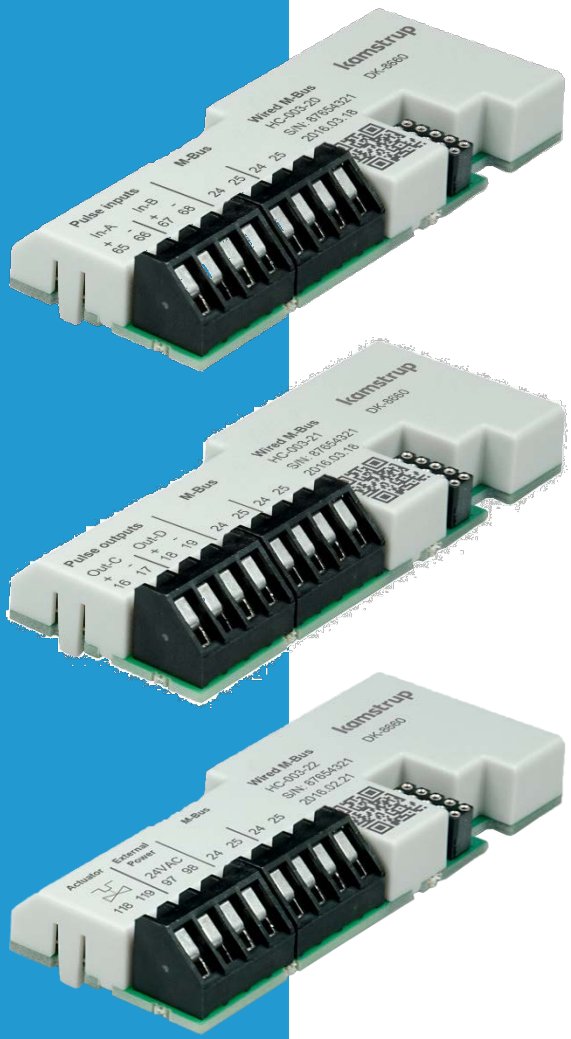
Technical Description

Wired M-Bus for:

MULTICAL® 403

MULTICAL® 603

MULTICAL® 803



Contents

1 Introduction

This document describes the manufacture specific part of the M-Bus communication protocol for the modules HC-003-20, HC-003-21 and HC-003-22 for MULTICAL® 403, MULTICAL® 603 and MULTICAL® 803. It is not intended as a full description of the M-Bus protocol and it is therefore expected that the reader has some knowledge of M-Bus. For a description of the standard we refer to the standard EN-13757:2013

2 Reading loggers from MULTICAL® via M-Bus

The loggers in MULTICAL® 403, MULTICAL® 603 and MULTICAL® 803 can be read out via the M-Bus module.

The reading is in accordance with both the M-Bus standard EN 13757 and the OMS TR02.

Following loggers can be read out:

- Yearly logger
- Monthly logger
- Daily logger
- Minute loggers

Only data defined in the meters data logger profile can be read out via M-Bus.
The logger is defined by the RR code in the energy meter configuration number.

2.1 Requesting logger data

The sequence for reading a logger:

- Select a logger application
- Request logger entries
- Deselect the logger application

2.1.1 Application selection

A logger reading application can be selected using the extended M-Bus application select request (CI=50h or CI=53h).

The application select is transmitted using the SND_UD frame type (C=53h or C=73h).

Optional data bytes can be included after the CI field. They describe which application to select and which block of data should be the first requested.

CI-field	50h
Application select, optional data, byte 1	AX
Application select, optional data, byte 2	BY
Application select, optional data, byte 3	CZ

The chosen application is calculated by doing a summation of the four most significant bits in the optional data bytes (A+B+C), starting from the first optional byte and ending when no more optional data bytes are in the found or when an optional data byte does not contain the maximum number.

The chosen data block is calculated by doing a concatenating the four least significant bits in all the optional data bytes (XYZ), with the first optional byte containing the least significant bits in the block.

Example 1:

CI-field	50h
Application select, optional data, byte 1	F3h
Application select, optional data, byte 2	F4h
Application select, optional data, byte 3	27h

Application 32 (Fh + Fh + 2h = 32d)

Block 1859 (743h = 1859d)

Example 2:

CI-field	50h
Application select, optional data, byte 1	F3h
Application select, optional data, byte 2	D3h
Application select, optional data, byte 3	40h

Application 28 (Fh + Dh = 28d, notice optional data byte 2 is less than 15 and causes the summation to end)

Block 51 (033h = 51d)

2.1.2 Supported applications

Only a few applications are available for selection. If any other application is selected, this is treated as an application reset and the default application is chosen.

The available logger reading applications can be seen in the table below:

Application	Description
31	Readout of MCXX3 logger type 2 (Year log)
32	Readout of MCXX3 logger type 3 (Month log)
33	Readout of MCXX3 logger type 4 (Day log)
34	Readout of MCXX3 logger type 5 (Minute log 1)
35	Readout of MCXX3 logger type 6 (Minute log 2)
36	Readout of MCXX3 logger type 7 (Minute log 3)

2.1.3 Application select timeout

Any request for logger data will extended the timeout with an additional 10 minutes. If no requests for logger data has been sent for 10 minutes, the module automatically returns to the default application, namely reading the standard configured datagram.

2.1.4 Application selection example

Example for selecting the latest entry in the month logger.

SND_UD:	Long frame. Application select for month logger – latest entry.	
	Start character	68h
	Length	07h
	Length	07h
	Start character	68h
	C-field	53h
	A-field	01h
	CI-field	50h
	Application select, optional data, byte 1	F0h
	Application select, optional data, byte 2	F0h
	Application select, optional data, byte 3	20h
	Application select, optional data, byte 4	00h
	Checksum	A4h
	Stop character	16h

2.1.5 Request logger data

Sending a request for user data 2 (REQ_UD2) will return a response with a logger entry (RSP_UD) if a logger reading application have been selected.

The first data record in the response will give information regarding the logger application and the block number. The record will use storage number 0 in the data information block. The data is formatted in the same way as the application selection with a summation of the 4 most significant bits and a concatenation of the lower 4 bits.

Only while a read logger application is in action, the first data record in the response will contains information of the selected logger. This can be used to confirm, that the response contains the requested log data, or if the module is subject to a timeout or other errors.

DIB	Data Information Field Storage Number 0, instantaneous value, 32 bit integer/binary	04h
VIF	Value Information Field Second Extension of VIF-codes	FDh
	Value Information Field Extended 2nd level VIFE code extension table	FDh
	Value Information Field Extended Currently selected application	00h
Data	Application selected, byte 1	AV
	Application selected, byte 2	BX
	Application selected, byte 3	CY
	Application selected, byte 4	DZ

Application = A + B + C + D, Block = ZYXV (bitwise concatenated)

The following data records will contain the logger entry information and they will all use the storage number 1 in the data information block. If the response datagram only contains a single data record with information regarding the application selected, then the logger does not have any log entries (is empty).

2.1.6 Request multiple logger entries

The logger application uses the same functionality for requesting multiple logger entries as used in a multi-datagram response.

The first request after selecting an application will give the logger entry selected. The next request will give the next logger entry backwards in time or the same logger entry, depending on whether the FCB bit was toggled or not. If the FCB bit is toggled, the response contains the next logger entry, otherwise it is a retransmission of the previous logger entry.

Several conditions will cause the block number in the response to become block 0 and thereby the response to contain the latest entry in a log.

Selecting an application with a block number that is out of bounds compared to the logger entries in the meter will give the most recent logger entry. Requesting the next logger entry where the entry is out of bounds compared to the logger entries in the meter will also give the latest logger entry.

2.1.7 Timing requirements of request logger

The module communicate with the meter for every logger entry requested.

The module does not respond to REQ_UD2 with the FCB toggled before the next logger entry is updated from the meter. After application select or request of logger entry, a master can request the next logger entry immediately. The master should however implement a retry-timeout scheme for reading the next logger entry.

The module does not respond to REQ_UD2 while the next logger entry is updated from the meter.

2.2 Logger response example

RSP_UD:	Long frame. Application select for month logger – latest entry.	[hex]
	Start character	68
	Length	9F
	Length	9F
	Start character	68
	C-field	08
	A-field	01
	CI-field, Long Application Header	72
	M-Bus identity, BCD coded LSB first (71003788)	88 37 00 71
	M-Bus manufacturer ID, LSB first (2C2Dh = KAM)	2D 2C
	Version ID	34
	Device Type (04=Heat Meter, Outlet)	04
	Access Number	03
	Status, Temporary error, no flow	10
	Configuration	00 00
	DIF1, storage number 0	04
	VIF1, Application and block data	FD FD 00
	DATA1, Application 32, Block 0	F0 F0 20 00
	DIF2, storage number 1	44
	VIF2, Date and time	6D
	DATA2, Date and time, 1. August 2016	00 20 01 28
	DIF3, storage number 1	44
	VIF3	06
	DATA3	00 00 00 00

	DIF4, storage number 1	44
RSP_UD:	Long frame. Application select for month logger – latest entry.	[hex]
	VIF4	FF 07
	DATA4	00 00 00 00
	DIF5, storage number 1	44
	VIF5	FF 08
	DATA5	00 00 00 00
	DIF6, storage number 1	C4 10
	VIF6	06
	DATA6	00 00 00 00
	DIF7, storage number 1	C4 20
	VIF7	06
	DATA7	00 00 00 00
	DIF8, storage number 1	C4 30
	VIF8	06
	DATA8	00 00 00 00
	DIF9, storage number 1	44
	VIF9	14
	DATA9	00 00 00 00
	DIF10, storage number 1	C4 40
	VIF10	14
	DATA10	00 00 00 00
	DIF11, storage number 1	C4 80 40
	VIF11	14
	DATA11	00 00 00 00
	DIF12, storage number 1	44
	VIF12	22
	DATA12	EA 04 00 00
	DIF13, storage number 1	74
	VIF13	22
	DATA13	00 00 00 00
	DIF14, storage number 1	44
	VIF14	FF 22
	DATA14	00 00 00 00
	DIF15, storage number 1	54
	VIF15	3B
	DATA15	00 00 00 00
	DIF16, storage number 1	52
	VIF16	EC FF 11
	DATA16	00 00
	DIF17, storage number 1	64
	VIF17	3B
	DATA17	00 00 00 00
	DIF18, storage number 1	62
	VIF18	EC FF 11
	DATA18	01 27
	DIF19, storage number 1	54
	VIF19	2D
	DATA19	00 00 00 00
	DIF20, storage number 1	52
	VIF20	EC FF 12
	DATA20	00 00
	DIF21, storage number 1	64
	VIF21	2D

	DATA21	00 00 00 00
RSP_UD:	Long frame. Application select for month logger – latest entry.	[hex]
	DIF22, storage number 1	62
	VIF22	EC FF 12
	DATA22	01 27
	Checksum	25
	Stop character	16h

Note: Looking at the example, the VIF(N) and Data(N) are generic examples of values in the log.
Each VIF(N) has to be interpreted as normal (including VIF extensions) in order to get the value information for the individual Logs.

