kamstrup

Data sheet

MULTICAL® 6L2

- Data loggers
- Info loggers
- Data backup in case of power failure

MID-2004/22/EC

CE M15 0200

EN 1434

Contents

Heat and cooling meter

Application
MULTICAL® 6L2 is an all-purpose energy calculator for heat and cooling together with an ULTRAFLOW® sensor and 2 wired temperature sensor pairs. Used together with Kamstrup ultrasonic flow sensor ULTRAFLOW® advanced functions are available. On account of its pinpoint accuracy the meter registers precise consumption throughout the whole lifetime of the meter. The meter is maintenance-free and has a long lifetime which guarantees minimum yearly operating costs.

MULTICAL® 6L2 is used for heat, cooling and combined heat /cooling measurement in all water-based systems with temperatures from 2 °C to 180 °C for heat and 2 °C to 50 °C for cooling.

Functionality
MULTICAL® 6L2 is used as heat meter together with the flow sensor, ULTRAFLOW® 54 and two temperature sensors. Flow sizes range from qp 0.6 m^3/h to 1,000 m^3/h. In cooling applications the meter is used together with ULTRAFLOW® 34 from qp 1.5 m^3/h to qp 100 m^3/h and with ULTRAFLOW® 54 from qp 150 m^3/h to qp 1,000 m^3/h.

MULTICAL® 6L2 is characterized by a range of popular communication modules, which make it easy to fit the meter into various applications. The meter can be fitted with LON, M-Bus, BACnet and Modbus for wired communication. If the installation requires wireless communication, please refer to Kamstrups MULTICAL® 602, which offers large a variety of wireless communication options.

The calculator's info codes and data loggers make up an invaluable tool for troubleshooting, error correction and analysis of energy consumption. The info logger constantly monitors a number of key functions in the meter, such as error in measuring system, power failure or mounting of sensor in wrong flow direction. In such cases a flashing "INFO" and an info code appear in the display.

MULTICAL® 6L2 saves consumption data on a yearly, monthly, daily and hourly basis, which provides the operations manager with a complete performance analysis.

Precise and secure
MULTICAL® 6L2 with ULTRAFLOW and the precisely matched temperature sensors guarantee accurate measuring results even at minimal temperature differences. The flow sensors long-term stability and accuracy are not influenced by flow velocity, flow disturbances or wear, which ensures an optimal operation. Finally, in case of power failure data is backed up, thus securing billing of consumption data.

Calculator functions

Energy calculation

MULTICAL® 6L2 calculates energy based on the formula in prEN 1434-1:2009, 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:
Energy = V x ΔΘ x k.

V is the supplied water volume

ΔΘ 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 x ΔΘ x k x 1000
E [kWh] =	E [Wh] / 1.000
E [MWh] =	E [Wh] / 1.000.000
E [GJ] =	E [Wh] / 277.780

Application types

MULTICAL® 6L2 operates with two different energy formulas, E1 and E3, that both are calculated in parallel in connection with each integration no matter how the meter is configured.

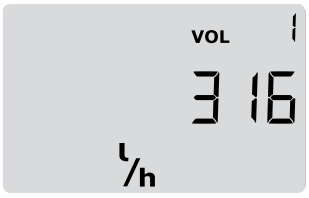
The energy types are calculated as follows:

E1=V1(T1-T2)k	Heat energy (V1 in inlet or outlet)
E3=V1(T2-T1)k	Cooling energy (V1 in inlet or outlet)

All energy types are data logged.

Flow measurement

MULTICAL® 6L2 calculates current water flow according to the principles of the ULTRAFLOW® flow meter, which means the flow indication is updated every 10 seconds.



Power measurement

MULTICAL® 6L2 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.

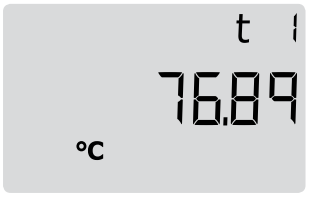
Calculator functions

Min. and max. flow and power
MULTICAL® 6L2 registers minimum and maximum flow and power on a monthly as well as on a yearly basis. The registrations include max. and min. flow and power values, all with date indication. These registrations can only be read via data communication, such as communication module or via the optical communication.

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.

