PolluWatt Duo II

Energy Meter - Totaliser

Main Features

The PolluWatt Duo II energy meter and totaliser is the successful combination of a high-performance energy meter and three integrated, freely programmable analogue outputs (0/4 – 20 mA) in one housing. PolluWatt Duo II can be used to complete the heat measuring point with almost all the usual volume measuring units and temperature sensors that are currently in use in the field of measuring quantities of heat.

Depending on the type and size of the volume measuring unit foreseen, the valence of the incoming volume signal is programmed ex works before delivery. For measuring points in which the volume measuring unit is built into the heating PolluWatt Duo II can be acquired as a supplycalibrated variant.

For cooling devices there is a variant with national cooling meter approval acc. to K7.2.

All measurements and information are shown in clear text on a backlit two-line dot matrix display. Operation is via two user-friendly buttons on the front side of the device.

All setting of parameters can be carried out directly on-site without additional peripheral devices.

In order to guarantee connection to current systems for the long-distance transmission of measurement data, PolluWatt Duo II possesses the following outputs and data interfaces:

- Three analogue freely programmable passive current outputs (0/4 – 20mA) in combination with mechanical meters or two analogue freely programmable passive current outputs in connection with static meter PolluFlow. For PolluWatt Duo II an external supply is needed for operation
- Two outputs for heat quantity and volume signals with programmable signal valence and closure time
- M-Bus interface in accordance with EN 1434 with variable data structure
- Optical interface
- Alarm relay output

A large number of special functions allows comprehensive evaluations and checks. For example, cutoff date programming enables the collation of 12 intermediate values of the heat quantities during a year. A minimum/maximum control over a longer period of time can be carried out by means of extreme value recording. In this, the highest and lowest dynamic values (inflow and outflow temperature, temperature difference, thermal performance and flowrate) which occur from a definable point in time are recorded. Furthermore, operational hours, quantity and duration of faulty states, date of calibration, date of recalibration, as well as number and duration of alarm states can be evaluated.

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Application

The PolluWatt Duo II is used for energy metering in split systems which are equipped with passive pulsed flow meters and 2-wire or

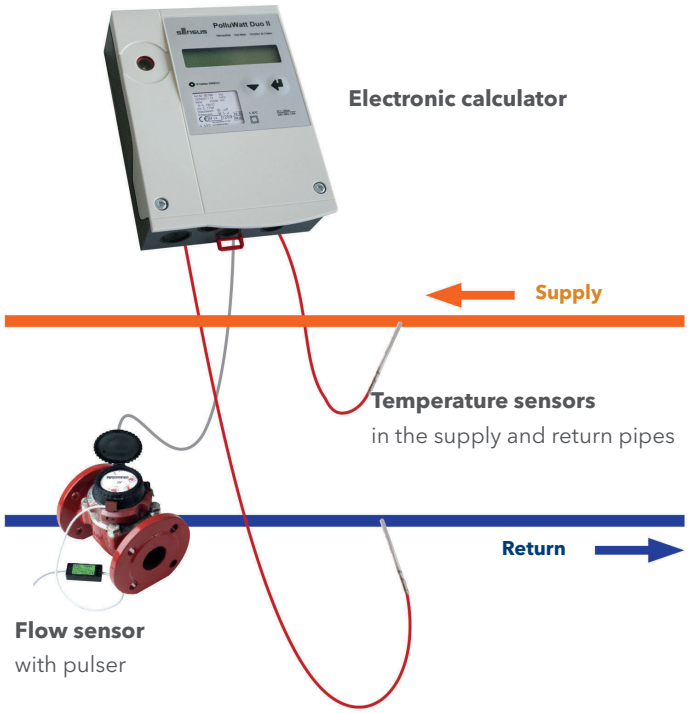
4-wire Pt500 temperature sensors. In most cases PolluWatt Duo II is used with the following flow sensors:

- Multi-jet meters: Qp 0.6 - 10 m3/h
- Woltman meters: Qp 15 - 600 m3/h
- Static ultrasonic meters: Qp 0.6 - 60 m3/h

Choose from our wide range of volume-measuring elements. Our advisers will be pleased to help you select the right ones for your needs.