3 Configuration of meter via the M-Bus network

Following parameters can be sent to the M-Bus module, in order to change the configuration of the MULTICAL®:

- Primary M-Bus address
- M-Bus ID number
- Date and time
- Preset of pulse input A and pulse input B

Selection of the M-Bus module via secondary address or enhanced secondary address, and application select/reset is obtained via SND_UD telegram from the M-Bus Master to the M-Bus module. Selection of device for secondary addressing is made by CI-field = 52h, and application select/reset by CI-field = 50h.

The M-Bus module will also reply with an acknowledgement (ACK) when receiving a set of baud rate telegrams (CI-field = B8h ... BFh), but will ignore the contents, as the M-Bus module is furnished with automatic baud rate detection.

The individual datagram for writing data in the M-Bus module are shown subsequently.

3.1 Setting Primary M-Bus address

A dedicated register in the MULTICAL® is used for storing the primary address. This register may be overwritten with a new M-Bus primary address using the datagram format below.

Start character	68h	
L-field	06h	
L-field	06h	
Start character	68h	
C-field	53h	(FCB=0) or 73h (FCB=1)
A-field	xxh or FDh	
CI-field	51h	
Record	01h	DIF: 1 byte, binary
Address	7Ah	VIF: Address
Primary add.	xxh	XX = 01h .. FAh. For primary address = 1 .. 250
Checksum	xxh	
Stop character	16h	

Note: During the ordering process the primary address for each meter can be specified. Normally it is the last 2-3 digits of the customer number.

3.2 Setting M-Bus ID number

As default the customer number in the MULTICAL® is used as secondary address. The M-Bus ID number may however be changed, using the datagram format below.

Start character	68h	
L-field	09h	
L-field	09h	
Start character	68h	
C-field	53h	(FCB=0) or 73h (FCB=1)
A-field	xxh or FDh	
CI-field	51h	
Record	0Ch	DIF: 4 bytes, 8 digit BCD
Meter No.	79h	VIF: ID number, e.g.: 31672106
ID No. LSB	06 BCD	
ID No.	21 BCD	
ID No.	67 BCD	
ID No. MSB	31 BCD	
Checksum	xxh	
Stop character	16h	

Note: During the ordering process the secondary address for each meter can be specified.

3.3 Setting Date and time

To synchronize the time in the meter towards a main application real time clock, the time and date may be sent to the MULTICAL ® using the datagram format below.

To avoid disturbing the internal loggers, setting the time must be done in due time before or after an hour shift. Typically the date/time is set once each 24 hour.

Start character	68h	
L-field	09h	
L-field	09h	
Start character	68h	
C-field	53h	(FCB=0) or 73h (FCB=1)
A-field	xxh or FDh	
CI-field	51h	
Record	04h	DIF: 4 bytes, compound data type F
Date and time	6Dh	VIF: Date and time, e.g. 02-09-04 13:10 standard time, valid
Date, time LSB	0Ah	IV, 0, MI5, MI4, MI3, MI2, MI1, MI0
Date, time	2Dh	SU, HY1, HY0, H4, H3, H2, H1, H0
Date, time	82h	Y2, Y1, Y0, D4, D3, D2, D1, D0
Date, time MSB	09h	Y6, Y5, Y4, Y3, M3, M2, M1, M0
Checksum	xxh	
Stop character	16h	

As MULTICAL® uses two digits to indicate year (00 .. 99), the M-Bus module always sends information concerning year as 2000 .. 2099 (bit HY1:HY0 always = 01 in ”Date and time record” ”, VIF = 6Dh and DIF = 04h, compound data type F).

3.3.1 Date time interpretation.

A record starting with DIF = 04h, and followed by VIF = 6D h, indicates a 4 byte binary value containing a Time-point stored as a 32 bit "compound data type F".

The 4 byte binary value maps the Date and time-information like this:

Byte \ Bit	7	6	5	4	3	2	1	0
1 (LSB)	IV	R1	m_5	m_4	m_3	m_2	m_1	m_0
2	SU	HY_1	HY_0	H_4	H_3	H_2	H_1	H_0
3	Y_2	Y_1	Y_0	D_4	D_3	D_2	D_1	D_0
4 (MSB)	Y_6	Y_5	Y_4	Y_3	M_3	M_2	M_1	M_0

3.3.1.1 Description of the various bits

Bit name	Description
IV	InValid IV = 0: Date and Time is valid IV = 1: Date and Time is invalid
R1	Reserved. Bit not used, but always = 0
m5, m4, m3, m2, m1, m0	Minutes. m5 is most significant bit. Minute value ranges from 0 to 59
H4, H3, H2, H1, H0	Hours. H4 is most significant bit. Hour value ranges from 0 to 23.
D4, D3, D2, D1, D0	Day. D4 is most significant bit. Day value ranges from 1 to 31.
M3, M2, M1, M0	Month. M3 is most significant bit. Month values ranges from 1 to 12.
Y6, Y5, Y4, Y3, Y2, Y1, Y0	Year within century. Y6 is most significant bit. Year values ranges from 0 to 99.
SU	SUmmer time SU=0: Normal time SU=1: Summer time
HY1, HY0	To get the right Century: HY1,0 = 00: century = 19 HY1,0 = 01: century = 20 HY1,0 = 10: century = 21 HY1,0 = 11: century = 22

Note: See EN13757-3 Annex A "Coding of data records" for details on how to decode the Date/Time data type.

3.4 Preset pulse input A

The Pulse input A volume register may be preset to a certain value, during install of the MULTICAL® meter. Here is normally entered the volume, read from the replaced meter. Change of pules input A volume-value are possible using the datagram format below.

Start character	68h	
L-field	0Ah	VIF: 0,001-1 m³ or kWh
L-field	0Ah	
Start character	68h	
C-field	53h	(FCB=0) or 73h (FCB=1)
A-field	xxh or FDh	
CI-field	51h	
Record	84h	DIF: 4 bytes binary, DIFE follows
Pulse counter A	40h	DIFE: sub unit number: LSB = 1 -» Device = 1, Volume on pulse input A
Volume	14h	VIF: volume in 0,01 m³ (= 10 l), e.g 001258,73 m³
vol. A LSB	B1h	
vol. A	EBh	
vol. A	01h	
vol. A MSB	00h	
Checksum	xxh	
Stop character	16h	

3.5 Preset pulse input B

The Pulse input B volume register may be preset to a certain value, during install of the MULTICAL® meter. Here is normally entered the volume, read from the replaced meter. Change of pules input B volume-value are possible using the datagram format below.

Start character	68h	
L-field	0Bh	VIF: 0,001-1 m³ or kWh
L-field	0Bh	
Start character	68h	
C-field	53h	(FCB=0) or 73h (FCB=1)
A-field	xxh or FDh	
CI-field	51h	
Record	84h	DIF: 4 bytes binary, DIFE follows
Pulse counter B	80h	DIFE: sub unit number: LSB = 0, DIFE follows
	40h	DIFE: sub unit number: MSB = -» Device = 1, Volume on pulse input B
Volume	14h	VIF: volume in 0,01 m³ (= 10 l), e.g. 000732,94 m³
vol. B LSB	4Eh	
vol. B	1Eh	
vol. B	01h	
vol. B MSB	00h	
Checksum	xxh	
Stop character	16h	

3.6 Application reset

After reading logs and wanting to select the default datagram reading of the module, the M-Bus application protocol layer may be reset, using the datagram format below.

Start character	68h	
L-field	04h	
L-field	04h	
Start character	68h	
C-field	53h	(FCB=0) or 73h (FCB=1)
A-field	xxh or FDh	
CI-field	50h	
Sub code	00h	Application Reset sub code, not interpreted by the M-Bus module.
Checksum	xxh	
Stop character	16h	

4 Protocol

When using M-Bus Masters and/or reading software of another manufacturer, the same commands must be used. The M-Bus modules only support commands stated in this description.

As the datagram is configurable to match various applications the actual datagram coding depends on the datagram chosen. Furthermore the content of the datagram may vary, depending of the meter type, e.g. the cooling energy E3 will normally not be available in the datagram from a heat meter. For further details please see the document Logger Profiles and Datagrams" document number 5512-2245.

4.1 RSP_UD data MULTICAL® 403/603/803 using Kamstrup specified VIFE

Complete description of reply from the M-Bus module (RSP_UD) on request from M-Bus Master (REQ_UD2):

DIF = Data Information Field, DIFE = DIF Extension
VIF = Value Information Field, VIFE = VIF Extension

RSP_UD: Standard profile yearly target data, shown for a Heat/Cooling energy meter.

