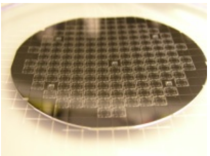
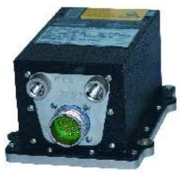
HISVESTA

HIgh Stability VErtical SeparaTion Altimeter instruments

D3.4 Demonstration kit (for TP4000)

WP3 Altimeter transducer

January 2011

Responsible: Memscap AS, Norway

Date / Revision 2011-01-27 / Revision 1
Dissemination level: PU = Public

Contract No: 213729 HISVESTA
Instrument: Collaborative Project, Small or medium-scale focused research project
Research Area: FP7-AAT-2007-RTD-1
Coordinator: SINTEF, Norway

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HISVESTA is a specific targeted research project running under EU's 7th Framework Programme, theme 7 Transport (including Aeronautics). The project started in January 2009 and will run until June 2011.

The project is the next step in solving the remaining RTD challenges after the successful HASTAC[1] project in FP6. The project will develop a new generation of altimetry module, suitable for fixed wing and rotary wing applications, which will give altitude accuracy capabilities significantly improved over those currently available today. Air Data Computer and aircraft flight testing performed in the project will demonstrate the effectiveness of the performance improvement.

SINTEF (Norway) coordinates the project. Memscap AS (Norway), Microelectronica SA (Romania), Curtiss-Wright Controls Ltd (Penny & Giles Aerospace Ltd) (United Kingdom) and Ceramica Ingenua SRL (Romania) are project partners.

www.sintef.no/hisvesta

[1] www.sintef.no/hastac

Revision history

Date	Version	Author	Comments
2011-01-27	0.1	OHG	
2011-02-07	1.0	DTA	QA

Contents

1 Introduction

In the HISVESTA project, one of the main outcomes are the new pressure transducer TP4000, as well as other pressure transducer versions in different pressure ranges.

In order to ease the test Set-Up, and to go around more sophisticated and time consuming programming tasks, one Milestone, and a specific Deliverable in the project was to establish a Evaluation Kit for the TP4000 transducers.

The evaluation kit should make it possible to, within few minutes connect to any PC, and run demonstration of pressure testing of the TP4000 pressure transducers developed in the project.

An early version of the Evaluation Kit and software was sent to Penny&Giles for performance testing of transducers during 2010, and was used to ease the integration of the HISVESTA transducers into Air Data Computer applications.

This document describes the functions, the set-up and use of the Evaluation Kit.

2 Description of TP-USB-4000 evaluation kit

2.1 Overview

The TP to USB converter is only meant for evaluation purposes and is not intended for real aircraft or flight usage. It has mechanical, electrical and software support for connection of TP2000, TP3100 and TP4000 pressure transducers.

Figure 1 – TP to USB converter

2.1.1 Contents of the evaluation kit

- TP to USB converter (TPUSB)
- USB cable
- CD with demo software
- Evaluation kit user manual
- Extension cable (for differential pressure transducers)

2.1.2 System requirements

- Computer with 100 Mbytes free space on HDD and one free USB port.
- Windows XP with service pack 2 or Windows 2000 with service pack 4 or newer.
- Web browser (optional – documentation can be accessed manually)

2.2 Installation

2.2.1 Installation of the TPUSB Evaluation software

Insert the CD into your computer. An autorun-file should start the installation automatically. If the setup do not start automatically, you should run the file named “setup.exe” on the CD manually. The setup program is a self-extracting installation program, which will guide you through the installation of the software as illustrated in 2 to **Figure 7**.

