

Instruction Manual • April 2009



million
in one

milltronics

MMI BELT SCALE

SIEMENS

Safety Guidelines: Warning notices must be observed to ensure personal safety as well as that of others, and to protect the product and the connected equipment. These warning notices are accompanied by a clarification of the level of caution to be observed.

Qualified Personnel: This device/system may only be set up and operated in conjunction with this manual. Qualified personnel are only authorized to install and operate this equipment in accordance with established safety practices and standards.

Unit Repair and Excluded Liability:

- The user is responsible for all changes and repairs made to the device by the user or the user's agent.
- All new components are to be provided by Siemens Milltronics Process Instruments Inc.
- Restrict repair to faulty components only.
- Do not reuse faulty components.

Warning: Cardboard shipping package provides limited humidity and moisture protection. This product can only function properly and safely if it is correctly transported, stored, installed, set up, operated, and maintained.

This product is intended for use in industrial areas. Operation of this equipment in a residential area may cause interference to several frequency based communications.

Note: Always use product in accordance with specifications.

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- For a selection of Siemens Milltronics weighing manuals, go to: **www.siemens.com/processautomation**. Under Weighing Technology, select *Continuous Weighing Systems* and then go to the manual archive listed under the product family.

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Milltronics MMI Belt Scale

Note: This product is intended for use in industrial areas. Operation of this equipment in a residential area may cause interference to several frequency based communications.

Milltronics MMI belt scale is a heavy-duty, high-accuracy multiple idler scale for critical process and load-out control. The MMI uses two Milltronics MSI belt scales in succession. The scales are designed to be inserted into belt conveyors for continuous weighing of dry bulk solids.

Each MSI includes:

- one weighbridge with two load cells
- Siemens Milltronics test weight(s)

The addition of an idler (supplied and installed by the customer) to each weighbridge completes the weighing assembly. The MMI load cells provide an electronic signal, proportional to load, which is fed to the integrator. Thus, weighing is accomplished without interrupting the process and without affecting the process material. The MMI is used where conveyor belt speeds or belt loading characteristics result in conditions that necessitate extending the weighing time beyond the capabilities of a single idler scale. It is also well suited for applications that require higher sustained accuracies, such as production control inventory accountability or where certification for trade purposes is required.

The MMI is an accurate and repeatable force sensor. Its performance is ultimately dependent upon the conveyor system and the quality of the installation and alignment.

Note: This manual addresses both the 2 idler and 3 idler versions of the MMI belt scale. Although the 2 idler version is depicted in most illustrations, the information provided is generally applicable to the 3 idler version.

Safety Notes

Special attention must be paid to warnings and notes highlighted from the rest of the text by grey boxes.

! **WARNING:** means that failure to observe the necessary precautions can result in death, serious injury, and/or considerable material damage.

Note: means important information about the product or that part of the operating manual.

The Manual

This instruction manual covers the installation, operation and maintenance of the MMI belt scale. Because the MMI belt scale is used in conjunction with an integrator and optional speed sensor, the instruction manual covering these components must be read as well.

Please refer to this manual for proper installation and operation of any component of the weighing system including the MMI. Adhering to the installation and operating procedures will ensure a quick, trouble-free installation and allow for the maximum accuracy and reliability of your weighing system.

If you have any questions, comments, or suggestions about the manual contents, please email us at techpubs.smpi@siemens.com.

For the complete library of Siemens manuals, go to www.siemens.com/processautomation.

Specifications

Accuracy¹

- 2 idler:
 - $\pm 0.25\%$ or better of totalization over 20 to 100% operating range
- 3 idler:
 - $\pm 0.125\%$ or better of totalization over 25 to 100% operating range

Load Cell

- Construction: Stainless steel with superior moisture protection
- Enclosure: IP65 rated
- Excitation: 10 V DC nominal, 15 V DC maximum
- Output: 2 mV / V excitation at rated load cell capacity
- Non-linearity: 0.02% of rated output
- Hysteresis: 0.02% of rated output
- Non-repeatability: 0.01% of rated output
- Capacity: Max. ranges: 50, 100, 250, 500, 750, 1000, 1250, 1500 lb
- Overload: Max. 1000% of rated capacity
- Temperature: – 40 to +75 °C (– 40 to +167 °F) operating range
– 18 to +65 °C (0 to +150 °F) compensated

Belt Width

- 18" to 96" in 1" increments to suit CEMA sizes, equivalent to 500 to 2000 mm in metric sizes
- Refer to *Outline Dimensions* on page 20

Belt Speed²

- Up to 5 m/s (984 fpm)

Capacity

- Up to 12000 t/h (13200 STPH) at maximum belt speed

-
1. Accuracy subject to: On factory approved installations the belt scale system's totalized weight will be within the specified accuracy when compared to a known weighed material test sample. The test rate must be within the specified range of the design capacity and held constant for the duration of the test. The minimum material test sample must be equivalent to a sample obtained at the test flow rate for three revolutions of the belt or at least ten minutes running time, whichever is greater.
 2. Contact Siemens application engineering for consideration of higher belt speeds.

Conveyor Incline

- $\pm 20^\circ$ from horizontal, fixed incline
- Up to $\pm 30^\circ$ with reduced accuracy

Conveyor Idler

- Flat to 35°
- Up to 45° with reduced accuracy

Idler Diameter

- 50 to 180 mm (2 to 7")

Idler Spacing

- 0.5 to 1.5 m (1.5 to 5.0 ft)

Weight

- See chart, *Outline Dimensions* on page 20

Approvals

- | | |
|-----------------|--|
| • US/Canada | FM/CSA Class II, Div. 1, Groups E,FG and Class III |
| • Europe | ATEX II 2D, Ex tD A21 IP65 T90 °C
CE |
| • International | IECEx Ex tD A21 IP65 T90 °C |
| • Australia | C-TICK |

Metrology Approvals

- | | |
|-----------------|--------------------|
| • Canada | Measurement Canada |
| • US | NTEP |
| • Europe | MID |
| • International | OIML |

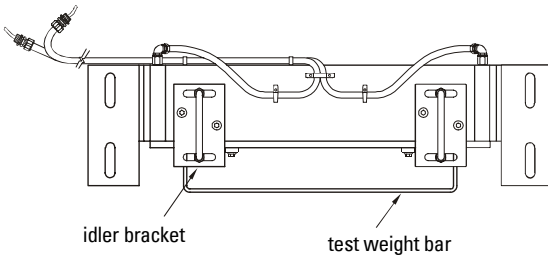
Operation

Each MSI weighbridge is designed to react only to the vertical component of the force being applied to it. Each MSI consists essentially of a fixed support frame (static) and a live frame (dynamic).

