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TEST CHAIN

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: This product can only function properly and safely if it is correctly transported, stored, installed, set up, operated, and maintained.

Note: Always use product in accordance with specifications.

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Safety Notes

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



WARNING: relates to a caution symbol on the product, and means that failure to observe the necessary precautions can result in death, serious injury, and/or considerable material damage.



WARNING:¹ means that failure to observe the necessary precautions can result in death, serious injury, and/or considerable material damage.

CAUTION: means that failure to observe the necessary precautions can result in considerable material damage.

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

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The Manual

Notes:

- Please follow the installation and operating procedures for a quick, trouble free installation and to ensure the maximum accuracy and reliability of your test chain.
- This manual applies to the test chain only.

This instruction manual is intended to provide the basic guidelines for installation, operation and maintenance of the calibration test chain and storage reel compartment.

This manual will help you set up your test chain for optimum performance. We always welcome suggestions and comments about manual content, design, and accessibility.

Please direct your comments to techpubs.smpi@siemens.com. For a selection of Siemens Milltronics weighing manuals, go to www.siemens.com/processautomation. Under *Weighing Technology*, select *Continuous Weighing Systems* and select the manual archive listed under the product family.

¹ This symbol is used when there is no corresponding caution symbol on the product.

Application Examples

The application examples used in this manual illustrate typical installations that use the test chain. Other configurations may also apply.

In all examples, substitute your own application details. If you require more information, please contact your Siemens Milltronics representative. For a complete list of Siemens Milltronics representatives, go to: www.siemens.com/processautomation.

Test Chain Calibration

Test chain calibration is used extensively for testing mechanical belt scales, and to calibrate high capacity electronic belt scales and weighfeeders that cannot be calibrated to material tests.

During the calibration, the test chain is applied to the conveyor belt and is secured at both ends so that the chain remains stationary over the weigh length. The chain rolls on the surface of the moving belt conveyor, providing dynamic scale loading of a known weight value, and thus supplying the calibration reference.

Advantages

The roller test chain simulates live material loading by causing the belt's structure to deflect in much the same manner as when material is present.

A much greater test load can be applied to high capacity belt scales and weighfeeders because most weighbridge designs can only accommodate a limited number of static weights applied to the suspension. The high capacity test load is especially important on systems using mechanical weighing elements and lever systems because they calibrate the systems with test load values close to normal operating loads.

CAUTION: Please consider the following:

- Ensure accessibility to the top (load) side of the conveyor belt in the scale area.
- Secure and remove the test chains each time they are used.
- Provide routine inspection and maintenance.
- Lubricate regularly and repair as necessary to ensure safe reliable service.
- Weigh and measure chain annually to determine the correct and accurate load value (required to compensate for wearing and stretching of the test chain components).

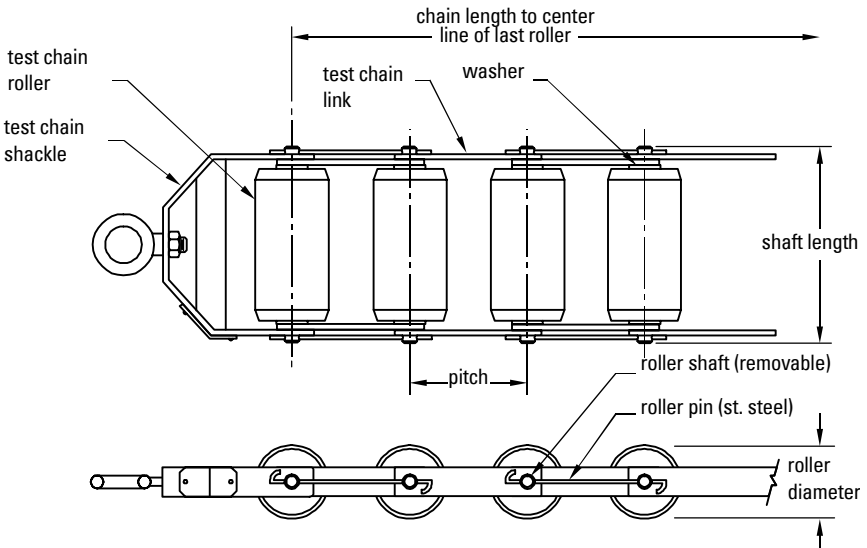
Technical Data and Specifications

The test chain assembly is available in two components: the test chain and the reel.

