

# MAXICAL III Thermal heat meter

4 analogue 4...20 mA outputs

Programmable alarm relays

Can be connected to flow meters up to  
14000 m<sup>3</sup>/h

4-wire Pt100 or Pt500 sensors,  
0°C...180°C

Optional Modem and M-Bus

LC-display with backlight

Clock and calendar with constant back-up



TS 

27.01	PTB	22.15
069		97.01

  
OIML R75

## Application

MAXICAL III is used for measuring, calculating and recording thermal energy in large heating systems where water is the heat transferring agent.

Typical applications include prime heat measuring at power heating and district heating stations. Furthermore, MAXICAL III is ideal for measuring thermal energy through a transmission network or an exchange station.

In addition to measuring energy, MAXICAL III has a range of facilities, including current and peak values, tariff register, relay, pulse and analogue outputs and data communication - which makes it ideal for use in industrial control and regulation applications.

Thermal energy is calculated on the basis of the differential temperature measured across the flow and return pipes and the volume of water. The value is automatically corrected for density and enthalpy.

4-wire technique is used for measuring and adjusting the temperature, ensuring optimal accuracy and reliability.

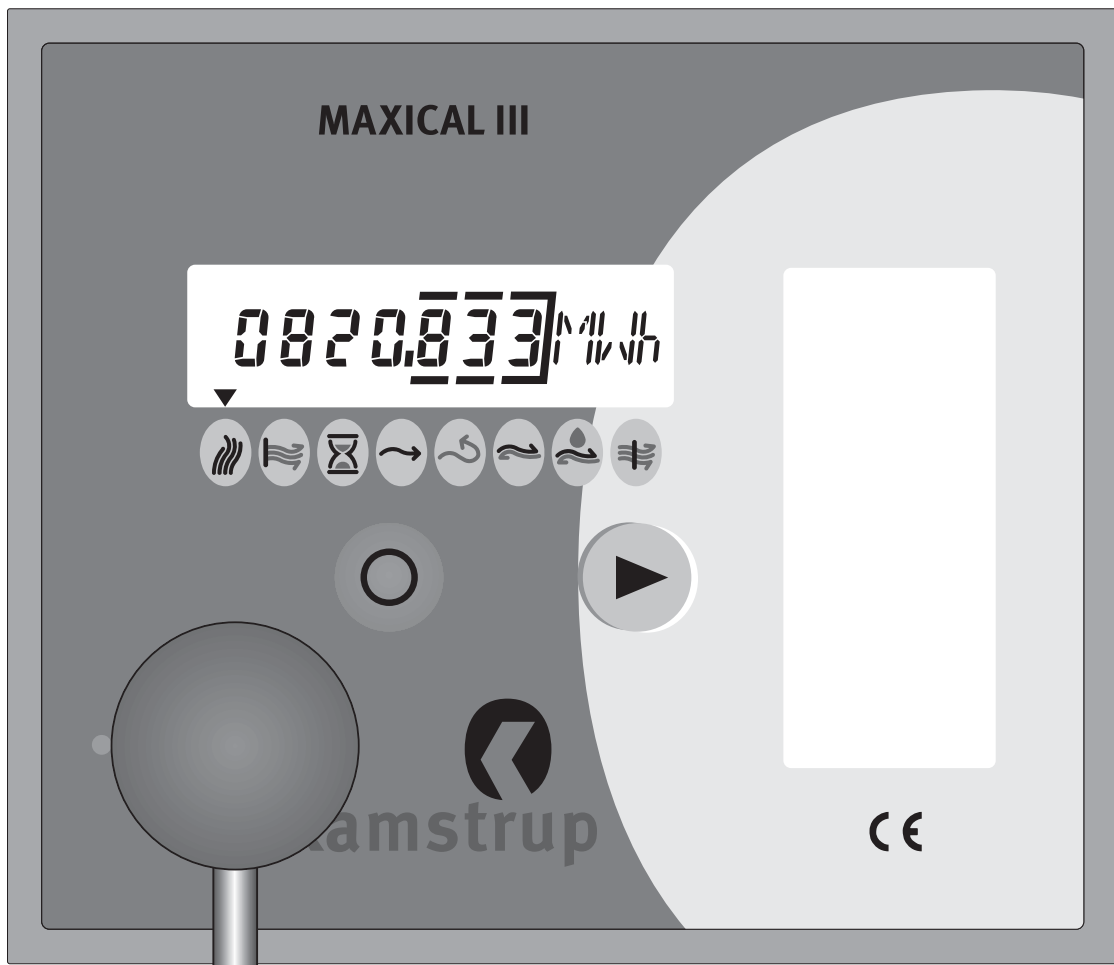
The flow meter input comprises galvanically connected stages, which can supply electronic pick-ups. Galvanically isolated stages are used for flow meters with active outputs up to 5 or 10 kHz.

