ELSETA

IEC 60870-5-101 Slave PID Interoperability

For WCC200 & WCC Lite devices

Elseta

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V0.4

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(in accordance with ISO / IEC Guide 22 and EN Section 45014)
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Contents

1 Preface

This document is applicable to the following product(s):
WCC200 and WCC Lite RTUs

Purpose of this manual
This manual describes the interoperability of WCC200 and WCC Lite RTUs using protocol element according to IEC 60870-5-101 and essentially contains:

- Interoperability IEC 60870-5-101

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

2 Introduction

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

3 Protocol architecture

3.1 Communication Protocol

Communication Protocols are the grammars through which computer-based devices communicate with one another - the way they organise, and transmit the bits and bytes of electronic on-off (binary) signals whose patterns encode data. Simply, a protocol is a set of rules that governs how message containing data and control information are assembled at a source for their transmission across the network and then dissembled when they reach their destination.

3.2 Anatomy of a communication Protocol

Most standards organisations use a layered model or stack to develop protocol specifications, with each layer performing some very specific functions and services.

3.2.1 The open Systems Interconnect Reference Model

The Open Systems Interconnect (OSI) reference model is a layered set of protocols to facilitate open communications between computer networks. It was developed by the International Organisation for Standardisation (ISO) in conjunction with the Consultative Committee on International Telegraphy and Telephony (CCITT).

The purpose of the OSI communication model is to make multivendor networking easy to implement, thereby reducing the overall costs and enhancing the level of system integration that normally could be realised with constantly changing and expanding protocol solutions.

3.2.2 The 7 - Layer Stack

The 7-Layer stack is based on established international ISO protocol standards. The architecture intended to provide full communications functionality based on the OSI Reference Model and is capable of supporting the majority and the industry data communication requirements.

3.2.3 The 3 - Layer Stack

The 3 - layer stack is also based on stable international standards. The 3 - layer stack provides a simpler mechanism for data communication and is based on the “Enhanced Performance Architecture” (EPA) as specified in clause 4 of IEC 870-5-3.

Table 1: Anatomy of communication protocol

7-layer	3-layer
7. Application	7. Application
6. Presentation	
5. Session	
4. Transport	
3. Network	
2. Data Link	2. Data Link
1. Physical	1. Physical

3.3 Scope and Object of IEC 60870-5-101

3.3.1 Introduction

IEC 60870-5-101 provides a communication profile for sending basic telecontrol messages between a central telecontrol station (controlling station) and telecontrol outstations (controlled stations), which uses permanent directly connected data circuits between the central station and individual outstations.

3.3.2 Scope

The defined telecontrol companion standard IEC 60870-5-101 utilizes standards of the series IEC 60870-5.

3.4 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this section of IEC 60870-5. At the time of publication, the editions indicated were valid. All normative documents are subject to revision, and parties to agreements based on this section of IEC 60870-5 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 50(371):	1984, International Electrotechnical Vocabulary (IEV) Chapter 371: Telecontrol
IEC 60870-1-1:	1988, Telecontrol equipment and systems - Part 1: General considerations - Section One: General principles
IEC 60870-1-3:	1997 Ed. 2, Telecontrol equipment and systems - Part 1: General considerations - Section Three: Glossary
IEC 60870-1-4:	1994, Telecontrol equipment and systems - Part 1: General considerations - Section 4: Basic aspects of telecontrol data transmission and organization of standards of IEC 60870-5 and IEC 60870-6
IEC 60870-5-3:	1992, Telecontrol equipment and systems - Part 5: Transmission protocols - Section 3: General structure of application data
IEC 60870-5-4:	1993, Telecontrol equipment and systems - Part 5: Transmission protocols - Section 4: Definition and coding of application information elements

IEC 60870-5-5:	1995, Telecontrol equipment and systems - Part 5: Transmission protocols - Section 5: Basic application functions
IEC 60870-5-101 ed.2:	2000, Telecontrol equipment and systems - Part 5: Transmission protocols - Section 101: & Companion standard for basic telecontrol tasks
ISO/IEC 8208:	1990, Information technology - Data communications - X.25 packet layer protocol for data terminal equipment

3.5 Definitions

3.5.1 Companion standard

A companion standard adds semantics to the definitions of the basic standard or a functional profile. This may be expressed by defining particular uses for information objects or by defining additional information objects, service procedures and parameters of the basic standard.

