

VariTrans P 42000

Universal high voltage transducers.
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 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 protective separation according to EN 61140 between input and output and power supply.

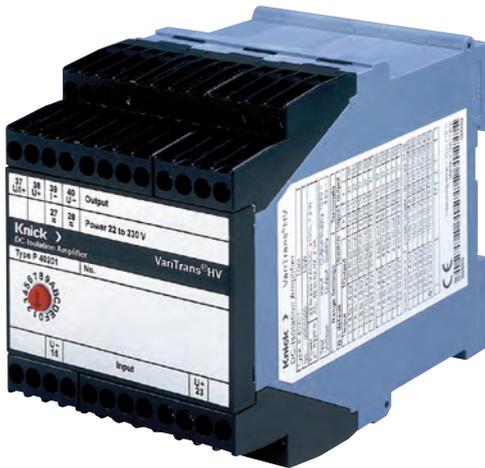
The Housing

A new 67.5 mm wide modular housing is used for the VariTrans P 42000 high voltage transducers. It is snapped onto a standard DIN rail. The front panels of the adjustable models provide a rotary encoder 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 encoder 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 insulation 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: isolation coordination).

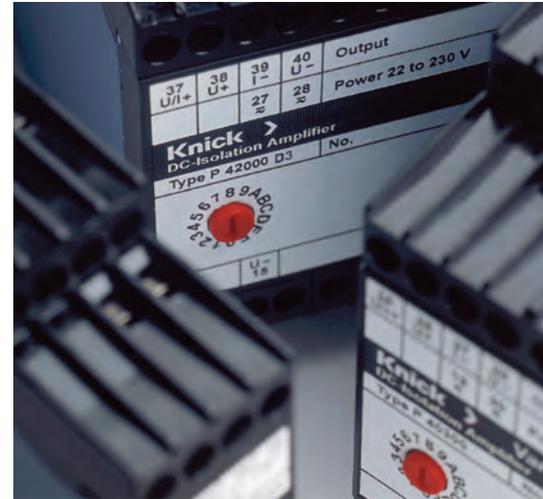


VariTrans P 42000

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



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 adjusted to customer requirements | ±100 mV ... 2200 V, one or more ranges to customer requirements ¹⁾ | ±10 V, ±20 mA, 4 ... 20 mA, one or more ranges to customer requirements ¹⁾ | ≤ 2.2 kV AC/DC | 10 kV AC | P 42000 D3 D3-nnnn |
| | ±100 mV ... 3600 V fixed, to customer requirement ¹⁾ | ±10 V, ±20 mA, or 4 ... 20 mA, fixed, to customer requirements ¹⁾ | ≤ 3.6 kV AC/DC | 15 kV AC | P 42100 D3 D3-nnnn |

“Specific Test Report” included in shipment

Power supply

20 ... 253 V AC/DC

¹⁾ Please specify the desired setting on the order

VariTrans P 42000

Specifications

Input

| | | |
|-------------------|---|--|
| Inputs | P 42000 D3 | $\pm 400\text{ V}$, $\pm 600\text{ V}$, $\pm 800\text{ V}$, $\pm 1000\text{ V}$, $\pm 1200\text{ V}$; calibrated switching, default setting: $\pm 1200\text{ V}$ |
| | P 42001 D3 | $\pm 1400\text{ V}$, $\pm 1600\text{ V}$, $\pm 1800\text{ V}$, $\pm 2000\text{ V}$, $\pm 2200\text{ V}$; calibrated switching, default setting: $\pm 2200\text{ V}$ |
| | P 42000 D3-nnnn | 100 V ... 2200 V, unipolar/bipolar; 1 to 16 ranges to customer requirements, calibrated switching |
| | P 42100 D3-nnnn | 100 V ... 3600 V, unipolar/bipolar; fixed setting, to customer requirements |
| 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 capacity | 20 % full scale, max. $\pm 3900\text{ V}$ | |

Output

| | | |
|-----------------|------------------------------|---|
| 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 |
| Displacement | Up to $\pm 150\%$ by default | |
| 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 mV _{rms} | |

Transmission behavior

| | | |
|---------------------------------------|---------------------------|---------------------------------|
| Gain error | < 0.3 % meas. val. | |
| 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 |
|--------------|--------------------|---|

Specifications (continued)

