Specification M-Bus
CALEC ST III

M-Bus Protocol

CALEC® ST III Standard
CALEC® ST III Smart
CALEC® ST III Advanced

Manufacturer:	INTEGRA Metering AG
Type:	CALEC® ST III
Firmware Version:	3.01.11
Manufacturer Code:	0x25b4
logic units:	0xC0 (Standard) 0xC1 (Mass) 0xC2 (Flow) 0xC3 (add Flow) 0xC4 (BDE) 0xC5 (X-50 / reserved) 0xC6 (AMBILL / reserved) 0xC7 (TGR) 0xC8 (BDV) 0xC9 (DTF) 0xCA (Twin-V) 0xCB (Twin-E) 0xCC (Tariff 8)
Medium:	0x04 (Cold Side) 0x0c (Hot Side) 0x07 (Water)

Table of contents

1. OVERVIEW 4
1.1 LOGIC UNITS 4
1.2 M-BUS INTERFACES 4
1.3 FIRMWARE VERSIONS 5
1.4 EXPLANATION OF ABBREVIATIONS 5
1.5 M-BUS SERVICES 5
1.6 BAUD RATES 5
1.7 M-BUS ADDRESSING 5
1.8 READOUT 6
1.9 PARAMETERIZATION 6
1.10 VARIABLE UNITS 7
2. ADDRESSING 7
2.1 PRIMARY ADDRESSING 7
2.2 POINT-TO-POINT ADDRESSING 7
2.3 BROADCAST ADDRESSING 7
2.4 SECONDARY ADDRESSING 7
2.4.1 Slave select telegram 8
2.4.2 SND_NKE telegram 8
3. READING 8
3.1 REQ_UD2 COMMAND 8
3.2 RSP_UD TELEGRAMS 9
3.2.1 Standard Telegram 9
3.2.2 Billing date telegrams 15
3.2.3 Logger telegram 19
3.2.4 Freeze Telegram 25
3.2.5 Empty telegram 25
3.2.6 Service Telegram 26
3.2.7 Short Telegram 30
3.2.8 Status 34
4. PARAMETERIZATION 35
4.1 SND_UD TELEGRAMS 35
4.1.1 Parameterize baud rate 35
4.1.2 Parameterize primary address 35
4.1.3 Parameterize secondary address 36
4.1.4 Parameterize the response telegram 36
4.1.5 Parameterize Date / Time 37
4.1.6 Programming error hour counter 37
4.1.7 Program alarm hour counter 38
4.1.8 Parameterize billing date 38
4.1.9 Parameterize customer text field 39
4.1.10 Freeze command 39
4.1.11 Parameterize pulse value 40
4.1.12 Parametrize pulse value for aux. counter #1 40
4.1.13 Parametrize pulse value for aux. counter #2 40
4.1.14 Parameterize Installation side 41
4.2 APPLICATION RESET 41
4.3 ACK TELEGRAM 42
5. VARIABLE UNITS 43
5.1 UNITS 43
5.2 UNITS AND RESOLUTION OF THE ENERGY METER READINGS (VIF1) 43
5.3 UNITS AND RESOLUTION OF VOLUME / MASS COUNTER READINGS (VIF2) 43
5.4 UNITS AND RESOLUTION FOR AUXILIARY COUNTER READINGS (VIF3) 44
5.5 UNITS FOR AUXILIARY COUNTER PULSE VALUES(VIF4) 44

5.6 NOTE ON UNITS OF ALL OTHER VALUES 44

Table directory

TABLE 1: VERSIONS OF CALEC ST III 4
TABLE 2: ABBREVIATIONS 5
TABLE 3: M-BUS SERVICES 5
TABLE 4: OVERVIEW M-BUS ADDRESSING 6
TABLE 5: OVERVIEW RESPONSE TELEGRAMS 6
TABLE 6: OVERVIEW PARAMETERIZATION TELEGRAMS 7
TABLE 7: OVERVIEW VARIABLE UNITS 7
TABLE 8: SLAVE SELECT TELEGRAM 8
TABLE 9: SND_NKE TELEGRAM 8
TABLE 10: REQ_UD2 TELEGRAM 9
TABLE 11: STANDARD TELEGRAM 12
TABLE 12: INCLUDED DATA IN STANDARD TELEGRAM 14
TABLE 13: BILLING DATE TELEGRAMS 17
TABLE 14: LOGGER TELEGRAM 21
TABLE 15: INCLUDED DATA IN LOGGER TELEGRAM 24
TABLE 16: NO DATA TELEGRAM 25
TABLE 17: SERVICE TELEGRAM 28
TABLE 18: INCLUDED DATA IN SERVICE TELEGRAM 30
TABLE 11: SHORT TELEGRAM 32
TABLE 12: INCLUDED DATA IN SHORT TELEGRAM 34
TABLE 19: STATUS BYTE 34
TABLE 20: BAUD RATE PARAMETERIZATION 35
TABLE 21: PRIMARY ADDRESS PARAMETERIZATION 36
TABLE 22: SECONDARY ADDRESS PARAMETERIZATION 36
TABLE 23: RESPONSE TELEGRAM PARAMETERIZATION FRAME 36
TABLE 24: PARAMETER RESPONSE TELEGRAM 37
TABLE 25: DATE / TIME PARAMETERIZATION 37
TABLE 26: ERROR HOUR COUNTER PROGRAMMING 38
TABLE 27: ALARM HOUR COUNTER PROGRAMMING 38
TABLE 28: CLOSING PARAMETERIZATION 39
TABLE 29: PARAMETERIZE CUSTOMER TEXT FIELD: 39
TABLE 30: FREEZE COMMAND 39
TABLE 31: PARAMETERIZED PULSE VALUE 40
TABLE 32: PARAMETRIZE IMPULSE VALUE FOR AUXILIARY COUNTER #1 40
TABLE 33: PARAMETRIZE IMPULSE VALUE FOR AUXILIARY COUNTER #2 41
TABLE 34: PARAMETERIZE INSTALLATION SIDE 41
TABLE 35: APPLICATION RESET 42
TABLE 36: APPLICATION RESET WITH SUBCODE B0H 42
TABLE 37: APPLICATION RESET WITH SUBCODE 05H 42
TABLE 38: ACK TELEGRAM 42
TABLE 39: VARIABLE UNITS FOR ENERGY COUNTER READINGS VIF1 43
TABLE 40: VARIABLE UNITS FOR VOLUME / MASS COUNTER READINGS VIF2 44
TABLE 41: NO-UNIT HCA UNIT OF AUXILIARY COUNTER VIF3 44
TABLE 42: VARIABLE UNITS OF THE PULSE VALUES OF THE AUXILIARY COUNTER VIF4 44

1. Overview

1.1 logic units

Different logic units of the CALEC ST III are available.
This document describes the M-Bus protocol used in all versions.

Version	On screen	Device	Statement
Standard	ST-STD	0xC0	Standard energy calculator with volume display
Mass	ST-MASS	0xC1	Standard energy calculator with mass display
Flow	ST-FLOW	0xC2	Flow calculator
Add Flow	ST-ADD	0xC3	Flow calculator, 2 channel adder
BDE	ST-BDE	0xC4	Bidirectional energy measurement controlled by the differential temperature
X-50	ST-STD	0xC5	reserved; Standard energy calculator X-50
AMBILL	AMBILL	0xC6	reserved; Same as Flow
TGR	ST-TGR	0xC7	Energy calculator with reference temperature controlled tariffs
BDV	ST-BDV	0xC8	Bidirectional energy measurement controlled by external control signal
DTF	ST-DTF	0xC9	Double-tariff energy calculator
Twin-V	ST-TNV	0xCA	Calculator with two flow sensors
Twin-E	ST-TNE	0xCB	Double heat calculator with 2 inputs and 2 energy- and volume-registers; the 2nd circuit is thermally open.
Tariff 8	ST-TR8	0xCC	Energy calculator with 8 reference temperature controlled tariffs

Table 1: Versions of CALEC ST III

A distinction is made between these versions in the M-Bus protocol as follows:

- The device version (device byte) is different.
- The mass version transfers mass instead of volume.
- The flow version is a flow calculator without temperature measurement and energy calculation.
- The BDE version has an additional channel for energy and volume in the event of negative output. The direction-dependent data are coded with tariff 1 (Energy counter reading neg.).
- The BDV version has an additional channel for energy and volume in the event of negative flow.
- The TGR version has two additional energy registers.
- The DTF version has an additional tariff channel.
- The Twin-V and twin-E have two energy and volume channels respectively.
- The Tariff 8 has an energy and volume Register plus 8 additional Registers/tariffs (R1 – R8).

1.2 M-Bus Interfaces

The CALEC ST III standard has up to 5 independent M-Bus channels. This allows the device to be operated simultaneously in several M-Bus networks. These channels are selectable on the display. The CALEC ST III Advanced has up to 9 independent M-Bus channels.

The baud rate and the response telegram can be parameterized separately for each channel. The parameterization of baud rate and readout telegram always affects the channel currently in use. For example, you cannot use channel 1 to change the baud rate for channel 2.

1.3 Firmware Versions

This document is valid from firmware version 3.00.00 onwards.

1.4 Explanation of abbreviations

Abbreviation	Explanation
REQ_UD2	Request of a data telegram (RSP_UD) from the master
RSP_UD	Data telegram as response to master
SND_UD	Data / parameterization telegram from master to CALEC ST III
SND_NKE	Initialization telegram according to EN 13757
ACK	Confirmation telegram to a SND_UD according to EN 13757
PADR	Placeholder for the primary address (1 byte)
LEN	Placeholder for the byte length (1 byte), calculation according to EN 13757
IDENT	Placeholder for the secondary address (4 bytes)
MAN	Placeholder for the manufacturer code (2 bytes)
DEV	Placeholder for the device version (1 byte)
MED	Placeholder for the medium (1 byte)
ACC	Placeholder for the access counter (1 byte)
STAT	Placeholder for the status (1 byte)
CS	Placeholder for checksum (1 byte), calculation according to EN 13757

Table 2: abbreviations

1.5 M-Bus Services

The device communicates according to EN 13757-2 and EN 13757-3.
These two standards are referred to as EN 13757 in this document.
The device supports only some of the telegrams defined in the standard.

Service	Master	CI	CALEC ST III	Details in chapter
Activate slave Selection	SND_UD	52h	ACK	2.4.1 Slave select telegram
Reset slave selection	SND_NKE		ACK	2.4.2 SND_NKE telegram
Data readout	REQ_UD2		RSP_UD	3 Reading
Parameterizing	SND_UD	51h	ACK	4 Parameterization
Application reset	SND_UD	50h	ACK	4.2 Application reset

Table 3: M-Bus Services

1.6 Baud rates

The CALEC ST III can communicate at 300, 2400 and 9600 baud.
Default setting for the baud rate is 2400.

1.7 M-Bus Addressing

The device supports primary and secondary addressing according to EN 13757.
The default setting for the device's primary address is 0.

Addressing	PADR	For details see chapter
Primary addressing	0 ... 250	2.1 Primary addressing
Point-to-point addressing	254	2.2 Point-to-point addressing
broadcast addressing	255	2.3 Broadcast addressing

Secondary addressing	253	2.4 Secondary addressing

Table 4: Overview M-Bus addressing

1.8 Readout

The CALEC ST III uses 7 different types of response telegrams.
The default telegram is active when the device is restarted.