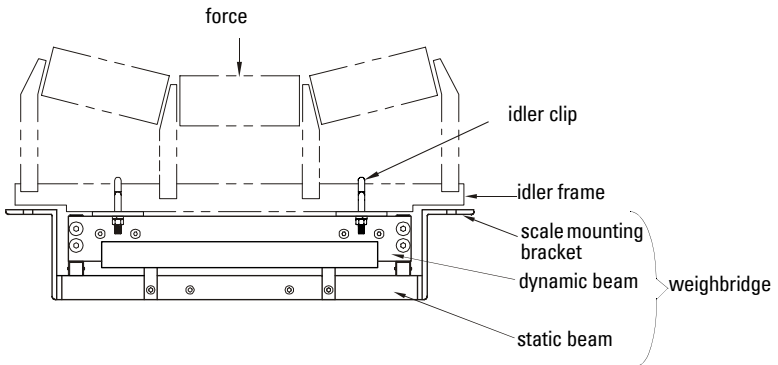
The static assembly is used to mount each MSI between the conveyor stringers and supports the weighing assembly via its load cells.

The weighing assembly supports the scale idler and transfers the weight of the material to the load cells. These are the active components in the weighing assembly.

As the material travels along the conveyor belt, a force is exerted through the suspended idler onto the weighing assembly. The weighing assembly is forced down proportionally. The movement in each load cell is sensed by its strain gauges when excited by voltage from the electronic integrator and produces a signal proportional to weight, which is returned to the integrator. The movement in each load cell is limited by the positive stop incorporated in the design of the load cell.



Note:
Conduit and Cable arrangement may differ from example shown



Installation

Notes:

- Installation shall be performed only by qualified personnel in accordance with local governing regulations.
- Use only approved conduit and conduit fittings or cable glands to maintain NEMA or IP rating, as applicable.
- For hazardous area installations, use only approved junction boxes, metal conduit and conduit fittings or cable glands. Adapter supplied for ½" NPT to M20x1.5. Discard if using ½" NPT conduit fitting.

The MMI is shipped from the factory as a single unit attached to a shipping frame for protection. Each MSI weighbridge must be removed from its shipping frame and inspected for physical damage.

Be sure the conveyor design meets the installation requirements for the Milltronics MMI belt scale. The conveyor stringers must be rigid, straight, parallel to, and square with, the belt line in the area of the scale installation. The idler to be used on each scale and at least the next two approach and retreat idlers must be of the same style and manufacture and in good condition.

Prepare the site in accordance with the Siemens Milltronics drawing(s) provided, and by referring to the Belt Scale Applications Guidelines (7ML19985GA01). (Go to www.siemens.com/mmi and click on *Instructions and Manuals* for the current version of the Application Guidelines.)

Welding



WARNING: Use extreme care when arc welding in the area of the belt scale. Ensure that no welding current can flow through the belt scale. Welding currents passing through the scale can functionally damage the load cells.

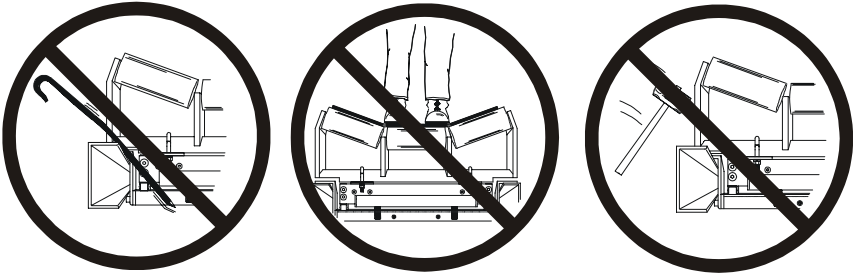
Load Cell Handling

The load cell can tolerate very little negative displacement without damaging the load cell.

When handling each MSI, install both shipping stops to their vertical position to protect the load cells. Do not lift the MSI by the dynamic frame or subject it to shock from blows of a hammer when trying to position it.

Installation Precautions

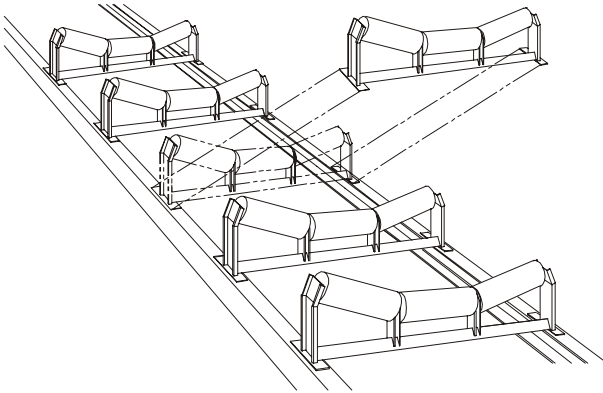
The following precautions should be observed when handling the scale.



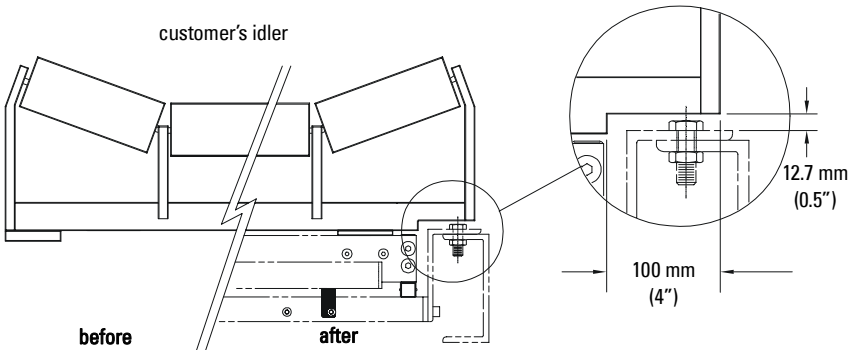
- Do not pry on the idler, its mountings, or the cells directly.
- Do not stand or lean on the scale.
- Overloading, shock, and twisting of the scale can damage the load cells.
- Do not lift each MMI by its idler.

