VARAN Digital Combined Module VDM 086

The VARAN VDM 086 module has eight +24 V / 2 A digital outputs (positive switching). The outputs are short circuit protected and back readable. They can therefore also be used as digital inputs with a +24 V gauge to read the signal status 0 and 1.

Through the VARAN-Out port, the VARAN bus can be configured in a linear structure.

Ab HW 3.0

Technical Data

Interfaces

Interfaces	1 x VARAN-In (RJ45) 1 x VARAN-Out (RJ45) (maximum length: 100 m)

Digital Outputs

Number of outputs	8
Short circuit protection	Yes
Maximum continuous current load allowed per channel	2 A
Supply voltages	+24 V per group of 4
Maximum total current (per 4-channel group)	4 A (100 % of on-time)
Voltage drop over power supply (output active)	≤ 1 V
Residual output current (inactive)	≤ 12 µA
Turn-on delay	< 400 µs
Turn-off delay	< 400 µs
Status display	Yellow LED
Max. braking energy of inductive loads	1 channel 0.12 [Joules]

Digital Inputs

Number of outputs	8	
Input voltage	Typically 24 V	Maximum +30 V
Signal level	Low: < +5 V	High: > +14 V
Signal level starting HW 3.0	Low: < +5 V	High: > +15 V
Switching threshold	Typically 11 V	
Input current	Typically 5 mA (at + 24 V)	
Input current starting HW 3.0	Typically 3.7 mA (at + 24 V)	
Input delay	Typically 0,5 ms	
Status Displays	Yellow LED	

When using I/Os X1 – X8 as inputs for encoders or sensors with an external supply, power must be supplied through X9 (+24 V1 for X1 – X4, +24 V2 for X5 – X8) due to the internal wiring; otherwise it could lead to back supply and therewith damage to the electronics.

Electrical requirements

Supply voltage + 24 V DC / 1-2	18 – 30 V DC	
Current consumption of voltage supply	+24 V / 1: (corresponds to the total load of digital outputs 1 - 4) max. 4 A +24 V / 2: (corresponds to the total load of digital outputs 5 - 8) max. 4 A	
+24 V current consumption	Typically 80 mA	Maximum 100 mA
+24 V current consumption starting HW 3.0	Typically 60 mA	Maximum 100 mA

