Protected VARAN Strain Gauge Module PVAI 011

For a resistance bridge
1.1 mV/V

A bridge circuit with a resolution of 1.1 mV/V can be connected using a 4-wire technology. The supply voltage for the bridge is 10 V. The minimum bridge resistance is 100 Ω.

Technical Data

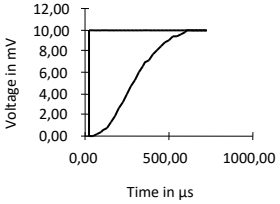
Interfaces

Interfaces	1 x VARAN-In (M12) (maximum length: 100 m)

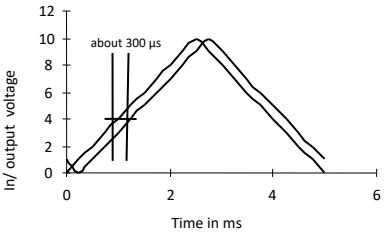
Input specifications

Number of channels	1 (4-wire connection)	
Measurement range	1.1 mV/V	
Measurement value	0 – 4000	
Resolution	12-bit	
Conversion time per channel	≤1 ms	
Input filter	Cutoff frequency 1 kHz (1ms)	Low pass 3 system
Supply voltage	10 V/±2.5 %	
Maximum voltage supply capacity	100 mA maximum, short circuit proof	
Min. Bridge resistance	100 Ω	
Precision of Analog channel measurement	±0.35 % of maximum Measurement value	
Repeating accuracy	1.1 mV/V ±0.3 %	
Liniearity error	1,1 mV/V ±0.35 %	

Step response of input filter PVAI 011
For 1 mV/V res. bridge



PVAI 011 input signal delay



Electrical requirements

Bus supply voltage	18 – 30 V	
Current consumption of the bus supply	Typically 75 mA / + 24 V	Maximum 130 mA / 24 V

