

Because every fraction of a second counts ■

hopf



FG8803S02

Technical Documentation

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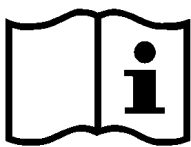
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3 Change History


Version	Date	Editor	Change Description
01.00	05.10.2023	POM	Document creation


4 Preliminary Remarks

This document describes the functions, operation, mounting and commissioning of the FG8803S02 product.

 	<p>WARNING</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

	CE conformity
	<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>

	UKCA- conformity
	<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:

 <p>ISO 7000-0434A</p> <p>Allgemeines Warnzeichen Vorsicht / Caution</p>	<p>DANGER</p> <p>The signal word denotes a hazard with a high degree of risk which, if not avoided, will result in death or serious injury.</p> <p>WARNING</p> <p>The signal word indicates a hazard with a medium level of risk which, if not avoided, may result in death or serious injury.</p> <p>CAUTION</p> <p>The signal word indicates a hazard with a low level of risk that, if not avoided, could result in a minor or moderate injury.</p>
 <p>IEC 60417-6042</p> <p>Vorsicht, Risiko eines elektrischen Schlages / Caution, risk of electric shock</p>	<p>DANGER</p> <p>The signal word indicates a hazard with electrical voltage with a high degree of risk. Danger of Electric Shock!</p>
 <p>IEC 60417-5041</p> <p>Vorsicht, heiÙe OberfläÙe / Caution, hot surface</p>	<p>CAUTION</p> <p>The signal word indicates a hazard with high device temperatures</p> <p>Risk of burns 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>
 <p>IEC 60417-6222</p> <p>Allgemeine Information, Hilfe / Information, general; help</p>	<p>Note</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>Note</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>Note</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>CAUTION</p> <p>Damage to the device due to overvoltage</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>DANGER</p> <p>Danger of Electric Shock</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>Note</p> <p>The manufacturer accepts no liability for applications that deviate from or go beyond the intended use.</p>
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6 Device description

The FG8803S02 is a field-replaceable, hot-pluggable, mutually independent extension board for time reference systems of the 8100 or 8200 product series with service provider (**SP** for short) functionality. It can only be operated in system of the 8100 or 8200 product series (e.g., FG8101G01).

7 Mounting and demounting

How to mount / demount the FG8803S02, is described in the technical documentation of the time reference system in which the FG8803S02 should be / is mounted.

8 FG8803S02 - SP functionality



Figure 1

FG8803S02 is an extension board with SP functionality. This extension board takes the time provided by one or two TDCs of the time reference system in which it is mounted and provides the time via its 9-pole D-SUB connectors.

SP functionality	
Time protocols	hopf standard serial time datagram types, IEC-103, ABB Melody, ABB Freelance, Trimble TSIP, SAT1703 / SICAM RTU, SINEC H1 Extended Configurable PPS
Output voltages	RS232, RS485
Maximum output current	RS232: 8mA RS485: 200mA
Connector type	2x 9-pole D-SUB male connector

8.1 9-pole D-SUB pinning

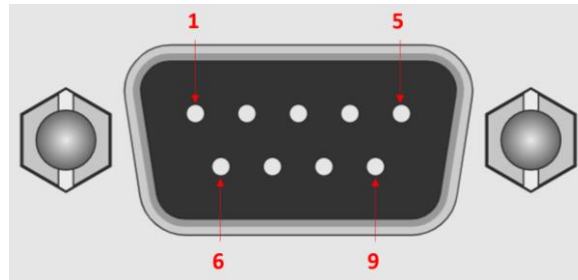


Figure 2

Figure 2 shows the pin numbers of the 9-pole D-SUB connectors of the FG8803S02. Their functionalities are described in the following table.

Receive and transmit are defined from the perspective of the FG8803S02, in the following table

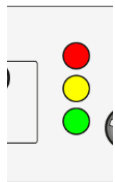
Pin number	Functionality short	Functionality
1	PPS+	When PPS output voltage is configured as RS232, the PPS signal in RS232 is output on this pin. When PPS output voltage is configured as RS485, the positive RS485 signal of the PPS is output on this pin.
2	RS232 RXD	RS232 receive line
3	RS232 TXD	RS232 transmit line
4	RS485 PPS-	Negative RS485 PPS line
5	GND	Ground for RS232 signals
6	RS485 TXD+	Positive RS485 transmit line
7	RS485 TXD-	Negative RS485 transmit line
8	RS485 RXD+	Positive RS485 receive line
9	RS485 RXD-	Negative RS485 receive line

RS232 and RS485 receive signals can be connected at the same time to the corresponding pins, but only the signal type configured as input modulation is used on the corresponding channel X1 / X2.