Byte	Text	Value	Description	
1	Start	68 h		
2	L-field	C9 h	Length 201 bytes	
3	L-field	C9 h	Length 201 bytes	
4	Start	68 h		
5	C-field	08 h	Code for RSP_UD	
6	A-field	01 h	Slave address (e.g. address = 1)	
7	CI-field	72 h	Code for variable data structure with LSB first (mode 1)	
8	ID-no.	70 BCD	e.g.: ID no. = 71000270	**Data header start**
9	ID-no.	02 BCD		
10	ID-no.	00 BCD		
11	ID-no.	71 BCD		
12	Manufac.	2D h	ID for Kamstrup A/S (KAM)	
13	Manufac.	2C h		
14	Version	xx h	34h = MULTICAL® 403 35h = MULTICAL® 603 3Dh = MULTICAL® 603M 39h = MULTICAL® 803 3Eh = MULTICAL® 803M	
15	Device ID	xx h	04h = Heat (volume measured at outlet) 0Ah = Cooling (volume measured at outlet) 0Bh = Cooling (volume measured at inlet) 0Ch = Heat (volume measured at inlet) 0Dh = Heat / Cooling	
16	Access	xx h	Increments after each RSP_UD. xx=00 after reset.	
17	Status	xx h	Error message. xx=00 no error. See text.	
18	Configuration	00 h	Not used	
19	Configuration	00 h	Not used	**Data header end**
20	**Record**	04 h	DIF: 4 bytes binary	
21	Heat energy E1	06 h	VIF: 06 h for Kwh	
22		86 h	e.g.: 00002086h = 8326	
23		20 h		
24		00 h		
25		00 h		

26	**Record**	04 h	DIF: 4 bytes binary
27	Cooling energy E3	86 h	VIF: 06h for Kwh + extension
28		FF h	VIFE: 7Fh + extension: The following VIFE and data are manufacturer specific
29		02 h	VIFE: for Kamstrup Cooling Energy (E3)
30		xx h	
31		xx h	
32		xx h	
33		xx h	
34	**Record**	04 h	DIF: 4 Bytes binary
35	Energy E8 (m^3*T1)	FF h	VIF: 7Fh + extension: The following VIFE and data are manufacturer specific
36		07 h	VIFE: for Kamstrup m^3°C (E8)
37		7F h	e.g. 0000767Fh = 30335
38		76 h	
39		00 h	
40		00 h	
41	**Record**	04 h	DIF: 4 Bytes binary
42	Energy E9 (m^3*T2)	FF h	VIF: 7Fh + extension: The following VIFE and data are manufacturer specific
43		08 h	VIFE: for Kamstrup m^3°C (E9)
44		CA h	e.g. 000025CAh = 9674
45		25 h	
46		00 h	
47		00 h	
48	**Record**	04 h	DIF: 4 bytes binary
49	Volume V1	13 h	VIF: 13h for 1 liter resolution
50		23 h	00007E23h = 32291 liters
51		7E h	
52		00 h	
53		00 h	
54	**Record**	84 h	DIF: 4 bytes binary + extension
55	Pulse input A	40 h	DIFE: sub unit number: LSB = 1 -» Device = 1, Volume on pulse input A
56		14 h	Volume 10 [l] , m^3 *10^{-2}
57		34 h	010434h = 66612 (10l) = 666,12 m^3
58		04 h	
59		01 h	
60		00 h	
61	**Record**	84 h	DIF: 4 bytes binary + extension
62	Pulse input B	80 h	DIFE: sub unit number: LSB = 0 + extension
63		40 h	DIFE: sub unit number: MSB = 1 -» Device = 2, Volume on pulse input B
64		14 h	Volume 10 [l] , m^3 *10^{-2}
65		15 h	021115h = 135445 (10l) = 1354,45 m^3
66		11 h	
67		02 h	
68		00 h	
69	**Record**	04 h	DIF: 4 bytes binary
70	Hour counter	22 h	VIF: 22h for Hour counter
71		28 h	00000528h = 1320 Hours
72		05 h	
73		00 h	
74		00 h	

75	**Record**	34 h	DIF: 4 bytes binary in Error state
76	Error hour counter	22 h	VIF: 22h for Hour Counter
77		CD h	000005CD = 1485 Hours
78		05 h	
79		00 h	
80		00 h	
81	**Record**	02 h	DIF: 2 bytes binary
82	Inlet temp. T1	59 h	VIF: 59h for Flow Temperature in 10^{-2} °C
83		BD h	22BDh = 8893 -» 88.93 °C
84		22 h	
85	**Record**	02 h	DIF: 2 bytes binary
86	Outlet temp. T2	5D h	VIF: 5Dh for Return Temperature in 10^{-2} °C
87		AE h	01AEh = 430 -» 4.30 °C
88		01 h	
89	**Record**	02 h	DIF: 2 bytes binary
90	Diff. temp. T1-T2	61 h	VIF: 61h Temperature Difference in 10^{-2} °K
91		0F h	210Fh = 8463 -» 84.63 °K
92		21 h	
93	**Record**	04 h	DIF: 4 bytes binary
94	Actual power	2D h	VIF: 2Dh for Power in 10^2 W (0.1 kW)
95		12 h	0112h = 274 -» 27.4 kW
96		01 h	
97		00 h	
98		00 h	
99	**Record**	14 h	DIF: 4 bytes binary, Maximum value
100	Max power this month	2D h	VIF: 2Dh for Power in 10^2 W (0.1 kW)
101		AB h	02AB = 683 -» 68.3 kW
102		02 h	
103		00 h	
104		00 h	
105	**Record**	04 h	DIF: 4 bytes binary
106	Actual Flow	3B h	VIF: 3Bh for Volume Flow in 10^{-3} m^3/h
107		59 h	0159h = 345 l/h
108		01 h	
109		00 h	
110		00 h	
111	**Record**	14 h	DIF: 4 bytes binary, Maximum value
112	Max flow this month	3B h	VIF: 3Bh for Volume Flow in 10^{-3} m^3/h
113		6A h	016A = 362 l/h
114		01 h	
115		00 h	
116		00 h	
117	**Record**	04 h	DIF: 4 bytes binary
118	Info	FF h	VIF: 7Fh + extension: The following VIFE and data are manufacturer specific
119		22 h	VIFE: for Kamstrup MCxx3 Info code
120		00 h	0100 h = 256 -» Air is detected in flow sensor
121		01 h	
122		00 h	
123		00 h	
124	**Record**	04 h	DIF: 4 bytes binary
125	Date/Time	6D h	VIF: 6Dh for Time point: Time and Date
126		17 h	Bits meaning: IV,R,Mi5,4,3,2,1,0: 17h 0,0, 1,0,0,1,1,1

			IV = 0 -» Valid time R = 0, Reserved (Not used) Mi5,4,3,2,1,0 = 17h -» Minute = 23
127		2C h	Bits meaning: SU,HY1,0,H4,3,2,1,0: 2C h 0, 0 ,1, 0, 1,1,0,0 SU = 0 -» Normal time (1 means Summer time) HY1,0 = 1 -» Millennium = 1, (1900 +100 = 2000) H4,3,2,1,0 = 0Ch -» Hour = 12
128		15 h	Bits meaning: Y2,1,0, D4,3,2,1,0 15 h 0,0,0, 1,0,1,0,1 Y2,1,0 = 000B D4,3,2,1,0 = 15h -» Date = 21
129		26 h	Bits meaning: Y6,5,4,3,M3,2,1,0 16 h 0 ,0,1,0, 0,1,1,0 Y6,5,4,3 = 0010B Y6,5,4,3,2,1,0 = 0010000B = 10h -» Year = 16 (2016) M3,2,1,0 = 06h -» Month = 6
130	**Record**	44 h	DIF: 4 bytes binary, historic (Storage 1)
131	Heat energy E1, Target	06 h	VIF: 06 h for Kwh
132		86 h	2086h = 8326 -»8326 Kwh
133		20 h	
134		00 h	
135		00 h	
136	**Record**	44H	DIF: 4 bytes binary, historic (Storage 1)
137	Cooling energy E3, Target	86 h	VIF: 06 h for Kwh + extension
138		FF h	VIFE: 7Fh + extension: The following VIFE and data are manufacturer specific
139		02 h	VIFE: for Kamstrup Cooling Energy (E3)
140		D1 h	000212D1h = 135889 kwh
141		12 h	
142		02 h	
143		00 h	
144	**Record**	44 h	DIF: 4 bytes binary, historic (Storage 1)
145	Energy E8 (m^3*T1), Target	FF h	VIFE: 7Fh + extension: The following VIFE and data are manufacturer specific
146		07 h	VIFE: for Kamstrup m^3°C (E8)
147		00 h	
148		00 h	
149		00 h	
150		00 h	
151	**Record**	44 h	DIF: 4 bytes binary, historic (Storage 1)
152	Energy E9 (m^3*T2),Target	FF h	VIFE: 7Fh + extension: The following VIFE and data are manufacturer specific
153		08 h	VIFE: for Kamstrup m^3°C (E9)
154		00 h	
155		00 h	
156		00 h	
157		00 h	
158	**Record**	44 h	DIF: 4 bytes binary, historic (Storage 1)
159	Volume V1, Target	13 h	VIF: 13h for Volume $m^3 * 10^{-3}$
160		23 h	7E23h = 32291 l
161		7E h	
162		00 h	
163		00 h	

164	**Record**	C4 h	DIF: 4 bytes binary, historic (Storage 1) + DIFE follows
165	Pulse input A, Target	40 h	DIFE: sub unit number: LSB = 1 -» Device = 1, Volume on pulse input A
166		14 h	VIF: 14h for $m^3 * 10^{-2}$ (10 l)
167		18 h	010418h = 66584 (10 l) = 665,84 m^3
168		04 h	
169		01 h	
170		00 h	
171	**Record**	C4 h	DIF: 4 bytes binary, historic (Storage 1) + Extension
172	Pulse input B, Target	80 h	DIFE: sub unit number: LSB = 0, DIFE follows
173		40 h	DIFE: sub unit number: MSB = 1 -» Device = 2, Volume on pulse input B
174		14 h	VIF: 14h for $m^3 * 10^{-2}$ (10 l)
175		33 h	021033h = 135219 (10 l) 1352,19 m^3
176		10 h	
177		02 h	
178		00 h	
179	**Record**	54 h	DIF: 4 bytes binary, historic (Storage 1), max. value
180	Max.power this year, Target	2D h	VIF: 2D for kW $*10^{-1}$ (100 W)
181		05 h	0001FE05 = 130565 -»13056,5 kW
182		FE h	
183		01 h	
184		00 h	
185	**Record**	54 h	DIF: 4 bytes binary, historic (Storage 1), max. value
186	Max. flow this year, Target	3B h	VIF: 3Bh for flow l/h
187		34 h	02234h = 8756 l/h
188		22 h	
189		00 h	
190		00 h	
191	**Record**	42 h	DIF: 2 bytes binary, historic (Storage 1),
192	Target Date	6C h	VIF: 6Ch for Date
193		15 h	Bits Meaning: Y2,1,0, D4,3,2,1,0 Y2,1,0 = 000B D4,3,2,1,0 = 15h -» Date = 21
194		26 h	Bits Meaning: Y6,5,4,3, M3,2,1,0 Y6,5,4,3 = 0010B (02h) Y6,5,4,3,2,1,0 = 0010000B = 10h -» Year = 16 (2016) M3,2,1,0 = 6 -» Month = 6
195	**Record**	02 h	DIF: 2 bytes binary
196	Meter Type	FF h	VIF: 7Fh + extension: The following VIFE and data are manufacturer specific
197		1x h	1A: Kamstrup designation for MC403 1B: Kamstrup designation for MC 603 1C: Kamstrup designation for MC 803 1D: Kamstrup designation for MC 603M 1E: Kamstrup designation for MC 803M
198		0x h	01: Heat meter 02: Heat/cooling 03: Cooling. 04: Volume cold 05: Volume warm
199		1A h	
200	**Record**	0C h	DIF: 4 bytes as 8 Digit BCD
201	Meter Serial number	78 h	VIF: 78h for Serial Number
202		70 h	71000270
203		02 h	

