Operating instructions
SIMEAS-T

SIEMENS

Electronic Design
and Manufacturing Services

Transducer with Auxiliary Power

for DC voltage or DC current

7KG6131

Compact unit for use on mounting rails

Operating instructions

2.1 Application range

SIMEAS transducers for DC current or DC voltage with auxiliary power convert the input current or the input voltage into load-independent DC output current or load-independent DC output voltage. As long as the maximum permissible limit is not exceeded, several appliances, such as recorders, indicators, telecontrol systems, computers or closed-loop controllers, can be connected and operated either directly or via remote connection. Input, output and the auxiliary power supply are safely separated from one another.

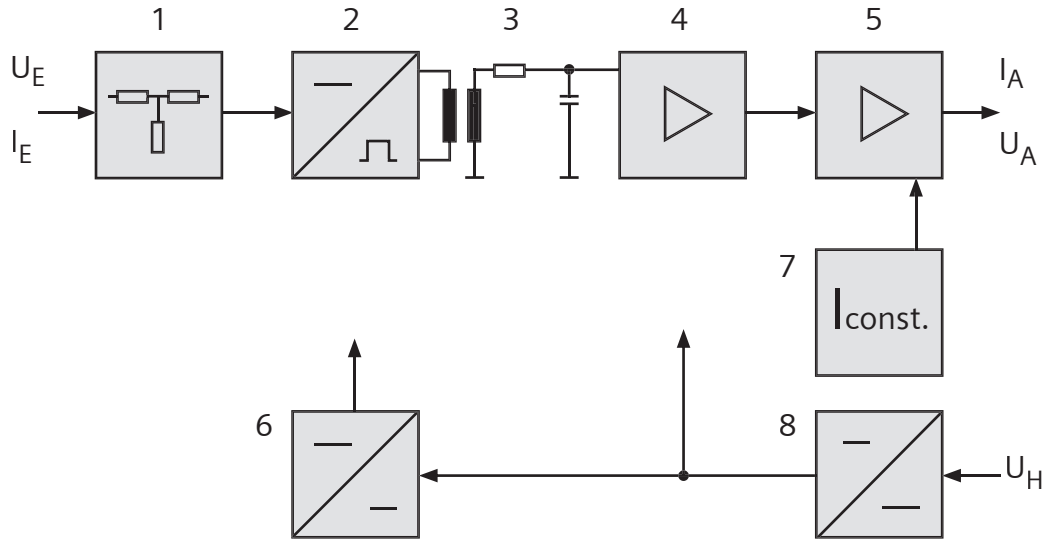
2.2 Performance features

- low price
- small dimensions
- short delivery times, standard types ex warehouse
- immunity to electromagnetic interference
- compliance with relevant national and international standards
- high quality, long life
- safe isolation with high test voltage
- high measuring accuracy
- powerful output signal circuits
- high plant safety and reliability

2.3 Working principle

Via resistors (1), the input voltage U_E is adapted to the pulse-pause-ratio voltage converter (2). The rectangular signal generated by this is transmitted via a transformer (3) to the output side, filtered and conditioned by the amplifier (4). The output amplifier (5) supplies a load-independent direct current I_A proportional to the input signal or a load-independent direct voltage U_A. Zero adjustment of the characteristic curve can be carried out with the reference current I_{const}.
The auxiliary power isolator (6) generates the galvanically isolated supply voltage of the input circuit.
The auxiliary power U_H~ or U_H- is converted into the internal supply voltages via an AC or DC voltage auxiliary power module (8).

