

BTU METER



RC is a high quality, reliable and high class heat calculator designed for measurement of energy in heating and cooling installations. It was developed based on the most up-to-date microcontroller system, innovative technical solutions, design solutions and functional solutions. Its wide communication possibilities allow an easy and correct reading and transfer of measuring data. Thanks to its high and stable mythological parameters the calculator fulfils the highest requirements and ensures a very accurate energy measurement through the whole operation time.

Application

RC is a device designed to be used in installations with water as a heating/ cooling factor. It works perfectly in heat distribution centers, residential buildings and functional buildings, industrial buildings etc. Depending on its design and configuration, the calculator can work as:

- heat meter for cooling installation
- heat meter for heating and cooling installation in one circuit

Special Features

COMFORT OF THE USER

- Big and readable 8-position display with additional 4-position indicator, many intuitive symbols and units for the displayed values
- Two buttons that make operation of the calculator much easier (mechanical or capacitive version)
- Possibility of individual configuration of the calculator according to particular requirements, configuration of parameters, functions, communication, type and range of data displayed on LCD through a dedicated program (on PC)
- Possibility of manual configuration of some parameters of the calculator using the buttons
- Possibility of mounting (without legalization infringement) two independent communication modules and a selection of communication protocols
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SAFETY OF THE USER

- Independent registers for archiving in non-volatile measuring data memory, failures and occurrences, non-metrological and mythological configuration changes
- Secured various permission levels for changing the configuration: user jumper, legalization jumper, HASP dongle for dedicated software
- Three levels of housing protection that ensure the required tightness even in the most difficult operating conditions: IP54, Ip65 and IP68 (the only such protection degree available on the market, only in Faun calculator)



FUNCTIONAL OPTIONS

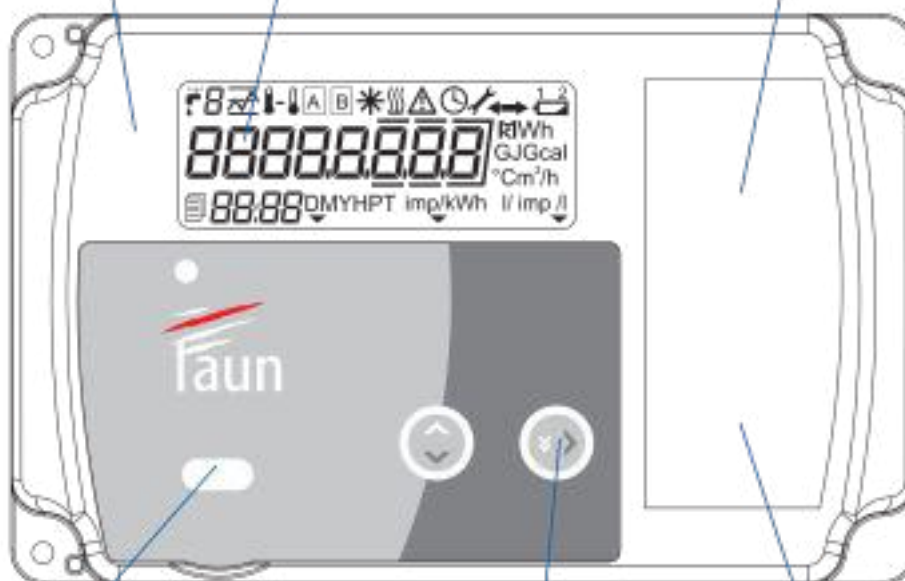


- Possibility of cooperation with heat transducers with ultrasound or r the market
- Possibility of cooperation with temperature sensors Pt100 or Pt500, in a 2 or 4-wire system
- Possibility of installation directly on flow transducers *)
- Environmental class c (M1, E1)
- Independent opto-connection
- Power supply versions: battery (possible application of various types of batteries, battery life 6 or 12 years) or internal power supply 230 VAC
- In standard version 4 configurable impulse inputs (additional possibility of functional change into alarm inputs or inputs for digital communication with a transducer)
- More than 5000 registers of measuring data archiving, to be configured by the user
- Two independent tariff registers (super luminal registers), possible configuration of the following thresholds: power, flow, power supply temperature, return temperature, temperature difference, tariff data archiving
- Independent registers of occurrences and failure modes, configuration changes
- Additional digital communication with ultrasound transducer that identifies the transducer errors, among others the return flow, weaker measuring signal, air-locks
- Dedicated software (for PC) for the configuration of parameters of the calculator and for the reading of all current and archived data