Basic function and measuring principle

A so-called combined heat meter is composed of the following individually approved sub-assemblies:



The thermal output (P) of a pipe-conduit network is based on a measurement of the flow temperature, return-flow temperature and volume flow of the heat transfer medium.

P = Volume rate of flow x (T heat side - T cold side) x k

T heat side: For heating, flow temperature, for cooling, return temperature

T cold side: For heating, return temperature, for cooling, flow temperature

k: Heat coefficient (function considering temperature and pressure-related characteristics of the heat carrier)

Energy can be determined by integration of output. The formula shows that, in order to meter energy, the specific heat and density of the heat transfer medium must be expressed in relation to the temperature of the counter mechanism. The following factors (among others) also have a decisive influence on metering accuracy:

- The static accuracy and stability of the temperature-measuring procedure
- The counter cycle of the temperature-measurement system, and the volume flow used to detect dynamic factors

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PolluWatt Duo II is ideally equipped for use in demanding metering tasks, thanks to:

- The use for temperature-measuring purposes of a high-resolution AD converter (20 bit) designed with long-term stability in mind and equipped with self-calibration and filter functions
- Short counter-cycle (mains version: 1 s)
- The ability to use high-resolution mechanical or electronic flow indicators operating at pulse frequencies of up to 200 Hz (mains version)

Flow-rate measurement

The system is compatible with all standard flow meters which use a pulse output. The pulse value should be set as low as possible if continuous measurement or high-resolution energy metering is required.

PolluWatt Duo II can operate contactors working at pulse frequencies of up 20 Hz and electronic transmitters (NAMUR, etc.) with pulse frequencies of up to 200 Hz.

The point of installation of the flow meter is crucially important, because the volume-to-mass conversion is based on the temperature detected at this point.

It is preferable to fit the flow transmitter to the section of the line where the temperature is closest to room temperature.

Temperature measurement

PolluWatt Duo II is fitted with two highly-accurate temperature-measurement inputs, which are each connected to type-approved, paired temperature sensors in two- or four-wire configuration. The planning of systems should conform to heat meter standard EN 1434, parts 2 and 6. EN 1434-4 stipulates that only sensors of the same design and length should be paired together.

The counter mechanism is available in Pt 500 configuration.

Thermal energy is measured from a temperature difference from dT above (respectively below) 0 K. PolluWatt Duo II is the ideal solution for air-conditioning or cooling installation when used with appropriate temperature sensors and flow meters for cooling.

Data communication

The M-Bus has established itself as the standard for meter reading as it has been standardised in EN 13757, and offers a variety of other features.

Advantages include:

- easy installation
- high cost-effectiveness
- multi-vendor capability

Not only standard data such as meter readings and current values can be read out over the M-Bus interface, but also all additional data available from the device, for example billing and logger values. With PolluWatt Duo II prrimary addresses and baud rates can be set with the operating keys, eliminating the need for a PC when commissioning the system.

Approvals

European approval in accordance with the Measuring Instruments Directive (MID) 2014/32/EU, CH-MI004-14020

Approval 22.75/14.01 as a cooling meter in accordance with PTB K7.2.

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Digital inputs and outputs

The PolluWatt Duo II can be fitted with two digitalsignal interfaces, which can be configured – by means of a switch – as either inputs or outputs. These signals can be used to process counter impulses, or to warn when limit values have been exceeded, or to transmit alarm messages to the building-management system.

Limit-value signals

Digital output signals can be used to emit limitvalue monitoring signals. The following parameters can be monitored in this respect:

Parameter	Display
Temperature on "hot" side	t-hot
Temperature on "cold" side	t-cold
Temperature difference	t-diff
Power	POUEr
Flow	FLOU
Mass flow	MAS-FLOU
C-factor	C-Factor
Density	dEnSitY

1. Function of one-sided limit-value monitoring (Limit1)

If an adjustable maximum limit is exceeded or if the reading fails to reach an adjustable minimum, the output signal switches over, hysteresis (0 - 10 %) and control direction are selectable as required. While the excess-reading remains in force, the meter (showing "Cnt" for "counter") calculates the total duration of the error for inspection purposes.

