

VariTrans P 42000

VariTrans P 42000

Universal high voltage transducer.
Input voltages up to $V_{in} = \pm 3600$ 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, high voltages and harsh ambient conditions may overload the galvanic isolation. This can result in false measurement values or even personal injury or damage to the equipment. These risks have to be eliminated safely and over the long term by suitably designed high voltage transducers.

The Solution

The VariTrans P 42000 high voltage transducers have been specially conceived for measuring high voltages up to 3600 V AC/DC. They reliably isolate high potentials at the input circuit. The separation 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 protective separation according to EN 61140 between input and output and power supply.

The Housing

A new 67.5 mm wide modular housing is used for the VariTrans P 42000 high voltage transducers. For measurement voltages up to 2200 V, a more compact housing with 45 mm width can be used. It is snapped onto a standard DIN rail. The front panels of the adjustable models provide a rotary switch for selecting the ranges.

The Advantages

The VariTrans P 42000 are available for any input voltages from ± 100 V to ± 3600 V. Unipolar and bipolar (standard) signals are available at the output: ± 20 mA, ± 10 V and 4 ... 20 mA. 16 input/output signal combinations can easily be selected with a rotary switch on the front of the device. There is no need for a complicated on-site adjustment with screwdriver, calibrator and multimeter. Drift problems due to unstable trimming components – e.g., potentiometers – are avoided. Thanks to the easy scalability of the range selection, the devices can easily be customized to individual customer solutions. Up to 16 customized signal combinations can be implemented in one device and configured optimally for the respective application.

The integrated 20 to 253 V AC/DC VariPower broad-range power supply offers maximum 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 safe and easy. Incorrect connection of the supply voltage is practically impossible. Expensive standstill times and repair work during commissioning are avoided. Vacuum encapsulation provides maximum protection against aggressive environmental influences, shock and vibrations and ensures that the high disruptive strength required for working voltages up to 3600 V AC/DC is maintained over the long term. The isolation system meets the safety requirements of EN 61010-1 and EN 50124-1 (Railway applications: Insulation coordination).



High Voltage Transducers

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 wide modular housing is sufficient for input voltages up to 3600 V AC/DC.

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



Facts and Features

– Universal high voltage transducers

for converting 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

with protective separation 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 filter / lower cutoff frequency on request)
- Rise time T_{90} approx. 110 μ s

– Maximum accuracy

– Tremendous flexibility provided by

- calibrated switching of up to 16 input/output ranges (working voltage up to 2200 V)
- up to 16 customer-specific measuring 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





VariTrans P 42000

Product Line

Devices	Input	Output	Working voltage	Test voltage	Order No.
VariTrans P 42000 Input and output adjustable	$\pm 800 / \pm 1000 / \pm 1500 / \pm 2000$ V, calibrated switching	± 10 V, ± 20 mA and 4 ... 20 mA, calibrated switching	≤ 2.2 kV AC/DC	10 kV AC	P 42000 D2
	$\pm 400 / \pm 600 / \pm 800 / \pm 1000 / \pm 1200$ V; calibrated switching	± 10 V, ± 20 mA and 4 ... 20 mA, calibrated switching	≤ 2.2 kV AC/DC	10 kV AC	P 42000 D3
	$\pm 1400 / \pm 1600 / \pm 1800 / \pm 2000 / \pm 2200$ V; calibrated switching	± 10 V, ± 20 mA and 4 ... 20 mA, switchable	≤ 2.2 kV AC/DC	10 kV AC	P 42001 D3
VariTrans P 42000 adjusted to customer requirements	± 100 V ... ± 2200 V; 1 to 16 switchable calibrated ranges to customer requirements ¹⁾	± 10 V, ± 20 mA and 4 ... 20 mA, one or more ranges to customer requirements ¹⁾	≤ 2.2 kV AC/DC	10 kV AC	P 42000 D2-nnnn
	± 100 V ... ± 2200 V; 1 to 16 switchable calibrated ranges to customer requirements ¹⁾	± 10 V, ± 20 mA and 4 ... ± 20 mA, one or more ranges to customer requirements ¹⁾	≤ 2.2 kV AC/DC	10 kV AC	P 42000 D3-nnnn
	± 100 V ... ± 3600 V, fixed setting, to customer requirements ¹⁾	± 10 V, ± 20 mA or 4 ... 20 mA, fixed setting, to customer requirements ¹⁾	≤ 3.6 kV AC/DC	15 kV AC	P 42100 D3-nnnn

