CONTROL CABINET

KR C1 A

Connection / Start-up

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Other functions not described in this documentation may be operable in the controller. The user has no claim to these functions, however, in the case of a replacement or service work.
We have checked the content of this documentation for conformity with the hardware and software described. Nevertheless, discrepancies cannot be precluded, for which reason we are not able to guarantee total conformity. The information in this documentation is checked on a regular basis, however, and necessary corrections will be incorporated in subsequent editions.
Subject to technical alterations without an effect on the function.

PD Interleaf

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1 Connection

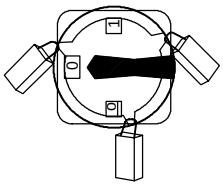
(Connecting cables – robot, ground conductor, power supply connection, peripheral cables)

The controller must be connected in accordance with the diagram in Fig. 2. The connection procedure can be divided into:

- Connection of connecting cables to robot
- Connection of connecting cables to periphery
- Robot equipotential bonding
- Power supply connection

The following basic rules must be observed when connecting the controller:

Before the work is started, the main switch must be turned to “OFF” and locked.



Main switch

- Cables not belonging to the controller must not be installed inside the control cabinet.
- The ground conductors must not be looped or connected to an intermediate terminal.
- All cables must be protected against mechanical or any other type of stress (e.g. installed on racks in the cable duct).

Permissible cable lengths

The designations and standard and optional lengths of the connecting cables may be noted from the table.

Cable designation	Length designation	Standard lengths in m	Optional lengths in m
Motor cable (motor/brake monitoring)	L1	7	15 / 25
Signal cable (control cable)	L1	7	15 / 25
KCP cable	L2	10	

2 Connector panel / Peripheral interfaces

For the purpose of operating the robot in a stand–alone mode or with an external controller, or for controlling peripheral equipment through the robot system, the connectors X20, X7, X21, X19, X1 and X01 are provided. These connectors have the following functions:

- X20: Motor connector, axes 1/3/4
- X7: Motor connector, axes 2/5/6
- X21: Data connector
- X11: Periphery data connector (optional)
- X13: (optional)
- X19: KCP connection
- X1: Power supply connection HAN 6
- X01: Service socket (optional)
- X7.1 Motor connector, external axis 7 (optional)
- X7.2 Motor connector, external axis 8 (optional)
- X8.1 Resolver connector, external axis 7 (optional)
- X8.2 Resolver connector, external axis 8 (optional)

The pin assignment of the CAN bus and Ethernet interfaces is also described in this documentation.

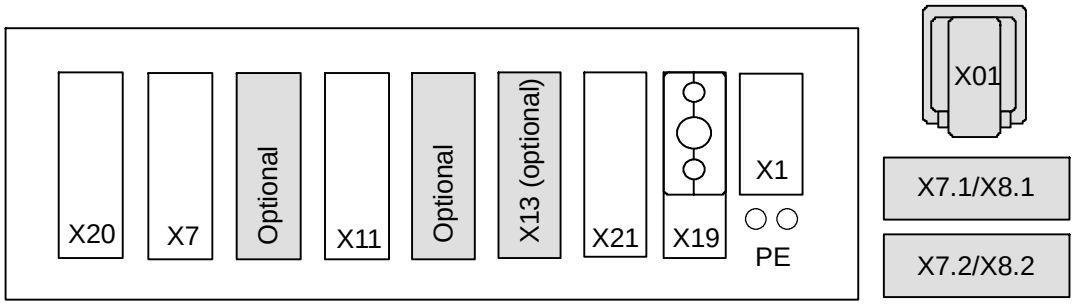
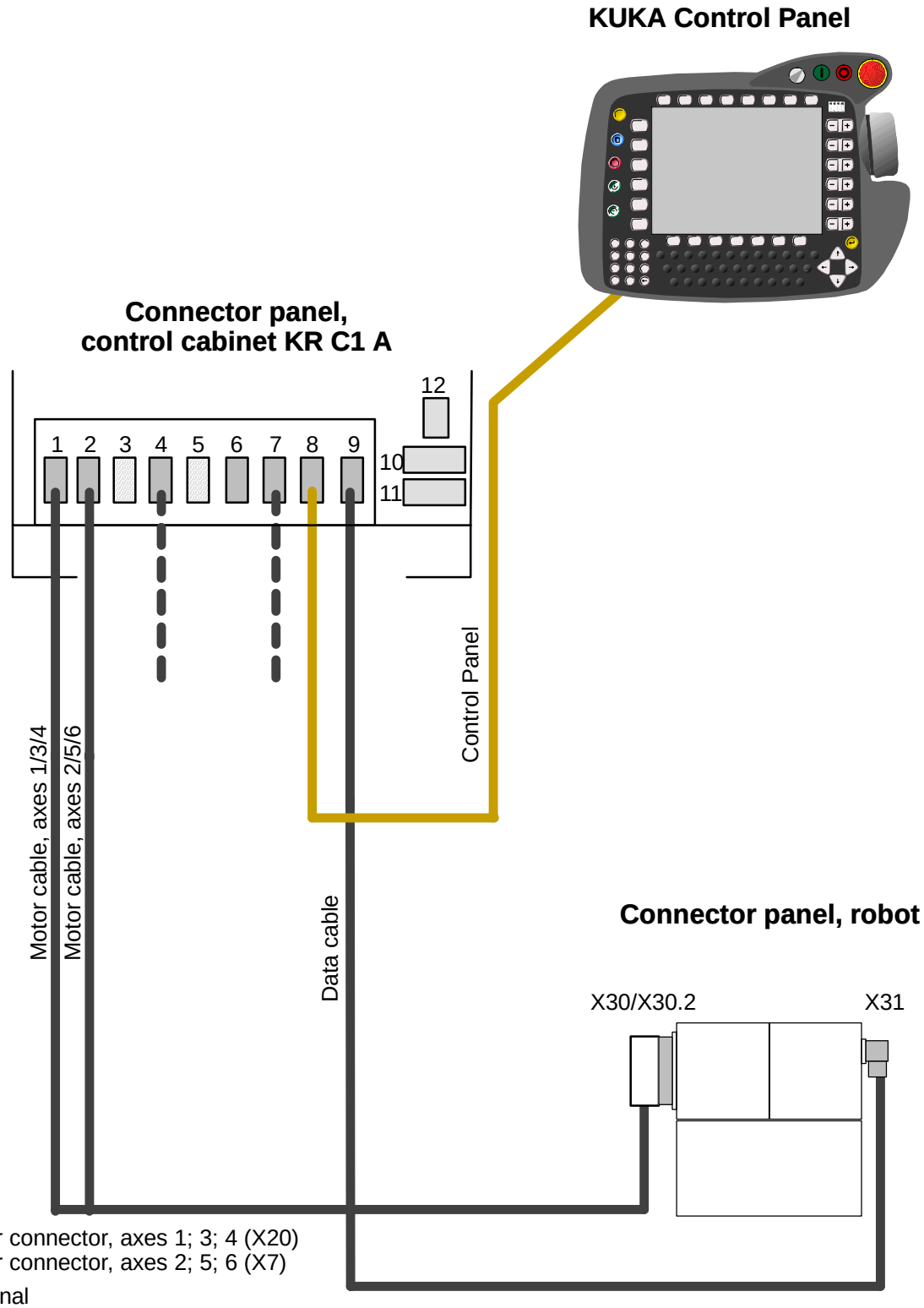


Fig. 1 Connector panel

All contactor, relay and valve coils that are connected to the robot controller must be equipped with appropriate suppressor diodes.

