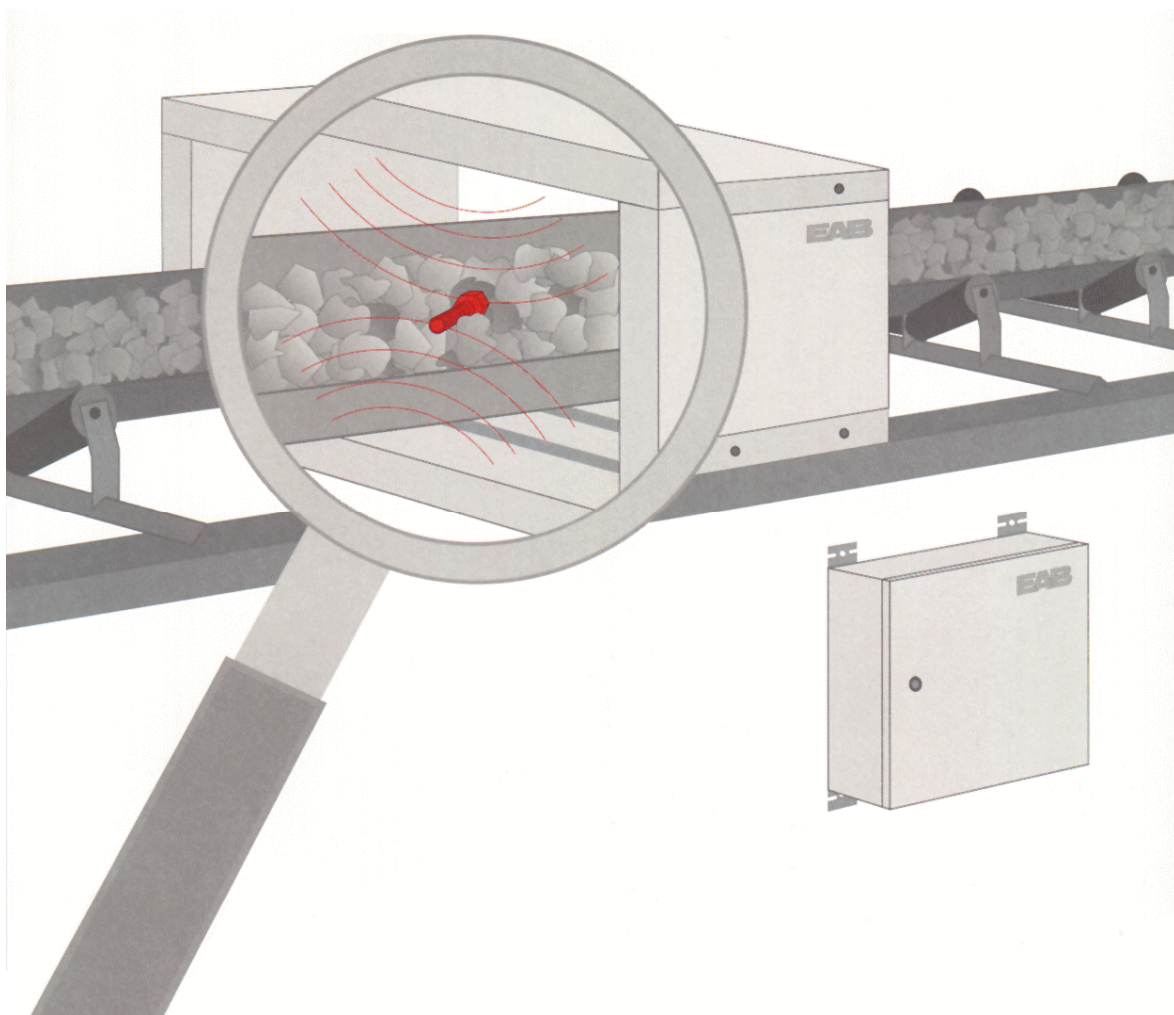


# EAB

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## Metal Detector

Model MS 04/03 QLC-M, QLCTA-M



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## MCR Technologies Group, Inc.

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## **QLC-M and QLCTA-M 110/220 VAC**

### **General**

The metal detector manufactured by EAB, series QLC-M / QLCTA-M is especially developed for the aggregate and mining industries. It is designed to be reliable, resistant to vibration and maintenance free under proper operational conditions. With the metal detector, it is possible to monitor material with a high percentage of metal oxide

IE: Basalt, Slag, Magnetite, Magnesium Oxide, etc.

The metal detector protects crushers, mills, mixers, and extruder machines. The metal detector will detect all kinds of metals including: Steel, Iron, Copper, Aluminum, Brass and Stainless Steel. This manual describes the application procedures and set up.

### **Design:**

The metal detector is available as either a single or dual probe unit.

### **Standard Units:**

The standard unit consists of a control box and probe. The probe will be provided in various widths depending on the conveyor belt width to be monitored. A single probe unit is mounted below the product belt. All controls required for operation of the unit are clearly arranged behind the door on the front panel.