8.2 Status LEDs

The FG8803S02 is equipped with status LEDs on its front panel. These LEDs are used for quick identification of the operating status of the FG8803S02.

LED status



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

8.2.1 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.



8.2.2 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

8.3 Supported strings

8.3.1 ABB Melody / Freelance (LF / CR), hopf 6021 (LF / CR)

Character no.	Meaning	Hex value
1	STX (start of text)	\$02
2	Status	\$30-\$39, \$41-\$46
3	Day of week 1 → Monday ... 7 → Sunday When the time is output in UTC the following hex values apply 9 → Monday ... F → Sunday	\$31-\$37 \$39, \$41-\$46
4	Ten's hours	\$30-\$32
5	Unit hour	\$30-\$39
6	Ten's minutes	\$30-\$35
7	Unit minutes	\$30-\$39
8	Ten's seconds	\$30-\$35
9	Unit seconds	\$30-\$39
10	Ten's day	\$30-\$33
11	Unit day	\$30-\$39
12	Ten's month	\$30-\$31
13	Unit month	\$30-\$39
14	Ten's year	\$30-\$39
15	Unit year	\$30-\$39
16	LF (line feed)	\$0A
17	CR (carriage return)	\$0D

18	ETX (end of text)	\$03
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Status:

Bit 3	Bit 2	Bit 1	Bit 0	Meaning
X	X	X	0	No DST announcement
X	X	X	1	DST announcement
X	X	0	X	Standard time
X	X	1	X	Daylight saving time (DST)
0	0	X	X	The time domain controller has no valid time
0	1	X	X	The time domain controller is operating in crystal mode and the accuracy is worse than or equal 100ns
1	0	X	X	The time domain controller is operating in crystal mode and the accuracy is better than 100ns
1	1	X	X	The time domain controller is locked to a sync source

8.3.2 ABB Melody / Freelance (CR / LF) / hopf 6021 (CR / LF)

Identical to ABB Melody / Freelance (LF / CR), hopf 6021 (LF / CR) only character 16 and 17 are exchanged.

8.3.3 hopf Master / Slave

Character no.	Meaning	Hex value
1	STX (start of text)	\$02
2	Status	\$30-\$39, \$41-\$46
3	Day of week 1 → Monday ... 7 → Sunday When the time is output in UTC the following hex values apply 9 → Monday ... F → Sunday	\$31-\$37 \$39, \$41-\$46
4	Ten's hours	\$30-\$32
5	Unit hours	\$30-\$39
6	Ten's minutes	\$30-\$35
7	Unit minutes	\$30-\$39
8	Ten's seconds	\$30-\$35
9	Unit seconds	\$30-\$39
10	Ten's day	\$30-\$33
11	Unit day	\$30-\$39
12	Ten's month	\$30-\$31
13	Unit month	\$30-\$39
14	Ten's year	\$30-\$39
15	Unit year	\$30-\$39
16	Difference time ten's hour, including sign 0 → difference time is negative (west), and ten's hour is 0 1 → difference time is negative (west), and ten's hour is 1	\$30, \$31, \$38, \$39

	8 → difference time is positive (east), and ten's hour is 0 9 → difference time is positive (east), and ten's hour is 1	
17	Difference time unit hours	\$30-\$39
18	Difference time ten's minutes	\$30-\$35
19	Difference time unit minutes	\$30-\$39
20	LF (line feed)	\$0A
21	CR (carriage return)	\$0D
22	ETX (end of text)	\$03

Status:

Bit 3	Bit 2	Bit 1	Bit 0	Meaning
X	X	X	0	No DST announcement
X	X	X	1	DST announcement
X	X	0	X	Standard time
X	X	1	X	Daylight saving time (DST)
X	0	X	X	No leap second announcement
X	1	X	X	Leap second announcement
0		X	X	The time domain controller is not locked to a sync source
1		X	X	The time domain controller is locked to a sync source

8.3.4 hopf Time Universal

Character no.	Meaning	Hex value
1	STX (start of text)	\$02
2 - 3	Status byte	\$30-\$39, \$41-\$46
4	Ten's hours	\$30-\$32
5	Unit hours	\$30-\$39
6	Ten's minutes	\$30-\$35
7	Unit minutes	\$30-\$39
8	Ten's seconds	\$30-\$35
9	Unit seconds	\$30-\$39
10	Ten's day	\$30-\$33
11	Unit day	\$30-\$39
12	Thousand's year	\$31, \$32
13	Hundred's year	\$30-\$39
14	Ten's year	\$30-\$39
15	Unit year	\$30-\$39
16 -17	Day of week 1 → Monday ... 7 → Sunday	\$31-\$37
18	Sign of difference time '+', '-'	\$2B, \$2D
19	Difference time ten's hours	\$30, \$31
20	Difference time unit hours	\$30-\$39
21	Difference time ten's minutes	\$30-\$35
22	Difference time unit minutes	\$30-\$39
23-25	"FFFF"	\$46
26	'*'	\$2A
27-28	XOR-Checksum	\$30-\$39, \$41-\$46
29	LF (line feed)	\$0A
30	CR (carriage return)	\$0D
31	ETX (end of text)	\$03

