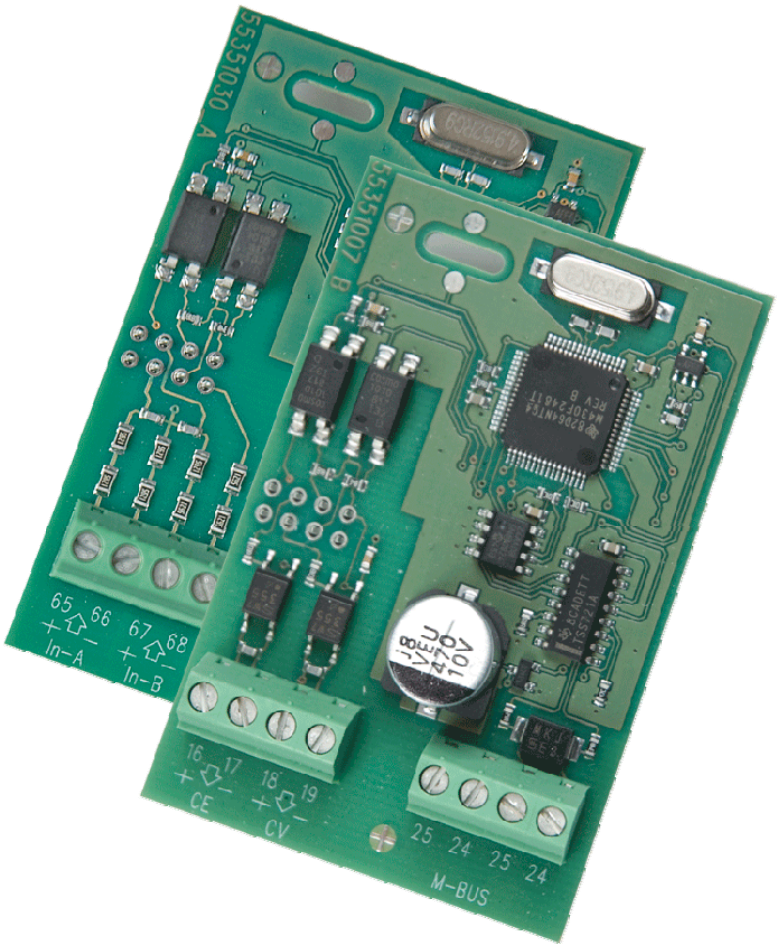
Technical Description

M-Bus modules for MULTICAL® 402



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1 Introduction

This technical description describes the two M-Bus modules for MULTICAL® 402, both supporting primary, secondary and enhanced secondary addressing as well as 300, 2400 and 9600 baud communication speed.

The modules are either fitted with two pulse inputs (VA and VB) for reading other meters, e.g. water and electricity meters, or two pulse outputs with energy (CE) and volume (CV) values.

1.1 Description

M-Bus is a bus system especially suited for communication with heat, cooling and water meters. The system consists of an M-Bus Master and one or more meters with M-Bus module.

The M-Bus modules for MULTICAL® 402 are developed as modules especially for the MULTICAL® 402 and can not be used in other meter types.

The M-Bus system is designed to meet the requirements in the EN 13757-2 and EN 13757-3 standards.

1.2 M-Bus communication

Communication on the M-Bus is an asynchronous serial bit transmission in half duplex mode, which means that it is possible only to transmit one way at a time on the M-Bus.

The framing of the communication is 1 start bit, 8 data bits, 1 parity bit (even) and 1 stop bit.

Transmission speeds for the modules are 300 baud, 2400 baud or 9600 baud. The transmission speed is auto detected by the module. When the M-Bus module receives a message from the M-Bus Master on a certain speed, it will reply with the same speed.

The M-Bus is communicating via voltage modulation from the M-Bus Master to the M-Bus module and current modulation from the M-Bus module to the M-Bus Master. Communication media is via an ordinary two-wire cable. As cable type twisted pair is recommended.

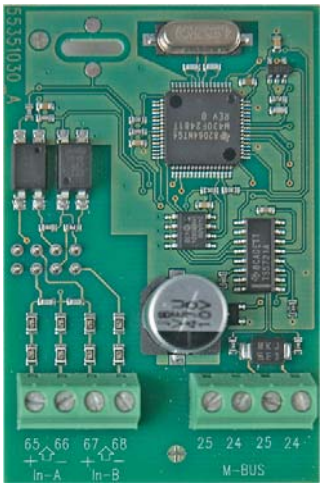
2 M-Bus modules for MULTICAL® 402

Kamstrup has developed two M-Bus modules for MULTICAL® 402.
The modules can not be used in other meter types.

2.1 Modules

2.1.1 M-Bus module with 2 pulse inputs (VA, VB)

Order number: 402x20xxxxxxx
Module number: 5550-1030
Software number: 5098-692



M-Bus connection

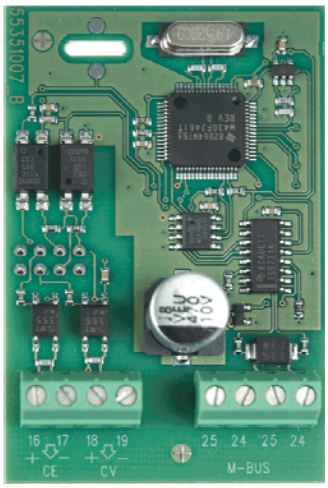
Terminal 24 M-Bus connection
Terminal 25 M-Bus connection
Max. cable size: 1,0mm^2

Pulse input connections

Terminal 65 Pulse input A/In-A (+)
Terminal 66 Pulse input A/In-A (-)
Terminal 67 Pulse input B/In-B (+)
Terminal 68 Pulse input B/In-B (-)
Max. cable size: 1,0mm^2

2.1.2 M-Bus module with 2 pulse outputs (CE, CV)

Order number: 402x21xxxxxxx
Module number: 5550-1007
Software number: 5098-638



M-Bus connection

Terminal 24 M-Bus connection
Terminal 25 M-Bus connection
Max. cable size: 1,0mm^2

Pulse output connections

Terminal 16 Pulse output Counter Energy (CE) (+)
Terminal 17 Pulse output Counter Energy (CE) (-)
Terminal 18 Pulse output Counter Volume (CV) (+)
Terminal 19 Pulse output Counter Volume (CV) (-)
Max. cable size: 1,0mm^2

It is easy to install the M-Bus module in the MULTICAL® 402. Simply place the module in the module space, and press it into the socket.

