SIEMENS

SICAM RTUs

IEC 60870-5-101/104

Interoperability
Certified (Conformance Tested)

DC0-131-2.02

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Preface

This document is applicable to the following product(s):

- SICAM RTUs

Purpose of this manual

This manual describes the interoperability of SICAM RTUs using protocol element according to IEC 60870-5-101/104 and essentially contains

- Interoperability IEC 60870-5-101/104 certified (conformance tested) by 3rd party accredited test laboratory.

Target Group

The document you are reading right now is addressed to users, who are in charge of the following tasks:

- Sales engineering and technical clarification
- Conceptual activities, as for example design and configuration

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1 Introduction

Contents

1.1 Area of Application

In this documentation, all definitions are described that are necessary for communication between automation units as per IEC 60870-5-101 and between automation units or automation units and control room process computer systems as per IEC 60870-5-104.

1.2 General Information

Syntax:

☐ Function or ASDU is not used

☒ Function or ASDU is used as standardized (default)

☒ Function or ASDU is used in reverse mode

☒ Function or ASDU is used in standard and reverse mode

☒ Function or ASDU is planned, please contact the product management

☒ Function or ASDU is used in a specific project

~~strike-through~~ the text descriptions of parameters which are not applicable to this companion standard

Definition:

Firmware/Revision	Device	Note
IEC60870-5-104 Ed.2 Controlled Station (standard direction)		
ET84 Rev. 02	SICAM CMIC	Protocol Implementation Conformance Statement (PICS) - Interoperability of SICAM CMIC according to IEC 60870-5-104 (ET84) as Controlled Station
ETA4 Rev. 02.01	SICAM AK SICAM TM SICAM BC	Protocol Implementation Conformance Statement (PICS) - Interoperability of SICAM AK, SICAM TM, SICAM BC according to IEC 60870-5-104 (ETA4) as Controlled Station
ETT0 Rev. 05	SICAM EMIC (TM1703 EMIC)	Protocol Implementation Conformance Statement (PICS) according Light PID – EDP Profile

2 Protocol Implementation Conformance Statement (PICS) - Interoperability of SICAM CMIC according to IEC 60870-5-104 (ET84) as Controlled Station

Contents

Interoperability of SICAM CMIC using IEC 60870-5-104 (ET84 firmware)

This companion standard presents sets of parameters and alternatives from which subsets must be selected to implement particular telecontrol systems. Certain parameter values, such as the choice of “structured“ or “unstructured“ fields of the INFORMATION OBJECT ADDRESS of ASDUs represent mutually exclusive alternatives. This means that only one value of the defined parameters is admitted per system. Other parameters, such as the listed set of different process information in command and in monitor direction allow the specification of the complete set or subsets, as appropriate for given applications. This clause summarizes the parameters of the previous clauses to facilitate a suitable selection for a specific application. If a system is composed of equipment, stemming from different manufacturers it is necessary that all partners agree on the selected parameters.

The interoperability list is defined as in IEC 60870-5-101 and extended with parameters used in this standard. The text descriptions of parameters which are not applicable to this companion standard are strike-through (corresponding check box is marked black).

Note:
In addition, the full specification of a system may require individual selection of certain parameters for certain parts of the system, such as the individual selection of scaling factors for individually addressable measured values.

The selected parameters should be marked in the white boxes as follows:

☐ Function or ASDU is not used

☒ Function or ASDU is used as standardized (default)

☐ Function or ASDU is used in reverse mode

☐ Function or ASDU is used in standard and reverse mode

☐ Function or ASDU is planned, please contact the product management

■ Function or ASDU is used in a specific project

The possible selection (blank, X, R, or B) is specified for each specific clause or parameter.

A black check box indicates that the option cannot be selected in this companion standard.

2.1 System or device function

(system-specific parameter, indicate the system's or station's function by marking one of the following with '**X**')

- [ ] System definition
- [ ] Controlling Station (Master)
- [X] Controlled Station (Slave)

2.2 Network configuration

(network-specific parameter, all configurations that are used are to be marked '**X**')

- [ ] ~~Point to point~~
- [ ] ~~Multiple point to point~~
- [ ] ~~Multipoint partyline~~
- [ ] ~~Multipoint star~~

2.3 Physical layer

(network-specific parameter, all interfaces and data rates that are used are to be marked '**X**')

Transmission speed (control direction)

Unbalanced interchange Circuit V.24/V.28 Standard	Unbalanced interchange Circuit V.24/V.28 Recommended if >1200 bit/s	Balanced interchange Circuit X.24/X.27	
~~100 bits/s~~	~~2400 bits/s~~	~~2400 bits/s~~	~~56000 bits/s~~
~~200 bits/s~~	~~4800 bits/s~~	~~4800 bits/s~~	~~64000 bits/s~~
~~300 bits/s~~	~~9600 bits/s~~	~~9600 bits/s~~	
~~600 bits/s~~	~~19200 bits/s~~	~~19200 bits/s~~	
~~1200 bits/s~~	~~38400 bits/s~~	~~38400 bits/s~~	

Transmission speed (monitor direction)

Unbalanced interchange Circuit V.24/V.28 Standard	Unbalanced interchange Circuit V.24/V.28 Recommended if >1200 bit/s	Balanced interchange Circuit X.24/X.27	
~~100 bits/s~~	~~2400 bits/s~~	~~2400 bits/s~~	~~56000 bits/s~~
~~200 bits/s~~	~~4800 bits/s~~	~~4800 bits/s~~	~~64000 bits/s~~
~~300 bits/s~~	~~9600 bits/s~~	~~9600 bits/s~~	
~~600 bits/s~~	~~19200 bits/s~~	~~19200 bits/s~~	
~~1200 bits/s~~	~~38400 bits/s~~	~~38400 bits/s~~	

2.4 Link layer

(network-specific parameter, all options that are used are to be marked '**X**'. Specify the maximum frame length. If a non-standard assignment of class 2 messages is implemented for unbalanced transmission, indicate the Type ID and COT of all messages assigned to class 2.)

~~Frame format FT 1.2, single character 1 and the fixed time out interval are used exclusively in this companion standard.~~

Link transmission procedure

- ~~Balanced transmission~~
- ~~Unbalanced transmission~~

Address filed of the link

- ~~not present (balanced transmission only)~~
- ~~1 Octet~~
- ~~2 Octets~~
- ~~structured~~
- ~~unstructured~~

Frame length

- ~~Maximum length L (number of octets, possible 9-255)~~

When using an unbalanced link layer, the following ASDU types are returned in class 2 messages (low priority) with the indicated causes of transmission:

~~The standard assignment of ASDUs to class 2 messages is used as follows:~~

Type identification	Cause of transmission
9, 11, 13	<1>

~~A special assignment of ASDUs to class 2 messages is used as follows:~~

Type identification	Cause of transmission

~~Note: In response to a class 2 poll, a controlled station may respond with class 1 data when there is no class 2 data available.~~

2.5 Application layer

Transmission mode for application data

Mode 1 (Least significant octet first), as defined in clause 4.10 of IEC 60870-5-4, is used exclusively in this companion standard.

Common address of ASDU
(system-specific parameter, all configurations that are used are to be marked „**X**“)

■ ~~1 Octet~~	[X] 2 Octets

Information object address
(system-specific parameter, all configurations that are used are to be marked „**X**“)

■ ~~1 Octet~~	[X] structured
■ ~~2 Octets~~	[X] unstructured
[X] 3 Octets	

Cause of transmission
(system-specific parameter, all configurations that are used are to be marked „**X**“)

■ ~~1 Octet~~	[X] 2 Octets (with originator address) Originator address is set to zero if not used.

Length of APDU
(system-specific parameter, specify the maximum length of the APDU per system)

The maximum length of the APDU is 253 (default). The maximum length may be reduced per system.

[253] Maximum length of APDU per system

Selection of standard ASDUs

Process information in monitor direction

(station-specific parameter, mark each Type ID „**X**“ if it is only used in the standard direction, „**R**“ if only used in the reverse direction, and „**B**“ if used in both directions)

X	<1>	:=	Single-point information	M_SP_NA_1	
■	<2>	:=	~~Single-point information with time tag~~	M_SP_TA_1	
X	<3>	:=	Double-point information	M_DP_NA_1	
■	<4>	:=	~~Double-point information with time tag~~	M_DP_TA_1	
X	<5>	:=	Step position information	M_ST_NA_1	
■	<6>	:=	~~Step position information with time tag~~	M_ST_TA_1	
X	<7>	:=	Bitstring of 32 bit	M_BO_NA_1	
■	<8>	:=	~~Bitstring of 32 bit with time tag~~	M_BO_TA_1	
X	<9>	:=	Measured value, normalized value	M_ME_NA_1	
■	<10>	:=	~~Measured value, normalized value with time tag~~	M_ME_TA_1	
X	<11>	:=	Measured value, scaled value	M_ME_NB_1	
■	<12>	:=	~~Measured value, scaled value with time tag~~	M_ME_TB_1	
X	<13>	:=	Measured value, short floating point value	M_ME_NC_1	
■	<14>	:=	~~Measured value, short floating point value with time tag~~	M_ME_TC_1	
X	<15>	:=	Integrated totals	M_IT_NA_1	
■	<16>	:=	~~Integrated totals with time tag~~	M_IT_TA_1	
■	<17>	:=	~~Event of protection equipment with time tag~~	M_EP_TA_1	
■	<18>	:=	~~Packed start events of protection equipment with time tag~~	M_EP_TB_1	
■	<19>	:=	~~Packed output circuit information of protection equipment with time tag~~	M_EP_TC_1	
	<20>	:=	Packed single-point information with status change detection	M_PS_NA_1	6)
	<21>	:=	Measured value, normalized value without quality descriptor	M_ME_ND_1	

X	<30>	:=	Single-point information with time tag CP56Time2a	M_SP_TB_1	
X	<31>	:=	Double-point information with time tag CP56Time2a	M_DP_TB_1	
X	<32>	:=	Step position information with time tag CP56Time2a	M_ST_TB_1	
X	<33>	:=	Bitstring of 32 bit with time tag CP56Time2a	M_BO_TB_1	
X	<34>	:=	Measured value, normalized value with time tag CP56Time2a	M_ME_TD_1	
X	<35>	:=	Measured value, scaled value with time tag CP56Time2a	M_ME_TE_1	
X	<36>	:=	Measured value, short floating point value with time tag CP56Time2a	M_ME_TF_1	
X	<37>	:=	Integrated totals with time tag CP56Time2a	M_IT_TB_1	
X	<38>	:=	Event of protection equipment with time tag CP56Time2a	M_EP_TD_1	
X	<39>	:=	Packed start events of protection equipment with time tag CP56Time2a	M_EP_TE_1	
X	<40>	:=	Packed output circuit information of protection equipment with time tag CP56Time2a	M_EP_TF_1	

Either the ASDUs of the set <2>, <4>, <6>, <8>, <10>, <12>, <14>, <16>, <17>, <18>, <19> or of the set <30> - <40> are used.