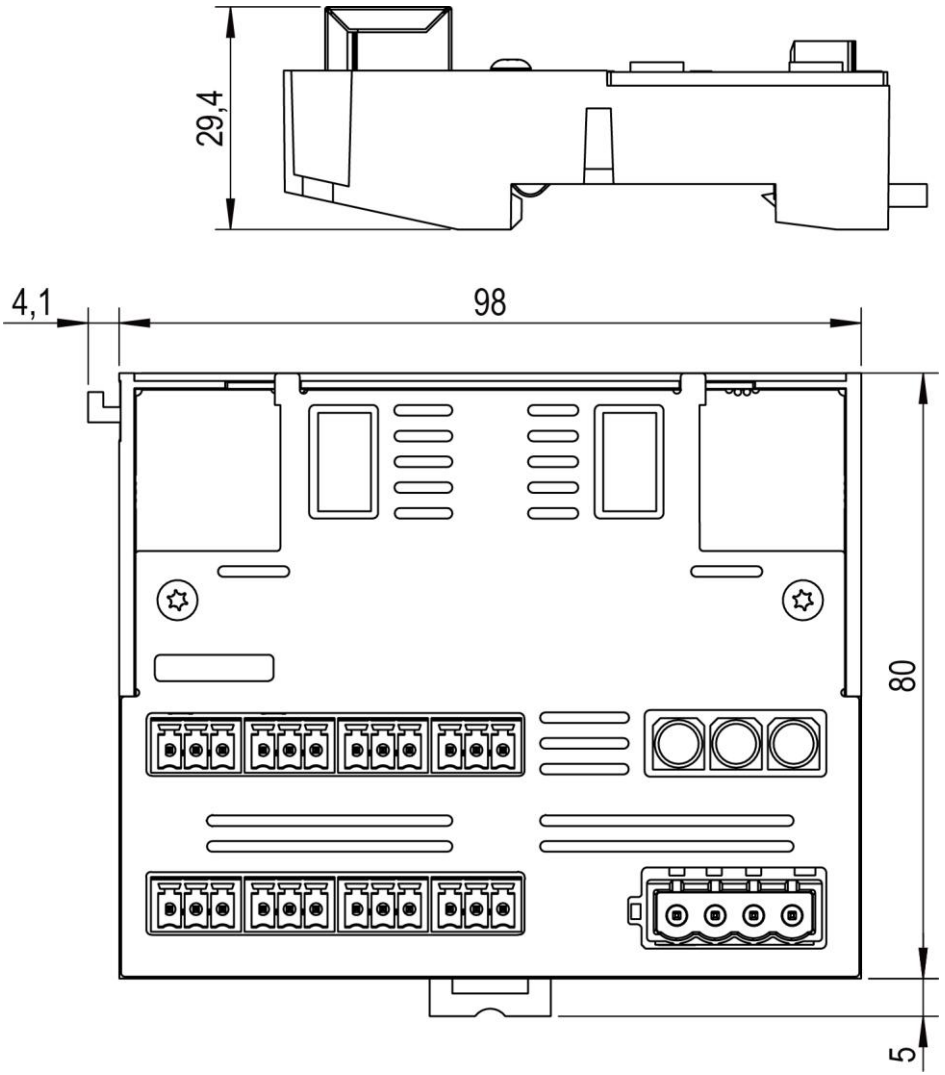
Miscellaneous

Article number	16-008-086
Software Macro	VDM086
Approbations	UKCA

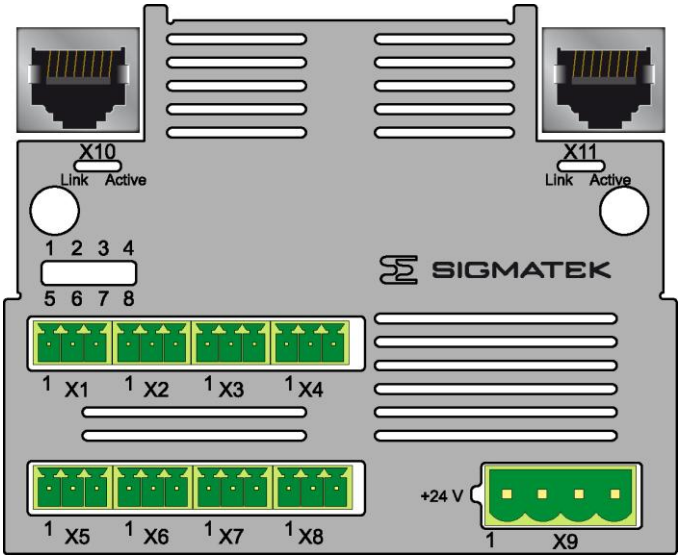
Environmental conditions

Storage temperature	-20 ... +85 °C	
Storage temperature starting HW 3.0	-25 ... +85 °C	
Environmental temperature	0 ... +60 °C	
Environmental temperature starting HW 3.0	-25 ... +60 °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	
Noise emissions	≤ 70 dB	
EMC resistance	EN 61000-6-2 (industrial area)	
EMC noise generation	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 (147.15 m/s^2)
Protection type	EN 60529	IP20

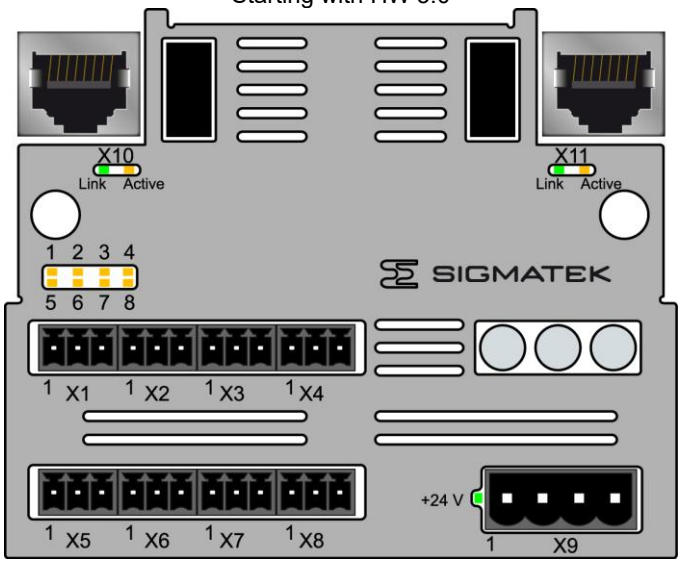
Mechanical Dimensions



Connector Layout

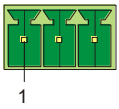


Starting with HW 3.0



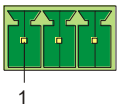
Connector Layout

X1 - X4: output 1 – 4 (MCV1.5/3-G-3.5)



