

# RAY MC

COMPACT ENERGY METER | MECHANICAL

**DIEHL**  
Metering



## APPLICATION

Fully electronic measuring capsule heat meter, heat and cooling meter or cooling meter with impeller scanning for volume measuring and energy calculation. Highly accurate recording of all billing data in a heating circuit or a cooling / heating circuit at medium temperatures from 5 °C up to 90 °C.

## FEATURES

- ▶ Electronic sensor control for recording flow rate
- ▶ Lithium battery, lifetime up to 12 years
- ▶ Optical ZVEI interface equipped as standard
- ▶ Adjustable reading date for billing
- ▶ Rotatable integrator
- ▶ Single-line 7-digit display for easy meter reading
- ▶ Can be installed in housings from the Diehl Metering range of accessories or in housings with a 2" coupling thread already available in the network

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## COMPONENTS

- Multi-jet volume measuring component (DN 15 - 20)
- Calculator, contains hardware and software for measuring flow rate, temperature and energy consumption
- Temperature sensor permanently connected in integrator

## CALCULATOR - BASIC FEATURES

RAY MC	
Ambient class	EN 1434 class C / MID E1 + M1
Protection class DIN 40050 / IEC-EN 60529	IP 54 (heat meter)   IP 65 with potted calculator (combined heat-cooling / cooling meter)
Interfaces standard	Optical ZVEI according IEC 870-5
Interfaces optional	M-Bus, radio, pulse

Note: IZAR@SET / HYDRO-SET Software for configuration of meters, reading of measured values and printout of meter logs. Available under [www.diehl.com/metering](http://www.diehl.com/metering) (Products - Downloads)

## DISPLAY

RAY MC	
Display indication	LCD, 7-digit
Unit	MWh - kWh - GJ - MJ - kW - m <sup>3</sup> /h - l/h - m <sup>3</sup> - l
Total values	9,999,999 - 999,999.9 - 99,999.99 - 9,999.999
Values displayed	Power - energy - flow rate - temperature - energy on reading date - reading date

## TEMPERATURE INPUT

RAY MC			
Temperature sensor type			Pt 500 / 2-wire
Measuring cycle	T	s	32
Max. temperature difference	$\Delta\theta$	K	+102
Min. temperature difference	$\Delta\theta$	K	+3
Starting temperature difference	$\Delta\theta$	K	+0.25
Absolute temperature measurement range	$\theta$	°C	0 ... 105

## SUPPLY VOLTAGE

RAY MC			
Operating voltage	$U_N$	$V_{DC}$	3.0 (lithium battery)
Battery lifetime			Up to 12 years
Nominal power	$P_N$	$\mu W$	30

## INTERFACES - OVERVIEW

RAY MC	
Optical	ZVEI interface for communication, M-Bus protocol
M-Bus	According to EN 1434-3. Data reading and parametrization are via two wires with polarity reversal protection. (Meter is powered with energy via M-Bus Master)
Radio	868 MHz, Real Data or Open Metering Standard (OMS) protocol
Pulse	Output for heat meters or cooling meters (energy / volume), for cooling-heat meters (energy cooling / energy heating or energy cooling / total volume), for heat-cooling meters (energy heating / energy cooling or energy heating / total volume)

## RADIO INTERFACE - SPECIFICATION

RAY MC		
Frequency	MHz	868
Protocol	Real Data (according EN 13757) or Open Metering Standard (OMS)	
Transmission power	mW	10
Transmission interval	sec.	64
Communication	Via Bluetooth optohead and IZAR@SET / HYDRO-SET software or IZAR@MOBILE software	

## VOLUME- / ENERGY PULSE

RAY MC		
Output type	Open collector	
Max. frequency	Hz	4
Max. input voltage	V	30
Max. input current	mA	100
Max. voltage drop at active output	V/mA	2/27
Max. current through inactive output	$\mu\text{A/V}$	5/30
Max. reverse voltage without destroying outputs	V	6
Min. pulse duration	ms	125
Min. pulse break	ms	125

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## GENERAL

		RAY MC	
Temperature range	°C	5 ... 90	
Ambient operating temperature	°C	0 ... 55	
Ambient storage temperature	°C	-20 ... 55	
Nominal pressure	PN	bar	16
Temperature sensor type	Pt 500 with 2 wire leads		
Cable length of temperature sensor	0.4 m mounted in measuring capsule; 1.5 m free		
Mounting position energy meter	In any position, also up side down		
Approval	MID (DE-07-MI004-PTB030) and PTB TR K7.2 (22.72 / 09.04) for cooling meter		

## TEMPERATURE SENSOR

		RAY MC	
Tangential sensor*	---		
Type 1	0.4 m   Ø 5.2 mm   PU grey   3 K - 102 K		
Free sensor	---		
Type 1	1.5 m   Ø 5.2 mm   PU grey   3 K - 102 K		
Type 2	1.5 m   Ø 5 mm   PU grey   3 K - 102 K		

