

TENSIOMETERS










LOAD CELL
MANUFACTURER



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PRODUCTS OVERVIEW - TENSIOMETERS

MODEL	DESCRIPTION	ACCURACY CLASS			MATERIAL			CAPACITIES (t)
		2.5 %	Stainless steel	Alloy steel	Aluminum			
 5560S  5562S	Static line tensiometers	●	●	●	●	From 2 t up to 75 t	   p. 136	
		●	●	●	●	From 0.4 t up to 40 t (up to 600 t on request)		p. 138
 5570  5575	Running line tensiometers	●	●	●	●	From 0.4 t up to 40 t (up to 600 t on request)	p. 140	
		●	●	●	●			

ASSOCIATED ELECTRONICS

 ANALOGUE AMPLIFIERS p. 290	 INDI-PAXS p. 210	 DISP-PAXDP p. 212	 INDI-PSD p. 236	 DISP-RLT p. 288	 BRIDGE-BOY p. 254	 CRANE-BOY CRANE-BOYP p. 266	 INDI-BOY DISP-BOYP p. 258	 DISP-BOYDP CRANE-BOYDP CRANE-BOYDP-Exd p. 262	 CRANE-SUMD DISP-SUMD p. 274	 DISP-F p. 286	 WI-T24TR-ACM p. 238	 WI-T24RE-AO1 p. 242	 WI-T24RE-Hx p. 240
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● Standard ■ Optional

Note: CSA and IECEx options are available only for 5560S model.

5560S-5562S

STATIC LINE TENSIO METERS

Load cells specially designed to measure the tension force applied to a static wire rope or rope fiber.



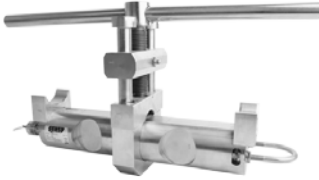
Features

- o Easy and fast mounting
- o Protection class: IP67
- o Wide range of cable diameters: from 3 up to 90 mm (0.11 to 3.5")
- o Material:
 - stainless steel (5560S)
 - anodised aluminium alloy (5562S)
- o Cable length: 6 m (other lengths available on request)

Most popular options (see more in ANNEX)



Model 5560S - 30 t



Application(s) SENSY's load cells 5560S-5562S are perfectly designed for the following applications:

- Hook-load sensor for drilling, mud-logging, ...
- Tension measurement of wire ropes, ropes, shrouds and riggings of electric pylons, transmission antenna, towers, flare masts, barge mooring lines, ...
- Tension measurement for suspended bridges and foot-bridges, big tops, ...

Capacities

5560S-5562S: 2 to 75 t on cable

Specifications	2 - 5 %	
Reference temperature	23	°C
Compensated temperature range	-10...+45	°C
Service temperature range	-30...+70	°C
Storage temperature range	-50...+85	°C
Temperature coefficient of the sensitivity	<± 0.1	% F.S./10°C
Temperature coefficient of zero signal	<± 0.1	% F.S./10°C
Nominal sensitivity	± 1 **	mV/V
Input resistance	350 ± 2	ohm(s)
Output resistance	350 ± 2	ohm(s)
Insulation resistance (50 V)	> 5000	Mohm(s)
Reference excitation voltage	10	VDC
Permissible nominal range of excitation voltage	3...12	VDC
Safe load limit	200	% F.S.*
Breaking load	>300	% F.S.*
Permissible dynamic loading	70	% F.S.*

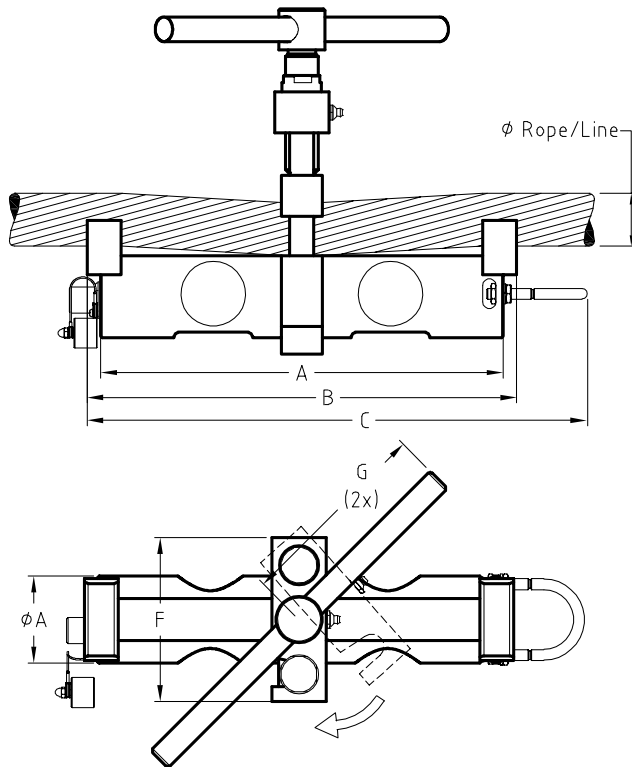
* F.S. : Full Scale.

** : can be different (depending on the wire rope)

Combined error depends on rope material and on-site calibration

Specifications subject to change without notice..

5560S-5562S > STANDARD DIMENSIONS



Ref. Item*	Capacities	ØRope/Line	ØA	A	B	C	D	E	F	G	H (Min)	H (Max)	Weight (kg)
5562S-A	2 - 4 t	Min 6 - Max 12	39	214	220	-	<49	<49	50	162	118	130	± 2
5560S-B	5 t	Min 12 - Max 20	64	295	315	367	72	100	120	217	224	264	±10.4
5560S-C	7.5 t	Min 18 - Max 26	64	295	315	367	72	100	120	217	224	264	±10.4
5560S-D	10 t	Min 8 - Max 20	64	295	315	367	72	100	120	217	224	264	±10.4
5560S-E	15 - 20 t	Min 22 - Max 50.8	64	295	315	367	72	100	120	217	224	264	±11
5560S-F	30 t	Min 22 - Max 50.8	64	295	315	367	72	100	120	217	224	284	±11
5560S-G	45 t	Min 22 - Max 50.8	64	295	315	367	72	100	120	217	224	284	±11
5560S-H	75 t	Min 38 - Max 58	74	405	415	472	89	150	147	324.5	296	365	±26

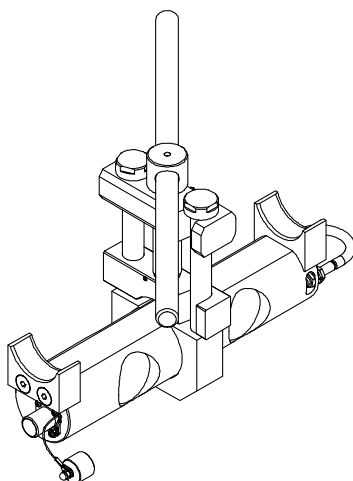
*x=Material: 5560S - stainless steel; 5562S - aluminium

Configurator: www.sensy.com/static-running-line-tensiometer/5560S-5562S

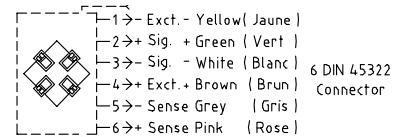
→ Other capacities and dimensions available on request

Dimensions in mm

Other view

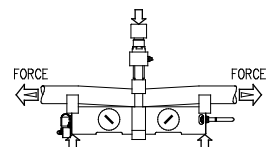


Wiring



Standard : Cable screen not connected to transducer
Faradisation non connectée au capteur

Load direction



Load cells specially designed to measure the tension force applied to a running cable or running rope.



Features

Model 5575 - 0.5 t



- o Custom-made design according to your needs:
 - type of rope (steel, synthetic, optical fiber, umbilical)
 - capacity
 - rope diameter (from 6 up to 115 mm)
 - maximum winding speed
 - accuracy
- o Protection class: IP65
- o Material:
 - load pin: stainless steel
 - other: nickel-plated steel or stainless steel (option)
- o Complete range of CE certified electronics and load limitation devices available
- o Cable length: 6 m (other lengths available on request)

Most popular options (see more in ANNEX)



Application(s) SENSY's load cells 5570-5575 are perfectly designed for the following applications:

- Mooring control in oil and gas and marine equipment,
- Single rope crane load limitation,
- Tension measurement of towage and haulage ropes,
- Winch force measurement.

