Specification M-Bus
CALEC ST III

M-Bus Protocol

CALEC® ST III Standard
CALEC® ST III Smart

Manufacturer:	INTEGRA Metering AG
Type:	CALEC® ST III
Firmware Version:	3:00:00
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

Table directory

1. Overview

1.1 logic units

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

Version	Device	Statement
Standard	0xC0	Standard energy calculator with volume display
Mass	0xC1	Standard energy calculator with mass display
Flow	0xC2	Flow calculator
Add Flow	0xC3	Flow calculator, 2 channel adder
BDE	0xC4	Bidirectional energy measurement controlled by the differential temperature
X-50	0xC5	reserved; Standard energy calculator X-50
AMBILL	0xC6	reserved; Same as Flow
TGR	0xC7	Energy calculator with reference temperature controlled tariffs
BDV	0xC8	Bidirectional energy measurement controlled by at external control signal
DTF	0xC9	Double-tariff energy calculator
Twin-V	0xCA	Calculator with two flow sensors
Twin-E	0xCB	Double heat calculator with 2 inputs and 2 energy- and volume-registers; the 2nd circuit is Thermally open.
Tariff 8	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 DIFE 0x3b or 0x3c.
- 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)

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 displayed as no. 1 to 5.

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 Readout
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.
The factory setting for the baud rate is 2400.

1.7 M-Bus Addressing

The device supports primary and secondary addressing according to EN 13757.
The factory 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 5 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 data	3.2.2 Billing Telegram
Logger	500	logger datas	3.2.3 Logger Telegram
Freeze	1	freezed counters	3.2.4 Freeze Telegram
No Data	1	no data present	3.2.5 No Data Telegram
Service	1	Only for service	3.2.6 Service 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
- Changing the protection level to allow programming may involve destroying the verification seal

Parameter	Degree of protection	For details see chapter
Baud rate	User	4.1.1 Parameterized baud rate
Primary address	User	4.1.2 Parameterize primary address
Secondary address	User	4.1.3 Parameterize secondary address
Response telegram	User	4.1.4 Parameterize response telegram
date / time	User	4.1.5 Parameterize Date / Time
Error hour counter	Programm	4.1.6 Programming error hour counter
Alarm hour counter	Programm	4.1.7 Program alarm hour counter
Stich date	User	4.1.8 Parameterize billing date
Customer text	User	4.1.9 Parameterize Customer text field
pulse value	Programm	4.1.11 Parameterized pulse value
Freeze	User	4.1.10 Freeze command
Pulse value aux-counter #1	service	4.1.12 Pulse value parameters aux counter #1
Pulse value aux-counter #2	service	4.1.13 Pulse value parameters aux counter #2
Pulse value aux-counter #2	service	4.1.14 Pulse value parameters aux counter #3
Installation side	programming	29 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

Point-to-point addressing can be use the M-Bus network consists of a single CALEC ST III and a master.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 are to 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 removed 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	

Name	No. of bytes	Value	Explanation (examples)
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 0x05b4
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	
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)	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				reading	All
Sec. Addr.-field	4	IDENT				Secondary address	All
Manufacturer	2	0xb405				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 reading	All
Status	1	STAT				Status according EN 13757	All
Signature	2	0000h				not used	All
DIF	1	0x04					C0, C1, C5, C7, C9, CA, CB
VIF	≥1	VIF1					C0, C1, C5, C7, C9, CA, CB
value	4	INT4	0	0	0	Energy counter reading	C0, C1, C5, C7, C9, CA, CB
DIF	1	0x04					C4, C8
VIF	≥2	VIF1, 0x3b					C4, C8
value	4	INT4	0	0	0	Energy counter reading pos.	C4, C8
DIF	1	0x04					C4, C8
VIF	≥2	VIF1, 0x3c					C4, C8
value	4	INT4	0	0	0	Energy meter reading neg.	C4, C8
DIF	2	0x84, 10					C7, C9
VIF	≥1	VIF1					C7, C9
value	4	INT4	0	1	0	Energy tariff 1	C7, C9
DIF	2	0x84, 20					C7
VIF	≥1	VIF1					C7
value	4	INT4	0	2	0	Energy tariff 2	C7
DIF	1	0x04					C0, C5, C7, C9, CA, CB