3.5.2 Group (of information objects)

A group (of information objects) is a selection of COMMON ADDRESSES or INFORMATION ADDRESSES which is specifically defined for a particular system.

3.5.3 Unbalanced transmission

Unbalanced transmission procedures are used in supervisory control and data acquisition (SCADA) systems in which a master station controls the data traffic by polling outstations sequentially. In this case the master station (master) is the primary station that initiates all message transfers while outstations are secondary stations (slaves) that may transmit only when they are polled.

The unbalanced mode procedure can be used generally, but must be used in party line «multidrop». configuration.

3.5.4 Balanced transmission

If balanced transmission procedures are used, each station may initiate message transfers. The balanced mode procedure is restricted to the configurations “point to point or multiple point to point”. Balanced mode the most effective way of communication on «point to point or multiple point to point». Balanced transmission can be used in full duplex mode. A balanced system thus contains a primary and a secondary side.

3.5.5 Controlling Station (Master station)

A location at which telecontrol of outstations is performed (IEV 371-06-01). Controlled Station (Outstation, Remote station, Remote terminal unit (RTU), Slave station) A station which is monitored or commanded by a master station (IEV 371-06-04).

3.5.6 Control direction

The direction of transmission from the controlling station, typical a SCADA system, to a controlled station, typical a station control system or a RTU.

3.5.7 Monitor direction

The direction of transmission from a controlled station to the controlling station.

3.5.8 Primary station

The station which starts the communication procedure, the master. In unbalanced transmission this is fixed, in balanced transmission the primary station is alternating.

3.5.9 Secondary station

The station which respond on the communication procedure, the slave. In unbalanced transmission this is fixed, in balanced transmission the secondary station is alternating.

4 Protocol structure

The physical layer uses ITU-T recommendations that provide binary symmetric and memory less transmission on the required medium in order to preserve the high level of data integrity of the defined block encoding method in the link layer. The link layer consists of a number of link transmission procedures using explicit LINK PROTOCOL CONTROL INFORMATION (LPCI) that are capable of carrying APPLICATION SERVICE DATA UNITs (ASDU's) as link-user data. The link layer uses a selection of frame formats to provide the required integrity/efficiency and convenience of transmission.

The application user layer contains a number of "Application Functions" that involve the transmission of APPLICATION SERVICE DATA UNITs (ASDU's) between source and destination.

The application layer of this companion standard does not use explicit APPLICATION PROTOCOL CONTROL INFORMATION (APCI). This is implicit in the contents of the ASDU DATA UNIT IDENTIFIER field and in the type of link service used.

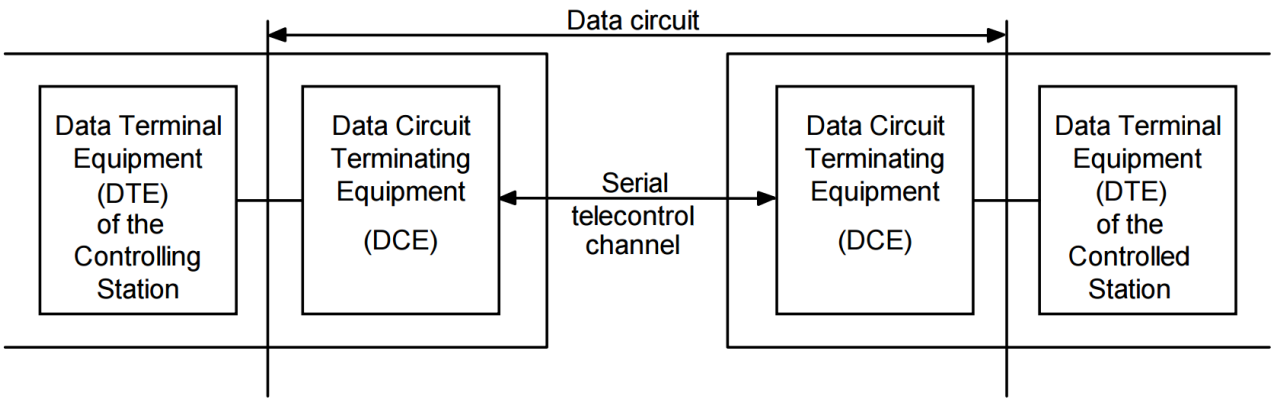
Table 3: Selected standard provisions of the defined Telecontrol companion standard

