Installation Manual
Safety Box (Automation Kit)
MV2400 / MP2400

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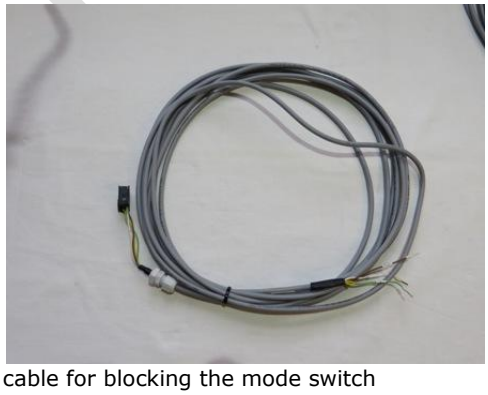
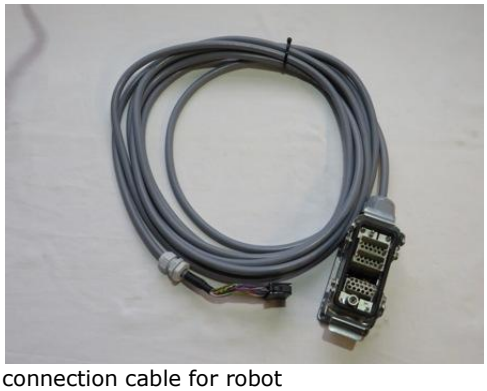
1.1 List of Materials

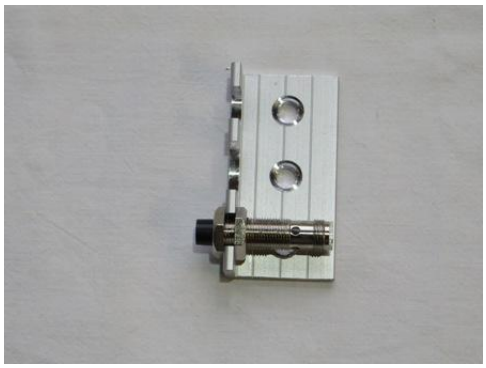

safety box


cable for emergency switch (to robot)


cable for blocking the mode switch

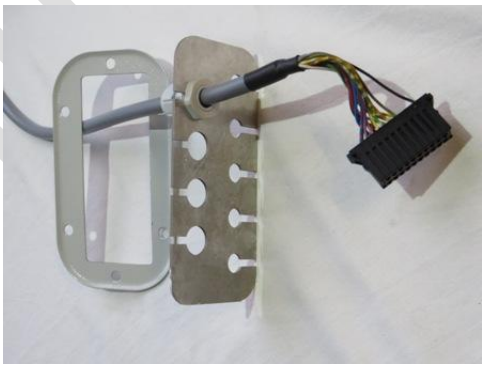

connection cable for robot


cable for emergency from robot


2 peaces of mounting bracket for sensor (short one)
with mounted proximity sensor (without cable)


new emergency switch

hole-punch for emergency switch

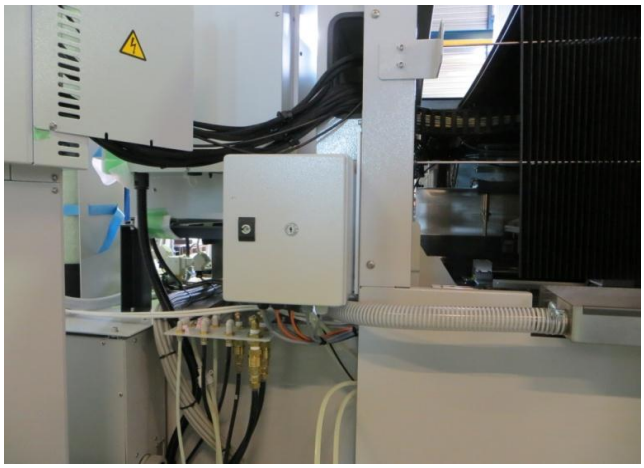

cable entry for safety box

1.2 List of necessary tools

Tools	
Drilling machine	
Driller	3.3mm; 5mm
Tap-drill	M4; M6

2.1 Mounting the Safety Box

The safety box can be installed at the backside of machine or generator.



Example for mounting at machine back-side

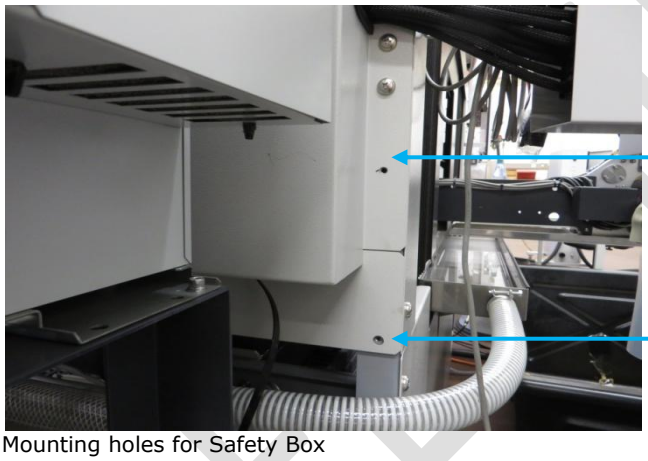
Steps to mount the safety box:

1) Drill a hole 200mm above the existing hole

2) Fix the safety box

This is only an example for a place to mount the safety box.

1) Drill a hole 200mm above the existing hole

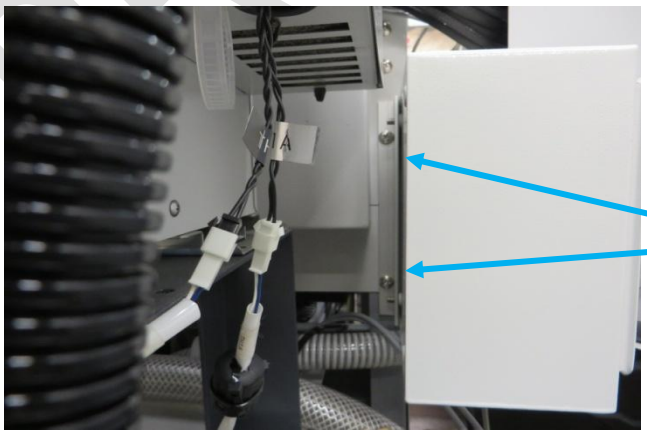


Mounting holes for Safety Box

- Make a second mounting hole with M6-Thread

- Existing hole (M6)

2) Fix the Safety Box



Fix the safety Box with two M6 Screws

- Fix the Safety Box with two M6 Screws

2.2 Mounting the new Emergency Switch

For use with a robot we need an emergency switch with minimum five contacts, so it is necessary to change the original one to the new one which is included in the Kit.

