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USER MANUAL

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Introduction



All persons concerned with the assembly, commissioning, operation, maintenance and repair of the metal detector unit must be correspondingly qualified and trained. Knowledge of the contents of this operating manual is a prerequisite.

The following symbols are used in this operating manual (all symbols conform to DIN 4844 and/or BGV A 8 standards):

Warning symbols:

Directive symbols:

Hazardous voltage	This warning symbol designates	Prohibited for persons fitted
	potential hazards. Non-observance of this symbol can lead to injuries, even to death.	with a cardiac pacemaker
Danger of injury to hands	Warning of harmful or irritant substances	

Mandatory signs:

Wear eye protection	Wear protective gloves	Take particular care	Switch off before carrying out work

Safety

All persons concerned with the assembly, commissioning, operation, maintenance and repair of the metal detector unit must be correspondingly qualified and trained. Knowledge of the contents of this operating manual is a prerequisite.

Persons Activity	Specially trained personnel	Personnel under instuction	Personnel with job- Specific training (mechanical/electronic)
Transport	Ø		
Commissioning	Ø		
Fault-finding and repair			
Adjustment, equipping	Ø		Ø
Operation		Ø	
Maintenance			
Disposal	Ø		

Key: \heartsuit = allowed -- = not allowed

Hazards related to this metal detection equipment:

A risk / hazard analysis has been carried out on the metal separator with subsequent safety check and safety acceptance. In the case of misoperation or misuse, there is a danger of injury to, or death of operators, maintenance personnel and others, damage to the metal detection equipment and the user's other property, and reduced efficiency of the equipment.

Safety and usage notices:

The following symbols have been applied to the equipment to indicate hazards which cannot be eliminated via structural measures:

Symbol	Description	Location
	Hazardous voltage	Control and evaluation unit

Hazard Activity **Dangerous part** Solution Transport / from site Complete Transport of the plant with equipment suitable and approved lifting appliances by trained personnel. Observe applicable safety regulations. Equipment weight Mount plant securely on Set-up/installation, Complete cleaning, equipment mounting holes. decommissioning/dis assembly Danger of plant tipping Maintenance Separation unit Mounting only by trained and authorised personnel Danger of injury to hands All operating modes Electronic cabinet, Keep the covers of the electronic pneumatic cabinet and pneumatic cabinets closed Hazardous voltage Cleaning with steam Complete Wear suitable protective equipment clothing when cleaning with a jet steam jet. Observe the manufacturer's safety instructions. Observe Danger due to protection class of the plant. pressurised hot water Cleaning with Complete Wear personal protective equipment and observe the cleaning agents equipment cleaning agent manufacturer's instructions Danger of substances hazardous to health or irritants Warning device All operating modes Instruction of personnel on (alarm) existing warning devices Warning of visual or acoustic signal

Please take particular notice of the following residual hazards:

Prohibited for persons fitted with a cardiac pacemaker	Normal operation	Complete equipment	Persons fitted with a cardiac pacemaker (or other implanted medical aid) must not work on this machine.			
	Generally, before clear made safe against ac conveyor belt stopped voltages.	cleaning or repairing the equipment, it must be switched off st accidental switch-on, the air pressure released and the opped. The switch outputs should be checked for externa				

Operation of the device as provided

The device only serves for detecting metal in flight conveyors. The following products

are excluded:

- those contained in metallic or partially metallic casings,
- electrically conductive products



• products containing desired metal constituents.

Since these products could possibly disturb the sensitivity of the metal detector, they may only be examined after consulting the manufacturer beforehand.

This device may not be operated

- in areas with explosive hazards (customized version available),
- outside the stated protective system,
- outside the permitted temperature range.

Operating the device in an improper way can lead to damages at the device and also to injuries or the death of persons.

Any structural change of the device may only be effected after consent and prior inspection of the manufacturer.

The data provided in the manual regarding operation, maintenance have to be observed. Works at the metal detector may only be carried out by trained and authorized personnel.

Warranty and liability

We are liable for defects in the unit manufactured by us in accordance with our terms and conditions of business. All claims are voided if damage occurs due to improper operation, repairs or interventions by persons not authorised by the manufacturer or the user, or the use of accessories and spare parts which not suitable for our unit.

Transport

When transporting the machines, you must observe the following points:



- When exceeding the country's legally prescribed maximum weight limits for people moving goods, lifting devices must be used!
- Mount the lifting devices in accordance with the following drawing! (check your coil type!)
- When mounting the eye bolts, please take care that they fit snugly onto the bearing face. Loads that run diagonal to the ring face are not allowed.
- Mounting the lifting devices and transport may only be carried out by trained and authorised staff!
- During transport, the safety regulations in force must be observed!

Mounting the C/CI-Coil

- 1. horizontal
- 2. vertical



Mounting the D-Coil

Upper part, or upper and lower part mounted:

- Remove the plug (1)
- Mount the washer (2) and the eye bolt (3) The washer and the eye bolt can be ordered via the spare parts list. **They are not included in the scope of delivery!**
- Fix the lifting device (4) to the eye bolts (3)
- Remove eye bolt (3) and put plug (1) back in

the lower part (see Mounting the S-coil)



Mounting the S-Coil

Operating principle

The following shows the simplified principle of a metal search detector, with an example of a conveyor belt application. The shape and look of your application may differ, but the principle is the same.



a) Metal detectorb) Electromagnetic fieldc) Product line

Metal detection

- **1.** The seeker head creates and evaluates an electromagnetic field with the help of transmitter and receiver coils.
- **2.** When the metallic piece enters the electromagnetic field, the electromagnetic field is altered. This change is recognized and analyzed by the electronics system. If a metal piece has caused the change, the electronic system indicates metal.

If metal is detected, several outputs, depending on your configuration, can be used to query the events: At least one Relay and a 24V (output A1) are available for your queries.

General notes on metal detection



Electro-magnetic short circuits

Certain metal frame constructions in conveyor belt frames (see drawing) and suspensions (e.g. castors, crossbars, adaptor plates) can act as an electro-magnetic loop in the vicinity of the metal detector, affecting the magnetic field of the metal detector. Closed conductive loops must either be welded tight, or interrupted, e.g. with unilateral isolation.

