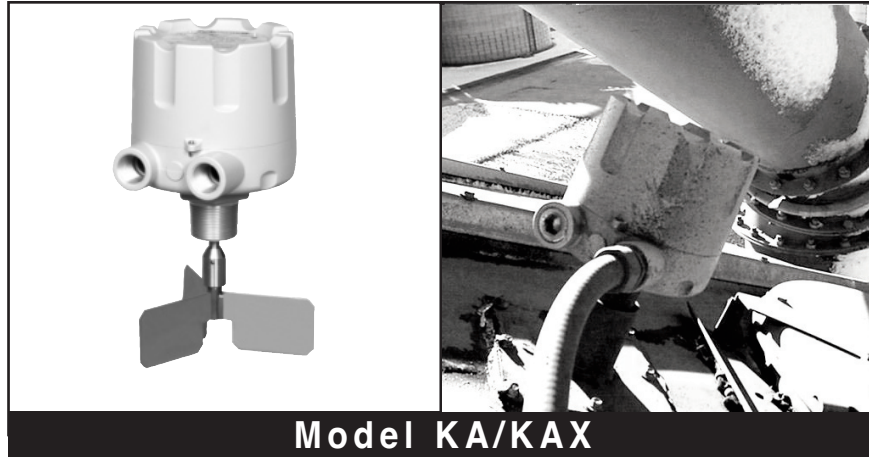


# BULLETIN 214A

## INSTALLATION & OPERATION

### Rotary Paddle Bin Monitors Models KA and KAX



Thank you for purchasing a quality product manufactured by Monitor Technologies LLC. We realize that you do have a choice of vendors when procuring rotary paddle bin level monitors and we sincerely appreciate your business!



This manual contains the information necessary to ensure a safe and successful installation. Please read and comply with the section on page 8 of this manual pertaining to SAFETY. Doing so will ensure proper operation of the equipment and the safety of all personnel.



Before discarding shipping container, please inspect it thoroughly and verify that all parts ordered are accounted for. Sometimes smaller parts become stuck under carton flaps and other packaging materials.

In the event that information contained herein does not completely satisfy your requirements or answer your questions, you may contact Technical Support on our website [www.monitortech.com](http://www.monitortech.com), by e-mail at [techsupport@monitortech.com](mailto:techsupport@monitortech.com) or by telephone at 800-766-6486 (1-630-365-9403). If your KA/KAX ever requires service either in or out of warranty, please contact us and obtain an RMA number prior to shipping the unit to us.



[www.monitortech.com](http://www.monitortech.com)

## PRE-INSTALLATION CONSIDERATIONS

**Choosing a Location:** (See Figure 1)

- 1) **Material Flow** - When selecting a location for any rotary paddle bin monitor, choose a point in the vessel where the paddle will be out of the direct flow of incoming and outgoing material to prevent any mechanical damage that may be caused by the pressure of the flow. This is particularly important for materials with large, lumpy characteristics. The paddle unit must be positioned at a point where incoming material will reach and cover the paddle in its normal flow, and when receding, will flow away from the paddle in an even manner.
- 2) **Vibration Concerns** - Mount at a location that is subject to limited vibration, away from bin vibrators thereby attaining maximum operational life. Consult the factory when questionable conditions exist.
- 3) **Guard Reinforcement** - When using rigid extensions and guards in top mounted applications, select a location where it is feasible to reinforce the guard to the vessel wall. See Mechanical Installation for further details.

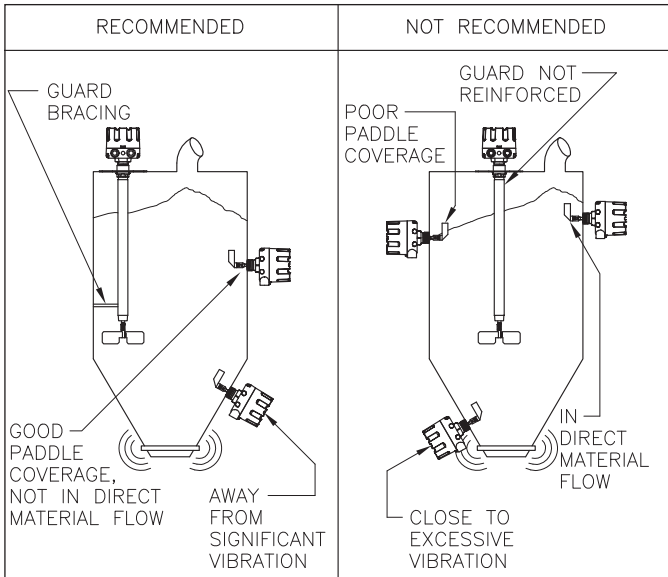


Figure 1

**Protective Baffles:** (See Figure 2)

The installation of protective baffles for low level monitoring is recommended for materials that weigh more than 65 lbs/ft<sup>3</sup> (1050kg/m<sup>3</sup>), have a tendency to pack, bridge, arch, or have unusual flow characteristics. This baffle can be created using a number of materials including angle iron, welded plates and pipe sections. This structure will keep the full weight of the material from damaging the bin monitor. The baffle should be welded to the bin wall and should not extend more than 6 inches (152 mm) into the bin. Also, the lowest point of the baffle should be approximately 6 inches (152 mm) above the top of the paddle arc.