New mounted emergency switch

Steps to mount the new switch:

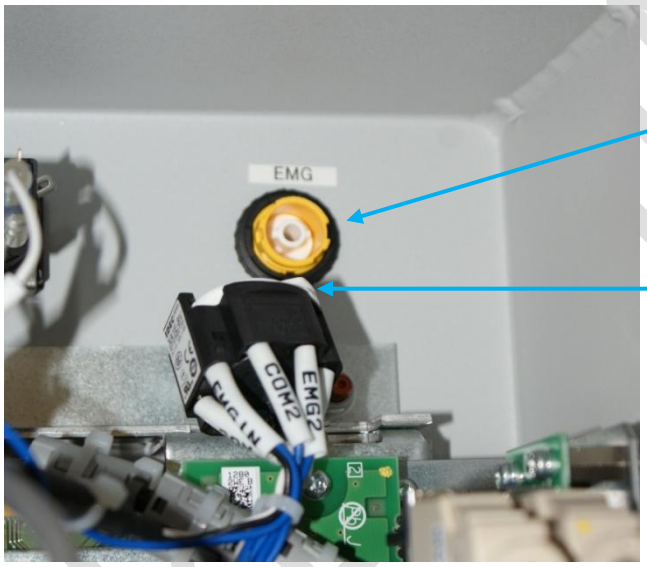
1) Dismount the original emergency switch.

2) Enlarge the hole for the switch with the included manual hole-punch to 22.5mm.

3) Mount the new switch and change the cables to the new switch.

4) Wire the cable to the safety box.

1) Dismount the original emergency switch

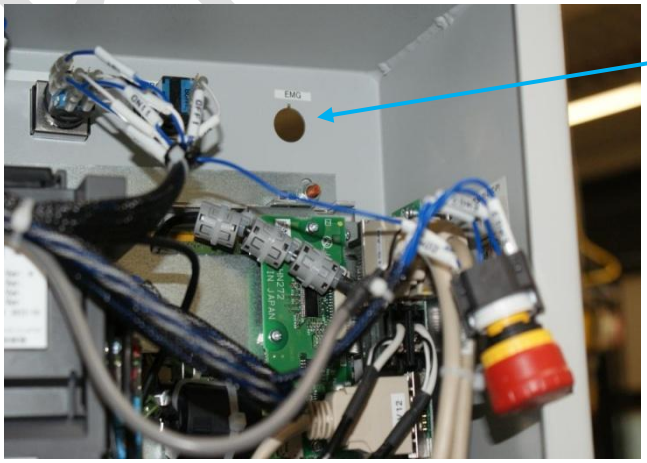


Original emergency switch

2) Turn the ring to dismount

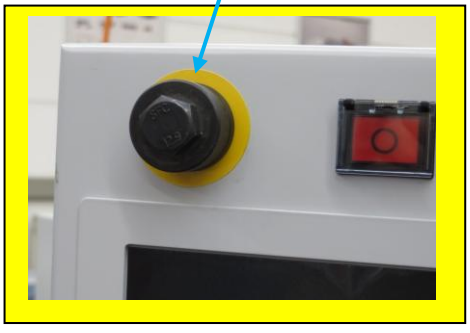
1) Push the white clip and turn the body of the contactblock to take it out.

2) Enlarge the hole



Dismounted original emergency switch

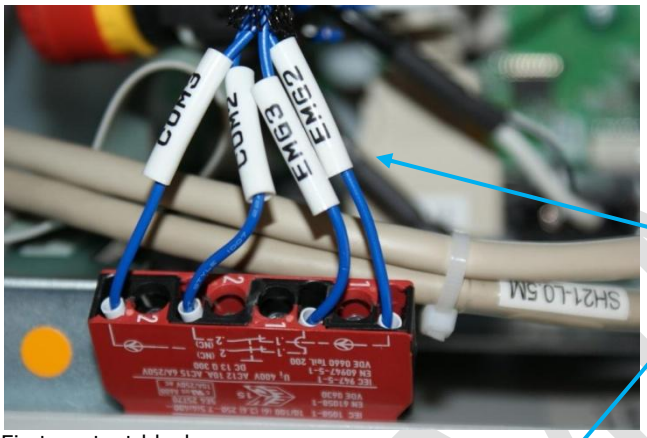
Use the hole punch in this Kit to enlarge the hole to 22.5mm



3) Mount the new emergency switch and change the cables

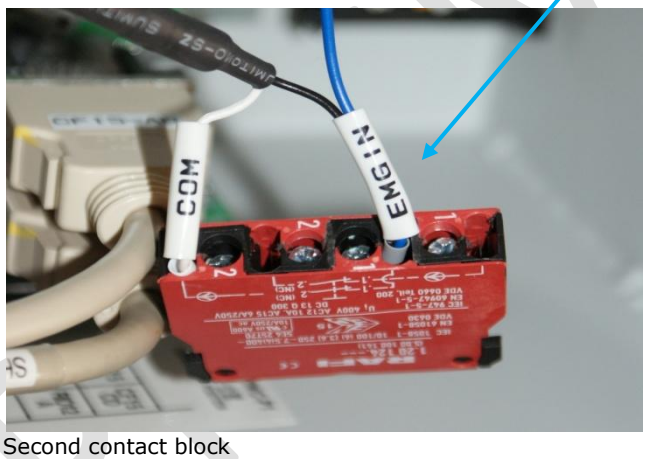
Mounted new emergency switch mounting latch