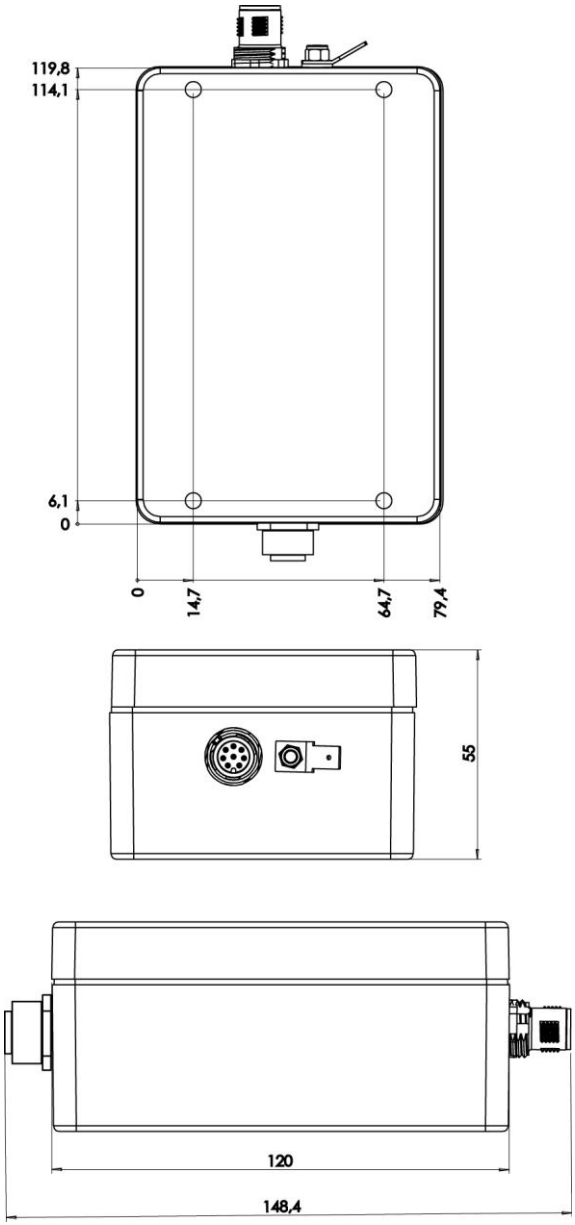
Miscellaneous

Article number	14-109-011
Hardware version	1.x
Standard	UL in preparation

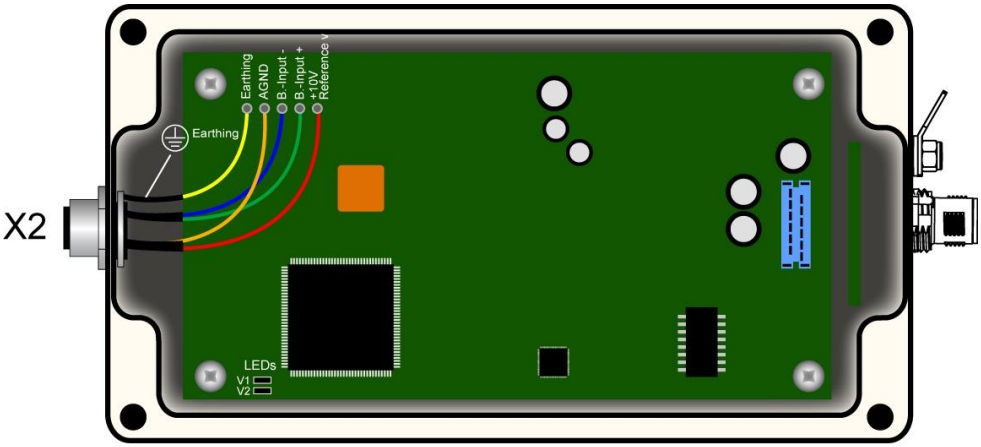
Environmental conditions

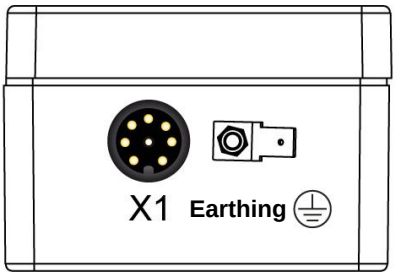
Storage temperature	-20 – +85 °C	
Operating temperature	0 – +60 °C	
Humidity	0 – 95 %, uncondensed	
EMV stability	According to EN 61000-6-2:2001 (industrial area)	
Shock resistance	EN 60068-2-27	150 m/s²
Protection	EN 60529	IP65

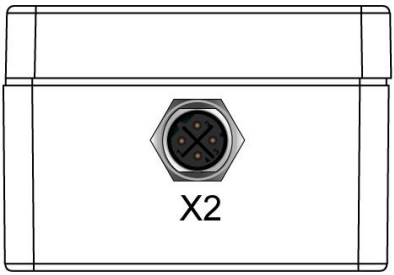
Mechanical Dimensions



Connector Layout

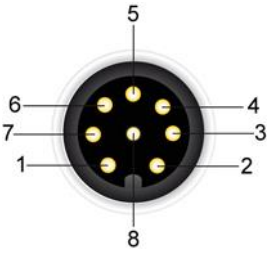






LED	Color	Description
V1, VARAN Link	Green	Lights when the connection between the two PHs is established.
V2, VARAN Active	Yellow	Lights when data is sent or received over the VARAN bus.

X1: VARAN-In (M12 plug, 8-pin)



Pin view

Pin	Function
1	n.c.
2	TX/RX+
3	TX/RX -
4	n.c.
5	RX/TX+
6	GND
7	+24 V power supply
8	RX/TX-

X2: Phoenix socket M12, 4-pin

Pin	Function
1	+10V reference voltage
2	AGND
3	Bridge input -
4	Bridge input +

Housing = Earthing (shielding)

It's absolutely necessary to connect the shielding!

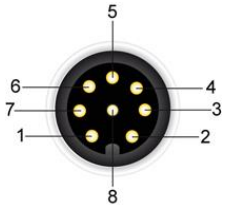
Mating plug to X2: **Phoenix type SACC-M12-MSD-4CON-PG-7-SH**
Phoenix order number: 15 21 25 8

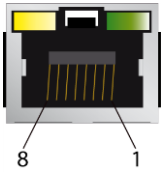
Cable layout (VARAN to RJ45)

M12			RJ45	
Pin	**Function**		**Pin**	**Function**
1	n.c.		7	GND
2	TX/RX+	**<=>**	1	TX/RX+
3	TX/RX-	**<=>**	2	TX/RX-
4	n.c.		4	+24 V
5	RX/TX+	**<=>**	3	RX/TX+
6	GND	**<=>**	8	GND
7	+24 V power supply	**<=>**	5	+24 V
8	RX/TX-	**<=>**	6	RX/TX-

Pin 7 of the RJ45 can be connected to Pin 6 of the M12; Pin 4 of the RJ45 can be connected to pin 7 of the M12.