It is not necessary with a special configuration of meter or module, as the system is self-configuring.

3 Design

The modules are supplied from the M-Bus Master. The M-Bus modules are galvanic isolated from MULTICAL® 402 and communicates with MULTICAL® 402 via opto couplers.

The M-Bus module automatically collects consumption data every 15 minutes and all data every 24 hours. In addition, data are collected in the meter at reset/start up, after communicating with the M-Bus Master and after receiving manual calls from MULTICAL® 402.

The time for collecting consumption data is approx. 4 sec., collecting all data takes approx. 12 sec.

A time limit has been put into the M-Bus module, which means that it always waits min. 28 seconds between several successive readings of data in the meter. This means that irrespective how often data are collected from the M-Bus module, the update period of data from the meter will be approx. 28 seconds, which must be seen in relation to the update period for measurements in MULTICAL® 402, which is min. 24 seconds.

Reset the M-Bus module by disconnecting the M-Bus for min. 30 seconds. To have the M-Bus module collect new data in the meter, the M-Bus Master can send either a normalization (SND_NKE) or an application reset command to the M-Bus module.

In connection with normalization (SND_NKE) the M-Bus module collects consumption data from the meter (as is the case with ordinary reading, as well as once every 15 minutes).

In connection with an application reset, the M-Bus module collects all M-Bus relevant data in the meter (as is the case after reset, receipt of manual calls as well as every 24 hours).

The M-Bus module uses information from the meter to place units, decimal points and number of decimals on the values in the M-Bus telegram ensuring that they correspond to the values read on the meter display, as far as it is supported in the M-Bus protocol. E.g. meters with MWh. and 3 decimals will in M-Bus typically be shown as kWh. without decimals.

The M-Bus connection is polarity independent. On the module there are – in addition to the M-Bus connection – 2 pulse inputs or 2 pulse outputs. Further details can be found in the technical description for MULTICAL® 402

3.1 Installation

We recommend that the entire M-Bus system is not powered up during installation of new M-Bus modules. Not until then can the M-Bus system be started up. This start-up will cause all M-Bus modules to be initialized.

To install a module into MULTICAL® 402; open the meter and install the M-Bus module in the module space, connect the M-Bus cables and close the meter.

For further details on installing communication modules into the meter, please refer to the Technical Description or Installation and User Guide for MULTICAL® 402.

When the M-Bus cables have been mounted and the meter supply has been connected, the M-Bus modules must have time to collect data (M-Bus ID numbers) in the meter, before read out is possible It is recommend to wait for min. 30 seconds before trying to communicate with the M-Bus modules.

M-Bus ID numbers are the serial number of the meter, primary/secondary/enhanced secondary address etc.

The M-Bus modules store these data in their own memory and will be ready to communicate on the M-Bus approx. 6 seconds after connecting the supply. In connection with short failures in the M-Bus supply (< 1 sec.) the M-Bus modules will usually be ready to communicate again less than 3 sec. after the supply has been reconnected.

When starting up the M-Bus, the modules try to collect data in the meter every 30 sec., until they have received correct data. This means that if the M-Bus modules have been switched off for approx. 1 min. and are mounted in a MULTICAL® 402 they will automatically be initialized.

M-Bus modules may also be installed without disconnecting the M-Bus system. To ensure that the M-Bus modules are having their M-Bus ID numbers read in from the meter, an “application reset” command can be sent to all M-Bus modules when installed. It is important that the M-Bus modules are mounted in the meter, before the M-Bus cable is connected.

If the M-Bus ID number, primary M-Bus address, or other meter data/setups are changed directly on the meter, e.g. via the optical eye, it will take up to 24 hours before these numbers are updated in the M-Bus module.

In this case it will be advantageous either to disconnect the meter supply or the M-Bus supply to the M-Bus module (for approx. 1 minute), or you can make a manual call on the meter.

A manual call is made by pressing briefly on both front keys on MULTICAL® 402 in 5-6 sec. The text “CALL” will then appear in the display. After ”CALL”, an ”OK” will appear in the display to indicate, that data in the M-Bus module has been updated.

Manual call may not be performed within the first 30 sec. after the module has been powered up.

3.2 Addressing forms

To make the M-Bus system function with more M-Bus modules connected, it is necessary to distinguish between the individual M-Bus modules. This is done by means of following M-Bus ID numbers i each M-Bus module:

- Primary addressing: 001...250, and the special addresses 000, 253, 254 and 255
- M-Bus ID number: 8 digits 00000000 .. 99999999
- Manufacturer ID: Always 2C2Dh for ”KAM” for Kamstrup M-Bus modules
- Version ID: 0Bh / 11 decimal
- Device type ID: 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 = Warm water (30 .. 90 deg. C)
  16h = Cold water
- Fabrication number: Serial number, 8 digits 00000000 .. 99999999

When the M-Bus Master sends a message on the M-Bus, some or all of the above ID numbers on the M-Bus module are encoded in the message. Thus, only the M-Bus module with the addressed ID numbers will reply.

Manufacturer ID and version ID are permanently encoded into the M-Bus module and cannot be changed. The M-Bus module reads the other M-Bus ID numbers in the meter.

3.2.1 Primary addressing

If the value is between 000 and 250, the M-Bus modules will regard this as a primary address. If the value exceeds 250 the M-Bus modules will regard the last 3 digits of the MULTICAL® 402 customer number as a primary address.

From the factory this value in MULTICAL® 402 equals to the last 3 digits of the customer number. If the last 3 digits in MULTICAL® 402's programmed customer number is larger than 250 (e.g. 345) the first digit is ignored and the M-Bus module’s address is only determined by the last 2 digits (e.g. 45).

If you write a valid primary address between 000 and 250 either via the M-Bus or directly on MULTICAL® 402, the M-Bus module will regard this as the primary address.

Setting the primary address can be performed in following ways:

- Using the two push buttons on the MULTICAL® 402
- Programming with METERTOOL for MULTICAL® 402
- Programming with MULTITERM Pro handheld unit

Changing the primary address, does not affect the customer number in the meter and vice versa.

In connection with primary addressing of the M-Bus modules, two or more M-Bus modules on the same M-Bus cannot have the same primary address. However, in connection with secondary addressing or enhanced secondary addressing it is possible to distinguish M-Bus modules with the same primary address on the same M-Bus.

Standard address range for an M-Bus module is 000 .. 250.

In addition to this there are 4 special addresses that work as follows:

Adr. 000 : Ordinary primary address reserved for non-configured M-Bus modules.

