

STANDARD REFERENCE FORCE TRANSDUCERS



LOAD CELL
MANUFACTURER



Hauptschalter
Kran



TECHNICAL DATA: STANDARD REFERENCE FORCE TRANSDUCERS

CLASSES

SENSY specifications according to ISO 376 standard	CLASSES			
	2	1	0.5	00
Hysteresis	≤ ± 0.50	≤ ± 0.30	≤ ± 0.15	≤ ± 0.07
Repeatability with rotation (reproductibility)	≤ ± 0.40	≤ ± 0.20	≤ ± 0.10	≤ ± 0.05
Repeatability without rotation (repeatability)	≤ ± 0.20	≤ ± 0.10	≤ ± 0.05	≤ ± 0.025
Creep (over 30 minutes)	≤ ± 0.20	≤ ± 0.10	≤ ± 0.05	≤ ± 0.025
Return to zero	≤ ± 0.10	≤ ± 0.05	≤ ± 0.025	≤ ± 0.012
Reference temperature	°C +20			
Compensated temperature range	°C - 10 ... +45			
Service temperature range	°C - 30 ... +70			
Storage temperature range	°C - 50 ... +85			
Temperature coefficient on sensitivity	≤ ± 0.05	≤ ± 0.035	≤ ± 0.035	≤ ± 0.015
Temperature coefficient on zero	≤ ± 0.035	≤ ± 0.03	≤ ± 0.03	≤ ± 0.023

(1)R.O. : Rated Output

(2)F.S. : Full Scale of the load cell

2712-ISO

STANDARD REFERENCE FORCE TRANSDUCERS IN TENSION AND COMPRESSION

Standard reference force transducers specially designed according to the ISO 376 standard (classes 1, 0,5 and 00).



Model 2712 - 250 N



Features

- o Wide range of capacities
- o Tension and / or compression (universal)
- o Compact design
- o Overload protection: see drawing table
- o Complete range of load accessories
- o Material: anodised aluminium alloy
- o Cable length: 3 m (other lengths available on request)

Most popular options (see more in ANNEX)



Application(s) SENSY's load cells 2712-ISO are perfectly designed for the following applications:

- Calibration of testing machines according to ISO 7500.

Note: this standard reference force transducer covers the calibration of standard force measurement instruments used for static verification of uniaxial testing machines.

Capacities

2712-ISO: 0.2 - 0.3 - 0.5 - 0.75 - 1 - 1.5 - 2 - 3 - 5 - 7.5 - 10 kN

Specifications	1	05	00	
Relative reversibility error	<± 0.3	<± 0.15	<± 0.07	% M.V.**
Relative repeatability error with rotation	<± 0.2	<± 0.1	<± 0.05	% M.V.**
Relative repeatability error without rotation	<± 0.1	<± 0.05	<± 0.025	% M.V.**
Stabilization time after power excitation supply	200...600	200...600	200...600	s
Creep error over 30 min.	<± 0.1	<± 0.05	<± 0.025	% F.S.*
Zero shift after loading	<± 0.05	<± 0.025	<± 0.012	% F.S.*
Reference temperature	20	20	20	°C
Compensated temperature range	-10...+45	-10...+45	-10...+45	°C
Service temperature range	-30...+70	-30...+70	-30...+70	°C
Storage temperature range	-50...+85	-50...+85	-50...+85	°C
Temperature coefficient of the sensitivity	<± 0.035	<± 0.035	<± 0.015	% F.S.*10°C
Temperature coefficient of zero signal	<± 0.03	<± 0.03	<± 0.023	% F.S.*10°C
Zero balance	± 0.02	± 0.02	± 0.02	mV/V
Nominal sensitivity	2	2	2	mV/V
Input resistance	350 ± 2	350 ± 2	350 ± 2	ohm(s)
Output resistance	350 ± 2	350 ± 2	350 ± 2	ohm(s)
Insulation resistance (50 V)	> 5000	> 5000	> 5000	Mohm(s)
Reference excitation voltage	10	10	10	VDC
Permissible nominal range of excitation voltage	3...12	3...12	3...12	VDC
Safe load limit	110	110	110	% F.S.*
Breaking load	>300	>300	>300	% F.S.*

* : Full Scale of the force transducer.

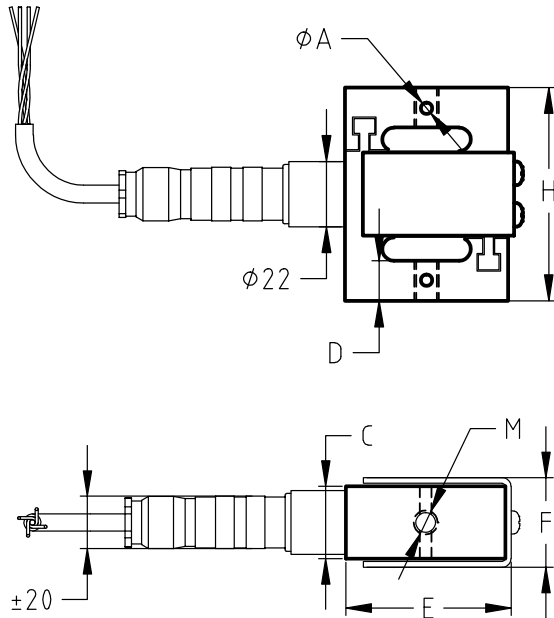
** : M.V. is the measured value. The mentioned values are only valid if M.V. >= 10 % of full scale.

Specifications subject to change without notice..

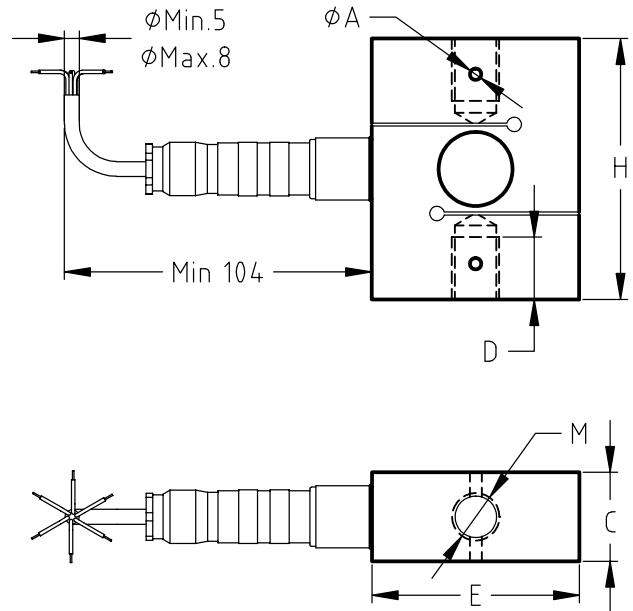
2712-ISO > STANDARD DIMENSIONS



2712-ISO-A / 2712-ISO-B



2712-ISO-D

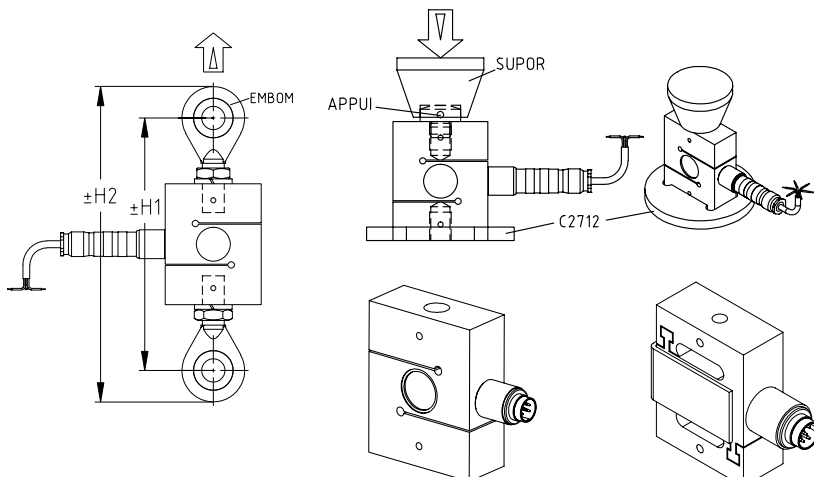


Ref. Item	Capacities	ØA	H	C	D	E	F	M	H1	H2	Breaking Load	Max. Deflexion (mm)	IP	Weight (kg)	ACCESSORIES
2712-ISO-A	200 - 1000 N	4	72	25	13.5	55	±32	M8	132	167	1000 %	0.40	IP54	0.42	C2712-ABC
2712-ISO-B	1500 - 3000 N	4	72	25	13.5	55	±32	M12	132	167	600 %	0.40	IP54	0.42	C2712-ABC
2712-ISO-D	5 - 10 kN	4	88	30	21	70	/	M16	188	233	> 300 %	0.30	IP65	0.6	C2712-D