IMPORTANT: Pins 1 and 4 of the M12 connector CANNOT be connected!





This cable is customer-specific and does not correspond to VARAN specifications!

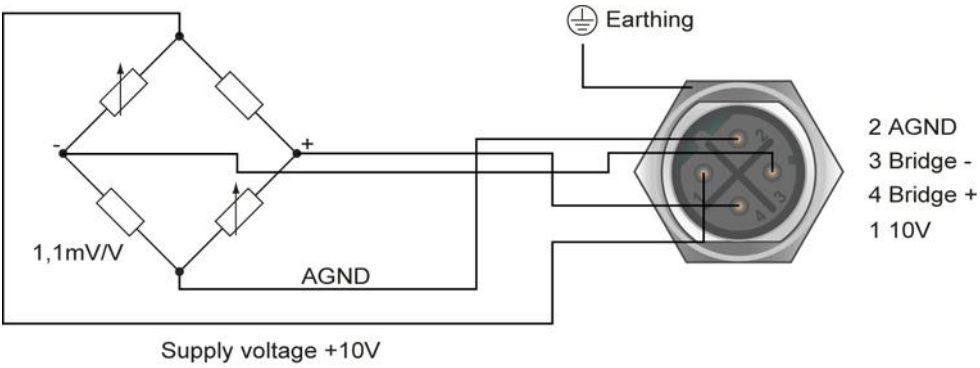
More information on the VARAN bus can be found in the VARAN bus specifications!

Wiring Guidelines

The signals recorded by the analog modules are very small, as compared to the digital signals. To ensure error-free operation, a careful wiring method must be followed:

- The earth connection must be connected properly to mass.
- The connection lines to the source of the analog signals must be as short as possible and parallel wiring to digital signal lines must be avoided.
- The signal lines must be shielded.
- The shielding should be connected to a shielding bus. If no shielding bus is available, the shield can also be clamped to the connectors (see below).

1.1 mV/V Bridge Circuit



Addressing

Address	RD/WR	Function / Bits
$00	RD16	Analog measurement value of the reference voltage
$02	RD16	Analog measurement value, Channel 1 (0 – 10 V)
$04	RD8	Bit 0: ADC error Bit1: Reference OK Bit2: Reference output OK (max. current 100 mA) Bit3.. 7: reserved

Calibration Data (Serial Flash)

The data is located, according to the VARAN bus specifications, in the serial Flash memory under the ID number 10 (area: calibration data). The data for this module is organized as follows:

Address	BYTE	Description
0000	4	Check sum
0004	4	Scan version
0008	4	Scan length Bit 31..0: scan length
000C	4	Number of channels
0010	4	AI0 Offset = Reference voltage at the time of calibration
0014	4	AIO Multiplier = not used
0018	4	AIO Divisor = not used
001C	4	AI1 Offset
0020	4	AI1 Multiplier
0024	4	AI1 Divisor

VARAN Recommended Shielding

The VARAN real-time Ethernet bus system offers robust performance in harsh industrial environments. Through the use of IEEE 802.3 standard Ethernet physics, the potential between an Ethernet line and sending/receiving components is kept separate. The VARAN Manager resends messages to a bus participant immediately when an error occurs. It is principally recommended that the shielding guidelines below be followed.

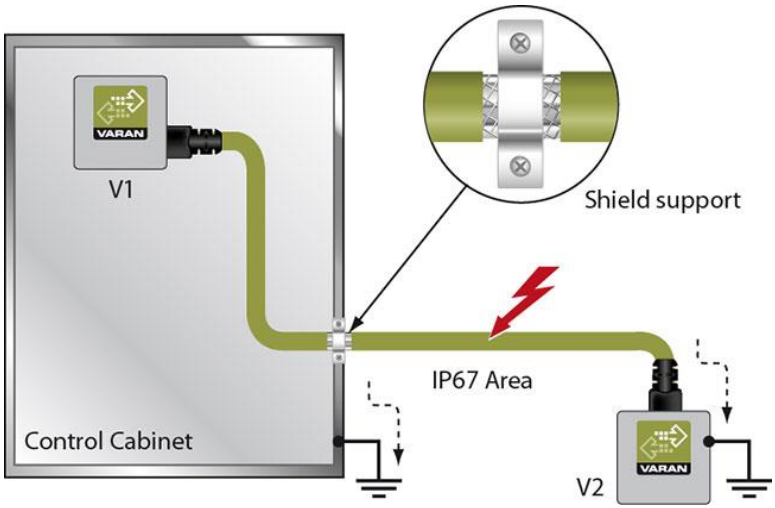
For applications in which the bus line is run outside the control cabinet, correct shielding is required. This is especially important, if due to physical requirements, the bus lines must be placed next to sources of strong electromagnetic noise. It is recommended that whenever possible, to avoid wiring VARAN-Bus lines parallel to power cables.

