Operating Instructions

Metal signalling system MDA 0104

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1. Safety

Approved applications

Metal detector MDA 010. may only be used to scan textiles.

The metal detector is built to state-of-the-art standard.

Only use the metal detector
- when in a technically perfect state
- for approved applications
- taking into account the safety recommendations and possible dangers listed in the operating instructions.

Work related to the operation, adaptation to production requirements, conversion or setting of the metal detector, its checking, maintenance and repair may be carried out by qualified personnel only. Please observe the ON/OFF switching procedures in the operating instructions.

Operating manual

Look after this operating manual carefully and make sure it is available to personnel at all times.

The operating manual is part of the package and should be read carefully prior to mounting, operation and maintenance.

Safety hints

Never touch the edges of moving webs.

Never touch live parts.

Mounting

The probe must not be mechanically stressed. It must not be used either as a ladder or support during servicing or as a depositing surface.
Purpose

The metal signalling system MDA 0104 tracks down magnetic and non-magnetic metal particles in moving webs. The web may be dry or damp and may be a film, woven or knit fabrics, tufting, felts, woven or tufted carpeting. The probe must be additionally equipped for wet webs.

The web may be run over the probe at rate of between 0.5 and 400 metres per minute. It is immaterial for the detection of metal particles whether the web travels slowly or quickly (within this range). Of decisive importance is the type, weight and form of the particles and the distance of these particles to the probe.

The table below indicates up to which weight and distance spherical metal particles can be detected by the system:

<table>
<thead>
<tr>
<th>Spherical metal particles</th>
<th>Distance to probe surface</th>
<th>Steel ST 37 1.0036</th>
<th>Niro steel A2 1.4301</th>
<th>Aluminium 3.1645</th>
<th>Copper, electrolytic copper 2.0060</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 mm</td>
<td>approx. 4 mg</td>
<td>approx. 50 mg</td>
<td>approx. 16 mg</td>
<td>approx. 20 mg</td>
</tr>
</tbody>
</table>

2. Function

Operation

The metal detector should only be operated by qualified personnel or suitably instructed persons.

Installation

Please ensure that:

- electrical components without enclosures such as switch panels or command devices are protected according to the locally applicable safety regulations, e.g. VDE 0100.
- when installing electrical leads, that the insulation is not damaged and the leads properly secured and screened.
- the metal detector power is switched on and off at the main switch of your main machine.
In the case of needle-shaped metal particles, sensitivity is not only dependent on the weight of the particles but also the position in which the metal needles are run over the probe (see fig. and table below).

### Needle-shaped metal particles

<table>
<thead>
<tr>
<th>Distance to probe surface</th>
<th>Steel 1.2206 lengthwise</th>
<th>Steel 1.2206 crosswise</th>
<th>Steel 1.2206 standing</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 mm</td>
<td>approx. 4 mg</td>
<td>approx. 10 mg</td>
<td>approx. 4 mg</td>
</tr>
<tr>
<td>5 mm</td>
<td>approx. 10 mg</td>
<td>approx. 40 mg</td>
<td>approx. 10 mg</td>
</tr>
</tbody>
</table>

**Important:**

Sensitivity deteriorates considerably as the distance increases between the metal particles and the probe surface.

The detection of a particle triggers a signal that you can use in various ways:

- as a permanent signal that may be manually reset. This permanent signal can be used to stop the machine
- or as a pulse signal that is reset automatically after a certain time, which can be set as required, has elapsed. This signal can, for instance, be used to operate a counter or marking device.
Design

The metal signalling system consists of a probe MD 1004 over which the web, in its full width, is run. The probe contains a series of probe areas ranged one behind the other, generally 30 centimetres apart. An amplifier board VK 4802 is located in the centre of each probe area.

A shielded, 6-pole connecting cable links the probe with the control device SG 1030, in the door of which a red illuminated pushbutton is located. The operating voltage of the probe amounts to 24 V DC.

Operating principle

An electromagnetic alternating field is generated in the probing area. If the web carries a stray metallic object over the probe this alternating field is disturbed and a pulse signal triggered.

