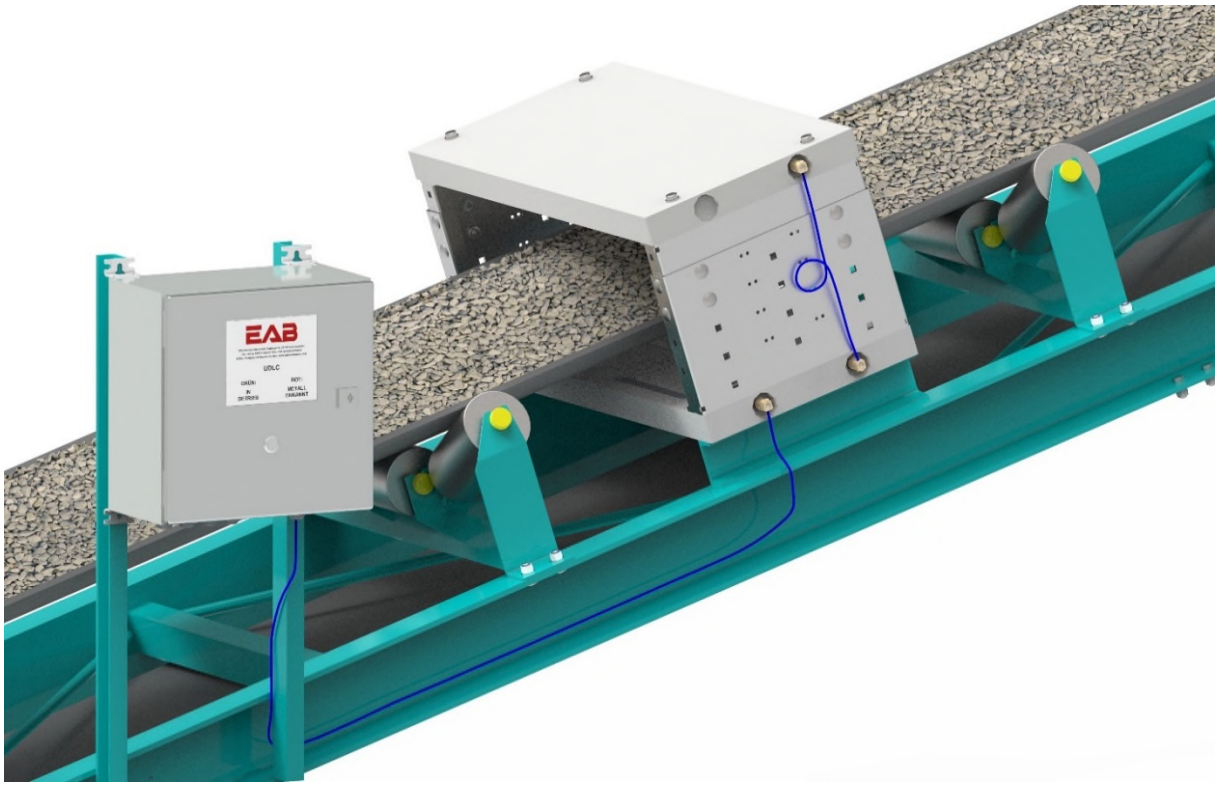
METAL
Detector

Model: UDLC-Q



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Warning! Before working on the device, switch off the mains and control voltage!

Important steps to prevent electrical interferences

1. **Never** weld on your conveyor without disconnecting the coaxial cable from the probe to the control box, otherwise damage to probes can occur.

2. **Never** install your metal detector probes within six (6) feet of magnets or electric motors.

3. Minimum distance between idler rollers and the middle of the probe is 16 inches.

4. Two idlers before and 2 idlers after the metal detector **must** be tack welded to the conveyor frame on both sides of the conveyor.

5. Distance between the bottom probe and the belt must be at least 2 inches.

6. Remove any cross member supports from directly under the probes.

7. Remove any return rollers from under the probes.

8. Any structural iron used for mounting the probes **must** be welded to the frame.

9. All diagonal and cross beams within 6 feet of the probes **must** be welded at the bolted joints.

10. Conveyor covers over the material belt or between belts **must** be removed or changed to non-metallic material in an area of 40 inches before to 40 inches after the probe. Metal structural supports are allowed but they must be welded.

    Any metal side boards should be removed a minimum of 3 feet each direction from the probes. If necessary, use non-metallic side boards.

11. You **cannot** coil excess coaxial cable going from the control box to the probe. Either mount the control box at the end of the coaxial distance or run the cable down and back the frame inside the conduit parallel.

12. Route your coaxial cable between the control box and probe inside metal conduit to prevent interference.

13. **Never** route your coaxial cable inside the metal conduit along with power cables of any voltage.

14. Route your earth ground wire inside the metal conduit with your coaxial cable and ground the wire to the conveyor frame near the probes.

15. After you have balanced the electronics with the probes using R5 as instructed, follow the instructions below.

16. Before starting up the conveyor, set your primary sensitivity to 10. Take a wooden 2 x 4 or rubber/plastic hammer and tap around on the structure of the conveyor frame, supports and idlers and idler cans to make sure the metal detector is stable and no disturbance is taking place. Fix any issues.

1 General

The Q-System metal detectors have been developed for use in conveyor systems in a wide variety of industrial sectors.

Wherever metal parts in the conveyed goods endanger sensitive machines, or where quality assurance does not allow any metal content, the metal detectors ensure problem-free production processes. Crushers, impact crushers, mixers and presses are protected from costly damage.

All types of metal are recorded, including aluminium, copper, brass, stainless steel and soft iron.

Material with metal oxide inclusions, e.g. B. basalt, magnetite, magnesite, hematite and blast furnace slag. These materials can be easily monitored with the metal detectors described here.

Both device versions can also be retrofitted without converting the existing conveyor belt.

These instructions describe the use of metal detectors in conveyor systems.

1.1 Structure

The metal detector is supplied with a control unit and a tandem probe TA (tandem system) to match the belt width.

The control unit contains the electronic assemblies. The controls are clearly arranged on the front panel and are accessible after opening the front door.

1.2.1 Tandem device

The tandem device consists of the control unit and two probe, one of which is mounted under the belt and the other with the help of two spacers above the belt (see Fig. 2).

The tandem probe is characterized by a uniform sensitivity in the area between the probe plates and is used for large layer heights.

1.3 Function

The functional principle of the Q-System is that a generator in the control unit builds up an electromagnetic field around a copper coil in the probe. If a metal part, steel or non-ferrous metal, moves over the probe, the electromagnetic field is influenced in such a way that the control unit recognizes it and generates standard-compliant output signals through signal evaluation.

The following additional technical features are available:

- 2 impulse relay outputs (NO/NC)
- 2 resettable relay outputs (NO/NC)
- Fault message with a relay output (NO/NC)
- Integrated 2-color illuminated pushbutton (green -> no fault, red -> metal, button -> RESET)
- A bar graph display to indicate all important signals
- large adjustable sensitivity range
- Adjustable interference filter for increased operational reliability
- Function control button for simulating a metal part in the conveyor belt

2 Selection of the installation location

2.1 Probe

The installation location of the probe on a rubber conveyor belt in front of the machine to be protected is to be selected based on the following aspects:

1. At the installation site, the conveyor construction must be stable and the idlers must be at least twice the probe width apart.
2. If the conveyor belt is to stop when a metal message is detected, it must be accessible behind the probe after the expected belt overrun distance for reading out the metal part.
3. The minimum distance from the probe to electric motors and large moving metal parts is 1.5 m and is sufficient in most cases.

When installing the probe, the installation instructions must be strictly observed.

2.2 Control Unit

Install the control unit near the probe, for example in the control room of the conveyor system or in an outdoor location that is protected from direct sunlight and rain. The coaxial cable supplied as standard is 10 m long (33 feet). Larger lengths available on request.

3.2 Assembly of the tandem probe

It must be ensured that the serial numbers of the probe and control unit match the serial numbers on the associated delivery note.

