

Modules

Isolation Amplifiers/ Transmitters

Isolation Amplifiers
Transmitters

Indicators

Process Analytics

Portable Meters

Laboratory Meters

Sensors

Fittings



Knick 



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Modular Housings for Safe Areas and Zone 2

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Isolation Amplifiers for Standard Signals	VariTrans® P 15000	46
	VariTrans® B 13000	54
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Standard-Signal Doublers	VariTrans® A 20300	74
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High-Voltage Isolators/ Isolation Amplifiers for Shunt Applications	VariTrans® P 41000	106
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Isolated Supplies	IsoAmp® PWR A 20100	126
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Universal Transmitters	PolyTrans® P 32000	138
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Temperature Transmitters	ThermoTrans® 205/206	246
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M12 Field Housings

Isolation Amplifiers for Standard Signals	DuraTrans® M12-A 20000	264
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Universal Isolation Amplifiers	IsoAmp® 11000/12000	278
Isolation Amplifiers for Standard Signals	IsoAmp® 3000/4000	286
Standard-Signal Multipliers	IsoAmp® EK 30/31	294
Loop-Powered Isolators for Standard Signals	IsoTrans® 41	302
	IsoTrans® 46	308

Modules

Universal Isolation Amplifiers	IsoAmp® 11000/12000	314
Isolation Amplifiers for Standard Signals	IsoAmp® 3000/4000	320
Loop-Powered Isolators for Standard Signals	IsoTrans® 41	328
	IsoTrans® 46	334

Selection Matrix

Model	Products	Input				Output			Isolation		Power supply				Width [mm]	Page		
		0 ... 20 mA	4 ... 20 mA	0 ... 10 V	Other	Bipolar	0 ... (±)20 mA	4 ... 20 mA	0 ... (±)10 V	0 ... 50 mA	Working voltage	Test voltage AC 50 Hz	24 V AC	24 V DC			110/115 V AC	220/230 V AC
Modular Housings for Safe Areas and Zone 2																		
Universal Isolation Amplifiers	VariTrans® P 27000	x	x	x	0 ... ±0.1 mA to 0 ... ±100 mA, 0 ... ±20 mV to 0 ... ±200 V	x	x	x	x	1000 V	5 kV	Broad-range power supply			0.08	12.5	32	
	VariTrans® A 26000	x	x			x	x	x		1000 V	4 kV	Broad-range power supply			0.1	12.5	40	
Isolation Amplifiers for Standard Signals	VariTrans® P 15000	x	x	x		x	x	x		1000 V	4 kV	Broad-range power supply			0.08	12.5	46	
	VariTrans® B 13000	x	x	x		x	x			600 V	3.25 kV	•	•	•	0.4	12.5	54	
	VariTrans® A 20000	x	x	x						300 V	2.5 kV	x			0.2	6	62	
	VariTrans® B 10000	x	x	x		x	x	x		100 V	510 V	x			0.4	6	68	
Standard Signal Doublers	VariTrans® A 20300	x	x	x		x	x			300 V	1.5 kV	x			0.2	6	74	
Isolation Amplifiers for Standard Signals	IsoTrans® 41	x	x		0 ... 50 mA	x	x	x		500 V	2.5 kV	Loop-powered			0.02	17.5/22.5	80	
	IsoTrans® A 47	x	x		0 ... 50 mA	x	x	x		300 V	2.5 kV	Loop-powered			0.2	17.5/22.5	88	
	IsoTrans® B 48	x	x			x	x			100 V	510 V	Loop-powered			0.1	6	94	
	IsoTrans® A 20400	x	x			x	x			300 V	2.5 kV	Loop-powered			0.1	6	100	
High-Voltage Isolators / Isolation Amplifiers for Shunt Applications	VariTrans® P 41000				±60 mV to ±100 V	x	x	x	x	3600 V	15 kV	Broad-range power supply			0.1	22.5	106	
	VariTrans® P 42000				±100 V to ±3600 V	x	x	x	x	3600 V	15 kV	Broad-range power supply			0.3	45	114	
	VariTrans® P 43000				±0.1 A to ±5 A	x	x	x	x	3600 V	15 kV	Broad-range power supply			0.3	67.5	120	
Repeater Power Supplies	IsoAmp® PWR A 20100	x				x	x	x		600 V	2.5 kV	x			0.1	6	126	
	IsoAmp® PWR B 10116	x				x	x			300 V	1.5 kV	x			0.2	6	132	
Universal Transmitters	PolyTrans® P 32000				Resistance thermometers, strain gages, thermocouples, potentiometers	x	x	x	x	300 V	2.5 kV	Broad-range power supply			0.1	6	138	
Temperature Transmitters	ThermoTrans® P 32100				Resistance thermometers, thermocouples	x	x	x	x	300 V	2.5 kV	Broad-range power supply			0.1	6	150	
	ThermoTrans® A 20210				Resistance thermometers, thermocouples	x	x	x	x	300 V	2.5 kV	x			0.1	6	162	
Strain gage transmitters	SensoTrans® DMS P 32200				Strain gages	x	x	x	x	300 V	2.5 kV	Broad-range power supply			0.1	6	172	
	SensoTrans® DMS A 20220				Strain gages	x	x	x	x	300 V	2.5 kV	x			0.1	6	180	
Resistance Transmitters	SensoTrans® R P 32300				Potentiometers	x	x	x	x	300 V	2.5 kV	Broad-range power supply			0.1	6	188	
	SensoTrans® R A 20230				Potentiometers	x	x	x	x	300 V	2.5 kV	x			0.1	6	198	
AC/DC Transmitters	IsoTrans® 600				0 ... 5 A AC, 0 ... 400 V AC, 48 ... 63 Hz	x	x			400 V/600 V	6 kV	Loop-powered			0.5	22.5	206	
Modular Housings for Hazardous Areas																		
Isolation Amplifiers for Standard Signals	WG 20	x	x			x	x			1000 V	4 kV	x	x		0.1	22.5	228	
Loop-Powered Isolators for Standard Signals	IsoTrans® 36/37	x	x			x				3600 V	10 kV	Loop-powered			0.2	22.5	220	
Repeater Power Supplies	WG 20	x				x				1000 V	4 kV	x	x		0.1	22.5	228	
	WG 21	x				x				1000 V	4.4 kV	•	•	•	0.1	22.5	234	
Loop-Powered Supplies	WG 25	x				x				1000 V	10 kV	Loop-powered			0.1	22.5	240	
Temperature Transmitters	ThermoTrans® 205				Resistance thermometers	x	x			1000 V	4 kV	•	•	•	•	0.1	22.5	246
	ThermoTrans® 206				Resistance thermometers			x		1000 V	4 kV	•	•	•	•	0.1	22.5	246
	ThermoTrans® 210				Thermocouples	x	x			1000 V	4 kV	•	•	•	•	0.1	22.5	254
	ThermoTrans® 211				Thermocouples			x		1000 V	4 kV	•	•	•	•	0.1	22.5	254
M12 Field Housings																		
Isolation Amplifiers for Standard Signals	DuraTrans® M12-A 20000	x	x	x		x	x	x		150 V	1.5 kV	x			0.3	83.3	264	
Loop-Powered Isolators	IsoTrans® M12-A 200	x	x			x	x			300 V	1.5 kV	Loop-powered			0.1	83.3	270	
Eurocards																		
Universal Isolation Amplifiers	IsoAmp® 11000	x	x		0 ... ±20 mV to 0 ... ±60 mV, 0 ... ±150 mV to 0 ... ±500 mV	x	x			1000 V	4 kV	•		•	0.2	5 TE	278	
	IsoAmp® 12000	x	x		0 ... ±20 mV to 0 ... ±60 mV, 0 ... ±150 mV to 0 ... ±500 mV	x		x		1000 V	4 kV	•		•	0.2	5 TE	278	
Isolation Amplifiers for Standard Signals	IsoAmp® 3000	x	x	x		x	x			1000 V	4 kV	x	x		0.01	4/5 TE	286	
	IsoAmp® 4000	x	x	x		x		x		1000 V	4 kV	x	x		0.02	4/5 TE	286	
Standard-Signal Multipliers	IsoAmp® EK 30/31	x	x	x		x	x			1000 V	4 kV	x	x		0.1	4 TE	294	
Loop-Powered Isolators	IsoTrans® 41	x	x		0 ... 50 mA	x	x	x		500 V	2.5 kV	Loop-powered			0.02	4 TE	302	
	IsoTrans® 46	x	x		0 ... 50 mA	x	x	x		100 V	510 V	Loop-powered			0.1	3 TE	308	
Modules																		
Universal Isolation Amplifiers	IsoAmp® 11000	x	x		0 ... ±20 mV to 0 ... ±60 mV, 0 ... ±150 mV to 0 ... ±500 mV	x	x			1000 V	4 kV			•	0.2	22.5	314	
	IsoAmp® 12000	x	x		0 ... ±20 mV to 0 ... ±60 mV, 0 ... ±150 mV to 0 ... ±500 mV	x		x		1000 V	4 kV			•	0.2	22.5	314	
Isolation Amplifiers for Standard Signals	IsoAmp® 3000	x	x	x		x	x			1000 V	4 kV	x	x		0.01	22.5	320	
	IsoAmp® 4000	x	x	x		x		x		1000 V	4 kV	x	x		0.02	22.5	320	
Loop-Powered Isolators	IsoTrans® 41	x	x		0 ... 50 mA	x	x	x		500 V	2.5 kV	Loop-powered			0.02	22.5	328	
	IsoTrans® 46	x	x		0 ... 50 mA	x	x	x		100 V	4 kV	Loop-powered			0.1	22.5	334	

x Covered / provided • Ordering alternatives

Overview of Product Types

- Isolation Amplifiers Transmitters
- Indicators
- Process Analytics
- Portable Meters
- Laboratory Meters
- Sensors
- Fittings



MODULAR HOUSINGS

Universal Isolation Amplifiers



VariTrans®
P 27000 / A 26000

Isolation Amplifiers for Standard Signals



VariTrans®
P 15000 / B 13000
VariTrans®
A 20000 / B 10000

Standard-Signal Doublers



VariTrans® A 20300

Loop-Powered Isolators for Standard Signals



IsoTrans® A 47
IsoTrans® B 48
IsoTrans® A 20400

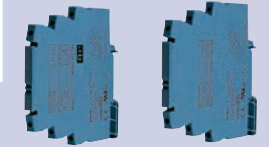
MODULAR HOUSINGS

Isolation Amplifiers for High Voltages / Shunt Applications



VariTrans®
P 41000
VariTrans®
P 42000
VariTrans®
P 43000

Repeater Power Supplies



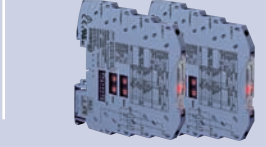
IsoAmp®
PWR A 20100
IsoAmp®
PWR B 10116

Universal Transmitters



PolyTrans®
P 32000

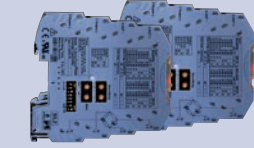
Temperature Transmitters



ThermoTrans® P 32100 /
ThermoTrans® A 20210

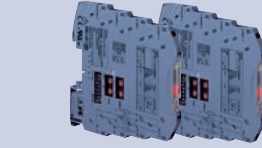
MODULAR HOUSINGS

Strain Gage Transmitters



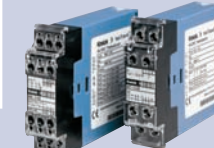
SensoTrans® DMS P 32200 /
SensoTrans® DMS A 20220

Resistance Transmitters



SensoTrans® R P 32300 /
SensoTrans® R A 20230

AC/DC Transmitters



IsoTrans® 600

Power Supplies



IsoPower® A 20900

MODULAR HOUSINGS Hazardous Area

Isolation Amplifiers for Standard Signals



IsoTrans® 36/37
WG 20

Repeater Power Supplies



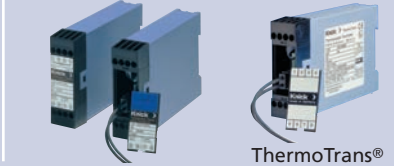
WG 20
WG 21

Loop-Powered Supplies



WG 25

Temperature Transmitters



ThermoTrans® 205/206
ThermoTrans® 210/211

M12 FIELD HOUSINGS

Isolation Amplifiers for Standard Signals



DuraTrans®
M12-A 20000

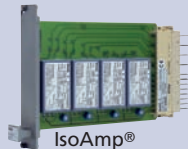
Loop-Powered Isolators for Standard Signals



IsoTrans®
M12-A 200

EUROCARDS

Universal Isolation Amplifiers



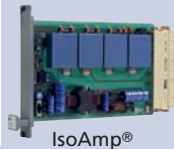
IsoAmp®
11000/12000

Isolation Amplifiers for Standard Signals



IsoAmp®
3000/4000

Standard-Signal Multipliers



IsoAmp®
EK 30/31

Loop-Powered Isolators for Standard Signals



IsoTrans® 41
IsoTrans® 46

MODULES

Universal Isolation Amplifiers



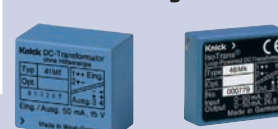
IsoAmp® 11000/12000

Isolation Amplifiers for Standard Signals



IsoAmp® 3000/4000

Loop-Powered Isolators for Standard Signals



IsoTrans® 41
IsoTrans® 46

State of the Art



Components from Knick

In the field of industrial galvanic isolation, Knick is the market leader and pacesetter for technological change. Components from Knick are designed in a way that they not only operate reliably under normal conditions but also ensure safe functioning under extreme operating conditions. The advantages are reflected in every detail. The selection of ranges, for example, is always calibrated in the Knick isolation amplifiers and transmitters. There is no need for complicated recalibration. Knick offers isolation amplifiers for particularly high working voltages – up to 3600 V AC/DC – as well as devices for applications where many signals must be processed in a small space. The 6-mm class includes isolation amplifiers and transmit-

ters that combine high flexibility and precise signal transmission with safe galvanical isolation – up to 300 V AC/DC according to EN 61140.

Constructive Competence

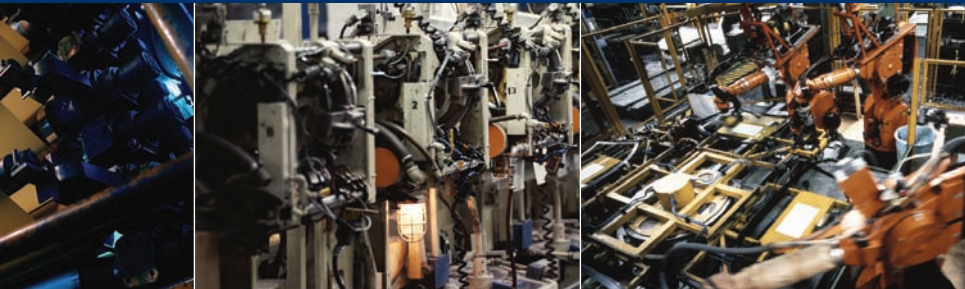
The conceptual design of new Knick devices focuses on the particular requirements and demands of the customers. Use of high-quality components with long service life is part of the basic design principles just as an intelligent circuit design and the planning of safety margins between the actual load and possible maximum load. Reliability is also achieved by reducing self-heating and the resulting thermal load by a suitable circuit design. As a result, MTBF values of many hundred years are obtained.

Knick devices always orient themselves to the customers' economic objectives such as minimizing operational and consequential costs and increasing the productivity. A typical Knick module is easy to configure, virtually maintenance-free, and provides a broad range of applications. The fact that one module can be used for many applications significantly reduces logistic costs and avoids effort caused by wrong ordering.

Certified Quality

Numerous approvals prove the suitability for extraordinary requirements and fields of application. The Knick range includes devices with SIL, UL, CSA, FM, ATEX, KTA, and GL approvals. The company maintains a quality management system according to DIN EN ISO 9001 : 2000 and has a confirmation of suitability of the quality assurance according to the KTA 1401 rule of the Nuclear Safety Standards Commission. One result of the strict implementation of the various regulatory requirements is the proverbial long life and reliability of Knick isolators that is proved by a 5-year warranty.

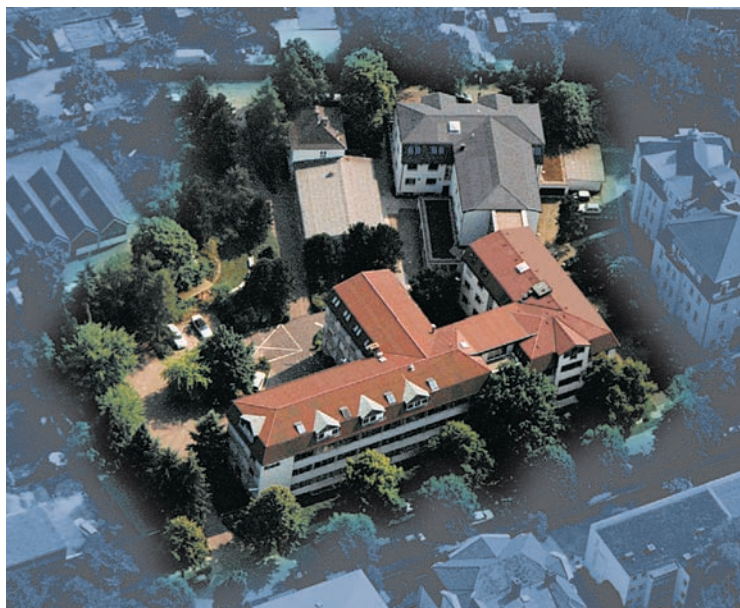




Knick >

The Company

For over 50 years, the name Knick has been a by-word for exceptional quality in the manufacture of electronic measuring devices. Back in 1945 the company's founder, engineer Ulrich Knick, started manufacturing high-precision zero-point-stabilized DC amplifiers, laying the foundation for the modules product range. These amplifiers also enabled the production of reliable and precise pH meters. Today Knick develops and sells a broad range of devices for industrial analog signal processing. About 50 % of the business volume is generated with analog interface products. The other half applies to the field of liquid analysis, where Knick's high-quality measuring systems have become established in industry and laboratory.



Innovative by Tradition

Today, company policy still focuses on a high technical level and a highly innovative orientation. Every fourth employee works in Research and Development. A large number of patents and licensing agreements are the result. Great emphasis is placed on Functional Safety, EMC, and explosion protection, where the firm has made a name for itself with its high level of expertise.

The strategy of achieving business success through the provision of optimal technical solutions for demanding applications has proved successful and still promises stability and independence along with solid economic growth. The company's economic independence permits long-term work of the Development department focusing on innovation and sustainability – a necessary requirement for today's complex products and systems but still not met by everyone. As a result, Knick can provide products that reliably solve the arising tasks and problems and are a safe and long-lasting investment.



The Whole Range of Perfection

– Signals Over Long Distances

If the measurement signal has a long path, for example, to reach the control room, potential differences can occur between the point of measurement and the control equipment causing considerable measurement errors. The electrical isolation completely eliminates the effects of these potential differences thus rectifying measurement errors. Isolation amplifiers and transmitters from Knick always provide 3-port isolation so that a signal disturbance is prevented in any case.

– Signal Adaptation

One common task is the conversion of almost any measurement signals to standard signals. The VariTrans® series from Knick features universal and standard-signal isolators with excellent characteristics in this area.

– High Voltages in the Measuring Environment

If the signal being measured is in a high-voltage area (for example, power supplies for production facilities, buildings, railway facilities), it needs to be kept away from the control technology, that is, it must be sufficiently isolated. Standard products of the VariTrans® series have excellent characteristics for these applications: They are designed for working voltages up to 1000 V AC/DC. The products of the P 40000 are even suitable for working voltages up to 3600 V AC/DC. The routine tests are performed with 15 kV AC. When measuring low signals at high potentials, a high common mode rejection (CMRR) must be ensured since otherwise common mode voltages can cause serious measurement errors. The P 41100 achieves a CMRR of 150 dB (DC/AC 50 Hz).

– Signal Amplification

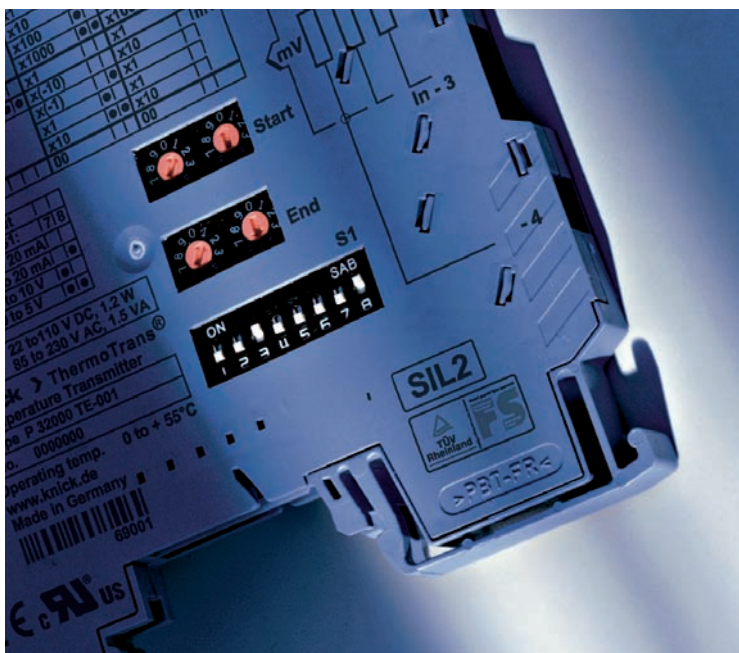
If the power output of the signal source is not sufficient, active Knick isolators amplify the signals without distorting it due to interfering errors. The current outputs of Knick products regularly supply 10 or 12 V, i.e. 500 or 600 ohms load at 20 mA. If that is not sufficient, the model A 20300 can be used to increase the maximum load to 1000 ohms (20 V) at 20 mA.

– Explosive Mixtures

Suitable hazardous area separation is required to connect measurement and control signals between a hazardous area and the control equipment. For these applications, the Knick range features devices which at the same time provide galvanic isolation to prevent measurement errors: 36A7, 37A7, WG 20. Repeater power supplies are available for the supply of 2-wire transmitters in hazardous areas: WG 20/21/25.

– Functional Safety (SIL)

When developing new products, Knick takes account of their use in safety-related applications, i.e. they are to provide functional safety according to EN 61508. The PolyTrans®, ThermoTrans®, and SensoTrans® P 32000 transmitters are certified to SIL 2 by the TÜV Rheinland, up to SIL 3 can be achieved by redundant configuration.





– Operability

Most of the Knick devices can be configured by the user. This is done by using DIP switches which permit a calibrated switching of the input and output signals. The new transmitters in the 6-mm class – PolyTrans® / ThermoTrans® / SensoTrans® – provide rotary switches for direct selection of range limits. In addition, they can be equipped with an infrared port which allows flexible configuration using the Paraly® SW 111 software. Error messages are shown in plain text. The transmitter settings can be stored for documentation and later use.

– Flexibility

If versatile applications are to be covered by few product variants, the VariTrans® P 27000 universal isolation amplifiers provide for isolation and conversion of almost any input voltages and currents to selectable standard output signals. The series P 32000 transmitters offer similar versatility when it comes to converting signals from temperature sensors, strain gages, or resistance transducers. A broad-range power supply is available to ensure operation at DC or AC supplies everywhere in the world.

– Universal Power Supply

We have a solution for all supply voltages: the VariPower® broad-range power supply operates with 24 V DC as well as with 230 V AC. This technique as proved successful a hundred thousand times in the 12-mm VariTrans® series. The new PolyTrans®, ThermoTrans®, and

SensoTrans® transmitters even include the broad-range power supply in their slim 6-mm housing.

– Space Requirement

If space is limited, the Knick isolators and transmitters of the 6-mm class provide an enormous space advantage without losing out on performance. Due to the minimal heat generation, the isolators can be placed next to each other without “ventilation gaps”. Depending on the application more than 300 channels are possible per meter of mounting rail (20X00 series).

– Fast Assembly

DIN rail bus connectors from Knick allow the supply of devices in 8-pole 6-mm housings through crosslink elements inserted in the mounting rail, e. g. for the A 32000 transmitter series. This makes a correct and fast assembly particularly easy. The IsoPower® A 20900 power supply module can also be plugged on to supply the devices mounted in parallel through the DIN rail bus connectors.

– Loop-Powered Isolation

Impressed current signals – such as common 0/4 ... 20 mA signals – can be electrically isolated by passive modules. An important advantage for the user: There is no need for a power supply. The IsoTrans® 41, A 47, and A 20400 have excellent transmission properties and very low power requirement. Their design principle allowed the implementation of highly reliable isolation transformers with a manageable number of components. In many

cases this is an economical and technically optimal solution. Even undesired feedback from output to input can be prevented by the Bürdenstop® (load stop) function in many applications (IsoTrans® A 20411 and A 20412).

– Signal Multipliers

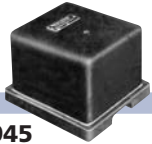
The measurement signal from a field device needs to be sent to an indicator and a data logger on site and to the control room. However, the output power provided (max. load) is not sufficient for both consumers. For these cases Knick supplies signal multipliers in modular housings (A 20300) and on Eurocards (EK 30/31).

– Installation without Enclosure

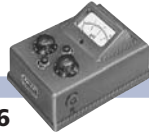
The isolators of the new M12 field housing series for installation without enclosures provide IP68 protection. Vacuum encapsulation protects the electronics reliably against extreme ambient conditions. The DuraTrans® M12 and IsoTrans® M12 isolate and convert standard signals. They are connected via broadly used M12 circular connectors, for which preassembled cables are available.

The Company

Chronology of Innovations



1945
First zero-point-stabilized modulated DC amplifier



1956
First laboratory pH meter with zero-point-stabilized Knick amplifier



1958
First zero point stabilized chopperless pH amplifier



1960
First transistorized chopper amplifier for measuring and control engineering



1964
First Knick amplifier for hazardous-area applications



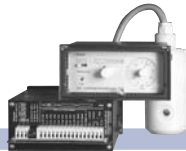
1964
First DC transformer for passive isolation in measuring and control engineering



1979
First microprocessor-controlled laboratory pH meter with automatic electrode calibration



1979
First industrial pH meter with digital display for on-site mounting in hazardous locations with a Zone-0 input



1980
First electrodeless conductivity measuring system for hazardous area applications with PTB-tested sensor



1980
First loop-powered digital indicator for mounting within hazardous locations



1980
First loop-powered DC transformer for mounting within hazardous locations



1985
First retractable probe controller for fully automated pH measurement



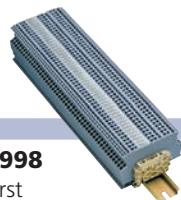
1995
First process analyzer for simultaneous measurement of pH and conductivity in hazardous areas



1996
First portable meter for hazardous area applications with IP 66 protection



1997
First process analyzer with 20 ... 253 V AC/DC broad-range power supply



1998
First terminal with electrical isolation



1999
First isolation amplifier in 12.5 mm modular housing with 20 ... 253 V AC/DC broad-range power supply and calibrated range selection



2000
First product line for liquid analysis with PROFIBUS® PA interface and "Profile for Process Control Devices"



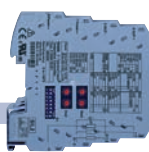
2004
First IP68 isolation amplifier in M12 field housing



2005
First high-voltage isolator with broad-range power supply and 15 kV test voltage



2005
Ceramat® WA 160 – First remote-calibration immersion probe



2006
First universal transmitter for temperature, resistance, strain gages in 6-mm housing with SIL approval



2006
First open standard of a contactless plug-in connection for intelligent electrochemical sensors



2006
First O-ring sealed sensor lock-gate with long service life and easy on-site maintenance

Knick >



1965
First zero-point-stabilized industrial pH transmitters for hazardous area applications



1967
First portable pH meter for hazardous-area applications (5000 operating hours without battery replacement)



1969
First compact digital pH meter



1972
First DC isolation amplifier from Knick for active isolation in measuring and control engineering.



1973
First portable pH meter with digital display and automatic sensor control (2500 measurements without battery replacement)



1976
First industrial pH transmitter for applications in the highest danger area Zone 0



1986
First system-capable DC calibrators in the DM 2000 price range



1988
Laboratory conductivity meter with 4-electrode sensor and a new circuit principle that for the first time enables measurements in the 1 µS/cm ... 1000 mS/cm range with a single sensor



1991
First loop-powered digital indicator with EMC to NAMUR



1992
First laboratory pH meter with complete self-monitoring including electrode and EMC according to NAMUR



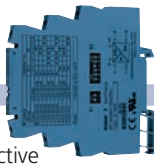
1992
First analyzer line with EMC and user interface to NAMUR



1995
First portable pH meter with data logger and PC interface



2001
First modular process analyzer in hygienic stainless steel enclosure



2002
First active isolation amplifier with 3-port isolation in 6 mm housing



2002
First portable meter for measuring dissolved oxygen with flow-free sensors



2003
First remote-calibration probe with maintenance-free ceramic sealing



2003
First measuring system for fully automated pH measurement in hygienic locations



2003
First repeater power supply in 6 mm housing



2006
First portable analyzer with water-tight, hygienic stainless steel enclosure

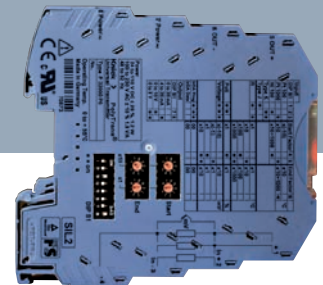


2006
First system for wireless signal transmission for pH, conductivity, and oxygen sensors

PROFIBUS® is a registered trademark of the PROFIBUS Nutzerorganisation e. V. (PNO)



Electrical isolation in industrial measuring technology

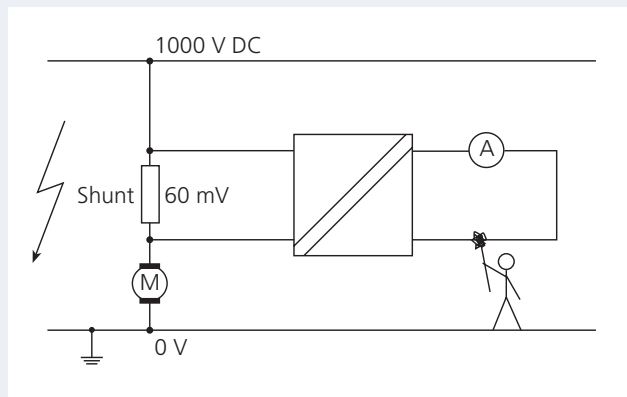


Introduction

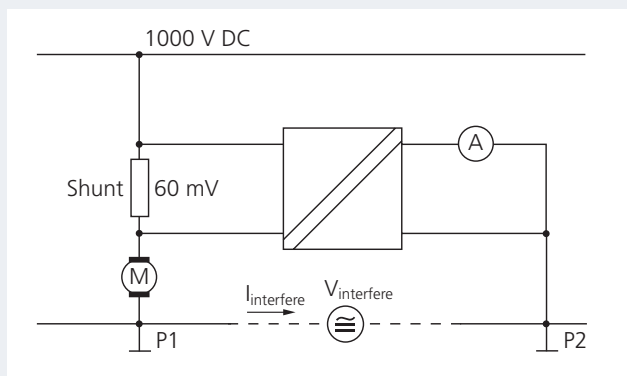
In industrial plants, the transmission of measuring and control signals almost always requires electrical isolation of the signals being processed both for safety reasons and in order to achieve optimum signal quality (see Fig. 1).

Measurements at dangerously high voltages or in areas where there is an explosion hazard, different ground potentials (see Fig. 2) for example, in plant sections located a long way apart, as well as high common-mode voltages do not allow direct connection of the measuring signals with other devices or assemblies. In this case, it is absolutely essential to electrically isolate the transmitted signals.

Knick offers suitable components for electrical isolation in various designs to meet these requirements. Our range includes modular housings, M12 field housings with IP68 protection, solder-in modules, and Eurocards. Depending on the model, the appropriate measuring signals are also amplified or converted to the standard values 10 V or 20 mA. Voltages of a few mV up to 3000 V and currents of a few μA up to 10 A can be



■ Fig. 1: Isolation of dangerous high voltages



■ Fig. 2: Avoiding interference caused by differences in potential

transmitted or converted with a high level of accuracy.

to facilitate assessment and selection of suitable equipment.

On the following pages the most important technical terms used in specifications and product descriptions will be explained

Electrical Isolation



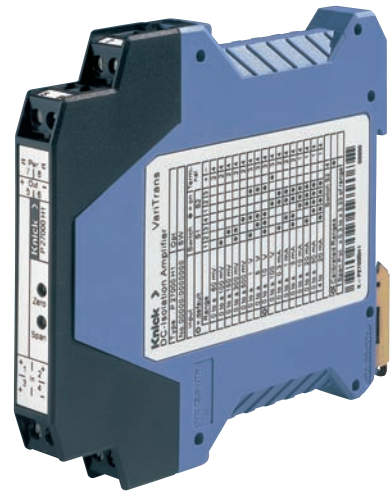
1. Isolators With / Without Power Supply

Principle of Operation:

It is obvious that transformers are the ideal components for transmission and electrical isolation of alternating quantities. Transformers are reliable, easy to produce and suitable for high working or isolation voltages. However, they cannot transmit direct voltage signals. The direct voltage signal is therefore first converted into an alternating voltage using an electronic chopper. This AC voltage is transmitted to the secondary circuit by a

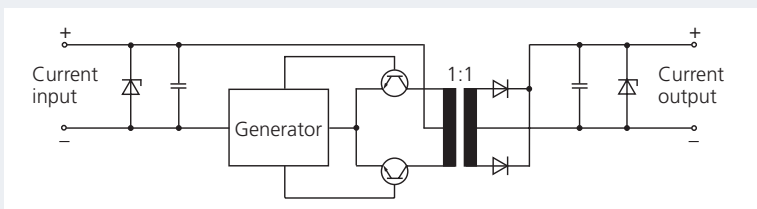
transformer, where it is rectified in sync with the chopper frequency (see Fig. 3). The resulting DC voltage is then converted or amplified if necessary.

Another principle of signal processing is used in the modern, switchable isolation amplifiers from the VariTrans® series. The input signal is converted into a rectangular signal with a constant frequency. The duty cycle of the rectangular voltage is changed depending on the input voltages (pulse width modulation, PWM). The pulse width

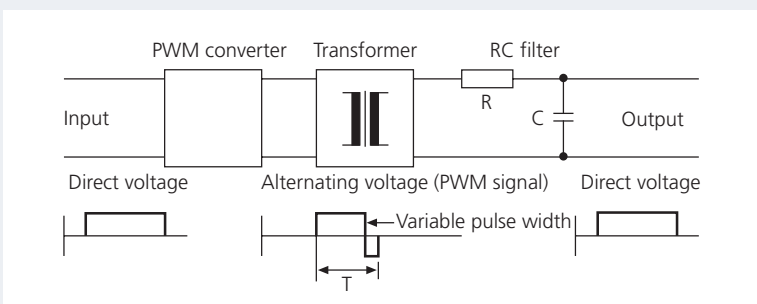


modulated rectangular signal is transmitted to the output side electrically isolated by means of a transformer. There it is recon-verted into a voltage or current using a low-pass filter (see Fig. 4).

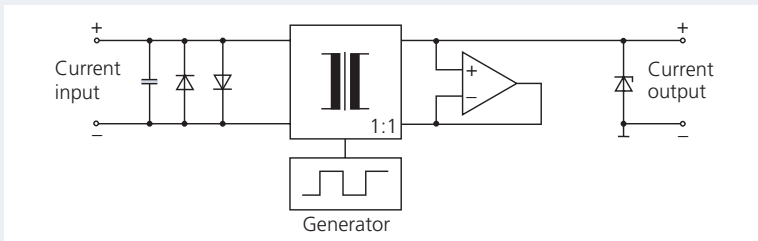
The transmission ratio of the isolation amplifier or transmitter is controlled by a microcontroller. The settings are made using DIP and rotary coding switches. Since these switches are not incorporated in the negative feedback of amplifier circuits, but instead only switch digital signals, they do not carry currents and cannot cause any contact resistance faults.



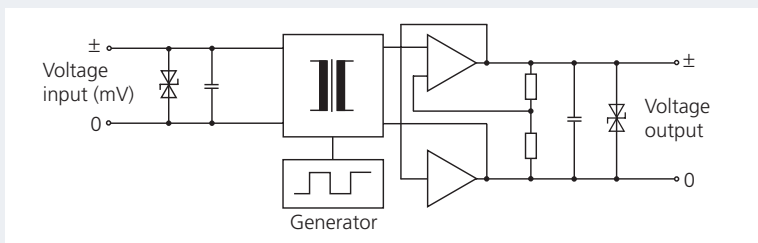
■ Fig. 3: Schematic diagram of an isolator with transformer isolation



■ Fig. 4: PWM principle: Pulse width modulation



■ Fig. 5: Schematic diagram of an active unipolar isolation amplifier



■ Fig. 6: Schematic diagram of an active bipolar isolation amplifier

1.1 Isolation Amplifiers with External Power Supply (Active Isolators)

Isolation amplifiers are the best known type of devices for galvanic isolation of measuring signals. Often they are not only used as electrical isolators but also as transmitters for signal conversion of voltages or currents into standardized 20 mA or 10 V signals. When measurement signals are transmitted 1:1, they are also used to increase the signal load capacity. The loading of the input signal by the isolation amplifier is generally negligible. Isolation amplifiers generally require an external power supply. Typical examples are the switchable VariTrans® P 27000 and P 15000 isolation amplifiers.

Isolation Amplifiers for Unipolar Signal Processing

Isolation amplifiers that are only suitable for transmitting unipolar

measuring signals can be used for many applications, for example, for processing standard 0/4 ... 20 mA and 0 ... 10 V signals. For the exact transmission even in the vicinity of zero, however, the control range of the Knick unipolar isolation amplifiers extends a few percent into the negative range (see Fig. 5).

Isolation Amplifiers for Bipolar Signal Processing

Bipolar measurement signals frequently need to be processed when, for example, motor currents are to be measured in both directions of rotation. Bipolar signals are also processed when distances are measured or for better resolution of measurement signals. Knick also supplies different types of bipolar isolation amplifiers, for example, the VariTrans® A 26000 for bipolar standard signals (see Fig. 6).

1.2 Loop-Powered Isolators (Passive Isolators)

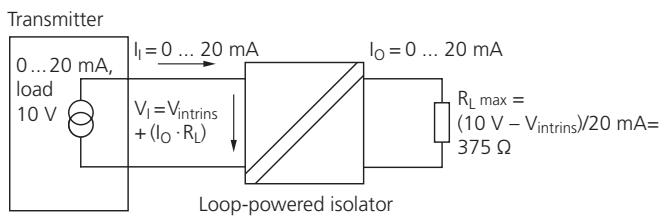
Electrical isolation of impressed current signals does not necessarily require active isolation amplifiers. Loop-powered isolators can often also be used without limitations.

The passive isolators from Knick do not need a power supply, the power is provided from the measurement signal at the input terminals as a voltage drop. The load capability of the input signal is reduced by the voltage requirement of the passive isolator.

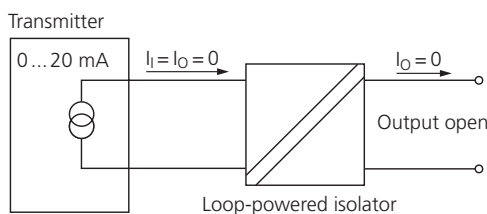
Passive isolators are suitable for 1:1 transmission of unipolar current signals. The suitability for the respective application should be checked taking the load capability of the input signal and output load into consideration.

Example:

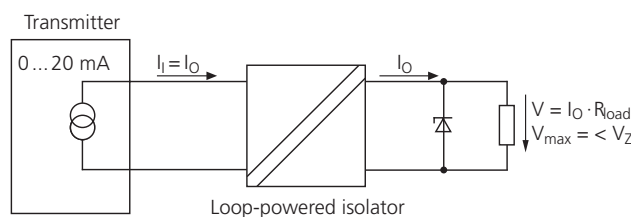
A transmitter with 0 ... 20 mA signal at the input of a loop-powered isolator can be loaded with maximally 10 V ($I_{IN} = 0 \dots 20 \text{ mA}$, $V_{INmax} = 10 \text{ V}$). The voltage drop V_{DROP} of the loop-powered isolator is specified as 2.5 V. After $V_{IN} = V_{DROP} + (I_{OUT} \cdot R_L)$ the maximum output load is $R_{Lmax} = (V_{INmax} - V_{DROP}) / 20 \text{ mA} = 375 \text{ ohms}$ (see Fig. 7).



■ Fig. 7: Circuit diagram for example 1



■ Fig. 8: Loop-powered isolator with open output



■ Fig. 9: Transmission of a measured signal over large distances

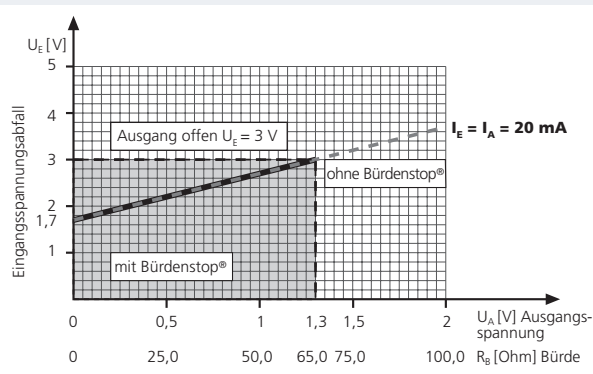
Loop-powered isolators do not allow signal amplification and are not reactionless, i. e. the output load acts directly on the input signal. As a result, a current cannot flow in the input circuit when the output is open (endless resistance) (see Fig. 8).

If temporary interruption of the output circuit could not be ruled out, a possible remedy was to connect a suitable Zener diode in parallel with the isolator output. When the output circuit is open, the input current then flows via the Zener diode in the output (see Fig. 9). In practice, this method often turned out to be complicated and too error-prone.

Knick's Bürdenstop® (load stop) function solves that problem and thus considerably extends the application possibilities for loop-

powered isolators. Here, the current supplied at the primary side is maintained independently from the output load. Any excessive load increase at the output, such as caused by line breakage or inconstant loads including complex impedances, can be compensated for. The IsoTrans® M12-A200 and IsoTrans® A 20400 passive isolators are available with or without Bürdenstop® function. When the output load (e.g. input resistance of the controller) is up to 60 Ω, a passive isolator with Bürdenstop® is the best solution (see Fig. 10).

The operating current required for the Knick passive isolators is very low. It is approx. 2 μA to 100 μA depending on the model without appearing as an additional transmission error. Passive isolators turn out to be particularly advantageous due to the simple installation without additional supply lines. Loop-powered isolators are available in all housing versions.



■ Fig. 10: Transfer function with Bürdenstop®

2. Transmitters



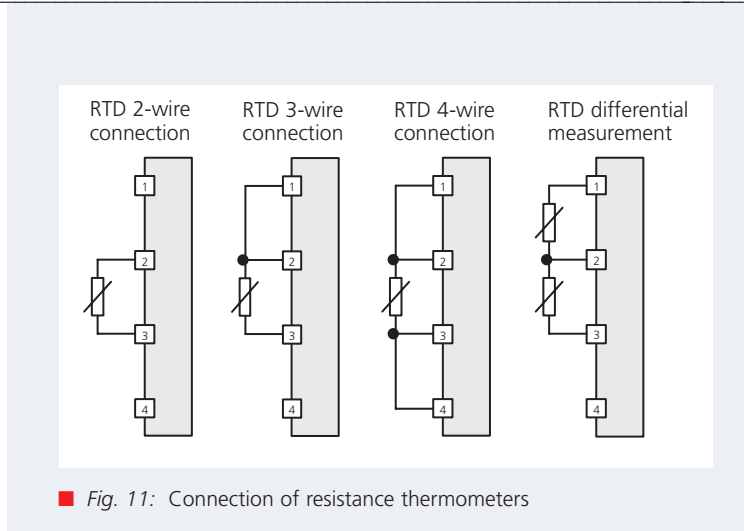
Transmitters measure the signals of sensors for physical quantities such as temperature, path, angle, pressure, or force. They perform a galvanic isolation and convert the signals into standardized analog output signals: 0 ... 20 mA, 4 ... 20 mA, or 0 ... 10 V. These standard signals can be transmitted to indicators, recorders and/or standardized controllers such as DCS and can be used for control applications.

2.1 Temperature Measurement with Resistance Thermometers and Thermocouples

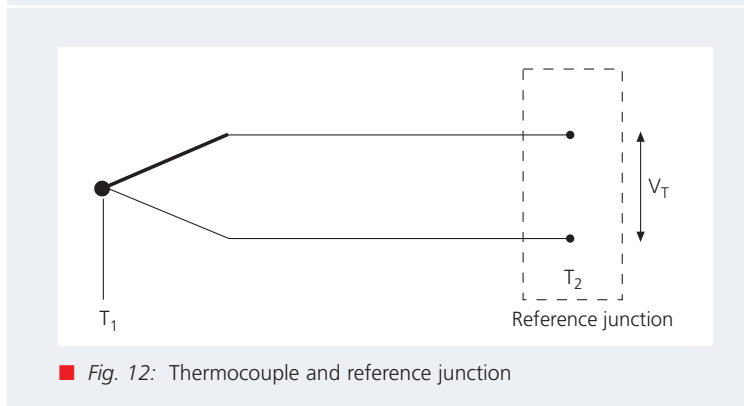
In many fields of industry temperature is an important controlled variable. Here, the most important sensors are resistance thermometers and thermocouples.

Resistance thermometers are highly accurate temperature sensors with long-term stability. They measure temperatures by using the temperature dependence of the electric resistor. Resistance thermometers are mainly used to measure low and medium temperatures, for example, in air-conditioning, process engineering, and the food industry.

The most common resistance thermometers are Pt100, Pt1000, and Ni100. The first part of the designation represents the resistor material, the second part specifies the resistance in ohms



■ Fig. 11: Connection of resistance thermometers



■ Fig. 12: Thermocouple and reference junction

at 0 °C. Thus, for example, Pt100 designates a resistance thermometer made of platinum and having a resistance of 100 ohms at 0 °C.

The ThermoTrans® 205/206, A 20210, and P 32100 as well as the PolyTrans® P 32000 transmitters allow connection of all common resistance thermometers either with 2-, 3-, or 4-wire connection (see Fig. 11).

Thermocouples

Thermocouples make use of the effect named after T. J. Seebeck that a junction of two dissimilar metals produces an electric voltage which is influenced by the difference between the temperature at the reference junction and the temperature of the point of measurement (see Fig. 12). When the thermoelectric voltage V_T is measured using a suitable transmitter and when the temperature at the reference junction is known, the temperature at the point of measurement can be



determined from the characteristic of the thermocouple used. This calculation is usually performed in the temperature transmitter.

The temperature at the reference junction can be measured or adjusted by thermostating. In practice, a measurement is either taken "internally", then the reference junction is within the temperature transmitter, or "externally", then reference junction and temperature sensor of the junction, e. g. a Pt100, are outside the transmitter.

The voltage caused by the thermoelectric effect is very low – just a few microvolts per Kelvin. To obtain an interference-proof measurement signal, thermocouples are preferably used for high temperatures, for example, for measurements in ovens, smelting plants, and plastic machines. A great number of metal pairs was tested for the production of practical thermocouples. Subsequent standardization resulted in a manageable range of standardized thermocouples with defined material pairs. They cover the majority of all industrial temperature measurement applications. The characteristics including permissible tolerances of thermocouples are defined internationally in the IEC 584-1 standard and in DIN 43710 which is not valid any more and is to be applied only to old plants.

IEC 584-1, EN 60584-1

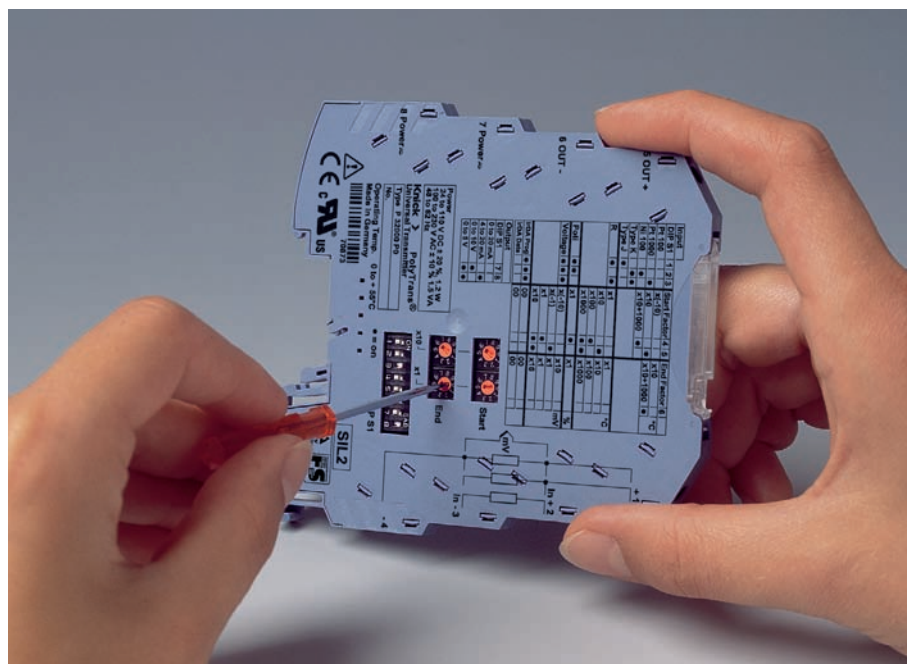
- Type J Iron/Constantan (Fe/CuNi)
- Type T Copper/Constantan (Cu/CuNi)
- Type K Nickel Chromium/Nickel (NiCr/Ni)
- Type E Nickel Chromium/Constantan (NiCr/CuNi)
- Type N Nicrosil/Nisil (NiCrSi/NiSi)
- Type S Platinum Rhodium/Platinum (Pt10Rh/Pt)
- Type R Platinum Rhodium/Platinum (Pt13Rh/Pt)
- Type B Platinum Rhodium/Platinum (Pt30Rh/Pt6Rh)

DIN 43710 (not valid any more)

- Type L Iron/Constantan (Fe/CuNi)
- Type U (Cu/CuNi)

High-temperature thermocouples such as W3Re/W25Re (tungsten 3% rhenium/tungsten 25% rhenium) or W5Re/W26Re (tungsten 5% rhenium/tungsten 26% rhenium) have not yet found their way into a standard. Their characteristics are specified in ASTM E 988-96.

The Knick ThermoTrans® 210/211, P 32100, and PolyTrans® P 32000 transmitters can process the signals of all common thermocouples.

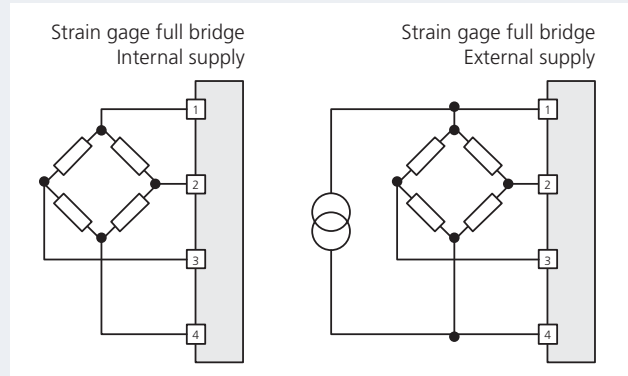


2.2 Force Measurements with Strain Gages

Force, weight, torque, mechanical tension, and the resulting parameters can be measured by using strain gages. These make use of the effect that a change in length of a conductor due to strain results in a proportional change in its electric resistance. In a strain gage transmitter this resistance change is detected as a measure for the strain, force, etc. and then is converted to a standard signal for display and further processing.

In practical industry applications the filling weight of a container, for example, is measured by load cells (force sensors, force transducers) which usually have integrated strain gage full bridges. The bridge sensitivity is specified as signal level at the bridge output in millivolts related to the excitation voltage in volts, i.e. for example 2 mV/V. When the sensitivity is known, e.g. from the calibration certificate of the sensor manufacturer, it is adjusted at the transmitter. If only the nominal sensitivity is known, the actual sensitivity can be determined by calibration with a defined mechanical load. Correspondingly, the zero point can be adjusted at the transmitter by using a tare function.

The strain gage bridge can be connected in 4-wire configuration (see Fig. 13). If the error caused by the current-carrying excitation lines is to be reduced, a 6-wire configuration is used.



■ Fig. 13: Supply of strain gages

Here, the bridge excitation voltage is measured through separate lines, virtually currentless and therefore fault-free.

In practice, also sensors that are equipped with 6 lines are operated at 4-wire transmitters by combining 2 excitation lines each. Alternatively, an external supply may be used to take advantage of the 6-wire connection (see Fig. 13).

The Knick SensoTrans® DMS A 20220 and P 32200 as well as the PolyTrans® P 32000 transmitters have been designed for customary strain gage sensors in a full-bridge arrangement. Sensitivity and zero point of calibrated sensors can be adjusted on the device by using rotary switches or the Paraly® SW 111 parameter setting software. A tare function to set the zero point can be activated by a pushbutton on the device or the software. Correspondingly, the sensor sensitivity can be calibrated at a defined load "at the push of a button".

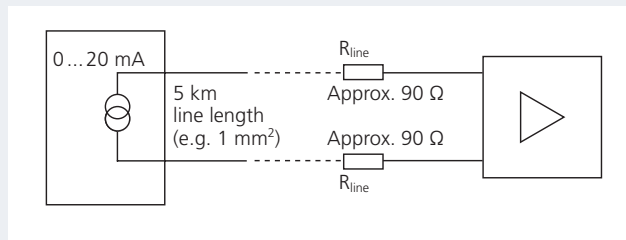
2.3 Path and Angle Measurements with Potentiometers

Among others, potentiometric sensors are used to detect linear or rotary movements. Potentiometric path or angle sensors contain resistance elements made of conductive plastic material or wire-wound resistance elements with movable sliding contacts. Potentiometer transmitters determine the resistance ratio produced by the sliding contact so that its position can be detected and output as standard signal.

Resistance transducers are used for setpoint specification in rail vehicles, on ships, during industrial production, and in many areas of machine and apparatus engineering. Resistive sensors are used for detecting the actual value of actuators, for measuring distances or thickness, and for various position measurement tasks. The Knick SensoTrans® R A 20230 and P 32300 as well as PolyTrans® P 32000 transmitters detect potentiometers up to 50 kohms in 3- or 4-wire configuration. The range of the movement to be mapped on the range of the output signal can easily be adjusted by using a button on the device or the Paraly® SW 111 software.

3. Transmission Properties

The properties required for signal transmission are determined by different factors. In addition to the requirements regarding accuracy and speed of the signal transmission, the input data of the following devices, the properties of the signal being transmitted and the ambient conditions also need to be taken into account.



■ Fig. 14: Transmission of a measured signal over large distances

3.1 Current or Voltage Transmission

The initial criteria for selecting an isolation amplifier or a transmitter are the input signal to be processed and the output signal required. The output signal is generally determined by the following devices such as controllers, indicators, DCS, PCS etc., whereby many of these devices have either current or voltage inputs.

If both possibilities are available, current signals should be preferred particularly for longer transmission paths (see Fig. 14). Impressed current signals are considerably less sensitive to interference than voltage signals.

3.2 Input Resistance

The input resistances of modern isolation amplifiers are generally dimensioned in a way that they are sufficiently high for voltage inputs and sufficiently low for current inputs so that the signal being processed is practically not loaded. Only in a few cases (very low voltage signals with a high source resistance or low-load capability current signals) would the input resistance be a selection criterion for isolation amplifiers.

The input resistance of the VariTrans® P 41000 isolation amplifiers specially developed for shunt applications is, at approx. 100 kΩ, relatively low compared with other isolation amplifiers. However, for shunt applications with resistances in the mΩ range, the resistance is still several times to the power of ten higher than required.



3.2.1 Input Voltage Drop

In various isolation amplifiers with a current input and in loop-powered isolators, the load on the input signal is specified as a voltage drop and not as an input resistance. This voltage drop is constant during normal operation and is max. 500 mV in isolation amplifiers depending on the model.

In passive isolators, there is a voltage drop at the input resulting from the voltage requirement of the device plus the load voltage at the output. Before passive isolators are used, the load capability of the measurement signal and the load connected to the isolator output should be known. An exception are the passive isolators from Knick with Bürdenstop® (load stop) function: The current supplied at the primary side is maintained independent of the output load.

3.3 Output Load Capability

The load capability of voltage outputs is generally indicated by the maximum current. Almost all manufacturers specify a resistance value for the load capability at current outputs. This specification does not indicate the load capability of the output currents of Knick isolation amplifiers absolutely correctly. Therefore the output load capability is "traditionally" given as a voltage value.

A 20 mA current output with a load capability of 10 V can be loaded, for example, with 2 k Ω at 5 mA or 1 k Ω at 10 mA. The specification of a maximum permissible load voltage of 10 V therefore applies to every current value, whereas 500 Ω would apply exclusively to 20 mA.

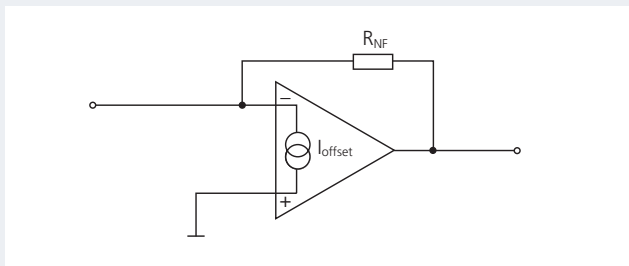
3.4 Transmission Accuracy

Many Knick isolation amplifiers stand out by extraordinarily low transmission errors so that the accuracy requirements of virtually all industrial measurement tasks are exceeded. The long-term stability of Knick signal isolators ensures maximum transmission accuracy even past the 5-year warranty granted for Knick isolation amplifiers and transmitters.

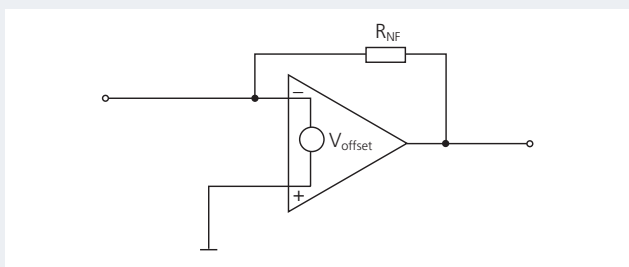
3.4.1 Quality of Measurement Signals

Best possible transmission of the input signal is required not only for applications in measurement engineering. Signal distortions due to change in polarity, overshoots in the case of signal changes, extreme angles in squarewave transmission are the rule in many isolation amplifiers available on the market. These undesirable properties are not immediately visible to the user. They often do not become noticeable until inexplicable errors occur during operation. In the cyclical, digital scanning of measured values, signal distortions, for example, due to overshooting, can cause serious measurement errors. For this reason, Knick traditionally places great emphasis on the accurate transmission of signals in the development of its isolation amplifiers.





■ Fig. 15: Offset voltage



■ Fig. 16: Offset current

3.4.2 Residual Ripple

The output signal of isolation amplifiers and transmitters is principally superimposed by low interference voltages. These interference voltages are caused, for example, by the chopper frequency as well as by mains feed-over. The amplitude of this interference voltage, referred to as residual ripple, should be as low as possible because otherwise measurement errors cannot be ruled out – especially with low modulation.

3.5 Temperature Coefficient (Gain Droop)

The temperature coefficient or gain droop is a specification for changes in gain caused by

temperature changes. Droop rates are specified as a relative parameter in %/K or as an absolute value in nA/K or $\mu\text{A/K}$, for example. In absolute value specifications, you need to check whether the TC refers to the input or the output.

Examples:

- The temperature coefficient at the output of an isolation amplifier is max. 10 nA/K. A change in temperature of 20 K causes a change in the output current of $20 \cdot 10 \text{ nA} = 200 \text{ nA}$.
- The TC of a transmitter is 0.0025 %/K. A temperature change of 20 K causes a gain change of $20 \cdot 0.0025 \% = 0.05 \%$.

3.6 Offset Voltage, Offset Current

In real amplifiers, the output variable is not exactly zero even when the input signal is zero. The input offset voltage of an amplifier is by definition the voltage that needs to be applied to the input in order for the output variable to become zero. It therefore acts as an input voltage or an additional voltage acting in series with the input signal (see Fig. 15).

The input offset current of an amplifier also acts as an additional input signal (see Fig. 16). In amplifiers with a voltage input, the offset current causes a voltage drop at the internal resistor of a signal voltage source that is added to the input signal. The offset voltage and offset current are so low in Knick isolation amplifiers that they are negligible for normal applications. Offset influences should only be considered for very special applications such as the 1:1 transmission of very small measurement signals or the transmission or amplification of very high-resistance signals. The polarity of offset parameters depends on the device and therefore is given as an absolute value without plus or minus sign.

Knick >

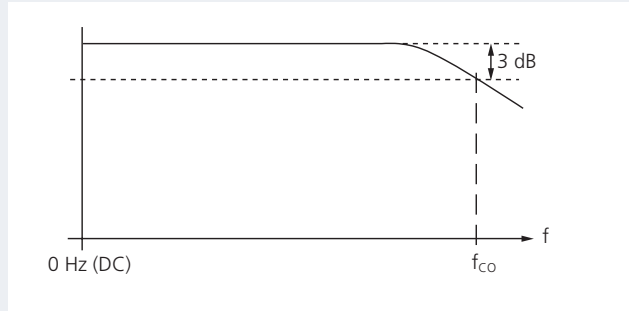




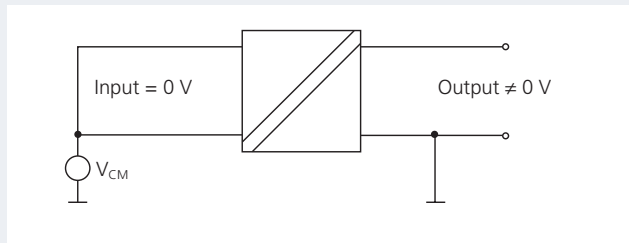
3.7 Cutoff Frequency

Isolation amplifiers and transmitters are principally designed for the transmission or amplification of direct voltage signals. In order to be able to transmit fast changes in the measured value almost without delay, Knick devices can also transmit alternating quantities to a certain extent. The upper cutoff frequency is up to approx. 12 kHz for sinusoidal signals depending on the model.

As an upper limit frequency, as is common in electronics and telecommunications, the frequency is defined at which the gain is attenuated by 3 dB compared to the DC gain, i. e. it corresponds to approx. 71 % DC gain (see Fig. 17).



■ Fig. 17: Frequency response of an isolation amplifier



■ Fig. 18: Common-mode modulation

3.8 Common-Mode Behavior

If the same voltage V_{cm} is applied to ground at both inputs of a symmetrical amplifier, the input voltage remains $V_{in} = 0$. This operating mode is called common-mode modulation. In an ideally symmetrical amplifier, the output voltage V_{out} would also remain at 0. However, this is not the case in real amplifiers, i. e. a voltage deviating from 0 will appear at the output (see Fig. 18).

A common-mode modulation always exists when the signal voltage is not at ground potential, i.e. when there is a potential difference between the (two)

input lines and the ground, for example, when measuring voltages across a shunt lying at a high potential against ground. Common-mode voltages can also occur as common-mode interferences, for example, during switching processes, due to stray pickup in the signal lines or due to compensating currents.

The ratio between an applied common-mode voltage and the resulting output voltage is known as common-mode gain. However, in practice, the deviation from the ideal common-mode behavior of an amplifier, specified as common-mode rejection, is of greater interest. The common-mode

rejection ratio CMRR is defined as the ratio of differential-mode to common-mode gain or as the logarithmic ratio of an applied common-mode voltage V_{cm} to a signal voltage V_d that would produce the same output signal: $CMRR = 20 \cdot \log(V_{cm}/V_d)$ [dB].





Example:

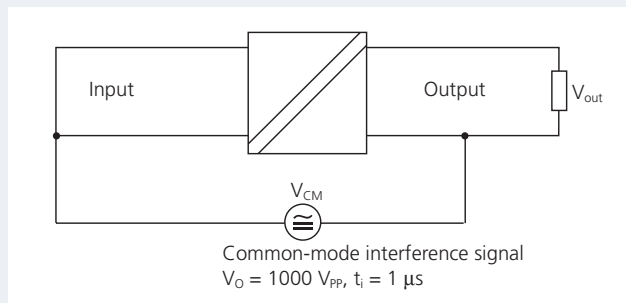
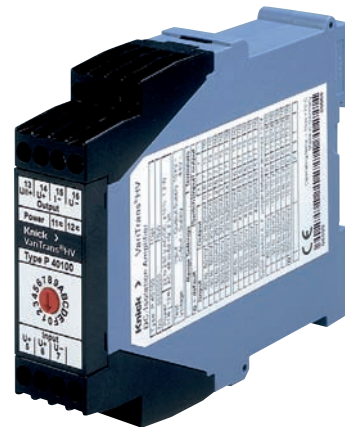
With a common-mode rejection of 120 dB the common-mode modulation of an isolation amplifier with $V_{cm} = 800 \text{ V}$ causes a common-mode error at the input of $V_d = 800 \text{ V}/10^{120/20} = 0.8 \text{ mV}$. In an isolation amplifier with an input sensitivity of 60 mV, this results in a common-mode error of approx. 1.3 % full scale.

For common-mode voltages in the DC and low-frequency AC range (50 Hz), high common-mode rejection is usually easy to achieve. The common-mode error of Knick isolation amplifiers is negligible in this range. However, the common-mode rejection of amplifiers is frequency-dependent and becomes considerably lower as the frequency increases. This is essentially influenced by the coupling capacitance between the primary and secondary coils of the transformer used that cannot be reduced as desired. Therefore the common-mode rejection is considerably lower with pulse-shaped common-mode voltages or fast common-mode voltage changes.

Transient common-mode voltages can be caused both by single or periodic switching processes such as in thyristor-controlled converters. In the VariTrans® P 40000 series isolation amplifiers the TransShield® technology has been implemented to suppress this kind of common-mode pulses.

Compared to conventional designs it enables very compact high-voltage transformers with low leakage.

Thanks to the resulting space advantage, the VariTrans® P 41000 shunt isolators can be installed in an only 22.5 mm wide modular housing. Common-mode interferences such as high transient overvoltages are reliably



■ Fig. 19: Test circuit for measuring the T-CMRR

isolated and cause hardly any measurement errors at the output.

The term T-CMRR (Transient Common Mode Rejection Ratio) is defined for the corresponding data specification. It describes the ratio of differential DC gain to common-mode gain of a transient interference signal with a rise speed of 1000 V/μs (see Fig. 19).

The devices of the VariTrans® P 40000 series are therefore particularly suited for measurements on shunts with which common-mode pulse voltages or rapidly changing common-mode voltages are to be expected. The isolation amplifiers achieve a T-CMR of 115 dB. The common-mode rejection for 50 Hz interferences is 150 dB.

4. Power Supply (Auxiliary Power)

The VariTrans® P 15000, A 26000, and P 27000 universal and standard-signal isolation amplifiers and the P 40000 high-voltage isolators are equipped with the VariPower® broad-range power supply unit. It is designed for supply voltages of 20 ... 253 V AC/DC.

The series P 32000 transmitters can also be equipped with a broad-range power supply. Using this 6-mm broad-range power supply, the transmitters operate at supply voltages from 24 ... 110 V DC and 110 ... 230 V AC.

Another advantage of the broad-range power supply is the insensitivity to mains voltage fluctuations within the specified ranges. All other Knick isolation amplifiers and transmitters in modular housings are offered for a standard supply voltage of 24 V DC.

The ZU 0628 DIN rail bus connectors from Knick present a new concept of power supply for modular-housing devices. They are simply inserted in the 35-mm rail. Combined with the IsoPower® A 20900 power

4.1 Power Requirement

A frequently neglected and often underestimated selection criterion is the power requirement of isolation amplifiers. It is not the additional energy required that is decisive, but the heat generated in the isolation amplifiers with unnecessarily high energy requirement due to the power loss. This disadvantage can have adverse effects especially in the case of high packing densities. The development of heat in isolation amplifiers and transmitters is sometimes so great that these devices cannot be mounted next to each other without spacing. This cancels out the advantages of small dimensions. Another consequence of high temperatures is the reduced service life of the electronic components. A 10 K higher operating temperature in the range between 40 °C and 50 °C theoretically causes the service life to be reduced by 50 % and thus lowers product reliability considerably.



These isolation amplifiers and transmitters are therefore suitable for connection to almost all mains supplies and can be used all over the world. This hugely simplifies storage and spare parts management.

supply or the ZU 0677 power terminal block, they supply power to isolators and transmitters of the 6-mm series and considerably reduce the cabling effort. Existing systems can easily be retrofitted.



Output Isolation Amplifiers

In output isolation amplifiers, the input is at the same potential as the power supply. The output signal can be applied to another possibly dangerously high potential.

3-Port Isolation Amplifiers

In 3-port isolation amplifiers, the input, output, and power supply circuits are galvanically isolated from each other (see Fig. 20).

The input and output circuits can be applied to any potentials taking the permitted working voltages into consideration. As previously mentioned, a distinction does not need to be made between input and output isolation amplifiers when selecting Knick isolation amplifiers as the 3-port isolation is the technical standard in this field.

The power requirement of isolation amplifiers is therefore one selection criterion that should not be ignored. Since the output power of different isolation amplifiers is generally almost identical, the power requirement of different brands can be compared directly.

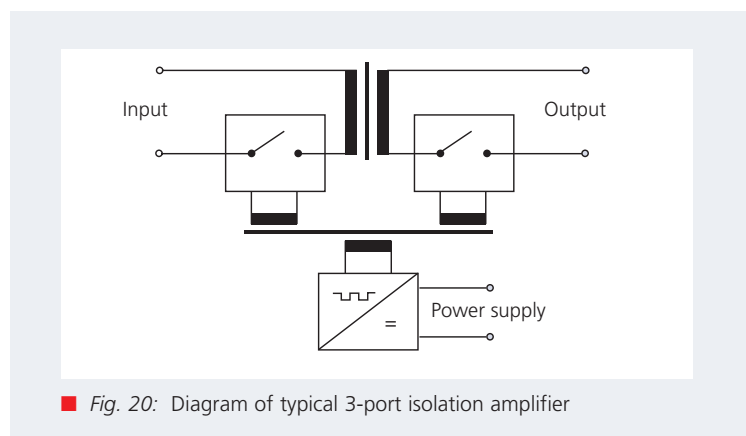
Some manufacturers who do not supply isolation amplifiers with 3-port isolation as standard distinguish between input isolation amplifiers, output isolation amplifiers, and 3-port isolation amplifiers.

Input Isolation Amplifiers

In input isolation amplifiers, the input is isolated from all other circuits, the output is at the power supply potential. Input isolation amplifiers are used to isolate an input signal that is at a possibly disturbing or high potential from the output and power supply circuit.

4.2 Electrical Isolation of the Power Supply Circuit

3-port isolation is the technical standard for all Knick isolation amplifiers and transmitters, i. e. the input, output, and power supply circuit are galvanically isolated from each other. In 3-port isolation amplifiers, the input and output circuits can be applied to any potentials taking the permitted working voltages into consideration. In rare cases, when the output needs to be applied to higher potentials, you should check whether the permitted working voltage (rated isolation voltage) between the output and power supply circuit is sufficiently high.



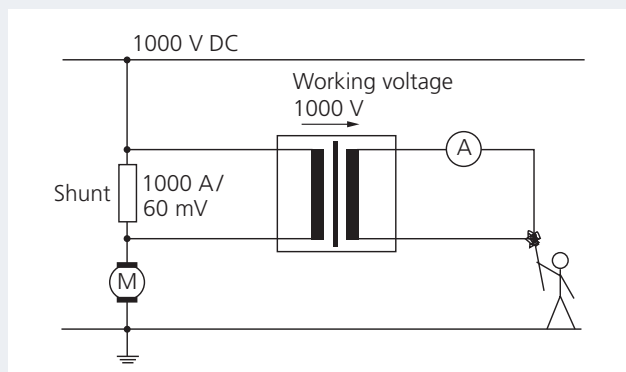
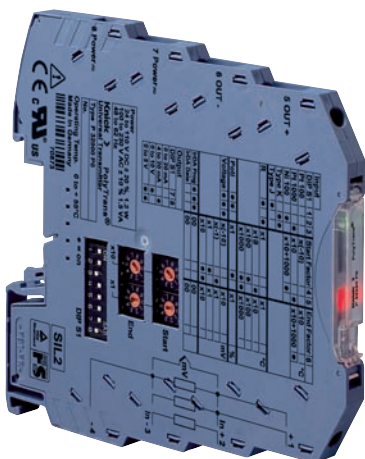
■ Fig. 20: Diagram of typical 3-port isolation amplifier

5. Electrical Safety

5.1 Working Voltage

An important parameter when selecting a suitable isolation amplifier or transmitter is the permitted working voltage. It indicates the permitted potential difference between the different circuits (input, output, and supply circuits) (see Fig. 21).

The permitted working voltage of an isolation amplifier may differ between the different circuits. The highest of the specified working voltages generally applies across the input and output and across the input and power supply. The permitted working voltage across the output and power supply can be lower. The permitted working voltages for Knick isolation amplifiers are up to approx. 3600 V AC/DC depending on the model.



■ Fig. 21: Illustration of the purpose of working voltage

The requirements for the working voltages are defined in EN 61010 Part 1. It should be noted that the permissible working voltage is not only determined by the dielectric strength of the solid insulations used for the isolating components, but also by constructional features such as clearance and creepage distances as well as by external influences, particularly the pollution degree (environment-related, possible contamination) and the overvoltage category (value of superimposed pulse voltages).

Pollution Degrees

Pollution Degree 1

There is no or only dry, non-conductive contamination, for example, in air-conditioned or clean, dry rooms.

Pollution Degree 2

There is only non-conductive contamination. Occasional, temporary conductivity due to condensation can be expected, for example, in laboratories, precision mechanics workshops, test departments, and salesrooms.

Pollution Degree 3

There is conductive contamination or dry, non-conductive contamination that becomes conductive due to expected condensation, for example, in rooms at industrial plants, agricultural plants, unheated warehouse rooms, and boiler rooms.

Pollution Degree 4

The contamination leads to permanent conductivity, for example, due to conductive dust, rain, or snow; in open rooms or outdoors.



Overvoltage Categories

Overvoltage Category I

No occurrence of overvoltage or protection by surge arresters or filters.

Overvoltage Category II

Systems with switching processes, but without lightning strikes, for example, in private households.

Overvoltage Category III

Systems without lightning strikes, connection of the device nearer to the power supply connection than the loads and/or special requirements for safety and availability of the device.

Overvoltage Category IV

Plants with lightning strikes.

5.2 Test Voltage

The dielectric strength of the insulation material used for the isolating components is many times greater than the working voltage permitted for the device. Therefore the test voltage with which each device is tested is specified additionally for isolating devices. This ensures that the specified limit values for the working voltage apply to each device.

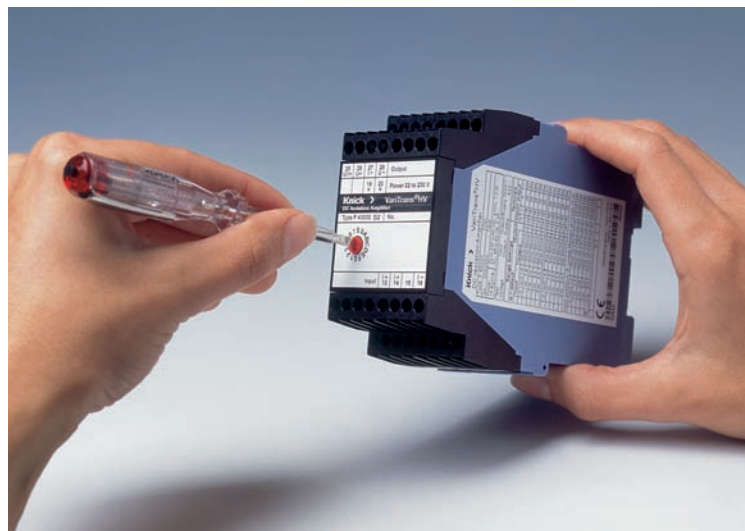
The test voltage is also used occasionally as a parameter for the dielectric strength instead of the working voltage. This then needs to be a certain factor higher than the maximum possible potential difference between the circuits to be isolated according to the directive for the specific application. The test voltage for Knick isolation amplifiers is up to 15 kV AC.

5.3 Safe Isolation

The term "Safe Isolation" is defined in EN 61140. This basic safety standard describes protective measures against electric shocks and thus defines the requirements to be met by electrical isolation between electric circuits. "Safe Isolation" refers to an isolation system which is characterized by basic protection and additional precautions (additional



insulation or protective shielding) or by equivalent insulation (reinforced insulation according to EN 61010-1). It has the aim to protect persons against electric shock. This particularly high level of safety must be ensured by constructive measures such as appropriate clearance and creepage distances as well as by the insulation properties of the internal isolating components. That means that the requirements of the basic safety standard have a direct effect on the isolator design.



The specification "Safe Isolation" always includes the indication of a working voltage up to which the "Safe Isolation" is guaranteed. All new isolation amplifiers and transmitters developed by Knick meet the requirements of EN 61140 regarding "Safe Isolation".

5.4 Approvals

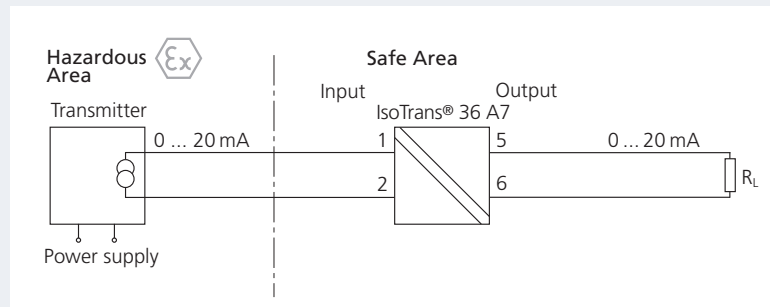
On an international basis, often the US and Canadian UL approvals (Underwriter Laboratories) and CSA (Canadian Standards Association) or their combination CUL are demanded. Many Knick isolation amplifiers have proven in strict approval tests that they fulfil the respective requirements for electrical safety and fire protection.

The GL approval (Germanischer Lloyd) confirms the high load capability of many Knick isolation amplifiers. It permits the use on ships and for offshore applications, for example. The "Kerntechnische Ausschuß" (KTA – Nuclear Safety Standards Commission) in the German Federal Office for Radiation Protection issues nuclear safety standards that are identified by the letters KTA. Knick offers isolation amplifiers with KTA 3503 (3507) approval for application in nuclear power stations.

5.5 Hazardous Area Separation

When electrical equipment (including electrical and electronic measuring devices) is used in potentially explosive atmospheres, it must be sure that these devices cannot ignite any explosive gas-air mixtures even when they malfunction. The possible types of protection include the "intrinsic safety" that ensures that the intrinsically safe circuits in the respective device cannot generate ignitable sparks even in the event of a malfunction.

In practice, an isolated solution with intrinsically safe circuits is hardly ever possible, i. e. coupling with non-intrinsically safe circuits is necessary for signal processing. The direct link would cancel out the intrinsic safety and is therefore not permitted. Knick supplies suitable isolation amplifiers with or without separate power supply for coupling the corresponding circuits and providing both electrical isolation and hazardous area separation between intrinsically safe and non-intrinsically safe circuits (see Fig. 22).



■ Fig. 22: Coupling of intrinsically safe and non-intrinsically safe circuits with the IsoTrans® 36 A7 passive isolator

The devices supplied by Knick with "intrinsic safety" type of protection comply with the 94/9/EC directive. This directive is generally referred to as ATEX.

In Europe equipment for explosion protected areas usually is understood as equipment of Category 1 or 2, that is for Zone 0 or 1. Equipment of Category 3 – for application in Zone 2 – is becoming increasingly important. Zone 2 is a place in which an explosive atmosphere consisting of a mixture of air with dangerous substances in the form of gas, vapor, or mist is not likely to occur in the normal operation and if it does occur, will persist for a short period only. Normal operation means the situation when installations and devices are used within their design parameters. Such installations and devices ensure the required safety level. Zone 2 may include, among others:

- Areas surrounding Zones 0 or 1
 - Areas around flange connections with ordinary flat gaskets in pipes in enclosed spaces.
- The Series P32x00 and A202x0 transmitters are intended for operation in ATEX Zone 2 (EN 60079-15) or Class 1, Div 2 / Zone 2 (UL 1604).

6. Functional Safety

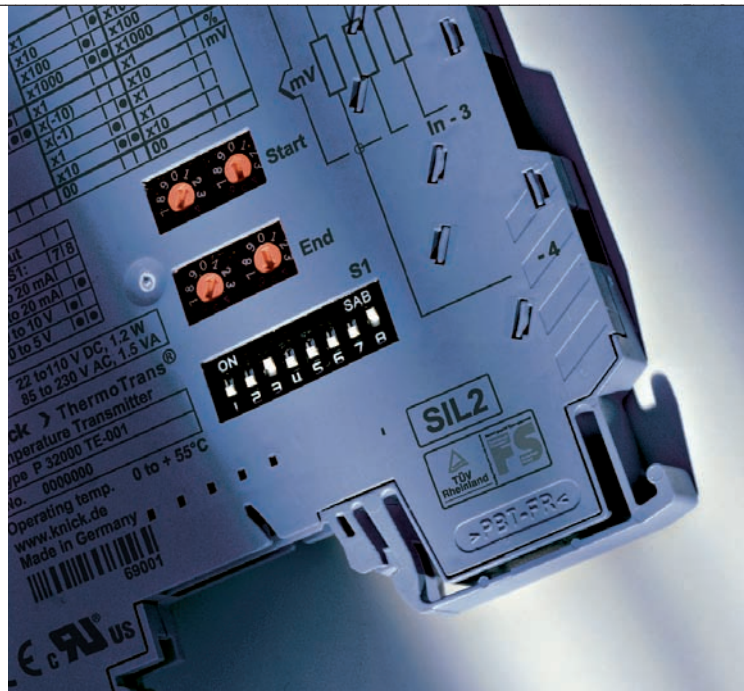
6.1 Functional Safety (SIL)

6.1.1 Functional Safety

The breakdown and malfunction of process plants and machines can lead to personal, environmental, and material risks. The effects of damage and the probabilities of occurrence determine the measures required for minimizing risk through fault prevention, fault detection, and fault control. The international safety standard IEC/EN 61508 defines the requirements for safety-related systems in a plant. The safety-related systems examined in this standard are based on electrical, electronic, and programmable electronic technology. The term “functional safety” describes the part of overall plant safety which depends on the correct functioning of the safety-related systems.

6.1.2 Safety Integrity Level (SIL)

The IEC/EN 61508 uses a risk-based approach to determine the safety integrity requirements. Each safety function is assigned a safety integrity level which specifies the risk reduction required for each determined hazardous event. The remaining residual risk is determined by calculating the probability of failure of all components involved in the safety circuit and their interconnection. There are 4 different safety levels:



from SIL 1 for a low risk to SIL 4 for a very high risk. Two SIL categories are distinguished according to the respective application:

- For safety functions which are activated when required (on demand), the probability of failure to perform the function on demand is specified (Low Demand Mode).
- For safety functions which are continuously active, the probability of a hazardous failure is specified for a given period of time (per hour) (High Demand Mode).

6.1.3 Device Certification

The IEC/EN 61508 covers safety-related systems over the entire safety lifecycle, i. e. from conception to shutdown or deinstallation. In the product development, particular importance is placed on verification. In a series of analyses and tests it must be proved that a device complies with the safety integrity requirement for a certain safety chain. The results form the basis for certification by an independent body. The PolyTrans® P 32000, ThermoTrans® P 32100, SensoTrans® DMS P 32200, and SensoTrans® P 32300 transmitters are certified to SIL 2 by the TÜV Rheinland. With redundant configuration they can achieve SIL 3.

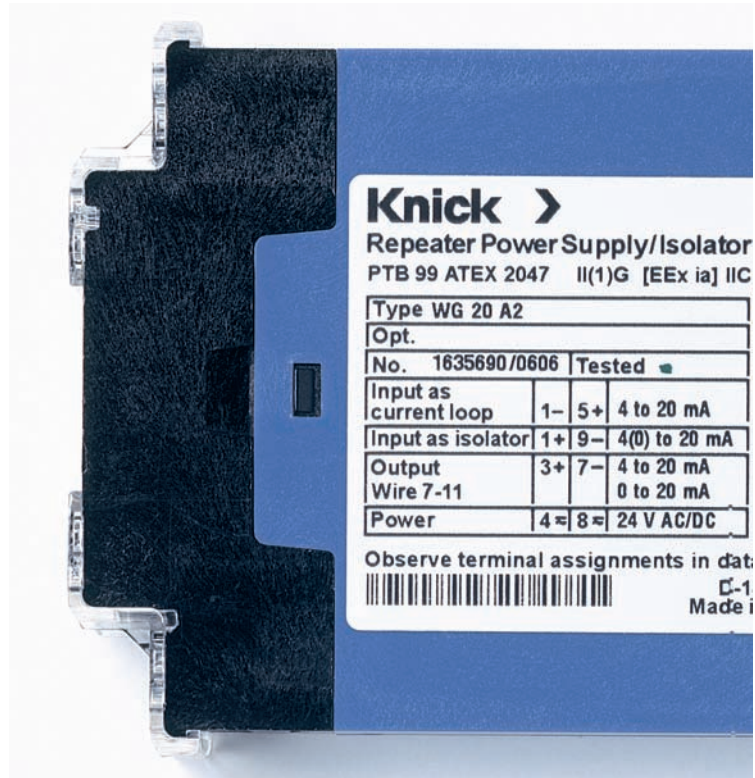
6.2 Surge Withstand

In industrial plants, transient overvoltages with rise speeds of several 1000 V/ μ s occur in particular due to switching processes. This kind of overvoltage can lead to damage or destruction of sensitive electronic components.

Newly developed Knick isolation amplifiers are surge proof according to IEC 255-4. Both the individual circuits (input, output, supply) and the isolation between the circuits are protected against being destroyed by temporary overvoltages. The test is made with positive and negative pulses of 5 kV with 1.2 or 50 μ s pulse duration.

6.3 Electromagnetic Compatibility (EMC)

The term "electromagnetic compatibility" refers to the ability of electrical and electronic equipment to function satisfactorily in its electromagnetic environment without introducing intolerable electromagnetic disturbances to other equipment in that environment. The increasing use of all kinds of devices that could emit interference, the constantly increasing use of modern microelectronics in all fields of industry and the interaction of power electronics and microelectronics calls for measures protecting against mutual influence.



Electromagnetic interference can cause malfunctions and even complete failure of unprotected electronic devices. The constantly lower energy requirement of microelectronics components and simultaneously increasing processing speeds lead to increased sensitivity to electromagnetic interference.

Within the European Union the limit values to be observed with regard to EMC, in addition to other requirements to be met, are regulated by harmonized standards and laws. The Low-

Voltage Directive and the EMC standards are relevant for isolation amplifiers. The CE certification of Knick products confirms conformity with the respective directives.



6.4 Protection against Mechanical Loads

Mechanical loads, for example, caused by shaking or vibrations, are often inevitable in industrial plants, in vehicles, on ships etc. However, the operating safety of electrical and electronic components also needs to be ensured in these environments.

The VariTrans® P 27000, A 26000, P 15000, B 13000, and A 20400 were therefore tested according to the rules of Germanischer Lloyd and have been granted the GL approval for environmental category D: applications with increased heat development and at increased vibration levels, for example, devices for mounting on combustion engines or compressors.

6.5 IP 68 Protection

With the M12 field housings, Knick has now presented a new series that considerably simplifies decentralization in the field of analog signal transmission. The DuraTrans® M12 and IsoTrans® M12 devices are protected to IP68 and are installed without an enclosure or additional protective case directly on the machine. Even harsh ambient conditions are no problem.

The housing material PBT (polybutylene terephthalate) is extremely resistant to mineral lubricants and alcohols and complies with flame class V-0 according to UL 94. Vacuum encapsulation reliably protects the electronics against environmental influences. For connection, the tried and tested M12 circular connectors are used.

6.6 Reliability

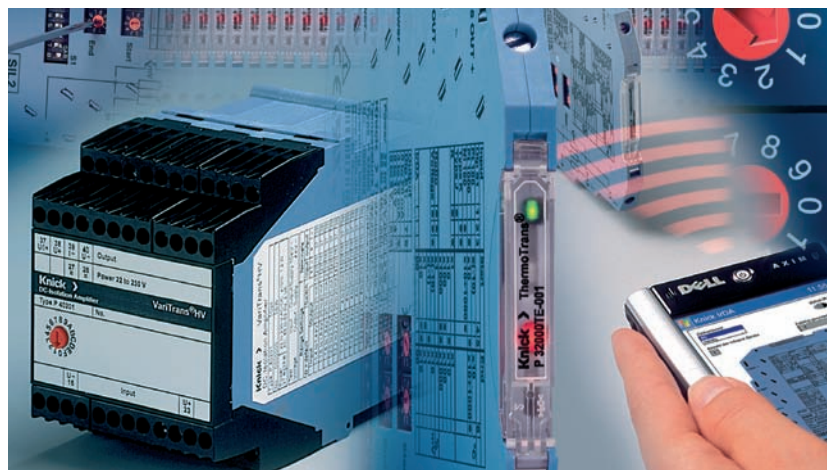
Knick gives a 5-year warranty on electrical isolation modules. Due to their recognized quality and reliability, they are widespread in industrial measuring and control engineering across the world.

The Knick quality management has been certified according to ISO 9001 for all areas of the company and has also contributed to Knick being certified according to KTA 1401 as a rec-

ognized supplier of isolation amplifiers for use in nuclear power stations since 1994. Other corresponding certifications have also been awarded for products used in the safety-related areas of nuclear power stations.

Intelligent circuits with minimal use of components allow reliability values that were previously considered to be impossible – for example, the MTBF (Mean Time Between Failures) of the new VariTrans® B 10000 standard-signal isolator is 440 years.

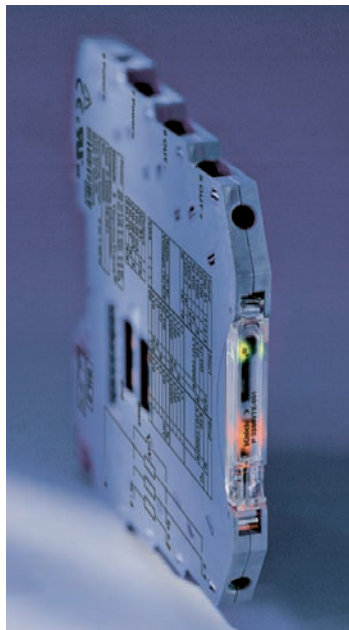
The quality of all Knick products is ensured by computer-supported individual testing. For the electrical isolation modules, this means that each individual device is checked again for perfect functioning and compliance with all data after the functional test, adjustment, encapsulation where necessary, and high-voltage test. Only then is the device approved for delivery.



7. Space Requirement

When selecting a device, the housing width is an important criterion since the available space is often limited. With the 6-mm class introduced by Knick, the minimum housing width has been achieved. Knick initiated this technological change in 2001 by introducing the VariTrans® B 10000 standard-signal isolators.

In the meantime Knick has complemented the product line of the 6-mm class with devices providing safe isolation, signal doublers or standard-signal isolators with high output load, passive standard-signal isolators, repeater power supplies with signal conversion as well as universal transmitters and temperature transmitters. Particular attention has been paid to energy efficiency. Power loss and the resulting self-heating are strongly reduced resulting in very high reliability and long service life.



In spite of the reduced space, the 6-mm class provides true 3-port isolation between input, output, and power supply to prevent parasitic voltages. Safe Isolation according to EN 61140 for working voltages up to 300 V AC/DC guarantees best possible protection of personnel and equipment. The test voltage is up to 2.5 kV AC. The 6-mm products are UL and CSA approved for application in North America.

The Knick isolation amplifiers in wider modular housings meet higher demands, for example concerning isolation or mechanical properties.

In this catalog the devices of the 6-mm class are identified by a corresponding logo.



6
mm

Modular Housings

Isolation Amplifiers
Transmitters

Indicators

Process Analytics

Portable Meters

Laboratory Meters

Sensors

Fittings



Modular Housings for Safe Areas and Zone 2		Page
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	VariTrans® B 13000	54
	VariTrans® A 20000	62
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Loop-Powered Isolators for Standard Signals	IsoTrans® 41	80
	IsoTrans® A 47	88
	IsoTrans® B 48	94
	IsoTrans® A 20400	100
High-Voltage Isolators / Isolation Amplifiers for Shunt Applications	VariTrans® P 41000	106
	VariTrans® P 42000	114
	VariTrans® P 43000	120
Isolated Supplies	IsoAmp® PWR A 20100	126
	IsoAmp® PWR B 10116	132
Universal Transmitters	PolyTrans® P 32000	138
Temperature Transmitters	ThermoTrans® P 32100	150
	ThermoTrans® A 20210	162
Strain Gage Transmitters	SensoTrans® DMS P 32200	172
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AC/DC Transmitters	IsoTrans® 600	206
Power Supplies	IsoPower® A 20900	212

Modular Housings

Knick >

VariTrans® P 27000



The “Multimeter” among the isolators. With 480 switchable calibrated ranges and broad-range power supply.

The Task

A wide range of measuring signals need to be galvanically isolated and converted into standard signals. This applies to any input signals in the range ± 20 mV to ± 200 V and from ± 0.1 mA to ± 100 mA.

The Problem

The variety of tasks results in a large number of different devices.

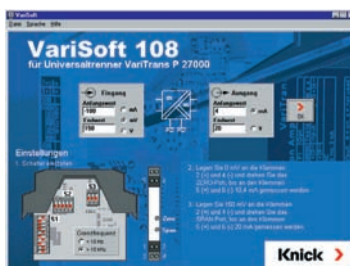
The Solution

The calibrated switching of the input and output ranges using DIP switches allow the Knick VariTrans® P 27000 professional universal isolators to be used without complicated readjustment. As switchover occurs without expensive and unreliable equipment, the devices can also be easily configured on site. The broad-range power supply for all common supply voltages from 20 to 253 V AC/DC offers maximum flexibility.