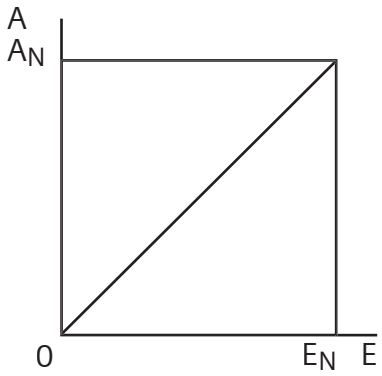
2.4 Overview circuit diagram

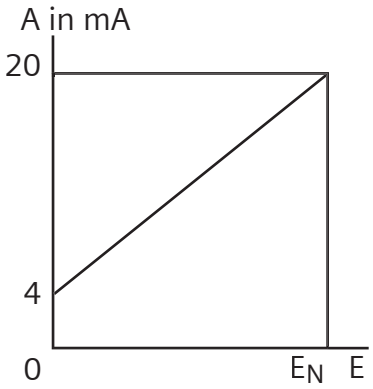


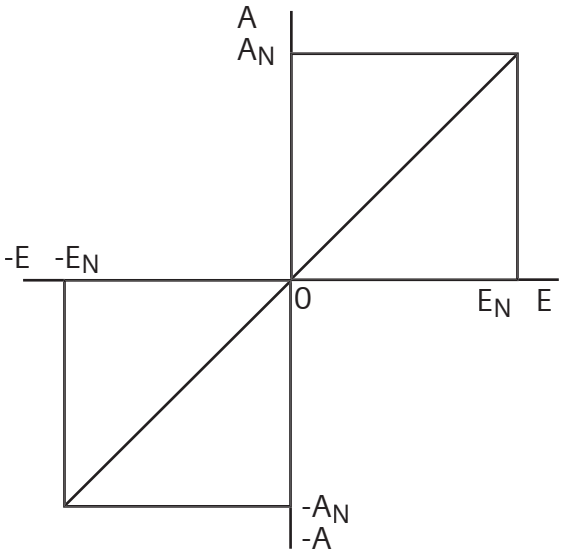
1. input voltage adaptation via resistors
2. pulse-pause-ratio voltage converter
3. transformer
4. amplifier
5. output amplifier
6. auxiliary power isolator
7. constant voltage source
8. auxiliary power module

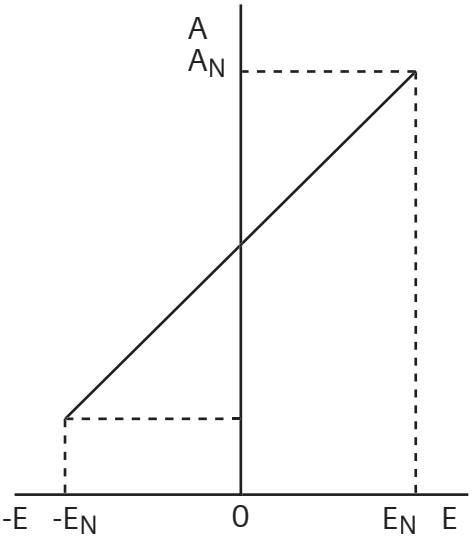
2.5 Characteristic curves

DC current and DC voltage









A = output signal, DC (mA, V)
A_N = nominal output signal
E = input signal, DC (mA, V)
E_N = nominal input signal

2.6 General remarks

These operating instructions include the information required for appropriate use of the products described therein. The document is addressed to technical personnel with special qualifications or know-how in the field of instrumentation and control engineering, in the following referred to as automation engineering.
Knowledge of and compliance with the safety notes and warnings described in this manual are a basic requirement for safe installation, commissioning, operation and maintenance of the product described. Only qualified personnel, as described below, have the required expert know-how to correctly interpret and apply the general safety notes and warnings in each specific case.
These operating instructions are part of the scope of delivery. In order to preserve the lucidity of the text, not all details of the various models have been included. Similarly, it is not possible to describe all possible installation, operation and maintenance procedures in this text. If further information is required or if special problems occur which are not sufficiently described in this document, please request the specific information from your local Siemens office or contact one of the departments listed on the back cover of this manual.

Furthermore, it should be noted that the contents of this product documentation are neither part of a previous or an existing agreement, commitment or legal relationship nor do they affect such a relationship in any way. All Siemens obligations derive from the respective sales contract, which also includes the complete and exclusive warranty agreement. This warranty agreement is neither extended nor restricted by any statements in this manual. The auxiliary power supply of the units must be equipped with an interrupter, such as an automatic circuit-breaker. This must be marked and installed in the vicinity of the units.

WARNING

Certain parts of electrical appliances are inevitably under hazardous voltage during operation. Grievous physical injury or damage can occur if the safety warnings are not heeded.
Only suitably qualified personnel should service this appliance. Appropriate transportation, storage, installation, assembly, operation and maintenance are basic requirements for correct and safe operation of this appliance.
Units and appliances are tested with regard to their dielectric strength at 5.55 kV/3.7 kV; their output circuits, however, do not carry functional extra-low voltages with safe separation according to VDE 0100, Part 410. This must be taken into account when using these units and appliances.

