

SIEMENS



Operating instructions

Milltronics

Belt scales

MSI and MMI

Edition

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SIEMENS

Milltronics

Belt scales Milltronics MSI and MMI

Operating Instructions

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Legal information

Warning notice system

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

⚠ DANGER
indicates that death or severe personal injury will result if proper precautions are not taken.
⚠ WARNING
indicates that death or severe personal injury may result if proper precautions are not taken.
⚠ CAUTION
indicates that minor personal injury can result if proper precautions are not taken.
NOTICE
indicates that property damage can result if proper precautions are not taken.

If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

Qualified Personnel

The product/system described in this documentation may be operated only by **personnel qualified** for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with these products/systems.

Proper use of Siemens products

Note the following:

⚠ WARNING
Siemens products may only be used for the applications described in the catalog and in the relevant technical documentation. If products and components from other manufacturers are used, these must be recommended or approved by Siemens. Proper transport, storage, installation, assembly, commissioning, operation and maintenance are required to ensure that the products operate safely and without any problems. The permissible ambient conditions must be complied with. The information in the relevant documentation must be observed.

Trademarks

All names identified by ® are registered trademarks of Siemens AG. The remaining trademarks in this publication may be trademarks whose use by third parties for their own purposes could violate the rights of the owner.

Disclaimer of Liability

We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

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Introduction

Note

The Siemens weighing system is to be used only in the manner outlined in this manual, otherwise protection provided by equipment may be impaired.

- It is your responsibility to read this manual before installing and starting up any component of the weighing system to which the belt scale is being applied.
-

1.1 The manual

This manual covers only belt scale installation, operation, and maintenance procedures. Integrator and speed sensor operating instructions are available for download from our website:

Siemens weighing (<http://www.siemens.com/weighing>)

Safety notes

2.1 General safety instructions

 CAUTION

Correct, reliable operation of the product requires proper transport, storage, positioning and assembly as well as careful operation and maintenance. Only qualified personnel should install or operate this instrument.

Note

Alterations to the product, including opening or improper repairs of the product, are not permitted.

If this requirement is not observed, the CE mark and the manufacturer's warranty will expire.

2.2 Installation in hazardous areas

Note**Hazardous area approvals**

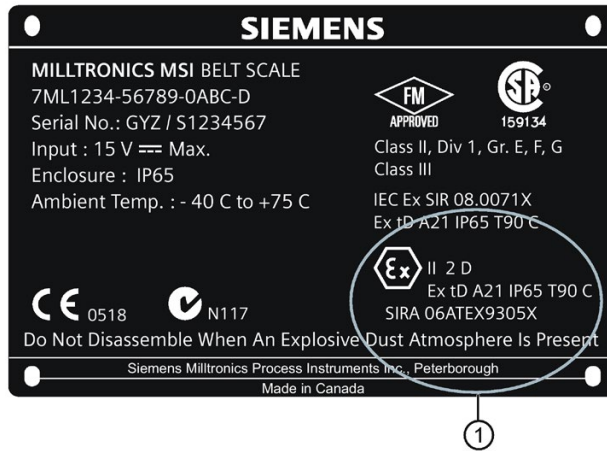
Equipment used in hazardous areas must be Ex-approved and marked accordingly. It is required that the special conditions for safe use provided in the manual and in the Ex certificate are followed.

Hazardous area approvals

These nameplates are given as examples only. Check the nameplates on your device for your specific device configuration.

The device is approved for use in hazardous areas and has the following approvals:

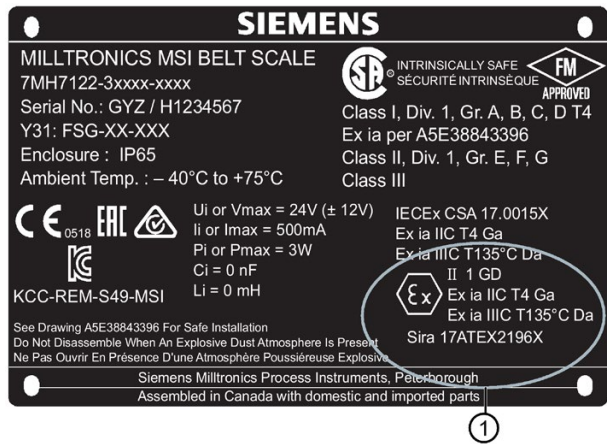
Dust ignition proof



① ATEX certificate

The ATEX certificate number (SIRA 06ATEX9305X) listed on the nameplate can be downloaded from our website Product page (www.siemens.com/MSI). Go to Support > Approvals/Certificates.

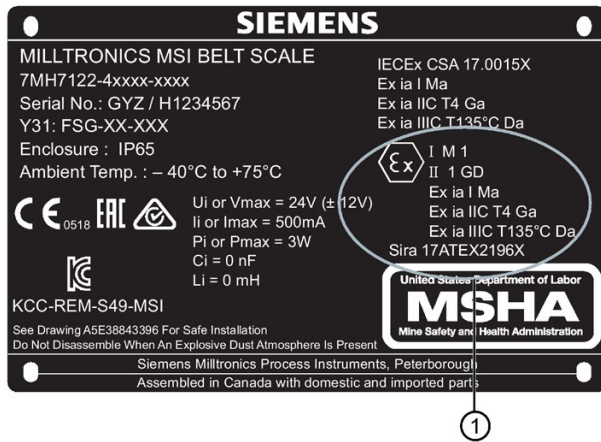
Intrinsically Safe (IS) for Group I and II (mining and surface gas)



① ATEX certificate

The ATEX certificate number (SIRA 17ATEX2196X) listed on the nameplate can be downloaded from our website Product page (www.siemens.com/MSI). Go to Support > Approvals/Certificates.

Intrinsically Safe (IS) for Group II (surface gas)



① ATEX certificate

The ATEX certificate number (SIRA 17ATEX2196X) listed on the nameplate can be downloaded from our website Product page (www.siemens.com/MSI). Go to Support > Approvals/Certificates.

2.3 Instructions specific to hazardous area installations

(Reference European ATEX Directive 2014/34/EU, Annex II, 1/0/6)

The following instructions apply to equipment covered by certificates:

- SIRA06ATEX9305X & IECEX Sir 08.0071X
 - SIRA17ATEX2196X & IECEX CSA 170015X
1. For use and assembly, refer to the main instructions.
 2. The equipment is certified for use as category M1, 1GD equipment per Sira 17ATEX2196X, IECEX CSA 170015X and Category 2D equipment per Sira 06ATEX9305X, IECEX Sir 08.0071X.
 3. The equipment may be used with flammable gases and vapours with apparatus Group IIC, IIB and IIA, and temperature classes T1, T2, T3, and T4.
 4. The equipment may be used with flammable dusts in hazardous zones 21 and 22.
 5. This equipment has a maximum surface temperature of T90°C (in a 75°C ambient). Refer to the applicable code of practise for selection of this equipment with respect to specific dust ignition temperatures.
 6. The equipment is certified for use in an ambient temperature range of -40°C to 75°C.
 7. 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 2014/34/EU for Group 1, Category M1, Group II, Category 1 GD and 2D.
 8. The equipment has not been assessed as a safety related device (as referred to by Directive 2014/34/EU, Annex II, clause 1.5).

