



To detect foreign metal objects  
in a variety of materials





# Brief presentation – of Medetec Metal Detector



With Medetecs metal detector QSDM 111L, the presence of foreign metal objects can be detected in a variety of materials. QSDM 111L offers a simple and reliable way of ensuring uninterrupted operation. This can bring considerable reductions in the costs of repair and damage to machinery, for example damaged saw disks and blades. Metal detector QSDM 111L detects all kinds of metals and is especially well suited for applications where high detection sensitivity is required.

Metal detector QSDM 111L is in two main parts: the search coil and the electronics unit. The electronics unit, which contains a microprocessor, is housed in a steel

wall cabinet. The search coil is glass fibre-reinforced and has embedded transmitter and receiver windings. The search coil has an effective screen which reduces the effect of the environment on the metal detector. In the connection box, which is mounted on the search coil, there is electronic circuitry which amplifies the received signal before it is fed to the cable. The coil is mechanically stable as well as insensitive to water and dirt.

The equipment is easy to install and operate. It is self-adjusting and requires very little maintenance.



# The operation and design of the detector

The transmitter winding of the search coil generates a magnetic field in and around the coil. Equal but opposed voltages are induced in the two receiver windings, which are connected back-to-back. The resulting voltage is zero. If a metal object passes through the search coil, the object will emit its own magnetic field due to the effect of the transmitter winding. This field influences first one receiver winding, then the other as the object passes through, giving a signal. This signal is amplified and sent to the electronics unit.

**Materials that can be detected**

All metals can be detected with QSDM 111L. Sensitivity is greatest for ordinary steel, slightly lower for copper, aluminium and stainless steel. Non-metallic materials with a high iron content or good electrical conductivity may give a signal as well.

**Alarm outputs**

QSDM 111L has two alarm outputs with same or different sensitivity for metal objects. One of them can be used, for instance, to activate a warning bell, the other for an emergency stop function.

**Detector sensitivity**

Detector sensitivity is defined as the diameter of the smallest detectable steel ball. The size of the smallest detectable object depends directly on the size (i.e. diameter) of the search coil. For QSDM 111L the smallest detectable steel ball is 0.5% of the inner diameter (D) of the coil. The sensitivity for long objects depends on how they are oriented relative to the coil geometry.

**Factors for added reliability**

The sensitivity that can be achieved in practice is highly dependent on the ability of the metal detector to eliminate the interference that always occurs in an industrial environment. Interference from mobile radio equipment and from motor drive systems powered by frequency converters are particularly troublesome. These problems have been taken in to account when designing QSDM 111L.

**Several built-in functions prevent false indications occurring:**

- » A screen which heavily suppresses electrical and magnetic interference.
- » Radio interference suppression filters effectively damp interference from sources such as mobile phones.
- » A powerful signal processing function in the microprocessor filters out electrical and mechanical interference.

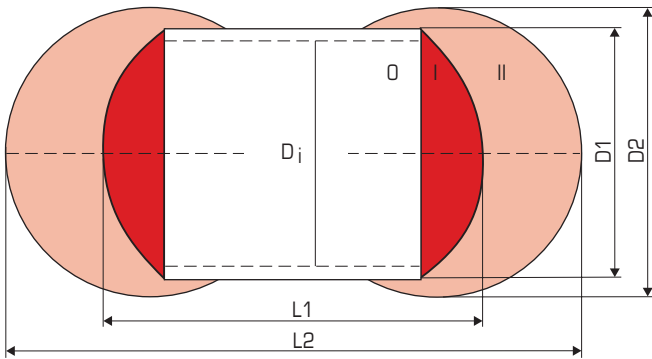
**Sensitivity in industrial applications**

Coil size (Ø mm)	Smallest detectable steel ball (mm)	Nail in favourable position (mm, length)	Nail in unfavourable position* (mm, length)	Coil size (mm)	Smallest detectable steel ball (mm)
300	2	4	12	1000 x 1000	12
600	4	10	30	1200 x 1000	13
800	5	13	40	1400 x 1000	14
1000	7	15	50	1600 x 1000	15
1200	8	20	60	1800 x 1000	16
1400	10	25	75		

\*Unfavourable position means that the nail is placed radially at the centre of the coil. Even slight deviations from this position gives significantly higher sensitivity.



Metal-free zones of the detector



Metallic objects close to the detector affect its sensitivity. There are recommendations concerning the required size of metal-free zones around the coil. The basic rule is that metallic objects should be avoided in the direction in which material is being conveyed.

Zone 0 should be free from metallic objects.

In Zone I, small metallic objects that do not move may be permissible.

In Zone II, small moving metallic objects may be permissible.

