

AX-WM-HM67C

Multical 601 Multi-Functional Thermal Heating and Cooling Meter



Product Overview

The AX-WM-HM67C is an exceptionally versatile meter with a wide range of features including data logging, PQ Limiter and leak detection. The unit has been designed for district heating or cooling systems and is an integrated intelligent unit. It can output the data using a variety of plug in modules such as Data/Pulse output to a BMS or M-bus, LON, Analogue or even a wireless option. The unit can be used in either closed or open systems and the unit can be used for both heating and cooling storing the data in different registers which facilitates differentiated user rates. The unit comes with a pair of matched Pt500 sensors and a variety of power supply options.

Features

- Measures Heating and Cooling
- Nominal flow of 0.6 to 3000m³/hr
- two additional pulse input can be connected
- EN 1434, DS2340, OIML R75, PTB approved
- Battery Backup
- Data is logged for 15 years
- Power and flow limiter
- 230 or 24 Vac supply or 10 year battery

Product Specifications

Power Supply:	specify	230Vac, +/- 15-30% 48 to 52Hz 24Vac/Dc +/- 30% D-Cell Lithium HiCap Battery (typically 10 years life)
Power Consumption:		< 1 Watt
Display Type:		8 + 3 digit LCD 7mm high
Datalogging:		460 days, 36 months and 15 years
Nominal Flow Rate:	Qn	0.6 to 3,000 m ³ /hr
Inputs:	max	2 or 3 temperature inputs PT500 (to EN 60751) 1 or 2 flow meter inputs (pulse/litre) A > 1 second duration B > 0.15 second duration
Outputs:		Top plug in module :- real time clock, CE + CV Outputs, PQ limiter 2 pulse inputs (add from electricity, water or gas meters) Galvanically insulated serial data output (can be converted to RS232) Memory EEPROM
	option	Pulse output, M-Bus , Analogue, LON-FTT-10, wireless Pulse length = 32 ms , 30Vdc@10ma
Temperature Range:		0 to 160 deg C
Differential Range:		3K to 150K
Ambient Temperature:		5 to 55 deg C
Protection:		IP54
Conformity:		EN 1434, DS2340, OIML R75, PTB approved CE; LVD, EN 50 081-1 and EN 50 082-1
Dimensions:		0.4 Kgs
Country of Origin:		EU

Calculator functions

energy calculation

MULTICAL® 601 calculates energy based on the formula in EN 1434-1:2004, in which the international temperature scale from 1990 (ITS-90) and the pressure definition of 16 bar is used.

The energy calculation can in a simplified way be expressed as

$$\text{Energy} = V \times \Delta\theta \times k$$

V is the supplied water volume

$\Delta\theta$ is the temperature difference measured

k is the thermal coefficient of water

The calculator always calculates energy in [Wh], and then it is converted into the selected measuring unit.



E [Wh] =	$V \times \Delta\theta \times k \times 1000$
E [kWh] =	E [Wh] / 1.000
E [MWh] =	E [Wh] / 1.000.000
E [GJ] =	E [Wh] / 277.780
E [Gcal] =	E [Wh] / 1.163.100

Application types

MULTICAL® 601 operates with 9 different energy formulas, E1...E9, that are all calculated in parallel in connection with each integration no matter how the meter is configured.

The energy types E1 to E9 are calculated as follows:

E1=V1 (T1-T2) Heat energy (V1 in flow or return)

E2=V2 (T1-T2) Heat energy (V2 in return)

E3=V1 (T2-T1) Cooling energy (V1 in flow or return)

E4=V1 (T1-T3) Forward energy

E5=V2 (T2-T3) Return energy or tapping from return

E6=V2 (T3-T4) Tap water energy, separate

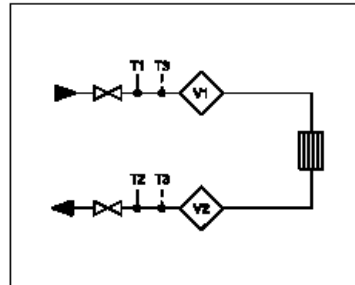
E7=V2 (T1-T3) Tap water energy, flow pipe

E8=m³*T1 (Flow pipe)

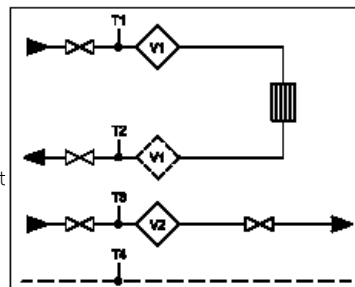
E9=m³*T2 (Return pipe)

This renders MULTICAL® 601 capable of calculating the heat and cooling energy of most applications, both closed and open systems.