Status byte:

Bit 7	Bit 6	Bit 5	Bit 4	Meaning
0	0	0	0	Time is invalid
0	0	0	1	Unused
0	0	1	0	The time domain controller is operating in crystal mode and accuracy is worse than 10 μ s
0	0	1	1	The time domain controller is operating in crystal mode and accuracy is better than or equal 10 μ s
0	1	0	0	The time domain controller is operating in sync mode and the accuracy is worse than 1 μ s
0	1	0	1	Unused
0	1	1	0	The time domain controller is operating in crystal mode and the accuracy is better than 1 μ s
0	1	1	1	The time domain controller is locked to a sync source (accuracy better than or equal 1 μ s)
Bit 3	Bit 2	Bit 1	Bit 0	Meaning
0	0	0	0	Unused
0	0	0	1	Unused
0	0	1	0	Standard time
0	0	1	1	UTC time
0	1	0	0	Local time DST not active
0	1	0	1	Local time DST active
0	1	1	0	Unused
0	1	1	1	Unused
1	X	X	0	Leap second is announced
1	X	X	1	Leap second is announced and active at the moment

8.3.5 IEC-103

If actual second is the change of a minute:

Character no.	Meaning	Hex value
1	Start flag	\$68
2	Length of information	\$0F
3	Repeated length of information	\$0F
4	Start flag	\$68
5	Control field	\$44
6	Station address	\$FF
7	Frame type identification	\$06
8	Variable structure identifier	\$81
9	Cause of transmission	\$08
10	Common address of ADSU	\$FF
11	Function type	\$FF
12	Information number	\$00
13	Milliseconds (Low octet)	\$0000-\$EA5F
14	Milliseconds (High octet)	
15	Minutes (0 to 59) + MSB = Invalid Flag	\$00-\$3B, \$80-\$BB
16	Hours (0 to 23) + MSB = SU Summer time Flag	\$00-\$17, \$80-\$97
17	Day in Month	\$01-\$1B
18	Month	\$01-\$0C
19	Year since 2000	\$00-\$63
20	Checksum (sum over characters no. 5–19 mod 256)	\$00-\$FF
21	End flag	\$16

Initialisation string for IEC-103 (sent every second which is not a minute change):

Character no.	Meaning	Hex value
1	Start flag	\$10
2	Control field	\$47
3	IEC-Address	\$01-\$FE
4	Checksum	\$00-\$FF
5	End flag	\$16

8.3.6 SAT 1703

Character no.	Meaning	Hex value	
1	STX (start of text)	\$02	
2	Ten's day	\$30-\$33	
3	Unit day	\$30-\$39	
4	“.”	\$2E	
5	Ten's month	\$30-\$31	
6	Unit month	\$30-\$39	
7	“.”	\$2E	
8	Ten's year	\$30-\$39	
9	Unit year	\$30-\$39	
10	“/”	\$2F	
11	Day of week 1 → Monday ... 7 → Sunday	\$31-\$37	
12	“/”	\$2F	
13	Ten's hours	\$30-\$32	
14	Unit hours	\$30-\$39	
15	“.”	\$3A	
16	Ten's minutes	\$30-\$35	
17	Unit minutes	\$30-\$39	
18	“.”	\$3A	
19	Ten's seconds	\$30-\$35	
20	Unit seconds	\$30-\$39	
21	“M” or “M” or “U”	(standard time, daylight saving time or UTC)	\$4D or \$55
22	“E” or “E” or “T”		\$45 or \$54
23	“Z” or “S” or “C”		\$43 or \$53 or \$5A
24	“ “ or “Z” or “ “		\$20 or \$5A
25	“ “ when the time domain controller is locked to a sync source	\$20 or \$2A	

	“*” when the time domain controller is not locked to a sync source	
26	“ “ when no announcement “!” when switch to or back from DST is announced	\$20 or \$21
27	CR (carriage return)	\$0D
28	LF (line feed)	\$0A
29	ETX (end of text)	\$03

8.3.7 SINEC H1 Extended

This string can be sent on request. To request this, string the character “?” (0x3F) must be sent to the channel where the SINEC H1 Extended is configured.

