

# 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  $\pm 20$  mA,  $\pm 10$  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 T90 < 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

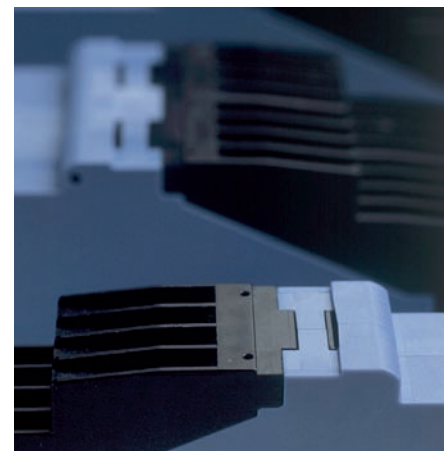
## Robust

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 <sup>1)</sup>	±10 V, ±20 mA, 4 ... 20 mA, one or more ranges to customer requirement <sup>1)</sup>	≤ 2.2 kV AC/DC	10 kV AC	P 43000 D2-nnnn
	±0.1 A ... 5 A, fixed, to customer requirement <sup>1)</sup>	±10 V, ±20 mA, 4 ... 20 mA, fixed, to customer requirement <sup>1)</sup>	≤ 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 $\leq 12$ V (600 ohms at 20 mA) With output voltage $\leq 10$ mA (1000 ohms at 10 V)
Offset	20 $\mu$ A or 10 mV
Residual ripple	$< 10$ mV <sub>rms</sub>

### Transmission behavior

Gain error	$< 0.3$ % meas. val.
Cutoff frequency ( $-3$ dB)	$> 5$ kHz; optional factory setting $< 10$ Hz
Common mode rejection ratio	CMRR <sup>1)</sup> DC: approx. 160 dB AC 50 Hz: approx. 120 dB
Temperature coefficient <sup>2)</sup>	$< 0.005$ %/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 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 P43100D2-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 P43100D2-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) 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 <sup>3)</sup>

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

#### Other data

MTBF<sup>4)</sup>

Approx. 96 years

Ambient temperature<sup>5)</sup>

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

<sup>3)</sup> Slight deviations are possible while there is interference

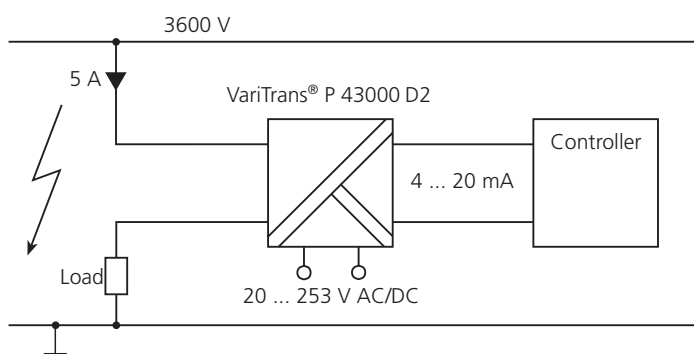
<sup>4)</sup> Mean Time Between Failures – MTBF – according to EN 61709 (SN 29500).

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

<sup>5)</sup> 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

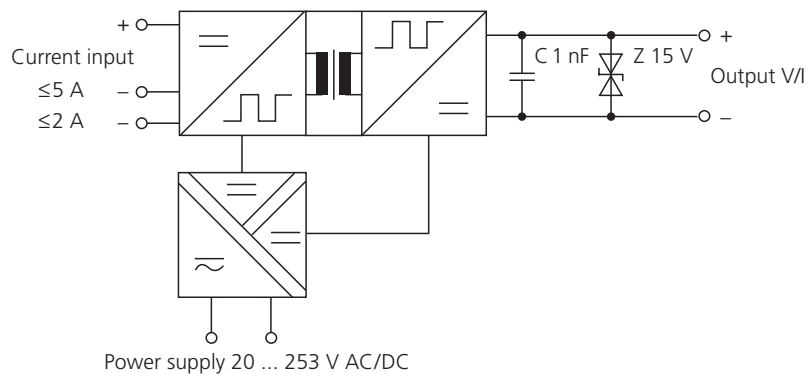
Laboratory Meters

Sensors

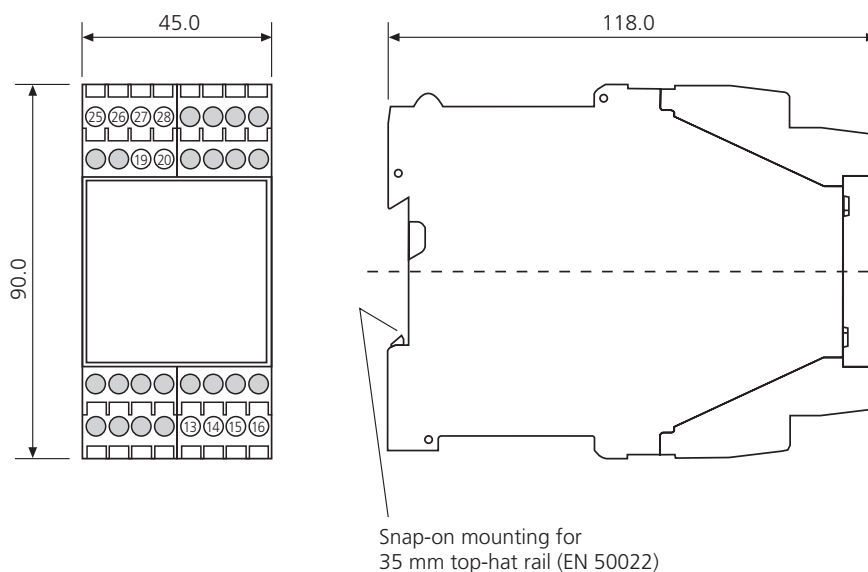
Fittings

**Knick** 



## ■ Block Diagram



## ■ Dimension Drawings and Terminal Assignments



### 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 + 
- 26 Voltage output + 
- 27 Current output -
- 28 Voltage output -

M 3.5 connecting screws with  
self-releasing terminal housing  
Conductor cross-section  
max. 1 x 4 mm<sup>2</sup> solid  
or 1 x 2.5 mm<sup>2</sup> stranded wire with ferrule,  
min. 1 x 0.5 mm<sup>2</sup> solid or stranded wire with ferrule

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

All dimensions in mm!