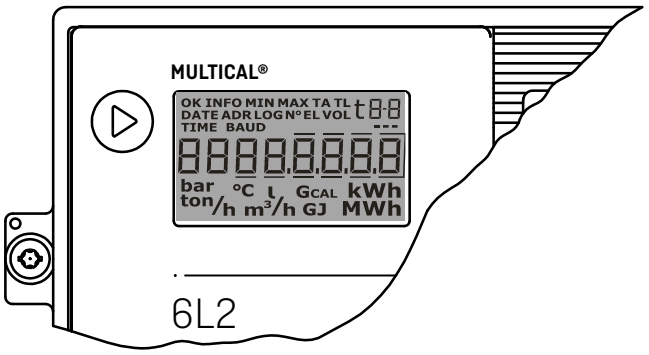
Temperature measurement
MULTICAL® 6L2 is available with Pt500 sensors in a 2-wire configuration.

The measuring circuit includes a high resolution analog/digital converter with a temperature range of 0.00...185.00 °C.



Display functions
MULTICAL® 6L2 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 front key is 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 front key.



The front key is used to switch between the readings. The consumers typically use the first reading in connection with self-reading for billing purposes.

Info codes
MULTICAL® 6L2 constantly monitors a number of important functions, e.g. power supply and temperature sensors. 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.

An error hour counter registers the hours during which the info code exceeds zero. The info logger stores the latest 50 changes.

Calculator functions

Info code	Description	Response time
0	No irregularities	-
1	Supply voltage has been cut off	-
8	Temperature sensor T1 outside measuring range	1...10 min.
4	Temperature sensor T2 outside measuring range	1...10 min.

Connecting ULTRAFLOW ® 54 to MULTICAL ® 6L2, a 2-way communication is achieved between the flow meter and calculator and an additional set of info codes are available:

Info code	Description	Response time
16	Flow sensor V1, Data communication error	
2048	Flow sensor V1, Signal too low (Air)	After 1 day (00:00)
4096	Flow sensor V1, Wrong flow direction	After 1 day (00:00)
16384	Flow sensor V1, Wrong flow direction	After 1 day (kl. 00:00)

Data loggers
MULTICAL® 6L2 contains a permanent memory (EEPROM), where the results of a number of various data loggers are stored. The meter contains the following data loggers:

Data logging interval	Data logging depth	Logged value
Yearly logger	15 years	Counter registers
Monthly logger	36 months	Counter registers
Daily logger	460 days	Consumption (increase)/day
Hourly logger	1392 hours	Consumption (increase)/hour
Info logger	50 events	Info code, date, time and energy (E1/E3)

Voltage supply
MULTICAL® 6L2 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® 6L2 in the base unit (base modules), in this way the meter can adapt to various applications and data reading methods. The modules can be seen in “Order specifications” on page 13.

Calculator functions

Programming and verification
METERTOOL for HCW is a Windows® -based software which includes all facilities for calculator programming. If the software is used together with VERIFICATION EQUIPMENT for MULTICAL® 6L2, the calculator can be tested and verified.

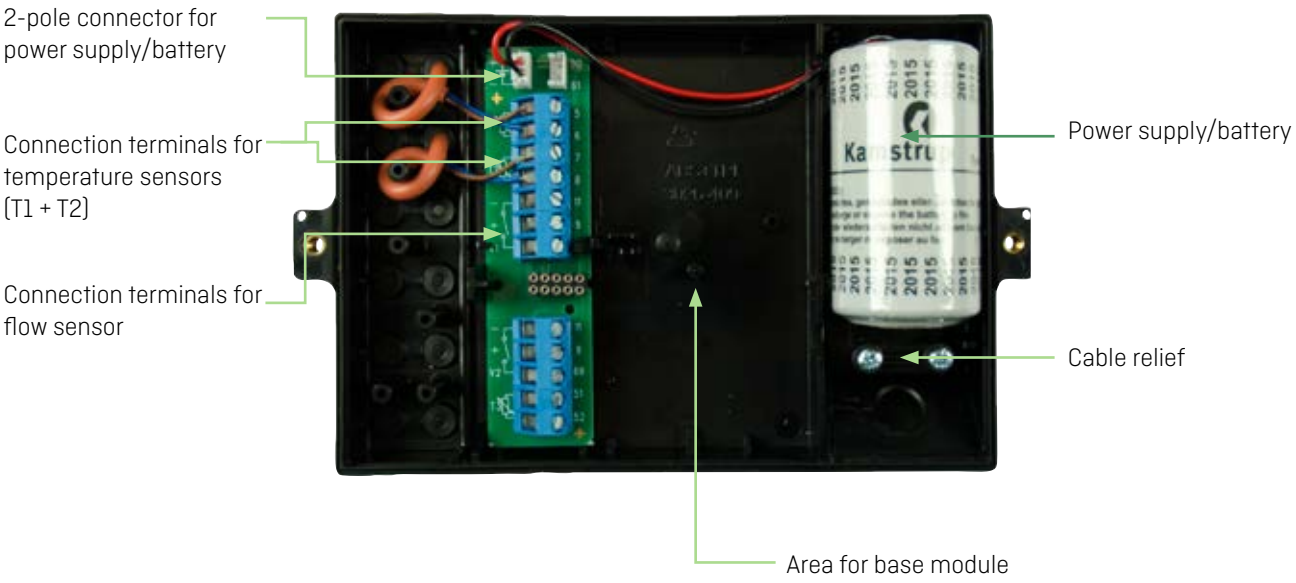
Tariff functions
MULTICAL® 6L2 has two extra registers TA2 and TA3 to accumulate energy parallelly to the main register based on a programmed tariff condition. No matter which tariff type you select the tariff registers will be displayed as TA2 and TA3.