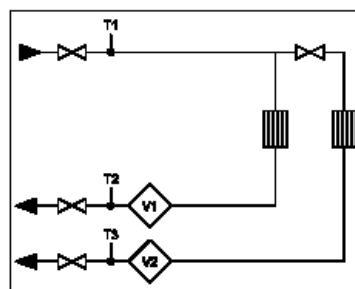
All energy types are data logged and can be displayed independent of configuration.



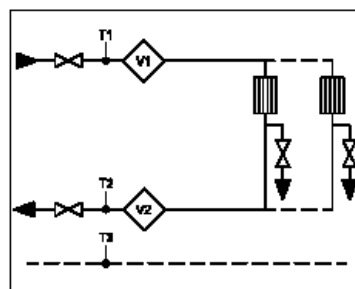
Example 1:
Closed thermal system
with 1 or 2 flow sensors



Example 2:
Closed thermal system
with 2 flow sensors



Example 3:
2 heat circuits with joint
flow



Example 4:
Open system with 2 flow
sensors

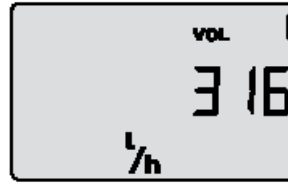
Calculator functions

Flow measurement

MULTICAL® 601 calculates current water flow according to two different principles depending on the connected flow sensor type:

The flow indication of electronic flow meters is updated every 10 seconds.

The flow indication of mechanical flow meters, typically with reed contact, is calculated on the basis of periodic time measurement and is updated with each volume pulse.



Power measurement

MULTICAL® 601 calculates current power on the basis of current water flow and the temperature difference measured in connection with the latest integration.

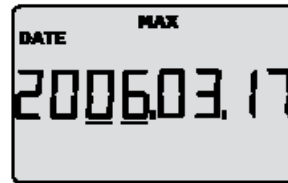
Current power is updated in the display simultaneously with the flow update.



Min. and max. flow and power

MULTICAL® 601 registers minimum and maximum flow and power on a monthly as well as on a yearly basis. The registrations which appear from the display or can be read via data communication include max. and min. flow and power values, all with date indication.

All max. and min. values are calculated as largest and smallest average respectively of a number of current flow or power measurements. The average period used for all calculations is selected in the interval 1..1440 min.

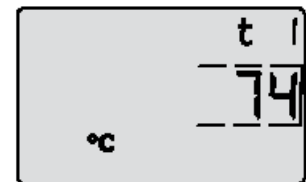


Temperature measurement

MULTICAL® 601 is available in different versions for either Pt100 or Pt500 sensors as well as in 2-wire and 4-wire versions.

The measuring circuit includes a high resolution analog/digital converter with a temperature range of 0,00°C..185,00°C.

In addition to current temperatures for the energy calculation average temperatures on a yearly and monthly basis can also be displayed.

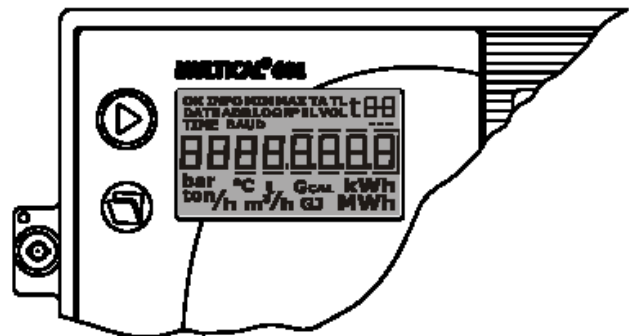


Display functions

MULTICAL® 601 is equipped with a clear LC display including 8 digits, units of measurement and information panel. In connection with energy and volume readings 7 digits and the units of measurement to match are used, whereas 8 digits are used when e.g. meter number is read.

As a starting point the display shows accumulated energy.

When the push buttons are activated the display reacts immediately by calling other readings. The display automatically returns to accumulated energy reading 4 minutes after the latest activation of the push buttons.



