

SIMATIC S7-1200
CP 1243-1 IEC
Protocol IEC 60870-5-104

Interoperability list
V1.2



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We have checked the content of this printed document in accordance with the hardware and software described. Nevertheless, the risk of deviations cannot be excluded completely, which is why we do not accept liability for complete conformity. The details provided in this printed document are checked on a regular basis, however, and any corrections necessary are included in subsequent editions. We would be happy to receive your suggestions for improvement.

Technical data subject to change

1 IEC870-5-104

This documentation is used to match the functionality required/demanded for communication of PCS7 Telecontrol with PLC, RTU or IED devices based on telecommunication standard IEC 60870-5-104. PCS7 Telecontrol provides master functionality.

1.1 General information

Legend:

- 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 or reverse mode

Notice:

- only possible, if the packages of master and slave are combined.

1.2 Device function

(system-specific parameter; mark system- or station function "X")

- System specification
- Controlling Station (Master)
- Controlled Station (Slave)

1.3 Network configuration

(network-specific parameters; mark each used configuration "X")

- Point to Point *
- Multiple Point to Point *
- Multipoint **
- Multipoint Star **

*-) balanced

**-) unbalanced

1.4 Physical layer

(network-specific parameters; mark each supported interface and data rates "X")

Transmission rate



Automatic detection of transmission rate (10/100 Mbits/s)

Unbalanced interface
V.24/V.28
Standard

<input type="checkbox"/>	300 bits/s
<input type="checkbox"/>	600 bits/s
<input type="checkbox"/>	1200 bits/s
<input type="checkbox"/>	2400 bits/s
<input type="checkbox"/>	4800 bits/s
<input type="checkbox"/>	9600 bits/s
<input type="checkbox"/>	19200 bits/s
<input type="checkbox"/>	38400 bits/s
<input type="checkbox"/>	57600 bits/s
<input type="checkbox"/>	76800 bits/s
<input type="checkbox"/>	115200 bits/s

Unbalanced interface
RS485/RS422

<input type="checkbox"/>	300 bits/s
<input type="checkbox"/>	600 bits/s
<input type="checkbox"/>	1200 bits/s
<input type="checkbox"/>	2400 bits/s
<input type="checkbox"/>	4800 bits/s
<input type="checkbox"/>	9600 bits/s
<input type="checkbox"/>	19200 bits/s
<input type="checkbox"/>	38400 bits/s
<input type="checkbox"/>	57600 bits/s
<input type="checkbox"/>	76800 bits/s
<input type="checkbox"/>	115200 bits/s

Balanced interface
X.24/X.27

<input type="checkbox"/>	300 bits/s
<input type="checkbox"/>	600 bits/s
<input type="checkbox"/>	1200 bits/s
<input type="checkbox"/>	2400 bits/s
<input type="checkbox"/>	4800 bits/s
<input type="checkbox"/>	9600 bits/s
<input type="checkbox"/>	19200 bits/s
<input type="checkbox"/>	38400 bits/s
<input type="checkbox"/>	57600 bits/s
<input type="checkbox"/>	76800 bits/s
<input type="checkbox"/>	115200 bits/s

1.5 Data link layer

(network-specific parameter; mark each supported option "X" and mark the maximum user data octets. If there is implemented a not standard classification of class 2 informations for the multi-point traffic, then type identification and transmission cause of all informations who are assigned to class 2 have to be indicated.)

Transmission procedure of the data link layer

<input type="checkbox"/>	Balanced transmission
<input type="checkbox"/>	Unbalanced transmission

Address of information object

<input type="checkbox"/>	Non-existent (only balanced transmission.)
<input type="checkbox"/>	1-Octet
<input type="checkbox"/>	2-Octets

Telegram length

<input type="checkbox"/>	Maximum length L (number of Octets)
--------------------------	-------------------------------------

1.6 Application layer

Transmission mode for application data

Mode 1 (least significant octet first), as defined in IEC 870-5-4, chapter 4.10, is used exclusively in this companion standard.