Name	Num. bytes	value	Unit	tariff	Storage	Explanation (examples)	Available in version
VIF	≥1	VIF2					C0, C5, C7, C9, CA, CB
value	4	INT4	0	0	0	Volume counter	C0, C5, C7, C9, CA, CB
DIF	1	0x04					C4, C8
VIF	≥2	VIF2, 0x3b					C4, C8
value	4	INT4	0	0	0	Volume counter pos.	C4, C8
DIF	1	0x04					C4, C8
VIF	≥2	VIF2, 0x3c					C4, C8
value	4	INT4	0	0	0	Volume counter neg.	C4, C8
DIF	2	0x84, 10					C9
VIF	≥1	VIF2					C9
value	4	INT4	0	1	0	Volume tariff 1	C9
DIF	1	0x04					C1
VIF	≥1	VIF2					C1
value	4	INT4	0	0	0	Mass counter reading	C1
DIF	1	0x04					C2
VIF	≥1	VIF3					C2
value	4	INT4	0	0	0	Auxiliary counter # 1	C2
DIF	1	0x04					C6
VIF	≥1	VIF2					C6
value	4	INT4	0	0	0	Auxiliary counter # 1 volume	C6
DIF	2	0x84, 40					All
VIF	≥1	VIF3					All
value	4	INT4	1	0	0	Auxiliary counter # 2	All
DIF	3	0x84, 80, 40					All [4]
VIF	≥1	VIF3					All [4]
value	4	INT4	2	0	0	Auxiliary counter # 3	All [4]
DIF	1	0x05					All [1]
VIF	1	0x2b					All [1]
value	4	float	0	0	0	Output [W]	All [1]
DIF	1	0x05					All except C1 [2]
VIF	1	0x3b					All except C1 [2]
value	4	float	0	0	0	Flow [l / h]	All except C1 [2]
DIF	1	0x05					C1 [2]
VIF	1	0x53					C1 [2]
value	4	float	0	0	0	Mass flow [kg / h]	C1 [2]
DIF	1	0x05					C0, C1, C4, C7, C8, C9, CA, CB
VIF	1	0x5b					C0, C1, C4, C7, C8, C9, CA, CB
value	4	float	0	0	0	Temperature hot side [° C]	C0, C1, C4, C7, C8, C9, CA, CB
DIF	1	0x05					C0, C1, C4, C7, C8, C9, CA, CB
VIF	1	0x5F					C0, C1, C4, C7, C8, C9, CA, CB

Name	Num. bytes	value	Unit	tariff	Storage	Explanation (examples)	Available in version
value	4	float	0	0	0	Temperature cold side [° C]	C0, C1, C4, C7, C8, C9, CA, CB
DIF	1	0x05					C0, C1, C4, C7, C8, C9, CA, CB
VIF	1	0x63					C0, C1, C4, C7, C8, C9, CA, CB
value	4	float	0	0	0	Temperature difference [K]	C0, C1, C4, C7, C8, C9, CA, CB
DIF	1	0x05					C0, C1, C4, C7, C8, C9, CA, CB
VIF	2	0x83, 33					C0, C1, C4, C7, C8, C9, CA, CB
value	4	float	0	0	0	K-factor [Wh / K / l]	C0, C1, C4, C7, C8, C9, CA, CB
DIF	1	0x05					C0, C1, C4, C7, C8, C9, CA, CB
VIF	2	0x9B, 2c					C0, C1, C4, C7, C8, C9, CA, CB
value	4	float	0	0	0	Density [kg / l]	C0, C1, C4, C7, C8, C9, CA, CB
DIF	1	0x04					All
VIF	1	0x22					All
value	4	INT4	0	0	0	Operating hours [h]	All
DIF	1	0x34					All
VIF	1	0x22					All
value	4	INT4	0	0	0	Error hours [h]	All
DIF	2	0xB4, 40					All
VIF	1	0x22					All
value	4	INT4	1	0	0	Alarm hours [h]	All
DIF	1	0x04					All
VIF	1	0x6d					All
value	4	INT4	0	0	0	Current Date & Time	All [3]
DIF	1	0x05					C0, C1, C4, C5, C6, C7, C8, C9, CA, CB
VIF	2	0x93, 28					C0, C1, C4, C5, C6, C7, C8, C9, CA, CB
value	4	float	0	0	0	Pulse value [l]	C0, C1, C4, C5, C6, C7, C8, C9, CA, CB
DIF	1	0x05					C2
VIF	≥2	VIF4					C2
value	4	float	0	0	0	Pulse value aux counter # 1	C2
DIF	2	0x85, 40					All
VIF	≥2	VIF4					All
value	4	float	1	0	0	Pulse value aux counter # 2	All
DIF	3	0x85, 80, 40					All [4]
VIF	≥2	VIF4					All [4]
value	4	float	2	0	0	Pulse value aux counter# 3	All [4]
DIF	1	0x0c					All

