Technical Description

MULTICAL® 62

Water Meter
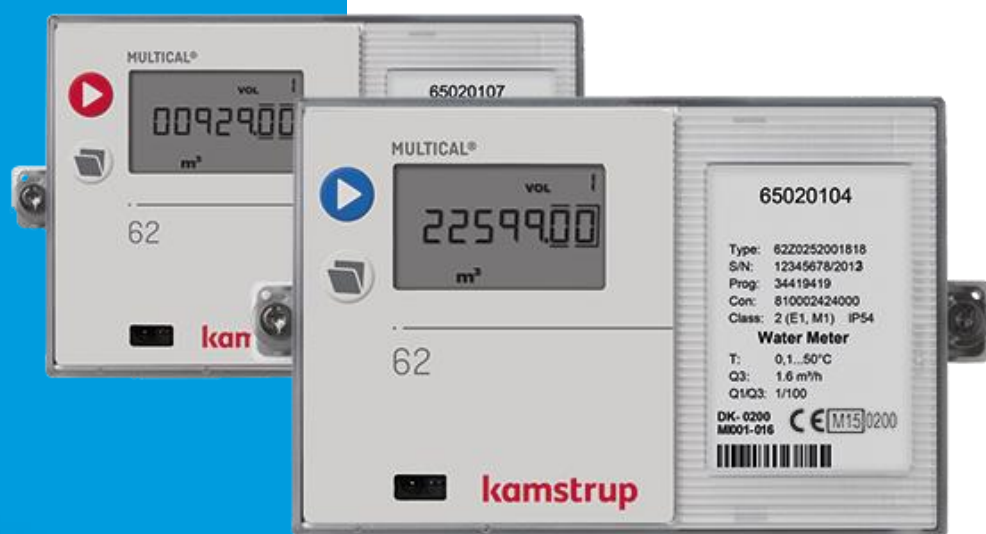
Contents

1 General Description

MULTICAL® 62 is a cold water meter (0.1…50°C) and hot water meter (0.1°C…90°C), consisting of the flow sensor part, ULTRAFLOW® 24, and the calculator MULTICAL® 62 (which is also identical with MULTICAL® 602)

Calculator MULTICAL® 62

(identical with MULTICAL® 602)

Flow part
MULTICAL® 62

MULTICAL® 62 is a static water meter based on the ultrasonic principle. The water meter has been developed on the basis of our experiences, since 1991, with the development and production of static ultrasonic meters. MULTICAL® 62 is an accurate and reliable meter for either battery or mains operation (optional).

Following applies for MULTICAL® 62:

- According to OIML R49 MULTICAL® 62 can be described as a 'complete water meter'. In practice, this means that the flow part and the calculator must not be separated.

- If the flow part and the calculator have been separated, and the seals have therefore been broken, the meter is no longer valid for billing purposes. Furthermore, the factory guarantee no longer applies.

- Possible reading options are: Operating hour counter, current flow, max and min. flow, information code, customer number and segment test etc. – depending on configuration.

- All data are saved daily in an EEPROM for 460 days. Moreover, monthly data for the last three years, yearly data for the last 15 years and the last 1,392 hours are saved.

- MULTICAL® 62 can be fitted with plug-in modules in both calculator top (top modules) and in connecting base (base modules). Thus, the meter can be adapted to many different applications and data readings.

- In addition to the water meter's own data, MULTICAL® 62 has two extra pulse inputs, VA and VB, for collection and remote accumulation of pulses from e.g. water and electricity meters. The pulse inputs are included in the base modules. Pulse inputs, VA and VB, function independently of the other in- and outputs.

In designing the MULTICAL® 62, we have attached great importance to flexibility via programmable functions and plug-in modules, in both the calculator top as well as in the base unit, to ensure optimal use in a large number of applications. In addition, the construction ensures that already installed MULTICAL® 62 meters can be updated via the PC program METERTOOL – HCW.

This technical description is prepared to give utility managers, meter electricians, consulting engineers and distributors the possibility of utilizing all functions available in the MULTICAL® 62. Furthermore, the description is made for laboratories for the testing and verification process.

1.1   Mechanical construction
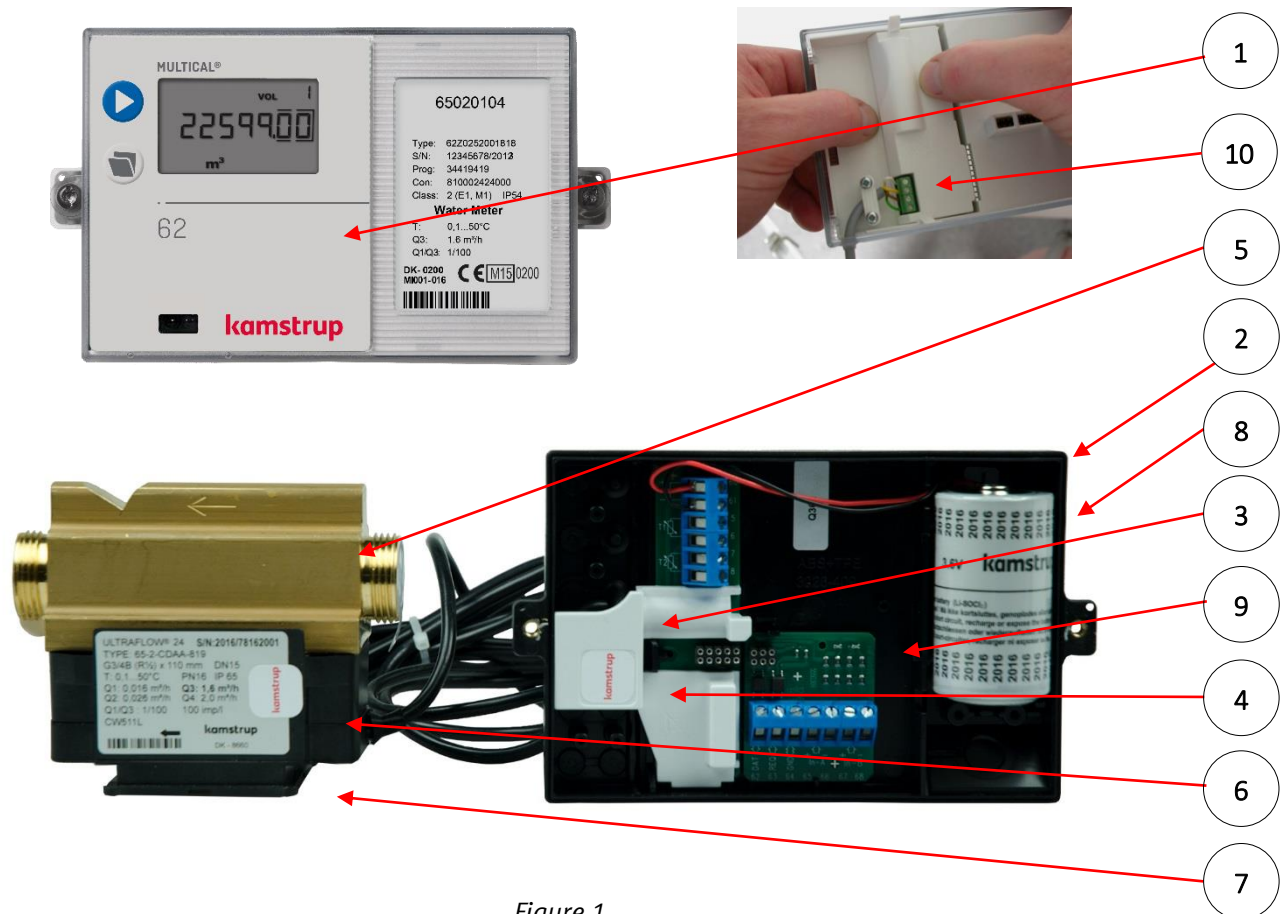
Figure 1

1.   Transparent top cover with front plate *(Blue: cold water meter, Red: hot water meter)*
2.   Cabinet for electronics unit
3.   Verification cover. The top cover can be dismounted without breaking the verification seal
4.   Verification label
5.   Meter housing
6.   Signal housing
7.   Fitting, also for wall mounting. Screws and rawlplugs for wall mounting are enclosed with the meter (item no. 3130-105)
8.   Supply: Battery, 24 VAC or 230 VAC. Can be replaced without breaking the verification seal
9.   Base module
10. Top module

Optional equipment for cold water meter only:

   o   Strainer (dirt filter) for DN15 and DN40 with gasket
   o   Anti-pollution check valves for DN15 to DN40 with gasket (NF EN 13959)

2   Technical Data

2.1 Approved meter data

Approval	DK-0200-MI001-016
EU directives	Measuring Instrument Directive
	Low Voltage Directive
	Electromagnetic Compatibility Directive
	Pressure Equipment Directive, Category 1, (DN50-DN80)
Standard	OIML R49-2006
	WELMEC guide 8.11
Mechanical environmental class	M1
Electromagnetic class	E1
Environmental class	B
Accuracy class	2
Temp. of medium in flow part	0.1…50°C Cold water meter
	0.1…90°C Hot water meter
Sanitary approval	
On flow part	WRAS (U.K.)
	DVGW (Germany)
	SZU (Czech republic)
	PZH (Poland)
	ÖVGW (Austria)
	SVGW (Switzerland)
ULTRAFLOW® 24	KTW + W270 (DE) Cold water up to 50°C
	Hot water up to 85°C

2.2 Electrical data

Display	LCD – 7 (8) digits, digit hight 7.6 mm
Resolution	9999.999 – 99999.99 – 999999.9 – 9999999
Data logger (Eeprom)	Standard: 1392 hours, 460 days(24 hours), 36 months, 15 years, 50 info codes Option: Data loggers with programmable interval
Clock/calender	Clock, calendar, compensation for leap years, target date, real-time clock with battery backup
Data communication	KMP protocol with CRC16 used for optical communication, and for top and base modules
Supply voltage	3.6 V ± 0.1 VDC
Battery (supply)	3.65 VDC, D-cell lithium
Backup battery	3.0 VDC, BR-cell lithium
Replacement interval: - Mounted on the Wall	12+1 years @ $t_{BAT} < 30°C$ The replacement interval is reduced when using data modules, frequent data communication and high ambient temperature.
Mains supply	230 VAC +15/-30%, 50/60 Hz 24 VAC ± 50%, 50/60 Hz
Power consumption mains supply	< 1W
Isolation voltage	4 kV
Backup supply	Integral SuperCap eliminates interruptions due to short-term power cuts *(Power supply modules type 602-0000-7 and type 602-0000-8 only)*
EMC data	Fulfils OIML R49 class E1

2.2.1 Pulse inputs <u>without</u> bounce damping

Pulse inputs VA and VB	Water meter connection	Electricity meter connection
VA: 65-66 and VB: 67-68	FF(VA) and GG(VB) = 71…90	FF(VA) and GG(VB) = 50…70
Pulse input	680 kΩ pull-up for 3.6 V	680 kΩ pull-up for 3.6 V
Pulse ON	< 0.4 V in > 30 msec.	< 0.4 V in > 30 msec.
Pulse OFF	> 2.5 V in > 100 msec.	> 2.5 V in > 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 < 1 µA	

2.2.2 Pulse inputs <u>with</u> bounce damping

Pulse inputs VA and VB	Water meter connection	
VA: 65-66 and VB: 67-68	FF(VA) and GG(VB) = 01…40	
Pulse input	680 kΩ pull-up for 3.6 V	
Pulse ON	< 0.4 V i > 200 ms.	
Pulse OFF	> 2.5 V i > 500 ms.	
Pulse frequency	< 1 Hz	
Electrical isolation	None	
Max. Cable length	25 m	
Requirements to external contact	Leakage current at function open < 1 μA	

Pulse outputs CE and CV

- via top module	67-0B	602-0C
Type	Opto FET	Open collector (OB)
External voltage	5…48 VDC/AC	5…30 VDC
Current	1…50 mA	1…10 mA
Residual voltage	$R_{ON} \leq 40\ \Omega$	$U_{CE} \approx 1$ V at 10 mA
Electrical isolation	2 kV	2 kV
Max. cable length	25 m	25 m
Pulse length	Optional 32 msec. or 100 msec.	

2.3 Mechanical data

Metrological class	2
Environmental class	Fulfils OIML R49 class B
Mechanical environment	MID class M1
Ambient temperature	5...55°C non-condensing, closed location (installation indoors)
Protection class	Calculator: IP54
	Flow sensor: IP65
Temperature of medium	Cold water meter: 0.1...30°C (T30)
	Cold water meter: 0.1...50°C (T50)
	Hot water meter: 0.1...90°C (T90)
Storage temperature	-25...60°C (drained flow part)
Weight	0.4 kg excl. flow sensor part
Pressure stage	Threaded meter: PN16
	Flange meter: PN25
Flow sensor cable	2.5 m

2.4 Materials

Wetted parts	Meter housing, coupling	DZR brass (Dezincification brass CW511L)
	Meter housing, flange	Stainless steel W.no. 1.4408
	Transducer	Stainless steel W.no. 1.4401
	Gaskets	EPDM
	Measuring tube	Thermoplastic, PES 30% GF
	Reflectors/mirrors	Stainless steel 1.4305, 1.4306, 1.4401
Signal house	Base	Thermoplastic, PBT 30% GF
	Cover	Thermoplastic, PC 20% GF
	Wall bracket	Thermoplastic, PC 20% GF
Calculator house	Top	Thermoplastic, PC
	Base	Thermoplastic, ABS with TPE gaskets (thermoplastic elastomer)
	Internal cover	Thermoplastic, ABS
Flow sensor cable	Copper cable with silicone jacket and inner Teflon insulation	

2.5 Accuracy

MPE according to OIML R49   MPE (maximum permissible error range)

Meter approved: 0.1...30°C °C   ± 5 % in range $Q_1 \leq Q < Q_2$, ± 2 % in range $Q_2 \leq Q \leq Q_4$

                    30...90°C °C   ± 5 % in range $Q_1 \leq Q < Q_2$, ± 3 % in range $Q_2 \leq Q \leq Q_4$

Q_1: Minimum flow velocity
Q_2: Transition flow velocity
Q_3: Permanent flow velocity
Q_4: Overload flow velocity
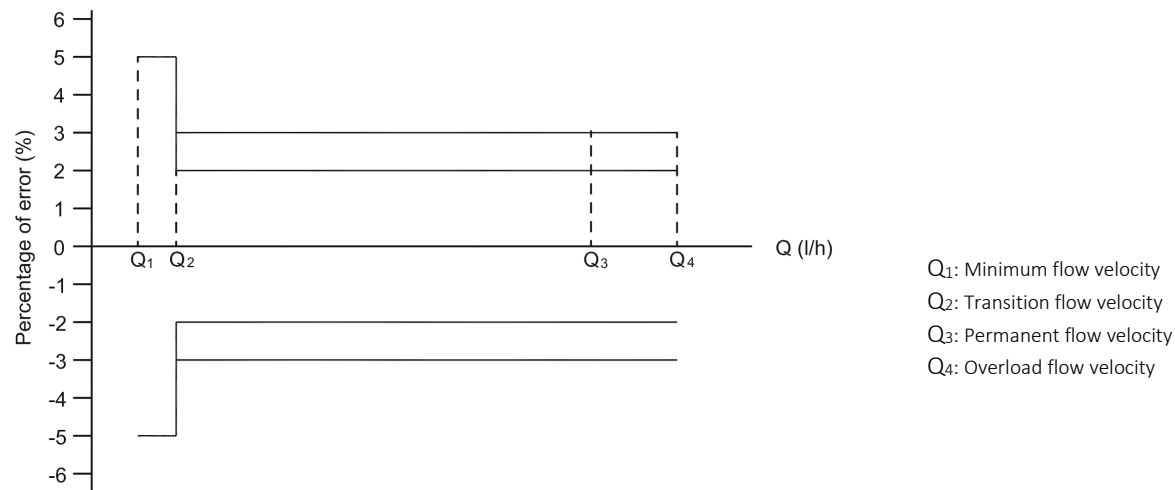
Diagram 1

OIML R49 requirements to water meters

3 Type Overview

3.1 Type number, calculator

MULTICAL® 62	62 -	Z	□	□□	□	00	□	□	□□

Top module

No module	0
Data output + hourly data logger	5
M-Bus	7
RTC + 2 pulse outputs for CE and CV + prog. data logger	B
2 Pulse outputs CE and CV	C

Base module

No module	00
Data + pulse inputs	10
M-Bus + pulse inputs	20
RadioRouter + pulse inputs	21
Prog. data logger + RTC + 4…20 mA inputs + pulse inputs	22
0/4…20 mA outputs	23
LonWorks + pulse inputs	24
Radio + pulse inputs (internal antenna) 434 or 444 MHz	25
Radio + pulse inputs (external antenna connection) 434 or 444 MHz	26
M-Bus module with medium data package + pulse inputs	28
M-Bus module with MC-III data package + pulse inputs	29
Wireless M-Bus Mode C1 + pulse inputs	30
Wireless M-Bus, Mode T1 OMS 15 min. (ind. key)	31
Wireless M-Bus, Mode C1 Fixed Network (ind. key)	38
ZigBee 2.4 GHz int.ant. + pulse inputs	60
Metasys N2 (RS485) + pulse inputs	62
SIOX module (Auto detect Baud rate)	64
BACnet MS/TP + pulse input	66
Modbus RTU + puls inputs	67
GSM/GPRS module (GSM6H)	80
3G GSM/GPRS module (GSM8H)	81
Ethernet/IP module (IP201)	82
High Power Radio Router + 2 pulse inputs	84

Require High Power supply modules (applies to 80, 81, 82, 84)

Supply

No supply	0
Battery, D-cell	2
230 VAC high power isolated SMPS	3
24 VAC high power isolated SMPS	4
230 VAC isolated linear supply	7
24 VAC isolated linear supply	8

Flow sensor

Supplied with one ULTRAFLOW® 24	1

Meter type

Hot water meter	7
Cold water meter	8

Country code (language on label etc.) XX

3.2 Type number, flow part

ULTRAFLOW® 24		Nom. flow Q_3	Max flow Q_4	Min. flow Q_1	Min. cut off	Pressure loss $\Delta p @ Q_3$	Connection on meter	Length	Anti-pollution check valve[1]	Strainer[1]
Type number		[m³/h]	[m³/h]	[l/h]	[l/h]	[bar]		[mm]		
65-2	-CDAA -XXX	1.6	2.0	16	3	0.25	G¾B (R½)	110	-	-
65-2	-CDAC[2] -XXX	1.6	2.0	16	3	0.25	G¾B (R½)	165	OK	OK
65-2	-CDA1 -XXX	1.6	2.0	16	3	0.25	G1B (R3/4)	110	-	-
65-2	-CDAF -XXX	1.6	2.0	16	3	0.25	G1B (R3/4)	190	OK	OK
65-2	-CEAF -XXX	2.5	3.1	25	6	0.04	G1B (R3/4)	190	OK	OK
65-2	-CGAG -XXX	4.0	5.0	40	7	0.09	G5/4B (R1)	260	OK	OK
65-2	-CHAG -XXX	6.3	7.9	63	12	0.22	G5/4B (R1)	260	OK	OK
65-2	-CJAJ -XXX	10	12.5	100	20	0.06	G2B (R1½)	300	OK	OK
65-2	-CKCE -XXX	16	20	160	30	0.16	DN 50	270	-	-
65-2	-CLCG -XXX	25	31.3	250	50	0.06	DN 65	300	-	-
65-2	-CMCH -XXX	40	50	400	80	0.05	DN 80	300	-	-

Table 1

[1] *Anti-pollution check valve and strainer are only valid options for cold water meters, max 50°C.*

[2] *MULTICAL® 62 with flow sensor type 65-2-CDAC (G¾B x 165) is only available as cold water meter.*

The type number of the flow part cannot be changed after factory programming

The Country Code is also used for:

- Language choise and approvals on type label
- Marking of PN class

Customer labels (2001-XXX) are integrated in the front label.

3.3 Accessories

3.3.1   Accessories list

1606-064	D-cell battery
60200004000000	24 VAC High Power isolated SMPS
60200003000000	230 VAC High Power isolated SMPS
60200008000000	24 VAC isolated linear supply
60200007000000	230 VAC isolated linear supply
66-99-098	Data cable w/USB plug
66-99-099	Infrared optical reading head w/USB plug
66-99-102	Infrared optical reading head w/D-sub 9F
66-99-106	Data cable RS 232, D-sub 9F
66-99-397/-398/-399	Verification unit to the display unit (used with METERTOOL)
679xxxxxx2xx	External Communication Box
6699-724	METERTOOL for HCW
6699-725	LogView for HCW

Please contact Kamstrup A/S for questions concerning more accessories.

3.3.2 Couplings incl. gaskets

6561-326   Coupling incl. gasket for DN15, (R½ x G¾)   (2 pcs.)

6561-327   Coupling incl. gasket for DN20, (R¾ x G1),   (2 pcs.)

6561-328   Coupling incl. gasket for DN25, (R1 x G5/4) (1 pcs.)

6561-329   Coupling incl. gasket for DN40, (R1½ x G2) (1 pcs.)

3.3.3 Gaskets (AFM 34 for hot and cold water)

Gasket for coupling		Gasket for flange	
3130-251	G¾ (R½) (2 pcs.)	3130-131	DN50 (2 pcs.)
3130-252	G1 (R¾) (2 pcs.)	2210-141	DN65 (1 pcs.)
3130-253	G1¼ (R1) (2 pcs.)	2210-140	DN80 (1 pcs.)
3130-254	G2 (R1½) (2 pcs.)		

3.3.4 Strainer for flow sensor inlet [1]

6556-513   Strainer DN15 for G¾B (R½), (1 pcs.), not for 110 mm housing

6556-514   Strainer DN20 for G1B (R¾), (1 pcs.)

6556-509   Strainer DN25 for G1¼B (R1), (1 pcs.)

6556-510   Strainer DN40 for G2B (R1½), (1 pcs.)

3.3.5 Anti-pollution check valve (EN 13959) for flow sensor return, incl. PE gasket [1]

6556-480   Anti-pollution check valve DN15 for G¾B, incl. strainer and two PE gaskets
              – not for 110 mm housing

6556-481   Anti-pollution check valve DN20 for G1B, incl. strainer and two PE gaskets

6556-482   Anti-pollution check valve DN25 for G1¼B, incl. PE gasket

6556-483   Anti-pollution check valve DN40 for G2B, incl. PE gasket

3.3.6 PE gasket for strainer and anti-pollution check valve [1]

6556-494   DN15   (10 pcs.)
6556-495   DN20   (10 pcs.)
6556-496   DN25   (10 pcs.)
6556-497   DN40   (10 pcs.)

3.3.7 Pulse Transmitter (Cable extension set)

6699-618.0   Pulse Transmitter, without cable
6699-618.2   Pulse Transmitter, incl. 10 m cable

[1] *Anti-pollution check valves, strainers and PE- gaskets are only valid options for cold water meters.*

(PE = Polyethylene)

4   Programming

MULTICAL® 62 can be ordered in countless combinations as required by the customer. First, select the required hardware from the type overview. Then, select 'Prog', 'Config' and 'Data' to suit the application in question.

The 'Prog' and 'Config' codes are printed on the front label and can be read out via the display or via METERTOOL. It is only possible to read out 'Data' via METERTOOL.

The supplied meter is configured from the factory and ready for use, but can also be changed/reconfigured after installation. However, this does not apply to type number and 'prog' (CCC-code), which cannot be changed unless the verification seal is broken. This requires that changes must be made by an accredited meter laboratory.

4.1 PROG (A-B-CCC-CCC)

The meter's legal parameters are determined by the 'Prog', which cannot be changed without breaking the verification seal. This means that the change must be made by an accredited meter laboratory.

Prog. number		A	-	B	-	CCC	-	CCC
		3		☐		☐☐☐		☐☐☐
Flow meter position	Internal value							
Measuring units								
GJ				2				
MWh				4				Internal value
Flow sensor coding	(CCC-table)					CCC		CCC

4.1.1   >A< and >B<

The A- code is always 3. B can be selected as either 2 or 4.

4.1.2   >CCC< CONFIGURATION OF FLOW METER TYPE

The CCC-code states the calculator's adaption to a specific flow sensor type to the effect that calculating speed and display resolution are optimized for the selected flow sensor at the same time as type approval regulations as to minimum resolution and maximum register overflow are obeyed. The 'Internal value CCC-code' must be identical with the selected CCC-code.

4.1.3   Standard CCC-codes

CCC-table for MULTICAL® 62									
			Number of decimals in display						
CCC No.	Pre-counter	Flow factor	m³	l/h	m³/h	Pulse output CV [m³]	Imp./l	Q₃ [m³/h]	Type
419	1000	235926	2	0	-	0,01	100	1.6	65-2-CDxx-xxx
407	100	235926	3	0	-	0,001	100	1.6	65-2-CDxx-xxx
498	600	393210	2	0	-	0,01	60	2.5	65-2-CExx-xxx
451	5000	471852	1	0	-	0,1	50	4	65-2-CGxx-xxx
436	500	471852	2	0	-	0,01	50	4	65-2-CGxx-xxx
437	2500	943704	1	0	-	0,1	25	6.3	65-2-CHxx-xxx
438	250	943704	2	0	-	0,01	25	6.3	65-2-CHxx-xxx
478	1500	1572840	1	0	-	0,1	15	10	65-2-CJxx-xxx
483	150	1572840	2	0	-	0,01	15	10	65-2-CJxx-xxx
420	1000	2359260	1	0	-	0,1	10	16	65-2-CKxx-xxx
485	100	2359260	2	0	-	0,01	10	16	65-2-CKxx-xxx
479	600	3932100	1	0	-	0,1	6	25	65-2-CLxx-xxx
458	5000	471852	0	-	2	1	5	40	**65-2-CMxx-xxx**
486	500	471852	1	-	2	0,1	5	40	**65-2-CMxx-xxx**

Current flow indication (l/h or m³/h) is calculated on the basis of volume pulses/10 sec. (See paragraph 8.1)

4.2 CONFIG (DDD-EE-FF-GG-MN)

4.2.1 >DDD< CONFIGURATION OF DISPLAY

Display code 'DDD' indicates the active readings of each meter type.
'1' is the first primary reading, whereas e.g. '1A' is the first secondary reading.
The display automatically returns to reading '1' after 4 minutes.