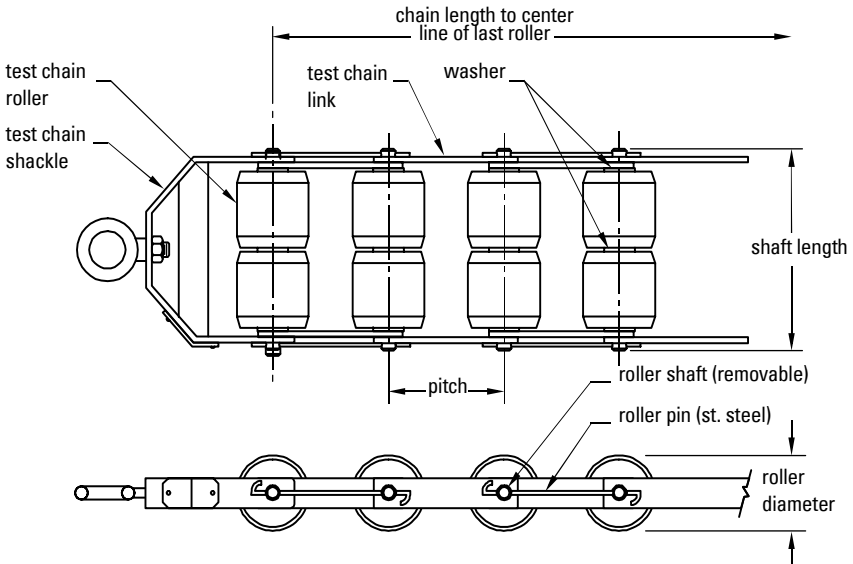
Test Chain Design and Features

- Chains are configured as single width or double width roll sets in pitches of 4" (10 cm) or 6" (15 cm) between adjacent rolls.
- Chain rollers are provided with oil impregnated bronze bushings.
- Side plates, pins, and end shackles are made from C1018 and C1020 cold rolled steel.
- End Shackles are fitted with Eye links for attachment of wire rope.
- Rollers are made from C1010 hot rolled steel.
- Roll bars/Cotter pins are made from 304 stainless steel.
- Connection links are retained by stainless steel roll bars.
- A brass plate bearing the calibrated weight in lb/ft or kg/m is fixed to the end shackle.
- The chain is sprayed with a rust inhibitor.
- Nickel plated chains are available on special request.

Single Roller Bushed Test Chain



Double Roller Bushed Test Chain



Chain Position and Restraints

Chain position is critical to accurate scale calibration. To ensure proper position, please account for the following:

- The pitch should be evenly divisible into the conveyor idler spacing.
- Rollers should straddle the idlers.
- Chain placement must be repeatable. Make sure that the chain extends a minimum two rollers before and after the weighing mechanism.

The use of appropriate chain restraints will help control longitudinal stability and is critical to ensure proper and safe usage. Restraints should do the following:

