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**Operation Manual**  
**Thorlabs Instrumentation**  
**Fast Inline Polarimeter**  
**IPM5300**



**2008**

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**THORLABS**

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We aim to develop and produce the best solution for your application in the field of optical measurement technique. To help us to come up to your expectations and develop our products permanently we need your ideas and suggestions. Therefore, please let us know about possible criticism or ideas. We and our international partners are looking forward to hearing from you.

*Thorlabs*

This part of the instruction manual contains every specific information on how to handle and use a IPM5300 card. A general description is followed by explanations of how to operate the unit remotely.

## **Attention**

**This manual contains “WARNINGS” and “ATTENTION” label in this form, to indicate dangers for persons or possible damage of equipment.**

**Please read these advises carefully!**

## **NOTE**

This manual contains also ‘notes’ and ‘hints’ written in this form!

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# 1 General description

## 1.1 Safety

### **Attention**

All statements regarding safety of operation and technical data in this instruction manual will only apply when the unit is operated correctly.

Patchcords must only be installed or removed with the corresponding laser source switched off.

Modern electronics and laser diodes mostly are sensitive to electrostatic discharges. Please take precaution to discharge your body before changing cards or lasers and apply the general rules for handling MOS devices!

This precision device is only dispatchable if duly packed into the complete original packaging including the plastic form parts. If necessary, ask for a replacement package

### **Attention**

Mobile telephones, cellular phones or other radio transmitters are not to be used within the range of three meters of this unit since the electromagnetic field intensity may then exceed the maximum allowed disturbance values according to EN 50 082-1.

The TXP must not be operated in explosion endangered environments.

## 1.2 Features

- **LabVIEW®- and LabWindows/CVI®-driver**

For the TXP-series cards *Thorlabs* supplies drivers for LabVIEW®- LabWindows/CVI®, MSVC and Borland-C.

Please refer to our homepage for the latest driver updates.

<http://www.thorlabs.com>

### 1.2.1 Ordering Codes

**IPM5300**

TXP Inline Polarimeter



## 1.3 Technical Data IPM5300

(All technical data are valid at  $23 \pm 5^\circ\text{C}$  and  $45 \pm 15\%$  humidity)

### Common technical data:

Operating Temperature	+5 ... + 40 °C
Storage temperature	- 40 ... + 70 °C
Weight	560 g
Optical input / output connector	FC / APC
Warm-up time for rated accuracy	10 min
Mechanical width	2 slots

### Optical Parameters

Wavelength range	1500 ... 1640 nm
Possible Wavelength range (user calibration)	1200 ... 1700 nm
Insertion loss (excl. Connectors)	< 0.5 dB
Insertion loss (incl. Connectors)	< 1 dB
Dynamic range	45 dB
Sampling Rate	3 S/s ... 1 MS/s (selectable)
Max. Input Power	+15 dBm
PDL	< 0.05 dB
Measurable SOP States	full Poincaré Sphere
Averaging time Continuous mode	10 $\mu\text{s}$ ... 300 ms
Averaging time Buffered Mode	1 $\mu\text{s}$ ... 300 ms
SOP Accuracy	$\pm 0.25$ deg. on Poincaré Sphere <sup>1)2)</sup>
DOP Accuracy	$\pm 0.25\%$ <sup>1)</sup>
Rel. Power meas. Accuracy	$\pm 0.01$ dB <sup>1)</sup>
Abs. Power meas. Accuracy ( $P_i > -20$ dBm)	$\pm 0.3$ dB
Dynamic Input power range	45 dB, -30 ... +15 dBm
Parameter Resolution	
DOP	0.01%
SOP angles	0.01°
$S_1, S_2, S_3$	0.0001
Analog monitor output	-2.5 V ... + 2.5 V