QUALIFIED PERSONNEL

Grievous physical injury or damage may result if this appliance/system is interfered with by **unqualified** persons or if the safety warnings in this manual are not heeded. Therefore, only suitably qualified personnel may service this appliance/system.
Qualified personnel, in the sense of the safety instructions in this manual or on the product itself, are such persons who,

- as project personnel are well acquainted with safety concepts in automation engineering;

- as operating personnel have been trained in the use of such equipment and are conversant with the sections of this manual dealing with operation;

- as startup and service personnel have attended training on the repair of automation equipment or are authorized to commission, earth and identify circuits and appliances/systems in accordance with the relevant safety standards.

2.7 Technical specifications

Input	
Only for connection to DC voltage systems with maximum nominal voltage of input signal E	500/1000 V see 2.8 description DC voltage U_E or DC current I_E
standard nominal current I_{EN}	1 mA; 2.5 mA; 5 mA; 10 mA; 20 mA
special nominal current I_{EN}	a value in a range from 1 mA to 100 mA
nominal control range	$-I_{EN}$ to 0 to $+I_{EN}$
permissible control range	-1.2 I_{EN} to 0 to +1.2 I_{EN}
voltage drop at input at I_{EN}	500 mV ± 5 %
standard nominal voltage U_{EN}	60 mV; 150 mV; 300 mV; 1 V; 10 V; 15 V; 25 V; 30 V; 60 V; 100 V; 150 V; 250 V; 300 V; 400 V; 500 V; 600 V; 800 V; 1000 V
special nominal voltage U_{EN}	a value in a range from 60 mV to 1000 V
nominal control range	$-U_{EN}$ to 0 to $+U_{EN}$
permissible control range	-1.2 U_{EN} to 0 to +1.2 U_{EN} however, max. 1000 V
input resistance R_E	
U_{EN} = 60 mV to 1 V	$R_E \geq$ 30 KΩ/V
U_{EN} > 1 V to 100 V	$R_E \geq$ 10 KΩ/V
U_{EN} > 100 V to 1000 V	$R_E \geq$ 2 KΩ/V
Output	
output signal A	bipolar, short-circuit protection and no-load protection, optionally load-independent direct current or load-independent direct voltage
standard nominal current I_{AN}	1 mA; 2.5 mA; 5 mA; 10 mA; 20 mA
special nominal current I_{AN}	in a range from ±1 to ±20 mA
nominal control range	$-I_{AN}$ to 0 to $+I_{AN}$ or 4 – 20 mA
permissible control range	-1.2 I_{AN} to 0 to +1.2 I_{AN}
zero adjustment	in a range from $-I_{AN}$ to 0 to $+I_{AN}$
no-load voltage U_{AL}	≤ 30 V
nominal load R_{BIN}	7.5 V / I_{AN}
working load R_B	0 to 15 V / I_{AN}
standard nominal voltage U_{AN}	1 V, 10 V
nominal control range	0 to U_{AN}
permissible control range	-1.2 U_{AN} to 0 to +1.2 U_{AN}
zero adjustment	in a range from 0 to U_{AN}
short-circuit current	≤ 25 mA
nominal load R_{BUN}	U_{AN} / 1 mA
load current I_B	≤ 2 mA
residual ripple I_{PP} / U_{PP}	≤ 0,5 % SS from I_{AN} or U_{AN}
response time t_{99}	≤ 50 ms (residual error = 1 % of the steady-state value)

