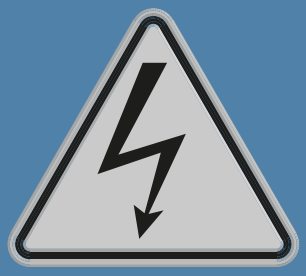
The Art of Measuring.

Knick

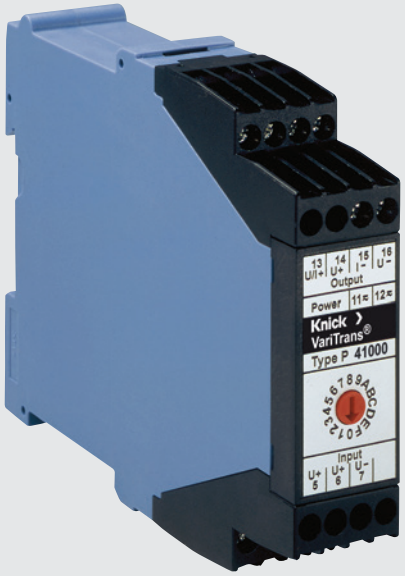
High Voltage Transducers

VariTrans P 40000

Measurement of Voltages from (±) 50 mV to 3600 V
and Currents from (±) 100 mA to 20 kA



VariTrans P 41000



VariTrans P 41000

Universal high voltage transducer.
Input signals from V_{in} = ±50 mV up to V_{in} = ±100 V.

The Task

In high-voltage systems, unipolar or bipolar voltage signals ranging from 50 mV to 100 V, e.g., voltages across shunt resistors, 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 41000 high voltage transducers have been specially conceived for measurements of bipolar voltages from millivolts to volts. 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 22.5 mm wide modular housing is used for the VariTrans P 41000 high voltage transducers. 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 41000 are available for any input voltages from ±50 mV to ±100 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 advantage, the P 41000 shunt isolators can be installed in an only 22.5 mm wide modular housing.
Another major advantage offered by 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, 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.

5 Year Warranty!

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Facts and Features

- **Universal high voltage transducers**
  for converting voltages, e.g. in shunt applications, from ±50 mV up to ±100 V 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 < 0.1 %
  - Cutoff frequency 5 kHz (low-pass filter / lower cutoff frequency on request)
  - Rise time T_{90} approx. 110 µs
- **Virtually no influence from common-mode voltages:**
  CMRR >150 dB
- **High immunity to transient interference:**
  T-CMRR >115 dB
- **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 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 41000

