

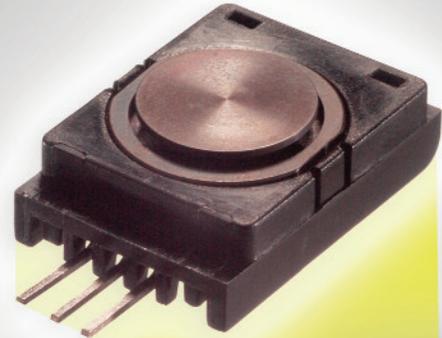
Proprietary
Microfused™
Technology
for time-tested
results!
Details on page 4

Force Sensors

Customized and Standard Load Cells
for OEM Applications

Embedded Sensor Technology
at the Heart of Every Day Life

- Medical Devices
- Consumer Products
- Transportation
- Industrial Monitoring



FS20 load cell determines occlusions in medicinal tubing via small changes in force.



| OEM Product Feature | Benefit |
|---|--|
| Customized packaging and output capability | Our applications engineers will help you design a load cell for the required form, fit and function |
| Operates at very low strains, to 0.005 Newtons resolution | Extremely high resolution for low force applications such as medical devices |
| Extreme durability – tested to millions of cycles without failure | Able to withstand harsh conditions and high cycle count |
| Long-term stability and high reliability | Customer product retains accuracy with no need to periodically recalibrate |
| Volumes from 1,000 to 1 million per year | Use standard packaging for low volume, or customize for high volume |
| Pricing under \$5 each in high volume | Disposable or non-disposable applications: allows designers to provide closed-loop feedback cost-effectively |

Medical Devices

Force measurements can be extremely useful in the design of reusable and disposable medical devices for diagnosis, surgery and treatment. OEM load cells by Measurement Specialties (MEAS) are helping device manufacturers with a broad range of applications; several examples are illustrated below. MEAS has met the quality requirements of ISO 13485 for medical device manufacturing.

Non-invasive Pressure Monitoring

Force Sensors enable the measurement of pressure and force without direct contact with the sterile solution or body fluids. For example, a load cell mounted against intravenous tubing can determine if the tube is occluded upstream or downstream. The FS20 load cell is designed for precisely these kind of measurements in infusion pumps, both portable and stationary. Attaching a load cell to a piston dispensing medication can also measure dosage and rates of induction. Load cells can also be inserted into body cavities or into incisions in the body during surgery to measure fluid pressure without requiring a flow of liquid, as would a pressure sensor. This opens up a world of possibilities for device design.

Applications:

- Infusion pump
- Medicine injection
- Irrigation pump



Tissue Forces

Load cells can measure the exact force an instrument is applying against skin or internal tissue. OEM load cells offer high resolution, and thus can be used to measure very slight changes in force, such as those which might be created by a wound below the epidermis. Opportunities are opening up for the measuring of tissues during surgery and during suturing and clamping at the close of an operation. Other possible uses could include measuring range of motion or bandage tension which positively impacts wound healing time.

Applications:

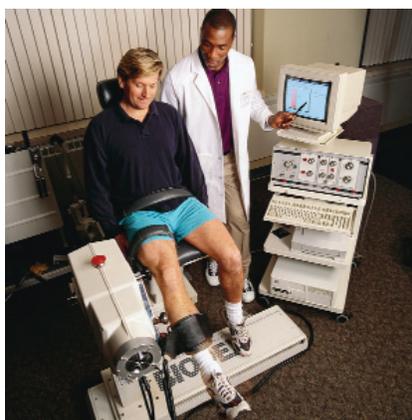
- Surgical instrument
- Handheld diagnosis equipment

Physiotherapy

Equipment used for PT and rehabilitation often requires lifting, pushing, pulling or squeezing, and all of those forces can be measured by load cells. Low cost load cells open the door for providing more precise physical therapy equipment for safer and more speedy recoveries. Since force times distance equals work, calories burned can be calculated as well.

Applications:

- Handheld therapeutic equipment
- Exercise and PT equipment



Weight

Cost-effective load cells – perfected over 15 years for use in digital bathroom scales – can be used to determine patient weight, occupancy (presence), or a sudden change in either. Manufacturers are building them into chairs, beds and other medical equipment.

Applications:

- Patient weighing systems
- Patient occupancy - beds, chairs, scanning tables
- Body mass index



Transportation

Direct force measurement with low cost load cells offers breakthrough technology for transportation applications. Forces are at work all over the vehicle, both for driver controls and for safety applications. Feedback from load cells can enable next generation design for better and safer handling in brake by wire applications, steering mechanisms, seat belts and suspension systems. Microfused load cells are rugged enough for aerospace applications, such as force feedback on control systems. Measurement Specialties is certified to both TS16949 and AS9100 standards for automotive and aerospace manufacturing.

Applications:

- Braking and stability systems
- Electronic parking brake
- Steering and suspension systems
- Seat belt and safety systems control
- Aerospace force detection

Occupant Weight Sensing

Microfused™ force sensors enable weight sensing to determine seat occupancy for deployment of airbags on millions of automobiles.