Capacities

5570 - 5575: from 0.4 to 40 t (up to 600 t on request)

Specifications	2 - 5 %	
Reference temperature	23	°C
Compensated temperature range	-10...+45	°C
Service temperature range	-25...+70	°C
Storage temperature range	-50...+85	°C
Temperature coefficient of the sensitivity	<± 0.1	% F.S.*10°C
Temperature coefficient of zero signal	<± 0.1	% F.S.*10°C
Nominal sensitivity	± 1 **	mV/V
Input resistance	350 ± 2	ohm(s)
Output resistance	350 ± 2	ohm(s)
Insulation resistance (50 V)	> 5000	Mohm(s)
Reference excitation voltage	10	VDC
Permissible nominal range of excitation voltage	3...12	VDC
Safe load limit	200	% F.S.*
Breaking load	> 300	% F.S.*
Permissible dynamic loading	70	% F.S.*

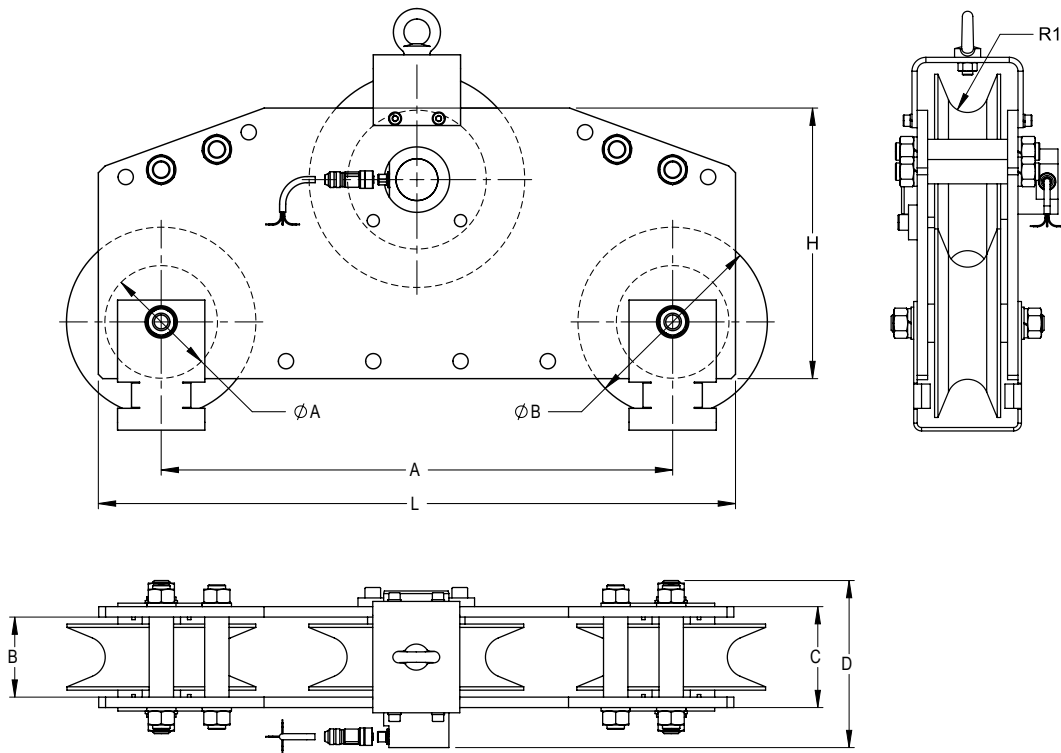
* F.S. : Full Scale.

** : can be different (depending on the wire rope)

Combined error depends on rope material and on-site calibration

Specifications subject to change without notice..

5570-5575 > STANDARD DIMENSIONS



Ref. Item*	Capacities	Ø rope (mm)	ØA	ØB	R1	A	B	C	D	H	L	Max. Speed (m/s)	Weight (kg)
557x-A	400 kg	8	48	90	8.5	500	34	50	110	117	630	1	±9
557x-B	1.5 t	12	48	90	8.5	500	34	50	110	140	630	1	±10.6
557x-C	6 t	16	119	151	9	500	34	50	110	140	661	2	±38
557x-D	20 t	32	120	184	17	900	63	79	159	341	1210	3	±51
557x-E	40 t	36	206	278	19	900	94	122	224	497	1188	4	±224

Ø38 → Ø115 according to customer's design specifications (up to 600 t)

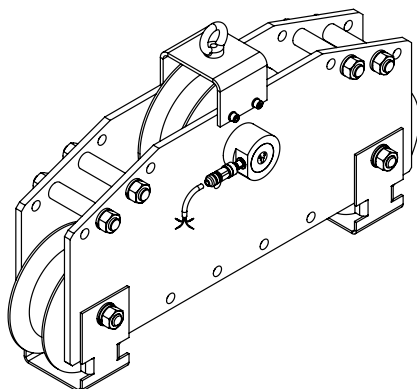
*x=Material: 5570 - stainless steel; 5575 - nickel-plated steel

Configurator: <http://www.sensy.com/tensiometer-configurator/5570-5575>

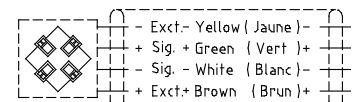
→ Other capacities and dimensions available on request

Dimensions in mm

Other view

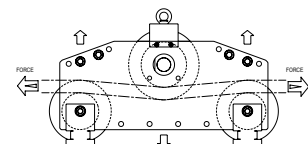


Wiring



Standard : Cable screen not connected to transducer
Faradisation non connectée au capteur

Load direction



5580-5585

RUNNING LINE TENSIO METERS WITH REMOVABLE CENTER SHEAVE

Load cells specially designed to measure the tension force applied to a running wire rope. The removable center sheave enables easy installation without cutting the winch lines.



Model 5580 - 2 t



Features

- o Wide range of cables (Ø from 6 up to 115 mm)
- o Protection class: IP67
- o Material:
 - load pin: stainless steel
 - other components: stainless steel (5580)
 - other components: nickel-plated steel (5585)
- o Complete range of CE certified electronics and load limitation devices available
- o Custom-made manufacturing
- o Cable length: 6 m (other lengths available on request)

Most popular options (see more in ANNEX)



Ex i



IP68



Application(s) SENSY's load cells 5580 and 5585 are perfectly designed for the following applications:

- Tension measurement of towage and haulage cables,
- Winch force measurement,
- ROV umbilical tension control, wireline / slickline tension monitoring.

Capacities

5580-5585: from 0.4 to 40 t (up to 600 t on request)

Specifications	2 - 5 %	
Reference temperature	23	°C
Compensated temperature range	-10...+45	°C
Service temperature range	-25...+70	°C
Storage temperature range	-50...+85	°C
Temperature coefficient of the sensitivity	<± 0.1	% F.S./10°C
Temperature coefficient of zero signal	<± 0.1	% F.S./10°C
Nominal sensitivity	± 1 **	mV/V
Input resistance	350 ± 2	ohm(s)
Output resistance	350 ± 2	ohm(s)
Insulation resistance (50 V)	> 5000	Mohm(s)
Reference excitation voltage	10	VDC
Permissible nominal range of excitation voltage	3...12	VDC
Safe load limit	200	% F.S.*
Breaking load	> 300	% F.S.*
Permissible dynamic loading	70	% F.S.*

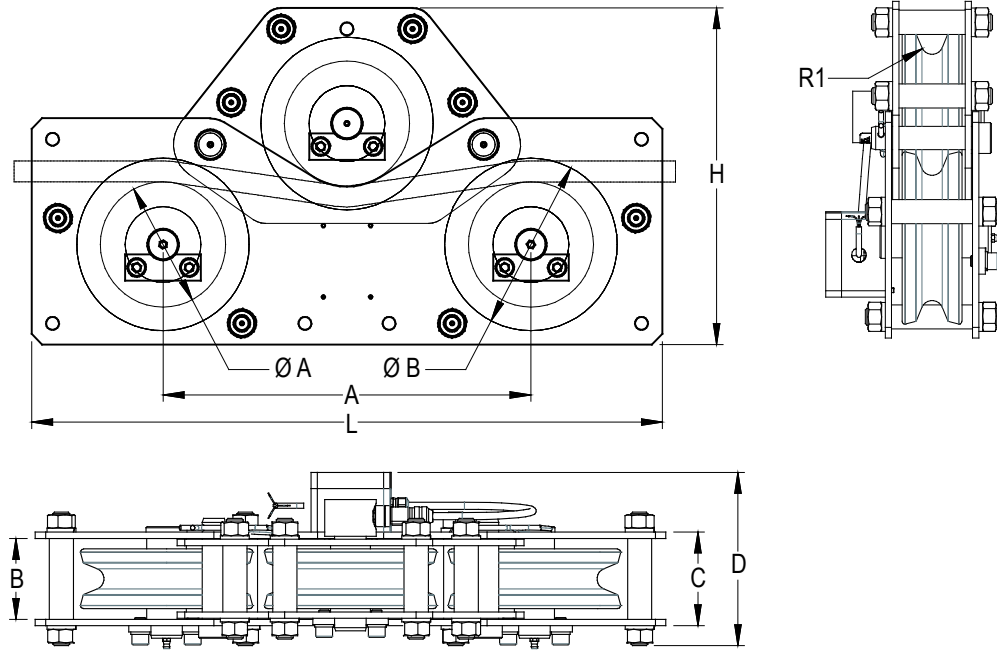
* F.S. : Full Scale.