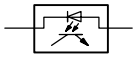


1 Motor connector, axes 1; 3; 4 (X20)
2 Motor connector, axes 2; 5; 6 (X7)
3 Optional
4 Peripheral interface (X11, optional)
5 Optional
6 Optional (X13)
7 Data cable (X21)
8 KCP connection (X19)
9 Han 6 HsB power supply connection (X1)
10 Motor connector X7.1, resolver connector X8.1 (optional)
11 Motor connector X7.2, resolver connector X8.2 (optional)
12 Service socket (optional)

Fig. 2 Connection of connecting cables

3 Connector pin allocation

3.1 Explanation of symbols


= electronic input, logic "1"
15 V – 30 V (approx. 6.5 mA at 24 V)

= relay coil 18 V – 30 V

* = low active signal

= power protection 500 mA

= electronic output
15V – 30V DC
load current for 2 A output min.: 0.02 A
max.: 2 A

= relay contact max. 500 mA / 30 V
make contact

= relay contact max. 500 mA / 30 V
break contact

3.2 Interface signals X11

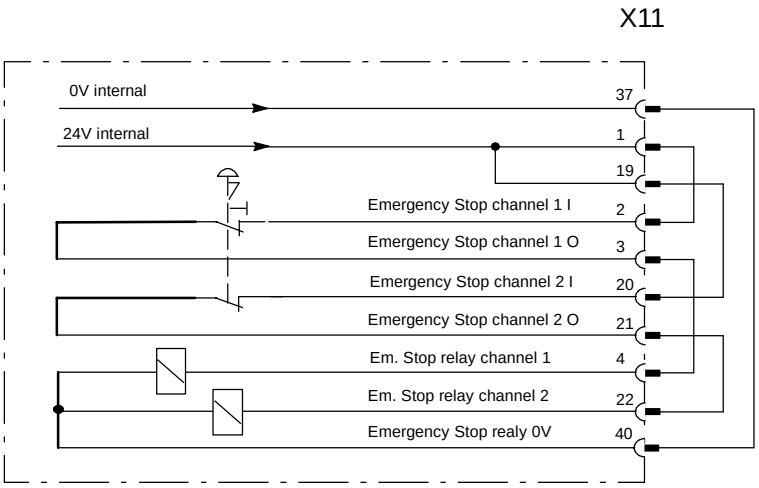
Interface signal	Pin	Description	Remarks
24 V control voltage	37 1 / 19	0 V internal +24 V internal, max. 500 mA	For supplying the safety circuit with internal power
Emergency Stop channels 1 and 2	2 / 3 20 / 21	Floating contacts of the Emergency Stop button on the KCP, 2–channel.	These contacts must be externally linked to the Emergency Stop relays.
Emergency Stop relay channels 1 and 2	4 22	Emergency Stop input, 2–channel	**CAUTION** Jumpering the two channels with one another is not permitted.
Emergency Stop relay 0V	40	0 V connection of the Emergency Stop relays for connection to the internal or external supply voltage.	
Ext. enabling channels 1 and 2	5 / 6 23 / 24	For connecting an external enabling switch to 2 floating contacts.	If no supplementary switch is connected, pins 5 and 6 as well as 23 and 24 must be jumpered. **CAUTION** Jumpering the two channels with one another is not permitted.
Safeguard channels 1 and 2	7 / 8 25 / 26	For the 2–channel connection of the interlock of isolating safeguards.	**CAUTION** Jumpering the two channels with one another is not permitted.
Ext. drives OFF	41 / 42	A floating contact (break contact) can be connected to this input. The drives are switched off when the contact is opened.	If this input is not used, pins 41 / 42 must be jumpered.

Ext. drives ON	43 / 44	For connecting a floating contact. Pulse ≥ 200 ms switches the drives on.	Signal must not be permanently active.
Emergency Stop contact channels 1 and 2	9 / 10 27 / 28	Floating contact of the Emergency Stop relays.	Contacts are closed if Emergency Stop is released.
Safety circuit channels 1 and 2	11 / 12 29 / 30	Floating contacts of the safety circuit	Is closed if the **safeguard** input is closed during automatic operation or if the enabling switch is pressed in the **Test** mode.
Test and **Automatic** mode groups	48 / 46 48 / 47	Floating contacts of the operating mode relays.	**Test** contact is closed if Test1 or Test2 is selected on the KCP. **Automatic** contact is closed if Automatic or External is selected.
Rapid gaging channels 1 to 4	13 / 14 / 31 / 32 / 49	Inputs are read by the DSEAT at the 125 µs clock rate.	When a 0/1 or 1/0 edge is detected, the actual axis values are stored by the software.

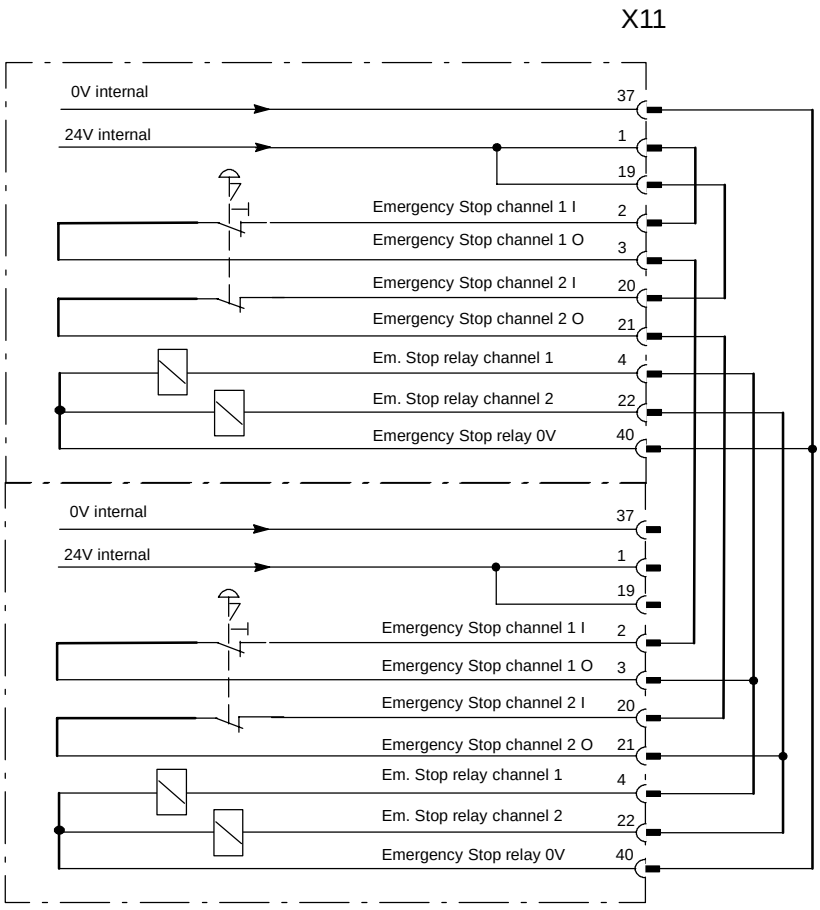
Emergency Stop circuit, safeguard and ext. enabling switch are signals that serve safety purposes and must be used in accordance with DIN EN 60204-1 and EN 775.

3.3 Emergency Stop circuit

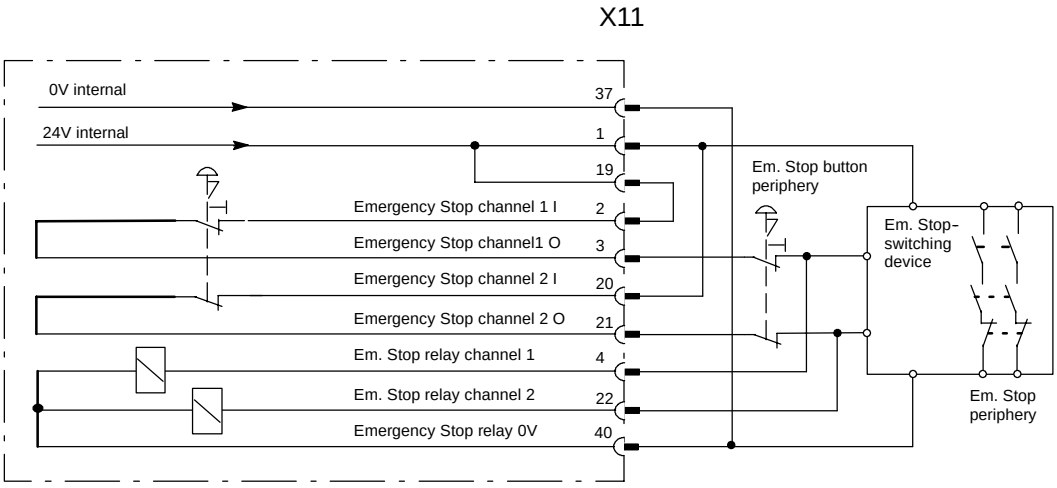
The following examples show how the robot Emergency Stop circuit can be linked to other robots or with the periphery.



