

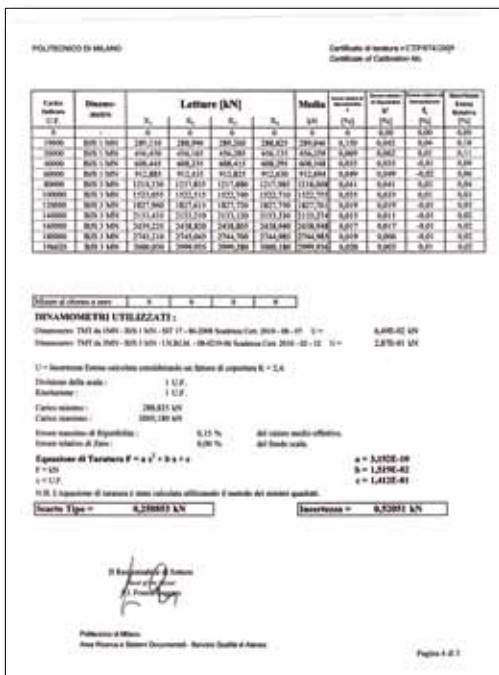
**GENERAL
EQUIPMENT**



5.4

LOAD CELLS

5.4.1 LOAD CELLS



MONOTRONIC DIGITAL CONTROL UNIT

MONOTRONIC - MICROPROCESSOR DIGITAL CONTROL UNIT AD 005

This Monotronic is an electronic instrument for reading load cells having 2 m V/V full scale input. The display can show numbers between - 30,000 ÷ + 30,000. The unit of measurement, scale and decimal point are pre-set during calibration of the load cell together with the control unit. Such calibration is carried out by a university laboratory using a sample cell for reference. It has a permanent memory pre-set to retain calibration parameters of up to 4 different cells, thus enabling the Monotronic to alternately read more than one sensor and call up the identification number if and when needed. It is also equipped with a tare function and serial port RS 232 interface for printer or PC.

Specifications:

- Graphic display: 60 x 32 mm
- Current value "HOLD" key
- "TARE" key
- Peak value memorisation
- Unit of measurement: kN, daN, N
- Power supply: 220 V, 50Hz, single phase via external adaptor
- Transducer input: 2 mV/V; 3 mV/V; 7 mV/V
- Transducer power supply: 10 V

CALIBRATION function allows:

- Testing of output devices for malfunctions
- Testing of non-volatile memory for malfunctions
- Testing of analog-digital converter for malfunctions
- Testing of displays and keypads for malfunctions
- Machine set-up
- Keypad input of calibration parameters
- Procedure for semi-automatic calibration on 11 points equally divided over the full scale

ACCESSORY:

AD 013/B02 PRINTER
It can be connected to the Monotronic for printing current value and peak value



AP 038/3

AD 005



AD 013/B02

ELECTRONIC COLUMN LOAD CELLS

Load cells are high quality instruments used to measure force; the mechanics of the column type load cell make it suitable for use under compression and it is therefore ideal for checking weights or, as a dynamometer, calibrating testing machines that work in compression.

The heart of the device is a special, treated, stainless steel column on which eight electric STRAIN GAUGES are located in specific positions.

Any load applied causes the elastic deformation of the column and strain gauges which, in turn, causes a modification of the electrical voltage in the circuit which can be read and converted into engineering units by means of an appropriate electronic unit.

Tecnotest's range of cells comprises models with full scales from 1 kN to 5000 kN.

The initial calibration is performed by our metrologic laboratory (AS series) or by an Independent Laboratory (AP series), authorised to certify such kind of cells.

NOTE: SIT (Italian accredited laboratory verification) certificate available only on request.

N.B. On request, the same cells are available with different accuracy classes:

EN 0.5 up to 100 kN - EN 1 from 300 to 1000 kN



MODELS AVAILABLE:

AP SERIES	AS SERIES	
AP 037/001	AS 037/001	1 kN LOAD CELL - EN 1 - \varnothing mm 63 x 94 (h) - 0.800 kg
AP 037/003	AS 037/003	3 kN LOAD CELL - EN 1 - \varnothing mm 63 x 94 (h) - 0.800 kg
AP 037/005	AS 037/005	5 kN LOAD CELL - EN 1 - \varnothing mm 57 x 117 (h) - 2.1 kg
AP 037/010	AS 037/010	10 kN LOAD CELL - EN 1 - \varnothing mm 57 x 117 (h) - 2.1 kg
AP 037/025	AS 037/025	25 kN LOAD CELL - EN 1 - \varnothing mm 57 x 117 (h) - 2.1 kg
AP 038/005	AS 038/005	50 kN LOAD CELL - EN 1 - \varnothing mm 82 x 149 (h) - 5.2 kg
AP 038/007	AS 038/007	75 kN LOAD CELL - EN 1 - \varnothing mm 82 x 148 (h) - 5.2 kg
AP 038/01	AS 038/01	100 kN LOAD CELL - EN 1 - \varnothing mm 82 x 148 (h) - 5.2 kg
AP 038/03	AS 038/03	300 kN LOAD CELL - EN 2 - \varnothing mm 135 x 200 (h) - 14 kg
AP 038/06	AS 038/06	600 kN LOAD CELL - EN 2 - \varnothing mm 135 x 200 (h) - 15 kg
AP 038/1	AS 038/1	1000 kN LOAD CELL - EN 2 - \varnothing mm 135 x 200 (h) - 16 kg
AP 038/2	AS 038/2	2000 kN LOAD CELL - EN 2 - \varnothing mm 135 x 200 (h) - 19 kg
AP 038/3	AS 038/3	3000 kN LOAD CELL - EN 2 - \varnothing mm 135 x 200 (h) - 21 kg
AP 038/5	AS 038/5	5000 kN LOAD CELL - EN 2 - \varnothing mm 180 x 200 (h) - 36 kg

Every load cell having capacity up to 100 kN is supplied complete with ball seating device for use in compression.

UNIVERSAL DIGITAL READOUT UNIT FOR DYNAMOMETERS AND LOAD CELLS



Designed for use in the most advanced and highly accurate static and dynamic measuring systems, such as those used in Metrology Laboratories, material testing equipment, test or inspection benches, etc.

It is highly recommended that it be periodically certified by an authorised body in combination with dynamometers, load cells (having 4 or 6 wires) or unamplified pressure transducers.

Input comprises a chain formed by a highly-accurate analog circuit having long-term stability, as well as a frequency generator used for supplying power to 6-wire dynamometers and an A/D converter with a resolution of $\pm 500,000$ divisions.

In order to work at a highly-stable resolution of $\pm 200,000$ divisions (at 2 mV/V), the readout unit has an internal reference (with guaranteed variation of 1 ppm/°C) which may be periodically checked by means of self-calibration function. User interface is guided by an LCD graphic display lit from the back (240 x 64 resolution) and by 5 function keys allowing full channel programming.

MODEL	AP 045	AP 048
Input signal	*2 mV/V (standard)	
Connectable load cells	1 (350 or 700 Ω , 4/6 wires)	
Configuration channels	2	10
Linearization	NO	YES
Bridge excitation voltage	5 Vac ($\pm 3\%$)	
Carrier frequency	440 Hz	
Standard resolution (2 mV/V)	± 200.000 div.	
Readings per sec.	50 (20 ms)	
Internal resolution	± 500.000 div.	
Accuracy class	$\geq \pm 0.0025\%$	
Linearity error	$\geq \pm 0.0015\%$	
Nominal working temperature	0 / +50°C	
Max. working temperature	-10 / +50°C	
Storage temperature	-20 / +70°C	
Temperature variation 10°C:		
a) on zero	$\geq \pm 0.005\%$	
b) on full scale	$\geq \pm 0.005\%$	
Serial interface (RS232C)	AP 045/1 OPTIONAL	STANDARD
Programmable baud rate (19200, 9600, 4800)		
Printer interface (24 columns)		
Client customisation (Company and address)		
Graphic back light LCD	240x64 dots	
Max. full scale	± 999.999 di.	
Programmable decimal point	each channel	
Programmable measure unit	kgf, tf, N, daN, kN, div.	
Prog. measure resolution	1, 2, 5, 10, 20, 50, 100	
Programmable digital filter	0-8	
Zero function (tare)	100% (each channel)	
Peak function	MIN / MAX	
Prog. transducer type	each Channel	
Prog. transducer S/N	each Channel	
Zero key remote input		
Print key remote input		
Peak key remote input		
Hold function remote input		
Power supply	220 Vac $\pm 10\%$ 50+60 Hz 10 VA	
Protection class (DIN40050)	IP40	
Dimensions	210 x 125 x 204 mm	
Weight	2.5 kg	
VDE Power supply cable	1.5 m	

Models:

TWO CHANNEL READOUT UNIT AP 045

The units may be individually programmed and calibrated by the user.

This version may also be equipped with an optional RS232C, 24-column printer interface and remote print input.