				Date stamp	Volume Hot DDD=710	Volume Hot DDD=714	Volume Cold DDD=810	Volume Cold DDD=814
4.0	Volume V1				1	1	1	1
		4.1	*Yearly data*	●	*1A*	*1A*	*1A*	*1A*
		4.2	*Monthly data*	●	*1B*	*1B*	*1B*	*1B*
6.0	Hour counter				2	2	2	2
		6.1	*Error hour counter (N° 60)*		*2A*	*2A*	*2A*	*2A*
12.0	Flow (V1)				3	3	3	3
		12.1	*This year's max.*	●	*3A*	*3A*	*3A*	*3A*
		12.2	*Max. yearly data*	●				
		12.3	*This year's min.*	●				
		12.4	*Min. yearly data*	●				
		12.5	*This month's max.*	●				
		12.6	*Max. monthly data*	●	*3B*	*3B*	*3B*	*3B*
		12.7	*This month's min.*	●				
		12.8	*Min. monthly data*	●	*3C*	*3C*	*3C*	*3C*
13.0	Flow (V2)		*Can not be connected*		4		4	
15.0	VA (Input A)				5		5	
		15.1	*Meter No. VA*		*5A*		*5A*	
		15.2	*Yearly data*	●	*5B*		*5B*	
		15.3	*Monthly data*	●	*5C*		*5C*	
		15.4	*L/Imp for VA (N° 65)*		*5D*		*5D*	
16.0	VB (Input B)				6		6	
		16.1	*Meter No. VB*		*6A*		*6A*	
		16.2	*Yearly data*	●	*6B*		*6B*	
		16.3	*Monthly data*	●	*6C*		*6C*	
		16.4	*L/Imp for VA (N° 67)*		*6D*		*6D*	
19.0	Info Code				7	4	7	4
		19.1	*Info event counter*		*7A*	*4A*	*7A*	*4A*
		19.2	*Info logger (36 latest events)*	●	*7B*	*4B*	*7B*	*4B*
20.0	Customer number (N° 1+2)				8	5	8	5
		20.1	*Date*		*8A*	*5A*	*8A*	*5A*
		20.2	*Hour*		*8B*	*5B*	*8B*	*5B*
		20.3	*Target date*		*8C*	*5C*	*8C*	*5C*
		20.4	*Serial no. (N° 3)*		*8D*	*5D*	*8D*	*5D*
		20.5	*Prog. (A-B-CCC-CCC) (N° 4)*		*8E*	*5E*	*8E*	*5E*
		20.6	*Config 1 (DDD-EE) (N° 5)*		*8F*	*5F*	*8F*	*5F*
		20.7	*Config 2 (FF-GG-M-N) (N° 6)*		*8G*	*5G*	*8G*	*5G*
		20.8	*Software edition (N° 10)*		*8H*	*5H*	*8H*	*5H*
		20.9	*Software check sum (N° 11)*		*8I*	*5I*	*8I*	*5I*
		20.10	*Segment test*		*8J*	*5J*	*8J*	*5J*
		20.11	*Top module type (N° 20)*		*8K*	*5K*	*8K*	*5K*
		20.12	*Top module primary adr. (N° 21)*		*8L*	*5L*	*8L*	*5L*
		20.13	*Top module second. adr. (N° 22)*		*8M*	*5M*	*8M*	*5M*
		20.14	*Base module type (N° 30)*		*8N*	*5N*	*8N*	*5N*
		20.15	*Base module primary adr. (N° 31)*		*8O*	*5O*	*8O*	*5O*
		20.16	*Base module second. adr. (N° 32)*		*8P*	*5P*	*8P*	*5P*

DDD = 714 is the 'standard code' for hot water meter type 62-Z-xxxx0017xx, whereas DDD = 814 is the 'standard code' for cold water meter type 62-Z-xxxx0018xx. Contact Kamstrup for other combinations. A data reading can include up to 36 pieces of monthly data and up to 15 pieces of yearly data; the number is determined by the DDD-code.

See paragraph 8.3.2 for more info on display structure.

Display example
showing PROG number

A complete survey of existing display codes (DDD) appears from a separate document.
Please contact Kamstrup A/S for further details.

4.3 Real Time Clock (RTC)

MULTICAL® 62 has built-in real time clock and battery backup. This is valuable for applications where correct date/time in data loggers as well as time-controlled tariffs are important. The battery will ensure the RTC function for at least 3 years without power during the entire lifetime of MULTICAL® 62. This small battery will only back-up the RTC, meaning that the display will go blank, when the main supply or main battery is off.

If a top module with RTC is mounted, the top module's RTC will not have any effect on the meter's own RTC.

4.3.1   >EE< Configuration

The EE-code is not used for MULTICAL® 62 in connection with ULTRAFLOW® 24 and is always '00'

4.3.2   >FF< Input A (VA), pulse division   >GG< Input B (VB), pulse division

MULTICAL® 62 has two extra optional pulse inputs, VA and VB, which are placed on the base modules (see paragraph 9.8 for further details). The inputs can be configured via the FF and GG codes as shown in the table below. In the absence of other information from the customer the inputs will be configured as FF=24 and GG=24.

Input A Terminal 65-66		Input B Terminal 67-68		Precounter	Wh/imp.	I/imp.	Measuring unit and decimal position	
FF	Max. input f ≤1Hz	GG	Max. input f ≤1 Hz					
01	100 m³ h	01	100 m³ h	1	-	100	vol A/vol B (m³)	000000.0
02	50 m³ h	02	50 m³ h	2	-	50	vol A/vol B (m³)	000000.0
03	25 m³ h	03	25 m³ h	4	-	25	vol A/vol B (m³)	000000.0
04	10 m³ h	04	10 m³ h	10	-	10	vol A/vol B (m³)	000000.0
05	5 m³ h	05	5 m³ h	20	-	5.0	vol A/vol B (m³)	000000.0
06	2.5 m³ h	06	2.5 m³ h	40	-	2.5	vol A/vol B (m³)	000000.0
07	1 m³ h	07	1 m³ h	100	-	1.0	vol A/vol B (m³)	000000.0
24	10 m³ h	24	10 m³ h	1	-	10	vol A/vol B (m³)	00000.00
25	5 m³ h	25	5 m³ h	2	-	5.0	vol A/vol B (m³)	00000.00
26	2.5 m³ h	26	2.5 m³ h	4	-	2.5	vol A/vol B (m³)	00000.00
27	1 m³ h	27	1 m³ h	10	-	1.0	vol A/vol B (m³)	00000.00
40	1,000 m³ h	40	1,000 m³ h	1	-	1000	vol A/vol B (m³)	0000000

Pulse outputs without bounce damping (for meters with electronic pulse output):

FF	Max. input	GG	Max. input	Precounter	Wh/imp.	I/imp.	Measuring unit and decimal position	
71	100 m³/h	71	100 m³/h	1	-	100	vol A/vol b (m³)	000000,0
72	50 m³/h	72	50 m³/h	2	-	50	vol A/vol b (m³)	000000,0
73	25 m³/h	73	25 m³/h	4	-	25	vol A/vol b (m³)	000000,0
74	10 m³/h	74	10 m³/h	10	-	10	vol A/vol b (m³)	000000,0
75	5 m³/h	75	5 m³/h	20	-	5,0	vol A/vol b (m³)	000000,0
76	2,5 m³/h	76	2,5 m³/h	40	-	2,5	vol A/vol b (m³)	000000,0
77	1 m³/h	77	1 m³/h	100	-	1,0	vol A/vol b (m³)	000000,0
84	10 m³/h	84	10 m³/h	1	-	10	vol A/vol b (m³)	00000,00
85	5 m³/h	85	5 m³/h	2	-	5,0	vol A/vol b (m³)	00000,00
86	2,5 m³/h	86	2,5 m³/h	4	-	2,5	vol A/vol b (m³)	00000,00
87	1 m³/h	87	1 m³/h	10	-	1,0	vol A/vol b (m³)	00000,00
90	1000 m³/h	90	1000 m³/h	1	-	1000	vol A/vol b (m³)	0000000

FF	Max. Input f ≤3 Hz	GG	Max. Input f ≤3 Hz	Precounter	Wh/imp.	I/imp.	Measuring unit and decimal position	
50	2500 kW	50	2500 kW	1	1000	-	EL A/EL B (kWh)	0000000
51	150 kW	51	150 kW	60	16.67	-	EL A/EL B (kWh)	0000000
52	120 kW	52	120 kW	75	13.33	-	EL A/EL B (kWh)	0000000
53	75 kW	53	75 kW	120	8.333	-	EL A/EL B (kWh)	0000000
54	30 kW	54	30 kW	240	4.167	-	EL A/EL B (kWh)	0000000
55	25 kW	55	25 kW	340	2.941	-	EL A/EL B (kWh)	0000000
56	20 kW	56	20 kW	480	2.083	-	EL A/EL B (kWh)	0000000
57	15 kW	57	15 kW	600	1.667	-	EL A/EL B (kWh)	0000000
58	7.5 kW	58	7.5 kW	1000	1.000	-	EL A/EL B (kWh)	0000000
59	750 kW	59	750 kW	10	100	-	EL A/EL B (kWh)	0000000
60	1250 kW	60	1250 kW	2	500	-	EL A/EL B (kWh)	0000000
70	25000 kW	70	25000 kW	1	10000	-	EL A/EL B (MWh)	00000.00

MULTICAL® 62 has no pulse output possibility via the base modules, only via the top modules.
See paragraph 11.1

4.3.3   >MN< Configuration of leak limits

When MULTICAL® 62 is used for leak surveillance, the sensitivity is determined by the configuration of 'MN'. See paragraph 8.6

M=		N=	Leak surveillance (V1) Leakage sensitivity (at 0.01 m^3 resolution in display)
0	OFF	0	OFF
		1	20 l/h 30 minutes continuously - from the last reading
		2	**10 l/h** 60 minutes continuously - from the last reading *(default)*
		3	5 l/h 120 minutes continuously - from the last reading

Note:

M=0 and N=2 are default values when leak surveillance is used. Increased sensitivity, e.g. N=3, can only be achieved by means of METERTOOL.
Info codes for leakage (info code 64) are only active when M = 0 and N > 0 respectively.
NB: Input VA of MULTICAL® 62 cannot be used for leak surveillance.

4.4 >T< Configuration of encryption level

MULTICAL® 62 is only available with encryption of the data transmission.

Encryption level	
T=	
0	No encryption
1	*Reserved for future use*
2	*Reserved for future use*
3	Encryption with separately forwarded key (individual key) *(default)*
4	*Reserved for future use*

T=3
The meter can only be read if the reading system recognizes the individual meter's encryption key. The encryption key is forwarded to the customer and is 'matched' with the individual meter's serial number in the reading system.

If the encryption key is lost, the meter cannot be read. A new encryption key must be supplied by Kamstrup.

Only encrypted data via the base modules can be read by Wireless M-Bus.

4.5 DATA for configuration

	Automatic	To be stated when ordering	Default
Serial no. (S/N) as well as year	E.g. 65000000/2012	-	-
Customer No. Display No. 1 = 8 digits MSD Display No. 2 = 8 digits LSD	-	Up to 16 digits Limited to 11 digits depending on PcBase compatibility	Customer number = S/N
Target date	-	MM=1-12 and DD=1-28	Depends on delivery code
TL2	-	N/A	N/A
TL3	-	N/A	N/A
Average peak time max./min.	-	1…1440 min.	60 min.
Max. T1 for cooling metering	-	N/A	N/A
T2 prog.		N/A	N/A
T3 prog.		N/A	N/A
T4 prog.		N/A	N/A
Date/time	YYYY.MM.DD/hh.mm.ss GMT+offset acc. to delivery code	GMT ± 12.0 hours (in 30 min. steps)	-

- DELIVERY CODES

Information on delivery codes see no. 5514-594

- MAINTENANCE

See instruction no. 5508-807 concerning update of programming, configuration and delivery codes.

4.6   Set-up via the front keys

Via the main key ▶ and the sub-key 📁 on MULTICAL® 62, a number of settings can be selected.

4.6.1   Activate the setup-menu

The setup-menu is activated in the following way:

1) Select the display reading that you wish to change
2) Remove the calculator from the base
3) Wait until the display goes blank (up to 2.5 minutes). Meanwhile do not touch the front keys
4) While replacing the calculator on the base, press and hold the main key for approx. 8 seconds
5) The setup-menu is now active

Having activated the setup-menu, the register that you wish to change is now displayed with the rightmost digit flashing (in the below for example the 'Date' has been selected):

If the selected display register is not supported, by a 'front key selection setup', the meter will show the normal display, without activating the setup-menu.

4.6.2   Setup of a display register

When the setup-menu is activated, the actual value in the register selected will be displayed (in the below example the date 2011.07.14)

The value of the flashing digit can be increased by pressing the sub-key:
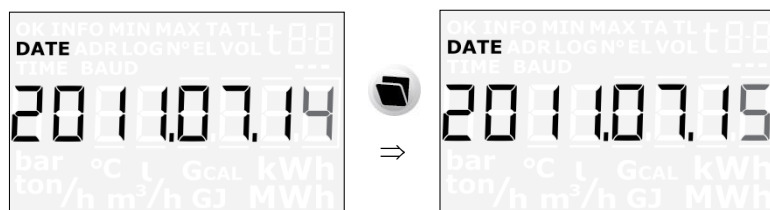
When pressing the main key, the next digit to the left will be flashing:

4.6.3 Exit setup-menu

When the display value has been changed, as required, hold the main key for 10 seconds, until the 'OK' segment is displayed. The display reverts to legal reading.

The new value is checked. If it is valid, the new value is saved. If it is invalid, the old value is kept and the 'OK' segment will not be displayed within approx. 3 seconds. The display reverts to legal reading.

If you wish to exit the setup-menu without saving the new value:

1) Remove the calculator from the base
2) Wait until the display goes blank (up to 2.5 minutes). Meanwhile do not touch the front keys
3) Replace the calculator on the base without pressing the front keys

Allow some seconds for the meter to boot-up without pressing the front keys. The normal display register is now shown and the setup menu is deactivated.

Note that if the front keys are not activated for 4 minutes in the setup-menu, the setup-menu will be deactivated and the meter will automatically return to normal operation.

No data will be stored in the meter's memory, unless the 'OK' segment is displayed.

4.6.4   Display registers supported by the setup-menu

The following registers are supported by the setup-menu:

● Date

● Clock

● Primary M-Bus address (for both top and base module if mounted)

● Preset of Input A

● Preset of Input B

● Meter No. for Input A

● Meter No. for input B

● Pulse value for Input A

● Pulse value for Input B

4.7 Reset via the front keys

Via the the main key ▶ and the sub-key 📁 on MULTICAL® 62, a number of reset functions can be made.

4.7.1   Activate the reset-menu

The reset-menu is activated in the following way:

1) Select the display reading that you wish to reset
2) Remove the calculator from the base
3) Wait until the display goes blank (up to 2.5 minutes). Meanwhile do not touch the front keys
4) While replacing the calculator on the base, press and hold the main key for approx. 8 seconds
5) The reset-menu has now been activated

Having activated the reset menu, either the operation hour counter, the infoevent-counter or the error hour counter will be displayed, depending on the register which was selected before activating the reset menu.

When the reset menu has been activated,'0' will be displayed. It is not possible to change to any other value. It is only possible to 'save' the value = 0 in order to reset the register, or to leave the reset menu without reset.

If a display register, which is not supported by the reset-menu, is selected, the meter will show the normal display without activating the reset menu.

4.7.2   Exit the reset menu

When the operation hour counter, the info-event counter or the error hour counter displayes '0', hold the main key for 5-6 seconds, until the 'OK' segment is displayed, and the display reverts to legal reading.

If you wish to exit the reset menu without resetting any registers, then:

1) Remove the calculator from the base
2) Wait until the display goes blank (up to 2.5 minutes). Meanwhile do not touch the front keys
3) Replace the calculator on the base without pressing the front keys

Allow some seconds for the meter to boot-up, without pressing the front keys. The normal display register is now displayed and the reset menu is deactivated.

Note! If the front keys are not activated for 4 minutes, in the 'Reset menu', the menu will be deactivated and the meter will automatically return to normal operation.

No data will be saved in the meter's memory, unless the 'OK' segment is shown.

4.7.3   Time-out

If no keys are activated for 4 min., the reset menu is deactivated and the display reverts to legal reading.
If the 'OK' is not displayed, no data will be saved.

4.7.4   Display Registers supported by the Reset menu

The following registers are supported by the reset menu:
• Operating hours counter
• Error hour meter
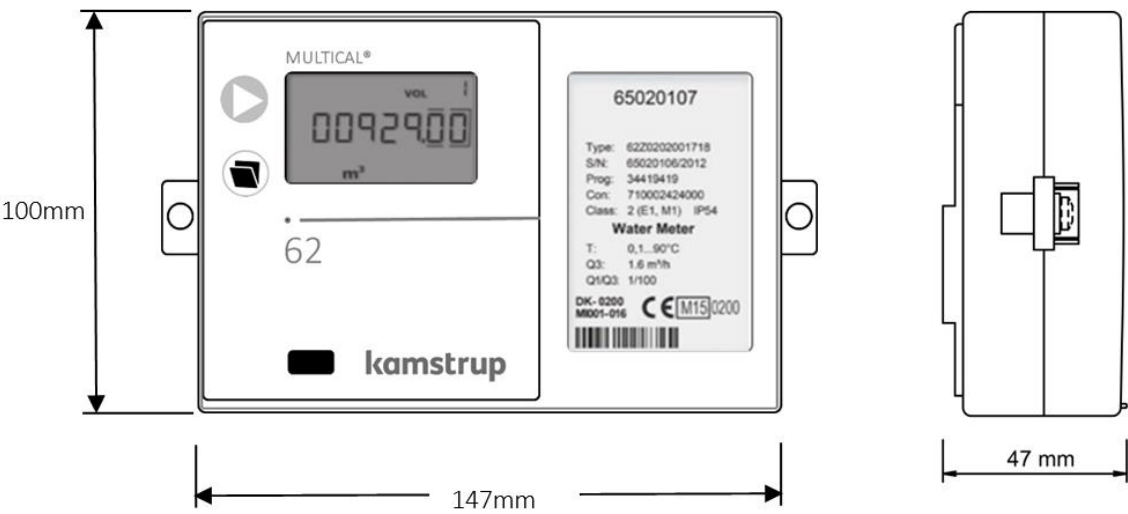• Info event counter

5   Dimensioned Sketches

MULTICAL® 62

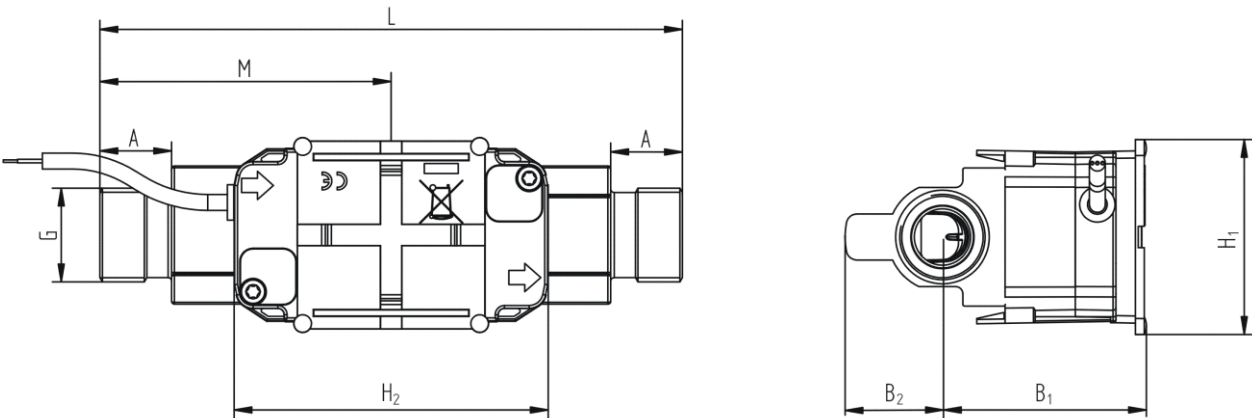

Figure 2   Physical measurements of the electronics unit

ULTRAFLOW® 24, G¾B and G1B

Figure 3   Flow sensor with G¾B and G1B threaded connection

Thread ISO 228-1

Q_3 [m³/h]	Thread	L [mm]	M [mm]	H_2 [mm]	A [mm]	B_1 [mm]	B_2 [mm]	H_1 [mm]	Approx. weight [kg]
1.6	G¾B	110	L/2	89	10.5	58	28	55	0.8
1.6	G¾B	165	L/2	89	20.5	58	28	55	1.2
1.6	G1B	110	L/2	89	10.5	58	28	55	0.9
1.6	G1B	190	L/2	89	20.5	58	28	55	1.4
2.5	G1B	190	L/2	89	20.5	58	29	55	1.3

Table 2   Total weight excl. packing

ULTRAFLOW® 24, G1¼B and G2B
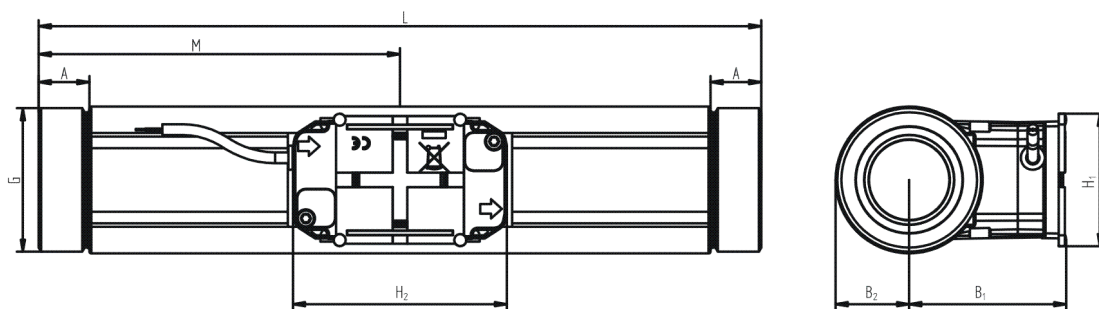
Figure 4   Flow sensor with G1¼B and G2B threaded connection

Thread ISO 228-1

Q_3 [m³/h]	Thread	L [mm]	M [mm]	H_2 [mm]	A [mm]	B_1 [mm]	B_2 [mm]	H_1 [mm]	Approx. weight [kg]
4.0 6.3	G1¼B	260	L/2	89	17	58	22	55	2.3
10	G2B	300	L/2	89	21	65	31	55	4.5

Table 3

ULTRAFLOW® 24, DN50
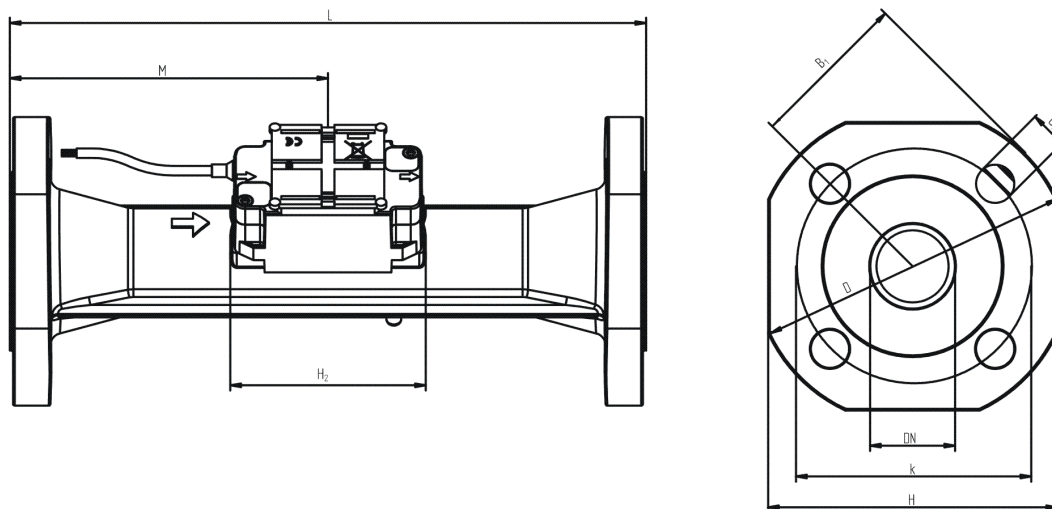
Figure 5   Flow sensor with DN50 flange connection

Flange EN 1092, PN25

Q_3 [m³/h]	Nom. diameter	L [mm]	M [mm]	H_2 [mm]	B_1 [mm]	D [mm]	H [mm]	k [mm]	Number [units]	Bolts Thread	d_2 [mm]	Approx. weight [kg]
16	DN50	270	155	89	65	165	145	125	4	M16	18	10.1

Table 4

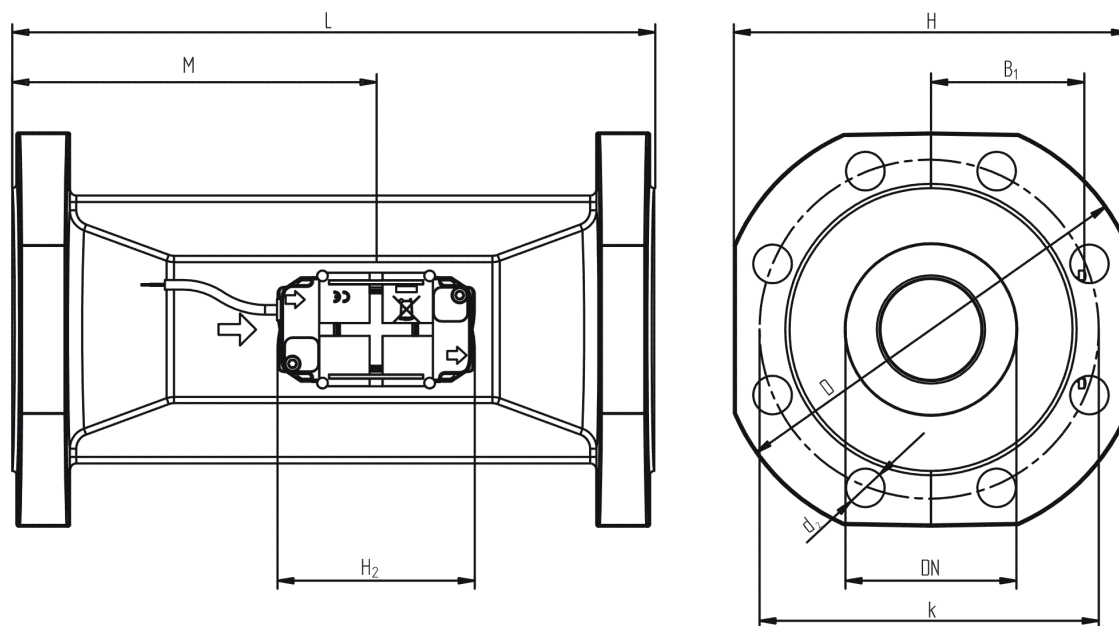## ULTRAFLOW® 24, DN65 and DN80

Figure 6   Flow sensor with DN65 and DN80 flange connection

Flange EN 1092, PN25

Q₃ [m³/h]	Nom. diameter	L [mm]	M [mm]	H₂ [mm]	B₁ [mm]	D [mm]	H [mm]	k [mm]	Number [units]	Bolts Thread	d₂ [mm]	Approx. weight [kg]
25	DN65	300	170	89	72	185	168	145	8	M16	18	13.2
40	DN80	300	170	89	80	200	184	160	8	M16	18	16.8

Table 5

6 Pressure Loss

According to OIML R49 the maximum pressure loss must not exceed 0.63 bar in range Q_1 up to and incl. Q_3 and max 1.0 bar at Q_4 respectively. The pressure loss is without anti-pollution check valve.

