG21**	**A20100**	**WG25**	**37**	**B10000**	**46MK**
Input	0 ... 20 mA or 4 ... 20 mA or 0 ... 50 mA	4 ... 20 mA	4 ... 20 mA	4 ... 20 mA	4 ... 20 mA	0 ... 20 mA or 4 ... 20 mA or 0 ... 10 V	0/4 ... 20 mA
Output	Like input 1:1 transmission	4 ... 20 mA	0 ... 20 mA or 4 ... 20 mA or 0 ... 10 V	4 ... 20 mA	Like input 1:1 transmission	0 ... 20 mA or 4 ... 20 mA or 0 ... 10 V	0/4 ... 20 mA
Isolation AC/DC	up to 500 V	up to 1000 V	up to 600 V	up to 1000 V	up to 3600 V	up to 100 V AC/DC	150 V
Test voltage	2.5 kV AC	4 kV AC	2.5 kV AC	4 kV AC	10 kV AC	0,51 kV AC	510 V AC (optionally up to 4 kV AC)
Power supply	Loop powered	24 V AC, 110/115 V AC, 220/230 V AC	24 V DC	Loop powered	Loop powered	24 V DC	Loop powered
Ambient operating temperature	-25 ... 80 °C	-10 ... 60 °C	0 ... 55 °C	-10 ... 50 °C	-10 ... 50 °C	0 ... 55 °C	-10 ... 70 °C
Dimensions (W x L x H)	22.5 x 88 x 99 mm	22.5 x 73.5 x 118.2 mm	6.2 x 98 x 88 mm	22.5 x 73.5 x 118.2 mm	22.5 x 73.5 x 118.2 mm	6.1 x 97.8 x 87.9 mm	34.8 x 29.8 x 10.8 mm
Special features	– Transformer-based isolation of 0(4) ... 20 mA standard current signals on up to 3 channels – Extreme precision: 0.02 % meas. val. transmission error – Extreme efficiency: Low voltage drop of 1.2 V	– ATEX: II (1) G [EEx ia] IIC – Transmission of HART signals	– The first standard-signal conditioner with protective separation and broad-range power supply in the 6 mm class – Extraordinary operating time and reliability with specially adapted design. MTBF (mean time between failures): 280 years	– ATEX: II (1) G [EEx ia] IIC – Transmission of HART signals	– ATEX: II (1) G [EEx ia] IIC – Transmission of HART signals	– One of the most cost-effective quality isolators on the market – fully switchable signal conditioner for standard signals in 6 mm housing – proven for decades – MTBF of 440 years due to reduced self-heating – Ex-certified for Zone 2/ Class 1 Div II	– PCB module for mounting on Eurocard – Extremely low mounting height – Optionally available with Safe Isolation to EN 61140 – MTBF: 1281 Years

Signal Multipliers

Doublers, converters and separators of speed sensor signals with high EMC, doublers and quadruplers of standard signals.

	Signal doubler	Signal quadrupler	Speed signal doubler
	A20300	**A20340**	**P16800**
Input	0 ... 20 mA or 4 ... 20 mA or 0 ... 10 V	0 ... 20 mA or 4 ... 20 mA or	Speed sensor signals 10 ... 33.6 V DC (max. 35 V) with Low: < 30 %, High: > 70 % or 6/7 ... 14/20 mA (max. 200 mA) with Low: < 8.5 mA, High: > 12.5 mA
Output	4 ... 20 mA or 0 ... 20 mA	4 ... 20 mA or 0 ... 20 mA	Low: < 1 V, High: = UB, Stand-still detection: 7.2 V (Option for f < 1 Hz) or Low: 6 mA, High: 14 or 20 mA or Direction of Travel (DoT) -one output only
Isolation AC/DC	up to 300 V	up to 300 V	up to 1,000 V
Test voltage	up to 2.5 kV AC	2.5 kV AC	up to 8.8 kV AC
Power supply	24 V DC	24 V DC	12 ... 24 V DC (UB)
Ambient operating temperature	0 ... 55 °C	0 ... 55 °C	-40 ... 70 °C
Dimensions (W x L x H)	6.2 x 101 x 93 mm	6.2 x 101 x 93 mm	28 x 142 x 118 mm
Special features	– Signal doubler with calibrated, switchable inputs and outputs – 2 electrically isolated outputs, each with full load of 500 ohms – All channels galvanically decoupled (4-port isolation)	– Signal quadrupler with calibrated inputs and 4 outputs, each driving full loads up to 500 ohms – All ports galvanically decoupled (6-port isolation)	– Safe decoupling acc. SIL 4, safe transmission acc. SIL 2 (EN 50129) – Doubling of speed sensor signals – Optional conversion of speed sensor signals – High immunity to EMC influences

Speed Signal Doubling on Rolling Stock



EN 50155

SIL 2/3 IEC 61508

- Providing flexibility in connecting speed sensors with control units
- Simplifies rolling stock upgrades
- SIL 4/SIL 2 (P16800) and SIL 3 (P16000) certified functional safety
- Strong isolation and ultra high EMC immunity

Sensor Transmitters

Measurement of speed, temperature, strain, force, resistance, and shunt voltages.

