Communication module

CM100

Manual

CM100.403570.001 Rev. 05.2022

Table of contents

Introduction

The Manual contains information about functions, recommendations for use, technical support, maintenance, packing, transportation, storage, as well as wiring diagrams.

Read this manual carefully before using the device.

Typical users

Engineers, personnel involved in setting, operation and maintenance of the devices.

Validity range

This manual applies to all CM100 modifications.

Support

If you have any questions about the device, please, do not hesitate to contact technical support of TOO “Institute of Automation”:

Website:	ains.kz
Phone:	+7 (7172) 645757
E-mail:	sales@ains.kz

ATTENTION:

- When using CM100, follow the rules and information set in this manual;
- Only qualified personnel are supposed to install, operate and maintain CM100;
- Do not use any cleaners except recommended by manufacturer;
- CM100 must be kept from impact;
- Before connecting CM100 to power supply, you must ensure that power supply’s voltage corresponds to the voltage set in the label on CM100.

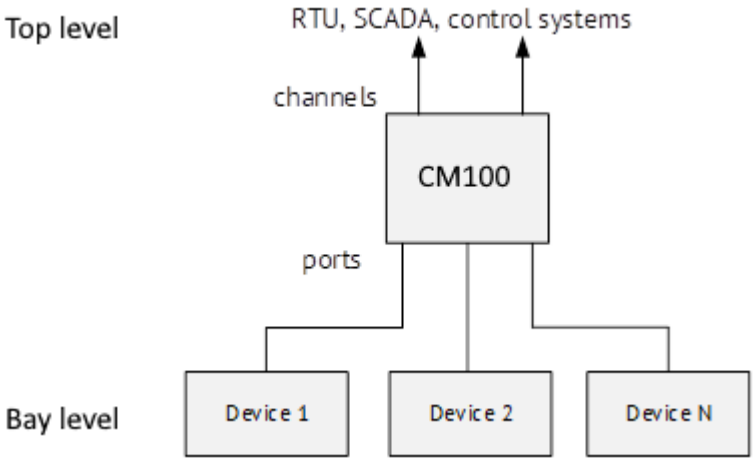
NOTICE:

- Our software is being constantly developed and implemented with new functions and features;
- New features may be added to the devices and software without announcing.

Glossary and symbols

- AC – Alternating current
- DC – Direct current
- DI – discrete input;
- DIO – Digital (binary) signal
- DO – digital output;
- GPS – the Global Positioning System;
- IED - Intelligent electronic device - integrated microprocessor-based controller of power system equipment.
- PE – Protective earth;
- RTU - remote terminal unit;
- SCADA – Supervisory Control and Data Acquisition
- UTC – Universal Coordinated Time.

Specific terminology for the manual:



- RTU channel – interfaces of RTU for data transmission to top level(s);
- RTU port – interfaces of RTU to poll devices on field level;
- Devices – multifunctional power meters, electrical meters, relay protection terminals and other devices which you can meet at bay level.

1 General information

CM100 is a reliable software and hardware platform for building remote control systems for substation and power plants.

Remote terminal unit CM100 designed to create geographically distributed systems:

— at the bay level installed devices (M1000, CM100 and other IED) which support measurement parameters values, monitoring digital signals and control by digital outputs to switchgears and mechanism;

— IEDs are connected to CM100 via RS-485 lines or Ethernet.

RTU CM100 consolidate and distribute collectable data to a top level of control systems. To control data traffic from IEDs CM100 uses absolute and relative apertures. Devices independently assign timestamps to registered events and measurements.

CM100 build on 32 bit ARM microcontroller and providing continuous operation for remote control systems.

CM100 use hard real-time algorithm, and thus provides high performance and reliability.

CM100 polls devices according IEC 60870-5-101, Modbus and etc. CM100 support up to 3 ports for device polling.

CM100 allows setup up to 16 channels to transmit data to upper level using LAN and RS485 ports.

RS-485 interface, Ethernet can be distributed by the user between data collection from field devices and transmission of information to the top level.

To communicate with the field devices are preferred protocol IEC 60870-5-101, which provides for the regulation of traffic between the RTU and devices, and allows sending data with timestamp directly from the sources of their formation.

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2 Design, dimensions, product identification system

CM100 has plastic case housing for DIN-rail mounting.

