

# SPA-ZC 200/SPA-ZC 202 IEC 60870-5-103/SPA-gateway

## Commissioning Manual





We reserve the right to change data without prior notice.

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# 1. Features

- IEC 60870-5-103 connection module for devices with SPA-bus interface.
- Polling of measurements, indications and events from SPA-bus slave modules to the local database.
- Spontaneous sending of measurements changed, indications and events to the IEC 60870-5-103 master.
- Transfer of DO commands.
- Configuration via the IEC 60870-5-103 interface.
- SPA-bus interface using a 9-pin D-connector with RS-485, RS-232 or TTL-level signalling, with a speed of 9600 bits/s.
- IEC 60870-5-103 interface using glass or plastic fibre cables, with a transfer rate of 9600 or 19200 bits/s.

## 1.1. Elements and connectors of SPA-ZC 20\_ modules

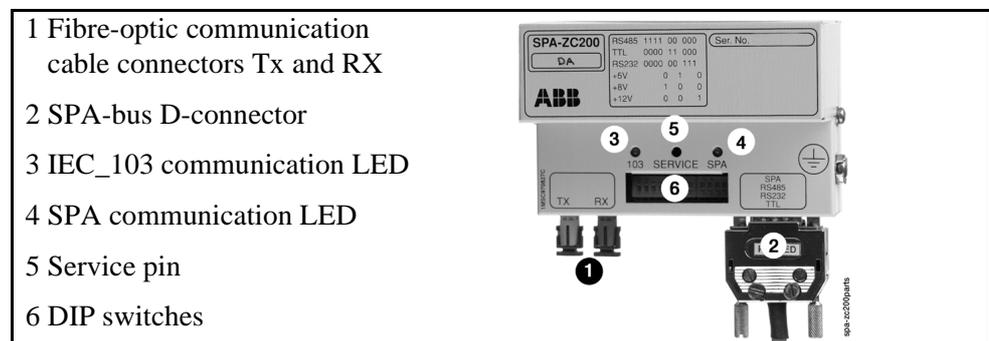


Fig. 1.1.-1 Elements of SPA-ZC 200

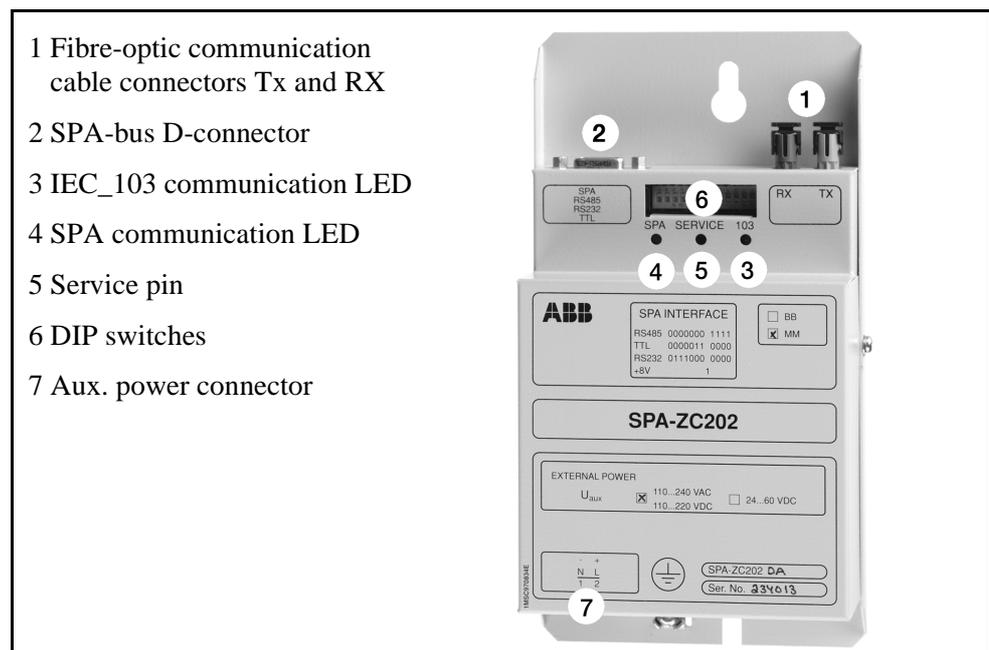


Fig. 1.1.-2 Elements of SPA-ZC 202

## 2. ICT Configuration Tool

### 2.1. ICT software

The ICT (IEC\_103 Configuration Tool) software is used to configure ABB's IEC 60870-5-103/SPA Gateway (ISG) in order to make it work in certain SPACOM systems. The gateway needs a working configuration to behave as required. When installed in an existing or a new system, the ISG module has to be configured with the ICT tool.

