Pitot-Static System PSS-8™
Affordable pitot-static system for small UAVs.

General Description

The purpose of a pitot-static system is to provide a flying vehicle with valuable information about the vehicle’s airspeed, the altitude and temperature of the ambient air.

Many propeller aircraft and UAVs fly slower than jet aircraft and require special pressure and temperature sensors and adapted electronics to account for the much lower impact pressure.

Smaller aircraft are more susceptible to wind gusts and wake turbulence, a fast system response is very important.

Simtec AG has developed a fully self-contained pitot-static system. The system can be installed on most test aircraft, operational aircraft or UAVs. Measured data is sent to an embedded or portable computer in the cockpit or to the flight control computer (FCC) of an UAV for real-time evaluation or post processing.

Pitot-Static System PSS-8™ has the following key features:

– Measures and outputs static pressure, impact pressure and temperature
– Outputs fully calibrated air data at up to 100Hz
– Small, light and durable
– High-Precision
– Affordable
Equipment Definition

Output data on the RS-485 data bus is:

Basic Data:
- Static Pressure (calibrated)
- Dynamic Pressure (calibrated)
- Outside Air Temperature (OAT)

Computed Air Data:
- Pressure Altitude (Hp)
- Calibrated Airspeed (CAS)
- True Airspeed (TAS)
- Mach-Number (M)
- Corrected Air Temperature (COAT)

Functionality:

The following steps describe the basic operation of the Pitot-Static System:

1. The impact pressure and static pressure is picked up and fed to the air data computer box (ADC) by two pressure tubes.
2. The electrical signal of the temperature sensor in the tip of the probe is fed to the ADC by two wires.
3. The sensor signal is amplified and digitized by a microprocessor based electronic circuitry (20 bit A/D conversion).
4. The ADC performs the sensor calibration. Then the embedded microprocessor computes data like altitude, airspeed, etc. from the sensor data.
5. The ADC provides the computed data over a RS-485 interface for further processing.

Operating Range

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Range</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Static Pressure</td>
<td>238 hPa … 1080 hPa</td>
<td>-1’800 ft … 35’000 ft</td>
</tr>
<tr>
<td>Dynamic Pressure</td>
<td>depends on aircraft &lt;350 KCAS</td>
<td>0 … 50 hPa</td>
</tr>
<tr>
<td>Temperature</td>
<td>-60°C … +70°C</td>
<td></td>
</tr>
</tbody>
</table>

Note: The sensors and sensor electronics are adapted to the flight envelop of the flight vehicle.
Electrical Interface

Power Input:
– 28VDC (9VDC ... 32VDC)
– about 30mA at 28VDC

Data Port:
– RS-485 interface (half-duplex)
– Baud rate 230400 bps (optional 115200 bps)

Mechanical Interfaces

The equipment is robust and stiff enough to withstand even very high g-loads.
– Milled aluminium ADC box (EN AW-6082)
– Ø12mm Aluminium Tube (EN AW-7075)
– OAT Sensor (EN AW-7075)
– Various Adaptors

Aluminium parts are anodized.

Equipment Performance

The sensors and electronics of the air data system is adapted to the required operating range of the aircraft to achieve the highest accuracy possible. The following data is valid for the specified operating range (174 KCAS).

Accuracy (Example 174 KCAS)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Range</th>
<th>Accuracy</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Static Pressure</td>
<td>238 hPa to 1050 hPa (-1000 ft to 25000 ft)</td>
<td>0.1%FS pressure</td>
<td>see below notes</td>
</tr>
<tr>
<td>Dynamic Pressure</td>
<td>Example: 0 to 50 hPa (0 to 174 KCAS) max. depends on aircraft</td>
<td>0.1%FS pressure</td>
<td>see below notes</td>
</tr>
<tr>
<td>Temperature</td>
<td>-60°C to +70°C</td>
<td>&lt;1°C</td>
<td></td>
</tr>
</tbody>
</table>

– accuracy is guaranteed at +25°C for standard calibration
– accuracy is guaranteed up to the temperature limits of -45° to +70°C for extended calibration
Data Rate, Resolution, Delay, Bandwidth

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Rate</td>
<td>100 Hz</td>
<td></td>
</tr>
<tr>
<td>Data Resolution</td>
<td>20bit</td>
<td>at ADC level, all calculation is done with 32bit, the final data protocol can increase or reduce the resolution</td>
</tr>
<tr>
<td>Transport Delay</td>
<td>&lt;20ms</td>
<td>Includes pressure sensors and 100Hz delay of data rate</td>
</tr>
<tr>
<td>Bandwidth</td>
<td>20Hz</td>
<td>cut-off frequency at -3dB</td>
</tr>
</tbody>
</table>

Environmental Performance

| Operational Temperature | -45° to +70°C | fully temperature calibrated probes only (deranged performance) |
| Ground Soak Temperature | -55° ... + 90°C |                                                          |

Dimensions and Weight

For details see CAD drawings.

Built-In Tests

Memory, interfaces and other components are tested at start-up. Sensors and electronics are continuously monitored. Errors are annunciated on the data port.

Testing

Every unit is acceptance tested thoroughly before it leaves the workshop. An acceptance test report (ATR) is provided with each unit.

Available Documents

The following document are available on request:

– User Manual
– Interface Definition Document (IDD)
– CAD Drawings
– Price-List
Service and Repair

Should any damage occur during shipping, handling, or misuse by the user, Simtec is able to service it.

Consultation

Technical consultation can be obtained from Simtec if expertise is needed for the integration of the air data system into the aircraft, during flight-testing or post processing of data.

About Simtec AG

Simtec develops and manufactures high-quality and fully self-contained, heated and unheated multi-hole air data systems, pitot-static probes and flow vanes. The products sense static and dynamic pressure, angle of attack, angle of side-slip and air temperature. Simtec's products are all Swiss Made. Simtec operates its own wind-tunnels and calibration laboratories.

Swiss Air Data Systems are used on unmanned aerial vehicles (UAV), remotely piloted aircraft (RPA), drones, aircraft, helicopters and for flight testing.

Simtec has a broad customer base that covers small start-up companies up to the largest aerospace companies all over the world.

Simtec AG is a small, family owned company duly organized and existing under the laws of Switzerland, registered in the Commercial Register of Basel-Landschaft, under company number CHE-110.048.055, having its registered office located at Gewerbestrasse 7 in 4147 Aesch, and with VAT number CHE-110.048.055 MWST. The company has been founded in 2003.

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Revision 5, 10.08.2018
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