Because every fraction of a second counts ■

FG8101G01

Technical Documentation

Time Reference Systems
Made in Germany

1 Table of Contents

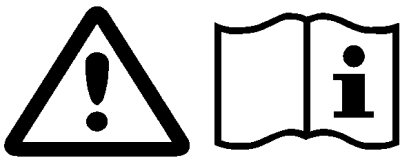
2 List of Figures

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	Added boards FG8800M00, FG8802S00, FG8802S01, FG8802S02, FG8802S20, FG8901P06 Added factory default instructions to all boards that have a configuration Added cable housing information to FG8901P01 and FG8901P04 Corrected LED description of all PSU boards Corrected number representation in technical specifications (decimal point and comma for thousands separator) Added supported requests per second for NTP in the technical specifications

4 Preliminary Remarks

This document describes the functions, operation, mounting and commissioning of the FG8101G01 product, as well as the hot-plug extension boards that can be used.

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

4.1 Conformity data

CE	**CE conformity** 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). 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.

UKCA	**UKCA- conformity** 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 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.

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	**DANGER** The signal word denotes a hazard with a **high** degree of risk which, if not avoided, will result in death or serious injury. **WARNING** The signal word indicates a hazard with a **medium** level of risk which, if not avoided, may result in death or serious injury. **CAUTION** The signal word indicates a hazard with a **low** level of risk that, if not avoided, could result in a minor or moderate injury.
 IEC 60417-6042 Vorsicht, Risiko eines elektrischen Schlages / Caution, risk of electric shock	**DANGER** The signal word indicates a hazard with electrical voltage with a high degree of risk. Danger of Electric Shock!
 IEC 60417-5041 Vorsicht, heiße Oberfläche / Caution, hot surface	**CAUTION** The signal word indicates a hazard with high device temperatures **Risk of burns** During operation, high device temperatures may occur depending on the operating parameters and type. Allow the unit to cool down before starting maintenance work.
 IEC 60417-6222 Allgemeine Information, Hilfe / Information, general; help	**Note** 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.

5 Safety instructions

Note

The product information is intended exclusively for qualified electricians.

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:

Note

Assembly, installation, commissioning and repairs of electrical devices may only be carried out by a qualified electrician.

It is essential to observe the safety regulations and generally applicable technical rules relevant to the installation location.

Observe the applicable standards and regulations for system installation.

Prevent malfunctions and thus avoid personal injury and damage to property.

CAUTION

Damage to the device due to overvoltage

Ensure that the power supply is correct.
Take suitable lightning protection measures to ensure that the permitted voltage is not exceeded at the connections.

DANGER

Danger of Electric Shock

The device is operated with dangerous voltages.
It is imperative that you observe the installation instructions for the respective extension boards.

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.

Note

The manufacturer accepts no liability for applications that deviate from or go beyond the intended use.

6 Device description

The FG8101G01 is a 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

Note

An extension board can provide more than one functionality.

6.1 Extension board positions

Figure 1

Figure 1 shows the rear panel of the FG8101G01, 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

	**CAUTION** **Extension boards positions** 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.

6.2 PSU - Power Supply Unit

Up to 2 PSUs are supported in FG8101G01. 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 FG8101G01, then a 1 out of 2 redundancy is obtained.

6.3 MC - Management Controller Board

In FG8101G01 one MC is supported. The MC distributes the configuration and updates and collects the status of the FG8101G01 and the remaining extension boards via the internal management bus. Additionally, the MC provides parts of the collected status via the display of the FG8101G01.

6.4 TDC - Time Domain Controller Board

In FG8101G01 up to 2 TDCs are supported. One 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 FG8101G01 and the remaining extension boards via a TDC interface.

FG8101G01 has two TDC interfaces, each of which is routed to all extension boards in the FG8101G01.

6.5 SP - Service Provider

In FG8101G01 up to 6 SP are supported. A SP synchronizes to one of the two TDC interfaces and thus generates its time output (e.g., NTP).

Each SP can also synchronize to both TDC interfaces of the FG8101G01 and thus generate its time output. Which TDC interface is the primary synchronization source of a SP can be configured per SP.

6.6 Minimal configuration of a FG8101G01

To operate a FG8101G01 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 FG8101G01 and the extension boards and for the data indication on the display of the FG8101G01. If the extension board with MC functionality is pulled out of the FG8101G01 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 FG8101G01.

6.7 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

6.7.1 LEDs

The LEDs show the current status of the FG8101G01.

If only the red LED is on, then there is an error in the FG8101G01 or at an extension board.

If only the yellow LED is on, then there is a warning in the FG8101G01 or on an extension board, but no error.

If only the green LED is on, then there are no errors or warnings in the FG8101G01 or at the extension boards.

If all three LEDs are on, then no extension board with MC functionality is accessible from the FG8101G01 (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 FG8101G01 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 run is performed one more time. Each combination is displayed for one second.

6.7.2 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, an event is triggered every 500ms that simulates a short button press. This way you can quickly scroll through all screens.

6.7.3 Display

With the help of the display the article and serial numbers of the FG8101G01 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 FG8101G01 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 is shown alternately empty and full.

After the display test, the FG8101G01 screen showing the part number and serial number of the FG8101G01 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 FG8101G01, either the FG8101G01 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 FG8101G01. 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 summer and winter time 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 FG8101G01 screen.

If the button on the FG8101G01 screen is pressed within 30 seconds, the system changes to the TDC screen, otherwise to the IDLE state.

7 System mounting FG8101G01

FG8101G01 is designed for installation in a 19" control cabinet. The following steps must be carried out for installation in the 19" control cabinet:

	**CAUTION** **Thermic** 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 may be exceeded due to insufficient convection and/or thermal coupling with surrounding devices. Fire protection must be ensured in the installed state.

- Insert the FG8101G01 into the 19" control cabinet and screw it tight to the front retaining brackets with 4 screws.
- FG8101G01 must be connected to at least one of the two grounding screws ⏚ for potential equalization (the positions of the grounding screws are shown in Figure 3). A grounding cable with at least 1.5mm² must be used.

Figure 3

	**Note** **Protection class 1** The system is a protection class 1 device and may only be operated with a grounded connection.

8 Connection of the supply and data lines

The FG8101G01 time reference system is designed for operation on hazardous voltages.

	**WARNING** 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.

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 laid without damage.

9 Extension boards

9.1 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 FG8101G01.

Figure 4

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

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

	Note Extension board rotation For POS5 to POS8 the extension boards must be inserted rotated into the FG8101G01, i.e., the labelling on the bezel of the extension board must be upside down for these positions.

After the extension board has been inserted into the FG8101G01, the extension board must be fixed against the FG8101G01 with the screws on the cover and then cables can be connected to the extension board.

	CAUTION **Connect cable to extension board** Cables may only be connected to the extension boards after the boards have been mounted in the FG8101G01, otherwise an electric shock or a defect of the extension board may occur.

9.2 Dismounting of extension boards

To remove an extension board from the FG8101G01, all cables must first be disconnected from the corresponding extension board.

	**CAUTION** **Disconnect cable from extension board** 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 FG8101G01, then the extension board can be pulled out of the FG8101G01.

	**DANGER** **Electric Shock** PSU extension boards must not be pulled out of the FG8101G01 immediately after disconnecting the cables. Wait at least one minute between unplugging the cables and pulling out the PSU extension board.

	**WARNING** **Risk of Burns** 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 FG8101G01 of the dismantled extension board.

9.3 Supported extension boards

Different extension boards are supported by the FG8101G01.

9.3.1 FG8702G01 - MC, TDC and SP functionality

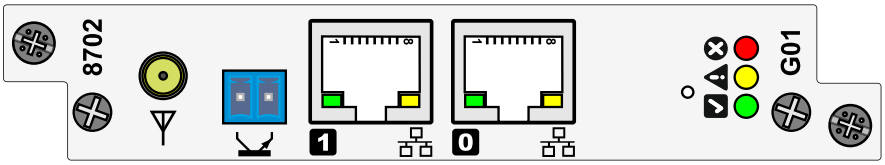


Figure 7

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.

To use the TDC functionality with this extension board, a GNSS antenna system must 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.

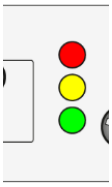
In addition, this extension board has two network interfaces which are used for the management of the FG8101G01 when using the MC functionality and can provide network time protocols for the SP functionality.

General	
Boot duration	Typical: 40 seconds May be prolonged depending on configuration
SP functionality	
Network time protocols	NTP, SNTP
MC functionality	
Network management protocols	http, https, SSH, SNMP, SNMP Traps, SMTP, Syslog, ***huma***

9.3.1.1 Status LEDs of extension boards

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 board on the system. The exact functional description can be found on the respective extension board.

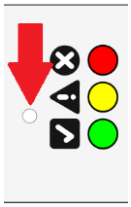
LED status



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

9.3.1.2 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.