The assembly is carried out according to Fig. 1 or Fig. 2:

- Fasten the probe in the middle between two idlers below and above the conveyor belt.
- Have the grouting pattern face each other.
- To fasten the probe, brackets must be welded to the support beams of the conveyor belt construction according to the sketches. It is important that the probe is firmly connected to the conveyor belt construction and cannot move relative to the surrounding metal construction.
- The distance of approx. 50 mm between the lower probe and the underside of the loaded belt must be observed unless otherwise stated in the specification.
- Mount the spacer with connection cable on the side of the probe connection sockets. Screw the connection cable into the associated sockets of the probes and tighten with full manual force, but without tools. (max. 5Nm). The height of the spacers should be chosen so that the distance between the upper probe and the material layer is not less than 50 mm and not more than 100 mm. It is true that the greater the distance between the probes, the lower the sensitivity in the middle of the tunnel.

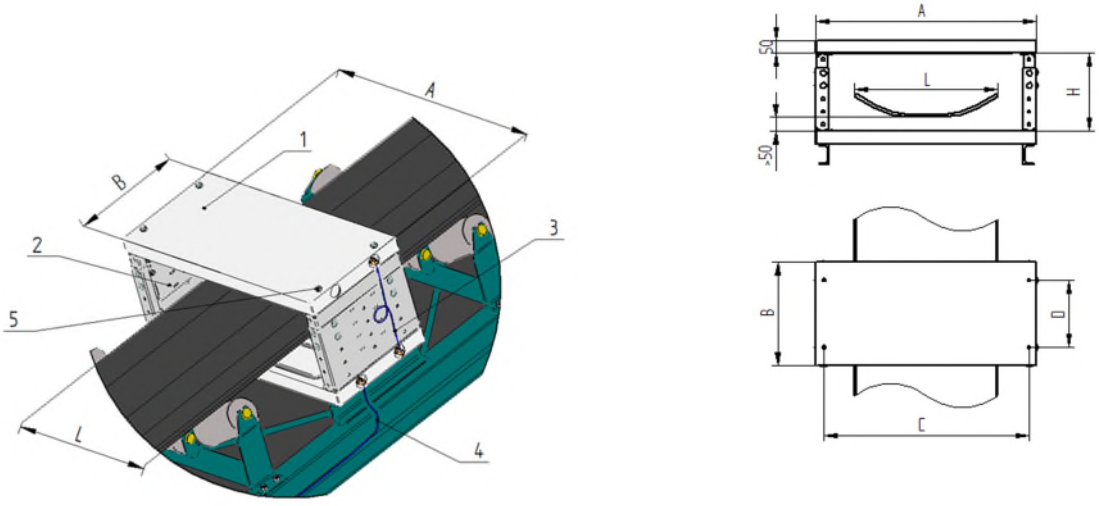


Fig.3 Installation of the tandem probe on the conveyor

1. Probes: single probe (1 coaxial socket) and extension probe (2 coaxial sockets);
2. 1 pair of spacers, adjustable in height; (4 variants, see table)
3. Connection cable 1m long for connecting the two probes to each other;
4. Coaxial cable 10 m long for electrical connection to a control unit; (5, 15, 20, 25 and 30 m available)

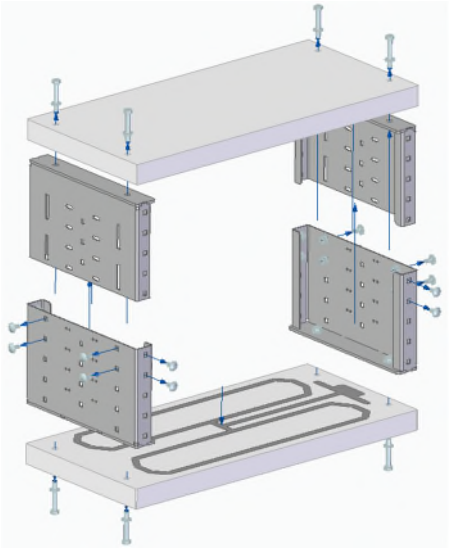


Fig. 4 The structure of the tandem system

3.3 Installation of the control unit

Install the control unit near the probe. Installation directly next to or below the probe is not permitted.

Use the wall bracket on the control unit housing for installation. The control unit is to be fastened with screws to a wall or to a part of the structure that is as vibration-free as possible. In the case of vibrating constructions, the control unit must be installed with little vibration, otherwise the expected service life of the electronics is significantly shorter.

The coaxial cable supplied as standard is 10 m (33 feet) long. Longer coaxial cables can be supplied on re-quest.

4 Fault-clearing of the installation site

It is very important to carefully clear all faults at the installation site so that the metal detector reliably achieves the required sensitivity even under production conditions and false alarms are avoided. The most important interference suppression measures are shown in Figs. 5 to 9.

- Stiffen swaying or sagging bands at the installation site of the probe.
- Remove cover plates, metal roofs and lateral chutes in the area of the probe, i.e. between the adjacent idler stations, or replace them with wood or plastic.
- Also remove the return rollers in the area of the probe.
- Weld the edges of the adjoining cover plates to the carrying beam on both sides if they protrude into the area of the probe.
- Store the carrying rollers adjacent to the probe in plastic bushings (Fig. 5). If there are no high demands on the sensitivity of the metal detector or if no plastic bushings can be used, then short-circuit brackets are to be used to suppress interference from the support rollers (Fig. 6 and 7).
- **Weld the adjacent idlers to both supporting beams, even if a screw connection is already pre-sent. A short weld seam of approx. 25 mm is sufficient for already screwed connections. Never weld with coaxial cables connected to probes or controls**
- Additionally weld all screw and rivet connections within a radius of 2 m from the probe with short weld seams.

Note: Screw and rivet connections are unsafe contacts for electrical currents, which experience has shown to cause faults in the vicinity of the probe. An additional welded connection creates an effective remedy here.

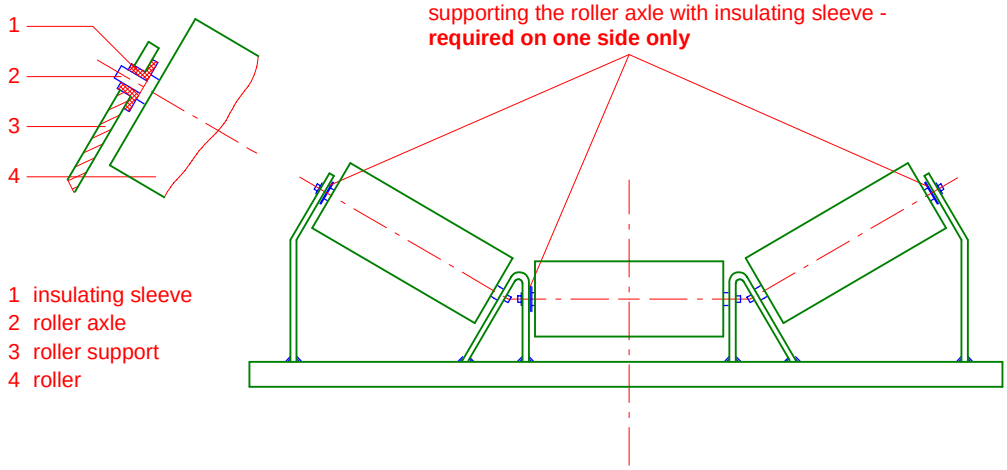
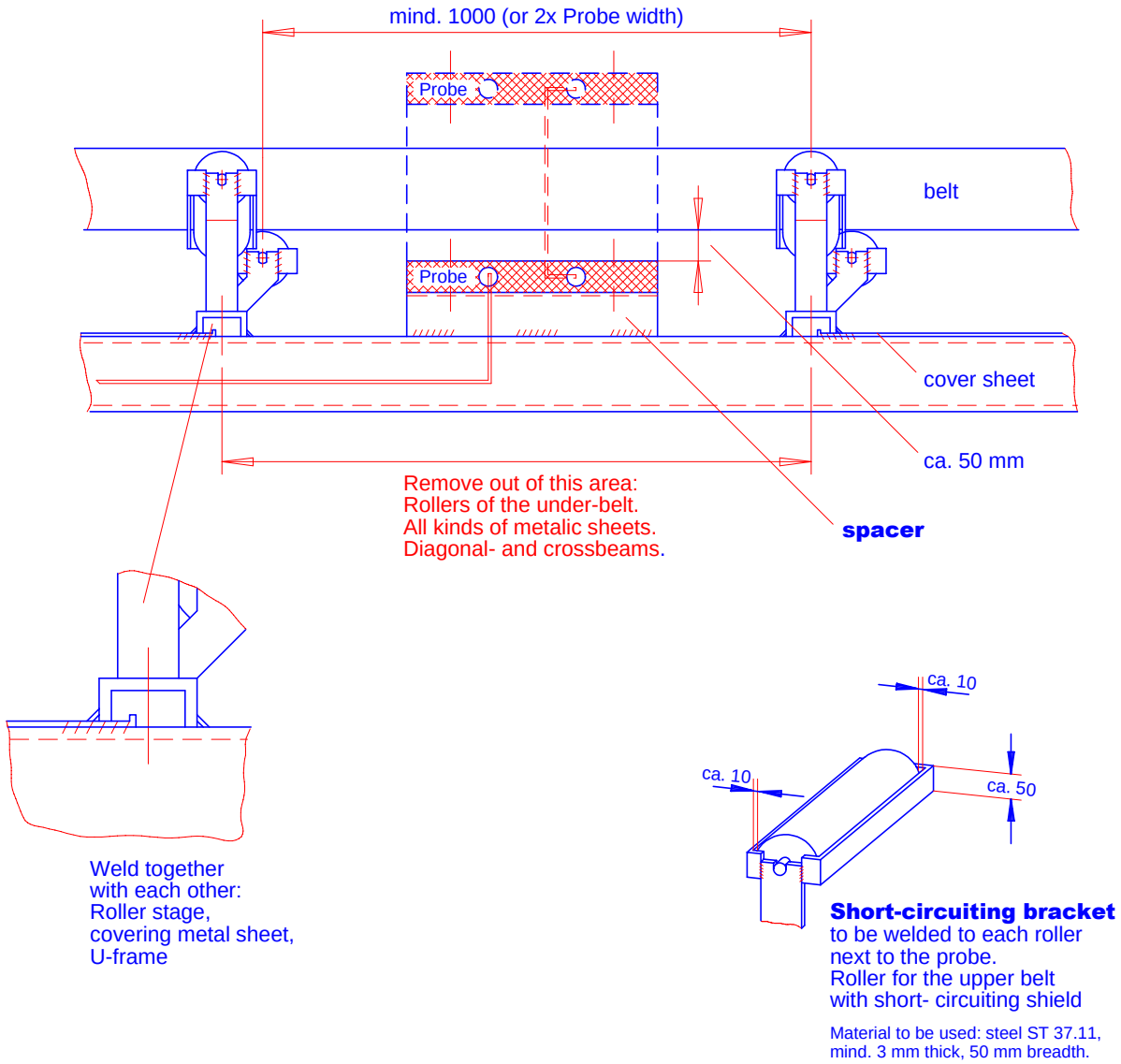