To make setting the required input and output ranges simple and user friendly, we supply a free software tool called VariSoft® to support the user. VariSoft® shows you the correct DIP switch position when you enter the required input and output ranges and it has a print option for your documentation. You can download VariSoft® free of charge from our website.

The Housing

At just 12.5 mm wide, the modular housing with pluggable screw terminals allows simple and fast assembly and prewiring of enclosures. Housings with fixed screw terminals are also available for extremely high mechanical loads.



The easy-to-open housing allows simple configuration of the input and output ranges and provides good protection against contact and unintentional adjustment.

The Advantages

The analog transmission of the measurement signal with transformer potential isolation and the digitally controlled range selection guarantee almost perfect signal transmission:

- Gain error only 0.08 %
- Excellent pulse formation
- Extremely low residual ripple
- Maximum long-term stability and reliability

The Technology

A microcontroller monitors the control element settings and controls the calibrated range selection. Interference to the signal transmission – for example, due to contact resistance in the range switch – is thus ruled out.

Thanks to the VariPower® power supply, the devices can be used all over the world with almost any power supply. The extremely low power consumption and the related minimal self-heating significantly increase reliability. The consequence: a 5-year warranty.

Warranty
5 years!

Defects occurring within 5 years from delivery are remedied free of charge at our works (carriage and insurance paid by sender).

Universal Isolation Amplifiers

Isolation Amplifiers
Transmitters

Indicators

Process Analytics

Portable Meters

Laboratory Meters

Sensors

Fittings



Knick >

■ The Facts

Flexible and highly accurate
Calibrated range selection without complicated readjustment

VariPower®
broad-range power supply,
20 ... 253 V AC/DC

Extremely compact design
12.5 mm modular housing,
up to 80 active isolators per
meter of mounting rail

Fast and easy configuration
Housing simple to open

Pluggable screw terminals
Simple, time-saving assembly and
prewiring of enclosures

3-port isolation
Protection against incorrect
measurements or damage

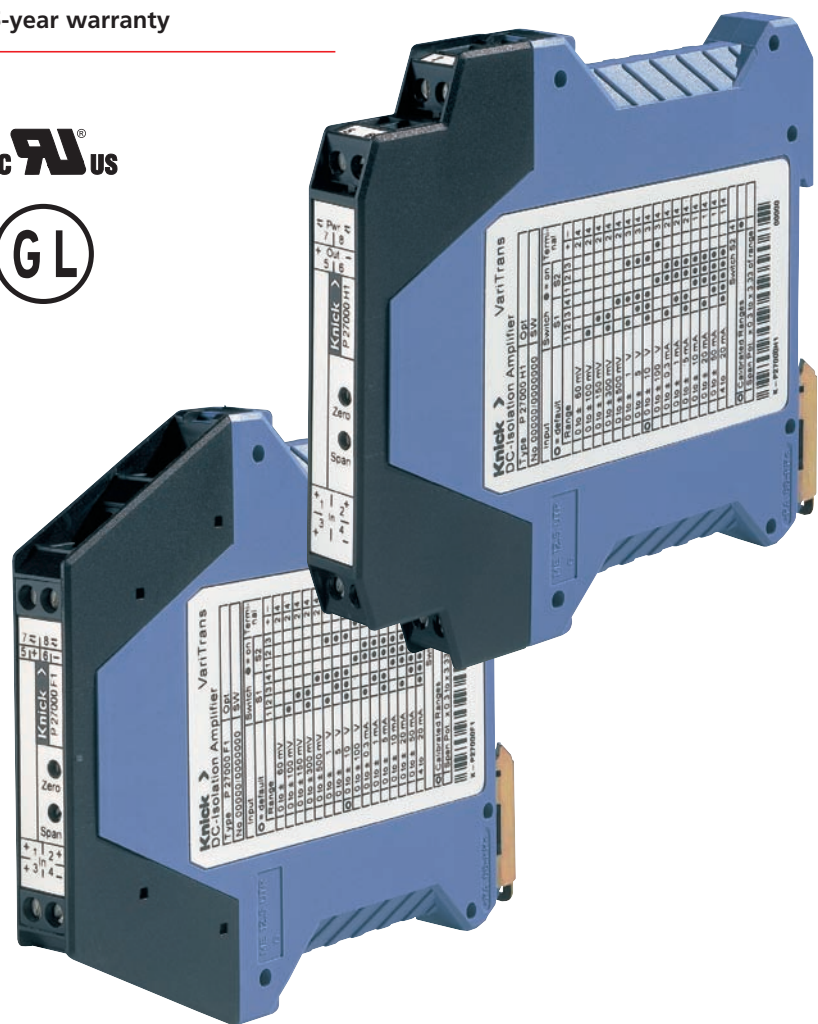
Maximum accuracy

Individual test report
following EN 10204 2.3

Safe isolation
according to EN 61140.
Protection against high voltages
(for example, with shunt meas-
urements at high potentials or in
3-phase systems).

Maximum reliability
No repair and failure costs

5-year warranty



Modular Housings

Modular Housings

VariTrans® P 27000

■ Product Line

Devices			Order No.	Order No.
	Input	Output	With pluggable screw terminal	With fixed screw terminal
VariTrans® P 27000 Input and output adjustable	0 ... ±20 mV/200 V 0 ... ±0.1 mA/100 mA	0 ... 20 mA 4 ... 20 mA 0 ... 10 V 0 ... ±10 V 0 ... ± 20 mA	P 27000 H1	P 27000 F1
VariTrans® P 27000 Fixed setting	0 ... ± 20 mA 0 ... ± 20 mA 0 ... ±60 mV 0 ... 60 mV 0 ... ±60 mV 0 ... ±150 mV 0 ... 150 mV 0 ... ±150 mV 0 ... ±300 mV 0 ... 300 mV 0 ... ±300 mV 0 ... ±500 mV 0 ... 500 mV 0 ... ±500 mV 0 ... ±1 V 0 ... 1 V 0 ... ±1 V 0 ... ±10 V 0 ... ±10 V	0 ... ± 20 mA 0 ... ±10 V 0 ... ± 20 mA 4 ... 20 mA 0 ... ±10 V 0 ... ± 20 mA 4 ... 20 mA 0 ... ±10 V 0 ... ± 20 mA 4 ... 20 mA 0 ... ±10 V 0 ... ± 20 mA 4 ... 20 mA 0 ... ±10 V 0 ... ± 20 mA 4 ... 20 mA 0 ... ±10 V 0 ... ± 20 mA 0 ... ±10 V 0 ... ± 20 mA 0 ... ±10 V	P 27016 H1 P 27018 H1 P 27056 H1 P 27057 H1 P 27058 H1 P 27066 H1 P 27067 H1 P 27068 H1 P 27076 H1 P 27077 H1 P 27078 H1 P 27086 H1 P 27087 H1 P 27088 H1 P 27096 H1 P 27097 H1 P 27098 H1 P 27036 H1 P 27038 H1	P 27016 F1 P 27018 F1 P 27056 F1 P 27057 F1 P 27058 F1 P 27066 F1 P 27067 F1 P 27068 F1 P 27076 F1 P 27077 F1 P 27078 F1 P 27086 F1 P 27087 F1 P 27088 F1 P 27096 F1 P 27097 F1 P 27098 F1 P 27036 F1 P 27038 F1
VariTrans® P 27000 Fixed setting to customer requirement			P 27000 H1-nnnn	P 27000 F1-nnnn
Power supply				
20 ... 253 V AC/DC				

Universal Isolation Amplifiers

Isolation Amplifiers
Transmitters

Indicators

Process Analytics

Portable Meters

Laboratory Meters

Sensors

Fittings

Knick 

■ Specifications

Input data

Inputs	P 27000 H1/F1:	Factory setting ± 10 V	
	Voltage	Configurable from 20 mV ... 200 V and switchable in calibrated steps: 60 mV, 100 mV, 150 mV, 300 mV, 500 mV, 1 V, 5 V, 10 V, 100 V, unipolar/bipolar	
	Current	Configurable from 0.1 mA ... 100 mA and switchable in calibrated steps: 1 mA, 5 mA, 10 mA, 20 mA, 50 mA, unipolar/bipolar and 4 ... 20 mA ¹⁾	
Input resistance	Current input	Ranges ≤ 5 mA	approx. 100 ohms
		Ranges > 5 mA	approx. 5 ohms
	Voltage input		approx. 1 Mohm
Overload	Current input	Ranges ≤ 5 mA	≤ 100 mA
		Ranges > 5 mA	≤ 300 mA
	Voltage input	Ranges ≤ 500 mV	limited by suppressor diode 36 V, max. permitted continuous current ≤ 20 mA
		Ranges > 500 mV	limited by suppressor diode 250 V, max. permitted continuous current ≤ 3 mA

Output data

Output	P 27000 H1/F1: factory setting ± 10 V 20 mA, 5 V, 10 V unipolar/bipolar and 4 ... 20 mA, 1 ... 5 V and 2 ... 10 V, calibrated selection		
Offset	-100 %, -50 %, 0 %, 50 %, 100 % of span of the selected output range calibrated selection		
Load	With output current	≤ 12 V (600 ohms at 20 mA)	
	With output voltage	≤ 10 mA (1 kohm at 10 V) ²⁾	
Offset	20 μ A or 10 mV		
Residual ripple	< 10 mV _{rms}		

Transmission behavior

Adjustment range of ZERO potentiometer	± 25 % span of selected output range		
Adjustment range of SPAN potentiometer	0.33 ... 3.30 x end value of selected input range (max. $V_{in} = 200$ V)		
Gain error	< 0.08 % meas. val. (DC)		
Cut-off frequency	P 27000 H1/F1: > 10 kHz, < 10 Hz, switchable -3 dB, fixed-setting models > 10 kHz, -3 dB		
Temperature coefficient ³⁾	< 0.005 %/K full scale (reference temperature 23 °C)		

1) Input 4 ... 20 mA: Offset switching not calibrated

2) Higher output load on request

3) Average TC in specified operating temperature range -10 °C ... +70 °C

Modular Housings

VariTrans® P 27000

Specifications (continued)

Power supply

Power supply	20 ... 253 V AC/DC; AC 48 ... 62 Hz, approx. 2 VA; DC approx. 0.9 W
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Isolation

Galvanic isolation	3-port isolation between input, output and power supply
--------------------	---

Test voltage	5 kV AC input against output; 4 kV AC output against power supply
--------------	---

Working voltage (basic insulation)	1000 V AC/DC with overvoltage category II and pollution degree 2 according to EN 61010-1. For applications with high working voltages, you should ensure there is sufficient spacing or isolation from neighboring devices and protection against electric shocks.
------------------------------------	---

Protection against electric shock	Safe Isolation according to EN 61140 by reinforced insulation in accordance with EN 61010-1. Working voltages with overvoltage category II and pollution degree 2 Working voltages: up to 600 V AC/DC across input and output up to 300 V AC/DC across output and power supply up to category II and degree 2 For applications with high working voltages, you should ensure there is sufficient spacing or isolation from neighboring devices and protection against electric shocks.
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Standards and approvals

Surge withstand	5 kV, 1.2/50 µs, according to IEC 255-4
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EMC ⁴⁾	European EMC regulations; EN 61326
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Approvals	CUL: File No. E 216767, Standards UL 3101-1, CSA-C 22.2, No. 10101-1 GL: No. 42843-02 HH KTA 3503/3507
-----------	--

Other data

MTBF ⁵⁾	Approx. 76 years
--------------------	------------------

Ambient temperature	Operation: -10 ... +70 °C Transport and storage: -40 ... +85 °C
---------------------	--

Design	Modular housing, width 12.5 mm, see dimension drawing for other measurements Pluggable screw terminals: Type H1 Fixed screw terminals: Type F1
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Ingress protection	IP 20
--------------------	-------

Mounting	Metal lock for mounting on 35 mm top hat rail according to EN 50022 See dimension drawings for conductor cross section
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Weight	Approx. 150 g
--------	---------------

4) Slight deviations are possible while there is interference

5) Mean Time Between Failures – MTBF – according to EN 61709 (SN 29500).

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

Universal Isolation Amplifiers

Isolation Amplifiers
Transmitters

Indicators

Process Analytics

Portable Meters

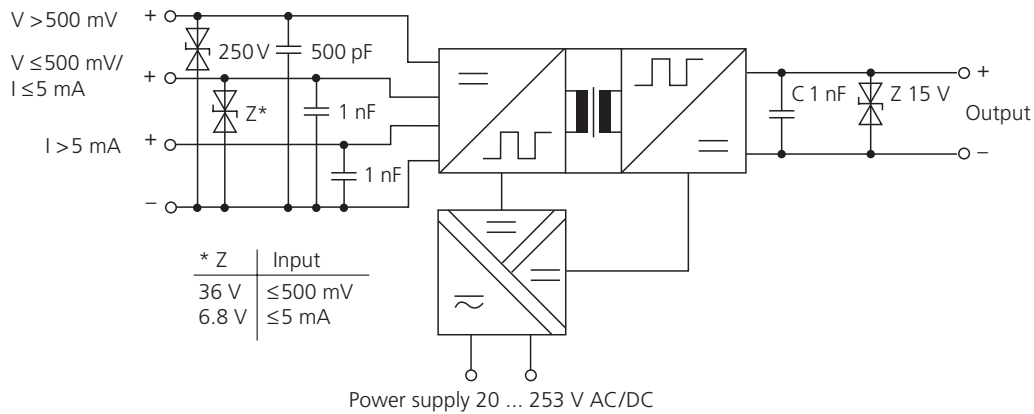
Laboratory Meters

Sensors

Fittings

Knick 

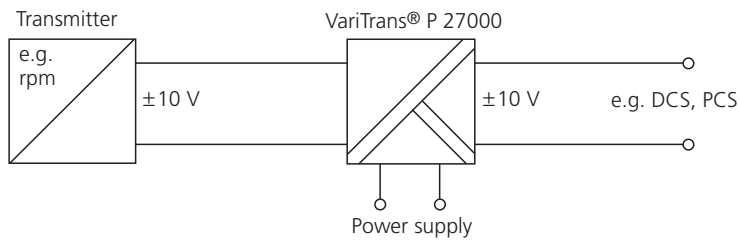
■ Block Diagram



■ Application Examples

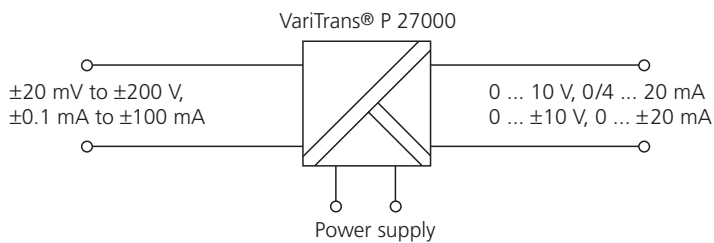
Electrical isolation

for safe coupling of the measurement signals to the evaluation electronics



Signal conversion or range adaptation

for conversion of any measurement signals into 10 V or 20 mA standard signals



Modular Housings

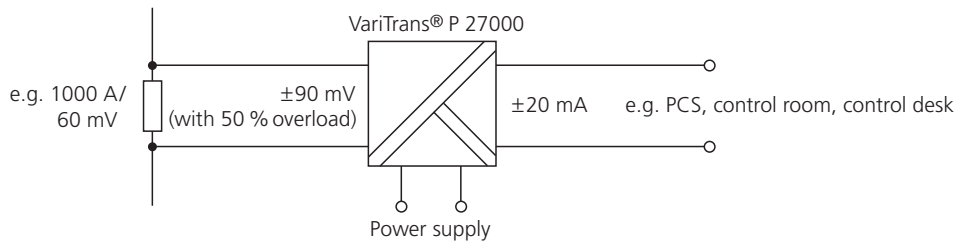
Modular Housings

VariTrans® P 27000

Application Examples (continued)

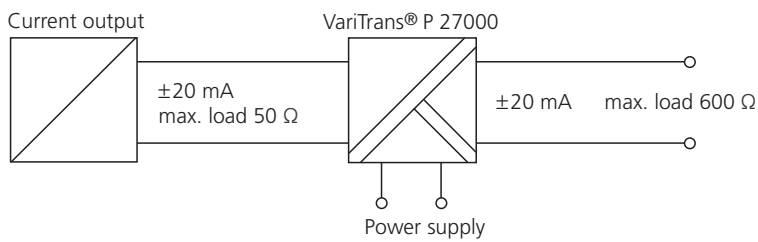
Simple shunt measurement

e.g. also with any overload range setting



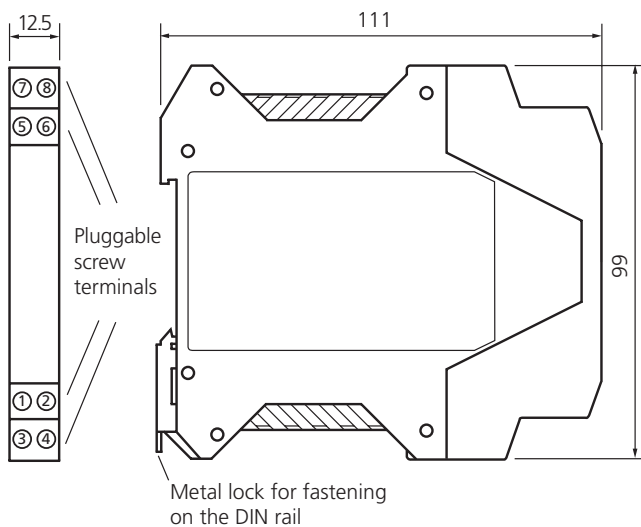
Electrical isolation

for safe coupling of the measurement signals to the evaluation electronics



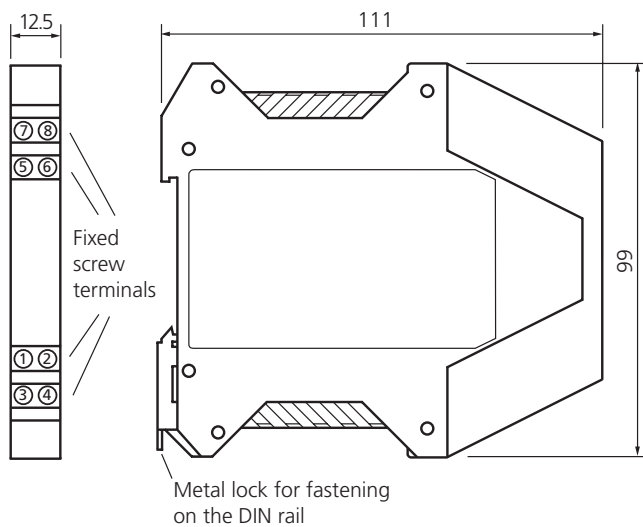
■ Dimension Drawings and Terminal Assignments

Housing with pluggable screw terminals



Dimension Drawings and Terminal Assignments (continued)

Housing with fixed screw terminals



Terminal Assignments

- | | |
|--|------------------|
| 1 Input + Current >5 mA | 5 Output + |
| 2 Input + Current ≤5 mA, voltage ≤500 mV | 6 Output - |
| 3 Input + Voltage >500 mV | 7 Power supply ≈ |
| 4 Input - | 8 Power supply ≈ |

Conductor cross-section max. 2,5 mm²

Multi-wire connection max. 1 mm² (two wires with same cross-section)

All dimensions in mm!

Modular Housings

Knick >

VariTrans® A 26000



The specialist for ± 10 V and ± 20 mA. With calibrated range selection and broad-range power supply.

The Task

The transmission and conversion of standard 0 ... ± 20 mA and 0 ... ± 10 V signals frequently used in industry, for example, for speed monitoring with tachogenerators.

The Problems

Measuring errors occur due to potential differences when bipolar measurement signals are transmitted. In addition, the signal adaptation previously required calibration of the isolators.

The Solution

Knick provides a tailor-made solution. Thanks to the calibrated selection of the input and output parameters using DIP switches, the Knick VariTrans® P 26000 universal isolation amplifiers can be used without complicated readjustment.

The broad-range power supply for all common supply voltages from 20 to 253 V AC/DC offers maximum flexibility.

The Housing

At just 12.5 mm wide, the modular housing with pluggable screw terminals allows simple and fast assembly and prewiring of enclosures. Housings with fixed screw terminals are also available for extremely high mechanical loads. The easy-to-open housing allows simple configuration of the input and output ranges and provides good protection against contact and unintentional adjustment.

The Advantages

The analog transmission of the measurement signal with transformer isolation and the digitally controlled range selection guarantee excellent signal transmission:

- Gain error only 0.1 %
- Excellent pulse formation
- Extremely low residual ripple
- Maximum long-term stability and reliability

The Technology

A microcontroller monitors the control element settings and controls the calibrated range selection. Interference to the signal transmission – for example, due to contact resistance in the range switch – is thus ruled out.

Thanks to the VariPower® power supply, the devices can be used all over the world with almost any power supply. The extremely low power consumption and the related minimal self-heating significantly increase reliability. The consequence: a 5-year warranty.

**Warranty
5 years!**

Defects occurring within 5 years from delivery are remedied free of charge at our works (carriage and insurance paid by sender).

Universal Isolation Amplifiers

Isolation Amplifiers
Transmitters

Indicators

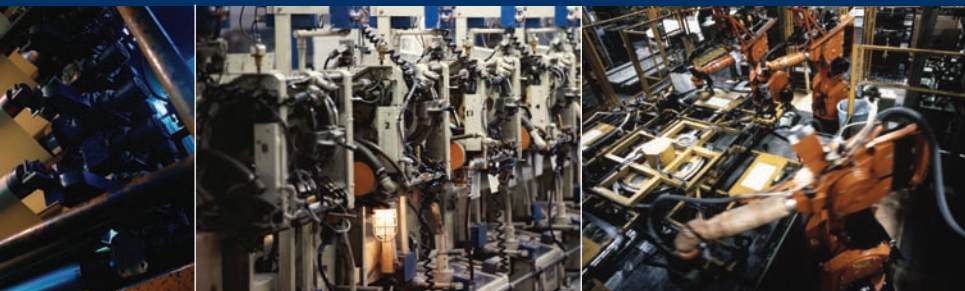
Process Analytics

Portable Meters

Laboratory Meters

Sensors

Fittings



Knick >

■ The Facts

Flexible and highly accurate
Calibrated range selection without complicated readjustment

VariPower®
broad-range power supply,
20 ... 253 V AC/DC

Extremely compact design
12.5 mm modular housing;
up to 80 active isolators per
meter of mounting rail

Fast and easy configuration
Housing simple to open

Pluggable screw terminals
Simple, time-saving assembly and
prewiring of enclosures

3-port isolation
Protection against incorrect
measurements or damage

Maximum accuracy

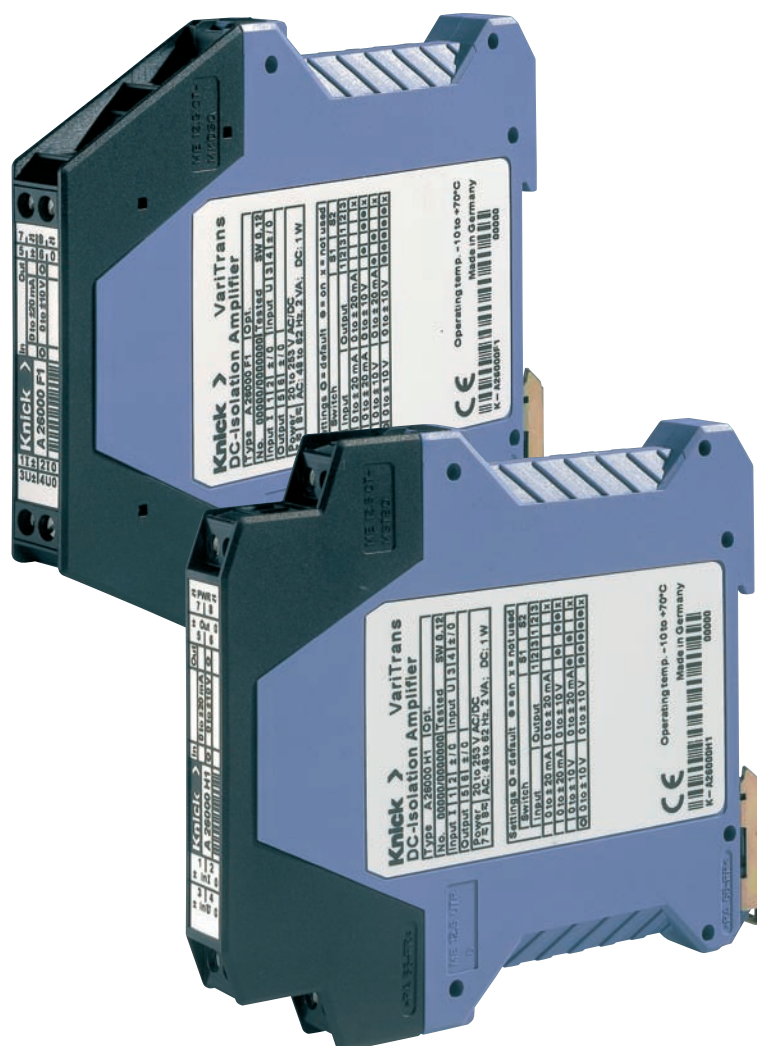
Specific test report
following EN 10204 2.3

Safe Isolation
according to EN 61140 protects
against unpermitted high voltages

Maximum reliability
No repair and failure costs

5-year warranty

CE **us**



Modular Housings

Modular Housings

VariTrans® A 26000

■ Product Line

Devices			Order No.	Order No.
	Input	Output	With pluggable screw terminal	With fixed screw terminal
VariTrans® A 26000 Input and output calibrated switchable	0 ... ±20 mA, 0 ... ±10 V	0 ... ±20 mA, 0 ... ±10 V	A 26000 H1	A 26000 F1
VariTrans® A 26000 with fixed settings	0 ... ±20 mA 0 ... ±20 mA 0 ... ±10 V 0 ... ±10 V	0 ... ±20 mA 0 ... ±10 V 0 ... ±20 mA 0 ... ±10 V	A 26016 H1 A 26018 H1 A 26036 H1 A 26038 H1	A 26016 F1 A 26018 F1 A 26036 F1 A 26038 F1
Power supply				
20 ... 253 V AC/DC				

■ Specifications

Input data

Inputs	0 ... ±20 mA 0 ... ±10 V	Terminal selectable/switchable (factory setting ±10 V) or fixed settings (see Product line)
Input resistance	Current input Voltage input	Voltage drop approx. 250 mV at 20 mA Approx. 1 Mohm
Overload	Current input Voltage input	≤ 300 mA Voltage limitation with suppressor diode 30 V, max. permitted continuous current 30 mA

Output data

Outputs	0 ... ±20 mA 0 ... ±10 V	Terminal selectable/switchable (factory setting ±10 V) or fixed settings (see Product line)
Load	With output current With output voltage	≤ 10 V (500 ohms at 20 mA) ≤ 10 mA (1 kohm at 10 V) ¹⁾
Offset	20 µA or 10 mV	
Residual ripple	< 10 mV _{rms}	

Transmission behavior

Gain error	< 0.1 % meas.val. (DC)	
Cut-off frequency	> 5 kHz, -3 dB	
Temperature coefficient ²⁾	0.0075 %/K full scale (reference temperature 23 °C)	

1) Higher output load on request

2) Average TC in specified operating temperature range -10 °C ... +70 °C

Universal Isolation Amplifiers

Isolation Amplifiers
Transmitters

Indicators

Process Analytics

Portable Meters

Laboratory Meters

Sensors

Fittings

Knick 

Specifications (continued)

Power supply

Power supply	20 ... 253 V AC/DC	AC 48 ... 62 Hz, approx. 2 VA DC approx. 0.9 W
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Isolation

Galvanic isolation	3-port isolation between input, output, and power supply	
Test voltage	4 kV AC input against output against power supply	
Working voltage (basic insulation)	1000 V AC/DC with overvoltage category II and pollution degree 2 according to EN 61010-1. For applications with high working voltages, you should ensure there is sufficient spacing or isolation from neighboring devices and protection against electric shocks.	
Protection against electric shock	Safe Isolation according to EN 61140 by reinforced insulation in accordance with EN 61010-1. Working voltages up to 300 V AC/DC with overvoltage category II and pollution degree 2 between input and output and power supply. For applications with high working voltages, you should ensure there is sufficient spacing or isolation from neighboring devices and protection against electric shocks.	

Standards and approvals

Surge withstand	5 kV, 1.2/50 μ s, according to IEC 255-4	
EMC ³⁾	European EMC regulations; EN 61326	
Approvals	CUL: File No. E 216767, Standards UL 3101-1, CSA-C 22.2-95, No. 10101-1 GL: No. 14593-99 HH	

Other data

MTBF ⁴⁾	Approx. 91 years	
Ambient temperature	Operation:	-10 ... +70 °C
	Transport and storage:	-40 ... +85 °C
Design	Modular housing, width 12.5 mm, see dimension drawing for other measurements, Pluggable screw terminals: Type H1 Fixed screw terminals: Type F1	
Ingress protection	IP 20	
Mounting	Metal lock for mounting on 35 mm top hat rail according to EN 50022 See dimension drawings for conductor cross section	
Weight	Approx. 150 g	

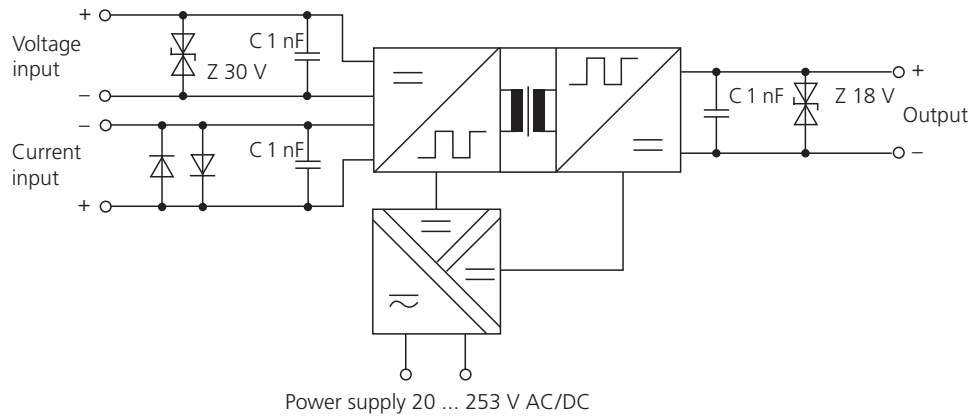
³⁾ Slight deviations are possible while there is interference

⁴⁾ Mean Time Between Failures – MTBF – according to EN 61709 (SN 29500). Conditions: stationary operation in well-kept rooms, average ambient temperature 40 °C, no ventilation, continuous operation

Modular Housings

VariTrans® A 26000

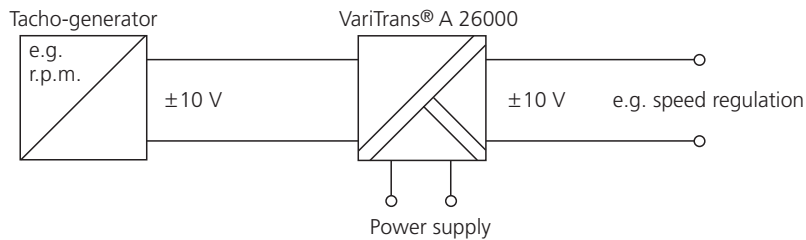
■ Block Diagram



■ Application Examples

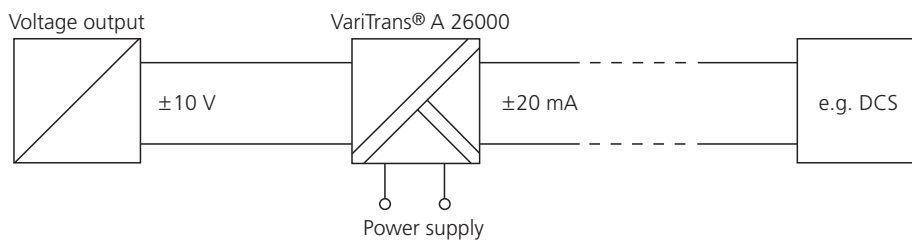
Electrical isolation

for safe coupling of the measurement signals to the evaluation electronics



Signal conversion

for conversion of voltage signals into current signals, for example, for interference-free signal transmission over long distances



Universal Isolation Amplifiers

Isolation Amplifiers
Transmitters

Indicators

Process Analytics

Portable Meters

Laboratory Meters

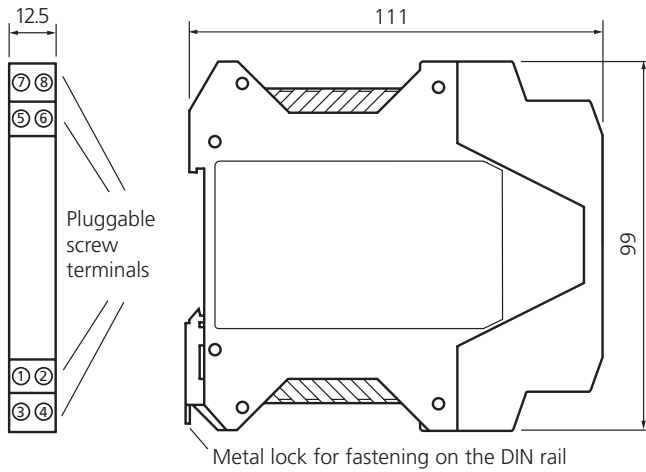
Sensors

Fittings

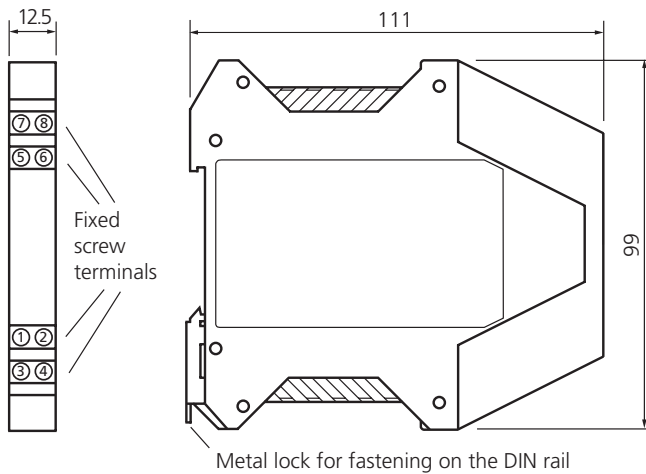
Knick 

■ Dimension Drawings and Terminal Assignments

Housing with pluggable screw terminals



Housing with fixed screw terminals



Terminal Assignments

- 1 Input + Current
- 2 Input - Current
- 3 Input + Voltage
- 4 Input - Voltage
- 5 Output +
- 6 Output -
- 7 Power supply ≈
- 8 Power supply ≈

Conductor cross-section max. 2,5 mm²

Multi-wire connection max. 1 mm²
(two wires with same cross-section)

All dimensions in mm!

Modular Housings

Knick >

VariTrans® P 15000



The professional standard-signal isolator. With calibrated range selection and broad-range power supply.

The Task

Industrial applications require the transmission and conversion of different standard signals (0 ... 20 mA, 4 ... 20 mA and 0 ... 10 V) with maximum accuracy.

The Problems

Long transmission paths can cause potential differences that lead to errors in the measuring result. Furthermore different products would be required for different signals and supply voltages.

The Solution

The VariTrans® P 15000 isolation amplifier from Knick features excellent transmission quality combined with the calibrated standard signal switching using DIP switches and a broad-range power supply.

The Housing

At just 12.5 mm wide, the modular housing with pluggable screw terminals allows simple and fast assembly and prewiring of enclosures. Housings with fixed screw terminals are also available for extremely high mechanical loads.

The easy-to-open housing allows simple configuration of the input and output ranges and provides good protection against contact and unintentional adjustment.

The Advantages

The analog transmission of the measurement signal with transformer isolation and the new digitally controlled range selection guarantee almost perfect signal transmission:

- Gain error only 0.08 %
- Excellent pulse formation
- Extremely low residual ripple
- Maximum long-term stability and reliability

The Technology

A microcontroller monitors the control element settings and controls the calibrated range selection. Interference to the signal transmission – for example, due to contact resistance in the range switch – is thus ruled out.

Thanks to the VariPower® power supply, the devices can be used all over the world for all common supply voltages from 20 to 253 V AC/DC with almost any power supply. The extremely low power consumption and the related minimal self-heating significantly increase reliability. The consequence: a 5-year warranty.

Warranty
5 years!

Defects occurring within 5 years from delivery are remedied free of charge at our works (carriage and insurance paid by sender).

Isolation Amplifiers for Standard Signals

Isolation Amplifiers
Transmitters

Indicators

Process Analytics

Portable Meters

Laboratory Meters

Sensors

Fittings



Knick >

■ The Facts

Flexible and highly accurate
Calibrated range selection without complicated readjustment

VariPower®
broad-range power supply,
20 ... 253 V AC/DC

Extremely compact design
12.5 mm modular housing;
up to 80 active isolators per
meter of mounting rail

Fast and easy configuration
Housing simple to open

Pluggable screw terminals
Simple, time-saving assembly and
rewiring of enclosures

3-port isolation
Protection against incorrect
measurements or damage

Maximum accuracy

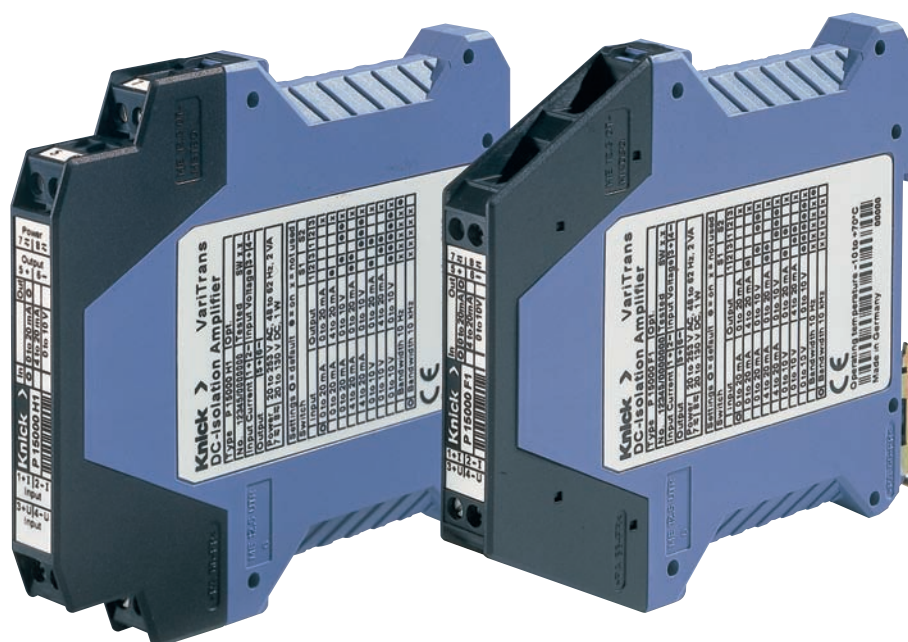
Specific test report
following EN 10204 2.3

Safe Isolation
according to EN 61140 protects
against unpermitted high
voltages

Maximum reliability
No repair and failure costs

5-year warranty

CE [®] US



Modular Housings

Modular Housings

VariTrans® P 15000

■ Product Line

Devices			Order No.	Order No.
	Input	Output	With pluggable screw terminal	With fixed screw terminal
VariTrans® P 15000 Input and output calibrated switchable	0 ... 20 mA, 4 ... 20 mA, 0 ... 10 V	0 ... 20 mA, 4 ... 20 mA, 0 ... 10 V	P 15000 H1	P 15000 F1
VariTrans® P 15000 with fixed settings	0 ... 20 mA 0 ... 20 mA 0 ... 20 mA 4 ... 20 mA 4 ... 20 mA 4 ... 20 mA 0 ... 10 V 0 ... 10 V 0 ... 10 V	0 ... 20 mA 4 ... 20 mA 0 ... 10 V 0 ... 20 mA 4 ... 20 mA 0 ... 10 V 0 ... 20 mA 4 ... 20 mA 0 ... 10 V	P 15016 H1 P 15017 H1 P 15018 H1 P 15026 H1 P 15016 H1 P 15028 H1 P 15036 H1 P 15037 H1 P 15038 H1	P 15016 F1 P 15017 F1 P 15018 F1 P 15026 F1 P 15016 F1 P 15028 F1 P 15036 F1 P 15037 F1 P 15038 F1

Power supply

20 ... 253 V AC/DC

■ Specifications

Input data

Inputs	0 ... 20 mA 4 ... 20 mA 0 ... 10 V	Terminal selectable/switchable (factory setting 0 ... 20 mA) or fixed settings (see Product Line)
Input resistance	Current input Voltage input	Voltage drop approx. 250 mV at 20 mA Approx. 1 Mohm
Overload	Current input Voltage input	≤ 300 mA Voltage limitation with suppressor diode 30 V, max. permitted continuous current 30 mA

Output data

Outputs	0 ... 20 mA 4 ... 20 mA 0 ... 10 V	Switchable (factory setting 0 ... 20 mA) or fixed settings (see Product line) (Transmission of negative measurement signals up to approx. -5 % full scale)
Load	With output current With output voltage	≤ 12 V (600 ohms at 20 mA) ≤ 10 mA (1 kohm at 10 V) ¹⁾

1) Higher voltage output load on request

Isolation Amplifiers for Standard Signals

Isolation Amplifiers
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Portable Meters

Laboratory Meters

Sensors

Fittings

Knick 

Specifications (continued)

Output data (continued)

Offset 20 μ A or 10 mV

Residual ripple < 10 mV_{rms}

Transmission behavior

Gain error < 0.08 % meas.val. (DC)

Cut-off frequency > 10 kHz, -3 dB, P 15000 F1/H1 switchable to < 10 Hz, -3 dB

Temperature coefficient²⁾ 0.005 %/K full scale (reference temperature 23 °C)

Power supply

Power supply 20 ... 253 V AC/DC AC 48 ... 62 Hz, approx. 2 VA
DC approx. 0.9 W

Isolation

Galvanic isolation 3-port isolation between input, output and power supply

Test voltage 4 kV AC input against output against power supply

Working voltage (basic insulation) 1000 V AC/DC with overvoltage category II and pollution degree 2 according to EN 61010-1.
For applications with high working voltages, you should ensure there is sufficient spacing or isolation from neighboring devices and protection against electric shocks.

Protection against electric shock Safe Isolation according to EN 61140 by reinforced insulation in accordance with EN 61010-1.
Working voltages up to 300 V AC/DC across input and output and power supply with overvoltage category II and pollution degree 2.
For applications with high working voltages, you should ensure there is sufficient spacing or isolation from neighboring devices and protection against electric shocks.

Standards and approvals

Surge withstand 5 kV, 1.2/50 μ s, according to IEC 255-4

EMC³⁾ European EMC regulations; EN 61326

Approvals CUL: File No. E 216767, Standards UL 3101-1, CSA-C22.2-95, No. 10101-1
GL: No. 14593-99 HH
KTA 3503/3507

³⁾ Slight deviations are possible while there is interference

²⁾ Average TC in specified operating temperature range -10 °C ... +70 °C

Modular Housings

VariTrans® P 15000

Specifications (continued)

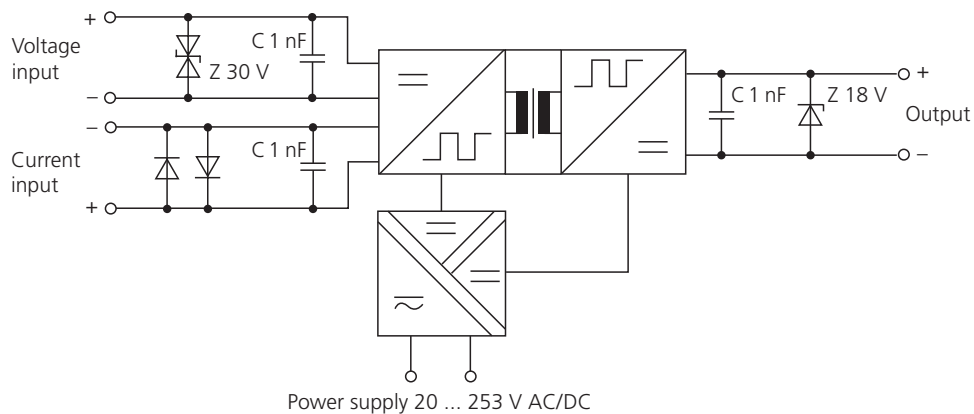
Other data

MTBF ⁴⁾	Approx. 91 years
Ambient temperature	Operation: -10 ... +70 °C Transport and storage: -40 ... +85 °C
Design	Modular housing, width 12.5 mm, see dimension drawing for other measurements Pluggable screw terminals: Type H1 Fixed screw terminals: Type F1
Ingress protection	IP 20
Mounting	Metal lock for mounting on 35 mm top hat rail according to EN 50022 See dimension drawings for conductor cross section
Weight	Approx. 150 g

4) Mean Time Between Failures – MTBF – according to EN 61709 (SN 29500).

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

■ Block Diagram



Isolation Amplifiers for Standard Signals

Isolation Amplifiers
Transmitters

Indicators

Process Analytics

Portable Meters

Laboratory Meters

Sensors

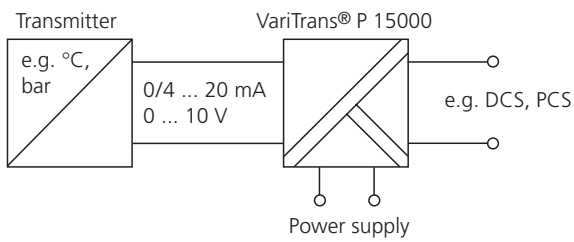
Fittings

Knick >

■ Application Examples

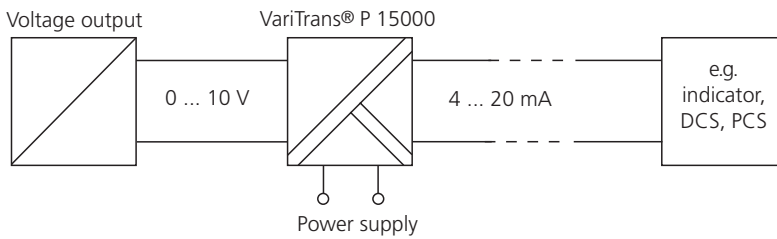
Electrical isolation

for safe coupling of the measurement signals to the evaluation electronics



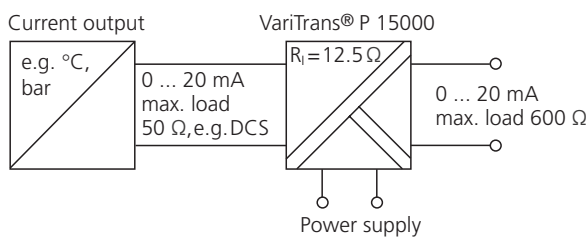
Signal conversion

e.g. conversion of voltage signals into current signals for interference-free signal transmission over long distances



Load increase

e. g. for low load capability signals



Modular Housings

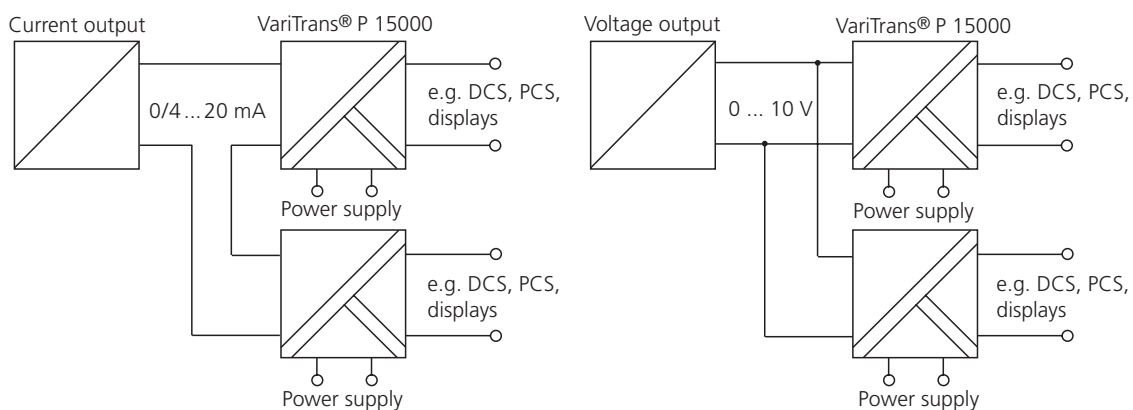
Modular Housings

VariTrans® P 15000

Application Examples (continued)

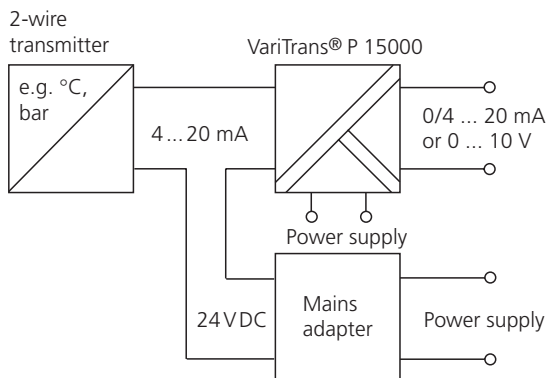
Signal multiplication

e. g. for correct evaluation of measurement signals in different devices



2-wire application

for simple set-up of 2-wire measuring circuits



Isolation Amplifiers for Standard Signals

Isolation Amplifiers
Transmitters

Indicators

Process Analytics

Portable Meters

Laboratory Meters

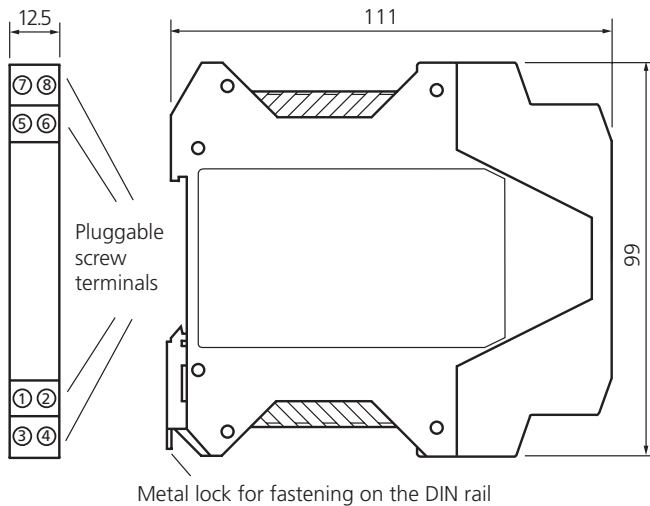
Sensors

Fittings

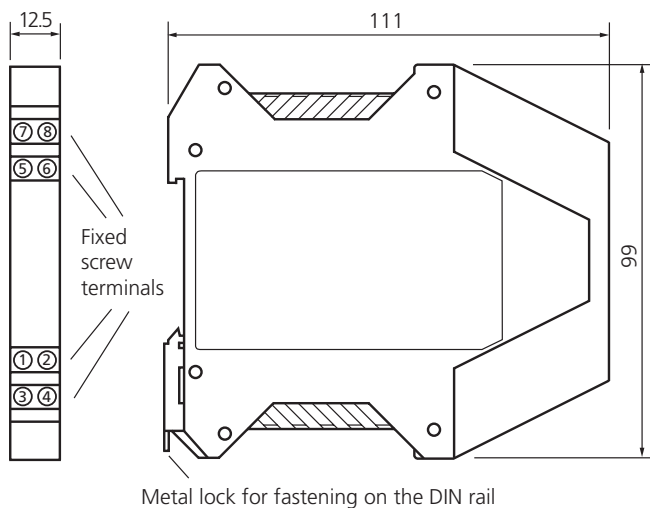
Knick >

■ Dimension Drawings and Terminal Assignments

Housing with pluggable screw terminals



Housing with fixed screw terminals



Terminal assignments

1	Input	+	Current	5	Output	+
2	Input	-	Current	6	Output	-
3	Input	+	Voltage	7	Power supply	≈
4	Input	-	Voltage	8	Power supply	≈

Conductor cross-section max. 2.5 mm²

Multi-wire connection max. 1 mm² (two wires with same cross-section)

All dimensions in mm!

Modular Housings

Knick >

VariTrans® B 13000



The reasonably priced alternative for standard industrial applications. Standard-signal isolators with calibrated range selection.

The Task

Guaranteeing reliable and safe system operation requires galvanic isolation between sensors and controller (e.g. PCS, DCS etc.).

The Problems

In particular with large-scale systems, the difficulties often lie in the financial pressure in addition to the lack of space for mounting the isolators. Up to now, low-cost single-range isolators have, however, caused relatively high purchase, logistics, and storage costs, for example, also for stocking of spare parts.

The Solution

The calibrated switching of the input and output ranges allows the VariTrans® B 13000 basic low-cost standard-signal isolators to be used universally – without complicated readjustment. The settings are made simply using DIP switches.

The Housing

The modular housing, just 12.5 mm in width, can also withstand high mechanical loads. The housing is easy to open providing access to the setting elements.

The Advantages

The analog transmission of the measurement signal with transformer isolation and the new digitally controlled range selection guarantee troublefree use in all standard industrial applications.

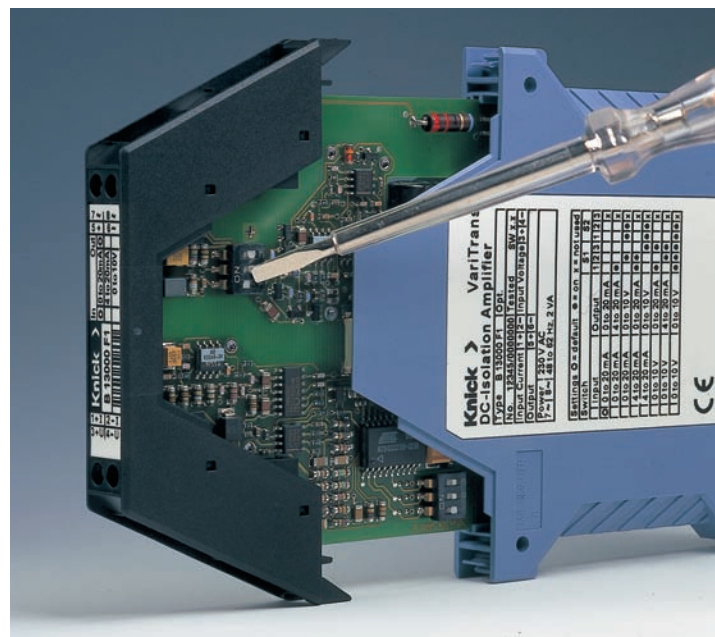
The Technology

A microcontroller monitors the control element settings and controls the calibrated range selection. Interference to the signal transmission – for example, due to contact resistance in the range switch – is thus ruled out.

The integrated power supply is configured for 230 V AC or 24 V AC/DC. The extremely low power consumption and the related minimal self-heating significantly increase reliability. The consequence: a 5-year warranty.

**Warranty
5 years!**

Defects occurring within 5 years from delivery are remedied free of charge at our works (carriage and insurance paid by sender).



Isolation Amplifiers for Standard Signals

Isolation Amplifiers
Transmitters

Indicators

Process Analytics

Portable Meters

Laboratory Meters

Sensors

Fittings



Knick >

■ The Facts

Flexible and accurate

Calibrated range selection without complicated readjustment

Low-cost

The competitively priced solution for standard applications; considerable reduction in purchasing, logistics, and storage costs, for example for stocking of spare parts.

Extremely compact design

12.5 mm modular housing; up to 80 active isolators per meter of mounting rail

Fast and easy configuration

Housing simple to open

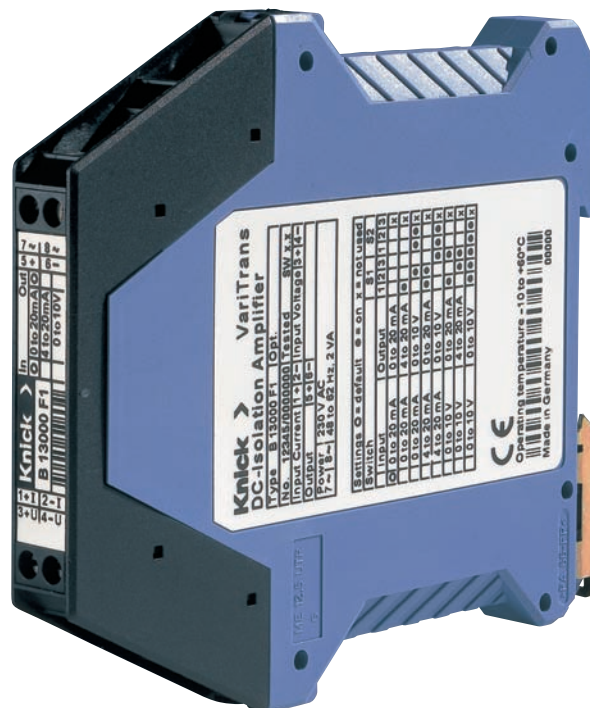
3-port isolation

Protection against incorrect measurements or damage

Maximum reliability

No repair and failure costs

5-year warranty



Modular Housings

Modular Housings

VariTrans® B 13000

■ Product Line

Devices	Input	Output	Order No.
VariTrans® B 13000 Input and output calibrated switchable	0 ... 20 mA, 4 ... 20 mA, 0 ... 10 V	0 ... 20 mA, 4 ... 20 mA, 0 ... 10 V	B 13000 F1
VariTrans® B 13000 with fixed settings	0 ... 20 mA 0 ... 20 mA 0 ... 20 mA 4 ... 20 mA 4 ... 20 mA 4 ... 20 mA 0 ... 10 V 0 ... 10 V 0 ... 10 V	0 ... 20 mA 4 ... 20 mA 0 ... 10 V 0 ... 20 mA 4 ... 20 mA 0 ... 10 V 0 ... 20 mA 4 ... 20 mA 0 ... 10 V	B 13016 F1 B 13017 F1 B 13018 F1 B 13026 F1 B 13016 F1 B 13028 F1 B 13036 F1 B 13037 F1 B 13038 F1
Power supply			
230 V AC			
24 V AC/DC			336

■ Specifications

Input data

Inputs	0 ... 20 mA 4 ... 20 mA 0 ... 10 V	Terminal selectable/switchable (factory setting 0 ... 20 mA) or fixed settings (see Product line)
Input resistance	Current input Voltage input	Voltage drop approx. 500 mV at 20 mA Approx. 1 Mohm
Overload	Current input Voltage input	≤ 300 mA Voltage limitation with suppressor diode 30 V, max. permitted continuous current 30 mA

Output data

Outputs	0 ... 20 mA 4 ... 20 mA 0 ... 10 V	Switchable (factory setting 0 ... 20 mA) or fixed settings (see Product line)
(Transmission of negative measurement signals up to approx. -5 % full scale)		

Isolation Amplifiers for Standard Signals

Isolation Amplifiers
Transmitters

Indicators

Process Analytics

Portable Meters

Laboratory Meters

Sensors

Fittings

Knick 

Specifications (continued)

Output data (continued)

Load	With output current ≤ 10 V (500 ohms at 20 mA) With output voltage ≤ 10 mA (1 kohm at 10 V) ¹⁾
Offset	20 μ A or 10 mV
Residual ripple	< 20 mV _{rms}

Transmission behavior

Gain error	< 0.4 % meas.val. (DC)
Cut-off frequency	> 1 kHz, -3 dB
Temperature coefficient ²⁾	0.015 %/K full scale (reference temperature 23 °C)

Power supply

Power supply	230 V AC, -15 % $+10$ %, 48 ... 62 Hz, approx. 2 VA
Option 336:	24 V AC/DC AC: ± 15 %, 48 ... 62 Hz, approx. 2 VA DC: ± 15 %, approx. 0.9 W

Isolation

Galvanic isolation	3-port isolation between input, output and power supply
Test voltage	3.25 kV AC input against output against power supply
Working voltage (basic insulation)	600 V AC/DC with overvoltage category II and pollution degree 2 according to EN 61010-1. For applications with high working voltages, you should ensure there is sufficient spacing or isolation from neighboring devices and protection against electric shocks.

Standards and approvals

Surge withstand	5 kV, 1.2/50 μ s, according to IEC 255-4
EMC ³⁾	89/336/EEC directive; EN 61326
Approvals	CUL: File No. E 216767, Standards UL 3101-1, CSA-C22.2-95, No. 10101-1 GL: No. 14627-99 HH

1) Higher voltage output load on request

2) Average TC in specified operating temperature range -10 °C ... $+60$ °C

3) Slight deviations are possible while there is interference

Modular Housings

VariTrans® B 13000

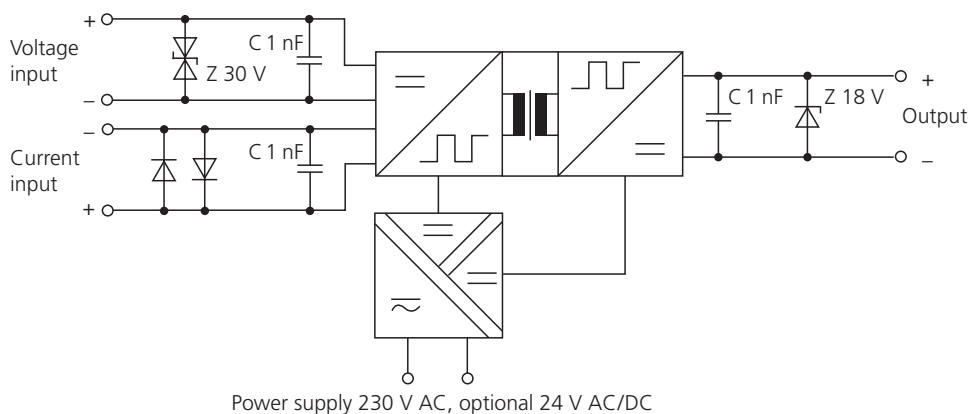
Specifications (continued)

Other data

MTBF ⁴⁾	Approx. 91 years
Ambient temperature	Operation: -10 ... +60 °C Transport and storage: -20 ... +85 °C
Design	Modular housing type F1, with screw terminals, width 12.5 mm, see dimension drawings for further measurements
Ingress protection	IP 20
Mounting	For 35 mm top hat rail to EN 50022 See dimension drawings for conductor cross section
Weight	Approx. 150 g

4) Mean Time Between Failures – MTBF – according to EN 61709 (SN 29500). Conditions: stationary operation in well-kept rooms, average ambient temperature 40 °C, no ventilation, continuous operation

■ Block Diagram



Isolation Amplifiers for Standard Signals

Isolation Amplifiers
Transmitters

Indicators

Process Analytics

Portable Meters

Laboratory Meters

Sensors

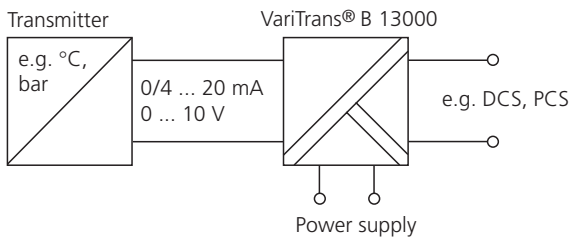
Fittings

Knick >

■ Application Examples

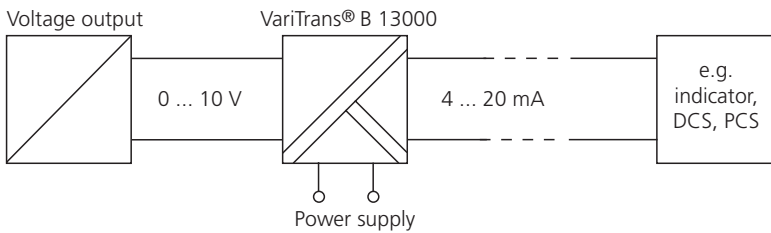
Electrical isolation

for safe coupling of the measurement signals to the evaluation electronics



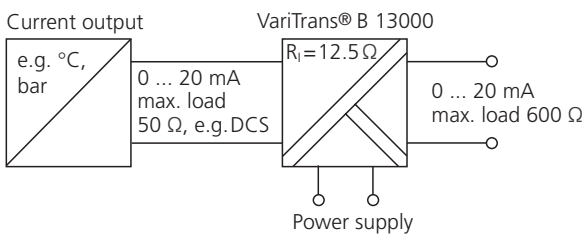
Signal conversion

e.g. conversion of voltage signals into current signals for interference-free signal transmission over long distances



Load increase

e. g. for low load capability signals



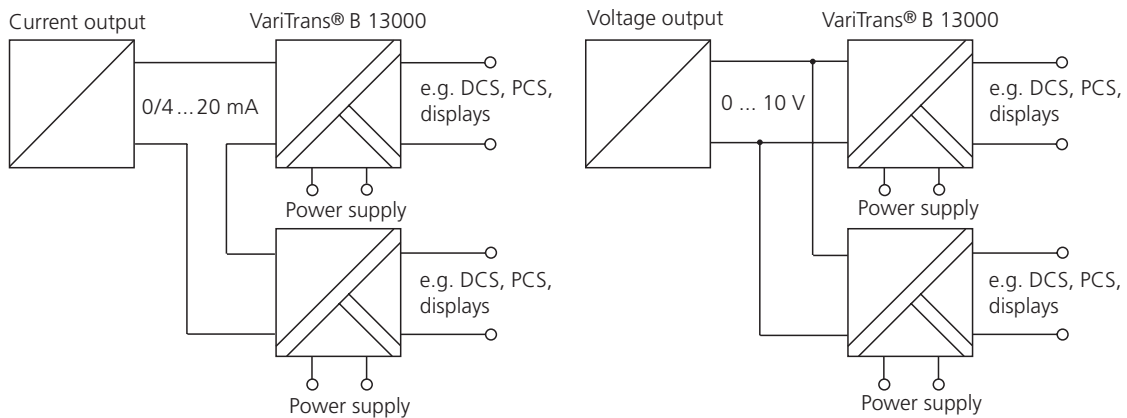
Modular Housings

VariTrans® B 13000

Application Examples (continued)

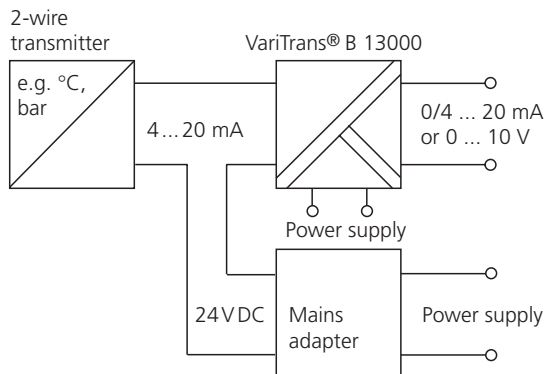
Signal Multiplication

e. g. for correct evaluation of measurement signals in different devices



2-wire application

for simple set-up of 2-wire measuring circuits



Isolation Amplifiers for Standard Signals

Isolation Amplifiers
Transmitters

Indicators

Process Analytics

Portable Meters

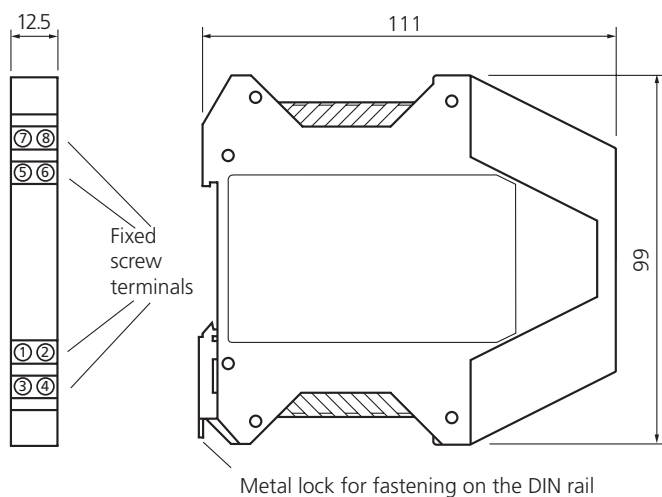
Laboratory Meters

Sensors

Fittings

Knick

■ Dimension Drawings and Terminal Assignments



Terminal Assignments

1	Input	+	Current	5	Output	+
2	Input	-	Current	6	Output	-
3	Input	+	Voltage	7	Power supply	≈
4	Input	-	Voltage	8	Power supply	≈

Conductor cross-section max. 2.5 mm²

Multi-wire connection max. 1 mm² (two wires with same cross-section)

All dimensions in mm!

Modular Housings

Knick >

VariTrans® A 20000



The world's first 3-port standard signal isolator in a 6 mm modular housing with Safe Isolation to EN 61140.

The Task

Isolation and conversion of 0 ... 20 mA, 4 ... 20 mA as well as 0 ... 10 V standard signals with high demands to measurement accuracy. At the same time, best possible protection of personnel and equipment must be guaranteed.

The Problem

The standards governing the erection of installations demand Safe Isolation according to EN 61140. The tightly dimensioned installation space on the mounting rail must be optimally used. Procurement logistics and stockkeeping call for a universal product which covers all common signal combinations.

The Solution

In spite of the just 6 mm narrow modular housing, the new VariTrans® A 20000 meets the requirements of EN 61140 regarding Safe Isolation up to an operating voltage of 300 V. Test voltage is 2.5 kV AC.

Very small leakage capacitances also ensure that high transient common-mode interferences can be reliably isolated and do not lead to system malfunctions. Standardization and flexible signal conversion are optimally implemented by the calibrated range selection – on-site calibration becomes superfluous.

The Housing

The 6-mm-wide modular housing allows high component density in the enclosure. Connection of power supply is facilitated by a simple-to-install cross-connection comb which can be cut to length as required.

The Advantages

3-port isolation allows universal usability. The input and output circuits can be applied to any potentials, taking account of the permitted working voltages. The distinction between input and output isolation amplifier is not required with the VariTrans® A 20000 because all three electric circuits are galvanically isolated from each other.

The Technology

Knick achieves a significant increase in reliability and service life through the development of isolation amplifiers with extremely low power consumption and low self-heating. This leads to a significant increase in the reliability and service life of the electronic components – for example, the MTBF (Mean Time Between Failures) of the new VariTrans® A 20000 isolation amplifier is 440 years. As the design of the electrical isolation also takes the requirements of EN 61131-2 into account, the isolator is ideal for DCS applications.

Isolation amplifiers are mainly used for d.c. current signals, but the correct transmission of fast signal changes cannot be dispensed with. Excellent large-signal characteristics guarantee a correct run into the overrange limit. Dead times, hysteresis, signal reversal, or latch-up effects are prevented – an indispensable feature for further processing in the DCS.

**Warranty
5 years!**

Defects occurring within 5 years from delivery are remedied free of charge at our works (carriage and insurance paid by sender).

Isolation Amplifiers for Standard Signals

Isolation Amplifiers
Transmitters

Indicators

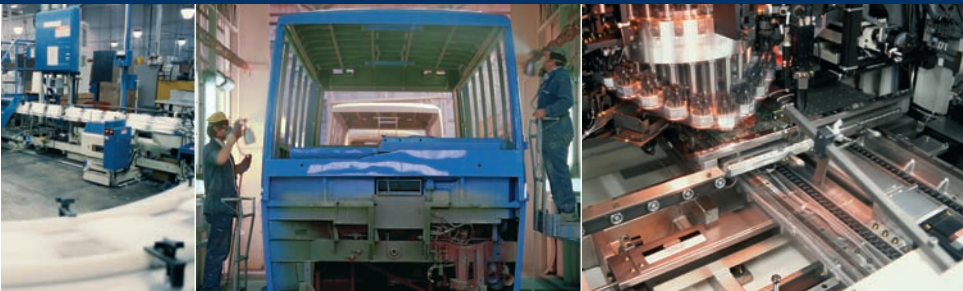
Process Analytics

Portable Meters

Laboratory Meters

Sensors

Fittings



Knick >

■ The Facts

3-port isolation
in a 6 mm housing

Protection of personnel and equipment conforming to standards

Safe Isolation according to EN 61140

Best price/performance ratio

High accuracy and isolation – 2.5 kV AC test voltage

Low-cost installation

Convenient power supply through pluggable cross-connection

Cost reduction by smaller switch cabinets

More channels per meter of rail thanks to space-saving 6-mm housing and closely packed mounting

Long service life

Extremely low failure rate (MTBF of 440 years) due to reduced self-heating

High accuracy and temperature stability

Gain error 0.2 % meas. val. and temperature coefficient 0.01 %/K

Calibrated range selection
without complicated adjustments

Simple configuration

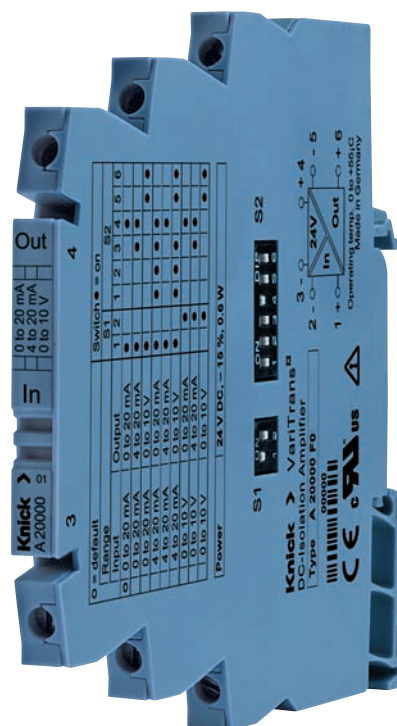
DIL switches accessible from outside

Adjustable or fixed range models

International application

UL /CSA approvals

5-year warranty



6
mm
CLASS

Modular Housings

Modular Housings

VariTrans® A 20000

■ Product Line

Devices	Input	Output	Order No.
VariTrans® A 20000 Input and output calibrated switchable	0 ... 20 mA, 4 ... 20 mA, 0 ... 10 V	0 ... 20 mA, 4 ... 20 mA, 0 ... 10 V	A 20000 F0
VariTrans® A 20000 with fixed settings	0 ... 20 mA 0 ... 20 mA 0 ... 20 mA 4 ... 20 mA 4 ... 20 mA 4 ... 20 mA 0 ... 10 V 0 ... 10 V 0 ... 10 V	0 ... 20 mA 4 ... 20 mA 0 ... 10 V 0 ... 20 mA 4 ... 20 mA 0 ... 10 V 0 ... 20 mA 4 ... 20 mA 0 ... 10 V	A 20016 F0 A 20017 F0 A 20018 F0 A 20026 F0 A 20016 F0 A 20028 F0 A 20036 F0 A 20037 F0 A 20038 F0
Cross-connections	Pluggable cross-connection for looping through of power supply for up to 41 power supply connections of VariTrans® A 20000, splittable		ZU 0542

Power supply

24 V DC

■ Specifications

Input data

Inputs	0 ... 20 mA 4 ... 20 mA 0 ... 10 V	Switchable (factory setting 0 ... 20 mA)
Input resistance	Current input: Voltage input:	Voltage drop < 0.1 V at 20 mA, with open current output or power failure approx. 350 mV Approx. 100 kohms
Overload	Current input: Voltage input:	< 100 mA Voltage limitation with suppressor diode 30 V, max. permitted continuous current 3 mA

Output data

Outputs	0 ... 20 mA 4 ... 20 mA 0 ... 10 V	Switchable (factory setting 0 ... 20 mA)
Load	With output current: With output current:	≤ 10 V (≤ 500 ohms at 20 mA) ≤ 1 mA (≥ 10 kohms at 10 V)
Offset	< 20 µA or < 10 mV	
Residual ripple	< 10 mV _{rms}	

Isolation Amplifiers for Standard Signals

Isolation Amplifiers
Transmitters

Indicators

Process Analytics

Portable Meters

Laboratory Meters

Sensors

Fittings

Knick 

Specifications (continued)

Transmission behavior

Gain error ¹⁾	< 0.2 % meas. val. with direct 1:1 current transmission < 0.3 % meas.val. with voltage input and/or voltage output
Temperature coefficient ²⁾	< 0.01 %/K full scale (reference temperature 23 °C)
Cut-off frequency	> 100 Hz, -3 dB

Power supply

Power supply	24 V DC (± 15 %), approx. 0.6 W The power supply can be routed from one device to another via cross-connections.
--------------	--

Isolation

Galvanic isolation	3-port isolation between input, output and power supply
Test voltage	2.5 kV AC, 50 Hz: Input against output/power supply 510 V AC, 50 Hz: Output against power supply
Working voltage (basic insulation)	Up to 300 V AC/DC across input and output / power supply with overvoltage category II and pollution degree 2, up to 100 V AC/DC across output and power supply with category II and degree 2 according to EN 61010 Part 1.
Protection against electric shock	Safe Isolation according to EN 61140 by reinforced insulation up to 300 V according to EN 61010-1 with overvoltage category II and pollution degree 2 between input and output/power supply. For applications with high working voltages, you should ensure there is sufficient spacing or isolation from neighboring devices and protection against electric shocks.

Standards and approvals

EMC ³⁾	Product standard: EN 61326 Emitted interference: Class B Immunity to interference: Industry
Approval	cURus, File Nr. E 220033 Standards: UL 508 and CAN/CSA 22.2 no. 14-95

Other data

MTBF ⁴⁾	Approx. 440 years
Ambient temperature	During operation: 0 ... +55 °C when mounted in row During storage: -40 ... +85 °C

1) Additional error in live-zero operation 20 μ A or 10 mV

2) Average TC in specified operating temperature range 0 °C ... +55 °C

3) Slight deviations are possible while there is interference

4) Mean Time Between Failures – MTBF – according to EN 61709 (SN 29500).

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

Modular Housings

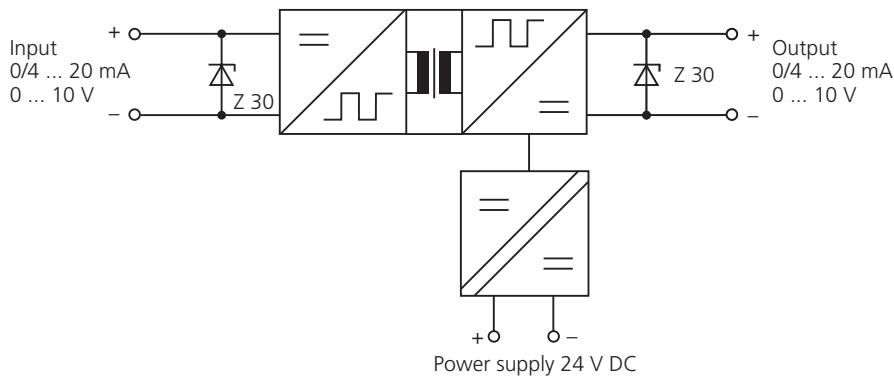
VariTrans® A 20000

Specifications (continued)

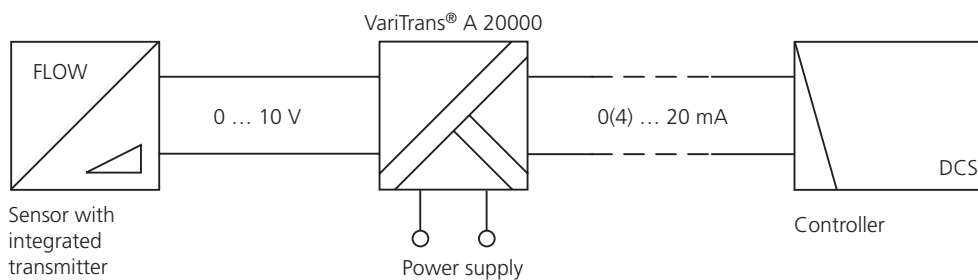
Other data (continued)

Design	Modular housing with screw terminals, power supply also possible via cross-connections, width 6.1 mm, see dimension drawing for other measurements
Ingress protection	IP 20
Mounting	For 35 mm top hat rail to EN 60715
Weight	Approx. 50 g

■ Block Diagram



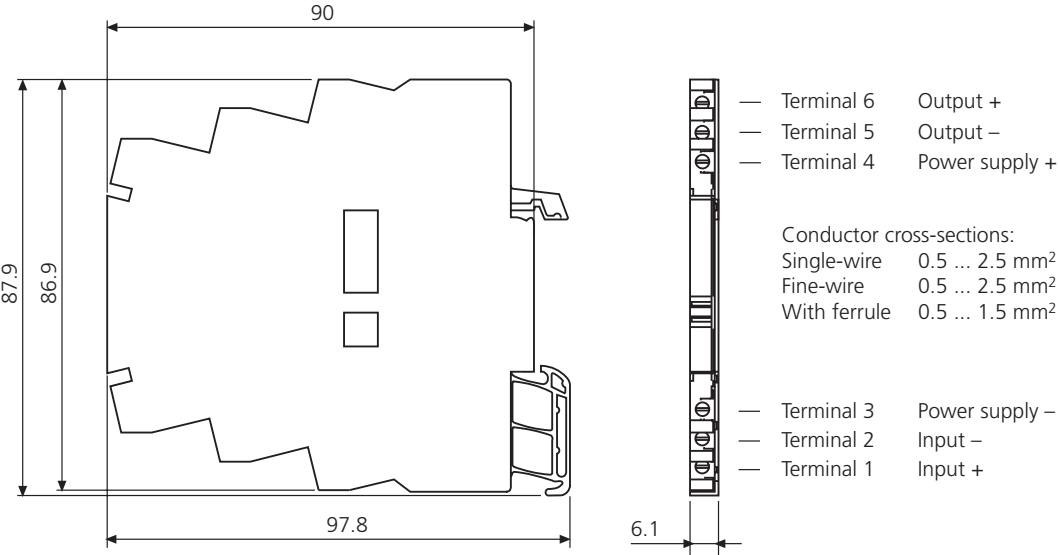
■ Application Example



Isolation Amplifiers for Standard Signals



■ Dimension Drawings and Terminal Assignments



All dimensions in mm!

Modular Housings

Knick >

The world's first 3-port standard signal isolator in a 6 mm modular housing.

The Task

Isolation and, if necessary, conversion of 0 ... 20 mA, 4 ... 20 mA as well as 0 ... 10 V standard signals. If you have limited space and budget, there could still be difficulties when it comes to selecting a suitable isolator despite the standard requirements for transfer in the selection.

The Problems

Up to now the only way of reducing costs substantially was to opt for low quality products. As a large number of different signals also required a large number of isolators, this also led to considerable stockkeeping costs.

The Solution

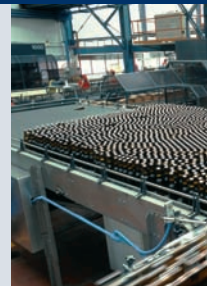
With its extreme compactness and low self-heating, the new standard-signal isolator from Knick sets new standards. The VariTrans® B 10000 is available with nine selectable, calibrated ranges or as one of eight different variants with fixed settings. In any case it has an extremely attractive price.

The Housing

Measuring only 6 mm, the closed modular housing of the VariTrans® B 10000 allows up to 163 active isolation amplifiers per meter top-hat rail.

A pluggable cross-connection for power supply ensures quick and therefore inexpensive mounting.

VariTrans® B 10000



The Advantages

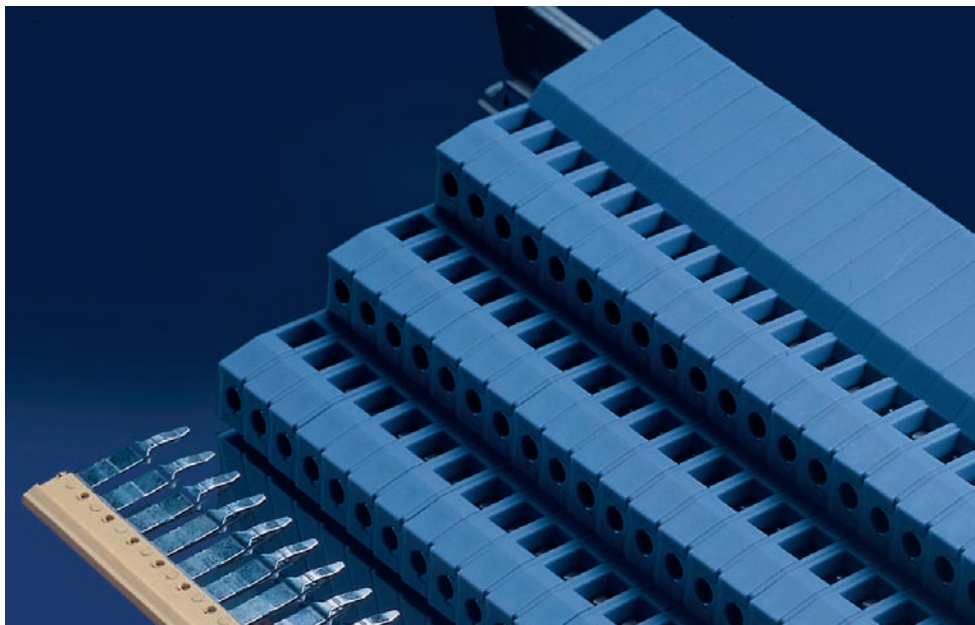
In spite of the reduced space, the VariTrans® B 10000 provides true 3-port isolation between input, output, and power supply to prevent parasitic voltages.

The Technology

Analog signal processing with transformer isolation ensures excellent signal transmission. The input and output ranges can easily be selected using DIP switches.

**Warranty
5 years!**

Defects occurring within 5 years from delivery are remedied free of charge at our works (carriage and insurance paid by sender).



Isolation Amplifiers for Standard Signals

Isolation Amplifiers
Transmitters

Indicators

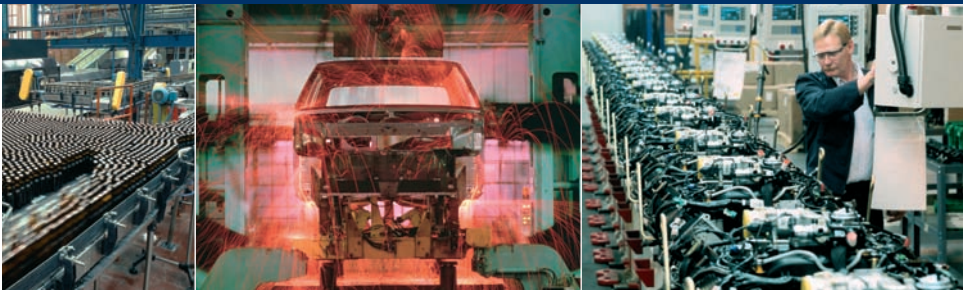
Process Analytics

Portable Meters

Laboratory Meters

Sensors

Fittings



Knick >

■ The Facts

Safety in the smallest of spaces
3-port isolation in a 6-mm housing

Space-saving assembly
No ventilation clearances required since there is no noticeable heat development

Attractive price
One of the cheapest high-quality isolators on the market

Long service life
Extremely low failure rate (MTBF of 440 years) due to reduced self-heating

Good accuracy
Exemplary signal transmission for standard applications

Low-cost installation
Pluggable cross-connections allow easy and extremely cost-efficient connection of power supply to several VariTrans® B 10000 units

Calibrated range selection
without complicated adjustments

8 fixed-range variants
if range shifting is to be avoided

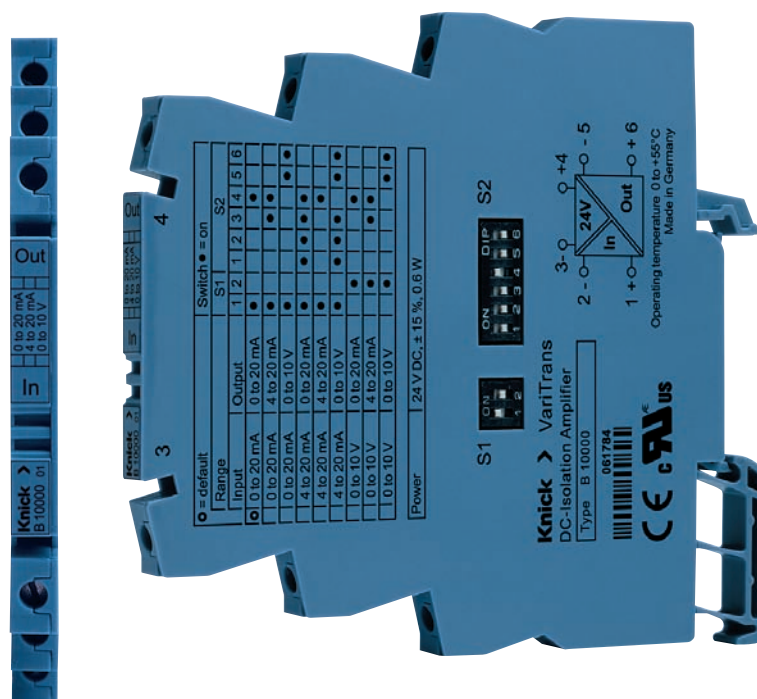
3-port isolation
Prevention of incorrect measurements caused by potential differences

Simple configuration
DIL switches accessible from outside

5-year warranty

CE **RU** US

6
mm
CLASS



Modular Housings

Modular Housings

VariTrans® B 10000

■ Product Line

Devices	Input	Output	Order No.
VariTrans® B 10000 with calibrated input and output selection	0 ... 20 mA, 4 ... 20 mA, 0 ... 10 V	0 ... 20 mA, 4 ... 20 mA, 0 ... 10 V	B 10000 FO
VariTrans® B 10000 with fixed settings	0 ... 20 mA 0 ... 20 mA 0 ... 20 mA 4 ... 20 mA 4 ... 20 mA 4 ... 20 mA 0 ... 10 V 0 ... 10 V 0 ... 10 V	0 ... 20 mA 4 ... 20 mA 0 ... 10 V 0 ... 20 mA 4 ... 20 mA 0 ... 10 V 0 ... 20 mA 4 ... 20 mA 0 ... 10 V	B 10016 FO B 10017 FO B 10018 FO B 10026 FO B 10016 FO B 10028 FO B 10036 FO B 10037 FO B 10038 FO
Cross-connections	Pluggable cross-connection for looping through of the power supply for up to 41 power supply connections of the VariTrans® B 10000, splittable.		ZU 0542
Power supply	24 V DC		

■ Specifications

Input data

Inputs	0 ... 20 mA 4 ... 20 mA 0 ... 10 V	Calibrated range selection or fixed settings (see Product Line)
Input resistance	Current input: Voltage input:	Voltage drop < 0.1 V at 20 mA, with open current output or power failure approx. 350 mV Approx. 100 kohms
Overload	Current input: Voltage input:	< 100 mA Voltage limitation with suppressor diode 30 V, max. permitted continuous current 3 mA

Output data

Outputs	0 ... 20 mA 4 ... 20 mA 0 ... 10 V	Calibrated range selection or fixed settings (see Product line)
Load	With output current: With output voltage:	≤ 10 V (≤ 500 ohms at 20 mA) ≤ 1 mA (≥ 10 kohms at 10 V)
Offset	< 20 µA or < 10 mV	
Residual ripple	< 10 mV _{rms}	

Isolation Amplifiers for Standard Signals

Isolation Amplifiers
Transmitters

Indicators

Process Analytics

Portable Meters

Laboratory Meters

Sensors

Fittings

Knick 

Specifications (continued)

Transmission behavior

Gain error ¹⁾	< 0.3 % full scale
Cut-off frequency	> 100 Hz, -3 dB
Temperature coefficient ²⁾	< 0.01 %/K full scale (reference temperature 23 °C)

Power supply

Power supply	24 V DC (± 15 %), 0.6 W The power supply can be routed from once device to another via cross-connections.
--------------	--

Isolation

Galvanic isolation	3-port isolation between input, output and power supply
Test voltage	510 V AC
Working voltage (basic insulation)	100 V AC/DC with overvoltage category II and pollution degree 2 according to EN 61010-1. For applications with high working voltages, you should ensure there is sufficient spacing or isolation from neighboring devices and protection against electric shocks.

Standards and approvals

EMC ³⁾	Product standard EN 61326, emitted interference: Class B, Immunity to interference: Industry
Approval	cURus, File No. E 220033, Standards: UL 508 and CAN/CSA 22.2 no. 14-95

Other data

MTBF ⁴⁾	Approx. 440 years
Ambient temperature	Operation: 0 ... +55 °C Transport and storage: -25 ... +85 °C
Design	Modular housing with screw terminals, width 6.1 mm, see dimension drawings for further measurements
Ingress protection	IP 20
Mounting	For 35 mm top hat rail to EN 60715, see dimension drawings for conductor cross section
Weight	Approx. 50 g

1) Additional error in live-zero operation 20 µA or 10 mV

2) Average TC in specified operating temperature range 0 °C ... +55 °C

3) Slight deviations are possible while there is interference

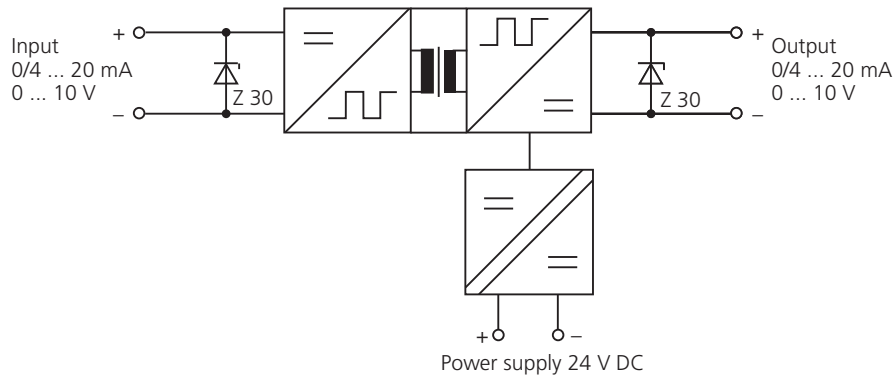
4) Mean Time Between Failures – MTBF – according to EN 61709 (SN 29500).

