

CERTIFICATE OF CALIBRATION no S02688

Customer UNIVERSITY OF HAWAII MARINE CENTER
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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 Y0620001

Instrument number --

Calibration performed November 10, 2009

Date November 11, 2009

Signature 
Ville Vuorio
Calibration Engineer

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Documents attached -

NOTES Component board replaced.

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	Y0620001
Configuration	1		
Linear adjustments	OFF	Transducer type	Serial number
Multipoint adjustments	ON	P1; PMT 16A	X4850025
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 November 10, 2009 by Ville Vuorio.
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. Pressure readings of the transmitter were read with the MPC -corrections ON.
From the results were calculated new MPC -corrections and input them to the transmitter's memory. The final results were calculated using new MPC -corrections.
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 723, 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. From the measurement results were calculated new MPC -corrections 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 X4850025

Old corrections		New corrections		Change [hPa]
Calibration date	2008-10-20	Reading	Correction	
Reading [hPa]	Correction [hPa]	Reading [hPa]	Correction [hPa]	
500,43	- 0,34	500,43	- 0,24	- 0,10
600,37	- 0,29	600,37	- 0,21	- 0,08
700,35	- 0,26	700,35	- 0,19	- 0,07
800,28	- 0,23	800,28	- 0,18	- 0,05
900,25	- 0,18	900,25	- 0,14	- 0,04
1000,17	- 0,13	1000,17	- 0,11	- 0,02
1060,14	- 0,11	1060,14	- 0,10	- 0,01
1100,14	- 0,12	1100,14	- 0,12	0,00

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

With old MPC -corrections			With new MPC -corrections		
Reference [hPa]	Reading [hPa]	Correction [hPa]	Reference [hPa]	Reading [hPa]	Correction [hPa]
1100,17	1100,17	0,00	1100,17	1100,17	0,00
1050,19	1050,19	0,00	1050,18	1050,19	- 0,01
1000,29	1000,28	+ 0,01	1000,29	1000,30	- 0,01
950,31	950,28	+ 0,03	950,33	950,33	0,00
850,27	850,23	+ 0,04	850,30	850,31	- 0,01
750,27	750,22	+ 0,05	750,32	750,33	- 0,01
650,11	650,04	+ 0,07	650,17	650,18	- 0,01
550,09	549,99	+ 0,10	550,19	550,18	+ 0,01
500,06	499,97	+ 0,09	500,15	500,16	- 0,01
499,93	499,84	+ 0,09	500,01	500,02	- 0,01
550,02	549,91	+ 0,11	550,15	550,13	+ 0,02
649,96	649,88	+ 0,08	650,05	650,04	+ 0,01
749,94	749,88	+ 0,06	750,00	750,00	0,00
849,92	849,88	+ 0,04	849,95	849,95	0,00
949,87	949,83	+ 0,04	949,91	949,90	+ 0,01
999,94	999,91	+ 0,03	999,98	999,97	+ 0,01
1049,87	1049,86	+ 0,01	1049,88	1049,88	0,00
1099,93	1099,92	+ 0,01	1099,94	1099,93	+ 0,01

The correction shall be added algebraically to the reading.