Common address of the ASDU

(system-specific parameters; mark each supported option "X")

<input type="checkbox"/>	1 Octet	<input checked="" type="checkbox"/>	2 Octets
--------------------------	---------	-------------------------------------	----------

Information object address

(system-specific parameter, mark all supported configurations 'X')

<input type="checkbox"/>	1 Octet	<input type="checkbox"/>	structured
<input type="checkbox"/>	2 Octets	<input checked="" type="checkbox"/>	unstructured
<input checked="" type="checkbox"/>	3 Octets		

Cause of transmission

(system-specific parameter, mark all supported configurations "X")

<input type="checkbox"/>	1 Octet	<input checked="" type="checkbox"/>	2 Octets (with address of origin)
--------------------------	---------	-------------------------------------	-----------------------------------

Selection of standard ASDU

Process information in monitor direction

(station-specific parameter; mark each supported Type ID "X" (if supported in standard direction), or "R" (if supported in reverse direction), or "B" (if supported in both directions))

<input checked="" type="checkbox"/>	<1> := Single-point information M_SP_NA_1
<input type="checkbox"/>	<2> := Single-point information with time tag M_SP_TA_1
<input type="checkbox"/>	<3> := Double-point information M_DP_NA_1
<input type="checkbox"/>	<4> := Double-point information with time tag M_DP_TA_1
<input checked="" type="checkbox"/>	<5> := Step position information M_ST_NA_1
<input type="checkbox"/>	<6> := Step position information with time tag M_ST_TA_1
<input checked="" type="checkbox"/>	<7> := Bitstring of 32 bit M_BO_NA_1
<input type="checkbox"/>	<8> := Bitstring of 32 bit with time tag M_BO_TA_1
<input checked="" type="checkbox"/>	<9> := Measured value, normalized value M_ME_NA_1
<input type="checkbox"/>	<10> := Measured value, normalized value with time tag M_ME_TA_1
<input checked="" type="checkbox"/>	<11> := Measured value, scaled value M_ME_NB_1
<input type="checkbox"/>	<12> := Measured value, scaled value with time tag M_ME_TB_1
<input checked="" type="checkbox"/>	<13> := Measured value, short floating point number M_ME_NC_1
<input type="checkbox"/>	<14> := Measured value, short floating point number with time tag M_ME_TC_1
<input checked="" type="checkbox"/>	<15> := Integrated totals M_IT_NA_1
<input type="checkbox"/>	<16> := Integrated totals with time tag M_IT_TA_1
<input type="checkbox"/>	<17> := Event of protection equipment with time tag M_EP_TA_1

<input checked="" type="checkbox"/>	<18> := Packed start events of protection equipment with time tag M_EP_TB_1
<input checked="" type="checkbox"/>	<19> := Packed output circuit information of protection equipment with time tag M_EP_TC_1
<input type="checkbox"/>	<20> := Packed single-point information with status change detection M_PS_NA_1
<input type="checkbox"/>	<21> := Measured value, normalized value without quality descriptor M_ME_ND_1
<input checked="" type="checkbox"/>	<30> := Single-point information with time tag CP56Time2a M_SP_TB_1
<input type="checkbox"/>	<31> := Double-point information with time tag CP56Time2a M_DP_TB_1
<input checked="" type="checkbox"/>	<32> := Step position information with time tag CP56Time2a M_ST_TB_1
<input checked="" type="checkbox"/>	<33> := Bitstring of 32 bit with time tag CP56Time2a M_BO_TB_1
<input checked="" type="checkbox"/>	<34> := Measured value, normalized value with time tag CP56Time2a M_ME_TD_1
<input checked="" type="checkbox"/>	<35> := Measured value, scaled value with time tag CP56Time2a M_ME_TE_1
<input checked="" type="checkbox"/>	<36> := Measured value, short floating point number with time tag CP56Time2a M_ME_TF_1
<input checked="" type="checkbox"/>	<37> := Integrated totals with time tag CP56Time2a M_IT_TB_1
<input type="checkbox"/>	<38> := Event of protection equipment with time tag CP56Time2a M_EP_TD_1
<input type="checkbox"/>	<39> := Packed start events of protection equipment with time tag CP56Time2a M_EP_TE_1
<input type="checkbox"/>	<40> := Packed output circuit information of protection equipment with time tag CP56Time2a M_EP_TF_1

Either use ASDU-type <2>,<4>,<6>,<8>,<10>,<12>,<14>,<16>,<17>,<18>,<19> or ASDU-type <30-40>.