AP 045/1 Serial interface RS-232C for AP 045 readout unit

TEN CHANNEL READOUT UNIT AP 048

All 10 channels may be individually programmed and calibrated by the user using point calibration (5 known points) or polynomial calibration (1st, 2nd or 3rd degree) as per official certificates issued by the competent authorities.

Calibration using these systems enables the dynamometer and readout unit to be linearized, thus eliminating any uncertainty in final measurement.

RS232C, a 24-column printer interfaces and remote print input are provided as standard.

CONNECTION DEVICE LOAD CELL/READOUT UNIT (NEEDED FOR EACH LOAD CELL) AP 049

AP 050 Printer for AP 045 - AP 048

REMOTE BUTTON SWITCH FOR READOUT UNITS AP 045 AND AP 048 AP 046/P

METROLOGICAL LOAD CELLS (BIDIRECTIONAL) FOR U.T.M. CALIBRATION

Used in calibration operations as reference cell: bidirectional for U.T.M. (compression/tensile) and complete with the ball-seating for compression purposes.

Tensile grips are not included and must therefore be ordered apart. Supplied with a calibration Certificate issued by an independent Laboratory authorized to the certifications.

On request, a SIT certification according to: ISO 376 (class 1) - EN 10.002-3 (class 1) ASTM E74 (class A) can be supplied.

Stainless steel made. Electric lead 5 m.

Accuracy class: 1 (EN 10002 - 3 and ISO 376)

LINEARITY - HYSTERESIS: $\leq \pm 0.02\%$ f.s.

RELATIVE ERROR (on reading):

- repeatability (0°-120°-240°): $\leq \pm 0.080\%$

- interpolation (2° equation): $\leq \pm 0.050\%$

- zero: $\leq \pm 0.010\%$ - reversibility: $\leq \pm 0.90\%$

EFFECT OF A TEMPERATURE OF 10°C:

- on zero: $\leq \pm 0.015\%$ - on sensitivity: $\leq \pm 0.010\%$

NOMINAL SENSITIVITY: 2mV/Volt

SENSITIVITY TOLERANCE: $\leq \pm 0.1\%$

RECOMMENDED SUPPLY VOLTAGE: 10 V (max. 18 V)

MECHANICAL LIMIT VALUES (NOMINAL LOAD)

- service load: 120% F.S.

- max permissible load: 150% F.S.

- failure load: > 300% F.S.

- max permissible dynamic load: 75% F.S.

NOMINAL TEMPERATURE RANGE: -10/+40 °C

PROTECTION GRADE (EN 60529): IP67

DIMENSIONS: diameter 230 x 250 (h) mm.

WEIGHT: 36 kg.

METROLOGICAL LOAD CELL 750 kN CAPACITY (WITHOUT READOUT UNIT)

AP 031

METROLOGICAL LOAD CELL 1000 kN (WITHOUT READOUT UNIT)

AP 033

TENSILE GRIPS (FOR AP 031 AND AP 033) AP 033/T

High resistance steel: connection threading M 80 x 2 - 70 mm long.