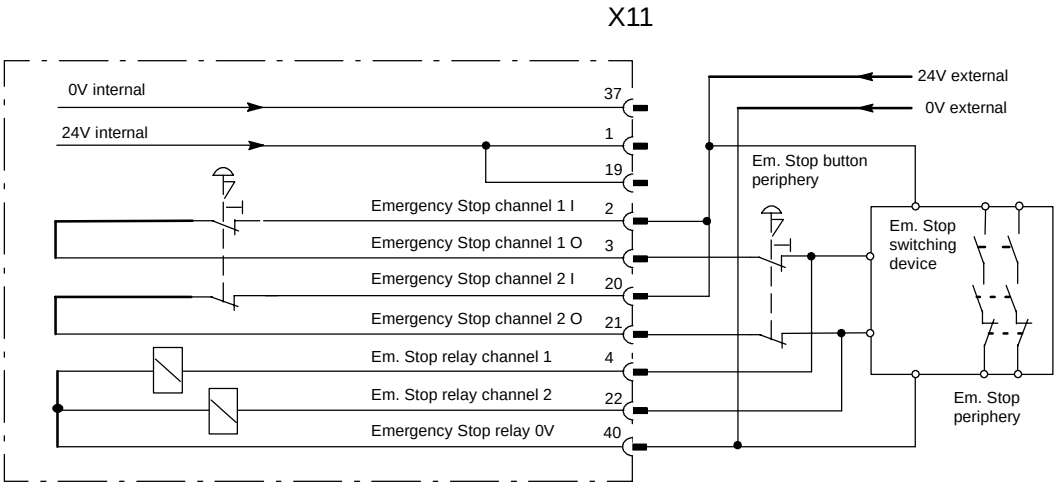
Emergency Stop circuit for one robot without periphery



Emergency Stop circuit for two robots without periphery

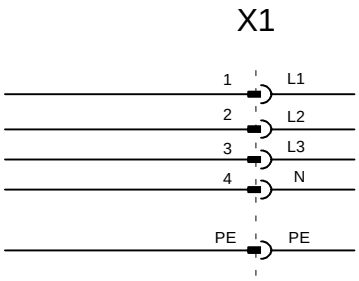


Emergency Stop circuit for one robot with periphery



Emergency Stop circuit with external voltage supply and with periphery

3.4 Supply connection X1, service socket X01



Incoming supply

3x400V 50/60Hz 25A

3x415V 50/60Hz 25A

only with transformer:

3x380V 50/60Hz 25A

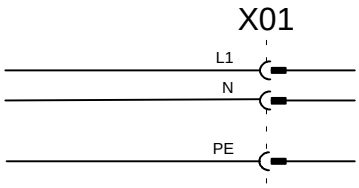
3x440V 50/60Hz 25A

3x480V 50/60Hz 25A

3x500V 50/60Hz 25A

* N–conductor is only required for optional service socket on 400V mains

Fig. 3 Supply connection X1



Service socket

(Standard version with PEN conductor in the mains!)

Supply voltage dependent on the mains used; max. load capacity 6A

Fig. 4 Service socket X01 (optional)