9.3.1.3 Supported board pages in huma

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

Board Overview	
General ➔ Status	**Yes**
General ➔ Action	**Yes**
Details ➔ Status	No
Network	
General ➔ Config	**Yes**
Interface ➔ Status	**Yes**
Interface ➔ Config	**Yes**
Routing ➔ Status	**Yes**
Routing ➔ Config	**Yes**

Firewall ➔ Config	**Yes**
Sync Setting	
General ➔ Status	**Yes**
General ➔ Action	**Yes**
General ➔ Config	**Yes** (Synchronization sources section in Synchronization sources for TDC boards variant)
GNSS ➔ Status	**Yes**
GNSS ➔ Config	**Yes**
NTP ➔ Status	**Yes**
NTP ➔ Action	**Yes**
NTP ➔ Config	**Yes**
PTP ➔ Status	**Yes**
PTP ➔ Config	**Yes**
Time Service	
General ➔ Status	**Yes**
General ➔ Config	**Yes**
NTP ➔ Status	**Yes**
NTP ➔ Action	**Yes**
NTP ➔ Config	**Yes**
PTP ➔ Status	**Yes**
PTP ➔ Config	**Yes**
SIMATIC NTP 10s broadcast ➔ Config	**Yes**
Xx ➔ Config	No
Monitoring	
Events ➔ Config	**Yes**
Syslog ➔ Config	**Yes**
Email ➔ Config	**Yes**
SNMP ➔ Config	**Yes**
Optocoupler ➔ Config	**Yes**

9.3.2 FG8702G02 - MC, TDC and SP functionality

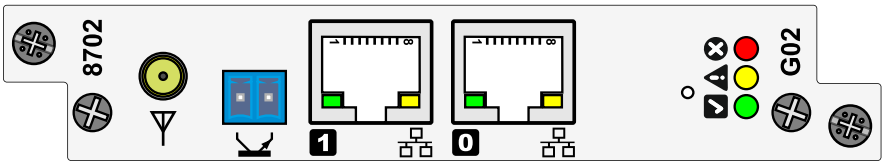


Figure 8

FG8702G02 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.

To use the TDC functionality with this extension board, a GNSS antenna system must 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.

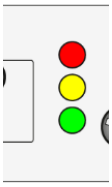
In addition, this extension board has two network interfaces which are used for the management of the FG8101G01 when using the MC functionality and can provide network time protocols for the SP functionality.

General	
Boot duration	Typical: 40 seconds May be prolonged depending on configuration
SP functionality	
Network time protocols	NTP, SNTP
MC functionality	
Network management protocols	http, https, SSH, SNMP, SNMP Traps, SMTP, Syslog, ***huma***

9.3.2.1 Status LEDs of extension boards

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 board on the system. The exact functional description can be found on the respective extension board.

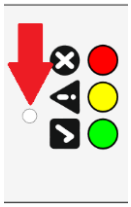
LED status



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

9.3.2.2 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.



9.3.2.3 Supported board pages in huma

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

Board Overview	
General ➔ Status	**Yes**
General ➔ Action	**Yes**
Details ➔ Status	No
Network	
General ➔ Config	**Yes**
Interface ➔ Status	**Yes**
Interface ➔ Config	**Yes**
Routing ➔ Status	**Yes**
Routing ➔ Config	**Yes**

Firewall ➔ Config	**Yes**
Sync Setting	
General ➔ Status	**Yes**
General ➔ Action	**Yes**
General ➔ Config	**Yes** (Synchronization sources section in Synchronization sources for TDC boards variant)
GNSS ➔ Status	**Yes**
GNSS ➔ Config	**Yes**
NTP ➔ Status	**Yes**
NTP ➔ Action	**Yes**
NTP ➔ Config	**Yes**
PTP ➔ Status	**Yes**
PTP ➔ Config	**Yes**
Time Service	
General ➔ Status	**Yes**
General ➔ Config	**Yes**
NTP ➔ Status	**Yes**
NTP ➔ Action	**Yes**
NTP ➔ Config	**Yes**
PTP ➔ Status	**Yes**
PTP ➔ Config	**Yes**
SIMATIC NTP 10s broadcast ➔ Config	**Yes**
Xx ➔ Config	No
Monitoring	
Events ➔ Config	**Yes**
Syslog ➔ Config	**Yes**
Email ➔ Config	**Yes**
SNMP ➔ Config	**Yes**
Optocoupler ➔ Config	**Yes**

9.3.3 FG8702G03 - MC, TDC and SP functionality

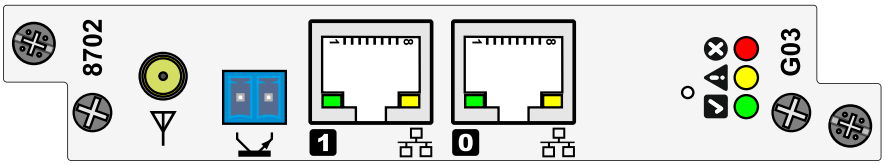


Figure 9

FG8702G03 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.

To use the TDC functionality with this extension board, a GNSS antenna system must 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.

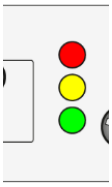
In addition, this extension board has two network interfaces which are used for the management of the FG8101G01 when using the MC functionality and can provide network time protocols for the SP functionality.

General	
Boot duration	Typical: 40 seconds May be prolonged depending on configuration
SP functionality	
Network time protocols	NTP, SNTP
MC functionality	
Network management protocols	http, https, SSH, SNMP, SNMP Traps, SMTP, Syslog, ***huma***

9.3.3.1 Status LEDs of extension boards

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 board on the system. The exact functional description can be found on the respective extension board.

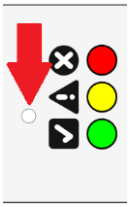
LED status



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

9.3.3.2 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.



9.3.3.3 Supported board pages in huma

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

Board Overview	
General ➔ Status	**Yes**
General ➔ Action	**Yes**
Details ➔ Status	No
Network	
General ➔ Config	**Yes**
Interface ➔ Status	**Yes**
Interface ➔ Config	**Yes**
Routing ➔ Status	**Yes**
Routing ➔ Config	**Yes**

Firewall ➔ Config	**Yes**
Sync Setting	
General ➔ Status	**Yes**
General ➔ Action	**Yes**
General ➔ Config	**Yes** (Synchronization sources section in Synchronization sources for TDC boards variant)
GNSS ➔ Status	**Yes**
GNSS ➔ Config	**Yes**
NTP ➔ Status	**Yes**
NTP ➔ Action	**Yes**
NTP ➔ Config	**Yes**
PTP ➔ Status	**Yes**
PTP ➔ Config	**Yes**
Time Service	
General ➔ Status	**Yes**
General ➔ Config	**Yes**
NTP ➔ Status	**Yes**
NTP ➔ Action	**Yes**
NTP ➔ Config	**Yes**
PTP ➔ Status	**Yes**
PTP ➔ Config	**Yes**
SIMATIC NTP 10s broadcast ➔ Config	**Yes**
Xx ➔ Config	No
Monitoring	
Events ➔ Config	**Yes**
Syslog ➔ Config	**Yes**
Email ➔ Config	**Yes**
SNMP ➔ Config	**Yes**
Optocoupler ➔ Config	**Yes**

9.3.4 FG8800M00 - MC and SP functionality

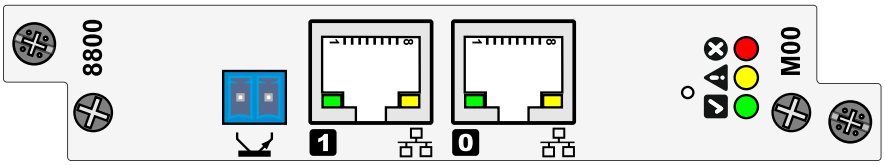


Figure 10

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.

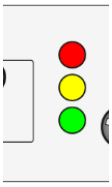
In addition, this extension board has two network interfaces which are used for the management of the FG8101G01 when using the MC functionality and can provide network time protocols for the SP functionality.

General	
Boot duration	Typical: 40 seconds May be prolonged depending on configuration
SP functionality	
Network time protocols	NTP, SNTP
MC functionality	
Network management protocols	http, https, SSH, SNMP, SNMP Traps, SMTP, Syslog, ***huma***

9.3.4.1 Status LEDs of extension boards

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 board on the system. The exact functional description can be found on the respective extension board.

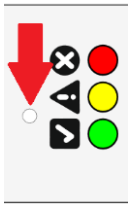
LED status



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

9.3.4.2 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.



9.3.4.1 Supported board pages in huma

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

Board Overview	
General ➔ Status	**Yes**
General ➔ Action	**Yes**
Details ➔ Status	No
Network	
General ➔ Config	**Yes**
Interface ➔ Status	**Yes**
Interface ➔ Config	**Yes**
Routing ➔ Status	**Yes**
Routing ➔ Config	**Yes**

Firewall ➔ Config	**Yes**
Sync Setting	
General ➔ Status	**Yes**
General ➔ Action	**Yes** (only the **Execute time jump** section)
General ➔ Config	**Yes** (only **Max. frequency change** and **Synchronization sources for non-TDC boards** section)
GNSS ➔ Status	No
GNSS ➔ Config	No
NTP ➔ Status	No
NTP ➔ Action	No
NTP ➔ Config	No
PTP ➔ Status	No
PTP ➔ Config	No
Time Service	
General ➔ Status	**Yes**
General ➔ Config	**Yes**
NTP ➔ Status	**Yes**
NTP ➔ Action	**Yes**
NTP ➔ Config	**Yes**
PTP ➔ Status	**Yes**
PTP ➔ Config	**Yes**
SIMATIC NTP 10s broadcast ➔ Config	**Yes**
Xx ➔ Config	No
Monitoring	
Events ➔ Config	**Yes**
Syslog ➔ Config	**Yes**
Email ➔ Config	**Yes**
SNMP ➔ Config	**Yes**
Optocoupler ➔ Config	**Yes**

9.3.5 FG8801N02 - SP functionality

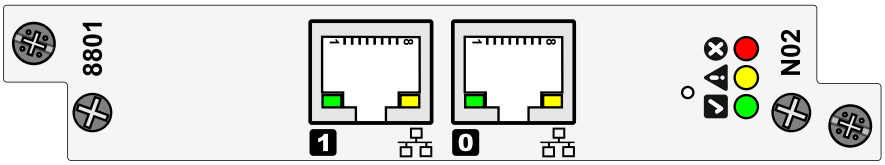


Figure 11

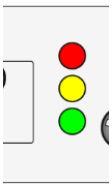
FG8801N02 is an extension board with SP functionality. This extension board takes the time provided by one or two TDCs in the FG8101G01 and places it at the network interfaces available through network timing protocols.

