ACCREDITED
CALIBRATION 1599.01

FLUKE ®
Calibration

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:**	21 to 25°C
Status:	AS-LEFT	**Relative Humidity:**	10 to 70% RH
		Pressure:	95 to 100 kPa
Calibration:	Full	**Issue Date:**	23 Feb 2016
Procedure:	PHC4504.0019 Rev. 20140630		
Customer:	VIDITEC SA BUENOS AIRES, AR	**RMA/SO Number:**	30923856
PO Number:	IRV NO 1476		

This calibration is traceable to the International System of Units (SI) through recognized national metrology institutes (NIST, PTB, NPL, NIM, NRC, etc.), ratiometric techniques, or natural physical constants and is in compliance with ISO17025:2005 and ANSI/NCSL Z540.1. The calibration has been completed in accordance with the Fluke Quality System document QSD 111.0. 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 unaccredited 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.

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602.491.9100 www.flukecal.com

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Josh Biggar

Approved Signatory

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Standards Used:

Asset	Description	Cal-Date	Due-Date
U548	PRESSUREMENTS PPA9633 PISTON-CYLINDER	03 Sep 2014	03 Sep 2016
X0775A	FLUKE CALIBRATION PPA9182 PISTON-CYLINDER	12 Aug 2015	12 Aug 2016
58222	PRESSUREMENTS DEADWEIGHT GAUGE MASS SET	29 Apr 2014	29 Apr 2016
58223	PRESSUREMENTS DEADWEIGHT GAUGE MASS SET	30 Apr 2014	30 Apr 2016
3/1	DH 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 crossfloat 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 NCSLI RIDSP4 and the Fluke Calibration publication "The Design and Implementation of a Fully Automated Crossfloat 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:
±(2.7E-3% of reading) for the high range
±(2.3E-3% of reading) for the low range
Reference uncertainty in mass was no greater that ±3 ppm or 0.5 mg, whichever is greater.

UUT Description

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

Range			Uncertainty in Pressure
Min		Max	Maximum of:
20	To	1100 kgf/cm2	±(0.015 % of reading or 0.00075% of full scale)
1	To	35 kgf/cm2	±(0.015 % of reading or 0.0015% of full scale)

NOTE: The test uncertainty stated above is valid when 'No Correction' is made and environmental conditions are within the stated requirements of Technical Note 2170TN13, dated July 1, 2012.
'No Correction' means that the test uncertainty specification is valid with respect to the nominal pressure values.

The effective area for the piston-cylinder(s) delivered with this deadweight tester were determined by a Fluke Calibration working standard reference by crossfloat.
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:	X6889	X6894	
Effective Area (23,0) :	4.031312E-06	8.063587E-05	square meters
Effective Area Unc:	3.3E1	3.1E1	ppm
Elastic Deformation:	9.61E-07	0.00E+00	MPa^{-1}
Thermal Expansion:	1.10E-05	1.66E-05	$^{\circ}C^{-1}$
Piston Mass:	0.0212207	0.0991536	kg
Piston Mass Unc:	5.0E-7	5.0E-7	kg
Surface Tension:	0.000020	0.000091	kg
Fluid Buoyancy:	-0.000274	-0.000334	kg
Head Correction:	0.000063	-0.005162	kg
Residual Oil:	0.000028	0.00005	kg

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 7920 kg/m^3. Though the actual density is given it should not be used for calculation of pressure.

As Left Mass Values

Mass ID	As Left Value [grams]	Uncertainty [grams]	Density [kg per cubic meter]
1 kgf/cm2 X6894 LS	712.751	1.4E-2	7800
20 kgf/cm2 X6889 HS	785.425	1.6E-2	7800
5/100 kgf/cm2 1	4032.281	8.1E-2	7800
5/100 kgf/cm2 2	4032.292	8.1E-2	7800
5/100 kgf/cm2 3	4032.292	8.1E-2	7800
5/100 kgf/cm2 4	4032.312	8.1E-2	7800
5/100 kgf/cm2 5	4032.265	8.1E-2	7800
5/100 kgf/cm2 6	4032.261	8.1E-2	7800
5/100 kgf/cm2 7	4032.309	8.1E-2	7800
5/100 kgf/cm2 8	4032.314	8.1E-2	7800
5/100 kgf/cm2 9	4032.312	8.1E-2	7800
5/100 kgf/cm2 10	4032.310	8.1E-2	7800
1/20 kgf/cm2 11	806.452	1.6E-2	7800
1/20 kgf/cm2 12	806.444	1.6E-2	7800
1/20 kgf/cm2 13	806.441	1.6E-2	7800
1/20 kgf/cm2 14	806.443	1.6E-2	7800
0.5/10 kgf/cm2 15	403.227	8.1E-3	7800
0.1/2 kgf/cm2 16	80.646	2.0E-3	7800
0.1/2 kgf/cm2 17	80.646	2.0E-3	7800
0.1/2 kgf/cm2 18	80.647	2.0E-3	7800
0.1/2 kgf/cm2 19	80.647	2.0E-3	7800

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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/s^2
Air Density:	1.2 kg/m^3
Piston Cylinder Temp:	23 °C

Calculated Pressure List For High Range Piston-Cylinder

Nominal Pressure [kgf/cm2]	Calculated Pressure [kgf/cm2]	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/cm2]	Calc Pressure [kgf/cm2]	Difference From Nominal [%]	Weight Combination
1	1.000020	-0.002	P,LS
7	6.999817	0.003	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	34.99886	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.