The ICT software uses default values for given SPACOM devices. Only very important, non-fixed values need to be entered. The process of downloading and saving backup copies is simple and fast.

### 2.2. System Requirements

The ICT user interface requires a 32-bit version of Microsoft Windows (Windows NT4 or Windows 9x). A serial port (COM1 or COM2) must also be available. When the ICT software is running on a PC with two (or more) COM ports, the other COM port(s) may not be used simultaneously.

All necessary cables are included in the ISG Configuration Package. See the SPA-ZC 200/202 Installation Manual (1MRS752018-MUM) for ordering information.

To install ICT software you need a working directory on a hard drive, with full read/write access. The software can also be installed in a network folder by using its own setup program.

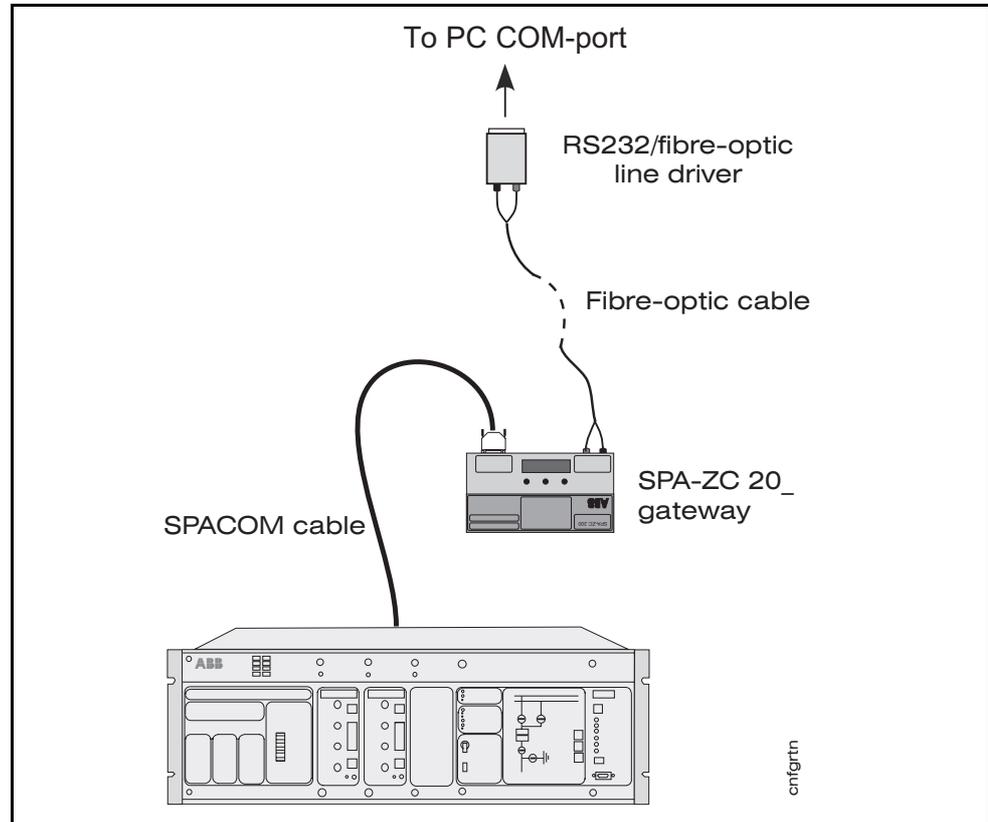


Fig. 2.2.-1 Configuration arrangement principle

### 2.3. Installing the software

The installation program will copy the needed files to the hard drive while giving you information about the progress. By default, the software is installed in the subdirectory ICT of the Program Files directory. When necessary, you are able to change the destination directory in the dialogue box below by clicking the button Change Directory.