204		00 h	
205		71 h	
206	**Record**	04 h	DIF: 4 bytes binary
207	Module configuration	FF h	VIF: 7Fh + extension: The following VIFE and data are manufacturer specific
208		16 h	VIFE: for Kamstrup Module type and Config
209		E5 h	001E84E5h = 2000101
210		84 h	20: Pulse input 00: Default configuration 101: Standard Profile Yearly Target Data
211		1E h	
212		00 h	
213	**Record**	04 h	DIF: 4 bytes binary
214	Module SW version	FF h	VIF: 7Fh + extension: The following VIFE and data are manufacturer specific
215		17 h	VIFE: for Kamstrup Module SW number and revision
216		31 h	00B4D431h = 11850801 1185: software number 0801: software revision H1 08: software revision letter H (01=A, 02=B ,..., 08=H,..) 01: software revision number
217		D4 h	
218		B4 h	
219		00 h	
220	Checksum	xx h	
221	Stop	16 h	

Note: A target value may read as zero, until passing the set target date.

4.2 RSP_SKE response from MULTICAL® 403/603/803

Reply from the M-Bus module (RSP_SKE) on request for communication status from M-Bus Master (REQ_SKE):

RSP_SKE:			
	Start	10h	
	C-field	0B h	Code for RSP_SKE (ACD bit and DFC bit is always = 0)
	A-field	6A h	Slave address (e.g. address = 106)
	Checksum	xx h	
	Stop	16 h	

The ACD (Access Demand) and DFC (Data Flow Control) status bits (bit 5 and bit 4 respectively) in the C-field will always be = 0 in the reply, which means that the M-Bus module does not have any time-critical (alarm) data to send and has no buffer overflow, as the M-Bus module does not support time-critical data (alarm protocol). But the (empty) RSP_SKE reply to REQ_SKE request ensures, the M-Bus module will function in M-Bus systems with other M-Bus modules supporting time-critical data (alarm protocol) and using communication status bit.

4.3 Data header in RSP_UD

Data	Value	Type	Description
ID-NO	xxh	A	M-Bus ID number ∗ 10^1 / M-Bus ID number ∗ 10^0
ID-NO	xxh	A	M-Bus ID number ∗ 10^3 / M-Bus ID number ∗ 10^2
ID-NO	xxh	A	M-Bus ID number ∗ 10^5 / M-Bus ID number ∗ 10^4
ID-NO	xxh	A	M-Bus ID number ∗ 10^7 / M-Bus ID number ∗ 10^6
MANUFACTURER	00101101	C	Manufacturer Id 2D [ascii “K” - 64]∗32∗32+[ascii “A” – 64]∗32+
MANUFACTURER	00101100	C	Manufacturer Id 2C [ascii “M” - 64] ISO 60870 standard
VERSION ID	34h	C	M-Bus version ID for MC 403
DEVICE TYPE ID	xxh	C	04h = Heat (volume measured at outlet) 0Ch = Heat (volume measured at inlet) 0Ah = Cooling (volume measured at outlet) 0Bh = Cooling (volume measured at inlet) 0Dh = Heat / Cooling 06h = Volume warm 16h = Volume cold
ACCESS NO	xxh	C	Counts 1 up for each data transmission to M-Bus Master
STATUS	xxh	C	00h = No errors 08h = One or more permanent errors 10h = One or more temporary errors 18h = One or more permanent and temporary errors at the same time
ENCRYPTION CONFIGURATION	00h	C	Encryption not used in Wired M-Bus
ENCRYPTION CONFIGURATION	00h	C	Encryption not used in Wired M-Bus

4.4 Table of common used VIF and DIF

The VIF codes contain both unit and scaling factor for the record value. The VIF codes for energy, volume, flow and power will, as far as possible, reflect the display reading in the meter regarding to the unit, decimal point and number of decimals. However this might not always be true and therefore the reading system should also be able to select the unit manually. The VIF codes for these data values will vary depending on the configuration of the MULTICAL®. The VIF code can under some circumstances change during the meters life time, this happens if the consumption gets too big to send out using the old VIF coding.

The majority of Kamstrup DIF and VIF codes are listed below.

DIF	VIF	KMP ID	Register Name	Data Type	Unit	Comma location
04	05	60	Heat energy E1	Int4	kWh	*1 dec
04	05	60	Heat energy E1	Int4	MWh	*4 dec
04	06	60	Heat energy E1	Int4	kWh	*0 dec
04	06	60	Heat energy E1	Int4	MWh	*3 dec
04	07	60	Heat energy E1	Int4	MWh	*2 dec
04	0E	60	Heat energy E1	Int4	GJ	*3 dec
04	0F	60	Heat energy E1	Int4	GJ	*2 dec
04	FB00	60	Heat energy E1	Int4	MWh	*1 dec
04	FB01	60	Heat energy E1	Int4	MWh	*0 dec
04	FB08	60	Heat energy E1	Int4	GJ	*1 dec
04	FB09	60	Heat energy E1	Int4	GJ	*0 dec
04	FB0C	60	Heat energy E1	Int4	Gcal	*4 dec
04	FB0D	60	Heat energy E1	Int4	Gcal	*3 dec
04	FB0E	60	Heat energy E1	Int4	Gcal	*2 dec
04	FB0F	60	Heat energy E1	Int4	Gcal	*1 dec
04	85FF03	61	Inlet energy E4	Int4	kWh	*1 dec
04	85FF03	61	Inlet energy E4	Int4	MWh	*4 dec
04	86FF03	61	Inlet energy E4	Int4	kWh	*0 dec
04	86FF03	61	Inlet energy E4	Int4	MWh	*3 dec
04	87FF03	61	Inlet energy E4	Int4	MWh	*2 dec
04	8EFF03	61	Inlet energy E4	Int4	GJ	*3 dec
04	8FFF03	61	Inlet energy E4	Int4	GJ	*2 dec
04	FB80FF03	61	Inlet energy E4	Int4	MWh	*1 dec
04	FB81FF03	61	Inlet energy E4	Int4	MWh	*0 dec
04	FB88FF03	61	Inlet energy E4	Int4	GJ	*1 dec
04	FB89FF03	61	Inlet energy E4	Int4	GJ	*0 dec
04	FB8CFF03	61	Inlet energy E4	Int4	Gcal	*4 dec
04	FB8DFF03	61	Inlet energy E4	Int4	Gcal	*3 dec
04	FB8EFF03	61	Inlet energy E4	Int4	Gcal	*2 dec
04	FB8FFF03	61	Inlet energy E4	Int4	Gcal	*1 dec
04	85FF04	62	Outlet energy E5	Int4	kWh	*1 dec
04	85FF04	62	Outlet energy E5	Int4	MWh	*4 dec
04	86FF04	62	Outlet energy E5	Int4	kWh	*0 dec
04	86FF04	62	Outlet energy E5	Int4	MWh	*3 dec

04	87FF04	62	Outlet energy E5	Int4	MWh	*2 dec
04	8EFF04	62	Outlet energy E5	Int4	GJ	*3 dec
04	8FFF04	62	Outlet energy E5	Int4	GJ	*2 dec
04	FB80FF04	62	Outlet energy E5	Int4	MWh	*1 dec
04	FB81FF04	62	Outlet energy E5	Int4	MWh	*0 dec
04	FB88FF04	62	Outlet energy E5	Int4	GJ	*1 dec
04	FB89FF04	62	Outlet energy E5	Int4	GJ	*0 dec
04	FB8CFF04	62	Outlet energy E5	Int4	Gcal	*4 dec
04	FB8DFF04	62	Outlet energy E5	Int4	Gcal	*3 dec
04	FB8EFF04	62	Outlet energy E5	Int4	Gcal	*2 dec
04	FB8FFF04	62	Outlet energy E5	Int4	Gcal	*1 dec
04	05	63	Cooling energy E3	Int4	kWh	*1 dec
04	05	63	Cooling energy E3	Int4	MWh	*4 dec
04	06	63	Cooling energy E3	Int4	kWh	*0 dec
04	06	63	Cooling energy E3	Int4	MWh	*3 dec
04	07	63	Cooling energy E3	Int4	MWh	*2 dec
04	0E	63	Cooling energy E3	Int4	GJ	*3 dec
04	0F	63	Cooling energy E3	Int4	GJ	*2 dec
04	853C	63	Cooling energy E3_HC	Int4	kWh	*1 dec
04	853C	63	Cooling energy E3_HC	Int4	MWh	*4 dec
04	85FF02	63	Cooling energy E3_HC	Int4	kWh	*1 dec
04	85FF02	63	Cooling energy E3_HC	Int4	MWh	*4 dec
04	863C	63	Cooling energy E3_HC	Int4	kWh	*0 dec
04	863C	63	Cooling energy E3_HC	Int4	MWh	*3 dec
04	86FF02	63	Cooling energy E3_HC	Int4	kWh	*0 dec
04	86FF02	63	Cooling energy E3_HC	Int4	MWh	*3 dec
04	873C	63	Cooling energy E3_HC	Int4	MWh	*2 dec
04	87FF02	63	Cooling energy E3_HC	Int4	MWh	*2 dec
04	8E3C	63	Cooling energy E3_HC	Int4	GJ	*3 dec
04	8EFF02	63	Cooling energy E3_HC	Int4	GJ	*3 dec
04	8F3C	63	Cooling energy E3_HC	Int4	GJ	*2 dec
04	8FFF02	63	Cooling energy E3_HC	Int4	GJ	*2 dec
04	FB00	63	Cooling energy E3	Int4	MWh	*1 dec
04	FB01	63	Cooling energy E3	Int4	MWh	*0 dec
04	FB08	63	Cooling energy E3	Int4	GJ	*1 dec
04	FB09	63	Cooling energy E3	Int4	GJ	*0 dec
04	FB0C	63	Cooling energy E3	Int4	Gcal	*4 dec
04	FB0D	63	Cooling energy E3	Int4	Gcal	*3 dec
04	FB0E	63	Cooling energy E3	Int4	Gcal	*2 dec
04	FB0F	63	Cooling energy E3	Int4	Gcal	*1 dec
04	FB803C	63	Cooling energy E3_HC	Int4	MWh	*1 dec
04	FB80FF02	63	Cooling energy E3_HC	Int4	MWh	*1 dec
04	FB813C	63	Cooling energy E3_HC	Int4	MWh	*0 dec
04	FB81FF02	63	Cooling energy E3_HC	Int4	MWh	*0 dec
04	FB883C	63	Cooling energy E3_HC	Int4	GJ	*1 dec
04	FB88FF02	63	Cooling energy E3_HC	Int4	GJ	*1 dec