The upper push button is used to switch between the primary readings. The consumers typically use the first primary readings in connection with self-reading for billing purposes.

The lower push button is used to show secondary information on the selected primary reading.

Calculator functions

Info codes

MULTICAL® constantly monitors a number of important functions, e.g. power supply, temperature sensors and leakage alarms. Should a serious error occur in the measuring system or in the installation, a flashing “info” will appear in the display whilst the error exists. The “Info” panel will automatically disappear when the error has been corrected. An Info Event Logger indicates how many times the info code has been changed. The info logger stores the latest 50 changes, of which 36 can be displayed.

Info code	Description
00000	No irregularities
00001	Supply voltage connected after cut off
00004	T2 sensor outside range, short-circuited or cut off
00008	T1 sensor outside range, short-circuited or cut off
00032	T3 sensor outside range, short-circuited or cut off
00064	Cold-water leakage
00256	District heating leak
00512	District heating burst

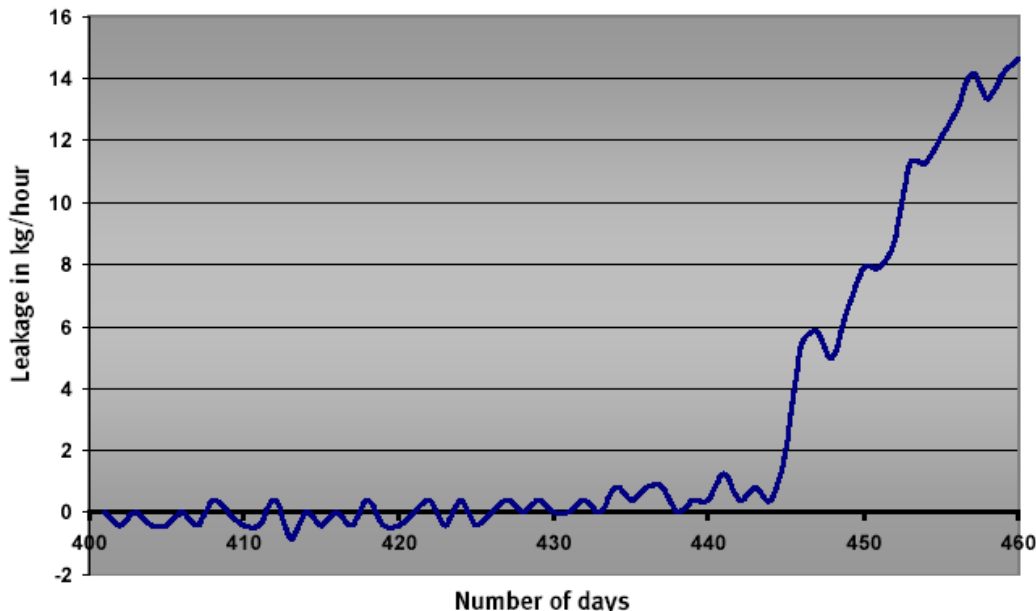


Data loggers

MULTICAL® 601 contains a permanent memory (EEPROM), where the results of a number of various data loggers are stored. The meter contains the following data loggers which can be read on the display or via serial data:

Data logging interval	Data logging depth	Logged value
Yearly logger	15 years	Counter (as seen on the display)
Monthly logger	36 months	Counter (as seen on the display)
Daily logger	460 days	Consumption (increase)/day
Hourly logger (option)	1392 hours	Consumption (increase)/hour
Info logger	50 events	Info code and date

Leak surveillance



District heating systems

The leak surveillance system is primarily intended for direct connected district heating installations. The surveillance system consists of two water meters based on the ultrasonic principle, placed in flow and return pipe respectively, and of temperature sensors in both pipes. MULTICAL® 601 monitors the mass difference that may appear between flow and return pipe.

Cold-water systems

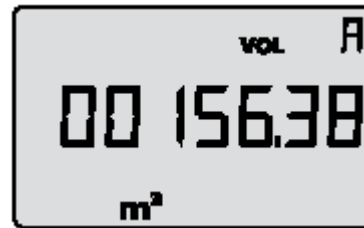
The pulse signal from the cold-water meter of the house can be connected to MULTICAL® 601. In this way it can monitor the cold-water consumption. A flushing toilet cistern, leaky heating coils in the water tanks or other leaks will cause that impulses from the cold-water meter are received 24 hours a day.