Response telegram	Number	Content	For details see chapter
Standard	1	Current counter readings	3.2.1 Standard Telegram
Stichdate	12	Stichdate	3.2.2 Billing date telegrams
Logger	500	Logger	3.2.3 Logger telegram
Freeze	1	Freezed counters	3.2.4 Freeze TelegramFreeze Telegram
No Data	1	no data present	3.2.5 Empty telegram
Service	1	Only for service	3.2.6 Service Telegram
Short	1	Short version of the standard telegram	3.2.7 Short Telegram

Table 5: Overview response telegrams

1.9 Parameterization

The CALEC ST III is protected against unauthorized manipulation by means of a protection concept.
There are three levels of protection:

User Mode (Highest level of protection)

- Locked padlock symbol on the display
- The keys cannot be used to change parameters
- Only non-meter-related parameters can be changed using M-Bus

Service Mode (Middle level of protection)

- Open padlock symbol on the display
- The keys or M-Bus can only be used to amend parameters which are not subject to verification

Programming Mode (Lowest level of protection)

- No padlock symbol on the display
- The keys or M-Bus can be used to amend all parameters
- The change of the protection level to programming mode results in the destruction of the verification seal (if sealed)

Parameter	Degree of protection	For details see chapter
Baud rate	User Mode	4.1.1 Parameterize
Primary address	User Mode	4.1.2 Parameterize primary address
Secondary address	User Mode	4.1.3 Parameterize secondary address
Response telegram	User Mode	4.1.4 Parameterize the response telegram
Date / time	User Mode	4.1.5 Parameterize Date / Time
Error hour counter	Programming Mode	4.1.6 Programming error hour counter
Alarm hour counter	Programming Mode	4.1.7 Program alarm hour counter
Stich date	User Mode	4.1.8 Parameterize billing date
Customer text	User Mode	4.1.9 Parameterize customer text field
Freeze	User Mode	4.1.10 Freeze command

Pulse value	Programming Mode	4.1.11 Parameterize pulse value
Pulse value aux-counter #1	Service Mode	4.1.12 Parametrize pulse value for aux. counter #1
Pulse value aux-counter #2	Service Mode	4.1.13 Parametrize pulse value for aux. counter #2
Installation side	Programming Mode	4.1.14 Parameterize Installation side
Units	Service / program.	5.1 Units

Table 6: Overview parameterization telegrams

1.10 Variable units

The units and resolutions of the counters and pulse values of the CALEC ST III are freely programmable. This has a direct effect on the transfer of data on M-Bus. These variable units are described as VIF1, VIF2 etc. in the protocol descriptions. Details can be found in chapter 5.

Value	Variable unit
Energy counters	VIF1
Volume / mass counters	VIF2
Auxiliary counters	VIF3
Auxiliary counter pulse values	VIF4

Table 7: Overview Variable Units

The units of the instantaneous values are fixed on the M-Bus and cannot be changed. However, a different unit can be set for the display. This does not affect data transfer on the M-Bus.

2. Addressing

2.1 Primary addressing

Individual CALEC ST III devices can be addressed in an M-Bus network via the primary address. The permitted primary address range is 0 – 250. Each telegram contains the primary address in the A field.

2.2 Point-to-point addressing

If the M-Bus network consists of only one CALEC ST III and one master, point-to-point addressing can be used. To do this, the A field in the master telegram is set to 254 (0xfe).The CALEC ST III responds to point to point telegrams irrespective of how the primary address is parameterized.

2.3 Broadcast addressing

Broadcast addressing can be used when all the counters in a network should receive a telegram at the same time (e.g. setting the date) which they need to process. The A field in the telegram of the master is set to 255 (0xff). The CALEC ST III does not respond to broadcast telegrams, but executes the commands.

2.4 Secondary addressing

If an M-Bus network contains more than 250 meters, secondary addressing is used.
Secondary addressing uses the A field: 253 (0xfd) with the 8-byte header selected.
The device must be selected using a slave select telegram prior to actual communication. Secondary addressing can be canceled again after the actual communication. Deselection is carried out via a SND_NKE command or by selecting another device.

2.4.1 Slave select telegram

The CALEC ST III can be selected for secondary addressing using the following telegram:

Name	No. of bytes	Value	Explanation (examples)
Start	1	0x68	
L-field	1	0x0b	
L-field	1	0x0b	
Start	1	0x68	
C-field	1	0x53 / 0x73	SND_UD
Address-field	1	0xfd	Secondary addressing
CI-field	1	0x52	Slave Select
Sek. Address-field	4	IDENT	Secondary address of the CALEC ST III
Manufacturer code	2	MAN	0x25b4 = Integra Metering
Device version	1	DEV	
Medium	1	MED	0x04 = Return / 0x0c = Flow
Checksum	1	CS	
Stop	1	0x16	

Table 8: Slave select telegram

C field: The CALEC ST III does not distinguish between 0x53 and 0x73.
IDENT: The 8-bit wildcard 0c0xff can be used instead of the exact secondary address. Example 0xfffff344: All CALEC ST devices with a secondary address ending in 0x344 are selected.
MAN: The 16-bit wildcard 0xffff can be used instead of 0x25b4
DEV: The 8-bit wildcard 0xff can be used instead of 0xc0
MED: The 8-bit wildcard 0xff can be used instead of 0x04/0x0c.

- If all 4 entries match the parameterization of the CALEC ST III, it is selected and responds with an ACK telegram.
- If at least one of the details does not match the parametrization, it is deselected and does not respond.

2.4.2 SND_NKE telegram

Secondary addressing can be cleared with the following telegram:

Name	No. of bytes	Value	Statement
Start	1	0x10	
C-field	1	0x40	SND_NKE
Address-field	1	PADR	Primary address
Checksum	1	CS	
Stop	1	0x16	

Table 9: SND_NKE Telegram

- The CALEC ST responds with an ACK telegram.

3. Reading

3.1 REQ_UD2 command

The reading is always requested by the master via the REQ_UD2 telegram:

Name	No. of bytes	Value	Statement
Start	1	0x10	

Name	No. of bytes	Value	Statement
C-field	1	0x5b / 0x7b	REQ_UD2
Address-field	1	PADR	Primary address
checksum	1	CS	
stop	1	0x16	

Table 10: REQ_UD2 Telegram

- The CALEC ST III does not distinguish between 0x5b and 0x7b in the C field.
- The CALEC ST III returns the set RSP_UD telegram.

3.2 RSP_UD telegrams

The CALEC ST III has various RSP_UD telegrams.
The parametrization of these telegrams is described in chapter 4.1.4.

3.2.1 Standard Telegram

Name	Num. bytes	value	Unit	tariff	Storage	Explanation (examples)
Start	1	0x68				
L-field	1	LEN				
L-field	1	LEN				
Start	1	0x68				
C-field	1	0x08				RSP_UD
Address-field	1	PADR				primary address
CI-field	1	0x52 / 0x72				reading
Sec. Addr.-field	4	IDENT				Secondary address
Manufacturer	2	0xb425				Man. = Integra Metering
Version	1	DEV				
Medium	1	MED				0x04 = cold side 0x0C = hot side 0x07 = water
Access-Cnt.	1	ACC				Increment per reading
Status	1	STAT				Status according EN 13757
Signature	2	0000h				not used
DIF	1	0x04				
VIF	≥1	VIF1				
value	4	INT4	0	0	0	Energy counter reading
DIF	1	0x84, 0x40				
VIF	≥1	VIF1				
value	4	INT4	0	0	0	Energy 2 counter reading
DIF	1	0x84, 0x10				
VIF	≥1	VIF1				
value	4	INT4	0	1	0	Energy tariff 1
DIF	2	0x84, 0x20				
VIF	≥1	VIF1				
value	4	INT4	0	2	0	Energy tariff 2
DIF	2	0x84, 0x10				
VIF	≥1	VIF1				

Name	Num. bytes	value	Unit	tariff	Storage	Explanation (examples)
value	4	INT4	0	1	0	Energy tariff R1 (TR8)
DIF	2	0x84, 0x20				
VIF	≥1	VIF1				
value	4	INT4	0	2	0	Energy tariff R2 (TR8)
DIF	2	0x84, 0x30				
VIF	≥1	VIF1				
value	4	INT4	0	3	0	Energy tariff R3 (TR8)
DIF	3	0x84, 0x80, 0x10				
VIF	≥1	VIF1				
value	4	INT4	0	4	0	Energy tariff R4 (TR8)
DIF	3	0x84, 0x90 ,0x10				
VIF	≥1	VIF1				
value	4	INT4	0	5	0	Energy tariff R5 (TR8)
DIF	3	0x84, 0xA0, 0x10				
VIF	≥1	VIF1				
value	4	INT4	0	6	0	Energy tariff R6 (TR8)
DIF	3	0x84, 0xB0, 0x10				
VIF	≥1	VIF1				
value	4	INT4	0	7	0	Energy tariff R7 (TR8)
DIF	2	0x84, 0x80, 0x20				
VIF	≥1	VIF1				
value	4	INT4	0	8	0	Energy tariff R8 (TR8)
DIF	1	0x04				
VIF	≥1	VIF2				
value	4	INT4	0	0	0	Volume counter reading
DIF	1	0x84, 0x40				
VIF	≥1	VIF2				
value	4	INT4	0	0	0	Volume 2 counter reading
DIF	1	0x84, 0x10				
VIF	≥1	VIF2				
value	4	INT4	0	1	0	Volume tariff 1
DIF	1	0x04				
VIF	≥1	VIF2				
value	4	INT4	0	0	0	Mass counter reading
DIF	1	0x84, 0x40				
VIF	≥1	VIF2				
value	4	INT4	0	0	0	Mass 2 counter reading
DIF	1	0x04				
VIF	≥1	VIF3				
value	4	INT4	0	0	0	Auxiliary counter # 1
DIF	2	0x84, 40				
VIF	≥1	VIF3				
value	4	INT4	1	0	0	Auxiliary counter # 2
DIF	1	0x05				
VIF	1	0x2b				
value	4	float	0	0	0	Power [W] 1)
DIF	1	0x85, 0x40				

Name	Num. bytes	value	Unit	tariff	Storage	Explanation (examples)
VIF	1	0x2b				
value	4	float	0	0	0	Power 2 [W] 1)
DIF	1	0x05				
VIF	1	0x3b				
value	4	float	0	0	0	Flow [l / h] 2)
DIF	1	0x85, 0x40				
VIF	1	0x3b				
value	4	float	0	0	0	Flow 2 [l / h] 2)
DIF	1	0x05				
VIF	1	0x53				
value	4	float	0	0	0	Mass flow [kg / h] 2)
DIF	1	0x85, 0x40				
VIF	1	0x53				
value	4	float	0	0	0	Mass flow 2 [kg / h] 2)
DIF	1	0x05				
VIF	1	0x5b				
value	4	float	0	0	0	Temperature hot side [° C]
DIF	1	0x05				
VIF	1	0x5f				
value	4	float	0	0	0	Temperature cold side [° C]
DIF	1	0x05				
VIF	1	0x63				
value	4	float	0	0	0	Temperature difference [K]
DIF	1	0x05				
VIF	2	0x83, 0x33				
value	4	float	0	0	0	K-factor [Wh / K / l]
DIF	1	0x05				
VIF	2	0x9b, 0x2c				
value	4	float	0	0	0	Density [kg / l]
DIF	1	0x04				
VIF	1	0x22				
value	4	INT4	0	0	0	Operating hours [h]
DIF	1	0x34				
VIF	1	0x22				
value	4	INT4	0	0	0	Error hours [h]
DIF	2	0xb4, 0x40				
VIF	1	0x22				
value	4	INT4	1	0	0	Alarm hours [h]
DIF	1	0x04				
VIF	1	0x6d				
value	4	INT4	0	0	0	Current Date & Time 3)
DIF	1	0x05				
VIF	2	0x80, 0x28				
value	4	float	0	0	0	Pulse value [l]
DIF	2	0x85, 0x40				
VIF	2	0x80, 0x28				
value	4	float	0	0	0	Pulse value 2 [l]

Name	Num. bytes	value	Unit	tariff	Storage	Explanation (examples)
DIF	3	0x14				
VIF	2	0xab, 0x39				
value	4	float	2	0	0	Time and Date Logger Power max [4]
DIF	1	0x15				
VIF	1	0x2b				
value	4	float	0	0	0	Logger max power [4]
DIF	1	0x15				
VIF	1	0x3b				
value	4	float	0	0	0	Logger max flow [4]
DIF	1	0x15				
VIF	1	0x53				
value	4	float	0	0	0	Logger max mass flow [4]
DIF	1	0x15				
VIF	1	0x5b				
value	4	float	0	0	0	Logger max Temp. hot side [4]
DIF	1	0x15				
VIF	1	0x5f				
value	4	float	0	0	0	Logger max Temp. cold side [4]
DIF	1	0x0c				
VIF	1	0x78				
value	4	BCD8	0	0	0	Production number
DIF	1	0x0d				
VIF	2	0xfd, 0x11				
value	1	int1				Size customer text field
value	-	ASCII	0	0	0	Customer text field
DIF	1	0x0b				
VIF	2	0xfd, 0x0e				
value	3	BCD6	0	0	0	Firmware version
DIF	1	0x0c				
VIF	2	0xfd, 0x0d				
value	3	BCD8	0	0	0	Hardware version
CS	1	CS				
stop	1	0x16				

Table 11: Standard Telegram

1) Power only available if the device is an energy calculator, or the auxiliary counter #1 is metering energy.
2) Flow only present if the device is an energy calculator, or the auxiliary counter #1 is metering volume / mass.
3) The current date and time supports both the millennium and summer/winter time bits.
4) Only available if “option max logger” is enabled. On the following List marked with (x)

Included data in standard telegram depending on logic unit and input

The following list shows all data contained in the standard telegram depending on the logic unit and the input functions.