2. Function of two-sided limit-value monitoring (Limit2)

If an adjustable maximum limit is exceeded and if there is failure to reach an adjustable minimum, the functions operate in a similar way to those of Limit1.

Alarm message

The microprocessor monitors the temperature sensor and internal functions, and displays any resulting error messages. This information can also be used to generate an alarm signal via the digital outputs.

Analogue output

PolluWatt Duo II is equipped with three passive analogue outputs in connection with mechanical meters and two passive analogue outputs in connection with the static meter PolluFlow. For the operation an external power supply is needed. The outputs are isolated galvanically among each other and towards the calculator.

The current range is configurable to 0 - 20 mA or 4 - 20 mA per channel. The following variables can be output as a current signal:

Parameter	Display
Temperature on "hot" side	t-hot
Temperature on "cold" side	t-cold
Temperature difference	t-diff
Power	POUEr
Flow	FLOU
Mass flow	MAS-FLOU
C-factor	C-Factor
Density	dEnSitY

Additional functions

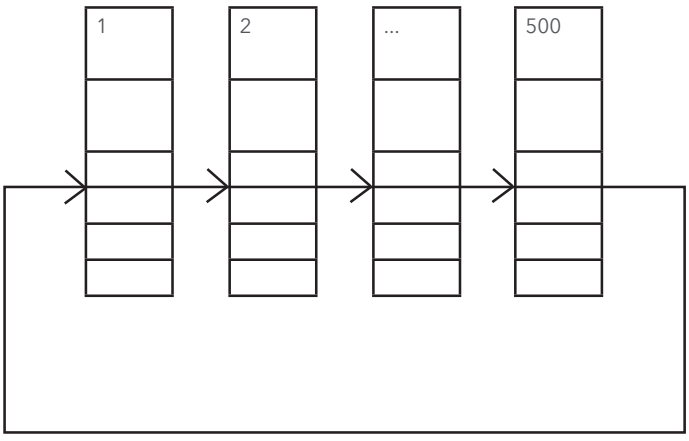
Billing date values

With the 12 freely programmable billing date values, the indexes can be memorized for defined dates and consulted at any time.

Data logging

The PolluWatt Duo II can record up to 500 data records in a ring buffer

Parameter	Display
Date	-
Energy	Total
Volume	Total
Auxiliary meter 1	Total
Auxiliary meter 2	Total
Power	Peak value
Downtimes	Total
Alarm hours	Total



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Simultaneous readout

In a plant with many meters, a considerable time difference between readings can occur if these are read out sequentially. PolluWatt Duo II avoids this problem with the "Freeze" command. A broadcast command instructs all meters simulateneously to store the required value after which they can be read out sequentially.

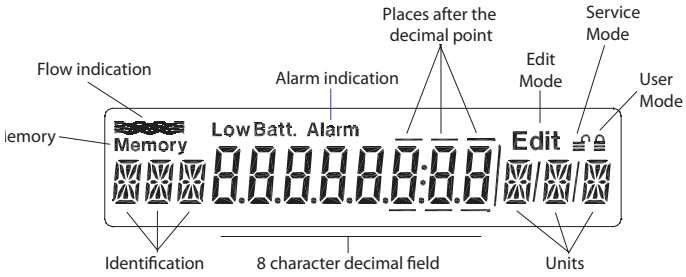
Low-flow OFF function

The system is factory-adjusted to carry out an energy calculation as soon as a temperature difference of >0 (when measuring heat) or <0 (when measuring cold) is detected. If, for example, a circulation conduit carries, over a long period of time, large quantities of heat transfer medium with a very low temperature difference, this can lead to significant reading errors in temperature measurement. The so-called "lowflow OFF function" can be activated to avoid this, ensuring that energy is only detected when a pre-defined temperature difference is exceeded.

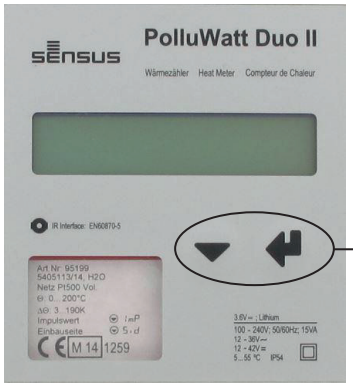
Operation

Thanks to their logically-structured functioning, all setting adjustments on the PolluWatt Duo II can be carried out locally and without the use of additional equipment.

