

**hopf**



## 8100 Product Series

TECHNICAL DOCUMENTATION

**TIME & FREQUENCY SOLUTIONS**

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**AUTOR:** hopf - POM  
**DOCUMENT:** HOPF\_8100-PRODUCTSERIES\_TECHNICAL-DOCUMENTATION\_V0300\_EN.DOCX  
**VERSION:** 03.00  
**DATE:** 06.08.2024

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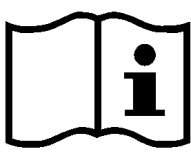
## 3 Change History

VERSION	DATE	EDITOR	CHANGE DESCRIPTION
01.00	23.09.2021	POM	Creating Document
01.01	28.01.2022	POD	Revision of the safety instructions
01.03	14.11.2022	POM	Formatting revised; Added new extension boards
02.00	18.07.2023	POM	<p>Added boards FG8800M00, FG8802S00, FG8802S01, FG8802S02, FG8802S20, FG8901P06</p> <p>Added factory default instructions to all boards that have a configuration</p> <p>Added cable housing information to FG8901P01 and FG8901P04</p> <p>Corrected LED description of all PSU boards</p> <p>Corrected number representation in technical specifications (decimal point and comma for thousands separator)</p> <p>Added supported requests per second for NTP in the technical specifications</p>
03.00	05.08.2024	POM	<p>Added extension boards FG8701G01, FG8701G02, FG8701G03, FG8702G04, FG8702G05, FG8702G06, FG8702G11, FG8702G12, FG8702G13, FG8702G14, FG8702G15, FG8801F02, FG8803S02, FG8803S20</p> <p>Added base system FG8101G02</p> <p>Renamed document to be able to refer to FG8101G02</p> <p>Replaced technical specification with a reference to the product sheet</p> <p>Replaced description of similar board with references to the other board</p>





## 4 Preliminary Remarks

This document describes the functions, operation, mounting and commissioning of the products of the 8100 product series, including the base systems as well as the hot-plug extension boards that can be used.

 	<p><b>WARNING</b></p> <p>Read the instructions completely. This will help you to avoid hazards and errors.</p> <p>The product information contains important information on the intended use, installation and start-up.</p> <p>Keep the product information in a suitable place where it can be accessed for maintenance and repair.</p>
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## 4.1 Conformity data

	<b>CE conformity</b>
	<p>This device complies with the requirements of the EU Directives 2014/30/EU "Electromagnetic Compatibility" and 2014/35/EU "Low Voltage Directive". For this purpose, the device bears the CE marking (CE = Communautés Européennes = European Communities).</p> <p>The CE indicates to the control authorities that the product complies with the requirements of the EU Directive - in particular with regard to health protection and safety of users and consumers - and may be freely placed on the Community market.</p>

	<b>UKCA- conformity</b>
	<p>This device complies with the requirements of the Directives S.I. 2012/3032 "The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012", S.I. 2016/1091 "The Electromagnetic Compatibility Regulations 2016" and S.I. 2016/1101 "The Electrical Equipment (Safety) Regulations 2016". For this purpose, the device bears the CE marking</p> <p>The UKCA indicates to the control authorities that the product complies with the requirements of the Directive - in particular with regard to health protection and safety of users and consumers - and may be freely placed on the UK market.</p>

## 4.2 Signal words for warnings

This document is not a complete list of all safety measures required for operation of the product. However, it does contain information that you must observe for your personal safety and to prevent damage to property. The instructions are presented as follows, depending on the degree of danger:

 ISO 7000-0434A  Allgemeines Warnzeichen Vorsicht / Caution	<p><b>DANGER</b></p> <p>The signal word denotes a hazard with a <b>high</b> degree of risk which, if not avoided, will result in death or serious injury.</p> <p><b>WARNING</b></p> <p>The signal word indicates a hazard with a <b>medium</b> level of risk which, if not avoided, may result in death or serious injury.</p> <p><b>CAUTION</b></p> <p>The signal word indicates a hazard with a <b>low</b> level of risk that, if not avoided, could result in a minor or moderate injury.</p>
 IEC 60417-6042  Vorsicht, Risiko eines elektrischen Schlages / Caution, risk of electric shock	<p><b>DANGER</b></p> <p>The signal word indicates a hazard with electrical voltage with a high degree of risk.                  Danger of Electric Shock!</p>
 IEC 60417-5041  Vorsicht, heiÙe OberfläÙe / Caution, hot surface	<p><b>CAUTION</b></p> <p>The signal word indicates a hazard with high device temperatures</p> <p><b>Risk of burns</b>                  During operation, high device temperatures may occur depending on the operating parameters and type.</p> <p>Allow the unit to cool down before starting maintenance work.</p>
 IEC 60417-6222  Allgemeine Information, Hilfe / Information, general; help	<p><b>Note</b></p> <p>A note in the sense of these instructions is important information about the product or the respective part of the instructions to which special attention is to be drawn.</p>

## 5 Safety instructions


	<p><b>Note</b></p> <p>The product information is intended exclusively for qualified electricians.</p> <p>This document is not a complete list of all safety measures required for operation of the product. However, it does contain information that you must observe for your personal safety and to avoid damage to property. The notes are presented as follows, depending on the degree of danger:</p>
	<p><b>Note</b></p> <p>Assembly, installation, commissioning and repairs of electrical devices may only be carried out by a qualified electrician.</p> <p>It is essential to observe the safety regulations and generally applicable technical rules relevant to the installation location.</p> <p>Observe the applicable standards and regulations for system installation.</p> <p>Prevent malfunctions and thus avoid personal injury and damage to property.</p>
	<p><b>CAUTION</b></p> <p><b>Damage to the device due to overvoltage</b></p> <p>Ensure that the power supply is correct. Take suitable lightning protection measures to ensure that the permitted voltage is not exceeded at the connections.</p>
	<p><b>DANGER</b></p> <p><b>Danger of Electric Shock</b></p> <p>The device is operated with dangerous voltages. It is imperative that you observe the installation instructions for the respective extension boards.</p>

## 5.1 Intended Use

The equipment may only be operated under the ambient conditions described in this document.

Correct and safe operation of the product requires the following:

- A proper transport
- Proper storage, installation and assembly
- Proper operation and maintenance
- When operating electrical equipment, certain parts are inevitably under dangerous voltage, or may have elevated temperatures.
- If not handled properly, death, serious injury or property damage may result.
- The equipment must be grounded at the ground terminal before any connections are made.
- Dangerous voltages may be present in all circuit parts connected to the power supply.

	<p><b>Note</b></p> <p>The manufacturer accepts no liability for applications that deviate from or go beyond the intended use.</p>
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## 6 Introduction


The 8100 product series are fully modular time reference systems that support the Global Navigation Satellite Systems (GNSS) GPS, Galileo, GLONASS, BeiDou and IRNSS/NavIC, as well as NTP, PTP and various other time sources for precise and reliable time synchronization at extremely competitive prices and are particularly well suited for critical infrastructure applications.

## 7 System description

8100 product series devices are fully modular time reference system, which can serve most different application cases by the supported field-replaceable, hot-pluggable, mutually independent extension boards (in the following text only called extension board/s).

A distinction is made between four functionalities that can be provided by extension boards:

- Power Supply Unit (**PSU**): Power supply extension, which supplies the FG8101G01 with power.
- Management Controller (**MC** for short): Management extension, with which the FG8101G01 and all its extension boards can be managed.
- Time Domain Controller (**TDC** for short): Time source extension, extension boards with this functionality have a connector for a time source and supply the FG8101G01 and the rest of the extension boards with a highly accurate time signal
- Service Provider (**SP** for short): process the time signals provided by the TDCs and thus generate a time output for the customer

	<b>Note</b>
	An extension board can provide more than one functionality.

## 7.1 Extension board positions



Figure 1

Figure 1 shows the rear panel of an 8100 product series base system, with labels for the individual positions for extension boards from POS1 to POS8. The following table lists the functionalities that are supported on the individual positions:

POS1				POS2				POS3				POS4			
PSU				MC	TDC	SP					SP				SP
POS5				POS6				POS7				POS8			
PSU						TDC	SP				SP				SP

	<b>CAUTION</b>
	<p><b>Extension boards positions</b></p> <p>Extension boards fulfil their proper function only at the designated insertion position in the system. However, if an extension board is incorrectly positioned, the rest of the system behaviour is not affected.</p>

## 7.2 PSU - Power Supply Unit

Up to 2 PSUs are supported in an 8100 product series base system. A PSU converts the voltage on its supply voltage input connector(s) to the device internal supply voltage.

If two PSUs are operated in one base system, then a 1 out of 2 redundancy is obtained.

## 7.3 MC - Management Controller Board

Each 8100 base system supports one MC. The MC distributes the configuration and updates and collects the status of the base system and the remaining extension boards via the internal management bus. Additionally, the MC provides parts of the collected status via the display of the base system.

## 7.4 TDC - Time Domain Controller Board

In 8100 product series base systems up to 2 TDCs are supported. A TDC processes the time signal connected to the corresponding connector of the TDC extension boards, converts it to an internal protocol, which is routed to the base system and the remaining extension boards via a TDI (time domain interface).

8100 product series base systems have two TDIs, each TDI is routed to all extension boards in the base system.

