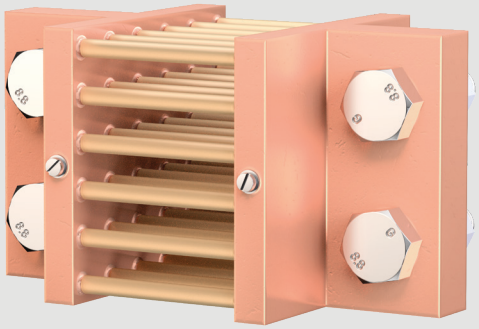
High voltage signal conditioner



P41000 AG

The First Signal Conditioner with "Knick Curve" for Precise Measurement of DC Currents in Normal Operation and Measurement of Very High Currents in Overload Conditions

P41000 AG (adaptive gain) is designed to measure currents in electrical supply systems and large power-consuming devices.

In addition to precise current measurements in normal operation, it also measures high overload currents occurring in the event of a fault,
e.g., due to short circuits, defects, storm damage, etc.

The current curves over time measured with the P41000 AG are analyzed with protective devices so as to interrupt the power supply early on in the event of a fault.

In order to enable key conclusions about the condition of the system, it is important to know the level and duration of the overload currents up to the time the power supply was interrupted. The P41000 AG makes this possible.

Facts and Features

- The P41000 AG fulfills two tasks in a single product:
  - Continuous measurement of the regular supply current for timely detection of overcurrent events.
  - Measurement, until disconnection, of the large overcurrents occurring in the event of a fault.
- This saves the need for an additional signal conditioner to measure overload currents and an additional measuring channel in a downstream protective device.
- With the P41000 AG, currents are always measured in combination with a (Maconic) shunt resistor. The P41000 AG measures shunt voltages of between 30 and 120 mV.

5-year warranty!

UK CA CE

P41000 AG

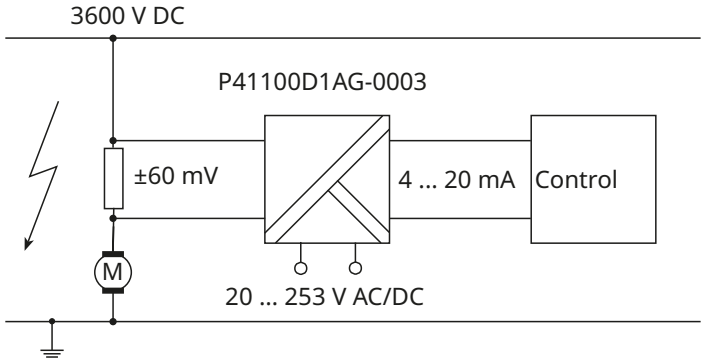
Product Line

Input		Output	Test voltage	Product Code for Version	
Insertable jumper in terminals 5 and 6	Insertable jumper in terminals 6 and 7			Without open circuit detection	With open circuit detection
±10 mV	±30 mV	4 ... 16 mA	10 kV	P41000D1AG-0001[1)]	P41001D1AG-0001[1)]
			15 kV	P41100D1AG-0001[1)]	P41101D1AG-0001[1)]
±30 mV	±60 mV	4 ... 16 mA	10 kV	P41000D1AG-0007	P41001D1AG-0007
			15 kV	P41100D1AG-0007	P41101D1AG-0007
±50 mV	±100 mV	4 ... 16 mA	10 kV	P41000D1AG-0002	P41001D1AG-0002
			15 kV	P41100D1AG-0002	P41101D1AG-0002
±60 mV	±120 mV	4 ... 16 mA	10 kV	P41000D1AG-0003	P41001D1AG-0003
			15 kV	P41100D1AG-0003	P41101D1AG-0003
0 ... 10 mV	0 ... 30 mV	4 ... 16 mA	10 kV	P41000D1AG-0004[1)]	P41001D1AG-0004[1)]
			15 kV	P41100D1AG-0004[1)]	P41101D1AG-0004[1)]
0 ... 30 mV	0 ... 60 mV	4 ... 16mA	10 kV	P41000D1AG-0008	P41001D1AG-0008
			15 kV	P41100D1AG-0008	P41101D1AG-0008
0 ... 50 mV	0 ... 100 mV	4 ... 16 mA	10 kV	P41000D1AG-0005	P41001D1AG-0005
			15 kV	P41100D1AG-0005	P41101D1AG-0005
0 ... 60 mV	0 ... 120 mV	4 ... 16 mA	10 kV	P41000D1AG-0006	P41001D1AG-0006
			15 kV	P41100D1AG-0006	P41101D1AG-0006