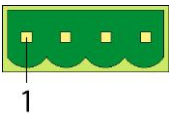
Pin	Function
1	Dig. I/O 1 – 4
2	+24 V1
3	EXGND

X5 - X8: output 5 – 8 (MCV1.5/3-G-3.5)



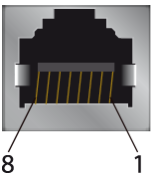
Pin	Function
1	Dig. I/O 5 – 8
2	+24 V2
3	EXGND

X9: Voltage supplies (MSTBVA 2,5/4-G-5,08) starting with HW 3.0 (CCVA2,5/4-6-5,08)



Pin	Function
1	+24 V1 (power outputs 1 - 4)
2	+24 V2 (power outputs 5 - 8)
3	+24 V
4	EXGND

X10: VARAN-In, X11: VARAN-Out (8-pin RJ45)



Pin	Function
1	TX+/RX+
2	TX-/RX–
3	RX+/TX+
4	-
5	-
6	RX-/TX-
7	-
8	-

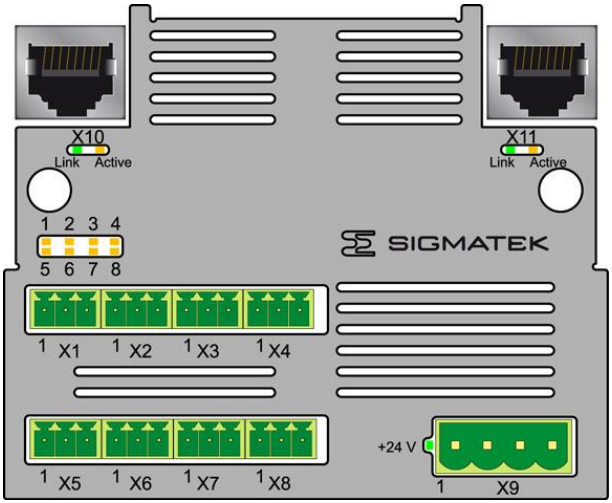
More information on the VARAN bus can be found in the VARAN bus specifications!

Applicable connectors

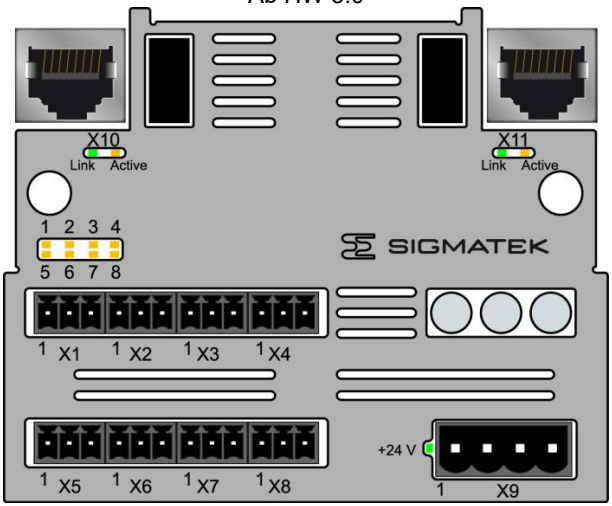
Connectors with spring terminals
Phoenix Contact: FK-MCP 1.5/ 3-ST-3.5
Phoenix Contact: SMTB2,5/4-ST-5,08

The complete C-DIAS VKL 032 connector set with spring terminals is available from Sigmatek under the article number 16-600-032.

Status Display



Ab HW 3.0



LED +24 V	Green	+24 V power supply for the electronics.
LED 1 – 8	Yellow	LEDs for back readable outputs 1 – 8.
LED Active	Yellow	Lights when data is sent or received over the VARAN bus.
LED Link	Green	Lights when the connection between the two PHs is established.

