

**TOVEY**

**ENGINEERING INNOVATION**

# Product Catalog



**Load Cells and Force/Torque Calibration Systems  
When Performance and Quality Matter Most**

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# CALIBRATION STANDARD (CS) SERIES LOAD CELLS

## FEATURES

- Designed for Metrology Lab Use
- Meets ASTM E74 Class A to 2% of Range, Class AA to 10% of Range (When Calibrated with Primary Standards)
- Lowest Creep
- Lowest Reproducibility Errors
- Includes ASTM E74 Transfer Standard Tension & Compression Calibration
- Temperature Compensated
- Proprietary Modulus Compensated Strain Gages
- Low Sensitivity to Rotation Error



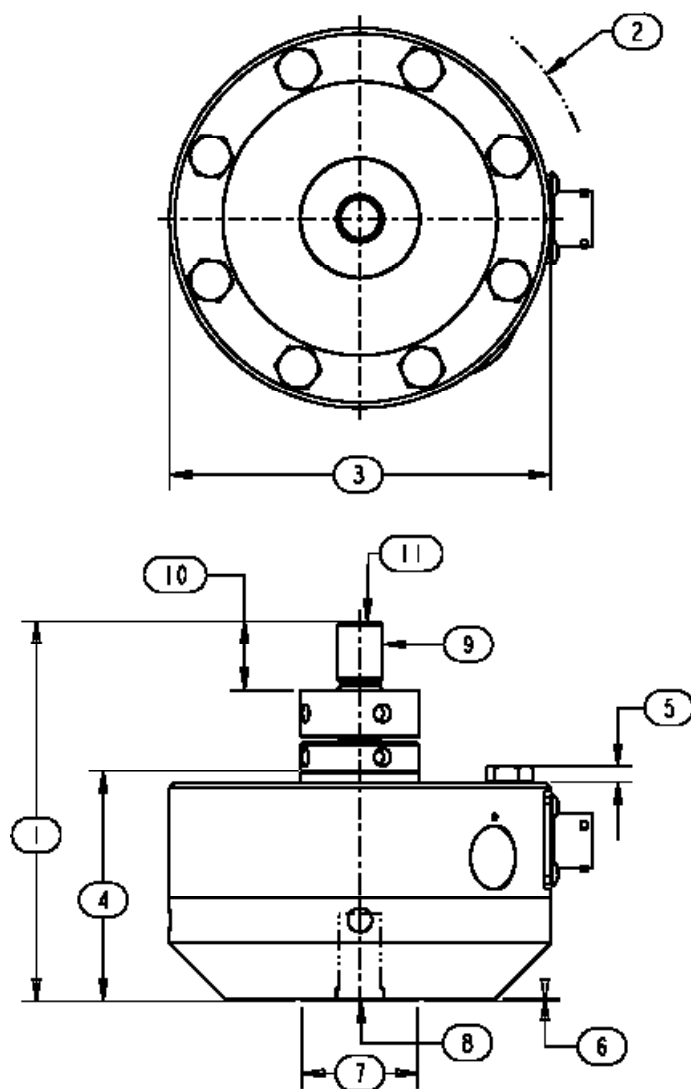
## SPECIFICATIONS

Model	CS10 300, 500, 1K, 2K	CS10 5K, 10K	CS20 25K, 50K	CS22 60K	CS30 100K
Capacity U.S. lbf.					
PARAMETERS Metric kN	1.5, 2.5, 5, 10	25, 50	100, 250	270	300, 500
<b>ACCURACY</b>					
Lower Load Limit, % Rated Output	2.000	2.000	2.000	2.000	2.000
Static Error Band, % Rated Output	+/- 0.020	+/- 0.025	+/- 0.025	+/- 0.030	+/- 0.030
Nonlinearity, % Rated Output	+/- 0.020	+/- 0.030	+/- 0.030	+/- 0.030	+/- 0.030
Hysteresis, % Rated Output	+/- 0.020	+/- 0.040	+/- 0.045	+/- 0.040	+/- 0.040
Nonrepeatability, % Rated Output	+/- 0.005	+/- 0.005	+/- 0.005	+/- 0.005	+/- 0.005
Creep, % in 20 minutes	+/- 0.010	+/- 0.010	+/- 0.010	+/- 0.010	+/- 0.010
Off-Center Load Sensitivity, % / inch	+/- 0.050	+/- 0.050	+/- 0.050	+/- 0.050	+/- 0.050
Side Load Sensitivity, %	+/- 0.050	+/- 0.050	+/- 0.050	+/- 0.050	+/- 0.050
Zero Balance, % Rated Output	+/- 1.0	+/- 1.0	+/- 1.0	+/- 1.0	+/- 1.0
<b>TEMPERATURE</b>					
Range, Compensated, °F	+15 to +115	+15 to +115	+15 to +115	+15 to +115	+15 to +115
Range, Compensated, °C	-10 to +45	-10 to +45	-10 to +45	-10 to +45	-10 to +45
Range, Operating, °F	-65 to +200	-65 to +200	-65 to +200	-65 to +200	-65 to +200
Range, Operating, °C	-55 to +90	-55 to +90	-55 to +90	-55 to +90	-55 to +90
Effect on Sensitivity, % Rdg / °F	+/- 0.0008	+/- 0.0008	+/- 0.0008	+/- 0.0008	+/- 0.0008
Effect on Sensitivity, % Rdg / °C	+/- 0.0015	+/- 0.0015	+/- 0.0015	+/- 0.0015	+/- 0.0015
Effect on Zero, % Rated Output / ° F	+/- 0.0008	+/- 0.0008	+/- 0.0008	+/- 0.0008	+/- 0.0008
Effect on Zero, % Rated Output / ° C	+/- 0.0015	+/- 0.0015	+/- 0.0015	+/- 0.0015	+/- 0.0015
<b>ELECTRICAL</b>					
Rated Output, mV/V, Nominal	2	4	4	4	4
Excitation Voltage, VDC Maximum	20	20	20	20	20
Input Resistance, Ohms	350 +40 / -3.5	350 +40 / -3.5	350 +40 / -3.5	350 +40 / -3.5	350 +40 / -3.5
Output Resistance, Ohms	350 +/- 3.5	350 +/- 3.5	350 +/- 3.5	350 +/- 3.5	350 +/- 3.5
Insulation Resistance, Megohms	5000 @ 50 VDC	5000 @ 50 VDC	5000 @ 50 VDC	5000 @ 50 VDC	5000 @ 50 VDC
Bayonet Connector	PT02E-10-6P (MS3112E-10-6P)				
<b>MECHANICAL</b>					
Safe Overload Range, % Rated Capacity	+/- 150	+/- 150	+/- 150	+/- 150	+/- 150
Weight, lb	2.8	6.9	23.6	29.6	57.8
Weight, kg	1.3	3.1	10.8	13.4	26.2
Flexure Material	Aluminum	Steel	Steel	Steel	Steel

# CALIBRATION STANDARD (CS) SERIES LOAD CELLS

## DIMENSIONS

Model	CS10	CS10M	CS10	CS10M	CS20	CS20M	CS22	CS22M	CS30	CS30M
Capacity	300, 500 1K, 2K lbf	1.5, 2.5, 5, 10 kN	5K, 10K lbf	25, 50 kN	25K, 50K lbf	100, 250 kN	60K lbf	270 kN	100K lbf	300, 500 kN
Dimensions	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
1.	4.13	104.9	4.13	106.7	6.32	160.5	7.68	195	7.85	199.4
2.	R 2.53	R 64.3	R 2.53	R 64.3	R 3.50	R 88.9	R 3.50	R 88.9	R 4.50	R 114.3
3.	4.12	104.8	4.12	104.8	6.06	154.0	6.06	154.0	8.00	203.2
4.	2.50	63.5	2.50	63.5	3.50	88.9	4.50	114.3	4.50	114.3
5.	0.19	4.7	0.19	4.7	0.30	7.5	0.31	7.9	0.40	10.2
6.	0.03	0.8	0.03	0.8	0.03	0.8	0.03	0.8	0.03	0.8
7.	1.25	31.8	1.25	31.8	2.25	57.2	3.00	76.2	3.00	76.2
8.	1/2 - 20 0.88 Deep	M12 x 1.25 22.4 Deep	5/8 - 18 0.88 Deep	M16 x 2 22.4 Deep	1 1/4 - 12 1.50 Deep	M33 x 2 38.1 Deep	1 1/2 - 12 2.0 Deep	M36 x 2 30.8 Deep	1 3/4 - 12 1.75 Deep	M42 x 2 44.5 Deep
9.	1/2 - 20	M12 x 1.25	5/8 - 18	M16 x 2	1 1/4 - 12	M33 x 2	1 1/2 - 12	M36 x 2	1 3/4 - 12	M42 x 2
10.	0.75	19.0	0.75	19.0	1.50	38.1	1.50	38.1	1.75	44.5
11.	R 4.00	R 101.6	R 4.00	R 101.6	R 6.00	R 152.4	R 6.00	R 152.4	R 12.00	R 304.8



### OPTIONS

- Additional bridges
- Output adjustment to standard
- Compression overload protection
- Integral cable
- Custom connectors
- Connector Protectors

### ACCESSORIES

- Mating connector
- Loading fixtures
- Interconnect cable
- Shunt calibration resistor
- Instrumentation

# /// HIGH CAPACITY CALIBRATION STANDARD (CS) SERIES LOAD CELLS

## FEATURES

- Designed for Metrology Lab Use
- Meets ASTM E74 Class A to 4% of Range, Class AA to 20% of Range (When Calibrated with Primary Standards)
- Guaranteed Maximum Off-Center Load & Moment Error
- Low Creep
- Lowest Reproducibility Errors
- Includes ASTM E74 Tension & Compression Transfer Standard Calibration
- Temperature Compensated
- Proprietary Modulus Compensated Strain Gages



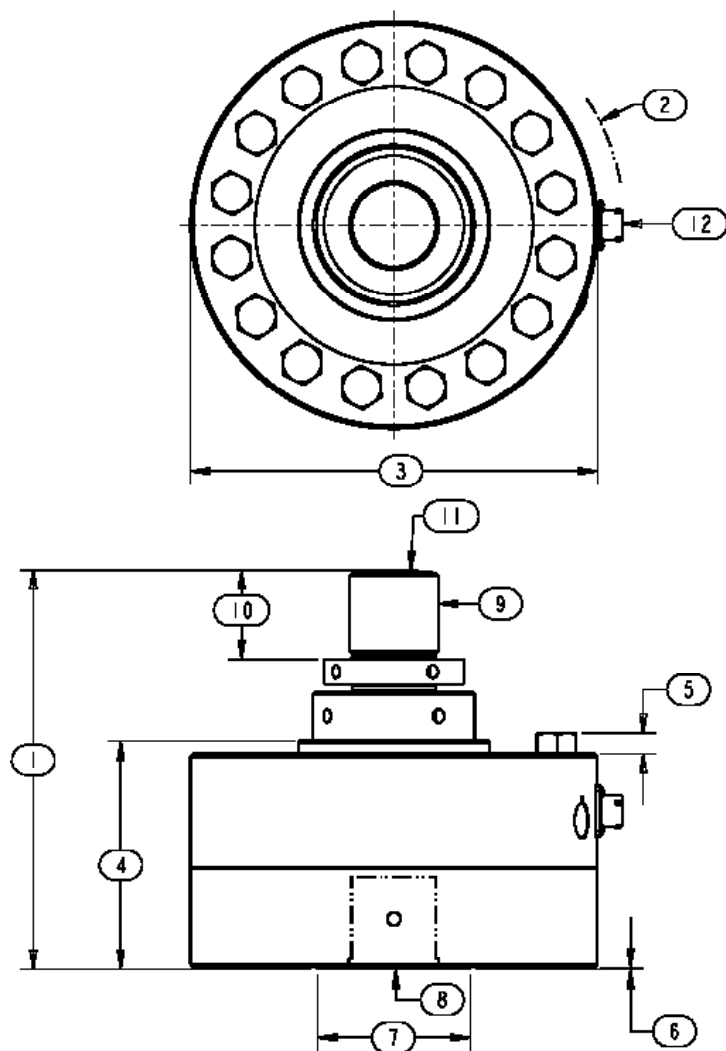
## SPECIFICATIONS

Model	CS40	CS42	CS45	CS62	CS80
Capacity U.S. lbf.	200K	270K	300K, 400K	500K, 600K	750K, 1000K
PARAMETERS Metric kN	1000	1200	1400, 1800	2200, 2700	3300, 4500
<b>ACCURACY</b>					
Lower Load Limit, % Rated Output	4.000	4.000	4.000	4.000	4.000
Static Error Band, % Rated Output	+/- 0.050	+/- 0.060	+/- 0.100	+/- 0.100	+/- 0.120
Nonlinearity, % Rated Output	+/- 0.050	+/- 0.060	+/- 0.100	+/- 0.100	+/- 0.120
Hysteresis, % Rated Output	+/- 0.050	+/- 0.060	+/- 0.100	+/- 0.100	+/- 0.120
Nonrepeatability, % Rated Output	+/- 0.005	+/- 0.005	+/- 0.010	+/- 0.010	+/- 0.010
Creep, % in 20 minutes	+/- 0.010	+/- 0.015	+/- 0.015	+/- 0.015	+/- 0.015
Off-Center Load Sensitivity, % / inch	+/- 0.100	+/- 0.100	+/- 0.200	+/- 0.200	+/- 0.200
Side Load Sensitivity, %	+/- 0.100	+/- 0.100	+/- 0.200	+/- 0.200	+/- 0.200
Zero Balance, % Rated Output	+/- 1.0	+/- 1.0	+/- 1.0	+/- 1.0	+/- 1.0
<b>TEMPERATURE</b>					
Range, Compensated, °F	+15 to +115	+15 to +115	+15 to +115	+15 to +115	+15 to +115
Range, Compensated, °C	-10 to +45	-10 to +45	-10 to +45	-10 to +45	-10 to +45
Range, Operating, °F	-65 to +200	-65 to +200	-65 to +200	-65 to +200	-65 to +200
Range, Operating, °C	-55 to +90	-55 to +90	-55 to +90	-55 to +90	-55 to +90
Effect on Sensitivity, % Rdg / °F	+/- 0.0008	+/- 0.0008	+/- 0.0008	+/- 0.0008	+/- 0.0008
Effect on Sensitivity, % Rdg / °C	+/- 0.0015	+/- 0.0015	+/- 0.0015	+/- 0.0015	+/- 0.0015
Effect on Zero, % Rated Output / ° F	+/- 0.0008	+/- 0.0008	+/- 0.0008	+/- 0.0008	+/- 0.0008
Effect on Zero, % Rated Output / ° C	+/- 0.0015	+/- 0.0015	+/- 0.0015	+/- 0.0015	+/- 0.0015
<b>ELECTRICAL</b>					
Rated Output, mV/V, Nominal	4	4	4	4	4
Excitation Voltage, VDC Maximum	20	20	20	20	20
Input Resistance, Ohms	350 +40 / -3.5	350 +40 / -3.5	350 +40 / -3.5	350 +40 / -3.5	350 +40 / -3.5
Output Resistance, Ohms	350 +/- 3.5	350 +/- 3.5	350 +/- 3.5	350 +/- 3.5	350 +/- 3.5
Insulation Resistance, Megohms	5000 @ 50 VDC	5000 @ 50 VDC	5000 @ 50 VDC	5000 @ 50 VDC	5000 @ 50 VDC
Bayonet Connector	PT02E-10-6P (MS3112E-10-6P) Included Protector				
<b>MECHANICAL</b>					
Safe Overload Range, % Rated Capacity	+/- 150	+/- 150	+/- 150	+/- 150	+/- 150
Weight, lb	166	176	277	519	660
Weight, kg	75	80	125	235	300
Flexure Material	Steel	Steel	Steel	Steel	Steel

# HIGH CAPACITY CALIBRATION STANDARD (CS) SERIES LOAD CELLS

## DIMENSIONS

Model	CS40	CS40M	CS42	CS42M	CS45	CS45M	CS62	CS62M	CS80	CS80M
Capacity	200K lbf	1000 kN	270K lbf	1200 kN	300K, 400K lbf	1400, 1800 kN	500K, 600K lbf	2200, 2700 kN	750K, 1000K lbf	3300, 4500 kN
Dimensions	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
1.	11.58	290.6	13.08	332.2	13.87	352.3	17.67	448.8	24.29	616.9
2.	R 6.16	R 156.5	R 6.16	R 156.5	R 6.78	172.2	R 8.65	R 219.7	R 10.89	R 276.6
3.	11.00	279.4	11.00	279.4	12.25	311.2	16.00	406.4	20.50	520.7
4.	6.50	165.1	8.00	203.2	8.75	222.3	10.25	260.4	13.00	330.2
5.	0.60	15.2	0.60	15.2	0.60	15.2	0.92	23.4	0.77	19.5
6.	0.03	0.8	0.03	0.8	0.03	0.8	0.03	0.8	0.03	0.8
7.	4.83	122.7	4.83	122.7	5.70	144.8	7.89	200.4	10.00	254
8.	2 3/4 - 8 2.70 Deep	M72 x 2 68.6 Deep	2 3/4 - 8 3.70 Deep	M72 x 2 94.0 Deep	3 - 12 3.90 Deep	M76 x 2 99.1 Deep	4 - 8 4.65 Deep	M100 x 3 118.1 Deep	6 - 8 5.4 Deep	M150 x 3 137.1 Deep
9.	2 3/4 - 8	M72 x 2	2 3/4 - 8	M72 x 2	3 - 12	M76 x 2	4 - 8	M100 x 3	6 - 8	M150 x 3
10.	2.50	63.5	2.50	63.5	2.50	63.5	3.50	88.9	4.70	119.3
11.	R 12	R 305	R 12	R 305	R 12	R 305	R 20	R 508	R 20	R 508



### OPTIONS

- Additional bridges
- Output adjustment to standard
- Compression overload protection
- Integral cable
- Custom connectors
- Connector Protectors

### ACCESSORIES

- Mating connector
- Loading fixtures
- Interconnect cable
- Shunt calibration resistor
- Instrumentation

# SHEAR WEB (SW) SERIES LOAD CELLS

## FEATURES

- First Choice for Structural and Materials Testing
- Low Height
- Guaranteed Maximum Off-Center Load & Moment Error
- Low Creep
- Low Susceptibility to Magnetic Fields
- Barometric Pressure Compensation
- Output to 4 mV/V
- 5pt Tension & Compression Calibration
- Proprietary Modulus Compensated Strain Gages



## SPECIFICATIONS

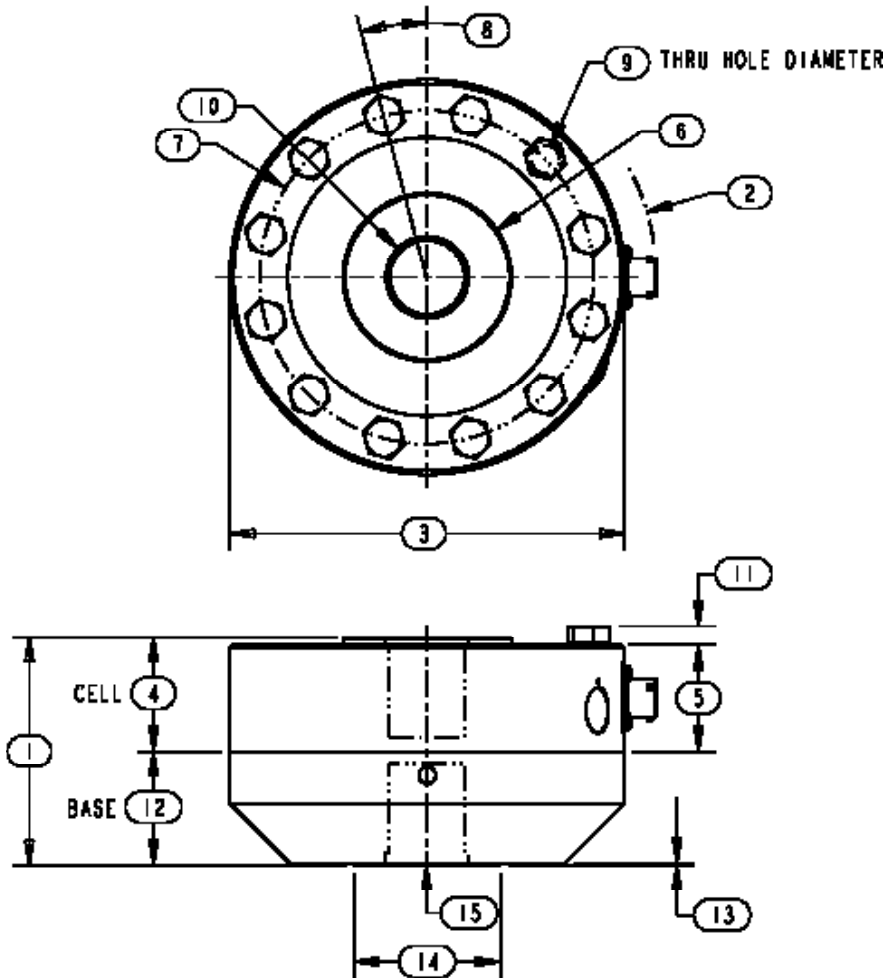
Model	SW10 300, 500, 1K, 2K	SW10 5K, 10K	SW20 25K, 50K	SW22 60K	SW30 100K
Capacity U.S. lbf.					
Capacity Metric kN	1.5, 2.5, 5, 10	25, 50	100, 250	270	300, 500
<b>PARAMETERS</b>					
<b>ACCURACY</b>					
Static Error Band, % Rated Output	+/- 0.040	+/- 0.040	+/- 0.040	+/- 0.050	+/- 0.050
Nonlinearity, % Rated Output	+/- 0.040	+/- 0.040	+/- 0.040	+/- 0.050	+/- 0.050
Hysteresis, % Rated Output	+/- 0.030	+/- 0.040	+/- 0.050	+/- 0.050	+/- 0.050
Nonrepeatability, % Rated Output	+/- 0.010	+/- 0.010	+/- 0.010	+/- 0.010	+/- 0.010
Creep, % in 20 minutes	+/- 0.025	+/- 0.025	+/- 0.025	+/- 0.025	+/- 0.025
Off-Center Load Sensitivity, % / inch	+/- 0.250	+/- 0.250	+/- 0.250	+/- 0.250	+/- 0.250
Side Load Sensitivity, %	+/- 0.250	+/- 0.250	+/- 0.250	+/- 0.250	+/- 0.250
Zero Balance, % Rated Output	+/- 1.0	+/- 1.0	+/- 1.0	+/- 1.0	+/- 1.0
<b>TEMPERATURE</b>					
Range, Compensated, °F	+15 to +115	+15 to +115	+15 to +115	+15 to +115	+15 to +115
Range, Compensated, °C	-10 to +45	-10 to +45	-10 to +45	-10 to +45	-10 to +45
Range, Operating, °F	-65 to +200	-65 to +200	-65 to +200	-65 to +200	-65 to +200
Range, Operating, °C	-55 to +90	-55 to +90	-55 to +90	-55 to +90	-55 to +90
Effect on Sensitivity, % Rdg / °F	+/- 0.0008	+/- 0.0008	+/- 0.0008	+/- 0.0008	+/- 0.0008
Effect on Sensitivity, % Rdg / °C	+/- 0.0015	+/- 0.0015	+/- 0.0015	+/- 0.0015	+/- 0.0015
Effect on Zero, % Rated Output / °F	+/- 0.0008	+/- 0.0008	+/- 0.0008	+/- 0.0008	+/- 0.0008
Effect on Zero, % Rated Output / °C	+/- 0.0015	+/- 0.0015	+/- 0.0015	+/- 0.0015	+/- 0.0015
<b>ELECTRICAL</b>					
Rated Output, mV/V, Nominal	2	4	4	4	4
Excitation Voltage, VDC Maximum	20	20	20	20	20
Input Resistance, Ohms	350 +40 / -3.5	350 +40 / -3.5	350 +40 / -3.5	350 +40 / -3.5	350 +40 / -3.5
Output Resistance, Ohms	350 +/- 3.5	350 +/- 3.5	350 +/- 3.5	350 +/- 3.5	350 +/- 3.5
Insulation Resistance, Megohms	5000 @ 50 VDC	5000 @ 50 VDC	5000 @ 50 VDC	5000 @ 50 VDC	5000 @ 50 VDC
Bayonet Connector	PT02E-10-6P (MS3112E-10-6P)				
<b>MECHANICAL</b>					
Safe Overload Range, % Rated Capacity	+/- 150	+/- 150	+/- 150	+/- 150	+/- 150
Weight, lb	1.0	2.9	9.1	13.5	23.5
Weight, kg	0.5	1.3	4.1	6.1	10.7
Weight w/base, lb	2.5	6.5	21.5	27.5	52.5
Weight w/base, kg	1.1	3.0	9.8	12.5	23.8
Flexure Material	Aluminum	Steel	Steel	Steel	Steel



# SHEAR WEB (SW) SERIES LOAD CELLS

## DIMENSIONS

Model	SW10	SW10M	SW10	SW10M	SW20	SW20M	SW22	SW22M	SW30	SW30M
<b>Capacity</b>	300, 500, 1K, 2K lbf	1.5, 2.5, 5, 10 kN	5K, 10K lbf	25, 50 kN	25K, 50K lbf	100, 250 kN	60K lbf	270 kN	100K lbf	300,500 kN
<b>Dimensions</b>	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
1.	2.51	63.5	2.51	63.5	3.51	88.9	4.50	114.3	4.50	114.3
2.	R 2.53	R 64.3	R 2.53	R 64.3	R 3.50	R 88.9	R 3.50	R 88.9	R 4.50	R 114.3
3.	4.12	104.8	4.12	104.8	6.06	154.0	6.06	154.0	8.00	203.2
4.	1.38	34.9	1.38	34.9	1.75	44.5	2.25	57.2	2.50	63.5
5.	1.25	31.8	1.25	31.8	1.63	41.3	2.13	54.1	2.25	57.2
6.	1.29	32.8	1.29	32.8	2.34 25K 2.58 50K	59.4 100kN 65.6 250kN	2.58	65.6	3.76	95.6
7.	3.50	88.9	3.50	88.9	5.13	130.3	5.13	130.3	6.50	165.1
8.	22.5°	22.5°	22.5°	22.5°	15°	15°	15°	15°	11.25°	11.25°
9.	0.28 8 Places	7.1 8 Places	0.28 8 Places	7.1 8 Places	0.41 12 Places	10.3 12 Places	0.47 12 Places	11.9 12 Places	0.53 16 Places	13.5 16 Places
10.	1/2 - 20 1.12 Deep	M12 x 1.25 28.5 Deep	5/8 - 18 1.12 Deep	M16 x 2 28.5 Deep.	1 1/4 - 12 1.50 Deep	M33x 2 38.1 Deep	1 1/2 - 12 2.0 Deep	M36x 2 50.8 Deep	1 3/4 - 12 2.20 Deep	M42 x 2 55.9 Deep
11.	0.18	4.7	0.18	4.7	0.29	7.5	0.31	7.9	0.40	10.2
12.	1.13	28.6	1.13	28.6	1.75	44.5	2.25	57.2	2.00	50.8
13.	0.03	0.8	0.03	0.8	0.03	0.8	0.03	0.8	0.03	0.8
14.	1.25	31.8	1.25	31.8	2.25	57.2	3.00	76.2	3.00	76.2
15.	1/2 - 20 .88 Deep	M12 x 1.25 22.4 Deep	5/8 - 18 .88 Deep	M16 x 2 22.4 Deep	1 1/4 - 12 1.50 Deep	M33 x 2 38.1 Deep	1 1/2 - 12 2.00 Deep	M36 x 2 50.8 Deep	1 3/4 - 12 1.75 Deep	M42 x 2 44.5 Deep



