

Metal Particle Detector

MPD

Typical applications

Developed for use in manual and automatic control systems:

- Reciprocating equipment
 - Gas engines
 - Diesel engines
 - Compressors
- Rotating equipment
 - Gas turbines
 - Steam turbines
 - Transmissions and gear boxes
 - Pumps
 - Compressors




MPD

Key features and benefits

- Unique grid sensing technology
 - Detects metal particles and metal chips
 - Detects all conductive metal particles (including non magnetic metal particles)
- Provides early warning of impending failure
 - Reduced operating costs
 - Corrective maintenance can be scheduled to minimize costly downtime
 - Prevents unnecessary repairs and replacement of expensive parts

Approvals

-  Class Division 1, Groups A, B, C & D.

Metal Particle Detector - MPD

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Metal Particle Detector - MPD

Overview

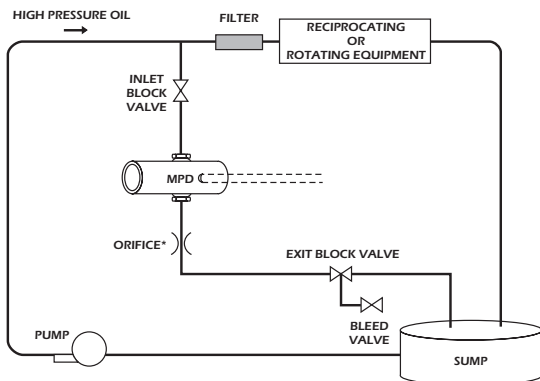
The Metal Particle Detector switch from AMOT can detect and alert equipment operations of the presence of metal particles in non-conductive fluid

lubrication systems (lube oil, transmission fluid etc). The switch can be used with the MPD controller.

Operation

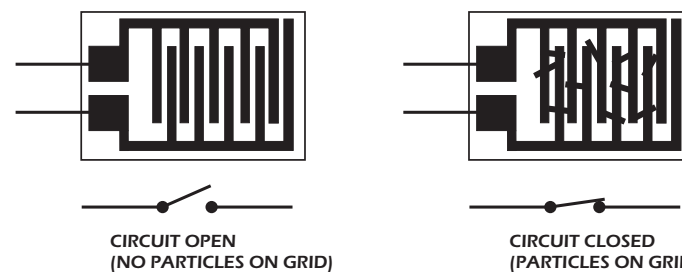
Operation is simple and straight forward. Process fluid, such as lube oil or transmission fluid, enters at the top of the MPD's body. Fluid then travels through a perforated board containing a plated electrical grid on the board's top and bottom sides. Fluid exits through the bottom of the MPD body (refer to figure 1).

Activation of the MPD switch occurs when metal particles bridge the gaps on its electrical grid and complete a normally open (N.O.) electrical circuit to drive an alarm or shutdown relay (refer to figure 2).



* Flow to the MPD should be limited to prevent starving the equipment of oil (use an orifice or other means of adequate restriction). Consult machinery manufacturers for recommended flow limits.

Figure 1 - MPD installation diagram



Metal particles gather on the MPD's grid to complete an electrical circuit. Refer to diagram above.

Figure 2 - MPD switch diagram

Design Considerations

The following considerations should be noted when installing the Metal Particle Detector:

● Locating where the MPD will be mounted:

- The MPD must be located in a side stream of the lube oil/fluid system, after the pump but before the filter.
- The MPD should be mounted above the sump oil level.

● Mounting the MPD:

- Mount the MPD with the grid in horizontal position.
- Two $\frac{5}{16}$ - 18 UNC mounting holes are cast into the MPD body for mounting.
- It does not matter which process port is the IN port, so long as the flow through the MPD is from top to bottom and the grid is on a horizontal plane.
- Isolating valves should be positioned either side of the MPD to facilitate inspection and service of the switch.

● Piping the process fluid to the MPD:

- Do not permit debris to enter the MPD while piping (this may close the MPD grid circuit).
- When connecting the piping, never use excessive force to stop thread leakage. Apply a quality thread sealant such as Loctite™ Pipe Sealant to the MPD's pipe threads.
- To avoid thread galling apply a quality anti-seize.
- Generally, flow to the MPD should not exceed 10% of oil pump capacity.

● Making MPD electrical connections:

- All wiring to and from the MPD should be done in accordance with the applicable electrical code.
- To access the MPD's terminal block, flying leads or plug connector (depending on the MPD connection option ordered), the MPD's end caps should be removed with a $\frac{1}{2}$ " S.A.E. drive ratchet.