04	FB893C	63	Cooling energy E3_HC	Int4	GJ	*0 dec
04	FB89FF02	63	Cooling energy E3_HC	Int4	GJ	*0 dec
04	FB8C3C	63	Cooling energy E3_HC	Int4	Gcal	*4 dec
04	FB8CFF02	63	Cooling energy E3_HC	Int4	Gcal	*4 dec
04	FB8D3C	63	Cooling energy E3_HC	Int4	Gcal	*3 dec
04	FB8DFF02	63	Cooling energy E3_HC	Int4	Gcal	*3 dec
04	FB8E3C	63	Cooling energy E3_HC	Int4	Gcal	*2 dec
04	FB8EFF02	63	Cooling energy E3_HC	Int4	Gcal	*2 dec
04	FB8F3C	63	Cooling energy E3_HC	Int4	Gcal	*1 dec
04	FB8FFF02	63	Cooling energy E3_HC	Int4	Gcal	*1 dec
8410	05	64	Tariff TA2	Int4	kWh	*1 dec
8410	05	64	Tariff TA2	Int4	MWh	*4 dec
8410	06	64	Tariff TA2	Int4	kWh	*0 dec
8410	06	64	Tariff TA2	Int4	MWh	*3 dec
8410	07	64	Tariff TA2	Int4	MWh	*2 dec
8410	0E	64	Tariff TA2	Int4	GJ	*3 dec
8410	0F	64	Tariff TA2	Int4	GJ	*2 dec
8410	13	64	Tariff TA2	Int4	m3	*3 dec
8410	14	64	Tariff TA2	Int4	m3	*2 dec
8410	15	64	Tariff TA2	Int4	m3	*1 dec
8410	16	64	Tariff TA2	Int4	m3	*0 dec
8410	FB00	64	Tariff TA2	Int4	MWh	*1 dec
8410	FB01	64	Tariff TA2	Int4	MWh	*0 dec
8410	FB08	64	Tariff TA2	Int4	GJ	*1 dec
8410	FB09	64	Tariff TA2	Int4	GJ	*0 dec
8410	FB0C	64	Tariff TA2	Int4	Gcal	*4 dec
8410	FB0D	64	Tariff TA2	Int4	Gcal	*3 dec
8410	FB0E	64	Tariff TA2	Int4	Gcal	*2 dec
8410	FB0F	64	Tariff TA2	Int4	Gcal	*1 dec
8420	05	65	Tariff TA3	Int4	kWh	*1 dec
8420	05	65	Tariff TA3	Int4	MWh	*4 dec
8420	06	65	Tariff TA3	Int4	kWh	*0 dec
8420	06	65	Tariff TA3	Int4	MWh	*3 dec
8420	07	65	Tariff TA3	Int4	MWh	*2 dec
8420	0E	65	Tariff TA3	Int4	GJ	*3 dec
8420	0F	65	Tariff TA3	Int4	GJ	*2 dec
8420	13	65	Tariff TA3	Int4	m3	*3 dec
8420	14	65	Tariff TA3	Int4	m3	*2 dec
8420	15	65	Tariff TA3	Int4	m3	*1 dec
8420	16	65	Tariff TA3	Int4	m3	*0 dec
8420	FB00	65	Tariff TA3	Int4	MWh	*1 dec
8420	FB01	65	Tariff TA3	Int4	MWh	*0 dec
8420	FB08	65	Tariff TA3	Int4	GJ	*1 dec
8420	FB09	65	Tariff TA3	Int4	GJ	*0 dec
8420	FB0C	65	Tariff TA3	Int4	Gcal	*4 dec
8420	FB0D	65	Tariff TA3	Int4	Gcal	*3 dec

8420	FB0E	65	Tariff TA3	Int4	Gcal	*2 dec
8420	FB0F	65	Tariff TA3	Int4	Gcal	*1 dec
04	13	68	Volume V1	Int4	m3	*3 dec
04	14	68	Volume V1	Int4	m3	*2 dec
04	15	68	Volume V1	Int4	m3	*1 dec
04	16	68	Volume V1	Int4	m3	*0 dec
04	93FF09	69	Volume V2	Int4	m3	*3 dec
04	94FF09	69	Volume V2	Int4	m3	*2 dec
04	95FF09	69	Volume V2	Int4	m3	*1 dec
04	96FF09	69	Volume V2	Int4	m3	*0 dec
04	1B	72	Mass M1	Int4	ton	*3 dec
04	1C	72	Mass M1	Int4	ton	*2 dec
04	1D	72	Mass M1	Int4	ton	*1 dec
04	1E	72	Mass M1	Int4	ton	*0 dec
04	9BFF0A	73	Mass M2	Int4	ton	*3 dec
04	9CFF0A	73	Mass M2	Int4	ton	*2 dec
04	9DFF0A	73	Mass M2	Int4	ton	*1 dec
04	9EFF0A	73	Mass M2	Int4	ton	*0 dec
04	3B	74	Flow V1 actual	Int4	l/h	*0 dec
04	3C	74	Flow V1 actual	Int4	m3/h	*2 dec
04	3D	74	Flow V1 actual	Int4	m3/h	*1 dec
04	3E	74	Flow V1 actual	Int4	m3/h	*0 dec
04	BBFF0D	75	Flow V2 actual	Int4	l/h	*0 dec
04	BCFF0D	75	Flow V2 actual	Int4	m3/h	*2 dec
04	BDFF0D	75	Flow V2 actual	Int4	m3/h	*1 dec
04	BEFF0D	75	Flow V2 actual	Int4	m3/h	*0 dec
04	2D	80	Power actual	Int4	kW	*1 dec
04	2E	80	Power actual	Int4	kW	*0 dec
04	2E	80	Power actual	Int4	MW	*3 dec
04	2F	80	Power actual	Int4	MW	*2 dec
04	FB28	80	Power actual	Int4	MW	*1 dec
8440	14	84	Pulse input A1	Int4	m3	*2 dec
8440	15	84	Pulse input A1	Int4	m3	*1 dec
8440	16	84	Pulse input A1	Int4	m3	*0 dec
848040	06	85	Pulse input B1	Int4	kWh	*0 dec
848040	07	85	Pulse input B1	Int4	MWh	*2 dec
848040	14	85	Pulse input B1	Int4	m3	*2 dec
848040	15	85	Pulse input B1	Int4	m3	*1 dec
848040	16	85	Pulse input B1	Int4	m3	*0 dec
02	59	86	t1 actual (2 decimals)	Int2	C	*2 dec
04	59	86	t1 actual (2 decimals)	Int4	C	*2 dec
02	5D	87	t2 actual (2 decimals)	Int2	C	*2 dec
04	5D	87	t2 actual (2 decimals)	Int4	C	*2 dec
02	D9FF0B	88	t3 actual (2 decimals)	Int2	C	*2 dec
04	D9FF0B	88	t3 actual (2 decimals)	Int4	C	*2 dec

02	61	89	t1-t2 diff. temp. (2 decimals)	Int2	K	*2 dec
04	61	89	t1-t2 diff. temp. (2 decimals)	Int4	K	*2 dec
02	E4FF1E	91	P1 actual – part 1	Int2	C	*3 dec
02	E5FF1E	91	P1 actual – part 1	Int2	C	*2 dec
02	E6FF1E	91	P1 actual – part 1	Int2	C	*1 dec
02	E7FF1E	91	P1 actual – part 1	Int2	C	*0 dec
02	E8FF1E	91	P1 actual – part 1	Int2	Bar	*3 dec
02	E9FF1E	91	P1 actual – part 1	Int2	Bar	*2 dec
02	EAFF1E	91	P1 actual – part 1	Int2	Bar	*1 dec
02	EBFF1E	91	P1 actual – part 1	Int2	Bar	*0 dec
02	FB9AF4FF1E	91	P1 actual – part 1	Int2	%RH	*3 dec
02	FB9AFF1E	91	P1 actual – part 1	Int2	%RH	*1 dec
02	FB9BF4FF1E	91	P1 actual – part 1	Int2	%RH	*2 dec
02	FB9BFF1E	91	P1 actual – part 1	Int2	%RH	*0 dec
04	E4FF1E	91	P1 actual – part 1	Int4	C	*3 dec
04	E5FF1E	91	P1 actual – part 1	Int4	C	*2 dec
04	E6FF1E	91	P1 actual – part 1	Int4	C	*1 dec
04	E7FF1E	91	P1 actual – part 1	Int4	C	*0 dec
04	E8FF1E	91	P1 actual – part 1	Int4	Bar	*3 dec
04	E9FF1E	91	P1 actual – part 1	Int4	Bar	*2 dec
04	EAFF1E	91	P1 actual – part 1	Int4	Bar	*1 dec
04	EBFF1E	91	P1 actual – part 1	Int4	Bar	*0 dec
04	FB9AF4FF1E	91	P1 actual – part 1	Int4	%RH	*3 dec
04	FB9AFF1E	91	P1 actual – part 1	Int4	%RH	*1 dec
04	FB9BF4FF1E	91	P1 actual – part 1	Int4	%RH	*2 dec
04	FB9BFF1E	91	P1 actual – part 1	Int4	%RH	*0 dec
02	E4FF1F	92	P2 actual – part 1	Int2	C	*3 dec
02	E5FF1F	92	P2 actual – part 1	Int2	C	*2 dec
02	E6FF1F	92	P2 actual – part 1	Int2	C	*1 dec
02	E7FF1F	92	P2 actual – part 1	Int2	C	*0 dec
02	E8FF1F	92	P2 actual – part 1	Int2	Bar	*3 dec
02	E9FF1F	92	P2 actual – part 1	Int2	Bar	*2 dec
02	EAFF1F	92	P2 actual – part 1	Int2	Bar	*1 dec
02	EBFF1F	92	P2 actual – part 1	Int2	Bar	*0 dec
02	FB9AF4FF1F	92	P2 actual – part 1	Int2	%RH	*3 dec
02	FB9AFF1F	92	P2 actual – part 1	Int2	%RH	*1 dec
02	FB9BF4FF1F	92	P2 actual – part 1	Int2	%RH	*2 dec
02	FB9BFF1F	92	P2 actual – part 1	Int2	%RH	*0 dec
04	E4FF1F	92	P2 actual – part 1	Int4	C	*3 dec
04	E5FF1F	92	P2 actual – part 1	Int4	C	*2 dec
04	E6FF1F	92	P2 actual – part 1	Int4	C	*1 dec
04	E7FF1F	92	P2 actual – part 1	Int4	C	*0 dec
04	E8FF1F	92	P2 actual – part 1	Int4	Bar	*3 dec
04	E9FF1F	92	P2 actual – part 1	Int4	Bar	*2 dec