—> Other capacities and dimensions available on request

Dimensions in mm

Accessories



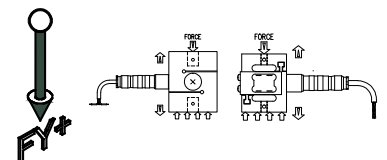
Wiring

Note: standard wiring for compression



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

Load direction

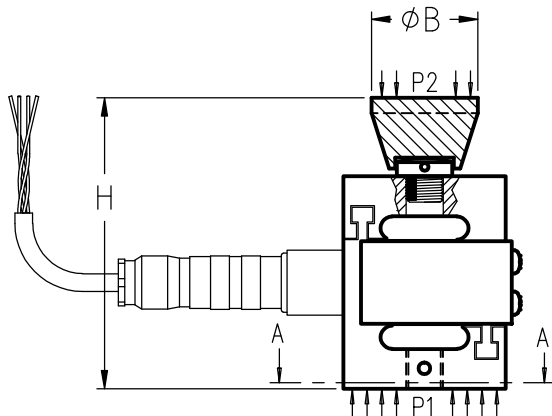


This page was intentionally left blank

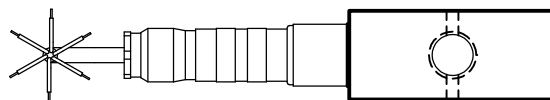
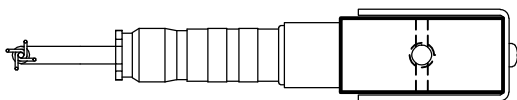
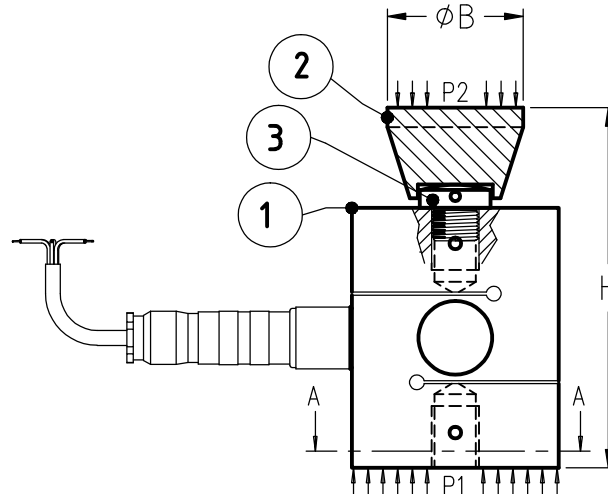
2712-ISO > CHOICE OF LOADING PADS



2712-ISO-A / 2712-ISO-B



2712-ISO-D



Ref. Item	Capacities ①	Section A-A mm ²	Pressure		Section ØB mm ²	Pressure		H	Total weight (kg)	ACCESSORIES	
			P1 N/mm ²	ØB		P2 N/mm ²	H			SUPOR ②	APPUI ③
2712-ISO-A	200 N	1325	0.2	49	1886	0.1	105	0.77	SUPOR-20	APPUI-8	
2712-ISO-A	300 N	1325	0.2	49	1886	0.2	105	0.77	SUPOR-20	APPUI-8	
2712-ISO-A	500 N	1325	0.4	49	1886	0.3	105	0.77	SUPOR-20	APPUI-8	
2712-ISO-A	750 N	1325	0.6	49	1886	0.4	105	0.77	SUPOR-20	APPUI-8	
2712-ISO-A	1000 N	1325	0.8	49	1886	0.5	105	0.77	SUPOR-20	APPUI-8	
2712-ISO-B	1.5 kN	1262	1.1	49	1886	0.8	108	0.78	SUPOR-20	APPUI-12	
2712-ISO-B	2.0 kN	1262	1.6	49	1886	1.1	108	0.78	SUPOR-20	APPUI-12	
2712-ISO-B	3.0 kN	1262	2.4	49	1886	1.6	108	0.78	SUPOR-20	APPUI-12	
2712-ISO-D	5.0 kN	1703	3	64	3217	1.6	135	1.46	SUPOR-30	APPUI-16	
2712-ISO-D	7.5 kN	1703	4.4	64	3217	2.3	135	1.46	SUPOR-30	APPUI-16	
2712-ISO-D	10 kN	1703	5.9	64	3217	3.1	135	1.46	SUPOR-30	APPUI-16	

→ Other capacities and dimensions available on request

Dimensions in mm

2715-ISO

STANDARD REFERENCE FORCE TRANSDUCERS IN TENSION AND COMPRESSION

Standard reference force transducers specially designed according to the ISO 376 standard (classes 1, 0,5 and 00).



Model 2715 - 30 kN



Features

- o Wide range of capacities
- o Tension and / or compression (universal)
- o Compact design
- o Complete range of load accessories
- o Protection class: IP65
- o Material: alloy steel (stainless steel available on request)
- o Cable length: see drawing (other lengths available on request)

Most popular options (see more in ANNEX)



Application(s) SENSY's load cells 2715-ISO are perfectly designed for the following applications:

- Calibration of testing machines according to ISO 7500.

Note: this standard reference force transducer covers the calibration of standard force measurement instruments used for static verification of uniaxial testing machines.

Capacities

2715-ISO: 20 - 30 - 50 - 75 - 100 kN

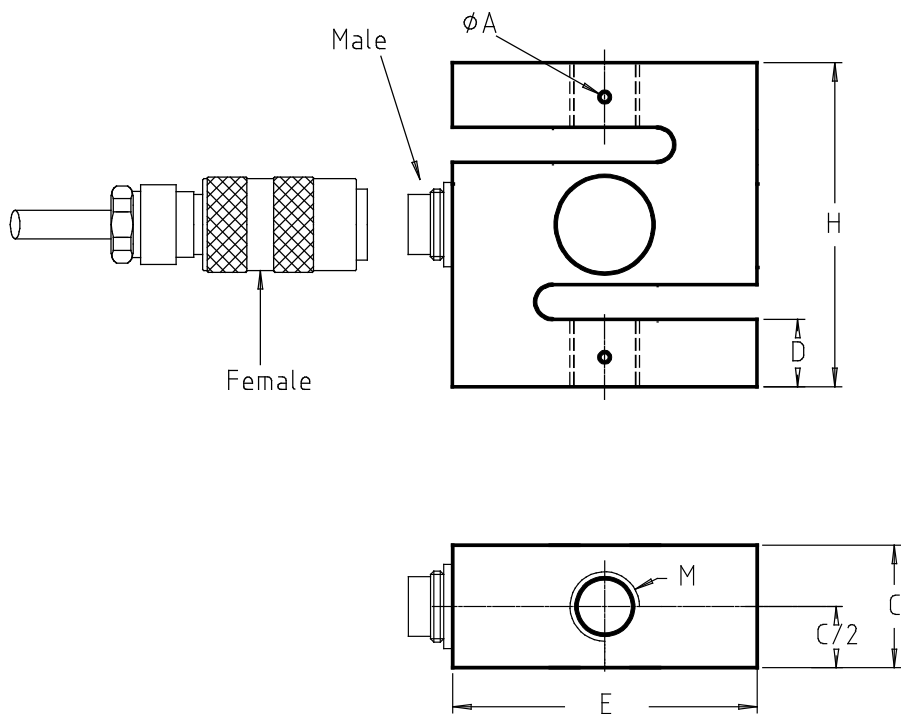
Specifications	1	05	00	
Relative reversibility error	<± 0.3	<± 0.15	<± 0.07	% M.V.**
Relative repeatability error with rotation	<± 0.2	<± 0.1	<± 0.05	% M.V.**
Relative repeatability error without rotation	<± 0.1	<± 0.05	<± 0.025	% M.V.**
Stabilization time after power excitation supply	200...600	200...600	200...600	s
Creep error over 30 min.	<± 0.1	<± 0.05	<± 0.025	% F.S.*
Reference temperature	20	20	20	°C
Compensated temperature range	-10...+45	-10...+45	-10...+45	°C
Service temperature range	-25...+70	-25...+70	-25...+70	°C
Storage temperature range	-50...+85	-50...+85	-50...+85	°C
Temperature coefficient of the sensitivity	<± 0.035	<± 0.035	<± 0.015	% F.S.*10°C
Temperature coefficient of zero signal	<± 0.03	<± 0.03	<± 0.023	% F.S.*10°C
Zero balance	± 0.02	± 0.02	± 0.02	mV/V
Nominal sensitivity	2	2	2	mV/V
Input resistance	350 ± 2	350 ± 2	350 ± 2	ohm(s)
Output resistance	350 ± 2	350 ± 2	350 ± 2	ohm(s)
Insulation resistance (50 V)	> 5000	> 5000	> 5000	Mohm(s)
Reference excitation voltage	10	10	10	VDC
Permissible nominal range of excitation voltage	3...12	3...12	3...12	VDC
Safe load limit	110	110	110	% F.S.*
Breaking load	>300	>300	>300	% F.S.*

* : Full Scale of the force transducer.

** : M.V. is the measured value. The mentioned values are only valid if M.V. >= 10 % of full scale.

Specifications subject to change without notice..

