The Drive & Control Company

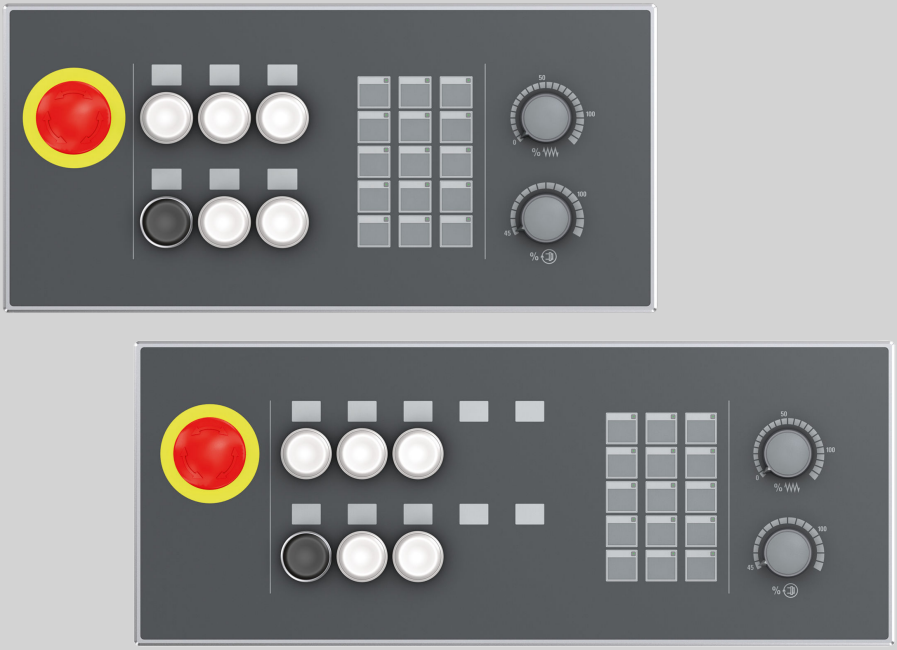
Rexroth
Bosch Group

IndraControl VAM 15.1/21.1

Machine Control Panels

Operating Instructions
R911346746

Edition 02



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1 About this documentation

1.1 About this documentation

Overview on target groups and product phases

In the following illustration, the framed activities, product phases and target groups refer to the present documentation.

Example: In the product phase "Mounting (assembly/installation)", the "mechanic/electrician" can execute the activity "install" using this documentation.

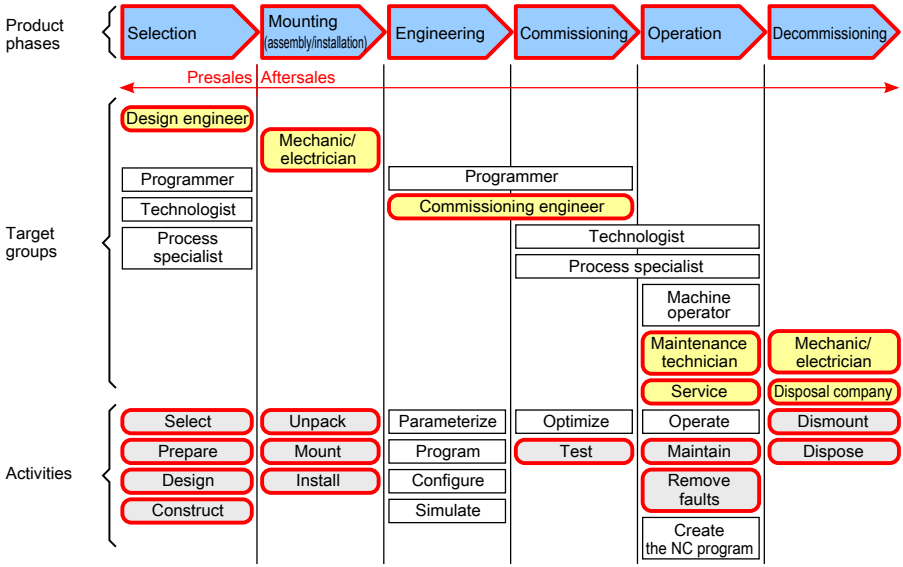


Fig. 1-1: Assigning the present documentation to the target groups, product phases and activities of the target group

Purpose

This document instructs the technical staff of the machine manufacturer on how to safely perform the mechanic and electric installation and on how to commission the machine control panels IndraControl VAM 15.1/VAM 21.1.

Required qualifications: Individual who is able to assess the tasks assigned and to identify possible safety risks owing to qualification in the subject, knowledge and experience. The individual should also be familiar with the standards and regulations.

Scope

This operating instruction applies to all variants whose type code starts with "VAM15.1...." or with "VAM21.1....". The type code specifications are located on

the type plate of the device, refer to chapter 2 "Product identification and scope of delivery" on page 2.

Related documents

Title	Part number and document type
Rexroth IndraControl	R911339613
VAP 01	Operating Instructions
Power Supply Unit	

Tab. 1-1: Related documents

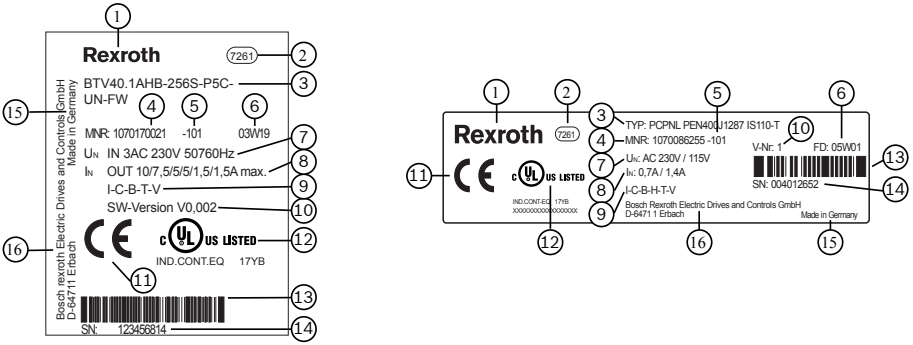
Customer Feedback

Customer requests, comments or suggestions for improvement are of great importance to us. Please email your feedback on the documentations to Feedback.Documentation@boschrexroth.de. Directly insert comments in the electronic PDF document and send the PDF file to Bosch Rexroth.

2 Product identification and scope of delivery

2.1 Product identification

The type plate is located on the rear side or at the side of the device.



1 Logotype
2 Division or plant number
3 Type designation code (type code)
4 Parts number
5 State of revision
6 Date of manufacture (yyWww)
7 Nominal voltage
8 Nominal current
9 Test marking
10 Version number
11 CE mark
12 Underwriters Laboratories Inc. mark
13 Serial number as barcode
14 Serial number
15 Designation of origin
16 Company address

Fig. 2-1: Exemplary type plates

2.2 Scope of delivery

- Machine control panel

3 Use of the safety instructions

3.1 Structure of the safety instructions

The safety instructions are structured as follows:

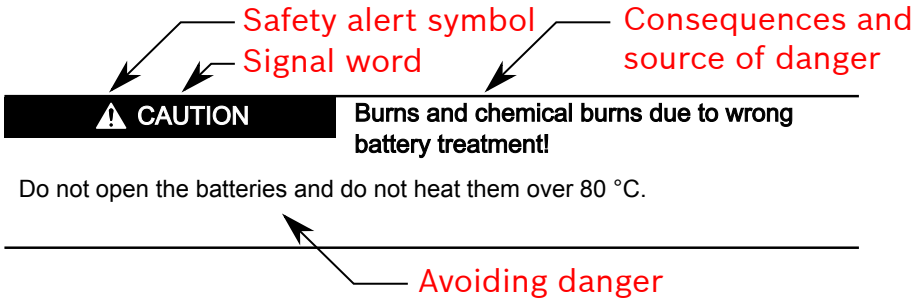


Fig. 3-1: Structure of the safety instructions

3.2 Explaining signal words and safety alert symbol

The safety instructions in this documentation contain specific signal words (danger, warning, caution, notice) and, if necessary, a safety alert symbol (according to ANSI Z535.6-2006).

The signal word is used to draw attention to the safety instruction and also provides information on the severity of the hazard.

The safety alert symbol (a triangle with an exclamation point), which precedes the signal words danger,warning and caution is used to alert the reader to personal injury hazards.

⚠ DANGER

In the event of non-compliance with this safety instruction, death or serious injury **will** occur.

⚠ WARNING

In the event of non-compliance with this safety instruction, death or serious injury **will** occur.

⚠ CAUTION

In the event of non-compliance with this safety instruction, minor or moderate injury can occur.

NOTICE

In the event of non-compliance with this safety instruction, material damage can occur.

3.3 Symbols used

Hints are represented as follows:

This is an information.

Tips are represented as follows:

This is a tip.

3.4 Signal graphic explanation on the device

Prior to the installation and commissioning of the device, refer to the device documentation.

4 Intended use

The machine control panels of the type IndraControl VAM 15.1/VAM 21.1 by Bosch Rexroth are intended for operating control units.

NOTICE

Risk of damaging the device if not expressly stated accessories, mounting parts and other components, cables, lines and software and firmware are used

The machine control panels may be used only as intended and with the accessories, mounting parts and other components specified in this documentation. Components that are not expressly mentioned must neither be attached nor connected. The same applies to cables and lines.

Only to be operated with the component configurations and combinations expressly defined and with the software and firmware specified in the corresponding functional description.

The machine control panels IndraControl VAM 15.1/VAM 21.1 were developed for the single-axis as well as for the multi-axis drive and control tasks.

For the application-specific use of the machine control panels IndraControl VAM 15.1/VAM 21.1, device types are available in different variants.

Areas of application of the machine control panels IndraControl VAM 15.1/ VAM 21.1:

- Lathes
- Milling machines
- Machining centers

The machine control panels of the IndraControl VAM 15.1/VAM 21.1 design may only be operated under the assembly conditions and installation conditions, in the specified position of use and under the specified ambient conditions (temperature, degree of protection, humidity, EMC etc.) given in this documentation.

NOTICE

Device surface damage due to unapproved lubricant and cleaner

Before use, check new lubricants or cleaners for compatibility with the material of the devices.