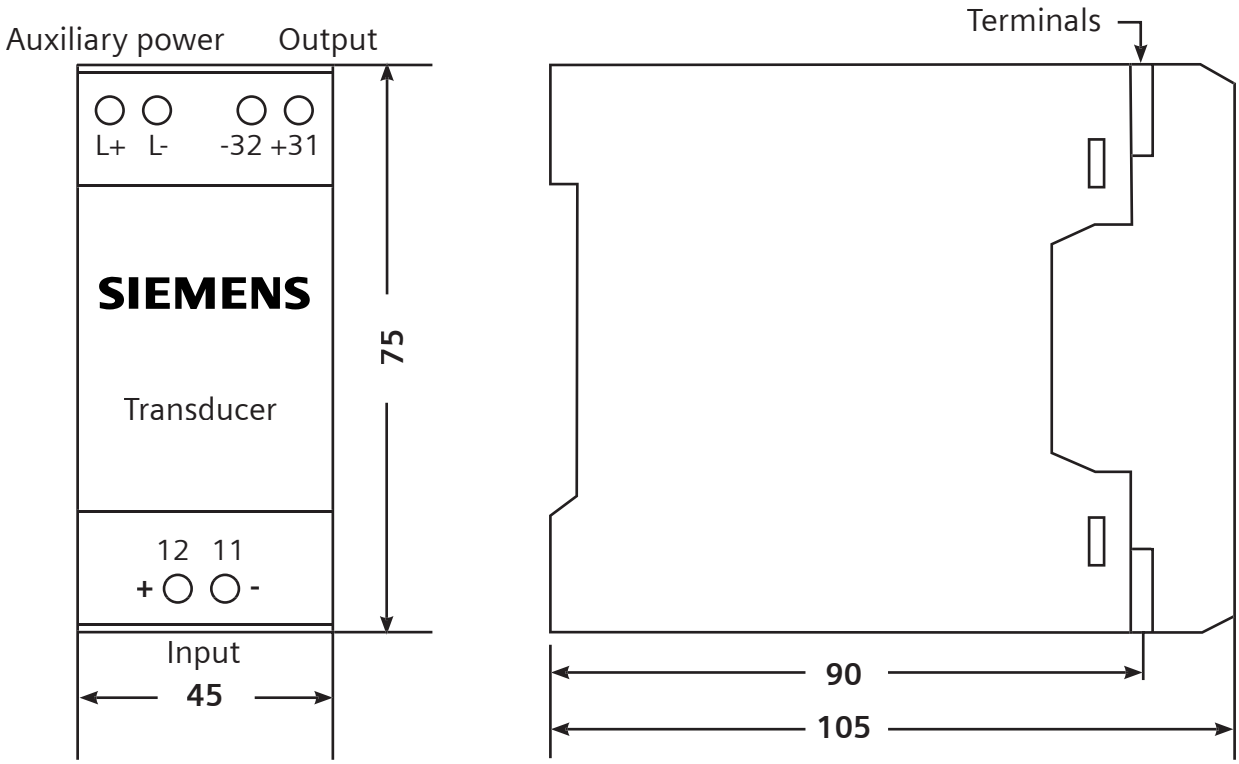
Auxiliary power U_H	
nominal input voltage U_{HN}	
- DC voltage	DC 24-60 V; 110-220 V
- AC voltage	AC 100; 115; 230 V; 45-65 Hz
input range	
- DC voltage	± 20 %
- AC voltage	± 20 %
power input	at $U_H = U_{HN}$; typical value
- DC voltage	2 W
- AC voltage	1.6 W; 2.5 VA
Tolerances and influence effects	the relative tolerances with signs + and – **!**
error at reference conditions	0.2 % referred to A_N
reference conditions	
- input current I_E	0 to I_{EN}
- input voltage U_E	0 to U_{EN}
- auxiliary AC voltage U_H	U_{HN} ± 1 %, harmonic distortion factor ≤ 5 %
- auxiliary DC voltage U_H	U_{HN} ± 1 %, ripple content ± 2 %
- load R_B	R_{BIN} ± 1 %, R_{BUN} ± 1 %
- ambient temperature T_U	23 °C ± 1 °C
- warm-up time	≥ 15 min
- external fields	none
influence effects of the	
- ambient temperature	≤ 0.2 % / 10 K
- load at current output for R_B = 15 V / I_{AN}	≤ 0.1 %
- load at voltage output for R_B = ∞ to UAN/2 mA	≤ 10 mV
- auxiliary power U_H = 0.8 to 1.2	≤ 0.1 %
- warm-up	≤ 0.3 %
An additional error may occur during interference according to I_{EC} 801-3 and I_{EC} 801-6 at certain frequencies.	

