SIGMATEK

VA 011

VARAN Analyzer

Technical Manual

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Translation from German

S-DIAS VARAN Analyzer VA 011

with 1 VARAN In

1 VARAN Out

1 Ethernet

The VA 011 S-DIAS VARAN Analyzer module allows the analysis of communication in a real-time Ethernet VARAN bus network. The connection is made over a free VARAN port. If no port is available, an existing VARAN bus connection can simply be removed and the VARAN Analyzer inserted. The data to analyze are output through a Gigabit Ethernet port and can be evaluated with the VARAN Service Tool. The option is also available to analyze the data via Wireshark and protocol plug-in from SIGMATEK.

Contents

1 Introduction

1.1 Target Group/Purpose of this Manual

This manual contains all information required for operating the VA 011.

This manual is intended for:

- Project planners
- Technicians
- Commissioning engineers
- Machine operators
- Maintenance/test technicians

General knowledge of automation technology is required.

Further help and training information, as well as the appropriate accessories can be found on our website www.sigmatek-automation.com

Our support team is happily available to answer your questions.
Please see our website for our hotline number and business hours.

1.2 Important Reference Documentation

- Design specification VARAN

These documents can be downloaded from our website or obtained through SIGMATEK Support.

1.3 Contents of Delivery

1x VA 011
1x opposing connector

This document can be downloaded from our website.
Additional documents may be included with delivery.

2 Basic Safety Guidelines

2.1 Symbols Used

The following symbols are used in the operator documentation for warning and danger messages, as well as informational notes:

DANGER 	Identifies an immediate danger with high risk, which **will** lead to immediate death or serious injury if not avoided.
WARNING 	Identifies a possible danger with a mid-level risk, which **can** lead to death or (serious) injury if not avoided.
CAUTION 	Identifies a low risk danger, which can lead to injury or property damage if not avoided.
	Provides user tips, informs of special features and identifies especially important information in the text.
	Danger for ESD-sensitive components

2.2 Disclaimer

The contents of this document were prepared with the greatest care. However, deviations cannot be ruled out. This document is regularly checked and required corrections are included in the subsequent versions. The machine manufacturer is responsible for the proper assembly, as well as device configuration. The machine operator is responsible for safe handling, as well as proper operation.

The current document can be found on our website. If necessary, contact our support.

Subject to technical changes, which improve the performance of the devices. The following documentation is purely a product description. It does not guarantee properties under the warranty.

Please thoroughly read the corresponding data sheets, operating instructions and this system handbook before handling a product.

SIGMATEK GmbH & Co KG is not liable for damages caused through non-compliance with these instructions or applicable regulations.

The general and special safety instructions described in the following sections, as well as technical regulations, must therefore be observed.

2.3 General Safety Guidelines

According to EU Guidelines, the operating instructions are a component of a product.

This manual must therefore be accessible in the vicinity of the machine since it contains important instructions.

This technical documentation should be included in the sale, rental or transfer of the product, or its online availability indicated.

Maintain this manual in readable condition and keep it accessible for reference.

Operate the unit with devices and accessories approved by SIGMATEK only.

CAUTION

Handle the device with care and do not drop or let fall.

Prevent foreign bodies and fluids from entering the device.

The device must not be opened, otherwise it could be damaged!

3 Residual Risks

3.1 Guidelines

The panel was constructed in compliance with European Union guidelines.

3.1.1 EU Declaration of Conformity

CE Declaration of Conformity

The VA 011 conforms to the following European guidelines:

- 2014/35/EU Low-voltage guideline
- 2014/30/EU “Electromagnetic Compatibility” (EMC guideline)
- 2011/65/EU “Restricted use of certain hazardous substances in electrical and electronic equipment” (RoHS Guideline)

The EU Conformity Declarations are provided on the SIGMATEK website. See Products/Downloads or use the search function and the keyword “EU Declaration of Conformity”.

4 Technical Data

4.1 Performance Data

Interfaces	1x Gigabit Ethernet 10/100/1000 1x VARAN In (RJ45) (maximum cable length: 100 m) 1x VARAN Out (RJ45) (maximum cable length:100 m)
Control Elements	1x mode button (front)
Status LEDs	1x RUN 1x Link/Speed Gigabit Ethernet 1x Active Gigabit Ethernet 3x Modus (shows the current operating mode) 2x VARAN Link (1x VARAN In and Out each) 2x VARAN Active (1x VARAN In and Out each) 1x DC OK

4.2 Electrical Requirements

Supply voltage	+18-30 V DC UL: Class 2 or LVLC[(1)]
Current consumption of +24 V power supply	typically 130 mA

[(1)] Limited Voltage/Limited Current

[(1)]The device must be connected to a secondary galvanically separated supply with a rated voltage of 24 V DC. In compliance with UL 249, max 4 A, the fuse must be connected in the area between the supply source and the end device.