Adr. 253 : Used for secondary addressing.
Only the M-Bus module accepting the address will reply.

Adr. 254 : All M-Bus modules will reply to this address. The address can only be used in systems where only 1 M-Bus module is connected.

Adr. 255 : No M-Bus modules will reply to this address, but all will receive the message. This address makes it possible e.g. to change the baud rate on an entire system at the same time by sending only one telegram.

Note

All Kamstrup's M-Bus modules are equipped with auto detection of the baud rate (300/2400/9600 baud).

3.2.2 Secondary addressing

M-Bus modules for MULTICAL® 402 support secondary addressing.

In connection with secondary addressing, the M-Bus modules are selected via the primary address 253 with its 8 byte long complete M-Bus ID consisting of :

- M-Bus ID – default from Kamstrup: The last 8 digits in the customer number (4 bytes)
- Manufacturer ID = ASCII characters "KAM" for Kamstrup encoded to the value 2C2Dh (2 bytes)
- Version/generation ID number = 0Bh (1 byte)
- Device type ID (previously medium) (1 byte).

These 8 bytes make up the secondary address of the M-Bus modules. It is possible to replace the individual bytes with wildcard characters. See chapter 3.2.4 Wildcard characters.

Selection of M-Bus modules via secondary address (and deselecting other M-Bus modules):

Start character	68h
L-field	0Bh
L-field	0Bh
Start character	68h
C-field	53h
A-field	FDh
CI-field	52h

ID No. LSB	37 or FF BCD	E.g. M-Bus ID number = 4118737
ID No.	87 or FF BCD	
ID No.	11 or FF BCD	
ID No. MSB	04 or FF BCD	
Man. ID LSB	2Dh or FFh	KAM encoded to 2C2Dh
Man. ID MSB	2Ch or FFh	
Version ID	0Bh or FFh	
Device ID	04h, 07h, 0Ah, 0Bh, 0Ch, or 0Dh (see also ID numbers) or FFh	
Checksum	xxh	
Stop character	16h	

As long as the M-Bus module is selected it will reply to primary address 253, which is dedicated to secondary addressing. The M-Bus module is deselected either by sending a new selection via primary address 253 with a secondary address different from that of the M-Bus module (by means of which another M-Bus module is selected, if necessary) or by sending a normalization SND_NKE to primary address 253.

3.2.3 Enhanced secondary addressing

As the M-Bus ID numbers in the meter can be changed by the user either via the M-Bus or directly on the meter e.g. via the optical eye, more M-Bus modules with the same secondary address may appear on the M-Bus.

The M-Bus module's secondary address can therefore be extended in order to comprise the 8 digit BCD "fabrication number" (4 bytes) that is identical with the serial number of the meter. This number is unique for each MULTICAL® 402 and cannot be changed after production.
In connection with enhanced secondary addressing the M-Bus module is selected by adding "fabrication number" as an ordinary data record with DIF = 0Ch (for 4 bytes, 8 digit BCD) and VIF = 78h (for Fabrication number) in the selection telegram after the secondary address.

When an M-Bus module is selected via enhanced secondary address it will reply to primary address 253, as is the case with secondary addressing. The M-Bus module is deselected either by sending a new selection via primary address 253 with an enhanced or ordinary secondary address different from that of the M-Bus module (by means of which another M-Bus module is selected, if necessary) or by sending a normalization SND_NKE to primary address 253.

Selection of M-Bus modules via enhanced secondary address (and deselecting other M-Bus modules):

Start character	68h	
L-field	11h	
L-field	11h	
Start character	68h	
C-field	53h	
A-field	FDh	
CI-field	52h	
ID No. LSB	37 or FF BCD	E.g. M-Bus ID number = 4118737
ID No.	87 or FF BCD	
ID No.	11 or FF BCD	
ID No. MSB	04 or FF BCD	
Man. ID LSB	2Dh or FFh	KAM encoded to 2C2Dh

Man. ID MSB	2Ch or FFh	
Version ID	0Bh or FFh	
Device ID	04h, 07h, 0Ah, 0Bh, 0Ch, or 0Dh (see also ID numbers) or FFh	
Record	0Ch DIF :	4 bytes, 8 digit BCD
Fabricat. no.	78h VIF :	Fabrication no. (serial no.), e.g.: 2500176
Fabr. no. LSB	76 or FF BCD	
Fabr. no.	01 or FF BCD	
Fabr. no.	50 or FF BCD	
Fabr. no. MSB	02 or FF BCD	
Checksum	xxh	
Stop character	16h	

3.2.4 Wildcard characters

Some or all digits in the M-Bus module's secondary or enhanced secondary address can be replaced by wildcard characters. The M-Bus module will not compare the wildcard characters with the equivalent digits in "its own" secondary and enhanced secondary address, and the M-Bus module will be selected if the other characters match.

The 8 digits in the M-Bus ID number and the 8 digits in the "fabrication number" (= serial number) can each be replaced by the wildcard character Fh.

The binary values "Manufacturer ID" (2 bytes), "Version / generation ID" (1 byte), and "Device type ID" (1 byte) in the secondary address may be replaced (bytes) by the wildcard value FFh.

The values for DIF = 0Ch (for 4 bytes, 8 digit BCD) and VIF = 78h (for fabrication number) in connection with enhanced secondary addressing cannot be replaced by wildcard values.

By means of wildcard characters (BCD Fh) and values (binary FFh) an M-Bus Master can relatively quickly search the M-Bus for connected M-Bus modules without knowing the M-Bus modules' primary, secondary or enhanced secondary addresses in advance.

This is called a "wildcard search", and is supported 100% by the M-Bus modules for MULTICAL® 402.

3.3 Physical properties

The bus is polarity independent.

The M-Bus modules has a max. power consumption of 1 unit load (1.5 mA).

R_{in} : 410 Ω

C_{in} : 0.5 nF

Max. cable resistance : 29 Ω/ 180 nF per pair.

Ambient temperature : 5…55 °C

Storage temperature : -20…60 °C

Bus current and voltages according to EN 13757-2

4 Data Communication

The M-Bus concept comprises various relevant formats and commands for communication between an M-Bus Master and an M-Bus module mounted in a MULTICAL® 402.

