SIGMATEK

IPC 221

Industrial PC

Operating Manual

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Translation from German

Industrial PC IPC 221

with 2 Ethernet

2 VARAN Out

2 CAN

1 USB 2.0

1 DVI

1 S-DVI

2 UART

3 KTY temperature-measurement

1 machine EEPROM

1 S-DIAS

The IPC 221 is an industrial PC with a Celeron1020E processor.
It is used to control S-DIAS modules and has various interface connections such as: a VARAN Manager with 2 VARAN Out interfaces. A 7-segment display and 3 status LEDs provide information on the actual status of the CPU directly on the IPC. A CompactFlash cards can be used as program memory.

Compatibility
PC compatible.
The IPC works with a standard PC BIOS, where SIGMATEK specific settings can be made.

LASAL is provided as the operating system.

Contents

1 Technical Data

1.1 Performance Data

Processor	Intel Celeron 1020E
Addressable I/O/P modules	VARAN bus: 65,280 CAN bus: > 100 S-DIAS bus: 64
Internal program memory (CompactFlash)	512-Mbyte CompactFlash card (12-610-051, included in delivery)
Internal data memory (SRAM)	256 Kbytes (battery powered)
Internal memory (DDR3 RAM)	2-Gbyte (SO-DIMM DDR3 1600 MHz) expandable up to 8 Gbytes
Internal I/O	no
Internal cache	2-Mbyte L3 Cache
Interfaces	1x Ethernet1 10/100 (front) 1x Ethernet2 10/100 (front) 2x VARAN Out - Out 1 (front) - Out 2 (side, above the fan housing) 2x CAN 1x USB 2.0 (front) 1x DVI (front) 1x S-DVI (front) 2x UART - RS232 (front) 3x KTY temperature measuring (front) 1x machine EEPROM (for article 12-250-031) (front) 1x S-DIAS
Data buffer	yes (SRAM battery buffered)
Status display	yes (2x 7-segment display)
Status LEDs	yes
Real-time clock	yes (battery buffered)

1.2 Standard Configuration

Ethernet 1	IP: 10.10.150.1	Subnet Mask: 255.0.0.0
Ethernet 2	not initialized after factory	not initialized after factory
CAN bus PLC	Station: 00	Baud rate: 00 = 615 kBaud
CAN bus Terminal	Station: 00	Baud rate: 01 = 500 kBaud
COM 1 (RS232)	57600 Baud	
COM 2 (RS232)	57600 Baud	

The CAN bus terminal (CAN 2) is used for the S-DVI and is therefore limited in use! Several CAN objects of the CAN bus terminal (CAN 2) are not available.

Problems can arise if a control is connected to an IP network, which contains modules that do not run on a SIGMATEK operating system. With such devices, Ethernet packets could be sent to the control with such a high frequency (i.e. broadcasts), that the high interrupt load could cause a real-time runtime error or runtime error. By configuring the packet filter (Firewall or Router) accordingly however, it is possible to connect a network with SIGMATEK hardware to a third party network without triggering the error mentioned above.

1.3 KTY Temperature Sensor Specifications

Number of channels	3	
Measurement range	1367-2980 Ω	
	KTY10	
	-20 ... +80 °C	
Converter resolution	16-bit	
Conversion time per channel	1 ms	
Sensor current	typically 0.3 mA at 25 °C	
Cable break monitor	yes	
Input filter	typically 2 Hz	low pass 3rd order
Precision of analog channel measurement	±1 % of maximum measurement value	
Voltage protection	up to +30 V	

1.4 Electrical Requirements

Supply voltage	+18 … +30 V
Supply voltage Current consumption (maximum total current)	maximum 5.5 A
Inrush current	maximum 6 A (10-500 ms, load-dependent)
Supply voltage Current consumption without external devices (+24 V)	0.8 A
Current available for S-DIAS (+5 V)	maximum 1.6 A
Current available for S-DIAS (+24 V)	maximum 1.6 A
Available current for S-DVI (+24 V)	maximum 2 A
Available current for PCI (+5 V)	maximum 0.5 A (per USB connection)
UL standard	for UL[1] : must be supplied with SELV / PELV and Limited Energy

[1] In US according to Class 2 UL 1310 or UL 61010-1, 3rd edition, chapter 9.4 or LPS (limited power supply) UL 60950-1 or Limited Energy UL 1585

If several S-DIAS modules are connected, the total current of the modules used must be determined and checked.	
Total current of the +24 V supply on the S-DIAS bus	**cannot exceed 1.6 A**
Total current of the +5 V supply on the S-DIAS bus	**cannot exceed 1.6 A**
The specification for the current can be found in the module-specific documentation under “Electrical Requirements”.	

UL Certification

The unit must be powered by a galvanically isolated source, which has a UL-certified secondary fuse with a maximum rated current of

a) 5 A at voltages from 0-20 Vrms (0-28.3 Vp) or
b) 100 VA/Vp at voltages from 20-30 Vrms (28.3-42.4 Vp).

For the IPC, only a class 2 supply can be used!

1.5 Mechanical Dimensions

IPC 221	218.5 x 110.3 x 77.2 mm (W x H x D)

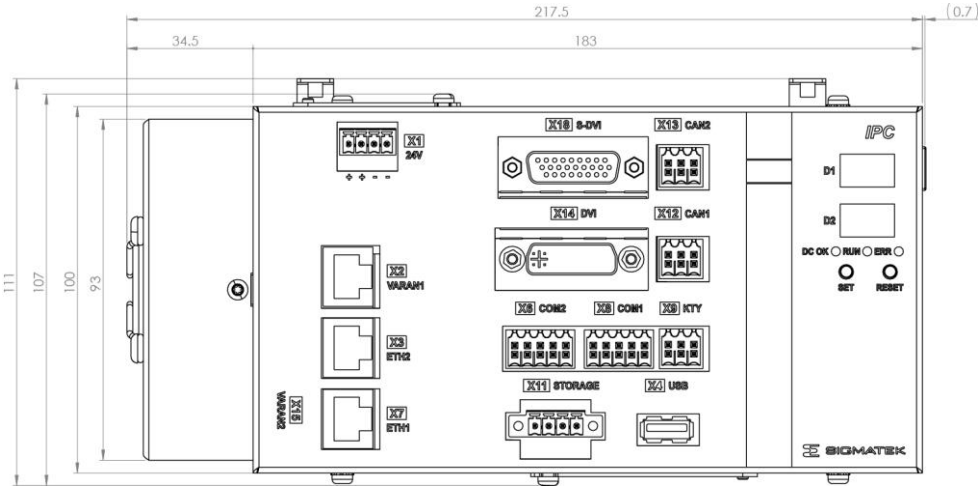
1.6 Miscellaneous

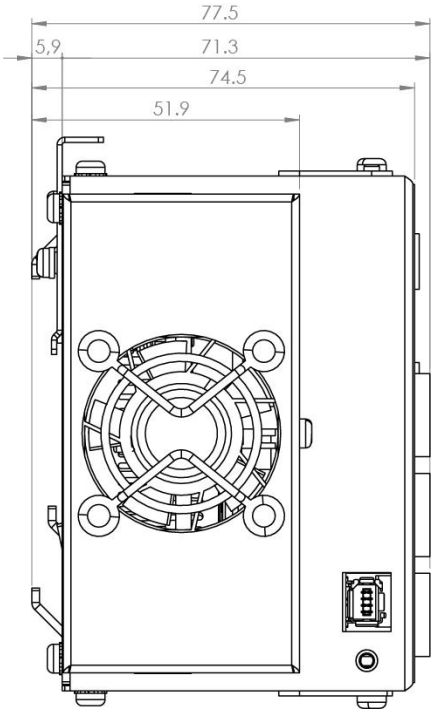
Article number	20-450-221
Hardware version	1.x
Project backup	internally on CompactFlash card
Standard	UL 61010-1, UL 61010-2-201 (E247993)
Approbations	UKCA