Selected application functions of IEC/DIS 870-5-5	**User process**
Selected application information elements of IEC 870-5-4	**Application (layer 7)**
Selected application service data units of IEC 870-5-3	
Selected link transmission procedures of IEC 870-5-2	**Link (layer 2)**
Selected transmission frame formats of IEC 870-5-1	
Selected ITU-T recommendations	**Physical (layer 1)**

4.1 Physical layer

The companion standard specifies ITU-T recommendations which define the interfaces between data circuit terminating equipment (DCE) and data terminating equipment (DTE) of the controlling and the controlled station (see Table 4).

Table 4: Interfaces and connections of controlling and controlled stations



The standard interface between DTE and DCE is the asynchronous ITU-T V.24/ITU-T V.28 interface. The use of the required interface signals depends on the operational mode of the used transmission channel

4.2 Link layer

IEC 870-5-2 offers a selection of link transmission procedures using a control field and the optional address fields.

4.3 Application layer

A companion standard or user conventions shall define appropriate ASDU's (telegram types) from a given general structure in IEC 870-5-3 and specifications in IEC 870-5-4.

4.4 Selection of ASDUs defined in IEC 60870-5-101 and additional ASDUs

The following ASDUs defined in IEC 60870-5-101 ed.2 and ASDUs for process information in control direction with time tag (defined in IEC 60870-5-104) are valid:

Table 5: Process information in monitor direction

TYPE IDENTIFICATION	:= UI8[1..8]<0..44>	
<0>	:= not defined	
<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 number	M_ME_NC_1
<14>	:= measured value, short floating point number 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 event 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
<22..29>	:= reserved for further compatible definitions	

<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 number 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
<41..44>	:= reserved for further compatible definitions	

Table 6: Process information in control direction

	TYPE IDENTIFICATION	:= UI8[1..8]<45..69>	
CON	<45>	:= single command	C_SC_NA_1
CON	<46>	:= double command	C_DC_NA_1
CON	<47>	:= regulating step command	C_RC_NA_1
CON	<48>	:= set point command, normalized value	C_SE_NA_1
CON	<49>	:= set point command, scaled value	C_SE_NB_1
CON	<50>	:= set point command, short floating point number	C_SE_NC_1
CON	<51>	:= bitstring of 32 bit	C_BO_NA_1
	<52..57>	:= reserved for further compatible definitions	

ASDUs for process information in control direction with time tag:

CON **)	<58>	:= single command with time tag CP56Time2a	C_SC_TA_1
CON **)	<59>	:= double command with time tag CP56Time2a	C_DC_TA_1
CON **)	<60>	:= regulating step command with time tag CP56Time2a	C_RC_TA_1
CON **)	<61>	:= set point command, normalized value with time tag CP56Time2a	C_SE_TA_1
CON **)	<62>	:= set point command, scaled value with time tag CP56Time2a	C_SE_TB_1
CON **)	<63>	:= set point command, short floating point number with time tag CP56Time2a	C_SE_TC_1
CON **)	<64>	:= bitstring of 32 bit with time tag CP56Time2a	C_BO_TA_1
	<65..69>	:= reserved for further compatible definitions	

Process information in control direction may be sent with or without a time tag, but must not be mixed when sending to a given station.