Fig. 2.3.-1 ICT setup dialogue

1. Insert the CD-ROM into the CD-ROM drive (e.g. drive D:). The installation will start if Autorun option is active in your PC. Otherwise you will have to start installation via Start > Run of Windows task bar.
2. Accept the default directory by clicking the installation icon, or change the directory (Change Directory button) and then click the installation icon.
3. Answer the questions of the installation program during the progress of the installation.
4. The following setup dialogue box appears when the installation is complete (see figure 2.3.-2).



Fig. 2.3.-2 Setup status dialogue

Now you are ready to run the ICT software, see chapter 2.4.

## 2.4.

### Starting configuration process

Once you have installed the devices mechanically and connected the PC serial port to the gateway through the fibre-optic module, you can start the ICT configuration process. Follow the step-by-step instructions below:

1. Start the software (from the default directory) by clicking Start > Programs > ICT > Gateway Configuration Tool. The following window should appear when the program is started.

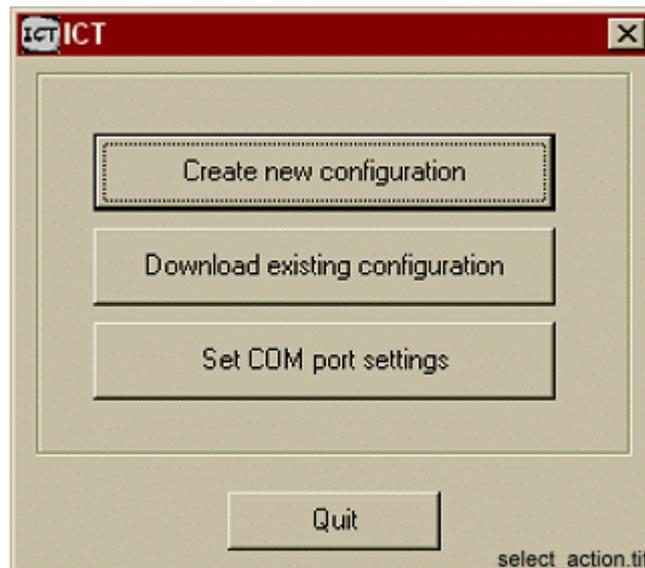


Fig. 2.4.-1 Selecting the action

When you start the software for the first time, configure the serial port as follows:

2. Click the `Set COM port settings` button.
3. Choose the communication port (COM1 or COM2). Baud rate, parity and byte length are fixed to 9600 bps, Even and 8 bit.

After setting the communication port, you can either:

1. create a new configuration or
2. download an existing one (the files have the extension `.cfg`).

A new configuration made with ICT gets the file name extension `.cfg` by default.

The standard way to name a configuration is: `XXXX_yyy.cfg`, where `XXXX` is a four-character type identification code and `yyy` is the IEC103/SPA Gateway address possibly filled with leading zeros.

## 2.5.

### New configurations

The main purpose of the ICT is to create new configurations. To create a new configuration, you can open a ready configuration template (see figure 2.5.-1). The configuration window that opens contains a table, see figure 2.5.-2. Fill in the values required in this table.

The connection from the ICT to the gateway can be monitored from a bus status area of the relay configuration window. Thus the user is able to see if the device is working or not, see figure 2.5.-2.

1. Click the button `Create new configuration` to open the window shown in figure 2.5.-1.
2. Select the file location from the field `Location`.
3. Choose the configuration template, to be used in the configuration process according to the relay type from the `List of available configurations`.

