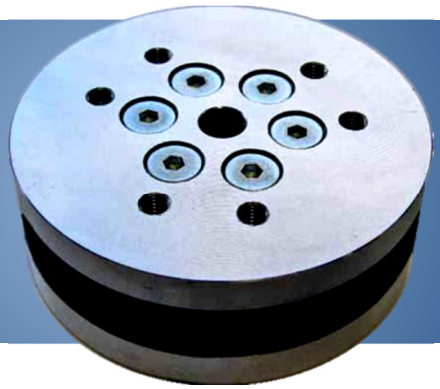
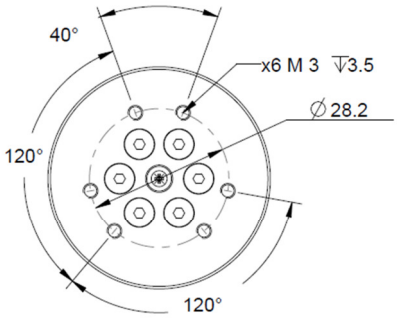
FTsens sensor specifications

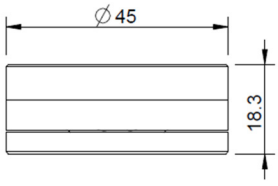
Version	Date	Author	Comments
1.0	9 Jan 2012	A. Parmiggiani	First version
1.1	10 Jan 2010	A. Parmiggiani	Improved graphic layout

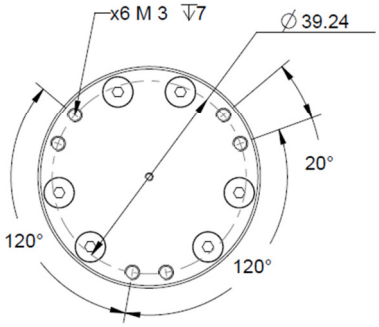
FTSens

6 axis torque and force sensor with CAN Bus communication









The FTSens is capable of measuring 3 forces and 3 torques (in a Cartesian reference system) and to transmit these data in digital form on a CAN Bus line. The sensor is based on semiconductor strain-gauge technology; the mechanical assembly contains all the signal conditioning electronics and a microcontroller that takes care of the communication.
Typical areas of application are:

- Robotic manipulator control
- Tele-robotics
- Bio-mechanics

1.1 Dimensions and physical parameters

The sensor is fabricated with high strength stainless steel and aluminium alloys.

Weight	0.122	[kg]
Diameter	45	[mm]
Height	18.3	[mm]

1.2 Embedded electronics specifications

Power supply	5V±10%, current consumption max 100mA, provided from CAN Bus connector
Communication	CAN Bus 2.0B, 1Mbps
Channels	Six, 3 torques (Tx, Ty, Tz) and 3 forces (Fx, Fy, Fz)
Output data	16 bit, 6 channels, up to 1K messages/sec
Microcontroller	dsPIC30F4013 16bit, 30MIPS, 48K Flash, 2K RAM, CAN, SPI
Alarms	CAN communication, memory, ADC and PGA
Digital filter	6 independent 5th order IIR
A/D Converter	16 bit, 250ksps
Gain settings	Fixed analog gain
Offset correction	digital offset correction
Utilities	In field reprogramming, device configuration, graphical data analysis
Operating conditions	0 to 50°C, humidity <85% without condensation

1.3 Sensor range and resolution

The following table lists typical values of the ranges of measurement and resolution in the six axes. Please note that these values might vary slightly while being optimized in the calibration procedure.

Range of measurement, Fx, Fy	±1500	[N]
Range of measurement, Fz	±2000	[N]
Range of measurement, Tx, Ty	±35	[Nm]
Range of measurement, Tz	±25	[Nm]
Resolution, Fx, Fy	0.25	[N]
Resolution, Fz	0.25	[N]
Resolution, Tx, Ty	0.005	[Nm]
Resolution, Tz	0.004	[Nm]

1.4 Single axis overloads

Overload, Fx, Fy	±2700	[N]
Overload, Fz	±4700	[N]
Overload, Tx, Ty	±55	[Nm]
Overload, Tz	±55	[Nm]

1.5 Sensor stiffness

Stiffness, x axis, y axis	$6.4\ 10^7$	[N/m]
Stiffness z axis	$7.25\ 10^7$	[N/m]
Torsional stiffness x axis, y axis	$8.4\ 10^3$	[Nm/rad]
Torsional stiffness z axis	$25.0\ 10^3$	[Nm/rad]

1.6 Sensor linearity

The following table lists typical average values of the MSE (μ) and its standard deviation (σ) after the calibration procedure.

	μ	σ	
MSE Fx, Fy	0.2	0.4	[N]
MSE Fz	0.7	0.2	[N]
MSE Tx, Ty	0.01	0.02	[Nm]
MSE Tz	0.005	0.05	[Nm]