6) Reception possible, thereby the blocked single-point information is deblocked and further individually processed as TI = 30 (address translation occurs algorithmic).

Process information in control direction
(station-specific parameter, mark each Type ID „**X**“ if it is only used in the standard direction, „**R**“ if only used in the reverse direction, and „**B**“ if used in both directions)

X	<45>	:=	Single command	C_SC_NA_1
X	<46>	:=	Double command	C_DC_NA_1
X	<47>	:=	Regulating step command	C_RC_NA_1 **)
X	<48>	:=	Set point command, normalized value	C_SE_NA_1
X	<49>	:=	Set point command, scaled value	C_SE_NB_1
X	<50>	:=	Set point command, short floating point	C_SE_NC_1
	<51>	:=	Bitstring of 32 bit	C_BO_NA_1

X	<58>	:=	Single command with time tag CP56Time2a	C_SC_TA_1
X	<59>	:=	Double command with time tag CP56Time2a	C_DC_TA_1
X	<60>	:=	Regulating step command with time tag CP56Time2a	C_RC_TA_1 **)
X	<61>	:=	Set point command, normalized value with time tag CP56Time2a	C_SE_TA_1
X	<62>	:=	Set point command, scaled value with time tag CP56Time2a	C_SE_TB_1
X	<63>	:=	Set point command, short floating point with time tag CP56Time2a	C_SE_TC_1
	<64>	:=	Bitstring of 32 bit with time tag CP56Time2a	C_BO_TA_1

Either the ASDUs of the set <45> - <51> or of the set <58> - <64> are used.

**) For <TI:=47> regulating step command and for <TI:=60> regulating step command with time tag CP56Time2a persistent output is not supported.

System information in monitor direction
(station-specific parameter, mark „X“ if used)

X	<70>	:=	End of initialization	M_EI_NA_1

System information in control direction
(station-specific parameter, mark each Type ID „**X**“ if it is only used in the standard direction, „**R**“ if only used in the reverse direction, and „**B**“ if used in both directions)

X	<100>	:=	Interrogation command	C_IC_NA_1
X	<101>	:=	Counter interrogation command	C_CI_NA_1
	<102>	:=	Read command	C_RD_NA_1
**	<103>	:=	Clock synchronization command	C_CS_NA_1
■	<104>	:=	~~Test command~~	C_TS_NA_1
X	<105>	:=	Reset process command	C_RP_NA_1
■	<106>	:=	~~Delay acquisition command~~	C_CD_NA_1
X	<107>	:=	Test command with time tag CP56time2a	C_CD_NA_1

** … out of scope during conformance testing!
Clock synchronization is supported with NTP, SNTP
Note: Time synchronization with <TI:=103> is supported but new time will be activated at change of minute. (higher accuracy of time synchronization with NTP)

Parameter in control direction
(station-specific parameter, mark each Type ID „**X**“ if it is only used in the standard direction, „**R**“ if only used in the reverse direction, and „**B**“ if used in both directions)

X	<110>	:=	Parameter of measured value, normalized value	P_ME_NA_1
X	<111>	:=	Parameter of measured value, scaled value	P_ME_NB_1
X	<112>	:=	Parameter of measured value, short floating point value	P_ME_NC_1
4)	<113>	:=	Parameter activation	P_AC_NA_1

4) … Not used in IEC 60870-5-104 Edition 2. No use case.

File transfer
(station-specific parameter, mark each Type ID „**X**“ if it is only used in the standard direction, „**R**“ if only used in the reverse direction, and „**B**“ if used in both directions)

X	<120>	:=	File ready	F_FR_NA_1
X	<121>	:=	Section ready	F_SR_NA_1
X	<122>	:=	Call directory, select file, call file, call section	F_SC_NA_1
X	<123>	:=	Last section, last segment	F_LS_NA_1
X	<124>	:=	Ack file, ack section	F_AF_NA_1
X	<125>	:=	Segment	F_SG_NA_1
X	<126>	:=	Directory {blank or X, only available in monitor (standard) direction}	F_DR_TA_1

Type identifier and Cause of Transmission Assignments
(station-specific parameter)

Shaded boxes are not required.
Black boxes are not permitted in this companion standard
Blank = Function or ASDU is not used.
Mark Type Identification/Cause of transmission combinations:
'**X**' if only used in the standard direction
'**R**' if only used in the reverse direction
'**B**' if used in both directions

Type Identification		**Cause of transmission**																		
		1	2	3	4	5	6	7	8	9	10	11	12	13	20 to 36	37 to 41	44	45	46	47
<0>																				
<1>	M_SP_NA_1		X	X								X	X		X					
~~<2>~~	~~M_SP_TA_1~~																			
<3>	M_DP_NA_1		X	X								X	X		X					
~~<4>~~	~~M_DP_TA_1~~																			
<5>	M_ST_NA_1		X	X*								X*	X*		X*					
~~<6>~~	~~M_ST_TA_1~~																			
<7>	M_BO_NA_1		X	X*											X*					
~~<8>~~	~~M_BO_TA_1~~																			
<9>	M_ME_NA_1	X	X	X											X					
~~<10>~~	~~M_ME_TA_1~~																			
<11>	M_ME_NB_1	X	X	X											X					
~~<12>~~	~~M_ME_TB_1~~																			
<13>	M_ME_NC_1	X	X	X											X					
~~<14>~~	~~M_ME_TC_1~~																			
<15>	M_IT_NA_1			X												X				
~~<16>~~	~~M_IT_TA_1~~																			
~~<17>~~	~~M_EP_TA_1~~																			
~~<18>~~	~~M_EP_TB_1~~																			
~~<19>~~	~~M_EP_TC_1~~																			
<20>	M_PS_NA_1																			
<21>	M_ME_ND_1																			
<22-29>																				
<30>	M_SP_TB_1			X								X	X							
<31>	M_DP_TB_1			X								X	X							
<32>	M_ST_TB_1			X*								X*	X*							
<33>	M_BO_TB_1			X*																
<34>	M_ME_TD_1			X																
<35>	M_ME_TE_1			X																
<36>	M_ME_TF_1			X																
<37>	M_IT_TB_1			X												X				
<38>	M_EP_TD_1			X																
<39>	M_EP_TE_1			X																
<40>	M_EP_TF_1			X																
<41-44>																				
<45>	C_SC_NA_1						X	X	X	X	X						X	X	X	X
<46>	C_DC_NA_1						X	X	X	X	X						X	X	X	X
<47>	C_RC_NA_1						X	X	X	X	X						X	X	X	X
<48>	C_SE_NA_1						X	X	X	X	X						X	X	X	X
<49>	C_SE_NB_1						X	X	X	X	X						X	X	X	X

X* … can be generated by the PLC

Type Identification		Cause of transmission																		
		1	2	3	4	5	6	7	8	9	10	11	12	13	20 to 36	37 to 41	44	45	46	47
<50>	C_SE_NC_1						X	X	X	X	X						X	X	X	X
<51>	C_BO_NA_1																			
<52-57>																				
<58>	C_SC_TC_1						X	X	X	X	X						X	X	X	X
<59>	C_DC_TC_1						X	X	X	X	X						X	X	X	X
<60>	C_RC_TC_1						X	X	X	X	X						X	X	X	X
<61>	C_SE_TA_1						X	X	X	X	X						X	X	X	X
<62>	C_SE_TB_1						X	X	X	X	X						X	X	X	X
<63>	C_SE_TC_1						X	X	X	X	X						X	X	X	X
<64>	C_BO_TA_1																			
<65-69>																				
<70>	M_EI_NA_1*				X															
<71-99>																				
<100>	C_IC_NA_1						X	X			X						X	X	X	X
<101>	C_CI_NA_1						X	X			X						X	X	X	X
<102>	C_RD_NA_1																			
<103>	C_CS_NA_1																			
~~<104>~~	~~C_TS_NA_1~~																			
<105>	C_RP_NA_1						X	X									X	X	X	X
~~<106>~~	~~C_CD_NA_1~~																			
<107>	C_TS_TA_1						X	X									X	X	X	X
<108,109>																				
<110>	P_ME_NA_1						X	X							X		X			
<111>	P_ME_NB_1						X	X							X		X			
<112>	P_ME_NC_1						X	X							X		X			
<113>	P_AC_NA_1																			
<114-119>																				
<120>	F_FR_NA_1													X			X	1)	1)	1)
<121>	F_SR_NA_1													X			X	1)	1)	1)
<122>	F_SC_NA_1					X								X			X	1)	1)	1)
<123>	F_LS_NA_1													X			X	1)	1)	1)
<124>	F_AF_NA_1													X			X	1)	1)	1)
<125>	F_SG_NA_1													X			X	1)	1)	1)
<126>	F_DR_TA_1*			X		X														
<127>																				
<128,255>																				