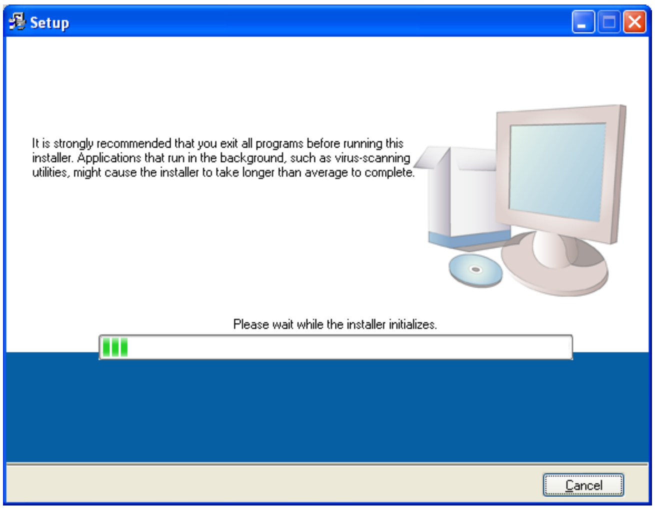


Figure 2 – Wait while initialising

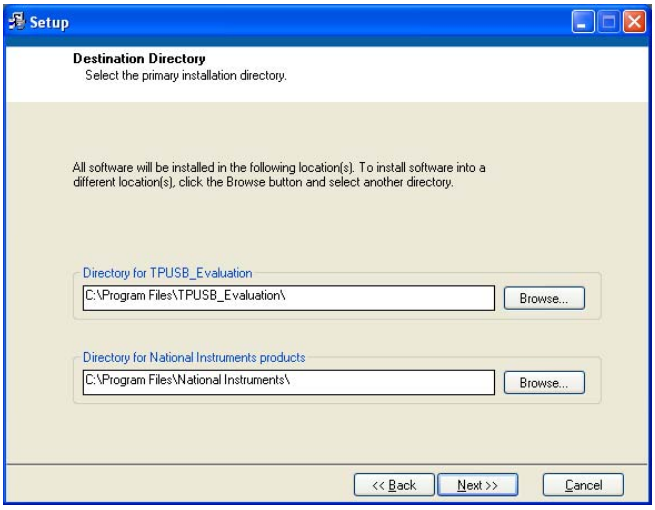


Figure 3 – Select directory and click next

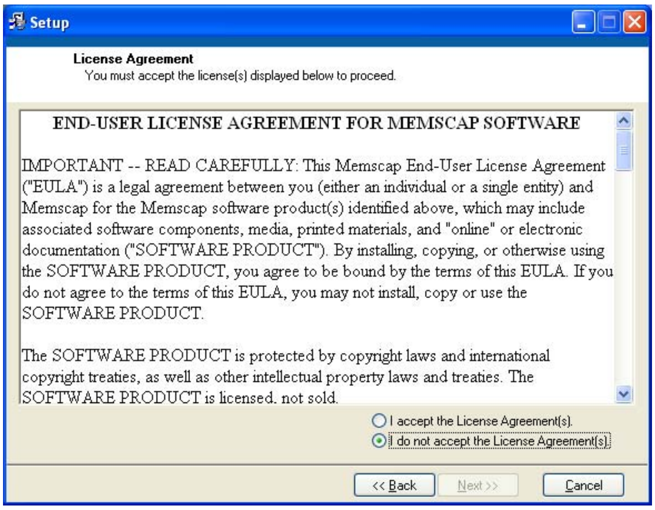


Figure 4 – Accept agreement and click next

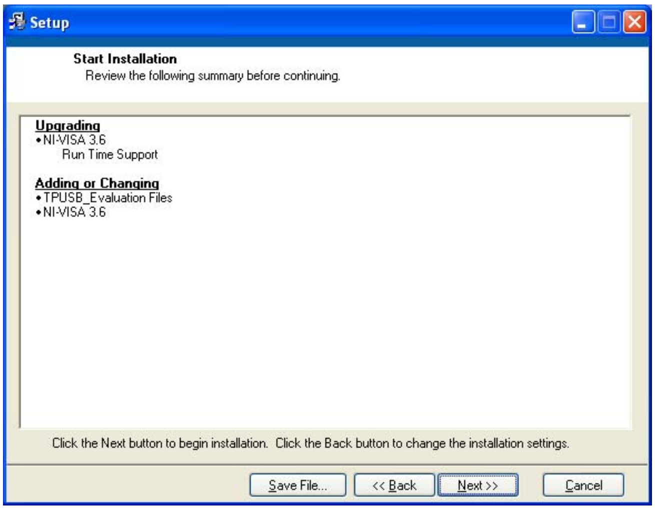


Figure 5 – Review and click next

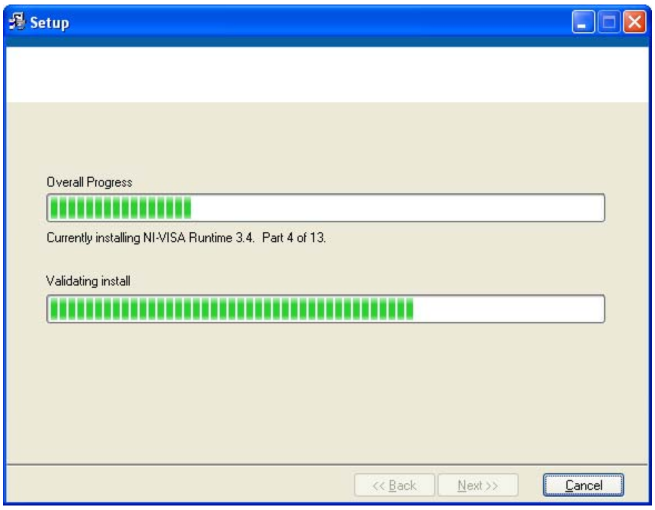


Figure 6 – Wait while installing

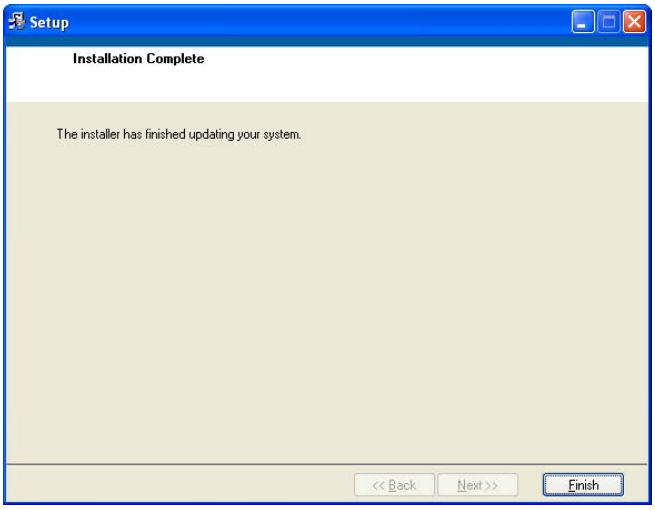


Figure 7 – Click finish, and reboot if asked

A shortcut to the software is automatically added to the start menu. It is located under Start → Programs → TPUSB_Evaluation → TPUSB_Evaluation. To remove the program from the computer use the Add / Remove Programs from control panel, located under the start menu of the computer.

2.2.2 Installation of the USB driver

It is important to install the drivers prior to connecting the hardware.
With the appended CD still inserted, please execute "*\CP210x Driver\CP210xVCPInstaller.exe*" on the CD manually.

Figure 8 – Click install to continue and follow the directions

When installation is finished, connect the USB cable from the computer to the SPI to USB converter. Hardware and driver recognition should now execute automatically.

2.2.3 Virtual COM port identification

After driver installation, the COM port number for the TPUSB can be found in the device manager (Start → Control panel → System → Hardware → Device manager → Ports):