Specification M-Bus
CALEC ST III

INTEGRA METERING

Logic unit	Input 1 function	Input 2 function	Energy counter reading	Energy 2 counter	Energy tariff 1	Energy tariff 2	Energy tariff R1 (TR8)	Energy tariff R2 (TR8)	Energy tariff R3 (TR8)	Energy tariff R4 (TR8)	Energy tariff R5 (TR8)	Energy tariff R6 (TR8)	Energy tariff R7 (TR8)	Energy tariff R8 (TR8)	Volume counter	Volume 2 counter	Volume tariff 1	Mass counter reading	Mass 2 counter reading	Auxiliary counter # 1	Auxiliary counter # 2	Power	Power 2	Flow	Flow 2	Mass flow	Mass flow 2	Temperature hot side	Temperature cold side	Temperature difference	K-factor	Density	Operating hours	Error hours	Alarm hours	Current Date & Time	Pulse value	Pulse value 2	Time and Date Logger	Logger max power	Logger max flow	Logger max mass flow	Logger max Temp. hot	Logger max Temp. cold	Production number	Customer text field	Firmware version	Hardware version
C0/C5	Volume	Volume	x												x	x						x		x	x			x	x	x	x	x	x	x	x	x	x	(x)	(x)	(x)		(x)	(x)	x	x	x	x
C0/C5	Volume	Mass	x												x			x				x		x			x	x	x	x	x	x	x	x	x	x	x	(x)	(x)	(x)		(x)	(x)	x	x	x	x
C0/C5	Volume	Energy	x	x											x							x	x	x				x	x	x	x	x	x	x	x	x	x	(x)	(x)	(x)		(x)	(x)	x	x	x	x
C0/C5	Volume	Alarm	x												x							x		x				x	x	x	x	x	x	x	x	x	x	(x)	(x)	(x)		(x)	(x)	x	x	x	x
C0/C5	Volume	HCA	x												x						x	x		x				x	x	x	x	x	x	x	x	x	x	(x)	(x)	(x)		(x)	(x)	x	x	x	x
C1	Volume	Volume	x													x		x				x			x	x		x	x	x	x	x	x	x	x	x	x	(x)	(x)		(x)	(x)	(x)	x	x	x	x
C1	Volume	Mass	x															x	x			x				x	x	x	x	x	x	x	x	x	x	x	x	(x)	(x)		(x)	(x)	(x)	x	x	x	x
C1	Volume	Energy	x	x														x				x	x			x		x	x	x	x	x	x	x	x	x	x	(x)	(x)		(x)	(x)	(x)	x	x	x	x
C1	Volume	Alarm	x															x				x				x		x	x	x	x	x	x	x	x	x	x	(x)	(x)		(x)	(x)	(x)	x	x	x	x
C1	Volume	HCA	x															x			x	x				x		x	x	x	x	x	x	x	x	x	x	(x)	(x)		(x)	(x)	(x)	x	x	x	x
C2/C6	HCA	HCA																		x	x											x	x	x	x	x	x							x	x	x	x
C2/C6	HCA	Volume														x				x					x							x	x	x	x	x	x							x	x	x	x
C2/C6	HCA	Mass																	x	x						x						x	x	x	x	x	x							x	x	x	x
C2/C6	HCA	Energy		x																x			x									x	x	x	x	x	x							x	x	x	x
C2/C6	HCA	Status																		x												x	x	x	x	x	x							x	x	x	x
C2/C6	Volume	HCA													x						x			x								x	x	x	x	x	x		(x)					x	x	x	x
C2/C6	Volume	Volume													x	x								x	x							x	x	x	x	x	x		(x)					x	x	x	x
C2/C6	Volume	Mass													x				x					x			x					x	x	x	x	x	x		(x)					x	x	x	x
C2/C6	Volume	Energy		x											x								x	x								x	x	x	x	x	x		(x)					x	x	x	x
C2/C6	Volume	Status													x									x								x	x	x	x	x	x		(x)					x	x	x	x
C2/C6	Mass	HCA																x			x				x							x	x	x	x	x	x			(x)				x	x	x	x
C2/C6	Mass	Volume														x		x							x	x						x	x	x	x	x	x			(x)				x	x	x	x
C2/C6	Mass	Mass																x	x							x	x					x	x	x	x	x	x			(x)				x	x	x	x

C2/C6	Mass	Energy		x														x					x			x							x	x	x	x	x	x				(x)			x	x	x	x
C2/C6	Mass	Status																x								x							x	x	x	x	x	x				(x)			x	x	x	x
C2/C6	Energy	HCA	x																		x	x											x	x	x	x	x	x	(x)	(x)					x	x	x	x
C2/C6	Energy	Volume	x													x						x			x								x	x	x	x	x	x	(x)	(x)					x	x	x	x
C2/C6	Energy	Mass	x																x			x					x						x	x	x	x	x	x	(x)	(x)					x	x	x	x
C2/C6	Energy	Energy	x	x																		x	x										x	x	x	x	x	x	(x)	(x)					x	x	x	x
C2/C6	Energy	Status	x																			x											x	x	x	x	x	x	(x)	(x)					x	x	x	x
C2/C6	Alarm	HCA																			x												x	x	x	x	x	x							x	x	x	x
C2/C6	Alarm	Volume														x									x								x	x	x	x	x	x							x	x	x	x
C2/C6	Alarm	Mass																	x								x						x	x	x	x	x	x							x	x	x	x
C2/C6	Alarm	Energy		x																			x										x	x	x	x	x	x							x	x	x	x
C2/C6	Alarm	Status																															x	x	x	x	x	x							x	x	x	x
C2/C6	Alarm	Alarm																															x	x	x	x	x	x							x	x	x	x
C3	Volume	Volume													x									x	x								x	x	x	x	x	x			(x)				x	x	x	x
C3	HCA	HCA																		x													x	x	x	x	x	x							x	x	x	x
C3	Energy	Energy	x																			x	x										x	x	x	x	x	x	(x)	(x)					x	x	x	x
C3	Mass	Mass																x								x	x						x	x	x	x	x	x				(x)			x	x	x	x
C4	Volume	HCA	x		x										x		x				x	x		x				x	x	x	x	x	x	x	x	x	x	x	(x)	(x)	(x)		(x)	(x)	x	x	x	x
C4	Volume	Alarm	x		x										x		x					x		x				x	x	x	x	x	x	x	x	x	x	x	(x)	(x)	(x)		(x)	(x)	x	x	x	x
C7	Volume	HCA	x		x	x									x						x	x		x				x	x	x	x	x	x	x	x	x	x	x	(x)	(x)	(x)		(x)	(x)	x	x	x	x
C7	Volume	Alarm	x		x	x									x							x		x				x	x	x	x	x	x	x	x	x	x	x	(x)	(x)	(x)		(x)	(x)	x	x	x	x
C8	Volume	Volume	x	x											x	x						x		x				x	x	x	x	x	x	x	x	x	x	x	(x)	(x)	(x)		(x)	(x)	x	x	x	x
C8	Volume	Status	x	x											x	x						x		x				x	x	x	x	x	x	x	x	x	x	x	(x)	(x)	(x)		(x)	(x)	x	x	x	x
C9	Volume	Status	x		x										x		x					x		x				x	x	x	x	x	x	x	x	x	x	x	(x)	(x)	(x)		(x)	(x)	x	x	x	x
CA	Volume	Volume	x												x							x		x	x			x	x	x	x	x	x	x	x	x	x	x	(x)	(x)	(x)		(x)	(x)	x	x	x	x
CB	Volume	Volume	x	x											x	x						x	x	x	x			x	x	x	x	x	x	x	x	x	x	x	(x)	(x)	(x)		(x)	(x)	x	x	x	x
CC	Volume	HCA	x				x	x	x	x	x	x	x	x	x						x	x		x				x	x	x	x	x	x	x	x	x	x	x	(x)	(x)	(x)		(x)	(x)	x	x	x	x
CC	Volume	Alarm	x				x	x	x	x	x	x	x	x	x							x		x				x	x	x	x	x	x	x	x	x	x	x	(x)	(x)	(x)		(x)	(x)	x	x	x	x

Table 12: Included data in standard telegram

3.2.2 Billing date telegrams

The CALEC ST III can handle 12 billing date memories.
Each Billing date memory is displayed in a separate telegram.
The protocol numbering starts from memory Number #1:
The data of billing date #1 is transferred as M-Bus memory number #1, and for date #12 it is M-Bus memory number #12.

Coding of memory numbers:
The following table shows the values of the billing date #1 (Memory #1); the memory number increases in accordance with the billing date [5)]

Name	Num. bytes	Value	Unit	tariff	Storage	Explanation (examples)
Start	1	0x68				
L-field	1	LEN				
L-field	1	LEN				
Start	1	0x68				
C-field	1	0x08				RSP_UD
Address-field	1	PADR				Primary address
CI-field	1	0x52 / 0x72				Readout
Sek.Addr-field	4	IDENT				Secondary address
Manufacturer	2	0xb425				0x25b4 = Integra Metering
Version	1	DEV				Device as per chapter 1.1
Medium	1	MED				0x04 = cold side 0x0C = hot side 0x07 = water
Access-Cnt.	1	ACC				Increment per readout
Status	1	STAT				Status accord. EN 13757
Signature	2	0000h				not used
DIF	≥1	0x42				
VIF		0xec, 7e				
value		Date Type G			1...	Future storage date [5) 6)]
DIF	≥1	0x42				
VIF		0x6c				
value		Date Type G			1...	Storage date [5)]
DIF	≥1	0x44				
VIF	≥1	VIF1				
value	4	INT4	0	0	1...	Energy counter reading [5)]
DIF	≥2	0xc4, 0x40				
VIF	≥1	VIF1				
value	4	INT4	0	0	1...	Energy 2 counter reading [5)]
DIF	≥2	0xc4, 0x10				
VIF	≥1	VIF1				
value	4	INT4	0	1	1...	Energy Tariff 1 [5)]
DIF	≥2	0xc4, 0x20				
VIF	≥1	VIF1				
value	4	INT4	0	2	1...	Energy Tariff 2 [5)]