ASDUs marked (CON) in control direction are confirmed application services and may be mirrored in monitor direction with different causes of transmission. These mirrored ASDUs are used for positive/negative acknowledgements (verifications).

**) … ASDUs defined in IEC 60870-5-104

Table 8: System information in monitor direction

TYPE IDENTIFICATION	:= UI8[1..8]<70..99>	
<70>	:= end of initialization	M_EI_NA_1
<71..99>	:= reserved for further compatible definitions	

Table 9: System information in control direction

	TYPE IDENTIFICATION	:= UI8[1..8]<100..109>	
CON	<100>	:= interrogation command	C_IC_NA_1
CON	<101>	:= counter interrogation command	C_CI_NA_1
CON	<102>	:= read command	C_RD_NA_1
CON	<103>	:= Clock synchronization command	C_CS_NA_1
CON	<104>	:= test command	C_CS_NA_1
CON	<105>	:= reset process command	C_RP_NA_1
CON	<106>	:= delay aquisition command	C_CD_NA_1
	<107..109>	:= reserved for further compatible definitions	

Table 10: Parameter in control direction

	TYPE IDENTIFICATION	:= UI8[1..8]<110..119>	
CON	<110>	:= parameter of measured value, normalized value	P_ME_NA_1
CON	<111>	:= parameter of measured value, scaled value	P_ME_NB_1
CON	<112>	:= parameter of measured value, short floating point number	P_ME_NC_1
CON	<113>	:= parameter activation	P_AC_NA_1
	<114..119>	:= reserved for further compatible definitions	

Table 11: File transfer

TYPE IDENTIFICATION	:= UI8[1..8]<120..127>	
<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
<127>	:= reserved for further compatible definitions	

Table 12: Semantics of CAUSE OF TRANSMISSION

Cause	:= UI6[1..6]<0..63>	
<0>	:= not used	
<1>	:= periodic, cyclic	per/cyc
<2>	:= background scan*	back
<3>	:= spontaneous	spont
<4>	:= initialised	init
<5>	:= request or requested	req
<6>	:= activation	act

<7>	:= activation confirmation	actcon
<8>	:= deactivation	deact
<9>	:= deactivation confirmation	deactcon
<10>	:= activation termination	actterm
<11>	:= return information caused by a remote command	retrem
<12>	:= return information caused by a local command	retloc
<13>	:= file transfer	file
<14..19>	:= reserved for further compatible definitions	
<20>	:= interrogated by general interrogation	inrogen
<21>	:= interrogated by group 1 interrogation	inro1
<22>	:= interrogated by group 2 interrogation	inro2
<23>	:= interrogated by group 3 interrogation	inro3
<24>	:= interrogated by group 4 interrogation	inro4
<25>	:= interrogated by group 5 interrogation	inro4
<26>	:= interrogated by group 6 interrogation	inro4
<27>	:= interrogated by group 7 interrogation	inro4
<28>	:= interrogated by group 8 interrogation	inro4
<29>	:= interrogated by group 9 interrogation	inro4
<30>	:= interrogated by group 10 interrogation	inro4
<31>	:= interrogated by group 11 interrogation	inro4
<32>	:= interrogated by group 12 interrogation	inro4
<33>	:= interrogated by group 13 interrogation	inro4
<34>	:= interrogated by group 14 interrogation	inro4
<35>	:= interrogated by group 15 interrogation	inro4
<36>	:= interrogated by group 16 interrogation	inro4
<37>	:= requested by general counter request	reqcogen
<38>	:= requested by group 1 counter request	reqco1
<39>	:= requested by group 2 counter request	reqco2
<40>	:= requested by group 3 counter request	reqco3
<41>	:= requested by group 4 counter request	reqco4
<44>	:= unknown type identification	
<45>	:= unknown cause of transmission	
<46>	:= unknown common address of ASDU	
<47>	:= unknown information object address	

* Used in monitor direction to synchronise the process information of the controlling and controlled stations on a low priority continuous basis.