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

Modular Housings

VariTrans® B 10000

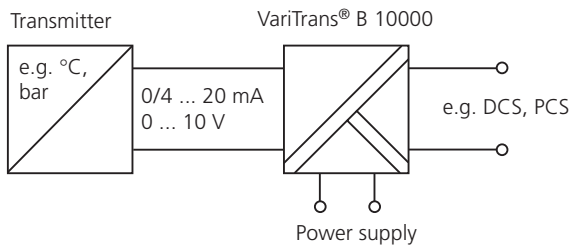
■ Block Diagram



■ Application Examples

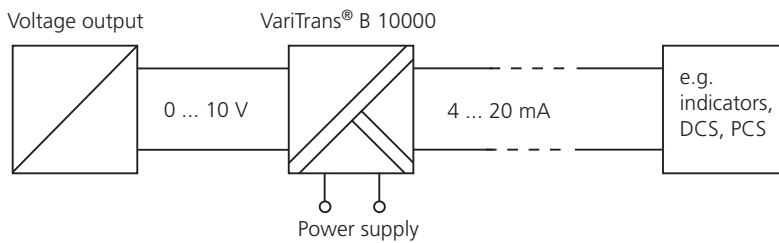
Electrical isolation

for safe coupling of the measurement signals to the evaluation electronics



Signal conversion

e.g. conversion of voltage signals into current signals for interference-free signal transmission over long distances



Isolation Amplifiers for Standard Signals

Isolation Amplifiers
Transmitters

Indicators

Process Analytics

Portable Meters

Laboratory Meters

Sensors

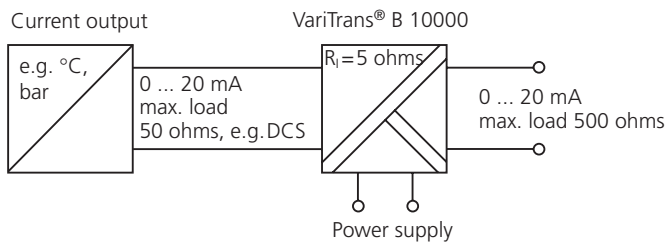
Fittings

Knick >

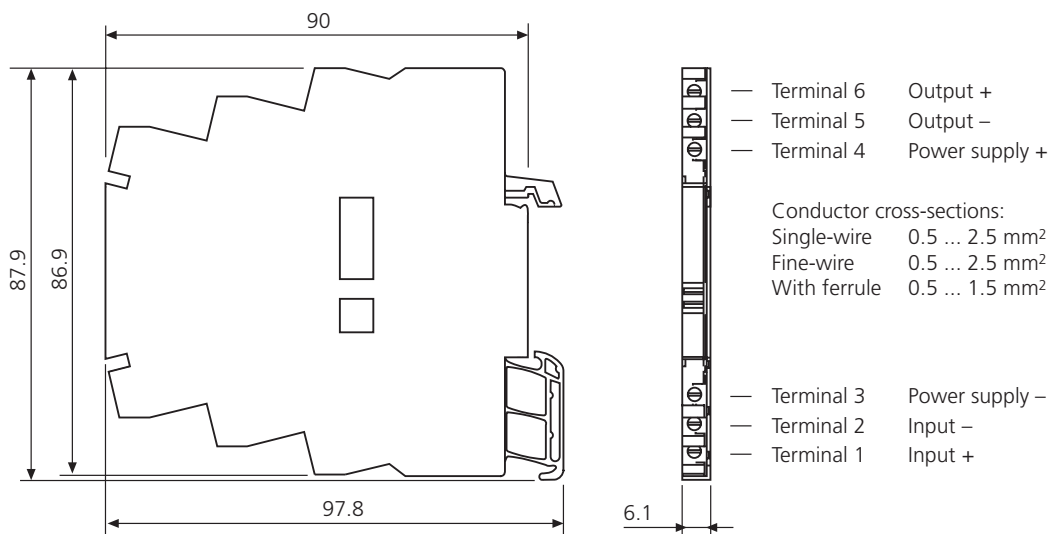
Application Examples (continued)

Load increase

e. g. for low load capability signals



■ Dimension Drawings and Terminal Assignments



All dimensions in mm!

Modular Housings

Modular Housings

Knick >

VariTrans® A 20300



Signal doublers with two switchable calibrated outputs in a 6 mm housing, also for applications with high-level output loads.



The Task

Isolation and transmission of 0(4) ... 20 mA and 0 ... 10 V standard signals in two 0(4) ... 20 mA output channels with galvanic isolation between input, outputs, and power supply.

The Problems

Measuring and control engineering frequently requires an analog standard signal to be processed at two points, i.e. by two devices, both of which are to recognize the signal. To prevent falsified signals and in particular, in the event of errors, interaction or even damage, it is vital to isolate signals and devices galvanically from one another.

The Solution

The VariTrans® A 20300 signal doubler is an extremely compact product which also allows the task to be dealt with cost-efficiently. Its input, both outputs, and power supply are decoupled from one another (4-port isolation).

The Housing

Measuring only 6 mm, the ultra-slim, closed 8-pin modular housing of the VariTrans® A 20300 takes up only a little space on the top hat rail and, if necessary, can be installed at a later date.

The Advantages

As a signal doubler:

In addition to “doubling” the analog signal, the VariTrans® A 20300 can also convert signals, if required. For example, if the signal source has only one voltage output but the installation uses current signals, the signal doubler converts the voltage signal (0 ... 10 V) proportionally into the required current signals (0 ... 20 mA or 4 ... 20 mA). An adjustment from “Dead Zero” (0 ... 20 mA) to “Live Zero” (4 ... 20 mA) is also possible. The corresponding input and output signals are calibrated and can be selected using DIP switches, the two outputs being switched together.

For load increase:

The VariTrans® A 20300 may also be used when a particularly high output load is required. Standard signal sources can often drive a load of up to 500 ohms, i.e. supply 10 V at 20 mA. Sometimes certain devices – e.g. actuators – require a higher voltage, i.e. their input resistance is higher. Likewise in this case, the signal doubler can solve the problem: Both output signals are now not used separately but are connected in series to form one signal. The available voltage is then doubled allowing an increased load up to 1000 ohms (20 V at 20 mA). The 0/4 up to 20 mA current which determines the signal remains, of course.

The Technology

In order to implement the high functionality of an A 20300 in the smallest of spaces – in a 6 mm wide modular housing with correspondingly small volume – a patented circuit technology is used. The energy balance (2 active outputs) in particular must be optimized for all operating conditions. An application for patent has been filed for the circuit principles of the VariTrans® A 20300. Like all products in the VariTrans® A 20XXX series, the signal doubler also provides Safe Isolation according to EN 61140 to ensure high-level protection of personnel and equipment. This is achieved by means of increased insulation in compliance with EN 61010-1.

In spite of being only 6 mm wide, the VariTrans® A 20300 makes no compromises regarding its insulation properties.

Standard Signal Doublers

Isolation Amplifiers
Transmitters

Indicators

Process Analytics

Portable Meters

Laboratory Meters

Sensors

Fittings



Knick >

Warranty
5 years!

Defects occurring within 5 years from delivery are remedied free of charge at our works (carriage and insurance paid by sender).

■ The Facts

Safety in the smallest of spaces
4-port isolation in a 6-mm housing

Signal doubling
combined with signal conversion

Load increase
up to 1000 ohms possible for inputs with high input impedances

Personal protection
through Safe Isolation according to EN 61140

Flexible use
with DIP switches accessible from the outside

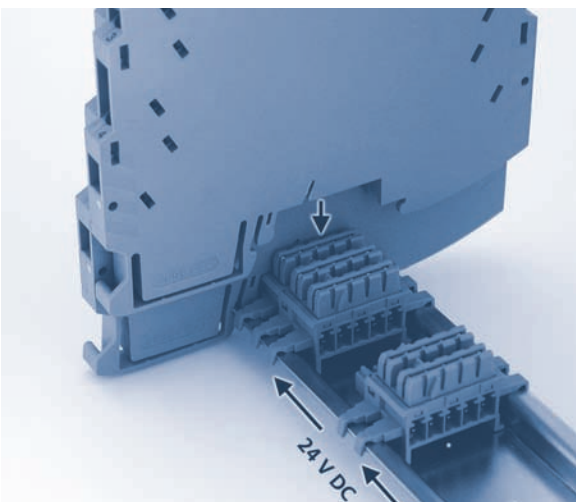
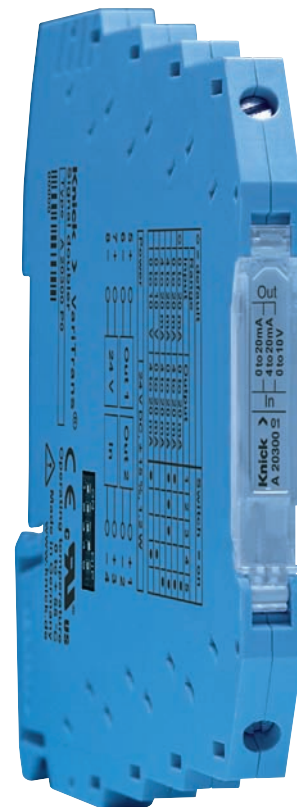
Calibrated range selection
without complicated adjustments

Low-cost solution
Only one compact, low-cost device is required instead of two conventional isolators

International application
UL /CSA approvals

5-year warranty

6mm CLASS



◀ The power supply can be routed from one device to another via DIN rail bus connectors.

Modular Housings

Modular Housings

VariTrans® A 20300

■ Product Line

Devices	Input	2 outputs	Order No.
VariTrans® A 20300 calibrated switchable (both outputs together)	0 ... 20 mA, 4 ... 20 mA, 0 ... 10 V	0 ... 20 mA, 10 V 4 ... 20 mA, 10 V	A 20300 P0

Power supply

24 V DC

Accessories

DIN rail bus connectors ZU 0628	Power supply bridging for 2 devices, A 20XXX P0 or P 32XXX P0	ZU 0628
IsoPower® A 20900	Power supply, 24 V DC, 1 A (see Page 212)	A 20900 H4
Power terminal block ZU 0677	Feeding the 20 ... 30 V DC supply voltage to the ZU 0628 DIN rail bus connector	ZU 0677

■ Specifications

Input data

Input	0 ... 20 mA, 4 ... 20 mA, 0 ... 10 V, switchable (factory setting 0 ... 20 mA)	
Input resistance	Current input:	Voltage drop ≤ 0.1 V at 20 mA (approx. 350 mV with power failure)
	Voltage input:	Approx. 100 kohms
Overload	Current input:	Self-resetting overcurrent protection (PTC characteristic)
	Voltage input:	Voltage limitation with suppressor diode 30 V, max. permitted continuous current 3 mA

Output data

Outputs 1 and 2	0 ... 20 mA, 4 ... 20 mA, switchable together (factory setting 0 ... 20 mA)	
Load	≤ 10 V (≤ 500 ohms at 20 mA), ≤ 20 V (both outputs in series)	
Offset	< 30 μ A	
Residual ripple	< 10 mV _{rms} (at 500 ohms load)	
Cut-off frequency	> 100 Hz	

Transmission behavior

Gain error ¹⁾	< 0.2 % meas. val. with direct 1:1 current transmission < 0.3 % meas. val. with voltage input	
--------------------------	--	--

1) Additional error in live-zero operation 20 μ A

Standard Signal Doublers

Isolation Amplifiers
Transmitters

Indicators

Process Analytics

Portable Meters

Laboratory Meters

Sensors

Fittings

Knick 

Specifications (continued)

Response (continued)

Temperature coefficient²⁾ < 0.01 %/K full scale (reference temperature 23 °C)

Power supply

Power supply 24 V DC (± 15 %), approx. 1.2 W
The power supply can be routed from one device to another via DIN rail bus connectors.

Isolation

Galvanic isolation 4-port isolation between input, outputs, and power supply

Test voltage 1.5 kV AC, 50 Hz: Power supply against input
2.5 kV AC, 50 Hz: Outputs among each other and against input/power supply

Working voltage (basic insulation) Up to 300 V AC/DC across all circuits with overvoltage category II and pollution degree 2.
For applications with high working voltages, you should ensure there is sufficient spacing or isolation from neighboring devices and protection against electric shocks.

Protection against electric shock Safe Isolation according to EN 61140 by reinforced insulation according to EN 61010-1.
Working voltages up to 300 V AC/DC across each output and all other circuits with overvoltage category II and pollution degree 2.
For applications with high working voltages, you should ensure there is sufficient spacing or isolation from neighboring devices and protection against electric shocks.

Standards and approvals

EMC³⁾ Product standard: EN 61326
Emitted interference: Class B
Immunity to interference: Industry

Approval cURus, File No. E 220033, Standards: UL 508 and CAN/CSA 22.2 no. 14-95

Other data

MTBF⁴⁾ Approx. 240 years

Ambient temperature During operation: 0 ... +55 °C when mounted in row
During storage: -25 ... +85 °C

Design Modular housing with screw terminals, width 6.2 mm,
see dimension drawings for further measurements

Ingress protection IP 20

Mounting For 35 mm top hat rail to EN 60715

Weight Approx. 50 g

²⁾ Average TC in specified operating temperature range 0 °C ... +55 °C

³⁾ Slight deviations are possible while there is interference

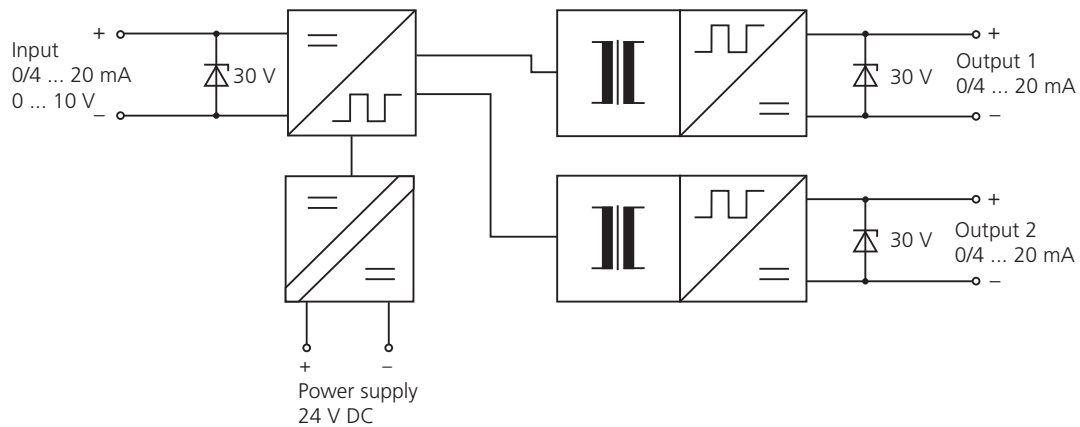
⁴⁾ Mean Time Between Failures – MTBF – according to EN 61709 (SN 29500).

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

Modular Housings

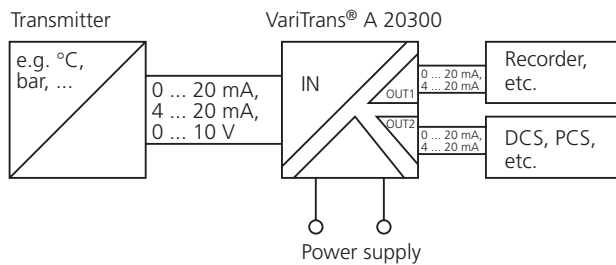
VariTrans® A 20300

■ Block Diagram

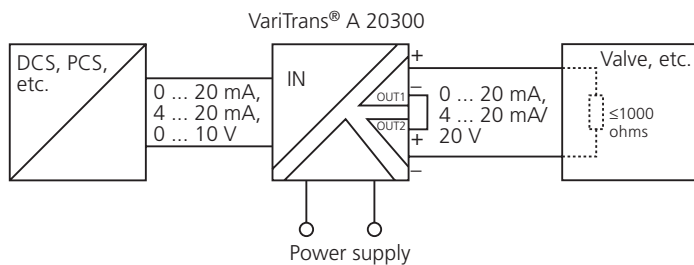


■ Application Examples

Signal doubling



Load increase



Standard Signal Doublers

Isolation Amplifiers
Transmitters

Indicators

Process Analytics

Portable Meters

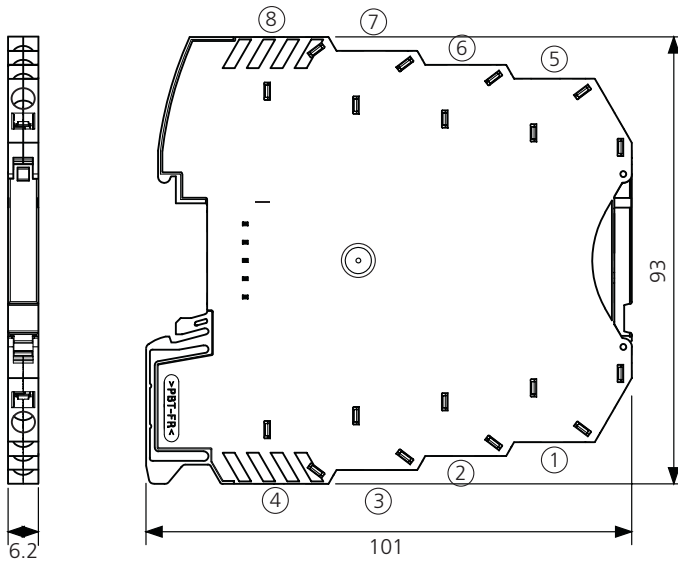
Laboratory Meters

Sensors

Fittings

Knick >

■ Dimension Drawings and Terminal Assignments



- ① Output 2, +
- ② Output 2, -
- ③ Input, +
- ④ Input, -
- ⑤ Output 1, +
- ⑥ Output 1, -
- ⑦ Power supply, +
- ⑧ Power supply, -

Conductor cross-sections
– Single-wire: 0.2 ... 2.5 mm²
– Fine-wire: 0.2 ... 2.5 mm²
– 24-14 AWG

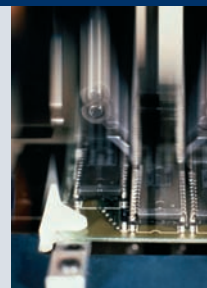
All dimensions in mm!

Modular Housings

Modular Housings

Knick >

IsoTrans® 41



**For isolation of
0(4) ... 20 mA standard
current signals;
up to 3 channels.**

The Task

If there is no power supply available, the galvanic isolation of 0(4) ... 20 mA standard current signals requires investment in power supply units.

The Problems

Many products provide loop-powered isolation with insufficient accuracy only. The desire for high accuracy demands an isolator concept that fulfils the highest expectations.

The load capability of the 20-mA source is limited and therefore requires economical handling of the load voltage.

The Solution

Knick IsoTrans® 41 with transformer potential isolation has specifications well beyond other loop-powered DC isolation amplifiers. 0.2 % fault class and just 1.2 V voltage requirement allow diverse uses of this isolator.

The Housing

The A2 modular housing with a width of 22.5 mm for max. 3 isolators offers optimum space usage in multichannel mode. The A3 modular housing for one isolator is just 17.5 mm wide.

The full encapsulation guarantees a high level of reliability even in extreme conditions.

The Advantages

The galvanic isolation in the IsoTrans® 41 is achieved using a passive isolator that obtains its power as a voltage drop from the measurement signal. This saves on supply units and cabling and increases the reliability accordingly.

The Technology

The units work with a serial chopper generator in the current path. This avoids the accuracy-reducing current losses of normal parallel connected generators, considerably reduces the voltage drop, and ensures accurate transmission even of the lowest currents.

The Application

Galvanic isolation

- of input and output circuits
- the supply voltage of 2-wire transmitters
- in the case of addition or another coupling of signals at different potentials
- for removal of double ground compensation currents
- when there is an insufficient insulation and test voltage
- of high-potential signal sources
- for battery-powered devices with a central battery

**Warranty
5 years!**

Defects occurring within 5 years from delivery are remedied free of charge at our works (carriage and insurance paid by sender).

Loop-Powered Isolators for Standard Signals

Isolation Amplifiers
Transmitters

Indicators

Process Analytics

Portable Meters

Laboratory Meters

Sensors

Fittings



Knick >

■ The Facts

Loop-powered

No mains influences

Extremely high accuracy

Broad field of application

Current transmission
from 2 μ A to 50 mA

Maximum reliability

No unnecessary heat and
therefore maximum service life of
components

Negligible loading of the measurement signal

Voltage drop just 1.2 V

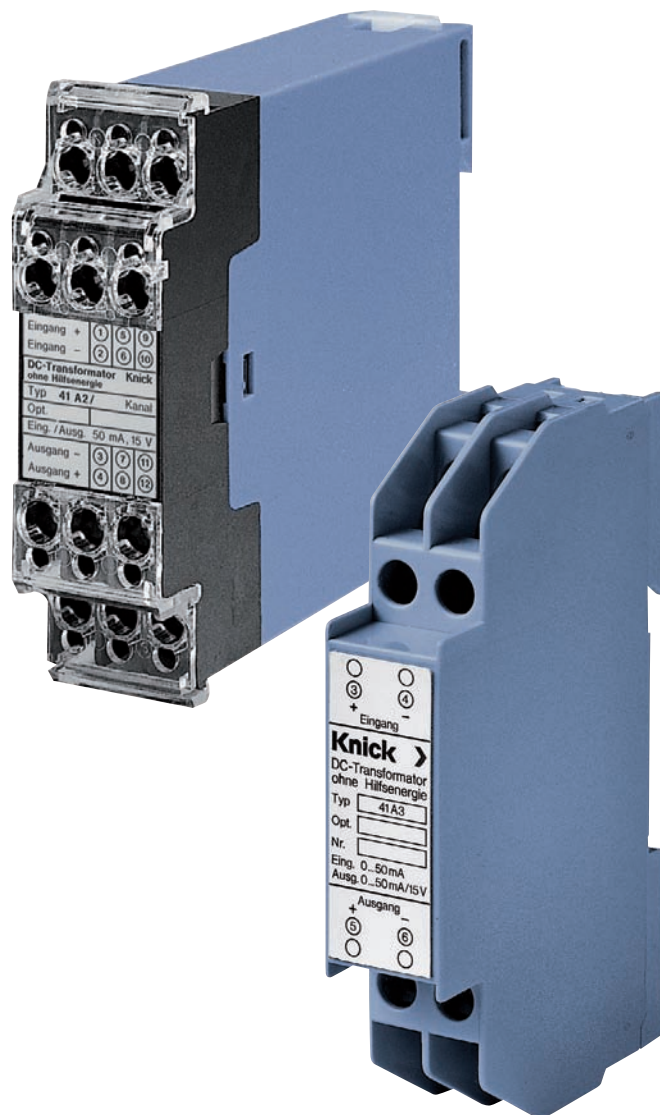
Low signal delay

Space-saving due to multichannel variants

Modular housing with up to
three channels

Computer-controlled testing guarantees quality

5-year warranty



Modular Housings

IsoTrans® 41

■ Product Line

Devices		Order No.
IsoTrans® 41	1-channel, A2 modular housing (width: 22.5 mm) 2-channel, A2 modular housing (width: 22.5 mm) 3-channel, A2 modular housing (width: 22.5 mm) 1-channel, A3 modular housing (width: 17.5 mm)	41 A2 / 1 41 A2 / 2 41 A2 / 3 41 A3
Power supply	None, supply from input signal	

■ Specifications

Input data

Inputs	0(4) ... 20 mA 0 ... 50 mA
Operating current	< 2 μ A
Voltage drop	Approx. 1.2 V (20 mA) Approx. 1.6 V (50 mA)
Overload	100 mA, 20 V (see also page 84)

Output data

Output	0(4) ... 20 mA/max. 15 V (corresponds to 750 ohms load) 0 ... 50 mA/max. 15 V (corresponds to 300 ohms load)
Offset	< 5 μ A
Residual ripple ¹⁾	< 1.5 mV _{pp} /mA

Transmission behavior

Transformation error ²⁾	0.02 % meas. val.
Load error	< 0.02 % meas. val. per 100 ohms
Rise or fall time	Approx. 2.5 ms at 500 ohms load resistance

1) Slightly increased residual ripple can occur when load < 5 ohms

2) Temperature range -10 ... +70 °C

Loop-Powered Isolators for Standard Signals

Isolation Amplifiers
Transmitters

Indicators

Process Analytics

Portable Meters

Laboratory Meters

Sensors

Fittings

Knick 

Specifications (continued)

Isolation

Test voltage	2.5 kV AC
Working voltage (basic insulation)	500 V DC across any inputs and outputs with overvoltage category II and pollution degree 3 according to EN 61010-1 (with model 41 A2/3 across neighboring inputs and outputs, with pollution degree 2 inside the housing, degree 3 outside). For applications with high working voltages, you should ensure there is sufficient spacing or isolation from neighboring devices and protection against electric shocks.

Standards and approvals

Surge withstand	5 kV, 1.2/50 μ s, according to IEC 255-4
Immunity to interference	8 kV according to IEC 801-2

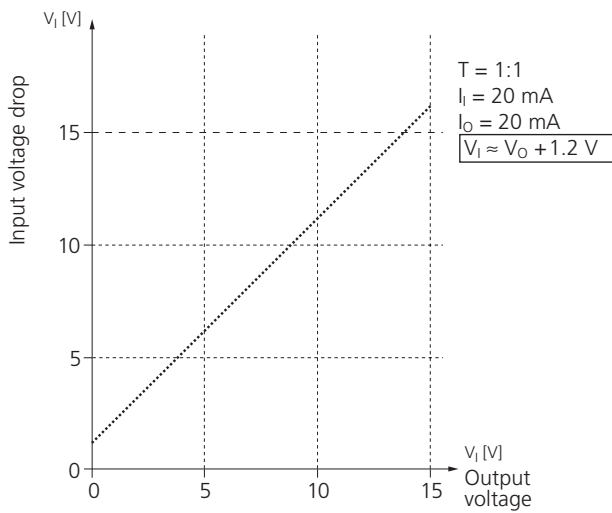
Other data

Ambient temperature	-25 ... +80 °C
Design	A2 modular housing, 22.5 mm wide, A3 modular housing, 17.5 mm wide, see dimension drawings for further measurements
Ingress protection	Protection class with terminal cover according to DIN 40050: Housing IP 40, terminals IP 20
Mounting	Snap-on mounting for 35 mm top hat rail according to EN 50022 or M4 screw mounting See dimension drawings for conductor cross section
Weight	41 A2 / 1: Approx. 140 g 41 A2 / 2: Approx. 190 g 41 A2 / 3: Approx. 210 g 41 A3: Approx. 70 g

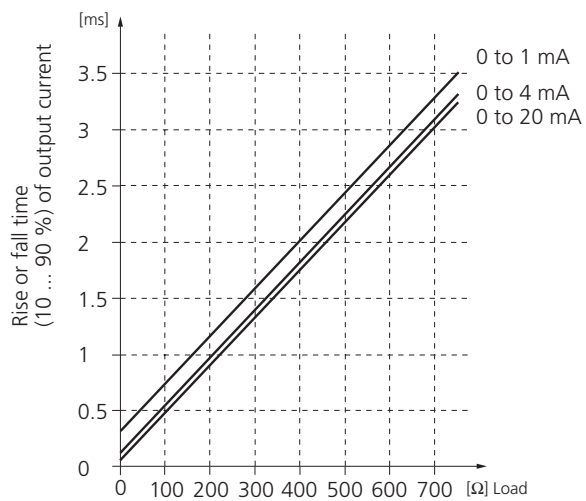
Modular Housings

IsoTrans® 41

■ Transfer Function



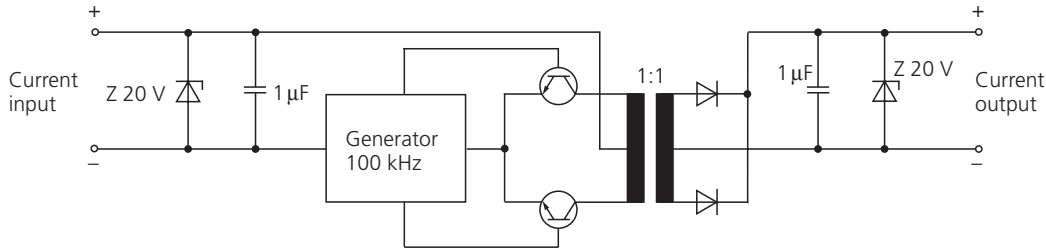
■ Reactions to Square Step of Input Current



Loop-Powered Isolators for Standard Signals



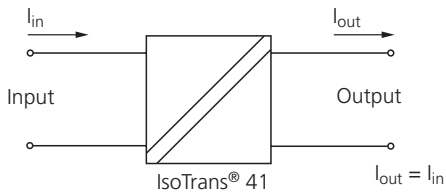
■ Block Diagram



■ Application Examples

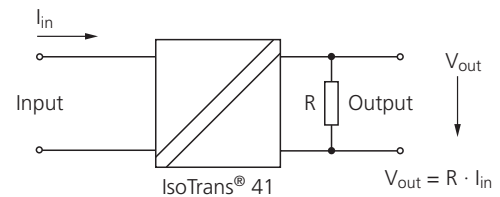
Electrical isolation

with impressed current, current output



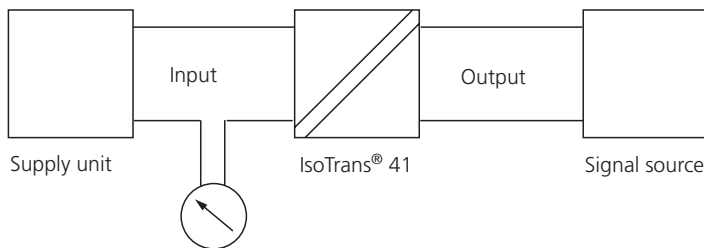
Electrical isolation

with impressed input current, voltage output



Electrical isolation

in two-wire technology



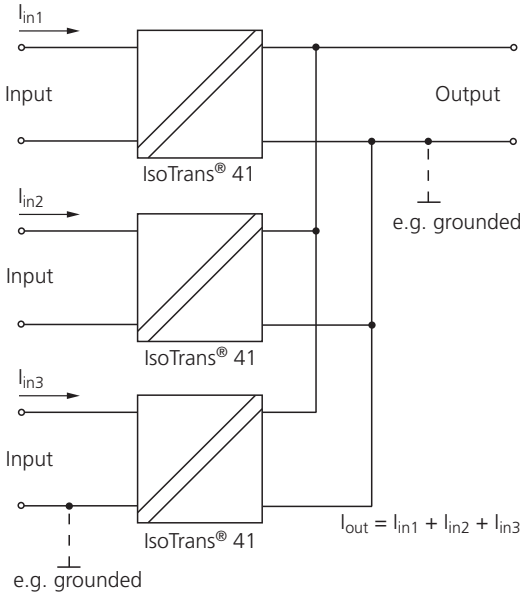
Modular Housings

IsoTrans® 41

Application Examples (continued)

Electrical isolation

for current addition with impressed currents



Loop-Powered Isolators for Standard Signals

Isolation Amplifiers
Transmitters

Indicators

Process Analytics

Portable Meters

Laboratory Meters

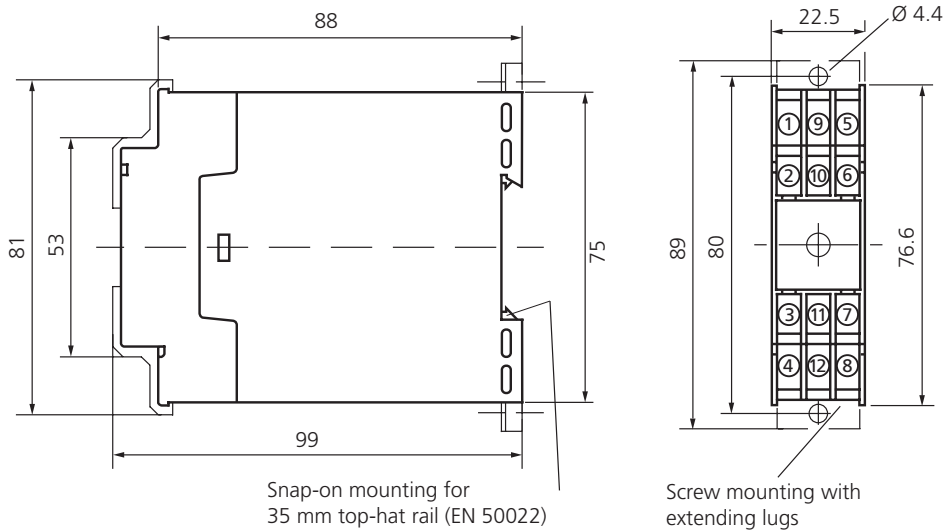
Sensors

Fittings

Knick 

■ Dimension Drawings and Terminal Assignments

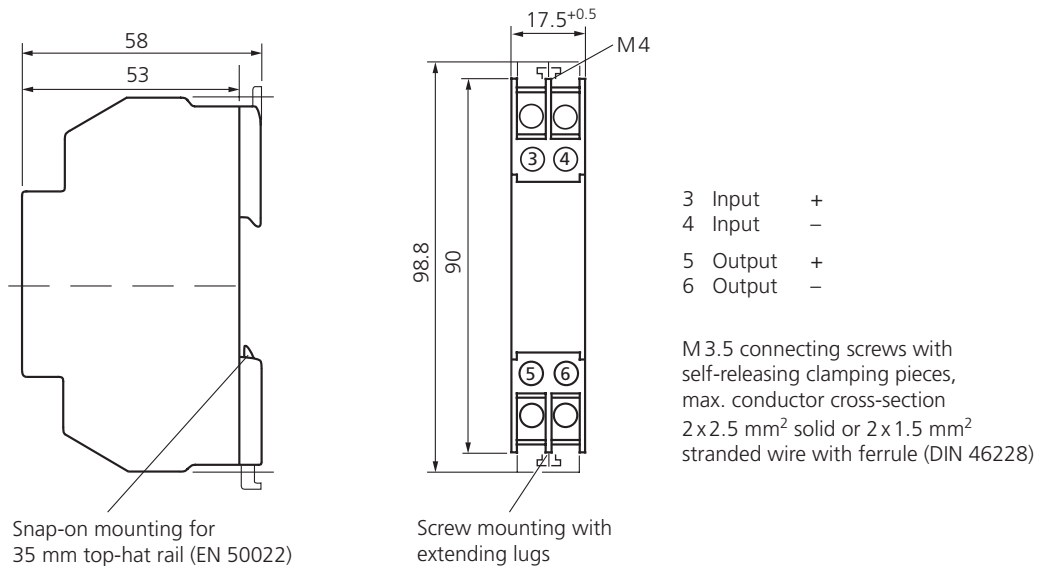
Type A2 Modular Housing



Channel 1	1 Input	+	Channel 2	5 Input	+	Channel 3	9 Input	+
	2 Input	-		6 Input	-		10 Input	-
	3 Output	-		7 Output	-		11 Output	-
	4 Output	+		8 Output	+		12 Output	+

M 2.5 x 8 connecting screws with self-releasing clamping pieces, max. conductor cross-section 2 x 2.5 mm² solid or 2 x 1.5 mm² stranded wire with ferrule

Type A3 Modular Housing



All dimensions in mm!

Modular Housings

Knick >

IsoTrans® A 47



**For isolation of
0(4) ... 20 mA standard
signals, up to 4 channels.**

The Task

Guaranteeing reliable and safe system operation requires galvanic isolation between sensors and controller (e. g. PCS or DCS).

The Problems

are often, particularly in large plants, the lack of space for mounting the isolators and the increasing operating temperatures in distributors and enclosures.

The Solution

comes in the form of the Knick Advanced Series IsoTrans® A 47 loop-powered isolators. An extremely high component density of 177 channels per meter mounting rail and excellent technical properties, such as their safe isolation, make the isolators unbeatable!

The Housing

The modern modular housings with a width of 12.5 mm for one or two channels and 22.5 mm width for four channels with practical plug-in terminals allow simple and quick assembly or prewiring of the enclosure.

The Function Principle

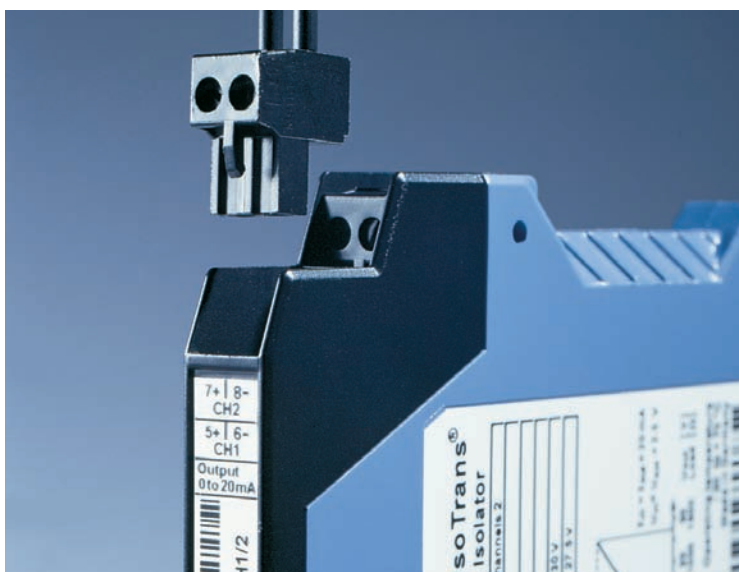
The IsoTrans® A 47 obtains its power as a voltage drop directly from the measurement signal without falsifying it. There are no costs for a power supply and wiring.

The IsoTrans® A 47 has virtually no self-heating that would cause the electronic components to age faster. Together with a patented switching technique, this means maximum reliability. Due to this extraordinary long service life: a 5-year warranty!

The Technology

A transmission error of just 0.1 %, excellent square-wave response and very low residual ripple guarantee perfect signal transmission. The low voltage drop of approx. 2.5 V only loads the signal slightly.

The high test voltage up to 4 kV and Safe Isolation up to 300 V according to EN 61140 protect operating personnel against the mains voltage, for example.



Loop-Powered Isolators for Standard Signals

Isolation Amplifiers
Transmitters

Indicators

Process Analytics

Portable Meters

Laboratory Meters

Sensors

Fittings



Knick >

■ The Facts

Extremely compact design

Up to 177 channels per meter

1-, 2-, and 4-channel versions

Cheap and flexible for a wide range of applications

Practical screw terminals

Simple, time-saving assembly and prewiring of enclosures

Galvanic isolation between input and output

Protection against incorrect measurements or damage to the equipment due to parasitic voltages

No power supply required

Cost savings due to lower wiring requirement, no mains influences, no unnecessary heating and therefore maximum service life of components

High accuracy

No distortion of the measurement signal

Maximum reliability

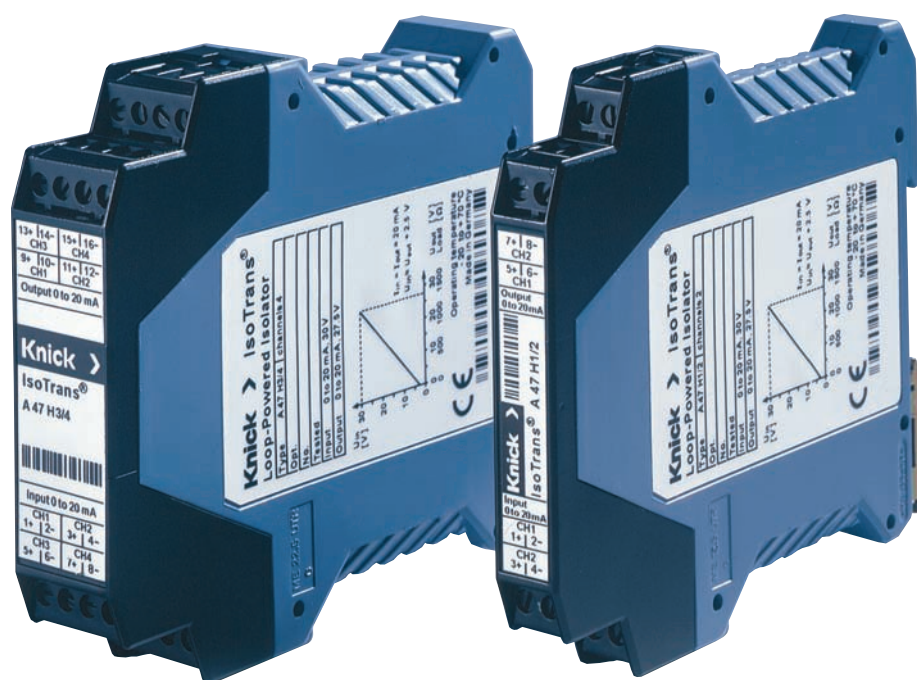
No repair and failure costs

5-year warranty

RA us

Warranty
5 years!

Defects occurring within 5 years from delivery are remedied free of charge at our works (carriage and insurance paid by sender).



Modular Housings

Modular Housings

IsoTrans® A 47

■ Product Line

Devices		Order No.
IsoTrans® A 47	1-channel, H1 modular housing (width: 12.5 mm) 2-channel, H1 modular housing (width: 12.5 mm) 4-channel, H3 modular housing (width: 22.5 mm)	A 47 H1 / 1 A 47 H1 / 2 A 47 H3 / 4
Power supply	None, supply from input signal	
Options	Increased test voltage 4 kV AC, Safe Isolation	506

■ Specifications

Input data

Input	0(4) ... 20 mA/max. 30 V (linear transmission up to 50 mA)
Operating current	< 20 μ A
Voltage drop	Approx. 2.5 V at 20 mA
Overload	100 mA, 30 V

Output data

Output	0(4) ... 20 mA/max. 27.5 V (corresponds to 1375 ohms load)
Residual ripple	< 5 mV _{rms}

Transmission behavior

Transmission error	< 0.1 % full scale
Load error	< 0.02 % meas. val./100 ohms
Response time (T_{90})	Approx. 5 ms at 500 ohm load
Temperature coefficient ¹⁾	< 0.002 %/K of meas. val. per 100 ohms load (reference temperature 23 °C)

1) Average TC in specified operating temperature range -10 ... +70 °C

Loop-Powered Isolators for Standard Signals

Isolation Amplifiers
Transmitters

Indicators

Process Analytics

Portable Meters

Laboratory Meters

Sensors

Fittings



Specifications (continued)

Isolation

Test voltage	1.5 kV AC input against output of the same channel 2.3 kV AC channels against each other
--------------	---

Standards and approvals

EMC ²⁾	89/336/EEC directive, EN 61326
Approvals	UL: File No. E 220033, Standards: UL 508 and CAN/CSA 22.2 no. 14

Data for Option 506

Test voltage	4 kV AC input against output of the same channel 2.3 kV AC channels against each other
Protection against electric shock	Safe Isolation according to EN 61140 by reinforced insulation in accordance with EN 61010-1. Working voltages up to 300 V AC/DC across all terminals with overvoltage category II and pollution degree 2. For applications with high working voltages, you should ensure there is sufficient spacing or isolation from neighboring devices and protection against electric shocks.

Other data

MTBF ³⁾	Approx. 1031 years/channel
Ambient temperature	Operation: -10 ... +70 °C Transport and storage: -40 ... +85 °C
Design	Modular housing, width 12.5 or 22.5 mm, with pluggable screw terminal See dimension drawings for further measurements
Ingress protection	IP 20
Mounting	Metal lock for mounting on 35 mm top hat rail according to EN 50022 See dimension drawings for conductor cross section
Weight	Approx. 100 g

²⁾ Applies to 4 ... 20 mA, slight deviations are possible while there is interference

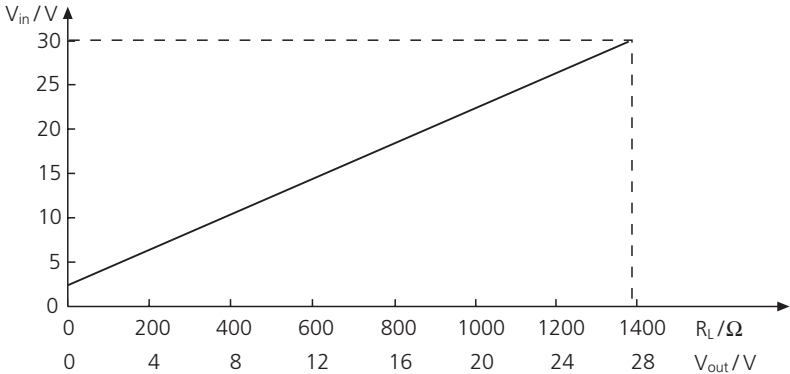
³⁾ Mean Time Between Failures – MTBF – according to EN 61709 (SN 29500).

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

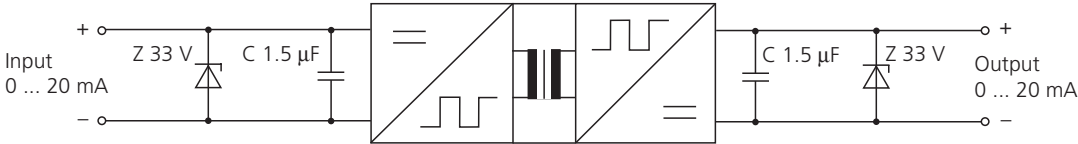
Modular Housings

IsoTrans® A 47

Transfer Function



Block Diagram



Loop-Powered Isolators for Standard Signals

Isolation Amplifiers
Transmitters

Indicators

Process Analytics

Portable Meters

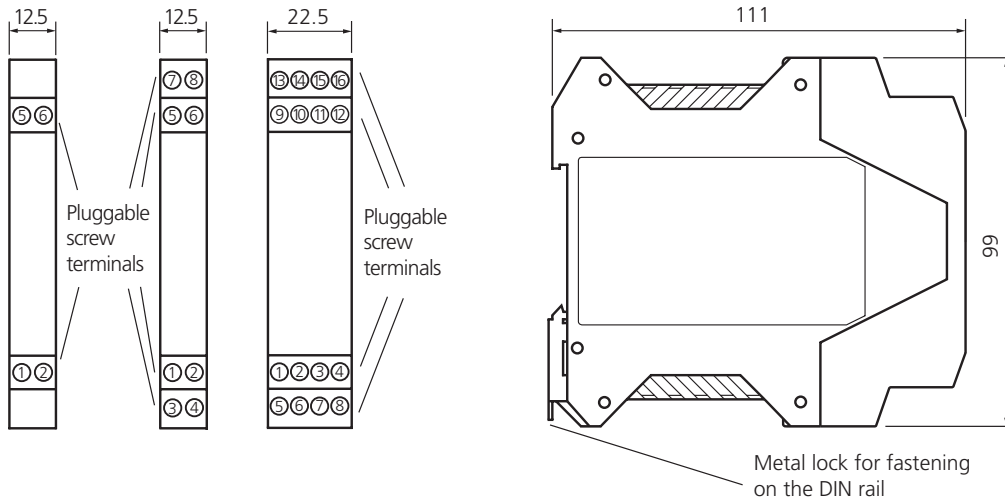
Laboratory Meters

Sensors

Fittings

Knick 

■ Dimension Drawings and Terminal Assignments



Conductor cross-section max. 2.5 mm²

Multi-wire connection max. 1 mm²
(two wires with same cross-section)

1- and 2-channel model

1	Input +	Channel 1
2	Input -	Channel 1
3	Input +	Channel 2
4	Input -	Channel 2
5	Output +	Channel 1
6	Output -	Channel 1
7	Output +	Channel 2
8	Output -	Channel 2

4-channel model

1	Input +	Channel 1	9	Output +	Channel 1
2	Input -	Channel 1	10	Output -	Channel 1
3	Input +	Channel 2	11	Output +	Channel 2
4	Input -	Channel 2	12	Output -	Channel 2
5	Input +	Channel 3	13	Output +	Channel 3
6	Input -	Channel 3	14	Output -	Channel 3
7	Input +	Channel 4	15	Output +	Channel 4
8	Input -	Channel 4	16	Output -	Channel 4

All dimensions in mm!

Modular Housings

Knick >

IsoTrans® B 48



**Unbelievably simple isolation!
20 mA transmission with electrical isolation.**

The Task

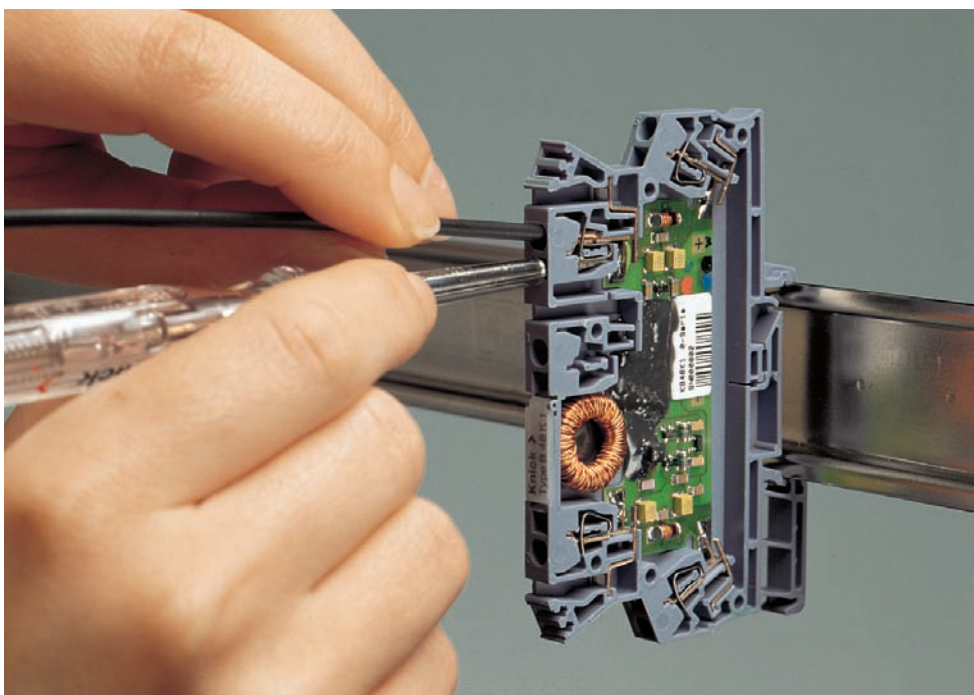
Preventing measuring errors or even destruction of the system normally requires floating connection of the sensors and actuators to the sensitive MSR electronics.

The Problem

was solved up to now with additional devices for electrical isolation after the routing and distributor level.

The Solution

comes in form of the 6-mm wide IsoTrans® B 48 isolating terminal. It fulfills all tasks set for modern terminals and safely and reliably isolates 0(4) ... 20 mA signals using loop power without distorting the measurement signal.



The Connections

use Z-springs and allow simple, fast, and safe connection of the wires.

specialty developed flat-core transformer have led to this extremely narrow housing with a width of just 6 mm. That are up to 166 isolating terminals per meter of mounting rail.

The Technology

The constantly improved circuit concept of our isolators that have been tried and tested over decades and draw their power as a voltage drop from the measurement signal and the use of a

Loop-Powered Isolators for Standard Signals

Isolation Amplifiers
Transmitters

Indicators

Process Analytics

Portable Meters

Laboratory Meters

Sensors

Fittings



Knick >

■ The Facts

Substantial cost- and space-savings

due to the omission of a whole installation stage

Minimum wiring effort

due to loop-powered electrical isolation and the combination of terminal and isolator in one device

Fast, simple, and safe wiring using Z-springs

High level of safety thanks to proven circuit technology

Galvanic isolation

Protection against incorrect measurements or damage to the equipment due to parasitic voltages

Extremely compact design

at just 6 mm in width the modular housing allows up to 166 channels per meter

Easy to use and to maintain

Simple and fast installation due to innovative Z-springs

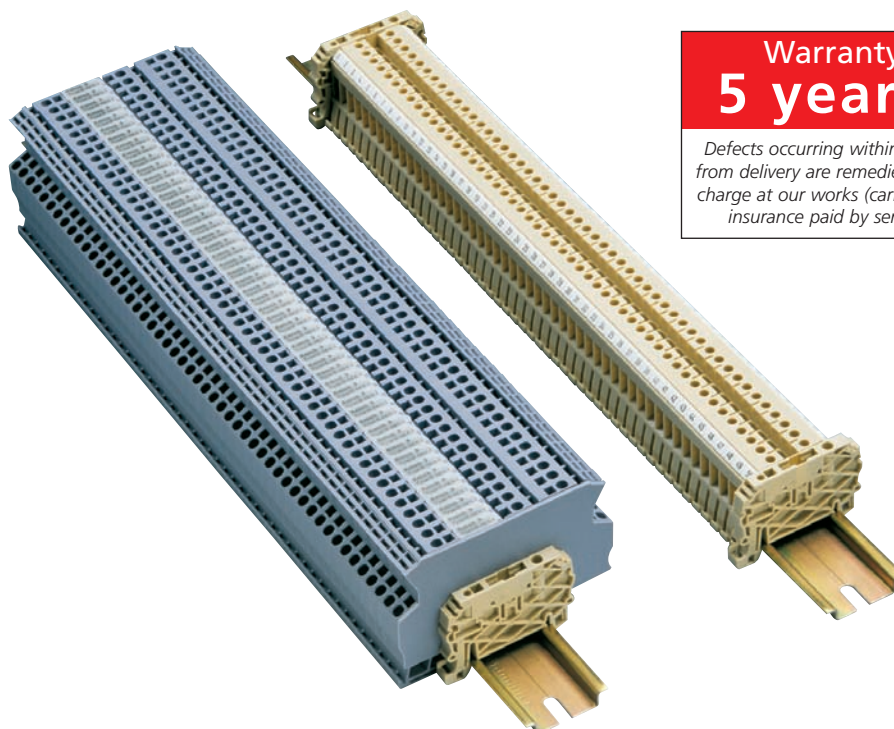
No power supply required

Cost saving due to lower wiring effort, no mains influences

High accuracy

No distortion of measurement signal

5-year warranty



Warranty
5 years!

Defects occurring within 5 years from delivery are remedied free of charge at our works (carriage and insurance paid by sender).

Modular Housings

IsoTrans® B 48

■ Product Line

Devices	Input	Output	Order No.
IsoTrans® B 48	0 ... 20 mA, 4 ... 20 mA	0 ... 20 mA, 4 ... 20 mA	B 48 K1

Power supply

None, supply from input signal

Accessories

End plate	Shock-hazard protection for the last isolating terminal in the row, required 1x per application!	ZU 0286
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■ Specifications

Input data

Input	0 ... 20 mA (linear transmission up to 22 mA)
Operating current	< 100 µA
Voltage drop	Approx. 2.7 V at 20 mA
Overload	50 mA, 15 V

Output data

Output	0 ... 20 mA, ≤ 500 ohms
Residual ripple	< 10 mV _{rms}

Transmission behavior

Transmission error	< 0.1 % full scale
Load error	< 0.05 % meas. val./100 ohms
Response time (T ₉₉)	Approx. 5 ms at 500 ohm load
Temperature coefficient ¹⁾	< 0.005 %/K of meas. val. per 100 ohm load (reference temperature 23 °C)

Isolation

Test voltage	510 V AC
Working voltage	100 V with overvoltage category II and pollution degree 2 according to EN 61010-1

1) Average TC in specified operating temperature range -25 ... +60 °C

Loop-Powered Isolators for Standard Signals

Isolation Amplifiers
Transmitters

Indicators

Process Analytics

Portable Meters

Laboratory Meters

Sensors

Fittings

Knick 

Specifications (continued)

Standards and approvals

EMC ²⁾	89/336/EEC directive, EN 61326
-------------------	--------------------------------

Other data

Ambient temperature	Operation: -25 ... +60 °C also when mounted in row Transport and storage: -40 ... +85 °C
---------------------	---

Design	Terminal housing, 6 mm width, terminal using Z-spring technology See dimension drawings for further measurements
--------	---

Ingress protection	IP 20 in row or with end plate
--------------------	--------------------------------

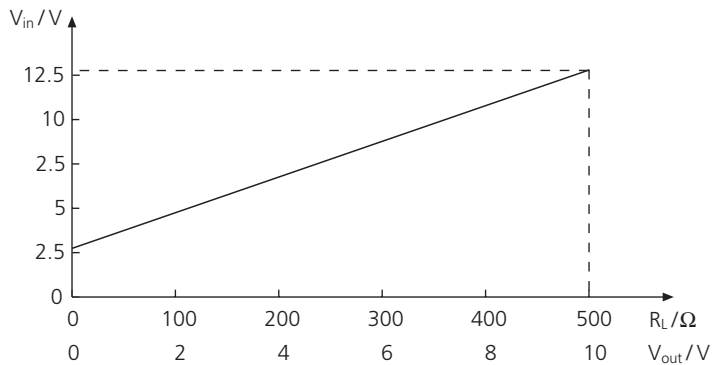
Mounting	For 35 mm top hat rail according to EN 50022, see dimension drawings for conductor cross section
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Weight	12 g
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2) Applies to 4 ... 20 mA, slight deviations are possible while there is interference

■ Input Voltage

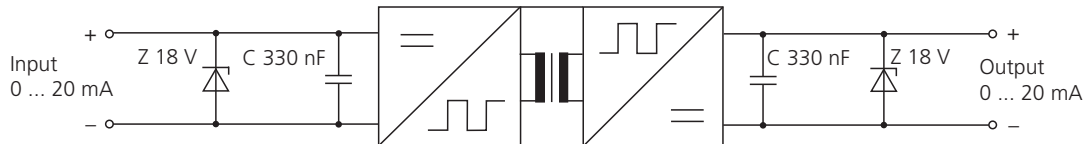
depending on the load at $I_{out} = 20$ mA



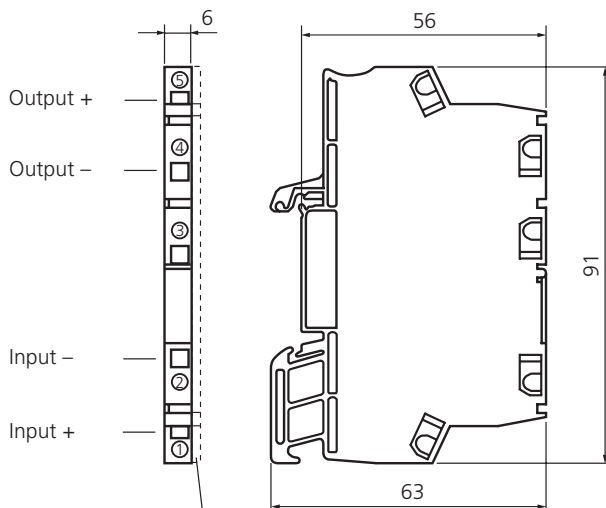
Modular Housings

IsoTrans® B 48

■ Block Diagram



■ Dimension Drawings and Terminal Assignments



ZU 0286 end plate, 1.5 mm wide, only required for last device in row as shock-hazard protection

Conductor cross-sections:

Single-wire	0.5 ... 2.5 mm ²
Fine-wire	0.5 ... 2.5 mm ²
With ferrule	0.5 ... 1.5 mm ²

All dimensions in mm!

Modular Housings

Knick >

IsoTrans® A 20400



The first reactionless passive isolator comprising the Bürdenstop® function to provide safe isolation of 0(4) ... 20 mA standard signals.

The Task

Measurement signals between sensor and controller should be isolated galvanically to ensure reliable and safe operation of the installation. Here, loop-powered standard signal isolators are a low-cost solution. There is no expenditure for power supply units and their wiring.

The Problems

are often, particularly in large plants, the lack of space for mounting the isolators and the increasing operating temperatures in distributors and switch cabinets.

The Solution

comes in the form of the Knick Advanced Series IsoTrans® A 20400 loop-powered isolators. An extremely high component density of up to 320 channels per meter top-hat rail and excellent technical properties, such as their safe isolation, make the isolators unbeatable – as does their price-performance ratio!

The Housing

The ultra-slim 6 mm wide modular housing for one or two channels allows simple and fast assembly.

The Function Principle

The IsoTrans® A 20400 obtains its power directly from the measurement signal as a voltage drop without distorting it.

There are no costs for a power supply and wiring.

The IsoTrans® A 20400 more or less has no self-heating that would cause the electronic components to age faster.

Together with a patented switching technique, this means maximum reliability. Due to this extraordinary long service life: 5 years warranty!

The Technology

A transmission error of just 0.1%, excellent square-wave response and very low residual ripple guarantee perfect signal transmission. The low voltage drop of approx. 1.7 V only loads the signal slightly.

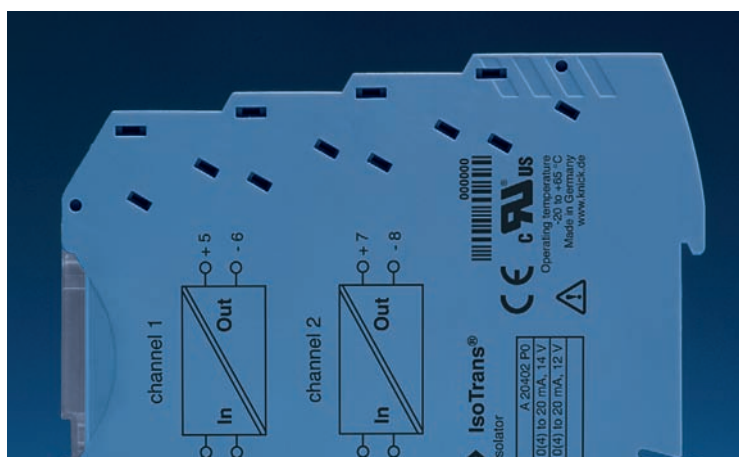
The high test voltage up to 2.5 kV and Safe Isolation up to 300 V according to EN 61140 protect the operating personnel against, for example, the mains voltage.

Interference-Free Functionality

Now Knick has considerably expanded the application possibilities of passive isolators by implementing a Bürdenstop® (load stop) function. Here, the current supplied at the primary side is maintained independently from the output load. Thus, for the first time any excessive load increase at the output, such as caused by line breakage or inconstant loads including complex impedances, can be compensated for.

Warranty
5 years!

Defects occurring within 5 years from delivery are remedied free of charge at our works (carriage and insurance paid by sender).



Isolation Amplifiers for Standard Signals

Isolation Amplifiers
Transmitters

Indicators

Process Analytics

Portable Meters

Laboratory Meters

Sensors

Fittings



Knick >

■ The Facts

Extremely compact design

up to 320 channels per meter

1 and 2-channel versions

cheap and flexible for a wide range of applications

Galvanic isolation between input and output

Protection against incorrect measurements or damage to the equipment due to parasitic voltages

Safe Isolation up to 300 V AC/DC according to EN 61140

to protect personnel and equipment

Bürdenstop® prevents undesired feedback

e.g. in the case of an open output circuit

No power supply required

Cost savings due to lower wiring requirement, no mains influences, no unnecessary heating and therefore maximum service life of components

High accuracy

No distortion of measurement signal

Maximum reliability

No repair and failure costs

International use

UL/CSA approvals

5-year warranty



6
mm
CLASS

GL

Modular Housings

Modular Housings

IsoTrans® A 20400

■ Product Line

Devices	Input	Order No.
IsoTrans® A 20400	1-channel, modular housing P0 (6 mm wide)	A 20401 P0
	2-channel, modular housing P0 (6 mm wide)	A 20402 P0
	1-channel, modular housing P0 (6 mm wide), with Bürdenstop®	A 20411 P0
	2-channel, modular housing P0 (6 mm wide), with Bürdenstop®	A 20412 P0

Power supply

None, supply from input signal

■ Specifications

Input data	A 20401 and A 20402 (without Bürdenstop®)	A 20411 and A 20412 (with Bürdenstop®)
Input	0(4) ... 20 mA/max. 18 V	0(4) ... 20 mA/max. 3 V
Operating current	Approx. 150 µA	Approx. 150 µA
Voltage drop	Approx. 1.7 V at 20 mA	Approx. 1.5 V at 20 mA
Overload	40 mA, 18 V	50 mA, 3 V
Output data		
Output	0(4) ... 20 mA/max. 12 V (600 ohm load at 20 mA)	0(4) ... 20 mA/max. 1.2 V (60 ohm load at 20 mA)
Residual ripple	< 10 mV _{rms}	< 10 mV _{rms}
Transmission behavior		
Transmission error	< 0.1 % full scale	< 0.1 % full scale
Load error	< 0.05 % meas. val./100 ohms	Negligible
Response time (T ₉₉)	Approx. 5 ms at 500 ohm load	Approx. 5 ms at 60 ohm load
Temperature coefficient ¹⁾	< 0.002 %/K of meas. val. per 100 ohm load (reference temperature 23 °C)	< 0.002 %/K of meas. val. (reference temperature 23 °C)

1) Average TC in specified operating temperature range -20 ... +65 °C

Isolation Amplifiers for Standard Signals

Isolation Amplifiers
Transmitters

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Laboratory Meters

Sensors

Fittings

Knick 

Specifications (continued)

Isolation

Test voltage	2.5 kV AC
Working voltage (basic insulation)	Up to 600 V AC/DC with overvoltage category II and pollution degree 2 across input and output of the same channel and channels against each other.
Protection against electric shock	Safe Isolation according to EN 61140 by reinforced insulation in accordance with EN 61010-1. Working voltages up to 300 V AC/DC across input and output of the same channel and across different channels with overvoltage category II and pollution degree 2 . For applications with high working voltages, you should ensure there is sufficient spacing or isolation from neighboring devices and protection against electric shocks.

Standards and approvals

EMC ²⁾	Product standard: EN 61326 Emitted interference: Class B Immunity to interference: Industry
Approvals	cUL: Standards: UL 508 and CAN/CSA 22.2 no. 14-95 GL: No. 32650-06 HH

Other data

MTBF ³⁾	Approx. 1031 years/channel
Chopper frequency	Approx. 100 kHz
Ambient temperature	Operation: -20 ... +65 °C Transport and storage: -25 ... +85 °C
Design	Modular housing with screw terminals, 6.2 mm wide, see dimension drawings for further measurements
Ingress protection	IP 20
Mounting	For 35 mm top hat rail to EN 50022
Weight	Approx. 50 g

2) Applies to 4 ... 20 mA, slight deviations are possible while there is interference

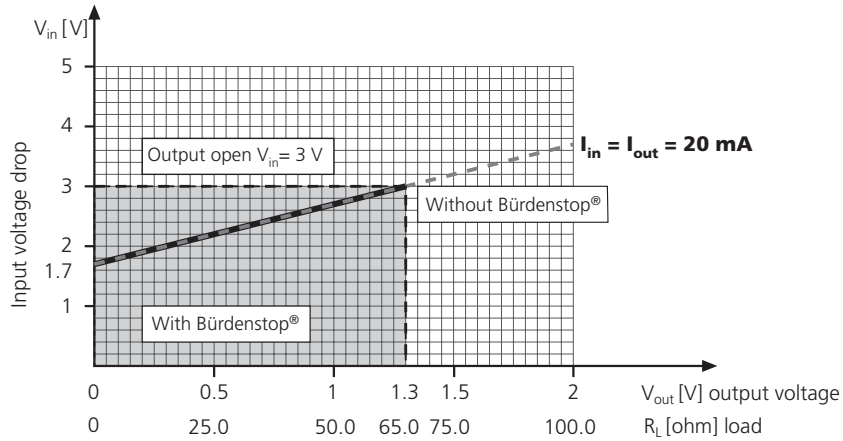
4) Mean Time Between Failures – MTBF – according to EN 61709 (SN 29500).

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

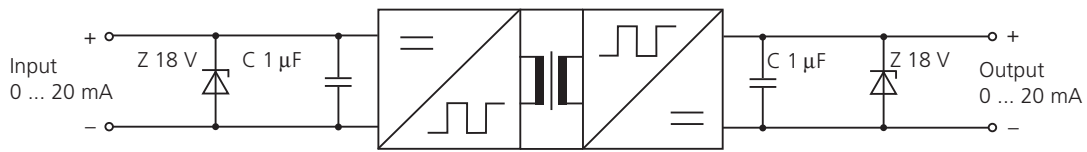
Modular Housings

IsoTrans® A 20400

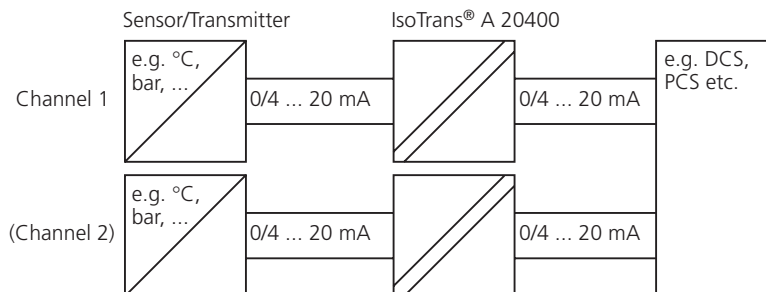
■ Transfer Function with Bürdenstop® (load stop)



■ Block Diagram



■ Application Example



Isolation Amplifiers for Standard Signals

Isolation Amplifiers
Transmitters

Indicators

Process Analytics

Portable Meters

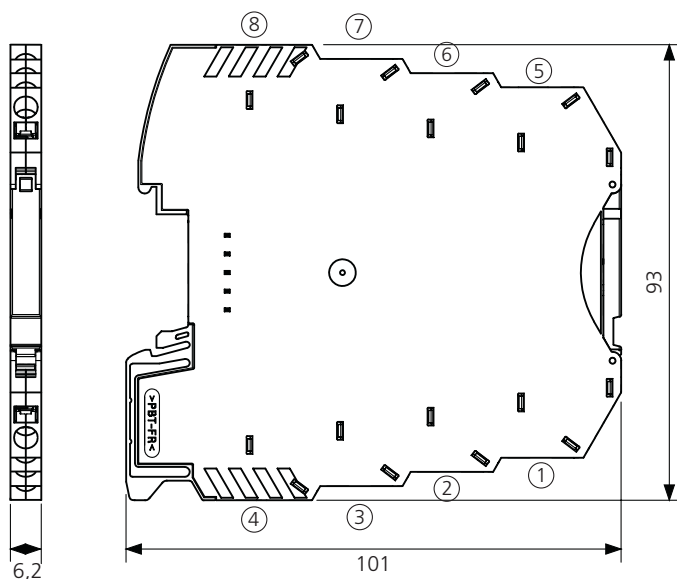
Laboratory Meters

Sensors

Fittings

Knick 

■ Dimension Drawings and Terminal Assignments



- ① Input 1, +
- ② Input 1, -
- ③ Input 2, +
- ④ Input 2, -
- ⑤ Output 1, +
- ⑥ Output 1, -
- ⑦ Output 2, +
- ⑧ Output 2, -

Conductor cross-sections
 - Single-wire: 0.2 ... 2.5 mm²
 - Fine-wire: 0.2 ... 2.5 mm²
 - 24-14 AWG

All dimensions in mm!

Modular Housings

Knick >

Universal high-voltage isolators.

Input signals from

$V_{in} = \pm 60 \text{ mV}$ up to

$V_{in} = \pm 100 \text{ V}$.

The Task

In high-voltage systems unipolar or bipolar voltage signals ranging from 60 mV to 100 V, e.g. voltages across shunt resistors, must be galvanically isolated and converted to standard $\pm 20 \text{ mA}$, $\pm 10 \text{ V}$, or 4 ... 20 mA output signals.

The Problems

In the case of insufficient insulation the high voltages and harsh ambient conditions may impair the galvanic isolation. This can result in false signals or even personal injury or damage to the equipment. These risks have to be securely eliminated in the long term through isolation amplifiers that are specially suited for high-voltage applications.

The Solution

The VariTrans® P 41000 isolation amplifiers have been specially conceived for measurements of bipolar voltages from millivolts to volts. They reliably isolate high potentials at the input circuit.

The isolating distances are designed to withstand permanent voltages up to 3600 V AC/DC and fast transients up to 20 kV. Protection against electric shock is achieved through Safe Isolation to EN 61140 from input to output and power supply.

VariTrans® P 41000



The Housing

For the VariTrans® P 41000 high-voltage isolation amplifiers a new 22.5 mm wide modular housing is used. It is snapped on a standard DIN rail. The front panels of the adjustable models provide a rotary coding switch for selecting the ranges.

The Advantages

The VariTrans® P 41000 are available for any input voltages from $\pm 60 \text{ mV}$ to $\pm 100 \text{ V}$. Analog unipolar and bipolar (standard) signals are available at the output: $\pm 20 \text{ mA}$, $\pm 10 \text{ V}$, and 4 ... 20 mA standard signals.

16 input/output signal combinations can easily be selected with

a rotary coding switch on the front of the device. Tedious on-site adjustment using a screwdriver, calibrator, and multimeter is no longer required. Drift problems due to instable trimming components (e. g. potentiometers) are avoided. Thanks to the easy scalability of the range selection, the devices can be flexibly suited to the individual needs of the application. Up to 16 customized signal combinations can be implemented in one device. The integrated 20 to 253 V AC/DC VariPower® broad-range power supply offers highest flexibility. This ensures trouble-free operation with alternating or direct voltages everywhere in the world and provides for maximum safety even in unstable power

High-Voltage Isolators / Isolation Amplifiers for Shunt Applications

Isolation Amplifiers
Transmitters

Indicators

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Sensors

Fittings



Knick >

supply networks. Installation is safe and easy: Erroneous connection of mains supply is practically impossible. Expensive standstill times and repair work during the commissioning are prevented.

Vacuum encapsulation provides maximum long-term protection against aggressive environmental influences, shock, and vibrations and ensures the high disruptive strength required for working voltages up to 3600 V AC/DC. The isolation system meets the safety requirements of EN 61010-1 and EN 50124-1 (railway applications: insulation coordination).

The Technology

In this series, Knick relies on the newly developed TransShield® technology which compared to conventional designs enables very compact high-voltage transformers with low leakage. Thanks to the resulting space advantage, the P 41000 shunt isolators can be installed in an only 22.5 mm wide modular housing.

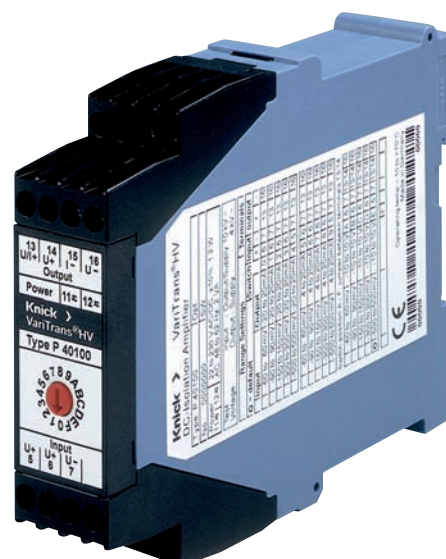
Another substantial advantage of this technology: High transient overvoltages (common-mode interference) are reliably isolated and cause hardly any measurement errors at the output.

To guarantee the specified isolation capabilities, the devices are subjected to routine testing with 15 kV AC (fixed-range models) or 10 kV AC (switchable models) on a 100 % basis.

Circuit design and device construction ensure excellent transmission characteristics, which are reflected in zero stability, linearity, long-term stability, frequency response, and immunity to interference. A cutoff frequency >5 kHz and rise time <0.1 ms guarantee distortion-free signal conversion. The output signal follows fast changes in the input signal almost without delay.

Warranty
5 years!

Defects occurring within 5 years from delivery are remedied free of charge at our works (carriage and insurance paid by sender).



Modular Housings

Modular Housings

VariTrans® P 41000

■ The Facts

Universal high-voltage isolators

for conversion of voltages, e. g. in shunt applications, from ± 60 mV up to ± 100 V to impressed ± 20 mA, ± 10 V, or 4 ... 20 mA output signals.

New TransShield® technology

enables extremely compact modular housings

Working voltages up to 3600 V AC/DC

Protection against electric shock

through Safe Isolation up to 1800 V AC/DC according to EN 61140

Test voltages up to 15 kV AC

Excellent transmission properties:

- Gain error < 0.1 %
- Cutoff frequency > 5 kHz (low-pass filtering possible)
- Rise time T_{90} < 0.1 ms

Virtually no influence from common-mode voltages:

CMRR > 150 dB

High immunity to transient interferences:

T-CMRR > 115 dB

Very high flexibility

- due to
- calibrated selection of up to 16 input/output ranges (up to 2200 V working voltage)
 - up to 16 customer-specific ranges
 - 20 V to 253 V AC/DC broad-range power supply unit

Reliable function even with unstable supply

No damage in the case of erroneous power connection

Switchable models

minimize required device variants and save stockkeeping costs

Robust

thanks to vacuum encapsulation

Suitable for DC railway systems

up to 3000 V DC

Mechanically stable

for operation on ships, rail vehicles and land crafts

5-year warranty

High-Voltage Isolators / Isolation Amplifiers for Shunt Applications



Product Line

Devices	Input	Output	Order No. Working voltage ≤2.2 kV AC/DC Test voltage 10 kV AC	Order No. Working voltage ≤3.6 kV AC/DC Test voltage 15 kV AC
VariTrans® P 41000 Input and output adjustable	±60 / 90 / 150 / 300 / 500 mV / 10 V ¹⁾ , switchable	±10 V, ±20 mA and 4 ... 20 mA, switchable	P 41000 D1	–
VariTrans® P 41000 with fixed settings	±60 mV	±20 mA	P 41056 D1	P 41156 D1
	±60 mV	4 ... 20 mA	P 41059 D1	P 41159 D1
	0 ... 60 mV	4 ... 20 mA	P 41057 D1	P 41157 D1
	±60 mV	±10 V	P 41058 D1	P 41158 D1
	±90 mV	±20 mA	P 41046 D1	P 41146 D1
	±90 mV	4 ... 20 mA	P 41049 D1	P 41149 D1
	0 ... 90 mV	4 ... 20 mA	P 41047 D1	P 41147 D1
	±90 mV	±10 V	P 41048 D1	P 41148 D1
	±150 mV	±20 mA	P 41066 D1	P 41166 D1
	±150 mV	4 ... 20 mA	P 41069 D1	P 41169 D1
	0 ... 150 mV	4 ... 20 mA	P 41067 D1	P 41167 D1
	±150 mV	±10 V	P 41068 D1	P 41168 D1
	±300 mV	±20 mA	P 41076 D1	P 41176 D1
	±300 mV	4 ... 20 mA	P 41079 D1	P 41179 D1
	0 ... 300 mV	4 ... 20 mA	P 41077 D1	P 41177 D1
	±300 mV	±10 V	P 41078 D1	P 41178 D1
	±500 mV	±20 mA	P 41086 D1	P 41186 D1
	±500 mV	4 ... 20 mA	P 41089 D1	P 41189 D1
	0 ... 500 mV	4 ... 20 mA	P 41087 D1	P 41187 D1
	±500 mV	±10 V	P 41088 D1	P 41188 D1
	±1 V	±20 mA	P 41096 D1	P 41196 D1
	±1 V	4 ... 20 mA	P 41099 D1	P 41199 D1
	0 ... 1 V	4 ... 20 mA	P 41097 D1	P 41197 D1
	±1 V	±10 V	P 41098 D1	P 41198 D1
	±10 V	±20 mA	P 41036 D1	P 41136 D1
	±10 V	±10 V	P 41038 D1	P 41138 D1
VariTrans® P 41000 with customer-specific settings	±60 mV ... 100 V one or more ranges to customer requirement ²⁾	±10 V, ±20 mA, 4 ... 20 mA, one or more ranges to customer requ. ²⁾	P 41000 D1-nnnn	–
	±60 mV ... 100 V, fixed to customer requirement ²⁾	±10 V, ±20 mA, 4 ... 20 mA, fixed, to customer requ. ²⁾	P 41000 D1-nnnn	P 41100 D1-nnnn

Power supply

20 ... 253 V AC/DC

1) Input ±10 V switchable only with output ±10 V

2) Please specify desired setting when ordering

Modular Housings

VariTrans® P 41000

■ Specifications

Input data

Inputs	P 41000 D1	± 60 mV, ± 90 mV, ± 150 mV, ± 300 mV, ± 500 mV, ± 10 V, (bipolar)	Calibrated selection, factory setting: ± 10 V
	P 41000 D1-nnnn	60 mV to 100 V, unipolar/bipolar	1 to 16 switchable calibrated ranges to customer requirements
	P 41100 D1-nnnn	60 mV to 100 V, unipolar/bipolar	Fixed settings, to customer requirements
Input resistance	Range ≤ 0.5 V	Approx. 100 kohms	
	Range > 0.5 V	> 2 Mohms	
Input capacitance	Range ≤ 0.5 V	Approx. 10 nF	
	Range > 0.5 V	Approx. 1 nF	
Overload	Range ≤ 10 V	Limited by 36 V suppressor diode, permitted continuous current = 20 mA	
	Range > 10 V	Limited by 150 V suppressor diode, permitted continuous current = 3 mA	

Output data

Outputs 1 and 2	P 41000 D1	20 mA, 10 V, unipolar/bipolar and 4 ... 20 mA	Calibrated selection, factory setting: ± 10 V
	P 41000 D1-nnnn	20 mA, 10 V, unipolar/bipolar and/or 4 ... 20 mA	Calibrated selection, to customer requirements
	P 41100 D1-nnnn	20 mA, 10 V, unipolar/bipolar or 4 ... 20 mA	Fixed settings, to customer requirements
Offset	Factory setting up to ± 150 %		
Load	With output current ≤ 12 V (600 ohms at 20 mA) With output voltage ≤ 10 mA (1000 ohms at 10 V)		
Offset	< 20 μ A or 10 mV		
Residual ripple	< 10 mV _{rms}		
Transmission behavior			
Gain error	< 0.1 % meas. val.		
Cutoff frequency (-3 dB)	> 5 kHz; optional factory setting: < 10 Hz		
Common mode rejection ratio	Input range ≤ 1 V	CMRR ¹⁾	Approx. 150 dB (DC/AC: 50 Hz)
	Input range > 1 V	T-CMRR ²⁾	Approx. 115 dB (1000 V, tr = 1 μ s)
		CMRR ¹⁾	DC: approx. 150 dB AC 50 Hz: approx. 120 dB
Temperature coefficient ³⁾	< 0.005 %/K		

1) Common-Mode Rejection Ratio = $\frac{\text{Differential voltage gain}}{\text{Common-mode voltage gain}}$

2) Transient Common-Mode Rejection Ratio = $\frac{\text{Differential DC gain}}{\text{Common-mode transient peak value gain}}$

3) Reference temperature for TC specifications 23 °C, average TC is specified

High-Voltage Isolators / Isolation Amplifiers for Shunt Applications

Isolation Amplifiers
Transmitters

Indicators

Process Analytics

Portable Meters

Laboratory Meters

Sensors

Fittings

Knick 

Specifications (continued)

Power supply

Power supply	20 ... 253 V AC/DC	AC 48 ... 62 Hz, approx. 2 VA; DC approx. 0.9 W
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Isolation

Galvanic isolation	3-port isolation between input, output and power supply	
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Test voltage	Calibrated selection	10 kV AC input against output and power supply
	Fixed settings (Model P411xxD1)	15 kV AC input against output and power supply
	All models	4 kV AC output against power supply

Working voltage (basic insulation) to EN 61010-1	Calibrated selection	Up to 2200 V AC/DC across input, output, and power supply with overvoltage category III and pollution degree 2 (fast transients: max. 13.5 kV)
	Fixed settings (Model P411xxD1)	Up to 3600 V AC/DC across input, output, and power supply with overvoltage category III and pollution degree 2 (fast transients: max. 20 kV)

Rated isolation voltage to EN 50124-1	Calibrated selection	Up to 2200 V AC/DC across input, output, and power supply with overvoltage category III and pollution degree 2
	Fixed settings (Model P411xxD1)	Up to 3600 V AC/DC across input, output, and power supply with overvoltage category III and pollution degree 2

Protection against electric shock	Calibrated selection	Safe Isolation according to EN 61140 by reinforced insulation in accordance with EN 61010-1 Working voltages with overvoltage category III and pollution degree 2: – up to 1100 V AC/DC across input and output/ power supply – up to 300 V AC/DC across output and power supply
	Fixed settings (Model P411xxD1)	Safe Isolation according to EN 61140 by reinforced insulation in accordance with EN 61010-1 Working voltages with overvoltage category III and pollution degree 2: – up to 1800 V AC/DC across input and output/ power supply – up to 300 V AC/DC across output and power supply

For applications with high working voltages, you should ensure there is sufficient spacing or isolation from neighboring devices and protection against electric shocks.

Standards and approvals

EMC ⁴⁾	Product standard:	EN 61326
	Emitted interference:	Class B
	Immunity to interference:	Industry

4) Slight deviations are possible while there is interference

Modular Housings

VariTrans® P 41000

Specifications (continued)

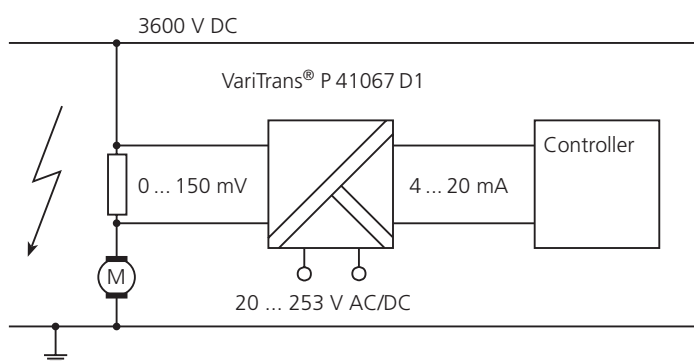
Other data

MTBF ⁵⁾	Approx. 96 years	
Ambient temperature ⁶⁾	Operation:	-10 ... +70 °C
	Transport and storage:	-40 ... +85 °C
Design	Modular housing With screw terminals	Housing width D1: 22.5 mm See dimension drawings for further measurements
Ingress protection	Housing IP 40, terminals IP 20	
Mounting	With snap-on mounting for 35 mm top hat rail according to EN 60715	
Weight	Approx. 180 g	

- 5) Mean Time Between Failures – MTBF – according to EN 61709 (SN 29500). Conditions: stationary operation in well-kept rooms, average ambient temperature 40 °C, no ventilation, continuous operation
 6) Extended temperature range -25 ... +85 °C on request

■ Application Example

Current measurement via shunt resistor



High-Voltage Isolators / Isolation Amplifiers for Shunt Applications

Isolation Amplifiers
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Portable Meters

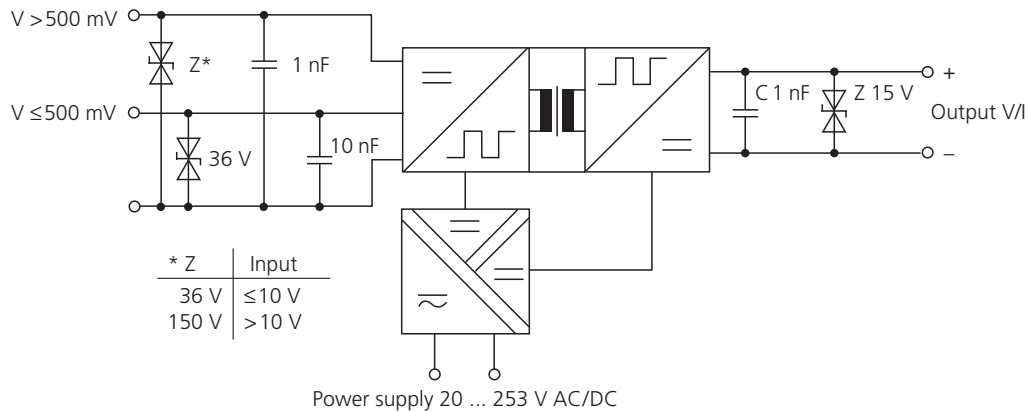
Laboratory Meters

Sensors

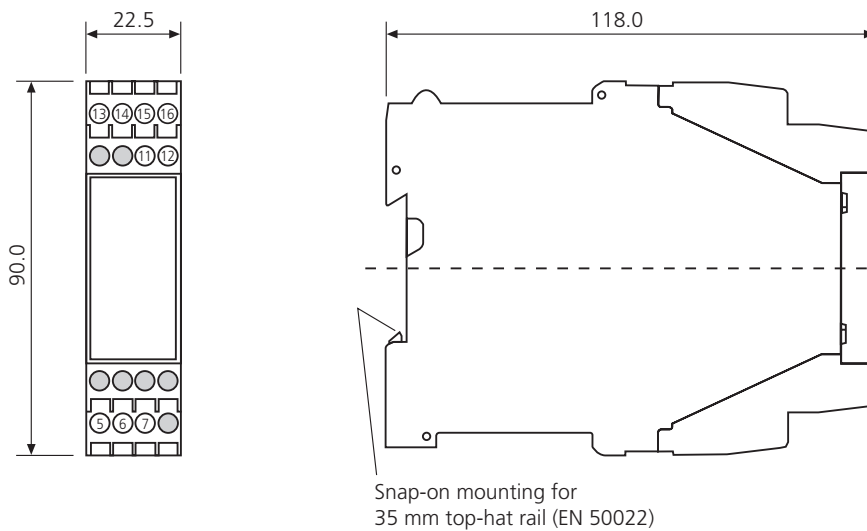
Fittings

Knick 

■ Block Diagram



■ Dimension Drawings and Terminal Assignments



Terminal assignments:

- 5 Voltage input + (>1 V ... 100 V)
- 6 Voltage input + (60 ... 1000 mV)
- 7 Input -
- 11 Power supply AC/DC
- 12 Power supply AC/DC
- 13 Current output + \square
- 14 Voltage output + \square
- 15 Current output -
- 16 Voltage output -

M 3.5 connecting screws with self-releasing terminal housing
Conductor cross-section
max. 1 x 4 mm² solid
or 1 x 2.5 mm² stranded wire with ferrule,
min. 1 x 0.5 mm² solid or stranded wire with ferrule

For switchable models and voltage output:
Place jumper across terminals 13 and 14

All dimensions in mm!

Modular Housings

Modular Housings

Knick >

Universal high-voltage isolators.
Input voltages up to
 $I_{in} = \pm 3600$ V.

The Task

In high-voltage systems unipolar or bipolar voltage signals ranging from 100 V to 3600 V must be galvanically isolated and converted to standard ± 20 mA, ± 10 V, or 4 ... 20 mA output signals.

The Problems

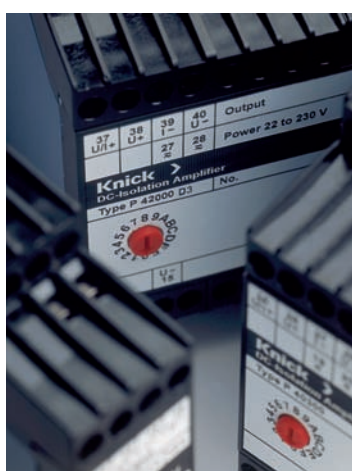
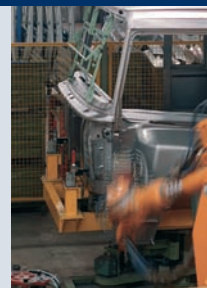
In the case of insufficient insulation the high voltages and harsh ambient conditions may impair the galvanic isolation. This can result in false signals or even personal injury or damage to the equipment. These risks have to be securely eliminated in the long term through isolation amplifiers that are specially suited for high-voltage applications.

The Solution

The VariTrans® P 42000 isolation amplifiers have been specially conceived for measuring high voltages up to 3600 V AC/DC. They reliably isolate high potentials at the input circuit.

The isolating distances are designed to withstand permanent voltages up to 3600 V AC/DC and fast transients up to 20 kV. Protection against electric shock is achieved through Safe Isolation to EN 61140 from input to output and power supply.

VariTrans® P 42000



The Housing

For the VariTrans® P 42000 high-voltage isolation amplifiers a new 67.5 mm wide modular housing is used. It is snapped on a standard DIN rail. The front panels of the adjustable models provide a rotary coding switch for selecting the ranges.

The Advantages

The VariTrans® P 42000 are available for any input voltages from ± 100 V to ± 3600 V. Analog unipolar and bipolar (standard) signals are available at the output: ± 20 mA, ± 10 V, and 4 ... 20 mA standard signals. 16 input/output signal combinations can easily be selected with a rotary coding switch on the front of the device. Tedious on-site adjustment using a screwdriver, calibrator, and multimeter

is no longer required. Drift problems due to instable trimming components (e. g. potentiometers) are avoided. Thanks to the easy scalability of the range selection, the devices can be flexibly suited to the individual needs of the application. Up to 16 customized signal combinations can be implemented in one device.

The integrated 20 to 253 V AC/DC VariPower® broad-range power supply offers highest flexibility. This ensures trouble-free operation with alternating or direct voltages everywhere in the world and provides for maximum safety even in unstable power supply systems. Installation is also easy and safe: Erroneous connection of mains supply is practically impossible. Expensive standstill times and repair work during the commissioning are prevented.

Vacuum encapsulation provides maximum long-term protection against aggressive environmental influences, shock, and vibrations and ensures the high disruptive strength required for working voltages up to 3600 V AC/DC. The isolation system meets the safety requirements of EN 61010-1 and EN 50124-1 (railway applications: insulation coordination).

High-Voltage Isolators / Isolation Amplifiers for Shunt Applications



Knick >

Warranty 5 years!
Defects occurring within 5 years from delivery are remedied free of charge at our works (carriage and insurance paid by sender).



Modular Housings

The Technology

In this series, Knick relies on the newly developed TransShield® technology which compared to conventional designs enables very compact high-voltage transformers with low leakage. Thanks to the resulting space savings a just 67.5 mm modular housing is sufficient for input voltages up to 3600 V AC/DC.

To guarantee the specified isolation capabilities, the devices are subjected to routine testing with 15 kV AC (fixed-range models) or 10 kV AC (switchable models) on a 100 % basis. Circuit design and device construction ensure excellent transmission characteristics, which are reflected in zero stability, linearity, long-term stability, frequency response, and immunity to interference. A cutoff frequency > 5 kHz and rise time < 0.1 ms guarantee distortion-free signal conversion. The output signal follows fast changes in the input signal almost without delay.

