

Protocol description COM/FCU/MBUS-EN

SensyCal FCU200, FCU400 Universal measuring computer M-Bus protocol

Measurement made easy



Universal measuring computer SensyCal FCU200, FCU400

Protocol description

COM/FCU/MBUS-EN

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Translation of the original instruction

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1 SENSYCAL Response Telegrams

The telegram structures that SENSYCAL can return are listed and explained in the following.

1.1 Response of Terminal without Data (after the Delete Output List Command)

This telegram is always sent when no output data has been selected in SENSYCAL. This is always the case if the internal output list has been deleted.

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	xx	
2	Length field	xx	
3	Start character	68h	
4	C field	08	
5	A field	0-255	
6	CI field	72h	
7	ID3	78h	ID (LSB first) BCD 12345678
8	ID2	56h	
9	ID1	34h	
10	ID0	12h	
11	Man1		Manufacturer (LSB first)
12	Man0		
13	Version		
14	Medium		
15	Access no.	0-255	Automatically increased
16	Status	0	
17	Signature 1	0	
18	Signature 0	0	
19	Checksum (CS)		Calculated from (\sum fields 4 to 18) mod 256
20	Terminator	16h	

1.2 Standard Response from SENSYCAL

This telegram is always issued after a REQ_UD2 preceded by an application reset. It is issued until further values are added to the output list or the SENSYCAL output list is deleted.

Note:

A SND_NKE sent to the device does **not** set this response.

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	Xx	
2	Length field	Xx	
3	Start character	68h	
4	C field	08	
5	A field	0-255	
6	CI field	72h	
7	ID3	78h	ID (LSB first) BCD 12345678
8	ID2	56h	
9	ID1	34h	
10	ID0	12h	
11	Man1		Manufacturer (LSB first)
12	Man0		
13	Version		
14	Medium		
15	Access no.	0-255	Automatically increased
16	Status	0	
17	Signature 1	0	
18	Signature 0	0	
19-ES	Standard response from the device		To be described in more detail
ES+1	Checksum (CS)		Calculated from (\sum fields 4 to ES) mod 256
ES+2	Terminator	16h	

ES = end of standard response

SENSYCAL Response Telegrams

1.3 Response from SENSYCAL with n Selected Parameters

This telegram enables the SENSYCAL data to be transferred in any combination. The sequence of the data is determined by the order in the drop-down list.

If the queried data cannot be transferred in a telegram, a multi-telegram sequence is automatically generated and the missing data is transferred in the following telegram.

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	xx	
2	Length field	xx	
3	Start character	68h	
4	C field	08	
5	A field	0-255	
6	CI field	72h	
7	ID3	78h	ID (LSB first) BCD 12345678
8	ID2	56h	
9	ID1	34h	
10	ID0	12h	
11	Man1		Manufacturer (LSB first)
12	Man0		
13	Version		
14	Medium		
15	Access no.	0-255	Automatically increased
16	Status	0	
17	Signature 1	0	
18	Signature 0	0	
19	Selected parameter 1		
19+x1	Selected parameter 2		
19+x1 +x2	Selected parameters ...		
19+x1 +x2+.. +xn-1	Selected parameter n		
19+x1 +x2+.. +xn+ 1	Checksum (CS)		Calculated from (\sum fields 4 to CS-1) mod 256
	Terminator	16h	

1.4 Response from SENSYCAL when Downloading the EEPROM with Additional Data in the Following Telegram

Data is transferred from the EEPROM using a multi-telegram sequence. This allows a variable volume of data to be transferred.

The following telegram is always used if more than one telegram is required and the current telegram is not the last telegram of the series.

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	xx	
2	Length field	xx	
3	Start character	68h	
4	C field	08	
5	A field	0-255	
6	CI field	72h	
7	ID3	78h	ID (LSB first) BCD 12345678
8	ID2	56h	
9	ID1	34h	
10	ID0	12h	
11	Man1		Manufacturer (LSB first)
12	Man0		
13	Version		
14	Medium		
15	Access no.	0-255	Automatically increased
16	Status	0	
17	Signature 1	0	
18	Signature 0	0	
19	Manufacturer-specific data will follow.	1fh	1fh further data will follow.
20	Start of manufacturer-specific data		
243	End of manufacturer-specific data		
244	Checksum (CS)		Calculated from (\sum fields 4 to 243) mod 256
245	Terminator	16h	

1.5 Response from SENSYCAL when Downloading the EEPROM without Further Data

This telegram is used if the current telegram is the last telegram in a multi-telegram sequence or the requested data from the EEPROM can be sent in a telegram.

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	Xx	
2	Length field	Xx	
3	Start character	68h	
4	C field	08h	
5	A field	0-255	
6	CI field	72h	
7	ID3	78h	ID (LSB first) BCD 12345678
8	ID2	56h	
9	ID1	34h	
10	ID0	12h	
11	Man1		Manufacturer (LSB first)
12	Man0		
13	Version		
14	Medium		
15	Access no.	0-255	Automatically increased
16	Status	0	
17	Signature 1	0	
18	Signature 0	0	
19	Manufacturer-specific data will follow.	0fh	0f Signals the end of the data.
20	Start of manufacturer-specific data		
EHS	End of manufacturer-specific data		
EHS+ 1	Checksum (CS)		Calculated from (\sum fields 4 to EHS) mod 256
EHS+ 2	Terminator	16h	

EHS = end of manufacturer-specific data

1.6 Response from SENSYCAL after Requesting the Power Down List

SENSYCAL transfers the power down list in the following format. A multi-telegram sequence is used.

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	Xx	
2	Length field	Xx	
3	Start character	68h	
4	C field	08h	
5	A field	0-255	
6	CI field	72h	
7	ID3	78h	ID (LSB first) BCD 12345678
8	ID2	56h	
9	ID1	34h	
10	ID0	12h	
11	Man1		Manufacturer (LSB first)
12	Man0		
13	Version		
14	Medium		
15	Access no.	0-255	Automatically increased
16	Status	0	
17	Signature 1	0	
18	Signature 0	0	
19	DIF	04h	
20	VIF	6dh	Time point
21-24	Time point (data type F)		Time point of power off. (Data type F)
25	DIF	02	
26	VIF	7fh	Manufacturer-specific DIF-VIF combination
27	Power down no.		
28	DIF	04h	
29	VIF	6dh	Time point
30-33	Time point (data type F)		Time point of power on. (Data type F)
34 to (CS-1)	Further errors: format as before		
CS-1	0fh = all errors transferred 1Fh = additional errors in the next telegram	1fh (0fh)	
CS	Checksum (CS)		
CS+1	Terminator	16h	

1.7 Response from SENSYCAL after Requesting the Error List

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	xx	
2	Length field	xx	
3	Start character	68h	
4	C field	08h	
5	A field	0-255	
6	CI field	72h	
7	ID3	78h	ID (LSB first) BCD 12345678
8	ID2	56h	
9	ID1	34h	
10	ID0	12h	
11	Man1		Manufacturer (LSB first)
12	Man0		
13	Version		
14	Medium		
15	Access no.	0-255	Automatically increased
16	Status	0	
17	Signature 1	0	
18	Signature 0	0	
19	DIF	04h	
20	VIF	6dh	Time point
21-24	Time point (data type F)		Time at which the error was set. (Data type F)
25	DIF	01	
26	VIF	7fh	Manufacturer-specific DIF-VIF combination
27	Error number (identical to errBuf[y].errTextNo.)		
28	DIF	04h	
29	VIF	6dh	Time point
30-33	Time point (data type F)		Time at which the error was reset. (Data type F)
34 to (CS-1)	Further errors: format as before		
CS-1	0fh = all errors transferred 1Fh = additional errors in the next telegram	1fh (0fh)	
CS	Checksum (CS)		
CS+1	Terminator	16h	

1.8 Response Telegram after Requesting the Error Texts.

The strings with the error texts will be sent in the language selected in SENSYCAL.

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	xx	
2	Length field	xx	
3	Start character	68h	
4	C field	08h	
5	A field	0-255	
6	CI field	72h	
7	ID3	78h	ID (LSB first) BCD 12345678
8	ID2	56h	
9	ID1	34h	
10	ID0	12h	
11	Man1		Manufacturer (LSB first)
12	Man0		
13	Version		
14	Medium		
15	Access no.	0-255	Automatically increased
16	Status	0	
17	Signature 1	0	
18	Signature 0	0	

Response telegram (VIFE of request telegram = 1)

19	DIF	02h	
20	VIF	fdh	
21	VIFE	17h	
22			Main error
23			Main error
24		0fh	MDH
25			Number of error texts
			String with error texts 1 - 10
CS	Checksum (CS)		
CS+1	Terminator	16h	

Response telegram (VIFE of request telegram = 2)

19		0fh	MDH
20			Number of error texts
			String with error texts 10...
CS	Checksum (CS)		
CS+1	Terminator	16h	

SENSYCAL Response Telegrams

1.9 Response from SENSYCAL after Requesting the Values from the Data Logger

SENSYCAL responds with a multi-telegram sequence. No more than one log period is transferred per telegram. The last transmitted block is always concluded with a 0fh.

Each telegram also contains the period length and the integration time. The period number is also transferred in the memory number of the DIF/DIFE combination. The units are formed according to the SENSYCAL configuration. Max. values are marked by the function field in the DIF. Init values are marked by an additional VIFE.