* … Blank or X only
X* … can be generated by the PLC
1) … transparent transmission through SICAM CMIC

Semantics of cause of transmission:

<0>	:=	not used
<1>	:=	periodic, cyclic (optional)
<2>	:=	background scan (optional)
<3>	:=	spontaneous
<4>	:=	initialized
<5>	:=	request or requested
<6>	:=	activation
<7>	:=	activation confirmation
<8>	:=	deactivation
<9>	:=	deactivation confirmation
<10>	:=	activation termination
<11>	:=	return information caused by a remote command
<12>	:=	return information caused by a local command
<13>	:=	file transfer
<14..19>	:=	not used
<20>	:=	interrogated by station interrogation
<21..36>	:=	interrogated by interrogation of the group 1..16
<37>	:=	requested by general counter request
<38..41>	:=	requested by counter interrogation of the group 1..4
<42, 43>	:=	not used
<44>	:=	unknown type identification
<45>	:=	unknown cause of transmission
<46>	:=	unknown common address of ASDU
<47>	:=	unknown information object address
<48, 63>	:=	not used

2.6 Basic application functions

Station initialization
(station-specific parameter, mark „**X**“ if function is used)

[X] Remote initialization

Cyclic data transmission
(station-specific parameter, mark „**X**“ if function only used in standard direction, „**R**“ if only used in the reverse direction, and „**B**“ if used in both directions)

[X] Cyclic data transmission

Read procedure
(station-specific parameter, mark „**X**“ if function only used in standard direction, „**R**“ if only used in the reverse direction, and „**B**“ if used in both directions)

[ ] Read procedure

Spontaneous transmission
(station-specific parameter, mark „**X**“ if function only used in standard direction, „**R**“ if only used in the reverse direction, and „**B**“ if used in both directions)

[X] Spontaneous transmission

Note: No spontaneous transmission (blank field) is not supported

Double transmission of information objects with cause of transmission spontaneous
(station-specific parameter, mark each information type ‘**X**’ where both a Type ID without time and corresponding Type ID with time are issued in response to a single spontaneous change of a monitored object)

The following type identifications may be transmitted in succession caused by a single status change of an information object. The particular information object addresses for which double transmission is enabled are defined in a project-specific list.

[ ] Single-point information M_SP_NA_1, M_SP_TA_1, M_SP_TB_1 and M_PS_NA_1
[ ] Double-point information M_DP_NA_1, M_DP_TA_1 and M_DP_TB_1
[ ] Step position information M_ST_NA_1, M_ST_TA_1 and M_ST_TB_1
[ ] Bitstring of 32 bit M_BO_NA_1, M_BO_TA_1 and M_BO_TB_1 (if defined for a specific project)
[ ] Measured value, normalized value M_ME_NA_1, M_ME_TA_1, M_ME_ND_1 and M_ME_TD_1
[ ] Measured value, scaled value M_ME_NB_1, M_ME_TB_1 and M_ME_TE_1
[ ] Measured value, short floating point value M_ME_NC_1, M_ME_TC_1 and M_ME_TF_1

Station interrogation
(station-specific parameter, mark „**X**“ if function only used in standard direction, „**R**“ if only used in the reverse direction, and „**B**“ if used in both directions)

[X] global		
[X] group 1	[X] group 7	[X] group 13
[X] group 2	[X] group 8	[X] group 14
[X] group 3	[X] group 9	[X] group 15
[X] group 4	[X] group 10	[X] group 16
[X] group 5	[X] group 11	
[X] group 6	[X] group 12	

Information Object Addresses assigned to each group must be shown in a separate table.

Clock synchronization
(station-specific parameter, mark „**X**“ if function only used in standard direction, „**R**“ if only used in the reverse direction, and „**B**“ if used in both directions)

[**] Clock synchronization
optional, see clause 7.6

** ... supported but not recommended (bad accuracy)

[X] Day of week used
[ ] RES1, GEN (time tag substituted/ not substituted) used
[X] SU-bit (summertime) used

Command transmission
(object-specific parameter, mark „**X**“ if function only used in standard direction, „**R**“ if only used in the reverse direction, and „**B**“ if used in both directions)

[X] Direct command transmission
[X] Direct set point command transmission
[X] Select and execute command
[X] Select and execute set point command
[X] C_SE ACTTERM used

[X] No additional definition
[X] Short pulse duration (duration determined by a system parameter in the outstation)
[X] Long pulse duration (duration determined by a system parameter in the outstation)
[X] Persistent output **)

**) For <TI:=47> regulating step command and for <TI:=60> regulating step command with time tag CP56Time2a persistent output is not supported.

[X] Supervision of maximum delay in command direction of commands and set point commands
[0-65535s] Maximum allowable delay of commands and set point commands

Transmission of integrated totals
(station- or object-specific parameter, mark „**X**“ if function only used in standard direction, „**R**“ if only used in the reverse direction, and „**B**“ if used in both directions)

X	Mode A: Local freeze with spontaneous transmission
**	Mode B: Local freeze with counter interrogation
X	Mode C: Freeze and transmit by counter interrogation commands
	Mode D: Freeze by counter interrogation command, frozen values reported spontaneously

** … out of scope during conformance testing!

Note: Integrated totals (Mode B) are transmitted with sequence number incremented at each local freeze period.

X	Counter read
X	Counter freeze without reset
X	Counter freeze with reset
X	Counter reset

X	General request counter
X	Request counter group 1
X	Request counter group 2
X	Request counter group 3
X	Request counter group 4

Parameter loading
(object-specific parameter, mark „**X**“ if function only used in standard direction, „**R**“ if only used in the reverse direction, and „**B**“ if used in both directions)

X	Threshold value
X	Smoothing factor
X	Low limit for transmission of measured value
X	High limit for transmission of measured value

Parameter activation
(object-specific parameter, mark „**X**“ if function only used in standard direction, „**R**“ if only used in the reverse direction, and „**B**“ if used in both directions)

	act/deact of persistent cyclic or periodic transmission of the addressed object

Test procedure
(station-specific parameter, mark „**X**“ if function only used in standard direction, „**R**“ if only used in the reverse direction, and „**B**“ if used in both directions)

X	Test procedure

File transfer
(station-specific parameter, mark each used function „**X**“)

File transfer in monitor direction

X*	Transparent file
X*	Transmission of disturbance data of protection equipment
X	Transmission of sequences of events
X*	Transmission of sequences of recorded analog values

File transfer in control direction

	Transparent file

X* … Data can be transparently transported by the system but not generated or evaluated.
A maximum of 220 bytes user data can be transported.

Background scan
(station-specific parameter, mark „**X**“ if function only used in standard direction, „**R**“ if only used in the reverse direction, and „**B**“ if used in both directions)

X	Background scan

Note: used for data which are transmitted caused by a self-initiated general interrogation

Acquisition of transmission delay
(station-specific parameter, mark „**X**“ if function only used in standard direction, „**R**“ if only used in the reverse direction, and „**B**“ if used in both directions)

■	~~Acquisition of transmission delay~~

Definition of time outs

Parameter	Default Value	Remarks	Selected value
t0	30 s	Time-out of connection establishment	30 s
t1	15 s	Time-out of send or test APDUs	15 s
t2	10 s	Time-out for acknowledges in case of no data messages t2<t1	10 s
t3	20 s	Time-out for sending test frames in case of a long idle state t3>t1	20 s

Maximum range of values t0-t2: 1 to 255 s, accuracy 1 s
Maximum range of values t3 (ET84): 0 to 172800 s (48h), accuracy 1 s

Maximum numbers of outstanding I format frames k and latest acknowledge

Parameter	Default Value	Remarks	Selected value
k	12 APDUs	Maximum difference receive sequence number to send state variable	12
w	8 APDU´s	Latest acknowledge after receiving w I-format APDUs	8

Maximum range of value k (ET84): 1 to 128, accuracy 1 APDU
Maximum range of value w (ET84): 1 to 128 APDUs, accuracy 1 APDU

Recommendation: w should not exceed 2/3 of k

Portnumber

Parameter	Value	Remarks	
Portnumber	2404	In all cases	

Redundant Connections

[4] Number N connections used in redundancy group

RFC 2200 suite

RFC 2200 is an official Internet Standard which describes the state of standardization of protocols used in the Internet as determined by the Internet Architecture Board (IAB). It offers a broad spectrum of actual standards used in the Internet. The suitable selection of documents from RFC 2200 defined in this standard for given projects has to be chosen by the user of this standard.

[X] Ethernet 802.3
[ ] Serial X.21 interface
[ ] Other selection from RFC 2200

List of valid documents from RFC 2200

1. ……
2. ……
3. ……
4. ……
5. ……
6. ……
7. etc.

3 Protocol Implementation Conformance Statement (PICS) - Interoperability of SICAM AK, SICAM TM according to IEC 60870-5-104 (ETA4) as Controlled Station

Contents

Interoperability of SICAM TM and SICAM AK using IEC 60870-5-104 (ETA4 firmware)

This companion standard presents sets of parameters and alternatives from which subsets must be selected to implement particular telecontrol systems. Certain parameter values, such as the choice of “structured“ or “unstructured“ fields of the INFORMATION OBJECT ADDRESS of ASDUs represent mutually exclusive alternatives. This means that only one value of the defined parameters is admitted per system. Other parameters, such as the listed set of different process information in command and in monitor direction allow the specification of the complete set or subsets, as appropriate for given applications. This clause summarizes the parameters of the previous clauses to facilitate a suitable selection for a specific application. If a system is composed of equipment, stemming from different manufacturers it is necessary that all partners agree on the selected parameters.

The interoperability list is defined as in IEC 60870-5-101 and extended with parameters used in this standard. The text descriptions of parameters which are not applicable to this companion standard are strike-through (corresponding check box is marked black).

Note:
In addition, the full specification of a system may require individual selection of certain parameters for certain parts of the system, such as the individual selection of scaling factors for individually addressable measured values.