Name	Num. bytes	Value	Unit	tariff	Storage	Explanation (examples)
DIF	2	0x84, 0x10				
VIF	≥1	VIF1				
value	4	INT4	0	1	1...	Energy tariff R1 (TR8) [5]
DIF	2	0x84, 0x20				
VIF	≥1	VIF1				
value	4	INT4	0	2	1...	Energy tariff R2 (TR8) [5]
DIF	2	0x84, 0x30				
VIF	≥1	VIF1				
value	4	INT4	0	3	1...	Energy tariff R3 (TR8) [5]
DIF	3	0x84, 0x80, 0x10				
VIF	≥1	VIF1				
value	4	INT4	0	4	1...	Energy tariff R4 (TR8) [5]
DIF	3	0x84, 0x90, 0x10				
VIF	≥1	VIF1				
value	4	INT4	0	5	1...	Energy tariff R5 (TR8) [5]
DIF	3	0x84, 0xA0, 0x10				
VIF	≥1	VIF1				
value	4	INT4	0	6	1...	Energy tariff R6 (TR8) [5]
DIF	3	0x84, 0xB0, 0x10				
VIF	≥1	VIF1				
value	4	INT4	0	7	1...	Energy tariff R7 (TR8) [5]
DIF	3	0x84, 0x80, 0x20				
VIF	≥1	VIF1				
value	4	INT4	0	8	1...	Energy tariff R8 (TR8) [5]
DIF	≥1	0x44				
VIF	≥1	VIF2				
value	4	INT4	0	0	1...	Volume counter reading [5]
DIF	≥2	0xc4, 0x40				
VIF	≥1	VIF2				
value	4	INT4	0	0	1...	Volume 2 counter reading [5]
DIF	≥2	0xc4, 0x10				
VIF	≥1	VIF2				
value	4	INT4	0	1	1...	Volume Tariff 1 [5]
DIF	≥1	0x44				
VIF	≥1	VIF2				
value	4	INT4	0	0	1...	Mass counter reading [5]
DIF	≥2	0xc4, 0x40				
VIF	≥1	VIF2				
value	4	INT4	0	0	1...	Mass 2 counter reading [5]
DIF	≥1	0x44				
VIF	≥1	VIF3				
value	4	INT4	0	0	1...	Auxiliary counter # 1 [5]
DIF	≥2	0xc4, 0x40				
VIF	≥1	VIF3				
value	4	INT4	1	0	1...	Auxiliary counter # 2 [5]
DIF	≥2	0x44, 0x22				
VIF	≥1	VIF3				

Name	Num. bytes	Value	Unit	tariff	Storage	Explanation (examples)
value	4	INT4	0	0	1...	Operating hours [5]
DIF	≥1	0x74				
VIF	1	0x22				
value	4	INT4	0	0	1...	Error hours [h] [5]
DIF	2	0xf4, 0x40				
VIF	1	0x22				
value	4	INT4	1	0	1...	Alarm hours [h] [5]
CS	1	CS				
stop	1	0x16				

Table 13: Billing date telegrams

[5] The DIF / DIFE includes the memory number according to EN 13757 as follows:

DIF	Billing #1	Billing #2	Billing #3	Billing #4	...	Billing #12
0x02	0x42	0x82, 01	0xC2, 01	0x82, 02		0x82, 06
0x04	0x44	0x84, 01	0xC4 01	0x84, 02		0x84, 06
0x84, 10	0xC4, 10	0x84, 11	0xC4, 11	0x84, 12		0x84, 16
0x84, 20	0xC4 20	0x84, 21	0xC4, 21	0x84, 22		0x84, 26
0x84, 40	0xC4 40	0x84, 41	0xC4, 41	0x84, 42		0x84, 46
0x84, 80, 40	0xC4,80,40	0x84,81,40	0xc4,81,40	0x84,82,40		0x84,86,40

[6] The date of future billing date is coded as “AnyYear”, i.e. the year is transferred as 127. The year does not matter for parametrization of the future billing date, as the CALEC ST III ignores this information.

Included data in billing date telegram depending on logic unit and input

The following list shows all data contained in the billing date telegram depending on the logic unit and the input functions.

Calculator function	Input 1 function	Input 2 function	Future storage date	Storage date	Energy counter reading	Energy 2 counter reading	Energy Tariff 1	Energy Tariff 2	Energy tariff R1 (TR8)	Energy tariff R2 (TR8)	Energy tariff R3 (TR8)	Energy tariff R4 (TR8)	Energy tariff R5 (TR8)	Energy tariff R6 (TR8)	Energy tariff R7 (TR8)	Energy tariff R8 (TR8)	Volume counter reading	Volume 2 counter reading	Volume Tariff 1	Mass counter reading	Mass 2 counter reading	Auxiliary counter # 1	Auxiliary counter # 2	Operating hours	Error hours	Alarm hours
C0/C5	Volume	Volume	x	x	x												x	x						x	x	x
C0/C5	Volume	Mass	x	x	x												x							x	x	x
C0/C5	Volume	Energy	x	x	x	x											x							x	x	x
C0/C5	Volume	Alarm	x	x	x												x							x	x	x
C0/C5	Volume	HCA	x	x	x												x						x	x	x	x
C1	Volume	Volume	x	x	x													x		x	x			x	x	x
C1	Volume	Mass	x	x	x															x	x			x	x	x
C1	Volume	Energy	x	x	x	x														x	x			x	x	x

C1	Volume	Alarm	x	x	x														x	x			x	x	x
C1	Volume	HCA	x	x	x														x	x		x	x	x	x
C2/C6	HCA	HCA	x	x																	x	x	x	x	x
C2/C6	HCA	Volume	x	x													x				x		x	x	x
C2/C6	HCA	Mass	x	x																	x		x	x	x
C2/C6	HCA	Energy	x	x		x															x		x	x	x
C2/C6	HCA	Status	x	x																	x		x	x	x
C2/C6	Volume	HCA	x	x												x						x	x	x	x
C2/C6	Volume	Volume	x	x												x	x						x	x	x
C2/C6	Volume	Mass	x	x												x							x	x	x
C2/C6	Volume	Energy	x	x		x										x							x	x	x
C2/C6	Volume	Status	x	x												x							x	x	x
C2/C6	Mass	HCA	x	x															x	x		x	x	x	x
C2/C6	Mass	Volume	x	x													x		x	x			x	x	x
C2/C6	Mass	Mass	x	x															x	x			x	x	x
C2/C6	Mass	Energy	x	x		x													x	x			x	x	x
C2/C6	Mass	Status	x	x															x	x			x	x	x
C2/C6	Energy	HCA	x	x	x																	x	x	x	x
C2/C6	Energy	Volume	x	x	x												x						x	x	x
C2/C6	Energy	Mass	x	x	x																		x	x	x
C2/C6	Energy	Energy	x	x	x	x																	x	x	x
C2/C6	Energy	Status	x	x	x																		x	x	x
C2/C6	Alarm	HCA	x	x																		x	x	x	x
C2/C6	Alarm	Volume	x	x													x						x	x	x
C2/C6	Alarm	Mass	x	x																			x	x	x
C2/C6	Alarm	Energy	x	x		x																	x	x	x
C2/C6	Alarm	Status	x	x																			x	x	x
C2/C6	Alarm	Alarm	x	x																			x	x	x
C3	Volume	Volume	x	x												x							x	x	x
C3	HCA	HCA	x	x																	x		x	x	x
C3	Energy	Energy	x	x	x																		x	x	x
C3	Mass	Mass	x	x															x	x			x	x	x
C4	Volume	HCA	x	x	x		x									x		x				x	x	x	x
C4	Volume	Alarm	x	x	x		x									x		x					x	x	x
C7	Volume	HCA	x	x	x		x	x								x						x	x	x	x
C7	Volume	Alarm	x	x	x		x	x								x							x	x	x
C8	Volume	Volume	x	x	x	x										x	x						x	x	x
C8	Volume	Status	x	x	x	x										x	x						x	x	x
C9	Volume	Status	x	x	x		x									x		x					x	x	x
CA	Volume	Volume	x	x	x											x							x	x	x
CB	Volume	Volume	x	x	x	x										x	x						x	x	x
CC	Volume	HCA	x	x	x				x	x	x	x	x	x	x	x	x					x	x	x	x
CC	Volume	Alarm	x	x	x				x	x	x	x	x	x	x	x	x						x	x	x

Table 14: Included data in billing date telegram

3.2.3 Logger telegram

The CALEC ST III can handle 500 logger memories.
Each logger memory is displayed in a separate telegram.
The protocol numbering starts from memory number 0:
i.e. the data from logger #1 is therefore transferred as M-Bus memory number #0.

Coding of memory numbers:
The following table contains a list of the values for logger #1 (memory #0); the memory number increases in accordance with 7)
The memory numbers are coded in DIF, DIFE according to EN13757-3. The maximum values are also coded in DIF in accordance with EN13757-3.

No logger data:
If there is no date for a logger (for new devices), the “no data telegram” is transmitted instead of the logger telegram.

Name	Num. bytes	Value	Unit	tariff	Storage	Explanation (examples)
Start	1	0x68				
L-field	1	LEN				
L-field	1	LEN				
Start	1	0x68				
C-field	1	0x08				RSP_UD
Address-field	1	PADR				Primary address
CI-field	1	0x52 / 0x72				Readout
Sec.Addr-field	4	IDENT				Secondary address
Manufacturer	2	0xb425				0x25b4 = Integra Metering
Version	1	DEV				
Medium	1	MED				0x04 = cold side 0x0C = hot side 0x07 = water
Access-Cnt.	1	ACC				Increment per Readout
Status	1	STAT				Status in accordance with EN 13757
Signature	2	0000h				not used
DIF	1	0x04				
VIF	1	0x6d				
value	4	INT4	0	0	0 ...	Storage date 7)
DIF	1	0x04				
VIF	≥1	VIF1				
value	4	INT4	0	0	0 ...	Energy counter reading 7)
DIF	1	0x84, 0x40				
VIF	≥1	VIF1				
value	4	INT4	0	0	0 ...	Energy 2 counter reading 7)
DIF	1	0x84, 0x10				
VIF	≥1	VIF1				
value	4	INT4	0	1	0 ...	Energy tariff 1 7)
DIF	2	0x84, 0x20				
VIF	≥1	VIF1				
value	4	INT4	0	2	0 ...	Energy tariff 2 7)

Name	Num. bytes	Value	Unit	tariff	Storage	Explanation (examples)
DIF	2	0x84, 0x10				
VIF	≥1	VIF1				
value	4	INT4	0	1	0...	Energy tariff R1 (TR8) [7]
DIF	2	0x84, 0x20				
VIF	≥1	VIF1				
value	4	INT4	0	2	0...	Energy tariff R2 (TR8) [7]
DIF	2	0x84, 0x30				
VIF	≥1	VIF1				
value	4	INT4	0	3	0...	Energy tariff R3 (TR8) [7]
DIF	3	0x84, 0x80, 0x10				
VIF	≥1	VIF1				
value	4	INT4	0	4	0...	Energy tariff R4 (TR8) [7]
DIF	3	0x84, 0x90, 0x10				
VIF	≥1	VIF1				
value	4	INT4	0	5	0...	Energy tariff R5 (TR8) [7]
DIF	3	0x84, 0xA0, 0x10				
VIF	≥1	VIF1				
value	4	INT4	0	6	0...	Energy tariff R6 (TR8) [7]
DIF	3	0x84, 0xB0, 0x10				
VIF	≥1	VIF1				
value	4	INT4	0	7	0...	Energy tariff R7 (TR8) [7]
DIF	3	0x84, 0x80, 0x20				
VIF	≥1	VIF1				
value	4	INT4	0	8	0...	Energy tariff R8 (TR8) [7]
DIF	1	0x04				
VIF	≥1	VIF2				
value	4	INT4	0	0	0 ...	Volume counter reading [7]
DIF	1	0x84, 0x40				
VIF	≥1	VIF2				
value	4	INT4	1	0	0 ...	Volume 2 counter reading [7]
DIF	1	0x84, 0x10				
VIF	≥1	VIF2				
value	4	INT4	0	1	0 ...	Volume tariff 1 [7]
DIF	1	0x04				
VIF	≥1	VIF2				
value	4	INT4	0	0	0 ...	Mass counter reading [7]
DIF	1	0x84, 0x40				
VIF	≥1	VIF2				
value	4	INT4	0	0	0 ...	Mass 2 counter reading [7]
DIF	1	0x04				
VIF	≥1	VIF3				
value	4	INT4	0	0	0 ...	Auxiliary counter # 1 [7]
DIF	2	0x84, 40				
VIF	≥1	VIF3				
value	4	INT4	1	0	0 ...	Auxiliary counter # 2 [7]
DIF	1	0x04				
VIF	1	0x22				