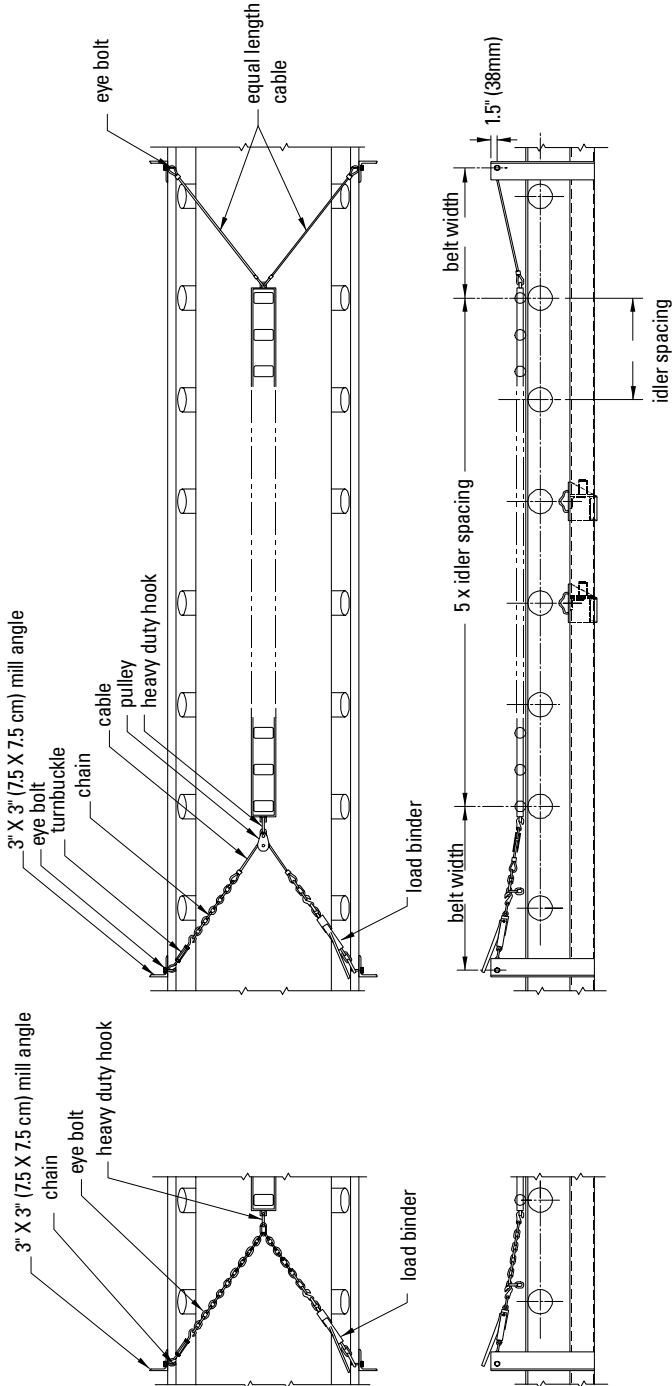
- Be attached to the chain at one end and fixed to posts mounted to each side of the conveyor at about one belt width from the end of the chain.
- Form a "V" shape when viewed from above.
- Cross over and clear the belt edges by approximately one to two inches (2.5 to 5.0 cm).

Tension in the restraints should:

- Prevent chain movement along the belt
- Not lift the ends of the chain

Notes: Turnbuckles are recommended to permit adequate adjustment of tension to ensure the chain is fully extended and each roller is turning freely

Chain Position and Restraints (cont'd)



Chain Reel

Location

On incline conveyors, the chain reel must be carefully installed upstream of the scale weighbridge so the chain rolls out with the movement of the belt. "Upstream" is when you look from the conveyor tail or infeed end towards the head or discharge end of conveyor.

On a level conveyor, locate the reel prior to the scale position.

Facilitate chain payout over the scale by jogging the belt until the chain rolls into position.

Mount the reel to the conveyor about 4 to 4.5 idler spaces from the scale center line. This places the support legs of the reel about 1.5 spaces from the end of the test chain for easy attachment to the restraining device.

Once the chain has been secured at both ends, the cable from the reel can be detached and the belt restarted for the calibration process.

Reel Size and Compartment Diameters

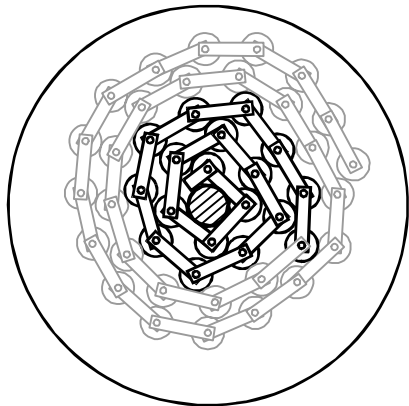
The size of the reel is determined by the requirements of the specific conveyor application and the selected chain loading. The width of the conveyor (18" [46 cm] through 72" [183 cm] belt conveyor), its incline, and its general construction determine the reel cross member length and section sizing for that member.

