



Tecnoplús de Ing Aldo A. Bruschi

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REV: 5/19

Maestro Alderete 2393.

Neuquén capital.

Prov. de Neuquén.

Tel: 0299-4478540

Certificado de calibración N°: CCPT-0191220

Este certificado de calibración documenta la trazabilidad a los patrones I.N.T.I. / N.I.S.T / UKAS, los cuales representan a las unidades físicas de medida en concordancia con el Sistema Internacional de Unidades (SI).

Este certificado no podrá ser reproducido parcialmente excepto cuando se haya obtenido previamente permiso por escrito del Laboratorio que lo emite.

Certificados de calibración sin firma y aclaración, no serán válidos.

El usuario es responsable de la recalibración del objeto a intervalos apropiados.

1- Información de calibración.

Objeto: Manómetro Keller Record

Fecha de calibración del instrumento: 09/12/2020

N° de Serie / Identificación: 23665

Fecha de emisión del certificado: 10/12/2020

Resultados:	Referencias:
Aceptado: SI	As-Found / As-Left: Como recibido / Como entregado
Estado Found/Left: Found-Left	Found-Left: Entregado como recibido
Estado del sello ajuste: OK	TUR: Relación de incertidumbre de la prueba.
	FDT: Fuera de tolerancia

2- Datos de la calibración.

Datos del cliente	Datos del Laboratorio
Cliente: Green Oil Services SA	Calibrado por: Guillermo Carlos Pompei
C.U.I.T. 30-70858254-5	Domicilio: Alderete 2393 - Neuquén
Domicilio: Av. Conquistadores del Desierto 2450, PIN Oeste - Neuquén capital.	Temperatura y humedad ambiente al momento de la calibración: 29,7 °C ± 0,5°C 26,4 % ± 0,3%

Número de páginas del certificado y anexos: 6

3 - Procedimientos aplicados

Eléctricos: NA

Presión: PCPT-03

Temperatura: NA

Dimensional: NA

HVAC: NA

PSV: NA

SyH: NA

Los resultados contenidos en el presente certificado se refieren al momento y condiciones en que se realizaron las mediciones. La empresa no se responsabiliza de los perjuicios que puedan derivarse del uso inadecuado de este certificado.

CCPT-0191220 - 1

4 - Características del instrumento.

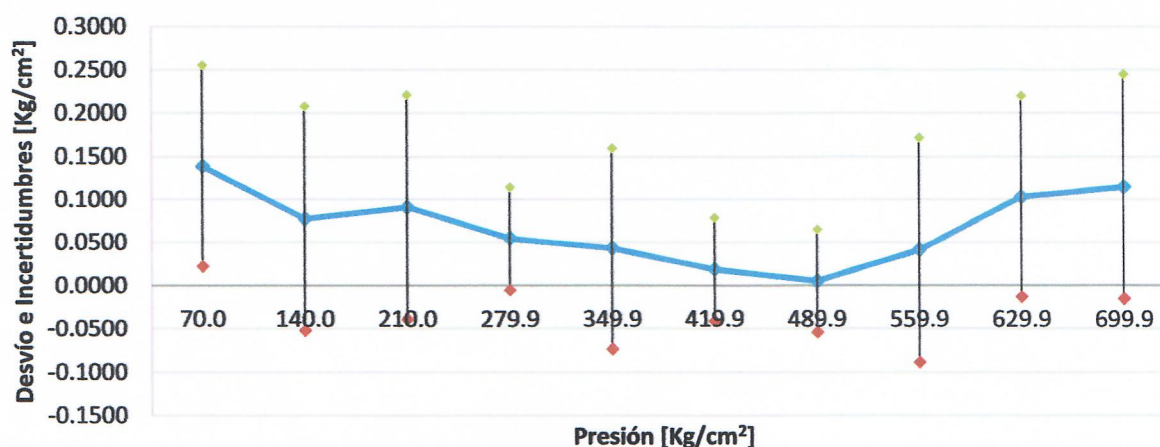
Escala	Rango		Clase F.S.	Resolución
	LRV	URV		
	Kg/cm ²	Kg/cm ²		
Presión	0.0	713.8	0.1	0.1

5 - Resultados obtenidos.