** : can be different (depending on the wire rope)

Combined error depends on rope material and on-site calibration

Specifications subject to change without notice..

5580-5585 > STANDARD DIMENSIONS



Ref. Item*	Capacities	Ø rope (mm)	ØA	ØB	R1	A	B	C	D	H	L	Max. Speed (m/s)	Weight (kg)
558x-A	400 kg	8	48	90	8.5	500	34	50	110	117	630	1	±9
558x-B	1.5 t	12	48	90	8.5	500	34	50	110	140	630	1	±10.6
558x-C	6 t	16	119	151	9	500	34	50	110	140	661	6	±38
558x-D	20 t	32	120	184	17	900	63	79	159	341	1210	80	±51
558x-E	40 t	36	206	278	19	900	94	122	224	497	1188	10	±224

Ø38 → Ø115 according to customer's design specifications (up to 600 t)

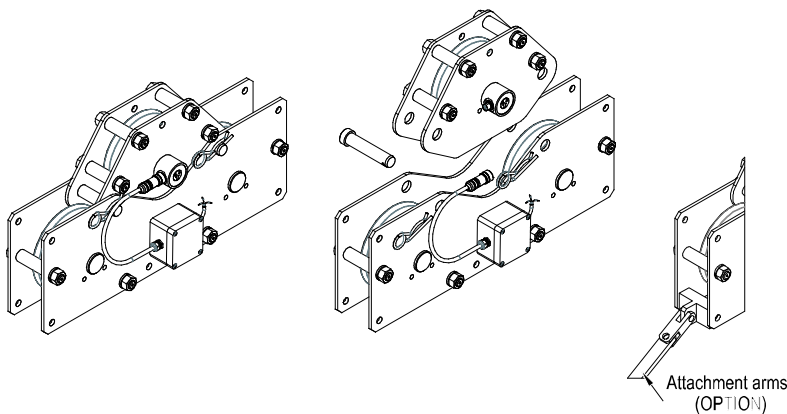
*x=Material: 5580 - stainless steel; 5585 - nickel-plated steel

Configurator: www.sensy.com/tensiometer-configurator/5580-5585

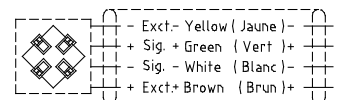
→ Other capacities and dimensions available on request

Dimensions in mm

Other views

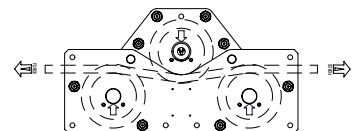


Wiring



Standard : Cable screen not connected to transducer
Faradisation non connectée au capteur

Load direction



ANNEXES

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- Option cards for PAX, CRANE-BOY, INDI-BOY, DISP-BOY family	p. 303
- Definitions: Certifications	p. 304
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DESCRIPTION OF MOST USED OPTIONS

OPTION DESCRIPTION



Amplified output

Amplified output

Signal conditioners for strain gauges are high-performance amplifiers built into the load cell. They amplify and convert the input signal (mV) into an output signal (mA or V). The current amplifiers make it possible to maintain an accuracy higher than 0.1 % at the different temperatures used. Robust and small in design (with an optional housing), their installation is easy and their temperature range is -40°C to $+85^{\circ}\text{C}$. These analogue amplification boards are designed to work in an industrial environment and offer both high stability and fast response. The directly amplified force transducer can be applied where space, weight and cost are limited as well as in areas where there are many electromagnetic signal disturbances.

OPTION DESCRIPTION



Angle Measurement

Angle measurement

This allows the angle of rotation to be measured at the same time as the torque. This information is provided in the form of two square waveforms providing 360 periods per revolution and offset by a quarter of a period to determine the direction of rotation.

OPTION DESCRIPTION



Attachment arm

Articulated arm

This accessory makes it possible to fix the running line tensiometer to the structure while leaving it sufficient freedom to follow the movements of the rope.

OPTION DESCRIPTION



ASTM E74

ASTM E74

The ASTM E74 standard is unique to the USA and serves the same purpose as the international standard ISO 376, i.e.: "Calibration of force measuring instruments used for the verification of uniaxial testing machines". It deals more generally with the calibration methods which can be used to perform the calibration.

Two categories of force transducers are differentiated:

- class AA: for secondary force standard dynamometers, i.e. used as references for calibrating other dynamometers.
- class A: for dynamometers used for checking testing machines.

This distinction introduces differences in the calibration procedure. The results of the calibration are used to define the area of use in the category to which the dynamometer belongs. A key difference from ISO 376 is that the ASTM protocol is based in part on calibration uncertainty.

OPTION DESCRIPTION



Cable length

Cable length

Transducers are defined as standard with a typical cable length. (e.g. 8 m for the '5510' model). It is possible to modify this length on request. Note: the maximum length can be limited especially in particular:

- by the presence of electromagnetic disturbances which then require amplification of the signal at the transducer to convey a robust signal of type 4 ... 20 mA / 0...10 V;
- for Ex i-certified transducers for operation in explosive zones for which the solution is to use a local amplification (e.g.: option C6 - model 'ANALOGUE AMPLIFIER' - delivering a signal 4 ... 20 mA 2 wires) enabling the use of a loop insulator accepting longer cables than the Zener barriers.

OPTION DESCRIPTION



Calculation note

Calculation note

Calculation note to demonstrate the mechanical strength and technical relevance of the design of a transducer according to its measurement range, its safety factor, the fatigue strength required and the characteristics of the material used.

OPTION DESCRIPTION



Calibration resistance









Calibration resistance

A resistor intended to be connected in parallel on one of the Wheatstone bridge branches in order to create a known imbalance and thus to simulate a known force or torque. This makes it possible to calibrate and verify the control electronics without applying a physical quantity to the force transducer or torque meter. A calibration resistor is therefore determined for a specific branch of a specific force transducer.




It can be internal to the transducer and activated by connecting two wires. It can also be external (supplied in a sachet).

DESCRIPTION OF MOST USED OPTIONS



OPTION	DESCRIPTION
	<p>CE hoisting</p> <p>CE Hoisting logo is SENSY specific. This means that the material is certified by SENSY to be integrated in the kinematic chain of a lifting system.</p> <p>To do this, SENSY provides a manufacturer folder which guarantees the overload resistance (breaking load coefficient of 5 for lifting systems and 10 for elevators) as well as the fatigue resistance.</p> <p>The CE Hoisting certification is not enough for the use of load cells in an overload protection systems. Indeed, in addition, a load cell used for crane overload protection must be conform to the concept of "fail safe"; namely that it must stop the lifting in case of any anomaly. This is for example not the case for load cells with wireless transmission like models: 5000-WI, 5000M-WI, 5050-WI and 5050M-WI...</p>
 Charpy certificate	<p>Charpy certificate</p> <p>This type of test makes it possible to control the impact resistance or the ductility of the proof body of a force transducer.</p> <p>The Charpy test is carried out on a specimen in the same material as that of the force transducer accompanied by a test report certified by an approved laboratory.</p>
	<p>Connector output</p> <p>As the standard, industrial and weighing transducers are generally equipped with a cable gland. This option replaces the latter with a connector so that it easy to disconnect from the cable. These connectors are chosen according to the transducer's environment. Some very specific connectors can also be used underwater (they can even be disconnected and connected underwater) while being subjected to high pressure.</p>
 Digital output	<p>Digital output</p> <p>The RS-232 and RS-485 options are high-performance digital amplifier boards for analogue / digital signal conversion which are typically used for high-accuracy transducers. The board has been developed for mounting in most of our strain gauge force transducers and provides a very stable RS-232 / RS-485 digital output signal in the MODBUS or ASCII protocol.</p>
 Dual Wheatstone bridge	<p>Dual Wheatstone bridge</p> <p>A double bridge force transducer is a transducer with two independent Wheatstone bridges equipped with strain gauges. In the context of high-risk industrial applications where, according to the Machine Directive, high levels of SIL (Safety Integrity Levels) or PL (Performance Levels) are required, safety is provided by an independent safety control device. The device's critical point of performance lies in its resistance to defects. This resistance depends on both the quality and reliability of the components, and in particular on its structure (or architecture). These safety devices are essentially built according to the well-known 'measurement signal / control logic / actuator' architecture. High SIL or PL levels can only be achieved by using the redundancy of the parts. Thanks to these double bridge measuring force transducers, SENSY technology enables the redundancy of the required measuring signal to be supplied to the safety control logic device. The monitoring and comparison of these redundant signals, performed by the control logic (safety PLC, configurable logic block 'fail-safe') provides the means of avoiding, detecting or tolerating defects. In this case, a fault in the measurement signal will be detected and processed before the next request for the safety function. Another reason to employ a second bridge is to have a spare bridge for very large capacity transducers or for transducers placed where mounting and accessibility are very difficult in order to facilitate dealing with the problem of signal drift or ripped cable.</p>
 Dye penetrant certificate	<p>Dye penetrant certificate</p> <p>Dye penetrant test certificate after machining.</p> <p>This type of test makes it possible to check the absence of any micro-cracks likely to cause the rupture of certain fatigue-rated transducers.</p>
 Accredited laboratory certificate	<p>EN 12390</p> <p>The EN 12390 and EN 12350 series of standards deal with concrete tests. The machines used for compressive strength testing of hardened concrete are tested according to the European standard EN 12390-4. The standard transducers manufactured by SENSY, have four separate gauge bridges to identify any parallelism anomaly on the machine. They may also be associated with an ISO 376 qualification and require an official certificate from a certified body based on tests carried out according to EN 12390-4.</p>
	<p>Ex i</p> <p>Type of protection is based on the limitation of electrical energy provided to an equipment and its wiring exposed to explosive atmosphere at a level below that which may cause ignition by a spark or thermal effect.</p> <p>Force transducers and torque meters equipped with this option are considered to be intrinsically safe, which allows them to work in explosives areas. SENSY load cells are ATEX Ex ia IIC T4 and T6, IECEx Ex ia IIC T6 and CSA (Canada and US) Class 1 Div 1 certified.</p>