Modern multifunction microprocessor heat counter that allows a very precise measurement of energy consumption and an exceptionally rich data archiving and parameter configuration according to the requirements of the user

Big and readable LCD screen for main data presentation and for additional description of values, error type signalization, time display, data display etc. Moreover, on the screen there are units for the displayed values and symbols that define them.

Rich kit of removable communication modules and the possible operation of two independent modules simultaneously. Selection of communication protocols.



Independent communication port - opto-connection

Operation using two buttons placed under the LCD screen - P1 left; P2 right

Universal power supply;
- battery supply
- mains supply

Functions of The

Calculator

- Measurement and indication of current data, instantaneous
- calculation and indication of data for averaging period, set in the range 1-1440 minutes (24 hours)
- calculation, archiving, indication of measuring data in 5 groups with time cycles**):
 - minutes cycle – data record period configurable in the range 1-21600 minutes (two weeks)
 - hours cycle – set record period, at the beginning of every full hour
 - 24 hours cycle – set record period, once per 24 hours at selected hour
 - monthly cycle – set record period , once per month at selected full hour on the selected day of the month
 - yearly cycle – set record period, once per year at selected full hour on the selected day and month
- Setting, archiving and indicating the tariff data (possible activation of two independent tariffs**)
- Setting, archiving and indicating the accounting data (possible setting of date and time of data record for accounting independent from the settings of other registrations**)
- Archiving of emergencies (83 last records) and occurrences (256 last records) with the exact time of occurrence, pretreatment and duration time of each of them
- Archiving of configuration changes by the user (83 last records) and changes of mythological configuration (62 last records) with the exact time of each change and the record of settings before a change
- configuration of calculator parameters using the dedicated software or in a narrower range using the buttons

**) Archiving of the above-mentioned data in the memory of the calculator is configurable. It is possible to select data for the record and to set the number of registrations for each group (cyclical records, tariff records, for the purpose of accounting) choosing from the general possible number (more than 5000) of such records

Removable Communication Modules

- M-Bus
- Rs232
- Rs485
- Impulse outputs (2 outputs)
- Impulse outputs and inputs (2 outputs class oB, oc, or oD and 2 inputs class IB or Ic) Analogue outputs (2 outputs, 4-20 mA or 0-10 V)
- LonWorks
- radio module Wireless M-Bus
- radio module for telemetric systems IMR

Communication Protocols

- M-Bus in conformity with: PN-EN 13757-2:2005, PN-EN 13757-3:2013 and oMS
- Modbus in conformity with specification Modbus RTU
- Lumbus
- LonWorks

Operation of The Calculator

BUTTONS

The calculator is operated using two buttons P1 and P2, each of them has two functions activated through a quick click (marked with dark arrow) or by pushing the button for about 2 seconds (marked with light arrow).

LCD SCREEN

On the display there are two result fields – one 8-digit field for quantity data display and the other field, depending on the displayed screen, for additional description of quantities, error type signalization or e.g. for time display on the screen with date and hour. Moreover, on the display there are units for the displayed values and intuitive symbols that define them.