Figure 2.1. CM100 front view

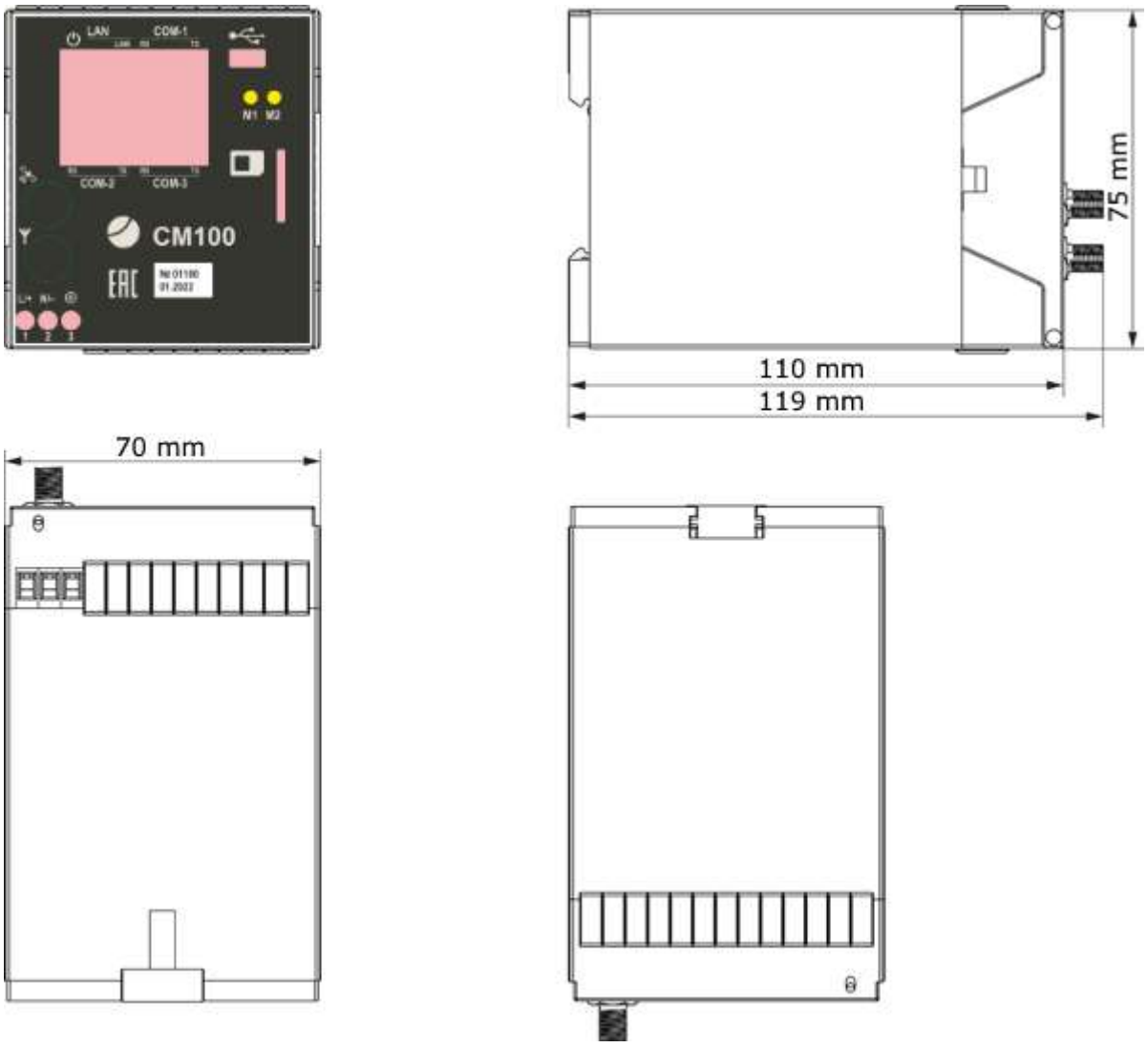

Figure 2.2. Dimensions of CM100

Dimension and weight see in Table 2.1.

Table 2.1

Modification	Dimension (WxHxD), mm	Max weight, kg	Note
CM100-x-C3E1GT-000	75x70x119	0,5	IP40, 35-mm DIN-rail mounting

Please use product identification system below to make an order.