9. The installation and inspection shall be carried out by suitably trained personnel in accordance with the applicable code of practice.
10. Repair of this equipment shall be carried out by suitably trained personnel in accordance with the applicable code of practice.
11. 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.
12. 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.
13. Product marking shall include the warning: Do not disassemble when an explosive dust atmosphere is present.

2.4 Special conditions for safe use

From Dust Ignition Proof (DIP) certificates, Sira 06ATEX9305X & IECEx SIR 08.0071X
SPECIAL CONDITIONS FOR SAFE USE (denoted by X after the certificate number):

- 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 an approved type metal conduit and conduit fittings.
- The equipment 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.

From Intrinsically Safe (IS) certificates, Sira 17ATEX2196X & IECEx CSA 17.0015X
SPECIFIC CONDITIONS OF USE (denoted by X after the certificate number):

- The load cell shall be bonded to earth by the use of an approved type metal conduit and conduit fittings. The belt scale frame shall be bonded to the conveyer for safety grounding.
- The equipment shall be installed in accordance with MSI/MMI Intrinsic safety connection drawing A5E38843396.
- This certificate does not cover any additional mechanical parts (e.g., conveyor belt, idlers) that are added during installation.

Description

Milltronics MSI and MMI belt scales

Milltronics MSI belt scale is a heavy-duty, high-accuracy single idler scale for process and load-out control.

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

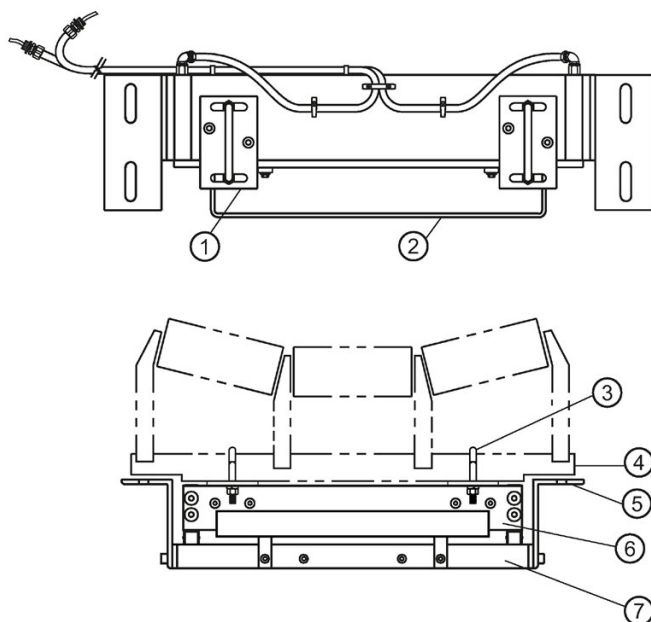
Each MSI includes:

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

The addition of an idler (supplied and installed by the customer) to the weighbridge completes the weighing assembly. The load cells provide an electronic signal, proportional to load, which is fed to the Siemens 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 MSI/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.



- ① idler mount bracket
- ② test weight bar
- ③ idler clip
- ④ idler frame
- ⑤ scale mounting bracket
- ⑥ dynamic beam
- ⑦ static beam

Figure 3-1 Overview of belt scale system

Note

Conduit and cable arrangement may differ from example shown

Principle of operation

Belt scales work with an existing belt conveyor and the selected Siemens integrator. As material moving along the conveyor belt travels over the belt scale, it exerts a force proportional to the material load through the suspended idler to the load cells.

The belt scale reacts only to the vertical component of the applied force. The resulting movement in each load cell is sensed by its strain gauges. When the strain gauges are excited by voltage from the electronic integrator, they produce an electrical signal proportional to weight, which is then returned to the integrator. The vertical movement of the load cells is limited by the positive overload stop incorporated into the load cell design.

Installing/Mounting

4.1 Introduction

⚠ CAUTION**Qualified personnel**

Installation shall be performed only by qualified personnel in accordance with local governing regulations.

The belt scale is shipped from the factory as a single unit packed in a container for protection. The weighbridge must be removed from its package and inspected for physical damage. Be sure the conveyor design meets the installation requirements for the belt scale.

Note

- 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.
- Adjust conveyor stringers to be rigid, straight, parallel to, and square with the belt line in the area of the scale installation.
- Adjust pulleys to ensure that the conveyor belt tracks straight and centrally from the head to the tail pulley.
- The idler to be used on the scale and at least the next two approach and retreat idlers, must be of the same style and manufacturer, and in good condition.

Prepare the site in accordance with the Siemens drawing(s) or by referring to the Belt Scale Applications Guidelines (7ML19985GA01).

For Intrinsically Safe and mining approved applications, refer to installation drawing A5E38843396 listed on the device nameplate. The drawing can be downloaded from our website:

Product page (www.siemens.com/MSI)

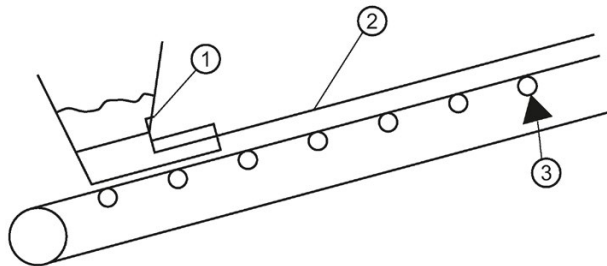
Go to **Technical Info > Images, graphics, drawings**.

4.2 Conveyor considerations

The ideal placement of the belt scale depends on the conveyor system. This section provides guidelines to determine belt scale placement.

4.2.1 Control gates

The installation of a material feed control gate or similar device improves uniform flow of material.



- ① Control gate
- ② Uniform material distribution
- ③ Belt scale

Note

Ensure steady and uniform material loading to the belt at or near the same speed as the conveyor belt.

4.2.2 Conveyor belting

Variations in the number of belt plies, the cover thickness and the type and number of splices in a given belt cause considerable change in the weight per unit length of the belt. During the course of zero calibrations, belt scales average the weight of the belt over one complete circuit of the belt. Large deviations from the average adversely affect the zero calibrations.

4.2.3 Head pulley

Note

Use caution when installing a scale in a short conveyor, or when locating the scale near the head pulley.