General	
Boot duration	Typical: 40 seconds May be prolonged depending on configuration
SP functionality	
Network time protocols	NTP, SNTP

9.3.5.1 Status LEDs of extension boards

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 board on the system. The exact functional description can be found on the respective extension board.

LED status



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

9.3.5.2 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.

9.3.5.3 Supported board pages in huma

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

Board Overview	
General ➔ Status	**Yes**
General ➔ Action	**Yes**
Details ➔ Status	No
Network	
General ➔ Config	**Yes**
Interface ➔ Status	**Yes**
Interface ➔ Config	**Yes**
Routing ➔ Status	**Yes**
Routing ➔ Config	**Yes**
Firewall ➔ Config	**Yes**
Sync Setting	
General ➔ Status	**Yes**
General ➔ Action	**Yes** (only the **Execute time jump** section)
General ➔ Config	**Yes** (only **Max. frequency change** and **Synchronization sources for non-TDC boards** section)
GNSS ➔ Status	No
GNSS ➔ Config	No
NTP ➔ Status	No
NTP ➔ Action	No
NTP ➔ Config	No
PTP ➔ Status	No
PTP ➔ Config	No
Time Service	
General ➔ Status	**Yes**

General ➔ Config	**Yes**
NTP ➔ Status	**Yes**
NTP ➔ Action	**Yes**
NTP ➔ Config	**Yes**
PTP ➔ Status	**Yes**
PTP ➔ Config	**Yes**
SIMATIC NTP 10s broadcast ➔ Config	**Yes**
Xx ➔ Config	No
Monitoring	
Events ➔ Config	No
Syslog ➔ Config	No
Email ➔ Config	No
SNMP ➔ Config	No
Optocoupler ➔ Config	No

9.3.6 FG8802S00 - SP functionality

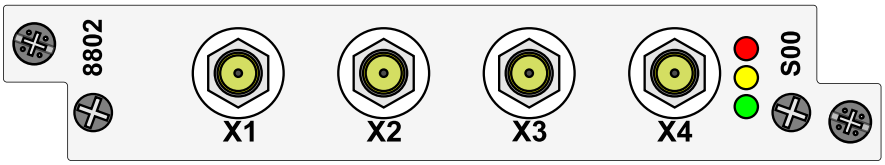


Figure 12

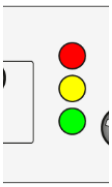
FG8802S00 is an extension board with SP functionality. This extension board takes the time provided by one or two TDCs in the FG8101G01 and provides the time via its SMA connectors.

General	
Boot duration	Typical: 10 seconds
SP functionality	
Time protocols	IRIG-B, DCF77, Cyclic pulse
Output voltages	5VDC, 12VDC, 24VDC 3.3Vp and 2.17Vp for IRIG-B amplitude modulation
Output power	1 watt per connector
Connector type	SMA female

9.3.6.1 Status LEDs of extension boards

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 board on the system. The exact functional description can be found on the respective extension board.

LED status



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

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

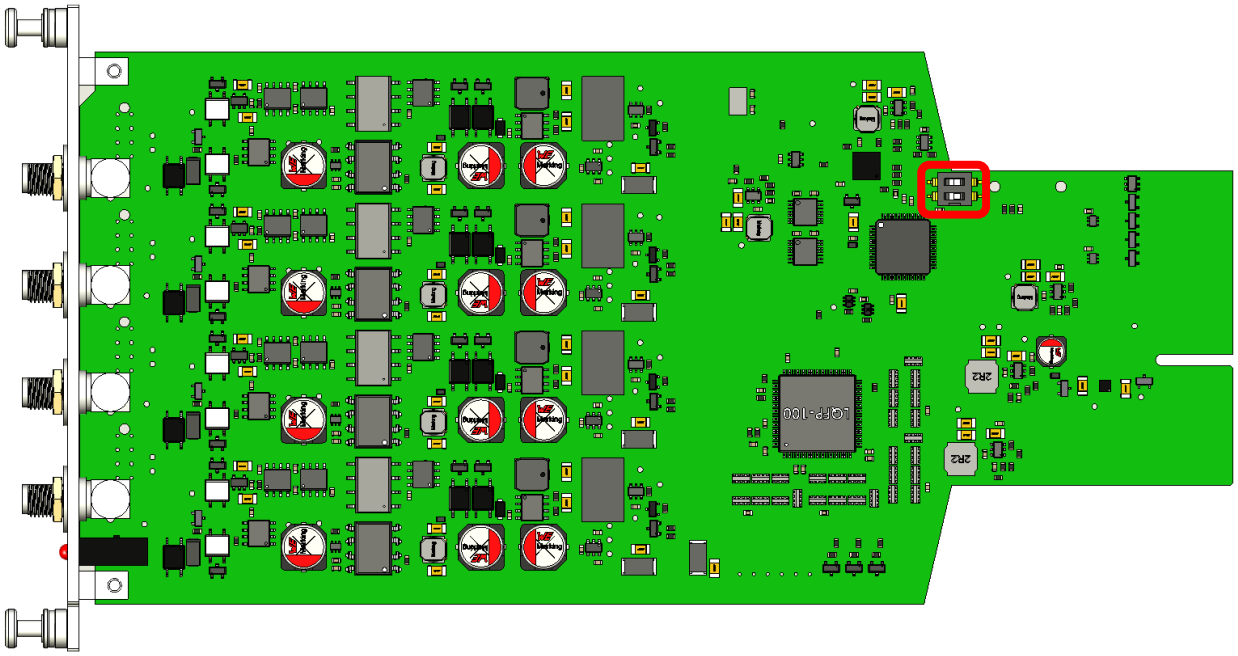


Figure 13

The position of the dip-switch is highlighted in Figure 13.

9.3.6.3 Supported board pages in huma

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

Board Overview	
General ➔ Status	**Yes**

General ➔ Action	**Yes**
Details ➔ Status	No
Network	
General ➔ Config	No
Interface ➔ Status	No
Interface ➔ Config	No
Routing ➔ Status	No
Routing ➔ Config	No
Firewall ➔ Config	No
Sync Setting	
General ➔ Status	**Yes**
General ➔ Action	**Yes** (only the **Execute time jump** section)
General ➔ Config	**Yes** (only **Max. frequency change** and **Synchronization sources for non-TDC boards** section)
GNSS ➔ Status	No
GNSS ➔ Config	No
NTP ➔ Status	No
NTP ➔ Action	No
NTP ➔ Config	No
PTP ➔ Status	No
PTP ➔ Config	No
Time Service	
General ➔ Status	**Yes**
General ➔ Config	**Yes**
NTP ➔ Status	No
NTP ➔ Action	No
NTP ➔ Config	No
PTP ➔ Status	No

PTP ➔ Config	No
SIMATIC NTP 10s broadcast ➔ Config	No
Xx ➔ Config	**Yes**
Monitoring	
Events ➔ Config	No
Syslog ➔ Config	No
Email ➔ Config	No
SNMP ➔ Config	No
Optocoupler ➔ Config	No

9.3.7 FG8802S01 - SP functionality

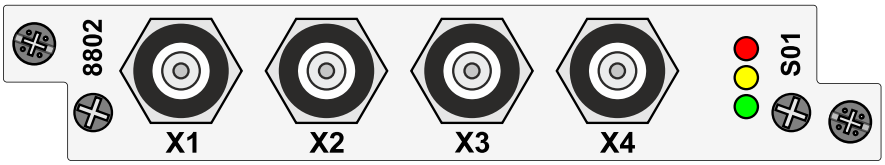


Figure 14

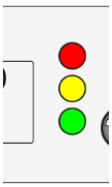
FG8802S01 is an extension board with SP functionality. This extension board takes the time provided by one or two TDCs in the FG8101G01 and provides the time via its BNC connectors.

General	
Boot duration	Typical: 10 seconds
SP functionality	
Time protocols	IRIG-B, DCF77, Cyclic pulse
Output voltages	5VDC, 12VDC, 24VDC 3.3Vp and 2.17Vp for IRIG-B amplitude modulation
Output power	1 watt per connector
Connector type	BNC female

9.3.7.1 Status LEDs of extension boards

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 board on the system. The exact functional description can be found on the respective extension board.