SELECTED SYMBOLS

- Important and common symbols displayed on the screens when a given occurrence appears are:
- Symbol that displays the volume or flow values
- cold symbol displayed for the values of cold registers
- Emergency symbol that signalizes a failure, displayed on the main screen and on the screens that are connected with the given failure
- Time symbol displayed for the value of current date and time
- Key symbol that signalizes the access to the configuration of calculator – displayed on all screens when unlocking the access
- Return flow symbol – flow at variance with the right direction e
- Flow symbol – flow in the right direction ?
- Battery empty symbol displayed on all screens when battery voltage falls below the minimum value

MENU GROUPS

1. Main group – enables the display of current main values of main registers of the calculator and of the measured instantaneous values.
2. Statistic group – contains average data and the highest data for averaging period.
3. Service group – enables the display of selected data of the calculator's configurations, among others the settings of main input and additional inputs, settings of additional modules, current date and time, operating time etc. The group is divided into three sub-groups with configuration data of the calculator, additional inputs/outputs and younger energy digits from the main group.
4. Tariff group – enables the display of current data from tariff registers, exceeding time and threshold value, and the archived tariff data, register's values of the calculator at the moment of retreat, exceed of tariff threshold.
5. Archive group – enables the display of archived data from cyclic archives, the data for each archive are placed in sub-groups of the registers: minute groups hour groups, month groups, year groups and accounting groups.
6. configuration group – enables the configuration of selected parameters of the counter.

Navigation in The Calculator's Menu

v button P1 – is used above all for navigation between the elements in a given group and sub-group (vertical navigation in menu):

- quick click of the button jumps to the next element in the group/sub-group or enters the group/sub-group
- pushing the button longer enables the exit from the group/sub-group

v button P2 – is used for navigation between the groups and sub-groups (horizontal navigation in menu):

- quick click of the button in case of the display of group selection screen jumps to the next group/sub-group, in case of display of selected quantity values it takes the shortcut and jumps directly to the value from a different group, which is connected to the displayed value
- pushing the button longer causes the activation of optical port and is used to confirm the change of settings from the calculator level (in group 06)

Main group 01	Statistic group 02	Service group 03 • Meter sub-group (counter's parameters)	Service group 03 • Sub-group I/O • Sub-group Regs (younger energy digits)
<ul style="list-style-type: none"> • Energy • Additional energy (cooling) • Energy tariff 1 • Energy tariff 2 • Main volume • Additional volume • Volume tariff 1 • Volume tariff 2 • Power supply temperature • Return temperature • Temperature difference • Instantaneous flow • Instantaneous power • Error code • In1 • In2 • In3 	<ul style="list-style-type: none"> • Average flow, max, min • Average power, max, min • Average power supply temperature max, min • Average return temperature max, min • Average temperature difference max, min 	<p>Meter</p> <ul style="list-style-type: none"> • Manufacturer's number • customer number • Network address • Impulse main weight • Mounting place, operation type • Date and time • Software version • Production date • operating time • Error operating time • cooling energy measurement threshold • Record time in accounting archive • Error threshold of exceeded flow • Error thresholds of lacking flow • Battery voltage 	<p>I/O</p> <ul style="list-style-type: none"> • configuration of additional Inputs in1, in2, in3, in4 • Type and configuration of installed communication modules • configuration of onto-connection Regs • Younger digits of: energy, additional energy, energy tariff 1, energy tariff 2
Tariff group 04 ***) • Subgroup tariff archive	Archive group 05 Sub-groups of the archive: yearly, monthly, 24 hours, hours, minutes, accounting		configuration group 06 ****)
<ul style="list-style-type: none"> • Energy tariff 1 • Volume tariff 1 • operating time in tariff 1 • Threshold type tariff 1 • Threshold value tariff 1 • Energy tariff 2 • Volume tariff 2 • operating time in tariff 2 • Threshold type tariff 2 • Threshold value tariff 2 • Record number • Time of threshold occurrence • Time of threshold retreat • Tariff energy • Tariff volume • operating time in a tariff 	<ul style="list-style-type: none"> • Record number • Energy • Energy tariff 1, 2 • Volume tariff 1, 2 • Additional energy • Additional volume • Error code • Instantaneous: flow, power, power supply temperature, return temperature, temperature difference • Flow (average, max, occurrence time max, min, occurrence time min) • Power (average, max, occurrence time max, min, occurrence time min) • Power supply temperature (average, max, occurrence time max, min, occurrence time min) • Return temperature (average, max, occurrence time max, min, occurrence time min) • Temperature difference (average, max, occurrence time max, min, occurrence time min) • In1, in2, in3, in4 • operating time • Error operating time 		<ul style="list-style-type: none"> • Year, month, day, hour, minute • customer number • Network address • Type: in1, in2, in3, in4 • Impulse constant: in1, in2, in3, in4 • Initial state: in1, in2, in3, in4 • Manufacturer's number: in1, in2, in3, in4 • confirmation of introduced changes • Year, month, day, hour, minute • customer number • Network address • Type: in1, in2, in3, in4 • Impulse constant: in1, in2, in3, in4 • Initial state: in1, in2, in3, in4 • Manufacturer's number: in1, in2, in3, in4 • confirmation of introduced changes