CM100-_-C3E1GT-00

Power supply

220 — 120-370 V DC, 100-265 V AC (50 Hz)
110 — 40...160 V DC
24 — 18...36 V DC

For example: CM100-220-C3E1GT-000

3 Specification

3.1 Operating condition

Table 3.1

Condition	Value
Temperature, °C	-40…+70
Relativity humanity, %	5-95%
Atmospheric pressure, kPa	70-106
Turn-on time	<30 sec
MTBF	100000 h
Device life	15 year

3.2 Power supply

Table 3.2

	CM100-**220**-C3E1GT-000	CM100-**110**-C3E1GT-000	CM100-**24**-C3E1GT-000
Voltage AC	100...265 V AC, 45…55 Hz	-	-
Voltage DC	120...370 V DC	42..176 V DC	18...36 V DC
Consumption	10 VA	10 W	10 W

3.3 Isolation

Table 3.3

Isolation to ground	1 min voltage, VAC
Digital interfaces	500
Input power	2000

3.4 Data operation and time syncing

Table 3.1

Amount of data	8192 measuring values, 4096 binary statuses, 2048 commands
Max number of slave devices	240 devices IEC 60870-5-101 (RS/UDP)
Data transmission to upper level	According to IEC 60870-5-101-2006, IEC 60870-5-104-2004, Modbus RTU/TCP
Interfaces	
3 x RS-485 (2400 – 115200 b/s)	Ports or channels
1 x Ethernet 100Base-TX	
4G/3G/2G	Data transmission via GSM
Data transmission to top level	
Up to 14 channels	RS-485 (up to 3) - IEC 60870-5-101-2006, Modbus RTU; LAN, GPRS - IEC 60870-5-104-2004, Modbus TCP
Polling slave devices	
Up to 4 ports	RS-485: IEC 60870-5-101, IEC 60870-5-103, Modbus RTU;
	Ethernet: IEC 60870-5-104, Modbus TCP; МЭК 60870-5-101 via UDP;
Other	
Time syncing	Internal GPS/GLONASS receiver; From up to 2 SNTP-server; From upper level, using IEC 60870-5-101 и IEC 60870-5-104 (C_CS_NA_1 (103)). For sync time of field level devices uses IEC 60870-5-101 or SNTP server mode.

3.5 Interfaces detail

The RTU has four main interfaces (LAN, COM1, COM-2, COM-3) for configuring, polling field-level devices, and data transmission to the top level.

The USB port allows to set configuration, to read data and logs, to update firmware.

RS-485 ports (COM1, COM-2, COM-3)

Parameter	Value
Interface type	2-wire (D+, D-, GND)
Baud rate	2400, 4800, 9600, 19200, 38400, 57600, 115200 bps
Parity	none, odd, even
Stop bits	1, 2
Response delay	0…25.5 ms
Protocols	Modbus RTU IEC-60870-5-101

Ethernet port (LAN)

Parameter	Value
Interface type	100Base-Tx
Baud rate	100 Mb/s
Protocols	Modbus RTU over TCP, Modbus TCP, IEC-60870-5-104

Ports pins assignment

RJ45 pins	LAN	RS-485 (COM-1, COM-2, COM-3)
1	Tx+	
2	Tx-	
3	Rx+	
4		
5		GND
6	Rx-	
7		A (data+)
8		B (data-)

4 Features

4.1 Protocols

RTU CM100 polls devices which are supports protocols below:

- Modbus RTU;
- Modbus TCP;
- IEC 60870-5-101;
- IEC 60870-5-103;
- IEC 60870-5-104.

All ports settings are configured by ConfigTool.

Table 4.1. Available protocols

Protocol	
IEC 60870-5-101 **IEC 60870-5-104**	According appendix B
IEC 60870-5-103	ASDU 1, 2, 3, 9
Modbus RTU **Modbus TCP**	Available commands: 0x01, 0x02, 0x03, 0x04, 0x05, 0x06

Attention! When polling devices via Ethernet using IEC-60870-5-104 and Modbus TCP protocols, it is necessary to take into account that the total number of devices polled using these protocols and transmission channels to the higher level cannot exceed 48.

4.2 Real-time clock

CM100 has real-time clock. It allows to save event logging and to transmit data with timestamp over IEC 60870-5-101/104

Synchronization is carried out by IEC 60870-5-101/104 commands.

Data timestamp may be transmitted via IEC 60870-5-101/104 with UTC or local time (with summer/winter time).

All settings, including time source, validity checking and time zone are configured by ConfigTool.

Time accuracy with synchronization is up to 500 µs. Without synchronization CM100 has up to 3 seconds error per day.

4.3 Event logging

CM100 saves in non-volatile memory the following log files:

- Event log (software update, configuration change, power supply on/off, diagnostic messages); up to 40 last events with timestamp are available.
- Digital signals log (status of digital inputs and outputs, logic); 1000 last events with timestamp are available.

You can read stored discrete signals data from CM100 over IEC 60870-5-101/104. You may also read, erase or export to *.csv log files using ConfigTool software.

4.4 Logic

CM100 has a feature to create and process logical expressions using external and internal DIO statuses. As a result of expressions new DI statuses adding to the RTUs data sets.