The selected parameters should be marked in the white boxes as follows:

☐ Function or ASDU is not used

☒ Function or ASDU is used as standardized (default)

☐ Function or ASDU is used in reverse mode

☐ Function or ASDU is used in standard and reverse mode

☐ Function or ASDU is planned, please contact the product management

■ Function or ASDU is used in a specific project

The possible selection (blank, X, R, or B) is specified for each specific clause or parameter.

A black check box indicates that the option cannot be selected in this companion standard.

3.1 System or device function

(system-specific parameter, indicate the system's or station's function by marking one of the following with '**X**')

- [ ] System definition
- [ ] Controlling Station (Master)
- [X] Controlled Station (Slave)

3.2 Network configuration

(network-specific parameter, all configurations that are used are to be marked '**X**')

- [ ] ~~Point to point~~
- [ ] ~~Multiple point to point~~
- [ ] ~~Multipoint partyline~~
- [ ] ~~Multipoint star~~

3.3 Physical layer

(network-specific parameter, all interfaces and data rates that are used are to be marked '**X**')

Transmission speed (control direction)

Unbalanced interchange Circuit V.24/V.28 Standard	Unbalanced interchange Circuit V.24/V.28 Recommended if >1200 bit/s	Balanced interchange Circuit X.24/X.27	
~~100 bits/s~~	~~2400 bits/s~~	~~2400 bits/s~~	~~56000 bits/s~~
~~200 bits/s~~	~~4800 bits/s~~	~~4800 bits/s~~	~~64000 bits/s~~
~~300 bits/s~~	~~9600 bits/s~~	~~9600 bits/s~~	
~~600 bits/s~~	~~19200 bits/s~~	~~19200 bits/s~~	
~~1200 bits/s~~	~~38400 bits/s~~	~~38400 bits/s~~	

Transmission speed (monitor direction)

Unbalanced interchange Circuit V.24/V.28 Standard	Unbalanced interchange Circuit V.24/V.28 Recommended if >1200 bit/s	Balanced interchange Circuit X.24/X.27	
~~100 bits/s~~	~~2400 bits/s~~	~~2400 bits/s~~	~~56000 bits/s~~
~~200 bits/s~~	~~4800 bits/s~~	~~4800 bits/s~~	~~64000 bits/s~~
~~300 bits/s~~	~~9600 bits/s~~	~~9600 bits/s~~	
~~600 bits/s~~	~~19200 bits/s~~	~~19200 bits/s~~	
~~1200 bits/s~~	~~38400 bits/s~~	~~38400 bits/s~~	

3.4 Link layer

(network-specific parameter, all options that are used are to be marked '**X**'. Specify the maximum frame length. If a non-standard assignment of class 2 messages is implemented for unbalanced transmission, indicate the Type ID and COT of all messages assigned to class 2.)

~~Frame format FT 1.2, single character 1 and the fixed time out interval are used exclusively in this companion standard.~~

Link transmission procedure

- ~~Balanced transmission~~
- ~~Unbalanced transmission~~

Address filed of the link

- ~~not present (balanced transmission only)~~
- ~~1 Octet~~
- ~~2 Octets~~
- ~~structured~~
- ~~unstructured~~

Frame length

- ~~Maximum length L (number of octets, possible 9-255)~~

When using an unbalanced link layer, the following ASDU types are returned in class 2 messages (low priority) with the indicated causes of transmission:

~~The standard assignment of ASDUs to class 2 messages is used as follows:~~

Type identification	Cause of transmission
9, 11, 13	<1>

~~A special assignment of ASDUs to class 2 messages is used as follows:~~

Type identification	Cause of transmission

~~Note: In response to a class 2 poll, a controlled station may respond with class 1 data when there is no class 2 data available.~~

3.5 Application layer

Transmission mode for application data

Mode 1 (Least significant octet first), as defined in clause 4.10 of IEC 60870-5-4, is used exclusively in this companion standard.

Common address of ASDU
(system-specific parameter, all configurations that are used are to be marked „**X**“)

■ ~~1 Octet~~ | [X] 2 Octets

Information object address
(system-specific parameter, all configurations that are used are to be marked „**X**“)

■ ~~1 Octet~~ | [X] structured
■ ~~2 Octets~~ | [X] unstructured
[X] 3 Octets

Cause of transmission
(system-specific parameter, all configurations that are used are to be marked „**X**“)

■ ~~1 Octet~~ | [X] 2 Octets (with originator address)
Originator address is set to zero if not used.

Length of APDU
(system-specific parameter, specify the maximum length of the APDU per system)

The maximum length of the APDU is 253 (default). The maximum length may be reduced per system.

[253] Maximum length of APDU per system

Selection of standard ASDUs

Process information in monitor direction

(station-specific parameter, mark each Type ID „**X**“ if it is only used in the standard direction, „**R**“ if only used in the reverse direction, and „**B**“ if used in both directions)

B	<1>	:=	Single-point information	M_SP_NA_1	
■	<2>	:=	~~Single-point information with time tag~~	M_SP_TA_1	
B	<3>	:=	Double-point information	M_DP_NA_1	
■	<4>	:=	~~Double-point information with time tag~~	M_DP_TA_1	
B	<5>	:=	Step position information	M_ST_NA_1	
■	<6>	:=	~~Step position information with time tag~~	M_ST_TA_1	
B	<7>	:=	Bitstring of 32 bit	M_BO_NA_1	
■	<8>	:=	~~Bitstring of 32 bit with time tag~~	M_BO_TA_1	
B	<9>	:=	Measured value, normalized value	M_ME_NA_1	
■	<10>	:=	~~Measured value, normalized value with time tag~~	M_ME_TA_1	
B	<11>	:=	Measured value, scaled value	M_ME_NB_1	
■	<12>	:=	~~Measured value, scaled value with time tag~~	M_ME_TB_1	
B	<13>	:=	Measured value, short floating point value	M_ME_NC_1	
■	<14>	:=	~~Measured value, short floating point value with time tag~~	M_ME_TC_1	
B	<15>	:=	Integrated totals	M_IT_NA_1	
■	<16>	:=	~~Integrated totals with time tag~~	M_IT_TA_1	
■	<17>	:=	~~Event of protection equipment with time tag~~	M_EP_TA_1	
■	<18>	:=	~~Packed start events of protection equipment with time tag~~	M_EP_TB_1	
■	<19>	:=	~~Packed output circuit information of protection equipment with time tag~~	M_EP_TC_1	
	<20>	:=	Packed single-point information with status change detection	M_PS_NA_1	6)
	<21>	:=	Measured value, normalized value without quality descriptor	M_ME_ND_1	

B	<30>	:=	Single-point information with time tag CP56Time2a	M_SP_TB_1	
B	<31>	:=	Double-point information with time tag CP56Time2a	M_DP_TB_1	
B	<32>	:=	Step position information with time tag CP56Time2a	M_ST_TB_1	
B	<33>	:=	Bitstring of 32 bit with time tag CP56Time2a	M_BO_TB_1	
B	<34>	:=	Measured value, normalized value with time tag CP56Time2a	M_ME_TD_1	
B	<35>	:=	Measured value, scaled value with time tag CP56Time2a	M_ME_TE_1	
B	<36>	:=	Measured value, short floating point value with time tag CP56Time2a	M_ME_TF_1	
B	<37>	:=	Integrated totals with time tag CP56Time2a	M_IT_TB_1	
B	<38>	:=	Event of protection equipment with time tag CP56Time2a	M_EP_TD_1	
B	<39>	:=	Packed start events of protection equipment with time tag CP56Time2a	M_EP_TE_1	
B	<40>	:=	Packed output circuit information of protection equipment with time tag CP56Time2a	M_EP_TF_1	

Either the ASDUs of the set <2>, <4>, <6>, <8>, <10>, <12>, <14>, <16>, <17>, <18>, <19> or of the set <30> - <40> are used.

6) Reception possible, thereby the blocked single-point information is deblocked and further individually processed as TI = 30 (address translation occurs algorithmic).

Process information in control direction
(station-specific parameter, mark each Type ID „**X**“ if it is only used in the standard direction, „**R**“ if only used in the reverse direction, and „**B**“ if used in both directions)

B	<45>	:=	Single command	C_SC_NA_1
B	<46>	:=	Double command	C_DC_NA_1
B	<47>	:=	Regulating step command	C_RC_NA_1 **)
B	<48>	:=	Set point command, normalized value	C_SE_NA_1
B	<49>	:=	Set point command, scaled value	C_SE_NB_1
B	<50>	:=	Set point command, short floating point	C_SE_NC_1
	<51>	:=	Bitstring of 32 bit	C_BO_NA_1

B	<58>	:=	Single command with time tag CP56Time2a	C_SC_TA_1
B	<59>	:=	Double command with time tag CP56Time2a	C_DC_TA_1
B	<60>	:=	Regulating step command with time tag CP56Time2a	C_RC_TA_1 **)
B	<61>	:=	Set point command, normalized value with time tag CP56Time2a	C_SE_TA_1
B	<62>	:=	Set point command, scaled value with time tag CP56Time2a	C_SE_TB_1
B	<63>	:=	Set point command, short floating point with time tag CP56Time2a	C_SE_TC_1
	<64>	:=	Bitstring of 32 bit with time tag CP56Time2a	C_BO_TA_1

Either the ASDUs of the set <45> - <51> or of the set <58> - <64> are used.

**) For <TI:=47> regulating step command and for <TI:=60> regulating step command with time tag CP56Time2a persistent output is not supported.