Calculator functions

Pulse inputs VA and VB

MULTICAL® 601 has two extra pulse inputs, VA and VB, to collect and accumulate pulses remotely, e.g from cold-water meters and electricity meters. The pulse inputs are physically placed on the "base modules".

The pulse inputs VA and VB function independently of the other inputs/outputs.



Voltage supply

MULTICAL® 601 is available with battery supply, 230 VAC mains module, or 24 VAC mains module. The supply modules are exchangeable without breaking the verification seal.

Plug-in modules

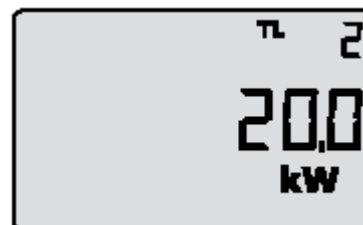
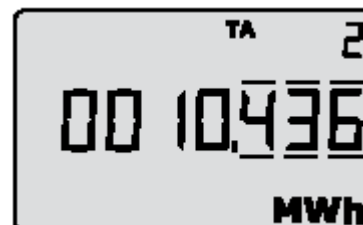
Plug-in modules can be added to MULTICAL® 601 both in the calculator top (top modules) and in the base unit (base modules), in this way the meter can adapt to various applications and data reading methods.

Programming and verification

METER TOOL for MULTICAL® 601 is a Windows® -based software which includes all facilities for calculator programming. If the software is used together with VERIFICATION EQUIPMENT for MULTICAL® 601, the calculator can be tested and verified.

Tariff functions

MULTICAL® 601 has 2 extra registers TA2 and TA3 to accumulate energy parallelly to the main register based on a programmed tariff condition. No matter which tariff type you select the tariff registers will be displayed as TA2 and TA3. The main register is always accumulated, irrespective of the selected tariff function, as it is considered the legal billing register. Tariff conditions TL2 and TL3 are monitored before each integration. If the tariff conditions are fulfilled, the consumed heat energy is accumulated in either TA2 or TA3, as well as the main register.



Order Codes - note add litre/ pulse requirement to end of code

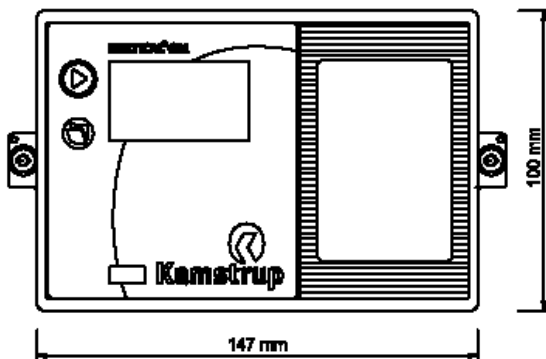
MULTICAL® 601		Type 67-	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sensor connection											
Pt100	2-wire (T1-T2)	A									
Pt500	4-wire (T1-T2)	B									
Pt500	2-wire (T1-T2-T3)	C									
Pt500	4-wire (T1-T2) w/24 V pulse inputs	D									
Top module											
No module		0									
RTC (Real Time Clock)		1									
RTC + ΔEnergy calculation + hourly data logger		2									
RTC + PQ or Δt-limiter + hourly data logger		3									
RTC + data output + hourly data logger		5									
RTC + 66-C compatibility + pulse outputs (CE and CV)		6									
RTC + M-Bus		7									
RTC + 2 pulse outputs for energy + volume + hourly data logger		8									
RTC + ΔVolume + hourly data logger		9									
Base module											
No module										00	
Data + pulse inputs										10	
M-Bus + pulse inputs										20	
RadioRouter + pulse inputs										21	
0/4...20 mA outputs										23	
LonWorks, FTT-10A + pulse inputs										24	
Radio + pulse inputs (internal antenna)										25	
Radio + pulse inputs (external antenna connection)										26	
M-Bus + pulse inputs (MULTICAL® III compatible)	Require top module									04	
M-Bus + pulse inputs (MULTICAL® 66-C compatible)	67-x6									08	
Supply											
No supply										0	
Battery, D-cell										2	
230 VAC supply module w/transformer										7	
24 VAC supply module w/transformer										8	
Pt500 sensor set											
No sensor set										0	
Pocket sensor set w/1.5 m cable										A	
Pocket sensor set w/3.0 m cable										B	
Pocket sensor set w/5 m cable										C	
Pocket sensor set w/10 m cable										D	
Short direct sensor set w/1.5 m cable										F	
Short direct sensor set w/3.0 m cable										G	
3 pocket sensors in sets w/10 m cable										P	
Flow sensor/pick-up unit											
Supplied w/1 ULTRAFLOW®	(Please specify type)									1	
Supplied w/2 (identical) ULTRAFLOW®	(Please specify type)									2	
Supplied with Kamstrup pick-up unit set										F	
Prepared for 1 ULTRAFLOW®	(Please specify type)									7	
Prepared for 2 (identical) ULTRAFLOW®	(Please specify type)									8	
Prepared for meters w/electronic pulse output										K	
Prepared for meters w/reed switch output (both V1 and V2)										L	
Prepared for meters w/24 V active pulses										M	
Meter type											
Heat meter, MID marked										2	
Heat meter, closed systems										4	
Cooling meter										5	
Heat/cooling meter										6	
Volume meter, hot water										7	
Volume meter, cooling water										8	
Energy meter, open systems										9	
Country code (language on label etc.)										XX	