Installation Procedure

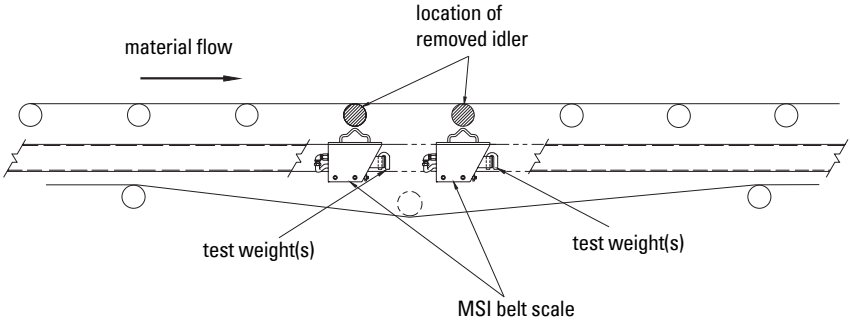
1. Remove the conveyor idlers currently at the desired points of installation.



2. Remove the idler foot plate and modify the idler frame at both ends of the idlers as shown below.



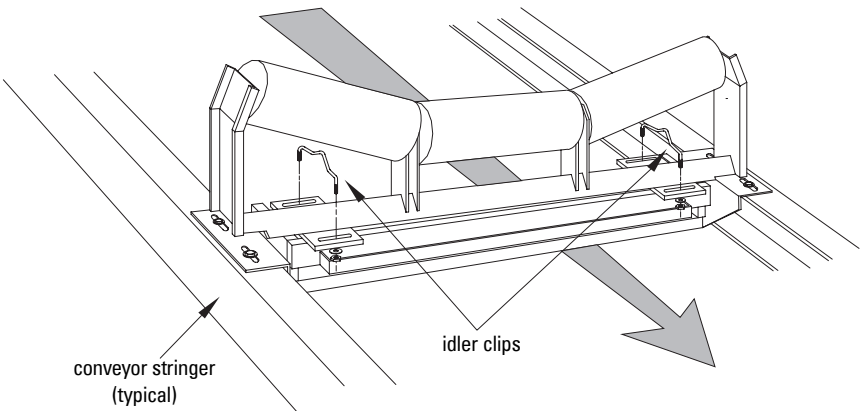
3. Insert the MSIs in the place of the removed idlers. The MSI is designed to use the existing holes in the stringer and should not require further drilling. Install the mounting bolts and nuts but do not tighten. Remove the idler clips from the scale (see diagram below). Refer to *Outline Dimensions* on page 20, for working dimensions.



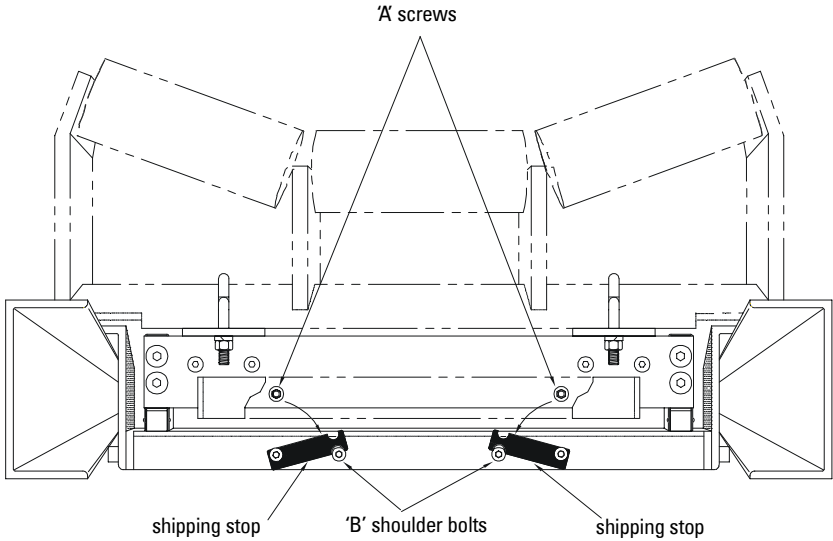
Note: Be sure there is sufficient clearance between the return belt, each MSI, and its test weight (when used during the calibration procedure).

4. Position the individual MSIs so that they are centered and square to the stringer. Mount the modified idler so that it is centered on the scale using the idler clips. Tighten all mounting hardware. Refer to *Idler Mounting* on page 16 for alternate idler mounting arrangements.

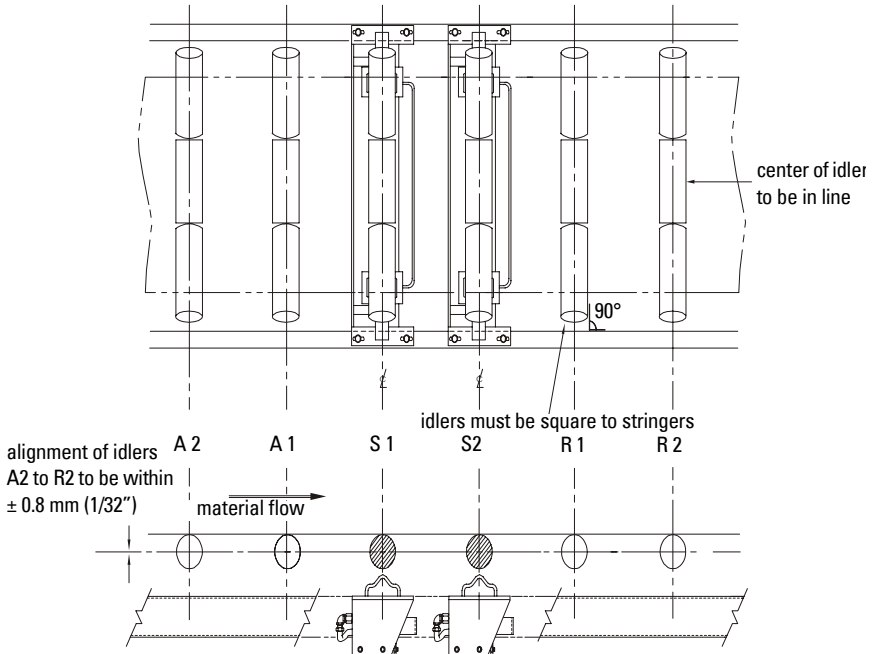
Position the scale so that the large arrow on the scale mounting brackets is pointing in the direction of material flow.



