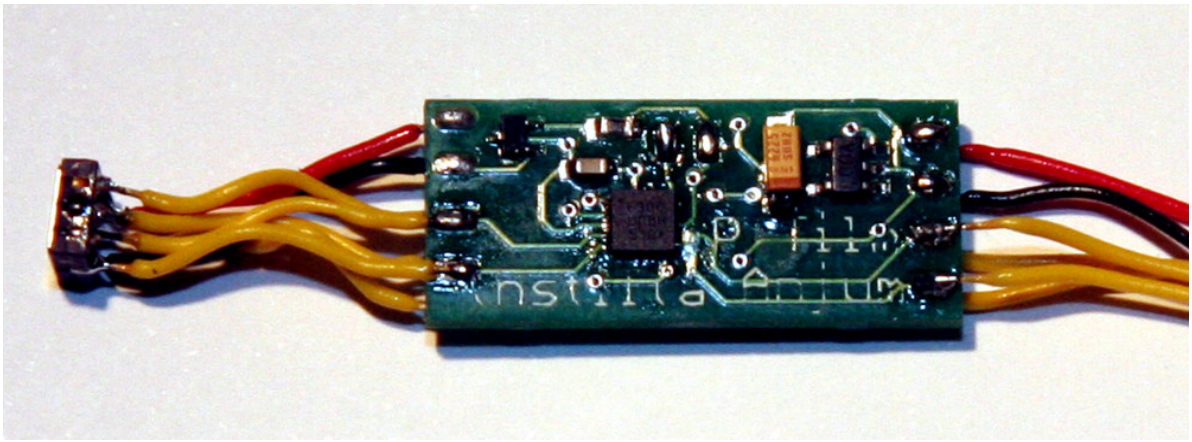
Manual

Two axis inclinometer TILT001-2AO-UART



Features

- Two axis inclination measurement
- Sensor seperated from printed circuit board
- UART serial interface.
- Two software configurable analog outputs.
- Small footprint.
- Desktop software.

Internet : www.ptilmahse.nl
Preliminary datasheet. Subject to change without notice.

Section 1 - **Contents**

Section 2 - **General description**

The **TILT001-2AO-UART** is a two axis intelligent inclinometer. The sensor part is seperated from the printed circuit board. This allows for inclination measurement in small spaces. Commands and data can be send to or received from the module through an onboard UART serial interface. The module is equipped with two analog outputs. On these outputs digital inclination data is translated to corresponding voltages. One of the voltage outputs can be configured to represent the vectorial addition of the X-axis and Y-axis inclination values.

Section 3 - **Technical specifications**

Electrical	
Supply voltage	6V..15V
Power consumption	10mA at 12V
Analog outputs(2)	0 .. 5V (12-bit resolution)
Serial interface	UART (3.3V logic)

Mechanical	
Board size (length x width x height)	26mm x 11mm x 4mm
Sensor size (length x width x height)	5mm x 5mm x 2mm (ADXL213)
Distance sensor board	max. 7 cm

Environmental	
Operating temperature	-10°C .. +30°C

Measurement	
Number of axes	2
Range per axis inclination / acceleration	70° / 1000mg
Inclination resolution / accuracy	0.1° / 0.2°
Acceleration resolution / accuracy	1 mg / 5 mg

Software	
UART communication parameters	9600 baud, 8 databits, 2 stopbits, no parity
Communication protocol	ASCII commands (see table)
Desktop application	Windows/x86

Section 4 - **Software commands**

With the supplied PC application program (or a third-party terminal program) it is possible to communicate with the module. Commands are implemented to perform calibration, change operational mode, request measurements for inclination and identify embedded software.

