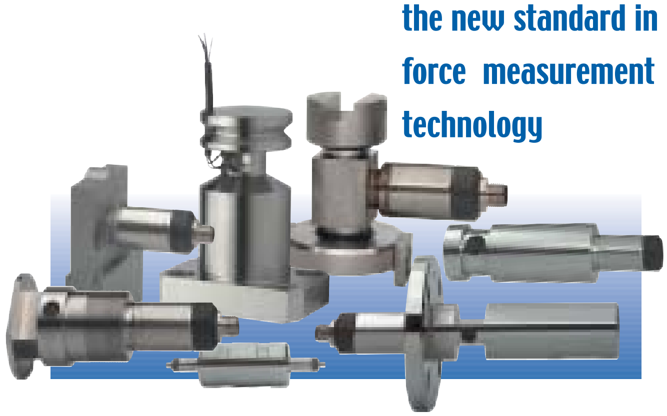
Pioneering
the new standard in
force measurement
technology



Custom Force Measurement

The
Instrumentation
Company

NOSHOK
INCORPORATED

Engineered Application + Custom Design = NOSHOK-TECSIS Custom Force Sensor

The Only Equation You Need To Build a Custom Force Sensor for Your OEM Application

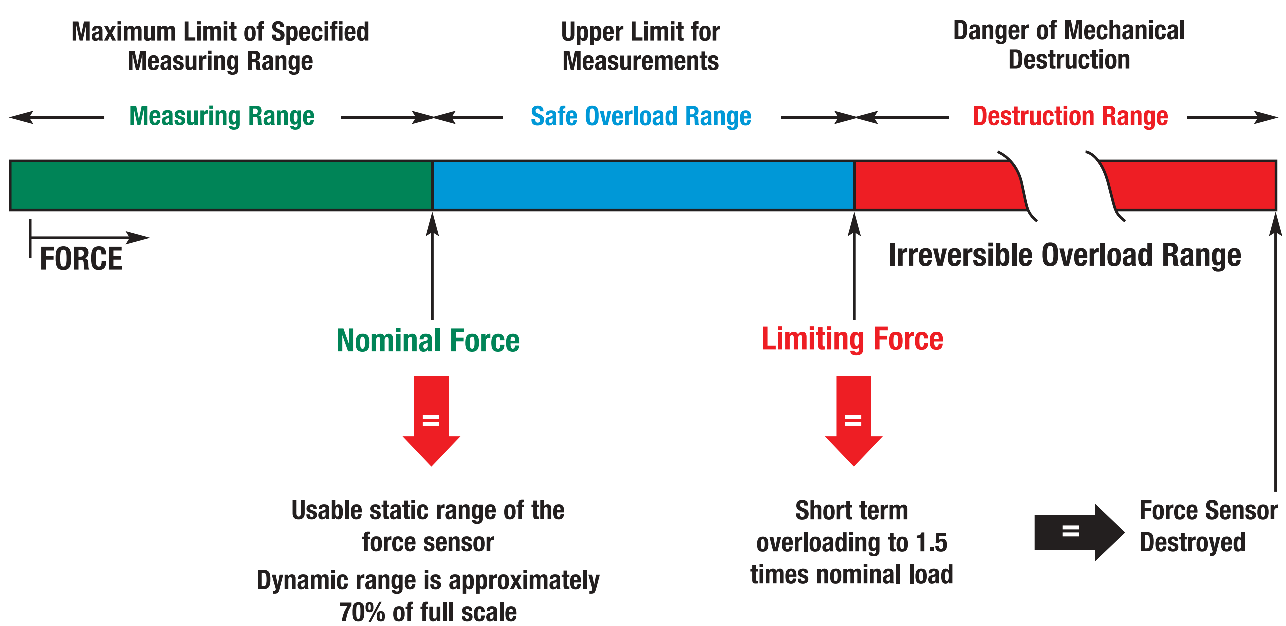
The NOSHOK-TECSIS **Custom Force Sensor is a break through** in force measurement. Utilizing proven thin film sensor technology combined with an advanced automated production process we create a highly adaptive force transmitter that is suitable for industrial use. This development process gives the **customer complete freedom** in creating a high quality, highly accurate **force sensor** that is **custom designed** and engineered **to meet their specific application needs.**

The sensor is a sputtered thin film strain gage membrane that is laser welded into the deformation body at the optimum location. While the deformation body is under force loading, one pair of strain gage registers a resistance change on the surface expansion in the middle and the other strain gages register the upsetting forces in the outer region of the membrane.