Fig. 5 Fault elimination on the rollers using insulating bushes



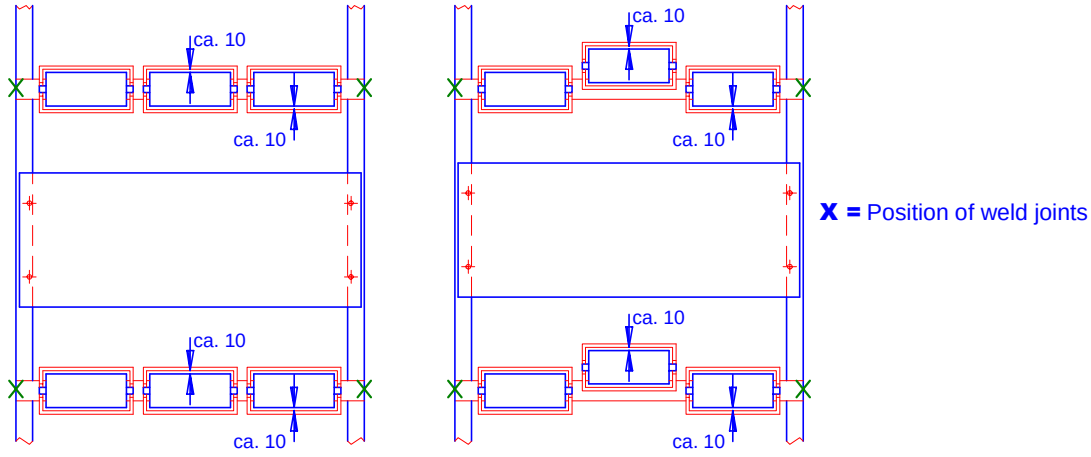
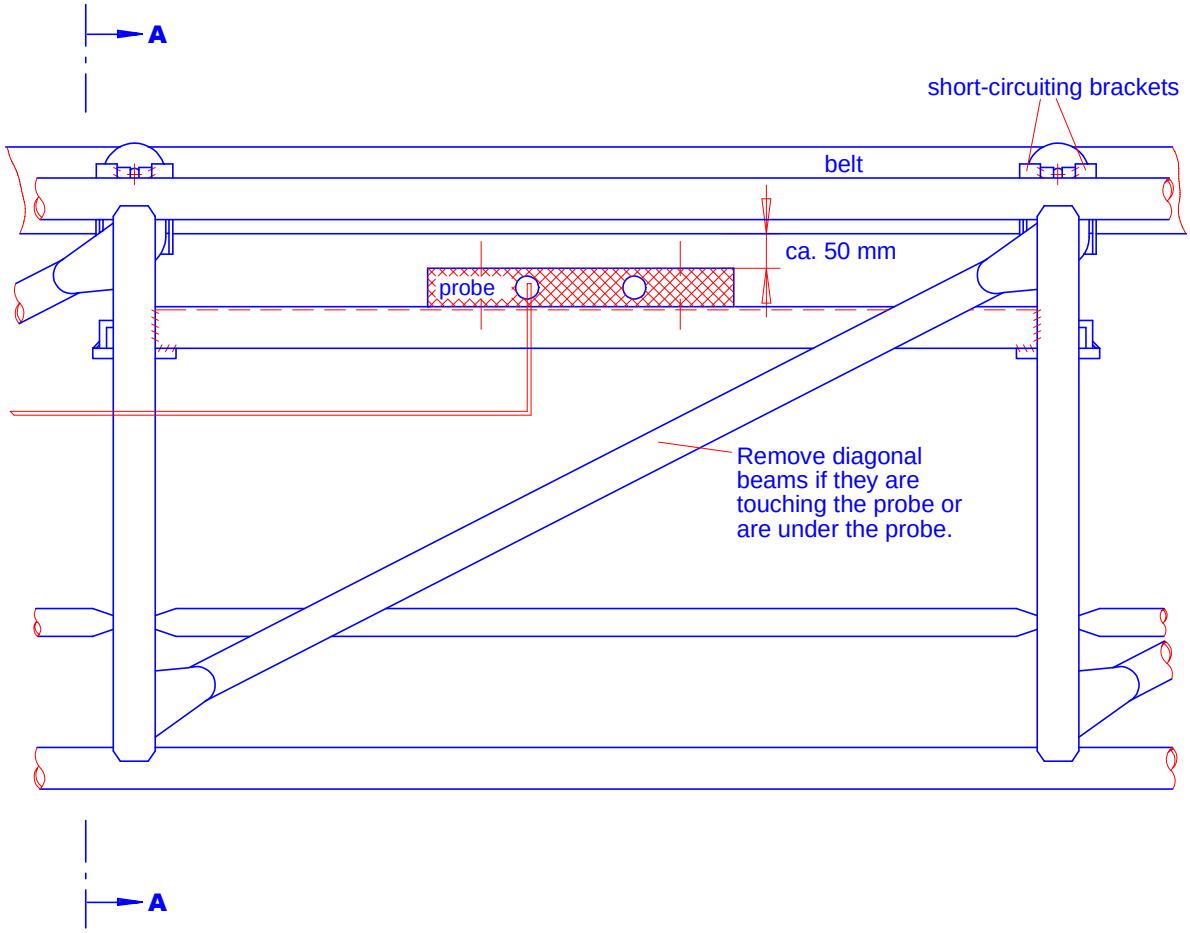