All operating parameters can be programmed by means of the optical eye on the front of the meter and a computer equipped with a Windows software package which facilitates quick and simple re-configuration.



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## Integrated features



### DISPLAY

MAXICAL III is equipped with a liquid crystal display with 8 numerical digits plus 3 alphanumeric characters. 7 digits indicate the current and accumulated values. The last three alphanumeric characters indicate the relevant unit of measurement or symbol.

Once the integrator has been connected to the mains, a discreet background lighting will appear in the display, ensuring that readings are clearly visible even in areas with poor lighting.

Press the right or left key, as appropriate, to move from one displayed value to another (see User's Manual (5511-229) about display values and combinations. Note that only values selected during configuration can be displayed.

### NOTE

The display will not revert automatically to show accumulated energy consumption but will continue to display the selected function.

### CALCULATION

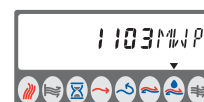


In MAXICAL III, thermal energy is calculated after a given amount of water has been recorded. The integration interval is 10 litres with a Qn 1.5 water meter and 1 m<sup>3</sup> if a Qn 120 to Qn 1400 water meter is connected. The thermal energy is derived by multiplying the volume of water by the actual cooling and the relevant correction factor - derived from

Dr. Stuck's k-factor table. Any reminder which cannot be displayed due to the resolution of the display will be saved and added to the next integration. Pulse separation and the number of pulses per litre, which ensure that the flow meter and the integrator match, are determined by the CCC program.

The current water flow and thermal power are calculated at 5 (CCC<sup>3</sup> 100) or 30 (CCC < 100) second intervals, depending on the configuration selected, based on the number of pulses emitted by the flow meter during a given period of time. MAXICAL III is configured to an average flow and peak value, if a water meter with few volume pulses is connected, e.g. a mechanical meter with a reed switch output (CCC < 100).

### LOGGING PEAK VALUES



The highest thermal power - or the highest water flow - of each 24 hour period is stored in the memory, together with the date and time for the measurement. The peak value for this period is the highest average, determined during a period between 1 and 120 minutes as required, occurring between 2400 hrs and 2400 hrs the next day.

The value is stored in the permanent EEPROM memory and - as with all other data - covers the last 31 days.

# Integrated features

## MEASURING TEMPERATURE



MAXICAL III can measure flow and return temperatures between 0.01°C and 182.00°C. Temperatures measured which exceed these limits will be registered as sensor faults after 10-20 minutes – please refer to section 6, Information Codes.



The differential temperature is accurately calculated throughout the entire measuring range even with cooling down to 0.01°C. If a negative differential temperature is registered, this will be perceived as 0.00°C. Energy registering will then stop.

MAXICAL III measures the temperature every 5 seconds, updating the display and analogue outputs with the new reading. Prior to each temperature measurement, the A/D converter's zero point and span is adjusted automatically, based on the internal precision resistors. Flow and return temperatures are then measured twice, the second measurement being taken 10 msec. after the first to ensure optimal damping of 50 Hz mains interference.

Depending on the type of meter selected, a set of either Pt100 or Pt500 sensors must be connected (according to IEC 751). A 4-wire screened cable must be used to connect the sensors, which are paired to MAXICAL III, to ensure optimal precision. The cable screen must be connected at the MAXICAL III and not at the sensor housings.

