Hardware Manual – Operation Instructions, Safety Guidelines and Specifications

SEA 9521

BiSS/SSI Interface Module

Part no.: 60000069

s·e·a Science & Engineering Applications Datentechnik GmbH

Doc. no.:
HB/SEA 9521 Hardware Manual/1.2.b/Mar-2023

Content

Getting Started

General

The safety ratings and specifications in this document are specific to the SEA 9521 module and may differ for other components in the system. To determine the safety ratings and specification of the entire system refer to each component in the system.

Before starting to work with the SEA 9521 module please read this document and the software manual carefully. If there are any questions about operating the module or if any term is not understood, please contact the vendor before using the module.

Ensure that you use the latest version of the manuals:
Check the Support/Downloads area on the S.E.A. website `https://www.sea-gmbh.com` for updates and get the latest version if available.

Refer to the software manual for details on programming and integration of the SEA 9521 module.

Refer to the appropriate NI™ documentation for details on NI™ hardware.

We believe that all information in this manual is accurate. The document has been carefully reviewed for technical accuracy. In the event of techni-

cal or typographical errors, we reserve the right to make changes to subsequent editions of this document without prior notice to holders of this edition. The reader should consult the vendor if errors are suspected.

End User License Agreement (EULA)

Before operating the SEA 9521 and the provided software you have to agree to the terms and conditions (EULA). This agreement is part of the software installation procedure. In addition, the terms and conditions are available through the LabVIEW™ menu after installation (Help › SEA › `product name` › Legal Information...). If you do NOT agree you can send back the hardware and software package within a period of two weeks after delivery. In this case S.E.A. will refund the product price and shipping costs.

Safety Guidelines

To protect persons against any harm and the module from damage, the operation of the SEA 9521 module is only allowed according to the rules described in this document.

Operator Protection

Hot or Cold Surface The metallic surface of the module might become hot or cold as well. Touching the surface may result in bodily injury.
Do not dismount the module from the chassis during operation. Wait until the module temperature has reached 20 °C.

Do not insert or remove the module from the system or connect/ disconnect wires or connectors to/from the module unless power has been switched completely off. Make sure working in an ESD safe environment.

Do not open or disassemble the module or other hardware parts.
Guarantee is void if the seal is broken!

Use only isolated power supplies with a nominal voltage of 12 VDC, made for use with CompactRIO systems.

Safety Critical Applications

The module is not failure tolerant and therefore not suitable for use in safety critical applications.

Do not use the module for medical applications or any live supporting apparatus.

Hazardous Locations

The module is suitable for use in non hazardous locations only. Keep the module always away from hazardous locations and explosive areas.

Protect the module from thunderstorm and lightning strikes or other electrical hazards.

Use the module only in dry areas. Do not operate the module in bath areas, kitchens etc., where water or vapor can be getting in contact with the module or cables.

Hazardous Voltages

A voltage is hazardous when higher than 25 V_{RMS} or 60 VDC to earth ground according to IEC 60364-4-41 (SELV). If the module specifications allow to connect hazardous voltages to the module, take the following precautions, when connecting hazardous voltages to the module:

Make sure that only qualified personnel wires hazardous voltage adhering to local electrical standards.

Do not mix hazardous voltage circuits and human-accessible circuits on the same module.

The module must not be operated in high voltage areas.

Prerequisites

The SEA 9521 module is shipped with the following accessory:

- Printed hardware manual with operating instructions, safety guidelines and specifications.

In order to operate the module the following components are required (not shipped with the module):

- Power cable for external power supply (order no.: 61000011), mandatory for operation
- CompactRIO™ system from NI™
- BiSS-C or SSI absolute encoder
- Power supply (7..30 VDC)
- Sensor cable(s) — refer to order no.: 61000607

The SEA 9521 can currently be operated in the following CompactRIO™ systems:

- Reconfigurable Chassis
- Expansion Chassis: all types[1]

1 Tested with: NI 9159, NI 9151, NI 9144

Connecting the SEA 9521

SEA 9521 provides three independent channels for BiSS-C or SSi encoders, as well as a connector for external power supply.

