WDA4 INSTRUCTION MANUAL



Approvals

WDA Sensor

Belt Alignment / Motion / Slack and Broken Chain Monitor.

Part Number: WDA4V34xCAI

REV082726

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4B appreciates your business and is pleased you have chosen our products to meet your needs.

Please read in its entirety and understand the literature accompanying the product before you place the product into service. Please read the safety precautions carefully before operating the product. With each product you purchase from 4B, there are some basic but important safety considerations you must follow to be sure your purchase is permitted to perform its design function and operate properly and safely, giving you many years of reliable service. Please read and understand the Customer Safety Responsibilities listed below. Failure to follow this safety directive and the Operation Manuals and other material furnished or referenced, may result in serious injury or death.

1. SAFETY NOTICE TO OUR CUSTOMERS

A. To maximize efficiency and safety, selecting the right equipment for each operation is vital. The proper installation of the equipment, and regular maintenance and inspection is equally important in continuing the proper operation and safety of the product. The proper installation and maintenance of all our products is the responsibility of the user unless you have asked 4B to perform these tasks.

B. All installation and wiring must be in accordance with Local and National Electrical Codes and other standards applicable to your industry or place of installation. All electrical or mechanical installation should be undertaken by an experienced and qualified professional. Failure to correctly install any product and/or machinery can result in the product or machine failing to operate as intended and can defeat its design function.

C. Periodic inspection by a qualified person will help assure your 4B product is performing properly. 4B recommends a documented inspection at least annually and more frequently under high use conditions.

D. Please see the last page of this manual for all warranty information regarding this product.

2. READ ALL LITERATURE PROVIDED WITH YOUR PRODUCT

Please read all user, instruction, and safety manuals to ensure that you understand your product operation and can safely and effectively use this product. If the equipment is used in a manner not specified in this manual, the protection provided by the equipment may be impaired.

3. YOU BEST UNDERSTAND YOUR NEEDS

Every customer and operation are unique, and only you best know the specific needs and capabilities of your operation. Please contact 4B (contact options are on the back cover of this manual) for assistance with any questions about the performance of products purchased from 4B. 4B is happy to discuss product performance with you at any time.

4. SELECT A QUALIFIED AND COMPETENT INSTALLER

Correct installation of the product is important for safety and performance. If you have not asked 4B to perform the installation of the unit on your behalf, it is critical for the safety of your operation and those who may perform work on your operation that you select a qualified and competent electrical installer to undertake the installation. The product must be installed properly to perform its designed functions. The installer should be qualified, trained, and competent to perform the installation in accordance with Local and National Electrical Codes, all relevant OSHA Regulations, as well as any of your own standards and preventive maintenance requirements, and other product installation information supplied with the product. You should be prepared to provide the installer with all necessary installation information to assist in the installation.

5. ESTABLISH AND FOLLOW REGULAR MAINTENANCE AND INSPECTION SCHEDULE FOR YOUR 4B PRODUCTS.

You should develop a proper maintenance and inspection program to confirm that your system is always in good working order. You will be in the best position to determine the appropriate frequency for inspection. Many different factors known to the user will assist you in deciding the frequency of inspection. These factors may include but are not limited to weather conditions; construction work at the facility; hours of operation; animal or insect infestation; and the real-world experience of knowing how your employees perform their jobs. The personnel or person you select to install, operate, maintain, inspect, or perform any work whatsoever, should be trained and qualified to perform these important functions. Complete and accurate records of the maintenance and inspection process should always be created and retained by you.

6. RETAIN AND REFER TO THE OPERATION MANUAL FOR 4B'S SUGGESTED MAINTENANCE AND INSPECTION RECOMMENDATIONS

As all operations are different, please understand that your specific operation may require additional adjustments in the maintenance and inspection process essential to permit the 4B product to perform its intended function. Retain the Operation Manual and other important maintenance and service documents provided by 4B and

have them readily available for people servicing your 4B equipment. Should you have any questions, please contact 4B (contact options are on the back cover of this manual).

7. SERVICE REQUEST

If you have questions or comments about the operation of your 4B product or require it to be serviced, please contact 4B (contact options are on the back cover of this manual). Please have available product part numbers, serial numbers, and approximate date of installation. To assist you, after the product has been placed into service, complete the online product registration section which is accessed via our website www.go4b.com.

WARNING / AVERTISSEMENT	
 	Moving parts can crush and cut. Lockout power before removing guard or servicing. Do NOT operate with guard removed. Les pièces mobiles peuvent écraser et couper.Coupez l'alimentation avant de retirer la protection ou d'effectuer toute intervention. Ne pas utiliser sans la protection.

PRODUCT OVERVIEW

The 4B WDA sensor is designed to detect moving ferrous (magnetic) material passing within its sensing range, and is used in conjunction with a speed relay, PLC or with 4B's Watchdog™ Elite and A400 Elite control units. The sensor will not detect non-ferrous material such as plastic, rubber, stainless steel or aluminum.

The WDA can detect ferrous steel elevator buckets from the side of the elevator leg, or through the elevator belt from the back of the leg. For plastic elevator buckets, the steel elevator bolts used to attach the buckets can be targeted by installing the WDA on the back of the leg.

A more specialized use for the WDA switch is as a broken/slack chain detector on drag chain conveyors, or as a non-contact speed switch for screw conveyors.

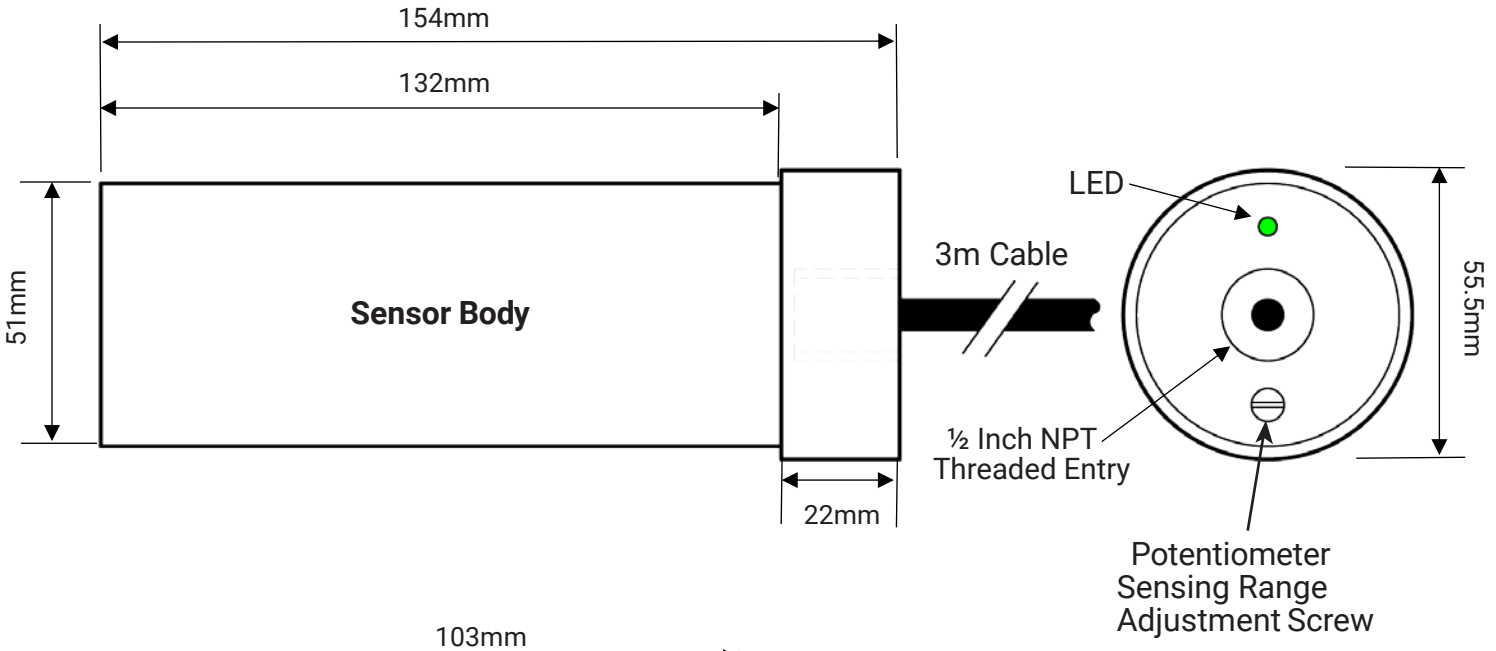
A flashing LED on the end of the sensor indicates a target has been detected. A potentiometer control screw, located below the LED, allows the target sensing range to be adjusted from 25 to 75 mm. Two output signals are provided: one signal is a pulse output, representing each object detected: the second signal is a continuous output when moving objects are detected (see wiring diagram).