[1)] On request

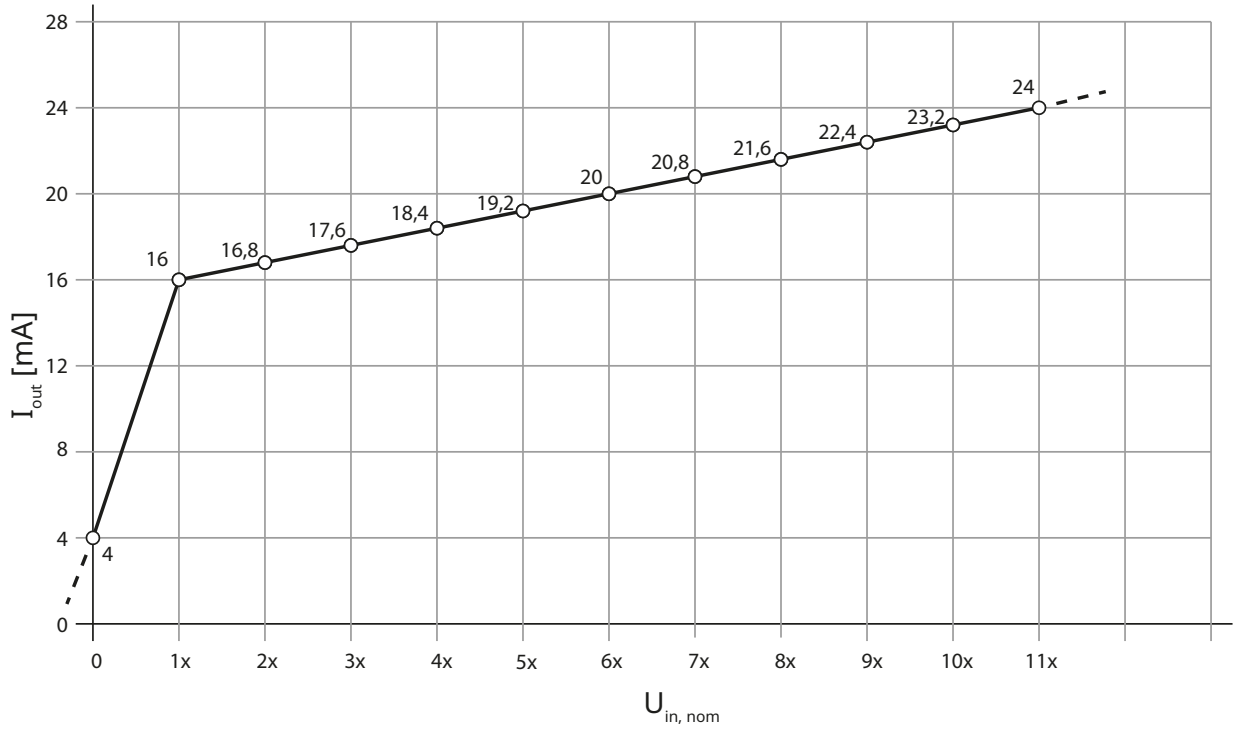
Application Example

Current measurement via shunt resistor

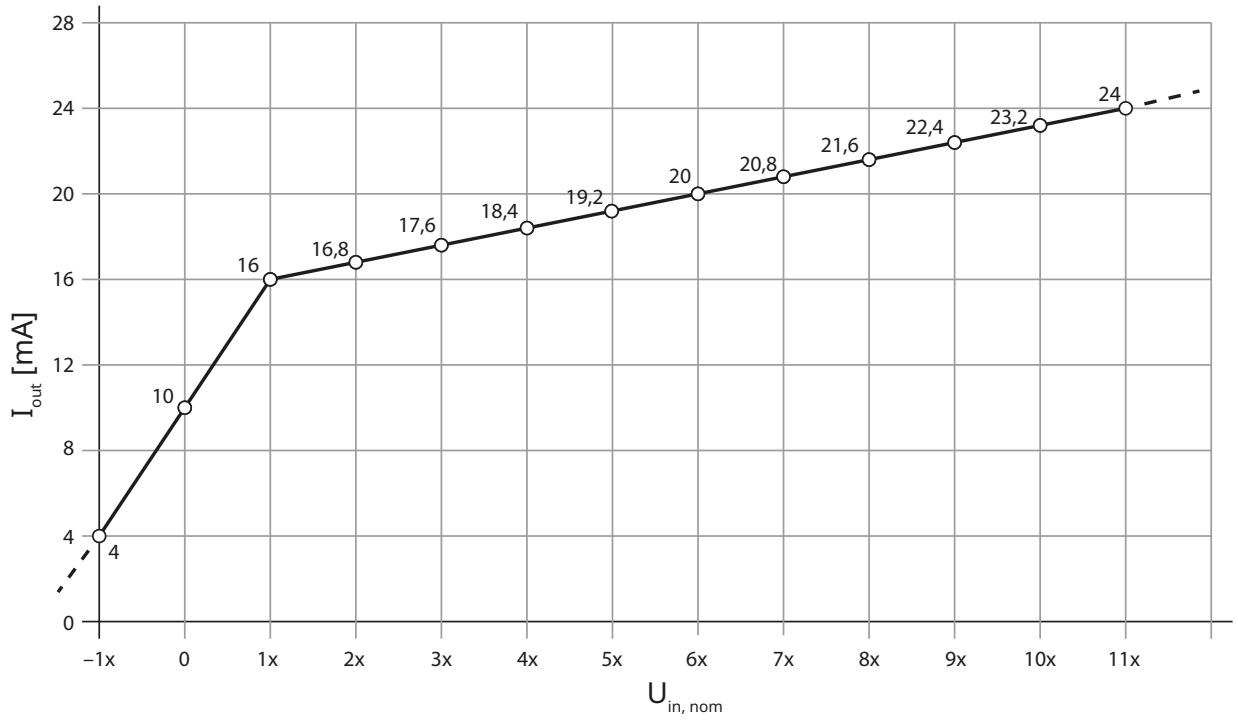


Transmission Curves

Unipolar Transmission Curve

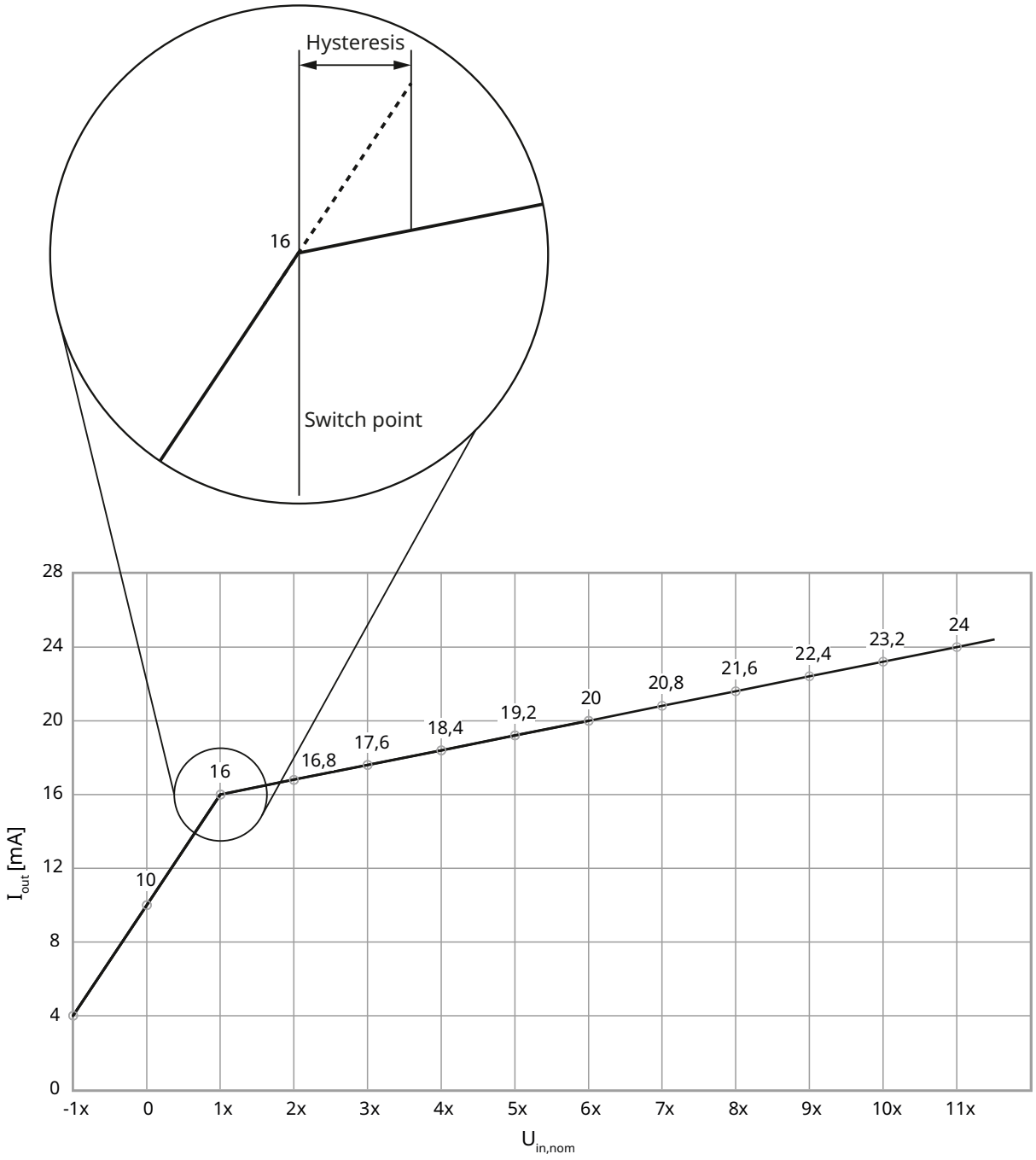


Unipolar Transmission Curve



Hysteresis at Switch Point as Example of Bipolar Transmission Curve

When passing the switch point, the gain switches with a delay (hysteresis).



High voltage signal conditioner

Specifications

Input	Bipolar	-10 mV ... 10 mV, -30 mV ... 30 mV
		-50 mV ... 50 mV, -60 mV ... 60 mV
		-100 mV ... 100 mV, -120 mV ... 120 mV
	Unipolar	0 mV ... 10 mV, 0 mV ... 30 mV
		0 mV ... 50 mV, 0 mV ... 60 mV