Name	Num. bytes	value	Unit	tariff	Storage	Explanation (examples)	Available in version
VIF	1	0x78					All
value	4	BCD8	0	0	0	Production number	All
DIF	1	0x0d					All
VIF	2	0xFD, 11					All
value	1	int1				Size customer text field	All
value	-	ASCII	0	0	0	Customer text field	All
DIF	1	0x0b					All
VIF	2	0xfd, 0e					All
value	3	BCD6	0	0	0	Firmware version	All
DIF	1	0x0c					All
VIF	2	0xfd, 0d					All
value	3	BCD8	0	0	0	Hardware version	All
CS	1	CS					All
stop	1	0x16					All

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) Auxiliary counter #3 is only available when input #3 is not used as a control signal (direction/tariff).

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)	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

Name	Num. bytes	Value	Unit	tariff	Storage	Explanation (examples)	Available in version
Sek.Addr-field	4	IDENT				Secondary address	All
Manufacturer	2	0xb405				0x25b4 = Integra Metering	All
Version	1	DEV				Device as per chapter 1.1	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 accord. EN 13757	All
Signature	2	0000h				not used	All
DIF	≥1	0x42					All [5]
VIF		0xec, 7e					All [6]
value		Date Type G			1...	Future storage date	All
DIF	≥1	0x42					All [5]
VIF		0x6C					All
value		Date Type G			1...	Storage date	All
DIF	≥1	0x44					C0, C1, C5, C7, C9, CA, CB [5]
VIF	≥1	VIF1					C0, C1, C5, C7, C9, CA, CB
value	4	INT4	0	0	1...	Energy counter reading	C0, C1, C5, C7, C9, CA
DIF	≥1	0x44					C4, C8 [5]
VIF	≥2	VIF1, 0x3b					C4, C8
value	4	INT4	0	0	1...	Energy counter reading pos.	C4, C8
DIF	≥1	0x44					C4, C8 [5]
VIF	≥2	VIF1, 0x3c					C4, C8
value	4	INT4	0	0	1...	Energy counter reading neg.	C4, C8
DIF	≥2	0xC4, 10					C7, C9 [5]
VIF	≥1	VIF1					C7, C9
value	4	INT4	0	1	1...	Energy Tariff 1	C7, C9
DIF	≥2	0xC4 20					C7 [5]
VIF	≥1	VIF1					C7
value	4	INT4	0	2	1...	Energy Tariff 2	C7
DIF	≥1	0x44					C0, C5, C7, C9, CA, CB [5]
VIF	≥1	VIF2					C0, C5, C7, C9, CA, CB
value	4	INT4	0	0	1...	Volume counter reading	C0, C5, C7, C9, CA, CB
DIF	≥1	0x44					C4, C8 [5]
VIF	≥2	VIF2, 0x3b					C4, C8
value	4	INT4	0	0	1...	Volume counter pos.	C4, C8
DIF	≥1	0x44					C4, C8 [5]
VIF	≥2	VIF2, 0x3c					C4, C8
value	4	INT4	0	0	1...	Volume counter neg.	C4, C8
DIF	≥2	0x84, 10					C9 [5]