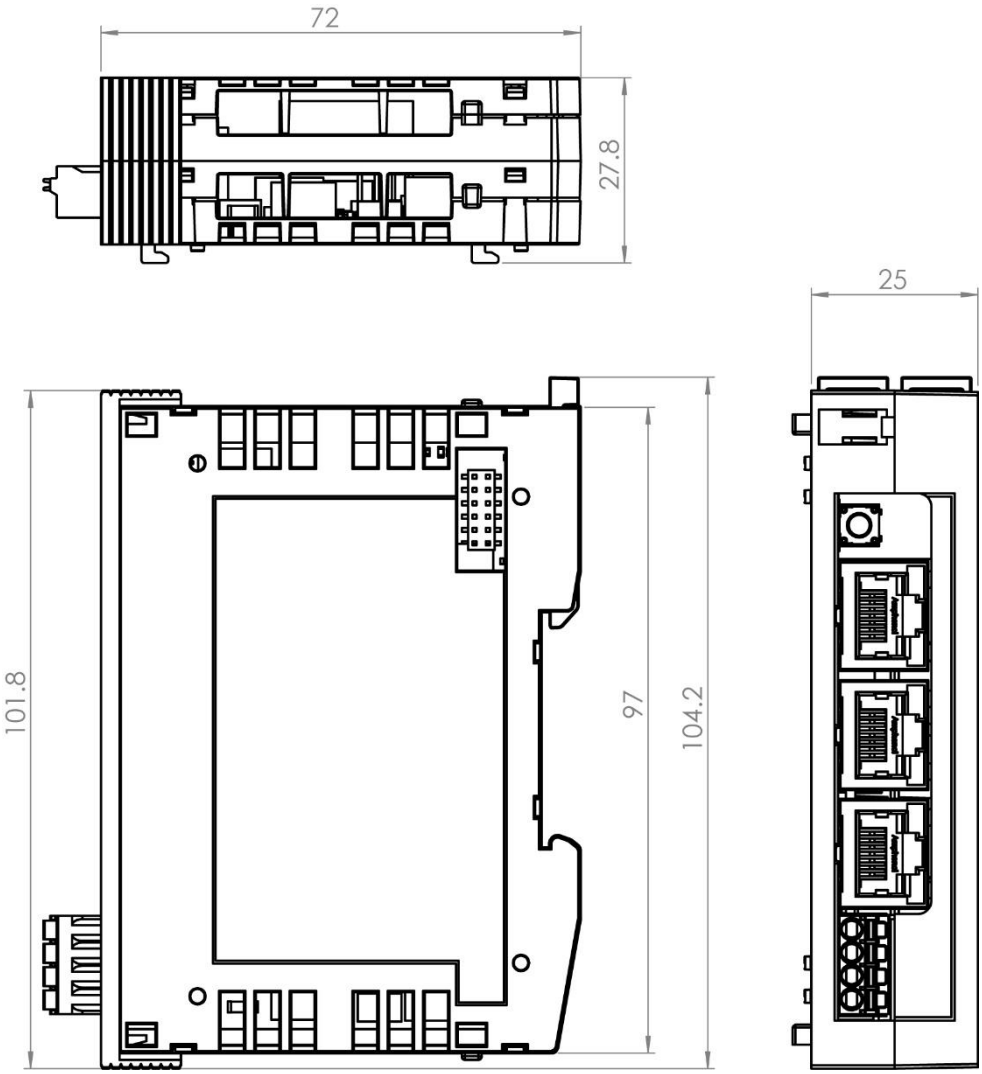
4.3 Environmental Conditions

Storage temperature	-20 ... +85 °C	
Environmental temperature	0 ... +55 °C	
Humidity	0-95 %, non-condensing	
Installation altitude above sea level	0-2000 m without derating > 2000 m up to a maximum of 5000 m with derating of the maximum environmental temperature by 0.5 °C per 100 m	
Operating conditions	pollution degree 2	
EMC resistance	in accordance with EN 61000-6-2 (industrial area)	
EMC noise generation	in accordance with EN 61000-6-4 (industrial area)	
Vibration resistance	EN 60068-2-6	3.5 mm from 5-8.4 Hz 1 g from 8.4-150 Hz
Shock resistance	EN 60068-2-27	15 g
Protection type	EN 60529	IP20

4.4 Miscellaneous

Article number	20-027-011
Hardware version	1.x
Approvals	CE

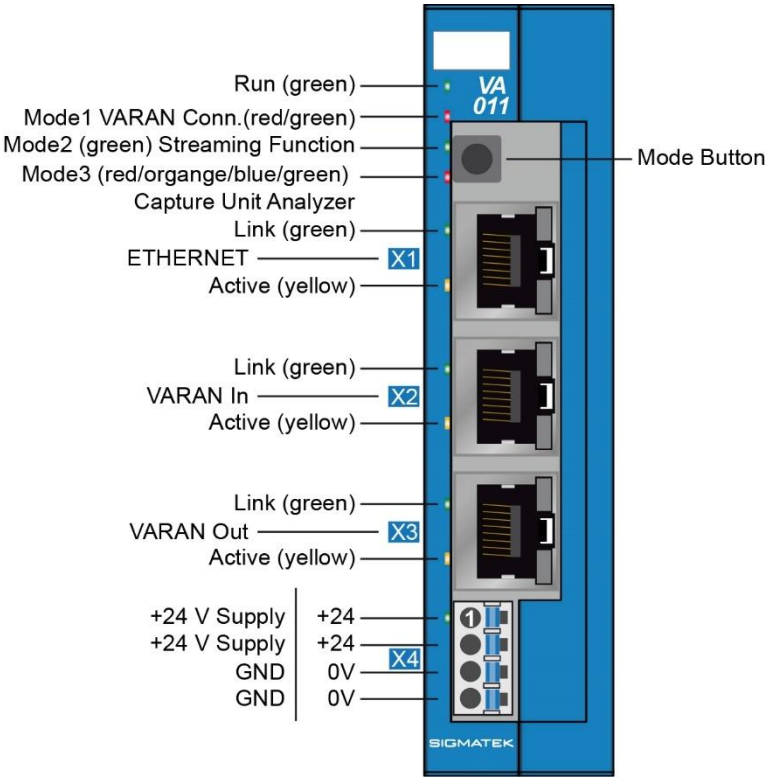
5 Mechanical Dimensions



6 ESD Protection

Before any device is connected to or disconnected from the VA 011, the potential with ground should be equalized (by touching the control cabinet or ground terminal). Electrostatic loads (through clothing and shoes) can thereby be dissipated.

7 Connector Layout



The connections of the +24 V supply (X4: pin 1 and pin 2) or the GND supply (X4: pin 3 and pin 4) are internally bridged. To supply the module, only one connection to a +24 V pin (pin 1 or pin 2) and a GND pin (pin 3 or pin 4) is required. The bridged connections may be used for further looping of the +24 V supply and the GND supply. However, it must be taken into account that a total current of 6 A per connection is not exceeded by the forward looping!