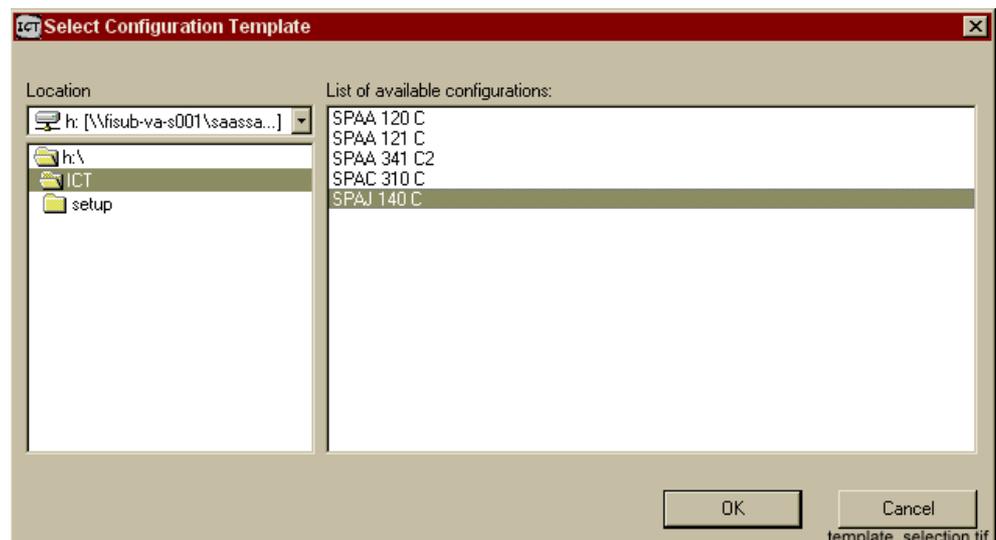


Fig. 2.5.-1 The Select Configuration Template dialogue

4. Click **OK** to open the window shown in figure 2.5.-2. In some cases an instruction window may open. If so, read the information and quit it.
5. Fill in the configuration form completely (the contents depend on the template chosen).  
Please make sure that the values are correctly filled in because the formats of the fields are not validated. The **Download** button will be activated.

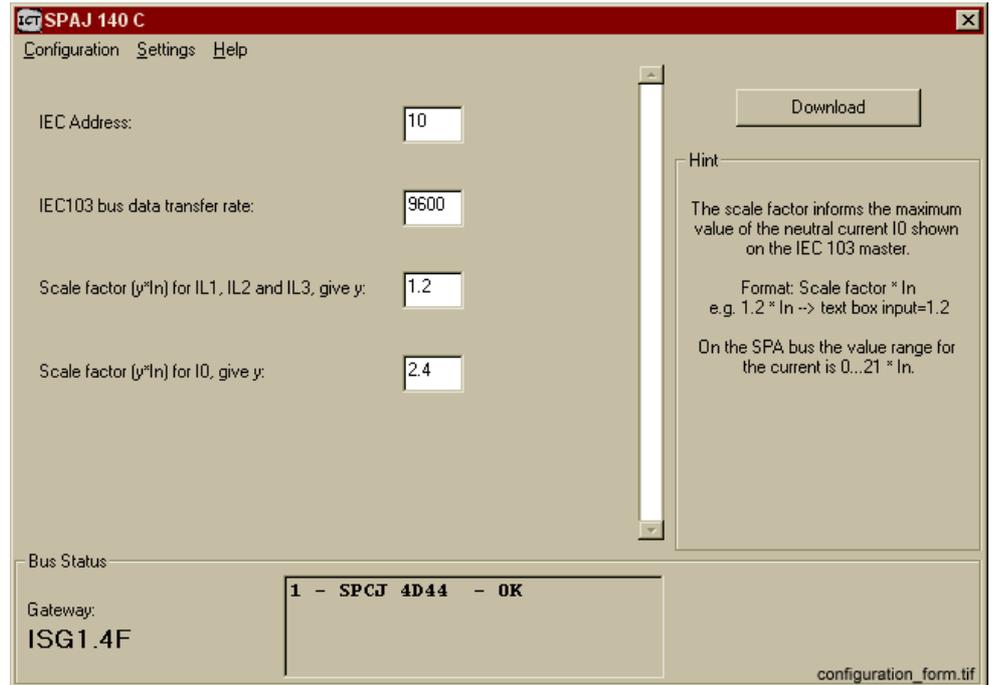


Fig. 2.5.-2 The configuration form

6. Test the gateway and connections from the menu **Settings > Update Bus Status**. In about 10 seconds the gateway version number and the SPA device found is shown in the **Bus Status** dialogue area of the configuration form, see figure 2.5.-2. (In the example, the SPA device SPCJ 4D44 is not the one required).  
If the **Bus status** information is **FAIL**, you have to set up serial the port again and make sure the connection works physically.
7. If the **Bus Status** information is correct, disable connection polling and click **Download**. A **Save configuration file as...** box is displayed.
8. It is recommended to save the file with the proposed name for backup purposes. When the file name has been accepted, click **Save** to start downloading.
9. Wait for the final configuration messages, see figure 2.5.-3.
10. If an error message occurs, the serial port settings may be wrong or there may be some problems with the connection between ISG and the PC. Check connections and repeat procedure from the beginning.