5 Spare parts, accessories and wear parts

5.1 Connectors and ready-made cables

Sercos III

Ordering code	Part number	Description
RKB0013/00,19 (*******-*******-*******)	R911329741	Bus cable, length 0.19 m, RJ45/RJ45 plug
RKB0013/00,25 (*******-*******-*******)	R911317797	Bus cable, length 0.25 m, RJ45/RJ45 plug

Ordering code	Part number	Description
RKB0013/00,35 (*******-*******-*******)	R911317800	Bus cable, length 0.35 m, RJ45/RJ45 plug
RKB0013/00,55 (*******-*******-*******)	R911317801	Bus cable, length 0.55 m, RJ45/RJ45 plug
RKB0013/001,0 (*******-*******-*******)	R911340679	Bus cable, length 1.0 m, RJ45/RJ45 plug
RKB0013/002,0 (*******-*******-*******)	R911338023	Bus cable, length 2.0 m, RJ45/RJ45 plug
RKB0013/003,0 (*******-*******-*******)	R911338011	Bus cable, length 3.0 m, RJ45/RJ45 plug
RKB0013/005,0 (*******-*******-*******)	R911347157	Bus cable, length 5.0 m, RJ45/RJ45 plug
RKB0013/007,0 (*******-*******-*******)	R911347158	Bus cable, length 7.0 m, RJ45/RJ45 plug
RKB0011/xxx,x		Bus cable, variable length, RJ45/RJ45 plug
RKB0044/xxx,x		Bus cable, variable length, RJ45/RJ45 plug

Tab. 5-1: Interface cables – Sercos III

Field-assembly RJ45 plug

Ordering code	Part number	Description
RBS0016	R911315797	Field-assembly RJ45 plug, IP 20 with straight cable outlet
RBS0022/S01 (CP-0008K-RJ45-SNAP*-****)	R911333124	Field-assembly RJ45 plug, IP 20 with 45°angled cable outlet

Tab. 5-2: Field-assembly RJ45 plug

6 Ambient conditions

Ambient conditions	In operation	Transport	Storage
Max. ambient temperature	+5 °C to +55 °C	-40 °C to +70 °C	
Max. temperature gradient	Temporal temperature changes up to 3 K per minute	-	Temporal temperature changes up to 3 K per minute

Ambient conditions	In operation	Transport	Storage
Humidity	Min. relative humidity: 5 % Max. relative humidity: 85 % Min. absolute humidity: 1 g/m^3 Max. absolute humidity: 25 g/m^3 Condensation not allowed Corresponds to climatic class 3K3 acc. to EN 60721-3-3	Min. relative humidity: 5 % Max. relative humidity: 75 % Min. absolute humidity: 1 g/m^3 Max. absolute humidity: 25 g/m^3 Condensation not allowed Corresponds to climatic class 2K2 acc. to EN 60721-3-2	Min. relative humidity: 5 % Max. relative humidity: 85 % Min. absolute humidity: 1 g/m^3 Max. absolute humidity: 25 g/m^3 Condensation not allowed Corresponds to climatic class 1K2 acc. to EN 60721-3-1
Air pressure acc. to EN 61131-2	80 kPa to 106 kPa (corresponds to an operating altitude from 0 m to 2000 m NN)	70 kPa to 106 kPa (corresponds to an operating altitude from 0 m to 3000 m NN)	
Mechanical strength	Max. vibration: Frequency range: 5…200 Hz Excursion: 3.5 mm at 5…9 Hz Acceleration: 1.3 g at 9…200 Hz Acc. to EN 60068-2-6	Max. shock: 15 g 11 ms Acc. to EN 60068-2-27, No malfunction	
Contamination level	2		
Overvoltage category	2	-	

Tab. 6-1: Ambient conditions

NOTICE **Failure of the product due to contaminated air**

- The ambient air must not contain acids, alkaline solutions, corrosive agents, salts, metal vapors and other electrically conductive contaminants in high concentrations
- The ambient air must be free of dust
- Housing and installation compartments must at least comply with degree of protection IP 54 according to DIN EN 60529

NOTICE **Defective product due to gases jeopardizing functions**

Due to the risk of corrosion, avoid sulphurous gases (e.g. sulphur dioxide (SO_2) and hydrogen suphide (H_2S)). The product is not resistant against these gases.

This is a product that corresponds to the limit values of the emitted interference of class A (industrial environments), but not of class B (residential area and small enterprises).

When using the product in residential areas or small enterprises, the operator has to take actions to prevent radio interferences (also refer to DIN EN 55022).

7 Technical data

7.1 Basic device

	IndraControl VAM 15.1	IndraControl VAM 21.1
Degree of protection	IP 54 (front panel)	
Front foil color	RAL 7024 graphite gray	
Dimensions (W × H × D)	422 mm × 169 mm × 84.1 mm	350 mm × 169 mm × 84.1 mm
Mounting cut-out (W × H)	403 +1/-0 mm × 152 +1/-0 mm	330 +1/-0 mm × 151 +1/-0 mm
Weight	Approx. 2120 g	Approx. 1940 g
Front panel material	Anodized aluminum, completely embedded, chemical resistant polyester foil	

Tab. 7-1: Basic device – General technical data

	IndraControl VAM 15.1/VAM 21.1
Voltage supply	Electrically isolated
Logic supply U_L	24 V DC (19.2 V to 30 V), PELV Use for example the 24 V industrial power supply unit VAP01.1H-W23-024-010-NN with the part number R911171065 (for specifications on the operating instructions of the power supply unit, refer to "Related documents" on page 2)
Current consumption from U_L	0.3 A typ.
Input supply and output supply U_M	24 V DC (19.2 V to 30 V), PELV Use for example the 24 V industrial power supply unit VAP01.1H-W23-024-010-NN (part number R911171065)
Current consumption from U_M	3.5 A max.
Fuse for U_L and U_M	SMD fuse 4 A
Reverse voltage protection	Integrated

Tab. 7-2: Basic device – Electrical data

D-SUB socket, 25-pin
RJ45 sockets
Connector strips by Weidmüller, 4-pin, 6-pin and 8-pin

Tab. 7-3: Connection method

7.2 E-STOP button

Only 24 V (protective extra-low voltage) may only be connected to the E-STOP button!

E-STOP button acc. to DIN EN 60947-5-5

Name	E-STOP button, tamper-proof with rotary release; equipped with: • 2 × standard auxiliary switches with forced opening • 1 × standard auxiliary switch N/O contact
Connection voltage	PELV/SELV
Max. current	0.5 A

B10d value mushroom button	Mechanics: B10d = 600,000 (acc. to the manufacturer) Assumption: B10d = 2 × B10 Fault exclusion at < 6050 cycles
B10d value auxiliary contact N/C contact	Electrics: B10d = 10,000,000 (acc. to the manufacturer) Assumption: B10d = 2 × B10 Fault exclusion at < 6050 cycles
B10d value auxiliary contact N/O contact	Electrics: B10d = 10,000,000 (acc. to the manufacturer) Assumption: B10d = 2 × B10 Fault exclusion at < 6050 cycles
Connection cross section	Min. without wire end sleeve (1 × 0.22 mm^2) Max. without wire end sleeve (2 × 1.5 mm^2)
Tightening torques	0.8 Nm (1.2 Nm max.)

Tab. 7-4: E-STOP button – Technical data

7.3 Machine pushbuttons

☞ Only 24 V (protective extra-low voltage) may be connected to the machine buttons!

Name	Standard auxiliary switch, N/O contact / N/C contact
Connection voltage	PELV/SELV
Max. current	0.5 A
Connection cross section	Min. without wire end sleeve (1 × 0.22 mm^2) Max. without wire end sleeve (2 × 1.5 mm^2)
Tightening torques	0.8 Nm (1.2 Nm max.)

Tab. 7-5: N/O and N/C contact acc. to DIN EN 60947-6-1 – Technical data

7.4 LED module

Name	LED module	
Voltage range	DC (DC voltage)	PELV/SELV
Current consumption	Direct connection 24 V AC/DC	18 mA

Tab. 7-6: LED module – Technical data

8 Standards

8.1 Standards used

Standard	Meaning
EN 60204-1	Safety of machinery - Electrical equipment of machines
EN 61000-6-4	Generic standards - Emission standard (industrial environments)
EN 61000-6-2	Generic standards – Noise immunity (industrial environments)
EN 61131-2	Requirements on the 24 V inputs and outputs
EN 60947-5-5	Low-voltage switchgear and control gear - Control circuit devices and switching elements - Electrical emergency stop device with mechanical latching function
EN 60529	Degrees of protection (including housings and installation compartments)
EN 60068-2-6	Vibration test
EN 60068-2-27	Shock test
EN 60721-3-3	Classification of ambient conditions – Operation
EN 60721-3-2	Classification of ambient conditions – Transport
EN 60721-3-1	Classification of ambient conditions – Storage
DIN EN 61131-2	Programmable logic controllers Equipment and test requirements
UL 61010	Industrial Control Equipment

Tab. 8-1: Standards used

8.2 CE marking

8.2.1 Declaration of conformity

CE

The electronic products described in the present operating instructions comply with the requirements and the target of the following EU directive and with the following harmonized European standards:

EMC directive 2004/108/EC (valid until 04/19/2016)

EMC directive 2014/30/EU (valid from 04/20/2016)

The electronic products described in the present operating instructions are intended for use in industrial environments and comply with the following requirements:

Standard	Title	Edition
IEC 61000-6-4	Electromagnetic compatibility (EMC) Part 6-4: Generic standards – Emission standard for industrial environments (EN 61000-6-4: 2007 + A1:2011)	2011
IEC 61000-6-2	Electromagnetic compatibility (EMC) Part 6-2: Generic standards – Immunity for industrial environments (EN 61000-6-2:2005)	2006 + B1:2011

Tab. 8-2: Standards for electromagnetic compatibility (EMC)

Loss of CE conformity due to modifications at the device

CE marking applies only to the device upon delivery. After modifying the device, verify CE conformity.

For the declaration of conformity, go to your contact person.

8.3 UL/CSA certified

c UL US LISTED

The devices are certified acc. to

- **UL508** (Industrial Control Equipment)
- **C22.2 no. 142-M1987** (CSA)

UL file no. E210730

However, there can be combinations or extension stages with a limited or missing certification. Thus, verify the registration according to the UL marking on the device.

Loss of UL/CSA conformity due to modifications at the device

UL and CSA marking applies only to the device upon delivery. After modifying the device, verify UL and CSA conformity.