2715-ISO > STANDARD DIMENSIONS



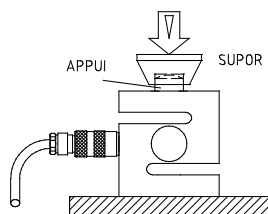
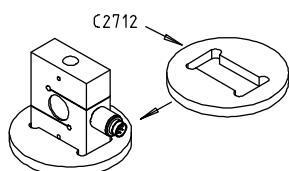
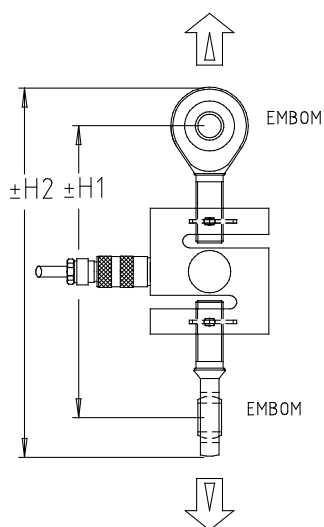
Ref. Item*	Capacities	ϕA	H \pm	C	D	E	M	H1	H2	CL (m)	Max. Deflexion (mm)	Weight (kg)	ACCESSORIES
271x-ISO-G	20 - 50 kN	4	116	38	30	98	M24x2	238	302	3	0.35	2.6	C2712-G
271x-ISO-H	75 - 100 kN	6	130	56	33	118	M36x3	318	402	6	0.60	5.2	C2712-H

*Material: 2710-ISO - stainless steel; 2715-ISO - nickel-plated steel

Other capacities and dimensions available on request

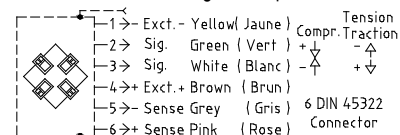
Dimensions in mm

Accessories



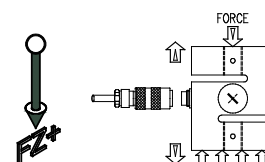
Wiring

Note: standard wiring for compression



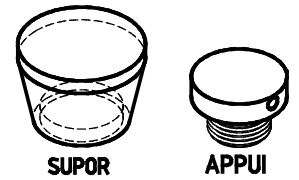
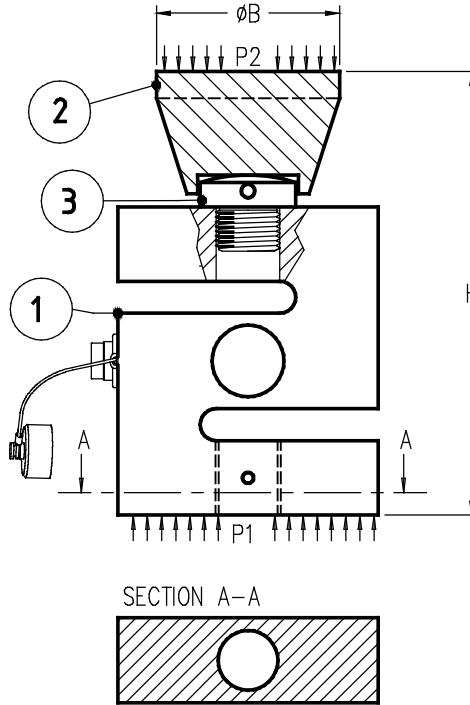
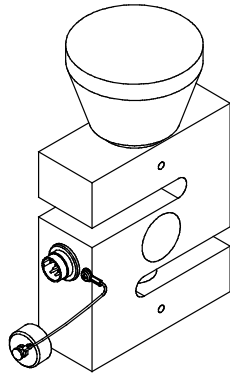
Standard : Cable screen not connected to transducer / Faradisisation non connectée au capteur

Load direction



This page was intentionally left blank

2715-ISO > CHOICE OF LOADING PADS



Ref. Item	Capacities ①	Section A-A mm ²	Pressure P1 N/mm ²	ØB	Section ØB mm ²	Pressure P2 N/mm ²	H	Total weight (kg)	ACCESSORIES	
									SUPOR ②	APPUI ③
271x-ISO-G	20 kN	3272	6.1	69	3739	5.3	167	3.73	SUPOR-36	APPUI-24
271x-ISO-G	30 kN	3272	9.2	69	3739	8	167	3.73	SUPOR-36	APPUI-24
271x-ISO-G	50 kN	3272	15.3	69	3739	13.4	167	3.73	SUPOR-36	APPUI-24
271x-ISO-H	75 kN	5590	13.4	79	4902	15.3	190	7.25	SUPOR-56	APPUI-36
271x-ISO-H	100 kN	5590	19.9	79	4902	20.4	190	7.25	SUPOR-56	APPUI-36

→ Other capacities and dimensions available on request

Dimensions in mm



3115-ISO

HIGH-CAPACITY COMPRESSION STANDARD REFERENCE FORCE TRANSDUCERS

Standard reference force transducers specially designed according to ISO 376 standard (classes 1, 0,5 and 00).



Features

- o Wide range of capacities (up to 50 MN)
- o Complete range of load accessories
- o Protection class: IP65
- o Material: alloy steel (stainless steel available on request)
- o Cable length: see drawing table - CL (other lengths available on request)

Most popular options (see more in ANNEX)



Model 3115-ISO - 3 MN



Application(s) SENSY's load cells 3115-ISO are perfectly designed for the following applications:

- Calibration of testing machines according to ISO 7500.

Note: this standard reference force transducer covers the calibration of standard force measurement instruments used for static verification of uniaxial testing machines.

Capacities

3115-ISO: 200 - 300 - 500 kN
(0.75) - 1 - 1.5 - 2 - 3 - 5 - 7.5 - 10 - 15 - 20 - 30 - 40 - 50 MN

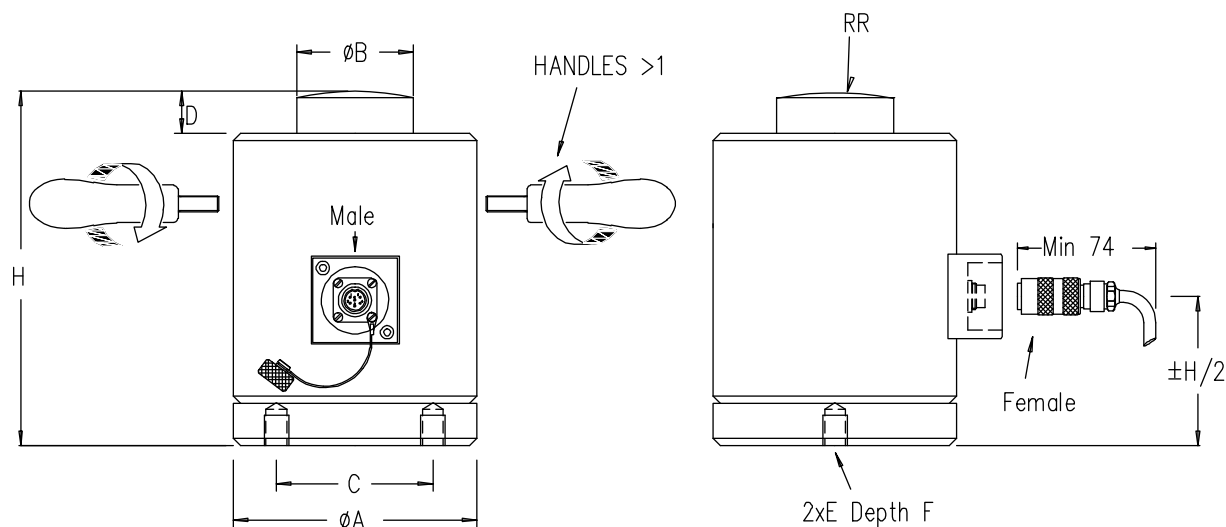
Specifications	1	05	00	
Relative reversibility error	<± 0.3	<± 0.15	<± 0.07	% M.V.**
Relative repeatability error with rotation	<± 0.2	<± 0.1	<± 0.05	% M.V.**
Relative repeatability error without rotation	<± 0.1	<± 0.05	<± 0.025	% M.V.**
Stabilization time after power excitation supply	200...600	200...600	200...600	s
Creep error over 30 min.	<± 0.1	<± 0.05	<± 0.025	% F.S.*
Zero shift after loading	<± 0.05	<± 0.025	<± 0.012	% F.S.*
Reference temperature	20	20	20	°C
Compensated temperature range	-10...+45	-10...+45	-10...+45	°C
Service temperature range	-30...+70	-30...+70	-30...+70	°C
Storage temperature range	-50...+85	-50...+85	-50...+85	°C
Temperature coefficient of the sensitivity	<± 0.035	<± 0.035	<± 0.015	% F.S.*10°C
Temperature coefficient of zero signal	<± 0.03	<± 0.03	<± 0.023	% F.S.*10°C
Zero balance	± 0.02	± 0.02	± 0.02	mV/V
Nominal sensitivity	1.5	1.5	1.5	mV/V
Input resistance	350...700 ± 2	350...700 ± 2	350...700 ± 2	ohm(s)
Output resistance	350...700 ± 2	350...700 ± 2	350...700 ± 2	ohm(s)
Insulation resistance (50 V)	> 5000	> 5000	> 5000	Mohm(s)
Reference excitation voltage	10	10	10	VDC
Permissible nominal range of excitation voltage	3...12	3...12	3...12	VDC
Safe load limit	110	110	110	% F.S.*
Breaking load	>300	>300	>300	% F.S.*

* : Full Scale of the force transducer.

** : M.V. is the measured value. The mentioned values are only valid if M.V. >= 10 % of full scale.

Specifications subject to change without notice..