### **Tandem Units:**

The standard single probe unit can be expanded to a dual probe configuration by the addition of a second probe, which will be mounted above the product belt. Two spacers will be used to separate and support the top probe. A coaxial cable will connect the top probe and the bottom probe. One coaxial cable will go from the bottom probe to the control box.

**Function:**

An oscillator located inside the control box feeds the probe a high frequency alternating voltage. This voltage is fed to the probe by a specially provided high quality 75 ohm coaxial cable. An electro magnetic alternating field is built up vertical to the probe (s) and penetrates the conveyor belt and the conveyed material. If a piece of metal passes within the detection range of the probe (s), the oscillating circuit is slightly attenuated. Inside the control box the pulse is filtered out of the amplitude surge. This in turn switches a built-in relay after passing through an amplifier. The relay is the detector output. It has two (2) dry contacts, Normally Open and Normally Closed, which can be used to stop the conveyor and or give a warning signal, or both, etc.

**Selection of Installation Position:****Probe:**

- Avoid positions where the conveyor belt is unstable.
- The distance between two idlers has to be at least 31.5 inches.
- If the conveyor system is to be stopped when material is detected, it must be accessible for removal of the metal.
- Take into consideration the distance the belt will travel after the conveyor stops. The detector must be located so there is sufficient distance for metal to be retrieved.
- Maintain at least 8 feet distance from electric motors and magnets.**
- Use Metal Conduit to protect the coaxial cable.

**Detector (Control Box):**

- Install the control box in the vicinity of the probe.
- The standard length of coaxial cable provided is 33 feet. If you decide to mount the control box farther away, you **MUST** make sure you purchase 75 ohm coaxial with specifications exactly like those provided or purchase the cable from MCR Technologies Group, Inc. Cable outside these specifications will NOT allow the unit to function properly.

Single probe system

- Components you need for metal detecting devices with single probes:

Nominal sizes:

Installation:
- 1 detector

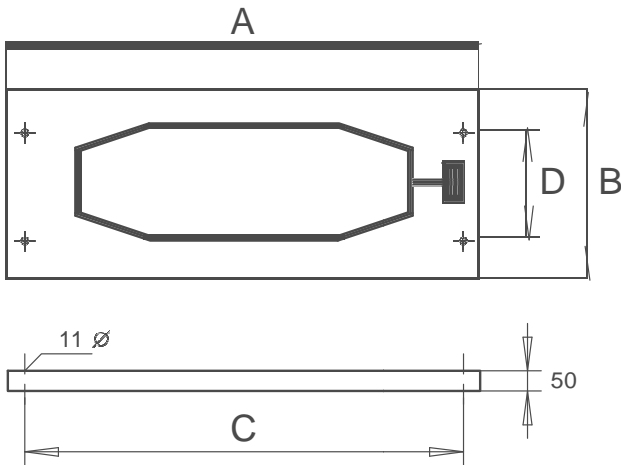
1 probe

1x 10 m coaxial cable, 75 ohm surge impedance

..... mm, other sizes on application

..... mm clearance between belt and lower probe

Single probe



Nominal-sizes	A	B	C	D	for belt width up to	weight
	mm	mm	mm	mm	mm	kg
500	700	400	640	260	500	18,0
650	850	400	790	260	650	23,6
800	1000	400	940	260	800	28,0
1000	1250	500	1170	300	1000	43,5
1200	1500	500	1420	300	1200	52,0
1400	1700	500	1620	300	1400	59,5
1600	1900	500	1820	300	1600	96,0
1800	2100	650	2020	300	1800	129,5
2000	2300	650	2220	300	2000	142,5

Other sizes on request

## Tandem probe System

Components you need for  
metal detecting devices with  
single probes:

Nominal sizes:

Installation:

1 detector

2 probes

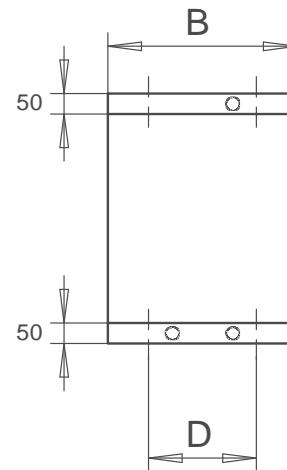
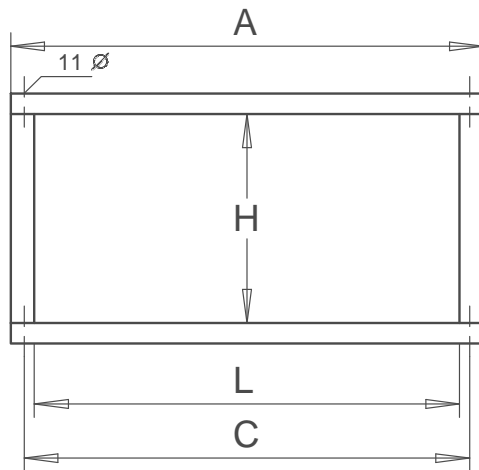
2 special supports