1.7 Environmental Conditions

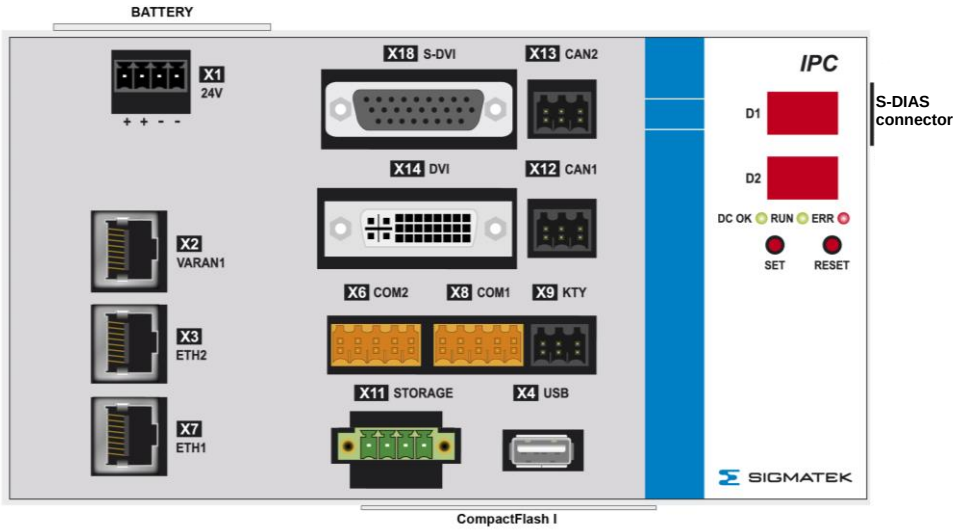
Storage temperature	-20 ... +85 °C	
Environmental temperature	0 ... +50 °C	
Maximum processor temperature	+120 °C (automatic cut-off)	
Humidity	10-90 %, non-condensing	
Operating conditions	Indoor use Pollution degree 2 Altitude up to 2000 m	
EMC resistance	according to EN 61000-6-2 (industrial area)	
EMC - noise generation	according to EN 61000-6-4 (industrial area)	
Vibration resistance	EN 60068-2-6	3.5 mm from 5-8.4 Hz 1g from 8.4-150 Hz
Shock resistance	EN 60068-2-27	15 g
Protection type	EN 60529	IP20 (no UL-rating)

2 Mechanical Dimensions





3 Connector Layout

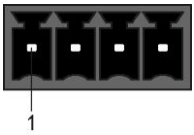


3.1 Status LEDs

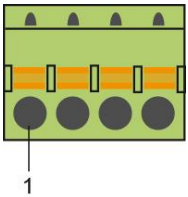
DC OK	green	LIGHTS	IPC is supplied with +24 V
Run	green	ON	can be set from the application
		OFF	
		BLINKING (2 Hz)	
		BLINKING (4 Hz)	
Error	red	LIGHTS	can be set from the application

3.2 Connectors

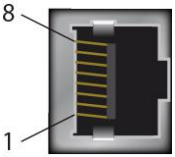
X1: Power supply (4-pin Phoenix Contact)



Pin	Function
1	+24 V DC
2	+24 V DC
3	GND
4	GND



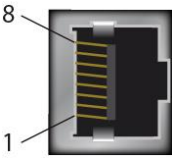
X2: VARAN Manager Out 1 (RJ45)



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

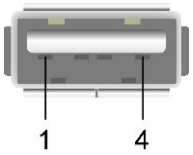
n.c. = do not use

X3: Ethernet 2 (RJ45)



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

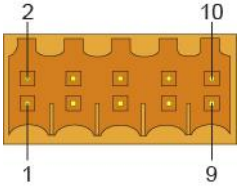
X4: USB Host 2.0 (Type A)



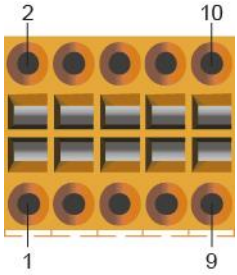
Pin	Function
1	+5 V
2	D-
3	D+
4	GND

It should be noted that many of the USB devices on the market do not comply with USB specifications; this can lead to device malfunctions. This can lead to malfunction of the device. It is also possible that these devices will not be detected at the USB port or function correctly. Therefore, it is recommended that every USB stick should be tested before actual use.

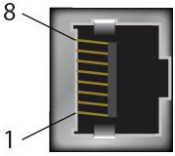
X6: COM 2/RS232 (10-pin Weidmüller Stecker)



Pin	Function
1	RxD
2	RTS
3	TxD
4	CTS
5	DTR
6	GND
7	DCD
8	DSR
9	RI
10	n.c.

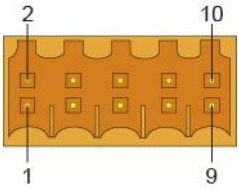


X7: Ethernet 1 (RJ45)

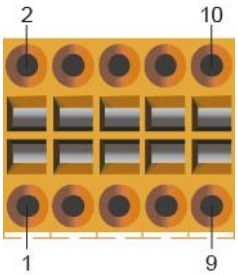


Pin	Function
1	Tx+
2	TX-
3	RX+
4	n.c.
5	n.c.
6	RX-
7	n.c.
8	n.c.

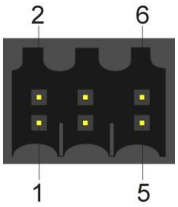
X8 COM 1 / RS232 (10-pin Weidmüller Stecker)



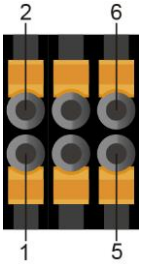
Pin	Function
1	RxD
2	RTS
3	TxD
4	CTS
5	DTR
6	GND
7	DCD
8	DSR
9	RI
10	n.c.