Multi-function display



The multi-function display shows the eight-digit meter reading, along with symbols and short texts for user operation purposes.



When the device is in operation and the housing is closed the displayed values can be selected using two keys.

Under the cover, and thus protected by the lead seal, is the Service button, which allows additional service information to be displayed and adjustments to be carried out.

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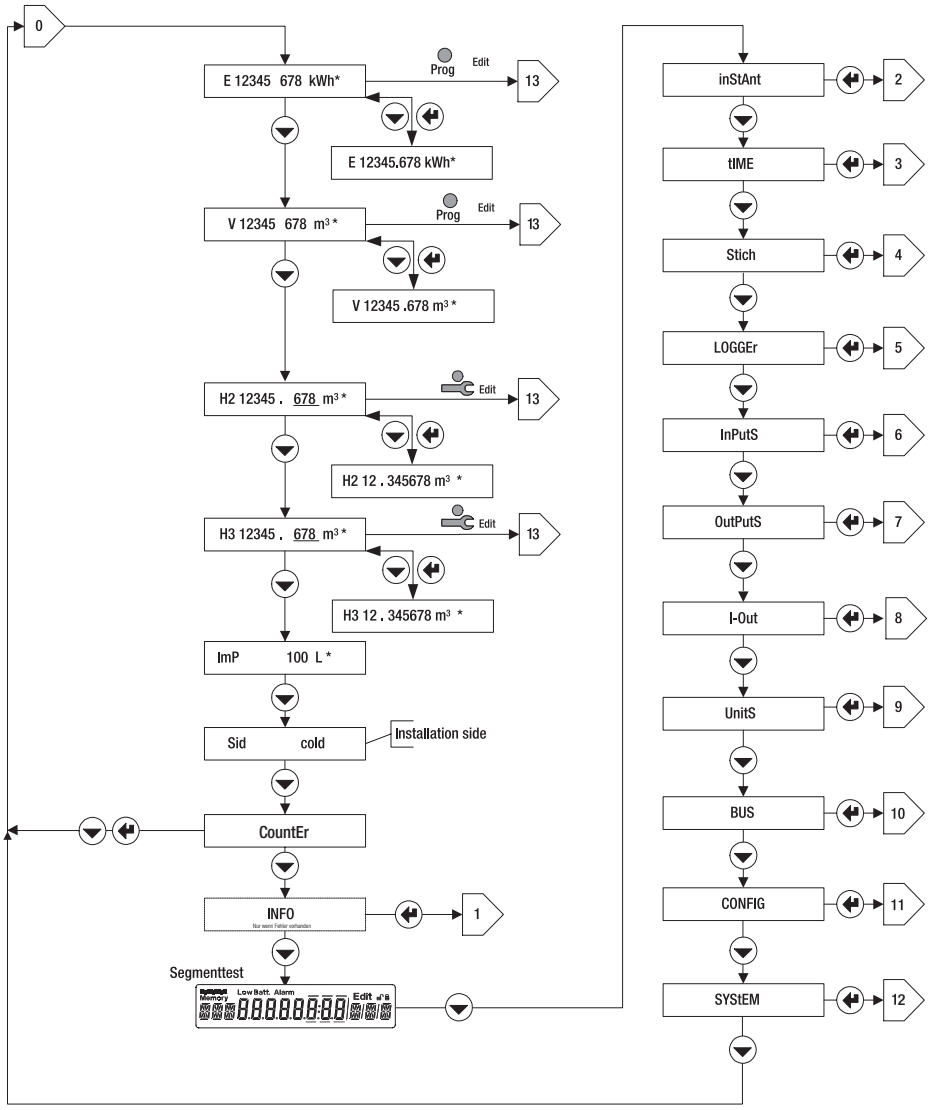
Circuit diagram

The following graph shows the information available at various points on the main operating flowchart, along with the short text designations of various sub-functions:



Display	Description
Info	Error message display
InstAnt	Current readings for temperature, output, flow rate, C-factor, density
Time	Date and time
Stich	Critical-date values
LoGGer	Data-log memory settings
InPuts	Settings and status of signal inputs
OutPuts	Settings and status of signal outputs
I - Out	Settings and status of the mA signal outputs
UnitS	Measurement-unit settings
BUS	M-Bus settings
CONFIG	Further settings, e.g. for glycol-based heat transfer medium
SYStem	System data, e.g. firmware version

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Plug-in calculator module

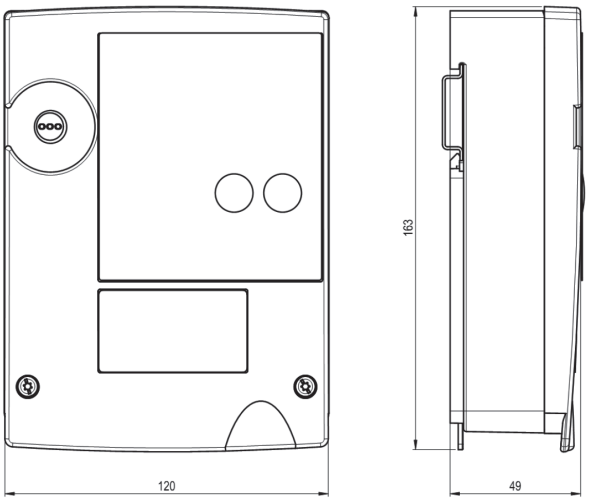
The energy calculator is housed in a plug-in module. The bottom of the housing (which contains the field wiring) does not have to be removed when recalibrating the unit. Furthermore, device-specific data are retained in the configuration memory (EEPROM) in the bottom of the housing (except parameters that are subject to calibration, like impulse value and installation side).

Housing

Lower section with connection terminals, computer module and cover.

Installation

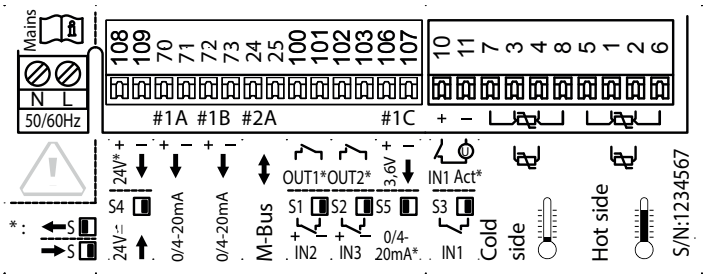
DIN-standard rail or three-point attachment directly to the wall.



Electrical connections

The wiring layout used depends on device configuration and applicable options. The factory-configured state of the unit is shown on the diagram attached to the inside of the housing cover.

Network version (with M-Bus and low-voltage power supply) (Example)



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Technical data and standards

The following tables contain information on the technical data of the available functions. Please refer to the price list for possible combinations.

Standards	
CE directives	2014/32/EU Measuring Instruments Directive (MID)
	2014/30/EU Electromagnetic compatibility (EMC)
	2014/35/EU Low voltage directive (LVD)
	2012/19/EU Waste Electrical and Electronic Equipment (WEEE) Directive
Standards	EN 1434, EN 61000-6-1, EN 61000-6-2, EN 61010, DIN 43863-5
Housing and operating conditions	
Dimensions	W x H x D = 120 x 163 x 49 mm
Ambient temperature	+5 ... +55 °C, EN 1434 class C
Storage temperature	0...60 °C
Humidity	Max. 95% rel. humidity (non-condensing)
Operating altitude	Up to 2,000 m above sea level
Protection rating	IP 54
Terminals	1.5 mm² spring terminals, power connection 2.5 mm² screw terminals
Basic data for calculator	
Temperature measuring range	5...+180 °C (heat carrier: water)
Temperature difference	3...175 K
Temperature sensor	Pt 500 acc. to IEC 751 paired acc. to EN 1434, 2-wire or 4-wire connection Max. sensor cable length 2-wire connection 10 m, 4-wire connection 15 m
Temperature measurement resolution	20-bit resolution, typical ±0.005 K (Ta = 5...55 °C)
Installation side	Hot or cold side
Pulse value of the flow sensor	0.001 ... 9999.999 litres
Pulse values and units for auxiliary inputs and contact outputs	Volume: 0.001 ... 9999.999 ml, l, m³, GAL Energy: 0.001 ... 9999.999 Wh, kWh, MWh, MJ, KBTU
Error limits	Better than those required for calculators in accordance with EN 1434-1
Optical interface	IEC 870-5, M-Bus protocol
Display	
Display units: volume	m³
Display units: energy	kWh, MWh, MJ, GJ
Data backup in the event of a power failure	In EERPOM >10 years
Data logger	500 records in ring buffer with all meter readings, Logger interval: 1 min, 1 hour, 1 day, 1 week, 1 month
Additional functions	
Adjustable low flow cut-off (SMU)	Function for stopping the energy calculation when the temperature difference is too low ΔT SMU adjustable ΔT = 0 - 2.99 K
Limit-value monitoring	One-sided or two-sided, hysteresis 0 - 10%, action of the output signal is selectable
Mains version	
Power supply	100 - 240 VAC, 50/60 Hz, max. 15 VA (acc. to EN 1434) 12 - 42 VDC or 12 - 36 VAC, max. 1 VA, (acc. to EN 1434)
Calculation cycle	1 s
Backup battery realtime clock	3.6 V lithium battery