Product Line

Device	Input	Output	Order No.	Order No.
			Working voltage ≤2.2 kV AC/DC Test voltage: 10 kV AC	**Working voltage ≤3.6 kV AC/DC Test voltage: 15 kV AC**
VariTrans P 41000 Input and output adjustable	±60 / 90 / 150 / 300 / 500 mV / 10 V[1], switchable	±10 V, ±20 mA and 4 … 20 mA, switchable	**P 41000 D1**	–
VariTrans P 41000 with fixed settings	±60 mV	±20 mA	**P 41056 D1**	**P 41156 D1**
	±60 mV	4 … 20 mA	**P 41059 D1**	**P 41159 D1**
	0 … 60 mV	4 … 20 mA	**P 41057 D1**	**P 41157 D1**
	±60 mV	±10 V	**P 41058 D1**	**P 41158 D1**
	±90 mV	±20 mA	**P 41046 D1**	**P 41146 D1**
	±90 mV	4 … 20 mA	**P 41049 D1**	**P 41149 D1**
	0 … 90 mV	4 … 20 mA	**P 41047 D1**	**P 41147 D1**
	±90 mV	±10 V	**P 41048 D1**	**P 41148 D1**
	±150 mV	±20 mA	**P 41066 D1**	**P 41166 D1**
	±150 mV	4 … 20 mA	**P 41069 D1**	**P 41169 D1**
	0 … 150 mV	4 … 20 mA	**P 41067 D1**	**P 41167 D1**
	±150 mV	±10 V	**P 41068 D1**	**P 41168 D1**
	±300 mV	±20 mA	**P 41076 D1**	**P 41176 D1**
	±300 mV	4 … 20 mA	**P 41079 D1**	**P 41179 D1**
	0 … 300 mV	4 … 20 mA	**P 41077 D1**	**P 41177 D1**
	±300 mV	±10 V	**P 41078 D1**	**P 41178 D1**
	±500 mV	±20 mA	**P 41086 D1**	**P 41186 D1**
	±500 mV	4 … 20 mA	**P 41089 D1**	**P 41189 D1**
	0 … 500 mV	4 … 20 mA	**P 41087 D1**	**P 41187 D1**
	±500 mV	±10 V	**P 41088 D1**	**P 41188 D1**
	±1 V	±20 mA	**P 41096 D1**	**P 41196 D1**
	±1 V	4 … 20 mA	**P 41099 D1**	**P 41199 D1**
	0 … 1 V	4 … 20 mA	**P 41097 D1**	**P 41197 D1**
	±1 V	±10 V	**P 41098 D1**	**P 41198 D1**
	±10 V	±20 mA	**P 41036 D1**	**P 41136 D1**
	±10 V	±10 V	**P 41038 D1**	**P 41138 D1**
VariTrans P 41000 adjusted to customer requirements	±50 mV ... 100 V one or more ranges to customer requirements[2]	±10 V, ±20 mA, 4 … 20 mA, one or more ranges to customer requirements[2]	**P 41000 D1-nnnn**	–
	±50 mV … 100 V fixed, to customer requirement[2]	±10 V, ±20 mA, 4 … 20 mA, fixed, to customer requirements[2]	**P 41000 D1-nnnn**	**P 41100 D1-nnnn**

"Specific Test Report" included in shipment

Power supply

20 … 253 V AC/DC

[1] Input ±10 V only switchable with output ±10 V

[2] Please specify the desired setting on the order

High Voltage Transducers

Specifications

Input

Inputs[1]	P 41000 D1	±60 mV, ±90 mV, ±150 mV, ±300 mV, ±500 mV, ±10 V, bipolar; calibrated switching; factory setting: ±10 V	
	P 41000 D1-nnnn	50 mV ... 2200 V, unipolar/bipolar; 1 to 16 ranges to customer requirements, calibrated switching	
	P 41100 D1-nnnn	50 mV ... 100 V, unipolar/bipolar; fixed setting according to customer requirements	
Input resistance	Range ≤ 0.5 V	Approx. 100 kΩ	
	Range > 0.5 V	> 2 MΩ	
Input capacitance	Range ≤ 0.5 V	Approx. 10 nF (approx. 94 nF with shunt monitoring option)	
	Range > 0.5 V	Approx. 1 nF	
Overload capacity	Range ≤ 10 V	Limited by suppressor diode 36 V,	allowable continuous current = 20 mA
	Range > 10 V	Limited by suppressor diode 150 V,	allowable continuous current = 3 mA

Output

Output	P 41000 D1	20 mA, 10 V unipolar/bipolar and 4 ... 20 mA; calibrated switching, factory setting: ±10 V	
	P 41000 D1-nnnn	20 mA, 10 V unipolar/bipolar and/or 4 ... 20 mA, calibrated switching, according to customer requirements	
	P 41100 D1-nnnn	20 mA, 10 V unipolar/bipolar or 4 ... 20 mA; fixed setting, according 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	< 0.1 % meas. value		
Cutoff frequency (–3 dB)	5 kHz; optional factory setting: 10 Hz		
Response time T_{90}	Approx. 110 µs		
Common-mode rejection ratio	Input range ≤ 1 V	CMRR[2]	approx. 150 dB (DC/AC: 50 Hz)
		T-CMRR[3]	approx. 115 dB (1000 V, tr = 1 µS)
	Input range > 1 V	CMRR[2]	DC: approx. 150 dB AC 50 Hz: approx. 120 dB
Temperature coefficient[4]	< 0.005 %/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 41000