Calculation

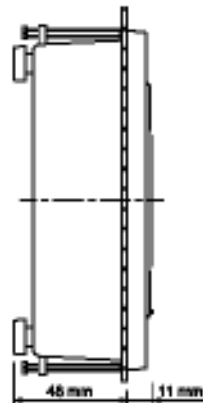
The MW-HM66 uses volume-based energy integrations, which means that the speed with which the calculator calculates energy consumption is proportional to the actual water flow. Depending on the size of the flow part, integrations are performed with intervals from 0.001 m³ to 10 m³. The water quantity and degree of cooling are multiplied using the k-factor from EN 1434, thus ascertaining the amount of thermal energy. The meter is very accurate, working with energy measurements in fractions. The value displayed will, however, be rounded off. Fractions remaining will be added to the next reading. Heating and cooling energy is calculated in the same manner. However, the total is stored in separate registers, depending on whether the temperature difference is positive or negative. If the meter is used for combined heating and cooling installations, the cooling power and temperature difference will be indicated by a minus (-) in the display. The current flow calculation, l/h or m³/h, is performed depending on the number of pulses generated by the flow meter. The display is updated every 10 sec. when connecting flow meters with electronic output (CCC=1xx), though only every 30 sec. when connecting mechanical flow meters with Reed-contact (CCC=0xx). Pulse separation (imp/l), which is determined by the CCC program, ensures that the flow meter and the integrator are totally compatible. The actual power, kW or MW, is calculated on the basis of the current values for: water flow, differential temperature and k-factor. The display value is updated every 10 sec. as is the water flow. The peak power and peak flow are determined as the average peak over a given period of time, typically 60 min., but can be configured in the range 1...1440 min. Measuring temperature Prior to each temperature measurement, the integrator measures two internal reference resistors, compensating for temperature and long-term drift. The temperatures of T1 Flow Temperature, T2 Reference Temperature and T3 Return Temperature are measured several times at different points, thus ensuring forceful mains immunity. The measurements are linear in the complete temperature range from 0...180°C with a resolution of 0.01°C. An information code is recorded if the temperature is above or below this range (see Information Codes section). The temperature measurements are effectuated at every energy integration as well as every 10 sec. when the display is updated. .