1x 10 m coaxial cable, 75 ohm surge impedance

..... mm, other sizes on application

..... mm clearance between belt and lower probe

## Tandem probe



Nominal-size	A	B	C	D	L	for belt-width up to	appr. weight
	mm	mm	mm	mm	mm	mm	kg
500	700	400	640	260	600	500	46,0
650	850	400	790	260	750	650	57,0
800	1000	400	940	260	900	800	66,0
1000	1250	500	1170	300	1150	1000	100,0
1200	1500	500	1420	300	1400	1200	118,0
1400	1700	500	1620	300	1600	1400	147,0
1600	1900	500	1820	300	1800	1600	227,0
1800	2100	650	2020	300	2000	1800	296,0
2000	2300	650	2220	300	2200	2000	321,0

Other sizes on request H = according to requirement

### 3.2 Mounting the tandem probe

The tandem probe should be assembled as indicated in figure 1 and 2. When mounting the probe, consider the following:

- Mount the probe at the midpoint between two roller stages.
- The cast patterns of the two probes must be mounted face to face.
- The clearance between lower probe and loaded belt should still be 1.5-2 inches if maximum belt sag may occur.

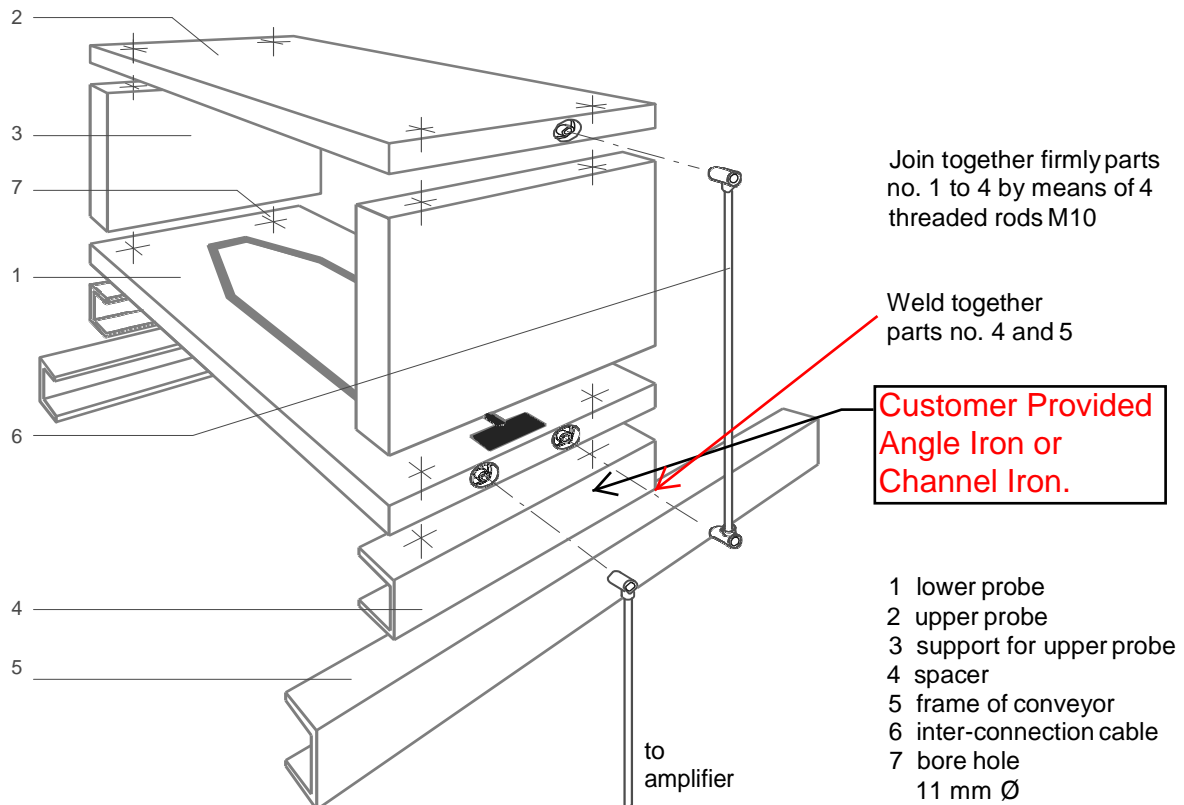
- The upper probe must be mounted exactly above the lower probe.
- Connect upper to lower probe by use of the short inter-connection cable (6)
- The distance between the upper probe and the belt depends on the maximum height the transported material may have on the belt.

**NEVER Weld on the conveyor w/o turning unit off AND Disconnecting Coax !**

In order to achieve a high degree of sensitivity, the distance between the two probes and the belt should be kept as small as possible.

In case of doubt send a drawing of the intended installation position to EAB - Elektroanlagenbau Reinhausen GmbH for evaluation.