Because of the optimum positioning of the sensor within the deformation body, the circuit tracks are short and symmetrical. This result's in the 2 pair of strain gages positioned at 90º to each other. The plane strain status is then clearly measured in the membrane.

The deformation body is designed to the customers specific application needs to provide a plain strain status within the region of the membrane. Thus there are two different loads that are feasible – the upsetting and the shearing in the membrane plane.

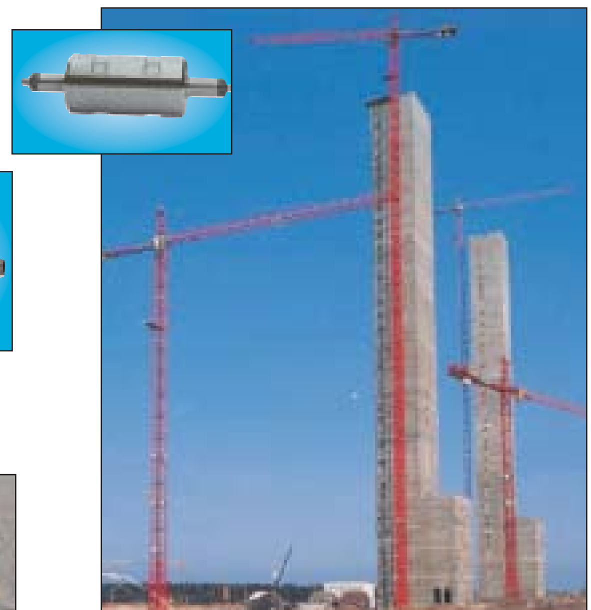
NOSHOK-TECSIS Custom Force Sensors provide the OEM and end user alike with unsurpassed flexibility to achieve a previously unavailable solution because of nonconforming standard designs and high accuracy requirements. NOSHOK achieves this solution in a way that is performance and reliability enhancing while remaining cost effective.



FEATURES

- Custom designed and built to the exact application specifications requiring less space for mounting and installation
- The proven thin film sensor is **LASER WELDED** to the deformation body for superior strength and performance
- Extremely accurate, with the help of Finite Element Method Analysis, the sensor is able to reach accuracies from 0.2% to 1% full scale.
- Available in a variety of standard current and voltage output signals, with others available upon request
- Measurement ranges from 1000 lbs/f to 100,000 lbs/f (5 kN to 500 kN) standard, others available upon request
- Deformation body is constructed from a high grade, high quality stainless steel that provides exceptional durability and contributes to extended service life