Example:



1. If the cross-bar is welded tight, the electro-magnetic effect on the metal detector remains constant, and does not have an adverse effect on the metal detector's magnetic field.

If the cross-bar is merely screwed on, a constant conductive connection cannot be guaranteed. The metal detector is affected adversely due to the changing conductive loop.

2. Castors and moving parts that constitute a conductor loop need to be isolated unilaterally (see 3), so that the conductor loop is interrupted.

Electrostatic discharges

Prevent at all cost electrostatic discharges to the metal detector and surrounding construction components using the appropriate earthing. Electrostatic discharges can cause false signals and at worst, destroy the analysis electronics.

Differences in sensitivity within the outlet opening

Please note, that the detector coil does not create a homogeneous electromagnetic field. As a consequence, differences in sensitivity occur in the outlet opening. The least sensitive part of the detector is in the middle of the outlet opening.



Sensitivity differences of different metal types

Please note, that different metal types influence the electromagnetic field to a different degree. Please read the metal-type dependent maximum sensitivity degrees in the data sheet.

Position-dependency of the metal parts

Metal detection can be dependent on the position and orientation of the metal part, depending on the shape of the metal part. The maximum sensitivity values of the data sheet are tested with ball-shaped test parts. Generally speaking, all metal parts that have at least the same diameter as the balls used for the data-sheet values can be detected with certainty, irrespective of position and orientation.

Regular testing

Changes in the environment of the detector (e.g. new machines) may affect the function of the detector. For this reason, the settings and functions of the metal detector must be checked at regular intervals using suitable test bodies.

Environmental and weather influences

The metal detector has to be protected against environmental and weather influences (direct sun, wind, frost). The detector has to be especially protected from direct or indirect insulation when heating up is above the allowed temperature. High surface temperatures can lead to false detections and destruction of the metal detector in the worst case. A suitable protection device must therefore be provided (do not use metal walls or roofing covers made from metal!)

Actuation



General

It is our company's goal to ship the metal detector to the customer with as many pre-configured settings as possible. If the machine is shipped with factory default settings, it should be noted, that the factory defaults are the best possible compromise between maximally attainable detection precision and lowest possible sensitivity to interference. The data sheet sensitivities are achieved with sensitivity settings between 90 and 100%.

In order to adjust the settings according to one's own requirements, the following plan will outline how to go about setting up the machine. Only the steps are explained, for a thorough explanation of the menu items, you should consult the operating manual.

Safety procedures before taking the device into operation



Before actuating the metal detector at least the following parts of the device must be checked:

- Is the device damaged anywhere?
- Are the electric ports and mains undamaged ?
- Are all protective covers fitted and free of damage?
- Are all pneumatic supplies and mains undamaged (if installed)?

The device can start if everything is perfect.

Actuation manual

Clean the metal detector

If the product is not allowed to have contact with foreign matter, all surfaces having contact with the product must be cleaned before start-up operation.

Please follow the safety instructions!

see chapter Maintenance and cleaning \rightarrow Cleaning

Assemble metal detector

Assemble the metal detector according to the information provided in the chapter "Assembly".

see chapter Assembly

Connecting the 24V switching exits and relays

Connect the 24V switching exits and relays as needed. Please follow the indications in the chapter Set-up.

see chapter Assembly → Connection

Connect power supply

see chapter Assembly → Connection → Supply voltage

Now your metal detector is fully assembled and connected.

All further instructions refer to the most important settings, that should be adjusted at your detector in order to ensure perfect operation of your device while maintaining the highest possible sensitivity.

Switch metal detector on

Having assembled the detector mechanically, as a first step it is taken into operation. Under this condition the detector is only subject to external influences (peripheral disturbances). If at this point faulty responses are triggered, you have to try and find the source of the disturbance and to correct the error. For this switch off all machines (motors, actuation, etc.) in the direct surroundings of the metal detector so that the metal signal of the metal detecting device stays within the triggering range. As a next step the device is taken again into operation step by step.

After each step control the measure signal in order to locate the disturbance, that causes an increased noise level. If a noise suppression is not possible, you can only reduce the sensitivity until there are no more incorrect triggering.

see chapter Adjustment → Sensitivity

Activate production- and transporting device

As a next step the production and transporting device is taken into operation without loading products. In this state the influence of the transporting device on the metal detector becomes evident. Here also applies: If there should be incorrect triggers try to locate the cause of the disturbance and suppress it. For this, take the production line into operation as mentioned above, step by step.

Contrary to peripheral disturbances that often need very high efforts to suppress them in this case a solution should be easily found.

Temporarily the sensitivity can be reduced until there are no more incorrect triggerings.

see chapter Adjustment \rightarrow Sensitivity

Start complete production line

Now start the complete production line. For the set-up-step you should, if possible, use only metal-free products.

Optimize sensitivity settings

Note:

The higher the sensitivity is set, the higher the susceptibility for incorrect triggering.

see chapter Adjustment → Sensitivity

Set the ejection time

see chapter Adjustment → Ejection time

You now have set your metal detection device at optimum level.

All further setting possibilities serve for adjusting the metal detection device to the production process and for implementing functions and evaluations adapted to applications.

An overview of all of your metal detection device's functions is provided in chapter "Adjustment".

see chapter Adjustment





Please note when assembling your detector the following assembly instructions in order to ensure perfect operation.

Installation guidelindes

Electronics

Connect the metal detector to a clean, constant voltage power supply.

Voltage fluctuations can cause false trippings. Therefore, a constant voltage transformer (AC line conditioner) is recommended. In order to check if false tripping is caused by voltage fluctuations you can temporarily supply the metal detector with a UPS (Uninterruptible Power Supply, direct, independent power supply as used for Computers). Please, do not forget to plug off the input cable of the UPS to separate it from the AC line.

Do Not install the control panel near MCC's or control panels of other machinery.

Stray fields of motor lines and high power cables can trigger faults. Be especially aware of frequency inverters and DC Drives as they can emit high frequent electromagnetic fields that might cause false trippings of the metal detector. Please follow the guidelines of the manufacturer of the motor drive. Especially take care of using screened motor cables, AC Filters and make sure that the ground connection is correct.

Run the transmitter and receiver cables to the metal detector separately from live wires.