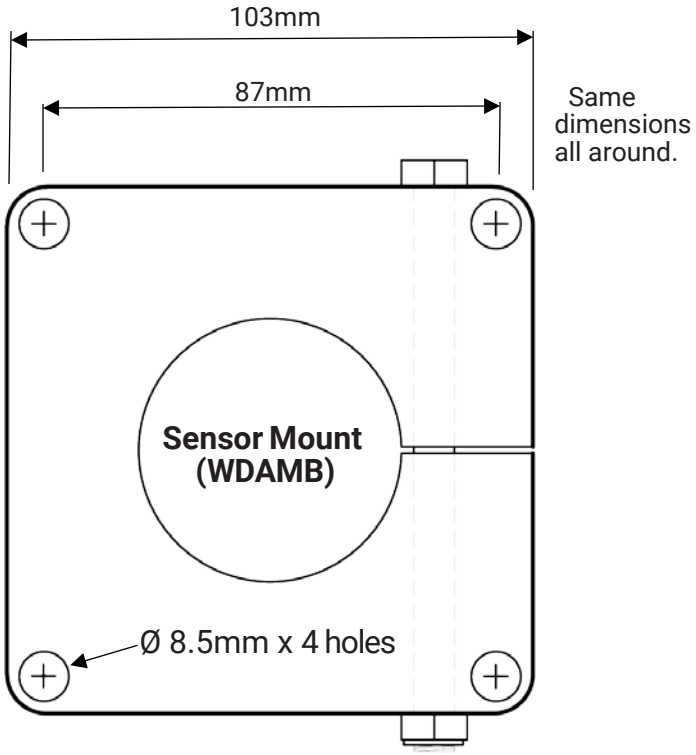
SPECIFICATIONS

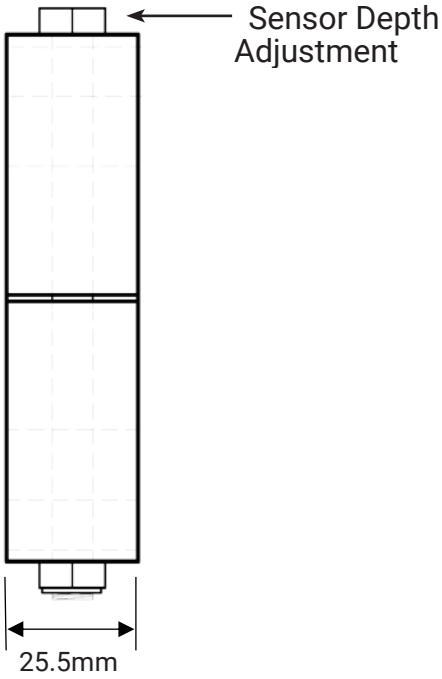
Operating Voltage Range	12 to 24 VDC + 10%
Supply Current	40 mA
LED Indicator	• Green (Flashing) – Target Detected • Green (Off) – No Target Detected
Pulses Output (MAX)	Solid State Relay, 25 mA @ 24 VDC (MAX), non-inductive
Continuous Output (MAX)	Solid State Relay, 25 mA @ 24 VDC (MAX), non-inductive
Detection Range	Adjustable 25 to 75mm (1 to 3 inch)
Detection Rate	20 – 2,000 PPM (Pulses Per Minute)
Cable	3m 6 core
Operating Temperature	-20 °C to +50 °C (-4 °F to 122 °F)
Conduit Entry	½" NPT
Ingress Protection	IP66

	Baseefa05ATEX0088X, BAS23UKEX0063X **WDA4V341CAI, WDA4V342CAI** II 1D Ex ta IIIC T_{200}120°C Da IP66 Tamb -20°C to +50°C **WDA4V341CAI-HT, WDA4V342CAI-HT** II 1D Ex ta IIIC T_{200}150°C Da IP66 Tamb -20°C to +50°C
IECEx	IECEx BAS 05.0031X **WDA4V341CAI, WDA4V342CAI** Ex ta IIIC T_{200}120°C Da IP66 Tamb -20°C to +50°C **WDA4V341CAI-HT, WDA4V342CAI-HT** Ex ta IIIC T_{200}150°C Da IP66 Tamb -20°C to +50°C
	WDA4V341CAI, WDA4V342CAI Class II Division 1 Groups E,F & G T120°C Zone 20 AEx ta IIIC T120°C Da IP66 -20°C ≤ Ta ≤ +50°C **WDA4V341CAI-HT, WDA4V342CAI-HT** Class II Division 1 Groups E,F & G T150°C Zone 20 AEx ta IIIC T150°C Da IP66 -20°C ≤ Ta ≤ +50°C

DIMENSIONS







Ø 8.5mm clearance hole required for 8mm(M8) bolts.

*Bracket can be used with earthing options 1 and 2 in external earthing options section



All dimensions are in millimeters.

SPECIFIC CONDITIONS OF USE

1. The integral cable shall be terminated in a suitably certified junction box or in a safe area.

2. The sensor shall be internally earthed via the green wire of the integral cable.

3. The sensor shall be externally earthed via one of the following three methods:

   i) Via the ½" NPT threaded entry in the metallic end cap of the WDA4 sensor that is fitted with metal conduit by the end user. The conduit shall be earthed by the end user and they shall check that the earth connection is less than 500 Milli Ohms, between the metallic end cap of the WDA4 sensor and the metallic conduit.

   ii) Via the optional WDA4 metallic mounting bracket, that is fitted around the sensor housing. The mounting bracket is fitted directly to the end users earthed machine housing, via the mounting brackets' 4 off bolts (M8) complete with anti-rotation and anti-vibration fixings. The end user shall check that the earth connection is less than 500 Milli Ohms, between the metallic body of the WDA4 sensor and the metallic mounting bracket, and between the mounting bracket and machine housing.

   iii) WDA4V342 only - Via a wire and ring crimp fitted on the external earth stud arrangement located on the WDA4 sensor end cap and wire connection to the site earth point.

4. **IECEx installations:** The supply circuit of the system where the equipment is connected shall be protected by a suitably rated fuse capable of interrupting a prospective short circuit current of 1.5 kA.