Control de la escala de medición de presión

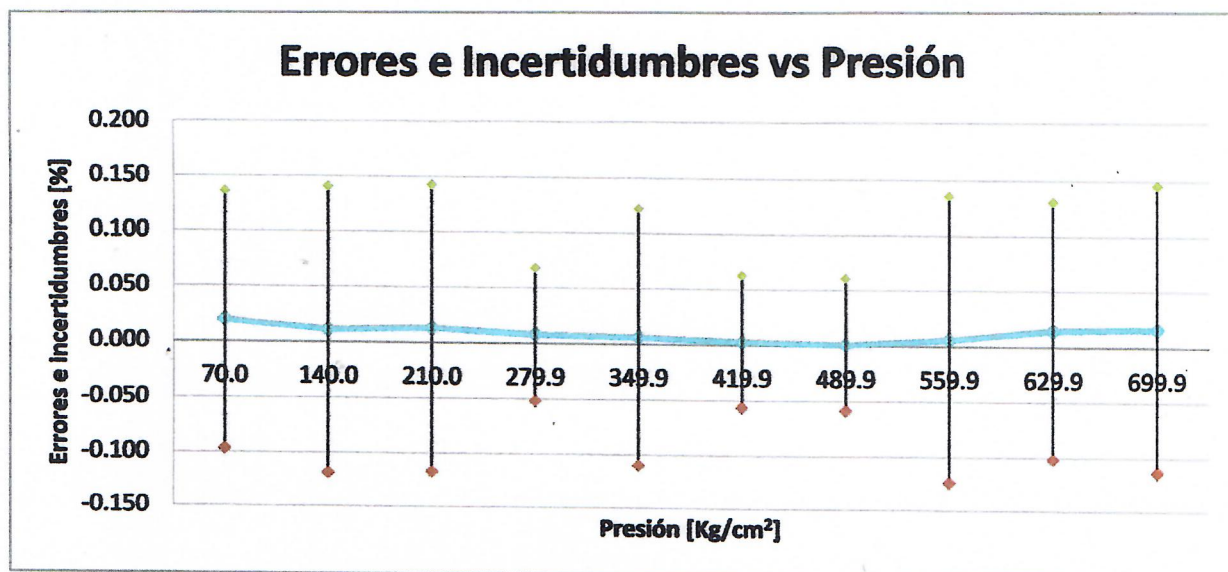
Lectura del patrón	1° Medición Ascen.	1° Medición Desc.	2° Medición Ascen.	2° Medición Desc.	Promedio	Desvío	Error en el punto	Incertidumbre	Máximo desvío permitido	Cumple espec. del fabricante
Kg/cm ²	Kg/cm ²	Kg/cm ²	Kg/cm ²	Kg/cm ²	Kg/cm ²	Kg/cm ²	%	Kg/cm ²	Kg/cm ²	-
69.9864	70.1	70.2	70.1	70.1	70.125	0.139	0.01942	± 0.1165	± 0.7138	SI
139.9729	140.0	140.1	140.0	140.1	140.050	0.077	0.01080	± 0.13	± 0.7138	SI
209.9593	210.0	210.0	210.1	210.1	210.050	0.091	0.01271	± 0.13	± 0.7138	SI
279.9457	280.0	280.0	280.0	280.0	280.000	0.054	0.00761	± 0.0597	± 0.7138	SI
349.9321	349.9	350.0	350.0	350.0	349.975	0.043	0.00601	± 0.1165	± 0.7138	SI
419.9186	419.9	419.9	419.9	419.9	419.900	0.019	0.00261	± 0.0597	± 0.7138	SI
489.905	489.9	489.9	489.9	489.9	489.900	0.005	0.00070	± 0.0597	± 0.7138	SI
559.8914	559.8	559.8	559.9	559.9	559.850	0.041	0.00580	± 0.13	± 0.7138	SI
629.8779	629.8	629.7	629.8	629.8	629.775	0.103	0.01442	± 0.1165	± 0.7138	SI
699.8643	699.8	699.7	699.7	699.8	699.750	0.114	0.01601	± 0.13	± 0.7138	SI

Desvíos e Incertidumbres vs Presión



Los resultados contenidos en el presente certificado se refieren al momento y condiciones en que se realizaron las mediciones. La empresa no se responsabiliza de los perjuicios que puedan derivarse del uso inadecuado de este certificado.

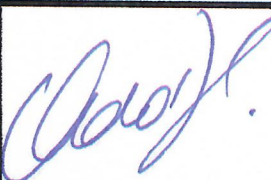
CCPT-0191220 - 2



6 - Patrones utilizados.