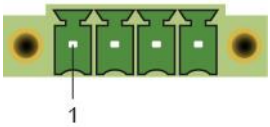
X9: KTY-Sensoren (6-pin Weidmüller)



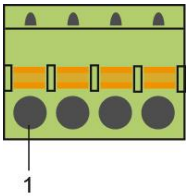
Pin	Function
1	KTY1-A
2	KTY1-B
3	KTY2-A
4	KTY2-B
5	KTY3-A
6	KTY3-B



X11: Machine EEPRORM (4-pin Phoenix Contact)

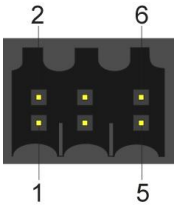


Pin	Function
1	Data
2	Clk
3	GND
4	+3.3 V

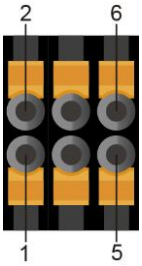


For X11, use only the machine EEPROM (article number 12-250-031)!

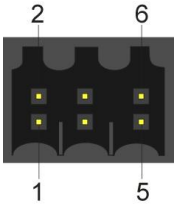
X12: CAN 1 (6-pin Weidmüller)



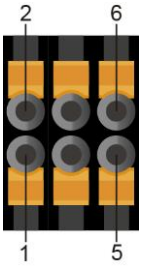
Pin	Function
1	CAN A (LOW)
2	CAN B (HIGH)
3	CAN A (LOW)
4	CAN B (HIGH)
5	CAN GND
6	n.c.



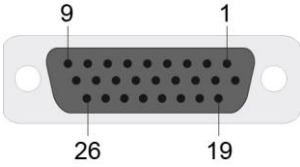
X13: CAN 2 (6-pin Weidmüller)



Pin	Function
1	CAN A (LOW)
2	CAN B (HIGH)
3	CAN A (LOW)
4	CAN B (HIGH)
5	CAN GND
6	n.c.

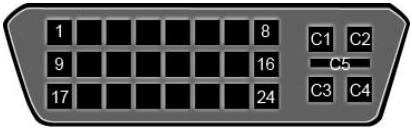


X18: S-DVI (26-pin HD-DSUB)



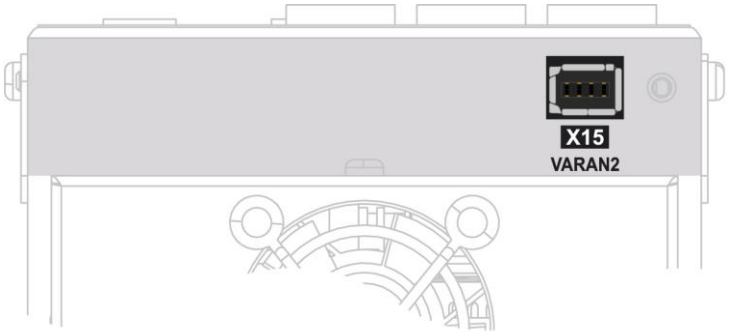
Pin	Function	Pin	Function
1	DVI1+	14	shielded
2	DVI1	15	shielded
3	DVI2+	16	shielded
4	DVI2	17	shielded
5	DVI3+	18	shielded
6	DVI3	19	+24 V
7	DVIC+	20	+24 V
8	DVIC-	21	USB Ext. In+
9	reserved	22	USB Ext. In-
10	GND	23	USB Ext. Out+
11	GND	24	USB Ext. Out-
12	shielded	25	CAN A
13	shielded	26	CAN B

X14: DVI (24-pin DVI)

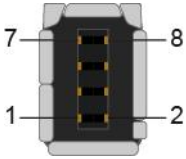


Pin	Function	Pin	Function
1	DVI2	13	DVI3+
2	DVI2+	14	+5 V
3	GND	15	GND
4	DVI4-	16	Hot Plug Detect
5	DVI4+	17	DVI0-
6	DDC-CLOCK	18	DVI0+
7	DDC-DATA	19	GND
8	V-Sync	20	DVI5-
9	DVI1	21	DVI5+
10	DVI1+	22	GND
11	GND	23	DVI-CLOCK+
12	DVI3	24	DVI-CLOCK-
C1	red	C4	H-Sync
C2	green	C5	GND
C3	blue		

The following resolutions are supported:
640x480 – 18-bit color depth
800x600 – 18-bit color depth
1024x768 – 18-bit color depth



X15: Mini-Ethernet – VARAN-Manager Out 2 (Industrial Mini I/O)



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

3.3 Applicable Connector Cables

VARAN

Cable type	Length	Article number
RJ45 on industrial Mini I/O Type 1, drag chain capable	0.5 m	16-911-005
	1 m	16-911-010
	1.5 m	16-911-015
	2 m	16-911-020
	3 m	16-911-030
	5 m	16-911-050
	10 m	16-911-100
	20 m	16-911-200
	50 m	16-911-500
Industrial Mini I/O Type 1 on industrial Mini I/O Type 1, drag chain capable	0.5 m	16-912-005
	1 m	16-912-010
	1.5 m	16-912-015
	2 m	16-912-020
	3 m	16-912-030
	5 m	16-912-050
	10 m	16-912-100
	20 m	16-912-200

S-DVI

S-DVI Cable	Length	Article number
	0.3 m	05-950-003
	2 m	05-950-020
	3 m	05-950-030
	3.5 m	05-950-035
	5 m	05-950-050

NOTE:
Connecting the S-DVI cable under voltage can damage the S-DVI interface; it is not hot-plug capable.

3.4 Applicable Connectors

Connectors:

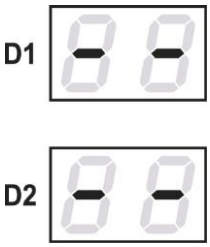
X1:	4-pin Phoenix Contact plug with spring terminal FK-MCP 1.5/ 4-ST-3.5 (not included with delivery) 4-pin Phoenix Contact plug with spring terminal MC 1.5/ 4-ST-3.5 (not included in delivery)
X2, X3, X7:	8-pin RJ45 (not included in delivery)
X4:	USB 2.0 (Type A) (not included in delivery)
X6, X8:	10-pin Weidmüller connector B2L/B2CF 3,5/10 (not included in delivery)
X9, X12, X13:	6-pin Weidmüller connector B2L/B2CF 3,5/6 (not included in delivery)
X15:	Industrial Mini I/O Plug Type 1 Lock Extend Version (not included in delivery)
X18:	26-pin D-Sub (not included in delivery)

The complete C-DIAS CKL 018 connector set with spring terminals is available from SIGMATEK under the article number 12-600-018.

4 Setting of Parameters for the IPC 221 with SET key (only under LASAL operating system)

To enter the mode to change settings, press and hold the SET button while the IPC is booting.

When the following display appears



the SET button can be released.

The upper section of the display shows which setting can be changed; the lower section of the display shows the set value.