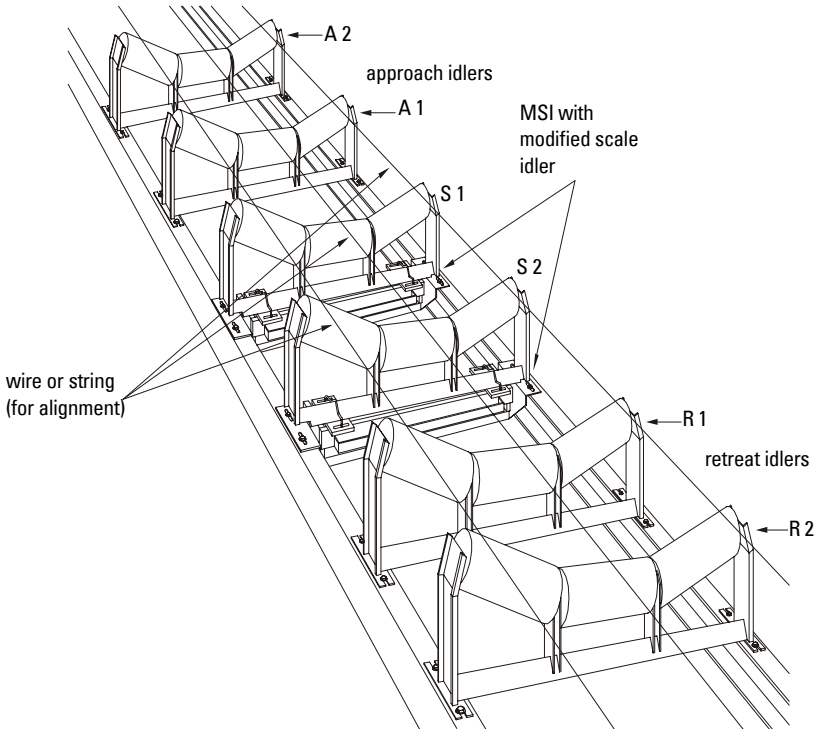
- Release the shipping stops on each MSI in order to free the weighing mechanism. Loosen screws 'A' and rotate both shipping stops inward until the underside slots slide around the shoulder bolts 'B'. Tighten screws 'A' to secure in place.



- The idlers in the weighing area must be properly aligned and leveled by shimming the scale idler (S#), the two approach idlers (A#) and the two retreat idlers (R#) until they are within $\pm 0.8 \text{ mm}$ ($1/32''$) of each other. Be sure to check that the idlers are centered and squared to the conveyor during the shimming process.



7. Precise idler alignment is very important if maximum accuracy of the weighing system is to be achieved. Misaligned idlers will result in unwanted forces being applied on each idler in the weighing area, causing calibration and measurement errors. Use a good quality wire or string to check for alignment. The wire or string must be able to withstand sufficient tension in order to eliminate any sag. Adjust shims so that all rolls of the A2 through to the R2 idlers are in line within 0.8 mm (1/32").



Although the accepted tolerance for idler alignment is ± 0.8 mm (1/32"), the scale mounted idler should never be lower than the adjacent idlers. Establishing good idler alignment is the most important part of the installation procedure. Scale accuracy is directly affected by alignment.

General Installation Requirements for Legal for Trade Applications

1. General Conveyor Requirements:
 - a. Conveyor must be permanent construction.
 - b. The conveyor length shall be no longer than 1000 ft (300 m) nor shorter than 40 ft (12 m) from head to tail pulley.
 - c. The scale must be so installed, that the nearest weigh idler of the scale is at least 20 ft or 5 idler spaces (whichever is greater) from either the end of the loading skirt boards or the head pulley.
 - d. Scale must be mounted a minimum of 40 ft from the tangent point of any curves in the conveyor.
 - e. The conveyor must have a Gravity type take-up and that take-up must be operating properly.
 - f. Material feed to conveyor to be uniform and centered.
 - g. The conveyor belting shall be no heavier than is required for normal use.
 - h. The conveyor must be covered on the top and sides for a minimum distance of 30 ft each end of the scale idlers. The side covers must extend down to a distance approximately 2 ft below the return belt line.
 - i. The electrical power to the scale equipment must remain on at all times.
 - j. The belt scale integrator must be located under cover, preferably in a control room, not subject to direct sunlight.

2. Stringer Requirements:
 - a. The MMI Scale shall be located close to a vertical conveyor support where conveyor stringer deflection is near zero.
 - b. The conveyor Stringers in the scale area should be strong enough to limit relative deflection to 0.8 mm (1\32").
 - c. The conveyor stringers must be straight to prevent any belt tracking problems.

3. Conveyor Idler Requirements:
 - a. The user must purchase and Install "twelve (12) Scale Quality Idlers", two idlers to be mounted on the MMI Weighbridge and 5 idlers to be mounted on the approach and retreat side of the MMI Weighbridge.
 - b. Do not use Scale Service Idlers: use Scale Quality Idlers.
 - i. Scale Quality idlers are high tolerance idlers; for roll run-out, frame deflection and alignment; whereas
 - ii. Scale Service idlers are choice idlers selected from a production run having the best roll run-out.
 - c. The two scale-mounted idlers must be modified to ensure proper clearance for belt scale deflection.
 - d. The twelve (12) Scale Quality Idlers must be aligned to within 0.5 mm (0.02") of each other or better.
 - e. The belt must remain in contact with all three rollers (center and wing rollers) of each of the aligned idlers.
 - f. Idlers must be flat, 20 or 35 degree trough angle. All idlers on the conveyor must have the same trough angle.
 - g. Training idlers **must not be** located within 60 ft of any scale weigh idler.

Metrological Characteristics

UK/0126/0047

R50/1997-GB1-08.01

- Accuracy Class ≥ 1
- Temperature Range $-10\text{ }^{\circ}\text{C}$ to $+40\text{ }^{\circ}\text{C}$
- Flowrate Qmax: Application dependent
Qmin: 20% of Qmax
- Belt Speed Vmax: 0.2 to 5.0 m/sec
- Totalization Scale Interval $\geq 0.001\text{ t}$
- Weigh Length L: Application dependent
- Climactic Environment Condensing, Open
- Electromagnetic Environment E1 and E2, electromagnetic disturbances likely found in other industrial locations

Technical Requirements

- BW500 Certification Switch When the switch is set for certification, editing of the parameter values, span calibrations and totalizer resets are denied.
- Conveyor Interlock If the weighing instrument is switched off or ceases to function, the conveyor belt shall stop, or visible or audible indication shall be given.
- Out-of-range Indication A continuous audible or visible indication shall be given when the flowrate is above the maximum or below the minimum value.
A continuous audible or visible indication shall be given when the belt speed is above the maximum or below the minimum value.
- Totalization Indicating Devices Remote totalization indicating devices shall be permanently engaged.
- Printing Devices Printing devices shall be permanently engaged.
- Installation Conditions The frame support of the conveyor shall be constructed in a rigid manner.
The belt shall always be supported by the weighing rollers.
Belt cleaning devices shall have no significant effect on the results.
The product being weighed shall travel in the same direction and speed as the belt.
- Sealing Components that are not intended to be adjusted or removed by the user shall be fitted with a sealing device.