Compartment disc diameter is determined by the following:

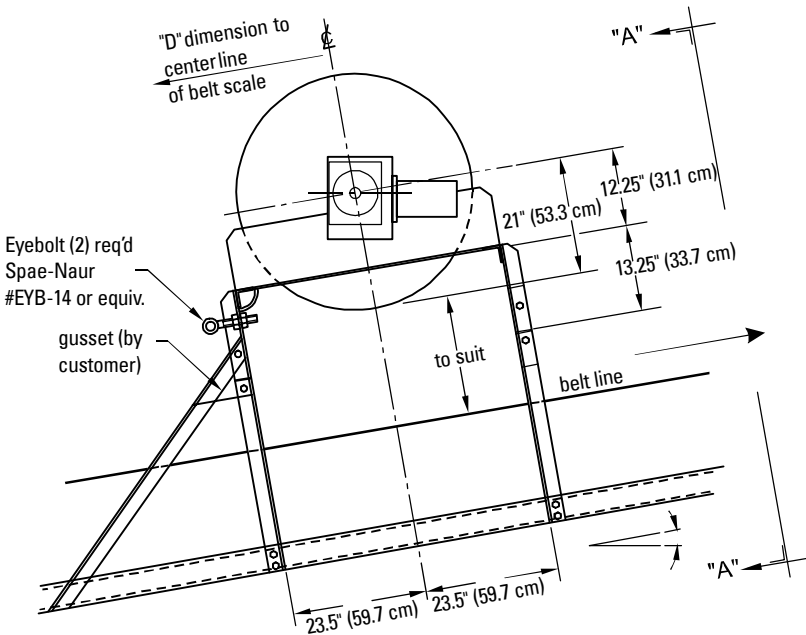
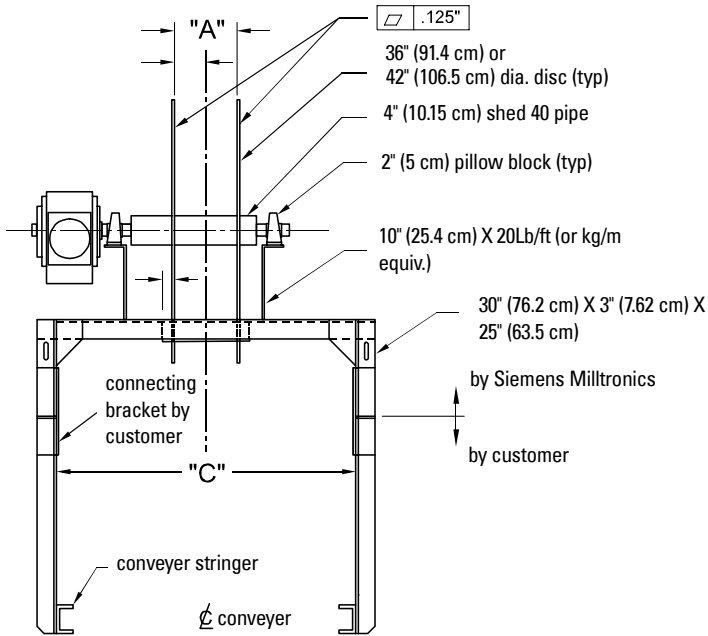
- Chain length, pitch, and roll diameter
- Wire rope and chain wrap around the reel drum
- Chain wrap around the successive wraps of chain
- The number of rolls in a given wrap increase with each revolution of the reel
- The number of wraps the reel disc holds depends on the given chain parameters
- As few as one to two wraps, to as many as nine wraps
- Overall wrap diameter varies from about 12" (30.5 cm) for the shortest chain to about 49" (124.5 cm) for the longest chain.

Specifications

- 6" (15 cm) pitch test chain, 20 ft (609 cm) long
- 42 rollers long, 41 pitches long
- roll diameter: 3.75" (9.5 cm)
- disc diameter: 36" (91.5 cm)



Standard Motorized Test Chain Storage Reel



Reels may have from one to three chain compartments (widths vary according to the width of the specific test chain).

- Compartment width is one to two inches wider than the length of the chain roller pins or shafts. Each compartment is made of ¼" (6.5 mm) thick discs available in diameters of 36", 42", and 48" (91.5, 107, 122 cm), depending on the chain length.
- Each disc has a small through-hole adjacent to the 4" (10 cm) diameter shaft centre. This is used to insert the wire rope and fittings needed to attach the test chain to the reel.
- Reels are supplied with 30 feet (9.14 m) of ¼" (6.5 mm) wire rope and two clamps per chain.
- Reels are painted standard grey epoxy and are shipped bolted to wooden skids
- Reel frame construction is all mild steel structural components that are welded and bolted. The disc compartments are welded to a 4" (10 cm) diameter tube, or pipe, serving as the rotating drum. A solid cold rolled drive shaft is welded to the drum assembly for attachment to the gear-motor and pillow blocks for mounting to the main support frame.
- A curved slide plate is welded to a cross member to prevent chain snagging at the cross member.