   USA/Canada – NRTL installations: The supply circuit shall not have a prospective short circuit current of greater than 1.5 kA and shall be protected by a fuse suitably rated for the prospective short circuit current.

EXTERNAL EARTHING OPTIONS

The WDA4 can be externally earthed using one of the following options:

1. 1/2" NPT conduit entry when an earthed conduit is fitted.
2. Earth stud present on the version 2 of end plug (bung), WDA4V342.
3. Using optional metal bracket when fitted to an earthed machine housing.

(For options 1 & 2, brackets do not need to be there, or any bracket type can be used).

Please see below for the instructions related to the above mentioned external earthing options.

External Earthing Option 1 Instructions

1. Confirm that the WDA4 sensor is fully powered down.
2. Ensure that the 1/2" NPT male conduit thread is earthed suitably as per the local electrical wiring regulations (such as NEC, CEC, EN IEC 60079-14).
3. Thread the Earthed Conduit Fitting into the 1/2" NPT threaded female entry of the WDA4. Hand-tighten it securely but avoid over-tightening, which can damage the threads.
4. Double-check that all connections are secure and properly tightened.
5. Before energizing the product, verify that the earth connection is secure and effective by testing it with a suitable continuity tester or multimeter as quantified in the specific conditions of use.

External Earthing Option 2 Instructions

The WDA4V342 is shipped with the following accessories for earthing the product.

2 x Saddle Washers

1 x Shake Proof Washer

1 x Bolt

1. Confirm that the WDA4 sensor is fully powered down.
2. Prepare a ring-crimped earth cable, strip the cable end, insert it into the ring terminal, and crimp securely using the appropriate crimping tool. Ensure that the cable is properly earthed as per the local electrical wiring regulations (such as NEC, CEC, EN IEC 60079-14).
3. Stack the components in the following order from bottom to top:
    a. Earth Stud with a threaded hole for the bolt
    b. Saddle Washer with sides facing up
    c. The crimped end of the Earth Cable
    d. Saddle Washer with sides facing down
    e. Anti-Vibration Washer

4. Thread the bolt through the entire stack-up, ensuring it passes through all the components in the specified order.
5. Using an appropriate tool, tighten the bolt securely but avoid over-tightening.
6. Check that all components are securely in place and that the earth cable is firmly attached.
7. Before energizing the product, verify that the earth connection is secure and effective by testing it with a suitable continuity tester or multimeter as quantified in the specific conditions of use.

External Earthing Option 3 Instructions

1. Confirm that the WDA4 sensor is fully powered down.
2. Ensure that the machine is earthed suitably as per the local electrical wiring regulations (such as NEC, CEC, EN IEC 60079-14).
3. Clean the sensor tube with a dry soft cloth to remove any residual material and make sure that the metal tube is contaminant free.
4. Identify the area of the sensor tube to install the metal mounting bracket without interfering with sensor fixing on the machine (depending on the application).
5. Put both the metal bracket's halves over the sensor tube & using 2 off bolts & Nord-lock/wedge washer along with anti-vibrational Nyloc locking nut fittings.
6. Align the metal bracket & secure the sensor assembly with machine using 4 off bolts & anti rotational Nord-lock/wedge washers along with ant vibrational Nyloc locking nut fittings.
7. Before energizing the product, verify that the earth connection is secure and effective by testing it with a suitable continuity tester or multimeter as quantified in the specific conditions of use.

POTENTIAL ELECTROSTATIC CHARGING HAZARD

Please check if the markings on the WDA4 are on an adhesive label, if this is the case then observe the following warning, if the marking is engraved into the body the warning maybe disregarded.

WARNING – Potential Electrostatic Charging Hazard

AVERTISSEMENT – Risque Potentiel de Charge Hazard

Warning: POTENTIAL ELECTROSTATIC CHARGING HAZARD, Clean only with a damp cloth.

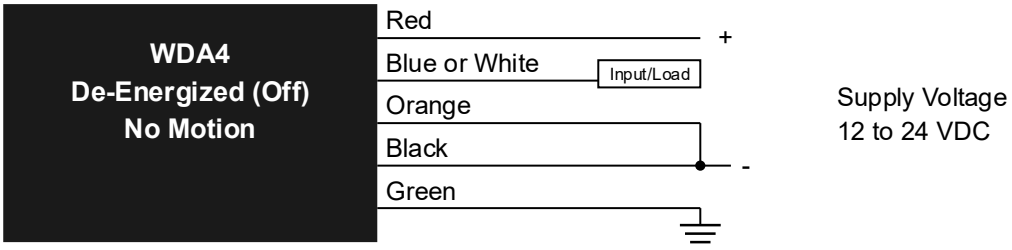
Avertissement : RISQUE DE CHARGAGE ÉLECTROSTATIQUE. Nettoyer uniquement avec un chiffon humide.

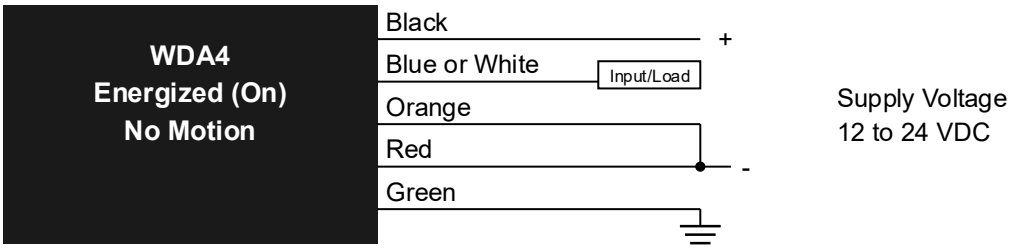
STANDARD WIRING DIAGRAM

All wiring must be in accordance with local and national electrical codes and should be undertaken by an experienced and qualified electrician.

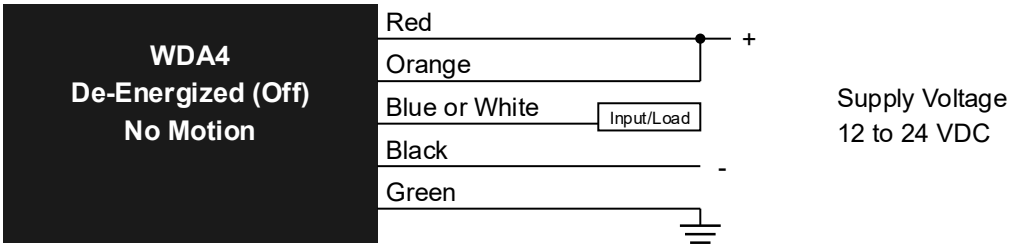
Where required use dust/liquid tight flexible metal conduit with approved fittings to protect the sensor cables. Use rigid metal conduit to protect the cables from the sensors to the control unit. Conduit systems can channel water due to ingress and condensation directly to sensors and sensor connections which over time will adversely affect the performance of the system. As such, the installation of low point conduit drains is recommended for all sensors. If required, mount a suitable junction box within the supplied length of the product's cable and (if required, using a suitable conduit to protect the cables) make the necessary wiring connections inside this junction box.