Seat Belt Tension

Using Microfused™ technology in a tension configuration, Measurement Specialties can make low cost force sensors to enable “smarter” seat belt control systems.

Brake by Wire

OEM load cells by Measurement Specialties are at the heart of next generation automotive braking and stability systems. By providing direct force measurement at both the brake pedal and at the disc, hydraulic systems can be replaced with lighter, less expensive components. Load cells can provide feedback to each wheel independently. And perhaps most importantly, load cells enable faster response time, shaving precious milliseconds off the overall stopping time, which reduces stopping distance and improves safety.

Industrial

Industrial monitoring systems can use load cells to improve system feedback and efficiency. Two broad categories are touch systems and weighing. In robotics, load cells can serve as end effectors, enabling contact detection as well as measuring how hard something is “squeezed” during production. Load cells can also be used for batch weighing of materials lifted, consumed or disposed of during manufacture. Material weighing capabilities can be built into industrial equipment such as forklifts.

Applications:

- Robotics end effectors
- Pressure molding systems
- Commercial lawn mowing systems
- Batch weighing



Consumer Products

The low cost of Microfused™ load cells paves the way for their use in consumer products such as washing machines, exercise equipment, vending machines – any equipment that would be “smarter” if it provided weight or load information. For example, force sensors are helping to enable washing machines to conserve both water and electricity.

Applications:

- Washing machines
- Vending machines - restock
- Musical instrument controls
- Closed loop force feedback for drive motors or joystick controls



OEM Load Cells - Standard Packaging

| | | | | | |
|-------------------------|--|---|--|---|---|
| |  |  |  |  |  |
| Package | FX1901 Low profile "coin cell" design | FS20 Miniature, drop-in replacement for industry standard | FC22 Plastic housing, button, flange mount-ing | FC23 Stainless steel housing for heavier loads, button shape | Test & Measurement Many packages, tension or compression or both |
| Ranges (lbf) | 10, 25, 50, 100 | 1.5, 3 | 10, 25, 50, 100 | 250, 500, 1000, 2000 | 0.05 up to 10,000 |
| Ranges (Newtons) | 45, 110, 225, 450 | 7, 14 | 45, 110, 225, 450 | 1100, 2250, 4500, 9000 | 0.20 up to 45,000 |
| Unique Feature | Ultra low cost, low strain design, essentially unlimited life cycle | Operates at very low strain | Low cost button shape, essentially unlimited life cycle | Industry standard low profile design, resistant to off-axis loads, essentially unlimited life cycle | Miniature and sub-miniature size. Calibration accuracy at very competitive pricing. Customization possible for high volumes |
| Applications | Consumer OEM, exercise and physical therapy machines, vending, appliances, medical devices | Medical devices, miniature pumps, contact sensing, consumer appliances | Infusion pumps, robotics end effectors, exercise machines, contact sensing, appliances | Batch weighing, robotics, assembly line forces, printing presses, pumps, winch & hoist | Test equipment, product validation, hoist and winch loads, weighing, industrial, biomedical and aerospace |

For more details and datasheets, visit <http://www.meas-spec.com/myMeas/sensors/force.asp>

These load cells measure compression only, but packaging can be modified for tension or compression and tension measurements. Output is typically 20 mV/V, but some models offer amplified output. Maximum overload is typically 250%, with most operating ranges from -40° to 85° C. Combined linearity and hysteresis is +/- 1% FSO, with only an additional 1% drift over extended time.

Microfused™ Technology. OEM force sensors (load cells) use Measurement Specialties' proprietary Microfused™ technology for unparalleled ruggedness and long term stability. Silicon strain gages are bonded to the load cell diaphragm with glass instead of traditional epoxy, which reduces the drift associated with epoxy bonding. This technology has been perfected over 20 years and qualified for automotive safety applications over the last 10 years, with more than 100 million units sold and in use. Microfused™ load cells have been tested to ten million cycles without failure.

Customized Services

Measurement Specialties specializes in developing custom sensor configurations for medium or high volume OEM use. Let our experienced application engineers help you design the right sensor for your equipment. Whether a simple modification of a standard package or an entirely new design, Measurement Specialties will help you customize:

- Input and output configuration – standard bridge, amplified or digital output
- Force range – from very low forces under 1 lbf (5 Newtons) to 2,000 lbf (10,000 Newtons) or more
- Tension or compression – or both
- Packaging – from low cost plastics to stainless steel or titanium depending on your application



Measurement Specialties' global research center for force and pressure sensing is located in Silicon Valley at Fremont, CA.

measurement
SPECIALTIES
sensing your world
www.meas-spec.com
Inquiries to: force@meas-spec.com

Americas
Measurement Specialties
Pressure-Force Global R&D
45738 Northport Loop
Fremont, CA 94538
+1 800 767 1888

Europe/Middle East
Measurement Specialties
Pressure Mfg and R&D
26 Rue des Dames
F78340 Les Clayes-sous-Bois, France
+33 (0) 1 30 79 33 00

Asia/Australia
Measurement Specialties (China), Ltd
Pressure-Force Mfg and R&D
F1.6-4D, Tian An Development Compound
ShenZhen, China 518048
+86 755 8330 1004