Calibration

After the MSI has been properly installed, calibration of the weighing system must be done in conjunction with the integrator. Refer to the integrator instruction manual for programming and calibration. The calibration is initially done using the supplied test load. Material tests are recommended to achieve maximum accuracy.

Test Load

The test load value is required for calibration of the integrator. Enter the calculated value into the associated programming parameter of the integrator in kilograms per meter or pounds per foot.

The test load value is calculated as follows:

$$\text{test load} = \frac{\text{Total weight of all test weights}}{\text{idler spacing}} \left(\frac{\text{Kg}}{\text{m}} \right) \text{ or } \left(\frac{\text{lb}}{\text{ft}} \right)$$

The above calculation must be performed for each MSI scale suspension using the weights designated for that particular suspension.

Enter the average value of the two calculations into the integrator's Test Load Parameter (test load value "A" + test load value "B")/2 in kilograms per meter or pounds per foot.

Zero

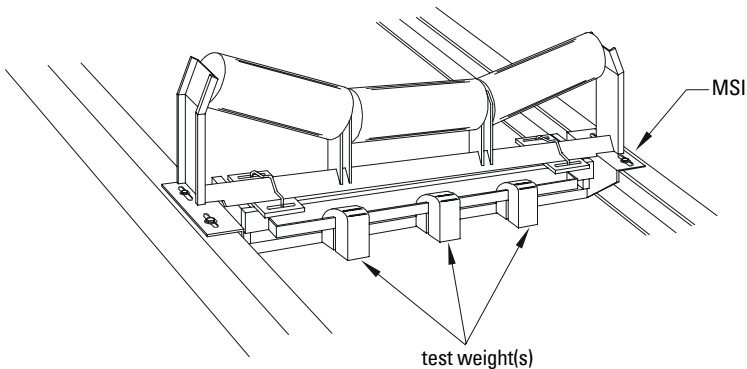
Perform the zero calibration as described in the Calibration section of the integrator manual.

Span

The test load used in the calibration procedure is the two sets of test weights (1 to 12) supplied, one for each MSI suspension.

Place each set of the test weights onto the calibration weight bar of the respective MSI as shown. Perform the span calibration as described in the Calibration section of the integrator instruction manual.

After the span calibration has been completed, remove the test load and store it.



Material Test

The MMI is guaranteed to be accurate to $\pm 0.25\%$ when installed on a conveyor in accordance with this manual and meeting the qualifications outlined in the Belt Scale Applications Guidelines (7ML19985GA01). (Go to www.siemens.com/mmi and click on *Instructions and Manuals* for the current version of the Application Guidelines.) This guarantee is based on calibrations performed using the test weights furnished with the scale and as referenced on the previous page.

When the existing conditions are such that the installation of the scale cannot meet the above mentioned requirements for an approved installation it is recommended that Material tests be performed. This will enable the user to compare the present scale results to the results of the material tests. The scale is then adjusted or factored so that subsequent scale calibrations with test weights will agree with actual run of material.

Re-Rating

To be sure that proper design parameters are maintained, consult your Siemens representative for any significant change in rate, speed and /or idler spacing from original design specifications.

Maintenance

Keep each weighbridge clean. Accumulation of material between the fixed support frame (static) and the live frame (dynamic) as well as around each load cell could affect the scale accuracy.

Periodically check the alignment of the stringers and idlers in the weighing area.

When a problem arises in the conveyor, it is possible that the scale will be affected. Therefore, periodic conveyor maintenance is important to proper scale operation which should include:

- lubrication of all pulleys and idlers
- proper belt tracking and training
- proper belt cleaning and scraping
- proper take up operation
- proper material feeding and spillage control.

You can observe the integrity of the load cells by performing zero and span calibrations. If the zero and span deviations display a continuous unidirectional drift or the system becomes uncalibratable for no apparent mechanical reason, the load cells may be suspect.

Spare Parts

The only spare part recommended for the MSI is the load cell. Refer to the load cell nameplate for the proper size and model number.

Re-balance any load cell that has been replaced. Refer to the Load Cell Balancing Procedure For Four Load Cells in the integrator manual.

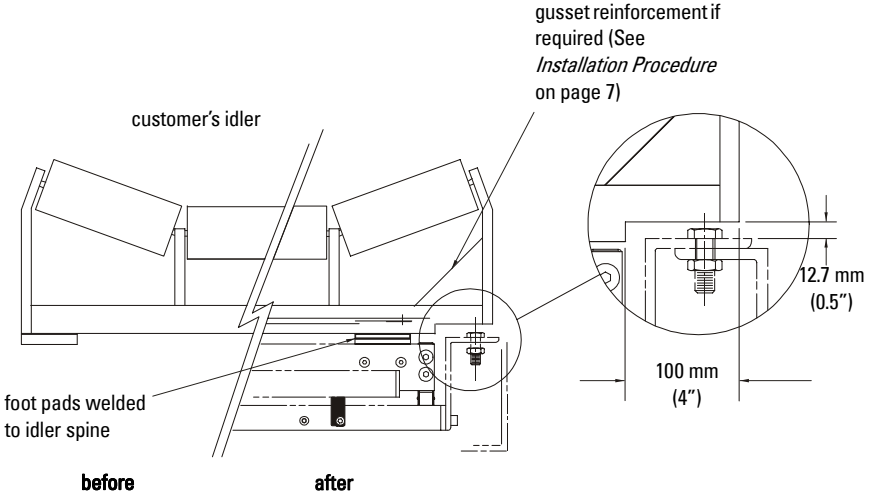
Maintenance Precautions

- When welding near the scale, do not allow current to pass through the belt scale.
- Reset the shipping stops to reduce physical shock to the load cells during maintenance.
- Recalibrate the scale after maintenance and prior to use.