## 7.5 SP - Service Provider

In 8100 product series base systems up to 6 SP are supported. A SP synchronizes to one of the two TDIs and generates its time output (e.g., NTP) with that time information.

Each SP can process both TDIs of the base system and depending on the configuration of the SP, it decides to which one it synchronizes.



## 7.6 Minimal configuration

To operate an 8100 product series device as a time reference system the following functions must be provided at least once by an extension board in the FG8101G01: PSU, MC, TDC, SP

**Note:** The MC functionality is only needed for the management (configuration and monitoring) of the device and the extension boards and for the data indication on the display of the base system. If the extension board with MC functionality is pulled out of the base system or fails due to a defect, then the time output of the extension boards with SP functionality is not affected as long as one extension board with PSU and one with TDC functionality are still operated in the base system.

## 7.7 Front cover



Figure 2

Figure 2 shows the various elements of the front panel:

- 1 ... LEDs of the front panel
- 2 ... Display of the front panel
- 3 ... Button of the front panel

### 7.7.1 LEDs

The LEDs show the current status of the whole device.

If only the red LED is on, then at least one extension board or the base system is operating in error state.

If only the yellow LED is on, then least one extension board or the base system is operating in warning state, but none of them are in error state.

If only the green LED is on, then the base system and none of the extension board are operating in error or warning state.

If all three LEDs are on, then no extension board with MC functionality is accessible from the base system (this is the case, for example, if the extension board with MC functionality is booting).

Additionally, in the first 6 seconds after a reboot of the base system a LED test is executed, where always 2 LEDs are on at the same time. Starting with yellow and red, green and red, green and yellow, then the sequence is performed one more time. Each combination is displayed for one second.

### 7.7.2 Button

The button can be used to switch between the different screens on the display.

If the button is pressed briefly (100 to 500ms), the display switches to the next screen.

If the button remains pressed for more than 500ms, the behaviour is determined by the configuration of the base system. In the factory default configuration, an event is triggered every 500ms that simulates a short button press. This way you can quickly scroll through all screens.

### 7.7.3 Display

With the help of the display the article and serial numbers of the base system and the extension boards can be queried, as well as basic information of the individual extension boards.

In the first 6 seconds after a reboot of the base system a display test is performed, where the backlight of the display is switched on and off and each of the 40x2 blocks of the display are shown alternately empty and full.

After the display test, the base system screen showing the part number and serial number of the base system on the display is shown for 30 seconds and the backlight is turned on. Then the display goes into the IDLE state.

In the IDLE state all of the 40x2 blocks of the display are blank and the backlight is off. By a short press of the button, depending on whether an extension board with MC functionality is accessible from the base system, either the base system screen (extension board with MC functionality not accessible) or the TDC screen (extension board with MC functionality accessible) is displayed.

The TDC screen displays the time information of the two TDC positions in the base system. If there is no extension board with TDC function on POS2, then "TD1 -" is displayed in the first line. If there is no extension board with TDC function on POS6, then "TD2 -" is displayed in the second line. Otherwise, the two lines will first display the accuracy, then the date and time, as well as daylight saving time status and leap second changeover status from the corresponding TDC position. This screen is active for 30 seconds, then the display changes to the IDLE state unless the button is pressed within the 30 seconds, in which case the display changes to the POS14 screen.

The POS14 screen displays the part numbers of the extension boards plugged into POS1 through POS4. This screen is active for 30 seconds, then the display will change to the IDLE state unless the button is pressed within the 30 seconds, then it will change to the POS58 screen.

The POS58 screen displays the part numbers of the extension boards plugged into POS5 through POS8. This screen is active for 30 seconds, then the display will change to the IDLE state unless the button is pressed within the 30 seconds, then it will change to the POS1 screen.

The POS1 screen displays the part number of the extension board that is in POS1 and status information that depends on the extension board type. This screen is active for 30 seconds, then the display changes to the IDLE state, unless the button is pressed within the 30 seconds, then it changes to the POS2 screen.

The POS2 through POS8 screens are identical to the POS1 screen. The only differences are the position for which they display the information and which screen is changed to by pressing the button. It will always change to the next position number and from the POS8 screen it will change to the base system screen.

## 8 System mounting

8100 product series base systems are designed for installation in a 19" control cabinet. The following steps must be carried out for installation in the 19" control cabinet:

	<b>CAUTION</b>
	<b>Thermic</b> The lateral ventilation openings on the left and right must not be covered. Otherwise, the ventilation is ineffective and the maximum permissible operating temperature of the device is decreased due to insufficient convection and/or thermal coupling with surrounding devices.  Fire protection must be ensured in the installed state.

- Insert the base system into the 19" control cabinet and screw it tight to the front retaining brackets with 4 screws.
- The base system must be connected to at least one of the two grounding screws  $\perp$  for potential equalization (the positions of the grounding screws are shown in Figure 3). A grounding cable with at least 1.5mm<sup>2</sup> must be used.




Figure 3

	<b>Note</b>
	<b>Protection class 1</b> The system is a protection class 1 device and may only be operated with a grounded connection.

## 9 Connection of the supply and data lines

The 8100 product series time reference systems are designed for operation on hazardous voltages.

	<p><b>WARNING</b></p> <p>Failure to follow the safety instructions in this manual can result in serious personal injury and property damage. Observe the safety instructions attached to the device.</p>
---	--

The following must be observed before connecting to the power supply:

- A grounding cable must be connected to the ground connection of the device.
- Proper and undamaged supply line routing must be ensured.
- The power supply should be connected with a short, low-inductance cable.
- Ensure that all supply cables are installed without damage.

## 10 Available base systems

Actually, two different base systems are available:

- FG8101G01: This base system supports all above-described features
- FG8101G02: This base system has the restriction, that POS6 cannot be used. Because POS2 is prepared to be equipped with a board that utilizes that space of POS2 and POS6

### 10.1 FG8101G02 restrictions

Due to the fact, that POS6 of FG8101G02 cannot be used, it has the following restrictions:

- Only one TDC is support (the one in POS6 cannot be equipped)
- Only five SP are supported (the one in POS6 cannot be equipped)

## 11 Extension boards

### 11.1 Mounting of extension boards

To mount an extension board, the blind cover of the corresponding position must be removed first. To do this, the two captive screws of the blind cover must be removed from the base system.



Figure 4

Figure 4 shows a FG8101G01 with removed blind covers on POS1 and POS2.

Then the extension board must be inserted into the desired position.

For POS2 to POS4 and POS6 to POS8, the circuit board of the extension board must be inserted between the guides of the corresponding position (see Figure 5)



Figure 5

For POS1 and POS5, the board must be placed on the guides of the isolation plate and then inserted into FG8101G01 (in Figure 6, the guides of the isolation plate on which the board must be placed are marked).



Figure 6

	<b>Note</b>
	<p>Extension board rotation</p> <p>For POS5 to POS8 the extension boards must be inserted rotated into the base system, i.e., the labelling on the cover of the extension board must be upside down for these positions.</p>


After the extension board has been inserted into the base system, the extension board must be fixed against the base system with the captive screws on the cover and then cables can be connected to the extension board.

	<b>CAUTION</b>
	<p><b>Connect cable to extension board</b></p> <p>Cables may only be connected to the extension boards after the boards have been mounted in the base system, otherwise an electric shock or a defect of the extension board may occur.</p>





## 11.2 Dismounting of extension boards

To remove an extension board from the base system, all cables must first be disconnected from the corresponding extension board.

	<b>CAUTION</b>
	<b>Disconnect cable from extension board</b> All cables must be disconnected from an extension board before disassembling it, otherwise an electric shock or a defect of the extension board may occur.

After that, the captive screws of the extension board cover must be unscrewed of the base system, then the extension board can be pulled out of the base system.

	<b>DANGER</b>
	<b>Electric Shock</b> PSU extension boards must not be pulled out of the base system immediately after disconnecting the cables. Wait at least one minute between unplugging the cables and pulling out the PSU extension board.

	<b>WARNING</b>
	<b>Risk of Burns</b> During operation, high device temperatures may occur depending on the operating parameters and system configuration.  Allow the device to cool down first before starting maintenance work.

Finally, either a blind cover or another extension board must be mounted to the open position in the base system of the dismantled extension board.

## 11.3 Supported extension boards

Different extension boards are supported by the 8100 product series base system. The following chapters describe the extension card cover elements, the LED states of the extension boards, how a factory default can be applied to the extension board and which **huma** board pages are supported by the extension board.

Technical specifications of all extension boards can be found in the latest 8100 product series product sheet.

All extension boards are equipped with status LEDs on their front panels. These are used for quick identification of the operating status of the respective extension board. The exact functional description of the LEDs can be found in the corresponding chapter of the extension board.