### OPTIONS

- Additional bridges
- Output adjustment to standard
- Compression overload protection
- Integral cable
- Custom connectors
- Connector Protectors
- Base

### ACCESSORIES

- Mating connector
- Loading fixtures
- Interconnect cable
- Shunt calibration resistor
- Instrumentation

# HIGH CAPACITY SHEAR WEB (SW) SERIES LOAD CELLS

## FEATURES

- First Choice for Structural and Materials Testing
- Low Height
- Guaranteed Maximum Off-Center Load and Moment Error
- Low Creep
- Low Susceptibility to Magnetic Fields
- Barometric Pressure Compensation
- Output to 4 mV/V
- 5pt Tension & Compression Calibration
- Proprietary Modulus Compensated Strain Gages



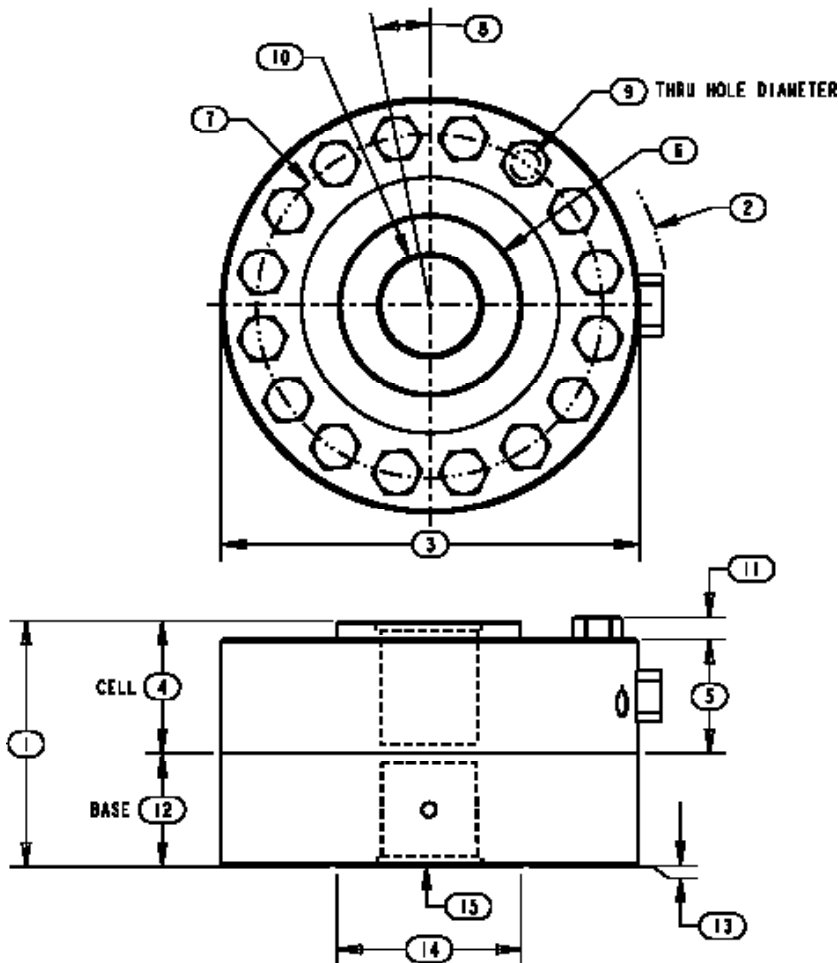
## SPECIFICATIONS

Model	SW40	SW42	SW45	SW62	SW80
Capacity U.S. lbf.	200K	270K	300K, 400K	500K, 600K	750K, 1000K
PARAMETERS Metric kN	1000	1200	1400, 1800	2200, 2700	3300, 4500
<b>ACCURACY</b>					
Static Error Band, % Rated Output	+/- 0.070	+/- 0.070	+/- 0.120	+/- 0.120	+/- 0.150
Nonlinearity, % Rated Output	+/- 0.070	+/- 0.080	+/- 0.120	+/- 0.120	+/- 0.150
Hysteresis, % Rated Output	+/- 0.070	+/- 0.080	+/- 0.120	+/- 0.120	+/- 0.150
Nonrepeatability, % Rated Output	+/- 0.010	+/- 0.020	+/- 0.020	+/- 0.020	+/- 0.020
Creep, % in 20 minutes	+/- 0.025	+/- 0.025	+/- 0.025	+/- 0.025	+/- 0.025
Off-Center Load Sensitivity, % / inch	+/- 0.250	+/- 0.250	+/- 0.250	+/- 0.250	+/- 0.250
Side Load Sensitivity, %	+/- 0.250	+/- 0.250	+/- 0.250	+/- 0.250	+/- 0.250
Zero Balance, % Rated Output	+/- 1.0	+/- 1.0	+/- 1.0	+/- 1.0	+/- 1.0
<b>TEMPERATURE</b>					
Range, Compensated, °F	+15 to +115	+15 to +115	+15 to +115	+15 to +115	+15 to +115
Range, Compensated, °C	-10 to +45	-10 to +45	-10 to +45	-10 to +45	-10 to +45
Range, Operating, °F	-65 to +200	-65 to +200	-65 to +200	-65 to +200	-65 to +200
Range, Operating, °C	-55 to +90	-55 to +90	-55 to +90	-55 to +90	-55 to +90
Effect on Sensitivity, % Rdg / °F	+/- 0.0008	+/- 0.0008	+/- 0.0008	+/- 0.0008	+/- 0.0008
Effect on Sensitivity, % Rdg / °C	+/- 0.0015	+/- 0.0015	+/- 0.0015	+/- 0.0015	+/- 0.0015
Effect on Zero, % Rated Output / °F	+/- 0.0008	+/- 0.0008	+/- 0.0008	+/- 0.0008	+/- 0.0008
Effect on Zero, % Rated Output / °C	+/- 0.0015	+/- 0.0015	+/- 0.0015	+/- 0.0015	+/- 0.0015
<b>ELECTRICAL</b>					
Rated Output, mV/V, Nominal	4	4	4	4	4
Excitation Voltage, VDC Maximum	20	20	20	20	20
Input Resistance, Ohms	350 +40 / -3.5	350 +40 / -3.5	350 +40 / -3.5	350 +40 / -3.5	350 +40 / -3.5
Output Resistance, Ohms	350 +/- 3.5	350 +/- 3.5	350 +/- 3.5	350 +/- 3.5	350 +/- 3.5
Insulation Resistance, Megohms	5000 @ 50 VDC	5000 @ 50 VDC	5000 @ 50 VDC	5000 @ 50 VDC	5000 @ 50 VDC
Bayonet Connector	PT02E-10-6P (MS3112E-10-6P) Included Protector				
<b>MECHANICAL</b>					
Safe Overload Range, % Rated Capacity	+/- 150	+/- 150	+/- 150	+/- 150	+/- 150
Weight, lb	74	84	120	245	450
Weight, kg	34	38	54	111	204
Weight w/base, lb	146	156	250	448	1050
Weight w/base, kg	66	71	113	203	476
Flexure Material	Steel	Steel	Steel	Steel	Steel

# HIGH CAPACITY SHEAR WEB (SW) SERIES LOAD CELLS

## DIMENSIONS

Model	SW40	SW40M	SW42	SW42M	SW45	SW45M	SW62	SW62M	SW80	SW80M
Capacity	200K lbf	1000 kN	270K lbf	1200 kN	300K, 400K lbf	1400, 1800 kN	500K, 600K lbf	2200, 2700 kN	750K, 1000K lbf	3300, 4500 kN
Dimensions	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
1.	6.50	165.1	8.00	203.2	8.75	222.3	10.25	260.4	13.00	330.2
2.	R 6.16	R 156.5	R 6.16	R 156.5	R 6.78	R 172.2	R 8.65	R 219.7	R 10.89	R 276.6
3.	11.00	279.4	11.00	279.4	12.25	311.2	16.00	406.4	20.50	520.7
4.	3.50	88.9	4.00	101.6	4.50	114.3	5.25	133.3	6.50	165.1
5.	3.00	76.2	3.50	88.9	4.25	108.0	4.75	120.6	6.25	158.7
6.	4.81	122.2	4.81	122.2	6.13	155.7	7.89	200.4	9.86	250.4
7.	9.00	228.6	9.00	228.6	10.11	256.9	13.06	331.6	16.50	419.1
8.	11.25°	11.25°	11.25°	11.25°	9.0°	9.0°	9.0°	9.0°	6.4°	6.4°
9.	0.78 16 Places	19.8 16 Places	0.78 16 Places	19.8 16 Places	0.78 20 Places	19.8 20 Places	1.18 20 Places	30.0 20 Places	1.06 28 Places	26.9 28 Places
10.	2 3/4 - 8 3.2 Deep	M72 x 2 81.3 Deep	2 3/4 - 8 3.7 Deep	M72 x 2 94.0 Deep	3 - 12 4.00 Deep	M76 x 2 101.6 Deep	4 - 8 4.75 Deep	M100 x 3 120.6 Deep	6 - 8 5.4 Deep	M150 x 3 137.1 Deep
11.	0.60	15.2	0.60	15.2	0.60	15.2	0.92	23.4	0.77	19.5
12.	3.00	76.2	4.00	101.6	4.25	108.0	5.00	127.0	6.50	165.1
13.	0.03	0.8	0.03	0.8	0.03	0.8	0.03	0.8	0.03	0.8
14.	4.83	122.7	4.83	122.7	5.70	144.8	7.89	200.4	10.00	254.0
15.	2 3/4 - 8 2.70 Deep	M72 x 2 68.6 Deep	2 3/4 - 8 3.70 Deep	M72 x 2 94.0 Deep	3 - 12 3.90 Deep	M76 x 2 99.1 Deep	4 - 8 4.65 Deep	M100 x 3 118.1 Deep	6 - 8 5.4 Deep	M150 x 3 137.1 Deep



### OPTIONS

- Additional bridges
- Output adjustment to standard
- Compression overload protection
- Integral cable
- Custom connectors
- Connector Protectors
- Base

### ACCESSORIES

- Mating connector
- Loading fixtures
- Interconnect cable
- Shunt calibration resistor
- Instrumentation

# SHEAR WEB COMPRESSION ONLY (SW) SERIES LOAD CELLS

## FEATURES

- Low Height
- Guaranteed Maximum Off-Center Load and Moment Error
- Low Creep
- Low Susceptibility to Magnetic Fields
- Counterbored Mounting Holes (w/out Base)
- Output to 4mV/V
- Integral Compression Interface (above 5K)
- 5pt Compression Calibration
- Proprietary Modulus Compensated Strain Gages



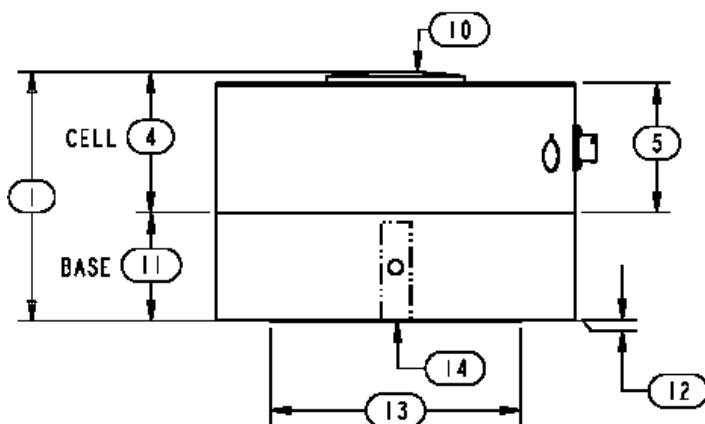
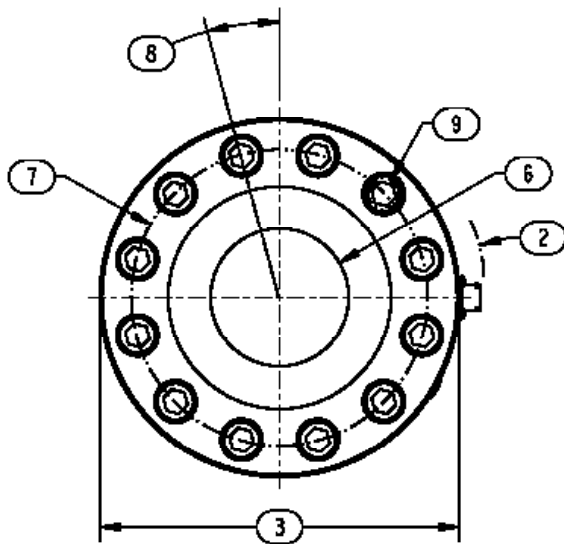
## SPECIFICATIONS

Model	SW11 300, 500, 1K, 2K	SW11 5K, 10K	SW21 25K, 50K	SW31 100K	SW41 200K
Capacity U.S. lbf.					
PARAMETERS Metric kN	1.5, 2.5, 5, 10	25, 50	100, 250	500	1000
<b>ACCURACY</b>					
Static Error Band, % Rated Output	+/- 0.030	+/- 0.040	+/- 0.040	+/- 0.040	+/- 0.050
Nonlinearity, % Rated Output	+/- 0.030	+/- 0.040	+/- 0.050	+/- 0.050	+/- 0.050
Hysteresis, % Rated Output	+/- 0.030	+/- 0.040	+/- 0.050	+/- 0.050	+/- 0.050
Nonrepeatability, % Rated Output	+/- 0.010	+/- 0.010	+/- 0.010	+/- 0.010	+/- 0.010
Creep, % in 20 minutes	+/- 0.025	+/- 0.025	+/- 0.025	+/- 0.025	+/- 0.025
Off-Center Load Sensitivity, % / inch	+/- 0.250	+/- 0.250	+/- 0.250	+/- 0.250	+/- 0.250
Side Load Sensitivity, %	+/- 0.250	+/- 0.250	+/- 0.250	+/- 0.250	+/- 0.250
Zero Balance, % Rated Output	+/- 1.0	+/- 1.0	+/- 1.0	+/- 1.0	+/- 1.0
<b>TEMPERATURE</b>					
Range, Compensated, °F	+15 to +115	+15 to +115	+15 to +115	+15 to +115	+15 to +115
Range, Compensated, °C	-10 to +45	-10 to +45	-10 to +45	-10 to +45	-10 to +45
Range, Operating, °F	-65 to +200	-65 to +200	-65 to +200	-65 to +200	-65 to +200
Range, Operating, °C	-55 to +90	-55 to +90	-55 to +90	-55 to +90	-55 to +90
Effect on Sensitivity, % Rdg / °F	+/- 0.0008	+/- 0.0008	+/- 0.0008	+/- 0.0008	+/- 0.0008
Effect on Sensitivity, % Rdg / °C	+/- 0.0015	+/- 0.0015	+/- 0.0015	+/- 0.0015	+/- 0.0015
Effect on Zero, % Rated Output / °F	+/- 0.0008	+/- 0.0008	+/- 0.0008	+/- 0.0008	+/- 0.0008
Effect on Zero, % Rated Output / °C	+/- 0.0015	+/- 0.0015	+/- 0.0015	+/- 0.0015	+/- 0.0015
<b>ELECTRICAL</b>					
Rated Output, mV/V, Nominal	2	4	4	4	4
Excitation Voltage, VDC Maximum	20	20	20	20	20
Input Resistance, Ohms	350 +40 / -3.5	350 +40 / -3.5	350 +40 / -3.5	350 +40 / -3.5	350 +40 / -3.5
Output Resistance, Ohms	350 +/- 3.5	350 +/- 3.5	350 +/- 3.5	350 +/- 3.5	350 +/- 3.5
Insulation Resistance, Megohms	5000 @ 50 VDC	5000 @ 50 VDC	5000 @ 50 VDC	5000 @ 50 VDC	5000 @ 50 VDC
Bayonet Connector	PT02E-10-6P (MS3112E-10-6P)				
<b>MECHANICAL</b>					
Safe Overload Range, % Rated Capacity	150	150	150	150	150
Weight, lb	1.1	3.1	5.1	12	33
Weight, kg	0.5	1.4	2.3	5.4	15
Weight w/base, lb	2.6	6.7	12.1	30.3	70
Weight w/base, kg	1.2	3.0	5.5	13.7	32
Flexure Material	Aluminum	Steel	Steel	Steel	Steel

# SHEAR WEB COMPRESSION ONLY (SW) SERIES LOAD CELLS

## DIMENSIONS

Model	SW11	SW11M	SW11	SW11M	SW21	SW21M	SW31	SW31M	SW41	SW41M
Capacity	300, 500, 2K, 5K lbf	1.5, 2.5, 5, 10, 25 kN	10K lbf	50 kN	25K, 50K lbf	100, 250kN	100K lbf	500 kN	200K lbf	1000 kN
Dimensions	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
1.			2.50	63.50	3.00	76.20	4.49	114	5.75	146.10
2.			R 2.53	R 64.30	R 2.84	R 72.1	R 3.51	R 89.10	R 4.61	R 117.10
3.			4.12	104.65	4.75	120.70	6.06	154.00	8.25	209.60
4.			1.38	35.00	1.75	44.50	2.50	63.50	3.25	82.60
5.			1.25	31.75	1.63	41.40	2.25	57.20	3.00	76.20
6.			1.29	32.80	1.56	39.60	2.58	65.50	3.16	80.30
7.			3.50	88.90	4.00	101.6	5.13	130.30	6.75	171.50
8.			22.5°	22.5°	45°	45°	15°	15°	15°	15°
9.	See SW for dimensions add compatible Load Button		C'Bore for 1/4 - 28 8 Places	C'Bore for M6 8 Places	C'Bore for 5/16 - 24 4 Places	C'Bore for M8 4 Places	C'Bore for 3/8 - 24 12 Places	C'Bore for M10 12 Places	C'Bore for 5/8 - 18 12 Places	C'Bore for M16 12 Places
10.			R 4.00	R 101.60	R 6.00	R 152.40	R 8.00	R 203.20	R 12.00	R 304.80
11.			1.13	28.70	1.25	31.80	1.99	50.50	2.50	63.50
12.			0.03	0.80	0.03	0.80	0.03	0.80	0.03	0.80
13.			1.25	31.75	2.00	50.80	4.38	111.30	5.75	146.10
14.			5/8 - 18 0.88 Deep	M12 x 1.25 22.4 Deep	1/2 - 20 1.00 Deep	M12 x 1.25 26 Deep	3/4 - 16 1.50 Deep	M27 x 2 38 Deep	3/4 - 16 1.50 Deep	M27 x 2 38 Deep



### OPTIONS

- Additional bridges
- Output adjustment to standard
- Compression overload protection
- Integral cable
- Custom connectors
- Connector Protectors

### ACCESSORIES

- Mating connector
- Loading fixtures
- Interconnect cable
- Shunt calibration resistor
- Instrumentation

# 2202 ROD END LOAD CELL

## FEATURES

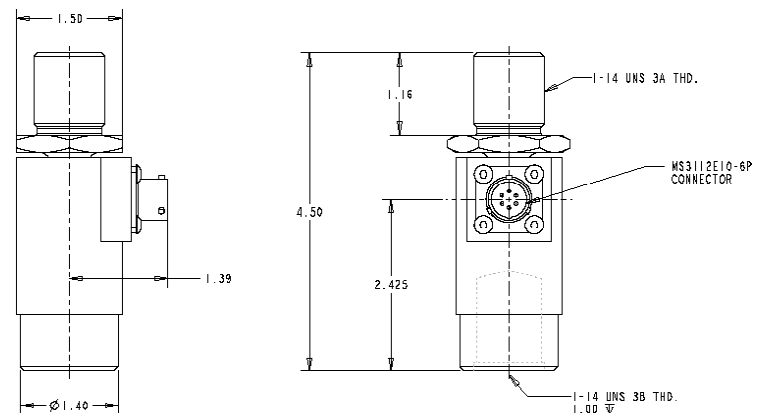
- Designed to attach directly onto Hydraulic Cylinders
- High Capacity vs Size
- Low Deflection
- Stable and Accurate
- 5pt Tension & Compression Calibration
- Proprietary Modulus Compensated Strain Gages



## SPECIFICATIONS

Model	2202
Capacity	U.S. lbf. 5K, 10K, 15K, 20K, 25K
<b>PARAMETERS</b>	
<b>ACCURACY</b>	
Static Error Band, % Rated Output	+/- 0.250
Nonlinearity, % Rated Output	+/- 0.250
Hysteresis, % Rated Output	+/- 0.150
Nonrepeatability, % Rated Output	+/- 0.050
Zero Balance, % Rated Output	+/- 1.0
<b>TEMPERATURE</b>	
Range, Compensated, °F	+70 to +170
Range, Compensated, °C	+21 to +77
Range, Operating, °F	-65 to +200
Range, Operating, °C	-55 to +90
Effect on Sensitivity, % Rdg / °F	+/- 0.0020
Effect on Sensitivity, % Rdg / °C	+/- 0.0036
Effect on Zero, % Rated Output / °F	+/- 0.0020
Effect on Zero, % Rated Output / °C	+/- 0.0036
<b>ELECTRICAL</b>	
Rated Output, mV/V, Nominal	2
Excitation Voltage, VDC Recommended/Max	10 / 15
Input Resistance, Ohms	350 +40 / -3.5
Output Resistance, Ohms	350 +/- 3.5
Insulation Resistance, Megohms	5000 @ 50 VDC
Bayonet Connector	PT02E-10-6P (MS3112E-10-6P)
<b>MECHANICAL</b>	
Safe Overload Range, % Rated Capacity	+/- 150
Weight, lb	1.2
Flexure Material	Stainless Steel

## DIMENSIONS



## OPTIONS

- Additional bridges
- Output adjustment to standard
- Integral cable
- Custom connectors

## ACCESSORIES

- Mating connector
- Loading fixtures
- Interconnect cable
- Shunt calibration resistor
- Instrumentation

# 2206 ROD END LOAD CELL

## FEATURES

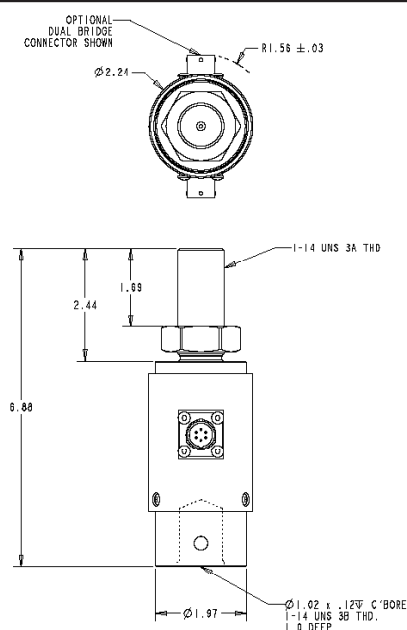
- Designed to attach directly on Hydraulic Cylinders
- High Capacity vs. Size
- Low Deflection
- Stable and Accurate
- 5pt Tension & Compression Calibration
- Proprietary Modulus Compensated Strain Gages



## SPECIFICATIONS

Model	2206
Capacity	U.S. lbf. 25K
<b>PARAMETERS</b>	
<b>ACCURACY</b>	
Static Error Band, % Rated Output	+/- 0.150
Nonlinearity, % Rated Output	+/- 0.150
Hysteresis, % Rated Output	+/- 0.100
Nonrepeatability, % Rated Output	+/- 0.050
Zero Balance, % Rated Output	+/- 1.0
<b>TEMPERATURE</b>	
Range, Compensated, °F	+70 to +170
Range, Compensated, °C	+21 to +77
Range, Operating, °F	-65 to +200
Range, Operating, °C	-55 to +90
Effect on Sensitivity, % Rdg/ °F	+/- 0.0020
Effect on Sensitivity, % Rdg/ °C	+/- 0.0036
Effect on Zero, % Rated Output/ °F	+/- 0.0020
Effect on Zero, % Rated Output/ °C	+/- 0.0036
<b>ELECTRICAL</b>	
Rated Output, mV/V, Nominal	2
Excitation Voltage, VDC Recommended/Max	10 / 15
Input Resistance, Ohms	350 +40 / -3.5
Output Resistance, Ohms	350 +/- 3.5
Insulation Resistance, Megohm	5000 @ 50 VDC
Bayonet Connector	PT02E-10-6P (MS3112E-10-6P)
<b>MECHANICAL</b>	
Safe Overload Range, % Rated Capacity	+/- 150
Weight lb	1.2
Flexure Material	Stainless Steel

## DIMENSIONS



## OPTIONS

- Additional bridges
- Output adjustment to standard
- Integral cable
- Custom connectors

## ACCESSORIES

- Mating connector
- Loading fixtures
- Interconnect cable
- Shunt calibration resistor
- Instrumentation

# SHEAR WEB PRECISION (SWP) SERIES LOAD CELLS

## FEATURES

- High Accuracy Version of SW Series
- Smaller Guaranteed Maximum Off-Center Load & Moment Error than SW Series
- Static Error Band 0.02 - 0.04%
- Low Creep
- Low Sensitivity to Magnetic Fields
- Barometric Pressure Compensation
- Temperature Compensated
- 5pt Tension & Compression Calibration
- Proprietary Modulus Compensated Strain Gages