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.

Pulse inputs VA and VB
MULTICAL® 6L2 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.

Cabinet design



Approved meter data

Approval	Standard: EN 1434:2007, prEN 1434:2009 and OIML R75:2002
EU-directives	– MID (Measuring Instruments Directive) – LVD (Low Voltage Directive) – EMC (Electromagnetic Compatibility Directive)
Heat meter	
– Approval	DK-0200-MI004-020
– Temperature range	θ: 2 °C...180 °C
– Differential range	$\Delta\Theta$: 3 K...170 K
Cooling meter	
– Temperature range	θ: 2 °C...50 °C
– Differential range	$\Delta\Theta$: 3 K...40 K
Accuracy	EC ± (0.5 + $\Delta\Theta$min/$\Delta\Theta$) %
Temperature sensors	
– Type 6L2-F	Pt500 EN 60 751, 2-wire connection
Flow sensor types	ULTRAFLOW®
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
EN 1434 designation	Environmental class A and C
MID designation	
– Mechanical environment	Class M1
– Electromagnetic environment	Class E1 and E2

The stated minimum temperatures apply to the type approval only. The meter has no cutoff for low temperature and thus measures as low temperatures as 0.01 °C and 0.01 K.

Electrical data

Calculator data

Typical accuracy	
– Calculator	E_C ± (0.15 + 2/ΔΘ) %
– Sensor set	E_T ± (0.4 + 4/ΔΘ) %
Display	LCD – 7 (8) digits with a digit heigth of 7.6 mm
Resolution	9999.999 – 99999.99 – 999999.9 – 9999999
Energy units	MWh – kWh – GJ
Data logger (Eeprom)	
– Standard	1392 hours, 460 days, 36 months, 15 years, 50 info codes
Clock/calendar	Clock, calendar, leap-year compensation, target date, Real time clock with battery back-up
Data communication	KMP protocol with CRC16 used for optical communication and for top and base modules
Power in temperature sensors	< 10 µW RMS
EMC data	Meets prEN 1434-4:2009 Class C (MID Class E2)

Supply

Supply voltage	3.6 VDC ± 0.1 VDC
Battery	3.65 VDC, D-cell lithium
Closed circuit	< 35 µA excluding flow sensor
Replacement interval	
– Mounted on wall	12 + 1 years @ t_{BAT} < 30 °C
– Mounted on flow sensor	10 years @ t_{BAT} < 40 °C The replacement interval is reduced when using data modules, frequent data communication or high ambient temperature.
Mains supply	230 VAC +15/-30 %, 50/60 Hz 24 VAC ± 50 %, 50/60 Hz
Insulation voltage	4 kV
Power consumption	< 1 W
Backup supply	Integral super-cap eliminates operational stop-down due to shortterm power cuts (this only applies for supply modules type 6L2-0000-7 and 6L2-0000-8).