Fig. 2.5.-3 Download status dialogue

## 2.6. Use of existing configuration file

Another way to use ICT is to download an existing configuration file. This is possible when a configuration has been generated and loaded and the user wants to reload it.

1. Click the Download existing configuration button.
2. Select the file to be downloaded: the configuration process starts.
3. Follow the process steps 9 and 10 of the section 2.5. above.

When the configuration is downloaded to a previously used gateway, the existing configuration in the gateway should be erased:

- Press the service pin (see figures 1.1.-1 and 1.1.-2) during power-up.

## 2.7. Upgrading and flexibility

The required configuration templates are published with the ICT software package. The most general SPACOM devices are supported.

The templates have to be made by a competent technician with enough knowledge of the technical specifications of SPACOM products and data cross-referencing between the protocols used and the file formats needed. These customized templates are ordered separately from the manufacturer.

## 2.8. Technical notes

The files installed in the ICT directory include configuration templates, executable files and some temporary files that are maintained by the program itself. The files are not directly editable. All tool settings and settings of the devices connected to it are made with the ICT software.

The software needs a working directory with full access and it does not support simultaneous users. The configuration template library can be installed in a separate folder but all executable files must be in the working directory.

### 3. Applications

This chapter explains the typical use of an IEC\_103/SPA gateway together with SPA-bus devices.

An IEC\_103/SPA gateway can be used for the connection of SPA-bus devices to any IEC\_103 master device. Normally there is an IEC\_103/SPA gateway connected to the rear of the device.

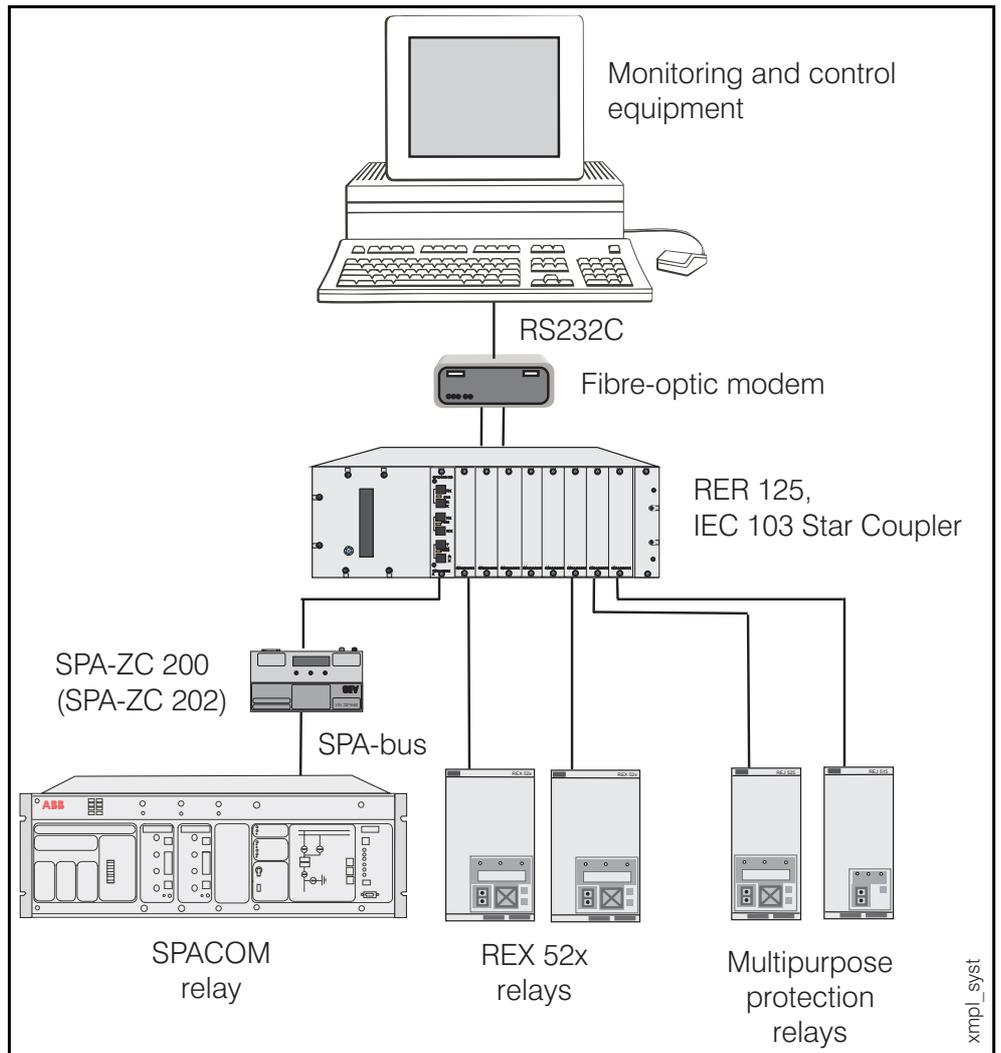


Fig. 3.-1 Structure of a substation protection and control system with IEC103-protocol and IEC103/SPA gateways