Name	Num. bytes	Value	Unit	tariff	Storage	Explanation (examples)	Available in version
VIF	≥1	VIF2					C9
value	4	INT4	0	1	1...	Volume Tariff 1	C9
DIF	≥1	0x44					C1 [5]
VIF	≥1	VIF2					C1
value	4	INT4	0	0	1...	Mass counter reading	C1
DIF	≥1	0x44					C2 [5]
VIF	≥1	VIF3					C2
value	4	INT4	0	0	1...	Auxiliary counter # 1	C2
DIF	≥1	0x44					C6 [5]
VIF	≥1	VIF2					C6
value	4	INT4	0	0	1...	Auxiliary counter # 1 volume	C6
DIF	≥2	0xC4 40					All [5]
VIF	≥1	VIF3					All
value	4	INT4	1	0	1...	Auxiliary counter # 2	All
DIF	≥3	0xC4, 80, 40					All [4] [5]
VIF	≥1	VIF3					All [4]
value	4	INT4	2	0	1...	Auxiliary counter # 3	All [4]
DIF	≥1	0x74					All [5]
VIF	1	0x22					All
value	4	INT4	0	0	1...	Error hours [h]	All
DIF	2	0xf4, 40					All [5]
VIF	1	0x22					All
value	4	INT4	1	0	1...	Alarm hours [h]	All
CS	1	CS					All
stop	1	0x16					All

Table 12: 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.

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 100:
i.e. the data from logger #1 is therefore transferred as M-Bus memory number #100.

Coding of memory numbers:
The following table contains a list of the values for logger #1 (memory #100); 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)	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	0xb405				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
DIF	≥3	0x84, 82, 03					All 7)
VIF		0x6d					All
value		Date Type F			100 ...	Storage date	All
DIF	≥3	0x84, 82, 03					C0, C1, C5, C7, C9, CA, CB 7)
VIF	≥1	VIF1					C0, C1, C5, C7, C9, CA, CB
value	4	INT4	0	0	100 ...	Energy counter reading	C0, C1, C5, C7, C9, CA, CB
DIF	≥3	0x84, 82, 03					C4, C8 7)
VIF	≥2	VIF1, 3b					C4, C8
value	4	INT4	0	0	100 ...	Energy counter pos.	C4, C8
DIF	≥3	0x84, 82, 03					C4, C8 7)
VIF	≥2	VIF1, 3c					C4, C8
value	4	INT4	0	0	100 ...	Energy counter neg.	C4, C8
DIF	≥3	0x84, 92, 03					C7, C9 7)
VIF	≥1	VIF1					C7, C9
value	4	INT4	0	1	100 ...	Energy Tariff 1	C7, C9
DIF	≥3	0x84, a2, 03					C7 7)

Name	Num. bytes	Value	Unit	tariff	Storage	Explanation (examples)	Available in version
VIF	≥1	VIF1					C7
value	4	INT4	0	2	100 ...	Energy Tariff 2	C7
DIF	≥3	0x84, 82, 03					C0, C5, C7, C9, CA, CB [7]
VIF	≥1	VIF2					C0, C5, C7, C9, CA, CB
value	4	INT4	0	0	100 ...	Volume counter	C0, C5, C7, C9, CA, CB
DIF	≥3	0x84, 82, 03					C4, C8 [7]
VIF	≥2	VIF2, 0x3b					C4, C8
value	4	INT4	0	0	100 ...	Volume counter pos.	C4, C8
DIF	≥3	0x84, 82, 03					C4, C8 [7]
VIF	≥2	VIF2, 0x3c					C4, C8
value	4	INT4	0	0	100 ...	Volume counter neg.	C4, C8
DIF	≥3	0x84, 92, 03					C9 [7]
VIF	≥1	VIF2					C9
value	4	INT4	0	1	100 ...	Volume Tariff 1	C9
DIF	≥3	0x84, 82, 03					C1 [7]
VIF	≥1	VIF2					C1
value	4	INT4	0	0	100 ...	Mass counter reading	C1
DIF	≥3	0x84, 82, 03					C2 [7]
VIF	≥1	VIF3					C2
value	4	INT4	0	0	100 ...	Auxiliary counter # 1	C2
DIF	≥3	0x84, 82, 03					C6 [7]
VIF	≥1	VIF2					C6
value	4	INT4	0	0	100 ...	Auxiliary counter # 1 volume	C6
DIF	≥3	0x84, c2, 03					All [7]
VIF	≥1	VIF3					All
value	4	INT4	1	0	100 ...	Auxiliary counter # 2	All
DIF	≥3	0x84, 82, 43					All [4] [7]
VIF	≥1	VIF3					All 4
value	4	INT4	2	0	100 ...	Auxiliary counter # 3	All 4
DIF	≥3	0xB4, 82, 03					All [7]
VIF	1	0x22					All
value	4	INT4	0	0	100 ...	Error hours [h]	All
DIF	≥3	0xB4, c2, 03					All [7]
VIF	1	0x22					All
value	4	INT4	1	0	100 ...	Alarm hours [h]	All
DIF	≥3	0x95, 82, 03					All [1] [7]
VIF	1	0x2b					All [1]
value	4	float	0	0	100 ...	Max. power [W]	All [1]
DIF	≥3	0x94, 82, 03					All [1] [7]
VIF	2	0xab, 39					All [1]
value	4	Date Type F	0	0	100 ...	Time of max. output	All [1]
DIF	≥3	0x95, 82, 03					All except C1 [2] [7]
VIF	1	0x3b					All except C1 [2]
value	4	float	0	0	100 ...	Max. Flow [l / h]	All except C1 [2]