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Technical data and standards

Low-voltage power supply for flow transmitter				
	Terminals 108/ 109		Terminals 106/ 107	
Supply voltage	24 VDC, max.150 mA, el. isolation max.48V VDC		3.6 VDC, max. 2 mA	
Pulse inputs and outputs				
Main input #1 (10/11)	Connecting a pulse generator according to NAMUR, with potential-free contact (reed relay) or SSR (solid state relay), or for active sensors with the following values:			
	Input passive		Input active	
	Open-circuit voltage	8 V	Voltage range	3...48 VDC
	Short-circuit current	8 mA	Current signal	> 2 mA
	Switching level	<1.5 mA, >2.1 mA	Reverse polarity protection	-48 V
	Min. OFF (t off)	20 Hz 20 ms	Electrical isolation	48 V
	Min. ON (t on)	20 Hz 3 ms	Min. OFF (t off)	20 Hz 20 ms
	Min. OFF (t off)	200 Hz 2 ms	Min. ON (t on)	20 Hz 3 ms
	Min. ON (t on)	200 Hz 300 µs	Min. OFF (t off)	200 Hz 2 ms
	Input capacity	20 nF	Min. ON (t on)	200 Hz 300µs
Switchable input and output Output #1/ input #2 (100/101)	Input		Output	
	Open-circuit voltage	8 V Max.	Contact rating	48 VDC, 100 mA
	Switching level	<1.5 mA, >2.1 mA	Electrical isolation	48 V
	Min. OFF (t off)	20 Hz 20 ms	Contact resistance (on)	<30 Ohm
	Min. ON (t on)	20 Hz 3 ms	Contact resistance (off)	>10 MOhm
	Min. OFF (t off)	200 Hz 2 ms	Pulse frequency	max. 4 Hz
	Min. ON (t on)	200 Hz 300 µs	Pulse width	100 ms
	Input capacity	20 nF		
Switchable input and output Output #2/ input #3 (102/103)	Input		Output	
	Open-circuit voltage	8 V	Contact rating	48 VDC, 100 mA
	Short-circuit current	800 µA	Electrical isolation	48 V
	Switching level	<1.4, >3.2 kOhm	Contact resistance (on)	<30 Ohm
	Pulse length t off	20 ms	Contact resistance (off)	>10 MOhm
	Pulse length t on	3 ms	Pulse frequency	max. 4 Hz
	Max. frequency	20 Hz	Pulse width	100ms
	Input capacity	20 nF		
Options				
M-Bus	**Factory settings**			
M-Bus interface	Acc. to EN 13757-2/-3			
Adresses	Primary address: 0 Secondray address: serial number			
Baud rate	2400 Baud			
3 analogue outputs				
Output signal	4...20 mA or 0...20 mA			
Supply voltage	6...24 VDC			
Electrical isolation	Max. 48 VDC			
Maximum resistance	≤ 837 Ohm at 24 VDC, 0 Ohm at 6 V			
Maximaler Wandlerfehler	0.15% vom Messwert + 0.15% vom Endwert			

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