The detector cables can catch noise, especially when they are close to motor lines or high power cables. To improve the screening of the cables, solid metal conduits with a good ground connection (best welded) are recommended. Please do not connect the conduits to the metal detector or at least use plastic fittings when connecting flexible conduits to the cabinet or transmitter and receiver boxes of the metal detector. Be aware of ground loops. Both cables can be run in the same conduit.

Do not disconnect the metal detector from the power if possible.

A constant, uninterrupted power supply enables more sensitive adjustments and prolongs lifetime of electronic components. Powering the unit on and off causes it to recalibrate (8 seconds) during which time metal will not be detected.

When welding at the construction where the metal detector is mounted, disconnect the metal detector from the power supply and do not use the control panel mounting surface as a ground.

Welding near the metal detector will lead to false trippings.

Vibration less using of the control panel

Mount the control panel on a vibration free surface. Vibration can cause premature electronic component failure.

If the electronics casing is mounted onto other machine parts, there is a danger of causing an earth connection loop, which can lead to malfunctions.

In such cases, the electronics casings should be isolated (suitable plastic panes and isolating materials can be found among spare parts for installation).

All wiring must be shielded.

Shielding must be placed vertically on the casing, preferably using an EMV screw connection.

Detector general

Be careful when you have more than one metal detector in operation!

If several metal detectors are installed in immediate proximity, they might Interfere with each other when running at the same detection frequency (frequency overlaps). If we know in advance that you have more than one detector in operation, we do already adjust the detectors to different frequencies. Should there be frequency overlaps, you can adjust one detector to side frequency.

see chapter Adjustments → Secondary frequency

Please observe the required minimum distances. For closed tunnel detectors type C, CI and CR: minimum distance = $10 \times LH$ (LW for type CR), if the detectors are installed parallelly in one row. For divisible tunnel detectors type D and single surface detectors type S: minimum distance= $15 \times LH$ (SB for type S), if the detectors are installed parallelly in one row. The minimum distances may be lower if you work with different frequencies. Please consult our sales or application department.

LH = Aperture Height LW = Aperture Width SB = Detector breadth

Do not install the detection coil inside a strong electromagnetic field. (especially if in the direct surroundings of the seeker head there are strong load variations at other electronic devices)

Interferences can trigger faults. Specifically, fields lying exactly within the operating freqency of the detector can lead to frequency overlapping and hence to false tripping.

Pay attention to the metal free zone (MFZ) of the metal detector.

Do fixed, non-moving metal parts outside the metal-free zone have little influence on the metal detector's function. Metal parts changing their distance to the detector (levers, swivel arms...), however, might cause problems within the metal free zone, please use electrically non-conductive material only, e.g. wood or plastics. Please keep in mind that the use of a plastics slide plate may promote the formation static charges.

see chapter Assembly → Tips for Set-up

Vibrationless use of the detector coil

Higher sensitivities can be attained and maintained if the operating conditions are optimal. Ensure the coil is mounted to a structure that is stationary at all times.

Vibrationless use of the control panel.

Mount the control panel on a vibration free surface. Vibration can cause premature electronic component failure.

Eliminate loose metal to metal connections near or within the detection field.

Intermittent metal contact from components such as roller axles, bolted structural connections of the conveyor frame, loose grids from access platforms or broken welds can cause false reject signals, especially at high sensitivity settings. In order to avoid creating intermittent magnetic loop contacts, please isolate metal parts from one another or weld them together. Bolted ground connections will not solve this problem.

see chapter Introduction \rightarrow General notes on metal detection

Pay attention to the maximum installation batter of the search head

You can take the maximum installation batter from the datasheet. For larger batter, please contact the manufacturer before installing the unit.

Please clean the conveyor belt (of belt conveyors) regularly.

Metal impurities cause fault detections. Please make sure the belt runs centrically on the rollers and nothing rubs on the belt.

Pay attention to an electrical insulated installation.

The mounting feet of the detector provide an electrical insulation, do not remove them.

Do not use anti-electrostatic belt material.

Anti-electrostatic belts are conductive and cause an effect similar to metal in the metal detector.

Depending on the relevant application, a conveyor belt appropriate for the metal detector must be chosen. The conveyor belt should have a so-called finger coupling. Furthermore, glue containing metal particles must not be used for connecting the belt.

Do not touch the sensor/coil surface of the detector.

Mechanical contacts may cause detection errors. Keep the surface free of debris.

The conveyor belt frame has to be stable.

Loose parts, especially loose cross-linkings like stiffening braces, screwed abrasive sheets, cover plates etc. may lead to immense interferences. If possible, do not use any screws in theist area try to weld the parts instead. Should screws be indispensable, please insulate them one-side.

Power rolls, deflection rollers and snub pulleys are also possible sources of interference, as the electrical contact is submitted to large variations caused by damaged or bad bearings.

The same applies to swivelling belt strippers. These parts should always be insulated on one side. **Please note:** Bridging bad contacts with earth band or wire will **not help!**

see chapter Introduction → General notes on metal detection

When welding at the construction where the metal detector is mounted, disconnect the metal detector from the power supply and do not use the control panel mounting surface as a ground.

Welding in the surroundings of the detector will trigger faults.

Tips for set-up

General



Metal free zone
 Metal detector
 Belt frame
 Conveyor belt
 Sliding plate
 Sensor surface

The product, conveyor belt and sliding plate must not touch the sensor surfaces (this is not true for VT/SL coils and Profi Line).

The sliding plate (plastic or wood) must have the correct size or supports, so that it cannot touch the sensor surface, even if the conveyor belt is fully laden (This also counts for the conveyor belt when backing up in the coil). Distance: roughly 10 mm. It is recommended to use wood, to avoid the generation of electrostatic charges.

The proper choice of conveyor belt, suitable for metal detectors, depends on its use. The conveyor belt should have a so-called "finger coupling". Also, the belt coupling must not be fixed with glues containing metal.

If the construction space of the conveyor belt allows, you may choose a longer metal-free zone.

Electronics AMD 03

Drawing number:





- **1.** Back of casing
- **2.** 4 mounting bores \emptyset 6,0
- 3. Mains
- **4.** Free
- **5.** Assigned by manufacturer for detector
- **6.** Reset tracer and metal lamp: When mounting the casing note that this tracer must still be easily accessible when in operation.