Fig. 1 Assembling the tandem probe



Attention! Always use the original coaxial cable from EAB. Don't use any other usual coaxial cables.

**NEVER WELD ON CONVEYOR WITH COAX CABLES CONNECTED TO ELECTRONICS. DAMAGE CAN OCCUR.**

### **Coaxial Cable Specifications:**

Normal Impedance: 75 ohms

Normal Capacity: 50 to 70 pF

Strand Resistance: 20 to 30 ohms

Shield Resistance: 8 to 12 ohm/meter

Attenuation: 6 to 12 dB / 100 meters with 100 MHz

Central Wire: 0.8 to 1.1 mm, silver plated Insulation  
of Central Wire: Cell-Pe

### **Mounting the Single Probe:**

Check to make sure the serial numbers for the probe and control unit are the same. Mount the probe as instructed in the overview. Make sure the cast pattern on the probe points towards the product belt. In the case of a single probe: up. **Clearance between the probe and the bottom of the belt should be approximately 2 inches (50 mm).** It might be necessary to use angle iron to elevate the probe off the conveyor frame. Any questionable installation location should be discussed with MCR Technologies or EAB before installation.

### **Mounting the Dual Probes:**

- Cast patterns of the two probes must face the product belt.
- Mount the probe with the two coaxial ports as the bottom unit. --  
**Clearance between the bottom probe and bottom of a loaded belt must be approximately 2 inches (50 mm)**
- The top probe must be mounted exactly above the bottom probe.
- The distance between top and bottom probe is dependent on the

spacer height. The distance between the probes should be kept to a minimum for best sensitivity.



#### 4.5 Potential Equalization Line:

In spite of the fact that the conveyor amplifier is connected to the ground wire of your power source, there is often additional interference. It is important that the coaxial cables NOT be routed near ANY voltage lines and they are routed inside Metal Conduit.

##### To this:

- Contact close to the probe. Clean contact surface very well and use a tooth lock washer.
- Connect to the grounding screw in the amplifier.
- Cross-cut of the potential equalizing line should be 2,5 mm<sup>2</sup> at least

Note: Do not run the potential equalization line together with current carrying lines. Run it together with the 75 ohm coaxial cable.

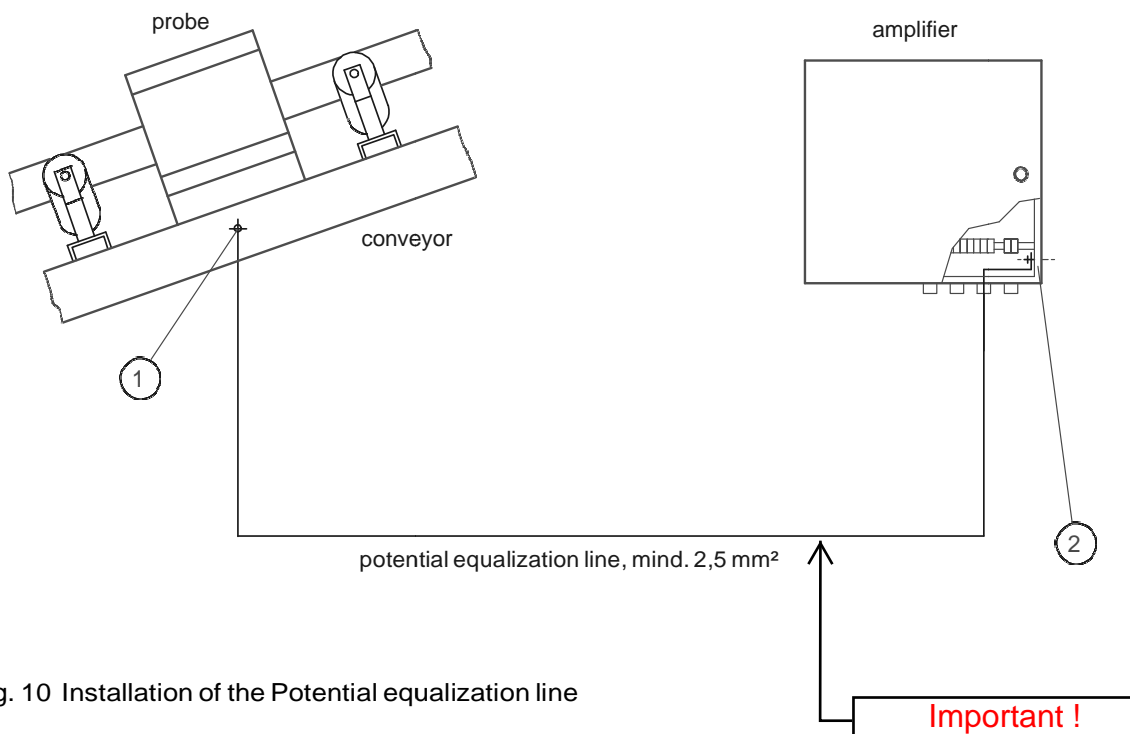


Fig. 10 Installation of the Potential equalization line

## Metal Detector Installation

Thank you for your purchase. There are some basic steps and equipment required for installation of your EAB metal detector. Following the correct steps and procedures will provide years of trouble free operation.