### 11.3.1 FG8701G01 - MC, TDC and SP functionality

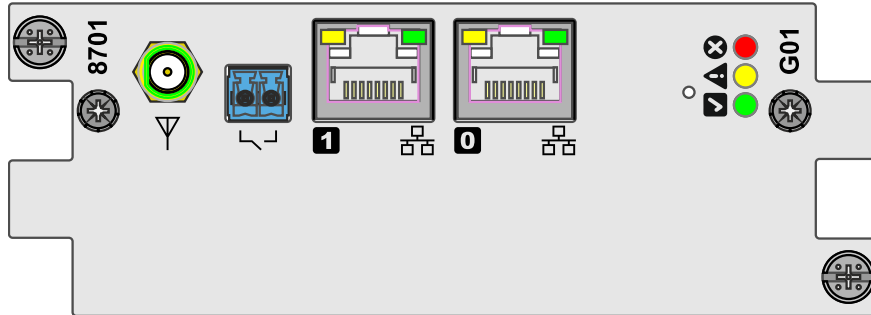


Figure 7

	<b>Note</b>
<p>FG8701G01 can only be equipped in POS2 of base system FG8101G02.                  It cannot be equipped in FG8101G01 or any other position of FG8101G02.</p>	

FG8701G01 is an extension board with MC, TDC and SP functionality.

A GNSS antenna system can be connected to the antenna connector . This connector provides a 5V supply voltage for the GNSS antenna system.

The status connector provides a potential free contact which can be configured by the customer.

In addition, this extension board has two network interfaces which are used for the MC, TDC and SP functionality.

#### 11.3.1.1 Status LEDs

	<p>Red                      Configured time outputs are no longer generated</p> <p>Yellow                    Configured time outputs are generated but a problem was detected</p> <p>Green                     Full function</p> <p>All Three                during the boot process all three LEDs are on</p>
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### 11.3.1.2 Factory default

A factory default can be performed via the push button that's reachable through the 1.5mm diameter hole next to the LED symbols on the board's bezel. The button must be pressed for at least 10s to perform a factory default. When the button is pressed for 1s to 10s a reboot is performed.



### 11.3.1.3 Supported board pages in huma

The following table lists the supported **huma** board pages of this board.

Board Overview	
General → Status	
General → Action	
General → Config	
Network	
General → Status	
General → Action	
General → Config	
Interface → Status	
Interface → Config	
Routing → Status	
Routing → Config	
Firewall → Config	
Sync Setting	
General → Status	
General → Action	
General → Config	TDC variant
GNSS → Status	
GNSS → Action	
GNSS → Config	
NTP → Status	
NTP → Action	
NTP → Config	

PTP → Status	
PTP → Config	
<b>Time Service</b>	
General → Status	
General → Config	
NTP → Status	
NTP → Action	
NTP → Config	
PTP → Status	
PTP → Config	
SIMATIC NTP 10s broadcast → Config	
SINEC H1 → Config	
<b>Monitoring</b>	
Events → Config	
Syslog → Config	
Email → Config	
SNMP → Config	
Relay → Config	

### 11.3.2 FG8701G02 - MC, TDC and SP functionality

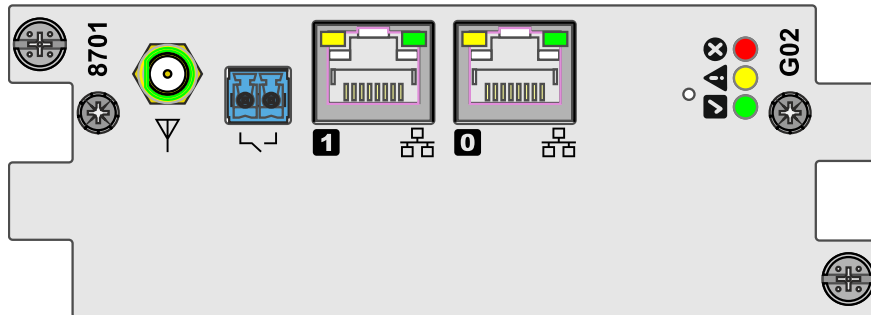


Figure 8

	<p><b>Note</b></p> <p>FG8701G02 can only be equipped in POS2 of base system FG8101G02.</p> <p>It cannot be equipped in FG8101G01 or any other position of FG8101G02.</p>
--	--

FG8701G02 is identical to FG8701G01, the only difference is equipped GNSS receiver.

### 11.3.3 FG8701G03 - MC, TDC and SP functionality

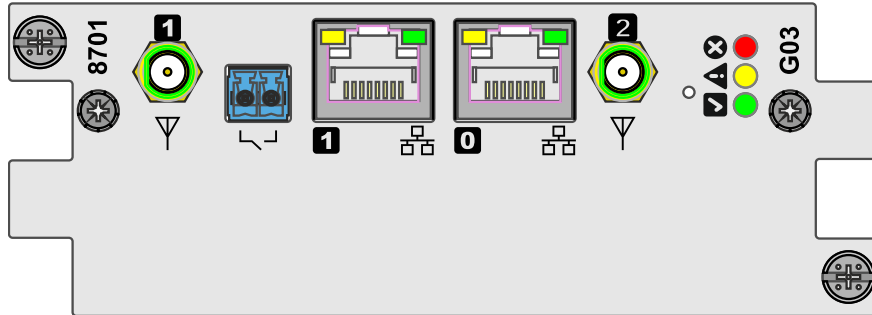


Figure 9

	<b>Note</b>
<p>FG8701G01 can only be equipped in POS2 of base system FG8101G02.                  It cannot be equipped in FG8101G01 or any other position of FG8101G02.</p>	

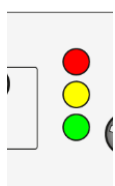
FG8701G03 is an extension board with MC, TDC and SP functionality.

GNSS antenna systems can be connected to the antenna connector **1** and **2**. Each of these connectors provide a 5V supply voltage for the GNSS antenna system. Both connectors are independent and feed different GNSS receivers.

The status connector provides a potential free contact which can be configured by the customer.

In addition, this extension board has two network interfaces which are used for the MC, TDC and SP functionality.

#### 11.3.3.1 Status LEDs



- |           |  |
|-----------|--|
| Red       | Configured time outputs are no longer generated                  |
| Yellow    | Configured time outputs are generated but a problem was detected |
| Green     | Full function  |
| All Three | during the boot process all three LEDs are on                    |

### 11.3.3.2 Factory default

A factory default can be performed via the push button that's reachable through the 1.5mm diameter hole next to the LED symbols on the board's bezel. The button must be pressed for at least 10s to perform a factory default. When the button is pressed for 1s to 10s a reboot is performed.



### 11.3.3.3 Supported board pages in huma

The following table lists the supported **huma** board pages of this board.

Board Overview	
General → Status	
General → Action	
General → Config	
Network	
General → Status	
General → Action	
General → Config	
Interface → Status	
Interface → Config	
Routing → Status	
Routing → Config	
Firewall → Config	
Sync Setting	
General → Status	
General → Action	
General → Config	TDC variant
GNSS → Status	
GNSS → Action	
GNSS → Config	
GNSS2 → Status	
GNSS2 → Action	
GNSS2 → Config	



NTP → Status	
NTP → Action	
NTP → Config	
PTP → Status	
PTP → Config	
<b>Time Service</b>	
General → Status	
General → Config	
NTP → Status	
NTP → Action	
NTP → Config	
PTP → Status	
PTP → Config	
SIMATIC NTP 10s broadcast → Config	
SINEC H1 → Config	
<b>Monitoring</b>	
Events → Config	
Syslog → Config	
Email → Config	
SNMP → Config	
Relay → Config	

### 11.3.4 FG8702G01 - MC, TDC and SP functionality

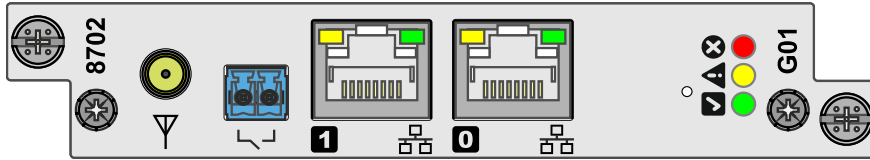


Figure 10

FG8702G01 is an extension board with MC, TDC and SP functionality. If it is plugged into a position that does not support MC functionality, then it can be operated as a TDC and SP extension board.

A GNSS antenna system can be connected to the antenna connector . This connector provides a 5V supply voltage for the GNSS antenna system.

The status connector provides a potential free contact which can be configured by the customer.

In addition, this extension board has two network interfaces which are used for the MC, TDC and SP functionality.

#### 11.3.4.1 Status LEDs

	Red	Configured time outputs are no longer generated
	Yellow	Configured time outputs are generated but a problem was detected
	Green	Full function
	All Three	during the boot process all three LEDs are on

#### 11.3.4.2 Factory default

A factory default can be performed via the push button that's reachable through the 1.5mm diameter hole next to the LED symbols on the board's bezel. The button must be pressed for at least 10s to perform a factory default. When the button is pressed for 1s to 10s a reboot is performed.



### 11.3.4.3 Supported board pages in huma

The following table lists the supported **huma** board pages of this board.