Each of displayed positions marked with blue colour can be turned off using the calculator configuration program
 ***) Group 04 appears when the threshold for a given tariff is turned on (positions that concern the active tariff are displayed)
 ****) Group 06 appears when the configuration possibility is active (after using the customer's jumper)

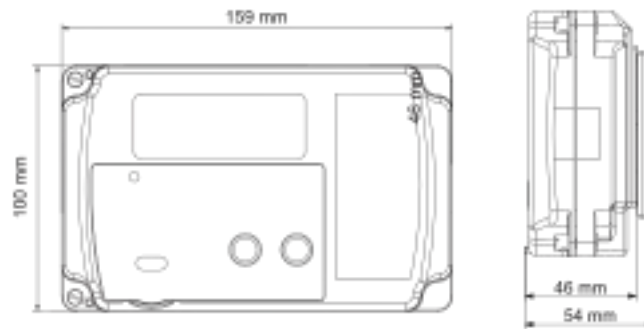
TABLE 1.

Basic operating parameters of the calculator			
Energy unit	–		GJ, MWh, kWh or Gcal
Volume unit	–		m ³
Temperature range	°C		Θ _{min} = 1 °C Θ _{max} = 180 °C
Temperature difference range	°C		ΔΘ _{min} = 3 °C ΔΘ _{max} = 175 °C
Nominal flow range	m³/h		0,6 ... 3 000
Impulse constant range for flow transducer	dm³/imp		1 ... 10 000
	imp/dm³		0,01 ... 300
Maximum permissible error MPE	%		E _c = ± (0,5+ ΔΘ _{min} / ΔΘ)
cooperating temperature sensors	–		- Pt 500 - 2 or 4-wire measurement - Pt 100 - 2 or 4-wire measurement
cooperating flow transducers	–		Ultrasound or rotor transducers
Switching for cold measurement when operating in heating and cooling installation in one circuit	–		Supply temperature < return temperature and power supply temperature below the set value
Power supply	–		Lithium battery 3,6 V type: AA, 2xAA, G or D or plug in power supply 230 VAc
Battery life	years		6-12 years, depending on battery type
Environmental class	PN-EN 1434	–	c
	MID	–	E1, M1
Ambient temperature	°C		5 ... 55
Protection degree	–		IP54 or IP65 or IP68