The Facts

Universal high-voltage isolators for conversion of input voltages up to 3600 V AC/DC to impressed ± 20 mA, ± 10 V, or 4 ... 20 mA output signals

New TransShield® technology enables extremely compact modular housings

Working voltages up to 3600 V AC/DC

Protection against electric shock through Safe Isolation up to 1800 V AC/DC according to EN 61140

Test voltages up to 15 kV AC

Excellent transmission properties:
– Gain error < 0.3 %
– Cutoff frequency > 5 kHz (low-pass filtering possible)
– Rise time T90 < 0.1 ms

Maximum accuracy

Tremendous flexibility

provided by
– selection of up to 16 calibrated input/output ranges (up to 2200 V working voltage)
– up to 16 customer-specific ranges
– 20 V to 253 V AC/DC broad-range power supply

Reliable function

even with unstable power supply

No damage in the case of erroneous power connection

Switchable models

minimize required device variants and save stockkeeping costs

Robust

thanks to vacuum encapsulation

Suitable for DC railway systems up to 3000 V DC

Mechanically stable

for operation on ships, rail vehicles and land crafts

5-year warranty

Modular Housings

VariTrans® P 42000

■ Product Line

Devices	Input	Output	Working voltage	Test voltage	Order No.
VariTrans® P 42000 Input and output adjustable	±400 / 600 / 800 / 1000 / 1200 V switchable	±10 V, ±20 mA and 4 ... 20 mA, switchable	≤ 2.2 kV AC/DC	10 kV AC	P 42000 D3
	±1400 / 1600 / 1800 / 2000 / 2200 V, switchable	±10 V, ±20 mA and 4 ... 20 mA, switchable	≤ 2.2 kV AC/DC	10 kV AC	P 42001 D3
VariTrans® P 42000 with customer-specific settings	±100 V ... 2200 V, one or more ranges to customer requirement ¹⁾	±10 V, ±20 mA, 4 ... 20 mA, one or more ranges to customer requirement ¹⁾	≤ 2.2 kV AC/DC	10 kV AC	P 42000 D3-nnnn
	±100 V ... 3600 V, fixed, to customer requirement ¹⁾	±10 V, ±20 mA, or 4 ... 20 mA, fixed, to customer requirement ¹⁾	≤ 3.6 kV AC/DC	15 kV AC	P 42100 D3-nnnn

Power supply

20 ... 253 V AC/DC

1) Please specify required setting when ordering

■ Specifications

Input data

Inputs	P 42000 D3	400 V, 600 V, 800 V, 1000 V, 1200 V, unipolar/bipolar	Calibrated selection, factory setting: ±1200 V
	P 42001 D3	1400 V, 1600 V, 1800 V, 2000 V, 2200 V, unipolar/bipolar	Calibrated selection, factory setting: ±2200 V
	P 42000 D3-nnnn	100 V ... 2200 V, unipolar/bipolar	1 to 16 ranges to customer requirement, calibrated selection
	P 42100 D3-nnnn	100 V ... 3600 V, unipolar/bipolar	Fixed settings, to customer requirement

Input resistance	P 42000 D3	7.2 Mohms
	P 42001 D3	14 Mohms
	P 42000 D3-nnnn	> 5 Mohms
	P 42100 D3-nnnn	> 5 Mohms

Input capacitance < 10 pF

Overload 20 % full scale, max. ±3900 V

Output data

Output	P 42000 D3	20 mA, 10 V, unipolar/bipolar, and 4 ... 20 mA
	P 42001 D3	20 mA, 10 V, unipolar/bipolar, and 4 ... 20 mA
	P 42000 D3-nnnn	20 mA, 10 V, unipolar/bipolar, and/or 4 ... 20 mA
	P 42100 D3-nnnn	20 mA or 10 V, unipolar/bipolar, or 4 ... 20 mA

High-Voltage Isolators / Isolation Amplifiers for Shunt Applications

Isolation Amplifiers
Transmitters

Indicators

Process Analytics

Portable Meters

Laboratory Meters

Sensors

Fittings

Knick 

Specifications (continued)

Output data (continued)

Offset	Factory setting up to $\pm 150\%$
Load	With output current $\leq 12\text{ V}$ (600 ohms at 20 mA) With output voltage $\leq 10\text{ mA}$ (1000 ohms at 10 V)
Offset	20 μA or 10 mV
Residual ripple	$< 10\text{ mV}_{\text{rms}}$

Transmission behavior

Gain error	$< 0.3\%$ meas. val.
Cutoff frequency (-3 dB)	$> 5\text{ kHz}$; optional factory setting: $< 10\text{ Hz}$
Temperature coefficient ¹⁾	0.01 %/K full scale

Power supply

Power supply	20 ... 253 V AC/DC AC 48 ... 62 Hz, approx. 2 VA; DC approx. 0.9 W
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Isolation

Galvanic isolation	3-port isolation between input, output and power supply
Test voltage	Calibrated selection 10 kV AC input against output and power supply Fixed settings 15 kV AC input against output and power supply (Model P42100D3-nnnn) All models 4 kV AC output against power supply
Working voltage (basic insulation) to EN 61010-1	Calibrated selection Up to 2200 V AC/DC across input, output, and power supply with overvoltage category III and pollution degree 2 (fast transients: 13.5 kV) Fixed settings Up to 3600 V AC/DC across input, output, and power supply with overvoltage category III and pollution degree 2 (fast transients: 20 kV) (Model P42100D3-nnnn)
Rated isolation voltage to EN 50124-1	Calibrated selection Up to 2200 V AC/DC across input, output, and power supply with overvoltage category III and pollution degree 2 Fixed settings Up to 3600 V AC/DC across input, output, and power supply with overvoltage category III and pollution degree 2 (Model P42100D3-nnnn)
Protection against electric shock	Calibrated selection Safe Isolation according to EN 61140 by reinforced insulation in accordance with EN 61010-1. Working voltages with overvoltage category III and pollution degree 2: – up to 1100 V AC/DC across input and output/power supply – up to 300 V AC/DC across output and power supply

1) Reference temperature for TC specifications = 23 °C, average TC is specified

Modular Housings

VariTrans® P 42000

Specifications (continued)

Isolation (continued)

Protection against electric shock

Fixed settings
(Model P42100D3-nnnn)

Safe Isolation according to EN 61140 by reinforced insulation in accordance with EN 61010-1.
Working voltages with overvoltage category III and pollution degree 2:
– up to 1800 V AC/DC across input and output/power supply
– up to 300 V AC/DC across output and power supply

For applications with high working voltages, you should ensure there is sufficient spacing or isolation from neighboring devices and protection against electric shocks.

Standards and approvals

EMC²⁾

Product standard: EN 61326
Emitted interference: Class B
Immunity to interference: Industry

Other data

MTBF³⁾

Approx. 96 years

Ambient temperature⁴⁾

Operation: –10 ... +70 °C
Transport and storage: –40 ... +85 °C

Design

Modular housing Housing width D3: 67.5 mm
With screw terminals See dimension drawings for further measurements

Ingress protection

Housing IP 40, terminals IP 20

Mounting

With snap-on mounting for 35 mm top hat rail according to EN 60715

Weight

Approx. 500 g

2) Slight deviations are possible while there is interference.

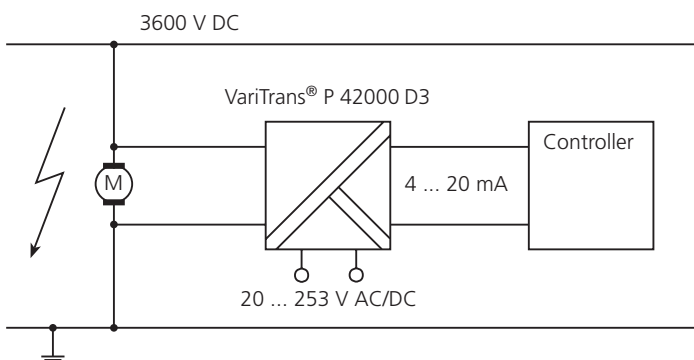
3) Mean Time Between Failures – MTBF – according to EN 61709 (SN 29500).

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

4) Extended temperature range –25 ... +85 °C on request

■ Application Example

Direct measurement of supply voltage



High-Voltage Isolators / Isolation Amplifiers for Shunt Applications

Isolation Amplifiers
Transmitters

Indicators

Process Analytics

Portable Meters

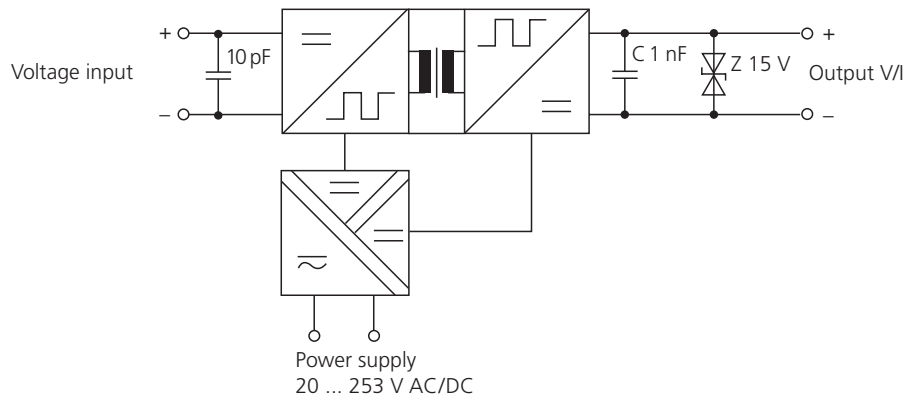
Laboratory Meters

Sensors

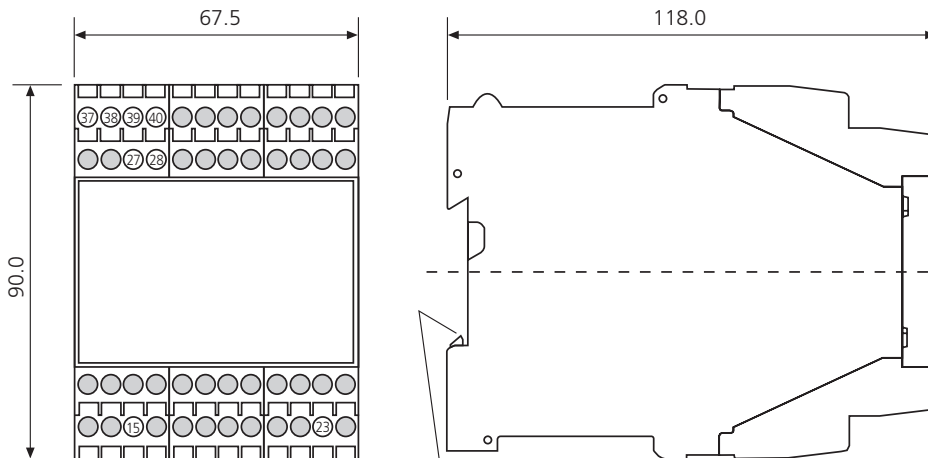
Fittings

Knick 



■ Block Diagram



■ Dimension Drawings and Terminal Assignments



Terminal assignments:

- 15 Voltage input -
- 23 Voltage input + (≤ 3600 V)
- 27 Power supply AC/DC
- 28 Power supply AC/DC
- 37 Current output + 
- 38 Voltage output + 
- 39 Current output -
- 40 Voltage output -

Snap-on mounting for
35 mm top-hat rail (EN 50022)

M 3.5 connecting screws with
self-releasing terminal housing
Conductor cross-section
max. 1×4 mm² solid
or 1×2.5 mm² stranded wire with ferrule,
min. 1×0.5 mm² solid or stranded wire with ferrule

For switchable models and voltage output:
Place jumper across terminals 37 and 38

All dimensions in mm!

Modular Housings

Modular Housings

Knick >

Universal high-voltage isolators.
Input currents up to
 $I_{in} = 5 \text{ A}$.

The Task

In high-voltage systems unipolar or bipolar currents ranging from 100 mA to 5 A must be galvanically isolated and converted to standard $\pm 20 \text{ mA}$, $\pm 10 \text{ V}$, or 4 ... 20 mA output signals.

The Problems

In the case of insufficient insulation the high voltages and harsh ambient conditions may impair the galvanic isolation. This can result in false signals or even personal injury or damage to the equipment. These risks have to be securely eliminated in the long term through isolation amplifiers that are specially suited for high-voltage applications.

The Solution

The VariTrans® P 43000 isolation amplifiers have been specially conceived for direct measurement of currents up to 5 A AC/DC. They reliably isolate high potentials at the input circuit.

The isolating distances are designed to withstand permanent voltages up to 3600 V AC/DC and fast transients up to 20 kV. Protection against electric shock is achieved through Safe Isolation to EN 61140 from input to output and power supply.

VariTrans® P 43000

Warranty
5 years!

Defects occurring within 5 years from delivery are remedied free of charge at our works (carriage and insurance paid by sender).

The Housing

For the VariTrans® P 43000 high-voltage isolation amplifiers a new 45 mm wide modular housing is used. It is snapped on a standard DIN rail. The front panels of the adjustable models provide a rotary coding switch for selecting the ranges.

The Advantages

The VariTrans® P 43000 are available for any input currents from $\pm 100 \text{ mA}$ to $\pm 5 \text{ A}$. Analog unipolar and bipolar (standard) signals are available at the output: $\pm 20 \text{ mA}$, $\pm 10 \text{ V}$, and 4 ... 20 mA. 16 input/output signal combinations can easily be selected with a rotary coding switch on the front of the device. Tedious on-site adjustment using a screwdriver, calibrator, and multimeter is no longer required. Drift problems due to instable trimming components (e. g. potentiometers) are avoided. Thanks to the easy scalability of the range selection, the devices can be flexibly suited to the individual needs of the application. Up to 16 customized signal combinations can be implemented in one device.

The integrated 20 to 253 V AC/DC VariPower® broad-range power supply offers highest flexibility. This ensures trouble-free operation with alternating or direct voltages everywhere in the world and provides for maximum safety even in unstable power supply networks. Installation is

also easy and safe: Erroneous connection of mains supply is practically impossible. Expensive standstill times and repair work during the commissioning are prevented.

Vacuum encapsulation provides maximum long-term protection against aggressive environmental influences, shock, and vibrations and ensures the high disruptive strength required for working voltages up to 3600 V AC/DC. The isolation system meets the safety requirements of EN 61010-1 and EN 50124-1 (railway applications: insulation coordination).



High-Voltage Isolators / Isolation Amplifiers for Shunt Applications

Isolation Amplifiers
Transmitters

Indicators

Process Analytics

Portable Meters

Laboratory Meters

Sensors

Fittings



Knick >

The Technology

In this series, Knick relies on the newly developed TransShield® technology which compared to conventional designs enables very compact high-voltage transformers with low leakage. Thanks to the resulting space savings a just 45 mm modular housing is sufficient for input currents up to 5 A AC/DC. Another substantial advantage of this technology: high transient overvoltages (common-mode interference) are reliably isolated and cause hardly any measurement errors at the output.

To guarantee the specified isolation capabilities, the devices are subjected to routine testing with 15 kV AC (fixed-range models) or 10 kV AC (switchable models) on a 100 % basis.

Circuit design and device construction ensure excellent transmission characteristics, which are reflected in zero stability, linearity, long-term stability, frequency response, and immunity to interference. A cutoff frequency > 5 kHz and rise time < 0.1 ms guarantee distortion-free signal conversion. The output signal follows fast changes in the input signal almost without delay.

The Facts

Universal high-voltage isolators for conversion of input currents up to 5 A to impressed ± 20 mA, ± 10 V, or 4 ... 20 mA output signals.

New TransShield® technology enables extremely compact modular housings

Working voltages up to 3600 V AC/DC

Protection against electric shock through Safe Isolation up to 1800 V AC/DC according to EN 61140

Increased test voltage up to 15 kV AC

Excellent transmission properties:

- Gain error < 0.3 %
- Cutoff frequency > 5 kHz (low-pass filtering possible)
- Rise time T_{90} < 0.1 ms

Tremendous flexibility provided by

- Calibrated switching of up to 16 input/output ranges (up to 2200 V working voltage)
- up to 16 customer-specific ranges
- 20 V to 253 V AC/DC broad-range power supply unit

Reliable function

even with unstable power supply

No damage

in the case of erroneous power connection

Switchable models

minimize required device variants and save stockkeeping costs

Robust

thanks to vacuum encapsulation

Mechanically stable

for operation on ships, rail vehicles, and land crafts

5-year warranty



Modular Housings

VariTrans® P 43000

■ Product Line

Devices	Input	Output	Working voltage	Test voltage	Order No.
VariTrans® P 43000 Input and output adjustable	±1 / 1.5 / 2 / 3 / 5 A switchable	±10 V, ±20 mA and 4 ... 20 mA, switchable	≤ 2.2 kV AC/DC	10 kV AC	P 43000 D2
VariTrans® P 43000 with settings to customer requirements	±0.1 A ... 5 A, one or more ranges to customer requirement ¹⁾	±10 V, ±20 mA, 4 ... 20 mA, one or more ranges to customer requirement ¹⁾	≤ 2.2 kV AC/DC	10 kV AC	P 43000 D2-nnnn
	±0.1 A ... 5 A, fixed, to customer requirement ¹⁾	±10 V, ±20 mA, 4 ... 20 mA, fixed, to customer requirement ¹⁾	≤ 3.6 kV AC/DC	15 kV AC	P 43100 D2-nnnn

Power supply

20 ... 253 V AC/DC

1) Please specify required setting when ordering

■ Specifications

Input data

Inputs	P 43000 D2	1 A, 1.5 A, 2 A, 3 A, 5 A, unipolar/bipolar	Calibrated selection, factory setting: ±5 A
	P 43000 D2-nnnn	0.1 A ... 5 A, unipolar/bipolar	1 to 16 ranges to customer requirement, calibrated selection
	P 43100 D2-nnnn	0.1 A ... 5 A, unipolar/bipolar	Fixed settings, to customer requirement
Input resistance	< 0.6 ohm		
Input capacitance	Approx. 1 nF		
Overload	20 % full scale		

Output data

Output	P 43000 D2	20 mA, 10 V, unipolar/bipolar and 4 ... 20 mA	Calibrated selection, factory setting: ±10 V
	P 43000 D2-nnnn	20 mA, 10 V, unipolar/bipolar and/or 4 ... 20 mA	Calibrated selection, to customer requirements
	P 43100 D2-nnnn	20 mA, 10 V, unipolar/bipolar or 4 ... 20 mA	Fixed settings, to customer requirement
Offset	Up to ±150 % as default		

High-Voltage Isolators / Isolation Amplifiers for Shunt Applications

Isolation Amplifiers
Transmitters

Indicators

Process Analytics

Portable Meters

Laboratory Meters

Sensors

Fittings

Knick 

Specifications (continued)

Output data (continued)

Load	With output current ≤ 12 V (600 ohms at 20 mA) With output voltage ≤ 10 mA (1000 ohms at 10 V)
Offset	20 μ A or 10 mV
Residual ripple	< 10 mV _{rms}

Transmission behavior

Gain error	< 0.3 % meas. val.
Cutoff frequency (-3 dB)	> 5 kHz; optional factory setting < 10 Hz
Common mode rejection ratio	CMRR ¹⁾ DC: approx. 160 dB AC 50 Hz: approx. 120 dB
Temperature coefficient ²⁾	< 0.005 %/K full scale

Power supply

Power supply	20 ... 253 V AC/DC AC 48 ... 62 Hz, approx. 2 VA; DC approx. 0.9 W
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Isolation

Galvanic isolation	3-port isolation between input, output, and power supply	
Test voltage	Calibrated selection	10 kV AC input against output and power supply
	Fixed settings (Model P43100D2-nnnn)	15 kV AC input against output and power supply
	All models	4 kV AC output against power supply
Working voltage (basic insulation) to EN 61010-1	Calibrated selection	Up to 2200 V AC/DC across input, output, and power supply with overvoltage category III and pollution degree 2 (fast transients: 13.5 kV)
	Fixed settings (Model P43100D2-nnnn)	Up to 3600 V AC/DC across input, output, and power supply with overvoltage category III and pollution degree 2 (fast transients: 20 kV)
Rated isolation voltage to EN 50124-1	Calibrated selection	Up to 2200 V AC/DC across input, output, and power supply with overvoltage category III and pollution degree 2
	Fixed settings (Model P43100D2-nnnn)	Up to 3600 V AC/DC across input, output, and power supply with overvoltage category III and pollution degree 2
Protection against electric shock	Calibrated selection	Safe Isolation according to EN 61140 by reinforced insulation in accordance with EN 61010-1. Working voltages with overvoltage category III and pollution degree 2: – up to 1100 V AC/DC across input and output / power supply – up to 300 V AC/DC across output and power supply

1) Common-Mode Rejection Ratio = $\frac{\text{Differential voltage gain}}{\text{Common-mode voltage gain}}$

2) Reference temperature for TC specifications = 23 °C, average TC is specified

Modular Housings

VariTrans® P 43000

Specifications (continued)

Isolation (continued)

Protection against electric shock

Fixed settings
(Model P43100D2-nnnn)

Safe Isolation according to EN 61140 by reinforced insulation in accordance with EN 61010-1. Working voltages with overvoltage category III and pollution degree 2:
– up to 1800 V AC/DC across input and output / power supply
– up to 300 V AC/DC across output and power supply

For applications with high working voltages, you should ensure there is sufficient spacing or isolation from neighboring devices and protection against electric shocks.

Standards and approvals

EMC³⁾

Product standard: EN 61326
Emitted interference: Class B
Immunity to interference: Industry

Other data

MTBF⁴⁾

Approx. 96 years

Ambient temperature⁵⁾

Operation: –10 ... +70 °C
Transport and storage: –40 ... +85 °C

Design

Modular housing Housing width D2: 45.0 mm
With screw terminals See dimension drawings for further measurements

Ingress protection

Housing IP 40, terminals IP 20

Mounting

With snap-on mounting for 35 mm top hat rail according to EN 60715

Weight

Approx. 350 g

3) Slight deviations are possible while there is interference

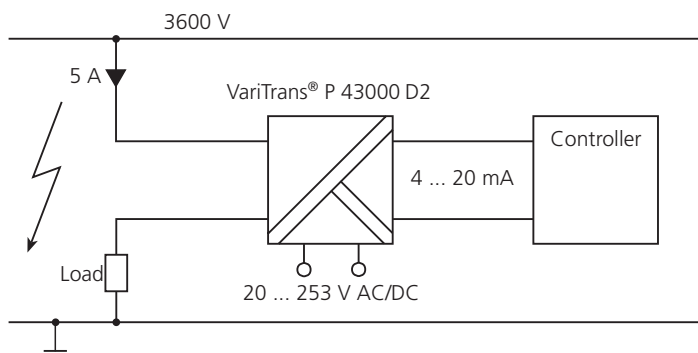
4) Mean Time Between Failures – MTBF – according to EN 61709 (SN 29500).

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

5) Extended temperature range –25 ... +85 °C on request

Application Example

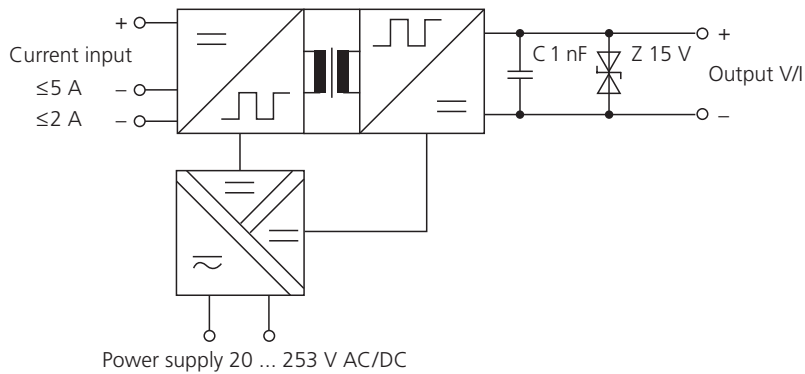
Direct measurement at a high input potential



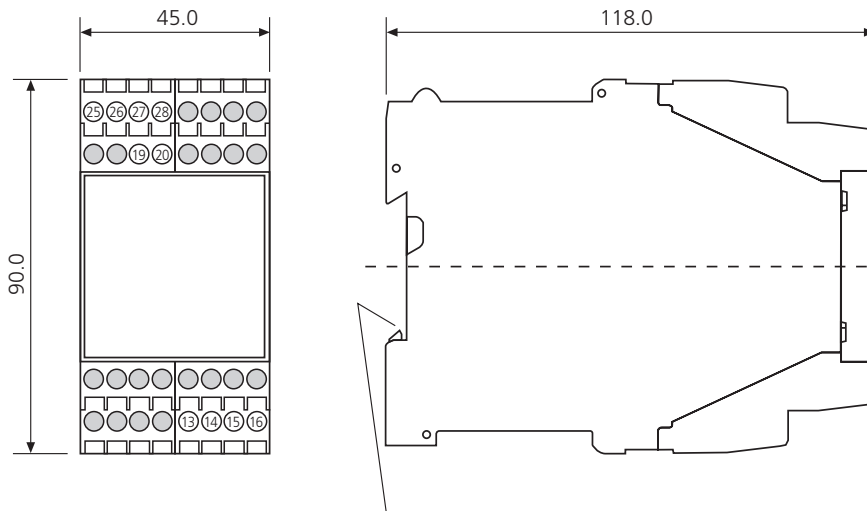
High-Voltage Isolators / Isolation Amplifiers for Shunt Applications



■ Block Diagram



■ Dimension Drawings and Terminal Assignments



Snap-on mounting for 35 mm top-hat rail (EN 50022)

Terminal assignments:

- 13 n. c.
- 14 Current input +
- 15 Current input $-(\leq 5 \text{ A})$
- 16 Current input $-(\leq 2 \text{ A})$
- 19 Power supply AC/DC
- 20 Power supply AC/DC
- 25 Current output + $\overline{\text{I}}$
- 26 Voltage output + $\overline{\text{U}}$
- 27 Current output $-$
- 28 Voltage output $-$

M 3.5 connecting screws with self-releasing terminal housing
Conductor cross-section
max. 1 x 4 mm² solid
or 1 x 2.5 mm² stranded wire with ferrule,
min. 1 x 0.5 mm² solid or stranded wire with ferrule

For switchable models and voltage output:
Place jumper across terminals 25 and 26

All dimensions in mm!

Modular Housings

Knick >

Repeater power supply in a 6-mm housing with calibrated switching of output signals, HART® transmission, and Safe Isolation

The Task

Flexible and safe supply of 2-wire transmitters via the 4 ... 20-mA current loops with simultaneous transmission of data protocols for SMART transmitters/HART® communication. Conversion of output signals to 0 ... 20 mA or 0 ... 10 V, if required.

The Problems

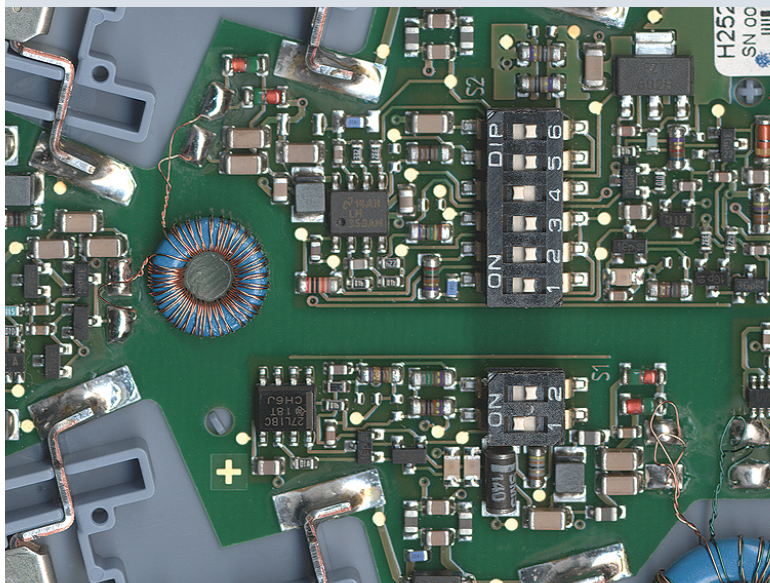
Good isolator properties combined with high transmission accuracy often result in complex systems that cost space and money.

Galvanic isolation of the supply and signal processing, however, are frequently indispensable to exclude measuring problems from the start. Therefore, the selection of possible alternatives within the budget is often limited.

The Solution

Knick is the first manufacturer to provide a repeater power supply for 2-wire transmitters in an extremely compact 6-mm housing. The IsoAmp® PWR A 20100 supplies the transmitter with power and transmits the measurement signal galvanically isolated to the output with a high level of accuracy. In case a signal other than the 4 to 20 mA current loop signal is required, the repeater power supply provides a selection of output signals via DIP switches.

IsoAmp® PWR A 20100



HART® signals are of course transmitted without alteration. The width of just 6 mm also allows use of the repeater power supply in the tightest of spaces.

The Housing

Mounted in tried and tested 6.1 mm wide modular housing with screw terminals. The outputs are selected using DIP switches that can be accessed without opening the housing.

The Advantages

The new IsoAmp® PWR A 20100 repeater power supply combines small dimensions with excellent features! Safe Isolation and 0.1 % accuracy also allow use for applications with increased requirements.

The Technology

The output signal is switchable between 0 ... 20 mA, 4 ... 20 mA, and 0 ... 10 V. The calibrated ranges are selected via DIP switches. In addition to the analog signal, the repeater power supply transmits data protocols for SMART transmitters (according to HART® specification).

It allows bidirectional communication with the field device via a host computer or HART® communicators (hand-held communicator).

**Warranty
5 years!**

Defects occurring within 5 years from delivery are remedied free of charge at our works (carriage and insurance paid by sender).

Repeater Power Supplies

Isolation Amplifiers
Transmitters

Indicators

Process Analytics

Portable Meters

Laboratory Meters

Sensors

Fittings



Knick >

■ The Facts

Extremely flat

3-port isolation in a
6 mm modular housing

Flexible and highly accurate

Calibrated output
signal switching

Fast and easy configuration

with DIL switches on the side so
they are easy to access and still
protected against accidental
adjustment

Low-cost assembly

Supply of the current loop and
galvanic isolation of the meas-
ured signal in one device

Safe Isolation

up to 300 V according to
EN 61140

SMART transmitter

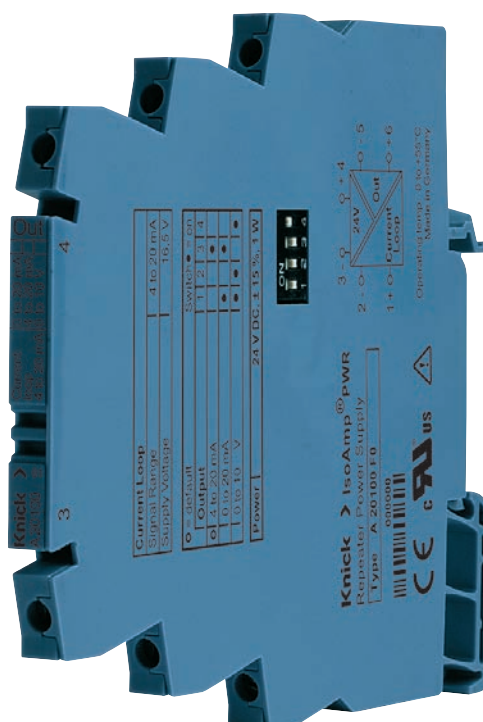
(to HART® specification)

Cross-connections for power supply

Power supply only wired once for
almost any number of parallel
repeater power supplies

5-year warranty

HART® is a registered trademark
of the HART Communication
Foundation



Modular Housings

Modular Housings

IsoAmp® PWR A 20100

■ Product Line

Devices	Input	Output	Order No.
IsoAmp® PWR A 20100	4 ... 20 mA	4 ... 20 mA, 0 ... 20 mA, 0 ... 10 V, calibrated selection	A 20100 F0

Power supply

24 V DC

Accessories

Cross-connections	Pluggable cross-connection for looping through of the power supply for up to 41 power supply connections of B 10XXX F0 and A 20XXX F0, separable.	ZU 0542
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■ Specifications

Input data

Input (current loop)	4 ... 20 mA, supply voltage 16.5 V, constant for 3 ... 22 mA, current limited to max. 25 mA
Residual ripple	< 10 mV _{rms}

Output data

Output	4 ... 20 mA, 0 ... 20 mA or 0 ... 10 V, calibrated selection
Output signal with input short-circuit	22 ... 25 mA or 11 ... 12.5 V
Output signal with open input	< 3 mA or 0 for 0 ... 20 mA or 0 ... 10 V outputs
Load	With output current ≤ 10 V (≤ 500 ohms at 20 mA) With output voltage ≤ 1 mA (≥ 10 kohms at 10 V)
Offset	Current output ¹⁾ < 30 μA Voltage output < 30 mV
Residual ripple at output	< 10 mV _{rms}

1) Additional error 30 μA for output 0 ... 20 mA

Specifications (continued)

Transmission behavior

Gain error	Current output	< 0.1% meas. val.
	Voltage output	< 0.2% meas. val.
Response time	< 2 ms	
Communication ²⁾ (output 4 ... 20 mA)	Bidirectional transmission of FSK signals according to the HART® specification between output and current loop	

Power supply

Power supply	24 V DC ($\pm 15\%$), approx. 1 W The power supply can be routed from one device to another via cross-connections.	
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Isolation

Galvanic isolation	3-port isolation between current loop, output, and power supply	
Test voltage	2.5 kV AC current loop against output/power supply 510 V AC output against power supply	
Working voltage (basic insulation)	Up to 600 V AC/DC across current loop and output/power supply with overvoltage category II and pollution degree 2, up to 100 V AC/DC across output and power supply with category II and degree 2 according to EN 61010-1. For applications with high working voltages, you should ensure there is sufficient spacing or isolation from neighboring devices and protection against electric shocks.	
Protection against electric shock	Safe Isolation according to EN 61140 by reinforced insulation in accordance with EN 61010-1. Up to 300 V across current loop and output/power supply with overvoltage category II and pollution degree 2. For applications with high working voltages, you should ensure there is sufficient spacing or isolation from neighboring devices and protection against electric shocks.	

Standards and approvals

EMC ³⁾	Product standard:	EN 61326
	Emitted interference:	Class B
	Immunity to interference:	Industry
Approval	cURus, File No. E 220033, Standards: UL 508 and CAN/CSA 22.2 no. 14-95	

2) HART® attenuation <6 dB

3) Slight deviations are possible while there is interference

Modular Housings

IsoAmp® PWR A 20100

Specifications (continued)

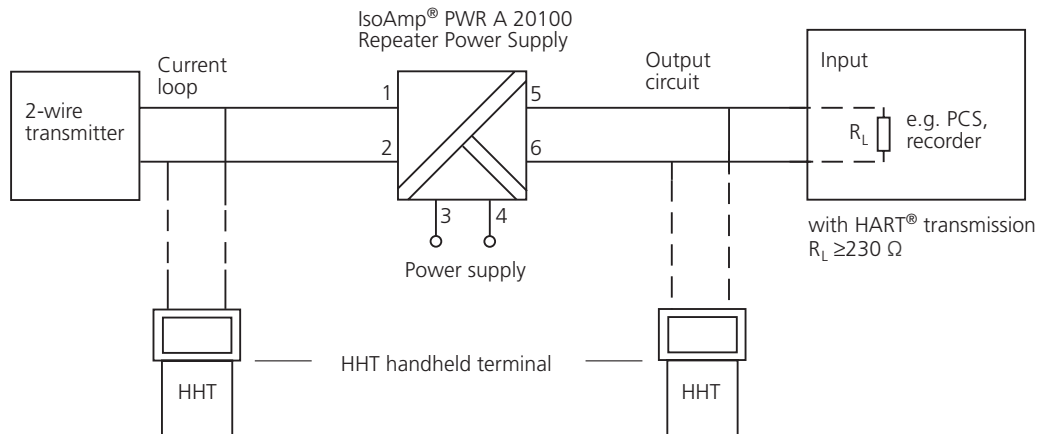
Other data

MTBF ⁴⁾	Approx. 450 years
Ambient temperature	Operation: 0 ... +55 °C Transport and storage: -25 ... +85 °C
Design	Modular housing with screw terminals, width 6.1 mm See dimension drawings for further measurements
Ingress protection	IP 20
Mounting	For 35 mm top hat rail to EN 50022, see dimension drawing for conductor cross-section
Weight	Approx. 50 g

4) Mean Time Between Failures – MTBF – according to EN 61709 (SN 29500).

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

■ Application Example



Repeater Power Supplies

Isolation Amplifiers
Transmitters

Indicators

Process Analytics

Portable Meters

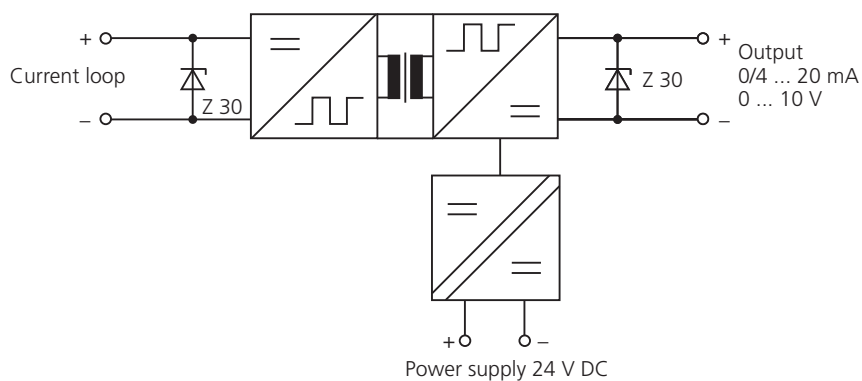
Laboratory Meters

Sensors

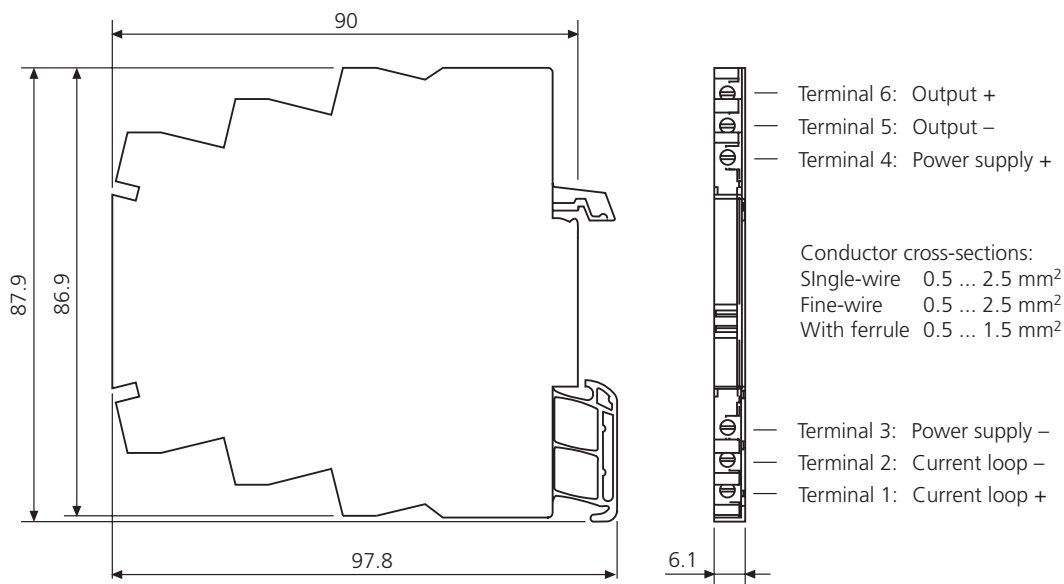
Fittings

Knick 

■ Block Diagram



■ Dimension Drawings and Terminal Assignments



All dimensions in mm!

Modular Housings

Modular Housings

Knick >

Repeater power supply in 6-mm housing.

The Task

Supply of 2-wire transmitters via the measuring line and 1:1 transmission of 4 ... 20 mA measurement signals.

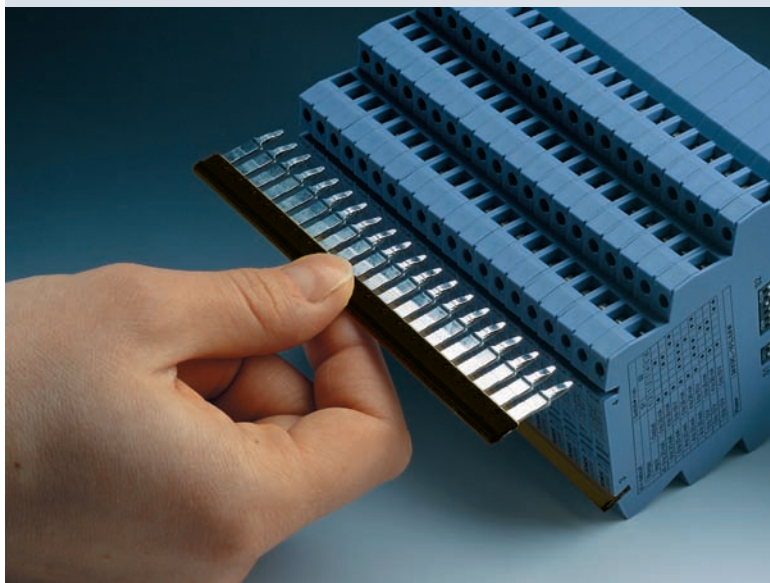
The Problems

In many cases, space is limited at the operating site and furthermore, additional effort for the supply units and galvanic isolation often requires two separate devices.

The Solution

We supply one of the narrowest repeater power supplies at an extremely attractive price. The IsoAmp® PWR B 10116 supplies the transmitter with power and transmits the measurement signal galvanically isolated to the output with a high level of accuracy. A high supply voltage allows use with almost all commercially available 2-wire transmitters.

IsoAmp® PWR B 10116



The Housing

Mounted in a 6-pin terminal housing with 6.1 mm row width. Connection with screw terminals.

The Advantages

The new IsoAmp® PWR B 10116 repeater power supply unites excellent technology with unbeatable value for money.

The Technology

Transformer signal and energy transmission. The output signal is permanently set to 4 ... 20 mA.

Warranty
5 years!

Defects occurring within 5 years from delivery are remedied free of charge at our works (carriage and insurance paid by sender).

Repeater Power Supplies

Isolation Amplifiers
Transmitters

Indicators

Process Analytics

Portable Meters

Laboratory Meters

Sensors

Fittings



Knick >

■ The Facts

Extremely flat

3-port isolation in a 6-mm modular housing

Low-cost assembly

Supply of the current loop and galvanic isolation of the measured signal in one device

Safety in the smallest space

3-port isolation in a 6-mm housing

Supplies all common 2-wire transmitters (2-wire sensors)

24 V DC power supply

Cross-connections for power supply

Power supply only wired once for almost any number of parallel repeater power supplies

5-year warranty



Modular Housings

IsoAmp® PWR B 10116

■ Product Line

Devices	Input	Output	Order No.
IsoAmp® PWR B 10116	4 ... 20 mA	4 ... 20 mA	B 10116 F0
Power supply			
24 V DC			
Accessories			
Cross-connections	Pluggable cross-connection for looping through of the power supply for up to 41 power supply connections of B 10XXX F0 and A 20XXX F0, separable.		ZU 0542

■ Specifications

Input data

Input (current loop)	4 ... 20 mA, supply voltage 16.5 V, constant for 3 ... 22 mA, Current limited to max. 25 mA
Residual ripple	< 10 mV _{rms}

Output data

Output	4 ... 20 mA
Output signal with input short-circuit	22 ... 25 mA
Output signal with open input	< 3 mA
Load	≤ 10 V (500 ohms at 20 mA)
Offset ¹⁾	< 30 μA
Residual ripple at output	< 10 mV _{rms}

Transmission behavior

Gain error	< 0.1 % meas. val.
Response time	< 5 ms

1) Additional error 30 μA for output 0 ... 20 mA

Repeater Power Supplies

Isolation Amplifiers
Transmitters

Indicators

Process Analytics

Portable Meters

Laboratory Meters

Sensors

Fittings



Specifications (continued)

Power supply

Power supply	24 V DC ($\pm 15\%$), approx. 1 W The power supply can be routed from one device to another via cross-connections.
--------------	---

Isolation

Galvanic isolation	3-port isolation between current loop, output, and power supply
Test voltage	1.5 kV AC current loop against output/power supply 510 V AC output against power supply
Working voltage (basic insulation)	Up to 300 V AC/DC across current loop and output/power supply with overvoltage category II and pollution degree 2, up to 100 V AC/DC across output and power supply with category II and degree 2 according to EN 61010-1. For applications with high working voltages, you should ensure there is sufficient spacing or isolation from neighboring devices and protection against electric shocks.

Standards and approvals

EMC ²⁾	Product standard: EN 61326 Emitted interference: Class B Immunity to interference: Industry
Approval	cURus, File No. E 220033, Standards: UL 508 and CAN/CSA 22.2 no. 14-95

Other data

MTBF ³⁾	Approx. 450 years
Ambient temperature	Operation: 0 ... +55 °C Transport and storage: -25 to +85 °C
Design	Modular housing, width 6.1 mm, see dimension drawing for other measurements, with screw terminals
Ingress protection	IP 20
Mounting	For 35 mm top hat rail to EN 50022 See dimension drawings for conductor cross section
Weight	Approx. 50 g

2) Slight deviations are possible while there is interference

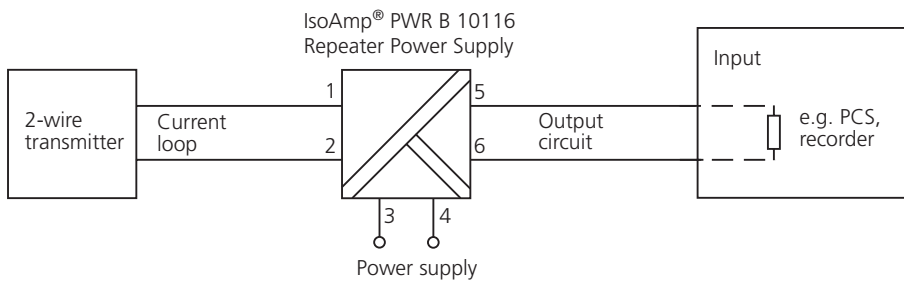
3) Mean Time Between Failures – MTBF – according to EN 61709 (SN 29500).

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

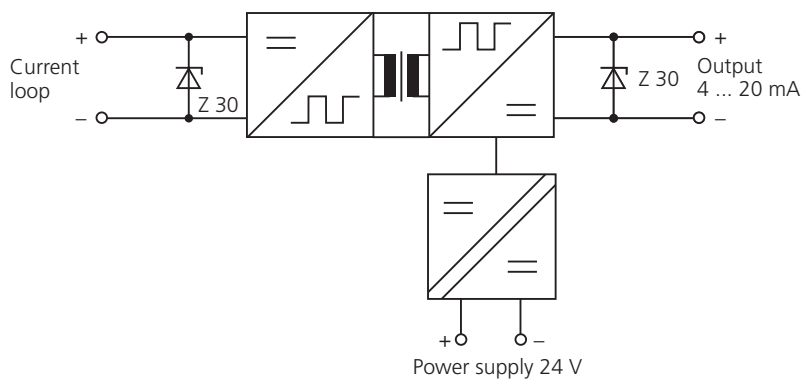
Modular Housings

IsoAmp® PWR B 10116

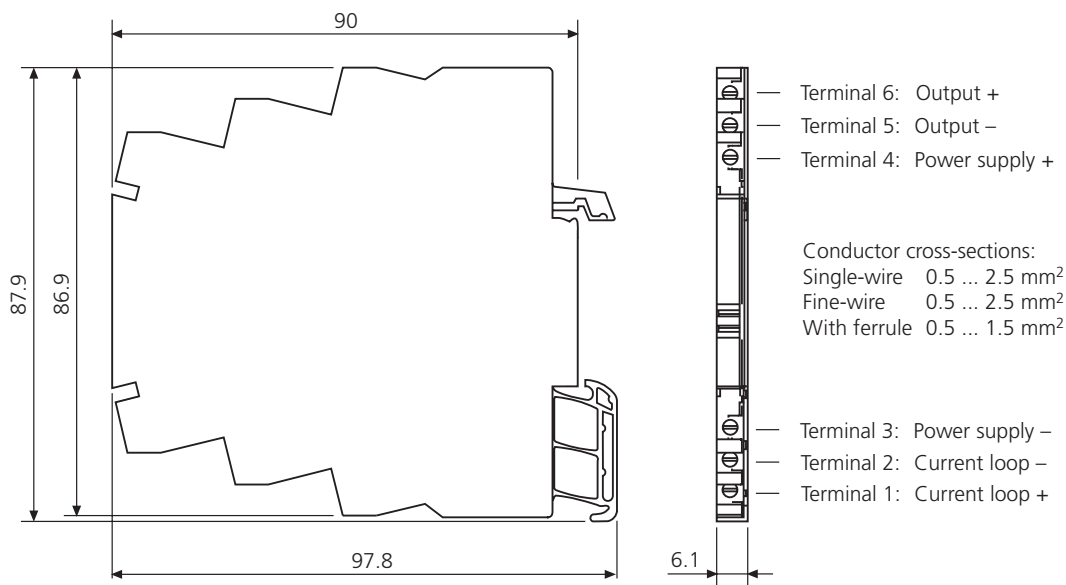
■ Application Example



■ Block Diagram



■ Dimension Drawings and Terminal Assignments



All dimensions in mm!

Modular Housings

Knick >

Universal transmitter for temperature, strain gages, and potentiometers – in a 6-mm housing with infrared interface, SIL approval, and broad-range power supply.

The Task

Temperature, strain or force, and position are parameters which must be measured in virtually all areas of industry. They are often used as reference input for control or monitoring systems, safety shutdown systems, or for similar critical jobs. Here, normally the highest demands are placed on accuracy, flexibility, and functional safety as well as electrical safety.

Different sensors are used depending on the measuring task. These sensors provide a raw signal which is prepared, linearized if required, and standardized for further processing using a transmitter.

The Problem

There is a very wide range of standardized and commercial sensors for the detection of temperature, strain or force, and position. The large number of sensors, connection variants, individual measurement ranges, different supply voltages, and required output signals call for very variable transmitters that can be optimally suited to the different conditions. However, the required flexibility should not be paid for with complex operation. Rather, it is desirable that adjustments can easily be made on the site. High performance should not result in increased susceptibility – high reliability and availability are key requirements.

PolyTrans® P 32000

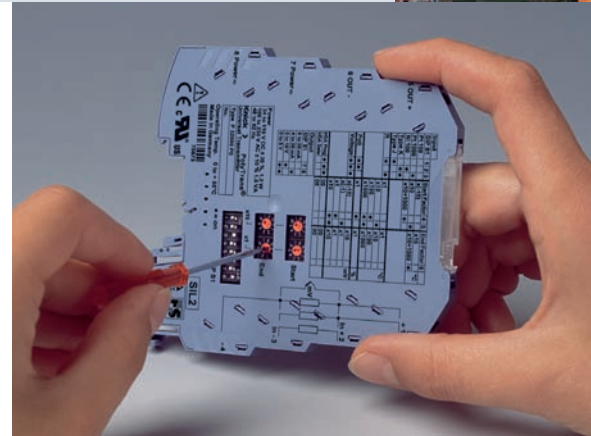
The Solution

The PolyTrans® P 32000 universal transmitters provide connection possibilities for all standard thermocouples, resistance thermometers, strain gage full bridges, resistors, and potentiometers/resistive sensors. They can be flexibly adapted to the respective measuring task using DIP and rotary switches or via an IrDA® port. The broad-range power supply covers all common supply voltages from 24 to 230 V and ensures maximum safety even with unstable mains supplies. 3-port isolation with Safe Isolation up to 300 V AC/DC according to EN 61140 ensures optimum protection of personnel and equipment as well as unaltered transmission of measurement signals.

The PolyTrans® P 32000 offer maximum performance in the smallest of spaces.

Resistance thermometers can be operated either in 2-, 3-, or 4-wire configuration. The configuration type is automatically recognized, adjustment is not required. All commercial thermocouples can be detected with internal or external reference junction compensation.

To detect mechanical quantities such as force or strain, strain gages can be connected in full-bridge configuration. The possibility for connecting resistive sen-



sors and potentiometers creates a wide range of application possibilities, for example, in the field of path or position measurement.

Input voltage signals up to ± 1000 mV are converted to 0/4 to 20 mA or 0 to 10 V standard signals. This enables low-cost implementation of current measurements using shunt resistors, for example.

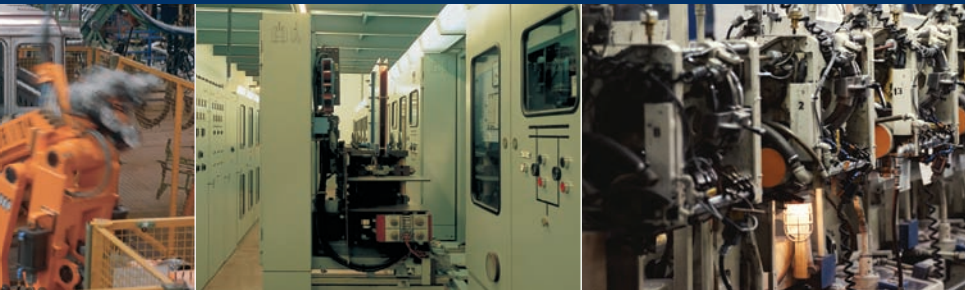
The devices meet the requirements of type of protection "n". This means they can be installed and used in Zone 2 hazardous areas in the EC, the USA, and in Canada. Thanks to their approval to Class 1, Division 2 (UL 1604), they can also be used according to the traditional North American classification system.

Knick offers the PolyTrans® P 32000 transmitters with SIL approval for applications with high demands on functional safety. The requirements of EN 61508 were implemented by a specially developed hardware



Universal Transmitters

- Isolation Amplifiers Transmitters
- Indicators
- Process Analytics
- Portable Meters
- Laboratory Meters
- Sensors
- Fittings



Knick >

and software. The fail-safe concept makes use of structural measures at the device level (redundancy of system components) and diagnostic methods for selective fault detection. The product is SIL 2 approved (EN 61508) by an authorized body (TÜV Rheinland).

Operating Software

The user-friendly, menu-guided Paraly® SW 111 communication software runs on standard and pocket PCs and opens a number of further options – such as access to further sensor types, input of customer-specific linearization curves, readout of the connection configuration, as well as the use of extensive diagnostic functions. Configuration, documentation and, if necessary, maintenance of entire plant components can be accomplished by “infrared remote control”. Moreover, the output current or voltage can be specified independently of the input value using the simulation function – a useful feature for plant commissioning or revision.

The Housing

The modular housing – 6 mm slim – is stingy with enclosure space and allows high component density. DIN rail bus connectors inserted in the mounting rail facilitate the power supply connection if necessary.

IRDA® is a registered trademark of the Infrared Data Association.

**Warranty
5 years!**

Defects occurring within 5 years from delivery are remedied free of charge at our works (carriage and insurance paid by sender).

Safety Integrity Level

>

SIL 2

IEC 61508

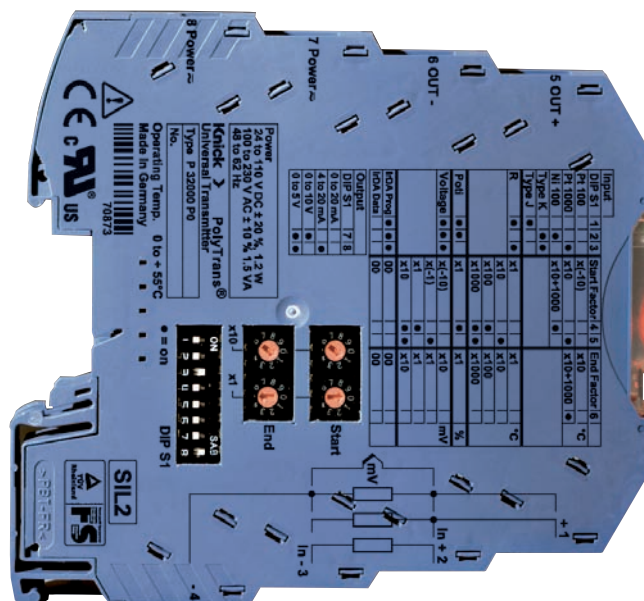
Safety Integrity Level

>

SIL 2

IEC 61508 / IEC 61511
*norme 11-4

6
mm
CLASS



Modular Housings

Modular Housings

PolyTrans® P 32000

■ The Facts

Universal usability

from simple to challenging measurement demands with all known temperature sensors, strain gage sensors, potentiometers, and similar sensors

Convenient parameter setting

via IrDA® port – uncomplicated, menu-guided adjustment also “on site” including archiving of configuration data

Intuitive configuration

of basic parameters – easy, without tools, using 4 rotary and 8 DIP switches

Calibrated range selection

without complicated adjustments

Automatic recognition

of the sensor connection (2-, 3-, or 4-wire)

Simulation

of any desired output values for correct installation/commissioning

World-wide usability

due to broad-range power supply 24 ... 110 V DC ($\pm 20\%$) and 110 ... 230 V AC ($\pm 10\%$)

Safe Isolation

according to EN 61140 – protection of maintenance staff and subsequent devices against non-permitted high voltages up to 300 V AC/DC

Functional safety

up to SIL 2 (up to SIL 3 in the case of redundant configuration) with TÜV

certificate – systematically developed according to EN 61508

High accuracy

due to innovative circuit design

Reduced stockkeeping

One transmitter covers all conceivable tasks

Minimum space consumption

in the enclosure: only 6 mm wide modular housing – more transmitters per meter of mounting rail

Low-cost assembly

Quick mounting, convenient connection of power supply through DIN rail bus connectors (in the case of 24 V DC supply)

5-year warranty

■ Product Line

Universal transmitter, adjustable

	Order No.	P 32000 P0 / <input type="checkbox"/> <input type="checkbox"/>
PolyTrans® P 32000		
Functional Safety (EN 61508)	Without SIL 2 (up to SIL 3 in the case of redundant configuration)	0 1
Power supply	Broad-range power supply 24 ... 110 V DC, 110 ... 230 V AC via screw terminals only, 24 V DC via screw terminals or DIN rail bus connector	1 0

Accessories

		Order No.
Paraly® SW 111	Communication software	SW 111
DIN rail bus connector ZU 0628	Power supply bridging for two devices, A 20XXX P0 or P 32XXX P0	ZU 0628
IsoPower® A 20900	Power supply, 24 V DC, 1 A, see Page 212	A 20900 H4
DIN rail bus connector ZU 0678	Tapping of supply voltage (A 20900), routing to ZU 0628 DIN rail bus connector	ZU 0678
Power terminal block ZU 0677	Feeding the 24 V DC supply voltage to the ZU 0628 DIN rail bus connector	ZU 0677

■ Specifications

Resistance/Resistance Thermometers

Input data	Sensor type	Standard	Measurement range
Input ¹⁾	Pt 100	DIN 60751	-200 ... +850 °C
	Pt 1000	DIN 60751	-200 ... +850 °C
	Other platinum resistors	DIN 60751	-200 ... +850 °C
	Ni 100	DIN 43760	-60 ... +180 °C
	Other nickel resistors	DIN 43760	-60 ... +180 °C
Connection	2-, 3-, or 4-wire (automatic recognition), signaling via yellow LED		
Resistance ranges incl. line resistance	Temperature measurement:	0 ... 5 kohms	
	Resistance measurement:	0 ... 5 kohms or 5 ... 100 kohms	
Max. line resistance	100 ohms		
Supply current	200 µA, 400 µA, or 0 ... 500 µA		
Line monitoring	Open circuits		
Input error limits	Resistances < 5 kohms: ±(50 mohms +0.05 % meas. val.) for spans > 15 ohms Resistances > 5 kohms: ±(1 mohm +0.05 % meas. val.) for spans > 50 ohms		
Temperature coefficient at input	< 50 ppm/K of adjusted end value (average TC in permitted operating temp range, reference temp 23 °C)		

Thermocouples

Input data	Sensor type	Standard	Measurement range
Input ²⁾	Type B	DIN 60584-1	+250 ... +1820 °C
	Type E	DIN 60584-1	-200 ... +1000 °C
	Type J	DIN 60584-1	-210 ... +1200 °C
	Type K	DIN 60584-1	-200 ... +1372 °C
	Type L	DIN 43710	-200 ... +900 °C
	Type N	DIN 60584-1	-200 ... +1300 °C
	Type R	DIN 60584-1	-50 ... +1767 °C
	Type S	DIN 60584-1	-50 ... +1767 °C
	Type T	DIN 60584-1	-200 ... +400 °C
	Type U	DIN 43710	-200 ... +600 °C
	W3Re/W25Re	ASTM E988-96	0 ... +2315 °C
	W5Re/W26Re	ASTM E988-96	0 ... +2315 °C
Input resistance	> 10 Mohms		
Max. line resistance	1 kohm		
Line monitoring	Open circuits		
Input error limits	± (10 µV + 0.05 % meas. val.) for spans > 2 mV		

1) Other sensor types with resistance values up to 5 kohms on request

2) Other thermocouple types on request

Modular Housings

PolyTrans® P 32000

Specifications (continued)

Thermocouples (continued)

Input data

Temperature coefficient at input	< 50 ppm/K of adjusted end value (average TC in permitted operating temp range, reference temp 23 °C)	
Reference junction compensation	Internal (Pt 100) Selectable via IrDA®: external (Pt 100), fixed value, or uncompensated	
Error of internal reference junction compensation	< 1.5 K	
Error of external reference junction compensation	< 80 mohms +0.1 % meas. val.	via Pt 100 for $T_{comp} = 0 \dots 80 \text{ °C}$

Shunt voltages

Input data

Input	-1000 ... 1000 mV unipolar/bipolar	
Input resistance	> 10 Mohms	
Input error limits	$\pm (200 \mu\text{V} + 0.05 \text{ \% meas. val.})$ for spans > 50 mV	
Line monitoring	Open circuits	
Temperature coefficient at input	< 50 ppm/K of adjusted end value (average TC in permitted operating temp range, reference temp 23 °C)	
Overload	5 V across all inputs	

Strain gage input data

Input	$\pm 7.5 \text{ mV/V}$	
Bridge resistance	200 ohms ... 10 kohms	
Zero adjustment	Within input range	
Supply current (int. supply)	0 ... 5 mA	
Supply voltage (ext. supply)	1 ... 3 V	
Line monitoring	Short circuit or open circuit	
Input error limits	$\pm (2 \mu\text{V/V} + 0.1 \text{ \% meas. val.})$ for spans $\geq 0.5 \text{ mV/V}$	
Temperature coefficient at input	< 50 ppm/K of adjusted sensitivity (average TC in permitted operating temp range, reference temp 23 °C)	
Overload	5 V across all inputs	

Specifications (continued)

Potentiometers

Input data

Input	200 ohms ... 50 kohms
Connection	3- or 4-wire
Supply current	0 ... 5 mA
Line monitoring	Short circuit or open circuit
Input error limits	$\pm(0.2\% \text{ full scale} + 0.05\% \text{ meas. val.})$ for spans $> 5\%$
Temperature coefficient at input	$< 50 \text{ ppm/K}$ of adjusted end value (average TC in permitted operating temp range, reference temp $23\text{ }^\circ\text{C}$)

Output data

Outputs	0 ... 20 mA, Calibrated selection 4 ... 20 mA, (factory setting 4 ... 20 mA) 0 ... 5 V, 0 ... 10 V
Control range	0 ... $\approx 102.5\%$ span with 0 ... 20 mA, 0 ... 10 V or 0 ... 5 V output $-1.25 \dots \approx 102.5\%$ span with 4 ... 20 mA output
Resolution	16 bits
Simulation mode adjustable via IrDA®	0 ... 20 mA current output: 0 ... 21 mA 4 ... 20 mA current output: 3 ... 21 mA 0 ... 5 V voltage output: 0 ... 5.25 V 0 ... 10 V voltage output: 0 ... 10.5 V
Load	Current output: $\leq 10 \text{ V}$ ($\leq 500 \text{ ohms}$ at 20 mA) Voltage output: $\leq 1 \text{ mA}$ ($\geq 10 \text{ kohms}$ at 10 V)
Output error limits	Current output: $\pm(10 \mu\text{A} + 0.05\% \text{ meas. val.})$ Voltage output: $\pm(5 \text{ mV} + 0.05\% \text{ meas. val.})$
Residual ripple	$< 10 \text{ mV}_{\text{rms}}$
Temperature coefficient at output	$< 50 \text{ ppm/K}$ full scale (average TC in permitted operating temp range, reference temp $23\text{ }^\circ\text{C}$)
Error signaling	0 ... 20 mA output: $I = 0 \text{ mA}$ or $\geq 21 \text{ mA}$ 4 ... 20 mA output: $I \leq 3.6 \text{ mA}$ or $\geq 21 \text{ mA}$ 0 ... 5 V or 0 ... 10 V output: $V = 0 \text{ V}$ or $V \geq 5.25 \text{ V}$ or $V \geq 10.5 \text{ V}$ via output signal, red LED, and IrDA® for out-of-range conditions, faulty settings, sensor short circuit or open circuit, output load error, unintentional adjustment of switches during operation (for SIL devices only), other device errors. Also see "Error Signaling" Page 149.

Modular Housings

PolyTrans® P 32000

Specifications (continued)

Transmission behavior

Characteristic	Linear rising / falling, curves defined by sampling points (via IrDA® port)
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Meas. rate	Approx. 3/s *)
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Display

Green LED	Power supply
-----------	--------------

Yellow LED	Signaling the connection type IrDA® communication
------------	--

Red LED	Maintenance request or device failure
---------	---------------------------------------

Power supply

Power supply	<table border="1"> <thead> <tr> <th>24 V DC power supply unit</th> <th>Broad-range power supply unit</th> </tr> </thead> <tbody> <tr> <td>24 V DC (–20 %, +25 %), approx. 1.2 W The power supply can be routed from one device to another via DIN rail bus connectors.</td> <td>24 V ... 110 V DC (±20 %), approx. 1.2 W 110 V ... 230 V AC (±10 %), 48 ... 62 Hz, approx. 1.5 VA</td> </tr> </tbody> </table>	24 V DC power supply unit	Broad-range power supply unit	24 V DC (–20 %, +25 %), approx. 1.2 W The power supply can be routed from one device to another via DIN rail bus connectors.	24 V ... 110 V DC (±20 %), approx. 1.2 W 110 V ... 230 V AC (±10 %), 48 ... 62 Hz, approx. 1.5 VA
24 V DC power supply unit	Broad-range power supply unit				
24 V DC (–20 %, +25 %), approx. 1.2 W The power supply can be routed from one device to another via DIN rail bus connectors.	24 V ... 110 V DC (±20 %), approx. 1.2 W 110 V ... 230 V AC (±10 %), 48 ... 62 Hz, approx. 1.5 VA				

Isolation

Galvanic isolation	3-port isolation between input, output, and power supply
--------------------	--

Test voltage	2.5 kV AC, 50 Hz: Power supply against input against output
--------------	---

Working voltage (basic insulation)	Up to 300 V AC/DC across all circuits with overvoltage category II and pollution degree 2 according to EN 61010-1. For applications with high working voltages, you should ensure there is sufficient spacing or isolation from neighboring devices and protection against electric shocks.
------------------------------------	--

Protection against electric shock	Safe Isolation according to EN 61140 by reinforced insulation in accordance with EN 61010-1. Working voltage up to 300 V AC/DC across all circuits with overvoltage category II and pollution degree 2. For applications with high working voltages, you should ensure there is sufficient spacing or isolation from neighboring devices and protection against electric shocks.
-----------------------------------	--

Standards and approvals

Functional safety	SIL 2 to EN 61508, SIL 3 with redundant configuration
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Explosion protection	ATEX Zone 2 (EN 60079-15) Class 1, Div 2 / Zone 2 (UL 1604)
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*) For thermocouples with external reference junction compensation or for resistance measurements in the range 5 kohms ... 100 kohms: measuring rate 2/s.

Specifications (continued)

Standards and approvals (continued)

EMC	Product family standard: EN 61326 Emitted interference: Class B Immunity to interference ³⁾ : Industry EMC-requirements for devices with safety-related functions IEC 61326-3: draft
cURus	File No. 220033 Standards: UL 508 and CAN/CSA 22.2 no. 14-95

Interfaces

IrDA®	Specification 1.1, slave device for bidirectional communication Paraly® SW 111 communication software Free download at www.knick.de
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Other data

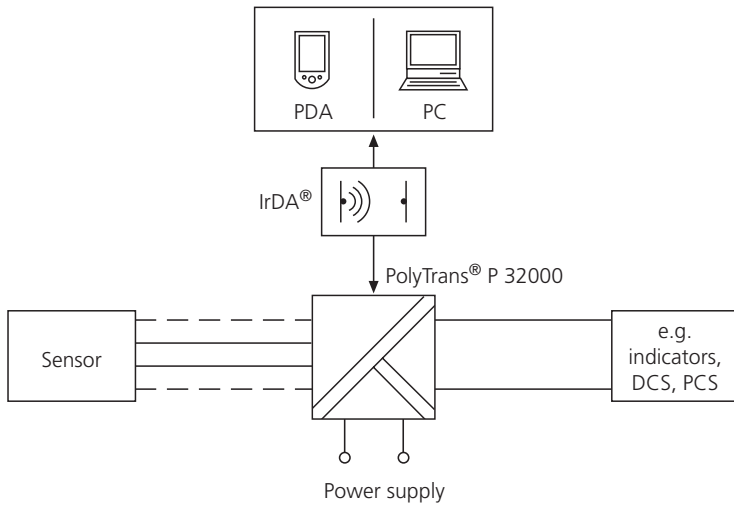
Ambient temperature	Operation: 0 ... +55 °C in row, without spacing 0 ... +65 °C with spacing ≥ 6 mm Storage: -25 to +85 °C
Ambient conditions	Stationary application, weather-protected relative air humidity: 5 ... 95 %, no condensation barometric pressure: 70 ... 106 KPa water or wind-driven rain, snow, or hail excluded
Design	Modular housing with screw terminals, width 6.2 mm, see dimension drawings for further measurements and conductor cross section
Ingress protection	Terminal IP 20, housing IP 40
Mounting	For 35 mm top hat rail to EN 50022
Weight	Approx. 60 g

3) Slight deviations are possible while there is interference

Modular Housings

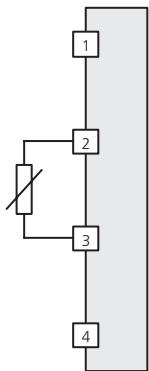
PolyTrans® P 32000

■ Application Examples



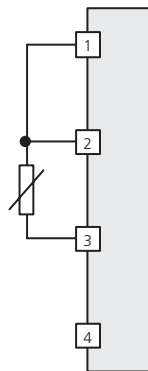
Connection of Resistance Thermometers

RTD
2-wire connection



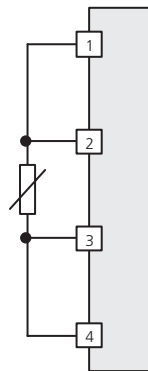
a)

RTD
3-wire connection



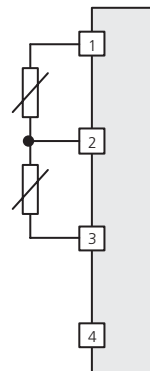
a)

RTD
4-wire connection



a)

RTD
differential measurement



b)

a) Selectable via DIP switches or IrDA® port

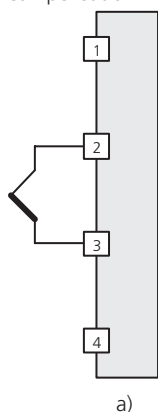
b) Special configuration selectable via IrDA®



Application Examples (continued)

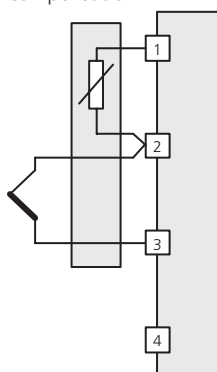
Connection of Thermocouples

Thermocouple with internal reference junction compensation



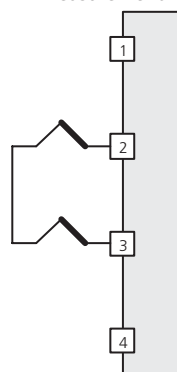
a)

Thermocouple with external reference junction compensation



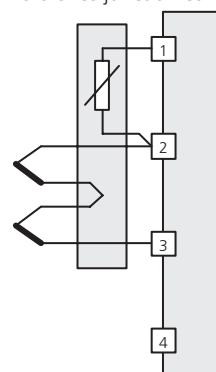
b)

Thermocouples for differential measurement



b)

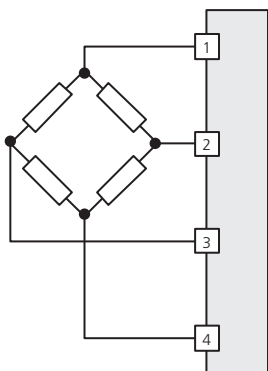
Thermocouples in summing configuration (averaging), external reference junction compensation



b)

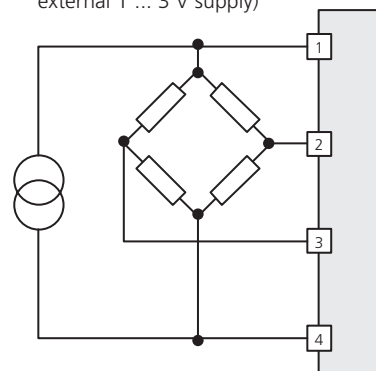
Connection of Strain Gages

4-wire connection



a)

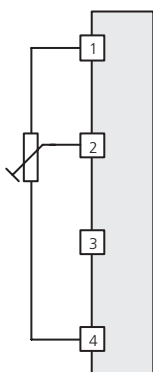
6-wire connection (with external 1 ... 3 V supply)



b)

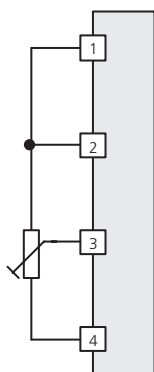
Connection of Potentiometers

3-wire connection



a)

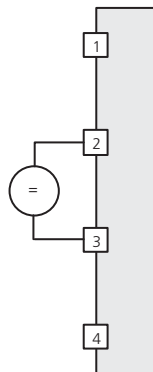
4-wire connection



b)

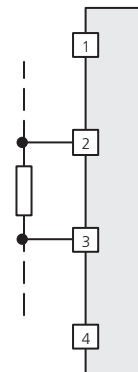
Voltage Input

Voltage measurement



a)

Current measurement with shunt resistor



a)

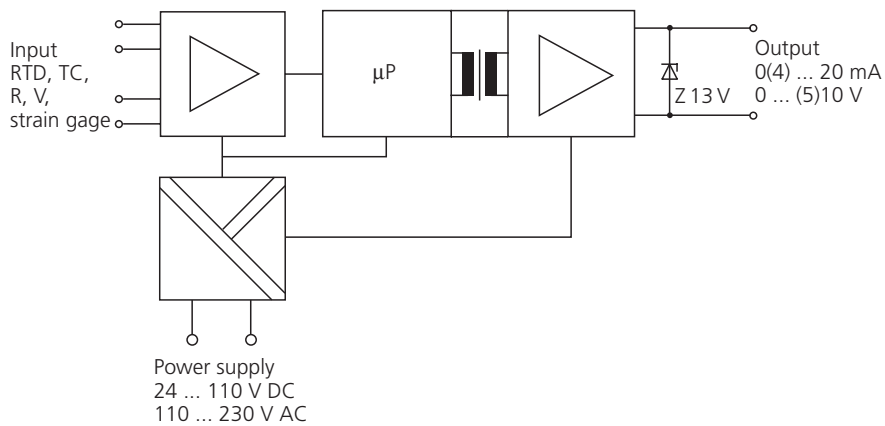
a) Selectable via DIP switches or IrDA® port

b) Special configuration selectable via IrDA®

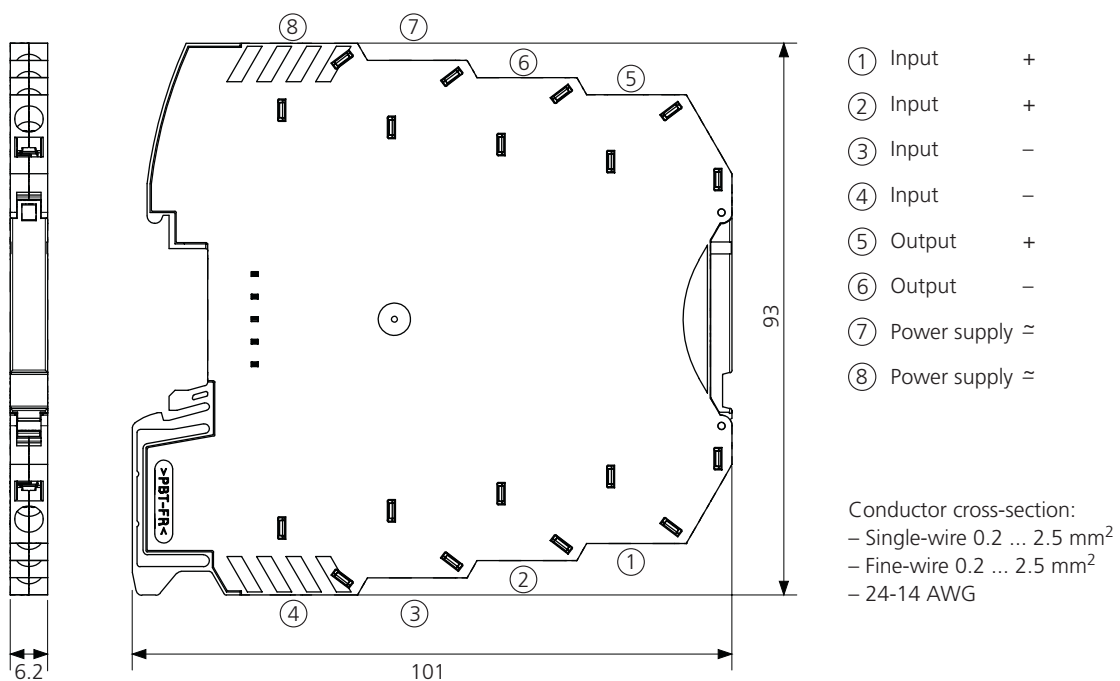
Modular Housings

PolyTrans® P 32000

■ Block Diagram



■ Dimension Drawings and Terminal Assignments



All dimensions in mm!

■ Error Signaling

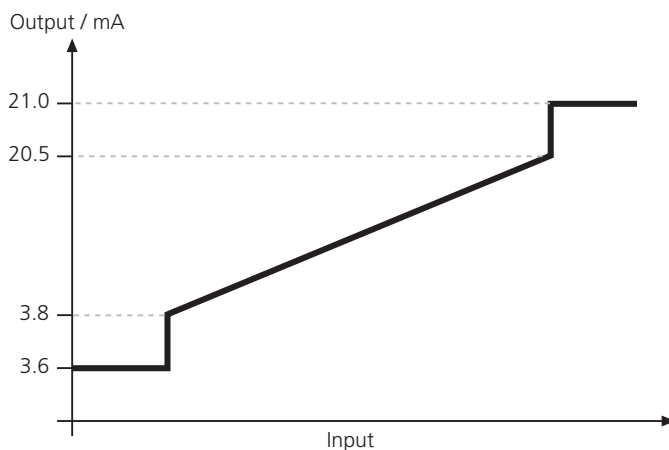
No.	Error	Message configuration ⁴⁾		Output			
		With SIL	Without SIL	4 ... 20 [mA]	0 ... 20 [mA]	0 ... 5 [V]	0 ... 10 [V]
0	None	Not self-locking	Not self-locking	–	–	–	–
1	Value below range	Not self-locking	Not self-locking	3.6	0	0	0
2	Value above range	Not self-locking	Not self-locking	21	21	5.25	10.5
3	Sensor short circuit	Self-locking	Not self-locking	21	21	5.25	10.5
4	Sensor open	Self-locking	Not self-locking	21	21	5.25	10.5
5	Basic resistance invalid ⁵⁾	Self-locking	Not self-locking	21	21	5.25	10.5
6	Load output error ⁶⁾	Not self-locking	Not self-locking	3.6	0	0	0
7	Identification of connection	Self-locking	Not self-locking	21	21	5.25	10.5
8	Switch misadjusted	Self-locking	Not self-locking	21	21	5.25	10.5
9	Parameter error	Self-locking	Not self-locking	21	21	5.25	10.5
10	Device error (subordinated error number distinguished via IrDA [®] port)	Self-locking	Self-locking	3.6	0	0	0

4) With the "self-locking" configuration, the error signal is maintained after termination of the error cause. The error message can be reset by restart (power supply on/off or via IrDA[®] port).

5) With potentiometer or strain gage only

6) With SIL models P 32000 P0/1x only

Output Current (4 ... 20 mA) Response to Out-Of-Range Conditions



Modular Housings

Knick >

ThermoTrans® P 32100



Universal transmitters for temperature measurement with resistance thermometers and thermocouples – in a 6-mm housing with infrared interface, SIL approval, and broad-range power supply.

The Task

In virtually all areas of industry temperatures are continuously measured and often used as reference input for closed-loop control systems, monitoring systems, safety shutdown systems, or for similar critical jobs. Here, normally the highest demands are placed on accuracy, flexibility, and functional safety as well as electrical safety.

Different sensors are used depending on the measuring task. They provide a raw signal which is prepared, linearized, and standardized for further processing using a temperature transmitter.

The Problem

There is a very wide range of standardized and commercial temperature sensors. The large number of sensors, connection variants, individual temperature ranges, different supply voltages, and required output signals call for very variable transmitters that can be optimally suited to the different conditions. However, the required flexibility should not be paid for with complex operation. Rather, it is desirable that adjustments can easily be made on the site. High performance should not result in increased susceptibility – high reliability and availability are key requirements.

The Solution

The universal ThermoTrans® P 32100 temperature transmitters provide connection possibilities for all common thermocouples and resistance thermometers. They can be flexibly adapted to the respective measuring task using DIP and rotary switches or via an IrDA® port. The broad-range power supply covers all common supply voltages from 24 to 230 V and ensures maximum safety even with unstable mains supplies.

3-port isolation with Safe Isolation up to 300 V AC/DC according to EN 61140 ensures optimum protection of personnel and equipment as well as unaltered transmission of measurement signals. The ThermoTrans® P 32100 offer maximum performance in the smallest of spaces.

Resistance thermometers can be operated either in 2-, 3-, or 4-wire configuration. The configuration type is automatically recognized, adjustment is not required. All commercial thermocouples can be detected with internal or external reference junction compensation.

Input voltage signals up to ± 1000 mV are converted to 0/4 to 20 mA or 0 to 10 V standard signals.

This enables low-cost implementation of current measurements using shunt resistors, for example.

The devices meet the requirements of type of protection “n”. This means they can be installed and used in Zone 2 hazardous areas in the EC, the USA, and in Canada. Thanks to their approval to Class 1, Division 2 (UL 1604), they can also be used according to the traditional North American classification system.

Special measuring tasks can be solved with ThermoTrans® devices that Knick configures according to individual specifications. Fixed-range models without switch are used, for example, when manipulations or mix-up are to be excluded.

Knick offers the ThermoTrans® P 32100 transmitters with SIL approval for applications with high demands on functional safety. The requirements of EN 61508 were implemented by a specially developed hardware and software. The fail-safe concept makes use of structural measures at the device level (redundancy of system components) and diagnostic methods for selective fault detection. The product is SIL 2 approved (EN 61508) by an authorized body (TÜV Rheinland).



Temperature Transmitters

Isolation Amplifiers
Transmitters

Indicators

Process Analytics

Portable Meters

Laboratory Meters

Sensors

Fittings



Knick 

Operating Software

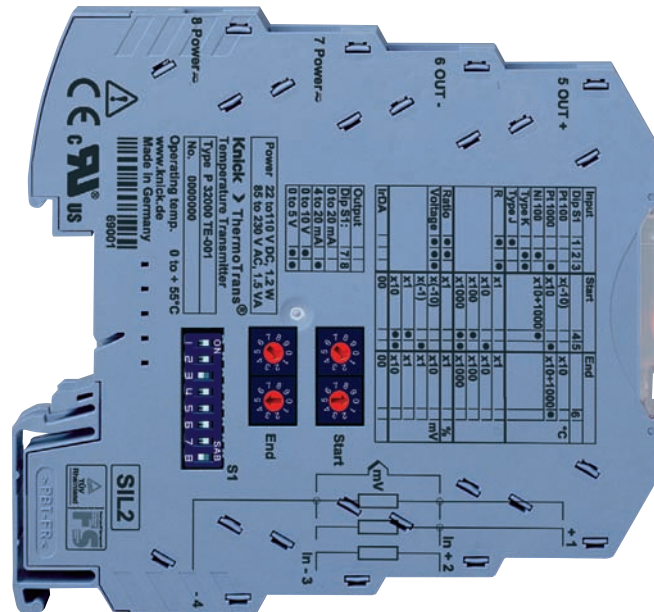
The user-friendly, menu-guided Paraly® SW 111 communication software runs on standard and pocket PCs and opens a number of further options – such as access to further sensor types, input of customer-specific linearization curves, readout of the connection configuration, as well as the use of extensive diagnostic functions. Configuration, documentation and, if necessary, maintenance of entire plant components can be accomplished by “infrared remote control”. Moreover, the output current or voltage can be specified independently of the input value using the simulation function – a useful feature for plant commissioning or revision.

The Housing

The modular housing – 6 mm slim – is stingy with enclosure space and allows high component density. DIN rail bus connectors inserted in the mounting rail facilitate the power supply connection if necessary.



IrDA® is a registered trademark of the Infrared Data Association.



Warranty 5 years!

Defects occurring within 5 years from delivery are remedied free of charge at our works (carriage and insurance paid by sender).

Modular Housings

Modular Housings

ThermoTrans® P 32100

■ The Facts

Universal usability

from simple to challenging measurement demands with all known temperature sensors

Convenient parameter setting

via IrDA® port – uncomplicated, menu-guided adjustment also “on site” including archiving of configuration data

Intuitive configuration of basic parameters – easy, without tools, using 4 rotary and 8 DIP switches

Calibrated range selection

without complicated adjustments

World-wide usability due to broad-range power supply 24 ... 110 V DC ($\pm 20\%$) and 110 ... 230 V AC ($\pm 10\%$)

Automatic recognition

of the sensor connection (2-, 3-, or 4-wire)

Safe Isolation according to EN 61140 – protection of maintenance staff and subsequent devices against non-permitted high voltages up to 300 V AC/DC

Functional safety

up to SIL 2 (up to SIL 3 in the case of redundant configuration) with TÜV certificate – systematically developed according to EN 61508

High accuracy due to innovative circuit design

Minimum space consumption

in the enclosure: only 6 mm wide modular housing – more transmitters per meter of mounting rail

Low-cost assembly

Quick mounting, convenient connection of power supply through DIN rail bus connectors (in the case of 24 V DC supply)

5-year warranty

■ Product Line

Temperature transmitter, adjustable

ThermoTrans® P 32100

Order No. P 32100 P0 /

Functional safety (EN 61508)

Without SIL 2 (up to SIL 3 in the case of redundant configuration) 0
1

Power supply

Broad-range power supply 24 ... 110 V DC, 110 ... 230 V AC via screw terminals only, 24 V DC via screw terminals or DIN rail bus connector 1
0

Modular Housings

ThermoTrans® P 32100

Accessories		Order No.
Paraly® SW 111	Communication software	SW 111
DIN rail bus connector ZU 0628	Power supply bridging for two devices, A 20XXX P0 or P 32XXX P0	ZU 0628
IsoPower® A 20900	Power supply, 24 V DC, 1 A, see Page 212	A 20900 H4
DIN rail bus connector ZU 0678	Tapping of supply voltage (A 20900), routing to ZU 0628 DIN rail bus connector	ZU 0678
Power terminal block ZU 0677	Feeding the 24 V DC supply voltage to the ZU 0628 DIN rail bus connector	ZU 0677

■ Specifications

Resistance thermometers

Input data	Sensor type	Standard	Measurement range
	Pt 100	DIN 60751	-200 ... +850 °C
	Pt 1000	DIN 60751	-200 ... +850 °C
	Other platinum resistors	DIN 60751	-200 ... +850 °C
	Ni 100	DIN 43760	-60 ... +180 °C
	Other nickel resistors	DIN 43760	-60 ... +180 °C
Connection	2-, 3-, or 4-wire (automatic recognition), signaling via yellow LED		
Resistance range incl. line resistance	0 ... 5 kohms		
Max. line resistance	100 ohms		
Supply current	200 µA, 400 µA, or 0 ... 500 µA		
Line monitoring	Open circuit monitoring		
Input error limits	Resistances < 5 kohms: ±(50 mohms +0.05 % meas. val.) for spans > 15 ohms Resistances > 5 kohms: ±(1 mohm +0.05 % meas. val.) for spans > 50 ohms		
Temperature coefficient at input	< 50 ppm/K of adjusted end value (average TC in permitted operating temp range, reference temp 23 °C)		

Temperature Transmitters

Isolation Amplifiers
Transmitters

Indicators

Process Analytics

Portable Meters

Laboratory Meters

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Fittings

Knick 

Specifications (continued)

Thermocouples

Input data

Input data	Sensor type	Standard	Measurement range
Input	Type B	DIN 60584-1	+250 ... +1820 °C
	Type E	DIN 60584-1	-200 ... +1000 °C
	Type J	DIN 60584-1	-210 ... +1200 °C
	Type K	DIN 60584-1	-200 ... +1372 °C
	Type L	DIN 43710	-200 ... +900 °C
	Type N	DIN 60584-1	-200 ... +1300 °C
	Type R	DIN 60584-1	-50 ... +1767 °C
	Type S	DIN 60584-1	-50 ... +1767 °C
	Type T	DIN 60584-1	-200 ... +400 °C
	Type U	DIN 43710	-200 ... +600 °C
	W3Re/W25Re	ASTM E988-96	0 ... +2315 °C
W5Re/W26Re	ASTM E988-96	0 ... +2315 °C	

Input resistance

>10 Mohms

Max. line resistance

1 kohm

Line monitoring

Open circuits

Input error limits

±(10 µV + 0.05 % meas. val.) for spans > 2 mV

Temperature coefficient at input

< 50 ppm/K of adjusted end value
(average TC in permitted operating temp range, reference temp 23 °C)

Reference junction compensation

Internal (Pt 100)
Selectable via IrDA®: external (Pt 100), fixed value, or uncompensated

Error of internal reference junction compensation

< 1.5 K

Error of external reference junction compensation

< 80 mohms + 0.1 % meas. val. via Pt 100 for T_{comp} = 0 ... 80 °C

Shunt voltages

Input data

Input	-1000 ... 1000 mV unipolar/bipolar
Input resistance	> 10 Mohms
Input error limits	± (200 µV + 0.05 % meas. val.) for spans > 50 mV
Line monitoring	Open circuits
Temperature coefficient at input	< 50 ppm/K of adjusted end value (average TC in permitted operating temp range, reference temp 23 °C)
Overload	5 V across all inputs

Modular Housings

ThermoTrans® P 32100

Specifications (continued)

Output data

Outputs	0 ... 20 mA, 4 ... 20 mA, 0 ... 5 V, 0 ... 10 V	Calibrated selection (factory setting 4 ... 20 mA)
Control range	0 ... ≈102.5 % span with 0 ... 20 mA, 0 ... 10 V or 0 ... 5 V output -1.25 ... ≈102.5 % span with 4 ... 20 mA output	
Resolution	16 bits	
Simulation mode adjustable via IrDA®	0 ... 20 mA current output: 4 ... 20 mA current output: 0 ... 5 V voltage output: 0 ... 10 V voltage output:	0 ... 21 mA 3 ... 21 mA 0 ... 5.25 V 0 ... 10.5 V
Load	Current output: Voltage output:	≤ 10 V (≤ 500 ohms at 20 mA) ≤ 1 mA (≥ 10 kohms at 10 V)
Output error limits	Current output: Voltage output:	±(10 µA + 0.05 % meas. val.) ±(5 mV + 0.05 % meas. val.)
Residual ripple	< 10 mV _{rms}	
Temperature coefficient at output	< 50 ppm/K full scale (average TC in permitted operating temp range, reference temp 23 °C)	
Error signaling	0 ... 20 mA output: I = 0 mA or ≥ 21 mA 4 ... 20 mA output: I ≤ 3.6 mA or ≥ 21 mA 0 ... 5 V or 0 ... 10 V output: V = 0 V or V ≥ 5.25 V or V ≥ 10.5 V via output signal, red LED, and IrDA® for out-of-range conditions, faulty settings, sensor short circuit or open circuit, output load error, unintentional adjustment of switches during operation (for SIL devices only), other device errors. Also see "Error Signaling" Page 161.	

Transmission behavior

Characteristic	Linear rising / falling, curves defined by sampling points (via IrDA® port)
Meas. rate	Approx. 3/s*)

Display

Green LED	Power supply
Yellow LED	Connection type signalling of IrDA® communication
Red LED	Maintenance request or device failure

*) For thermocouples with external reference junction compensation: measuring rate 2/s.

Temperature Transmitters

Isolation Amplifiers
Transmitters

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Laboratory Meters

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Fittings

Knick 

Specifications (continued)

Power supply

Power supply

24 V DC power supply unit

24 V DC (–20 %, +25 %), approx. 1.2 W
The power supply can be routed from one device to another via DIN rail bus connectors.

Broad-range power supply unit

24 V ... 110 V DC (±20 %), approx. 1.2 W
110 V ... 230 V AC (±10 %),
48 ... 62 Hz, approx. 1.5 VA

Isolation

Galvanic isolation

3-port isolation between input, output and power supply

Test voltage

2.5 kV AC, 50 Hz: Power supply against input against output

Working voltage
(basic insulation)

Up to 300 V AC/DC across all circuits with overvoltage category II and pollution degree 2 according to EN 61010-1.

For applications with high working voltages, you should ensure there is sufficient spacing or isolation from neighboring devices and protection against electric shocks.

Protection against
electric shock

Safe Isolation according to EN 61140 by reinforced insulation in accordance with EN 61010-1.

Working voltage up to 300 V AC/DC across all circuits with overvoltage category II and pollution degree 2. For applications with high working voltages, you should ensure there is sufficient spacing or isolation from neighboring devices and protection against electric shocks.