3115-ISO > STANDARD DIMENSIONS



Ref. Item*	Capacities	ØA	ØB	C	D	E	F	H	RR	CL (m)	Max. Deflexion (mm)	Weight (kg)
311x-ISO-B	200 kN	64	36	45	20	M10	12	135	250	6	0.16-0.18	2.2
311x-ISO-C	300 - 500 kN	89	56	60	30	M12	15	160	300	6	0.18-0.20	4.5
311x-ISO-D	0.75 - 1MN	99	64	65	30	M16	16	190	400	6	0.33-0.34	6
311x-ISO-E	1.5 - 2 MN	119	90	90	30	M16	16	225	400	6	0.29-0.35	20
311x-ISO-F	3 MN	159	125	100	40	M20	20	270	450	12	±0.4	42
311x-ISO-G	5 MN	205	160	125	50	M20	35	350	500	12	±0.5	90
311x-ISO-H	7.5 - 10 MN	294	200	200	60	M30	40	460	600	12	±0.7	243
311x-ISO-I	15 MN	330	250	250	65	M30	40	510	800	12	±0.75	330
311x-ISO-J	20 MN	364	250	270	75	M36	50	550	800	12	±0.8	446
311x-ISO-K	30 MN	445	300	300	75	M36	50	660	1000	12	±1	770
311x-ISO-L	40 MN	495	360	330	90	M36	50	730	1200	12	±1.1	1060
311x-ISO-M	50 MN	540	430	360	90	M36	50	900	2000	12	±1.2	1587

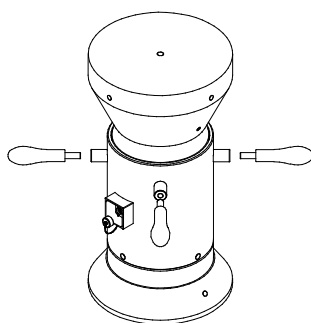
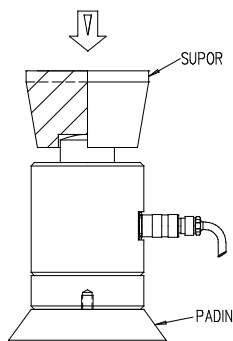
Note: 2 - 50 MN (200 - 5000 t) according to customer's design specification.

*x=Material: 3110-ISO - stainless steel; 3115-ISO - nickel-plated steel

→ Other capacities and dimensions available on request

Dimensions in mm

Accessories

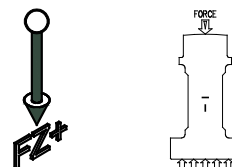


Wiring



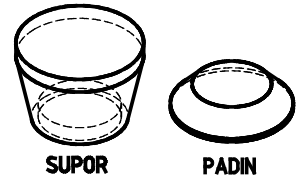
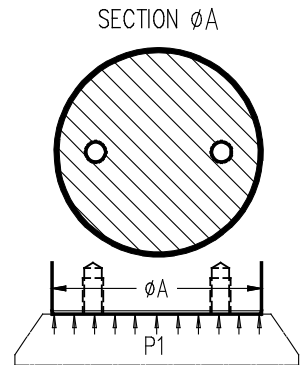
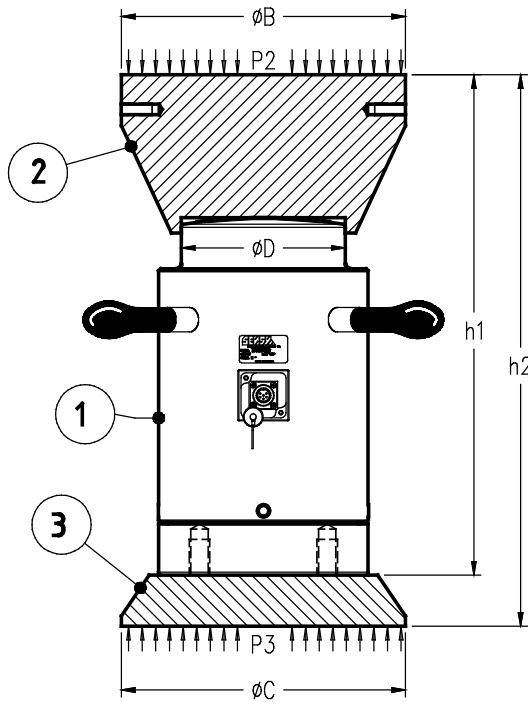
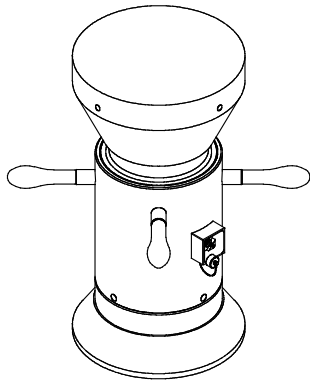
Standard : Cable screen not connected to transducer Faradisation non connectée au capteur

Load direction



This page was intentionally left blank

3115-ISO > CHOICE OF LOADING PADS



Ref. Item	Force ①	$\varnothing D$	$\varnothing A$	Section $\varnothing A$ mm ²	Pressure P1 N/mm ²	$\varnothing B$	Section $\varnothing B$ mm ²	Pressure P2 N/mm ²	$\varnothing C$	Section $\varnothing C$ mm ²	Pressure P3 N/mm ²	h1	h2	Total weight (kg)	ACCESSORIES	
															SUPOR ②	PADIN ③
311x-ISO-B	200 kN	36	64	2670	75	69	3739	53	/	/	/	174	/	3.2	SUPOR-36	NOT NECESSARY
311x-ISO-C	300 kN	56	89	5449	55	79	4902	61	/	/	/	200	/	6	SUPOR-56	
311x-ISO-C	500 kN	56	89	5449	92	79	4902	102	/	/	/	200	/	6	SUPOR-56	
311x-ISO-D	0.75 MN	64	99	6686	112	99	7698	97	129	13070	57	237	262	11.1	SUPOR-64	PADIN-100B
311x-ISO-D	1 MN	64	99	6686	150	114	10207	98	129	13070	77	248	273	12.5	SUPOR-64E	PADIN-100B
311x-ISO-E	1.5 MN	90	119	9985	150	164	21124	71	158	19607	77	317	342	36	SUPOR-90B	PADIN-125A
311x-ISO-E	2 MN	90	119	9985	200	164	21124	95	158	19607	102	317	342	36	SUPOR-90B	PADIN-125A
311x-ISO-F	3 MN	125	159	18241	164	195	29865	100	248	48305	62	360	420	79	SUPOR-125B	PADIN-160
311x-ISO-G	5 MN	160	205	31103	161	248	48305	104	248	48305	104	476	506	141	SUPOR-160	PADIN-210
311x-ISO-H	7.5 MN	200	294	64638	116	308	74506	101	353	97868	77	615	650	342	SUPOR-200A	PADIN-300
311x-ISO-H	10 MN	200	294	64638	155	353	97868	102	353	97868	102	640	675	372	SUPOR-200B	PADIN-300
311x-ISO-I	15 MN	250	330	85530	175	438	150674	100	438	150674	100	730	790	604	SUPOR-250A	PADIN-330
311x-ISO-J	20 MN	250	364	99752	200	503	198713	101	503	198713	101	805	885	845	SUPOR-250B	PADIN-365
311x-ISO-K	30 MN	300	445	155528	193	594	277117	109	594	277117	109	957	1042	1397	SUPOR-300A	PADIN-445
311x-ISO-L	40 MN	360	495	192442	208	694	379367	106	694	379367	106	1077	1187	2122	SUPOR-360A	PADIN-495
311x-ISO-M	50 MN	430	540	229022	218	795	496391	100	795	496391	100	1298	1428	3202	SUPOR-430A	PADIN-540

→ Other capacities and dimensions available on request

Dimensions in mm

5105-ISO

HIGH-CAPACITY STANDARD REFERENCE FORCE TRANSDUCERS IN TENSION AND COMPRESSION

Standard reference force transducers specially designed according to the ISO 376 standard (classes 1, 0,5 and 00).



Features

- o Wide range of capacities (up to 50 MN)
- o Complete range of load accessories
- o Tension and / or compression (universal)
- o Protection class: IP65
- o Material: alloy steel (stainless steel available on request)
- o Cable length: see drawing table - CL (other lengths available on request)

Most popular options (see more in ANNEX)



Model 5105



Application(s) SENSY's load cells 5105-ISO are perfectly designed for the following applications:

- Calibration of testing machines according to ISO 7500.

Note: this standard reference force transducer covers the calibration of standard force measurement instruments used for static verification of uniaxial testing machines.

Capacities

5105-ISO: 200 - 300 - 500 kN
(0.75) - 1.5 - 2 - 3 - 5 - 7.5 - 10 - 15 - 20 - 30 - (40) - (50) MN

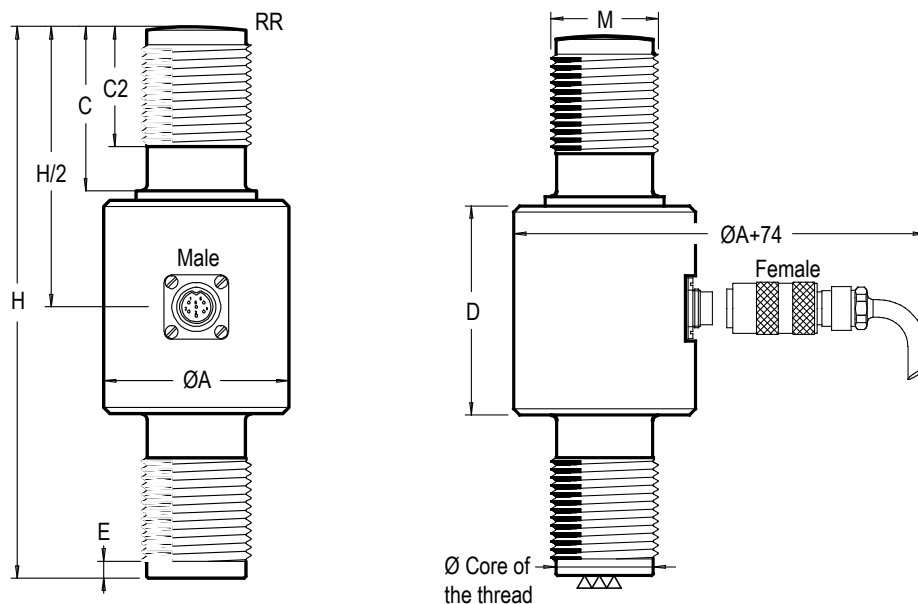
Specifications	1	05	00	
Relative reversibility error	<± 0.3	<± 0.15	<± 0.07	% M.V.**
Relative repeatability error with rotation	<± 0.2	<± 0.1	<± 0.05	% M.V.**
Relative repeatability error without rotation	<± 0.1	<± 0.05	<± 0.025	% M.V.**
Stabilization time after power excitation supply	200...600	200...600	200...600	s
Creep error over 30 min.	<± 0.1	<± 0.05	<± 0.025	% F.S.*
Zero shift after loading	<± 0.05	<± 0.025	<± 0.012	% F.S.*
Reference temperature	20	20	20	°C
Compensated temperature range	-10...+45	-10...+45	-10...+45	°C
Service temperature range	-25...+70	-25...+70	-25...+70	°C
Storage temperature range	-50...+85	-50...+85	-50...+85	°C
Temperature coefficient of the sensitivity	<± 0.035	<± 0.035	<± 0.015	% F.S./10°C
Temperature coefficient of zero signal	<± 0.03	<± 0.03	<± 0.023	% F.S./10°C
Zero balance	± 0.02	± 0.02	± 0.02	mV/V
Nominal sensitivity	1.5	1.5	1.5	mV/V
Input resistance	350 or 700 ± 2	350 or 700 ± 2	350 or 700 ± 2	ohm(s)
Output resistance	350 or 700 ± 2	350 or 700 ± 2	350 or 700 ± 2	ohm(s)
Insulation resistance (50 V)	> 5000	> 5000	> 5000	Mohm(s)
Reference excitation voltage	10	10	10	VDC
Permissible nominal range of excitation voltage	3...12	3...12	3...12	VDC
Safe load limit	110	110	110	% F.S.*
Breaking load	>300	>300	>300	% F.S.*