9 Connections

9.1 Connector panel

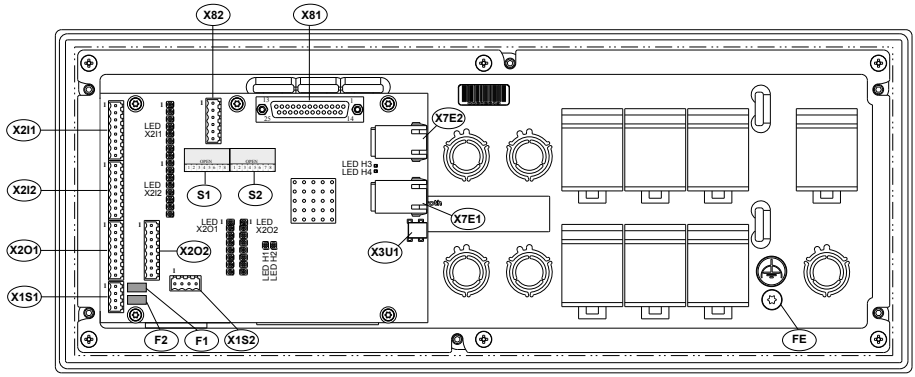


Fig. 9-1: Connections of the IndraControl VAM 15.1/VAM 21.1

Name	Description
F1	Fuse for voltage supply U_M at X1S1
F2	Fuse for voltage supply U_L at X1S1
H1-H4	Status LEDs, see chapter 12.4.2 "Status displays H1 to H4" on page 39

Tab. 9-1: Fuses und LEDs

9.2 X1S1: 24 V DC voltage supplies

4-pin Weidmüller plug

A 4-pin Weidmüller plug (3.5 pin spacing) is provided with the following assignment to connect the voltage supplies:

Plugs	Pin	Signal	Meaning
X1S1	1	U_M	+24 V DC input/output supply U_M
	2	0 V U_M	0 V input supply/output supply U_M
	3	U_L	+24 V DC logic supply U_L
	4	0 V U_L	0 V logic supply U_L

Tab. 9-2: Pin assignment X1S1

The voltage supplies at X1S1 are protected by the two SMD fuses F1 and F2 (refer to chapter 10.6.5 "Notes on current and voltage supply" on page 28).

9.3 X1S2: Voltage tapping for front elements

4-pin Weidmüller plug

X1S2 provides the voltage U_M to supply operating elements and light indicators on the IndraControl VAM 15.1/VAM 21.1 front panel.

Plugs	Pin	Signal	Meaning
X1S2	1, 2	U_M	+24 V DC input/output supply U_M
			Max. current for front elements: 0.5 A
	3, 4	0 V U_M	0 V input/output supply U_M

Tab. 9-3: Pin assignment X1S2

9.4 X7E1, X7E2: Sercos III interfaces

9.4.1 General information

The IndraControl VAM 15.1/VAM 21.1 devices are connected to the field bus via the X7E1 and X7E2 connectors.

Field bus interface

RJ45, socket, 8-pin	
Interface type	Ethernet 100Base-TX
Cable length	100 m max.
Cable type	CAT5e with S/STP
Transmission rate	100 MBit/s

Tab. 9-4: Sercos III field bus interfaces

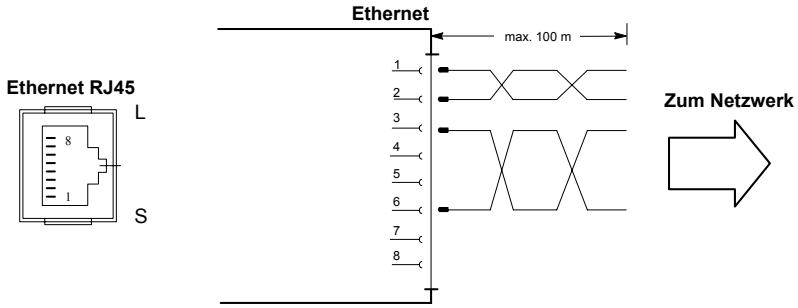


Fig. 9-2: Real-time Sercos III interface

9.5 X2I1, X2I2, X2O1, X2O2: Digital 24 V inputs and outputs

9.5.1 General information

The IndraControl VAM 15.1/VAM 21.1 component group provides 16 digital 24 V inputs and 16 digital 24 V outputs. The plugs of the inputs and outputs are located on the logic circuit board. Green LEDs indicate the I/O states.

The input states are sent to the master control via field bus. The outputs are defined by the master control via field bus.

The address allocation is described chapter "Bit string for digital 24 V inputs and outputs" on page 44.

9.5.2 Pin assignment (4 × 8-pin Weidmüller plug, 3.5 grid)

Plugs	Name on the circuit board	Pin	Signal	Meaning
X2I1	1	1	I0	Digital 24 V inputs I 0 – I 7
		2	I1	
		3	I2	
		4	I3	
		5	I4	
		6	I5	
		7	I6	
	8	8	I7	
X2I2	9	1	I8	Digital 24 V inputs I 8 - I 15
		2	I9	
		3	I10	
		4	I11	
		5	I12	
		6	I13	
		7	I14	
	16	8	I15	
X2O1	1	1	Q0	Digital 24 V outputs Q 0 – Q 7
		2	Q1	
		3	Q2	
		4	Q3	
		5	Q4	
		6	Q5	
		7	Q6	
	8	8	Q7	

Plugs	Name on the circuit board	Pin	Signal	Meaning
X2O2	9	1	Q8	Digital 24 V outputs Q 8 - Q 15
		2	Q9	
		3	Q10	
		4	Q11	
		5	Q12	
		6	Q13	
		7	Q14	
	16	8	Q15	

Tab. 9-5: Pin assignment X2I1, X2I2, X2O1, X2O2

⚠ DANGER **Dangerous movements due to plugging or unplugging plug connectors under load!**

The plug connectors for the inputs and the outputs must not be connected or disconnected under load.

9.5.3 Characteristics of the digital inputs

Input types	Type 1 acc. to EN 61131-2
Number of inputs	16
Status display by LED	Green
Electrical isolation	No
Reverse voltage protected	Yes
Plug grid	3,5 (Weidmüller terminal)

Tab. 9-6: Digital input characteristics

9.5.4 Characteristics of the digital outputs

Output types	Semiconductor outputs, non-saving; with automatic restart, current-carrying
Number of outputs	16
Status display by LED	Green
Electrical isolation	No

Reverse voltage protection	Only guaranteed without load connection Defect of the component caused by: • Polarity reversal with simultaneous short circuit of the output lines • Polarity reversal with simultaneous connection of externally polarized suppressor diodes at the output lines • Applying of external voltage > U_M
Output voltage	
Nominal value	24 V
Rated output current	
Nominal value:	0.2 A
UL rating:	0.2 A general purpose 5W Tungsten
Simultaneity factor	100 %
Plug grid	3,5 (Weidmüller terminal)

Tab. 9-7: Digital output characteristics

NOTICE

Damages to the input and output circuits due to the connection of inductive and capacitive loads.

The digital inputs and outputs are not electrically isolated! These inputs and outputs are used to evaluate switch states and to set indicator lights. Do not connect inductive or capacitive loads!

9.6 X81: Connection for external hand-held terminal

9.6.1 General information

Next to the inputs for the handwheel of the hand-held terminal (A, /A, B, /B), 12 inputs (IN0 – IN11) are available for the keys of the hand-held terminal. The keys are supplied via the "+24 V" provided at the X81 plug.

The "+24 V" supply is internally generated by the supply "U_L" and may only be used to connect the keys of the hand-held terminal.

Connection "X81" for the hand-held terminal is located on the logic circuit board.

The states of the inputs and the counter value of the handwheel are transmitted to the master control via field bus.

The address allocation is described chapter "Bit string for external hand-held terminal" on page 45.

9.6.2 X81: Pin assignment (25-pin female connector strip, D-Sub)

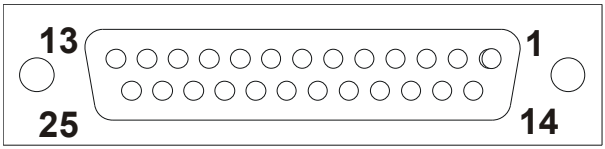


Fig. 9-3: Pin assignment X81

Plugs	Pin	Signal	Meaning
X81	1	+24 V	24 V DC for switches of the hand-held terminal
	2	IN 0	24 V input for hand-held terminal switch
	3	IN 2	24 V input for hand-held terminal switch
	4	IN 4	24 V input for hand-held terminal switch
	5	IN 6	24 V input for hand-held terminal switch
	6	IN 8	24 V input for hand-held terminal switch
	7	IN10	24 V input for hand-held terminal switch
	8	n.c.	Not assigned
	9	n.c.	Not assigned
	10	GND	0 V handwheel supply (-)
	11	+5 V	5 V DC ±5% handwheel supply (+)
	12	/B	Handwheel, channel B, inverted
	13	/A	Handwheel, channel A, inverted
	14	+24 V	24 V DC for switches of the hand-held terminal
	15	IN 1	24 V input for hand-held terminal switch
	16	IN 3	24 V input for hand-held terminal switch
	17	IN 5	24 V input for hand-held terminal switch
	18	IN 7	24 V input for hand-held terminal switch
	19	IN 9	24 V input for hand-held terminal switch
	20	IN 11	24 V input for hand-held terminal switch
	21	n.c.	Not assigned
	22	GND	0 V handwheel supply (-)
	23	+5 V	5 V DC ±5% handwheel supply (+)
	24	B	Handwheel, channel B
	25	A	Handwheel, channel A

Tab. 9-8: Pin assignment X81

Handwheel supply	5 V DC ± 5 %
Current consumption, handwheel	200 mA max.
Maximum cable length	Approx. 5 m (depending on handwheel)
Cable type	Twisted pair, separately shielded
Inputs	12 × 24 V input (For switch or pushbutton of the hand-held terminal)
Reference device	HBA 102434, company Euchner 100 pulses/revolution; max. 300/min

Tab. 9-9: Handwheel interface characteristics

9.7 X82: Connection for internal handwheel

9.7.1 General information

Connection "X82" for the internal handwheel is located on the logic circuit board.

The counter value of the handwheel is transmitted to the master control via field bus.

The address allocation is described chapter "Bit string for internal handwheel" on page 45.

