



## SPECIFICATION SHEET MODEL: FCS-204

### APPLICATION:

- For calibrating or for verification of Uni-axial Testing Machines, Universal Testing Machines, Compression and Tensile Testing machine as per IS:1878-1:2005 / ISO 7500-1:2015 or any other international standards
- Suitable for metrology use as a reference standard or a transfer standard
- Suitable for verifying test benches and fatigue testing systems, structural and material testing machines, Hydraulic/Pneumatic Press Force monitoring

### DESCRIPTION:

Sushma™ electronic force proving instrument or the system consists of a Force transducer and a high-resolution touch screen smart control display unit. These products have become very popular in the market in recent times for its numerous advantages.

### IMPORTANCE:

Unlike proving ring devices, these force transducers are less sensitive to temperature, creep, extraneous loads, side loads and moments. Also, the biggest limitation of proving rings is the resolution limited to 2000

or 5000 counts or divisions. However, with a Force Transducer and Display Unit Combo you can have resolution upto 1,00,000 counts or divisions thus helps covering a larger range of UTM Machine Classes i.e. from Class 0.5 to Class 3, with no loss of accuracy. Hence, less number of force sensors (force transducers) can be used to cover wide range of capacities and class of machine thus being very economical in terms of maintenance, service, running and calibration costs.

Also, with the advantage of the interpolation equation the force can be calculated at any given step, whereas the proving ring devices can be used at the specific forces in which they are calibrated. Unless otherwise the dial gauge used in the force proving ring is also calibrated every time.

## FEATURES:

- Classification of Class of Sensors as per ISO 376:2011 or IS:4169:2014
- The shear web design in the small profile sensor yields high performance and offers high resistance to extraneous forces such as bending, side and torsion loads. Low deflection, high accuracy and lowest creep
- Compact low-profile design frees up valuable vertical testing space
- Calibrated directly with Dead Weight Force Calibration machine as per ISO 376 in an accredited ISO 17025 lab
- Temperature compensated for better results as per standards
- Universal Type (Compression & Tension) or only compression models available

## HIGHLIGHTS:

- Sensor Class: 0.5, 1, 2
- Capacities: 500N to 3000kN
- Basic: Display Unit
- Advanced: Touch Screen Display Unit

## SCOPE OF SUPPLY:

- Sushma's Force Sensor-Low Profile Type
- Sushma's Smart Control Display Unit
- Suitable Adapters (Optional)
- PC Software (Optional)
- Calibration Certificate (Optional)
- Manufacturer certificate or accredited certificate as per 17025 if selected
- Warranty Certificate
- Instruction Sheet
- User Manual
- Cable with both side connectors suitable for the 6-pin connector of the sensor at one side & other side 6-pin connector will be connected to the display unit

**PRODUCT SELECTION:**

LOADING PATTERN	CLASS 0.5	CLASS 1
Compression & Tension (Low Capacities)	Model No: <b>FS-216B</b>	Model No: <b>FS-216C</b>
	Capacities Available: 500N,1kN,2kN,5kN,10kN	
	Usable Range: 20% to 100%	Usable Range: 10% to 100%
Compression & Tension (High Capacities)	Model No: <b>FS-217B</b>	Model No: <b>FS-217C</b>
	Capacities Available: 20kN, 50kN, 100kN, 200kN, 500kN	
	Usable Range: 20% to 100%	Usable Range: 10% to 100%
Compression Only (Low Capacities)	Model No: <b>FS-218B</b>	Model No: <b>FS-218C</b>
	Capacities Available: 500N,1kN,2kN,5kN,10kN	
	Usable Range: 20% to 100%	Usable Range: 10% to 100%
Compression Only (High Capacities)	Model No: <b>FS-219B</b>	Model No: <b>FS-219C</b>
	Capacities Available: 20kN, 50kN, 100kN, 200kN, 500kN,1000kN, 2000kN, 3000kN	
	Usable Range: 20% to 100%	Usable Range: 10% to 100%