The blinking part of the display can be set with a short press of the SET button:

If the upper section is blinking, the various settings can be viewed by quickly pressing the set button multiple times. To change between the setting and the value, the Set button must be pressed for about 1.5 s.

Once the desired changes are made, press the SET button for about 5 seconds to end the process. If the changes are to be discarded, press the RESET button to restart the IPC

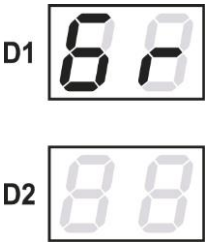
The settings for the IP address, subnet mask and gateway are hexadecimal, whereas in the left and right digits, 0 - F must be entered separately. The switch occurs when the SET button is pressed for about 1.5 s.

When changing the graphic resolution, a special feature is available: Because the BIOS must first read the new value, the computer must be restarted (Reset value, current supply)

The values from AUTOEXEC.LSL are used as the standard settings; changes are written back to this file. Before this, the original content of the file is written to AUTOEXEC.BAK.

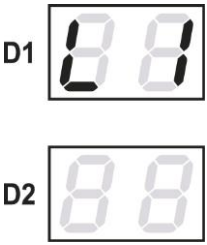
Gr ... graphics resolution

01. QVGA 320x240
02. VGA 640x480
03. SVGA 800x600
04. XGA 1024x768



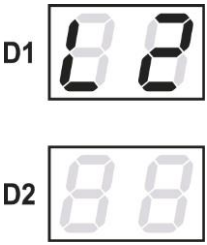
L1 … Lasal Online COMx interface number

01. COM1
02. COM2



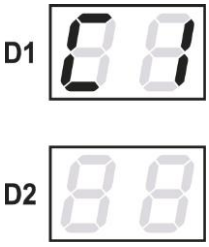
L2 .. Lasal Online Baud rate for COMx

00. 300
01. 600
02. 1200
03. 2400
04. 4800
05. 9600
06. 14400
07. 19200
08. 38400
09. 57600
10. 115200



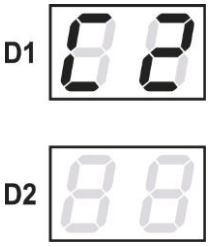
C1 ... CAN 1 PLC station

00-30 Station number



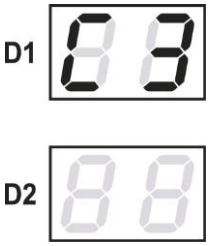
C2 ... CAN 1 SPS Baud rate

00. 615,000
01. 500,000
02. 250,000
03. 125,000
04. 100,000
05. 50,000
06. 20,000
07. 1,000,000

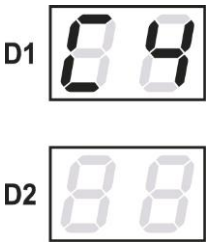


C3 ... CAN 2 terminal station

00-30 Station number



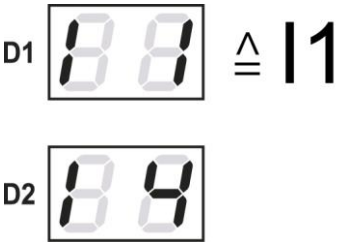
C4 ... CAN 2 Terminal Baud rate
00. 615,000
01 … 500,000
02 … 250,000
03 … 125,000
04 … 100,000
05 … 50,000
06 … 20,000
07 … 1,000,000



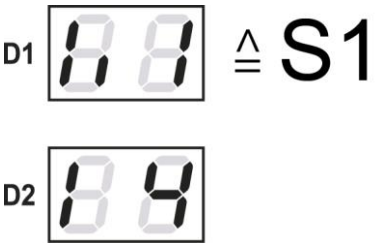
I1, I2, I3, I4 IP address IP1: I1.I2.I3.I4, hexadecimal each 00-FF e.g.:

I1 = 0A (decimal 10)
I2 = 0A (decimal 10)
I3 = 96 (decimal 150
I4 = 01 (decimal 1)

results in IP address 10.10.150.1



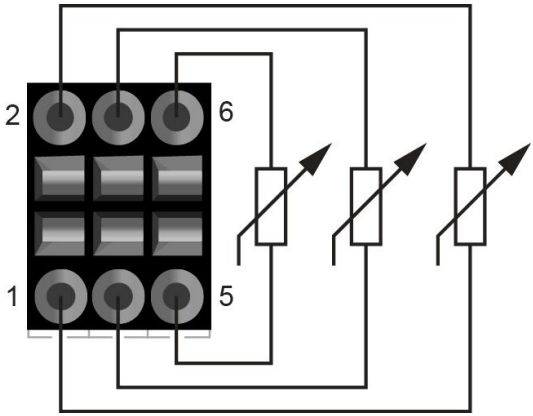
S1, S2, S3, S4 subnet mask S1.S2.S3.S4, hexadecimal each 00-FF



G1, G2, G3, G4 gateway G1,G2.G3.G4, hexadecimal each 00-FF

5 Wiring

5.1 Wiring Example KTY



5.2 Note

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 DIN rail must have an adequate mass connection.
- The lines connected 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 must be connected to a shielding bus.
- Avoid parallel connections between analog lines and load-bearing circuits.

The ground bus should be connected to the control cabinet when possible!

5.3 Shielding

The wiring for the COM1, COM2, CAN1, CAN2, ETH1, ETH2, S-DVI and DVI must be shielded. In addition, twisted-pair wires must be used for the CAN bus. The prefabricated S-DVI cable is available in various lengths. For wiring of ETH1 and ETH2 cables according **CAT5e** are recommended.

The low-ohm shielding is either connected at the entry to the control cabinet or directly before the IPC of a large surface (cable grommets, grounding clamps)!

Noise signals can therefore be prevented from reaching the electronics and affecting the function.

5.4 ESD Protection

Typically, USB devices (keyboard, mouse) are not equipped with shielded cables. These devices are disrupted by ESD and in some instances, no longer function.

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

6 CAN Bus Setup

This section explains how to correctly configure the CAN bus. The following parameters must first be set: Station number and data transfer rate.

6.1 CAN Bus Station Number

Each CAN bus station is assigned its own station number. With this station number, data can be exchanged with other stations connected to the bus. In a CAN bus system however, each station number can only be assigned once!

6.2 Number of CAN Bus Participants

The maximum number of participants on the CAN bus depends on the cable length, termination resistance, data transfer rate and the drivers used in the participants. With a termination resistance of 120 Ω, at least 100 participants are possible.

6.3 CAN Bus Data Transfer Rate

Various data transfer rates (baud rates) can be set on the CAN bus. The longer the bus line is, the lower the data transfer rate that must be selected.