Detector C-Coil



1. Metal-free-zone MFZ (non moving metal) = $SL + LH^{1}$ MFZ (moving metal) = $SL + 3,5 \times LH^{1}$ 2. Mounting foot:

Thread reach: max. = 18 mm Thread M12

¹⁾ The metal detector has to be positioned centrically within the "metal-free-zone". The calculated values can be used for orientation (minimum values can of course be exceeded!) but must be confirmed by us for the respective project.

Aperture height	Detector length	Top / Bottom thickness	Distance between threaded bore holes			Number of threaded bore holes for each detector	Mounting foot middle	Measure
LH	SL	SH	BA 1	BA 2	BA 3	Α		Х
50-150	260	115	130	-	-	4	no	18
175 - 200	300	115	170	-	-	4	yes	22
225 - 250	350	115	220	-	-	6	yes	26
275 - 300	400	115	230	-	-	6	yes	27
325 - 350	450	115	280	-	-	6	yes	31
375 - 400	500	115	110	330	-	8	no	36
425 - 450	550	115	190	380	-	10	yes	40
475 - 500	600	115	215	430	-	10	yes	44
550 - 600	650	115	240	480	-	10	yes	49
650 - 700	700	150	265	530	-	10	yes	-
750 - 800	800	150	150	390	630	12	no	-
850 - 900	900	150	150	440	730	12	no	-
950 - 1000	1000	150	280	560	830	14	yes	-
LH > 1000	1200	150	340	690	1030	14	yes	-

LB (Aperture width)

Dimensions in mm

Detector D-Coil (separately coils)

The calibrating bolts must not be re-adjusted or removed, this is why they are painted over.

Please observe the following assembly notes for diagonal mounting of D-Coils.



- **1.** Self-locking screw nut M 12 (Art.-Nr. 300 789)
- **2.** Washer DIN125 (Art.-Nr. 300 126)
- **3.** Insulating bush (Art.-Nr. 301 092)
- **4.** Drilling pattern for drills 17 please see datasheet METRON-D (Fixing holes)
- **5.** Metal detector
- **6.** Fixing bar
- **7.** Conveyor frame
- 8. Amount (2 or 4 pieces each of fixing bars) depending on detector width
- **9.** Threaded rod M12 (l=200): Please adjust length when mounting



The metal detector has to be connected (screwed) to the conveyor frame by means of the threaded rod.

However, an insulated mounting has to be guaranteed by the insulating bush:

- The insulating bush must not be damaged during installation
- Threaded rod, washer and screw nut must not touch the metal detector

D-Coil Assembly



- **1.** Screw
- **2.** Helical spring washer
- **3.** Washer at least 4.5 mm thick
- **4.** Distance to receiver housing
- **5.** Receiver housing
- **6.** Earth connector

The top of the detector is fastened onto the detector bottom with 3 screws on each side.

The following points must be noted:

- Make sure that you have a good earth connection (see **6**). If necessary, treat with Zinc spray.
- The central screw (1) must be screwed together with the spring washer (2) and the appropriate additional washer (3) to ascertain that the distance to the receiver housing is sufficient (5).



The central screw must not touch the receiver housing, since that could lead to false metal events.

Dimension drawing of D-Coil



- **1.** Metal-free zone $(MFZ)^{1}$ MFZ for non-moving metals = MFZ 1 / MFZ 2 / MFZ 3 MFZ for moving metals = MFZ 4 / MFZ 5 / MFZ 6
- **2.** Mounting foot: Thread reach: max. = 18 mmThread M12

¹⁾ The metal detector has to be positioned centrically within the "metal-free-zone". The calculated values can be used for orientation (minimum values can of course be exceeded!) but must be confirmed by us for the respective project.

SB (Coil width) = $LB+200$ EB (Sensitive area)										
Light height	Light width	Top/ Bottom thickness	Coil l	ength	Tap hole Mount	distance ing foot	Tap hole distance	Mounting foot middle		
LH	LB	SH	SL	BA1	BA2	BA3	Α			
until 200	EB+220	115	400	230	-	-	6	yes		
until 300	EB+220	115	500	110	330	-	8	no		
until 400	EB+240	115	600	215	430	-	10	yes		
until 500	EB+240	115	700	265	530	-	10	yes		
until 600	EB+240	115	750	290	580	-	10	yes		
until 700	EB+280	115	800	150	390	630	12	no		
until 800	EB+280	120	850	150	420	680	12	no		
until 900	EB+280	120	900	150	440	730	12	no		
until 1000	EB+280	120	1000	280	560	830	14	yes		
>1000	EB+300	120	1200	340	690	1030	14	yes		

SB (Coil width) = LB+200 EI	3 (Sensitive ar
-----------------------------	-----------------

Dimensions in mm.

Detector LCR-Coil

For assembling the LCR – Spool use the enclosed rubber metal connections.

These rubber metal connections improve the attenuation of the spool and by their isolative layer prevent electromagnetic short circuits.







С D min ØN



Rubber-metal connections :

fastening holes for rubber-metal connections

Тур	NW ca. ØA	В	С	D	E	F	G	H	ØK	L	М	min. Ø N	Wigth (in kg)
45	45	150	140	90	120	60	4 x Thread M6 -12 deep	15	25	M6 x 10	M6 x 6	70	app. 3,5
55	55	150	140	90	120	60	4 x Thread M6 -12 deep	15	25	M6 x 10	M6 x 6	80	app. 3,5
70	70	160	150	100	120	60	4 x Thread M6 -12 deep	15	25	M6 x 10	M6 x 6	95	app. 4,0
85	85	160	150	100	120	60	4 x Thread M6 -12 deep	15	25	M6 x 10	M6 x 6	110	app. 4,0
100	100	210	180	120	170	80	4 x Thread M6 -12 deep	15	25	M6 x 10	M6 x 6	130	app. 4,5
115	115	210	180	120	170	80	4 x Thread M6 -12 deep	15	25	M6 x 10	M6 x 6	145	app. 7,3
130	130	210	180	120	170	80	4 x Thread M6 -12 deep	15	25	M6 x 10	M6 x 6	160	app. 7,4
150	150	280	190	130	230	80	4 x Thread M8 -15 deep	30	40	M8 x 12	M8 x 6	180	app. 11,8
170	170	280	190	130	230	80	4 x Thread M8 -15 deep	30	40	M8 x 12	M8 x 6	200	app. 11,8
210	210	300	230	150	230	100	4 x Thread M8 -15 deep	30	40	M8 x 12	M8 x 6	245	app. 11,2