## SPECIFICATIONS

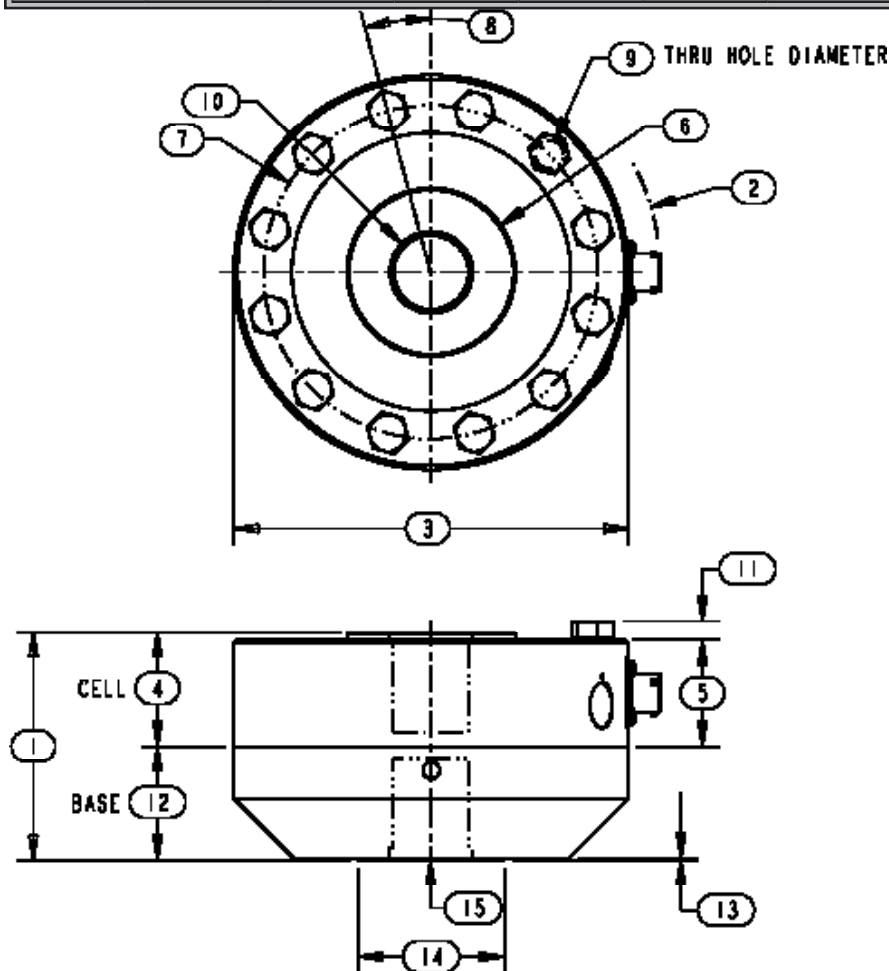
Model	SWP10	SWP10	SWP20	SWP22	SWP30
Capacity U.S. lbf.	300, 500, 1K, 2K	5K, 10K	25K, 50K	60K	100K
PARAMETERS Metric kN	1.5, 2.5, 5, 10	25, 50	100, 250	270	300, 500
<b>ACCURACY</b>					
Static Error Band, % Rated Output	+/- 0.020	+/- 0.025	+/- 0.035	+/- 0.040	+/- 0.040
Nonlinearity, % Rated Output	+/- 0.030	+/- 0.030	+/- 0.030	+/- 0.030	+/- 0.030
Hysteresis, % Rated Output	+/- 0.020	+/- 0.040	+/- 0.045	+/- 0.040	+/- 0.040
Nonrepeatability, % Rated Output	+/- 0.010	+/- 0.010	+/- 0.010	+/- 0.010	+/- 0.010
Creep, % in 20 minutes	+/- 0.025	+/- 0.025	+/- 0.025	+/- 0.025	+/- 0.025
Off-Center Load Sensitivity, %/inch	+/- 0.100	+/- 0.100	+/- 0.100	+/- 0.100	+/- 0.100
Side Load Sensitivity, %	+/- 0.100	+/- 0.100	+/- 0.100	+/- 0.100	+/- 0.100
Zero Balance, % Rated Output	+/- 1.0	+/- 1.0	+/- 1.0	+/- 1.0	+/- 1.0
<b>TEMPERATURE</b>					
Range, Compensated, °F	+15 to +115	+15 to +115	+15 to +115	+15 to +115	+15 to +115
Range, Compensated, °C	-10 to +45	-10 to +45	-10 to +45	-10 to +45	-10 to +45
Range, Operating, °F	-65 to +200	-65 to +200	-65 to +200	-65 to +200	-65 to +200
Range, Operating, °C	-55 to +90	-55 to +90	-55 to +90	-55 to +90	-55 to +90
Effect on Sensitivity, % Rdg / °F	+/- 0.0008	+/- 0.0008	+/- 0.0008	+/- 0.0008	+/- 0.0008
Effect on Sensitivity, % Rdg / °C	+/- 0.0015	+/- 0.0015	+/- 0.0015	+/- 0.0015	+/- 0.0015
Effect on Zero, % Rated Output / °F	+/- 0.0008	+/- 0.0008	+/- 0.0008	+/- 0.0008	+/- 0.0008
Effect on Zero, % Rated Output / °C	+/- 0.0015	+/- 0.0015	+/- 0.0015	+/- 0.0015	+/- 0.0015
<b>ELECTRICAL</b>					
Rated Output, mV/V, Nominal	2	4	4	4	4
Excitation Voltage, VDC Maximum	20	20	20	20	20
Input Resistance, Ohms	350 +40 / -3.5	350 +40 / -3.5	350 +40 / -3.5	350 +40 / -3.5	350 +40 / -3.5
Output Resistance, Ohms	350 +/- 3.5	350 +/- 3.5	350 +/- 3.5	350 +/- 3.5	350 +/- 3.5
Insulation Resistance, Megohms	5000 @ 50 VDC	5000 @ 50 VDC	5000 @ 50 VDC	5000 @ 50 VDC	5000 @ 50 VDC
Bayonet Connector	PT02E-10-6P (MS3112E-10-6P)				
<b>MECHANICAL</b>					
Safe Overload Range, % Rated Capacity	+/- 150	+/- 150	+/- 150	+/- 150	+/- 150
Weight, lb	1.0	2.9	9.1	13.5	23.5
Weight, kg	0.5	1.3	4.1	6.1	10.7
Weight w/base, lb	2.5	6.5	21.5	27.5	52.5
Weight w/base, kg	1.1	3.0	9.8	12.5	23.8
Flexure Material	Aluminum	Steel	Steel	Steel	Steel



# SHEAR WEB PRECISION (SWP) SERIES LOAD CELLS

## DIMENSIONS

Model	SWP10	SW10M	SWP10	SWP10M	SWP20	SWP20M	SWP22	SWP22M	SWP30	SWP30M
Capacity	300, 500, 1K, 2K lbf	1.5, 2.5, 5, 10 kN	5K, 10K lbf	25, 50 kN	25K, 50K lbf	100, 250 kN	60K lbf	270kN	100K lbf	300, 500 kN
Dimensions	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
1.	2.51	63.5	2.51	63.5	3.51	88.9	4.50	114.3	4.50	114.3
2.	R 2.53	R 64.3	R 2.53	R 64.3	R 3.50	R 88.9	R 3.50	R 88.9	R 4.50	R 114.3
3.	4.12	104.8	4.12	104.8	6.06	154.0	6.06	154.0	8.00	203.2
4.	1.38	34.9	1.38	34.9	1.75	44.5	2.25	57.2	2.50	63.5
5.	1.25	31.8	1.25	31.8	1.63	41.3	2.13	54.1	2.25	57.2
6.	1.29	32.8	1.29	32.8	2.34 25K 2.58 50K	59.4 100kN 65.6 250kN	2.58	65.6	3.76	95.6
7.	3.50	88.9	3.50	88.9	5.13	130.3	5.13	130.3	6.50	165.1
8.	22.5°	22.5°	22.5°	22.5°	15°	15°	15°	15°	11.25°	11.25°
9.	0.28 8 Places	7.1 8 Places	0.28 8 Places	7.1 8 Places	0.41 12 Places	10.3 12 Places	0.47 12 Places	11.9 12 Places	0.53 16 Places	13.5 16 Places
10.	1/2 - 20 1.12 Deep	M12 x 1.25 28.5 Deep	5/8 - 18 1.12 Deep	M16 x 2 28.5 Deep.	1 1/4 - 12 1.50 Deep	M33x 2 38.1 Deep	1 1/2 - 12 2.0 Deep	M36x 2 50.8 Deep	1 3/4 - 12 2.20 Deep	M42 x 2 55.9 Deep
11.	0.18	4.7	0.18	4.7	0.29	7.5	0.31	7.9	0.40	10.2
12.	1.13	28.6	1.13	28.6	1.75	44.5	2.25	57.2	2.00	50.8
13.	0.03	0.8	0.03	0.8	0.03	0.8	0.03	0.8	0.03	0.8
14.	1.25	31.8	1.25	31.8	2.25	57.2	3.00	76.2	3.00	76.2
15.	1/2 - 20 0.88 Deep	M12 x 1.25 22.4 Deep	5/8 - 18 0.88 Deep	M16 x 2 22.4 Deep	1 1/4 - 12 1.50 Deep	M33 x 2 38.1 Deep	1 1/2 - 12 2.00 Deep	M36 x 2 50.8 Deep	1 3/4 - 12 1.75 Deep	M42 x 2 44.5 Deep



### OPTIONS

- Additional bridges
- Output adjustment to standard
- Compression overload protection
- Integral cable
- Custom connectors
- Connector Protectors
- Base

### ACCESSORIES

- Mating connector
- Loading fixtures
- Interconnect cable
- Shunt calibration resistor
- Instrumentation

# /// HIGH CAPACITY SHEAR WEB PRECISION (SWP) SERIES LOAD CELLS

## FEATURES

- High Accuracy at High Capacity
- Low Height
- Low Guaranteed Maximum Off-Center Load and Moment Error
- Low Creep
- Low Susceptibility to Magnetic Fields
- Temperature Compensated
- Barometric Pressure Compensation
- 5pt Tension & Compression Calibration
- Proprietary Modulus Compensated Strain Gages



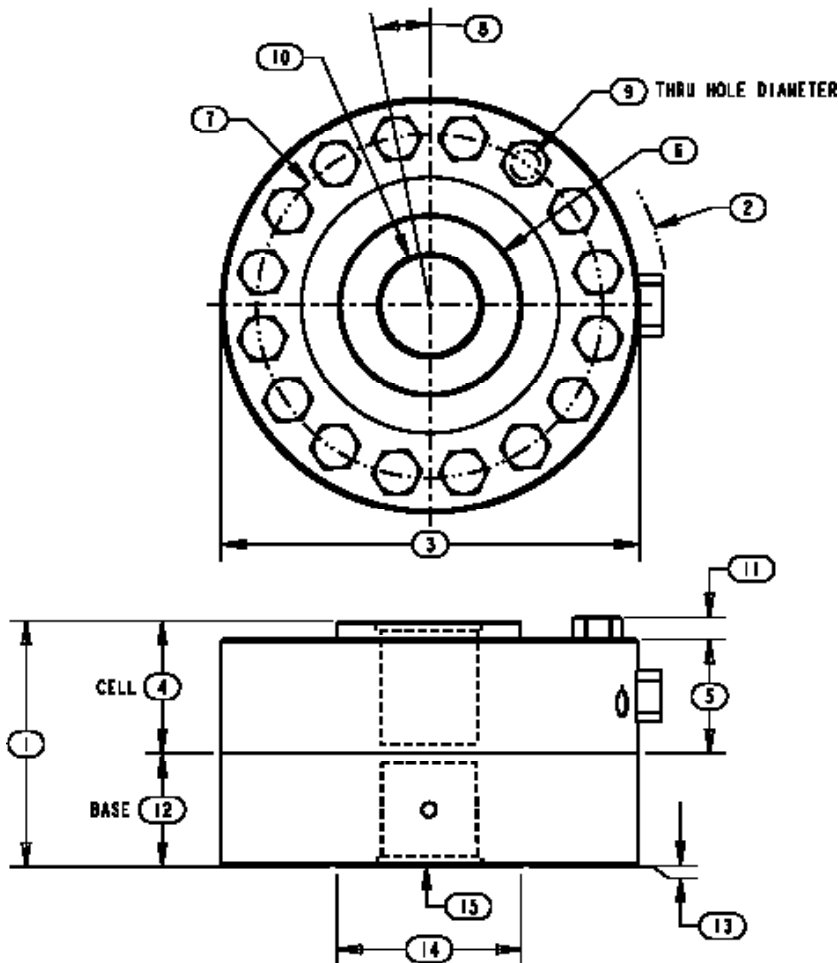
## SPECIFICATIONS

Model		SWP40	SWP42	SWP45	SWP62	SWP80
Capacity	U.S. lbf.	200K	270K	300K, 400K	500K, 600K	750K, 1000K
PARAMETERS	Metric kN	1000	1200	1400, 1800	2200, 2700	3300, 4500
<b>ACCURACY</b>						
Static Error Band, % Rated Output		+/- 0.050	+/- 0.060	+/- 0.100	+/- 0.100	+/- 0.120
Nonlinearity, % Rated Output		+/- 0.050	+/- 0.060	+/- 0.100	+/- 0.100	+/- 0.120
Hysteresis, % Rated Output		+/- 0.050	+/- 0.060	+/- 0.100	+/- 0.100	+/- 0.120
Nonrepeatability, % Rated Output		+/- 0.010	+/- 0.010	+/- 0.010	+/- 0.010	+/- 0.010
Creep, % in 20 minutes		+/- 0.025	+/- 0.025	+/- 0.025	+/- 0.025	+/- 0.025
Off-Center Load Sensitivity, %/inch		+/- 0.100	+/- 0.100	+/- 0.200	+/- 0.200	+/- 0.200
Side Load Sensitivity, %		+/- 0.100	+/- 0.100	+/- 0.200	+/- 0.200	+/- 0.200
Zero Balance, % Rated Output		+/- 1.0	+/- 1.0	+/- 1.0	+/- 1.0	+/- 1.0
<b>TEMPERATURE</b>						
Range, Compensated, °F		+15 to +115	+15 to +115	+15 to +115	+15 to +115	+15 to +115
Range, Compensated, °C		-10 to +45	-10 to +45	-10 to +45	-10 to +45	-10 to +45
Range, Operating, °F		-65 to +200	-65 to +200	-65 to +200	-65 to +200	-65 to +200
Range, Operating, °C		-55 to +90	-55 to +90	-55 to +90	-55 to +90	-55 to +90
Effect on Sensitivity, % Rdg / °F		+/- 0.0008	+/- 0.0008	+/- 0.0008	+/- 0.0008	+/- 0.0008
Effect on Sensitivity, % Rdg / °C		+/- 0.0015	+/- 0.0015	+/- 0.0015	+/- 0.0015	+/- 0.0015
Effect on Zero, % Rated Output / °F		+/- 0.0008	+/- 0.0008	+/- 0.0008	+/- 0.0008	+/- 0.0008
Effect on Zero, % Rated Output / °C		+/- 0.0015	+/- 0.0015	+/- 0.0015	+/- 0.0015	+/- 0.0015
<b>ELECTRICAL</b>						
Rated Output, mV/V, Nominal		4	4	4	4	4
Excitation Voltage, VDC Maximum		20	20	20	20	20
Input Resistance, Ohms		350 +40 / -3.5	350 +40 / -3.5	350 +40 / -3.5	350 +40 / -3.5	350 +40 / -3.5
Output Resistance, Ohms		350 +/- 3.5	350 +/- 3.5	350 +/- 3.5	350 +/- 3.5	350 +/- 3.5
Insulation Resistance, Megohms		5000 @ 50 VDC	5000 @ 50 VDC	5000 @ 50 VDC	5000 @ 50 VDC	5000 @ 50 VDC
Bayonet Connector		PT02E-10-6P (MS3112E-10-6P) Included Protector				
<b>MECHANICAL</b>						
Safe Overload Range, % Rated Capacity		+/- 150	+/- 150	+/- 150	+/- 150	+/- 150
Weight, lb		74	84	120	245	450
Weight, kg		34	38	54	111	204
Weight w/base, lb		146	156	250	448	1050
Weight w/base, kg		66	71	113	203	476
Flexure Material		Steel	Steel	Steel	Steel	Steel

# HIGH CAPACITY SHEAR WEB PRECISION (SWP) SERIES LOAD CELLS

## DIMENSIONS

Model	SWP40	SWP40M	SWP42	SWP42M	SWP45	SWP45M	SWP62	SWP62M	SWP80	SWP80M
Capacity	200K lbf	1000 kN	270K lbf	1200 kN	300K, 400K lbf	1400, 1800 kN	500K, 600K lbf	2200, 2700 kN	750K, 1000 lbf	3300, 4500 kN
Dimensions	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
1.	6.50	165.1	8.00	203.2	8.75	222.3	10.25	260.4	13.00	330.2
2.	R 6.16	R 156.5	R 6.16	R 156.5	R 6.78	R 172.2	R 8.65	R 219.7	R 10.89	R 276.6
3.	11.00	279.4	11.00	279.4	12.25	311.2	16.00	406.4	20.50	520.7
4.	3.50	88.9	4.00	101.6	4.50	114.3	5.25	133.3	6.50	165.1
5.	3.00	76.2	3.50	88.9	4.25	108.0	4.75	120.6	6.25	158.7
6.	4.81	122.2	4.81	122.2	6.13	155.7	7.89	200.4	9.86	250.4
7.	9.00	228.6	9.00	228.6	10.11	256.9	13.06	331.6	16.50	419.1
8.	11.25°	11.25°	11.25°	11.25°	9.0°	9.0°	9.0°	9.0°	6.4°	6.4°
9.	0.78 16 Places	19.8 16 Places	0.78 16 Places	19.8 16 Places	0.78 20 Places	19.8 20 Places	1.18 20 Places	30.0 20 Places	1.06 28 Places	26.9 28 Places
10.	2 3/4 - 8 3.2 Deep	M72 x 2 81.3 Deep	2 3/4 - 8 3.7 Deep	M72 x 2 94.0 Deep	3 - 12 4.00 Deep	M76 x 2 101.6 Deep	4 - 8 4.75 Deep	M100 x 3 120.6 Deep	6 - 8 5.4 Deep	M150 x 3 137.1 Deep
11.	0.60	15.2	0.60	15.2	0.60	15.2	0.92	23.4	.77	19.5
12.	3.00	76.2	4.00	101.6	4.25	108.0	5.00	127.0	6.50	165.1
13.	0.03	0.8	0.03	0.8	0.03	0.8	0.03	0.8	0.03	0.8
14.	4.83	122.7	4.83	122.7	5.70	144.8	7.89	200.4	10.00	254.0
15.	2 3/4 - 8 2.70 Deep	M72 x 2 68.6 Deep	2 3/4 - 8 3.70 Deep	M72 x 2 94.0 Deep	3 - 12 3.90 Deep	M76 x 2 99.1 Deep	4 - 8 4.65 Deep	M100 x 3 118.1 Deep	6 - 8 5.4 Deep	M150 x 3 137.1 Deep



## OPTIONS

- Additional bridges
- Output adjustment to standard
- Compression overload protection
- Integral cable
- Custom connectors
- Connector Protectors
- Base

## ACCESSORIES

- Mating connector
- Loading fixtures
- Interconnect cable
- Shunt calibration resistor
- Instrumentation

# LOW CAPACITY FATIGUE RATED (FR5) SERIES LOAD CELLS

## FEATURES

- Fatigue Rated
- Small Scale
- Sealed
- Static Error Band 0.05%
- In-line Loading
- Compensated for Off Axis Loads
- 5pt Tension & Compression Calibration
- Proprietary Modulus Compensated Strain Gages

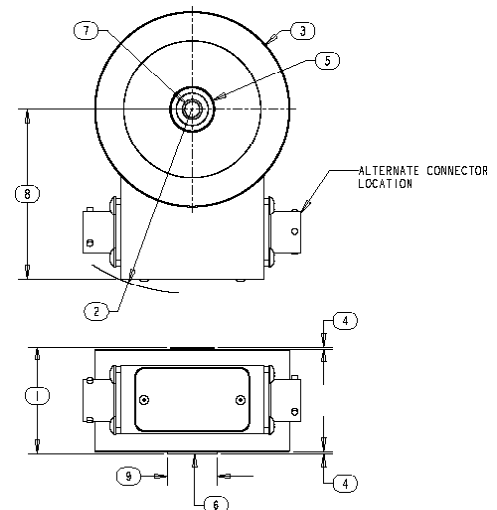


## SPECIFICATIONS

Model	FR5	
Capacity	U.S. lbf.	25, 50, 100, 200, 300
<b>PARAMETERS</b>	N	125, 250, 500, 1000, 1500
<b>ACCURACY</b>		
Static Error Band, % Rated Output		+/- 0.050
Nonlinearity, % Rated Output		+/- 0.050
Hysteresis, % Rated Output		+/- 0.050
Nonrepeatability, % Rated Output		+/- 0.010
Creep, % in 20 minutes		+/- 0.030
Off-Center Load Sensitivity, % / inch		+/- 0.250
Side Load Sensitivity, %		+/- 0.250
Zero Balance, % Rated Output		+/- 1.0
<b>TEMPERATURE</b>		
Range, Compensated, °F		+15 to +115
Range, Compensated, °C		-10 to +45
Range, Operating, °F		-65 to +200
Range, Operating, °C		-55 to +90
Effect on Sensitivity, % Rdg / °F		+/- 0.0008
Effect on Sensitivity, % Rdg / °C		+/- 0.0015
Effect on Zero, % Rated Output / °F		+/- 0.0015
Effect on Zero, % Rated Output / °C		+/- 0.0027
<b>ELECTRICAL</b>		
Rated Output, mV/V, Nominal		2
Excitation Voltage, VDC Maximum		15
Input Resistance, Ohms		700 +80/-7
Output Resistance, Ohms		700 +80/-7
Insulation Resistance, Megohms		5000 (@ 50VDC)
Bayonet Connector		PT02E-10-6P (MS3112E-10-6P)
<b>MECHANICAL</b>		
Safe Overload Range, % Rated Capacity		+/- 150
Weight, lb		0.8
Weight, kg		0.36
Flexure Material		Aluminum

## DIMENSIONS

Model	FR5	FR5M
Capacity	25, 50, 100, 200, 300 lbf	125, 250, 500, 1000, 1500 N
Dimensions	inch	mm
1.	1.50	38.1
2.	R 2.57	R 65.3
3.	2.73	69.3
4.	0.03	0.8
5.	0.63	16.0
6.	1/4 - 28 0.37 Deep	M6 x 1 9.4 Deep
7.	1/4 - 28 0.75 Deep	M6 x 1 19.0 Deep
8.	2.37	60.2
9.	0.69	17.5



## OPTIONS

Additional bridges  
Output adjustment to standard  
Compression overload protection  
Integral cable  
Custom connectors

## ACCESSORIES

Mating connector  
Loading fixtures  
Interconnect cable  
Shunt calibration resistor  
Instrumentation

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# FATIGUE RATED (FR) SERIES LOAD CELLS

## FEATURES

- First Choice for Fatigue Testing Applications
- Guaranteed for 100 Million Fully Reversed Cycles
- Low Height
- Guaranteed Maximum Off-Center Load & Moment Error
- Low Creep
- Low Susceptibility to Magnetic Fields
- Barometric Pressure Compensation
- 5pt Tension & Compression Calibration
- Proprietary Modulus Compensated Strain Gages



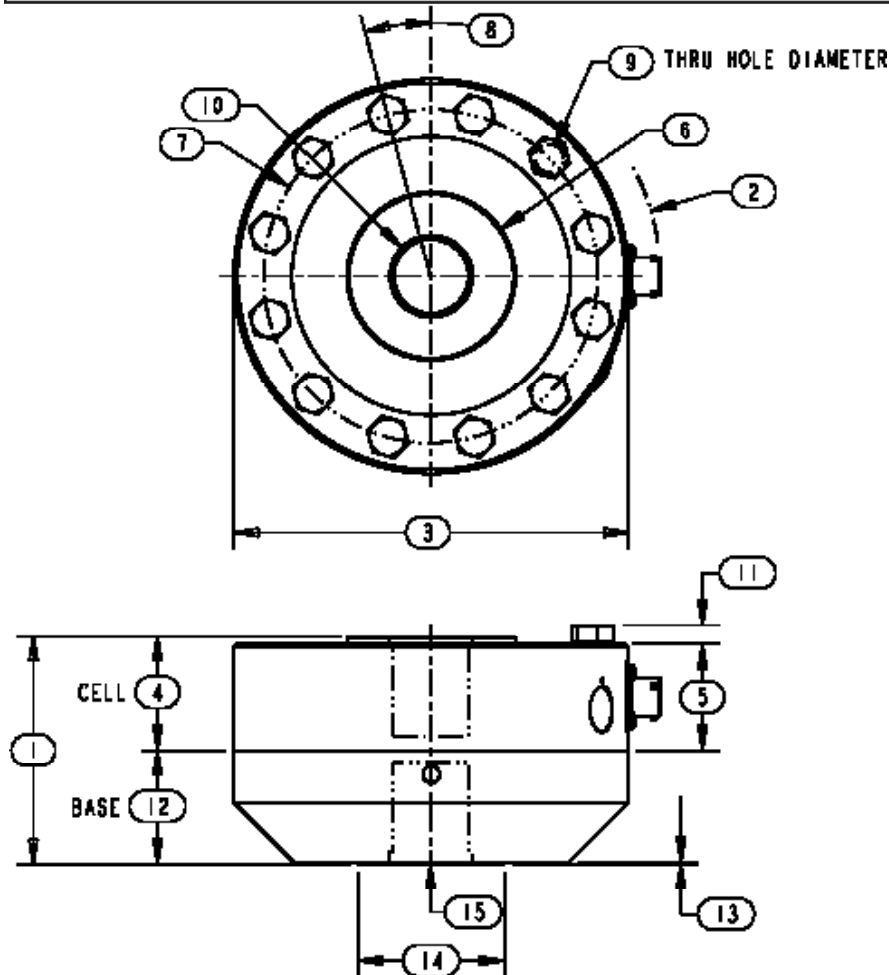
## SPECIFICATIONS

Model	FR10 150, 250, 500, 1K	FR10 2.5K, 5K	FR20 12.5K, 25K	FR22 30K	FR30 50K
Capacity U.S. lbf.					
PARAMETERS Metric kN	0.75, 1.25, 2.5, 5	12.5, 25	50, 125	135	150, 250
<b>ACCURACY</b>					
Static Error Band, % Rated Output	+/- 0.030	+/- 0.040	+/- 0.040	+/- 0.050	+/- 0.050
Nonlinearity, % Rated Output	+/- 0.040	+/- 0.040	+/- 0.040	+/- 0.050	+/- 0.050
Hysteresis, % Rated Output	+/- 0.030	+/- 0.040	+/- 0.050	+/- 0.050	+/- 0.050
Nonrepeatability, % Rated Output	+/- 0.010	+/- 0.010	+/- 0.010	+/- 0.010	+/- 0.010
Creep, % in 20 minutes	+/- 0.025	+/- 0.025	+/- 0.025	+/- 0.025	+/- 0.025
Off-Center Load Sensitivity, % / inch	+/- 0.100	+/- 0.100	+/- 0.100	+/- 0.100	+/- 0.100
Side Load Sensitivity, %	+/- 0.100	+/- 0.100	+/- 0.100	+/- 0.100	+/- 0.100
Zero Balance, % Rated Output	+/- 1.0	+/- 1.0	+/- 1.0	+/- 1.0	+/- 1.0
<b>TEMPERATURE</b>					
Range, Compensated, °F	+15 to +115	+15 to +115	+15 to +115	+15 to +115	+15 to +115
Range, Compensated, °C	-10 to +45	-10 to +45	-10 to +45	-10 to +45	-10 to +45
Range, Operating, °F	-65 to +200	-65 to +200	-65 to +200	-65 to +200	-65 to +200
Range, Operating, °C	-55 to +90	-55 to +90	-55 to +90	-55 to +90	-55 to +90
Effect on Sensitivity, % Rdg / °F	+/- 0.0008	+/- 0.0008	+/- 0.0008	+/- 0.0008	+/- 0.0008
Effect on Sensitivity, % Rdg / °C	+/- 0.0015	+/- 0.0015	+/- 0.0015	+/- 0.0015	+/- 0.0015
Effect on Zero, % Rated Output / °F	+/- 0.0008	+/- 0.0008	+/- 0.0008	+/- 0.0008	+/- 0.0008
Effect on Zero, % Rated Output / °C	+/- 0.0015	+/- 0.0015	+/- 0.0015	+/- 0.0015	+/- 0.0015
<b>ELECTRICAL</b>					
Rated Output, mV/V, Nominal	1	2	2	2	2
Excitation Voltage, VDC Maximum	20	20	20	20	20
Input Resistance, Ohms	350 +40 / - 3.5	350 +40 / - 3.5	350 +40 / - 3.5	350 +40 / - 3.5	350 +40 / - 3.5
Output Resistance, Ohms	350 +/- 3.5	350 +/- 3.5	350 +/- 3.5	350 +/- 3.5	350 +/- 3.5
Insulation Resistance, Megohms	5000 @ 50 VDC	5000 @ 50 VDC	5000 @ 50 VDC	5000 @ 50 VDC	5000 @ 50 VDC
Bayonet Connector	PT02E-10-6P (MS3112E-10-6P)				
<b>MECHANICAL</b>					
Safe Overload Range, % Rated Capacity	+/- 300	+/- 300	+/- 300	+/- 300	+/- 300
Weight, lb	1.0	2.9	9.1	13.5	23.5
Weight, kg	0.5	1.3	4.1	6.1	10.7
Weight w/base, lb	2.5	6.5	21.5	27.5	52.5
Weight w/base, kg	1.1	3.0	9.8	12.5	23.8
Flexure Material	Aluminum	Steel	Steel	Steel	Steel