Metal Particle Detector - MPD

Design Considerations Continued

• Hazardous area requirements:

- Hazardous area rating requires that a safety barrier is installed. The following must also be complied with:

- 1) Selected safety barriers shall be listed or approved with intrinsically safe circuits for Class I, Groups A, B, C, & D.
- 2) Output current of the barrier must be limited by a resistor such that the output voltage-current plot is a straight line drawn between open circuit voltage and short circuit current.
- 3) Intrinsically safe wiring must be installed in accordance with the national electrical code, ANSI/NFPA 70, Article 50 and the Canadian Electrical Code where applicable.
- 4) Safety barrier must meet the following parameters:

$$V_{oc} \leq V_{max} = 28 \text{ V}$$

$$I_{sc} \leq I_{max} = 100 \text{ mA}$$

$$C_a \geq C_i + C_{cable}$$

$$L_a \geq L_i + L_{cable}$$

5) If the electrical parameters of the cable are unknown, the following values must be used to calculate C_{cable} and L_{cable} :

$$\text{Capacitance} = 60 \text{ pF/ft}$$

$$\text{Inductance} = 0.2 \text{ } \mu\text{H/ft}$$

Example: 1000 ft of cable would equal:

$$C_{cable} = 1000 \text{ ft} * 60 \text{ pF/ft} = 0.06 \text{ } \mu\text{F}$$

$$L_{cable} = 1000 \text{ ft} * 0.2 \text{ } \mu\text{H/ft} = 200 \text{ } \mu\text{H}$$

6) The Metal Particle Detector entity parameters for Class I, Groups A, B, C, & D Hazardous Locations are:

$$V_{max} = 28 \text{ V}$$

$$C_i = 0$$

$$I_{max} = 100 \text{ mA}$$

$$L_i = 0$$

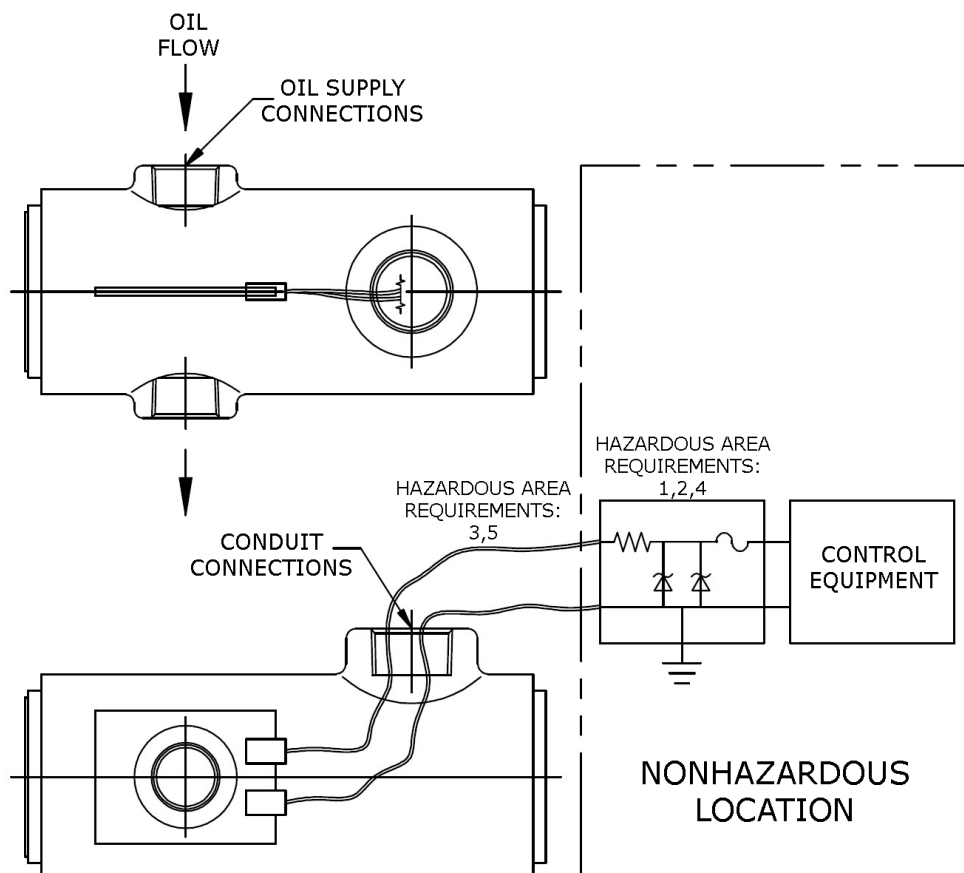


Figure 3 - MPD hazardous area diagram

Metal Particle Detector - MPD

How to Order

Use the table below to select the unique specification of your MPD - Metal Particle Detector.