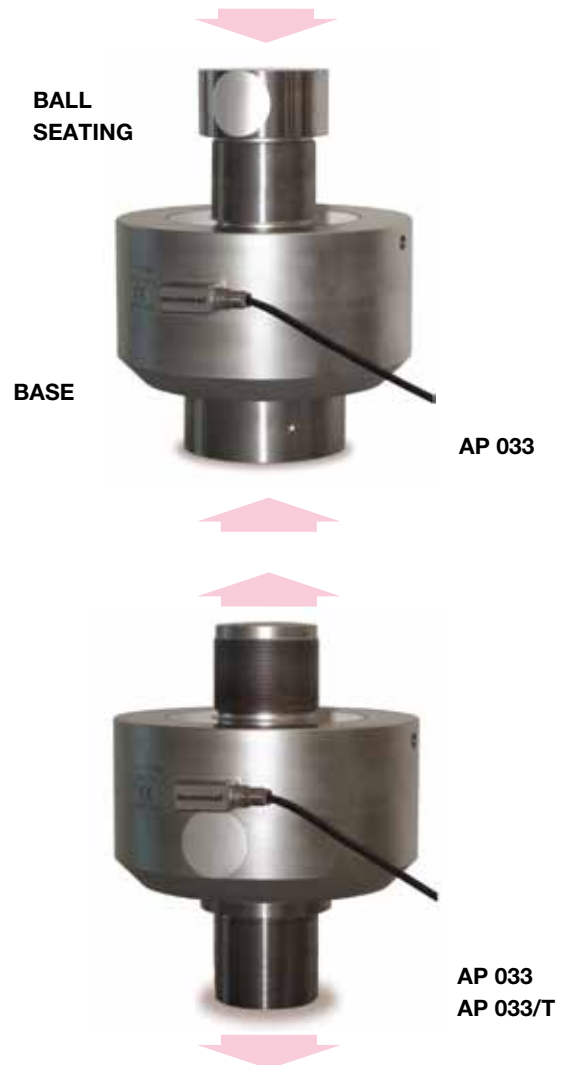
Official "SIT" Certificate - Class 1

AP 031/CC	compression
AP 031/CT	tension
AP 031/CB	compression/tension

The load cells AP 031 and AP 033 need to be coupled with a signal processor adequate to the required accuracy class. A microprocessor-controlled amplifier for obtaining the best results (resolution 200,000 digits) is suggested.

The picture shows, the model AP 048. Its carrier frequency is 440 Hz (preferable to the usual a.c. power).

Many important functions are provided and the remote control via RS 232 interface is a standard device.



AP 048

Our two and ten channel universal signal readout units for 2-10 channels (AP 045 and AP 048) are illustrated on page 394

COMPRESSION FRAME STABILITY VERIFICATION SYSTEM (FOOTE METER TEST)

EN 12390-4



European Standard EN 12390-4 appendix A prescribes that compression testing machines comply with requirements for stability test (commonly known as the Foote Meter test), more specifically:

- accuracy of force indication
- self-alignment of the upper machine platen
- alignment of the component parts of the machine
- restraint on movement of the upper platen

The system comprises:

STRAIN LOAD CELL WITH 4 STRAIN GAUGES 3000 kN CAPACITY

AP 300

The strain load cell is fitted with four strain gauge bridges (4 outputs) for verifying behaviour during loading, with a fifth strain gauge (5th output) for verifying force accuracy (for use as a load cell during normal calibration tests).

Complete with 5 cables and relevant connectors.

DIMENSIONS: 220 x 130 x 200 (h) mm.

WEIGHT: 17 kg.

POSITIONING/TESTING PLATEN (FOR AP 300) AP 300/P

Made of special, rectified steel, it allows positioning and centring of the load cell (strain gauged load cell) on the lower auxiliary platen with 6 mm offset, as prescribed by the Standard.

DIMENSIONS: 150 x 150 x 40 (h) mm.

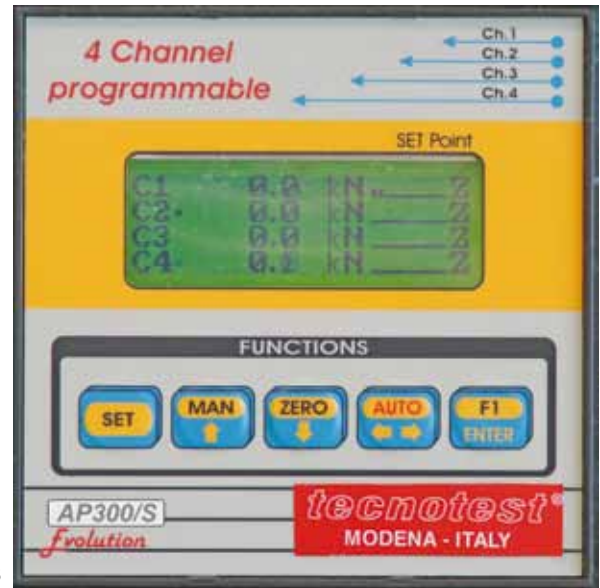
WEIGHT: 7 kg.



DIGITAL, 4 CHANNEL STRAIN INDICATOR FOR AP 300 AP 300/S

Connected to a load cell (strain gauged load cell AP 300) allows simultaneous readout of 4 channels while verifying behaviour of the compression testing machine during loading phase. Fitted with serial port RS 232C for transmission of data to a PC.

DIMENSIONS: 255 x 270 x 120 (h) mm.
WEIGHT: 3 kg.