		0 mV ... 100 mV, 0 mV ... 120 mV
Input resistance	Approx. 100 kΩ	
Input capacitance	< 12 nF	
Overload capacity, permanent	1100 % of $U_{in,nom}$	
Overload capacity, transient	10 V	for max. 500 ms / once per hour

Output

Output (nominal)	4 ... 16 mA ... 24 mA
Max. output current	25 mA < I_{out} < 55 mA @ 0 Ω load
Max. load	400 Ω
Ripple	I_{rms} = 50 µA (R_L = 250 Ω)

Transmission Behavior	Output	Gain	Gain error
Input –1 × $U_{in,nom}$ ... 1 × $U_{in,nom}$	4 ... 16 mA	6 mA / $U_{in,nom}$	±0.1 % of measured value ±20 µA
Input 0 ... 1 × $U_{in,nom}$	4 ... 16 mA	12 mA / $U_{in,nom}$	±0.1 % of measured value ±20 µA
Input 1 × $U_{in,nom}$ ... 11 × $U_{in,nom}$	16 ... 24 mA	0.8 mA / $U_{in,nom}$	±0.5 % of measured value ±300 µA
Gain switch point	1 × $U_{in,nom}$		
Hysteresis at switch point	max. 12 % × $U_{in,nom}$		
Cutoff frequency (-3 dB)	> 5 kHz		
Common-mode rejection ratio	CMRR[1)]	> 110 dB (applies to 1 × $U_{in,nom}$ range)	
Temperature influence[2)]	< 50 ppm/K full scale		

Power Supply

Power consumption, max.	< 2 W at -25 °C (-13 °F); 20 V supply; full scale; 0 Ω load
Power consumption, type	< 1.2 W
	Broad-range power supply 22 ... 230 V ±10 %

Insulation

Galvanic isolation	3-port isolation between input, output, and power supply		
Type test voltage	Input – output/power supply	P410**	10 kV AC, 1 min
		P411**	15 kV AC, 1 min
	Output – power supply	4 kV AC, 1 min	