The pressure loss in a sensor increases with the square of the flow and can be stated as:

$$Q = kv \times \sqrt{\Delta p}$$

where:

Q   = volume flow rate [m³/h]

kv   = volume flow rate at 1 bar pressure loss [m³/h]

Δp   = pressure loss [bar]

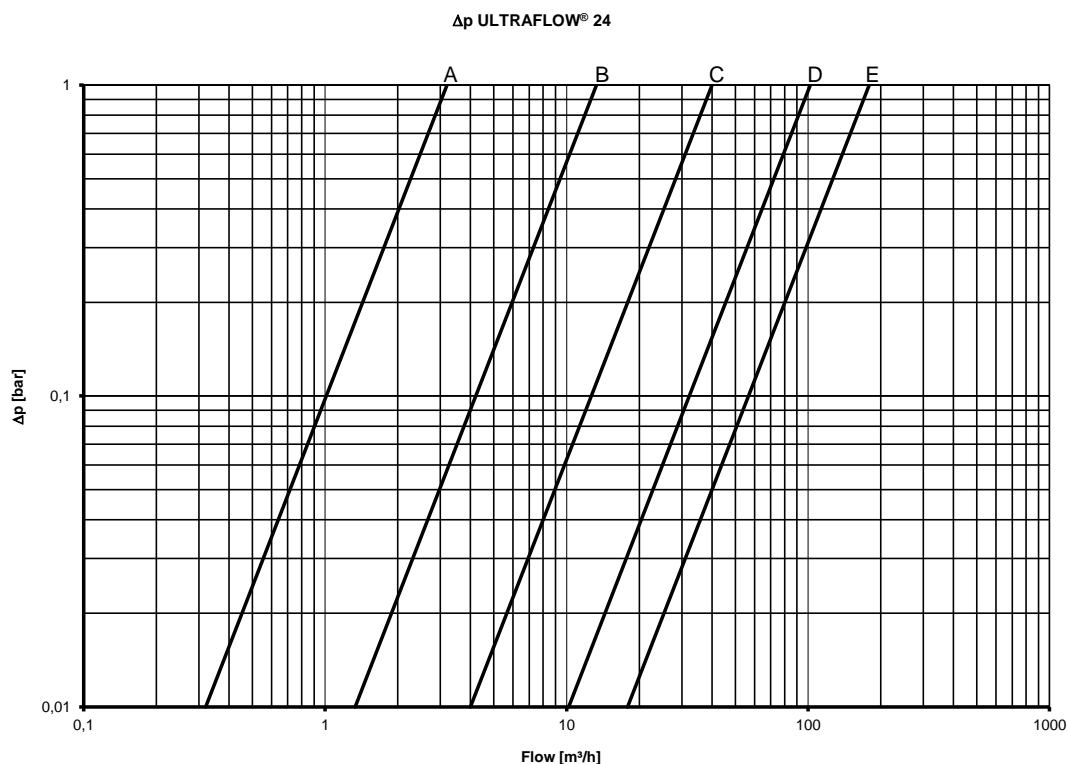| Graph	Q_3 [m³/h]	Nom. diameter [mm]	kv	Q @ 0.63 bar [m³/h]
A	1.6	DN15 & DN20	3.2	2.5
B	2.5 & 4 & 6.3	DN20 & DN25	13.4	10.6
C	10 & 16	DN40 & DN50	40	32
D	25	DN65	102	81
E	40	DN80	179	142

Table 6   Pressure loss table

Diagram 2   Pressure loss chart

7 Installation

7.1 Installation requirements

Prior to installing the flow sensor part, ULTRAFLOW® 24, the installation ought to be flushed while a fitting piece is replacing the meter. Remove adhesive wafers from the meter's inlet and outlet and mount the flow sensor with couplings. You must always use new gaskets in original quality.

The flow sensor part must be correctly placed according to the drawings overleaf. See paragraph 7.2

The flow direction is indicated by an arrow on each side of the flow part.

Mounting the flow part you must make sure that the threaded length of the couplings does not prevent proper tightening of the sealing surface and that PN10 or couplings/gaskets are used (PN16 couplings/gaskets can be used).

Using strainer and/or anti-pollution check valve (only to be used in cold water meters) the enclosed thicker PE gaskets must be used to avoid damaging strainer or anti-pollution check valve.

When mounting the sensor's connection cables, please make sure that condensation water cannot penetrate the sensor.

Permissible operating conditions

Ambient temperature: 5…55°C non-condensing, closed location (installation indoors)

Temperature of medium: 0.1…50°C   Cold water meter

0.1…90°C   Hot water meter

System pressure: 1.5…16 bar (See paragraph 7.5)

EMC conditions

MULTICAL® 62 has been designed for installation in housing and in light industrial environments. The meter is CE-marked, on the basis of OIML R49 type test class E1 and the Low Voltage Directive.

The meter's control cables must be routed at min. 25 cm distance from other installations.

Electrical installations

MULTICAL® 62 is available for both 24 VAC and 230 VAC mains supply. The mains connection consists of a two-wire cable without safety ground.

Use a strong connection cable with an outer diameter of max. 7 mm and ensure correct cable relief for the meter.

National regulations for electric installations must be observed, including e.g. the cable cross section used in relation to the installation's fuse size (short circuit current). Max fuse 6 A.

Installation in Denmark is subject to an SIK announcement 27/09 from The Danish Safety Technology Authority concerning 'Installations for mains supplied equipment for consumption registration' (See paragraph 10.11) for both direct 230 VAC supplied meters and 24 VAC meters which are powered via a safety transformer.

Service

When the meter has been mounted in the system neither welding nor freezing is allowed. Dismount the meter from the system and switch off the mains supply to the meter, if any, before starting the work.

In order to facilitate replacement of the meter, shut-off valves ought to be mounted on both sides of the meter.
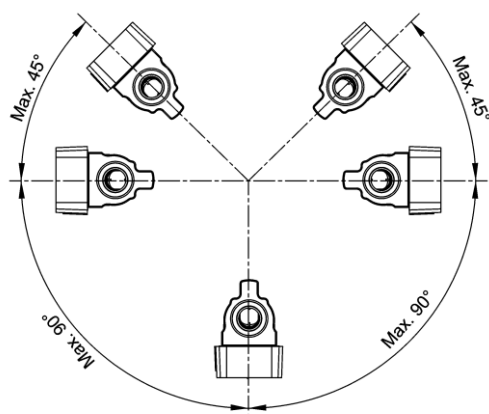
Under normal operating conditions, no pipe strainer is required in front of the meter.

7.2 Installation angle for ULTRAFLOW® 24
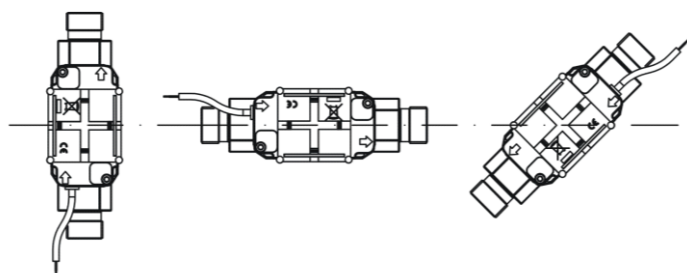
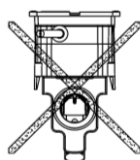ULTRAFLOW® 24 can be mounted vertically, horizontally or at an angle.

Figure 7

Important!

ULTRAFLOW® 24 may be turned upwards to max 45°, and downwards to max 90° – in relation to the pipe axis.

Figure 8

The plastic housing must **not** face upwards, since the meter then may be affected by air build-up.

Figure 9

7.3 Straight inlet

ULTRAFLOW® requires neither straight inlet nor outlet to meet the Measuring Instruments Directive (MID) 2004/22/EC and OIML R49. Only in case of heavy flow disturbances, before the meter, a straight inlet section is necessary.

7.4 Installation example

The calculator can be mounted on top of the flow sensor's plastic housing; it must then be oriented as shown in Figure 10.
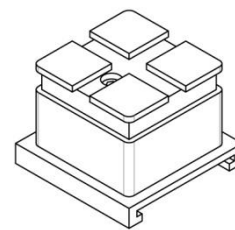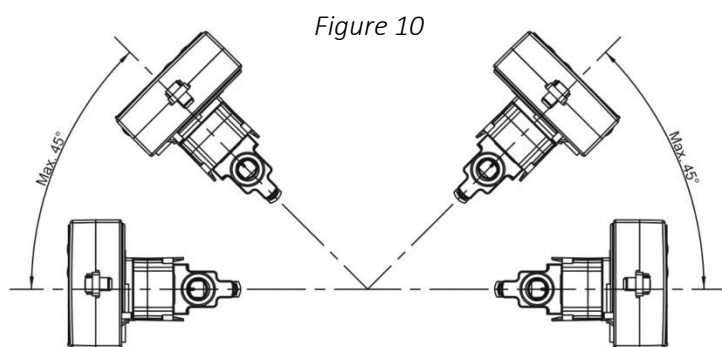

Figure 10

Figure 11

If there is a risk of high humidity or low water temperature, in the flow sensor part, then the socket extender (65-61-332) should be used, as shown in figure 11.

If the flow sensor part is mounted with plastic housing facing down, the calculator must be wall mounted, as shown in Figure 12. Alternatively, the calculator can be mounted on the flow part with an angle fitting, as shown in Figure 13.
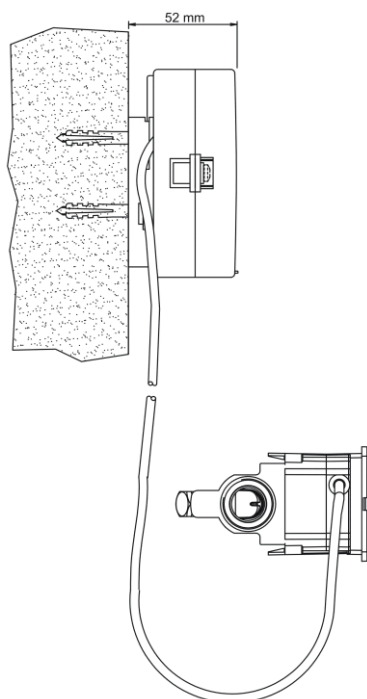

Figure 12
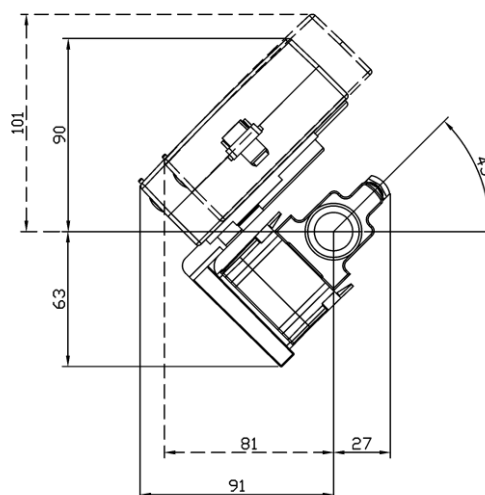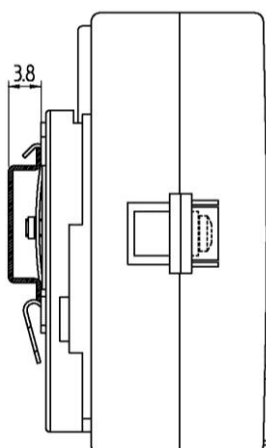
MULTICAL® 62 mounted on a wall

Figure 13

MULTICAL® 62 mounted on ULTRAFLOW® 24, by means of angle fitting 3026-252

MULTICAL® 62 can also be mounted on a DIN rail using a DIN rail bracket 5915-145.

Panel-mounted MULTICAL® 62
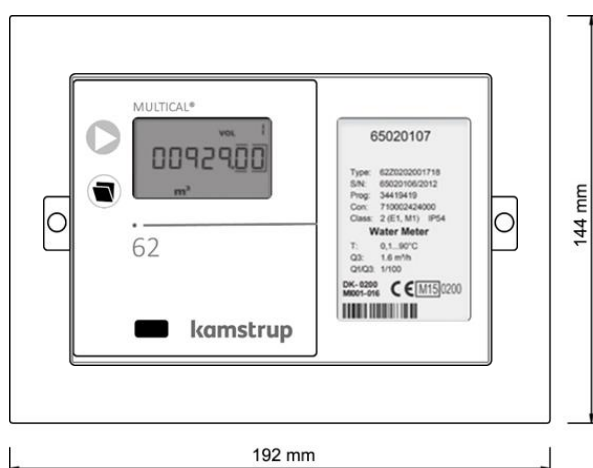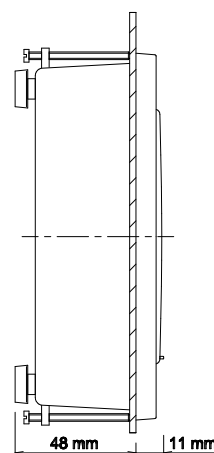
− seen from the front   − seen from the side

7.5 Operating pressure

In order to prevent cavitation the operating pressure at ULTRAFLOW® 24 must be

min. 1.6 bar at Q_3 and

min. 2.5 bar at Q_4.

ULTRAFLOW® 24 must not be subjected to pressure lower than the ambient pressure (vacuum).

7.6 Mounting of Pulse Transmitter 66-99-618

See installation instructions 5512-587 DK-GB-DE

8 The Calculator

8.1 Flow measurement and calculation

MULTICAL® 62 calculates the current water flow of quick volume pulses, without average determination, as the number of volume pulses per 10 sec. multiplied by the scaling factor.

$Q = (Imp./10 s. \times flow\ factor)/65535$ $[l/h]$ or $[m^3/h]$

Example:

$Q_3 = 1.6\ m^3/h$ with 100 imp./l (CCC=419), flow factor = 235926

Current water flow = 317 l/h, corresponding to 88 Imp./10 s.

$q = (88 \times 235926)/65535 = 316.8$ which is displayed as 316 $[l/h]$
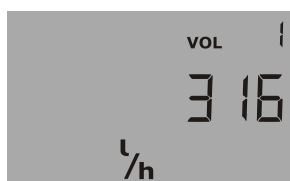
Current water flow of V1

8.2 Min. and max flow, V1

MULTICAL® 62 can register both minimum and maximum flow on monthly as well as yearly basis. The complete registration can be read via data communication. Furthermore, a few monthly and yearly registers can be read from the display, depending on the selected DDD-code.

The min. and max registration includes the following flow values, with indication of date:

Type of registration	Max data	Min. data	Yearly data	Monthly data
Max this year (since latest target date)	●		●	
Max yearly data, up to latest 15 years	●		●	
Min. this year (since latest target date)		●	●	
Min. yearly data, up to latest 15 years		●	●	
Max this month (since latest target date)	●			●
Max monthly data, up to latest 36 months	●			●
Min. this month (since latest target date)		●		●
Min. monthly data, up to latest 36 months		●		●

All max and min. values are calculated as highest and lowest average respectively of a number of current flow measurements. The average period used for all calculations can be selected in the interval 1...1440 min. in 1 min. leaps. (1,440 min. = 24 hours).

The average period and target date must be stated in the order, or be reconfigured by means of METERTOOL. If no information is given with the order, the average period will be set to 60 min. and the target date will be set to the standard value, applying to the delivery code used.

By the end of a year or a month, the max and min. values are saved in the data logger and the current max. and min. registers are 'reset' according to the selected target date and the meter's internal clock and calendar.

'Reset' is made by setting the max. value to zero and the min. value to a high value.

(e.g. 100000 l/h at CCC=419)

Date of max flow this year
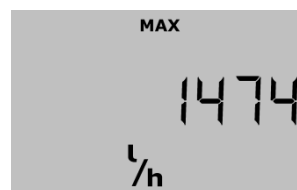
Value of max flow this year

8.3 Display functions

MULTICAL® 62 is fitted with an easily readable LCD-display including 8 digits, measuring units and information field. Volume readings use 7 digits and the corresponding measuring units, whereas 8 digits are used for display of e.g. meter number.

Basically, the accumulated volume is displayed. Activating the pushbuttons, the display reacts at once by calling up other readings. The display automatically returns to volume reading four minutes after the latest activation of the pushbuttons.
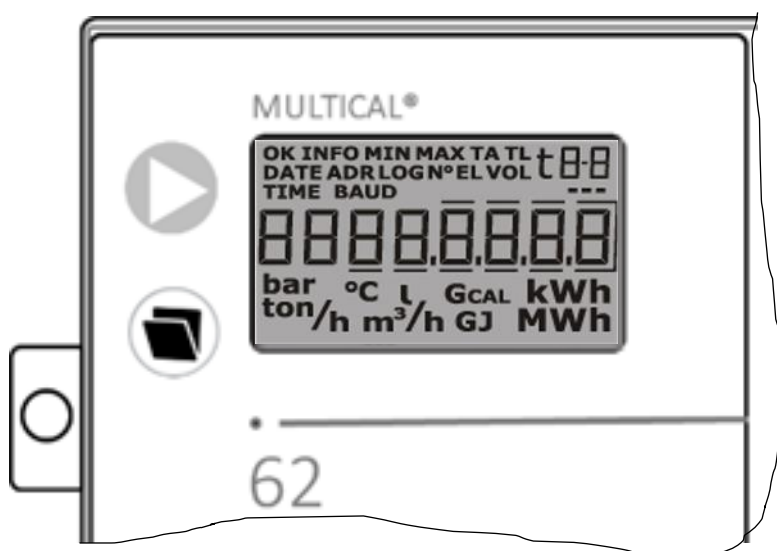
8.3.1   Primary and secondary readings

The top pushbutton is used to change between readings of the primary register. Consumers normally use the first primary reading in connection with self-reading for billing purposes.

The lower pushbutton is used to display readings of the secondary register, with additional information on the selected primary reading.

Example: If the selected primary reading is 'Volume', the secondary readings will be yearly and monthly data for volume.
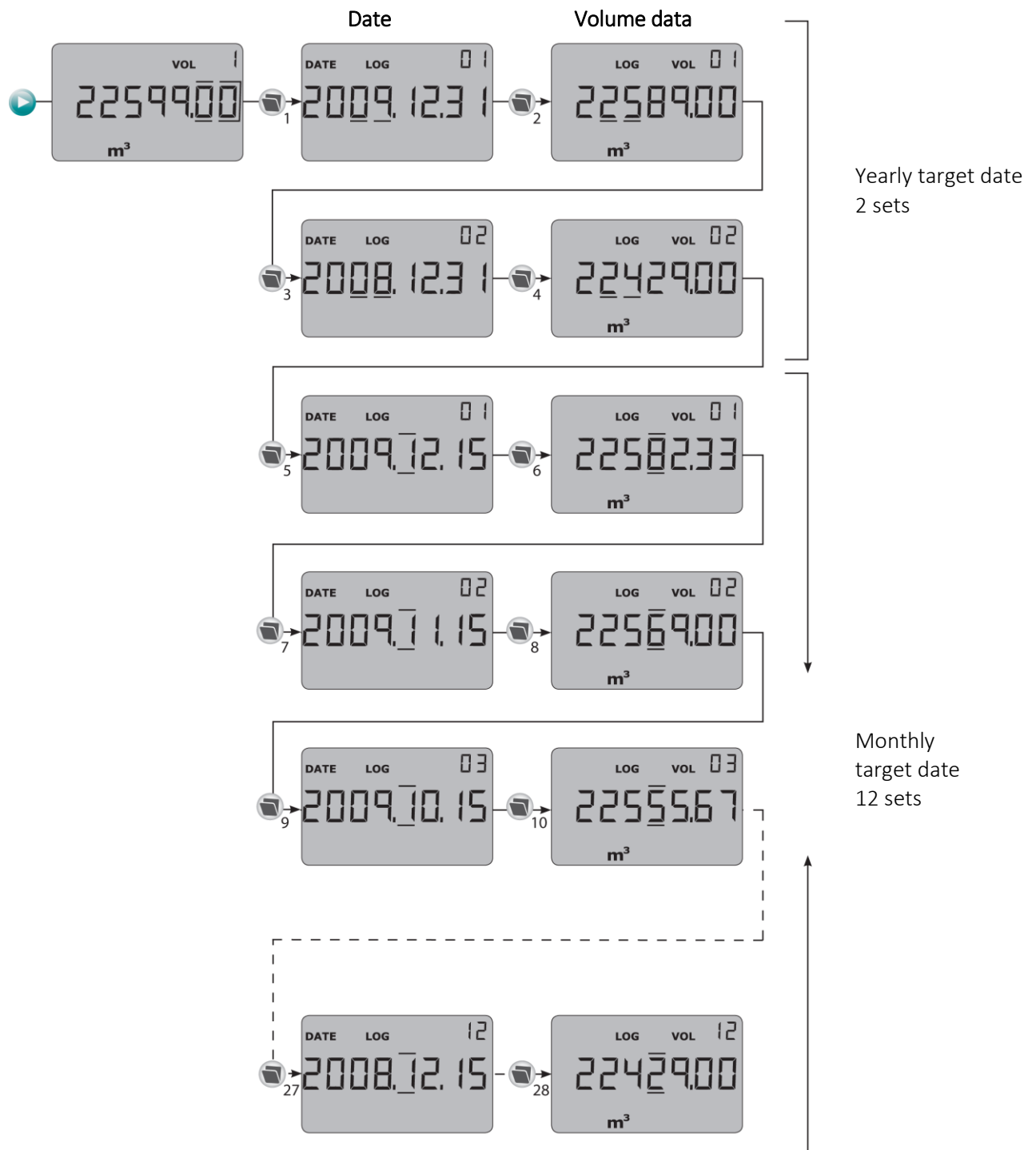
Figure 15

8.3.2   Display structure

The below-mentioned diagram shows the display structure of DDD=814 with 5 primary readings and a number of secondary readings under most primary readings. The number of secondary readings in connection with yearly and monthly data has been determined under the DDD-code. If not specified when ordering the water meter, secondary readings will consist of 2 yearly data sets and 12 monthly data sets. The target date will be the standard date applying to the delivery code used.

The contents of both main and submenus (primary and secondary registers) are determined by the selected configuration of the meter (see paragraph 4.2.1 *Configuration of display*). The MULTICAL® 62 display includes both a main menu and a submenu. The main menu includes accumulated volume, flow readings, operating hour counter and info codes (error codes).

Figure 16

8.4 Information Codes 'Info'

MULTICAL® 62 constantly monitors a number of important functions. If there is a serious error in the measuring system or installation, a flashing 'info' will appear in the display. The 'Info' field will flash as long as the error exists, no matter which reading you choose. The 'Info' field automatically disappears when the reason for the error has been removed.