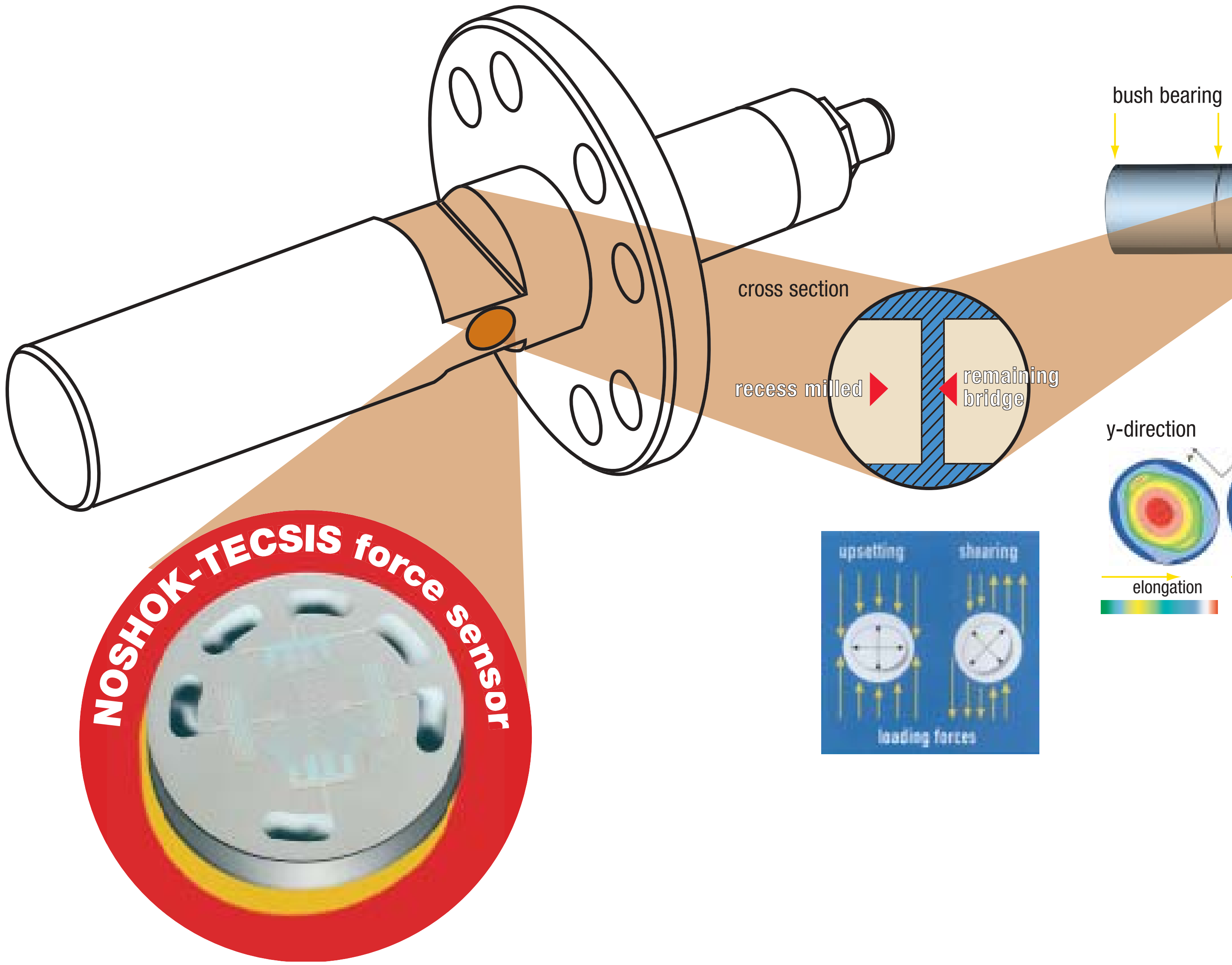
Force measurement on deflection roller in a tower crane

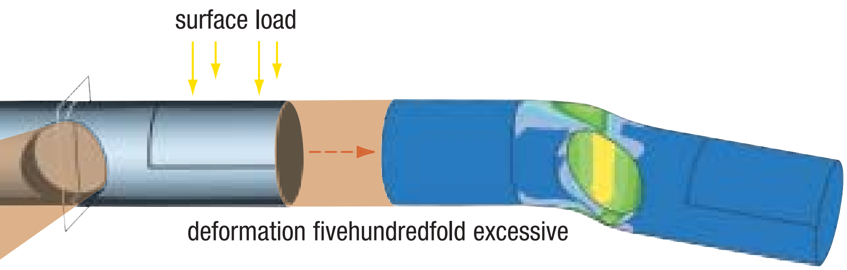


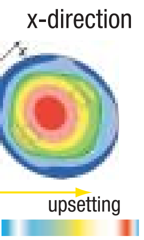
Torque converter bearing on chain drives of a bottle cleaning machine

Torque converter bearing on hoists

Force measurement for overload protection in the fork bearing of a ship crane"