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 P411xxD1)	15 kV AC ainput 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: max. 13.5 kV)
	Fixed setting (model P411xxD1)	Up to 3600 V AC/DC with overvoltage category III and pollution degree 2, input against output / power supply (transient overvoltage: max. 20 kV)
Rated insulation voltage according to EN 50124-1	Calibrated switching	Up to 2200 V AC/DC with overvoltage category III and pollution degree 2, input against output / power supply
	Fixed setting	Up to 3000 V AC/DC with overvoltage category III and pollution degree 2, input against output / power supply
Protection against electric shock	Calibrated switching	Protective separation according to EN 61140 through 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 P411xxD1)	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	P410 ... :	2200 V AC (45 ... 65 Hz) / DC
	P411 ... :	3600 V AC (45 ... 65 Hz) / DC
	Input impedance:	< 50 µA
	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[5)]	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

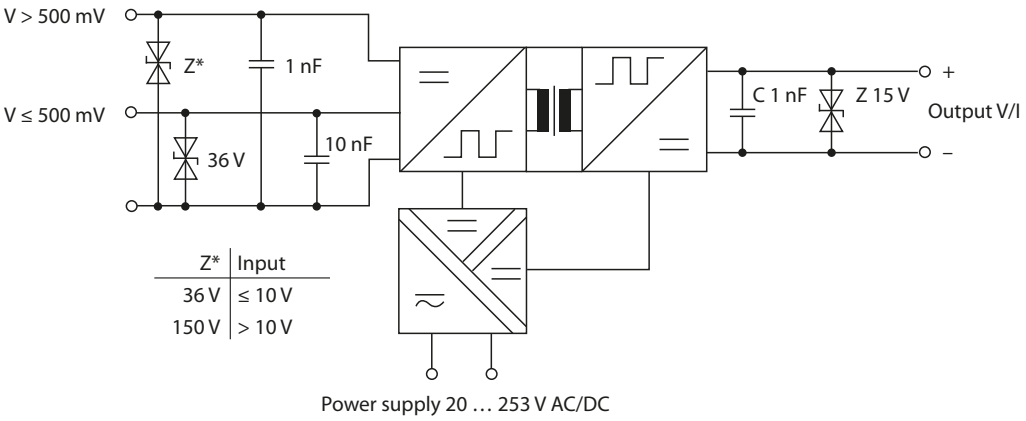
Further Data

MTBF[6]	Approx. 96 years		
Ambient temperature[7]	Operation:	-10 ... +70 °C	
	Transport and storage:	-40 ... +85 °C	
Ambient conditions	Indoor use[8]; relative humidity 5 ... 95%, no condensation; Altitude up to 2000 m (air pressure: 790 ... 1060 hPa)[9]		
Design	Modular housing	D1 housing width: 22.5 mm	with screw terminals
	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	Approx. 180 g		

[1] Up to 500 mV input voltage with shunt monitoring on request
[2] Common-mode rejection ratio = Differential voltage gain / Common-mode voltage gain
[3] Transient Common-Mode Rejection Ratio = Differential DC gain / Common-mode transient peak value gain
[4] Reference temperature for TC specifications = 23 °C, average TC
[5] Slight deviations are possible while there is interference
6) 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
[7] Extended operating temperature range –25 ... +85 °C on request
[8] Closed, weather-protected operating areas. Water or wind-driven precipitation (rain, snow, hail, etc.) excluded
[9] Lower air pressure reduces the allowable working voltages.

