

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



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
--------------	--

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 P43100D2-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 (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

EMC ³⁾

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

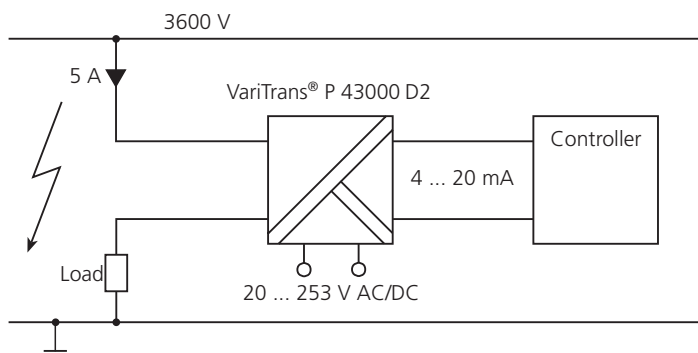
4) Mean Time Between Failures – MTBF – according to EN 61709 (SN 29500).

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

Isolation Amplifiers
Transmitters

Indicators

Process Analytics

Portable Meters

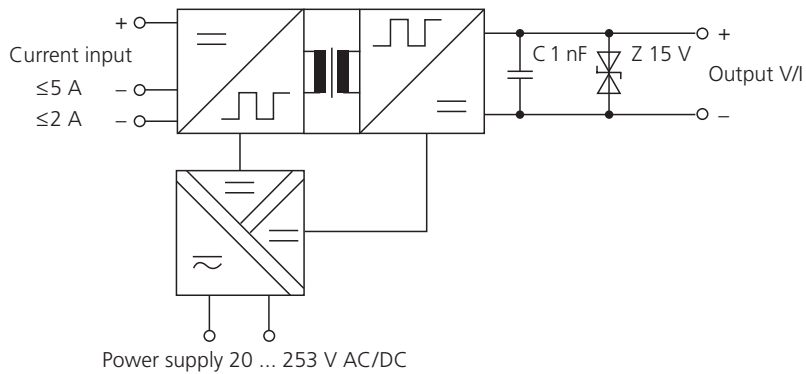
Laboratory Meters

Sensors

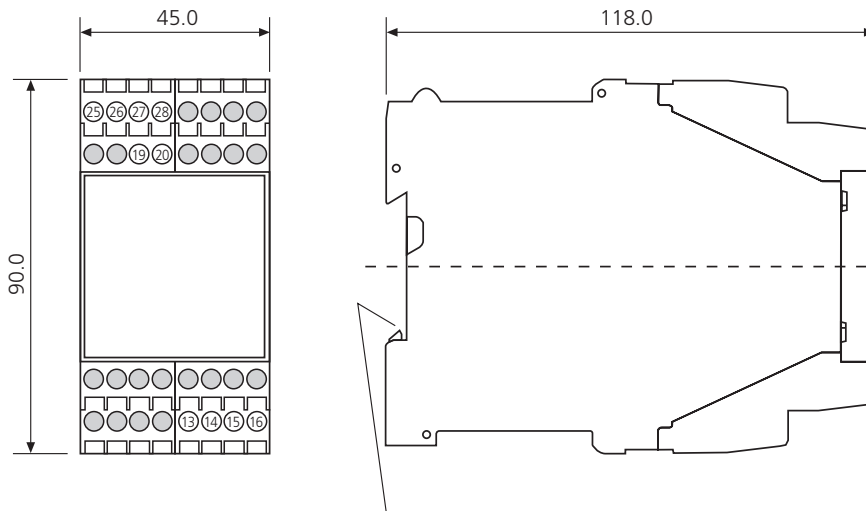
Fittings

Knick 

■ 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 -(≤ 5 A)
- 16 Current input -(≤ 2 A)
- 19 Power supply AC/DC
- 20 Power supply AC/DC
- 25 Current output + $\overline{\square}$
- 26 Voltage output + $\overline{\square}$
- 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