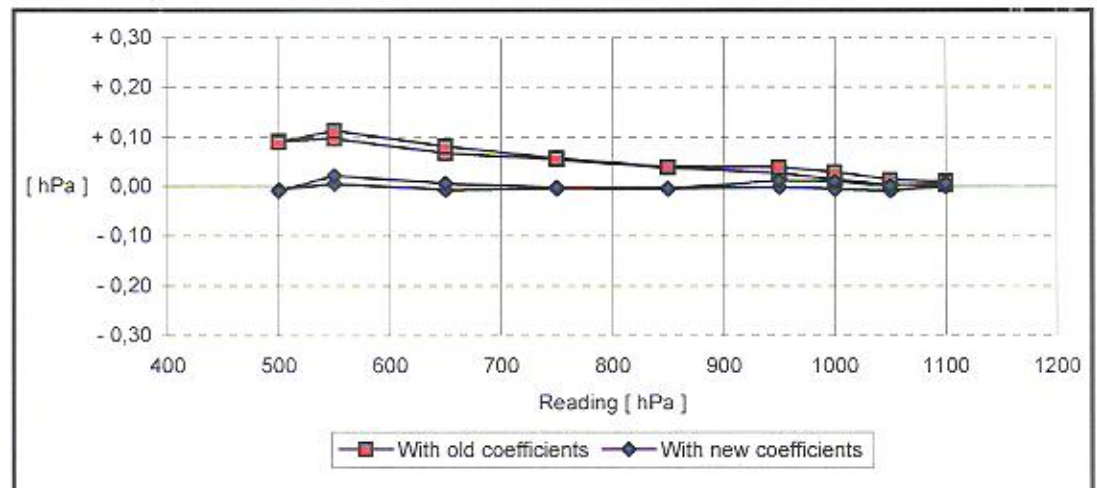


Figure 1. Measurement results

Results

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

Table 4. Final results

Reference [hPa]	With old MPC -corrections		With new MPC -corrections		Uncertainty [hPa]
	Reading [hPa]	Correction [hPa]	Reading [hPa]	Correction [hPa]	
1100,05	1100,04	+ 0,01	1100,05	0,00	± 0,04
1050,03	1050,02	+ 0,01	1050,03	0,00	± 0,04
1000,13	1000,11	+ 0,02	1000,13	0,00	± 0,04
950,12	950,09	+ 0,03	950,12	0,00	± 0,04
850,13	850,09	+ 0,04	850,14	- 0,01	± 0,05
750,16	750,10	+ 0,06	750,16	0,00	± 0,05
650,11	650,04	+ 0,07	650,11	0,00	± 0,05
550,16	550,05	+ 0,11	550,15	+ 0,01	± 0,05
500,09	500,00	+ 0,09	500,10	- 0,01	± 0,06

The correction shall be added algebraically to the reading.

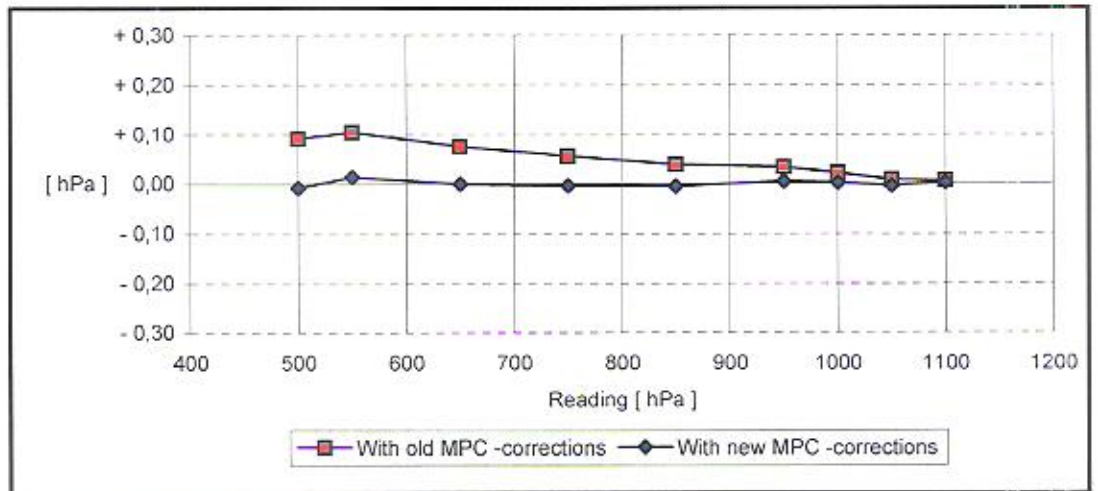


Figure 2. Final results

Conditions

Pressure 1008,9 hPa ± 0,2 hPa
 Temperature + 22,7 °C ± 0,3 °C
 Humidity 37 %RH ± 3 %RH