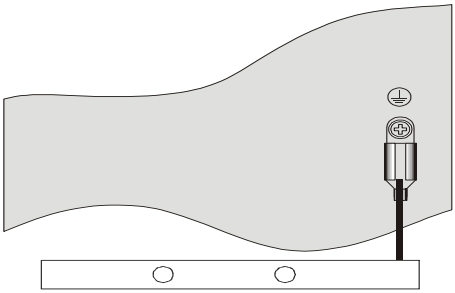
Wiring Guidelines for the Digital Inputs

The input filters used, which suppress noise signals, allow operation in harsh environmental conditions. In addition, a careful wiring method is recommended to ensure error-free function.

The following guidelines should be observed:

Avoid parallel connections between input lines and load-bearing circuits.
Protective circuits for all relays (RC networks or free-wheeling diodes)
Correct wiring to mass

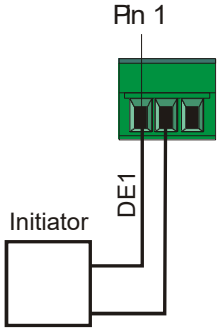
The GND connection must be connected to a common earth bus, whereas the connection must be kept as short as possible.



The earth bus should be connected to the switchbox when possible!

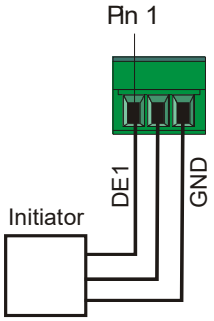
Connecting the Signal Sensor

2-wire initiators and mechanical end switches



Schematic 1

3-wire initiators



Schematic 2

General Information on the Digital Outputs

Up to 4 outputs are powered by a common +24 V supply:
+24 V1 (outputs 1 - 4) and +24 V2 (outputs 5 - 8).

The cross sectional area of the +24 V and GND supply must be designed for the maximum output current drawn by a group.

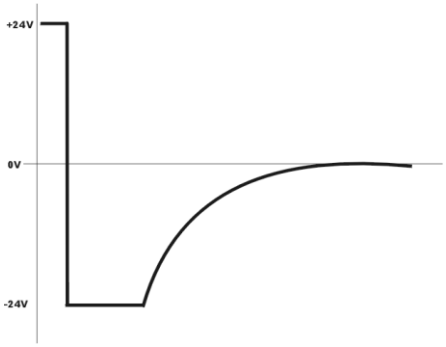
CAUTION!
When inductive loads are not fitted with a protective circuit, the high surge current flows over the GND line when the load is disconnected, as the internal protective circuit is wired against GND V Using conductors with an incorrect length or that are too thin can lead to undesired cross talk on the outputs of the affected terminal.

The outputs can be turned off by disconnecting the +24 V supply voltage.

Applying power to an output whose supply voltage exceeds 0.7 V is not allowed.

All outputs are electrically protected against +24V. The Disconnection of inductive loads is limited to -24 V as shown in the graph below. A Protective circuit connected directly to the inductive load is recommended however, to avoid system disruptions through voltage spikes (cross talk on analog lines). This results in the internal voltage limit being effective only up to -0.6 V.

Disconnecting inductive loads:



Example: Maximum braking energy of inductive loads

Uin is limited to 48 V by BTS
L = 37 mH
Rl = 28.9 Ω (direct current resistance of the coil)

Stored Energy of the coil $E_L = \frac{L * I_l^2}{2} = \frac{L * U_{in}^2}{2 * R_l^2} = 51m\ Joule$

Dissipable energy:

1 channel	: EB = 0.12 [Joule]
2 channels	: EB = 0.14 [Joule]
3 channels	: EB = 0.16 [Joule]

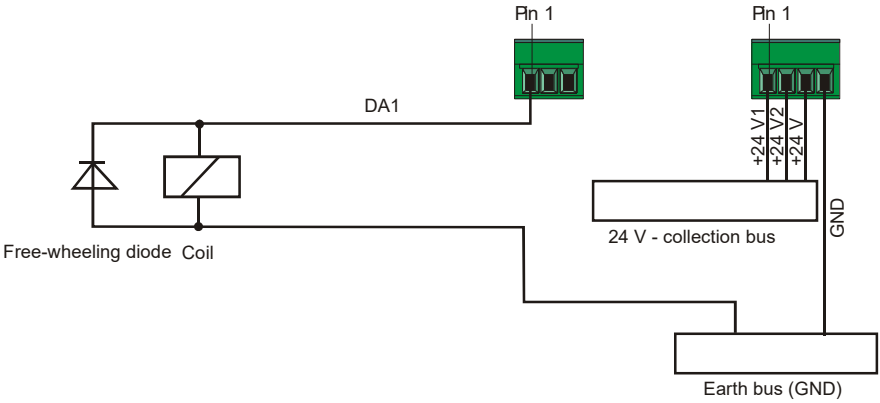
Wiring Guidelines for the Digital Outputs