Other technical specifications	
surge voltage VDE 0435, Part 303 for type testing	
- input to output	Ü = 5 kV, 1.2/50 µsec Ri = 500 Ω
- input to auxiliary power	Ü = 5 kV, 1.2/50 µsec Ri = 500 Ω
- output to auxiliary power	Ü = 5 kV, 1.2/50 µsec Ri = 500 Ω
- on input and auxiliary power as	Ü = 5 kV, 1.2/50 µsec Ri = 500 Ω
normal-mode voltage	Ü = 5 kV, 1.2/50 µsec Ri = 500 Ω
- on output as normal-mode	Ü = 500 V, 1.2/50 µsec Ri = 500 Ω
voltage	three pulses in each polarity direction
permissible ambient temperature to I_{EC} 68-2/1-3	
- working temperature range	-10 °C bis +60 °C
- storage temperature range	-40 °C bis +85 °C
Climatic application class	temperature 3K8H
EN 60721-3-3	humidity 3K5 (rare light condensation)
Safety according to DIN EN 61010 Part 1	
overvoltage category	
- at U_{EN} = 0 – 500 V	III
- at U_{EN} = 500 – 1000 V	II
pollution degree	2
fire resistance class	VO
safely separated	
dielectric strength (test voltage) for type testing	
- input and output	U_{rms} = 5.5 kV, 50 Hz, sinusoidal
- input to auxiliary power	U_{rms} = 5.5 kV, 50 Hz, sinusoidal
- output to auxiliary power	U_{rms} = 3.7 kV, 50 Hz, sinusoidal
Electomagnetic compatibility	
interference emission	to DIN EN 50081-1
• radio interference fields	to DIN EN 55022 class B
• radio interference voltage	to DIN EN 55011 class B
interference immunity	to DIN EN 50082-2
• immunity to electromagnetic fields 10 V/m	to DIN EN 61000-4-3 (I_{EC} 801-3)
• electrostatic discharge ESD 8 kV	to DIN EN 61000-4-2 (I_{EC} 801-2)
• fast transients, asymmetrical burst	to DIN EN 61000-4-4 (I_{EC} 801-4)
input and output 2 kV	
power supply 4 kV	
HF exposure 10 V_{rms}	to I_{EC} 801-6

2.8 Description

The transducers in their housing are permanently-wired and tested function units. They include snap-on mounting for a 35 mm top-hat rail according to DIN EN 50022. Inputs and outputs can be safely connected with screw terminals. The appliances are free of silicon and halogen and are flame-retardent.
The balancing potentiometers can be accessed after removing the modules from the housing.

Weight:	approx. 0.33 kg
Protection type:	DIN VDE 0470 Part 1/EN 60529 housing: IP40 terminals: IP20
Connections:	screw terminals input: 4 mm² output: 2.5 mm²



Ordering data for DC voltage, DC current, isolation amplifier

Designation	Order-No.					Code
Housing 7KG	6 1 3 1 - 1	☐	☐	☐	☐	
DC Input voltage E_N		↑				
- 60 mV to 60 mV		**A**				
- 150 mV to 150 mV		**B**				
- 300 mV to 300 mV		**C**				
- 1 V to 1 V		**L**				
- 10 V to 10 V		**M**				
- 15 V to 15 V		**D**				
- 25 V to 25 V		**F**				
- 30 V to 30 V		**X**				
- 150 V to 150 V		**P**				
- 250 V to 250 V		**Q**				
- 300 V to 300 V		**U**				
- 400 V to 400 V		**R**				
- 500 V to 500 V		**S**				
- 600 V to 600 V		**T**				
- 800 V to 800 V		**V**				
- 1000 V to 1000 V		**W**				
DC input current						
- 1 mA to 0 to 1 mA		**E**				
- 2.5 mA to 0 to 2.5 mA		**G**				
- 5 mA to 0 to 5 mA		**H**				
- 10 mA to 0 to 10 mA		**J**				
- 20 mA to 0 to 20 mA		**K**				
4 mA to 20 mA		**N**				
Other input signal, plain text specification		**Z**				**J1Y**
DC output signal						
- 1 mA to 1 mA			**E**			
- 2.5 mA to 2.5 mA			**G**			
- 5 mA to 5 mA			**H**			
- 10 mA to 10 mA			**J**			
- 20 mA to 20 mA			**K**			
- 1 V to 1 V			**L**			
- 10 V to 10 V			**M**			
4 mA to 20 mA			**N**			
Other output signal, plain text specification			**Z**			**K1Y**
Zero position						
Input = Output						
0 mA, V = 0 mA, V				**1**		
0 mA, V = 4 mA				**2**		
0 mA, V = 12 mA				**3**		
4 mA = 0 mA, V				**4**		
12 mA = 0 mA, V				**5**		
as stated in the plain text spcification				**9**		**L2Y**
Auxililary power						
DC 19.2 - 72 V					**1**	
DC 88 - 264 V					**4**	
AC 45 bis 65 Hz, 100 V					**5**	
AC 45 bis 65 Hz, 115 V					**6**	
AC 45 bis 65 Hz, 230 V					**7**	

2.10 Installation and operation

WARNING

Certain parts of electrical appliances are inevitably under hazardous voltage during operation. Grievous physical injury or damage can occur if the operating instructions are not heeded.
The installation and connection of the appliance must only be carried out by suitably qualified personnel.
In particular, all safety warnings must be observed.