LED status



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

9.3.7.2 Factory default

The FG8802S01 is equipped with a dip-switch. To perform a factory default on the FG8802S01 perform the following steps:

- Dismount the FG8802S01 of the system
- Bring both switches of the dip-switch in the ON-position
- Mount the FG8802S01 in a powered system
- Wait 60 seconds
- Dismount the FG8802S01 of the system
- Bring both switches of the dip-switch in the OFF-position
- Mount the FG8802S01 in a powered system

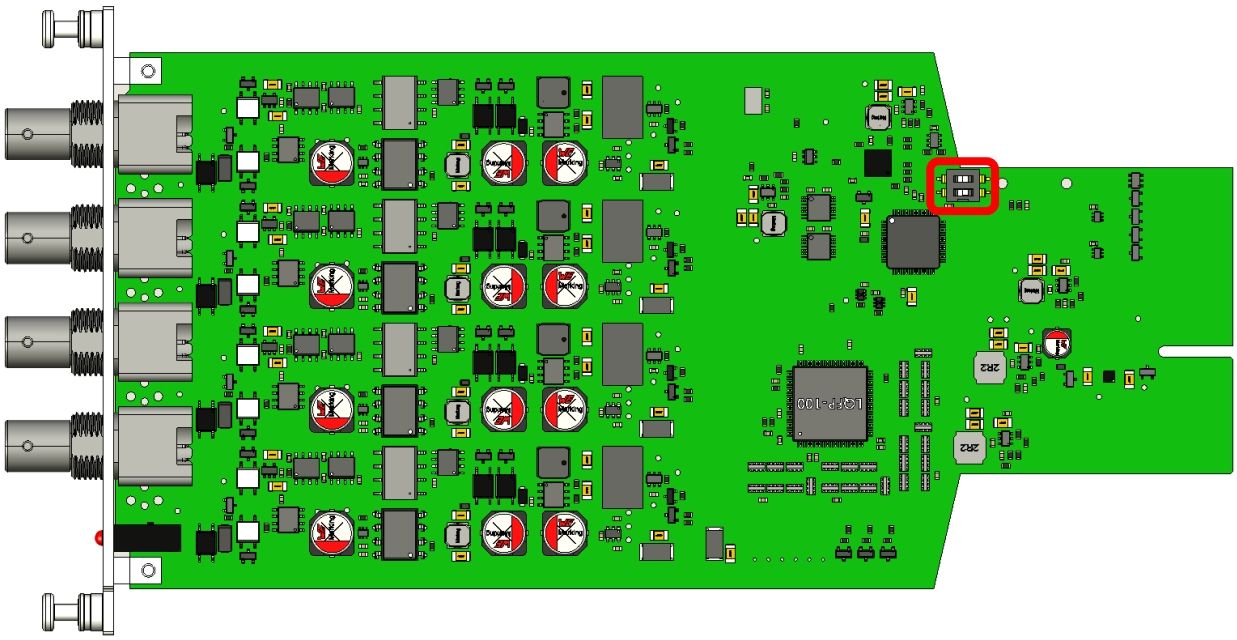


Figure 15

The position of the dip-switch is highlighted in Figure 15.

9.3.7.3 Supported board pages in huma

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

Board Overview	
General ➔ Status	**Yes**
General ➔ Action	**Yes**

Details ➔ Status	No
Network	
General ➔ Config	No
Interface ➔ Status	No
Interface ➔ Config	No
Routing ➔ Status	No
Routing ➔ Config	No
Firewall ➔ Config	No
Sync Setting	
General ➔ Status	**Yes**
General ➔ Action	**Yes** (only the **Execute time jump** section)
General ➔ Config	**Yes** (only **Max. frequency change** and **Synchronization sources for non-TDC boards** section)
GNSS ➔ Status	No
GNSS ➔ Config	No
NTP ➔ Status	No
NTP ➔ Action	No
NTP ➔ Config	No
PTP ➔ Status	No
PTP ➔ Config	No
Time Service	
General ➔ Status	**Yes**
General ➔ Config	**Yes**
NTP ➔ Status	No
NTP ➔ Action	No
NTP ➔ Config	No
PTP ➔ Status	No
PTP ➔ Config	No

SIMATIC NTP 10s broadcast ➔ Config	No
Xx ➔ Config	**Yes**
Monitoring	
Events ➔ Config	No
Syslog ➔ Config	No
Email ➔ Config	No
SNMP ➔ Config	No
Optocoupler ➔ Config	No

9.3.8 FG8802S02 - SP functionality

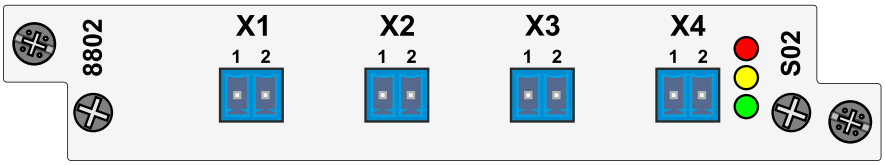


Figure 16

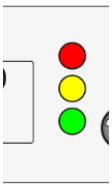
FG8802S02 is an extension board with SP functionality. This extension board takes the time provided by one or two TDCs in the FG8101G01 and provides the time via its screw terminals.

General	
Boot duration	Typical: 10 seconds
SP functionality	
Time protocols	IRIG-B, DCF77, Cyclic pulse
Output voltages	5VDC, 12VDC, 24VDC 3.3Vp and 2.17Vp for IRIG-B amplitude modulation
Output power	1 watt per connector
Connector type	Screw terminal

9.3.8.1 Status LEDs of extension boards

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 board on the system. The exact functional description can be found on the respective extension board.

LED status



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

9.3.8.2 Factory default

The FG8802S02 is equipped with a dip-switch. To perform a factory default on the FG8802S02 perform the following steps:

- Dismount the FG8802S02 of the system
- Bring both switches of the dip-switch in the ON-position
- Mount the FG8802S02 in a powered system
- Wait 60 seconds
- Dismount the FG8802S02 of the system
- Bring both switches of the dip-switch in the OFF-position
- Mount the FG8802S02 in a powered system

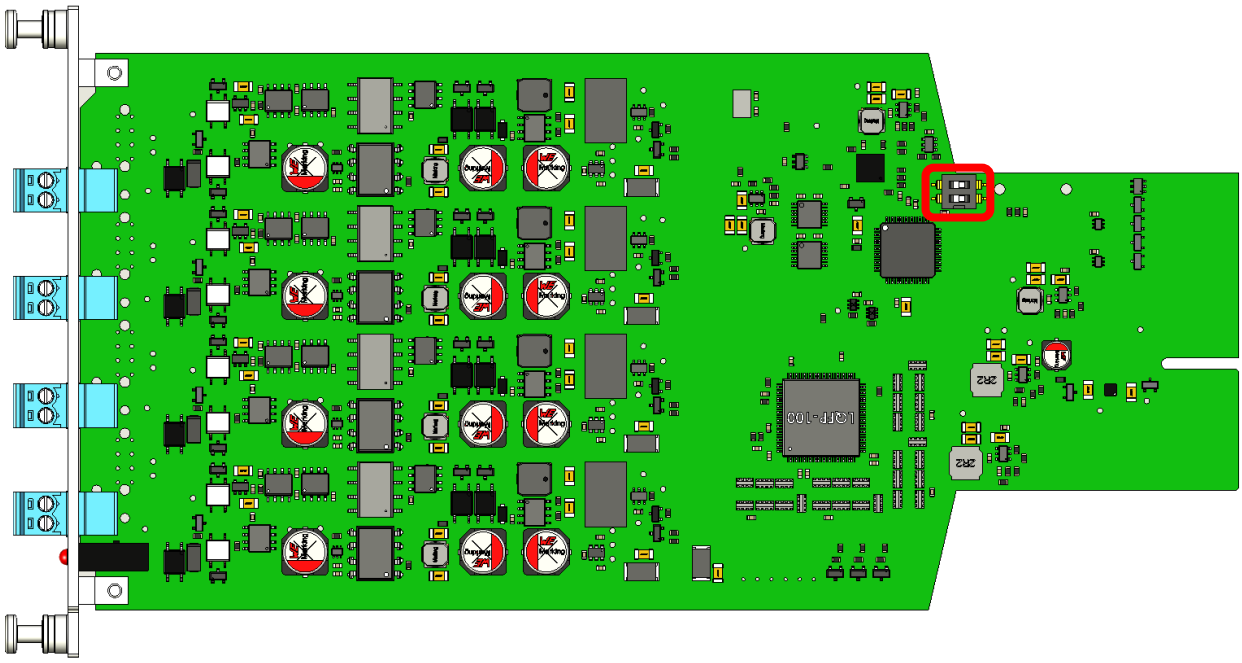


Figure 17

The position of the dip-switch is highlighted in Figure 17.