Mount the new mounting latch for the contact-blocks of the emergency switch

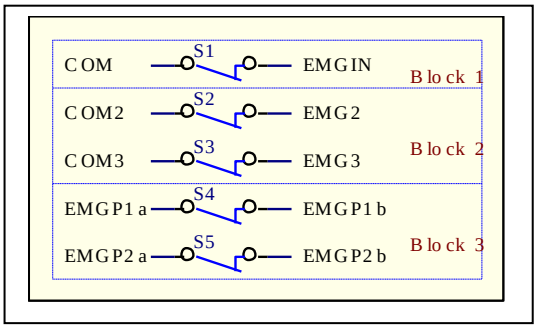


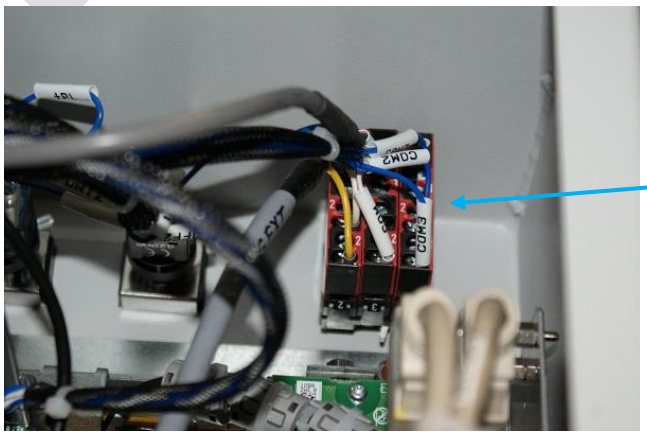
First contact block

Disconnect the cables from the old emergency switch and connect them to the new contact-blocks



Second contact block





All three contact blocks mounted

Mount the contact blocks including the third one in this Kit on the mounting latch

4) Wire the cable to the safety box

Install first the cable for blocking the machine and wire the cable for emergency switch and blocking switch together in Step 2.3 Link

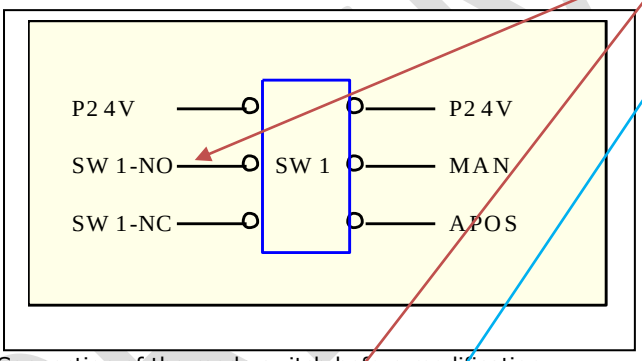
2.3 Mounting the cable for blocking the machine

If the robot will move inside of the machine area (for changing tools), the machine must be blocked in AUTO mode. The safety-box get a message from the robot and block the machine with a contact on the mode switch (MAN-POS-AUTO)

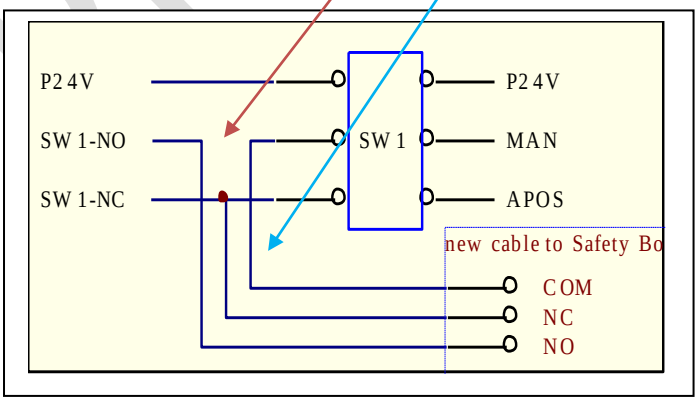
Emergency and mode switch

Steps to mount the machine block cable:

1) Cut the wire SW1-NO to the mode-switch
2) Make the new wiring as shown in the grafik
3) Wire the cable to the safety box.



Connection of the mode switch before modification

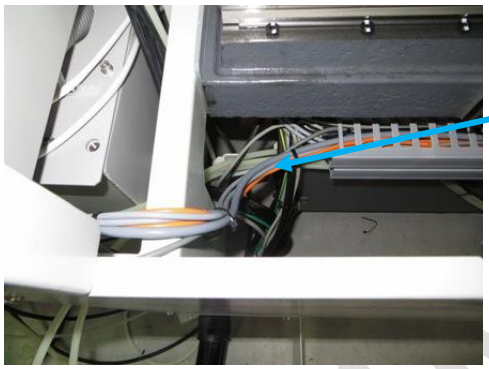


Connection of the mode switch after modification

3) Wire the cables to the safety-box

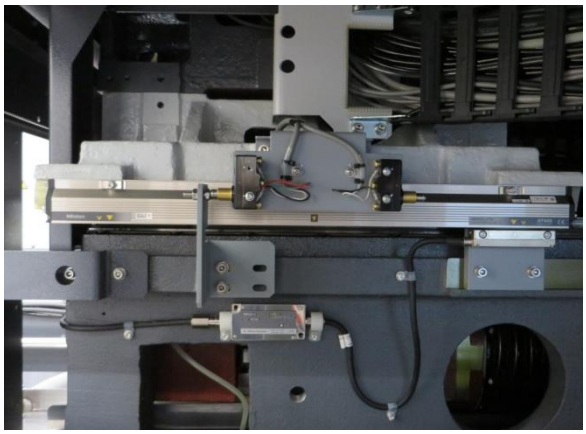
cable guides between machine and tank

cable entry at the MP2400



Wire the cables from the PCNC to the safety-box. Fix the cables with ties.