Equipment required:

Welder.....Torch

Electric Drill and bits. Wrenches (Metric and Standard)

Angle Iron (To support probe if it needs to be elevated off the conveyor frame)

Inch/metric tape measure

¾ inch pipe for mounting splice detector to conveyor frame

Adjustable coupling for mounting splice detector (Provided)

### Installation Overview: Please read over the entire manual before starting the installation.

1. Remove any cross bracing or return belt shielding from the area you have determined you will be mounting the metal detector probe. You cannot have METAL sideboards
2. Place the probe on the conveyor frame between two idler assemblies. Measure each direction from the probe to center the unit. Confirm the location and height from the belt complies with the guidelines explained in the manual. Mark the location of the probe on the conveyor frame with a pencil.
3. Measure the distance between the top of the probe and the bottom of the belt. The belt should be loaded when this measurement is taken.
4. Measure the width of the probe and cut angle iron to proper length. After both pieces have been cut, slide the lower probe **with cast pattern up** to one direction. Place angle iron under end of probe and mark the bolt hole location. Drill out these holes in the angle iron. Bolt the probe to the angle iron. Slide the probe the other direction and repeat the previous steps. **(If you have a dual probe unit supplied spacers will support the top probe. The top probe cast pattern must face down, towards the belt).**
5. Position the probe on the conveyor using the pencil marks made in step 2.

6. Measure the location of the probe to confirm it is centered between the idlers and to confirm the probe is approximately **2 inches** below the loaded belt (if not specified otherwise). **Remove Probe from angle iron and weld the angle iron to the conveyor frame. (It is also recommended that you put a bead of weld on the feet of the idler preceding and idler following the probe). Do NOT weld the angle iron support with the probe bolted to the angle iron.**
7. Bolt the lower probe to the angle iron making sure the cast pattern faces belt.
8. (If required) Mount the splice detector as instructed ahead of the probe. Follow the distance guidelines as explained in the directions. A coupling is provided to allow you to adjust the pipe supports for the splice detector. 3/4" pipe is required for mounting. (The metal detector LED will indicate the detection of the splice, but the splice detector timer when adjusted properly, will prevent the unit from stopping the conveyor.)
9. Install the control unit at a location within 33 feet of the probe. If you determine you want to mount the control box farther, you **MUST** use coaxial cable with specifications exactly as instructed in the manual.
10. Route the coaxial cable from the probe to the metal detector control unit as instructed in the manual. Conduit is recommended if there is a danger of material falling and damaging the coaxial cable.

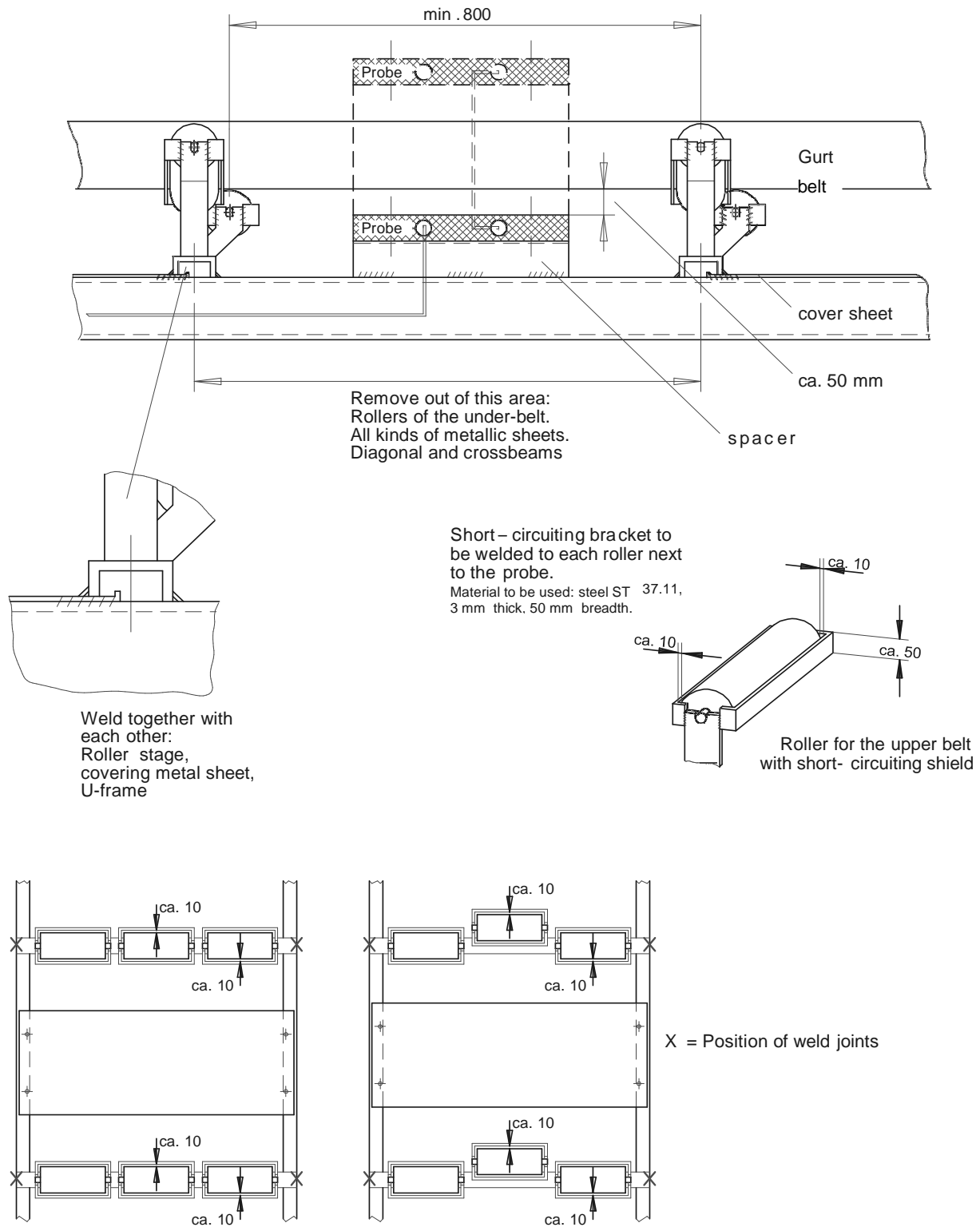
**IT IS VERY IMPORTANT YOUR CABLE CONNECTIONS BE KEPT DRY. MOISTURE INSIDE YOUR CONNECTIONS WILL AFFECT THE FREQUENCY GENERATED BY THE METAL DETECTOR AND CAUSE OPERATION PROBLEMS AND FALSE TRIPS.**