The pulse signal is amplified and sent to the control device. There, the red illuminated pushbutton lights up (see fig.), either as a time-limited signal that is automatically reset or as a permanent signal.

If you have switched the permanent signal to the machine contact, your production machine will stop automatically and you can remove the metal particle.

Press the illuminated pushbutton on the control device to reset the signal and the production machine can be restarted.
3. Mounting

The metal signalling system probe can be mounted in any position and subsequently aligned with the web.

The distance between path roller to probe and probe to the next path roller must be at least 500 mm (see fig. above).

In the case of wider webs the following mounting arrangement is recommended.

Please pay special attention to the following mounting hints!

1. Relative movements in relation to other metal parts may also trigger an error signal. For this reason, the probe must not be vibrated. When mounting the probe please therefore use the rubber-bonded to metal bearing supplied.

2. Extreme turning by the probe along its longitudinal axis can be avoided by attaching padded mounts to the ends. This prevents relative movements by the probe in reaction to metal parts nearby (frame structure, rollers).
3. Heavily magnetised, rotating steel rollers directly adjacent may also disturb the metal signalling device.

4. In order to be able to set a higher degree of sensitivity, it must be ensured that the electromagnetic alternating fields above the probe are not disturbed.

Disturbances are caused, for instance, by motors and transformers, by reactive coils, thyristor controllers or even by fluorescent lamps and heavily loaded cables. Avoid such interference fields building up in the proximity of the probe.

5. When used with high web tensions or greater unit lengths (from 3 m on) the probe must be equipped with a mechanical central support.

6. In the case of polyester or mixed polyester fabrics the probe becomes extremely electrostatically charged. Make sure that the probe is effectively grounded. If necessary, install an ionizing rod in front of the probe to decharge the web.

Control device SG 1030

The control device, like any other current-carrying device, can interfere with the operation of the probe. For this reason, mount the control device at least 1 metre away from the probe scanning area.

Secure the control device so that the illuminated pushbutton can be easily observed in the control device door and is easy to operate.

Install an additional external illuminated pushbutton as required (see also installation section).
4. Installation

Install the system according to the attached diagram. Please ensure that your mains voltage is identical to the voltage set on control device SG 1030. If necessary, alter the connections on the transformer. Also check the mains filter connection (see fig. below).

Control device SG 1030

The 6-pole connection cable to the probe supplied is 4 metres long. Connect the open end to the control board NK 2701 according to the diagram. Lay the cable to the probe away from inductively loaded cables.
With the aid of a shielded terminal socket, you can extend the total length of the cable to a maximum of 15 metres. Use a shielded cable with a 0.75 mm² cross-section.

Connect the devices with which you intend to evaluate probe signal. Thus either the machine contact for stopping your machine, a counter or marking device.

**External illuminated pushbutton**

You may install an external illuminated pushbutton which, like the illuminated pushbutton on the control device SG 1030, indicates that a metal particle has been registered and with which you can reset the permanent signal. Connect the lamp and the make contact according to the attached diagram. The connecting cable to the external illuminated pushbutton should be shielded and not longer than 15 metres, a cable cross-section of 0.75 mm² is sufficient. Lay the cable apart from inductively loaded cables.

**Probe**

Plug the connection cable plug into the socket on the probe (see fig. on left) and lock it by a turn to the right.

**Important:** connect the metal probe ground ribbon cable to the grounded machine frame. Please ensure that the probe is not additionally grounded. The probe is electrically isolated from the machine frame by the metal bonded to rubber bearing.
5. Commissioning and operation

Before you start operating the metal signalling system, the following components must be set:

- metal detector sensitivity
- signal type
- and - if you have set a pulse signal - the duration of this signal.

**Metal detector sensitivity**

You can only influence the metal signaller sensitivity within the area specified by the size and type of the metal particles (see table pages 3/4). It is therefore not possible to detect smaller particles than those entered in the table. You can however modify too high a sensitivity.

The sensitivity setting can be influenced by the following circumstances:

- possible electromagnetic fields in the vicinity of the probe
- probe vibrations during operation
- metal residue in the web caused by pretreatment in metal baths (e.g. with ferrous or copper oxides, titanium oxides or zinc nitrates).