3.5 Motor connector X20, axes 1, 3 and 4

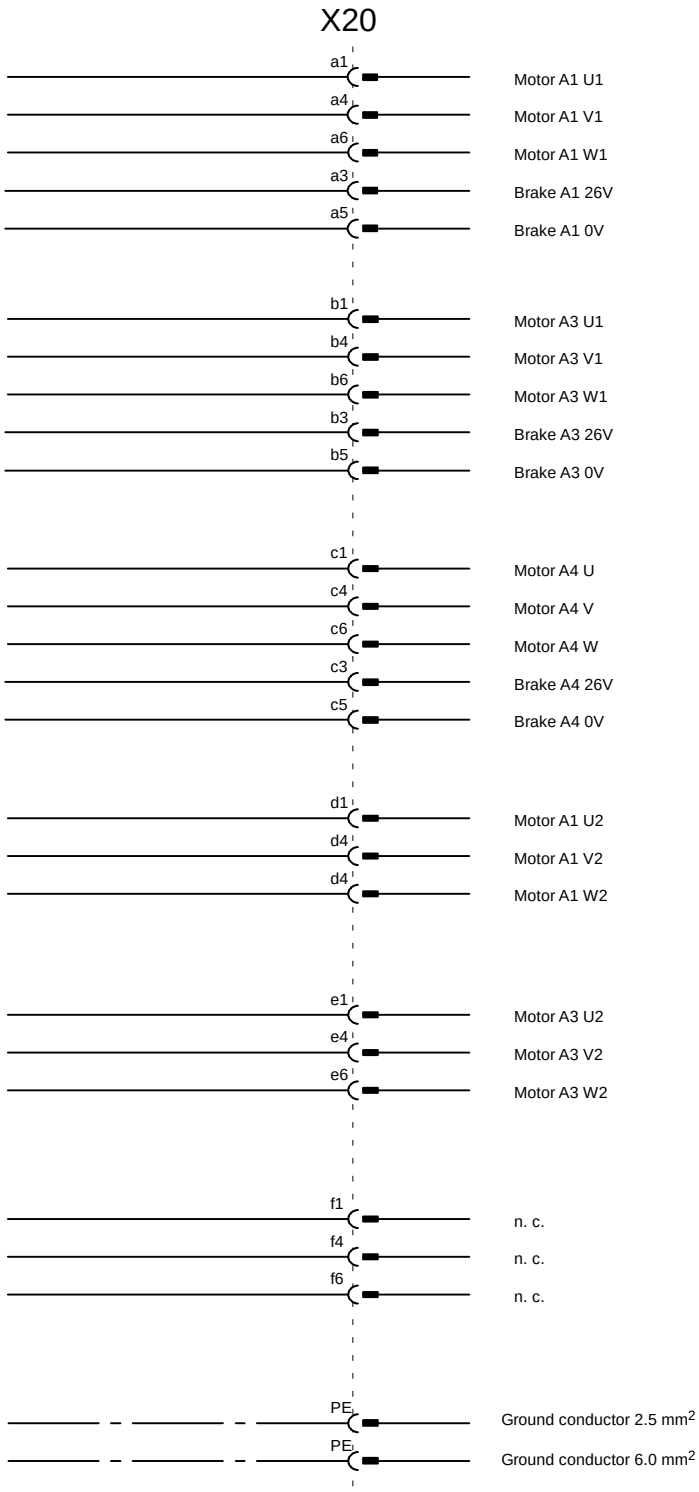


Fig. 5 Motor connector X20

3.6 Motor connector X7, axes 2, 5 and 6

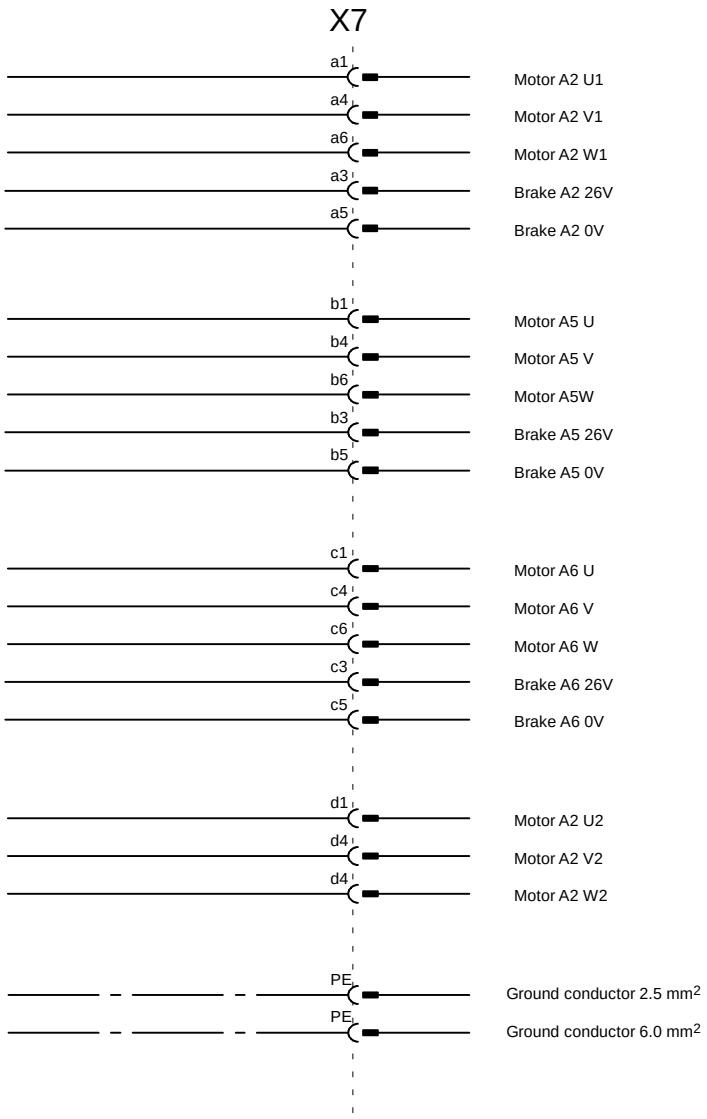


Fig. 6 Motor connector X7

3.7 Peripheral connector X11 (optional)

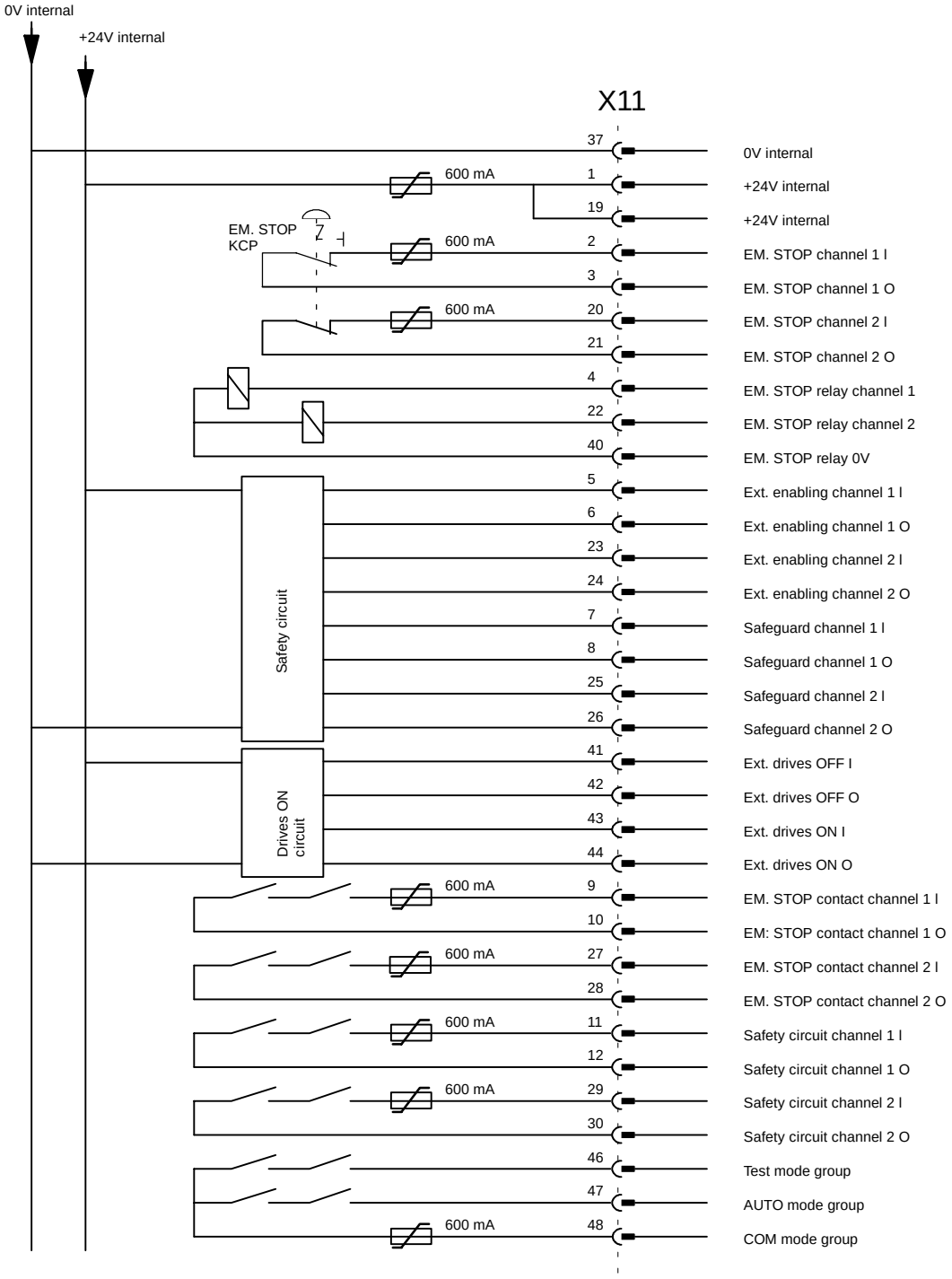


Fig. 7 Peripheral connector X11, part 1

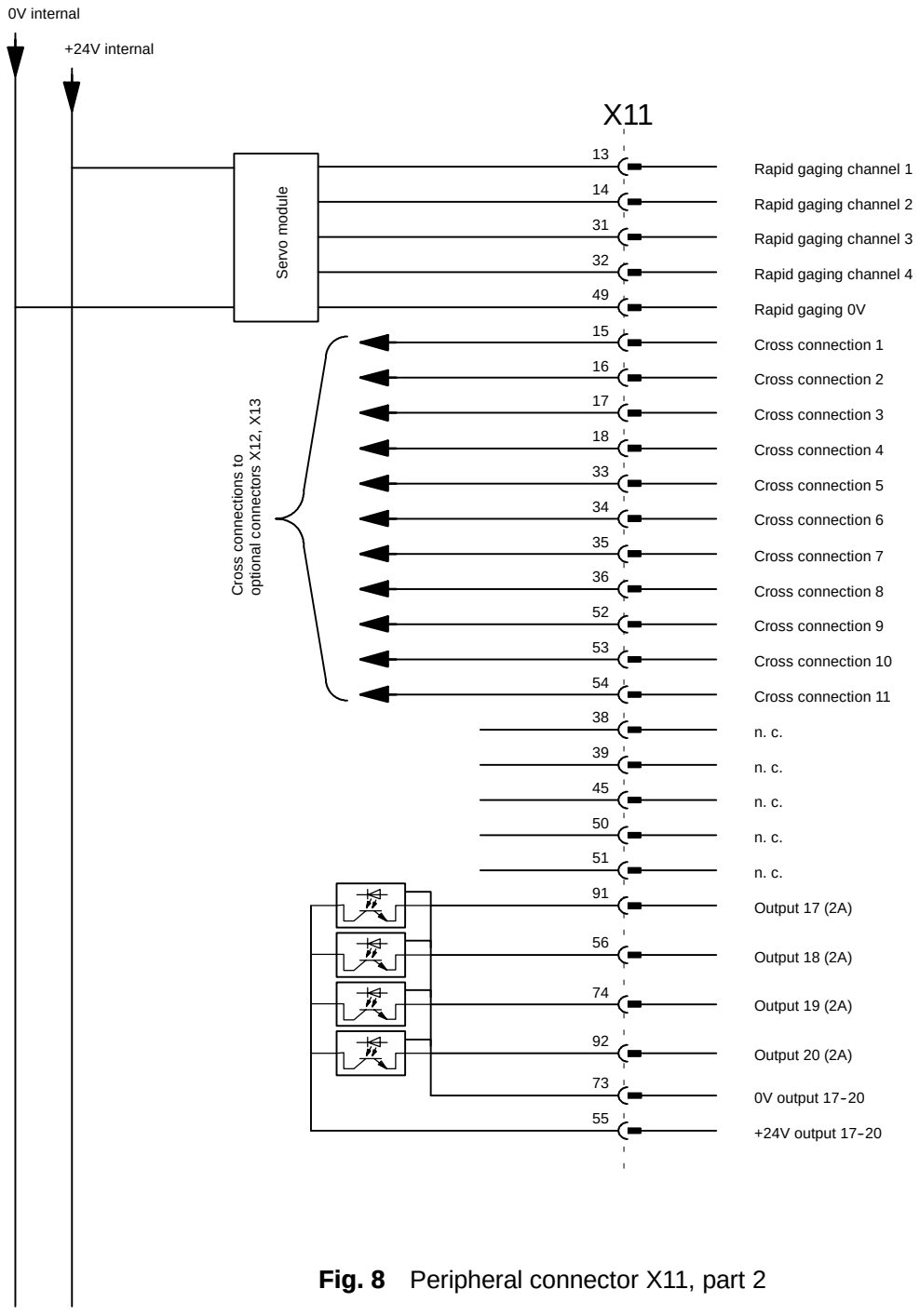