Standards and approvals

Functional safety

SIL 2 to EN 61508, SIL 3 with redundant configuration

Explosion protection

ATEX Zone 2 (EN 60079-15)
Class 1, Div 2 / Zone 2 (UL 1604)

EMC

Product family standard: EN 61326
Emitted interference: Class B
Immunity to interference¹⁾: Industry
EMC-requirements for devices with safety-related functions
IEC 61326-3: draft

cURus

File No. 220033
Standards: UL 508 and CAN/CSA 22.2 no. 14-95

Interfaces

IrDA®

Specification 1.1, slave device for bidirectional communication
Paraly® SW 111 communication software
Free download at www.knick.de

1) Slight deviations are possible while there is interference

Modular Housings

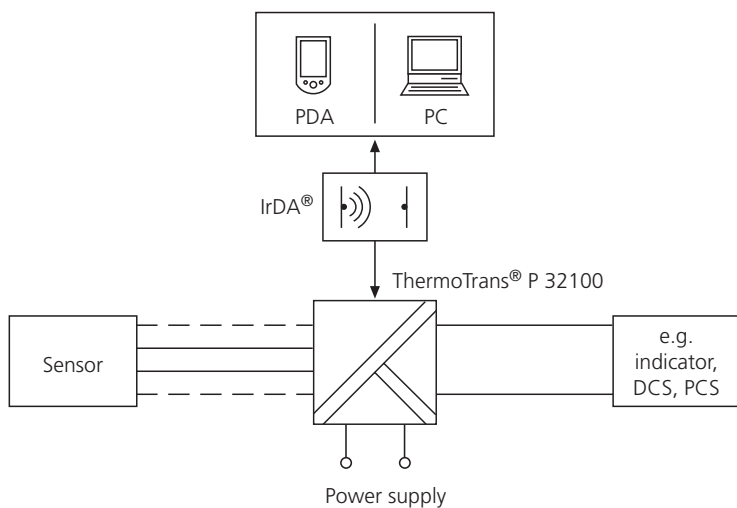
ThermoTrans® P 32100

Specifications (continued)

Other data

Ambient temperature	Operation: 0 ... +55 °C in row, without spacing 0 ... +65 °C with spacing \geq 6 mm Storage: -25 ... +85 °C
Ambient conditions	Stationary application, weather-protected relative air humidity: 5 ... 95 %, no condensation barometric pressure: 70 ... 106 KPa water or wind-driven rain, snow, or hail excluded
Design	Modular housing with screw terminals, width 6.2 mm, see dimension drawings for further measurements and conductor cross section
Ingress protection	Terminal IP 20, housing IP 40
Mounting	For 35 mm top hat rail to EN 50022
Weight	Approx. 60 g

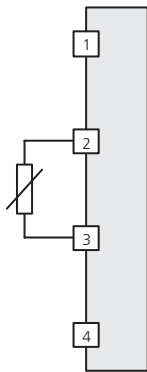
■ Application Examples



Application Examples (continued)

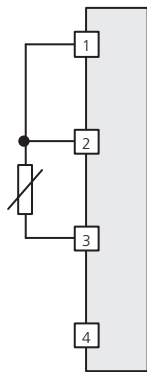
Connection of Resistance Thermometers

RTD / 2-wire connection



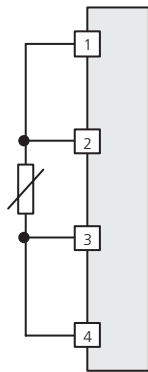
a)

RTD / 3-wire connection



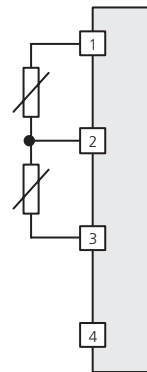
a)

RTD / 4-wire connection



a)

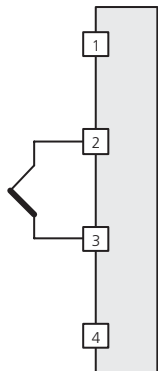
RTD / differential measurement



b)

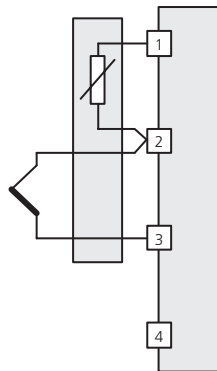
Connection of Thermocouples

Thermocouple with internal reference junction compensation



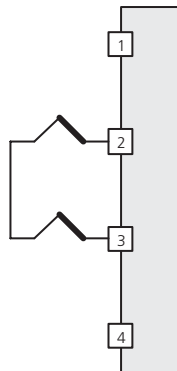
a)

Thermocouple with external reference junction compensation



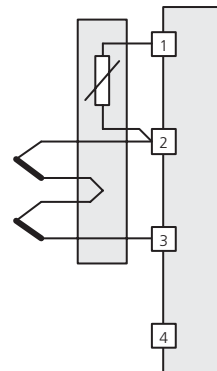
a)

Thermocouples for differential measurement



b)

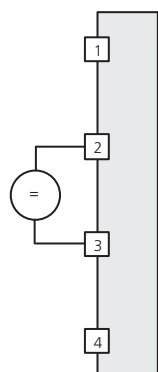
Thermocouples in summing configuration (averaging), external reference junction compensation



b)

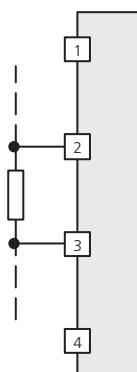
Voltage Input

Voltage measurement



a)

Current measurement with shunt resistor



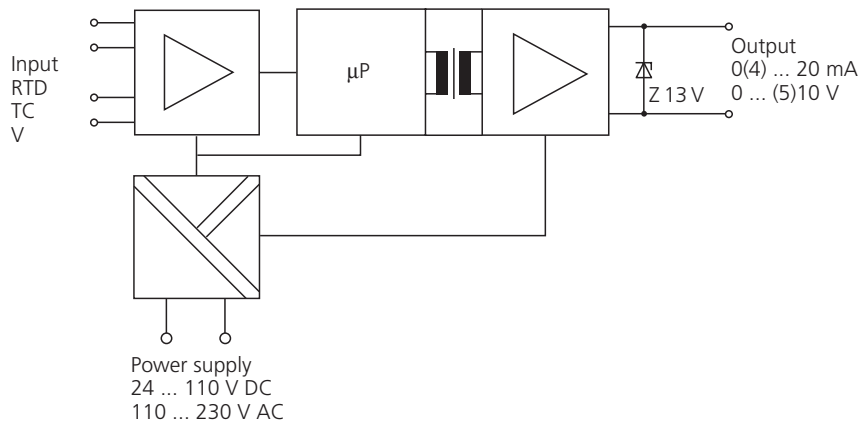
a)

a) Selectable via DIP switches or IrDA® port
b) Special configuration selectable via IrDA®

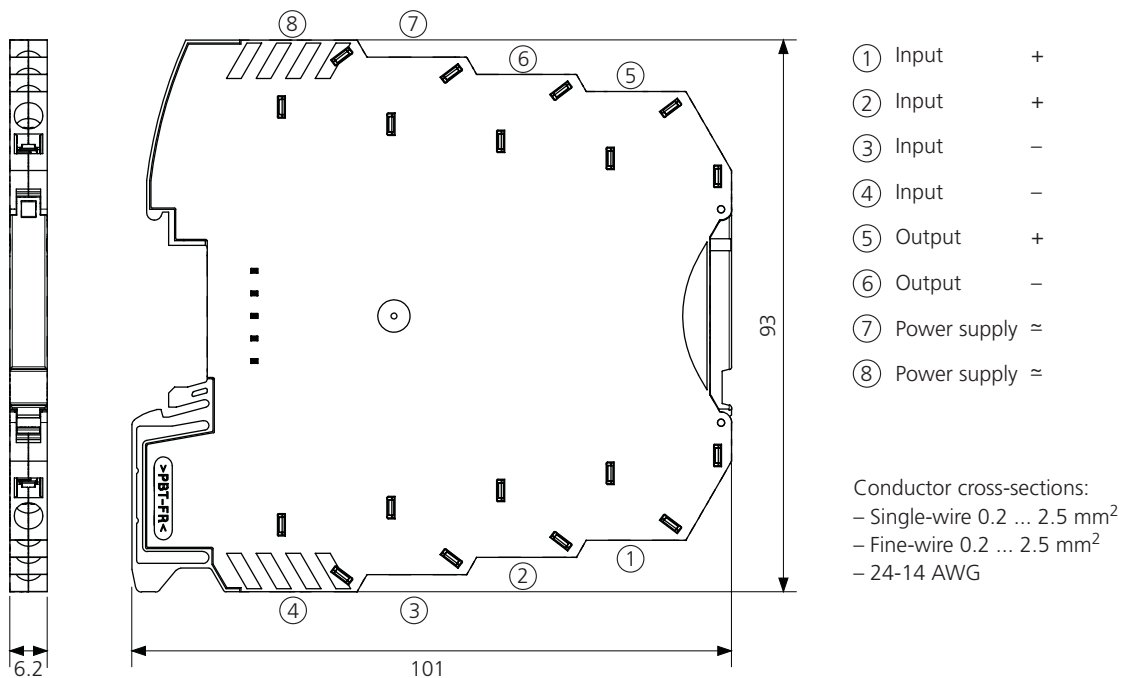
Modular Housings

ThermoTrans® P 32100

■ Block Diagram



■ Dimension Drawings and Terminal Assignments



All dimensions in mm!

■ Error Signaling

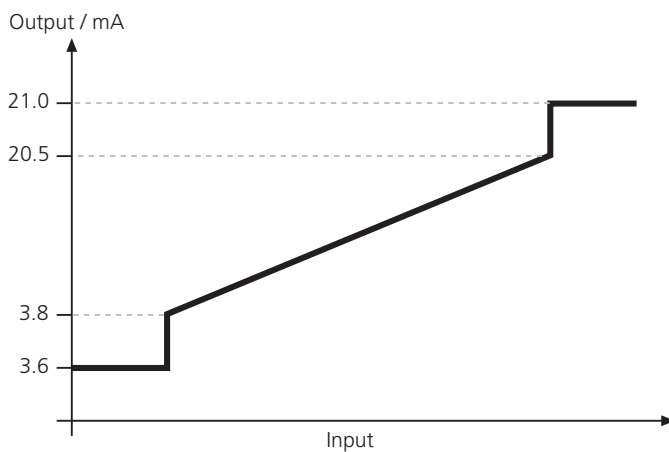
No.	Error	Message configuration ²⁾		Output			
		With SIL	Without SIL	4 ... 20 [mA]	0 ... 20 [mA]	0 ... 5 [V]	0 ... 10 [V]
0	None	Not self-locking	Not self-locking	–	–	–	–
1	Value below range	Not self-locking	Not self-locking	3.6	0	0	0
2	Value above range	Not self-locking	Not self-locking	21	21	5.25	10.5
3	Sensor short circuit	Self-locking	Not self-locking	21	21	5.25	10.5
4	Sensor open	Self-locking	Not self-locking	21	21	5.25	10.5
5	–	–	–	–	–	–	–
6	Load output error ³⁾	Not self-locking	Not self-locking	3.6	0	0	0
7	Identification of connection	Self-locking	Not self-locking	21	21	5.25	10.5
8	Switch misadjusted	Self-locking	Not self-locking	21	21	5.25	10.5
9	Parameter error	Self-locking	Not self-locking	21	21	5.25	10.5
10	Device error (subordinated error number distinguished via IrDA® port)	Self-locking	Self-locking	3.6	0	0	0

2) With the "self-locking" configuration, the error signal is maintained after termination of the error cause.

The error message can be reset by restart (power supply on/off or via IrDA® port).

3) With SIL models P 32100 P0/1x only

Output Current (4 ... 20 mA) Response to Out-Of-Range Conditions



Modular Housings

Knick >

ThermoTrans® A 20210



Standard transmitters for temperature measurement with resistance thermometers and thermocouples in a 6-mm housing.



The Task

In virtually all areas of industry temperatures are continuously measured and often used as reference input for closed-loop control systems, monitoring systems, safety shutdown systems, or for similar critical jobs. Here, normally the highest demands are placed on function, accuracy, flexibility, and electrical safety.

Different sensors are used depending on the measuring task. They provide a raw signal which is prepared, linearized, and standardized for further processing using a temperature transmitter.

The Problem

There is a very wide range of standardized and commercial temperature sensors. The large number of sensors, connection variants, individual temperature ranges, different supply voltages, and required output signals call for very variable transmitters that can be optimally suited to the different conditions.

However, the required flexibility should not be paid for with complex operation. Rather, it is desirable that adjustments can easily be made on the site. High performance should not result in increased susceptibility – high reliability and availability are key requirements.

The Solution

The flexible ThermoTrans® A 20210 temperature transmitters provide connection possibilities for all common thermocouples and resistance thermometers. They can be flexibly adapted to the respective measuring task using DIP and rotary coding switches. 3-port isolation with Safe Isolation up to 300 V AC/DC according to EN 61140 ensures optimum protection of personnel and equipment as well as unaltered transmission of measurement signals. The ThermoTrans® A 20210 offer maximum performance in the smallest of spaces.

Resistance thermometers can be operated either in 2-, 3-, or 4-wire configuration. The configuration type is automatically recognized, adjustment is not required. Thermocouples can be detected with internal or external reference junction compensation.

Input voltage signals up to ± 1000 mV are converted to 0/4 to 20 mA or 0 to 10 V standard signals.

This enables low-cost implementation of current measurements using shunt resistors, for example.

The devices meet the requirements of type of protection “n”. This means they can be installed and used in Zone 2 hazardous areas in the EC, the USA, and in Canada. Thanks to their approval to Class 1, Division 2 (UL 1604), they can also be used according to the traditional North American classification system.

Special measuring tasks can be solved with ThermoTrans® devices that Knick configures according to individual specifications. Fixed-range models without switch are used, for example, when manipulations or mix-up are to be excluded.

The Housing

The modular housing – 6 mm slim – is stingy with enclosure space and allows high component density. DIN rail bus connectors inserted in the mounting rail facilitate the power supply connection if necessary.

Temperature Transmitters

Isolation Amplifiers
Transmitters

Indicators

Process Analytics

Portable Meters

Laboratory Meters

Sensors

Fittings



Knick >

■ The Facts

Flexible application

with common temperature sensors: Pt100, Pt1000, Ni100, thermocouples type J and K

Intuitive configuration

Easy, without tools, using 4 rotary and 8 DIP switches

Calibrated range selection

without complicated adjustments

Automatic recognition

of the sensor connection (2-, 3-, or 4-wire)

Safe Isolation

according to EN 61140 – protection of maintenance staff and subsequent devices against non-permitted high voltages up to 300 V AC/DC

High accuracy due to innovative circuit design

Minimum space consumption

in the enclosure: only 6 mm wide modular housing – more transmitters per meter of mounting rail

Low-cost assembly

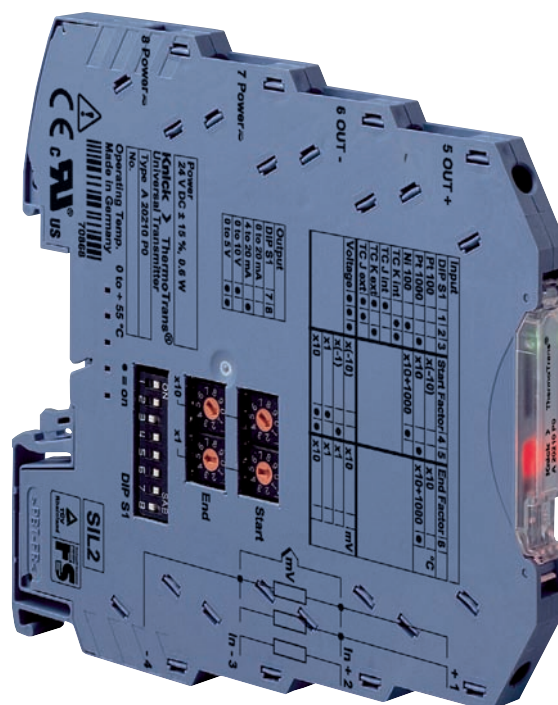
Quick mounting, convenient connection of power supply through DIN rail bus connectors

5-year warranty



Warranty
5 years!

Defects occurring within 5 years from delivery are remedied free of charge at our works (carriage and insurance paid by sender).



Modular Housings

Temperature Transmitters

Isolation Amplifiers
Transmitters

Indicators

Process Analytics

Portable Meters

Laboratory Meters

Sensors

Fittings

Knick 

■ Specifications

Resistance thermometers

Input data

	Sensor type	Standard	Measurement range
	Pt 100	DIN 60751	-200 ... +850 °C
	Pt 1000	DIN 60751	-200 ... +850 °C
	Ni 100	DIN 43760	-60 ... +180 °C
Connection	2-, 3-, or 4-wire (automatic recognition), signaling via yellow LED		
Max. resistance range incl. line resistance	5 kohms		
Max. line resistance	100 ohms		
Supply current	200 µA, 400 µA, or 0 ... 500 µA		
Line monitoring	Open circuits		
Input error limits	Resistances < 5 kohms: ±(50 mohms +0.05 % meas. val.) for spans > 15 ohms Resistances > 5 kohms: ±(1 mohm +0.05 % meas. val.) for spans > 50 ohms		
Temperature coefficient at input	< 50 ppm/K of adjusted end value (average TC in permitted operating temp range, reference temp 23 °C)		

Thermocouples

Input data

	Sensor type	Standard	Measurement range
Input	Type J Type K	DIN 60584-1 DIN 60584-1	-210 ...+1200 °C -200 ...+1372 °C
Input resistance	> 10 Mohms		
Max. line resistance	1 kohm		
Line monitoring	Open circuits		
Input error limits	±(10 µV + 0.05 % meas. val.) for spans > 2 mV		
Temperature coefficient at input	< 50 ppm/K of adjusted end value (average TC in permitted operating temp range, reference temp 23 °C)		
Reference junction compensation	Internal (Pt 100) external (Pt 100), fixed value, or uncompensated		
Error of internal reference junction compensation	< 1.5 K		
Error of external reference junction compensation	< 80 mohms +0.1 % meas. val.		via Pt 100 for T _{comp} = 0 ... 100 °C

Modular Housings

ThermoTrans® A 20210

Specifications (continued)

Shunt voltages

Input data

Input	-1000 ... 1000 mV unipolar/bipolar
Input resistance	> 10 Mohms
Input error limits	± (200 µV + 0.05 % meas. val.) for spans > 50 mV
Line monitoring	Open circuits
Temperature coefficient at input	< 50 ppm/K of adjusted end value (average TC in permitted operating temp range, reference temp 23 °C)
Overload	5 V across all inputs

Output data

Outputs	0 ... 20 mA, Calibrated selection 4 ... 20 mA, (factory setting 4 ... 20 mA) 0 ... 5 V, 0 ... 10 V
Control range	0 ... ≈102.5 % span with 0 ... 20 mA, 0 ... 10 V or 0 ... 5 V output -1.25 ... ≈102.5 % span with 4 ... 20 mA output
Resolution	16 bits
Load	Current output: ≤ 10 V (≤ 500 ohms at 20 mA) Voltage output: ≤ 1 mA (≥ 10 kohms at 10 V)
Output error limits	Current output: ±(10 µA + 0.05 % meas. val.) Voltage output: ±(5 mV + 0.05 % meas. val.)
Residual ripple	< 10 mV _{rms}
Temperature coefficient at output	< 50 ppm/K full scale (average TC in permitted operating temp range, reference temp 23 °C)
Error signaling	0 ... 20 mA output: I = 0 mA or ≥ 21 mA 4 ... 20 mA output: I ≤ 3.6 mA or ≥ 21 mA 0 ... 5 V or 0 ... 10 V output: V = 0 V or V ≥ 5.25 V or V ≥ 10.5 V via output signal and red LED for out-of-range conditions, faulty settings, sensor short circuit or open circuit, output load error, other device errors. Also see "Error Signaling" Page 171.

Transmission behavior

Characteristic	Linear rising / falling
Meas. rate	Approx. 3/s *)

*) For thermocouples with external reference junction compensation: measuring rate 2/s.

Temperature Transmitters

Isolation Amplifiers
Transmitters

Indicators

Process Analytics

Portable Meters

Laboratory Meters

Sensors

Fittings

Knick 

Specifications (continued)

Display

Green LED

Power supply

Yellow LED

Connection type

Red LED

Maintenance request or device failure

Power supply

Power supply

24 V DC (– 20 %, + 25 %), approx. 1.2 W

The power supply can be routed from one device to another via DIN rail bus connectors.

Isolation

Galvanic isolation

3-port isolation between input, output and power supply

Test voltage

2.5 kV AC, 50 Hz: Power supply against input against output

Working voltage
(basic insulation)

Up to 300 V AC/DC across all circuits with overvoltage category II and pollution degree 2 according to EN 61010-1.

For applications with high working voltages, you should ensure there is sufficient spacing or isolation from neighboring devices and protection against electric shocks.

Protection against
electric shock

Safe Isolation according to EN 61140 by reinforced insulation in accordance with EN 61010-1.

Working voltage up to 300 V AC/DC across all circuits with overvoltage category II and pollution degree 2.

For applications with high working voltages, you should ensure there is sufficient spacing or isolation from neighboring devices and protection against electric shocks.

Standards and approvals

Explosion protection

ATEX Zone 2 (EN 60079-15)

Class 1, Div 2 / Zone 2 (UL 1604)

EMC

Product family standard:

EN 61326

Emitted interference:

Class B

Immunity to interference¹⁾:

Industry

cURus

File No. 220033

Standards: UL 508 and CAN/CSA 22.2 no. 14-95

¹⁾ Slight deviations are possible while there is interference

Modular Housings

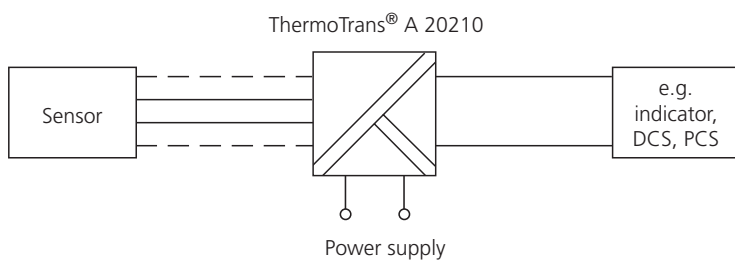
ThermoTrans® A 20210

Specifications (continued)

Other data

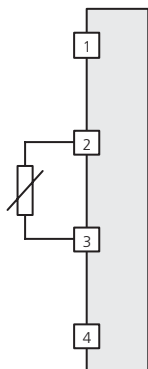
Ambient temperature	Operation: 0 ... +55 °C in row, without spacing 0 ... +65 °C with spacing \geq 6 mm Storage: -25 ... +85 °C
Ambient conditions	Stationary application, weather-protected relative air humidity: 5 ... 95 %, no condensation barometric pressure: 70 ... 106 KPa water or wind-driven rain, snow, or hail excluded
Design	Modular housing with screw terminals, width 6.2 mm, see dimension drawings for further measurements and conductor cross section
Ingress protection	Terminal IP 20, housing IP 40
Mounting	For 35 mm top hat rail to EN 50022
Weight	Approx. 60 g

■ Application Examples

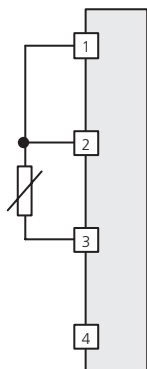


Connection of Resistance Thermometers

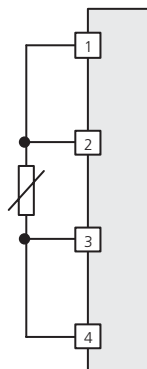
RTD / 2-wire connection



RTD / 3-wire connection



RTD / 4-wire connection



Temperature Transmitters

Isolation Amplifiers
Transmitters

Indicators

Process Analytics

Portable Meters

Laboratory Meters

Sensors

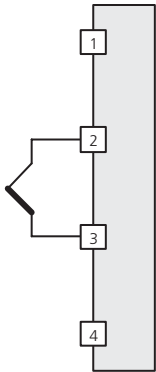
Fittings

Knick >

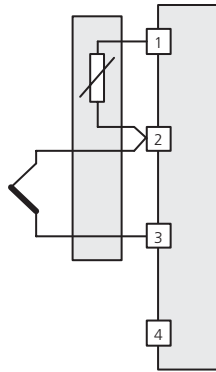
Application Examples (continued)

Connection of Thermocouples

Thermocouple with
internal reference
junction compensation

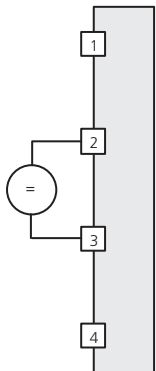


Thermocouple with
external reference
junction compensation

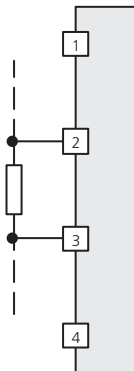


Voltage Input

Voltage measurement



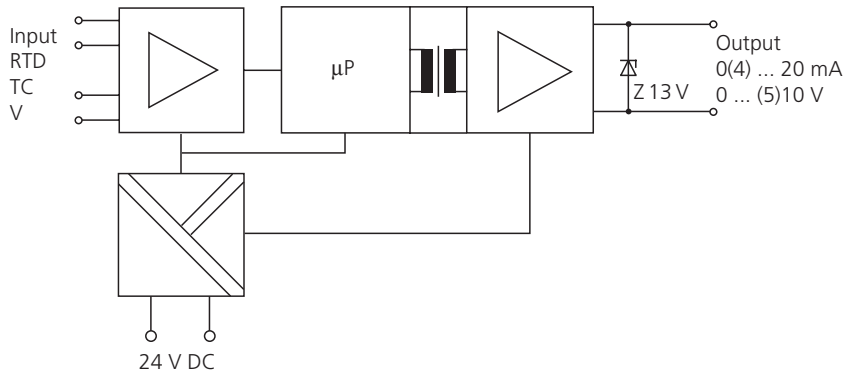
Current measurement
with shunt resistor



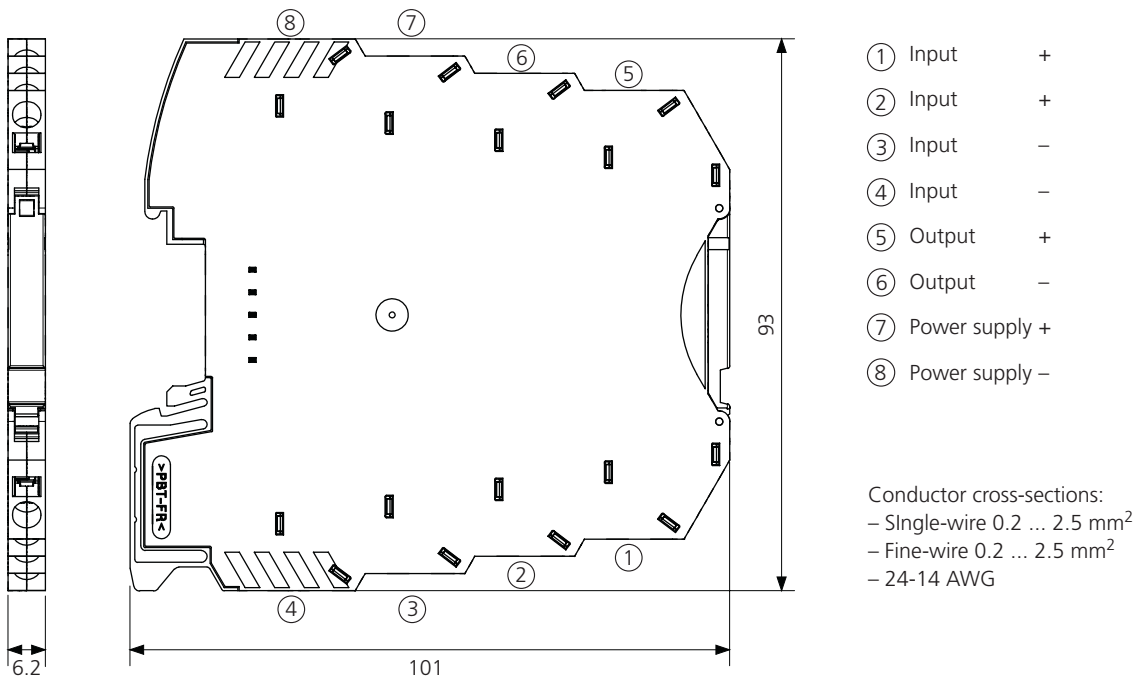
Modular Housings

ThermoTrans® A 20210

■ Block Diagram



■ Dimension Drawings and Terminal Assignments



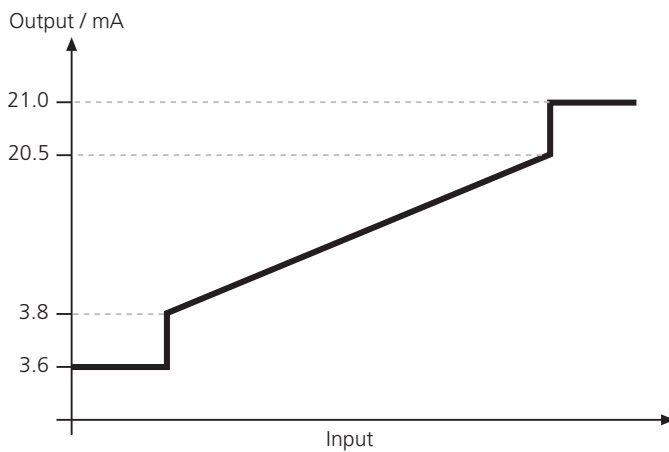
All dimensions in mm!

■ Error Signaling

No.	Error	Message configuration ¹⁾	Output			
			4 ... 20 [mA]	0 ... 20 [mA]	0 ... 5 [V]	0 ... 10 [V]
0	None	Not self-locking	–	–	–	–
1	Value below range	Not self-locking	3.6	0	0	0
2	Value above range	Not self-locking	21	21	5.25	10.5
3	Sensor short circuit	Not self-locking	21	21	5.25	10.5
4	Sensor open	Not self-locking	21	21	5.25	10.5
5	–	–	–	–	–	–
6	Output load error	Not self-locking	3.6	0	0	0
7	Identification of connection	Not self-locking	21	21	5.25	10.5
8	Switch misadjusted	Not self-locking	21	21	5.25	10.5
9	Parameter error	Not self-locking	21	21	5.25	10.5
10	Device error	Self-locking	3.6	0	0	0

¹⁾ With the "self-locking" configuration, the error signal is maintained after termination of the error cause. The error message can be reset by restart (power supply on/off).

Output Current (4 ... 20 mA) Response to Out-Of-Range Conditions



Modular Housings

Knick >

SensoTrans® DMS P 32200

The transmitters for strain gage full bridges – in a 6-mm housing with infrared interface, SIL approval, and broad-range power supply.

The Task

In many different industrial applications strain gages are used to continuously measure mechanical quantities such as force/weight or deflection/torsion.

In many cases they are used as reference input for monitoring systems, safety shutdown systems, or for similar critical jobs. Here, normally the highest demands are placed on accuracy, flexibility, and functional safety as well as electrical safety.

Strain gages are high-sensitive resistors which react to mechanical stress with a slight change in resistance. These changes can be detected by a bridge circuit, in most cases a full bridge. In force transducers and load cells the strain gages are already mechanically applied in full bridge circuits. These sensors provide a raw signal which is prepared and standardized for further processing using a strain gage transmitter.

The Problem

Customary strain gage sensors have individual characteristics, which requires tedious and time-consuming adjustment of the respective strain gage transmitter using potentiometers.

Furthermore, strain gage transmitters up to now had a very wide modular housing and therefore occupied a large amount of

space in the enclosure. For worldwide applications, often several versions with different supply voltages were used.

The Solution

The universal SensoTrans® DMS P 32200 strain gage transmitters provide connection possibilities for all standard strain gage force transducers and strain gage load cells in full bridge configuration. They can be flexibly adapted to the respective measuring task using DIP and rotary switches or via an IrDA® port. The broad-range power supply covers all common supply voltages from 24 to 230 V and ensures maximum safety even with unstable mains supplies.

3-port isolation with Safe Isolation up to 300 V AC/DC according to EN 61140 ensures optimum protection of personnel and equipment as well as unaltered transmission of measurement signals. The SensoTrans® DMS P 32200 offer maximum performance in the smallest of spaces.

Adjusting the zero point and sensitivity to the individual strain gage sensor is particularly convenient via the infrared port, for example using a PDA. Sensors with known characteristics can be very easily calibrated using 4 rotary coding switches and 8 DIP switches.

Special measuring tasks can be solved with SensoTrans® devices that Knick configures according to individual specifications. Fixed-range models without switch are used, for example, when manipulations or mix-up are to be excluded.

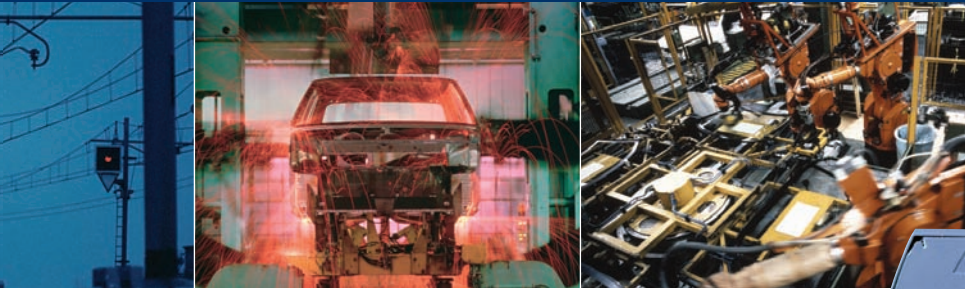
The devices meet the requirements of type of protection "n". This means they can be installed and used in Zone 2 hazardous areas in the EC, the USA, and in Canada. Thanks to their approval to Class 1, Division 2 (UL 1604), they can also be used according to the traditional North American classification system.

Knick offers the SensoTrans® DMS P 32200 transmitters with SIL approval for applications with high demands on functional safety. The requirements of EN 61508 were implemented by a specially developed hardware and software. The fail-safe concept makes use of structural measures at the device level (redundancy of system components) and diagnostics methods for selective fault detection. The product is SIL 2 approved (EN 61508) by an authorized body (TÜV Rheinland).



Strain Gage Transmitters

- Isolation Amplifiers Transmitters
- Indicators
- Process Analytics
- Portable Meters
- Laboratory Meters
- Sensors
- Fittings



Knick

The Operating Software

The user-friendly, menu-guided Paraly® SW 111 communication software runs on standard and pocket PCs and opens a number of further options such as input of customer-specific linearization curves, readout of the connection configuration, as well as the use of extensive diagnostic functions. Configuration, documentation and, if necessary, maintenance of entire plant components can be accomplished by "infrared remote control". Moreover, the output current or voltage can be specified independently of the input value using the simulation function – a useful feature for plant commissioning or revision.

The Housing

The modular housing – 6 mm slim – is stingy with enclosure space and allows high component density. DIN rail bus connectors inserted in the mounting rail facilitate the power supply connection if necessary.

Warranty

5 years!

Defects occurring within 5 years from delivery are remedied free of charge at our works (carriage and insurance paid by sender).

6

CLASS

Safety Integrity Level

SIL 2

IEC 61508

✓

Safety Integrity Level

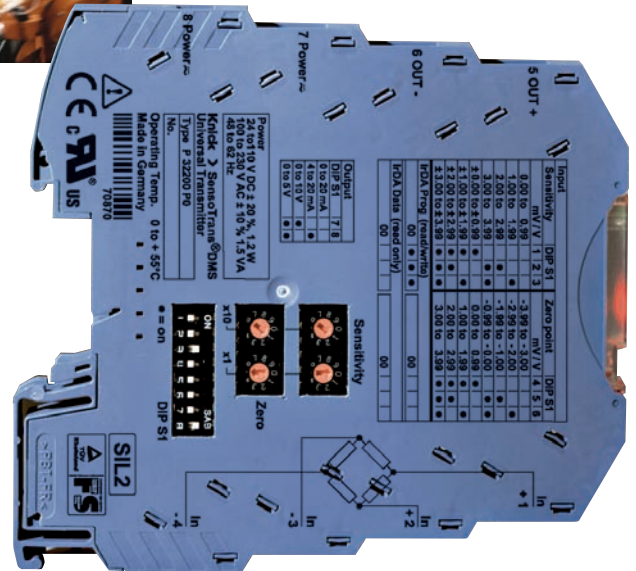
SIL 2

IEC 61508/
IEC 61511*

□

■ The Facts

- Universal usability** for strain gages, pressure and load cells, and other resistive measuring bridges
- Convenient parameter setting** via IrDA® port – uncomplicated, menu-guided adjustment also "on site" including archiving of configuration data
- Intuitive configuration** Easy, without tools, using 4 rotary and 8 DIP switches
- Calibrated range selection** without complicated adjustments
- Convenient adjustment** Zero point and sensitivity adjustable via IrDA®
- Simulation** of any desired output values for correct installation/commissioning
- World-wide usability** due to broad-range power supply 24 ... 110 VDC, 110 ... 230 VAC



Safe Isolation according to EN 61140 – protection of maintenance staff and subsequent devices against non-permitted high voltages up to 300 V AC/DC

Functional safety up to SIL 2 (up to SIL 3 in the case of redundant configuration) with TÜV certificate – systematically developed according to EN 61508

High accuracy due to innovative circuit design

Minimum space consumption in the enclosure: only 6 mm wide modular housing – more transmitters per meter of mounting rail

Low-cost assembly Quick mounting, convenient connection of power supply through DIN rail bus connectors

5-year warranty

IrDA® is a registered trademark of the Infrared Data Association.

Modular Housings

Modular Housings

SensoTrans® DMS P 32200

■ Product Line

Strain gage transmitter, adjustable

SensoTrans® DMS P 32200	Order No.	P 32200 P0 /	<input type="checkbox"/>	<input type="checkbox"/>
Functional safety (EN 61508)	Without		0	
	SIL 2 (up to SIL 3 in the case of redundant configuration)		1	
Power supply	Broad-range power supply			
	24 ... 110 V DC, 110 ... 230 V AC via screw terminals only,		1	
	24 V DC via screw terminals or DIN rail bus connectors		0	

Strain gage transmitter, with fixed settings

SensoTrans® DMS P 32200	Order No.	P 32200 P0 /	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Functional safety (EN 61508)	Without		0					
	SIL 2 (up to SIL 3 in the case of redundant configuration)		1					
Power supply	Broad-range power supply							
	24 ... 110 V DC, 110 ... 230 V AC			1				
	24 V DC via screw terminals or DIN rail bus connectors			0				
Customer-specific settings, e. g. cutoff frequency, zero/sensitivity	As specified				n	n	n	n

Accessories

		Order No.
Paraly® SW 111	Communication software	SW 111
DIN rail bus connector ZU 0628	Power supply bridging for two devices, A 20XXX P0 or P 32XXX P0	ZU 0628
IsoPower® A 20900	Power supply, 24 V DC, 1 A, see Page 212	A 20900 H4
DIN rail bus connector ZU 0678	Tapping of supply voltage (A 20900), routing to ZU 0628 DIN rail bus connector	ZU 0678
Power terminal block ZU 0677	Feeding the 24 V DC supply voltage to the ZU 0628 DIN rail bus connector	ZU 0677

■ Specifications

Strain gage input data

Input	±7.5 mV/V
Bridge resistance	200 ohms ... 10 kohms
Zero adjustment	Within input range
Supply current (int. supply)	0 ... 5 mA

Strain Gage Transmitters

Isolation Amplifiers
Transmitters

Indicators

Process Analytics

Portable Meters

Laboratory Meters

Sensors

Fittings

Knick 

Specifications (continued)

Strain gage input data (continued)

Supply voltage (ext. supply)	1 ... 3 V
Input error limits	$\pm (2 \mu\text{V/V} + 0.1 \% \text{ meas. val.})$ for spans $\geq 0.5 \text{ mV/V}$
Line monitoring	Short circuit or open circuit
Temperature coefficient at input	50 ppm/K of adjusted sensitivity (average TC in permitted operating temp range, reference temp 23 °C)
Overload	5 V across all inputs

Output data

Outputs	0 ... 20 mA, Calibrated selection 4 ... 20 mA, (factory setting 4 ... 20 mA) 0 ... 5 V, 0 ... 10 V
Control range	0 ... $\approx 102.5 \% \text{ span}$ with 0 ... 20 mA, 0 ... 10 V or 0 ... 5 V output $-1.25 \dots \approx 102.5 \% \text{ span}$ with 4 ... 20 mA output
Resolution	16 bits
Simulation mode adjustable via IrDA®	0 ... 20 mA current output: 0 ... 21 mA 4 ... 20 mA current output: 3 ... 21 mA 0 ... 5 V voltage output: 0 ... 5.25 V 0 ... 10 V voltage output: 0 ... 10.5 V
Load	Current output: $\leq 10 \text{ V}$ ($\leq 500 \text{ ohms}$ at 20 mA) Voltage output: $\leq 1 \text{ mA}$ ($\geq 10 \text{ kohms}$ at 10 V)
Output error limits	Current output: $\pm (10 \mu\text{A} + 0.05 \% \text{ meas. val.})$ Voltage output: $\pm (5 \text{ mV} + 0.05 \% \text{ meas. val.})$
Residual ripple	$< 10 \text{ mV}_{\text{rms}}$
Temperature coefficient at output	50 ppm/K (average TC in permitted operating temp range, reference temp 23 °C)
Error signaling	0 ... 20 mA output: $I = 0 \text{ mA}$ or $\geq 21 \text{ mA}$ 4 ... 20 mA output: $I \leq 3.6 \text{ mA}$ or $\geq 21 \text{ mA}$ 0 ... 5 V or 0 ... 10 V output: $V = 0 \text{ V}$ or $V \geq 5.25 \text{ V}$ or $V \geq 10.5 \text{ V}$ via output signal, red LED, and IrDA® for out-of-range conditions, faulty settings, sensor short circuit or open circuit, output load error, unintentional adjustment of switches during operation (for SIL devices only), other device errors. Also see "Error Signaling" Page 179.

Transmission behavior

Characteristic	Linear rising / falling, curves defined by sampling points (via IrDA® port)
Meas. rate	Approx. 3/s

Modular Housings

SensoTrans® DMS P 32200

Specifications (continued)

Display

Green LED

Yellow LED

Red LED

Power supply

Connection type, IrDA® communication

Maintenance request or device failure

Power supply

Power supply

24 V DC power supply unit

24 V DC (–20 %, +25 %), approx. 1.2 W

The power supply can be routed from one device to another via DIN rail bus connectors.

Broad-range power supply unit

24 V ... 110 V DC (±20 %), approx. 1.2 W

110 V ... 230 V AC (±10 %),

48 ... 62 Hz, approx. 1.5 VA

Isolation

Galvanic isolation

Test voltage

Working voltage (basic insulation)

Protection against electric shock

3-port isolation between input, output, and power supply

2.5 kV AC, 50 Hz: Power supply against input against output

Up to 300 V AC/DC across all circuits with overvoltage category II and pollution degree 2 according to EN 61010-1. For applications with high working voltages, you should ensure there is sufficient spacing or isolation from neighboring devices and protection against electric shocks.

Safe Isolation according to EN 61140 by reinforced insulation in accordance with EN 61010-1. Working voltages up to 300 V AC/DC across all circuits with overvoltage category II and pollution degree 2.

For applications with high working voltages, you should ensure there is sufficient spacing or isolation from neighboring devices and protection against electric shocks.

Standards and approvals

Functional safety

Explosion protection

EMC

cURus

SIL 2 to EN 61508, SIL 3 with redundant configuration

ATEX Zone 2 (DIN EN 60079-15), Class 1, Div 2 / Zone 2 (UL 1604)

Product family standard: EN 61326
Emitted interference: Class B
Immunity to interference¹⁾: Industry
EMC requirements for devices with safety-related functions
IEC 61326-3: draft

File No. 220033
Standards: UL 508 and CAN/CSA 22.2 no. 14-95

Interfaces

IrDA®

Specification 1.1, slave device for bidirectional communication
Paraly® SW 111 communication software, free download at www.knick.de

Other data

Ambient temperature

Operation: 0 ... +55 °C in row, without spacing
0 ... +65 °C with spacing ≥ 6 mm
Storage: –25 ... +85 °C

Strain Gage Transmitters

Isolation Amplifiers
Transmitters

Indicators

Process Analytics

Portable Meters

Laboratory Meters

Sensors

Fittings

Knick 

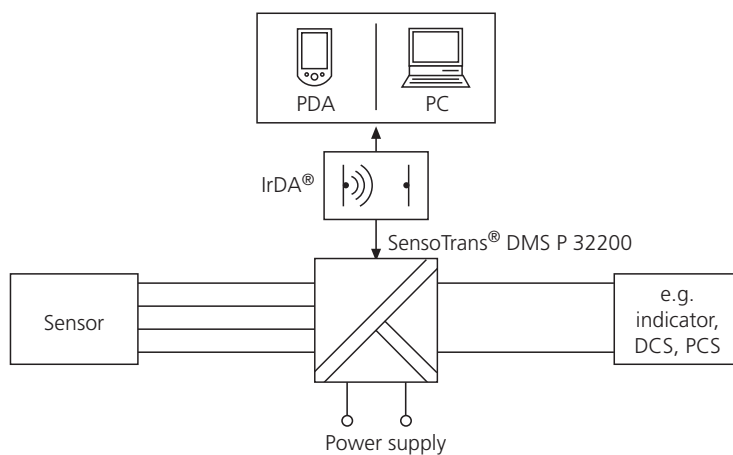
Specifications (continued)

Other data (continued)

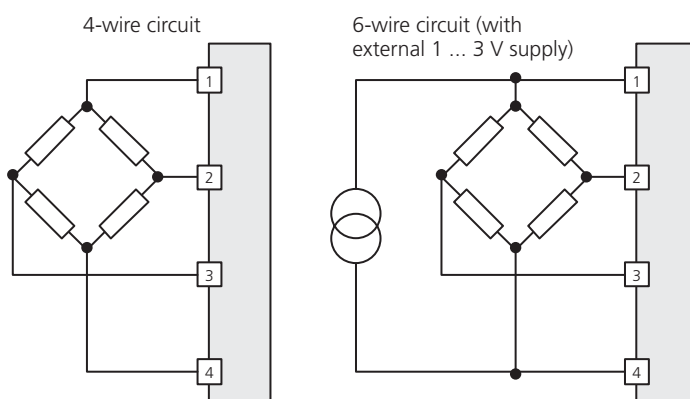
Ambient conditions	Stationary application, weather-protected relative air humidity: 5 ... 95 %, no condensation barometric pressure: 70 ... 106 KPa water or wind-driven rain, snow, or hail excluded
Design	Modular housing with screw terminals, 6.2 mm wide, see dimension drawing for further measurements and conductor cross section
Ingress protection	Terminal IP 20, housing IP 40
Mounting	For 35 mm top hat rail to EN 50022
Weight	Approx. 60 g

1) Slight deviations are possible while there is interference

Application Examples



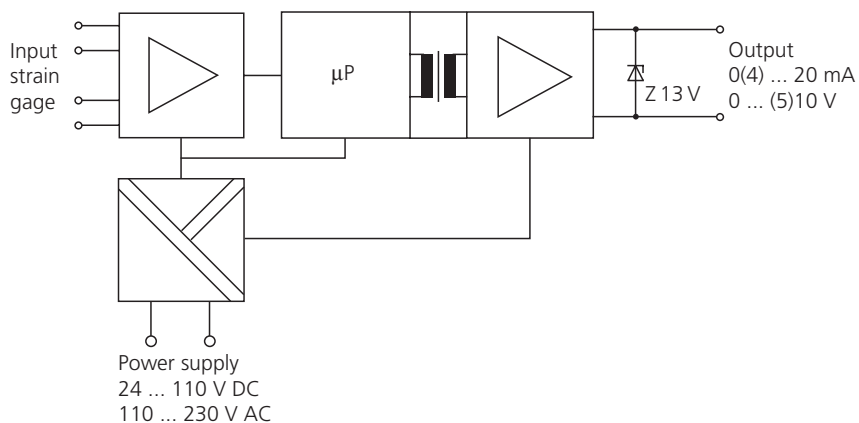
Connection of Strain Gages



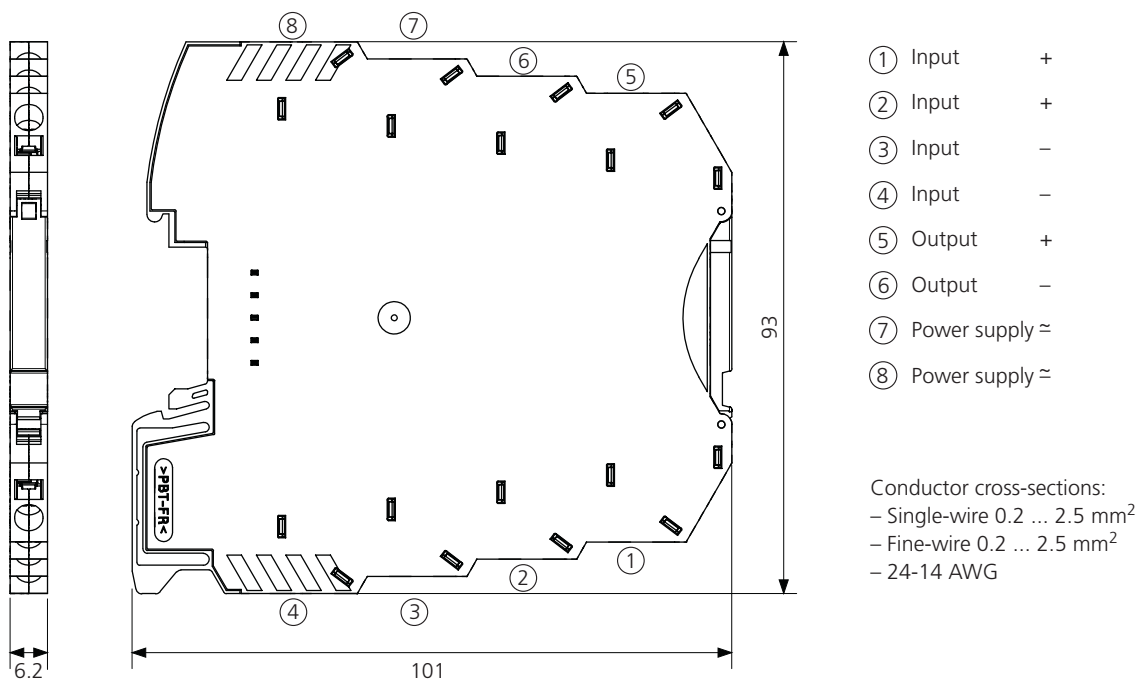
Modular Housings

SensoTrans® DMS P 32200

■ Block Diagram



■ Dimension Drawings and Terminal Assignments



All dimensions in mm!

■ Error Signaling

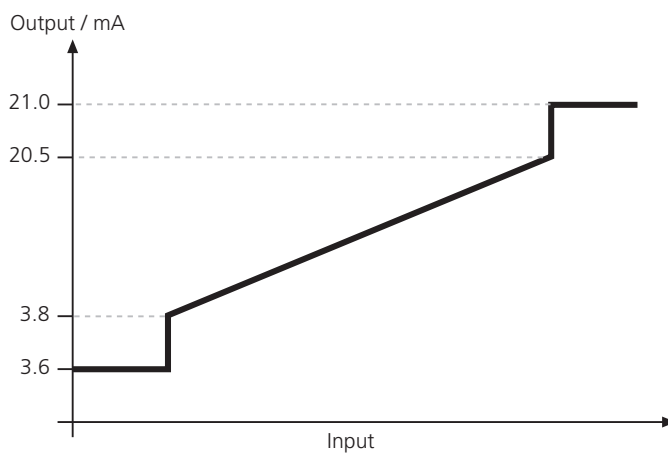
No.	Error	Message configuration ²⁾		Output			
		With SIL	Without SIL	4 ... 20 [mA]	0 ... 20 [mA]	0 ... 5 [V]	0 ... 10 [V]
0	None	Not self-locking	Not self-locking	–	–	–	–
1	Value below range	Not self-locking	Not self-locking	3.6	0	0	0
2	Value above range	Not self-locking	Not self-locking	21	21	5.25	10.5
3	Sensor short circuit	Self-locking	Not self-locking	21	21	5.25	10.5
4	Sensor open	Self-locking	Not self-locking	21	21	5.25	10.5
5	Basic resistance invalid	Self-locking	Not self-locking	21	21	5.25	10.5
6	Load output error ³⁾	Not self-locking	Not self-locking	3.6	0	0	0
7	Identification of connection	Self-locking	Not self-locking	21	21	5.25	10.5
8	Switch misadjusted	Self-locking	Not self-locking	21	21	5.25	10.5
9	Parameter error	Self-locking	Not self-locking	21	21	5.25	10.5
10	Device error (subordinated error number distinguished via IrDA® port)	Self-locking	Self-locking	3.6	0	0	0

2) With the "self-locking" configuration, the error signal is maintained after termination of the error cause.

The error message can be reset by restart (power supply on/off or via IrDA® port).

3) With SIL models P 32200 P0/1x only

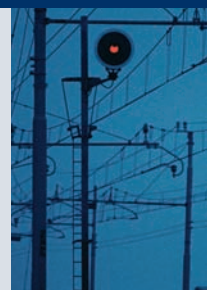
Output Current (4 ... 20 mA) Response to Out-Of-Range Conditions



Modular Housings

Knick >

SensoTrans® DMS A 20220



The transmitter for strain gage full bridges in 6-mm housing.

The Task

In many different industrial applications strain gages are used to continuously measure mechanical quantities such as force/weight or deflection/torsion.

In many cases they are used as reference input for monitoring systems, safety shutdown systems, or for similar critical jobs. Here, normally the highest demands are placed on function, accuracy, flexibility, and electrical safety.

Strain gages are high-sensitive resistors which react to mechanical stress with a slight change in resistance. These changes can be detected by a bridge circuit, in most cases a full bridge. In force transducers and load cells the strain gages are already mechanically applied in full bridge circuits. These sensors provide a raw signal which is prepared and standardized for further processing using a strain gage transmitter.

The Problem

Customary strain gage sensors have individual characteristics, which requires tedious and time-consuming adjustment of the respective strain gage transmitter using potentiometers.

Furthermore, strain gage transmitters up to now had a very wide modular housing and there-

fore occupied a large amount of space in the enclosure. For worldwide applications, often several versions with different supply voltages were used.

The Solution

The universal SensoTrans® DMS A 20220 strain gage transmitters provide connection possibilities for all standard strain gage force transducers and strain gage load cells in full bridge configuration. They can be flexibly adapted to the respective measuring task using DIP and rotary coding switches or via a "teach-in function". 3-port isolation with Safe Isolation up to 300 V AC/DC according to EN 61140 ensures optimum protection of personnel and equipment as well as unaltered transmission of measurement signals. The SensoTrans® DMS A 20220 offer maximum performance in the smallest of spaces.

Adjusting the zero point and sensitivity to the individual strain gage sensor is particularly convenient using the "teach-in function" – just at the push of a button at the device front. Sensors with known characteristics can be very easily calibrated using 4 rotary coding switches and 8 DIP switches. Special measuring tasks can be solved with SensoTrans devices

that Knick configures according to individual specifications. Fixed-range models without switch are used, for example, when manipulations or mix-up are to be excluded.

The devices meet the requirements of type of protection "n". This means they can be installed and used in Zone 2 hazardous areas in the EC, the USA, and in Canada. Thanks to their approval to Class 1, Division 2 (UL 1604), they can also be used according to the traditional North American classification system.

The Housing

The modular housing – 6 mm slim – is stingy with enclosure space and allows high component density. DIN rail bus connectors inserted in the mounting rail facilitate the power supply connection if necessary.

**Warranty
5 years!**

Defects occurring within 5 years from delivery are remedied free of charge at our works (carriage and insurance paid by sender).

Strain Gage Transmitters

Isolation Amplifiers
Transmitters

Indicators

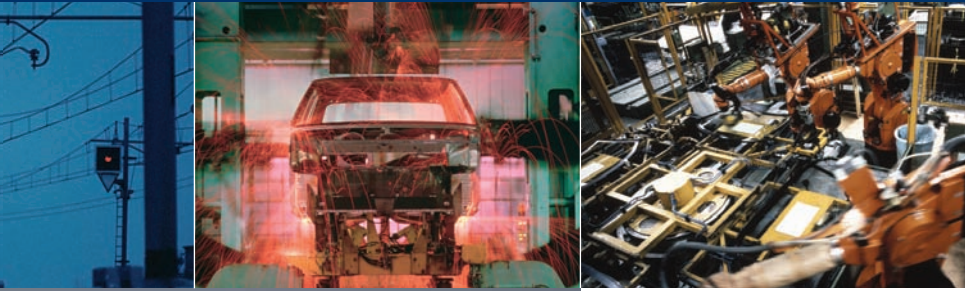
Process Analytics

Portable Meters

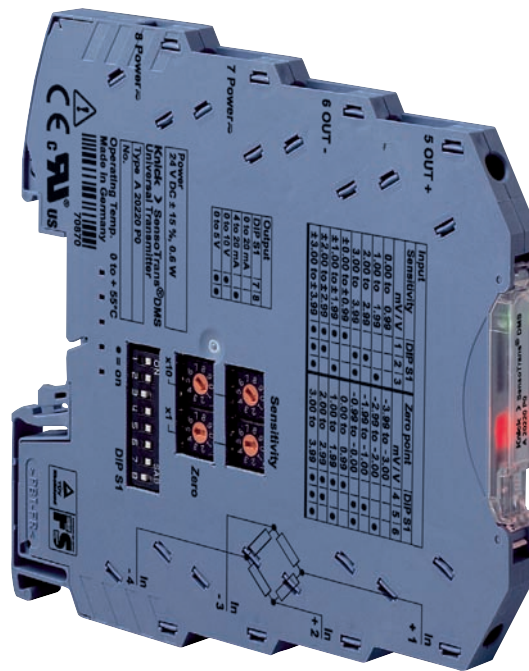
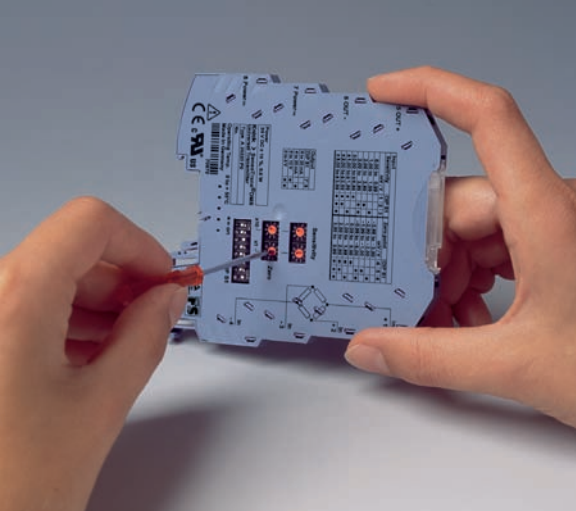
Laboratory Meters

Sensors

Fittings



Knick >



Modular Housings

■ The Facts

Universal usability

for strain gages, pressure and load cells, and other resistive measuring bridges

Intuitive configuration

of basic parameters – easy, without tools, using 4 rotary and 8 DIP switches

Calibrated range selection

without complicated trimming

Convenient adjustment

Zero point and sensitivity are directly adjusted “at the push of a button” using the teach-in function

Safe Isolation according to EN 61140 – protection of maintenance staff and subsequent devices against non-permitted high voltages up to 300 V AC/DC

High accuracy due to innovative circuit design

Minimum space consumption

in the enclosure: only 6 mm wide modular housing – more transmitters per meter of mounting rail

Low-cost assembly

Quick mounting, convenient connection of power supply through DIN rail bus connectors

5-year warranty



6mm CLASS

Modular Housings

SensoTrans® DMS A 20220

■ Product Line

Strain gage transmitter,
adjustable

SensoTrans® DMS A 20220

Order No. A 20220 P0

Strain gage transmitter,
with fixed settings

SensoTrans® DMS A 20220

Order No. A 20220 P0 /

Further customer-specific
settings (e. g. cutoff
frequency, zero/sensitivity)

As specified n n n n

Accessories

Order No.

DIN rail bus connector
ZU 0628

Power supply bridging for two devices, A 20XXX P0 or
P 32XXX P0

ZU 0628

IsoPower® A 20900

Power supply, 24 V DC, 1 A, see Page 212

A 20900 H4

Power terminal block ZU 0677

Feeding the 24 V DC supply voltage to the
ZU 0628 DIN rail bus connector

ZU 0677

DIN rail bus connector
ZU 0678

Tapping of supply voltage (A 20900), routing to
ZU 0628 DIN rail bus connector

ZU 0678

■ Specifications

Strain gage input data

Input

±7.5 mV/V

Bridge resistance

200 ohms ... 10 kohms

Zero adjustment

Within input range

Supply current (int. supply)

0 ... 5 mA

Supply voltage (ext. supply)

1 ... 3 V

Input error limits

± (2 µV/V + 0.1 % meas. val.) for spans ≥ 0.5 mV/V

Line monitoring

Short circuit or open circuit

Temperature coefficient
at input

< 50 ppm/K of adjusted sensitivity
(average TC in permitted operating temp range, reference temp 23 °C)

Overload

5 V across all inputs

Specifications (continued)

Output data

Outputs	0 ... 20 mA, 4 ... 20 mA, 0 ... 5 V, 0 ... 10 V	Calibrated selection (factory setting 4 ... 20 mA)
Control range	0 ... ≈ 102.5 % span with 0 ... 20 mA, 0 ... 10 V or 0 ... 5 V output -1.25 ... ≈ 102.5 % span with 4 ... 20 mA output	
Resolution	16 bits	
Load	Current output:	≤ 10 V (≤ 500 ohms at 20 mA)
	Voltage output:	≤ 1 mA (≥ 10 kohms at 10 V)
Output error limits	Current output:	$\pm(10 \mu\text{A} + 0.05$ % meas. val.)
	Voltage output:	$\pm(5$ mV + 0.05 % meas. val.)
Residual ripple	< 10 mV _{rms}	
Temperature coefficient at output	< 50 ppm/K full scale (average TC in permitted operating temp range, reference temp 23 °C)	
Error signaling	0 ... 20 mA output: $I = 0$ mA or ≥ 21 mA 4 ... 20 mA output: $I \leq 3.6$ mA or ≥ 21 mA 0 ... 5 V or 0 ... 10 V output: $V = 0$ V or $V \geq 5.25$ V or $V \geq 10.5$ V via output signal and red LED for out-of-range conditions, faulty settings, sensor short circuit or open circuit, output load error, other device errors. Also see "Error Signaling" Page 187.	

Transmission behavior

Characteristic	Linear rising / falling
Meas. rate	Approx. 3/s

Display

Green LED	Power supply
Yellow LED	Connection type
Red LED	Maintenance request or device failure

Power supply

Power supply	24 V DC (-20 % +25 %), approx. 1.2 W The power supply can be routed from one device to another via DIN rail bus connectors.
--------------	--

Modular Housings

SensoTrans® DMS A 20220

Specifications (continued)

Isolation

Galvanic isolation	3-port isolation between input, output, and power supply
Test voltage	2.5 kV AC, 50 Hz: Power supply against input against output
Working voltage (basic insulation)	Up to 300 V AC/DC across all circuits with overvoltage category II and pollution degree 2 according to EN 61010-1. For applications with high working voltages, you should ensure there is sufficient spacing or isolation from neighboring devices and protection against electric shocks.
Protection against electric shock	Safe Isolation according to EN 61140 by reinforced insulation in accordance with EN 61010-1. Working voltage up to 300 V AC/DC across all circuits with overvoltage category II and pollution degree 2. For applications with high working voltages, you should ensure there is sufficient spacing or isolation from neighboring devices and protection against electric shocks.

Standards and approvals

Explosion protection	ATEX Zone 2 (EN 60079-15) Class 1, Div 2 / Zone 2 (UL 1604)
EMC	Product family standard: EN 61326 Emitted interference: Class B Immunity to interference ¹⁾ : Industry
cURus	File No. 220033 Standards: UL 508 and CAN/CSA 22.2 no. 14-95

Other data

Ambient temperature	Operation: 0 ... +55 °C in row, without spacing 0 ... +65 °C with spacing \geq 6 mm Storage: -25 ... +85 °C
Ambient conditions	Stationary application, weather-protected relative air humidity: 5 ... 95 %, no condensation barometric pressure: 70 ... 106 KPa water or wind-driven rain, snow, or hail excluded
Design	Modular housing with screw terminals, width 6.2 mm, see dimension drawings for further measurements and conductor cross section
Ingress protection	Terminal IP 20, housing IP 40
Mounting	For 35 mm top hat rail to EN 50022
Weight	Approx. 60 g

1) Slight deviations are possible while there is interference

Strain Gage Transmitters

Isolation Amplifiers
Transmitters

Indicators

Process Analytics

Portable Meters

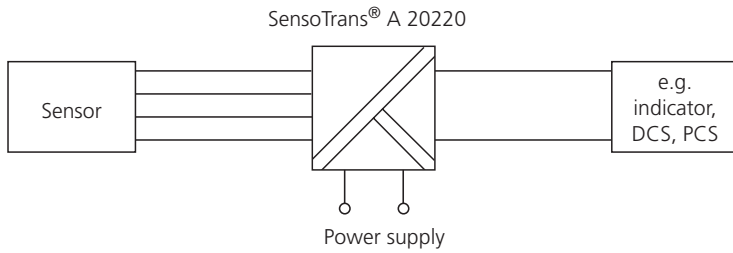
Laboratory Meters

Sensors

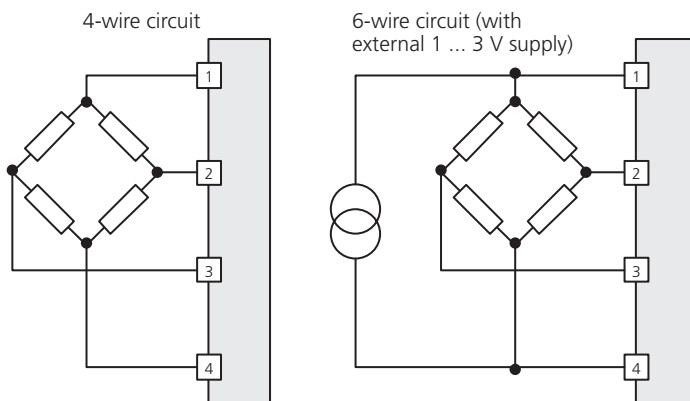
Fittings

Knick 

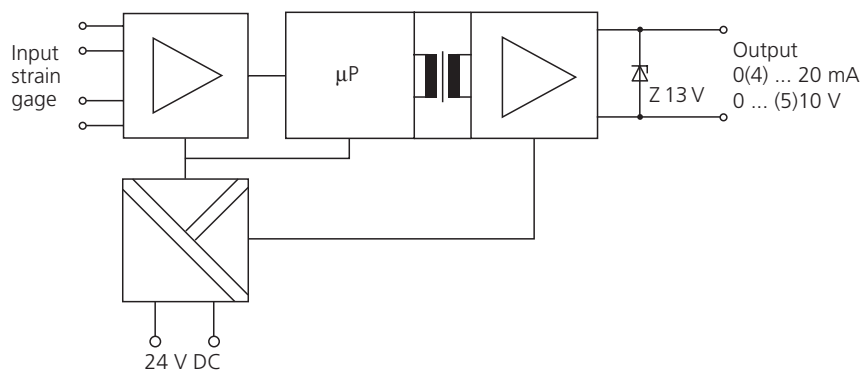
■ Application Examples



■ Connection of Strain Gages



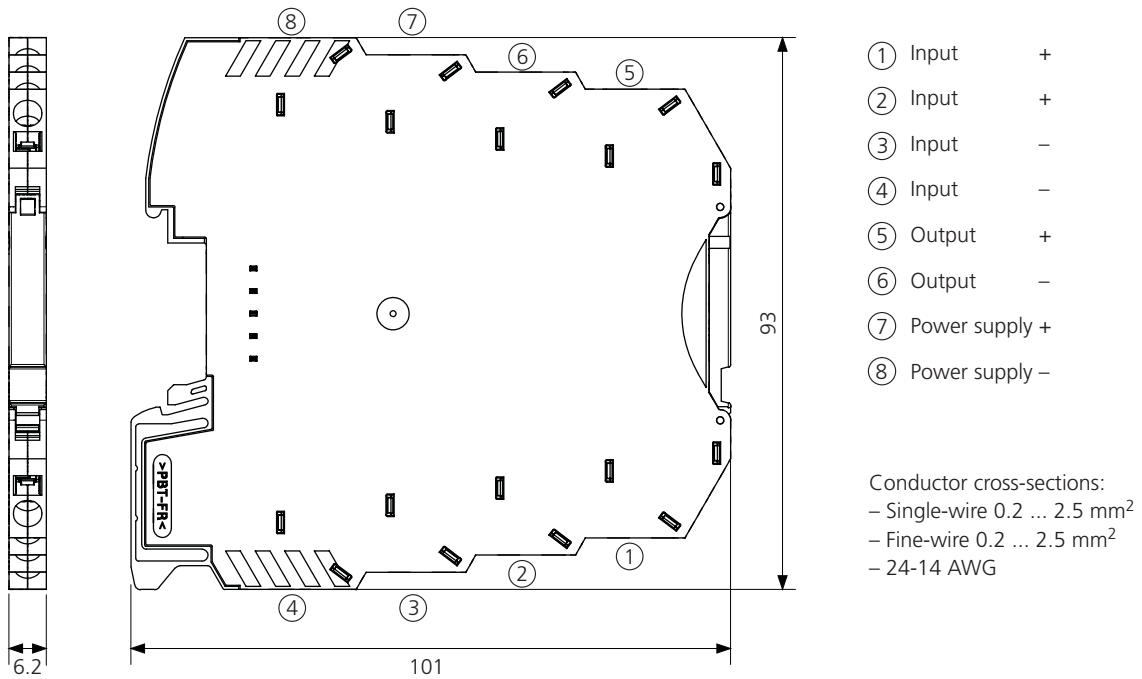
■ Block Diagram



Modular Housings

SensoTrans® DMS A 20220

■ Dimension Drawings and Terminal Assignments



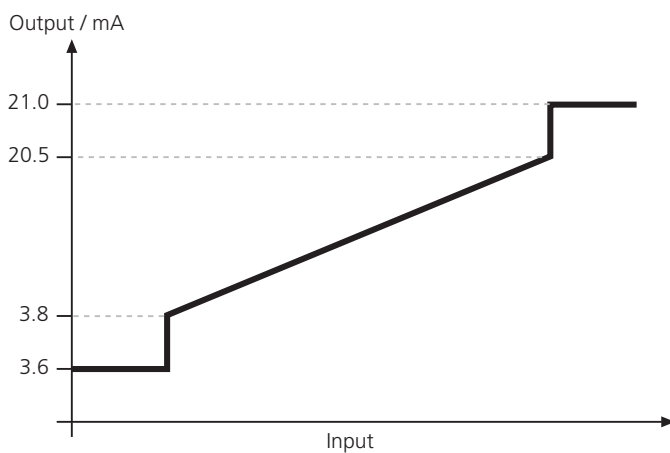
All dimensions in mm!

■ Error Signaling

No.	Error	Message configuration ¹⁾	Output			
			4 ... 20 [mA]	0 ... 20 [mA]	0 ... 5 [V]	0 ... 10 [V]
0	None	Not self-locking	–	–	–	–
1	Value below range	Not self-locking	3.6	0	0	0
2	Value above range	Not self-locking	21	21	5.25	10.5
3	Sensor short circuit	Not self-locking	21	21	5.25	10.5
4	Sensor open	Not self-locking	21	21	5.25	10.5
5	Basic resistance invalid	Not self-locking	21	21	5.25	10.5
6	Output load error	Not self-locking	3.6	0	0	0
7	Identification of connection	Not self-locking	21	21	5.25	10.5
8	Switch misadjusted	Not self-locking	21	21	5.25	10.5
9	Parameter error	Not self-locking	21	21	5.25	10.5
10	Device error	Self-locking	3.6	0	0	0

¹⁾ With the "self-locking" configuration, the error signal is maintained after termination of the error cause. The error message can be reset by restart (power supply on/off).

Output Current (4 ... 20 mA) Response to Out-Of-Range Conditions



Modular Housings

Knick >

SensoTrans® R P 32300



The transmitter for potentiometers for position determination, path measurement, or set-point specification – in a 6 mm housing with infrared interface, SIL approval, and broad-range power supply.

The Task

In many fields of industry positions of actuators or directors, for example, must be accurately detected. In many cases they are used as reference input for control or monitoring systems, safety shutdown systems, or for similar critical jobs. Here, normally the highest demands are placed on accuracy, flexibility, and functional safety as well as electrical safety.

Rotative motions can be detected by potentiometers used as angle encoder, translative motions by linear potentiometers used as position encoder.

These and other sensors provide a raw signal which is prepared, scaled, and converted to a standard signal for further processing using a resistance transmitter.

The Problem

Customary position sensors have individual characteristics, which requires tedious and time-consuming adjustment of the respective resistance transmitter using potentiometers.

Furthermore, resistance transmitters up to now had a very wide modular housing and therefore occupied a large amount of space in the enclosure. For world-wide applications, often several versions with different supply voltages were used.

The Solution

The universal SensoTrans® R P 32300 resistance transmitters provide connection possibilities for all standard potentiometers for angle, path, or position detection up to 50 kohms. They can be flexibly adapted to the respective measuring task using DIP and rotary switches or via an IrDA® port. The broad-range power supply covers all common supply voltages from 24 to 230 V AC/DC and ensures maximum safety even with unstable mains supplies. 3-port isolation with Safe Isolation up to 300 V AC/DC according to EN 61140 ensures optimum protection of personnel and equipment as well as unaltered transmission of measurement signals. The SensoTrans® R P 32300 offer maximum performance in the smallest of spaces. Adjusting the start and end value to the individual position sensor is particularly convenient via the infrared interface, for example using a PDA. Sensors with known characteristics can be very easily calibrated using 4 rotary coding switches and 8 DIP switches.

Special measuring tasks can be solved with SensoTrans® devices that Knick configures according to individual specifications. Fixed-range models without switch are used, for example, when manipulations or mix-up are to be excluded.

The devices meet the requirements of type of protection "n". This means they can be installed and used in Zone 2 hazardous areas in the EC, the USA, and in Canada. Thanks to their approval to Class 1, Division 2 (UL 1604), they can also be used according to the traditional North American classification system.

Knick offers the SensoTrans® R P 32300 transmitter with SIL approval for applications with high demands on functional safety. The requirements of EN 61508 were implemented by a specially developed hardware and software. The fail-safe concept makes use of structural measures at the device level (redundancy of system components) and diagnostic methods for selective fault detection. The product is SIL 2 approved (EN 61508) by an authorized body (TÜV Rheinland).

Resistance Transmitters

Isolation Amplifiers
Transmitters

Indicators

Process Analytics

Portable Meters

Laboratory Meters

Sensors

Fittings



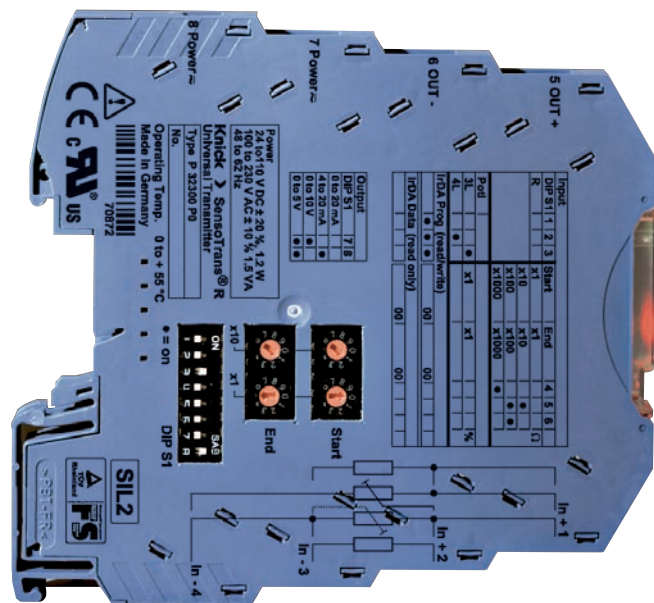
Knick

The Operating Software

The user-friendly, menu-guided Paraly® SW 111 communication software runs on standard and pocket PCs and opens a number of further options such as input of customer-specific linearization curves, readout of the connection configuration, as well as the use of extensive diagnostic functions. Configuration, documentation and, if necessary, maintenance of entire plant components can be accomplished by “infrared remote control”. Moreover, the output current or voltage can be specified independently of the input value using the simulation function – a useful feature for plant commissioning or revision.

The Housing

The modular housing – 6 mm slim – is stingy with enclosure space and allows high component density. DIN rail bus connectors inserted in the mounting rail facilitate the power supply connection if necessary.



Warranty
5 years!

Defects occurring within 5 years from delivery are remedied free of charge at our works (carriage and insurance paid by sender).

IrDA® is a registered trademark of the Infrared Data Association.

Modular Housings

Modular Housings

SensoTrans® R P 32300

■ The Facts

Universal usability

with potentiometers, resistive sensors, remote resistance transducers, and similar sensors

Convenient parameter setting

via IrDA® port – uncomplicated, menu-guided adjustment also “on site” including archiving of configuration data

Intuitive configuration of basic parameters – easy, without tools, using 4 rotary and 8 DIP switches

Calibrated range selection

without complicated trimming

Convenient adjustment

Start and end point adjustable via IrDA® interface

Simulation of any desired output values for correct installation/commissioning

World-wide application

due to broad-range power supply 24 ... 110 V DC ($\pm 20\%$) and 110 ... 230 V AC ($\pm 10\%$)

Safe Isolation

to EN 61140 – protection of maintenance staff and subsequent devices against non-permitted high voltages up to 300 V AC/DC

Functional safety

up to SIL 2 (up to SIL 3 in the case of redundant configuration) with TÜV certificate – systematically developed according to EN 61508

High accuracy due to innovative circuit design

Minimum space consumption

in the enclosure: only 6 mm wide modular housing – more transmitters per meter of mounting rail

Low-cost assembly

Quick mounting, convenient connection of power supply through DIN rail bus connectors (in the case of 24 V DC supply)

5-year warranty

■ Product Line

Resistance transmitters, adjustable

SensoTrans® R P 32300	Order No.	P 32300 P0 / <input type="checkbox"/> <input type="checkbox"/>
Functional safety (EN 61508)	Without SIL 2 (up to SIL 3 in the case of redundant configuration)	0 1
Power supply	Broad-range power supply 24 ... 110 V DC, 110 ... 230 V AC via screw terminals only, 24 V DC via screw terminals or DIN rail bus connector	1 0

Modular Housings

SensoTrans® R P 32300

■ Specifications

Resistance measurement

Input data

Resistance measurement incl. line resistance	0 ... 5 kohms or 5 ... 100 kohms
Connection	2-, 3-, or 4-wire (automatic recognition), signaling via yellow LED
Max. line resistance	100 ohms
Supply current	200 µA, 400 µA, or 0 ... 500 µA
Line monitoring	Open circuits
Input error limits	Resistances < 5 kohms: ±(50 mohms +0.05 % meas. val.) for spans > 15 ohms Resistances < 5 kohms: ±(1 mohms +0.05 % meas. val.) for spans > 50 ohms
Temperature coefficient at input	< 50 ppm/K of adjusted end value (average TC in permitted operating temp range, reference temp 23 °C)

Potentiometer

Input data

Input	200 ohms ... 50 kohms
Connection	3- or 4-wire
Supply current	0 ... 5 mA
Line monitoring	Short circuit or open circuit
Input error limits	± (0.2 % full scale + 0.05 % meas. val.) for spans > 5 %
Temperature coefficient at input	< 50 ppm/K of adjusted end value (average TC in permitted operating temp range, reference temp 23 °C)

Output data

Outputs	0 ... 20 mA, Calibrated selection 4 ... 20 mA, (factory setting 4 ... 20 mA) 0 ... 5 V, 0 ... 10 V
Control range	0 ... ≈102.5 % span with 0 ... 20 mA, 0 ... 10 V or 0 ... 5 V output -1.25 ... ≈102.5 % span with 4 ... 20 mA output
Resolution	16 bits
Simulation mode Adjustable via IrDA®	0 ... 20 mA current output: 0 ... 21 mA 4 ... 20 mA current output: 3 ... 21 mA 0 ... 5 V voltage output: 0 ... 5.25 V 0 ... 10 V voltage output: 0 ... 10.5 V

Resistance Transmitters

Isolation Amplifiers
Transmitters

Indicators

Process Analytics

Portable Meters

Laboratory Meters

Sensors

Fittings

Knick 

Specifications (continued)

Output data (continued)

Load	Current output: $\leq 10 \text{ V}$ ($\leq 500 \text{ ohms}$ at 20 mA) Voltage output: $\leq 1 \text{ mA}$ ($\geq 10 \text{ kohms}$ at 10 V)
Output error limits	Current output: $\pm(10 \mu\text{A} + 0.05 \% \text{ meas. val.})$ Voltage output: $\pm(5 \text{ mV} + 0.05 \% \text{ meas. val.})$
Residual ripple	$< 10 \text{ mV}_{\text{rms}}$
Temperature coefficient at output	$< 50 \text{ ppm/K}$ full scale (average TC in permitted operating temp range, reference temp $23 \text{ }^\circ\text{C}$)
Error signaling	0 ... 20 mA output: $I = 0 \text{ mA}$ or $\geq 21 \text{ mA}$ 4 ... 20 mA output: $I \leq 3.6 \text{ mA}$ or $\geq 21 \text{ mA}$ 0 ... 5 V or 0 ... 10 V output: $V = 0 \text{ V}$ or $V \geq 5.25 \text{ V}$ or $V \geq 10.5 \text{ V}$ via output signal, red LED, and IrDA® for out-of-range conditions, faulty settings, sensor short circuit or open circuit, output load error, unintentional adjustment of switches during operation (for SIL devices only), other device errors. Also see "Error Signaling" Page 197.

Transmission behavior

Characteristic	Linear rising / falling, curves defined by sampling points (via IrDA® port)
Meas. rate	Approx. 3/s*)

Display

Green LED	Power supply
Yellow LED	Connection type IrDA® communication
Red LED	Maintenance request or device failure

Power supply

	24 V DC power supply unit	Broad-range power supply unit
Power supply	24 V DC (-20% , $+25 \%$), approx. 1.2 W	24 V ... 110 V DC ($\pm 20 \%$), approx. 1.2 W 110 V ... 230 V AC ($\pm 10 \%$), 48 ... 62 Hz, approx. 1.5 VA

Isolation

Galvanic isolation	The power supply can be routed from one device to another via DIN rail bus connectors. 3-port isolation between input, output, and power supply
Test voltage	2.5 kV AC, 50 Hz: Power supply against input against output

*) For resistance measurements in the range 5 kohms ... 100 kohms: measuring rate 2/s.

Modular Housings

SensoTrans® R P 32300

Specifications (continued)

Isolation (continued)

Working voltage
(basic insulation)

Up to 300 V AC/DC across all circuits with overvoltage category II and pollution degree 2 according to EN 61010-1.

For applications with high working voltages, you should ensure there is sufficient spacing or isolation from neighboring devices and protection against electric shocks.

Protection against
electric shock

Safe Isolation according to EN 61140 by reinforced insulation in accordance with EN 61010-1. Working voltage up to 300 V AC/DC across all circuits with overvoltage category II and pollution degree 2. For applications with high working voltages, you should ensure there is sufficient spacing or isolation from neighboring devices and protection against electric shocks.

Standards and approvals

Functional safety

Optional: SIL 2 to EN 61508, SIL 3 with redundant configuration

Explosion protection

ATEX Zone 2 (EN 60079-15)
Class 1, Div 2 / Zone 2 (UL 1604)

EMC

Product family standard: EN 61326
Emitted interference: Class B
Immunity to interference¹⁾: Industry
EMC requirements for devices with safety-related functions
IEC 61326-3: draft

cURus

File No. 220033
Standards: UL 508 and CAN/CSA 22.2 no. 14-95

Interfaces

IrDA®

Specification 1.1, slave device for bidirectional communication
Paraly® SW 111 communication software is included in the shipment
Free download at www.knick.de

Other data

Ambient temperature

Operation: 0 ... +55 °C in row, without spacing
0 ... +65 °C with spacing \geq 6 mm
Storage: -25 ... +85 °C

Ambient conditions

Stationary application, weather-protected
relative air humidity: 5 ... 95 %, no condensation
barometric pressure: 70 ... 106 KPa
water or wind-driven rain, snow, or hail excluded

Design

Modular housing with screw terminals, width 6.2 mm,
see dimension drawings for further measurements and conductor cross section

Ingress protection

Terminal IP 20, housing IP 40

Mounting

For 35 mm top hat rail to EN 50022

Weight

Approx. 60 g

1) Slight deviations are possible while there is interference

Resistance Transmitters

Isolation Amplifiers
Transmitters

Indicators

Process Analytics

Portable Meters

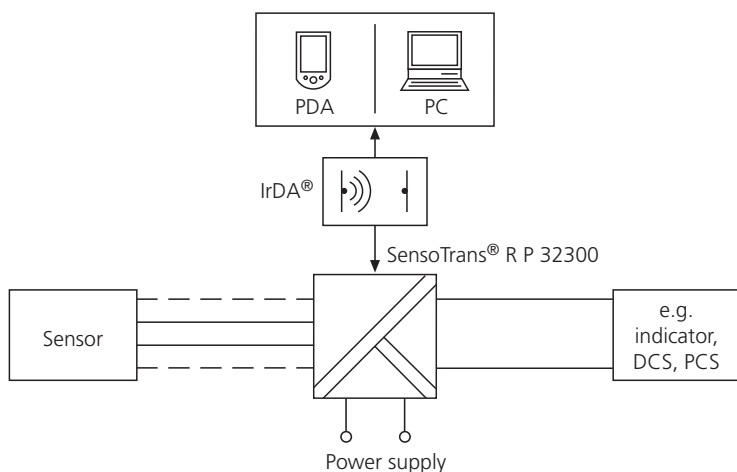
Laboratory Meters

Sensors

Fittings

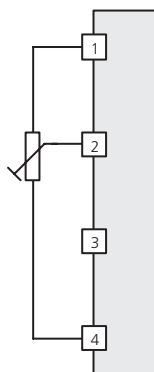


Application Examples

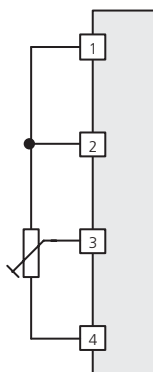


Connection of Potentiometers

3-wire connection

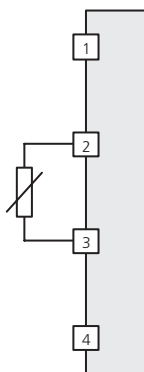


4-wire connection

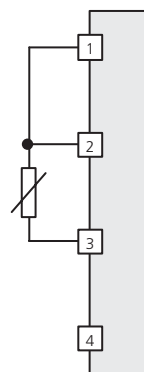


Connection of Resistors

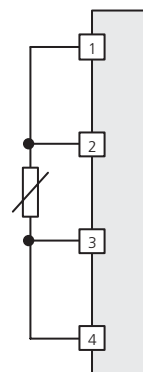
2-wire connection



3-wire connection



4-wire connection

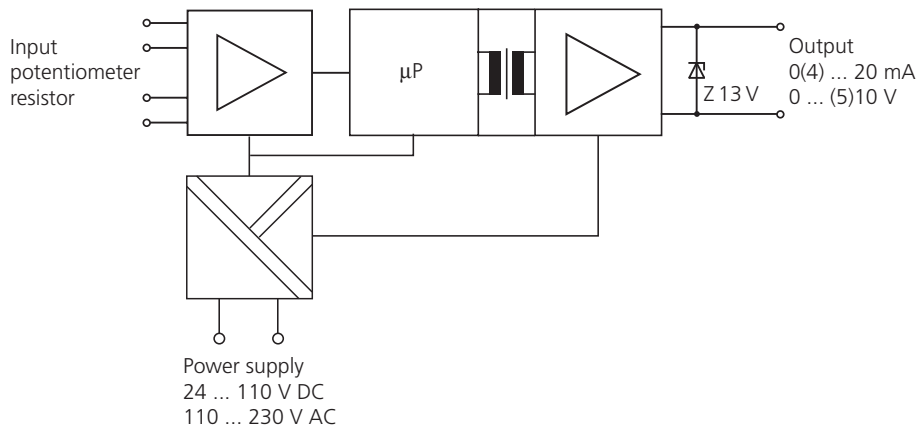


Modular Housings

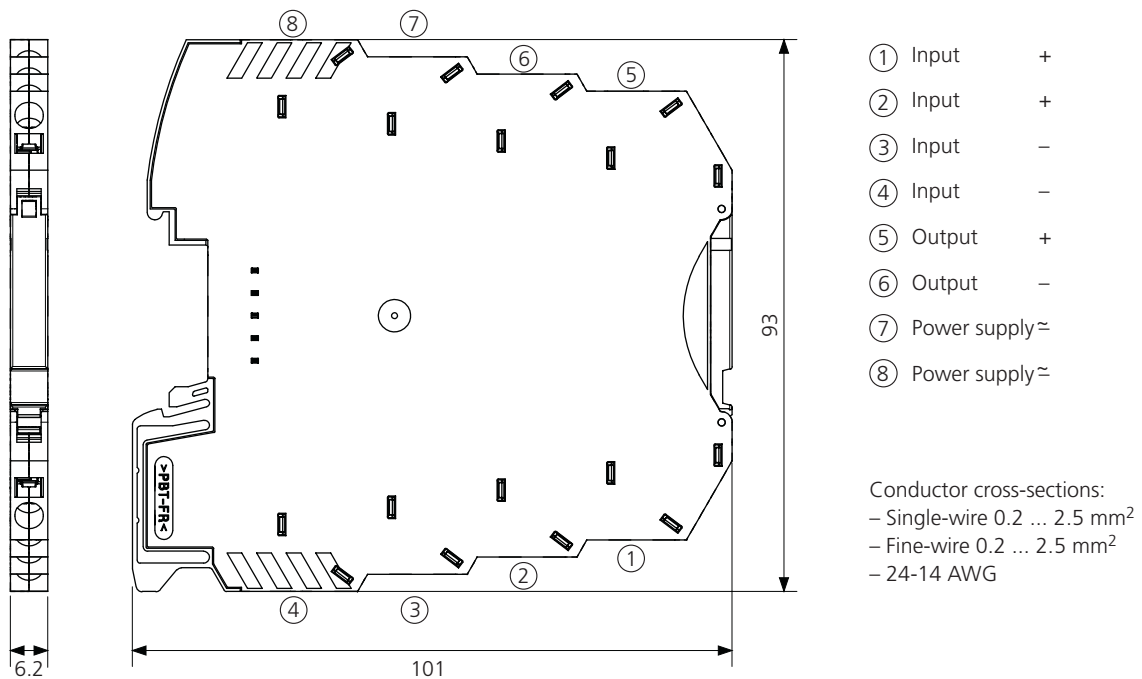
Modular Housings

SensoTrans® R P 32300

■ Block Diagram



■ Dimension Drawings and Terminal Assignments



All dimensions in mm!

■ Error Signaling

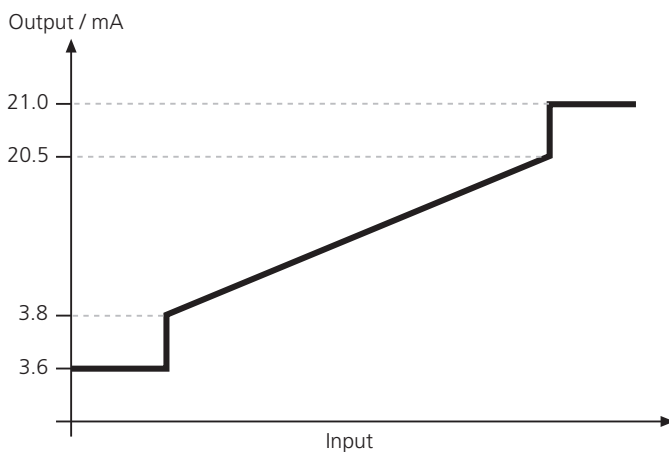
No.	Error	Message configuration ²⁾		Output			
		With SIL function	Without SIL function	4 ... 20 [mA]	0 ... 20 [mA]	0 ... 5 [V]	0 ... 10 [V]
0	None	Not self-locking	Not self-locking	–	–	–	–
1	Value below range	Not self-locking	Not self-locking	3.6	0	0	0
2	Value above range	Not self-locking	Not self-locking	21	21	5.25	10.5
3	Sensor short circuit	Self-locking	Not self-locking	21	21	5.25	10.5
4	Sensor open	Self-locking	Not self-locking	21	21	5.25	10.5
5	Basic resistance invalid ³⁾	Self-locking	Not self-locking	21	21	5.25	10.5
6	Load output error ⁴⁾	Not self-locking	Not self-locking	3.6	0	0	0
7	Identification of connection	Self-locking	Not self-locking	21	21	5.25	10.5
8	Switch misadjusted	Self-locking	Not self-locking	21	21	5.25	10.5
9	Parameter error	Self-locking	Not self-locking	21	21	5.25	10.5
10	Device error (subordinated error number distinguished via IrDA [®] port)	Self-locking	Self-locking	3.6	0	0	0

2) With the "self-locking" configuration, the error signal is maintained after termination of the error cause. The error message can be reset by restart (power supply on/off or via IrDA[®] port).

3) With potentiometers only

4) With SIL models P 32300 P0/1x only

Output Current (4 ... 20 mA) Response to Out-Of-Range Conditions



Modular Housings

Knick >

SensoTrans® R A 20230



The transmitter for potentiometers for position determination, path measurement, or setpoint specification in a 6 mm housing.

The Task

In many fields of industry positions of actuators or directors, for example, must be accurately detected. In many cases they are used as reference input for control or monitoring systems, safety shutdown systems, or for similar critical jobs. Here, normally the highest demands are placed on function, accuracy, flexibility, and electrical safety.

Rotative motions can be detected by potentiometers used as angle encoder, translative motions by linear potentiometers used as position encoder. These and other sensors provide a raw signal which is prepared, scaled, and converted into a standard signal for further processing using a resistance transmitter.

The Problem

Customary position sensors have individual characteristics, which requires tedious and time-consuming adjustment of the respective resistance transmitter using potentiometers.

Furthermore, resistance transmitters up to now had a very wide modular housing and therefore occupied a large amount of space in the enclosure. For world-wide applications, often several versions with different supply voltages were used.

The Solution

The universal SensoTrans® R A 20230 resistance transmitters provide connection possibilities for all standard potentiometers for angle, path, or position detection up to 50 kohms. They can be flexibly adapted to the respective measuring task using DIP and rotary coding switches or via a "teach-in function". 3-port isolation with Safe Isolation up to 300 V AC/DC according to EN 61140 ensures optimum protection of personnel and equipment as well as unaltered transmission of measurement signals. The SensoTrans® R A 20230 offer maximum performance in the smallest of spaces.

Adjusting the start and end value to the individual position sensor is particularly convenient using the "teach-in function" – just at the push of a button at the device front. Sensors with known characteristics can be very easily calibrated using 4 rotary coding switches and 8 DIP switches.

Special measuring tasks can be solved with SensoTrans® devices that Knick configures according to individual specifications. Fixed-range models without switch are used, for example, when manipulations or mix-up are to be excluded.