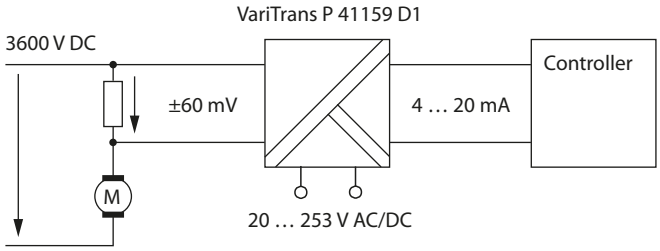
VariTrans P 41000

Block Diagram



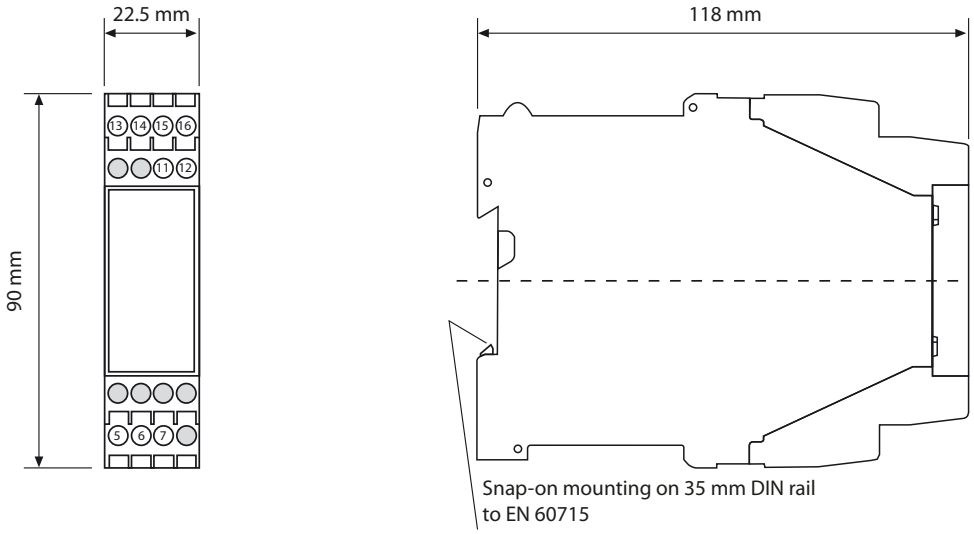
Typical Application

Current measurement via shunt resistor



High Voltage Transducers

Dimension Drawing and Terminal Assignments, Type D1

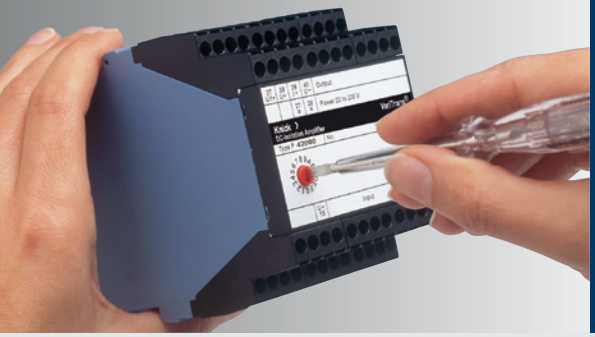


Terminal Assignments

5	Input	+	Voltage (> 0.5 V ... 100 V)
6	Input	+	Voltage (50 ... 500 mV)
7	Input	–	
11	Power supply	AC/DC	
12	Power supply	AC/DC	
13	Output	+	Current
14	Output	+	Voltage
15	Output	–	Current
16	Output	–	Voltage

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

For voltage output, place jumper
across terminals 13 and 14.
Do not use a jumper for current output
(remove pre-installed jumper).



VariTrans P 42000

VariTrans P 42000

Universal high voltage transducer.
Input voltages up to V_{in} = ±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.

5 Year Warranty!

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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 µs
- **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	±800 / ±1000 / ±1500 / ±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**
	±400 / ±600 / ±800 / ±1000 / ±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**
	±1400 / ±1600 / ±1800 ±2000 / ±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)
Rated insulation voltage according to EN 50124-1	Calibrated switching	Up to 2200 V AC/DC with overvoltage category III and pollution degree 2. Input against output / power supply
	Fixed setting (model P42100D3-nnnn)	Up to 3000 V AC/DC with overvoltage category III and pollution degree 2. Input against output / power supply
Protection against electric shock	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	