DESCRIPTION OF MOST USED OPTIONS


OPTION	DESCRIPTION
Ex d	<p>Ex d</p> <p>This is an envelope (housing or proof body of the force transducer) enclosing components that can ignite an explosive gaseous atmosphere. The transducer structure is therefore designed to resist the pressure developed during an internal explosion of an explosive mixture and prevents the transmission of this one to the surrounding explosive atmosphere of the envelope.</p> <p>We offer this type of option on our load pin model '5050' or for some of our electronics (displays, load limiters, etc.). In the latter case, these are placed in suitable explosion-proof housings.</p>
 Up to 800 m	<p>External antenna</p> <p>Options for the wireless transmission of measurements have an internal antenna as standard. Depending on the application, it is sometimes necessary to increase the range of our wireless transmitters.</p> <p>We also offer external antennas for the industrial sector as well as for explosive areas with our Ex i wireless transmitters.</p>
20... 100 kHz Frequency output	<p>Frequency output</p> <p>This provides a signal in the form of frequency modulation to overcome electromagnetic disturbances.</p>
 High pressure resistance	<p>High-pressure resistance</p> <p>This option involves design and components (e.g. gaskets) that can withstand high pressures. It is therefore necessary to know the nature of the fluid under pressure (water, air, oil, etc. ...), the maximum pressure to which the transducer will be subjected as well as the duration of exposure to this pressure.</p>
 Hydraulic hose	<p>Hydraulic hose</p> <p>Mechanical protection of the cable by using a hydraulic sheath. This option is recommended in environments where the cable is subject to mechanical and chemical aggressions.</p>
IP64 Not for Angle Sensor	<p>IP64</p> <p>The protection rating of our force transducers is in accordance with the international standard of the International Electrotechnical Commission for waterproofing.</p>
IP65 Not for Angle Sensor	<p>IP65</p> <p>The protection rating of our force transducers is in accordance with the international standard of the International Electrotechnical Commission for waterproofing.</p> <p>In the case of IP65, this corresponds to total protection against dust and strong jets of water in all directions.</p>
IP67 MARINE	<p>IP67 MARINE</p> <p>The protection rating of our force transducers is in accordance with the international standard of the International Electrotechnical Commission for waterproofing. In the case of IP67 MARINE, this corresponds to total protection against dust and the effects of immersion (1 m max) with corrosion resistance adapted to marine environments.</p>
IP68	<p>IP68</p> <p>The waterproofness is such that it is possible to immerse the transducer without altering its performance.</p> <p>In order to optimise the protection techniques, it is necessary to know the depth to which the transducer will be immersed as well as the duration of immersion and the characteristics of the liquid.</p>


DESCRIPTION OF MOST USED OPTIONS




OPTION	DESCRIPTION
IP69K	IP69K The protection rating of our force transducers is in accordance with the international standard of the International Electrotechnical Commission for waterproofing.
	In the case of the IP69K, this corresponds to protection against high-pressure cleaning, at high temperature and coming from several directions.

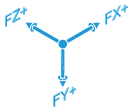
OPTION	DESCRIPTION
 Class 00	ISO 376 - class 00 The purpose of ISO 376 is to calibrate force-measuring instruments used for the static verification of uniaxial testing machines (e.g. tension/compression testing machines). It describes a procedure for classifying these instruments. These high-precision, so-called "transfer" standard transducers make the link between national metrology and testing machines that must be (re)-calibrated.
	The class of the instrument must be equal to or better than the class for which the machine is to be calibrated according to ISO 7500-1. With this option, these high-accuracy-transducers not only allow the calibration of scale machines in classes 05, 1 or 2 but also enable intercomparison tests between national standards.


OPTION	DESCRIPTION
 Class 0,5	ISO 376 - class 0,5 The purpose of ISO 376 is to calibrate force-measuring instruments used for the static verification of uniaxial testing machines (e.g. tension/compression testing machines). It describes a procedure for classifying these instruments. These high-precision, so-called "transfer" standard transducers make the link between national metrology and testing machines that must be (re)-calibrated.
	The class of the instrument must be equal to or better than the class for which the machine is to be calibrated according to ISO 7500-1. This option allows for the calibration of scale machines in classes 0,5, 1 or 2.

OPTION	DESCRIPTION
 Class 1	ISO 376 - class 1 The purpose of ISO 376 is to calibrate force-measuring instruments used for the static verification of uniaxial testing machines (e.g. tension/compression testing machines). It describes a procedure for classifying these instruments. These high-precision, so-called "transfer" standard transducers make the link between national metrology and testing machines that must be (re)-calibrated.
	The class of the instrument must be equal to or better than the class for which the machine is to be calibrated according to ISO 7500-1. This option allows for the calibration of scale machines in classes 1 or 2.


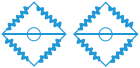

OPTION	DESCRIPTION
ISO 376 Accredited laboratory certificate	ISO 376 - Accredited laboratory certificate The purpose of ISO 376 is the calibration of force-measuring instruments used for the static verification of uniaxial testing machines (e.g. tension/compression testing machines). It describes a procedure for classifying these instruments. These high-precision, so-called "transfer" standard transducers make the link between national metrology and testing machines that must be (re)-calibrated.

OPTION	DESCRIPTION
 Magnetic certificate	Magnetoscopic test certificate Magnetoscopic test certificate after machining. This method makes possible the detection of the presence of cracks that can cause the transducer to break.

OPTION	DESCRIPTION
	Multi-axis load cells For some types of proof bodies, it is possible to manufacture load cells with several gauge bridges in order to measure forces in different directions. In particular for load pins, it is allowed to measure the force in two orthogonal directions (Fx, Fy). This allows the resultant force to be calculated, without knowing the direction, by using the formula: $F \text{ Result.} = \sqrt{(F_x^2 + F_y^2)}$

OPTION	DESCRIPTION
	Multi-direction For some applications it is necessary to know both the forces and the moments in several directions: for example, a torque wrench for which the torque as well as the thrust have to be measured. This can be done using a single transducer equipped with several gauge bridges in an appropriate design.