Recommended metal-free zones (mm)

Round Coil

Note:  $D_i$  is equal to the inner diameter of a round coil.

Search coil $D_i$	Zone I		Zone II	
	D1	L1	D2	L2
300	420	550	450	750
600	800	1000	900	1500
800	1000	1300	1200	2000
1000	1200	1600	1500	2500
1200	1500	2000	1800	3000
1400	1700	2200	2100	3500

Rectangular Coil

CxD (inner size) (where  $C \geq D$ )

Search coil D	Zone I		Zone II	
	D1	L1	D2	L2
1000	1500	1600	1800	2500

Electronics unit of QSDM 111

As well as supplying the search coil, the electronics unit has functions for:

- detecting signal changes due to the presence of metal
- eliminating interference and preventing false indications
- alarm indication
- automatic self-adjustment
- self-testing and diagnosis

Setting the sensitivity

The Sensitivity of the detector can easily be keyed in and changed using pushbuttons on the front panel of the unit. The settings are continuously shown on a two-digit display. The sensitivity should be adjusted to suit the conditions at the installation.

Setting maximum speed

With the Max Speed function the signal processing of the detector can be matched to the highest conveyor speed. This gives effective damping of transient interference.

Level indicator for easier setting

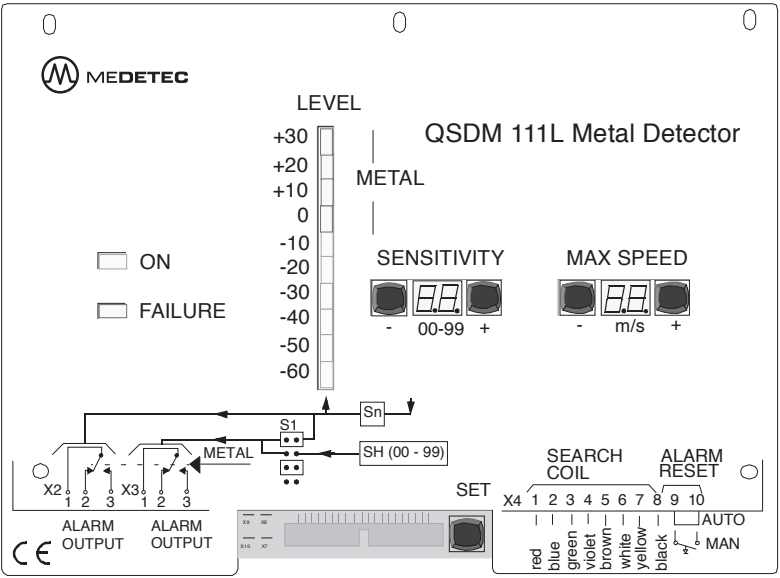
A level indicator makes it easy to set the sensitivity on commissioning and is also an excellent means of continuously displaying the interference margin. The indicator is in the form of a row of LEDs.

Test function

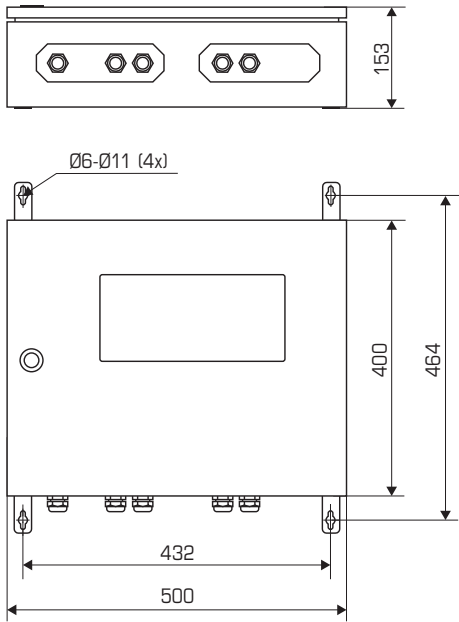
Test voltages, error codes and internal parameters can be read off on the panel of the detector. This provides extensive function checking without the need for any external measuring instruments.



Data for the electronics unit



The front panel of the electronics unit and dimension drawing.