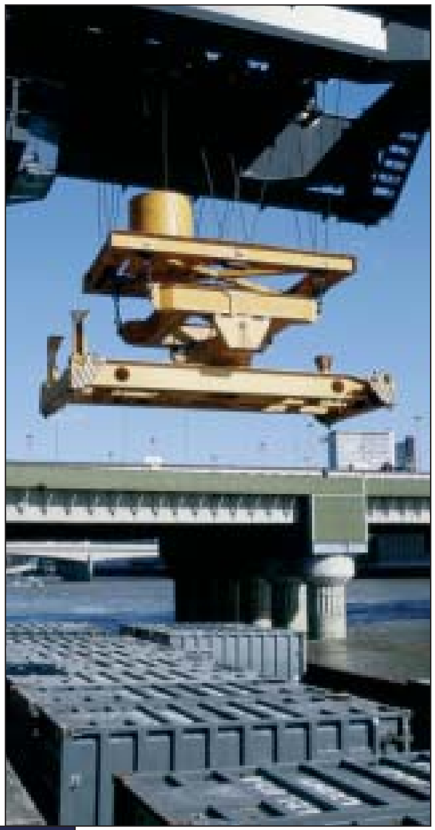

bush bearing
cross section
recess milled
remaining bridge
y-direction
elongation
NOSHOK-TECSIS force sensor
upsetting
shearing
loading forces





A basic element in this case is a round bolt which is a common yet deformation body. Because it is simple it is used in countless fastening devices such as force bearings, chain bolts, axles and many others.

Using the bolt as an example, if the bolt is machined to produce a weakened area between the bearing and the force introduction point it leaves a thin bridge at symmetrical level and a very close shape to a double T section. If the bolt is clamped at one end, and the other end is loaded with a vertical force at bridge level to the bolt axis, virtually no deformation will occur in the region of the round section. However, these will be shearing forces in the region of the double T section. If the thin film sensor is welded at this bridge to position the measurement strain gages at an angle of 45° to the bolt axis, then a symmetrical deflection of the bridge proportional to the shearing force is produced. Using Finite Element Analysis techniques the load is simulated and the optimum design of the force sensor is determined. As a result, accuracies of less than 1% can be achieved.



GREATER VALUE

The NOSHOK-TECSIS sputtered thin film force sensor is laser welded for the optimum in manufacturing consistency and cost. This means that the resultant product is more attractive to the OEM who demands high performance and value.

COMPACT and FLEXIBLE

Each force sensing deformation body is custom designed to meet the specific needs of each customer and because the sensor is small, there is an endless array of possible configurations with a full bridge circuit.

BROAD APPLICATIONS

Through customization of the deformation structure, and the state-of-the-art design techniques, the tension and shearing components result in a linearity of less than 1%. The bridge signal is identical to the pressure load applied with current and voltage output signals available.

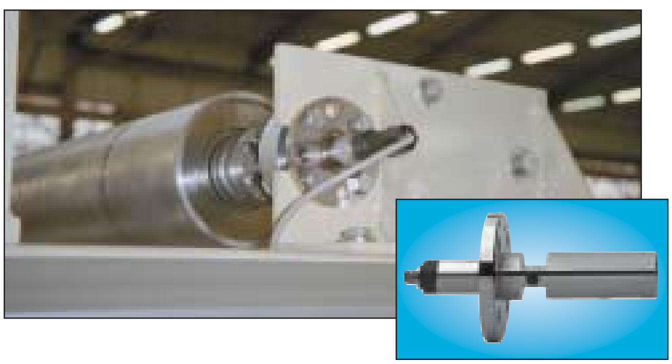
The NOSHOK-TECSIS Custom Force Sensor is the ideal force measurement solution with a proven thin film sensor integrated into a custom designed deformation body structure. The result is an unsurpassed level of performance and a new standard for electronic force measurement. In many cases conventional force sensors lack the adaptability in construction to suit the customer's specific requirements, forcing the customer to alter their design needs to meet the specifications of the "standard" cataloged force sensor. Now, NOSHOK makes it possible for the customer to receive an application specific, engineered force sensor suited for their specific requirements. All while being provided with the highest accuracy levels, proven sputtered thin film sensor technology and the highest level of reliability. The possibilities are endless…and NOSHOK-TECSIS custom force sensors are there to meet them.