Test	Description	Answer
<cr>	Software version	**softw,0105<crlf>**
getRate<cr>	Update rate per second	**rate,7<crlf>**

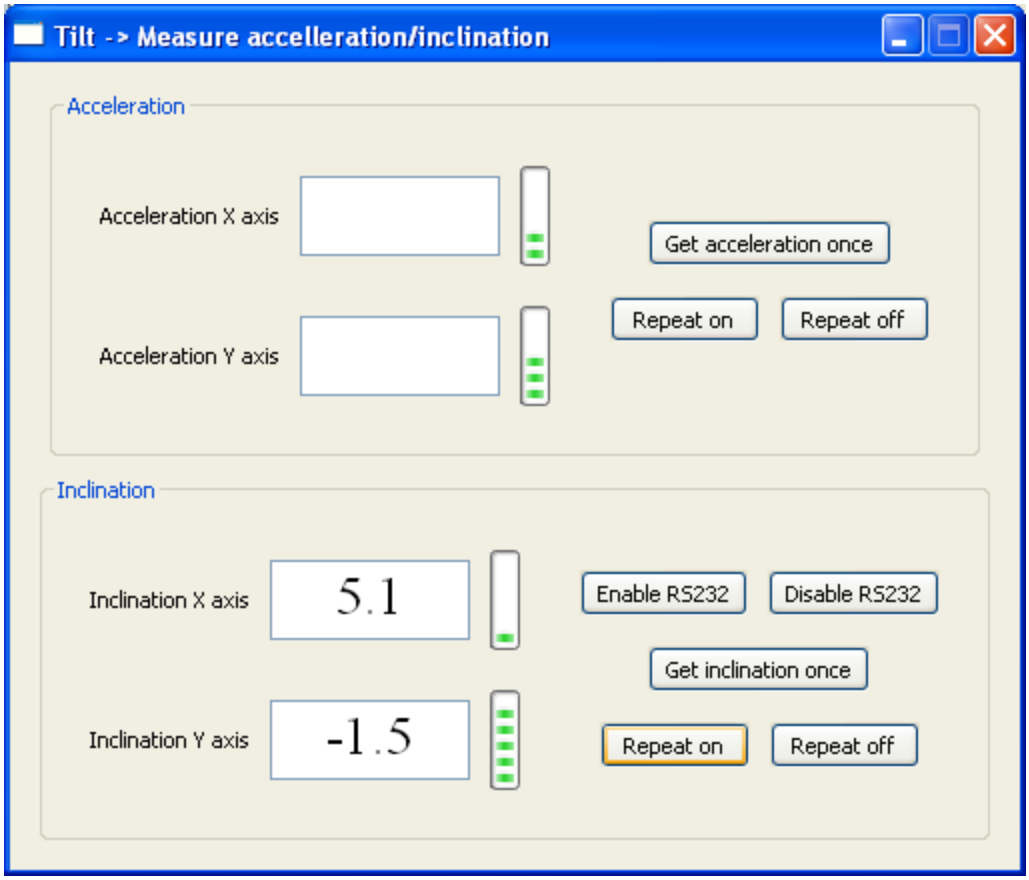
Measurement	Description	Answer
getAccel<cr>	Acceleration values for X-axis and Y-axis	**accelX,300<crlf>** **accelY,-600<crlf>**
repAccelOn<cr>	Acceleration values for X-axis and Y-axis continuously.	
repAccelOff<cr>	Repeat function off for accelleration	
getIncl<cr>	Inclination values for X-axis and Y-axis	**inclX,-15<crlf>** **inclY, 3<crlf>**
repInclOn<cr>	Inclination values for X-axis and Y-axis continously.	
repInclOff<cr>	Repeat function off for inclination	

Initialisation	Description	Answer
initNv<cr>	Set calibration variables to default	
setDaMode,4<cr>	Configure analog output mode	
getDaMode<cr>	Read current analog output mode	**daMode,3<cr>**
rs232On<cr>	Enable inclination data to serial port	
rs232Off<cr>	Disable inclination data to serial port	