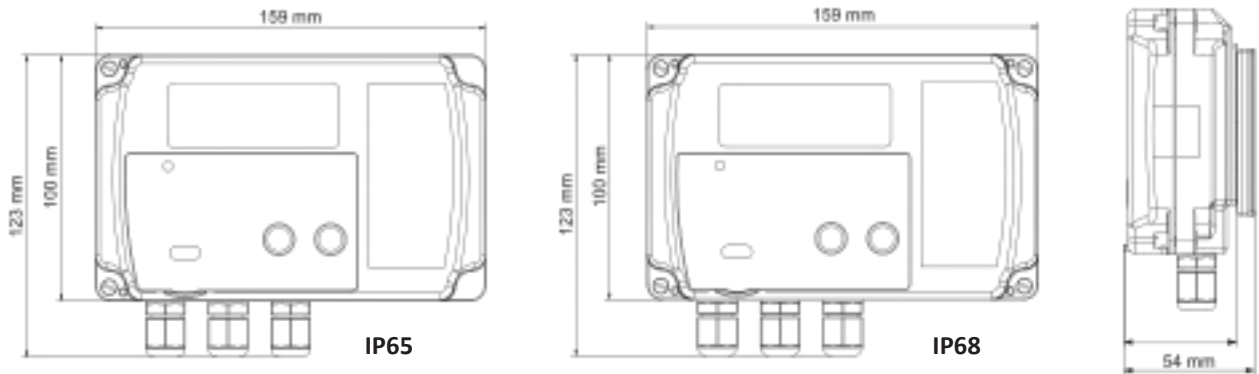
Other parameters of the calculator			
Display type	–		LCD 8 main digits, 4 additional digits, graphic symbols
Indication change	–		Two buttons: mechanical or capacitive
Maximum range of energy counter	GJ		99 999,999 ... 99 999 999
	Gcal		99 999,999 ... 99 999 999
	kWh/MWh		9 999 999,9 kWh ... 9 999 999,9 MWh
Maximum range of volume counter	m³		99999,999 ... 99999999
Maintenance of the calculator's power supply (after the loss of main supply)	–		Lithium battery 3,6 V ½ AA or cR 3 V battery or super-cap
Maximum frequency of impulses for the main input	imp/dm ³	Hz	< 150
	dm ³ /imp		< 22
Maximum frequency of impulses for additional inputs		Hz	< 3
Maximum length of cables for impulse inputs	m		15
Maximum diameter of connecting cables	mm²		2,5 (max outside diameter of the cable 5,5 mm)
Number of main inputs	pieces		1
Maximum number of additional inputs	pieces		4
Storage temperature	°C		- 25 ... + 60
Housing material	–		polycarbonate (Pc)
Housing size, length/width/height	mm		159/100/46,5
Weight without the battery	kg		0,35
Mounting of the calculator	–		on the wall (mounting handle provided) or on the flow transducer *)