11. Wire the unit as instructed in the manual. The probe and control unit has been adjusted at the factory. It is suggested that the following step be done to confirm the settings have not been changed during shipment.

### **Check list of points for preventing electrical interference.**

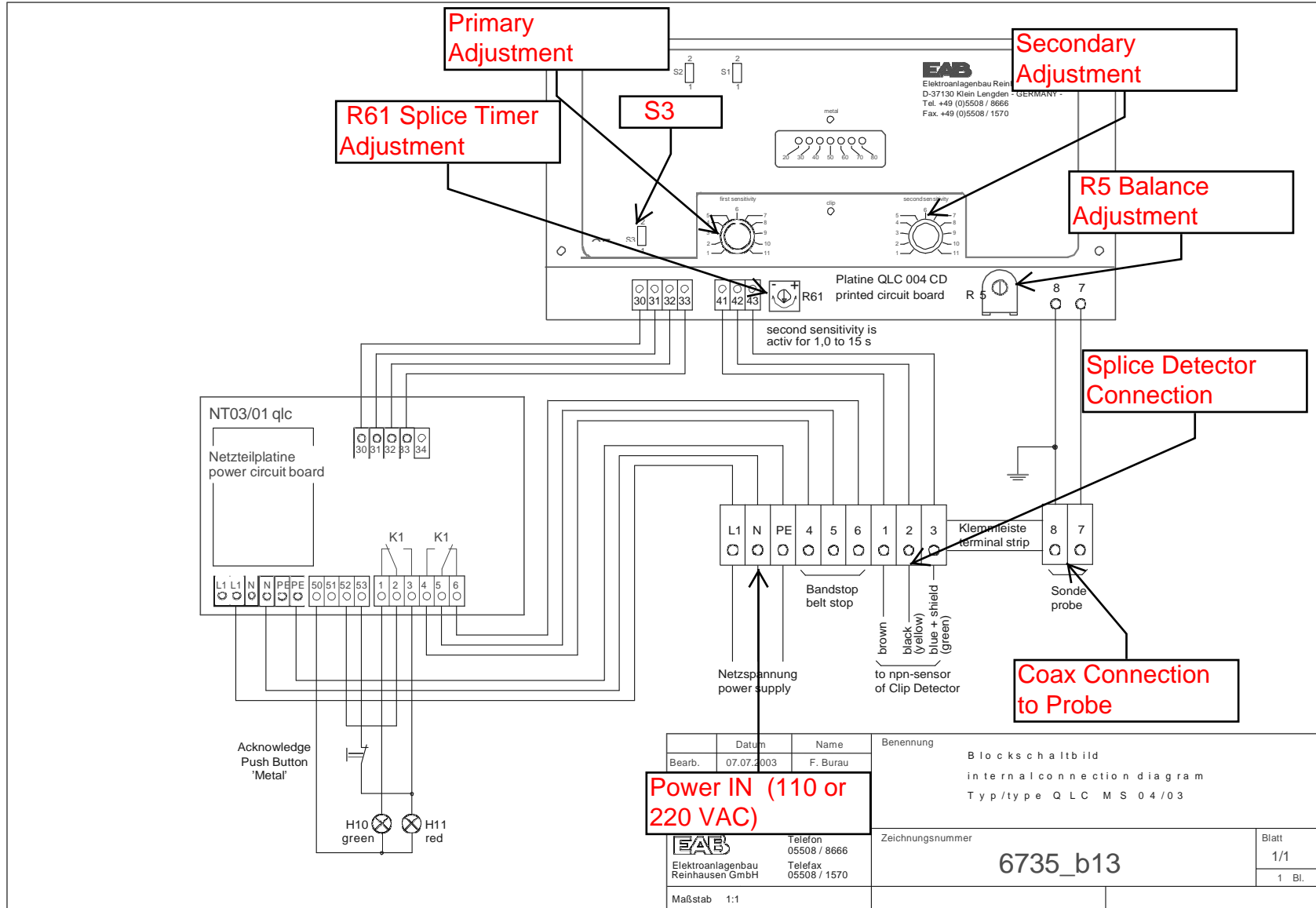
1. Minimum distance between rollers and middle of probe = 16" (406 mm)
2. Distance between bottom probe and belt = 2 inches (50 mm)
3. Weld all cross beams or supports under the probe providing it does not interfere with the installation of the probe.
4. Structural iron used for mounting the probe must be welded
5. All diagonal and cross beams within 40 inches (1016 mm) must be welded
6. The idler preceding and following the probe must be welded
7. Floor legs supporting a permanent conveyor must be welded
8. Cable used of cable pull safety stops will not affect the probe If the cable is run beside the probe
9. Conveyor covers over the material belt or between belts must be removed or changed to non-metallic material in an area of 40" before and after the probe. Metal structural supports are allowed but all supports must be welded
10. An earth ground cable connecting the control box to conveyor frame is highly recommended and we provide.
11. Route the coaxial cable separately and **never along with power cables of any voltage.** Crossing power cables is not recommended but can be done with care. No installation within 40" inches (1016 mm) parallel to loaded power cables is permitted.