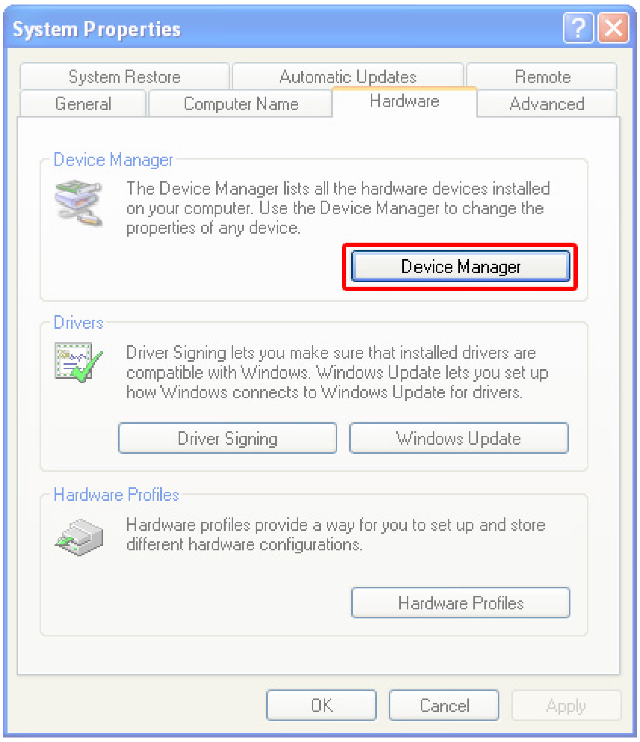


Figure 9 – Hardware in system properties

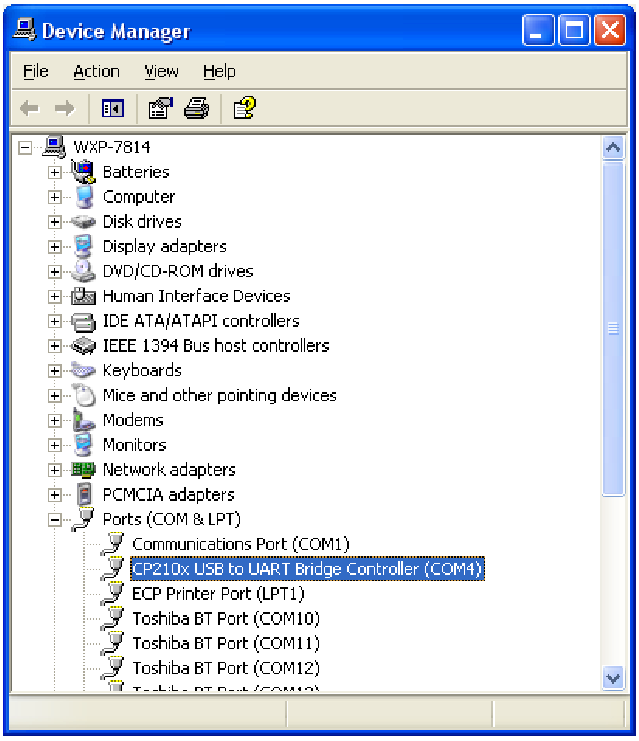


Figure 10 – Device manager

The COM port number can be found after the "CP210x USB to UART Bridge Controller" inside "Ports (COM & LPT)" in 10.

2.3 Running the demo system

2.3.1 Connecting hardware

Connect the TP to USB converter to your computer using the USB cable. How to identify the virtual serial-port (com-port) to use is described in last chapter. Make a note of the specific com-port used. Place the TP unit onto the converter. **Figure 11** shows the orientation of a TP4000 unit while connecting. Connection must be according to the TP to USB converter marking.

Figure 11 – Connection of a TP4000 unit

Extension cable

In cases where a TP unit has a differential pressure sensor, the extension cable must be used to be able to connect the TP unit onto the TP to USB converter. When using the extension cable, make sure that the TP is not rotated to obtain the correct orientation. Failure to observe this requirement can permanently damage the TP to USB converter.

Power supply

The TP to USB converter and the connected TP unit is supplied with 5 VDC from USB. To be able to supply TP units with required power, the converter contains a voltage doubler. The supplying computer must comply with the USB standard (from 4.375 to 5.25 V, 100 mA).

2.3.2 TPUSB Evaluation software

Start the TPUSB Evaluation software, located in the start menu (Start → Programs → TPUSB_Evaluation → TP USB-TP4000). **Figure 12** shows the initial graphical user interface (GUI) for the software. Select COM port (as identified in last chapter) in the pull-down menu in this GUI (User Interface), click on “Read EEPROM” and then Press the “Read TP” button. Optionally the port can be typed in.