System information in monitor direction
(station-specific parameter, mark „X“ if used)

B	<70>	:=	End of initialization	M_EI_NA_1

System information in control direction
(station-specific parameter, mark each Type ID „**X**“ if it is only used in the standard direction, „**R**“ if only used in the reverse direction, and „**B**“ if used in both directions)

B	<100>	:=	Interrogation command	C_IC_NA_1
X	<101>	:=	Counter interrogation command	C_CI_NA_1
	<102>	:=	Read command	C_RD_NA_1
**	<103>	:=	Clock synchronization command	C_CS_NA_1
	<104>	:=	~~Test command~~	C_TS_NA_1
X	<105>	:=	Reset process command	C_RP_NA_1
	<106>	:=	~~Delay acquisition command~~	C_CD_NA_1
B	<107>	:=	Test command with time tag CP56time2a	C_CD_NA_1

** … out of scope during conformance testing!
Clock synchronization is supported with NTP, SNTP
Note: Time synchronization with <TI:=103> is supported but new time will be activated at change of minute. (higher accuracy of time synchronization with NTP)

Parameter in control direction
(station-specific parameter, mark each Type ID „**X**“ if it is only used in the standard direction, „**R**“ if only used in the reverse direction, and „**B**“ if used in both directions)

X	<110>	:=	Parameter of measured value, normalized value	P_ME_NA_1
X	<111>	:=	Parameter of measured value, scaled value	P_ME_NB_1
X	<112>	:=	Parameter of measured value, short floating point value	P_ME_NC_1
4)	<113>	:=	Parameter activation	P_AC_NA_1

4) … Not used in IEC 60870-5-104 Edition 2. No use case.

File transfer
(station-specific parameter, mark each Type ID „**X**“ if it is only used in the standard direction, „**R**“ if only used in the reverse direction, and „**B**“ if used in both directions)

X	<120>	:=	File ready	F_FR_NA_1
X	<121>	:=	Section ready	F_SR_NA_1
X	<122>	:=	Call directory, select file, call file, call section	F_SC_NA_1
X	<123>	:=	Last section, last segment	F_LS_NA_1
X	<124>	:=	Ack file, ack section	F_AF_NA_1
X	<125>	:=	Segment	F_SG_NA_1
X	<126>	:=	Directory {blank or X, only available in monitor (standard) direction}	F_DR_TA_1

Type identifier and Cause of Transmission Assignments
(station-specific parameter)

Shaded boxes are not required.
Black boxes are not permitted in this companion standard
Blank = Function or ASDU is not used.
Mark Type Identification/Cause of transmission combinations:
'**X**' if only used in the standard direction
'**R**' if only used in the reverse direction
'**B**' if used in both directions

Type Identification		**Cause of transmission**																		
		1	2	3	4	5	6	7	8	9	10	11	12	13	20 to 36	37 to 41	44	45	46	47
<0>																				
<1>	M_SP_NA_1		X	B								B	B		B					
~~<2>~~	~~M_SP_TA_1~~																			
<3>	M_DP_NA_1		X	B								B	B		B					
~~<4>~~	~~M_DP_TA_1~~																			
<5>	M_ST_NA_1		X	B*								B*	B*		B*					
~~<6>~~	~~M_ST_TA_1~~																			
<7>	M_BO_NA_1		X	B*											B*					
~~<8>~~	~~M_BO_TA_1~~																			
<9>	M_ME_NA_1	B	X	B											B					
~~<10>~~	~~M_ME_TA_1~~																			
<11>	M_ME_NB_1	B	X	B											B					
~~<12>~~	~~M_ME_TB_1~~																			
<13>	M_ME_NC_1	B	X	B											B					
~~<14>~~	~~M_ME_TC_1~~																			
<15>	M_IT_NA_1			B												X				
~~<16>~~	~~M_IT_TA_1~~																			
~~<17>~~	~~M_EP_TA_1~~																			
~~<18>~~	~~M_EP_TB_1~~																			
~~<19>~~	~~M_EP_TC_1~~																			
<20>	M_PS_NA_1																			
<21>	M_ME_ND_1																			
<22-29>																				
<30>	M_SP_TB_1			B								B	B							
<31>	M_DP_TB_1			B								B	B							
<32>	M_ST_TB_1			B*								B*	B*							
<33>	M_BO_TB_1			B*																
<34>	M_ME_TD_1			B																
<35>	M_ME_TE_1			B																
<36>	M_ME_TF_1			B																
<37>	M_IT_TB_1			B												X				
<38>	M_EP_TD_1			B																
<39>	M_EP_TE_1			B																
<40>	M_EP_TF_1			B																
<41-44>																				
<45>	C_SC_NA_1						B	B	B	B	B						B	B	B	B
<46>	C_DC_NA_1						B	B	B	B	B						B	B	B	B
<47>	C_RC_NA_1						B	B	B	B	B						B	B	B	B
<48>	C_SE_NA_1						B	B	B	B	B						B	B	B	B
<49>	C_SE_NB_1						B	B	B	B	B						B	B	B	B

X* … can be generated by the PLC

Type Identification		Cause of transmission																		
		1	2	3	4	5	6	7	8	9	10	11	12	13	20 to 36	37 to 41	44	45	46	47
<50>	C_SE_NC_1						B	B	B	B	B						B	B	B	B
<51>	C_BO_NA_1																			
<52-57>																				
<58>	C_SC_TC_1						B	B	B	B	B						B	B	B	B
<59>	C_DC_TC_1						B	B	B	B	B						B	B	B	B
<60>	C_RC_TC_1						B	B	B	B	B						B	B	B	B
<61>	C_SE_TA_1						B	B	B	B	B						B	B	B	B
<62>	C_SE_TB_1						B	B	B	B	B						B	B	B	B
<63>	C_SE_TC_1						B	B	B	B	B						B	B	B	B
<64>	C_BO_TA_1																			
<65-69>																				
<70>	M_EI_NA_1*				B															
<71-99>																				
<100>	C_IC_NA_1						B	B			B						B	B	B	B
<101>	C_CI_NA_1						X	X			X						X	X	X	X
<102>	C_RD_NA_1																			
<103>	C_CS_NA_1																			
~~<104>~~	~~C_TS_NA_1~~																			
<105>	C_RP_NA_1						X	X									X	X	X	X
~~<106>~~	~~C_CD_NA_1~~																			
<107>	C_TS_TA_1						B	B									B	B	B	B
<108,109>																				
<110>	P_ME_NA_1						X	X							X		X			
<111>	P_ME_NB_1						X	X							X		X			
<112>	P_ME_NC_1						X	X							X		X			
<113>	P_AC_NA_1																			
<114-119>																				
<120>	F_FR_NA_1													X			X	1)	1)	1)
<121>	F_SR_NA_1													X			X	1)	1)	1)
<122>	F_SC_NA_1					X								X			X	1)	1)	1)
<123>	F_LS_NA_1													X			X	1)	1)	1)
<124>	F_AF_NA_1													X			X	1)	1)	1)
<125>	F_SG_NA_1													X			X	1)	1)	1)
<126>	F_DR_TA_1*			X		X														
<127>																				
<128,255>																				

* … Blank or X only
X* … can be generated by the PLC
1) … transparent transmission through SICAM CMIC

Semantics of cause of transmission:

<0>	:=	not used
<1>	:=	periodic, cyclic (optional)
<2>	:=	background scan (optional)
<3>	:=	spontaneous
<4>	:=	initialized
<5>	:=	request or requested
<6>	:=	activation
<7>	:=	activation confirmation
<8>	:=	deactivation
<9>	:=	deactivation confirmation
<10>	:=	activation termination
<11>	:=	return information caused by a remote command
<12>	:=	return information caused by a local command
<13>	:=	file transfer
<14..19>	:=	not used
<20>	:=	interrogated by station interrogation
<21..36>	:=	interrogated by interrogation of the group 1..16
<37>	:=	requested by general counter request
<38..41>	:=	requested by counter interrogation of the group 1..4
<42, 43>	:=	not used
<44>	:=	unknown type identification
<45>	:=	unknown cause of transmission
<46>	:=	unknown common address of ASDU
<47>	:=	unknown information object address
<48, 63>	:=	not used

3.6 Basic application functions

Station initialization
(station-specific parameter, mark „**X**“ if function is used)

[X] Remote initialization

Cyclic data transmission
(station-specific parameter, mark „**X**“ if function only used in standard direction, „**R**“ if only used in the reverse direction, and „**B**“ if used in both directions)

[B] Cyclic data transmission

Read procedure
(station-specific parameter, mark „**X**“ if function only used in standard direction, „**R**“ if only used in the reverse direction, and „**B**“ if used in both directions)

[ ] Read procedure

Spontaneous transmission
(station-specific parameter, mark „**X**“ if function only used in standard direction, „**R**“ if only used in the reverse direction, and „**B**“ if used in both directions)

[B] Spontaneous transmission

Note: No spontaneous transmission (blank field) is not supported

Double transmission of information objects with cause of transmission spontaneous
(station-specific parameter, mark each information type ‘**X**’ where both a Type ID without time and corresponding Type ID with time are issued in response to a single spontaneous change of a monitored object)

The following type identifications may be transmitted in succession caused by a single status change of an information object. The particular information object addresses for which double transmission is enabled are defined in a project-specific list.

[ ] Single-point information M_SP_NA_1, M_SP_TA_1, M_SP_TB_1 and M_PS_NA_1
[ ] Double-point information M_DP_NA_1, M_DP_TA_1 and M_DP_TB_1
[ ] Step position information M_ST_NA_1, M_ST_TA_1 and M_ST_TB_1
[ ] Bitstring of 32 bit M_BO_NA_1, M_BO_TA_1 and M_BO_TB_1 (if defined for a specific project)
[ ] Measured value, normalized value M_ME_NA_1, M_ME_TA_1, M_ME_ND_1 and M_ME_TD_1
[ ] Measured value, scaled value M_ME_NB_1, M_ME_TB_1 and M_ME_TE_1
[ ] Measured value, short floating point value M_ME_NC_1, M_ME_TC_1 and M_ME_TF_1

Station interrogation
(station-specific parameter, mark „**X**“ if function only used in standard direction, „**R**“ if only used in the reverse direction, and „**B**“ if used in both directions)

B	global				
B	group 1	B	group 7	B	group 13
B	group 2	B	group 8	B	group 14
B	group 3	B	group 9	B	group 15
B	group 4	B	group 10	B	group 16
B	group 5	B	group 11		
B	group 6	B	group 12		

Information Object Addresses assigned to each group must be shown in a separate table.