Metal-free-zone LCR-Coil





Туре	NW ca. Ø A Clear width	L Detector length	SH = SB Detector height = Detector width	MFZ 1) (Metal-free-zone) non-moving metal	MFZ 1) (Metal-free-zone) moving metal
LCR 45	45	90	150	135	180
LCR 55	55	90	150	145	200
LCR 70	70	100	160	170	240
LCR 85	85	100	160	185	270
LCR 100	100	120	210	220	320
LCR 115	115	120	210	235	350
LCR 130	130	120	210	250	380
LCR 150	150	130	280	280	430
LCR 170	170	130	280	300	470
LCR 210	210	150	300	360	570
			D' ' '		

Dimensions in mm.

¹⁾ The metal detector has to be positioned centrically within the "metal-free-zone". The calculated values can be used for orientation (minimum values can of course be exceeded), but must be confirmed by us for the respective project.

Detector S-Coil



- Conveying direction
 Metal free zone (MFZ)
- **3.** Bridge plate
- **4.** Conveyor belt
- **5.** Conveyor frame
- **6.** Attention! Bridge plate may not be in contact with aperture Distance: 5 to 10 mm
- a) View

Mount the type "S" metal detectors as closely as possible to the lower side of the vibro slat or of the conveyor belt.

The closer the product to be analysed is to the sensor surface, the better the sensitivity achieved on the metal parts. HOWEVER: the sensor surface of the metal detector must not be in direct contact (touch).

Dimension drawing of S-Coil



Dimensions in mm.

- **1.** Metal free zone $(MFZ)^{1}$
- **2.** Mounting foot:

Thread reach: max. = 18 mm Thread: M12

¹⁾ The metal detector has to be positioned centrically within the "metal-free-zone". The calculated values can be used for orientation (minimum values can of course be exceeded!) but must be confirmed by us for the respective project.

BA = Distance between threaded bore holes SB = Detector breadth EB = Sensitive width

Other measurements on request

Detector SL-Coil

Fastening possibilities:



Notice:

Pay attention that the metal detector is fastened in a stable way without twists

Mechanical voltages can lead to spurious releases!

Do not expose the seeker head to strong electromagnetic fields(especially if devices near the seeker head are subject to voltage changes).

Field interferences lead to spurios releases



In order to prevent malfunctions caused by frequency interferences, the minimum distance of 1,2 m must be observed when assembling conveyor belts (detector spools) parallely!







possible overall width	Coil shell	Sensitivity	Wight
possible overall widdl	breadth	breadth *	[kg]
Α	В	B - 10	
min. 210 - max. 300	200	190	ca. 5,3
min. 260 - max. 350	250	240	ca. 6,0
min. 310 - max. 400	300	290	ca. 7,0
min. 360 - max. 450	350	340	ca. 7,6
min. 410 - max. 500	400	390	ca. 8,4
min. 430 - max. 520	420	410	ca. 9,0
min. 460 - max. 550	450	440	ca. 9,8
min. 510 - max. 600	500	490	ca. 10,9
min. 560 - max. 550	550	540	ca. 11,7
min. 610 - max. 700	600	590	ca. 12,5
min. 660 - max. 750	650	640	ca. 13,6
min. 710 - max. 800	700	690	ca. 14,7
min. 760 - max. 850	750	740	ca. 15,7
min. 810 - max. 900	800	790	ca. 16,7
min. 860 - max. 950	850	840	ca. 17,7
min. 910 - max.1000	900	890	ca. 18,7
min. 960 - max.1050	950	940	ca. 19,3

* for details please refer to data sheet

Connection

Having mounted your metal detector according to the directions provided on the above pages you now can connect it:

see too chapter **Technology** → **Plug configuration**

General

To avoid malfunctions arising from the power supply, the analysis electronics are equipped with a demodulator.



Please note:

The electronics cannot be damaged by malfunctions of the power supply. The malfunctions can, however, lead to a reduced detection precision or even erroneous detection impulses, if no demodulator is used.



- 1. Central ground point (connection via spade connector 6.3 mm)
- 2. Mains filter
- 3. Mains socket
- 4. External earth wires should be connected to the central ground point (1).

see too chapter Montage \rightarrow Connection \rightarrow Supply voltage

Metal relay (as needed)

Relay 1 is set by the factory to be used as the "metal" relay. Neutral relay – switch contact, switches when detecting metal Impuls time: coupled with separation time



Failure relay (recommended)

Relay 2 is set by the factory to be used as the "failure" relay.

Neutral relay - switch contact, switches when system monitoring is actated

You can determine the functional state of the appliance with the help of a neutral contact.

If the control system detects an **"internal error**"(defect in analyzing electronic) or an **"external error**"(defect in peripheral equipment), it immediately activates the **"Failure relay**". You can use the change-over process of the differential relay to connect an alarm or to disconnect the materials supply by the metal detector.



Resetting failure info on the failure relay can only be effected by manual reset.

Connecting the differential relay is not necessary to operate the metal detecting unit. However, it increases the safety of your production process.

In order for the metal detector to continue operation after eliminating the source of errors, a manual reset has to be effected.

see chapter Errors and problems

If the fault condition is unknown, please consult the chapter "Errors and problems" to diagnose the problem.

Supply voltage

Connect the supply voltage only after you have integrated all connections. Otherwise there will be error messages.

The supply voltage has to lie within the following bounds:

Continuously:	100 to 240 V AC
2	50 / 60 Hz
or:	100 to 353 V DC
Power protectio	n: max. 10 A

Customized version: on request

If you do not use the mains plug of the shipped package, you have to configure the mains connector as follows:



a) Alternate voltage b) Direct voltage c) after line filter



- The electrical safety and installation provisions of the respective country must be observed.
- The mains voltage must be separable, i.e. it must be possible at any time to separate the device from the electrical power system.
- The applied power connection/mains socket must be in visible near of the device and be well accessible.
- Repair and maintenance work on the board may only be carried out by trained and authorized personnel!
 - Improper adjustments can impair or even prevent your metal detector from operating!