4.1 M-Bus formats

The M-Bus protocol comprises following telegram / message format types:

Single character
Ack. = E5h

Short frame
Start = 10h
C-Field
A-Field
Checksum
Stop = 16h

Control frame
Start = 68h
L-Field = 3
L-Field = 3
Start = 68h
C-Field
A-Field
CI-Field
Checksum
Stop = 16h

Long frame
Start = 68h
L-Field = N + 3
L-Field = N + 3
Start = 68h
C-Field
A-Field
CI-Field
Userdata (N = 0..252 bytes)
Checksum
Stop = 16h

The meaning of the individual characters:

C-FIELD:	40h	SND_NKE		
	08h	RSP_UD		
	0Bh	RSP_SKE		
	49h	REQ_SKE		
	53h	SND_UD (FCB=0)	73h	SND_UD (FCB =1)
	5Ah	REQ_UD1 (FCB=0)	7Ah	REQ_UD1 (FCB =1)
	5Bh	REQ_UD2 (FCB=0)	7Bh	REQ_UD2 (FCB =1)

OBS: The FCB bit is not used, but the M-Bus modules accept both FCB=0 and FCB=1.

A-FIELD:	xxh	The primary address of the M-Bus module which is encoded via MULTICAL® 402.
	FDh	(253) The primary address of the M-Bus module in connection with secondary addressing. However, in connection with RSP_UD the M-Bus module still replies with its own primary address.
	FEh	(254) Address to which all M-Bus modules will reply. By using this address only one M-Bus module can be connected.
	FFh	(255) Joint address where all M-Bus modules can receive data from the M-Bus Master, but replies are not returned.
CI-FIELD:	50h	Application reset, (re-) initialization of application layer.

51h	Normal transmission of SND_UD, data send (M-Bus Master to M-Bus module).
52h	Opening for secondary addressing (selection of M-Bus modules) is required.
72h	Respond in variable structure.
B8h	Baud rate shift to 300 baud.
BBh	Baud rate shift to 2400 baud.
BDh	Baud rate shift to 9600 baud.

4.2 M-Bus Master to M-Bus module

Communication on the M-Bus is initiated by the M-Bus Master. After this the addressed M-Bus module replies. Basically, there are 2 different communication sequences (from M-Bus Master to M-Bus module):

SEND -> CONFIRM

REQUEST -> RESPONSE

When using “SEND -> CONFIRM” the M-Bus Master sends a command or data to the M-Bus module, that replies with an acknowledgement (ACK). The acknowledgement (ACK) just means that the M-Bus module has received the telegram successfully, but it has not necessarily accepted the contents.

When using “REQUEST -> RESPONSE” the M-Bus Master sends a request to the M-Bus module, which replies with a telegram containing the last read meter data from the meter or with an ACK.

The M-Bus module only supports "Mode 1" data format where all multi-byte data values to and from the M-Bus module are transmitted with Least Significant Byte (LSB) first.

The M-Bus modules does not use FCB / FCV bit in the C-Field but accepts both FCB / FCV bit = 0 and 1.

The M-Bus module does not use DFC (Data Flow Control) / ACD (Access Demand) bits, which means that both bits will always have the value 0 in the C-Field from the M-Bus module.

The following describes the individual M-Bus telegrams from M-Bus Master to M-Bus module and from M-Bus module to M-Bus Master that are supported.

REQ_UD1: Short frame. Request for time-critical data alarm.

Start character	10h
C-field	5Ah
A-field	xxh or FDh
Checksum	xxh
Stop character	16h

REQ_UD2: Short frame. Request for data from the M-Bus module (heat meter).

Start character	10h
C-field	5Bh
A-field	xxh or FDh
Checksum	xxh
Stop character	16h

REQ_SKE: Short frame. Status request.

Start character	10h	
C-field	49h	
A-field	xxh or FDh	
Checksum	xxh	
Stop character	16h	

SND_NKE : Short frame. Normalizes the M-Bus module.

Start character	10h	
C-field	40h	
A-field	xxh or FDh	
Checksum	xxh	
Stop character	16h	

SND_UD : Long frame, Data to the M-Bus module.

Start character	68h	
L-field	xxh	length field = number of data bytes N + 3
L-field	xxh	length field repeated
Start character	68h	
C-field	53h	(FCB=0) or 73h (FCB=1) = SND_UD
A-field	xxh or FDh	
CI-field	xxh	51h = data send, 52h = create secondary address
Data byte 1	xx	
:	:	
:	:	
Data byte 1	xx	
Checksum	xxh	
Stop character	16h	

4.3 M-Bus module to M-Bus Master

RSP_UD : Long frame.
Data to M-Bus Master. See telegram later.

RSP_SKE : Short frame.
Data to M-Bus Master. See telegram later.

ACK : Single control character.
Data format from M-Bus Master received successfully.

Description of the codes of the individual formats can be viewed later in this document.

Communication takes place in following sequences:

4.3.1 REQ_UD2 -> RSP_UD

When meter data are collected from the M-Bus module, an REQ_UD2 is transmitted from the M-Bus Master. The M-Bus module checks the message, and if it is correct, the M-Bus module returns with an RSP_UD, which is meter data packed according to the M-Bus format for RSP_UD. The consumption data collected may be up to 15 minutes old. When RSP_UD has been sent from the M-Bus module, new data are collected from the meter. This will make it possible to collect actual data by sending REQ_UD2 twice to the same M-Bus module, or SND_NKE followed by REQ_UD2.

As collection of consumption data in MULTICAL® 402 may take 4 sec. (without retry), please wait min. 4 sec. before sending the next request to the M-Bus module to be sure to get fresh data. However, the M-Bus module will still try to reply to the M-Bus while collecting data from the meter, but with a mixture of fresh and previous data, until all fresh data have been read.

A time limit has been put into the M-Bus module, which means that it always waits min. 28 seconds between several successive readings of data in the meter. This means that irrespective how often data are collected from the M-Bus module, the update period of data from the meter will be approx. 28 seconds, which must be seen in relation to the update period for measurements in MULTICAL® 402, which is min. 24 seconds.

An explanation of the format RSP_UD can be viewed later in the manual.

4.3.2 REQ_UD1 -> ACK

REQ_UD1 from the M-Bus Master is a request for time-critical (alarm) data from the M-Bus module. The M-Bus module for MULTICAL® 402 does not support time-critical data (alarm protocol), but it replies with an ACK (link layer receipt) when receiving REQ_UD1, which means that the M-Bus module does not have any time-critical (alarm) data to transmit.

In this way the M-Bus module will function in M-Bus systems with other M-Bus modules supporting time-critical data (alarm protocol).