Clock synchronization
(station-specific parameter, mark „**X**“ if function only used in standard direction, „**R**“ if only used in the reverse direction, and „**B**“ if used in both directions)

**	Clock synchronization

optional, see clause 7.6

** ... supported but not recommended (bad accuracy)

B	Day of week used
	RES1, GEN (time tag substituted/ not substituted) used
B	SU-bit (summertime) used

Command transmission
(object-specific parameter, mark „**X**“ if function only used in standard direction, „**R**“ if only used in the reverse direction, and „**B**“ if used in both directions)

B	Direct command transmission
B	Direct set point command transmission
B	Select and execute command
B	Select and execute set point command
B	C_SE ACTTERM used

B	No additional definition
B	Short pulse duration (duration determined by a system parameter in the outstation)
B	Long pulse duration (duration determined by a system parameter in the outstation)
B	Persistent output **)

**) For <TI:=47> regulating step command and for <TI:=60> regulating step command with time tag CP56Time2a persistent output is not supported.

X	Supervision of maximum delay in command direction of commands and set point commands
0-65535s	Maximum allowable delay of commands and set point commands

Transmission of integrated totals
(station- or object-specific parameter, mark „**X**“ if function only used in standard direction, „**R**“ if only used in the reverse direction, and „**B**“ if used in both directions)

[X] Mode A: Local freeze with spontaneous transmission
[**] Mode B: Local freeze with counter interrogation
[X] Mode C: Freeze and transmit by counter interrogation commands
[ ] Mode D: Freeze by counter interrogation command, frozen values reported spontaneously

** … out of scope during conformance testing!
Note: Integrated totals (Mode B) are transmitted with sequence number incremented at each local freeze period.

[X] Counter read
[X] Counter freeze without reset
[X] Counter freeze with reset
[X] Counter reset

[X] General request counter
[X] Request counter group 1
[X] Request counter group 2
[X] Request counter group 3
[X] Request counter group 4

Parameter loading
(object-specific parameter, mark „**X**“ if function only used in standard direction, „**R**“ if only used in the reverse direction, and „**B**“ if used in both directions)

[X] Threshold value
[X] Smoothing factor
[X] Low limit for transmission of measured value
[X] High limit for transmission of measured value

Parameter activation
(object-specific parameter, mark „**X**“ if function only used in standard direction, „**R**“ if only used in the reverse direction, and „**B**“ if used in both directions)

	act/deact of persistent cyclic or periodic transmission of the addressed object

Test procedure
(station-specific parameter, mark „**X**“ if function only used in standard direction, „**R**“ if only used in the reverse direction, and „**B**“ if used in both directions)

B	Test procedure

File transfer
(station-specific parameter, mark each used function „**X**“)

File transfer in monitor direction

X*	Transparent file
X*	Transmission of disturbance data of protection equipment
X	Transmission of sequences of events
X*	Transmission of sequences of recorded analog values

File transfer in control direction

	Transparent file

X* … Data can be transparently transported by the system but not generated or evaluated.
A maximum of 220 bytes user data can be transported.

Background scan
(station-specific parameter, mark „**X**“ if function only used in standard direction, „**R**“ if only used in the reverse direction, and „**B**“ if used in both directions)

X	Background scan

Note: used for data which are transmitted caused by a self-initiated general interrogation

Acquisition of transmission delay
(station-specific parameter, mark „**X**“ if function only used in standard direction, „**R**“ if only used in the reverse direction, and „**B**“ if used in both directions)

■	~~Acquisition of transmission delay~~

Definition of time outs

Parameter	Default Value	Remarks	Selected value
t0	30 s	Time-out of connection establishment	30 s
t1	15 s	Time-out of send or test APDUs	15 s
t2	10 s	Time-out for acknowledges in case of no data messages t2<t1	10 s
t3	20 s	Time-out for sending test frames in case of a long idle state t3>t1	20 s

Maximum range of values t0-t2: 1 to 255 s, accuracy 1 s
Maximum range of values t3 (ET84): 0 to 172800 s (48h), accuracy 1 s

Maximum numbers of outstanding I format frames k and latest acknowledge

Parameter	Default Value	Remarks	Selected value
k	12 APDUs	Maximum difference receive sequence number to send state variable	12
w	8 APDU´s	Latest acknowledge after receiving w I-format APDUs	8

Maximum range of value k (ETA4): 1 to 128, accuracy 1 APDU
Maximum range of value w (ETA4): 1 to 128 APDUs, accuracy 1 APDU

Recommendation: w should not exceed 2/3 of k

Portnumber

Parameter	Value	Remarks	
Portnumber	2404	In all cases	

Redundant Connections

[4] Number N connections used in redundancy group

RFC 2200 suite

RFC 2200 is an official Internet Standard which describes the state of standardization of protocols used in the Internet as determined by the Internet Architecture Board (IAB). It offers a broad spectrum of actual standards used in the Internet. The suitable selection of documents from RFC 2200 defined in this standard for given projects has to be chosen by the user of this standard.

[X] Ethernet 802.3
[ ] Serial X.21 interface
[ ] Other selection from RFC 2200

List of valid documents from RFC 2200

8. ……
9. ……
10. ……
11. ……
12. ……
13. ……
14. etc.

4 Protocol Implementation Conformance Statement (PICS) - Interoperability of SICAM EMIC according to IEC 60870-5-104 (ETT0)

Contents

The Protocol Implementation Conformance Statement (PICS) in this paragraph is based on *EDP-Energias de Portugal Light Protocol Implementation Document for IEC 60870-5-104 Final version 1.1. ("EDPlight104").*

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Interoperability of SICAM EMIC (TM1703 emic) using IEC 60870-5-104 (ETT0 firmware)

This companion standard presents sets of parameters and alternatives from which subsets must be selected to implement particular telecontrol systems. Certain parameter values, such as the choice of “structured“ or “unstructured“ fields of the INFORMATION OBJECT ADDRESS of ASDUs represent mutually exclusive alternatives. This means that only one value of the defined parameters is admitted per system. Other parameters, such as the listed set of different process information in command and in monitor direction allow the specification of the complete set or subsets, as appropriate for given applications. This clause summarizes the parameters of the previous clauses to facilitate a suitable selection for a specific application. If a system is composed of equipment, stemming from different manufacturers it is necessary that all partners agree on the selected parameters.

The interoperability list is defined as in IEC 60870-5-101 and extended with parameters used in this standard. The text descriptions of parameters which are not applicable to this companion standard are strike-through (corresponding check box is marked black).

Note:
In addition, the full specification of a system may require individual selection of certain parameters for certain parts of the system, such as the individual selection of scaling factors for individually addressable measured values.

The selected parameters should be marked in the white boxes as follows:

☐ Function or ASDU is not used

☒ Function or ASDU is used as standardized (default)

☐ Function or ASDU is used in reverse mode

☐ Function or ASDU is used in standard and reverse mode

☐ Function or ASDU is planned, please contact the product management

■ Function or ASDU is used in a specific project

The possible selection (blank, X, R, or B) is specified for each specific clause or parameter.

A black check box indicates that the option cannot be selected in this companion standard.

4.1 System or device

(system-specific parameter, indicate the system's or station's function by marking one of the following with '**X**')

- [ ] System definition
- [ ] Controlling station definition
- [X] Controlled station definition

4.2 Network configuration

(network-specific parameter, all configurations that are used are to be marked '**X**')

- [ ] ~~Point to point~~
- [ ] ~~Multiple point to point~~
- [ ] ~~Multipoint partyline~~
- [ ] ~~Multipoint star~~

4.3 Physical layer

(network-specific parameter, all interfaces and data rates that are used are to be marked '**X**')

Transmission speed (control direction)

Unbalanced interchange Circuit V.24/V.28 Standard	Unbalanced interchange Circuit V.24/V.28 Recommended if >1200 bit/s	Balanced interchange Circuit X.24/X.27	
~~100 bits/s~~	~~2400 bits/s~~	~~2400 bits/s~~	~~56000 bits/s~~
~~200 bits/s~~	~~4800 bits/s~~	~~4800 bits/s~~	~~64000 bits/s~~
~~300 bits/s~~	~~9600 bits/s~~	~~9600 bits/s~~	
~~600 bits/s~~	~~19200 bits/s~~	~~19200 bits/s~~	
~~1200 bits/s~~	~~38400 bits/s~~	~~38400 bits/s~~	

Transmission speed (monitor direction)

Unbalanced interchange Circuit V.24/V.28 Standard	Unbalanced interchange Circuit V.24/V.28 Recommended if >1200 bit/s	Balanced interchange Circuit X.24/X.27	
~~100 bits/s~~	~~2400 bits/s~~	~~2400 bits/s~~	~~56000 bits/s~~
~~200 bits/s~~	~~4800 bits/s~~	~~4800 bits/s~~	~~64000 bits/s~~
~~300 bits/s~~	~~9600 bits/s~~	~~9600 bits/s~~	
~~600 bits/s~~	~~19200 bits/s~~	~~19200 bits/s~~	
~~1200 bits/s~~	~~38400 bits/s~~	~~38400 bits/s~~	

4.4 Link layer

(network-specific parameter, all options that are used are to be marked '**X**'. Specify the maximum frame length. If a non-standard assignment of class 2 messages is implemented for unbalanced transmission, indicate the Type ID and COT of all messages assigned to class 2.)