* : Full Scale of the force transducer.

** : M.V. is the measured value. The mentioned values are only valid if M.V. >= 10 % of full scale.

Specifications subject to change without notice..

5105-ISO > STANDARD DIMENSIONS



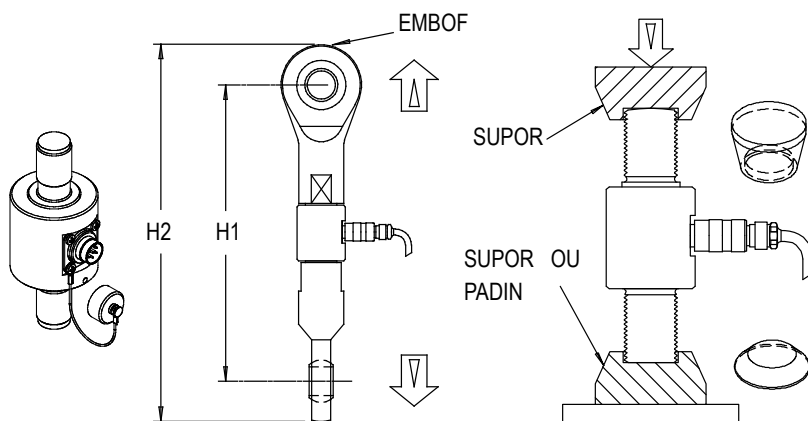
Ref. Item*	Capacities	Ø A	C	C2	D	E	H	RR	CL (m)	M	H1	H2	Max. Deflexion	Weight (kg)
510x-ISO-C	200 kN	75	49	44	87	4	190	350	6	M45x3	398	510	0.14-0.16	3.65
510x-ISO-D	300 - 750 kN	88.5	69	59	119	5	265	400	6	M64x4	560	740	0.19-0.25	9.8
510x-ISO-E	0.75 - 1.5 MN	111	95	80	145	5	340	400	6	M90x4	/	/	0.30-0.42	21
510x-ISO-F	2 MN	150	128	120	165	7	430	600	6	M110x4	/	/	0.35-0.65	33
510x-ISO-G	2 - 3 MN	150	128	120	165	7	430	600	6	M125x4	/	/	0.35-0.65	38
510x-ISO-H	5 MN	180	162	158	180	8	520	800	6	M160x6	/	/	0.73	87
510x-ISO-I	7.5 - 10 MN	220	205	175	200	10	590	1000	6	M200x6	/	/	0.83	151
510x-ISO-J	10 MN	270	279	254	237	25.4x30°	795	1000	6	Stub Acme 9"-1"	/	/	1.23	270
510x-ISO-K	15 MN	280	250	230	230	10	710	1200	12	M250x6	/	/	1	280
510x-ISO-L	20 MN	360	380	340	320	36x30°	1080	1500	12	TR 330x24	/	/	1.7	700
510x-ISO-M	30 MN	450	460	460	540	36x30°	1460	2000	12	TR 400x24	/	/	2.26	1420
-	40 - 50 MN	According to customer's design specification.												

*x=Material: 5100-ISO - stainless steel; 5105-ISO - nickel-plated steel

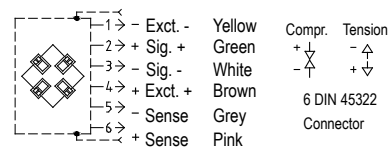
Other capacities and dimensions available on request

Dimensions in mm

Accessories

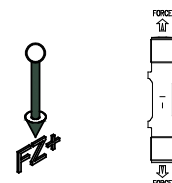


Wiring



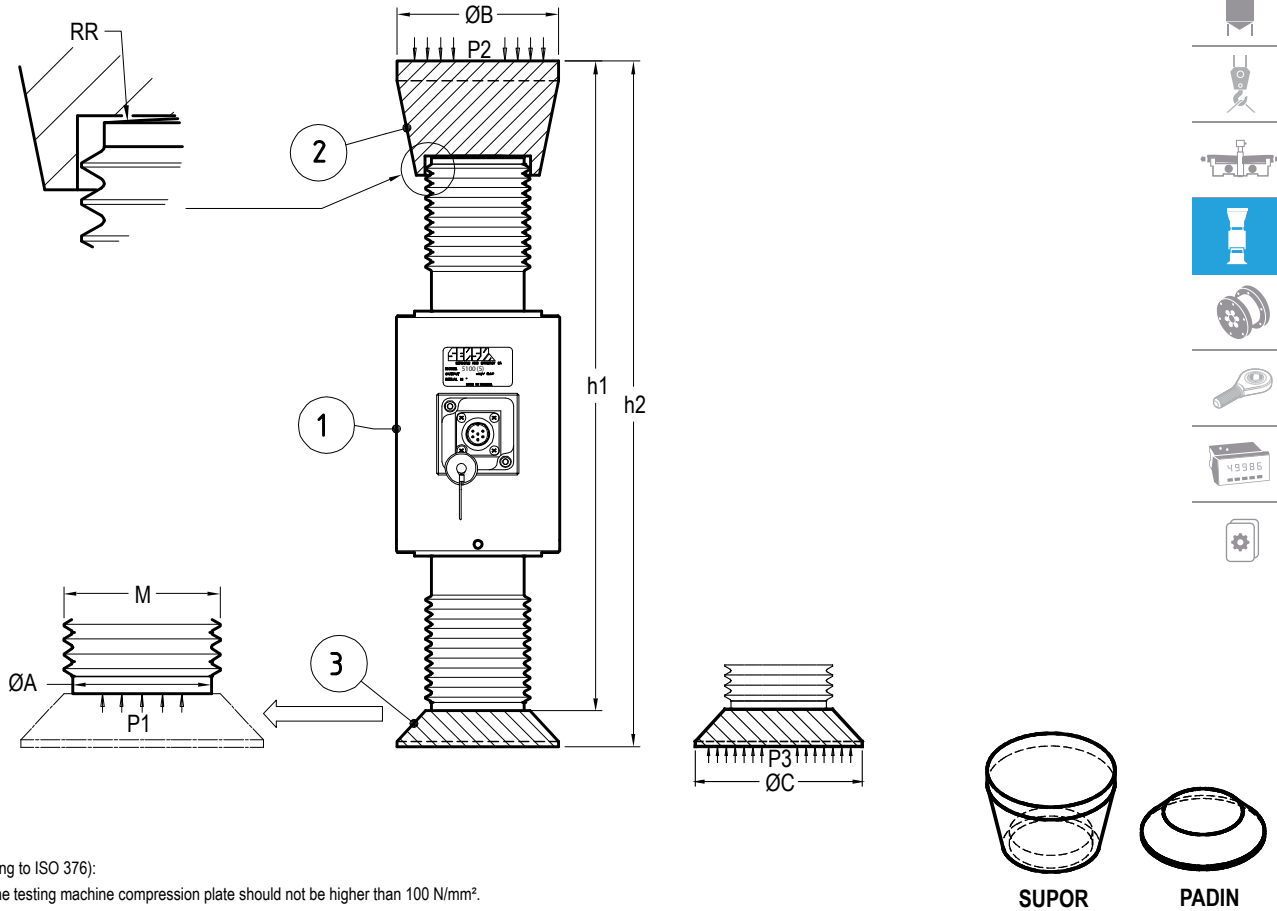
Standard: Cable screen not connected to the transducer

Load direction



This page was intentionally left blank

5105-ISO > CHOICE OF LOADING PADS



Principles (according to ISO 376):

The pressure on the testing machine compression plate should not be higher than 100 N/mm².

If necessary intermediate plates "PADIN"(3) should be chosen and installed.