SIGMATEK recommends the use of **CAT5e** industrial Ethernet bus lines.

For the shielding variants, an S-FTP bus line is recommended, which is a symmetric, multi-wire cable with unshielded pairs. For the total shielding, a combination of foil and braiding is used; it is recommended that an unvarnished variant be used.

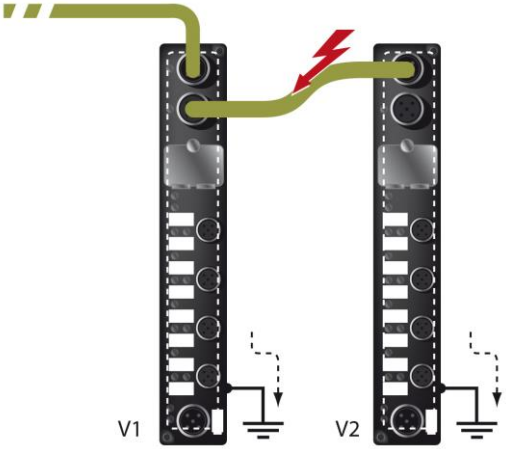
1. Wiring from the Control Cabinet to an External VARAN Component

If the Ethernet lines are connected from a VARAN component to a VARAN node outside the control cabinet, the shielding should be placed at the entry point to the control cabinet housing. All noise can then be deflected from the electronic components before reaching the module.



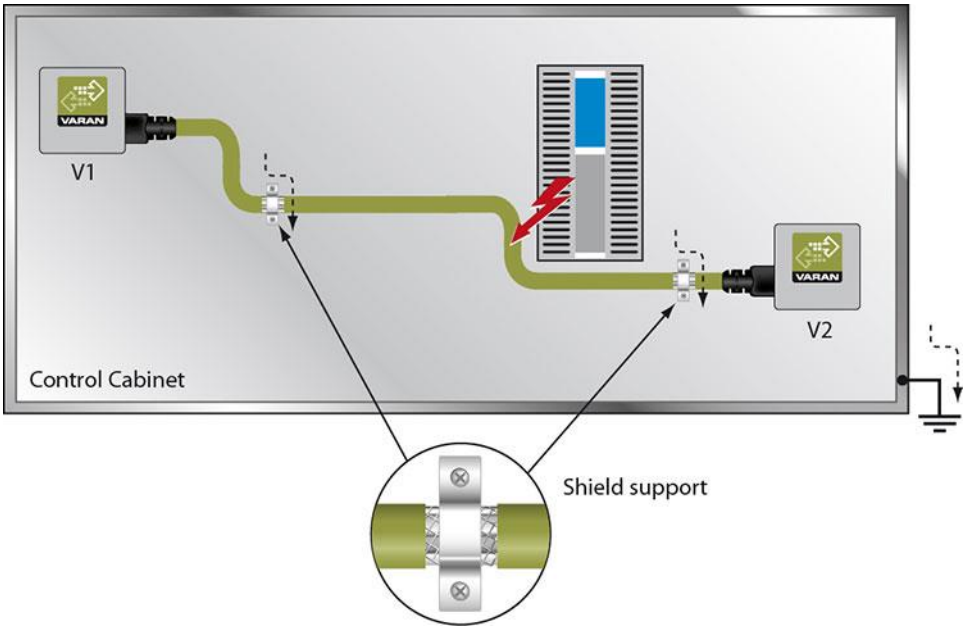
2. Wiring Outside of the Control Cabinet

If a VARAN bus cable must be placed outside of the control cabinet only, no additional shield connection is required. This requires that only IP67 modules and connectors be used. These components are very robust and noise resistant. The shielding for all sockets in IP67 modules are internally connected to common bus or electrically connected to the housing, whereby the deflection of voltage spikes does not flow through the electronics.