Metal detector sensitivity is adjusted using potentiometer R 1, which is located in the scanning device beneath the screw-off plastic cover (see fig. below). The preset value is 8.

Turn the potentiometer to the right to increase metal detector sensitivity, and to the left to decrease it.
The upper limit has been exceeded if the pushbutton on the control device lights up and can't be extinguished. In this case, the potentiometer must be turned back until the signal can be cancelled.

We recommend you start by setting a value of between 8 and 9.

During testing you can also use pushbutton S 2 on the control board NK 2701 in the control device (see fig. below) to reset the signal.

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**Selecting signal type**

Use switch S 1 on the control board NK 2701 to select which signal is to be used to indicate a metal particle in the web.

- In position "1" (on left), a metal particle in the web will trigger a permanent signal that must be manually reset.
- In position "2" (on right), a metal particle generates a pulse signal of limited duration. It then resets itself automatically.
Setting the pulse signal

The duration of the pulse signal is set using potentiometer R 1 on the control board NK 2701.

Potentiometer R 1 has no mechanical stop. Turn by 20 full revolutions to the left for a minimum pulse duration of half a second. Each full revolution to the right now increases the pulse duration by a little more than 0.1 seconds. In this way, you can set a maximum pulse duration of 3 seconds.

The following applies in daily practice:

1. The metal signalling system is ready for operation a minute after power is supplied.

2. The web should leave the outer 20 millimetres of the probe surface exposed as in this area no metal can be detected.

3. Before starting the machine, check the metal signalling system operation everyday. Introduce a metal particle on a plastic rod into the probing area and check whether a signal is triggered or not.

4. The probe must not be mechanically stressed. It must not be used either as a ladder or support or depositing surface during service work.
6. Fault locating instructions

The metal signalling system stops registering metal particles in one of the parts of the probing area

If you establish that one part of the probe area doesn’t react to metal particles while the other adjacent areas signal metal particles then the amplifier board VK 4802 in this area is defective (see fig. below).

First disconnect from mains!

- Unscrew the cover at the back of the probe. Insert an amplifier board that you know for sure is intact in the place of the potentially defective board. If this area now indicates metal particles (once mains power is supplied) then you know that the other board was defective and you need a new board.

We recommend you keep an amplifier board VK 4802 in reserve.

Amplifier board VK 4802 in probe

The metal signalling system has stopped registering metal particles throughout the entire probing area

- Check whether power is available
- Check the cable connections between the probe and control device
• Check whether the green display for "operational" lights up again (see fig. on left) once the illuminated pushbutton has been pressed.

**If it doesn’t light up...**

... check the secondary voltage fuses on the control board NK 2701 (see fig. on left)

**If it does light up...**

... increase metal detector sensitivity (see "commissioning" section)

If the fault is still not cleared, then either the probe oscillator board OK 1201 or the control board NK 0501 is defective. These boards must be exactly adjusted for your unit. For this reason please get in touch with your E+L service agent.

**The signal can’t be cancelled**

• Reduce probe sensitivity (see "commissioning" section)

• Check whether the signal has been triggered by foreign electromagnetic alternating fields, e.g. electro-motors, transformers or fluorescent lamps. If this is the case, try to mount the probe at least one metre away. If necessary select a new mounting location.

• Check the ground ribbon cable on the probe. It must be connected to a grounded machine frame made of clean, rustproof metal.

• If the signal output cannot be reset in position "1" using the manual pushbutton or if the output signal continues as a permanent signal in position "2" during continuous operation, it may be that one of the two power boards, NK 2701/ NK 0501, is defective.

Measure the operating voltage on power board NK 2701, terminal 13 against terminal 8 and terminal 11 against terminal 12. Both voltages must be approximately +24 V. Should one of the two voltages be missing, check fuses F 1 and F 2 on power board NK 2701.

Measure the operating voltage on power board NK 0501, +12 V (plug connector 8 against plug connector 9) and -12 V (plug connector 7 against plug connector 9).
If all voltages are supplied and the signal can still not be reset, get in touch with your E+L service center.

**Inadequate sensitivity**

- If you are obliged to reduce sensitivity due to electromagnetic interference fields, try to mount the probe at least one metre away. If necessary, select a new mounting location.