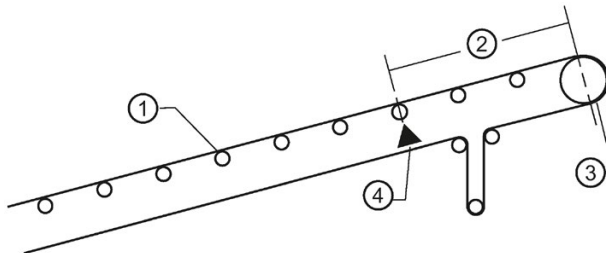
4.2 Conveyor considerations

Since head pulleys are flat faced, and carrying idlers are generally troughed, the belt profile must change from troughed to flat in a short distance. To accommodate this, the conveyor manufacturer designs a built-in vertical displacement of the head pulley above the top of the center roll of the adjacent idler.

- Insert idlers of decreasing trough angles between the head pulley and the normal run of idlers or there will be a considerable amount of stress on the belt edges and the idlers adjacent to the head pulley. The stress is transmitted to the scale.

Note

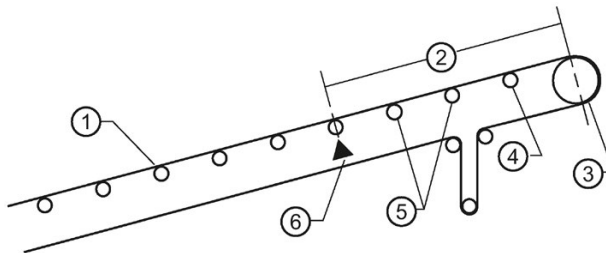
On conveyors with 20° trough idlers throughout, a minimum of two fixed 20° idlers must be located between the scale idler and the head pulley.



- ① 20° idlers
- ② Minimum 3 idler spaces
- ③ Head pulley
- ④ Belt scale

Note

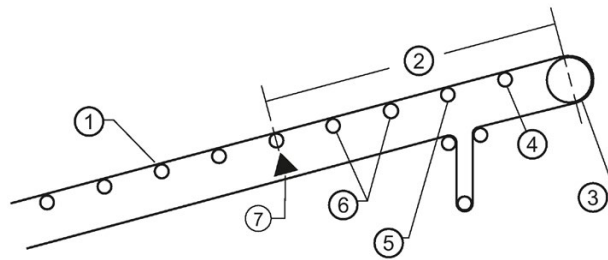
On conveyors with 35° trough idlers throughout, a minimum of two 35° and one 20° retreat idlers must be located between the scale and the head pulley.



- ① 35° idlers
- ② Minimum 4 idler spaces
- ③ Head pulley
- ④ 20° idler
- ⑤ 35° idlers
- ⑥ Belt scale

Note

On conveyors with 45° trough idlers throughout, a minimum of two 45°, one 35°, and one 20° retreat idlers must be located between the scale and the head pulley.

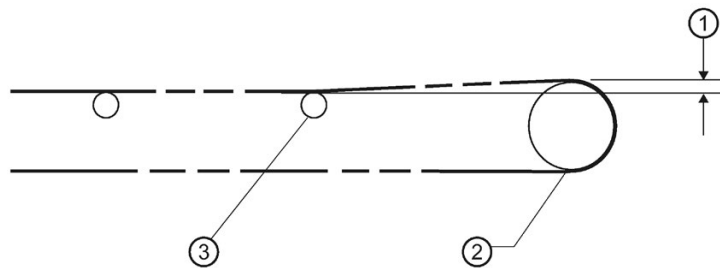


- ① 45° idlers
- ② Minimum 5 idler spaces
- ③ Head pulley
- ④ 20° idler
- ⑤ 35° idler
- ⑥ 45° idlers
- ⑦ Belt scale

Note

The vertical displacement of the head pulley relative to the adjacent retreat idler is normally in excess of that which is acceptable for belt scale installations.

When locating the scale close to the head pulley, a maximum of 13 mm ($\frac{1}{2}$ ") vertical displacement between the top of the head pulley and the top of the center of the adjacent roll is allowed.



- ① 13 mm ($\frac{1}{2}$ ") maximum
- ② Head pulley
- ③ 20° idler, center roll

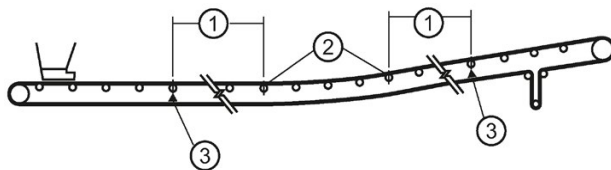
4.2.4 Conveyor curvature

Vertical curvature (varied heights on one belt) is common in conveyor design, but creates difficulties for belt scales if not dealt with correctly. The curvature, whether concave (internal) or convex (external), disturbs the idler alignment, if the scale is installed in the area of curvature. The concave curve tends to lift the belt off of the idlers in the area of curvature as belt loading decreases, adversely affecting the zero calibration.

Note

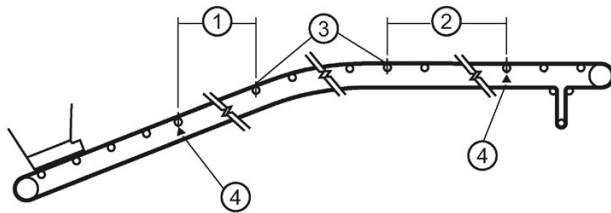
Avoid locating the scale within the tangents of scale curvature.

Concave



- ① Minimum 12 m (40 ft)
- ② Tangents
- ③ Belt scale

Convex



- ① Minimum 6 m (20 ft)
- ② Minimum 12 m (40 ft)
- ③ Tangents
- ④ Belt scale

4.2.5 Belt ploughs

Belt ploughs or any conveyor or material control device that changes the profile of the carrying belt in or near the scale area is not recommended. These devices can negatively affect the belt scale idler alignment and usually create drag on the belt which the scale senses as a material force of load.

Note

Do not install the scale within 9 m (30 ft) of belt ploughs or similar devices that contact the material or belt.

4.2.6 Stackers conveyors

Any conveyor that is not a permanent structure, which varies in its incline, elevation or profile is not considered a good installation for an accurate belt scale. A belt scale can be used effectively in this conveyor type, but requires special setup. Siemens offers an inclinometer for use with variable incline conveyors.

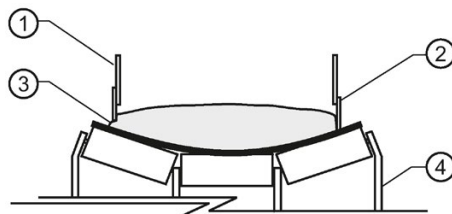
4.2.7 Conveyor trippers

Note

On a conveyor with a tripper car, locate the scale under the recommendations for vertical curves, but with the tripper fully retracted.

