INTEGRA
METERING

CALEC® ST III

BACnet® MS/TP

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ASHRAE® BACnet™

1   General information

1.1   Content
This communication description includes only specific information about CALEC® ST III with the BACnet® MS/TP module. Further information is available in the technical documentation of CALEC® ST III.

REFERENCE!	You will find **further documentation** on our websites.
	International clients: https://integra-metering.com/product/calec-st-iii-standard-smart/
	German clients: https://aquametro.de/product/calec-st-iii-standard-smart/
	Swiss Clients (DE): https://aquametro.com/product/calec-st-iii-standard-smart/
	Swiss Clients (FR): https://aquametro.com/fr/product/calec-st-iii-standard-smart/

General information about BACnet® can be found at www.bacnet.org.

1.2   Definition
BACnet® is a globally accepted, open standard (ISO Standard 16484-5) in building automation. BACnet® assures the inter-operability between devices of different manufacturers. CALEC® ST III with BACnet® MS/TP interface allows an integration in BACnet® networks without using gate-ways. The physics of RS485 interface is used for transmission.

1.3   Registered trademark and brand names
BACnet®, as well as the **BACnet® logo** are registered trademarks of ASHRAE (American Society of Heating, Refrigerating and Air-Conditioning Engineers) in Atlanta, GA (USA).

1.4   Certification according to BACnet® standard
CALEC® ST III with the BACnet® MS/TP module is certified according to the following test stand-ards:

Test standards
ISO 16484-5:2014
ANSI/ASHRAE 135-2012
Addendum ai to ANSI/ASHRAE 135-2012
Addendum al to ANSI/ASHRAE 135-2012
Addendum ar to ANSI/ASHRAE 135-2012
Addendum as to ANSI/ASHRAE 135-2012
Addendum ay to ANSI/ASHRAE 135-2012
Addenda an, at, au, av, aw, ax, and az to ANSI/ASHRAE 135-2012
ANSI/ASHRAE 135.1-2013
Addendum o to ANSI/ASHRAE 135.1-2013
BTL Test Plan 14.0
BTL Specified Tests 14.0
BTL Checklist 14.0

2 Hardware

2.1 Communication interface

INTEGRA METERING AG uses a communication interface defined by BACnet® technology with twisted-pair wiring (2-core).

CALEC® ST III: Overview of supported functions			
Function	**Parameter**	**Value description**	**More information**
Manufacturer ID	431	-	This identification is valid for INTEGRA METERING AG and Aquametro AG
Data protocol	BACnet® MS/TP	-	-
BACnet device profile	B-ASC	-	-
MAC address	0...127 master and slave 0...254 slave	Factory setting: the last 2 digits of the device serial no. Master/slave setting: Changeable via CALEC® ST III operating menu. Factory setting: master	See: Chapter 3.4 Master/slave mode
Baud rate	9600, 19200, 38400, 57600, 76800, 115200	Automatic adjustment	See: Chapter 3.2 BACnet Baud rate
Device instance number	-	The last 5 digits of the device serial no.	See: Chapter 3.5 Device instance number (DIN)
BACnet connection type	-	RS-485	-

2.2 Line termination

A termination resistor must be connected to both ends of the segment. The technical BACnet® MS/TP specifications recommend a 120 Ohm resistor. If CALEC® ST III is at the end of a seg-ment, the internal termination resistor can be activated.

Operating menu: BACNET ⊕ ⊙ TRM ⊕

3 Commissioning

3.1 Commissioning of CALEC® ST III with the BACnet® MS/TP interface

After connecting the RS-485 cable with the terminals A11 (+) and B11 (-) Modul #1 or A21 (+) and B21 (-) Modul #2, the following steps need to be performed:

Step-by-step instructions		
Step	**Action**	**Description**
1	Configuration of CALEC® ST III for use of application	The respective information can be found in the operating instructions of CALEC® ST III.
2	Configuration of CALEC® ST III for BACnet® use	According to this description The relevant bus number for the configuration results from the assembly of the BACnet® interface in socket # 1 or socket # 2.