Fig. 2 - Build example for U-Frame-Conveyor-Belts



Rollers can alternatively be prepared with insulating sleeves, according Fig. 6, page 10

Fig. 12 Internal connection diagram



### **Electrical Connections:**

All connection data is contained in the specifications.

#### **Detector** (control box):

Connect the power and protective ground according to the terminal labeling (power consumption approximately 10 VA). Connect the control cable according to the function to be controlled (IE: Stop Conveyor, Reverse Belt, Sound Alarm, etc.) Install the coaxial cable between the control box and bottom probe. Coaxial cable and equalization wires should be routed through METAL conduit. Keep the coaxial cable away from any voltage cables. Maintain a distance no less than 12 inches.

**IT IS VERY IMPORTANT THAT THERE IS NO MOISTURE IN THE CABLE CONNECTOR AND PROBE CONNECTOR. MAKE SURE THIS CONNECTION IS DRY DURING CONNECTION OF THE CABLES AND PROBES.**

## **Start-up and Operation:**

After connecting the probe, power supply and control cable the metal detector is ready to be started up and calibrated.

- A) Turn ON power at the power source. Wait about 20 seconds for the metal detector to balance.
- B) Slide / flip switch **S3** UP to **Position 2** "Adjustment" position. LED Light should be ON at the 50 location. IF not - Slowly adjust **R5** located on the circuit board to move the light to the LED at 50. Wait about 10 seconds for the electronics to balance.
- C) Slide S3 DOWN to Position 1 "Operation".

## Splice Detector and Sensitivity Adjustment:

1. **Preliminary Sensitivity Setting:** Set the **Red** knob “First Sensitivity” dial to 10.
2. **Adjusting Splice Timer:** If you have a mechanical splice connecting the belt.... You must....Locate **R61** on the circuit board under the front panel. With the conveyor running, adjust **R61** to set the time interval the First Sensitivity is off and the Secondary Sensitivity is on. The splice should pass the probe and the primary sensitivity turns back on without stopping the belt.
3. **Adjusting First Sensitivity:** Turn the **Red** knob labeled “**First Sensitivity**” to the setting of 8. Operate the conveyor with material being conveyed. Select a piece of metal you wish to detect. (Usually a machinery nut will work the best). Securely tie a string to the nut and allow it to repeatedly pass over the probe (Single Probe) or between the probes (Dual Probe). Pass the metal object across or between the probes adjusting sensitivity higher until the object is detected every time.

### IF YOU HAVE A MECHANICAL BELT SPLICE FOLLOW INSTRUCTIONS AT STEP 4. OTHERWISE SKIP STEP 4.

4. **Adjusting Secondary Sensitivity:** Adjust the **Yellow** knob labeled “**Second Sensitivity**” on until it detects the splice. Slow reduce sensitivity until it no longer detects the splice. You are setting the field strength as high as possible while unit is on “Secondary Sensitivity” but still allowing the mechanical splice to pass.