Higher Capacities or Non-Standard Capacities available on request and can be customized

## SPECIFICATION:

### ACCURACY



Characteristics of force proving instruments	Class 0.5 of ISO 376:2011 Or IS:4169 2014	Class '1' of ISO 376:2011 Or IS:4169 2014
Reproducibility	0.1%	0.2%
Repeatability	0.05%	0.1%
Error of interpolation	± 0.05%	± 0.1%
Hysteresis	0.15%	0.3%
Creep (in 30 minutes)	0.05%	0.1%
Zero Return	± 0.025%	± 0.05%

### ELECTRICAL



Rated output (Sensitivity)	: 2mV/V ±10% of rated output
Zero Balance	: ±2% of rated output
Bridge Resistance	: 350 to 2100 Ohms- nominal depending on capacity
Recommended Excitation Voltage	: 10 Volts D.C
Maximum Excitation Voltage	: 15 Volts
Insulation Resistance	: 1000 Mega ohms or more
Maximum Excitation Voltage	: 15 Volts D.C

### MECHANICAL



Safe Overload	: 150% of rated output
Safe Side Load	: 30% of rated output
Ultimate overload	: 200% of rated output
Cable Length	: 2 Metres
Deflection	: ≤ 0.4 mm at rated capacity
Material, Finish & Construction	: Alloy steel, Electro less plated Below 5 kN Aluminium construction, anodised
Environmental Protection	: IP 50

### ENVIRONMENTAL



Operating Temperature Range	: 10 °C to 40 °C
Compensated Temperature Range	: -10°C to +40 °C
Effect of temperature on output	: ± 0.005% of rated output/°C
Effect of temperature on zero	: ±0.005% of rated output /°C

### CALIBRATION REPORT



**Standard:** Manufacturer's certificate with only error verification

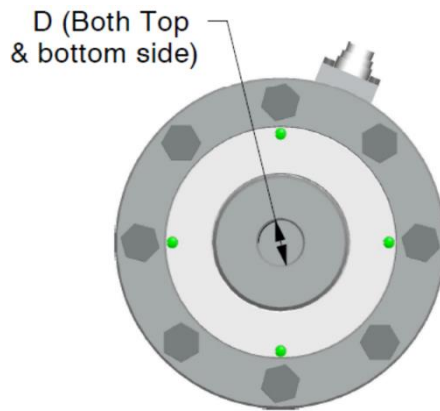
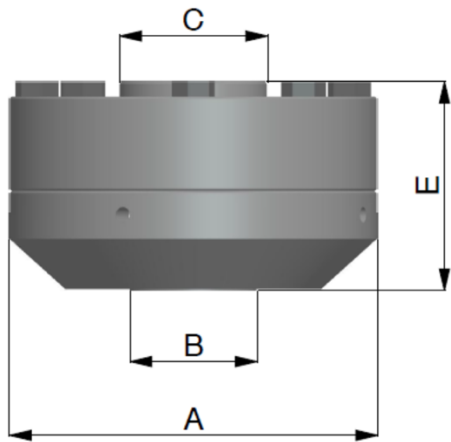
**Optional:** Calibrated in First principle method using dead weights at our Sushma Calibration laboratory accredited as per ISO 17025