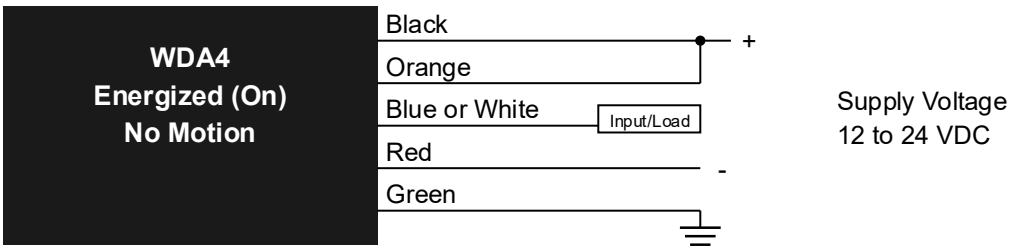
NPN CONNECTIONS





PNP CONNECTIONS





RED	+ Supply, 12 to 24 VDC + 10%
BLACK	- Supply, 0 VDC
GREEN	Ground Connection
YELLOW / ORANGE	Output Supply Common
BLUE	Pulsed Output.
WHITE	Continuous Output. On with motion and off when no target for 2.5s (states reverse if polarity to red/black is reversed)

NOTE

The sensitivity of the WDA4 sensor must be adjusted at the sensor. It cannot be adjusted remotely by an A400 unit.

Please note that the following instructions are guidelines and suggestions only, the end users may have to adapt these for the end application. All installations must conform to the local electrical wiring regulations (such as NEC, CEC, EN IEC 60079-14).

Sensors are placed in pairs at the head and boot on the up side of the elevator leg. Sensor installation will vary depending on the type of elevator bucket (metal or plastic). Once the proper placement has been identified, cut a 2-1/4 inch (57 mm) diameter hole in the elevator leg housing for each sensor.

The WDA sensor can be mounted using one of the following three methods -

1. Drill and tap the machine casing for 5/16 (M8) threaded bolts. Make sure that the bolts used to secure the sensor mounting bracket are short enough that they do not interfere with the operation of the machine.

2. Use threaded rivet nuts for 5/16 (M8) threads. The length of the rivet nut will depend on the thickness of the machine's casing. Make sure that the bolts used to secure the sensor mounting bracket are short enough that they do not interfere with the operation of the machine.

3. CD weld 5/16 (M8) threaded welding studs to the machine casing.

To drill the four 5/16 (M8) bolt holes for the sensor mounting bracket, use the supplied paper template from the website, www.go4b.com or use the bracket itself, by centring on the existing 2-1/4 inch (57 mm) hole.

For side mounting of steel buckets (Option 1), make sure that the belt is centred on the pulley and install a sensor on each side of the trunking, with the sensor centred on the edge of the elevators bucket at a distance of no more than 2 inches (50 mm) from the buckets, or with the outer edge of the sensor in line with the tips of buckets with very close vertical spacing at a distance of no more than 1-1/2 inches (38 mm) from the buckets. Set the sensor so that it does not have to work at maximum sensitivity. Always ensure that in the worst case of elevator misalignment, the sensors will not be damaged within the elevator.

For rear mounting of plastic buckets with steel bolt heads (Option 2), make sure that the belt is centred on the pulley and install a sensor on either side of the rear of the trunking. The sensor should be centred on the outside edge of the outermost bucket bolts and protrude slightly through the trunking around 1 1/2 inch (25.4 mm) from the bolt head.

The sensor depth within the elevator leg can be adjusted by loosening the adjustment bolt on the mounting bracket, sliding the sensor to the required depth and retightening the bolt.

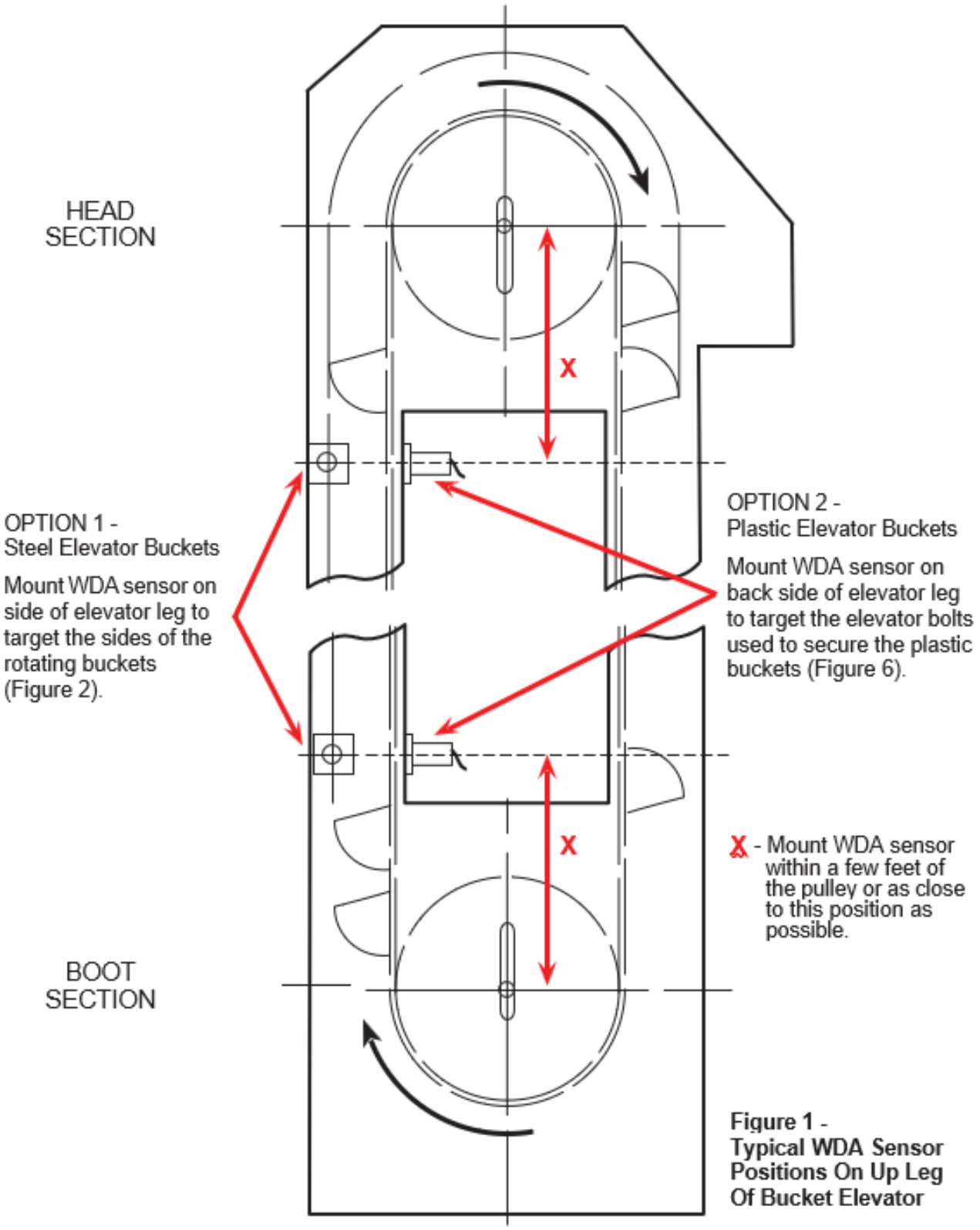


Figure 1 - Typical WDA Sensor Positions On Up Leg Of Bucket Elevator

NOTE

For bucket elevator installations, WDA sensors are designed to work in pairs. One pair mounted on the head of the elevator leg and another pair on the boot section.

NOTE

WDA sensors can be installed on the front of the elevator leg if side mounting in not possible. 4B recommends that all sensors be placed either on the side or on the front, but not in combinations.