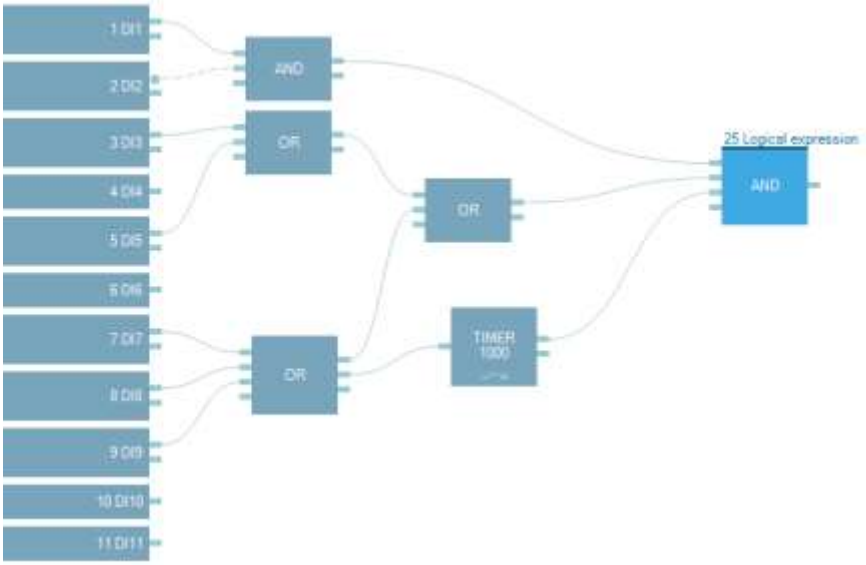

Figure 4.1. Example of a logical expression setting using ConfigTool software.

5 Operation

CM100 might be installed in protection compartments of enclosed switchgear, in panels and cabinets. Due to wide operating temperature range, CM100 can be applied in unattended and non-heated facilities.

Make sure that selective main circuit breaker for power supply circuit is set near the CM100.

Attention! Before connect/disconnect CM100 to power supply make sure that all sources of power supply are disconnected.

5.1 Package contents

Communication module CM100 - 1

All documentation and software updates see on http://sas.ains.tilda.ws

5.2 Before installation

Make sure that packing has no defects. Unpacking CM100, check the package contents.

Before configuring, installing, and operating CM100, read and follow the guide rules of the manual.

When connecting/disconnecting CM100 to digital interfaces make sure that the power supply of CM100 is switched off.

Do not use CM100 in an explosive or corrosive environment.

Save CM100 from heating above 70 °C, large temperature variations and strong electro-magnetic fields.

5.3 Mounting and connection

For safety, you must read the instructions in this manual before performing mounting and operation. Only qualified personnel should be allowed for installation.

CM100 is mounted on 35mm DIN-rail.

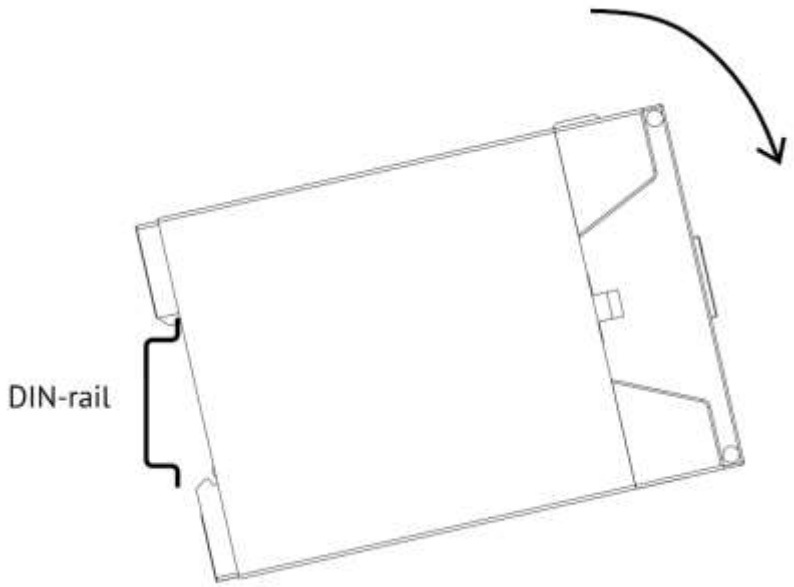

Figure 6.1. CM100 installation to 35 mm DIN-rail

Pull down the clip in bottom to remove CM100 from DIN-rail.

Recommendation for wires:

Tightening torque is 0.5 to 0.6 N·m.