Once the supply has been connected, the 4-wire compensation eliminates 99% of the measuring error arising as a result of the length of the cable. In stand-by mode – i.e. when the supply is disconnected – temperatures will be displayed without 4-wire compensation.

When MAXICAL III is connected to a pipe with a large diameter, average measuring must be established to reduce the influence of temperature fluctuation in the water. Average measuring can be built up with 5 pcs. Pt100 sensors connected in series to a Pt500 input or with 4 pcs. sensors connected parallelly/in series.

## PERMANENT MEMORY

MAXICAL III has an electronic, eraseable, programmable read-only memory (EEPROM) which stores data independent of the power supply. All accumulated values are hourly refreshed in the memory at hourly intervals. At midnight every night the following data will be stored in a 31-day datalogger:

Date, Energy, Water, TA2, TA3, Alarm, Peak time and Peak power/flow.

## INFORMATION CODES



During normal operation the information code will be 000.



If one or more of the following faults occur, the letter "E" will be shown in the current display. The information codes, which will be

added together if more than one is activated, can be displayed as required.

### +2 Check the water meter connection

Flow pulses have not been registered for a period of 48 hours, whilst Dt has been larger than 20°C.

### +4 Check the temperature sensor in the return pipe

The return temperature has been less than 0°C or more than 182°C for 10...20 minutes.

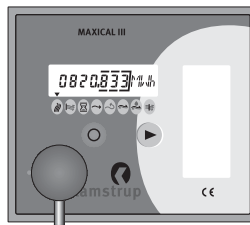
### +8 Check the temperature sensor in the flow pipe

The flow temperature has been less than 0°C or more than 182°C for 10...20 minutes.

### +256 Check the flow meter code

The meter has registered an excess of flow impulses corresponding to more than 1 integration per second.

## OPTICAL DATA ACQUISITION



An optical, infrared receiver/transmitter is situated in the bottom left hand corner of MAXICAL III's front panel which communicates with serial data in accordance with IEC 1107/EN61107.

A read-out head, type 66-99-102 with a 9-pole D-sub plug, is used for data acquisition and when configuring the meter from a computer.

## VOLTAGE SUPPLY

MAXICAL III operates on 230 VAC, supplying the integrator and the analogue module via two internal double insulated transformers. Furthermore, an integrated lithium cell ensures that the internal clock (with date) is continuously supplied, should the power be cut off.

## TARIFF FUNCTIONS

MAXICAL III features several tariff functions. Regardless of the tariff type, the total thermal energy will always be accumulated in the primary register. Furthermore, tariff registers TA2 and TA3 accumulate the portion of the energy consumed in connection with a specific condition. This condition, together with relevant limit values (TL2 and TL3), can be conveniently configured using a Windows software package, type no. 66-99-212, which can easily be installed on your computer.