Operation



Reset

411

GND

Made in Germany

B

OUT:24.0V ...: 0,6A

Operating the metal detector is limited to operating the Reset button after metal was indicated or after an error notice. The Reset button is located on the electonics case.

Metal is indicated, when the Reset buton lights up.

The analyzing electronics permanently monitor the metal detector's operating parameters. If an error is recognized, this is signalled by a flashing Reset button.

-	-		-
) *	METAL FAULT
	Reset-Button		
	• dark	⇒	Normal state
	 aligth 	⇒	Metal
	 blinks 	⇒	Error

Referring to this you will find three ZEDs on the electronic board which show you the operating state of the metal detector.

	- Mains-LED 24V	dark	→n
	(green)	alight	\rightarrow s
	- Mains-LED +15V	dark	\rightarrow s
	(green)	alight	\rightarrow s
	Mains-LED -15V	dark	\rightarrow s
	(green)	alight	$\rightarrow s$
50	• Metal-LED	dark	\rightarrow n
	(red)	alight	\rightarrow n
20	- Fehler-LED	dark	→ n
	(red)	alight	$\rightarrow e$
		blinkt	$\rightarrow e$

- o/wrong voltage upply voltage o.k. upply voltage fault supply voltage o.k. upply voltage fault supply voltage o.k. ormal state
- netal
- normal state
- error
- error

Opening the electronics case

In order to be able to adjust advanced settings of the analyzing electronics, (normally not necessary, because the metal detector is delivered ex factory with default) you first of all have to remove the electronics casing lid.

Note:

Only trained and authorized personnel may open the electronics casing box.



In Order to be able to open the casing box, first of all remove the four screws. Then carefully remove the lid.

Make sure that the casing box is grounded.

Do not forget to reconnect to ground if disconnected when detaching.

Make sure there are no external voltage on the switch outputs.

Adjustment



General

The metal detector comes with default values ex factory. Usually changing factory default should not be necessary. If you should nevertheless require changes you should record the factory Factory default default settings in the intended textboxes for your safety, so that you can restore them if required.



In order to be able to change settings the casing box of the analyzing electronics has to be opened.

see chapter **Operation** \rightarrow **Opening the electronics case**

The exact location of the switches that have to be changed is depicted in the "Key plan".

see chapter **Technology** \rightarrow **Key plan**

You can change the switch settings with the help of a small screw driver.



Note that changing the settings can impair correct operation of your metal detector Settings may only be changed by trained an authorized personnel.

Mush killing

The expression "Mush killing" describes an adjustable filter. Mush killing is an option, that can only be used at low hauling speed (for instance when using conveyor belts). With free fall application the mush killer cannot be used.

- A filter allows signals up to a certain frequency to pass unhindered (cut-off frequency). All signals with a higher frequency are reduced. These signals can, for instance be so-called background noise, i.e. there is an external electrical field near the detector (for instance a frequency converter or an electromotor). With detector sensitivity high, these external signals would cause faulty metal signals. With the help of the mush killing device this can be prevented in almost all cases.
- Additionally you can optimize your metal detector with the help mush killing and adapt it to conveyor belt speed.



Sensitivity

The sensitivity settings can be altered using the below depicted rotary potentiometer.

If sensitivity is set to a high level, smaller metal pieces can be detected.

A higher sensitivity, however, also increases a higher susceptibility to parasitic induction



In order to guarantee optimized settings for sensitivity the following approach is recommended.



Ejection time

If, with the help of your metal detector, you operate a removal facility, you can control the duration of the metal impulse by changing the settings in the **Ejection time** options.

Ejection facilities usually are connected to the relay or to the active output.

see chapter **Technology** \rightarrow **Plug configuration** Futhermore note that an automatic reset after a metal impulse can only be effected if switch K 2.1 is set to "Automatic reset".

see chapter **Technology** \rightarrow **Switches**



The time span for removal time can be set with switch K 3.2.

see chapter **Technology** → **Switches**

Secondary frequency (not Coil-LCR/SL)

If the metal detector is exposed to strong interference in the factory-pre-set main frequency, and normal operation is impossible, you can change to a secondary frequency.



\bigcirc	Main frequency	
\bigcirc	Secondary frequency	
Fac	tory default	

Maintenance and cleaning



Maintenance

Electronics

• All electronic components are maintenance-free.

Electrical



- Regularly check the connectors of all wires of the metal separator, as well as the wires themselves for damage of any kind.
- Damaged and defective components must be replaced.

Detector

- Please check regularly whether all installation supports of your metal detector are still firmly attached.
- Check regularly whether all interconnecting cables and screw (transmitter / receiver control box cover...) are firmly attached.

Cleaning

General

Before cleaning your metal detector, check the permitted protection type

see chapter Technology → Technical data

In order to guarantee operation free of malfunctions, apart from maintenance, cleaning is also necessary in regular intervals. It is recommended to carry out maintenance and cleaning work at the same time.

Cleaning includes removing dust and dirt from all surfaces, gaps and inside the machine.

Please note:



- All casings must be closed.
- All covers must be fitted.
- The sensor surface must be kept free of impurities, especially metallic or conductive particles, at all times.
- None of the electronic casings and lids may be cleaned using high-pressure cleaning devices.
- Works on the machine may only be carried out by trained and authorised staff.

Errors and Problems

General

The analyzing electonics permanently monitor the functional status of the metal detector.



Additionally to the LRD you can determine the operational status with the help of a neutral contact.

See also chapter Assembly \rightarrow Connection \rightarrow Failure relay

┌┐7

If the controlling system recognizes a failure status, the connection "Failure relay" is switched on.

The connection "Failure relay" remains in failure status even after repairing the failure.

Manual reset occurs after when the test button for a test reject is activated.

Next is failure finding. The following pages list and explain different causes of errors.

Troubleshooting



Troubleshooting should only be performed by authorized and trained persons.

The following troubleshooting hints should help you to find the problem. Please follow the recommended sequence.