7.1 Status LEDs

Run	green	LIGHTS	module operation-ready
		BLINKS	the VARAN Analyzer does not yet have an IP address.
Mode LED 1 VARAN connection status	red	LIGHTS	VARAN PHY held in reset
	green	LIGHTS	VARAN Analyzer transparent
		OFF	no VARAN Out available, the device is then visible as a client in the VARAN network.
Mode LED 2 Streaming function	green	LIGHTS:	if via the mode button (short press), VARAN data streaming is active. If active, it can be recorded with Wireshark. This can also be activated through the VARAN Service Tool.
		OFF	operation / use via the VARAN Service Tool
Mode LED 3 Capture unit analyzer	red	LIGHTS	analyzer active and waiting for a VARAN frame that meets the trigger conditions.
	orange	LIGHTS	recording active
	blue	LIGHTS	frame in which the stop conditions were defined has been detected; active trace or resampling is displayed.
	green	LIGHTS	recording ended, data can be called through the VARAN Service Tool
Ethernet LINK / SPEED	green	LIGHTS	Ethernet connection 1000 Mbits
	orange	LIGHTS	Ethernet connection 100 Mbits
	red	BLINKS	Ethernet connection 10 Mbits
Ethernet Active	yellow	LIGHTS	link established
		BLINKS	data transfer at Ethernet interface
VARAN In Link	green	LIGHTS	connection between both PHYs made
		BLINKS	VARAN In of the primary client has no link
VARAN In Active	yellow	LIGHTS	data is exchanged over the VARAN bus
VARAN Out Link	green	LIGHTS	connection between both PHYs made
		BLINKS	there is no connection between VARAN In and the primary client.
VARAN Out Active	yellow	LIGHTS	data is exchanged over the VARAN bus
DC OK	green	LIGHTS	module is supplied with a voltage > 18 V

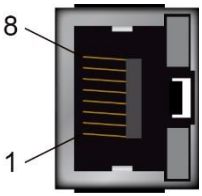
7.2 Button

The operating mode can be changed via the Mode button.

With a short press, the Analyzer can be switched to “Streaming Mode”. The active mode is indicated by the Status LED “M2”. If the LED lights green, streaming mode is active.

7.2.1 Connectors

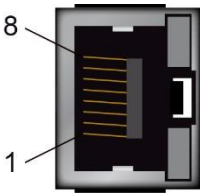
7.2.1.1 X1: Gigabit Ethernet (10/100/1000)



Pin	Function
1	D1+
2	D-
3	D2+
4	D3+
5	D3-
6	D2-
7	D4+
8	D4-

n.c. = do not use

7.2.1.2 X2, X3: VARAN In, VARAN Out



Pin	Function
1	Tx+/Rx+
2	Tx-/Rx-
3	Rx+/Tx+
4 - 5	n.c.
6	n.c.
7 - 8	Rx-/Tx-

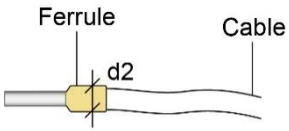
More information on the VARAN bus can be found in the VARAN bus specifications!

7.3 Applicable Connectors

Connectors:
X1 X2 X3 8-pin RJ45 (not included in delivery)
X4 Connectors with spring terminals (included in delivery)
The spring terminals are suitable for the connection of ultrasonically compressed (ultrasonically welded) strands.

Connections:

Stripping length/sleeve length:	10 mm
Mating direction:	parallel to the conductor axis or circuit board
Conductor cross section rigid:	0.2-1.5 mm^2
Conductor cross section flexible:	0.2-1.5 mm^2
conductor cross section strands ultrasonically compacted:	0.2-1.5 mm^2
Conductor cross section AWG/kcmil:	24-16
Conductor cross section flexible with ferrule without plastic sleeve:	0.25-1.5 mm^2
Conductor cross section flexible with ferrule with plastic sleeve:	0.25-0.75 mm^2 (reason for reduction d2 of the ferrule)

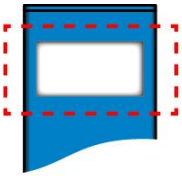


d2 = max. 2.8 mm

CAUTION

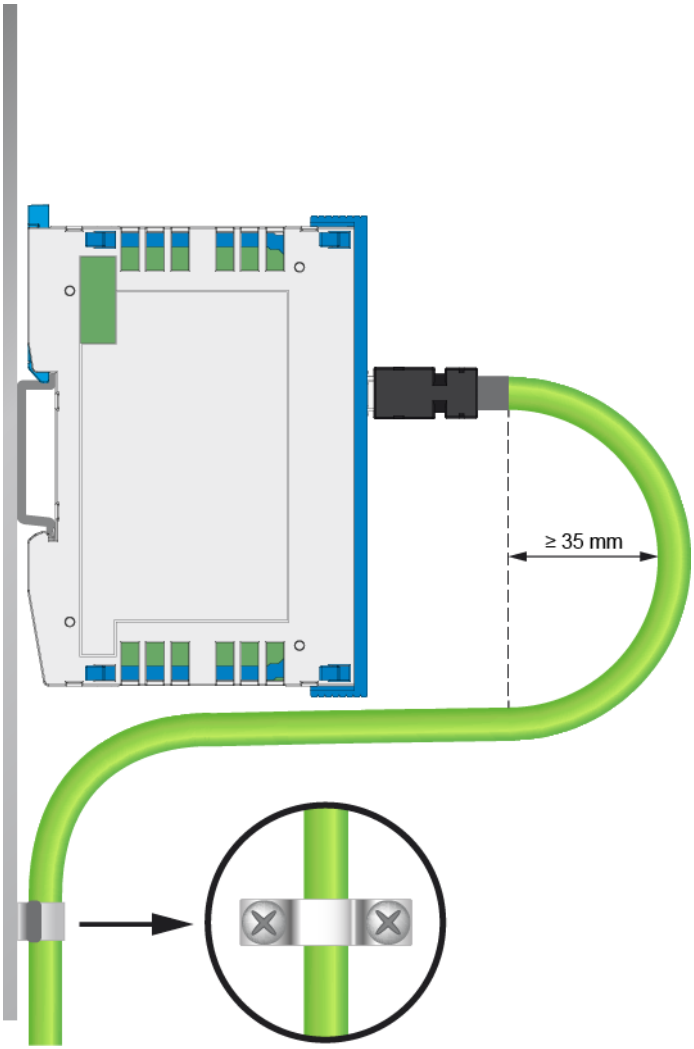
The module cannot be connected or disconnected while voltage is applied!