# FATIGUE RATED (FR) SERIES LOAD CELLS

## DIMENSIONS

Model	FR10	FR10M	FR10	FR10M	FR20	FR20M	FR22	FR22M	FR30	FR30M
<b>Capacity</b>	150, 250, 500, 1K lbf	.75, 1.25, 2.5, 5 kN	2.5K, 5K lbf	12.5, 25 kN	12.5K, 25K lbf	50, 125 kN	30K	135kN	50K lbf	150, 250 kN
<b>Dimensions</b>	inch	mm	inch	mm	inch	mm	inch	mm	inch	inch
1.	2.51	63.5	2.51	63.5	3.51	88.9	4.50	114.3	4.50	114.3
2.	R 2.53	R 64.3	R 2.53	R 64.3	R 3.50	R 88.9	R 3.50	R 88.9	R 4.50	R 114.3
3.	4.12	104.8	4.12	104.8	6.06	154.0	6.06	154.0	8.00	203.2
4.	1.38	34.9	1.38	34.9	1.75	44.5	2.25	57.2	2.50	63.5
5.	1.25	31.8	1.25	31.8	1.63	41.3	2.13	54.1	2.25	57.2
6.	1.29	32.8	1.29	32.8	2.34 12.5K 2.58 25K	59.4 50kN 65.6 125kN	2.58	65.6	3.76	95.6
7.	3.50	88.9	3.50	88.9	5.13	130.3	5.13	130.3	6.50	165.1
8.	22.5°	22.5°	22.5°	22.5°	15°	15°	15°	15°	11.25°	11.25°
9.	0.28 8 Places	7.1 8 Places	0.28 8 Places	7.1 8 Places	0.41 12 Places	10.3 12 Places	0.47 12 Places	11.9 12 Places	0.53 16 Places	13.5 16 Places
10.	1/2 - 20 1.12 Deep	M12 x 1.25 28.5 Deep	5/8 - 18 1.12 Deep	M16 x 2 28.5 Deep.	1 1/4 - 12 1.50 Deep	M33x 2 38.1 Deep	1 1/2 - 12 2.00 Deep	M36x 2 50.8 Deep	1 3/4 - 12 2.20 Deep	M42 x 2 55.9 Deep
11.	0.18	4.7	0.18	4.7	0.29	7.5	0.31	7.9	0.40	10.2
12.	1.13	28.6	1.13	28.6	1.75	44.5	2.25	57.2	2.00	50.8
13.	0.03	0.8	0.03	0.8	0.03	0.8	0.03	0.8	0.03	0.8
14.	1.25	31.8	1.25	31.8	2.25	57.2	3.00	76.2	3.00	76.2
15.	1/2 - 20 0.88 Deep	M12 x 1.25 22.4 Deep	5/8 - 18 0.88 Deep	M16 x 2 22.4 Deep	1 1/4 - 12 1.50 Deep	M33 x 2 38.1 Deep	1 1/2 - 12 2.00 Deep	M36 x 2 50.8 Deep	1 3/4 - 12 1.75 Deep	M42 x 2 44.5 Deep



### OPTIONS

- Additional bridges
- Output adjustment to standard
- Compression overload protection
- Integral cable
- Custom connectors
- Connector Protectors
- Base

### ACCESSORIES

- Mating connector
- Loading fixtures
- Interconnect cable
- Shunt calibration resistor
- Instrumentation

# HIGH CAPACITY FATIGUE RATED (FR) SERIES LOAD CELLS

## FEATURES

- First Choice for Fatigue Testing Applications
- Guaranteed for 100 Million Fully Reversed Cycles
- Low Height
- Guaranteed Maximum Off-Center Load and Moment Error
- Low Creep
- Low Susceptibility to Magnetic Fields
- Barometric Pressure Compensation
- 5pt Tension & Compression Calibration
- Proprietary Modulus Compensated Strain Gages



## SPECIFICATIONS

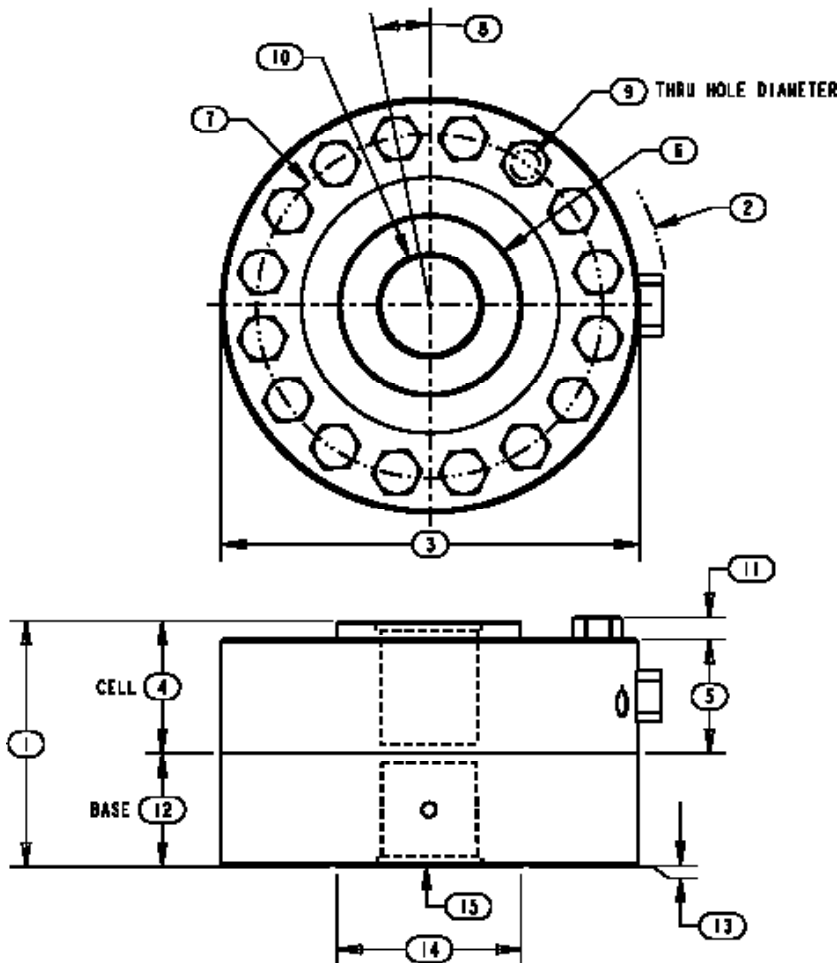
Model	FR40	FR42	FR45	FR62	FR80
Capacity U.S. lbf.	100K	135K	150K, 200K	250K, 300K	375K, 500K
PARAMETERS Metric kN	500	600	700, 900	1100, 1350	1650, 2250
<b>ACCURACY</b>					
Static Error Band, % Rated Output	+/- 0.060	+/- 0.070	+/- 0.100	+/- 0.100	+/- 0.150
Nonlinearity, % Rated Output	+/- 0.060	+/- 0.080	+/- 0.100	+/- 0.100	+/- 0.150
Hysteresis, % Rated Output	+/- 0.060	+/- 0.080	+/- 0.100	+/- 0.100	+/- 0.150
Nonrepeatability, % Rated Output	+/- 0.010	+/- 0.020	+/- 0.020	+/- 0.020	+/- 0.020
Creep, % in 20 minutes	+/- 0.025	+/- 0.025	+/- 0.025	+/- 0.025	+/- 0.025
Off-Center Load Sensitivity, % / inch	+/- 0.250	+/- 0.250	+/- 0.250	+/- 0.250	+/- 0.250
Side Load Sensitivity, %	+/- 0.250	+/- 0.250	+/- 0.250	+/- 0.250	+/- 0.250
Zero Balance, % Rated Output	+/- 1.0	+/- 1.0	+/- 1.0	+/- 1.0	+/- 1.0
<b>TEMPERATURE</b>					
Range, Compensated, °F	+15 to +115	+15 to +115	+15 to +115	+15 to +115	+15 to +115
Range, Compensated, °C	-10 to +45	-10 to +45	-10 to +45	-10 to +45	-10 to +45
Range, Operating, °F	-65 to +200	-65 to +200	-65 to +200	-65 to +200	-65 to +200
Range, Operating, °C	-55 to +90	-55 to +90	-55 to +90	-55 to +90	-55 to +90
Effect on Sensitivity, % Rdg / °F	+/- 0.0008	+/- 0.0008	+/- 0.0008	+/- 0.0008	+/- 0.0008
Effect on Sensitivity, % Rdg / °C	+/- 0.0015	+/- 0.0015	+/- 0.0015	+/- 0.0015	+/- 0.0015
Effect on Zero, % Rated Output / °F	+/- 0.0008	+/- 0.0008	+/- 0.0008	+/- 0.0008	+/- 0.0008
Effect on Zero, % Rated Output / °C	+/- 0.0015	+/- 0.0015	+/- 0.0015	+/- 0.0015	+/- 0.0015
<b>ELECTRICAL</b>					
Rated Output, mV/V, Nominal	2	2	2	2	2
Excitation Voltage, VDC Maximum	20	20	20	20	20
Input Resistance, Ohms	350 +40 / -3.5	350 +40 / -3.5	350 +40 / -3.5	350 +40 / -3.5	350 +40 / -3.5
Output Resistance, Ohms	350 +/- 3.5	350 +/- 3.5	350 +/- 3.5	350 +/- 3.5	350 +/- 3.5
Insulation Resistance, Megohms	5000 @ 50 VDC	5000 @ 50 VDC	5000 @ 50 VDC	5000 @ 50 VDC	5000 @ 50 VDC
Bayonet Connector	PT02E-10-6P (MS3112E-10-6P) Included Protector				
<b>MECHANICAL</b>					
Safe Overload Range, % Rated Capacity	+/- 300	+/- 300	+/- 300	+/- 300	+/- 300
Weight, lb	74	84	120	245	450
Weight, kg	34	38	54	111	204
Weight w/base, lb	146	156	250	448	1050
Weight w/base, kg	66	71	113	203	476
Flexure Material	Steel	Steel	Steel	Steel	Steel



# HIGH CAPACITY FATIGUE RATED (FR) SERIES LOAD CELLS

## DIMENSIONS

Model	FR40	FR40M	FR42	FR42M	FR45	FR45M	FR62	FR62M	FR80	FR80M
Capacity	100K lbf	500 kN	135K lbf	600 kN	150K, 200K lbf	700, 900 kN	250K, 300K lbf	1100, 1350 kN	375K, 500K lbf	1650, 2250 kN
Dimensions	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
1.	6.50	165.1	8.00	203.2	8.75	222.3	10.25	235.0	13.00	330.2
2.	R 6.16	R 156.5	R 6.16	R 156.5	R 6.78	172.2	R 8.65	R 219.7	R 10.89	R 276.6
3.	11.00	279.4	11.00	279.4	12.25	311.2	16.00	406.4	20.50	520.7
4.	3.50	88.9	4.00	101.6	4.50	114.3	5.25	133.3	6.50	165.1
5.	3.00	76.2	3.50	88.9	4.25	108.0	4.75	120.6	6.25	158.7
6.	4.81	122.2	4.81	122.2	6.13	155.7	7.89	200.4	9.86	250.4
7.	9.00	228.6	9.00	228.6	10.11	256.9	13.06	331.6	16.50	419.1
8.	11.25°	11.25°	11.25°	11.25°	9.0°	9.0°	9.0°	9.0°	6.4°	6.4°
9.	0.78 16 Places	19.8 16 Places	0.78 16 Places	19.8 16 Places	0.78 20 Places	19.8 20 Places	1.18 20 Places	30.0 20 Places	1.06 28 Places	26.9 28 Places
10.	2 3/4 - 8 3.2 Deep	M72 x 2 81.3 Deep	2 3/4 - 8 3.7 Deep	M72 x 2 94.0 Deep	3 - 12 4.00 Deep	M76 x 2 101.6 Deep	4 - 8 4.75 Deep	M100 x 3 120.7 Deep	6 - 8 5.4 Deep	M150 x 3 137.1 Deep
11.	0.60	15.2	0.60	15.2	0.60	15.2	0.92	20.8	0.77	19.5
12.	3.00	76.2	4.00	101.6	4.25	108.0	5.00	101.6	6.50	165.1
13.	0.03	0.8	0.03	0.8	0.03	0.8	0.03	0.8	0.03	0.8
14.	4.83	122.7	4.83	122.7	5.70	144.8	7.89	200.4	10.00	254.0
15.	2 3/4 - 8 2.70 Deep	M72 x 2 68.6 Deep	2 3/4 - 8 3.70 Deep	M72 x 2 94.0 Deep	3 - 12 3.90 Deep	M76 x 2 99.1 Deep	4 - 8 4.65 Deep	M100 x 3 88.9 Deep	6 - 8 5.4 Deep	M150 x 3 137.1 Deep



## OPTIONS

- Additional bridges
- Output adjustment to standard
- Compression overload protection
- Integral cable
- Custom connectors
- Connector Protectors
- Base

## ACCESSORIES

- Mating connector
- Loading fixtures
- Interconnect cable
- Shunt calibration resistor
- Instrumentation

# AXIAL FORCE AND TORQUE (SWT) SERIES TRANSDUCERS

## FEATURES

- Measure both Force and Torque
- High Accuracy Both Bridges
- Low Crosstalk
- Low Creep
- 5pt T/C Axial & CW/CCW Torsion Calibration
- Proprietary Modulus Compensated Strain Gages

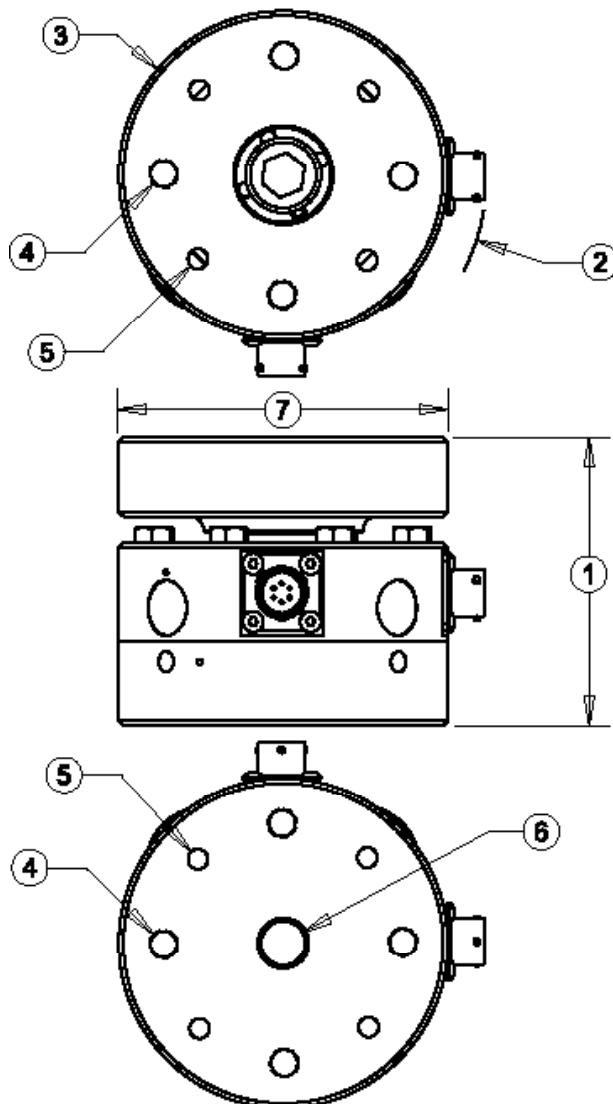


## SPECIFICATIONS

Model	SWT10		SWT10		SWT20		SWT30	
	Capacity	U.S. lbf / lbf-in	300/150, 500/250, 1K/500	2K/1K, 5K/2K	10K/3K	10K/3K	50K/25K	50K/25K
			Axial Force Bridge	Torque Bridge	Axial Force Bridge	Torque Bridge	Axial Force Bridge	Torque Bridge
<b>PARAMETERS</b>								
<b>ACCURACY</b>								
Nonlinearity, % Rated Output			+/- 0.040	+/- 0.070	+/- 0.040	+/- 0.070	+/- 0.040	+/- 0.070
Hysteresis, % Rated Output			+/- 0.040	+/- 0.050	+/- 0.045	+/- 0.050	+/- 0.050	+/- 0.050
Nonrepeatability, % Rated Output			+/- 0.020	+/- 0.050	+/- 0.020	+/- 0.050	+/- 0.020	+/- 0.050
Creep, % in 20 minutes			+/- 0.025	+/- 0.025	+/- 0.025	+/- 0.025	+/- 0.025	+/- 0.025
Zero Balance, % Rated Output			+/- 2.0	+/- 2.0	+/- 2.0	+/- 2.0	+/- 2.0	+/- 2.0
<b>TEMPERATURE</b>								
Range, Compensated, °F			+15 to +115	+15 to +115	+15 to +115	+15 to +115	+15 to +115	+15 to +115
Range, Compensated, °C			-10 to +45	-10 to +45	-10 to +45	-10 to +45	-10 to +45	-10 to +45
Range, Operating, °F			-65 to +200	-65 to +200	-65 to +200	-65 to +200	-65 to +200	-65 to +200
Range, Operating, °C			-55 to +90	-55 to +90	-55 to +90	-55 to +90	-55 to +90	-55 to +90
Effect on Sensitivity, % Rdg / °F			+/- 0.0008	+/- 0.0008	+/- 0.0008	+/- 0.0008	+/- 0.0008	+/- 0.0008
Effect on Sensitivity, % Rdg / °C			+/- 0.0015	+/- 0.0015	+/- 0.0015	+/- 0.0015	+/- 0.0015	+/- 0.0015
Effect on Zero, % Rated Output / °F			+/- 0.0015	+/- 0.0015	+/- 0.0015	+/- 0.0015	+/- 0.0015	+/- 0.0015
Effect on Zero, % Rated Output / °C			+/- 0.0027	+/- 0.0027	+/- 0.0027	+/- 0.0027	+/- 0.0027	+/- 0.0027
<b>ELECTRICAL</b>								
Rated Output, mV/V, Nominal			1.0	1.5	2.0	2.5	2.0	1.0
Excitation Voltage, VDC Maximum			20	20	20	20	20	20
Input Resistance, Ohms			350	700	350	700	350	700
Output Resistance, Ohms			350	700	350	700	350	700
Insulation Resistance, Megohms			5000 @ 50 VDC		5000 @ 50 VDC		5000 @ 50 VDC	
Bayonet Connector			PT02E-10-6P (MS3112E-10-6P)					
<b>MECHANICAL</b>								
Safe Overload Range, % Capacity			+/- 150	+/- 150	+/- 150	+/- 150	+/- 150	+/- 150
Weight, lb			4	4	11	11	32	76
Flexure Material			Aluminum			Steel		

# AXIAL FORCE AND TORQUE (SWT) SERIES TRANSDUCERS

<b>DIMENSIONS</b>				
Model	SWT10	SWT10	SWT20	SWT30
Capacity	300/150, 500/250, 1K/500	2K/1K, 5K/2K	10K/3K	50K/25K
Dimensions	inch	inch	inch	inch
1.	3.63	3.63	4.70	7.10
2.	R 2.5	R 2.5	R 3.5	R 4.5
3.	4.12 Dia.	4.12 Dia.	6.06 Dia.	8.00 Dia.
4.	3/8 - 24 0.66 Deep on 3.00 B.C.	3/8 - 24 0.66 Deep on 3.00 B.C.	3/8 - 24 0.66 Deep on 3.00 B.C.	5/8 - 18 1.0 Deep on 5.50 B.C.
5.	0.25 SF on 3.00 B.C.	0.25 SF on 3.00 B.C.	0.25 SF on 3.00 B.C.	0.50 SF on 5.50 B.C.
6.	5/8 - 18 0.95 Deep	5/8 - 18 0.95 Deep	5/8 - 18 1.05 Deep	1 3/4 - 12 1.75 Deep
7.	4.12 Dia.	4.12 Dia.	4.12 Dia.	6.85 Dia.



## OPTIONS

- Additional bridges
- Output adjustment to standard
- Compression overload protection
- Integral cable
- Custom connectors
- Connector Protectors
- Alternate Capacities

## ACCESSORIES

- Mating connector
- Loading fixtures
- Interconnect cable
- Shunt calibration resistor
- Instrumentation

# AXIAL FORCE AND MOMENT (SW-XYZ) SERIES

## FEATURES

- Measure Z-Axis Force, X- and Y-Axis Moment
- High Accuracy Force Measurement
- Proprietary Modulus Compensated Strain Gages



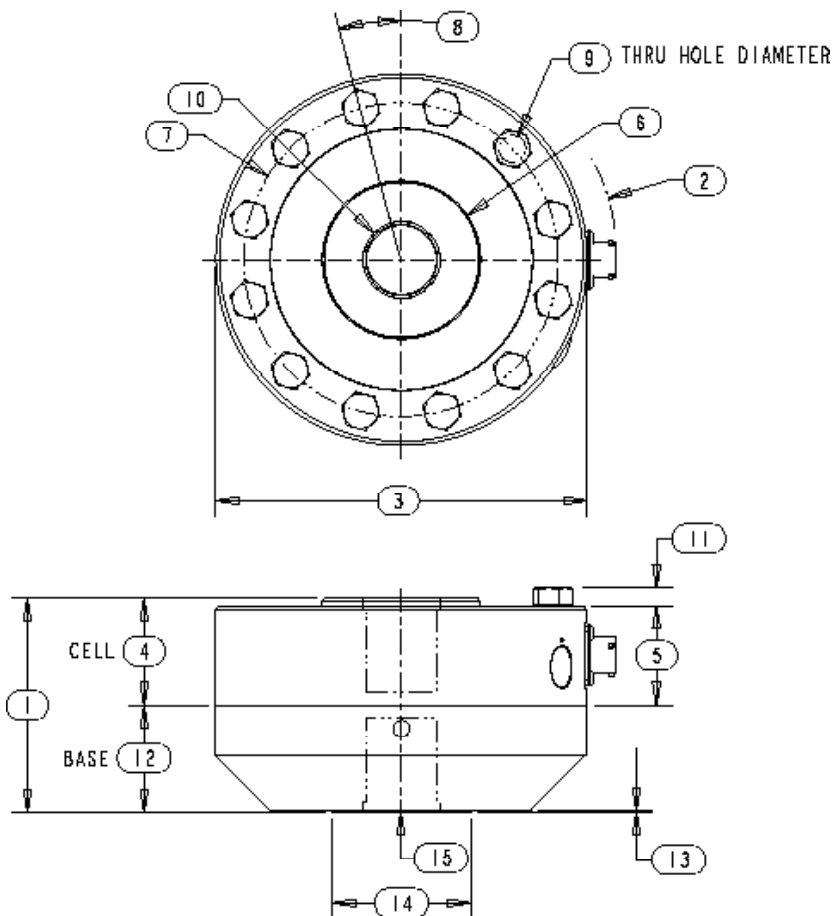
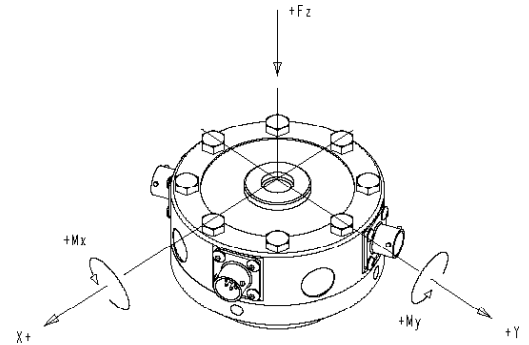
## SPECIFICATIONS

Model	SW10-XYZ		SW10-XYZ		SW20-XYZ		SW30-XYZ	
	Capacity	U.S. lbf.	500/200, 1K/400, 2K/800,	5K/1K, 10K/2K	25K/10K, 50K/20K	100K/50K	Force-lbf	Moment-in-lbf
<b>PARAMETERS</b>	Force-lbf	Moment-in-lbf	Force-lbf	Moment-in-lbf	Force-lbf	Moment-in-lbf	Force-lbf	Moment-in-lbf
<b>ACCURACY</b>								
Static Error Band, % Rated Output	+/- 0.040	+/- 1.000	+/- 0.040	+/- 1.000	+/- 0.050	+/- 1.000	+/- 0.050	+/- 1.000
Nonlinearity, % Rated Output	+/- 0.030	+/- 1.000	+/- 0.030	+/- 1.000	+/- 0.050	+/- 1.000	+/- 0.050	+/- 1.000
Hysteresis, % Rated Output	+/- 0.040	+/- 0.100	+/- 0.040	+/- 0.100	+/- 0.050	+/- 0.100	+/- 0.050	+/- 0.100
Nonrepeatability, % Rated Output	+/- 0.010	+/- 0.050	+/- 0.010	+/- 0.050	+/- 0.010	+/- 0.050	+/- 0.010	+/- 0.050
Creep, % in 20 minutes	+/- 0.025	+/- 0.025	+/- 0.025	+/- 0.025	+/- 0.025	+/- 0.025	+/- 0.025	+/- 0.025
Off-Center Load Sensitivity, % / Inch	+/- 0.250	+/- 1.000	+/- 0.250	+/- 1.000	+/- 0.250	+/- 1.000	+/- 0.250	+/- 1.000
Side Load Sensitivity, %	+/- 0.250	+/- 1.000	+/- 0.250	+/- 1.000	+/- 0.250	+/- 1.000	+/- 0.250	+/- 1.000
Zero Balance, % Rated Output	+/- 1.0	+/- 1.0	+/- 1.0	+/- 1.0	+/- 1.0	+/- 1.0	+/- 1.0	+/- 1.0
<b>TEMPERATURE</b>								
Range, Compensated, °F	+15 to +115	+15 to +115	+15 to +115	+15 to +115	+15 to +115	+15 to +115	+15 to +115	+15 to +115
Range, Compensated, °C	-10 to +45	-10 to +45	-10 to +45	-10 to +45	-10 to +45	-10 to +45	-10 to +45	-10 to +45
Range, Operating, °F	-65 to +200	-65 to +200	-65 to +200	-65 to +200	-65 to +200	-65 to +200	-65 to +200	-65 to +200
Range, Operating, °C	-55 to +90	-55 to +90	-55 to +90	-55 to +90	-55 to +90	-55 to +90	-55 to +90	-55 to +90
Effect on Sensitivity, % Rdg / °F	+/- 0.0008	+/- 0.0008	+/- 0.0008	+/- 0.0008	+/- 0.0008	+/- 0.0008	+/- 0.0008	+/- 0.0008
Effect on Sensitivity, % Rdg / °C	+/- 0.0015	+/- 0.0015	+/- 0.0015	+/- 0.0015	+/- 0.0015	+/- 0.0015	+/- 0.0015	+/- 0.0015
Effect on Zero, % Rated Output / °F	+/- 0.0015	+/- 0.0015	+/- 0.0015	+/- 0.0015	+/- 0.0015	+/- 0.0015	+/- 0.0015	+/- 0.0015
Effect on Zero, % Rated Output / °C	+/- 0.0027	+/- 0.0027	+/- 0.0027	+/- 0.0027	+/- 0.0027	+/- 0.0027	+/- 0.0027	+/- 0.0027
<b>ELECTRICAL</b>								
Rated Output, mV/V, Nominal	2	1.5	4	1.5	4	1.5	4	1.5
Excitation Voltage, VDC Maximum	20	20	20	20	20	20	20	20
Input Resistance, Ohms	350	350	350	350	350	350	350	350
Output Resistance, Ohms	350	350	350	350	350	350	350	350
Insulation Resistance, Megohms	5000	5000	5000	5000	5000	5000	5000	5000
Bayonet Connector	PT02E-10-6P (MS3112E-10-6P)							
<b>MECHANICAL</b>								
Safe Overload Range, % Rated Capacity	+/- 150	+/- 150	+/- 150	+/- 150	+/- 150	+/- 150	+/- 150	+/- 150
Weight, lb	1.0	1.0	1.0	1.0	9.1	9.1	23.5	23.5
Weight, kg	0.45	0.45	0.45	0.45	4.13	4.13	10.66	10.66
Weight w/base, lb	2.5	2.5	2.5	2.5	21.5	21.5	52.5	52.5
Weight w/base, kg	1.13	1.13	1.13	1.13	9.75	9.75	23.81	23.81
Flexure Material	Aluminum		Steel		Steel		Steel	