The devices meet the requirements of type of protection "n". This means they can be installed and used in Zone 2 hazardous areas in the EC, the USA, and in Canada. Thanks to their approval to Class 1, Division 2 (UL 1604), they can also be used according to the traditional North American classification system.

The Housing

The modular housing – 6 mm slim – is stingy with enclosure space and allows high component density. DIN rail bus connectors inserted in the mounting rail facilitate the power supply connection if necessary.

Warranty
5 years!

Defects occurring within 5 years from delivery are remedied free of charge at our works (carriage and insurance paid by sender).

Resistance Transmitters

Isolation Amplifiers
Transmitters

Indicators

Process Analytics

Portable Meters

Laboratory Meters

Sensors

Fittings



Knick >

■ The Facts

Universal usability with potentiometers, resistive sensors, remote resistance transducers, and similar sensors

Intuitive configuration of basic parameters – easy, without tools, using 4 rotary and 8 DIP switches

Calibrated range selection without complicated trimming

Convenient adjustment Start and end point are directly adjusted “at the push of a button” using the teach-in function

Safe Isolation to EN 61140 – protection of maintenance staff and subsequent devices against non-permitted high voltages up to 300 V AC/DC

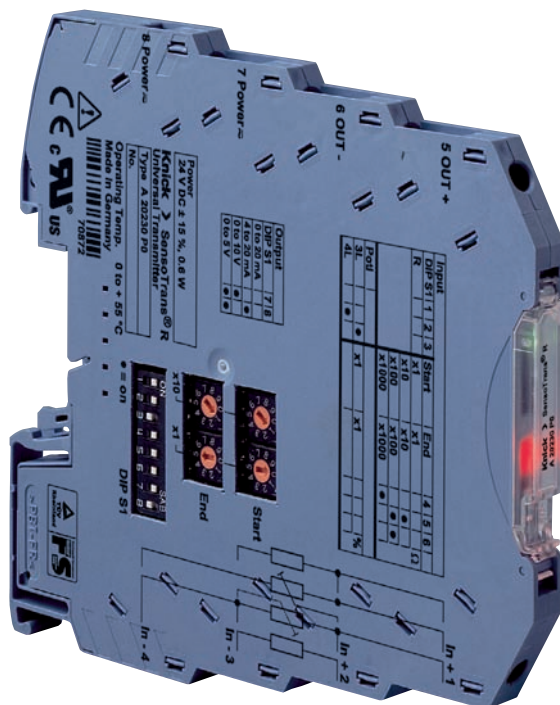
High accuracy due to innovative circuit design

Minimum space consumption in the enclosure: only 6 mm wide modular housing – more transmitters per meter of mounting rail

Low-cost assembly Quick mounting, convenient connection of power supply through DIN rail bus connectors

5-year warranty

6mm CLASS



Modular Housings

Modular Housings

SensoTrans® R A 20230

■ Product Line

Resistance transmitters,
adjustable

SensoTrans® R A 20230

Order No. A 20230 P0

Resistance transmitters,
with fixed settings

SensoTrans® R A 20230

Order No. A 20230 P0 / -

Input / Sensor type

Potentiometer P
Resistor R

Start of range

4-digit number (0xxx % / xx.xx kOhm) X X X X

End of range

4-digit number (0xxx % / xx.xx kOhm) X X X X

Output

0 ... 20 mA A
4 ... 20 mA B
0 ... 10 V C
0 ... 5 V D

Further customer-specific
settings

Without
As specified n n n n

Accessories

Order No.

DIN rail bus connector
ZU 0628

Power supply bridging for two devices, A 20XXX P0 or
P 32XXX P0

ZU 0628

IsoPower® A 20900

Power supply, 24 V DC, 1 A, see Page 212

A 20900 H4

Power terminal block
ZU 0677

Feeding the 24 V DC supply voltage to the
ZU 0628 DIN rail bus connector

ZU 0677

DIN rail bus connector
ZU 0678

Tapping of supply voltage (A 20900), routing to
ZU 0678 DIN rail bus connector

ZU 0678

■ Specifications

Resistance measurement Input data

Resistance measurement incl.
line resistance

0 ... 5 kohms or 5 ... 100 kohms

Connection

2-, 3-, or 4-wire (automatic recognition), signaling via yellow LED

Max. line resistance

100 ohms

Supply current

200 µA, 400 µA, or 0 ... 500 µA

Specifications (continued)

Resistance measurement

Input data (continued)

Line monitoring	Open circuits
Input error limits	Resistances < 5 kohms: $\pm(50 \text{ mohms} + 0.05 \% \text{ meas. val.})$ for spans > 15 ohms Resistances < 5 kohms: $\pm(1 \text{ mohms} + 0.05 \% \text{ meas. val.})$ for spans > 50 ohms
Temperature coefficient at input	< 50 ppm/K of adjusted end value (average TC in permitted operating temp range, reference temp 23 °C)

Potentiometer input data

Input	200 ohms ... 50 kohms
Connection	3- or 4-wire
Supply current	0 ... 5 mA
Line monitoring	Short circuit or open circuit
Input error limits	$\pm(0.2 \% \text{ full scale} + 0.05 \% \text{ meas. val.})$ for spans > 5 %
Temperature coefficient at input	< 50 ppm/K of adjusted end value (average TC in permitted operating temp range, reference temp 23 °C)

Output data

Outputs	0 ... 20 mA, Calibrated selection 4 ... 20 mA, (factory setting 4 ... 20 mA) 0 ... 5 V, 0 ... 10 V
Control range	0 ... $\approx 102.5\%$ span with 0 ... 20 mA, 0 ... 10 V or 0 ... 5 V output -1.25 ... $\approx 102.5\%$ span with 4 ... 20 mA output
Resolution	16 bits
Load	Current output: $\leq 10 \text{ V}$ ($\leq 500 \text{ ohms}$ at 20 mA) Voltage output: $\leq 1 \text{ mA}$ ($\geq 10 \text{ kohms}$ at 10 V)
Output error limits	Current output: $\pm(10 \mu\text{A} + 0.05 \% \text{ meas. val.})$ Voltage output: $\pm(5 \text{ mV} + 0.05 \% \text{ meas. val.})$
Residual ripple at output	< 10 mV _{rms}
Temperature coefficient at output	< 50 ppm/K full scale (average TC in permitted operating temp range, reference temp 23 °C)
Error signaling	0 ... 20 mA output: I = 0 mA or $\geq 21 \text{ mA}$ 4 ... 20 mA output: I $\leq 3.6 \text{ mA}$ or $\geq 21 \text{ mA}$ 0 ... 5 V or 0 ... 10 V output: V = 0 V or V $\geq 5.25 \text{ V}$ or V $\geq 10.5 \text{ V}$ via output signal and red LED for out-of-range conditions, faulty settings, sensor short circuit or open circuit, output load error, other device errors. Also see "Error Signaling" Page 205.

Modular Housings

SensoTrans® R A 20230

Specifications (continued)

Transmission behavior

Characteristic	Linear rising/falling
Meas. rate	Approx. 3/s*)

Display

Green LED	Power supply
Yellow LED	Connection type
Red LED	Maintenance request or device failure

Power supply

Power supply	24 V DC (– 20 %, + 25 %), approx. 1.2 W The power supply can be routed from one device to another via DIN rail bus connectors.
--------------	---

Isolation

Galvanic isolation	3-port isolation between input, output, and power supply
Test voltage	2.5 kV AC, 50 Hz: Power supply against input against output
Working voltage (basic insulation)	Up to 300 V AC/DC across all circuits with overvoltage category II and pollution degree 2 according to EN 61010-1. For applications with high working voltages, you should ensure there is sufficient spacing or isolation from neighboring devices and protection against electric shocks.
Protection against electric shock	Safe Isolation according to EN 61140 by reinforced insulation in accordance with EN 61010-1. Working voltage up to 300 V AC/DC across all circuits with overvoltage category II and pollution degree 2. For applications with high working voltages, you should ensure there is sufficient spacing or isolation from neighboring devices and protection against electric shocks.

Standards and approvals

Explosion protection	ATEX Zone 2 (EN 60079-15) Class 1, Div 2 / Zone 2 (UL 1604)
EMC	Product family standard: EN 61326 Emitted interference: Class B Immunity to interference ¹⁾ : Industry
cURus	File No. 220033 Standards: UL 508 and CAN/CSA 22.2 no. 14-95

*) For resistance measurements in the range 5 kohms ... 100 kohms: measuring rate 2/s.

1) Slight deviations are possible while there is interference

Resistance Transmitters

Isolation Amplifiers
Transmitters

Indicators

Process Analytics

Portable Meters

Laboratory Meters

Sensors

Fittings

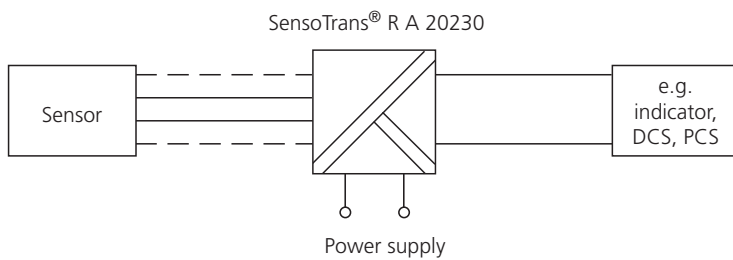
Knick 

Specifications (continued)

Other data

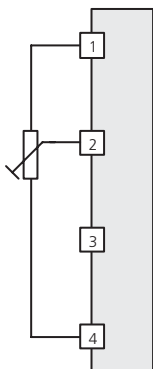
Ambient temperature	Operation: 0 ... +55 °C in row, without spacing 0 ... +65 °C with spacing ≥ 6 mm Storage: -25 ... +85 °C
Ambient conditions	Stationary application, weather-protected relative air humidity: 5 ... 95 %, no condensation barometric pressure: 70 ... 106 KPa water or wind-driven rain, snow, or hail excluded
Design	Modular housing with screw terminals, width 6.2 mm, see dimension drawings for further measurements and conductor cross section
Ingress protection	Terminal IP 20, housing IP 40
Mounting	For 35 mm top hat rail to EN 50022
Weight	Approx. 60 g

■ Application Examples

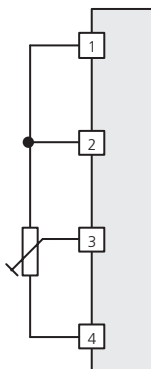


Connection of Potentiometers

3-wire connection

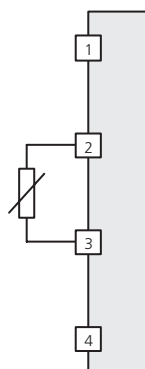


4-wire connection

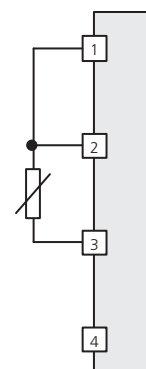


Connection of Resistors

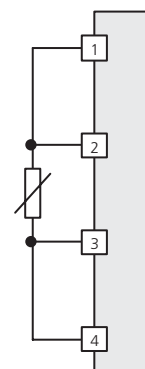
2-wire connection



3-wire connection



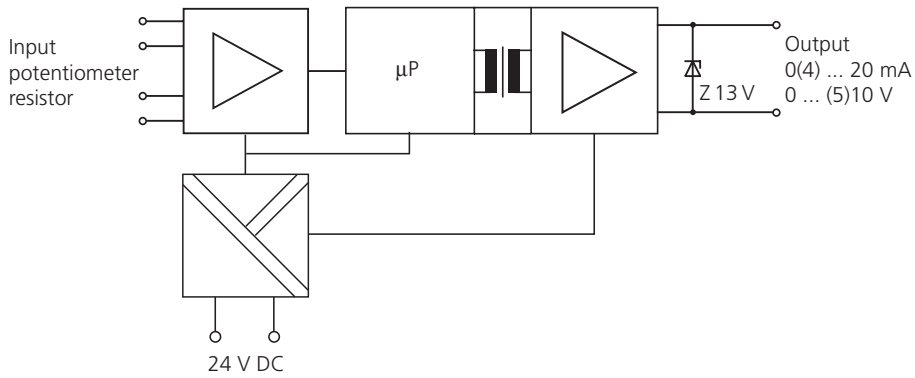
4-wire connection



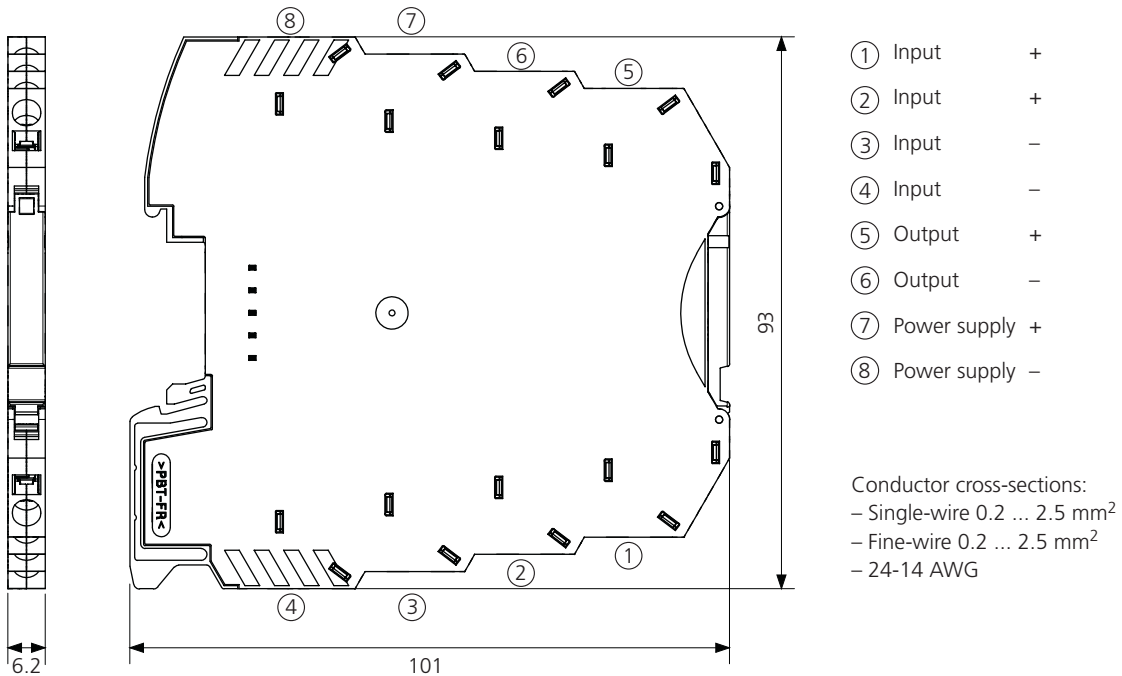
Modular Housings

SensoTrans® R A 20230

■ Block Diagram



■ Dimension Drawings and Terminal Assignments



All dimensions in mm!

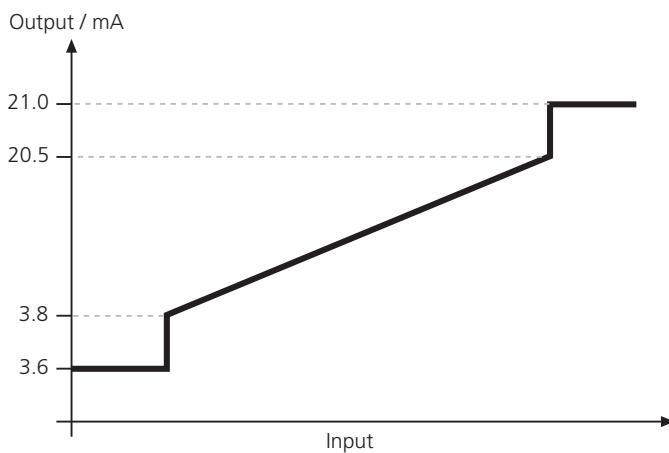
■ Error Signaling

No.	Error	Message configuration ²⁾	Output			
			4 ... 20 [mA]	0 ... 20 [mA]	0 ... 5 [V]	0 ... 10 [V]
0	None	Not self-locking	–	–	–	–
1	Value below range	Not self-locking	3.6	0	0	0
2	Value above range	Not self-locking	21	21	5.25	10.5
3	Sensor short circuit	Not self-locking	21	21	5.25	10.5
4	Sensor open	Not self-locking	21	21	5.25	10.5
5	Basic resistance invalid ³⁾	Not self-locking	21	21	5.25	10.5
6	Output load error	Not self-locking	3.6	0	0	0
7	Identification of connection	Not self-locking	21	21	5.25	10.5
8	Switch misadjusted	Not self-locking	21	21	5.25	10.5
9	Parameter error	Not self-locking	21	21	5.25	10.5
10	Device error	Self-locking	3.6	0	0	0

2) With the "self-locking" configuration, the error signal is maintained after termination of the error cause.
The error message can be reset by restart (power supply on/off).

3) With potentiometers only

Output Current (4 ... 20 mA) Response to Out-Of-Range Conditions



Modular Housings

Knick >

IsoTrans® 600



For isolation and conversion of sinusoidal alternating currents and voltages into standard signals.

The Task

For monitoring mains supplies, control of electric motors etc., alternating currents up to 10 A and voltages up to 800 V are converted to 0(4) ... 20 mA or 0 ... 10 V standard signals.

The Problem

is the provision of several AC/DC transmitters for different measurement ranges. Furthermore the maintenance staff and the system need to be protected against high potentials.

The Solution

comes with the switchable loop-powered IsoTrans® 600 AC/DC transmitters. Only the transmitters with 4 ... 20 mA output require 230 V AC power supply.

The calibrated range selection for all regular alternating voltages and the 22.5 mm slim modular housing allow universal use.



The Advantages

The accuracy class is 0.5 – no need to readjust the switchable ranges.

The IsoTrans® 600 provides Safe Isolation up to 600 V AC/DC according to EN 61010-1.

This allows use in 3-phase systems. Further measures for ensuring safe isolation are not necessary.

Except for the 4 ... 20 mA output, the IsoTrans® 600 is supplied directly from the measurement signal. There are no costs for a power supply and wiring.

Optimized switching technology makes the power consumption and the resulting self-heating very low. This protects against unnecessary temperature-related component aging and thus increases reliability.

The Technology

For conversion, the average input values are calibrated to form r. m. s values.

Short rise times, very low residual ripple and excellent overload behavior guarantee maximum transmission quality.

AC/DC Transmitters

Isolation Amplifiers
Transmitters

Indicators

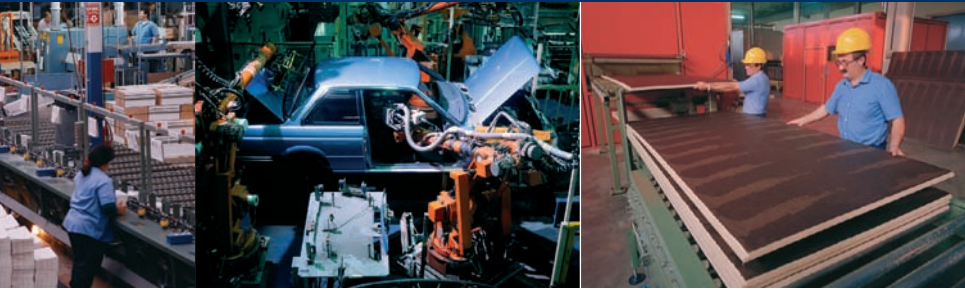
Process Analytics

Portable Meters

Laboratory Meters

Sensors

Fittings



Knick >

■ The Facts

Calibrated range selection

Simple stockkeeping due to universal application possibilities, no need for complicated readjustment

Loop-powered models with 0 ...20 mA and 0 ... 10 V output

Reduced wiring effort, no mains influences

Safe Isolation according to EN 61140

Protection of maintenance staff and subsequent devices against non-permitted high voltages

Modular 22.5 mm housing

Low space requirement due to compact design

High long-term stability and accuracy

Reliable operation without recalibration

Very low power consumption

allows minimum ratings of the upstream current and voltage transformer

Very low self-heating

No temperature-related component aging, high MTBF

Maximum reliability

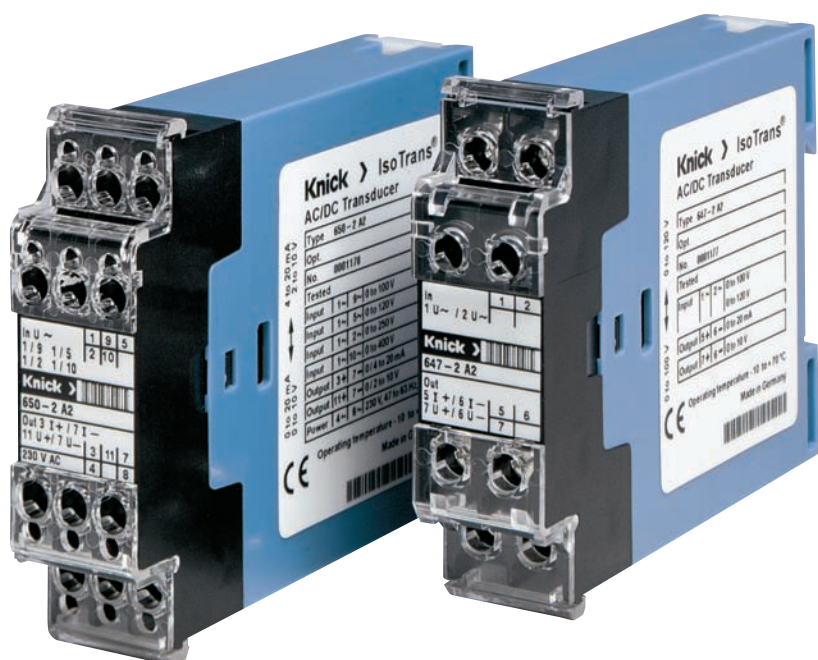
No repair and failure costs

High reliability

5-year warranty

Warranty
5 years!

Defects occurring within 5 years from delivery are remedied free of charge at our works (carriage and insurance paid by sender).



Modular Housings

Modular Housings

IsoTrans® 600

■ Product Line

Devices

IsoTrans® 600

with current input

	Input	Output	Order No.
IsoTrans® 611-1	0 ... 1 A	0 ... 20 mA	611-1 A2
IsoTrans® 621-1 (with power supply)	0 ... 1 A	4 ... 20 mA	621-1 A2
IsoTrans® 631-1	0 ... 1 A	0 ... 10 V	631-1 A2
IsoTrans® 615-1	0 ... 5 A	0 ... 20 mA	615-1 A2
IsoTrans® 625-1 (with power supply)	0 ... 5 A	4 ... 20 mA	625-1 A2
IsoTrans® 635-1	0 ... 5 A	0 ... 10 V	635-1 A2

IsoTrans® 600

with voltage input

IsoTrans® 647-2	0 ... 100/120 V switch selectable	0 ... 20 mA / 0 ... 10 V terminal selectable	647-2 A2
IsoTrans® 648-2	0 ... 250/400 V switch selectable	0 ... 20 mA / 0 ... 10 V terminal selectable	648-2 A2
IsoTrans® 650-2 (with power supply)	0 ... 100 / 120 / 250 / 400 V, terminal selectable	0 ... 20 mA / 4 ... 20 mA 0 ... 10 V, switch/terminal selectable	650-2 A2

Power supply

621-1, 625-1, 650-2: 230 V AC, others: none, supply from input signal

Options

IsoTrans® 635-1 and IsoTrans® 650-2 for input frequency 16 2/3 Hz
(635-1: response time 1 s, load ≥ 7.5 kohms)

469

■ Selection Aid

Input		Output		
		0 ... 20 mA	4 ... 20 mA	0 ... 10 V
0 ... 1 A AC		611-1 A2	621-1 A2*)	631-1 A2
0 ... 5 A AC		615-1 A2	625-1 A2*)	635-1 A2
0 ... 100 V AC		647-2 A2 650-2 A2*)	650-2 A2*)	647-2 A2 650-2 A2*)
0 ... 120 V AC		647-2 A2 650-2 A2*)	650-2 A2*)	647-2 A2 650-2 A2*)
0 ... 250 V AC		648-2 A2 650-2 A2*)	650-2 A2*)	648-2 A2 650-2 A2*)
0 ... 400 V AC		648-2 A2 650-2 A2*)	650-2 A2*)	648-2 A2 650-2 A2*)

*) With power supply

■ Specifications

Input data	IsoTrans® 600 with current input			IsoTrans® 600 with voltage input		
	6x1	6x5		647	648	650
Input ¹⁾	0 ... 1 A	0 ... 5 A		0 ... 100 / 120 V	0 ... 250 / 400 V	0 ... 100 / 120 / 250/400 V
	48 ... 63 Hz	48 ... 63 Hz		switch selectable Measurement from 10 % full scale 48 ... 63 Hz	switch selectable Measurement from 10 % full scale 48 ... 63 Hz	terminal selectable 48 ... 63 Hz
Overload	Continuous: 2 times I_{nom} 1 s: 50 times I_{nom}			Continuous: 1.5 times V_{nom} 1 s: 4 times V_{nom}		
Input power	Approx. 1 VA			max. 0.4 VA		
Output data	IsoTrans® 600 with current input			IsoTrans® 600 with voltage input		
	61x	62x	63x	647	648	650
Output	0 ... 20 mA	4 ... 20 mA	0 ... 10 V	0 ... 20 mA/ 0 ... 10 V		0(4) ... 20 mA/ 0(2) ... 10 V
Load	≤ 750 ohms		≥ 2 kohms	with output current: ≤ 600 ohms with output current: ≥ 1 kohm		
Response time (T_{90})	Approx. 0.1 s		<0.2 s	Approx. 0.25 s		
Load 0 ohm	Approx. 0.1 s					
Load 750 ohms	Approx. 0.2 sec					
Transmission behavior						
Transmission error	Class 0.5 (EN 60688)					
Power supply						
Power supply (models with 4 ... 20 mA output)	230 V AC -15% $+10\%$, 47 ... 63 Hz, approx. 1 VA (IsoTrans® 650 approx. 1.5 VA)					
Isolation						
Galvanic isolation	With power supply:		3-port isolation between input, output and power supply			
	Loop-powered:		Isolation between input and output			
Test voltage	With current input:		6 kV AC for models with power supply: 6 kV AC (input against output/ power supply), 4 kV AC (output against power supply)			
	With voltage input:		4 kV AC			

1) Other input values up to 10 A or 800 V in the frequency range 16 ... 63 Hz are available on request

Modular Housings

IsoTrans® 600

Specifications (continued)

Isolation (continued)

Protection against electric shock

Safe Isolation according to EN 61140 by reinforced insulation in accordance with EN 61010-1. Working voltages with overvoltage category II and pollution degree 2: up to 400 V AC/DC across output and power supply, up to 600 V AC/DC across input and output and, where necessary, power supply (current isolator up to category III, degree 2). For applications with high working voltages, you should ensure there is sufficient spacing or isolation from neighboring devices and protection against electric shocks.

Standards and approvals

Surge withstand

5 kV, 1.2/50 μ s, according to IEC 255-4

EMC

89/336/EEC directive; EN 61326

Other data

Ambient temperature

Operation: $-10 \dots +70 \text{ }^\circ\text{C}$
Transport and storage: $-30 \dots +80 \text{ }^\circ\text{C}$

Design

A7 modular housing, width 22.5 mm, screw terminals
See dimension drawings for further measurements

Ingress protection

Housing IP 40, terminals IP 20

Mounting

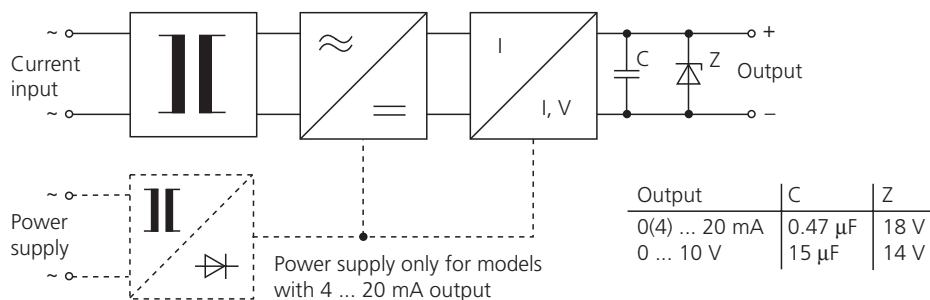
With snap-on mounting for 35 mm top hat rail according to EN 50022 or M4 screw mounting, see dimension drawings for conductor cross section

Weight

6xx-1: Approx. 350 g
6xx-2: Approx. 250 g

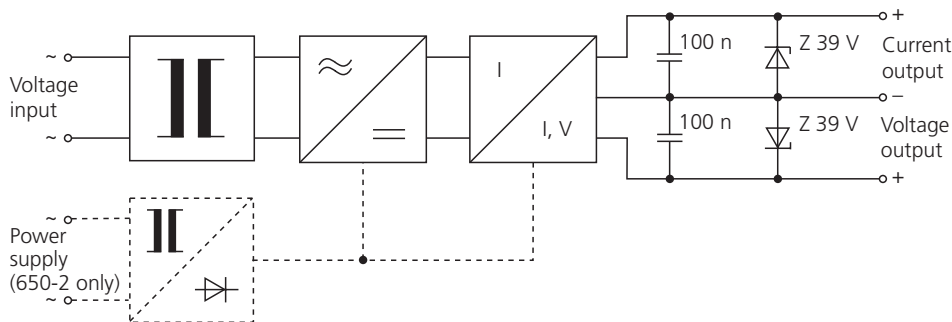
■ Block Diagrams

AC/DC Transmitter with Current Input

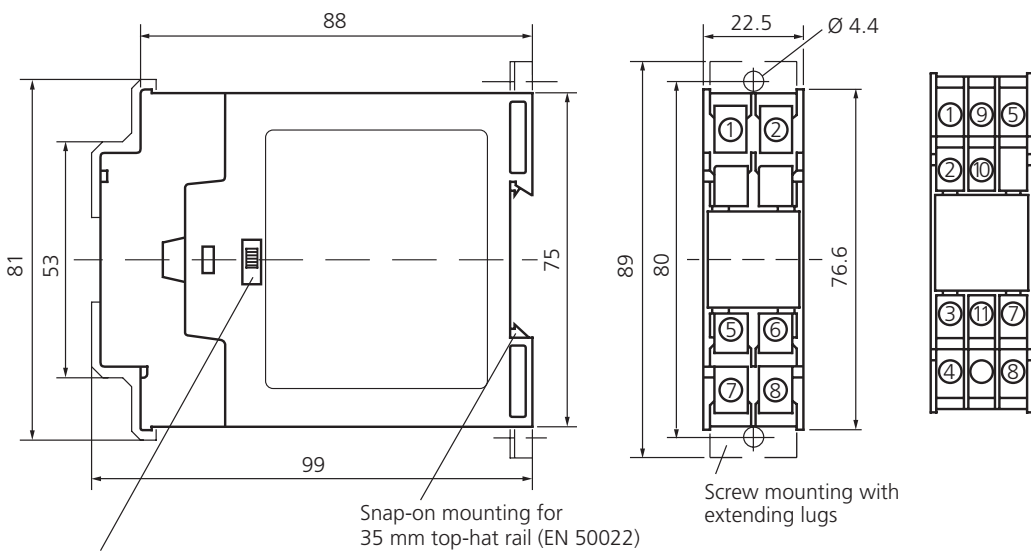


Block Diagrams (continued)

AC/DC Transmitter with Voltage Input



Dimension Drawings and Terminal Assignments



Range switch, do not use during operation!

M2.5x8 connecting screws
with self-releasing clamping pieces
max. conductor cross-section
2x2.5 mm² solid or
2x1.5 mm² stranded wire with ferrule

AC/DC Transmitters with Current Input 6**-1

- 1 Input ~
 - 2 Input ~
 - 5 Output +
 - 6 Output -
 - 7 Power supply ~ }
 - 8 Power supply ~ }
- (only for Models 621 and 625,
otherwise not connected)

AC/DC Transmitters with Voltage Input 647-2 and 648-2

- 1 Input ~
- 2 Input ~
- 5 Output + 20 mA
- 6 Output -
- 7 Output + 10 V

AC/DC Transmitters with Voltage Input 650-2

- 1 Input 0
- 9 Input 100 V ~
- 5 Input 120 V ~
- 2 Input 250 V ~
- 10 Input 400 V ~
- 7 Output -
- 11 Output + 20 mA
- 3 Output + 10 V
- 4 Power supply ~
- 8 Power supply ~

All dimensions in mm!

Modular Housings

Knick >

IsoPower® A 20900

24 V DC power supply with broad-range power supply unit.

The Task

Transmitters and isolation amplifiers which are not loop-powered require a stable and safe supply voltage. The series A 20XXX P0 and P 32XXX P0 devices permit power supply through DIN rail bus connectors. Power supply shall be fed into the DIN rail bus as comfortably as these devices are supplied with power by being snapped onto the DIN rail.

The Problem

In many regions of the world the stability of the public mains supply is not always sufficiently ensured. The nominal voltages of the public mains systems vary from country to country and sometimes even within one country. Therefore, broad-range power supplies are ideal to cover all requirements with one device.

The Solution

The IsoPower® A 20900 power supply provides a 24 V DC output voltage via two terminal pairs. At the rear side there are contacts to the DIN rail bus connector. When the IsoPower® power supply is snapped on the DIN rail, the DIN rail bus is automatically supplied with 24 V. The IsoPower® A 20900 is equipped with broad-range power supply unit. A floating signal contact signalizes a drop in the output voltage of more than 10 %.



The Advantages

The IsoPower® A 20900 power supply is designed for a broad input voltage range of 100 to 240 V AC (-15 % +10 %) which makes it suitable for all typical mains voltages. It ensures a high safety of operation in industrial networks that are influenced by large inductive loads as well as in countries with unstable mains supplies. Using DIN rail bus connectors a supply network for transmitters and isolation amplifiers of the 6-mm class can be built up. The devices can be installed much faster and they can be replaced very easily.

The IsoPower® A 20900 is equipped with pluggable screw terminals for easy installation and replaceability.



Power Supplies

Isolation Amplifiers
Transmitters

Indicators

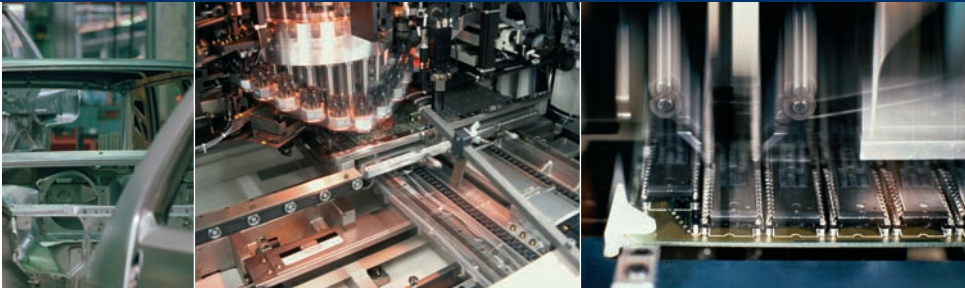
Process Analytics

Portable Meters

Laboratory Meters

Sensors

Fittings



Knick >

■ The Facts

Slim design 35 mm

World-wide application

100 ... 240 V AC
broad-range power supply

High availability

even in fluctuating mains supply
systems

**Low-priced, fast multiple
supply**

Feeding up to twenty 6-mm
devices conveniently via DIN rail
bus connectors

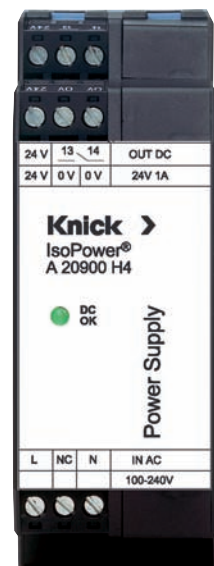
Floating relay output

for monitoring the output
voltage

Pluggable screw terminals

Simple and fast assembly and
prewiring of enclosures

2-year warranty



Modular Housings

IsoPower® A 20900

■ Product Line

Devices	Input	Output	Order No.
IsoPower® A 20900	100 ... 240 V AC	24 V DC, 1 A	A 20900 H4
Power supply			
100 ... 240 V AC			
Accessories			
DIN rail bus connector ZU 0678	Tapping of supply voltage, routing to ZU 0628 DIN rail bus connector, required number: supply towards left = 1, supply towards right = 2		ZU 0678
DIN rail bus connector ZU 0628	Power supply bridging for two devices, A 20XXX P0 or P 32XXX P0		ZU 0628

■ Specifications

Input data

Nominal input voltage	100 ... 240 V AC (broad-range input)
Input voltage range	85 ... 264 V AC
Frequency	45 ... 65 Hz
Current consumption	Approx. 0.5 A (at 120 V AC) Approx. 0.3 A (at 230 V AC)
Peak inrush current/ I^2t (at 25 °C)	< 15 A / < 0.6 A ² s
Turn-on time after applying the mains voltage	< 0.5 s

Output data

Nominal output voltage	24 V DC, ±1 %
Output current	1 A
Current limitation at short-circuits	7 A
Startup of capacitive loads	Unlimited
Typ. deviation	With static load change 10 ... 90 %: < 1 % With dynamic load change 10 ... 90 %: < 3 % With input voltage change ±10 %: < 0.1 %
Power loss	Idling Approx. 1 W Nominal load Approx. 5 W

Specifications (continued)

Output data (continued)

Efficiency	> 84 % (at 230V AC and nominal values)	
Rise time V_{OUT} (10 ... 90 %)	< 2 ms	
Residual ripple	< 100 mV _{pp} (at nominal values)	
Surge voltage protection against internal surge voltages	Yes, limited to approx. 30 V DC	
Resistance to reverse feed	30 V DC	
DC OC output, floating, max.: 30 V AC/DC, 1 A	$V_{OUT} > 21.5$ V DC	Contact closed
	$V_{OUT} \leq 21.5$ V DC	Contact open

Display

Green LED	Signaling of output voltage: $V_{OUT} > 21.5$ V DC LED on $V_{OUT} \leq 21.5$ V DC LED off	
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Isolation

Test voltage	3 kV AC input against output and DC OK output	
Protection against electric shock	Safe Isolation according to EN 50178 by reinforced insulation. Rated isolation voltage 300 V AC across input and output and across input and DC OK output with overvoltage category III and pollution degree 2	
Rated isolation voltage (basic insulation)	Up to 150 V AC/DC across output and DC OK output with overvoltage category III and pollution degree 2	

Standards and approvals

EMC	In conformance with EMC directive 89/336/EEC and low voltage directive 73/23/EEC	
Electrical equipment of machines	EN 60204 (overvoltage category III)	
Safety transformers for switched-mode power supplies	EN 61558-2-17	
Electrical safety	EN 69950 / VDE 0805	
Electronic equipment for use in electric power plants	EN 50178/VDE 0160	
Protective low voltage	PELV (EN 60204)	SELV (EN 60950)

Modular Housings

IsoPower® A 20900

Specifications (continued)

Standards and approvals (continued)

Limitation of mains harmonic currents

According to EN 61000-3-2

Approvals

UL/C-UL Recognized UL 60 950
UL/C-UL Listed UL 508

Other data

MTBF¹⁾

Approx. 57 years

Ambient temperature

Operation: -25 ... +70 °C
Transport and storage: -40 ... +85 °C

Humidity

Up to 95 % at +25 °C, no condensation

Climatic class

3K3 to EN 60 721

Design

Modular housing, width 35 mm, screw terminals, polyamide PA
See dimension drawings for further measurements

Ingress protection

IP20

Mounting

Metal lock for mounting on 35 mm top hat rail according to EN 50022
See dimension drawings for conductor cross section

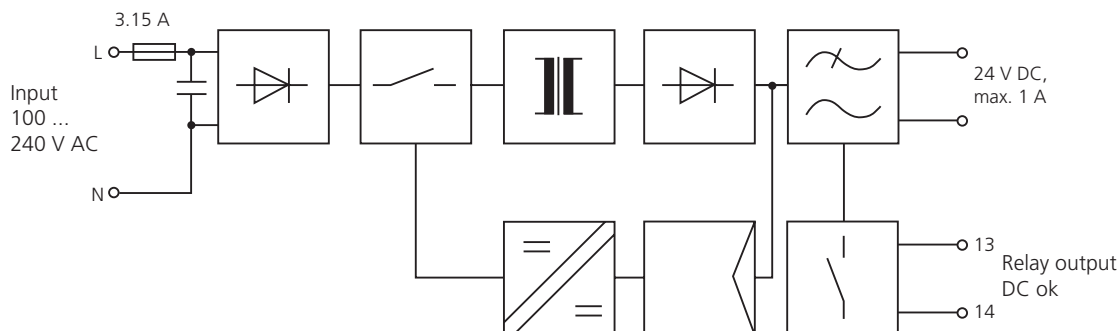
Weight

Approx. 250 g

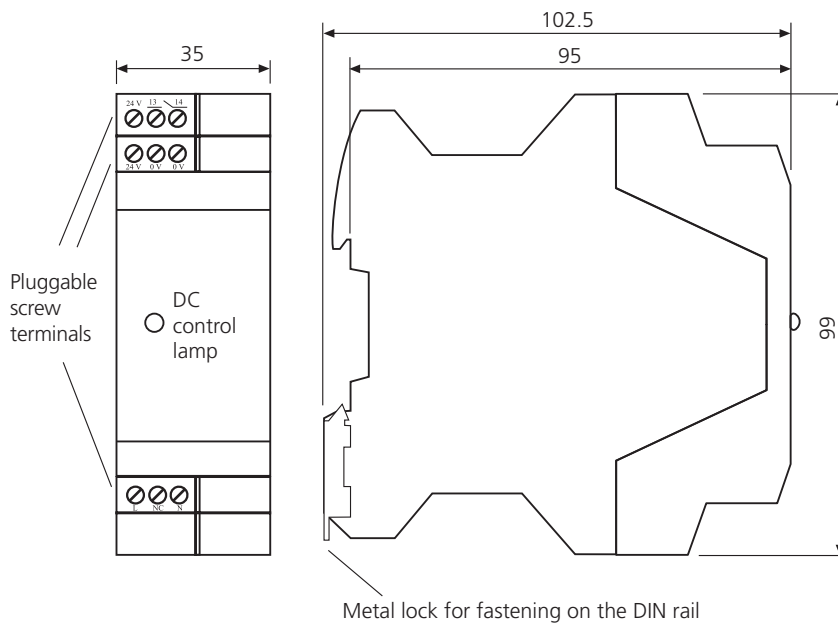
¹⁾ Mean Time Between Failures – MTBF – according to EN 61709 (SN 29500).

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

■ Block Diagram



■ Dimension Drawings and Terminal Assignments



Terminal Assignments

- L L conductor input (single-phase AC networks)
- L1 conductor input (three-phase networks)
- NC Not connected
- N (PE)N conductor input (single-phase AC networks)
- L2 conductor input (three-phase networks)
- 24 V 24 V DC outputs
- 0 V 0 V outputs
- 13 Floating relay output
- 14

All dimensions in mm!

Modular Housings for Hazardous Areas

Isolation Amplifiers
Transmitters

Indicators

Process Analytics

Portable Meters

Laboratory Meters

Sensors

Fittings

Knick 

Modular Housings for Hazardous Areas		Page
Isolation Amplifiers for Standard Signals	WG 20	230
Loop-Powered Isolators for Standard Signals	IsoTrans® 36/37	222
Repeater Power Supplies	WG 20	230
	WG 21	236
Loop-Powered Supplies	WG 25	242
Temperature Transmitters	ThermoTrans® 205/206	248
	ThermoTrans® 210/211	256

Modular Housings for Hazardous Areas

Knick >

IsoTrans® 36/37



For hazardous area/safe area isolation of 0 ... 20 mA standard signals without power supply.

The Task

Hazardous area normally means systems in continuous operation that require highly reliable components. The measurement signals need to be transmitted to the controller outside the hazardous area very accurately to control the processes optimally.

The Problems

Often complex systems with power supplies are used for reliable hazardous/safe area isolation combined with electrical isolation to prevent measurement errors.

The Solution

Knick loop-powered isolators for 0(4) ... 20 mA signal transmission. These devices are available as hazardous-area input and hazardous-area output isolators. Due to their patented design (German patent 3526997), they are considered to be the most reliable solution for isolating standard signals without external power supply.

The Advantages

The IsoTrans® 36 and 37 isolators are not only suitable as highly reliable isolators for normal applications, they also meet the most extreme requirements that can be set for potential isolation. There is no need to wire the power supply.

The Technology

The pioneering TransShield® technology allows specifications that previously could not be implemented:

- Extremely high reliability
- Safe Isolation, transient protection
- 10 kV test voltage (optional)
- High electromagnetic compatibility
- Extremely low residual ripple and common-mode interference
- Excellent pulse formation
- High transmission accuracy
- SMART transmission
- Hazardous/safe area isolation

In addition to the analog signals, they also transmit data protocols for SMART transmitters (HART®). They allow bidirectional communication from every point of the cabling.

**Special model available!
Measure voltage without a power supply.**

Voltages in the range from 250 to 1200 V DC can be converted into current signals up to 5 mA using a special loop-powered version of the isolator. This allows, for example, the contact wire voltage to be checked easily. Please contact us if you need detailed information on this special model.

**Warranty
5 years!**

Defects occurring within 5 years from delivery are remedied free of charge at our works (carriage and insurance paid by sender).

Loop-Powered Isolators for Standard Signals

Isolation Amplifiers
Transmitters

Indicators

Process Analytics

Portable Meters

Laboratory Meters

Sensors

Fittings



Knick >

■ The Facts

Galvanic isolation between input and output signal

Protection against measuring errors caused by grounding problems and parasitic interference voltage

No power supply required

Cost saving due to lower wiring effort, no mains influences

Very low residual ripple

No interference of the connected measuring or control system

Explosion protection according to ATEX

High transmission accuracy

Excellent pulse formation due to exact transmission of measured values

Very low common-mode interference

Avoiding incorrect measurements or failure due to interference signals

Maximum reliability

No repair and failure costs

10 kV test voltage (optional)

Safe Isolation according to EN 61140

Protection of maintenance staff and subsequent devices against non-permitted high voltages

SMART transmission

Bidirectional point-to-point transmission of digital data according to HART® specification

5-year warranty

HART® is a registered trademark of the HART Communication Foundation



Modular Housings for Hazardous Areas

IsoTrans® 36/37

■ Product Line

Devices	Order No.
IsoTrans® 36	36 A7
IsoTrans® 37	37 A7
IsoTrans® 36 A9 special model	36 A9-xxx
Power supply None, supply from input signal	
Options Increased test voltage 10 kV AC	

■ Specifications

Input data	36 A7	37 A7
Input ¹⁾	0 ... 20 mA, intrinsically safe	0 ... 20 mA
Operating current	≤ 20 µA	
Overload	50 mA	
Voltage drop	Approx. 4.5 V at 20 mA ²⁾	Approx. 4 V at 20 mA
Output data	36 A7	37 A7
Output	0 ... 20 mA, max. 10 V (corresponds to 500 ohms load)	0 ... 20 mA, max. 20 V, intrinsically safe (corresponds to 1000 ohms load)
Load error	< 0.15 % meas. val. per 100 ohms load	
Offset	< 20 µA	
Residual ripple V_{rms}	< 10 mV at 20 mA and 500 ohms load	
Transmission behavior		
Transmission error	0.2 % meas. val.	
Rise or fall time	≤ 400 µs at 500 ohms load (10 ... 90 %, jump from 0 ... 20 mA or 20 ... 0 mA)	
HART® attenuation	<10 dB	

1) Linear transmission IsoTrans® 36: up to 50 mA, IsoTrans® 37: up to 22 mA

2) Approx. 8.5 V at 50 mA

Loop-Powered Isolators for Standard Signals

Isolation Amplifiers
Transmitters

Indicators

Process Analytics

Portable Meters

Laboratory Meters

Sensors

Fittings

Knick 

Specifications (continued)

Isolation

Test voltage	4.4 kV AC 10 kV AC with option 471
Working voltages (basic insulation)	3600 V AC/DC, 2500 V AC ³⁾ with overvoltage category II and pollution degree 2 according to EN 61010-1 For applications with high working voltages, you should ensure there is sufficient spacing or isolation from neighboring devices and protection against electric shocks. Permissible working voltages for other overvoltage categories and pollution degrees on request. For hazardous area applications the maximum working voltage is 250 V.
Protection against electric shock	Safe Isolation according to EN 61140 by reinforced insulation in accordance with EN 61010-1. Working voltages with overvoltage category II and pollution degree 2: 600 V AC/DC. For applications with high working voltages, you should ensure there is sufficient spacing or isolation from neighboring devices and protection against electric shocks. For hazardous area applications the maximum working voltage is 250 V.

Standards and approvals

	36 A7	37 A7
Explosion protection	II (1) G [EEx ia] IIC, input intrinsically safe PTB 02 ATEX 2134 For further specifications, refer to EC-Type-Examination Certificates.	II (2) G [EEx ib] IIC, output intrinsically safe PTB 02 ATEX 2063
EMC ⁴⁾	European EMC regulations according to 89/536/EEC directive NAMUR NE 21, EN 61326	

Other data

Ambient temperature	Operation: -10 ... +50 °C Transport and storage: -30 ... +80 °C
Design	Modular housing, width 22.5 mm, screw terminals, See dimension drawings for further measurements
Ingress protection	Housing IP 20, terminals IP 20
Mounting	With snap-on mounting for 35 mm top hat rail according to EN 50022, see dimension drawings for conductor cross section
Weight	Approx. 120 g

³⁾ For circuits according to table 6 from EN 61010-1 (transient overvoltage 2600 V)

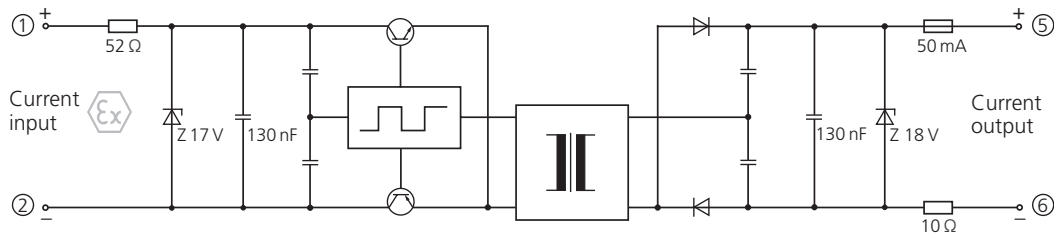
⁴⁾ In the 1 ... 20 mA range

Modular Housings for Hazardous Areas

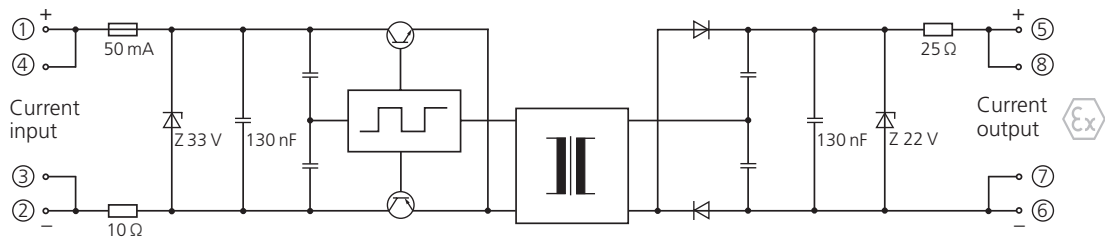
IsoTrans® 36/37

■ Block Diagrams

IsoTrans® 36 A7



IsoTrans® 37 A7

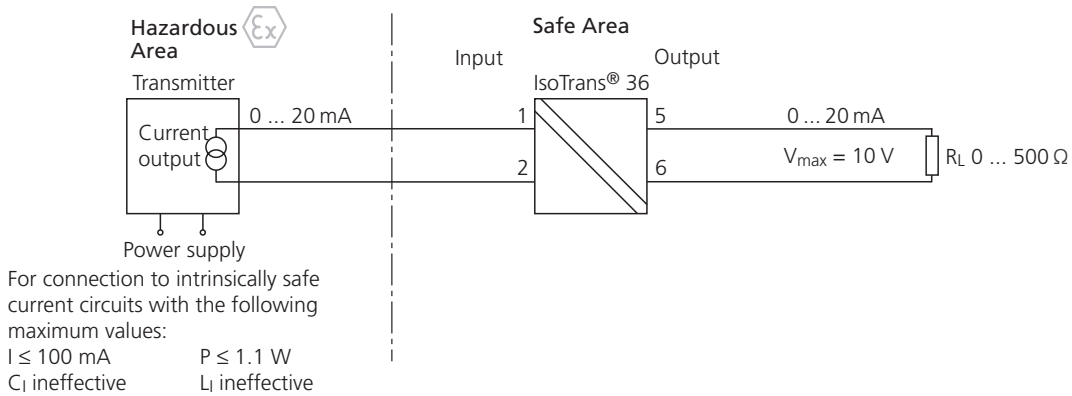


Loop-Powered Isolators for Standard Signals

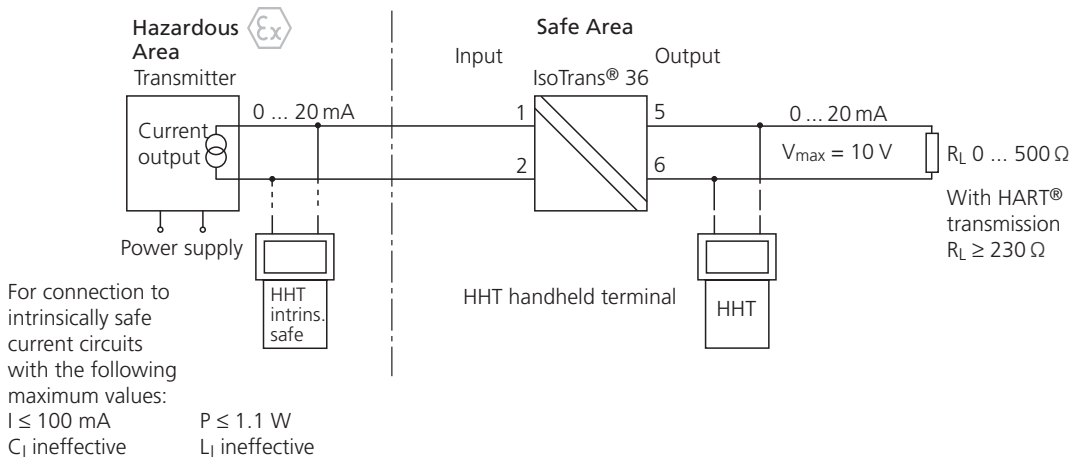


Application Examples IsoTrans® 36 A7

Without HART® communication



With HART® communication

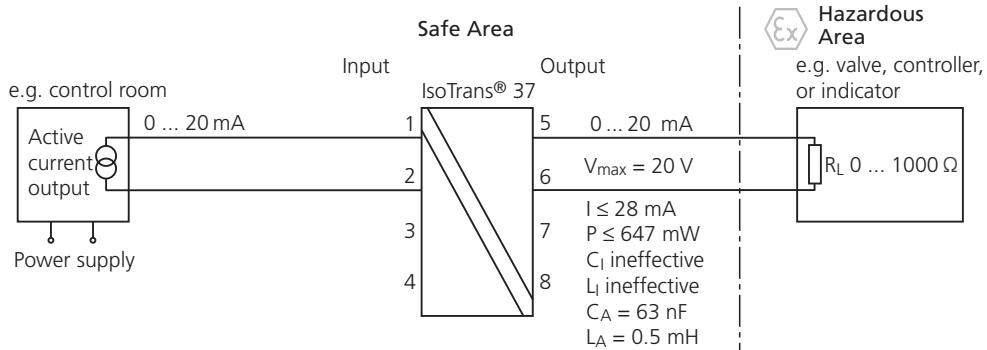


Modular Housings for Hazardous Areas

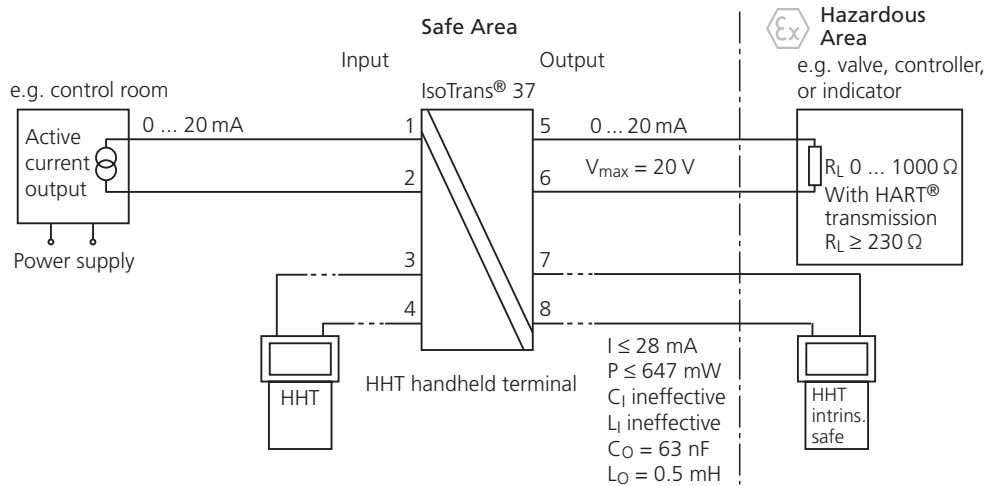
IsoTrans® 36/37

Application Examples IsoTrans® 37 A7 (continued)

Without HART® communication



With HART® communication



Loop-Powered Isolators for Standard Signals

Isolation Amplifiers
Transmitters

Indicators

Process Analytics

Portable Meters

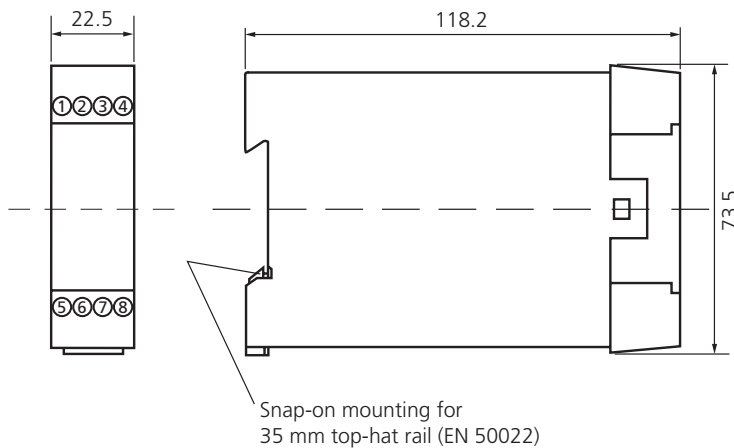
Laboratory Meters

Sensors

Fittings

Knick >

■ Dimension Drawings and Terminal Assignments



IsoTrans® 36 A7

- 1 Input +
- 2 Input -
- 5 Output +
- 6 Output -

IsoTrans® 37 A7

- 1 Input +
- 2 Input -
- 3 HHT non-intrinsically safe
- 4 HHT non-intrinsically safe
- 5 Output +
- 6 Output -
- 7 HHT intrinsically safe
- 8 HHT intrinsically safe

HHT = handheld terminal

Captive M3x8 clamping screws, box terminals with self-releasing wire protection, max. conductor cross-section
1 x 4 mm² solid; 1 x 2.5 mm² stranded with ferrule;
2 x 1.5 mm² stranded with ferrule

Installation, commissioning, and maintenance
may be carried out only by trained personnel!

All dimensions in mm!

Modular Housings for Hazardous Areas

Knick >

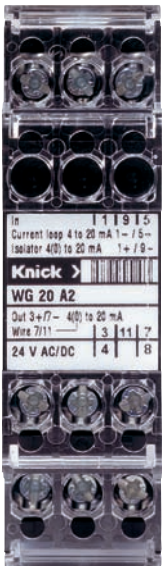
For transmission of 0(4) ... 20-mA signals from hazardous areas or supply of intrinsically safe 2-wire transmitters.

The Task

The WG 20 power supply/isolator is used to supply intrinsically safe 2-wire transmitters. It supplies the transmitter with power and transmits the measurement signal to the output with high accuracy.

The Advantages

The WG 20 provides Safe Isolation and high insulation from the input to the output and to the power supply.

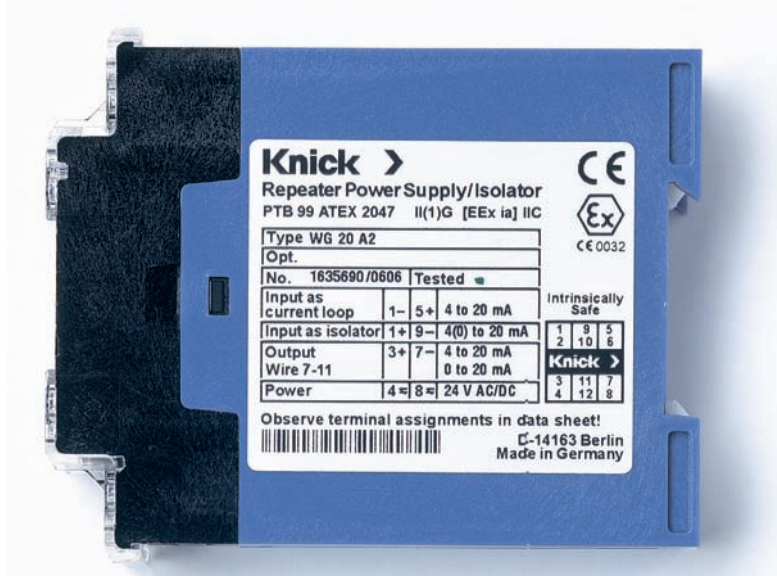


The Technology

An additional measurement current input allows use as a highly accurate standard-signal isolator in hazardous areas.

High supply voltage, good hazardous area ratings and the simple LiveZero (4...20 mA) / Dead Zero (0...20 mA) switching allow universal applications.

WG 20



Knick > **CE**
Repeater Power Supply/Isolator
 PTB 99 ATEX 2047 II(1)G [EEEx ia] IIC
Type WG 20 A2
 Opt.
 No. 1635690/D606 Tested
 Input as current loop 1- 5+ 4 to 20 mA Intrinsically Safe
 Input as isolator 1+ 9- 4(0) to 20 mA 1 9 5
 2 10 6
 Output 3+ 7- 4 to 20 mA Knick >
 Wire 7-11 0 to 20 mA 3 11 7
 Power 4 8 24 V AC/DC 4 12 8
 Observe terminal assignments in data sheet!
 C-14163 Berlin
 Made in Germany

The WG 20 achieves an extraordinarily high transmission accuracy for hazardous-area applications.

The control range of the measuring circuit extends to the negative values and allows strictly linear transmission also in the zero range.

The encapsulation technique allows maximum operating safety, long-time stability, and disruptive strength even under extreme conditions.

Warranty
5 years!

Defects occurring within 5 years from delivery are remedied free of charge at our works (carriage and insurance paid by sender).

Repeater Power Supplies

Isolation Amplifiers
Transmitters

Indicators

Process Analytics

Portable Meters

Laboratory Meters

Sensors

Fittings



Knick >

■ The Facts

Universal use for 2-wire transmitters or as standard-signal isolators

Low stockkeeping costs with many application possibilities

Safe Isolation according to EN 61140

Protection of maintenance staff and subsequent devices against non-permitted high voltages

3-port isolation

Protection against incorrect measurements or damage to the equipment due to parasitic voltages

High transmission accuracy

Exact transmission of measured values

Explosion protection according to ATEX

Trouble-free use in hazardous areas

Output 0 ... 20 mA or 4 ... 20 mA, switchable

Universal adaptation to the following devices

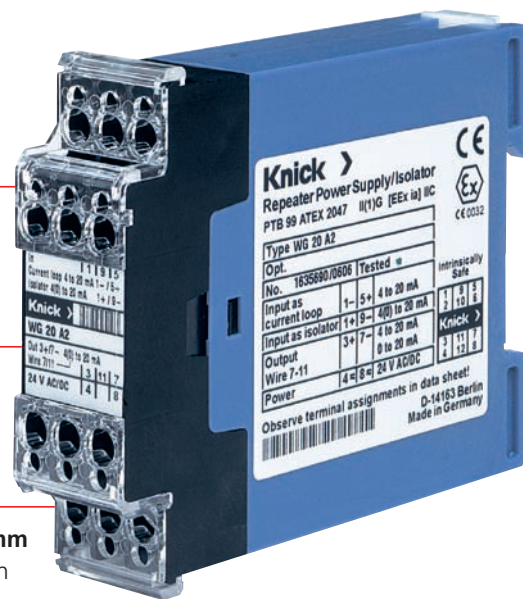
Measuring circuit with linear zero crossing

No transmission loss in the zero range

Modular housing 22.5 mm

Straightforward installation due to compact design

5-year warranty



■ Product Line

Devices

WG 20

Power supply

24 V AC/DC

Order No.

WG 20 A2

Modular Housings

Modular Housings for Hazardous Areas

WG 20

■ Specifications

Operation as a repeater power supply

Input (current loop)	4 ... 20 mA, intrinsically safe
Output	4 ... 20 mA/0 ... 20 mA, switchable ¹⁾
Current loop	Intrinsically safe supply voltage 20 V, constant for 0 ... 22 mA, floating, resistant to continuous short-circuit, current limited to 30 mA, residual ripple < 10 mV _{pp}

Operation as isolation amplifier

Input ²⁾	0 ... 20 mA, intrinsically safe	4 ... 20 mA, intrinsically safe
Output	0 ... 20 mA	4 ... 20 mA/0 ... 20 mA, switchable ¹⁾
Overload capacity (at input)	≤ 300 mA, limited by diode ≤ 1 V, 13 ohms	
Input voltage drop	≤ 300 mV	

Output data

Load	≤ 12 V
Offset	< 10 μA
Residual ripple at output	≤ 10 mV _{pp}

Transmission behavior

Transmission error (at output)	0.1% meas. val.
Cutoff frequency	1 kHz, -3 dB
Temperature coefficient (at output)	≤ 1 μA/K (reference temperature 23 °C)

Power supply

Power supply	24 V AC/DC AC -15 % +10 %, 48 ... 62 Hz, approx. 3.3 VA	DC -15% +20%, approx. 2.2 W
--------------	--	-----------------------------

1) Additional error at output 10 μA

2) Transmission of negative signals up to approx. 3% full scale

Specifications (continued)

Isolation

Galvanic isolation	3-port isolation between input, output and power supply
Test voltage	4 kV AC (current loop, input / output / power supply)
Working voltages (basic insulation)	1000 V AC/DC current loop, input against output and power supply 800 V AC/DC output against power supply with overvoltage category II and pollution degree 2 according to EN 61010-1. For applications with high working voltages, you should ensure there is sufficient spacing or isolation from neighboring devices and protection against electric shocks. For hazardous area applications the maximum working voltage is 250 V.
Protection against electric shock	Safe Isolation according to EN 61140 by reinforced insulation in accordance with EN 61010-1. Working voltages with overvoltage category II and pollution degree 2: up to up to 600 V AC/DC across current loop, input, and output / power supply, as well as 250 V AC/DC across output and power supply. For applications with high working voltages, you should ensure there is sufficient spacing or isolation from neighboring devices and protection against electric shocks. For hazardous area applications the maximum working voltage is 250 V.

Standards and approvals

Explosion protection	II (1) G [EEx ia] IIC current loop, input intrinsically safe, PTB 99 ATEX 2047, for further details see certificates of conformity at our website: www.knick.de
EMC	89/336/EEC directive ³⁾

Other data

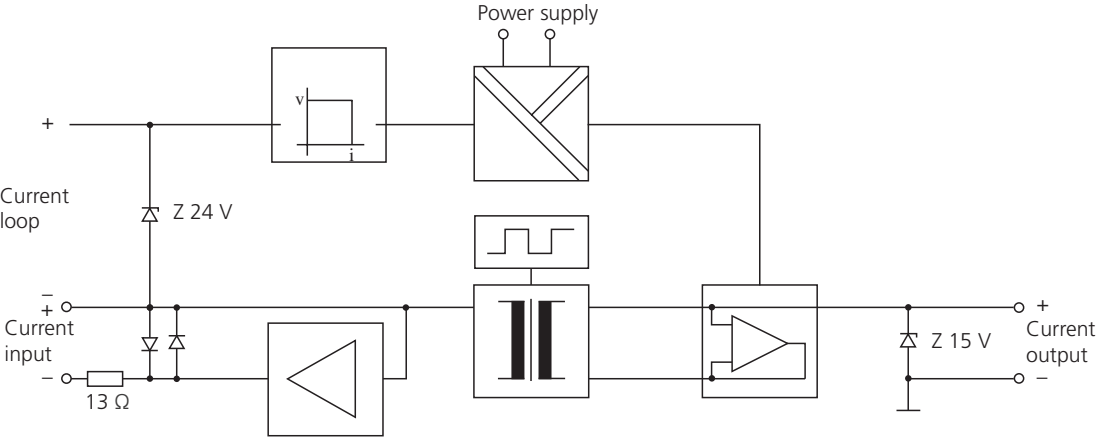
Ambient temperature	Operation: -10 ... +60 °C Transport and storage: -30 ... +80 °C
Design	Modular housing, width 22.5 mm, screw terminals See dimension drawings for further measurements
Ingress protection	Housing IP 40, terminals IP 20
Mounting	With snap-on mounting for 35 mm top hat rail according to EN50022 or M4 screw mounting, see dimension drawings for conductor cross section
Weight	Approx. 250 g

³⁾ Deviations are possible while there is interference

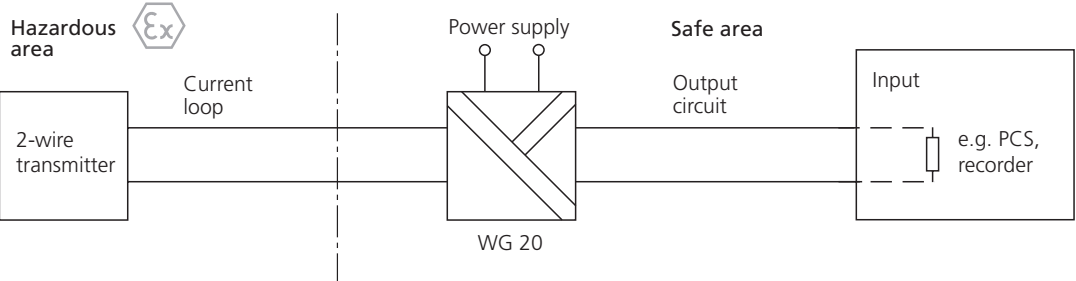
Modular Housings for Hazardous Areas

WG 20

■ Block Diagram



■ Application Example



Repeater Power Supplies

Isolation Amplifiers
Transmitters

Indicators

Process Analytics

Portable Meters

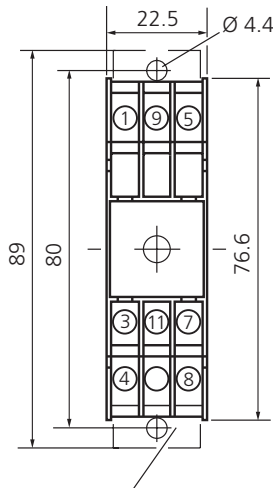
Laboratory Meters

Sensors

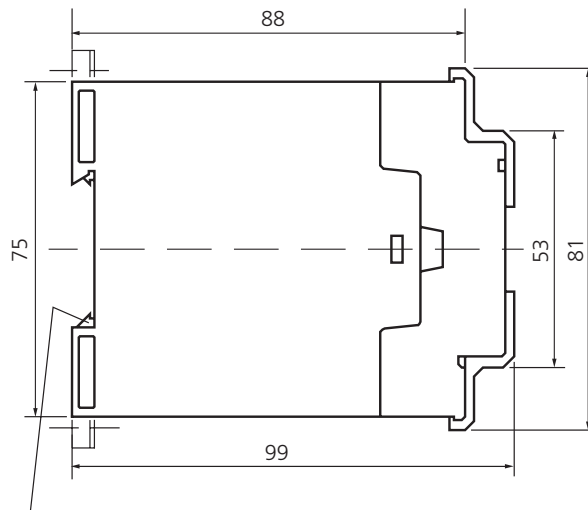
Fittings

Knick 

■ Dimension Drawings and Terminal Assignments



Screw mounting with extending lugs



Snap-on mounting for 35 mm top-hat rail (EN 50022)

- 1 Current loop -;
Input +
- 5 Current loop +
Input -
- 3 Output +
- 7 Output -; jumper
- 11 Jumper (for output
0 ... 20 mA: jumper 7-11)
- 4 Power supply ≈
- 8 Power supply ≈

M3x8 connecting screws with self-releasing clamping pieces,
max. conductor cross-section 2x.1.5 mm² solid
or 2x 1.0 mm² stranded wire with ferrule

All dimensions in mm!

Modular Housings for Hazardous Areas

Knick >

WG 21



For supply of intrinsically safe 2-wire transmitters and SMART transmitters.

The Task

The WG 21 repeater power supply is used to supply intrinsically safe 2-wire transmitters. It supplies the transmitter with power and transmits the measurement signal to the output galvanically isolated and with high accuracy.

In addition to the analog signal, the WG 21 also optionally transmits data protocols for SMART transmitters (HART®). It allows bidirectional communication with the field device from every point of the cabling.



The Advantages

The WG 21 provides Safe Isolation and high insulation between the input, output, and power supply.

The Technology

The high supply voltage, the good hazardous area ratings and the broad-range power supply allow universal use. Cables 1400 m in length can therefore be used without any problems.

Thanks to a new transformer transmission technique, the WG 21 achieves an extraordinarily high transmission accuracy for hazardous-area applications.

The encapsulation provides maximum operating safety, long-term stability, and disruptive strength even under extreme ambient conditions.



Repeater Power Supplies

Isolation Amplifiers
Transmitters

Indicators

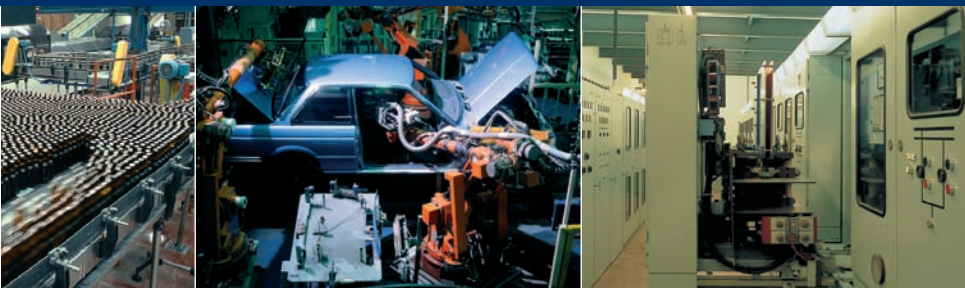
Process Analytics

Portable Meters

Laboratory Meters

Sensors

Fittings



Knick >

■ The Facts

SMART transmission

(Optional) bidirectional point-to-point transmission of digital data according to HART® specification

High supply voltage and good hazardous area ratings

Universal use

Broad-range power supply

Just 2 versions for all mains voltages

Safe Isolation according to EN 61140

Protection of maintenance staff and subsequent devices against non-permitted high voltages

3-port isolation

Protection against incorrect measurements or damage to the equipment due to parasitic voltages

High transmission accuracy

Exact transmission of measured values

Explosion protection according to ATEX

Trouble-free use in hazardous areas

Modular housing 22.5 mm

Straightforward installation due to compact design

5-year warranty

HART® is a registered trademark of the HART Communication Foundation

Warranty
5 years!

Defects occurring within 5 years from delivery are remedied free of charge at our works (carriage and insurance paid by sender).



Modular Housings for Hazardous Areas

WG 21

■ Product Line

Devices	Order No.
WG 21	WG 21 A7
Power supply	
90 ... 253 V AC	
24 V AC/DC	336
Options	
Transmission of data protocols for SMART transmitters (HART®)	470

■ Specifications

Input data

Current loop Intrinsicly safe supply voltage ≥ 18 V, constant for 0 ... 22 mA, floating, current limited to approx. 30 mA; residual ripple 10 mV

Output data

Output 4 ... 20 mA¹⁾

Load ≤ 13 V

Offset < 20 μ A

Residual ripple at output < 10 mV

Transmission behavior

Transmission error 0.2 % meas. val.

Response time < 10 ms

Temperature coefficient < 0.5 μ A/K + 0.005 %/K meas. val. (average TC), (reference temperature 23 °C)

Communication (Option 470) Bidirectional transmission of FSK signals according to the HART® specification between output and current loop

Power supply

Power supply 90 ... 253 V AC, 48 ... 62 Hz, approx. 3 VA

Option 336: 24 V AC/DC AC: -15 % +10 %, 48 ... 500 Hz, approx. 3 VA
DC: -15 % +20%, approx. 2 W

1) Linear transmission of 3.6 ... 22 mA

Specifications (continued)

Isolation

Galvanic isolation	3-port isolation between input, output and power supply
Test voltage	4 kV AC (current loop against output and power supply) 3 kV AC (power supply against output)
Working voltages (basic insulation)	1000 V AC/DC current loop against output and power supply, 600 V AC/DC output against power supply with overvoltage category II and pollution degree 2 according to EN 61010-1. For applications with high working voltages, you should ensure there is sufficient spacing or isolation from neighboring devices and protection against electric shocks. Permitted working voltage for other overvoltage categories and pollution degrees on request. For hazardous area applications the maximum working voltage is 250 V.
Protection against electric shock	Safe Isolation according to EN 61140 by reinforced insulation in accordance with EN 61010-1. 600 V AC/DC working voltage with overvoltage category II and pollution degree 2, 300 V AC/DC current loop against output and power supply, output against power supply. For applications with high working voltages, you should ensure there is sufficient spacing or isolation from neighboring devices and protection against electric shocks.

Standards and approvals

Explosion protection	II (1) G [EEx ia] IIC PTB 01 ATEX 2059 current loop intrinsically safe For further details see certificates of conformity at our website: www.knick.de
EMC ²⁾	89/336/EEC directive, EN 61326, NAMUR NE 21

Other data

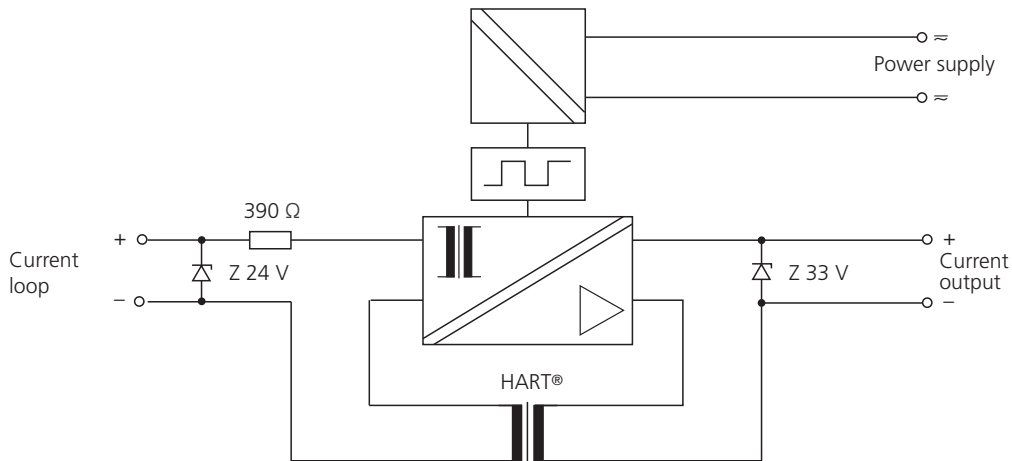
Ambient temperature	Operation: -10 ... +60 °C Transport and storage: -30 ... +80 °C
Design	Modular housing, width 22.5 mm, screw terminals See dimension drawings for further measurements
Ingress protection	Housing IP 40, terminals IP 20
Mounting	With snap-on mounting for 35 mm top hat rail according to EN 50022 See dimension drawings for conductor cross section
Weight	Approx. 250 g

²⁾ Slight transmission errors are possible while there is interference

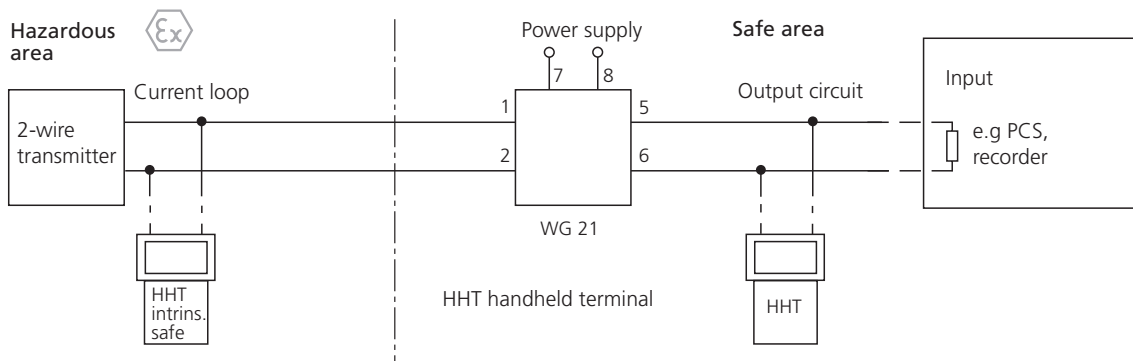
Modular Housings for Hazardous Areas

WG 21

■ Block Diagram



■ Application Example



HART® communication between transmitter and HHT at intrinsically safe current loop.

The communication signals are also transmitted to the non-intrinsically safe output circuit. A HART® resistor of 390 Ω is integrated in the WG 21.

HART® communication between transmitter and PCS, HHT at non-intrinsically safe output circuit.

The communication signals are transmitted bidirectionally via the WG 21. A minimum load resistance of 230 Ω is required. It should be added if necessary.

Repeater Power Supplies

Isolation Amplifiers
Transmitters

Indicators

Process Analytics

Portable Meters

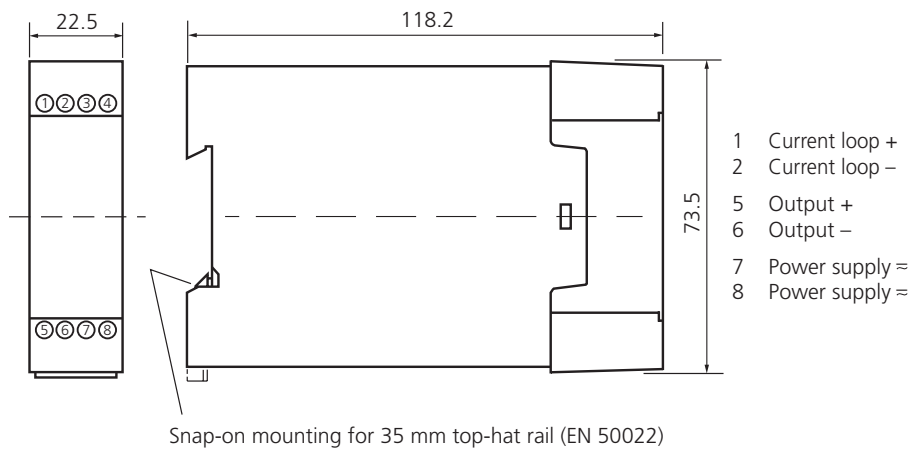
Laboratory Meters

Sensors

Fittings

Knick 

■ Dimension Drawings and Terminal Assignments



Captive M3x8 clamping screws, box terminals with self-releasing wire protection

Max. conductor cross-section 1 x 4 mm² solid
1 x 2.5 mm² stranded wire with ferrule
2 x 1.5 mm² stranded wire with ferrule

Installation, commissioning, and maintenance may only be carried out by trained personnel!

All dimensions in mm!

Loop-Powered Supplies

Isolation Amplifiers
Transmitters

Indicators

Process Analytics

Portable Meters

Laboratory Meters

Sensors

Fittings



Knick >

■ The Facts

Low-cost

Good price due to omission of integrated power supply

No mains supply required

Cost saving due to lower wiring requirement, no mains influences

Low power loss

No unnecessary heating in enclosure

Safe Isolation according to EN 61140

Protection of maintenance staff and subsequent devices against non-permitted high voltages

HART® transmission

Bidirectional point-to-point transmission of digital data according to HART® specification

EMC tested

RFI suppressed and surge proof, reliable operation even with electromagnetic interference

Maximum reliability

No maintenance work, therefore the related costs are not incurred

5-year warranty

HART® is a registered trademark of the HART Communication Foundation



Modular Housings

Modular Housings for Hazardous Areas

WG 25

■ Product Line

Devices	Order No.
WG 25	WG 25 A7
Power supply	
None, supply from output signal	
Options	
Increased test voltage 10 kV AC	471

■ Specifications

Input data

Input (current loop)	4 ... 20 mA (transmission up to 22 mA possible), intrinsically safe
Supply voltage	≥ 17 V, short-circuit-proof, see diagram on page 244
Operating current	< 1 mA
Input short-circuit current	≤ 28 mA
Voltage drop	< 4.2 V at 20 mA and supply ≤ 20 V, see diagram on page 244

Output data

Output	4 ... 20 mA, 1:1 transmission (22 mA)
Overload	50 mA, 30 V (corresponds to 600 ohm load)
Offset	< 20 µA
Residual ripple V_{rms}	< 1.5 mV/mA

Transmission behavior

Transmission error	0.2 % meas. val.
Supply voltage influence	< 15 µA/V
HART® attenuation	< 10 dB

Specifications (continued)

Isolation

Test voltage

4.4 kV AC
10 kV AC with option 471

Working voltages
(basic insulation)

1000 V AC/DC with overvoltage category II and pollution degree 2 according to EN 61010-1.
For applications with high working voltages, you should ensure there is sufficient spacing or isolation from neighboring devices and protection against electric shocks.
Permissible working voltage for other overvoltage categories and pollution degrees on request.
For hazardous area applications the maximum working voltage is 250 V.

Protection against
electric shock

Safe Isolation according to EN 61140 by reinforced insulation in accordance with EN 61010-1.
Working voltage up to 600 V AC/DC with overvoltage category II and pollution degree 2.
For applications with high working voltages, you should ensure there is sufficient spacing or isolation from neighboring devices and protection against electric shocks.
For hazardous area applications the maximum working voltage is 250 V.

Standards and approvals

Explosion protection

II (2) G [EEx ib] IIC PTB 02 ATEX 2063
For further details see certificates of conformity at our website: www.knick.de

EMC

89/336/EEC directive, EN 61326, NAMUR NE 21

Other data

Ambient temperature

Operation: -10 ... +50 °C
Transport and storage: -30 ... +80 °C

Design

Modular housing, width 22.5 mm, screw terminals
See dimension drawings for further measurements

Ingress protection

Housing IP 40, terminals IP 20

Mounting

With snap-on mounting for 35 mm top hat rail according to EN 50022
See dimension drawings for conductor cross section

Weight

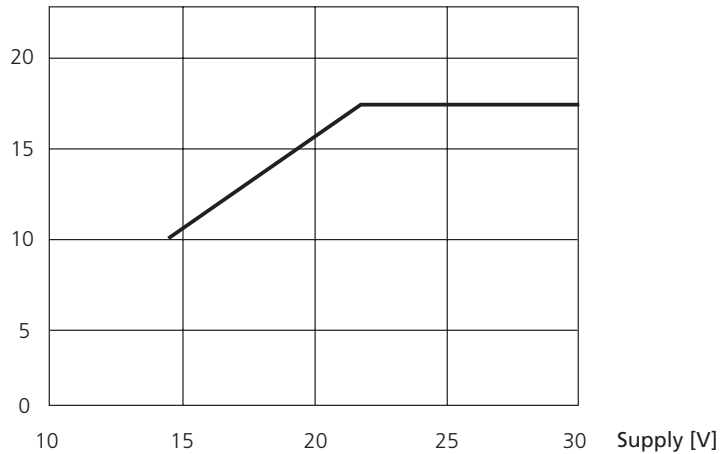
Approx. 120 g

Modular Housings for Hazardous Areas

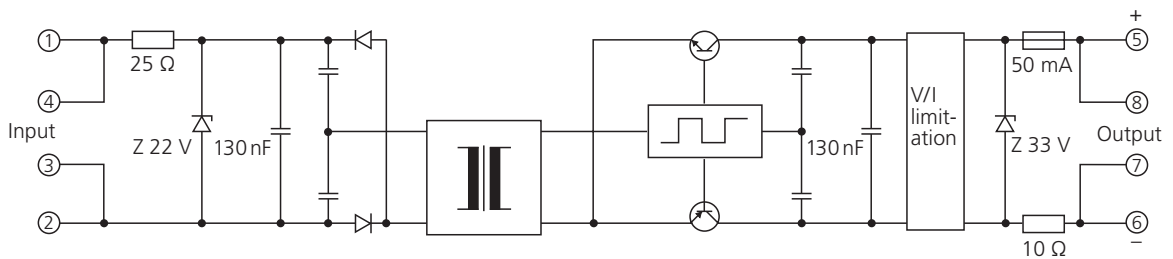
WG 25

Supply Voltage versus Supply

Supply voltage at 2-wire transmitter [V]

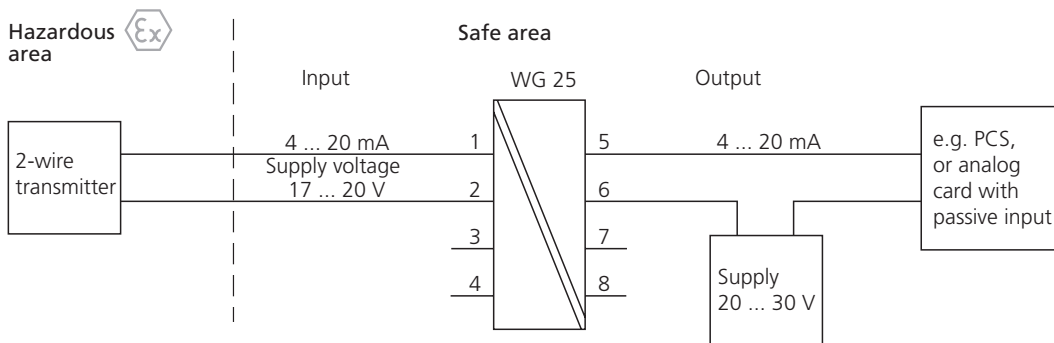


Block Diagram



Application Examples

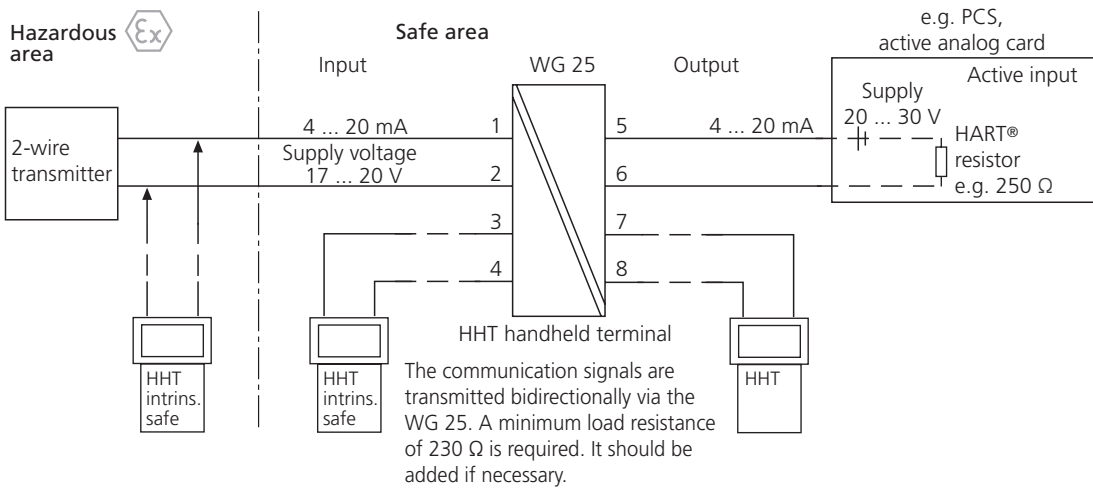
Without HART® communication



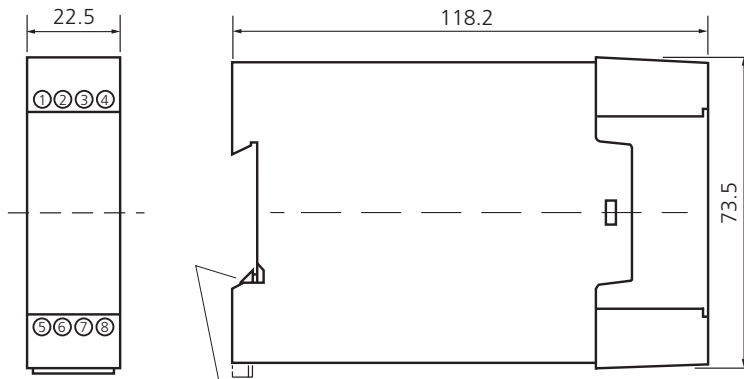


Application Examples (continued)

With HART® communication



■ Dimension Drawings and Terminal Assignments



- | | | |
|---|----------|---|
| 1 | Input + | |
| 2 | Input - | |
| 3 | HHT IS | Captive M3x8 clamping screws, box terminals with self-releasing wire protection |
| 4 | HHT IS | |
| 5 | Output + | Max. conductor cross-section 1 x 4 mm ² solid |
| 6 | Output - | 1 x 2.5 mm ² stranded wire with ferrule |
| 7 | HHT | 2 x 1.5 mm ² stranded wire with ferrule |
| 8 | HHT | |

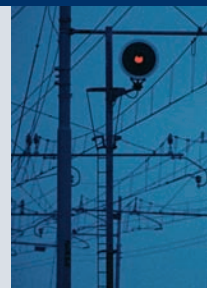
Installation, commissioning, and maintenance may only be carried out by trained personnel!

All dimensions in mm!

Modular Housings for Hazardous Areas

Knick >

ThermoTrans® 205/206



The practical solution for temperature measurement with resistance thermometers.

The Advantages

The ThermoTrans® 205/206 temperature transmitters provide you with just the flexibility you need:

- Configuration effort where it is only really necessary, instead of complicated parameter tables.
- High level of reliability and compact design due to digital signal processing specially developed for the measuring task instead of unnecessary reduction in reliability due to overburdening with complicated technology.

The Models

For the majority of standard applications with fixed preset parameters, you simply select one of the numerous preconfigured standard models.