Fig.6 Installation example in U-frame construction



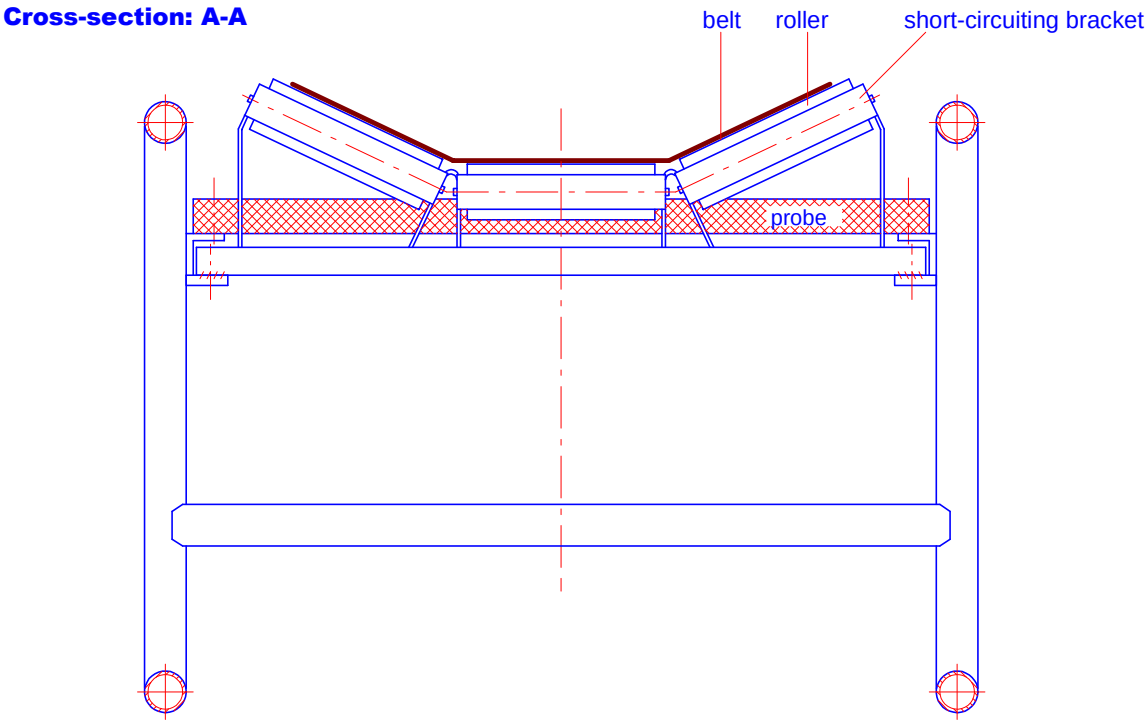


Fig. 7 Installation example in tubular construction

Fig. 8 Installation examples of a tandem probe in a U-frame construction

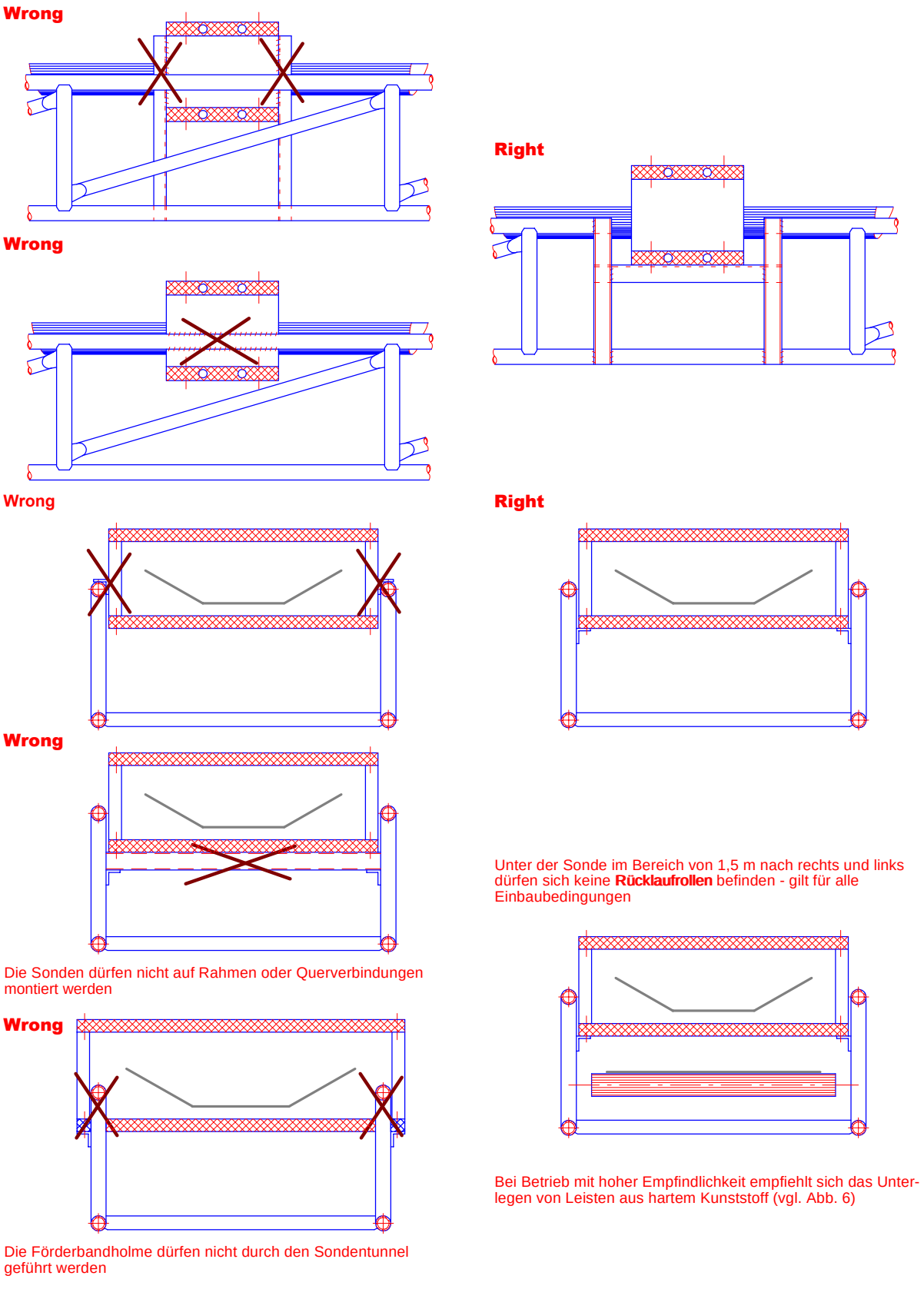


Fig. 9 Installation examples of a tandem probe in tubular construction

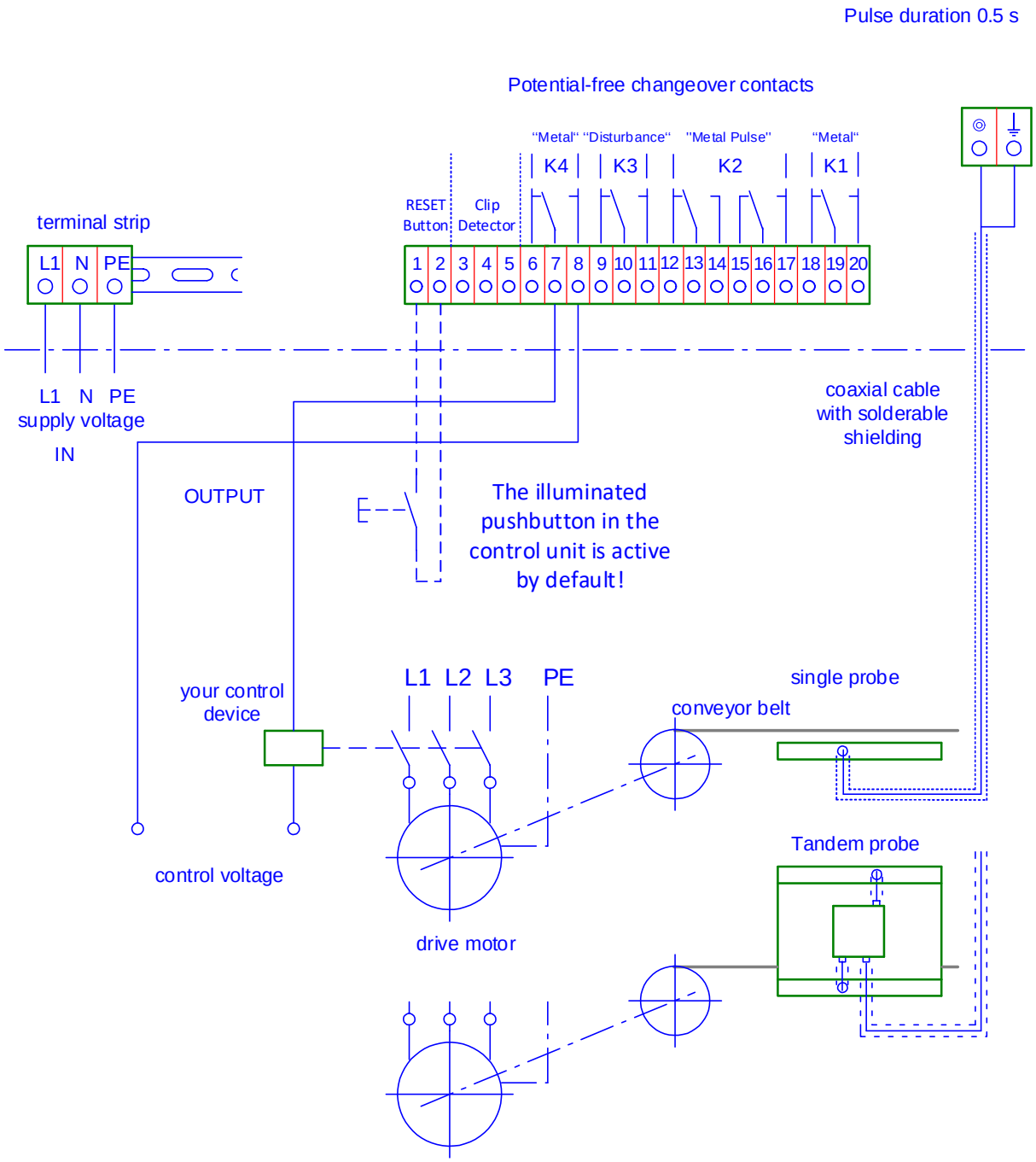


Fig. 10 Electrical connections of the metal detector with circuit for the 'conveyor stop' function

5 Electrical Connections

5.1 Power supply and control line

Please refer to the specification for data on the supply voltage and the outputs. Connect the supply voltage to terminals L1, N and PE. The voltage fluctuations must not exceed +/- 10%. It is advisable to feed the device from the mains.

Connect the control line to terminals 6 - 8 as standard. The control contact can be B. to stop the belt, reverse the conveyor belt or to operate an ejection flap or similar. Further contacts 12-20 can be used for additional evaluation (horn, flashing light, counter).

The representation of the relay contacts in Fig. 8 refers to the de-energized state. The slide switch on the main circuit board (see section 7.6.) can be used to set whether the relay for the metal signal is de-energized during operation and picks up when there is a metal signal, or whether it is picked up during operation and drops out when there is a metal signal K2 (safety position).

Fig. 8 shows an example of the 'Conveyor Stop' function.

5.2 Self-Monitoring

Faults can be reported potential-free from terminals 9 to 11. It lasts as long as the fault persists (see Section 7.4.)

5.3 Coaxial Cable

The UDLC-Q and UDLC-Q/TA type metal detectors require only 1 coaxial cable to connect the probe and control unit. Lay the coaxial cable separately in a plastic tube.

Single Probe

- Clamp the end to the controller as shown in Fig.8. Caution: Do not confuse the inner conductor and shielding!
- Screw the coaxial plug into the socket provided on the probe and tighten with full manual force (max. 5 Nm).

Tandem probe

- Place the end on the control unit as shown in Fig. 8 and connect. Caution: Do not confuse the inner conductor and shielding!
- Screw the coaxial plugs into the sockets provided on the probes and tighten with full manual force (max. 5 Nm).

5.4 Equipotential bonding line

Although the conveyor structure and controller are connected to the protective earth conductor, there are often significant peak potentials between the two. The metal detector reacts to this with error messages, for example when the conveyor belt starts up.

By laying a direct connection between the conveyor belt construction and the control unit, these potential differences are short-circuited.