The Test points (TP) found you under key plan.



see chapter Technology \rightarrow Key plan The service diagnosis, that includes connecting and disconnecting the plugged cables, is carried out live-line.



Mains supply

The control lamp or mains LED must be lit for the evaluation circuit to function properly.

Net-LED / Main supply-LED dark?

1. Step: Check the mains supply!

Range of the mains supply:

Continuously: 100 to 240 V AC 50 / 60 Hz or : 100 to 353 V DC System protraction: max.10 A Customized version: on request

2. Step: Check the device fuse!

In order to protect the evaluation electronics a time-lag 315 mA fuse has to be used.

• Fuse o.k.

Mains supply not o.k.

Measures:

- Check the voltage actually connected to the **mains supply**. Does the voltage meet the requirements?
- Contact our service department
- Fuse defective

Replace the device fuse with a spare fuse located on the electronics board. (315 mA, 5x20 mm according to DIN)

- **1.** Main supply LED
- **2.** Time-lag spare fuse. 315 mA, 5x20 mm according to DIN
- **3.** Device fuse, 315 mA, 5x20 mm according to DIN

MTM POWER www.mm-power.com 1N* 1N* POWER POMAS 15 S 24 900015-02403R 100 - 240V- 50/60 Hz Imax 0,4A 100 - 353V = 001724,0V-0.0.6A 001724,0V-0.0.6A CG Made in Germany GND -	- (B) (B) (B) (B)
	2
24 21 22 12 11 14 24 21 22 12 11 14 24 21 22 12 11 14	3

see chapter Errors and problems→ Service

Service

Our trained personnel will be glad to help you removing errors and problem at your metal detector.

Please find the contact person responsible for you on the type plate on the seeker head. The type plate is on the backside of the electronic control box cover and on the outside of the metal detector.

Before contacting our service department, please fill-in the following form thoroughly. This will help our service technicians to find the error.

AB-number

Serial number device

The device's serial number you can find on the type plate. It is a 6-digit number and a 2-digit character combination. (for instance. 010512-MN)

Serial number electronics

The electronics serial number you can find on the electronics casing box or on the power supply transformer or on the board. It is a 6-digit number and a 2-digit number (for instance 010512-50)

Product description

(type, temperature, impurities, ...)

Detailed error description

Measures taken so far

e there been prior service calls?	ves no	Γ
If yes, which order number and/or error description?		

Technology



Technical data

Operating voltage:	100 to 240 V AC 50 / 60 Hz 100 to 353 V DC
Customized version:	on request
Current load:	max. 300 mA
Device fuse:	315 mA time-lag, 5x20 mm according to DIN
Mains protection:	max. 10 A
Protective system:	IP 54
Temperature range: Operating: Storage/Transportation:	-10° to +50° C -10° to +60° C
Humidity:	up to 100 % without condensation water
Mains connection:	ca. 1,8 m cable with safety plug (US-version with US-standard plug)
Lacquering:	Structural lacquer RAL 3027 or customized lacquer (as desired)
Material: Electronics casing box:	Steel sheet 1,5 mm lacquered, (weight incl. electronics ca. 2 kg)

Plug configuration

Electric mains



Contact L1, N **Electric mains voltage range:** Continuously: 100 to 240 V AC 50 / 60 Hz

or : 100 to 353 V DC

Customized version: on request

see too chapter Montage→Operation

Relay 1 (switches when metal is detected)



Contacts 12, 11, 14

Dead state: Contacts 11 and 12 closed

Contact load: U~ 250V Imax 3A

Relay 2 (switches when an error is detected)



Contacts 24, 21, 22

Dead state: Contacts 21 and 22 closed

Contact load: U~ 250V Imax 3A

Terminal block



I_{max} total (all connections): 100 mA

- **1.** Contacts **24V**, **I4** connection possibilities of test callipers. Using the test callipers you can initiate a est in order to test the operability of the metal relay or of the active output. (max. cable length 5m)
- 2. Contacts I3, 24V (additional reset connection, max. cable length 5m)
- **3.** Contacts **GND**, **A1** active output (switches when detecting metal), can be reserved ex plant (for instance signal, Segregation device (combinations Electrovalve) at QUICKTRON).
- **4.** Contacts **24V**, **I2**, **(GND)** optional connection possibilities for callipers or initiator to control outward transfer (for instance to pusher or switch) (has to be installed ex plant)
- **5.** Contacts **24V**, **I1**, **(GND)** optional connection possibilities for pressure control device for pressure control of outward transfer (for instance to pusher or switch)

Transmitter- / Receiver connection

The Transmitter– / Receiver connection of your detector, can be configured in two variations, depending on your way of utilization

1. Transmitter and Receiver of the detector are located in one casing box:

Transmitter- / Receiver connection

Contacts: Receiver E1, E3, E4, Transmitter S8, S1



- a) Electronics
- b) Detector / Transmitter- / Receiver connection housing
- c) EMV-screws
- d) Shielding

Electronic	Conductor Nr	Colour	Detector
E1	1	white	1
S1	2	brown	2
E3	3	green	3
E4	4	yellow	4
S8	8	black	8

2. The detector's transmitter and receiver are located in two casing boxes:



Receiver connector casings Transmitter connector casings

- **1.** Receiver connection
- **2.** Transmitter connection

Toward electronics

Toward electronics

Receiver connection

Contacts E8, E1, E2, E3, E4



Optional: Flange plug 6 pin, brass

Electronic	Conductor	Plug	Detector
E1	1	1	1
E2	2	2	2
E3	3	3	3
E4	4	4	4
-	-	5	-
E8	8	6	8

- a) Electronics
- b) Detector / Receiver connection housing
- c) EMV-screws
- d) Shielding
- e) Flange plug (optional)



Transmitter connection

Contacts S8, S1, S2

a)

b)

c) d)

e)



Detector / Transmitter connection



Optional: Flange box 6 pin, brass

Electronic	Conductor	Plug	Detector
S1	1	1	1
S2	2	2	2
-	-	3	-
-	-	4	-
-	-	5	-
S 8	8	6	8

Test / Reset - connection

Electronics

housing EMV-screws

Shielding

Flange box (optional)

Function depends on field of application.



Switches

Metering points

If malfunctions should occur, you can check the most important signals with a multimeter or oscilloscope.