2.4 Mounting the Proximity Sensor Y-Axes



Steps to mount Y-Sensor

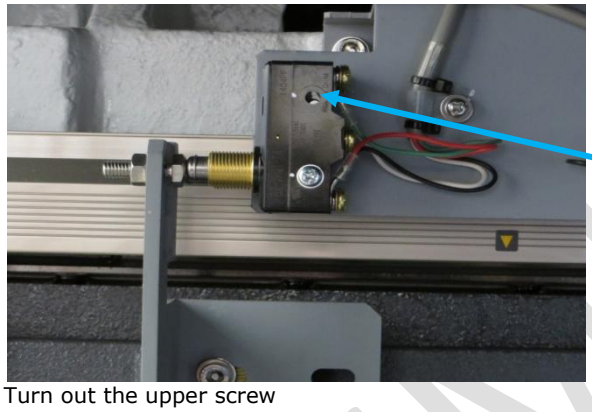
1) Open the cover on left hand side of machine

2) Fix the mounting plate for Y-Sensor

3) Wire the cable to the safety box

4) Adjust the gap between Sensor and metal-plate

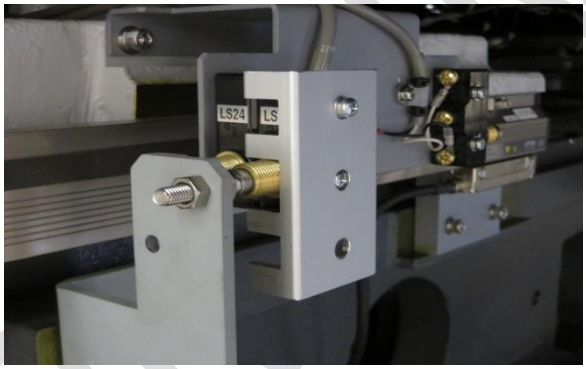
2) Fix the mounting plate for Y-Sensor



Turn out the upper screw

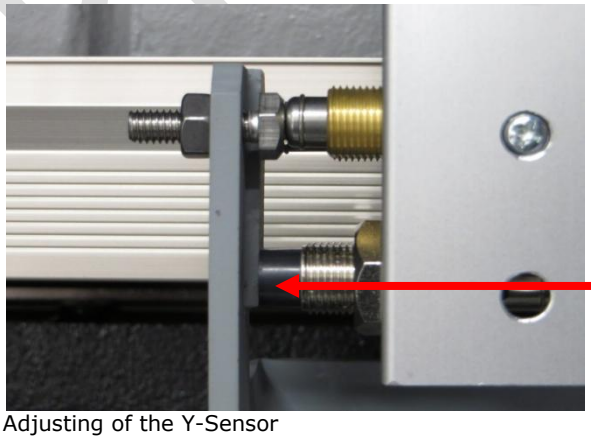
Unlock and take out the upper screw from the near-point switch.

If you turn out only one screw, the position of the switch will not be changed.



Installing the mount bracket

Install the Sensor mount bracket



Adjusting of the Y-Sensor

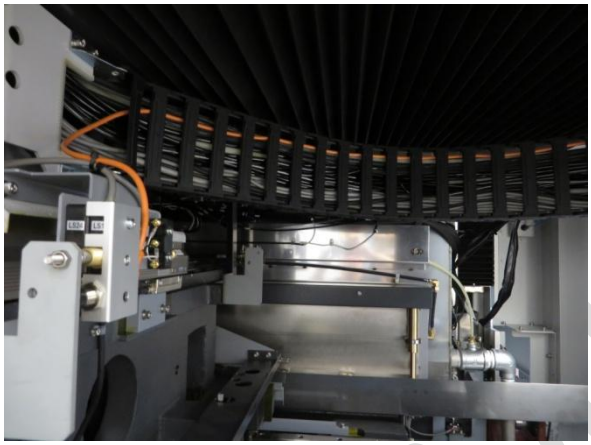
Drive the Y-Axes in +Stroke End and install the Sensor. Please pay attention, that the axes should move in Manual mode without Power. **Set the mode to AUTO or POS !**

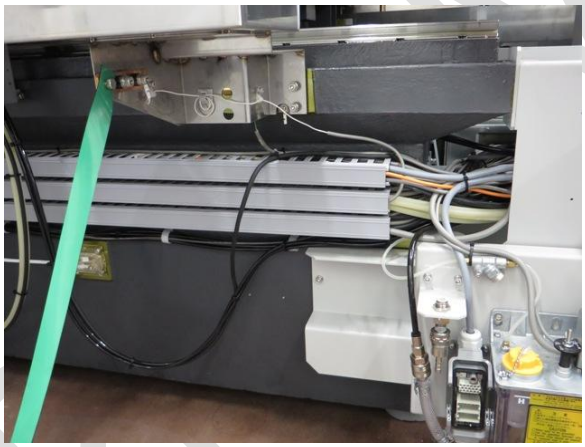
Attention!

The gap to the metal plate must be **3-4mm** or more, so that the machine can move up to the Overrun-switch!

3) Wire the cable to the safety box

Wire the sensor-cable to the safety box


Wire the sensor-cable to the safety box

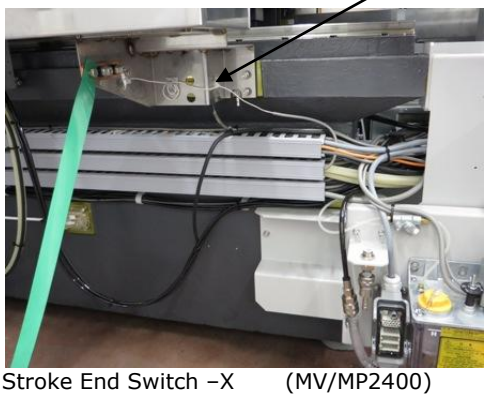

Wire the sensor-cable to the safety box


Wire the sensor-cable to the safety box

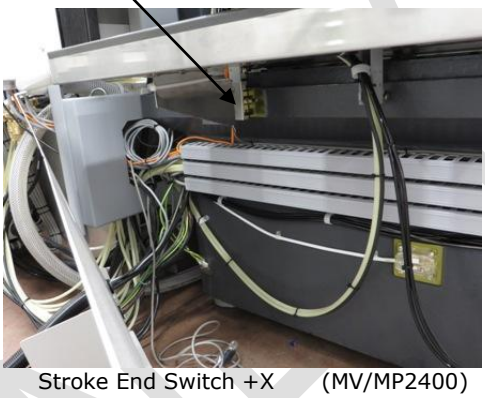
2.5 Mounting the Proximity Sensor X-Axes

Mounting the Sensor for X-Axes is similar to the Y-Axes. For the MV2400 and MP2400 you need to use the larger mounting bracket.