Example	MPD2R	T	5	P	2	-AA	Code description
							Model and design level (A)
Model and design level (A)	MPD2R						Basic stainless steel model
							Oil port connection (B)
Oil port connection (B)		T					1/2" NPT
		U					1/2" BSP (P1)
		W					1/2" SAE
							Connection tube (C)
Connection tube (C)			5				3/4" NPT
							Electrical connection type (D)
Electrical connection type (D)				P			Terminal plug
				T			Terminal block
				W			Wire leads 18"
							Seal material (E)
Seal material (E)					1		Buna N/Nitrile
					2		Viton
							Customer special requirements (F)
Customer special requirements (F)						-AA	Standard (may be omitted)
						-***	Special requirements

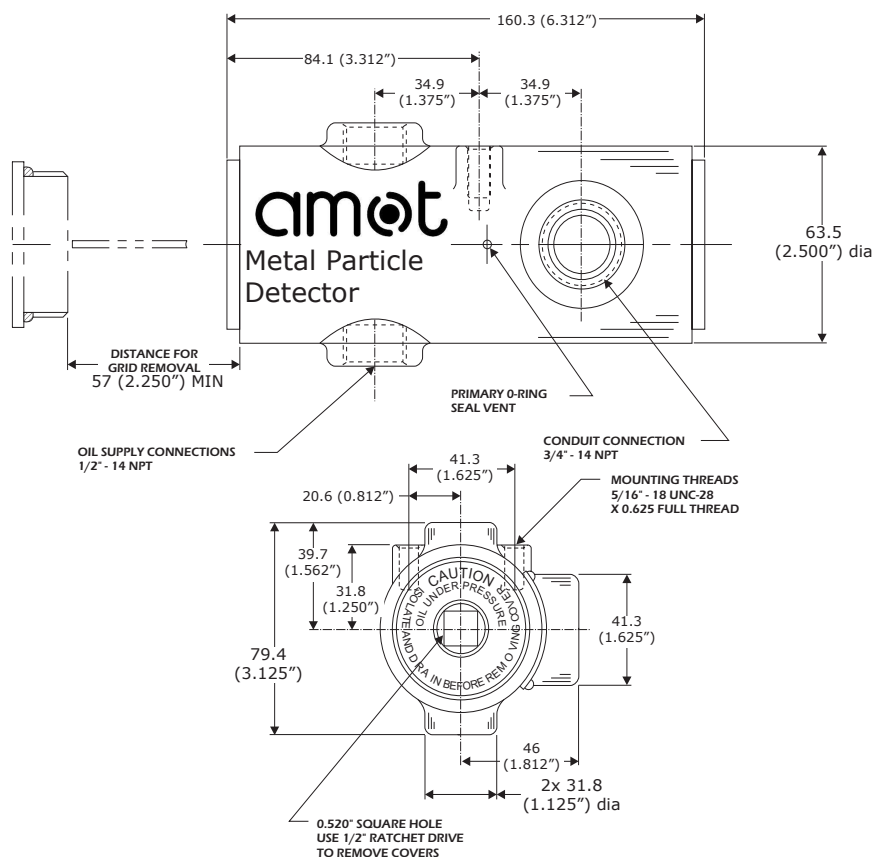
Specification

		Metric units	English units
Body and end caps	316 Stainless steel		
Seals	Viton, Buna N/Nitrile		
Electrical connections	Plated tin		
Oil port connections	1/2" NPT, 1/2" SAE, 1/2" BSP (P1)		
Electrical connection	3/4" NPT		
Grid electrical ratings	3.5 va. 24 volts (AC or DC) Maximum recommended for operator safety. Intrinsically safe power supplies may also be used.		
Temperature ratings	Viton	-23 - 177 °C	-10 - 350 °F
	Buna N/Nitrile	-48 - 121 °C	-54 - 250 °F
Maximum working pressure		13.8 bar	200 psi
Recommended wire gauge		1.5 mm ²	16 gauge
Lead wire gauge		1.5 mm ²	16 gauge
Flow coefficient		Kv = 3.78	Cv = 4.39
Grid specification	Hole size	0.8 mm	1/32"
	Grid space distance	1.6 mm	1/16"
Approvals	UL Class, Division 1, Groups A, B, C & D		

Metal Particle Detector - MPD

Dimensions

Dimensions - mm (inches)



Maintenance and Service Parts

Over time, exposure to foreign chemicals and particulate matter as well as prolonged operation at extreme conditions may reduce the effectiveness of the metal particle detector. At such time, AMOT Metal Particle Detectors can be restored to original performance by installing an AMOT metal particle detector service kit.

Service kits include all new seals and seal components required for normal maintenance. Block valves and bleed valves should be used to facilitate inspection and service.