## DISPLAY UNIT OPTIONS

FEATURES	ADVANCED DISPLAY UNIT- HANDHELD	ADVANCED DISPLAY UNIT- HANDHELD WIRELESS
Display type	High Resolution Color Touch LCD	High Resolution Color Touch LCD
Display Size	7inch	7inch
Display Resolution	2,00,000 counts	2,00,000 counts
	Resolution for capacities 1kN, 2kN, 5kN, 10kN & 20kN: - <b>0.0001kN</b>	
	Resolution for capacities 50kN, 100kN & 200kN: - <b>0.01kN</b>	
	Resolution for capacities 500kN, 1000kN & 2000kN: - <b>0.01kN</b>	
Measurement Units	N, kN, kg f, lbf	N, kN, kgf, lbf
Mode of Operation	Trace, Peak, Auto Peak	Trace, Peak, Auto Peak
Plug and Play Sensors (No. of Sensors)	7	7
Data Storage & Logging	Upto 9999 as Calibration Reports	Upto 9999 as Calibration Reports
Calibration Sequence and Report Capture as per ISO 7500-1	Automated Sequence to ensure data credibility	Automated Sequence to ensure data credibility
Data Transfer Options	USB-PC or Pendrive	USB-PC or Pendrive
PC Software Compatibility	Yes	Yes
Master Sensor Calibration	13 Point Calibration with Password Protection	13 Point Calibration with Password Protection
Interpolation Equation for Master Sensors	Yes	Yes
Standard Cable Length- Display to Sensor	2 meters	Wireless
Battery Specifications	Rechargeable Li-ion Battery with 16 hours continuous usage	Rechargeable Li-ion Battery with 12 hours continuous usage
Power Supply	110-240 VAC 50-60hz	110-240 VAC
Operating Temperature	-10 °C to +65°C	-10 °C to +65°C
Construction	Aluminium	Aluminium

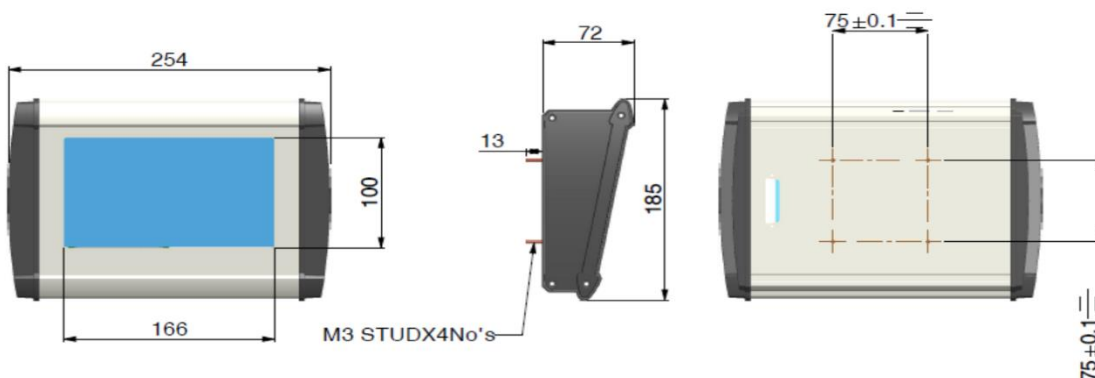
## DIMENSIONS:

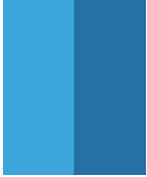
### LALOADCELL



Capacity N	A mm	B mm	C mm	D mm	E mm	~ Weight kg
Model No: FS 216 & FS 218 (Low capacities)						
100, 200, 500, 1k	Ø 112	Ø 25	Ø 25	M10	86	1.5
2k	Ø 100	Ø 26	Ø 25	M10	62	1
5k	Ø 100	Ø 26	Ø 25	M12 x 1.75P	62	3
Model No: FS 217 & FS 219 (High capacities)						
10k	Ø 100	Ø 25	Ø 25	M12 x 1.75P	62	3
20k	Ø 120	Ø 32	Ø 32	M16 x 2P	65	4.5
50k	Ø 120	Ø 32	Ø 34.5	M20 x 2.5P	65	4.5
100k	Ø 162	Ø 56	Ø 65	M24 x 2P	92	11.5
200k	Ø 162	Ø 56	Ø 65	M30 x 2P	92	11.5
500k	Ø 217	Ø 76	Ø 95	M42 x 3P	114	26
1000k	Ø 289	Ø 114	Ø 122	M64 x 4P	171	70.8
2000k	Ø 315	Ø 130	Ø 156	M80 x 6P	207	95