9.7.2 Pin assignment (6 pin Weidmüller plug, 3.5 grid)

Plugs	Pin	Signal	Meaning
X82	1	+5 V	5 V DC ±5 % handwheel supply (+)
	2	A	Handwheel, channel A
	3	B	Handwheel, channel B
	4	GND	0 V handwheel supply (-)
	5	/A	Handwheel, channel A, inverted
	6	/B	Handwheel, channel B, inverted

Tab. 9-10: Pin assignment X82

Reference device	Incremental handwheel CESI 100, company EBE 100 pulses per revolution each at outputs A and B Current consumption < 60 mA

Tab. 9-11: Reference device

9.8 X3U1: Service interface

The interface "X3U1" is a service interface (mini USB socket) only intended for the Bosch Rexroth Service (also refer to chapter 17 "Service and support" on page 49).

10 Mounting, demounting and electric installation

10.1 Mounting notes

- When mounting the machine control panel, ensure an ergonomic operation. Additionally, ensure that all moving machine components can be seen by the operator at any time!
- Avoid installation locations exposed to direct sunlight, as additional heat development can occur
- When mounting the machine control panel, ensure an easy access to the front panel (top side)
- Provide a sufficient minimum clearance of 50 mm for cooling and cable routing behind the device
- Lay all connecting cables in loops and use strain reliefs for all cables
- Keep the maximum distance possible from interference sources

10.2 Mounting

Mount the machine control panel as follows:

1. Prepare a mounting cut-out acc. to the specifications in chapter 10.3 "Mounting cut-out" on page 21.
2. Insert the machine control panel into the cut-out from the front.
3. Fold out the clamp fastenings.

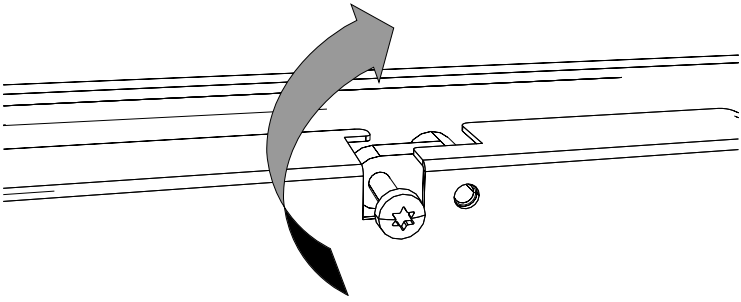


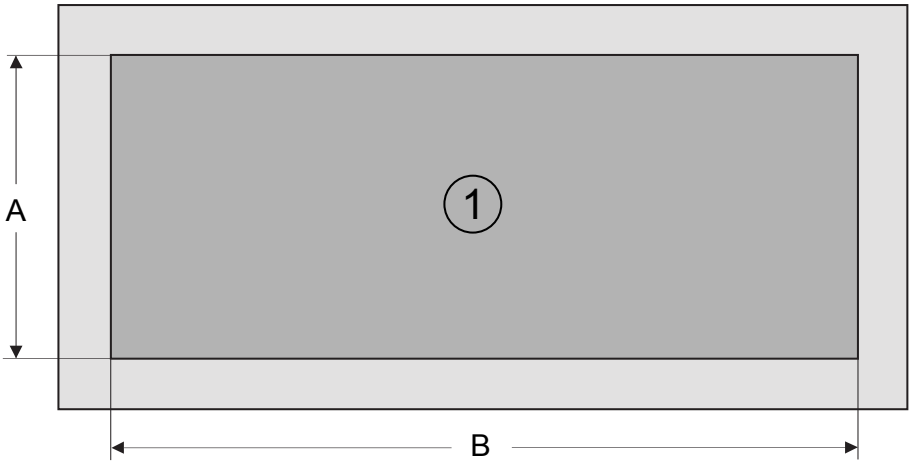
Fig. 10-1: Clamp fastening

4. Tighten the clamping screws.

NOTICE **Damage of the clamping screws caused by wrong torque.**

Tighten the clamping screws with a torque of 1.0 Nm.

10.3 Mounting cut-out



① Mounting cut-out (dimension A, B)

Fig. 10-2: Dimensions of the mounting cut-out

Machine control panel	Mounting cut-out	
	Dimension A	Dimension B
IndraControl VAM 15.1	152 +1/-0	403 +1/-0
IndraControl VAM 21.1	151 +1/-0	330 +1/-0