9.3.8.3 Supported board pages in huma

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

Board Overview	
General ➔ Status	**Yes**

General ➔ Action	**Yes**
Details ➔ Status	No
Network	
General ➔ Config	No
Interface ➔ Status	No
Interface ➔ Config	No
Routing ➔ Status	No
Routing ➔ Config	No
Firewall ➔ Config	No
Sync Setting	
General ➔ Status	**Yes**
General ➔ Action	**Yes** (only the **Execute time jump** section)
General ➔ Config	**Yes** (only **Max. frequency change** and **Synchronization sources for non-TDC boards** section)
GNSS ➔ Status	No
GNSS ➔ Config	No
NTP ➔ Status	No
NTP ➔ Action	No
NTP ➔ Config	No
PTP ➔ Status	No
PTP ➔ Config	No
Time Service	
General ➔ Status	**Yes**
General ➔ Config	**Yes**
NTP ➔ Status	No
NTP ➔ Action	No
NTP ➔ Config	No
PTP ➔ Status	No

PTP ➔ Config	No
SIMATIC NTP 10s broadcast ➔ Config	No
Xx ➔ Config	**Yes**
Monitoring	
Events ➔ Config	No
Syslog ➔ Config	No
Email ➔ Config	No
SNMP ➔ Config	No
Optocoupler ➔ Config	No

9.3.9 FG8802S20 - SP functionality

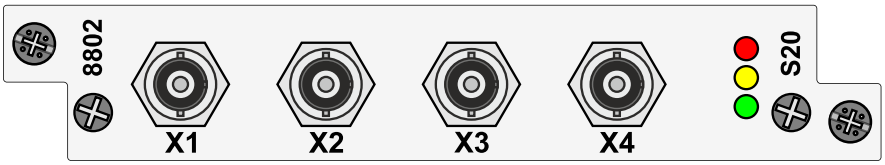


Figure 18

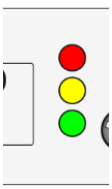
FG8802S20 is an extension board with SP functionality. This extension board takes the time provided by one or two TDCs in the FG8101G01 and provides the time via its fiber optic connectors.

General	
Boot duration	Typical: 10 seconds
SP functionality	
Time protocols	IRIG-B, DCF77, Cyclic pulse
Wave length	820nm
Connector type	ST type

9.3.9.1 Status LEDs of extension boards

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 board on the system. The exact functional description can be found on the respective extension board.

LED status



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

9.3.9.2 Factory default

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

- Dismount the FG8802S20 of the system
- Bring both switches of the dip-switch in the ON-position
- Mount the FG8802S20 in a powered system
- Wait 60 seconds
- Dismount the FG8802S20 of the system
- Bring both switches of the dip-switch in the OFF-position
- Mount the FG8802S20 in a powered system

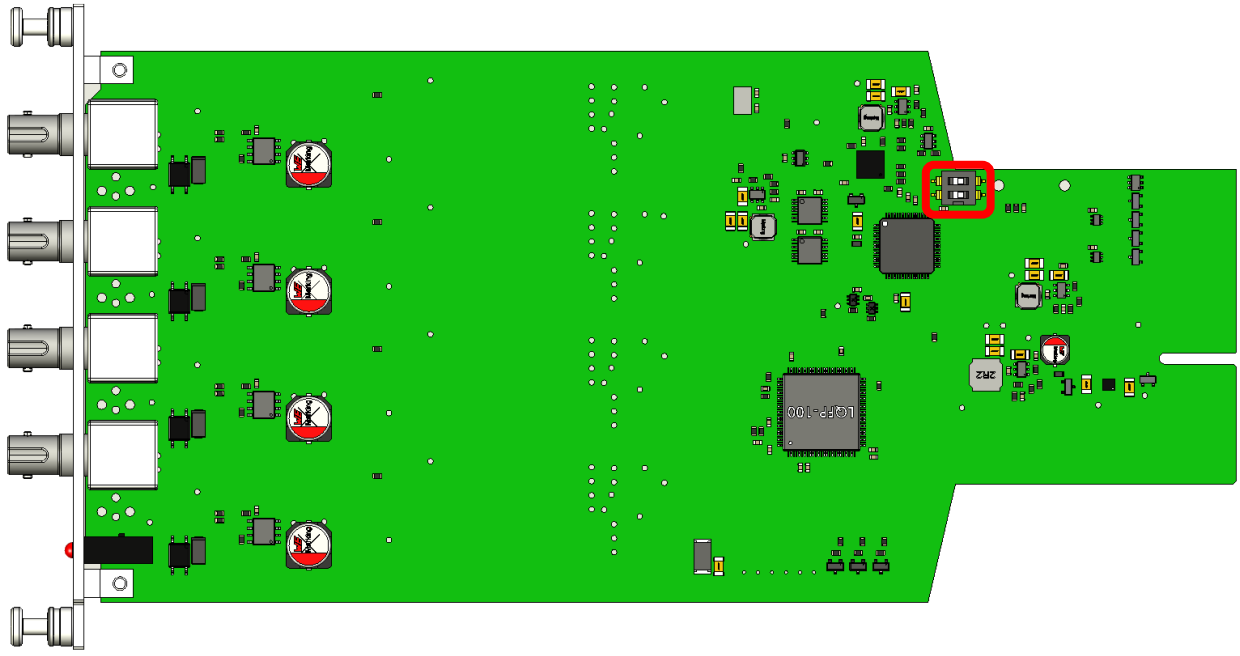


Figure 19

The position of the dip-switch is highlighted in Figure 19.

9.3.9.3 Supported board pages in huma

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

Board Overview	
General ➔ Status	**Yes**

General ➔ Action	**Yes**
Details ➔ Status	No
Network	
General ➔ Config	No
Interface ➔ Status	No
Interface ➔ Config	No
Routing ➔ Status	No
Routing ➔ Config	No
Firewall ➔ Config	No
Sync Setting	
General ➔ Status	**Yes**
General ➔ Action	**Yes** (only the **Execute time jump** section)
General ➔ Config	**Yes** (only **Max. frequency change** and **Synchronization sources for non-TDC boards** section)
GNSS ➔ Status	No
GNSS ➔ Config	No
NTP ➔ Status	No
NTP ➔ Action	No
NTP ➔ Config	No
PTP ➔ Status	No
PTP ➔ Config	No
Time Service	
General ➔ Status	**Yes**
General ➔ Config	**Yes**
NTP ➔ Status	No
NTP ➔ Action	No
NTP ➔ Config	No
PTP ➔ Status	No

PTP ➔ Config	No
SIMATIC NTP 10s broadcast ➔ Config	No
Xx ➔ Config	**Yes**
Monitoring	
Events ➔ Config	No
Syslog ➔ Config	No
Email ➔ Config	No
SNMP ➔ Config	No
Optocoupler ➔ Config	No

9.3.10 FG8901P01 - PSU 85-264VAC / 125-250VDC

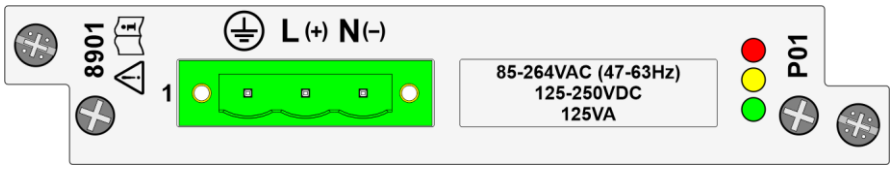


Figure 20

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

	**DANGER** **The device is operated with dangerous voltages.** a) Disconnect all necessary live supply lines / plugs before working on the device. b) The extension board may only be mounted and dismounted by instructed, skilled personnel. 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

9.3.10.1 Connection

	**DANGER** When selecting the safety-tested supply line, ensure that the conductor cross-section is sufficient and that the fuse protection is appropriate.

	**DANGER** This PSU is delivered with the cable housing ST0001H00. Mount the cable housing on the power supply connector, to obtain additional protection against direct contact with the supply voltage and strain relief. The cable housings length is 37mm, keep that in mind when planning the space requirements of the FG8101G01

	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: 1mm² - 2.5mm² (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

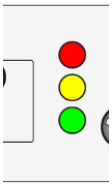
Conductor cross section	1mm² - 2.5mm² (17 AWG - 13 AWG)

	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.

9.3.10.2 Status LEDs of extension boards

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 board on the system.

LED status



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

9.3.10.3 Supported board pages in huma

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

Board Overview	
General ➔ Status	**Yes**

General ➔ Action	**Yes**
Details ➔ Status	**Yes**
Network	
General ➔ Config	No
Interface ➔ Status	No
Interface ➔ Config	No
Routing ➔ Status	No
Routing ➔ Config	No
Firewall ➔ Config	No
Sync Setting	
General ➔ Status	No
General ➔ Action	No
General ➔ Config	No
GNSS ➔ Status	No
GNSS ➔ Config	No
NTP ➔ Status	No
NTP ➔ Action	No
NTP ➔ Config	No
PTP ➔ Status	No
PTP ➔ Config	No
Time Service	
General ➔ Status	No
General ➔ Config	No
NTP ➔ Status	No
NTP ➔ Action	No
NTP ➔ Config	No
PTP ➔ Status	No
PTP ➔ Config	No
SIMATIC NTP 10s broadcast ➔ Config	No
Xx ➔ Config	No
Monitoring	
Events ➔ Config	No

Syslog ➔ Config	No
Email ➔ Config	No
SNMP ➔ Config	No
Optocoupler ➔ Config	No

9.3.11 FG8901P02 - PSU 18-36VDC

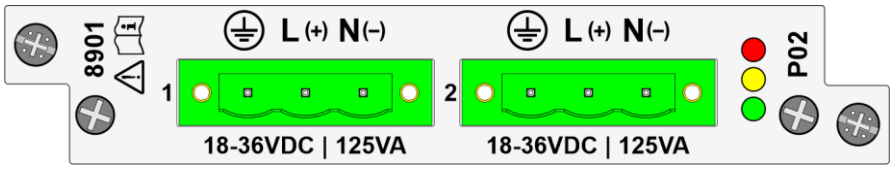


Figure 21

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

	**DANGER** **The device is operated with dangerous voltages.** a) Disconnect all necessary live supply lines / plugs before working on the device. b) The extension board may only be mounted and dismounted by instructed, skilled personnel. 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

9.3.11.1 Connection

	**DANGER** When selecting the safety-tested supply line, ensure that the conductor cross-section is sufficient and that the fuse protection is appropriate.