Depending on the change position for the robot you need to install the switch at the -X or +X Stroke End Switch



Stroke End Switch –X (MV/MP2400)



Stroke End Switch +X (MV/MP2400)

2) Fix the mounting plate for X-Sensor

Use the larger mounting bracket, install like the Y-Sensor.

Steps to mount X-Sensor

1) Open the cover on back side of machine

2) Fix the mounting plate for X-Sensor

3) Wire the cable to the safety box

4) Adjust the gap between Sensor and metal-plate

Adjusting the X-Sensor (View from below)

Example for installing at +X side:

Drive the X-Axes in +Stroke End and install the Sensor. Please pay attention, that the axes should move in Manual mode without Power. **Set the mode to AUTO or POS !**

Attention!

The gap to the metal plate must be 3-4mm or more, so that the machine can move up to the Overrun-switch!

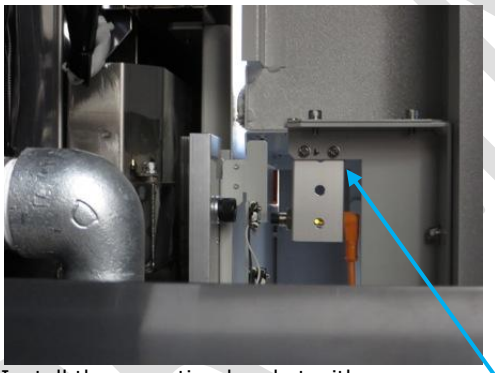
3) Wire the cable to the safety box

2.6 Mounting the Proximity Sensor for Frontdoor (Option)

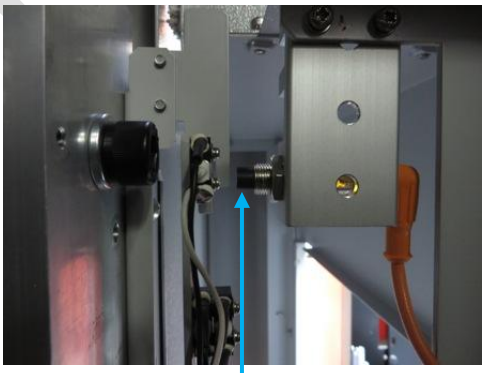
If it is necessary to monitor the state of the front door, install a third sensor. Here is an example to do this:

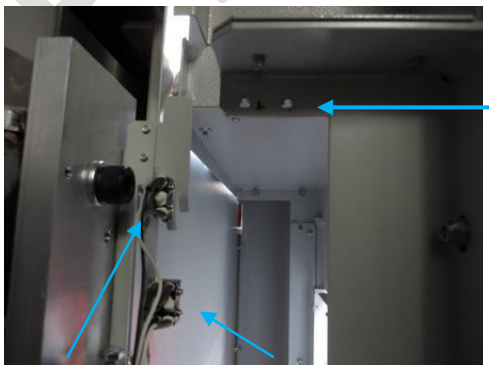
MP2400:

In MP2400, the sensor can be placed at the left hand side of machine where the stroke-end switches for the moveable tank are placed:



Install the mounting bracket with sensor





door switches at left hand side of machine

Steps to mount the door sensor:

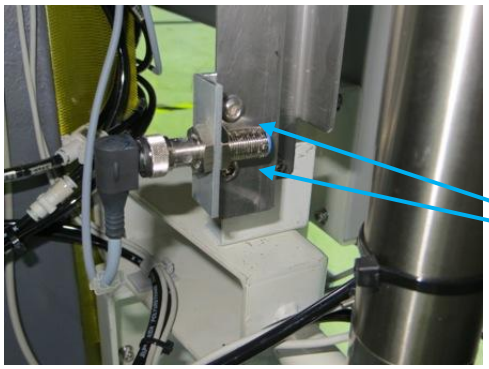
1) Make two holes with a thread inside (M4) to install the mounting bracket for a proximity sensor

2) Move the watertank to the lowest position (0) and adjust the sensor around 3mm from the metal-plate

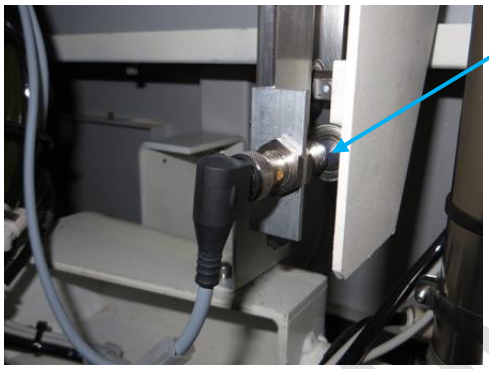
3) Lay the cable to the safety box

MV2400:

In MV2400, the sensor can be placed at the left hand side of the machine close to the pneumatic zylinder for the door: Here an example:



closed front door



opened front door , the ball bearing is the conductor for the proximity sensor

Steps to mount the door sensor:

1) Make two holes to install the mounting bracket for a proximity sensor

2) Move the front door to the lowest position (0) and adjust the sensor around 3mm from the ball bearing

3) Lay the cable to the safety box

3) Lay the cable to the safety box

> See Sensor X/Y

2.7 Mounting the Harting Connector to Robot

Install the connector for robot in a place of your choice. Here some examples:

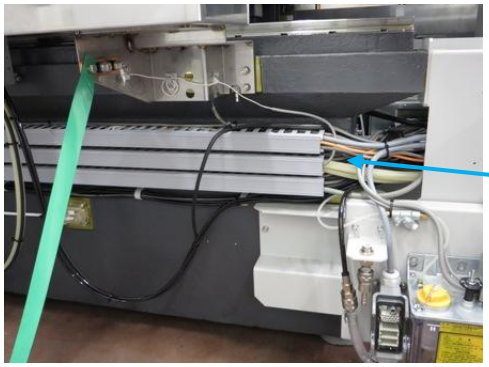
MP2400:

Harting connector on MP2400 (back side of machine)

Steps to mount the Harting connector:

1) Make four holes to install the connector

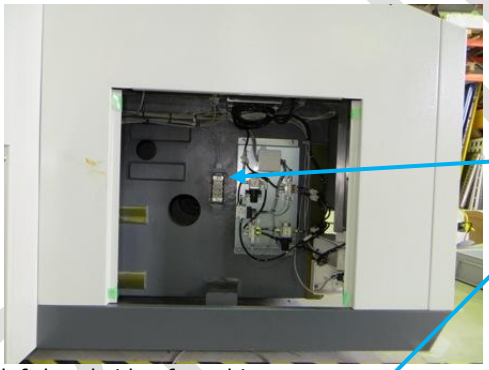
2) Lay the cable to the safety box



Back side of machine

Lay the cables in the cable duct

MV2400:



left hand side of machine

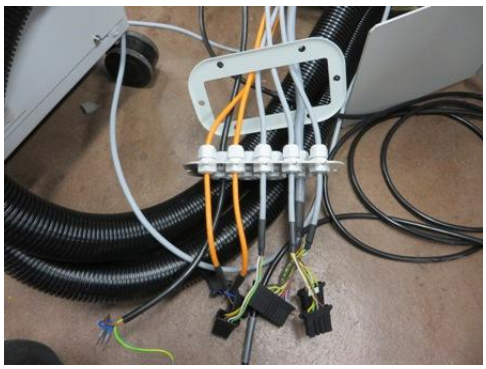
Steps to mount the Harting connector:

1) Make four holes to install the connector

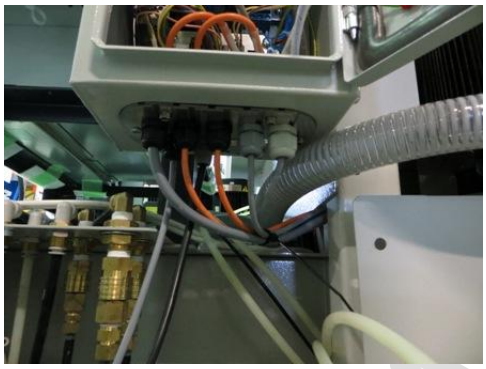
2) Lay the cable to the safety box

2.8 Connect all parts with the safety box

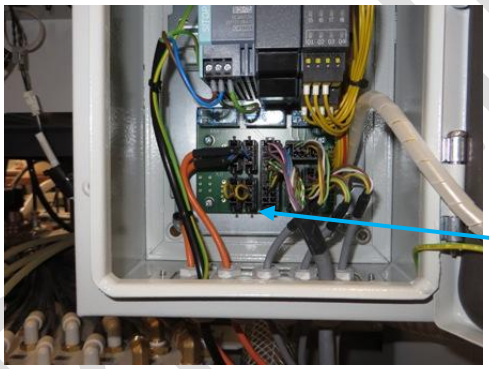
Now lay all cables through the cable entry for the safety box and connect them.



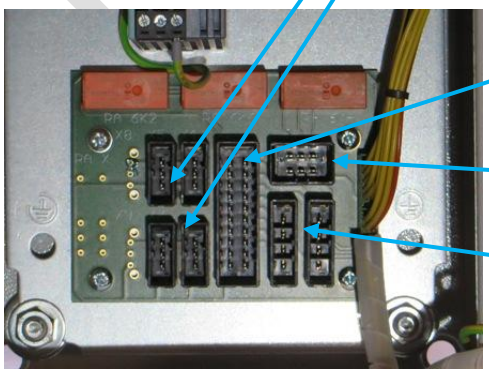
1) cable entry



2) mounted cable entry



3) connected cables



PCB inside of safety box

Steps to connect all cables to the safety box:

1) Lay all cables, including power and emergency cable (connected later) to the safety box and guide it through the cable entry

2) Mount the cable entry with 6 screws

3) Connect the cables on the PCB

Please plug in a dummy connector in unused inputs for proximity sensors

4 connectors for proximity sensors

Connector for Robot (Harting)

Connector for blocking machine

2 Connectors for emergency in / out

2.9 Connect the safety box to power and emergency

The safety box needs 100-220V AC Power supply. It is easy to lay the power cord cable together with the emergency cable through the cable hose between generator and machine.

cable hose between generator and machine

Steps to connect the power supply:

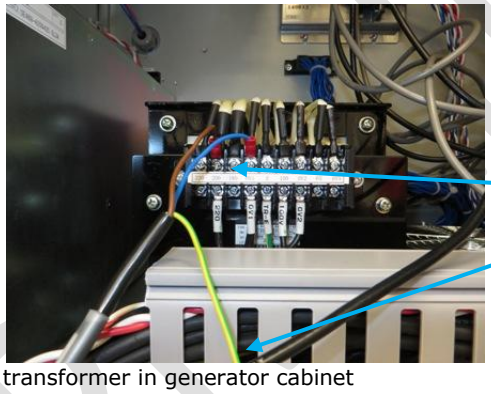
1) Lay the two cables (power and emergency) through the cable hose to the generator

2) Connect the power to the transformer

3) Connect the emergency cable

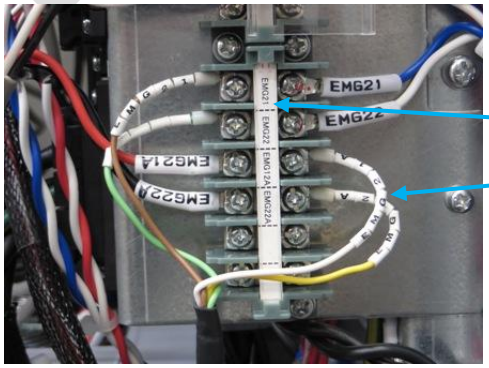
dismounted cable hose

Route the cables through the hose



transformer in generator cabinet

Connect the power cable to the transformer in the left side of generator cabinet (200V + 0VS) and of course don't forget the ground cable !



emergency connection

1) Reconnect the EMG21 + EMG22 to EMG21A + EMG22A

2) Connect the new emergency cable

3.0 Testing the installation

To test the installation switch on the machine.