Temperature measurement

Sensor inputs T1, T2	
– Measuring range	0.00...185.00 °C
Max. cable lengths	
– Pt500, 2-wire	2 x 0.25 mm²: 10 m 2 x 0.50 mm²: 20 m

Pulse connections

Flow measuring V1	**ULTRAFLOW® V1: 9-10-11**
EN 1434 pulse class	IC
Pulse input	680 kΩ pull-up to 3.6 V
Pulse ON	< 0.4 V for > 0.5 msec.
Pulse OFF	> 2.5 V for > 10 msec.
Pulse frequency	< 128 Hz
Integration frequency	< 1 Hz
Electrical isolation	No
Max. cable length	10 m

Pulse inputs without bounce damping VA and VB VA: 65-66 and VB: 67-68	**Water meter connection FF(VA) and GG(VB) = 71…90**	**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 > 30 msec.	< 0.4 V for > 30 msec.
Pulse OFF	> 2.5 V for > 100 msec.	> 2.5 V for > 100 msec.
Pulse frequency	< 1 Hz	< 3 Hz
Electrical isolation	No	No
Max. cable length	25 m	25 m
Requirements to external contact	Leakage current at function open < 1µA	

Pulse inputs with bounce damping VA and VB VA: 65-66 and VB: 67-68	**Water meter connection FF(VA) and GG(VB) = 01…40**
Pulse input	680 kΩ pull-up to 3.6 V
Pulse ON	< 0.4 V for > 200 msec.
Pulse OFF	> 2.5 V for > 500 msec.
Pulse frequency	< 1 Hz
Electrical isolation	No
Max. cable length	25 m
Requirements to external contact	Leakage current at function open < 1µA

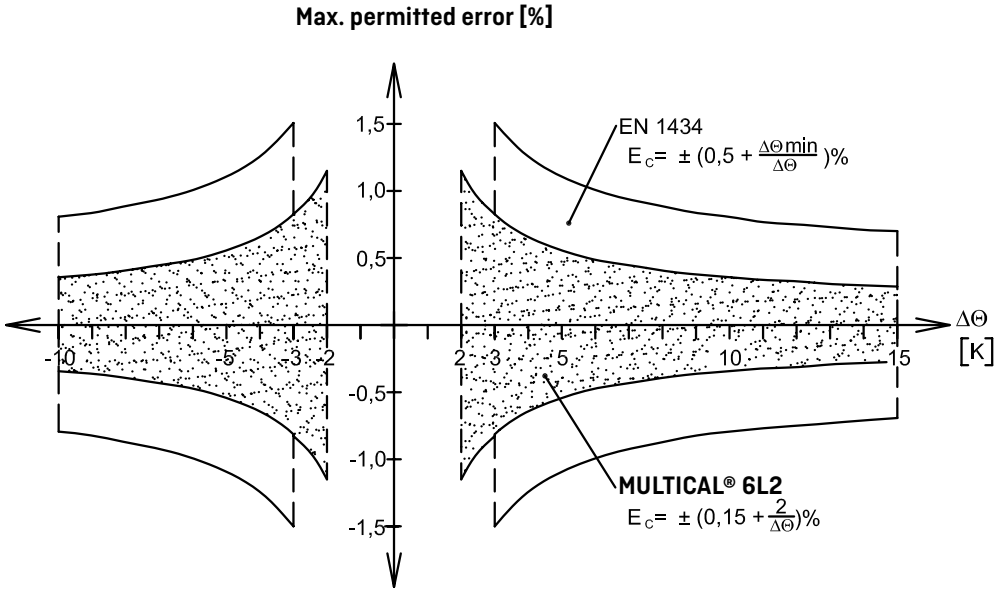
Mechanical data

Environmental class	Meets EN 1434 Class A and C
Ambient temperature	5…55 °C non condensing, closed location (indoor installation)
Protection class	IP54
Storage temperature	-20…60 °C (drained flow meter)
Weight	0.4 kg excluding sensors and flow sensor
Connection cables	ø3.5…6 mm
Supply cable	ø5…10 mm

Materials

Top cover	PC
Base unit	ABS with TPE gaskets (thermoplastic elastomer)
Print box	ABS
Wall bracket	Thermoplastic, PC 20 % GF

Tolerance band



The above diagram shows the tolerance band of MULTICAL® 6L2 compared to the tolerance requirements of EN 1434.

