

# 29.2 IEC 60870-5-103

## IEC 60870-5-103

The IEC 60870-5-103 protocol is a companion standard for the informative interface of protection equipment. Standard IEC 60870-5-103 was prepared by IEC technical committee 57 (Power system control and associated communications). It is a companion standard for the basic standards in series IEC 60870-5:

Standard IEC 60870-5-103 defines communication between protection equipment and devices of a control system (supervisor or RTU) in a substation.

Standard IEC 60870-5-103 defines a multipoint communication protocol via which information can be exchanged between a control system (supervisor or RTU) and one or more protection devices. The control system is the master and the protection devices are the slaves. Each slave is identified by a unique address between 1 and 254. Address 255 is reserved for broadcast frames.

## IEC 60870-5-103 Master

### Configuring datapoints

WCC Lite supports IEC 60870-5-103 Master protocol over serial link (according EIA RS-485). Its full functionality list can be found in a IEC 60870-5-103 PID Interoperability List.

To use IEC 60870-5-103 Master in WCC Lite, it has to be configured via an Excel configuration. This configuration contains two Excel sheets where parameters have to be filled in - Devices and Signals.

IEC 60870-5-103 parameters for Devices tab

| Parameter    | Type    | Description                              | Required | Default Value<br>(when not specified) | Range   |       |
|--------------|---------|--|----------|---------------------------------------|---|-------|
|              |         |  |          |                                       | Min   | Max   |
| name         | string  | User-friendly name for a device          | Yes      |                                       |   |       |
| description  | string  | Description of a device                  | No       |                                       |   |       |
| device_alias | string  | Alphanumeric string to identify a device | Yes      |                                       |   |       |
| enable       | boolean | Enabling/disabling of a device           | No       | 1                                     | 0   | 1     |
| protocol     | string  | Protocol to be used                      | Yes      |                                       | IEC 60870-5-103 master  |       |
| device       | string  | Communication port                       | Yes      |                                       | PORT1   | PORT2 |
| baudrate     | integer | Communication speed, baud/s              | No       | 9600                                  | 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200 |       |
| databits     | integer | Data bit count for communication         | No       | 8                                     | 8   |       |
| stopbits     | integer | Stop bit count for communication         | No       | 1                                     | 1   | 2     |

|                        |         |   |     |      |                 |       |
|------------------------|---------|---|-----|------|-----------------|-------|
| parity                 | string  | Communication parity option   | No  | none | none, even, odd |       |
| flowcontrol            | string  | Number of requests, before link is considered lost (device status signals are changed) and reconnect attempt will be issued | No  | none | none            |       |
| link_address           | integer | Destination address when in transmit and source address when broadcasting   | Yes |      | 0               | 65535 |
| asdu_address           | integer | Application Service Data Unit address   | Yes |      | 0               | 65535 |
| time_sync_interval_sec | integer | Time frame between Time Synchronization requests in seconds   | No  | 60   |                 |       |
| gi_interval_sec        | integer | Time frame between General Interrogation requests in seconds, if 0 requests are disabled                                    | No  | 300  |                 |       |
| scan_rate_ms           | integer | Polling interval in milliseconds. Time frame between two telegrams from master  | No  | 100  |                 |       |
| timeout_ms             | integer | Response timeout in milliseconds  | No  | 1000 |                 |       |
| serial_delay           | integer | Communication device's serial delay in milliseconds. Time frame in which master station is not TX'ing after last RX byte    | No  | 50   |                 |       |
| retry_count            | integer | Number of retries of failed requests before announcing that device is in Error state  | No  | 3    |                 |       |
| retry_delay_ms         | integer | Time before the next retry in milliseconds  | No  | 500  |                 |       |

### IEC 60870-5-103 master parameters for Signals tab

| Parameter           | Type   | Description   | Required     | Default Value<br>(when not specified) | Range |     |
|---------------------|--------|---|--------------|---------------------------------------|-------|-----|
|                     |        |   |              |                                       | Min   | Max |
| signal_name         | string | User-friendly signal name                             | Yes          |                                       |       |     |
| device_alias        | string | Alphanumeric string to identify a device              | Yes          |                                       |       |     |
| signal_alias        | string | Unique alphanumeric name of the signal to be Yes used | Yes          |                                       |       |     |
| source_device_alias | string | device_alias of a source device                       | For commands |                                       |       |     |

|                       |         |   |                     |     |   |   |
|-----------------------|---------|---|---------------------|-----|---|---|
| source_signal_aliases | string  | signal_alias of a source signal   | For commands        |     |   |   |
| enable                | boolean | Enabling/disabling of an individual signal  | No                  | 1   | 0 | 1 |
| log                   | integer | Allow signal to be logged. If <b>log is 0</b> signal will not be logged. If <b>log is more than 0</b> signal will be logged | No                  | 0   |   |   |
| gi                    | boolean | Including/excluding (1 or 0) signal from General Interrogation  | No                  | 0   | 0 | 1 |
| common_address        | integer | Address of a destination device   | Yes                 |     |   |   |
| function              | integer | Function number   | No                  | 0   |   |   |
| info_address          | integer | Information object address  | Yes                 |     |   |   |
| info_number           | integer | Information number  | Yes                 |     |   |   |
| data_type             | integer | ASDU type identifier  | No                  | 0   |   |   |
| fleeting              | boolean | Mark signal as fleeting type (1 or 0). Fleeting signals have to go to DPI::OFF after defined time                           | No                  |     | 0 | 1 |
| normalise_time_ms     | integer | Time in milliseconds between station receiving DPI::ON and automatically switching to DPI::OFF                              | If fleeting is used | 100 |   |   |

IEC 60870-5-103 has an additional signal which can be configured to show communication status. It is used to indicate if the slave device has disconnected from master (WCC Lite). To configure such signal, two columns should be filled with particular values. To a newly created additional signal one should make **job\_todo** equal to device\_status and **tag\_job\_todo** equal to communication\_status.

## Debugging a IEC 60870-5-103 Master application

If configuration for IEC 60870-5-103 devices is set up, the handler for the protocol will start automatically. If a configuration is missing or contains errors, the protocol will not start. It is done intentionally to decrease unnecessary memory usage.

If IEC 60870-5-103 does not work properly (e.g. no communication between devices, data is corrupted, etc.), a user can launch a debug session from command-DPI interface and find out why link is not functioning properly or use WCC Utility to do that.

To launch a debugging session, a user should stop the iec103-master process and run the iec103-master command with respective flags.

- Step 1: Service must be stopped by entering the following command into the wcc-lite:  
**/etc/init.d/iec103-master stop**
- Step 2: After service is stopped it must be started with the preferred configuration file (JSON files found in /etc/ folder) and a debug level 7: **iec103-master -c /etc/iec/iec103-master.json -d7**
- Step 3: Once the problem is diagnosed normal operations can be resumed with the following command:  
**/etc/init.d/iec103-master start**

### IEC 60870-5-103 command line debugging options

```
-h [ -help ] Display help information
-V [ -version ] Show version
-d<debug level> Set debugging level
-c [ -config ] Config path
-r [ -raw ] Show raw telegram data
-f [ -frame ] Show frame data
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