04	EAFF1F	92	P2 actual – part 1	Int4	Bar	*1 dec
04	EBFF1F	92	P2 actual – part 1	Int4	Bar	*0 dec
04	FB9AF4FF1F	92	P2 actual – part 1	Int4	%RH	*3 dec
04	FB9AFF1F	92	P2 actual – part 1	Int4	%RH	*1 dec
04	FB9BF4FF1F	92	P2 actual – part 1	Int4	%RH	*2 dec
04	FB9BFF1F	92	P2 actual – part 1	Int4	%RH	*0 dec
04	85FF01	94	Heat energy E2	Int4	kWh	*1 dec
04	85FF01	94	Heat energy E2	Int4	MWh	*4 dec
04	86FF01	94	Heat energy E2	Int4	kWh	*0 dec
04	86FF01	94	Heat energy E2	Int4	MWh	*3 dec
04	87FF01	94	Heat energy E2	Int4	MWh	*2 dec
04	8EFF01	94	Heat energy E2	Int4	GJ	*3 dec
04	8FFF01	94	Heat energy E2	Int4	GJ	*2 dec
04	FB80FF01	94	Heat energy E2	Int4	MWh	*1 dec
04	FB81FF01	94	Heat energy E2	Int4	MWh	*0 dec
04	FB88FF01	94	Heat energy E2	Int4	GJ	*1 dec
04	FB89FF01	94	Heat energy E2	Int4	GJ	*0 dec
04	FB8CFF01	94	Heat energy E2	Int4	Gcal	*4 dec
04	FB8DFF01	94	Heat energy E2	Int4	Gcal	*3 dec
04	FB8EFF01	94	Heat energy E2	Int4	Gcal	*2 dec
04	FB8FFF01	94	Heat energy E2	Int4	Gcal	*1 dec
04	85FF05	95	Tap water energy E6	Int4	kWh	*1 dec
04	85FF05	95	Tap water energy E6	Int4	MWh	*4 dec
04	86FF05	95	Tap water energy E6	Int4	kWh	*0 dec
04	86FF05	95	Tap water energy E6	Int4	MWh	*3 dec
04	87FF05	95	Tap water energy E6	Int4	MWh	*2 dec
04	8EFF05	95	Tap water energy E6	Int4	GJ	*3 dec
04	8FFF05	95	Tap water energy E6	Int4	GJ	*2 dec
04	FB80FF05	95	Tap water energy E6	Int4	MWh	*1 dec
04	FB81FF05	95	Tap water energy E6	Int4	MWh	*0 dec
04	FB88FF05	95	Tap water energy E6	Int4	GJ	*1 dec
04	FB89FF05	95	Tap water energy E6	Int4	GJ	*0 dec
04	FB8CFF05	95	Tap water energy E6	Int4	Gcal	*4 dec
04	FB8DFF05	95	Tap water energy E6	Int4	Gcal	*3 dec
04	FB8EFF05	95	Tap water energy E6	Int4	Gcal	*2 dec
04	FB8FFF05	95	Tap water energy E6	Int4	Gcal	*1 dec
04	85FF06	96	Tap water energy E7	Int4	kWh	*1 dec
04	85FF06	96	Tap water energy E7	Int4	MWh	*4 dec
04	86FF06	96	Tap water energy E7	Int4	kWh	*0 dec
04	86FF06	96	Tap water energy E7	Int4	MWh	*3 dec
04	87FF06	96	Tap water energy E7	Int4	MWh	*2 dec
04	8EFF06	96	Tap water energy E7	Int4	GJ	*3 dec
04	8FFF06	96	Tap water energy E7	Int4	GJ	*2 dec
04	FB80FF06	96	Tap water energy E7	Int4	MWh	*1 dec
04	FB81FF06	96	Tap water energy E7	Int4	MWh	*0 dec
04	FB88FF06	96	Tap water energy E7	Int4	GJ	*1 dec

04	FB89FF06	96	Tap water energy E7	Int4	GJ	*0 dec
04	FB8CFF06	96	Tap water energy E7	Int4	Gcal	*4 dec
04	FB8DFF06	96	Tap water energy E7	Int4	Gcal	*3 dec
04	FB8EFF06	96	Tap water energy E7	Int4	Gcal	*2 dec
04	FB8FFF06	96	Tap water energy E7	Int4	Gcal	*1 dec
04	FF07	97	Energy E8	Int4	m3xC	*0 dec
04	FF08	110	Energy E9	Int4	m3xC	*0 dec
02	DDFF0C	122	t4 actual (2 decimals)	Int2	C	*2 dec
04	DDFF0C	122	t4 actual (2 decimals)	Int4	C	*2 dec
14	3B	124	Flow V1 max year	Int4	l/h	*0 dec
14	3C	124	Flow V1 max year	Int4	m3/h	*2 dec
14	3D	124	Flow V1 max year	Int4	m3/h	*1 dec
14	3E	124	Flow V1 max year	Int4	m3/h	*0 dec
24	3B	126	Flow V1 min year	Int4	l/h	*0 dec
24	3C	126	Flow V1 min year	Int4	m3/h	*2 dec
24	3D	126	Flow V1 min year	Int4	m3/h	*1 dec
24	3E	126	Flow V1 min year	Int4	m3/h	*0 dec
14	2D	128	Power max year	Int4	kW	*1 dec
14	2E	128	Power max year	Int4	kW	*0 dec
14	2E	128	Power max year	Int4	MW	*3 dec
14	2F	128	Power max year	Int4	MW	*2 dec
14	FB28	128	Power max year	Int4	MW	*1 dec
24	2D	130	Power min year	Int4	kW	*1 dec
24	2E	130	Power min year	Int4	kW	*0 dec
24	2E	130	Power min year	Int4	MW	*3 dec
24	2F	130	Power min year	Int4	MW	*2 dec
24	FB28	130	Power min year	Int4	MW	*1 dec
14	3B	139	Flow V1 max month	Int4	l/h	*0 dec
14	3C	139	Flow V1 max month	Int4	m3/h	*2 dec
14	3D	139	Flow V1 max month	Int4	m3/h	*1 dec
14	3E	139	Flow V1 max month	Int4	m3/h	*0 dec
24	3B	141	Flow V1 min month	Int4	l/h	*0 dec
24	3C	141	Flow V1 min month	Int4	m3/h	*2 dec
24	3D	141	Flow V1 min month	Int4	m3/h	*1 dec
24	3E	141	Flow V1 min month	Int4	m3/h	*0 dec
14	2D	143	Power max month	Int4	kW	*1 dec
14	2E	143	Power max month	Int4	kW	*0 dec
14	2E	143	Power max month	Int4	MW	*3 dec
14	2F	143	Power max month	Int4	MW	*2 dec
14	FB28	143	Power max month	Int4	MW	*1 dec
24	2D	145	Power min month	Int4	kW	*1 dec
24	2E	145	Power min month	Int4	kW	*0 dec
24	2E	145	Power min month	Int4	MW	*3 dec
24	2F	145	Power min month	Int4	MW	*2 dec
24	FB28	145	Power min month	Int4	MW	*1 dec
02	59	146	t1 average year	Int2	C	*2 dec

02	5D	147	t2 average year	Int2	C	*2 dec
02	59	149	t1 average month	Int2	C	*2 dec
02	5D	150	t2 average month	Int2	C	*2 dec
04	FF11	153	Config No. 1	Int4	number	*0 dec
04	FF12	168	Config No. 2	Int4	number	*0 dec
34	22	175	Error hour counter	Int4	h	*0 dec
04	85FF22	178	Differential energy dE	Int4	kWh	*1 dec
04	85FF22	178	Differential energy dE	Int4	MWh	*4 dec
04	86FF22	178	Differential energy dE	Int4	kWh	*0 dec
04	86FF22	178	Differential energy dE	Int4	MWh	*3 dec
04	87FF22	178	Differential energy dE	Int4	MWh	*2 dec
04	8EFF22	178	Differential energy dE	Int4	GJ	*3 dec
04	8FFF22	178	Differential energy dE	Int4	GJ	*2 dec
04	FB80FF22	178	Differential energy dE	Int4	MWh	*1 dec
04	FB81FF22	178	Differential energy dE	Int4	MWh	*0 dec
04	FB88FF22	178	Differential energy dE	Int4	GJ	*1 dec
04	FB89FF22	178	Differential energy dE	Int4	GJ	*0 dec
04	FB8CFF22	178	Differential energy dE	Int4	Gcal	*4 dec
04	FB8DFF22	178	Differential energy dE	Int4	Gcal	*3 dec
04	FB8EFF22	178	Differential energy dE	Int4	Gcal	*2 dec
04	FB8FFF22	178	Differential energy dE	Int4	Gcal	*1 dec
04	85FF23	179	Control energy cE	Int4	kWh	*1 dec
04	85FF23	179	Control energy cE	Int4	MWh	*4 dec
04	86FF23	179	Control energy cE	Int4	kWh	*0 dec
04	86FF23	179	Control energy cE	Int4	MWh	*3 dec
04	87FF23	179	Control energy cE	Int4	MWh	*2 dec
04	8EFF23	179	Control energy cE	Int4	GJ	*3 dec
04	8FFF23	179	Control energy cE	Int4	GJ	*2 dec
04	FB80FF23	179	Control energy cE	Int4	MWh	*1 dec
04	FB81FF23	179	Control energy cE	Int4	MWh	*0 dec
04	FB88FF23	179	Control energy cE	Int4	GJ	*1 dec
04	FB89FF23	179	Control energy cE	Int4	GJ	*0 dec
04	FB8CFF23	179	Control energy cE	Int4	Gcal	*4 dec
04	FB8DFF23	179	Control energy cE	Int4	Gcal	*3 dec
04	FB8EFF23	179	Control energy cE	Int4	Gcal	*2 dec
04	FB8FFF23	179	Control energy cE	Int4	Gcal	*1 dec
04	93FF22	180	Differential volume dV	Int4	m3	*3 dec
04	94FF22	180	Differential volume dV	Int4	m3	*2 dec
04	95FF22	180	Differential volume dV	Int4	m3	*1 dec
04	96FF22	180	Differential volume dV	Int4	m3	*0 dec
04	93FF23	181	Control volume cV	Int4	m3	*3 dec
04	94FF23	181	Control volume cV	Int4	m3	*2 dec
04	95FF23	181	Control volume cV	Int4	m3	*1 dec
04	96FF23	181	Control volume cV	Int4	m3	*0 dec
84c040	14	224	Pulse input A2	Int4	m3	*2 dec
84c040	15	224	Pulse input A2	Int4	m3	*1 dec