"Specific Test Report" included in shipment

Power supply

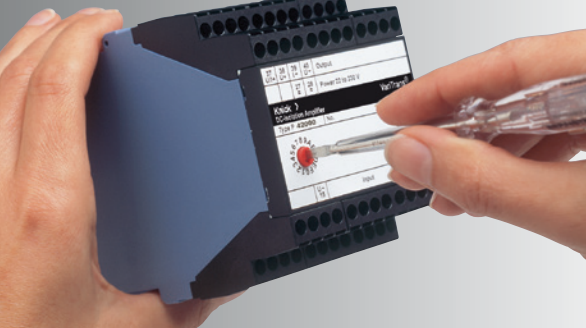
20 ... 253 V AC/DC

¹⁾ Please specify the desired setting on the order

High Voltage Transducers

Specifications

Input		
Inputs	P 42000 D2	±800 V, ±1000 V, ±1500 V, ±2000 V; calibrated switching, factory setting: ±2000 V
	P 42000 D3	±400 V, ±600 V, ±800 V, ±1000 V, ±1200 V; calibrated switching, factory setting: ±1200 V
	P 42001 D3	±1400 V, ±1600 V, ±1800 V, ±2000 V, ±2200 V; calibrated switching, factory setting: ±2200 V
	P 42000 D2-nnnn	±100 V ... ±2200 V, 1 to 16 ranges to customer requirements, calibrated switching
	P 42000 D3-nnnn	±100 V ... ±2200 V, 1 to 16 ranges to customer requirements, calibrated switching
	P 42100 D3-nnnn	±100 V ... ±3600 V, fixed setting, to customer requirements
Input resistance	P 42000 D2	7.2 MΩ
	P 42000 D3	7.2 MΩ
	P 42001 D3	14 MΩ
	P 42000 Dx-nnnn	100 ... 900 V DC 3.6 MΩ 400 ... 1400 V DC 7.2 MΩ 1000 ... 2200 V DC 14 MΩ
Input capacitance	< 10 pF	
Overload capacity	P 42000 D2	20 % full scale, max. ±2400 V
	P 42x00 D3	20 % full scale, max. ±3900 V
Output		
Output	P 42000 D2	±20 mA, ±10 V and 4 ... 20 mA calibr. switching, factory setting: ±10 V
	P 42000 D3	±20 mA, ±10 V and 4 ... 20 mA calibr. switching, factory setting: ±10 V
	P 42001 D3	±20 mA, ±10 V and 4 ... 20 mA calibr. switching, factory setting: ±10 V
	P 42000 D2-nnnn	±20 mA, ±10 V and/or 4 ... 5 mA, calibrated switching
	P 42000 D3-nnnn	±20 mA, ±10 V and/or 4 ... 5 mA, calibrated switching
	P 42100 D3-nnnn	±20 mA, ±10 V or 4 ... 20 mA; fixed setting, to customer requirements
Displacement	Up to ±150 % by default	
Load	With output current	≤ 12 V (600 Ω at 20 mA)
	With output voltage	≤ 10 mA (1000 Ω at 10 V)
Offset	20 μA or 10 mV	
Residual ripple	< 10 mV _{rms}	
Transmission Behavior		
Gain error	< 0.3 % meas. value	
Cutoff frequency (–3 dB)	5 kHz	optional factory setting: 10 Hz
Response time T ₉₀	Approx. 110 μs	
Temperature coefficient ¹⁾	< 0.01 %/K full scale	
Power Supply		
Power supply	20 ... 253 V AC/DC	AC 48 ... 62 Hz, approx. 2 VA; max. approx. 1.2 W



VariTrans P 42000

Specifications

Isolation

Galvanic isolation	3-port isolation between input, output, and power supply	
Test voltage	Calibrated switching	10 kV AC input against output and power supply
	fixed setting (model P42100D3-nnnn)	15 kV AC input against output and power supply
	All models	4 kV AC output against power supply
Working voltage (basic insulation) according to EN 61010-1	Calibrated switching	Up to 2200 V AC/DC with overvoltage category III and pollution degree 2. Input against output / power supply (transient overvoltage: 13.5 kV)
	Fixed setting (model P42100D3-nnnn)	Up to 3600 V AC/DC with overvoltage category III and pollution degree 2. Input against output / power supply (transient overvoltage: 20 kV)
	Calibrated switching	Up to 2200 V AC/DC with overvoltage category III and pollution degree 2. Input against output / power supply
Rated insulation voltage according to EN 50124-1	Fixed setting (model P42100D3-nnnn)	Up to 3000 V AC/DC with overvoltage category III and pollution degree 2. Input against output / power supply
	Calibrated switching	Protective separation according to EN 61140 by reinforced insulation according to EN 61010-1. Working voltages with overvoltage category III and pollution degree 2: – up to 1100 V AC/DC input against output / power supply – up to 300 V AC/DC across output and power supply
	Fixed setting (model P42100D3-nnnn)	Protective separation according to EN 61140 by reinforced insulation according to EN 61010-1. Working voltages with overvoltage category III and pollution degree 2: – up to 1800 V AC/DC input against output / power supply – up to 300 V AC/DC across output and power supply

For applications with high working voltages, take measures to prevent accidental contact and make sure that there is sufficient distance or insulation between adjacent devices.