DIMENSIONS ARE SHOWN IN INCHES WITH MILLIMETER EQUIVALENT IN BRACKETS

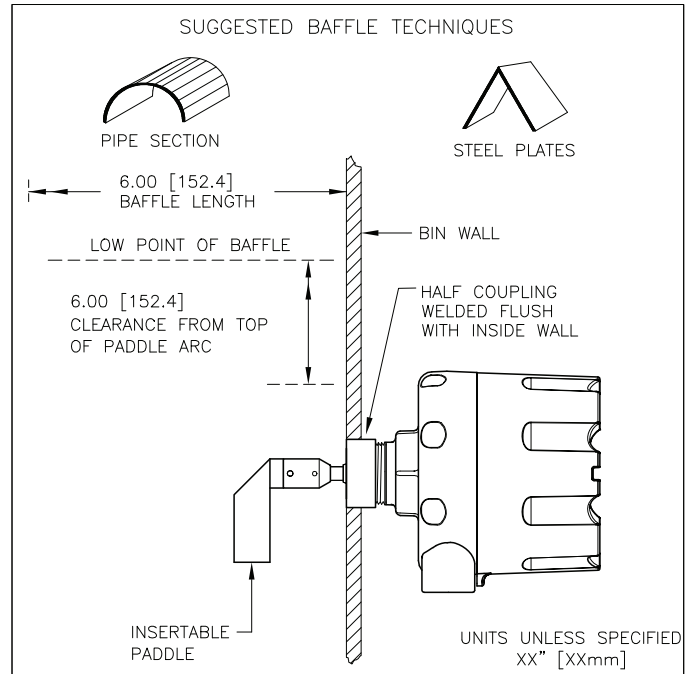


Figure 2

**Rotary Paddle Bin Monitor Preparation:** (See Figure 3)

- 1) **Mounting Plate Attachment** (if applicable)- After using the mounting plate gasket as a mounting hole template, (see Mechanical Installation portion of this bulletin), attach the mounting plate to the rotary paddle bin monitor prior to attaching to vessel. This is particularly advantageous if the paddle to be used is not an "insertable" type. Grease the paddle unit's threaded hub with anti-seize compound and thread the mounting plate into place until snug.
- 2) **Flexible Coupling Attachment** (if applicable)- Remove lock pin from rotary paddle bin monitor. Screw the flex coupling into the coupling provided on the paddle unit. Align "through hole" within the connection and secure with lock pin.
- 3) **Extension Attachment** (if applicable)- Remove lock pin from rotary paddle bin monitor or flex coupling. Screw the extension into the coupling provided on the paddle unit, or flex coupling. Align "through hole" within the connection and secure with lock pin. Guards should be used with rigid extensions greater than 18 inches (457 mm) in length.
- 4) **Guard Attachment** (if applicable)- In applications using a mounting plate with a full coupling, slide the 1-1/4" pipe over the shaft extension and secure to mounting plate coupling. The shaft extension should protrude from guard a distance of approximately 4 inches (102 mm). When not using a mounting plate, the guard must be connected to paddle unit with a 1-1/4" full coupling and in some cases may require attachment after rotary paddle bin monitor installation to vessel.
- 5) **Paddle Attachment** (if applicable)- Paddle should be attached at this time only if variety chosen is an "insertable" type or if mounting plate is being utilized. Remove lock pin from applicable connection point (i.e. bin monitor, flex coupling, or extension). Screw the paddle into the applicable coupling. Align "through hole" within the connection and secure with lock pin.

## MECHANICAL INSTALLATION

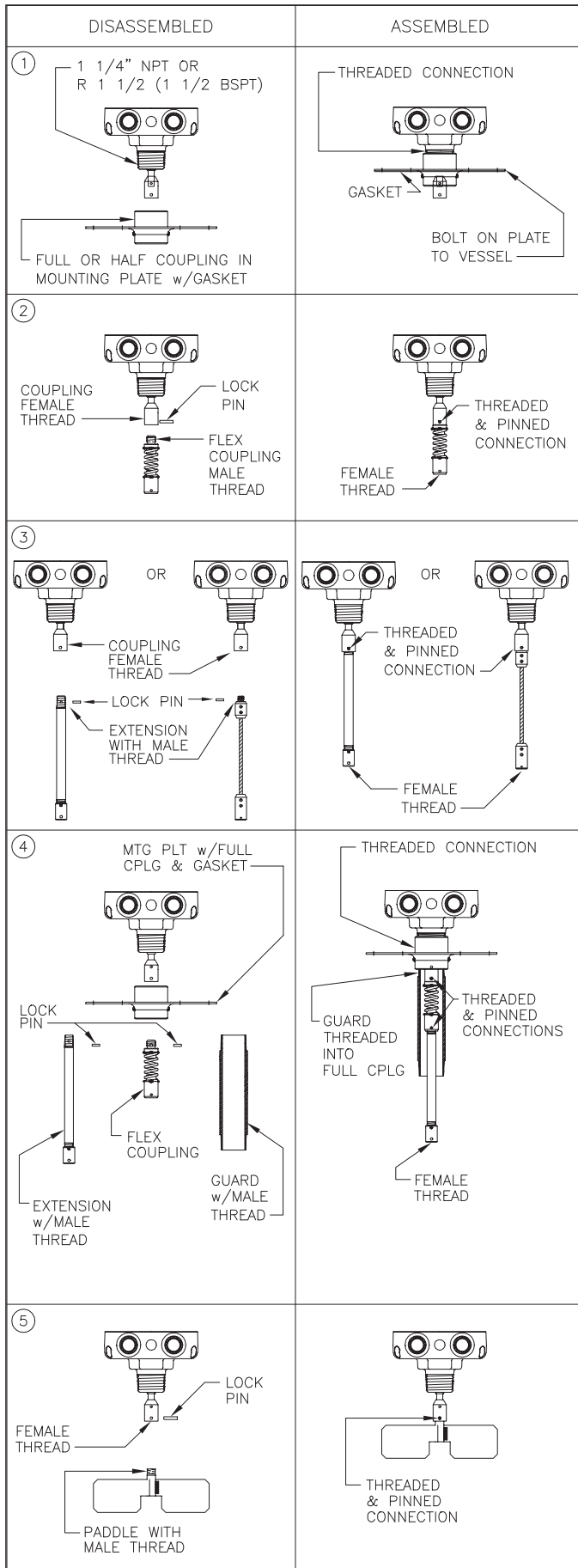


Figure 3

### Side Mount/Top Mount:

- 1) Coupling Mounting** - Cut a hole into the vessel that corresponds to the outer diameter of the applicable pipe coupling. In side mount applications, position a half-coupling flush with the inside of the vessel and weld into place. In top mount applications, position a full coupling halfway into the vessel and weld into place. After greasing the mounting threads with anti-seize compound, thread the KA/KAX into the coupling and position the conduit entrance to prevent moisture infiltration. Attach paddle if applicable. (See Figure 2)
- 2) Plate Mounting** - Using the gasket provided with the mounting plate as a template, drill six holes at the diameter applicable to the attachment method being used. Drill six clearance holes at 11/32 inch (9 mm) diameter for use with 5/16" bolts. The bolts may be secured by tack welding the bolt heads to the vessel, or by an adjoining nut. Cut a hole (suggested size 2-5 inches (50-125 mm)) centered within the bolt circle to allow an attached paddle to fit within the bin. Attach gasket and mounting plate to the vessel positioning the conduit entrance to eliminate the possibility of any and all moisture infiltration. (See Figure 4)