## 4. Functions

The main functions of the IEC\_103/SPA gateway are illustrated in figure 4.-1. The gateway is in principle similar to any other SPA-bus master unit and it includes all the necessary SPA-bus master functions. The main difference is the limited database and event buffer size, and the maximum number of SPA-bus slave units permitted.

The main task of the gateway is to collect data from a number of SPA devices and to allow an IEC\_103 master to access that data by emulating IEC\_103 slave units.

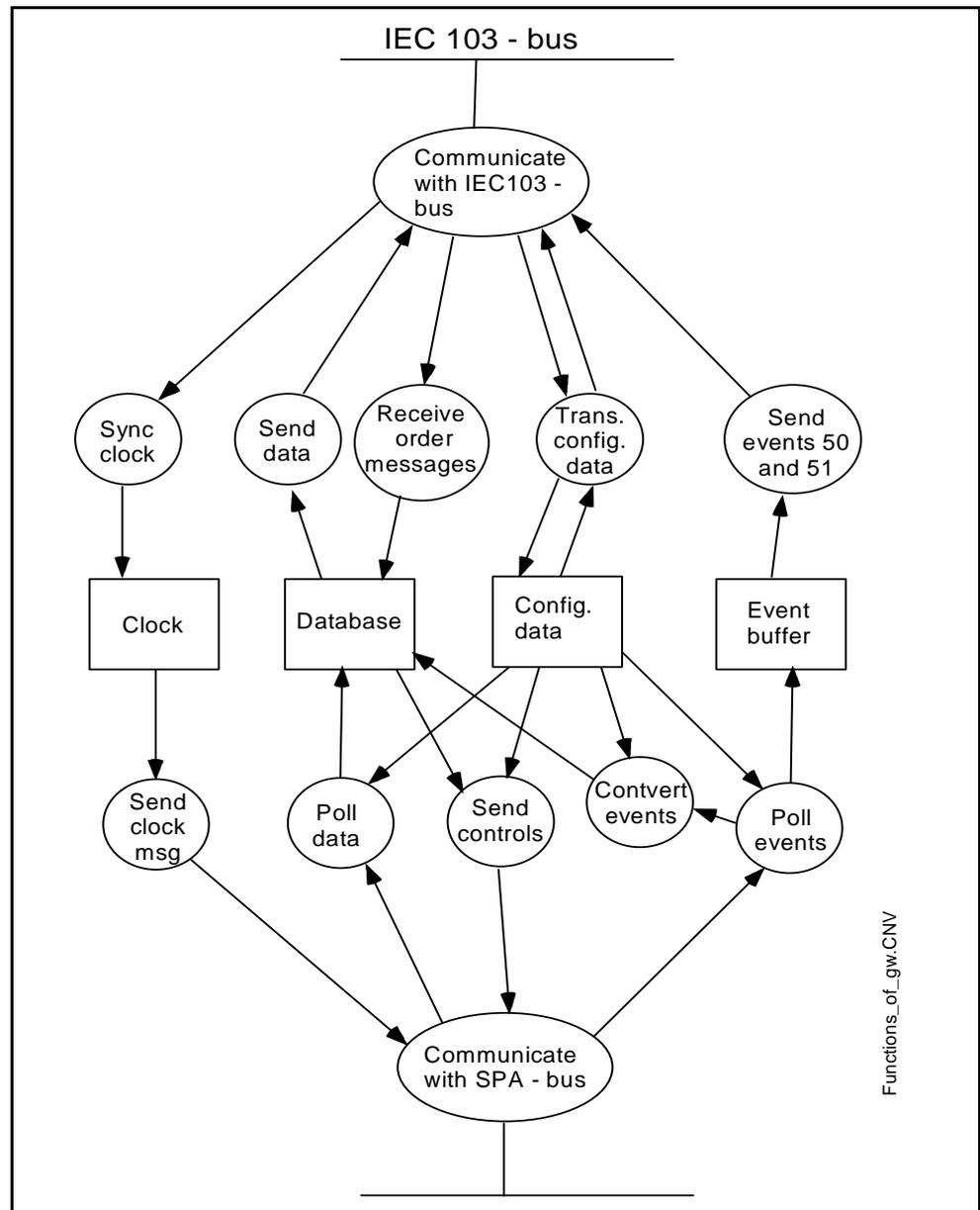


Fig. 4.-1 Functions of the IEC\_103/SPA gateway

## 5. Technical data

### Interfaces

#### Specifications of fibre-optic connections:

	Glass fibre	Plastic fibre
<b>Cable connector</b>	ST connector	snap-in connector
<b>Cable diameter</b>	62.5/125 µm	1 mm
<b>Max. cable length</b>	1 000 m	20 m
<b>Wavelength</b>	820-900 nm	660 nm
<b>Transmitted power</b>	-13 dBm (HFBR-1414)	-13 dBm (HFBR-1521)
<b>Receiver sensitivity</b>	-24 dBm (HFBR-2412)	-20 dBm (HFBR-2521)

#### IEC\_103 interface:

- Type SPA-ZC 20x MM:  
Optical glass fibre transmitter and receiver with ST connectors
- Type SPA-ZC 20x BB:  
Optical plastic fibre transmitter and receiver with snap-in connectors
- Communication rate 9600 or 19200 bits/s

#### SPA-bus interface:

- RS-232, RS-485 or TTL
- 9-pin, male D-connector (SPA-ZC 200), female D-connector (SPA-ZC 202)
- The maximum cable length for SPA-ZC 200 is 0.5 m.

### Power supply

#### SPA-ZC 200:

- Source via pins of the SPA-bus D-connector:  
+8 V DC from pin 9 (RS 485, TTL) or  
+12 V DC from pin 4 (RS 232C) or  
+5 V regulated DC from pin 8

#### SPA-ZC 202:

- Input voltage: 24 V...60 V DC or 110 V...240 V AC/DC
- Output voltage (conf. with DIP switch 1.5): +8 V DC unregulated from pin 9 (RS 485, TTL)

#### Supply current consumption:

Input voltage	SPA-ZC200	SPA-ZC202