Channel Terminals

Fig. 1: Front side

The encoder channel terminals have a M12 female connector and accept only encoders with M12 male connector. Matching encoder connectors can be obtained from S.E.A.:

- S.E.A.: www.sea-gmbh.com

  order no.: 61000607

as well as various vendors:

- Phoenix Contact: www.phoenixcontact.com

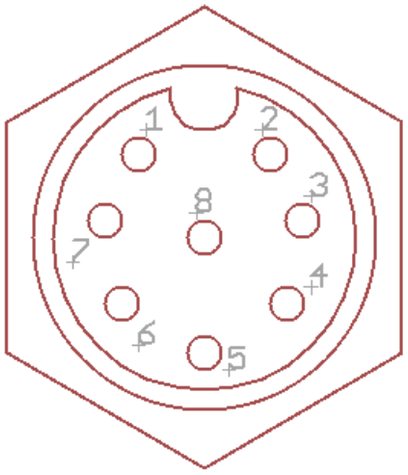
  M12 Series Speedcon 8P,
  SAC-8P-MS SH SCO/.../... Series

- Binder: www.binder-connector.de

  M12 Series 763 with 8 poles

The encoders can be supplied with power from the module through the channel terminals. For this, an external

power supply to the module is required. The pin allocation of the M12 socket is shown in Fig. 2.



1 = NC
2 = NC
3 = D+
4 = D–
5 = GND
6 = CLK–
7 = CLK+
8 = UCC

Fig. 2: Pin allocation

Pin 8 (VCC) is the sensor supply voltage (5 V) **output**. This is a regulated DC voltage to provide power to the sensor. This output only supplies a voltage if the external power connector is connected to an adequate power supply. D+ and D– are the differential “data” lines. NC stands for “not connected” and CLK for “clock”.

It is important to not switch up “+” and “–” lines. BiSS MasterOut (MO+/MO–) and SlaveIn (SLI+/SLI–) lines (as described in the BiSS-C interface protocol) are <u>not</u> supported by the SEA 9521 module.

If encoders with supply voltages greater than 5 V are used, they have to be supplied **externally**.

DO NOT CONNECT ANY EXTERNAL POWER SUPPLY TO PIN 8 (VCC) or you might damage the module!

The mapping between SEA 9521 connector and standard BiSS encoders can be seen in the following table:

SEA 9521				BiSS Encoder	
Input/ Output	Pin	Signal	BiSS Signal	Input/ Output	Signal
Input	3	Data+ (D+)	SL+	Output	SLO+
Input	4	Data– (D–)	SL–	Output	SLO–
—	5	GND	V– (0 V)	—	V– (0 V)
Output	6	Clock– (CLK–)	MA–	Input	MA–
Output	7	Clock+ (CLK+)	MA+	Input	MA+
Output	8	VCC	V+ (5 V)	Input	V+ (5 V)
Output	—	—	MO+	Input	SLI+
Output	—	—	MO–	Input	SLI–

MA is an abbreviation for “master” and SL for “slave”. If the attached encoder does not use standard BiSS nomenclature, please contact the encoder manufacturer for details.

The module features cable delay compensation. In principle, possible cable length could be up to 100 m or more even at maximum bus speed, but S.E.A Datentechnik GmbH cannot warrant any cable lengths larger than 10 m for any given setup. The safe cable lengths have to determined on an application specific basis as they are also dependent on electro-magnetic noise (shielding) and encoder/line driver hardware.

Before connecting encoder(s) to the module or inserting the module in the chassis make sure that all power supplies are disconnected or switched off.

Double Shielding Encoder Cables

If you want to establish double shielding by connecting the outer shield to machine earth (field ground) and the inner shield to module ground, you should avoid connecting both shields together (causing unwanted noise).

The SEA 9521 encoder connectors are connected via the SEA 9521 casing and the cRIO connector with the NI cRIO casing and earth. In many NI cRIO systems, however, ground and earth are internally connected which leads to an unwanted connection between outer and inner shield. To avoid this, it is necessary to supply the module from an **external** power supply which needs to be **electrically insulated** from the NI cRIO power supply.