\* mounted in measuring capsule

## TECHNICAL DATA

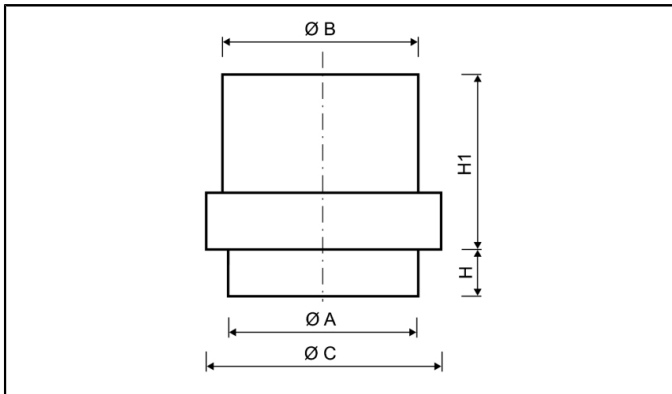
Nominal diameter	DN	mm	15	15	20
Nominal flow rate	$q_p$	m <sup>3</sup> /h	0.6	1.5	2.5
Maximum flow rate	$q_s$	m <sup>3</sup> /h	1.2	3	5
Minimum flow rate at $\Delta\theta$ 3 K	$q_i$	l/h	120	120	120
Minimum flow rate*	$q_i$	l/h	6	15	25
Starting flow rate		l/h	1.5 - 2	3 - 4	5 - 6
Pressure loss at $q_p$	$\Delta p$	mbar	243	243	242
Flow rate at 0.1 bar pressure loss		m <sup>3</sup> /h	0.385	0.962	1.607
Flow resistance coefficient $\bar{Zeta}$			56.25	9	10.24

\* according to EN1434 for flow sensor

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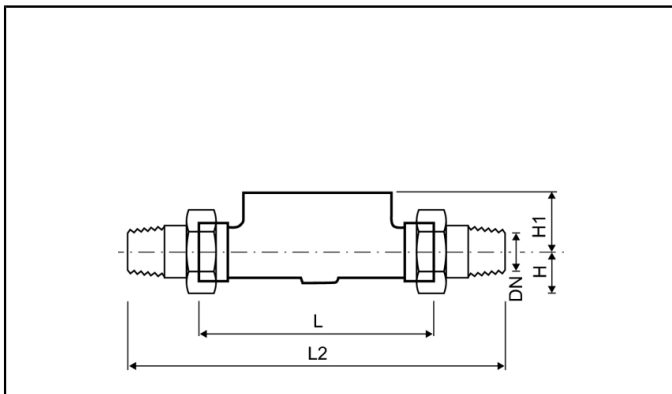
## DIMENSIONS



Capsule

Nominal diameter	DN	mm	15	15	20
Nominal flow rate	$q_p$	$m^3/h$	0.6	1.5	2.5
Connection interface	$\varnothing A$	Inch	G2B	G2B	G2B
Height	H	mm	15.2	15.2	15.2
Height	H1	mm	55	55	55
Diameter	$\varnothing B$	mm	63	63	63
Diameter	$\varnothing C$	mm	74	74	74
Weight		kg	0.5	0.5	0.5

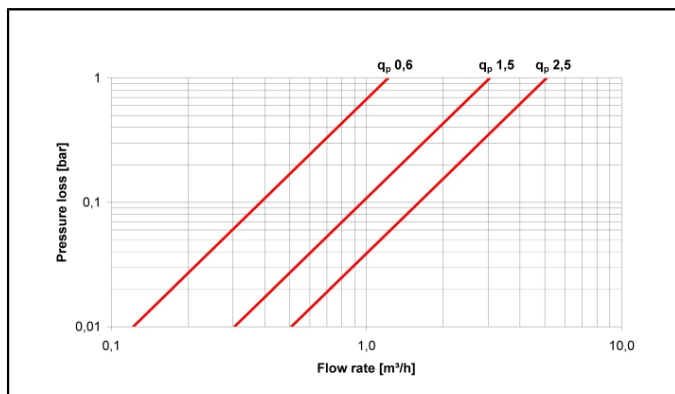
## DIMENSIONS - ACCESSORY



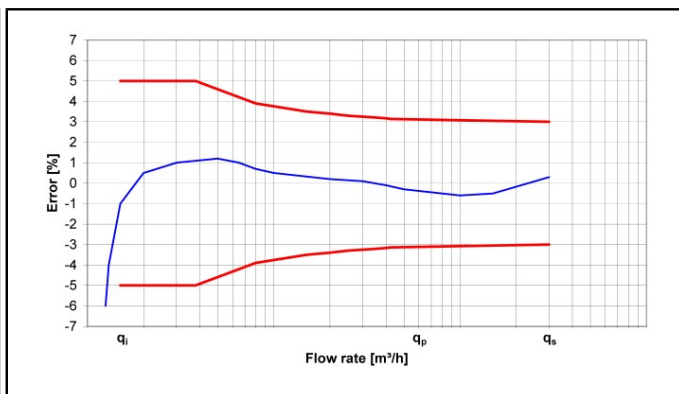
Housing

Nominal diameter	DN	mm	15	15	20
Nominal flow rate	$q_p$	$m^3/h$	0.6	1.5	2.5
Overall length	L	mm	110	110	130
Overall length with coupling	L2	mm	190	190	210
Height	H	mm	17	17	21
Height	H1	mm	29	29	31
Order no. 1 piece			3031602	3031602	3031600
Order no. 6 pieces			3026961	3026961	3029251

## PRESSURE LOSS GRAPH / TYPICAL ERROR GRAPH



Pressure loss graph



Typical error graph