

STIRRUP FOR HORSE RIDING EQUIPPED WITH FORCE-TORQUE SENSOR



DESCRIPTION OF THE FORCE-TORQUE SENSOR

Definition

A six components force-torque sensor measures the components of the force-torque mechanical actions applied on it. It quantifies the three components of the Force (F_x , F_y , F_z) and the three components of the moment (M_x , M_y , M_z).

Technical characteristics

Sensor dimensions	Height 22.2mm	Diameter 53mm	Weight 90g			
Sensor natural frequency	F_x 15Hz	F_y 15Hz	F_z 15Hz	M_x 15Hz	M_y 15Hz	M_z 15Hz
Simultaneous measuring range	F_x 250 N	F_y 250N	F_z 2000N	M_x 40N.m	M_y 40N.m	M_z 25N.m
Measuring Range by component (MR) By stimulating only one component at a time	F_x 2830N	F_y 2710N	F_z 9060N	M_x 90N.m	M_y 100N.m	M_z 110N.m
Precision	Combined error (linearity and hysteresis)			1 % EM		
	Crosstalk between the components			1.5 < % EM		
Electronic Conditioning	Integrated					
Channel number	6					
Output voltage range	3.3 V					
Power Supply	En charge			0-3.3 V		
	Sans charge			1.65 V		
Temperature	Operating range			-20...+70 °C		
	Temp. Shift span			0.0020% of M.R./°C		
	Temp. Shift zero			0.0075% of M.R./°C		
Altitude	<2000m					
Humidity	100%					
Index Protection	IP 65					

SENSOR GETTING STARTED

Presentation of the different element of the measuring chain

The measuring chain consists of:

- A six components force-torque sensor
- Mechanical parts to integrate the sensor into the stirrup



Connections

The output/input connector on the sensor is a 9 pins Lemo connector corresponding to the 6 measuring channels, (related to) their signal ground and to two power conductors.



MEASUREMENT ACQUISITION AND TREATMENT

Efforts calculation

The 6 components of the efforts in the sensor reference location are obtained by the matrix product:

$$\mathbf{F} = \mathbf{G}\mathbf{U}$$

With

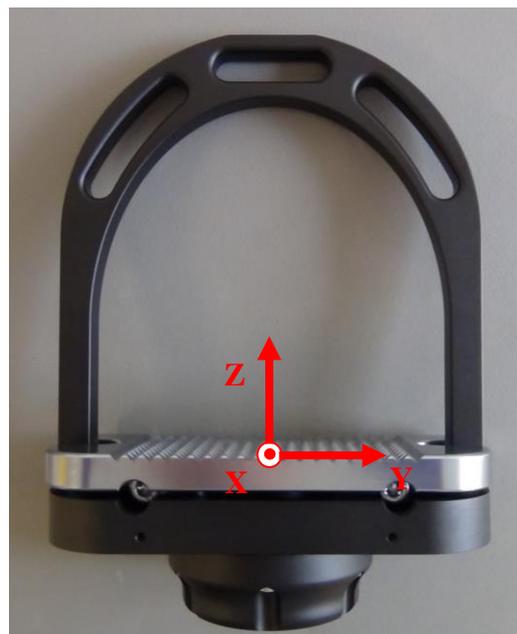
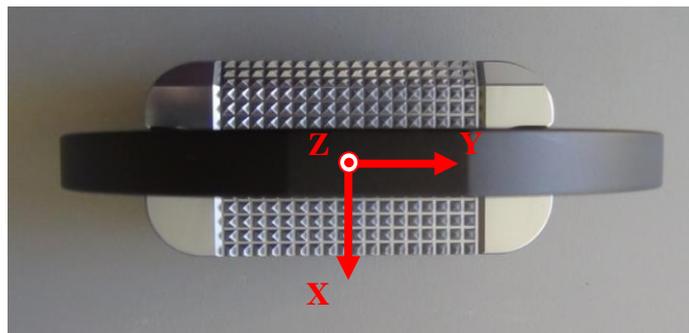
\mathbf{F} the torque effort: $(F_x, F_y, F_z, M_x, M_y, M_z)^t$ which components are expressed in N for the forces and in Nm for the moments.

\mathbf{U} the vector gathering the six voltage measurements expressed in Volt $(U_1, U_2, U_3, U_4, U_5, U_6)^t$

\mathbf{G} the 6X6 calibration matrix.

Sensor reference

The location of the sensor reference is as indicated below.



PRODUCT CERTIFICATION

This product meets the essential requirements of applicable European Directives, as amended for CE marking, as follows:

- 2006/95/EC; Low-Voltage Directive (safety)
- 2004/108/EC; Electromagnetic Compatibility Directive (EMC)

This product is designed to meet the requirements of the standards of safety for electrical equipment for measurement, control, and laboratory use: EN 61010-1:2010

This product meets the requirements of the following EMC standards for electrical equipment for measurement, control, and laboratory use:

- EN 61326-1:2006 ; Class B emissions; Basic immunity
- EN 55011:2004 ; Group 1, Class B emissions

IMPORTANT: The below symbols are on your electro-device. Please, study and learn their meanings. A right interpretation of those symbols will help you using your electro-device more efficiently and decreasing the risks.

SYMBOL	NAME	DESCRIPTION
	Direct current voltage	Voltage (potential) direct current
A	Ampere	Strength
	"Do not throw it in the dustbin"	Dump into specific bins
	European conformity	It falls to the manufacturer to have a product in accordance with the community requirements.
	Operating instructions	Operating instructions to commit the operator to refer to the operating manual.
	Warning	Warning, sign of general safety, underlined the fact that some specific warnings or precautions combined with the device are not mentioned on the stickers. It means: "Attention, refer to the operating manual".
IP65	IP classification	Protection from dust penetration (airtightness) and protection from water projected by a nozzle.

NOTE: Logos, labels, symbols and registered trade names mentioned on this page are the property of their respective owners.