Board Overview	
General → Status	
General → Action	
General → Config	
Network	
General → Status	
General → Action	
General → Config	
Interface → Status	
Interface → Config	
Routing → Status	
Routing → Config	
Firewall → Config	
Sync Setting	
General → Status	
General → Action	
General → Config	TDC variant
GNSS → Status	
GNSS → Action	
GNSS → Config	
NTP → Status	
NTP → Action	
NTP → Config	
PTP → Status	
PTP → Config	
Time Service	
General → Status	

General → Config	
NTP → Status	
NTP → Action	
NTP → Config	
PTP → Status	
PTP → Config	
SIMATIC NTP 10s broadcast → Config	
SINEC H1 → Config	
<b>Monitoring</b>	
Events → Config	
Syslog → Config	
Email → Config	
SNMP → Config	
Relay → Config	

### 11.3.5 FG8702G02 - MC, TDC and SP functionality

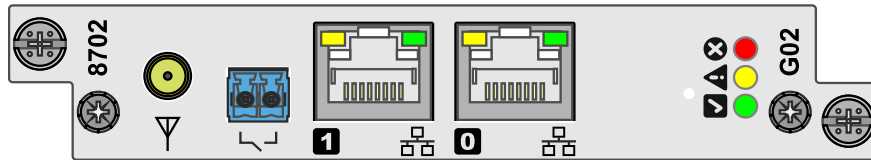


Figure 11

FG8702G02 is identical to FG8702G01, the only difference is the holdover performance.

### 11.3.6 FG8702G03 - MC, TDC and SP functionality

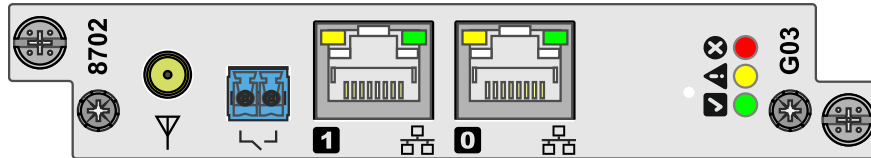


Figure 12

FG8702G03 is identical to FG8702G01, the only difference is the holdover performance.

### 11.3.7 FG8702G04 - MC, TDC and SP functionality

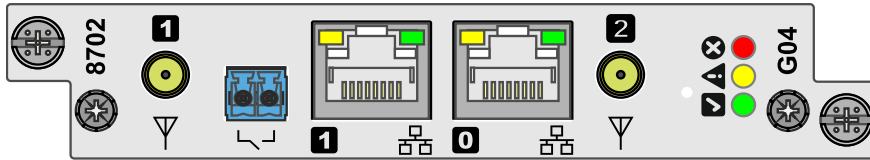


Figure 13

FG8702G04 is an extension board with MC, TDC and SP functionality. If it is plugged into a position that does not support MC functionality, then it can be operated as a TDC and SP extension board.

GNSS antenna systems can be connected to the antenna connector **1** and **2**. Each of these connectors provide a 5V supply voltage for the GNSS antenna system. Both connectors are independent and feed different GNSS receivers.

The status connector provides a potential free contact which can be configured by the customer.

In addition, this extension board has two network interfaces which are used for the MC, TDC and SP functionality.

#### 11.3.7.1 Status LEDs

	Red	Configured time outputs are no longer generated
	Yellow	Configured time outputs are generated but a problem was detected
	Green	Full function
	All Three	during the boot process all three LEDs are on

#### 11.3.7.2 Factory default

A factory default can be performed via the push button that's reachable through the 1.5mm diameter hole next to the LED symbols on the board's bezel. The button must be pressed for at least 10s to perform a factory default. When the button is pressed for 1s to 10s a reboot is performed.



### 11.3.7.3 Supported board pages in huma

The following table lists the supported **huma** board pages of this board.

Board Overview	
General → Status	
General → Action	
General → Config	
Network	
General → Status	
General → Action	
General → Config	
Interface → Status	
Interface → Config	
Routing → Status	
Routing → Config	
Firewall → Config	
Sync Setting	
General → Status	
General → Action	
General → Config	TDC variant
GNSS → Status	
GNSS → Action	
GNSS → Config	
GNSS2 → Status	
GNSS2 → Action	
GNSS2 → Config	
NTP → Status	
NTP → Action	
NTP → Config	
PTP → Status	



PTP → Config	
<b>Time Service</b>	
General → Status	
General → Config	
NTP → Status	
NTP → Action	
NTP → Config	
PTP → Status	
PTP → Config	
SIMATIC NTP 10s broadcast → Config	
SINEC H1 → Config	
<b>Monitoring</b>	
Events → Config	
Syslog → Config	
Email → Config	
SNMP → Config	
Relay → Config	

### 11.3.8 FG8702G05 - MC, TDC and SP functionality

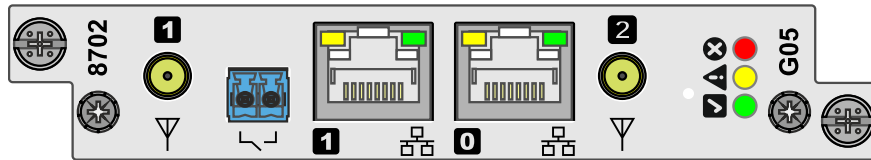


Figure 14

FG8702G05 is identical to FG8702G04, the only difference is the holdover performance.

### 11.3.9 FG8702G06 - MC, TDC and SP functionality

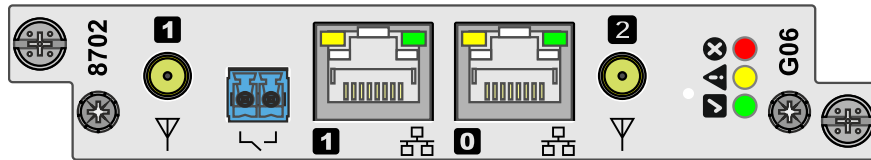


Figure 15

FG8702G06 is identical to FG8702G04, the only difference is the holdover performance.

### 11.3.10 FG8702G11 - MC, TDC and SP functionality

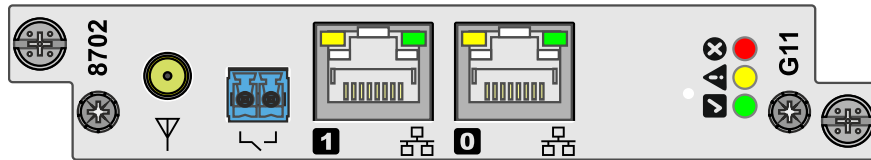


Figure 16

FG8702G11 is identical to FG8702G01, the only difference is the receiver performance.

### 11.3.11 FG8702G12 - MC, TDC and SP functionality

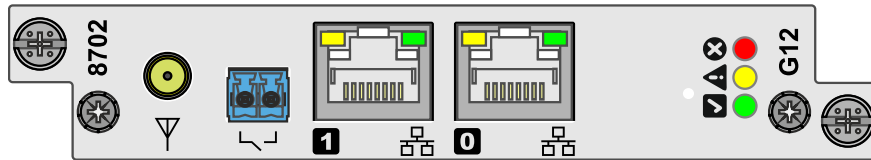


Figure 17

FG8702G12 is identical to FG8702G01, the only differences are the holdover and receiver performances.

### 11.3.12 FG8702G13 - MC, TDC and SP functionality

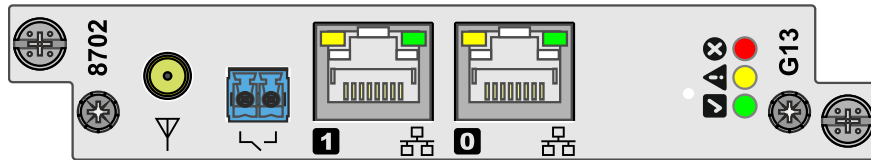


Figure 18

FG8702G13 is identical to FG8702G01, the only differences are the holdover and receiver performance.

### 11.3.13 FG8702G14 - MC, TDC and SP functionality

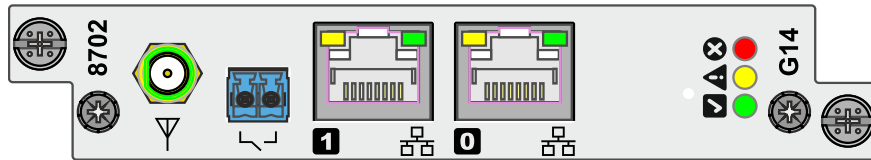


Figure 19

FG8702G14 is identical to FG8702G01, the only differences are the holdover and receiver performances.

### 11.3.14 FG8702G15 - MC, TDC and SP functionality

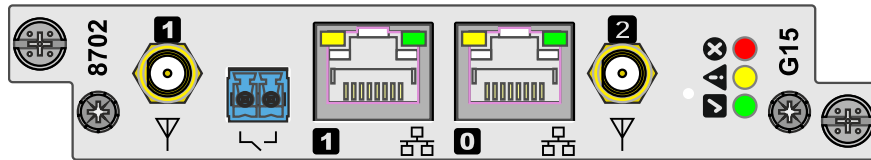


Figure 20

FG8702G15 is identical to FG8702G04, the only differences are the holdover and receiver performances.



### 11.3.15 FG8800M00 - MC and SP functionality

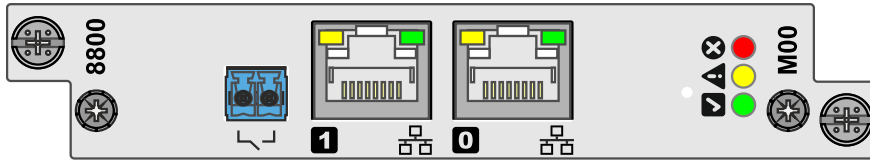




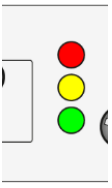
Figure 21

FG8800M00 is an extension board with MC and SP functionality. If it is plugged into a position that does not support MC functionality, then it can be operated as a SP extension board.