DIMENSIONS ARE SHOWN IN INCHES WITH MILLIMETER EQUIVALENT IN BRACKETS

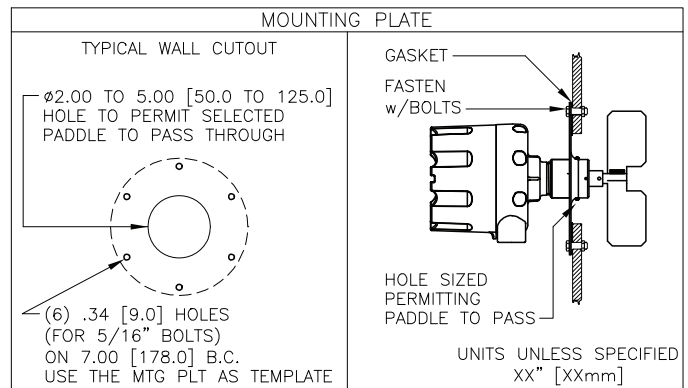


Figure 4

### Extension/Guard Installation: (See Figure 5)

- 1) Typical Configuration** - Rigid extensions are recommended for top mount applications only and should be always accompanied by a flexible coupling. Shaft guards are recommended whenever extensions are longer than 18 inches (457 mm).
- 2) Guard Reinforcement** - Mechanical reinforcement of the shaft guard should be considered whenever a guard length greater than 72 inches (1829 mm) is used. The guard should be anchored to the sidewall with braces to reduce mechanical stress at the connection point of the guard.
- 3) Guard/Extension Multi-Stage Assemblies** - It may be necessary to connect multiple short pieces to ultimately achieve the desired length. In all cases, extensions and guards should not exceed 144 inches (3658 mm). Shaft extensions can be simply connected one to another. Guards must use a 1-1/4" full coupling as an interface between sections. Couplings are available from Monitor.
- 4) Cable Extensions** - Lengths up to 78 inches (1981 mm) are permitted. Length can be shortened in the field as required. See instructions provided with cable extension for details.

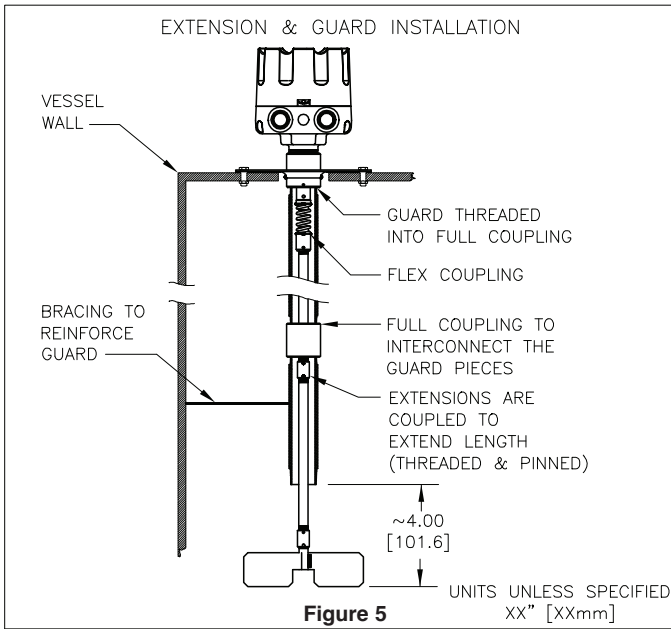


Figure 5

**High-Temp Models:**

- 1) **Mounting** - Carefully handle the hi-temp. gasket provided with the assembly. Using it as a template, mark the locations of the six boltholes on the vessel. Drill six holes at the diameter applicable to the attachment method being used (i.e. tapped holes or clearance holes for bolt/nut combination). For example, drill six clearance holes at 11/32 inch (9 mm) diameter for use with 5/16" bolts. The bolts may be secured by tack welding the bolt heads to the vessel, or by an adjoining nut. Cut a hole (suggested size 2-5 inches(50-125 mm)) centered within the bolt circle to allow the paddle when attached to the bin monitor to fit within the bin. Attach gasket and hi-temp. paddle unit to the vessel positioning the conduit entrance in a manner, which restricts moisture infiltration.
- 2) **Extensions/Guards** - Use of extensions are permissible on Hi-Temp units also. (See Extension/Guard Installation section). Installing guards on Hi-Temp models requires in-field modifications. Consult factory for guidance.
- 3) **Effective Cooling** - The Hi-Temp. model includes a steel lagging pipe, which thermally insulates (via lag pipe material and physical separation) the internal bin temperature from the paddle unit thereby protecting its critical components. This technique is very effective but is dependent on careful consideration of ambient air temperature surrounding paddle unit, thermal conductivity of the material being sensed, and the actual temperature present at the mounting point. The following chart is intended to provide general guidance for installation. Each application should be evaluated to ensure that the KA/KAX operating temperature is not exceeded. In addition, an air connection is provided on the lagged pipe to further increase the cooling capacity of the system. When applicable, connect airline to 1/2" coupling provided on Hi-Temp. model using only the recommended air pressure, which must exceed the bin pressure to be effective. The air should be clean and dry and is required to be continually supplied to the Hi-Temp. model to assure cooling.