DESCRIPTION OF MOST USED OPTIONS

OPTION	DESCRIPTION
	Overload protection <p>Transducers associated with overload protection electronics (crane, EOT crane, lift, nacelle, etc.) are defined as "safety components placed on the market separately" and must comply with the essential requirements of the Machine Directive 2006/42/EC for safety component aspects and the Electromagnetic Compatibility Directive 2014/30/EU.</p> <p>They are the subject of specific strain studies and a choice of appropriate material of aeronautical quality, to prevent any risk of rupture. SENSY S.A. keeps the technical file certifying the said conformity at the disposal of the authorities throughout the legal period (in reality, the documents are kept for more than 30 years, although the lifespan of a transducer may be more than 50 years).</p>
 COVER	Protective cover <p>The cover is designed to improve the mechanical protection of a transducer which, as the norm, only has a silicone layer on the strain gauges.</p>
 Sheaves of synthetic material	REA synthetic option (tensiometer) <p>Use of sheaves made from synthetic materials instead of metal sheaves for particular applications (cable type, cable diameter, weight, etc.).</p>
 SIL 3 COMPLIANT	SIL (Safety Integrity Levels) / EN-61508 compliant <p>In the context of high-risk industrial applications where, according to the Machine Directive, high levels of SIL (Safety Integrity Levels – EN 62061 standard) or PL (Performance Levels – ISO 13849 standard) are required, safety is provided by an independent safety control device. The critical point of the device's performance lies in its resistance to defects. This depends on the quality and reliability of the components, and in particular its structure (or architecture). These safety devices are essentially built according to the well-known architecture (measurement signal / control logic / actuator). High SIL or PL levels can only be achieved by using the redundancy of the parts. Thanks to these double-bridge measuring transducers, SENSY technology enables the redundancy of the required measuring signal to be supplied to the safety control logic device. The monitoring and comparison of these redundant signals, performed by the control logic (safety PLC, configurable logic block 'fail-safe') provides the means of avoiding, detecting or tolerating defects. In this case, a fault in the measurement signal will be detected and processed before the next request for the safety function.</p>
 SOFTWARE AVAILABLE	Software <p>The signals from our force transducers can be used either through industrial displays or via acquisition software. SENSY has developed a range of specialized software either for computers (SOFT-ISO376, SOFT-ISO7500, SOFT-EN12390, ...) or for industrial PLCs. These applications make it possible to acquire the signals of one or more force transducers/load pins via different types of interfaces (RS-232, RS-485, USB, wireless, etc.).</p> <p>For example, when supplying a complete measuring system, we also regularly offer to develop customised applications.</p>
 Special Impedance	Special impedance <p>The force transducers and the torque meters are made from strain gauges connected via a Wheatstone bridge. The impedance of this bridge depends on the type of gauges (usually 350 Ω) and the number of these in each of the branches. As a result, there is a standard impedance for each force transducer which depends on the model, the measurement range and finally the required accuracy.</p> <p>This impedance can be adapted (700, 1000, 5000 Ω) for certain applications: need for low consumption (e.g. battery operation, amplifier 4 ... 20 mA 2 wires) or the need to limit heat dissipation (Ex i certified transducers (intrinsic safety), small transducers).</p>
 Speed sensor	Speed transducer <p>Measurement of the rotation speed.</p> <p>This option is proposed for rotating torque meters and tensiometers to measure the running speed of the cable.</p>
 Spider lubrication hole	Spider lubrication hole <p>In the case of load pins, to avoid wear due to friction, it is possible to provide a lubrication hole(s) to lubricate the areas where the forces are applied to limit wear and avoid seizure. This lubrication hole can be a 'spider' to improve the distribution of the lubricant over the entire contact area.</p>

DESCRIPTION OF MOST USED OPTIONS



OPTION **DESCRIPTION**


 **Stainless steel connector**
 4 poles miniature standardised connector with mechanical parts made of stainless steel to replace the standard connector (9 pins binder according to DIN 45322 with chromed brass mechanical parts).

STAINLESS STEEL

OPTION **DESCRIPTION**

 **Subsea load pin with 'wet mate' connector**
 This option allows the cable from a transducer to be connected or disconnected under water. This option is obviously expensive but is recommended for underwater applications where the connecting cable must be removable.

OPTION **DESCRIPTION**

 **Subsea load pin with 'submersible' connector**
 Waterproofness of the proof body and connector for immersing the load pin. It is necessary to specify the depth and duration of immersion to optimise the design and life of its components.

Submerged

OPTION **DESCRIPTION**

ANODISING
 Surface treatment

Surface treatment: anodising
 Anodising refers to an electrolytic treatment that creates a thin layer of oxide on the surface of a metal body. It is used in particular for aluminum and its alloys on which a layer of alumina of 10 to 50 microns increases its resistance to wear and corrosion. Anodising also improves the visual appearance of the force transducer or accessory.

OPTION **DESCRIPTION**

CHROME PLATING
 Surface treatment


Surface treatment: chrome-plating
 Application by electrolysis of a chromium layer on the surface of the proof body of a force transducer or its accessory to improve its resistance to corrosion. This operation enhances the product's visual appearance and makes it easier to clean (e.g. food industry).

OPTION **DESCRIPTION**

NICKEL MARINE
 Surface treatment

Surface treatment: nickel marine
 Additional surface treatment to the proof body of a force transducer or its accessory made of alloy steel to increase its corrosion resistance for use in the marine environment.

OPTION **DESCRIPTION**

 **Passivation treatment**


Surface treatment: passivation
 Passivation is a surface treatment intended to create a protective film against corrosion on the surface of a metal body. For example, in the case of stainless steel, a tight protective layer of chromium oxide will be formed in the presence of oxygen in the air which is able to regenerate in case of accidental deterioration of the surface.

OPTION **DESCRIPTION**

TEFLON
 Surface treatment

Surface treatment: teflon
 Application of a Teflon (PTFE) layer to the surface of the proof body of a force transducer or its accessory to improve its resistance to friction and corrosion, even at high temperatures.


OPTION **DESCRIPTION**


 **Teds linearity**


TEDS (Transducer Electronic Data Sheet)
 This technology is not only compatible with force transducers but has been designed to be used with all types of transducers (temperature, pressure, accelerometer, etc.). It consists of a digital circuit for transmitting the information necessary for its calibration to the measurement electronics. Other information is stored in the memory of this chip: for example, transducer type, serial number, year of manufacture, manufacturer, etc. In this way, when the force transducer is connected to a TEDS-compatible indicator, it behaves like a fully 'plug and play' feature with automatic calibration which allows N, kg or t to be displayed directly, rather than mV.


Note: when necessary, and depending on the design of the transducer or application, it is also possible to improve the linearity of the transducer by integrating pairs of points and the corresponding adjustments into the memory.


DESCRIPTION OF MOST USED OPTIONS


OPTION	DESCRIPTION
 -30°C...+130°C -40°C...+180°C -50°C...+130°C -50°C...+150°C -50°C...+180°C	Temperature range When manufacturing force transducers or torque meters, SENSY takes into account three types of temperature range: <ul style="list-style-type: none">• The compensated temperature range where the thermal drift of the force transducer is corrected, optimised and verified during its manufacturing (standard: -10°C ... +45°C).• The nominal operating temperature range (standard: -30°C ... +70°C) for which the transducer has been designed and qualified but which is not subjected to systematic temperature control. Nevertheless, the drift remains substantially the same as over the compensated temperature range. As an option and depending on the models, we propose to extend the operating temperature from to -50°C ... +180°C and, if necessary, to compensate for a part or all these temperatures.• The storage temperature range (standard: -50°C ... +85°C) which is always adapted according to the chosen temperature option.


OPTION	DESCRIPTION
 Third inspection	Third inspection A request for an inspection by an authorised third party (e.g. Lloyd's) of an order during production and upon delivery.


OPTION	DESCRIPTION
 US control	US control Ultrasonic testing for fault detection within a material. This is based on ultrasonic waves transmission and reflection inside a material, such as the proof body of a transducer or loading accessory.

OPTION	DESCRIPTION
 USB	USB The COND-USB is a digital conditioner designed to convert the signal from the gauge bridge of our force transducers to a USB-type digital output. This product is totally 'plug and play' since it is directly powered by the USB port and no additional energy source is needed to power the force transducer. Thus, it is sufficient to connect it to a computer or PLC to recover the measurement of the force measured by the force transducer. The rugged metal housing on the converter equips the device for use in all indoor environments.

OPTION	DESCRIPTION
 Vacuum proof	Vacuum proof This option involves the use of materials capable of withstanding the vacuum in the long term and in particular not to be subjected to degassing. It is necessary to know the value of the vacuum (absolute pressure) as well as the duration of exposure to this vacuum for an optimal definition of the required components.

OPTION	DESCRIPTION
 Tightness certificate	Waterproofness certificate Waterproofness certificate: this type of test makes it possible, for example, to check the waterproofness of a load pin intended for underwater use.

OPTION	DESCRIPTION
 Wireless	Wireless Depending on the application, it may be interesting to recover the signals from force transducers or load pins by replacing the wiring with a wireless link. Our wireless options enable us to provide wireless communications in industrial environments as well as in explosive areas. The proposed solutions are suitable for measuring force as well as for lifting (for example, recovering the signal from load shackle on a portable indicator), but exclude safety functions such as overload protection. They are available as both single channel and multiplexed options to connect multiple transducers to the same wireless display.