3.2 BACnet® Baud rate

The baud rate adjustment of CALEC® ST III will be set automatically after connecting the BTU meter to the network. Supported baud rates are 9600, 19200, 38400, 76800 and 115200. If the Baud rate is changed at the master system during operation, CALEC® ST III needs to be restart-ed.

3.3 BACnet® MAC address

The BACnet® MS/TP MAC address can be changed in the operating menu of CALEC® ST III. The applicable range of the BACnet® MS/TP MAC address lies between 0 and 254 (for master func-tionality between 0 and 127, for the slave functionality between 0 and 254). The differentiation between master and slave address range is defined via the operating menu in the menu MOD of CALEC® ST III.

Operating menu: BACNET ⬅ ⬇ ADR ⬅

3.4 Master/slave mode

By means of the BACnet® MS/TP mode selection the mode behaviour of CALEC® ST III can be selected as master or slave. After 30 seconds the change is active.

Operating menu: BACNET ⬅ ⬇ MOD ⬅

3.5 Device instance number (DIN)

The device instance number can be changed in the operating menu of CALEC® ST III. The last 5 digits of the serial number (CALEC® ST III) are the factory setting for the DIN.

Operating menu: BACNET ⬅ ⬇ DIN ⬅

3.6　Device object name
The parameter „object-name" can be overwritten (standard: "**CALEC ST III BACnet**")

3.7　Location
The parameter "location" can be overwritten (standard: "**No Location se**t")

3.8　Description
The parameter "description" can be overwritten (standard: "**CALEC BTU METER**")

4　CALEC® ST III BACnet® services and objects

4.1　Supported BACnet® services
CALEC® ST III is a BACnet Application Specific Controller (B-ASC) and supports the following services:

BACnet Interoperability Building Blocks (BIBB's)	
Data Sharing - ReadProperty - B	DS-RP-B
Data Sharing - ReadPropertyMultiple - B	DS-RPM-B
Data Sharing - WriteProperty - B	DS-WP-B
Data Sharing – WritePropertyMultiple - B	DS-WPM-B
Data Sharing - COV - B	DS-COV-B
Device Management - Dynamic Device Binding - B	DM-DDB-B
Device Management - Dynamic Object Binding - B	DM-DOB-B
Device Management - DeviceCommunicationControl - B	DM-DCC-B
Device Management - TimeSynchronization - B	DM-TS-B
Device Management - UTCTimeSynchronization - B	DM-UTC-B
Device Management - ReinitializeDevice - B	DM-RD-B

4.2 Supported BACnet® objects

CALEC® ST III with BACnet® MS/TP supports the following device objects and variants and their analog inputs. The analog inputs are made available according to the respective device variants.

Analog inputs									
Object no.	**Designation**	Volume	Mass	Flow	BDE	TGR	BDV	DTF
AI-0	Energy	X	X		X	X	X	X
AI-1	Energy-BDE				X	X	X	X
AI-2	Volume	X			X	X	X	X
AI-3	Volume-BDE				X		X	X
AI-4	Mass		X					
AI-5	Auxiliary counter 1			X				
AI-6	Auxiliary counter 2	X	X	X	X	X	X	X
AI-7	Auxiliary counter 3	X	X	X	X	X		
AI-8	Power	X	X		X	X	X	X
AI-9	Volume flow	X		X	X	X	X	X
AI-10	Mass flow		X					
AI-11	Temperature warm	X	X		X	X	X	X
AI-12	Temperature cold	X	X		X	X	X	X
AI-13	Temperature difference	X	X		X	X	X	X
AI-14	Density	X	X		X	X	X	X
AI-15	Energy-TGR					X		

Binary outputs									
Object no.	**Designation**	Volume	Mass	Flow	BDE	TGR	BDV	DTF
BO-0	Relay 1	X	X	X	X	X	X	X
BO-1	Relay 2	X	X	X	X	X	X	X

