



MEASUREMENT STANDARDS LABORATORY

CERTIFICATE OF CALIBRATION no S01542

Customer OCEAN TECHNOLOGY GROUP
Unit of Hawaii Marine Center
1 Sand Island Access Rd.
HI-96819 Honolulu
UNITED STATES

Item Pressure Transmitter
Pressure range from 500 to 1100 hPa abs., calibrated from 500 to 1100 hPa abs.
Resolution 0,01 hPa, read via serial port

Manufacturer Vaisala Oyj

Model PTB220

Serial number C2750001

Instrument number - -

Calibration performed On June 23, 2009

Date June 26, 2009

Signature 
Ville Vuorio
Calibration Engineer

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Documents attached -

NOTES

This Certificate may only be reproduced in full, except with the prior written permission by the issuing Laboratory.
The measurement results issued in this Certificate are traceable to national or international measurement standards either via ISO/IEC 17025 Accredited Laboratories and/or internal calibrations performed in Vaisala Measurement Standards Laboratory.

Configuration Before the measurements the transmitter's configuration and settings were read from the transmitter's memory.

Table 1. Configuration and settings

Setups read from the memory		Instrument configuration	
Software version	PTB220 / 3.05	CPU serial number	C2750001
Configuration	1	Transducer type P1: PMT 16A	Serial number C2230076
Linear adjustments	OFF		
Multipoint adjustments	ON		
Averaging time [s]	1.0		
Mtim [ms]	64		

PRESSURE CALIBRATION

Description The above described Pressure Transmitter was calibrated from 500 to 1100 hPa absolute pressure in the Measurement Standards Laboratory (MSL) of Vaisala Oyj on June 23, 2009 by Ville Vuorio.
Before calibration were the Multi Point Correction -values (MPC) for the transducer measured, calculated and input to the transmitter's memory.
The readings of the transmitter were compared to the readings of the reference at above mentioned range. Pressure values were read via serial port with resolution of 0,01 hPa.
The supply voltage during the calibration was 15,0 VDC \pm 0,3 DCV and the warm-up and stabilization time was more than 2 hours.
The used pressure transmitting medium was air and/or nitrogen.

References DHI PPC3 Pressure Controller/Calibrator, sno 722, traceable to the National Institute of Standards and Technology (NIST, USA) via MSL and Centre for Metrology and Accreditation (MIKES, Finland).

Uncertainty The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2$, which for a normal distribution corresponds to a coverage probability of approximately 95 %. The standard uncertainty of measurement has been determined in accordance with EA Publication EA-4/02.
- The uncertainty is calculated from the uncertainties caused from the reference equipment, calibration process and unit under calibration (UUC) including resolution, stability (short term), repeatability, hysteresis and rounding of the final results.
- The measurement results and uncertainty are representing the measurement points only.
The measurement uncertainty represents the situation at the time and conditions of calibration. When using the UUC at different conditions and at different time the effect of the conditions and stability of the UUC shall be evaluated separately.



Preliminary checks

Before calibration the old MPC -corrections were read from the memory. The new MPC -corrections for the transducer were measured, calculated and input to the transmitter's memory. The old and the new MPC -corrections for the transducer are in table 2. These corrections were protected by switching pin no.4 to write DISABLE position (OFF) so that any corrections to transmitter's reading can not be made without switching the pin no. 4 to ON position.

Table 2. MPC -corrections for transducer P1 sno C2230076

Old corrections		New corrections		Change [hPa]
Calibration date Reading [hPa]	2007-07-09 Correction [hPa]	Reading [hPa]	Correction [hPa]	
499,51	+ 0,01	500,17	+ 0,03	- 0,02
598,95	+ 0,05	600,09	+ 0,06	- 0,01
698,44	+ 0,04	700,04	+ 0,05	- 0,01
800,86	+ 0,02	800,01	+ 0,04	- 0,02
900,34	+ 0,02	900,08	+ 0,02	0,00
947,14	+ 0,03	999,96	+ 0,03	
999,81	+ 0,03	1059,94	+ 0,03	
1099,25	+ 0,06	1099,90	+ 0,03	+ 0,03

Date

June 26, 2009

Item

Pressure Transmitter

Manufacturer

Vaisala Oyj

Model

PTB220

Serial number

C2750001

Instrument number

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Measurement Standards Laboratory
Ville Vuorio

Measurement results

One single measurement point consists of an average of ten readings of the reference and the transmitter.

Measured one increasing and decreasing pressure cycle consisting of 18 measurement points.

