

SIA-C

Self & Dual Powered Overcurrent & Earth Fault Protection Relay



IEC60870-5-103 PROTOCOL MANUAL

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1 INTEROPERABILITY PROFILE FOR IEC60870-5-103

This document describes the IEC 60870-5-103 data points and structures available in the IED. The point lists describe a superset of all data available through the standard configuration/s.

1.1 Physycal layer

1.1.1 Electrical interface

- ☒ EIA RS-485
- ☐ Number of Loads **32** for one protection equipment.

NOTE: EIA RS-485 standard defines unit loads so that 32 of them can be operated on one line. For detailed information to clause 3 of EIA RS-485 standard.

1.1.2 Optical Interface

- ☐ Glass fibre.
- ☐ Plastic fibre.
- ☐ F-SMA type connector.
- ☐ BFOC/2,5 type connector.

1.1.3 Transmission speed

- ☒ 4800 bits/s.
- ☒ 9600 bits/s.
- ☒ 19200 bits/s.
- ☒ 38400 bits/s.
- ☒ 57600 bits/s.
- ☒ 115200 bits/s.

NOTE: Configurable Data Size, parity and stop bits.

Available options: 8-N-1, 8-E-1, 8-0-1, 9-N-1, 8-N-2, 8-E-2, 8-0-2, 9-N-2

1.2 Link Layer

There are no choices for the link layer.

1.3 Application Layer

1.3.1 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.

1.3.2 COMMON ADDRESS of ASDU

- ☒ One COMMON ADDRESS OF ASDU (identical with station address)
- ☐ More than one COMMON ADDRESS OF ASDU.

1.3.3 Selection of standard information numbers in monitor direction

The following functionalities are supported:

- ☒ Initialization.
- ☒ General Interrogation.
- ☒ Synchronization.
- ☒ Commands Transmission.

Type in monitor direction:

	TYP	Semantics
☒	<1>	Time-tagged message.
☒	<2>	Time-tagged message with relative time.
☒	<3>	Measurements I.
☒	<5>	Identification.
☒	<6>	Time synchronization.
☒	<8>	General interrogation termination.

Type in control direction:

	TYP	Semantics
☒	<6>	Time synchronization.
☒	<7>	General Interrogation.
☒	<20>	General command.

SIA-C	FUN	INF	Description	TYP	COT
System functions in monitor direction					
X	160	<0>	End of General Interrogation	8	End of GI
X	160	<0>	Sincronización	6	TS
X	160	<2>	Reset FCB	5	Reset FCB
X	160	<3>	Reset CU	5	Reset CU
X	160	<4>	Start/restart	5	Start/restart
Measurements in monitor direction					
X	160	<148>	Measurements IL1,2,3, V L1,2,3, P, Q, f (**)	9	CYC

From FW version M4.00 function and information numbers of the following monitoring direction points are configurable from SICOM software:

Monitor direction information	COT	FUN range	INF range
Status indications			
Fault indications	SE, GI, RO	0-255	0-255
Auto-reclosure indication			
Generic functions			

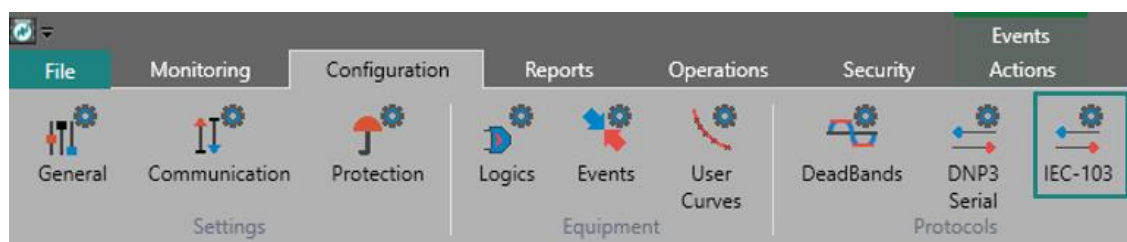
SE: Spontaneous event (3) GI: General interrogation (1) RO: Remote operation indication (12)

NOTE: The spontaneous events generated depend on the event configuration. From sicom event configuration activation and deactivation can be selected.