4.2.1 Supported BACnet® units of current values

CALEC® ST III with BACnet® MS/TP supports the following units for current values:

Energy and Energy-BDE/TGR units	
Unit	**BACnet Enum**
J	16
kJ	17
kJ/kg	125
MJ	126
Wh	18
kWh	19
MWh	146
BTU	20
kBTU	147
MBTU	148
thm	21
Th	22

Volume and Volume-BDE units	
Unit	**BACnet Enum**
cft	79
m^3	80
Imp.gal.	81
L	82
US.gal.	83

Mass units	
Unit	**BACnet Enum**
kg	39
lb	40
Tons	41

4.2.2 Supported BACnet® units of the auxiliary counters 1...3

The selectable units depend on the setting of the auxiliary counter in CALEC® ST III.

Energy-related	
Unit	**BACnet Enum**
J	16
kJ	17
kJ/kg	125
MJ	126
Wh	18
kWh	19
MWh	146
BTU	20
kBTU	147
MBTU	148
thm	21
Th	22

Volume-related	
Unit	**BACnet Enum**
cft	79
m^3	80
Imp.gal.	81
L	82
US.gal.	83

Mass-related	
Unit	**BACnet Enum**
kg	39
lb	40
Tons	41

Without unit	
Unit	**BACnet Enum**
Without unit	95

4.2.3 Supported BACnet® units instant values

CALEC® ST III with BACnet® MS/TP supports the following units for instant values:

Power units	
Unit	**BACnet Enum**
mW	132
W	47
kW	48
MW	49
BTU/h	50
kBTU/h	157
PS	51
RT	52

Volume flow units	
Unit	**BACnet Enum**
cft/s	142
cft/min	84
m^3/s	85
m^3/min	165
m^3/h	135
Imp.gal./min	86
l/s	87
l/min	88
l/h	136
US.gal./min	89

Mass flow units	
Unit	**BACnet Enum**
g/s	154
g/min	155
kg/s	42
kg/min	43
kg/h	44
lb/s	119
lb/min	45
lb/h	46
Tons/h	156

Temperature units	
Unit	**BACnet Enum**
°C	62
°K	63
°F	64

Temperature difference units	
Unit	**BACnet Enum**
°K	63

5 BACnet® connections, e.g. with water and oil meters

There are two auxiliary inputs available to measure pulses from other meters, such as water and oil meters with pulse signals and to directly communicate the result to the BACnet® MS/TP net-work.

6 Alarm

CALEC® ST III status messages are linked with the BACnet® objects. INTEGRA METERING AG differs between the following types of status messages:

Device status "error"
All important device errors such as "system error" need to be verified including their error codes.

Measurement value status "alarm":
Specific messages such as "dt alarm" have to be verified (further information can be found in the section "Error messages, alarms" in the operating instructions of CALEC® ST III).

7 PICS document

The PICS document of CALEC® ST III can be found on our websites.

REFERENCE!	You will find **further documentation** here:
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8 Troubleshooting

Communication errors			
No.	**Error / malfunction**	**Possible reason**	**Correction**
1	CALEC® ST III is not communicating in the BACnet® MS/TP network	Wiring of the network Terminating resistors Configuratin of CALEC® ST III Configuration of BMS	Check if the BACnet MS/TP® devices are correctly connected. Check, if the termination and bus topology are correct. Check, if the BACnet® MAC address and the device instance number are correctly configured and unique within the network
2	After changing the Baud rate on the master system, CALEC CALEC® ST III is not communicating via BACnet® MS/TP anymore	CALEC® ST III is unable to automatically recognise the set Baud rate	Restart CALEC® ST III by switching the power supply off and on again. CALEC® ST III runs through an initialisation process and takes over the new Baud rate. The adapted Baud rate is displayed in "Device Object" in the "Proprietary Property 10000"

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