pin 4, pin 8 or pin 9	< 250 mA	
24 V...60 V DC		< 90 mA
110 V...240 V AC/DC		< 60 mA

### Environmental conditions

Specified ambient service temperature range	-10...+55°C
Transport and storage temperature range	-40...+70°C
Maximum relative humidity (without condensation)	95%

### Environmental tests

Dry heat test according to IEC 60068-2-2	+55°C
Dry cold test according to IEC 60068-2-1	-10°C
Damp heat test according to IEC 60068-2-30	RH = 93%, 55°C, 6 cycles
Degree of protection by enclosure of the device case according to IEC 60529	IP20

### Electromagnetic compatibility tests

The EMC immunity test level fulfils the requirements specified below		
1 MHz burst disturbance test, class III, IEC 60255-22-1	common mode	2.5 kV
	differential mode	1.0 kV
Electrostatic discharge test, class III, IEC 61000-4-2 and IEC60255-22-2	for contact discharge	6 kV
	for air discharge	8 kV
Radio frequency interference test	conducted, common mode IEC 61000-4-6	10 V (rms), f = 150 kHz...80 MHz
	radiated, amplitude-modulated IEC 61000-4-3 and IEC 60255-22-3	10 V/m (rms), f = 80...1000 MHz
	radiated, pulse-modulated ENV 50204	10 V/m, f = 900 MHz
	radiated, test with a portable transmitter IEC 60255-22-3, method C	f = 77.2 MHz, P = 6 W; f = 172.25 MHz, P = 5 W
Fast transient disturbance test IEC 60255-22-4 and IEC 61000-4-4	power supply	4 kV
Surge immunity test IEC 61000-4-5	power supply	4 kV, line to earth 2 kV, line to line
Power frequency (50 Hz) magnetic field IEC 61000-4-8	100 A/m continuous	
Voltage dips and short interruptions IEC 61000-4-11	30%, 10 ms 60%, 100 ms >90%, 5000 ms	
Electromagnetic emission tests EN 55011	conducted RF emission (mains terminal)	EN 55011, class A
	radiated RF emission	EN 55011, class A
CE approval	Complies with the EMC directive 89/336/EEC and the LV directive 73/23/EEC	