# AXIAL FORCE AND MOMENT (SW-XYZ) SERIES

## DIMENSIONS

Model	SW10-XYZ	SW10-XYZ	SW20-XYZ	SW30-XYZ
Capacity	500/200, 1K/400, 2K/800	5K/1K, 10K/2K	25K/10K, 50K/20K	100K/50K
Dimensions	inch	inch	inch	inch
1.	2.51	2.51	3.51	4.50
2.	R 2.53	R 2.53	R 3.50	R 4.50
3.	4.12	4.12	6.06	8.00
4.	1.38	1.38	1.75	2.50
5.	1.25	1.25	1.63	2.25
6.	1.29	1.29	2.34 25K/10K 2.58 50K/20K	3.76
7.	3.50	3.50	5.13	6.50
8.	22.5°	22.5°	15°	11.25°
9.	0.28 8 Places	0.28 8 Places	0.41 12 Places	0.53 16 Places
10.	1/2-20 1.12 Deep	5/8-18 1.12 Deep	1 1/4 - 12 1.50 Deep	1 3/4-12 2.20 Deep
11.	0.18	0.18	0.29	0.40
12.	1.13	1.13	1.75	2.00
13.	0.03	0.03	0.03	0.03
14.	1.25	1.25	2.25	3.00
15.	1/2-20 0.88 Deep	5/8-18 0.88 Deep	1 1/4 - 12 1.50 Deep	1 3/4-12 1.75 Deep



## OPTIONS

- Additional bridges
- Output adjustment to standard
- Compression overload protection
- Integral cable
- Custom connectors
- Connector Protectors
- Base

## ACCESSORIES

- Mating connector
- Loading fixtures
- Interconnect cable
- Shunt calibration resistor
- Instrumentation

# 5000 SERIES HIGH CAPACITY UNIVERSAL FORCE TRANSDUCER

## FEATURES

- Universal Tension and Compression
- 0.2% Accuracy
- Capacities to 1 Million lbf.
- 5pt Tension & Compression Calibration
- Proprietary Modulus Compensated Strain Gages
- Metric Capacities Available - Contact Factory



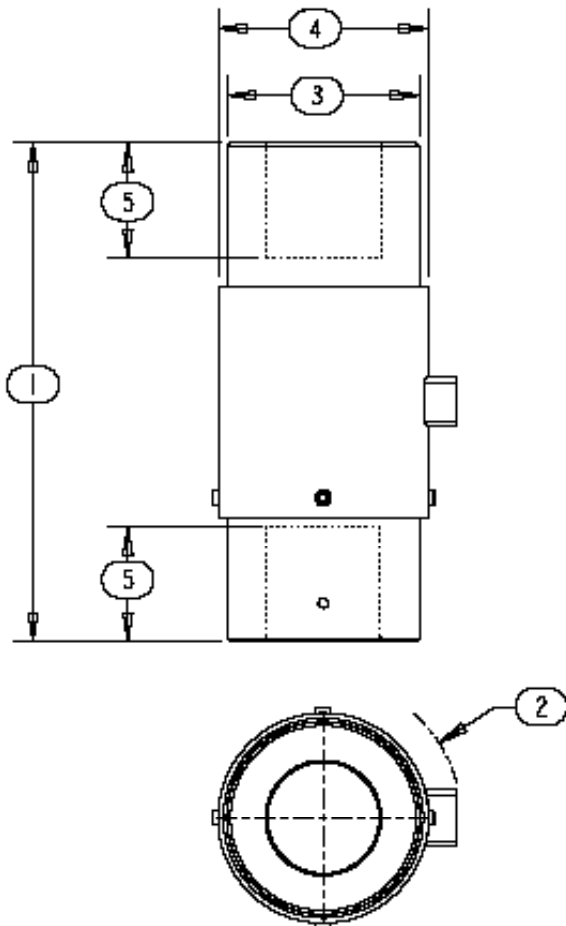
## SPECIFICATIONS

Model	5030	5040	5060	5080
Capacity U.S. lbf.	100K, 135K	250K, 300K	500K, 600K	1000K
<b>PARAMETERS</b>				
<b>ACCURACY</b>				
Static Error Band, % Rated Output	+/- 0.200	+/- 0.200	+/- 0.200	+/- 0.200
Nonlinearity, % Rated Output	+/- 0.200	+/- 0.200	+/- 0.200	+/- 0.200
Hysteresis, % Rated Output	+/- 0.200	+/- 0.200	+/- 0.200	+/- 0.200
Nonrepeatability, % Rated Output	+/- 0.010	+/- 0.010	+/- 0.010	+/- 0.010
Creep, % in 20 minutes	+/- 0.025	+/- 0.025	+/- 0.025	+/- 0.025
Zero Balance, % Rated Output	+/- 1.0	+/- 1.0	+/- 1.0	+/- 1.0
<b>TEMPERATURE</b>				
Range, Compensated, °F	+15 to +115	+15 to +115	+15 to +115	+15 to +115
Range, Compensated, °C	-10 to +45	-10 to +45	-10 to +45	-10 to +45
Range, Operating, °F	-30 to +200	-30 to +200	-30 to +200	-30 to +200
Range, Operating, °C	-35 to +90	-35 to +90	-35 to +90	-35 to +90
Effect on Sensitivity, % Rdg / °F	+/- 0.003	+/- 0.003	+/- 0.003	+/- 0.003
Effect on Sensitivity, % Rdg / °C	+/- 0.006	+/- 0.006	+/- 0.006	+/- 0.006
Effect on Zero, % Rated Output / ° F	+/- 0.003	+/- 0.003	+/- 0.003	+/- 0.003
Effect on Zero, % Rated Output / ° C	+/- 0.006	+/- 0.006	+/- 0.006	+/- 0.006
<b>ELECTRICAL</b>				
Rated Output, mV/V, Nominal	2	2	2	2
Excitation Voltage, VDC Maximum	15	15	15	15
Input Resistance, Ohms	350	350	350	350
Output Resistance, Ohms	350	350	350	350
Insulation Resistance, Megohms	5000 @ 50 VDC	5000 @ 50 VDC	5000 @ 50 VDC	5000 @ 50 VDC
Bayonet Connector	PT02E-10-6P (MS3112E-10-6P)			
<b>MECHANICAL</b>				
Safe Overload Range, % Rated Capacity	+/- 150	+/- 150	+/- 150	+/- 150
Weight, lb	19	52	146, 153	329
Flexure Material	Steel			

# 5000 SERIES HIGH CAPACITY UNIVERSAL FORCE TRANSDUCER

## DIMENSIONS

Model	5030	5040	5060	5080
Capacity	100K, 135K lbf	250K, 300K lbf	500K, 600K lbf	1000K lbf
Dimensions	inch	inch	inch	inch
1.	10.00	15.30	23.00	27.50
2.	R 2.56	R 3.53	R 4.27	R 6.27
3.	3.50	5.00	6.50 <td 9.00	
4.	3.85	5.50	7.00	9.50
5.	2 - 12 2.00 Deep	3 - 12 3.00 Deep	4 - 8 4.50 Deep	6 - 8 6.00 Deep



### OPTIONS

- Additional bridges
- Output adjustment to standard
- Compression overload protection
- Integral cable
- Custom connectors
- Connector Protectors

### ACCESSORIES

- Mating connector
- Loading fixtures
- Interconnect cable
- Shunt calibration resistor
- Instrumentation

# 5100 SERIES HIGH CAPACITY COMPRESSION COLUMN FORCE TRANSDUCERS

## FEATURES

- Compact Design
- .15% Accuracy
- Special Capacities to 2 Million lbf.
- 5pt Compression Calibration
- Proprietary Modulus Compensated Strain Gages
- Metric Capacities Available - Consult Factory



## SPECIFICATIONS

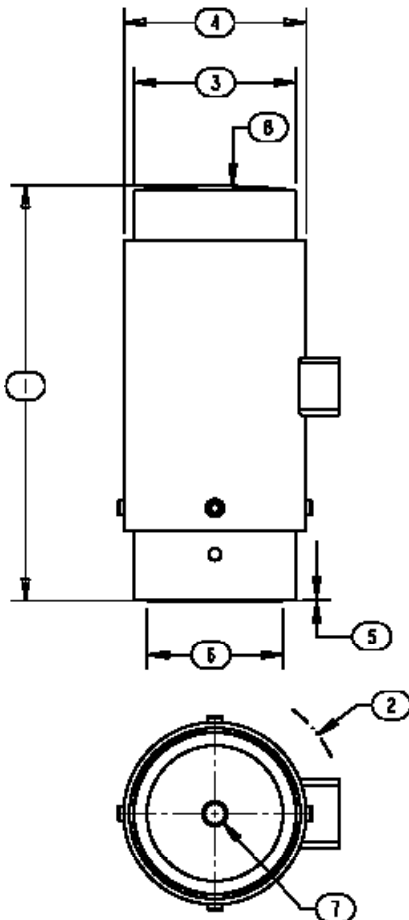
Model	5130	5135	5140	5160	5180
Capacity U.S. lbf.	100K	200K	300, 400K	500K, 600K	750K, 1000K
<b>PARAMETERS</b>					
<b>ACCURACY</b>					
Static Error Band, % Rated Output	+/-0.150	+/-0.150	+/-0.150	+/-0.150	+/-0.150
Nonlinearity, % Rated Output	+/-0.150	+/-0.150	+/-0.150	+/-0.150	+/-0.150
Hysteresis, % Rated Output	+/-0.150	+/-0.150	+/-0.150	+/-0.150	+/-0.150
Nonrepeatability, % Rated Output	+/-0.010	+/-0.010	+/-0.010	+/-0.010	+/-0.010
Creep, % in 20 minutes	+/-0.025	+/-0.025	+/-0.025	+/-0.025	+/-0.025
Zero Balance, % Rated Output	+/-1.0	+/-1.0	+/-1.0	+/-1.0	+/-1.0
<b>TEMPERATURE</b>					
Range, Compensated, °F	+15 to +115	+15 to +115	+15 to +115	+15 to +115	+15 to +115
Range, Compensated, °C	-10 to +45	-10 to +45	-10 to +45	-10 to +45	-10 to +45
Range, Operating, °F	-30 to +200	-30 to +200	-30 to +200	-30 to +200	-30 to +200
Range, Operating, °C	-34 to +90	-34 to +90	-34 to +90	-34 to +90	-34 to +90
Effect on Sensitivity, % Rdg/ °F	+/-0.003	+/-0.003	+/-0.003	+/-0.003	+/-0.003
Effect on Sensitivity, % Rdg/ °C	+/-0.006	+/-0.006	+/-0.006	+/-0.006	+/-0.006
Effect on Zero, % Rated Output/ ° F	+/-0.003	+/-0.003	+/-0.003	+/-0.003	+/-0.003
Effect on Zero, % Rated Output/ ° C	+/-0.006	+/-0.006	+/-0.006	+/-0.006	+/-0.006
<b>ELECTRICAL</b>					
Rated Output, mV/V, Nominal	2	2	2	2	2
Excitation Voltage, VDC Maximum	15	15	15	15	15
Input Resistance, Ohms	350	350	350	350	350
Output Resistance, Ohms	350	350	350	350	350
Insulation Resistance, Megohm	5000	5000	5000	5000	5000
Bayonet Connector	PT02E-10-6P (MS3112E-10-6P)				
<b>MECHANICAL</b>					
Safe Overload Range, % Rated Capacity	150	150	150	150	150
Weight lb	5	13	25	45, 46	96
Flexure Material	Steel	Steel	Steel	Steel	Steel



# 5100 SERIES HIGH CAPACITY COMPRESSION COLUMN FORCE TRANSDUCERS

## DIMENSIONS

Model	5130	5135	5140	5160	5180
Capacity	100K lbf	200K lbf	300K, 400K lbf	500K, 600K lbf	750K, 1000K lbf
Dimensions	inch	inch	inch	inch	inch
1.	5.00	7.00	9.00	10.00	12.00
2.	R 1.99, 2.26	R 2.33	R 2.78- 300K R 3.00- 400K	R 3.29	R 4.02
3.	2.00	3.00	3.50-300K 3.70-400K	4.50	6.00
4.	2.38	3.25	3.95	5.00	6.50
5.	.03	.03	.03	.03	.03
6.	1.68	2.37	2.94-300K 3.50-400K	3.89	5.02
7.	3/8 -24 .50 Deep	1/2 - 20 .50 Deep	1/2 - 20 .75 Deep.	1 - 14 .75 Deep	1 - 14 1.00 Deep
8.	R 12	R 12	R 15-300K R 16-400K	R 20	R 20



## OPTIONS

- Additional bridges
- Output adjustment to standard
- Compression overload protection
- Integral cable
- Custom connectors
- Connector Protectors

## ACCESSORIES

- Mating connector
- Loading fixtures
- Interconnect cable
- Shunt calibration resistor
- Instrumentation

# 5200 SERIES UNIVERSAL HIGH CAPACITY LOAD CELLS

## FEATURES

- Universal Tension and Compression
- 4 Column Cell
- 0.1% Accuracy
- Accomodates High Side and Off-Center Loads
- 5pt Tension & Compression Calibration
- Proprietary Modulus Compensated Strain Gages
- Metric Capacities Available - Consult Factory



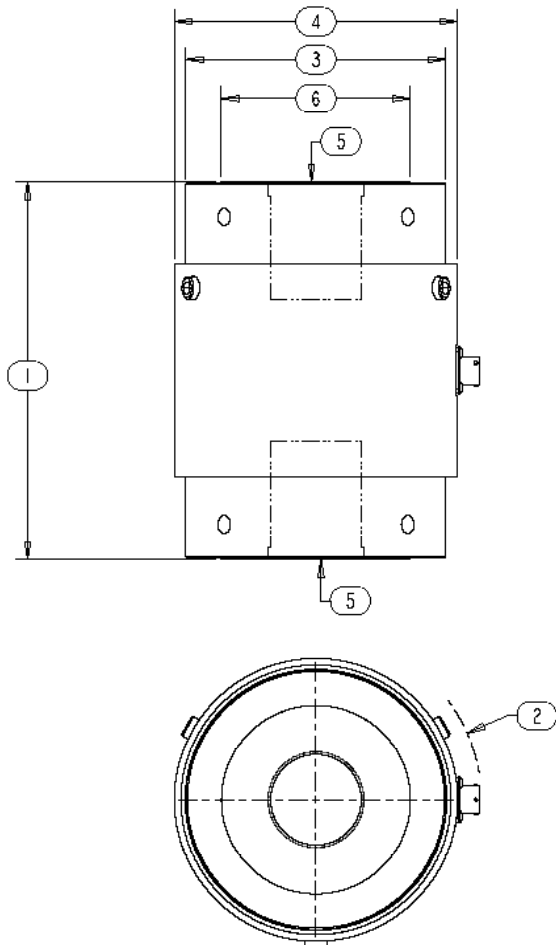
## SPECIFICATIONS

Model	5230	5240	5260	5280
Capacity U.S. lbf.	100K, 135K	250K	500K	1000K
<b>PARAMETERS</b>				
<b>ACCURACY</b>				
Static Error Band, % Rated Output	+/- 0.100	+/- 0.100	+/- 0.100	+/- 0.150
Nonlinearity, % Rated Output	+/- 0.100	+/- 0.100	+/- 0.100	+/- 0.150
Hysteresis, % Rated Output	+/- 0.100	+/- 0.100	+/- 0.100	+/- 0.150
Nonrepeatability, % Rated Output	+/- 0.010	+/- 0.010	+/- 0.010	+/- 0.010
Creep, % in 20 minutes	+/- 0.025	+/- 0.025	+/- 0.025	+/- 0.025
Zero Balance, % Rated Output	+/- 1.0	+/- 1.0	+/- 1.0	+/- 1.0
<b>TEMPERATURE</b>				
Range, Compensated, °F	+15 to +115	+15 to +115	+15 to +115	+15 to +115
Range, Compensated, °C	-10 to +45	-10 to +45	-10 to +45	-10 to +45
Range, Operating, °F	-30 to +200	-30 to +200	-30 to +200	-30 to +200
Range, Operating, °C	-34 to +90	-34 to +90	-34 to +90	-34 to +90
Effect on Sensitivity, % Rdg / °F	+/- 0.0008	+/- 0.0008	+/- 0.0008	+/- 0.0008
Effect on Sensitivity, % Rdg / °C	+/- 0.0015	+/- 0.0015	+/- 0.0015	+/- 0.0015
Effect on Zero, % Rated Output / ° F	+/- 0.0015	+/- 0.0015	+/- 0.0015	+/- 0.0015
Effect on Zero, % Rated Output / ° C	+/- 0.0027	+/- 0.0027	+/- 0.0027	+/- 0.0027
<b>ELECTRICAL</b>				
Rated Output, mV/V, Nominal	2	2	2	2
Excitation Voltage, VDC Maxi-	15	15	15	15
Input Resistance, Ohms	700	700	700	700
Output Resistance, Ohms	700	700	700	700
Insulation Resistance, Megohms	5000 @ 50 VDC	5000 @ 50 VDC	5000 @ 50 VDC	5000 @ 50 VDC
Bayonet Connector	PT02E-10-6P (MS3112E-10-6P)			
<b>MECHANICAL</b>				
Safe Overload Range, % Rated Capacity	+/- 150	+/- 150	+/- 150	+/- 150
Weight, lb	34	42	129	331
Flexure Material	Steel			

# 5200 SERIES UNIVERSAL HIGH CAPACITY LOAD CELLS

## DIMENSIONS

Model	5230	5240	5260	5280
Capacity	100K, 135K lbf	250K lbf	500K lbf	1000K
Dimensions	inch	inch	inch	Consult Factory
1.	8.00	8.00	12.00	
2.	R 3.23	R 3.48	R 4.96	
3.	5.00	5.50	8.40	
4.	5.49	5.99	8.90	
5.	2 - 12 2.4 Deep	2 - 12 2.75 Deep	4 - 8 4.0 Deep	
6.	3.30	4.00	6.00	



## OPTIONS

- Additional bridges
- Output adjustment to standard
- Compression overload protection
- Integral cable
- Custom connectors
- Connector Protectors

## ACCESSORIES

- Mating connector
- Loading fixtures
- Interconnect cable
- Shunt calibration resistor
- Instrumentation

# STAINLESS STEEL (SWS) SERIES FORCE TRANSDUCERS

## FEATURES

- Stainless Steel Construction
- Welded Diaphragm
- Optional Hermetically Sealed Connector
- Guaranteed Maximum Off-Center Load and Moment Error
- Low Creep
- Low Susceptibility to Magnetic Fields
- Temperature and Barometric Pressure Compensation
- 5pt Tension & Compression Calibration
- Proprietary Modulus Compensated Strain Gages



Note: Shown with Optional Integral Cable

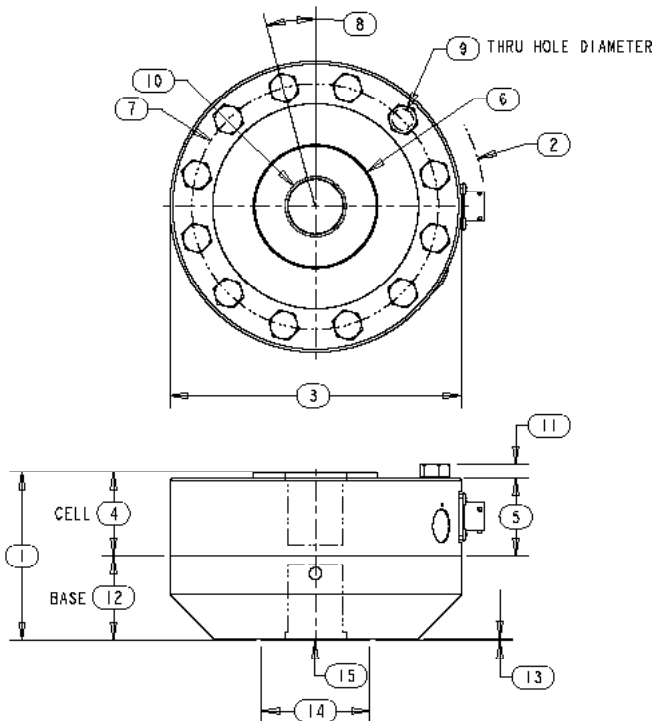
## SPECIFICATIONS

Model	SWS10	SWS20	SWS30
Capacity U.S. lbf.	5K, 10K	25K, 50K	100K
PARAMETERS Metric kN	25, 50	100, 250	500
<b>ACCURACY</b>			
Static Error Band, % Rated Output	+/-0.050	+/-0.050	+/-0.060
Nonlinearity, % Rated Output	+/-0.050	+/-0.050	+/-0.050
Hysteresis, % Rated Output	+/-0.060	+/-0.060	+/-0.060
Nonrepeatability, % Rated Output	+/-0.010	+/-0.010	+/-0.010
Creep, % in 20 minutes	+/-0.025	+/-0.025	+/-0.025
Off-Center Load Sensitivity, %/inch	+/-0.250	+/-0.250	+/-0.250
Side Load Sensitivity, %	+/-0.250	+/-0.250	+/-0.250
Zero Balance, % Rated Output	+/-1.0	+/-1.0	+/-1.0
<b>TEMPERATURE</b>			
Range, Compensated, °F	+15 to +115	+15 to +115	+15 to +115
Range, Compensated, °C	-10 to +45	-10 to +45	-10 to +45
Range, Operating, °F	-65 to +200	-65 to +200	-65 to +200
Range, Operating, °C	-55 to +90	-55 to +90	-55 to +90
Effect on Sensitivity, % Rdg/ °F	+/-0.0008	+/-0.0008	+/-0.0008
Effect on Sensitivity, % Rdg/ °C	+/-0.0015	+/-0.0015	+/-0.0015
Effect on Zero, % Rated Output/ °F	+/-0.0015	+/-0.0015	+/-0.0015
Effect on Zero, % Rated Output/ °C	+/-0.0027	+/-0.0027	+/-0.0027
<b>ELECTRICAL</b>			
Rated Output, mV/V, Nominal	4	4	4
Excitation Voltage, VDC Maximum	20	20	20
Input Resistance, Ohms	350 + 40/-3.5	350 + 40/-3.5	350 + 40/-3.5
Output Resistance, Ohms	350 +/-3.5	350 +/-3.5	350 +/-3.5
Insulation Resistance, Megohm	5000 @ 50 VDC	5000 @ 50 VDC	5000 @ 50 VDC
Bayonet Connector	PT02E-10-6P (MS3112E-10-6P)		
<b>MECHANICAL</b>			
Safe Overload Range, % Rated Capacity	+/-150	+/-150	+/-150
Weight lb	2.9	9.1	23.5
Weight kg	1.3	4.1	10.7
Weight w/base lb	6.5	21.5	52.5
Weight w/base kg	3.0	9.8	23.8
Flexure Material	Stainless Steel		

# STAINLESS STEEL (SWS) SERIES FORCE TRANSDUCERS

## DIMENSIONS

Model	SWS10	SWS10M	SWS20	SWS20M	SWS30	SWS30M
Capacity	5K, 10K lbf	25, 50 kN	25K, 50K lbf	100, 250 kN	100K lbf	500kN
Dimensions	inch	mm	inch	mm	inch	mm
1.	2.51	63.5	3.51	88.9	4.50	114.3
2.	R 2.53	R 64.3	R 3.50	R 88.9	R 4.50	R 114.3
3.	4.12	104.8	6.06	154.0	8.00	203.2
4.	1.38	34.9	1.75	44.5	2.50	63.5
5.	1.25	31.8	1.63	41.3	2.25	57.2
6.	1.18	30.0	2.22 25K 2.46 50K	56.4 100kN 62.5 250kN	3.64	92.5
7.	3.50	88.9	5.13	130.3	6.50	165.1
8.	22.5°	22.5°	15°	15°	11.25°	11.25°
9.	28 8 Places	7.1 8 Places	.41 12 Places	10.3 12 Places	.53 16 Places	13.5 16 Places
10.	5/8 - 18 1.12 Deep	M16 x 2 28.5 Deep	1 1/4 - 12 1.50 Deep	M33x 2 38.1 Deep	1 3/4-12 2.20 Deep	M42 x 2 55.9 Deep
11.	0.18	4.7	0.29	7.5	.40	10.2
12.	1.13	28.6	1.75	44.5	2.00	50.8
13.	0.03	0.8	0.03	0.8	0.03	0.8
14.	1.25	31.8	2.25	57.2	3.00	76.2
15.	5/8-18 .88 Deep	M16 X 2 22.4 Deep	1 1/4-12 1.50 Deep	M33 X 2 38.1 Deep	1 3/4-12 1.75 Deep	M42 X 2 44.5 Deep



### OPTIONS

- Additional bridges
- Output adjustment to standard
- Compression overload protection
- Hermetically sealed connector
- Connector Protectors
- Integral cable

### ACCESSORIES

- Mating connector
- Loading fixtures
- Interconnect cable
- Shunt calibration resistor
- Instrumentation

# FATIGUE RATED STAINLESS STEEL (FRS) SERIES FORCE TRANSDUCERS

## FEATURES

- Stainless Steel Construction
- Welded Diaphragm
- Optional Hermetically Sealed Connector
- Guaranteed Maximum Off-Center Load and Moment Error
- Low Creep
- Low Susceptibility to Magnetic Fields
- Temperature and Barometric Pressure Compensation
- 5pt Tension & Compression Calibration
- Proprietary Modulus Compensated Strain Gages



Note: Shown with Optional Connector and Connector Box

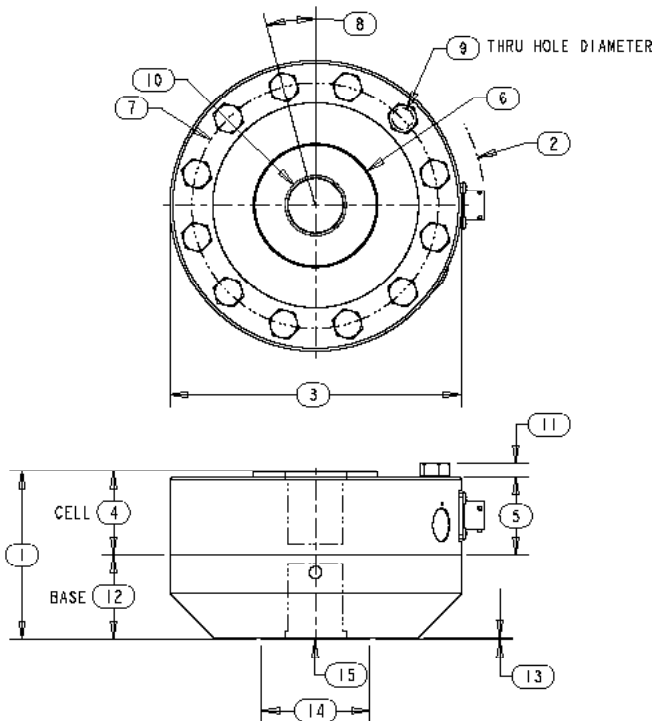
## SPECIFICATIONS

Model	FRS10	FRS20
Capacity U.S. lbf.	2.5K, 5K	12.5K, 25K
PARAMETERS Metric kN	12.5, 25	50, 125
<b>ACCURACY</b>		
Static Error Band, % Rated Output	+/-0.050	+/-0.050
Nonlinearity, % Rated Output	+/-0.050	+/-0.050
Hysteresis, % Rated Output	+/-0.060	+/-0.060
Nonrepeatability, % Rated Output	+/-0.010	+/-0.010
Creep, % in 20 minutes	+/-0.025	+/-0.025
Off-Center Load Sensitivity, %/inch	+/-0.250	+/-0.250
Side Load Sensitivity, %	+/-0.250	+/-0.250
Zero Balance, % Rated Output	+/-1.0	+/-1.0
<b>TEMPERATURE</b>		
Range, Compensated, °F	+15 to +115	+15 to +115
Range, Compensated, °C	-10 to +45	-10 to +45
Range, Operating, °F	-65 to +200	-65 to +200
Range, Operating, °C	-55 to +90	-55 to +90
Effect on Sensitivity, % Rdg/ °F	+/-0.0008	+/-0.0008
Effect on Sensitivity, % Rdg/ °C	+/-0.0015	+/-0.0015
Effect on Zero, % Rated Output/ ° F	+/-0.0015	+/-0.0015
Effect on Zero, % Rated Output/ ° C	+/-0.0027	+/-0.0027
<b>ELECTRICAL</b>		
Rated Output, mV/V, Nominal	2	2
Excitation Voltage, VDC Maximum	20	20
Input Resistance, Ohms	350 + 40/-3.5	350 + 40/-3.5
Output Resistance, Ohms	350 +/-3.5	350 +/-3.5
Insulation Resistance, Megohm	5000 @ 50 VDC	5000 @ 50 VDC
Bayonet Connector	PT02E-10-6P (MS3112E-10-6P)	
<b>MECHANICAL</b>		
Safe Overload Range, % Rated Capacity	+/-300	+/-300
Weight lb	2.9	9.1
Weight kg	1.3	4.1
Weight w/base lb	6.5	21.5
Weight w/base kg	3.0	9.8
Flexure Material	Stainless Steel	