OPTION	DESCRIPTION
 Xray proof	X-ray proof Withstand ionising radiation. This option involves the use of materials resistant to ionising radiation (radioactivity). It is necessary to know the type of radiation (alpha, beta, gamma or X), the dose rate as well as the total dose accumulated during the life of the transducer to obtain an optimal definition of the required components.

OPTIONAL CARDS

Communication cards (max. 1 choice)

CARD-CDC10

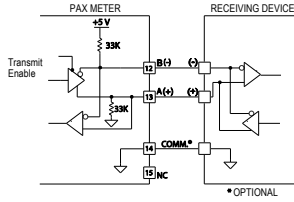


- RS-485 field bus communication interface

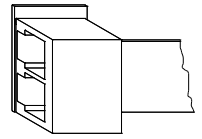
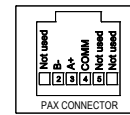
CARD-CDC1C



CARD-CDC10



CARD-CDC1C



CARD-CDC20

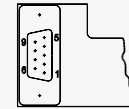
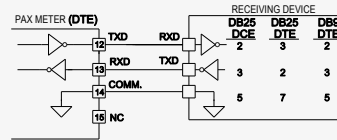


- RS-232 half-duplex communication interface
Available with crew terminals or DB9 connector

CARD-CDC2C



CARD-CDC20



FEMALE
PIN 2 TXD
PIN 3 RXD
PIN 5 COMMON

CARD-CDC30



- DeviceNet communication interface

CARD-CDC40



- Modbus communication interface

CARD-CDC40 is not necessary for models:

- INDI-PAXS2 DISP-PAXx2
- INDI-BOYS2 DISP-BOYP2
- CRANE-BOYS2 CRANE-BOYP2
- CRANE-SUMD2 DISP-SUMD2
- DISP-PAXDP, DISP-BOYDP, CRANE-BOYDP

CARD-CDC50 / CARD-CDC50-CRANE*



- Profibus-DP (EN 50170) communication interface

* As the CARD-CDC50 is too long for the housing of the CRANE-BOY, the CARD-CDC50-CRANE is supplied with a spacer to be insert between the front of the electronics and the housing.

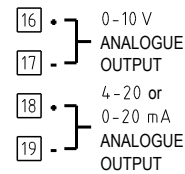
Analogue output card

CARD-CDL10



- Analogue output signal: 0-20 mA, 4-20 mA, 0-10 VDC

CARD-CDL10



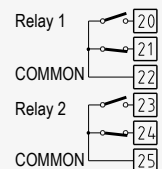
Relay cards (max. 1 choice)

CARD-CDS10 & CARD-CDS20

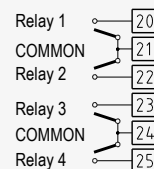


- 2 or 4 set-points activating each an independent relay

CARD-CDS10



CARD-CDS20



Cards already included

- Analogue output card:

CARD-CDL10

- Relay card:

CARD-CDS20 (4 set-points)

- Models:

CABIN-2xB1SUMD; CABIN-4xB1SUMD

- Models:

INDI-BOY DISP-BOYP; CRANE-BOY CRANE-BOYP; DISP-BOYDP
CRANE-BOYDP; CRANE-SUMD DISP-SUMD; CRANE-BOY-Exd;
CABIN-2xB1SUMD; CABIN-4xB1SUMD.

DEFINITIONS: CERTIFICATIONS

OPTION	DESCRIPTION
	<p>ATEX</p> <p>The ATEX (ATmosphère EXplosive in French) logo is specific to the European market and means that the material can be certified (option) to be used in an explosive environment.</p> <p>Most of the sensors can be Ex i certified (intrinsic safety) and some Ex d certified (explosion proof). The sensors with Ex i certification need to be connected to the electronics (located in a safe area) through Zener barriers or loop insulators that limit the transmitted energy. If the associated electronics need to function in an explosive environment, SENSY can integrate them in an explosion-proof certified housing.</p>
	<p>CE</p> <p>The CE logo means that the material corresponds to all the essential requirements for the different guidelines that are applicable in the European Union.</p>
	<p>CE Hoisting</p> <p>The CE Hoisting logo is SENSY-specific. This means that the material is certified by SENSY to be integrated in the kinematic chain of a lifting system.</p> <p>To do this, SENSY provides a manufacturer folder which guarantees the overload resistance (breaking load coefficient of 5 for lifting systems and 10 for elevators) as well as the fatigue resistance.</p> <p>The CE Hoisting certification is not sufficient for the use of load cells in an overload protection system. Indeed, in addition, a load cell used for crane overload protection must conform to the concept of "fail safe"; namely, it must stop the lifting in case of any anomaly. For example, this is not the case for load cells with wireless transmission, such as models: 5000-WI, 5000M-WI, 5050-WI and 5050M-WI...</p>
	<p>CSA</p> <p>The CSA logo is equivalent to the ATEX logo but is applicable to the North American markets (USA and Canada).</p>
	<p>IECEX</p> <p>The IECEX logo (International Electrotechnical Commission System for Certification to Standards Relating to Equipment for Use in Explosive Atmospheres) is equivalent to the ATEX logo but is applicable for the global market.</p>
	<p>ISO 376</p> <p>The purpose of ISO 376 is the calibration of force-measuring instruments used for the static verification of uniaxial testing machines (e.g. tension/compression testing machines). It describes a procedure for classifying these instruments. These high-precision, so-called "transfer" standard transducers make the link between national metrology and testing machines that must be (re)-calibrated.</p>
	<p>OIML</p> <p>OIML is the International Organization of Legal Metrology.</p> <p>In the SENSY documentation, the OIML logo means that the load cell or the weighing electronics are certified by an internationally recognised Metrology institute (PTB, NMI, NWML, etc.) as compliant to the international recommendation OIML concerning the type of material in order to integrate the sensor into a "legal" weighing system designed to measure the mass in order to determine its price.</p> <p>It is the R60 for the load cells and the R76 for the electronics (non-automatic weighing).</p>
	<p>OVERLOAD PROTECTION</p> <p>Transducers associated with overload protection electronics (crane, EOT crane, lift, nacelle, etc.) are defined as "safety components placed on the market separately" and must comply with the essential requirements of the Machine Directive 2006/42/EC for safety component aspects and the Electromagnetic Compatibility Directive 2014/30/EU.</p> <p>They are the subject of specific strain studies and a choice of appropriate material of aeronautical quality to prevent any risk of rupture. SENSY keeps the technical file certifying the said conformity at the disposal of the authorities throughout the legal period (in reality, the documents are kept for more than 30 years, although the lifespan of a transducer may be more than 50 years).</p>
	<p>EN 12390</p> <p>The EN 12390 and EN 12350 series of standards deal with concrete tests. The machines used for compressive strength testing of hardened concrete are tested according to the European standard EN 12390-4. The standard transducers manufactured by SENSY, have four separate gauge bridges to identify any parallelism anomaly on the machine. They may also be associated with an ISO 376 qualification and require an official certificate from a certified body based on tests carried out according to EN 12390-4.</p>



DESCRIPTION

Carbon cable

These small-diameter cables are made of carbon-fibre-reinforced materials. As there are many varieties it is essential to specify the characteristics of the cable concerned.

DESCRIPTION

Steel cable

A steel cable is an assembly of strands which are themselves an assembly of steel wires arranged in helical form around their respective core and assembled to become one. The cable allows for transmitting, force, movement and energy in an assembly of mechanical parts.

DESCRIPTION

Synthetic cable

Cable made from synthetic fibres (high-molecular-weight polyethylene) braided into 12 strands, with a hollow core. Its advantages over steel are: 8 x lighter, easier to handle, can hoist over longer distances, low elasticity, and in case of cutting there is no whiplash so it is safer.

DESCRIPTION

Deflection

Deformation along the main axis of a proof body, observed between a situation when no load is applied and nominal loading.

DESCRIPTION

Loading accessories

In order to verify the force sensors used in calibration or reference machines, loading wedges are employed to transmit the load to the measuring instrument. In the case of a wedge with two flat surfaces, to avoid any errors during the test they must be flat and parallel. In addition, the pressure on the machine trays must remain at less than 100 N/mm². If necessary, it is possible to install intermediate plates with a force application diameter large enough to better distribute the pressure. Ideally, the effective height of a mounting compression accessory must be greater than or equal to half of the force application diameter of the latter. In addition, the cavity diameter of the accessory should be 0.1 to 0.2 mm greater than the diameter of the force-transmitting motor element to allow this part to be centred in the accessory without generating side contact between both parts.