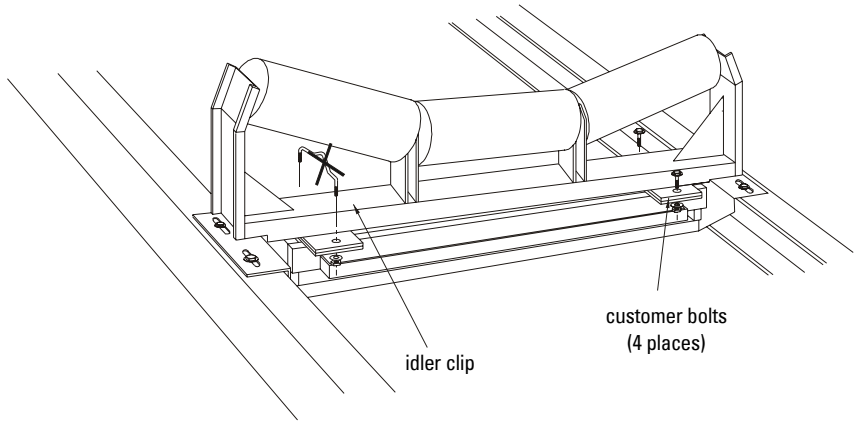
Idler Mounting

The MSI is usually installed in conveyors employing conventional rigid structure idlers. Within this type of idler, construction will vary depending on the manufacture and the application. The idler depicted in the *Installation Procedure* section on page 7 uses an angle iron spine. The following images depict alternate idler construction and tips on how they should be modified and installed.