	**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: 1mm² - 2.5mm² (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

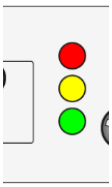
Conductor cross section	1mm² - 2.5mm² (17 AWG - 13 AWG)

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

9.3.11.2 Status LEDs of extension boards

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 board on the system.

LED status



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

9.3.11.1 Supported board pages in huma

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

Board Overview	
General ➔ Status	**Yes**
General ➔ Action	**Yes**
Details ➔ Status	**Yes**
Network	
General ➔ Config	No
Interface ➔ Status	No
Interface ➔ Config	No
Routing ➔ Status	No
Routing ➔ Config	No
Firewall ➔ Config	No

Sync Setting	
General ➔ Status	No
General ➔ Action	No
General ➔ Config	No
GNSS ➔ Status	No
GNSS ➔ Config	No
NTP ➔ Status	No
NTP ➔ Action	No
NTP ➔ Config	No
PTP ➔ Status	No
PTP ➔ Config	No
Time Service	
General ➔ Status	No
General ➔ Config	No
NTP ➔ Status	No
NTP ➔ Action	No
NTP ➔ Config	No
PTP ➔ Status	No
PTP ➔ Config	No
SIMATIC NTP 10s broadcast ➔ Config	No
Xx ➔ Config	No
Monitoring	
Events ➔ Config	No
Syslog ➔ Config	No
Email ➔ Config	No
SNMP ➔ Config	No
Optocoupler ➔ Config	No

9.3.12 FG8901P03 - PSU 36-76VDC

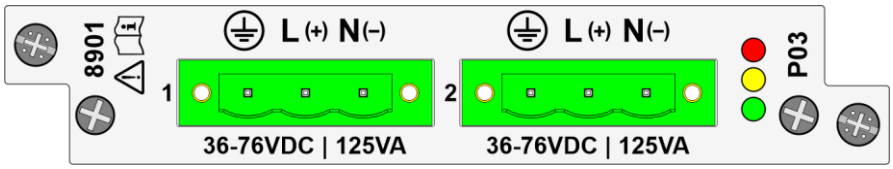


Figure 22

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

	**DANGER** **The device is operated with dangerous voltages.** a) Disconnect all necessary live supply lines / plugs before working on the device. b) The extension board may only be mounted and dismounted by instructed, skilled personnel. 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

9.3.12.1 Connection

	**DANGER** When selecting the safety-tested supply line, ensure that the conductor cross-section is sufficient and that the fuse protection is appropriate.

	**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: 1mm² - 2.5mm² (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

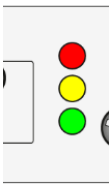
Conductor cross section	1mm² – 2,5mm² (17 AWG – 13 AWG)

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

9.3.12.2 Status LEDs of extension boards

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 board on the system.

LED Status



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

9.3.12.1 Supported board pages in huma

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

Board Overview	
General ➔ Status	**Yes**
General ➔ Action	**Yes**
Details ➔ Status	**Yes**
Network	
General ➔ Config	No
Interface ➔ Status	No
Interface ➔ Config	No
Routing ➔ Status	No
Routing ➔ Config	No
Firewall ➔ Config	No

Sync Setting	
General ➔ Status	No
General ➔ Action	No
General ➔ Config	No
GNSS ➔ Status	No
GNSS ➔ Config	No
NTP ➔ Status	No
NTP ➔ Action	No
NTP ➔ Config	No
PTP ➔ Status	No
PTP ➔ Config	No
Time Service	
General ➔ Status	No
General ➔ Config	No
NTP ➔ Status	No
NTP ➔ Action	No
NTP ➔ Config	No
PTP ➔ Status	No
PTP ➔ Config	No
SIMATIC NTP 10s broadcast ➔ Config	No
Xx ➔ Config	No
Monitoring	
Events ➔ Config	No
Syslog ➔ Config	No
Email ➔ Config	No
SNMP ➔ Config	No
Optocoupler ➔ Config	No

9.3.13 FG8901P04 - PSU 60-160VDC

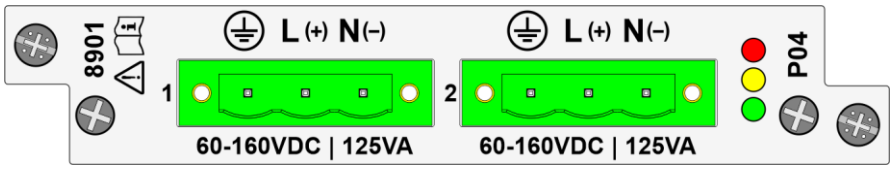


Figure 23

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

	**DANGER** **The device is operated with dangerous voltages.** d) Disconnect all necessary live supply lines / plugs before working on the device. e) The extension board may only be mounted and dismounted by instructed, skilled personnel. 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

9.3.13.1 Connection

	**DANGER** When selecting the safety-tested supply line, ensure that the conductor cross-section is sufficient and that the fuse protection is appropriate.

	**DANGER** This PSU is delivered with the two cable housings ST0001H00. Mount the cable housings on the power supply connectors, to obtain additional protection against direct contact with the supply voltage and strain relief. The cable housings length is 37mm, keep that in mind when planning the space requirements of the FG8101G01

	**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: 1mm² - 2.5mm² (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

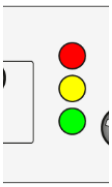
Conductor cross section	1mm² – 2,5mm² (17 AWG – 13 AWG)

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

9.3.13.2 Status LEDs of extension boards

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 board on the system.

LED Status



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

9.3.13.1 Supported board pages in huma

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

Board Overview	
General ➔ Status	**Yes**
General ➔ Action	**Yes**

Details ➔ Status	**Yes**
Network	
General ➔ Config	No
Interface ➔ Status	No
Interface ➔ Config	No
Routing ➔ Status	No
Routing ➔ Config	No
Firewall ➔ Config	No
Sync Setting	
General ➔ Status	No
General ➔ Action	No
General ➔ Config	No
GNSS ➔ Status	No
GNSS ➔ Config	No
NTP ➔ Status	No
NTP ➔ Action	No
NTP ➔ Config	No
PTP ➔ Status	No
PTP ➔ Config	No
Time Service	
General ➔ Status	No
General ➔ Config	No
NTP ➔ Status	No
NTP ➔ Action	No
NTP ➔ Config	No
PTP ➔ Status	No
PTP ➔ Config	No
SIMATIC NTP 10s broadcast ➔ Config	No
Xx ➔ Config	No
Monitoring	
Events ➔ Config	No
Syslog ➔ Config	No

Email ➔ Config	No
SNMP ➔ Config	No
Optocoupler ➔ Config	No

9.3.14 FG8901P06 - PSU 19-75VDC

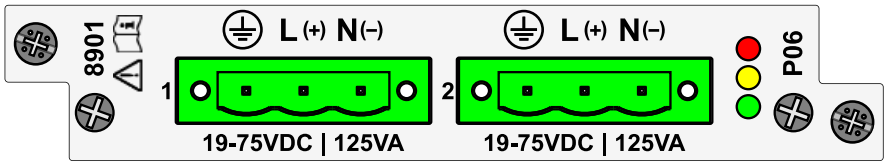


Figure 24

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

	**DANGER** **The device is operated with dangerous voltages.** d) Disconnect all necessary live supply lines / plugs before working on the device. e) The extension board may only be mounted and dismounted by instructed, skilled personnel. 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

9.3.14.1 Connection

	**DANGER** When selecting the safety-tested supply line, ensure that the conductor cross-section is sufficient and that the fuse protection is appropriate.

	**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: 1mm² - 2.5mm² (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

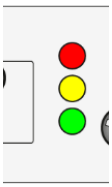
Conductor cross section	1mm² - 2.5mm² (17 AWG - 13 AWG)

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

9.3.14.2 Status LEDs of extension boards

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 board on the system.

LED status



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

9.3.14.3 Supported board pages in huma

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

Board Overview	
General ➔ Status	**Yes**
General ➔ Action	**Yes**
Details ➔ Status	**Yes**
Network	
General ➔ Config	No
Interface ➔ Status	No
Interface ➔ Config	No
Routing ➔ Status	No
Routing ➔ Config	No
Firewall ➔ Config	No

Sync Setting	
General ➔ Status	No
General ➔ Action	No
General ➔ Config	No
GNSS ➔ Status	No
GNSS ➔ Config	No
NTP ➔ Status	No
NTP ➔ Action	No
NTP ➔ Config	No
PTP ➔ Status	No
PTP ➔ Config	No
Time Service	
General ➔ Status	No
General ➔ Config	No
NTP ➔ Status	No
NTP ➔ Action	No
NTP ➔ Config	No
PTP ➔ Status	No
PTP ➔ Config	No
SIMATIC NTP 10s broadcast ➔ Config	No
Xx ➔ Config	No
Monitoring	
Events ➔ Config	No
Syslog ➔ Config	No
Email ➔ Config	No
SNMP ➔ Config	No
Optocoupler ➔ Config	No

10 Commissioning

To put the FG8101G01 into operation, the following steps must be carried out:

- Mount FG8101G01 as described in *chapter 7 System mounting FG8101G01*
- Mount the extension boards into the FG8101G01 as described in *chapter 9.1 Mounting of extension boards* (the minimum configuration described in *chapter 6.6 Minimal configuration of a FG8101G01* 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 9.3 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 FG8101G01 front panel (*see chapter 6.7.1 LEDs*)
- Use the front panel button to switch to the POS2 screen as described in chapter *6.7.3* 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 FG8101G01 and the extension boards can be configured and mounted (username and password is *administrator*).