84c040	16	224	Pulse input A2	Int4	m3	*0 dec
84808040	06	225	Pulse input B2	Int4	kWh	*0 dec
84808040	07	225	Pulse input B2	Int4	MWh	*2 dec
84808040	14	225	Pulse input B2	Int4	m3	*2 dec
84808040	15	225	Pulse input B2	Int4	m3	*1 dec
84808040	16	225	Pulse input B2	Int4	m3	*0 dec
04	FF18	228	Config No. 3	Int4	number	*0 dec
04	FD0E	346	Meter SW revision	Int4	number	*0 dec
04	FD0E	346	Meter SW revision	Int4	number	*0 dec
04	FF17	346	Module SW revision	Int4	number	*0 dec
04	FF17	346	Module SW revision	Int4	number	*0 dec
0c	FD11	347	Customer Number	BCD8	number	*0 dec
0e	FD11	347	Customer Number	BCD12	number	*0 dec
02	6C	348	Date	Int2	No unit	*0 dec
02	6D	348	Date and time	Int2	No unit	*0 dec
04	6C	348	Date	Int4	No unit	*0 dec
04	6D	348	Date and time	Int4	No unit	*0 dec
02	FF04	355	COP year	Int2	No unit	*1 dec
8430	05	362	Tariff TA4	Int4	kWh	*1 dec
8430	05	362	Tariff TA4	Int4	MWh	*4 dec
8430	06	362	Tariff TA4	Int4	kWh	*0 dec
8430	06	362	Tariff TA4	Int4	MWh	*3 dec
8430	07	362	Tariff TA4	Int4	MWh	*2 dec
8430	0E	362	Tariff TA4	Int4	GJ	*3 dec
8430	0F	362	Tariff TA4	Int4	GJ	*2 dec
8430	13	362	Tariff TA4	Int4	m3	*3 dec
8430	14	362	Tariff TA4	Int4	m3	*2 dec
8430	15	362	Tariff TA4	Int4	m3	*1 dec
8430	16	362	Tariff TA4	Int4	m3	*0 dec
8430	FB00	362	Tariff TA4	Int4	MWh	*1 dec
8430	FB01	362	Tariff TA4	Int4	MWh	*0 dec
8430	FB08	362	Tariff TA4	Int4	GJ	*1 dec
8430	FB09	362	Tariff TA4	Int4	GJ	*0 dec
8430	FB0C	362	Tariff TA4	Int4	Gcal	*4 dec
8430	FB0D	362	Tariff TA4	Int4	Gcal	*3 dec
8430	FB0E	362	Tariff TA4	Int4	Gcal	*2 dec
8430	FB0F	362	Tariff TA4	Int4	Gcal	*1 dec
04	8568	364	Heat energy A1	Int4	kWh	*1 dec
04	8568	364	Heat energy A1	Int4	MWh	*4 dec
04	8668	364	Heat energy A1	Int4	kWh	*0 dec
04	8668	364	Heat energy A1	Int4	MWh	*3 dec
04	8768	364	Heat energy A1	Int4	MWh	*2 dec

04	8E68	364	Heat energy A1	Int4	GJ	*3 dec
04	8F68	364	Heat energy A1	Int4	GJ	*2 dec
04	FB8068	364	Heat energy A1	Int4	MWh	*1 dec
04	FB8168	364	Heat energy A1	Int4	MWh	*0 dec
04	FB8868	364	Heat energy A1	Int4	GJ	*1 dec
04	FB8968	364	Heat energy A1	Int4	GJ	*0 dec
04	FB8C68	364	Heat energy A1	Int4	Gcal	*4 dec
04	FB8D68	364	Heat energy A1	Int4	Gcal	*3 dec
04	FB8E68	364	Heat energy A1	Int4	Gcal	*2 dec
04	FB8F68	364	Heat energy A1	Int4	Gcal	*1 dec
04	856C	365	Heat energy A2	Int4	kWh	*1 dec
04	856C	365	Heat energy A2	Int4	MWh	*4 dec
04	866C	365	Heat energy A2	Int4	kWh	*0 dec
04	866C	365	Heat energy A2	Int4	MWh	*3 dec
04	876C	365	Heat energy A2	Int4	MWh	*2 dec
04	8E6C	365	Heat energy A2	Int4	GJ	*3 dec
04	8F6C	365	Heat energy A2	Int4	GJ	*2 dec
04	FB806C	365	Heat energy A2	Int4	MWh	*1 dec
04	FB816C	365	Heat energy A2	Int4	MWh	*0 dec
04	FB886C	365	Heat energy A2	Int4	GJ	*1 dec
04	FB896C	365	Heat energy A2	Int4	GJ	*0 dec
04	FB8C6C	365	Heat energy A2	Int4	Gcal	*4 dec
04	FB8D6C	365	Heat energy A2	Int4	Gcal	*3 dec
04	FB8E6C	365	Heat energy A2	Int4	Gcal	*2 dec
04	FB8F6C	365	Heat energy A2	Int4	Gcal	*1 dec
02	DD40	366	t5 limit	Int2	C	*2 dec
02	FF04	367	COP month	Int2	No unit	*1 dec
04	FF19	368	Config No. 4	Int4	number	*0 dec
04	FF22	369	Info bits	Int4	No unit	*0 dec
02	FF04	371	COP	Int2	No unit	*1 dec
848040	2E	372	Power Input B1	Int4	kW	*0 dec
02	D912	379	t1 time average day	Int2	C	*2 dec
02	DD12	380	t2 time average day	Int2	C	*2 dec
02	D912	381	t1 time average hour	Int2	C	*2 dec
02	DD12	382	t2 time average hour	Int2	C	*2 dec
12	ECFF11	383	Flow V1 max year date	Int2	No unit	*0 dec
12	ECFF11	383	Flow V1 max year date	Int2	No unit	*0 dec
22	ECFF11	384	Flow V1 min year date	Int2	No unit	*0 dec
12	ECFF12	385	Power max year date	Int2	No unit	*0 dec
12	ECFF12	385	Power max year date	Int2	No unit	*0 dec
22	ECFF12	386	Power min year date	Int2	No unit	*0 dec
12	ECFF11	387	Flow V1 max month date	Int2	No unit	*0 dec
22	ECFF11	388	Flow V1 min month date	Int2	No unit	*0 dec
12	ECFF12	389	Power max month date	Int2	No unit	*0 dec
12	ECFF12	389	Power max month date	Int2	No unit	*0 dec
22	ECFF12	390	Power min month date	Int2	No unit	*0 dec

04	FF16	393	Module type config No.	Int4	number	*0 dec
02	FF15	404	Module type	Int2	No unit	*0 dec
02	FF15	404	Module type	Int2	No unit	*0 dec
02	FF1A	404	Meter type	Int2	No unit	*0 dec
02	FF1A	404	Meter type	Int2	No unit	*0 dec
04	FF05	473	Energy E10	Int4	m3xC	*0 dec
04	FF06	474	Energy E11	Int4	m3xC	*0 dec
02	D992FF0B	477	t3 time average day	Int2	C	*2 dec
02	D992FF0B	478	t3 time average hour	Int2	C	*2 dec
12	ECFF2C	590	t2 max month date	Int2	No unit	*0 dec
12	ECFF2C	591	t2 max year date	Int2	No unit	*0 dec
22	ECFF2C	592	t2 min month date	Int2	No unit	*0 dec
22	ECFF2C	593	t2 min year date	Int2	No unit	*0 dec
12	5D	594	t2 max month	Int2	C	*2 dec
14	5D	594	t2 max month	Int4	C	*2 dec
12	5D	595	t2 max year	Int2	C	*2 dec
14	5D	595	t2 max year	Int4	C	*2 dec
22	5D	596	t2 min month	Int2	C	*2 dec
24	5D	596	t2 min month	Int4	C	*2 dec
22	5D	597	t2 min year	Int2	C	*2 dec
24	5D	597	t2 min year	Int4	C	*2 dec
12	ECFF2B	598	t1 max month date	Int2	No unit	*0 dec
12	ECFF2B	599	t1 max year date	Int2	No unit	*0 dec
22	ECFF2B	600	t1 min month date	Int2	No unit	*0 dec
22	ECFF2B	601	t1 min year date	Int2	No unit	*0 dec
12	59	602	t1 max month	Int2	C	*2 dec
14	59	602	t1 max month	Int4	C	*2 dec
12	59	603	t1 max year	Int2	C	*2 dec
14	59	603	t1 max year	Int4	C	*2 dec
22	59	604	t1 min month	Int2	C	*2 dec
24	59	604	t1 min month	Int4	C	*2 dec
22	59	605	t1 min year	Int2	C	*2 dec
24	59	605	t1 min year	Int4	C	*2 dec
04	85FF24	611	Energy E12	Int4	kWh	*1 dec
04	85FF24	611	Energy E12	Int4	MWh	*4 dec
04	86FF24	611	Energy E12	Int4	kWh	*0 dec
04	86FF24	611	Energy E12	Int4	MWh	*3 dec
04	87FF24	611	Energy E12	Int4	MWh	*2 dec
04	8EFF24	611	Energy E12	Int4	GJ	*3 dec
04	8FFF24	611	Energy E12	Int4	GJ	*2 dec
04	FB80FF24	611	Energy E12	Int4	MWh	*1 dec
04	FB81FF24	611	Energy E12	Int4	MWh	*0 dec
04	FB88FF24	611	Energy E12	Int4	GJ	*1 dec
04	FB89FF24	611	Energy E12	Int4	GJ	*0 dec
04	FB8CFF24	611	Energy E12	Int4	Gcal	*4 dec
04	FB8DFF24	611	Energy E12	Int4	Gcal	*3 dec