Tab. 10-1: Mounting cut-out in mm

10.4 Housing dimensions of the IndraControl VAM 15.1

10.4.1 Front view

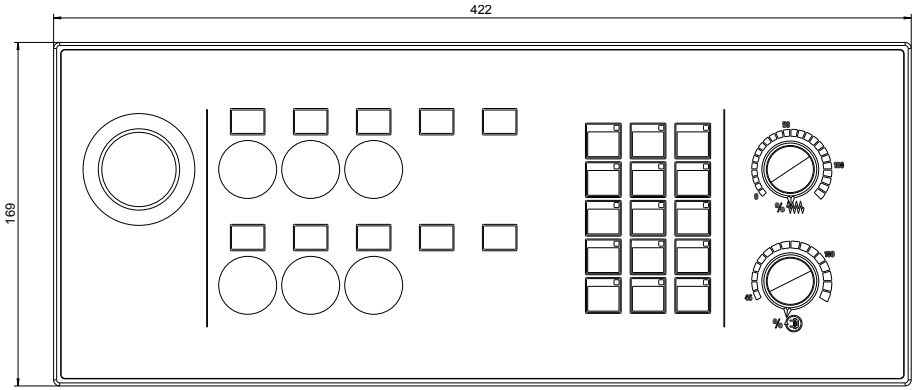


Fig. 10-3: IndraControl VAM 15.1, front view

10.4.2 Side view

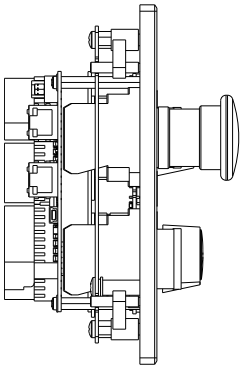


Fig. 10-4: IndraControl VAM 15.1, side view

10.4.3 Top view

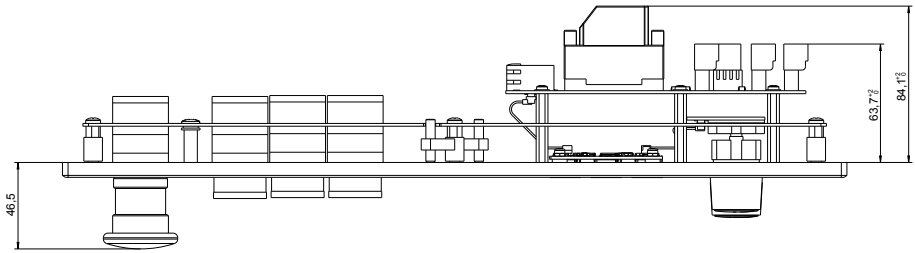


Fig. 10-5: IndraControl VAM 15.1, top view

10.4.4 Rear view

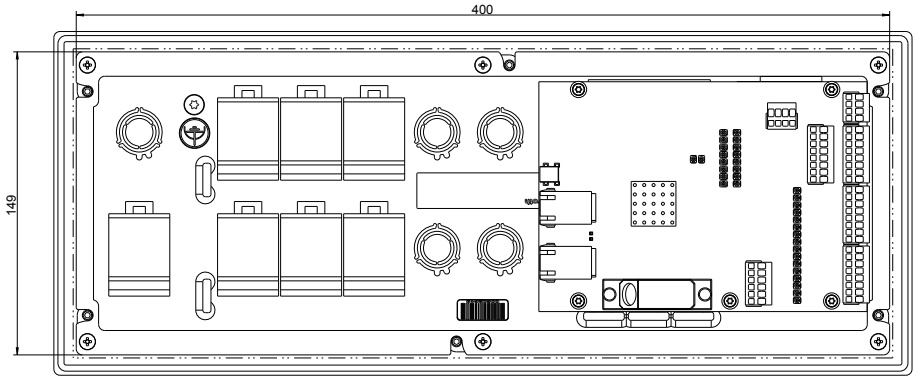


Fig. 10-6: IndraControl VAM 15.1, rear view

10.5 Housing dimensions of the IndraControl VAM 21.1

10.5.1 Front view

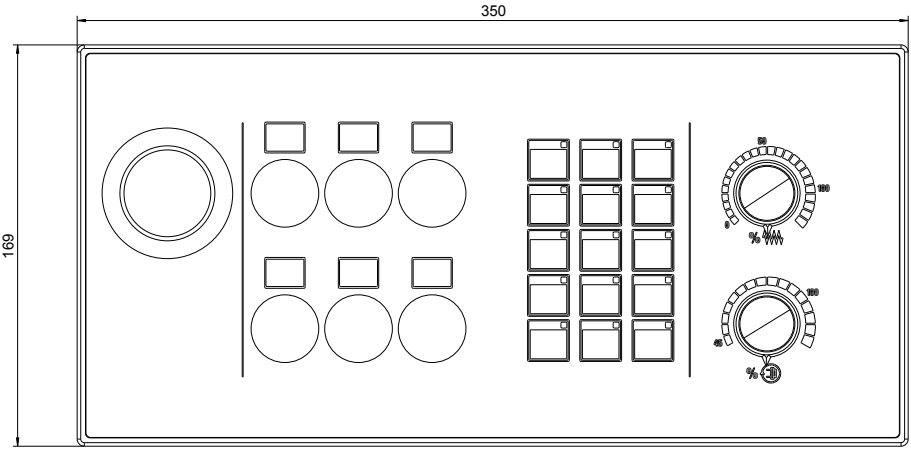


Fig. 10-7: IndraControl VAM 21.1, front view

10.5.2 Side view

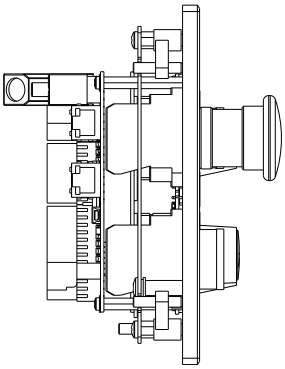


Fig. 10-8: IndraControl VAM 21.1, side view

10.5.3 Top view

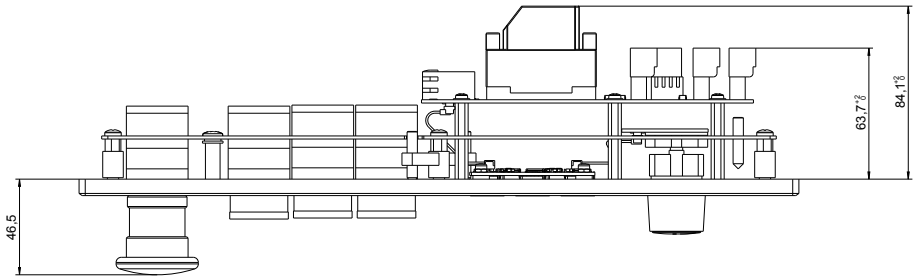


Fig. 10-9: IndraControl VAM 21.1, top view

10.5.4 Rear view

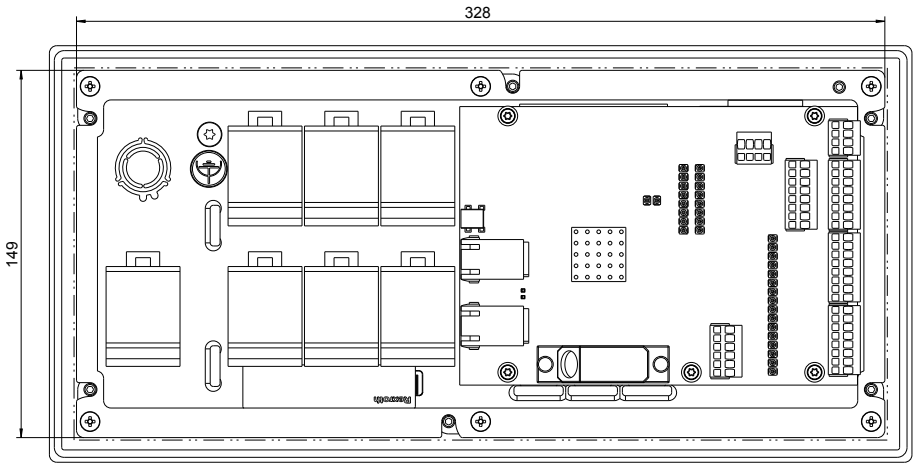


Fig. 10-10: IndraControl VAM 21.1, rear view

10.6 Electric connection

10.6.1 General information

⚠ DANGER **Danger without safe separation!**

- The 24 V DC input voltages must comply with the requirements of the "safe separation"!
- Plug and remove the plug connection only if there is no voltage!

10.6.2 Connecting the machine control panel to the 24 V voltage supplies

NOTICE **Both voltage supplies have to be galvanically isolated**

Always use two galvanically isolated power supply units for 24 V voltage supplies.

Connection diagram

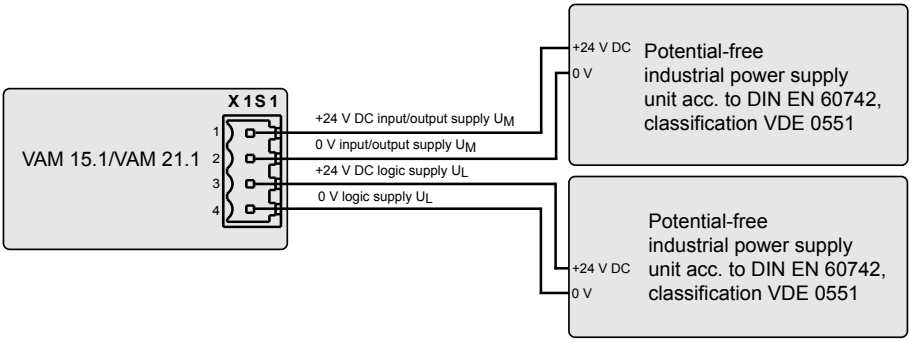


Fig. 10-11: Cabling of the machine control panel with 24 V voltage supplies

Connection

1. Connect X1S1 for the 24 V voltage supplies to the industrial power units.

Use 24 V industrial power supply units acc. to DIN EN 60742, classification VDE 0551, for example "VAP01.1H-W23-024-010-NN" (part number R911171065) for the voltage supplies.

For specifications of the operating instructions of the power supply unit, refer to "Related documents" on page 2.

10.6.3 Connection diagram

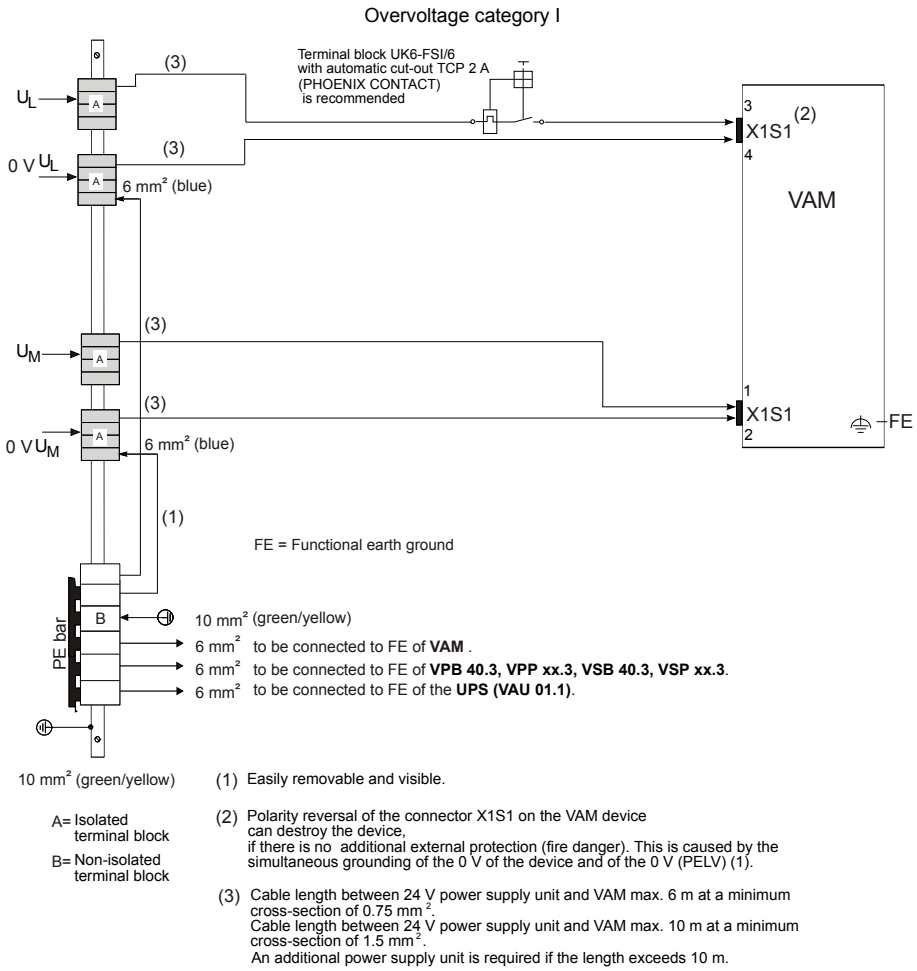


Fig. 10-12: IndraControl VAM 15.1/VAM 21.1 cabling

10.6.4 Functional earth connection

Ensure a sufficient conductor cross section during functional earth wiring.

For the functional earth wiring, use a cable with a cross section of at least 6 mm².

To ensure a proper operation of the EMC suppressor circuits of the IndraControl VAM 15.1/VAM 21.1 according to the guidelines, the functional earth has to be connected!

10.6.5 Notes on current and voltage supply

NOTICE **Insufficient contact and loss of UL certification if inadequate wire is used.**

Use only copper wire (24 to 18 AWG) for wiring the connection terminals.

Fuses

The voltage supplies at X1S1 are internally protected by the SMD fuses F1 and F2 with 4 A each.

Supply	Fuse	Fuse blows
U_M	F1	• Simultaneous short circuit of several outputs (plugs X11, X2O2) against 0 V • Simultaneous exceedance of I = 200 mA at several outputs (X2O1, X2O2) • Hardware defect
U_L	F2	• Short circuit of the +24 V supply of the hand-held terminal (X81 plug, pin 1 or pin 14) against 0 V • Hardware defect

Tab. 10-2: Fuses

NOTICE **The fuses are soldered on the board**

SMD fuses may only be replaced by trained staff.

10.6.6 Voltage tapping for front elements

4-pin Weidmüller plug

The connection X1S2 provides the voltage U_M for switches and indicator lights on the IndraControl VAM 15.1/VAM 21.1 front panel. The pin assignment is described in chapter 9.3 "X1S2: Voltage tapping for front elements" on page 14.

10.6.7 E-STOP button

The connections of both N/C contacts ("NC") are labeled with "1" and "2" in the following illustration. The N/O contact "NO" with the connector names "3" and

"4" can be used for example as signal contact for the state evaluation of the E-STOP button via a PLC.

Only 24 V (protective extra-low voltage) may only be connected to the E-STOP button!

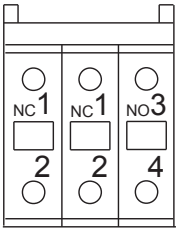


Fig. 10-13: Connection diagram: N/C contacts (NC) and N/O contacts (NO) of the E-STOP button

⚠ WARNING **Non-functioning E-STOP devices can have fatal consequences!**

Ensure that the release of the E-STOP button does not cause any uncontrolled machine restart!

Test the E-STOP function cyclically by activating the E-STOP button.

10.6.8 Sercos III Interfaces

General information

The IndraControl VAM 15.1/VAM 21.1 devices are connected to the field bus via the X7E1 and X7E2 connectors. The pin assignment of the RJ45 sockets is described in chapter 9.4 "X7E1, X7E2: Sercos III interfaces" on page 14.

10.6.9 Digital 24 V inputs and outputs

General information

The IndraControl VAM 15.1/VAM 21.1 component group provides 16 digital 24 V inputs and 16 digital 24 V outputs. The plugs of the inputs and outputs are located on the logic circuit board. Green LEDs indicate the I/O states.

The input states are sent to the master control via field bus. The outputs are defined by the master control via field bus.

The pin assignment is described in chapter 9.5 "X2I1, X2I2, X2O1, X2O2: Digital 24 V inputs and outputs" on page 15.

10.6.10 Connection for external hand-held terminal

General information

Next to the inputs for the handwheel of the hand-held terminal (A, /A, B, /B), 12 inputs (IN0 – IN11) are available for the keys of the hand-held terminal. The keys are supplied via the "+24 V" provided at the X81 plug.