Instrumento	Identificación	Certificado	Emitido por:	Fecha de vencimiento
Fluke P3125	CCP-005-17	1500195068	Fluke	23/02/2021
Termómetro Testo 174H	CCP-012-17	CCTT-0060719	Aldo A. Bruschi	02/07/2021

Los certificados de calibración de los patrones utilizados están disponibles para su descarga desde nuestra página web: www.tecnoplusonline.com.ar, ingresando el código correspondiente indicado en la tabla anterior.

 GUILLERMO C. POMPEI Técnico Electrónico Mat. TEC 4050	 TECNOPLUS de ALDO A. BRUSCHI CUT: 20-10583900-5 Alderete 2393 - Neuquén
Calibrado por: Guillermo Pompei. Técnico de laboratorio	Aprobado por: Aldo Bruschi. Ingeniero Supervisor

Los resultados contenidos en el presente certificado se refieren al momento y condiciones en que se realizaron las mediciones. La empresa no se responsabiliza de los perjuicios que puedan derivarse del uso inadecuado de este

Anexo I - Referencias

TRUE-RMS: Verdadero valor eficaz.

Ajuste: Corrección de valores típicos al instrumento, debido a excesiva desviación en las mediciones.

AS-FOUND: Calibración inicial, previo al ajuste.

AS-LEFT: Calibración final, luego del ajuste.

FOUND-LEFT: Calibración inicial igual a la calibración final, no requirió ajuste.

Rango: Diferencia entre el valor máximo y el valor mínimo de un instrumento.

Exactitud: (o Clase), es el error cometido por el instrumento luego de repetidas mediciones.

Resolución: Menor división capaz de discriminar un instrumento.

Patrón: Instrumento con una exactitud y resolución mejorada, respecto del instrumento a calibrar.

Constraste: Comparación de mediciones de un instrumento con el patrón, para su verificación.

Calibración: Comparación de mediciones de un instrumento con el patrón, para un certificado.

Valor de referencia: Valor arrojado por el patrón.

Promedio: Media aritmética de las mediciones.

Desviación: diferencia entre los valores patrón y el promedio de las mediciones.

Error %: Error relativo porcentual de las mediciones comparado con el valor patrón.

Incertidumbre: Dispersión de valores medidos atribuible a los errores del patrón, condiciones ambientales, métodos de medidas, etc.

Desvió estándar (S): Promedio cuadrático, entre la medición y el valor patrón.

En todos los casos anteriores la incertidumbre de medición expandida fue estimada empleando un factor de cubrimiento t-Student = 4,303 considerado para tres grados de libertad y para un intervalo de confianza aproximado del 95 %.

	Promedio	Desvió estándar	Incertidumbre
<u>Cálculos estadísticos</u>	$\bar{X} = \sum_{i=1}^n \frac{x_i}{n}$	$s = \sqrt{\frac{1}{n-1} \sum (x_i - \bar{x})^2}$	$It = k * \sqrt{S^2 + I_d^2 + \left(\frac{I_p}{2}\right)^2}$

Dónde:

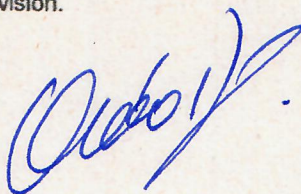
n: Número de mediciones

k: Factor de cubrimiento para una distribución normal para un nivel de confianza del 95 %

Id: Incertidumbre atribuible a la menor división.

Ip: Incertidumbre del Patrón.

It: Incertidumbre total y expandida.



Anexo II- Certificado de calibración Fluke P3125-KGCM2



**Certificate of Calibration
Fluke Calibration Phoenix
Primary Pressure and Flow Laboratory**

Description: DEADWEIGHT TESTER	Certificate Number: 1500195068
Manufacturer: FLUKE CALIBRATION	Date of Calibration: 23 Feb 2016
Model: P3125-KGCM2	Date Due:
Serial Number: 72101	Temperature: 23 to 25°C
Status: AS LEFT	Relative Humidity: 10 to 70% RH
	Pressure: 95 to 100 kPa
	Issue Date: 23 Feb 2016
Calibration: FUL	
Procedure: PHC1504-0019 Rev 20140630	
Customer: VIDITECSA	RMA/ISO Number: 20923856
PO Number: IRV NO 1478	

This calibration is traceable to the International System of Units (SI) through recognized national metrology institutes (NIST, PTB, NPL, NMJ, NRC, etc.), calibrating techniques, or national physical constants and is in compliance with ISO/IEC 17025:2005 and ANSI/NCSL Z540.1. This calibration has been completed in accordance with the Fluke Quality System document QSD 111.6. Calibration certificates without signatures are not valid. This certificate applies to only the item identified and shall not be reproduced other than in full, without the specific written approval by Fluke Corporation. This certificate shall not be used to claim product endorsement by the accreditation body.