7.4 Labeling Field



Manufacturer	Weidmüller
Type	MF 10/5 CABUR MC NE WS
Article number Weidmüller	1854510000
Compatible printer	Weidmüller
Type	Printjet Advanced 230V
Article number Weidmüller	1324380000

8 Strain Relief



The VARAN cable must be mounted close to the module (e.g. using a clamp)!

No mechanical stress can be applied to the connection!

9 Recommended Shielding for VARAN

The VARAN real-time Ethernet bus system exhibits a very robust quality in harsh industrial environments. Using IEEE 802.3 standard Ethernet physics, the potentials between an Ethernet line and sending/receiving components are separated. In the event of an error, the VARAN Manager resends messages to a bus participant immediately. The shielding described below is mainly recommended.

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

SIGMATEK recommends the use of CAT5e industrial Ethernet bus cables.

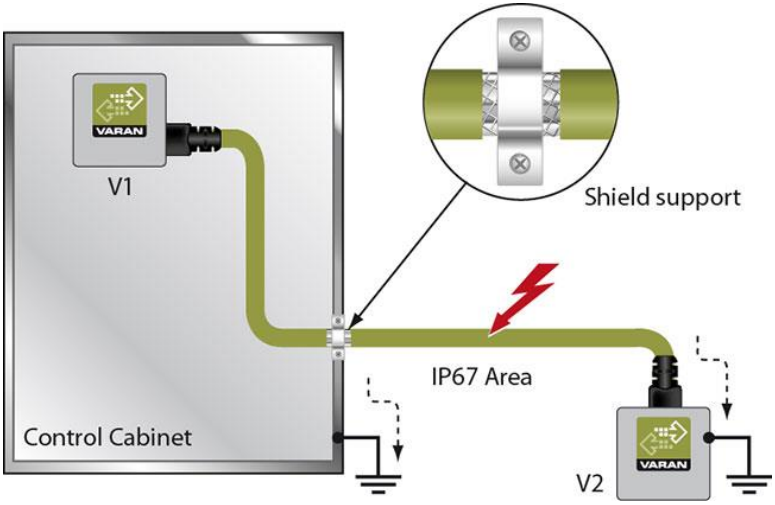
For the shielding, an S-FTP cable should be used.

An S-FTP bus is a symmetric, multi-wire cable with unshielded pairs. For the entire shielding, a combination of foil and braiding is used. A non-laminated variant is recommended.

The VARAN cable must be secured at a maximum distance of 20 cm from the connector to protect against vibration!

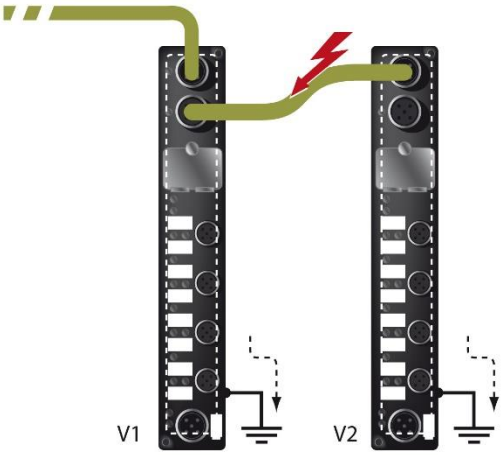
9.1 Wiring from the Control Cabinet to an External VARAN Component

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



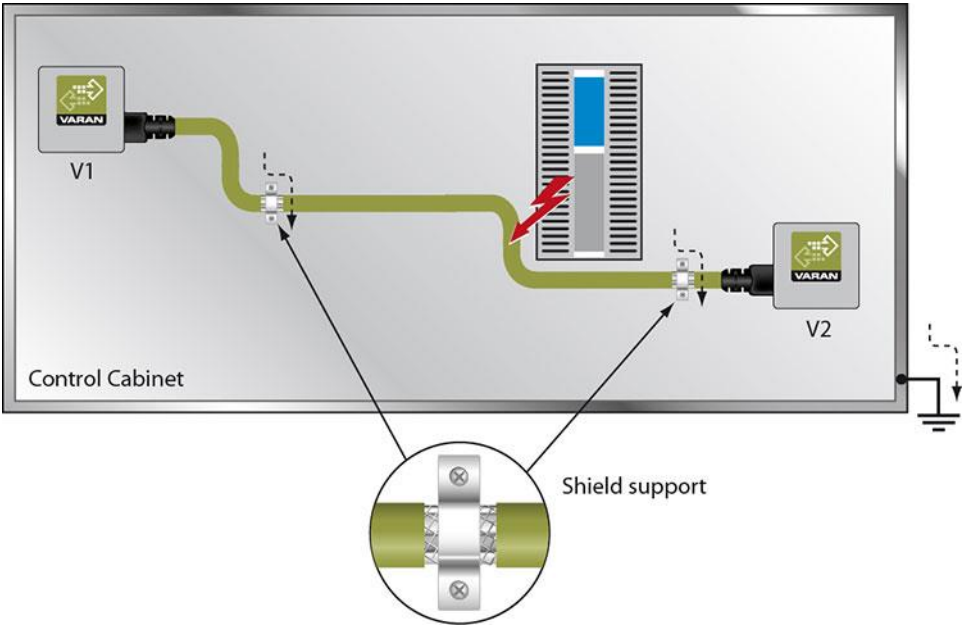
9.2 Wiring Outside of the Control Cabinet

If a VARAN bus line must be connected outside of the control cabinet only, no additional shield support is required. A requirement therefore, is that only IP67 modules and connectors can be used outside the control cabinet. These components are very robust and noise resistant. The shielding for all sockets in IP67 modules are electrically connected internally or over the housing, whereby voltage spikes are not dissipated through the electronics.