The structure of the data logger is variable; the response telegram therefore also varies accordingly. The structure of the data logger can be requested by reading out the data field (device-specific data).

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	xx	
2	Length field	xx	
3	Start character	68h	
4	C field	08h	
5	A field	0-255	
6	CI field	72h	
7	ID3	78h	ID (LSB first) BCD 12345678
8	ID2	56h	
9	ID1	34h	
10	ID0	12h	
11	Man1		Manufacturer (LSB first)
12	Man0		
13	Version		
14	Medium		
15	Access no.	0-255	Automatically increased
16	Status	0	
17	Signature 1	0	
18	Signature 0	0	
	Data logger: log period		The units of the following data are dependent on the SENSYCAL configuration and therefore cannot be described in more detail.
	Data logger: integration period		
	Data logger: period n time		
	Data logger: period n counter		Main counter 0 - 6
	Data logger: period n floats		Float values 0 - 50
	Data logger: period n mean values		Mean values 0 - 8
	Data logger: period n max. time		Maximum values 0 - 8
	Data logger: period n maximum value		
	Data logger: period n min. time		Minimum values (number as per max. values)
	Data logger: period n minimum value		
CS-1	0Fh = all data transferred 1Fh = additional data in the next telegram	1fh (0fh)	
CS	Checksum (CS)		
CS+1	Terminator	16h	

1.10 Response Telegram after Requesting a Data Field.

The returned buffer has the following format:

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	xx	
2	Length field	xx	
3	Start character	68h	
4	C field	08h	
5	A field	0-255	
6	CI field	72h	
7	ID3		ID (LSB first) example: BCD 12345678 78h
8	ID2		56h
9	ID1		34h
10	ID0		12h
11	Man1		Manufacturer (LSB first)
12	Man0		
13	Version		
14	Medium		
15	Access no.	0-255	Automatically increased
16	Status	0	
17	Signature 1	0	
18	Signature 0	0	
19	DIF	04h	
20	VIF	6dh	Time point
21-24	Time point (data type F)		Time of transfer (data type F)

1.10.1 Reading Out a Data Field (Control Byte 10h/20h)

25	DIF	02	2 bytes
26	VIF	7f	Manufacturer-specific
27	Mode		Example: 0x10 = float
28	Length		0x12 = 18 float values
29	DIF		Example: float DIF 05 manufacturer VIF 7F
	DIFE (if present)		
	VIF		DIF (DIFE) and VIF (VIFE) and
	VIFE (if present) in each case		4 bytes for the value
	Value (4 bytes)		
...	DIF	0f	MDH (if present)
...		Data	Example of output of x bytes
CS	Checksum (CS)		
CS+1	Terminator	16h	

SENSYCAL Response Telegrams

1.10.2 Reading Out the Output List (Control Byte 40h)

25	DIF	0f	MDH
26			Output list: number of bytes
27			Output list
...			
CS	Checksum (CS)		
CS+1	Terminator	16h	

1.10.3 Reading Out the Serial Number (Control Byte 60h)

25	DIF	0C	
26	VIF	78	
27		xx	Serial no. 1st byte
28		xx	Serial no. 2nd byte
29		xx	Serial no. 3rd byte
30		xx	Serial no. 4th byte
31	DIF	4D	
32	DIFE	FD	
33	DIFE	0E	
34	VIF	08	
35		xx	R_strID[14] firmware version
36		xx	R_strID[13]
37		xx	strID[43]
38		xx	strID[42]
39		xx	strID[41]
40		xx	strID[40]
41		xx	strID[39]
42		xx	strID[38]
CS	Checksum (CS)		
CS+1	Terminator	16h	

1.10.4 Reading Out the Device-Specific Data (Control Byte 70h)

25	DIF	0f	MDH
27	Data field: number of floats		
28	Data logger for number of main counters		
29	Data logger for number of floats		
30	Data logger for number of MaxMinF		
31	Data logger for average number		
32	Data logger for number of log periods (LSB)		
33	Data logger for number of log periods (MSB)		
34	Number of main counters		
35	OptionBoardType[0]		
36	OptionBoardType[1]		
37	OptionBoardType[2]		
38	OptionBoardType[3]		
39	PRM.IO[0].type		
40	PRM.IO[1].type		
41	PRM.IO[2].type		
42	PRM.IO[3].type		
43	PRM.IO[4].type		
44	PRM.IO[5].type		
45	PRM.IO[6].type		
46	PRM.IO[7].type		
47	PRM.IO[8].type		
48	PRM.IO[9].type		
49	PowerDataCount		
50	Reserve	00	
51	Reserve	00	
CS	Checksum (CS)		
CS+1	Terminator	16h	

1.10.5 Reading Out Device Type and Current Date and Time (Control Byte 00h (Default))

25	DIF	0fh	MDH
26			Device type 1st letter
27			Device type 2nd letter
28			Device type 3rd letter
29			Special type (0 = normal, M = MVV)
CS	Checksum (CS)		
CS+1	Terminator	16h	

Note: Only single telegrams intended. MDH can follow immediately after the time point

Telegrams to SENSYCAL

2 Telegrams to SENSYCAL

All telegrams that can be sent from the master to the SENSYCAL are listed below.

2.1 Application Reset (Communications Reset)

If SENSYCAL receives such a telegram, it performs a reset of the communications application layer. After the application reset, SENSYCAL responds to every request from the next request onwards with its standard response (see above).

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	xx	
2	Length field	xx	
3	Start character	68h	
4	C field	53h or 73h	
5	A field	0-255	
6	CI field	50h	Application reset
CS	Checksum		
CS+1	Terminator	16h	

2.2 Setting the Transmission Rate

The telegram changes the transmission rate for communication.
The telegram is still acknowledged with the old transmission rate.

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	xx	
2	Length field	xx	
3	Start character	68h	
4	C field	53h or 73h	
5	A field	0-255	
6	CI field	b8h-bfh	Baud rate 300-38400 bd (see table)
CS	Checksum		
CS+1	Terminator	16h	

CI field	Transmission rate
b8h	300 bd
b9h	600 bd
Bah	1200 bd
Bbh	2400 bd
Bch	4800 bd
Bdh	9600 bd
Beh	19,400 bd
Bfh	38,400 bd

2.3 Deleting the Output List.

This telegram deletes the SENSYCAL output list.

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	xx	
2	Length field	xx	
3	Start character	68h	
4	C field	53h or 73h	
5	A field	0-255	
6	CI field	51h	
7	DIF	7fh	
8	VIF	feh	
9	VIFE1	0dh	
CS	Checksum		
CS+1	Terminator	16h	

2.4 Restoring the Output List.

This telegram restores the output list after it has been deleted once

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	xx	
2	Length field	xx	
3	Start character	68h	
4	C field	53h or 73h	
5	A field	0-255	
6	CI field	51h	
7	DIF	7fh	
8	VIF	feh	
9	VIFE1	Ffh	
10	VIFE2	0ch	
CS	Checksum		
CS+1	Terminator	16h	

2.5 Request: Global Readout Request

This request deletes the existing output list and then adds all the values from SENSYCAL.

Not included in the output:

- The EEPROM contents
- The fault lists
- The data logger values.

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	xx	
2	Length field	xx	
3	Start character	68h	
4	C field	53h or 73h	
5	A field	0-255	
6	CI field	51h	
7	DIF	7fh	
8	VIF	7eh	
CS	Checksum		
CS+1	Terminator	16h	

2.6 Requesting the EEPROM Data

The following telegram requests the specified EEPROM pages. The first DIF/VIF combination specifies the start page, the second combination the end page. If the end page is omitted, the last EEPROM page automatically becomes the end page.

The transfer of the data from the SENSYCAL EEPROM starts with the next REQ_UD2 and ends when the specified end page is reached, which will generally result in a multi-telegram sequence. Once the requested EEPROM data has been transmitted, SENSYCAL responds with its previously set response.

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	0bh	
2	Length field	0bh	
3	Start character	68h	
4	C field	53h or 73h	
5	A field	0-255	
6	CI field	51h	
7	DIF	1(S0)00 1000	Request of EEPROM data
8	DIFE1	1000 (S4) (S3) (S2) (S1)	Starting with page S
9	DIFE2	0000 (S8) (S7) (S6) (S5)	
10	VIF	7fh/ffh	7fh: no VIFEffh: extend. Para
	VIFE	7fh	
	DIF(optional)	1(S0)00 1000	Ended with page S
	DIFE1 (optional)	1000 (S4) (S3) (S2) (S1)	Set at the end of the EEPROM by default.
	DIFE2 (optional)	0000 (S8) (S7) (S6) (S5)	
	VIF (optional)	7fh	
	Checksum		
	Terminator	16h	

S is a nine-digit binary number S8(MSB), S7... S0(LSB)

Example:

\$68 \$0b \$0b \$68 \$73 \$64 \$51 \$88 \$80 \$00 \$7f \$C8 \$8F \$01 \$7f Cs 16

Reads the EEPROM contents from page 0 to page 63 inclusive

2.7 Writing to the EEPROM Data

The following telegram is provided for writing data to the SENSYCAL EEPROM.

The data will be written from the start page coded in the first DIF/VIF combination. The data will only be written to the EEPROM if sufficient data is available.