Rated voltage acc. to UL 347	P 420...	2200 V AC (45 ... 65 Hz) / DC
	P 42100...	3600 V AC (45 ... 65 Hz) / DC
	Input impedance	> 1 MΩ (1 VA)
	BIL (rated lightning impulse withstand):	30 kV
	Overvoltage category	OV3
	Pollution degree	PD2

Contains no components requiring maintenance. Use copper cables only.

Standards and Approvals

EMC ²⁾	Product family standard:	EN 61326
	Emitted interference:	Class B
	Immunity to interference:	Industrial applications
UL	Listed acc. to UL 347	E356768
Mechanical strength	IEC 61373	
RoHS conformity	According to directive	2011/65/EU

High Voltage Transducers

Specifications

Further Data	
MTBF ³⁾	Approx. 96 years
Ambient temperature ⁴⁾	Operation: -10 ... +70 °C Transport and storage: -40 ... +85 °C
Ambient conditions	Indoor use ⁵⁾ ; relative humidity 5 ... 95 %, no condensation; max. altitude 2000 m (air pressure: 790 ... 1060 hPa) ⁶⁾
Design	Modular housing Housing width D2: 45 mm with screw terminals Housing width D3: 67.5 mm See dimension drawings for other measurements.
Connection	M 3.5 screw terminals with self-lifting clamps Conductor cross section max. 1 x 4 mm ² solid or 1 x 2.5 mm ² stranded with ferrule, min. 1 x 0.5 mm ² solid or stranded with ferrule
Tightening torque	0.6 Nm
Ingress protection	Housing: IP 40, terminals: IP 20
Mounting	With snap-on mounting for 35 mm DIN rail according to EN 60715
Weight	D2: approx. 350 g D3: approx. 500 g

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

²⁾ Slight deviations are possible while there is interference.

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

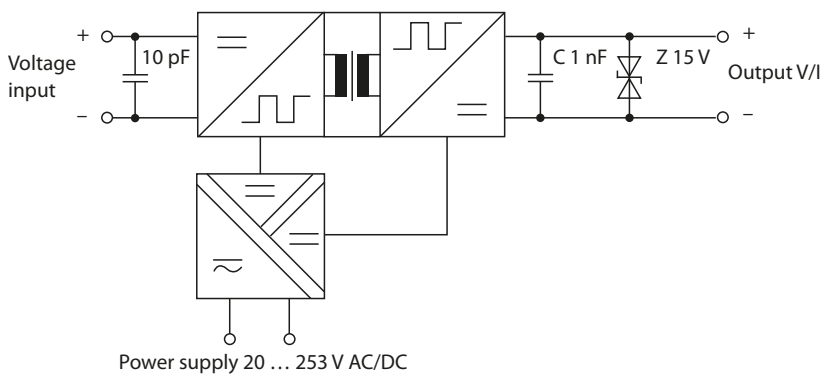
Preconditions: stationary operation in well-kept rooms, average ambient temperature 40 °C, no ventilation, continuous operation

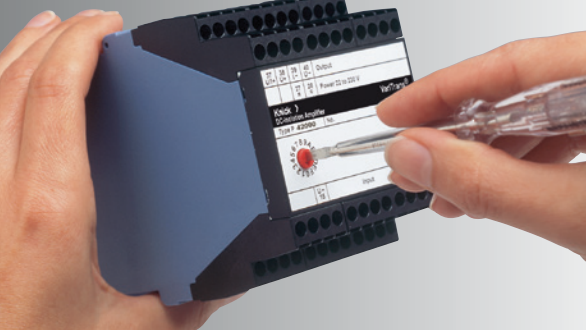
⁴⁾ Extended temperature range -25 ... +85 °C on request

⁵⁾ Closed, weather-protected operating areas. Water or wind-driven precipitation (rain, snow, hail etc.) excluded

⁶⁾ Lower air pressure reduces the allowable working voltages.