The "+24 V" supply is internally generated by the supply "U_L" and may only be used to connect the keys of the hand-held terminal.

Connection "X81" for the hand-held terminal is located on the logic circuit board.

The states of the inputs and the counter value of the handwheel are transmitted to the master control via field bus.

The pin assignment is described in chapter 9.6 "X81: Connection for external hand-held terminal" on page 17.

10.6.11 Connection for internal handwheel

General information

Connection "X82" for the internal handwheel is located on the logic circuit board.

The counter value of the handwheel is transmitted to the master control via field bus.

The pin assignment is described in chapter 9.7 "X82: Connection for internal handwheel" on page 19.

10.6.12 Override VD

The module is connected to the logic circuit board via the internal shift register bus. The switch positions of both rotary switches are transmitted to the master control via Profibus DP.

For details refer to chapter 12.5.2 "Override rotary switch" on page 42.

11 Commissioning

11.1 General switch positions S1 and S2

The DIP switches on the IndraControl VAM 15.1/VAM 21.1 circuit board have to be set on "OPEN" for the operation.

11.2 Commissioning Sercos III

11.2.1 Engineering tool "IndraWorks"

The Bosch Rexroth engineering tool "IndraWorks" can be used for commissioning. In this engineering tool, the devices IndraControl VAM 15.1/VAM 21.1 are already in the device library "Periphery".

11.2.2 SDDML file

A Sercos device description file (SDDML file) is required when commissioning with another engineering tool. This device description file can be downloaded from the Rexroth product portal.

11.2.3 Sercos address

General information

- Sercos address 254 is preset upon delivery
- Automatic address assignment acc. to Sercos III is supported
- The Sercos address is stored remanently on the device

Device exchange

The behavior of the Sercos III ring after replacing a IndraControl VAM 15.1/ VAM 21.1 depends on the master used. As the devices support automatic address assignment and remanent storage of the Sercos address on the device, the device can be replaced without using a configuration tool. For details, please refer to the documentation of the master.

12 Device description

12.1 Brief description

Machine control panels supplement operator and visualization terminals. They are used for the operation mode selection and the manual machine operation. These devices contain operating elements, e. g., keys with LED displays, rotary switches for feed override and spindle override, E-STOP buttons and machine pushbuttons.

The machine control panels IndraControl VAM 15.1/VAM 21.1 were especially designed to be used with the devices of the IndraControl Vxx product family and are adapted to the design of these devices. The IndraControl VAM 15.1 width corresponds to the IndraControl VPP 15.3 panel PC width or the IndraControl VDP 15.3 width. The IndraControl VAM 21.1 width corresponds to the IndraControl VPP 21.3 panel PC width or the IndraControl VDP 21.3 in vertical mounting position.

The IndraControl VAM 15.1/VAM 21.1 devices are Maschinenbedienfelder with Sercos III connection.

12.2 Standard variantsIndraControl VAM 15.1/VAM 21.1

12.2.1 Overview on standard variants

The IndraControl VAM 15.1/VAM 21.1 machine control panels are available in different standard variants:

	Keypad with keys and LED that can be labeled and programmed freely	Further elements	Ordering numbers and type codes
IndraControl VAM 15.1 (Sercos III)	1 keypad with 15 keys	• E-STOP button • Two override rotary switches for feed and spindle • Six 22.5 mm switching elements, can be labeled • One pre-cut-out for 16 mm/22.5 mm elements below the E-STOP button • Four pre-cut-outs for 16 mm/22.5 mm elements, can be labeled	R911173752 VAM15.1-S3-NF-NN-TB-TA-VD-NN
IndraControl VAM 21.1 (Sercos III)	1 keypad with 15 keys	• E-STOP button • Two override rotary switches for feed and spindle • Six 22.5 mm switching elements, can be labeled • One pre-cut-out for 16 mm/22.5 mm elements below the E-STOP button	R911173753 VAM21.1-S3-NF-NN-TB-TA-VD-NN

Tab. 12-1: IndraControl VAM 15.1/VAM 21.1 standard variants

12.2.2 Rear side

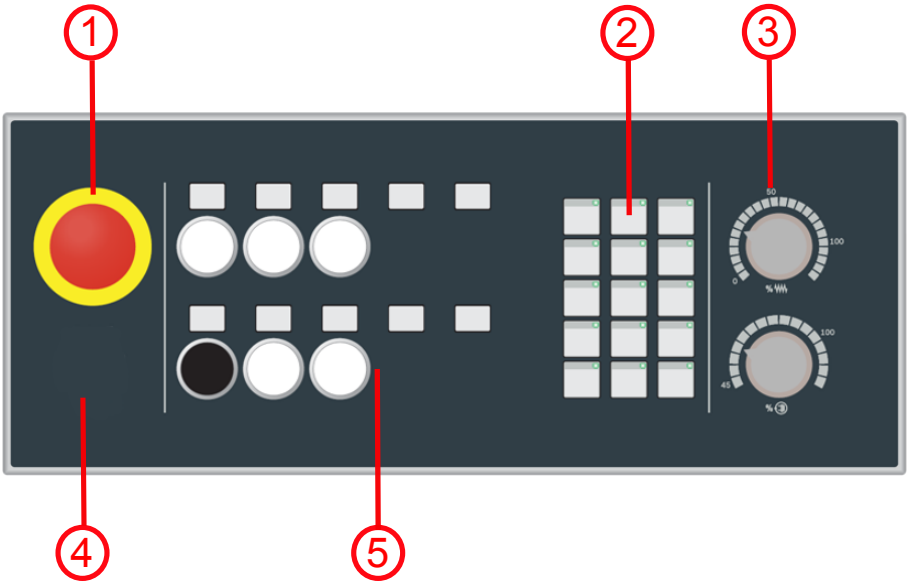
The devices of the variant IndraControl VAM 15.1/VAM 21.1 are delivered without a rear covering plate.

The following components are located on the rear side of the IndraControl VAM 15.1/VAM 21.1:

- 25-pin plug to connect a hand-held terminal
- 6-pin plug to connect a handwheel
- 16 digital 24 V inputs

- 16 digital 24 V outputs
- Voltage supply connections
- Functional earth connection
- Voltage tapping for front elements
- Two RJ45 sockets for Sercos III
- Service interface
- LEDs for status displays
- Two DIP switches to set the operating mode

12.2.3 Front view of the machine control panel, overview



① E-STOP button
② Keys with LED that can be labeled with slide-in strips
③ Override rotary switch for feed and spindle
④ Combined pre-cut-out 16 mm/22.5 mm
⑤ Equipped 22.5 mm switching elements with labeling field. For the IndraControl VAM 15.1, additional four combined pre-cut-outs of 16mm/22.5 mm with labeling field

Fig. 12-1: Front view of the machine control panel

12.2.4 Front view of the machine control panel IndraControl VAM 15.1

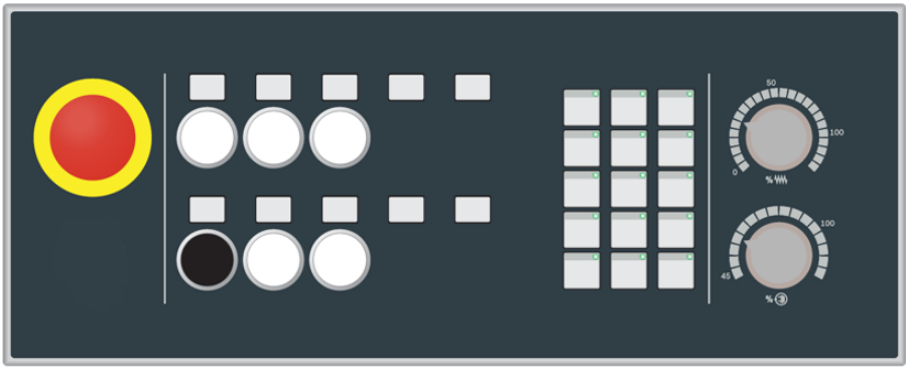


Fig. 12-2: Front view of the IndraControl VAM 15.1

12.2.5 Front view of the machine control panel IndraControl VAM 21.1

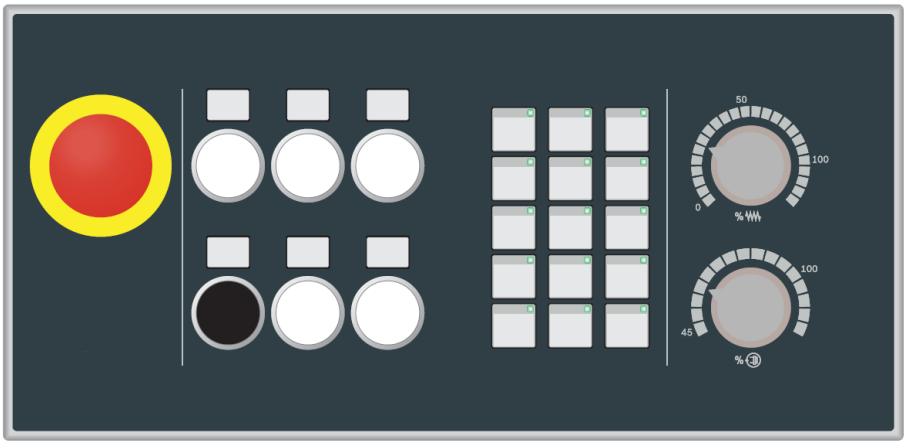


Fig. 12-3: Front view of the IndraControl VAM 21.1

12.3 Describing operating elements

12.3.1 General information

As the IndraControl VAM 21.1 corresponds to the IndraControl VAM 15.1 except for the additional 22.5 pre-cut-outs, this device is not described in detail in the following.

12.3.2 Labeling templates for slide-in strips

Please find the labeling templates on the Bosch Rexroth web site or contact your sales representative.

The labels for the machine function keys can be created with the templates and can be printed on transparent foil or on paper using a laser printer.

After cutting out the slide-in strips, the slide-in strips can be inserted on the rear side of the devices.

12.3.3 E-STOP button

Fig. 12-4: E-STOP button

This cut-out is equipped with an unwired standard E-STOP button. The two N/C contacts of the switching elements can be wired with the E-STOP circuits of the machine.