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	xx	
2	Length field	xx	
3	Start character	68h	
4	C field	53h or 73h	
5	A field	0-255	
6	CI field	51h	
7	DIF	1(S0)00 0000	EEPROM data
8	DIFE1	1000 (S4) (S3) (S2) (S1)	Starting with page S
9	DIFE2	0000 (S8) (S7) (S6) (S5)	
10	VIF	7fh/ffh	7fh: no VIFE ffh: extend. Para
	VIFE	7fh	
	DIF	1(S0)00 0000	Ended with page S
	DIFE1	1000 (S4) (S3) (S2) (S1)	
	DIFE2	0000 (S8) (S7) (S6) (S5)	
	VIF	7fh	
	DIF	0fh	MDH
	Data for the EEPROM		
CS	Checksum		
CS+1	Terminator	16h	

S is a nine-digit binary number S8(MSB), S7... S0(LSB)

Note:

After writing the EEPROM data, a time of 500 ms should be allowed to elapse before the written data can be accessed again.

If communication parameters have been changed as a result of writing the EEPROM data, this must be taken into account accordingly.

2.8 Changing the M Bus Address

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	xx	
2	Length field	xx	
3	Start character	68h	
4	C field	53h or 73h	
5	A field	0-255	
6	CI field	51h	
7	DIF	1	
8	VIF	7a	
9			New MBus address
CS	Checksum		
CS+1	Terminator	16h	

2.9 Adding the Request: Device Type

This telegram extends the output list. The device type is delivered in the form of an ASCII character (W, S, T, etc.).

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	xx	
2	Length field	xx	
3	Start character	68h	
4	C field	53h or 73h	
5	A field	0-255	
6	CI field	51h	
7	DIF	1	
8	VIF	Fdh	
9	VIFE1	8c	
10	VIFE2	0ch	
CS	Checksum		
CS+1	Terminator	16h	

2.10 Adding the Request: Possible Baud Rates

This telegram extends the output list. An MBus record containing information about the available transmission rates is now also output.

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	xx	
2	Length field	xx	
3	Start character	68h	
4	C field	53h or 73h	
5	A field	0-255	
6	CI field	51h	
7	DIF	1	
8	VIF	Fdh	
9	VIFE1	9c	
10	VIFE2	0ch	
CS	Checksum		
CS+1	Terminator	16h	

The RSP_DU returns a binary byte coded as follows:

Bit	MSB(7)	6	5	4	3	2	1	LSB(0)
Baud rate	38,400 bd	19,200 bd	9600 bd	4800 bd	2400 bd	1200 bd	600 bd	300 bd

A set bit means that this transmission rate is available.

Telegrams to SENSYCAL

2.11 Adding the Request: Current Energy in GJ (SensyCal T: mass 1)

This telegram extends the output list. An MBus record containing the current energy is now also output.

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	xx	
2	Length field	xx	
3	Start character	68h	
4	C field	53h or 73h	
5	A field	0-255	
6	CI field	51h	
7	DIF	5	
8	VIF	Fbh	See also
9	VIFE1	89H	table
10	VIFE2	0ch	of energy units
CS	Checksum		
CS+1	Terminator	16h	

The current energy can also be requested in other units (see table of energy units).

Energy units

Unit	VIF	VIFE1	VIFE2
GJ	fbh	89H	0ch
MJ	8eh	0ch	
kJ	8bh	0ch	
GJ	88h	0ch	
MWh	fbh	81h	0ch
kWh	86h	0ch	
Wh	83h	0ch	
BTU	ffh	81h	0ch
kBTU	ffh	81h	0ch
MBTU	ffh	81h	0ch

Mass 1 units (SensyCal T)

Unit	VIF	VIFE1	VIFE2
kg	9bh	0ch	
t	9eh	0ch	
klb	ffh	82h	0ch
lb	ffh	86h	0ch

However, the device always responds with the unit set in the device.

2.12 Adding the Request: Billing Date 1: Energy

This telegram extends the output list. An MBus record containing the energy on billing date 1 is now also output.

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	xx	
2	Length field	xx	
3	Start character	68h	
4	C field	53h or 73h	
5	A field	0-255	
6	CI field	51h	
7	DIF	45h	
8	VIF		See
9	VIFE1		table
10	VIFE2		of energy units (2.11)
CS	Checksum		
CS+1	Terminator	16h	

2.13 Adding the Request: Billing Date 2: Energy

This telegram extends the output list. An MBus record containing the energy on billing date 2 is now also output.

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	xx	
2	Length field	xx	
3	Start character	68h	
4	C field	53h or 73h	
5	A field	0-255	
6	CI field	51h	
7	DIF	85h	
8	DIFE1	01h	
9	VIF		See
10	VIFE1		table
11	VIFE2		of energy units (2.11)
CS	Checksum		
CS+1	Terminator	16h	

2.14 Adding the Request: Current Volume

This telegram extends the output list. An MBus record containing the current volume is now also output.

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	xx	
2	Length field	xx	
3	Start character	68h	
4	C field	53h or 73h	
5	A field	0-255	
6	CI field	51h	
7	DIF	5	
8	VIF		See
9	VIFE1		table
10	VIFE2		of volume units
CS	Checksum		
CS+1	Terminator	16h	

Volume units

Unit	VIF	VIFE1	VIFE2
m ³	96h	0ch	
l	93h	0ch	
t	9eh	0ch	
kg	9bh	0ch	
klb	ffh	82h	0ch

2.15 Adding the Request: Mass 2 (SensyCal T)

This telegram extends the output list. An MBus record containing the current volume is now also output.

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	xx	
2	Length field	xx	
3	Start character	68h	
4	C field	53h or 73h	
5	A field	0-255	
6	CI field	51h	
7	DIF	85	
8	DIFE	40	
9	VIF		See
10	VIFE1		table
11	VIFE2		of mass 2 units
CS	Checksum		
CS+1	Terminator	16h	

Mass 2 units

Unit	VIF	VIFE1	VIFE2
kg	9bh	0ch	
t	9eh	0ch	
klb	ffh	82h	0ch
lb	ffh	86h	0ch

However, the device always responds with the unit set in the device.

2.16 Adding the Request: Billing Date 1: Volume

This telegram extends the output list. An MBus record containing the volume on billing date 1 is now also output.

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	xx	
2	Length field	xx	
3	Start character	68h	
4	C field	53h or 73h	
5	A field	0-255	
6	CI field	51h	
7	DIF	45h	
8	VIF		See
9	VIFE1		table
10	VIFE2		of volume units (2.14)
CS	Checksum		
CS+1	Terminator	16h	

2.17 Adding the Request: Billing Date 1: Mass 2 (SensyCal T)

This telegram extends the output list. An MBus record containing the volume on billing date 1 is now also output.

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	xx	
2	Length field	xx	
3	Start character	68h	
4	C field	53h or 73h	
5	A field	0-255	
6	CI field	51h	
7	DIF	c5h	
8	DIFE	40h	
9	VIF		See
10	VIFE1		table
11	VIFE2		of mass 2 units (2.15)
CS	Checksum		
CS+1	Terminator	16h	

Telegrams to SENSYCAL

2.18 Adding the Request: Billing Date 2 Volume

This telegram extends the output list. An MBus record containing the volume on billing date 2 is now also output.

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	xx	
2	Length field	xx	
3	Start character	68h	
4	C field	53h or 73h	
5	A field	0-255	
6	CI field	51h	
7	DIF	85h	
8	DIFE1	01h	
9	VIF		See
10	VIFE1		table
11	VIFE2		of volume units (2.14)
CS	Checksum		
CS+1	Terminator	16h	

2.19 Adding the Request: Billing Date 2 Mass 2 (SensyCal T)

This telegram extends the output list. An MBus record containing the volume on billing date 2 is now also output.

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	xx	
2	Length field	xx	
3	Start character	68h	
4	C field	53h or 73h	
5	A field	0-255	
6	CI field	51h	
7	DIF	85h	
8	DIFE1	41h	
9	VIF		See
10	VIFE1		table
11	VIFE2		of mass 2 units (2.15)
CS	Checksum		
CS+1	Terminator	16h	

2.20 Adding the Request: Counter 3 Value

This telegram extends the output list. An MBus record containing the current value of counter 3 is now also output.

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	xx	
2	Length field	xx	
3	Start character	68h	
4	C field	53h or 73h	
5	A field	0-255	
6	CI field	51h	
7	DIF	5	
8	VIF	7fh	
CS	Checksum		
CS+1	Terminator	16h	

When counter 3 is queried, the value of main counter 3 is returned. The unit is returned in accordance with the SENSYCAL settings. Counter readings that define a tariff or a value during an error condition are indicated by the corresponding flags in the DIF block. The unit is then identical to that of the corresponding main counter.

2.21 Adding the Request: Counter 3 Billing Date 1

This telegram extends the output list. An MBus record containing the value of counter 3 on billing date 1 is now also output.

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	xx	
2	Length field	xx	
3	Start character	68h	
4	C field	53h or 73h	
5	A field	0-255	
6	CI field	51h	
7	DIF	45h	
8	VIF	ffh	
9	VIFE	0ch	
CS	Checksum		
CS+1	Terminator	16h	

2.22 Adding the Request: Counter 3 Billing Date 2

This telegram extends the output list. An MBus record containing the value of counter 3 on billing date 2 is now also output.