# FATIGUE RATED STAINLESS STEEL (FRS) SERIES FORCE TRANSDUCERS

## DIMENSIONS

Model	FRS10	FRS10M	FRS20	FRS20M
<b>Capacity</b>	2.5K, 5K lbf	12.5, 25 kN	12.5K, 25K lbf	50, 125 kN
<b>Dimensions</b>	inch	mm	inch	mm
1.	2.51	63.5	3.51	88.9
2.	R 2.53	R 64.3	R 3.50	R 88.9
3.	4.12	104.8	6.06	154.0
4.	1.38	34.9	1.75	44.5
5.	1.25	31.8	1.63	41.3
6.	1.29	32.8	2.34 12.5K 2.58 25K	59.4 50 kN 65.6 125 kN
7.	3.50	88.9	5.13	130.3
8.	22.5°	22.5°	15°	15°
9.	.28 8 Places	7.1 8 Places	.41 12 Places	10.3 12 Places
10.	5/8 - 18 1.12 Deep	M16 x 2 28.5 Deep.	1 1/4 - 12 1.50 Deep	M33x 2 38.1 Deep
11.	0.18	4.7	0.29	7.5
12.	1.13	28.6	1.75	44.5
13.	0.03	0.8	0.03	0.8
14.	1.25	31.8	2.25	57.2
15.	5/8 - 18 .88 Deep	M16 x 2 22.4 Deep	1 1/4 - 12 1.50 Deep	M33 x 2 38.1 Deep



## OPTIONS

- Additional bridges
- Output adjustment to standard
- Compression overload protection
- Hermetically sealed connector
- Connector Protectors
- Integral cable

## ACCESSORIES

- Mating connector
- Loading fixtures
- Interconnect cable
- Shunt calibration resistor
- Instrumentation

# LOW HEIGHT COLUMN 2029/2030 SERIES FORCE TRANSDUCERS

## FEATURES

- Sealed for Environmental Protection
- Water Immersion to 300 ft.
- Integral Cable
- External Male Threads
- 5pt Tension & Compression Calibration
- Proprietary Modulus Compensated Strain Gages
- Optional Female Thread
- Metric Capacities Available- Consult Factory



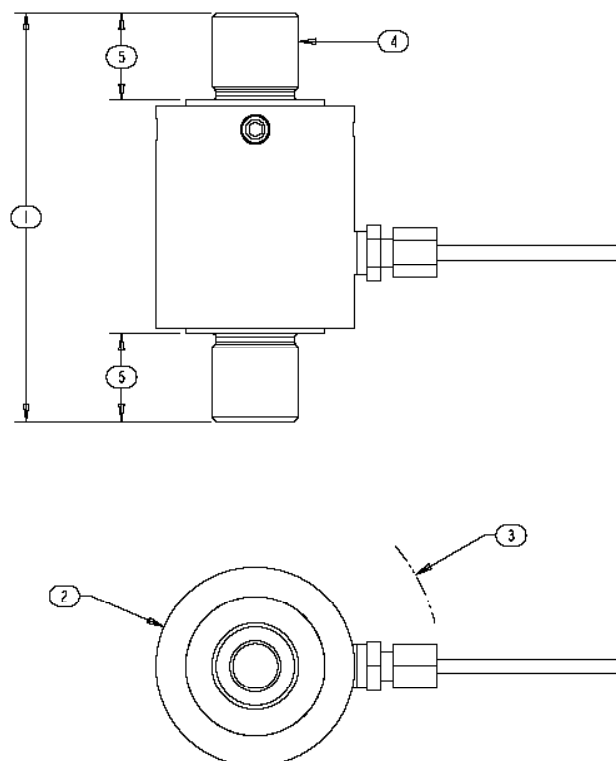
Note: shown with Optional Female Threads.

## SPECIFICATIONS

Model	2029	2030
Capacity U.S. lbf.	500, 1000, 5K	2.5K, 5K, 7.5K
<b>PARAMETERS</b>		
<b>ACCURACY</b>		
Static Error Band, % Rated Output	+/-0.250	+/-0.250
Nonlinearity, % Rated Output	+/-0.250	+/-0.250
Hysteresis, % Rated Output	+/-0.150	+/-0.150
Nonrepeatability, % Rated Output	+/-0.050	+/-0.050
Creep, % in 20 minutes	+/-0.030	+/-0.030
Zero Balance, % Rated Output	+/-1.0	+/-1.0
<b>TEMPERATURE</b>		
Range, Compensated, °F	+15 to +115	+15 to +115
Range, Compensated, °C	-10 to +45	-10 to +45
Range, Operating, °F	-65 to +200	-65 to +200
Range, Operating, °C	-55 to +90	-55 to +90
Effect on Sensitivity, % Rdg/ °F	+/-0.0015	+/-0.0015
Effect on Sensitivity, % Rdg/ °C	+/-0.0027	+/-0.0027
Effect on Zero, % Rated Output/ °F	+/-0.0015	+/-0.0015
Effect on Zero, % Rated Output/ °C	+/-0.0027	+/-0.0027
<b>ELECTRICAL</b>		
Rated Output, mV/V, Nominal	1	1
Excitation Voltage, VDC Maximum	15	15
Input Resistance, Ohms	1000 +100/-10	1000 +100/-10
Output Resistance, Ohms	1000 +100/-10	1000 +100/-10
Insulation Resistance, Megohm	5000 (@ 50VDC)	
<b>MECHANICAL</b>		
Safe Overload Range, % Rated Capacity	+/-150	+/-150
Weight lb	0.7	0.8
Flexure Material	Stainless Steel	Stainless Steel

## DIMENSIONS

Model	2029	2030
Capacity	500, 1000, 5K lbf	2.5K, 5K, 7.5K lbf
Dimensions	inch	inch
1.	3.50	3.50
2.	1.70	1.70
3.	R 1.57	R 1.57
4.	5/8-18	3/4-16
5.	.75	.75





# 2121 SERIES COMPACT STAINLESS STEEL COMPRESSION LOAD CELLS

## FEATURES

- Compact Size
- Accuracy-.05% - .07% of Rated Output
- Optional Full Encapsulation for Harsh Environments
- 5pt Compression Calibration
- Proprietary Modulus Compensated Strain Gages
- Optional Connectors or Integral Cable

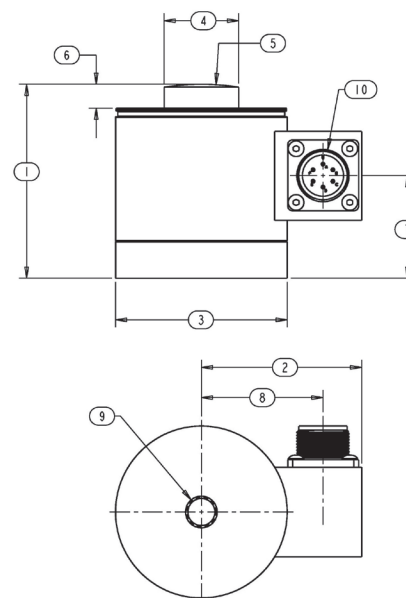


## SPECIFICATIONS

Model	2121
Capacity	U.S. lbf. 10K, 25K lbf
Capacity	Metric kN 45, 100
<b>PARAMETERS</b>	
<b>ACCURACY</b>	
Static Error Band, % Rated Output	+/-0.070
Nonlinearity, % Rated Output	+/-0.070
Hysteresis, % Rated Output	+/-0.050
Nonrepeatability, % Rated Output	+/-0.010
Creep, % in 20 minutes	+/-0.025
Zero Balance, % Rated Output	+/-1.0
<b>TEMPERATURE</b>	
Range, Compensated, °F	+15 to +115
Range, Compensated, °C	-10 to +45
Range, Operating, °F	-30 to +200
Range, Operating, °C	-35 to +93
Effect on Sensitivity, % Rdg/ °F	+/-0.0020
Effect on Sensitivity, % Rdg/ °C	+/-0.0036
Effect on Zero, % Rated Output/ °F	+/-0.0020
Effect on Zero, % Rated Output/ °C	+/-0.0036
<b>ELECTRICAL</b>	
Rated Output, mV/V, Nominal	2
Excitation Voltage, VDC Maximum	15
Input Resistance, Ohms	350
Output Resistance, Ohms	350
Insulation Resistance, Megohm	5000
Bayonet Connector	MS3102E-14S-6P
<b>MECHANICAL</b>	
Safe Overload Range, % Rated Capacity	+/-150
Weight lb	3.6
Weight kg	1.6
Flexure Material	Stainless Steel

## DIMENSIONS

Model	2121	2121
Capacity	10K, 25K lbf	45, 100 kN
Dimensions	inch	mm
1.	3.25	82.55
2.	2.69	68.3
3.	2.88	73.15
4.	1.25	31.75
5.	4	101.6
6.	.40	10.16
7.	1.72	43.69
8.	2.04	51.82
9.	1/2-20 .5 Deep	M12 X 1.25 12.7 Deep



# MODEL 4110 STAINLESS STEEL FORCE TRANSDUCERS

## FEATURES

- Stainless Steel Construction
- Compact Size
- Welded Diaphragm
- 5pt Tension & Compression Calibration
- Optional Hermetically Sealed Connector
- Optional Base
- Counterbored Mounting Holes
- Proprietary Modulus Compensated Strain Gages

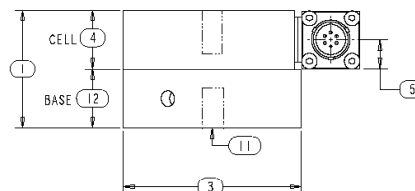
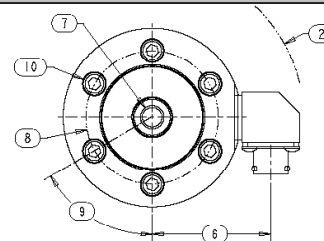


## SPECIFICATIONS

Model	4110	4115
Capacity U.S. lbf.	500, 1K	2K, 5K
<b>PARAMETERS</b>		
<b>ACCURACY</b>		
Static Error Band, % Rated Output	+/-0.100	+/-0.100
Nonlinearity, % Rated Output	+/-0.100	+/-0.100
Hysteresis, % Rated Output	+/-0.100	+/-0.100
Nonrepeatability, % Rated Output	+/-0.020	+/-0.020
Creep, % in 20 minutes	+/-0.050	+/-0.050
Zero Balance, % Rated Output	+/-2.0	+/-2.0
<b>TEMPERATURE</b>		
Range, Compensated, °F	+15 to +115	+15 to +115
Range, Compensated, °C	-10 to +45	-10 to +45
Range, Operating, °F	-65 to +200	-65 to +200
Range, Operating, °C	-55 to +90	-55 to +90
Effect on Sensitivity, % Rdg/ °F	+/-0.0020	+/-0.0020
Effect on Sensitivity, % Rdg/ °C	+/-0.0036	+/-0.0036
Effect on Zero, % Rated Output/ ° F	+/-0.0020	+/-0.0020
Effect on Zero, % Rated Output/ ° C	+/-0.0036	+/-0.0036
<b>ELECTRICAL</b>		
Rated Output, mV/V, Nominal	3	3
Excitation Voltage, VDC Recommended/Max	10/15	10/15
Input Resistance, Ohms	350	350
Output Resistance, Ohms	350	350
Insulation Resistance, Megohm	5000	5000
Connector	PT02E-10-6P (MS3112E-10-6P)	
<b>MECHANICAL</b>		
Safe Overload Range, % Rated Capacity	+/-150	+/-150
Weight lb	1.5	2.0
Weight kg	.5	1
Flexure Material	Stainless Steel	

## DIMENSIONS

Model	4110	4115
Capacity	500, 1K	2K, 5K
Dimensions	inch	inch
1.	2.00	2.00
2.	R 2.53	R 2.78
3.	3.00	3.50
4.	1.00	1.00
5.	.50	.50
6.	2.00	2.25
7.	3/8 -24 UNF 3B THRU	1/2 -20 UNF 3B THRU
8.	2.25	2.63
9.	60°	60°
10.	C'Bore for 1/4-28 SHCS 6 Places	C'Bore for 5/16-24 SHCS 6 Places
11.	3/8-24 UNF 3B .70 Deep	1/2-20 UNF 3B .70 Deep
12.	1.00	1.00



## OPTIONS

Additional bridges  
Output adjustment to standard  
Compression overload protection  
Integral cable  
Connector Protectors  
Custom connectors

## ACCESSORIES

Mating connector  
Loading fixtures  
Interconnect cable  
Shunt calibration resistor  
Instrumentation

# MODEL 4120 STAINLESS STEEL FORCE TRANSDUCERS

## FEATURES

- Stainless Steel Construction
- Welded Diaphragm
- 5pt Tension & Compression Calibration
- Optional Hermetically Sealed Connector
- Optional Base
- Counterbored Mounting Holes on 10K Model
- Proprietary Modulus Compensated Strain Gages



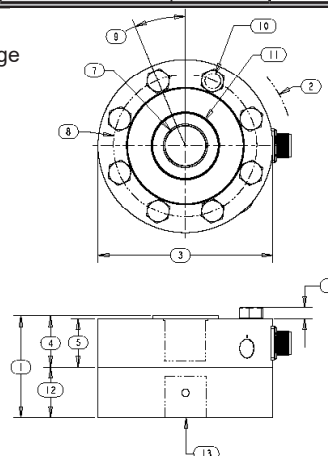
## SPECIFICATIONS

Model	4120	4125
Capacity U.S. lbf.	10K	20K
<b>PARAMETERS</b>		
<b>ACCURACY</b>		
Static Error Band, % Rated Output	+/-0.100	+/-0.100
Nonlinearity, % Rated Output	+/-0.100	+/-0.100
Hysteresis, % Rated Output	+/-0.080	+/-0.080
Nonrepeatability, % Rated Output	+/-0.020	+/-0.020
Creep, % in 20 minutes	+/-0.030	+/-0.030
Zero Balance, % Rated Output	+/-2.0	+/-2.0
<b>TEMPERATURE</b>		
Range, Compensated, °F	+15 to +115	+15 to +115
Range, Compensated, °C	-10 to +45	-10 to +45
Range, Operating, °F	-65 to +200	-65 to +200
Range, Operating, °C	-55 to +90	-55 to +90
Effect on Sensitivity, % Rdg/ °F	+/-0.0008	+/-0.0008
Effect on Sensitivity, % Rdg/ °C	+/-0.0015	+/-0.0015
Effect on Zero, % Rated Output/ ° F	+/-0.0015	+/-0.0015
Effect on Zero, % Rated Output/ ° C	+/-0.0027	+/-0.0027
<b>ELECTRICAL</b>		
Rated Output, mV/V, Nominal	3	3
Excitation Voltage, VDC Recommended/Max	10/20	10/20
Input Resistance, Ohms	350	350
Output Resistance, Ohms	350	350
Insulation Resistance, Megohm	5000	5000
Connector	MS3102E14S-6	
<b>MECHANICAL</b>		
Safe Overload Range, % Rated Capacity	+/-150	+/-150
Weight lb	6	9
Weight kg	3	4
Flexure Material	Stainless Steel	

## DIMENSIONS

Model	4120	4125
Capacity	10K	20K
<b>Dimensions</b>		
1.	inch	inch
2.	3.55	3.55
3.	R 3.39	R 3.62
4.	5.50	6.00
5.	1.80	1.80
6.	1.70	1.70
7.	N/A	.38
8.	1 -14 UNS 3B	1 1/2 -12 UNF 3B
9.	4.50	4.88
10.	22.5°	22.5°
11.	C Bore for 3/8-24 8 Places	.53 8 Places
12.	1.73	2.25
13.	1.75	1.75
	1 -14 1.65 Deep	1 1/2 -12 1.65 Deep

Note: 20K drawing shown. 10K package has counterbored mounting holes.



## OPTIONS

Hermetically sealed connector  
Custom Connectors  
Base  
Output Adjusted to Standard

## ACCESSORIES

Mating connector  
Loading fixtures  
Interconnect cable  
Shunt calibration resistor  
Instrumentation

# PREMIUM "S" TYPE (SSC) SERIES LOAD CELLS

## FEATURES

- Premium Version of the Standard "S" Cell
- Designed for the Test Measurements Market
- In-Line Loading
- Sealed for Environmental Protection
- Bayonet Connector for 500 lbf and above
- 10' Cable for 250 lbf and below
- 3pt Tension Calibration
- Proprietary Modulus Compensated Strain Gages

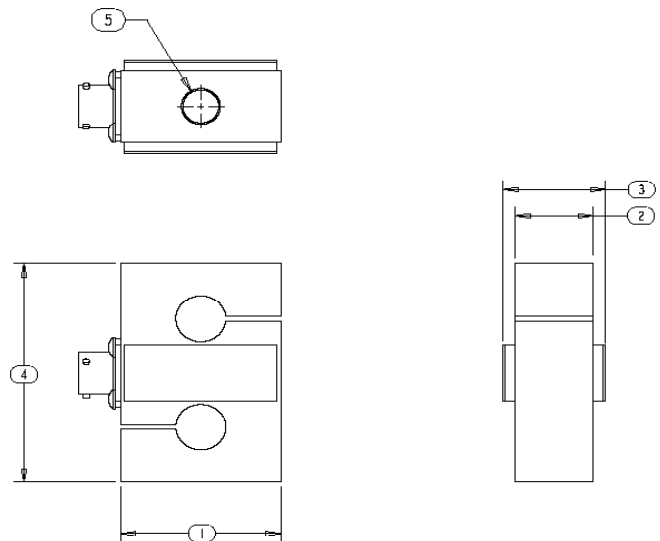


## SPECIFICATIONS

Model	SSC	
	50, 100, 250, 500, 1K	2K, 3K, 5K
Capacity	U.S. lbf.	
<b>PARAMETERS</b>		
<b>ACCURACY</b>		
Static Error Band, % Rated Output	+/-0.030	+/-0.050
Nonlinearity, % Rated Output	+/-0.030	+/-0.050
Hysteresis, % Rated Output	+/-0.030	+/-0.050
Nonrepeatability, % Rated Output	+/-0.010	+/-0.010
Creep, % in 20 minutes	+/-0.030	+/-0.030
Zero Balance, % Rated Output	+/-1.0	+/-1.0
<b>TEMPERATURE</b>		
Range, Compensated, °F	+15 to +115	+15 to +115
Range, Compensated, °C	-10 to +45	-10 to +45
Range, Operating, °F	-65 to +200	-65 to +200
Range, Operating, °C	-55 to +90	-55 to +90
Effect on Sensitivity, % Rdg/ °F	+/-0.0008	+/-0.0008
Effect on Sensitivity, % Rdg/ °C	+/-0.0015	+/-0.0015
Effect on Zero, % Rated Output/ °F	+/-0.0015	+/-0.0015
Effect on Zero, % Rated Output/ °C	+/-0.0027	+/-0.0027
<b>ELECTRICAL</b>		
Rated Output, mV/V, Nominal	3	3
Excitation Voltage, VDC Recommended/Max	10/15	10/15
Input Resistance, Ohms	350 +40/ -3.5	350 +40/ -3.5
Output Resistance, Ohms	350 +/- 3.5	350 +/- 3.5
Insulation Resistance, Megohm	5000 (@ 50 VDC)	
Bayonet Connector	PT02E-10-6P (MS3112E-10-6P)	
<b>MECHANICAL</b>		
Safe Overload Range, % Rated Capacity	+/-150	+/-150
Weight lb	0.5	1.2
Flexure Material	Aluminum	Stainless Steel

## DIMENSIONS

Capacity lbf.	1	2	3	4	5
50	2.00	.48	.80	2.50	1/4 - 28 UNF -2B
100	2.00	.48	.80	2.50	1/4 - 28 UNF -2B
250	2.00	.48	.80	2.50	1/4 - 28 UNF -2B
500	2.00	.97	1.30	3.00	1/2 - 20 UNF -2B
1K	2.00	.97	1.30	3.00	1/2 - 20 UNF -2B
2K	2.00	.97	1.30	2.97	1/2 - 20 UNF -2B
3K	2.00	.97	1.30	2.97	1/2 - 20 UNF -2B
5K	2.50	1.47	1.80	3.47	5/8 - 18 UNF -2B



## OPTIONS

Output adjustment to standard  
Integral cable  
Special connector  
Metric Capacities  
3pt Tension & Compression  
Calibration

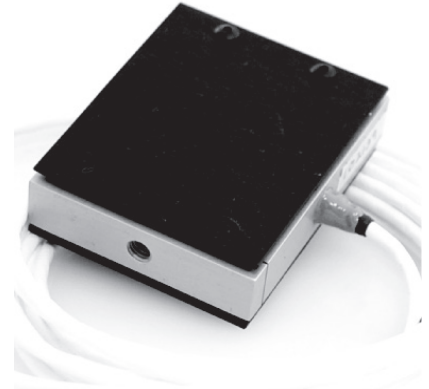
## ACCESSORIES

Mating connector  
Loading fixtures  
Interconnect cable  
Shunt calibration resistor  
Instrumentation

# SCT SERIES PRECISION OVERLOAD PROTECTED S-TYPE LOAD CELLS

## FEATURES

- Overload Protected to 1000% of FS in both Tension and Compression
- High Accuracy-.02% of R.O.
- Integral Cable
- 5pt Tension & Compression Calibration
- Proprietary Modulus Compensated Strain Gages

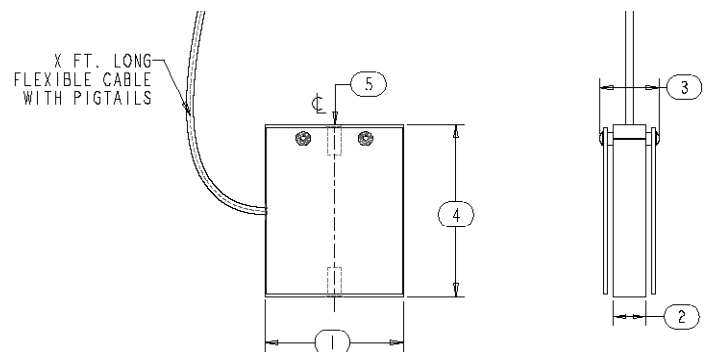


## SPECIFICATIONS

Model	SCT	
Capacity	U.S. lbf.	2.2 - 225
PARAMETERS	Metric N	10 - 1000 N
<b>ACCURACY</b>		
Static Error Band, % Rated Output		+/-0.030
Nonlinearity, % Rated Output		+/-0.040
Hysteresis, % Rated Output		+/-0.030
Nonrepeatability, % Rated Output		+/-0.010
Creep, % in 20 minutes		+/-0.025
Zero Balance, % Rated Output		+/-1.0
<b>TEMPERATURE</b>		
Range, Compensated, °F		0 to +125
Range, Compensated, °C		-15 to +50
Range, Operating, °F		-10 to +175
Range, Operating, °C		-25 to +80
Effect on Sensitivity, % Rdg/ °F		+/-0.0010
Effect on Sensitivity, % Rdg/ °C		+/-0.0018
Effect on Zero, % Rated Output/ °F		+/-0.0015
Effect on Zero, % Rated Output/ °C		+/-0.0027
<b>ELECTRICAL</b>		
Rated Output, mV/V, Nominal		2
Excitation Voltage, VDC Maximum		15
Input Resistance, Ohms		350
Output Resistance, Ohms		350
Insulation Resistance, Megohm		5000
<b>MECHANICAL</b>		
Safe Overload Range, % Rated Capacity		+/-1000
Weight lb		0.3
Flexure Material		Aluminum

## DIMENSIONS

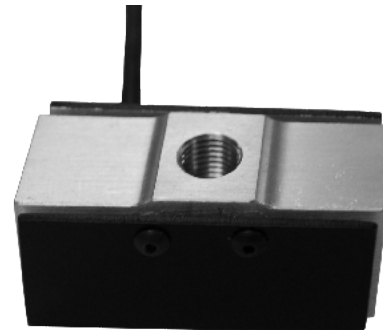
Model	SCT			
Capacity	2.2, 4.4, 11, 22, 55 lbf	10, 20, 50, 100, 250 N	110, 225 lbf	500, 1000 N
Dimensions	inch	mm	inch	mm
1.	2.00	50.8	2.25	57.1
2.	.50	12.7	1.00	25.4
3.	.85	21.6	1.35	34.3
4.	2.50	63.5	3.0	76.2
5.	1/4 - 28 .37 Deep	M6 X 1 9.4 Deep	1/2 - 20 .54 Deep	M12 X 1.75 13.7 Deep



# SLH SERIES LOW HEIGHT S-TYPE LOAD CELLS

## FEATURES

- Compact Size
- Tension and Compression
- Accuracy-.05%-.10% of R.O.
- Integral Cable
- 3pt Tension Calibration
- Proprietary Modulus Compensated Strain Gages