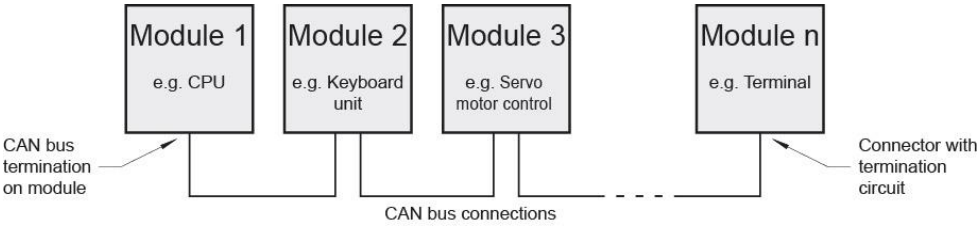
Value	Baud Rate	maximum length
00	615 Kbits/s	60 m
01	500 kbits/s	80 m
02	250 Kbits/s	160 m
03	125 Kbits/s	320 m
04	100 Kbits/s	400 m
05	50 Kbits/s	800 m
06	20 kbits/s	1200 m
07	1 Mbit / s	30 m

These values apply to the following cable: 120 Ω Twisted Pair.

Note: For the CAN bus protocol: 1 kbits/s = 1 kBaud.

6.4 CAN Bus Termination

In a CAN bus system, both end modules must be terminated. This is necessary to avoid transmission errors caused by reflections in the line.



If the processor module like the IPC 221 is an end module, it can be terminated by placing a 120 Ω resistor between CAN A (LOW) and CAN B (HIGH).

CAN1 (CAN PLC) has no internal terminating resistor.
CAN2 (CAN terminal) has an internal 120 Ω terminating resistor.

7 Storage Media

It is recommended that only storage media provided by SIGMATEK (CompactFlash cards, microSD cards etc.) be used.
The number of read and write actions have a significant influence on the lifespan of the storage media.

8 Buffer Battery

The exchangeable buffer battery ensures that the clock time (RTC) and SRAM data of the IPC 221 is preserved in the absence of a supply voltage. A lithium battery is installed at the manufacturer.

After delivery of the IPC 221 and storage of one year, the lifespan of the battery reaches 8 years.

With continuously switched-on supply voltage data are buffered with the supply voltage. This operating mode increases the life span of the battery to a minimum of 8 years. The capacity of the battery thereby is sufficient to buffer data for at least 4 weeks per year on switching off the supply during these 8 years.

We recommend however, that the battery be replaced **every 7 years** to ensure optimal performance.

Battery order number: 01-690-055

	COMPANY	DATA
Lithium battery	RENATA	3.0 V / 190 mAh

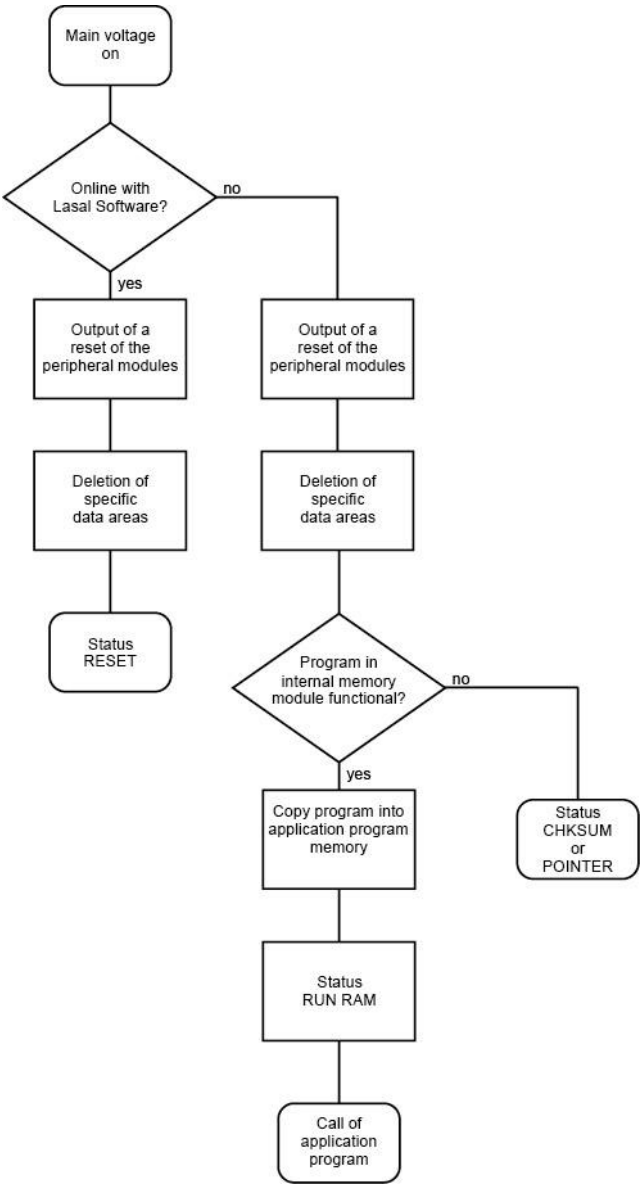
Use batteries from RENATA with the label CR2032 only!
WARNING! Incorrect use of the batteries could result in fire or explosion! Do not re-charge, disassemble or throw batteries into fire!

An exchange of batteries without supply voltage (see Exchanging the Battery).

9 Exchanging the Battery

	Exchanging the battery without data loss is possible. Supply the device with +24 V for at least 1 s. Switch off the device. From switching off the supply voltage and removing the battery data are buffered for ca. 4 minutes. Remove the battery directly after switching off the supply (maximum 1 minute). To exchange the battery, loosen the screw and slide the cover aside.
	Now you can take the battery out of the fixation. Replace it with the new battery. Ensure the polarity is correct (plus-side to the front)! Finally, replace the cover and tighten the screws.

10 Process Diagram



11 System Boot Checkpoints

Number	Meaning	Cause/solution
4913	Display during system start. If the status does not change, the operating system resp. the application cannot be started for different reasons.	- The operating system is not completely booted - Check operating system/boot medium - Boot medium not plugged in - Boot medium defective - No operating system on the boot medium - Error in BIOS self test - Main memory, CPU, BIOS, etc.

12 Status and Error Messages

Status and error messages are shown in the status test of the LASAL CLASS software.