- Use contact point near the probe. Clean the contact point well and use toothed washers for contacting.
- Use the grounding screw in the control unit junction box.
- Equipotential bonding line – cross-section at least 2.5 mm². **PROVIDED**
- Lay the Equipotential bonding line together with the coaxial cable but separately from other cables.

The compensating line and the coaxial cable must not lie in the cable bundle of current-carrying cables.

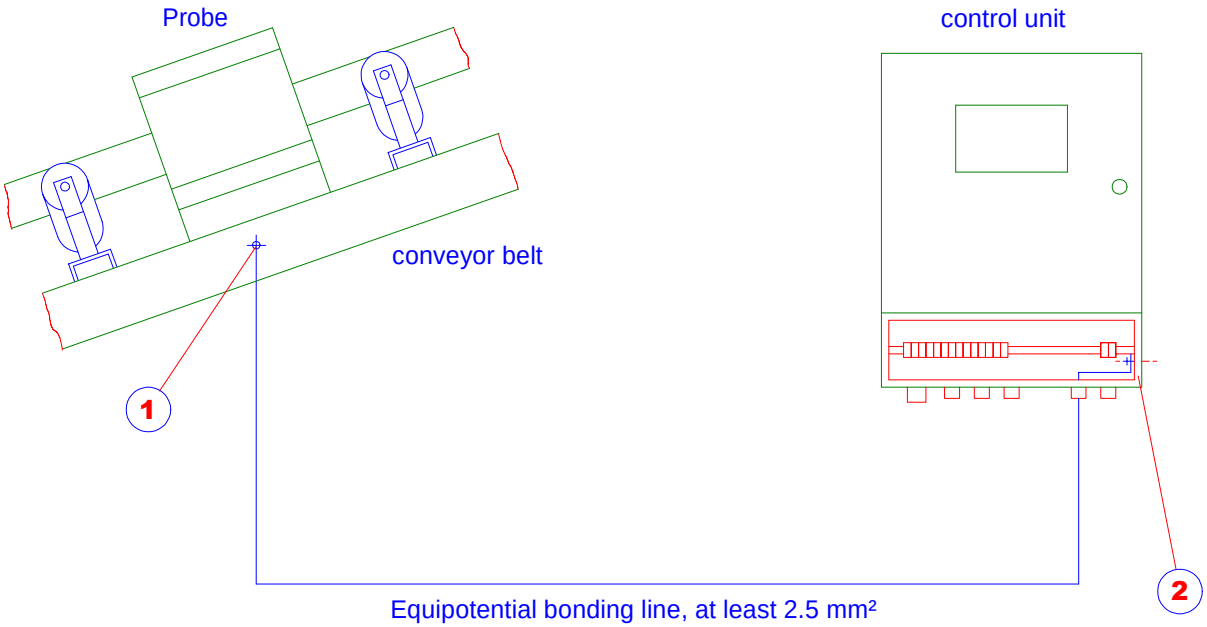


Fig. 11 Laying the equipotential bonding line

6 Commissioning into Operation.

6.1 Switch on

After connecting the probe, mains voltage and control line, the metal detector is to be put into operation as follows:

After applying or switching on the mains voltage, the red LED 'Metal' lights up briefly. The device is ready for operation after approx. 30 seconds.

To check, set the measuring point selector switch S3 to position 2 (= adjustment). The 9-digit LED line display must show a value between 30 and 80 µA. A value of 60 µA is set at the factory.

Then set the measuring point selector switch S3 to position 1 (= operation). The LED line display must show a value of approx. 50 µA.

During operation, the measuring point selector switch S3 should be in position 1. This is the only way for the LED line display to provide permanent information about the general operating status of the metal detector. As long as the display is relatively steady in the middle, the metal detector is okay. Unsteady deflections of more than +/- 10% can indicate interference.

6.2 Sensitivity adjustment

The correct position of the sensitivity potentiometer is of great importance for practical operation: Too insensitive a setting endangers the following machines, too sensitive a setting leads to unnecessary belt stops or material ejections. For setting the sensitivity:

- Choose a test part that corresponds to the smallest metal part that can still be detected, e.g. B. a steel nut of the appropriate size, and attach it to a string.
- Empty and switch off conveyor belt.
- Switch on the device and set the measuring point selector switch S3 to the 'operation' position. The values displayed on the LED line display may only be between 40 and 60 uA, otherwise check the mains voltage for interference.
- Move the test part repeatedly on the string through the probe field, at about the same speed as the belt, and set the sensitivity potentiometer so that switching just takes place. The metal part should be placed on the belt approx. 0.5 m in front of the probe and only removed approx. 0.5 m after the probe.
- Turn on the conveyor and let it run, but without material. When the tape is running, the values displayed on the LED line display should only range between 40 and 60 uA.