You can solve special measuring tasks with a transmitter that we configure according to your specifications.

The Technology

The ThermoTrans® 205/206 temperature transmitters provide Safe Isolation and high insulation resistance between the input, output, and power supply. They meet the strict NAMUR EMC requirements and can easily be used for measurements in hazardous areas.

Vacuum encapsulation protects the devices against aggressive environmental influences, shock, and vibrations.

ThermoTrans® 205/206 for resistance thermometers

Resistance thermometers are highly accurate temperature sensors with long-term stability for measuring temperatures up to max. 850 °C.

They are mainly used to measure low and medium temperatures, for example, in air-conditioning, process engineering, and the food industry.

The ThermoTrans® 205/206 transmitters allow connection of all common resistance thermometers either in 2-, 3-, or 4-wire configuration.

The possibility for connecting resistive sensors and potentiometers creates a wide range of application possibilities, for example, in the field of path measurement. Converting the input signal into a proportional current/voltage signal allows simple further processing.

**Warranty
5 years!**

Defects occurring within 5 years from delivery are remedied free of charge at our works (carriage and insurance paid by sender).

Temperature Transmitters

Isolation Amplifiers
Transmitters

Indicators

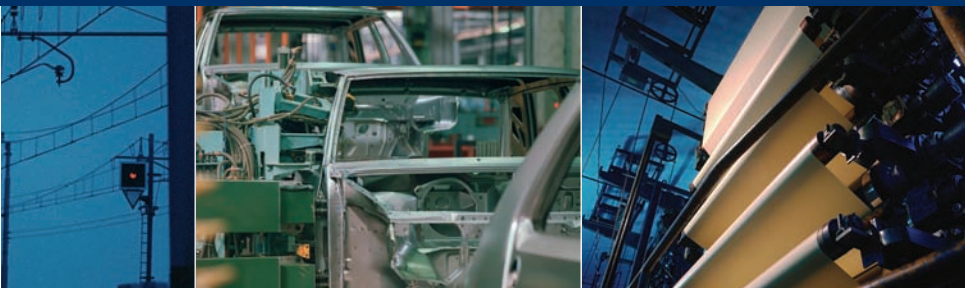
Process Analytics

Portable Meters

Laboratory Meters

Sensors

Fittings



Knick >

■ The Facts

Explosion protection [Ex ia] IIC according to ATEX

Trouble-free use in hazardous areas

Extensive range of standard models

Configuration not necessary for standard applications

Adjustable via optical interface

Universal for a wide range of measuring tasks, can also be configured on site

EMC tested

Reliable operation even with electromagnetic interference in the mains or in the environment

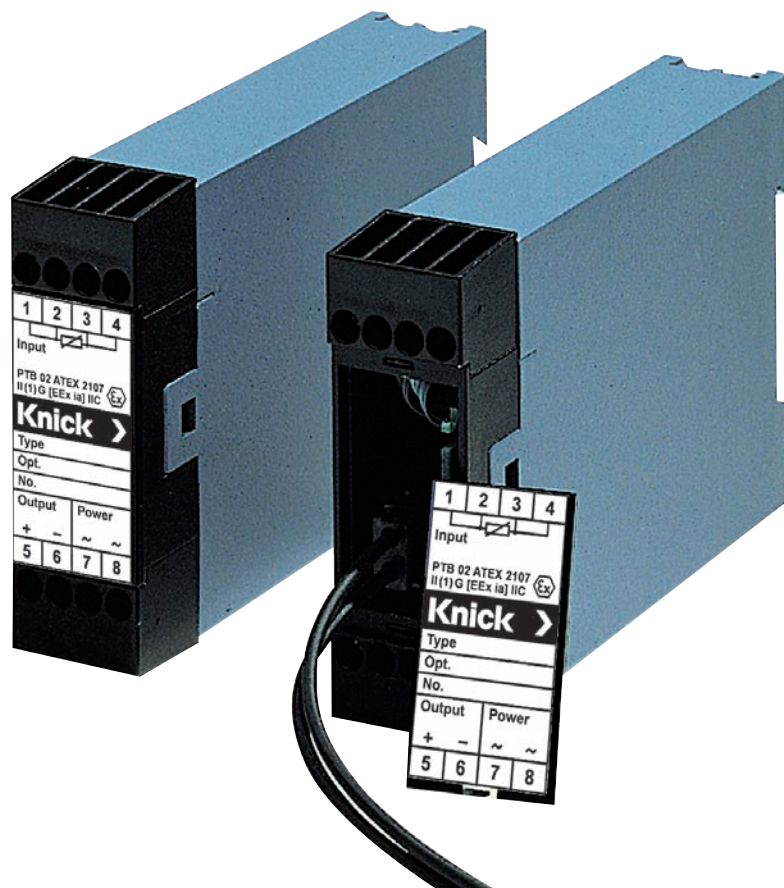
Safe Isolation according to EN 61140

Protection of maintenance staff and the subsequent devices against non-permitted high voltages

Modular housing, 22.5 mm wide with 73.5 mm standard height

Compact design means easy installation, also easy to fit in standard cabinets

5-year warranty



Modular Housings for Hazardous Areas

ThermoTrans® 205/206

■ Product Line

		ThermoTrans® 205 with current output	ThermoTrans® 206 with voltage output
Adjustable models	Order No.	205 A7 000 000 Opt. 444	206 A7 000 000 Opt. 444
Adjustable via interface, communication kit on request. See Configuration Schedule for factory setting.			
Fixed range standard models	Order No.	205 A7 x xx xx x Opt. 444	206 A7 x xx xx V Opt. 444
Sensors			
Pt 100 (–200 ... +850 °C)		A	A
Pt 1000 (–200 ... +850 °C)		B	B
Ni 100 (–60 ... +180 °C)		C	C
1000 ohms		D	D
5000 ohms		E	E
Span			
50 K		05	05
100 K		10	10
150 K		15	15
200 K		20	20
300 K		30	30
400 K		40	40
1000 K		70	70
5000 K		88	88
Start of scale			
–100 °C		02	02
–50 °C		01	01
0 °C		00	00
50 °C		11	11
100 °C		12	12
200 °C		14	14
0 ohm		30	30
Output			
0 ... 20 mA			
4 ... 20 mA		D	
0 ... 10 V		L	V

Sensor with 4-wire connection (3-wire connection Option 494), rising output curve, without filter constant
ThermoTrans® 205: open circuit recognition 22 mA; ThermoTrans® 206: open circuit recognition 11 V

Power supply	Order No.
230 V AC	
24 V AC/DC	336
115 V AC	363
Options	
ThermoTrans® 205/206 standard model with 3-wire connection	494

Temperature Transmitters

Isolation Amplifiers
Transmitters

Indicators

Process Analytics

Portable Meters

Laboratory Meters

Sensors

Fittings

Knick 

Product Line (continued)

	ThermoTrans® 205 with current output	ThermoTrans® 206 with voltage output
Customer-specific models Order No.	205 A7 999 999 Opt. 444	206 A7 999 999 Opt. 444

■ Configuration Schedule

Important! Please fill in the configuration schedule completely and enclose it with your order. If entries are missing, the value entered in square brackets or the red-colored setting ■ will be set.

ThermoTrans® 205/206

Sensor ¹⁾	Temperature detector: <input checked="" type="checkbox"/> Pt 100 according to IEC 751 <input type="checkbox"/> Ni 100 according to DIN 43 760 <input type="checkbox"/> Pt 500 <input type="checkbox"/> Ni 120 <input type="checkbox"/> Pt 1000 <input type="checkbox"/> Ni 500 <input type="checkbox"/> <input type="checkbox"/> Ni 1000
Connection	Resistive sensor or potentiometer: <input type="checkbox"/> ≤ 500 ohms <input type="checkbox"/> ≤ 5000 ohms <input type="checkbox"/> 2-wire connection, line resistance ²⁾ _____, ___ ohms <input type="checkbox"/> 3-wire connection <input checked="" type="checkbox"/> 4-wire connection
Range	Start of scale ²⁾ _____ °C [0 °C] or _____ ohms Span ²⁾ _____ K [100 K] or _____ ohms
Output ³⁾	<input checked="" type="checkbox"/> 0 ... 20 mA <input type="checkbox"/> 0 ... 10 V <input type="checkbox"/> 4 ... 20 mA
Curve	<input checked="" type="checkbox"/> Rising <input type="checkbox"/> Falling
Error messages	Message: <input checked="" type="checkbox"/> only with open circuit <input type="checkbox"/> with open circuit and overrange
Filter constant T ₉₉	Signal: <input checked="" type="checkbox"/> 22 mA or 11 V <input type="checkbox"/> -1 mA or -0.5 V _____ s ²⁾ (1st order filter) [0 s]
Tag number	_____ [none]

1) Other models on request

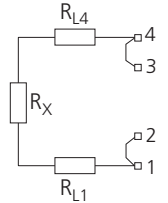
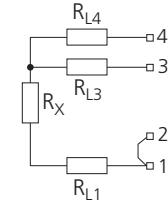
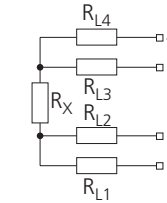

2) See the specifications for the possible parameter range

3) Other values on request

Modular Housings for Hazardous Areas

ThermoTrans® 205/206

■ Specifications

Input data	Sensor type	Measurement range	Span (user-defined)	
Intrinsically safe	Pt 100 to IEC 751 Pt 500 Pt 1000	-200 ... +850 °C	25 ... 1050 K	
	Ni 100 to DIN 43760 Ni 120 Ni 500 Ni 1000	-60 ... +180 °C	25 ... 240 K	
	Remote resistance transducer and potentiometer	0 ... 500 ohms or 0 ... 5000 ohms	9 ... 500 ohms or 90 ... 5000 ohms	
Connection	2-wire connection: configured line resistance is calculated in the measured value			
	3-wire connection: $R_{L1} = R_{L4}$			
	4-wire connection	2-wire connection	3-wire connection	4-wire connection
	Max. line resistance	$R_{L1} + R_{L4} = 100$ ohms		
Sensor current	Approx. 1 mA or 0.1 mA depending on the measurement range			
Open-circuit voltage	< 5 V			
Sensor failure monitoring	All inputs for open circuit			
Input error limits	Resistance:	Range 0 ... 500 ohms	± 0.05 ohm	
		Range 0 ... 5 kohms	± 0.5 ohm	
	With Pt:	Range -200 ... +850 °C	± 0.2 K	
	With Ni:	Range -60 ... +180 °C	± 0.2 K	
Temperature coefficient at input	0.0025 % / K full scale (average TC in permitted operating temperature range, reference temperature 23 °C)			
Output data				
Output signal (0 ... 100 %)	Model 205: 0/4 ... 20 mA, impressed current, load voltage ≤ 10 V Model 206: 0 ... 10 V, impressed voltage, load current ≤ 10 mA			
Resolution	Approx. 8000 steps (for 0 ... 100 %)			
Control range	-2.5 ... 102.5 % span			
Overload range with error message	Model 205: -1.0 mA or 22 mA Model 206: -0.5 V or 11 V			
Output error limits	0.1 % full scale			

Specifications (continued)

Output data

Temperature coefficient at output	0.01 % / K full scale (average TC in permitted operating temperature range, reference temperature 23 °C)
Residual ripple at output	< 10 mV _{pp} + digitalization error of input

Transmission behavior

Characteristic	Resistance or temperature linear rising or falling
Meas. rate	Approx. 1 / s
Response time T ₉₉	≤ 900 ms
Digital output filter	T ₉₉ = 0 ... 100 s (1st order filter)

Power supply

Power supply	230 V AC – 15 % + 10 %, 48 ... 62 Hz, approx. 2 VA
Option 336:	24 V AC/DC AC: – 15 % + 10 %, 48 ... 500 Hz, approx. 1.5 VA DC: – 15 % + 20 %, approx. 1.2 W
Option 363:	115 V AC – 15 % + 10 %, 48 ... 62 Hz, approx. 2 VA

Isolation

Galvanic isolation	3-port isolation between input, output and power supply
Test voltage	4 kV AC (input against output and power supply) 3 kV AC (output against power supply)
Working voltage (basic insulation)	1000 V AC/DC input against output and power supply with overvoltage category II and pollution degree 2, 300 V AC/DC output against power supply with overvoltage category II and pollution degree 2 according to EN 61010-1. For applications with high working voltages, you should ensure there is sufficient spacing or isolation from neighboring devices and protection against electric shocks. For hazardous area applications the maximum working voltage is 250 V.
Protection against electric shock	Safe Isolation according to EN 61140 by reinforced insulation in accordance with EN 61010-1. Working voltages with overvoltage category II and pollution degree 2: 600 V AC/DC for input against output and power supply, 300 V AC / DC for output against power supply. For applications with high working voltages, you should ensure there is sufficient spacing or isolation from neighboring devices and protection against electric shocks. When used in hazardous areas, the max. working voltage is 250 V.

Modular Housings for Hazardous Areas

ThermoTrans® 205/206

Specifications (continued)

Standards and approvals

Explosion protection
(Opt. 444)

II (1) G [Ex ia] II C PTB 02 ATEX 2107

For further details see certificates of conformity at our website: www.knick.de

Surge withstand

5 kV 1.2 / 50 μ s according to IEC 255-4

EMC ¹⁾

89/336/EEC directive, EN 61326, NAMUR NE 21

Other data

Interface
(adjustable models only)

Optical, interface adapter on RS 232 interface (PC) is included in the communications kit (ZU 0254)

Ambient temperature

Operation: -10 ... +60 °C

Transport and storage: -30 ... +80 °C

Design

A7 modular housing, width 22.5 mm, screw terminals
See dimension drawings for further measurements

Ingress protection

Housing IP 40, terminals IP 20

Mounting

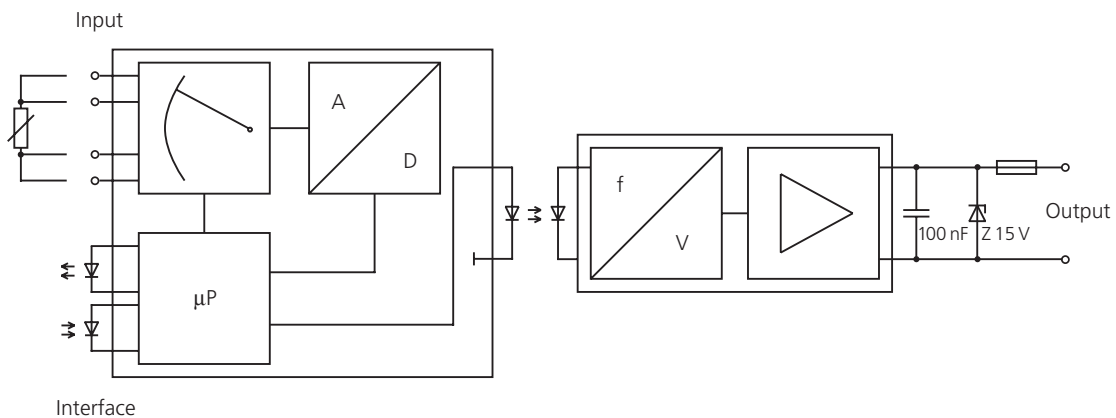
With snap-on mounting for 35 mm top hat rail according to EN 50022-35,
width 22.5 mm, see dimension drawings for conductor cross section

Weight

Approx. 300 g

1) Slight deviations are possible while there is interference from RF radiation

■ Block Diagram



Temperature Transmitters

Isolation Amplifiers
Transmitters

Indicators

Process Analytics

Portable Meters

Laboratory Meters

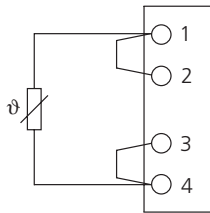
Sensors

Fittings

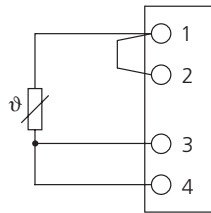
Knick >

Application Examples

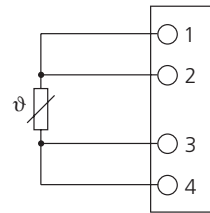
2-wire connection



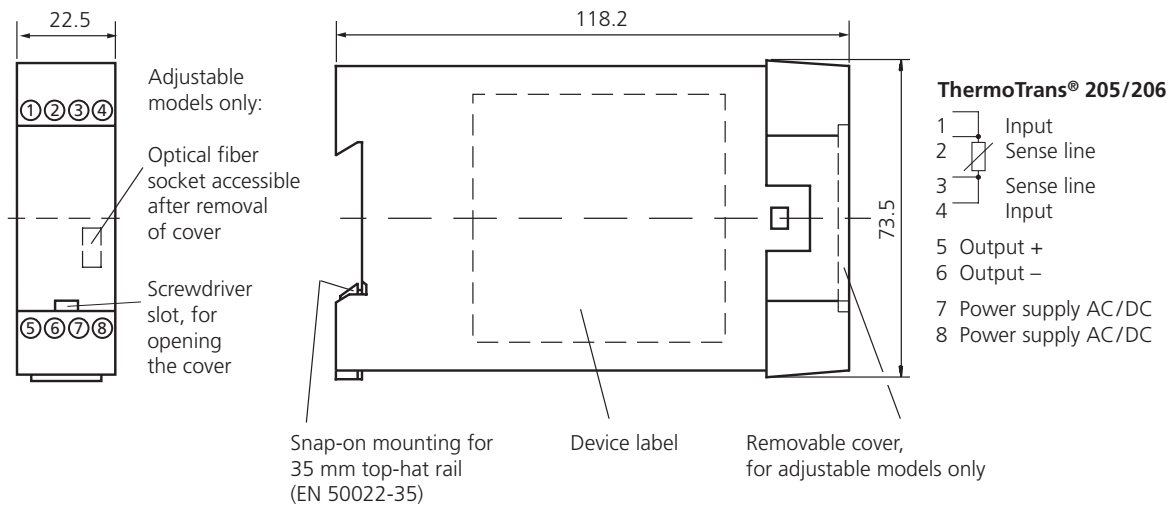
3-wire connection



4-wire connection



Dimension Drawings and Terminal Assignments



Captive M3x8 clamping screws, box terminals with self-releasing wire protection

Max. conductor cross-section

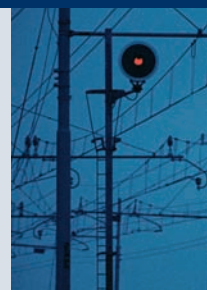
- 1 x 4 mm² solid
- 1 x 2.5 mm² stranded wire with ferrule
- 2 x 1.5 mm² stranded wire with ferrule

All dimensions in mm!

Modular Housings for Hazardous Areas

Knick >

ThermoTrans® 210/211



The practical solution for temperature measurement with thermocouples.

The Advantages

The ThermoTrans® 210/211 temperature transmitters provide you with just the flexibility you need:

- Configuration effort where it is only really necessary, instead of complicated parameter tables.
- High level of reliability and compact design due to digital signal processing specially developed for the measuring task instead of unnecessary reduction in reliability due to overburdening with complicated technology.

The Models

For the majority of standard applications with fixed preset parameters, you simply select one of the numerous preconfigured standard models.

You can solve special measuring tasks with a transmitter that we configure according to your specifications.

The Technology

The ThermoTrans® 210/211 temperature transmitters provide Safe Isolation and high insulation resistance between the input, output, and power supply. They meet the strict NAMUR EMC requirements and can easily be used for measurements in hazardous areas.

Vacuum encapsulation protects the devices against aggressive environmental influences, shock, and vibrations.

ThermoTrans® 210/211 for Thermocouples

Thermocouples have very low resistance which makes them fail-safe. They are preferably used for high temperatures, for example, for measurements in ovens, smelting plants, and plastic machines.

The range of standard thermocouples is very wide.

The ThermoTrans® 210/211 transmitters therefore provide consistent connection possibilities for all common thermocouples.

To avoid long compensating cables, an external reference junction can also be used in addition to the internal one. For reference junctions with thermostat, the reference temperature can be fixed or measured with a Pt 100.

The ThermoTrans® 210/211 transmitters can also be used to measure voltages in the range of $-20 \dots +100$ mV at a transmission rate of 1/sec. Due to the transfer curve freely configured using functions or sampling points, they are ideal for difficult measuring tasks, such as level measurement in spherical tanks.

Warranty
5 years!

Defects occurring within 5 years from delivery are remedied free of charge at our works (carriage and insurance paid by sender).

Temperature Transmitters

Isolation Amplifiers
Transmitters

Indicators

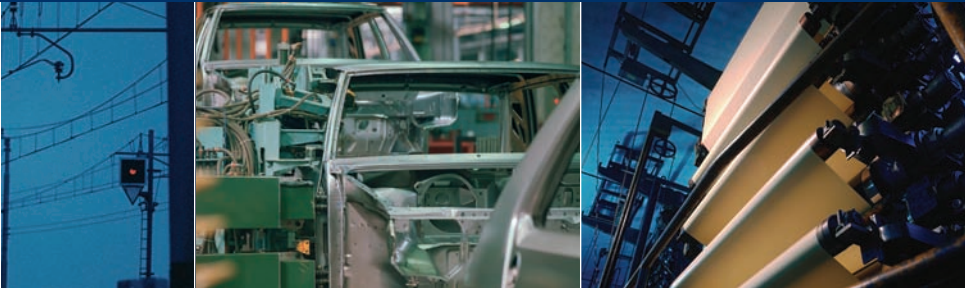
Process Analytics

Portable Meters

Laboratory Meters

Sensors

Fittings



Knick >

■ The Facts

Explosion protection [EEx ia] IIC

according to ATEX, trouble-free use in hazardous areas

Extensive range of standard models

Configuration not necessary for standard applications

Adjustable via optical interface

Universal for a wide range of measuring tasks, can also be configured on site

EMC tested

Reliable operation even with electromagnetic interference in the mains or in the environment

Safe Isolation according to EN 61140

Protection of maintenance staff and the subsequent devices against non-permitted high voltages

Modular housing, 22.5 mm wide with 73.5 mm standard height

Compact design means easy installation, also easy to fit in standard cabinets

5-year warranty



Modular Housings for Hazardous Areas

ThermoTrans® 210/211

■ Product Line

		ThermoTrans® 210 with current output	ThermoTrans® 211 with voltage output
Adjustable models	Order No.	210 A7 000 000 Opt. 444	211 A7 000 000 Opt. 444
Adjustable via interface, communication kit on request. See Configuration Schedule for factory setting.			
Fixed range standard models	Order No.	210 A7 x xx xx x Opt. 444	211 A7 x xx xx V Opt. 444
Sensors	J K S	J K S	J K S
Span	700 K 1000 K 1700 K	60 75 97	60 75 97
Start of scale	0 °C	00	00
Output	0 ... 20 mA 4 ... 20 mA 0 ... 10 V	D L	V

Output curve rising, without filter constant, internal reference junction

ThermoTrans® 210: open circuit recognition 22 mA; ThermoTrans® 211: open circuit recognition 11 V

Power supply	Order No.
230 V AC	
24 V AC/DC	336
115 V AC	363

Temperature Transmitters



Product Line (continued)

Customer-specific models	Order No.	ThermoTrans® 210 with current output	ThermoTrans® 211 with voltage output
		210 A7 999 999 Opt. 444	211 A7 999 999 Opt. 444

■ Configuration Schedule

Important! Please fill in the configuration schedule completely and enclose it with your order. If entries are missing, the value entered in square brackets or the red-colored setting ■ will be set.

ThermoTrans® 210/211

Sensor	Thermocouple: <input type="checkbox"/> Type B <input type="checkbox"/> Type E <input type="checkbox"/> Type J <input checked="" type="checkbox"/> Type K <input type="checkbox"/> Type L <input type="checkbox"/> Type N <input type="checkbox"/> Type R <input type="checkbox"/> Type S <input type="checkbox"/> Type T <input type="checkbox"/> Type U <input type="checkbox"/> Voltage
Range	Start of scale ¹⁾ ___ °C [0 °C] or ___ mV Span ¹⁾ ___ K [1000 K] or ___ mV
Reference junction	<input checked="" type="checkbox"/> Internal <input type="checkbox"/> External Pt 100 <input type="checkbox"/> Internal/external, selectable (via jumper) <input type="checkbox"/> Permanently set temperature ²⁾ or ___ , ___ °C [25 °C]
Output ³⁾	<input checked="" type="checkbox"/> 0 ... 20 mA <input type="checkbox"/> 4 ... 20 mA <input type="checkbox"/> 0 ... 10 V
Curve	<input checked="" type="checkbox"/> Rising <input type="checkbox"/> Falling
Error messages	Message: <input checked="" type="checkbox"/> only with open circuit <input type="checkbox"/> with open circuit and overrange Signal: <input checked="" type="checkbox"/> 22 mA or 11 V <input type="checkbox"/> -1 mA or -0.5 V
Filter constant T ₉₉	___ s ¹⁾ (1st order filter) [0 s]
Tag number	_____ [none]

1) See the specifications for the possible parameter range

2) Compensation range -10 ... 80 °C

3) Other values on request

Modular Housings for Hazardous Areas

ThermoTrans® 210/211

■ Specifications

Input data	Sensor type	Range
Intrinsically safe	Type B IEC 584-1 Type E IEC 584-1 Type J IEC 584-1 Type K IEC 584-1 Type L DIN 43710 Type N ASTM E 230-87 Type R IEC 584-1 Type S IEC 584-1 Type T IEC 584-1 Type U DIN 43710	0 ... +1820 °C -270 ... +1000 °C -210 ... +1200 °C -270 ... +1372 °C -200 ... +900 °C -270 ... +1300 °C -50 ... +1767 °C -50 ... +1767 °C -270 ... +400 °C -200 ... +600 °C
Voltage input	-20 ... +100 mV	
Input resistance	> 10 Mohms	
Span (configurable)	Min.: ≥ 2 mV, max.: end of scale – start of scale	
Sensor failure monitoring	all inputs for open circuit (not with voltage measurement)	
Input error limits	± 10 µV + 0.05 % meas.val.	
Temperature coefficient at input	0.01 % / K full scale (average TC in permitted operating temperature range, reference temperature 23°C)	
Reference junction input (user-defined)	Internal Pt 100	< ±1.0 K
	External Pt 100	< ±0.3 K + error of Pt 100 used
Output data		
Output signal (0 ... 100 %)	Model 210: 0/4 ... 20 mA, impressed current, load voltage ≤ 10 V Model 211: 0 ... 10 V, impressed voltage, load current ≤ 10 mA	
Resolution	Approx. 8000 steps (for 0 ... 100 %)	
Control range	-2.5 ... 102.5 % span	
Overload range with error message	Model 210: -1.0 mA or 22 mA Model 211: -0.5 V or 11 V	
Output error limits	0.1 % full scale	
Temperature coefficient at output	0.01 % / K full scale (average TC in permitted operating temperature range, reference temperature 23°C)	
Residual ripple at output	< 10 mV _{pp} + digitalization error of input	

Temperature Transmitters

Isolation Amplifiers
Transmitters

Indicators

Process Analytics

Portable Meters

Laboratory Meters

Sensors

Fittings

Knick 

Specifications (continued)

Transmission behavior

Characteristic	Resistance or temperature linear rising or falling
Meas. rate	Approx. 1/s
Response time T_{99}	≤ 900 ms
Digital output filter	$T_{99} = 0 \dots 100$ s (1st order filter)

Power supply

Power supply	230 V AC – 15 % + 10 %, 48 ... 62 Hz, approx. 2 VA
Option 336:	24 V AC/DC AC: – 15 % + 10 %, 48 ... 500 Hz, approx. 1.5 VA DC: – 15 % + 20 %, approx. 1.2 W
Option 363:	115 V AC – 15 % + 10 %, 48 ... 62 Hz, approx. 2 VA

Isolation

Galvanic isolation	3-port isolation between input, output and power supply
Test voltage	4 kV AC (input against output and power supply) 3 kV AC (output against power supply)
Working voltage (basic insulation)	1000 V AC/DC input against output and power supply with overvoltage category II and pollution degree 2, 330 V AC/DC output against power supply with overvoltage category II and pollution degree 1, according to EN 61010-1. For applications with high working voltages, you should ensure there is sufficient spacing or isolation from neighboring devices and protection against electric shocks. For hazardous area applications the maximum working voltage is 250 V.
Protection against electric shock	Safe Isolation according to EN 61140 by reinforced insulation in accordance with EN 61010-1. Working voltages with overvoltage category II and pollution degree 2: 600 V AC/DC for input against output and power supply, 300 V AC / DC for output against power supply. For applications with high working voltages, you should ensure there is sufficient spacing or isolation from neighboring devices and protection against electric shocks. For hazardous area applications the maximum working voltage is 250 V.

Modular Housings for Hazardous Areas

ThermoTrans® 210/211

Specifications (continued)

Standards and approvals

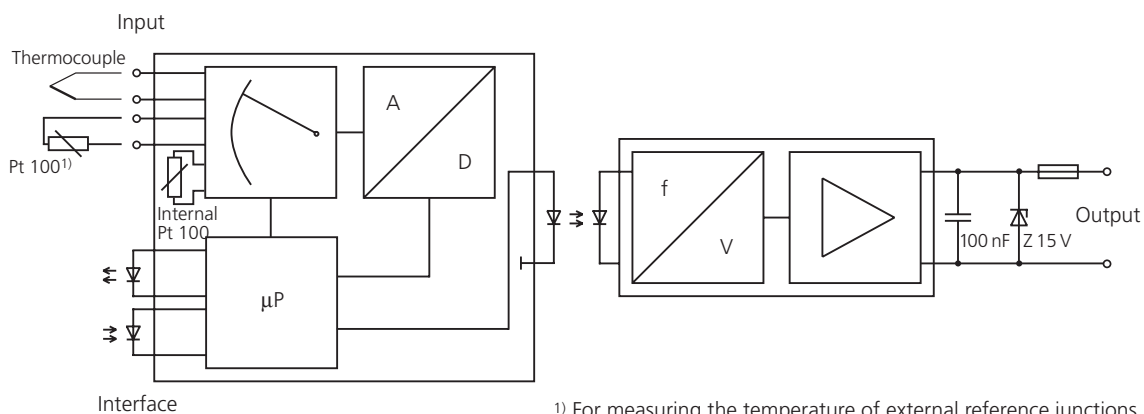
Explosion protection (Opt. 444)	II (1) G [EEx ia] II C PTB 02 ATEX 2107 For further details see certificates of conformity at our website: www.knick.de
Surge withstand	5 kV 1.2 / 50 μ s according to IEC 255-4
EMC ¹⁾	89/336/EEC directive, EN 61326, NAMUR NE 21

Other data

Interface (adjustable models only)	Optical, interface adapter on RS 232 interface (PC) is included in the communications kit (ZU 0254)
Ambient temperature	Operation: -10 ... +60 °C Transport and storage: -30 ... +80 °C
Design	A7 modular housing, width 22.5 mm, screw terminals See dimension drawings for further measurements
Ingress protection	Housing IP 40, terminals IP 20
Mounting	With snap-on mounting for 35 mm top hat rail according to EN 50022-35, width 22.5 mm, see dimension drawings for conductor cross section
Weight	Approx. 300 g

1) Slight deviations are possible while there is interference from RF radiation

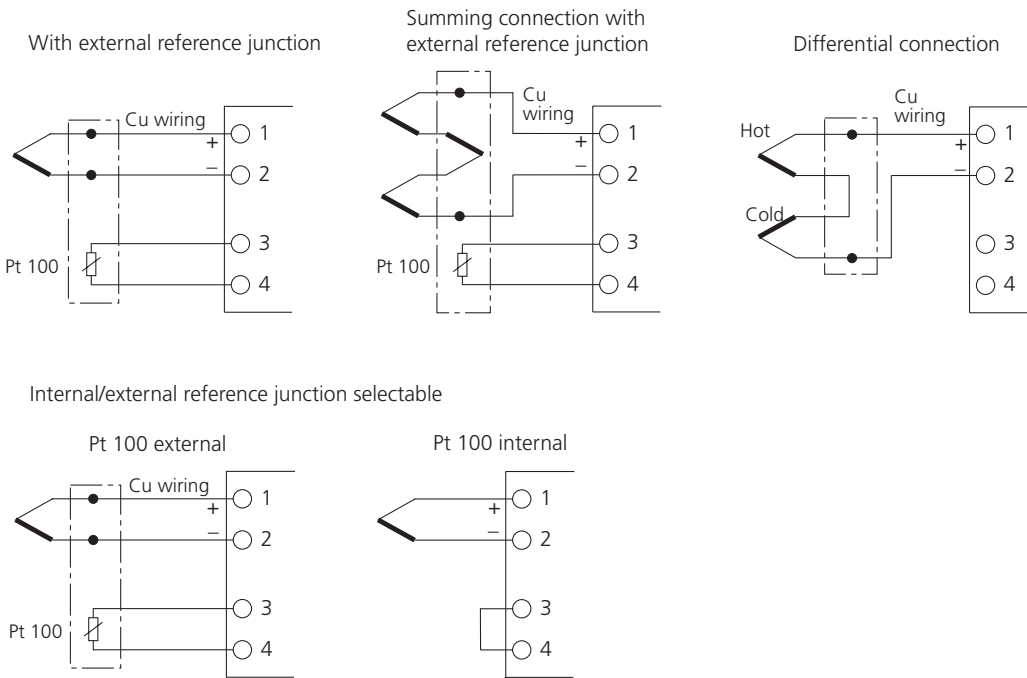
■ Block Diagram



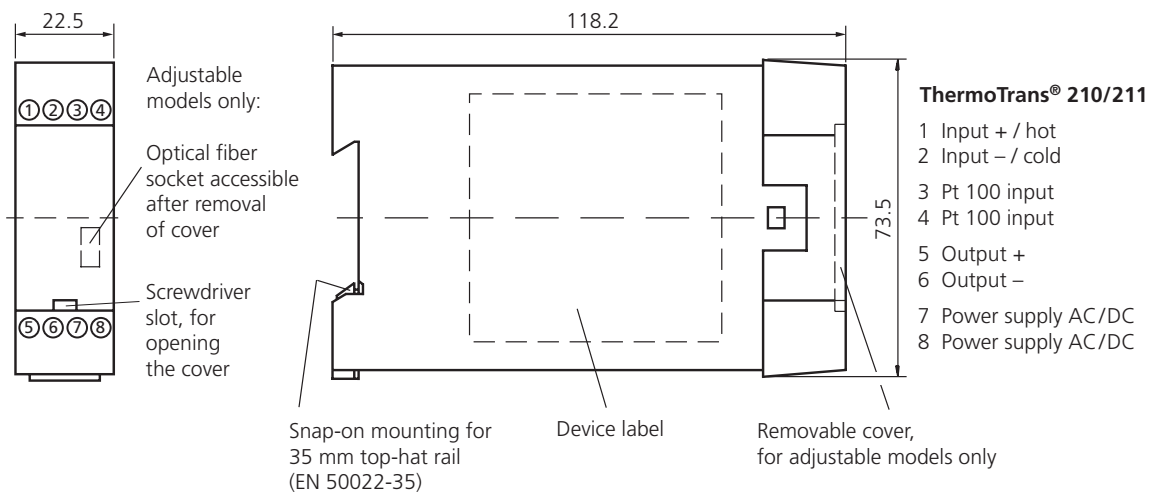
Temperature Transmitters



Application Examples



Dimension Drawings and Terminal Assignments



Captive M3x8 clamping screws, box terminals with self-releasing wire protection
 Max. conductor cross-section
 1x4 mm² solid
 1x2.5 mm² stranded wire with ferrule
 2x1.5 mm² stranded wire with ferrule

All dimensions in mm!

M12 Field Housings

Isolation Amplifiers
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M12 Field Housings

Page

Isolation Amplifiers for Standard Signals	DuraTrans® M12-A 20000	266
Loop-Powered Isolators for Standard Signals	IsoTrans® M12-A 200	272

M12 Field Housings

Knick >

Compact standard signal isolators / converters with M12 connection technology for automation without enclosures.

DuraTrans® M12-A 20000



The Task

Isolation and conversion of 0 (4) ... 20 mA und 0 ... 10 V standard signals directly on the site in harsh industrial environment.

The Problems

Wet, dirty, or dusty environments require a robust housing. Therefore, components with IP20 protection are not suitable for modern automation concepts without enclosures since they would require additional and expensive protective cases. An easy and above all feasible solution must be found for analog signal processing in an IP67 environment.

The Solution

With the DuraTrans® M12-A 20000 standard-signal isolation converters, Knick has now presented a new series that considerably simplifies decentralization in the field of analog signal transmission. The devices are protected according to IP68 and are installed without an enclosure or additional protective case directly in the machine – even under harsh ambient conditions. They enable signal adaptation and galvanic isolation in one component and carry out the two core functions of analog signal processing directly on the site.

The Housing

DuraTrans® M12-A 20000 consistently uses the tried and tested M12 circular connectors, thus it optimally supports existing wiring concepts for IP67. Measuring 83 x 36 x 14 mm, the DuraTrans® M12 housings have extremely compact dimensions. The housing material is PBT (polybutylene terephthalate). It is extremely resistant to mineral lubricants and alcohols and complies with flame class V-0 according to UL 94. A retaining bracket for easy on-site installation as well as cables in different lengths with M12 connection technology are available as product accessories.

The Advantages

- Substantial cost and space savings due to omission of enclosures or terminal boxes.
- Plug & Play:
 - Easy connection thanks to screwable M12 circular connectors
 - Quick and easy installation without tools
 - Preassembled connections to prevent wiring errors

- Sturdy housing with IP 68 protection, fully encapsulated and therefore optimally suited for wet, dirty, or dusty environments.
- Eight device variants with fixed input and output settings: 0 to 20 mA, 4 to 20 mA, or 0 to 10 V.

The Technology

Despite the extremely compact housings, the DuraTrans® M12 series provides true 3-port isolation between input, output, and power supply. Safe Isolation according to EN 61140 ensures optimum protection of personnel and equipment. The test voltage across input, output, and power supply is 1500 V AC. Minimum self-heating enables use in a wide temperature range and increases the service life of the devices. For example, the MTBF (mean time between failures) is 440 years. Vacuum encapsulation protects the electronics reliably against extreme ambient conditions. Analog transmission of measured values ensures excellent signal quality with maximum long-term stability and reliability.

Isolation Amplifiers for Standard Signals

Isolation Amplifiers
Transmitters

Indicators

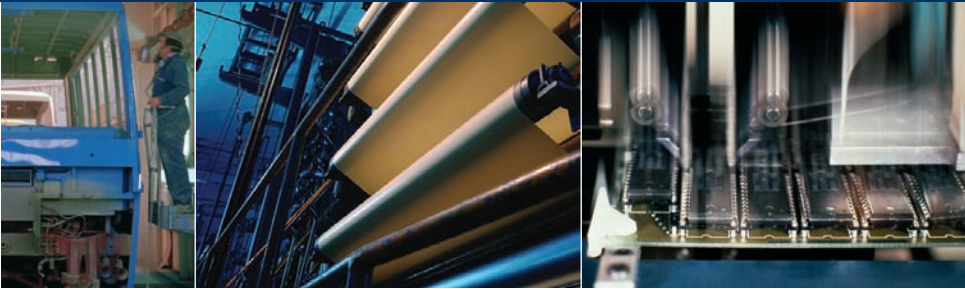
Process Analytics

Portable Meters

Laboratory Meters

Sensors

Fittings



Knick >

■ The Facts

Appropriate signal adaptation
with preconfigured fixed range models

Low gain error of only
0.1 ... 0.3 %

Excellent pulse imaging
Undistorted transmission,
even of critical input signals

**Prevention of
signal interferences**
through 3-port isolation

Safe electrical isolation

Test voltage 1500 V AC

**Safe Isolation according to
EN 61140**
provides best possible protection
of personnel and equipment

Plug & Play:

- Easy connection using screw-on M12 circular connectors
- Quick and easy installation without tools
- Preassembled connections to prevent wiring errors

Fully cast housing
with IP 68 protection

5-year warranty

Warranty
5 years!

Defects occurring within 5 years from delivery are remedied free of charge at our works (carriage and insurance paid by sender).



M12 Field Housings

DuraTrans® M12-A 20000

■ Product Line

Devices	Input	Output	Order No.
DuraTrans® M12-A 20000	0 ... 20 mA	0 ... 20 mA	M12-A20016
	0 ... 20 mA	4 ... 20 mA	M12-A20017
	0 ... 20 mA	0 ... 10 V	M12-A20018
	4 ... 20 mA	0 ... 20 mA	M12-A20026
	4 ... 20 mA	4 ... 20 mA	M12-A20016
	4 ... 20 mA	0 ... 10 V	M12-A20028
	0 ... 10 V	0 ... 20 mA	M12-A20036
	0 ... 10 V	4 ... 20 mA	M12-A20037
	0 ... 10 V	0 ... 10 V	M12-A20038

Power supply

24 V DC

Accessories

Retaining bracket for wall mounting		ZU 0610
Signal line, 4-pole, M12 plug, straight – M12 socket, straight	Length 0.3 m	ZU 0611
Signal line, 4-pole, M12 plug, straight – M12 socket, straight	Length 0.6 m	ZU 0612
Signal line, 4-pole, M12 plug, straight – M12 socket, straight	Length 1.5 m	ZU 0613
Signal line, 4-pole, M12 plug – one side open	Length 1.5 m	ZU 0614
Signal line, 4-pole, M12 socket – one side open	Length 1.5 m	ZU 0615

■ Specifications

Input data

Inputs	0 ... 20 mA, 4 ... 20 mA, 0 ... 10 V	
Input resistance	Current input	Voltage drop < 0.1 V at 20 mA (approx. 350 mV with open current output or power failure)
	Voltage input	Approx. 100 kohms
Overload	Current input	< 100 mA
	Voltage input	Voltage limitation with suppressor diode 30 V, max. permitted continuous current 3 mA

Output data

Outputs	0 ... 20 mA, 4 ... 20 mA, 0 ... 10 V	
Load	With output current	≤ 10 V (≤ 500 ohms at 20 mA)
	With output voltage	≤ 1 mA (≥ 10 kohms at 10 V)
Offset	< 20 µA or < 10 mV	
Residual ripple	< 10 mV _{rms}	

Isolation Amplifiers for Standard Signals

Isolation Amplifiers
Transmitters

Indicators

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Portable Meters

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Knick 

Specifications (continued)

Transmission behavior

Gain error ¹⁾	< 0.2 % meas. val. with direct 1:1 current transmission < 0.3 % meas.val. with voltage input and/or voltage output
Cutoff frequency	> 100 Hz, -3 dB
Temperature coefficient ²⁾	< 0.01 %/K full scale (reference temperature 23 °C)

Power supply

Power supply	24 V DC (±15 %), approx. 0.6 W
--------------	--------------------------------

Isolation

Galvanic isolation	3-port isolation between input, output, and power supply
Test voltage	1.5 kV AC, 50 Hz
Working voltage (basic insulation)	300 V AC/DC across input and output with overvoltage category II and pollution degree 3, up to 100 V AC/DC across output and power supply with category II and degree 3 according to EN 61010 Part 1.
Protection against electric shock	Safe Isolation up to 150 V AC/DC according to EN 61140 by reinforced insulation according to EN 61010 Part 1 with overvoltage category II and pollution degree 3 across input and output/power supply.

Standards and approvals

EMC ³⁾	Product standard: EN 61326 Emitted interference: Class B Immunity to interference: Industry
cURus	Standards: UL 508 and CAN/CSA 22.2 no. 14-95, File No. E 220033

Other data

MTBF ⁴⁾	Approx. 440 years
Ambient temperature	Operation: -10 ... +70 °C Transport and storage: -25 ... +85 °C
Design	M12 field housing with 4 pole M12 circular connectors H 36 mm, W 83.3 mm, D 14 mm
Ingress protection	IP68
Mounting	Retaining bracket for wall mounting
Weight	Approx. 50 g

1) Additional error in live-zero operation 20 µA or 10 mV

2) Average TC in specified operating temperature range -10 °C ... +70 °C

3) Slight deviations are possible while there is interference

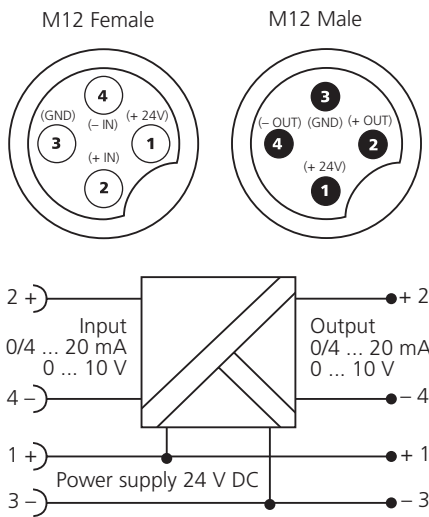
4) Mean Time Between Failures – MTBF – according to EN 61709 (SN 29500).

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

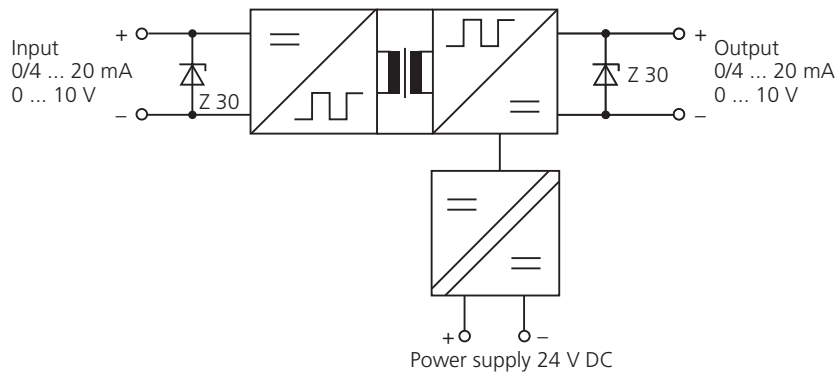
M12 Field Housings

DuraTrans® M12-A 20000

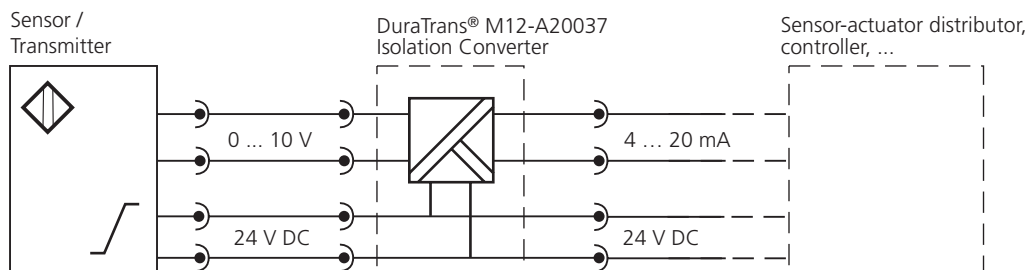
Terminal Assignments



Block Diagram



Application Example



Isolation Amplifiers for Standard Signals

Isolation Amplifiers
Transmitters

Indicators

Process Analytics

Portable Meters

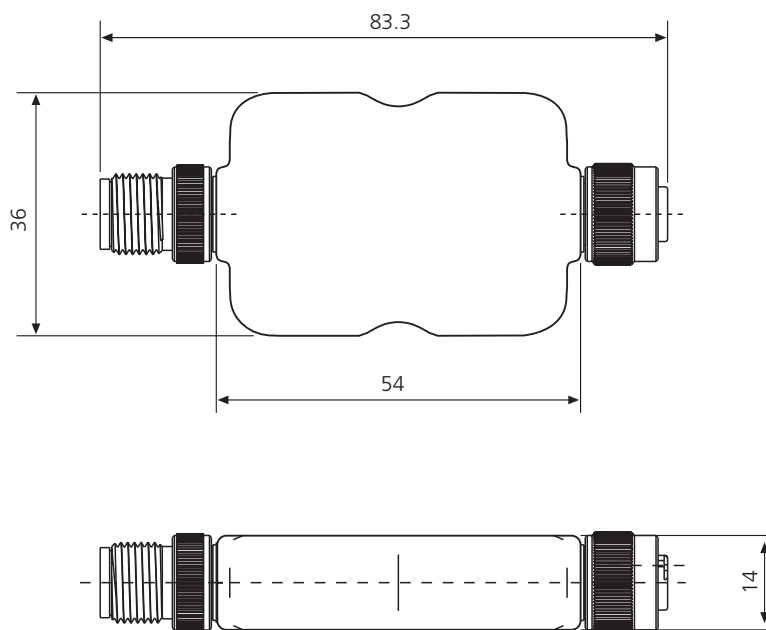
Laboratory Meters

Sensors

Fittings

Knick >

■ Dimension Drawings and Terminal Assignments



All dimensions in mm!

M12 Field Housings

Knick >

Compact, robust standard-signal isolator with IP68 protection: IsoTrans® M12-A 200. With M12 connection technology for decentralized automation. For the safe isolation of 0(4) ... 20 mA standard signals.

The Task

If a singular analog signal isolation is required outside the enclosure, the ideal IP 68 isolator is now available: IsoTrans® M12-A 200.

No further protective housing is required for the installation.

A metal clamp available as accessory offers a secure fixture.

The Housing

Fully cast and system-compatible, the new IsoTrans® M12-A 200 by Knick supports modern installation concepts and is destined for low-priced applications directly on plant and machinery – even in wet, dirty, or dusty environments.

IsoTrans® M12-A 200



The Technology

The wiring of the IsoTrans® M12-A 200 is effected easily and quickly using low-priced standard cables with M12 connectors or sockets. The innovative standard signal isolator is plugged directly onto the sensor-actuator distributor or is simply inserted into the cable.

IsoTrans® M12-A 200 shows virtually no self-heating, minimizing the aging of the electronic components. This means maximum reliability and exceptional durability.



Loop-Powered Isolators for Standard Signals

Isolation Amplifiers
Transmitters

Indicators

Process Analytics

Portable Meters

Laboratory Meters

Sensors

Fittings



Knick >

■ The Facts

Easy connection using a screw-on M12 connector

Fully cast housing
with IP 68 protection

Fast and easy installation
Even without tools

Preassembled connections
to prevent wiring errors

Safe electrical isolation

Maximum protection of personnel and equipment

Safe Isolation
according to EN 61140

Excellent pulse imaging,
Undistorted transmission, even
of critical input signals

Extremely low gain error
of only 0.1 %

Reduction of system costs by
appropriate electrical isolation

5-year warranty



Warranty
5 years!

Defects occurring within 5 years from delivery are remedied free of charge at our works (carriage and insurance paid by sender).

M12 Field Housings

M12 Field Housings

IsoTrans® M12-A 200

■ Product Line

Devices	Input	Output	Order No.
IsoTrans® M12-A 200	0 ... 20 mA, 4 ... 20 mA	0 ... 20 mA, 4 ... 20 mA	M12-A200
IsoTrans® M12-A 210 with Bürdenstop®	0 ... 20 mA, 4 ... 20 mA	0 ... 20 mA, 4 ... 20 mA	M12-A210

Accessories

Retaining bracket for wall mounting, stainless steel			ZU 0610
Signal line, 4-pole, M12 plug, straight – M12 socket, straight	Length 0.3 m		ZU 0611
Signal line, 4-pole, M12 plug, straight – M12 socket, straight	Length 0.6 m		ZU 0612
Signal line, 4-pole, M12 plug, straight – M12 socket, straight	Length 1.5 m		ZU 0613
Signal line, 4-pole, M12 plug – one side open	Length 1.5 m		ZU 0614
Signal line, 4-pole, M12 socket – one side open	Length 1.5 m		ZU 0615

■ Specifications

Input data	IsoTrans® M12-A 200 (without Bürdenstop®)	IsoTrans® M12-A 210 (with Bürdenstop®)
Inputs	0(4) ... 20 mA/max. 18 V	0(4) ... 20 mA/max. 3 V
Operating current	< 150 µA	
Voltage drop	Approx. 1.7 V at 20 mA	Approx. 1.5 V at 20 mA
Overload	40 mA, 18 V	50 mA, 3 V
Output data		
Outputs	0(4) ... 20 mA/max. 12 V (600 ohms load at 20 mA)	0(4) ... 20 mA/max. 1.2 V (60 ohms load at 20 mA)
Residual ripple	< 10 mV _{rms}	
Transmission behavior		
Transmission error	< 0.1 % full scale	
Load error	< 0.05 % meas. val./100 ohms	Negligible
Response time (T ₉₉)	Approx. 5 ms at 500 ohms load	Approx. 5 ms at 60 ohms load
Temperature coefficient ¹⁾	< 0.002 %/K of meas. val. per 100 ohms load (reference temperature 23 °C)	< 0.002 %/K of meas. val. (reference temperature 23 °C)

1) Average TC in specified operating temperature range 0 °C ... +60 °C

Loop-Powered Isolators for Standard Signals

Isolation Amplifiers
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Knick 

Specifications (continued)

Isolation

Galvanic isolation	Isolation between input and output and all other circuits
Test voltage	1.5 kV AC, 50 Hz
Working voltage (basic insulation)	300 V AC/DC across input and output and all other circuits with overvoltage category II and pollution degree 3
Protection against electric shock	Safe Isolation according to EN 61140 by reinforced insulation in accordance with EN 61010-1. Working voltage up to 300 V AC/DC across input and output and all other circuits with overvoltage category II and pollution degree 3. For applications with high working voltages, you should ensure there is sufficient spacing or isolation from neighboring devices and protection against electric shocks.

Standards and approvals

EMC ²⁾	Product standard: EN 61326 Emitted interference: Class B Immunity to interference: Industry
cUL	Standards: UL 508 and CAN/CSA 22.2 no. 14-95

Other data

MTBF ³⁾	Approx. 945 years
Chopper frequency	Approx. 100 kHz
Ambient temperature	Operation: 0 ... +60 °C Transport and storage: -25 ... +85 °C
Design	M12 field housing with 4 pole M12 circular connectors H 36 mm, W 83.3 mm, D 14 mm
Ingress protection	IP68
Mounting	Retaining bracket for wall mounting
Weight	Approx. 50 g

2) Applies to 4 ... 20 mA, slight deviations are possible while there is interference

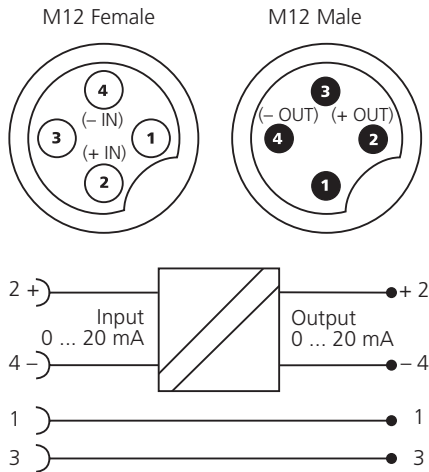
3) Mean Time Between Failures – MTBF – according to EN 61709 (SN 29500).

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

M12 Field Housings

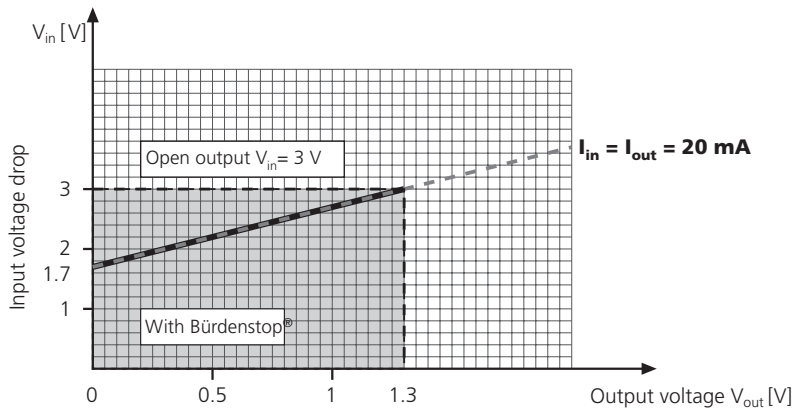
IsoTrans® M12-A 200

Terminal Assignments

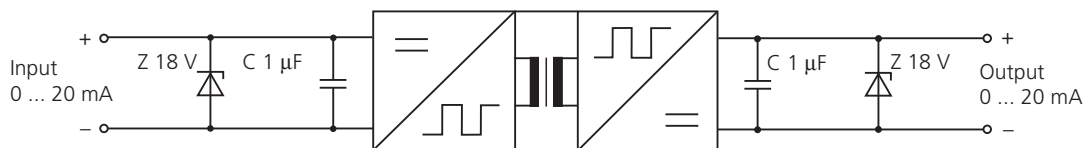


Transfer Function with Bürdenstop® (Load Stop)

Transfer Function with Bürdenstop® (Load Stop)



Block Diagram



Loop-Powered Isolators for Standard Signals

Isolation Amplifiers
Transmitters

Indicators

Process Analytics

Portable Meters

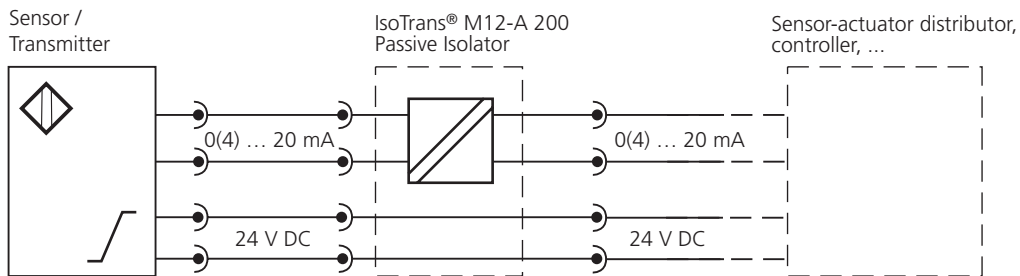
Laboratory Meters

Sensors

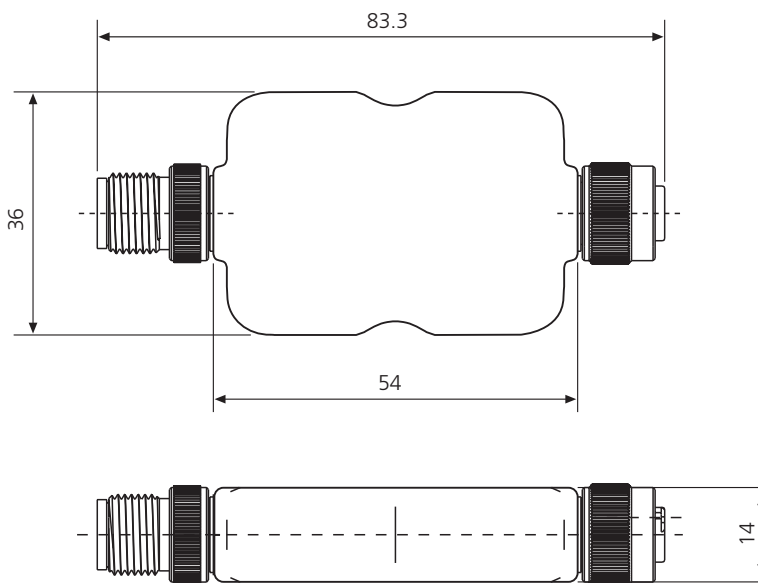
Fittings

Knick >

■ Application Example



■ Dimension Drawings and Terminal Assignments



All dimensions in mm!

Eurocards Page

Universal Isolation Amplifiers	IsoAmp® 11000/12000	280
Isolation Amplifiers for Standard Signals	IsoAmp® 3000/4000	288
Standard-Signal Multipliers	IsoAmp® EK 30/31	296
Loop-Powered Isolators for Standard Signals	IsoTrans® 41	304
	IsoTrans® 46	310



Knick >

IsoAmp® 11000/12000



Universal isolation amplifiers for ± 20 mV to ± 10 V or ± 20 mA input signals.

The Models

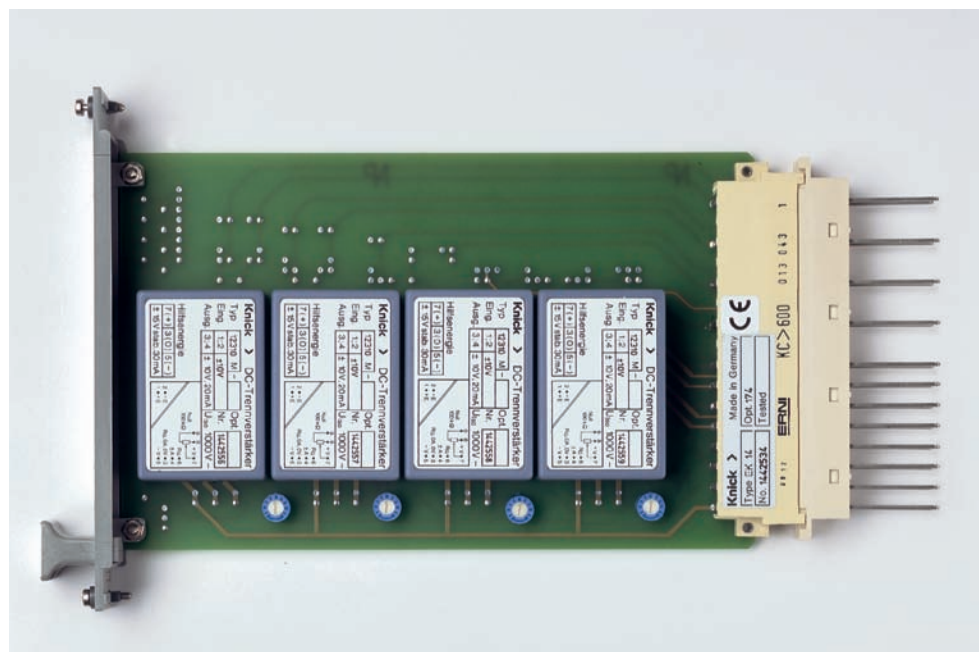
Knick's IsoAmp® 11000/12000 series features a tried and tested range of powerful DC isolation amplifiers that have excellent specifications despite their small dimensions and have a symmetrical input with high common mode rejection.

The Problems

When conventional unsymmetrical isolation amplifiers are used, measurement signal interference can occur that seem inexplicable to the user at first. If, for example, there are several devices in a current output loop, an isolation amplifier can meet a LO output with its HI input which can cause the above-mentioned signal interference.

The Inputs

On the Knick IsoAmp® 11000/12000 DC isolation amplifiers, the input is symmetrical, i. e. both input terminals can be exchanged without undesired effects on the common mode rejection.



Models with connections for external gain setting, zeroing and live-zero switching (0 ... 20 mA/ 4 ... 20 mA) are available for special tasks.

The Applications

The isolation amplifiers allow trouble-free use, particularly for applications where small dimensions are required in conjunction with high isolation voltage, high accuracy, and maximum reliability.

Warranty
5 years!

Defects occurring within 5 years from delivery are remedied free of charge at our works (carriage and insurance paid by sender).

Universal Isolation Amplifiers

Isolation Amplifiers
Transmitters

Indicators

Process Analytics

Portable Meters

Laboratory Meters

Sensors

Fittings



Knick >

■ The Facts

Symmetrical input
with high common mode rejection

Excellent specifications

High isolation voltage

High output power

Optional external gain adjustment with just one resistor

Live-zero switching

Complete modules without external wiring

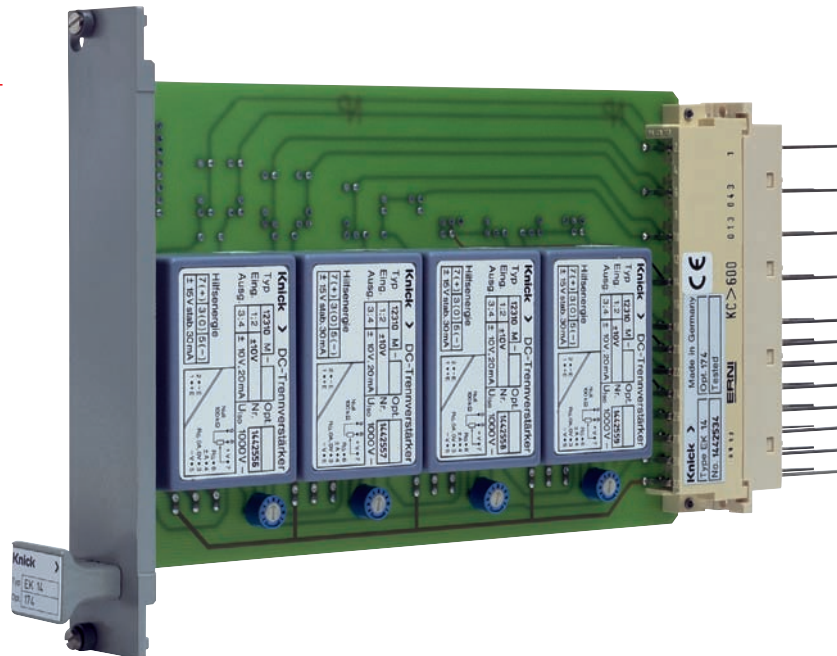
Eurocard up to 4 channels

Eurocard up to 2 channels,
floating outputs

High quality and reliability

100 % computer-aided production control and final inspection

5-year warranty



Eurocards

IsoAmp® 11000/12000

■ Product Line

Devices		Order No.			
IsoAmp® 11000/12000 Eurocards	For up to 4 channels	EK 14 –... ¹⁾			
	With isolation transformer for isolated supply For up to 2 channels	EK 16 –... ¹⁾			
Channels for Eurocards	Symmetrical input	Impressed output	Loadability		
Free wiring	Up to ±500 mV depending on wiring	±20 mA	10 V ²⁾	11001 M	
	Up to ±500 mV depending on wiring	±10 V ²⁾	20 mA	12001 M	
Fixed settings	±20 mV	±20 mA	10 V ²⁾	11202 M	
	±60 mV	±20 mA	10 V ²⁾	11206 M	
	±150 mV	±20 mA	10 V ²⁾	11215 M	
	±500 mV	±20 mA	10 V ²⁾	11250 M	
	±10 V	±20 mA	10 V ²⁾	11310 M	
	±20 mA	±20 mA	10 V ²⁾	11820 M	
	±20 mV	±10 V	20 mA	12202 M	
	±60 mV	±10 V	20 mA	12206 M	
	±150 mV	±10 V	20 mA	12215 M	
	±500 mV	±10 V	20 mA	12250 M	
	±10 V	±10 V	20 mA	12310 M	
	±20 mA	±10 V	20 mA	12820 M	
	Options				
	Eurocard	INTERMAS front panel for EK 14 or EK 16 Eurocard, mounted			174
EK 14 or EK 16 Eurocard with wiring to customer requirements in the range $V_{in} \geq 20 \text{ mV} \dots \leq 200 \text{ V}$ or $I_{in} \geq 100 \mu\text{A} \dots \leq 50 \text{ mA}$				185 ³⁾	
Channels for Eurocard	Output ±0 ... 20 mA or +4 ... 20 mA, switchable (additional error with live zero: ±10 µA)			173	
	Gain error < 0.1 % of measured value (not for Model 11202)			04 ³⁾	

1) Please indicate the required channel configuration when ordering. Any channel combination possible.

2) ±10 V or 20 V unipolar (note power supply!)

3) Options 04 and 185 cannot be combined.

Universal Isolation Amplifiers

Isolation Amplifiers
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■ Specifications

Input data

Input	See Product Line
Configuration	EK 14 Max. 4 channels also in combined version EK 16 Max. 2 channels also in combined version (EK16 with isolation transformer for isolated supply)
Input resistance	> 1 Mohm, for models with $I_{in} \pm 20$ mA: 7.5 ohms
Overload	$V_{in} \leq 25$ V, $I_{in} \leq 300$ mA

Output data

Output	See Product Line
Offset current ²⁾	< 50 nA
Offset voltage ²⁾ Drift	< 500 μ V, external nulling < 5 μ V/month
Residual ripple	≤ 10 mV _{pp}

Transmission behavior

Gain error	< 0.2% meas. val., Option 04: < 0.1 % meas.val.
Cutoff frequency ¹⁾	> 1.5 ... 5 kHz -3 dB (20 mV ... 500 mV or 10 V) (different values on request)
Temperature coefficient ²⁾³⁾	< 1 nA/K, < 2 μ V/K (reference temperature 23 °C)

Power supply

EK 14	± 14.5 ... 15.5 V stabilized, approx. 30 mA for unipolar operation up to 20 V output voltage: -5, +25 V, stabilized
EK 16 with isolation transformers for isolated supply	24 V - ± 10 %, approx. 80 mA 30 V ⁴⁾ - ± 10 %, approx. 60 mA, switchable

Isolation

Galvanic isolation	3-port isolation between input, output and power supply
Test voltage across input and output/power supply	4 kV AC

1) Current output up to 250 ohm load, models 11310 and 12310 up to 10 V_{pp}

2) x 10 for models 11310, 12310

3) Offset set to zero

4) For operation with ± 15 V without 0-V line

IsoAmp® 11000/12000

Specifications (continued)

Isolation (continued)

Working voltage (basic insulation)	EK 14: 600 V AC/DC EK 16: 900 V DC each input against all other inputs and outputs 250 V DC power supply against all other circuits with overvoltage category II and pollution degree 2 according to EN 61010-1. For applications with high working voltages, you should ensure there is sufficient spacing or isolation from neighboring devices and protection against electric shocks.
---------------------------------------	--

Standards and approvals

EMC	European EMC regulations, according to directive 89/336/EEC
-----	---

Other data

Ambient temperature	-10 ... +70 °C
Design	Eurocard 5 TE
Pin connector	Type F according to DIN 41612, see also dimension drawings
Socket connector ⁵⁾	Type F according to DIN 41612 (wire-wrap connection), see also dimension drawings
Front plate	Option 174: INTERMAS SP / K 3-n 05 T, plastic, gray, see also dimension drawings
Weight	Approx. 45 g per channel

5) The socket connector belongs to package contents

Universal Isolation Amplifiers

Isolation Amplifiers
Transmitters

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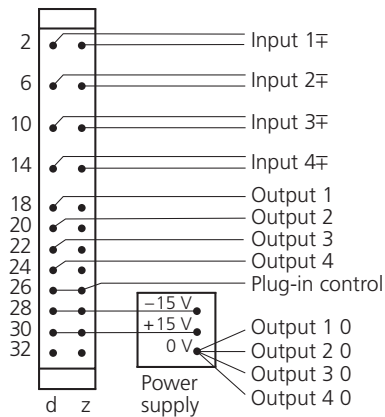
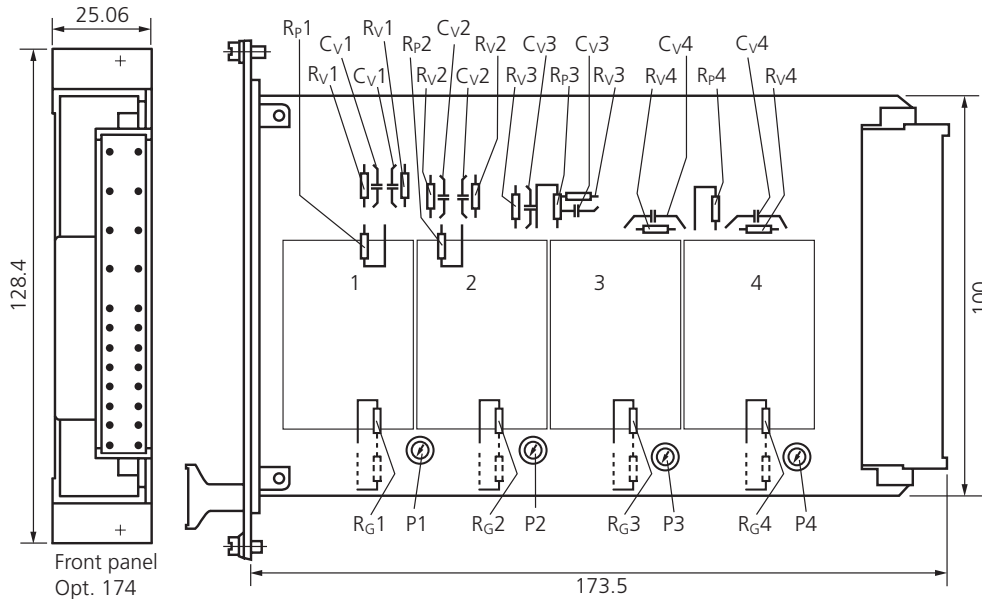
Sensors

Fittings

Knick >

■ Dimension Drawings and Pin Assignments

EK 14, Equipped with 11000 M



Wiring is not required for fixed-range models!

Separate the strip conductors when R_V , C_V are mounted!

R_G : Negative feedback resistor

R_P : Shunt resistor

R_V : Sym. voltage divider (R_V , R_P , R_V)

C_V : Frequency compensation

P1 ... P4 = Nulling potentiometer

$$\text{Model 11001: } R_G = \frac{V_{in}}{20} [\Omega, \text{ mV}] \quad (1 \dots 25 \Omega)$$

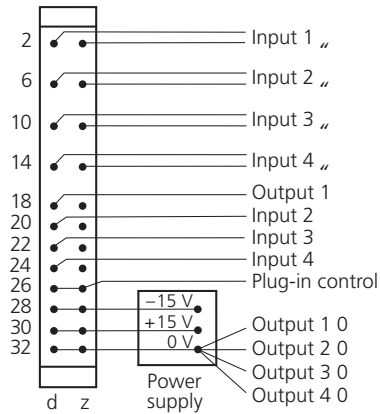
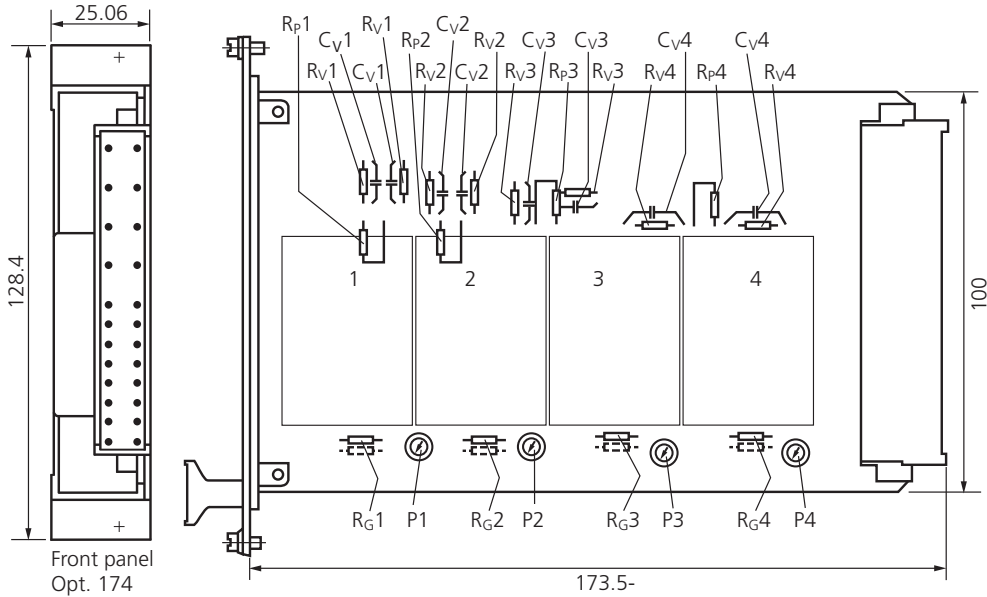
Output with Option 173

	$\pm 0 \dots 20 \text{ mA}$	$+4 \dots 20 \text{ mA}$
Output 1	d 18	z 18
Output 2	d 20	z 20
Output 3	d 22	z 22
Output 4	d 24	z 24

IsoAmp® 11000/12000

Dimension Drawings and Pin Assignments (continued)

EK 14, Equipped with 12000 M



Wiring is not required for fixed-range models!

Separate the strip conductors when R_V , C_V are mounted!

R_G : Negative feedback resistor

R_P : Shunt resistor

R_V : Sym. voltage divider (R_V , R_P , R_V)

C_V : Frequency compensation

P1 ... P4 = Nulling potentiometer

$$\text{Model 12001: } R_G = \frac{20500 V_{in}}{10000 - V_{in}} [\Omega, \text{mV}] \quad (41.1 \dots 1079 \Omega)$$

Universal Isolation Amplifiers

Isolation Amplifiers
Transmitters

Indicators

Process Analytics

Portable Meters

Laboratory Meters

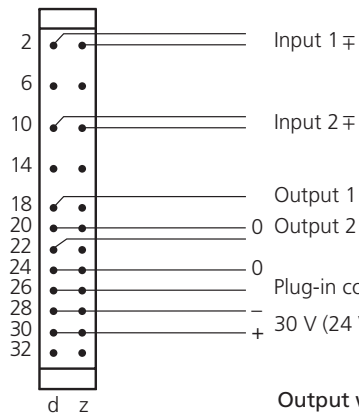
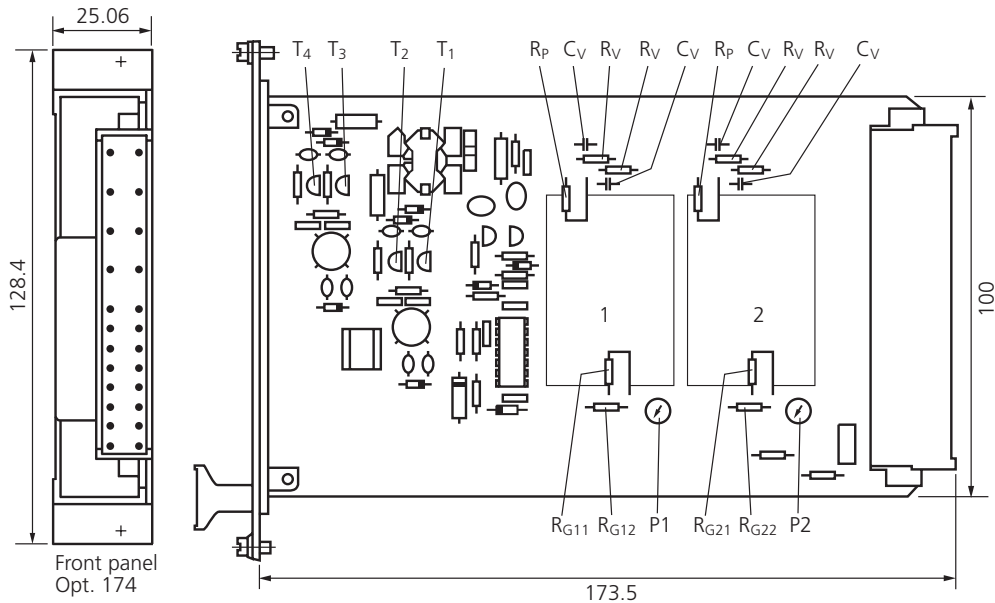
Sensors

Fittings

Knick 

Dimension Drawings and Pin Assignments (continued)

EK 16, Equipped with 11000/12000 M



Wiring is not required for fixed-range models!

R_{G11} , R_{G21} : Negative feedback resistor 11000 M

R_{G12} , R_{G22} : Negative feedback resistor 12000 M

R_P : Shunt resistor

R_V : Sym. voltage divider (R_V , R_P , R_V)

C_V : Frequency compensation

P1, P2 = Nulling potentiometer

Separate the strip conductors when R_V , C_V are mounted!

12000 M: Base emitters of T_1 , T_2 or T_3 , T_4 must be jumpered.

Output with 11000 M Option 173

	$\pm 0 \dots 20 \text{ mA}$	$+4 \dots 20 \text{ mA}$
Output 1	d 18/dz 20	d 18/dz 20
Output 2	d 22/dz 24	d 22/dz 24

All dimensions in mm!

Knick >

For transmission and conversion of impressed signals.

The DC isolation amplifiers of the IsoAmp® 3000/4000 series transmit and convert impressed 0(4) ... 20 mA or 0 ... 10 V standard signals according to our German patent DBP 34 12 843 with maximum accuracy.

They provide Safe Isolation and high insulation from input to output to power supply.

The Advantages

The control range extends into the negative values and allows strict linear transmission in the zero range. Compared with conventional unipolar amplifiers, this has a great advantage: The often asymptotic setting of the zero point, for example, when calibrating with a sensor, is ruled out.

The number of transmission errors is unusually low. The reason for this is mainly a negative feedback circuit that is incorporated in the electrical isolation. It has no sensing resistor with 1:1 transmission and just one sensing resistor for current/voltage conversion. Differentiated signal return allows the circuit to remain stable even with strong complex loads.

The components required in conventional concepts for matching amplifiers and resistor networks are omitted. The reliability is accordingly high. The computer-aided production control and final inspection ensure high and

IsoAmp® 3000/4000



constant quality. The full encapsulation guarantees maximum safety and reliability even in extreme conditions.

The Applications

The devices can be used for many galvanic isolation applications, for example:

- in measuring and control engineering
- for linking measurement signals to different potentials
- for removal of double ground compensation currents
- for isolation of dangerous touch voltages
- for computer interfacing
- for increase of load voltage and decoupled signal transmission

Each Eurocard can be equipped with up to four channels. The 16-mm-high channel design even allows just 4 TE rack width. Therefore 21 cards with 84 channels can be accommodated per 19" rack.

For Safe Isolation according to EN 61140, the required clearance and creepage distances should be taken into consideration.

The Models

IsoAmp® 3820 transforms the input current 1:1 into an impressed output current without negative feedback resistors by means of negative-feedback current transformation.

IsoAmp® 4820 converts the input current 2:1 into an impressed output voltage with just one precision resistor after current transformation.

IsoAmp® 3310 converts the input voltage 3:1 into an impressed output current with just a precision resistor after voltage transformation.

IsoAmp® 4310 converts the input voltage 1:1 into an impressed output voltage without negative-feedback resistors after voltage transformation.

**Warranty
5 years!**

Defects occurring within 5 years from delivery are remedied free of charge at our works (carriage and insurance paid by sender).

Isolation Amplifiers for Standard Signals

Isolation Amplifiers
Transmitters

Indicators

Process Analytics

Portable Meters

Laboratory Meters

Sensors

Fittings



Knick 

■ The Facts

Safe Isolation according to EN 61140

Protection of maintenance staff and subsequent devices against non-permitted high voltages

3-port isolation

Protection against incorrect measurements or damage to the

equipment due to parasitic voltages

Decoupled

No load effect on the signal source

Maximum reliability

No maintenance work, therefore the related costs are not incurred

High accuracy: No distortion of measurement signal

Simple live zero/dead zero switching option

Multiple application possibilities due to optional switching of input or output

5-year warranty

■ Product Line

Devices		Order No.
IsoAmp® 3000/4000	For up to 3 channels	EK 8 ⁻¹⁾²⁾
Eurocards	For up to 4 channels	EK 9 ⁻¹⁾²⁾
Channels for Eurocards	Input: 0 ... 20 mA, output: 0 ... 20 mA Input: 0 ... 20 mA, output: 0 ... 10 V	3820 Mh 4820 Mh
	Input: 0 ... 10 V, output: 0 ... 20 mA Input: 0 ... 10 V, output: 0 ... 10 V	3310 Mg 4310 Mg

Power supply

24 V AC/DC

Options

Input 0 ... 20 mA or 4 ... 20 mA, switchable	250 ³⁾
Output 0 ... 20 mA or 4 ... 20 mA, switchable	251 ³⁾
INTERMAS front panel, width 25 mm, for EK 8 or EK 9 Eurocard, mounted	174
INTERMAS front panel, width 20 mm, for EK 8 or EK 9 Eurocard, when equipped with 3820 Mh and 4820 Mh only	301

1) Please indicate the required channel configuration when ordering. Any channel combination possible.

2) ±10 V or 20 V unipolar (note power supply!)

3) Options 250 and 251 cannot be combined; additional error at output: ±10 µA, with Model 4820: ±10 mV

IsoAmp® 3000/4000

Product Line (continued)

Accessories

Inspection Certificate 3.1 B according to EN 10204	ZU 0267
Inspection Certificate 3.1 B according to EN 10204, with description and results of inspections performed	ZU 0268

■ Selection Aid for Modules and Options

		Output		
		0 ... 20 mA	0 ... 20 mA/ 4 ... 20 mA ⁴⁾	0 ... 10 V
Input	0 ... 20 mA	3820 Mh	3820 Mh Option 251	4820 Mh
	0/4 ... 20 mA ⁴⁾	3820 Mh Option 250	3820 Mh ⁵⁾	4820 Mh Option 250
	0 ... 10 V	3310 Mg	3310 Mg Option 251	4310 Mg

4) Selectable

5) 1:1 transmission

■ Specifications

Input data	3820 Mh	4820 Mh	3310 Mg	4310 Mg
Input ⁶⁾	0 ... 20 mA impressed current Option 250: 0/4 ... 20 mA, switchable ⁷⁾		0 ... 10 V	
Input voltage drop	Approx. 100 mV, open output: approx. 750 mV, power failure: approx. 750 mV		Approx. 150 mV, power failure: approx. 750 mV	
Input resistance	–		> 5 Mohms	> 2 Mohms
Offset current ⁸⁾	–		< 500 nA ±10 nA/K	< 1 nA ±10 nA/K
Overload	≤ 300 mA Limited to 750 mV by diode		≤ 100 mA Limited to 13 V by suppressor diode	

6) Transmission of negative signals up to approx. –3 % full scale

Isolation Amplifiers for Standard Signals

Isolation Amplifiers
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Specifications (continued)

Output data	3820 Mh	4820 Mh	3310 Mg	4310 Mg
Output ⁶⁾	0 ... 20 mA, 14 V ⁹⁾ Option 251: 0/4 ... 20 mA selectable ⁷⁾	0 ... 10 V, 10 mA	0 ... 20 mA, 10 V Option 251: 0/4 ... 20 mA selectable ⁷⁾	0 ... 10 V, 20 mA
Residual ripple	< 10 mV _{pp}			
Transmission error	0.01 % meas. val.	0.1 % meas. val.	0.1 % meas. val.	0.02 % meas. val.
Offset	< 2 µA	< 2 mV	< 5 µA	< 2 mV
Cutoff frequency	5 kHz, -3 dB	10 kHz, -3 dB/ V _{out} ≤ 3 V _{pp} ; 3 kHz, -3 dB/ V _{out} ≤ 10 V _{pp}	10 kHz, -3 dB	10 kHz, -3 dB/ V _{out} ≤ 3 V _{pp} ; 3 kHz, -3 dB/ V _{out} ≤ 10 V _{pp}
Temperature coefficient ⁸⁾	< 10 nA/K	< 40 µV/K ±0.0025 %/K m. val.	< 100 nA/K ±0.0025 %/K m. val.	< 40 µV/K
Power supply				
Power supply	24 V AC/DC	AC: -15 % +10 %, 48 ... 500 Hz, approx. 1.3 VA DC: -15 % +20%, approx. 0.6 VA		
Isolation				
Galvanic isolation	3-port isolation between input, output and power supply			
Test voltage	4 kV AC (input / output / power supply)			
Working voltages (basic insulation)	According to EN 61010-1			
	Type EK8	Overvoltage category / Perm. pollution degree	Permitted working voltage	
	Each input against all other circuits	II / degree 2 II / degree 3	1000 V DC 660 V DC / 630 V AC	
	Each output against all other circuits	I / degree 1 II / degree 2	1000 V DC 660 V AC/DC	
	Power supply against all other circuits	II / degree 1 III / degree 2	1000 V DC 600 V AC/DC	

6) Transmission of negative signals up to approx. -3 % full scale

7) Options 250 and 251 cannot be combined.

8) Reference temperature for TC specifications: 23 °C

IsoAmp® 3000/4000

Specifications (continued)

Isolation (continued)

Working voltages (basic insulation)	According to EN 61010-1		
	Type EK9	Overvoltage category / Perm. pollution degree	Permitted working voltage
	Each input against all other circuits	II / degree 1 III / degree 2	1000 V DC 600 V AC/DC
	Each output against all other circuits	I / degree 1 II / degree 1	1000 V DC 600 V AC/DC
	Power supply against all other circuits	II / degree 1 II / degree 2	1000 V DC 600 V AC/DC
	Permissible working voltages for other overvoltage categories and pollution degrees and for reinforced insulation/Safe Isolation on request. For applications with high working voltages, you should ensure there is sufficient spacing or isolation from neighboring devices and protection against electric shocks.		
Protection against electric shock	Safe Isolation according to EN 61140 by reinforced insulation in accordance with EN 61010-1. For applications with high working voltages, you should ensure there is sufficient spacing or isolation from neighboring devices and protection against electric shocks.		

Standards and approvals

Surge withstand	5 kV, 1.2/50 µs according to IEC 255-4
EMC	European EMC regulations, 89/336/EEC directive ¹⁰⁾

Other data

Ambient temperature	Operation: -10 ... +70 °C Transport and storage: -30 ... +80 °C
Design	Eurocard 5 TE (opt. 174) / 4 TE (opt. 301)
Pin connector	Type F according to DIN 41612, see also dimension drawings
Socket connector ¹¹⁾	Type F according to DIN 41612 (wire-wrap connection), see also dimension drawings
Front plate	Option 174: INTERMAS, SP / K3-n05T, plastic, gray, see also dimension drawings Option 301: INTERMAS, SP / K3-n04T, plastic, gray, see also dimension drawings
Weight	Approx. 60 g – 73 g per channel

10) Deviations are possible while there is interference

11) The socket connector belongs to package contents

Isolation Amplifiers for Standard Signals

Isolation Amplifiers
Transmitters

Indicators

Process Analytics

Portable Meters

Laboratory Meters

Sensors

Fittings

Knick 

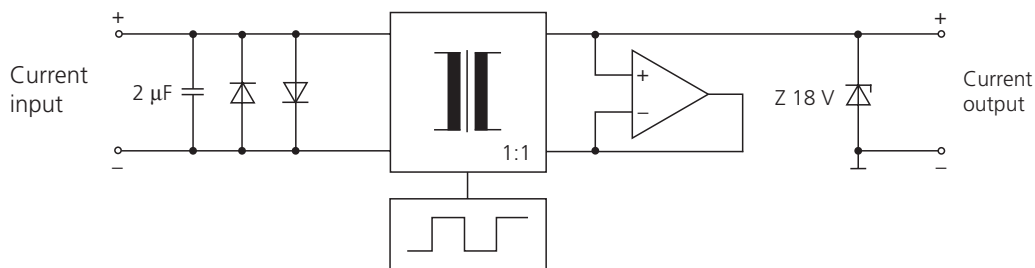
Terminal Assignments for Options 250 and 251

Model	Option	Input ^{*)}	Output	Output connection	Jumper (output)
3820	250	0 ... 20 mA	0 ... 20 mA	dz	
		4 ... 20 mA	0 ... 20 mA	dz	db
3820	251	0 ... 20 mA	0 ... 20 mA	dz	
		0 ... 20 mA	4 ... 20 mA	db	
4820	250	0 ... 20 mA	0 ... 10 V	dz	db
		4 ... 20 mA	0 ... 10 V	dz	
3310	251	0 ... 10 V	0 ... 20 mA	dz	
		0 ... 10 V	4 ... 20 mA	db	

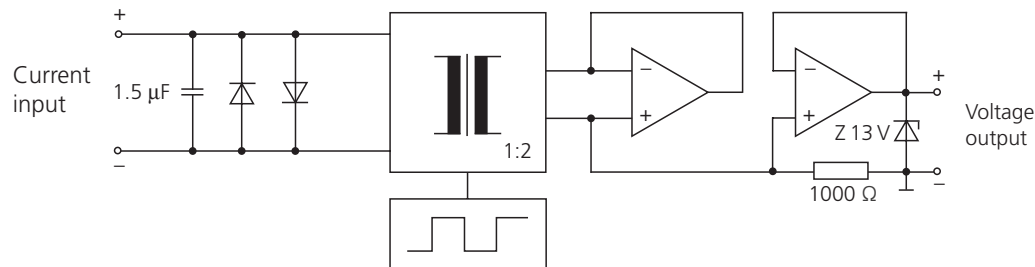
*) See dimension drawing

Block Diagrams

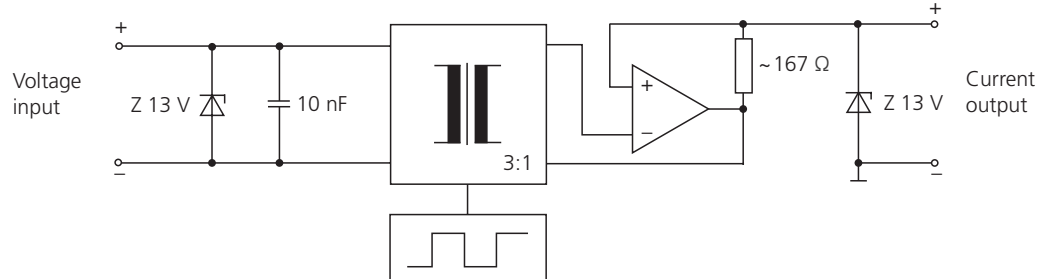
Model 3820



Model 4820



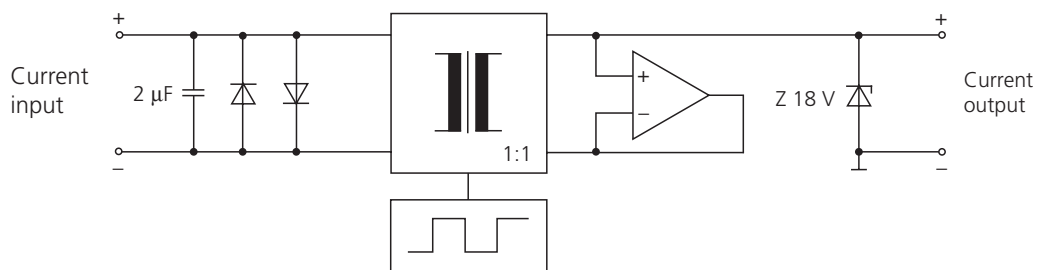
Model 3310



IsoAmp® 3000/4000

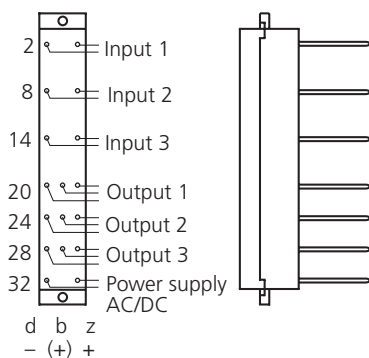
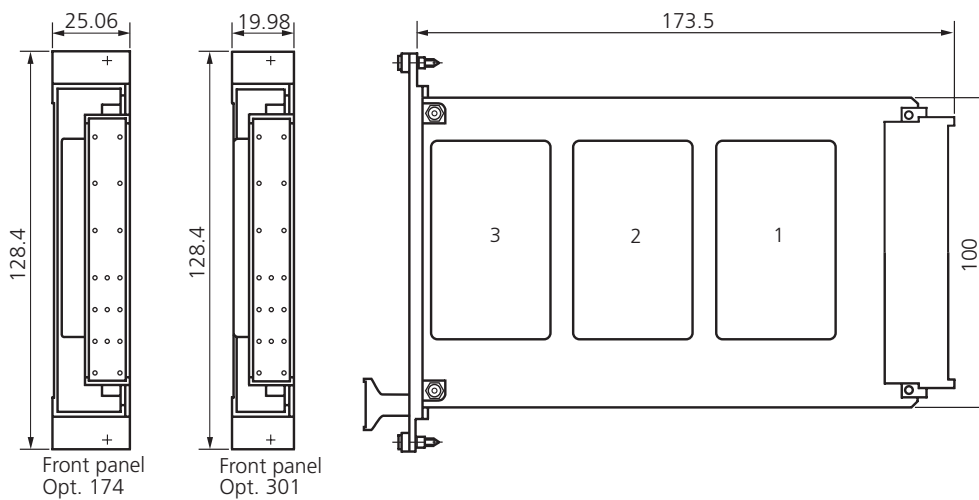
Block Diagrams (continued)

Model 4310



■ Dimension Drawings and Pin Assignments

For EK 8 Eurocard



Plug-in connection: Type F according to DIN 41612

Front panel Opt. 174: INTERMAS SP/K3-n05T, plastic, gray

Front panel Opt. 301: INTERMAS SP/K3-n04T, plastic, gray

Installation, commissioning, and maintenance may only be carried out by trained personnel!