4.2.8 Skirt boards and sealing strips

Sometimes it is necessary to extend the infeed skirt boards and sealing strips the full length of the conveyor. This can create problems in weighing accuracy if the sealing strips exert excess force when contacting the belt and indirectly upon the idlers, especially where pinching occurs. The situation adversely affects the zero calibrations.



- ① Skirt board
- ② Sealing strip dragging along belt
- ③ Pinching can occur here
- ④ Idler

Note

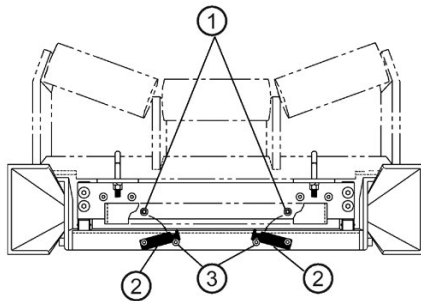
If possible, remove skirting in scale area. If not, adjust skirting so sealing strip does not put excess force on the belt or allow pinching of material.

4.3 Load cell handling

Load cell handling

The MSI and MMI belt scales are designed for medium- to high-capacity operation and use two, four, or six load cells. The load cells are protected by shipping stops to keep them from moving, but the scale still needs to be handled with care to avoid damage. Shipping stops are 107 mm (4.25") metal strips with holes at each end for screws. One screw holds the stop to the dynamic section and the other screw holds the stop to the static section.

- When handling the belt scale during installation and set-up, make sure the stops remain in place. Always re-install both shipping stops during maintenance or prolonged shutdown.



- ① 'A' screws
- ② shipping stop
- ③ 'B' screws

4.4 Installation procedure

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.
- Avoid shock from blows of a hammer when trying to position the scale during installation.
- Do not lift the scale by its idler.
- Do not lift the scale by the idler mounting brackets.



Note

For general safety and best system performance, the belt scale must be grounded through the conveyor and the conveyor must be grounded to earth.

⚠ CAUTION

Arc welding

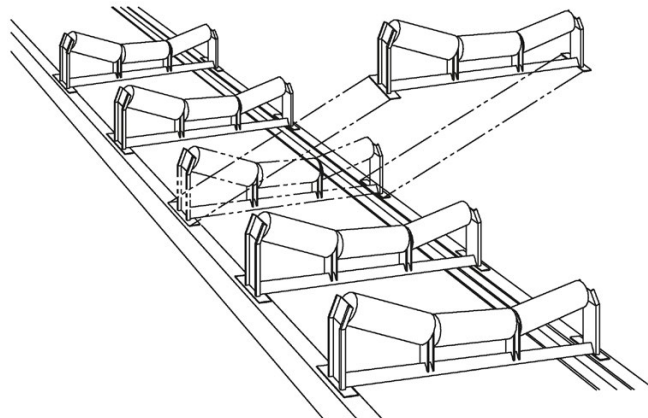
Use extreme caution when arc welding in the area of the belt scale. Ensure that no welding current can flow through the belt scale. Welding currents passing through the scale can functionally damage the load cells.

The MSI installation has eight stages:

1. Remove the idler(s)
2. Remove the idler foot plate
3. Idler mounting
4. Position the weigh bridge
5. Position the scale
6. Release the shipping stops
7. Align and level the idlers
8. Check alignment

4.4.1 Remove the idler

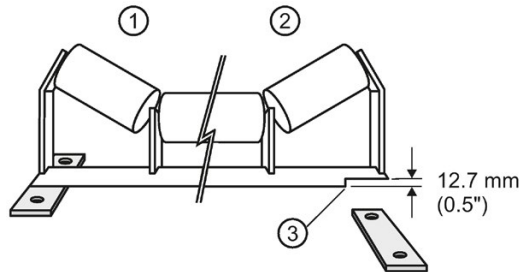
1. Remove the idler(s) from the desired location on the conveyor.



4.4.2 Remove the idler foot plate and modify the idler frame at both ends

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

Occasionally, in less than 5% of applications, the combined effect of the idler rework and the clamping of the scale at its inboard mounting position could result in abnormal idler vibration. When this occurs, gusset plate reinforcements should be welded to the idler at the joints of the horizontal spine and the outer vertical leg member.



- ① Before
- ② After
- ③ See notes below

Note

Idler support

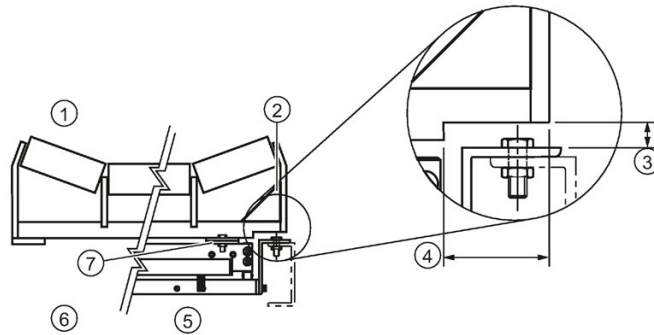
Cut idler support as shown to allow clearance when the load is applied. Maximum allowable idler spine for fitting to a belt scale is:

- 457 to 1346 mm (18 to 53") belt width options:
 - angled spine: 75 mm (3"), channel spine: 120 mm (4.75")
 - 1372 to 1651 mm (54 to 65") belt width options:
 - angled spine 100 mm (4.5"), channel spine 170 mm (6.75")
 - 1676 to 2438 mm (66 to 96") belt width options:
 - angled spine 125 mm (5"), channel spine 184 mm (7.25")
-

4.4.3 Idler mounting:

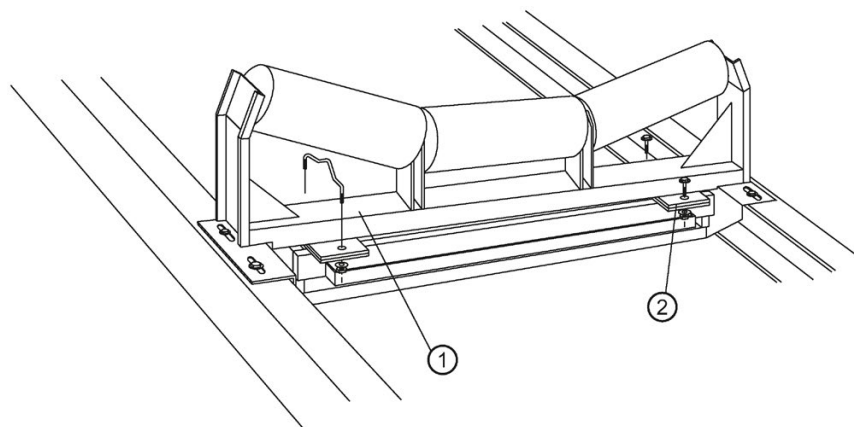
The belt scale is usually installed in conveyors employing conventional rigid structure idlers. Within this type of idler, construction will vary depending on the manufacturer and the application. The idler depicted in this section uses an angle iron spine. The following images depict alternate idler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