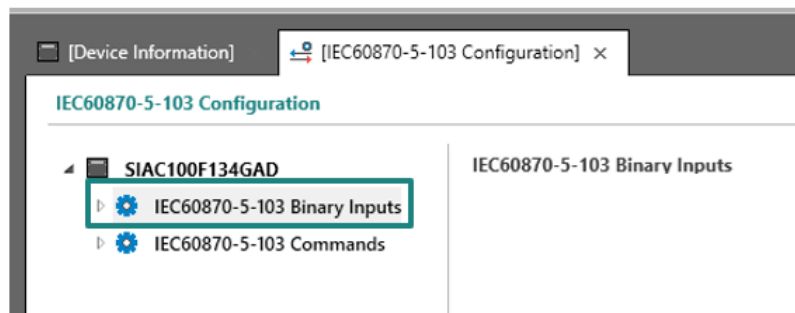
For example, for configuring the following command addresses:

FUN	INF	Descripción	TYP	COT
100	<1>	Watchdog	1	SE, GI
200	<1>	50-1 Trip	1	SE, GI
210	<1>	50-2 Trip	1	SE, GI
220	<1>	50G-1 Trip	1	SE, GI

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Select Binary inputs and fill the table with the required commands and addresses



The following table will open:

IEC60870-5-103 Binary Inputs

Position	Criterion	State 2	State 1	Type	Function	Information	COT	Inverted
1	Self Diagnostic	-	Ready	1: Time-Tagged message	100	1	-- <1> Spontaneous<9> General Interrogation	☒
2	50-1	-	Phase Trip	1: Time-Tagged message	200	1	-- <1> Spontaneous<9> General Interrogation	☐
3	50-2	-	Phase Trip	1: Time-Tagged message	210	1	-- <1> Spontaneous<9> General Interrogation	☐
4	50G-1	-	Ground Trip	1: Time-Tagged message	220	1	-- <1> Spontaneous<9> General Interrogation	☐
5	-	-	-	-	0	0	-- -	☒
6	-	-	-	-	0	0	-- -	☐
7	-	-	-	-	0	0	-- -	☐
8	-	-	-	-	0	0	-- -	☐

Where:

Name	Description
Position	Internal index of the position on the configuration table
Criterion	Group of signals according to the relay model, selectable from a list.
State 2	Used only in circuit breaker monitoring to select open / closed to on / off.
State 1	Select the state of the criterion selected in "Function" column to communicate.
Type	Define transmission format, selectable from a list.
Function	Configurable Function Type, from 0 to 255.
Information	Configurable Information Number, from 0 to 255.
COT	Selection of desired the cause of transmission.
Inverted	When activated, relay will communicate to the master the contrary value of the real data point .

After configuring the desired states, send the configuration to the relay with "Send configuration" button on the top menu bar.

Type Identification 9: Measurands II (Measurements IL123, VL123, P, Q, f).

SIAC relay uses this type to send the value of the currents IL1, IL2 and IL3, the other measures remain with value 0.

- I_{L1} , I_{L2} and I_{L3} current values are in the range 0 – 4095 where 4095 corresponds to $1,2 * I_n$.
- For values higher than $1,2 * I_n$ an overflow situation is indicated.

e.g : A received value of 806 with nominal value $I_n = 5 A$ corresponds to 1,18 A.

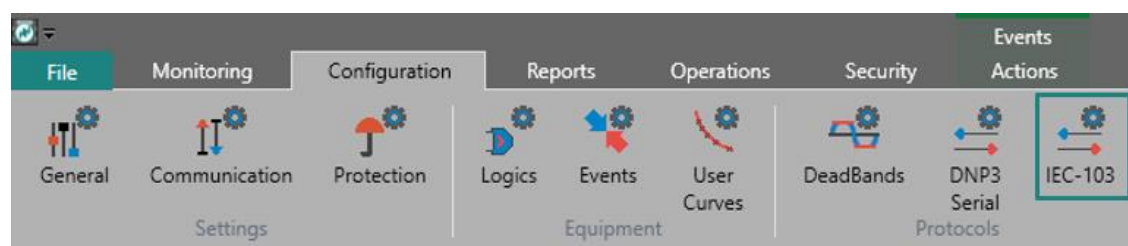
1.3.4 Selection of standard information numbers in control address

SIA-C	FUN	INF	Descripción	TYP	COT
System functions in control address					
X	160	<0>	Initiation of general interrogation	7	Init of GI
X	160	<0>	Synchronization	6	TS
General commands in control address					
X	160	<16>	Auto-recloser Unblock (ON) / Block (OFF)	20	ACK, NACK
Particular commands in control address					
X	200	<1>	CB Open (OFF) / Close (ON)	20	ACK, NACK
X	200	<10>	Reset TI (OFF)	20	ACK, NACK