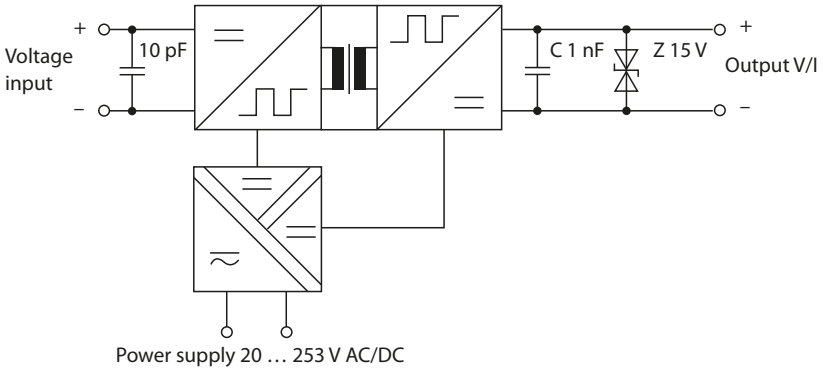
High Voltage Transducers

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 with screw terminals	Housing width D2: 45 mm 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 mm² solid or 1 x 2.5 mm² stranded with ferrule, min. 1 x 0.5 mm² 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.

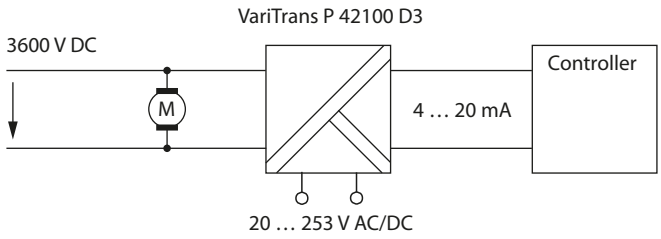
Block Diagram



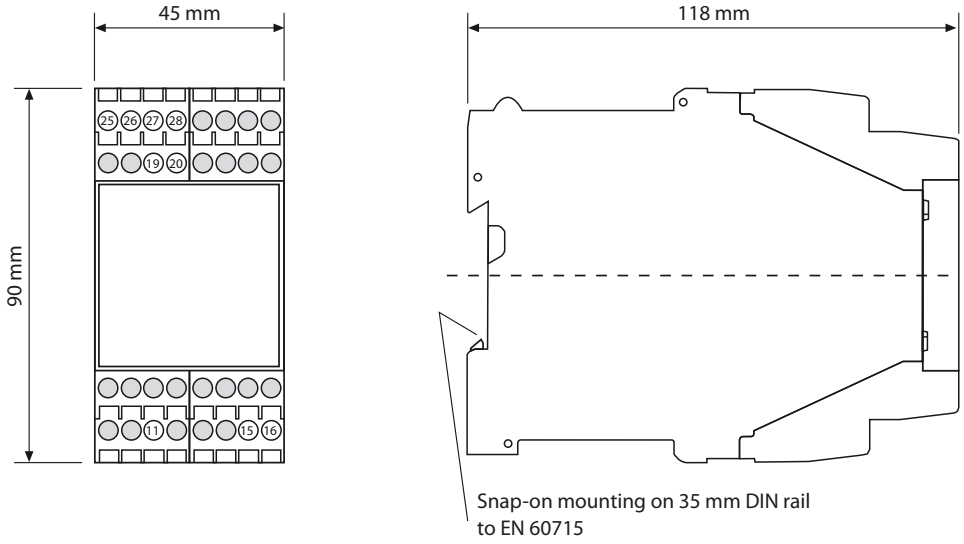
VariTrans P 42000

Typical Application

Direct measurement of supply voltage



Dimension Drawing and Terminal Assignments, Type D2



Terminal Assignments

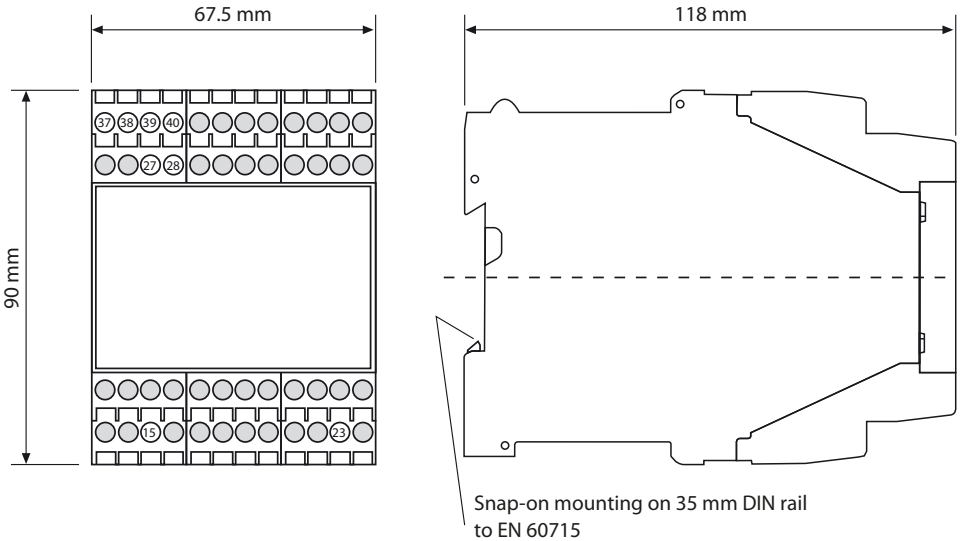
11	Input	+	Voltage
15	Input	–	Voltage
16	Do not use		
19	Power supply		AC/DC
20	Power supply		AC/DC
25	Output	+	Current
26	Output	+	Voltage
27	Output	–	Current
28	Output	–	Voltage

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)
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 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

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

VariTrans P 43000

VariTrans P 43000

Universal high voltage transducer.
Input currents up to I_{in} = 5 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 ±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 43000 high voltage transducers 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 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 45 mm wide modular housing is used for the VariTrans P 43000 high voltage transducers. 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 43000 are available for any input currents from ±100 mA to ±5 A. 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 45 mm wide modular housing is sufficient for input currents up to 5 A AC/DC. Another major advantage offered by 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, 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.

5 Year Warranty!

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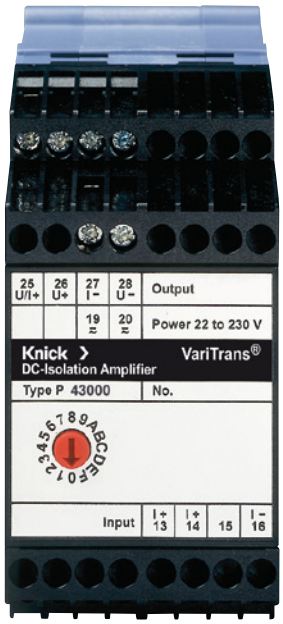