4.3.3 REQ_SKE -> RSP_SKE

REQ_SKE from the M-Bus Master is a request for communication status and for information on whether the M-Bus module has any time-critical (alarm) data to send. When receiving an REQ_SKE the M-Bus module replies with an RSP_SKE, but as the M-Bus module does not support time-critical data (alarm protocol) and cannot have overflow in its input buffer, the status bits ACD (Access Demand) and DFC (Data Flow Control) will always be = 0 in the M-Bus module reply, which means that the M-Bus module does not have any time-critical (alarm) data to send and has no buffer overflow.

Therefore, 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.

4.3.4 SND_NKE -> ACK

The M-Bus Master normalizes the M-Bus module with an SND_NKE and the M-Bus module acknowledges successful recepit of the message by means of an ACK. Normalization results in the fact that the M-Bus module collects consumption data from the meter. Furthermore, an SND_NKE to primary address 253 will deselect the M-Bus module if it was selected by means of secondary or enhanced secondary addressing.

4.3.5 SND_UD -> ACK

The M-Bus Master wishes to send data to the M-Bus module or to select/deselect the M-Bus module via secondary or enhanced secondary addressing. The M-Bus module acknowledges successful receipt of the SND_UD telegram by means of an ACK. The acknowledgement (ACK) just means that the M-Bus module has received the telegram successfully in the Data Link

Layer and is as such no guarantee that the M-Bus module has accepted the contents of the Application Layer.

Therefore, when receiving an SND_UD command with a new baud rate, the M-Bus module will acknowledge receipt by means of an ACK, even though it ignores the contents, as the M-Bus module automatically detects the baud rate on receipt.

4.4 Error Messages

MULTICAL® 402 constantly surveys a number of important functions. Where serious errors have occurred in the measuring system or in the installation, a flashing "info" will appear in the display while the error exists. The “Info” panel will flash for as long as the error exists no matter which reading is selected. The "Info" panel will automatically turn off, when the source of error has been corrected.

M-Bus modules for MULTICAL® 402 support info codes from MULTICAL® 402 and are mapped to the two error bits ”Permanent Error” (bit 3) and ”Temporary Error” (bit 4) in the status field of the data header as described in the following chapter.

4.4.1 Permanent Error

Permanent Error (Bit 3) is set when one of the following info codes is active in MULTICAL® 402:

Error Code in MULTICAL® 402	Status field value	Description
4	0004h	T2 temperature sensor error
8	0008h	T1 temperature sensor error
16384	4000h	Flow sensor V1 wrong direction

4.4.2 Temporary Error

Temporary Error (Bit 4) is set when one of the following info codes is active in MULTICAL® 402:

Error Code in MULTICAL® 402	Status field value	Description
1	001h	MC 402 reset
4096	1000h	Flow sensor V1 signal too low (air)

4.4.3 Status field

The ”Status field” in the M-Bus data header will always have one of the following 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 ore more ”Permanent Error” and ”Temporary Error” info codes at the same time

4.5 Data telegram

The M-Bus modules for MULTICAL® 402 are transferring following data:

Actual data	Target data	Manufacture specified data
Meter No. Energy E1 Volume V1 Hour counter Tforward Treturn Tdiff. Actual power Max. power Actual flow Max. flow TA2 TA3 In-A In-B Cooling Energy E3 Date/Time	Energy E1 Volume V1 Max. power Max. flow TA2 TA3 VA/In-A VB/In-B Cooling Energy E3 Target date	Info code Energy input E8 Returned energy E9 TL2 TL3 Prog. No. Config. No. 1 Config. No. 2 Customer No. 1 Customer No. 2 Meter type + revision Module type + revision

Target data are default yearly data, but can be changed to monthly date. See chapter 5.6 Readout of monthly target data.

In the module version with pulse outputs, are the VA/In-A and VB/IN-B registers included in the data telegram, but not in use.

4.6 Reading and writing data in MULTICAL® 402

The M-Bus modules read MULTICAL® 402 data in blocks of up to 50 bytes at a time. Reading takes place in one of the following two sequences depending on the situation:

1. Complete reading of all M-Bus related data in MULTICAL® 402.
2. Reading of current consumption values and time (subset of complete reading).

If reading takes place while the M-Bus module is reading data in MULTICAL®402, data will be a mixture of fresh and previous data. However, data within the same block will be simultaneous and valid but either fresh or previous. As the last data block is always time and date - both complete and consumption data readings – it is possible to determine if data are updated by comparing time in the latest reading with time in the previous reading.

In other words, if time has been updated since last M-Bus reading, all other data have been updated as well. As time is only sent with a resolution of 1 minute, different reading values may appear within the same minute.

4.6.1 Complete reading

The M-Bus modules make a complete reading in following situations:

- After reset
- After manual call – via push buttons on MULTICAL® 402
- After writing data in MULTICAL® 402 via the M-Bus
- After shifting between selecting yearly log data or monthly log data
- After receiving an M-Bus “Application Reset” command
- 24 hours after last complete reading

A complete reading takes approx. 12 seconds.

4.6.2 Reading consumption data

In addition, the M-Bus modules read current consumption values and time in following situations:

- After receiving SND_NKE (M-Bus normalization)
- After receiving REQ_UD2 (M-Bus data request)
- After receiving REQ_SKE (M-Bus status request)
- 15 minutes after the last reading of consumption values

A reading of current consumption values and time takes min. approx. 4 seconds.

5 Configuration of MULTICAL® 402 via M-Bus

Following data can be sent to the M-Bus module (with CI-field = 51h) and then be changed in MULTICAL® 402:

- Primary M-Bus address (1 byte binary)
- M-Bus ID number = part of the secondary address (4 bytes - 8 BCD digits)
- Date and time (4 bytes binary encoded as data type F according to EN13757-3 Annex A)
- Preset of pulse input A and B (2 x 4 bytes, binary)
- Readout of monthly target data instead of yearly target data

Selection of the M-Bus module via secondary address or enhanced secondary address, and application reset is obtained via SND_UD telegram from the M-Bus Master to the M-Bus module with CI-field = 52h (selection of M-Bus modules) and CI-field = 50h (application reset), respectively.

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 telegrams for writing data in the M-Bus module are shown subsequently:

5.1 Primary M-Bus address

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	

5.2 M-Bus ID Number = part of secondary M-Bus address

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
Customer 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	

5.3 Date and time

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	

5.4 Preset of pulse input A and B

Via the M-Bus module with 2 pulse inputs (VA, VB), the presets of the counter values of the connected meters can be configured and shown in the display of MULTICAL® 402.