Ref. Item	Capacities ①	M	ØA	Section		Pressure		Section		Pressure		h1	h2	Total Weight (kg)	ACCESSORIES	
				ØA mm ²	P1 N/mm ²	ØB mm ²	P2 N/mm ²	ØC mm ²	P3 N/mm ²	SUPOR ②	PADIN ③					
510x-ISO-C	200 kN	45x3	41.8	1372	146	79	4902	41	79	4902	41	231	252	5.9	SUPOR-45	PADIN-45
510x-ISO-D	300 kN	64x4	59.7	2799	107	99	7698	39	99	7698	39	312	334	14	SUPOR-64	PADIN-64
510x-ISO-D	500 kN	64x4	59.7	2799	179	99	7698	65	99	7698	65	312	334	14	SUPOR-64	PADIN-64
510x-ISO-D	0.75 MN	64x4	59.7	2799	268	99	7698	97	99	7698	97	387	409	25	SUPOR-64	PADIN-64
510x-ISO-E	0.75 MN	90x4	85.7	5768	130	129	13070	57	129	13070	57	402	427	30	SUPOR-90	PADIN-100A
510x-ISO-E	1 MN	90x4	85.7	5768	173	129	13070	77	129	13070	77	402	427	30	SUPOR-90	PADIN-100A
510x-ISO-E	1.5 MN	90x4	85.7	5768	260	129	13070	115	129	13070	115	402	427	30	SUPOR-90	PADIN-100A
510x-ISO-F	2 MN	110x4	105	8775	228	195	29865	67	195	29865	67	520	571	46	SUPOR-110	PADIN-110E
510x-ISO-F	3 MN	110x4	105	8775	341	195	29865	101	195	29865	101	520	571	46	SUPOR-110	PADIN-110E
510x-ISO-G	2 MN	125x4	121	11442	175	158	19607	102	158	19607	102	505	530	53	SUPOR-125A	PADIN-125A
510x-ISO-G	3 MN	125x4	121	11442	262	195	29865	101	195	29865	101	520	565	66	SUPOR-125B	PADIN-125B
510x-ISO-H	5 MN	160x6	154	18506	270	248	48305	104	248	48305	104	646	706	105	SUPOR-160	PADIN-160
510x-ISO-I	7.5 MN	200x6	194	29407	255	308	74506	101	308	74506	101	745	812	257	SUPOR-200A	PADIN-200A
510x-ISO-I	10 MN	200x6	194	29407	340	353	97868	102	353	97868	102	770	860	307	SUPOR-200B	PADIN-200B
510x-ISO-J	10 MN	Acme 9"	199	31187	321	353	97868	102	353	97868	102	972	1052	438	SUPOR-230	PADIN-230
510x-ISO-K	15 MN	250x6	244	46568	322	438	150674	100	438	150674	100	930	1010	559	SUPOR-250A	PADIN-250
510x-ISO-L	20 MN	TR330x24	288	65339	306	503	198713	102	503	198713	102	1332	1447	1171	SUPOR-330A	PADIN-330A
510x-ISO-M	30 MN	TR400x24	358	100902	297	594	277117	109	594	277117	109	1757	1877	2216	SUPOR-400A	PADIN-400A
	40 - 50 MN														According to customer's design specifications	

→ Other capacities and dimensions available on request

Dimensions in mm

3115F-12390

STRAIN GAUGE CYLINDERS (HARDENED CONCRETE TESTING)

Standard reference force transducers specially designed for checking concrete testing machines according to the EN 12390-4 or standard DIN 51302-2.



Model 3115F-12390 - 3 MN



Features

- o Allows the homogeneity of the repartition of the forces generated to be checked by verifying:
 - self-alignment and restraint on movement of the upper plate
 - alignment of the machine's component parts
- o Standard dimensions
- o 4 independent full bridges at 90°
- o Protection class: IP65
- o Material: nickel-plated alloy steel
- o Cable length: 4 x 6 m (other lengths available on request)

Most popular options (see more in ANNEX)



Application(s) SENSY's load cells 3115F-12390 are perfectly designed for the following applications:

- Testing machines for compressive strength of hardened concrete according to EN 12390 standard.

Capacities

3115F-12390: 2 - (3) - (5) MN

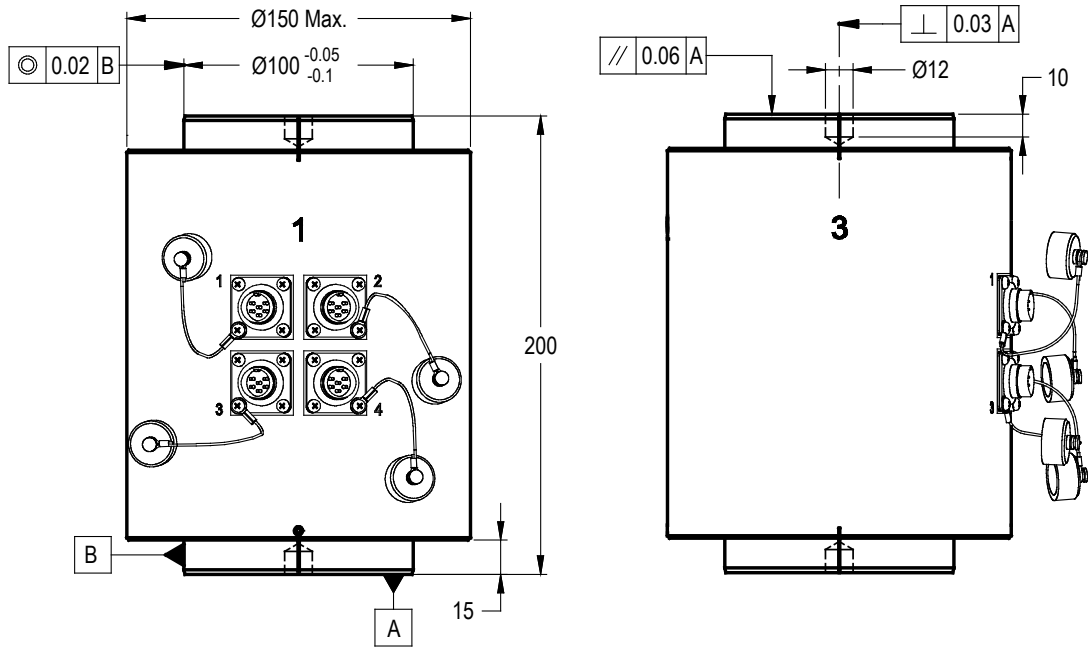
Specifications	12390	1	
Relative reversibility error	-	<± 0.3	% M.V.**
Relative repeatability error with rotation	-	<± 0.2	% M.V.**
Relative repeatability error without rotation	-	<± 0.1	% M.V.**
Stabilization time after power excitation supply	200...600	200...600	s
Creep error over 30 min.	<± 0.25	<± 0.1	% F.S.*
Zero shift after loading	<± 0.05	<± 0.05	% F.S.*
Reference temperature	20	20	°C
Compensated temperature range	0...+30	-10...+45	°C
Service temperature range	-25...+70	-25...+70	°C
Storage temperature range	-50...+85	-50...+85	°C
Temperature coefficient of the sensitivity	0.05	<± 0.035	% F.S.*10°C
Temperature coefficient of zero signal	0.05	<± 0.03	% F.S.*10°C
Zero balance	0.02	± 0.02	mV/V
Nominal sensitivity	1.5	1.5	mV/V
Input resistance	350 or 700 ± 2	350 or 700 ± 2	ohm(s)
Output resistance	350 or 700 ± 2	350 or 700 ± 2	ohm(s)
Insulation resistance (50 V)	>5000	> 5000	Mohm(s)
Reference excitation voltage	10	10	VDC
Permissible nominal range of excitation voltage	5...15	3...12	VDC
Safe load limit	110	110	% F.S.*
Breaking load	>300	>300	% F.S.*

* : Full Scale of the force transducer.

** : M.V. is the measured value. The mentioned values are only valid if M.V. >= 10 % of full scale.

Specifications subject to change without notice..

3115F-12390 > STANDARD DIMENSIONS

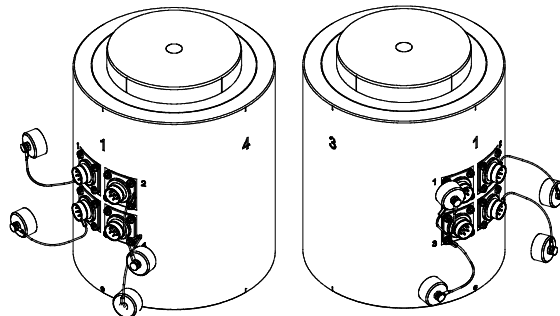
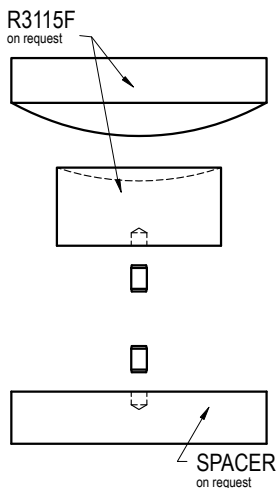


Ref. Item	Capacities	Weight (kg)	Note
3115F-12390-A	2 MN	15.8	-
3115F-12390-B	3 MN	28	Dimensions on request
3115F-12390-C	5 MN	66	Dimensions on request

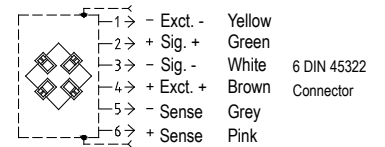
→ Other capacities and dimensions available on request

Dimensions in mm

Accessories

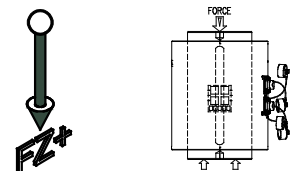


Wiring



Standard: Cable screen not connected to the transducer

Load direction



ANNEXES

- Definitions: Most popular options	p. 296
- Option cards for PAX, CRANE-BOY, INDI-BOY, DISP-BOY family	p. 303
- Definitions: Certifications	p. 304
- Definitions: Technical features	p. 305
- SENSY software	p. 306
- Stainless steel screws: Features and references	p. 310
- IP codes (International Protection Marking)	p. 311

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.