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	xx	
2	Length field	xx	
3	Start character	68h	
4	C field	53h or 73h	
5	A field	0-255	
6	CI field	51h	
7	DIF	85h	
8	DIFE	01h	
9		ffh	
10	VIF	0ch	
CS	Checksum		
CS+1	Terminator	16h	

2.23 Adding the Request: Power

This telegram extends the output list. An MBus record containing the current power is now also output.

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	xx	
2	Length field	xx	
3	Start character	68h	
4	C field	53h or 73h	
5	A field	0-255	
6	CI field	51h	
7	DIF	5	
8	VIF		See
9	VIFE1		table
9	VIFE2		of power units
CS	Checksum		
CS+1	Terminator	16h	

Power units

Unit	VIF	VIFE1	VIFE2
J/h	b0h	0ch	
kJ/h	b3h	0ch	
MJ/h	b6h	0ch	
GJ/h	fbh	b1h	0ch
W	abh	0ch	
kW	aeh	0ch	
MW	fbh	a9h	0ch
BTU/h	ffh	83h	0ch
kBTU/h	ffh	83h	0ch
MBTU/h	ffh	83h	0ch

However, the device always responds with the unit set in the device.

2.24 Adding the Request: Flow Rate

This telegram extends the output list. An MBus record containing the current flow rate is now also output.

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	xx	
2	Length field	xx	
3	Start character	68h	
4	C field	53h or 73h	
5	A field	0-255	
6	CI field	51h	
7	DIF	5	
8	VIF		See table
9	VIFE1		of flow
10	VIFE2		rate units
CS	Checksum		
CS+1	Terminator	16h	

Flow rate units

Unit	VIF	VIFE1	VIFE2
m ³ /h	beh	0ch	
l/h	bbh	0ch	
l/s	ceh	0ch	
g/h	fbh	a6h	0ch
g/min	fbh	a5h	0ch
g/s	ffh	84h	0ch

However, the device always responds with the unit set in the device.

2.25 Adding the Request: Mass Flow

This telegram extends the output list. An MBus record containing the current mass flow is now also output.

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	xx	
2	Length field	xx	
3	Start character	68h	
4	C field	53h or 73h	
5	A field	0-255	
6	CI field	51h	
7	DIF	5	
8	VIF		See
9	VIFE1		table
10	VIFE2		of mass flow units
CS	Checksum		
CS+1	Terminator	16h	

Mass flow units

Unit	VIF	VIFE1	VIFE2
t/h	d6h	0ch	
kg/h	d3h	0ch	
kg/s	9bh	a0h	0ch
kg/min	9bh	a1h	0ch
lb/h	ffh	85h	0ch
lb/min	ffh	85h	0ch

Additional SensyCal T units

Unit	VIF	VIFE1	VIFE2
l/min	c4h	0ch	
l/s	ceh	0ch	
m³/h	beh	0ch	
Special unit	ffh	a1h	0ch
SCFS	ffh	a2h	0ch
SCFM	ffh	a3h	0ch
SCFH	ffh	a4h	0ch
NI/s	ffh	a5h	0ch
NI/min	ffh	a6h	0ch
Nm³/h	ffh	a7h	0ch

However, the device always responds with the unit set in the device.

2.26 Adding the Request: Forward Flow Temperature

This telegram extends the output list. An MBus record containing the current forward flow temperature is now also output.

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	xx	
2	Length field	xx	
3	Start character	68h	
4	C field	53h or 73h	
5	A field	0-255	
6	CI field	51h	
7	DIF	5	
8	VIF		See table
9	VIFE1		See table
9	VIFE2		See table
CS	Checksum		
CS+1	Terminator	16h	

The forward flow temperature can be requested with the following VIF(E)s (see next table). However, the device always responds with the unit set in the device.

Unit	VIF	VIFE1	VIFE2
°C	dbh	0ch	-
°F	fbh	dbh	0ch

2.27 Adding the Request: Return Temperature

This telegram extends the output list. An MBus record containing the current return temperature is now also output.

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	xx	
2	Length field	xx	
3	Start character	68h	
4	C field	53h or 73h	
5	A field	0-255	
6	CI field	51h	
7	DIF	5	
8	VIF		See table
9	VIFE1		See table
9	VIFE2		See table
CS	Checksum		
CS+1	Terminator	16h	

The return temperature can be requested with the following VIF(E)s (see next table). However, the device always responds with the unit set in the device.

Unit	VIF	VIFE1	VIFE2
°C	dfh	0ch	-
°F	fbh	dfh	0ch

2.28 Adding the Request: Differential Temperature

This telegram extends the output list. An MBus record containing the current differential temperature is now also output.

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	xx	
2	Length field	xx	
3	Start character	68h	
4	C field	53h or 73h	
5	A field	0-255	
6	CI field	51h	
7	DIF	5	
8	VIF		See table
9	VIFE1		See table
9	VIFE2		See table
CS	Checksum		
CS+1	Terminator	16h	

The differential temperature can be requested with the following VIF(E)s (see next table). However, the device always responds with the unit set in the device.

Unit	VIF	VIFE1	VIFE2
K	e3h	0ch	-
°F	fbh	e3h	0ch

2.29 Adding the Request: Specific Enthalpy Hw

This telegram extends the output list. An MBus record containing the specific enthalpy Hw is now also output.

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	xx	
2	Length field	xx	
3	Start character	68h	
4	C field	53h or 73h	
5	A field	0-255	
6	CI field	51h	
7	DIF	5	
8	VIF	8bh	
9	VIFE1	aeH	
9	VIFE2	0c	Add to output list
CS	Checksum		
CS+1	Terminator	16h	

2.30 Adding the Request: Specific Enthalpy Hk

This telegram extends the output list. An MBus record containing the specific enthalpy Hk is now also output.

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	xx	
2	Length field	xx	
3	Start character	68h	
4	C field	53h or 73h	
5	A field	0-255	
6	CI field	51h	
7	DIF	45h	
8	VIF	8bh	
9	VIFE1	aeH	
9	VIFE2	0c	Add to output list
CS	Checksum		
CS+1	Terminator	16h	

2.31 Adding the Request: Specific Density

This telegram extends the output list. An MBus record containing the specific density is now also output.

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	xx	
2	Length field	xx	
3	Start character	68h	
4	C field	53h or 73h	
5	A field	0-255	
6	CI field	51h	
7	DIF	5	
8	VIF	9bh	
9	VIFE1	ach	(Including adh)
9	VIFE2	0ch	Add to output list
CS	Checksum		
CS+1	Terminator	16h	

2.32 Adding the Request: Current Date and Time (Data Type F)

This telegram extends the output list. An MBus record containing the current date and time is now also output.

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	xx	
2	Length field	xx	
3	Start character	68h	
4	C field	53h or 73h	
5	A field	0-255	
6	CI field	51h	
7	DIF	4	
8	VIF	edh	
9	VIFE1	0ch	Add to output list
CS	Checksum		
CS+1	Terminator	16h	

Telegrams to SENSYCAL

2.33 Adding the Request: Billing Date 1 (Data Type G)

This telegram extends the output list. An MBus record containing the date of billing date 1 is now also output.

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	xx	
2	Length field	xx	
3	Start character	68h	
4	C field	53h or 73h	
5	A field	0-255	
6	CI field	51h	
7	DIF	2	
8	VIF	ech	
9	VIFE1	feh	
10	VIFE2	0ch	Add to output list
CS	Checksum		
CS+1	Terminator	16h	

2.34 Adding the Request: Billing Date 2 (Data Type G)

This telegram extends the output list. An MBus record containing the date of billing date 2 is now also output.

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	xx	
2	Length field	xx	
3	Start character	68h	
4	C field	53h or 73h	
5	A field	0-255	
6	CI field	51h	
7	DIF	42h	
8	VIF	ech	
9	VIFE1	feh	
10	VIFE2	0ch	Add to output list
CS	Checksum		
CS+1	Terminator	16h	

2.35 Adding the Request: K Factor

This telegram extends the output list. An MBus record containing the K factor is now also output.

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	xx	
2	Length field	xx	
3	Start character	68h	
4	C field	53h or 73h	
5	A field	0-255	
6	CI field	51h	
7	DIF	05h	
8	VIF	88h	
9	VIFE1	ach	
10	VIFE2	Afh	
11	VIFE3	0ch	Add to output list
CS	Checksum		
CS+1	Terminator	16h	

2.36 Adding the Request: Binary Input 1

This telegram extends the output list. An MBus record containing the status of binary input 1 is now also output.

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	xx	
2	Length field	xx	
3	Start character	68h	
4	C field	53h or 73h	
5	A field	0-255	
6	CI field	51h	
7	DIF	05h	No 0
8	VIF	fdh	
9	VIFE1	9bh	Dig. input
11	VIFE2	0ch	Add to output list
CS	Checksum		
CS+1	Terminator	16h	

The unit is determined in the response based on the SENSYCAL configuration.

Telegrams to SENSYCAL

2.37 Adding the Request: Binary Input 2

This telegram extends the output list. An MBus record containing the status of binary input 2 is now also output.