Name	Num. bytes	Value	Unit	tariff	Storage	Explanation (examples)
value	4	INT4	0	0	0 ...	Operating hours [h] 7)
DIF	1	0x34				
VIF	1	0x22				
value	4	INT4	0	0	0 ...	Error hours [h] 7)
DIF	2	0xb4, 0x40				
VIF	1	0x22				
value	4	INT4	1	0	0 ...	Alarm hours [h] 7)
DIF	1	0x15				
VIF	1	0x2b				
value	4	float	0	0	0 ...	Max. power 1) 7)
DIF	1	0x14				
VIF	2	0xab, 0x39				
value	4	Date Type F	0	0	0 ...	Time of max. power 1) 7)
DIF	1	0x15				
VIF	1	0x3b				
value	4	float	0	0	0 ...	Max. Flow [l / h] 2) 7)
DIF	≥3	0x14				
VIF	2	0xbb, 0x39				
value	4	Date Type F	0	0	0 ...	Time Max. flow 2) 7)
DIF	1	0x15				
VIF	1	0x53				
value	4	float	0	0	0 ...	Max. mass flow [kg / h] 2) 7)
DIF	≥3	0x14				
VIF	1	0xd3, 0x39				
value	4	Date Type F	0	0	0 ...	Time max. mass 2) 7)
DIF	1	0x15				
VIF	1	0x5b				
value	4	float	0	0	0 ...	Max. Temp. hot [° C] 7)
DIF	≥3	0x14				
VIF	2	0xdb, 0x39				
value	4	Date Type F	0	0	0 ...	Time max. Temp. hot 7)
DIF	1	0x15				
VIF	1	0x5f				
value	4	float	0	0	0 ...	Max. Temp. cold [° C] 7)
DIF	≥3	0x14				
VIF	2	0xdf, 0x39				
value	4	Date Type F	0	0	0 ...	Time Max. Temp. cold 7)
CS	1	CS				
stop	1	0x16				

Table 14: Logger telegram

Notes on the maximum values:
All 15, 30 or 60min (MLP setting), the CALEC ST III calculates the value for the maximum power. At the time of the max power, the flow rate, temperature hot side and temperature cold side are also recorded. These four values are transmitted as max. power, max. flow, max. Temp hot and max. Temp cold. The time of occurrence is also transmitted for each of these four values. These four times are always the same, but are transmitted to simplify data evaluation.

Specification M-Bus
CALEC ST III

INTEGRA METERING

Included data in logger telegram depending on logic unit and input

The following list shows all data contained in the logger telegram depending on the logic unit and the input functions.

Logic unit	Input 1 function	Input 2 function	Storage date	Energy counter reading	Energy 2 counter reading	Energy tariff 1	Energy tariff 2	Energy tariff R1 (TR8)	Energy tariff R2 (TR8)	Energy tariff R3 (TR8)	Energy tariff R4 (TR8)	Energy tariff R5 (TR8)	Energy tariff R6 (TR8)	Energy tariff R7 (TR8)	Energy tariff R8 (TR8)	Volume counter reading	Volume 2 counter reading	Volume tariff 1	Mass counter reading	Mass 2 counter reading	Auxiliary counter # 1	Auxiliary counter # 2	Operating hours	Error hours	Alarm hours	Max. power	Time of max. power	Max. Flow [l / h]	Time max. Flow	Max. mass flow [kg / h]	Time max. mass flow	Max. Temp. hot [° C]	Time max. Temp. hot	Max. Temp. cold [° C]	Time Max. Temp. Cold
C0/C5	Volume	Volume	x	x												x	x						x	x	x	x	x	x	x			x	x	x	x
C0/C5	Volume	Mass	x	x												x							x	x	x	x	x	x	x			x	x	x	x
C0/C5	Volume	Energy	x	x	x											x							x	x	x	x	x	x	x			x	x	x	x
C0/C5	Volume	Alarm	x	x												x							x	x	x	x	x	x	x			x	x	x	x
C0/C5	Volume	HCA	x	x												x						x	x	x	x	x	x	x	x			x	x	x	x
C1	Volume	Volume	x	x													x		x	x			x	x	x	x	x			x	x	x	x	x	x
C1	Volume	Mass	x	x															x	x			x	x	x	x	x			x	x	x	x	x	x
C1	Volume	Energy	x	x	x														x	x			x	x	x	x	x			x	x	x	x	x	x
C1	Volume	Alarm	x	x															x	x			x	x	x	x	x			x	x	x	x	x	x
C1	Volume	HCA	x	x															x	x		x	x	x	x	x	x			x	x	x	x	x	x
C2/C6	HCA	HCA	x																		x	x	x	x	x										
C2/C6	HCA	Volume	x														x				x		x	x	x										
C2/C6	HCA	Mass	x																		x		x	x	x										
C2/C6	HCA	Energy	x		x																x		x	x	x										
C2/C6	HCA	Status	x																		x		x	x	x										
C2/C6	Volume	HCA	x													x						x	x	x	x			x	x						
C2/C6	Volume	Volume	x													x	x						x	x	x			x	x						
C2/C6	Volume	Mass	x													x							x	x	x			x	x						

C2/C6	Volume	Energy	x		x			x							x	x	x			x	x						
C2/C6	Volume	Status	x					x							x	x	x			x	x						
C2/C6	Mass	HCA	x								x	x		x	x	x	x					x	x				
C2/C6	Mass	Volume	x						x		x	x			x	x	x					x	x				
C2/C6	Mass	Mass	x								x	x			x	x	x					x	x				
C2/C6	Mass	Energy	x		x						x	x			x	x	x					x	x				
C2/C6	Mass	Status	x								x	x			x	x	x					x	x				
C2/C6	Energy	HCA	x	x										x	x	x	x	x	x								
C2/C6	Energy	Volume	x	x					x						x	x	x	x	x								
C2/C6	Energy	Mass	x	x											x	x	x	x	x								
C2/C6	Energy	Energy	x	x	x										x	x	x	x	x								
C2/C6	Energy	Status	x	x											x	x	x	x	x								
C2/C6	Alarm	HCA	x											x	x	x	x										
C2/C6	Alarm	Volume	x						x						x	x	x										
C2/C6	Alarm	Mass	x												x	x	x										
C2/C6	Alarm	Energy	x		x										x	x	x										
C2/C6	Alarm	Status	x												x	x	x										
C2/C6	Alarm	Alarm	x												x	x	x										
C3	Volume	Volume	x					x							x	x	x			x	x						
C3	HCA	HCA	x										x		x	x	x										
C3	Energy	Energy	x	x											x	x	x	x	x								
C3	Mass	Mass	x								x	x			x	x	x					x	x				
C4	Volume	HCA	x	x		x		x		x				x	x	x	x	x	x	x	x			x	x	x	x
C4	Volume	Alarm	x	x		x		x		x					x	x	x	x	x	x	x			x	x	x	x
C7	Volume	HCA	x	x		x	x	x						x	x	x	x	x	x	x	x			x	x	x	x
C7	Volume	Alarm	x	x		x	x	x							x	x	x	x	x	x	x			x	x	x	x
C8	Volume	Volume	x	x	x			x	x						x	x	x	x	x	x	x			x	x	x	x
C8	Volume	Status	x	x	x			x	x						x	x	x	x	x	x	x			x	x	x	x
C9	Volume	Status	x	x		x		x		x					x	x	x	x	x	x	x			x	x	x	x

CA	Volume	Volume	x	x												x								x	x	x	x	x	x	x			x	x	x	x
CB	Volume	Volume	x	x	x											x	x							x	x	x	x	x	x	x			x	x	x	x
CC	Volume	HCA	x	x				x	x	x	x	x	x	x	x	x						x	x	x	x	x	x	x	x			x	x	x	x
CC	Volume	Alarm	x	x				x	x	x	x	x	x	x	x	x							x	x	x	x	x	x	x			x	x	x	x

Table 15: Included data in logger telegram

3.2.4 Freeze Telegram

The “Freeze” command (see chapter 4.1.10 Freeze command) allows the current values to be frozen. These frozen values can be read out using the “Freeze telegram”. This telegram has the same structure as the logger telegram. The values are transmitted as M-Bus memory number 31 (see [7]).

[7] The DIF / DIFE includes the memory number according to EN 13757 as follows:

DIF	Freeze Mem. (Mem. # 31)	...	Logger # 1 = (Mem. # 100)	Logger # 2 = (Mem. # 101)	...	Logger # 500 = (Mem. # 599)
0x02	0xC2, 0f		0x82, 82, 03	0xC2, 82, 03		0xC2, 8b, 82, 01
0x04	0xC4, 0f		0x84, 82, 03	0xC4, 82, 03		0xC4, 8b, 82, 01
0x05	0xC5, 0f		0x85, 82, 03	0xC5, 82, 03		0xC5, 8b, 82, 01
0x84, 10	0xC4, 1f		0x84, 92, 03	0xC4, 92, 03		0xC4, 9b, 82, 01
0x84, 20	0xC4, 2f		0x84, a2, 03	0xC4, a2, 03		0xC4, from, 82, 01
0x84, 40	0xC4, 4f		0x84, c2, 03	0xC4, c2, 03		0xC4, cb, 82, 01
0x84, 80, 40	0xC4, 8f, 40		0x84, 82, 43	0xC4, 82, 43		0xC4, 8b, c 2, 01

3.2.5 Empty telegram

If no logger data are available, the “no data” telegram is transmitted instead of the other telegrams.

Name	No. bytes	Value	Unit	Tariff	Storage	Explanation (examples)	Available in version
Start	1	0x68					All
L-field	1	LEN					All
L-field	1	LEN					All
Start	1	0x68					All
C-field	1	0x08				RSP_UD	All
Address-field	1	PADR				Primary address	All
CI-field	1	0x52 / 0x72				Readout	All
Sec.addr-field	4	IDENT				Secondary address	All
Manufacturer	2	0xb425				0x25b4 = Integra Metering	All
Version	1	DEV					All
Medium	1	MED				0x04 = cold side 0x0C = hot side 0x07 = water	All
Access-Cnt.	1	ACC				Increment per readout	All
Status	1	STAT				Status in accordance with EN 13757	All
Signature	2	0000h				not used	All
CS	1	CS					All
stop	1	0x16					All

Table 16: No data telegram

3.2.6 Service Telegram

The service telegram transfers data required for service, testing and production.