When the first permanent information code appears it is saved in the EEPROM, after a response time, together with the date and the volume registers, at the time the error occurred.
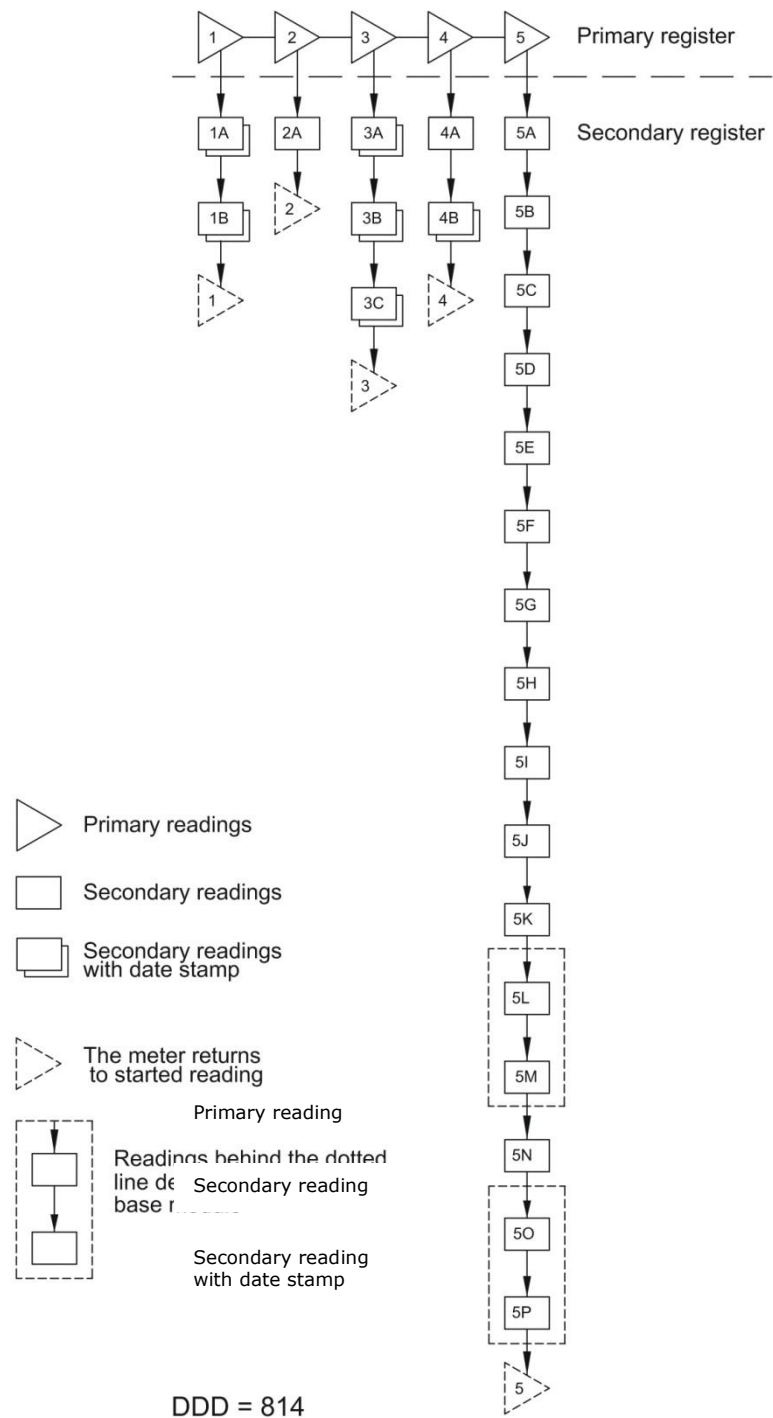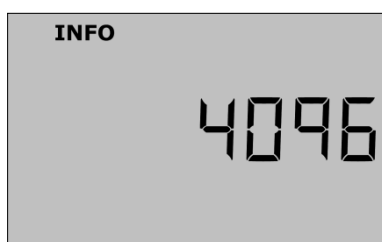
Furthermore, the info code is saved in the hourly logger (if a top module with hourly logger is mounted), the daily logger, the monthly logger and the yearly logger for diagnosis purposes.

```
INFO

      4096
```

8.4.1   Info code types

info	Description	Response time
0	No irregularities	-
1	Supply voltage has been interrupted	-
16	Flow meter V1, communication error	After 24 hours (at 00:00)
64	Leak in water installation	24 hours
2048	Flow meter V1, wrong pulse figure	After 24 hours (at 00:00)
4096	Flow meter V1, signal too weak (air)	
16384	Flow meter V1, wrong flow direction	

If several info codes appear at a time, the sum of the info codes is displayed.
Example: E2064 = E16 + E2048.

Info code 1 will be logged when mains/main battery is disconnected, and info code 1 will be deleted when mains/main battery is connected. This may be read from the data logger, how long the meter has been without power.

Important: Forced info code update for ULTRAFLOW® X4 info codes

In certain cases, e.g. after installation of a meter, a shorter response time may be required for the ULTRAFLOW® X4 info codes than stated in the table above. CCC=4xx will always be = 4XX.

In order to perform a forced info code update, press the main key until the info code panel shows up in the display. After 10-20 seconds, the meter will update the display with the current info code. The display is then updated every ten seconds until the display returns to the main reading (volume) after about 4 minutes. This procedure can not be repeated more than 25 times per day.

8.4.2   Transport mode

When the meter leaves the factory it is in 'transport mode', i.e. the info codes are active in the display only, not in the data logger. This prevents logging of 'info event' from counting during transportation and non-relevant data from appearing in the info logger. When the meter has accumulated the volume register, first time after installation, the info code automatically becomes 'active'.

8.4.3   Info event counter
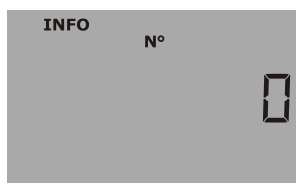
Info event counter.

Counting takes place every time the info code is changed

The info event counter will be 0 on receipt, as 'transport mode' prevents counting during transport.

Info code	'INFO' on display	Registration in the info, daily, monthly or yearly logger	Counting Info-event
1	No	Yes	At each 'Power-On-Reset'
64	Yes	Yes	When info is set and when info is deleted. Max. 1 time/24 hours
16, 2048, 4096, 16384,	Yes	Yes	When info is set and when info is deleted. Max. 1 time/24 hours

8.4.4   Error hour counter

An 'error hour counter' is added. This will sum up the approx. number of hours with an info code > zero.
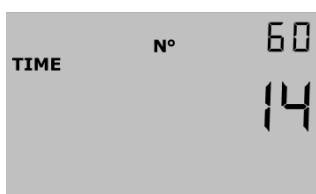
8.5 Data loggers

MULTICAL® 62 includes a permanent memory (EEPROM), in which the values of various data loggers are saved. The meter includes the following data loggers:

Data logging interval	Data logging depth	Logged value	Logger read-out	
Yearly logger	15 years	Counter registers	LogView/MT Pro	●
Monthly logger	36 months	Counter registers	LogView/MT Pro	●
Daily logger	460 days	Consumption (increase)/day	LogView/MT Pro	◆
Hourly logger	1392 hours	Consumption (increase)/hour	LogView/MT Pro	◆
Programmable data logger top module 67-0B and base module 67-00-22	1080 loggings Logging interval 1-1440 min. (e.g. 45 days' hour loggings or 11 days' 15 min. loggings)	30 registers and values	AMR[*] LogView/MT Pro	●
Info logger	50 events (36 events can be displayed)	Info code, date, time and volume[**]	LogView/MT Pro	

[*] Example of AMR (Automatic Meter Reading) for the data logger is GSM/GPRS.

[**] Only info code and date appear from the display.

The loggers are static and therefore the register types cannot be changed. Furthermore, the logging intervals are fixed. When the last 'record' has been written in the EEPROM, the oldest one is overwritten.

8.5.1   Yearly, monthly, daily and hourly loggers

The following registers are logged every year and every month, on target date as counter values. Furthermore, the day and hour increases are logged at midnight.

Register type	Description	Yearly logger	Monthly logger	Daily logger	Hourly logger	67-0B 67-00-22 Prog. logger
Date (YY.MM.DD)	Year, month and day of logging time	●	●	◆	◆	●
Clock (hh.mm.ss.)	Time	-	-	-	-	●
V1	Volume register for Volume 1	●	●	◆	◆	●
VA	Extra water or electricity meter connected to Input A	●	●	◆	◆	●
VB	Extra water or electricity meter connected to Input B	●	●	◆	◆	●
INFO	Information code	●	●	◆	◆	●
DATE FOR MAX FLOW V1	Date stamp for max. flow during period	●	●	-	-	-
MAX FLOW V1	Value of max. flow during period	●	●	-	-	-
DATE FOR MIN. FLOW V1	Date stamp for min. flow during period	●	●	-	-	-
MIN. FLOW V1	Value of min. flow during period	●	●	-	-	-

8.5.2   Info logger

Every time the information code changes, date and info codes are logged. Thus, it is possible to data read the latest 50 changes of the information code as well as the date the change was made.

Register type	Description
Date (YY.MM.DD)	Logging time, year, month and day
info	Information code on above date
Clock (hh.mm.ss.)	Time

When the info logger is read from the display, only the latest 36 changes including dates can be read. All 50 changes can be read via METERTOOL. Time can only be read out via LogView.

8.6 Leak surveillance

Water installation

MULTICAL® 62 can monitor the water consumption. Possible running cisterns, leaky heating spirals of tap water tanks, or other leakages, will result in water flow being registered from the water meter 24 hours a day.

If MULTICAL® 62 does not detect for example at least 1 continuous hour (60 minutes)/day, without pulses from the water meter, this may be the sign of a leak in the water system. 'Info' will be displayed (info code 64), and an alarm will be sent via remote communication.

Leak surveillance (V1)	
N=	Leakage sensitivity at 0.01 m^3 resolution in display
0	OFF
1	20 l/h (30 minutes continuously without counting in display) (measured from last reading)
2	**10 l/h (60 minutes continuously without counting in display)** (measured from last reading) *default*
3	5 l/h (120 minutes continuously without counting in display) (measured from last reading)

Note: N=2 is default value in connection with leak surveillance. Increased sensitivity, e.g. N=3, can only be achieved by means of METERTOOL.

Users must be aware that water consumption can occur during the night too in connection with lavatory visits in households with many residents. Thus, hours without counting may not occur, and MULTICAL® 62 will therefore set an alarm for these 24 hours. Users and water works should therefore not be uncritical towards the leakage alarm of MULTICAL® 62. The alarm will dissappear automatically after 24 hours with at least one hour without counting (at N=2), and after this the event will only appear from the info logger.

When the leak function is activated in MULTICAL® 62 (N>0), input VA of the base module cannot be used, and therefore it is only possible to connect one extra meter (e.g. an electricity meter to input VB). If the function is inactive, it is thus possible to connect two extra meters (e.g. an electricity meter and a water meter).

Receipt of alarm messages

When the meter has registered a leakage, it can send an alert message to a receiving station, where incoming alarms are processed, according to an encoded action pattern determined for each customer. E.g. starting with an SMS message to the customer's mobile phone, parallel with the person on guard receiving the message. Regular data readings from MULTICAL® 62 to receiving station/control centre ensure that defective remote reading, if any, is detected.

Max. flow

MULTICAL® 62 makes it possible to keep an eye on the max. flow on a monthly basis. The max flow is a measure of the maximum water flow in the system, at a given consumption pattern. If the max flow decreases over time, this may indicate a leakage in the residential service pipe.

8.7 Reset Function

8.7.1 Resetting the hour counter

As the hour counter, usually, is used to control if the meter has been in operation mode, in the entire billing period (e.g. 1 year = 8760 hours), the district heating supplier must always be informed about which meters have had the hour counter reset.

The operational hour counter can only be reset via the front bottons. Please, see 4.7

8.7.2 Resetting data loggers

Separate reset of data loggers, info loggers and max & min. loggers (without resetting the legal registers) are only possible by means of METERTOOL.

8.7.3 Resetting all registers

Resetting all legal and non-legal registers – including all data loggers, info loggers, max & min. Loggers – can only be made by using METERTOOL, if the verification seal is broken and the internal 'Total programming lock' is short-circuited. As the verification seal hereby is broken, this can only be made at an accredited laboratory.

Following registers are reset:

All legal and non-legal registers including all data loggers, info loggers, max & min. loggers (max. values are set at zero, whereas min. values are set at 100000).

After 'reset'. 'date' is set at 2000.01.01 and is then changed to current date/time of the PC used for the task. Remember to check if date/time (technical standard time = 'winter-time') is correct on the PC, before the reset function is initiated.

9 The Flow Sensor

9.1 Ultrasound combined with piezo ceramics

Flow sensor manufacturers have been working on alternative techniques to replace the mechanical principle. Research and development at Kamstrup has proven that ultrasonic measuring is the most viable solution. Combined with microprocessor technology and piezo ceramics, ultrasonic measuring is not only accurate but also reliable.

9.2 Principles

The thickness of a piezo ceramic element changes when exposed to an electric field (voltage). When the element is influenced mechanically, a corresponding electric charge is generated. Therefore, the piezo ceramic element can function as both sender and receiver.

Within ultrasonic flow measuring there are two main principles: the transit time method and the Doppler method. The Doppler method is based on the frequency change which occurs when sound is reflected by a moving particle. This is very similar to the effect you experience when a car drives by. The sound (the frequency) decreases when the car passes by.

9.3 Transient time method

The transit time method used in ULTRAFLOW® 24 utilizes the fact that it takes an ultrasonic signal, emitted in the opposite direction of the flow, longer to travel from sender to receiver than a signal sent in the same direction as the flow. The transit time difference in a flow sensor is very small (nanoseconds). Therefore, the time difference is measured as a phase difference between the two 1 MHz sound signals in order to obtain the necessary accuracy.
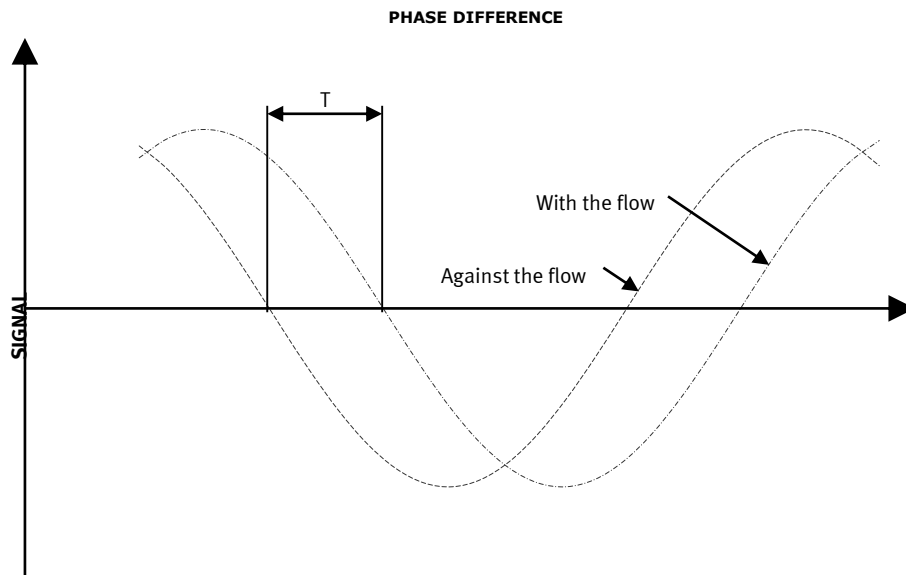
Diagram 3

Figure 17

Flow direction
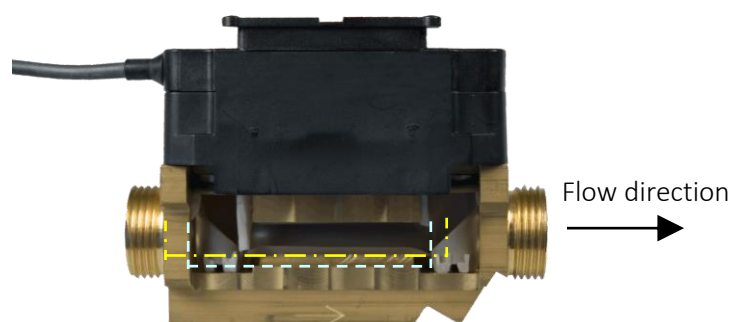
In principle, flow is determined by measuring the flow velocity and multiplying it by the area of the measuring pipe:

$$Q = F \times A$$

where:

Q is the flow

F is the flow velocity

A Is the area of the measuring pipe

The area and the length which the signal travels in the sensor are well-known factors. The length which the signal travels can be expressed as $L = T \times V$, which can also be written as:

$$T = \frac{L}{V}$$

where:

L is the measuring distance

V is the sound propagation velocity

T is the time

The phase difference can be expressed as:

$$\Delta T = L \times \left(\frac{1}{V_1} - \frac{1}{V_2} \right)$$

In connection with ultrasonic flow sensors the velocities up- and downstream, V_1 and V_2 respectively, can be stated as:

$$V_1 = C - F \text{ and } V_2 = C + F$$

where: C is the velocity of sound in water

Using the above formula you get:

$$\Delta T = L \times \frac{1}{C - F} - \frac{1}{C + F}$$

which can also be written as:

$$\Delta T = L \times \frac{(C+F)-(C-F)}{(C-F)\times(C+F)} \qquad \Rightarrow \qquad \Delta T = L \times \frac{2F}{C^2 - F^2}$$

As $C^2 \rangle\rangle F^2$ it is reasonable to omit F^2 and the formula is reduced as follows:

$$F = \frac{\Delta T \times C^2}{L \times 2}$$

To minimize the influence from variations of the velocity of sound in water, the latter is measured via a number of absolute time measurements between the two transducers. These measurements are subsequently converted in the built-in ASIC into the current velocity of sound, which is used in connection with flow calculations.

9.4 Signal paths
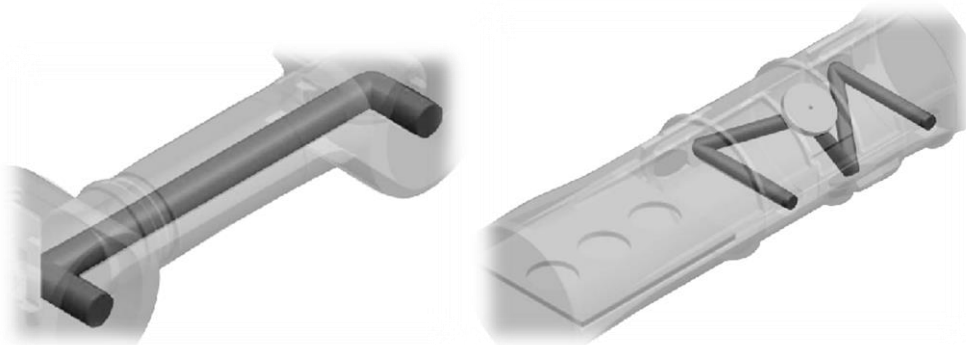
Q₃: 1.6 m³ h

Figure 18

Q₃: 2.5...40 m³/h

2 parallel tracks

The sound path is parallel with the measuring pipe, sent from the transducers via reflectors.

Triangle

The sound path covers the measuring pipe in a triangle, sent from the transducers around the measuring pipe via reflectors.

Measuring sequences

During flow measuring, ULTRAFLOW® passes through a number of sequences which are repeated at fixed intervals. Deviations only occur when the meter is in test mode and when connecting the supply during initialization/start-up. The routines of normal mode are listed in the table below.

Time [s]	Operation
0	Phase difference and absolute time measurement with and against the flow as well as pulse emission
1	Pulse emission
2	Pulse emission
3	Phase difference and absolute time measurement with and against the flow, reference measurement and pulse emission
4	Pulse emission
5	Pulse emission
6	Phase difference and absolute time measurement with and against the flow as well as pulse emission
7	Pulse emission
8	Pulse emission
9	Phase difference and absolute time measurement with and against the flow as well as pulse emission
10	Pulse emission
11	Pulse emission
12	Phase difference and absolute time measurement with and against the flow as well as pulse emission

Table 7

The routines are the same in test mode, but with 1 sec. intervals between measurings instead of 3 sec. as in normal mode.

It may take up to 16 seconds to obtain correct function after a power failure.

Function

In the meter's working range from min. cut off to saturation flow there is a linear connection between the flow rate and the number of pulses being emitted. The below diagram shows an example of the connection between flow and pulse frequency for ULTRAFLOW® 62 ($Q_3 = 1.6$ m³/h). See *Diagram 4*.

Flow frequency (Q_3 = 1.6 m³/h)
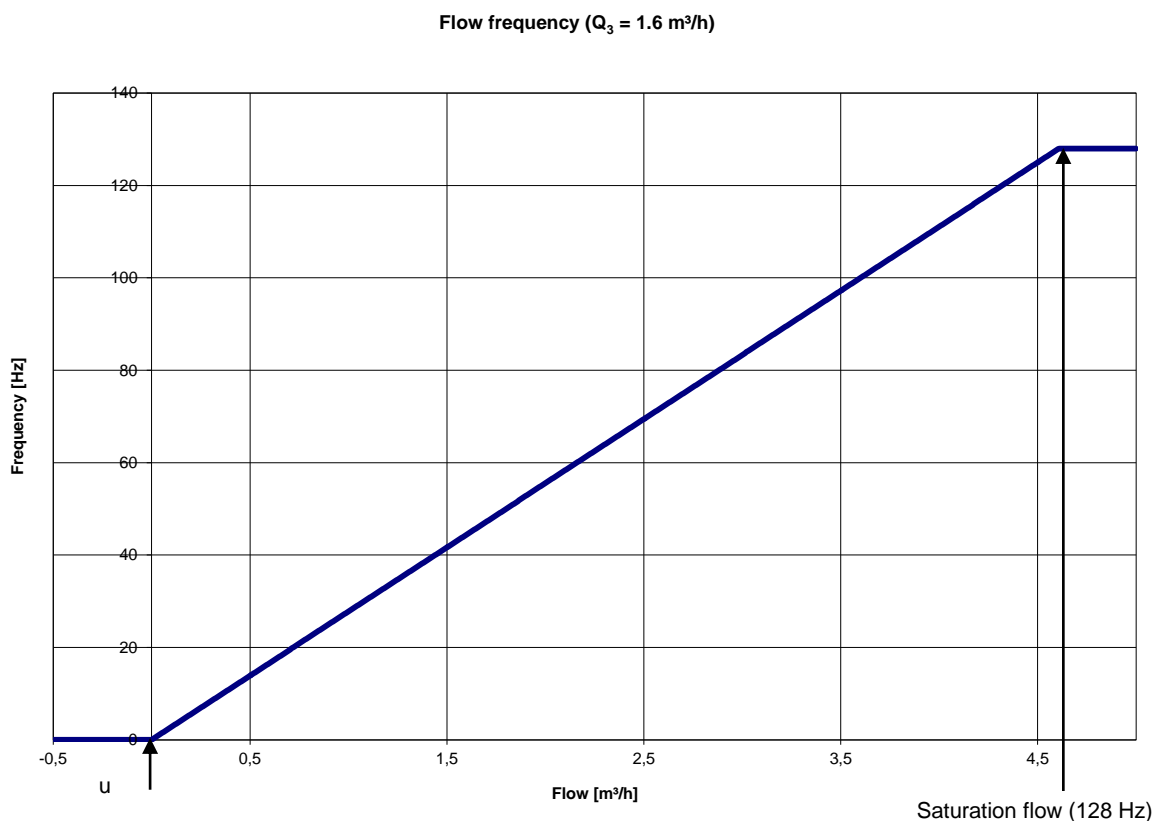
Diagram 4

If the flow is lower than 'min. cut off' – or negative – ULTRAFLOW® 24 will not send out pulses. (See *Diagram 4)*

At flows above the saturation flow, corresponding to pulse emission with a max pulse frequency of 128 Hz, the max pulse frequency will maintain. (See *Diagram 4)*. *Table 8* shows the saturation flow (flow at 128 Hz) of the various flow sizes/pulse figures.

Q_3	Pulse figure	Flow at 128 Hz
[m³/h]	[imp./l]	[m³/h]
1.6	100	4.61
2.5	60	7.68
4	50	9.22
6.3	25	18.4
10	15	30.7
16	10	46.1
25	6	76.8
40	5	92.2

Table 8

9.5 Flow limits

In the meter's working range from min. cut-off and far beyond Q_4 there is a linear connection between the flow rate and the measured water flow.

In practice, the highest possible water flow through the sensor will be limited by the pressure in the system or cavitation due to too low back pressure.

If the flow is lower than 'min. cut-off' – or negative – ULTRAFLOW® 24 does not measure any flow.

According to OIML R49, the upper flow limit Q_4 is the highest flow, at which the flow sensor may operate for short periods of time, without exceeding maximum permissible error. ULTRAFLOW® 24 has no functional limitations while operating above Q_4. Please note, however, that high flow velocities > Q_4 involve the risk of cavitation, especially at low static pressures.

9.6 Guidelines for dimensioning ULTRAFLOW® 24

In installations, it has shown appropriate to work with pressures higher than the pressures shown below:

Nominal flow Q_3 [m³/h]	Recommended minimum operating pressure [bar]	Max. flow Q_4 [m³/h]	Recommended operating pressure [bar]
1.6	1.5	2	2.5
2.5	1	3.1	2
4	1	5	2
6.3	1.5	7.9	2.5
10	1	12.5	2
16	1.5	20	2.5
25	1	31	2
40	1.5	50	2.5

Table 9

The purpose of recommended minimum operating pressure is to avoid measuring errors as a result of cavitation or air in the water.