### DISPLAY UNIT



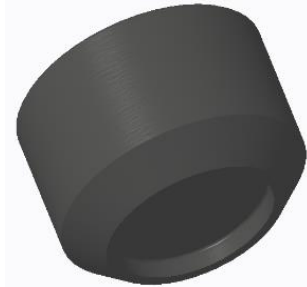


## OPTIONAL ACCESSORIES:

### COMPRESSION ADAPTERS:



Load button with Convex area

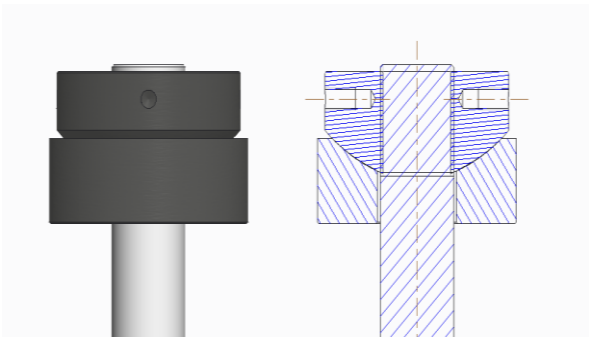


Load button top adapter



Load button with concave area for ball mounting

### TENSILE ADAPTERS:



Ball Nut & Cup



Road end bearing



Clevises



Male Studs



One side Male & other side Female stud



## DISADVANTAGES OF ANALOG FORCE PROVING RING DEVICE



Proving ring is a force measuring instrument whose shape changes as diameter deflects elastically under load which is used as a device for calibration/verification of Uni-Axial Testing Machines. It consists of a steel ring with a Dial gauge mounted so as to measure the vertical deflection when the loads are applied through the threaded blocks at the top and bottom. Applied load is known from its load and deflection characteristics.

For all these years, the proving rings are considered as standard of excellence for force calibration. However, they suffer from the following adverse characteristics:

- **Creep** - If, we maintain the same force and continue to measure the length in the dial gauge having a very high resolution, we will see the length continues to change over time
- **Deflection measurement** - when the forces are applied to the proving ring, it departs from its circular shape and becomes egg- shape or elliptical. The determination of the deflection of a proving ring depends on the subtraction of two large numbers, namely, the inside diameter of the proving ring and length of the Dial gauge measurement assembly. Since the difference is so small, any slight error in measuring either dimension leads to a large percentage error in the number at interest, the deflection
- **Resolution** - Any mechanical measurement system introduces errors which are difficult to control or overcome. The most obvious problem is resolution, which is limited by the fitness of the Dial gauge threads and the spacing of the indicator marks. Non-repeatability of duplicate measurements taken in the same direction depends mainly how much force is applied to the Dial gauge's screw threads, while hysteresis measurements taken at the same points from opposite directions is dependent on the preload, friction, and looseness in the plates
- **Temperature effect** - Variation in the temperature of either the steel ring or the Dial gauge assembly will cause expansion or contraction, which will result in a change in the deflection reading. Hence, proving ring is susceptible to temperature effect. Also, spring constant changes with temperature, thus change in the calibration



- **Response to extraneous forces** - The construction of a proving ring does not lend itself to the cancellation of extraneous forces such as side loads and moment loads. Any load other than a pure force through the sensitive axis of the ring, can result in an extraneous output
- **Specially trained personnel** - the proving ring requires specially trained personnel for proper operation, because of the possibility of errors introduced by creep, and it also subject to errors due to temperature and extraneous loads. Normally proving rings are calibrated in terms of divisions for specific forces and hence, he should have knowledge to convert division to unit of force or vice versa

**Release Note**

- *In view of continuous improvement in design and performance, specification is subject to change without notice*
- *Correct mounting is essential to ensure optimum performance*
- *Consult your application specialists or the factory for more technical information*