Installation

- The installation point should be as free from vibrations as possible. The permissible ambient temperature (working or functional temperature) must be observed (see Technical specifications).
- Operation outside the functional temperature range can result in incorrect measurement and may lead to a failure of the transducer.
- Plastic housing, overvoltage category III according to DIN EN 61010 part 1.
- Screw terminals for max. 2.5 mm^2 or 4 mm^2.
- The transducer can be snapped onto a 35 mm top-hat rail (according to DIN EN 50022).
- The units are certified only for operation in closed housings or cubicles.

Connection

The regulations concerning the electrical installation of power systems must be complied with.

- If several receiving units, e.g. recorders, indicators, telecontrol systems, computers or closed-loop controllers are to be used, they should be connected in series with the current output of the transducer (pay attention to the polarity!).
- The auxiliary power connection must be protected externally.
- The entire load, including the wiring, must not exceed the maximum value given in the technical specifications.
- The terminal assignment is described in section 2.9.

2.11 Startup

Make sure that the operating data match the data given on the rating plate. Do not modify any transducer settings. The transducer is operational after a 15 minute warm-up period and will keep within the error tolerances.

- Measuring the output current and the load voltage:
  Before connecting an amperemeter to the output side of the transducer, the auxiliary power must be disconnected, since the voltage at terminals 31 und 32 can reach a maximum of 30 V DC during interruption of the output current I_A.

- Measuring the output current (output signal I_A):
  Disconnect the wire from terminal 31(+) or 32(-) and connect the amperemeter in series.

- Measuring the load voltage (output signal I_A), or the output signal U_A:
  Connect the voltmeter to terminals 31(+) and 32(-)

2.12 Maintenance

The transducer is maintenance-free. The output signal can be tested in a laboratory 6 months after startup and thereafter every two years (section on “Calibration and testing”). For this, the appliance needs to be opened.

2.13 Calibration and testing

WARNING

When carrying out these tasks, the provisions and instructions of the accident prevention regulations VBG 4.0 must be observed. Point 8 is of particular importance: "Permissible deviations while working on active parts". Appropriate electrical tools are to be used.

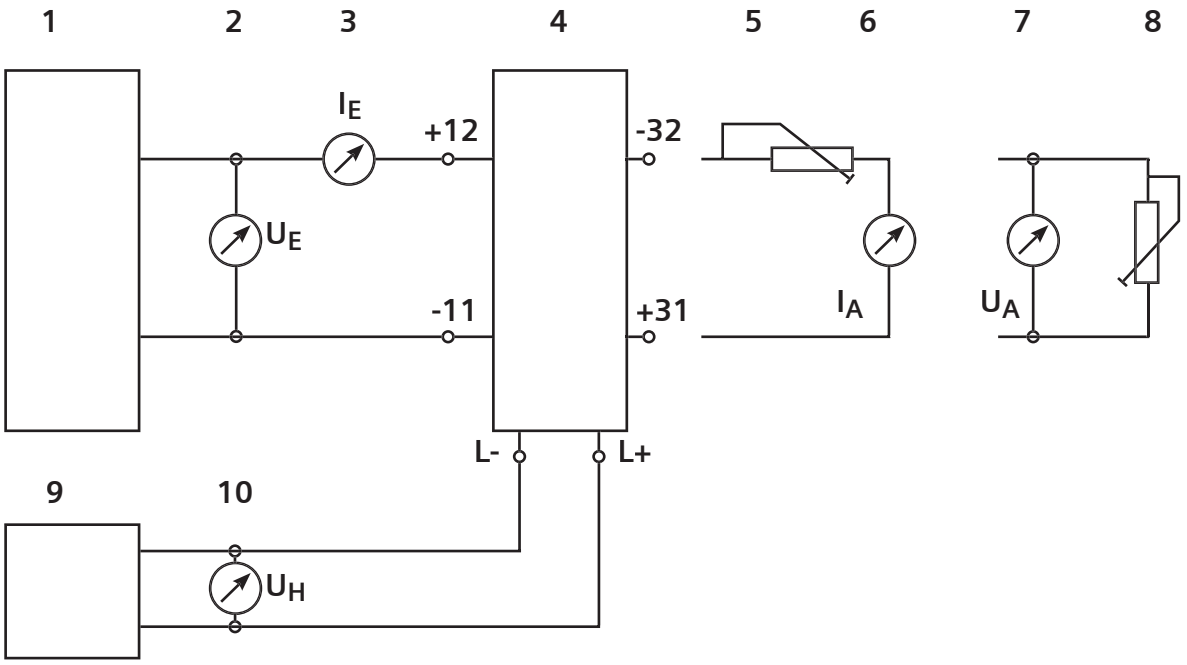
To calibrate the device, the transducer needs to be opened and the subassembly units removed.
After disconnecting the external wiring, open the lid of the transducer and remove the subassembly units. The circuit comprises the following units:

- measuring module G34924-J1003-L1
- connection module G34932-F1801-L1
- power supply unit G34932-F1802-L1

The trimming potentiometers are on the measuring module.

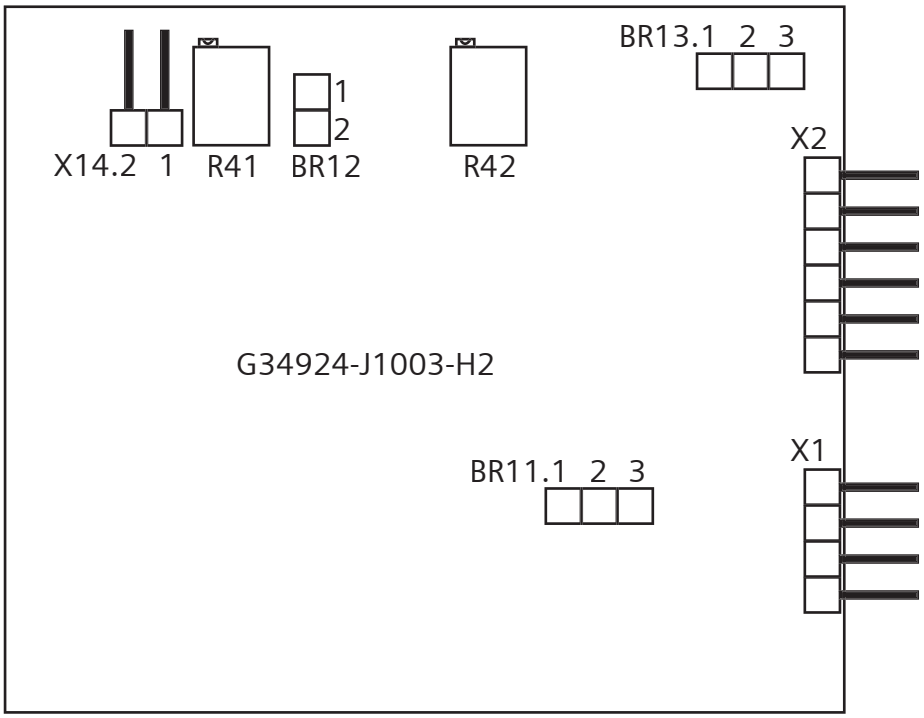
Special care is required during work on the open modules, since hazardous voltages could be present on the back of the measuring module and power supply unit.
Therefore, the back of the modules should be appropriately covered.

Test circuit for voltage and current transducers.



1. DC voltage sensor 0 to 1000 V or
   DC current sensor 0 to 30 mA
2. voltmeter, class 0.01
3. amperemeter, class 0.01, Ri ≤ 10 Ω
4. test specimen, voltage or current transducer
5. decade resistor 0 to 20 kΩ
6. amperemeter, class 0.01, Ri ≤ 10 Ω
7. voltmeter, class 0.01
8. decade resistor 0 to 20 kΩ
9. AC or DC voltage sensor
10. voltmeter

Arrangement of the balance potentiometers and bridges on the measuring module.



current output	**BR13.1 – BR13.2:**	**open**
	BR13.2 – BR13.3:	**closed**
voltage output	**BR13.1 – BR13.2:**	**closed**
	BR13.2 – BR13.3:	**open**

Transducer with a linear characteristic
input and output unipolar or
input and output symmetrically bipolar

BR11.1 – BR11.2 : open
BR12.1 – BR12.2 : open
X14.1 – X14.2 : closed

BR11.2 – BR11.3 : open

Zero adjustment
Apply E = 0 ± 0.05 % E_N, or short-circuit (terminals 11 and 12), set the output value to A = 0 ± 0.1 % A_N with trimming potentiometer **R41**.