AP 300/S

RAPPORTO DI VERIFICA TECNOTEST No 124/2007			
Verifica della stabilità in fase di carico di una pressa a compressione secondo la normativa EN12390/4 appendice A			
CLIENTE	MODELLO MACCHINA	RD 300	
CONSTRUTTORE	TECNOTEST		
ANNO DI COSTRUZIONE	2007		
MATRICOLO	2392		
CARICO MASSIMO	3000kN		
RISOLUZIONE			
LUOGO DELLE MISURE			
TEMPERATURA			
NORMATIVA DI RIFERIMENTO EN 12390-4:2000			
REQUISITI RIPORTATI NELLA TABELLA 3 DELLA NORMATIVA EN 12390/4			
FORZE (kN)	autoallineamento del piatto superiore della macchina	allineamento dei componenti della macchina	limitazione del piatto superiore
200	requisiti rapporto di deformazione	requisiti rapporto di deformazione medio	deformazione per mm di spostamento
2000	max 0.10	max +/-0.10	max 0.04
	N/A	N/A	max 0.06
la forza massima deve corrispondere al minimo tra la capacità massima della pressa e 2000kN			
<p>piatto ausiliario quadrato 150mm A: fronte macchina B: sinistra C: retro D: destra 1-2-3-4: centro dei 4 punti</p>			
Data	26/06/2007		
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RAPPORTO DI VERIFICA TECNOTEST No 124/2007						
MISURE: PROCEDURA A.2 EN12390/4 APPENDICE A						
FORZA (kN)	USCITA CELLA DI CARICO (kN)				media	piatto superiore inclinato verso
200	204.7	196.4	203.7	195.8	200.15	A
200	198.8	198.2	201.4	194.0	198.10	C
200	206.4	194.2	203.0	196.4	200.00	B
200	206.6	193.6	202.4	196.0	199.60	D
FORZA (kN)	rapporti di deformazione				/	piatto superiore inclinato verso
200	0.0227	-0.0187	0.0177	-0.0217	/	A
200	0.0035	0.0005	0.0167	-0.0207	/	C
200	0.0320	-0.0290	0.0160	-0.0190	/	B
200	0.0346	-0.0306	0.0140	-0.0180	/	D
MISURE: PROCEDURA A.5 EN12390/4 APPENDICE A						
FORZA (kN)	USCITA CELLA DI CARICO (kN)				media	cella spostata di 6mm
200	152.2	249.4	200.2	197.5	199.93	verso A lungo AC
2000	1623.1	2367.4	1980.6	2008.6	1994.93	verso A lungo AC
200	264.7	140.0	206.2	192.6	200.88	verso C lungo AC
2000	2330.6	1687.0	2018.9	1969.7	1996.55	verso C lungo AC
200	205.0	196.6	148.5	255.0	201.33	verso B lungo BD
2000	1959.6	2032.0	1653.0	2339.9	1996.13	verso B lungo BD
200	203.4	198.9	264.3	139.2	201.45	verso D lungo BD
2000	1957.5	2035.6	2348.4	1642.2	1995.93	verso D lungo BD
FORZA (kN)	rapporti di deformazione				/	cella spostata di 6mm
200	-0.2383	0.2481	0.0019	-0.0116	/	verso A lungo AC
2000	-0.1864	0.1867	-0.0072	0.0069	/	verso A lungo AC
200	0.3177	-0.3030	0.0265	-0.0412	/	verso C lungo AC
2000	0.1673	-0.1651	0.0112	-0.0134	/	verso C lungo AC
200	0.0183	-0.0225	-0.2624	0.2666	/	verso B lungo BD
2000	-0.0183	0.0180	-0.1719	0.1722	/	verso B lungo BD
200	0.0097	-0.0127	0.3120	-0.3090	/	verso D lungo BD
2000	-0.0193	0.0199	0.1766	-0.1772	/	verso D lungo BD
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RAPPORTO DI VERIFICA TECNOTEST No 124/2007					
RISULTATI DELLA VERIFICA					
<p>piatto ausiliario quadrato 150mm A: fronte macchina B: sinistra C: retro D: destra 1-2-3-4: centro dei 4 punti</p>					
AUTOALLINEAMENTO DEL PIATTO SUPERIORE DELLA MACCHINA					
differenza rapporto di deformazione	0.031	0.031	0.004	0.004	
limite	0.1				
ALLINEAMENTO DEI COMPONENTI DELLA MACCHINA					
rapporto di deformazione medio	0.023	-0.019	0.016	-0.020	
limite	+/- 0.1				
LIMITAZIONE DEL PIATTO SUPERIORE DELLA MACCHINA					
FORZA (kN)	LUNGO AC	LUNGO BD	limite		
200	0.046	0.048	0.06		
2000	0.029	0.029	0.04		
STRUMENTI CAMPIONE UTILIZZATI					
flessimetro capacità 2000kN					
Costruttore:	TMT - Torino - Italy	modello:	C/PA - C/F	matricola:	BOY
Rapporto di verifica TMT del 02-03-2007					
Indicatore estensimetrico digitale - 4 canali					
Costruttore:	AEP - Modena - Italy	modello:	MP4	matricola:	42311
Certificato di collaudo AEP - certificato n° 15207C - 15107C - 15007C - 14907C del 18/05/2007					
Data	26/06/2007				
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