Fig. 8 Peripheral connector X11, part 2

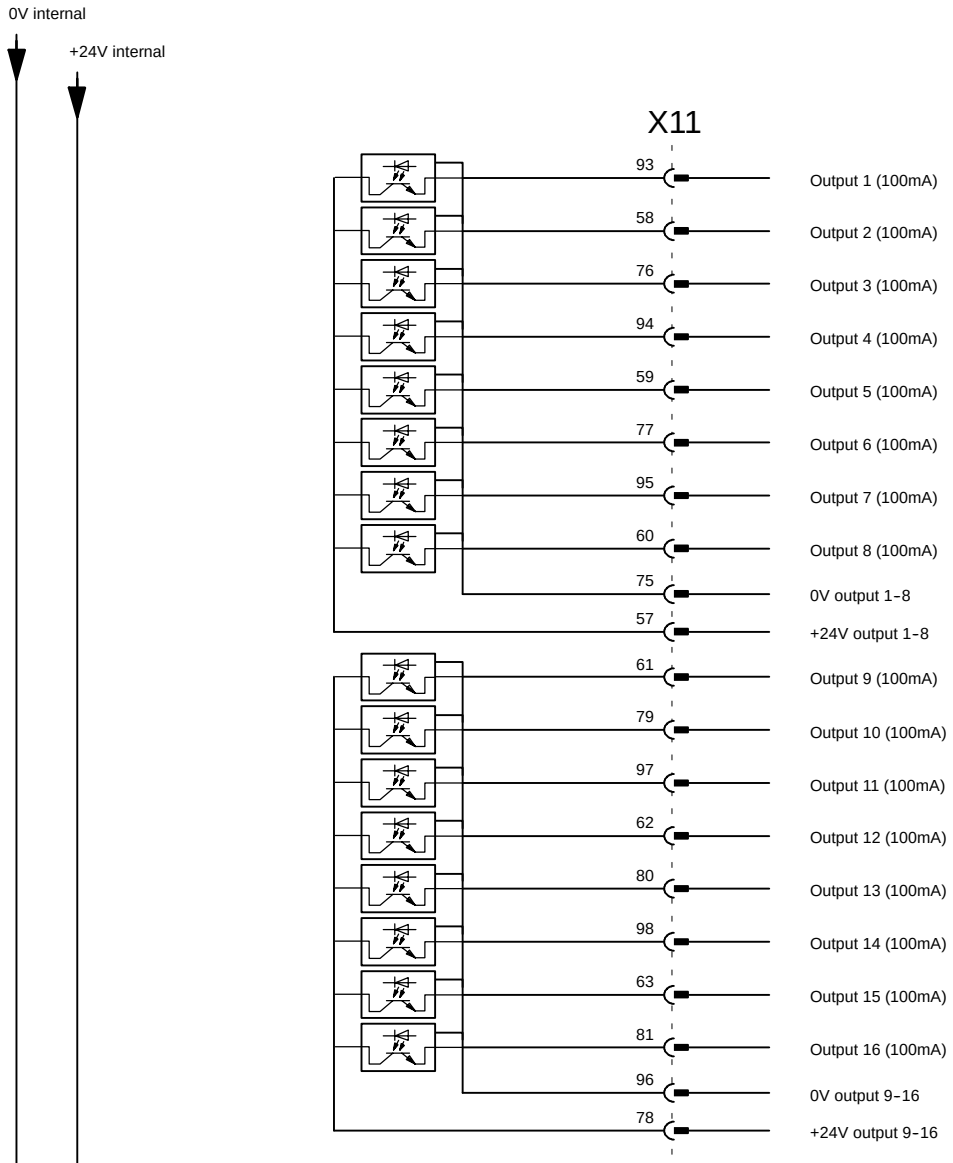


Fig. 9 Peripheral connector X11, part 3

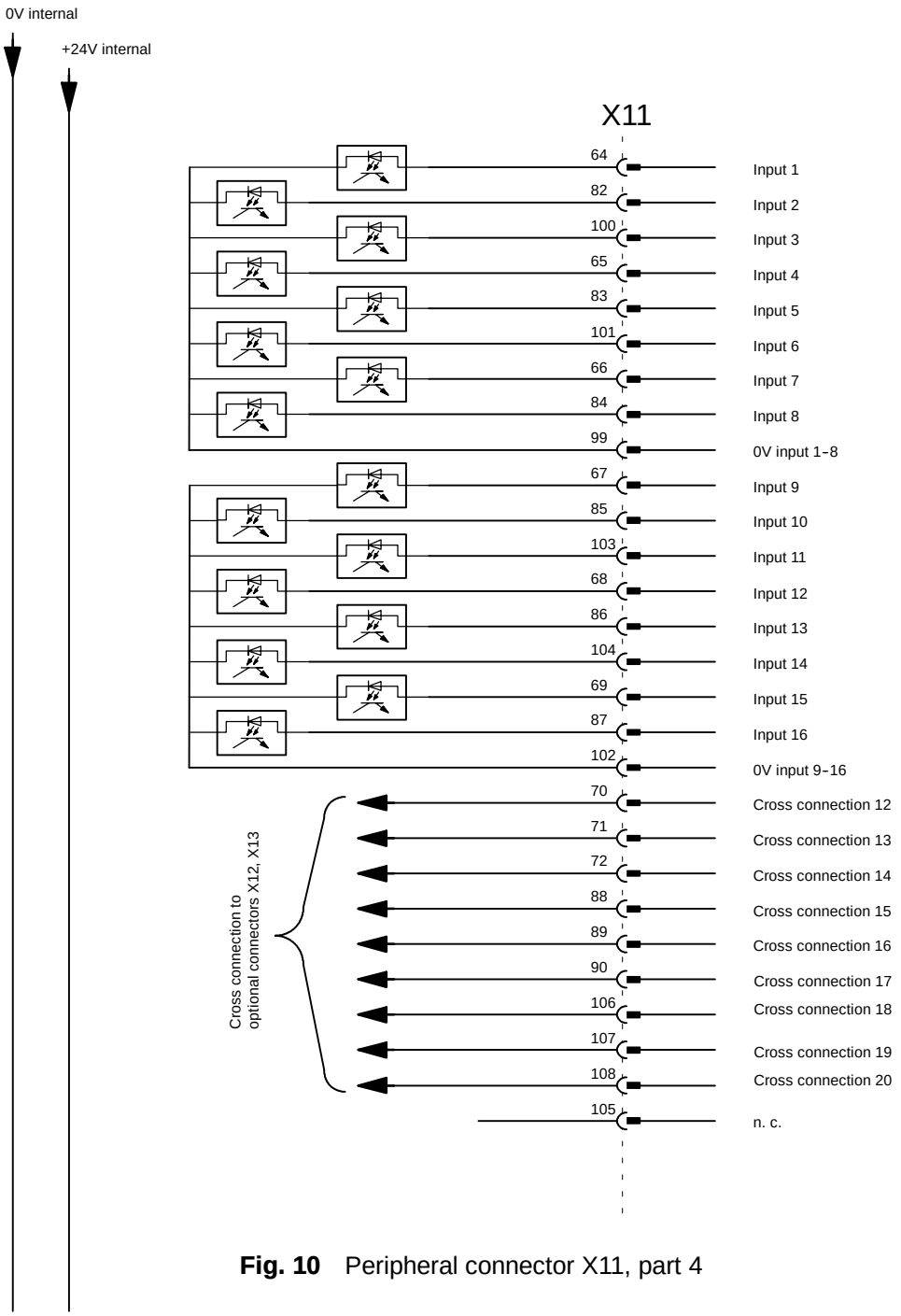


Fig. 10 Peripheral connector X11, part 4

3.8 Data cable connector X21

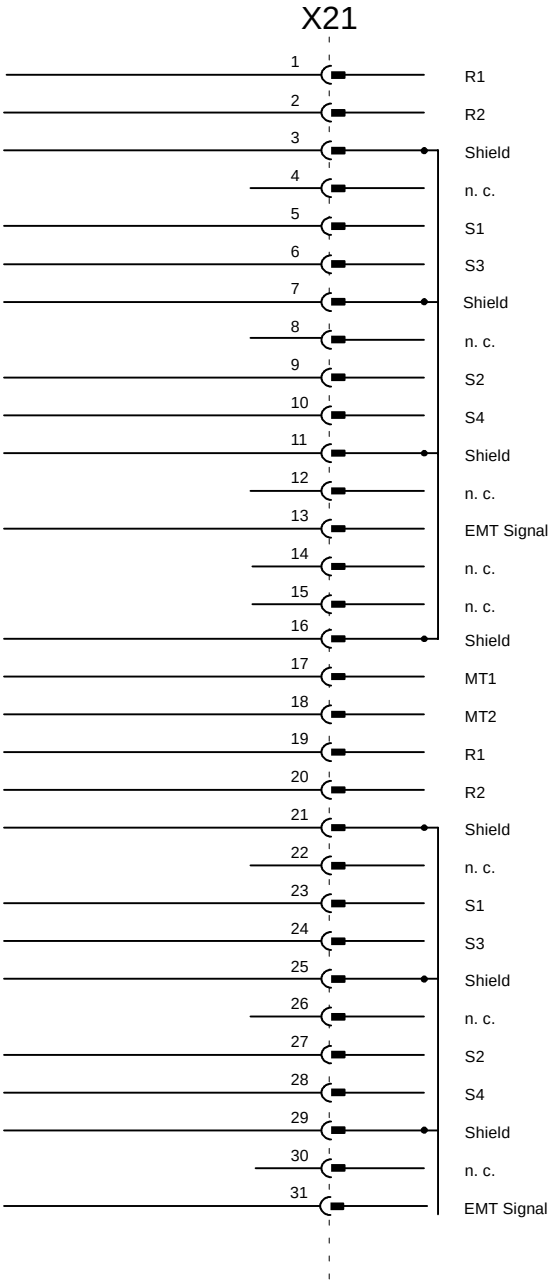


Fig. 11 Data cable connector X21 / part 1

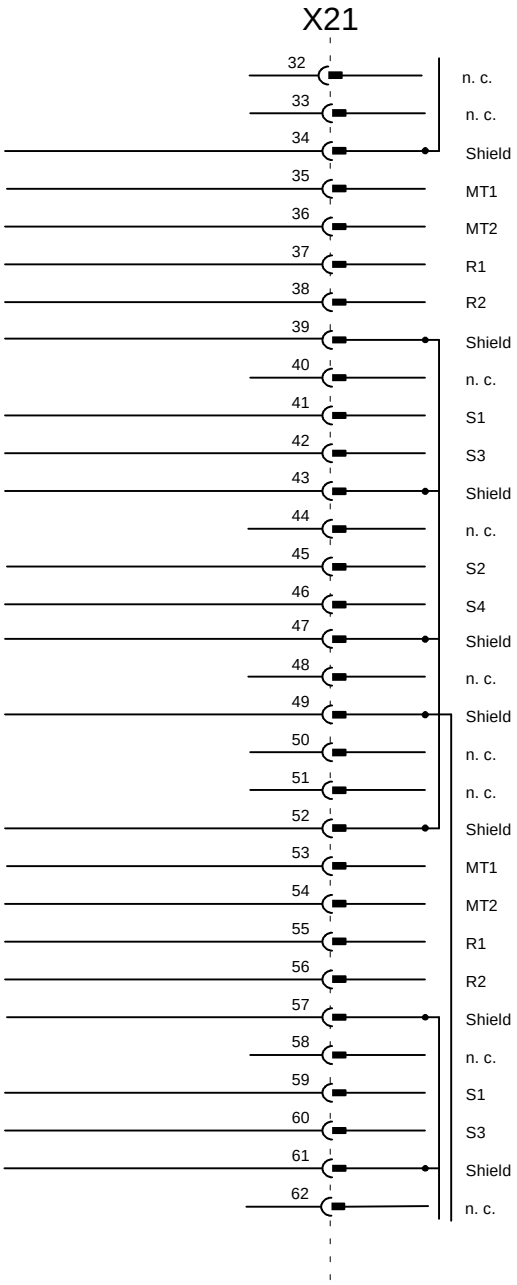