Dimensions and Mounting

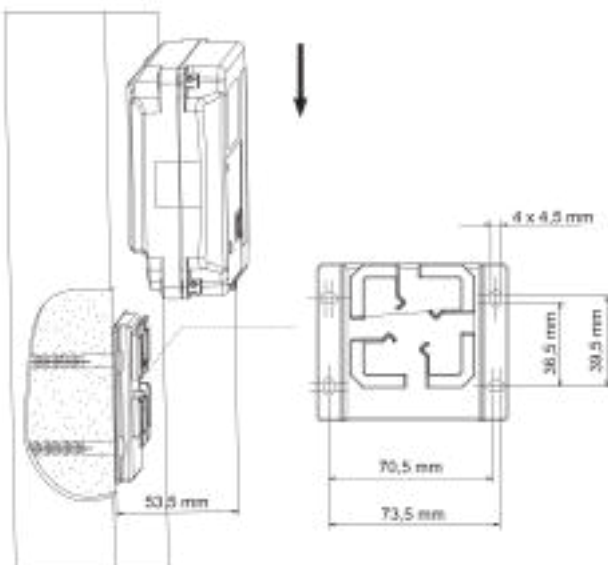
VIEW AND HOUSING SIZES IN IP54 VERSION



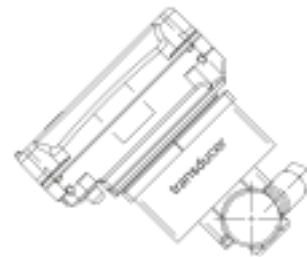
VIEW AND HOUSING SIZES IN A VERSION



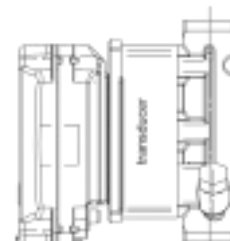
MOUNTING OF THE CALCULATOR ON THE WALL



WITH A TRANSDUCER



In horizontal position

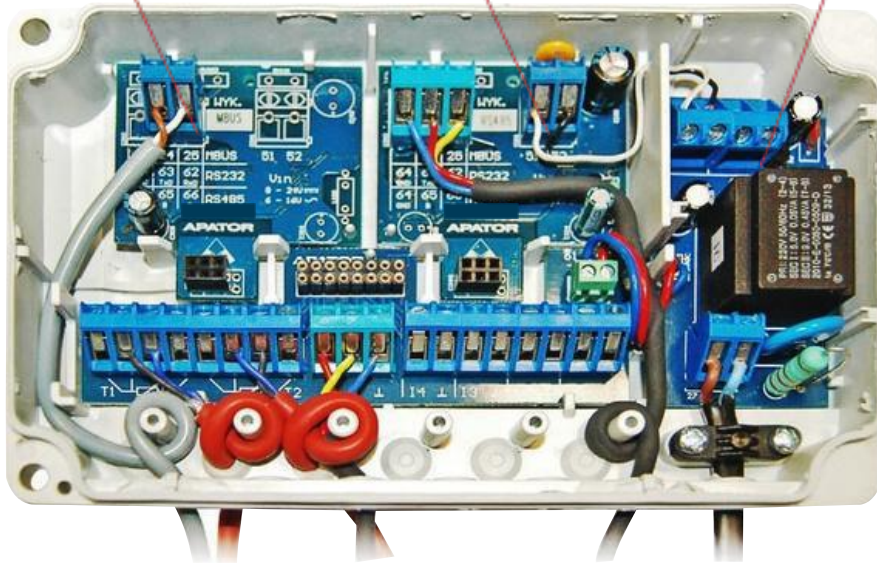


In vertical position

Mounting
place module 1

Mounting
place module 2

Mounting place
battery or power pack



View of the base with connecting binding, with installed communication modules and plug-in power supply as well as the way of leading the cables in IP54 version

Conformity with The Norms

- The calculator is in conformity with the following norms:
- PN-EN 1434 – heat meters, 6 parts
- PN-EN 13757 – communication system for remote reading of measuring devices indications, parts 1-4

Flow Measurement Technology - Inline Ultrasonic

A typical transit-time flow measurement system utilizes two or more ultrasonic transducers that function as both ultrasonic transmitter and receiver. The flow meter operates by alternately transmitting and receiving a burst of sound energy between the two transducers and measuring the transit time that it takes for sound to travel between the two transducers. The difference in the transit time measured is directly and exactly related to the velocity of the liquid in the pipe.

To be more precise, let's assume that T_{down} is the transit-time (or time-of-flight) of a sound pulse traveling from the upstream transducer A to the downstream transducer B, and T_{up} is the transit-time from the opposite direction, B to A. The following equations hold:

$$T_{down} = (D / \sin \phi) / (c + V \cdot \cos \phi), \quad (1)$$

$$T_{up} = (D / \sin \phi) / (c - V \cdot \cos \phi), \quad (2)$$

Where c is the sound speed in the liquid, D is the pipe diameter and V is the flow velocity averaged over the sound path. Solving the above equations leads to

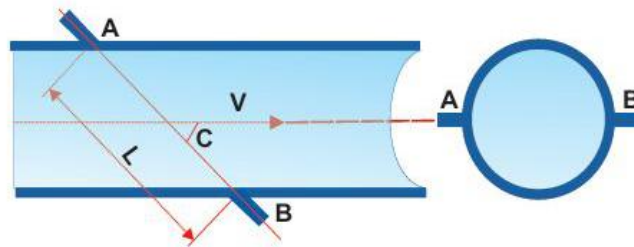
$$V = (D / \sin 2\phi) * \Delta T / (T_{up} * T_{down}), (3)$$

Where $\Delta T = T_{up} - T_{down}$. Therefore, by accurately measuring the upstream and downstream transit-time T_{up} and T_{down} , we are able to obtain the flow velocity V . Subsequently, the flow rate is calculated as following,

$$Q = K * A * V, (4)$$

Where A is the inner cross-section area of the pipe and K is the instrument coefficient. Usually, K is determined through calibration.