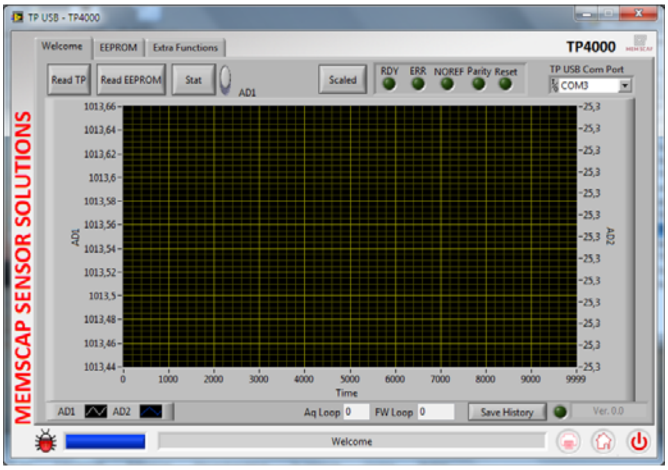


Figure 12 – Initial GUI for TPUSB_Evaluation

Description of the main GUI

The main GUI (User Interface) in **Figure 13** consists of a graph showing the pressure and temperature from the TP unit elapsed during time of measurement. The graph auto scales pressure (y-axis left side, white curve) to make the best resolution during time. The y-axis on the right side shows the temperature (blue curve). The pressure and temperature can be displayed either in scaled or raw values (ADC values) by toggling the “Scale” button.

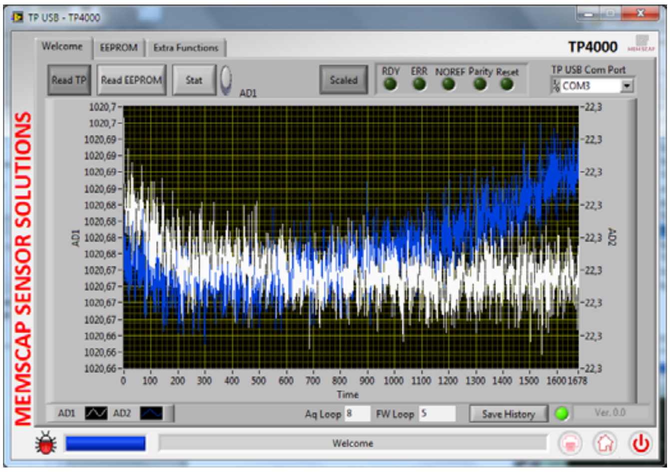


Figure 13 – Main GUI for the software (TP4000)

A status field is displayed above the graph containing **RDY, ERR, NOREF, Parity and Reset**.

RDY:

Ready bit for the ADC. Cleared when data is written to the ADC data register. The RDY bit is set automatically after the ADC data register is read, or a period of time before the data register is updated with a new conversion result, to indicate to the user that the conversion data should not be read. It is also set when the part is placed in power-down mode or idle mode or when RDY SYNC is taken low.

The end of a conversion is also indicated by the DOUT/RDY pin. This pin can be used as an alternative to the status register for monitoring the ADC for conversion data. RDY

ERR:

ADC error bit. This bit is written to at the same time as the RDY bit. The ERR bit is set to indicate that the result written to the ADC data register is clamped to all 0s or all 1s. Error sources include over range or under range or the absence of a reference voltage. The bit is cleared by a write operation to start a conversion.

NOREF:
No external reference bit. This bit is set to indicate that the selected reference (REFIN1 or REFIN2) is at a voltage that is below a specified threshold. When set, conversion results are clamped to all 1s. This bit is cleared to indicate that a valid reference is applied to the selected reference pins. The NOREF bit is enabled by setting the REFDET bit in the configuration register to 1.