5 Interoperability list

This companion standard presents sets of parameters and alternatives from which subsets have to be selected to implement particular telecontrol systems. Certain parameter values, such as the number of octets in the COMMON 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 summarises 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 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)
R Function or ASDU is used in reverse mode
B Function or ASDU is used in standard and reverse mode
■ Parameter is not applicable to this companion standard

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

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.

5.1 Network configuration

(network - specific parameter)

☒ Point-to-point [1]
☒ Multiple point-to-point [2]
☒ Multidrop (Multipoint-partyline) [3]
☒ Multi-point-star

[1] Multipoint-Partyline (half duplex) with one Slave RS232 or RS485 (or RS422)
[2] Only available in WCC RTUs supporting more than one serial interfaces
[3] Over RS-485

5.2 Physical layer

Electrical interface

Implementation	Configuration	Remark
☒	RS-232	V.24/V.28 Standard - Point-to-Point (Master with 1 Slave)
☒	RS-422	V.11 (4-wire) - Point-to-Point (Master with 1 Slave)
☒	RS-485	V.11 (2-wire): • Multipoint-Partyline (Master with max. 32-Slaves) • Point-to-Point (Master with 1 Slave)

Transmission speed

Unbalanced interchange circuit V.24/V.28

- ☐ 100 bit/s
- ☐ 200 bit/s
- ☒ 300 bit/s
- ☒ 600 bit/s
- ☒ 1200 bit/s
- ☒ 2400 bit/s
- ☒ 4800 bit/s
- ☒ 9600 bit/s
- ☒ 19200 bit/s
- ☒ 38400 bit/s
- ☒ 57600 bit/s
- ☒ 115200 bit/s

Byte framing

- ☒ No parity
- ☒ Even parity
- ☒ Odd parity

- ☒ 1 stop bit
- ☐ 1.5 stop bits
- ☒ 2 stop bits

5.3 Link layer

(Network - specific parameter)

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
255 Maximum no. of retries [4]

Address field of the link

☐ Not present (balanced systems only)
☒ One octet (unbalanced systems only)
☒ Two octets (unbalanced systems only)
☐ Structured (to be defined by customer)
☒ Unstructured

Frame length

255 Maximum length L (number of octets) [5]

5.4 Application layer

Transmission mode for application data

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

Common address of ASDU

(system-specific parameter)

☒ One octet
☒ Two octets

Information object address

(system-specific parameter)

☒ One octet
☒ Two octets
☒ Three octets
☐ Structured
☒ Unstructured

Cause of transmission

[4] Configurable
[5] The maximum frame length can be selected per Controlled Station up to 255

(system-specific parameter)

☒ One octet

☒ Two octets (with originator address) Set to zero in case of no originator address

Selection of standard ASDUs

Process information in monitor direction (station-specific parameter)

☒	<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_TA_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, normalised value	M_ME_NA_1
☒	<10>	:= Measured value, normalised 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_TA1
☐	<18>	:= Packed start events of protection equipment with time tag	M_EP_TB1
☐	<19>	:= Packed output circuit information of protection equipment with time tag	M_EP_TC_1
☐	<20>	:= Packed single point information with time tag	M_PS_NA_1
☐	<21>	:= Measured value, normalised value without quality descriptor	M_ME_ND_1
☒	<30>	:= Single point information with full time	M_SP_TB_1
☒	<31>	:= Double point information with full time	M_DP_TB_1
☒	<32>	:= Step position information with full time	M_ST_TB_1
☐	<33>	:= Bitstring of 32 bit with full time	M_BO_TB_1
☒	<34>	:= Measured value, normalised value with full time	M_ME_TD_1
☒	<35>	:= Measured value, scaled value with full time	M_ME_TE_1
☒	<36>	:= Measured value, short floating point value with full time	M_ME_TF_1

☐	<37>	:= Integrated totals with full time	M_IT_TB_1
☐	<38>	:= Event of protection equipment with full time	M_EP_TD_1
☐	<39>	:= Packed start events of protection equipment with full time	M_EP_TE_1
☐	<40>	:= Packed tripping events of protection equipment with full time	M_EP_TF_1