It is not necessarily cavitation in the flow sensor part itself, but also bubbles from cavitating pumps or regulating valves, mounted before the sensor.

In addition, the water may contain air in the form of small bubbles or air in the water.

The risk of influence from these factors is reduced by maintaining a fair pressure in the installation.

Furthermore, it must be taken into consideration that the above-mentioned pressure is the pressure at the sensor and that the pressure is lower <u>after</u> a contraction than <u>before</u> (e.g. cones). This means that pressure, measured elsewhere in the system, may be different from the pressure at the sensor.

This can be explained by combining the continuity equation and Bernoulli's equation. The total energy from the flow will be the same at any cross section. It can be reduced to: $P + \frac{1}{2} \rho v^2 = \text{constant}$, where P is the pressure, ρ is the density of water and v is the flow velocity.

Dimensioning the flow sensor, the above must be taken into consideration, especially if the sensor is used within the scope of OIML R49 between Q_3 and Q_4, and in case of strong contractions of the pipe.

9.7 Pulse Transmitter (Cable extension set) 66-99-618

The pulse transmitter is for use at readings on long distances (up to 10 metres).
Installation instructions: 5512-587
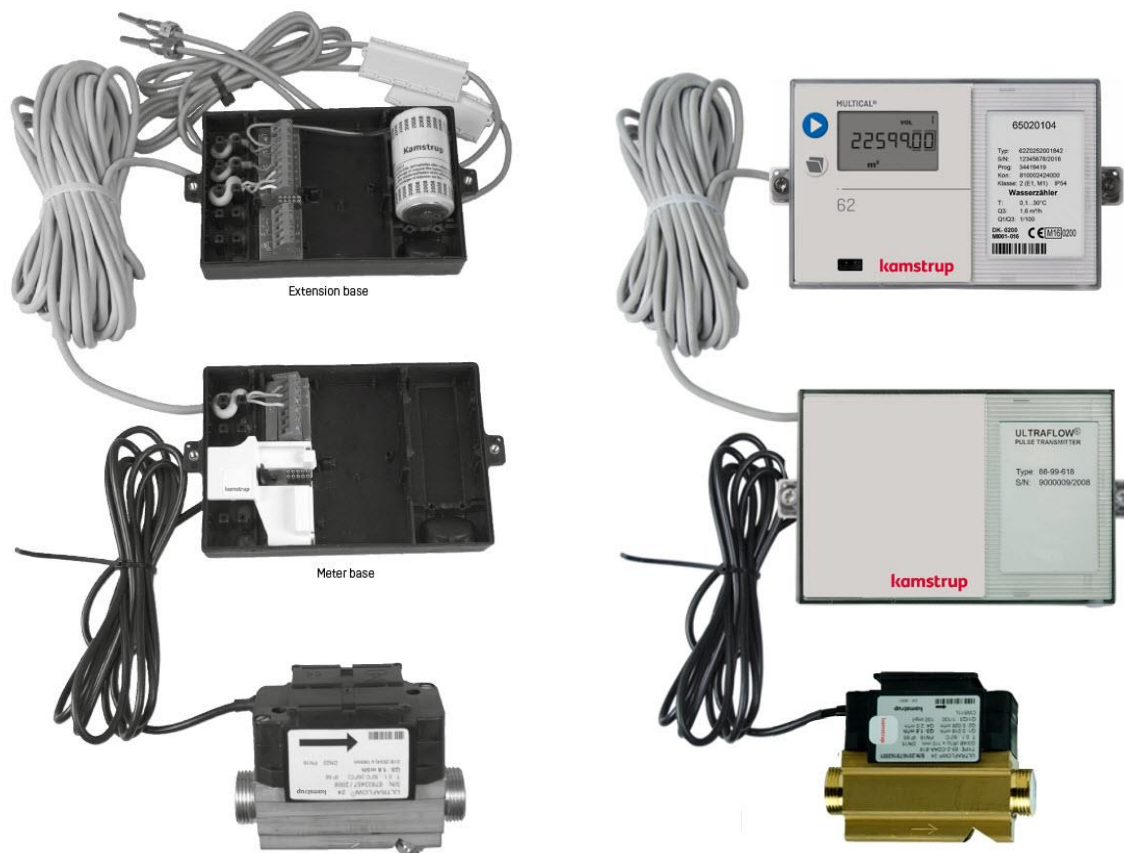
9.8 Pulse inputs VA and VB

In addition to pulse input V1, to which ULTRAFLOW® 24 is connected, MULTICAL® 62 has two extra pulse inputs, VA and VB, for collection and remote accumulation of pulses from e.g. electricity meters or another flow meter. The pulse inputs are physically placed on the base modules, e.g. the 'data/pulse input module', which can be mounted in the connection base, but where accumulation and data logging of values is carried out by the calculator. Please, be aware that pulse inputs, VA and VB, function independently of the other inputs/outputs. Therefore, their values are not included in any kind of volume calculation.

Pulse inputs VA and AB
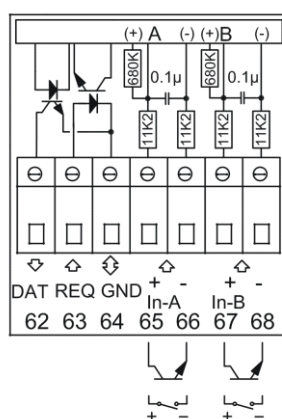
The two pulse inputs are identically constructed and can be individually set up to receive pulses from water meters of max 1 Hz, or pulses from electricity meters of max 3 Hz.

Correct pulse value is configured from the factory on the basis of order information, or by means of METERTOOL. See paragraph 4.3.2 concerning configuration of VA (FF-codes) and VB (GG-codes).

MULTICAL® 62 registers the accumulated consumption of the meters, which are connected to VA and VB, and saves the counter values every month and every year on target date. In order to facilitate the identification during data reading, it is also possible to save the meter numbers of the two meters connected to VA and VB. Programming can be done by means of METERTOOL.

The registration, which can be read, both from the display (selecting a suitable DDD-code) and via data communication, includes the following, as well as date indication of yearly and monthly data:

Type of registration	Counter value	Identification	Yearly data	Monthly data
VA (accumulated register)	●			
Meter number VA		●		
Yearly data, up to latest 15 years			●	
Monthly data, up to latest 36 months				●
VB (accumulated register)	●			
Meter number VB		●		
Yearly data, up to latest 15 years			●	
Monthly data, up to latest 36 months				●

Counter values VA and VB can, by means of METERTOOL, be pre-set to the values of the connected meters (at the time of commissioning)

Display example, VA

In the example below, VA is configured as FF=24, which matches 10 litres/pulse and a max. flow of 10 m^3/h. The meter connected to VA has meter no. 75420145, which has been saved in the internal memory of MULTICAL® 62, by using METERTOOL

1

Accumulated register of VA (Input A)

2

Meter no. of VA (max 8 digits)

3

Yearly data, date of LOG1 (latest target date)

4

Yearly data, value of LOG1 (latest yearly reading)

This is the accumulated volume, registered on 1 January 2012

10 Power Supply

MULTICAL® 62 must be internally powered by 3.6 VDC (± 0,1VDC) on terminals 60(+) and 61(-). This is obtained using one of the following supply modules:

	MULTICAL® 62	Type 62-	Z	☐	☐☐	☐	00	☐	☐	☐☐
Supply										
Battery D-cell						2				
230 VAC high power isolated SMPS						3				
24 VAC high power isolated SMPS						4				
230 VAC supply module with transformer						7				
24 VAC supply module with transformer						8				

The above mentioned supply modules are all included in the comprehensive type test, to which MULTICAL® 62 has been subjected. Within the framework of the type approval, the CE-declaration and the manufacturer's guarantee no other types of power supplies, than the ones listed above, can be used.

ULTRAFLOW® 24 will be powered by the same supply.

10.1 Built-in D-cell lithium battery

When power supplied by a battery, MULTICAL® 62 uses a lithium D-cell (Kamstrup type 66-00-200-100).

The battery is mounted in the right side of the connection base with the red wire connected to terminal 60(+) and the black wire to terminal 61(-). The battery is easily replaced using a screwdriver.

The battery lifetime depends on temperatures, to which the battery is exposed, as well as the selected application for the meter.

Application (temperature)	Battery lifetime
MULTICAL® 62 mounted on a wall (battery temperature < 30°C)	12+1 years
MULTICAL® 62 mounted on the flow sensor part (battery temperature < 45°C)	10 years

The above-mentioned battery lifetimes apply to standard installations. The battery lifetime is reduced by:

- Warm ambient temperature
- Connection of data modules
- Frequent data communication

Please contact Kamstrup A/S for further information.

10.2 Battery lifetimes

Supply options and battery lifetime for wall mounted MULTICAL® 62 with ULTRAFLOW® 24
Estimated battery lifetime in years.

Top ⇒ Base ⇓		67-00 Without Top module	67-05 Data + H-Log	67-07 M-Bus	67-0B 2 pulse out + prog. Data logger	602-0C 2 pulse out
67-00-00 Without base module		12+1	12+1	Mains only	9	10
67-00-10 Data+ pulse inp.		Monthly: 12 daily: 12 hourly: 10 min.: 5	Monthly: 12 daily: 12 hourly: 10 min.: 5	Mains only	Monthly: 9 daily: 8 hourly: 7 min.: 4	Monthly: 10 daily: 9 hourly: 8 min.: 5
67-00-20/28/29 M-Bus+ pulse inp.		Monthly: 12 daily: 11 hourly: 9 min.: 1	Monthly: 12 daily: 11 hourly: 9 min.: 1	Mains only	Monthly: 9 daily: 8 hourly: 6 min.: 1	Monthly: 10 daily: 9 hourly: 7 min.: 1
67-00-21 Radio Router +pulse inp.		Mains only	Mains only	Mains only	Mains only	Mains only
67-00-22 Prog. datalogger + analog inputs		Mains only	Mains only	Mains only	Mains only	Mains only
67-00-23 0/4-20 Analogue Out		Mains only	Mains only	Mains only	Mains only	Mains only
67-00-24 LONWorks +pulse inp.		Mains only	Mains only	Mains only	Mains only	Mains only
67-00-25/26 RF+p/i, read by Hand Held Terminal		Monthly: 10 daily: 9 hourly: - min.: -	Monthly: 9 daily: 8 hourly: - min.: -	Mains only	Monthly: 7 daily: 6 hourly: - min.: -	Monthly: 8 daily: 7 hourly: - min.: -
67-00-30/31/38 WM-Bus Mode C1 + pulse inp. wM-Bus Mode T1 OMS 15 min wM-Bus Mode C1 Fixed Network		12+1	12+1	Mains only	9	10
67-00-60 ZigBee + pulse inp.		Mains only	Mains only	Mains only	Mains only	Mains only
67-00-62 Metasys N2 +pulse inp.		Mains only	Mains only	Mains only	Mains only	Mains only
602-00-64 SIOX		Mains only	Mains only	Mains only	Mains only	Mains only
602-00-66 BACnet MS/TP + pulse input		Mains only	Mains only	Mains only	Mains only	Mains only
67-00-67 Modbus RTU + pulse inputs		Mains only	Mains only	Mains only	Mains only	Mains only
602-00-80 GSM/GPRS		High Power Mains only	High Power Mains only	High Power Mains only	High Power Mains only	High Power Mains only
602-00-81 3G GSM/GPRS module (GSM8H)		High Power Mains only	High Power Mains only	High Power Mains only	High Power Mains only	High Power Mains only
602-00-82 Ethernet/IP		High Power Mains only	High Power Mains only	High Power Mains only	High Power Mains only	High Power Mains only
602-00-84 High Power RF + pulse inp.		High Power Mains only	High Power Mains only	High Power Mains only	High Power Mains only	High Power Mains only

Note 1:   Battery lifetime in [years] at one data reading per month, day, hour or minute.
Note 2:   Battery temperature between 30 and 45°C (pipe mounted calculator) will reduce the lifetime by 1-3 years.
Note 3:   With top module 67-0B, log intervals from 60 to 1 min. will reduce the battery lifetime by up to 3 years.
Note 4:   Pulse outputs are calculated at an average of 50% qp for standard CCC-codes and 32 ms. pulse duration.

10.3 High Power supply module 230 VAC

This PCB module is galvanically separated from the mains supply and is suited for direct 230 V mains installation. The module is a **S**witch **M**ode **P**ower **S**upply (SMPS) that meets the demands for double insulation when the calculator top is mounted. The power consumption is less than 1.7 VA/1 W.
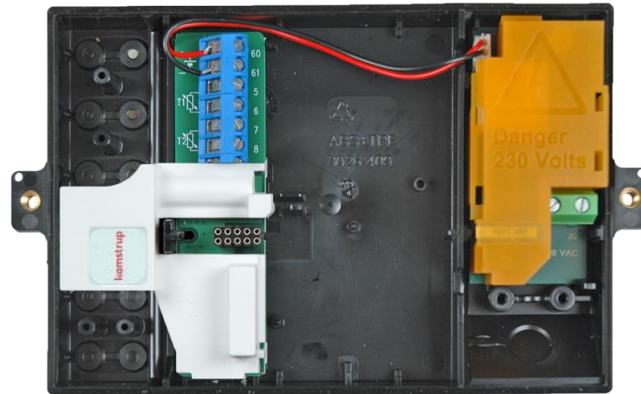
National electricity installation requirements must be met. The 230 VAC module must be connected/disconnected by the utility staff, whereas the fixed 230 V installation for the switch cabinet must only be made by an authorised electrician.

If mains disappears, this SMPS will keep the meter running for a few seconds.

10.4 High Power supply module 24 VAC

This PCB module is galvanically separated from the 24 VAC mains supply and is suited for industrial installations with joint 24 VAC supply and individual installations supplied from a separate 230/24 V safety transformer in the switch cabinet. The module is a **S**witch **M**ode **P**ower **S**upply (SMPS) that meets the demands for double insulation when the calculator top has been mounted. The power consumption is less than 1.7 VA/1 W.

National electricity installation requirements must be met. The 24 VAC module must be connected/disconnected by the utility staff, whereas installation of 230/24 V in the switch cabinet must only be made by an authorised electrician.

The module is specially suited for installation together with a 230/24 V safety transformer, e.g. type 66-99-403, that can be installed in the switch cabinet <u>before</u> the safety relay. When the transformer is used the power consumption will be less than 1.7 W for the entire meter including the 230/24 V transformer. If mains disappears, this SMPS will only keep the meter running for a few seconds.

10.5 Supply module 230 VAC

This PCB module is galvanically separated from the mains supply and is suited for direct 230 V mains installation. The module contains a double chamber safety transformer that meets the demands for double insulation, when the calculator top has been mounted. The power consumption is less than 1.5 VA/0.7 W.

National electricity installation requirements must be met. The 230 VAC module must be connected/dis-connected by the utility staff, whereas, the fixed 230 V installation for the switch cabinet must only be made by an authorised electrician.

10.6 Supply module 24 VAC

This PCB module is galvanically separated from the 24 VAC mains supply and is suited for both industrial installations with joint 24 VAC supply and individual installations supplied from a separate 230/24 V safety transformer in the switch cabinet. The module contains a double chamber safety transformer, which meets the demands for double insulation, when the calculator top is mounted. The power consumption (without an external 230/24 V transformer) is less than 1.5 VA/0.7 W.
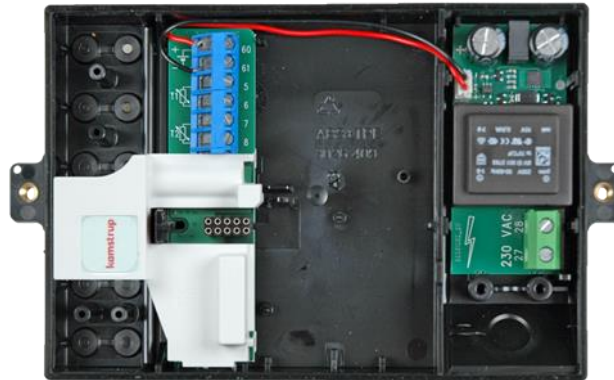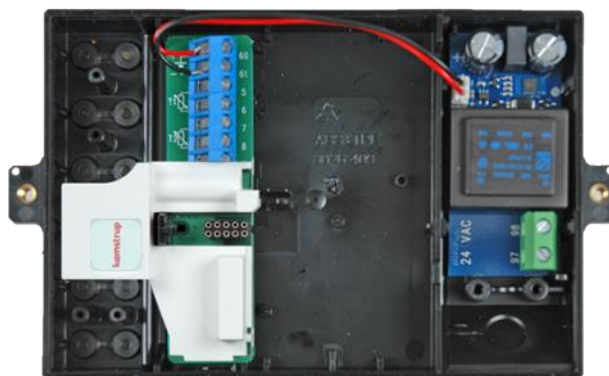

National electricity installation requirements must be met. The 24 VAC module must be connected/dis-connected by the utility staff, whereas installation of 230/24 V in the switch cabinet must only be made by an authorised electrician.

The module is suited especially for installation together with a 230/24 V safety transformer, e.g. type 66-99-403, which can be installed in the switch cabinet before the safety relay. When the transformer is used, the power consumption will be less than 2.2 W for the entire meter, including the 230/24 V transformer.

If mains disappears this power supply will keep the meter running for a few minutes.

10.6.1   Requirements for 230/24V transformer

Transformer type 66-99-403 is recommended for connection to a 24 VAC high-power supply module. Other types may be used, however, it ought to be secured that the transformer has the correct output voltage; this applies if the transformer has an off-load voltage of ≤ 26 VAC and a voltage of ≥ 20 VAC loaded at 100 Ohm (or two 47 Ohm connected in series).

Ubelastet: ≤ 26 VAC

Belastet: ≥ 20 VAC

230 VAC
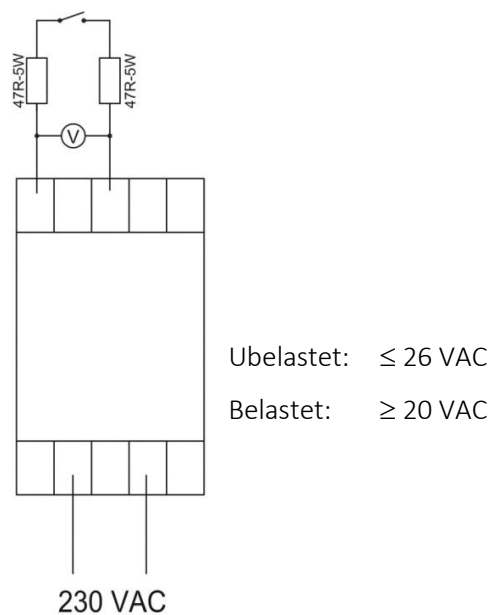
Figur 1

10.7 Change of supply unit

The supply unit for MULTICAL® 62 can be changed from mains supply to battery, or visa versa, as the needs of the utility change. Thus, it can be an advantage to change mains supplied meters to battery supplied meters in buildings under construction, where the mains supply can be unstable or periodically missing.

The change from battery to mains supply or visa versa does <u>not</u> require reprogramming as MULTICAL® 62 does not include an information code for worn out battery.

However, mains supply must not be changed to battery if MULTICAL® 62 is fitted with one of the following base modules:

MULTICAL® 62	Type 62-	Z	□	□ □	□	**00**	□	□	□ □
Base module									
RadioRouter + pulse inputs				21					
Prog. data logger + RTC + 4…20 mA inputs + pulse inputs				22					
0/4…20 mA outputs				23					
LonWorks, FTT-10A + pulse inputs				24					
ZigBee 2.4 GHz int.ant. + pulse inputs				60					
Metasys N2 (RS485) + pulse inputs				62					
SIOX module (Auto detect Baud rate)				64					
BACnet MS/TP + pulse input				66					
Modbus RTU + pulse inputs				67					
GSM/GPRS module (GSM6H)				80					
3G GSM/GPRS module (GSM8H)				81					
Ethernet/IP module (IP201)				82					
High Power Radio Router + pulse inputs				84					

See paragraph 11.1.3 concerning supply options for top and base modules.

10.9 Mains cables

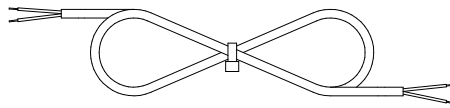MULTICAL® 62 is available with mains cables H05 VV-F for either 24 V or 230 V (l=1.5 m):

Figure 20

Mains cable, type 5000-286 (2x0.75 mm²), max. 6 A fuse

'H05 VV-F' is the designation of a strong PVC mantle, which withstands max. 70°C. Therefore, the mains cable must be installed with sufficient distance to hot pipes etc.

10.10   Back-up of data during power down

An early warning circuit and corresponding software is added, securing safety back-up of all main registers during power down. In fact, this will function as the hourly data back-up, but also during power down. This will ensure that the meter always starts up with the same display values as before the power break.

This will be effective for both 24V and 230V power break and also when the top part of MULTICAL® 62 is removed from the base, or in case of a battery failure.
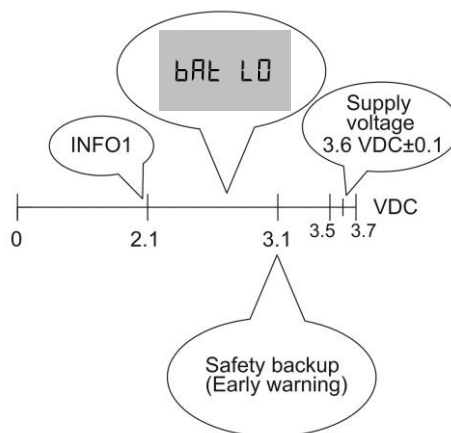
The battery has been constructed to maintain a constant voltage level of 3.6 VDC ±0,1 V throughout its entire life-time. Shortly before the battery's energy is used completely, the voltage falls. When the battery reaches 3.1 V the meter safety backs up. When the voltage is further reduced, 'bAt LO' is displayed to indicate that the battery voltage of the meter is too low to carry out measurements. At 2.1 V, info code = 1 is logged in the info event logger, with time and date, to make it possible to see when the battery's energy has been completely used up.

10.11 Danish regulations for the connection of mains operated meters

Installation of mains connected equipment for registration of consumption (www.sik.dk, safety notification electric services no. 27/09, February 2009).

The consumption of energy and resources (electricity, heat, gas and water) of the individual consumer is, to an increasing extent, registered by electronic meters, and often equipment for remote reading and remote control, of both electronic and non-electronic meters, is used.

General regulations for carrying out installations must be observed. However, the following modifications are permitted:

- If meter or equipment for remote reading or remote control is double-isolated, it is not necessary to run the protective conductor all the way to the connection point. This also applies if the connection point is a plug socket – provided that it is placed in a canning which is sealable or can be opened with key or tool only.

If meter or equipment, used for remote reading and remote control, is connected to a safety transformer mounted in the panel and direct connected to the branch conductor, no on-off switch or separate overcurrent protection in either primary or secondary circuit is required – provided that the following conditions are fulfilled:

- The safety transformer must either be inherently short-circuit-proof or fail-safe

- The conductor of the primary circuit must either be short-circuit protected by the overcurrent protection of the branch conductor or short-circuit safely run.

- The conductor of the secondary circuit must have a cross section of at least 0.5 mm² and a current value which exceeds the absolute maximum current deliverable by the transformer

- It must be possible to separate the secondary circuit, either by separators, or it must appear from the installation instructions that the secondary circuit can be disconnected at the transformer's terminals

General information

Work on the fixed installation, including any intervention in the group panel, must only be carried out by an authorized electrician.

It is not required that service work on equipment comprised by this notification, as well as connection and disconnection of the equipment outside the panel, is carried out by an authorized electrician. These tasks can also be carried out by persons or companies, who professionally produce, repair or maintain equipment, if only the person carrying out the work has the necessary expert knowledge.

11 Plug-in Modules

MULTICAL® 62 can be fitted with plug-in modules in both calculator top (top modules) and connection base (base modules) which means, the meter can be adapted to various applications.

All plug-in modules are included in the comprehensive type test, to which MULTICAL® 62 has been subjected. Within the framework of the type approval, the CE-declaration and the manufacturer's guarantee, no other types of plug-in modules than the ones listed below can be used.

11.1 Top modules

MULTICAL® 62	Type 62-	Z	☐	☐☐	☐	00	☐	☐	☐☐
Top module									
No module		0							
RTC + data output + hourly data logger		5							
RTC + M-Bus		7							
RTC + pulse output for CV + prog. data logger		B							
2 Pulse outputs CE and CV		C							

Diagram 5
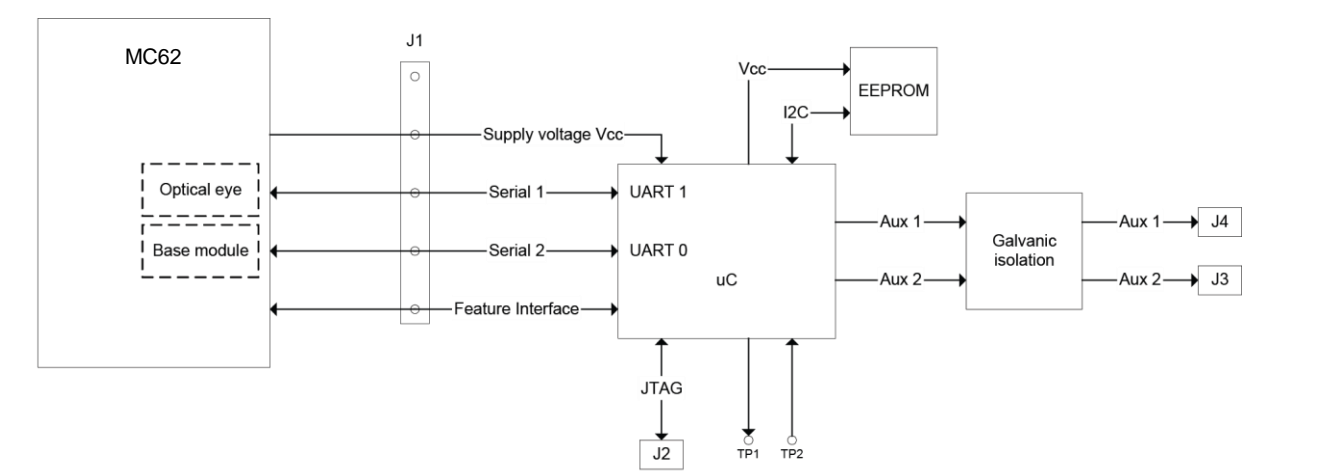
Topmodule functional block diagram

The top modules are build up on the above common hardware platform. The application program in the micro controller and the component location vary according to the task.