Name	No. bytes	Value	Unit	Tariff	Storage	Explanation (examples)
Start	1	0x68				
L-field	1	LEN				
L-field	1	LEN				
Start	1	0x68				
C-field	1	0x08				RSP_UD
Address-field	1	PADR				Primary address
CI-field	1	0x52 / 0x72				Readout
Sec.addr-field	4	IDENT				Secondary address
Manufacturer	2	0xb425				0x25b4 = Integra Metering
Version	1	DEV				
Medium	1	MED				0x04 = cold side 0x0C = hot side 0x07 = water
Access-cnt.	1	ACC				Increment per readout
Status	1	STAT				Status in accordance with EN 13757
Signature	2	0000h				not used
DIF	1	0x04				
VIF	≥1	VIF1				
value	4	INT4	0	0	0	Energy counter reading
DIF	1	0x05				
VIF	≥1	VIF1				
value	4	float	0	0	0	Residual energy counter reading
DIF	1	0x04				
VIF	≥1	VIF2				
value	4	INT4	0	0	0	Volume counter
DIF	1	0x05				
VIF	≥1	VIF2				
value	4	float	0	0	0	Residual volume counter reading
DIF	1	0x04				
VIF	≥1	VIF2				
value	4	INT4	0	0	0	Mass counter reading
DIF	1	0x05				
VIF	≥1	VIF2				
value	4	float	0	0	0	Residual mass counter reading
DIF	1	0x15				
VIF	1	0x2b				
value	4	float	0	0	0	Max. power [W] 1)
DIF	1	0x15				
VIF	1	0x3b				
value	4	float	0	0	0	Max. flow [l / h] 2)
DIF	1	0x15				
VIF	1	0x53				
value	4	float	0	0	0	Max. mass flow [kg / h] 2)

Name	No. bytes	Value	Unit	Tariff	Storage	Explanation (examples)
DIF	1	0x15				
VIF	1	0x5b				
value	4	float	0	0	0	Max. Temp. hot [°C]
DIF	1	0x25				
VIF	1	0x5f				
value	4	float	0	0	0	Min. Temp. cold [°C]
DIF	1	0x15				
VIF	1	0x63				
value	4	float	0	0	0	Temperature differential [K]
DIF	1	0x45				
VIF	2	0xfd, 3a				
value	4	float	0	0	1	Arithm. mean value Temp. hot
DIF	2	0x85, 01				
VIF	2	0xfd, 3a				
value	4	float	0	0	2	Arithm. mean value Temp. cold
DIF	2	0xc5, 01				
VIF	2	0xfd, 3a				
value	4	float	0	0	3	Std. deviation Temp. hot
DIF	2	0x85, 02				
VIF	2	0xfd, 3a				
value	4	float	0	0	4	Std. deviation Temp. cold
DIF	2	0xc5, 02				
VIF	2	0xfd, 3a				
value	4	float	0	0	5	Gradient Temp. hot
DIF	2	0x85, 03				
VIF	2	0xfd, 3a				
value	4	float	0	0	6	Gradient Temp. cold
DIF	2	0xc5, 03				
VIF	2	0xfd, 3a				
value	4	float	0	0	7	Zero point Temp. hot
DIF	2	0x85, 04				
VIF	2	0xFD, 3a				
value	4	float	0	0	8th	Zero point Temp. cold
DIF	1	0x74				
VIF	1	0x6d				
value	4	Date Type F	0	0	1	Time of E-counter overflow
DIF	2	0xb4, 01				
VIF	1	0x6d				
value	4	Date Type F	0	0	2	Time of counter reset
DIF	2	0xf4, 01				
VIF	1	0x6d				
value	4	Date Type F	0	0	3	Time of temp. alarm
DIF	2	0xb4, 02				
VIF	1	0x6d				
value	4	Date Type F	0	0	4	Time of calibration error
DIF	2	0xf4, 02				
VIF	1	0x6d				

Name	No. bytes	Value	Unit	Tariff	Storage	Explanation (examples)
value	4	Date Type F	0	0	5	Time of CRC error
DIF	1	0x02				
VIF	2	0xfd, 66				
value		INT2				Calibration year
DIF	1	0x0c				
VIF	1	0x78				
value	2	BCD8	0	0	0	Fabrication number
DIF	2	0x02				
VIF	1	0xec, 0x39				
value	4	Date Type G	1	0	0	Fabrication date
CS	1	CS				
stop	1	0x16				

Table 17: Service Telegram

Included data in service telegram depending on logic unit and input

The following list shows all data contained in the service telegram depending on the logic unit and the input functions.

Logic unit	Input 1 function	Input 2 function	Energy counter reading	Residual energy counter reading	Volume counter reading	Residual volume counter reading	Mass counter reading	Residual mass counter reading	Max. power [W]	Max. flow [l / h]	Max. mass flow [kg / h]	Max. Temp. hot [°C]	Min. Temp. cold [°C]	Temperature differential [K]	Arithm. mean value Temp. Hot	Arithm. mean value Temp. Cold	Std. deviation Temp. Hot	Std. deviation Temp. Cold	Gradient Temp. Hot	Gradient Temp. Cold	Zero point Temp. Hot	Zero point Temp. Cold	Time of E-counter overflow	Time of counter reset	Time of temp. Alarm	Time of calibration error	Time of CRC error	Calibration year	Fabrication number	Fabrication date
C0/C5	Volume	Volume	x	x	x	x			x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
C0/C5	Volume	Mass	x	x	x	x			x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
C0/C5	Volume	Energy	x	x	x	x			x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
C0/C5	Volume	Alarm	x	x	x	x			x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
C0/C5	Volume	HCA	x	x	x	x			x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
C1	Volume	Volume	x	x			x	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
C1	Volume	Mass	x	x			x	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
C1	Volume	Energy	x	x			x	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
C1	Volume	Alarm	x	x			x	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
C1	Volume	HCA	x	x			x	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
C2/C6	HCA	HCA																						x			x		x	x
C2/C6	HCA	Volume																						x			x		x	x
C2/C6	HCA	Mass																						x			x		x	x
C2/C6	HCA	Energy																						x			x		x	x
C2/C6	HCA	Status																						x			x		x	x
C2/C6	Volume	HCA			x	x				x														x			x		x	x
C2/C6	Volume	Volume			x	x				x														x			x		x	x
C2/C6	Volume	Mass			x	x				x														x			x		x	x
C2/C6	Volume	Energy			x	x				x														x			x		x	x
C2/C6	Volume	Status			x	x				x														x			x		x	x
C2/C6	Mass	HCA					x	x			x													x			x		x	x
C2/C6	Mass	Volume					x	x			x													x			x		x	x
C2/C6	Mass	Mass					x	x			x													x			x		x	x
C2/C6	Mass	Energy					x	x			x													x			x		x	x
C2/C6	Mass	Status					x	x			x													x			x		x	x
C2/C6	Energy	HCA	x	x					x															x			x		x	x
C2/C6	Energy	Volume	x	x					x															x			x		x	x
C2/C6	Energy	Mass	x	x					x															x			x		x	x
C2/C6	Energy	Energy	x	x					x															x			x		x	x
C2/C6	Energy	Status	x	x					x															x			x		x	x
C2/C6	Alarm	HCA																						x			x		x	x

C2/C6	Alarm	Volume																					x			x		x	x
C2/C6	Alarm	Mass																					x			x		x	x
C2/C6	Alarm	Energy																					x			x		x	x
C2/C6	Alarm	Status																					x			x		x	x
C2/C6	Alarm	Alarm																					x			x		x	x
C3	Volume	Volume			x	x				x													x			x		x	x
C3	HCA	HCA																					x			x		x	x
C3	Energy	Energy	x	x					x														x			x		x	x
C3	Mass	Mass					x	x			x												x			x		x	x
C4	Volume	HCA	x	x	x	x			x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
C4	Volume	Alarm	x	x	x	x			x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
C7	Volume	HCA	x	x	x	x			x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
C7	Volume	Alarm	x	x	x	x			x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
C8	Volume	Volume	x	x	x	x			x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
C8	Volume	Status	x	x	x	x			x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
C9	Volume	Status	x	x	x	x			x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
CA	Volume	Volume	x	x	x	x			x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
CB	Volume	Volume	x	x	x	x			x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
CC	Volume	HCA	x	x	x	x			x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
CC	Volume	Alarm	x	x	x	x			x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

Table 18: Included data in service telegram

3.2.7 Short Telegram

The short telegram only contains some of the data records included in the standard telegram.

Name	Num. bytes	value	Unit	tariff	Storage	Explanation (examples)
Start	1	0x68				
L-field	1	LEN				
L-field	1	LEN				
Start	1	0x68				
C-field	1	0x08				RSP_UD
Address-field	1	PADR				primary address
CI-field	1	0x52 / 0x72				reading
Sec. Addr.-field	4	IDENT				Secondary address
Manufacturer	2	0xb425				Man. = Integra Metering
Version	1	DEV				
Medium	1	MED				0x04 = cold side 0x0C = hot side 0x07 = water
Access-Cnt.	1	ACC				Increment per reading
Status	1	STAT				Status according EN 13757

Name	Num. bytes	value	Unit	tariff	Storage	Explanation (examples)
Signature	2	0000h				not used
DIF	1	0x04				
VIF	≥1	VIF1				
value	4	INT4	0	0	0	Energy counter reading
DIF	1	0x84, 0x40				
VIF	≥1	VIF1				
value	4	INT4	0	0	0	Energy 2 counter reading
DIF	1	0x84, 0x10				
VIF	≥1	VIF1				
value	4	INT4	0	1	0	Energy tariff 1
DIF	2	0x84, 0x20				
VIF	≥1	VIF1				
value	4	INT4	0	2	0	Energy tariff 2
DIF	1	0x04				
VIF	≥1	VIF2				
value	4	INT4	0	0	0	Volume counter reading
DIF	1	0x84, 0x40				
VIF	≥1	VIF2				
value	4	INT4	0	0	0	Volume 2 counter reading
DIF	1	0x84, 0x10				
VIF	≥1	VIF2				
value	4	INT4	0	1	0	Volume tariff 1
DIF	1	0x04				
VIF	≥1	VIF2				
value	4	INT4	0	0	0	Mass counter reading
DIF	1	0x84, 0x40				
VIF	≥1	VIF2				
value	4	INT4	0	0	0	Mass 2 counter reading
DIF	1	0x04				
VIF	≥1	VIF3				
value	4	INT4	0	0	0	Auxiliary counter # 1
DIF	2	0x84, 40				
VIF	≥1	VIF3				
value	4	INT4	1	0	0	Auxiliary counter # 2
DIF	1	0x05				
VIF	1	0x2b				
value	4	float	0	0	0	Power [W] 1)
DIF	1	0x85, 0x40				
VIF	1	0x2b				
value	4	float	0	0	0	Power 2 [W] 1)
DIF	1	0x05				
VIF	1	0x3b				
value	4	float	0	0	0	Flow [l / h] 2)
DIF	1	0x85, 0x40				
VIF	1	0x3b				
value	4	float	0	0	0	Flow 2 [l / h] 2)
DIF	1	0x05				

Name	Num. bytes	value	Unit	tariff	Storage	Explanation (examples)
VIF	1	0x53				
value	4	float	0	0	0	Mass flow [kg / h] 2)
DIF	1	0x85, 0x40				
VIF	1	0x53				
value	4	float	0	0	0	Mass flow 2 [kg / h] 2)
DIF	1	0x05				
VIF	1	0x5b				
value	4	float	0	0	0	Temperature hot side [° C]
DIF	1	0x05				
VIF	1	0x5f				
value	4	float	0	0	0	Temperature cold side [° C]
DIF	1	0x05				
VIF	1	0x63				
value	4	float	0	0	0	Temperature difference [K]
DIF	1	0x04				
VIF	1	0x22				
value	4	INT4	0	0	0	Operating hours [h]
DIF	1	0x34				
VIF	1	0x22				
value	4	INT4	0	0	0	Error hours [h]
DIF	2	0xb4, 0x40				
VIF	1	0x22				
value	4	INT4	1	0	0	Alarm hours [h]
DIF	1	0x0d				
VIF	2	0xfd, 0x11				
value	1	int1				Size customer text field
value	-	ASCII	0	0	0	Customer text field
CS	1	CS				
stop	1	0x16				

Table 19: Short Telegram

1) Power only available if the device is an energy calculator, or the auxiliary counter #1 is metering energy.
2) Flow only present if the device is an energy calculator, or the auxiliary counter #1 is metering volume / mass.

Included data in short telegram depending on logic unit and input

The following list shows all data contained in the short telegram depending on the logic unit and the input functions.