The following guidelines should be followed:

- Avoid parallel wiring between input lines and load-bearing circuits.
- Protective circuits for all relays (RC networks or free-wheeling diodes)
- Correct wiring to mass

The earth bus should be connected to the earth bus of the control cabinet whenever possible!

Connecting inductive loads:



Schematic 3

Addressing

Address (hex)	Size (Byte)	Access type	Description	Reset value
Memory				
0000	1	r/w	Input/Output Register Bit 0: Input/Output 1 Bit 1: Input/Output 2 Bit 2: Input/Output 3 Bit 3: Input/Output 4 Bit 4: Input/Output 5 Bit 5: Input/Output 6 Bit 6: Input/Output 7 Bit 7: Input/Output 8	00
0001	1	r	Status Register Bit 0: +24V1 OK Bit 1: +24V2 OK Bit 2..7: Reserved	00

Control Address Mapping

Address (hex)	Size (Byte)	Description
0000	264	SPI Master
0140	64	Reserved
0180	64	VARAN Configuration registers

Recommended Shielding for VARAN

The VARAN real-time Ethernet bus system exhibits a very robust quality in harsh industrial environments. Through the use of 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. It is principally recommended that the shielding guidelines below be followed.

For applications in which the bus is run 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 that whenever possible, to avoid wiring VARAN-Bus lines parallel to power cables.

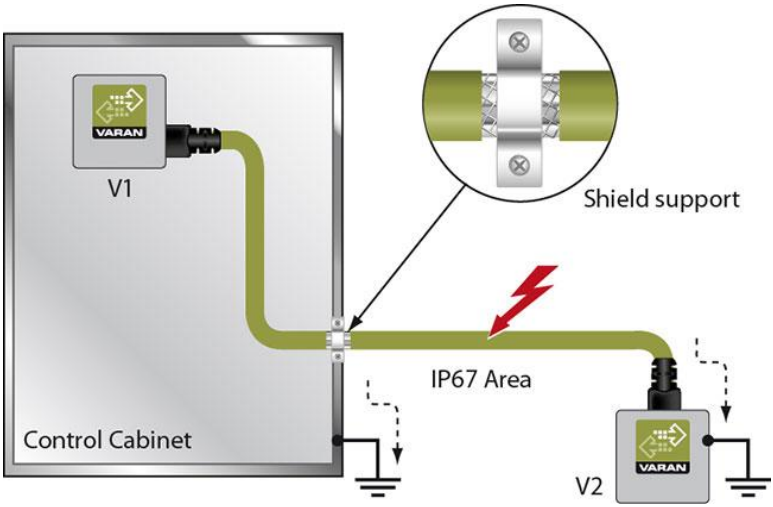
SIGMATEK recommends the use of CAT5e industrial Ethernet bus cables.

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

The VARAN cable must be secured at a distance of 20 cm from the connector for protection against vibration!

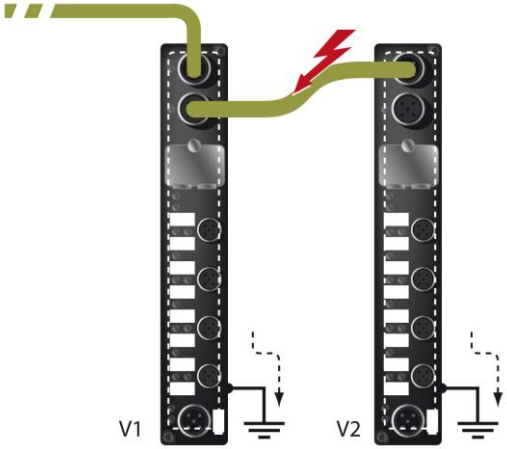
1. Wiring from the Control Cabinet to an External VARAN Component

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 to the control cabinet housing. All noise can then be deflected from the electronic components before reaching the module.