How to order service kits

Service kits are available with grids and seals required to service your Metal Particle Detector. Order service kits using the service kit model number which is identified by the seal material code and the special requirements code from the AMOT valve part number.

AMOT recommends inspecting the aforementioned components during the equipments scheduled maintenance.

AMOT designs and tests all its products to ensure that high quality standards are met. For good product life, carefully follow AMOT's installation and maintenance instructions; failure to do so could result in damage to the equipment being protected or controlled.

Refer to the AMOT valve part number that is printed on the valve nameplate and the AMOT valve part number structure in the How to order section on page 5.

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Service Kits Continued

Service kit model number structure

- 1) Identify the seal material code, located in the Seal material (E) section of the AMOT valve part number.
- 2) Identify the special requirements code, located in the Customer special requirements (F) section of the AMOT valve part number.
- 3) Use those two codes in the Service kit identification table below to identify the proper service kit required to service your MPD.

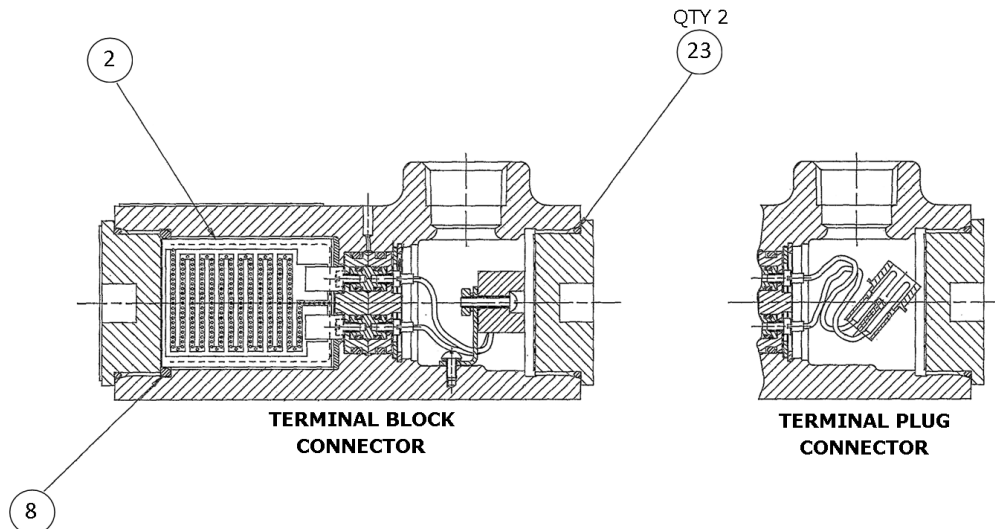
Service kit identification						
				Seal material code (E) ²	Special requirements code (F) ³	Service kit model no.
				1	NONE or -AA	10829X101
					-RNQ or -RNQA	10829X105
					-CFD	10829X106
				2	NONE or -AA	10829X001
					-RNQ or -RNQA	10829X005
					-CFD	10829X006
Examples						
Valve part number					Service kit model no.	
MPD2R ¹	T	5	T	1		10829X101
MPD2R ¹	U	5	W	2	-CFD	10829X006
MPD2R ¹	W	5	W	2	-RNQ	10829X005

Service parts

Service kit parts			
Ref no.	Qty.		Description
	10829X0(--)& 10829X1(--)		
	01 & 06	05	
2	1	-	Grid
2	-	1	PC board
8	1	1	Grid seal
23	2	2	End cap seal

NOTES:

- ¹ If your basic model number does not correspond with the given values, please contact the facility to confirm your basic model number.
- ² If your seal material code does not correspond with the given values, please contact the facility to confirm your seal material code.
- ³ If your special requirements code does not correspond with the given values, please contact the facility to confirm your special requirements code.



Metal Particle Detector - MPD

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 **WARNING**

These products can expose you to chemicals including carbon black (airborne and extracts), antimony trioxide, titanium dioxide, silica (crystalline), di(2-ethylhexyl)phthalate, ethylene thiourea, acrylonitrile, 1,3-butadiene, epichlorohydrin, toluenediisocyanate, tetrafluoroethylene, ethylbenzene, formaldehyde, furfuryl alcohol, glass fibers, methyl isobutyl ketone, nickel (metallic and compounds), lead and lead compounds which are known to the state of California to cause cancer; and 1,3 butadiene, epichlorohydrin, di(2-ethylhexyl)phthalate, di-isodecyl phthalate, ethylene thiourea, methyl isobutyl ketone, toluene, lead and lead components which are known to the state of California to cause birth defects and other reproductive harm. For more information go to www.P65Warnings.ca.gov.