Logic unit	Input 1 function	Input 2 function	Energy counter reading	Energy 2 counter	Energy tariff 1	Energy tariff 2	Volume counter	Volume 2 counter	Volume tariff 1	Mass counter reading	Mass 2 counter reading	Auxiliary counter # 1	Auxiliary counter # 2	Power	Power 2	Flow	Flow 2	Mass flow	Mass flow 2	Temperature hot side	Temperature cold side	Temperature difference	Operating hours	Error hours	Alarm hours	Customer text field
C0/C5	Volume	Volume	x				x	x						x		x	x			x	x	x	x	x	x	x
C0/C5	Volume	Mass	x				x				x			x		x			x	x	x	x	x	x	x	x
C0/C5	Volume	Energy	x	x			x							x	x	x				x	x	x	x	x	x	x
C0/C5	Volume	Alarm	x				x							x		x				x	x	x	x	x	x	x
C0/C5	Volume	HCA	x				x						x	x		x				x	x	x	x	x	x	x
C1	Volume	Volume	x					x		x				x			x	x		x	x	x	x	x	x	x
C1	Volume	Mass	x							x	x			x				x	x	x	x	x	x	x	x	x
C1	Volume	Energy	x	x						x				x	x			x		x	x	x	x	x	x	x
C1	Volume	Alarm	x							x				x				x		x	x	x	x	x	x	x
C1	Volume	HCA	x							x			x	x				x		x	x	x	x	x	x	x
C2/C6	HCA	HCA										x	x										x	x	x	x
C2/C6	HCA	Volume						x				x					x						x	x	x	x
C2/C6	HCA	Mass									x	x							x				x	x	x	x
C2/C6	HCA	Energy		x								x			x								x	x	x	x
C2/C6	HCA	Status										x											x	x	x	x
C2/C6	Volume	HCA					x						x			x							x	x	x	x
C2/C6	Volume	Volume					x	x								x	x						x	x	x	x
C2/C6	Volume	Mass					x				x					x			x				x	x	x	x
C2/C6	Volume	Energy		x			x								x	x							x	x	x	x
C2/C6	Volume	Status					x									x							x	x	x	x
C2/C6	Mass	HCA								x			x					x					x	x	x	x
C2/C6	Mass	Volume						x		x							x	x					x	x	x	x
C2/C6	Mass	Mass								x	x							x	x				x	x	x	x
C2/C6	Mass	Energy		x						x					x			x					x	x	x	x
C2/C6	Mass	Status								x								x					x	x	x	x
C2/C6	Energy	HCA	x										x	x									x	x	x	x
C2/C6	Energy	Volume	x					x						x			x						x	x	x	x
C2/C6	Energy	Mass	x								x			x					x				x	x	x	x
C2/C6	Energy	Energy	x	x										x	x								x	x	x	x
C2/C6	Energy	Status	x											x									x	x	x	x
C2/C6	Alarm	HCA											x										x	x	x	x
C2/C6	Alarm	Volume						x									x						x	x	x	x
C2/C6	Alarm	Mass									x								x				x	x	x	x
C2/C6	Alarm	Energy		x											x								x	x	x	x
C2/C6	Alarm	Status																					x	x	x	x
C2/C6	Alarm	Alarm																					x	x	x	x

C3	Volume	Volume					x									x	x						x	x	x	x
C3	HCA	HCA										x											x	x	x	x
C3	Energy	Energy	x											x	x								x	x	x	x
C3	Mass	Mass								x								x	x				x	x	x	x
C4	Volume	HCA	x		x		x		x				x	x		x				x	x	x	x	x	x	x
C4	Volume	Alarm	x		x		x		x					x		x				x	x	x	x	x	x	x
C7	Volume	HCA	x		x	x	x						x	x		x				x	x	x	x	x	x	x
C7	Volume	Alarm	x		x	x	x							x		x				x	x	x	x	x	x	x
C8	Volume	Volume	x	x			x	x						x		x				x	x	x	x	x	x	x
C8	Volume	Status	x	x			x	x						x		x				x	x	x	x	x	x	x
C9	Volume	Status	x		x		x		x					x		x				x	x	x	x	x	x	x
CA	Volume	Volume	x				x							x		x	x			x	x	x	x	x	x	x
CB	Volume	Volume	x	x			x	x						x	x	x	x			x	x	x	x	x	x	x
CC	Volume	HCA	x				x						x	x		x				x	x	x	x	x	x	x
CC	Volume	Alarm	x				x							x		x				x	x	x	x	x	x	x

Table 20: Included data in short telegram

3.2.8 Status

Every RSP_UD telegram is sent with a status byte in the header. Consequently, this byte is described according to EN 13757.

Bit	Description
Bit 0-2	not used
Bit 3	permanent error
Bit 4	temporary error
Bit 5-7	not used
Bit 0-2	not used

Table 21: Status byte

4. Parameterization

All parameters are stored in an EEPROM and are not lost when power fails or battery is replaced.

All parameter settings are initiated by the master via a SND_UD telegram. The CALEC ST III responds with an ACK telegram.

4.1 SND_UD telegrams

There is a separate telegram for each configurable value. Only one parameter can be changed with each telegram. It is not possible to summarize multiple values in one telegram.

4.1.1 Parameterize baud rate

The CALEC ST III supports 300, 2400 and 9600 baud. The baud rate can be parametrized using the following telegrams:

Name	No. of bytes	Value	Explanation
Start	1	0x68	
L-field	1	0x03	
L-field	1	0x03	
Start	1	0x68	
C-field	1	0x53 / 0x73	SND_UD
Address-field	1	PADR	Primary address
CI-field	1	0xb8 / 0xbb / 0xbd	0xb8 = 300 baud 0xbb = 2400 baud 0xbd = 9600 baud
checksum	1	CS	
stop	1	0x16	

Table 22: Baud rate parameterization

- The CALEC ST III does not distinguish between 0x53 and 0x73 in the C field.
- The CALEC ST III responds with an ACK telegram at the old baud rate and then switches to the new baud rate.

4.1.2 Parameterize primary address

The primary address can be parameterized using the following telegram. Values of 0 to 250 are accepted.

Name	No. of bytes	Value	Explanation
Start	1	0x68	
L-field	1	0x06	
L-field	1	0x06	
Start	1	0x68	
C-field	1	0x53 / 0x73	SND_UD
Address-field	1	PADR	(old) Primary address
CI-field	1	0x51	Parameterization
DIF	1	0x01	
VIF	1	0x7a	
Value	1	0x00 - 0xfa	new primary address 0 - 250
Checksum	1	CS	
Stop	1	0x16	

Table 23: Primary address parameterization

- The CALEC ST III does not distinguish between 0x53 and 0x73 in the C field.
- The CALEC ST III responds with an ACK telegram.

4.1.3 Parameterize secondary address

Name	No. of bytes	Value	Explanation
Start	1	0x68	
L-field	1	0x09	
L-field	1	0x09	
Start	1	0x68	
C-field	1	0x53 / 0x73	SND_UD
Address-field	1	PADR	Primary address
CI-field	1	0x51	Parameterization
DIF	1	0x0c	
VIF	1	0x79	
Value	4	BCD8	New secondary address
Checksum	1	CS	
Stop	1	0x16	

Table 24: Secondary address parameterization

- The CALEC ST III does not distinguish between 0x53 and 0x73 in the C field.
- The CALEC ST III responds with an ACK telegram.

4.1.4 Parameterize the response telegram

The response telegram can be parameterized using the following command. The telegram always has the same structure. The appropriate DIF, DIFE and VIF must be used depending on the required response telegram. These can be found in Table 20: Parameterize response telegram.
The factory setting for the CALEC ST III is the standard telegram (default telegram).

Name	No. of bytes	Value	Explanation
Start	1	0x68	
L-field	1	0x03	
L-field	1	0x03	
Start	1	0x68	
C-field	1	0x53 / 0x73	SND_UD
Address-field	1	PADR	Primary address
CI-field	1	0x51	Parameterization
DIF, DIFE	Variable		See column "DIF, DIFE" in the following table
VIF	1		See column "VIF" in the following table
Checksum	1	CS	
Stop	1	0x16	

Table 25: Response telegram parameterization frame

- The memory numbering is according to EN 1434 and EN 13757.
- The CALEC ST III does not distinguish between 0x53 and 0x73 in the C field.
- The CALEC ST III responds with an ACK telegram.

Response tel.	DIF, DIFE	VIF
Standard	0x08	0x7e
Service	0x08	0x7f
Freeze	0xc8,0f	0x7e

Response tel.	DIF, DIFE	VIF
logger 1	0x88, 82, 03	0x7e
logger 2	0xc8, 82, 03	0x7e
...		

Response tel.	DIF, DIFE	VIF
Billing date 1	0x48	0x7e
Billing date 2	0x88, 01	0x7e
Billing date 3	0xc8, 01	0x7e
Billing date 4	0x88, 02	0x7e
Billing date 5	0xC8, 02	0x7e
Billing date 6	0x88, 03	0x7e
Billing Date 7	0xc8, 03	0x7e
Billing date 8	0x88, 04	0x7e
Billing date 9	0xc8, 04	0x7e
Billing date 10	0x88, 05	0x7e
Billing date 11	0xc8, 05	0x7e
Billing date 12	0x88, 06	0x7e

Response tel.	DIF, DIFE	VIF
logger 100	0xC8, 83, 06	0x7e
logger 101	0x88, 84, 06	0x7e
...		
logger 200	0xc8, 85, 09	0x7e
logger 201	0x88, 86, 09	0x7e
...		
logger 300	0xc8, 87, 0C	0x7e
logger 301	0x88, 88, 0C	0x7e
...		
logger 400	0xc8, 89, 0f	0x7e
logger 401	0x88, 8a, 0f	0x7e
...		
logger 500	0xC8, 8b, 82, 01	0x7e

Table 26: Parameter response telegram

The short telegram can only be enabled by application reset with corresponding subcode 0x05. For more details, please check chapter 41 Application reset.

4.1.5 Parameterize Date / Time

Name	No. of bytes	Value	Explanation
Start	1	0x68	
L-field	1	0x09	
L-field	1	0x09	
Start	1	0x68	
C-field	1	0x53 / 0x73	SND_UD
Address-field	1	PADR	Primary address
CI-field	1	0x51	Parameterization
DIF	1	0x04	
VIF	1	0x6d	
Value	4	type F	new Date / Time
Checksum	1	CS	
Stop	1	0x16	

Table 27: Date / Time parameterization

- The date and time format supports both the millennium and summer/winter time bits.
- The CALEC ST III does not distinguish between 0x53 and 0x73 in the C field.
- The CALEC ST III responds with an ACK telegram.

4.1.6 Programming error hour counter

Name	No. of bytes	Value	Explanation
Start	1	0x68	
L-field	1	0x09	
L-field	1	0x09	
Start	1	0x68	
C-field	1	0x53 / 0x73	SND_UD
Address-field	1	PADR	Primary address
CI-field	1	0x51	Parameterization
DIF	1	0x34	

Name	No. of bytes	Value	Explanation
VIF	1	0x22	
Value	4	int4	New value of the error hour counter
Checksum	1	CS	
Stop	1	0x16	

Table 28: Error hour counter programming

- The programming of the error hour counter requires the programming mode
- The CALEC ST III does not distinguish between 0x53 and 0x73 in the C field.
- The CALEC ST III responds with an ACK telegram.

4.1.7 Program alarm hour counter

Name	No. of bytes	Value	Explanation
Start	1	0x68	
L-field	1	0x0a	
L-field	1	0x0a	
Start	1	0x68	
C-field	1	0x53 / 0x73	SND_UD
Address-field	1	PADR	Primary address
CI-field	1	0x51	Parameterization
DIF	2	0xb4, 0x40	
VIF	1	0x22	
Value	4	int4	New value of the alarm hours counter
Checksum	1	CS	
Stop	1	0x16	

Table 29: Alarm hour counter programming

- The programming of the alarm hours counter requires the programming mode
- The CALEC ST III does not distinguish between 0x53 and 0x73 in the C field.
- The CALEC ST III responds with an ACK telegram.

4.1.8 Parameterize billing date

The CALEC ST III can handle 12 billing (stich) date memories.
Each memory time (billing date) can be programmed separately.
The data are stored at the end of the defined day.

Name	No. of bytes	Value	Statement
Start	1	0x68	
L-field	1	0x0a	
L-field	1	0x0a	
Start	1	0x68	
C-field	1	0x53 / 0x73	SND_UD
Address-field	1	PADR	Primary address
CI-field	1	0x51	Parameterization
DIF	1	0x42	
VIF, VIFE	≥ 2	0xec, 0x7e	Example of Billing date # 1. Numbering according Table 3.2.2 Billing date telegrams
Value	2	type G	New billing date
Checksum	1	CS	
Stop	1	0x16	

Table 30: Closing parameterization

- The date of the entered year is ignored and set internally to 127 (AnyYear). The day and month are taken over.
- The CALEC ST III does not distinguish between 0x53 and 0x73 in the C field.
- The CALEC ST III responds with an ACK telegram.