~~Frame format FT 1.2, single character 1 and the fixed time out interval are used exclusively in this companion standard.~~

Link transmission procedure

- ~~Balanced transmission~~
- ~~Unbalanced transmission~~

Address filed of the link

- ~~not present (balanced transmission only)~~
- ~~1 Octet~~
- ~~2 Octets~~
- ~~structured~~
- ~~unstructured~~

Frame length

- ~~Maximum length L (number of octets, possible 9-255)~~

When using an unbalanced link layer, the following ASDU types are returned in class 2 messages (low priority) with the indicated causes of transmission:

~~The standard assignment of ASDUs to class 2 messages is used as follows:~~

Type identification	Cause of transmission
9, 11, 13, 21	<1>

~~A special assignment of ASDUs to class 2 messages is used as follows:~~

Type identification	Cause of transmission

~~Note: In response to a class 2 poll, a controlled station may respond with class 1 data when there is no class 2 data available.~~

4.5 Application layer

Transmission mode for application data

Mode 1 (Least significant octet first), as defined in clause 4.10 of IEC 60870-5-4, is used exclusively in this companion standard.

Common address of ASDU
(system-specific parameter, all configurations that are used are to be marked „**X**“)

■ ~~1 Octet~~	[X] 2 Octets

Information object address
(system-specific parameter, all configurations that are used are to be marked „**X**“)

■ ~~1 Octet~~	[ ] structured
■ ~~2 Octets~~	[X] unstructured
[X] 3 Octets	

Cause of transmission
(system-specific parameter, all configurations that are used are to be marked „**X**“)

■ ~~1 Octet~~	[X] 2 Octets (with originator address) Originator address is set to zero if not used.

Length of APDU
(system-specific parameter, specify the maximum length of the APDU per system)

The maximum length of the APDU is 253 (default). The maximum length may be reduced per system.

[253] Maximum length of APDU per system

Selection of standard ASDUs

Process information in monitor direction

(station-specific parameter, mark each Type ID „**X**“ if it is only used in the standard direction, „**R**“ if only used in the reverse direction, and „**B**“ if used in both directions)

X	<1>	:=	Single-point information	M_SP_NA_1
■	<2>	:=	~~Single-point information with time tag~~	M_SP_TA_1
X	<3>	:=	Double-point information	M_DP_NA_1
■	<4>	:=	~~Double-point information with time tag~~	M_DP_TA_1
	<5>	:=	Step position information	M_ST_NA_1
■	<6>	:=	~~Step position information with time tag~~	M_ST_TA_1
	<7>	:=	Bitstring of 32 bit	M_BO_NA_1
■	<8>	:=	~~Bitstring of 32 bit with time tag~~	M_BO_TA_1
	<9>	:=	Measured value, normalized value	M_ME_NA_1
■	<10>	:=	~~Measured value, normalized value with time tag~~	M_ME_TA_1
	<11>	:=	Measured value, scaled value	M_ME_NB_1
■	<12>	:=	~~Measured value, scaled value with time tag~~	M_ME_TB_1
X	<13>	:=	Measured value, short floating point value	M_ME_NC_1
■	<14>	:=	~~Measured value, short floating point value with time tag~~	M_ME_TC_1
	<15>	:=	Integrated totals	M_IT_NA_1
■	<16>	:=	~~Integrated totals with time tag~~	M_IT_TA_1
■	<17>	:=	~~Event of protection equipment with time tag~~	M_EP_TA_1
■	<18>	:=	~~Packed start events of protection equipment with time tag~~	M_EP_TB_1
■	<19>	:=	~~Packed output circuit information of protection equipment with time tag~~	M_EP_TC_1
	<20>	:=	Packed single-point information with status change detection	M_PS_NA_1
	<21>	:=	Measured value, normalized value without quality descriptor	M_ME_ND_1

X	<30>	:=	Single-point information with time tag CP56Time2a	M_SP_TB_1
X	<31>	:=	Double-point information with time tag CP56Time2a	M_DP_TB_1
	<32>	:=	Step position information with time tag CP56Time2a	M_ST_TB_1
	<33>	:=	Bitstring of 32 bit with time tag CP56Time2a	M_BO_TB_1
	<34>	:=	Measured value, normalized value with time tag CP56Time2a	M_ME_TD_1
	<35>	:=	Measured value, scaled value with time tag CP56Time2a	M_ME_TE_1
X	<36>	:=	Measured value, short floating point value with time tag CP56Time2a	M_ME_TF_1
X	<37>	:=	Integrated totals with time tag CP56Time2a	M_IT_TB_1
	<38>	:=	Event of protection equipment with time tag CP56Time2a	M_EP_TD_1
	<39>	:=	Packed start events of protection equipment with time tag CP56Time2a	M_EP_TE_1
	<40>	:=	Packed output circuit information of protection equipment with time tag CP56Time2a	M_EP_TF_1

Either the ASDUs of the set <2>, <4>, <6>, <8>, <10>, <12>, <14>, <16>, <17>, <18>, <19> or of the set <30> - <40> are used.

Process information in control direction
(station-specific parameter, mark each Type ID „**X**“ if it is only used in the standard direction, „**R**“ if only used in the reverse direction, and „**B**“ if used in both directions)

☐	<45>	:=	Single command	C_SC_NA_1
☐	<46>	:=	Double command	C_DC_NA_1
☐	<47>	:=	Regulating step command	C_RC_NA_1
☐	<48>	:=	Set point command, normalized value	C_SE_NA_1
☐	<49>	:=	Set point command, scaled value	C_SE_NB_1
☐	<50>	:=	Set point command, short floating point	C_SE_NC_1
☐	<51>	:=	Bitstring of 32 bit	C_BO_NA_1

☒	<58>	:=	Single command with time tag CP56Time2a	C_SC_TA_1
☒	<59>	:=	Double command with time tag CP56Time2a	C_DC_TA_1
☐	<60>	:=	Regulating step command with time tag CP56Time2a	C_RC_TA_1
☐	<61>	:=	Set point command, normalized value with time tag CP56Time2a	C_SE_TA_1
☐	<62>	:=	Set point command, scaled value with time tag CP56Time2a	C_SE_TB_1
☒	<63>	:=	Set point command, short floating point with time tag CP56Time2a	C_SE_TC_1
☐	<64>	:=	Bitstring of 32 bit with time tag CP56Time2a	C_BO_TA_1

Either the ASDUs of the set <45> - <51> or of the set <58> - <64> are used.

System information in monitor direction
(station-specific parameter, mark „X“ if used)

☒	<70>	:=	End of initialization	M_EI_NA_1

System information in control direction
(station-specific parameter, mark each Type ID „**X**“ if it is only used in the standard direction, „**R**“ if only used in the reverse direction, and „**B**“ if used in both directions)

☒	<100>	:=	Interrogation command	C_IC_NA_1
☒	<101>	:=	Counter interrogation command	C_CI_NA_1
☐	<102>	:=	Read command	C_RD_NA_1
☒	<103>	:=	Clock synchronization command	C_CS_NA_1
■	<104>	:=	~~Test command~~	C_TS_NA_1
☒	<105>	:=	Reset process command	C_RP_NA_1
■	<106>	:=	~~Delay acquisition command~~	C_CD_NA_1
☒	<107>	:=	Test command with time tag CP56time2a	C_CD_NA_1

Parameter in control direction
(station-specific parameter, mark each Type ID „**X**“ if it is only used in the standard direction, „**R**“ if only used in the reverse direction, and „**B**“ if used in both directions)

	<110>	:=	Parameter of measured value, normalized value	P_ME_NA_1
	<111>	:=	Parameter of measured value, scaled value	P_ME_NB_1
X	<112>	:=	Parameter of measured value, short floating point value	P_ME_NC_1
	<113>	:=	Parameter activation	P_AC_NA_1

4) … Not used in IEC 60870-5-104 Edition 2. No use case.

File transfer
(station-specific parameter, mark each Type ID „**X**“ if it is only used in the standard direction, „**R**“ if only used in the reverse direction, and „**B**“ if used in both directions)

X	<120>	:=	File ready	F_FR_NA_1
X	<121>	:=	Section ready	F_SR_NA_1
X	<122>	:=	Call directory, select file, call file, call section	F_SC_NA_1
X	<123>	:=	Last section, last segment	F_LS_NA_1
X	<124>	:=	Ack file, ack section	F_AF_NA_1
X	<125>	:=	Segment	F_SG_NA_1
X	<126>	:=	Directory {blank or X, only available in monitor (standard) direction}	F_DR_TA_1

Type identifier and Cause of Transmission Assignments
(station-specific parameter)

Shaded boxes are not required.
Black boxes are not permitted in this companion standard
Blank = Function or ASDU is not used.
Mark Type Identification/Cause of transmission combinations:
'**X**' if only used in the standard direction
'**R**' if only used in the reverse direction
'**B**' if used in both directions

Type Identification		**Cause of transmission**																		
		1	2	3	4	5	6	7	8	9	10	11	12	13	20 to 36	37 to 41	44	45	46	47
<1>	M_SP_NA_1														X					
~~<2>~~	~~M_SP_TA_1~~																			
<3>	M_DP_NA_1														X					
~~<4>~~	~~M_DP_TA_1~~																			
<5>	M_ST_NA_1																			
~~<6>~~	~~M_ST_TA_1~~																			
<7>	M_BO_NA_1																			
~~<8>~~	~~M_BO_TA_1~~																			
<9>	M_ME_NA_1																			
~~<10>~~	~~M_ME_TA_1~~																			
<11>	M_ME_NB_1																			
~~<12>~~	~~M_ME_TB_1~~																			
<13>	M_ME_NC_1														X					
~~<14>~~	~~M_ME_TC_1~~																			
<15>	M_IT_NA_1																			
~~<16>~~	~~M_IT_TA_1~~																			
~~<17>~~	~~M_EP_TA_1~~																			
~~<18>~~	~~M_EP_TB_1~~																			
~~<19>~~	~~M_EP_TC_1~~																			
<20>	M_PS_NA_1																			
<21>	M_ME_ND_1																			
<30>	M_SP_TB_1			X		X						X	X							
<31>	M_DP_TB_1			X		X						X	X							
<32>	M_ST_TB_1																			
<33>	M_BO_TB_1																			
<34>	M_ME_TD_1																			
<35>	M_ME_TE_1																			
<36>	M_ME_TF_1			X																
<37>	M_IT_TB_1			X																
<38>	M_EP_TD_1																			
<39>	M_EP_TE_1																			
<40>	M_EP_TF_1																			
<45>	C_SC_NA_1																			
<46>	C_DC_NA_1																			
<47>	C_RC_NA_1																			
<48>	C_SE_NA_1																			
<49>	C_SE_NB_1																			