Either 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)

☒	<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, normalised value	C_SE_NA_1
☒	<49>	:= Set point command, scaled value	C_SC_NB_1
☒	<50>	:= set point command, short floating point number	C_SC_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 number with time tag CP56Time2a	C_SE_TC_1

System information in monitor direction
(station-specific parameter)

☒	<70>	:= End of initialisation	M_EI_NA_1

System information in control direction
(station-specific parameter)

☒	<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

Parameter in control direction
(station-specific parameter)

☐	< 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)

☐	<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 blank or X, only available in monitor (standard) direction	F_DR_TA_1
☐	<127> := Query Log - Request archive file	F_SC_NB_1

Type identifier and cause of transmission assignments Shaded boxes: option not required. Blank: functions or ASDU not used.

(station-specific parameters)

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											X					
<2>	M_SP_TA_1			X																
<3>	M_DP_NA_1			X											X					
<4>	M_DP_TA_1			X																
<5>	M_ST_NA_1			X											X					
<6>	M_ST_TA_1			X																
<7>	M_BO_NA_1																			
<8>	M_BO_TA_1																			
<9>	M_ME_NA_1			X											X					
<10>	M_ME_TA_1			X																
<11>	M_ME_NB_1			X											X					
<12>	M_ME_TB_1			X																
<13>	M_ME_NC_1			X											X					
<14>	M_ME_TC_1			X																
<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																
<31>	M_DP_TB_1			X																
<32>	M_ST_TB_1			X																
<33>	M_BO_TB_1																			
<34>	M_ME_TD_1			X																
<35>	M_ME_TE_1			X																
<36>	M_ME_TF_1			X																
<37>	M_IT_TB_1																			
<38>	M_EP_TD_1																			
<39>	M_EP_TE_1																			
<40>	M_EP_TF_1																			
<45>	C_SC_NA_1						X	X			X									
<46>	C_DC_NA_1						X	X			X									
<47>	C_RC_NA_1						X	X			X									
<48>	C_SE_NA_1						X	X			X									
<49>	C_SE_NB_1						X	X			X									

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									
<58-63>							X	X												
<51>	C_BO_NA_1																			
<70>	M_EI_NA_1				X															
<100>	C_IC_NA_1						X	X			X									
<101>	C_CI_NA_1																			
<102>	C_RD_NA_1																			
<103>	C_CS_NA_1						X	X												
<104>	C_TS_NA_1																			
<105>	C_RP_NA_1																			
<106>	C_CD_NA_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																			

5.5 Basic application functions

Station initialization
(station-specific parameter)

☒ Remote initialization

Cyclic data transmission
(station-specific parameter)

☐ Cyclic data transmission

Read procedure
(station-specific parameter)

☐ Read procedure

Spontaneous transmission (station-specific parameter)

☒ Spontaneous transmission

Double transmission of information objects with cause of transmission spontaneous
(station-specific parameter)

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)

☒ global

☐ group 1 - 16

Clock synchronization
(station-specific parameter)

☒ Clock synchronization

☐ CDay of week used

☐ CRES1, GEN (time tag substituted/ not substituted) used

☐ CSU-bit (summertime) used

Command transmission
(object-specific parameter)

☒ 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 controlled station)

☒ Long-pulse duration (duration determined by a system parameter in the controlled station)

☒ Persistent output

☐ Supervision of maximum delay in command direction of commands and set point commands

0 Maximum allowable delay of commands and set point commands

Transmission of integrated totals

(station or object-specific parameter)

☐ Mode A: local freeze with spontaneous
☐ Mode B: local freeze with counter
☐ Mode C: freeze and transmit by counter interrogation
☐ 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

Parameter loading
(object-specific parameter)

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

Parameter activation
(object-specific parameter)

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

Test procedure
(station-specific parameter)

☐ Test procedure

File transfer
(station-specific parameter)

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)

☐ Background scan

Acquisition of transmission delay
(station-specific parameter)

☐ Acquisition of transmission delay

6 Information about the equipment manufacturer

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