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	xx	
2	Length field	xx	
3	Start character	68h	
4	C field	53h or 73h	
5	A field	0-255	
6	CI field	51h	
7	DIF	45h	No 1
8	VIF	fdh	
9	VIFE1	9bh	Dig. Input
11	VIFE2	0ch	Add to output list
CS	Checksum		
CS+1	Terminator	16h	

The unit is determined in the response based on the SENSYCAL configuration.

2.38 Adding the Request: Opt. Board n Value 1

This telegram extends the output list. An MBus record containing value 1 of the optional board selected through n is now also output.

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	xx	
2	Length field	xx	
3	Start character	68h	
4	C field	53h or 73h	
5	A field	0-255	
6	CI field	51h	
7	DIF	c5h	
8	DIFE1	80h	
9	DIFE2	4nh	n = [1...4] number of board
10	VIF	ffh	
11	VIFE1	0c	
CS	Checksum		
CS+1	Terminator	16h	

Note:

If a board is not present, an additional VIFE (15h: value not available) will also be included in the output. In this case, the value is undefined.

2.39 Adding the Request: Opt. Board n Value 2

This telegram extends the output list. An MBus record containing value 2 of the optional board selected through n is now also output.

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	xx	
2	Length field	xx	
3	Start character	68h	
4	C field	53h or 73h	
5	A field	0-255	
6	CI field	51h	
7	DIF	85h	
8	DIFE1	81h	
9	DIFE2	4nh	n = [1...4] number of board
10	VIF	ffh	
11	VIFE1	0c	
CS	Checksum		
CS+1	Terminator	16h	

Note:

If a board is not present, an additional VIFE (15h: value not available) will also be included in the output. In this case, the value is undefined.

2.40 Adding the Request: Opt. Board n Value 3

This telegram extends the output list. An MBus record containing value 3 of the optional board selected through n is now also output.

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	xx	
2	Length field	xx	
3	Start character	68h	
4	C field	53h or 73h	
5	A field	0-255	
6	CI field	51h	
7	DIF	c1h	
8	DIFE1	81h	
9	DIFE2	4nh	n = [1...4] number of board
10	VIF	ffh	
11	VIFE1	0c	
CS	Checksum		
CS+1	Terminator	16h	

Note:

If a board is not present, an additional VIFE (15h: value not available) will also be included in the output. In this case, the value is undefined.

Telegrams to SENSYCAL

2.41 Adding the Request: Opt. Board n Value 4

This telegram extends the output list. An MBus record containing value 4 of the optional board selected through n is now also output.

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	xx	
2	Length field	xx	
3	Start character	68h	
4	C field	53h or 73h	
5	A field	0-255	
6	CI field	51h	
7	DIF	81h	
8	DIFE1	82h	
9	DIFE2	4nh	n = [1...4] number of board
10	VIF	ffh	
11	VIFE1	0c	
CS	Checksum		
CS+1	Terminator	16h	

Note:

If a board is not present, an additional VIFE (15h: value not available) will also be included in the output. In this case, the value is undefined.

2.42 Adding the Request: Operating Hours

This telegram extends the output list. An MBus record containing the operating hours of SENSYCAL is now also output.

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	xx	
2	Length field	xx	
3	Start character	68h	
4	C field	53h or 73h	
5	A field	0-255	
6	CI field	51h	
7	DIF	04h	
8	VIF	a6h	
9	VIFE1	0c	
CS	Checksum		
CS+1	Terminator	16h	

2.43 Adding the Request: Hardware Version

This telegram extends the output list. An MBus record containing the SENSYCAL hardware version is now also output.

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	xx	
2	Length field	xx	
3	Start character	68h	
4	C field	53h or 73h	
5	A field	0-255	
6	CI field	51h	
7	DIF	8dh	
8	DIFE1	01h	
9	VIF	fdh	
10	VIFE1	8dh	
11	VIFE2	0ch	
CS	Checksum		
CS+1	Terminator	16h	

A buffer is returned following a request. The length can be found in buffer[0].

2.44 Adding the Request: Firmware Version

This telegram extends the output list. An MBus record containing the SENSYCAL firmware version is now also output.

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	xx	
2	Length field	xx	
3	Start character	68h	
4	C field	53h or 73h	
5	A field	0-255	
6	CI field	51h	
7	DIF	4dh	
8	VIF	fdh	
9	VIFE1	8eh	
10	VIFE2	0ch	
CS	Checksum		
CS+1	Terminator	16h	

A buffer is returned following a request. The length can be found in buffer[0].

2.45 Adding the Request: Parameterization Software Version

This telegram extends the output list. An MBus record containing the version of the SENSYCAL parameterization software is now also output.

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	xx	
2	Length field	xx	
3	Start character	68h	
4	C field	53h or 73h	
5	A field	0-255	
6	CI field	51h	
7	DIF	0dh	
8	VIF	fdh	
9	VIFE1	8fh	
10	VIFE2	0ch	
CS	Checksum		
CS+1	Terminator	16h	

A buffer is returned following a request. The length can be found in buffer[0].

2.46 Adding the Request: Main Error

This telegram adds the main error to the output list.

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	xx	
2	Length field	xx	
3	Start character	68h	
4	C field	53h or 73h	
5	A field	0-255	
6	CI field	51h	
7	DIF	02h	
8	VIF	fdh	
9	VIFE1	97h	
10	VIFE2	0ch	
CS	Checksum		
CS+1	Terminator	16h	

2.47 Adding the Request: Language

This telegram extends the output list. An MBus record containing the language in which SENSYCAL is operated is now also output.

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	xx	
2	Length field	xx	
3	Start character	68h	
4	C field	53h or 73h	
5	A field	0-255	
6	CI field	51h	
7	DIF	81h	
8	DIFE	02h	
9	VIF	ffh	
10	VIFE1	0ch	
CS	Checksum		
CS+1	Terminator	16h	

2.48 Adding the Request: Temperature Unit

This telegram extends the output list. An MBus record containing the temperature unit used by SENSYCAL is now also output.

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	xx	
2	Length field	xx	
3	Start character	68h	
4	C field	53h or 73h	
5	A field	0-255	
6	CI field	51h	
7	DIF	C1h	
8	DIFE	02h	
9	VIF	ffh	
10	VIFE1	0ch	
CS	Checksum		
CS+1	Terminator	16h	

2.49 Reading Out of Data Logger

The following telegram requests the values from the data logger. The transfer starts with the next REQ_UD2. Once the transfer is complete, SENSYCAL responds again with the telegram set by the output list. The structure of the data logger can be requested when reading out a data field.

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	0bh	
2	Length field	0bh	
3	Start character	68h	
4	C field	53h or 73h	
5	A field	0-255	
6	CI field	51h	
7	DIF	1 (S0)00 1000h	First block
8	DIFE1	1100 (S4)(S3)(S2)(S1)h	
9	DIFE2	0100 (S8)(S7)(S6)(S5)h	
10	VIF	Fdh	(== first storage)
11	VIFE1	20h	
12	DIF	1 (S0)00 1000h	Last block (inclusive)
13	DIFE1	1100 (S4)(S3)(S2)(S1)h	
14	DIFE2	a100 (S8)(S7)(S6)(S5)h	a = 0: no DIFE3 a = 1: DIFE3
	DIFE3	01/02/04	01: read out indiv. 02: reset readout
			04: read out directly
	VIF	Fdh	(== last storage)
	VIFE1	21h	
CS	Checksum		
CS+1	Terminator	16h	

S is an eight-digit binary number formed from S0(LSB) to S8(MSB) value range [0...511]

First block: 511 = read out everything (contents of last block not relevant)

Last block: 511 = read out current log period (contents of first block not relevant)

Number of bytes per log/readDirect(x): 64/100 128/50 192/32 256/24 readDirect = number x to current log period.

If the log period is outside of readDirect, an interval of approx. 500 ms between the readout telegram and the next REQ_UD2 is required.

2.50 Reading Out the Error List

The following telegram requests the error list from SENSYCAL. The transfer starts with the next REQ_UD2. Once the transfer is complete, SENSYCAL responds again with the telegram set by the output list.

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	0bh	
2	Length field	0bh	
3	Start character	68h	
4	C field	53h or 73h	
5	A field	0-255	
6	CI field	51h	
7	DIF	88h	
8	DIFE	01h	
9	VIF	7fh	
CS	Checksum		
CS+1	Terminator	16h	

The error list is output with the next REQ_UD2. If the error list does not fit in a telegram, a multi-telegram sequence is automatically started. The error list is concluded with a 0fh in each case.

2.51 Reading Out the Error Texts

The following telegram requests the error texts from SENSYCAL. The transfer starts with the next REQ_UD2. The texts will be output in the language selected in SENSYCAL. Once the transfer is complete, SENSYCAL responds again with the telegram set by the output list.

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	0bh	
2	Length field	0bh	
3	Start character	68h	
4	C field	53h or 73h	
5	A field	0-255	
6	CI field	51h	
7	DIF	88h	
8	DIFE	01h	
9	VIF	ffh	
10	VIFE		1 = texts 1...10 2 = texts 10...20 3 = texts 21 ...
CS	Checksum		
CS+1	Terminator	16h	

2.52 Acknowledging Errors

The error messages are acknowledged with the following telegram. Note: Error messages that are still active cannot be acknowledged.