Dimensions

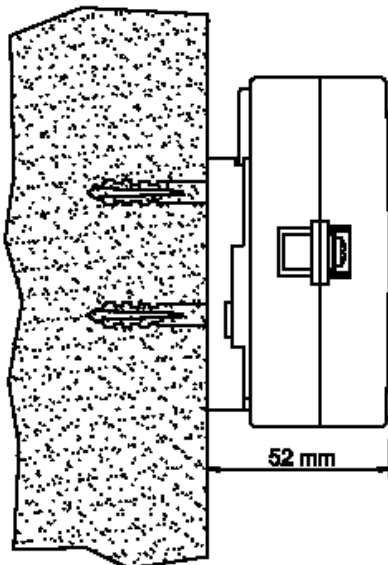
Front dimensions of MULTICAL® 601



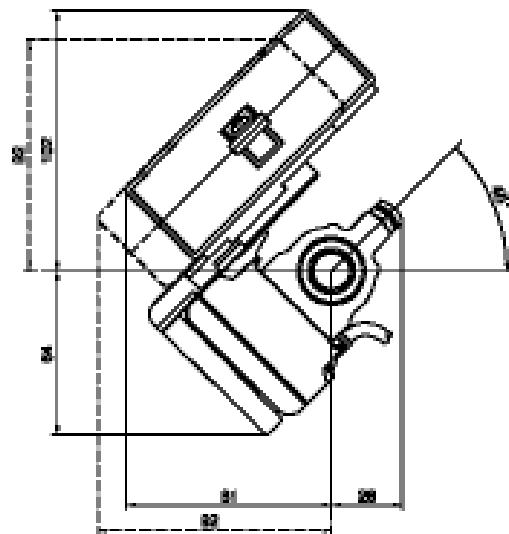
Panel-mounted MULTICAL® 601 seen from the side



Wall-mounted MULTICAL® 601 seen from the side



MULTICAL® 601 mounted on ULTRAFLOW®



Electrical data

Flow measuring V1 and V2	ULTRAFLOW® V1: 9-10-11 and V2: 9-69-11	Reed switches V1: 10-11 and V2: 69-11	24 V active pulses V1: 10B-11B and V2: 69B-79B
EN 1434 pulse class	IC	IB	(IA)
Pulse input	680 kΩ pull-up to 3.6 V	680 kΩ pull-up to 3.6 V	12 mA at 24 V
Pulse ON	< 0.4 V for > 0.5 msec.	< 0.4 V for > 50 msec.	< 4 V for > 0.5 msec.
Pulse OFF	> 2.5 V for > 10 msec.	> 2.5 V for > 50 msec.	> 12 V for > 10 msec.
Pulse frequency	< 128 Hz	< 1 Hz	< 128 Hz
Integration frequency	< 1 Hz	< 1 Hz	< 1 Hz
Electrical isolation	No	No	2 kV
Max. cable length	10 m	25 m	100 m

Pulse inputs VA and VB VA: 65-66 og VB: 67-68	Water meter connection FF(VA) and GG(VB) = 01...40	Electricity meter connection FF(VA) and GG(VB) = 50...60
Pulse input	680 kΩ pull-up to 3.6 V	680 kΩ pull-up to 3.6 V
Pulse ON	< 0.4 V for > 0.1 sec.	< 0.4 V for > 0.1 sec.
Pulse OFF	> 2.5 V for > 0.1 sec.	> 2.5 V for > 0.1 sec.
Pulse frequency	< 1 Hz	< 3 Hz
Electrical isolation	No	No
Max. cable length	25 m	25 m

Pulse outputs CE and CV – via top module	
Type	Open collector (OB)
Pulse length	Optionally 32 msec. or 100 msec. for top module 67-04 (32 msec. for 67-06)
External voltage	5...30 VDC
Current	1...10 mA
Residual voltage	$U_{CE} \approx 1 \text{ V at } 10 \text{ mA}$
Electrical isolation	2 kV
Max. cable length	25 m

Approved meter data

Approval	PTB 22.52/05.04, PTB 22.55/05.01, TS 27.01/155	Flow sensor types	– ULTRAFLOW® – Electronic meters with active 24 V pulse output – Mechanical meters with electronic pick-up – Mechanical meters with reed switch
Standard	EN 1434:2004 and OIML R75:2002	Flow sensor sizes	– [kWh] qp 0.6 m³/h...qp 15 m³/h – [MWh] qp 0.6 m³/h...qp 1500 m³/h – [GJ] qp 0.6 m³/h...qp 3000 m³/h
EU-directives	– MID (Measuring Instruments Directive) – LVD (Low Voltage Directive) – EMC (Electromagnetic Compatibility Directive)	EN 1434 designation	Environmental class A and C
Temperature range	θ: 2°C...180°C	MID designation	– Mechanical environment Class M1 – Electromagnetic environment Class E1 and E2
Differential range	Δθ: 3K...170K		
Accuracy	$E_c \pm (0.5 + \Delta\theta_{\min} / \Delta\theta)\%$		
Temperature sensors	– Type 67-A Pt100 EN 60 751, 2-wire connection – Type 67-B+67-D Pt500 EN 60 751, 4-wire connection – Type 67-C Pt500 EN 60 751, 2-wire connection		