### Dimensions and weight

Type	Dimensions [mm]	Weight [g]
SPA-ZC 200 (BB)	102 x 66 x 50	240
SPA-ZC 200 (MM)	102 x 77 x 50	240
SPA-ZC 202	197 x 104 x 50	530

## 6. Maintenance and service

### 6.1. Self-diagnosis

#### 6.1.1. SPA indicator

The SPA indicator is lit whenever the SPA-ZC 200/202 module sends a message to the SPA bus.

If the self-supervision system of the SPA-ZC 200/202 detects a fault in the SPA-bus communication, the SPA indicator remains lit.

#### 6.1.2. IEC\_103 indicator

The IEC\_103 indicator has two functions. It operates as a service LED indicating the status of the application process. It also indicates that an application of SPA-ZC 200/202 is sending messages to IEC\_103.

At start-up, the IEC\_103 indicator is normally lit once and then turned off.

Pressing the service pin (see figures 1.1.-1 and 1.1.-2) turns on the IEC\_103 indicator.

The IEC\_103 indicator is lit whenever the SPA-ZC 200/202 application sends a message to IEC\_103.

### 6.2. Trouble-shooting

The following table can be used to localize a fault and to take corrective actions:

**Table 6.2.-1 Fault localization**

Problem	Fault type	Actions
The SPA and IEC_103 LED is not lit on start-up (power supply through the connection cable). The SPA indicator is off. The IEC_103 indicator is off.	Supply failing	<ul style="list-style-type: none"> <li>• Check if the SPA-bus device has power</li> <li>• Check that the SPA-ZC 200/202 is properly connected to the device</li> <li>• Check the DIP-switch settings for SPA-bus interface type and supply voltage</li> </ul>
SPA-ZC 200/202 does not respond to IEC_103 messages.	IEC_103 fault	<ul style="list-style-type: none"> <li>• Check the communication speed of devices using the same communication channel.</li> </ul>
The IEC_103 LED is blinking.	IEC_103 fault	<ul style="list-style-type: none"> <li>• Check that the SPA-ZC 200/202 is properly connected to the device</li> <li>• Check the fibre-optic connections of IEC_103</li> <li>• Check that the master address of the SPA-ZC 200/202 is correct</li> </ul>
SPA-ZC 200/202 does not work properly or it gives different answers to the same query.	IEC_103 fault	<ul style="list-style-type: none"> <li>• Ensure that the IEC_103 address of the SPA-ZC 200/202 is unique in the communication network.</li> </ul>

**Table 6.2.-1 Fault localization**

<p>There is no response from the SPA device. The SPA indicator is continuously on, and it blinks occasionally.</p>	<p>SPA-bus fault</p>	<ul style="list-style-type: none"> <li>• Check that the SPA-ZC 200/202 is properly connected to the device</li> <li>• Check the operation of the SPA-bus device</li> <li>• Check the DIP-switch settings of the SPA-bus interface type.</li> <li>• Check the configuration of the SPA bus: SPA-bus bit rate, parity, slave address.</li> </ul>
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**6.3.**

**General about service**

If the SPA-ZC 200/202 module or part of it is found to be faulty, the normal service operation is to replace the entire module. Please read the ordering information for more details.

## **7. References**

- Installation Manual 1MRS752018-MUM
- Standard Configuration Templates (1MRS752034-MUM) on SPA-ZC200/202 Configuration CD 1MRS 752078-MCD
- RER 125 User's Manual 1MRS751295-MUM
- <http://www.abb.com/substationautomation>

## **8. Customer Feedback**

Date: \_\_\_\_\_

To fax: +358 10 224 1094

Category:                    \_\_Comment

                                  \_\_Query

                                  \_\_Complaint

In case of feedback related to a specific product, please state the name of the product.

Product: \_\_\_\_\_

Description: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

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\_\_\_\_\_

Initiator: \_\_\_\_\_

Issuer: \_\_\_\_\_

Company: \_\_\_\_\_

Country: \_\_\_\_\_

Telefax no/  
e-mail address: \_\_\_\_\_

If necessary, additional pages may be enclosed.





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