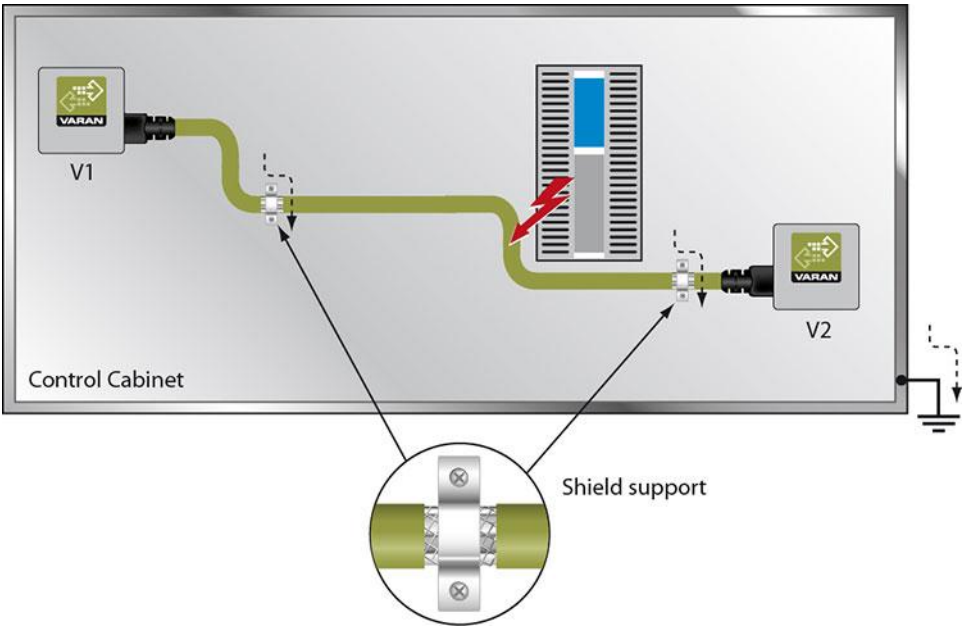
2. Wiring Outside of the Control Cabinet

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.



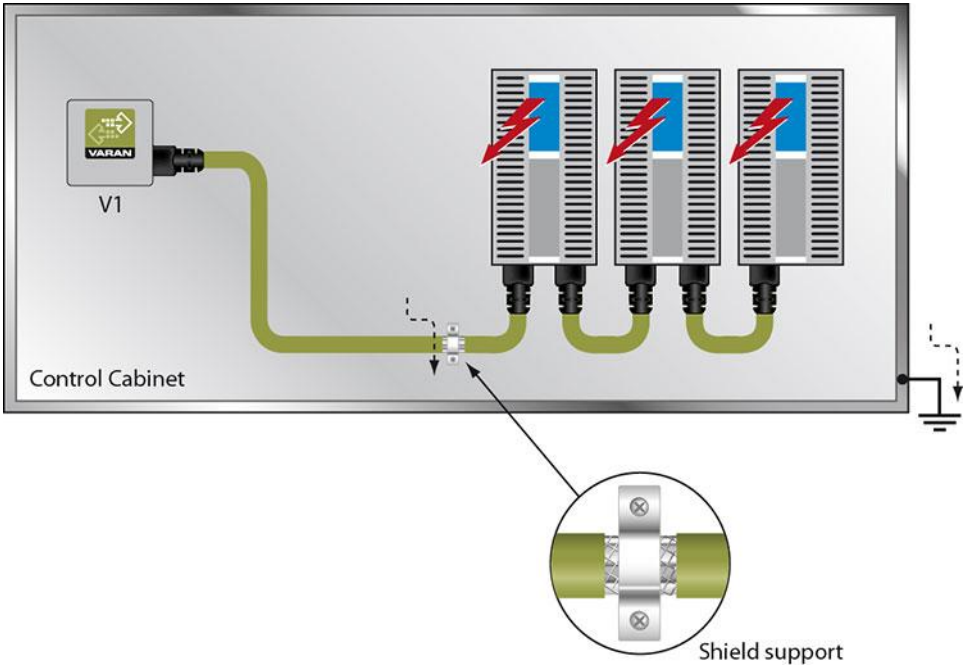
3. Shielding for Wiring Within the Control Cabinet

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 for all electronic components be connected within the control cabinet.



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