Process information in control direction

(station-specific parameters; mark each supported Type ID "X" (if supported in standard direction), or "R" (if supported in opposite direction), or "B" (if supported in both directions))

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

Process information in control direction with time tag

<input type="checkbox"/>	<58> := Single command C_SC_TA_1
<input type="checkbox"/>	<59> := Double command C_DC_TA_1
<input type="checkbox"/>	<60> := Regulating step command C_RC_TA_1
<input type="checkbox"/>	<61> := Set point command, normalized value C_SE_TA_1
<input type="checkbox"/>	<62> := Set point command, scaled value C_SE_TB_1
<input type="checkbox"/>	<63> := Set point command, short floating point number C_SE_TC_1
<input type="checkbox"/>	<64> := Bitstring of 32 Bit C_BO_TA_1

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

System information in monitoring direction

(station-specific parameters; mark "X" if supported)

<70> := End of initialization M_EI_NA_1

System information in control direction

(station-specific parameters; mark each supported Type ID "X" (if supported in standard direction), or "R"(if supported in opposite direction), or "B" (if supported 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_TS_TA_1

Parameter in control direction

(station-specific parameters; mark each supported Type ID "X" (if supported in standard direction), or "R"(if supported in opposite direction), or "B" (if supported 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 number P_ME_NC_1
- <113> := Parameter activation P_AC_NA_1

File transfer

(station-specific parameters; mark each supported Type ID "X" (if supported in standard direction), or "R"(if supported in opposite direction), or "B" (if supported 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

Type Identifier and Cause of Transmission assignments
(station-specific parameters)

Empty box = combination of Type Identifier and Transmission Assignments are not used.

Mark Type Identification/Cause of transmission combinations:

'X' if used in standard direction

'R' if used in 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 up to 36	37 up to 41	44	45	46	47
<1>	M_SP_NA_1			X		X						X	X		X					
<2>	M_SP_TA_1																			
<3>	M_DP_NA_1																			
<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					
<10>	M_ME_TA_1																			
<11>	M_ME_NB_1																			
<12>	M_ME_TB_1																			
<13>	M_ME_NC_1			X		X									X					
<14>	M_ME_TC_1																			
<15>	M_IT_NA_1			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																			
<30>	M_SP_TB_1			X		X						X	X		X					
<31>	M_DP_TB_1																			
<32>	M_ST_TB_1			X		X						X	X		X					
<33>	M_BO_TB_1			X		X									X					
<34>	M_ME_TD_1			X		X									X					
<35>	M_ME_TE_1			X		X									X					
<36>	M_ME_TF_1			X		X									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						X	X	X	X	X						X	X	X	X
<46>	C_DC_NA_1																			
<47>	C_RC_NA_1																			
<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
<50>	C_SE_NC_1						X	X	X	X	X						X	X	X	X
<51>	C_BO_NA_1						X	X	X	X	X						X	X	X	X

Type Identification		Cause of transmission																		
		1	2	3	4	5	6	7	8	9	10	11	12	13	20 up to 36	37 up to 41	44	45	46	47
<58>	C_SC_TA_1																			
<59>	C_DC_TA_1																			
<60>	C_RC_TA_1																			
<61>	C_SE_TA_1																			
<62>	C_SE_TB_1																			
<63>	C_SE_TC_1																			
<64>	C_BO_TA_1																			
<70>	M_EI_NA_1*)				X															
<100>	C_IC_NA_1						X	X	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	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																			
<110>	P_ME_NA_1																			
<111>	P_ME_NB_1																			
<112>	P_ME_NC_1																			
<113>	P_AC_NA_1																			
<120>	F_FR_NA_1																			
<121>	F_SR_NA_1																			
<122>	F_SC_NA_1																			
<123>	F_LS_NA_1																			
<124>	F_AF_NA_1																			
<125>	F_SG_NA_1																			
<126>	F_DR_TA_1*)																			

1.7 Basic application functions

Station initialization

(station-specific parameters; mark "X" if function is supported)

Remote initialization

Cyclic data transmission

(station-specific parameter; mark "X" if function is supported in standard direction, or "R" if supported in reverse direction, or "B" if supported in both directions)

Cyclic data transmission

Read procedure

(station-specific parameter; mark "X" if function is supported in standard direction, or "R" if supported in reverse direction, or "B" if supported in both directions)