This calibration certificate may contain data that is not covered by the Scope of Accreditation. The uncredited test points, where applicable, are indicated by an asterisk (*), or confined to clearly marked sections. Functional tests are not accredited.

Measurement uncertainties at the time of test are given where applicable. They are calculated in accordance with the method described in the ISO Guide to the Expression of Uncertainty in Measurement. The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k such that the coverage probability corresponds to approximately 95%.

Comments: This calibration has been completed in accordance with Fluke ISO 17025 Quality Manual, QSD 111.41, revision 005, dated Sept 2014.



Jose Bigger

Approved Signatory

Fluke Corporation Telephone Internet Page 1 of 5
4700 East Beaver Creek Road 800-431-7230 www.flukecal.com Rev 20140630
Phoenix, AZ 85004-0328 USA

Certificate Number: 1500195068

Date of Calibration 23 Feb 2016

Standards Used:

Asset	Description	Cal Date	Due Date
US48	PRESSUREMETS PIPER31 PISTON CYLINDER	08 Sep 2014	08 Sep 2016
K0775A	FLUKE CALIBRATION PIPER312 PISTON CYLINDER	12 Aug 2015	12 Aug 2016
58222	PRESSUREMETS DEADWEIGHT GAUGE MASS SET	29 Apr 2014	29 Apr 2016
58223	PRESSUREMETS DEADWEIGHT GAUGE MASS SET	30 Apr 2014	30 Apr 2016
3/2	OH INSTRUMENTS WORKING REFERENCE MASS SET	07 May 2015	10 May 2016

Test Description

This Deadweight Tester's piston-cylinder effective area(s) were determined by crosslink comparison with a Fluke Calibration Phoenix Primary Pressure and Flow Laboratory (FCP) standard at no less than six pressures in its range. The range tested was from a pressure that is close to its minimum mass load to the approximately expected full scale mass load for that piston-cylinder. The method used for determining effective area is the Direct Ratio method that is explained in the NCSL R0204 and the Fluke Calibration publication "The Design and Implementation of a Fully Automated Crosslink System for the Comparison of Piston Gauges in Both Gauge and Absolute Measurement Modes" July 2008.

The weights in this calibration certificate were received and inspected per the FCP Quality Assurance Program. If there was gross contamination upon receipt the weights were cleaned to prevent contamination of the references. Apparent damage to weights is documented in an Equipment Discrepancy Form (EDF).

The masses are kept in the laboratory environment for a minimum of four hours for temperature stabilization. All masses were compared to FCP mass working standards by direct weighing.

Lubricating Fluid: ST-55

Operating Fluid: ST-55

Reference uncertainty in effective area was

±0.25-3% of reading for the high range

±0.25-3% of reading for the low range

Reference uncertainty in mass was no greater than ±3 ppm or 0.5 mg, whichever is greater

OUT Description

The device under test consists of a Fluke Calibration Deadweight Tester with a stated uncertainty of

Range	Uncertainty in Pressure
Min To Max	Maximum of
20 To 1100 kgf/cm ²	±0.015 % of reading or 0.00075% of full scale)
1 To 35 kgf/cm ²	±0.015 % of reading or 0.00015% of full scale)

NOTE: The test uncertainty stated above is valid when the Correction is made and environmental conditions are within the stated requirements of Technical Note 21707N13, dated July 1, 2012.

No Correction means that the test uncertainty specification is valid with respect to the nominal pressure values

Page 2 of 5

Certificate Number: 1500195068

Date of Calibration 23 Feb 2016

The effective area for the piston-cylinder(s) delivered with this deadweight tester were determined by a Fluke Calibration working standard reference by crosslink.
For hydraulic piston cylinders the piston mass value is given with a standardized correction that accounts for residual oil that clings to the piston. The calculated pressures given later in the certificate account for the fluid buoyancy, surface tension, and a head correction to the test port seal on the DWT. These corrections are given below in kg.