- Troughed idler with channel spine



- ① Customer's idler
- ② Gusset reinforcement if required
- ③ 12.7 mm (0.5")
- ④ 100 mm (4")
- ⑤ After
- ⑥ Before
- ⑦ Foot pads welded to idler spine

Figure 4-1 Idler modification

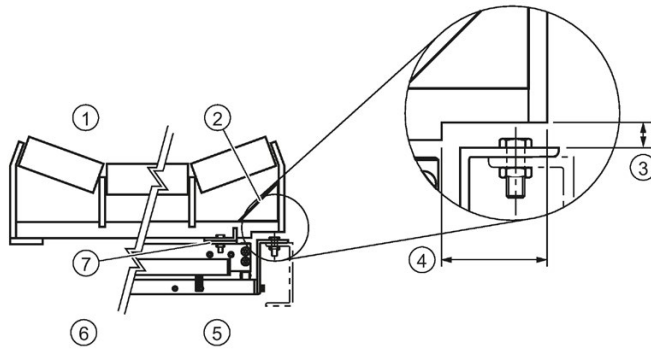


- ① Idler clip
- ② Customer bolts (4 places)

Figure 4-2 Idler installation

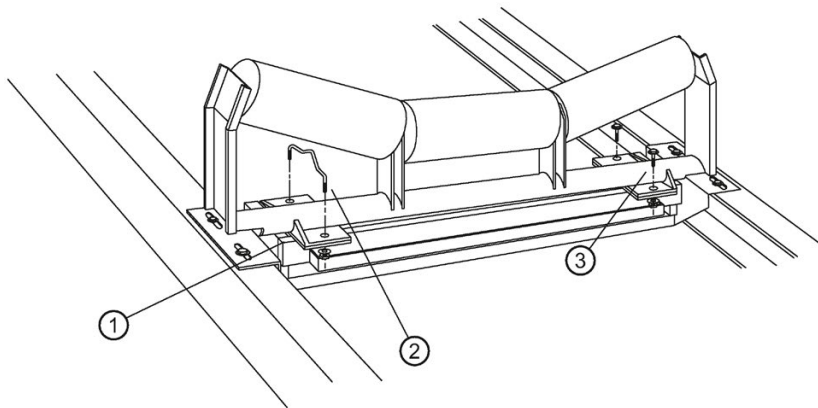
- Troughed idler with pipe spine

4.4 Installation procedure



- ① Customer's idler
- ② Gusset reinforcement if required
- ③ 12.7 mm (0.5")
- ④ 100 mm (4")
- ⑤ After
- ⑥ Before
- ⑦ Foot pads welded to idler spine

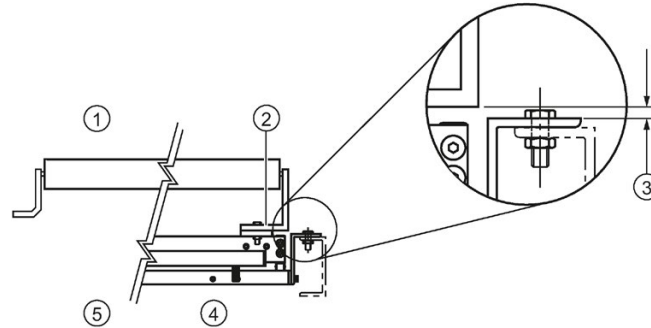
Figure 4-3 Idler modification



- ① Welded to idler pipe (be sure idler is square to scale & conveyor frame)
- ② Idler clip
- ③ Customer bolts (4 places)

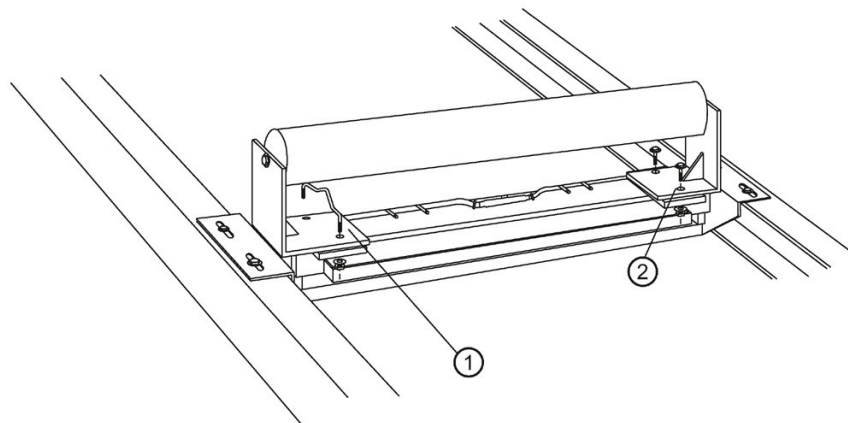
Figure 4-4 Idler installation

- Flat idler



- ① Customer's idler
- ② In most applications standard conveyor manufacturers' brackets cannot be used, replacement brackets (as shown) are needed.
- ③ 12.7 mm (0.5")
- ④ After
- ⑤ Before

Figure 4-5 Idler modification



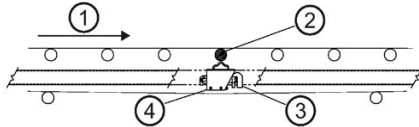
- ① Idler clip
- ② Customer bolts (4 places)

Figure 4-6 Idler installation

4.4.4 Position the weighbridge

Position the weigh bridge so that the center of the scale idler is centered between the adjacent approach and retreat idlers. The belt scale is designed to use the existing holes in the stringer and should not require further drilling.

Ensure that the scale is centered and square to the stringers and idler, and remove the idler clamping brackets.



- ① Belt travel
- ② Location of removed idler
- ③ Test weights
- ④ Belt scale

Note

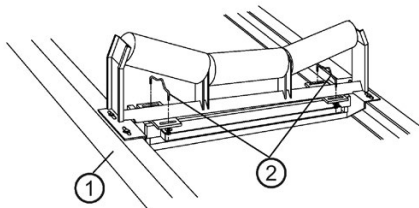
Clearance

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

4.4.5 Position the scale

Position the scale so that it is centered and square to the stringer. Mount the modified idler so that it is centered on the scale using the idler clips (on large models, 1676 to 2438 mm (66 to 96") belt widths, the idler needs to be welded directly to the mount). Tighten all mounting hardware.