<sup>1</sup> At power  $0 \pm 3$  dBm, averaging time >1ms

<sup>2</sup> Accuracies referring to the IPM5300 internal reference plane

## 1.4 Operating Elements at the Front of the Card

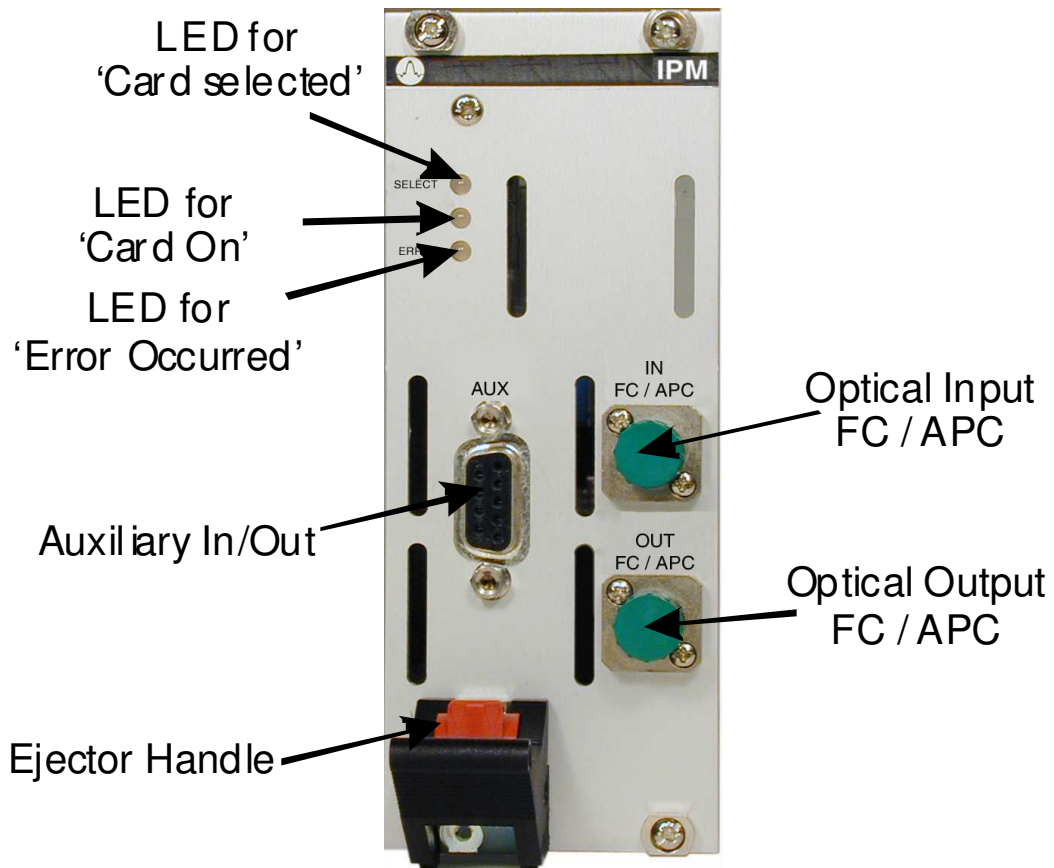
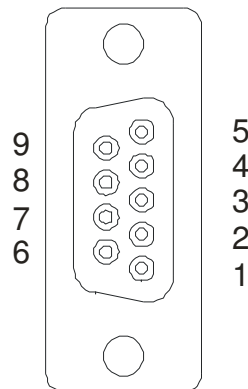


Figure 1 Operating elements on front panel

## 1.5 The Auxiliary Connector



**Figure 2 The Auxiliary Connector (D-SUB 9, f)**

PIN	Name	I/O	Value	Function
1	Trigger	I	3.3/5V	External Trigger-signal (0V=L, 3.3 ... 5V=H) (for array mode)
2	AGND			Analog ground for analog inputs
3	DOP	O	-2.5 ... +2.5V	Degree of Polarization (0 ... 125%) -2.5V=0%, 0V=62.5%, +1.5V=100%
4	S <sub>2</sub>	O	-2.5 ... +2.5V	Normalized Stokes Vector S <sub>2</sub> (-1 ... +1)
5	Power	O	-2.5 ... +2.5V	Optical Power log. (-30 ... +20 dBm) 0V = -5 dBm
6	DGND			Digital ground for Trigger
7	Analog In	I	0 ... +2.5V	Analog Control signal (not used here)
8	S <sub>3</sub>	O	-2.5 ... +2.5V	Normalized Stokes Vector S <sub>3</sub> (-1 ... +1)
9	S <sub>1</sub>	O	-2.5 ... +2.5V	Normalized Stokes Vector S <sub>1</sub> (-1 ... +1)

## 1.6 Installing and removing Cards

The Thorlabs TXP series mainframes and cards are 'Hot-Swappable', that means you do not have to switch off the mainframe while exchanging cards:

- Loosen the four mounting screws on top and below the ejector handle (see Figure 1)
- Push the red button of the ejector handle and flip down the black ejector handle. This pulls out the card from its internal plug.

