Protocol IEC 60870-5-104 (master)

SPIDER ä

Indications
Both single and double indications are supported with or without full time tag.

Analog Measured Values
Supported, with and without full time tag.

Digital Measured Values
Supported, with and without full time tag.

Pulse Counter Values
The pulse counters are frozen locally in the controlled stations at specified point of times. The frozen counter values are reported spontaneously. The included full time tag is the point of time for the freezing.
The used method is described as method 1 (Acquisition of integrated totals) in IEC 870-5-5, chapter 6.9.

Commands
Both single and double object commands are supported, with or without full time tag.
Regulating step command is supported, with or without full time tag.
Set point command is supported, with or without full time tag.
Bit string command is supported, with or without full time tag.

Clock Synchronization
Time synchronization telegram may be sent to the RTUs from SPIDER but is not advisable. Preferably the RTUs shall be synchronized in another way, e.g., a GPS clock.

Network Configuration
This implementation works over a TCP/IP based WAN. Redundancy using multiple logical connections can be achieved using the method described in the Norwegian IEC 60870-5-104 User Conventions.

Technical data

Scope of Implementation

☐ Supported
■ Not supported
R Function or ASDU is used in reverse mode
B Function or ASDU is used in standard and reverse mode
☐ Some restriction, see comment
☒ Always used, i.e., must be supported by the controlled station

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).

Network configuration		
~~Point-to-point~~		■
~~Multiple point-to-point~~		■
~~Multipoint partyline~~		■
~~Multipoint star~~		■

Transmission speed (unbalanced interchange circuit V.24/V.28)			
~~100 bit/s~~	■	~~1200 bit/s~~	■
~~200 bit/s~~	■	~~2400 bit/s~~	■
~~300 bit/s~~	■	~~4800 bit/s~~	■
~~600 bit/s~~	■	~~9600 bit/s~~	■

Transmission speed (balanced interchange circuit X.24/X.27)			
~~2400 bit/s~~	■	~~38400 bit/s~~	■
~~4800 bit/s~~	■	~~56000 bit/s~~	■
~~9600 bit/s~~	■	~~64000 bit/s~~	■
~~19200 bit/s~~	■		

Link transmission procedure			
~~Balanced transmission~~	■	~~Unbalanced transmission~~	■

Address field of the link			
~~Not present (balanced transmission only)~~	■	~~Structured~~	■
~~One octet~~	■	~~Unstructured~~	■
~~Two octet~~	■	~~Frame length L (number of octets)~~	■

Common address of ASDU			
~~One octet~~	■	Two octets	☐

Information object address			
~~One octet~~		Structured	■
~~Two octets~~	■	Unstructured	□
Three octets	□		

Cause of transmission			
~~One octet~~	■	Two octets (with originator address) Originator address is set to zero if not used.	□

Length of APDU	
Maximum length of APDU per system	255

Telegrams				
1	Single-point information	M_SP_NA_1		□
~~2~~	~~Single-point information with time tag~~	~~M_SP_TA_1~~		■
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~~		■
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		■
30	Single-point information with time tag CP56Time2a	M_SP_TB_1		□
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		■
36	Measured value, short floating point value with time tag CP56Time2a	M_ME_TF_1		□
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		■
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	C_SE_NA_1		□

Telegrams				
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 value with time tag CP56Time2a	C_SE_TC_1		☐
64	Bitstring of 32 bit with time tag CP56Time2a	C_BO_TA_1		☐
70	End of initialization	M_EI_NA_1		☐
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_NB_1~~		■
105	Reset process command	C_RP_NC_1		☐
~~106~~	~~Delay acquisition command~~	~~C_CD_NA_1~~		■
107	Test command with time tag CP56Time2a	C_TS_TA_1		☐
110	Parameter of measured value, normalized value	P_ME_NA_1	Will require non standard functionality in the SPIDER system.	☐
111	Parameter of measured value, scaled value	P_ME_NB_1		■
112	Parameter of measured value, short floating point value	P_ME_NC_1	Will require non standard functionality in the SPIDER system.	☐
113	Parameter activation	P_AC_NA_1	Can be used for blocking of cyclic or periodic sending of measured values.	☐
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		☐

Basic application functions			
Remote initialisation	☐	Read procedure	■
Cyclic data transmission	☐	Spontaneous transmission	☐

Double transmission of information objects with cause of transmission spontaneous [1]			
Single-point information M_SP_NA_1, M_SP_TB_1 and M_PS_NA_1	■	Measured value, normalized value M_ME_NA_1, M_ME_ND_1 and M_ME_TD_1	■
Double-point information M_DP_NA_1 and M_DP_TB_1	■	Measured value, scaled value M_ME_NB_1 and M_ME_TE_1	■
Step position information M_ST_NA_1 and M_ST_TB_1	■	Measured value, short floating point number M_ME_NC_1 and M_ME_TF_1	■

[1] The type identifications in the list 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.

Double transmission of information objects with cause of transmission spontaneous [1]	
Bitstring of 32 bit M_BO_NA_1 and M_BO_TB_1	■

Station interrogation			
Global	□	Group 9	■
Group 1	■	Group 10	■
Group 2	■	Group 11	■
Group 3	■	Group 12	■
Group 4	■	Group 13	■
Group 5	■	Group 14	■
Group 6	■	Group 15	■
Group 7	■	Group 16	■
Group 8	■		

Clock synchronization	
Clock synchronization	□

Command transmission			
Direct command transmission	□	No additional definition	□
Direct set point command transmission	□	Short pulse duration	□
Select and execute command	□	Long pulse duration	□
Select and execute set point command	□ Will require non standard functionality in the SPIDER system.	Persistent output	□
C_SE ACTTERM used	□	Supervision of maximum delay in command direction of commands and set point commands	■
		Maximum allowable delay of commands and set point commands	

Transmission of integrated totals			
Mode A: Local freeze with spontaneous transmission	□	Counter reset	■
Mode B: Local freeze with counter interrogation	■	General request counter	■
Mode C: Freeze and transmit by counter interrogation commands	■	Request counter group 1	■
Mode D: Freeze by counter interrogation command, frozen values reported spontaneously	■	Request counter group 2	■
Counter read	■	Request counter group 3	■

Transmission of integrated totals			
Counter freeze without reset	☐	Request counter group 4	■
Counter freeze with reset	■		

Parameter loading/activation			
Threshold value	☐ Will require non standard functionality in the SPIDER system.	Low limit for transmission of measured value	■
Smoothing factor	☐ Will require non standard functionality in the SPIDER system.	High limit for transmission of measured value	■
Act/deact of persistent cyclic or periodic transmission of the addressed object	☐ Will require non standard functionality in the SPIDER system.		

Test procedure	
Test procedure	☐

File transfer (monitor direction)			
Transparent file	■	Transmission of sequences of events	■
Transmission of disturbance data of protection equipment	■	Transmission of sequences of recorded analogue values	■

File transfer (control direction)	
Transparent file	☐

Background scan	
Background scan	■

Definition of time outs[1]

Parameter	Default value	Remarks	Selected value
t_0	30s	Time out of connection establishment	
t_1	15s	Time out of send or test APDUs	
t_2	10s	Time out for acknowledges in case of no data messages $t_2 < t_1$	
t_3	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[2]			
Parameter	Default value	Remarks	Selected value
k	12 APDUs	Maximum difference receive sequence number to send state variable	
w	8 APDUs	Latest acknowledge after receiving w I-format APDUs	

Port number		
Parameter	Value	Remarks
Port number	2404	In all cases

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

[2] Maximum range of values for all time outs: 1 to 255 s, accuracy 1 s

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

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