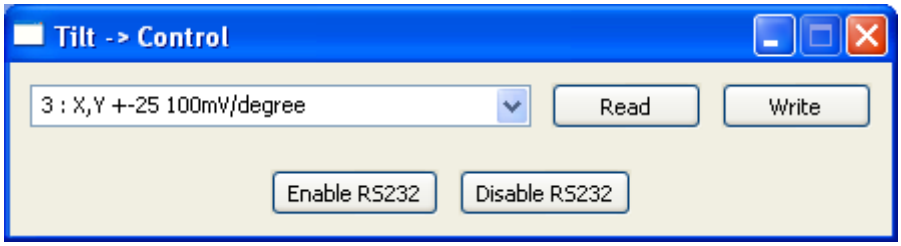
Calibration	Description	Answer
setCalXh<cr>	Set calibration value for X-axis horizontal	
setCalXv<cr>	Set calibration value for X-axis vertical	
getCalXh<cr>	Get calibration value for X-axis horizontal	**calXh,50000<crlf>**
getCalXv<cr>	Get calibration value for X-axis vertical	**calXv,30000<crlf>**
setCalYh<cr>	Set calibration value for Y-axis horizontal	
setCalYv<cr>	Set calibration value for Y-axis vertical	
getCalYh<cr>	Get calibration value for Y-axis horizontal	**calYh,50000<crlf>**
getCalYv<cr>	Get calibration value for Y-axis vertical	**calYv,30000<crlf>**