5.4.1 Preset counter value A

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 nr. = 1 (input A)
Volume	14h	VIF : volume in 0,01 m3 (= 10 l), e.g 001258,73m3
vol. A LSB	B1h	
vol. A	EBh	
vol. A	01h	
vol. A MSB	00h	
Checksum	xxh	
Stop character	16h	

5.4.2 Preset counter value B

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 nr. LSB = 0, DIFE follows
	40h	DIFE : sub unit nr. MSB = 1 => unit nr. = 2 (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	

5.5 Application reset

In connection with application reset the M-Bus module re-initializes its M-Bus application protocol layer, which results in the following:

- Resetting of access number, which is included in the RSP_UD, and counting 1 up every time an RSP_UD has been sent.
- Default readout of yearly data irrespective of previous configuration
- Reading of all M-Bus related data in MULTICAL® 402.

The M-Bus module does not perform a total reset, as is the case after “power-on”.

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	

5.6 Readout of monthly target data

Selection of historical data readout (yearly or monthly):

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	SND_UD, data send (M-Bus Master to M-Bus module).
DIF	08h	Selection for readout
VIF	7Fh	Manufacturer specific coding (of Option bytes 1..4)
Option 1	01h	Historical value configuration
Option 2	xxh	00h = yearly data, 01h = monthly log data
Option 3	YYh	LSB of index in log (01h..0Fh for yearly log and 01h..24h for monthly log)
Option 4	ZZh	MSB of index in log (always 00h)
Checksum	xxh	
Stop character	16h	

Together Option 3 = YYh, and Option 4 = ZZh make up a 16 bit integer, where ZZYYh states the index in the selected MULTICAL® 402 log (yearly log or monthly log) from which historical data should be read out.

For yearly log data (Option 2 = 00h), logged data from latest 1 .. 15 years' target dates can be selected:

Option 4, Option 3 = 00 01h .. 00 0Fh , corresponding to index 1 .. 15 in the MULTICAL® 402 yearly log.

For monthly log data (Option 2 = 01h), logged data from latest 1 .. 36 months' target dates can be selected :

Option 4, Option 3 = 00 01h .. 00 24h, corresponding to index 1 .. 36 in the MULTICAL® 402 monthly log.

Default after reset the module is configured to read out historical data for last yearly target date corresponding to:

Option 1 = 01h

Option 2 = 00h

Option 3 = 01h

Option 4 = 00h

Note

If an Application Reset command is sent to the M-Bus module, or if it has been without voltage for more than one minute, the M-Bus module will go back to its original setting = read-out of yearly data. To select read-out of monthly data, above programming command must be sent to the M-Bus module once again. Replies from the M-Bus module (RSP_UD) contain status information concerning the actual setting. See data telegram description for RSP_UD in chapter 6.1.

6 Protocol

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

6.1 RSP_UD data

Complete description of replies from the M-Bus modules (RSP_UD) on requests from M-Bus Master (REQ_UD2):

DIF - Data Information Field

VIF - Value Information Field

RSP_UD data:			
Start	68h		
L-field	F7h	Length of 247 bytes	
L-field	F7h	Length of 247 bytes	
Start	68h		
C-field	08h	Code for RSP_UD	
A-field	6Ah	M-Bus module address (e.g address = 106)	
CI-field	72h	Code for variable data structure with LSB first (mode 1)	
ID-no.	67 BCD	e.g.: M-Bus ID no. = 01234567	**Data header start**
ID-no.	45 BCD		
ID-no.	23 BCD		
ID-no.	01 BCD		
Manufacturer	2Dh	ID for Kamstrup A/S (KAM)	
Manufacturer	2Ch		
Version	0Bh	Version ID = 11 for MULTICAL® 402 modules	
Device ID	xxh	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 = Warm water (30 .. 90 deg. C)	
		16h = Cold water	
Access	xxh	Counts 1 up after each RSP_UD. xx=00 after reset.	
Status	xxh	Error message. xx=00 means no error. 08h = One or more “permanent error”	
		10h = One or more “temporary error”	
		18h = Combination of both permanent and temporary errors	
Signature	00h	Not used	
Signature	00h	Not used	**Data header end**
Record	0Ch	DIF: 4 bytes, 8 digit BCD	
Fabricat. no.	78h	VIF: Fabrication no. (serial number), e.g.: 6001234	
	34 BCD		

	12 BCD	
	00 BCD	
	06 BCD	
Record	04h	DIF : 4 bytes binary
Energy 1	xxh	VIF : energy, e.g.: xx=0F (for 10 MJ), xx=06 (for kWh)
	B1h	e.g. 000137,45 GJ or 13745 kWh
	35h	
	00h	
	00h	
Record	04h	DIF : 4 bytes binary
Volume 1	xxh	VIF : volume, e.g.: xx=14 (for 10 litres in resolution)
	10h	e.g. 000258,72 m3
	65h	
	00h	
	00h	
Record	04h	DIF : 4 bytes binary
Hour Counter	22h	VIF : hours (on time)
	C6h	e.g. 00012486 timer
	30h	
	00h	
	00h	
Record	04h	DIF : 4 bytes binary
Temp. flow	59h	VIF : flow pipe temperature in 0,01 °C
	70h	e.g. 000077,92 °C
	1Eh	
	00h	
	00h	
Record	04h	DIF : 4 bytes binary
Temp. return	5Dh	VIF : return pipe temperature in 0,01 °C
	CDh	e.g. 00027,65 °C
	0Ah	
	00h	
	00h	
Record	04h	DIF : 4 bytes binary
Temp.diff.	61h	VIF : temperature difference in 0,01 K
	A3h	e.g. 000050,27 K
	13h	
	00h	
	00h	
Record	04h	DIF : 4 bytes binary
Power	xxh	VIF : power, e.g.: xx=2D (for 0,1 kW resolution)
	12h	e.g. 27,4 kW