METAL ELEVATOR BUCKET SIDE MOUNTING DIAGRAMS

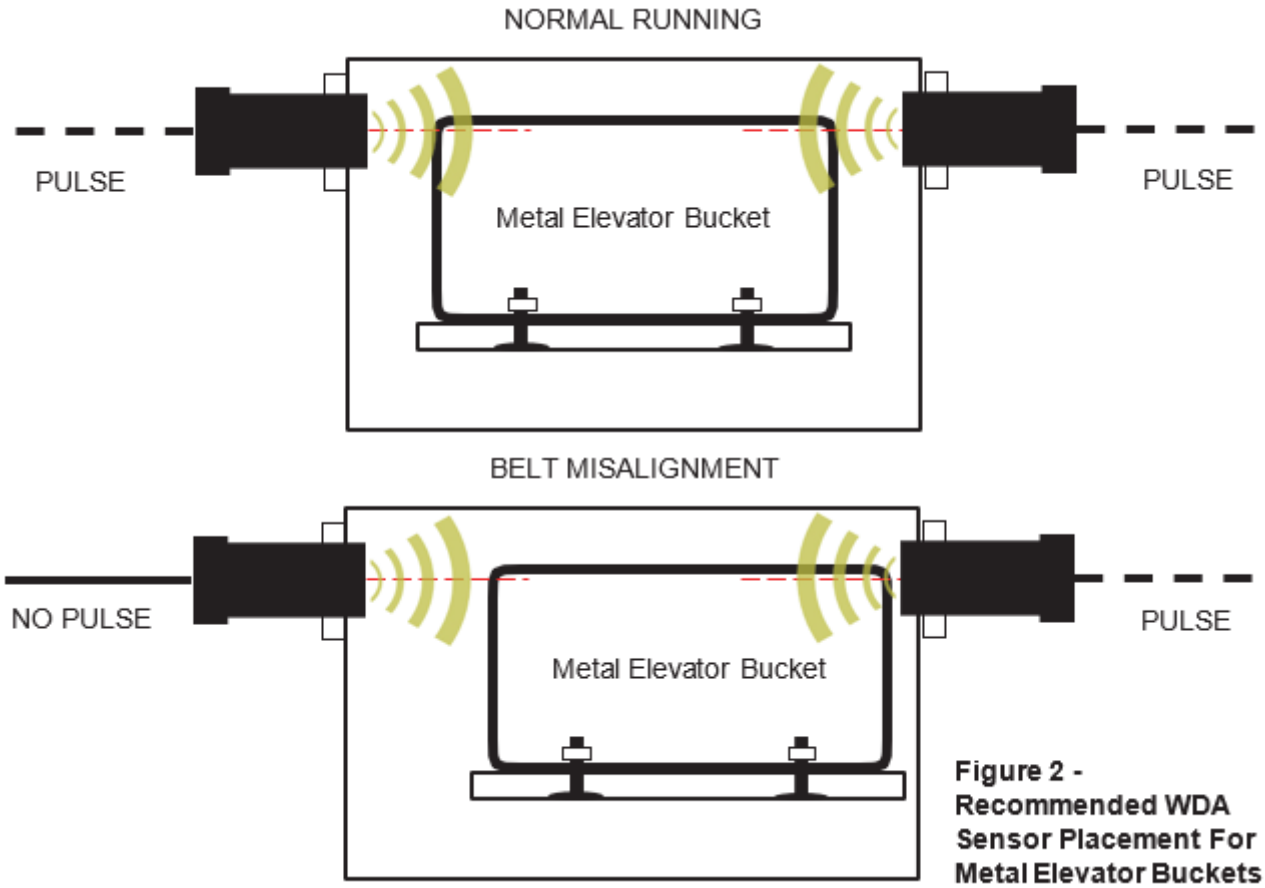


Figure 2 - Recommended WDA Sensor Placement For Metal Elevator Buckets

NOTE - If using stainless steel elevator buckets and bolts (non-ferrous), use PTFE coated steel fender washers (ferrous) between the belt and bucket. Mount WDA sensor on the back side of the leg to target the ferrous bolts / washers.

Alternatively, 400 series stainless steel bolts (magnetic) can be used

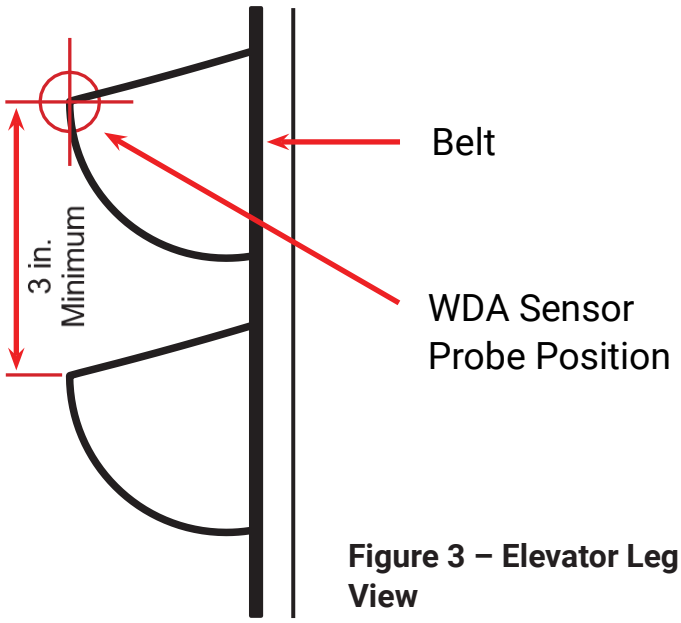


Figure 3 – Elevator Leg Side View

METAL ELEVATOR BUCKET OPTIONAL FRONT MOUNTING DIAGRAMS

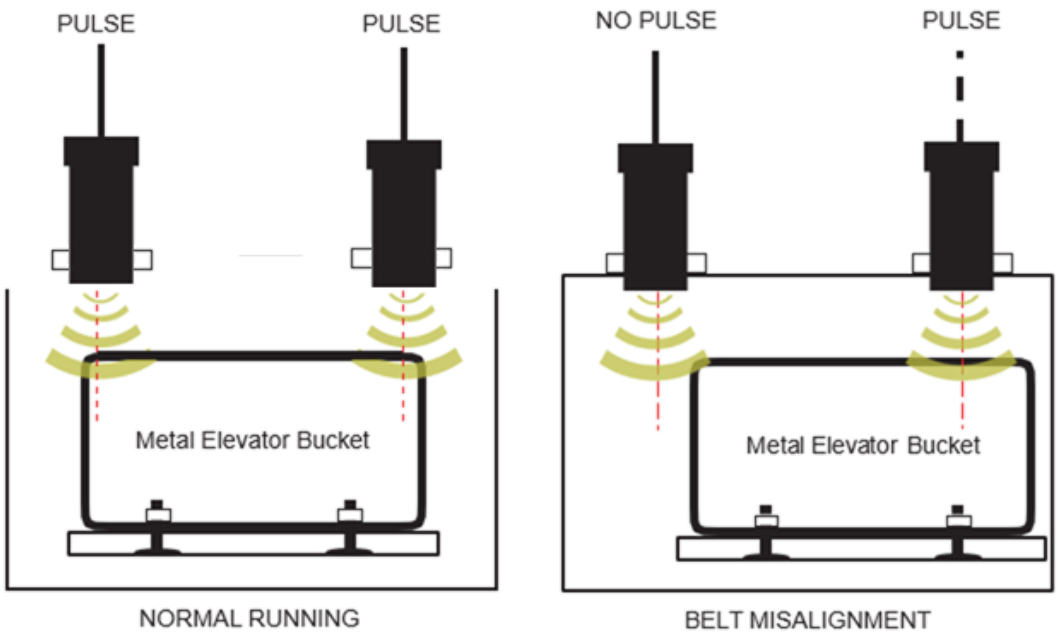


Figure 4 -
Optional Front Mounting Of WDA Sensor For Metal Elevator Buckets

METAL ELEVATOR BUCKET WITH CLOSE VERTICAL CENTERS

Figure 5 illustrates the optimal WDA sensor placement for elevator buckets with close vertical spacing. This placement allows for the maximum differential between the buckets. GB Spidex™ and Starco™ low profile are two examples of these bucket types. For additional information, contact 4B.