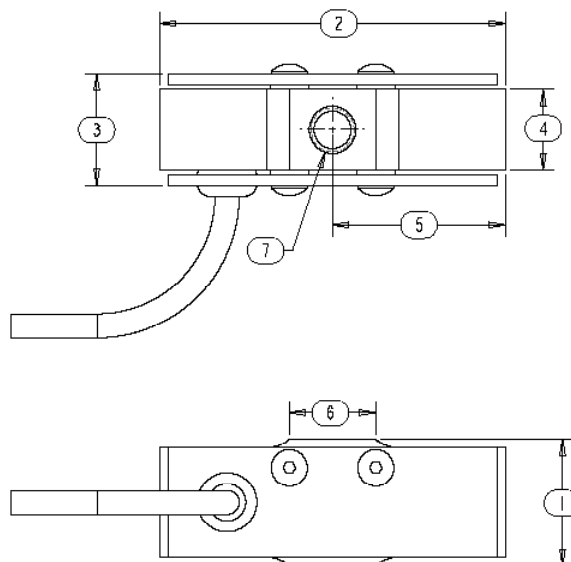


## SPECIFICATIONS

Model	SLH	
	Capacity	U.S. lbf.
	10-300	500, 1K
	50N-1.35kN	2.25kN, 4.5kN
<b>PARAMETERS</b>	<b>Metric</b>	
<b>ACCURACY</b>		
Static Error Band, % Rated Output	+/-0.050	+/-0.100
Nonlinearity, % Rated Output	+/-0.050	+/-0.100
Hysteresis, % Rated Output	+/-0.050	+/-0.100
Nonrepeatability, % Rated Output	+/-0.030	+/-0.030
Creep, % in 20 minutes	+/-0.050	+/-0.050
Zero Balance, % Rated Output	+/-1.0	+/-1.0
<b>TEMPERATURE</b>		
Range, Compensated, °F	0 to +150	0 to +150
Range, Compensated, °C	-15 to +65	-15 to +65
Range, Operating, °F	-65 to +200	-65 to +200
Range, Operating, °C	-55 to +90	-55 to +90
Effect on Sensitivity, % Rdg/ °F	+/-0.0008	+/-0.0008
Effect on Sensitivity, % Rdg/ °C	+/-0.0015	+/-0.0015
Effect on Zero, % Rated Output/ °F	+/-0.005	+/-0.005
Effect on Zero, % Rated Output/ °C	+/-0.010	+/-0.010
<b>ELECTRICAL</b>		
Rated Output, mV/V, Nominal	2	2
Excitation Voltage, VDC Maximum	15	15
Input Resistance, Ohms	350	350
Output Resistance, Ohms	350	350
Insulation Resistance, Megohm	5000	5000
<b>MECHANICAL</b>		
Safe Overload Range, % Rated Capacity	+/-150	+/-150
Weight lb	0.15	0.15
Flexure Material	Aluminum	

## DIMENSIONS

Model	SLH					
	Capacity	10 lbf	50 N	25, 50, 100 lbf	115, 225, 450 N	200,300, 900N, 1.35kN, 500, 1K lbf 2.25kN, 4.5kN
<b>Dimensions</b>	inch	mm	inch	mm	inch	mm
1.	.73	18.6	.73	18.6	.98	24.9
2.	1.80	45.7	2.00	50.8	2.12	53.8
3.	.52	13.2	.64	16.3	.90	22.9
4.	.34	8.6	.46	11.7	.72	18.3
5.	.90	22.9	1.00	25.4	1.06	26.9
6.	.50	12.7	.50	12.7	.57	14.5
7.	10 - 32 .20 Deep		1/4 - 28 .25 Deep		3/8 - 24 .38 Deep	



# LW SERIES LOAD WASHER

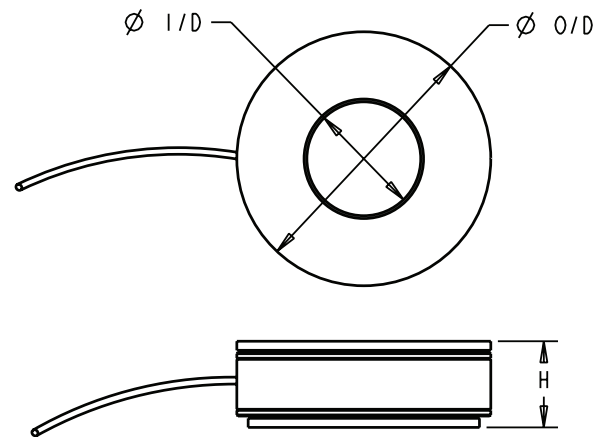
## FEATURES

- Compact Size (.5 to 1.12" Dia.)
- Hollow Cylinder
- Integral Cable
- Special Sizes and Capacities Available
- Optional Stainless Steel



## DIMENSIONS

Consult Factory



## SPECIFICATIONS

Model	LW
Capacity	U.S. lbf. 2K - 10K
<b>PARAMETERS</b>	
<b>ACCURACY</b>	
Static Error Band, % Rated Output	+/- 3.000
<b>TEMPERATURE</b>	
Range, Compensated, °F	+60 to +160
Range, Compensated, °C	16 to +71
Range, Operating, °F	-65 to +250
Range, Operating, °C	-54 to +121
Effect on Zero, % Rated Output/ °F	+/-0.005
Effect on Zero, % Rated Output/ °C	+/-0.008
<b>ELECTRICAL</b>	
Rated Output, mV/V, Nominal	1-3
Excitation Voltage, VDC Maximum	10
Input Resistance, Ohms	350
Output Resistance, Ohms	350
<b>MECHANICAL</b>	
Safe Overload Range, % Rated Capacity	+/-150
Weight lb	
Flexure Material	Steel

# MINATURE REACTION TORQUE (RT) SERIES TORQUE TRANSDUCERS

## FEATURES

- Compact Size
- Accuracy-.1% of Rated Output
- Capacities from 25 to 500 lbf-in.
- Integral Cable
- 5pt CW and CCW Calibration
- Proprietary Modulus Compensated Strain Gages
- Metric Capacities Available - Consult Factory

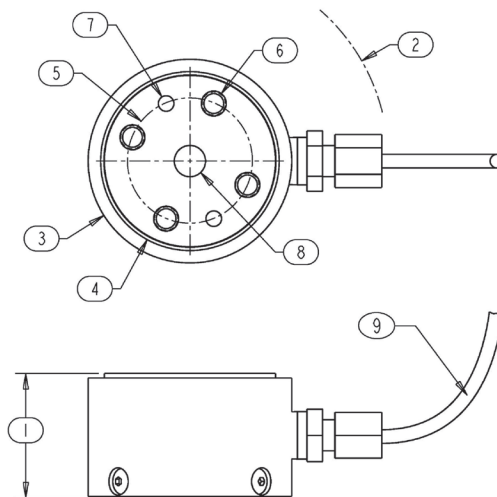


## SPECIFICATIONS

Model	RT
Capacity U.S. lbf-in.	25, 50, 100, 200, 250, 500
<b>PARAMETERS</b>	
<b>ACCURACY</b>	
Nonlinearity, % Rated Output	+/-0.100
Hysteresis, % Rated Output	+/-0.100
Nonrepeatability, % Rated Output	+/-0.050
Creep, % in 20 minutes	+/-0.100
<b>TEMPERATURE</b>	
Range, Compensated, °F	+15 to +115
Range, Compensated, °C	-10 to +45
Range, Operating, °F	-65 to +200
Range, Operating, °C	-55 to +90
Effect on Sensitivity, % Rdg/ °F	+/-0.0010
Effect on Sensitivity, % Rdg/ °C	+/-0.0018
Effect on Zero, % Rated Output/ °F	+/-0.0020
Effect on Zero, % Rated Output/ °C	+/-0.0036
<b>ELECTRICAL</b>	
Rated Output, mV/V, Nominal	2
Excitation Voltage, VDC Maximum	15
Input Resistance, Ohms	350
Output Resistance, Ohms	350
Insulation Resistance, Megohm	5000
<b>MECHANICAL</b>	
Safe Overload Range, % Rated Capacity	+/-150
Weight lb	0.15
Flexure Material	Aluminum
Overhung Moment, lbf-in Maximum	12.5, 25, 50, 100, 125, 250

## DIMENSIONS

Model	RT
Capacity	25, 50, 100, 200, 250, 500
<b>Dimensions</b>	inch
1.	1.00
2.	R 1.54
3.	1.64
4.	1.38
5.	1.00
6.	10-32 UNF 2B
7.	.125 +/- .0005
8.	.251 +/- .001 Thru
9.	10 ft Conductor Cable with Pig Tails





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# INSTRUMENTS INTRODUCTION

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<b>INSTRUMENTS</b>		
	Model	Page
High Precision Indicator	9150	52
High Precision Indicator	9150-X-300	53
Sealed Indicator	7120	55
Portable Indicator	7230	56
Strain Gage Amplifier	SGA	58
<b>LOAD CELL SIMULATORS</b>		
Reference Std. Simulator	TS-10-2	59

# 9150 HIGH PRECISION INDICATOR

## FEATURES

- 24-bit Resolution
- 10-point Linearization
- Linearity of 0.005% of Full Scale
- Sensitivity of +/-4.5 mV/V
- 2 Channel Transducer Input (Optional)
- Software Selectable Filters
- RS-232, RS-485 or USB Computer Interface
- Stores Calibration Data for up to 25 Load cells



SPECIFICATIONS	
Model	9150-1 Single Channel 9150-2 Dual Channel
<b>PARAMETERS</b>	
<b>PERFORMANCE</b>	
Power Requirements	115 VAC, 60Hz/ 230 VAC, 50Hz
Excitation	5VDC or 10 VDC software/auto selectable
Current Drive	180 mA at 5 VDC or 10 VDC
Push Button Shunt	Yes
Internal Shunt Resistor	1 standard, 2 optional. Rear panel selectable
Display Values	-999,999 through 999,999
Calibration Method	Shunt, mV/V, Known Load
Push Button Tare	100% of range--display and analog output
Sensitivity Adjust	1 mV/V to 4.5 mV/V
Accuracy	0.01% of full scale +/- digital count
CMRR	115 dB
<b>TRANSDUCER CHANNELS</b>	
Number of Channels	9150-1 Single, 9150-2 Dual
<b>D/A ANALOG OUTPUT</b>	
Full Scale Output	+/- 10 VDC nominal +/- 0.5 VDC
Linearity	0.02% of full scale
Scaling	Gain and offset selected software
Frequency Response	Approx. 15 Hz (plus filtering)
Output Source	Any displayed quantity
<b>DIRECT ANALOG OUTPUT</b>	
Full Scale Output	+/- 8.14 VDC +/- 0.25 VDC
Linearity	0.02% of full scale
Scaling	Fixed with no tare, transducer channel only
Frequency Response	Approx. 1.5 kHz
<b>DIGITAL I/O</b>	
Inputs--Interface	4 optically isolated inputs
Outputs--Quad Limits	4 isolated solid state switches
<b>SERIAL INTERFACE</b>	
RS-232, RS-485	Standard, Optional
USB	Standard
<b>AUTO TRANSDUCER I.D.</b>	
Auto I.D. and Setup	Standard

# 9150-X-300 HIGH PRECISION INDICATOR

## FEATURES

- Ratiometric measurement measures true mV/V
- Resolution 0.00001 mV/V
- Display mV/V or physical units
- Stores calibration data for up to 25 load cells
- 10-point linearization
- Special high performance unit
- Linearity of 0.003% of full scale
- Sensitivity of +/-4.5 mV/V
- 1 or 2 channel transducer input and display
- RS-232, RS-485 or USB Computer Interface
- Software selectable filters



The Model 9150-X-300 is a high performance version of the standard Model 9150 featuring higher accuracy, stability and lower temperature errors.

## SPECIFICATIONS

Model	9150-1-300 Single Channel 9150-2-300 Dual Channel
<b>PARAMETERS</b>	
<b>PERFORMANCE</b>	
Power Requirements	115 VAC, 60Hz/ 230 VAC, 50Hz
Excitation	5VDC or 10 VDC software/auto selectable
Current Drive	180 mA at 5 VDC or 10 VDC
Push Button Shunt	Yes
Internal Shunt Resistor	1 standard, 2 optional. Rear panel selectable
Display Values	-999,999 through 999,999
Calibration Method	Shunt, mV/V, Known Load
Push Button Tare	100% of range--display and analog output
Sensitivity Adjust	1 mV/V to 4.5 mV/V
Accuracy	0.003% of full scale +/- digital count
CMRR	115 dB
<b>TEMPERATURE</b>	
Effect on Zero	0.005%/C
Effect on Output	0.005%/C
<b>TRANSDUCER CHANNELS</b>	
Number of Channels	9150-1-300 Single, 9150-2-300 Dual
<b>D/A ANALOG OUTPUT</b>	
Full Scale Output	+/- 10 VDC nominal +/- 0.5 VDC
Linearity	0.02% of full scale
Scaling	Gain and offset selected software
Frequency Response	Approx. 15 Hz (plus filtering)
Output Source	Any displayed quantity
<b>DIRECT ANALOG OUTPUT</b>	
Full Scale Output	+/- 8.14 VDC +/- 0.25 VDC
Linearity	0.02% of full scale
Scaling	Fixed with no tare, transducer channel only
Frequency Response	Approx. 1.5 kHz
<b>DIGITAL I/O</b>	
Inputs--Interface	4 optically isolated inputs
Outputs--Quad Limits	4 isolated solid state switches
<b>SERIAL INTERFACE</b>	
RS-232, RS-485	Standard, Optional
USB	Standard
<b>AUTO TRANSDUCER I.D.</b>	
Auto I.D. and Setup	Standard

# 7230 PORTABLE STRAIN DISPLAY LOAD CELL INDICATOR

## FEATURES

- Portable Handheld Instrument
- Powered by 2 AA Internal Batteries
- Environmentally Sealed to IP65/NEMA 4
- Dual Range Selection
- 7 1/2 Digit LCD Display
- Optional RS-232 Computer Interface



SPECIFICATIONS	
Model	7230
<b>PARAMETERS</b>	
<b>PERFORMANCE</b>	
Full Scale	Selectable
Resolution (Bits)	24 bits
Resolution (Counts)	250,000 counts/divisions @ 1Hz sample rate
Resolution (Counts)	65,000 counts/divisions @ 10 Hz sample rate
Temp. Effect on Zero	0.05% FS per 100 degree C
Temp. Effect on Span	0.07% FS per 100 degree C
<b>Non-Linearity</b>	0.005% FS
Off-Set Stability	0.008% FS
Gain Stability	0.01% per year
Excitation Voltage	5.2 Vdc
Battery Life	45 hours continuous operation
Update Rate	10 mS to 2s including peak/valley hold rate
<b>ELECTRICAL</b>	
Power Input	12-26 VAC/12-36 VDC
Electrical Connection	5 pin binder socket (mating plug supplied).
<b>INDICATION</b>	
Display Type	7 1/2 digit LCD display, 8.8mm high digits
Decimal Resolution	1 part in 250,000 at 1s update
Annunciators	Low battery warning, peak, trough, hold, net, shunt cal, range, by LCD annunciators
<b>ENCLOSURE</b>	
Material	ABS, dark grey (optional carrying case)
Width	90 mm
Height	152 mm
Depth	34 mm

# 7120 SEALED GENERAL PURPOSE INDICATOR

## FEATURES

- Sealed Enclosure for Harsh Environments
- 20-bit Resolution
- 10-point Linearization
- Lb and Kg Measurement Units
- RS-232 Computer Interface
- Peak Hold



SPECIFICATIONS	
Model	7120
<b>PARAMETERS</b>	
<b>PERFORMANCE</b>	
Full Scale	Selectable
Resolution	100,000 displayed (+/- 500,000)
A/D Conversion	60 Hz
Non-Linearity	0.005% FS
Zero Track	0.05-20.0 displayed divisions
Zero Range	Selectable to 100%
Display Units	Selectable
Calibration	Selectable, up to 10 multi-point calibration
Division Size	0.00001 through 500
<b>ELECTRICAL</b>	
Power Input	90-250 VAC, 50-60 Hz, 10-32 VDC
Fuse	0.8 Amp time lag
<b>LOAD CELL INPUT</b>	
Connections	4 lead or 6 lead with sense
Power	(12) 350-ohm cells
Signal Range	0.1 to 20 mV/V
Excitation	10 VDC with short circuit protection
Current	400 mA maximum
<b>COMMUNICATIONS</b>	
Computer Interface	RS-232 serial port
Baud Rate	Selectable
Protocal	Selectable
Formatting	Selectable
<b>DISPLAY</b>	
Display Type	Vacuum fluorescent
Decimal Point	Selectable
Display Values	-99,999 through 999,999
<b>ENCLOSURE</b>	
Material	Stainless Steel
Width	11 in (279 mm)
Height	9 in (228 mm)
Depth	4.4 in (112 mm)

# SGA/A & SGA/D STRAIN GAGE AMPLIFIER

## FEATURES

- 10V Excitation for up to 4 x 350R Bridges
- Adjustable Sensitivity 0.1 to 30 mV/V
- User Selectable Analog Output
- Simultaneous Voltage and Current Output
- Direct Connection to PLC, Display, Instrument
- LVDT Version Available



SPECIFICATIONS	
Model	SGA
<b>PARAMETERS</b>	
<b>PERFORMANCE</b>	
Power Supply (SGA/A)	110/230 V AC
Power Supply DC	18-24 V DC
Power Supply Current	200 mA
Bridge Excitation	10 V (350R Strain Gage)
Bridge Resistance	85 Ohms
Bridge Sensitivity (Switchable)	0.06 Min - 29 Max mV/V
Gain Adj. (Pot-fine adj.)	0.06 Min - 1.0 Max mV/V
Offset Adj. (Pot-fine adj.)	-1.25 Min - 1.25 Max %FS
Offset Adj. (Switchable-course adj.)	+/-1.25 Min - +/-79 %FS
Output Load (Voltage output)	2 mA
Output Load (Current output)	0 - 500 Ohms
Temp. Effect on Zero	0.09% FS /100 degrees C
Temp. Effect on Span	1.0% FS /100 degrees C
Non-linearity	0.03% % FS
Gain Stability	0.2% FS (1st 1000 hrs)
Output Load Stability Gain (0-100%)	.01% FS
Output Load Stability Off-set (0-100%)	.01% FS
Power Supply Reject. Gain (0-100%)	.01% FS
Power Supply Reject. Offset (0-100%)	.01% FS
Operating Temperature Range	-20 - 50 degrees C
Humidity Range	0-95%

# TRANSDUCER SIMULATOR

## FEATURES

- High Accuracy Calibration Standard
- Output stability of less than 15ppm over 1 year
- Low Temperature Coefficient
- Available in multiple configurations

## Description:

Our Transducer Simulator reference standards provide metrology grade bridge simulation. The bridge simulator provides calibrated inputs to a load cell indicator to verify and calibrate the instrument.



## SPECIFICATIONS

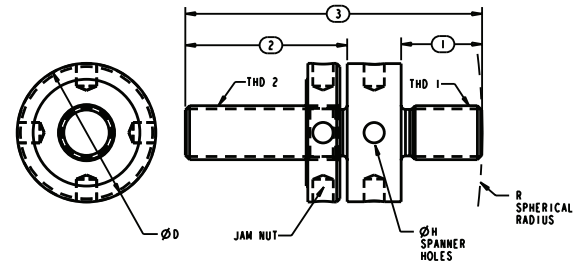
Model	TS-10-2	TS-2-2	TS-2-3	TS-2-4
<b>PARAMETERS</b>				
<b>PERFORMANCE</b>				
Output Settings, +/- mV/V	0.0, 0.1, 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5	0.0, 2.0	0.0, 3.0	0.0, 4.0
Excitation Voltage	10 VDC, Recommended			
I/O Resistance Ohms	350 +/-0.005% at Zero Settings >348 at All Output Settings			
Output at Zero Setting	<0.5 $\mu$ V			
Error in Nominal Output Values	<0.03% at 0.1 mV/V <0.015% at 0.5 - 4.5 mV/V	<0.015% at 2.0 mV/V	<0.015% at 3.0 mV/V	<0.015% at 4.0 mV/V
Error in Calibrated Value of Output Settings	<15 ppm / year typical			
Temperature Coefficient of Output	<5 ppm / degree C			
Measurement Uncertainty of Charted Values	0.00063%			
<b>Dimensions</b>				
Length, Enclosure, inches	7.4	4.6	4.6	4.6
Length, Overall, inches	7.6	5.6	5.6	5.6
Width, Enclosure, inches	3.3	2.3	2.3	2.3
Width, Overall, inches	4.2	3.1	3.1	3.1
Height, Enclosure, inches	4.8	3.6	3.6	3.6
Height, Overall, inches	4.8	5.3	5.3	5.3

## FEATURES

• Tovey Engineering manufactures precision thread adaptors, fixtures, cables and connectors. They're designed specifically for use with load cell applications. Design considerations incorporate the appropriate material, heat treat, and exact tolerances required for applied load and to maintain proper alignment. Standard configurations shown- Consult factory for alternate thread sizes and custom applications.

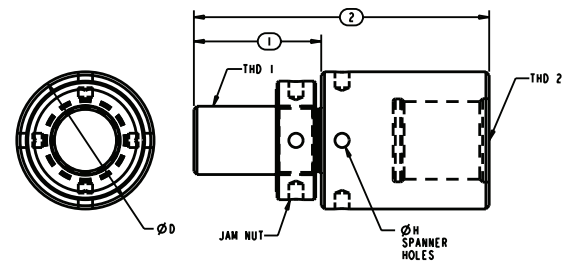
## CALIBRATION ADAPTERS

PART NUMBER	MALE THREAD SIZE	JAM NUT	DIMENSIONS				
			D	L1	L2	L3	R
TAMM-100	1/2-20	JN-100	1.28	.75	1.50	2.75	4
TAMM-101	5/8-18	JN-101	1.28	.75	1.57	2.82	4
TAMM-102	1-14	JN-102	2.00	1.50	2.15	4.15	6
TAMM-103	1 1/4-12	JN-103	2.00	1.50	2.32	4.32	6
TAMM-104	1 3/4-12	JN-104	2.75	1.75	3.26	5.52	6
TAMM-105	2 3/4-8	JN-105	3.50	2.50	5.03	8.28	12
TAMM-106	4-8	JN-106	7.00	3.50	7.25	12.25	20
TAMM-120	6-8	JN-120	9.50	4.70	10.44	16.64	20



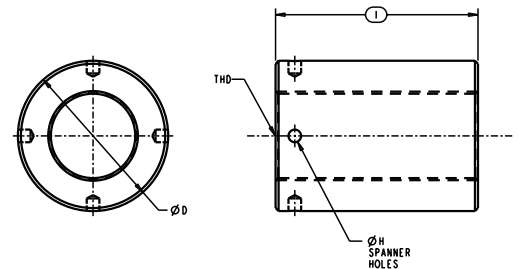
## THREAD ADAPTERS

PART NUMBER	THREAD SIZE		JAM NUT	DIMENSIONS		
	MALE	FEMALE		D	1	2
TAMF-100	1/2-20	1/2-20	JN-100	1.29	1.50	2.94
TAMF-101	5/8-18	5/8-18	JN-101	1.24	1.57	3.07
TAMF-102	1-14	1-14	JN-102	2.00	2.15	4.65
TAMF-103	1 1/4-12	1 1/4-12	JN-103	1.97	2.32	4.82
TAMF-104	1 3/4-12	1 3/4-12	JN-104	3.17	3.30	6.80
TAMF-105	2 3/4-8	2 3/4-8	JN-105	3.95	5.03	9.03



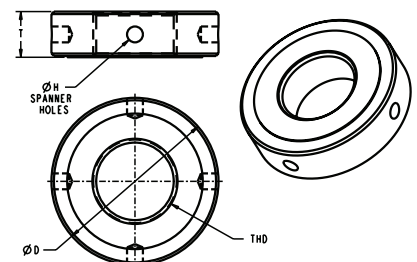
## COUPLERS

PART NUMBER	FEMALE THREAD SIZE	DIMENSIONS		
		D	1	H
TAFF-099	1/4-28	.47	1.00	.42 flat
TAFF-100	1/2-20	1.22	2.00	3/16
TAFF-101	5/8-18	1.36	2.00	3/16
TAFF-102	1-14	1.97	3.25	1/4
TAFF-103	1 1/4-12	2.22	3.25	1/4
TAFF-104	1 3/4-12	3.00	4.00	1/4
TAFF-105	2 3/4-8	5.00	5.50	3/8
TAFF-107	1 1/2-12	3.00	4.00	1/4



## JAM NUTS

PART NUMBER	THREAD SIZE	DIMENSIONS		
		D	T	H
JN-100	1/2-20	1.29	.31	3/16
JN-101	5/8-18	1.29	.38	3/16
JN-102	1-14	2.00	.55	3/16
JN-103	1 1/4-12	2.16	.72	1/4
JN-104	1 3/4-12	3.17	.97	1/4
JN-105	2 3/4-8	4.75	1.58	3/8
JN-106	4-8	7.00	2.188	3/8
JN-120	6-8	9.50	4.75	1/2-13





**LOAD BUTTONS**

PART NUMBER	THREAD SIZE	FIGURE	DIMENSIONS			
			H/D	1	2	R
LB-099	1/4-28	1	0.44	0.63	0.15	2
LB-100	1/2-20	1	0.75	1.05	0.30	4
LB-101	5/8-18	1	0.94	1.41	0.41	4
LB-102	1-14	1	1.50	2.1	0.61	4
LB-103	1 1/4-12	2	2.25	2.38	0.88	6
LB-104	1 3/4-12	2	3.75	3.34	1.34	6
LB-105	2 3/4-8	2	4.00	3.40	1.40	12
LB-106	4-8	2	7.89	4.39	2.89	20
LB-107	1 1/2-12	2	3.95	3.50	1.50	6

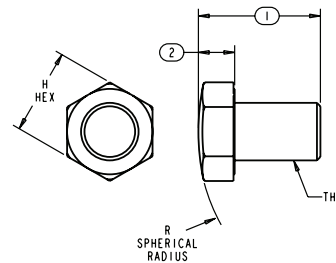


Figure 1

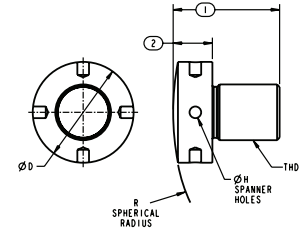
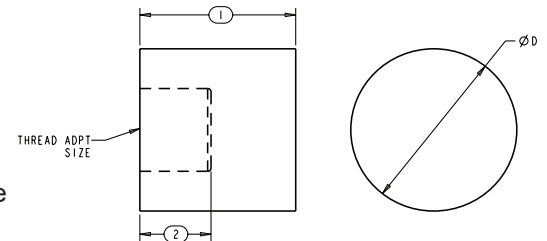


Figure 2

**COMPRESSION PLATE**

PART NUMBER	THREAD SIZE	DIMENSIONS		
		D	L1	L2
CP-100	1/2-20	1.47	1.38	.63
CP-101	5/8-18	1.47	1.38	.63
CP-102	1-14	2.00	2.00	.63
CP-103	1 1/4 -12	2.00	2.00	.63
CP-104	1 3/4 -12	2.50	2.25	.75
CP-105	2 3/4 -8	4.00	2.50	.75
CP-106	4 -8	6.00	3.75	.75

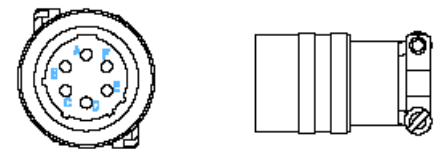
• Used for compression loading, Compression Plates are used in conjunction with installed TAMM Calibration Adapters. Contacting the spherical end on the adapter, the CP is a hardened interface that is free to swivel on the TAMM, spreading the load, and allowing for compensation of non-parallel loading surfaces.

**INSTRUMENT CABLES**

PART NUMBER	DISCRIPTION
CBL-101-10	Interconnect Cable, 7 wire to 4 pins, MS3116F-10-6S to pigtail, 10'
CBL-102-10	Interconnect Cable, 7 wire to 6 pins, MS3116F-10-6S to pigtail, 10'
CBL-108-10	Interconnect Cable, 7 wire, MS3116F-10-6S to 9150 instrument, mating connector, 6-4 adaption made on MS3116 connector, 10'
CBL-120-10	Interconnect Cable, 7 wire, MS3116F-10-6S to 9150 instrument, mating connector, 10'
CBL-123-10	Serial Cable, 9150 instrument (DB-15) to computer (DB-9), 10'
CBL-135-10	Interconnect Cable, 7 wire to 6 pins, MS3116F-10-6S to 7230 Instrument

**MATING CONNECTORS**

PART NUMBER	DISCRIPTION
MC-100	MS3116F-10-4S (PT06A-10-6S)-SR, mating connector
MC-200	MS3112E-10-6P (PT02E-10-6P), load cell connector
MC-201	Bendix PC04E-10-6P, load cell connector
MC-101	Bendix PC06W-10-6S, mating connector



## FEATURES

- Tovey Engineering provides standard and customized Pelican-Hardigg™ cases for all load cell and instrumentation requirements. Complex foam cushioning can be provided to accommodate any load cell, instrument, fixturing, cabling or combination thereof.
- Consult Factory for more information.