Number	Message	Definition	Cause/Solution
00	**RUN RAM**	The user program is currently running in RAM. The display is not affected.	Info
01	**RUN ROM**	The user program stored in the program memory module loaded into the RAM is currently running. The display is not affected.	Info
02	**RUNTIME**	The total time for all cyclic objects exceed the maximum time; the time can be configured using two system variables: - Runtime: time remaining - SWRuntime: pre-selected value for the runtime counter	Solution: - Optimize the application's cyclic task. - Use higher capacity CPU - Configure preset value
03	**POINTER**	Incorrect program pointers were detected before running the user program	Possible Causes: - The program memory module is missing, not programmed or defect. - The program in the user program memory (RAM) is not executable. - The buffering battery has failed. - The user program has overwritten a software error. Solution: - Reprogram the memory module, if the error reoccurs exchange the module. - Exchange the buffering battery - Correct programming error
04	**CHKSUM**	An invalid checksum was detected before running the user program.	Cause/solution: s. POINTER

05	**WATCHDOG**	The program was interrupted via the watchdog logic.	Possible Causes: - User program interrupts blocked over a longer period of time (STI command forgotten) - Programming error in a hardware interrupt. - INB, OUTB, INW, OUTW instructions used incorrectly. - The processor is defect. Solution: - Correct programming error. - Exchange CPU.
06	**GENERAL ERROR**	General error An error has occurred while stopping the application over the online interface.	The error occurs only during the development of the operating system.
07	**PROM DEFECT**	An error has occurred while programming the memory module.	Cause: - The program memory module is defect. - The user program is too large. - The program memory module is missing. Solution: - Exchange the program memory module
08	**RESET**	The CPU has received the reset signal and is waiting for further instructions. The user program is not processed.	Info
09	**WD DEFEKT**	The hardware monitoring circuit (watchdog logic) is defective. After power-up, the CPU checks the watchdog logic function. If an error occurs during this test, the CPU deliberately enters an infinite loop from which no further instructions are accepted.	Solution: - Exchange CPU.
10	**STOP**	The program was stopped by the programming system.	
11	**PROG BUSY**	Reserved	
12	**PROGRAM LENGTH**	Reserved	
13	**PROG END**	A memory module was successfully programmed.	Info
14	**PROG MEMO**	The CPU is currently programming the memory module.	Info

15	**STOP BRKPT**	The CPU was stopped by a breakpoint in the program.	Info
16	**CPU STOP**	The CPU was stopped by the programming software.	Info
17	**INT ERROR**	The CPU has triggered a false interrupt and stopped the user program or has encountered an unknown instruction while running the program.	Cause: - A non-existent operating system was used. - Stack error (uneven number of PUSH and POP instructions). - The user program was interrupted through a software error. Solution: - Correct program error
18	**SINGLE STEP**	The CPU is in single step mode and is waiting for further instructions.	Info
19	**READY**	A module or project was sent to CPU and it is now ready to run the program.	Info
20	**LOAD**	The program is stopped and the CPU is currently receiving a new module or project.	Info
21	**UNZUL. MODULE**	The CPU has received a module that does not belong to the project.	Solution: - Recompile and download the entire project
22	**MEMORY FULL**	The operating system memory /heap) is too small. No memory could be reserved while calling an internal or interface function from the application.	Cause: - Memory is only allocated bun not released. Solution - Clear memory
23	**NOT LINKED**	When starting the CPU, a missing module or a module that does not belong to the project was detected.	Solution: - Recompile and download the entire project
24	**DIV BY 0**	A division error has occurred.	Possible Causes: - Division by 0. - The result of a division does not fit in the result register. Solution: - Correct program error
25	**DIAS ERROR**	While accessing a DIAS module, an error has occurred.	Hardware problem
26	**WAIT**	The CPU is busy.	Info

27	**OP PROG**	The operating system is currently being reprogrammed.	Info
28	**OP INSTALLED**	The operating system has been reinstalled.	Info
29	**OS TOO LONG**	The operating system cannot be loaded; too little memory.	Restart; report error to SIGMATEK.
30	**NO OPERATING SYSTEM**	Boot loader message. No operating system found in RAM.	Restart; report error to SIGMATEK.
31	**SEARCH FOR OS**	The boot loader is searching for the operating system in RAM.	Restart; report error to SIGMATEK.
32	**NO DEVICE**	Reserved	
33	**UNUSED CODE**	Reserved	
34	**MEM ERROR**	The operating system loaded does not match the hardware configuration.	Solution: - Use the correct operating system version
35	**MAX IO**	Reserved	
36	**MODULE LOAD ERROR**	The LASAL Module or project cannot be loaded.	Solution: - Recompile and download the entire project
37	**BOOTIMAGE FAILURE**	A general error has occurred while loading the operating system.	Solution: - Contact SIGMATEK
38	**APPLMEM ERROR**	An error has occurred in the application memory (user heap).	Solution: - Correct allocated memory access error
39	**OFFLINE**	This error does not occur in the control.	This error code is used in the programming system to show that there is no connection to the control.
40	**APPL LOAD**	Reserved	
41	**APPL SAVE**	Reserved	
44	**VARAN MANAGER ERROR**	An error number was entered In the VARAN manager and stopped the program.	Solution: - Read logfile
45	**VARAN ERROR**	A required VARAN client was disconnected or communication error has occurred.	Solution: - Read logfile - Error Tree

46	**APPL-LOAD-ERROR**	An error has occurred while loading the application.	Cause: - Application was deleted. Solution: - Reload the application into the control.
47	**APPL-SAVE-ERROR**	An error has occurred while attempting to save the application.	
50	**ACCESS-EXCEPTION-ERROR**	Read or write access of a restricted memory area. (I.e. writing to the NULL pointer).	Solution: - Correct application errors
51	**BOUND EXCEEDED**	An exception error has occurred when accessing arrays. The memory area was overwritten through accessing an invalid element.	Solution: - Correct application errors
52	**PRIVILEDGED INSTRUCTION**	An unauthorized instruction for the current CPU level was given. For example, setting the segment register.	Cause: - The application has overwritten the application program code. Solution: - Correct application errors
53	**FLOATING POINT ERROR**	An error has occurred during a floating-point operation.	
60	**DIAS-RISC-ERROR**	Error from the Intelligent DIASMaster.	Restart; report error to SIGMATEK.
64	**INTERNAL ERROR**	An internal error has occurred, all applications are stopped.	Restart; report error to SIGMATEK.
65	**FILE ERROR**	An error has occurred during a file operation.	
66	**DEBUG ASSERTION FAILED**	Internal error.	Restart; report error to SIGMATEK.
67	**REALTIME RUNTIME**	The total time for all real time objects exceeds the maximum time allowed. The time cannot be configured. 2 ms for 386 CPUs 1 ms for all other CPUs	Solution: - Optimize the application's real-time task (RtWork). - Reduce the clock time for the real-time task of all objects. - Correct application errors - CPU is overloaded in real-time => use a higher capacity CPU.
68	**BACKGROUND RUNTIME**	The total time for all background objects exceed the maximum time; the time can be configured using two system variables: -BTRuntime: time remaining SWBTRuntime: pre-selected value for the runtime counter	Solution: - Optimize the application's background task (background) - Use higher capacity CPU - Set SWBTRuntime correctly

70	**C-DIAS ERROR**	A connection error with a C-DIAS module has occurred.	Cause: - The cause of the error is documented in the log file Solution: - This depends on the cause
72	**S-DIAS ERROR**	A connection error with a S-DIAS module has occurred.	Possible causes: - real network does not match the project - S-DIAS client is defective Solution: - analyze logfile
75	**SRAM ERROR**	An error occurred while initializing, reading or writing SRam data.	Possible Causes: - SRam configured incorrectly - Battery fort he internal program memory supply is empty Solution: - Analyze log file (Event00.log, Event19.log) - Check configuration - Change internal program memory supply battery
96	**USER DEFINED 1**	User-definable code.	
97	**USER DEFINED 2**	User-definable code.	
98	**USER DEFINED 3**	User-definable code.	
99	**USER DEFINED 4**	User-definable code.	
100	**C_INIT**	Initialization start; the configuration is run.	
101	**C_RUNRAM**	The LASAL project was successfully started from RAM.	
102	**C_RUNROM**	The LASAL project was successfully started from ROM.	
103	**C_RUNTIME**		
104	**C_READY**	The CPU is ready for operation.	
105	**C_OK**	The CPU is ready for operation.	