Terminals	**CM100 recommended wires**
Power supply	2.5 mm^2 wires (AWG 14)
Digital interface	0.5 mm^2 wires (AWG 24) or shielded patch cord Cat5 cables using 8P8C (RJ-45)

Recommendation for protection:

Use surge protection for the safe operation of the power supply and the interface ports of CM100.

6 Maintenance and repair

When performing the maintenance, follow the rules set in the manual. Maintenance is supposed to be performed by qualified personnel only.

Do not open the housing during operation. Opening the CM100 voids the warranty.

CM100 does not need special maintenance operations.

For cleaning use non-abrasive detergent or 70% ethanol-water solution.

7 Transporting, storage and packing

CM100 may be transported with any type of transport. Transport conditions temperature is –50…+70°C, relative humidity is 95% at 30°C.

CM100 is packaged in the carton box.

Net weight – up to 0.6 kg.

Gross weight – up to 1.1 kg.

Store the device in dry and clean location. Essential storage conditions are listed in the following table:

Table 7.1

Condition	Device in manufacturer packing	Device without manufacturer packing
Temperature	5-40 °C	10-35 °C
Relative humidity	80% (at 25 °C)	80% (at 25 °C)

Appendix A. Connection diagrams.

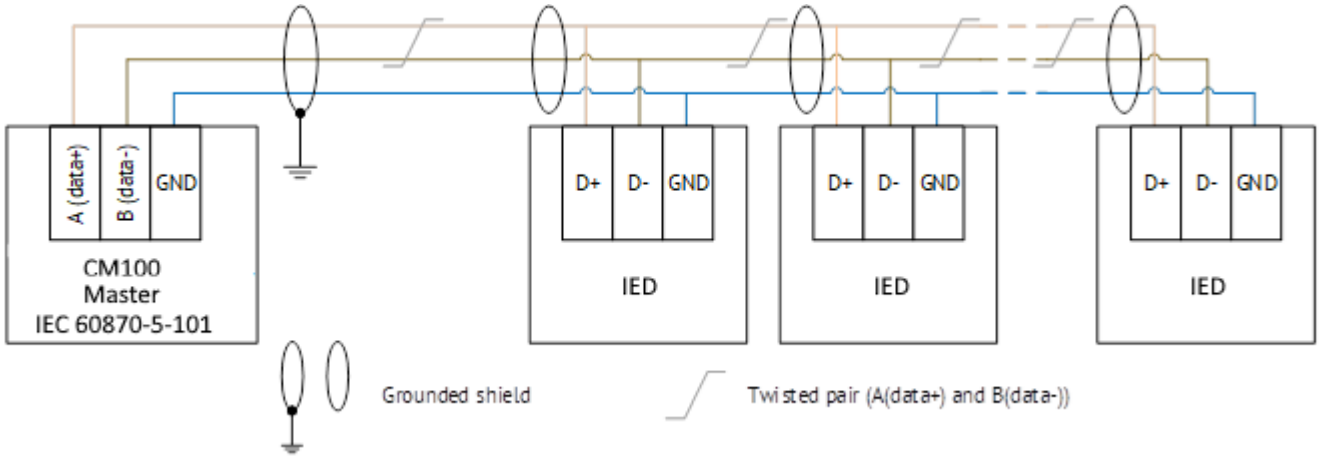

Figure A1. An example of the connection between CM100 and polled IEDs via IEC 60870-5-101 using RS-485.

Appendix B. CM100: IEC 60870-5-101/104

IEC 60870-5-101/104 Protocol Implementation Conformance Statement

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 summarizes 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.

Designation:

☐ - 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/

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

1. System or device

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

IEC 60870-5-101		IEC 60870-5-104	
☐	System definition	☐	System definition
☒	Controlling station definition (master)	☐	Controlling station definition (master)
☒	Controlled station definition (slave)	☐	Controlled station definition (slave)

2. Network configuration

IEC 60870-5-101			
☒	Point-to-point	☒	Multipoint-partyline
☒	Multiple point-to-point	☒	Multipoint-star

IEC 60870-5-104			
■	~~Point-to-point~~	■	~~Multipoint-partyline~~
■	~~Multiple point-to-point~~	■	~~Multipoint-star~~

3. Physical layer

(network-specific parameter, all interfaces and data rates that are used are to be marked with an «X»)

Transmission speed (control direction)

IEC 60870-5-101		
Unbalanced interchange circuit V.24/V.28 Standard	Unbalanced interchange circuit V.24/V.28 recommended if >1200 bit/s	Balanced interchange circuit X.24/X.27
☐ 100bit/s ☐ 200bit/s ☐ 300bit/s ☐ 600bit/s ☐ 1200bit/s	☒ 2400bit/s ☒ 4800bit/s ☒ 9600bit/s ☒ 19200bit/s ☒ 38400 bit/s ☒ 57600 bit/s ☒ 115200 bit/s	☐ 2400bit/s ☐ 4800bit/s ☐ 9600bit/s ☐ 19200bit/s ☐ 38400bit/s ☐ 56000bit/s ☐ 64000bit/s