Parity:
Parity check of the data register. If the ENPAR bit in the mode register is set, the parity bit is set if there is an odd number of 1s in the data register. It is cleared if there is an even number of 1s in the data register. The DAT_STA bit in the mode register should be set when the parity check is used. When the DAT_STA bit is set, the contents of the status register are transmitted along with the data for each data register read.

Reset:
Reset check of the ADC. This checks the channel bit in the status register and if the 2 LSB is set to 0 there has been a Reset or a bower glitch.

The “Stat” button gives you the possibility to do some noise evaluation on both Pressure and Temperature readings. This by toggling the AD1 or AD2 then press 2 “Stat” button while the program reads the TP4000.

Description of the EEPROM GUI

The EEprom Gui allow you to read, write and view the content of the EEprom. This is meant for evaluation of the embedded implementation of the transducer to secure the translation of the EEProm content. Note that a change in EEprom values regarding ADC setup and calibration data will affect the calibration of the transducer.

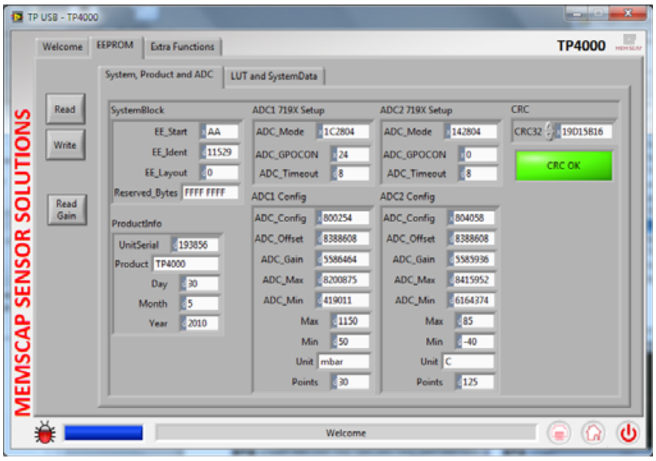


Figure 14 – EEProm System, Product and ADC

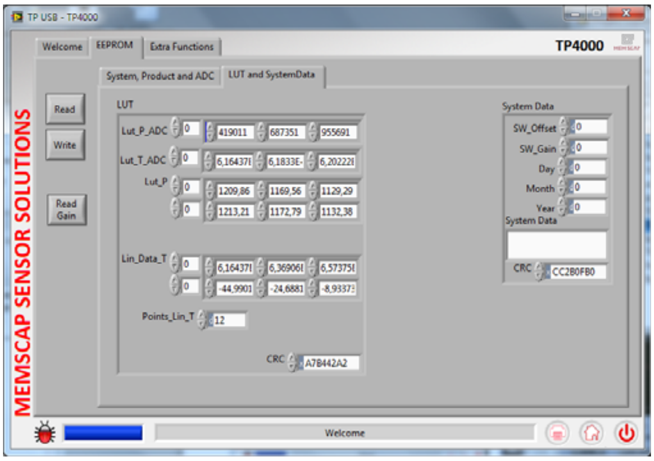
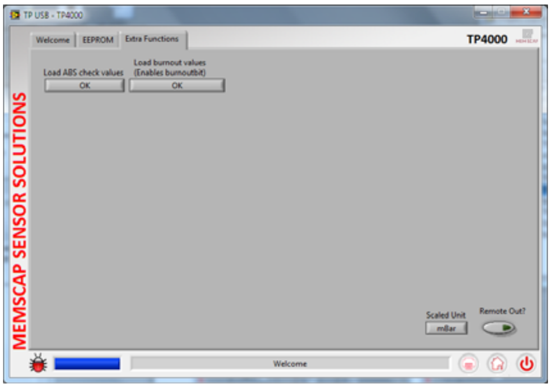


Figure 15 – EEProm LUT (Look Up Table) and SystemData

Description of the Extra functions

Load ABS check values:
This function set up the ADC to measure the on board reference.