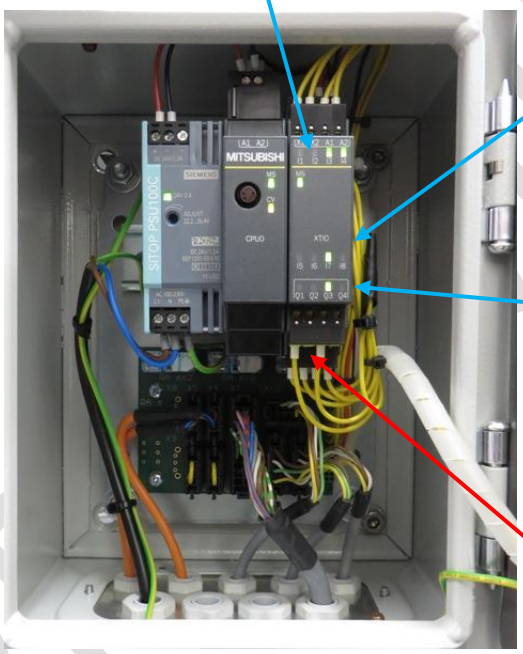
If the robot is not connected, it is necessary to short the emergency input line in the Harting connector to the robot ! See electrical diagram for detailed informations.

Setting the key switch in front of the safety box is disabling the blocking of the AUTO mode! Use it only in test-mode without robot !

Detailed explanation of inputs and outputs of the safety relais:

Input signals:

I1 = Sensor X I2 = Sensor Y
I3 = Door 1 I4 = Ext (reserve)



safety box

Input signals:

I5 = Enable signal from robot
I6 = Spare
I7 = Key switch in front of safety box for disabling blocking AUTO mode
I8 = Spare

Output signals:

Q1 = Enable signal to robot (active high)
Q2 =
Q3= Enable signal for machine blocking
Q4 =

ONLY FOR OLDER VERSIONS:
Disconnect the cable to Input 6 if you are using a robot with potential free contacts

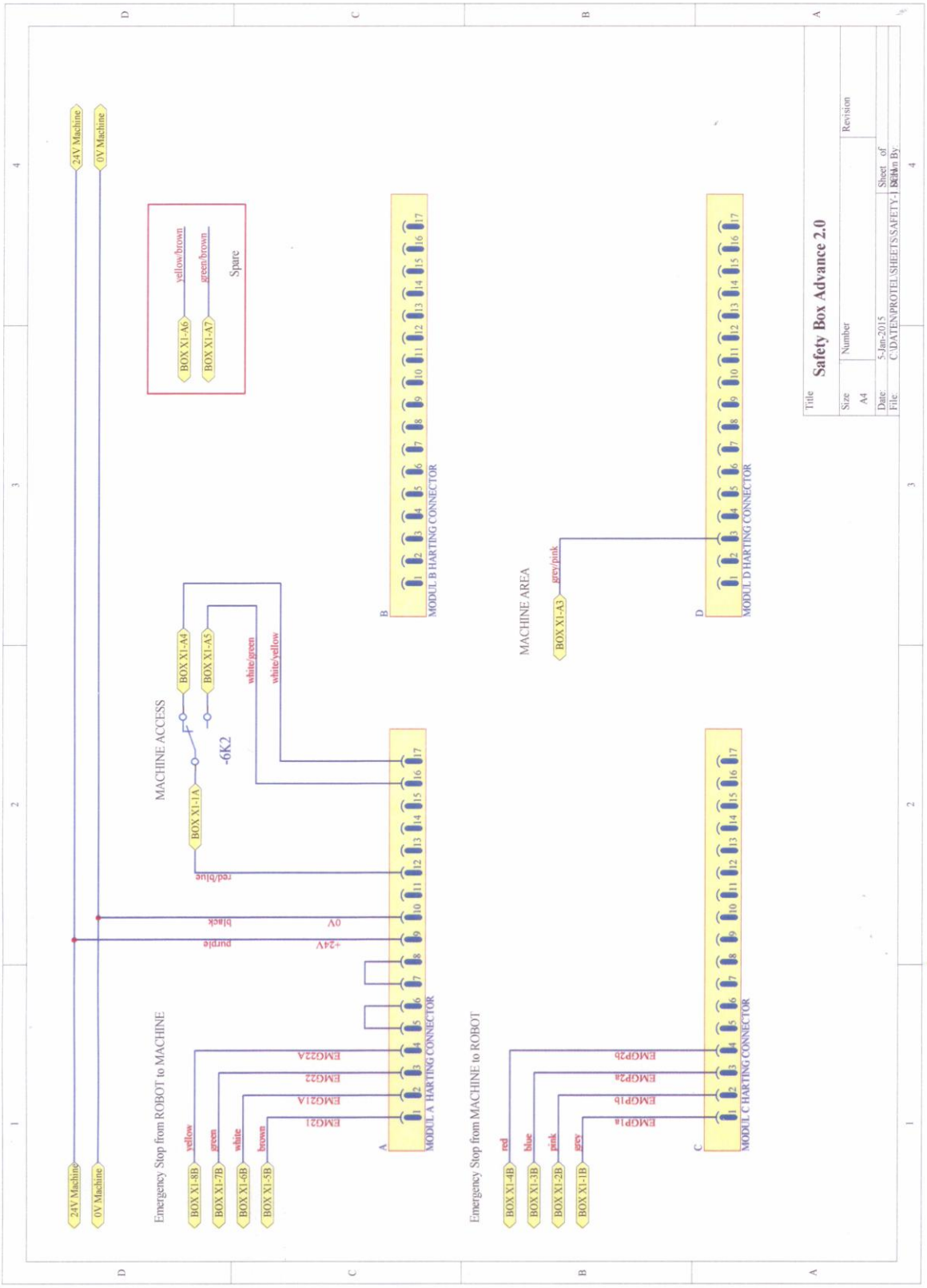
(Already disconnected and isolated in the picture)

- Enable signal to robot (Q1) is after 3sec high, when I1 – I4 = 1
- Enable signal from robot (I5) = 0 is blocking the machine in AUTO mode Turn the key switch to disable this function for testing
- Driving the machine in the robot change position (I1-I4 = 1) will enable the robot to drive inside of machine area.