Isolation

| | | |
|--|--|--|
| Galvanic isolation | 3-port isolation between input, output, and power supply | |
| Test voltage | Calibrated switching | 10 kV AC across input and output / power supply |
| | Fixed setting (model P42100D3-nnnn) | 15 kV AC across input and output / power supply |
| | All models | 4 kV AC across output and power supply |
| Working voltage (basic insulation) according to EN 61010-1 | Calibrated switching | Up to 2200 V AC/DC between input, output, and power supply with overvoltage category III and pollution degree 2 (fast transients: 13.5 kV) |
| | Fixed setting (model P42100D3-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 according to EN 50124-1 | Calibrated switching | Up to 2200 V AC/DC across input, output and power supply with overvoltage category III and pollution degree 2 |
| | Fixed setting (model P42100D3-nnnn) | Up to 3000 V AC/DC across input, output and power supply with overvoltage category III and pollution degree 2 |
| Protection against electric shock | Calibrated switching | Protective separation 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 across input and output / power supply – up to 300 V AC/DC across output and power supply |
| | Fixed setting (model P42100D3-nnnn) | Protective separation 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 across input and 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 | P420 ... : | 2200 V AC (45 ... 65 Hz) / DC |
| | Input impedance: | > 1 MΩ (0.4 VA) |
| | BIL (rated lightning impulse withstand): 30 kV Overvoltage category Cat III pollution degree 2 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 environment |
| UL | Listed acc. to UL 347 E356768 | |
| Mechanical strength | IEC 61373 | |
| RoHS conformity | According to directive 2011/65/EU | |

VariTrans P 42000

Specifications (continued)

| 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 D3 housing width: 67.5 mm with screw terminals See dimension drawings for further measurements |
| Connection | M 3.5 connecting screws with self-releasing terminal housing 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 | 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)

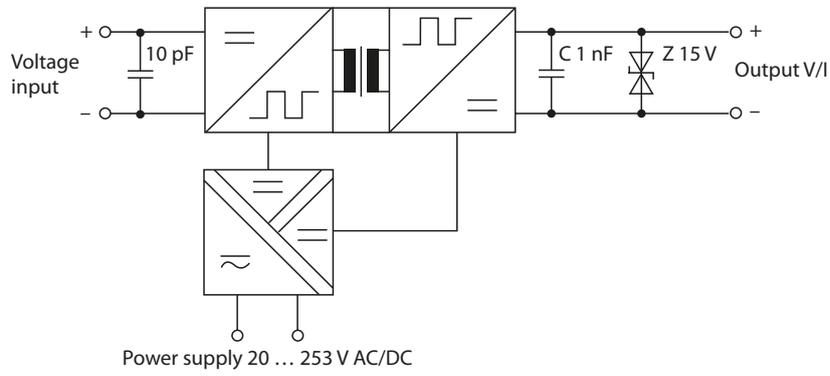
Conditions: stationary operation in well-kept rooms, average ambient temperature 40 °C, no ventilation, continuous operation

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

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

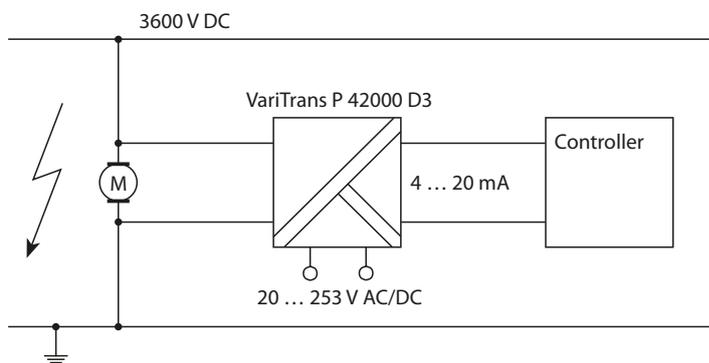
⁶⁾ Lower air pressure reduces the allowable working voltages.

Block Diagram



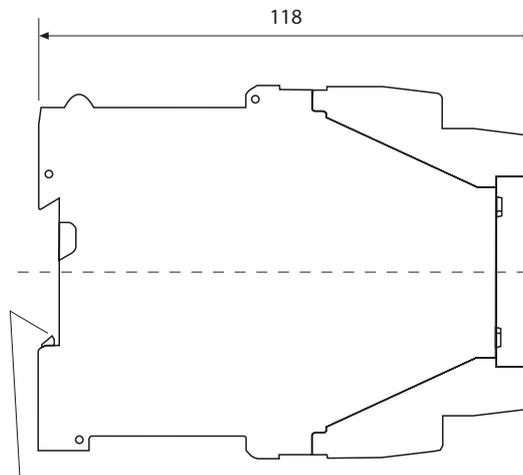
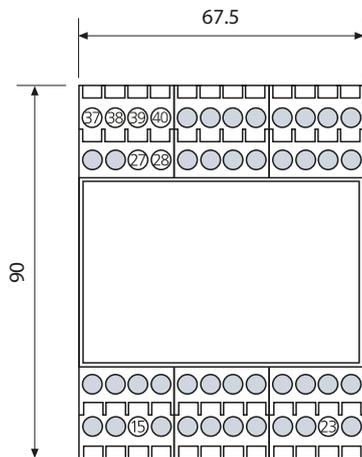
Typical Application

Direct measurement of supply voltage



VariTrans P 42000

Dimension Drawing and Terminal Assignments



Snap-on mounting on 35 mm DIN rail
EN 60715

Terminal assignments

- 15 Input - voltage
- 23 Input + voltage ($\leq 3600\text{ V}$)

- 11 Power supply AC/DC
- 28 Power supply AC/DC

- 37 Output + current
- 38 Output + voltage
- 39 Output - current
- 40 Output - voltage

M 3.5 connecting screws with self-releasing terminal housing
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).