IEC 60870-5-104		
Unbalanced interchange circuit V.24/V.28 Standard	Unbalanced interchange circuit V.24/V.28 recommended if >1200 bit/s	Balanced interchange circuit X.24/X.27
~~■ 100bit/s~~ ~~■ 200bit/s~~ ~~■ 300bit/s~~ ~~■ 600bit/s~~ ~~■ 1200bit/s~~	~~■ 2400bit/s~~ ~~■ 4800bit/s~~ ~~■ 9600bit/s~~	~~■2400bit/s~~ ~~■38400bit/s~~ ~~■4800bit/s~~ ~~■56000bit/s~~ ~~■9600bit/s~~ ~~■64000bit/s~~ ~~■19200bit/s~~

Transmission speed (monitor direction)

IEC 60870-5-101		
Unbalanced interchange circuit V.24/V.28 Standard	Unbalanced interchange circuit V.24/V.28 recommended if >1200 bit/s	Balanced interchange circuit X.24/X.27
☐ 100bit/s ☐ 200bit/s ☐ 300bit/s ☐ 600bit/s ☐ 1200bit/s	☒ 2400bit/s ☒ 4800bit/s ☒ 9600bit/s ☒ 19200bit/s ☒ 38400 bit/s ☒ 57600 bit/s ☒ 115200 bit/s	☐ 2400bit/s ☐ 4800bit/s ☐ 9600bit/s ☐ 19200bit/s ☐ 38400bit/s ☐ 56000bit/s ☐ 64000bit/s

IEC 60870-5-104		
Unbalanced interchange circuit V.24/V.28 Standard	Unbalanced interchange circuit V.24/V.28 recommended if >1200 bit/s	Balanced interchange circuit X.24/X.27
~~■ 100bit/s~~ ~~■ 200bit/s~~ ~~■ 300bit/s~~ ~~■ 600bit/s~~ ~~■ 1200bit/s~~	~~■ 2400bit/s~~ ~~■ 4800bit/s~~ ~~■ 9600bit/s~~	~~■2400bit/s~~ ~~■38400bit/s~~ ~~■4800bit/s~~ ~~■56000bit/s~~ ~~■9600bit/s~~ ~~■64000bit/s~~ ~~■19200bit/s~~

4. Link layer

Network-specific parameter, all options that are used are to be marked with an “×”. Specify the maximum frame length. If a non-standard assignment of class 2 messages is implemented for unbalanced transmission, indicate the type ID and COT of all messages assigned to class 2.

IEC 60870-5-101

Frame format FT 1.2, single character 1 and the fixed time out interval are used exclusively in this companion standard.

Link transmission procedure	Address field of the link
☐ Balanced transmission ☒ Unbalanced transmission	☐ Not present (balanced transmission only) ☒ One octet ☐ Two octets ☐ Structured ☒ Unstructured
Frame length 255 Maximum length L (control direction) 255 Maximum length L (monitor direction) 5 - repetitions Time during which repetitions are permitted (Trp) or number of repetitions	

When using an unbalanced link layer, the following ASDU types are returned in class 2 messages (low priority) with the indicated causes of transmission:

☐ The standard assignment of ASDUs to class 2 messages is used as follows:

Type identification	Cause of transmission

☒ A special assignment of ASDUs to class 2 messages is used as follows:

Type identification	Cause of transmission

NOTE: In response to a class 2 poll, a controlled station may respond with class 1 data when there is no class 2 data available.

IEC 60870-5-104

Frame format FT 1.2, single character 1 and the fixed time out interval are used exclusively in this companion standard.

Link transmission procedure	Address field of the link
■ ~~Balanced transmission~~ ■ ~~Unbalanced transmission~~	■ ~~Not present (balanced transmission only)~~ ■ ~~One octet~~ ■ ~~Two octets~~ ■ ~~Structured~~ ■ ~~Unstructured~~
~~Frame length~~ ■ ~~Maximum length L~~	

When using an unbalanced link layer, the following ASDU types are returned in class 2 messages (low priority) with the indicated causes of transmission:

■ The standard assignment of ASDUs to class 2 messages is used as follows:

Type identification	Cause of transmission

■ A special assignment of ASDUs to class 2 messages is used as follows:

Type identification	Cause of transmission

5. Application layer

Transmission mode for application data Mode 1 (least significant octet first), as defined in 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 with an X).