Troughed Idler With Channel Spine



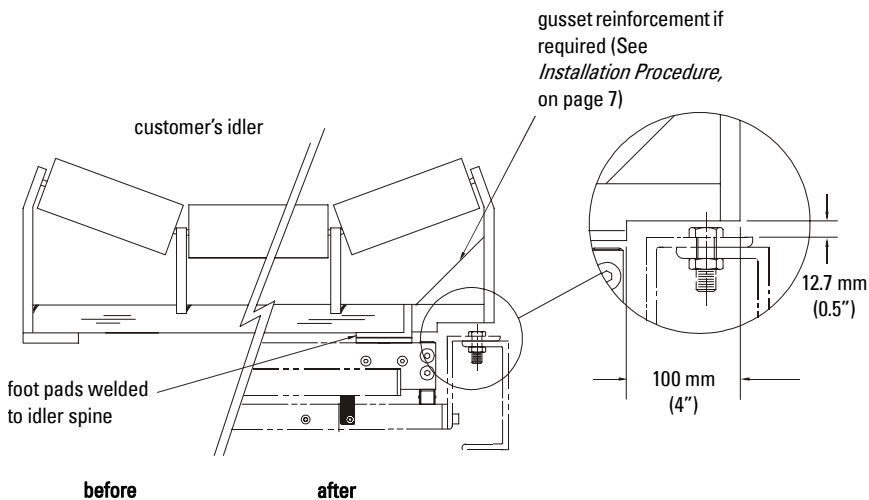
idler modification



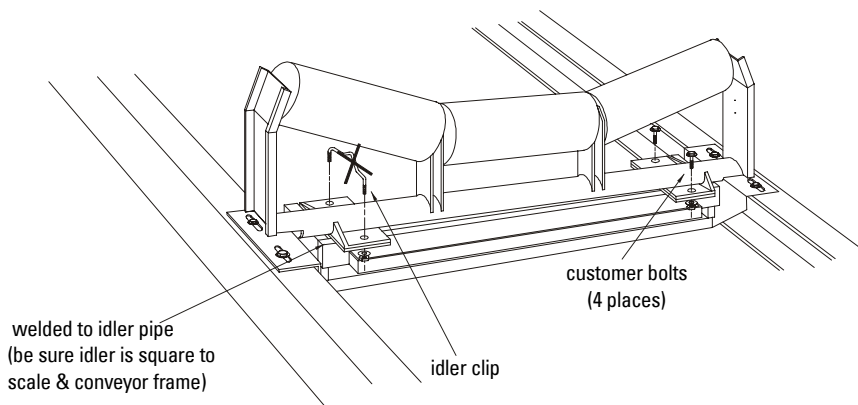
idler installation

Mounting

Troughed Idler With Pipe Spine

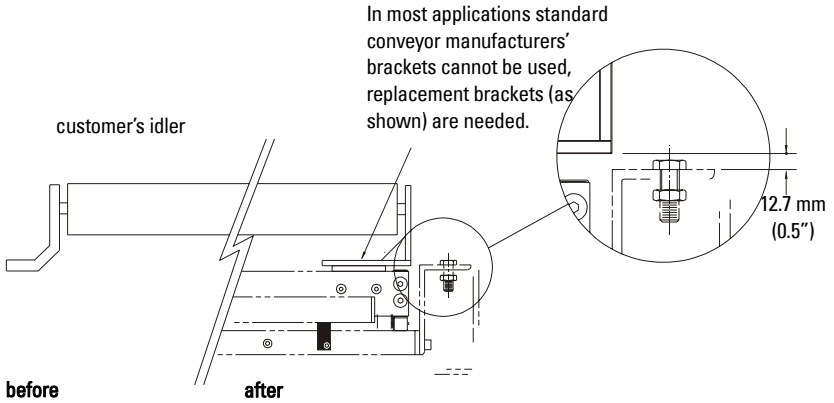


idler modification

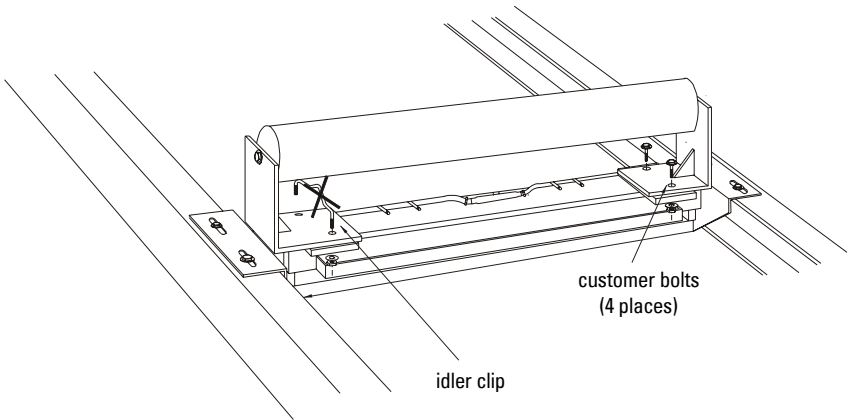


idler installation

Flat Idler

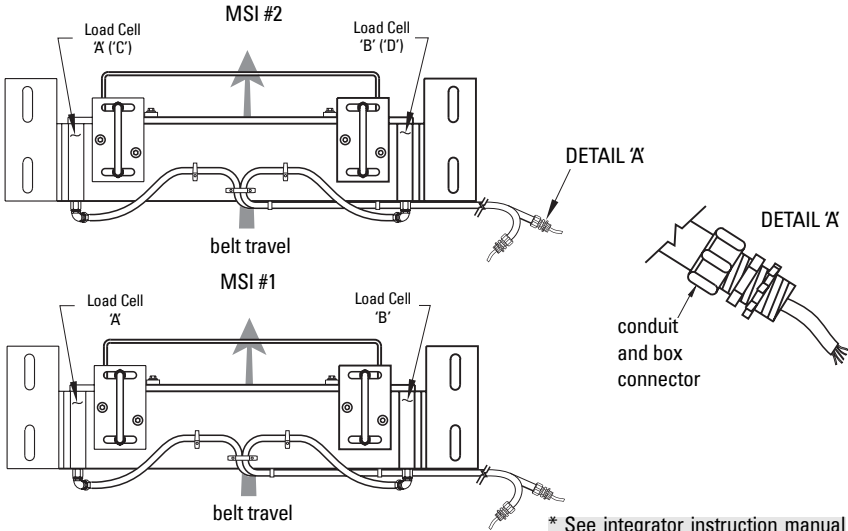


idler modification

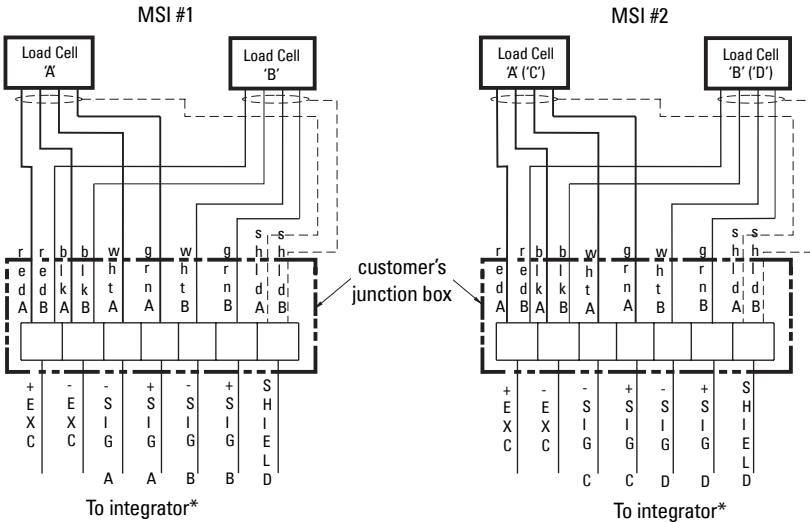


idler installation

MMI Wiring - 2 Idler



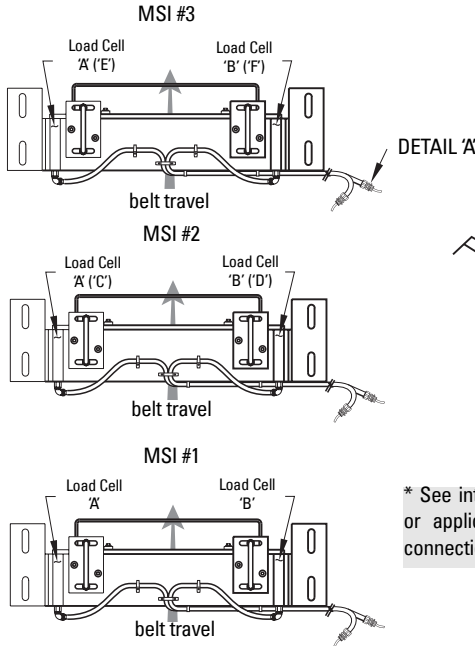
* See integrator instruction manual or applicable system drawing for connection to integrator.



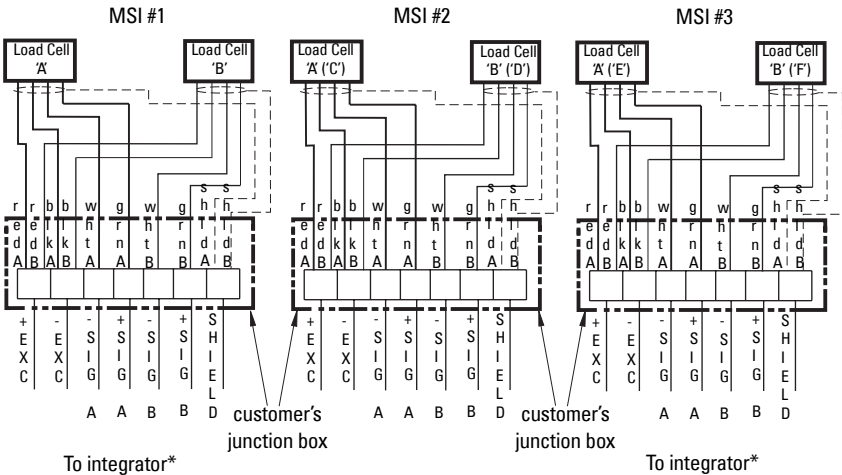
Notes:

- Installation shall be performed only by qualified personnel in accordance with local governing regulations.
- Conduit and cable arrangement may differ from example shown
- Use only approved conduit and conduit fittings or cable glands to maintain NEMA or IP rating, as applicable.
- For hazardous area installations, use only approved junction boxes, metal conduit and conduit fittings or cable glands. Adapter supplied for ½" NPT to M20x1.5. Discard if using ½" NPT conduit fitting.

MMI Wiring - 3 Idler



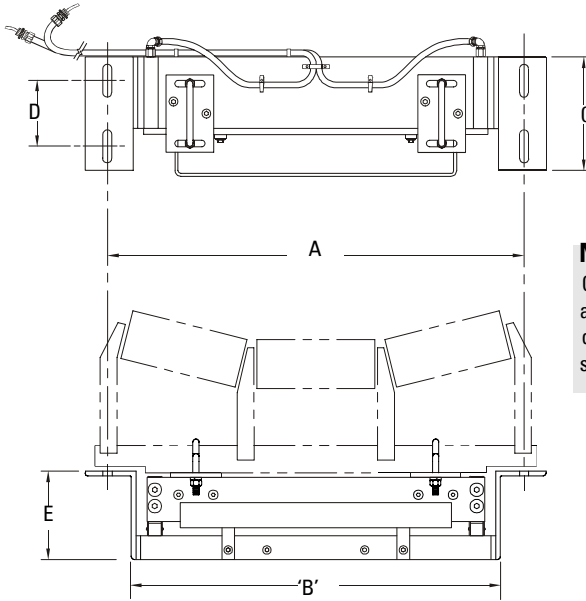
* See integrator instruction manual or applicable system drawing for connection to integrator.