In the event of larger scale fluctuations, especially if switching occurs, the installation site must be checked again for sources of interference. For example, are all insulating bushings or short-circuit bars installed on the rollers adjacent to the probe, are the roller stations adjacent to the probe welded to the support bars, is the sensitivity set too high, is the coaxial cable firmly clamped and are the plugs tight? If faults nevertheless occur, the manufacturer will be happy to answer any questions you may have. For this we ask you to state the device number and the displayed values of the LED line display in the two positions of the measuring point selector switch S3.

- Conveyor belt is running and the metal detector is working properly. Now run with material.

- Loosen the sample part from the string and repeatedly throw it into the material to be conveyed, check the sensitivity setting and correct it if necessary.

Attention: Make sure that the conveyor can be stopped manually during the sensitivity tests.

6.3 Self-Monitoring

The electrical circuitry of the self-monitoring is set in the factory so that the alarm contact (terminals 9 - 11) switches and the red fault LEDs light up as soon as one of the important operating parameters falls below the value of approx. 30 uA or exceeds 80 uA . Fault 1 illuminates when the main circuit board operating parameters are out of range. Fault 2 illuminates when the operating parameters of the sonde module, coax cable, or sonde are out of range.

6.4 Function control button

The S8 button ('function check') is used to simulate a metal part of a certain size and thus to check the entire functional chain from the probe to the motor contactor, the ejection device or similar.

The device is set in the factory in such a way that from position 2-3 of the sensitivity potentiometer R2 (S2 must be in the HIGH position), an actuation of S8 just leads to a switching. Depending on the operating conditions, the button should be pressed every two to six weeks.

6.5 Slide and toggle switches and their function

The slide switches S1-S7 are arranged side by side on the front panel with the following functions:

Sliding switch S1 in position S:

The control unit is set to operate as a single system.

Slide switch S1 in position T:

The control unit is set to operate as a tandem system (2 probes).

After changing the switch S1, trimmer R4 must be used to recalibrate.

Slide switch S2 in position HIGH:

The metal detector works with undamped primary sensitivity.

Sliding switch S2 in the LOW position:

The metal detector works with damped primary sensitivity. All primary sensitivity settings are reduced to significantly coarser metal parts.

Toggle switch S3 in position 1:

The measuring point switch S3 enables the selection of the two measuring points, probe adjustment value and measured value of the metal detection. The OP position shows the measured value of the metal detection.

Toggle switch S3 in position 2:

The ADJ position shows the reading that represents the probe trim value.

Slide switch S4 in position PNP:

The connected clip detector works in PNP mode.

Slide switch S4 in position NPN:

The connected clip detector works in NPN mode.

The mode of the clip detector can be read on the clip detector. By default, clip detectors are shipped with NPN mode. The function of the clip detector is described in a separate operating manual.

Slide switch S5 in position ON:

The relay outputs are activated and can be used for external wiring.

Slide switch S5 in the OFF position:

The relay outputs are deactivated and cannot be used for external wiring.

Sliding switch S6 in position REG:

The "Regular" setting means that the pulse relay gives a pulse with a duration of 0.5 s when metal is detected. The triggering of the relay can be seen on the LED above the relay K1.

Slide switch S6 in position INV:

The "Inverted" setting means that the pulse relay gives an inverted pulse with a duration of 0.5 s when metal is detected. The triggering of the relay can be seen on the LED above relay K1.

Sliding switch S7 in position INT:

The "Internal" setting means that the RESET is made internally using an illuminated pushbutton installed in the front door.

Sliding switch S7 in position EXT:

The "EXTERNAL" setting means that the RESET is external, using a button installed outside of the control unit. This could be connected to terminals 1 and 2.

6.6 Secondary Sensitivity Adjustment

When using the clip and seam detector, settings of R12 and R49 must be made. The 2nd sensitivity can be set with R12 and the function duration of the 2nd sensitivity with R49.

Splice Detector Adjustment Overview:
If your conveyor belt is connected with a mechanical splice, a splice detector is required. This timer device switches the metal detector to the Second Sensitivity to time out the contact output so the metal detector does not stop the conveyor every time the splice passes the probe. The sensor of the splice detector must be mounted as instructed in order to sense the splice as it passes.

Comment: If your belt has repair clips you must place clips at the outside edge of the belt to indicate where the belt clips are located on the belt. The sensitivity must be adjusted down so the metal detector does not trip with each pass.

Mounting the Splice Detector Sensor:
-- The sensor must always be mounted just before the probe adjacent to an idler.

-- The distance between the idler and Splice Detector must be no closer than 1.6 inches (40 mm) and no farther away than 2.5" inches (63.5 mm)

-- The distance between the Splice Detector and Metal Detector probe must be no closer than 8 inches (200 mm) and farther away than 6.5' feet (2000 mm).

-- The distance from the sensor for the detection of the splice is limited to a maximum of 1.6" inches (40 mm), therefore it should be mounted in the vicinity of the idler were belt sag is reduced.

(see photo next page)


