Abdominal Pressure Twin Sensors - USER MANUAL

APT SENSORS – GENERAL DESCRIPTION AND SPECIFICATIONS

The APT sensors[1] have been especially designed to measure the abdomen pressure inside dummy to certify child restraint systems during crash test[2].

Each sensor is made of a soft and robust cylindrical elastomer bladder, filled with a specific liquid and sealed with a mechanical head. The sensor head includes a miniature pressure cell and signal conditioning electronics. The key design of the fluid-elastomer assembly enables a very high biofidelity with the real stiffness of abdominal tissues. The ability of the restraint system to meet injury regulatory criteria is assessed by recording the pressure inside the abdomen during the crash impact.

For impact testing, the sensors are inserted vertically by pair in the abdomen.

The V3 current version of the APTS described in this document is available in three dimensions. The nominal diameter of the sensor corresponds to the main dimension accordingly the abdomen Q dummy size; key specifications are provided in Table 2.

- Nominal diameter of 30mm for the Q1 and Q1.5 dummy,
- Nominal diameter of 40mm for the Q3 and Q6 dummies,
- Nominal diameter of 50mm for the Q10 dummy.

The APTS are mounted inside special Q dummy abdomen. Those abdomen assemblies are designed by Humanetics Innovation Solutions featuring two blind holes parallel to the lumbar spine.

The APTS must be inserted in the abdomen with the aluminum cap down and the sensor cables come out of the abdomen through small holes. To reduce the friction with the skin inside the hole, each APTS sensor shall be inserted in a thin Lycra socket (supplied with abdomens). To prevent unwanted slippage during testing, the socket should be attached to the bottom of the hole.

---

[1] The product is patented and is under exclusive license with IFSTTAR. Transpolis SAS keeps intellectual property on the means and methods of production. No use of the drawings and the model can be done without a specific agreement with IFSTTAR and TRANSPOLIS

[2] United Nations agreement concerning the adoption of uniform technical prescriptions. Regulation 129: Uniform provisions concerning the approval of Enhanced Child Restraint Systems used on board of motor vehicles. For frontal impact. The abdomen of the Q1.5, Q3, Q6 and Q10 are instrumented using Abdominal Pressure Twin Sensors (APTS). See the Working Group 12 Report: "The use of thoracic deflection criteria balanced with abdomen pressure criteria for the Q-Series in frontal impacts" (http://www.eevc.org).

Rev. 11.05.2020

Performance, environmental and electrical characteristics

Range (bar / psi / kPa)	5 / 73 / 500	Safe temperature (°C)	-20 to 70
Safe overload	150%	Compensated temperature (°C)	0 to 50
Rated output (mV/bar) (1)	0.42 ±20%	Temperature effect on zero (%RO/°C)	±1%
Non linearity (%RO)	±1% max.	Safe excitation (VDC)	2.4 to 18
Hysteresis (%RO)	±1% max.	Bridge resistance (Ω)	350 ±10%
Cable	Length 9m, PTFE coated, copper wires 6 x AWG 28/7	Compliance	RoHS 3 directive (2015/863/CE)
Plug	Lemo FGG.00.306.CLAD35Z	TEDS (IEEE P1451.4)	DS2431 1024-bit EEPROM chip

Mechanical characteristics

Sensor type	APTS-D30	APTS-D40	APTS-D50
Dimensions L × D (mm)	105 × 30	125 × 40	141 × 50
Weight (g)	81±2%	160±2%	272±2%
Special abdomen P/N	Q1/1.5 : 036-5005	Q3 : 020-5005 Q6 : 033-5005	Q10 : 010-4309
Biofidelity static response (bar/mm) (2)	1.01/10.81 ±10%	0.67/16.51 ±10%	0.60/15.81 ±10%

(1) With constant reference voltage 2.05 VDC
(2) Data obtained after static compression test with a belt: measurement of the pressure (bar) and the deflection (mm) with 250 N load.

GENERAL REQUIREMENTS & RECOMMENDATIONS

It is listed below the general requirements to operate the APTS sensor with the maximum safety and quality regarding the measurement results.

- The APTS should be stored in a temperature control room (around 20 °C/68°F).
- Before their use in test, the APTS should be kept in the test environment at least 4 hours.
- After each test, verify that the APTS are still in place: check the upper bladder position with respect to the abdomen. If the APTS have moved upwards (typically 2 cm or more) then the test results may not be valid and the APTS must be checked for damage (cable, etc.).
- For data processing, pressure signals should be filtered using a CFC 180 filter. Before the test, the signal pressure offset should be cancelled or the pressure value just prior to the test shall be recorded (with the dummy in position). The maximum pressure criterion is the maximum of the left and right pressure (low passed filtered and offset removed).
- To guaranty a high standard quality of the measurements, it is highly recommended to perform an official calibration of the pressure cell at least once a year. The calibration must be done in Transpolis maintenance workshop or in a certified one who is accredited by Transpolis (please ask Transpolis for technical support or maintenance service quotation). During this calibration phase, it is also verified the APTS static response.
- A time interval of at least 30 minutes should be observed between two tests on the same APTS.

SAFETY PRECAUTIONS

Be sure to observe the safety precautions given in the instruction manual in order to ensure correct and safe operation.

Contact Transpolis technical support in case of doubt.

TRANSPOLIS SAS
620 route des Fromentaux – FR-01500 SAINT-MAURICE-DE-REMENS
Tel : +33 (0)474 34 00 22 – contact@transpolis.fr – www.transpolis.fr
S.A.S au capital de 2 109 698€ - RCS Bourg en Bresse 537 689 523
SIRET 537 689 523 00034 – TVA FR00 537 689 523 – APE 7120B