IEC 60870-5-101	IEC 60870-5-104
☒ One octet ☒ Two octets	~~■ One octet~~ ■ Two octets

Information object address

(system-specific parameter, all configurations that are used are to be marked with an X).

IEC 60870-5-101			
☐	One octet	☒	Structured
☒	Two octets	☒	Unstructured
☒	Three octets		

IEC 60870-5-104			
■	One octet	☐	Structured
■	Two octets	B	Unstructured
X	Three octets		

Cause of transmission

(system-specific parameter, all configurations that are used are to be marked with an X).

IEC 60870-5-101			
☒	One octet	☒	Two octets (with originator address)

IEC 60870-5-104			
~~■~~	~~One octet~~	☒	Two octets (with originator address)

Originator address is set to zero if not used

Selection of standard ASDUs

Process information in monitor direction

Type identification and cause of transmission assignments

(station-specific parameters).

IEC 60870-5-104-2004																
Type identification		Cause of transmission														
		1	2	3	4	5	6	7	8	9	10	11	12	13	20-36	37-41	44-47
<1>	M_SP_NA_1		X												X		
<2>	M_SP_TA_1			■		■						■	■				
<3>	M_DP_NA_1		X	X											X		
<4>	M_DP_TA_1			■		■						■	■				
<5>	M_ST_NA_1		X	X											X		

<6>	M_ST_TA_1																
<7>	M_BO_NA_1																
<8>	M_BO_TA_1																
<9>	M_ME_NA_1	X	X	X											X		
<10>	M_ME_TA_1																
<11>	M_ME_NB_1	X	X	X											X		
<12>	M_ME_TB_1																
<13>	M_ME_NC_1	X	X	X											X		
<14>	M_ME_TC_1																
<15>	M_IT_NA_1			X												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													
<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			X													
<38>	M_EP_TD_1																
<39>	M_IT_TB_1																
<40>	M_EP_TD_1																
<45>	C_SC_NA_1						R	R	R	R	R						R
<46>	C_DC_NA_1						R	R	R	R	R						R
<47>	C_RC_NA_1																
<48>	C_SE_NA_1																
<49>	C_SE_NB_1																
<50>	C_SE_NC_1																
<51>	C_BO_NA_1																
<70>	M_EI_NA_1																
<100>	C_IC_NA_1						R	R	R	R	R						
<101>	C_CI_NA_1						R	R			R						
<102>	C_RD_NA_1					R											R
<103>	C_CS_NA_1						R	R									R
<104>	C_TS_NA_1																
<105>	C_RP_NA_1																
<106>	C_CD_NA_1																
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<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_CG_NA_1																
<126>	F_DR_TA_1																

IEC 60870-5-101-2006	
Type identification	Cause of transmission

		1	2	3	4	5	6	7	8	9	10	11	12	13	20-36	37-41	44-47
<1>	M_SP_NA_1		X			X						X	X		X		
<2>	M_SP_TA_1																
<3>	M_DP_NA_1		X	X		X						X	X		X		
<4>	M_DP_TA_1																
<5>	M_ST_NA_1		X	X		X						X	X		X		
<6>	M_ST_TA_1																
<7>	M_BO_NA_1																
<8>	M_BO_TA_1																
<9>	M_ME_NA_1	X	X	X		X									X		
<10>	M_ME_TA_1																
<11>	M_ME_NB_1	X	X	X		X									X		
<12>	M_ME_TB_1																
<13>	M_ME_NC_1	X	X	X		X									X		
<14>	M_ME_TC_1																
<15>	M_IT_NA_1			X												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				
<31>	M_DP_TB_1			X		X						X	X				
<32>	M_ST_TB_1			X		X						X	X				
<33>	M_BO_TB_1																
<34>	M_ME_TD_1			X		X											
<35>	M_ME_TE_1			X		X											
<36>	M_ME_TF_1			X		X											
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<48>	C_SE_NA_1																
<49>	C_SE_NB_1																
<50>	C_SE_NC_1																
<51>	C_BO_NA_1																
<70>	M_EI_NA_1																
<100>	C_IC_NA_1						R	R	R	R	R						
<101>	C_CI_NA_1						R	R			R						
<102>	C_RD_NA_1					R											R
<103>	C_CS_NA_1						R	R									R
<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_CG_NA_1															
<126>	F_DR_TA_1															

6. Basic application functions

Station initialization

☐ Remote initialization

Cyclic data transmission

|X| Cyclic data transmission

Read procedure

☐ Read procedure

Spontaneous transmission

|×| Spontaneous transmission

Double transmission of information objects with cause of transmission spontaneous