- Check the material and weight of the particles and compare these with the data in the tables on pages 3 and 4 to see whether these particles can be registered.

- Check whether the distance between the metal particles and the probe is too great (see tables on pages 3 and 4).

**The system signals metal particles although none are there**

- Check whether the switching on of another machine has triggered the signal. If this is the case, connect the metal signalling system to another circuit and clear the contacts of the machine in question using capacitors and resistors.

- Measure the mains voltage. If it fluctuates by more than ±10 % you must connect your system to another circuit. Also take the voltage drop when the drive motor starts up into consideration.

- Check the electric leads for defects.

- Check whether the system sensitivity has been set unnecessarily high.

- Examine the cover layer. It is possible that small metal particles have lodged themselves in the cracks. If these move, they trigger the alarm.

- Please check to make sure that the cover layer has not become detached at some place or other.

- In the case of polyester or mixed polyester fabrics the probe becomes extremely electrostatically charged. Make sure that the probe is effectively grounded. If necessary, install an ionizing rod in front of the probe to decharge the web.

- Vibrations cause contact disturbances.

- Sensitivity is set too high.
The indicator lights up when the system is switched on

- Check the metal signalling system for influencing by electromagnetic interference fields. Control device SG 1030 is possibly mounted too close to the probe. It must be mounted at least one metre away

- Measure the mains voltage. If it fluctuates by more than ±10 % you must connect your system to another circuit. Also take the voltage drop when the drive motor starts up into consideration

- Examine the cover layer. Damage or soiling leads to malfunctions

- Sensitivity is set too high

**Important:**

For the sake of operational safety, repairs to the cover layer and electronic modules should be effected by E+L only.

### 7. Maintenance

The metal signalling system MDA 0104 is maintenance-free. The probe should however always be kept clean. Deposits increase the distance of the web to the probe and thus reduce the sensitivity of the system.

Clean the scanning surface regularly with a damp (not wet) cloth. Don't use solvents.
8. Spare parts

We recommend you keep the following spare parts in stock:

- Amplifier board VK 4802 077504
- Oscillator board OK 1201 065616
- Control board NK 0501 209697
- Control board NK 2701 066677
- 5 bulbs à 24 V, 2 W, 0.08 A (BA 9s) 003297

9. Technical data

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply voltage</td>
<td>110 to 240 V</td>
</tr>
<tr>
<td>Frequency</td>
<td>50/60 Hz</td>
</tr>
<tr>
<td>Power input</td>
<td>approx. 160 VA</td>
</tr>
<tr>
<td>Output signal</td>
<td>permanent signal with reset button or pulse signal (variable 0.5-3 secs)</td>
</tr>
<tr>
<td>Output switchover contact:</td>
<td></td>
</tr>
<tr>
<td>Switch capacity</td>
<td>max. 100 VA/30 W</td>
</tr>
<tr>
<td>Switch voltage</td>
<td>max. 250 V~/250 V=</td>
</tr>
<tr>
<td>Switch current</td>
<td>max. 5 A~/1 A=</td>
</tr>
<tr>
<td>Protection type:</td>
<td></td>
</tr>
<tr>
<td>Probe</td>
<td>IP 50</td>
</tr>
<tr>
<td>Control device SG 1030</td>
<td>IP 54</td>
</tr>
<tr>
<td>Connection cable</td>
<td>6-pole, shielded, 4 m long</td>
</tr>
<tr>
<td>Ambient temperature:</td>
<td></td>
</tr>
<tr>
<td>Probe</td>
<td>maximum +40 °C</td>
</tr>
<tr>
<td>Amplifier</td>
<td>maximum +40 °C</td>
</tr>
<tr>
<td>Dimensions:</td>
<td></td>
</tr>
<tr>
<td>Probe</td>
<td>see attached dimensioned drawing</td>
</tr>
<tr>
<td>Control device SG 1030</td>
<td>Height 335 mm</td>
</tr>
<tr>
<td></td>
<td>Width 235 mm</td>
</tr>
<tr>
<td></td>
<td>Depth 160 mm</td>
</tr>
</tbody>
</table>

Subjekt to technical modifications without notice