



APTS Calibration Certificate

N° EXA20P001
- TRA1

Certificate issued by

TRANSPOLIS SAS
620 Route des Fromentaux
01500 Saint-Maurice-de-Rémens
France
Tél +33 (0)4 74 34 00 22 - www.transpolis.fr

Date of issue

20/11/2020

Certificate issued for

Client name
Address
City
COUNTRY

APTS Sensor General Data

Model	APTS-D30-U10-L9-C0
Range (max)	5 bar S
Pressure Cell Serial Number	TRA1
Bladder Serial Number	20-090-31
Dallas ID	970000239E27552C
Excitation voltage (Full bridge)	10 V DC
Input resistance	1190 Ohm
Output resistance	1232 Ohm
Soft cable length	9 m

Calibration Test Conditions

Temperature	20.3°C
Relative humidity	52.1%
Pressure range (Full scale)	4 bars

Instrumentation

Data acquisition system

Type / Supplier	K3700-16 Minidau / KISTLER
Serial nr.	3316
Calibration certificate nr. / date	4239959 / 18-02-2020

Reference pressure sensor

Type / Supplier	PR-33X / 80794 / KELLER
Serial nr.	751064
Calibration certificate nr. / date	20-L35-P109 R01 / 06-08-2020



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Summary of the calibration procedure

The calibration is performed by direct comparison of the pressure signal of the APTS sensor with the reference sensor.

- The sensors are placed one at a time in a pressure vessel.
- After offset adjustment, the air pressure inside the vessel is applied and increased slowly from 0 bar to 4 bars within about 30 seconds, then decreased from 4 bars to 0 bar within about 30 seconds.
- The pressure signals of the reference sensor and the APTS sensors are recorded with the data acquisition system.

The measurement results in the table below, are :

- Applied pressure Pr (Pressure measured by the reference sensor).
- Output signal, given by the APTS sensor.
- Modelling pressure, calculated with column 1 & 2 (linearization of the measurement curve).
- Non-linearity, which is the max value of deviation of the positive slope, given in percentage of the full scale (%FS).
- The sensitivity is the positive slope of the modelling curve, considering the excitation voltage.
- The sensitivity uncertainty is the standard deviation of the sensitivity taking into account 95% confidence interval.
- Hysteresis is the half maximum difference between increasing and decreasing values of the pressure, given in % of the FS.

Results table

Applied pressure Pr (bar)	Output signal (mV/V)	Modelling pressure Pm (bar)	Deviation Pr-Pm (bar)	Non-linearity (%FS)
0.002	-0.004	0.002	0.000	0.0%
0.402	0.231	0.401	0.002	0.0%
0.800	0.466	0.799	0.001	0.0%
1.200	0.701	1.197	0.003	0.1%
1.600	0.936	1.595	0.005	0.1%
2.000	1.176	2.002	-0.002	0.0%
2.400	1.411	2.400	0.000	0.0%
2.801	1.646	2.798	0.002	0.1%
3.201	1.881	3.197	0.004	0.1%
3.601	2.121	3.603	-0.002	0.1%
4.001	2.361	4.010	-0.009	0.2%
3.601	2.121	3.603	-0.002	0.1%
3.201	1.881	3.197	0.004	0.1%
2.801	1.646	2.798	0.002	0.1%
2.400	1.411	2.400	0.000	0.0%
2.000	1.171	1.993	0.007	0.2%
1.600	0.936	1.595	0.005	0.1%
1.200	0.701	1.197	0.003	0.1%
0.800	0.466	0.799	0.001	0.0%
0.402	0.231	0.401	0.002	0.0%
0.002	-0.004	0.002	0.000	0.0%