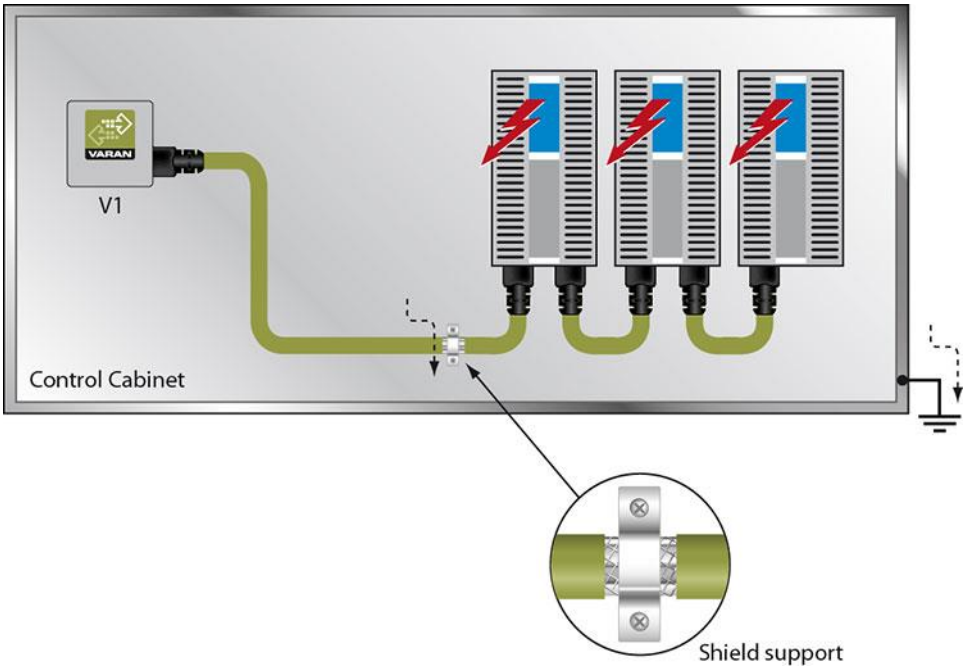
9.3 Shielding for Wiring Within the Control Cabinet

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 exchange, it is recommended that the shielding for all electronic components be connected within the control cabinet.



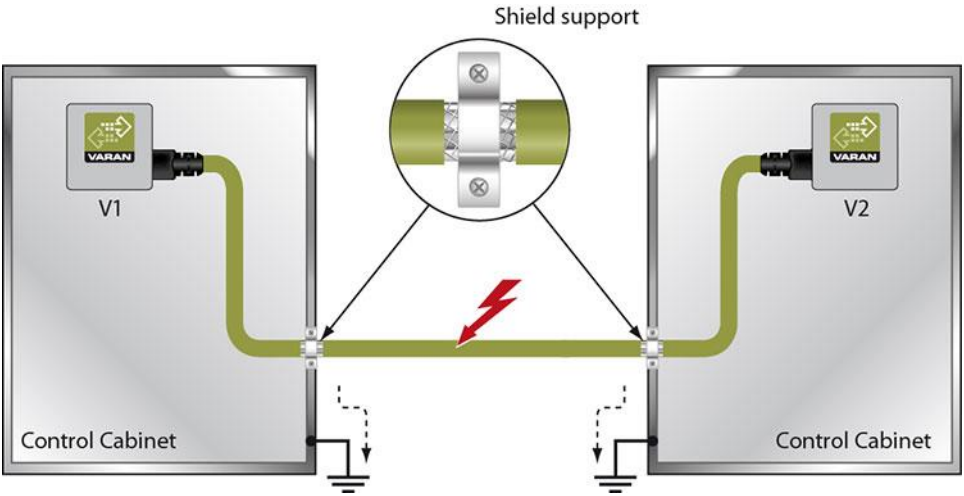
9.4 Connecting Noise Generating Components

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



9.5 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 of both cabinets. Noise can be thereby prevented from reaching the electronics within the control cabinet.



10 Transport/Storage

This device contains sensitive electronics. During transport and storage, high mechanical stress must therefore be avoided.