Splice Detector

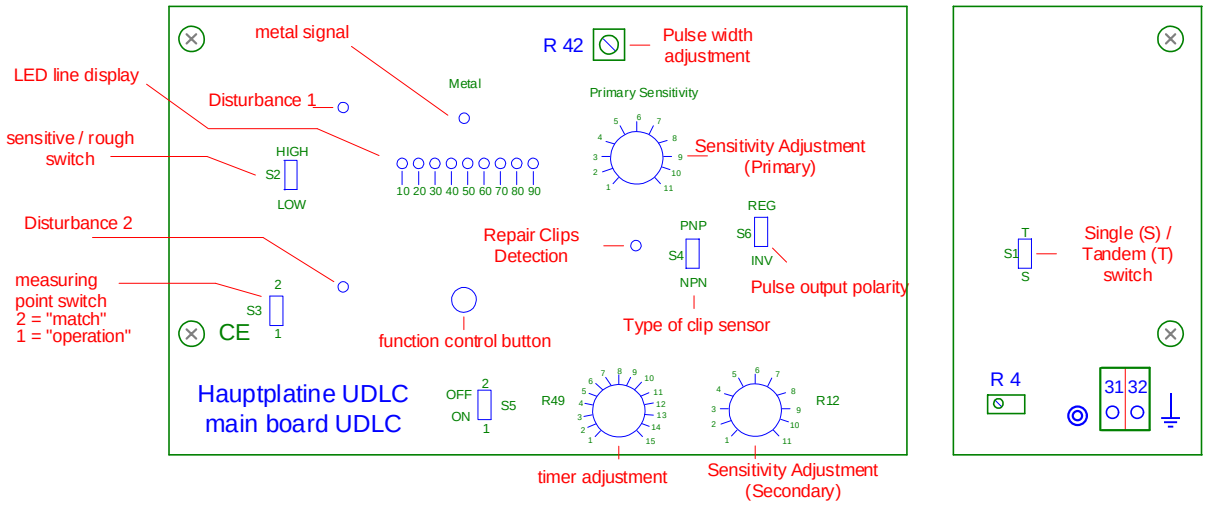


Fig. 12 Operating and control instruments of the control unit

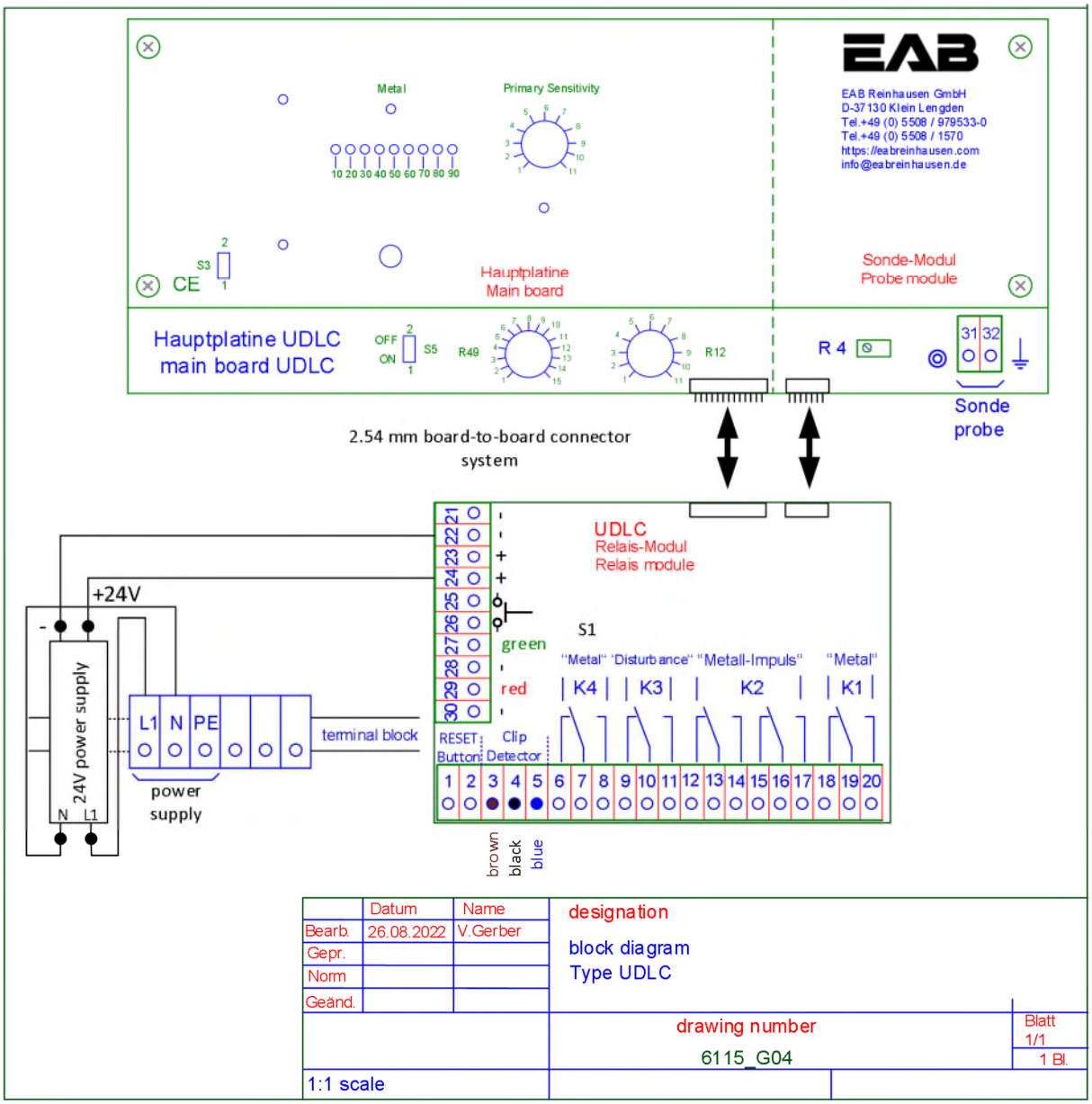


Fig. 13 Block diagram of the control unit

7 Specifications

7.1 Control Unit

Power supply	100-240 VAC, 50-60 Hz, 15 VA
Permissible belt speed	0,3 - 6 m/s **60 FPM to 1200 FPM**
operating temperature	- 20 ° C to + 55 ° C, - 40 ° C to + 55 ° C with heating (optionally)
Input	Coaxial cable, 50 ohm
Outputs	Metal message: 2x relay output (NO/NC) impulse -like, 2x relay output (NO/NC), 230 V/5A Fault report: 1x relay output (NO/NC), 230 V/5A
Housing material	Steel sheet with powder coating, Stainless steel (optional)
Color	Steel: RAL 7035 Stainless steel: line cut, grain 400
Protection class	IP65
Weight	12 kg
Type of fastening	Wall assembly

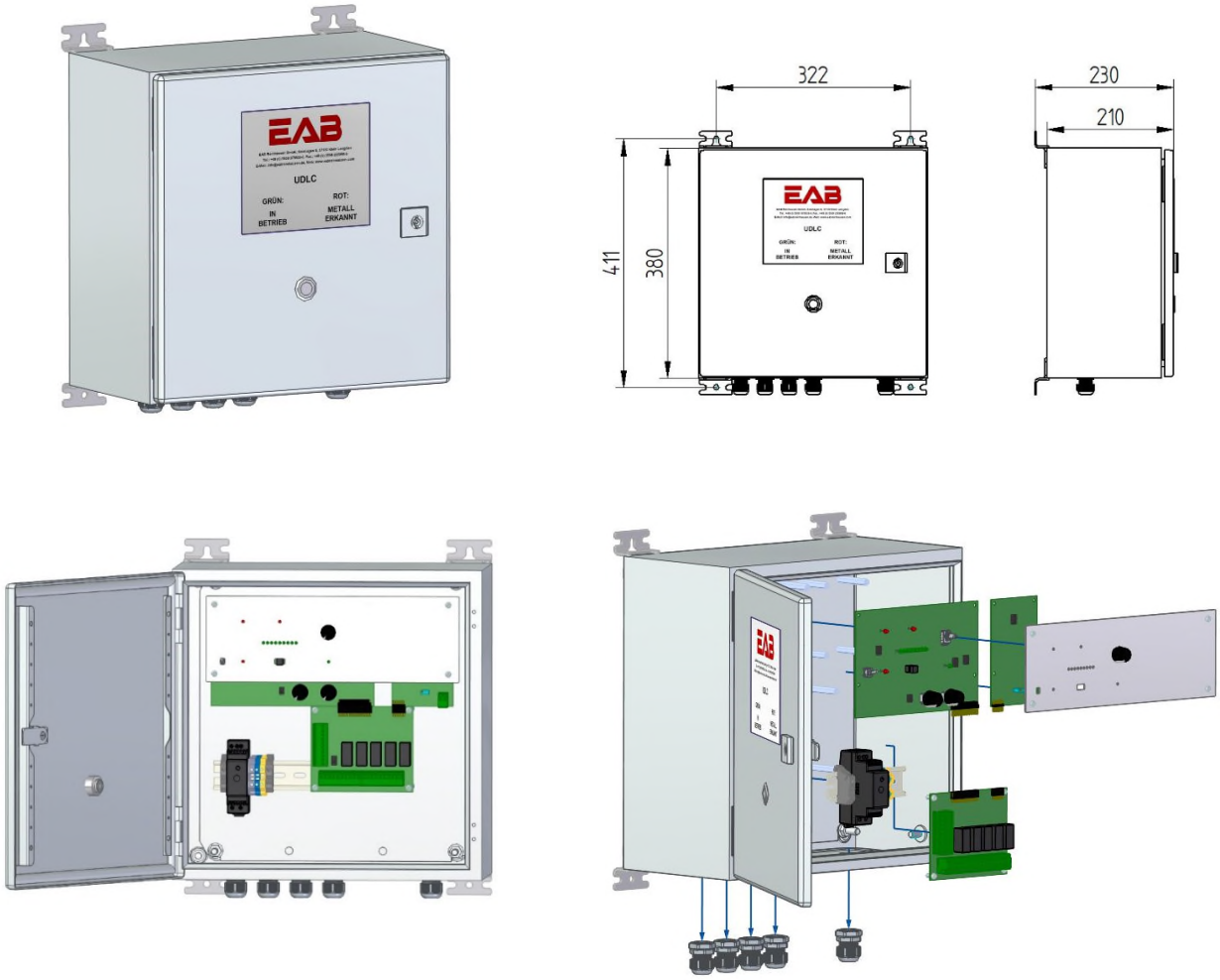


Fig. 14 illustration of the UDLC control unit

7.2 Probe

Structure	Single probe: solid rectangular plate bodies with milled and spilled induction coils. Flagated coaxial sockets for the electrical connection. Tandem probe: As before, but built with spacers.
Material:	Probe bodies from PE or PA 6.6; Power mass from 2-component polyurethane.
Perm. Ambient temperature:	PE execution -30 ° C to +70 ° C PA6.6 execution -50 ° C to +120 ° C

7.2.2 Tandem device

Device scope:	1x Control unit
	2x Probes
	2x Spacers Based on Max Burden Height.
	1x Inter-connection Cable
	1x 10 m Coaxial cable with N-connector
Nominal size	Please refer to the delivery note or type sign
Height of the spacers	According to the layer height
Assembly	Under and above the belt, 50-60 mm light distance between the belt and lower probe