Only authorized and trained personnel may carry out repairs or other kinds of works on the board!

Improper changes can impair or prevent the function of the metal detector.

Metering with applied voltage **!! extremely Dangerous !!**

Ground points

TP M Test points for connecting ground **TP 14**

Measurable by Multimeter:

TP 4	Test point current, output transformer:
	Direct voltage: -40mV to 500mV

Receiver voltage: TP 23 Direct voltage: -150mV to 250mV

Measurable by oscilloscope:

TP 3	Test point current, output transformer: Direct voltage: 250mVss to 1,5Vss

TP 7 Receiver voltage: Alternating current: max. 950mVss

Test points for failure routine:

TP 17

TP 18

Key plan

Electronics

- **1.** Test / reset connection
- **2.** Mush killer
- **3.** Sensitivity
- **4.** Ejection time
- **5.** Secondary frequency
- 6. Switches
- **7.** Power supply
- 8. LED's
- **9.** Mains supply
- **10.** Time-lag spare fuse 315 mA, 5x20 mm according to DIN
- **11.** Time-lag device fuse 315 mA, 5x20 mm according to DIN
- **12.** Relay 1 (Metal relay)
- **13.** Relay 2 (Failure relay)
- **14.** Terminal block
- **15.** Transmitter connection
- **16.** Receiver connection

Spare part

Electronic AMD 03

Spare part drawing no: XXX 0101 1723 003 EX Ĩ 6 ନ Ĩ 5 ١ ନ 1 7 -2 3/4 5 \$00000 K 12-DO DO 8 OP. 14 -13 - 10 - 11

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Electronics AMD 03

Spare part list: D-AMD3.4-001

Drawing: XXX 0101 1723 003 EX

RefNo.	Spare part	ItemNo	Comment
1	Analyzing electronics AMD 3.4	400 101*	
2	Spare fuse 315mA slow, 5x20 mm acc. DIN	200 348	
3	Reset-callipers, complete	350 087	
4	Incandescent lamp (LED)	200 277	pay attention to polarity
5	Electronic cabinet, painted	260 042*	quote colour
6	Screw incl. gasket	300 701	
7	Distance bushing	300 205	
8	Net filter with short connector cable	350 284	Vers. 2
10	Counter nut M 20 x 1,5	300 613	Polyamide
11a	Screwed cable gland M 20 x 1,5 6,5-9 mm	301 306	Polyamide
11b	Screwed cable gland M 20 x 1,5 8-13 mm	300 610	Polyamide
12	Counter nut M 16 x 1,5	300 612	Polyamide
13	Screwed cable gland M 16 x 1,5	300 609	Polyamide
14	Screw plug M 20 x 1,5	300 984	Polyamide
	Screw plug M 16 x 1,5	301 018	Polyamide

* When spare parts are requested, please state serial number, acknowledgement number and detector type!!!

Detector C-Coil

Spare part drawing number:

C 0500 0000 003 EX

Detector D-Coil

Spare part drawing number:

D 0200 0000 007 EX

Detector S-Coil

Spare part drawing number:

S 0200 0000 003 EX

Detector C/D/S-Coil

Spare part list number: GB-MD.005

Refnr.	Spare part	ItemNo.	Comment
102	Transmitter electronics, fully equipped	350 281*	
103	Transmitter connector cable, not pluggable	*	State length
104	Transmitter connector cable, pluggable (with cable plug)	*	State length
105	6-pin cable plug for transmitter cable, brass	200 381	
106	6-pin flange socket for transmitter casing, brass	200 380	
108	Receiver electronics, fully equipped	350 282*	
109	Receiver connector cable, not pluggable	*	State length
110	Receiver connector cable, pluggable (with cable plug)	*	State length
111	6-pin cable plug for receiver cable, brass	200 379	
112	6-pin flange socket for receiver casing, brass	200 378	
120	Counter-nut M 20 x 1,5 brass – EMV	301 655	
121	Reducer M20 x 1,5 auf M 16 x 1,5 brass	301 687	
122	Bolted angular joint M 16 x 1,5 brass	301 868	
123	Bolted cable joint M 16 x 1,5 brass – EMV short thread– clamping range 5 to 9 mm	301 653	
125	Quick-action closure screw with coil spring (1 set = 4 pieces)	301 838	
130	Mounting feet	*	Indicate detector type and detector measurements
131	Coil foot	301 714	
132	Disc DIN 125 – A 8,4 – galvanised	300 124	
133	Fillister-head screw DIN 912 M8 x 35 – galvanised	301 837	Check length!
134	Hexagon nut DIN 985 – M8 – galvanised (self- locking nut)	300 697	
135a	Rubber metal Ø 25	300 044	
135b	Rubber metal \varnothing 40	300 164	
136	Fillister-head screw DIN 912 M8 x 30 – A2	301 718	Check length!
137	Base disc DIN 125 – A 8,4 – A2	301 290	

Refnr.	Spare part	ItemNo.	Comment
150	Fillister-head screw DIN 912 – M10 x 30 - galvanised	300 088	Check length!
151	Spring washer DIN 127 – A 10 – galvanised	300 774	
152	Base disc Øi=11; ØA=34; s=5	301 150	
153	Fillister-head screw DIN 7984 – M8 x 20 – galvanised (with inner torx)	300 116	
154	Disc DIN 440 – R9 – galvanised (Øi=9; ØA=28; s=3)	300 113	
155	Centring pin	300 636	
156	Eye bolt DIN 580 - M 12 - galvanised	300 058	optional
157	Disc (PA) $\emptyset_i = 13$, polyamide	300 057	optional
158	Plug M 12 x 1,5, DIN 13	300 041	
160	Rubber metal Ø50	300 208	
161	Disc DIN 125 – A 10,5 – galvanised	300 125	
162	Spring washer DIN 127 – A 10 – galvanised	300 774	
163	Hexagon nut DIN 934 – M 10 – galvanised	300 082	
164	Mounting plate	*	
165	Fastener for pneumatics casing (mounting angle)	250 548	

* When spare parts are requested, please state serial number, acknowledgement number and detector type!!!

All wearing parts (i.e. moving parts and/or those touching products) are excluded from the warranty!