(station-specific parameter, mark each information type with an “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,

M_PS_NA_1

☐ Double-point information M_DP_NA_1, M_DP TA 1, M_DP_TB_1

☐ Step position information M_ST_NA_1, M_ST_TA_1, M_ST_TB_1

☐ Bitstring of 32 bit M_BO_NA_1, M_BO_TA_1, M_BO_TB_1 (if defined for a specific project, see 7.2.1.1)

☐ Measured value, normalized value M_ME_NA_1, M_ME_TA_1, M_ME_ND_1, M_ME_TD_1

☐ Measured value, scaled value M_ME_NB_1, M_ME_TB_1, M_ME_TE_1

☐ Measured value, short floating point number M_ME_NC_1, M_ME_TC_1, M_ME_TF_1

Station interrogation

|X| – Global

|X| – Group 1 ☐ – Group 7 ☐ – Group 13

☐ – Group 2 ☐ – Group 8 ☐ – Group 14

☐ – Group 3 ☐ – Group 9 ☐ – Group 15

☐ – Group 4 ☐ – Group 10 ☐ – Group 16

☐ – Group 5 ☐ – Group 11

☐ – Group 6 ☐ – Group 12 ☐ – Information object addresses assigned to each group are configurable

Clock synchronization

R – Clock synchronization

Command transmission

X Direct command transmission

☐ Direct set point command transmission

X Select and execute command

☐ Select and execute set point command

☐ C_SE ACTTERM used

☐ No additional definition

X Short-pulse duration (1 sec.)
X Long-pulse duration (1 sec.)
X Persistent output (255 sec.)

Transmission of integrated totals

☐ 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

R – Clock synchronization
R – Request counter group 1

☐ Request counter group 2

☐ Request counter group 3

☐ Request counter group 4

Parameter loading

☐ Threshold value

☐ Smoothing factor

☐ Low limit for transmission of measured value

☐ High limit for transmission of measured

Parameter activation

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

Test procedure

☐ Test procedure

File transfer

File transfer in monitor direction

|X| 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

|X| Background scan

For IEC 60870-5-104 only:

Definition of time outs

Parameter	Default value	Remarks	Selected value
t_0	30 s	Time-out of connection establishment	
t_1	15 s	Time-out of send or test APDUs	15
t_2	10 s	Time-out for acknowledges in case of no data messages t2 < t1	10
t_3	20 s	Time-out for sending test frames in case of a long idle state	20

Maximum range for timeouts t0 to t2: 1 s to 255 s, accuracy 1 s.

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

Parameter	Default value	Remarks
K	12 APDU	Maximum difference receive sequence number to send state variable
W	8 APDU	Latest acknowledge after receiving w I format APDUs

K and W are not change.

Port number

Parameter	Value	Remarks
Port number	2404	In all cases

Appendix C. CM100: Modbus

About Modbus

Modbus (Schneider Electric trademark) is a serial communications protocol. Full description see on www.modbus.org. This protocol is used for data communication via RS-485 or Ethernet interfaces.

Modbus RTU

In Modbus RTU, bytes are sent consecutively with no space in between them with a 3-1/2 character space between messages for a delimiter.

- 1 start bit
- 8 data bits
- 1 parity bit; no parity bit
- 1 stop bit, if parity even; 2 stop bits if parity none
- Cyclical Redundancy Check (CRC)

Available function code

h01 read coil;

h02 read input status;

h03 read holding registers;

h04 read input registers;

h05 write single coil;

h06 write single holding register.

Modbus-request:

read

address	function code	Start address of parameters	Number of parameters	checksumm
1 byte	1 byte	2 bytes	2 bytes	2 bytes

write

address	function code	Parameter's address	Status of parameter	checksumm
1 byte	1 byte	2 bytes	2 bytes	2 bytes

address – slave address of polling device; 1…254.

function code – one of available function codes;

Start address of parameters (Parameter's address) – 0…65535 (hFFFF). When setting up the RTU address specified in decimal format

Address in device	Converting	Address for CM100
15 (decimal)	-	15
0x02 (1-byte hex)	h02 = 2	2
0x011B (2-byte hex)	h011B = 283	283
416396 (logical address)	Discard the first digit, then of the remaining number subtract 1	16395

Number of parameters – the number of parameters requested; for example, when requesting three parameters with the starting address 02, the answer will be the values stored in the addresses 02, 03, 04.

Parameter status – used when sending remote control commands, takes the values hFF00 (enable) or h0000 (disable);

The checksum is a standard protocol checksum (CRC).