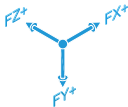
OPTION	DESCRIPTION
 Class 00	ISO 376 - class 00 The purpose of ISO 376 is to calibrate force-measuring instruments used for the static verification of uniaxial testing machines (e.g. tension/compression testing machines). It describes a procedure for classifying these instruments. These high-precision, 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.

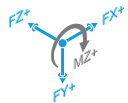
OPTION	DESCRIPTION
 Class 0,5	ISO 376 - class 0,5 The purpose of ISO 376 is to calibrate force-measuring instruments used for the static verification of uniaxial testing machines (e.g. tension/compression testing machines). It describes a procedure for classifying these instruments. These high-precision, 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.


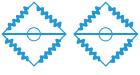


OPTION	DESCRIPTION
ISO 376 Accredited laboratory certificate	ISO 376 - Accredited laboratory certificate The purpose of ISO 376 is the calibration of force-measuring instruments used for the static verification of uniaxial testing machines (e.g. tension/compression testing machines). It describes a procedure 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

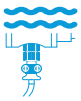


OPTION **DESCRIPTION**


 **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

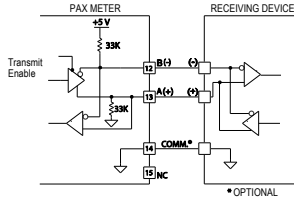


- RS-485 field bus communication interface

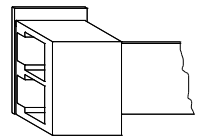
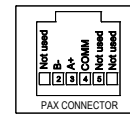
CARD-CDC1C



CARD-CDC10



CARD-CDC1C



CARD-CDC20

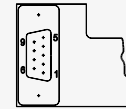
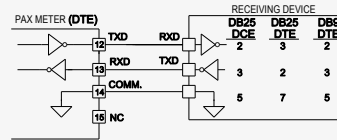


- RS-232 half-duplex communication interface
Available with crew terminals or DB9 connector

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.

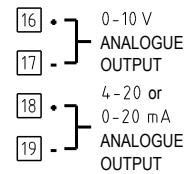
Analogue output card

CARD-CDL10



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

CARD-CDL10



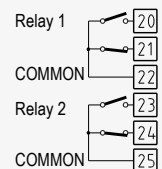
Relay cards (max. 1 choice)

CARD-CDS10 & CARD-CDS20

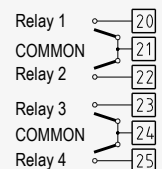


- 2 or 4 set-points activating each an independent relay

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.

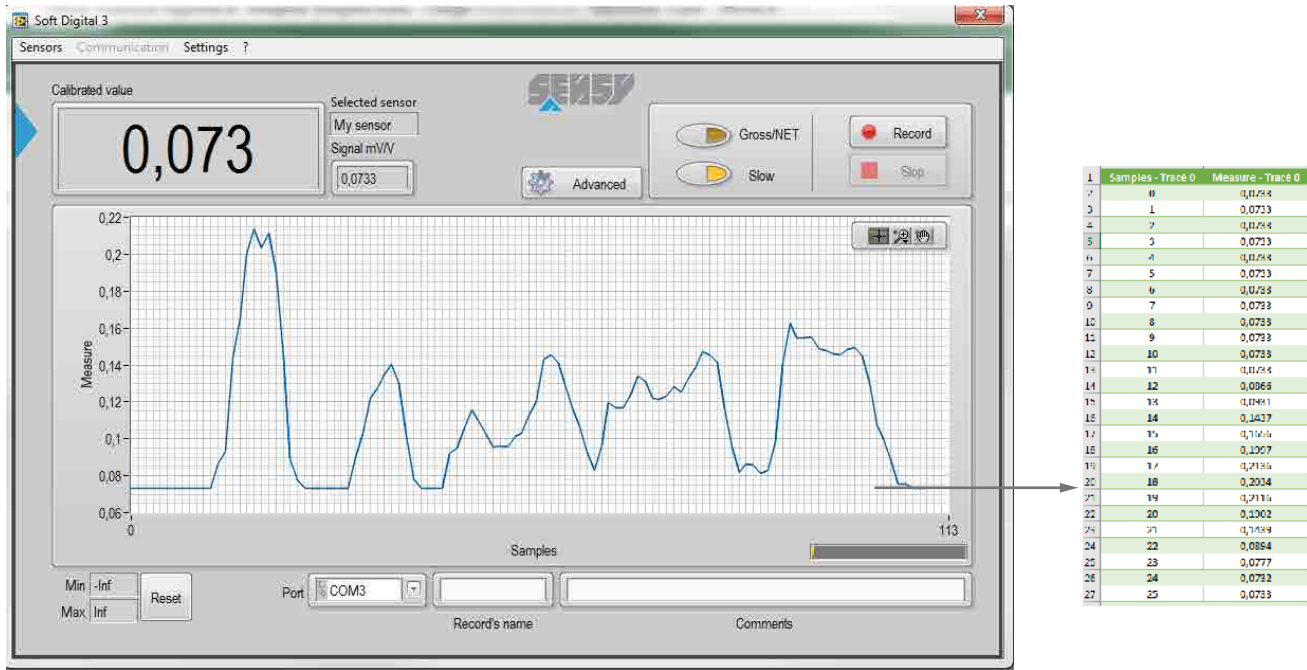
Furthermore, it should be noted that the output signal is also proportional to the supply voltage V. in. The sensitivity of the sensor is therefore expressed in mV/V where the denominator is equal to V. in. Thus for a sensor whose sensitivity is 2 mV/V and is supplied with 10 V, the output signal will 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.

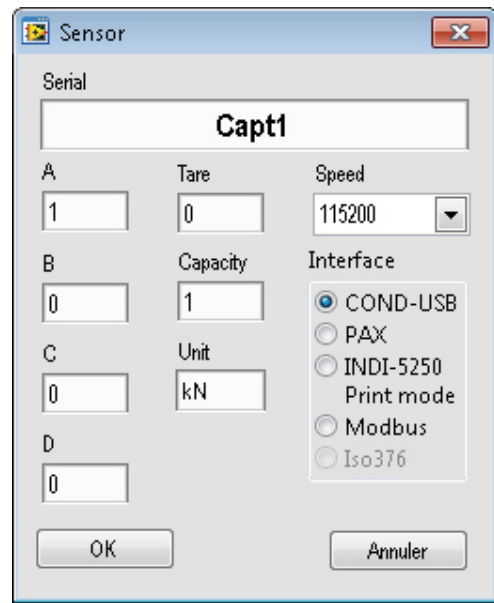
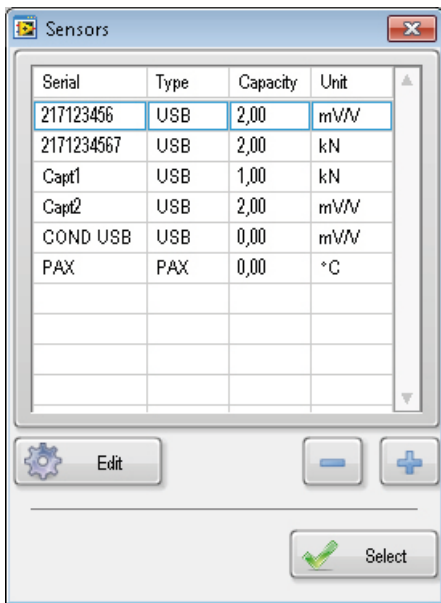


LOAD CELLS CALIBRATIONS

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.



This programme has been developed according to ISO 7500-1.

It is intended for certified laboratories carrying out periodic inspection on different force testing machines.

It allows the automatic generation of verification reports of static force uni-axial testing machines.

SOFT-ISO7500 allows all the coefficients to be defined from the calibration sheet of several standard reference transducers.

Each transducer has an equation like the one below:

$F(x) = a \cdot x + b \cdot x^2 + c \cdot x^3$ where F = force and x = electrical display signal.