You can now remove the card. If you do not insert another card, please close the empty slot with a blind module to maintain a proper cooling air flow inside of the unit. Re-tighten the four screws.

### NOTE

All Slots of the TXP must be occupied, either by a card or by a blind module to maintain proper air flow for internal cooling!

## 2 Getting Started

This section gives a quick introduction how to operate the IPM5300.

### 2.1 Preconditions

1. Precondition: you have installed and initialized the connection between the TXP and your PC according to the manual of the corresponding TXP mainframe.
2. You have installed the card specific software driver (is normally installed together with the TXP Administrator and TXP Explorer. If not, insert the CD-ROM delivered with the TXP / card into your CD-ROM drive. If the 'autorun' function is active on your PC, the installation program should start automatically. If not start the program 'TXP\_Series\_Instrumentation.exe' on the CD. The installation wizard leads you through the installation process. When it comes to the type of installation, select 'Custom Installation'. Then mark the components for the IPM modules and proceed with the installation.
3. Insert the IPM5300 card in your TXP mainframe (see 1.6 Installing and removing Cards).
4. Switch on the TXP if not yet done


The TXP system is now ready for operation and you can start the card specific graphics user interface (GUI).

## 2.2 The Graphics User Interface (GUI)

### 2.2.1 Start the GUI

To start the graphics user interface you have two possibilities:

1. Use the TXP Explorer or
2. Directly start the program: TXP\_Polarization\_Tools.exe

1) Start the TXP-Explorer and connect to the desired mainframe . You will get a system overview of the selected TXP mainframe (all TXP-Explorer details are explained in the mainframe manual):