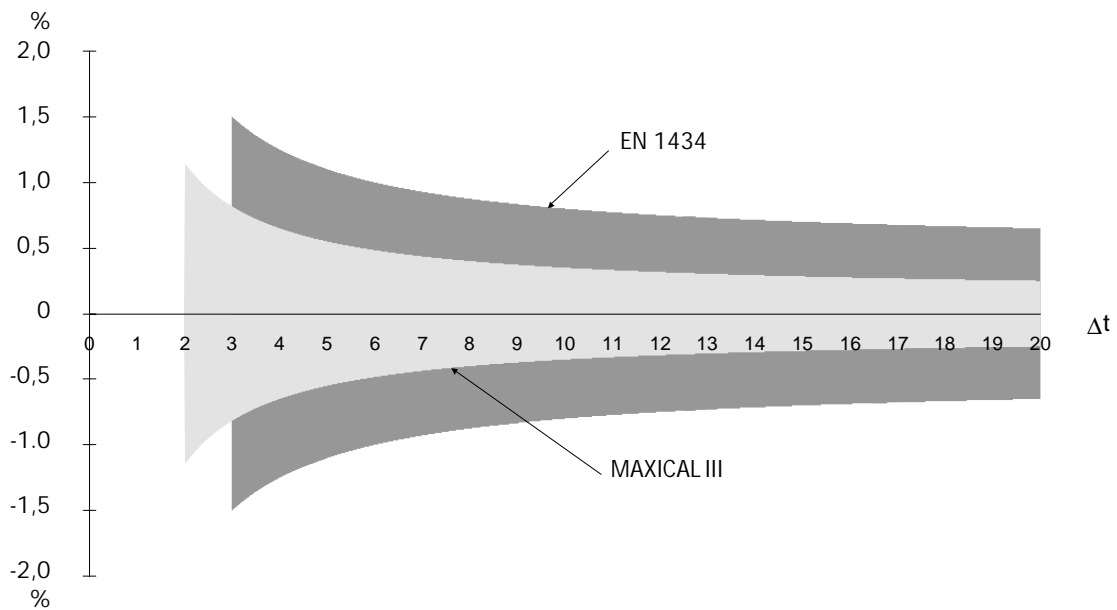
## PLUG-IN MODULES

The facilities offered by MAXICAL III can be extended by means of plug-in modules. There is space for two modules, which can be installed and configured on site.

The uppermost space can be used for 4 active analogue outputs for flow, power, flow temperature and return/differential temperature. Furthermore, the module has two relay outputs; a programmable limit switch and an information code switch.

The bottom space is designed for M-Bus or telephone modem.

## Tolerance band



The above diagram shows MAXICAL III's tolerance band, compared to the tolerance requirements stipulated in EN 1434.

$$\text{MAXICAL III: } E_c = \pm \left( 0.15 + \frac{2}{\Delta T} \right) \%$$

$$\text{EN 1434: } E_c = \pm \left( 0.5 + \frac{3}{\Delta T} \right) \%$$

## Approved data integrator, excluding sensor pair

		TS/OIML R75	PTB
Temperature range	$\Theta$	0°C...160°C	0°C...180°C
Differential range	$\Delta\Theta$	3°C...150°C	3°C...170°C
Accuracy class	$\pm 0.6\%$	$3 \leq \Delta\Theta < 10$ [°C]	PTB
	$\pm 0.4\%$	$10 \leq \Delta\Theta < 20$ [°C]	K-7
	$\pm 0.2\%$	$20 \leq \Delta\Theta$ [°C]	
Temperature sensors		Pt100/Pt500, IEC 751	Pt100/Pt500, IEC 751
Flow meter size	$Q_n$	< 14,000 m <sup>3</sup> /h	< 14,000 m <sup>3</sup> /h

## Technical data, integrator (numbers in brackets refer to the terminal)

Accuracy (0.15 + 2/Δt) %

Input resistance > 100 kW

### TEMPERATURE MEASURING (1-8)

Temperature range 0°C...182°C

Pulse duration, LO,  $V_{in} = 0...1$  V > 0.5 msec.

Differential range 1°C...172°C

Pausetid, > 0.5 msec. active

Display resolution 0.01°C

HI,  $V_{in} = 2.6...3.6$  V > 25 msec. passive

Temperature sensors Pt100/Pt500, IEC 751

Pulse frequency < 100 Hz

Measuring principle 4-wire

Integration frekveny < 1 Hz

4-wire correction 1:100

### FLOW METER INPUT (75-76)

Cable length 0...100 m, screened

Galvanic isolation Opto-coupler

Cable length ≤ 50 m

### FLOW METER INPUT (9-11)

Galvanic isolation None

Pulse voltage 12...30 V

Cable length ≤ 5 m

Pulse current 8...20 mA

## Technical data, integrator

Pulse duration,  
HI, Vin = 12...30 V > 70 msec.