Isolation Amplifiers for Standard Signals

Isolation Amplifiers
Transmitters

Indicators

Process Analytics

Portable Meters

Laboratory Meters

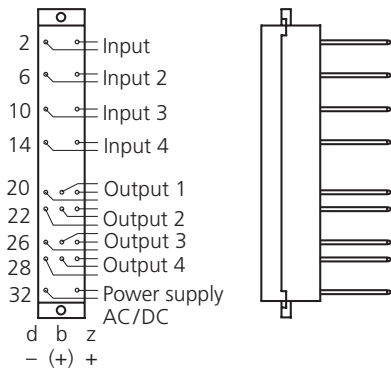
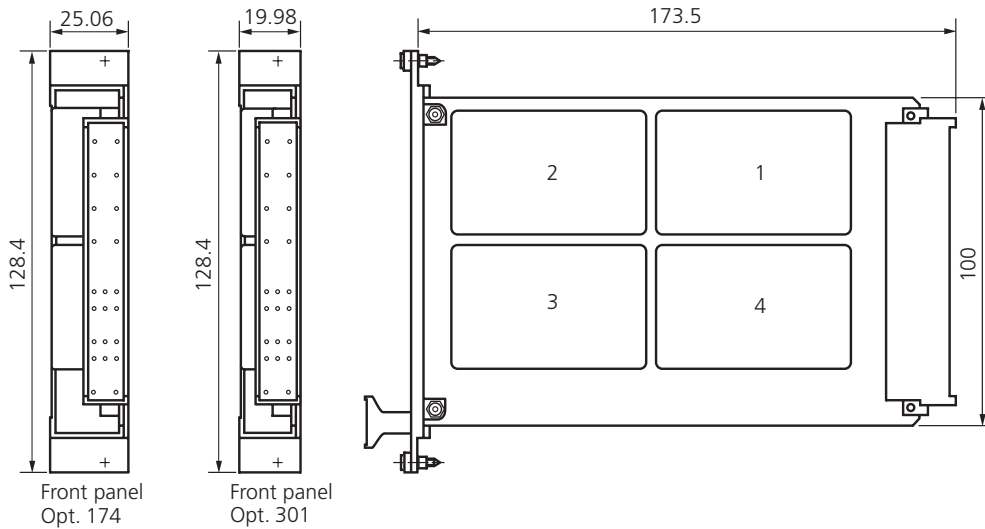
Sensors

Fittings

Knick 

Dimension Drawings and Pin Assignments (continued)

For EK 9 Eurocard



Plug-in connection: Type F according to DIN 41612

Front panel Opt. 174: INTERMAS SP/K3-n05T, plastic, gray

Front panel Opt. 301: INTERMAS SP/K3-n04T, plastic, gray

Installation, commissioning, and maintenance
may only be carried out by trained personnel!

All dimensions in mm!

Knick >

IsoAmp® EK 30/31



For isolation and conversion of impressed signals.

The Task

Reliable transmission and conversion of (0)4 ... 20 mA and 0 ... 10 V signals to up to four 0(4) ... 20 mA output signals with high accuracy.

The Problems

Best possible signal transmission with avoidance of dangerous electric shock.

The Solution

The Knick standard-signal multipliers provide perfect solutions for

- signal multiplication to up to four output channels with galvanic isolation
- increasing the output load to a max. of 40 V (series connection of output circuits)
- converting the standard current or the voltage input signal to any standard current output signals
- prevention of dangerous electric shocks by Safe Isolation

The Housing

The compact design allows the use of a Eurocard with a width of just 4 TE. This means up to 84 channels can be accommodated in a 19" rack.

The Advantages

There are no negative feedback resistors as normally required in conventional amplifiers. The number of components is thus reduced to a minimum. Accuracy and reliability are increased accordingly.

The modular concept allows simple retrofitting of output channels. Your point of measurement is therefore expandable for future measuring tasks.

The Technology

With an optimized circuit design, the Knick standard-signal multipliers achieve almost perfect signal transmission.

Warranty
5 years!

Defects occurring within 5 years from delivery are remedied free of charge at our works (carriage and insurance paid by sender).

Standard-Signal Multipliers

Isolation Amplifiers
Transmitters

Indicators

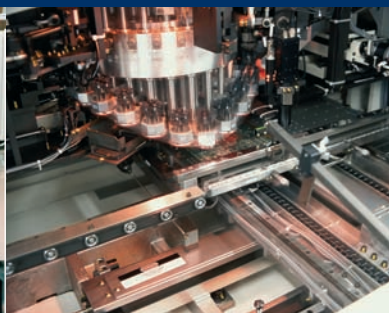
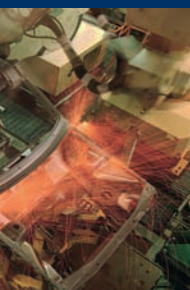
Process Analytics

Portable Meters

Laboratory Meters

Sensors

Fittings



Knick >

■ The Facts

Easy signal switching

Universal use for numerous signal combinations

3-port isolation

Protection against incorrect measurements or damage to the equipment due to parasitic voltages

Safe Isolation according to EN 61140

Protection against unpermitted high voltages

Compact design

Eurocard with just 4 TE width, up to 84 output channels in a 19" rack

Maximum accuracy

No distortion of measurement signal

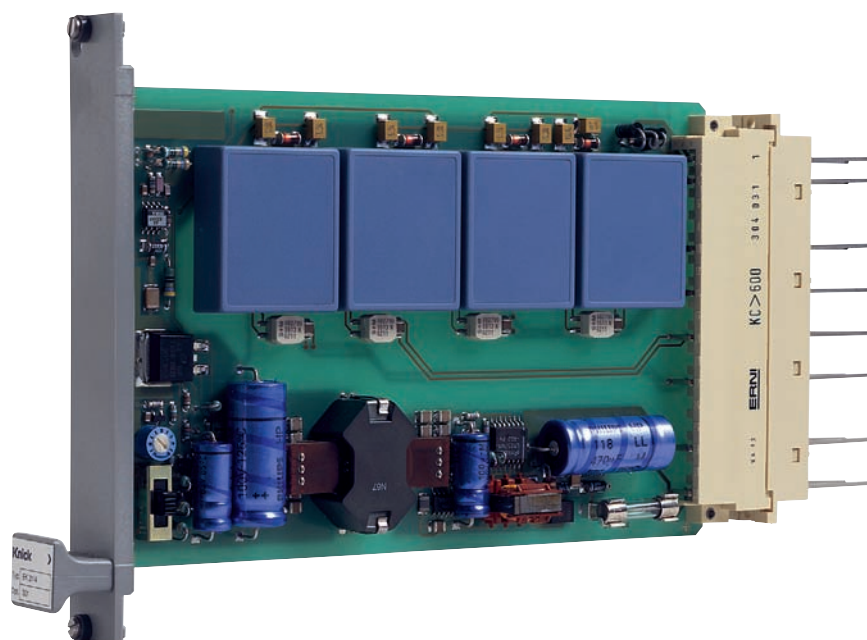
Maximum reliability

No repair or failure costs

Expandable

Retrofittable outputs, expandable for future measuring tasks

5-year warranty



Eurocards

IsoAmp® EK 30/31

■ Product Line

Eurocards	Configuration	Order No.
IsoAmp® EK 30 Eurocards	2 output channels	EK 30 / 2
	3 output channels	EK 30 / 3
	4 output channels	EK 30 / 4
IsoAmp® EK 31 with Safe Isolation also of the outputs	2 output channels	EK 31 / 2
	3 output channels	EK 31 / 3
	4 output channels	EK 31 / 4
Power supply		
24 V AC/DC		
Option		
INTERMAS SP / K3-n04T front panel, width 20 mm, plastic, gray, mounted		301
Accessories		
Output module for IsoAmp® EK 30, individually retrofittable		46 Mk
Output module with Safe Isolation, for IsoAmp® EK 31, individually retrofittable		46 Mk Opt. 453

■ Specifications

Input data

Input ¹⁾	0 ... 20 mA or 4 ... 20 mA, voltage drop approx. 400 V 0 ... 10 V, input resistance 1 Mohm
Configuration	Max. 4 output channels
Overload	100 mA

Output data

Output	up to 4 channels, 0 ... 20 mA or 4 ... 20 mA (selectable via slide switches for all channels together)
Load	≤ 500 ohms per channel at 20 mA
Load error	< 0.02 % meas. val./100 ohms
Offset	20 µA at input 0 (4) ... 20 mA 25 µA at input 0 ... 10 V
Residual ripple	< 5 mV

1) Other ranges on request

Specifications (continued)

Transmission behavior

Transmission error²⁾ 0.1 % meas. val. with 0 (4) ... 20 mA input
0.25 % meas. val. with 0 ... 10 V input

Rise or fall time Approx. 5 ms at 500 ohms load

Transmission error³⁾ 0.01 % meas. val. with 0 (4) ... 20 mA input
0.015 %/K of meas. val. with 0 ... 10 V input

Power supply

Power supply 24 V DC –15 % +20 %, approx. 2.7 W
24 V AC –15 % +10 %, 48 ... 500 Hz, approx. 3.5 VA

Isolation

Galvanic isolation 3-port isolation between input, output, and power supply

Test voltage	EK 30	Power supply against all other circuits	4 kV AC
		Outputs against each other and against input	510 V AC
	EK 31	All isolating distances	4 kV AC

Working voltages (basic insulation) According to EN 61010-1

Type EK 30	Overvoltage category / Perm. pollution degree	Permitted working voltage
Output against each other and against input	I / degree 4	150 V AC/DC
	II / degree 4	100 V AC/DC
	I / degree 4	50 V AC/DC
Power supply against input and against output	II / degree 2	1000 V AC/DC
	III / degree 2	600 V AC/DC
	III / degree 3	410 V AC/DC
	IV / degree 3	300 V AC/DC
Type EK 31		
All isolating distances	II / degree 2	1000 V AC/DC
	III / degree 2	600 V AC/DC
	III / degree 3	410 V AC/DC
	IV / degree 3	300 V AC/DC

For applications with high working voltages, you should ensure there is sufficient spacing or isolation from neighboring devices and protection against electric shocks.

Protection against electric shock

Safe Isolation according to EN 61140 by reinforced insulation to EN 61010-1.
Working voltage up to overvoltage category III and pollution degree 2
with EK 30: 300 V AC/DC across power supply and all other circuits,
with EK 31: 300 V AC/DC across each output and all other circuits as well as across power supply and all other circuits.
For applications with high working voltages, you should ensure there is sufficient spacing or isolation from neighboring devices and protection against electric shocks.

2) Additional error in live-zero operation (mode selector position 2 and 3) 20 µA

3) Average TC, reference temperature 23 °C; additional error in live-zero operation (mode selector position 2 and 3) 1 µA/K

IsoAmp® EK 30/31

Specifications (continued)

Standards and approvals

EMC	European EMC regulations; according to 89/336/EEC directive, EN 61326; NAMUR NE 21
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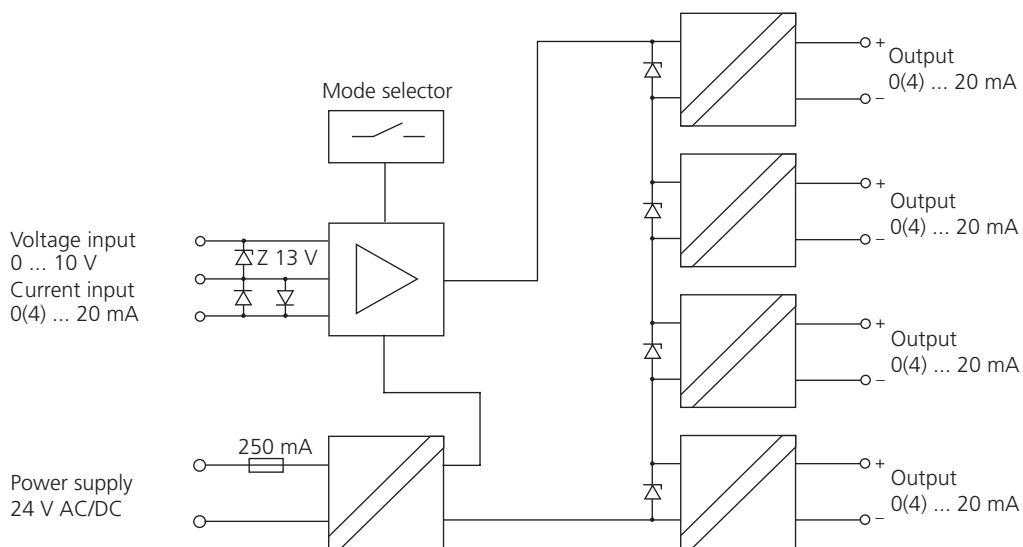
Other data

MTBF ⁴⁾	Approx. 144 years/channel
Ambient temperature	Operation: -10 ... +70 °C Transport and storage: -30 ... +80 °C
Design	Eurocard, 4 TE, see also dimension drawing
Pin connector	Type F according to DIN 41612, see also dimension drawings
Socket connector	Type F according to DIN 41612 (included in package contents), see also dimension drawings
Weight	With 2 channels approx. 170 g, with 3 channels approx. 185 g, with 4 channels approx. 200 g

4) Mean Time Between Failures – MTBF – according to EN 61709 (SN 29500).

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

■ Block Diagram



Standard-Signal Multipliers

Isolation Amplifiers
Transmitters

Indicators

Process Analytics

Portable Meters

Laboratory Meters

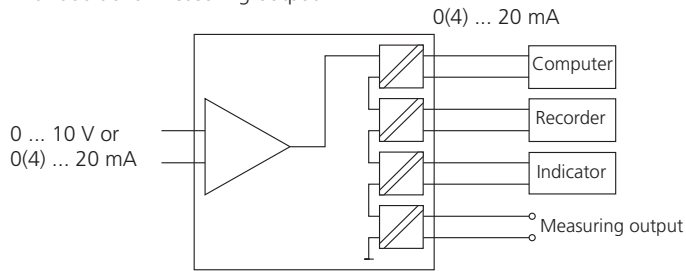
Sensors

Fittings

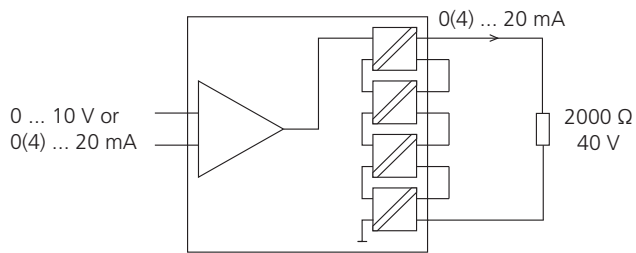
Knick >

■ Application Examples

Galvanically isolated actuation of computer, recorder, and indicator with additional measuring output

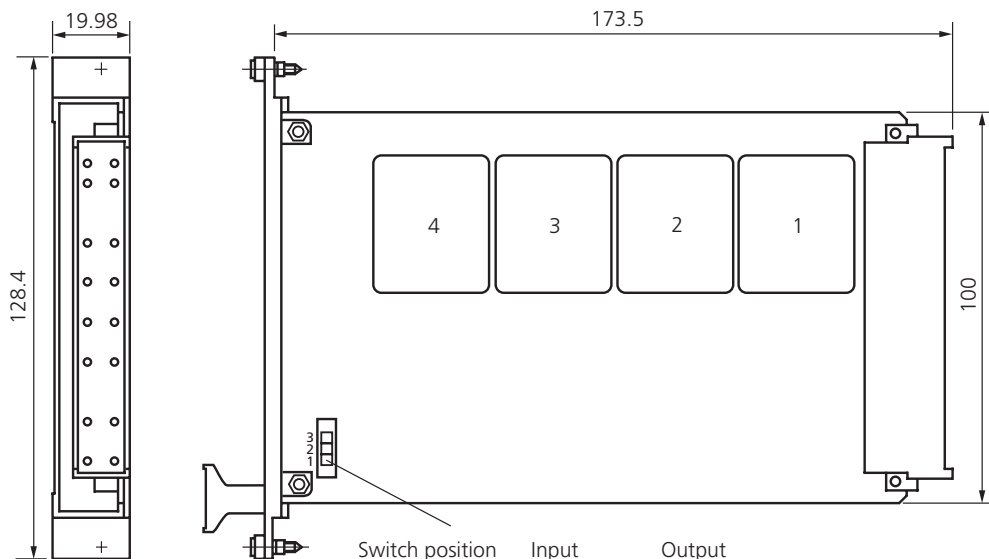


Series connection for increasing the load voltage



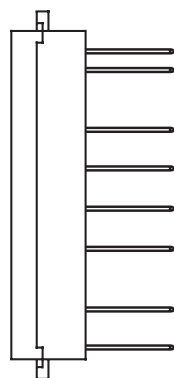
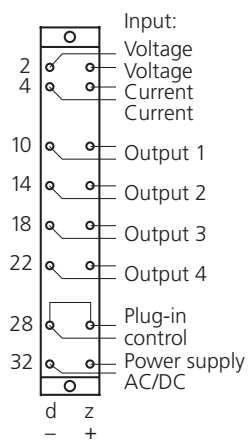
IsoAmp® EK 30/31

■ Dimension Drawings and Pin Assignments



Front panel
Opt. 301

Switch position	Input	Output
1	0 – 10 V 0 – 20 mA	0 – 20 mA
2	0 – 10 V 0 – 20 mA	4 – 20 mA
3	4 – 20 mA	0 – 20 mA



Plug-in connection: Type F according to DIN 41612

Front panel Opt. 301: INTERMAS SP/K3-n04T, plastic, gray

Installation, commissioning, and maintenance may only be carried out by trained personnel!

All dimensions in mm!

Knick >

IsoTrans® 41



For isolation of 0(4) ... 20 mA standard signals in 19" format without a power supply.

The Task

Galvanic isolation of measurement signals using 19" technology, cost cutting by means of minimum cabling in series production

The Problems

The application possibilities for loop-powered isolators are mainly defined by the following critical data:

- Voltage drop
- Operating current
- Accuracy
- Load voltage
- Signal delay
- Isolation voltage
- Dimensions

The Solution

Knick's IsoTrans® 41 isolator has unmatched technical specifications. The isolator draws its power as voltage drop from the measured signal without influencing it noticeably. This saves on supply units and cabling and increases the reliability accordingly.

The Housing

The integration of several modules on a Eurocard means minimum cabling, compact design, and a low price. The full encapsulation guarantees a high level of reliability even in extreme conditions.

The Advantages

The IsoTrans® 41 with a voltage drop of 1.2 V is the 1:1 isolator for all applications where loop-powered isolators are not suitable because of technical problems such as excessive voltage drop.

The Application

- Galvanic isolation
- of input and output circuits
 - of the supply voltage of 2-wire transmitters
 - in the case of addition or other coupling of signals at different potentials
 - for removal of double ground compensation currents
 - in the case of insufficient insulation and test voltage
 - of high-potential signal sources
 - for battery-powered devices with a central battery

The Technology

Knick's IsoTrans® 41 DC isolators with transformer isolation have specifications well beyond any other loop-powered isolators. They feature a chopper generator connected in series in the current path and current conversion which gradually changes from sine to square wave over the measuring range. This avoids the accuracy-reducing power losses of normal parallel connected generators, reduces the voltage drop considerably and also ensures accurate transmission of the smallest currents.

Warranty
5 years!

Defects occurring within 5 years from delivery are remedied free of charge at our works (carriage and insurance paid by sender).

Loop-Powered Isolators for Standard Signals

Isolation Amplifiers
Transmitters

Indicators

Process Analytics

Portable Meters

Laboratory Meters

Sensors

Fittings



Knick >

■ The Facts

Lower costs due to multi-channel design

Eurocard with up to 8 channels

Minimum loading

Voltage drop from 1.2 V, current transmission from 2 μ A to 50 mA

Good signal transmission

Low signal delay

No power supply required

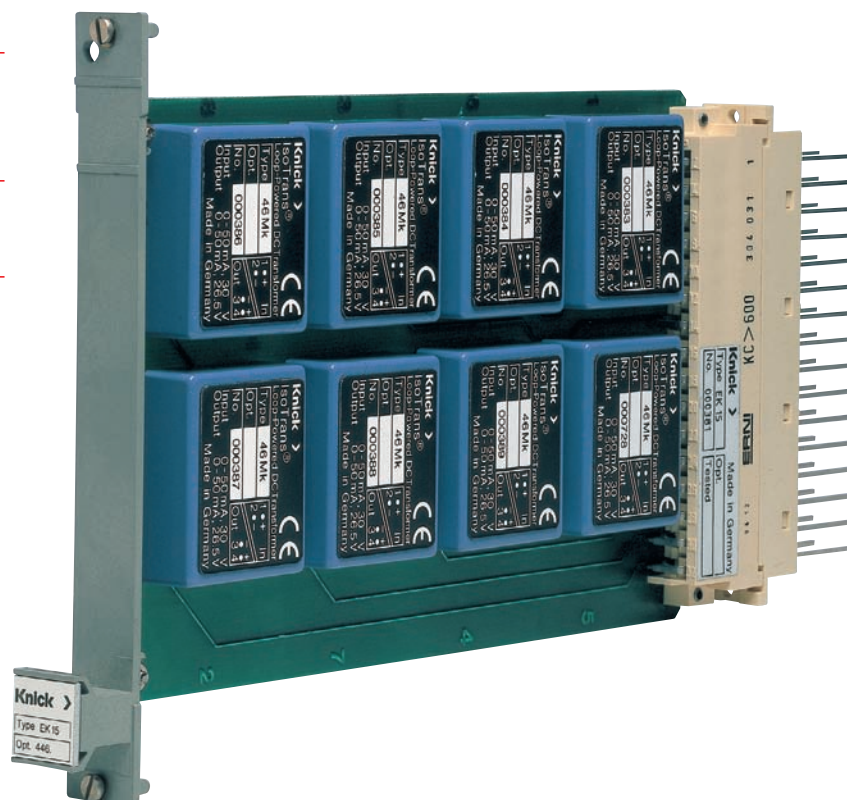
Cost saving due to lower wiring effort, no mains influences

Maximum reliability

No repair and failure costs

Extremely high accuracy

5-year warranty



Eurocards

IsoTrans® 41

■ Product Line

Devices		Order No.
IsoTrans® 41 Eurocards	For up to 8 channels	EK 15-41Mi... ¹⁾
Power supply	None, supply from input signal	
Options	INTERMAS SP/K3-n04T front panel, plastic, gray, width 20 mm	301

1) Please indicate the required channel number when ordering. Model EK 5 -... is still available for replacement purposes.

■ Specifications

Input data

Input	0 ... 20 mA 0 ... 50 mA
Operating current	< 2 μ A
Configuration	Max. 8 modules
Voltage drop	Approx. 1.2 V (20 mA) Approx. 1.6 V (50 mA)
Overload	100 mA, 20 V

Output data

Output	0 ... 20 mA/max. 15 V (corresponds to 750 ohms load) 0 ... 50 mA/max. 15 V (corresponds to 300 ohms load)
Offset	< 5 μ A
Residual ripple ²⁾	< 1.5 mV _{pp} /mA

Transmission behavior

Transformation error ³⁾	0.02 % meas. val.
Load error	< 0.02 % measured value per 100 ohms
Rise or fall time	Approx. 2.5 ms at 500 ohms load resistance

2) Slightly increased residual ripple can occur with 5 ohms load

3) Temperature range -10 ... +70 °C

Loop-Powered Isolators for Standard Signals

Isolation Amplifiers
Transmitters

Indicators

Process Analytics

Portable Meters

Laboratory Meters

Sensors

Fittings

Knick 

Specifications (continued)

Isolation

Test voltage	2.5 kV AC
Working voltage (basic insulation)	<p>≤ 4 channels: 500 V DC with overvoltage category II and pollution degree 2</p> <p>≥ 5 channels: 500 V DC with overvoltage category II and pollution degree 1 according to EN 61010-1.</p> <p>For applications with high working voltages, you should ensure there is sufficient spacing or isolation from neighboring devices and protection against electric shocks.</p>

Standards and approvals

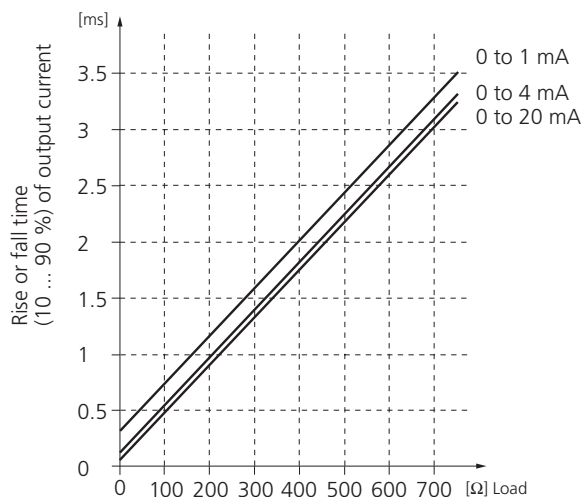
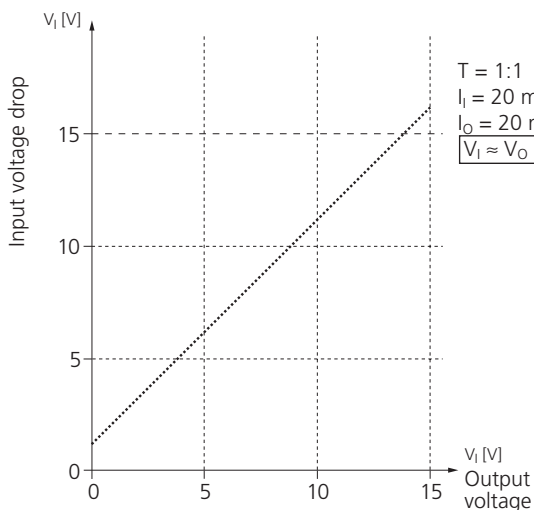
Surge withstand	5 kV, 1.2/50 μs according to IEC 255-4
Immunity to interference	8 kV according to IEC 801-2

Other data

Ambient temperature	-25 ... +80 °C
Design	Eurocard 4 TE
Pin connector	Type F according to DIN 41612, see also dimension drawings
Socket connector ⁴⁾	Type F according to DIN 41612 (wire-wrap connection), see also dimension drawings
Weight	Approx. 40 g per channel

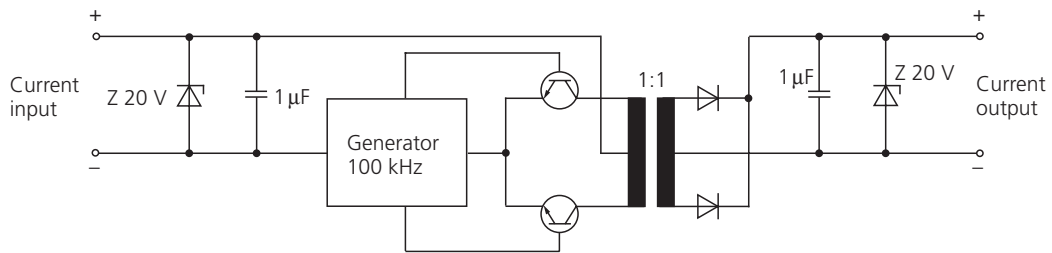
4) Included in package contents.

Transfer Functions



IsoTrans® 41

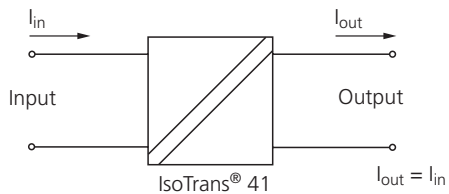
■ Block Diagram



■ Application Examples

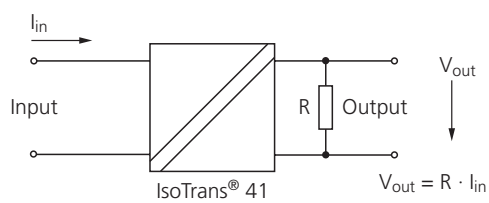
Electrical isolation

with impressed current, current output



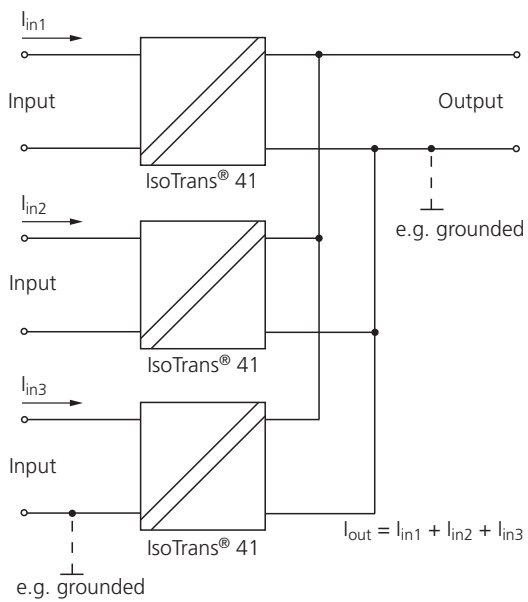
Electrical isolation

with impressed output current, voltage output



Electrical isolation

for current addition with impressed currents



Loop-Powered Isolators for Standard Signals

Isolation Amplifiers
Transmitters

Indicators

Process Analytics

Portable Meters

Laboratory Meters

Sensors

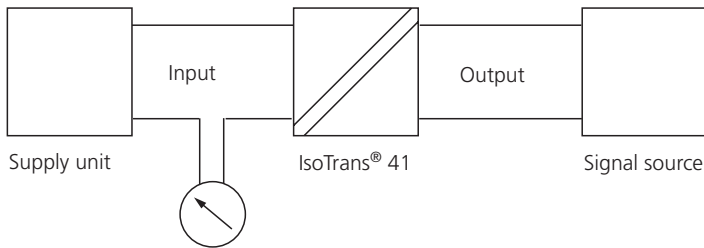
Fittings

Knick >

Application Examples (continued)

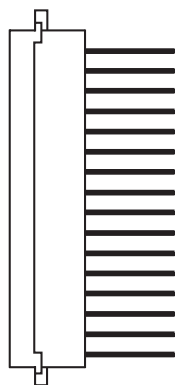
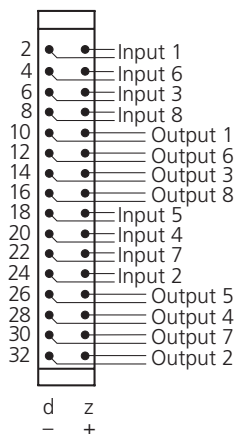
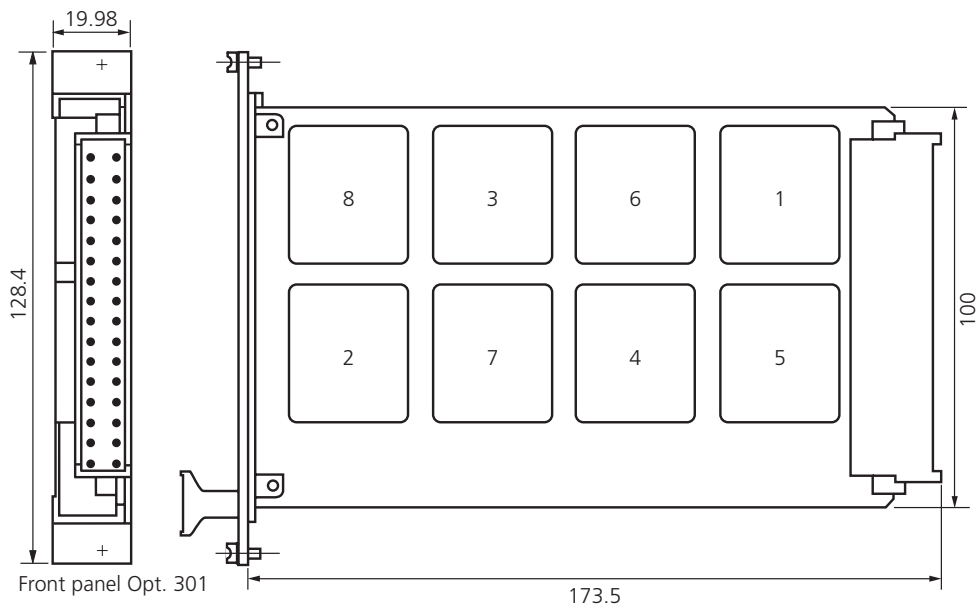
Electrical isolation

in two-wire configuration



Dimension Drawings and Pin Assignments

For EK 15 Eurocard



Plug-in connection
Front panel Opt. 301

Type F acc. to DIN 41612
INTERMAS SP/K3-n04 T,
plastic, gray

All dimensions in mm!

Eurocards

Knick >

IsoTrans® 46

For isolation of 0 ... 20 mA standard signals.

The IsoTrans® 46 complements Knick's loop-powered isolators to a competitively priced, compact series.

The Task

The IsoTrans® 46 isolates 0 ... 20 mA standard current signals avoiding parasitic voltages or currents and eliminating grounding problems. It is optionally available with safe isolation to EN 61140.

The Technology

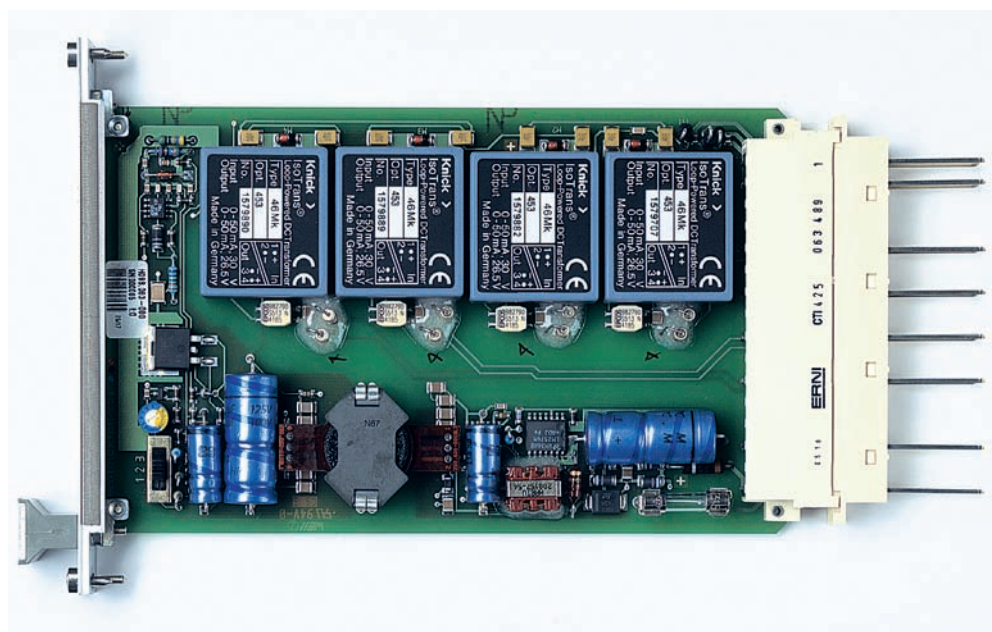
The IsoTrans® 46 draws its power as voltage drop directly from the measurement signal. This saves on the costs for power supplies and cabling and increases reliability.

The Mounting Height

The low height allows use of up to 8 channels on a Eurocard with just 3 TE front plate. This means 224 channels can be accommodated in a 19" rack.

Warranty
5 years!

Defects occurring within 5 years from delivery are remedied free of charge at our works (carriage and insurance paid by sender).



Loop-Powered Isolators for Standard Signals

Isolation Amplifiers
Transmitters

Indicators

Process Analytics

Portable Meters

Laboratory Meters

Sensors

Fittings



Knick >

■ The Facts

No mains supply required

Cost saving due to lower wiring effort, no mains influences

Low power loss

No unnecessary heating in enclosure

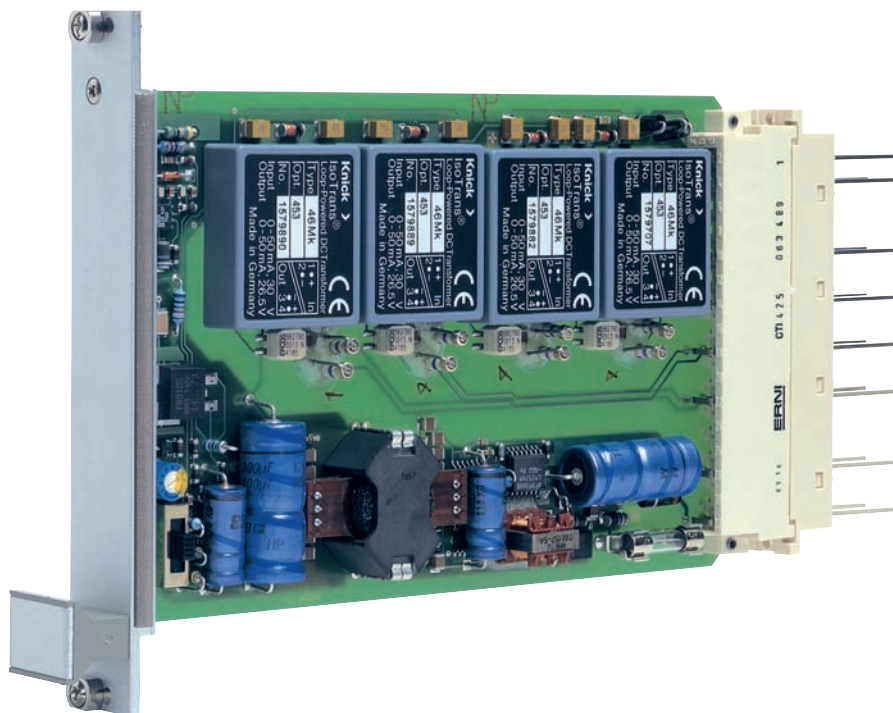
Safe Isolation according to EN 61140

Protection of maintenance staff and subsequent devices against non-permitted high voltages

Maximum reliability

No maintenance work, therefore the related costs are not incurred

5-year warranty



Eurocards

IsoTrans® 46

■ Product Line

Devices		Order No.
IsoTrans® 46 Eurocards	For up to 8 channels	EK 15–46Mk/... ¹⁾
Power supply		
None, supply from input signal		
Options		
INTERMAS SP/K3-n03T front panel, plastic, gray, width 15 mm, for EK 15 Eurocard, mounted		446
Safe Isolation to EN 61140		453

1) Please indicate the required module number when ordering.

■ Specifications

Input data

Input	0 ... 20 mA ²⁾
Operating current	< 20 µA
Configuration	Up to 8 channels
Overload	100 mA, 30 V
Voltage drop	Approx. 2.5 V ³⁾

Output data

Output	0 ... 20 mA, max. 27.5 V (corresponds to 1375 ohms load)
Load error	< 0.02 % meas. val./100 ohms
Residual ripple	< 5 mV

Transmission behavior

Transmission error	< 0.1 % full scale
Rise and fall time	Approx. 5 ms at 500 ohms load
Temperature coefficient ⁴⁾	0.002 %/K of meas. val. per 100 ohms load

Isolation

Test voltage	510 V AC 4 kV AC with Option 453
--------------	-------------------------------------

2) Linear transmission up to 50 mA 3) Approx. 3.5 V at 50 mA
4) Average TC, reference temperature 23 °C

Loop-Powered Isolators for Standard Signals

Isolation Amplifiers
Transmitters

Indicators

Process Analytics

Portable Meters

Laboratory Meters

Sensors

Fittings

Knick 

Specifications (continued)

Isolation (continued)

Working voltages
(basic insulation)

According to EN 61010-1

Type EK15

Overvoltage category /
Permitted pollution degree

Permitted
working voltage

Input against output
of the same channel

I / degree 4
II / degree 4
III / degree 4

150 V AC/DC
100 V AC/DC
50 V AC/DC

With ≤ 4 channels
Inputs/outputs against inputs or
outputs of external channels

III / degree 2
IV / degree 3

600 V AC/DC
300 V AC/DC

With ≥ 5 channels
Inputs/outputs against inputs or
outputs of external channels

II / degree 2
III / degree 2

600 V AC/DC
300 V

Permitted working voltages for modules with safe isolation (opt. 453) and other overvoltage categories and pollution degrees on request.

For applications with high working voltages, you should ensure there is sufficient spacing or isolation from neighboring devices and protection against electric shocks.

Protection against
electric shock (Opt. 453)

Safe Isolation according to EN 61140 by reinforced insulation in accordance with EN 61010-1.

For applications with high working voltages, you should ensure there is sufficient spacing or isolation from neighboring devices and protection against electric shocks.

Standards and approvals

Surge withstand
according to IEC 255-4

5 kV 1.2/50 μ s (only with Option 453)

Surge withstand
according to EN 61010-1

850 V
> 6 kV with Option 453

EMC⁵⁾

NAMUR NE 21, European EMC regulations

Other data

Ambient temperature

Operation: $-10 \dots +70 \text{ }^\circ\text{C}$
Transport and storage: $-30 \dots +80 \text{ }^\circ\text{C}$

Design

Eurocard 3 TE

Pin connector

Type F according to DIN 41612, see also dimension drawings

Socket connector

Type F according to DIN 41612, wire-wrap connection (included in package contents), see also dimension drawings

Front plate (opt. 446)

INTERMAS, SP / K3-n03T, plastic, gray, see also dimension drawings

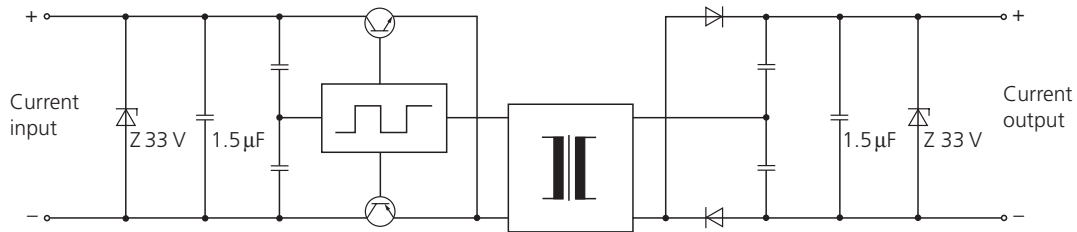
Weight

Approx. 13 g per channel

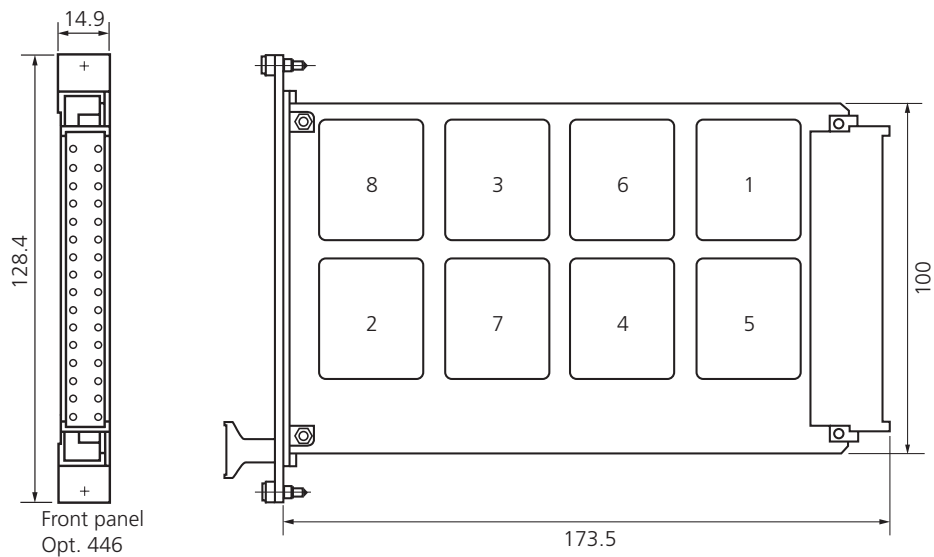
5) Valid for 4 ... 20 mA, slight deviations possible during interference.

IsoTrans® 46

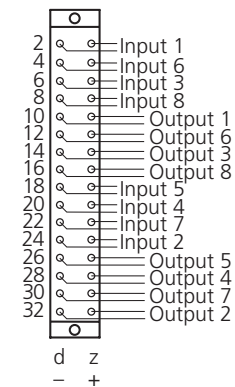
■ Block Diagram



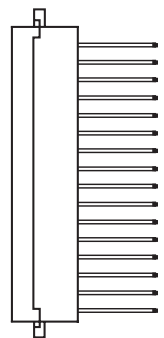
■ Dimension Drawings and Pin Assignments



Front panel
Opt. 446



d z
- +



Plug-in connection
Front panel Opt. 446

Type F acc. to DIN 41612
INTERMAS SP/K3-n3 T,
plastic, gray

All dimensions in mm!

Modules

Page

Universal Isolation Amplifiers	IsoAmp® 110000/12000	314
Isolation Amplifiers for Standard Signals	IsoAmp® 3000/4000	320
Loop-Powered Isolators for Standard Signals	IsoTrans® 41	328
	IsoTrans® 46	334



Modules

Knick >

IsoAmp® 11000/12000



The universal isolator.

The Models

Knick's IsoAmp® 11000/12000 series features a tried and tested range of powerful DC isolation amplifiers that have excellent specifications despite their small dimensions and have a symmetrical input with high common mode rejection.

The Problems

When conventional unsymmetrical isolation amplifiers are used, measurement signal interferences can occur that seem inexplicable to the user at first. If, for example, there are several devices in a current output loop, an isolation amplifier can meet a LO output with its HI input which can cause the above-mentioned signal interferences.

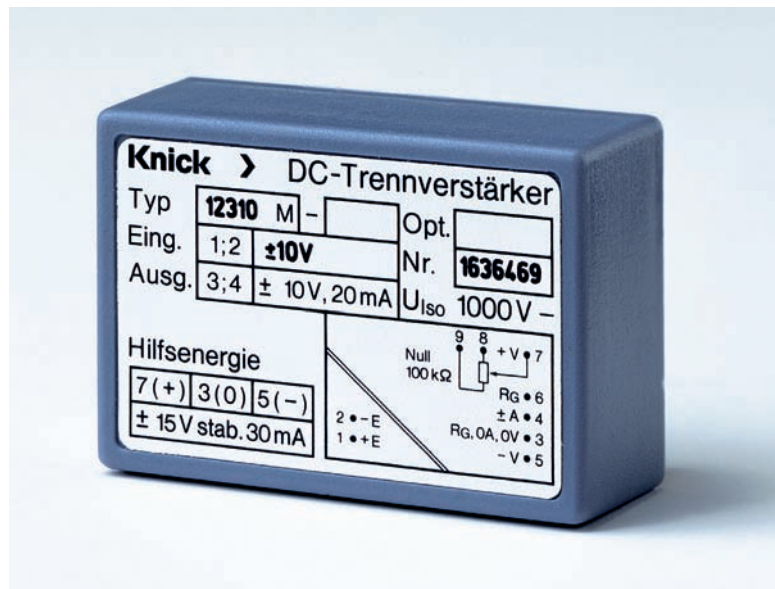
The Inputs

On the Knick IsoAmp® 11000/12000 DC isolation amplifiers, the input is symmetrical, i. e. both input terminals can be exchanged without undesired effects on the common mode rejection.

Models with connections for external gain setting, nulling, and live-zero switching (0 ... 20 mA / 4 ... 20 mA) are available for special tasks.

The Applications

The isolation amplifiers allow problem-free use, particularly for applications where small dimensions are required in conjunction with high isolation voltage, high accuracy, and maximum reliability.



Universal Isolation Amplifiers

Isolation Amplifiers
Transmitters

Indicators

Process Analytics

Portable Meters

Laboratory Meters

Sensors

Fittings



Knick >

■ The Facts

Symmetrical input with high common mode rejection

Excellent specifications

High isolation voltage

High output power

Optional external gain adjustment
with just one resistor

Live-zero switching
(0 ... 20 mA / 4 ... 20 mA)

Complete modules without external wiring

Miniature flat design for pcb mounting

High quality and reliability

100 % computer-aided production control and final inspection

5-year warranty

**Warranty
5 years!**

Defects occurring within 5 years from delivery are remedied free of charge at our works (carriage and insurance paid by sender).

Knick > DC-Trennverstärker

Typ	11310 M -	Opt.	
Eing.	1;2 ±10V	Nr.	1613541
Ausg.	4 ± 20 mA, 10V	U _{ISO}	1000V -
Ausg.	4' 4...20mA	Ausg. 0 an 0V Hilfsenergiequelle anschließen Null 100 kΩ +V • 7 RG • 6 RG .DZ ± A • 4 (Opt.173)LZ + A • 4' -V • 5 2 • -E 1 • +E	
Hilfsenergie	7 (+) 5 (-)		
	0mA		

Knick > DC-Trennverstärker

Typ	12310 M -	Opt.	
Eing.	1;2 ±10V	Nr.	1636469
Ausg.	3;4 ± 10V, 20mA	U _{ISO}	1000V -
Hilfsenergie	7 (+) 3 (0) 5 (-)	Null 100 kΩ +V • 7 RG • 6 ± A • 4 RG, 0A, 0V • 3 -V • 5 2 • -E 1 • +E	
	± 15V stab. 30mA		

Modules

IsoAmp® 11000/12000

■ Product Line

Devices	Symmetrical input	Impressed output	Load capability	Order No.
IsoAmp® 11000/12000 Free wiring	up to ± 500 mV Depending on wiring	±20 mA	10 V ¹⁾	11001 M
	up to ± 500 mV Depending on wiring	±10 V ¹⁾	20 mA	12001 M
IsoAmp® 11000/12000 Fixed settings	±20 mV	±20 mA	10 V ¹⁾	11202 M
	±60 mV			11206 M
	±150 mV			11215 M
	±500 mV			11250 M
	±10 V			11310 M
	±20 mA	11820 M		
	±20 mV	±10 V	20 mA	12202 M
	±60 mV			12206 M
	±150 mV			12215 M
	±500 mV			12250 M
±10 V	12310 M			
±20 mA	12820 M			

Power supply

15 V DC

Option

Output ±0 ... 20 mA and +4 ... 20 mA, selectable (at live-zero: unipolar input, additional error ±10 µA)	173
Gain error < 0.1 % measured value (not for Model 11202)	04

1) ±10 V or 20 V unipolar (note power supply!)

■ Specifications

Input data

Input	See Product Line
Input resistance	> 1 Mohm, for models with $I_{in} \pm 20$ mA: 7.5 ohms
Overload	$V_{in} \leq 25$ V, $I_{in} \leq 300$ mA

Universal Isolation Amplifiers

Isolation Amplifiers
Transmitters

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Process Analytics

Portable Meters

Laboratory Meters

Sensors

Fittings

Knick 

Specifications (continued)

Output data

Output	See Product Line
Offset current ³⁾	< 50 nA
Offset voltage ³⁾	< 500 μ V, external nulling
Drift	< 5 μ V/month
Residual ripple	\leq 10 mV _{pp}

Transmission behavior

Gain error	< 0.2% meas. val., Option 04: 0.1% meas. val.
Cutoff frequency ²⁾	> 1.5 ... 5 kHz -3 dB (20 mV ... 500 mV or 10 V); different values on request
Temperature coefficient ^{3) 4)}	< 1 nA/K, < 2 μ V/K (reference temperature 23 °C)

Power supply

Power supply	\pm 14.5 ... 15.5 V DC, stabilized, approx. 30 mA for unipolar operation up to 20 V output voltage: -5, +25 V, stabilized
--------------	--

Isolation

Galvanic isolation	3-port isolation between input, output and power supply
Test voltage	4 kV AC across input and output / power supply
Working voltages (basic insulation)	1000 V DC with overvoltage category II and pollution degree 3 according to EN 61010-1 For applications with high working voltages, you should ensure there is sufficient spacing or isolation from neighboring devices and protection against electric shocks.

Standards and approvals

EMC	European EMC regulations, according to directive 89/336/EEC
-----	---

Other data

Ambient temperature	-10 ... +70 °C
Design	Module, encapsulated, see dimension drawings for measurements
Weight	Approx. 45 g

2) Current output up to 250 ohms load, models 11310 and 12310 up to 10 V_{pp}

3) x 10 for models 11310, 12310

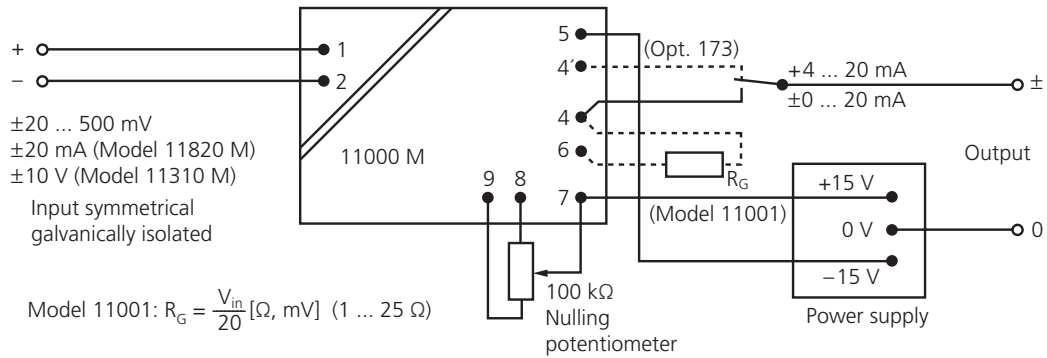
4) Offset set to zero

Modules

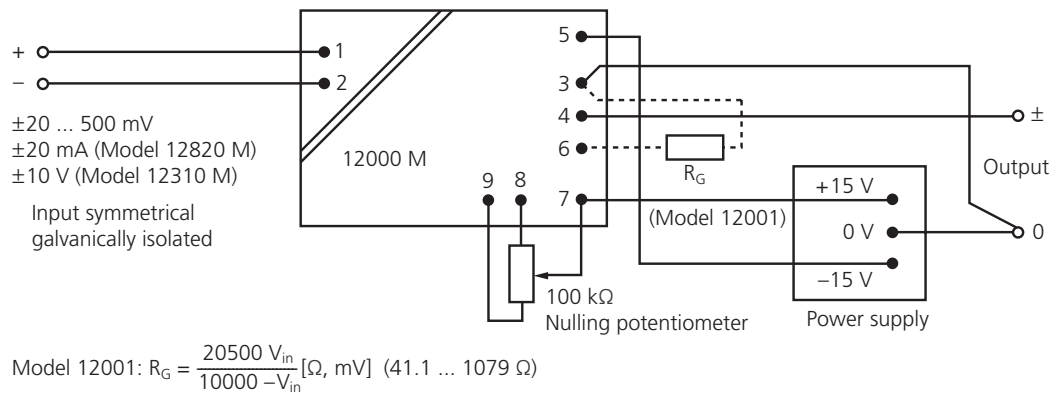
IsoAmp® 11000/12000

■ Connection Diagrams

11000 M Connection Diagram



12000 M Connection Diagram



Universal Isolation Amplifiers

Isolation Amplifiers
Transmitters

Indicators

Process Analytics

Portable Meters

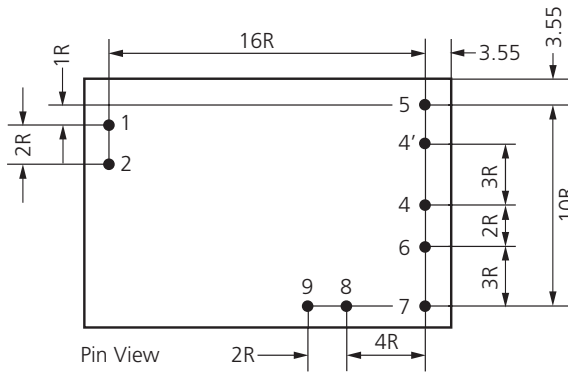
Laboratory Meters



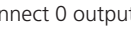
Sensors

Fittings

Knick 

■ Dimension Drawings and Pin Assignments






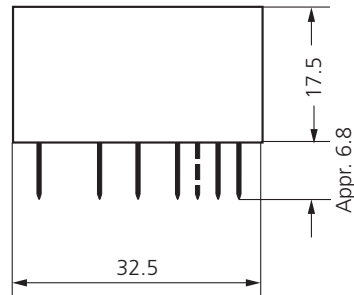
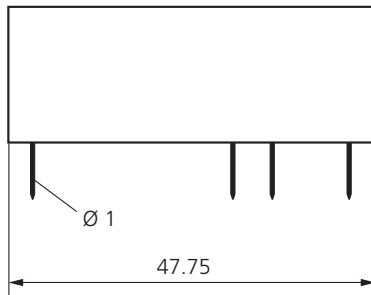
- 1 Input +
- 2 Input -
- 4 Output $\pm 0 \dots 20 \text{ mA}$, R_G
- 4 Output $+ 4 \dots 20 \text{ mA}$ (Opt. 173)
- 5 Power supply -
- 6 R_G (Model 11 001)
- 7  Nulling potentiometer Power supply +
- 8  100 k Ω
- 9  100 k Ω

Connect 0 output to 0 V power supply



R = Spacing = 2.54
Pin View

- 1 Input +
- 2 Input -
- 3 Output 0, Power supply 0 V, R_G
- 4 Output \pm
- 5 Power supply -
- 6 R_G (Model 12 001)
- 7  Nulling potentiometer Power supply +
- 8  100 k Ω
- 9  100 k Ω



All dimensions in mm!

Knick >

For transmission and conversion of impressed signals.

IsoAmp® 3000/4000



The DC isolation amplifiers of the IsoAmp® 3000/4000 series transmit and convert impressed 0(4) ... 20 mA or 0 ... 10 V standard signals according to our German patent DBP 34 12 843 with a high level of accuracy.

They provide Safe Isolation and high insulation from input to output to power supply.

The Advantages

The control range extends into the negative values and allows strict linear transmission in the zero range. Compared with conventional unipolar amplifiers, this has a great advantage: The often asymptotic setting of the zero point, for example, when calibrating with a sensor, is ruled out.

The transmission error is unusually low. The reason for this is mainly a negative feedback circuit that is incorporated in the electrical isolation. It has no sensing resistor with 1:1 transmission and just one sensing resistor for current/voltage conversion. Differentiated signal return allows the circuit to remain stable even with strong complex loads.

The components required in conventional concepts for matching amplifiers and resistor networks are omitted. The reliability is accordingly high.

The computer-aided production control and final inspection ensure high and constant quality. The full encapsulation guarantees maximum safety and reliability even in extreme conditions.

The Applications

The devices can be used for many galvanic isolation applications, for example:

- in measuring and control engineering
- for linking measurement signals to different potentials
- for removal of double ground compensation currents
- for isolation of dangerous touch voltages
- for computer interfacing
- for increase of load voltage and decoupled signal transmission

The DC isolation amplifier is available as a module for universal 24 V AC/DC current supply for use on printed circuit boards.

For Safe Isolation according to EN 61140, the required clearance and creepage distances should be taken into consideration.

The Models

IsoAmp® 3820

transforms the input current 1:1 into an impressed output current without negative feedback resistors by means of negative-feedback current transformation.

IsoAmp® 4820

converts the input current 2:1 into an impressed output voltage with just one precision resistor after current transformation.

IsoAmp® 3310

converts the input voltage 3:1 into an impressed output current with just one precision resistor after voltage transformation.

IsoAmp® 4310

converts the input voltage 1:1 into an impressed output voltage without negative-feedback resistors after voltage transformation.

Isolation Amplifiers for Standard Signals

Isolation Amplifiers
Transmitters

Indicators

Process Analytics

Portable Meters

Laboratory Meters

Sensors

Fittings



Knick >

■ The Facts

Safe Isolation according to EN 61140

Protection of maintenance staff and subsequent devices against non-permitted high voltages

3-port isolation

Protection against incorrect measurements or damage to the equipment due to parasitic voltages

Decoupled

No load effect on the signal source

Maximum reliability

No maintenance work, therefore the related costs are not incurred

Full encapsulation

Reliable functioning also in aggressive atmospheres or with considerable mechanical loading, for example, due to vibrations

High accuracy

No distortion of measurement signal

Simple live zero/dead zero switching option

Multiple application possibilities due to optional switching of input or output 0 ... 20 mA, 4 ... 20 mA

5-year warranty

Warranty
5 years!

Defects occurring within 5 years from delivery are remedied free of charge at our works (carriage and insurance paid by sender).



IsoAmp® 3000/4000

■ Product Line

Devices	Order No.
IsoAmp® 3000/4000 Input: 0 ... 20 mA, output: 0 ... 20 mA Input: 0 ... 20 mA, output: 0 ... 10 V	3820 Mh 4820 Mh
IsoAmp® 3000/4000 Input: 0 ... 10 V, output: 0 ... 20 mA Input: 0 ... 10 V, output: 0 ... 10 V	3310 Mg 4310 Mg
Power supply	
24 V AC/DC	
Options	
Input 0 ... 20 mA or 4 ... 20 mA, switchable	250 ¹⁾
Output 0 ... 20 mA or 4 ... 20 mA, switchable	251 ¹⁾
Accessories	
Inspection Certificate 3.1 B according to EN 10204	ZU 0267
Inspection Certificate 3.1 B according to EN 10204, with description and results from inspections	ZU 0268

1) Options 250 and 251 cannot be combined; additional error at output: ±10 µA, with Model 4820: ±10 mV

■ Selection Aid

Input		Output		
		0 ... 20 mA	0 ... 20 mA/ 4 ... 20 mA ²⁾	0 ... 10 V
Input	0 ... 20 mA	3820 Mh	3820 Mh Opt. 251	4820 Mh
	0 / 4 ... 20 mA ²⁾	3820 Mh Opt. 250	3820 Mh ³⁾	4820 Mh Opt. 250
	0 ... 10 V	3310 Mg	3310 Mg opt. 251	4310 Mg

2) Switchable

3) 1:1 transmission

Isolation Amplifiers for Standard Signals

Isolation Amplifiers
Transmitters

Indicators

Process Analytics

Portable Meters

Laboratory Meters

Sensors

Fittings

Knick 

■ Specifications

Input data	3820 Mh	4820 Mh	3310 Mg	4310 Mg
Input ¹⁾	0 ... 20 mA impressed current Option 250: 0/4 ... 20 mA, switchable ²⁾		0 ... 10 V	
Input resistance	–		> 5 Mohms	> 2 Mohms
Input voltage drop	Approx. 100 mV With open output: approx. 750 mV Upon power failure: approx. 750 mV	Approx. 150 mV Upon power failure: approx. 750 mV	–	
Offset current ³⁾	–		< 500 nA ± 10 nA/K	< 1 µA ± 10 nA/K
Overload	≤ 300 mA Limited to 750 mV by diode		≤ 100 mA Limited to 13 V by suppressor diode	
Output data	3820 Mh	4820 Mh	3310 Mg	4310 Mg
Output ¹⁾	0 ... 20 mA, 14 V ⁴⁾ Option 251: 0/4 ... 20 mA selectable ²⁾	0 ... 10 V, 10 mA	0 ... 20 mA, 10 V Option 251: 0/4 ... 20 mA selectable ²⁾	0 ... 10 V, 20 mA
Offset	< 2 µA	< 2 mV	< 5 µA	< 2 mV
Residual ripple	< 10 mV _{pp}			
Transmission error	0.01 % meas. val.	0.1 % meas. val.	0.1 % meas. val.	0.02 % meas. val.
Cutoff frequency	5 kHz, –3 dB	10 kHz, –3 dB/ V _{out} ≤ 3 V _{pp} ; 3 kHz, –3 dB/ V _{out} ≤ 10 V _{pp}	10 kHz, –3 dB	10 kHz, –3 dB/ V _{out} ≤ 3 V _{pp} ; 3 kHz, –3 dB/ V _{out} ≤ 10 V _{pp}
Temperature coefficient ³⁾	< 10 nA/K	< 40 µV/K 0.0025 %/K m. val.	< 100 nA/K 0.0025 %/K m. val.	< 40 µV/K
Power supply				
Power supply	24 V AC/DC AC: –15 % +10 %, 48 ... 500 Hz, approx. 1.3 VA DC: –15 % +20%, approx. 0.6 VA			

1) Transmission of negative signals up to approx. –3 % full scale

2) Options 250 and 251 cannot be combined.

3) Reference temperature for TC specifications: 23 °C

4) Options 250 and 251: 12 V

IsoAmp® 3000/4000

Specifications (continued)

Isolation

Galvanic isolation	3-port isolation between input, output and power supply
Test voltage	4 kV AC (input / output / power supply)
Working voltages (basic insulation)	1000 V DC with overvoltage category II and pollution degree 3 according to EN 61010-1. For applications with high working voltages, you should ensure there is sufficient spacing or isolation from neighboring devices and protection against electric shocks.
Protection against electric shock	Safe Isolation according to EN 61140 by reinforced insulation in accordance with EN 61010-1. For applications with high working voltages, you should ensure there is sufficient spacing or isolation from neighboring devices and protection against electric shocks.

Standards and approvals

Surge withstand	5 kV, 1.2/50 µs according to IEC 255-4
EMC	European EMC regulations, 89/336/EEC directive ⁵⁾

Other data

Ambient temperature	Operation: -10 ... +70 °C Transport and storage: -30 ... +80 °C
Design	Height: Mg module (Models 3310/4310): 19 mm, Mh module (Models 3820/4820): 15.9 mm See dimension drawings for further measurements
Weight	Approx. 45 g

⁵⁾ Deviations are possible while there is interference

Isolation Amplifiers for Standard Signals

Isolation Amplifiers
Transmitters

Indicators

Process Analytics

Portable Meters

Laboratory Meters

Sensors

Fittings

Knick 

■ Terminal Assignments for Options 250 and 251

Model	Option	Input *)	Output	Output connection	Jumper (output)
3820	250	0 ... 20 mA	0 ... 20 mA	2 – 4	3 – 4
		4 ... 20 mA	0 ... 20 mA	2 – 4	
3820	251	0 ... 20 mA	0 ... 20 mA	2 – 4	
		0 ... 20 mA	4 ... 20 mA	3 – 4	
4820	250	0 ... 20 mA	0 ... 10 V	2 – 4	3 – 4
		4 ... 20 mA	0 ... 10 V	2 – 4	
3310	251	0 ... 10 V	0 ... 20 mA	2 – 4	
		0 ... 10 V	4 ... 20 mA	3 – 4	

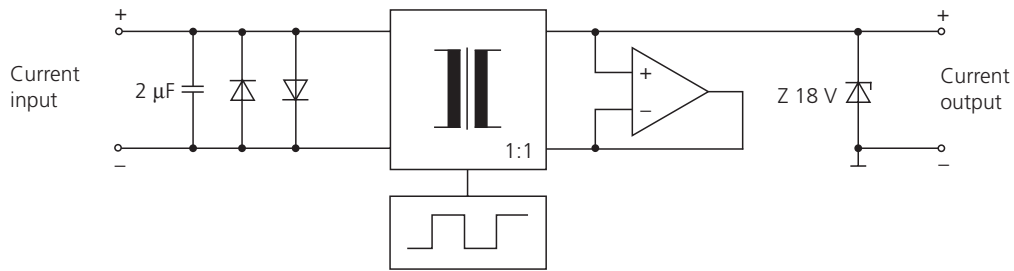
*) See dimension drawing

Modules

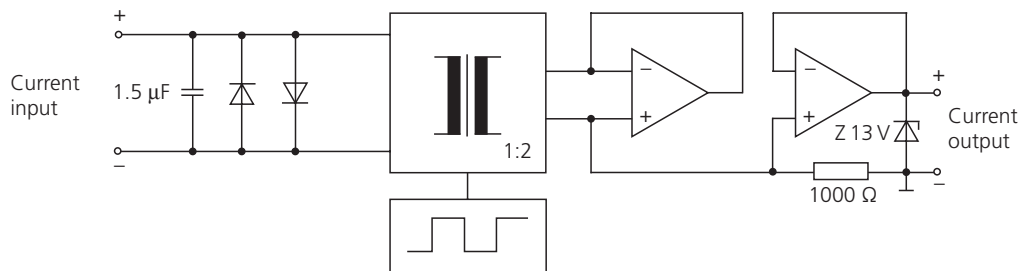
IsoAmp® 3000/4000

■ Block Diagrams

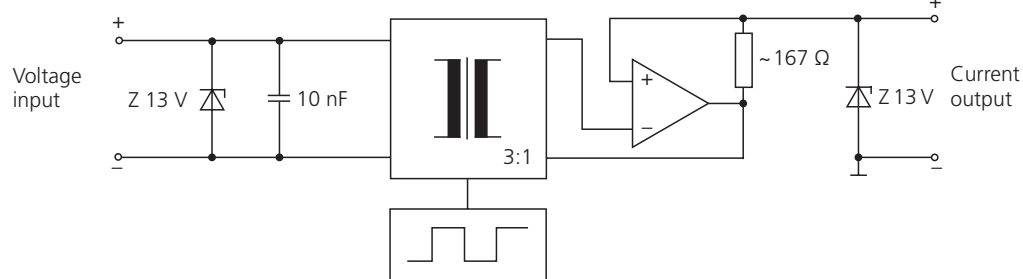
Model 3820



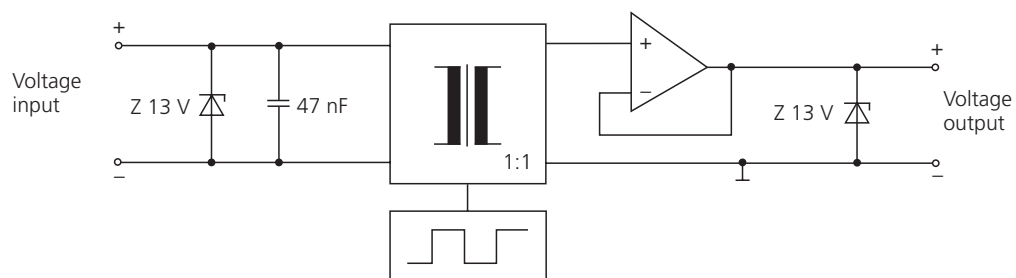
Model 4820



Model 3310



Model 4310



Isolation Amplifiers for Standard Signals

Isolation Amplifiers
Transmitters

Indicators

Process Analytics

Portable Meters

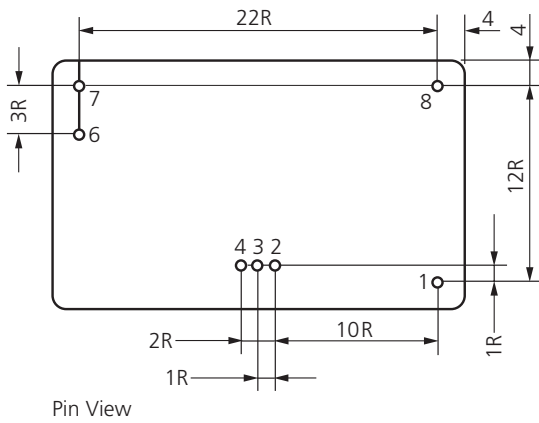
Laboratory Meters

Sensors

Fittings

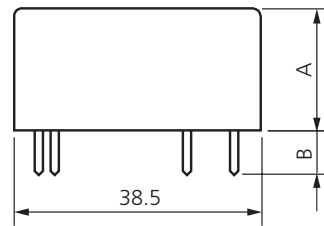
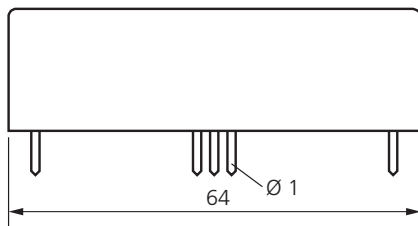
Knick 

■ Dimension Drawings and Pin Assignments



- 1 Power supply +
 - 2 Output +
 - 3 Output +, Jumper
 - 4 Output -, Jumper
 - 6 Input -
 - 7 Input +
 - 8 Power supply -
- R = Spacing = 2.54

	Mg	Mh
A	19	15.9
B	appr. 6.8	appr. 9.8



All dimensions in mm!

Knick >

IsoTrans® 41



**For isolation of
0 ... 20 mA standard signals.**

The Task

Galvanic isolation of measurement signals on circuit boards, cost cutting by means of minimum effort in series production.

The Problems

The application possibilities for loop-powered isolators are mainly defined by the following critical data:

- Voltage drop
- Operating current
- Accuracy
- Load voltage
- Signal delay
- Isolation voltage
- Dimensions

The Solution

Knick's IsoTrans® 41 isolator has unmatched technical specifications. The isolator draws its power as voltage drop from the measured signal without influencing it noticeably. This saves on supply units and cabling and increases the reliability accordingly.

The Housing

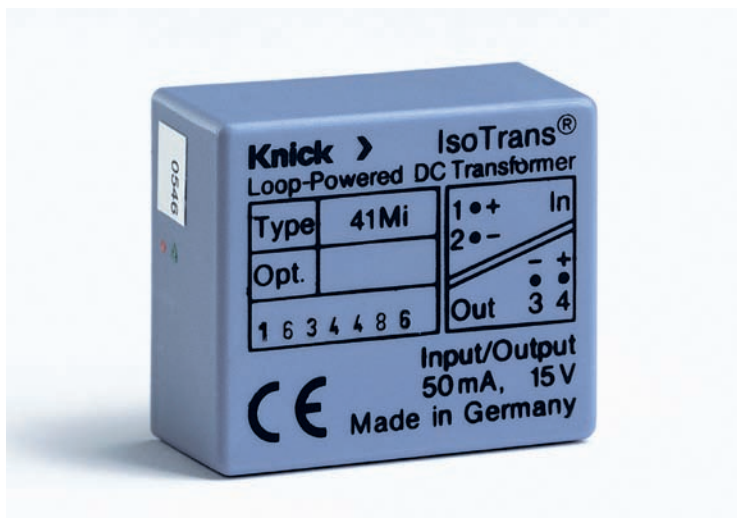
The full encapsulation guarantees maximum reliability even in extreme conditions.

The Advantages

The IsoTrans® 41 with a voltage drop of 1.2 V is the 1:1 isolator for all applications where loop-powered isolators are not suitable because of technical problems such as excessive voltage drop.

The Application

- Galvanic isolation
- of input and output circuits
 - of the supply voltage for 2-wire transmitters
 - in the case of addition or another coupling of signals at different potentials
 - for removal of double ground compensation currents
 - when there is an insufficient insulation and test voltage
 - of high-potential signal sources
 - for battery-powered devices with a central battery



Loop-Powered Isolators for Standard Signals

Isolation Amplifiers
Transmitters

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Portable Meters

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Fittings



Knick >

The Technology

Knicks IsoTrans® 41 isolators with transformer isolation have specifications well beyond any other loop-powered isolators. They feature a chopper generator connected in series in the current path and current conversion which gradually changes from sine to square wave over the measuring range. This avoids the accuracy-reducing current losses of normal parallel connected generators, considerably reduces the voltage drop, and ensures accurate transmission even of the lowest currents.

■ The Facts

Minimum loading

Voltage drop from 1.2 V, current transmission from 2 µA to 50 mA

Good signal transmission

Low signal delay

No power supply required

Cost saving due to lower wiring effort, no mains influences

Maximum reliability

No repair and failure costs

Extremely high accuracy

5-year warranty

Warranty
5 years!

Defects occurring within 5 years from delivery are remedied free of charge at our works (carriage and insurance paid by sender).



IsoTrans® 41

■ Product Line

Devices	Order No.
IsoTrans® 41	41 Mi
Power supply	
None, supply from input signal	

■ Specifications

Input data

Input	0 ... 20 mA 0 ... 50 mA
Operating current	< 2 μ A
Overload	100 mA, 20 V
Voltage drop	Approx. 1.2 V (20 mA) Approx. 1.6 V (50 mA)

Output data

Output	0 ... 20 mA/max. 15 V (corresponds to 750 ohms load) 0 ... 50 mA/max. 15 V (corresponds to 300 ohms load)
Load error	< 0.02 % meas. val. per 100 ohms
Offset	< 5 μ A
Residual ripple ¹⁾	< 1.5 mV _{pp} /mA

Transmission behavior

Transformation error ²⁾	0.02 % meas. val.
Rise or fall time	Approx. 2.5 ms at 500 ohms load resistance

Isolation

Test voltage	2.5 kV AC
Working voltages (basic insulation)	500 V DC with overvoltage category II and pollution degree 4 according to EN 61010-1. For applications with high working voltages, you should ensure there is sufficient spacing or isolation from neighboring devices and protection against electric shocks.

1) Slightly increased residual ripple can occur with 5 ohms load

2) Temperature range -10 ... +70 °C

Loop-Powered Isolators for Standard Signals

Isolation Amplifiers
Transmitters

Indicators

Process Analytics

Portable Meters

Laboratory Meters

Sensors

Fittings

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Specifications (continued)

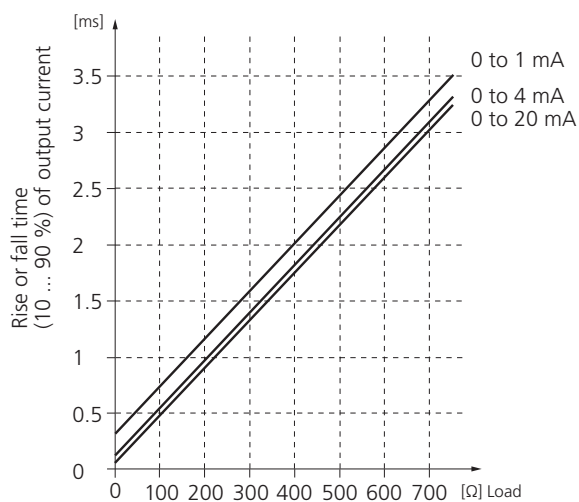
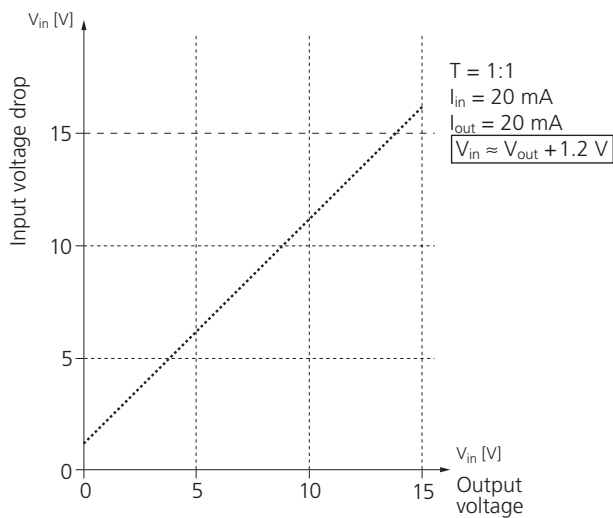
Standards and approvals

Surge withstand	5 kV, 1.2/50 μ s according to IEC 255-4
Immunity to interference	8 kV according to IEC 801-2

Other data

Ambient temperature	-25 ... +80 °C
Design	Mi module, height 16 mm, see also dimension drawings

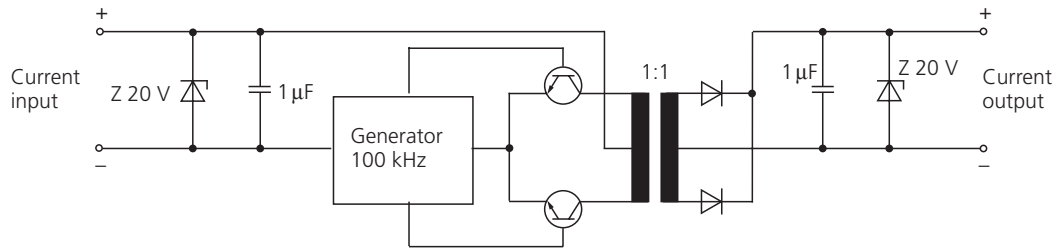
Transfer Functions



Modules

IsoTrans® 41

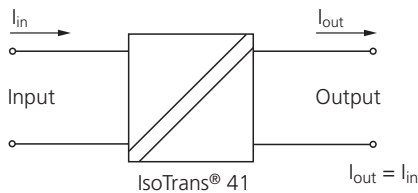
■ Block Diagram



■ Application Examples

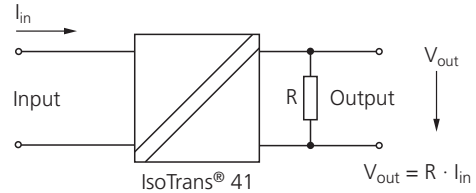
Electrical isolation

with impressed current, current output



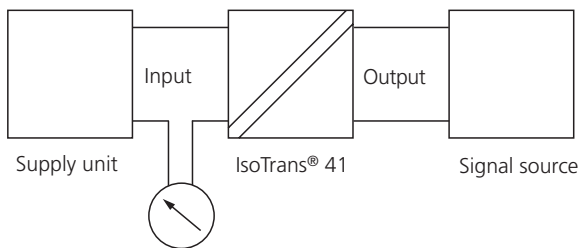
Electrical isolation

with impressed input current, voltage output



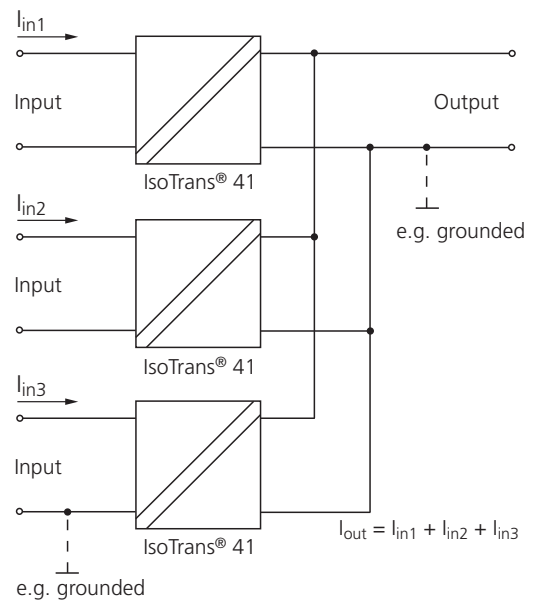
Electrical isolation

in two-wire connection



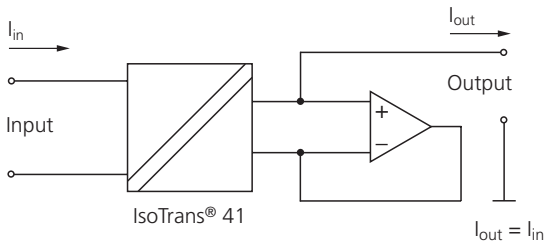
Electrical isolation

for current addition with impressed currents



Electrical isolation

in short-circuit operation, current output with respect to ground



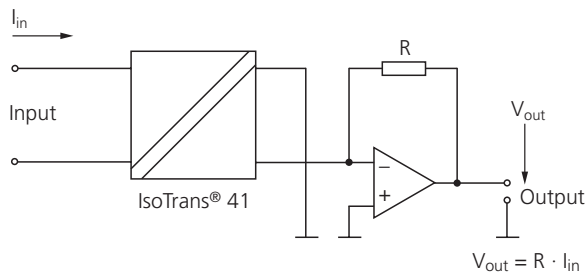
Loop-Powered Isolators for Standard Signals



Application Examples (continued)

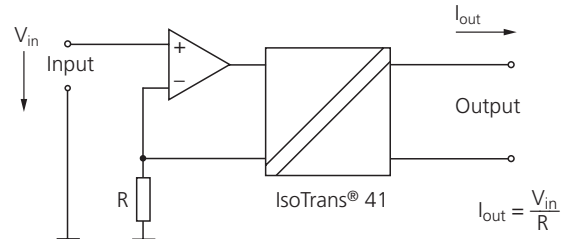
Electrical isolation

with impressed input current and low-resistance voltage output



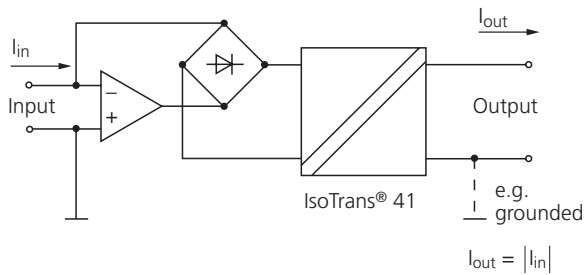
Electrical isolation

with high-resistance voltage input and impressed output current



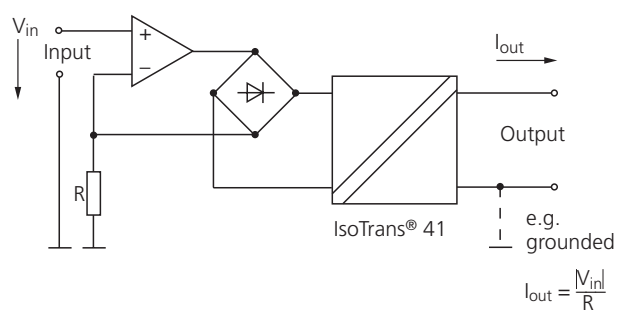
Electrical isolation

with precision full-wave rectification, impressed input and output current

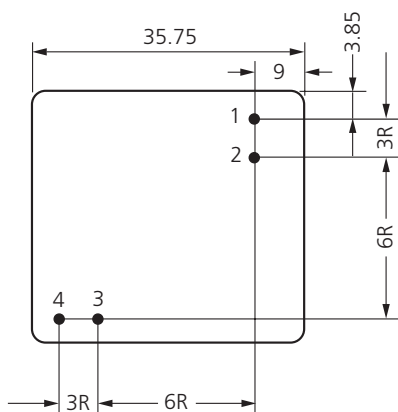


Electrical isolation

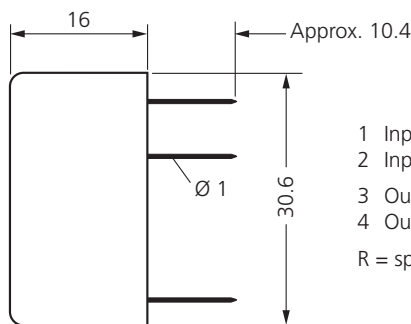
with precision rectification, high-resistance voltage input, impressed output current



Dimension Drawings and Pin Assignments



Pin View



- 1 Input +
 - 2 Input -
 - 3 Output -
 - 4 Output +
- R = spacing = 2.54

All dimensions in mm!

Modules

Knick >

IsoTrans® 46

For isolation of 0 ... 20 mA standard signals.

Knick has expanded its range of loop-powered isolators with the IsoTrans® 46, a competitively priced, compact model with a modular design.

The Task

The IsoTrans® 46 isolates 0 ... 20 mA standard current signals avoiding parasitic voltages or currents and eliminating

grounding problems. It is optionally available with Safe Isolation to EN 61140.

The Technology

The IsoTrans® 46 draws its power as voltage drop directly from the measurement signal. This saves on the costs for power supplies and cabling and increases reliability.

Warranty
5 years!

Defects occurring within 5 years from delivery are remedied free of charge at our works (carriage and insurance paid by sender).



Loop-Powered Isolators for Standard Signals

Isolation Amplifiers
Transmitters

Indicators

Process Analytics

Portable Meters

Laboratory Meters

Sensors

Fittings



Knick >

■ The Facts

Galvanic isolation between input and output signal

Protection against measurement errors caused by grounding problems and parasitic interference voltage

Maximum reliability

No maintenance work, therefore the related costs are not incurred

5-year warranty

Safe Isolation according to EN 61140

Protection of maintenance staff and subsequent devices against non-permitted high voltages

Module mounting height 11 mm

Extremely low mounting height, mounting on Eurocard with width of just 3 TE

No power supply required

Cost saving due to lower wiring effort, no mains influences



IsoTrans® 46

■ Product Line

Devices	Order No.
IsoTrans® 46, module	46 Mk
Power supply	
None, supply from input signal	
Options	
Safe Isolation to EN 61140, test voltage 4 kV AC	453

■ Specifications

Input data

Input	0 ... 20 mA ¹⁾
Operating current	< 20 µA
Overload	100 mA, 30 V
Voltage drop	Approx. 2.5 V ²⁾

Output data

Output	0 ... 20 mA, max. 27.5 V
Load error	< 0.02 % meas. val./100 ohms
Residual ripple	< 5 mV

Transmission behavior

Transmission error	< 0.1 % full scale
Rise and fall time	Approx. 5 ms at 500 ohms load
Temperature coefficient ³⁾	< 0.002 %/K of meas. val. per 100 ohms load

1) Linear transmission up to 50 mA

2) Approx. 3.5 V at 50 mA

3) Average TC, reference temperature 23 °C

Loop-Powered Isolators for Standard Signals

Isolation Amplifiers
Transmitters

Indicators

Process Analytics

Portable Meters

Laboratory Meters

Sensors

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Specifications (continued)

Isolation

Test voltage	510 V AC 4 kV AC with option 453
Working voltages (basic insulation)	150 V with overvoltage category I and pollution degree 4 according to EN 61010-1 Permissible working voltages for other overvoltage categories and pollution degrees and for reinforced insulation/Safe Isolation on request. For applications with high working voltages, you should ensure there is sufficient spacing or isolation from neighboring devices and protection against electric shocks.
Protection against electric shock (Opt. 453)	Safe Isolation according to EN 61140 by reinforced insulation in accordance with EN 61010-1. For applications with high working voltages, you should ensure there is sufficient spacing or isolation from neighboring devices and protection against electric shocks.

Standards and approvals

Surge withstand according to IEC 255-4	5 kV 1.2/50 μ s (only with Option 453)
Surge withstand according to EN 61010-1	850 V > 6 kV with Option 453
EMC ⁴⁾	According to NAMUR NE 21, European EMC regulations according to 89/336/EEC directive, EN 61326

Other data

MTBF ⁵⁾	Approx. 1281 years
Ambient temperature	Operation: -10 ... +70 °C Transport and storage: -30 ... +80 °C
Design	Mk module, encapsulated, see dimension drawings for further measurements
Weight	Approx. 13 g

4) Valid for 4 ... 20 mA, slight deviations possible during interference.

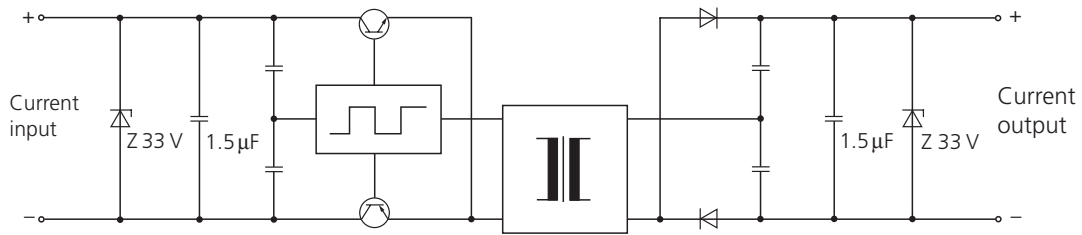
5) Mean Time Between Failures – MTBF – according to EN 61709 (SN 29500).

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

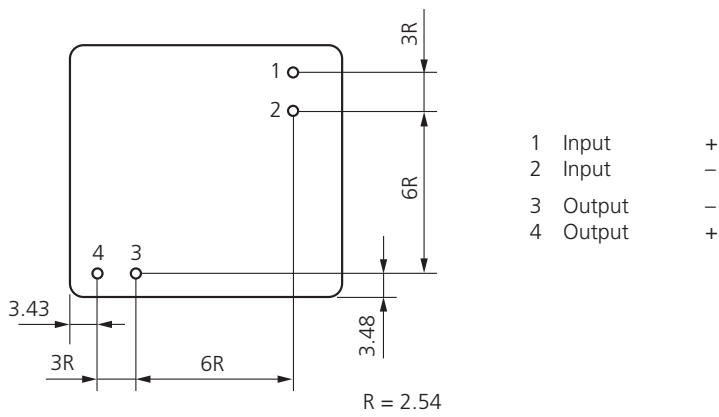
Modules

IsoTrans[®] 46

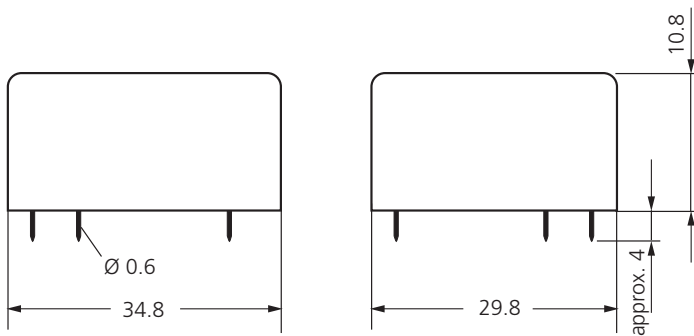
■ Block Diagram



■ Dimension Drawings and Pin Assignments



Pin View



All dimensions in mm!

Isolation Amplifiers
Transmitters

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Laboratory Meters

Sensors

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**Knick
Elektronische Messgeräte
GmbH & Co. KG**

Beuckestraße 22, D-14163 Berlin
P.O. Box 37 04 15, D-14134 Berlin

Phone: +49 (0)30-801 91-0

Fax: +49 (0)30-801 91-200

E-Mail: knick@knick.de

Internet: www.knick.de