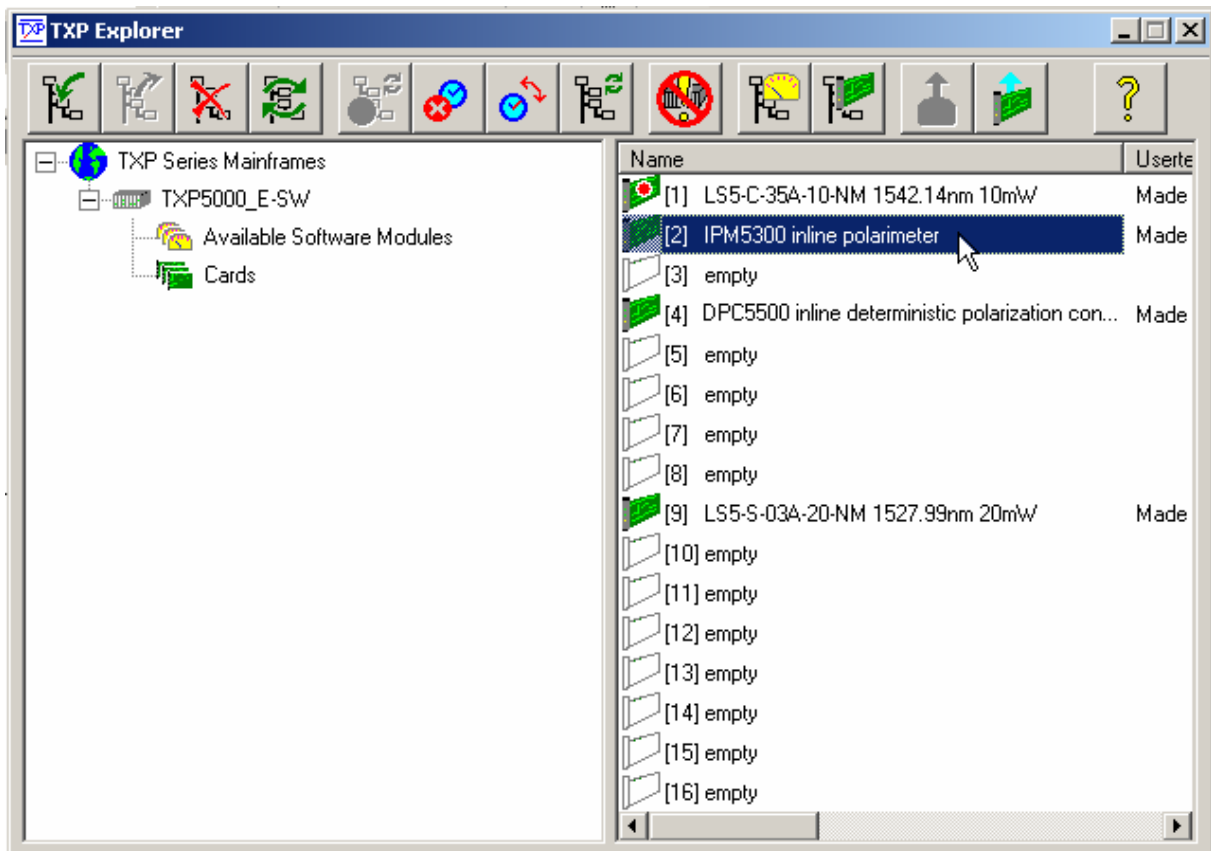
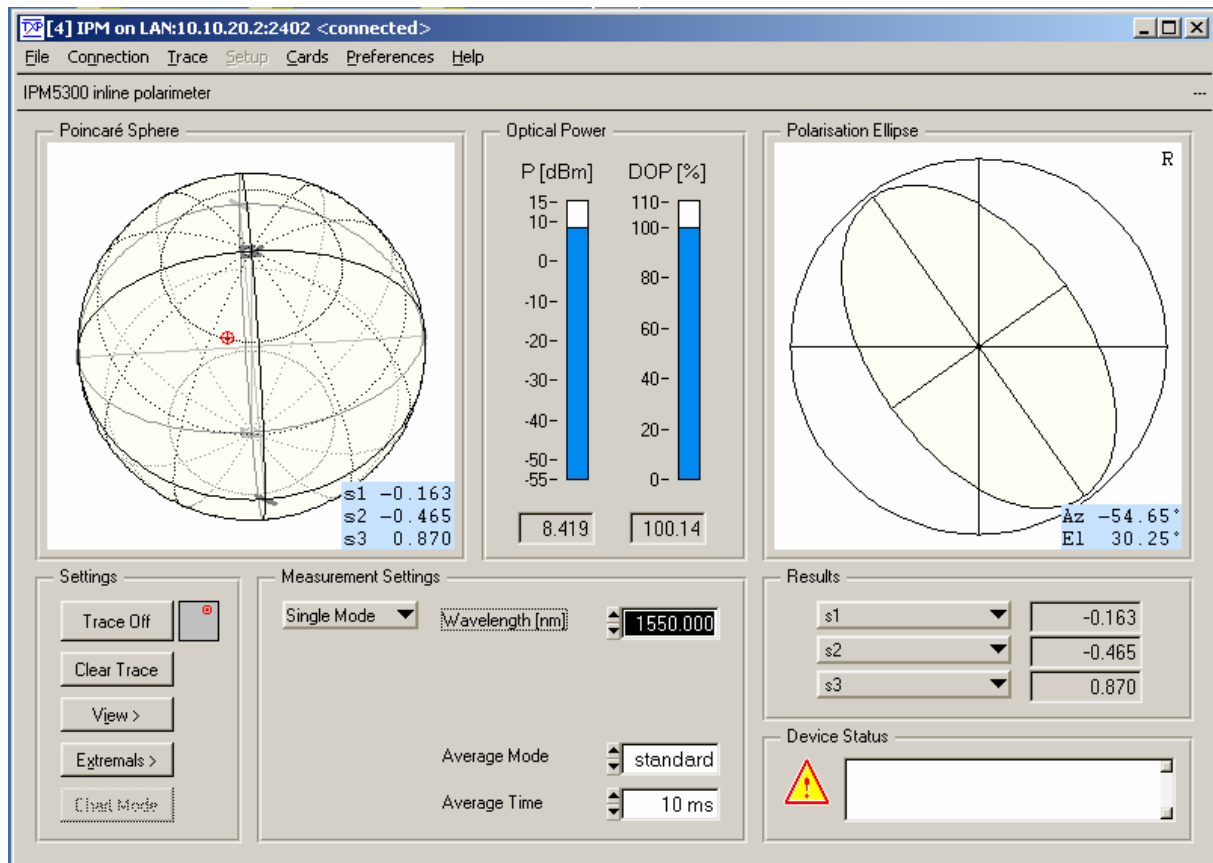


Figure 3 The TXP Explorer Window

Now select the module you want to control (here shown in slot [4]) and launch the IPM specific operating program by clicking the button 'Use card with standard module'.