	High Range P-C	Low Range P-C	Unit
SN	58865	58864	
Effective Area (25.0)	4.0312126-09	8.0635876-05	square meters
Effective Area Unc	3.3E-7	3.1E-7	ppm
Elastic Deformation	9.61E-07	0.00E+00	MPa ⁻¹
Thermal Expansion	1.10E-05	1.68E-05	°C ⁻¹
Piston Mass	0.0212207	0.0992536	kg
Piston Mass Unc	5.0E-7	5.0E-7	kg
Surface Tension	0.000020	0.000091	kg
Fluid Buoyancy	-0.000124	-0.000394	kg
Head Correction	0.000068	-0.005162	kg
Residual Oil	0.000028	0.00005	kg

Page 3 of 5

Certificate Number: 1500195068

Date of Calibration 23 Feb 2016

The mass set(s) for this deadweight tester, and the piston(s) were tested by the Fluke Calibration Metrology service using a direct weighing method. The following table(s) give the Mass ID, As Left Value, Uncertainty at the time of the test and the actual density of the masses. The As Left Values given are using an apparent mass of 7926 kg/m³. Though the actual density is given it should not be used for calculation of pressure.

As Left Mass Values	As Left Value	Uncertainty	Density
Mass ID	(grams)	(grams)	kg per cubic meter
1 kgf/cm ² X0804 LS	117.751	1.4E-2	7900
20 kgf/cm ² X6809 HG	786.425	1.0E-2	7900
5/100 kgf/cm ² 1	4032.281	8.1E-3	7800
5/100 kgf/cm ² 2	4032.280	8.1E-3	7800
5/100 kgf/cm ² 3	4032.282	8.1E-3	7800
5/100 kgf/cm ² 4	4032.312	8.1E-3	7800
5/100 kgf/cm ² 5	4032.286	8.1E-3	7800
5/100 kgf/cm ² 6	4032.281	8.1E-3	7800
5/100 kgf/cm ² 7	4032.308	8.1E-3	7800
5/100 kgf/cm ² 8	4032.314	8.1E-3	7800
5/100 kgf/cm ² 9	4032.312	8.1E-3	7800
5/100 kgf/cm ² 10	4032.310	8.1E-3	7800
1/20 kgf/cm ² 11	806.452	1.0E-2	7900
1/20 kgf/cm ² 12	806.444	1.0E-2	7900
1/20 kgf/cm ² 13	806.441	1.0E-2	7900
1/20 kgf/cm ² 14	806.443	1.0E-2	7900
0.5/10 kgf/cm ² 15	403.227	8.1E-3	7900
0.1/2 kgf/cm ² 16	80.646	2.0E-3	7900
0.1/2 kgf/cm ² 17	80.646	2.0E-3	7900
0.1/2 kgf/cm ² 18	80.647	2.0E-3	7900
0.1/2 kgf/cm ² 19	80.647	2.0E-3	7900

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Page 4 of 5



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Maestro Alderete 2393.

Neuquén capital.

Prov. de Neuquén.

Tel: 0299-4478540

Certificate Number: 1500195068

Date of Calibration: 28 Feb. 2016

The following table(s) are lists of calculated pressures using the metrological values, including effective area, elastic deformation, thermal expansion, mass and assuming gravity and air density shown below.

Gravity: 9.80665 m/s²
Air Density: 1.2 kg/m³
Piston Cylinder Temp: 23 °C

Calculated Pressure List For High Range Piston-Cylinder

Nominal Pressure [kgf/cm ²]	Calculated Pressure [kgf/cm ²]	Difference From Nominal [%]	Weight Combination
20	20.00167	-0.008	P HS
220	220.0147	-0.007	P HS 1, 2
440	440.0210	-0.005	P HS 1, 2, 3, 4, 11
660	660.0161	-0.002	P HS 1, 2, 3, 4, 5, 6, 11, 12
880	880.0043	0.000	P HS 1, 2, 3, 4, 5, 6, 7, 8, 11, 12, 13
1100	1099.983	0.002	P HS 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14

Calculated Pressure List For Low Range Piston-Cylinder

Nominal Pressure [kgf/cm ²]	Calc. Pressure [kgf/cm ²]	Difference From Nominal [%]	Weight Combination
1	1.000020	-0.002	P LS
7	6.999817	0.002	P LS 1, 11
14	13.99957	0.003	P LS 1, 2, 11, 12, 13
21	20.99943	0.003	P LS 1, 2, 3, 4
28	27.99915	0.003	P LS 1, 2, 3, 4, 5, 11, 12
35	34.99880	0.003	P LS 1, 2, 3, 4, 5, 6, 11, 12, 13, 14

In the weight combination P stands for piston. If there is a high range HS stands for high range sleeve, and if there is a low range with a sleeve weight then LS stands for low sleeve weight.