04	FB8EFF24	611	Energy E12	Int4	Gcal	*2 dec
04	FB8FFF24	611	Energy E12	Int4	Gcal	*1 dec
04	85FF25	612	Energy E13	Int4	kWh	*1 dec
04	85FF25	612	Energy E13	Int4	MWh	*4 dec
04	86FF25	612	Energy E13	Int4	kWh	*0 dec
04	86FF25	612	Energy E13	Int4	MWh	*3 dec
04	87FF25	612	Energy E13	Int4	MWh	*2 dec
04	8EFF25	612	Energy E13	Int4	GJ	*3 dec
04	8FFF25	612	Energy E13	Int4	GJ	*2 dec
04	FB80FF25	612	Energy E13	Int4	MWh	*1 dec
04	FB81FF25	612	Energy E13	Int4	MWh	*0 dec
04	FB88FF25	612	Energy E13	Int4	GJ	*1 dec
04	FB89FF25	612	Energy E13	Int4	GJ	*0 dec
04	FB8CFF25	612	Energy E13	Int4	Gcal	*4 dec
04	FB8DFF25	612	Energy E13	Int4	Gcal	*3 dec
04	FB8EFF25	612	Energy E13	Int4	Gcal	*2 dec
04	FB8FFF25	612	Energy E13	Int4	Gcal	*1 dec
04	85FF26	613	Energy E14	Int4	kWh	*1 dec
04	85FF26	613	Energy E14	Int4	MWh	*4 dec
04	86FF26	613	Energy E14	Int4	kWh	*0 dec
04	86FF26	613	Energy E14	Int4	MWh	*3 dec
04	87FF26	613	Energy E14	Int4	MWh	*2 dec
04	8EFF26	613	Energy E14	Int4	GJ	*3 dec
04	8FFF26	613	Energy E14	Int4	GJ	*2 dec
04	FB80FF26	613	Energy E14	Int4	MWh	*1 dec
04	FB81FF26	613	Energy E14	Int4	MWh	*0 dec
04	FB88FF26	613	Energy E14	Int4	GJ	*1 dec
04	FB89FF26	613	Energy E14	Int4	GJ	*0 dec
04	FB8CFF26	613	Energy E14	Int4	Gcal	*4 dec
04	FB8DFF26	613	Energy E14	Int4	Gcal	*3 dec
04	FB8EFF26	613	Energy E14	Int4	Gcal	*2 dec
04	FB8FFF26	613	Energy E14	Int4	Gcal	*1 dec
04	85FF27	614	Energy E15	Int4	kWh	*1 dec
04	85FF27	614	Energy E15	Int4	MWh	*4 dec
04	86FF27	614	Energy E15	Int4	kWh	*0 dec
04	86FF27	614	Energy E15	Int4	MWh	*3 dec
04	87FF27	614	Energy E15	Int4	MWh	*2 dec
04	8EFF27	614	Energy E15	Int4	GJ	*3 dec
04	8FFF27	614	Energy E15	Int4	GJ	*2 dec
04	FB80FF27	614	Energy E15	Int4	MWh	*1 dec
04	FB81FF27	614	Energy E15	Int4	MWh	*0 dec
04	FB88FF27	614	Energy E15	Int4	GJ	*1 dec
04	FB89FF27	614	Energy E15	Int4	GJ	*0 dec
04	FB8CFF27	614	Energy E15	Int4	Gcal	*4 dec
04	FB8DFF27	614	Energy E15	Int4	Gcal	*3 dec
04	FB8EFF27	614	Energy E15	Int4	Gcal	*2 dec

04	FB8FFF27	614	Energy E15	Int4	Gcal	*1 dec
04	85FF28	615	Energy E16	Int4	kWh	*1 dec
04	85FF28	615	Energy E16	Int4	MWh	*4 dec
04	86FF28	615	Energy E16	Int4	kWh	*0 dec
04	86FF28	615	Energy E16	Int4	MWh	*3 dec
04	87FF28	615	Energy E16	Int4	MWh	*2 dec
04	8EFF28	615	Energy E16	Int4	GJ	*3 dec
04	8FFF28	615	Energy E16	Int4	GJ	*2 dec
04	FB80FF28	615	Energy E16	Int4	MWh	*1 dec
04	FB81FF28	615	Energy E16	Int4	MWh	*0 dec
04	FB88FF28	615	Energy E16	Int4	GJ	*1 dec
04	FB89FF28	615	Energy E16	Int4	GJ	*0 dec
04	FB8CFF28	615	Energy E16	Int4	Gcal	*4 dec
04	FB8DFF28	615	Energy E16	Int4	Gcal	*3 dec
04	FB8EFF28	615	Energy E16	Int4	Gcal	*2 dec
04	FB8FFF28	615	Energy E16	Int4	Gcal	*1 dec
04	9BFF29	616	Mass M3	Int4	ton	*3 dec
04	9CFF29	616	Mass M3	Int4	ton	*2 dec
04	9DFF29	616	Mass M3	Int4	ton	*1 dec
04	9EFF29	616	Mass M3	Int4	ton	*0 dec
04	9BFF2A	617	Mass M4	Int4	ton	*3 dec
04	9CFF2A	617	Mass M4	Int4	ton	*2 dec
04	9DFF2A	617	Mass M4	Int4	ton	*1 dec
04	9EFF2A	617	Mass M4	Int4	ton	*0 dec
02	DD92FF0C	635	t4 time average day	Int2	C	*2 dec
02	DD92FF0C	636	t4 time average hour	Int2	C	*2 dec
04	ADFF2D	637	Power 2 actual	Int4	kW	*1 dec
04	AEFF2D	637	Power 2 actual	Int4	kW	*0 dec
04	AEFF2D	637	Power 2 actual	Int4	MW	*3 dec
04	AFFF2D	637	Power 2 actual	Int4	MW	*2 dec
04	FBA8FF2D	637	Power 2 actual	Int4	MW	*1 dec
01	FF0B	647	Fluid type	Int1	number	*0 dec
01	FF0C	648	Fluid concentration	Int1	number	*0 dec
0c	78	1001	Fabrication number	BCD8	number	*0 dec
04	22	1004	Operating hours	Int4	h	*0 dec
0c	22	1004	Operating hours	BCD8	h	*0 dec

4.5 Kamstrup specific VIFE coding

Below are shown a list of Kamstrup VIFE coding.

DIF (hex)	Coding	Description
01h	00000001	Control Energy (E2)
02h	00000010	Cooling Energy (E3)
03h	00000011	Inlet Energy (E4)
04h	00000100	Coefficient of Power (Resolution = 0,1)
05h	00000101	V1xT3 = m3°C (E10)
06h	00000110	V2xT3 = m3°C (E11)
07h	00000111	V1xT1 = m3°C (E8)
08h	00001000	V1xT2 = m3°C (E9)
0Bh	00001011	Fluid type
0Ch	00001100	Fluid concentration
0Fh	00001111	Meter No 1 (low 8 digit) + Meter No 2 (high 8 digit) = up to 16 decimal Meter No digits in one 64 bit integer
10h	00010000	Program no. ABCCCCCC / ABCCC (PROG NO)
11h	00010001	Config No 1
12h	00010010	Config No 2
16h	00010110	Module type and Config
17h	00010111	Module SW number and revision
18h	00011000	Config No3
19h	00011001	Config No4
22h	00100010	MCxx3 Info code

5 Error messages

The MULTICAL® constantly surveys a number of important functions. Where errors have occurred in the measuring system or in the installation this is reflected into the bits of the status field.

5.1 Status field

M-Bus modules for MULTICAL® support info codes from MULTICAL® and are mapped to the two error bits ”Permanent Error” (bit 3) and ”Temporary Error” (bit 4) in the status field.

The ”Status field” in the M-Bus data header can have one of the following values, or the sum of more values:

Status field value	Description
00h	No info code
08h	One or more ”Permanent Error” info codes
10h	One or more ”Temporary Error” info codes
18h	One or more ”Permanent Error” and ”Temporary Error” info codes at the same time

5.2 Permanent error MULTICAL® 403/603/803

Permanent Error (Bit 3) is set when one of the following info codes is active in MULTICAL®:

Bit	Error Code in MULTICAL®	Description
3	8	Temperature sensor T1 above range or disconnected
4	16	Temperature sensor T2 above range or disconnected
5	32	Temperature sensor T1 below range or short circuited
6	64	Temperature sensor T2 below range or short circuited
20*	1048576	Temperature sensor T3 above range or disconnected
21*	2097152	Temperature sensor T3 below range or short circuited

*) MULTICAL® 603/803 only

5.3 Temporary error MULTICAL® 403/603/803

Temporary Error (Bit 4) is set when one of the following info codes is active in MULTICAL®:

Bit	Error Code in MULTICAL®	Description
2	4	External alarm
7	128	Wrong differential temperature (T1-T2)
8	256	Air detected in flow sensor V1
9	512	Reverse flow in flow sensor V1
10	1024	Signal too low in flow sensor V1
11	2048	Very high flow in flow sensor V1 for more than 1 hour
12	4096	Water leakage detected on Pulse input A (A1)
13	8192	Water leakage detected on Pulse input B (B1)
14	16384	External alarm on Pulse input A (A1)
15	32768	External alarm on Pulse input B (B1)
16*	65536	Flow sensor V1 communication error
17*	131072	Flow sensor V1 pulse error
18*	262144	Water leakage detected on Pulse input A2
19*	524288	Water leakage detected on Pulse input B2
22*	4194304	Flow sensor V2 communication error
23*	8388608	Flow sensor V2 pulse error
24*	16777216	Air detected in flow sensor V2,
25*	33554432	Reverse flow in flow sensor V2
26*	67108864	Signal too low in flow sensor V2
27*	134217728	Very high flow in flow sensor V2 for more than 1 hour
28*	268435456	V1V2 burst out of the system
29*	536870912	V1V2 burst into the system
30*	1073741824	V1V2 leakage out of the system
31*	2147483648	V1V2 leakage into the system

*) MULTICAL® 603/803 only