The status connector  provides a potential free contact which can be configured by the customer.

In addition, this extension board has two network interfaces  which are used for the MC and SP functionality and can provide network time protocols for the SP functionality.

#### 11.3.15.1 Status LEDs

	Red	Configured time outputs are no longer generated
	Yellow	Configured time outputs are generated but a problem was detected
	Green	Full function
	All Three	during the boot process all three LEDs are on

#### 11.3.15.2 Factory default

A factory default can be performed via the push button that's reachable through the 1.5mm diameter hole next to the LED symbols on the board's bezel. The button must be pressed for at least 10s to perform a factory default. When the button is pressed for 1s to 10s a reboot is performed.



### 11.3.15.1 Supported board pages in huma

The following table lists the supported **huma** board pages of this board.

<b>Board Overview</b>	
General → Status	
General → Action	
General → Config	
<b>Network</b>	
General → Status	
General → Action	
General → Config	
Interface → Status	
Interface → Config	
Routing → Status	
Routing → Config	
Firewall → Config	
<b>Sync Setting</b>	
General → Status	
General → Action	
General → Config	SP variant
<b>Time Service</b>	
General → Status	
General → Config	
NTP → Status	
NTP → Action	
NTP → Config	
SIMATIC NTP 10s broadcast → Config	
SINEC H1 → Config	
<b>Monitoring</b>	
Events → Config	



Syslog → Config	
Email → Config	
SNMP → Config	
Relay → Config	

### 11.3.16 FG8801F02 - SP functionality

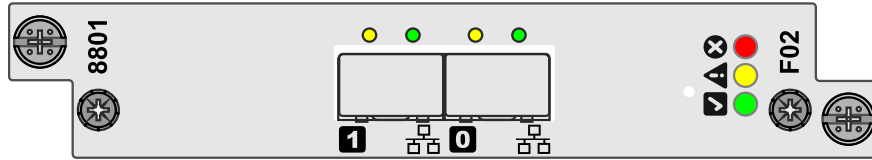

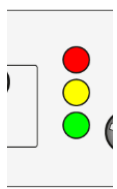


Figure 22

FG8801F02 is an extension board with SP functionality. This extension board takes the time provided on one or both TDIs of the base system and provides the time via its two network interfaces  in various network time protocol formats.

#### 11.3.16.1 Status LEDs

	Red	Configured time outputs are no longer generated
	Yellow	Configured time outputs are generated but a problem was detected
	Green	Full function
	All Three	during the boot process all three LEDs are on

#### 11.3.16.2 Factory default

A factory default can be performed via the push button that's reachable through the 1.5mm diameter hole next to the LED symbols on the board's bezel. The button must be pressed for at least 10s to perform a factory default. When the button is pressed for 1s to 10s a reboot is performed.



### 11.3.16.3 Supported board pages in huma

The following table lists the supported **huma** board pages of this board.

<b>Board Overview</b>	
General → Status	
General → Action	
General → Config	
<b>Network</b>	
General → Status	
General → Action	
General → Config	
Interface → Status	
Interface → Config	
Routing → Status	
Routing → Config	
Firewall → Config	
<b>Sync Setting</b>	
General → Status	
General → Action	
General → Config	SP variant
<b>Time Service</b>	
General → Status	
General → Config	
NTP → Status	
NTP → Action	
NTP → Config	
PTP → Status	
PTP → Config	
SIMATIC NTP 10s broadcast → Config	
SINEC H1 → Config	

### 11.3.17 FG8801N02 - SP functionality

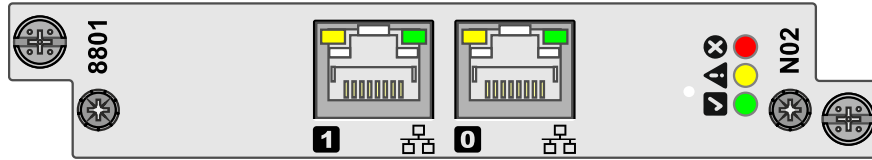

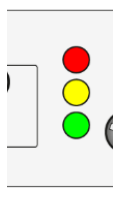


Figure 23

FG8801N02 is an extension board with SP functionality. This extension board takes the time provided on one or both TDIs of the base system and provides the time via its two network interfaces  in various network time protocol formats.

#### 11.3.17.1 Status LEDs

	Red	Configured time outputs are no longer generated
	Yellow	Configured time outputs are generated but a problem was detected
	Green	Full function
	All Three	during the boot process all three LEDs are on

#### 11.3.17.2 Factory default

A factory default can be performed via the push button that's reachable through the 1.5mm diameter hole next to the LED symbols on the board's bezel. The button must be pressed for at least 10s to perform a factory default. When the button is pressed for 1s to 10s a reboot is performed.



### 11.3.17.3 Supported board pages in huma

The following table lists the supported *huma* board pages of this board.

Board Overview	
General → Status	
General → Action	
General → Config	
Network	
General → Status	
General → Action	
General → Config	
Interface → Status	
Interface → Config	
Routing → Status	
Routing → Config	
Firewall → Config	
Sync Setting	
General → Status	
General → Action	
General → Config	SP variant
Time Service	
General → Status	
General → Config	
NTP → Status	
NTP → Action	
NTP → Config	
PTP → Status	
PTP → Config	
SIMATIC NTP 10s broadcast → Config	
SINEC H1 → Config	

### 11.3.18 FG8802S00 - SP functionality

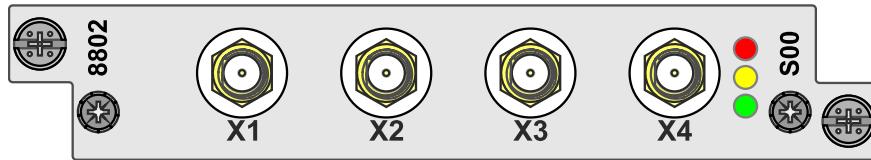


Figure 24

FG8802S00 is an extension board with SP functionality. This extension board takes the time provided on one or both TDIs of the base system and provides the time via its four SMA connectors (X1 – X4) in various signal formats.

#### 11.3.18.1 Status LEDs

	Red	Configured time outputs are no longer generated
	Yellow	Configured time outputs are generated but a problem was detected
	Green	Full function
	All Three	during the boot process all three LEDs are on

#### 11.3.18.2 Factory default

The FG8802S00 is equipped with a dip-switch. To perform a factory default on the FG8802S00 perform the following steps:

- Dismount the FG8802S00 of the base system
- Bring both switches of the dip-switch in the ON-position
- Mount the FG8802S00 in a powered base system
- Wait 60 seconds
- Dismount the FG8802S00 of the base system
- Bring both switches of the dip-switch in the OFF-position
- Mount the FG8802S00 in a powered system



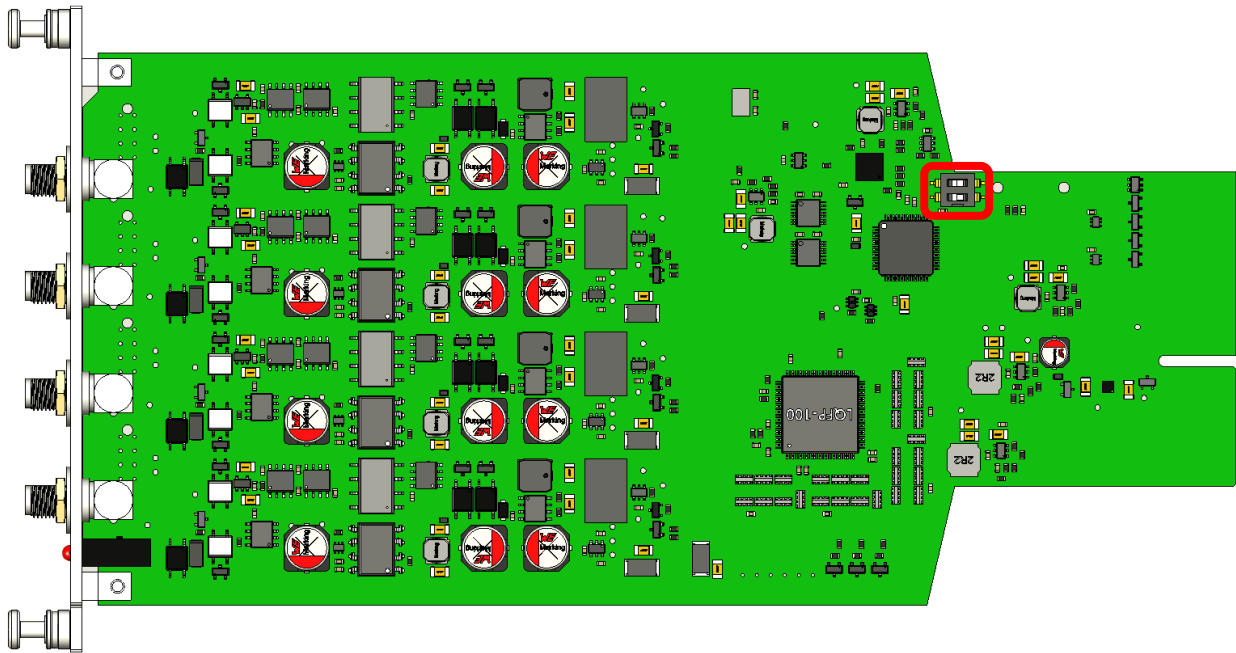


Figure 25

The position of the dip-switch is highlighted in Figure 25.