Internal Temp.	Model	Air Required	CFM
< 300°F (150°C)	standard	none	N/A
300-500°F (150-260°C) [without air-cooling]	Hi-Temp.	none	N/A
500-750°F (260-400°C) [with air-cooling]	Hi-Temp.	0.5 psig	2.14

- 1) **Hazardous Location Precautions** - (See Safety and Specifications sections of this manual before starting electrical installation.) Observe all government regulations regarding equipment in hazardous locations. In particular, for CSA approved explosion-proof products, install a conduit seal fitting within 2 inches (50 mm) of the rotary paddle bin monitor. On all models ensure power is disconnected whenever the cover is removed and upon completion ensure cover is completely re-attached.
- 2) **Factory Wiring** - The industry exclusive motor shutoff feature is prewired at the factory and must not be altered in the field. The jumper wire (s) from the main terminal block to the motor switch must not be removed.
- 3) **Permanently Connected Equipment** - Disconnecting devices shall be included in the system installation. In installations where multiple circuits are used, individual disconnects are required. The disconnects shall be within close proximity of the equipment, accessible to operators, and marked appropriately as the disconnect for the associated circuit. Assure the disconnect ratings are appropriately sized for the circuit protected (See Specifications).
- 4) **Circuit Separation** - Since the KA/KAX's single wiring compartment can not absolutely protect against physical contact between multiple circuits, it is required that all wiring used must have an insulation rating of 300v minimum, and a temperature rating of 221°F (105°C) minimum.
- 5) **Protective Earthing** - Each KA/KAX is provided with a "protective conductor terminal" ⊕ which shall be terminated to the local earth ground potential to eliminate shock hazard. Select wire size that can carry in excess of the sum of all circuit's maximum amperage.
- 6) **Power Input** - Verify the intended voltage supply is compatible with the voltage configuration indicated on the external nameplate. Connect power as shown in Figures 6-7.
- 7) **Output Contacts** - (See Figures 6-7) **Use Isolated Switch for optimum performance.** When the paddle is free to turn, the two switches in the KA/KAX are in their normal condition (i.e. N.C. contacts are closed to COM, and N.O. contacts are open to COM). However, when material surrounds the paddle preventing it from turning, the motor rotates on a switch actuating plate which activates the switches into opposite from normal condition (i.e. N.C. contacts are open to COM, and N.O. contacts are closed to COM). When selecting which switch to wire, the following should be considered:
 

Motor Switch:

  - a) The load must be capable of operating at the same voltage as the unit's motor.
  - b) **The load must be tolerant of periodic on and off switching which is caused by minor paddle motion during sensing condition.**
  - c) The load must not exceed the rated current capacity of the switch (See Specifications).

Isolated Switch: (Use this switch for optimum performance)

  - a) Any voltage within limits of the switch (See Specifications) can be connected independent of the motor voltage.
  - b) **This switch permits minor amounts of paddle motion without constant "on and off" signalling.**
  - c) The load must not exceed the rated current capacity of the switch (See Specifications).

# SETUP

## Paddle Selection

The best "calibration" can be achieved by proper paddle selection. Incorrect paddle selection may lead to false sensing and therefore a poor "calibration". Monitor offers a variety of interchangeable paddle assemblies to meet the needs of a wide variety of applications. Different material densities, particle sizes and flow characteristics require specific paddles to provide optimum performance. Ensure that the paddle being used for the application corresponds with the recommendations found in Monitor's Material Characteristics Guide (Bulletin #115A).

## Sensitivity Spring

- 1) **Setting Upon Receipt** - (See Figure 8) All rotary paddle bin monitors are shipped from the factory with the spring tension preset at the mid-range sensitivity setting. In most applications this setting results in acceptable operation assuming proper paddle selection. Setting can be verified by locating the cotter pin holding the spring to the switch bracket frame. The cotter pin will be inserted into the middle hole.
- 2) **Increased Sensitivity** - When sensing extremely light materials (less than 10 lbs/ft<sup>3</sup>, 160kg/m<sup>3</sup>), it is desirable to move the cotter pin to the hole which exerts minimum spring tension. The reduced spring tension will permit switch actuation with less material restriction at the paddle.
- 3) **Decreased Sensitivity** - When sensing extremely heavy materials (greater than 75 lbs/ft<sup>3</sup>, 1200kg/m<sup>3</sup>) or materials which have a tendency to stick or build up around shaft seal, it is desirable to move the cotter pin to the hole which exerts maximum spring tension. The increased spring tension will require greater material restriction at the paddle but will prevent cases of the sensor remaining in the activated condition when material is absent.