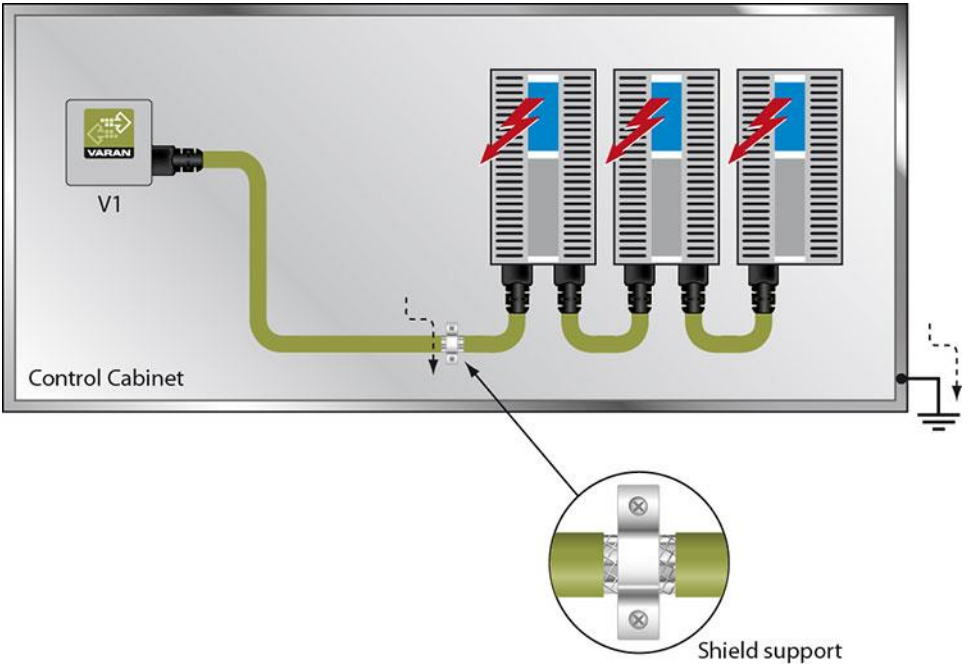
3. Shielding for Wiring Within the Control Cabinet

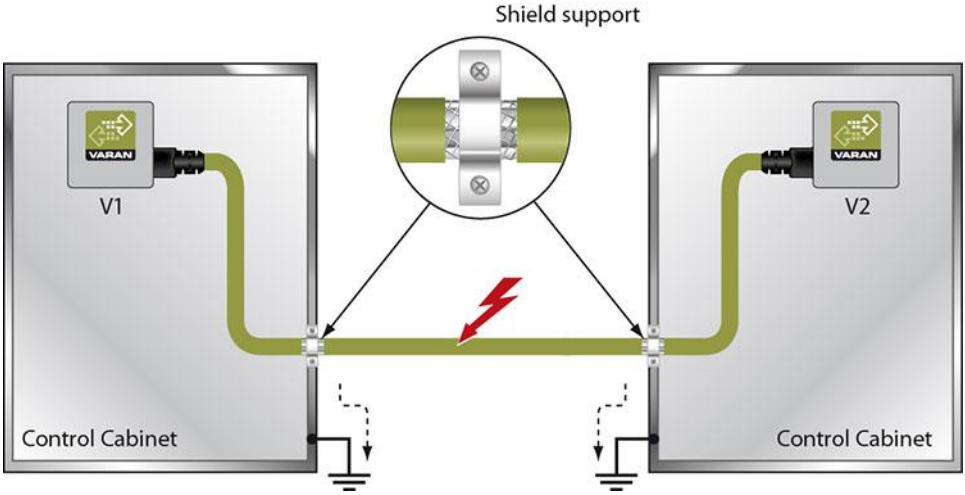
Sources of strong electromagnetic noise located within the control cabinet (drives, Transformers, etc.) can induce interference in a VARAN bus line. Spike voltages are deflected over the metallic housing of a RJ45 connector. Noise is conducted through the control cabinet housing without further action from the electronic components To eliminate sources of noise during data transfer, it is recommended that the shielding from all electronic components be connected within the control cabinet.



4. Connecting Noise-Generating Components

With the connection of power components that generate strong electromagnetic noise, it is also critical to ensure correct shielding. The shielding should be placed before a power component (or a group thereof).



5. Shielding Between Two Control Cabinets

If two control cabinets must be connected over a VARAN bus, it is recommended that the shielding be located at the entry points to both cabinets. Noise can thereby be kept from reaching the electronics within the control cabinet.