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	0bh	
2	Length field	0bh	
3	Start character	68h	
4	C field	53h or 73h	
5	A field	0-255	
6	CI field	51h	
7	DIF	88h	
8	DIFE	01h	
9	VIF	ffh	
10	VIFE	05h	
CS	Checksum		
CS+1	Terminator	16h	

2.53 Reading out the Power Down List

The following telegram requests the power down list from SENSYCAL. The power down list is output when the next request is issued. If the list does not fit in a telegram, a multi-telegram sequence is automatically started. The output of the list is concluded with a 0fh in each case. Once the transfer is complete, SENSYCAL responds again with the telegram set by the output list.

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	0bh	
2	Length field	0bh	
3	Start character	68h	
4	C field	53h or 73h	
5	A field	0-255	
6	CI field	51h	
7	DIF	c8h	
8	DIFE	01h	
9	VIF	7fh	
CS	Checksum		
CS+1	Terminator	16h	

2.54 Writing the Calibration Data (SERVICE only!!!)

The following telegram writes the calibration data to SENSYCAL. A calibration is then triggered.

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	xx	
2	Length field	xx	
3	Start character	68h	
4	C field	53h or 73h	
5	A field	0-255	
6	CI field	51h	
7	DIF	8dh	
8	DIFE	13h	
9	VIF	ffh	
10	VIFE1	00h	
11	Len	05h	
12	remoteCntrl[0]	xx	
13	remoteCntrl[1]	xx	
14	remoteCntrl[2]	xx	
15	remoteCntrl[3]	xx	
16	remoteCntrl[4]	xx	
CS	Checksum		
CS+1	Terminator	16h	

2.55 Reading Out a Data Field.

The following telegram requests the *dataField[]* data field from SENSYCAL. The transfer starts with the next REQ_UD2. Once the transfer is complete, SENSYCAL responds again with the telegram set by the output list.

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	0dh	
2	Length field	0dh	
3	Start character	68h	
4	C field	53h or 73h	
5	A field	0-255	
6	CI field	51h	
7	DIF	88h	
8	DIFE	0fh	
9	VIF	0ffh	
10	VIFE1	0ffh	
11	VIFE2	1xxx xxxxb	Control byte (see below)
12	VIFE3	0xxx xxxxb	y (where control byte = 0xAx)
CS	Checksum		
CS+1	Terminator	16h	

Control byte: 090h (= E + 10h) Reading out of float field complete
 0Axh (= E + 2xh) Reading out of float field [y] to float field [y+x]
 0C0h (= E + 40h) Reading out of device type and output list (VIFE3 = 0)
 0E0h (= E + 60h) Reading out of serial number (VIFE3 = 0)
 0F0h (= E + 70h) Reading out of device-specific data (VIFE3 = 0)
 080h (= E + 00h) (Default) only date and time (VIFE3=0) + device type

2.55.1 List of Physical Variables in the Data Field

Float no.	SensyCal G	SensyCal IR	SensyCal P01	SensyCal P02	SensyCal S	SensyCal T	SensyCal W
0	Vn (Z1)	Z1	Z1	Tw	Steam energy (Z1)	Z1	Energy (Z1)
1	Qv	Z2	Z2	Tk	Steam mass flow (Z2)	Z2	Volume/mass (Z2)
2	Qn	Z3	Z3	dT	Steam/water energy (Z3)	Z3	Z3
3	Tw	Z4	Z4		Water energy (Z4)	Z4	Power
4	Density	Z5	Z5		Water mass flow (Z5)	Z5	Qv
5	dp	Z6	Z6			Z6	Qm
6	dp2	T1	Qv1		Steam power	Qv1	Tw
7	p	T2	Qv2		Steam volume flow rate	Qv2	Tk
8	Zkor	T3			Steam mass flow		DT
9	Epsilon	T4			Steam temperature		hw
10	Ckor	T5			Condensate temperature		hk
11		T6			dT		Density
12		T7			Steam enthalpy		dp1
13		T8			Condensate enthalpy		Cpm
14		T9			Specific volume of steam		
15		T10			Pressure difference		dp2
16		T11			Steam pressure		
17		T12			Condensate volume flow rate		
18		Tw			Condensate mass flow		
19					Specific volume of condensate		
20					Water power		
21					Power balance		
22							
23					Pressure difference of split range		
24					Lkor		
25					Ckor		
26					p2 (pressure)		

2.56 Adding the Request: Water Energy

This telegram extends the output list. An MBus record containing the energy of the water is now also output.

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	xx	
2	Length field	xx	
3	Start character	68h	
4	C field	53h or 73h	
5	A field	0-255	
6	CI field	51h	
7	DIF	c5h	
8	DIFE1	01h	
9	VIF		See
10	VIFE1		table
11	VIFE2		of energy units (2.11)
CS	Checksum		
CS+1	Terminator	16h	

2.57 Adding the Request: Water Mass

This telegram extends the output list. An MBus record containing the mass of the water is now also output.

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	xx	
2	Length field	xx	
3	Start character	68h	
4	C field	53h or 73h	
5	A field	0-255	
6	CI field	51h	
7	DIF	c5h	
8	DIFE	1h	
9	VIF		See
10	VIFE1		table
11	VIFE2		of volume units (2.14)
CS	Checksum		
CS+1	Terminator	16h	

2.58 Adding the Request: Water Energy Billing Date 1

This telegram extends the output list. An MBus record containing the energy of the water on billing date 1 is now also output.

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	xx	
2	Length field	xx	
3	Start character	68h	
4	C field	53h or 73h	
5	A field	0-255	
6	CI field	51h	
7	DIF	85h	
8	DIFE1	02h	
9	VIF		See
10	VIFE1		table
11	VIFE2		of energy units (2.11)
CS	Checksum		
CS+1	Terminator	16h	

2.59 Adding the Request: Water Energy Billing Date 2

This telegram extends the output list. An MBus record containing the energy of the water on billing date 2 is now also output.

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	xx	
2	Length field	xx	
3	Start character	68h	
4	C field	53h or 73h	
5	A field	0-255	
6	CI field	51h	
7	DIF	c5h	
8	DIFE1	02h	
9	VIF		See
10	VIFE1		table
11	VIFE2		of energy units (2.11)
CS	Checksum		
CS+1	Terminator	16h	

2.60 Adding the Request: Water Mass Billing Date 1

This telegram extends the output list. An MBus record containing the mass of the water on billing date 1 is now also output.

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	xx	
2	Length field	xx	
3	Start character	68h	
4	C field	53h or 73h	
5	A field	0-255	
6	CI field	51h	
7	DIF	85h	
8	DIFE1	02h	
9	VIF		See
10	VIFE1		table
11	VIFE2		of volume units (2.14)
CS	Checksum		
CS+1	Terminator	16h	

2.61 Adding the Request: Water Mass Billing Date 2

This telegram extends the output list. An MBus record containing the mass of the water on billing date 2 is now also output.

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	xx	
2	Length field	xx	
3	Start character	68h	
4	C field	53h or 73h	
5	A field	0-255	
6	CI field	51h	
7	DIF	c5h	
8	DIFE1	02h	
9	VIF		See
10	VIFE1		table
11	VIFE2		of volume units (2.14)
CS	Checksum		
CS+1	Terminator	16h	

2.62 Adding the Request: Pressure Difference

This telegram extends the output list. An MBus record containing the pressure difference is now also output.

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	xx	
2	Length field	xx	
3	Start character	68h	
4	C field	53h or 73h	
5	A field	0-255	
6	CI field	51h	
7	DIF	45h	
8	VIF	ebh	
9	VIFE1	0ch	
CS	Checksum		
CS+1	Terminator	16h	

2.63 Adding the Request: Steam Pressure

This telegram extends the output list. An MBus record containing the pressure of the steam is now also output.

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	xx	
2	Length field	xx	
3	Start character	68h	
4	C field	53h or 73h	
5	A field	0-255	
6	CI field	51h	
7	DIF	85h	
8	DIFE1	01h	
9	VIF	e8h	
10	VIFE1	0ch	
CS	Checksum		
CS+1	Terminator	16h	

2.64 Adding the Request: Condensate Volume Flow Rate

This telegram extends the output list. An MBus record containing the volume flow rate of the condensate is now also output.

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	xx	
2	Length field	xx	
3	Start character	68h	
4	C field	53h or 73h	
5	A field	0-255	
6	CI field	51h	
7	DIF	45h	
9	VIF		See
10	VIFE1		table
11	VIFE2		of volume flow rate units (2.24)
CS	Checksum		
CS+1	Terminator	16h	

2.65 Adding the Request: Condensate Mass Flow

This telegram extends the output list. An MBus record containing the mass flow of the condensate is now also output.

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	xx	
2	Length field	xx	
3	Start character	68h	
4	C field	53h or 73h	
5	A field	0-255	
6	CI field	51h	
7	DIF	85h	
8	DIFE1	02h	
9	VIF		See
10	VIFE1		table
11	VIFE2		of mass flow units (2.25)
CS	Checksum		
CS+1	Terminator	16h	

2.66 Adding the Request: Specific Density of Condensate

This telegram extends the output list. An MBus record containing the specific density of the condensate is now also output.

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	xx	
2	Length field	xx	
3	Start character	68h	
4	C field	53h or 73h	
5	A field	0-255	
6	CI field	51h	
7	DIF	85h	
8	DIFE1	01h	
9	VIF	9bh	
10	VIFE1	adh	
11	VIFE2	0ch	
CS	Checksum		
CS+1	Terminator	16h	

2.67 Adding the Request: Water Power

This telegram extends the output list. An MBus record containing the power of the water is now also output.