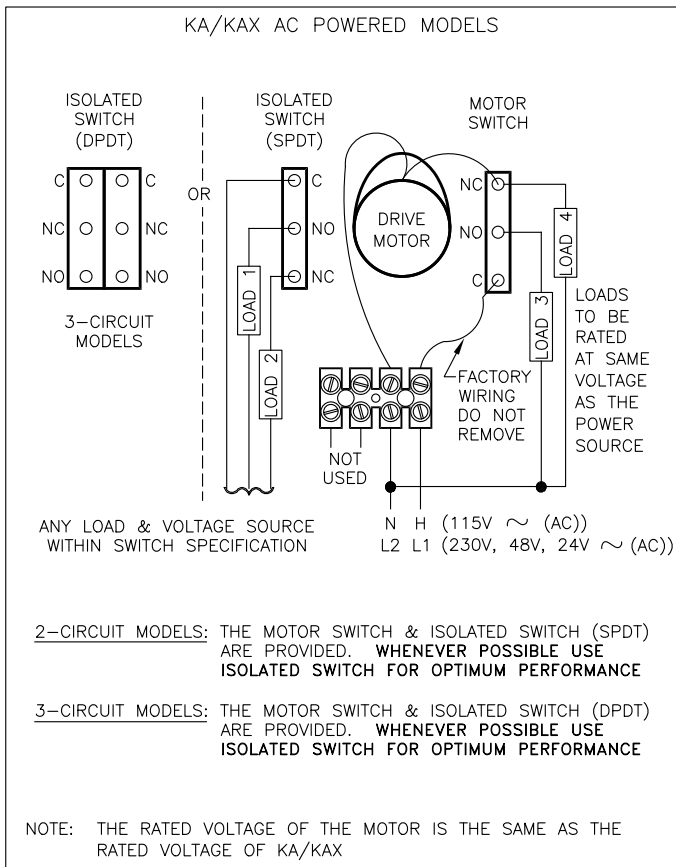


Figure 6

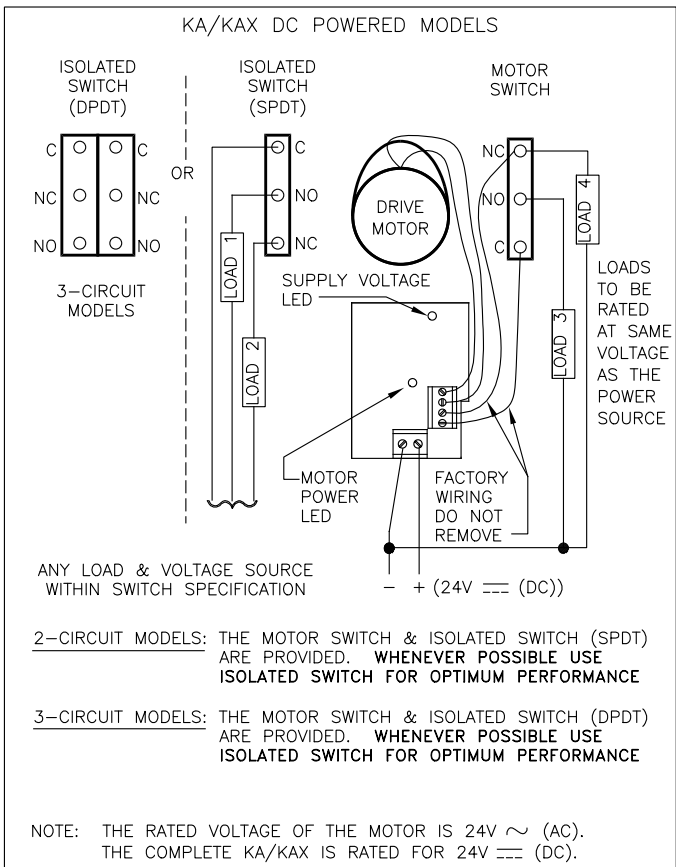


Figure 7

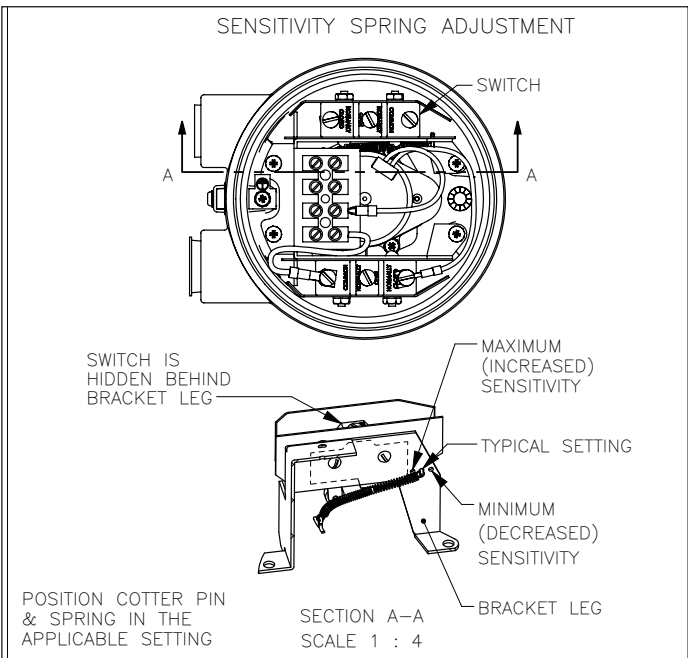


Figure 8

## TROUBLESHOOTING

**PROBLEM: The paddle does not rotate when material is absent and the sensor is in "no sensing" mode.**

**CAUSE/SOLUTION:**

- 1) Verify electrical power is connected to the proper terminations (See wiring diagrams) and that it is the proper voltage as depicted on the cover.
- 2) Verify jumper wire is in place between the power terminal and the motor switch (See wiring diagrams).
- 3) Verify motor operation by connecting the two motor leads directly to the incoming power. Motor will rotate if operational. Reconnect motor leads.
- 4) Verify condition of motor switch by measuring voltage between its COM and NC terminals. Replace the switch if a voltage reading equivalent to the power source exists.
- 5) Verify if motor is rotating. Replace the clutch mechanism if the motor is turning but the paddle is not.

**PROBLEM: The paddle does not rotate when material is absent and the sensor is in "sense" mode. CAUSE/SOLUTION:**

- 1) Verify condition of sensitivity spring. It should not be cut, broken or excessively stretched to the point that it loses its ability to retract motor to "no sense" condition. Replace if necessary.
- 2) Verify status of material around shaft and hub of rotary paddle bin monitor. Excessive buildup may restrict shaft from returning to "no sense" condition. Clean material buildup.
- 3) Verify if drive shaft is free to rotate by manually twisting paddle. If rotation is restricted, replace the outer seal and the two internal bearings.

**PROBLEM: The paddle rotates but material is not sensed when the paddle is covered.**

**CAUSE/SOLUTION:**

- 1) Verify isolated switch is activated prior to the motor switch when the paddle is halted. If sequence is incorrect, realign switches on the bracket. Consult the factory if problem persists.
- 2) Verify switch operation by measuring continuity while in the "sense" and "no sense" modes. Replace switches if contact states are incorrect.
- 3) Verify that the paddle being used in the application follows the guidelines outlined in the Paddle Selection Guide (Bulletin #115A). Change paddle to one capable of sensing lighter material.