Section 5 - **Screenshots PC application**

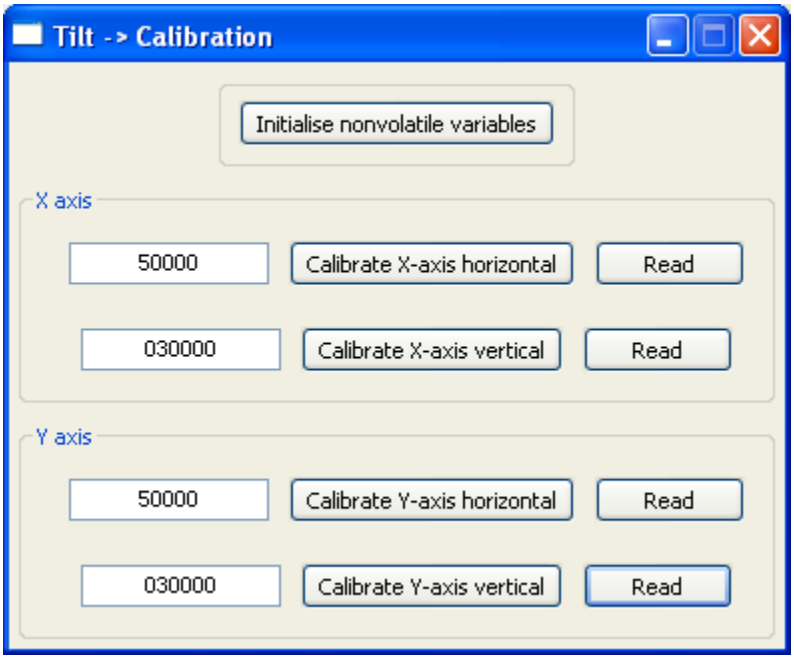
Main window



Display inclination or acceleration



Configuration analog outputs



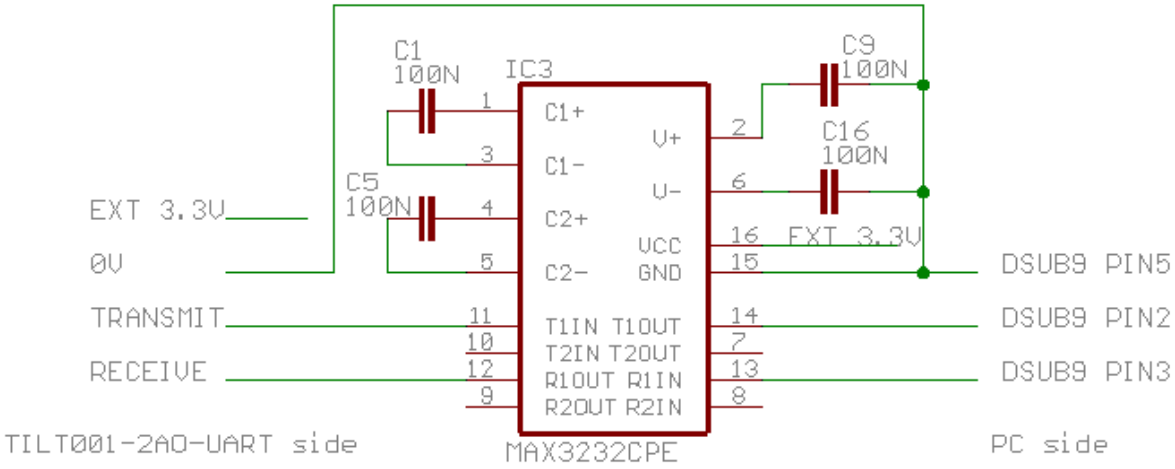
Calibration

Section 6 - **Analog outputs**

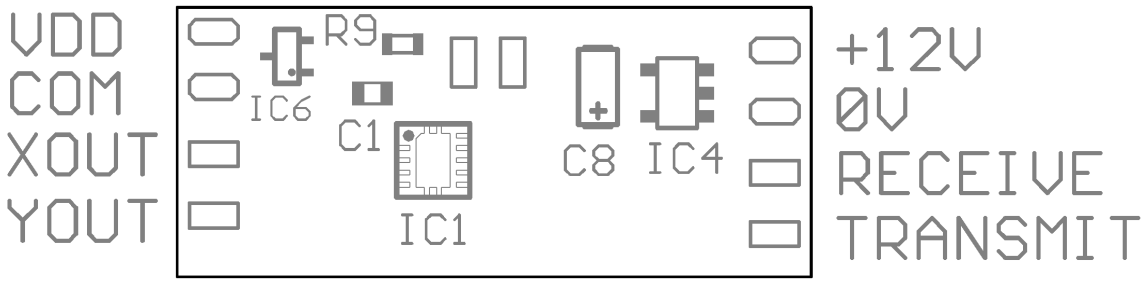
Depending on one of eight different modes inclination angles are translated to voltage outputs.

Mode	Range (X, Y)	Analog output 1 [mV]	Analog output 2 [mV]
0	-5° .. +5°	$2500 + (500 * X)$	$2500 + (500 * Y)$
1	-10° .. +10°	$2500 + (250 * X)$	$2500 + (250 * Y)$
2	-16° .. +16°	$2500 + (150 * X)$	$2500 + (150 * Y)$
3	-25° .. +25°	$2500 + (100 * X)$	$2500 + (100 * Y)$
4	-5° .. +5°	$500 * \sqrt{(X^2 + Y^2)}$	$500 * \sqrt{(X^2 + Y^2)}$
5	-10° .. +10°	$250 * \sqrt{(X^2 + Y^2)}$	$250 * \sqrt{(X^2 + Y^2)}$
6	-16° .. +16°	$150 * \sqrt{(X^2 + Y^2)}$	$150 * \sqrt{(X^2 + Y^2)}$
7	-25° .. +25°	$100 * \sqrt{(X^2 + Y^2)}$	$100 * \sqrt{(X^2 + Y^2)}$