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	xx	
2	Length field	xx	
3	Start character	68h	
4	C field	53h or 73h	
5	A field	0-255	
6	CI field	51h	
7	DIF	45h	
8	VIF		See
9	VIFE1		table
10	VIFE2		of power
11	VIFE3		units (2.23)
CS	Checksum		
CS+1	Terminator	16h	

2.68 Adding the Request: Power Balance

This telegram extends the output list. An MBus record containing the power balance of the water is now also output.

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	xx	
2	Length field	xx	
3	Start character	68h	
4	C field	53h or 73h	
5	A field	0-255	
6	CI field	51h	
7	DIF	85h	
8	DIFE1	01h	
9	VIF		See
10	VIFE1		table
11	VIFE2		of power units (2.23)
CS	Checksum		
CS+1	Terminator	16h	

2.69 Adding the Request: Standard Specific Density of Condensate

This telegram extends the output list. An MBus record containing the standard specific density of the condensate is now also output.

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	xx	
2	Length field	xx	
3	Start character	68h	
4	C field	53h or 73h	
5	A field	0-255	
6	CI field	51h	
7	DIF	c5h	
8	DIFE1	01h	
9	VIF	9bh	
10	VIFE1	adh	
11	VIFE2	0ch	
CS	Checksum		
CS+1	Terminator	16h	

2.70 Adding the Request: Pressure Difference of Split Range

This telegram extends the output list. An MBus record containing the pressure difference of the split range is now also output.

No.	Description	Value	Comments
	Start character	68h	
1	Length field	xx	
2	Length field	xx	
3	Start character	68h	
4	C field	53h or 73h	
5	A field	0-255	
6	CI field	51h	
7	DIF	c5h	
8	DIFE1	01h	
9	VIF	e8h	
10	VIFE1	0ch	
CS	Checksum		
CS+1	Terminator	16h	

2.71 Writing the Current Energy (SensyCal T: Mass 1)

The counter value must be transferred in the unit set in the device!

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	xx	
2	Length field	xx	
3	Start character	68h	
4	C field	53h or 73h	
5	A field	0-255	
6	CI field	51h	
7	DIF	5	
8	VIF		Table of
9	VIFE1		energy units (writing)
	VIFE2		
			Value
			Value
			Value
			Value
CS	Checksum		
CS+1	Terminator	16h	

Energy units (writing)

Unit	VIF	VIFE1	VIFE2
GJ	fbh	89H	0h
MJ	8eh	0h	
kJ	8bh	0h	
GJ	88h	0h	
MWh	fbh	81h	0h
kWh	86h	0h	
Wh	83h	0h	
BTU	ffh	1h	
kBTU	ffh	1h	
MBTU	ffh	1h	

Mass 1 units (writing)

Unit	VIF	VIFE1	VIFE2
kg	9bh	0h	
t	9eh	0h	
klb	ffh	2h	0
lb	ffh	6h	0

2.72 Writing Current Volume

The counter value must be transferred in the unit set in the device!

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	xx	
2	Length field	xx	
3	Start character	68h	
4	C field	53h or 73h	
5	A field	0-255	
6	CI field	51h	
7	DIF	5	
8	VIF		Table of
9	VIFE1		volume units (writing)
			Value
			Value
			Value
			Value
CS	Checksum		
CS+1	Terminator	16h	

Volume units (writing)

Unit	VIF	VIFE1
m ³	96h	0h
l	93h	0h
t	9eh	0h
kg	9bh	0h
klb	ffh	2h

2.73 Writing Mass 2 (SensyCal T)

The counter value must be transferred in the unit set in the device!

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	xx	
2	Length field	xx	
3	Start character	68h	
4	C field	53h or 73h	
5	A field	0-255	
6	CI field	51h	
7	DIF	85	
8	DIFE	40	
9	VIF		Table of
10	VIFE1		mass 2 units (writing)
			Value
			Value
			Value
			Value
CS	Checksum		
CS+1	Terminator	16h	

Mass 2 units (writing)

Unit	VIF	VIFE1
kg	9bh	0h
t	9eh	0h
klb	ffh	2h
lb	ffh	6h

2.74 Writing Counter 3

The counter value must be transferred in the unit set in the device!

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	xx	
2	Length field	xx	
3	Start character	68h	
4	C field	53h or 73h	
5	A field	0-255	
6	CI field	51h	
7	DIF	5	
8	VIF	ffh	
9	VIFE1	0h	
10			Value
11			Value
12			Value
13			Value
CS	Checksum		
CS+1	Terminator	16h	

2.75 Writing the Current Energy of the Water

The counter value must be transferred in the unit set in the device!

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	xx	
2	Length field	xx	
3	Start character	68h	
4	C field	53h or 73h	
5	A field	0-255	
6	CI field	51h	
7	DIF	c5h	
8	DIFE	01h	
9	VIF		Table of
10	VIFE1		water energy units (writing)
			Value
			Value
			Value
			Value
CS	Checksum		
CS+1	Terminator	16h	

Water energy units (writing)

Unit	VIF	VIFE1
GJ	fbh	9h
MJ	0eh	
kJ	0bh	
GJ	08h	
MWh	fbh	01h
kWh	06h	
Wh	03h	
BTU	ffh	1h
kBTU	ffh	1h
MBTU	ffh	1h

2.76 Writing the water mass

The counter value must be transferred in the unit set in the device!

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	xx	
2	Length field	xx	
3	Start character	68h	
4	C field	53h or 73h	
5	A field	0-255	
6	CI field	51h	
7	DIF	c5h	
8	DIFE	1	
9	VIF		Table of
	VIFE1		water mass units (writing)
			Value
			Value
			Value
			Value
CS	Checksum		
CS+1	Terminator	16h	

Water mass units (writing)

Unit	VIF	VIFE1
m ³	16	
l	13h	
t	1eh	
kg	1bh	
klb	ffh	02h

2.77 Writing the Current Time and Date

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	xx	
2	Length field	xx	
3	Start character	68h	
4	C field	53h or 73h	
5	A field	0-255	
6	CI field	51h	
7	DIF	04h	
8	VIF	6dh	
10			Data type F
11			
12			
13			
CS	Checksum		
CS+1	Terminator	16h	

2.78 Setting the Output List (Directly)

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	xx	
2	Length field	xx	
3	Start character	68h	
4	C field	53h or 73h	
5	A field	0-255	
6	CI field	51h	
7	DIF	8Fh	
8	DIFE	0Fh	
9	VIF	Ffh	
10	VIFE1	Ffh	
11	VIFE2	02h	
12			Number of data types
13			Numbers of data types
			...
			...
CS	Checksum		
CS+1	Terminator	16h	

Output list data types

Data type	No.	Data type	No.
Current date/time	1	Option board 2 value 4	43
Current energy (counter 1)	2	Option board 3 value 1	44
Current mass 1 (SensyCal T)	3	Option board 3 value 2	45
Current vol/mass (counter 2)	4	Option board 3 value 3	46
Current mass 2 (SensyCal T)	5	Option board 3 value 4	47
Counter 3	6	Option board 4 value 1	48
Billing date 1	7	Option board 4 value 2	49
Billing date 1 for energy	8	Option board 4 value 3	50
Billing date for mass 1 (SensyCal T)	9	Option board 4 value 4	51
Billing date 1 volume/mass	10	Operating hours	52
Billing date 1 mass 2 (SensyCal T)	11	Possible baud rates	53
Billing date 1 for counter 3	12	Parameterization software version	54
Billing date 2	13	Hardware version	55
Billing date 2 for energy	14	Firmware version	56
Billing date 2 for mass 1 (SensyCal T)	15	Language	57
Billing date 2 for vol/mass	16	Temperature unit	58
Billing date 2 for mass 2 (SensyCal T)	17	Condensate energy (Counter 4)	59
Billing date 2 for counter 3	18	Condensate mass (Counter 5)	60
Main error	19	Billing date 1 for condensate energy	61
Power	20	Billing date 2 for condensate energy	62
Volume flow	21	Billing date 1 for condensate mass	63
Mass flow 2 (SensyCal T)	22	Billing date 2 for condensate mass	64
Mass flow	23	Pressure difference	65
Mass flow 1 (SensyCal T)	24	Steam pressure	66
Forward flow temperature	25	Condensate volume	67
Return temperature	26	Condensate mass	68
Differential temperature	27	Spec. density of condensate	69
Enthalpy hw	28	Condensate power	70
Enthalpy hk	29	Power balance	71
Specific density	30	Standard spec. density of condensate	72
k factor	31	Differential pressure of split range	73
Binary input 1	32	V_DeviceVer	74
Binary input 2	33	L correction factor	75
	34	C correction factor	76
	35	Z correction factor	77
Option board 1 value 1	36	P01-E1	78
Option board 1 value 2	37	P01-E2	79
Option board 1 value 3	38	P01-E3	80
Option board 1 value 4	39	P01-E4	81
Option board 2 value 1	40	P01-E5	82
Option board 2 value 2	41	P01-E6	83
Option board 2 value 3	42	P01 total	84
		Free text	85
		Serial no.	86