106	**C_UNKNOWN_CID**	An unknown object from a stand-alone or embedded object, or an unknown base class was detected.	
107	**C_UNKNOWN_CONSTR**	The operating system class cannot be created; the operating system is probably wrong.	
108	**C_UNKNOWN_OBJECT**	Indicates an unknown object in an interpreter program; more the one DCC080 object.	
109	**C_UNKNOWN_CHNL**	The hardware module number is greater than 60.	
110	**C_WRONG_CONNECT**	No connection to the required channels.	
111	**C_WRONG_ATTR**	Wrong server attributes.	
112	**C_SYNTAX_ERROR**	No specific error, recompile all project components and reload the project.	
113	**C_NO_FILE_OPEN**	An attempt was made to open an unknown table.	
114	**C_OUTOF_NEAR**	Memory allocation error	
115	**C_OUT OF_FAR**	Memory allocation error	
116	**C_INCOMAPTIBLE**	An object with the same name already exists but has a different class.	
117	**C_COMPATIBLE**	An object with the same name and class already exists but must be updated.	
224	**LINKING**	The application is currently linking.	
225	**LINKING ERROR**	An error has occurred while linking. An error messaged is generated in the LASAL status window.	
226	**LINKING DONE**	Linking is complete.	
230	**OP BURN**	The operating system is currently being burned into the Flash memory.	
231	**OP BURN FAIL**	An error has occurred while burning the operating system.	
232	**OP INSTALL**	The operating system is currently being installed.	
240	**USV-WAIT**	The power supply was disconnected; the UPS is active. The system is shutdown.	
241	**REBOOT**	The operating system is restarted.	
242	**LSL SAVE**		

243	**LSL LOAD**		
252	**CONTINUE**		
253	**PRERUN**	The application is started.	
254	**PRERESET**	The application is ended.	
255	**CONNECTION BREAK**		

13 Application Exceptions

13.1 File Size on the CF card

If files are stored, modified or written on the CompactFlash card from the user program, these files must always be stored with a fixed maximum size. Since changes in size and the simultaneous shutdown of the voltage supply can corrupt the file system, a later change in the file size is not allowed.

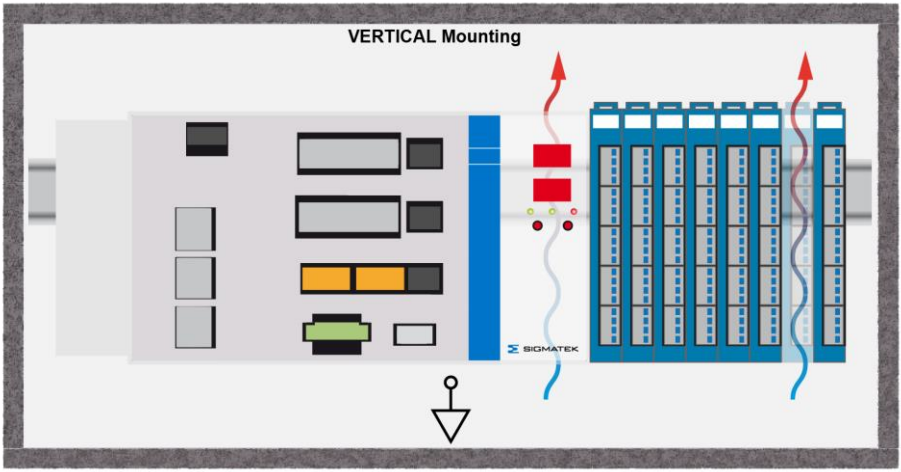
13.2 Data Breakpoint

This CPU does not support the data breakpoint feature.

14 Mounting

To mount the S-DIAS module, 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 modules must be mounted vertically with sufficient clearance between the ventilation slots of the S-DIAS module blocks and nearby components and/or the control cabinet wall. This is required to provide optimal cooling and air circulation so that functionality is ensured at the maximum operating temperature.

It has to be cared, that the temperature escaping at the ventilation slots can be up to 60 °C.



15 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. 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.

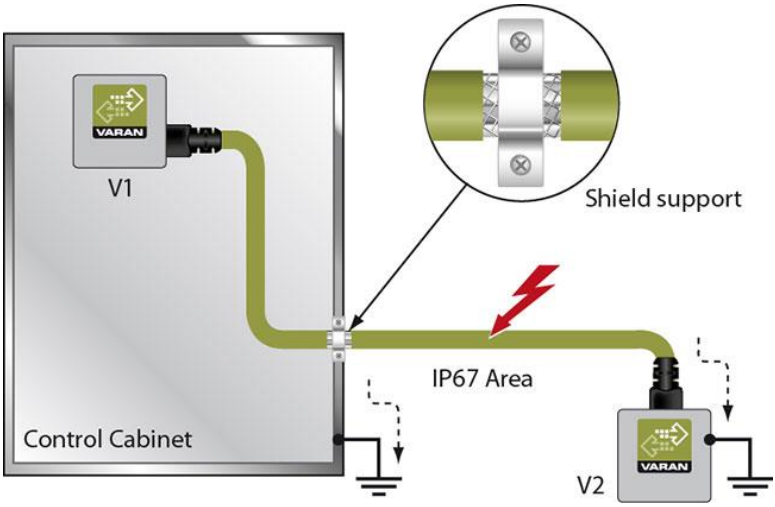
An S-FTP cable should be used for the shielding.

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!

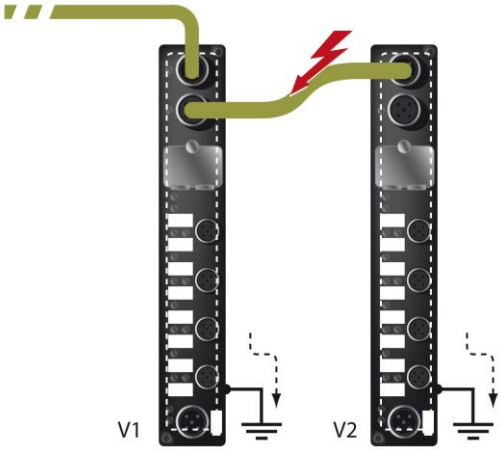
15.1 Wiring from the Control Cabinet to an External VARAN Component

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.