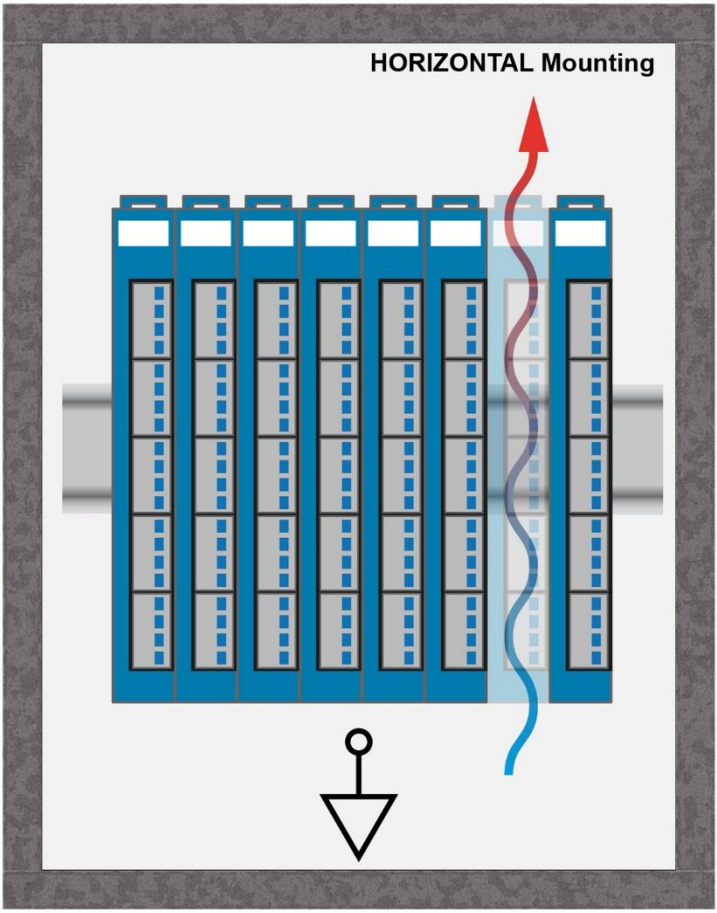
For storage and transport, the same values for humidity and vibration as for operation must be maintained!

CAUTION

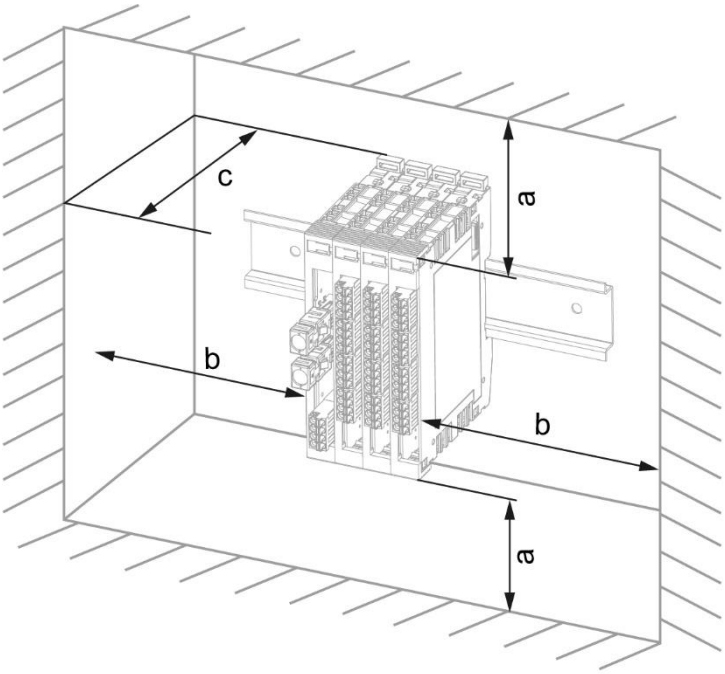
During transport, temperature and humidity fluctuations may occur. Ensure that no moisture condenses in or on the device.

11 Mounting

The S-DIAS modules are designed for installation into the control cabinet. To mount the modules, a DIN-rail is required. The DIN rail must establish a conductive connection with the back wall of the control cabinet. The individual S-DIAS modules are mounted on the DIN rail as a block and secured with latches. The functional ground connection from the module to the DIN rail is made via the grounding clamp on the back of the S-DIAS modules. The modules must be mounted horizontally (module label up) with sufficient clearance between the ventilation slots of the S-DIAS module blocks and nearby components and/or the control cabinet wall. This is necessary for optimal cooling and air circulation, so that proper function up to the maximum operating temperature is ensured.



Recommended minimum distances of the S-DIAS modules to the surrounding components or control cabinet wall:



a	b	c
30 mm (1.18″)	**30 mm** (1.18″)	**100 mm** (3.94″)

a, b, c … distances in mm (inches)

12 Maintenance

WARNING

During maintenance as well as servicing, observe the safety instructions from chapter 2.

12.1 Maintenance

This product was constructed for low-maintenance operation.

12.2 Repair

When sent for repair, the panel should be transported in the original packaging if possible. Otherwise, packaging should be selected that sufficiently protects the product from external mechanical influences. Such as cardboard filled with air cushioning.

In the event of a defect/repair, send the panel with a detailed error description to the address listed at the beginning of this document.

13 Disposal

When disposing of the panel, the national electronic scrap regulation must be observed.

The panel cannot be discarded with domestic waste.

14 Application Information

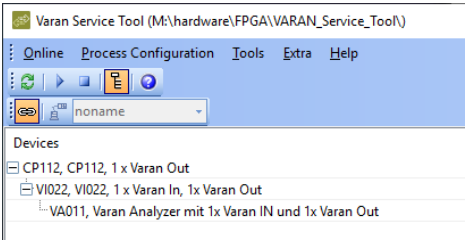
14.1 IP Settings

To assign the VARAN Analyzer a fixed IP address if no DHCP server is available or the Analyzer is connected to the PC/laptop directly, follow the procedure below.

14.1.1 Connecting with the VARAN Analyzer via the VARAN Bus

1. Connect the VARAN Analyzer with the VARAN bus without connecting VARAN Out. The device is then visible on the VARAN bus as a client.