Telegrams to SENSYCAL

2.79 Adding the Request: L Correction Factor

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	Xx	
2	Length field	Xx	
3	Start character	68h	
4	C field	53h or 73h	
5	A field	0-255	
6	CI field	51h	
7	DIF	5h	
8	VIF	Fdh	
9	VIFE	Bah	
10	VIFE1	0ch	
CS	Checksum		
CS+1	Terminator	16h	

2.80 Adding the Request: C Correction Factor

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	Xx	
2	Length field	Xx	
3	Start character	68h	
4	C field	53h or 73h	
5	A field	0-255	
6	CI field	51h	
7	DIF	45h	
8	VIF	Fdh	
9	VIFE	Bah	
10	VIFE1	0ch	
CS	Checksum		
CS+1	Terminator	16h	

2.81 Adding the Request: Z Correction Factor

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	Xx	
2	Length field	Xx	
3	Start character	68h	
4	C field	53h or 73h	
5	A field	0-255	
6	CI field	51h	
7	DIF	85h	
8	DIFE	01h	
9	VIF	Fdh	
10	VIFE	Bah	
11	VIFE1	0ch	
CS	Checksum		
CS+1	Terminator	16h	

2.82 Adding the Request: Free Text

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	Xx	
2	Length field	Xx	
3	Start character	68h	
4	C field	53h or 73h	
5	A field	0-255	
6	CI field	51h	
7	DIF	88h	
8	DIFE	11h	
9	VIF	Ffh	
10	VIFE	Ffh	
11	VIFE1	0ch	
CS	Checksum		
CS+1	Terminator	16h	

** String ends or zeros are replaced with blanks, i.e. between text 1 and text 2 there is at least one space.

Response from the device:8dh, 00h, fch, 00h, VLAR, [text] VLAR = length of text

2.83 Adding the Request: Serial Number

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	Xx	
2	Length field	Xx	
3	Start character	68h	
4	C field	53h or 73h	
5	A field	0-255	
6	CI field	51h	
7	DIF	0Ch	
8	VIF	F8h	
9	VIFE1	0Ch	
CS	Checksum		
CS+1	Terminator	16h	

2.84 Writing the ID Number

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	Xx	
2	Length field	Xx	
3	Start character	68h	
4	C field	53h or 73h	
5	A field	0-255	
6	CI field	51h	
7	DIF	8dh	
8	DIFE	13h	
9	VIF	Ffh	
10	VIFE1	00h	
11		07h	
12		A0h	
13		Beh	
14		14h	
15		X1h	ID number 4 bytes
16		X2h	E.g.: ID = 19237001
17		X3h	X1 = 19h, X2 = 23h, X3 = 70h
18		X4h	X4 = 01h
CS	Checksum		
CS+1	Terminator	16h	

2.85 Saving the MBus Output List Permanently (in EEPROM)

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	Xx	
2	Length field	Xx	
3	Start character	68h	
4	C field	53h or 73h	
5	A field	0-255	
6	CI field	51h	
7	DIF	8fh	
8	DIFE	0fh	
9	VIF	Ffh	
10	VIFE1	Ffh	
11	VIFE2	03h	
CS	Checksum		
CS+1	Terminator	16h	

3 Special MVV Version

The special version for MVV and the standard version differ only in terms of the output from the data logger. The data logger has a different function in the special version.

3.1 Reading Out of Data Logger

The following telegram requests the values from the data logger. The transfer starts with the next REQ_UD2. Once the transfer is complete, SENSYCAL responds again with the telegram set by the output list.

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	0bh	
2	Length field	0bh	
3	Start character	68h	
4	C field	53h or 73h	
5	A field	0-255	
6	CI field	51h	
7	DIF	1100 1000h	
8	DIFE	0100 (S3)(S2)(S1)(S0)h	
9	VIF	fdh	
10	VIFE1	20h	
11	DIF	1000 1000h	
12	DIFE	0100 (S7)(S6)(S5)(S4)h	
13	VIF	fdh	
14	VIFE1	21h	
CS	Checksum		
CS+1	Terminator	16h	

S is an eight-digit binary number formed from S0(LSB) to S7(MSB) value range [0...255]

- S:
- 1 Mean power values for January
 - 2 Mean power values for February
 - 3 Mean power values for March
 - ...
 - 12 Mean power values for December
 - 13 Mean power values for current month

 - 16 Mean power values data set (2 previous months and current month)
 - 32 Load analysis
 - 64 Power-free time, deactivation time

Return S = 1...13 (1...0DH):

Mean power values for one month

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	xx	
2	Length field	xx	
3	Start character	68h	
4	C field	53h or 73h	
5	A field	0-255	
6	CI field	8h	
7	ID3	78h	ID (LSB first) BCD 12345678
8	ID2	56h	
9	ID1	34h	
10	ID0	12h	
11	Man1		Manufacturer (LSB first)
12	Man0		
13	Version		
14	Medium		
15	Access no.	0-255	Automatically increased
16	Status	0	
17	Signature 1	0	
18	Signature 0	0	
	Time point of readout		Time point
	Time point of maximum 1		Time point
	Maximum 1		Float
	Time point of maximum 2		
	Maximum 2		
	Time point of maximum 3		
	Maximum 3		
CS	Checksum (CS)		
CS+1	Terminator	16h	

Return S = 16 (10H):

Mean power values data set

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	xx	
2	Length field	xx	
3	Start character	68h	
4	C field	53h or 73h	
5	A field	0-255	
6	CI field	8h	
7	ID3	78h	ID (LSB first) BCD 12345678
8	ID2	56h	
9	ID1	34h	
10	ID0	12h	
11	Man1		Manufacturer (LSB first)
12	Man0		
13	Version		
14	Medium		
15	Access no.	0-255	Automatically increased
16	Status	0	
17	Signature 1	0	
18	Signature 0	0	
	Time point of readout		Time point
	Start range		Float
	End range		Float
	Time point of maximum 1 for current month		Time point
	Maximum 1 for current month		Float
	Time point of maximum 2 for current month		
	Maximum 2 for current month		
	Time point of maximum 3 for current month		
	Maximum 3 for current month		
	Time point of maximum 1 for previous month		
	Maximum 1 for previous month		
	Time point of maximum 2 for previous month		
	Maximum 2 for previous month		
	Time point of maximum 3 for previous month		
	Maximum 3 for previous month		
	Time point of maximum 1 for month before last		
	Maximum 1 for month before last		
	Time point of maximum 2 for month before last		
	Maximum 2 for month before last		
	Time point of maximum 3 for month before last		
	Maximum 3 for month before last		
CS	Checksum (CS)		
CS+1	Terminator	16h	

Return S = 32 (20H):

Load analysis

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	xx	
2	Length field	xx	
3	Start character	68h	
4	C field	53h or 73h	
5	A field	0-255	
6	CI field	8h	
7	ID3	78h	ID (LSB first) BCD 12345678
8	ID2	56h	
9	ID1	34h	
10	ID0	12h	
11	Man1		Manufacturer (LSB first)
12	Man0		
13	Version		
14	Medium		
15	Access no.	0-255	Automatically increased
16	Status	0	
17	Signature 1	0	
18	Signature 0	0	
	Time point of readout		Time point
	Limit 1 for current month		Float
	Counter for limit 1		Word (2 bytes)
	Limit 2 for current month		
	Counter for limit 2		
	Limit 3 for current month		
	Counter for limit 3		
	Limit 4 for current month		
	Counter for limit 4		
	Limit 5 for current month		
	Counter for limit 5		
	Limit 6 for current month		
	Counter for limit 6		
	Limit 1 for previous month		
	Counter for limit 1		
	Limit 2 for previous month		
	Counter for limit 2		
	Limit 3 for previous month		
	Counter for limit 3		
	Limit 4 for previous month		
	Counter for limit 4		
	Limit 5 for previous month		
	Counter for limit 5		
	Limit 6 for previous month		
	Counter for limit 6		
CS	Checksum (CS)		
CS+1	Terminator	16h	

Return S = 64 (40H):

Power-free time, deactivation time

No.	Description	Value	Comments
0	Start character	68h	
1	Length field	xx	
2	Length field	xx	
3	Start character	68h	
4	C field	53h or 73h	
5	A field	0-255	
6	CI field	8h	
7	ID3	78h	ID (LSB first) BCD 12345678
8	ID2	56h	
9	ID1	34h	
10	ID0	12h	
11	Man1		Manufacturer (LSB first)
12	Man0		
13	Version		
14	Medium		
15	Access no.	0-255	Automatically increased
16	Status	0	
17	Signature 1	0	
18	Signature 0	0	
	Time point of readout		Time point
	Start of power-free time		Time point (date = 0)
	End of power-free time		Time point (date = 0)
	Start of deactivation time point		Time point
	End of deactivation time point		Time point
CS	Checksum (CS)		
CS+1	Terminator	16h	

4 FCB Bit Management of SENSYCAL

SENSYCAL uses FCB bit handling of the MBus protocol.

It manages an FCB bit for REQ_UD2 and SND_DU for each address (primary address, 253.254). The FCB bits are reset with an SND_NKE. In addition, the FCB bit of address 253 is reset when the secondary address is selected.

If SENSYCAL receives a telegram with an FCB bit no different to that of the previous telegram, the previously transmitted telegram is sent again. The data in the telegram remains unchanged; any changed counter readings are not taken into account.

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