Name	Num. bytes	Value	Unit	tariff	Storage	Explanation (examples)	Available in version
DIF	≥3	0x94, 82, 03					All except C1 [2) 7)]
VIF	2	0xBB, 39					All except C1 [2)]
value	4	Date Type F	0	0	100 ...	Time Max. Fl.	All except C1 [2)]
DIF	≥3	0x95, 82, 03					C1 [2) 7)]
VIF	1	0x53					C1 [2)]
value	4	float	0	0	100 ...	Max. mass flow [kg / h]	C1 [2)]
DIF	≥3	0x94, 82, 03					C1 [2) 7)]
VIF	1	0xD3, 39					C1 [2)]
value	4	Date Type F	0	0	100 ...	Time max. mass	C1 [2)]
DIF	≥3	0x95, 82, 03					C0, C1, C4, C7, C8, C9, CA, CB [7)]
VIF	1	0x5b					C0, C1, C4, C7, C8, C9, CA, CB
value	4	float	0	0	100 ...	Max. Temp. hot [° C]	C0, C1, C4, C7, C8, C9, CA, CB
DIF	≥3	0x94, 82, 03					C0, C1, C4, C7, C8, C9, CA, CB [7)]
VIF	2	0xDB, 39					C0, C1, C4, C7, C8, C9, CA, CB
value	4	Date Type F	0	0	100 ...	Time max. Temp. hot	C0, C1, C4, C7, C8, C9, CA, CB
DIF	≥3	0x95, 82, 03					C0, C1, C4, C7, C8, C9, CA, CB [7)]
VIF	1	0x5F					C0, C1, C4, C7, C8, C9, CA, CB
value	4	float	0	0	100 ...	Max. Temp. cold [° C]	C0, C1, C4, C7, C8, C9, CA, CB
DIF	≥3	0x94, 82, 03					C0, C1, C4, C7, C8, C9, CA, CB [7)]
VIF	2	0xDF, 39					C0, C1, C4, C7, C8, C9, CA, CB
value	4	Date Type F	0	0	100 ...	Time Max. Temp. cold	C0, C1, C4, C7, C8, C9, CA, CB
CS	1	CS					All
stop	1	0x16					All

Table 13: Logger telegram

Notes on the maximum values:
In each logger period, the CALEC ST III calculates the value for the maximum output. The throughput and flow and return temperatures are also recorded at the point at which this maximum output occurs. These four values are transferred as the max. output, the max. throughput, the max. flow temperature and the max. return temperature. 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.

3.2.4 Freeze-Telegram

The “Freeze” command (see chapter 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 this telegram.