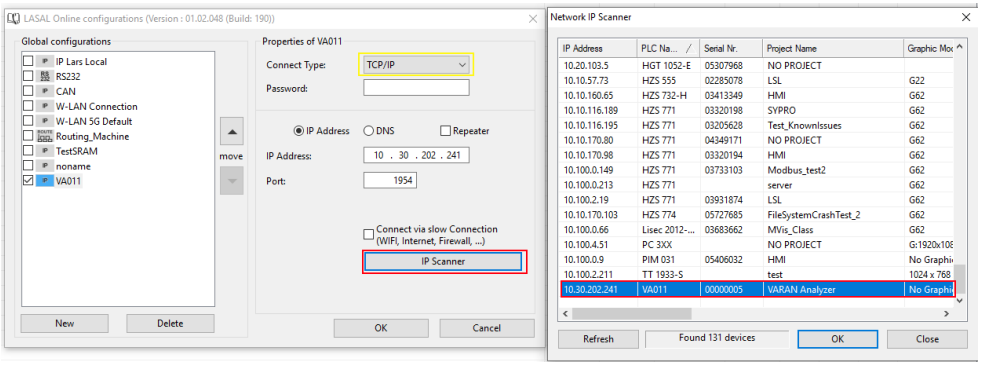
2. Next, connect the control to the VARAN Service Tool via the IP address.



14.1.2 Connecting the VARAN Analyzer via the IP interface

Here, the VARAN Analyzer must be in a network with DHCP servers. As soon as the Analyzer receives a valid IP address, LED M1 lights green.

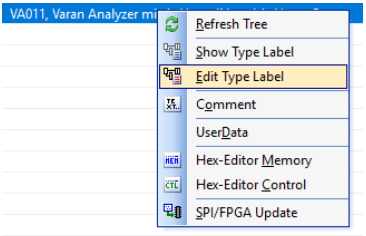
1. Open the “LASAL Online Settings”
2. Create a new item or select an existing item (TCP/IP Connection Type – marked yellow) to edit.
3. Locate the VARAN Analyzer via the “IP Scanner” function (marked red)
4. Select the VARAN Analyzer from the list. This can be uniquely assigned via the PLC name and serial number.



14.1.3 Set the IP Address

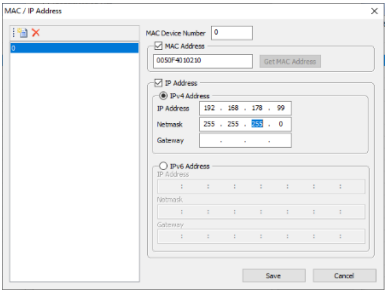
1. Under *Extras* > *Login*, enter the administration password received from support

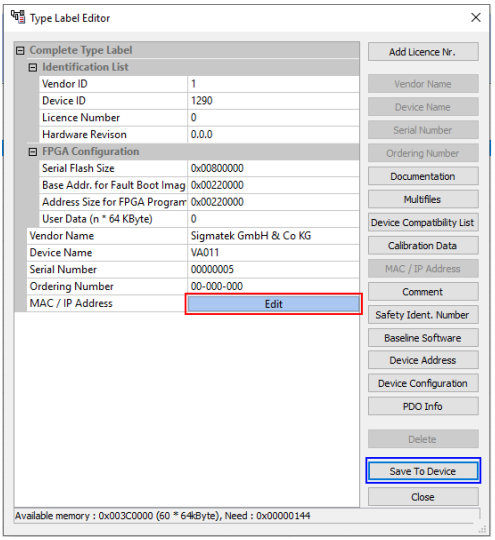
2. Right-click on the Analyzer and select the menu item “Edit Type Label”



3. In the “Type Label Editor” now opened, select the item “MAC / IP Address” (marked in red)

4. In the opened mask, enter the IP address that should be assigned to the Analyzer. Press the “Save” button.

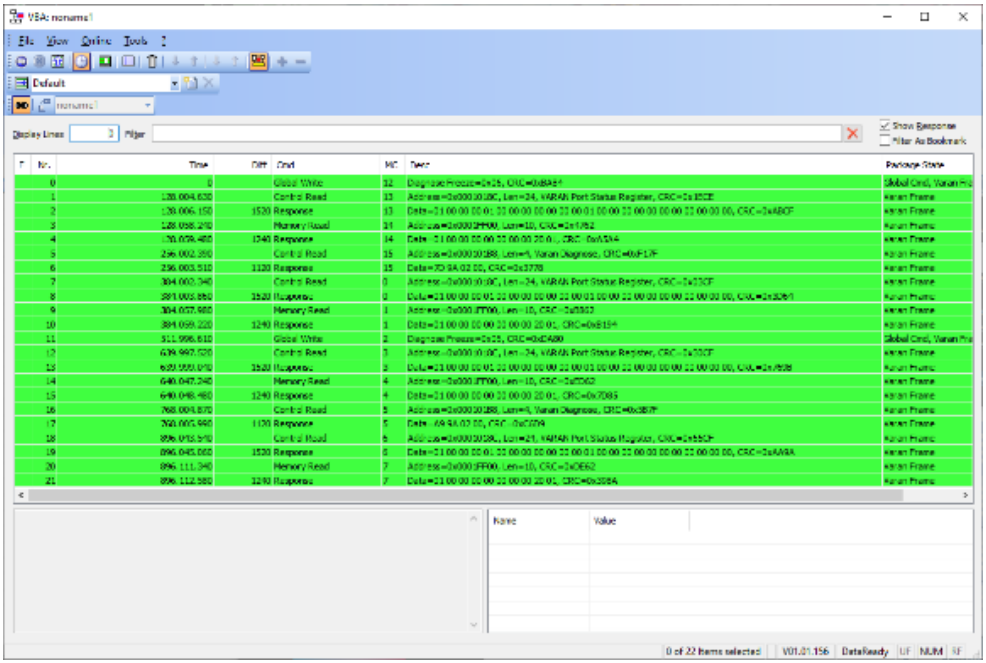




5. The “MAC / IP Address” closes and in the “Type Label Editor”, the settings can be stored via “Save to Device” (marked in blue).

14.2 Analysis with the VARAN Service Tool

1. Connect to the VARAN Analyzer
2. Under Extras, select the VARAN Analyzer tool
3. The description of the VARAN Analyzer function is found under the **"?"**, Menu item or with the F1 key.