Block Diagram

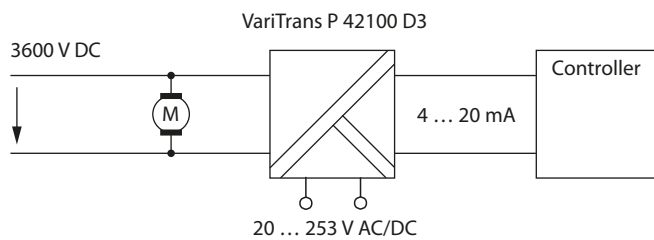




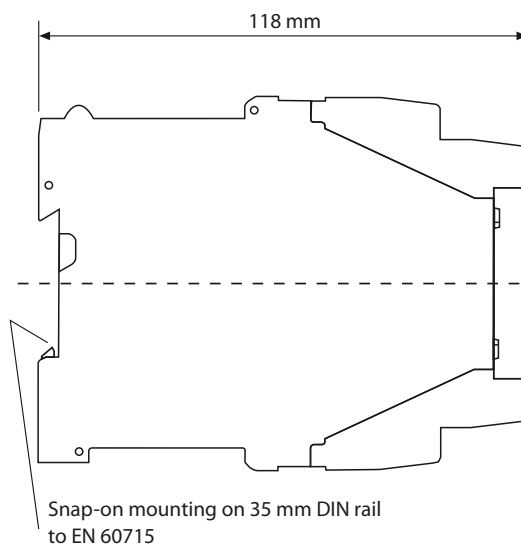
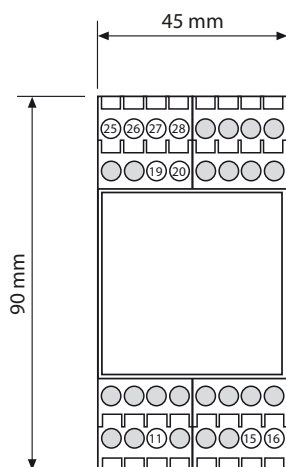
VariTrans P 42000

Typical Application

Direct measurement of supply voltage



Dimension Drawing and Terminal Assignments, Type D2



Terminal Assignments

- 11 Input + Voltage
- 15 Input - Voltage
- 16 Do not use

- 19 Power supply AC/DC
- 20 Power supply AC/DC

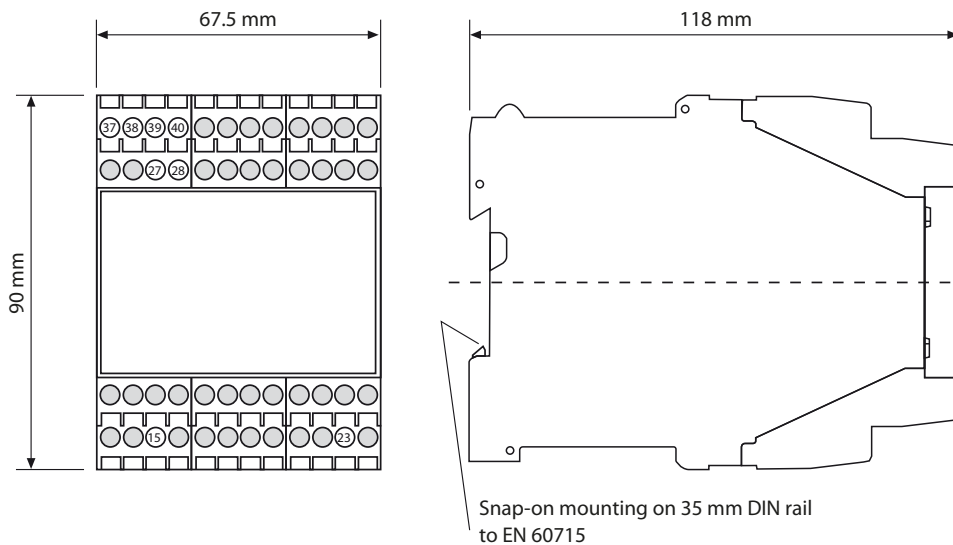
- 25 Output + Current
- 26 Output + Voltage
- 27 Output - Current
- 28 Output - Voltage

M 3.5 screw terminals with self-lifting clamps
Conductor cross-section max. 1 x 4 mm²
solid or 1 x 2.5 mm² stranded with ferrule,
min. 1 x 0.5 mm² solid or stranded with ferrule

For voltage output, place jumper
across terminals 25 and 26.
Do not use a jumper for current output
(remove pre-installed jumper).

High Voltage Transducers

Dimension Drawing and Terminal Assignments, Type D3



Terminal assignments

15 Input - Voltage
23 Input + Voltage (≤ 3600 V)

27 Power supply AC/DC
28 Power supply AC/DC

37 Output + Current
38 Output + Voltage
39 Output - Current
40 Output - Voltage

M 3.5 screw terminals with self-lifting clamps
Conductor cross-section max. $1 \times 4 \text{ mm}^2$
solid or $1 \times 2.5 \text{ mm}^2$ stranded with ferrule,
min. $1 \times 0.5 \text{ mm}^2$ solid or stranded with ferrule

For voltage output, place jumper
across terminals 37 and 38.
Do not use a jumper for current output
(remove pre-installed jumper).