Interval frequency,  
LO, Vin = 0...2 V > 30 msec

Pulse frequency 0...10 kHz (< 12 kHz)

Qmax, CCC=300-303 5 kHz

Qmax, CCC=310-313 10 kHz

Integration frequency < 1 Hz

### VOLTAGE SUPPLY (27-28)

Net supply 230 VAC ±15%

Net frequency < 48...52 Hz

Galvanic isolation Double-isolated transformer

Power consumption < 6 W

Internal clock back-up 1 Ah Lithium

Back-up period 1 year without supply

Expected lifetime of back-up cell 8 years @ Tamb < 35°C

### PULSE OUTPUT (16-19)

Galvanic isolation Opto-coupler

Passive energy and water pulses 0.1 or 0.5 sec. pulse width

Load, max. 35 VDC/100 mA

### DATA OUTPUT (62-64)

Galvanic isolation Opto-coupler

Serial communication RS232, open collector

Speed 1200 Baud

Protocol Please, refer to User's Manual

### OPTICAL DATA ACQUISITION – LOCATED ON FRONT PANEL

Serial communication IEC 1107/EN61107

Speed 300/1200 Baud

Protocol Please refer to User's Manual

### ANALOGUE OUTPUTS (80-87)

Galvanic isolation Opto-couplers

Individually isolated No

4 active analogue outputs Power, water flow,  $t_f$ ,  $t_r$   
Power, water flow,  $t_f$ ,  $\Delta t$

Output signal 4...20 mA (max. 24 mA)

Zero point 4 mA=0

Scaling (20mA) Programmable

Load 0...500  $\Omega$ , @ 230 VAC  
+15/-10%

0...450 W, @ 230 VAC  
±15%

Accuracy ± 0.15%

Refreshing times  
 $t_f$ ,  $t_r$  and  $\Delta t$  5 sec.

Power and water flow 5 sec. @ CCC≥100  
30 sec. @ CCC<100

### RELAY OUTPUTS (88-93)

Galvanic isolation Relays

Relay type Change-over

Load 100 VAC/DC, 500 mA

Limit relay (88-90) Programmable limit value for:  
power, water flow,  $t_f$ ,  $t_r$  or  $\Delta t$ .

Relay switch 89-90 closes  
when the prevailing value  
exceeds the limit value.

Infocode relay (91-93) Relay switch 91-92 closes in  
the event of system error or if  
net supply is interrupted.  
Info>000.

### ENVIRONMENTAL CONDITIONS

Ambient temperature 0°C...+55°C

Storage temperature -20°C...+60°C

Humidity < 93% RH

Environmental protection IP54 - Q144 panel version

IP20 - 19" Rack version

EMC-data CE-mark

Complies w/EN 50 082-2,  
EN 50 081-1 and  
EN 1434-4.

### DIMENSIONS AND WEIGHT

Q144 version, DIN 43 700 144 x 144 x 105 mm

Panel cut-out, Q144 138 x 138 ± 0.5 mm

Plate thickness, Q144 1...6 mm

19" rack version, 142 x 128 x 105 mm

DIN 41 494 28 TE & 3 HE (1/3 Rack)

Installation depth 110 mm

Weight 1 kg

### MATERIALS

Front plate ABS/PC

Back panel Hard PVC, UL94 V1

Housing and bracket Anodized aluminium

### TYPE APPROVALS

TS 27.01 PTB 22.15  
069

OIML R75

# Order Specification

MAXICAL III - Type No. 66 -  -  -  -  -  -  -

Pt100 input	F						
Pt500 output	G						
No analogue and relay module <sup>1)</sup>		0					
Analogue and relay module		1					
No communication module <sup>1)</sup>			0				
No sensors				0			
Pt500 pocket sensor set with 1.5 m cable				A			
Pt100 pocket sensor set with 3 m cable				W			
Q144 panel version						1	
19" rack version						2	
Delivery code (designated by Kamstrup A/S)							???

<sup>1)</sup> These modules can be retrofitted.

## Programmering af MAXICAL III

### Prog, Config. and Data

The multitude of functions available in MAXICAL® III are selected by means of a Windows program, run on a computer, an optical read-out head and software, type no. 66-99-210.

Programming is split up into three groups: PROG, CONFIG and DATA.