Table 3. Measurement results

Reference [hPa]	Reading [hPa]	Correction [hPa]
1099,95	1099,95	0,00
1050,06	1050,06	0,00
1000,09	1000,10	- 0,01
950,11	950,11	0,00
850,24	850,24	0,00
750,16	750,16	0,00
650,11	650,10	+ 0,01
550,27	550,27	0,00
500,22	500,22	0,00
500,15	500,16	- 0,01
550,11	550,11	0,00
650,03	650,02	+ 0,01
749,99	749,99	0,00
849,99	849,99	0,00
949,94	949,94	0,00
999,95	999,95	0,00
1049,91	1049,90	+ 0,01
1099,92	1099,92	0,00

The correction shall be added algebraically to the reading.

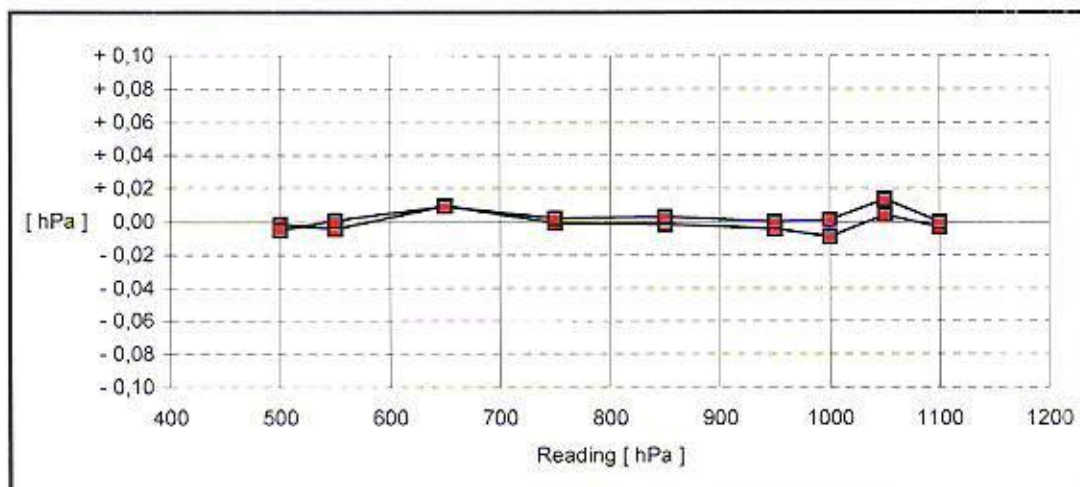


Figure 1. Measurement results

Results

The values in table 4 are averages of the measured values.

Table 4. Final results

Reference [hPa]	Reading [hPa]	Correction [hPa]	Uncertainty [hPa]
1099,93	1099,93	0,00	± 0,04
1049,99	1049,98	+ 0,01	± 0,04
1000,02	1000,02	0,00	± 0,05
950,03	950,03	0,00	± 0,05
850,11	850,11	0,00	± 0,05
750,08	750,08	0,00	± 0,05
650,07	650,06	+ 0,01	± 0,05
550,19	550,19	0,00	± 0,06
500,18	500,18	0,00	± 0,07

The correction shall be added algebraically to the reading.

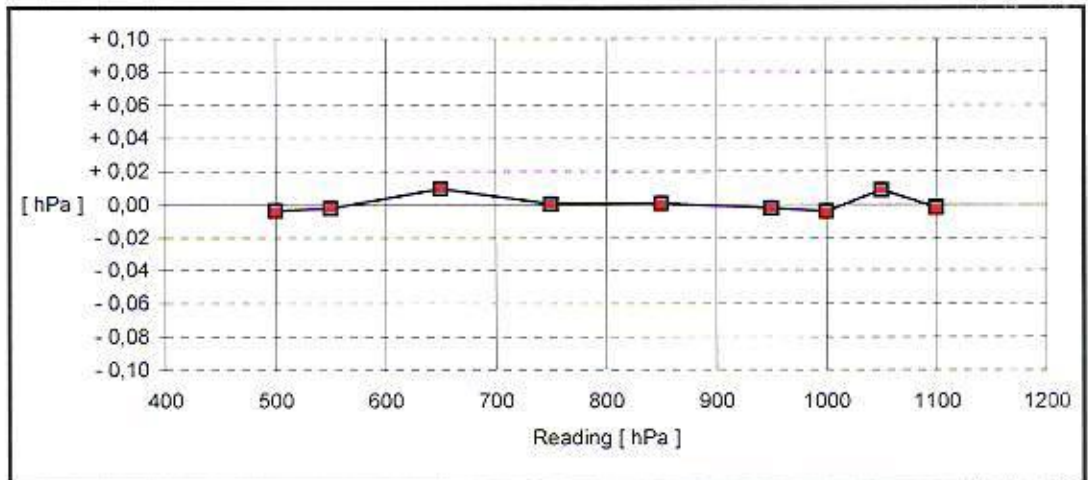


Figure 2. Final results

Conditions

Pressure 1023,8 hPa ± 0,2 hPa
 Temperature + 22,6 °C ± 0,3 °C
 Humidity 37 %RH ± 3 %RH