11 Maintenance

No special maintenance is required for the FG8101G01 system.

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

12 Troubleshooting

12.1 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.

13 Repair

Apart from the extension boards only fans at the FG8101G01 may be exchanged outside a factory of the company ***hopf*** Elektronik GmbH.

Limit work on the hardware to the necessary extent.

Note

Have defective extension boards replaced only by trained persons.

CAUTION

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.

WARNING

Risk of Burns

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.

13.1 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 FG8101G01 must first be unplugged/dismounted, then the FG8101G01 must be removed from the control cabinet.

	**WARNING** Disconnect / dismantle cables All cables must be unplugged / dismantled from the FG8101G01 and its extension boards before removing the FG8101G01 from the control cabinet, otherwise the FG8101G01 or the extension boards may suffer an electric shock or become defective.

Then the five screws with which the cover of the FG8101G01 is mounted must be removed (see Figure 25).

Figure 25

Then the lid of the FG8101G01 must be lifted and placed in front of the front panel of the FG8101G01 so that the inside of the lid is facing up (see Figure 26).

	**WARNING** 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 26

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 FG8101G01. Figure 27 shows the positions of the cable guide and the plug of the fan.

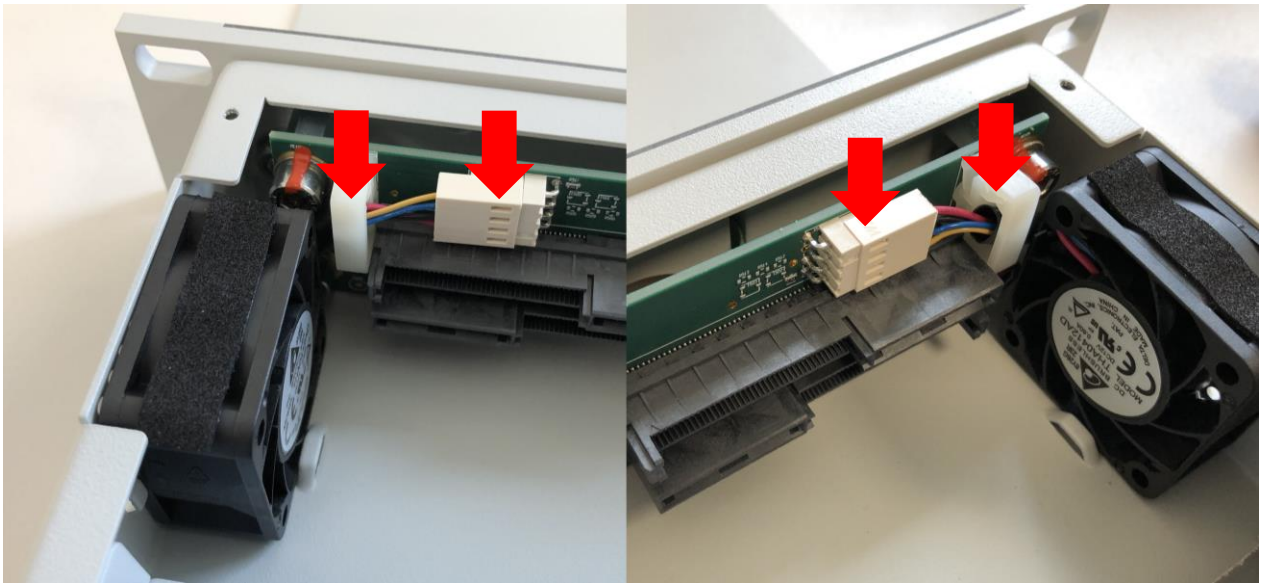


Figure 27

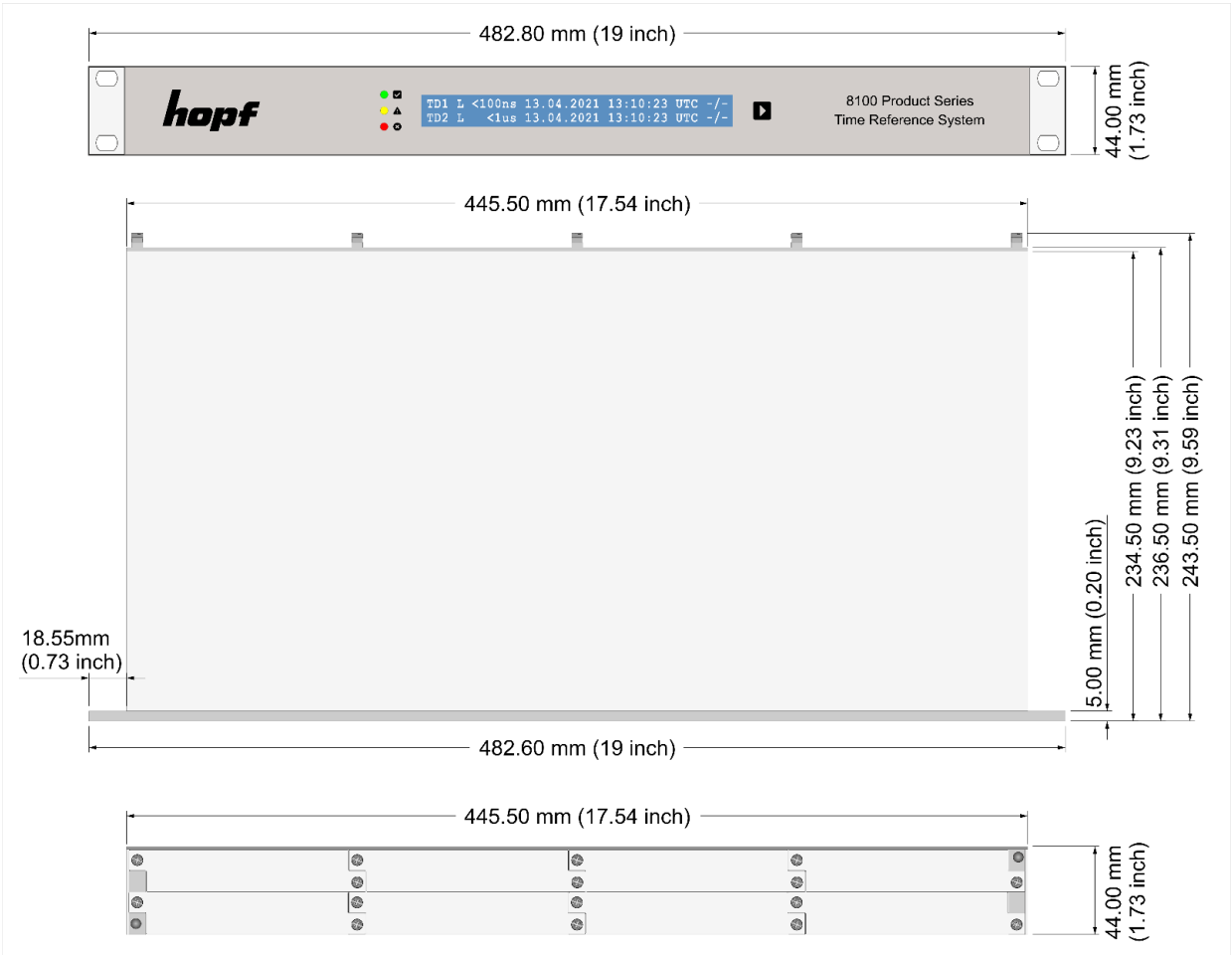
After that, a new fan can be plugged into the FG8101G01, the cable can be led through the cable guide and plugged in and the cable guide can be closed.

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 FG8101G01 must be mounted as described in *chapter* 7 *System mounting FG8101G01* and then all cables must be connected to the extension boards.