**DATA**  
Clock and tariff limits

**CONFIG.**  
DD-E-H-J - Display, tariff, alarm etc.

**PROG**  
A-B-CCC [V]  
Legal measuring data

### MAXICAL® III unverified, V = 0

All parameters can be freely configured using the computer software.

### MAXICAL® III, verified, V = 1

All but the legal parameters (A-B-CCC) can be freely configured using the computer software.

**Prog. No.** A B C C C

-  -

Flow meter placed in flow pipe →  1

Flow meter placed in return pipe →  2

Energy calculation in

GJ →  2

kWh (Qn ≤ 3m³/h) →  3

MWh →  4

Flow meter coding →

Qmax (only CCC ≥ 300) →  m³/h

**V**

**Prog. access**

Program accessible →  0

Access to program denied (can be verified) →  1

CCC	imp/l	Qn	Fmax
119	100	1.5/2.0	100 Hz
136	50	2.5	
151	50	3.0/3.5	
137	25	6.0/10	
120	10	15/25	
158	5	40	
		<b>Qm</b>	5 kHz
300	18000/Qm	1.2...14	
301	18000/Qm	12...140	
302	18000/Qm	120...1400	
303	18000/Qm	1200...14000	

Please refer to the User's Manual for MAXICAL III for other CCC codes

# Configuring MAXICAL III

	DD	E	H	J	K
	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Display without tariff indication	50				
Display with tariff indication	51				
Other (please refer to User's Manual)	xx				
No tariff function	0				
Power tariff	1				
Flow tariff	2				
Cooling tariff	3				
Return tariff	5				
Average temperature	6				
Remote management	8				
Time tariff	9				
No alarm		0			
Power alarm		1			
Flow rate alarm		2			
Cooling alarm		3			
Flow temperature alarm		4			
Return temperature alarm		5			
No analogue outputs				0	
Analogue outputs for power, flow rate, flow and return temperatures				1	
Analogue outputs for power, flow rate, flow temperatures and cooling				2	
No divider of pulse outputs					0
10:1 divider of energy pulses					1
10:1 divider of volume pulses					2
10:1 divider of energy and volume pulses					3

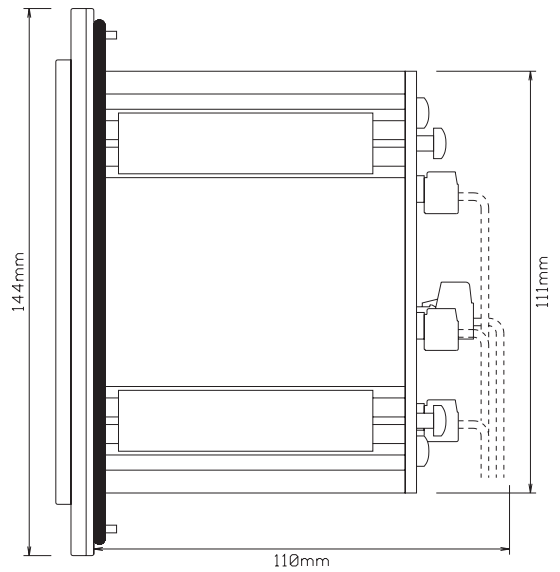
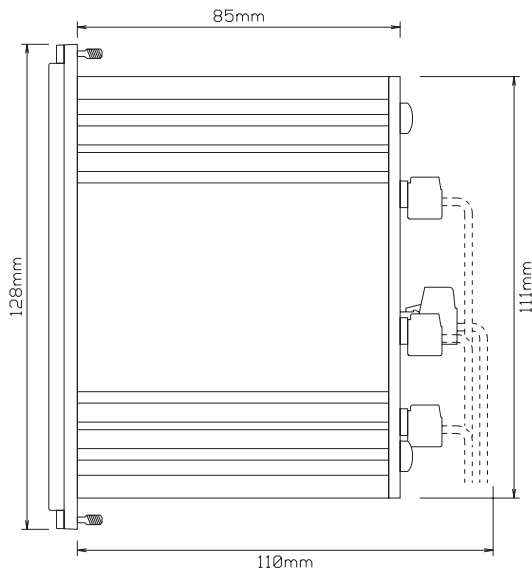
## Analogue outputs