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	0xb405				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 14: 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)	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	0xb405				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
DIF	1	0x04					C0, C1, C5, C7, C9, CA, CB
VIF	≥1	VIF1					C0, C1, C5, C7, C9, CA, CB
value	4	INT4	0	0	0	Energy counter reading	C0, C1, C5, C7, C9, CA, CB
DIF	1	0x05					C0, C1, C5, C7, C9, CA, CB
VIF	≥1	VIF1					C0, C1, C5, C7, C9, CA, CB
value	4	float	0	0	0	Residual energy meter reading	C0, C1, C5, C7, C9, CA, CB
DIF	1	0x04					C4, C8
VIF	≥2	VIF1, 0x3b					C4, C8
value	4	INT4	0	0	0	Energy counter reading pos.	C4, C8
DIF	1	0x05					C4, C8
VIF	≥2	VIF1, 0x3b					C4, C8
value	4	float	0	0	0	Rest energy counter pos.	C4, C8
DIF	1	0x04					C0, C5, C7, C9, CA, CB
VIF	≥1	VIF2					C0, C5, C7, C9, CA, CB
value	4	INT4	0	0	0	Volume counter	C0, C5, C7, C9, CA, CB
DIF	1	0x05					C0, C5, C7, C9, CA, CB
VIF	≥1	VIF2					C0, C5, C7, C9, CA, CB
value	4	float	0	0	0	Rest volume counter	C0, C5, C7, C9, CA, CB
DIF	1	0x04					C4, C8
VIF	≥2	VIF2, 0x3b					C4, C8
value	4	INT4	0	0	0	Volume counter pos.	C4, C8
DIF	1	0x05					C4, C8
VIF	≥2	VIF2, 0x3b					C4, C8

Name	No. bytes	Value	Unit	Tariff	Storage	Explanation (examples)	Available in version
value	4	float	0	0	0	Rest volume counter. pos.	C4, C8
DIF	1	0x04					C1
VIF	≥1	VIF2					C1
value	4	INT4	0	0	0	Mass counter reading	C1
DIF	1	0x05					C1
VIF	≥1	VIF2					C1
value	4	float	0	0	0	Rest Mass counter reading	C1
DIF	1	0x15					All [1)]
VIF	1	0x2b					All [1)]
value	4	float	0	0	0	Max. output [W]	All [1)]
DIF	1	0x15					All except C1 [2)]
VIF	1	0x3b					All except C1 [2)]
value	4	float	0	0	0	Max. Flow [l / h]	All except C1 [2)]
DIF	1	0x15					C1 [2)]
VIF	1	0x53					C1 [2)]
value	4	float	0	0	0	Max. Mass flow [kg / h]	C1 [2)]
DIF	1	0x15					C0, C1, C4, C7, C8, C9, CA, CB
VIF	1	0x5b					C0, C1, C4, C7, C8, C9, CA, CB
value	4	float	0	0	0	Max. Temp. hot [° C]	C0, C1, C4, C7, C8, C9, CA, CB
DIF	1	0x25					C0, C1, C4, C7, C8, C9, CA, CB
VIF	1	0x5F					C0, C1, C4, C7, C8, C9, CA, CB
value	4	float	0	0	0	Min. Temp. cold [° C]	C0, C1, C4, C7, C8, C9, CA, CB
DIF	1	0x15					C0, C1, C4, C7, C8, C9, CA, CB
VIF	1	0x63					C0, C1, C4, C7, C8, C9, CA, CB
value	4	float	0	0	0	Temperature differential [K]	C0, C1, C4, C7, C8, C9, CA, CB
DIF	1	0x45					C0, C1, C4, C7, C8, C9, CA, CB
VIF	2	0xFD, 3a					C0, C1, C4, C7, C8, C9, CA, CB
value	4	float	0	0	1	Arithm. mean value th	C0, C1, C4, C7, C8, C9, CA, CB
DIF	2	0x85, 01					C0, C1, C4, C7, C8, C9, CA, CB
VIF	2	0xFD, 3a					C0, C1, C4, C7, C8, C9, CA, CB
value	4	float	0	0	2	Arithm. mean value tc	C0, C1, C4, C7, C8, C9, CA, CB
DIF	2	0xC5, 01					C0, C1, C4, C7, C8, C9, CA, CB
VIF	2	0xFD, 3a					C0, C1, C4, C7, C8, C9,