Note:

- Motor starters, push button stations, and support legs from the reel to the conveyor frame are supplied by others.
- Vertical support legs from the reel frame to the conveyor are to be supplied by others. Provision is made for direct attachment to the customer-furnished supports by short vertical leg sections from the reel support cross members.

Reel Horsepower

- Motor horsepower varies with application loading and are available in 0.75, 1, 1.5, 2, 3, and 5
- Of primary concern is the ability of the reel to handle the total test chain weight and the associated forces needed to pull the chain along the belt and up the reel.
- The gear-motor horsepower is based on these force requirements and the intermittent usage for the calibration process.
- Typical reel gear-motors have NEMA D rated starting characteristics, a totally enclosed non-ventilated (TENV) housing, intermittent (30-minute duty) motor operating at either 230 or 460 volts, 3 cycle, 50 or 60 Hz. (other voltages are also available).
- The gearing ratios are approximately 180 to 200:1 with output RPMs in the 8 to 10 RPM range. Depending on the chain parameters, this affords an average chain rollout time of about 3 minutes to 30 seconds.

Chain load range for each gear-motor

Chain Load	Horsepower
Up to 800 lbs	0.75
800 to 1100 lbs	1
1100 to 1800 lbs	1.5
1800 to 2400 lbs	2
2400 to 3600 lbs	3
3600 to 5000 lbs	5

Test Chain and Reel Selection

A calibration range is generally targeted between 50% to 80% of the maximum design load. Use the belt scale's design information to determine chain requirements.

Example

Belt Scale Design Information	
Belt Scale's Capacity:	1500 MTPH
Design Load Maximum:	166.67 kg/m
Idler Spacing:	1.0 m
Type of Belt Scale	1 weigh idler (MSI)
Belt Width:	1400 mm
Belt Speed:	2.5 m/sec

The next larger chain is the preferred choice to retain the desired percent of maximum loading. In our example, the calculation is performed at 60%:

$$166.67 * .60 = 100 \text{ kg/m (67.05 lb/ft)}$$

Using the nominal kg/m value of 100, the next larger chain is selected from the chart of available test chains. The value selected is equivalent to 104 kg/m (70 lb/ft). Test Chain design size is based at 62.5% belt loading.

The length is based on the idler spacing. The test chain should extend no less than two fixed idlers beyond each end of the scale mounted idlers. Nominal chain length = (# of scale idlers + 3) * idler spacing:

$$1 + 3 * 1 = 4\text{m (13 ft.)}$$

- Note that some chain pitches do not divide evenly into the nominal chain length. The selected chain may require to be increased by a pitch or two to accommodate construction.
- Stamped value is derived from the actual manufactured results.
- The motorized storage reel is sized for a 1400 mm belt width with a conveyor width outside of stringer channels of 1820 mm, “C” dimension as given by others.

Installing Test Chain and Reel

CAUTION:

- Be sure to arrange proper transportation to carry the components to the conveyor to avoid injury to personnel during handling.
- Break larger size test chains into sections for ease of handling. These sections must be re-assembled prior to use and installing on the storage reel.
- Mechanical assistance may be required to lift the chains onto the conveyor.

The Siemens Milltronics test chain storage reel requires a support steel structure for installing above the conveyor. Locate an area suitable for the storage reel for flat or inclined conveyors upstream of the belt scale's location toward the head pulley. For declined conveyors, the reel should be located to the upper side of the conveyor, approach end. Use this structure to gravity feed the test chain into place.

Once the location has been selected, ensure that the reel is centered over the center line of the belt and that it will clear the maximum material bed depth anticipated for the application. Material loads should not come in to contact with any portion of the storage reel.

Installation Guidelines

Notes:

- Support legs, gussets, brackets, and mounting bolts are to be supplied by customer.
- A mechanical engineer should oversee the installation and verify the support structure.
- Provision for AC power is required for wiring of gear motor. Ensure the power source is available. All wiring must be done in conjunction with approved conduit, boxes, and fittings; and done to procedure in accordance with all governing regulations.