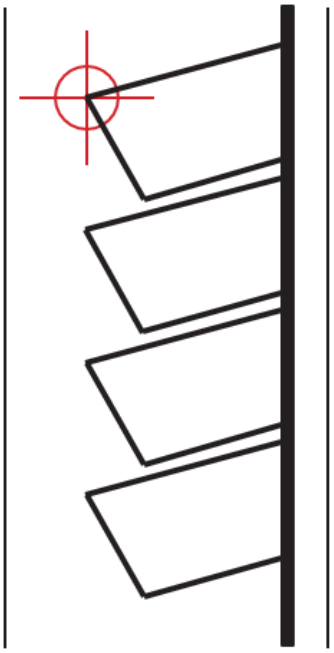


Figure 5 -
WDA Sensor Placement For Metal Buckets With Close Vertical Centers

PLASTIC ELEVATOR BUCKET MOUNTING DIAGRAMS

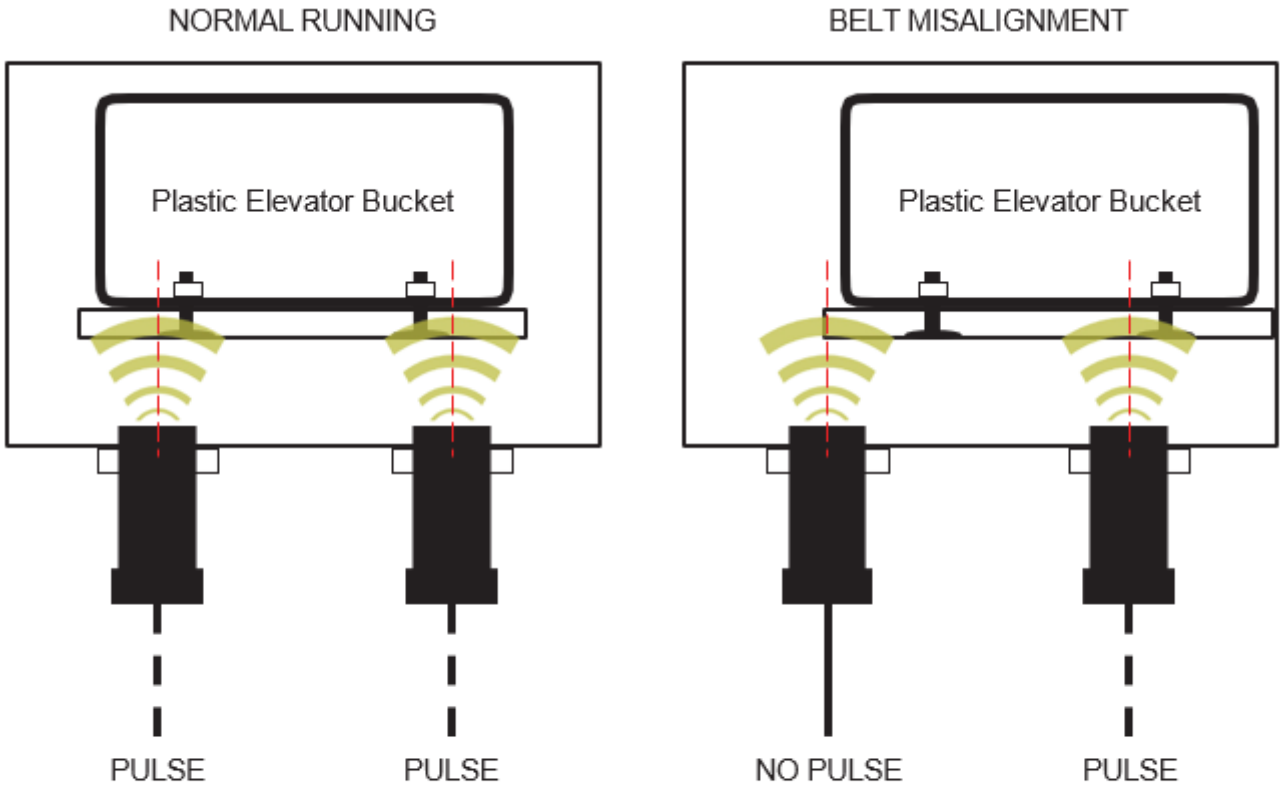


Figure 6 -
WDA Sensor Placement For Plastic Elevator Buckets (Detecting Bolts) On Up Side Of Leg

If using stainless steel bolts (non-ferrous), use PTFE coated steel fender washers (ferrous) between the belt and bucket.

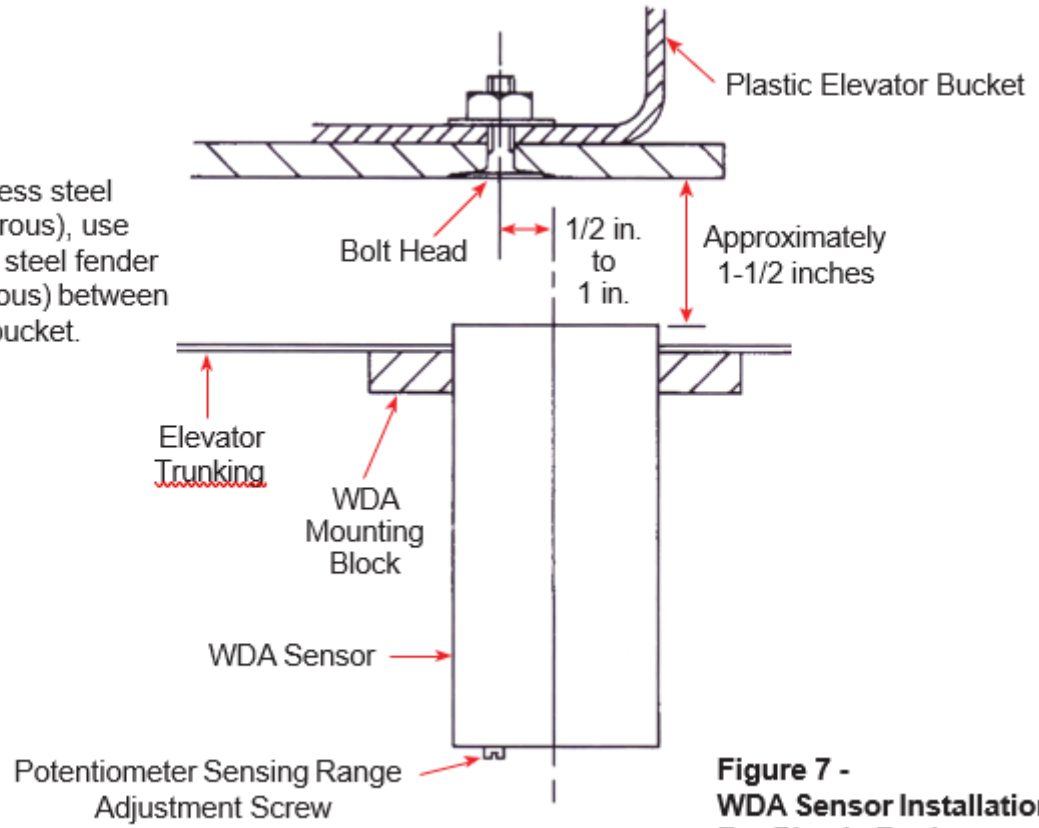


Figure 7 -
WDA Sensor Installation For Plastic Buckets

SCREW CONVEYOR

For speed monitoring on a screw conveyor, the sensor will need to detect a ferrous steel flight (target). If the housing is mild steel, cut a 4 inch or larger diameter hole in the housing and weld a 300 series stainless steel plate over the hole. Make sure that the plate is larger than the WDA's mounting bracket,
and mount the WDA sensor to the stainless steel plate. The sensor should be mounted 1-3 inches away from the edge of the hole in the housing or it may detect the mild steel as a false target. Since 300 series stainless steel is non-ferrous, the sensor will not be affected as the sensing field can pass through the plate.