Fig. 12 Data cable connector X21 / part 2

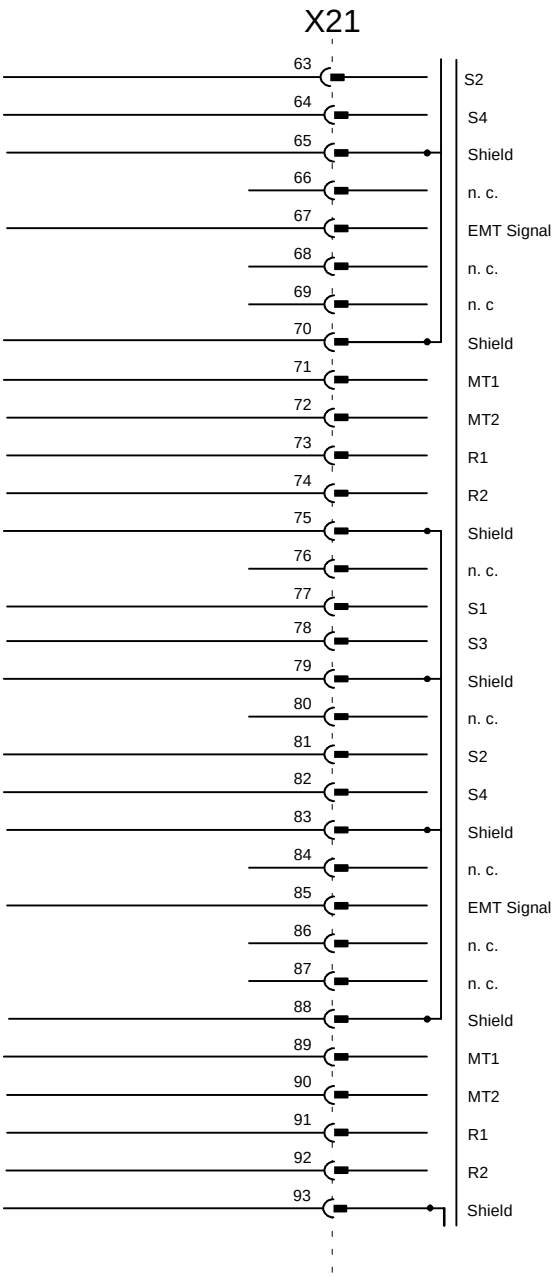


Fig. 13 Data cable connector X21 / part 3

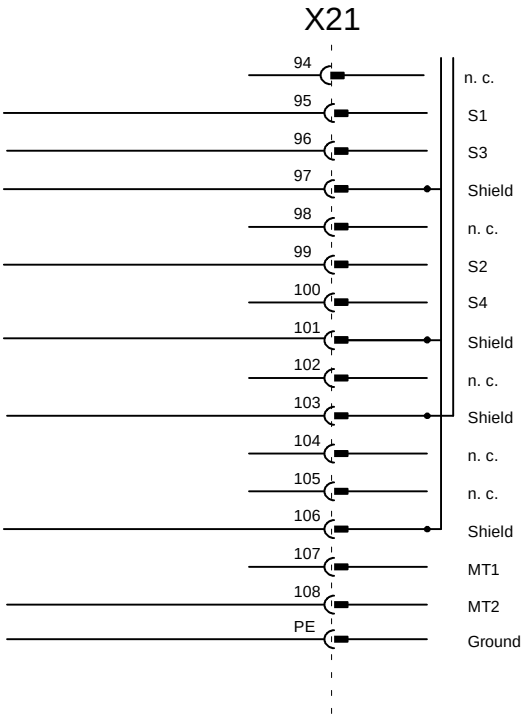


Fig. 14 Data cable connector X21 / part 4

3.9 KCP connector X19

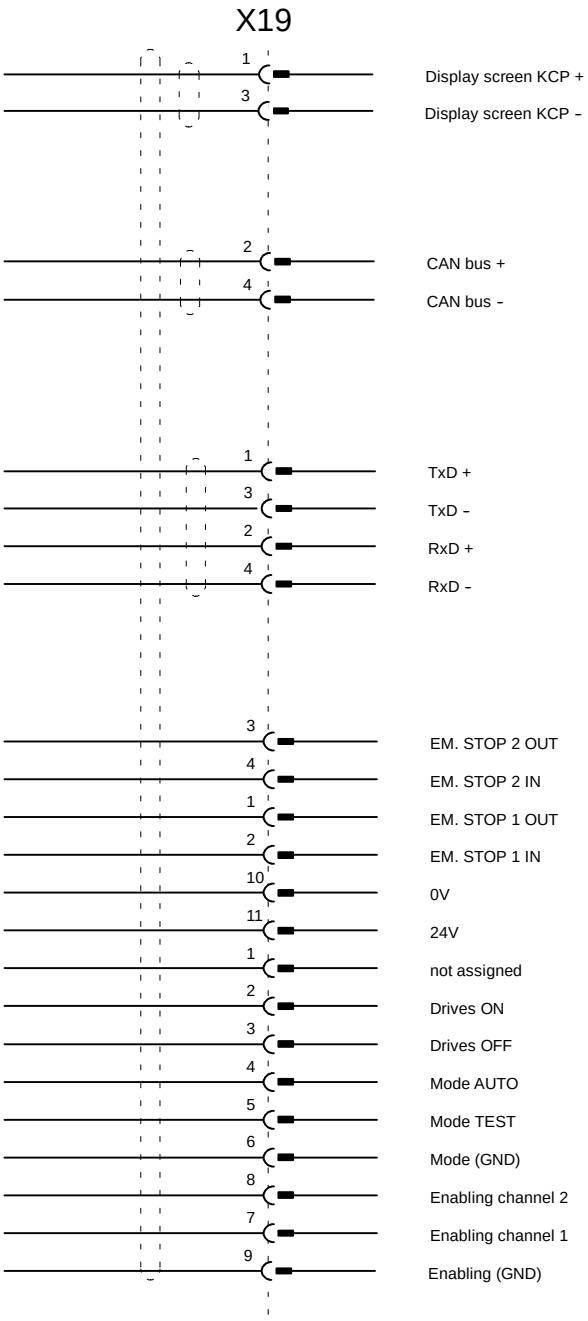


Fig. 15 KCP connector X19

3.10 Jumpers for stand–alone operation X11

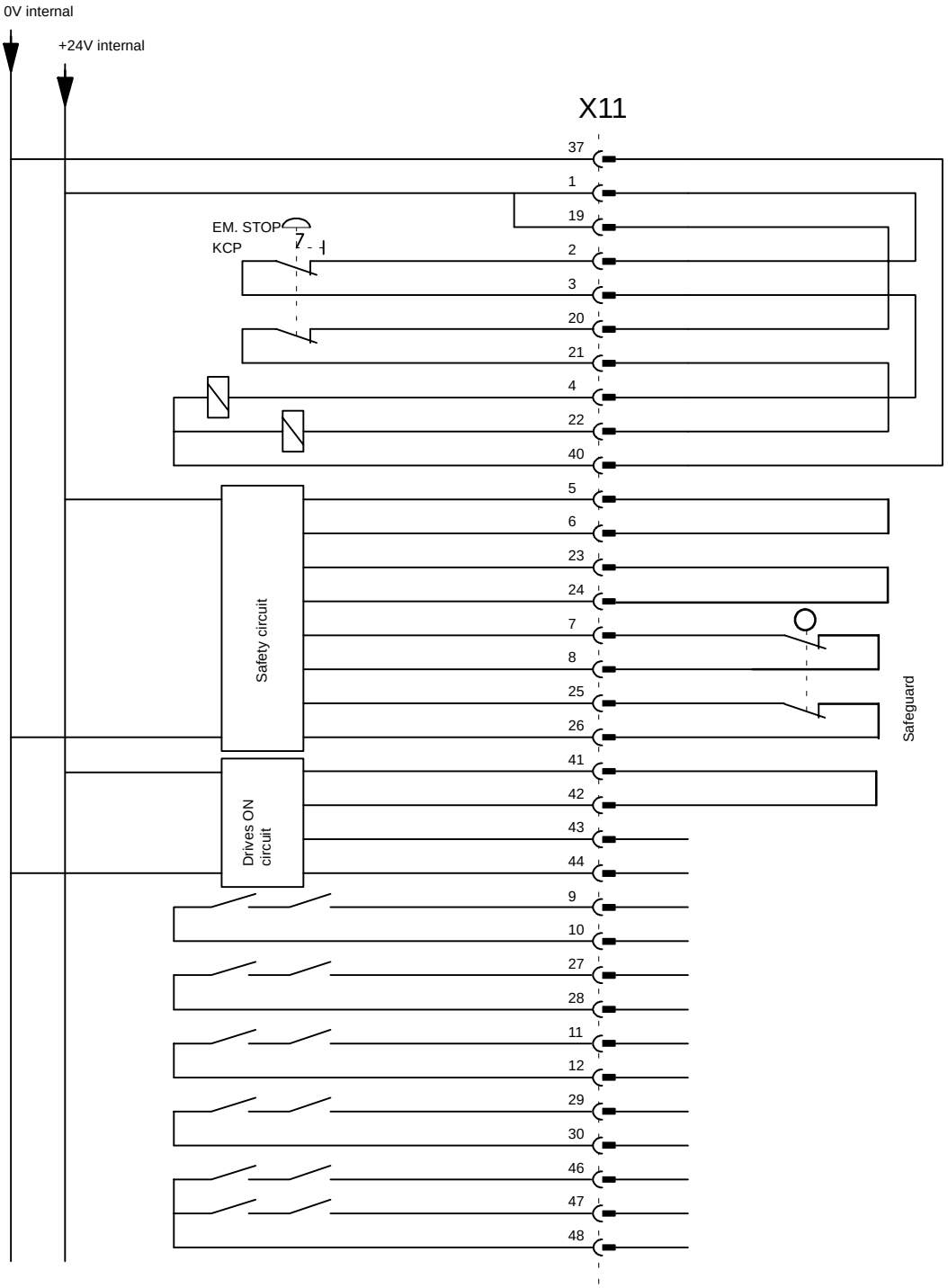


Fig. 16 Jumpers for stand–alone operation X11

4 Putting the control cabinet into operation

4.1 Operator control elements on the KUKA Control Panel

The KUKA Control Panel (KCP) is used for teaching and operating the robot controller KR C1A. The keyboard and status data are transferred via a standard CAN bus to the PC. The display information is transferred serially via a separate high-speed interface.