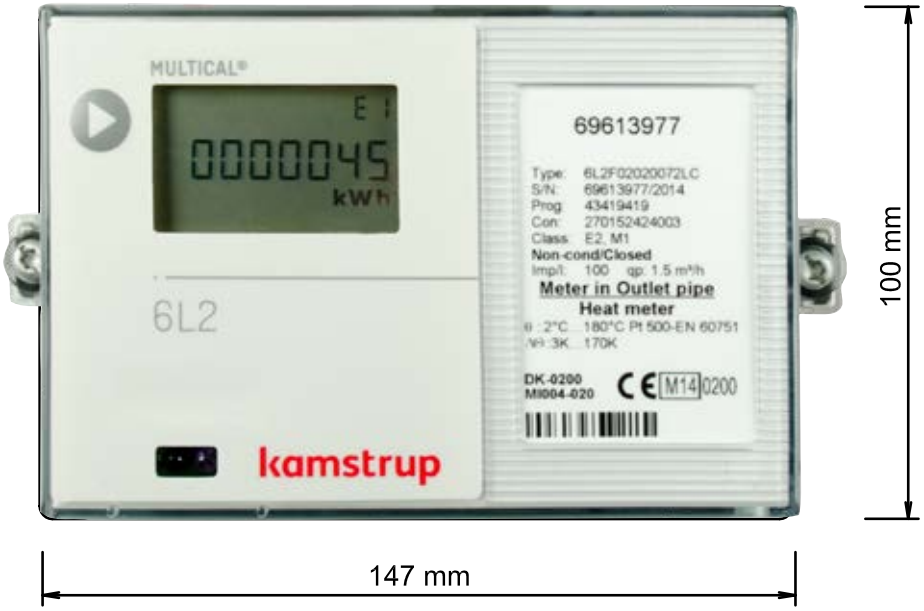
Order specifications

MULTICAL® 6L2	Type 6L2-	□	□	□□	□	□□	□	□	□□
Sensor connection									
Pt500 2-wire (T1-T2)		F							
Top module									
No module			0						
Base module									
No module				00					
M-Bus + pulse inputs				20					
LonWorks + pulse inputs				24					
BACnet MS/TP module				66					
ModBus RTU + pulse inputs				67					
Supply									
No supply					0				
Battery, D-cell					2				
230 VAC isolated linear supply					7				
24 VAC isolated linear supply					8				
Pt500 sensor set									
No sensor set						00			
Pocket sensor set w/1.5 m cable						0A			
Pocket sensor set w/3.0 m cable						0B			
Pocket sensor set w/5 m cable						0C			
Pocket sensor set w/10 m cable						0D			
Short direct sensor set w/1.5 m cable						0F			
Short direct sensor set w/3.0 m cable						0G			
Flow sensor/pick-up unit									
Supplied w/1 ULTRAFLOW® (Please specify type)							1		
Prepared for 1 ULTRAFLOW® (Please specify type)							7		
Meter type									
Heat meter (MID module B + D)								2	
Heat meter (MID module B + D) with cooling register								3	
Cooling meter								5	
Country code (language on label etc.)									XX

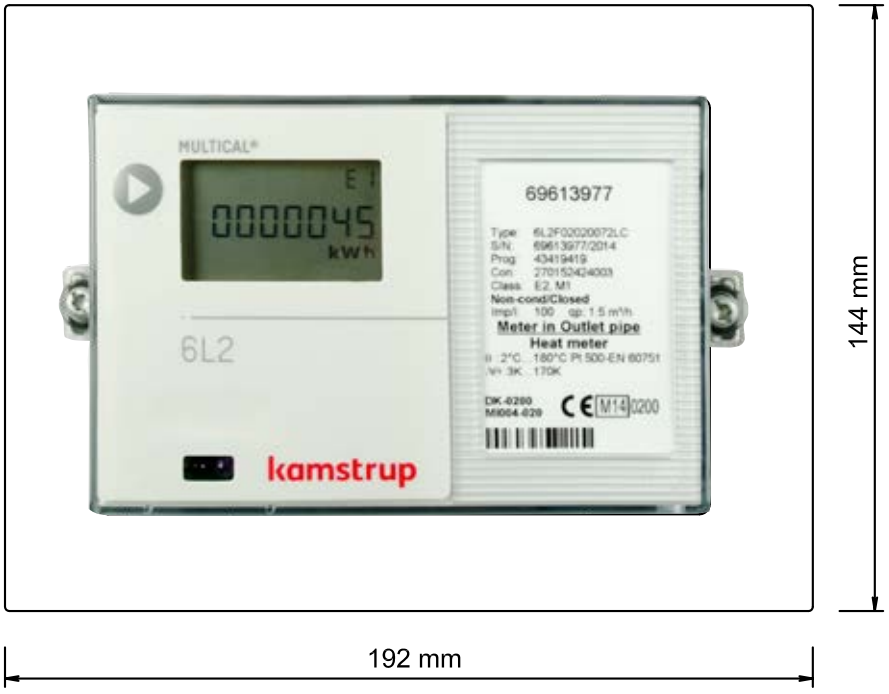
When placing orders please state ULTRAFLOW® type numbers separately.