Specifications	
Output Signal	4 mA to 20 mA, 2-wire, 0 Vdc to 5 Vdc, 3-wire, 0 Vdc to 10 Vdc, 3-wire Others Available – Please Consult Factory
Nominal Ranges	1000 lbs/f to 100,000 lbs/f (5 kN to 500 kN), Standard Others Available – Please Consult Factory
Limit Force	150% F_{nom}
Fracture Force	>300% F_{nom}
Accuracy	< 1% Full Scale
Hysteresis	< 0.5% Full Scale
Power Supply	10 Vdc to 30 Vdc 14 Vdc to 30 Vdc for 0Vdc to 10Vdc output
Housing Material	316 Stainless Steel
Temperature Ratings	Storage -4 ºF to 176 ºF (-20 ºC to 80 ºC) Ambient -40 ºF to 212 ºF (-40 ºC to 100 ºC)
Response Time	≤ 0.5s (between 10% to 90% Full Scale)
Environmental Rating	IP 67, NEMA 4X to EN 60529/IEC 529
Electrical Protection	Reverse polarity, over-voltage and short circuit protection
Vibration	20 g's per IEC 68-2
Electrical Connection	M12 X 1, 4-pin Standard Others Available – Please Consult Factory

APPLICATIONS

Jointing Technology	Robot Technology	Platform Technology
Pressing Punching Riveting	Contact forces Process forces Tong forces	Safety technology Lifting platforms Load statuses
Cranes	**Farm Vehicles and Building Machines**	**Force Measuring Bearings**
Overload protection Load measurement Cable tension measurement Slack rope recognition	Torque converter bearing Weight registration Tipping protection Support forces	Web tension Driving forces
Hoists and Material Handling		**Elevators**
Rough scales, Cable Tension		Safety Cutoff
Testing Facilities, Machine and Plant Construction		
Locking Forces Torque monitoring Tightening forces Anchor winches	Traction and pressure forces Fill level measurement Tensioning forces Braking forces	Forces on deflection rollers Cutting forces Cable winches Conveyor belts

Force measuring bearing mounted left and right on a cylinder to measure the web tension on paper machines



Force measurement as an integral component of a ram insert in a press

Force measurement to determine the load status on a fire truck turntable ladder

Tension and Compression Force Transducers

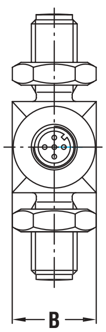
- Compact design
- Stainless Steel construction
- Amplified output
- Sputtered thin film sensor for maximum repeatability and stability
- From 2 kN (450 lbf) to 50 kN (11240 lbf) nominal loads

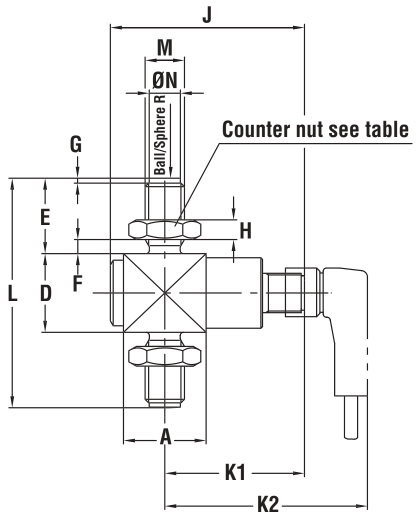
Specifications

Model	3540 / 3550						
Nominal Load	kN	2	5	10	20	30	50
	lbf	450	1124	2248	4496	6744	11240
Limit Load	150 % Full Scale						
Fracture Load	> 300 % Full Scale						
Permissible Oscillation	±80 % Full Scale Acc. To DIN 50100						
Output Signal Cn	4mA to 20mA, two wire or three wire; 0 – 10 Vdc, three wire						
Accuracy	< ± 0.2 % Cn						
Hysteresis	< ± 0.1 % Cn						
Stability	< ± 0.1 % Cn at Fnom						
Ambient temperature range	-20 ° C to 80 ° C (-4 ° F to 176 ° F)						
Storage temperature range	-20 ° C to 100 ° C (-4 ° F to 212 ° F)						
Temperature Effect – span **– zero**	< ± 0.01 % Fnom / ºF < ± 0.01 % Fnom / ºF						
Vibration Effect	20 g, 100h, 50Hz to 150Hz according to IEC68-2-6-Fc						
Environmental Protection	IP 67 according to EN 60 529 /IEC 529						
Electrical Connection	M12 x 1 or cable						
Power Supply	0 Vdc to 10 Vdc for 4 mA to 20 mA output; 14 Vdc to 30 Vdc for 10 Vdc to 30 Vdc output						
Current Consumption	4 mA to 20 mA, signal 0 to 10 Vdc, 8 mA						
Response time	< 1 ms (within 10 % to 90 % Fnom)						
Noise Protection	CE comliant; RFI, EMI and ESD protected according to EN 61326						
Electrical protection	Short circuit, overvoltage and reverse polarity protection						
Material	17-4PH Stainless Steel						

