

# Modular Housings

**Knick** ➤

**Universal high-voltage isolators.**

**Input voltages up to**  
 **$I_{in} = \pm 3600 \text{ V}$ .**

## VariTrans® P 42000



### 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  $\pm 20 \text{ mA}$ ,  $\pm 10 \text{ V}$ , or 4 ... 20 mA output signals.

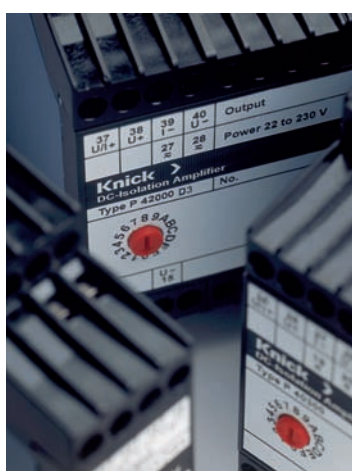
### The Problems

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 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.



### 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  $\pm 100 \text{ V}$  to  $\pm 3600 \text{ V}$ . 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 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

Isolation Amplifiers Transmitters	Indicators	Process Analytics	Portable Meters	Laboratory Meters	Sensors	Fittings
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**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 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  $\pm 20$  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

**Test voltages 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

**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 <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 42000 D3-nnnn
	±100 V ... 3600 V, fixed, to customer requirement <sup>1)</sup>	±10 V, ±20 mA, or 4 ... 20 mA, fixed, to customer requirement <sup>1)</sup>	≤ 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
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## Specifications (continued)

### Output data (continued)

Offset	Factory setting up to $\pm 150$ %	
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	
Temperature coefficient <sup>1)</sup>	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.
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#### Standards and approvals

EMC <sup>2)</sup>	Product standard:	EN 61326
	Emitted interference:	Class B
	Immunity to interference:	Industry

#### Other data

MTBF <sup>3)</sup>	Approx. 96 years	
Ambient temperature <sup>4)</sup>	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.

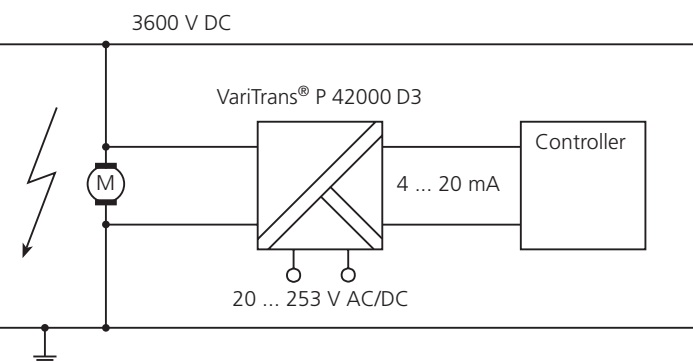
3) Mean Time Between Failures – MTBF – according to EN 61709 (SN 29500).

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

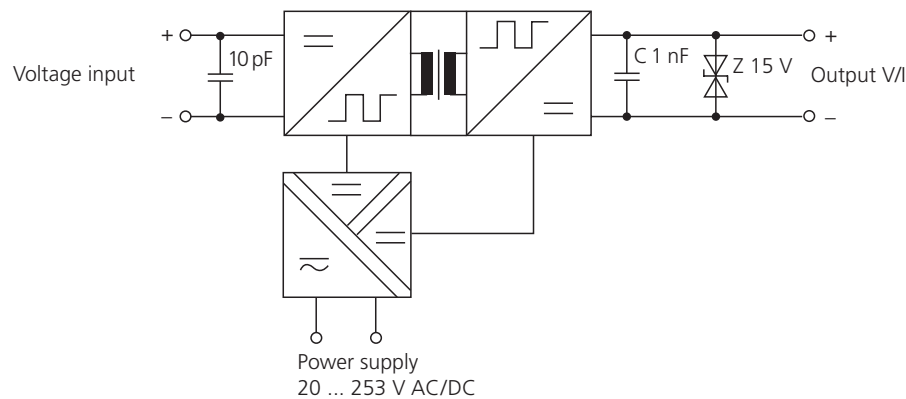
Laboratory Meters

Sensors

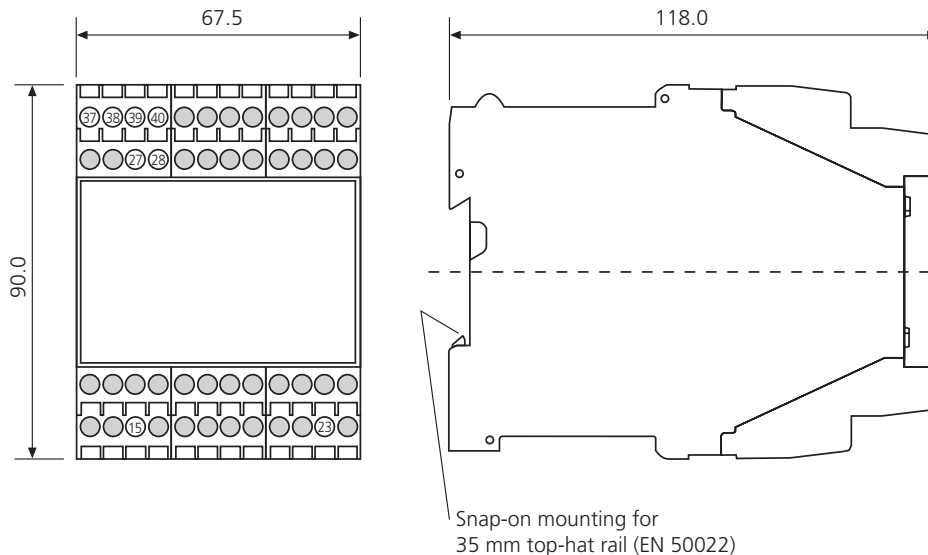
Fittings

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## ■ Block Diagram



## ■ Dimension Drawings and Terminal Assignments



### Terminal assignments:

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

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

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

All dimensions in mm!