Facts and Features

- **Universal high voltage transducers**
  for converting 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**
  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 T90 approx. 110 µs
- **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
- **Mechanically stable**
  for operation on ships, rail vehicles and land crafts
- **5-year warranty**



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, calibrated switching	±10 V, ±20 mA and 4 ... 20 mA, calibrated switching	≤ 2.2 kV AC/DC	10 kV AC	**P 43000 D2**
VariTrans P 43000 adjusted to customer requirements	±0.1 A ... ±5 A 1 to 16 switchable calibrated 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 43000 D2-nnnn**
	±0.1 A ... ±5 A, fixed setting, to customer requirements[1)]	±10 V, ±20 mA, 4 ... 20 mA, fixed setting, to customer requirements[1)]	≤ 3.6 kV AC/DC	15 kV AC	**P 43100 D2-nnnn**

Power supply

20 ... 253 V AC/DC

1) Please specify the desired setting on the order

Specifications

Input		
Inputs	P 43000 D2	±1 A, ±1,5 A, ±2 A, ±3 A, ±5 A, calibrated switching, factory setting: ±5 A
	P 43000 D2-nnnn	±0.1 A ... ±5 A, 1 to 16 ranges to customer requirements, calibrated switching
	P 43100 D2-nnnn	0,1 A … 5 A, unipolar/bipolar; fixed setting, to customer requirements
Input resistance	< 0.6 Ω	
Input capacitance	Approx. 1 nF	
Overload capacity	20 % full scale	
Output		
Output	P 43000 D2	20 mA, 10 V unipolar/bipolar and 4 ... 20 mA; calibrated switching, factory setting: ±10 V
	P 43000 D2-nnnn	20 mA, 10 V unipolar/bipolar and/or 4 ... 20 mA, calibrated switching, to customer requirements
	P 43100 D2-nnnn	20 mA, 10 V unipolar/bipolar or 4 ... 20 mA; fixed setting, to customer requirements
Displacement	Up to ±150 % by default	
Load	With output current With output voltage	≤ 12 V (600 Ω at 20 mA) ≤ 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)	Approx. 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	

