WASHER LOAD CELLS
- Highly accurate under uneven loading conditions. The location is between the nut and the housing.
- Conditions favorable at the top of the mill.
- For roughing mills or plate mills with high impact loading.
- Easily and economically retrofitted into existing mills.

DISC LOAD CELLS
- Insensitive to uneven loading.
- Dry locations require less maintenance.
- Ambient conditions are favorable at the top of the mill.
- Can economically update existing disk-shaped cell installations.

SLAB LOAD CELLS
- Length matching that of rocker block ensures load distribution.
- Can economically update existing rectangular-shaped cell installations.

T-BLOCK LOAD CELLS
- Narrow load cell is specially designed to fit beneath rocker block at bottom of mill.
- Provides integration of line load from rocker block with no need for line distribution plates.
- Protected against mill fluids and scale found in this location.
- Will tolerate bending of mill housing without error.

SPECIAL LOAD CELLS
- Direct replacements and repairs for all models.
- No hardware change required.
- Made in the U.S.A with minimal delivery time.
**MillMaster® Rectangular Load Cell**  
**TWVLSG 141 Strain Gage Type**

### DIMENSIONS:

<table>
<thead>
<tr>
<th>Nominal Load (MN)</th>
<th>Various Length (L) mm</th>
<th>Various Width (W) mm</th>
</tr>
</thead>
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<td>100 310 490</td>
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<td>130 340 520</td>
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<td>160 370 550</td>
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<td>240 540 840</td>
<td>190 400 580</td>
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<tr>
<td>10.0</td>
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<tr>
<td>12.5</td>
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</tr>
<tr>
<td>56.0</td>
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<td></td>
</tr>
</tbody>
</table>

- Determine the load for which the load cell is to be used & choose from the table the next higher value in the standard range.

### SPECIFICATIONS

- **Capacity:** Up to 7500 Tonnes  
  - Bridge Resistance: 120 ohms min.  
  - Output: 1.0 to 1.8mV/V
- **Linearity:** Within +/- 0.5% of full scale  
  - Operating Temperature: 0°C to 150°C (32°F to 302°F)
- **Hysteresis:** Less than 0.3% of full scale  
  - Compression: 0.1% of cell height at rated load
- **Accuracy of Calibration:** +/- 0.1% of full scale at rated load – tested on a press traceable to NIS
DESCRIPTION:

- TWS Slab Load Cells are strain gage sensors used to measure the roll force in rolling mills under harsh environments.
- The TWS load cell strain gage technology uses DC excitation to provide fast responses to the changes of force in the rolling mill.
- The shape and the high quality construction of the Mill Master Load Cells make them highly suited for the metals rolling mills where they are engineered and fitted for measurement and control of roll forces for automatic gage control.
- The TWS load cells interface with the TWS DSP2000S digital signal processor to offer the fastest response available. The DSP2000S allows for a wide variety of features to meet each mill’s specific requirements.

FEATURES:

- Machined and manufactured from a single high strength stainless steel forging
- Mechanically interchangeable with other manufacturers load cells
- Hermetically sealed, welded construction, filed with a high performance gel potting for long term performance and protection
- Excellent linearity and low hysteresis
- Durable construction with accuracy over a wide range of temperatures
- All load cells are standard with a 20 meter teflon cable. Additional cable lengths are available for no additional cost to customer
- All cables are fitted with steel reinforce. Oil resistant hydraulic hose assemblies
- TWS engineers are available to ensure successful designs and installations
SPECIFICATIONS:
MODEL: TWVL SG 141 STRAIN GAGE TYPE LOAD CELL
CAPACITY RANGE: UP TO 7,500 TONNES
BRIDGE RESISTANCE: 120 OHMS MINIMUM
EXCITATION VOLTAGE: 15 VDC OR VAC MAXIMUM
OUTPUT: 1.0 TO 1.8 MV/V
RESPONSE TIME: LESS THAN 0.1 MS
LINEARITY: WITHIN +/- 0.5% OF FULL SCALE OUTPUT
HYSTERSIS: LESS THAN 0.3% OF FULL SCALE OUTPUT
REPEATABILITY: WITHIN 0.1% OF FULL SCALE AT RATED LOAD
THERMAL ZERO SHIFT: +/- 0.005% OF FULL SCALE OUTPUT PER DEG... C
TEMPERATURE CHANGE OVER THE COMPENSATED RANGE OF 20 TO 150 DEG... C
LOAD LIMITS: 300% OF RATED LOAD WITHOUT 0 SHIFT
500% OF RATED LOAD WITHOUT CHANGE IN CHARACTERISTICS
700% OF RATED LOAD WITHOUT MECHANICAL DAMAGE
OPERATING TEMP. RANGE: 0 TO 150 DEG.... C
STORING TEMP. RANGE: -40 TO 180 DEG.... C
COMPRESSION: 0.1% OF HEIGHT AT RATED LOAD
ACCURACY OF CAL.: +/- 0.1% OF FULL SCALE AT RATED LOAD
TRACEABLE TO THE NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY ISO ACCREDITED AND GUIDE 17025 LABORATORY STANDARDS
DIMENSIONS:

<table>
<thead>
<tr>
<th>Nominal Load (MN)</th>
<th>ID (mm)</th>
<th>OD (mm)</th>
<th>Max Cable Length (m)</th>
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<td>1.6</td>
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<td>4.0</td>
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<td>60</td>
<td>810</td>
<td>890</td>
<td>6</td>
</tr>
</tbody>
</table>

SPECIFICATIONS:

- Determine the load for which the load cell is to be used & choose from the table the next higher value in the standard range.

Capacity: Up to 7500 Tonnes          Bridge Resistance: 120 ohms min.          Output: 1.0 to 1.8 mv/V
Linearity: Within +/- 0.5% of full scale          Operating Temp.: 0 - 150 deg... C (32 - 302 deg... F.)
Hysteresis: Less than 0.3% of full scale          Compression: 0.1% of cell height at rated load
Accuracy of Calibration: +/- 0.1% of full scale at rated load (tested on a press traceable to NIST)
DESCRIPTION:

- TWS Circular Load cells are strain gage technology sensors used to measure the roll force in rolling mills under harsh environments.
- The TWS load cell strain gage technology uses DC excitation to provide fast responses to the changes of force in the rolling mill.
- The shape and the high quality construction of the MillMaster Load cells make them highly suited for the metal rolling mills where they are engineered and fitted for measurement and control of roll forces for automatic gage control.
- In this application, the cells are mounted between the screw and top back-up chock in mills with roller bearings or plain bearings with accutely machined loading plates that are used to distribute the load uniformly over the load surface.
- The TWS load cells interface with the TWS DSP2000S digital signal processor to offer the fastest response available. The DSP2000S allows for a wide variety of features to meet each mill’s specific requirements.

FEATURES:

- Machined and manufactured from a high strength stainless steel forging.
- Mechanically interchangeable with other manufacturer’s load cells.
- Hermetically sealed, welded construction, filed with high performance gel potting for long term performance and protection.
- Excellent linearity and low hysteresis.
- Durable construction with accuracy over a wide range of temperatures.
- All load cells are standard with a 20 meter teflon cable. Additional cable lengths are available with no additional cost to the customer.
- All cables are fitted with steel reinforce. Oil resistant hydraulic hose assemblies.
- TWS engineers are available to ensure successful designs and installations.
SPECIFICATIONS:

MODEL: TWVL SG 141C CIRCULAR STRAIN GAGE TYPE LOAD CELL

CAPACITY RANGE: UP TO 7,500 TONNES

BRIDGE RESISTANCE: 120 OHMS MINIMUM

EXCITATION VOLTAGE: 15 VDC OR VAC MAXIMUM

OUTPUT: 1.0 TO 1.8 Mv/V

RESPONSE TIME: LESS THAN 0.1 Ms

LINEARITY: WITHIN +/- 0.5% OF FULL SCALE OUTPUT

HYSTERESIS: LESS THAN 0.3% OF FULL SCALE OUTPUT

REPEATABILITY: WITHIN 0.1% OF FULL SCALE AT RATED LOAD

THERMAL ZERO SHIFT: +/- 0.005% OF FULL SCALE OUTPUT PER DEG... C TEMPERATURE CHANGE OVER THE COMPENSATED RANGE OF 20 TO 150 DEG... C