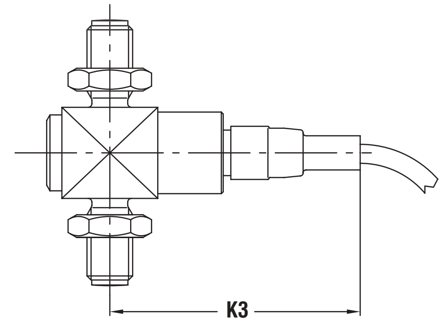
Dimensional Drawings

M12 x 1 Connector
Version 2-30 kN



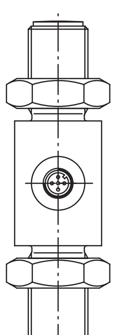


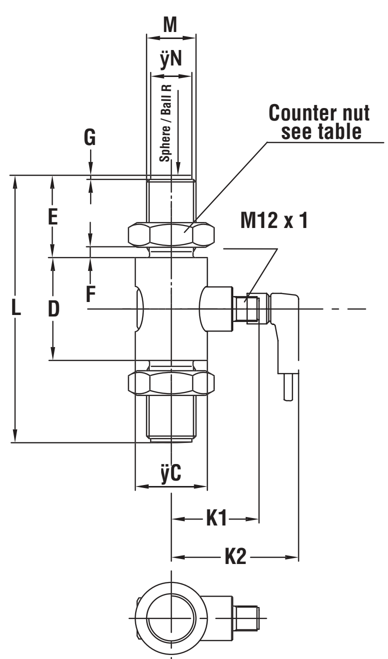
Cable Version



Nominal Load	Unit	A	B	D	E	F	G	H	J	K1	K2	K3	L	M	N-0,1	Ball / Sphere R	MA (Nm)
2 kN	mm	25.2	22	24	23	4.3	1.5	6	59.2	42.6	61.8	65.8	70	M12	9.5	60	60
450 lbf	in	0.99	0.87	0.95	0.91	0.17	0.06	0.24	2.33	1.68	2.43	2.59	2.76	M12	0.37	2.36	2.36
5 kN	mm	25.2	22	24	23	4.3	1.5	6	59.2	42.6	61.8	65.8	70	M12	9.5	60	60
1124 lbf	in	0.99	0.87	0.95	0.91	0.17	0.06	0.24	2.33	1.68	2.43	2.59	2.76	M12	0.37	2.36	2.36
10 kN	mm	25.2	22	31	23	4.3	1.5	6	59.2	42.6	61.8	65.8	77	M12	9.5	80	60
2248 lbf	in	0.99	0.87	1.22	0.91	0.17	0.06	0.24	2.33	1.68	2.43	2.59	3.03	M12	0.37	3.15	2.36
20 kN	mm	25.2	26	33	34	3.8	2	10	59.2	42.6	61.8	65.8	101	M20 X	17	100	300
4496 lbf	in	0.99	1.42	1.30	1.34	1.50	0.08	0.39	2.33	1.68	2.43	2.59	3.98	M20 X	0.67	3.94	11.81
30 kN	mm	27.5	27.5	40	34	3.80	2	10	61.5	43.8	63	67	108	M20 X	17	120	300
6744 lbf	in	1.08	1.08	1.56	1.34	1.50	0.08	0.39	2.42	1.72	2.48	2.64	4.25	M20 X	0.67	4.72	11.81