End value
Apply E = E_N ± 0.05 % E_N, set the output to A = A_N ± 0.1 % A_N with trimming potentiometers **R42**.
Check the intermediate values.
With bipolar input and output, feed in positive and negative values and check symmetry.

Transducer with a linear characteristic
input symmetrically bipolar -E_N to 0 to +E_N
output unipolar 0 to +A_N

BR11.1 – BR11.2 : open
BR12.1 – BR12.2 : open
X14.1 – X14.2 : closed

BR11.2 – BR11.3 : closed

Zero adjustment
Apply E = -E_N ± 0.05 % E_N, set the output value to A = 0 ± 0.1 % A_N with trimming potentiometer **R41**.

End value
Apply E = EN ± 0.05 % E_N, set the output end value to A = A_N ± 0.1 % AN with trimming potentiometer **R42**.
Check the intermediate values.

Transducer with a linear characteristic

input unipolar 0 bis +E_N
output unipolar +4 mA to +20 mA

BR11.1 – BR11.2 : open
BR11.2 – BR11.3 : open
BR12.1 – BR12.2 : closed

Zero adjustment
X14.1 – X14.2 : closed
Apply E = 0 ± 0.05 % E_N, or short-circuit input (terminals 11 and 12), set the output value to A = 0 ± 0.1 % A_N with trimming potentiometer **R41**.

16 mA
X14.1 – X14.2 : closed
Apply E = E_N ± 0.05 % E_N, set the output value to A = 16 mA ± 0.1 % A_N with trimming potentiometer **R42**.

20 mA
X14.1 – X14.2 : open
Apply E = E_N ± 0.05 % E_N, set the output value to A = 20 mA ± 0.1 % A_N with trimming potentiometer **R41**.
Check the intermediate values.

Transducer with a linear characteristic

input symmetrically bipolar -E_N to 0 to +E_N
output unipolar +4 mA to +12 mA to +20 mA

BR11.1 – BR11.2: open
BR11.2 – BR11.3: closed
BR12.1 – BR12.2: closed

Zero adjustment
X14.1 – X14.2 : closed
Apply E = -E_N ± 0.05 % E_N, set the output value to A = 0 ± 0.1 % A_N with trimming potentiometer **R41**.

16 mA
X14.1 – X14.2 : closed
Apply E = +E_N ± 0.05 % E_N, set the output value to A = 16 mA ± 0,1 % A_N with trimming potentiometer **R42**.

20 mA
X14.1 – X14.2 : open
Apply E = +E_N ± 0.05 % E_N, set the output value to A = 20 mA ± 0.1 % A_N with trimming potentiometer **R41**.
Check the intermediate values.

Transducer with a linear characteristic
input unipolar +4 mA to + 20 mA
output unipolar 0 to +A_N

BR11.1 – BR 11.2 : closed BR11.2 – BR11.3 : open
BR12.1 – BR 12.2 : open
X14.1 – X14.2 : closed

Zero adjustment
Apply E = 4 mA ± 0.05 % E_N, set the output value to A = 0 ± 0.1 % A_N with trimming potentiometer **R41** .

End value
Apply E = 20 mA ± 0.05 % E_N, set the output end value to A = A_N ± 0.1 % A_N with trimming potentiometers **R42**.
Check the intermediate values.

Transducer with a linear characteristic
input unipolar +4 mA to +12 mA to +20 mA
output symmetrically bipolar -20 mA to 0 to +20 mA

BR11.1 – BR11.2 : closed BR11.2 – BR11.3: open
BR12.1 – BR12.2 : open

1. Zero adjustment
X14.1 – X14.2: open
Apply E = +4 mA ± 0.05 %, set the output value to A = 0 mA ± 0.1 % with trimming potentiometer **R41**.

Set output value
X14.1 – X14.2 : open
Apply E = +12 mA ± 0.05 %, set the output value to A = +20 mA ± 0.1 % with trimming potentiometer **R42**.

2. Zero adjustment
X14.1 – X14.2 : closed
Apply E = +12 mA ± 0.05 %, set the output value to A = 0 mA ± 0.1 % with trimming potentiometer **R41**.

Check output value
X14.1 – X14.2 : closed
Apply E = +20 mA ± 0.05 %,
check output value A = +20 mA ± 0.1 %.
Apply E = +4 mA ± 0.05 %,
check output value A = -20 mA ± 0.1 %.
Check the intermediate values.

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