Name	No. bytes	Value	Unit	Tariff	Storage	Explanation (examples)	Available in version
							CA, CB
value	4	float	0	0	3	Std. deviation Th	C0, C1, C4, C7, C8, C9, CA, CB
DIF	2	0x85, 02					C0, C1, C4, C7, C8, C9, CA, CB
VIF	2	0xFD, 3a					C0, C1, C4, C7, C8, C9, CA, CB
value	4	float	0	0	4	Std. deviation Tc	C0, C1, C4, C7, C8, C9, CA, CB
DIF	2	0xC5, 02					C0, C1, C4, C7, C8, C9, CA, CB
VIF	2	0xFD, 3a					C0, C1, C4, C7, C8, C9, CA, CB
value	4	float	0	0	5	Increase th	C0, C1, C4, C7, C8, C9, CA, CB
DIF	2	0x85, 03					C0, C1, C4, C7, C8, C9, CA, CB
VIF	2	0xFD, 3a					C0, C1, C4, C7, C8, C9, CA, CB
value	4	float	0	0	6	Increase tc	C0, C1, C4, C7, C8, C9, CA, CB
DIF	2	0xC5, 03					C0, C1, C4, C7, C8, C9, CA, CB
VIF	2	0xFD, 3a					C0, C1, C4, C7, C8, C9, CA, CB
value	4	float	0	0	7	Zero point th	C0, C1, C4, C7, C8, C9, CA, CB
DIF	2	0x85, 04					C0, C1, C4, C7, C8, C9, CA, CB
VIF	2	0xFD, 3a					C0, C1, C4, C7, C8, C9, CA, CB
value	4	float	0	0	8th	Zero point tc	C0, C1, C4, C7, C8, C9, CA, CB
DIF	1	0x74					All
VIF	1	0x6d					All
value	4	Date Type F	0	0	1	Time of E-counter overflow	All
DIF	2	0xB4, 01					All
VIF	1	0x6d					All
value	4	Date Type F	0	0	2	Time of counter reset	All
DIF	2	0xf4, 01					All
VIF	1	0x6d					All
value	4	Date Type F	0	0	3	Time of temp. alarm	All
DIF	2	0xB4, 02					All
VIF	1	0x6d					All
value	4	Date Type F	0	0	4	Time of calibration error	All
DIF	2	0xf4, 02					All
VIF	1	0x6d					All
value	4	Date Type F	0	0	5	Time of CRC error	All
DIF	1	0x02					All

Name	No. bytes	Value	Unit	Tariff	Storage	Explanation (examples)	Available in version
VIF	2	0xFD, 66					All
value		INT2				Calibration year	All
DIF	1	0x05					C0, C1, C4, C5, C6, C7, C8, C9
VIF	2	0x93, 28					C0, C1, C4, C5, C6, C7, C8, C9
value	4	float	0	0	0	Pulse value [l]	C0, C1, C4, C5, C6, C7, C8, C9
DIF	1	0x05					C2
VIF	≥2	VIF4					C2
value	4	float	0	0	0	Pulse value for auxiliary counter# 1	C2
DIF	2	0x85, 40					All
VIF	≥2	VIF4					All
value	4	float	1	0	0	Pulse value for auxiliary counter # 2	All
DIF	3	0x85, 80, 40					All 4
VIF	≥2	VIF4					All 4
value	4	float	2	0	0	Pulse value for auxiliary counter # 3	All 4
DIF	1	0x02					All
VIF	2	0xec, 39					All
value	2	Date Type G	0	0	0	Manufacturing date	All
DIF	2	0x8C, 40					All
VIF	1	78					All
value	4	BCD8	1	0	0	Hardware lot number	All
CS	1	CS					All
stop	1	0x16					All

Table 15: Service-Telegram

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 Parameterized baud rate

The CALEC ST III supports 300, 2400 and 9600 baud. It is parametrized to 2400 baud on delivery (default value). 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 16: 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. The factory setting for the primary address is 0.