From equations (3) and (4), we see that the measurement results, V and Q , are independent of fluid properties, pressure, temperature, pipe materials, etc. The sound speed term does not appear in the final equations. These characteristics, plus large turn-down ratio, no pressure drop, no moving parts, no disturbance to the flow and many other features, make ultrasonic transit-time flow meter extremely attractive.



Specification

Parameter	Value
Nominal Diameter Of The Pipeline, DN	15, 20, 25, 32, 40, 50, 65, 80, 100, 125, 150, 200, 250, 300, 350, 400, 500, 600, 700, 800, 900, 1000
Accuracy, %	± 1.0
Flow velocity range, m/s	0.02 - 5
Fluid temperature range, °C:	50 / 130
Ambient temperature range, °C	5 - 65
Maximum pipeline pressure, MPa / bar	1.6 / 16

Outputs

- LCD;
- Universal output;
- RS-485 interface (ModBus);
- Wired or wireless M-Bus interface – on request.
- 4-20 mA as option available with power supply as 24 VDC

Order

- In order to buy the right BTU Meter please provide us with necessary data: v operation in:
 - heating installation,
 - cooling installation,
 - heating and cooling installation in 1 circuit
- mounting place of flow transducer: power supply / return
- size of flow sensor

Flow Metering Technology - Ultrasonic Clamp-On

FEATURE



- High Accuracy
Better than $\pm 1\%$
- Wide Measuring Range
Several types transducer for selection, pipe size from DN25mm to DN6000mm
- High Reliability
Adopt low voltage, multi-pulse technology to improve accuracy, useful life and reliability.
- Strong Anti-interference
Dual-balance signal differential receiver/driver circuit to avoid interference of converter, TV tower, high voltage line etc.
- Powerful Recording Function
Automatically record the following data :
 1. The totalizer data of the last 512 days/128 months/10 years
 2. The time and corresponding flow rate of the last 64 times of power on and off events
 3. The working status of the last 32 days
- Far transmission distance , easy for networking
RS485 support wireless network, connect GPRS module to accomplish wireless transmission .
- Support Heat Measurement
Connect the temperature transducer, can finish the heat / energy measurement



LIQUID TYPE

This flowmeter can be virtually applied to a wide range of measurement. A variety of liquid applications can be accommodated: ultra-pure liquids, potable water, chemicals, raw

OPTIONAL TEMPERATURE TRANSDUCERS

Front	Wiring	Back																								
	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>TX2</td> <td>T2</td> <td>GN</td> <td>T1</td> <td>TX1</td> <td>AI5</td> <td>AI4</td> <td>AI3</td> <td>OCT1-</td> <td>OCT1+</td> <td>RLY-</td> <td>RLY+</td> </tr> <tr> <td>24V+</td> <td>24V-</td> <td>485+</td> <td>485-</td> <td>AO-IN</td> <td>AO</td> <td>UP+</td> <td>UP-</td> <td>GND</td> <td>DN+</td> <td>DN-</td> <td>GND</td> </tr> </table>	TX2	T2	GN	T1	TX1	AI5	AI4	AI3	OCT1-	OCT1+	RLY-	RLY+	24V+	24V-	485+	485-	AO-IN	AO	UP+	UP-	GND	DN+	DN-	GND	
TX2	T2	GN	T1	TX1	AI5	AI4	AI3	OCT1-	OCT1+	RLY-	RLY+															
24V+	24V-	485+	485-	AO-IN	AO	UP+	UP-	GND	DN+	DN-	GND															
<ul style="list-style-type: none"> • Dimensions:92×90×34mm • LCD Display:60×19mm • 4 keyboard operation 		<ul style="list-style-type: none"> • Installation Method: Guide Rail(width is 35mm) 																								

Flow Metering Technology - Magnetic Flow Meter

Magnetic Flow Meter modification is designed to measure average volumetric flow rate and volume of hot, cold and waste waters or other non-aggressive electrically conductive liquids within wide temperature and conductivity ranges. The flow meter is typically used as part of heat meters, metering systems and automatic process control systems in power industry and municipal engineering. The flow meter is designed for use either in metal or plastic (metal-plastic) pipelines. Optionally the flow meter can be adjusted for reverse flow measurements with indication of flow direction.