When a top module with RTC is mounted in MULTICAL® 62, the top module's RTC will not have any effect on the meter's internal RTC.

11.1.1 Overview of top modules

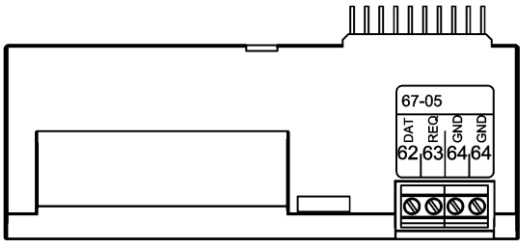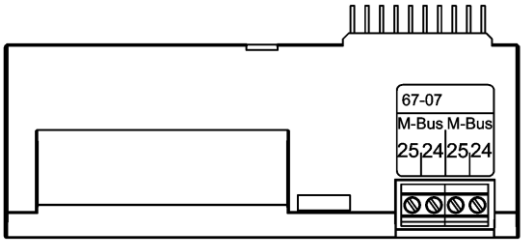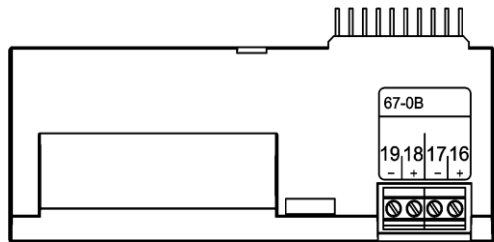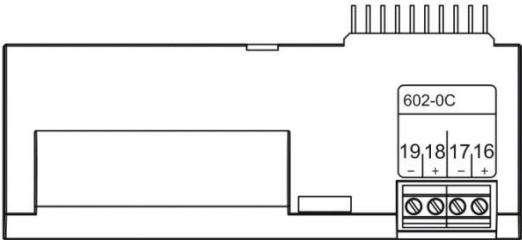|	
67-05 DAT REQ GND GND 62 63 64 64	**Type 67-05: Data output** The module has a galvanically separated data port which functions with the KMP protocol. The data output can be used for e.g. connection of external communication units or other hardwired data communication which it is not expedient to carry out via the optical communication on the meter's front. 62: DATA (brown) – 63:REQ (white) – 64: GND (green). Use data cable type 66-99-106 with 9-pole D-sub or type 66-99-098 with USB connector.
67-07 M-Bus M-Bus 25 24 25 24	**Type 67-07: M-Bus** M-Bus can be connected in star, ring and bus topology. Depending on M-Bus Master and cable length/cross section, up to 250 meters with primary addressing can be connected, and even more using secondary addressing. Cable resistance in network: < 29 Ohm Cable capacity in network: < 180 nF The connection polarity of terminals 24-25 is unimportant. This module may only be used in mains supplied meters. Unless otherwise stated with the order, the primary address consists of the last 3 digits of the customer number, however, this can be changed using the PC program, METERTOOL. In order to function properly in a MULTICAL® 62, it requires as minimum, a program version D1 – released March 2011.
67-0B 19 18 17 16 – + – +	**Type 67-0B: RTC + pulse output for CV + prog. data logger** Pulse output functions of this top module are identical with the functions described under top module 602-0C. Type 67-0B however, is supplied with Opto FET output for AC/DC pulses. See paragraph 2.2 Electrical data as to specifications of pulse outputs CE and CV. The top module is prepared for use in a Kamstrup radio network together with the High Power Radio Router base module 6020084, read data being transferred to the system software via network unit RF Concentrator. The prog. data logger function is configured for the specific meter where it is installed by using the serial number. If the module is removed and installed in another meter, the configuration is set to default values.

Type 602-0C: 2 pulse outputs for CV

This top module has two configurable pulse outputs, which are suitable for volume and energy pulses for heat meters, cooling meters and combined heat/cooling meters.

The pulse resolution follows the display (fixed in the CCC-code).

The pulse outputs are optoinsulated and can be charged with 30 VDC and 10 mA.

Normally volume (CV) is connected to 18-19, but other combinations can be selected via the PC program METERTOOL, also used to select pulse duration 32 or 100 ms.

11.1.2   Mounting and dismounting the top module

The top module is released by pressing down at the middle, to the left, of the plastic item, while pushing the top module to the left.
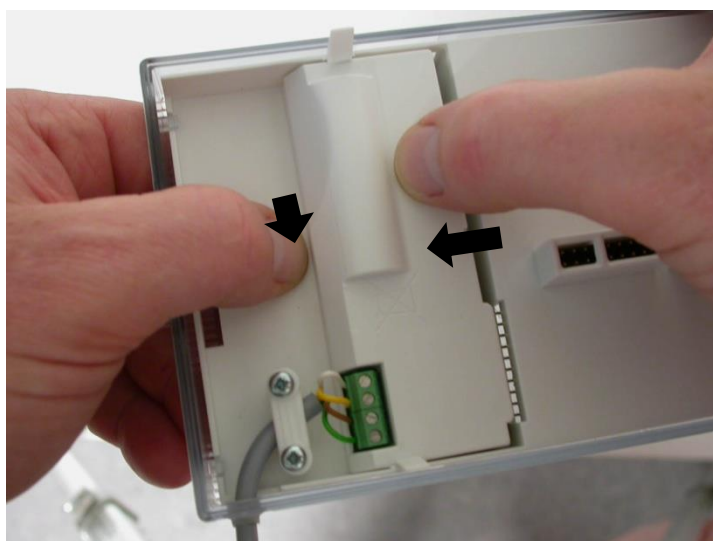
Figure 21

11.1.3   Supply options for top and base modules

Top ⟹ Base ⇓	67-05 Data + H-Log	67-07 M-Bus	67-0B 2 pulse out+ prog.datalog	602-0C 2 pulse outputs (CE/CV)
67-00-10 Data + pulse inp.	Battery or mains	Mains only	Battery or mains	Battery or mains
67-00-20/28/29 M-Bus + pulse inp.	Battery or mains	Mains only	Battery or mains	Battery or mains
67-00-21 Radio Router + pulse inp.	Mains only	Mains only	Mains only	Mains only
67-00-22 4-20 inp.	Mains only	Mains only	Mains only	Mains only
67-00-23 0/4-20 out	Mains only	Mains only	Mains only	Mains only
67-00-24 LonWorks + pulse inp.	Mains only	Mains only	Mains only	Mains only
67-00-25 RF + pulse inp.	Battery or mains	Mains only	Battery or mains	Battery or mains
67-00-26 RF + pulse inp.	Battery or mains	Mains only	Battery or mains	Battery or mains
67-00-30 wM-Bus + pulse inp.	Battery or mains	Mains only	Battery or mains	Battery or mains
67-00-31 wM-Bus, 15 min.	Battery or mains	Mains only	Battery or mains	Battery or mains
67-00-38 wM-Bus, Fixed Network	Battery or mains	Mains only	Battery or mains	Battery or mains
67-00-60 ZigBee + pulse inp.	Mains only	Mains only	Mains only	Mains only
67-00-62 Metasys N2 + pulse inp.	Mains only	Mains only	Mains only	Mains only
602-00-64 SIOX	Mains only	Mains only	Mains only	Mains only
602-00-66 BACnet MS/TP + pulse input	Mains only	Mains only	Mains only	Mains only
67-00-67 Modbus RTU + puls inputs	Mains only	Mains only	Mains only	Mains only
602-00-80 GSM/GPRS	High Power Mains only	High Power Mains only	High Power Mains only	High Power Mains only
602-00-81 3G GSM/ GPRS module (SM8H)	High Power Mains only	High Power Mains only	High Power Mains only	High Power Mains only
602-00-82 Ethernet/IP (IP201)	High Power Mains only	High Power Mains only	High Power Mains only	High Power Mains only
602-00-84 High power Radio Router + pulse inp.	High Power Mains only	High Power Mains only	High Power Mains only	High Power Mains only

11.1.4 Overview for top module 67-05 with external communication unit

Top ⇒ Ext. box ⇓	67-05 Data + H-Log		Comments/restrictions in use
67-00-10	N/A		
67-00-20/28/29	N/A		
67-00-21	N/A		
67-00-22	N/A		
67-00-23	N/A		
67-00-24 LonWorks	Mains only		The module type in the external communication box is not shown in the MULTICAL® 62 display. Only accumulated and actual data can be read. No hourly/daily/monthly/yearly data loggers can be read through the data port on the 62-05 top module. LonWorks always requires mains supply.
67-00-25	N/A		
67-00-26	N/A		
67-00-30	N/A		
67-00-31	N/A		
67-00-38	N/A		
67-00-60	N/A		
67-00-62	N/A		
602-00-64	N/A		
602-00-66	N/A		
602-00-67	N/A		
602-00-80	N/A		
602-00-81	N/A		
602-00-82	N/A		
602-00-84	N/A		

Note: If the module is used in an external communication unit, Pulse inputs VA and VB (terminals 65-66-67-68) are not connected.

11.2 Base modules

The base modules for MULTICAL® 62 can be divided into four groups:

67-00-<u>1X</u>	Modules with simple functions and without a microprocessor.
67-00-<u>2X</u>	Modules specifically developed for MULTICAL® 602 and the KMP protocol.
67/602-00-<u>3X</u> 67/602-00-<u>6X</u>	Modules specifically developed for MULTICAL® 602 and the KMP protocol.
602-00-<u>8X</u>	Modules specifically developed for MULTICAL® 602 to be used together with 230 VAC or 24 VAC high power SMPS module.

MULTICAL® 62	Type 62-	Z	□	□□	□	**00**	□	□	□□
Base modules									
No module				00					
Data + pulse inputs				10					
M-Bus + pulse inputs				20					
RadioRouter + pulse inputs				21					
Prog. data logger + RTC + 4…20 mA inputs + pulse inputs				22					
0/4…20 mA outputs				23					
LonWorks, FTT-10A + pulse inputs				24					
Radio + pulse inputs (internal antenna) 434 or 444 MHz*				25					
Radio + pulse inputs (external antenna connection) 434 or 444 MHz*				26					
M-Bus module with medium data package + pulse inputs				28					
M-Bus module with MC-III data package + pulse inputs				29					
Wireless M-Bus Mode C1 Std. reg. + pulse inputs*				30					
Wireless M-Bus, Mode T1 OMS 15 min. (ind. Key)*				31					
Wireless M-Bus, C1, Fixed Network, (ind. Key)*				38					
ZigBee 2.4 GHz int.ant. + pulse inputs				60					
Metasys N2 (RS485) + pulse inputs				62					
SIOX module (Auto detect Baud rate)				64					
BACnet MS/TP + pulsindgang				66					
Modbus RTU + pulse inputs				67					
GSM/GPRS (GSM6H)			Requires	80					
3G GSM/GPRS modul (GSM8H)			High Power	81					
Ethernet/IP (IP201)			supply	82					
High Power RadioRouter + pulse inputs*			modules	84					

*Kamstrup recommends that an external antenna is mounted on this module if the meter is fitted with a top module too. This ensures the best possible radio range

11.2.1   Data + pulse inputs (67-00-10) (PCB 5550-369)

The module has a galvanically separated data port which functions with the KMP protocol. The data output can be used for e.g. connection of external communication units or other hardwired data communication which it is not expedient to carry out via the optical communication on the meter's front.

See paragraph 9.8 Pulse inputs VA and VB concerning the function of the pulse inputs.

The module includes data connection, which can e.g. be used for the external reading plug designed for Kamstrup's hand-held terminal or hardwiring of PC connection.

The data connection is galvanically isolated with optocouplers, which makes it necessary to use data cable type 6699-105 or 6699-106 in order to adapt the signal to RS232 level, which suits PC and Kamstrup's hand-held terminal.
See section 12 *Data Communication* for information on data sequences and protocols. If the computer does not have a COM-port, data cable with USB type 6699-098 can be used.
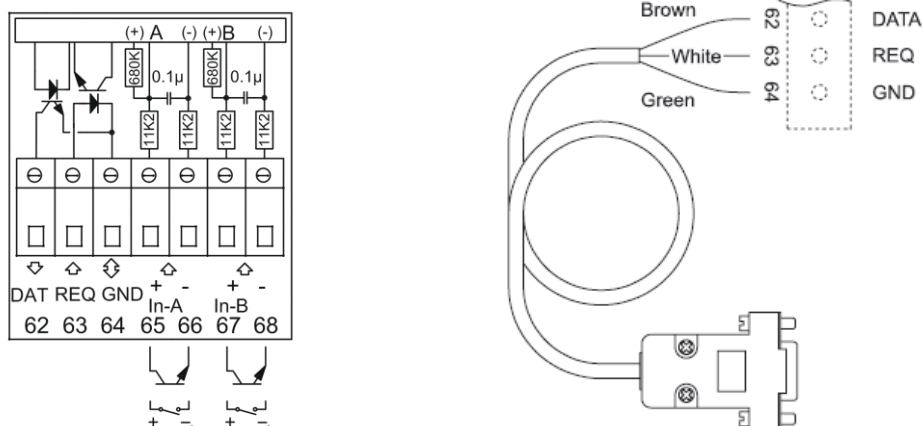
11.2.2   M-Bus + pulse inputs (67-00-20) (PCB 5550-831)

The M-bus module is supplied through the M-bus network and is thus independent of the meter's internal supply. Two-way communication between M-bus and water meter is carried out via optocouplers providing galvanic separation between M-bus and meter. The module supports both primary, secondary and enhanced secondary addressing.
The M-Bus module has two extra inputs.
See paragraph 9.8 concerning the function of pulse inputs VA and VB.
In order to function properly in a MULTICAL® 62, program version H1, released March 2011, is required as minimum.
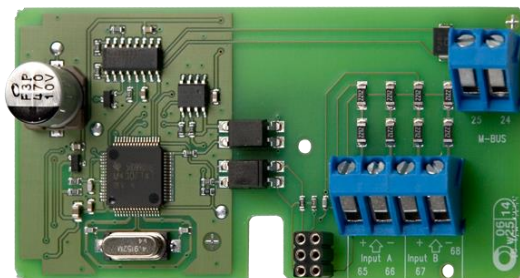
11.2.3   RadioRouter + pulse inputs (67-00-21) (PCB 5550-805)

The radio module is available for operation at both licence-free and licence demanding frequencies. The module is available with internal antenna as well as connection for external antenna.

The radio module is prepared to form part of a Kamstrup radio network, the read data being automatically transferred to system software via the network component/network unit, RF Concentrator.

The radio module has two extra inputs. See paragraph 9.8 concerning the function of pulse inputs VA and VB.

The RadioRouter module (67-00-21) must be used with mains supply.

Kamstrup recommends that an external antenna is mounted on this module if the meter is fitted with a top module too. This ensures the best possible radio range.
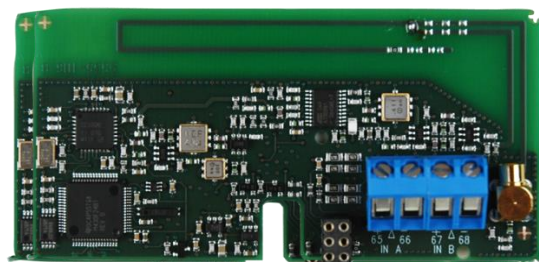
11.2.4   Prog. data logger + RTC + 4…20 mA inputs + pulse inputs (67-00-22) (PCB 5550-925)

The module has connection possibility for two pressure transmitters on terminals 57, 58 and 59 and can be adjusted for current reading or pressure ranges of 6, 10 or 16 bar.

The module is prepared for remote reading, data from meter/module being transferred to the system software via the connected external GSM/GPRS modem on terminals 62, 63 and 64.

The prog. data logger function is configured for the specific meter where it is installed by using the serial number. If the module is removed, and installed in another meter the configuration is set to default values.

Furthermore the module has two extra pulse inputs, see paragraph 9.8 – concerning the function of pulse inputs VA and VB. The module must be powered by 24 VAC.

Pressure transmitter requirements: 4...20 mA, 2-wire, loop-powered, loop voltage max. 16 VDC
                                                                 (e.g. type CTL from Baumer A/S)

11.2.5   0/4...20 mA analog outputs (67-00-23) (PCB 5550-1005)

The module has two active analog outputs, which can be individually configured at 0...20 mA or 4...20 mA. Furthermore, the outputs can be configured for a specific measuring value as well as the required range scaling.

All values on the two analog outputs are updated every 10 seconds. The total response time – incl. response time of the flow meter, calculator and digital to analog conversion – may have duration of 30-40 seconds. This response time must be taken into account, when the analog outputs are used for purposes other than remote viewing. The module shall be mounted in MULTICAL® 62. It cannot be used separately with flowmeters.

It must be powered by 24 VAC. Configuration is done through 'Base module' menu in METERTOOL.
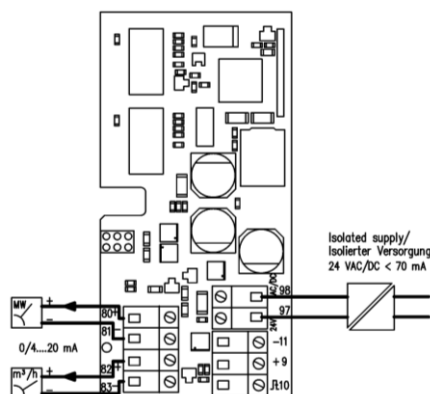
11.2.6 LonWorks + pulse inputs (67-00-24) (PCB 5550-1128)

The LON-module is used for data transfer from MULTICAL® 62 either for data reading or for regulation purposes via the LON-bus, which is ideal for iter alia climate control and building automation. The high-speed data communication makes it possible to connect many applications to a LON-network.
The connection between the LON-module and and the other LON-nodes consists of standard twisted pair cable of up to 2700 m length at bus topology or 500 m length at free topology.

The module requires that MULTICAL® 62 is externally supplied (24-VAC /230-VAC); battery supply of MULTICAL® 62 is not possible (see paragraph 9.8 – concerning the function of pulse inputs VA and VB). Regarding network variable list (SNVT) and further information on the LonWorks module please refer to the data sheet 5810-1043 (GB)
As to installation, please refer to installation instructions 5512-1105 (GB).

As the module is de-energised when the calculator top is not mounted, it is not possible to send Neuron ID by activating the button on the module.
See paragraph 9.8 'Pulse inputs VA and VB' – describes how the pulse inputs function.

Neuron ID is sent by simultaneous activation of both front plate keys of MULTICAL® 62. When 'Call' is displayed the Neuron ID has been sent.
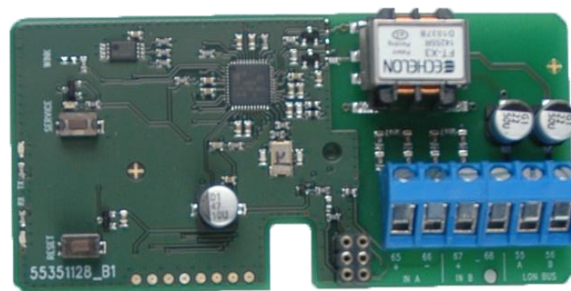
11.2.7 RadioRouter + pulse inputs (67-00-25/26) (PCB 5550-608/640)

The standard version of the radio module is for operation in licence-free frequency bands, but it is also available for other licence demanding frequencies.

The radio module is prepared to form part of a Kamstrup radio network, the read data being automatically transferred to system software via the network components RF Router and RF Concentrator. The radio module has two extra inputs. See paragraph 9.8 concerning the function of pulse inputs VA and VB.

Kamstrup recommends that an external antenna is mounted on this module if the meter is fitted with a top module too. This ensures the best possible radio range
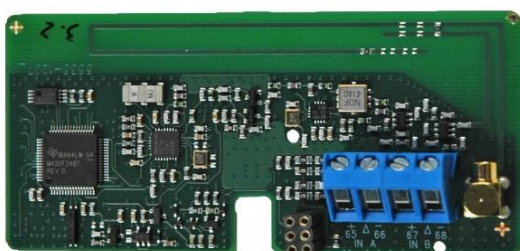
67-00-25: Internal antenna

67-00-26: External antenna connection

11.2.8 M-Bus module with medium data package + pulse inputs (67-00-28) (PCB 5550-1104)

A new M-Bus base module has been developed for MULTICAL® 602/62 and can solely be used in these meter types.

The 'Error hour counter' has been added to the M-Bus telegram, and following registers has been removed: TA2 and TA3 in actual and target data, and E8, E9, TL2 and TL3 in manufacture-specific data.

In order to function correctly in a MULTICAL® 62, program version D1, released in April 2011, is required as minimum.
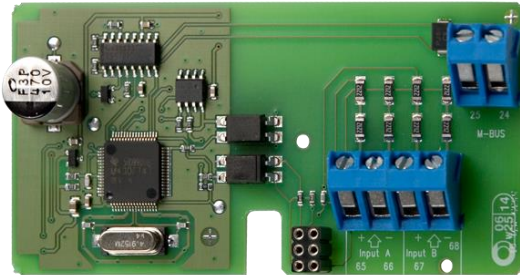
11.2.9 M-Bus module with MC-III data package + pulse inputs (67-00-29) (PCB 5550-1125)

The M-Bus module 670029 comprises the same data packet as M-Bus module 6604 for MC III/66-C and module 660S for MCC/MC 401.

The module can e.g. be used together with the old M-Bus master with display, old regulators and old reading systems, not supporting the newer M-Bus modules.

In order to function correctly in a MULTICAL® 62, program version E1, released in June 2011, is required as minimum.

See paragraph 9.8 'Pulse inputs VA and VB' – describes how the pulse inputs function.
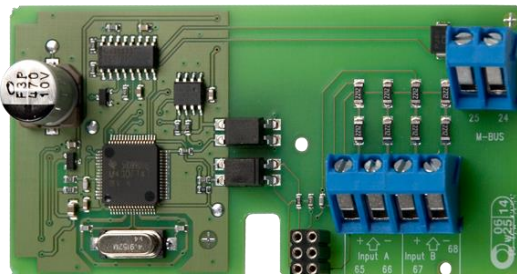
11.2.10 Wireless M-Bus + 2 pulse inputs (67-00-30) (PCB 5550-1097)

The radio module has been designed to form part of Kamstrup's hand-held Wireless M-Bus Reader systems, which operate within the unlicensed frequency band in the 868 MHz area.

The module fulfils the C-mode specifications of prEN13757-4 and can thus form part of other systems using Wireless M-Bus C-mode communication.
The radio module comes with internal antenna and external antenna connection as well as two pulse inputs
(VA + VB). See paragraph 9.8 'Pulse inputs VA and VB' – describes how the pulse inputs function.

The Wireless M-Bus radio transmitter is switched off before dispatch from the factory. It switches on automaticaly when approx. one litre of water has run through meter. The radio transmitter can also be switched on by making a forced call (keep both front keys activated for approx. 5 sec. until 'CALL' is displayed).
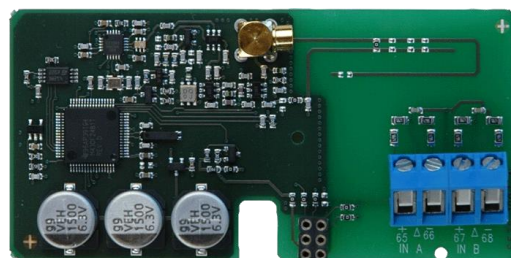
Kamstrup recommends that an external antenna is mounted on this module if the meter is fitted with a top module too. This ensures the best possible radio range

### 11.2.11 Wireless M-Bus (67-00-31) (PCB 5550-1386)

The Wireless M-Bus module has been developed to be integrated in an 'Open Metering System' (OMS) solution without further configuration, and operates within the unlicensed frequency band in the 868 MHz area.

The communication protocol is T-mode according to OMS specifications: Volume 2: Primary Communication Version 4.0.2, and the module uses one-way communication, data being automatically sent from the meter after installation, every 15 minutes from module 67-00-31

The T1 OMS module supports individual encryption and comes with internal antenna as well as MCX connection for external antenna.

Kamstrup recommends that an external antenna is mounted on this module if the meter is fitted with a top module too. This ensures the best possible radio range

Photo, see above paragraph.
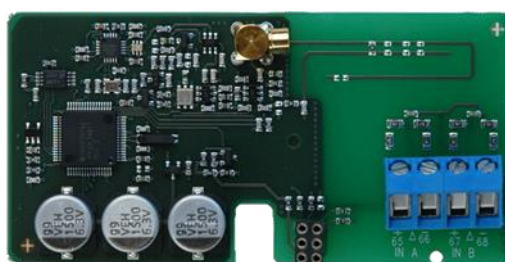
11.2.12 Wireless M-Bus (67-00-38) (PCB 5550-1356)

The Wireless M-Bus module has been specifically developed to be integrated in a Wireless M-Bus network (Radio Link Network) and operates within the unlicensed frequency band in the 868 MHz area.