Dimensional sketches

Front dimensions of MULTICAL® 6L2

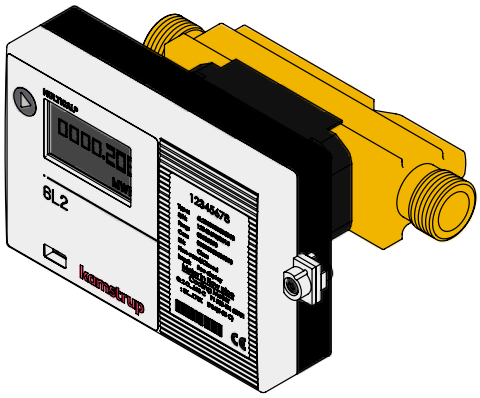


Panel mounted MULTICAL® 6L2 seen from the front

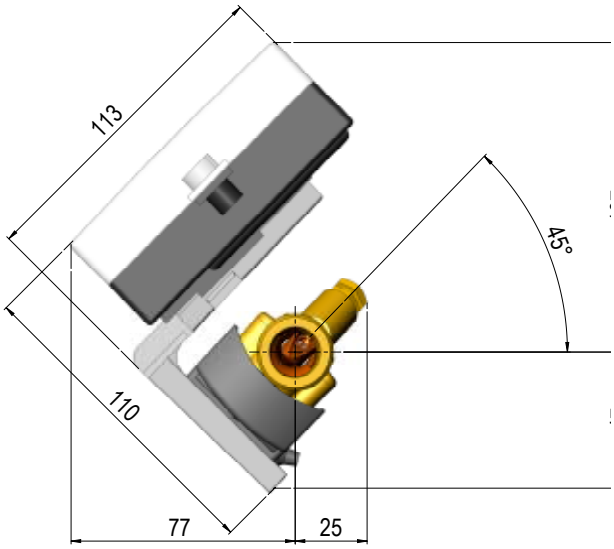


Dimensional sketches

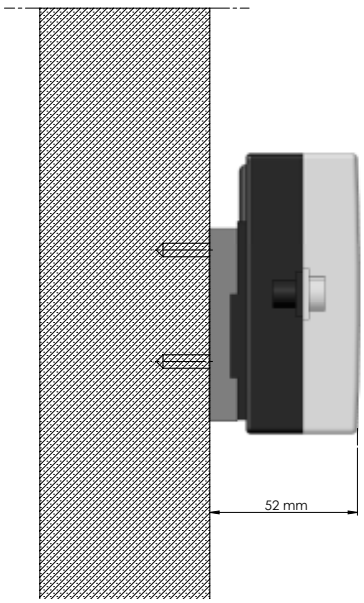
MULTICAL® 6L2 mounted on ULTRAFLOW®



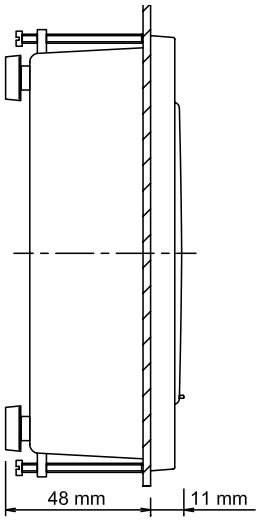
MULTICAL® 6L2 mounted on ULTRAFLOW® using angle fitting



Wall-mounted MULTICAL® 6L2 seen from the side



Panel-mounted MULTICAL® 6L2 seen from the side



Accessories

Description	Type No.
D-cell battery	1606-064
230 VAC isolated linear supply	6L200007000000
24 VAC isolated linear supply	6L200008000000
Data cable w/USB plug	6699-098
Infrared optical reading head w/USB plug	6699-099
Infrared optical reading head w/D-sub 9F	6699-102
Data cable RS232, D-sub 9F	6699-106
Verification unit (used with METERTOOL)	6699-397/-398/-399
Temperature sensor set with connecting head (2/4 wired)	6556-4x-xxx
METERTOOL HCW	6699-724
LogView HCW	6699-725

Please, contact Kamstrup A/S for questions concerning further accessories.

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