High Voltage Transducers

Specifications

Power Supply		
Power supply	20 … 253 V AC/DC	AC 48 … 62 Hz, approx. 2 VA; max. approx. 1.2 W
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 P43100D2-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 P43100D2-nnnn)	Up to 3600 V AC/DC with overvoltage category III and pollution degree 2. Input against output / power supply (transient overvoltage: 20 kV)
Rated insulation voltage according to EN 50124-1	Calibrated switching	Up to 2200 V AC/DC with overvoltage category III and pollution degree 2. Input against output / power supply
	Fixed setting (model P43100D2-nnnn)	Up to 3000 V AC/DC with overvoltage category III and pollution degree 2. Input against output / power supply
Protection against electric shock	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 P43100D2-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.		
Standards and Approvals		
EMC[3]	Product family standard:	EN 61326
	Emitted interference:	Class B
	Immunity to interference:	Industrial applications
Further Data		
MTBF[4]	Approx. 96 years	
Ambient temperature[5]	Operation:	-10 ... +70 °C
	Transport and storage:	-40 ... +85 °C
Design	Modular housing with screw terminals	D2 housing width: 45.0 mm
See dimension drawings for other measurements.		
Ingress protection	Housing: IP 40	Terminals: IP 20
Mounting	With snap-on mounting for 35 mm DIN rail according to EN 60715	
Weight	Approx. 350 g	

1) Common-mode rejection ratio = Differential voltage gain / Common-mode voltage gain

2) Reference temperature for TC specifications = 23 °C, the average TC is specified

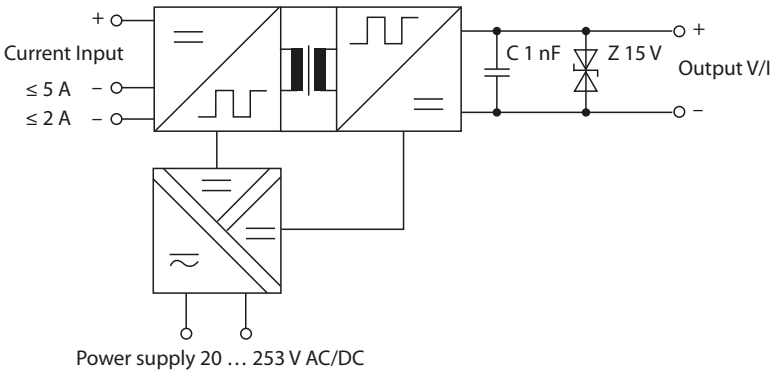
3) Slight deviations are possible while there is interference.