APTS Calibration Data

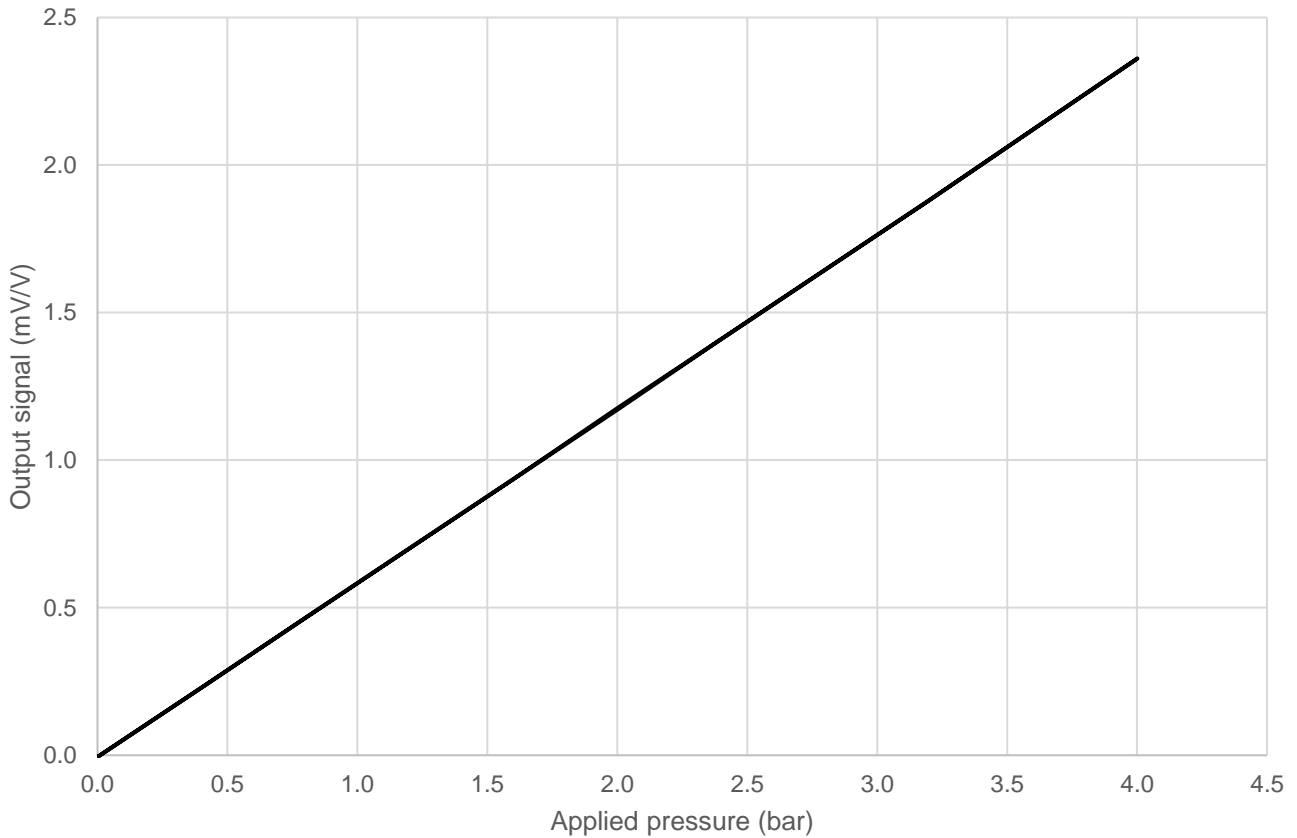
Sensitivity (mV/bar/V)	0.590
Intercept (mV/V)	-0.006
Sensitivity uncertainty U at k=2	0.5%
Sensitivity drift (%)	N.C
Non-linearity (%FS)	0.2%
Hysteresis (%FS)	0.1%



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Output signal vs Applied pressure



APTS Certification Data : Biofidelity Static Response

Sensor specification		Test data	
Delta Pressure (bar)	Belt vertical displacement (mm)	Delta Pressure (bar)	Belt vertical displacement (mm)
1,01 +/-10%	10,81 +/-10%	1.03	10.73
Test result		Passed	

Observation / Additional information

Visa QC : AP

Date : 20/11/2020