### 11.3.18.3 Supported board pages in huma

The following table lists the supported *huma* board pages of this board.

Board Overview	
General → Status	
General → Action	
General → Config	
Sync Setting	
General → Status	
General → Action	
General → Config	SP variant
Time Service	
General → Status	
General → Config	
X1 → Config	
X1 → Action	

X2 → Config	
X2 → Action	
X3 → Config	
X3 → Action	
X4 → Config	
X4 → Action	

### 11.3.19 FG8802S01 - SP functionality

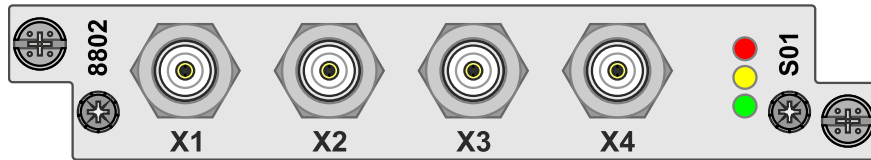


Figure 26

FG8802S01 is identical to FG8802S00, the only difference is that it has four BNC connectors instead of four SMA connectors.

### 11.3.20 FG8802S02 - SP functionality

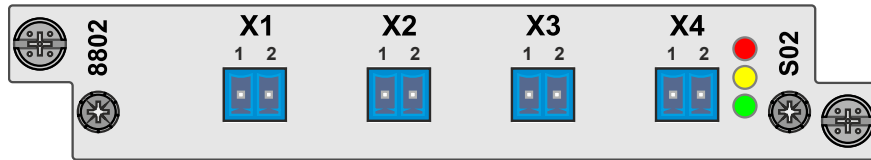


Figure 27

FG8802S02 is identical to FG8802S00, the only difference is that it has four screw terminals instead of four SMA connectors.

### 11.3.21 FG8802S20 - SP functionality

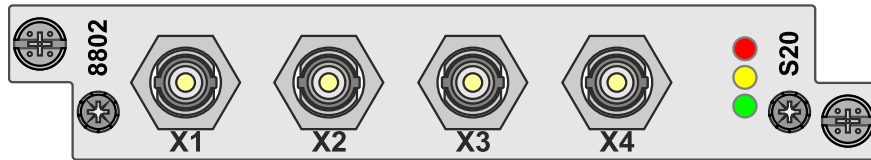


Figure 28

FG8802S20 is identical to FG8802S00, the only difference is that it has four ST type fiber optic connectors (820nm multimode) instead of four SMA connectors.

### 11.3.22 FG8803S02 - SP functionality

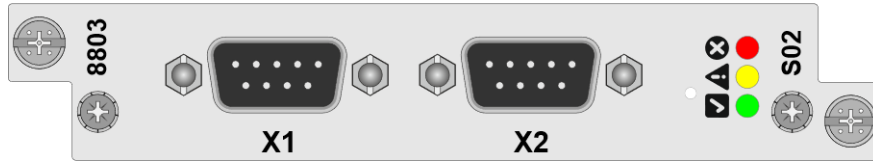
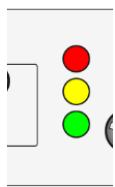


Figure 29

FG8803S02 is an extension board with SP functionality. This extension board takes the time provided on one or both TDIs of the base system and provides the time via its two 9-pole D\_SUB connectors (X1 – X2) in various serial string formats.

Details of the supported serial strings and the 9-pole D-SUB connector can be found in the FG8803S02 technical documentation.

#### 11.3.22.1 Status LEDs



- Red Configured time outputs are no longer generated
- Yellow Configured time outputs are generated but a problem was detected
- Green Full function
- All Three during the boot process all three LEDs are on

#### 11.3.22.2 Factory default

A factory default can be performed via the push button that’s reachable through the 1.5mm diameter hole next to the LED symbols on the board’s bezel. The button must be pressed for at least 10s to perform a factory default. When the button is pressed for 1s to 10s a reboot is performed.



### 11.3.22.3 Supported board pages in huma

The following table lists the supported *huma* board pages of this board.

Board Overview	
General → Status	
General → Action	
General → Config	
Sync Setting	
General → Status	
General → Action	
General → Config	SP variant
Time Service	
General → Status	
General → Config	
X1 → Config	
X1 → Action	
X2 → Config	
X2 → Action	

### 11.3.23 FG8803S20 - SP functionality

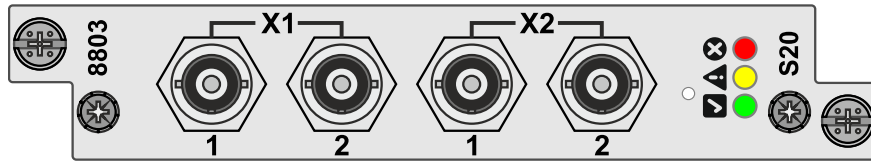


Figure 30

FG8803S02 is an extension board with SP functionality. This extension board takes the time provided on one or both TDIs of the base system and provides the time via its for ST type fiber optic connectors (820nm multimode) in various serial string formats.

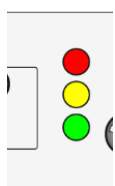
Details of the supported serial strings can be found in the FG8803S02 technical documentation (the supported strings of FG8803S02 and FG8803S20 are identically).

#### 11.3.23.1 Connector description

The following table describes the functionality of the four ST type fiber optic connectors:

X1-1	FG8803S20 channel 1 (X1) RX. This connector is only used when transmission interval of channel 1 is configured to “Only on request”
X1-2	FG8803S20 channel 1 (X1) TX. The configured serial string is output on this connector.
X2-1	FG8803S20 channel 2 (X2) RX. This connector is only used when transmission interval of channel 2 is configured to “Only on request”
X2-2	FG8803S20 channel 2 (X2) TX. The configured serial string is output on this connector.

#### 11.3.23.2 Status LEDs



Red	Configured time outputs are no longer generated
Yellow	Configured time outputs are generated but a problem was detected
Green	Full function
All Three	during the boot process all three LEDs are on



### 11.3.23.3 Factory default

A factory default can be performed via the push button that's reachable through the 1.5mm diameter hole next to the LED symbols on the board's bezel. The button must be pressed for at least 10s to perform a factory default. When the button is pressed for 1s to 10s a reboot is performed.



### 11.3.23.4 Supported board pages in huma

The following table lists the supported **huma** board pages of this board.

Board Overview	
General → Status	
General → Action	
General → Config	
Sync Setting	
General → Status	
General → Action	
General → Config	SP variant
Time Service	
General → Status	
General → Config	
X1 → Config	
X1 → Action	
X2 → Config	
X2 → Action	

### 11.3.24 FG8901P01 - PSU 85-264VAC / 125-250VDC

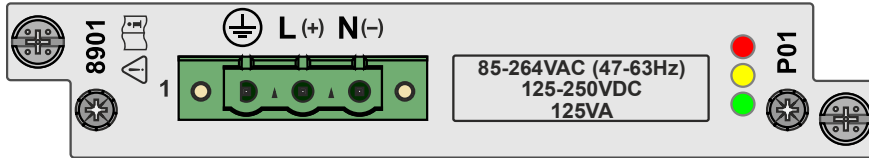


Figure 31

FG8901P01 is an extension board with PSU functionality. It has a connector via which the supply voltage can be connected to this board.

	<b>DANGER</b>
	<p><b>The device is operated with dangerous voltages.</b></p> <ul style="list-style-type: none"> <li>a) Disconnect all necessary supply lines / plugs before working on the device.</li> <li>b) The extension board may only be mounted and dismantled by instructed, skilled personnel.</li> <li>c) Even after disconnecting the power supply, dangerous residual voltages may still be present in the equipment (capacitor memory). A one-minute discharge period must be waited for.</li> </ul>

#### 11.3.24.1 Connection

	<b>DANGER</b>
	<p>When selecting the safety-tested supply line, ensure that the conductor cross-section is sufficient and that the fuse protection is appropriate.</p>

	<b>DANGER</b>
	<p>This PSU is delivered with the cable housing ST0001H00.</p>
	<p>Mount the cable housing on the power supply connector, to obtain additional protection against direct contact with the supply voltage and strain relief.</p> <p>The cable housings length is 37mm, keep that in mind when planning the space requirements of the base system</p>

	DANGER
	Provisions of IEC 62368-1
	Assembly and disassembly of the supply line to the plug is only permitted in a de-energized state (e.g., by the primary-side line protection).
	The supply lines must be adequately fused and dimensioned.
	Connection cross-section: 1mm <sup>2</sup> - 2.5mm <sup>2</sup> (17 AWG - 13 AWG)
The device must be supplied via a suitable disconnecting device (switch). The disconnecting device must be easily accessible, installed near the device and marked as a disconnecting device for the device.	