P41000 AG

Specifications

Routine test voltage	Dependent on the version (see Product Line, p. 3)
Working voltage (basic insulation) according to DIN EN 61010-1[3)]	Up to 3600 V AC/DC across input, output, and power supply with overvoltage category III and pollution degree 2 (fast transients: max. 20 kV).
Rated insulation voltage according to EN 50124-1	Up to 3600 V AC/DC across input, output, and power supply with overvoltage category III and pollution degree 2
Protection against electric shock	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 across input, output, and power supply, up to 300 V across output and power supply

Standards and Approvals

EMC[4)]	Product family standard:	EN 61326
	Emitted interference:	Class B
	Immunity to interference:	Industrial applications

Open Circuit Detection

(optional)

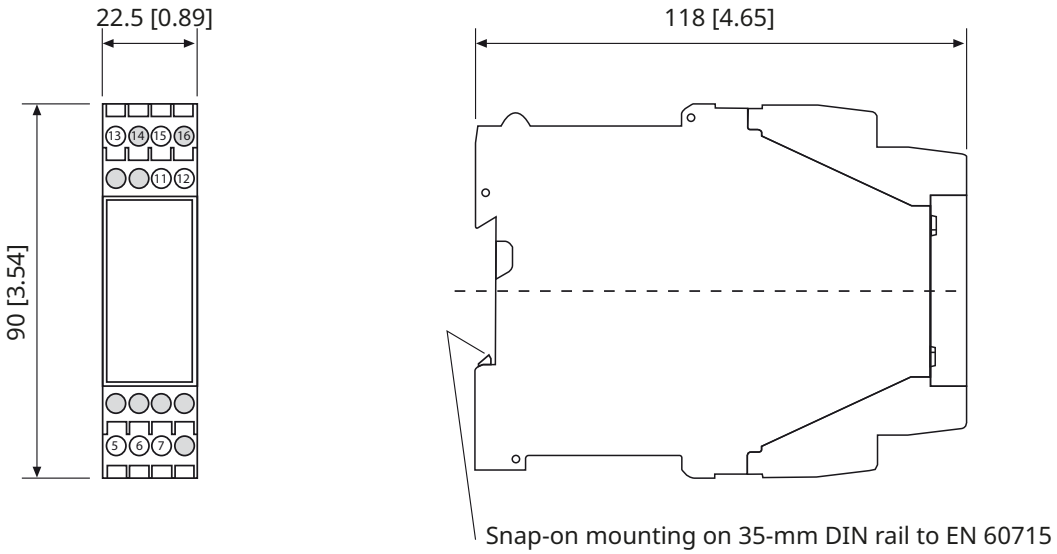
Diagnostic current impressed in the shunt	I_{diag} < 20 µA
Additional error ΔF in [%]	$\Delta F < I_{diag} \times (R_L + R_S) \times 100 / (I \times R_S)$ R_L: Shunt to signal conditioner total cable resistance R_S: Shunt resistor I: Measuring current
I_{out} at open circuit R_{cable} > 100 kΩ	> 25 mA @ max. 400 Ω load

Device

Ambient temperature[5)]	-10 ... 70 °C (14 ... 158 °F)
Design	Modular housing with screw terminals, housing width D1: 22.5 mm, see Dimension Drawings for other measurements
Degree of protection	Housing IP40, terminals IP20
Mounting	35 mm DIN rail for snap-on mounting according to EN 60715
Weight	Approx. 180 g

[1)] Common-mode rejection ratio = differential voltage gain / common-mode voltage gain
[2)] Reference temperature for TC specifications = 23 °C (73.4 °F), average TC
[3)] 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.
[4)] Slight deviations are possible while there is interference.
[5)] The specified values must also be adhered to during transport and storage.

Dimension Drawing



All dimensions in mm [inches]

Terminal Assignments

5	Input voltage	+	M 3.5 connecting screws with self-lifting terminal clamps. Conductor cross-section max. 1 x 4 mm² solid or 1 x 2.5 mm² stranded wire with ferrule, min. 1 x 0.5 mm² solid or stranded wire with ferrule
6	Jumper		
7	Input voltage	–	
11	Power supply	AC/DC	
12	Power supply	AC/DC	
13	Current output	+	With voltage output jumper across terminals 13 and 14. Do not set a jumper for current output (remove pre-mounted jumper).
14	Do not connect		
15	Current output	–	
16	Do not connect		