Documento de Interoperabilidade do Protocolo IEC/60870-5-104 no SAGE

JUNHO 2023

Documento de Interoperabilidade

1 System or/and Device

(system-specific parameter, indicate definition of a system or a device by marking one of the following with '**X**')

[x] System definition
[x] Controlling station definition (Master)
[x] Controlled station definition (Slave)

2 Network Configuration

(not applicable)

3 Physical Layer

(not applicable)

4 Link Layer

(not applicable)

5 Application Layer

Transmission mode of 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**')

[x] Two octets (range 0-255)

Information object address

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

[x] 3 octets
[ ] Structured
[x] Unstructured

Cause of transmission

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

[x] Two octets (with originator address)

Lenght of APDU

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

253 Maximum lenght 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).

Os assinalamentos '**b**' observados a seguir indicam que o SAGE implementa a mensagem nas duas direções, sendo que, em uma das direções, associada à conexão TCP-IP de aquisição (caso a mesma esteja configurada) e na outra direção, associada à conexão TCP-IP de distribuição (idem). Da mesma forma 'x' indica que o SAGE implementa a mensagem apenas na conexão TCP-IP de aquisição.

[b]	<1>	:= Single-point information	M_SP_NA_1
[b]	<3>	:= Double-point information	M_DP_NA_1
[b]	<5>	:= Step position information	M_ST_NA_1
[b]	<7>	:= Bitstring of 32-bit	M_BO_NA_1
[b]	<9>	:= Measured value, normalized value	M_ME_NA_1
[b]	<11>	:= Measured value, scaled value	M_ME_NB_1
[b]	<13>	:= Measured value, short floating point value	M_ME_NC_1
[b]	<15>	:= Integrated totals	M_IT_NA_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
[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
[x]	<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
[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, 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 prot. equip. with time tag CP56Time2a	M_EP_TE_1
[ ]	<40>	:= Packed output circuit info of prot. equip. w tim-tag CP56Time2a	M_EP_TF_1

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 value	C_SE_NC_1
[b]	<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 w/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 value w/t-tag CP56Time2a	C_SE_TC_1
[ ]	<64>	:= Bitstring of 32 bit with time tag CP56Time2a	C_BO_TA_1

System 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]	<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
[b]	<101>	:= Counter interrogation command	C_CI_NA_1
[ ]	<102>	:= Read command	C_RD_NA_1
[b]	<103>	:= Clock syncrhronization command	C_CS_NA_1
[b]	<105>	:= Reset process command	C_RP_NC_1
[b]	<107>	:= Test command with time tag CP56Time2a	C_TS_TA_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
[ ]	<112>	:= Parameter of measured value, short floating point value	P_ME_NC_1
[ ]	<113>	:= Parameter activation	P_AC_NA_1

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).

[ ]	<120>	:= File ready	F_FR_NA_1
[ ]	<121>	:= Section ready	F_SR_NA_1
[ ]	<122>	:= Call directory, select file, call file call section	F_SC_NA_1
[ ]	<123>	:= Last section, last segment	F_LS_NA_1
[ ]	<124>	:= Ack file, ack section	F_AF_NA_1
[ ]	<125>	:= Segment	F_SG_NA_1
[ ]	<126>	:= Directory	F_DR_TA_1

5 Basic Application Functions

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

[b] Remote initialization

Cyclic data transmission
(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] Cyclic data transmission

Read Procedure
(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).

[ ] Read procedure

Spontaneous transmission
(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] Spontaneous transmission

Double transmission of information objects with cause of transmission spontaneous
(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).

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.

[x] Single-point information
[x] Double-point information
[x] Step-position information
[x] Bitstring of 32 bits (if defined for a specific project)
[x] Measured value, normalized value
[x] Measured value, scaled value
[x] Measured value, short floating-point value

Station interrogation
(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] 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	Addresses per group have to be defined.

Clock synchronization
(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] Clock synchronization (optional)

Command transmission
(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] 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

[b] Supervision of maximum delay in command direction of commands and set point commands
[configurável] Maximum allowable delay of commands and set point commands

Transmission of integrated totals
(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] Local freeze with spontaneous transmission
[b] Local freeze with counter interrogation
[b] Freeze and transmit by counter interrogation commands.
[ ] Freeze by couner interrogation commands, frozen values reported spontaneously.

[b] Counter read
[b] Counter freeze without reset
[ ] Counter freeze with reset
[ ] Counter reset
[b] General request counter
[ ] Request counter group 1
[ ] Request counter group 2
[ ] Request counter group 3
[ ] Request counter group 4

Addresses per group have to be defined.

Parameter loading
(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).

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

Parameter activation
(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).

[ ] Act/deact of persistent cyclic or periodic transmission of the addressed object

Test procedure
(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] Test procedure

File transfer
(station-specific parameter)

[ ] File transfer in monitor direction
[ ] File transfer in control direction

Background scan
(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] Background scan

Definition of time outs

[configurável – def. 30s] Time out of connection establishment
[configurável – def. 15s] Time out of send or test APDUs.
[configurável – def. 10s] Time out of acknowledges in case of no data messages.
[configurável – def. 20s] Time out for sending test frames in case of a long idle state.

Maximum number of outstanding I-format APDUs 'k' and latest acknowledge

[configurável – def. 12] **k** - Maximum diference receive sequence number to send state value.
[configurável – def. 8] **w** - Last acknowledge after receiving **I-format** APDUs.

Port number

[configurável – def. 2404]