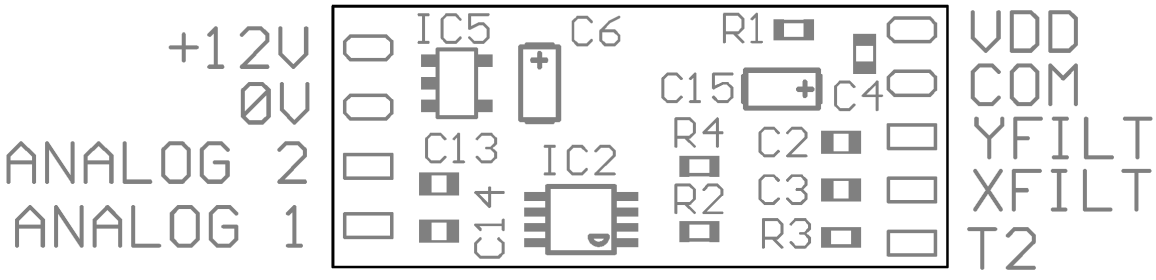
Section 7 - **Serial port interface.**
With the following circuit between PC and the TILT001-2AO-UART it is possible to setup a communication link.



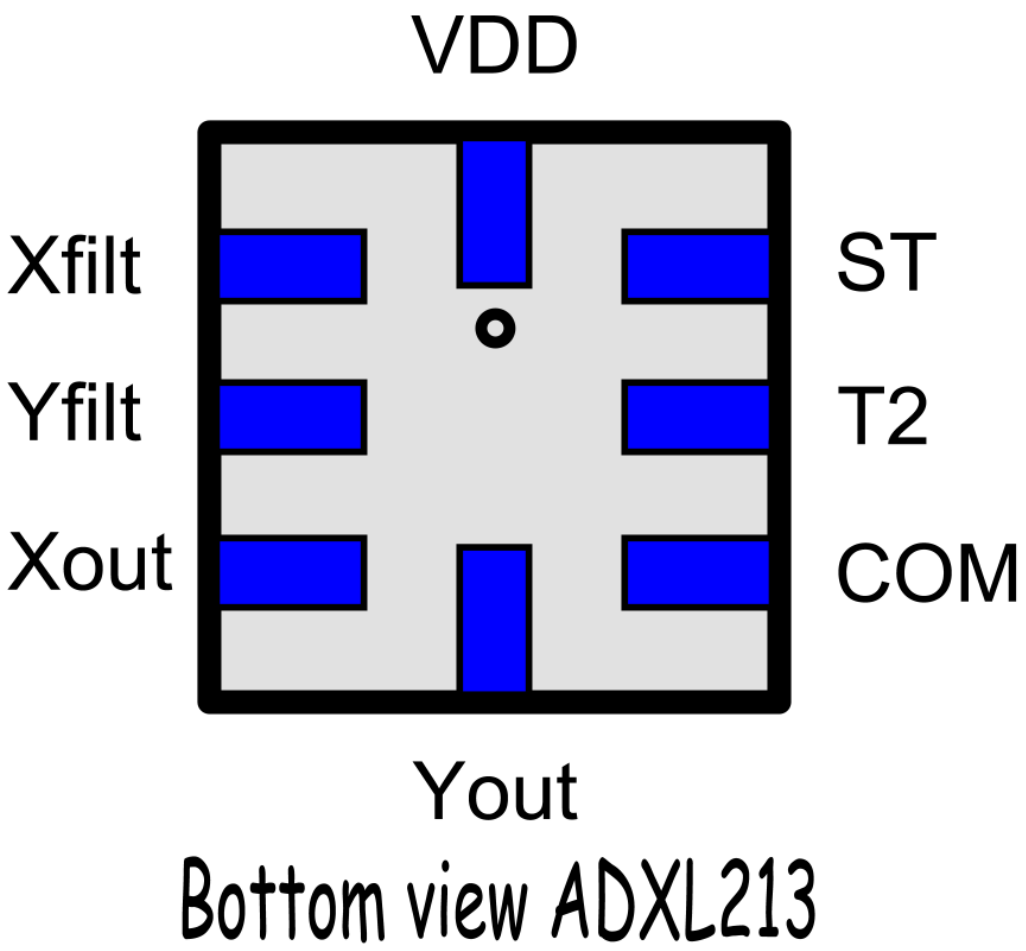
Connections printed circuit board top view :



Connections printed circuit board bottom view :



Section 8 - **Pin configuration ADXL213**



Bottom view ADXL213

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