The KCP features an 8-inch full-graphics color display (VGA resolution 640x480), a membrane keyboard, a 6D mouse and the control elements EMERGENCY STOP, Drives ON/OFF, mode selector switch and enabling switches.

It is also possible to connect an MF II keyboard to the KCP via a DIN connector on the back of the KCP.

The Ethernet connection allows data to be archived on a PC.

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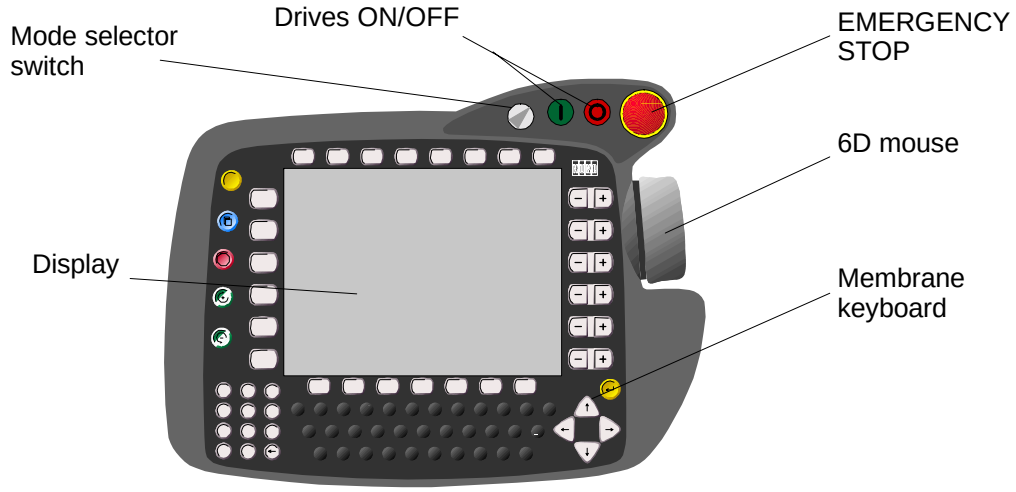
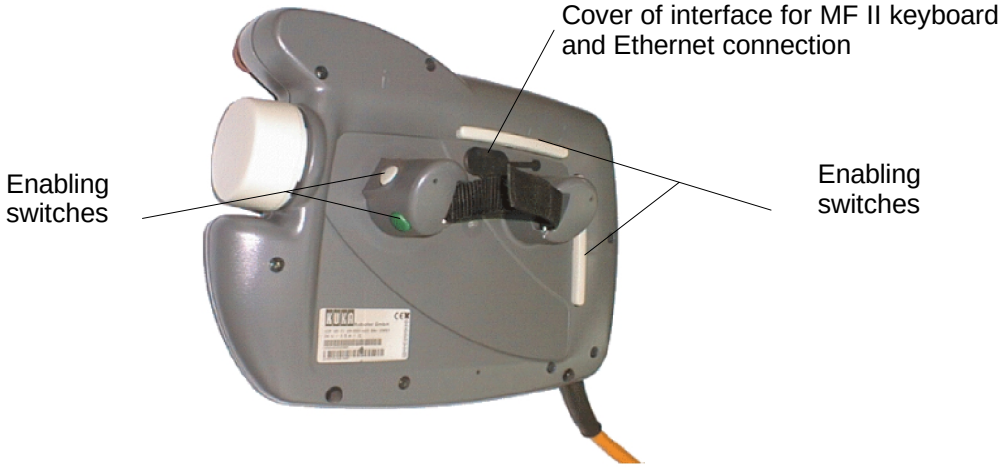


Front view of KCP



Rear view of KCP

The Windows environment guides the user through all the necessary procedures:

- Start-up of the robot controller
- Programming
- Program test and correction
- Program control (start, stop)
- Visualization and diagnostics during production

The following displays are possible on the screen:

- Application programs, program status
- Interrupt, override
- Program display, motion display
- Actual value display, following error display
- Online correction, mastering display
- Robot position, traversing mode
- Interface signals, messages
- Logbook
- Help display

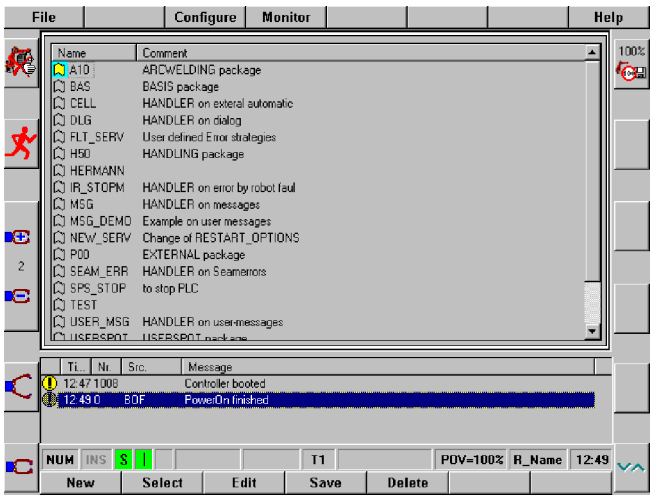
4.2 Switching on the control cabinet

Before switching on the controller, make sure that nobody is present within the working range of the robot. The mushroom-head EMERGENCY STOP button on the KCP should be pressed.

After you have correctly installed and connected your robot system, you can start it up for the first time.

Turn on the main switch of your control cabinet. The computer integrated into the control cabinet begins to load the programs and data required for operation from the hard disk. You can follow the run-up phase of the controller on the KCP display. The run-up phase is concluded after approximately 3 minutes and the main menu of the KR C1 A controller is displayed.

As the EMERGENCY STOP button is pressed at this stage (and the EMERGENCY STOP circuits of the periphery may not have been wired up yet), the robot cannot yet be moved. Appropriate messages are displayed on the KCP to inform you of this.



To prepare your system for production, you must wire up the EMERGENCY STOP circuits, master the robot axes and calibrate the tool that is fitted. The relevant information can be found in the following documentation:

Operating Handbook, Control Cabinet (this documentation)

Wiring up the EMERGENCY STOP circuits

- [Connection/Start-up]

Operating Handbook, Start-up

Mastering the robot axes

- [Robot Mastering/Unmastering]

Calibrating the tool

- [Tool Calibration]

4.3 Online documentation

If your documentation is available on CD-ROM, you can have this displayed on the KCP or on a suitably equipped PC and printed out.
The booklet (Safety and Installation Instructions) accompanying the CD-ROM explains how to access the documentation on your CD-ROM.

4.4 Switching off the control cabinet

To switch off, turn the main switch on the control cabinet to the “OFF” position. Shutdown of the control computer as with Windows 95 is not necessary.

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#PGNO_ACKN, 10
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