14.3 Installation and Analysis with Wireshark

With the open-source packet analysis tool Wireshark and the plugin provided by SIGMATEK, the data stream can be analyzed and evaluated with the VA 011.

To run an analysis with Wireshark, we recommend connecting the Analyzer output to a dedicated Ethernet port on the PC/laptop.
For the analysis, switch the Analyzer to “Streaming Mode”.

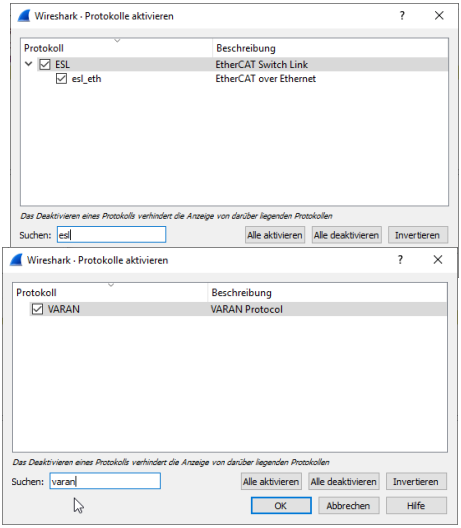
14.3.1 Wireshark Installation

1. Install Wireshark (version 3.0.2 or higher) https://www.wireshark.org/
2. Install plugin for VARAN (Download => SIGMATEK homepage fort he respective module or search term „SIGMATEK-Wireshark-Plugin“):
   varan.dll file in the directory
   [Wireshark Installationsordner]\plugins\[WiresharkVersion]\epan
   copy
3. Start/restart Wireshark

14.3.2 Analysis with Wireshark

1. Protocol activation
   Activate the ESL and VARAN protocols

2. (Optional) Load the color rules to clearly display the data packets.
   This can be run under
   View > Color Rules > Input



3. Next, start a recording at the desired interface.
   In the recording, VARAN and EtherCAT packets are displayed as follows:

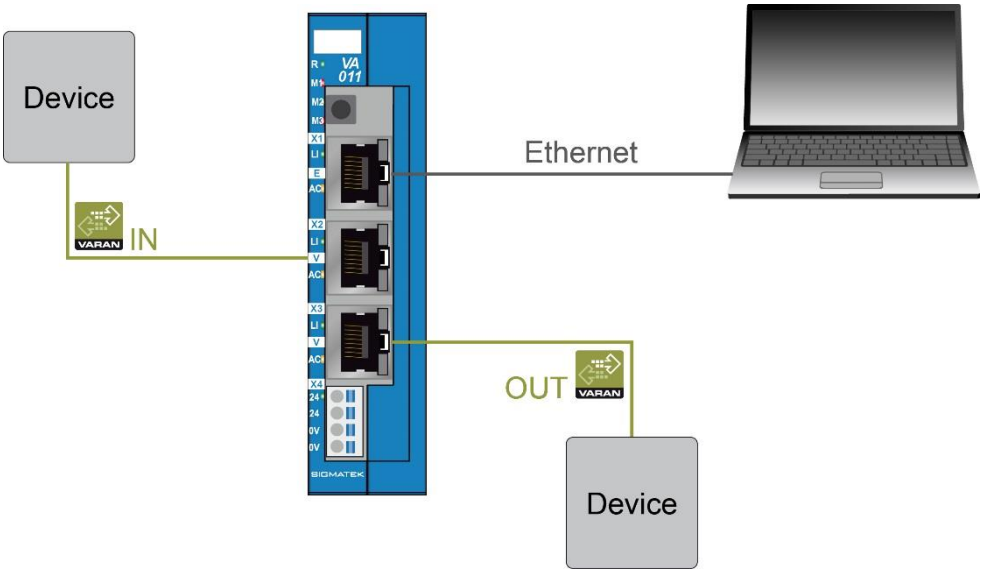
```
> Frame 23312: 76 bytes on wire (608 bits), 76 bytes captured (608 bits) on interface 0
> Ethernet II, Src: Sigmatek_00:01:02 (00:50:f4:00:01:02), Dst: Sigmatek_00:01:02 (00:50:f4:00:01:02)
v VARAN Protocol
    Type: VARAN 1 (1)
  > TX Frame
    CRC: 0xbe68
  > Varan Status
v EtherCAT Switch Link
    Port: 0
    .... 0... .... .... = Alignment Error: no
    ...0 .... .... .... = Crc Error: no
    timestamp: 0x00000b7fb385695a
```

VARAN packets can be filtered with the following filter setting ***eth.type == 0x88FA***

eth.type == 0x88FA

No.	timestamp	timedif	Source	Destination	Info	Length	Protocol	MS	CMD
2			Sigmatek_01:02:10	Sigmatek_01:02:10	[VARAN 1] SIGMATEK	6	VARAN	2	Control Read
3			Sigmatek_01:02:10	Sigmatek_01:02:10	[VARAN 1] SIGMATEK	25	VARAN	2	Response
6			Sigmatek_01:02:10	Sigmatek_01:02:10	[VARAN 1] SIGMATEK	2	VARAN	3	Global Write
7			Sigmatek_01:02:10	Sigmatek_01:02:10	[VARAN 1] SIGMATEK	6	VARAN	4	Memory Read
8			Sigmatek_01:02:10	Sigmatek_01:02:10	[VARAN 1] SIGMATEK	11	VARAN	4	Response
9			Sigmatek_01:02:10	Sigmatek_01:02:10	[VARAN 1] SIGMATEK	6	VARAN	5	Control Read
10			Sigmatek_01:02:10	Sigmatek_01:02:10	[VARAN 1] SIGMATEK	25	VARAN	5	Response

14.4 Example Application



Documentation Changes

Change date	Affected page(s)	Chapter	Note
13.11.2019-	34	14.3.1 Wireshark Installation	Downloadinfo for Wireshark plugin added
04.11.2020	27	11 Mounting	Expansion functional ground connection