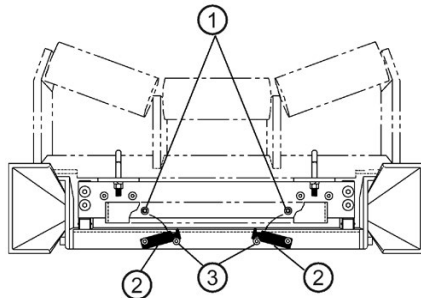
Position the scale so that the large arrow on the scale mounting brackets is pointing in the direction of belt travel.



- ① Conveyor stringer
- ② Idler clips

4.4.6 Release the shipping stops

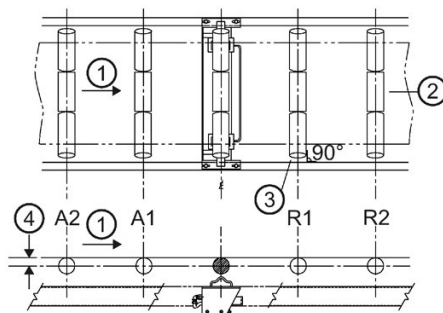
Release the shipping stops in order to free the weighing mechanism. Loosen screws 'A' and rotate both shipping stops inward until the underside slots slide around the screws 'B'. Tighten screws 'A' to secure in place.



- ① 'A' screws
- ② Shipping stop
- ③ 'B' screws

4.4.7 Align and level the idlers

Align and level the idlers properly by shimming the scale idler, the two approach idlers, and the two retreat idlers, until they are within ± 0.8 mm ($1/32$ ") of each other. Check that the idlers are centered and squared to the conveyor during the shimming process.



- ① Belt travel
- ② Center of idlers to be in line
- ③ Idlers must be square to stringers
- ④ Alignment of idlers A2 to R2 to be within ± 0.8 mm ($1/32$ ")

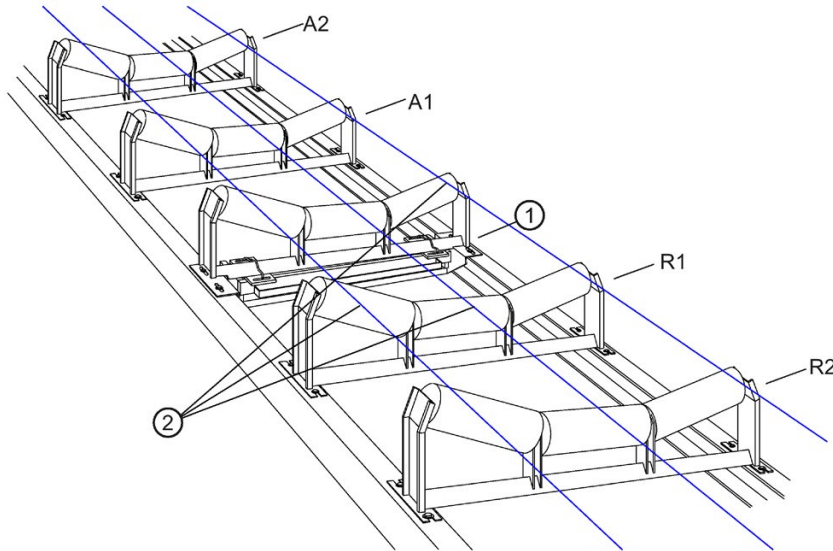
Note

Idler alignment

Precise idler alignment is very important to achieve maximum accuracy of the weighing system. Misaligned idlers will result in unwanted forces being applied on each idler in the weighing area, causing calibration and measurement errors.

4.4.8 Check alignment

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 ($1/32$ ").



- ① MSI with modified idler
- ② Wire or string (for alignment)

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.

4.5 Requirements for legal for trade applications

General installation requirements for legal for trade applications

General Conveyor Requirements

1. Conveyor must be permanent construction.
2. The conveyor length shall be no longer than 300 m (1000 ft) nor shorter than 12 m (40 ft) from head to tail pulley.
3. The scale must be so installed, that the nearest weigh idler of the scale is at least 6 m (20 ft) or 5 idler spaces (whichever is greater) from either the end of the loading skirt boards or the head pulley.
4. Scale must be mounted a minimum of 12 m (40 ft) from the tangent point of any curves in the conveyor.
5. The conveyor must have a Gravity type take-up and that take-up must be operating properly.

6. Material feed to conveyor to be uniform and centered.
7. The conveyor belting shall be no heavier than is required for normal use.
8. The conveyor must be covered on the top and sides for a minimum distance of 9 m (30 ft) each end of the scale idlers. The side covers must extend down to a distance approximately 0.6 m (2 ft) below the return belt line.
9. The electrical power to the scale equipment must remain on at all times.
10. The belt scale integrator must be located under cover, preferably in a control room, not subject to direct sunlight.

Stringer Requirements

1. The belt scale shall be located close to a vertical conveyor support where conveyor stringer deflection is near zero.
2. The conveyor Stringers in the scale area should be strong enough to limit relative deflection to 0.8 mm (1/32").
3. The conveyor stringers must be straight to prevent any belt tracking problems.

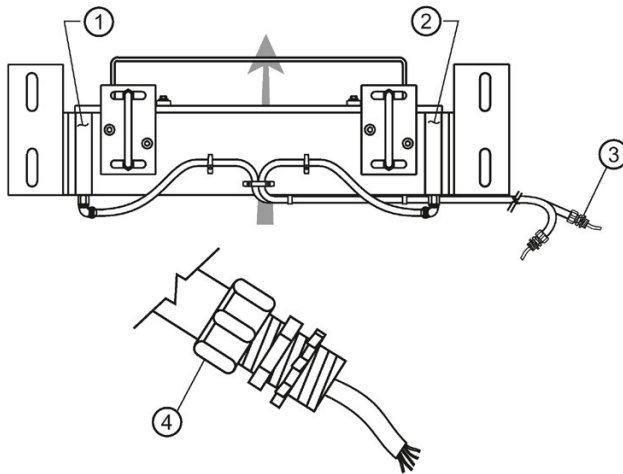
Conveyor Idler Requirements

1. The user must purchase and Install "eleven (11) Scale Quality Idlers", one idler to be mounted on the MSI Weighbridge and 5 idlers to be mounted on the approach and retreat side of the MSI Weighbridge.
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.
2. Do not use Scale Service Idlers: use Scale Quality Idlers.
3. Scale Quality idlers are high tolerance idlers; for roll run-out, frame deflection and alignment; whereas Scale Service idlers are choice idlers selected from a production run having the best roll run-out.
4. The scale-mounted idlers must be modified to ensure proper clearance for belt scale deflection.
5. The Scale Quality Idlers must be aligned to within 0.5 mm (0.02") of each other or better.
6. The belt must remain in contact with all three rollers (center and wing rollers) of each of the aligned idlers.
7. Idlers must be flat, 20 or 35 degree trough angle. All idlers on the conveyor must have the same trough angle.
8. Training idlers must not be located within 18 m (60 ft) of any scale weigh idler.