DESCRIPTION

MTTFd

The reliability of components is obviously at the core of a system's ability to perform its security function. The lower the reliability of a component, the more likely it is that this component will cause failures (and therefore will be dangerous). However, it should be noted that it would be inconceivable to consider the reliability of a component as justification for achieving high levels of performance. Standard 13849 also provides a limit on the use of an MTTFd (100 years). This is because an MTTFd value is an average and does not reflect reality. It is therefore likely that a reliable product will fail, despite the small statistical probability. It is particularly true that, in the case of failure, this component will not immediately be identified as the probable cause of that failure.

DESCRIPTION

Wheatstone bridge

A Wheatstone bridge is an electrical circuit that can measure very small variations in electrical resistance. This technique is commonly used for strain gauge sensors because it accurately measures relative deformations of a few mm/m. If no force is applied to the sensor, the four gauges have the same resistance and the V. out output signal is zero.

If a force is applied in compression, gauges 1 and 4 become longer and consequently their resistance increases. Conversely, gauges 2 and 3 become shorter and their resistance decreases. As a result, the Wheatstone bridge is unbalanced and a positive V.out voltage can be measured. Conversely, this voltage becomes negative if a tension force is applied. If these relative variations are small (<1 %), we can consider that the relation (Force => Deformation => Resistance of the gauges => Electrical signal) is linear.

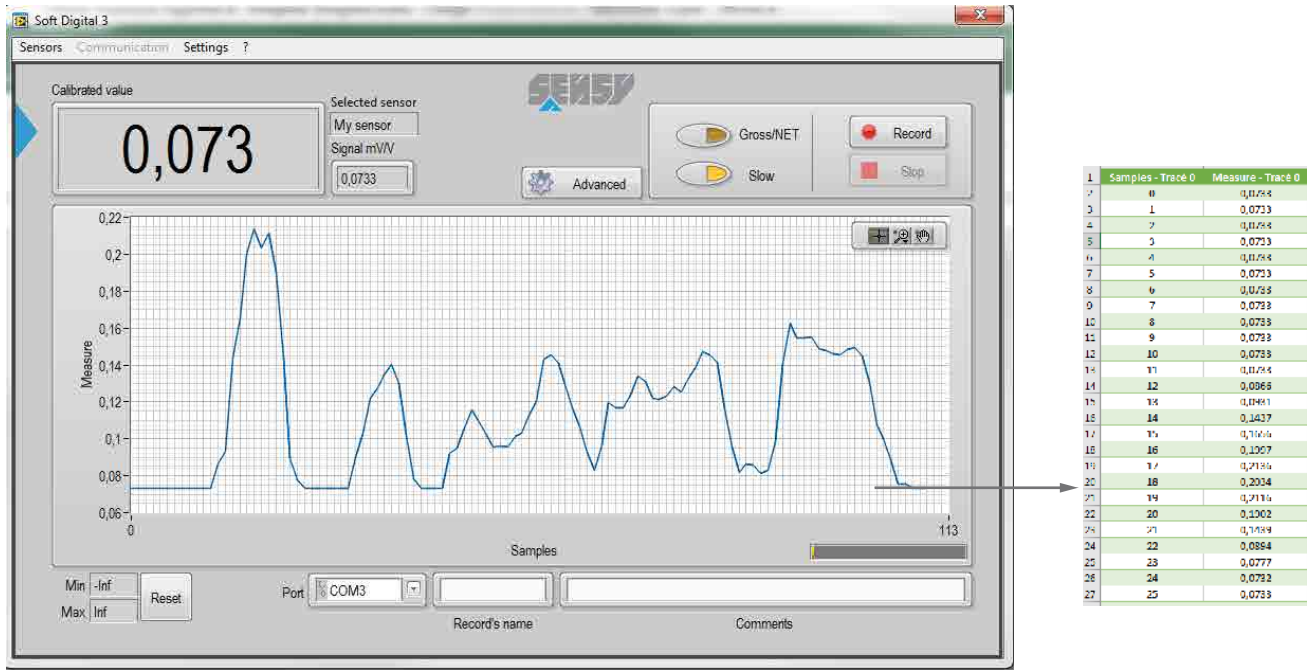
Furthermore, it should be noted that the output signal is also proportional to the supply voltage V. in. The sensitivity of the sensor is therefore expressed in mV/V where the denominator is equal to V. in. Thus for a sensor whose sensitivity is 2 mV/V and is supplied with 10 V, the output signal will evolve from 20 mV between zero and full scale. Typical sensitivities for metal gauge sensors change from 0.5 to 4 mV/V depending on:

- Principle of operation

For some sensors, the four gauges are deformed in the same proportion; for others, some gauges operate at 100 % and others at 30 % (Poisson's ratio).

- The required overload capacity, e.g. the breaking capacity must be 500 % for a hoisting device.
- Fatigue resistance.
- The type of material selected for the proof body.

SOFT-DIGITAL enables the reading, real-time display and recording of measurements of a SENSY load cell transmitted by the indicators for a standard reference force transducer called "INDI-00" and "INDI-ISO376", as well as the range of digital converters (USB, RS-232, RS-485) proposed by SENSY.

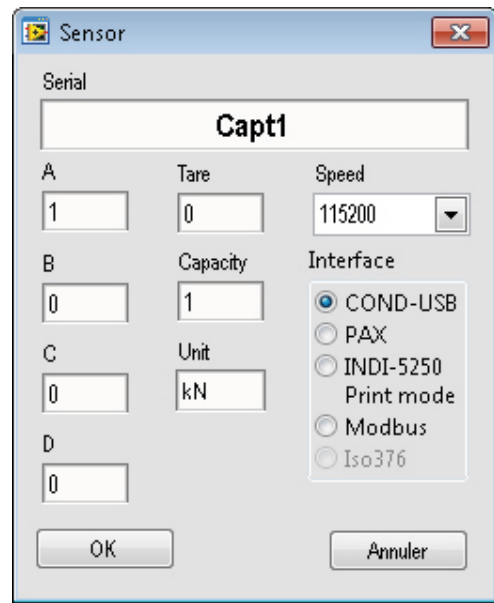
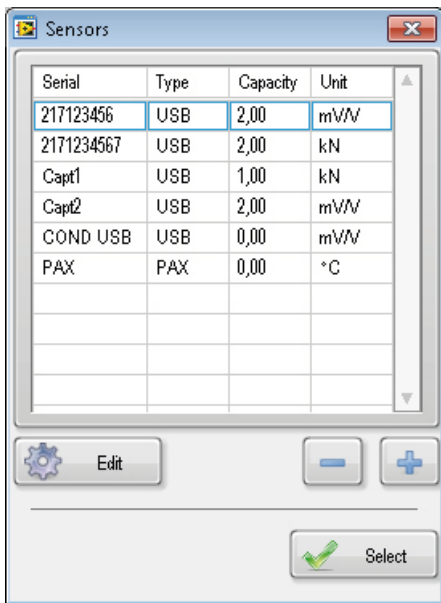


LOAD CELLS CALIBRATIONS

Define all the coefficients from calibration sheet of several standard reference transducers.

Each one uses the following equation: $F(x) = a \cdot x + b \cdot x^2 + c \cdot x^3$ Where F = force and x = electrical display signal .

The software calculates the applied force from the digitalised raw analogue signal x(mV/V) using the 3rd order function.



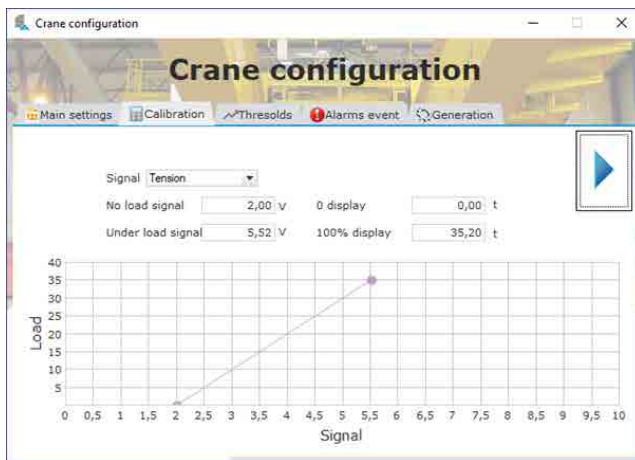
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The COACHVIEW software is delivered with the COACH-II (data logger dedicated to hoisting equipment).