Voltage supply – 3 poles

<b>Conductor cross section</b>	1mm <sup>2</sup> - 2.5mm <sup>2</sup> (17 AWG - 13 AWG)
--------------------------------	---

	DANGER
	For safe operation, the device must be protected by an installation fuse of max. 16A and equipped with a residual current circuit breaker in accordance with the applicable national standards.
	An additional disconnecting device (protective contact socket / mains switch) must be easily accessible.

### 11.3.24.2 Status LEDs

	Red	The PSU has detected an operating fault e.g., missing supply voltage / defective board
	Yellow	The PSU is working close to its maximum ratings
	Green	The PSU is in full operational readiness

### 11.3.24.3 Supported board pages in huma

The following table lists the supported **huma** board pages of this board.

Board Overview	
General → Status	
General → Action	
General → Config	
Details → Status	

### 11.3.25 FG8901P02 - PSU 18-36VDC

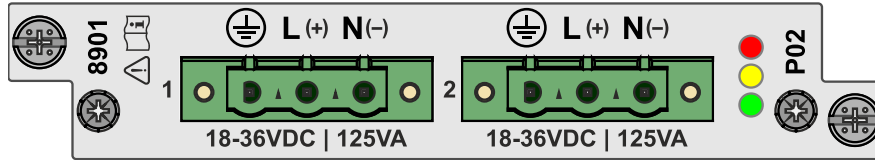


Figure 32

FG8901P02 is an extension board with PSU functionality. It has two connectors for a redundant supply voltage feed.

	<b>DANGER</b>
	<p><b>The device is operated with dangerous voltages.</b></p> <ul style="list-style-type: none"> <li>a) Disconnect all necessary live supply lines / plugs before working on the device.</li> <li>b) The extension board may only be mounted and dismantled by instructed, skilled personnel.</li> <li>c) Even after disconnecting the power supply, dangerous residual voltages may still be present in the equipment (capacitor memory). A one-minute discharge period must be waited for</li> </ul>

#### 11.3.25.1 Connection

	<b>DANGER</b>
	<p>When selecting the safety-tested supply line, ensure that the conductor cross-section is sufficient and that the fuse protection is appropriate.</p>

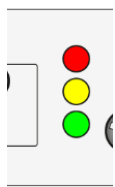
	<b>DANGER</b>
	<p>Provisions of IEC 62368-1</p> <p>Assembly and disassembly of the supply line to the plug is only permitted in a de-energized state (e.g., by the primary-side line protection).</p> <p>The supply lines must be adequately fused and dimensioned.</p> <p>Connection cross-section: 1mm<sup>2</sup> - 2.5mm<sup>2</sup> (17 AWG - 13 AWG)</p> <p>The device must be supplied via a suitable disconnecting device (switch). The disconnecting device must be easily accessible, installed near the device and marked as a disconnecting device for the device.</p>

2 x voltage supply (redundant) - 3 pole

<b>Conductor cross section</b>	1mm <sup>2</sup> - 2.5mm <sup>2</sup> (17 AWG - 13 AWG)
--------------------------------	---

	DANGER
	An additional disconnecting device (protective contact socket / mains switch) must be easily accessible.

### 11.3.25.2 Status LEDs



- Red            The PSU has detected an operating fault  
                  e.g., missing supply voltage / defective board
- Yellow        The PSU is working close to its maximum ratings
- Green         The PSU is in full operational readiness

### 11.3.25.3 Supported board pages in huma

The following table lists the supported **huma** board pages of this board.

Board Overview	
General → Status	
General → Action	
General → Config	
Details → Status	

### 11.3.26 FG8901P03 - PSU 36-76VDC

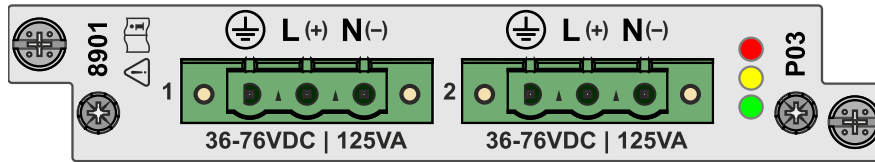


Figure 33

FG8901P03 is an extension board with PSU functionality. It has two connectors for a redundant supply voltage feed.

	<b>DANGER</b>
	<p><b>The device is operated with dangerous voltages.</b></p> <ul style="list-style-type: none"> <li>a) Disconnect all necessary live supply lines / plugs before working on the device.</li> <li>b) The extension board may only be mounted and dismantled by instructed, skilled personnel.</li> <li>c) Even after disconnecting the power supply, dangerous residual voltages may still be present in the equipment (capacitor memory). A one-minute discharge period must be waited for</li> </ul>


#### 11.3.26.1 Connection

	<b>DANGER</b>
	<p>When selecting the safety-tested supply line, ensure that the conductor cross-section is sufficient and that the fuse protection is appropriate.</p>

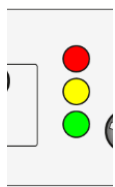
	<b>DANGER</b>
	<p>Provisions of IEC 62368-1</p>
	<p>Assembly and disassembly of the supply line to the plug is only permitted in a de-energized state (e.g., by the primary-side line protection).</p>
	<p>The supply lines must be adequately fused and dimensioned.                  Connection cross-section: 1mm<sup>2</sup> - 2.5mm<sup>2</sup> (17 AWG - 13 AWG)</p>
<p>The device must be supplied via a suitable disconnecting device (switch). The disconnecting device must be easily accessible, installed near the device and marked as a disconnecting device for the device.</p>	

2 x voltage supply (redundant) - 3 pole

<b>Conductor cross section</b>	1mm <sup>2</sup> – 2,5mm <sup>2</sup> (17 AWG – 13 AWG)
--------------------------------	---

	<b>DANGER</b>
	An additional disconnecting device (protective contact socket / mains switch) must be easily accessible.

### 11.3.26.2 Status LEDs



- Red            The PSU has detected an operating fault  
                  e.g., missing supply voltage / defective board
- Yellow        The PSU is working close to its maximum ratings
- Green         The PSU is in full operational readiness

### 11.3.26.3 Supported board pages in huma

The following table lists the supported **huma** board pages of this board.

Board Overview	
General → Status	
General → Action	
General → Config	
Details → Status	

### 11.3.27 FG8901P04 - PSU 60-160VDC

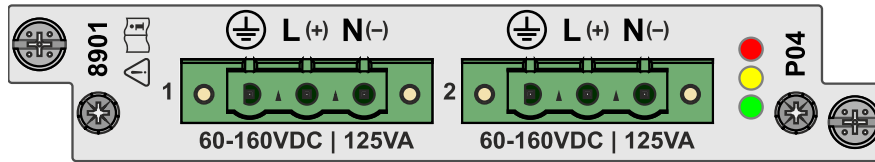


Figure 34

FG8901P04 is an extension board with PSU functionality. It has two connectors for a redundant supply voltage feed.

	<b>DANGER</b>
	<p><b>The device is operated with dangerous voltages.</b></p> <ul style="list-style-type: none"> <li>d) Disconnect all necessary live supply lines / plugs before working on the device.</li> <li>e) The extension board may only be mounted and dismantled by instructed, skilled personnel.</li> <li>f) Even after disconnecting the power supply, dangerous residual voltages may still be present in the equipment (capacitor memory). A one-minute discharge period must be waited for</li> </ul>

#### 11.3.27.1 Connection

	<b>DANGER</b>
	<p>When selecting the safety-tested supply line, ensure that the conductor cross-section is sufficient and that the fuse protection is appropriate.</p>

	<b>DANGER</b>
	<p>This PSU is delivered with the two cable housings ST0001H00.</p> <p>Mount the cable housings on the power supply connectors, to obtain additional protection against direct contact with the supply voltage and strain relief.</p> <p>The cable housings length is 37mm, keep that in mind when planning the space requirements of the base system</p>



	DANGER
	Provisions of IEC 62368-1
	Assembly and disassembly of the supply line to the plug is only permitted in a de-energized state (e.g., by the primary-side line protection).
	The supply lines must be adequately fused and dimensioned.
	Connection cross-section: 1mm <sup>2</sup> - 2.5mm <sup>2</sup> (17 AWG - 13 AWG)
The device must be supplied via a suitable disconnecting device (switch). The disconnecting device must be easily accessible, installed near the device and marked as a disconnecting device for the device.	

2 x voltage supply (redundant) - 3 pole

<b>Conductor cross section</b>	1mm <sup>2</sup> – 2,5mm <sup>2</sup> (17 AWG – 13 AWG)
--------------------------------	---

	DANGER
	An additional disconnecting device (protective contact socket / mains switch) must be easily accessible.

### 11.3.27.2 Status LEDs

	Red	The PSU has detected an operating fault e.g., missing supply voltage / defective board
	Yellow	The PSU is working close to its maximum ratings
	Green	The PSU is in full operational readiness

### 11.3.27.3 Supported board pages in huma

The following table lists the supported **huma** board pages of this board.