See also

Metrological characteristics (Page 36)

Connecting



- ① Load cell A (C, E)
- ② Load cell B (D, F)
- ③ See detail 'A'
- ④ Detail 'A'

Load cell	MSI, MMI-2, MMI-3	Integrator (MSI)	Integrator (MMI-2)	Integrator (MMI-3)	SIWAREX FTC
A	RED	+ EXC	+ EXC	+ EXC	+ EXC
	BLK	- EXC	- EXC	- EXC	- EXC
	WHT	- SIG 'A'	- SIG 'A'	- SIG 'A'	- SIG
	GRN	+ SIG 'A'	+ SIG 'A'	+ SIG 'A'	+ SIG
	SHIELD	SHIELD	SHIELD	SHIELD	SHIELD
B	RED	+ EXC	+ EXC	+ EXC	+ EXC
	BLK	- EXC	- EXC	- EXC	- EXC
	WHT	- SIG 'B'	- SIG 'B'	- SIG 'B'	- SIG
	GRN	+ SIG 'B'	+ SIG 'B'	+ SIG 'B'	+ SIG
	SHIELD	SHIELD	SHIELD	SHIELD	SHIELD
C	RED		+ EXC	+ EXC	+ EXC
	BLK		- EXC	- EXC	- EXC
	WHT		- SIG 'C'	- SIG 'A'	- SIG
	GRN		+ SIG 'C'	+ SIG 'A'	+ SIG
	SHIELD		SHIELD	SHIELD	SHIELD
D	RED		+ EXC	+ EXC	+ EXC
	BLK		- EXC	- EXC	- EXC
	WHT		- SIG 'D'	- SIG 'B'	- SIG

Load cell	MSI, MMI-2, MMI-3	Integrator (MSI)	Integrator (MMI-2)	Integrator (MMI-3)	SIWAREX FTC
	GRN		+ SIG 'D'	+ SIG 'B'	+ SIG
	SHIELD		SHIELD	SHIELD	SHIELD
E	RED			+ EXC	+ EXC
	BLK			- EXC	- EXC
	WHT			- SIG 'A'	- SIG
	GRN			+ SIG 'A'	+ SIG
	SHIELD			SHIELD	SHIELD
F	RED			+ EXC	+ EXC
	BLK			- EXC	- EXC
	WHT			- SIG 'B'	- SIG
	GRN			+ SIG 'B'	+ SIG
	SHIELD			SHIELD	SHIELD

Commissioning

6.1 Calibration

After all parts of the weighing system (belt scale, speed sensor, integrator) have been properly installed and connected, the weighing system and integrator must be calibrated. The calibration is initially done using the test weight(s), however material tests are recommended to achieve the greatest accuracy. Refer to the integrator operating instructions for programming and calibration details and for information about material tests. All operating instructions are available for download at our web site:

Siemens weighing (<http://www.siemens.com/weighing>)

6.2 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:

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

6.3 Balancing

For applications where the conveyor loading does not repeat in locations across the width of the belt, such as side-to-side loading, electronic balancing of the two load cells is recommended. Balancing is completed during the initial start-up, but should be repeated if either load cell is reinstalled or replaced. Refer to the associated integrator manual to complete the balancing procedure.

When balancing load cells, apply a test weight to the extreme sides (side A or B), as required.

6.4 Final calibration

Program the belt scale integrator as suggested in its operating instructions and with parameters suitable for the application. With programming complete, the system is ready for calibration.

A zero calibration can be performed after sufficient running of the conveyor allows the belt to limber up and take its natural formation. A zero calibration is performed in accordance to the belt scale integrator operating instructions with the conveyor running empty.

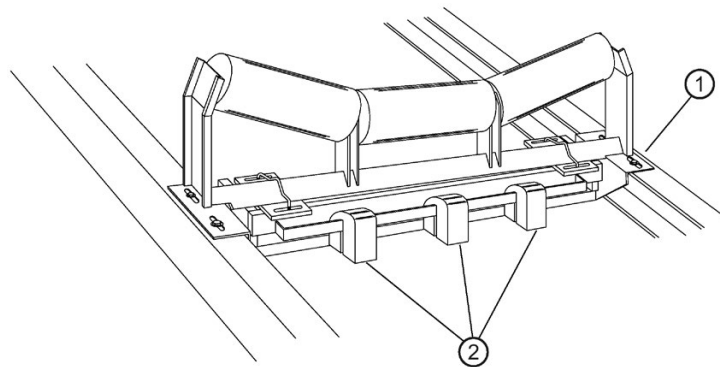
6.5 Zero calibration

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

After the completion of the zero calibration, a span calibration, as described in the belt scale integrator operating instructions, can be performed with the test weight(s) applied. Be sure to stop the conveyor when applying and removing the test weight.

6.6 Span calibration

1. The span reference (test load) is simulated using the test weight.
2. Apply the calibration test weight(s) to the scale.



- ① MSI
- ② Test weights

3. Perform the span calibration as described in the Calibration section of the integrator operating instructions.

After completing the span calibration, remove the test weights and store them. With a successful zero and span calibration, and with the test weight(s) removed from the belt scale, the belt scale system is ready for operation. Ensure that the belt scale integrator is left in RUN mode.

6.7 Material test

To achieve accuracy with respect to absolute values, perform material tests. Refer to the associated integrator manual for instructions on material testing.

6.8 Re-rating

Consult your Siemens representative for any significant change in rate, speed, and/or idler spacing from original design specifications to maintain proper design parameters.

Service and maintenance

7.1 Maintenance

Keep the weighing equipment 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 cannot be calibrated for any apparent mechanical reason, the load cells may be damaged.

7.2 Replacing a load cell

 **CAUTION**

Re-install the shipping stops during maintenance or any other time when protection of the load cells is required.

1. Install both shipping stops
2. Support the belt and weighing idler from above or below.
3. Remove load cell hardware from the dynamic (moving) parts.
4. Remove load cell hardware from the static support.
5. Remove the existing load cell from the belt scale.
6. Replace with a new load cell fastening to static support then dynamic (moving structure).
7. Remove belt and idler support.
8. Release both shipping stops
9. Adjust idler alignment if necessary.
10. Perform balance, zero, and span calibrations.

7.3 Spare parts

The only spare part recommended for the belt scale 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.