M12 x 1 Connector
Version 50 kN





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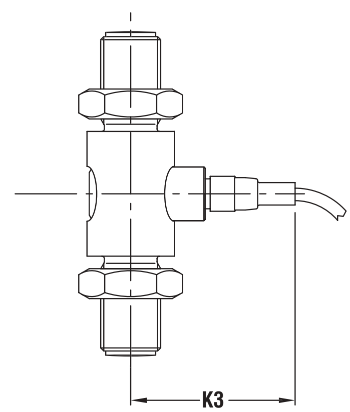
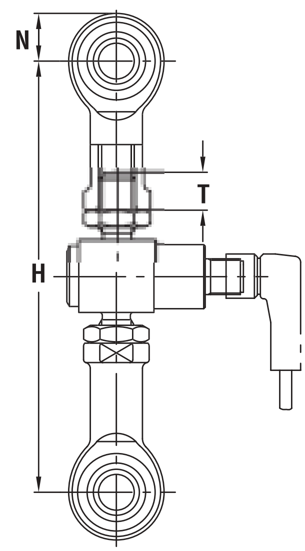
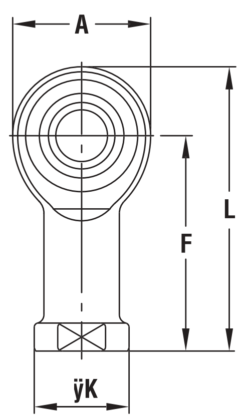


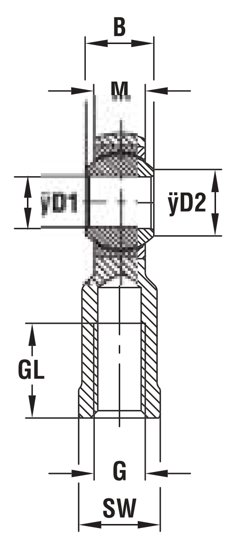
Force		C	D	E	F	G	H	K2	K3	L	M	N -01	Sphere/ Ball R	MA (Nm)
50 kN	mm	35	50	40	5	2	42.6	61.3	65.8	130	M24 x 2	20	150	500
11240 lbf	in	1.38	1.97	1.57	0.20	0.47	1.68	2.41	2.59	5.12	M24 x 2	0.79	5.906	19.685

Dimensional Drawings

Nominal Load		H	N	Minimum depth of screw down
2 kN	mm	148 ± 3	50	9.5
450 lbf	in	5.83 ± 0.12	1.97	0.37
5 kN	mm	148 ± 3	50	9.5
1124 lbf	in	5.83 ± 0.12	1.97	0.37
10 kN	mm	155 ± 3	50	9.5
2248 lbf	in	6.10 ± 0.12	1.97	0.37
20 kN	mm	219 ± 4	77	16
4496 lbf	in	8.62 ± 0.16	3.03	0.63
30 kN	mm	226 ± 4	77	16
6744 lbf	in	8.90 ± 0.16	3.03	0.63
50 kN	mm	276 ± 4	74	19.5
11240 lbf	in	10.87 ± 0.16	2.91	0.77







Nominal load in kN		Weight in kg (oz)	A	B	D1	D2	F	G	GL	K	L	M	SW
2 kN to 10 kN	mm	0.115 (4.06)	32	16	12	15.4	50	M12	22	22	66	12	19
450 to 2248 lbf	in	0.115 (4.06)	1.26	0.63	0.47	0.61	1.97	M12	0.87	0.87	2.60	0.47	0.75
20 kN to 30 kN	mm	0.415 (14.64)	50	25	20	24.3	37	M20x1.5	33	34	102	18	32
4496 to 6744 lbf	in	0.415 (14.64)	1.97	0.99	0.79	0.96	1.46	M20x1.5	1.30	1.34	4.02	0.47	1.26
50 kN	mm	0.750 (26.46)	60	31	25	29.6	94	M20x2	42	42	124	22	36
11240 lbf	in	0.750 (26.46)	2.36	1.22	0.95	1.17	3.0 7	M20x2	1.65	1.65	4.88	0.87	1.42

NOTES

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