Type Identification		**Cause of transmission**																		
		1	2	3	4	5	6	7	8	9	10	11	12	13	20 to 36	37 to 41	44	45	46	47
<50>	C_SE_NC_1																			
<51>	C_BO_NA_1																			
<58>	C_SC_TC_1						X	X	X	X	X						X	X	X	X
<59>	C_DC_TC_1						X	X	X	X	X						X	X	X	X
<60>	C_RC_TC_1																			
<61>	C_SE_TA_1																			
<62>	C_SE_TB_1																			
<63>	C_SE_TC_1						X	X	X	X	X						X	X	X	X
<64>	C_BO_TA_1																			
<70>	M_EI_NA_1*				X															
<100>	C_IC_NA_1						X	X			X						X	X	X	X
<101>	C_CI_NA_1						X	X			X						X	X	X	X
<102>	C_RD_NA_1																			
<103>	C_CS_NA_1						X	X									X	X	X	X
~~<104>~~	~~C_TS_NA_1~~																			
<105>	C_RP_NA_1						X	X									X	X	X	X
~~<106>~~	~~C_CD_NA_1~~																			
<107>	C_TS_TA_1						X	X									X	X	X	X
<110>	P_ME_NA_1																			
<111>	P_ME_NB_1																			
<112>	P_ME_NC_1						X	X									X	X	X	X
<113>	P_AC_NA_1																			
<120>	F_FR_NA_1													X			X	X	X	X
<121>	F_SR_NA_1																X	X	X	X
<122>	F_SC_NA_1					X								X			X	X	X	X
<123>	F_LS_NA_1													X			X	X	X	X
<124>	F_AF_NA_1													X			X	X	X	X
<125>	F_SG_NA_1													X			X	X	X	X
<126>	F_DR_TA_1*			X		X														

* … Blank or X only

4.6 Basic application functions

Station initialization
(station-specific parameter, mark „**X**“ if function is used)

[X] Remote initialization

Cyclic data transmission
(station-specific parameter, mark „**X**“ if function only used in standard direction, „**R**“ if only used in the reverse direction, and „**B**“ if used in both directions)

[ ] Cyclic data transmission

Read procedure
(station-specific parameter, mark „**X**“ if function only used in standard direction, „**R**“ if only used in the reverse direction, and „**B**“ if used in both directions)

[ ] Read procedure

Spontaneous transmission
(station-specific parameter, mark „**X**“ if function only used in standard direction, „**R**“ if only used in the reverse direction, and „**B**“ if used in both directions)

[X] Spontaneous transmission

Double transmission of information objects with cause of transmission spontaneous
(station-specific parameter, mark each information type ‘**X**’ where both a Type ID without time and corresponding Type ID with time are issued in response to a single spontaneous change of a monitored object)

The following type identifications may be transmitted in succession caused by a single status change of an information object. The particular information object addresses for which double transmission is enabled are defined in a project-specific list.

[ ] Single-point information M_SP_NA_1, M_SP_TA_1, M_SP_TB_1 and M_PS_NA_1
[ ] Double-point information M_DP_NA_1, M_DP_TA_1 and M_DP_TB_1
[ ] Step position information M_ST_NA_1, M_ST_TA_1 and M_ST_TB_1
[ ] Bitstring of 32 bit M_BO_NA_1, M_BO_TA_1 and M_BO_TB_1 (if defined for a specific project)
[ ] Measured value, normalized value M_ME_NA_1, M_ME_TA_1, M_ME_ND_1 and M_ME_TD_1
[ ] Measured value, scaled value M_ME_NB_1, M_ME_TB_1 and M_ME_TE_1
[ ] Measured value, short floating point value M_ME_NC_1, M_ME_TC_1 and M_ME_TF_1

Station interrogation
(station-specific parameter, mark „**X**“ if function only used in standard direction, „**R**“ if only used in the reverse direction, and „**B**“ if used in both directions)

[X] global		
[ ] group 1	[ ] group 7	[ ] group 13
[ ] group 2	[ ] group 8	[ ] group 14
[ ] group 3	[ ] group 9	[ ] group 15
[ ] group 4	[ ] group 10	[ ] group 16
[ ] group 5	[ ] group 11	
[ ] group 6	[ ] group 12	

Information Object Addresses assigned to each group must be shown in a separate table.

Clock synchronization
(station-specific parameter, mark „**X**“ if function only used in standard direction, „**R**“ if only used in the reverse direction, and „**B**“ if used in both directions)

[X] Clock synchronization

Command transmission
(object-specific parameter, mark „**X**“ if function only used in standard direction, „**R**“ if only used in the reverse direction, and „**B**“ if used in both directions)

[X] Direct command transmission
[X] Direct set point command transmission
[X] Select and execute command
[X] Select and execute set point command
[X] C_SE ACTTERM used

[X] No additional definition
[X] Short pulse duration (duration determined by a system parameter in the outstation)
[X] Long pulse duration (duration determined by a system parameter in the outstation)
[X] Persistent output

[X] Supervision of maximum delay in command direction of commands and set point commands
[configurable] Maximum allowable delay of commands and set point commands

Transmission of integrated totals
(station- or object-specific parameter, mark „**X**“ if function only used in standard direction, „**R**“ if only used in the reverse direction, and „**B**“ if used in both directions)

- [X] Mode A: Local freeze with spontaneous transmission
- [ ] Mode B: Local freeze with counter interrogation
- [ ] Mode C: Freeze and transmit by counter interrogation commands
- [X] Mode D: Freeze by counter interrogation command, frozen values reported spontaneously

- [X] Counter read
- [X] Counter freeze without reset
- [ ] Counter freeze with reset
- [ ] Counter reset

- [X] General request counter
- [ ] Request counter group 1
- [ ] Request counter group 2
- [ ] Request counter group 3
- [ ] Request counter group 4

Parameter loading
(object-specific parameter, mark „**X**“ if function only used in standard direction, „**R**“ if only used in the reverse direction, and „**B**“ if used in both directions)

- [X] Threshold value
- [ ] Smoothing factor
- [ ] Low limit for transmission of measured value
- [ ] High limit for transmission of measured value

Parameter activation
(object-specific parameter, mark „**X**“ if function only used in standard direction, „**R**“ if only used in the reverse direction, and „**B**“ if used in both directions)

☐ act/deact of persistent cyclic or periodic transmission of the addressed object

Test procedure
(station-specific parameter, mark „**X**“ if function only used in standard direction, „**R**“ if only used in the reverse direction, and „**B**“ if used in both directions)

☒ Test

File transfer
(station-specific parameter, mark each used function „**X**“)

File transfer in monitor direction

☐ Transparent file
☐ Transmission of disturbance data of protection equipment
☐ Transmission of sequences of events
☐ Transmission of sequences of recorded analog values

File transfer in control direction

☐ Transparent file

Background scan
(station-specific parameter, mark „**X**“ if function only used in standard direction, „**R**“ if only used in the reverse direction, and „**B**“ if used in both directions)

☐ Background scan

Note: used for data which are transmitted caused by a self-initiated general interrogation

Acquisition of transmission delay
(station-specific parameter, mark „**X**“ if function only used in standard direction, „**R**“ if only used in the reverse direction, and „**B**“ if used in both directions)

■ ~~Acquisition of transmission delay~~

Definition of time outs

Parameter	Default Value	Remarks	Selected value
t0	30 s	Time-out of connection establishment	NA
t1	15 s	Time-out of send or test APDUs	15 s
t2	10 s	Time-out for acknowledges in case of no data messages t2<t1	10 s
t3	20 s	Time-out for sending test frames in case of a long idle state t3>t1	20 s

Maximum range of values t0-t2: 1 to 255 s, accuracy 1 s
Maximum range of values t3 (ET84): 0 to 172800 s (48h), accuracy 1 s

Maximum numbers of outstanding I format frames k and latest acknowledge

Parameter	Default Value	Remarks	Selected value
k	12 APDUs	Maximum difference receive sequence number to send state variable	12
w	8 APDU´s	Latest acknowledge after receiving w I-format APDUs	8

Maximum range of value k: 1 to 32767 APDUs, accuracy 1 APDU
Maximum range of value w: 1 to 32767 APDUs, accuracy 1 APDU (Recommendation: w should not exceed 2/3 of k).

Portnumber

Parameter	Value	Remarks	
Portnumber	2404	In all cases	

Redundant Connections

☐ Number N connections used in redundancy group

RFC 2200 suite

RFC 2200 is an official Internet Standard which describes the state of standardization of protocols used in the Internet as determined by the Internet Architecture Board (IAB). It offers a broad spectrum of actual standards used in the Internet. The suitable selection of documents from RFC 2200 defined in this standard for given projects has to be chosen by the user of this standard.

☒ Ethernet 802.3
☐ Serial X.21 interface
☐ Other selection from RFC 2200

List of valid documents from RFC 2200

15. ……
16. ……
17. ……
18. ……
19. ……
20. ……
21. etc.

Literature

SICAM RTUs . Ax 1703 Common Functions Protocols	DC0-023-2
IEC 60870-5-101 Telecontrol equipment and systems Part 5: Transmission protocols Section 101: Companion standard for basic telecontrol tasks	
IEC 60870-5-104 Telecontrol equipment and systems Part 5: Transmission protocols Section 104: Network access for IEC 60870-5-104 using standard transport profiles	