**Slide Switches: S1 and S2:**

**NOTE: You must remove the Front Panel to operate S1 and S2.**

**Function of Slide Switch S1:**

**Position 1:** “Operation” The output relay IS ACTIVATED if metal is detected.

**Position 2:** “Test” The output relay will stay in the position Chosen with the slide switch S2 independent of detected metal pieces. Only the LED will indicate The detection of metal, the conveyor will not stop.

**Function of Slide Switch S2:**

**Position 1:** The output relay becomes activated and the **RED** LED On the front of the door becomes activated. The contact will remain activated (OPEN) until the **GREEN** RESET BUTTON is pushed to reset the contact.

**Position 2:** The output relay is in the activated state. In the case Of detection of metal, the relay will go off for a Period of 0.5 seconds. This mode is favorable if an Alarm is desired in case of power failure.

**Remarks: S2 is preset to Position 1 at the factory.**

**Splice Detectors:** EAB metal detectors have two levels of sensitivity. The “First Sensitivity” is for the detection of a metal object without the presence of a mechanical belt splice. The “Second Sensitivity” is for detection of a metal object lying near a mechanical splice.

When the splice passes the splice detector, splice detector automatically switches the metal detector to the “Second Sensitivity” for the time period programmed. In the case of a piece of metal lying on the splice, the generated metal pulse must be higher than the clip without the piece of metal.

### **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 sensor 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 sensor 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 where belt sag is reduced.
- The belt doesn't always run in the middle of the conveyor. The sensor therefore should be assembled so the belt edge lies over the middle of the sensor.



## **Metal Detector Information:**

Model Type: \_\_\_\_\_

Purchased From: \_\_\_\_\_

Phone: \_\_\_\_\_

Belt Width: \_\_\_\_\_

Probe (s) Serial Number: \_\_\_\_\_

Control Box Serial Number: \_\_\_\_\_

Date of Purchase: \_\_\_\_\_

Notes: \_\_\_\_\_

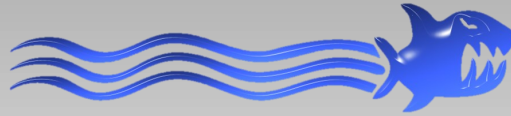
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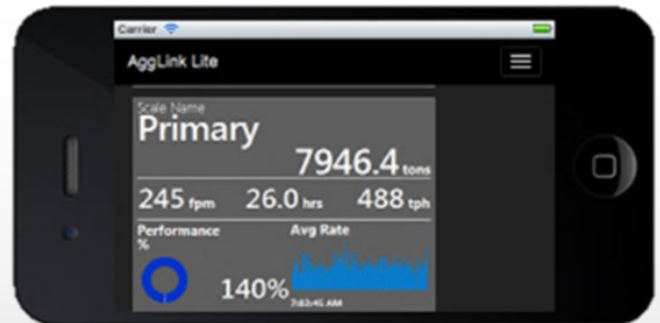
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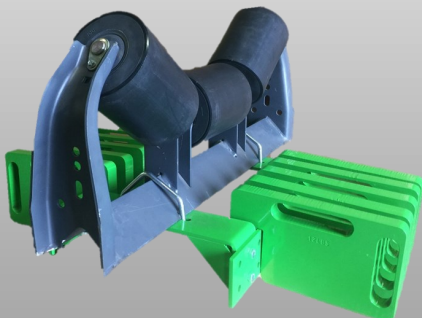
**Remote Displays:** RD3 Networking up to 16 conveyors at the same time

Plant Efficiency: 78%				
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Scale Name	Total	Rate	Speed	Eff %
C4	2697.9	163.1	254.4	47%
C7	3994.5	233.7	316.2	67%
C9	4397.6	276.6	221.4	102%
C1	21.4	1355.3	546.7	100%
C6	3976.7	241.4	246.0	97%
C5	3814.5	221.8	235.6	63%
Scrolling <input checked="" type="checkbox"/>				
Single View Multi-View Menu				

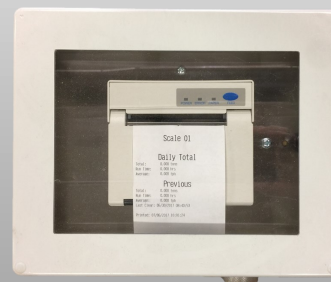
**AggLink:** Networking through the Cloud from ANYWHERE!



**Calibration Kit:** Weights and Bracket for all models - Troughing, and Wing Idlers - Each weight weighs #12

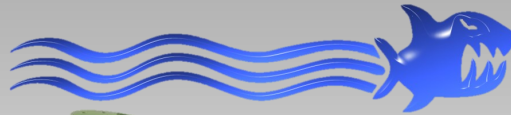


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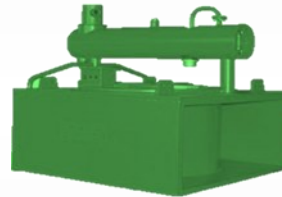


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