## DIMENSIONS

Dimensions	Length Inches	Width Inches	Case Depth Inches	Lid Depth Inches	Load Cells
<b>Models</b>					
TC-10	10	10	6	4	Series 10
TC-20	10	10	6	4	Series 20
TC-22	10	10	9	4	Series 22
TC-30	14	13	10	5	Series 30
TC-40	20	20	13	5	Series 40
TC-5060	29	14	9	5	5060
TC-5160	12	12	4	4	5160
TC-5180	16	16	5	4	5180
TC-5240	12	12	4	5	5240

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## OPTIONS

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### Tovey Engineering offers the following load cell options:

- **Additional Bridges:** Additional bridges provide separate independent electrical measurement circuits, producing isolated measurement outputs. Additional bridges are often used for measurement redundancy or control. Dual bridges are commonly used; occasionally, triple or quad bridges are used. Most Tovey models accommodate additional bridges.
- **Output Adjustment to Standard Value:** Typical variation in load cell output may fall between +/- 10% of the nominal specified output. If desired, the load cell sensitivity can be adjusted to within +/- 0.1% of the nominal output.
- **Compression Overload Protection:** Typical safe overload values are in the range of 150%-200% of rated load cell output. On Tovey Shear Web models, overload protection to 500% of rated load can be provided by carefully controlling the clearance gap between the load cell hub and base. Some other model types, including the SCT S-cell, are specially designed to be tolerant of overload situations.
- **Integral Cable:** In some cases, it may be desirable to have an integral cable rather than a connector on a load cell. Substitution of a cable is possible for most Tovey load cell models.
- **Custom Connectors:** Many customers have adopted standard connectors for use in their facilities. In most cases, these special connectors can be placed on Tovey load cells in place of standard connectors.
- **TEDS (Transducer Electronic Data Sheet):** Electronic identification is available for most Tovey load cell models. Identification is compatible with IEEE 1451.4 TEDS standards.
- **On-Board Electronics:** Optional on-board electronics are available on most Tovey load cell models. Electronic modules are available providing bi-polar voltage output, current output, and serial digital output.
- *Male and Female Threads:* Every item has the capabilities to have either a male or female threads.

# ALIGNMENT AND DYNAMIC VERIFICATION TRANSDUCERS

## FEATURES

- Tovey Engineering makes alignment and dynamic verification transducers to support the materials testing industry.

- Alignment transducers are made to use in machine alignment to minimize the imposition of bending strains and stresses on specimens under test. These transducers are made to closely simulate specimens used for materials testing. TEI can manufacture the specimens or instrument specimens furnished by the customer. Alignment transducers typically have eight to twelve strain gages placed on the test section to allow the bending induced in the specimen by the machine and grip fixtures to be measured. Machine components are then adjusted to bring the alignment into appropriate bounds. Our alignment transducers meet the requirements of ASTM E1012, *Verification of Test Frame and Specimen Alignment Under Tensile and Compressive Axial Force Application*.



- Dynamic verification specimens are used to determine the range of frequencies the testing machine can be operated over while maintaining accurate force measurement with a given specimen geometry and fixtures. These parts are instrumented as full bridge transducers. The correlation between the machine load cell and dynamic verification transducer is determined quasi-statically. The machine is then operated at increasing frequencies of load application until the machine load cell and the verification transducer differ in output by the allowable error (typically 1%). This frequency sets the upper bound of the frequency spectrum over which the machine can be operated in that configuration.

- We offer custom transport cases and can supply fixtures for the transducers. We work closely with the customer to design custom made transducers to satisfy each application.

# COMPONENT STRAIN GAGE SERVICE

## FEATURES

Tovey Engineering offers strain gaging services to the industry including engineering the project, installing strain gages, wiring the circuit, installing appropriate protective coatings, and testing for function.

Tovey will perform services in our facility when possible or do field installations when necessary. The same standards and methods used for Tovey transducer manufacture are used in component gaging, resulting in high quality, reliable strain gage installations.

Motor cycle Brake Lever instrumented to measure bending strain. Typical of many automotive and aerospace vehicle component strain gage jobs.



On-site installation of strain gages on the nose gear drag length of a Boeing 747. The drag length was instrumented as a full bridge transducer to measure towing force applied to the landing gear during towing. Calibration was performed using a Tovey fatigue rated 100 klbF load cell installed in a modified tow bar.

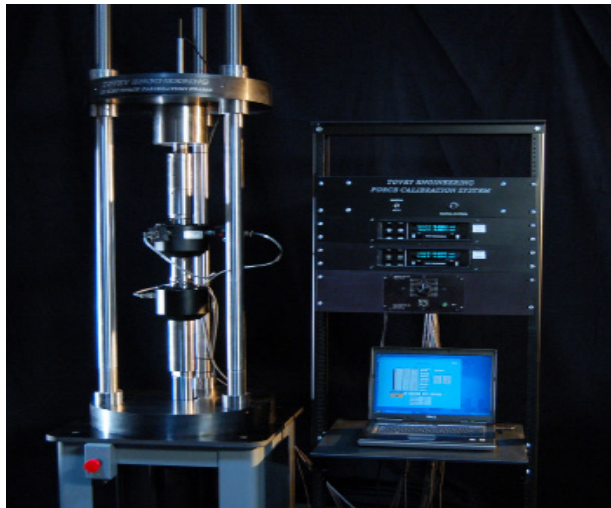
Strain gage installation on the Mars Science Lab in a clean room environment. In total 600 strain gages were installed over a 6 month period as assembly was completed on the Mars Science Lab Cruise Stage structure, Descent Stage structure, and Rover component parts. Some of the work was performed at the Tovey facility, but much of the work was done on-site.



# AUTOMATED FORCE CALIBRATION SYSTEMS

## Tovey Automated Systems.

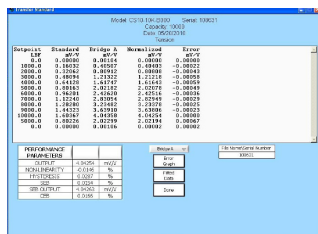
Tovey Engineering (TEI) is the industry leader in automated transfer standard force calibration systems. TEI systems have been engineered over more than a 10-year period to achieve very low uncertainties with maximum ease-of-use for cal lab personnel.



55K lbf System

Tovey systems are designed specifically for metrology grade calibration, rather than being modified test systems. All key system components are manufactured by the company in-house to meet exacting standards for metrology use. Reliability is excellent, and alignment is second to none. TEI systems closely approximate results from deadweight calibrators.

TEI developed the first automated systems on the market to enable efficient, high accuracy calibration and we continue to engineer system products for maximum performance. Customer feedback has been extremely positive.



10 Point Calibration Data



Tension Error Data

## System Features:

- Systems include load frame, transfer standard load cells, hydraulic power unit, automated control, and data analysis software.
- Durable multi-column load frames exhibit high frame stiffness, highly symmetric stiffness, and exceptional alignment.
- Universal fixturing allows tension and compression calibration without changeover.
- Systems feature Tovey CS Series metrology grade transfer standards, which meet the highest performance standards of any load cell manufacturer.
- Systems enable fully automated calibration, exercise transducers automatically with specified forces and number of cycles.
- Calibrate transducers in load sequences using up to thirty different load points with simultaneous measurement of up to three bridges (standard) or up to 8 bridges (optional).
- Automated closed-loop system calculates performance parameters and performs data evaluations per ASTM E74 and/or ISO 376.
- Model 9150 ratio-metric instruments provide excitation of 5 or 10 Volts, signal conditioning and A to D conversion with 24 bit digital resolution and a useable resolution to < 100 nanovoltz.
- Model TS-10-2 Transducer Simulator with 30ppm measurement uncertainty (1 year) simplifies instrument calibration and provides an instrument check standard.
- Data files and graphs for calibration records are produced and stored.
- Data analysis and output is compliant with national and international standards



1000K lbf System

ACCREDITATIONS: NVLAP Lab Code 200662-0 • ANSI Z540, ISO/IEC 17025 • ASTM E74, ISO 376

## System Capacity and Performance.

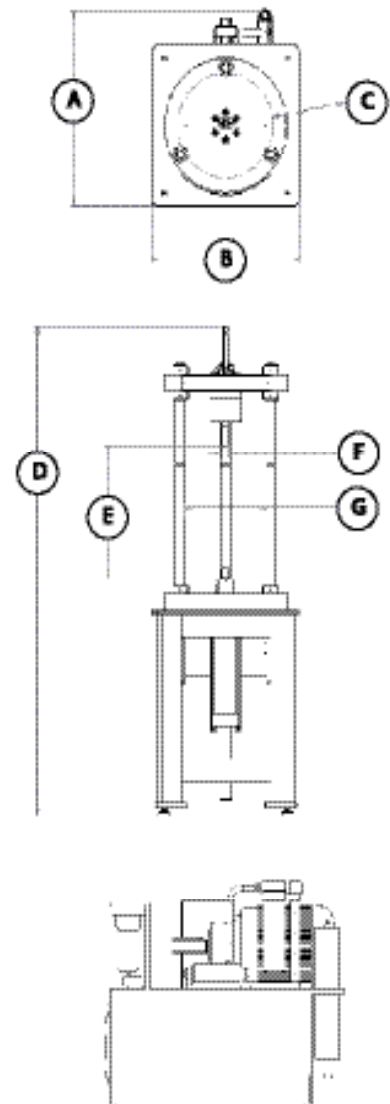
Tovey Engineering transfer standard force calibration systems are available in capacities ranging from 20 lbf to 1 million lbf. These versatile automated calibration systems reduce calibration time and cost, permitting efficient in-house transducer calibration. Systems meet ASTM E74 required measurement uncertainty of applied forces of less than 0.005% of range, or overall measurement uncertainty of 0.025%-0.050% of reading. Systems feature Tovey CS Series metrology grade load cells, with industry leading performance.



11K and 110K lbf System

## DIMENSIONS

Load frames 3K-55K				
Capacity		3K	11K	55K
<b>Dimensions</b>				
A	Base Depth	29 in (74 cm)	29 in (74 cm)	29 in (74 cm)
B	Base width	24 in (61 cm)	24 in (61 cm)	24 in (61 cm)
C	Working diameter	12.8 in max (32.5 cm)	15.3 in max (38.9 cm)	14.9 in max (37.9 cm)
D	Overall height	76 in (193 cm)	85 in (215 cm)	98 in (249 cm)
E	Vertical working space	21.5-30.0 in (54.6 cm-76.2 cm)	21.0-30.0 in (53.3 cm-76.2 cm)	29.0-40.0 in (73.7 cm-101.6 cm)
F	Thread size	1/2-20 UNC 3A (Both ends)	1-14 UNS 3A (Both ends)	1 3/4 -12 UN 3A (Both ends)
G	Column opening	10.8 in max (27.4 cm)	13.2 in (33.5 cm)	12.6 in (32 cm)
	Weight of load frame	480 lbs (219 kg)	920 lbs (419 kg)	1,380 lbs (628 kg)
Load frames 110K-1M				
Capacity		110K	220K	1M
<b>Dimension</b>				
A	Base Depth	29 in (74 cm)	34 in (86 cm)	38 in (97 cm)
B	Base width	24 in (61 cm)	34 in (86 cm)	38 in (97 cm)
C	Working diameter	14.5 in max (36.8 cm)	21.0 in max (53.4 cm)	34.5 in max (87.6 cm)
D	Overall height	95 in (242 cm)	117 in (298 cm)	186 in (472 cm)
E	Vertical working space	29.0-38.0 in (73.7 cm-96.6 cm)	28.0-41.0 in (71.2 cm-104.2 cm)	68.5-98.0 in (173.9 cm-248.9 cm)
F	Thread size	1 3/4 -12 UN 3A (Both ends)	2 3/4 -8 UN 3A (Both ends)	6 -8 UN 3A (Head) 5 1/2 -8 UN 3A (Cyl)
G	Column opening	12.2 in max (30.9 cm)	17.9 in max (45.4 cm)	23.5 in max (59.7 cm)
	Weight of load frame	2,000 lbs (907 kg)	4,900 lbs (2,228 kg)	32,000 lbs (14,545 kg)
Hydraulic pump				
	Length	Width	Height	Weight
	44 in (112 cm)	30 in (77 cm)	38 in (97 cm)	660 lbs (300 kg)



# CALIBRATION SYSTEMS

## TORQUE CALIBRATION SYSTEMS

Tovey Engineering transfer standard torque calibration systems are available in capacities ranging from 200 in-lb to 100,000 in-lb. These versatile automated calibration systems reduce calibration time and cost, permitting efficient in-house transducer calibration.

### FEATURES:

- System includes torque frame, transfer standard load cells, hydraulic actuator, automated control and data analysis software.
- Precision torque arm and meticulously machined components.
- Efficient transition from clockwise to counterclockwise calibration.
- True zero deadband measurement.
- Alignment couplings to reduce transducer misalignment errors.
- Metrology grade transfer standards with industry leading accuracy, or dead weight hangers and weights for primary standard torque calibrations.
- Fully automated calibration; exercise transducers automatically with specified forces and number of cycles.
- Comprehensive software for data acquisition and data reduction.
- Data files and graphs for calibration records are produced and stored.
- Data analysis and output is compliant with national and international standards.



*6,000 in-lb System*

## DEADWEIGHT FORCE CALIBRATION SYSTEMS

Tovey Engineering offers fully automated, as well as manually operated, deadweight calibration systems. Designed specifically for the most stringent calibration labs, university settings, and government facilities, these systems provide the most accurate calibration of load cells in both tension and compression. System capacities available from 50 lbf to 10K lbf.



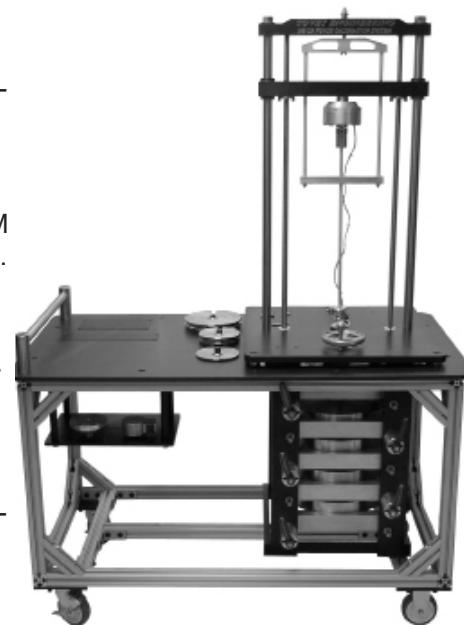
*Deadweight Rig*

### Features:

- System includes load frame, certified weight stack, pneumatic hand operated or automated control system, data acquisition and analysis software.
- Accurate to as low as .002% of applied force (acceptable for ASTM Class AA calibration requirements).
- Easy setup hardware allows tension and compression calibration.
- Automated data acquisition, analysis, and storage.
- Simple file export and report writing.
- Data analysis and output is compliant with national and international standards.

### Options include:

- Wide variety of mounting adapters.
- Metric capacities.



*Portable Deadweight Rig*



## /// MANUAL FORCE CALIBRATION SYSTEMS

Tovey Engineering now offers a very economical, manually operated calibration system. Designed specifically for smaller calibration labs, these systems provide accurate calibration of load cells in both tension and compression. Capacities available from 2klbf to 100klbf.

### Features:

- System includes load frame, transfer standard load cells, hydraulic hand operated pump, data acquisition and analysis software.
- Universal fixture hardware allows tension and compression calibration without changeover.
- Easy setup and operation.
- Automated data acquisition, analysis, and storage.
- Simple file export and report writing.
- Data analysis and output is compliant with national and international standards.

### Options available include:

- Hydraulic power unit.
- Wide variety of mounting adapters.
- Metric capacities.
- Custom designs- based on customer specific application needs.



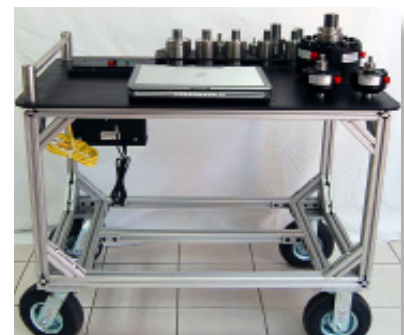
*Manual System with Manual Pump*



*Manual System with Hydraulic Pump*

## /// PORTABLE CALIBRATION SYSTEMS

Tovey provides self-contained mobile platforms for remote system verification with reference standard load cells and/or dead weights. These systems provide everything an operator needs to perform a verification at a testing machine or in a stress lab test cell. Portable systems include several reference load cells, cables, fixtures, an instrument, a load cell simulator and a laptop computer. Systems are calibrated at the factory as an integrated unit. Software is provided to acquire data and verify that the system under test produces measured forces within a specified tolerance band. The calibration system also provides a measurement of non-repeatability. Tovey's portable systems are often used to perform verifications consistent with ASTM E4 or other requirements. Push cart or carry case formats are available.



*System Accessories Cart*

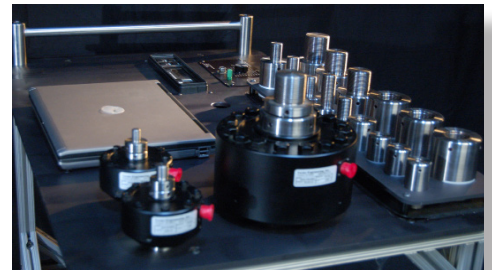
## **CALIBRATION ACCESSORIES**

### **SHUNT CALIBRATION PRODUCTS**

Shunt calibration is often used to provide a means of setting up an instrument in the field. Tovey offers two options to meet this need. An automated shunt cal module features four separate shunt calibration values. Any number of these resistor values can be switched into the circuit in sequence or used individually. This instrument is capable of performing shunt calibration on single, double, or triple bridge load cells simultaneously and in a fully automated manner. A lower cost option consists of shunt calibration adapters that attach directly to the connector of the unit under test.

### **CALIBRATION ACCESSORIES**

- **Adapters and Loading Fixtures.** Tovey manufactures a wide variety of standard thread adapters and custom made fixtures to satisfy the requirements of our customers. All parts are heat treated to provide high strength and wear resistant surfaces and are engineered to provide excellent alignment. Premium materials are utilized in manufacture. Rod end bearings, clevises, compression load plates, and special adaptors for many applications are available.
- **Rotation washers** are designed to provide for rotation of the unit under test for ASTM E-74 /ISO 376 calibrations. These washers allow precise rotation of the unit under test and permit quick setups for significant time savings.



*System Accessories*

### **SYSTEM ALIGNMENT VERIFICATION**

- **Alignment dynamometers.** Tovey alignment dynamometers permit high accuracy misalignment measurement. Dynamometers have three or four strain gages equally spaced around the circumference of the part at either two or three axial positions. When installed in a load frame and a force is applied, readings from the individual strain gages can be used as a measure of misalignment, providing a quantitative measure of that misalignment.
- **Multi-axis load cells** measure force and moment in orthogonal planes. The moment readings from these load cells provide information that permits alignment adjustments to be made and also quantifies the amount of moment that may be applied along with the axial force. Tovey's standard and special multi-axis load cells are among the world's most accurate.



*Dynamometers*

# TEST SOFTWARE

## CALIBRATION & TEST SOFTWARE

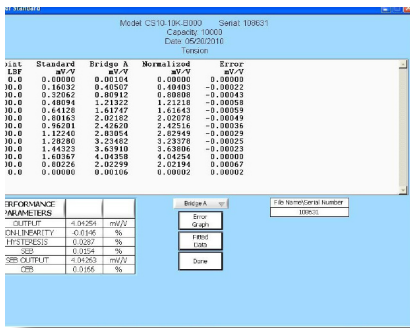
Tovey Engineering offers several software packages to support calibration and testing. The software is applicable to strain gage based force, torque, and pressure transducers.

### Available software packages include:

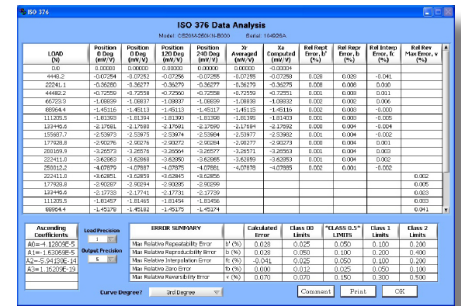
- CalSoft-DW for dead weight calibration systems.
- CalSoft-FTS for transfer standard calibration systems.
- CalAnalysis for comprehensive data analysis.
- CalSoft-Test for test applications.

### Software Features:

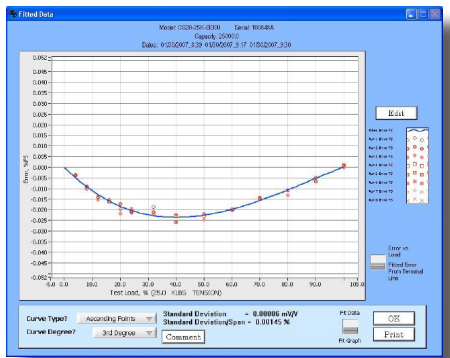
- Supports automated or manual exercise cycles.
- Supports automated or manual load setting.
- Automated data acquisition.
- Performs standard performance analysis including determining non-linearity, hysteresis, and static error band.
- ASTM E74 Analysis.
- ISO 376 Analysis.
- All data presented graphically or in tabular form.
- Statistically determines degree of curve fit according to ASTM E74 procedure, or user may override to select from 1st to 5th degree.
- Calibrates stand-alone systems with independent readout instruments.
- Allows simultaneous calibration of bridges in multi-bridge transducers.
- Can be customized to meet special customer requirements.



10 Point Calibration Data



ISO 376 Compression Data



Tension Error Data

# CALIBRATION SERVICES

## CALIBRATION SERVICES

Tovey Engineering offers accredited force transducer calibration from 1 gf to 1 million lbf. and primary torque calibration to 10,000 in-lb. State-of-the-art calibration facilities include both deadweight and servo-controlled hydraulic transfer standard calibration rigs. Force calibrations are performed in compliance with ISO 17025 requirements (under NVLAP Lab Code 200662-0), and meet the requirements of NIST Handbook 150, ISO/IEC 17025 and ANSI Z540.

### Experienced Staff, Quick Turnaround

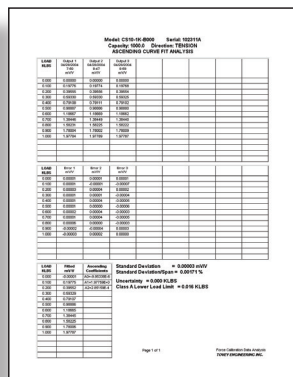
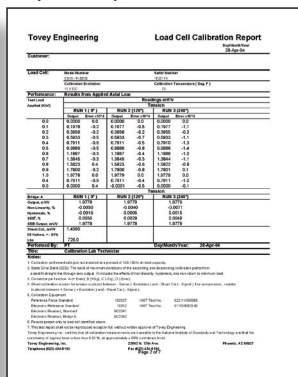
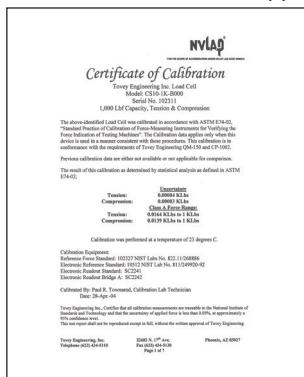
Calibrations are performed by experienced and knowledgeable technical staff. The calibration lab is overseen by the current Chairman of ASTM Committee E28.01 for calibration of load cells and testing machines, a NV-LAP Technical Expert in force calibration. All force calibrations are performed quickly and efficiently to minimize customer downtime.



**ACCREDITATIONS:**  
NVLAP Lab Code 200662-0  
ANSI Z540, ISO/IEC 17025  
ASTM E74, ISO 376

## CALIBRATION REPORTS

Customers receive comprehensive reports with calibration data presented in both graphical and tabular form. All data analysis and output is compliant with national and international standards. As an example, a standard E74 report package includes a Certificate of Calibration, a Calibration Report, a curve fit analysis report and associated graphs for tension and compression. Additional graphical representations of calibration data can be supplied upon request.



# TERMS AND CONDITIONS OF SALE AND WARRANTY

## Terms and conditions of sale and warranty

The conditions stated below shall constitute an integral part of an agreement between a buyer ("buyer") and tovey engineering, inc. ("Tovey engineering" or "the corporation") for purchase of any tovey engineering product.

- 1. Warranty** - Products manufactured or offered for sale by tovey engineering, inc. (The corporation) are guaranteed free from defects in material or workmanship to the original purchaser for a period of 2 years for force transducers, 1 year for other manufactured parts, and manufacturer's warranty period for components, computers and other resale items from the date of shipment, when products are properly used and correctly installed. The corporation's liability is limited to the repair or replacement of products found by our inspection to be defective upon receipt f.O.B our factory. In no event shall the corporation be liable for incidental or consequential damages. These express warranties supercede any and all other warranties, express or implied, including implied warranty of merchantability or fitness for a particular purpose. No agent or representative is authorized to assume for the corporation any liability except as above set forth.
- 2. Acceptance** - All orders based on this quotation shall be subject to the corporation's approval and acceptance as to quantity, delivery, and other conditions not herein set forth. Orders will be accepted only on the terms and conditions expressed herein, modifying or additive terms and conditions on the customer's purchase order notwithstanding.
- 3. Taxes** - The amount or amounts of taxes or other governmental charges upon production, sale and/or shipments of the goods sold hereunder, now imposed by any government authority or hereafter becoming effective, shall be paid by the purchaser.
- 4. ERRORS IN PRICE** - Prices quoted shall be subject to correction for errors.
- 5. CANCELLATION** - Orders accepted shall not be subject to cancellation except on terms that shall protect the Corporation from loss.
- 6. RETURN OF MATERIALS** - Materials may be returned for credit only after authorization has been obtained from the Corporation, and shall be subject to handling charges to be determined by the Corporation. Materials that are manufactured to special order are shipped without privilege of return.
- 7. SHIPMENTS AND DELIVERY** - Shipping dates are approximate and based upon prompt receipt of all necessary information by the Corporation. The Corporation shall not be liable for delays in manufacture or delivery of its products. While every effort will be made to ship products on time, the Corporation assumes no liability for loss, damage, or consequential damages due to delays. All goods are shipped at the purchaser's risk. While every reasonable precaution is taken in packing, the Corporation is NOT RESPONSIBLE for goods damaged or lost in transit. Claims to recover such loss must be filed with the carrier by the purchaser.
- 8. CONDITIONS OF CREDIT** - The credit terms are payment in full within (30) days from invoice date. Any unpaid balances after said period shall be subject to a finance charge. In consideration of the agreement of TEI to extend credit to Applicant, Applicant, by its duly authorized officer, partner or owner, agrees that Applicant will pay interest at the rate of 1 1/2 % per month and also agrees to pay all court cost and attorney's fees shall be greater of (a) the number of hours worked by the attorney's times a reasonable hourly fee of (b) an amount equal to the percentage contingent fee which TEI has agreed to pay its attorney's fees for collection of amounts due and owing in cases of this kind, a copy of which contingent fee agreement is on file in the main offices of TEI and is available upon request. No part of this agreement may be waived or modified except by written document duly signed by an authorized officer or owner or both creditor and customer.