If the housing is 300 series stainless steel, no hole is required, mount the WDA sensor directly to the housing. The sensor should be mounted 1-3 inches away from the moving ferrous flight (target) but over 3 inches away from the rotating shaft. This installation is very similar to option 1 for drag conveyors.

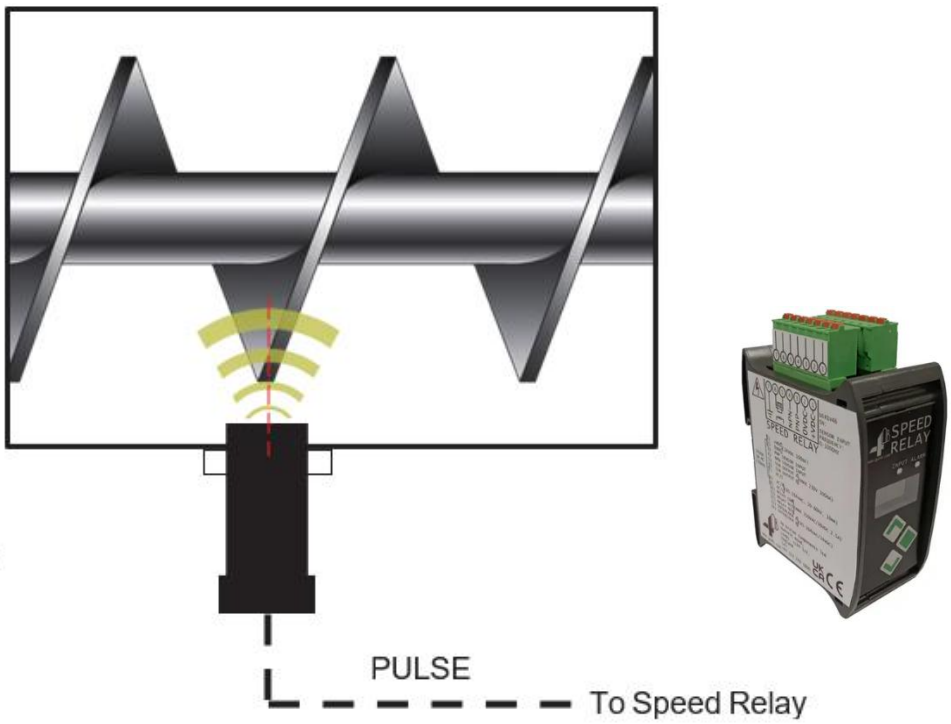


Figure 8 -
WDA Sensor Detecting Screw Flight (Pulse)

Speed Relay USR1V46

DRAG CONVEYOR

For slack/broken chain detection on drag conveyors, the WDA sensor can be installed using one of three options (see below). Either a hole can be cut in the conveyor housing for the sensor, or the mount can be installed on a stainless steel plate welded directly to the conveyor housing over the hole. Since stainless steel is

non-ferrous, the sensor will not be affected as the sensing field can pass through the plate.

Once the proper placement has been identified, cut a 2-1/4 inch (57 mm) diameter hole in the drag conveyor housing for each sensor. If using stainless steel plate, the hole diameter may need to be larger.

The WDA sensor can be mounted using one of the following three methods -

1. Drill and tap the machine casing for 5/16 (M8) threaded bolts. Make sure that the bolts used to secure the sensor mounting bracket are short enough that they do not interfere with the operation of the machine.

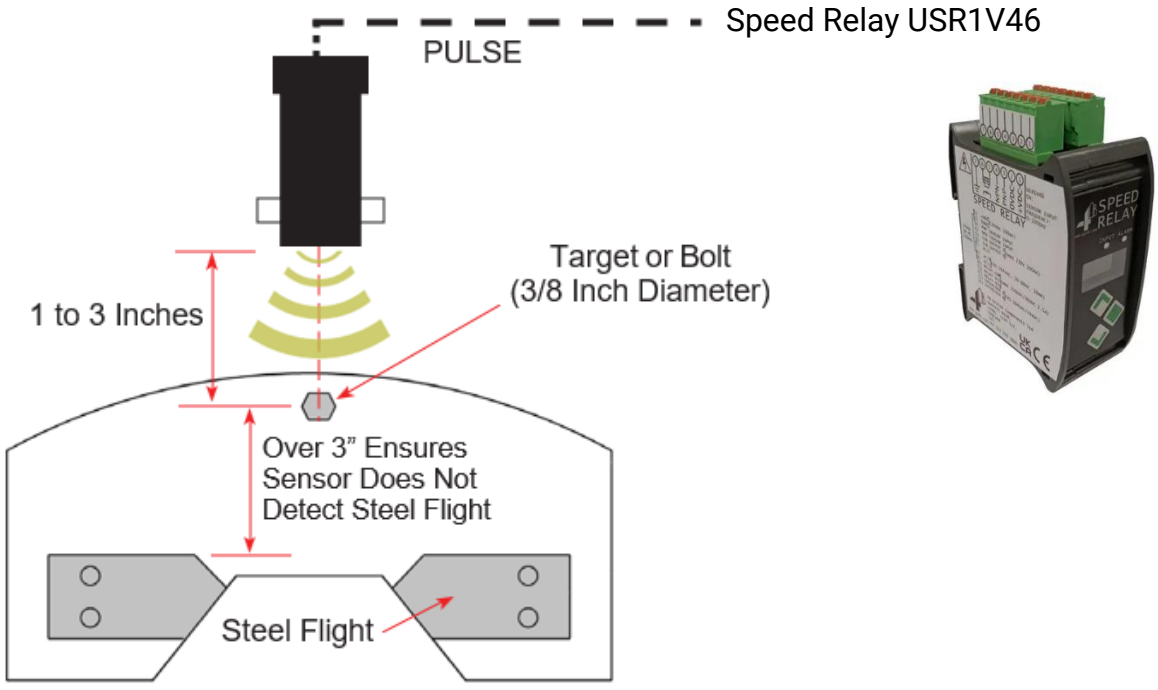
2. Use threaded rivet nuts for 5/16 (M8) threads. The length of the rivet nut will depend on the thickness of the machine's casing. Make sure that the bolts used to secure the sensor mounting bracket are short enough that they do not interfere with the operation of the machine.

3. CD weld 5/16 (M8) threaded welding studs to the machine casing.

To drill the four 5/16 (M8) bolt holes for the sensor mounting bracket, use the supplied paper template from the sensor manual or use the bracket itself, by centering on the existing 2-1/4 inch (57 mm) hole.