Read procedure

Spontaneous transmission

(station-specific parameter; mark "X" if function is supported in standard direction, or "R" if supported in reverse direction, or "B" if supported in both directions)

Spontaneous transmission

Note: no spontaneous transmission (empty box) 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
- 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 number M_ME_NC_1, M_ME_TC_1 and M_ME_TF_1

Station interrogation

(station-specific parameter; mark "X" if function is supported in standard direction, or "R" if supported in reverse direction, or "B" if supported in both directions)

<input checked="" type="checkbox"/>	Global						
<input checked="" type="checkbox"/>	Group 1	<input checked="" type="checkbox"/>	Group 2	<input checked="" type="checkbox"/>	Group 3	<input checked="" type="checkbox"/>	Group 4
<input checked="" type="checkbox"/>	Group 5	<input checked="" type="checkbox"/>	Group 6	<input checked="" type="checkbox"/>	Group 7	<input checked="" type="checkbox"/>	Group 8
<input checked="" type="checkbox"/>	Group 9	<input checked="" type="checkbox"/>	Group 10	<input checked="" type="checkbox"/>	Group 11	<input checked="" type="checkbox"/>	Group 12
<input checked="" type="checkbox"/>	Group 13	<input checked="" type="checkbox"/>	Group 14	<input checked="" type="checkbox"/>	Group 15	<input checked="" type="checkbox"/>	Group 16

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

Clock synchronization

(station-specific parameter; mark "X" if function is supported in standard direction, or "R" if supported in reverse direction, or "B" if supported in both directions)

- Clock synchronization
- Day of the week
- Bit RES1 or GEN (time tag substitute or not substitute)
- Bit SU (summer time)

Command transmission

(object-specific parameter; mark "X" if function is supported in standard direction, or "R" if supported in reverse direction, or "B" if supported in both directions)

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

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

Transmission of integrated totals

(station- or object-specific parameter; mark "X" if function is supported in standard direction, or "R" if supported in reverse direction, or "B" if supported in both directions)

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

- Counter read
- Counter freeze without reset
- Counter freeze with reset
- Counter reset

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

The addresses for each group have to be specified.

Parameter loading

(object-specific parameter; mark "X" if function is supported in standard direction, or "R" if supported in reverse direction, or "B" if supported in both directions)

- 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 is supported in standard direction, or "R" if supported in reverse direction, or "B" if supported in both directions)

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

Test procedure

(station-specific parameter; mark "X" if function is supported in standard direction, or "R" if supported in reverse direction, or "B" if supported in both directions)

- Test procedure

File transfer

(station-specific parameter, mark each supported 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 analogue values

File transfer in control direction

- Transparent file

Background scan

(station-specific parameter; mark "X" if function is supported in standard direction, or "R" if supported in reverse direction, or "B" if supported in both directions)

- Background scan

Note: used for data of a not required (triggering independently) general query

Acquisition of transmission delay

(station-specific parameter; mark "X" if function is supported in standard direction, or "R" if supported in reverse direction, or "B" if supported in both directions)

- Acquisition of transmission delay

Definition of time outs

Parameter	Default Value	Remarks	Selected value (Default)
t ₀	15 s	Time-out of connection establishment	15 s
t ₁	15 s	Time-out of send or test APDUs	15 s
t ₂	10 s	Time-out for acknowledges in case of no data messages t ₂ < t ₁	10 s
t ₃	30 s	Time-out for sending test frames in case of a long idle state	30 s

Maximum range of values for time-out t₀ to t₃: 1 to 120 s, accuracy 1 ms.

Great time-out values t₃ are needed in special cases where satellites or switched communications are used (for example at only daily or weekly connection set-up for the data transmission).

Maximum number of outstanding I format APDUs k and latest acknowledge APDUs (w)

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

Maximum range of values k: 1 to 99 APDUs, accuracy 1 APDU

Maximum range of values w: 1 to 99 APDUs, accuracy 1 APDU (Recommendation: w should not exceed two-thirds of k).

Portnummer

Parameter	Default Value	Remarks	Selected value (Default)
Portnumber Conn. 1	2404	adjustable	2404
Portnumber Conn. 2	2404	adjustable	2404

Redundant Connections

2

Number N of connections in a redundancy group