

# 1 EN/IEC60870-5-101 Interoperability Document for RTU870 Compact Telemetry Outstation

## 1.1 Network configuration (network-specific parameter)

- |                                                             |                                                           |
|-------------------------------------------------------------|-----------------------------------------------------------|
| <input checked="" type="checkbox"/> Point-to-point          | <input checked="" type="checkbox"/> Multipoint-party line |
| <input checked="" type="checkbox"/> Multiple point-to-point | <input type="checkbox"/> Multipoint-star                  |

## 1.2 Physical layer (network-specific parameter)

### Transmission speed on RS232

- 300 bit/s
- 600 bit/s
- 1200 bit/s
- 2400 bit/s
- 4800 bit/s
- 9600 bit/s

### Transmission speed V23

- 1200 bit/s

## 1.3 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

### Address field of link

- Not present (balanced transmission only)
- One octet
- Two octets
- Structured
- Unstructured

### Frame length

Maximum length L (number of octets)

## 1.4 Application Layer

### 1.4.1 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.

#### 1.4.2 Common address of ASDU (system-specific parameter)

- One octet                     Two octets

Follow the link address.

#### 1.4.3 Information object address (system-specific parameter)

- One octet                     structured  
 Two octets                     unstructured  
 Three octets

#### 1.4.4 Cause of transmission (system-specific parameter)

- One octet                     Two octets (with originator address)

#### 1.4.5 Selection of standard ASDUs

##### Process information in monitor direction (station-specific parameter)

- |                                          |                                                                         |           |
|------------------------------------------|-------------------------------------------------------------------------|-----------|
| <input checked="" type="checkbox"/> <1>  | := Single-point information                                             | M_SP_NA_1 |
| <input checked="" type="checkbox"/> <2>  | := Single-point information with time tag                               | M_SP_TA_1 |
| <input checked="" type="checkbox"/> <3>  | := Double-point information                                             | M_DP_NA_1 |
| <input checked="" type="checkbox"/> <4>  | := Double-point information with time tag                               | M_DP_TA_1 |
| <input 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 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 checked="" 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 checked="" type="checkbox"/> <12> | := Measured value, scaled value with time tag                           | M_ME_TB_1 |
| <input type="checkbox"/> <13>            | := Measured value, short floating point value                           | M_ME_NC_1 |
| <input type="checkbox"/> <14>            | := Measured value, short floating point value with time tag             | M_ME_TC_1 |
| <input checked="" type="checkbox"/> <15> | := Integrated totals                                                    | M_IT_NA_1 |
| <input checked="" 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 type="checkbox"/> <18>            | := Packed start events of protection equipment with time tag            | M_EP_TB_1 |
| <input type="checkbox"/> <19>            | := Packed output circuit information of protection equipment w/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 checked="" type="checkbox"/> <31> | := Double-point information with time tag CP56Time2A                    | M_DP_TB_1 |
| <input type="checkbox"/> <32>            | := Step position information with time tag CP56Time2A                   | M_ST_TB_1 |
| <input 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 type="checkbox"/> <36> := Measured value, short floating point value 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 w/time tag CP56time2A	M_EP_TE_1
<input type="checkbox"/> <40> := Packed output circuit information of protection equipment w/time tag CP56Time2a	M_EP_TF_1

**Process information in control direction** (station-specific parameter)

<input checked="" type="checkbox"/> <45> := Single command Short pulse output , 500 ms pulse. (configurable) Persistent output Activation and activation termination	C_SC_NA_1
<input checked="" type="checkbox"/> <46> := Double command Short pulse output , 500 ms pulse. (configurable) Persistent output Activation and activation termination	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 Activation confirmation	C_SE_NB_1
<input type="checkbox"/> <50> := Set point command, short floating point value	C_SE_NC_1
<input type="checkbox"/> <51> := Bitstring of 32 bit	C_BO_NA_1