Board Overview	
General → Status	
General → Action	
General → Config	
Details → Status	

### 11.3.28 FG8901P06 - PSU 19-75VDC

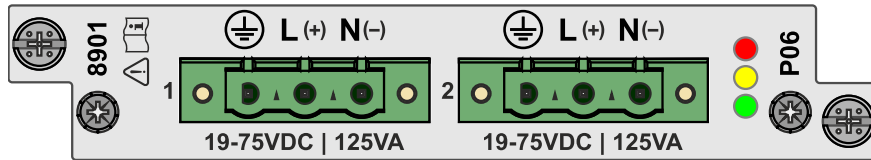


Figure 35

FG8901P06 is an extension board with PSU functionality. It has two connectors for a redundant supply voltage feed.

	<b>DANGER</b>
	<p><b>The device is operated with dangerous voltages.</b></p> <ul style="list-style-type: none"> <li>d) Disconnect all necessary live supply lines / plugs before working on the device.</li> <li>e) The extension board may only be mounted and dismantled by instructed, skilled personnel.</li> <li>f) Even after disconnecting the power supply, dangerous residual voltages may still be present in the equipment (capacitor memory). A one-minute discharge period must be waited for</li> </ul>

#### 11.3.28.1 Connection

	<b>DANGER</b>
	<p>When selecting the safety-tested supply line, ensure that the conductor cross-section is sufficient and that the fuse protection is appropriate.</p>

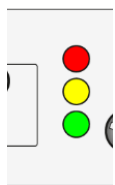
	<b>DANGER</b>
	<p>Provisions of IEC 62368-1</p> <p>Assembly and disassembly of the supply line to the plug is only permitted in a de-energized state (e.g., by the primary-side line protection).</p> <p>The supply lines must be adequately fused and dimensioned.              Connection cross-section: 1mm<sup>2</sup> - 2.5mm<sup>2</sup> (17 AWG - 13 AWG)</p> <p>The device must be supplied via a suitable disconnecting device (switch). The disconnecting device must be easily accessible, installed near the device and marked as a disconnecting device for the device.</p>

2 x voltage supply (redundant) - 3 pole

<b>Conductor cross section</b>	1mm <sup>2</sup> - 2.5mm <sup>2</sup> (17 AWG - 13 AWG)
--------------------------------	---

	<b>DANGER</b>
	An additional disconnecting device (protective contact socket / mains switch) must be easily accessible.

### 11.3.28.2 Status LEDs



- Red            The PSU has detected an operating fault  
                  e.g., missing supply voltage / defective board
- Yellow        The PSU is working close to its maximum ratings
- Green         The PSU is in full operational readiness

### 11.3.28.3 Supported board pages in huma

The following table lists the supported **huma** board pages of this board.

Board Overview	
General → Status	
General → Action	
General → Config	
Details → Status	

## 12 Commissioning

To put an 8100 product series device into operation, the following steps must be carried out:

- Mount the base system as described in *chapter 8 System mounting*
- Mount the extension boards into the base system as described in *chapter 11.1 Mounting of extension boards* (the minimum configuration described in *chapter 7.6 Minimal configuration* must be fulfilled).
- Connect supply voltage to the PSU(s) (supported input voltage ranges of the PSU extension boards are defined on the panels of the PSU extension boards, alternatively the supported input voltage ranges can also be read from the corresponding *chapter 11.3 Supported extension boards* )
- After connecting the supply voltage, it is necessary to wait until the extension board has booted with the MC functionality. Recognizable by the LEDs of the base systems front panel (*see chapter 7.7.1 LEDs*)
- Use the front panel button to switch to the POS2 screen as described in *chapter 7.7.3 Display*
- On the POS2 screen the IPv4 addresses and netmasks of the extension board with the MC functionality are displayed. Via these the extension board with the MC functionality can be reached and then according to the **huma**® web edition documentation the base system and the extension boards can be configured and mounted (username and password is *administrator*).

## 13 Maintenance

No special maintenance is required for the 8100 product series devices.

If you detect a malfunction, follow the instructions in the corresponding chapters for troubleshooting or contact the **hopf** Elektronik GmbH -Support.

## 14 Troubleshooting

### 14.1 Procedure

If the device reports an error, then **hopf** Elektronik GmbH recommends proceeding as follows:

- If there is no light emitting diode on the device and no display activity (pressing the button), check whether the supply voltage is sufficient and the polarity is correct at the corresponding terminals.
- If the device displays a fault via the red error LED, look in the corresponding menu of the extension boards for the cause of the fault.

**The device / extension board is ready for operation when:**

- According to the functional description of the respective extension board, the operational readiness is signalled via the three LEDs in each board front panel.
- A red LED usually indicates limited functionality, while the green and yellow LEDs signal that the device is ready for operation.
- The exact function description of the LEDs can be found in the corresponding menu of the respective extension board.

## 15 Repair

Apart from the extension boards only fans of the base system may be exchanged outside a factory of the company **hopf** Elektronik GmbH.

Limit work on the hardware to the necessary extent.

	<b>Note</b>
	Have defective extension boards replaced only by trained persons.

	<b>CAUTION</b>
	Repairs to the device may only be carried out by the manufacturer or by authorized personnel.
	Improper repairs may result in considerable danger to the user (electric shock, fire hazard).
	Unauthorized opening of the device or individual parts of the device can also cause considerable danger to the user and will result in loss of warranty and exclusion of liability.

	<b>WARNING</b>
	<b>Risk of Burns</b>
	During operation, high device temperatures may occur depending on the operating parameters and type.
	Allow the device to cool down first before starting maintenance work.

## 15.1 Fan replacement

Tools needed: Phillips screwdriver PH1

To replace one or both fans, all cables from the extension boards and the ground cable(s) of the base system must first be unplugged/dismounted, then the base system must be removed from the control cabinet.

	<b>WARNING</b>
	Disconnect / dismantle cables All cables must be unplugged / dismantled from the base system and its extension boards before removing the base system from the control cabinet, otherwise the base system or the extension boards may suffer an electric shock or become defective.

Then the five screws with which the cover of the base system is mounted must be removed (see Figure 36).



Figure 36

Then the cover of the base system must be lifted and placed in front of the front panel of the base system so that the inside of the cover is facing up (see Figure 37).


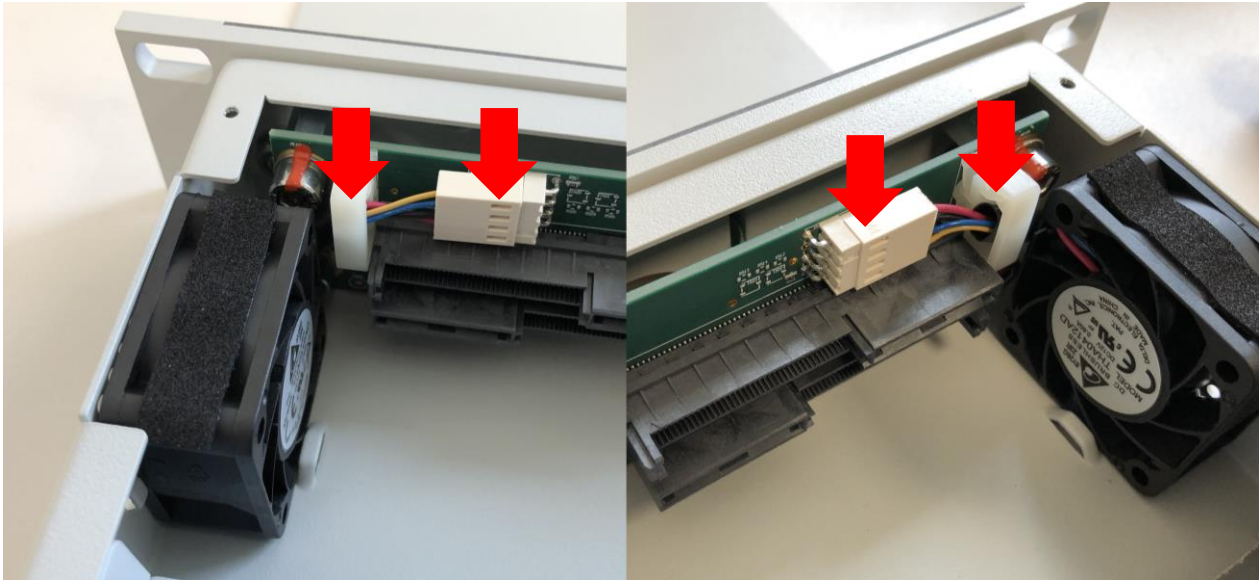
	<b>WARNING</b>
Cover grounding cable	
The cover must be lifted carefully, as it is connected to the rest of the housing by a grounding cable. If care is not taken when removing the cover, the FG8101G01 may be destroyed.	



Figure 37



Then the cable guide of the fan cable must be opened, the fan must be unplugged from its connector and the defective fan must be removed from the base system. Figure 38 shows the positions of the cable guide and the plug of the fan.



**Figure 38**

After that, a new fan can be plugged into the base system, the cable can be led through the cable guide and plugged in and the cable guide can be closed.

After that, the cover must be mounted and fixed with the five screws (Tighten the screws with a torque of 0.2 Nm), making sure that the ground cable of the cover is not over the backplane connectors of POS1 and POS2.

Finally, the base system must be mounted as described in *chapter 8 System mounting* and then all cables must be connected to the extension boards.

## 16 Technical Specifications

Technical specifications of the base system and all extension boards can be found in the latest 8100 product series product sheet.