



**COMAC CAL**

**CZECH PRODUCER  
AND DEVELOPER**  
OF MEASUREMENT  
AND SENSOR TECHNOLOGY

# **CALOR 40**

## ***M-Bus communication protocol specification***

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## Transmission service used

The master is the primary station which initiates all the messages transfers, the satellites stations are secondary stations which only transmit when they are asked for.

### *Initialization of Slave (SND\_NKE)*

EN 1434-3 compatibility (redundant) command. The secondary station answers ACK (E5h) if the reception is correct.

Request:	<b>10h</b>	
	<b>40h</b>	Initialization of slave
	<b>A</b>	Address
	<b>CS</b>	Checksum
	<b>16h</b>	Stop
Response:	<b>E5h</b>	

### *Send User Data to Slave (SND\_UD)*

With this procedure the master transfers user data to the slave. The slave can either confirm the correct receipt of data with a single character acknowledge (E5h). This procedure serves to set date and time.

Request:	<b>68h</b>	
	<b>0Ah</b>	Total length of the frame
	<b>0Ah</b>	Total length of the frame
	<b>68h</b>	
	<b>53h/73h</b>	SND_UD
	<b>A</b>	Address
	<b>51h</b>	CI (mode 1)
	<b>04h</b>	DIF (4 bytes binary coded)
	<b>Edh</b>	VIF (time point – type F)
	<b>00h</b>	VIFE
	<b>xxh</b>	date & time
	<b>xxh</b>	
	<b>xxh</b>	
	<b>xxh</b>	
	<b>CS</b>	Checksum
	<b>16h</b>	Stop
Response:	<b>E5h</b>	

**Date & time M-BUS type F format: 32 bits integer**

byte n°1

0	0	m5	m4	m3	m2	m1	m0
---	---	----	----	----	----	----	----

Minutes from 0 to 59 (binary coded)

byte n°2

0	0	0	H4	H3	H2	H1	H0
---	---	---	----	----	----	----	----

Hours from 0 to 23 (binary coded)

byte n°3

Y2	Y1	Y0	D4	D3	D2	D1	D0
----	----	----	----	----	----	----	----

Day from 1 to 31 (binary coded) and lsb of the year from 00 to 99 (binary coded)

byte n°4

Y6	Y5	Y4	Y3	M3	M2	M1	M0
----	----	----	----	----	----	----	----

***Request / Response (REQ\_UD2)***

The master sends a short frame with the data request code 5Bh or 7Bh and the address of secondary station.

<b>Request:</b>	<b>10h</b>	
	<b>5Bh/7Bh</b>	Data request instruction code
	<b>A</b>	Address
	<b>CS</b>	Checksum
	<b>16h</b>	Stop

**Response:**

The meter answers a frame composed with the following parameters:

- Energy ( $E_{\text{heat}}$ )
- Volume ( $V_{\text{heat}}$ )
- Power
- Flow
- Inlet temperature
- Outlet temperature
- Temperature difference
- Date and time
- Operating time
- Software version
- Error code

## Energy

The energy index is calculated with a resolution equal to the digit of the displayed energy index whatever the comma position.

The entire part of the energy index after adjustment on the unit (coded on 32 Bit Integer) is transmitted.

The following table gives the possibly VIF value:

<b>transmitted unit</b>	<b>VIF</b>	<b>VIFE</b>
1MJ	0Eh	
10MJ	0Fh	
100 MJ	FBh	08h

## Volume

The volume is transmitted (coded on 32 Bit Integer) with the unit of the significant digit on the display.

The following table gives the possibly VIF value:

<b>transmitted unit</b>	<b>VIF</b>
1 m3	16h
100 litre	15h
10 litre	14h
1 litre	13h

## Power

P is transmitted (coded on 32 Bit Integer) with the unit of the significant digit on the display.

The following table gives the possibly VIF value:

<b>transmitted unit</b>	<b>VIF</b>
1 kW	2Eh
100 W	2Dh
10 W	2Ch
1 W	2Bh

## Flow

The flow is transmitted on 4 binary bytes (coded on 32 Bit Integer).  
The following table gives the possibly VIF value:

transmitted unit	VIF
1 m <sup>3</sup> /hour	3Eh
100 litre/hour	3Dh
10 litre/hour	3Ch
1 litre/hour	3Bh

## Temperatures

The inlet and outlet temperatures are transmitted on 32 Bit Real values.

## Temperature difference

The temperature difference is transmitted on 32 Bit Real values.

## Date and time

The date and time format used is the M-BUS type F format: 32 bits integer

byte n°1

0	0	m5	m4	m3	m2	m1	m0
---	---	----	----	----	----	----	----

Minutes from 0 to 59 (binary coded)

byte n°2

0	0	0	H4	H3	H2	H1	H0
---	---	---	----	----	----	----	----

Hours from 0 to 23 (binary coded)

byte n°3

Y2	Y1	Y0	D4	D3	D2	D1	D0
----	----	----	----	----	----	----	----

Day from 1 to 31 (binary coded) and lsb of the year from 00 to 99 (binary coded)