The red-yellow E-STOP button of the IndraControl VAM 15.1/VAM 21.1 complies with the requirements of the EN ISO 13850. It has to be designed as a STOP button of category 0 or 1 (see EN 60204-1 chapter 9.2.5.4.2) based on the risk assessment for the machine. The connection of the positive break contacts to an appropriate monitoring system must meet the category (acc. to EN ISO 13849-1) defined based on the risk assessment (acc. to EN ISO 14121-1) of the machine.

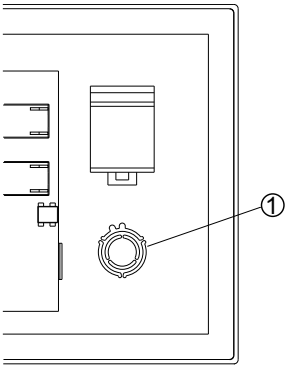
Only 24 V (protective extra-low voltage) may only be connected to the E-STOP button!

For information on the connections, refer to chapter 10.6.7 "E-STOP button" on page 28.

12.3.4 Combined cut-out for a 16 mm or 22.5 mm operating or display element

The IndraControl VAM 15.1/VAM 21.1 devices are provided with a cut-out, where either a 16 mm or a 22.5 mm hole can be broken out (refer to following figures).

Fig. 12-5: Combined cut-out for a 16 mm or 22.5 mm operating or display element



① Cut-out

Fig. 12-6: Position of the cut-out for a 16 mm or 22.5 mm operating or display element

12.3.5 Keypad

Fig. 12-7: Keypad

One keypad with 15 keys is available for the user. The keys are short-stroke keys that can be configured and labeled freely. The keys are covered by a foil arranged in a matrix containing three columns and five rows. Each key is illuminated by a green point LED.

The module is connected to the logic circuit board via the internal shift register bus. The key states are sent to the master control via field bus. The LEDs are triggered via field bus by the master control.

The address allocation of keys and LEDs is described in chapter 12.5.1 "Keypad" on page 41.

12.3.6 Override rotary switch

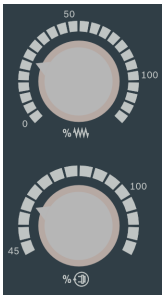


Fig. 12-8: Override rotary switch

Feed override (Upper rotary switch)	24 switch positions
Spindle override (Lower rotary switch)	16 switch positions

Tab. 12-2: Override rotary switch

The module is connected to the logic circuit board via the internal shift register bus. The switch positions of both rotary switches are transmitted to the master control via the field bus.

The address allocation of the module is described in chapter 12.5.2 "Override rotary switch" on page 42.

12.3.7 22.5 mm switching elements

The 22.5 mm switching elements (① in the following figure) are provided on both the machine control panels IndraControl VAM 15.1 and IndraControl VAM 21.1.

The four additional combine pre-cut-outs for 16 mm/22.5 mm switching elements (② in the following figure) are only provided on the IndraControl VAM 15.1.

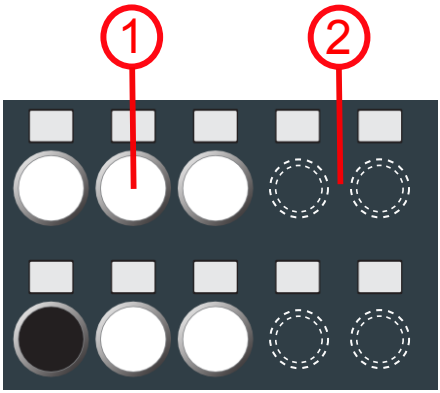


Fig. 12-9: 22.5 mm switching elements and combined pre-cut-outs of 16mm/22.5 mm

The 22.5 mm switching elements can be wired application-specifically.

Switching element	Contact equipment	Illumination
Illuminated pushbutton, white	1 x N/O contact (Contact name 3 and 4)	24 V LED (Contact name X1 and X2)
Pushbutton, black	2 x N/C contacts (Contact name 1 and 2)	No

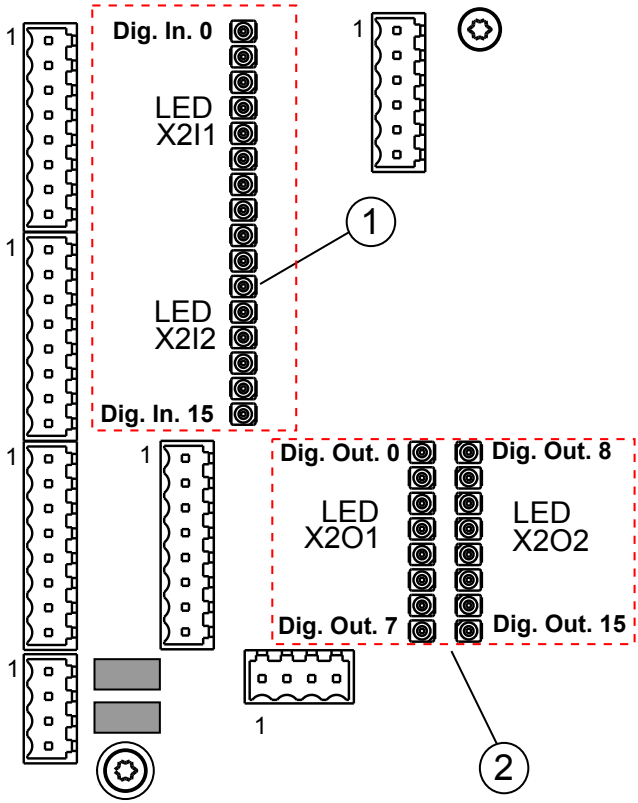
Tab. 12-3: Contacts equipped with 22.5 mm switching elements

Only 24 V (protective extra-low voltage) may be connected to the switching elements!

12.4 Operating and error display

12.4.1 Status displays of digital inputs and outputs

LEDs indicate the status of the digital inputs and outputs.



① Status displays of the digital inputs 0 to 15
② Status displays of the digital outputs 0 to 15

Fig. 12-10: Status displays of digital inputs and outputs

12.4.2 Status displays H1 to H4

H1 to H4 overview

The following figure shows the general status displays H1 to H3 (see also chapter "General status displays H1 to H3" on page 40) as well as the status display H4 for Sercos III (also refer to chapter "Status display H4 for Sercos III" on page 40).

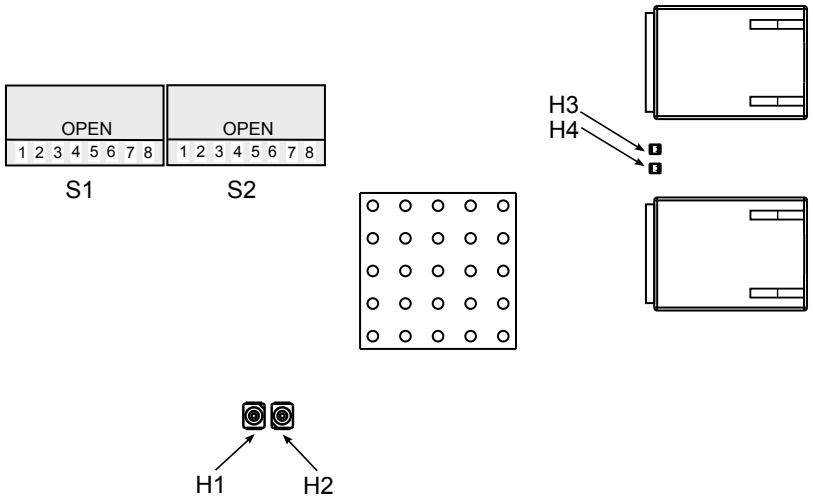


Fig. 12-11: Status displays H1 to H4

General status displays H1 to H3

LED	Display	Meaning
H1	Lights green	Normal state I.e. the internal application (e.g. Sercos III Firmware) runs without errors
H2	Lights orange	The internal operating system runs without application. Please contact the Bosch Rexroth Service
H2	Flashes orange	Check the switch position at the S1 and S2 DIP switches. All switches have to be set to the "open" position!
H3 (Duo LED)	Red	Fatal internal error
H3	Green	Firmware of the circuit board runs without errors
H3	Orange	Not yet supported

Tab. 12-4: General status displays H1 to H3

Status display H4 for Sercos III

Depending on the IndraControl VAM 15.1/VAM 21.1 variant, the status display H4 indicates the Sercos states.

Sercos III LED - H4

The Sercos III messages are displayed on the LED H4. H4 is a two-colored LED, which lights either red, green or orange in this use case. The meaning of the states corresponds to the valid Sercos III specification.

LED	Display	Meaning
H4	Lights green	CP4 no error
H4	Flashes green (4 Hz)	Loopback enabled
H4	Flashes red and green (4 Hz alternating)	Communication error (S-0-1003)
H4	Lights red	Sercos III CD1 (Diagnostic class 1)
H4	Lights orange	CP0 to CP3
H4	Flashes orange (4 Hz)	Identification (bit 15 in Interface Control). Used for address assignment and configuration errors
H4	Off	No Sercos communication

Tab. 12-5: Sercos III S3 – H4 status displays

12.4.3 Status displays at X7E1 and X7E2

The communication states of the field buses are displayed via the integrated LEDs in the RJ45 sockets X7E1 and X7E2.

LED	Status
L (Link)	On: Connection to network is available Off: No network connection
S (Send)	On: Data packages are sent Off: No data is sent

Tab. 12-6: LED display at X7E1 and X7E2

12.5 Address allocation

12.5.1 Keypad

General information

Each Sx.y key (input) is assigned to one green LED Hx.y (output). The keypads are connected to the logic circuit board via the internal shift register bus. The inputs (buttons) and outputs (LEDs) of the keypad are mapped in the "Keypad TA" module at the field bus.