## MAINTENANCE

### Cleaning Requirements

The hazardous and environmental protection techniques are functional only when the cover is completely installed on to the housing. If necessary, clean the cover/housing threads to permit complete thread engagement. Do not alter the threads and ensure O-ring is in place and free of contaminants.

This is a good opportunity to inspect the O-ring, clean and re-lubricate with Silicone O-ring lubricant. Do NOT lubricate with a petroleum-based grease or jelly.

**Motor Replacement:** (See Figure 9)

- 1) Disconnect power source from rotary paddle bin monitor.
- 2) Disconnect motor leads from incoming terminal block (all models) and from motor switch (AC models only).
- 3) Remove the four screws holding the switch bracket assembly to the housing. Drape switch bracket over the side of the housing so the motor is completely accessible. Do not over extend the spring.
- 4) Remove the two screws holding the motor to the actuator plate thereby freeing motor.
- 5) Install new motor and retain with two screws.
- 6) Install the switch bracket and fasten with four screws.
- 7) Fasten motor leads to terminal block (all models) and motor switch (AC models only). Lead orientation does not matter.
- 8) Reconnect the power source to the rotary paddle bin monitor.

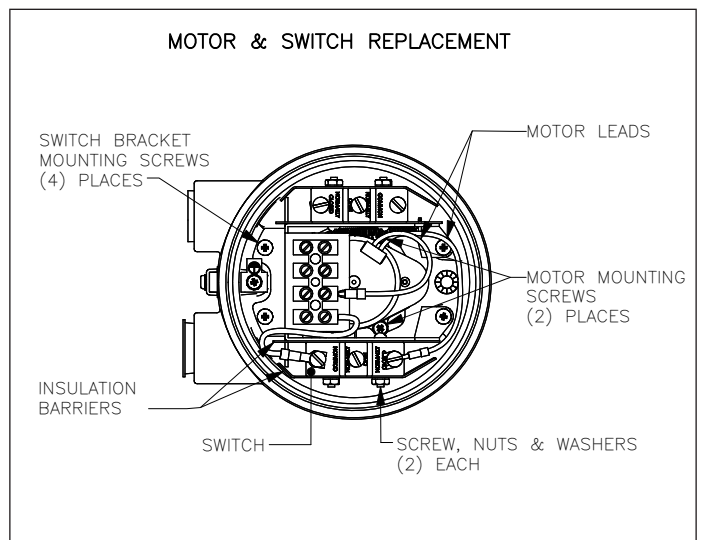