	01h	
	00h	
	00h	
Record	14h	DIF : 4 bytes binary, max value (year or month)
Peak power	xxh	VIF : power, e.g.: xx=2D (for 0,1 kW resolution)
	ABh	e.g. 68,3kW
	02h	
	00h	
	00h	
Record	04h	DIF : 4 bytes binary
Flow	xxh	VIF : flow, e.g.: xx=3B (for l/h resolution)
	59h	e.g. 345 l/h
	01h	
	00h	
	00h	
Record	14h	DIF : 4 bytes binary, max value (year or month)
Peak flow	xxh	VIF : flow, e.g.: xx=3B (for l/h resolution)
	17h	e.g. 791 l/h
	03h	
	00h	
	00h	
Record	84h	DIF : 4 bytes binary, DIFE follows
Tariff 2	10h	DIFE : tariff no. = 1 (TA2 in MC 402)
Energy	xxh	VIF : energy, e.g.: xx=0F (for 10 MJ), xx=06 (for kWh)
	B1h	e.g. 000137,45 GJ or 13745 kWh
	35h	
	00h	
	00h	
Record	84h	DIF : 4 bytes binary, DIFE follows
Tariff 3	20h	DIFE : tariff no. = 2 (TA3 in MC 402)
Energy	xxh	VIF : energy, e.g.: xx=0F (for 10 MJ), xx=06 (for kWh)
	xxh	
	xxh	
	xxh	
	xxh	
Record	84h	DIF : 4 bytes binary, DIFE follows
Pulse Counter A	40h	DIFE : sub unit no. = 1 (input A)
Vol. / energy	xxh	VIF : volume / energy, e.g.: xx=14 (for 10-2 m3 resolution)
	B1h	e.g. 001258,73 m3
	EBh	
	01h	
	00h	

Record	84h	DIF : 4 bytes binary, DIFE follows
Pulse Counter B	80h	DIFE : sub unit no. LSb = 0, DIFE follows
	40h	DIFE : sub unit no. MSb = 1 => unit no. = 2 (input B)
Vol. / energy	xxh	VIF : volume / energy, e.g.: xx=06 (for kWh resolution)
	4Eh	e.g. 00073294 kWh
	1Eh	
	01h	
	00h	
Record	84h	DIF : 4 bytes binary, DIFE follows
Energy 3	C0h	DIFE : sub unit no. LSb = 1, DIFE follows
	40h	DIFE : sub unit no. MSb = 1 => unit no. = 3
		(E3 = Cooling energy)
Energy	xxh	VIF : energy, e.g.: xx=0F (for 10 MJ), xx=06 (for kWh)
	xxh	
	xxh	
	xxh	
	xxh	
Record	04h	DIF : 4 bytes, compound data type F
Date and time	6Dh	VIF : Date and time, e.g. 07-09-2006 14:13 std. time, valid
	0Dh	IV, 0, MI5, MI4, MI3, MI2, MI1, MI0
	2Eh	SU, HY1, HY0, H4, H3, H2, H1, H0
	C7h	Y2, Y1, Y0, D4, D3, D2, D1, D0
	09h	Y6, Y5, Y4, Y3, M3, M2, M1, M0
Record	44h	DIF : 4 bytes binary, historical (storage no. = 1)
Target energy	xxh	VIF : energy, e.g.: xx=0F (for 10 MJ), xx=06 (for kWh)
	xxh	
	xxh	
	xxh	
	xxh	
Record	44h	DIF : 4 bytes binary, historical (storage no. = 1)
Target volume	xxh	VIF : volume, e.g.: xx=14 (for 10-2 m3 resolution)
	xxh	
	xxh	
	xxh	
	xxh	
Record	54h	DIF : 4 bytes binary, hist. (storage no. = 1), max. value
Target pk. pwr	xxh	VIF : power, e.g.: xx=2D (for 0,1 kW resolution)
	xxh	
	xxh	
	xxh	
	xxh	
Record	54h	DIF : 4 bytes binary, hist. (storage no. = 1), max. value

Target pk. flow	xxh	VIF : flow, e.g. xx=3B (for l/h resolution)
	xxh	
	xxh	
	xxh	
	xxh	
Record	C4h	DIF : 4 bytes binary, hist. (storage no. = 1) DIFE follows
Target Tariff 2	10h	DIFE : tariff no. = 1 (TA2 in MC 402)
Energy	xxh	VIF : energy, e.g.: xx=0F (for 10 MJ), xx=06 (for kWh)
	xxh	
	xxh	
	xxh	
	xxh	
Record	C4h	DIF : 4 bytes binary, hist. (storage no. = 1) DIFE follows
Target Tariff 3	20h	DIFE : tariff no. = 2 (TA3 in MC402)
Energy	xxh	VIF : energy, e.g.: xx=0F (for 10 MJ), xx=06 (for kWh)
	xxh	
	xxh	
	xxh	
	xxh	
Record	C4h	DIF : 4 bytes binary, hist. (storage no. = 1), DIFE follows
Pulse counter A	40h	DIFE : sub unit no. = 1 (input A)
Target vol./	xxh	VIF : volume, e.g.: xx=14 (for 10-2 m3 resolution)
energy	B1h	e.g. 001258,73 m3
	EBh	
	01h	
	00h	
Record	C4h	DIF : 4 bytes binary, hist. (storage no. = 1), DIFE follows
Pulse counter B	80h	DIFE : sub unit no. LSB = 0, DIFE follows
	40h	DIFE : sub unit no. MSB = 1 => unit no. = 2 (input B)
Target vol./	xxh	VIF : volume / energy, e.g.: xx=06 (for kWh resolution)
energy	4Eh	e.g. 00073294 kWh
	1Eh	
	01h	
	00h	
Record	C4h	DIF : 4 bytes binary, hist. (storage no. = 1) DIFE follows
Target Energy 3	C0h	DIFE : sub unit no. LSB = 1, DIFE follows
	40h	DIFE : sub unit no. MSB = 1 => unit no. = 3 (E3 = Cooling energy)
Energy	xxh	VIF : energy, e.g.: xx=0F (for 10 MJ), xx=06 (for kWh)
	xxh	
	xxh	
	xxh	

	xxh	
Record	42h	DIF : 2 bytes, data type G, historical (storage no. = 1)
Target date	6Ch	VIF : date
	DFh	e.g. 310506 (2006-05-31)
	05h	
MDH	0Fh	**Manufacturer Data Header**.
Info	xxh	4 bytes binary, LSB first for all, meter data after
	xxh	
	xxh	
	xxh	
Energy E8	xxh	Energy E8 = flow energy V1*T1 [m3*C]
	xxh	
	xxh	
	xxh	
Energy E9	xxh	Energy E9 = return energy V1*T2 [m3*C]
	xxh	
	xxh	
	xxh	
Unit TL2	xxh	Unit for tariff limit TL2
SignExp TL2	xxh	Prefix and exponent for tariff limit TL2
TL2	xxh	
	xxh	
	xxh	
	xxh	
Unit TL3	xxh	Unit for tariff limit TL3
SignExp TL3	xxh	Prefix and exponent for tariff limit TL3
TL3	xxh	
	xxh	
	xxh	
	xxh	
Prog. no.	CFh	e.g. ABCCCCCC : 34119119
	9Dh	
	08h	
	02h	
Config. No. 1	28h	e.g. DDDEE : 41000
	A0h	
	00h	
	00h	
Config. No. 2	F6h	e.g. FFGGMN : 242422
	B2h	
	03h	
	00h	