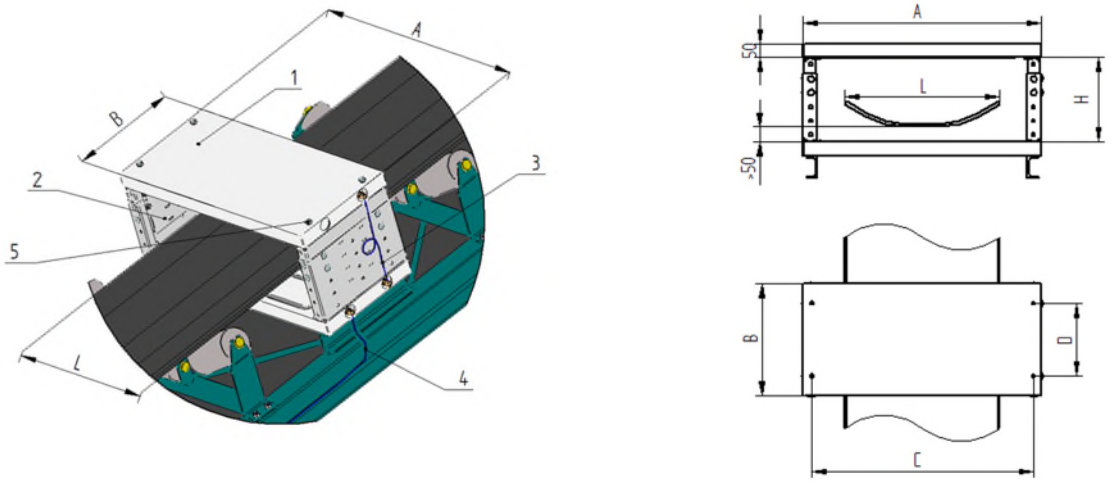


Fig. 16: Dimensioned drawing of the tandem system

8 Checklist for fault-clearance procedure (5798)

Probe installation in U profile frame

1. Points 1 - 15 are shown in the enclosed installation sketch.
2. Distance 'roll axis -probe': At least 500 mm.
3. 'Returning roller-probe' distance: At least 500 mm.
4. Remove any diagonal or cross braces under the probe.
5. Weld the mounting bracket (angle on which the probe is mounted) to the band frame.
6. Weld all diagonal and cross braces to the tape frame up to 1000 mm in front of and behind the probe. Weld length: at least 25 mm.
7. The stations of the support rollers: Weld 1 each in front of and behind the probe to the belt frame on both sides. Weld length: at least 25 mm.
8. Axles of the rollers: With 1 roller station each in front of and behind the probe, store the roller axles on one side in plastic insulating bushes (see page 6). Plastic insulating bushings are included in the scope of delivery.
9. Lower chord holder.
10. Store the lower belt roller axles up to 1000 mm in front of and behind the probe in plastic bushes on one side (as under item 8).
11. Weld additional bolted connections between 'conveyor belt frame belt supports' if the distance to the probe is less than 1000 mm. Weld length: at least 25 mm.
12. The emergency stop cord, which is required by law, must not be impaired in its function by the installation of the metal detector.
13. Roof covers: minimum distance to probe surface 1000 mm. Additionally weld screw connections between the 'roof support struts and the conveyor belt construction' up to 1000 mm in front of and behind the probe. Weld length: at least 25 mm.
14. Lay the equipotential bonding line between the strip frame (near the probe) and the control unit (earthing bolt). Laying together with coaxial cable (see page 17).
15. Do not lay the coaxial cable between the probe and the control unit together with other cables (except potential equalization, item 14). Crossings are allowed, but no parallel passages closer than 1 meter.

In addition to these points, the assembly and commissioning instructions must be observed.

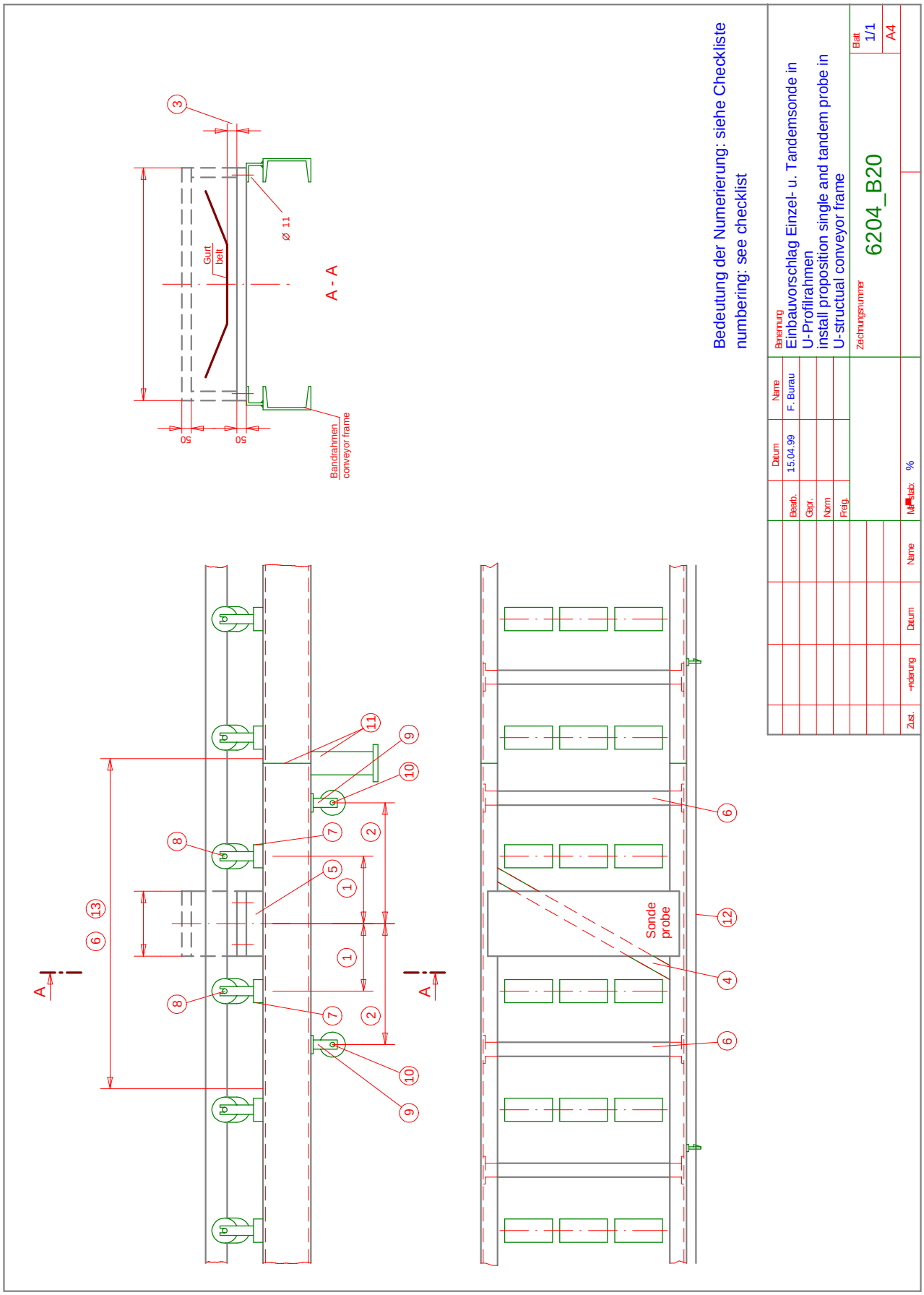


Fig. 17 Installation suggestion for single and tandem system in U-profile frame

ERSATZTEILLISTE

SPARE PARTS

	Name name	Datum date	Typ Type: **Q-System**	
bearbeitet authorized	V.Gerber	06.03.2023		

Pos.	Benennung designation	Ort place	Stck. piece	Type/Best. -Nr. type and order no.
1	10 m Koaxialkabel mit Stecker (Typ N) coaxial cable 10m with plug (type N)		1	10 m Koaxialkabel mit Stecker (Typ N)
2	Koaxialbuchse (Typ N) coaxial plug (type N)		1	Koaxialstecker ((Typ N))
3	Q-Module Q-Module	1/5	1	UDLC-Q-Module
4	Output module Output module	1/3	1	UDLC-Output Module
5	Hauptplatine main board	1/5	1	UDLC-Main Board
6	24 V Hutschienen-Netzteil 24V DC DIN rail power supply	???	1	24VDC-DIN-Power Supply