Technical data

8.1 Specifications

Accuracy

MSI	± 0.5% or better of totalization over 20 to 100% operating range
MMI-2	± 0.25% or better of totalization over 20 to 100% operating range
MMI-3	± 0.125% or better of totalization over 25 to 100% operating range

Accuracy subject to: On factory approved installations the belt scale systems 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.

Load cell

Construction	17-4 PH (1.4568) stainless steel construction with 304 (1.4301) stainless steel cover, 316 (1.4401) stainless steel cover (optional)
Degree of protection	IP67 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	maximum ranges: 50, 100, 250, 500, 750, 1000, 1250, 1500 lb
Overload	150% of rated capacity ultimate 300% of rated capacity
Temperature	-18 to +65 °C (0 to +150 °F) compensated -40 to +75 °C (-40 to +167 °F) operating range, up to +175 °C (+347 °F) (optional)

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 (Page 37).

Belt speed

up to 5 m/s (984 fpm)

Contact Siemens application engineering for consideration of higher belt speeds.

Capacity

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

Conveyor line

± 20° from horizontal, fixed incline; up to ±30° 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)

Interconnection (to integrator)

< 150 m (500 ft) 18 AWG 6 conductor shielded cable

> 150 m (500 ft) to 300 m (1000 ft.) 20 AWG 8 conductor shielded cable

Approval

US/Canada	<ul style="list-style-type: none"> FM/CSA Class I, Div 1, Groups A,B,C,D FM/CSA Class II, Div. 1, Groups E,F,G and Class III
Europe	<ul style="list-style-type: none"> ATEX I M1, Ex ia I T4 Ma, ATEX II 1 GD, Ex ia IIC T4 Ga Ex ia IIIC T135°C Da per Sira 17ATEX2196X ATEX II 2D, Ex tD A21 IP65 T90 °C CE per Sira 06ATEX9305X
International	<ul style="list-style-type: none"> IECEX Ex tD A21 IP65 T90 °C per Sir 08.0071X IEC Ex Ex ia I T4 Ma, Ex ia IIC T4 Ga, Ex ia IIIC T135°C Da per CSA 170015X
Australia	C-TICK
Russia	GOST-R GOST-R Ex
China	NEPSI 2D, Ex tD A21 IP65 T90 °C

Metrology approvals

MSI, MMI		
	Canada	Measurement Canada
	Europe	MID
	International	OIML
	China	CMC
MSI		
	South Africa	SABS
	Russia	Pattern approval
MMI		
	USA	NTEP

8.2 Metrological characteristics

UK/0126/0047

R50/1997-GB1-09.01

Accuracy class		≥ 1
Temperature range		-10 °C to +40 °C
Flowrate	Qmax:	Application dependent
	Qmin:	20% of Qmax
Belt speed	Vmax:	0.2 to 5.0 m/sec
Totalization scale interval		≥ 0.001 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

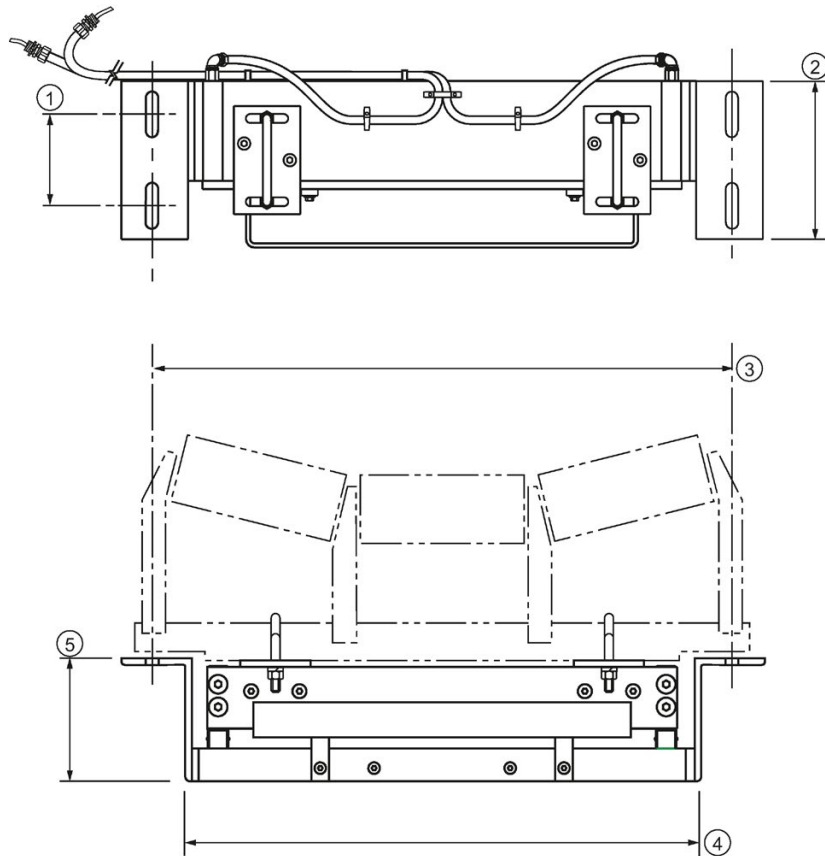
BW500 certification switch	When the switch is set for certification, editing of the parameter values, span calibrations and totalizer resets are denied.
Conveyor interlock	If the weighing instrument is switched off or ceases to function, the conveyor belt shall stop, or visible or audible indication 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 on 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.

Dimension drawings

9.1 Outline dimensions

Note

Conduit and cable arrangement may differ from example shown



Conveyor belt width	③ Mounting scale width	⑤ minimum drop in width	②	①	④	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)	5.5" (140 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.

Certificates and support

A.1 Technical support

Technical support

If this documentation does not provide complete answers to any technical questions you may have, contact Technical Support at:

- Instructions and manuals (<http://www.siemens.com/processinstrumentation/documentation>)
- More information about our Technical Support is available at Technical Support (<http://www.siemens.com/automation/csi/service>)

Internet Service & Support

In addition to our documentation, Siemens provides a comprehensive support solution at:

- Partner (<http://www.automation.siemens.com/partner>)

Personal contact

If you have additional questions about the device, please contact your Siemens personal contact at:

- Support request (<http://www.siemens.com/automation/support-request>)

To find the personal contact for your product, go to "All Products and Branches" and select "Products & Services > Industrial Automation > Process Instrumentation".

Documentation

You can find documentation on various products and systems at:

- Services & Support (<http://www.siemens.com/automation/service&support>)

A.2 Certificates

You can find certificates on the Internet at Industry Online Support (<https://support.industry.siemens.com/cs/products?dtp=Certificate&mf=ps&pnid=17456&lc=en-WW>) or on an included DVD.

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