**System information in monitor direction** (station-specific parameter)

<input checked="" type="checkbox"/> <70> := End of initialization COI=0, local power switch on, is sent at cold and warm start.	M_EI_NA_1
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**System information in control direction** (station-specific parameter)

<input checked="" type="checkbox"/> <100> := Interrogation command	C_IC_NA_1
<input type="checkbox"/> <101> := Counter interrogation command	C_CI_NA_1
<input type="checkbox"/> <102> := Read command	C_RD_NA_1
<input checked="" type="checkbox"/> <103> := Clock synchronization command Spontaneous and activation confirmation	C_CS_NA_1
<input type="checkbox"/> <104> := Test command	C_TS_NB_1
<input type="checkbox"/> <105> := Reset process command	C_RP_NC_1
<input type="checkbox"/> <106> := Delay acquisition command	C_CD_NA_1

**Parameter in control direction** (station-specific parameter)

<input type="checkbox"/> <110> := Parameter of measured value, normalized value	P_ME_NA_1
<input type="checkbox"/> <111> := Parameter of measured value, scaled value	P_ME_NB_1
<input type="checkbox"/> <112> := Parameter of measured value, short floating point value	P_ME_NC_1
<input type="checkbox"/> <113> := Parameter activation	P_AC_NA_1

**File transfer** (station-specific parameter)

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

## 1.5 Basic application functions

### 1.5.1 Station initialization (station-specific parameter)

- Remote initialization

### 1.5.2 General Interrogation (system- or station-specific parameter)

Addresses are not defined by the firmware. Address mapping implemented by B-CON can be found in chapters 1.6 and 1.7

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

### 1.5.3 Clock synchronization (station-specific parameter)

- Clock synchronization  
Clock adjustment accuracy +/-2 seconds

### 1.5.4 Command transmission (object-specific parameter)

- Direct command transmission
- Direct set point command transmission
- 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
- Select and execute command
- Select and execute set point command
- C\_SE\_ACTTERM used

### 1.5.5 Transmission of Integrated totals (station- or object-specific parameter)

Addresses are not defined by the firmware. Address mapping implemented by B-CON can be found in chapter 1.6

- |                                                       |                                                  |
|-------------------------------------------------------|--------------------------------------------------|
| <input type="checkbox"/> Counter request              | <input type="checkbox"/> General request counter |
| <input type="checkbox"/> Counter freeze without reset | <input type="checkbox"/> Request counter group 1 |
| <input type="checkbox"/> Counter freeze with reset    | <input type="checkbox"/> Request counter group 2 |
| <input type="checkbox"/> Counter reset                | <input type="checkbox"/> Request counter group 3 |
|                                                       | <input type="checkbox"/> Request counter group 4 |

#### **1.5.6 Parameter loading (object-specific parameter)**

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

#### **1.5.7 Parameter activation (object-specific parameter)**

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

#### **1.5.8 File transfer (station-specific parameter)**

- File transfer in monitor direction
- File transfer in control direction

## 1.6 RTU870 outstation configuration

The configuration program IOTOOL870 can be used to configure the IEC60870-5-101 protocol in the RTU870 Outstations.

In IOTOOL870 you can assign IOA addresses to the physical I/O on a RTU870 system.

## 1.7 IEC870 Functions and data queues in RTU870

Physical I/O	IOA type	General interrogation	FIFO		Cyclic	
			Class 1	Class 2	Class 1	Class 2
DI	Single point	X	X			
DI x 2	Double point	X	X			
AI	Measured normalised value					X
AO	Measured normalised value					
Status Word Old Status Word	Measured scaled value	X	X X			
DI0-0..DI0-1 Counter	Integrated totals		X			
M9.6 Battery Error	Single point	X	X			
M9.7 Mains Error	Single point	X	X			
DO	Single command					
DO x 2	Double command					
<b>Responses to different requests/events</b>						
Activation/Deactivation responses						
Clock synchronise response						
Meter driver transparent messages						