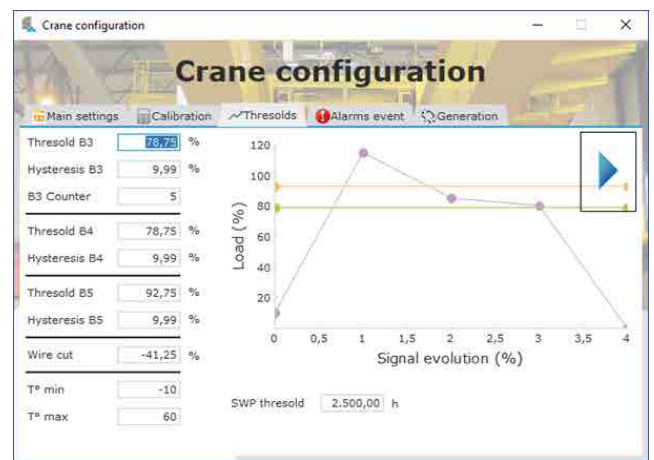
This very-user-friendly program allows for optimisation of the servicing schedule, the detection of downtimes and calculation of the FEM classification of the crane.

The main functions of COACHVIEW are:

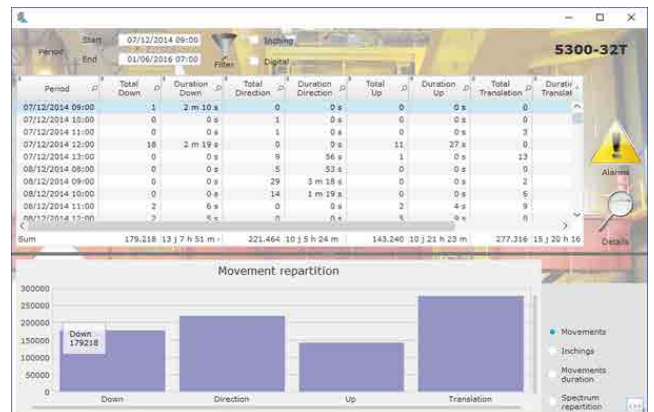
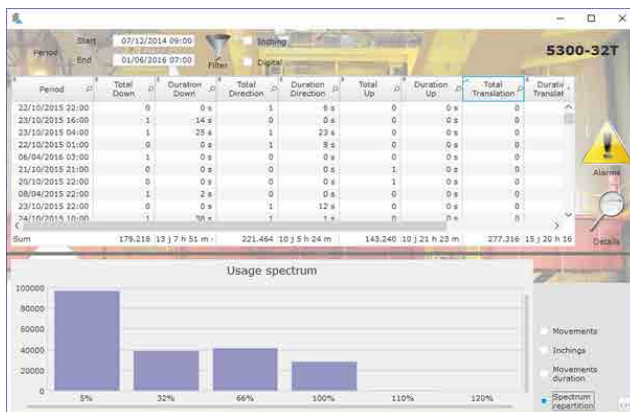
- Creation and management of configuration files for COACH-II (capacity, set-point, alarms, SWP),
- Analysis of the recordings performed by COACH-II,
- Generation of charts and tables.



Usage spectrum



Movement repartition



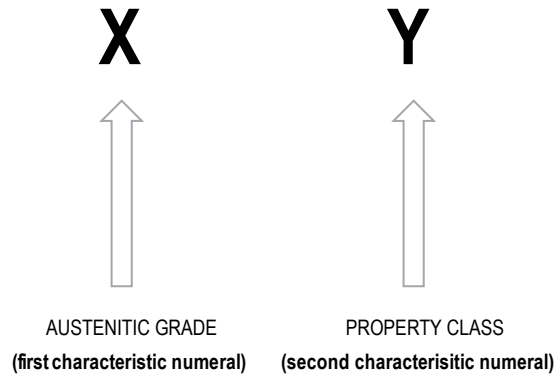
STAINLESS STEEL SCREWS > MECHANICAL AND CHEMICAL PROPERTIES

Mechanical properties of corrosion-resistant stainless steel fasteners:

- bolts, screws and studs (NF EN ISO 3506-2)
- nuts (NF EN ISO 3506-1)

SENSY mainly uses A2 and A4 stainless steels.

Mechanical properties of stainless steel screws are described below:



X: AUSTENITIC GRADE

First characteristic numeral	AISI nb	Properties
A2	A2	Good corrosion resistance in the open air and in fresh water
		Mainly used in food industry, chemical applications
A4	A4	Greater corrosion resistance in marine and coastal environment and chlorine pools
		Alloy steel with higher molybdenum concentration
		High resistance to alkaline and acidic solutions

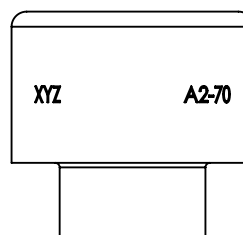
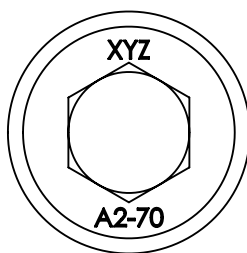
Y: PROPERTY CLASS⁽¹⁾

Second characteristic numeral	Characteristics	Field of use
70	Cold-worked	SENSY standard
80	High tensile strength	SENSY option (mandatory for load cells used in EX d environment)

⁽¹⁾ : the class represents the minimum tensile strength of the bolt divided by ten; for example 70 is equal to 1/10 of the minimal tensile strength Rm = 700 MPa (N/mm²).

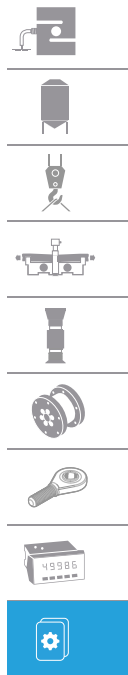
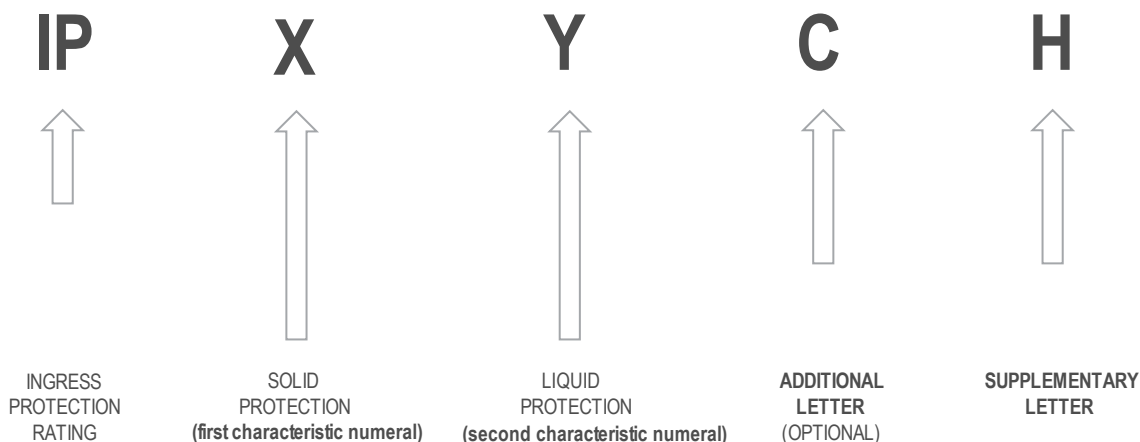
Screw marking:

Marking is mandatory for thread size ≥ 5mm



IP CODES > MEANING

International Protection Marking in accordance with DIN EN IEC 60529



First characteristic numeral	Description
0	Non-protected
1	Protected against solid foreign objects of 50 mm diameter or greater
2	Protected against solid foreign objects of 12.5 mm diameter or greater
3	Protected against solid foreign objects of 2.5 mm diameter or greater
4	Protected against solid foreign objects of 1 mm diameter or greater
5	Dust-protected
6	Dust-tight

Additional letter	Description
A	Protected against access with the back of the hand
B	Protected against access with a finger
C	Protected against access with a tool
D	Protected against access with a wire

Second characteristic numeral	Description
0	Non-protected
1	Protected against vertically falling water drops
2	Protected against vertically falling water drops when enclosure tilted up to 15°
3	Protected against spraying water
4	Protected against splashing water
5	Protected against water jets
6	Protected against powerful water jets
6K ⁽¹⁾	Protected against powerful water jets with increased pressure
7	Protected against the effects of temporary immersion in water (≤1m)
8	Protected against the effects of continuous immersion in water (>1m)
9K ⁽¹⁾	Protected against the effects of powerful water jets at high temperature

Supplementary letter	Description
H	High-voltage equipment
M	Device moving during water test
S	Device standing still during water test
W	Weather conditions

⁽¹⁾ : All tests with letter K are defined by ISO 20653 (replacing DIN 40050-9)