Character no.	Meaning	Hex value
1	STX (start of text)	\$02
2	“D”	\$44
3	“.”	\$3A
4	Ten’s day	\$30-\$33
5	Unit day	\$30-\$39
6	“.”	\$2E
7	Ten’s month	\$30-\$31
8	Unit month	\$30-\$39
9	“.”	\$2E
10	Ten’s year	\$30-\$39
11	Unit year	\$30-\$39
12	“.”	\$3B
13	“T”	\$54
14	“.”	\$3A
15	Day of week 1 → Monday ... 7 → Sunday	\$31-\$37
16	“.”	\$3B
17	“U”	\$55
18	“.”	\$3A
19	Ten’s hours	\$30-\$32
20	Unit hours	\$30-\$39
21	“.”	\$2E
22	Ten’s minutes	\$30-\$35
23	Unit minutes	\$30-\$39
24	“.”	\$2E

25	Ten's seconds	\$30-\$35
26	Unit seconds	\$30-\$39
27	“,” ”	\$3B
28	“#” when time domain controller has no valid time “ ” when the time domain controller has a valid time	\$20 or \$23
29	“*“ when the time domain controller is operating in crystal mode or has no valid time “ ” when the time domain controller is locked to a sync source	\$20 or \$2A
30	“U” when output time is UTC “ “ when output time is standard time “S” when output time is daylight saving time	\$20 or \$53 or \$55
31	“ “ no announcement “A” leap second announcement “!” DST announcement	\$20 or \$21 or \$41
32	ETX (end of text)	\$03

8.3.8 Trimble TSIP

Character no.	Meaning	Hex value
1	DLE	\$10
2	Packet ID	\$8F
3	Sub packet ID	\$0B
4	Event count (0 for GPS)	\$00
5	Event count (0 for GPS)	\$00
	Second in week as little endian	
6	Exponent 1. byte	\$00-\$FF
7	Exponent 3. nibble plus 1. Nibble mantissa	\$00-\$FF
8	Mantissa	\$00-\$FF
9	Mantissa	\$00-\$FF
10	Mantissa	\$00-\$FF
11	Mantissa	\$00-\$FF
12	Mantissa	\$00-\$FF
13	Mantissa LSB	\$00-\$FF
	Date	
14	Day of month	\$01-\$1F
15	Month	\$01-\$0C
16	Year 1. byte	\$00-\$FF
17	Year 2. byte	\$00-\$FF
18 - 76	GPS data (actually all set to 0)	\$00
77	DLE	\$10
78	ETX	\$03

9 Configuration

The FG8803S02 can be configured and monitored via the **huma**® web edition of the extension board with the management functionality, that is equipped to the system.

10 Maintenance

No special maintenance is required for the FG8803S02.

If a malfunction is detected, follow the instructions in the troubleshooting chapter or contact the **hopf** Elektronik GmbH -Support.

11 Troubleshooting

If the FG8803S02 reports an error, then **hopf** Elektronik GmbH recommends proceeding as follows:

- Access the **huma**® web edition of the extension board with the management functionality, that is equipped to the system, go to the Start Page and hover over the FG8803S02. The active events give you a hint, to identify the problem
- When X1/X2 is turned off (overcurrent) is in your active events, a short circuit has been detected on the corresponding connector. Access the Time Service → X1/X2 → ACTION page and restart the channel via clicking the Restart button
- When X1/X2 is turned off (inaccuracy) is in your active events, the accuracy is not sufficient to meet your configuration for the corresponding channel. Check that your extension boards with TDC functionality are connected to their configured sync source and that their status is locked to sync source, if that is the case and the failure on the FG8803S02 is present for more than 5 minutes, reboot the FG8803S02. If the failure is also present 5 minutes after the reboot, contact the **hopf** Elektronik GmbH -Support.

12 Repair

FG8803S02 cannot be repaired outside a factory of the company **hopf** Elektronik GmbH, if a defect is observed, contact the **hopf** Elektronik GmbH -Support to organize the shipment to our factory.

13 Technical Specifications

Functionality Specifications	
FG8801N02	<p>9-pole D-SUB</p> <p>Ports 2</p> <p>Modulation RS232/RS485</p> <p>Baud rate 150/300/600/1200/2400/4800 9600/19200/38400/57600/115200</p> <p>Data bits 7/8</p> <p>Parity No/Even/Odd</p> <p>Stop bits 1/2</p> <p>Boot time typ. ≤ 10 seconds depending on the configuration</p> <p>Time Accuracy Internal time accuracy ±15ns to system internal PPS</p> <p>Reliability MTBF 1,250,000h</p>