Advantages

- Available in sizes from DN 20 to 1200mm;
- Bidirectional flow measurement (on request);
- Full-bore meter design eliminates pressure loss in measurement section;
- No filtering required;
- Short straight pipe runs required for installation;
- Protection against unauthorized access;
- Connection types: wafer, Flanged;
- Suitable for mounting on polymer pipes;

Application (hot and cold water measurement):

- Water abstraction;
- Water treatment;
- Water distribution network;
- Irrigation;
- Wastewater treatment;
- Filtration plants;
- Heat distribution systems;
- Heat generation plants;
- Industrial water applications.

Specifications:

Parameter	Value
Pipe size, DN, mm	20 - 250
Accuracy, %	from ±1.0
Maximum pipeline pressure, Mpa	2.5
Minimum conductivity, µS/cm	5
Fluid temperature range, °C	minus 10 -150
Ambient temperature range, °C	5 - 50
Minimum straight pipe runs	5 DN upstream and 2 DN downstream
Protection	IP65
Power supply	24 VDC / 220VAC



Outputs:

- LCD (on request);
- 2 pulse outputs;
- RS-485 interface (on request).

Design (material):

- Housing and flow sensor for DN20-250 mm – MS Painted;
- Electrodes – stainless steel.
- For wafer-type DN20-250 mm lining – Neoprene,
- High-strength heat-resistant polymer.



2020	BTU Meter											Data Sheet Ver 1.0			
	Heat Meter	XXX	X	X	X	X	X	X	X	X	X	X	X	X	X
Size	15	15													
	20	20													
	25	25													
	32	32													
	40	40													
	50	50													
	65	65													
	80	80													
	100	100													
	125	125													
	150	150													
	200	200													
	250	250													
	300	300													
	350	350													
	400	400													
	450	450													
500	500														
600	600														
700	700														
800	800														
900	900														
1000	1000														
Mounting	Insertion	2													
	Inline	1													
Flow Sensor Type	Ultrasonic Inserted			U											
	Ultrasonic Clampon			C											
	Electromagnetic			M											
Flow Sensor Protection	IP68														
	IP67														
Calculator Display Structure	Integral								1						
	Remote mount Heat calculator Faun with 5 meter cable								2						
	Remote+Integral mount Heat calculator Faun with 5 meter cable								3						
Process Connection	CS Flange								M						
	Screwed								S						
Pressure Rating	10 Bar											A			
	16 Bar											B			
	25 Bar											C			
	40 Bar											P			
Flange Class	Skip												0		
	Class 150												1		
	Class 600												4		
	Class 300												6		
	PN 10/16												2		
PN 40												3			
Calculator Display Enclosure	D Skip													0	
	IP 65													B	
Output	Not applicable														O
	M Bus														M
	RS485														C
	RS232														D
	LonWorks														A
	Radio module Wireless M-Bus														B
	Radio module for telematic systems IMR														E
	Impulse Outputs (2 Outputs)														F
	Analog outputs (2 outputs, 4-20 mA or 0-10 V)														G
	Impulse Outputs and inputs (2 Outputs class oB, oC or oD and 2 inputs class 1B or 1c)														H
Power Supply	24 VDC														2
	Battery														B
	220 VAC 50 Hz														1
Temp Sensors	Temp Sensors Pair calibrated with 3 meter cable														1
	Temp Sensors Pair calibrated with head														2