LOAD LIMITS: 300% OF RATED LOAD WITHOUT 0 SHIFT
500% OF RATED LOAD WITHOUT CHANGE IN CHARACTERISTICS
700% OF RATED LOAD WITHOUT MECHANICAL DAMAGE

OPERATING TEMP. RANGE: 0 TO 150 DEG.... C

STORING TEMP. RANGE: -40 TO 180 DEG.... C

COMPRESSION: 0.1% OF HEIGHT AT RATED LOAD

ACCURACY OF CAL.: +/- 0.1% OF FULL SCALE AT RATED LOAD TRACEABLE TO THE NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY ISO ACCREDITED AND GUIDE 17025 LABORATORY STANDARDS
**MillMaster® Annular Load Cell**

**TWVLSG 141R Strain Gage Type**

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**DIMENSIONS:**

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<thead>
<tr>
<th>Nominal Load (MN)</th>
<th>D1 (mm)</th>
<th>D2 (mm)</th>
<th>D3 (mm)</th>
<th>D4 (mm)</th>
<th>Max Cable Length (m)</th>
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</thead>
<tbody>
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<td>895</td>
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</tbody>
</table>

- Determine the load for which the load cell is to be used & choose from the table the next higher value in the standard range. We can customize load cells if a standard load cell is not suitable for a particular application.

**SPECIFICATIONS:**

Capacity: Up to 7,500 Tonnes  
Bridge Resistance: 120 ohms min.  
Output: 1.0 to 1.8 mV/V  
Linearity: Within +/- 0.5% of full scale  
Operating Temp: 0°C to 150°C (32°F to 302°F)  
Hysteresis: Less than 0.3% of full scale  
Compression: 0.1% of cell height at rated load  
Accuracy of Calibration: +/- 0.1% of full scale at rated load (tested on a press traceable to NIST)
DESCRIPTION:

• TWS Annular Load cells are strain gage technology sensors used to measure the roll force in rolling mills under harsh environments.
• The TWS load cell strain gage technology uses DC excitation to provide fast responses to the changes of force in the rolling mill.
• The shape and the high quality construction of the MillMaster Load cells make them highly suited for the metal rolling mills where they are engineered and fitted for measurement and control of roll forces for automatic gage control.
• In this application, the cells are mounted between the nut and the mill housing and do not require removal during back-up roll change. They can also be fitted between the thrust bearing and the top back-up roll.
• The TWS load cells interface with the TWS DSP2000S digital signal processor to offer the fastest response available. The DSP2000S allows for a wide variety of features to meet each mill’s specific requirements.

FEATURES:

• Machined and manufactured from a high strength stainless steel forging.
• Mechanically interchangeable with other manufacturer’s load cells.
• Hermetically sealed, welded construction, filed with high performance gel potting for long term performance and protection.
• Excellent linearity and low hysteresis.
• Durable construction with accuracy over a wide range of temperatures.
• All load cells are standard with a 20 meter teflon cable. Additional cable lengths are available with no additional cost to the customer.
• All cables are fitted with steel reinforce. Oil resistant hydraulic hose assemblies.
• TWS engineers are available to ensure successful designs and installations.
SPECIFICATIONS:

MODEL:    TWVL SG 141R ANNULAR STRAIN GAGE TYPE LOAD CELL
CAPACITY RANGE:  UP TO 7,500 TONNES
BRIDGE RESISTANCE:  120 OHMS MINIMUM
EXCITATION VOLTAGE:  15 VDC OR VAC MAXIMUM
OUTPUT:    1.0 TO 1.8 Mv/V
RESPONSE TIME:  LESS THAN 0.1 Ms
LINEARITY:  WITHIN +/- 0.5% OF FULL SCALE OUTPUT
HYSTERESIS:  LESS THAN 0.3% OF FULL SCALE OUTPUT
REPEATABILITY:  WITHIN 0.1% OF FULL SCALE AT RATED LOAD
THERMAL ZERO SHIFT:  +/- 0.005% OF FULL SCALE OUTPUT PER DEG... C
                    TEMPERATURE CHANGE OVER THE COMPENSATED RANGE OF 20 TO 150 DEG... C
LOAD LIMITS:  300% OF RATED LOAD WITHOUT 0 SHIFT
              500% OF RATED LOAD WITHOUT CHANGE IN CHARACTERISTICS
              700% OF RATED LOAD WITHOUT MECHANICAL DAMAGE
OPERATING TEMP. RANGE:  0 TO 150 DEG.... C
STORING TEMP. RANGE:  -40 TO 180 DEG.... C
COMPRESSION:  0.1% OF HEIGHT AT RATED LOAD
ACCURACY OF CAL.:  +/- 0.1% OF FULL SCALE AT RATED LOAD
                    TRACEABLE TO THE NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY ISO ACCREDITED AND GUIDE 17025 LABORATORY STANDARDS
MillMaster® T-Block Load Cell
TWVLSG 141 T Strain Gage Type

<table>
<thead>
<tr>
<th>Capacities in Tonne</th>
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</thead>
<tbody>
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<td>500  1400  2800</td>
</tr>
<tr>
<td>600  1600  3000</td>
</tr>
<tr>
<td>700  1800  3600</td>
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<td>800  2000  4000</td>
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<td>900  2200  4500</td>
</tr>
<tr>
<td>1000 2400  5000</td>
</tr>
<tr>
<td>1200 2600  5400</td>
</tr>
</tbody>
</table>

SPECIFICATIONS:
- Capacity: Up to 7500 Tonnes
- Bridge Resistance: 120 ohms min.
- Output: 1.0 to 1.8 mV/V
- Linearity: Within +/- 0.5% of full scale
- Operating Temp: 0°C to 150°C (32°F to 302°F)
- Hysteresis: Less than 0.3% of full scale
- Compression: 0.1% of cell height at rated load
- Accuracy of Calibration: +/- 0.1% of full scale at rated load – tested on a press traceable to NIST
DESCRIPTION:

- TWS T-BLOCK Load cells are strain gage technology sensors used to measure the roll force in rolling mills under harsh environments.
- The TWS load cell strain gage technology uses DC excitation to provide fast responses to the changes to force in the rolling mill.
- The shape and the high quality construction of the MillMaster Load cells make them highly suited for the metals rolling mills where they are engineered and fitted for measurement and control of roll forces for automatic gage control.
- In this application they are mounted under the bottom back-up roll to measure the force spread over a plate of hardened steel which is required.
- The TWS load cells interface with the TWS DSP2000 digital signal processor to offer the user the fastest response available. The DSP2000 allows for a wide variety of features to meet each mill’s roll force measurement’s specific requirements.

FEATURES:

- Machined and manufactured from a high strength stainless steel forging.
- Mechanically interchangeable with other manufacturer’s load cells.
- Hermetically sealed, welded construction, filed with high performance gel potting for long term performance and protection.
- Excellent linearity and low hysteresis.
- Durable construction with accuracy over a wide range of temperatures.
- All load cells are standard with a 20 meter teflon cable. Additional cable lengths are available with no additional cost to the customer.
- All cables are fitted with steel reinforce. Oil resistant hydraulic hose assemblies.
- TWS engineers are available to ensure successful designs and installations.
SPECIFICATIONS:
MODEL: TWVL SG 141T T-BLOCK STRAIN GAGE TYPE LOAD CELL
CAPACITY RANGE: UP TO 7,500 TONNES
BRIDGE RESISTANCE: 120 OHMS MINIMUM
EXCITATION VOLTAGE: 15 VDC OR VAC MAXIMUM
OUTPUT: 1.0 TO 1.8 Mv/V
RESPONSE TIME: LESS THAN 0.1 Ms
LINEARITY: WITHIN +/- 0.5% OF FULL SCALE OUTPUT
HYSTERESIS: LESS THAN 0.3% OF FULL SCALE OUTPUT
REPEATABILITY: WITHIN 0.1% OF FULL SCALE AT RATED LOAD
THERMAL ZERO SHIFT: +/- 0.005% OF FULL SCALE OUTPUT PER DEG... C TEMPERATURE CHANGE OVER THE COMPENSATED RANGE OF 20 TO 150 DEG... C
LOAD LIMITS: 300% OF RATED LOAD WITHOUT 0 SHIFT 
500% OF RATED LOAD WITHOUT CHANGE IN CHARACTERISTICS 
700% OF RATED LOAD WITHOUT MECHANICAL DAMAGE
OPERATING TEMP. RANGE: 0 TO 150 DEG.... C
STORING TEMP. RANGE: -40 TO 180 DEG.... C
COMPRESSION: 0.1% OF HEIGHT AT RATED LOAD
ACCURACY OF CAL.: +/- 0.1% OF FULL SCALE AT RATED LOAD TRACEABLE TO THE NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY ISO ACCREDITED AND GUIDE 17025 LABORATORY STANDARDS
MillMaster® DSP-2000...

High Speed Force Measurement Systems
Suitable for Inner Loop Process Control

Designed specifically to meet the demands of the Modern Rolling Mill, the Millmaster DSP-2000 delivers accurate measurement and communication at the high speed required by today’s technology, and other applications that require continuous measurements.

The Millmaster DSP-2000 processes two input analog signals and supplies four analog output signals at a rate of 10,000 updates per second. Real time histograms representing up to 20 minutes of operation are displayed on the Millmaster’s large graphical screen. The user friendly interface also makes setup and calibration easy.

Simple key presses navigate the operator through on screen diagnostics, allowing you to monitor the information critical to your process. View operator side, drive side, total or differential values.

The Millmaster DSP-2000 can interface with high-capacity magnetic transducers or strain gauge load cells, and is capable of single cell operation.

The Millmaster DSP-2000 can be integrated with any roll force and/or strip tension system to provide the high accuracy and reliability required by today’s modern rolling mill.

Standard Features
- Large 4.6” W x 3.4” H
- 320 x 240 pixel back-lit LCD graphical display
- Five displayed soft keys
- Front panel or serial configuration/calibration
- Operator prompts
- 24 on-board digital I/O
- Multiple screens
- Time domain up to 20 minutes
- High-speed; up to 10,000 counts per second
- Designed for simplicity and ease of use
- Capable of single cell operation
- User password protection
- Factory calibrated prior to shipping
- On screen level detection I/O and rate of rise (metal in mill) detect

Approvals

MillMaster® DSP-2000 Universal System can be integrated with the following load cells:
- 1st Generation ABB Load Cells
- 2nd Generation ABB Load Cells
- ABB MillMate Load Cells
- All Kelk Load Cells
- MillMaster® Load Cells

The DSP-2000’s user friendly interface allows operators to monitor process in real time. A simple key press allows navigation through various screen modes.
Technical Weighing Services, Inc (TWS) was formed in 1986 to provide the steel industry with custom scales, electronic weighing packages, and control systems. Our Process Control Systems Group was formed to compliment the mechanical weighing aspects of our business.

The combination of weighing and material handling capability along with computer based process control products and expertise allows us to offer clients the unique advantage of “One Stop Shopping”. As a company we can offer solutions ranging from the load cells and scales, to complete, integrated control and material handling solutions.

The effective application of weighing science technology demands more than a piece-meal approach. TWS can provide tightly coordinated services such as mechanical design, fabrication, installation, controls design and build, and turnkey project management, thus assuring a successful project.

TWS Roll Force Measurement System

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