Customer No. 1	87h	8 least significant digits. e.g.: 01234567
	D6h	
	12h	
	00h	
Customer No. 2	00h	8 most significant digits. e.g.: 00000890
	00h	Result in = 89001234567
	00h	
	00h	
Meter type	01h	e.g. meter type 1101 h = MC 402 – Heat
+	11h	
Revision no.	02h	e.g. revision 0302 h = B1
	03h	
Module type	03h	e.g. type no. 7003 h = M-Bus module with pulse outputs
+	70h	
Revision no.	01h	e.g. revision 0201 h = B1
	02h	
Reserved	xxh	Reserved for possible status information
	xxh	(Default, xx = 00h)
	xxh	
	xxh	
Year / month	xxh	Status info: Yearly/Monthly data : 00h = Year, 01h = Month
Checksum	xxh	
Stop	16h	

Note

As MULTICAL® 402 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).

6.2 VIF codes (Value Information Field)

The VIF codes contain both unit and scaling factor / decimal point (multiplier) for the value in a given data record. In the data package from the M-Bus modules to MULTICAL® 402 the VIF codes for energy, volume, flow and power will (as far as possible) reflect the display reading in the meter as regards unit, decimal point and number of decimals.
Thus, the VIF codes for these data values will vary depending on the configuration of MULTICAL® 402.
The tariff limits in the manufacturer specific part of the data reply are always in the meter's basic units for the current tariff selected in MULTICAL® 402 (defined by the E-code in config. no. DD-EE-FF-GG-MN).

VIF: Value Information Field

VIF (HEX)	Coding	Subject	Unit	Size
05h	00000101	Energy	kWh	$Wh*10^{2}$
06h	00000110	Energy	kWh	$Wh*10^{3}$
07h	00000111	Energy	MWh	$Wh*10^{4}$
0Dh	00001101	Energy	MJ	$J*10^{5}$
0Eh	00001110	Energy	GJ	$J*10^{6}$
0Fh	00001111	Energy	GJ	$J*10^{7}$
12h	00010010	Volume	m^3*10^{-4}	m^3*10^{-4}
13h	00010011	Volume	m^3*10^{-3}	m^3*10^{-3}
14h	00010100	Volume	m^3*10^{-2}	m^3*10^{-2}
15h	00010101	Volume	m^3*10^{-1}	m^3*10^{-1}
16h	00010110	Volume	m^3	m^3*10^{0}
22h	00100010	Hour counter	Hours	Hours
2Bh	00101011	Power	$kW*10^{-3}$	$W*10^{0}$
2Ch	00101100	Power	$kW*10^{-2}$	$W*10^{1}$
2Dh	00101101	Power	$kW*10^{-1}$	$W*10^{2}$
2Eh	00101110	Power	$MW*10^{-3}$	$W*10^{3}$
2Fh	00101111	Power	$MW*10^{-2}$	$W*10^{4}$
3Ah	00111010	Flow	$l/h*10^{-1}$	$m^3/h*10^{-4}$
3Bh	00111011	Flow	l/h	$m^3/h*10^{-3}$
3Ch	00111100	Flow	$m^3/h*10^{-2}$	$m^3/h*10^{-2}$
3Dh	00111101	Flow	$m^3/h*10^{-1}$	$m^3/h*10^{-1}$
3Eh	00111110	Flow	m^3/h	$m^3/h*10^{0}$
59h	01011001	Temp. flow pipe	°C	$°C*10^{-2}$
5Dh	01011101	Temp. return flow	°C	$°C*10^{-2}$
61h	01100001	ΔT	K	$K*10^{-2}$
6Ch	01101100	Date	G-Type	Date
6Dh	01101101	Date and time	F-Type	Date and time
78h	01111000	Serial number	A-Type	Serial no.
79h	01111001	ID no.	A-Type	Customer no.
7Ah	01111010	Primary address	C-Type	Primary address

CODING: VIF-field coding in the data package

SUBJECT: Subject in the record

UNIT: Unit required

SIZE: Unit programmed in VIF

6.3 DIF (Data Information Field)

Subject	Value	Hex	Description
PRIMARY ADDRESS	00000001	01h	8 bit binary, Current Value, Type C
M-BUS ID (CUSTOMER) NO	00001100	0Ch	8 Digit BCD, Current Value, Type A
SERIAL NO.	00001100	0Ch	8 Digit BCD, Current Value, Type A
DATE_TARGET	01000010	42h	16 Integer, Historical Value, Type G
ENERGY_TARGET	01000100	44h	32 bit binary, Historical Value, Type B
WATER_TARGET	01000100	44h	32 bit binary, Historical Value, Type B
PEAK POWER_TARGET	01010100	54h	32 bit binary, Maximum, Historical Value, Type B
PEAK FLOW_TARGET	01010100	54h	32 bit binary, Maximum, Historical Value, Type B
INPUT A+B	10000100	84h	32 bit binary, Current Value, Type B, DIFE extension follows
INPUT A+B_TARGET	11000100	C4h	32 bit binary, Historical Value, Type B, DIFE extension follows
OTHERS	00000100	04h	32 bit binary, Current Value, Type B

6.4 Data header

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
MANUFAC	00101101	C	[ascii “K” - 64]*32*32+[ascii “A” – 64]*32+
MANUFAC	00101100	C	[ascii “M” - 64] ISO 60870 standard
VERSION ID	0B	C	Meter generation
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 = Warm water (30 .. 90 deg. C) 16h = Cold water
ACCESS	xxH	C	Counts 1 up for each data transmission to M-Bus Master
STATUS	xxH	C	Error code (Always = 00)
SIGNATURE	00H	C	(not used)
SIGNATURE	00H	C	(not used)

7 Timing summary

7.1 Power up

Timing from power on module until data are available for read out

Data	Max. time	Notes
New data from meter	25 sec.	
Module data	6 sec.	
Module data after short disconnect	3 sec	Disconnect of power < 1 sec.

7.2 Automatic data refresh

Timing for automatic refresh of data in module

Data	Interval	Reading time	Notes
Consumption data	15 min.	4 sec.	
All data	24 hours	12 sec	

7.3 Read out

Timing for reading data from the module after initialization, where the module has refreshed data form the meter

Data	Max time	Notes
Initialize -> Request	6 sec.	SND_NKE -> REQ_UD2

Most often data collection interval from the meter is every 28 sec.