byte n°4

Y6	Y5	Y4	Y3	M3	M2	M1	M0
----	----	----	----	----	----	----	----

Month from 1 to 12 (binary coded) and msb of the year

## **Operating time**

Number of days : 16 bit integer format

## **Software version**

8 bit integer format

## **Alarms**

8 bit integer

bit 0	Internal write error
bit 1	Internal read error
bit 2	EEPROM error
bit 3	Flow out of range (large signal feature)
bit 4	Power out of range (large signal feature)
bit 5	Hot sensor alarm
bit 6	Cold sensor alarm
bit 7	dT out of range

total length of the frame : 79 (80) bytes

*Meter response frame:*

0	68h	start
	49h/4Ah	(total length of the frame) - 6
	49h/4Ah	(total length of the frame) - 6
	68h	start
	08h	
5	xxh	address
	72h	CI (mode 1)
	xxh	identification numer (LSB)
	xxh	„
	xxh	„
10	xxh	„ (MSB)
	43h	manufacturer identification
	4Dh	„
	28h	generation (CALOR40)
	04h	heat meter
15	xxh	numer of access
	xxh	error code
	00h	signature
	00h	„
	04h	DIF : 4 bytes binary coded
20	0Eh/0Fh or FBh	VIF : energy depending on comma positron
	(08h)	VIF=FBh -> VIFE=08h (Energy unit 0.1GJ)
	xxh	energy index (LSB)
	xxh	„
	xxh	„
	xxh	„ (MSB)
25	04h	DIF : 4 bytes binary coded
	13h/14h/15h or 16h	VIF : volume, depending on comma position
	xxh	volume index (LSB)
	xxh	„
	xxh	„
30	xxh	„ (MSB)
	04h	DIF : 4 bytes binary coded
	2Bh/2Ch/2Dh or 2Eh	VIF : power in 1 W - 1 kW
	xxh	instantaneous power (LSB)
	xxh	„
35	xxh	„
	xxh	„ (MSB)
	04h	DIF : 4 bytes binary coded
	3Bh/3Ch/3Dh or 3Eh	VIF : flow in 1 l/h – 1 m3/h
	xxh	instantaneous flow (LSB)
40	xxh	„
	xxh	„
	xxh	„ (MSB)
	05h	DIF : 32 Bit Real
	5Bh	VIF : flow temperature in °C
45	xxh	inlet temperature (LSB)
	xxh	„

	xxh	”
	xxh	” (MSB)
	05h	DIF : 32 Bit Real
50	5Fh	VIF : return temperature in °C
	xxh	outlet temperature (LSB)
	xxh	”
	xxh	”
	xxh	” (MSB)
55	05h	DIF : 32 Bit Real
	63h	VIF : temperature difference in °C
	xxh	temperature difference (LSB)
	xxh	”
	xxh	”
60	xxh	” (MSB)
	04h	DIF : 4 bytes binary coded
	6Dh	VIF : time point in data type F
	xxh	” (LSB)
	xxh	”
65	xxh	”
	xxh	” (MSB)
	02h	DIF 2 bytes binary coded
	27h	VIF : operating time in days
	xxh	operating time (LSB)
70	xxh	” (MSB)
	01h	DIF : 1 bytes binary coded
	FDh	VIF : extension of VIF code
	0Fh	VIFE : software version
	xxh	software version value
75	0Fh	CALOR40 specific data
	xxh	alarm code
	CS	checksum
	16h	stop

## Archives

### *Send User Data to Slave (SND\_UD)*

With this procedure the master transfers user data to the slave. The slave can either confirm the correct receipt of data with a single character acknowledge (E5h). This procedure serves to set archives address and switch instantaneous value frame to archives value frame.

Request:	<b>68h</b>	
	<b>06h</b>	Total length of the frame
	<b>06h</b>	Total length of the frame
	<b>68h</b>	
	<b>53h/73h</b>	SND_UD
	<b>A</b>	Address
	<b>51h</b>	CI (mode 1)
	<b>0Fh</b>	DIF (special functions)
	<b>AddrLo</b>	archives address
	<b>AddrHi</b>	
	<b>CS</b>	Checksum
	<b>16h</b>	Stop
Response:	<b>E5h</b>	

Archives address is valid 4sec. After this time change back response archives value frame to instantaneous value frame.

Day archives:

Archives address =  $64 \times ((\text{Month}-1) \times 32 + \text{Day})$

Month archives:

Archives address =  $64 \times (\text{Month}+432)$

(exception: Month=12 → Archives address =  $64 \times 432$ )

Next address position are reserved for specific data.

### *Request / Response (REQ\_UD2)*

The master sends a short frame with the data request code 5Bh or 7Bh and the address of secondary station.

Request:	<b>10h</b>	
	<b>5Bh/7Bh</b>	Data request instruction code
	<b>A</b>	Address
	<b>CS</b>	Checksum
	<b>16h</b>	Stop

## Response:

The meter answers a special frame composed with the archives structure:

0	68h	start
	50h	(total length of the frame) - 6
	50h	(total length of the frame) - 6
	68h	start
	08h	
5	xxh	address
	72h	CI (mode 1)
	xxh	identification numer (LSB)
	xxh	”
	xxh	”
10	xxh	” (MSB)
	43h	manufacturer identification
	4Dh	”
	28h	generation (CALOR40)
	04h	heat meter
15	xxh	numer of access
	xxh	error code
	00h	signature
	00h	”
	0Fh	DIF : special function
20	xxh	64B data composed with the archives structure
	xxh	
	—	
	—	
	—	
	CS	checksum
85	16h	stop