14 Technical Specifications

Mechanical Data	
Housing	19-inch 1U subrack according to IEC 60297-3-100
Dimensions	Width: 482.6 mm (19.00 inch) / 445.5 mm (17.54 inch) Height: 44.00 mm (1.73 inch) Depth: 236.5 mm (9.31 inch) / 243.5 mm (9.59 inch)
Material	metal, powder coated
Color (RAL)	light gray (7035)
Protection Class	IP30 according to IEC 60529
Weight	3.5 kg (7.7 lbs.) without power supply units and extension boards



Environmental Conditions	
Operating Temperature	-40 °C to +70 °C (-40 °F to +158 °F) according to IEC 61850-3 and IEEE 1613
Storage Temperature	-40 °C to +70 °C (-40 °F to +158 °F) according to IEC 61850-3 and IEEE 1613
Operating Altitude	up to 5,000 m (16,404 ft) above sea level according to IEC 61850-3
Relative Humidity	5 to 95 % (non-condensing) at 40 °C (104 °F) according to IEC 61850-3
Operating Environment	Pollution Degree: 2 Overvoltage Category: II
Reliability (MTBF)	1,850,000h (without display and fan)

Environmental and Electromagnetic Compatibility Tests			
Temperature	IEC 60068-2-1	Severity Level 16h at -40°C	
	IEC 60068-2-2	Severity Level 16h at +85°C storage	
		Severity Level 16h at +65°C operating	
	IEC 60068-2-14	Severity Level -20° to +55°C, 5 cycles	
	IEC 60068-2-30	Severity Level +25° to +55°C, 6 cycles, RH 95%	
	IEC 60068-2-78	Severity Level 240h at +40°C, RH 95%	
Mechanical Stress	IEC 60255-21-1	Severity Level Class 2	
	IEC 60255-21-2	Severity Level Class 2	
	IEC 60255-21-3	Severity Level Class 2	
Electromagnetic Compatibility	EN 55032	Class B (CISPR 32)	
	IEC 61000-4-2	Severity Level 4	8kV contact / 15kV air
	IEC 61000-4-3	Severity Level 3	10V/m
	IEC 61000-4-4	Severity Level 4	4kV power connector
			4kV signal connector
	IEC 61000-4-5	Severity Level 4	2kV line-to-line
			4kV line-to-earth
	IEC 61000-4-6	Severity Level 3	10V
	IEC 61000-4-11	Severity Level X	30% one period
			60% 50 periods
			100% 5 periods
			100% 50 periods
	IEC 61000-4-12	Severity Level 3	1kV line-to-line
			2.5kV line-to-earth
	IEC 61000-4-17	Severity Level 3	10%
	IEC 61000-4-18	Severity Level 3	1kV line-to-line
			2.5kV line-to-earth
	IEC 61000-4-29	Severity Level X	30% 0,1sec
			60% 0,1sec
			100% 0,05sec

Extension Card Dependent Specifications		
FG8901P01	Input Voltage: Input Frequency: Input Current: Reliability (MTBF):	85-264VAC 125-250VDC 47-63Hz for AC input voltage max. 1.3A@100VAC max. 0.7A@200VAC 250,000h
FG8901P02	Input Voltage: Input Current: Reliability (MTBF):	18-36VDC max. 5.47A@24VDC 300,000h
FG8901P03	Input Voltage: Input Current: Reliability (MTBF):	36-76VDC max. 2.69A@48VDC 300,000h
FG8901P04	Input Voltage: Input Current: Reliability (MTBF):	60-160VDC max. 1.1A@110VDC 300,000h
FG8901P06	Input Voltage: Input Current: Reliability (MTBF):	19-75VDC max. 5.7A@24VDC 300,000h
FG8702G01	**Ethernet** Ports Data Rate Connector **Status Output** Dry Contact Operating Voltage Operating Current **Boot time** typ. ≤ 40 seconds depending on the configuration **Antenna** Supply Voltage Current **Receiver** GNSS systems Channels Time to first fix Sensitivity **Clock Accuracy** Internal PPS	 2 10/100/1000Mbps RJ45 +/-250VDC max. 120mA 5V±10% max. 100mA GPS, GLONASS, Beidou, Galileo 72 Warm start: <2 s Cold start: <30 s First initialization: <750 s Tracking: -166dBm Warm start: -157dBm Cold start: -148dBm ±15ns (after 5 minutes GNSS reception

		with clear sky view)
	Holdover	236.71µs per day at constant temperature after 2 days of continuous operation
	NTP	
	Timestamp Accuracy	typ. <30µs
	Requests per second	25,000
	PTP	
	Timestamp Accuracy	typ. <50ns to system internal PPS
	Reliability	
	MTBF	1,100,000h
FG8702G02	Identical to FG8702G01 except holdover	
	Clock Accuracy	
	Holdover	25.9µs per day after 7 days of continuous operation (±1°C)
FG8702G03	Identical to FG8702G01 except holdover	
	Clock Accuracy	
	Holdover	4.32µs per day after 7 days of continuous operation (±1°C)
FG8801N02	**Ethernet**	
	Ports	2
	Data Rate	10/100/1000Mbps
	Connector	RJ45
	Boot time	
	typ. ≤ 40 seconds depending on the configuration	
	Time Accuracy	
	Internal time accuracy	±15ns to system internal PPS
	NTP	
	Timestamp Accuracy	typ. <30µs
	Requests per second	25,000
	PTP	
	Timestamp Accuracy	typ. <50ns to system internal PPS
	Reliability	
	MTBF	1,250,000h
FG8801F02	**Ethernet**	
	Ports	2
	Data Rate	dependent on SFP transceiver module
	Connector	LC

	Boot time typ. ≤ 40 seconds depending on the configuration **Time Accuracy** Internal time accuracy ±15ns to system internal PPS **NTP** Timestamp Accuracy typ. <30µs Requests per second 25,000 **PTP** Timestamp Accuracy typ. <50ns to system internal PPS **Reliability** MTBF 1,250,000h
FG8800M00	**Ethernet** Ports 2 Data Rate 10/100/1000Mbps Connector RJ45 **Status Output** Dry Contact Operating Voltage +/-250VDC Operating Current max. 120mA **Boot time** typ. ≤ 40 seconds depending on the configuration **Time Accuracy** Internal time accuracy ±15ns to system internal PPS **NTP** Timestamp Accuracy typ. <30µs Requests per second 25,000 **Reliability** MTBF 1,250,000h

General standards and protocols

- IEEE 802.1Q VLANs
- IEEE 802.3 Type 10BASE-T
- IEEE 802.3ab 1000BASE-T
- IEEE 802.3ad Link Aggregation Control Protocol (LACP)
- IEC 62439-3:2016 Parallel Redundancy Protocol (PRP) and High-availability Seamless Redundancy (HSR)
- RFC 768 User Datagram Protocol (UDP)
- RFC 791 Internet Protocol, Version 4 (IPv4)
- RFC 792 Internet Control Message Protocol (ICMPv4)
- RFC 793 Transmission Control Protocol (TCP)
- RFC 826 Address Resolution Protocol (ARP)
- RFC 1035 Domain Names (client)
- RFC 1918 Address Allocation for Private Internet
- RFC 4443 Internet Control Message Protocol (ICMPv6)
- RFC 2131 Dynamic Host Configuration Protocol (DHCPv4)
- RFC 3484 Default Address Selection for Internet Protocol version 6 (IPv6)
- RFC 3596 DNS Extensions to Support IP Version 6
- RFC 8200 Internet Protocol, Version 6 (IPv6)
- RFC 8415 Dynamic Host Configuration Protocol for IPv6 (DHCPv6)

Device and Network Management

- RFC 1098 A Simple Network Management Protocol (SNMP)
- RFC 1155 Structure and Identification of Management Information for TCP/IP-based Internets
- RFC 1213 Management Information Base for Network Management of TCP/IP-based internets: MIB-II
- RFC 2578 Structure of Management Information Version 2 (SMIv2)
- RFC 2579 Textual Conventions for SMIv2
- RFC 3411 An Architecture for Describing Simple Network Management Protocol (SNMP) Management Frameworks
- RFC 3412 Message Processing and Dispatching for the Simple Network Management Protocol (SNMP)
- RFC 3413 Simple Network Management Protocol (SNMP) Applications
- RFC 3414 User-based Security Model (USM) for version 3 of the Simple Network Management Protocol (SNMPv3)
- RFC 3418 Management Information Base (MIB) for the Simple Network Management Protocol (SNMP)
- RFC 3584 Coexistence between Version 1, Version 2, and Version 3 of the Internet-standard Network Management Framework
- RFC 4250/4251/5252/4253/4254 The Secure Shell (SSH) Protocol
- RFC 5321 Simple Mail Transfer Protocol
- RFC 5424 The Syslog Protocol
- RFC 7540 Hypertext Transfer Protocol Version 2 (HTTP/2)
- ***hopf*** Private Enterprise MIB

Security / Authentication

- IEC 62351-8:2020 Power systems management and associated information exchange - Data and communications security - Role-based access control
- IEC 62443-4-2:2019 Security for industrial automation and control systems - Technical security requirements for IACS components
- IEEE 1686-2013 Standard for Intelligent Electronic Devices Cyber Security Capabilities
- RFC 4510/4511/4512/4513/4514/4515/4516/4517/4518/4519/4520 Lightweight Directory Access Protocol (LDAP)
- RFC 2865 Remote Authentication Dial In User Service (RADIUS)
- RFC 2866 RADIUS Accounting
- RFC 8915 Network Time Security for the Network Time Protocol

Time Synchronization

- RFC 5905 Network Time Protocol Version 4: Protocol and Algorithms Specification
- RFC 5906 Network Time Protocol Version 4: Autokey Specification
- RFC 5907 Definitions of Managed Objects for Network Time Protocol Version 4 (NTPv4)
- IEEE 1588-2019 Standard for a Precision Clock Synchronization Protocol for Networked Measurement and Control Systems (PTP v2.1)
- IEEE C37.238-2017 Standard Profile for Use of IEEE 1588 Precision Time Protocol in Power System Applications
- IEC 61850-9-3:2016 Communication networks and systems for power utility automation - Precision time protocol profile for power utility automation
- IEEE 60255-118-1:2018-12 Measuring relays and protection equipment - Synchrophasor for power systems – Measurements
- SIMATIC NET SINEC H1 Time Datagram