Load burnout values:
This extra function is implemented to review the effect and function of the Burnout.
The burnout function is controlled by the config register in the ADC. When this bit is activated the ADC connect a 500nA current to the input Lo and Hi of the ADC. This will check the sensor connected to the ADC for broken wires/connection. If there is a broken connection to the sensors whetstone bridge the signal will go to under range or over range.



3 Summary

This document describes the function, set-up and use of the TP4000 Evaluation Kit. For more details or questions contact sensors@memscapo.com or enquire via www.memscap.com as significant parts of the design are confidential information, not freely available.

Appendix 1 Technical specification

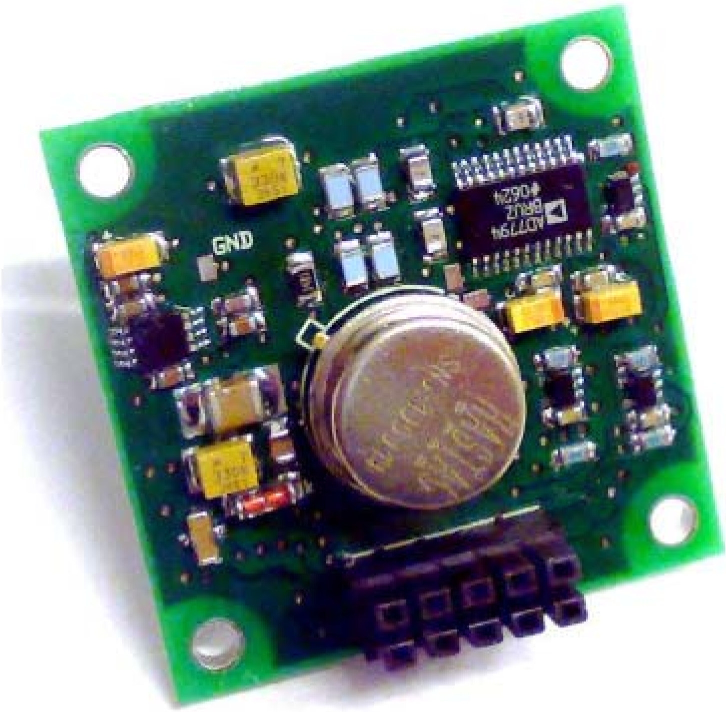


Figure 1 – TP4000

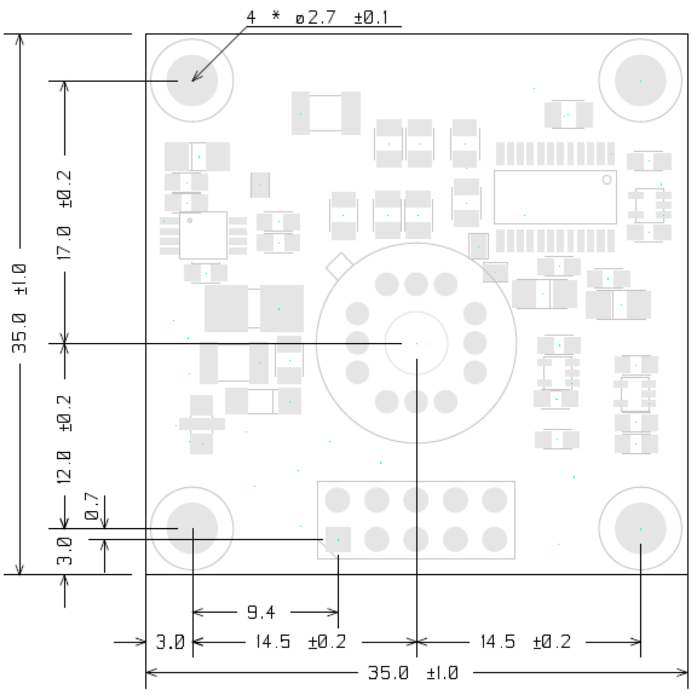


Figure 2 – Mechanical dimensions top view in mm

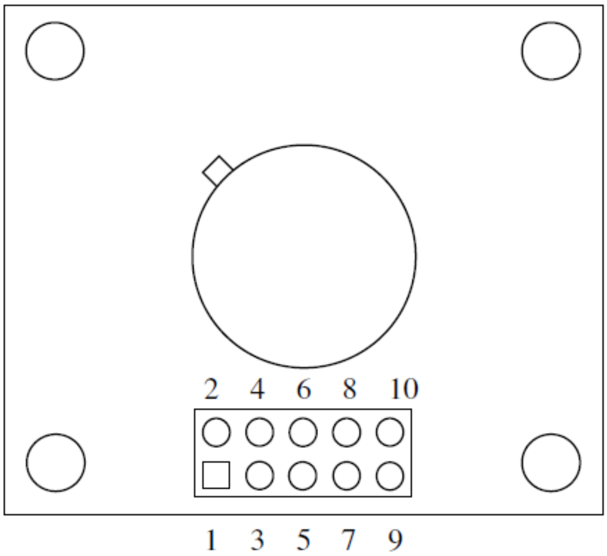


Figure 5 – Pin configuration

Pin number	Function
1	Power
2	EE_CS
3	EE_WP
4	SCLK
5	MISO
6	VCC_ERR
7	ADC1_CS
8	ADC2_CS
9	GND
10	MOSI

Table 3 – Pin functions

This block schematic illustrates the functionality in TP4000, and how to connect to an external system:

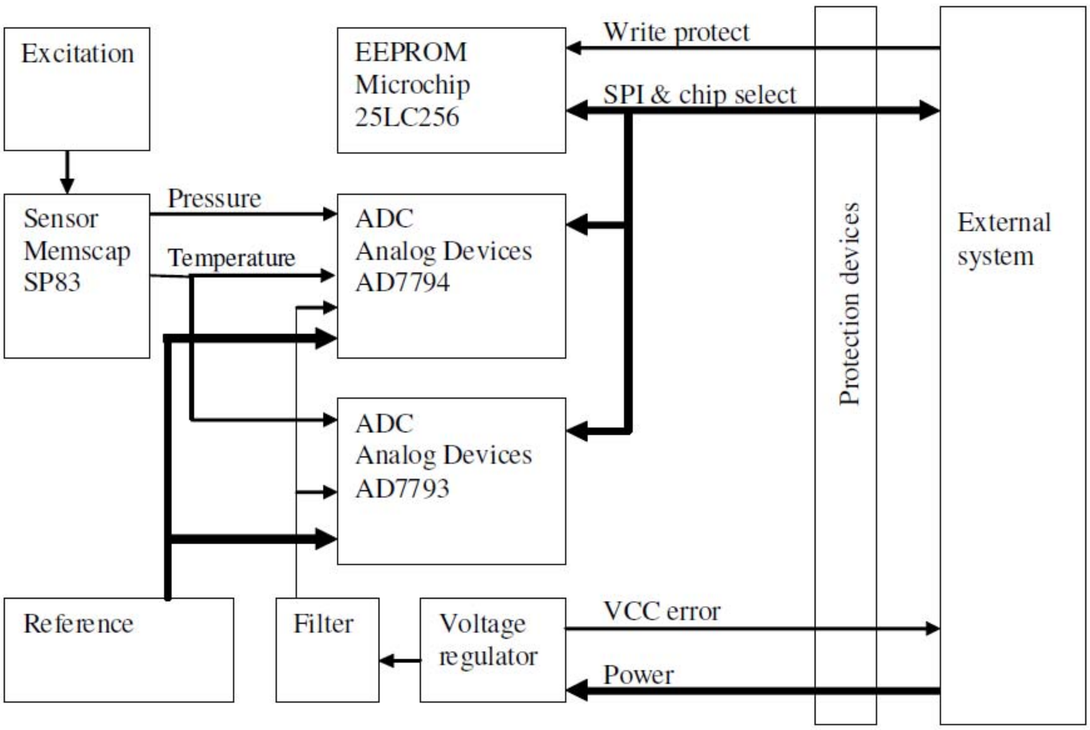


Figure 4 – TP4000 block schematic