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	(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 17: 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	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	1	0x0c	
VIF	1	0x79	
Value	4	BCD8	New secondary address

Name	No. of bytes	Value	Explanation
Checksum	1	CS	
Stop	1	0x16	

Table 18: 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 is an active standard 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 19: 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
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 1	0x88, 82, 03	0x7e
logger 2	0xc8, 82, 03	0x7e
...		
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 20: Parameter response telegram

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 21: 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	
VIF	1	0x22	
Value	4	int4	New value of the error hour counter
Checksum	1	CS	
Stop	1	0x16	

Table 22: 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

Name	No. of bytes	Value	Explanation
DIF	2	0xB4, 40	
VIF	1	0x22	
Value	4	int4	New value of the alarm hours counter
Checksum	1	CS	
Stop	1	0x16	

Table 23: 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, 7e	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 24: 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, 11	
	1	0x01-0x28	Number of bytes of the customer text field
Value	1 - 40		Customer text field (ASCII string)

Name	No. of bytes	Value	Explanation
Checksum	1	CS	
Stop	1	0x16	

Table 25: 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 26: 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 Parameterized 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, 28	
Value	4	float	Pulse value [l]
Checksum	1	CS	
Stop	1	0x16	

Table 27: 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 28: 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
Address-field	1	PADR	Primary address
CI-field	1	0x51	Parameterization
DIF, DIFE	2	0x85, 40	
VIF, VIFE	2	VIF4	
Value	4		Pulse value for auxiliary counter #2
Checksum	1	CS	
Stop	1	0x16	

Table 29: 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 Parametrize pulse value aux. counter #3

In all versions of the device which do not require input #3 as a control signal (direction/tariff), the pulses of input #3 on auxiliary counter #3 are cumulative. The impulse value for this input is parameterized using the following command:

Name	No. of bytes	Value	Explanation
Start	1	0x68	

Name	No. of bytes	Value	Explanation
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	3	0x85, 80, 40	
VIF, VIFE	2	VIF4	
Value	4		Pulse value for auxiliary counter #3
Checksum	1	CS	
Stop	1	0x16	

Table 30: Parametrize impulse value for auxiliary counter #3

- 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.

4.1.15 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, 09	
Value	1	0x04 / 0x0c	Installation side: 0x04 = return, 0x0c = supply (Medium byte according to EN 13757)
Checksum	1	CS	
Stop	1	0x16	

Table 31: 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 / 73	SND_UD

Name	No. of bytes	Value	Explanation
Address-field	1	PADR	Primary address
CI-field	1	0x50	Application reset
checksum	1	CS	
stop	1	0x16	

Table 32: 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 / 73	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 33: 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 / 73	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 43: 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.

Name	No. of bytes	Value	Statement
ACK	1	0xE5	

Table 34: 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. Where devices have been validated, this means destroying the validation seal.

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, 08
1	KWh	0x06	1	GJ	0xFB, 09
0.001	MWh	0x06	0.001	kBtu	0x80, 3d
0.01	MWh	0x07	0.01	kBtu	0x81, 3d
0.1	MWh	0xFB, 00	0.1	kBtu	0x82, 3d
1	MWh	0xFB, 01	1	kBtu	0x83, 3d
0.001	MJ	0x0b	0.001	Mbtu	0x83, 3d
0.01	MJ	0x0c	0.01	Mbtu	0x84, 3d
0.1	MJ	0x0d	0.1	Mbtu	0x85, 3d
1	MJ	0x0e	1	Mbtu	0x86, 3d

Table 35: 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
0.001	USGAL	0x90, 3d			
0.01	USGAL	0x91, 3d			
0.1	USGAL	0x92, 3d			
1	USGAL	0x93, 3d			

Table 36: Variable units for volume / mass counter readings VIF2

5.4 Units and resolution for auxiliary counter readings (VIF3)

The input medium can be selected:
This can be energy, volume, mass or no units.

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 37: 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 medium set. 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, 28
volume	l / pulse	0x93, 28
Dimensions	kg / pulse	0x9B, 28
no unit	HCA / Pulse	0xEE, 28

Table 38: 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 altered.

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