	Functional safe signal conditioning for sensors		Functional safe signal conditioning for sensors		
	Speed signal conditioner	**Universal measurements**	**Temp. measurement**	**Strain measurement**	**Resistance measurement**
	P16000	**P32000**	**P32100/A20210**	**P32200/A20220**	**P32300/A20230**
Input	Speed sensor signal 0 ... 0.5 kHz or 0 ... 1 kHz or 0 ... 2 kHz or 0 ... 5 kHz or 0 ... 10 kHz or 0 ... 20 kHz	Resistance thermometers, strain gauges, thermocouples, potentiometers, resistors, shunt voltages up to ±1000 mV	Resistance thermometers, thermocouples, resistors, shunt voltages up to ±1000 mV	Strain gauges, load cells	Potentiometers and resistors
Output	4 ... 20 mA or 0 ... 20 mA or 0 ... 10 V	4 ... 20 mA or 0 ... 20 mA or 0 ... (±)5 V or 0 ... 10 V	4 ... 20 mA or 0 ... 20 mA or 0 ... (±)5 V or 0 ... 10 V	4 ... 20 mA or 0 ... 20 mA or 0 ... (±)5 V or 0 ... 10 V	4 ... 20 mA or 0 ... 20 mA or 0 ... (±)5 V or 0 ... 10 V
Isolation AC/DC	up to 300 V	up to 300 V	up to 300 V	up to 300 V	up to 300 V
Test voltage	3 kV AC	2.5 kV AC	2.5 kV AC	2.5 kV AC	2.5 kV AC
Power supply	24 ... 110 V DC	24 V DC	24 V DC	24 V DC	24 V DC
Ambient operating temperature	-40 ... 70 °C	0 ... 55 (65) °C	0 ... 55 (65) °C	0 ... 55 (65) °C	0 ... 55 (65) °C
Dimensions (W x L x H)	12.5 x 99 x 114.5 mm³	6.2 x 101 x 93 mm	6.2 x 101 x 93 mm	6.2 x 101 x 93 mm	6.2 x 101 x 93 mm
Special features	– Safe decoupling acc. SIL 3 (IEC 61508) – Decoupling of safety-related encoder signals for detecting the train's speed from existing circuits – Signal doubling omits the need to retrofit sensors	– For safety circuits up to SIL 3 – Universal transmitter for temperature, strain gauges, and potentiometers in a 6 mm housing – Interface for configuration via PC – Rotary and DIP switches for easy, intuitive configuration	– For safety circuits up to SIL 3 – Transmitter for platinum temperature sensors and thermocouples or for measuring mV shunt voltages, in a 6 mm housing – Interface for configuration via PC (P32100) – Rotary and DIP switches for easy, intuitive configuration	– For safety circuits up to SIL 3 – Transmitter for load cells and strain gauges (full bridges) in a 6 mm housing – Interface for configuration via PC (P32200) – Rotary and DIP switches for easy, intuitive configuration	– For safety circuits up to SIL 3 – Transmitter for resistors and potentiometers in a 6 mm housing – Interface for configuration via PC (P32300) – Rotary and DIP switches for easy, intuitive configuration

Indicator and Special Solutions

Loop powered digital indicators for panel mounting or in separate housing, and compact set-point alarm relay for monitoring and controlling process variables.

	Special		Special	
	Set-point alarm relay	Digital indicator	Digital indicator	
	BL550	**830R**	**830S1**	**830S2**
Input	0 ... 20 mA or 4 ... 20 mA or 0 ... 10 V	0 ... 20 mA 4 ... 20 mA	0 ... 20 mA 4 ... 20 mA	0 ... 20 mA 4 ... 20 mA
Output	Changeover relay contact (SPDT), 240 V AC/2 A	4-digit measured value display for physical property (temperature, pressure, level, flow, weight ...) Optional floating solid-state switches (min and max), 60 V DC, 350 mA	4-digit measured value display for physical property (temperature, pressure, level, flow, weight ...) Optional floating solid-state switches (min and max), 60 V DC, 350 mA	4-digit measured value display for physical property (temperature, pressure, level, flow, weight ...) Optional floating solid-state switches (min and max), 60 V DC, 350 mA
Isolation AC/DC	up to 50 V	N/A	N/A	N/A
Test voltage	1.5 kV AC	N/A	N/A	N/A
Power supply	24 V DC	0.5 V or 3.2 V voltage drop in current loop	0.5 V or 3.2 V voltage drop in current loop	0.5 V or 3.2 V voltage drop in current loop
Ambient operating temperature	0 ... 55 °C	-25 ... 65 °C	-25 ... 55 °C	-25 ... 55 °C
Dimensions (W x L x H)	6.2 x 101 x 93 mm	200 x 80 x 57 mm	96 x 48 x 118 mm	144 x 72 x 57 mm
Special features	– Adjustable hysteresis and switching delay – Shreshold freely adjustable via front potentiometer	– Loop powered digital indicator in an IP65 filed housing – Can be inserted into 0/4 ... 20 mA current loops	– Loop powered digital indicator for panel mounting – Can be inserted into 0/4 ... 20 mA current loops	– Loop powered digital indicator for panel mounting – Can be inserted into 0/4 ... 20 mA current loops

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