4) 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

5) Extended temperature range –25 ... +85 °C on request

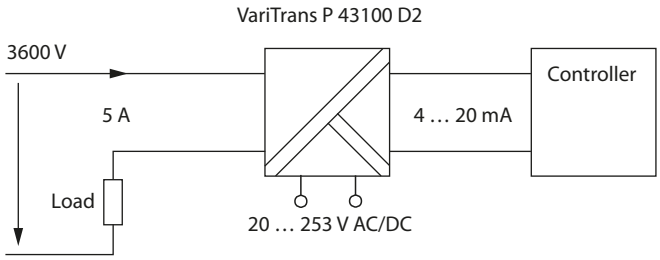
VariTrans P 43000

Block Diagram



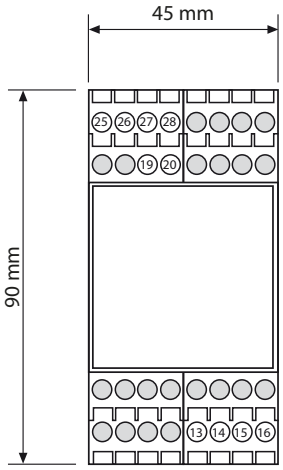
Typical Application

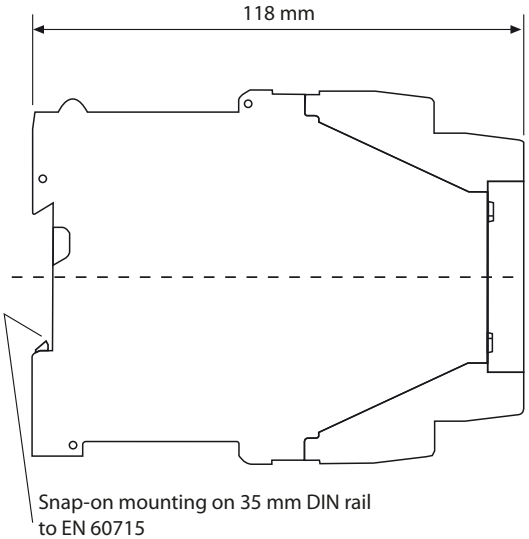
Direct measurement with a high input potential



High Voltage Transducers

Dimension Drawing and Terminal Assignments





Snap-on mounting on 35 mm DIN rail
to EN 60715

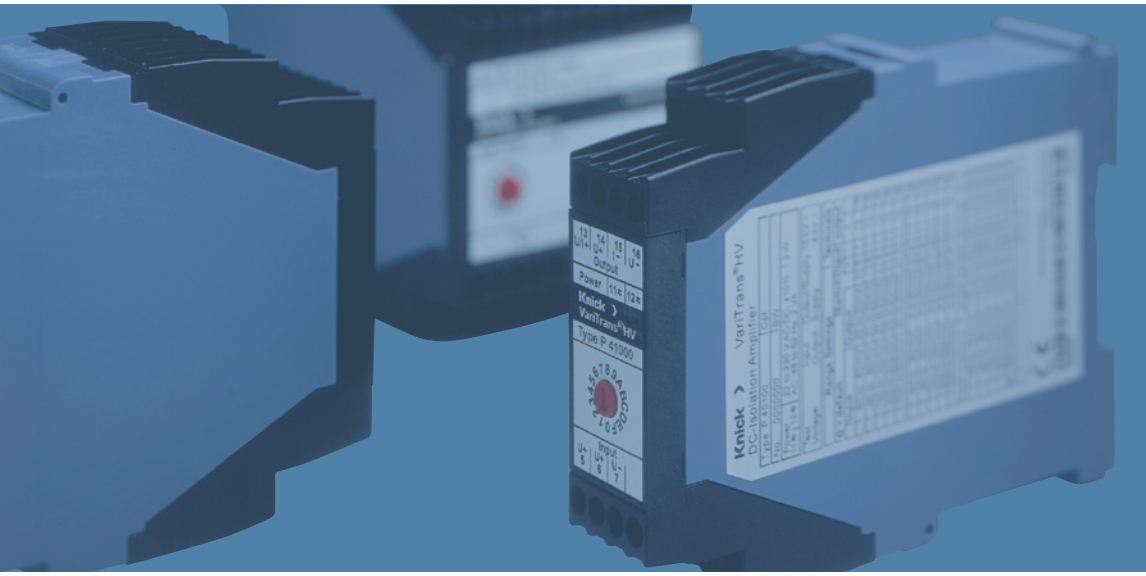
Terminal assignments

13	n/c		
14	Input	+	Current
15	Input	–	Current (≤5 A)
16	Input	–	Current (≤2 A)
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).

Knick



Interface Technology

- Transducers for Railway Applications
- High Voltage Transducers
- Universal Isolated Signal Conditioners
- Isolated Standard Signal Conditioners
- Temperature Transmitters
- Loop-Powered Isolators for Standard Signals
- Transducers for shunt applications
- Repeater Power Supplies
- Universal Transmitter

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