A 30 foot (9.14 m) length of stainless steel wire rope is supplied with clips. One end of the cable is attached to the test chain shackle. The other end is attached to the spool piece of the reel.

Installing

Position local control station within direct viewing of the storage reel and the belt scale. Minimum requirements for the control station (supplied by customer):

- Forward / Reverse or Raise / Lower
- Three position (on, off, on) spring return configuration

Upright posts constructed of angle iron may be placed at opposite end of the test chain. These may be welded to main conveyor stringers on both sides, for securing the test chain's free end while in use.

Use eye hooks attached to the posts to secure the wire rope cables from the test chain shackle. This positions the test chain, allowing it to track centrally on the belt.

Refer to installation or outline diagrams, and review all areas of the installation to ensure that the safety aspects of the mechanics have been met. All welding, hardware, fasteners, wiring, location, and other aspects must be sound and secure.

Operation Guidelines

Notes:

- Follow the calibration details for the manufacture's belt scale to perform a Zero calibration.
- Check for and adjust to a acceptable repeatability and error. Ensure the free end of the chain has been released from the storage reel.
- Frequency of calibration is determined by the repeatability of the span results and the monitoring of the scale's performance.

CAUTION: During this step of the operation, the conveyor belt must be stopped, to prevent injury to operating personnel.

1. Using the control station lower the test chain onto the conveyor belt. Spread the test chain out until it spans across the weigh idler suspension: two idlers from the approach side to two idler on the retreat side of the weigh suspension. (This is often referred to as the A2 approach idlers to R2 retreat idlers. Refer to "Chain Position and Restraints" on page 4).
2. Secure both ends of the test chain using wire rope cables attached to the eye bolts of the frame on the storage reel and at opposite end. The test chain should lay flat on the center roll of each idler, with the links of the chain in a horizontal position to the conveyor belt.

3. Run conveyor at the normal operating belt speed and observe the performance of the test chain. The rollers of the chain should run freely without incident and track centrally to the middle of belt. No side motion or “snaking” should be observed.

Note: Snaking causes the results to be non repeatable and varying. Eliminate by readjusting the wire rope guide cable (stays) until the problem is solved. Tension should not be applied to the retrieving cable.

4. Continue to run the conveyor and perform the span calibration as outlined in the scale manufacturer’s manual.

Ensure the following upon completing the exercise:

- Stop the conveyor
- Retrieve the test chain by using the control station to raise the test chain into the storage reel.
- Leave the wire rope cable attached to the shackle.
- During raising, ensure the chain shackle is free to move and does not bind onto any portion of the storage reel. Once completely retrieved, secure the free end of the chain using the wire rope.

CAUTION: Disable the gear motor by removing power from the unit. This prevents any unauthorized or accidental release of the chain during normal belt operation. The test chains should never be released while material is on the belt.

Maintenance

Test Chain

- Check all parts of the test chain regularly.
- Ensure the links and rollers are free to move on shafts.
- Replace broken or missing retaining pins.
- Ensure wire rope anchoring cables are not frayed or twisted
- Ensure clips are tight on the cable.
- Lubricate the chain with light machine oil to prevent rusting and ensure safe and free movement. Either submerge the chain in a oil bath, or spray with common lubricants or rust prohibitor.
- Place a hood or cover over the storage reel to minimize negative effects of dirt or debris falling onto the test chain.
- Annual verification of the chain should be made against a known, certified platform with scale and length to precision measurements. Recalculate with the following measurements.

Test Chain Mass (without shackles)	_____	Lb or Kg
Length stretched, reference from center of first roll to center of last roll.	_____	Ft or M
Roller Pitch: from technical data.	_____	Ft or M
Weight of 1 link:	_____	Lb or Kg
$\frac{\text{Mass + weight of 2 links}}{\text{Stretched length + 1 Pitch}}$	_____	Lb/ft or Kg/M
	_____	Chain Length Ft or M

Storage Reel

All components should be inspected. Pillow block bearings supporting reel to be lubricated during periodic maintenance. Motor and gearbox must be obstruction free.

This assembly in whole or in part must never be used for anything other than its intended purpose.

Notes



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