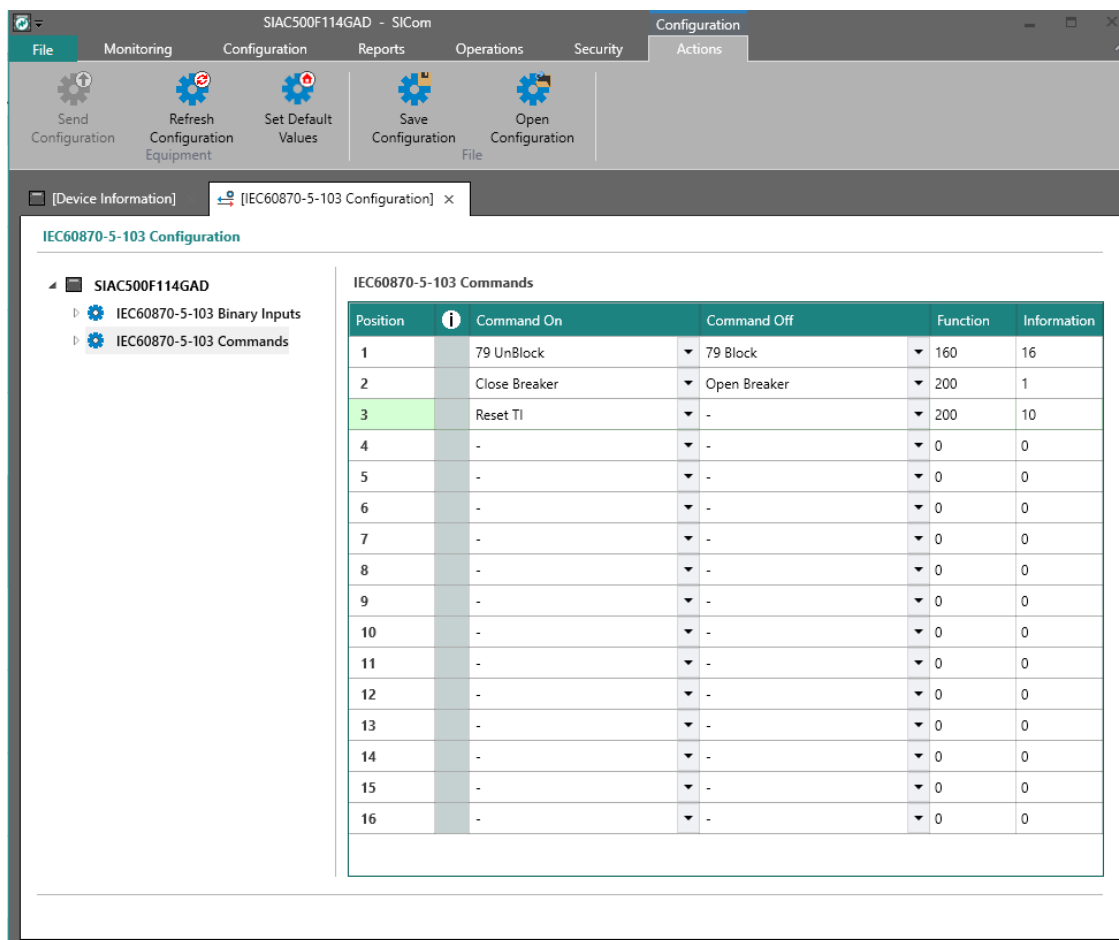
General commands such as Auto-recloser Unblock / Block and Particular commands like open / close CB can be configured from sicom software. For example, for configuring the following command addresses:

FUN	INF	Descripción	TYP	COT
160	<16>	Auto-recloser Unblock (ON) / Block (OFF)	20	ACK, NACK
200	<1>	CB Open (OFF) / Close (ON)	20	ACK, NACK
200	<10>	Reset TI (OFF)	20	ACK, NACK

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Select Commands and fill the table with the required commands and addresses



Position	Command On	Command Off	Function	Information
1	79 Unblock	79 Block	160	16
2	Close Breaker	Open Breaker	200	1
3	Reset TI	-	200	10
4	-	-	0	0
5	-	-	0	0
6	-	-	0	0
7	-	-	0	0
8	-	-	0	0
9	-	-	0	0
10	-	-	0	0
11	-	-	0	0
12	-	-	0	0
13	-	-	0	0
14	-	-	0	0
15	-	-	0	0
16	-	-	0	0

Where:

Name	Description
Position	Internal index of the position on the configuration table
Command On	Command to execute when "On" value is sent to the relay, selectable from a list.
Command Off	Command to execute when "Off" value is sent to the relay, selectable from a list.
Function	Configurable Function Type, from 0 to 255.
Information	Configurable Information Number, from 0 to 255.

After configuring the desired commands, send the configuration to the relay with "Send configuration" button on the top menu bar.

To receive command confirmation from the relay, on the binary inputs configuration, select the COT 12 "Remote operation" in addition to the spontaneous COT 1 in the command status.

IEC60870-5-103 Binary Inputs

Position	Criterion	State 2	State 1	Type	Function	Information	COT	Inverted
1	IEC 103	-	Close Breaker	1: Time-Tagged message	300	1	<1> Spontaneous<12> Remote operation	☐
2	IEC 103	-	Open Breaker	1: Time-Tagged message	300	2	<1> Spontaneous<12> Remote operation	☐
3	-	-	-	-	0	0	-	☐



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