The communication protocol is C-mode according to the standard EN13757-4 and the module uses one-way communication, data being automatically sent from the meter every 96 seconds after installation.

The Wireless M-Bus module for fixed network supports individual encryption and comes with internal antenna as well as MCX connection for external antenna.

Kamstrup recommends that an external antenna is mounted on this module if the meter is fitted with a top module too. This ensures the best possible radio range
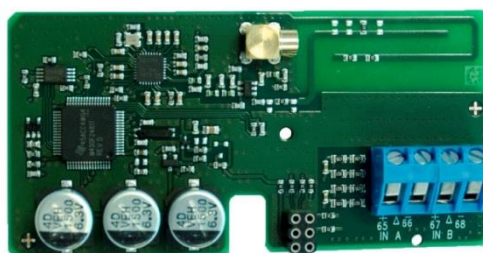
11.2.13 ZigBee + 2 pulse inputs (67-00-60) (PCB 5550-992)

The ZigBee module is mounted direct in the meter and is powered by the meter's supply. The module operates within the 2.4 GHz area and is ZigBee Smart Energy certified. The certification secures that the meter can form part of other ZigBee networks, e.g. reading several meter types from different meter suppliers.
To be able to offer a compact solution the module uses an internal antenna.
See paragraph 9.8 'Pulse inputs VA and VB' – describes how the pulse inputs function.
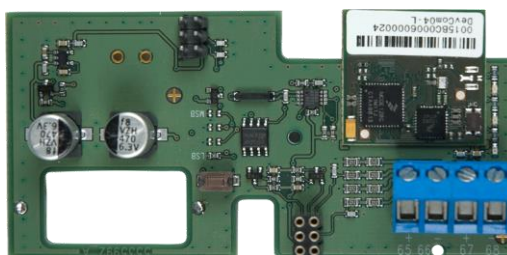
11.2.14 Metasys N2 (RS485) + 2 pulse inputs (VA, VB) (67-00-62) (PCB 5550-1110)

The N2 module is used for data transfer from MULTICAL® 62 heat and cooling meters to an N2 Master in a Johnson Controls System. The N2 module transfers accumulated energy and volume, current temperatures, flow and power from the heat or cooling meter to an N2 Master. N2 Open from Johnson Controls is a widespread and established field bus protocol used within building automation. The N2 module for MULTICAL® 62 ensures simple integration from Kamstrup's water meters to N2 Open based systems. Adress area is 1-255 determined by the last three digits of the meters customer number. More details on Metasys N2 module – see data sheet 5810-925, GB-version.
See paragraph 9.8 concerning the function of pulse inputs VA and VB.
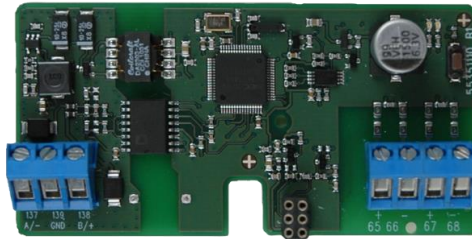
11.2.15 SIOX module (Auto detect Baud rate) (602-00-64) (PCB 5920-193)

SIOX is used for data reading of small and medium size groups of heat meters via cable, the data reading being presented by the main system, e.g. Mcom, Fix or Telefrang. Further information on these systems can be ordered from the supplier in question. Furthermore, a configuration tool is available from Telefrang.

The two-wire serial SIOX bus connection is opto-isolated from the meter and is connected without regard to polarity (i.e. the polarity is unimportant). The module is powered by the SIOX bus. Communication speed is between 300 and 19,200 baud. The module automatically uses the highest possible communication speed. The module converts data from KMP protocol to SIOX-protocol.
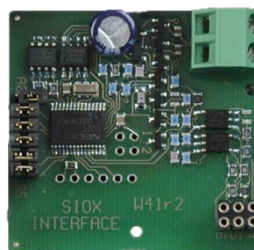
11.2.16 BACnet MS/TP (B-ASC) RS485 + 2 pulse inputs (VA, VB) (67-00-66) (PCB 5550-1240)

The BACnet module is used for data transfer from MULTICAL® 62 water meters into BACnet systems.

The BACnet module transfers Meter number (programmable), Serial number, Accumulated volume flow (V1), Actual flow, Accumulated values (from additional meters with via pulse InA, InB) and Info codes from the water meter to the BACnet system.

BACnet is a widespread and established field bus protocol used within building automation. The BACnet module for MULTICAL® 62 ensures simple integration from Kamstrup's heat, cooling and water meters to BACnet based systems. The Module can be used as master or slave, depending on the used MAC address.

Further details about the BACnet MS/TP module appear from data sheet 5810-1055, GB-version.
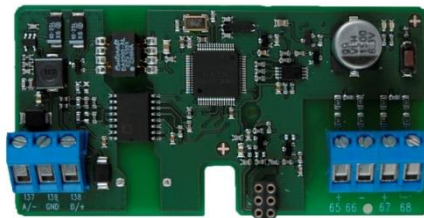
11.2.17 Modbus RS485 RTU* Slave Module with 2 pulse inputs (VA, VB) (67-00-67) (PCB 5550-1277)

* RTU : Remote Terminal Unit

The Modbus base module for MULTICAL® 62 ensures a simple integration from Kamstrup's heat, cooling and water meters in to a Modbus based systems.

Modbus is an open, widespread and well established serial ommunication protocol used within building automation.

Further details about the Modbus MS/TP module appear from data sheet 5810-1253, GB-version.

11.2.18 GSM/GPRS module (GSM6H) (602-00-80)(PCB 5550-1137)

The GSM/GPRS module functions as transparent communication path between reading software and MULTICAL® 62, and is used for data reading. The module includes an external dual-band GSM antenna which must always be used. The module itself includes a line of light emitting diodes indicating signal strength which are very useful during installation.

Further details about the GSM/GPRS module appear from data sheet: 5810-628, GB-version
For mounting, please refer to installation instructions: 5512-687, GB-version.

The GSM/GPRS module (602-00-80) must always be used with the High Power mains supply (230 VAC: 602-00-00-3 and 24 VAC: 602-00-00-4).

11.2.19   3G GSM/GPRS module (GSM8H) (67-00-81) (PCB - 5550-1209)

Like GSM6H, this module functions as transparent communication path between reading software and MULTICAL® 62 and is used for data reading.
However, this module supports both 2G (GSM/GPRS) and 3G (UMTS) which makes it applicable in areas with 3G coverage only.
The module requires an external Antenna, which covers 900 MHz, 1800 MHz and 2100 MHz.
The module itself is fitted with a line of light emitting diodes indicating signal strength which are very useful during installation. Furthermore, it is indicated whether the module is connected to a 2G or a 3G network.
Additional details about the 3G module appear from data sheet 55101058, GB-version.
Regarding mounting we refer to installation instructions 55121122, GB-version.

11.2.20 Ethernet/IP module (IP201) (602-00-82) (PCB 5550-844)

The IP module functions as transparent communication between reading software and MULTICAL® 62 and is used for data reading. The module supports both dynamic and static addressing. This is specified in the order, or selected during subsequent configuration. The module has no built-in security and must, therefore, always be used in connection with a firewall or NAT.

Further details appear from the data sheet, 5810-542 GB-version.
As far as installation is concerned, we refer to installation instructions, 5512-937 GB.

The Ethernet/IP module (602-00-82) must be used together with the High Power mains supply (230 VAC: 602-00-00-3 and 24 VAC: 602-00-00-4).
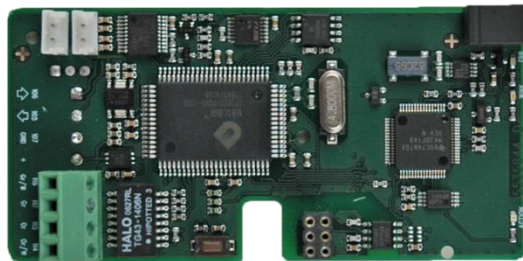
11.2.21 High Power Radio Router + 2 pulse inputs (VA, VB) (602-00-84) (PCB 5550-1116)

The High Power RadioRouter module has built-in router functionality and is thus, optimized to form part of a Kamstrup radio network, the read data being automatically transferred to system software via the network unit RF Concentrator.
Furthermore, the module can be read by Kamstrup's hand-held reading systems,
– e.g. USB Meter Reader and MT Pro.

The RadioRouter module is available for operation in both licence-free and licence demanding frequences permitting a transmitting strength of up to 500 mW. The module is by default fitted with internal antenna, connection for external antenna, and two extra pulse inputs.
See paragraph 9.8 concerning the function of pulse inputs VA and VB.

The High Power RadioRouter module (602-00-84) must be used together with the High Power mains supply (230 VAC: 602-00-00-3 and 24 VAC: 602-00-00-4).
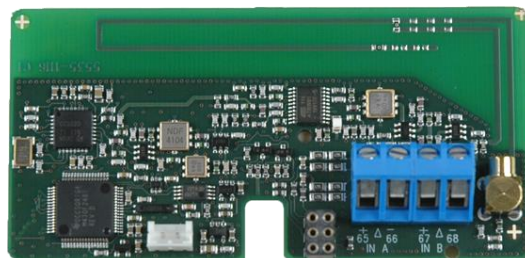
11.3 Retrofitting modules

Both top modules and base modules for MULTICAL® 62 can be supplied separately for retrofitting. The modules are configured and ready for installation from the factory. Some of the modules require individual configuration after installation which is possible by means of METERTOOL.

Top module		Possible configuration after installation
Data output + hourly data logger	5	N/A
M-Bus	7	Primary and secondary M-Bus addresses can be changed via METERTOOL or M-Bus. Furthermore, monthly logger data can be selected instead of yearly logger data via M-bus.
2 pulse output for CE and CV + prog. data logger	B	Configuration of pulse output.
2 pulse outputs for CE and CV	C	Configuration of pulse outputs.

Base module		
Data + pulse inputs	10	Pulse values of VA and VB are changed via METERTOOL.
M-Bus + pulse inputs	20	Pulse values of VA and VB are changed via METERTOOL. Primary and secondary M-Bus addresses can be changed via METERTOOL or M-Bus. Furthermore, monthly logger data can be selected instead of yearly logger data via M-bus.
RadioRouter + pulse inputs	21	Pulse values of VA and VB are changed via METERTOOL.
Prog. data logger + RTC + 4...20 mA inputs + pulse inputs	22	Clock adjustment. Pulse values of VA and VB are changed via METERTOOL.
0/4...20 mA outputs	23	Config data must be programmed into the calculator by means of METERTOOL after retrofitting. Furthermore, all parameters can be changed via METERTOOL.
LonWorks + pulse inputs	24	Pulse values of VA and VB are changed via METERTOOL. All other configurations are made via LonWorks.
Radio + pulse inputs (internal antenna)	25	Pulse values of VA and VB are changed via METERTOOL.
Radio + pulse inputs (connection for external antenna)	26	Pulse values of VA and VB are changed via METERTOOL.
M-Bus module with medium data package + pulse inputs	28	Pulse values of VA and VB are changed via METERTOOL. Primary and secondary M-Bus addresses can be changed via METERTOOL or M-Bus. Furthermore, yearly logger data can be selected instead monthly logger via M-Bus.
M-Bus module with MC-III data package + pulse inputs	29	Pulse values of VA and VB are changed via METERTOOL. Primary and secondary M-Bus addresses can be changed via METERTOOL or M-Bus.
Wireless M-Bus + pulse inputs	30/31/38	Pulse values of VA and VB are changed via METERTOOL
ZigBee 2.4 GHz internal antenna + pulse inputs	60	Pulse values of VA and VB are changed via METERTOOL
Metasys N2 (RS485) + pulse inputs	62	Pulse values of VA and VB are changed via METERTOOL
SIOX module (Auto detect Baud Rate)	64	Baud rate can be set via SIOX-TOOL
BACnet MS/TP + pulse inputs	66	Pulse values of VA and VB are changed via METERTOOL
Modbus RTU + pulse inputs	67	Pulse values of VA and VB are changed via METERTOOL
GSM/GPRS module (GSM6H)	80	APN changed via GSM-TOOL
3G GSM/GPRS module (GSM8H)	81	APN changed via GSM-TOOL
Ethernet/IP module (IP201)	82	IP configuration changes via IP TOOL
High Power Radio Router + pulse inputs	84	Pulse values of VA and VB are changed via METERTOOL

12 Data Communication

12.1 MULTICAL® 62 Data Protocol

Internal data communication in MULTICAL® 62 is based on the Kamstrup Meter Protocol (KMP) which both provides a quick and flexible reading structure and fulfils future requirements to data reliability.

The KMP protocol is used in all Kamstrup consumption meters launched in 2006 and later. The protocol is used for the optical eye and via plug pins for the base module. Thus, base modules with e.g. M-bus interface use the KMP protocol internally and the M-bus protocol externally.

The KMP protocol has been designed to handle point to point communication in a master/slave system (e.g. a bus system) and is used for data reading of Kamstrup consumption meters.

Software and parameter protection
The meter's software is implemented in a ROM and cannot be changed, neither deliberately nor by mistake. The legal parameters cannot be changed via data communication without breaking the legal seal and short circuiting the 'total programming lock'.

Software conformity
Software checksum based on CRC16 is available via data communication and in the display.

Integrity and authenticity of data
All data parameters include type, measuring unit, scaling factor and CRC16 checksum. Every produced meter includes a unique identification number.

Two different formats are used in the communication between master and slave. Either a data frame format or an application acknowledgement format.

- A request from master to slave is always sent in a data frame.

- The response from the slave can either be sent in a data frame or as an application acknowledgement.

The data frame is based on the OSI model using the physical layer, the data link layer and the application layer.

Number of bytes in each field	1	1	1	0-?	2	1
Field designation	Start byte	Destination address	CID	Data	CRC	Stop byte
OSI – layer				Application layer		
		Data link layer				
	Physical layer					

The protocol is based on half duplex serial asynchronous communication with setup: 8 data bits, no parity and 2 stop bits. The data bit rate is 1200 or 2400 baud. CRC16 is used in both request and response.

Data is transferred byte for byte in a binary data format, of which the 8 data bits represent one byte of data.

Byte Stuffing is used for extending the data value range.

12.1.1   MULTICAL® 62 Register IDs for water meter

ID	Register	Description
1003	DATE	Current date (YYMMDD)
68	V1	Volume register V1
84	VA	Input register VA
85	VB	Input register VB
1004	HR	Operating hour counter
113	INFOEVENT	Info event counter
1002	CLOCK	Current hour (hhmmss)
99	INFO	Info code register, current
74	FLOW1	Current flow
123	MAX FLOW1DATE/ÅR	Date of this year's max.
124	MAX FLOW1/ÅR	This year's max. value
125	MIN FLOW1DATE/ÅR	Date of this year's min.
126	MIN FLOW1/ÅR	This year's min. value
138	MAX FLOW1DATE/MÅNED	Date of this month's max.
139	MAX FLOW1/MÅNED	This month's max. value
140	MIN FLOW1DATE/MÅNED	Date of this month's min.
141	MIN FLOW1/MÅNED	This month's min. value
98	XDAY	Target date (reading date)
152	PROG NO	Program no. ABCCCCCC
153	CONFIG NO 1	Config no. DDDEE
168	CONFIG NO 2	Config. no. FFGGMN
1001	SERIE NO	Serial no. (unique number of each meter)
112	METER NO 2	Customer number (8 most significant digits)
1010	METER NO 1	Customer number (8 least significant digits)
114	METER NO VA	Meter no. of VA
104	METER NO VB	Meter no. of VB
1005	METER TYPE	Software edition
154	CHECK SUM 1	Software checksum
157	TOPMODUL ID	ID number of top module
158	BOTMODUL ID	ID number of base module
175	INFOHOUR	Error hour counter
234	IMPINa	l/imp. for VA
235	IMPINb	l/imp. for VB
239	V1HighRes	High resolution volume for input 1

12.1.2   Data protocol

Utilities and other relevant companies who want to develop their own communication driver for the KMP protocol can order a demonstration program in C# (.net based) as well as a detailed protocol description (in English).

12.2 MULTICAL® 62 Communication paths

Physically the possibility of direct communication has been implemented as shown below.

Data communication can be routed internally between modules and calculator via destination addresses.
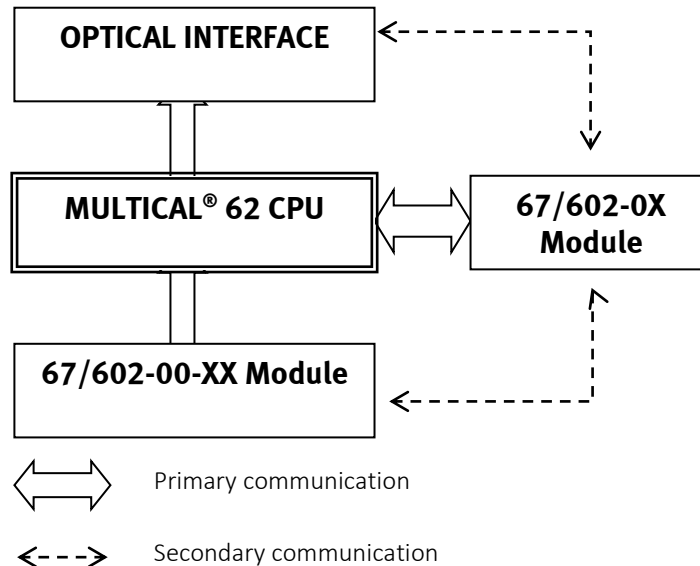
12.3 Optical eye

For data communication, via the optical interface, an optical eye can be used. The optical eye must be located at the front of the calculator, just above the IR-diode as shown on the photo below. Please note that the optical eye contains a very powerful magnet that should be protected with the magnet protector when not in use.

Different variants of the optical eye can be found in the list of accessories (see chapter 3.3.1)

12.3.1 Power saver for the optical eye
The circuit behind the optical eye has been improved by a magnet sensor that only allows current consumption for the optical eye when a magnet (optical head) is attached to the meter.

13 Verification

13.1 High resolution volume for test

If high resolution volume reading (V1HighRes) is needed during test or verification of the meter, it can be initialized as follows:

- Lift the calculator top off the connection base and wait until the display goes blank.

- Activate the sub-key 🔲 and place the calculator top on the connection base again, press the key for approx. 8 seconds, until the display becomes active in HighRes mode.

- The display remains active in HighRes verification mode, until a key is activated or the calculator top is reset.

Example:

V1	V1HighRes
0.001 m3	0.0001 L
0.01 m3	0.001 L
0.1 m3	0.01 L
1 m3	0.1 L

Example of a high resolution volume (V1HighRes) reading:

In the example below the display start value is 573.24 m^3 (v1). When HighRes mode becomes active the display changes to high resolution, and the litre reading appears. Now a pulse value for verification can be entered; here with a value of 20.205.

$$00573.24 \text{ m}^3$$
$$(0057)\ 3.240000 \text{ m}^3$$
$$3240.000 \text{ L}$$
$$+\ 20.205 \text{ L}$$
$$3260.205 \text{ L}$$

Please note: V1HighRes is updated periodically every 10 seconds.

13.1.1   Data reading of high resolution volume

The register 'HighRes' can be data read using ID = 239.

By data reading, the measuring unit and value will appear correctly, irrespective of meter size.

14 METERTOOL for MULTICAL® 62

14.1 Introduction

'**METERTOOL HCW**' (Item no. 6699-724) is configuration software for reconfiguration and test of MULTICAL® 62 **as well as configuration and verification of Kamstrup heat and cooling meters.**

'**LogView HCW**' (Item no. 6699-725) for log data read-out as well as interval logging. The read data can be used for analysis and diagnostic test of the heating installation. Data can be presented as table and graphics, tables can be exported direct to "Windows Office Excel".

14.1.1   System requirements

METERTOOL/LogView requires minimum Windows XP SP3, Windows 7 Home Premium SP1 or newer, as well as Windows Internet Explorer 5.01.

Minimum:	1 GB RAM	**Recommended:**	4 GB RAM
	10 GB free HD space		20 GB free HD space
	Display resolution 1280 x 720		1920 x 1080
	USB		
	Printer installed		

Administrator rights to the PC are needed in order to install and use the programs. They must be installed under the user login of the person, who is to use the programs.

14.1.2   Interface

The following interfaces can be used:

Programming base	type	S7590-014	Total/partial reconfiguration
Programming base	type	6699-360	Configuration/programming hardware for MC602/S6, to be used together with optical eye
Optical eye USB	type	6699-099	Partial reconfiguration
Optical eye COM port	type	6699-102	Partial reconfiguration
USB 3-wire	type	6699-098	Partial reconfiguration via module
Bluetooth Optical Eye	type	6696-005	Partial reconfiguration

Using equipment with Kamstrup USB, the USB driver must be installed before connection.

14.1.3   Installation

Check that system requirements are fulfilled.

Close other open programs before starting the installation.

Download the METERTOOL and/or LogView software from Kamstrup's FTP-server and follow the program's directions through the installation.

During installation of the METERTOOL-program the USB-driver for the optical read-out head is automatically installed if not already existing.

When the installation is completed, the icon "METERTOOL HCW" will appear in the 'All Programs' menu under 'Kamstrup METERTOOL' (or from the menu "start" for Windows XP) and as a link on the desktop. Double-click on link or icon in order to start the program.

14.2 How to use METERTOOL HCW for MULTICAL® 62

14.2.1 General information

It is important to be familiar with the meter's functions before starting programming.

The Kamstrup Software product "METERTOOL HCW" (6699-724) is used for **MULTICAL® 62.**

Before running the program, connect your optical read-out head to your computer and place it in the bottom left-hand corner of the face of the meter, resting on the two plastic studs with the cable pointing downwards.

Start up METERTOOL HCW and click **"Connect".**

METERTOOL HCW responds by showing a picture of MULTICAL® 62 with S/W revision information etc.
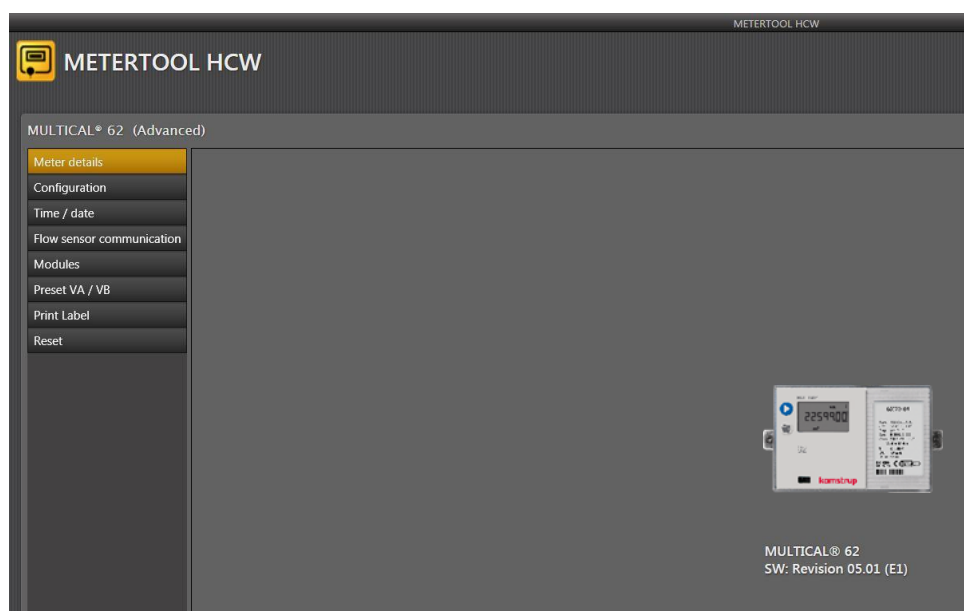
From the menu in the left side of the screen a number of different options are available, depending on mode (Basic/Advanced).

14.2.2 Configuration (Basic/Advanced Mode)

There are two programming modes; 'Partial programming' and 'Total programming'.

'Partial programming' does not allow change of coding which is important to flow calculation, e.g. Type number and Program number.

'Total programming' makes it possible also to change the rest of the values. Programming is only possible if the internal programming lock is closed (short circuit pen 6699-278).

It is not possible to change the serial number, as this is a unique number which is allocated to the meter during production.
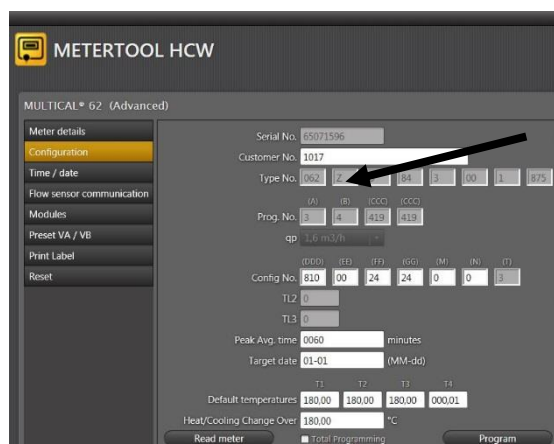
□ = Partial programming
× = Total programming

The program is self-explanatory as to most coding numbers (see text in 'combo-boxes'), further details can be found in the respective paragraphs of the technical description.