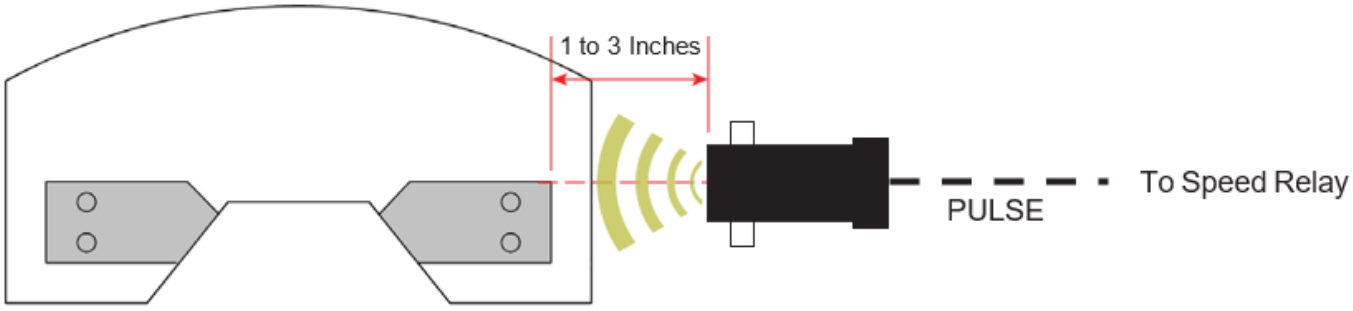
OPTION 1: SENSOR DETECTING TARGET ON PADDLE

Under normal running conditions, the target bolt passes through the sensor's field and a pulse is sent to the speed relay. If the chain becomes slack, the target bolt will drop below the field and the pulses will stop, causing the relay contact to change state.



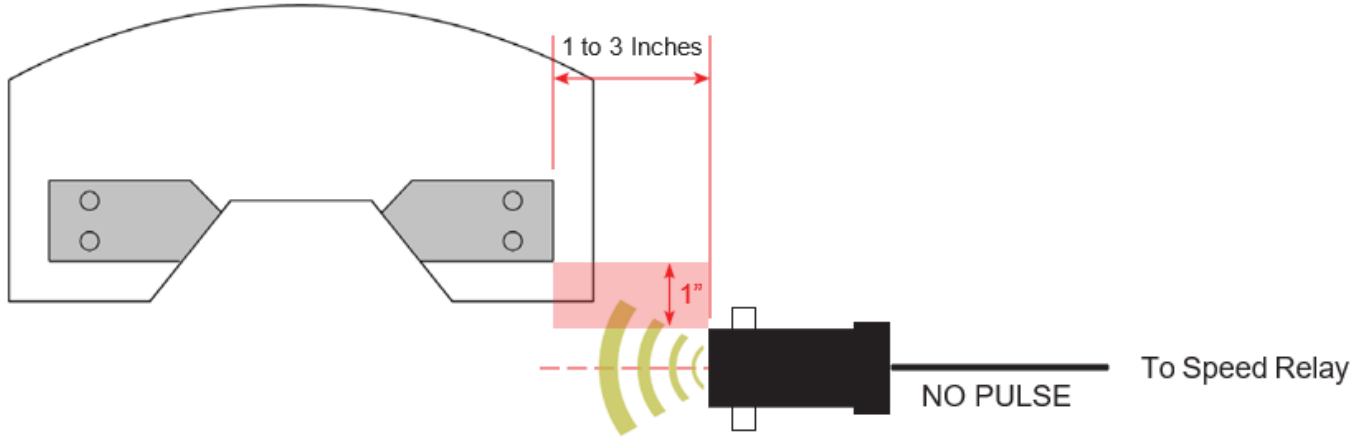
OPTION 2: SENSOR DETECTING STEEL FLIGHT

Under normal running conditions, the steel flight passes through the sensor's field and a pulse is sent to the speed relay. If the chain becomes slack, the steel flight will drop below the field and the pulses will stop, causing the relay contact to change state.



OPTION 3: SENSOR WAITING TO DETECT STEEL FLIGHT -

Under normal running conditions, the steel flight is out of the sensor's field, so no pulses are sent to the speed relay. If the chain becomes slack, the steel flight comes into the sensor's field and a pulse is sent to the speed relay, causing it to change state.



NOTE

The sensor depth can be adjusted by loosening the adjustment bolt on the mounting bracket, sliding the sensor to the required depth and retightening the bolt. Final sensitivity adjustments should be made using the potentiometer sensing range adjustment screw.

⚠WARNING / AVERTISSEMENT

Ensure that no ferrous steel, such as the machine's frame, is within the target sensing field. This can interfere with the sensor detecting the intended target.

Veillez à ce qu'aucun objet en acier ferreux, comme le châssis de la machine, ne se trouve dans le champ de détection de la cible. Cela pourraitinterférer avec la détection de la cible par le capteur.

SENSOR CALIBRATION

Turn the sensing range adjustment screw fully clockwise while machine is running, the green LED should flash consistently. Slowly turn the sensing range adjustment screw counter-clockwise until the flashing becomes irregular. Then turn it slowly clockwise until a regular flashing pattern appears, add an extra 1/8th turn clockwise for range compensation.

Periodically test the WDA4 and the system to ensure that both are operating correctly.

1. Check that the unit is correctly installed. (See Electrical Setup)
2. Ensure that all cabling is in a good state, and that all the electrical connections are secure and in good order.

⚠ WARNING / AVERTISSEMENT

If the system does not immediately shutdown as expected or alarm as required, then remove the machine from service until the problem has been diagnosed and corrected.

Si le système ne s'arrête pas immédiatement comme prévu ou ne déclenche pas d'alarme comme requis, mettez la machine hors service jusqu'à ce que le problème ait été diagnostiqué et corrigé.

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4B Locations Around the World



USA
4B Components Ltd.
625 Erie Avenue
Morton, IL 61550
Tel: +1 (309) 698-5611

France
4B France
35 bis, rue du 8 mai 1945,
Villers Bretonneux, F-80800
Tel: +33 (0) 3 22 42 32 26

Australia
4B Australia
Building 1, 41 Bellrick St,
Acacia Ridge 4110,
Queensland
Tel: +61 (0)7 3216 9365

United Kingdom
4B Braime Components Ltd.
Hunslet Road
Leeds, LS10 1JZ
Tel: +44 (0) 113 246 1800

Germany
4B Deutschland
35 bis, rue du 8 mai 1945,
Villers Bretonneux, F-80800
France
Tel: +49 (0) 2333 601681

China
4B China
F1, Building 5A,
8 West Lake Road Wujin High &
New Technology Develop. Zone
Changzhou 213164
Jiangsu Province
Tel: +86-136 0160 9266

Thailand
4B Asia Pacific
Build No.899/1 Moo 20
Soi Chongsiri, Bangplee-Tam Ru Road
Tanbon Bangpleeyai, Amphur Bangplee
Samutprakarn 10540
Tel: +66 (0) 2 173-4339

South Africa
4B Africa
14 Newport Business Park
Mica Drive, Kya Sand
2163 Johannesburg
Tel: +27 (0) 11 708 6114

United Arab Emirates
4B Braime Components Limited
Sharjah International Airport Free Zone
Saif Zone, Y Building, Office no. Y-44A
P.O Box: SHJ-0., UAE reg. no. 23784
Tel: +971 (0) 6 5212 044

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