4.1.9 Parameterize customer text field

Name	No. of bytes	Value	Explanation
Start	1	0x68	
L-field	1	LEN	
L-field	1	LEN	
Start	1	0x68	
C-field	1	0x53 / 0x73	SND_UD
Address-field	1	PADR	Primary address
CI-field	1	0x51	Parameterization
DIF,	1	0x0d	
VIF, VIFE	2	0xfd, 0x11	
	1	0x01-0x28	Number of bytes of the customer text field
Value	1 - 40		Customer text field (ASCII string)
Checksum	1	CS	
Stop	1	0x16	

Table 31: parameterize Customer text field:

- The length of the customer text field is variable. 1 to 40 bytes are allowed. The length byte can be found between VIFE and the text field.
- The CALEC ST III does not distinguish between 0x53 and 0x73 in the C field.
- The CALEC ST III responds with an ACK telegram.

4.1.10 Freeze command

With the freeze command, the current values can be frozen. The frozen values remain stored in memory until a new Freeze command is triggered. They can be read out via the “Freeze telegram” (see chapter: 3.2.4 Freeze Telegram).

Name	No. of bytes	Value	Explanation
Start	1	0x68	
L-field	1	0x07	
L-field	1	0x07	
Start	1	0x68	
C-field	1	0x53 / 0x73	SND_UD
Address-field	1	PADR	Primary address
CI-field	1	0x51	Parameterization
DIF, DIFE	2	0xc0, 0f	
VIF, VIFE	2	0xfe, 0b	
Checksum	1	CS	
Stop	1	0x16	

Table 32: Freeze command

- The CALEC ST III does not distinguish between 0x53 and 0x73 in the C field.
- The CALEC ST III responds with an ACK telegram.

4.1.11 Parameterize pulse value

Name	No. of bytes	Value	Explanation
Start	1	0x68	
L-field	1	0x0a	
L-field	1	0x0a	
Start	1	0x68	
C-field	1	0x53 / 0x73	SND_UD
Address-field	1	PADR	Primary address
CI-field	1	0x51	Parameterization
DIF	1	0x05	
VIF, VIFE	2	0x93, 0x28	
Value	4	float	Pulse value [l]
Checksum	1	CS	
Stop	1	0x16	

Table 33: Parameterized pulse value

- For this parameterization, the device must be in "Programming" protection level.
- The CALEC ST III does not distinguish between 0x53 and 0x73 in the C field.
- The CALEC ST III responds with an ACK telegram.

4.1.12 Parametrize pulse value for aux. counter #1

In the device version “Flow (C2)”, input #1 on auxiliary counter #1 is incremented. The allocated impulse value is configured using the following command:

Name	No. of bytes	Value	Explanation
Start	1	0x68	
L-field	1	LEN	
L-field	1	LEN	
Start	1	0x68	
C-field	1	0x53 / 0x73	SND_UD
Address-field	1	PADR	Primary address
CI-field	1	0x51	Parameterization
DIF, DIFE	1	0x05	
VIF, VIFE	2	VIF4	
Value	4		Pulse value for auxiliary counter #1
Checksum	1	CS	
Stop	1	0x16	

Table 34: Parametrize impulse value for auxiliary counter #1

- For this parameterization, the device must be in "Service" protection level.
- The CALEC ST III does not distinguish between 0x53 and 0x73 in the C field.
- The CALEC ST III responds with an ACK telegram.

4.1.13 Parametrize pulse value for aux. counter #2

Name	No. of bytes	Value	Explanation
Start	1	0x68	
L-field	1	LEN	
L-field	1	LEN	
Start	1	0x68	
C-field	1	0x53 / 0x73	SND_UD

Name	No. of bytes	Value	Explanation
Address-field	1	PADR	Primary address
CI-field	1	0x51	Parameterization
DIF, DIFE	2	0x85, 0x40	
VIF, VIFE	2	VIF4	
Value	4		Pulse value for auxiliary counter #2
Checksum	1	CS	
Stop	1	0x16	

Table 35: Parametrize impulse value for auxiliary counter #2

- For this parameterization, the device must be in "Service" protection level.
- The CALEC ST III does not distinguish between 0x53 and 0x73 in the C field.
- The CALEC ST III responds with an ACK telegram.

4.1.14 Parameterize Installation side

Name	No. of bytes	Value	Explanation
Start	1	0x68	
L-field	1	0x03	
L-field	1	0x03	
Start	1	0x68	
C-field	1	0x53 / 73	SND_UD
Address-field	1	PADR	Primary address
CI-field	1	0x51	Parameterization
DIF	1	0x01	
VIF, VIFE	2	0xfd, 0x09	
Value	1	0x04 / 0x0c	Installation side: 0x04 = return, 0x0c = supply (Medium byte according to EN 13757)
Checksum	1	CS	
Stop	1	0x16	

Table 36: Parameterize Installation side

- For this parameterization, the CALEC ST III must be in "programming" protection level.
- The CALEC ST III does not distinguish between 0x53 and 0x73 in the C field.
- The CALEC ST III responds with an ACK telegram.

4.2 Application reset

The CALEC ST III supports the application reset and an extension based on what is known as subcode. These commands only affect the choice of response telegram.

The Application reset commands are initiated by the master via a SND_UD telegram.

Name	No. of bytes	Value	Explanation
Start	1	0x68	
L-field	1	0x03	
L-field	1	0x03	
Start	1	0x68	
C-field	1	0x53/0x73	SND_UD
Address-field	1	PADR	Primary address
CI-field	1	0x50	Application reset
checksum	1	CS	

Name	No. of bytes	Value	Explanation
stop	1	0x16	

Table 37: Application reset

- The application reset activates the standard telegram and has the same effect as the relevant parametrization command.
- The CALEC ST III does not distinguish between 0x53 and 0x73 in the C field.
- The CALEC ST III responds with an ACK telegram.

Name	No. of bytes	Value	Explanation
Start	1	0x68	
L-field	1	0x03	
L-field	1	0x03	
Start	1	0x68	
C-field	1	0x53/0x73	SND_UD
Address-field	1	PADR	Primary address
CI-field	1	0x50	Application reset
	1	0xb0	Subcode 0xb0
Checksum	1	CS	
Stop	1	0x16	

Table 38: Application reset with subcode B0h

The application reset with subcode 0xb0 activates the service telegram and has the same effect as the relevant parametrization command.

- The CALEC ST III does not distinguish between 0x53 and 0x73 in the C field.
- The CALEC ST III responds with an ACK telegram.

Name	No. of bytes	Value	Explanation
Start	1	0x68	
L-field	1	0x03	
L-field	1	0x03	
Start	1	0x68	
C-field	1	0x53/0x73	SND_UD
Address-field	1	PADR	primary address
CI-field	1	0x50	Application reset
	1	0x05	Subcode 0x05
Checksum	1	CS	
Stop	1	0x16	

Table 39: Application reset with subcode 05h

- The application reset with subcode 0x05 activates the short standard telegram.
- The CALEC ST III does not distinguish between 0x53 and 0x73 in the C field.
- The CALEC ST III responds with an ACK telegram.

4.3 ACK telegram

If the device responds with an ACK telegram, this means the command from the SND_UD telegram has been successfully executed. If the device cannot execute the command correctly, no ACK telegram is sent and there is a timeout (no answer is sent).

Name	No. of bytes	Value	Statement
ACK	1	0xE5	

Table 40: ACK telegram

5. Variable units

5.1 Units

Most units are variable and can be parameterized. The M-Bus standard treats the unit and resolution as a single unit, i.e. a conversion from e.g. kWh to kJ works on the same principle as changing the resolution by a factor of 100, for example. The VIF standardized in EN 13757 is used.

There are no M-Bus commands for parametrizing units. The conversion is done manually using the buttons (display menu). In the case of first-calibrated devices, the calibration mark must be destroyed for this purpose.

5.2 Units and resolution of the energy meter readings (VIF1)

Each energy counter is stored as a 4-byte integer. Every counter also has a remainder register. This is a 4 byte float. The counter reading and remainder register always have the same unit/resolution.

The CALEC ST III display always shows the energy counter readings in the same unit/resolution as on the M-Bus.

All meter readings described with VIF1 can accept the following units and resolution:

resolution	unit	VIF / VIFE	resolution	unit	VIF / VIFE
0.001	KWh	0x03	0001	GJ	0x0e
0.01	KWh	0x04	0.01	GJ	0x0f
0.1	KWh	0x05	0.1	GJ	0xFB, 0x08
1	KWh	0x06	1	GJ	0xFB, 0x09
0.001	MWh	0x06	0.001	kBtu	0x80, 0x3d
0.01	MWh	0x07	0.01	kBtu	0x81, 0x3d
0.1	MWh	0xFB, 0x00	0.1	kBtu	0x82, 0x3d
1	MWh	0xFB, 0x01	1	kBtu	0x83, 0x3d
0.001	MJ	0x0b	0.001	Mbtu	0x83, 0x3d
0.01	MJ	0x0c	0.01	Mbtu	0x84, 0x3d
0.1	MJ	0x0d	0.1	Mbtu	0x85, 0x3d
1	MJ	0x0e	1	Mbtu	0x86, 0x3d

Table 41: Variable units for energy counter readings VIF1

5.3 Units and resolution of volume / mass counter readings (VIF2)

All volume/mass counter readings are saved as 4-byte integers. Every counter reading also has a remainder register. This is a 4 byte float. The counter reading and remainder register always have the same unit/resolution. The CALEC ST III display always shows the volume/mass counter readings in the same unit/resolution as on the M-Bus.
All counter readings described with VIF2 can have the following units and resolutions:

Resolution	Unit volume	VIF / VIFE	Resolution	Unit mass	VIF / VIFE
0.001	m3	0x13	0.001	T	0x1b
0.01	m3	0x14	0.01	T	0x1c
0.1	m3	0x15	0.1	T	0x1d
1	m3	0x16	1	T	0x1e

Resolution	Unit volume	VIF / VIFE	Resolution	Unit mass	VIF / VIFE
0.001	USGAL	0x90, 0x3d			
0.01	USGAL	0x91, 0x3d			
0.1	USGAL	0x92, 0x3d			
1	USGAL	0x93, 0x3d			

Table 42: Variable units for volume / mass counter readings VIF2

5.4 Units and resolution for auxiliary counter readings (VIF3)

The input medium can be selected:
Energy, volume, mass or no units is selectable.

All auxiliary counter readings are saved as 4 byte integers. Every counter reading also has a remainder register. This is a 4 byte float. The counter reading and remainder register always have the same unit/resolution.
The CALEC ST III display always shows the auxiliary counter readings in the same unit/resolution as on the M-Bus.

For energy, volume and mass, the unit is taken from the tables above.
Where there are no units, the following unit is used:

medium	resolution	unit	VIF / VIFE
Units-los	1	HCA	0x6e

Table 43: No-unit HCA unit of auxiliary counter VIF3

5.5 Units for auxiliary counter pulse values(VIF4)

The units for the auxiliary counter impulse values depend on the set medium. The counter reading and impulse value always have the same unit. While the resolution for the counter reading can be configured, this is not necessary for the impulse value as it is a floating value.

All counter readings described with VIF4 can accept the following units and resolution:

medium	unit	VIF / VIFE
energy	kWh / pulse	0x86, 0x28
volume	l / pulse	0x93, 0x28
Dimensions	kg / pulse	0x9B, 0x28
no unit	HCA / Pulse	0xee, 0x28

Table 44: Variable units of the pulse values of the auxiliary counter VIF4

5.6 Note on units of all other values

All the values and units not described in chapters 5.2 to 5.5 are fixed on the M-Bus and cannot be changed.

However, they can be changed on the display of the CALEC ST III, which means that the values on the M-Bus and display can be shown differently. However, correct physical conversion between the units is guaranteed in all cases.