Notes:

- Installation shall be performed only by qualified personnel in accordance with local governing regulations.
- Conduit and cable arrangement may differ from example shown
- Use only approved conduit and conduit fittings or cable glands to maintain NEMA or IP rating, as applicable.
- For hazardous area installations, use only approved junction boxes, metal conduit and conduit fittings or cable glands. Adapter supplied for 1/2" NPT to M20x1.5. Discard if using 1/2" NPT conduit fitting.

Outline Dimensions



Note:
Conduit and cable arrangement may differ from example shown

conveyor belt width	mounting scale width A	minimum drop-in width B	C	D	E	weight
18" (457 mm)	27" (686 mm)	23.25" (591 mm)	9.5" (241 mm)	5.5" (140 mm)	7" (178 mm)	82 lbs. (37 kg)
20" (508 mm)	29" (737 mm)	25.25" (641 mm)	9.5" (241 mm)	5.5" (140 mm)	7" (178 mm)	85 lbs. (39 kg)
24" (610 mm)	33" (838 mm)	29.25" (743 mm)	9.5" (241 mm)	5.5" (140 mm)	7" (178 mm)	90 lbs. (41 kg)
30" (762 mm)	39" (991 mm)	35.25" (895 mm)	9.5" (241 mm)	5.5" (140 mm)	7" (178 mm)	99 lbs. (45 kg)
36" (914 mm)	45" (1143 mm)	41.25" (1048 mm)	9.5" (241 mm)	5.5" (140 mm)	7" (178 mm)	107 lbs. (49 kg)
42" (1067 mm)	51" (1295 mm)	47.25" (1200 mm)	9.5" (241 mm)	5.5" (140 mm)	7" (178 mm)	116 lbs. (53 kg)
48" (1219 mm)	57" (1448 mm)	53.25" (1353 mm)	9.5" (241 mm)	8" (203 mm)	7" (178 mm)	125 lbs. (57 kg)
54" (1372 mm)	63" (1600 mm)	59.25" (1505 mm)	12" (305 mm)	8" (203 mm)	7" (178 mm)	175 lbs. (79 kg)
60" (1524 mm)	69" (1753 mm)	65.25" (1657 mm)	12" (305 mm)	8" (203 mm)	7" (178 mm)	193 lbs. (88 kg)
66" (1676 mm)	75" (1905 mm)	71.25" (1810 mm)	12" (305 mm)	8" (203 mm)	8* (203 mm)	229 lbs. (104 kg)
72" (1829 mm)	81" (2057 mm)	77.25" (1962 mm)	12" (305 mm)	8" (203 mm)	8* (203 mm)	247 lbs. (112 kg)

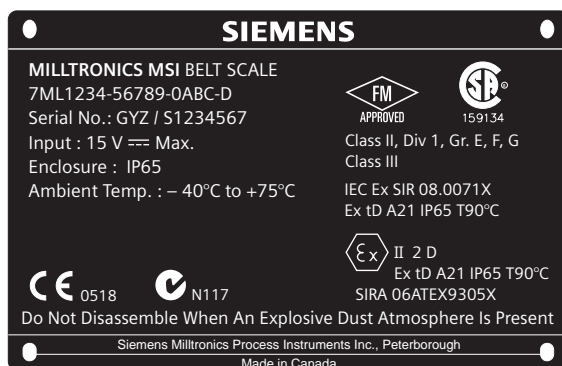
Other widths available. Sizes are from 18 to 96" (457 to 2438 mm) in 1" (25.4 mm) increments. All sizes are nominal.

*As shown for North America; 8.5" (216 mm) Europe.

Dimensions

Hazardous Area Installations

Note: The nameplate shown is a typical example. Please check the nameplate on your device for your specific device configuration.



Instructions Specific to Hazardous Area Installations

(Reference European ATEX Directive 94/9/EC, Annex II, 1/0/6)

The following instructions apply to equipment covered by certificate number SIRA06ATEX9305X:

1. For use and assembly, refer to the main instructions.
2. The equipment is certified for use as Category 2D equipment and may be used in hazardous zones 21 and 22 with dusts.
3. This equipment has a maximum surface temperature of T90 °C (in a 75 °C ambient). Refer to the applicable code of practice for selection of this equipment with respect to specific dust ignition temperatures.
4. The equipment is certified for use in an ambient temperature range of -40 °C to 75 °C.
5. If the conductors of the attached cable are terminated in the hazardous area, appropriate explosion protection ('Ex') methods should be used that meet the requirements of European Directive 94/9/EC for Group II, Category 2D.
6. The equipment has not been assessed as a safety related device (as referred to by Directive 94/9/EC Annex II, clause 1.5).
7. Installation and inspection of this equipment shall be carried out by suitably trained personnel in accordance with the applicable code of practice.

8. Repair of this equipment shall be carried out by suitably trained personnel in accordance with the applicable code of practice.
9. Components to be incorporated into or used as replacements in the equipment shall be fitted by suitably trained personnel in accordance with the manufacturer's documentation.
10. If the equipment is likely to come into contact with aggressive substances, then it is the responsibility of the user to take suitable precautions that prevent it from being adversely affected, thus ensuring that the type of protection is not compromised.

Aggressive substances: e.g. acidic liquids or gases that may attack metals or solvents that may affect polymeric materials.

Suitable precautions: e.g. regular checks as part of routine inspections or establishing from the material's data sheet that it is resistant to specific chemicals

11. Product marking shall include the warning: Do not disassemble when an explosive dust atmosphere is present.

Special Conditions for Safe Use

The 'X' suffix to the certificate number relates to the following special condition(s) for safe use:

- The equipment shall be installed such that the supply cable is protected from mechanical damage. The cable shall not be subjected to tension or torque. If the cable is to be terminated within an explosive atmosphere, then appropriate protection of the free end of the cable shall be provided.
- The equipment shall be bonded to earth by the use of approved type metal conduit and conduit fittings.
- The apparatus shall be supplied with an input voltage not exceeding 15V.
- This assessment does not cover any additional mechanical parts (e.g. conveyor belt, idlers) that are added during installation which may require an ignition hazard assessment as specified in EN 13463-1:2001 Annex B.



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Printed in Canada

Rev. 4.0