General data

Supply voltage	100-127 V, 200-250 V, +10/-15 %, 47-63 Hz
Power consumption	55 VA
Sensitivity	Adjustable: diameter of the smallest detectable steel ball is 0.5% of search coil diameter.
Material travel speed	0.2-8 times the inside diameter of the search coil per second for reliable detection. Detection can be limited to a given speed range.
Alarm function	Has a holding function with selectable resetting: auto/manual

Contact data of output relays

Max system voltage	250 V ac/dc
Max continuous load	4 A (30 A for 200 ms)
Max breaking/making current	ac: 4 A at 250 V $\cos \Phi > 0.4$ dc: 0.3 A at 110, 127 V 0.2 A at 220, 240 V
Contact resistance	0.1 $\Omega$ at 0.1 A/24 V/50 Hz (see also IEC 255-0-20)

Environmental data

Permitted ambient temperature	0 - +40°C
Degree of protection	S54 according to SEN 2121 (dust- and splash proof) IP 65 according to IEC 144
Electromagnetic compatibility	As per EMC Directive 89/336/EEC
Electrical safety	Fulfils the Low Voltage Directive 73/23/EEC

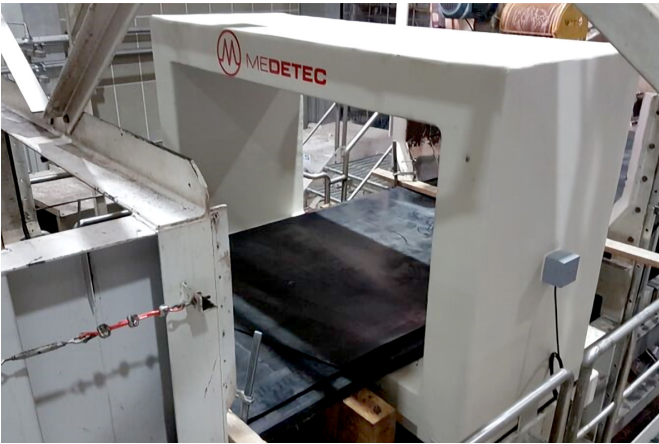




# Search coil

### Choosing a coil

The size of the coil to choose depends mainly on the required sensitivity and the size of the conveyor belt. As a general rule it is best to choose as small a coil as possible. This maximises the sensitivity and minimises the metal-free zones. Normally it is not possible to alter the width of the conveyor and the height of the load, so the size of the coil is usually governed by those dimensions.



### Environmental data

Ambient temperature	-40 to +50°C
Degree of protection	S54 to SEN2121 (dust- and splash proof) IP 65 to IEC144

### Dimension drawing

Round coil	D <sub>i</sub>	B	C
QSDM 110S03	300	420	400
QSDM 110S06	600	800	600
QSDM 110S08	800	1000	800
QSDM 112S10	1000	1460	1200
QSDM 110S12	1200	1500	1200
QSDM 110S14	1400	1700	1400

Rectangular coil	A	B	C	D	E
QSDM 111S1010	1500	1500	1000	1000	1020
QSDM 111S1210	1700	1500	1200	1000	1020
QSDM 111S1410	1900	1500	1400	1000	1020
QSDM 111S1610	2100	1500	1600	1000	1020
QSDM 111S1810	2300	1500	1800	1000	1020



# Ordering guide

### Instructions

The following ordering instructions should be observed for quick, reliable delivery. Check that the correct catalogue numbers are stated. See the ordering example below.

Description		Dimensions	Catalogue number	Weight kg
Electronics unit QSDM 111L			3BSE021017R1	18
Cable 8 x 0.5 mm <sup>2</sup> to connect between search coil and electronics unit: max length 100 m			3BSC950205R2	0.2/m
Search coil round:	QSDM 110 S03	D <sub>i</sub> 300 mm	5699 649-C	25
	QSDM 110 S06	D <sub>i</sub> 600 mm	5699 649-F	55
	QSDM 110 S08	D <sub>i</sub> 800 mm	5699 649-G	70
	QSDM 112 S10	D <sub>i</sub> 1000 mm	5699 649-H	150
	QSDM 110 S12	D <sub>i</sub> 1200 mm	5699 649-K	150
	QSDM 110 S14	D <sub>i</sub> 1400 mm	5699 649-L	260
Search coil rectangular:	QSDM 111 S1010	1000 x 1000 mm	3BSE022119R1010	340
	QSDM 111 S1210	1200 x 1000 mm	3BSE022119R1210	370
	QSDM 111 S1410	1400 x 1000 mm	3BSE022119R1410	400
	QSDM 111 S1610	1600 x 1000 mm	3BSE022119R1610	425
	QSDM 111 S1810	1800 x 1000 mm	3BSE022119R1810	450

D<sub>i</sub> = inside diameter; see also dimension drawing.

Di = inside diameter; see also dimension drawing.

### Ordering example

The example on the right is for metal detector with a search coil with Di = 1000 mm.

Description	Catalogue number
1 x Electronics unit QSDM 110K	3BSE021017R1
1 x Search coil QSDM 110 S10	5699 649-H
X* m Connecting cable, screened, 8 x 0.5 mm <sup>2</sup>	3BSC950205R2

\* Please specify your specific needs regarding cable length (m).



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