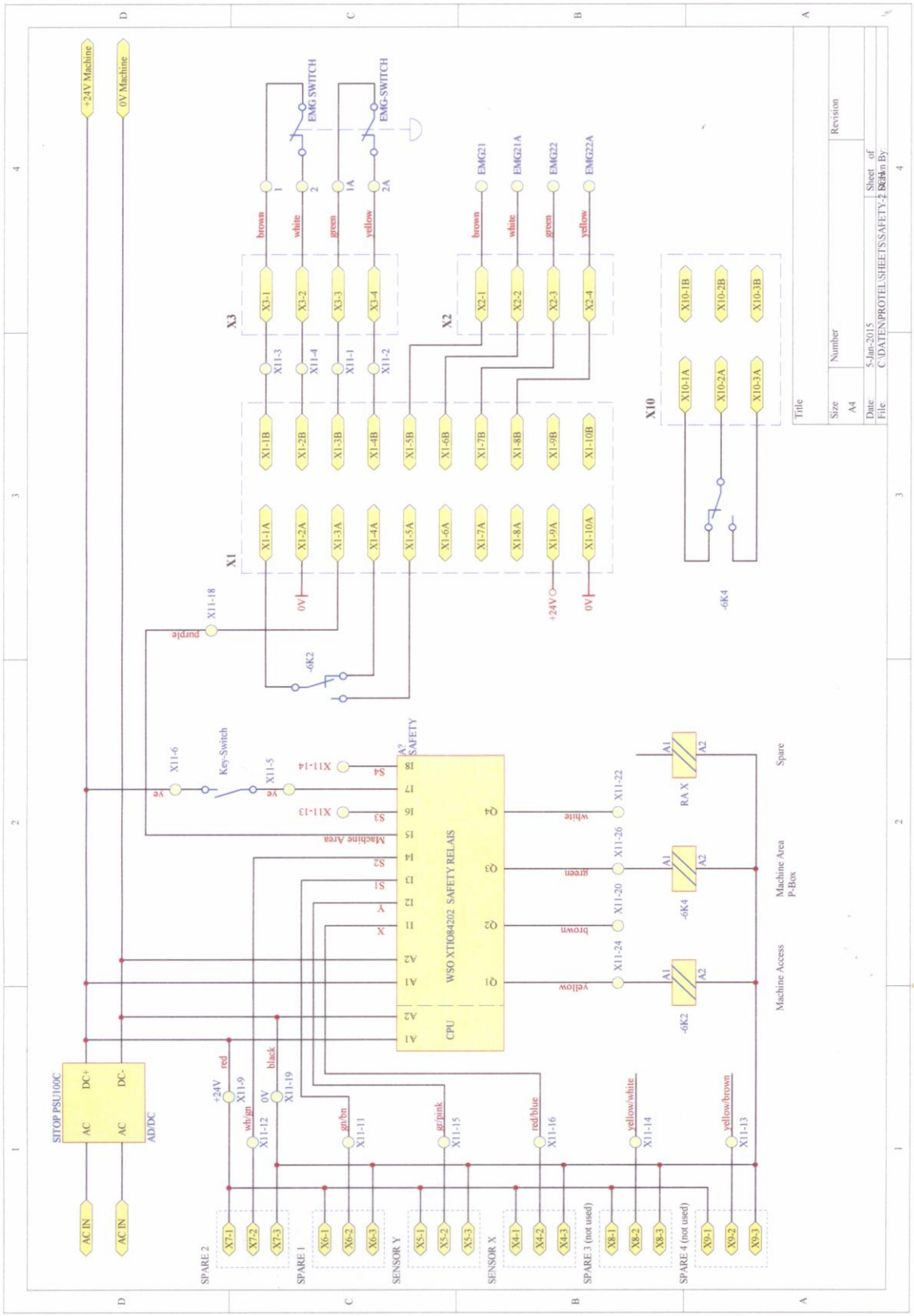
For more informations see the electrical diagram

4.1 Electrical Drawings

Harting Connector



Safety Box


+24V Machine
0V Machine
EMG-SWITCH
EMG-SWITCH
X3
X2
X10
X1
brown
white
green
yellow
EMG21
EMG21A
EMG22
EMG22A
X3-1
X3-2
X3-3
X3-4
X2-1
X2-2
X2-3
X2-4
X10-1B
X10-2B
X10-3B
X10-1A
X10-2A
X10-3A
X11-3
X11-4
X11-1
X11-2
X1-1B
X1-2B
X1-3B
X1-4B
X1-5B
X1-6B
X1-7B
X1-8B
X1-9B
X1-10B
X1-1A
X1-2A
X1-3A
X1-4A
X1-5A
X1-6A
X1-7A
X1-8A
X1-9A
X1-10A
0V
+24V
-6K4
-6K2
X11-18
purple
Key-Switch
X11-6
X11-5
X11-14
X11-13
SAFETY
WSO XTIO84202 SAFETY RELAIS
CPU
Machine Area
Q4
Q3
Q2
Q1
X11-22
X11-26
X11-20
X11-24
white
green
brown
yellow
RA X
Spare
Machine Area
P-Box
Machine Access
SITOP PSU100C
DC+
DC-
AC
AC
AD/DC
AC IN
AC IN
+24V
0V
red
black
X11-9
X11-19
wh/gn
X11-12
gn/bn
X11-11
gr/pink
X11-15
red/blue
X11-16
yellow/white
X11-14
yellow/brown
X11-13
SPARE 2
SPARE 1
SENSOR Y
SENSOR X
SPARE 3 (not used)
SPARE 4 (not used)
X7-1
X7-2
X7-3
X6-1
X6-2
X6-3
X5-1
X5-2
X5-3
X4-1
X4-2
X4-3
X8-1
X8-2
X8-3
X9-1
X9-2
X9-3
Title
Size
A4
Number
Revision
Date
5-Jan-2015
Sheet of
File
C:\DATEN\PROTEL\SHEETS\SAFETY-2.SchDoc
Drawn By