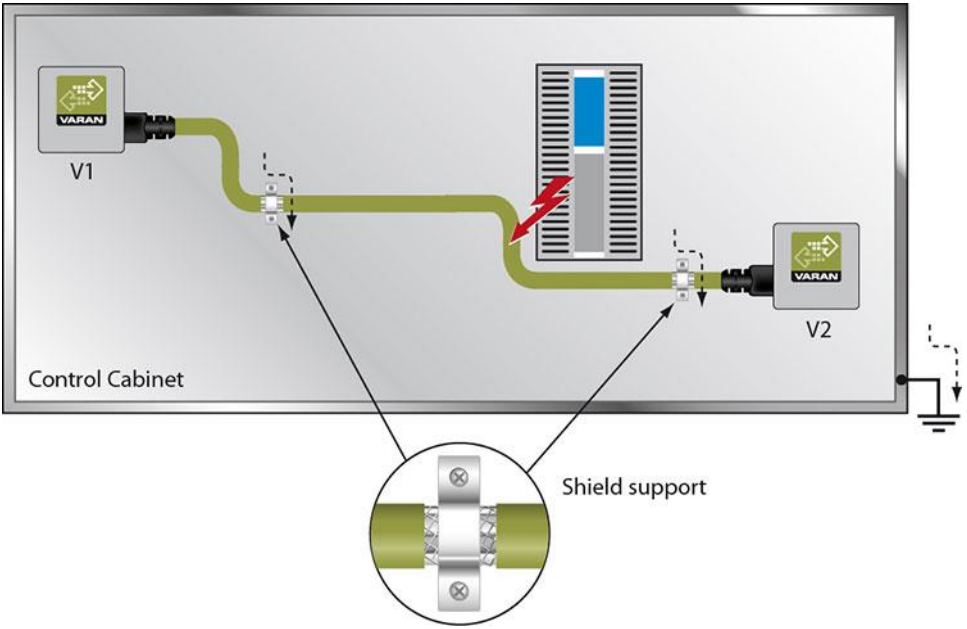
15.2 Wiring Outside of the Control Cabinet

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 is electrically connected internally or over the housing, whereby voltage spikes are not deflected through the electronics.



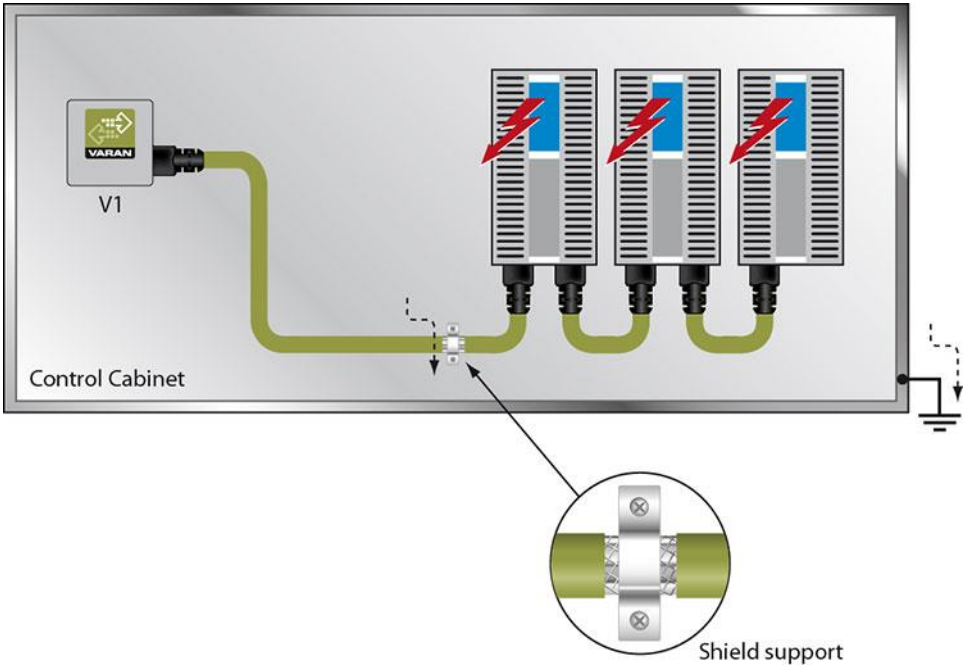
15.3 Shielding for Wiring Within the Control Cabinet

Sources of strong electromagnetic noise located within the control cabinet (drives, Transformers, etc.) can induce interference in a VARAN bus line. Spike voltages are dissipated 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.



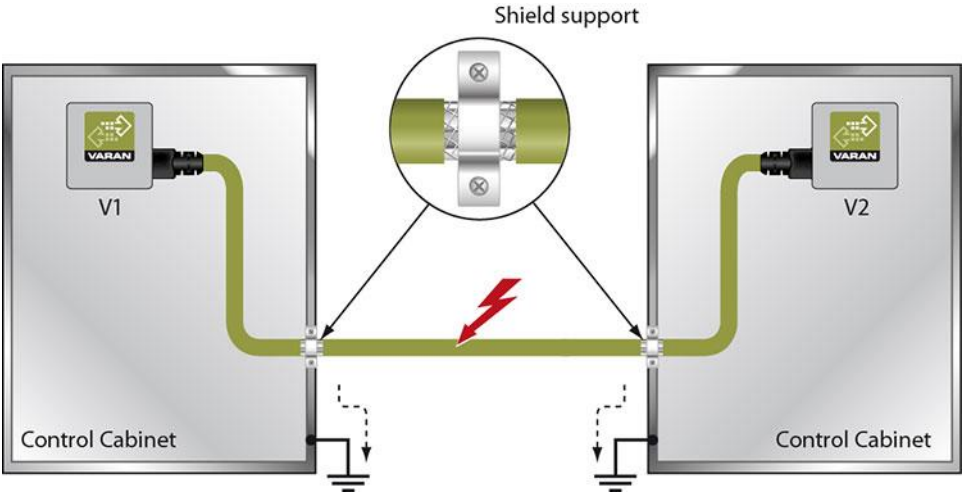
15.4 Connecting Noise Generating Components

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).



15.5 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.



Documentation Changes

Change date	Affected page(s)	Chapter	Note
12.01.2016	5	1.1 Performance Data	Internal program memory extended
20.10.2016	8	1.7 Environmental Conditions	Added “Operating conditions”
10.11.2016	37	12 Status and Error Messages	Error code 75 added
10.03.2017	7 8	1.4 Electrical Requirements 1.7 Environmental Conditions	Added UL standard Reformatted the advice for the “total current” Added UL note in protection type
06.06.2017	18	3.4 Applicable Connectors	Changed scope of delivery
03.10.2017	17	3.3 Applicable Connector Cables	RJ45 on industrial Mini I/O Type 1, drag chain capable: 50 m cable added
17.05.2018	5	1.1 Performance Data	Addressable E/ A/ P modules added
06.12.2022	8	1.6 Miscellaneous	UKCA conformity
20.11.2023	10	3 Connector Layout	B2CF added