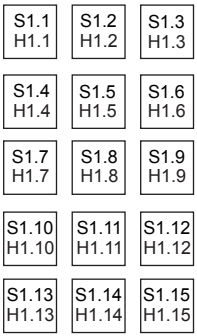


Fig. 12-12: LED and key assignment of the "Keypad TA" module

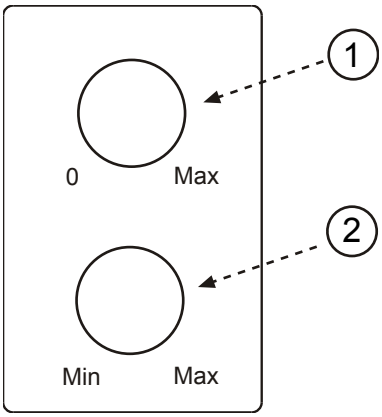
Bit string of the keypad

Keypad TA	Format	MSB							LSB
LED outputs	BYTE	H1.8	H1.7	H1.6	H1.5	H1.4	H1.3	H1.2	H1.1
	BYTE	–	H1.15	H1.14	H1.13	H1.12	H1.11	H1.10	H1.9
Key inputs	BYTE	S1.8	S1.7	S1.6	S1.5	S1.4	S1.3	S1.2	S1.1
	BYTE	0	S1.15	S1.14	S1.13	S1.12	S1.11	S1.10	S1.9

Tab. 12-7: I/O assignment of the "Keypad" module

12.5.2 Override rotary switch

General information



① Feed override
② Spindle override

Fig. 12-13: Override rotary switch – Schematic

The positions of the rotary switches (inputs) of the override module are mapped in the "Override VD" module at the field bus.

Gray code table for 24-stage feed override

Switch position	E	D	C	B	A
0 (min.)	0	0	0	0	0
1	0	0	0	0	1
2	0	0	0	1	1
3	0	0	0	1	0
4	0	0	1	1	0
5	0	0	1	1	1
6	0	0	1	0	1
7	0	0	1	0	0
8	0	1	1	0	0
9	0	1	1	0	1
10	0	1	1	1	1
11	0	1	1	1	0
12	0	1	0	1	0
13	0	1	0	1	1
14	0	1	0	0	1
15	0	1	0	0	0
16	1	1	0	0	0
17	1	1	0	0	1
18	1	1	0	1	1
19	1	1	0	1	0
20	1	1	1	1	0
21	1	1	1	1	1
22	1	1	1	0	1
23 (max.)	1	1	1	0	0

Tab. 12-8: Gray code table for 24-stage feed override

Gray code table for 16-stage spindle override

Switch position	D	C	B	A
0 (min.)	0	0	0	0
1	0	0	0	1
2	0	0	1	1
3	0	0	1	0
4	0	1	1	0

Switch position	D	C	B	A
5	0	1	1	1
6	0	1	0	1
7	0	1	0	0
8	1	1	0	0
9	1	1	0	1
10	1	1	1	1
11	1	1	1	0
12	1	0	1	0
13	1	0	1	1
14	1	0	0	1
15 (max.)	1	0	0	0

Tab. 12-9: Gray code table for 16-stage spindle override

Bit string for override

Override VD	Format	MSB							LSB
Feed override	BYTE	0	0	0	E	D	C	B	A
Spindle override	BYTE	0	0	0	0	D	C	B	A

Tab. 12-10: Input assignment of the module "Override VD"

12.5.3 Digital 24 V inputs and outputs

General information

The digital I/Os are mapped in the module "16DI, 16DO" at the field bus.

Bit string for digital 24 V inputs and outputs

16DI, 16DO	Format	MSB							LSB
Digital outputs 7-0	BYTE	Q7	Q6	Q5	Q4	Q3	Q2	Q1	Q0
Digital outputs 15-8	BYTE	Q15	Q14	Q13	Q12	Q11	Q10	Q9	Q8
Digital inputs 7-0	BYTE	I7	I6	I5	I4	I3	I2	I1	I0
Digital inputs 15-8	BYTE	I15	I14	I13	I12	I11	I10	I9	I8

Tab. 12-11: I/O assignment of the module "16DI, 16DO"

12.5.4 External hand-held terminal

General information

The inputs of the hand-held terminal (pushbutton and 16-bit counter of the handwheel) are mapped in the "Manual Control Unit" module at the field bus.

Bit string for external hand-held terminal

Manual Control Unit	Format	MSB														LSB
Handwheel	WORD	16-bit counter value														
Button inputs	WORD	0	0	0	0	IN11	IN10	IN9	IN8	IN7	IN6	IN5	IN4	IN3	IN2	IN1	IN0

Tab. 12-12: Input assignment for module "Manual Control Unit"

12.5.5 Internal handwheel

General information

The 16-bit counter of the handwheel is mapped in the "Handwheel" module at the field bus.

Bit string for internal handwheel

Handwheel	Format	MSB	LSB
Handwheel, internal	WORD	16-bit counter value, handwheel	

Tab. 12-13: Input assignment for the "Handwheel" module

13 Error causes and troubleshooting

The error display on the board is described in chapter 12.4 "Operating and error display" on page 38.

Errors	Troubleshooting
No Sercos communication	Check cables at the Sercos connections X7E1 and X7E2
No function of inputs and outputs	+24 V DC input and output supply U_Q not connected to X1S1

Tab. 13-1: Error causes and troubleshooting

Repairs at the device by the customer are not permitted. Exceptions are maintenance works listed in the chapter "Maintenance".

For further information in the event of repair, please contact the Bosch Rexroth Service.

14 Maintenance

14.1 General information

The IndraControl VAM 15.1/VAM 21.1 machine control panels are maintenance-free.

Only the maintenance works at the device listed in this chapter are permitted.

For further information in the event of repair, please contact the Bosch Rexroth Service.

NOTICE **Loss of IP degree of protection due to incorrect maintenance**

Ensure that the IP degree of protection remains during maintenance!

NOTICE **Damages to the device due to electrostatic discharges!**

Comply with all ESD protective measures while working with modules and components! Avoid electrostatic discharges!

NOTICE **Destruction of screw terminals, insufficient contact and loss of UL certification if no copper wire is used and/or wrong tightening torque**

Use only copper wires to wire connection terminals. Tighten the screws of the screw terminal blocks with a torque of 2.25 lb in (0.22 Nm).

14.2 Tightening torques and stripping length

Torques

Thread	Tightening torque
M2,5	0.4 Nm
M3	0.7 Nm
M4	1.4 Nm
M5	2.8 Nm

Tab. 14-1: Torques for the screws M2,5 ... M5

Stripping length

The stripping length for female connector strips is 10 mm.

14.3 Cleaning notes

NOTICE **The foil surface is dissolved by solvents!**

- Do not use any solvents (e. g. diluents)!
- Do not use high pressure cleaning device!

14.4 Regular maintenance tasks

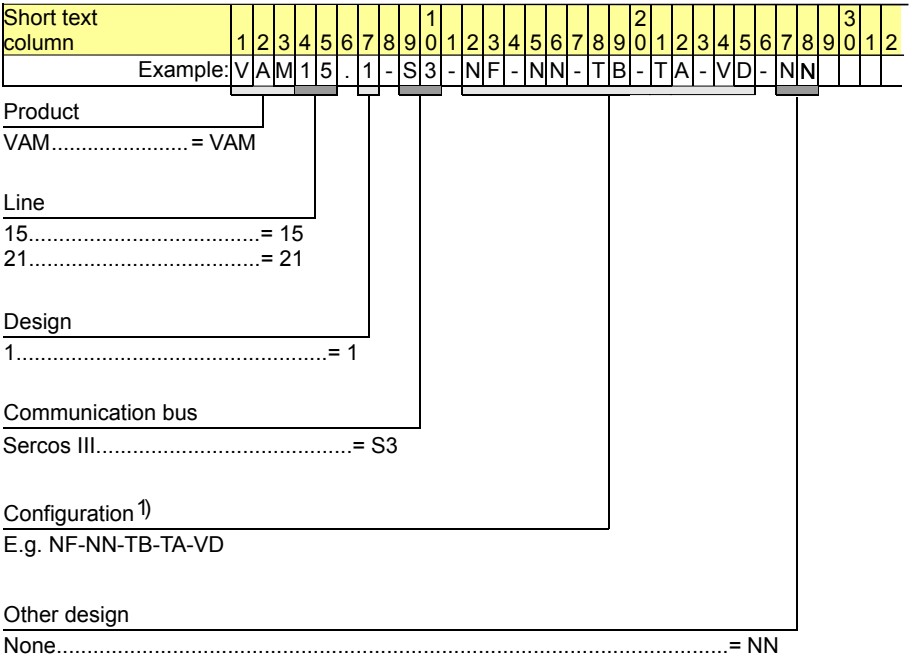
- Check all plug and terminal connections of the components for proper tightness and possible damage at least once a year
- Check that no cables are broken or pinched
- Replace damaged parts immediately

15 Ordering information

15.1 Accessories and spare parts

For ordering information on accessories and spare parts, refer to chapter 5 "Spare parts, accessories and wear parts" on page 5.

15.2 Type code



Note:

1) Configuration

NF = E-STOP module
NN = Not equipped
TA = Keypad can be labeled by slide-in strips
TB = Pushbuttons with slide-in strips
U1 = USB port
VD = Feed override with 24 stages and spindle override with 16 stages

Fig. 15-1: Type code IndraControl VAM 15.1/VAM 21.1

16 Disposal

16.1 General information

Dispose the products according to the respective valid national standard.

16.2 Return

For disposal, our products can be returned free of charge. However, the products must be free of remains like oil and grease or other impurities.

Furthermore, the products returned for disposal must not contain any undue foreign substances or components.

Send the products free of charge to the following address:

Bosch Rexroth AG
Electric Drives and Controls
Bürgermeister-Dr.-Nebel-Straße 2
D-97816 Lohr am Main, Germany

16.3 Packaging

The packaging material consists of cardboard, plastics, wood or styrofoam. Packaging material can be recycled anywhere.

For ecological reasons, please do not return empty packages.

17 Service and support

Our worldwide service network provides an optimized and efficient support. Our experts offer you advice and assistance should you have any queries. You can contact us **24/7**.

Service Germany

Our technology-oriented Competence Center in Lohr, Germany, is responsible for all your service-related queries for electric drive and controls.

Contact the **Service Hotline** and **Service Helpdesk** under:

Phone:	**+49 9352 40 5060**
Fax:	**+49 9352 18 4941**
E-mail:	service.svc@boschrexroth.de
Internet:	http://www.boschrexroth.com/

Additional information on service, repair (e.g. delivery addresses) and training can be found on our internet sites.

Service worldwide

Outside Germany, please contact your local service office first. For hotline numbers, refer to the sales office addresses on the internet.

Preparing information

To be able to help you more quickly and efficiently, please have the following information ready:

- Detailed description of malfunction and circumstances

- Type plate specifications of the affected products, in particular type codes and serial numbers
- Your contact data (phone and fax number as well as your e-mail address)

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Notes

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