External Power Supply

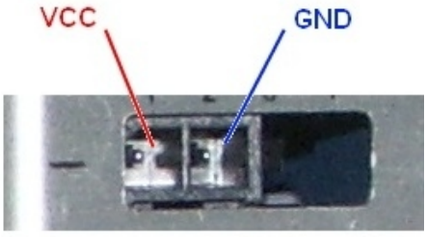


Fig. 3: External Power

For the module and the CompactRIO™ system a single power supply can be used if the provided voltage and current is adequate for both, the module and the CompactRIO™ system. The enclosed external power cable has therefore open cable connectors on one side to allow parallel connection to the terminal block of the CompactRIO™ system power supply.

Take care that the supply voltage corresponds to the module's technical data and that the supply can provide the additional current. The total current drawn by the external power connector is strongly dependent on the power consumption of the connected encoder(s).

Before connecting the external power cable, check the correct polarity of the cable, refer to Fig. 3. For open cable ends, note the allocation of the positive supply wire and the ground connection. An input voltage range of 7 V DC to 30 V DC is accepted. The SEA 9521 module and any cabling is not protected against lightning strike or any over-voltage above 30 V.

Status LEDs

The green front panel LED lights up if the module is connected to an external supply voltage **and** the module's firmware has been loaded successfully. Note: Some targets (like Ethernet RIO expansion chassis) may enter the sleep mode per default, which prevents the LED from flashing.

Sleep Mode

This module supports a low-power sleep mode. In sleep mode typically there is no communication with the module and the power consumption is minimized. The system thermal dissipation may decrease. Refer to the *Specifications* section for more information about power consumption and thermal dissipation. The sleep mode can be enabled by software.

Specifications

The following specifications are typical for the nominal temperature of 20 °C unless otherwise noted.

Encoding Characteristics		
Number of channels		3
Acquisition rate/channel	kHz	20 (with 3 encoders) 33 (with 1 encoder)
Resolution		depending on encoder type, max. 64 bit (singleturn + multiturn)
Protocol		BiSS-C, SSI
Power Requirements		
<u>Operating voltage for module</u> Nominal Minimal Maximal Over-voltage protection	 VDC V	 12 7 30 max. 30

Operating voltage for the backplane Nominal Minimal Maximal	VDC	 5 4.8 5.2
Operating voltage for encoder Nominal Minimal Maximal	VDC	 5 4.8 5.2
Power consumption from chassis at 5 V:		
Operating current in active mode Typical Minimal Maximal	mA	 50 45 55
Operating current in sleep mode Typical Minimal Maximal	mA	 1 1 2.5
Power consumption from external connector at 12 V:		
Operating current in active mode Typical Minimal Maximal	mA	 50 45 500

Power consumption from encoder at 5 V:		
Operating current in active mode Maximal (per channel)	mA	350
Physical Characteristics		
Weight	g	180
Dimensions	mm	87 x 23 x 89
Environmental Conditions		
Operating Temperature	°C	–40 to 70
Storage Temperature	°C	–40 to 85
Ingress Protection[1]		IP 30
Operating Humidity[2]	%	5 to 90
Shock and Vibration		
Operating Vibration Random (IEC 60068-2-64) Sinusoidal (IEC 60068-2-6)	Hz	5 g_{rms}, 10 to 575 5 g, 10 to 575

1 with connected power cable
2 RH, noncondensing

Operating Shock (IEC 60068-2-27)		15 g, 11 ms half sine, 30 g, 11 ms half sine, 50 g, 3 ms half sine, (10 shocks at 6 orientations)

Tab. 1: Specifications

Electromagnetic Compatibility

The SEA 9521 module is conform with the following European Union Directives:

- Directive 89/336/EEC for conformity for EMC
- EMC (Electromagnetic Compatibility). Standards: EN 301 489-1 and EN 301 489-7

CE

The module is compliant with the following US Directives:

- EMC (Electromagnetic Compatibility). Standards: FCC47 Part 15

Maintenance

Only use a clean and dry cloth to wipe the SEA 9521. The SEA 9521 is not water resistant and should not be operated in humid environments.

The SEA 9521 does not contain any components, which have to be maintained.

Opening the SEA 9521 will destroy the heat conductors and will void warranty.

Contact and Support

Address

S.E.A. Datentechnik GmbH
Muelheimer Strasse 7
53840 Troisdorf
Germany

Support channels

1. website: https://www.sea-gmbh.com
2. email: techsupport@sea-gmbh.com
3. phone: + 49 2241 12737 – 0
4. fax: + 49 2241 12737 – 14