14.2.3   Total programming

With METERTOOL HCW running and the PC connected to the meter, via an optical eye, total programming mode can be entered. Break the verification seal and short circuit the TOTAL PROG points on the inside of the calculator top with a short circuit pen (6699-278).
Note! This should be done only by an accredited laboratory since breaking of the verification seal voids the legal verification as well as the factory warranty.

The TOTAL PROG mode is activated by short circuiting the two points on the PCB during programming. When the desired values have been set, METERTOOL HCW terminates programming mode by a reset and the meter returns to normal mode ready for use.

Verification seal   TOTAL PROG-button
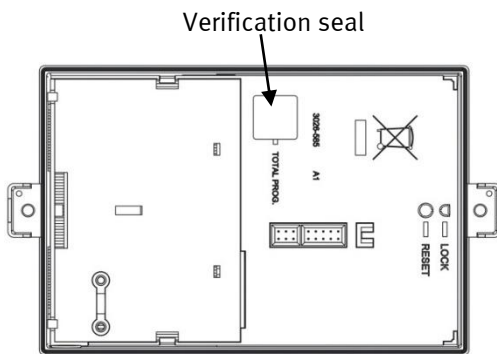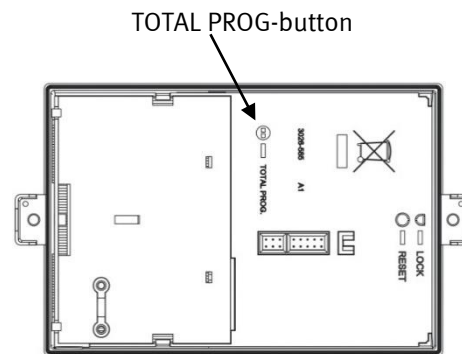
Figure 2   *Figure 3*

14.2.4   Time / date (Basic/Advanced Mode)

In this menu the built-in clock in the meter can be read out and adjusted either manually or by setting the meter to the clock of the PC, on which METERTOOL is running. Having corrected the time, the new time and date can be written to the meter.

14.2.5   Flow sensor Communication on/off (Advanced Mode)

In this menu the digital communication between flow sensor and meter can be turned on or off – see below.

14.2.6   Modules (Advanced Mode)

This is the module setup menu used for configuration of top and base modules.

14.2.7   Preset VA / VB (Advanced Mode)

If the external pulse inputs (VA and/or VB) are used, the preset values can be entered here.

14.2.8   Print label (Advanced Mode)

If the meter configuration has been read prior to entering this menu, the front label can be printed here.

14.2.9   Reset (Advanced Mode)

This menu comprises three different types of reset.

1. Normal Reset

This reset does not zero any registers. The data logger structure implemented in the meter permits logging at intervals: hour, day, month, year. Furthermore, info events and configuration events are logged. In addition to the logs mentioned, which are dedicated to reading, a backup log, which is used in case of voltage failure or reset, is logged. 'Normal Reset' updates the backup log, the meter restarts and restores the configuration parameters.

It may be necessary to perform a 'Normal Reset' if the
configuration parameters are changed as a 'Normal Reset' restores the configuration parameters, which means that the meter registers the changes.

2. Data logger reset

This reset zeroes the meter's data protocols, including yearly, monthly, daily and hourly logs as well as info code and configuration log.

3. Total reset

Resets all registers including historical and legal registers.

14.2.10 Flow sensor communication on/off (Advanced Mode)

"Flow sensor communication" is used for disabling/enabling **data c**ommunication between

MULTICAL® 62 and ULTRAFLOW® 24. "Info code setup" is carried out via optical reading head without breaking the meter's verification sealing.

MULTICAL® 62 can communicate with ULTRAFLOW® 24 in order to receive error messages from the flow meter. This communication is only supported if MULTICAL® 62 and ULTRAFLOW® 24 are direct connected (not via Pulse Transmitter, except for 6699-618 – see below).

In MULTICAL® 62 and ULTRAFLOW® 24 (water meter) communication is also supported if using Pulse Transmitter type 6699-618 is used.
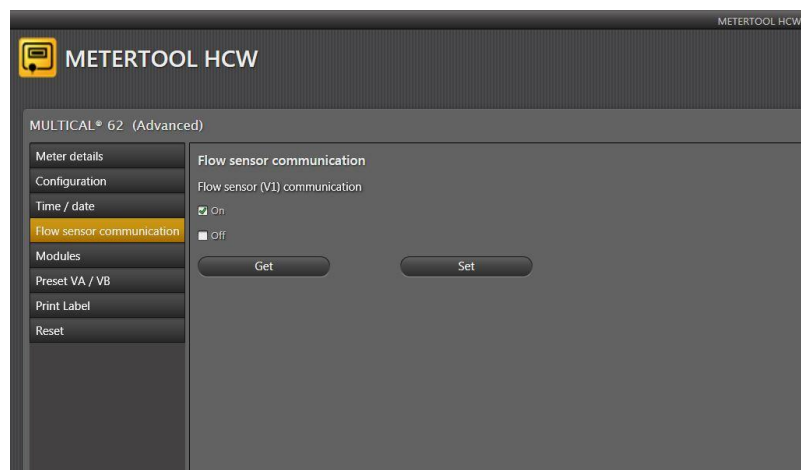
Open 'Flow sensor communication' and activate 'Get' in order to read the meter's setup of communication with flow sensors.

Select the required values for flow sensor 1 and flow sensor 2.
Subsequently, activate 'Set' in order to send the change to the meter.
The meter now supports the selected setup.

NOTE!   If the meter is subsequently configured, the communication setup is reset to standard setup.
          The change of communication setup must, therefore, be repeated.

14.2.11 Settings

By clicking the "Settings" tab the following can be changed:

| Change language | The program language can be changed to 9 different languages: Danish, German, English, French, Spanish, Polish, Czech, Sweedish and Russian. |

| COM port settings | The COM port can be selected manually instead of the automatically selected default setting. |

| Update program | In this menu the METERTOOL HCW program can be updated if a newer version is available on Kamstrup's FTP-server. |

| Update database | In this menu the METERTOOL HCW database can be updated if a newer revision is available on Kamstrup's FTP-server. |

| Backup and restoring data bases | This menu is used for Heat-/Coling meteres to backup and restore verification data as well as equipment data. |

| Install USB driver | This button manually installs the USB driver used for the optical read-out head. |
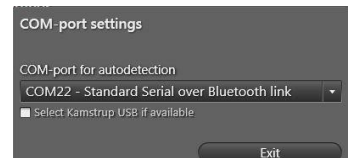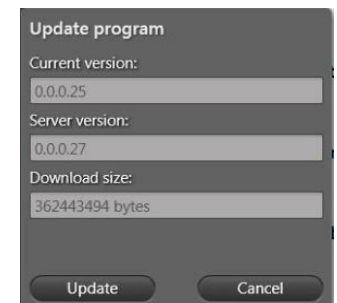
14.2.12 Help button

Contact	The contact button gives you the links to Kamstrup's website and mailbox.
Output	This function shows the latest functions used in the program.
User manual	Links to the user manual for the meter on Kamstrup's website.

14.2.13 About button

Lists the METERTOOL HCW program version and revision numbers as well as all sub-programs, their type numbers and revision numbers for the entire METERTOOL HCW program.

14.2.14 Application

Double-click on link or icon in order to start the program.

Select 'Configuration' in the menu to the left in order to start meter configuration.
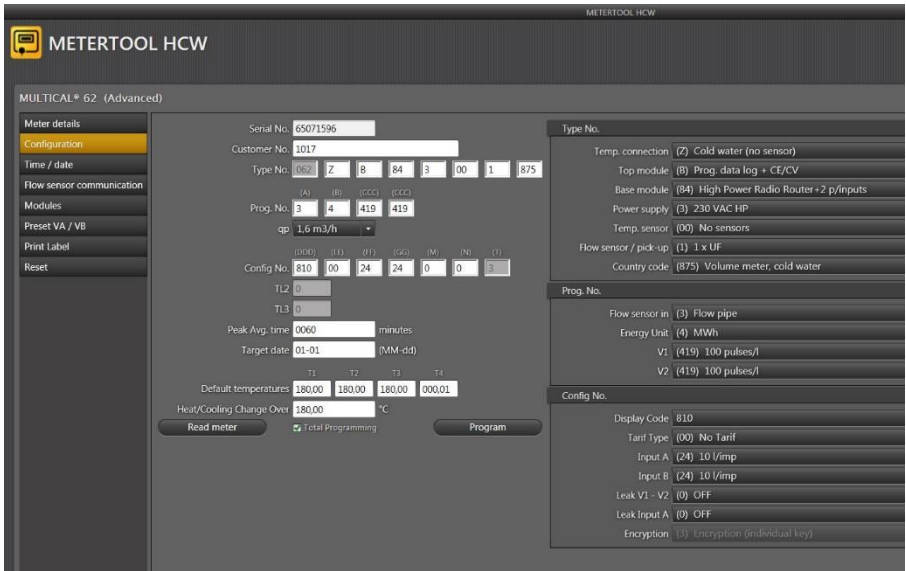
Enter the present configuration by activating 'Read meter'.

Make the required coding changes and activate 'Program' in order to carry out the changes in the meter.

14.3   LogView HCW

14.3.1   Introduction and installation

Regarding 'Introduction', 'Interface' and 'Installation' see paragraph 'Introduction' (since LogView HCW is similar to METERTOOL).

14.3.2   General information

'**LogView HCW**' is used for read-out of logging data from MULTICAL® 62 calculator and top modules (e.g. hourly data) as well as interval logging. The read out data can be used for analysis and diagnostic test of the heating installation. Data can be presented as table and graphics, tables can be exported to 'Windows Office Excel' (ordering no. 6699-725).

For available logging data see paragraph 'Data loggers'.

14.3.3   'Log'

Select the required data function.

Interval Log allows interval reading of current MULTICAL® 62 counts at optional intervals between 1 and 1440 minutes as well as an optional number of repetitions of the reading between 1 and 9999 times.

For read-out of 'current' counts, enter interval: 1 and repetition: 1. Thereby you obtain one 'instantaneous' reading.
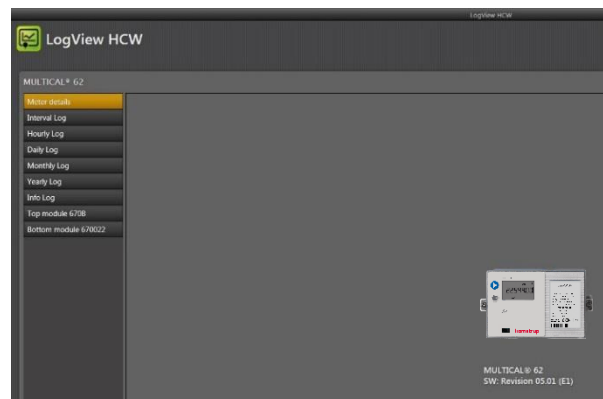
Hourly Log, Daily Log, Monthly Log and Yearly Log allow read-out of data logged by MULTICAL® 62, with optional data period and values.

Info Log allows read-out of the latest 50 info events from MULTICAL® 62, reading includes date and info code of the info event.

14.3.4   'Top Module 670B'

This function makes it possible to read out logging data, which have been logged by and stored in a top module. This will mainly be read-out of e.g. 'Hourly Logging Data'. For other possibilities see paragraph 10.1.1 Top modules.

14.3.5   'Bottom Module 670022'

Is used for reading of logger data collected in base modules.

14.3.6   Help button

Contact   The contact button gives you the links to Kamstrup's website and mailbox.

Output   This function shows the latest functions used in the program.

User manual   Links to the user manual for the meter on Kamstrup's website.

14.3.7   'About' button

Lists the LogViews program version and revision numbers as well as all sub-programs, their type numbers and revision numbers for the entire LogView HCW program.
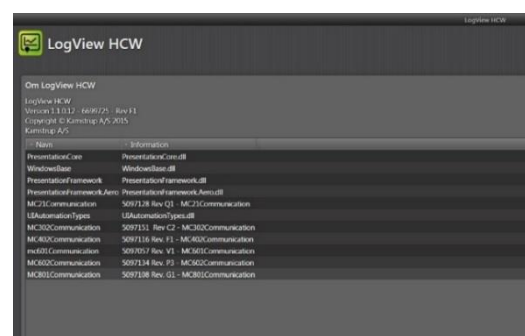
14.3.8   Application

Double-click on link or icon for 'LogView HCW' in order to start the program, and select the required data function.

Meter identification! Click 'connect to meter'

'<u>Daily Data</u>' is used as an example:
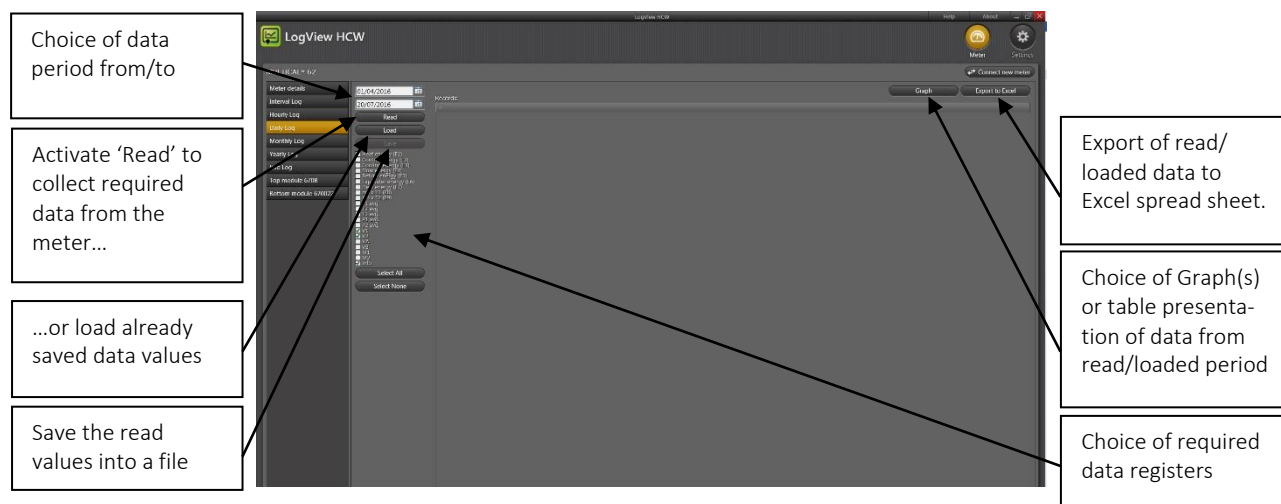
Select the required registers by clicking on the box next to the register name. To read out all data, activate 'Select All' to select all values.

When read-out has been completed the read values can be saved by clicking 'Save'. We recommend to save the read-outs, securing that data can be reopened later for further analysis or documentation.

The values appear in graphs or list form by activating 'Graph'/'Table' (toggle function).

In order to carry out a new data read-out, you just select a new period and new data registers. If the formerly read values are not already saved you will be asked if you want to do so.

Tables can be exported, directly to 'Windows Office Excel' or be printed.

To zoom in, activate zoom and select the area you wish to zoom in.

To zoom out, double-click anywhere on the coordinate system.

To read exact values on the graphs, deselect zoom and let the mouse pointer 'hover' over the point of interest.

15 Approvals

15.1 Type approvals

MULTICAL® 62 has been MID approved on the basis of OIML R49-1:2006 and R 49-2:2006, with FORCE Certification as notified body.
Please contact Kamstrup A/S for further details on type approvals and verification.

15.2 CE-Marking

MULTICAL® 62 is CE-marked in accordance with the following directives:

EMC directive	2004/108/EC
LV directive	2006/95/EC (together with Pulse Transmitter)
PE directive	97/23/EF (DN50…DN80) category 1

15.3 Measuring Instrument Directive (MID)

MULTICAL® 62 is available with CE-marking according to MID (2004/32/EU). The certificates have the following numbers:

B-module:	DK-0200-MI001-016
D-module:	DK-0200-MIQA-001

15.4 Declaration of Conformity

EU Declaration of Conformity

Overensstemmelseserklæring
Déclaration de conformité
Konformitätserklärung
Deklaracja Zgodności
Declaración de conformidad
Declaraţie de conformitate
Atbilstības deklarācija

We / Vi / Nous / Wir / My / Nosotros / Noi / Mēs

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declare under our sole responsibility that the product(s)

Instrument	Type	Type No.	Classes	Type approval reference		From
Heat meter	MULTICAL® 302	302 T	Cl. 2/3, E1, M1/M2	DK-0200-MI004-031		2016
Heat meter	MULTICAL® 402	402-V/W/T	Cl. 2/3, E1, M1	DK-0200-MI004-013		2016
Heat meter	MULTICAL® 403	403-V/W/T	Cl. 2/3, E1, M1/M2	DK-0200-MI004-037		2016
Temperature sensor	PL DS	65-00-0A/B/C/D; 66-00-0F/G; 66-00-0H/M/N/P; 66-00-0Q/J/4; 65-56-4	M1	DK-0200-MI004-002; DK-0200-MI004-036		2016
Flow sensor	ULTRAFLOW® 34 qp 1.5 … 100m³/h; ULTRAFLOW® 54 qp 0.6 … 100 m³/h; qp 150 … 1000 m³/h; ULTRAFLOW® 54 qp 0.6 – 2.5 m³/h	65-3; 65-5; 65-5	Cl. 2/3; M1, E1/E2; Cl. 2/3; M1/M2, E1/E2; Cl. 2/3; M1/M2, E1/E2	DK-0200-MI004-008; DK-0200-MI004-008; DK-0200-MI004-033		2016
Calculator	MULTICAL® 602; MULTICAL® 6L2; MULTICAL® 601	602-A/B/C/D; 6L2-F; 601-F/G/K/L	M1, E1/E2; M1, E1/E2; M1, E1/E2	DK-0200-MI004-020; DK-0200-MI004-020; DK-0200-MI004-009		2016
Water meter	MULTICAL® 21; flowIQ® 2101; flowIQ® 3100; flowIQ® 3100	021; 021; 031 xx A-L, P-W; 031 xx M, N, Q, X, 1-8	Cl. 2, M1, E1/E2; Cl. 2, M1, E1/E2; Cl. 2, M1, E1/E2; Cl. 2, M1, E1/E2	DK-0200-MI001-015; DK-0200-MI001-015; DK-0200-MI001-017; DK-0200-MI001-017		2016
Water meter	MULTICAL® 62	62 Z	Cl. 2, M1, E1, B	DK-0200-MI001-016		2016

are in conformity with the requirements of the following directives:

Measuring Instrument Directive 2014/32/EU
Notified body, Module U: FORCE CERTIFICATION; Note 1

MID: OIML R49:2006; OIML R49:2013; EN 1434-4:2015; EN 1434-4:2007 Welmec 7.2

EMC Directive 2014/30/EU
EN 61000-6-1:2007; EN 61000-6-2:2005; EN 61000-6-3:2007; EN 61000-6-4:2007

Low Voltage Directive 2014/35/EU
EN 61010-1:2010; EN 60950-1:2006; EN 60950-22:2006; EN 62311:2008

Pressure Equipment Directive 2014/68/EU — Table 1 applies

Radio & Telecommunication Terminal equipment Directive (R&TTE) 1999/5/EC
EN 300 220-2 v.2.4.1:2012; EN 301 489-1 v.1.9.2:2011; EN 301 489-3 v.1.5.1:2013; EN 61010-1:2010; EN 60950-1:2006 + A11:2009 + A12:2011 + A1:2010 + A2:2013 + AC:2011; EN 60950-22:2006 + AC 2008; EN 62311:2008

RoHS Directive 2011/65/EU
WEEE Directive 2012/19/EU
Conflict Minerals (CSR)

Kamstrup documents: 5509-016, 5509-045

Table 1

DN sizes in the table applies										
Fluids										
Category	32	25	16	11		25	16			
		493	N/A		493	N/A				
Module		A			A			A2	II	
		Group 2								
Nominal bore	DN25	DN15-DN40	DN15-DN40	DN40-DN50	DN50-DN100	DN50-DN125	DN65-DN100	DN150-DN250	DN300	
Maximum allowable pressure PS										
Notified body, Inspection	N/A						Force Certification (0200), Park Allé 345, DK-2605 Brøndby			
Notified body, Quality system ISO 9001	DNV GL, Tuborg Parkvej 8, 2, DK-2900 Hellerup									

Conformity assessment procedures according to directive 2014/68/EU, Annex III.
Products that fall under Article 4§3 shall not be CE marked according to directive 2014/68/EU.

Notes:
- Note 1: MID applies for meters marked with CE M16 0200
- Note 2: LVD applies for products with 230 VAC power supply
- Note 3: LVD applies when connected to Pulse Transmitter/Divider with 230 VAC power supply
- Note 4: R&TTE applies for products with radio communication

KAMSTRUP A/S
Industrivej 28
DK-8660 Skanderborg
Denmark

Sign.: Viggo Andersen, V.P. Quality group

Order No.:
Document No.: 5518-277
Document date: 2016-07-19　　Replaces: 2016-05-19

TECHNICAL DESCRIPTION

16 Troubleshooting

MULTICAL® 62 with flow sensor ULTRAFLOW® 24 is designed for quick and simple installation as well as long and reliable operation at the water consumer.

Should you, however, experience an operating problem, the table below can be used for troubleshooting.

Repairing the meter, if needed, we recommend only to replace parts like battery and communication modules. Alternatively the whole meter ought to be replaced.

Major repairs must be made by Kamstrup A/S.

Before sending in the sensor for repair or check, please use the error detection table below to help you clarify the possible cause of the problem.

Symptom	Possible reason	Proposal for correction
The display value is not updated	Power supply missing	Change battery or check mains supply
No display function (empty display)	Power supply missing	Change battery or check mains supply. Is there 3.6 VDC on terminals 60(+) and 61 (-)?
If 'info' = 1	Supply voltage has been interrupted	The info code is corrected automatically
No accumulation of volume (m^3)	Read 'info' in the display	Check the error indicated by the info code
If 'info' = 16	Communication error or signal too weak or wrong flow direction	There is air in the flow sensor? Bleed the system and check the meter again. Check that the flow direction matches the arrow on the flow sensor
If 'info' = 2048	Flow sensor programmed with wrong pulse figure	Please contact Kamstrup A/S
If 'info' = 4096	Signal too weak	There is air in the flow sensor? Bleed the system and check the meter again.
If 'info' = 16384	Flow sensor mounted in wrong direction	Check that the flow direction matches the arrow on the flow sensor

17 Disposal

Kamstrup A/S is environmentally certified according to ISO 14001, and as far as possible and as part of our environmental policy we use materials that can be recycled in an environmentally correct way.

Kamstrup A/S has calculated carbon footprint of all meters.
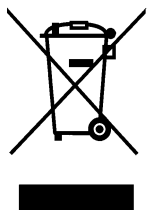
As of August 2005 heat meters from Kamstrup are marked according to the EU directive 2002/96/EEA and the standard EN 50419.

The purpose of marking is to inform that the heat meter cannot be disposed of as ordinary waste.

- **Disposal by Kamstrup A/S**

  Kamstrup accepts worn-out meters for environmentally correct disposal according to previous agreement. The disposal is free of charge to the customer, except for the cost of transportation to Kamstrup A/S.

- **The customer sends for disposal**

  The meters must <u>not</u> be disassembled prior to dispatch. The complete meter is handed in for approved national/local disposal. Enclose a copy of this chapter in order to inform the recipient of the contents.

Please note that lithium cells, and meters containing lithium cells must be shipped as dangerous goods. Please see Kamstrup document 5509-682 *'Shipping of battery powered heat meters and lithium batteries'*

Item	Material	Recommended disposal
Lithium cell in MULTICAL® 62	Lithium and Thionylcloride >UN 3090< D-cell: 4.9 g lithium	Approved deposit of lithium cells
PCBs in MULTICAL® 62 (Remove LCD-display)	Coppered epoxy laminate, components soldered on	PCB scrap for metal recovery
LCD-display	Glass and liquid crystals	Approved processing of LCD-displays
Cable for flow sensor	Copper cable, silicone jacket, FEP insulation	Cable recovery
Transparent top cover	Thermoplastic, PC	Plastic recovery
Black connection base	Thermoplastic, ABS with TPE gaskets	Plastic recovery
Internal cover	Thermoplastic, ABS	Plastic recovery
Other plastic parts, cast moulding	Thermoplastic, PC + 20% GF	Plastic recovery
Meter housing (threaded meter)	DZR brass	Metal recovery
Meter housing (flange meter)	Stainless steel 1.4408	Metal recovery
Signalhousing (top)	Thermoplastic, PC 20% GF	Plastic recovery
Signalhousning (bottom), plug holder	Thermoplastic, PBT 30% GF	Plastic recovery
Clamping plate incl. screws	Stainless steel 1.4301	Metal recovery
Flowpipe, reflector	Thermoplastic, PES 30% GF	Plastic recovery
Reflector plate, mirror, transducer	Stainless steel 1.4305, 1.4306, 1.4401	Metal recovery
Gaskets	EPDM	Plastic recovery
Packing	Environmental cardboard	Cardboard recycling
Packing	Polystyrene	EPS recovery

Please send any questions you may have regarding environmental matters to:

Kamstrup A/S
Att.: Quality and environmental department
Fax.: +45 89 93 10 01
info@kamstrup.dk

18 Documents

	Danish	English	German	SNG
Technical Description	5512-1035	5512-1036	5512-1037	5512-1038
Data Sheet	5810-1034	5810-1035	5810-1036	5810-1038
Installation Guide	5512-1070	5512-1068	5512-1069	5512-1100

Terms and expressions used in this document are explained at www.kamstrup.dk

Think forward

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