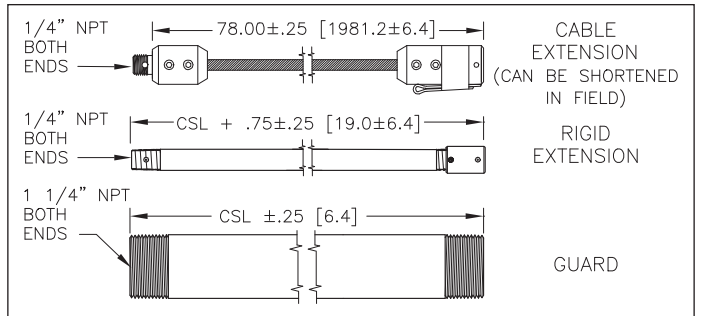
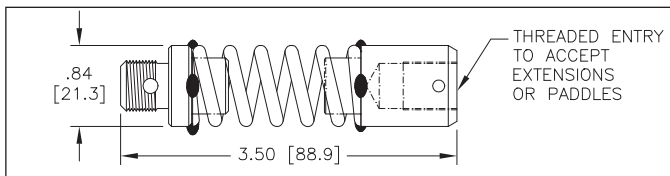
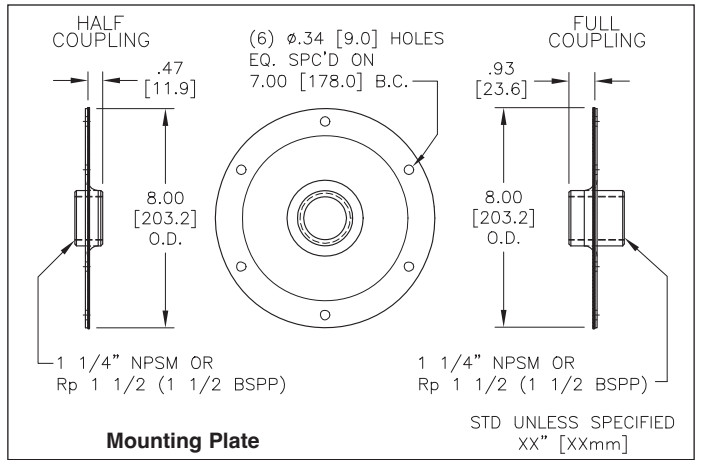
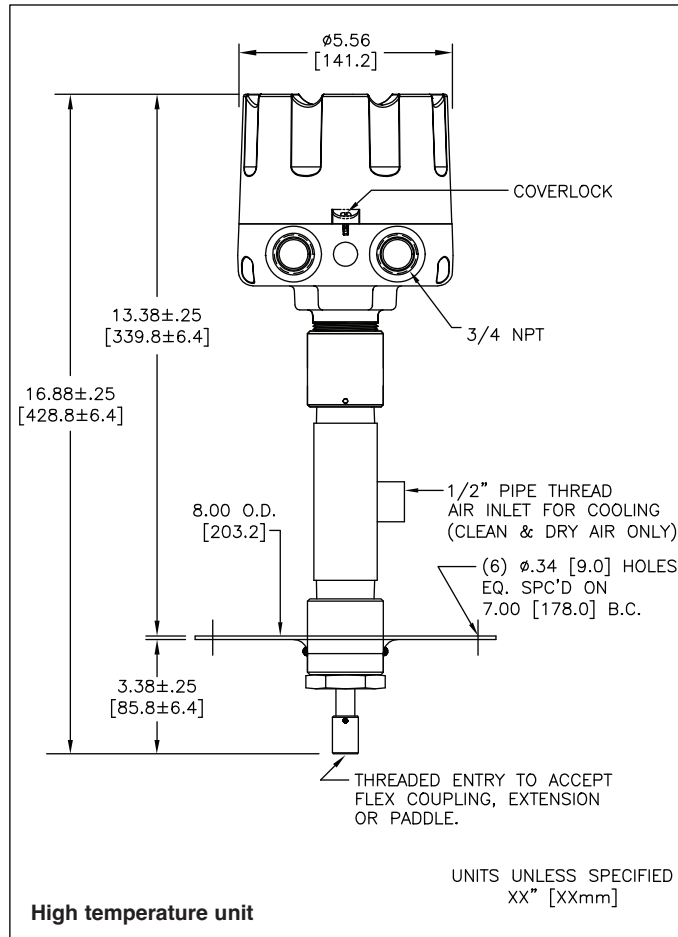
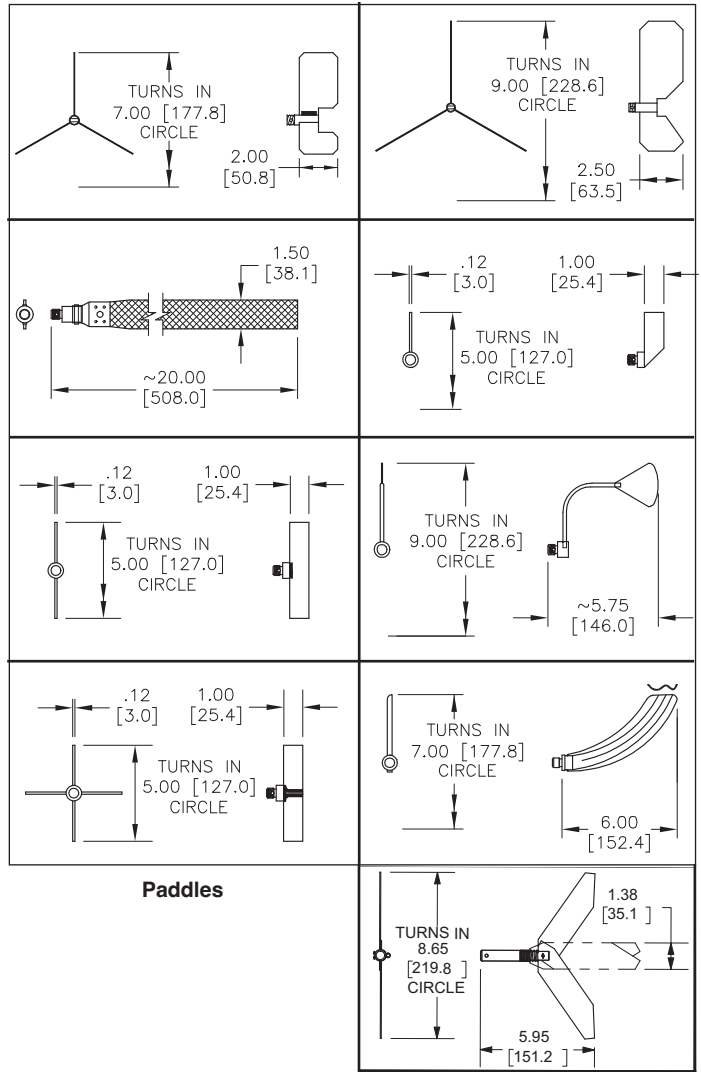
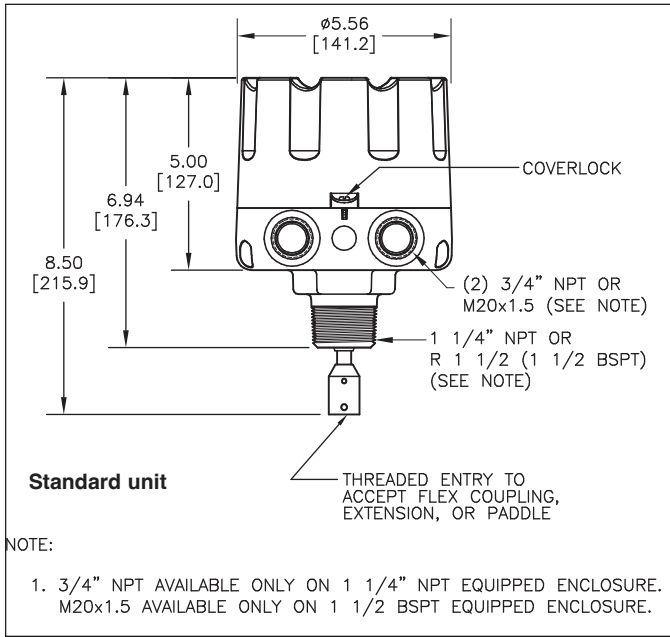
Figure 9

**Switch Replacement or Addition:** (See Figure 9)

- 1) Disconnect power source from the rotary paddle bin monitor.
- 2) Remove the four screws holding the switch bracket assembly to the housing. Raise the bracket out of housing far enough to access the switches. DO NOT over extend the spring.
- 3) Disassemble the switch from the switch bracket by removing the screws and nuts. Replace switch and reassemble using the same insulation barriers and hardware.
- 4) (Applicable to DPDT switches only) On the switch actuator plate, the ramp that causes the switch lever to be activated must be bent downward on a 90 degree angle in order to provide proper operation. If necessary, remove the motor and the switch actuator plate and bend the ramp with a pair of pliers. The motor switch should not be changed to a DPDT type.
- 5) Install the switch bracket and fasten with four screws. Twist the external drive shaft and verify both switches are actuating. The isolated switch should always activate before the motor switch.
- 6) Reconnect the power source to the rotary paddle bin monitor.