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



Standard reference force transducers

Calibration data of the test cell (see certificate)

Load cell #	Label	Capacity	Unit	Coef A	Coef B	Coef C	Manufacturer	Type	Class	Ref. Certif.	Ref. Certif.	Expiration date
2	1 MN	1.000	kN	0.00000000000000000000	0	0	SENSY	3115	0.5	20013000	ES/SHD/w	31/06/2009
3	500 kN	500	kN	0.00000000000000000000	0	0	SENSY	3115	0.5	20000708	ES/SHD/w/M	31/07/2009
4	100 kN	100	kN	0.00000000000000000000	0	0	SENSY	3115	0.5	99068000	ES/SHD/w	30/07/2009
5	50 kN	50	kN	0.00000000000000000000	0	0	SENSY	2715	0.5	20004500	ES/SHD/w	29/07/2009
6	0	0	0	0	0	0			0.0			
7	0	0	0	0	0	0			0.0			
8	0	0	0	0	0	0			0.0			
9	0	0	0	0	0	0			0.0			
10	0	0	0	0	0	0			0.0			

Equation: $F = a \cdot X + b \cdot X^2 + c \cdot X^3$ (values by the order of the numbering)

Display information:

Display no.	Label	Manufacturer	Type	Serial number	Ref. Certif.	Expiration date	Incremental
1	IND	IND	IND	20010300	ES/SHD/w/M/2009	29/07/2009	0
2							0



BENCH CONDITIONING

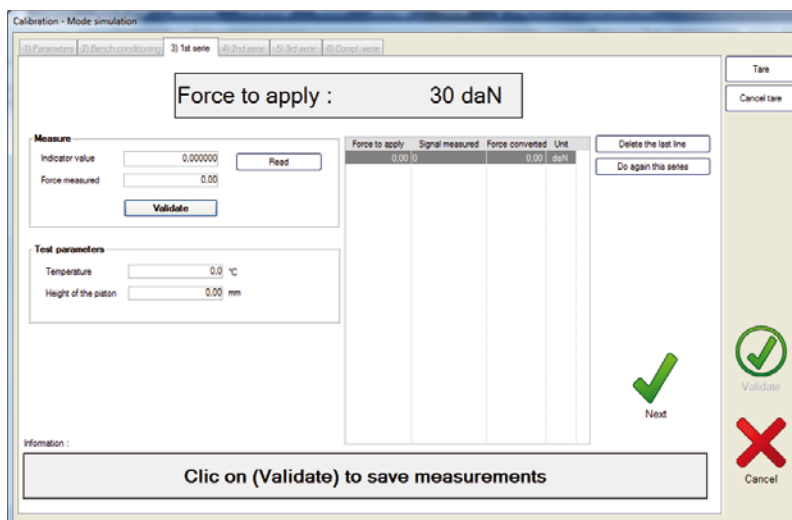


Conditioning machine is defined by the ISO7500-1 standard, point 6.4.3.

In the first step, you must unload the machine. The program then requires you to load the machine until the threshold indicated.

Restart this test 3 times and then you can start to test the machine.

TESTING PROCEDURE



The test comprises three series of measurements divided by equal steps of loads.

The procedure comprises loading the test machine with the value announced by the program, then taking measurements via the standard reference transducer; these two values will be compared to calculate the errors and determine the machine class.

You have the possibility to do a reversibility test.

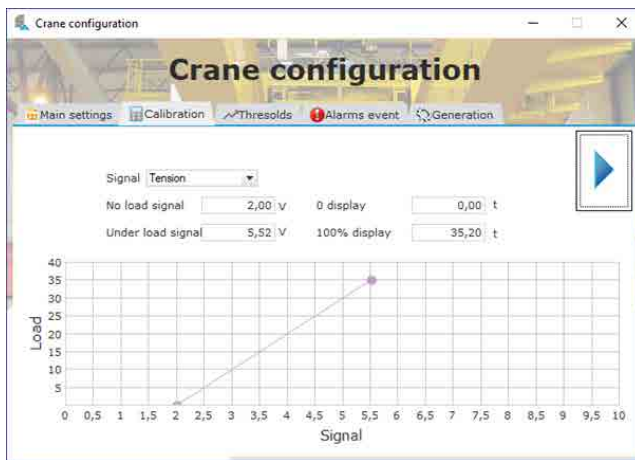
This page was intentionally left blank

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

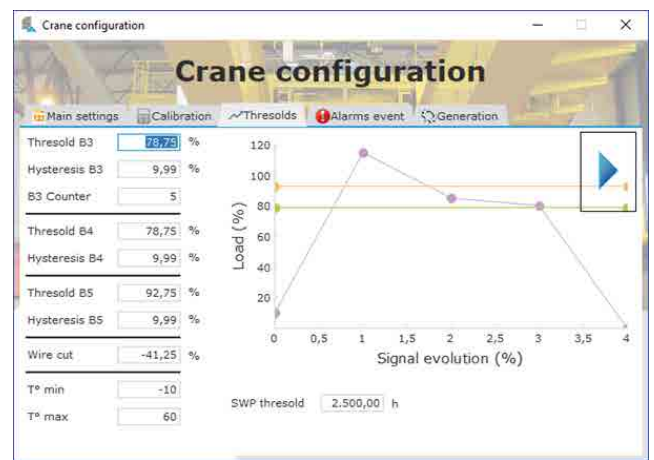
This very-user-friendly program allows for optimisation of the servicing schedule, the detection of downtimes and calculation of the FEM classification of the crane.

The main functions of COACHVIEW are:

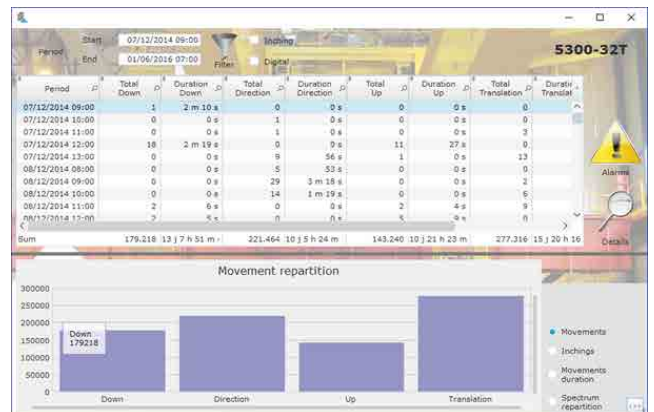
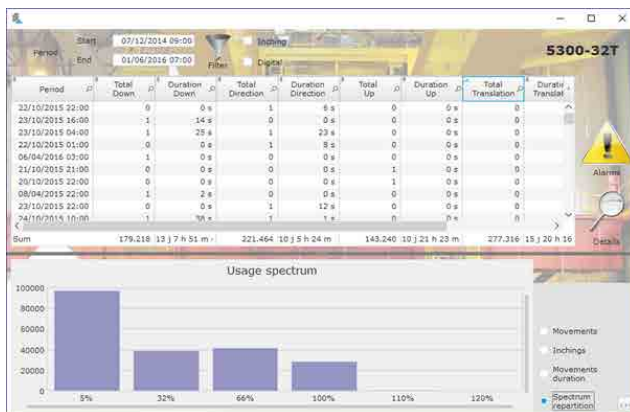
- Creation and management of configuration files for COACH-II (capacity, set-point, alarms, SWP),
- Analysis of the recordings performed by COACH-II,
- Generation of charts and tables.



Usage spectrum



Movement repartition



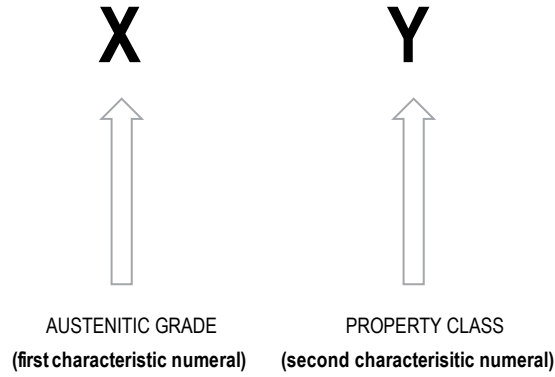
STAINLESS STEEL SCREWS > MECHANICAL AND CHEMICAL PROPERTIES

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

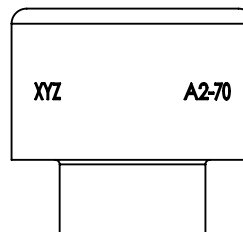
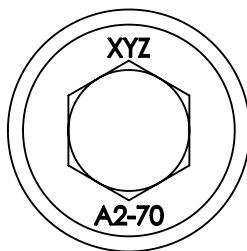
Y: PROPERTY CLASS⁽¹⁾

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).

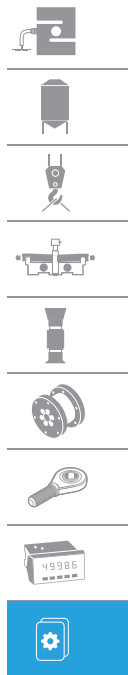
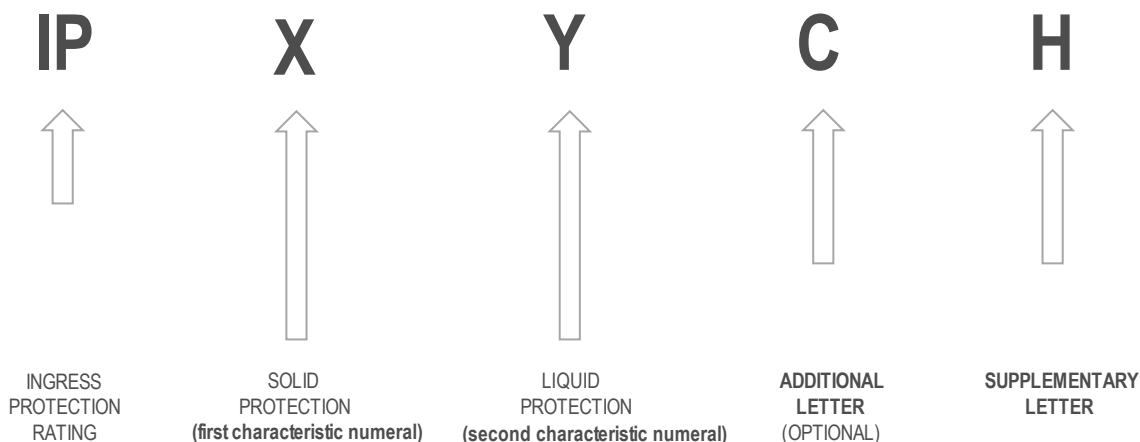
Screw marking:

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)