Power	20 mA =	<input type="text"/>	<input type="text"/>	Tariff Limit 2	TL2 =	<input type="text"/>	<input type="text"/>
Flow rate	20 mA =	<input type="text"/>	<input type="text"/>	Tariff Limit 3	TL3 =	<input type="text"/>	<input type="text"/>
Flow temperature (1...180°C)	20 mA =	<input type="text"/>	°C	Alarm Limit	AL =	<input type="text"/>	<input type="text"/>
Return/cooling (1...180°C)	20 mA =	<input type="text"/>	°C	Peak average time (1...120 min)	=	<input type="text"/>	min.
				Target date (1...28)	=	<input type="text"/>	day
				Target month (1...12)	=	<input type="text"/>	month

## Accessories

Analogue and relay module, optional extras	66-99-600	Temperature sensors	5810-337
Read-out head w/9-pole D-sub plug	66-99-102	Pt500 Pocket sensors with connecting head	5810-329
Data cable with RS232 adapter	66-99-106	ULTRAFLOW®	5810-394
9M/25F D-sub adapter	66-99-120	Vane wheel flow meter	5810-028
Windows programming software	66-99-212		
METERTOOL LogView (data reading)	66-99-703		

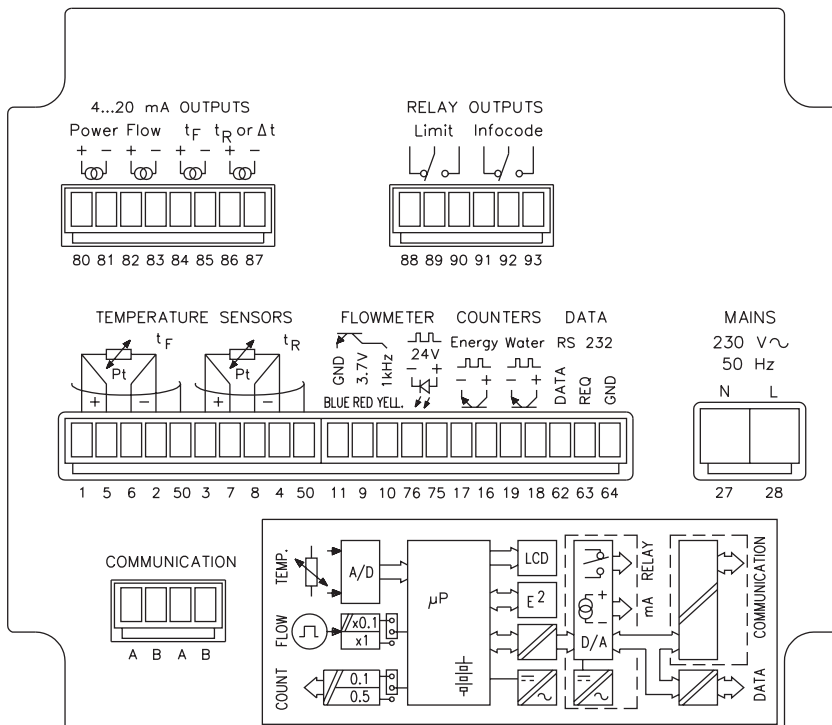
## Dimensional drawing



19" rack version. Front dimensions 142 x 128 mm or 28 TE & 3 HE, corresponding to 1/3 rack.

Q144 version, for flush mounting in control panels. Panel cut-out: 138 x 138 ± 0.5 mm. Brackets and gaskets are included in the supply.

## Electrical connections



### Flow meter connection 11-9-10

Used when connecting ULTRAFLOW® or vane wheel meter with electronic pick-up. This connection can also be used for mechanical meters with reed-switch output.

### Flow meter connection 76-75

Used for electronic flow meters with 24 V active output up to 10 kHz.

Changing between the two flow meter inputs is effected by placing a jumper at the back of the rear plate.

Temperature sensors must always be fitted with 4-wire screen cable. The screen may only be connected to terminal 50.