# MECHANICALS

DIMENSIONS ARE SHOWN IN INCHES WITH MILLIMETER EQUIVALENT IN BRACKETS



## SAFETY

### ⚠ General Safety

**CAUTION:** It is essential that all instructions in this manual be followed to ensure proper operation of the equipment and safety of operating personnel. Use of equipment in a manner not specified by the manufacturer, may impair protection provided by equipment. The use of this symbol is used throughout manual to highlight important safety issues.

### ⚠ Electrical Shock Caution:

Certain KA/KAX bin monitors are powered with HIGH VOLTAGE. No operator serviceable parts are inside. All servicing is to be performed by qualified personnel. Each KA/KAX is provided with a "protective conductor terminal" (⊕) which shall be terminated to earth ground potential (see Electrical Installation). This product's design complies with EN61010-1 installation category II and pollution degree 2.

### ⚠ Hazardous Location Caution

Certain KA/KAX bin monitors can be used in Hazardous Locations (See Specifications). These models shall only be used in applications covered by stated ratings or those considered non-hazardous. Failure to comply could result in damage to personnel and property. The following must be maintained to assure safe operation:

- 1) Enclosure integrity** - The KA/KAX is manufactured from aluminum and stainless steel with nitrile rubber seals. The user or installer should consider the performance of these materials with regard to attack by aggressive substances that may be present in a hazardous location. The dimensions of the housing, cover or drive-shaft shall not be altered.
- 2) Maintenance** - Power to all circuits must be disconnected before conducting any investigation, setup or maintenance.

### Electromagnetic Compatibility (EMC)

The KA/KAX was tested and found to comply with the standards listed below. The KA/KAX should not be used in the residential or commercial environments. Compliance to the EMC standards was demonstrated by means of a test setup using the following installation methods.

- 1) KA/KAX enclosure was connected to protective earth ground.
- 2) No specific wiring convention was used to supply power or to retrieve output signal from the KA/KAX.

### EMC Emissions:

Meets	EN 61326-1	Electrical Equipment for Control Use, EMC
	EN 55011	Radiated and conducted emissions (Class A- industrial)
	EN 61000-3	Fluctuations/Flicker
Meets	FCC Part 15B:	RF Devices, Unintentional Radiators
	CISPR 11	Radiated and conducted emissions (Class A- industrial)

### EMC Immunity:

Meets	EN 61326-1	Electrical Equipment for Control Use, EMC
	IEC 1000-4-2	Electrostatic discharge (industrial)
	IEC 1000-4-3	RF radiated EM fields (industrial)
	IEC 1000-4-4	Electrical fast transients (industrial)
	IEC 1000-4-5	Electrical surges (industrial)
	IEC 1000-4-6	RF conducted EM energy (industrial)
	IEC 1000-4-8	Power frequency magnetic fields (industrial)
	IEC 1000-4-11	Source voltage deviation

## SPECIFICATIONS

Power Requirements:	115 VAC (+/- 10%), 50/60 Hz; 230 VAC (+/- 10%), 50/60 Hz; 24 VAC (+/- 10%), 48 VAC (+/- 10%), 50/60 Hz; 24 VDC (+/- 15%)
Power Consumption:	4W max.
Ambient Operating Temp:	-40°F (-40°C) to +200°F (+93°C) ext. amb.
Internal Bin Temp:	
Standard Unit:	to +300°F (+150°C)
Hi-Temp Unit :	to +750°F (+400°C)
Conduit Connection:	Two (2) 3/4" NPT; M20 cable glands (Model KA units with 1-1/2" BSPT process connection only; Not on KAX units)
Outputs Contacts:	
2-Circuit Configuration -	Two SPDT 15A @ 250 VAC ea. max
3-Circuit Configuration -	One SPDT 15A @ 250 VAC max One DPDT 10A @ 250 VAC max
Maximum Pressure:	30 PSI (2 bar) maximum
Sensitivity:	5 lb./ft <sup>3</sup> (80 kg/m <sup>3</sup> ) minimum material density (when using large 3-vane paddle)
Housing:	Die cast aluminum, NEMA 4X / ENCLOSURE TYPE 4X, IP66
Housing Finish:	Powder coating
Mounting Connection:	1-1/4" NPT or R 1-1/2 (BSPT 1-1/2)
Weight:	Approx. 5-1/2 lb. (2.5 kg) with paddle

### Materials of construction/accessories:

Flexible Coupling:	304 stainless steel
Mounting Plates:	Powder coated carbon steel or plain 304 stainless steel
All Paddles except Ex-Flex:	304 stainless steel
Ex-Flex Belt:	304 stainless steel coupling, rubber/fabric blend belt
Flexible Cable Extension:	304 stainless steel
Solid Shaft Extension/Guards:	Galvanized or 304 stainless steel
Shaft Seal:	Nitrile

### Listings/Approvals:

KA:	UL and CSA: Ordinary Locations
KAX:	UL and CSA: Class I, Div. 1 & 2, Groups C, D; Class II, Div. 1 & 2, Groups E, F, G
ATEX/UKEx:	Ⓜ II 1/2 D Ex ta/tb IIIC T100°C Da/Db Ex h IIIC T100°C Da/Db (Ta -40°C to +93°C) ATEX certificate #Sira 03ATEX9340 UKEx certificate #CSAE 21UKEx9587
IECEX:	Ex ta/tb IIIC T100°C Da/Db Certificate #IECEX SIR 06.0081

All Models:	 CE Mark
	 UKCA Mark
	 CHINA RoHS 2

## WARRANTY

Monitor Technologies LLC warrants each rotary paddle bin indicator it manufactures to be free from defects in material and workmanship under normal use and service within two (2) years from the date of purchase. The purchaser must give notice of any defect to Monitor within the warranty period, return the product intact and prepay transportation charges. The obligation of Monitor Technologies LLC under this warranty is limited to repair or replacement at its factory. This warranty shall not apply to any product which is repaired or altered outside of the Monitor Technologies LLC factory, or which has been subject to misuse, negligence, accident, incorrect wiring by others or improper installation. Monitor Technologies LLC reserves the right to change the design and/or specifications without prior notice.

## Monitor Technologies LLC

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