Now the card specific operating software starts (TXP\_Polarization\_Tools.exe):



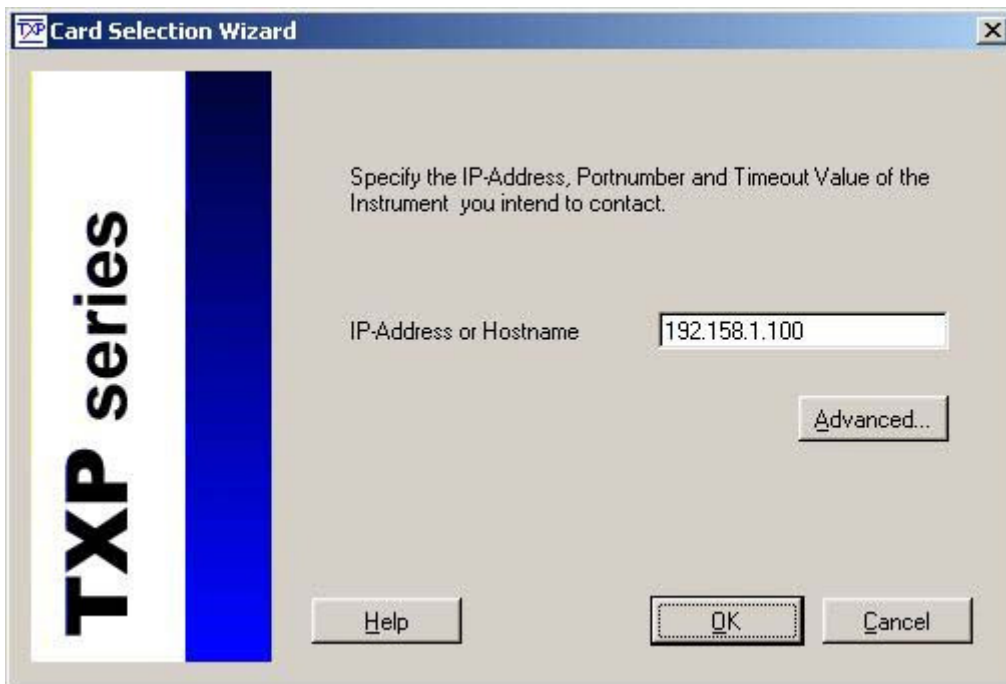
**Figure 4 The IPM5300 GUI Surface**

Alternatively:

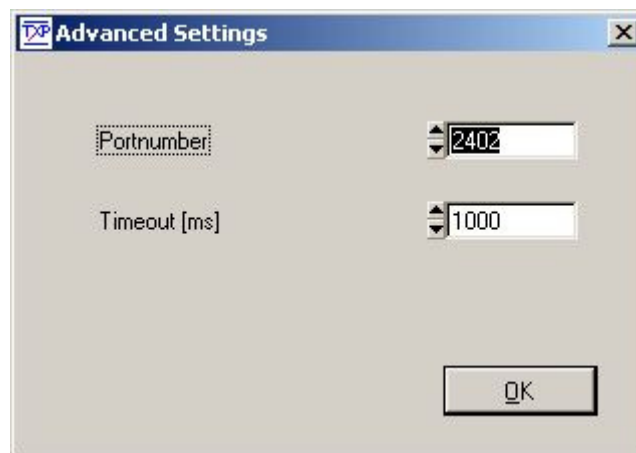
2) Start TXP\_Polarization\_Tools.exe directly ( e.g. by double clicking the corresponding symbol).

In this case you must connect to the desired card in the corresponding mainframe through the 'Connection' menu. Clicking 'Connect' opens the selection window for the mainframe IP-address (see Figure 5). If necessary (ask your system administrator) also enter the port-number and a timeout-value in the 'advanced' section (see Figure 6).

Click 'OK' and the program will yield a selection of all possible IPM cards, which are accessible. Not shown are cards, which are in use by another program / operator. (See Figure 7). Select the card you want to use and confirm with 'OK'. You are now connected to this specific card and can operate it in the main window (Figure 4).

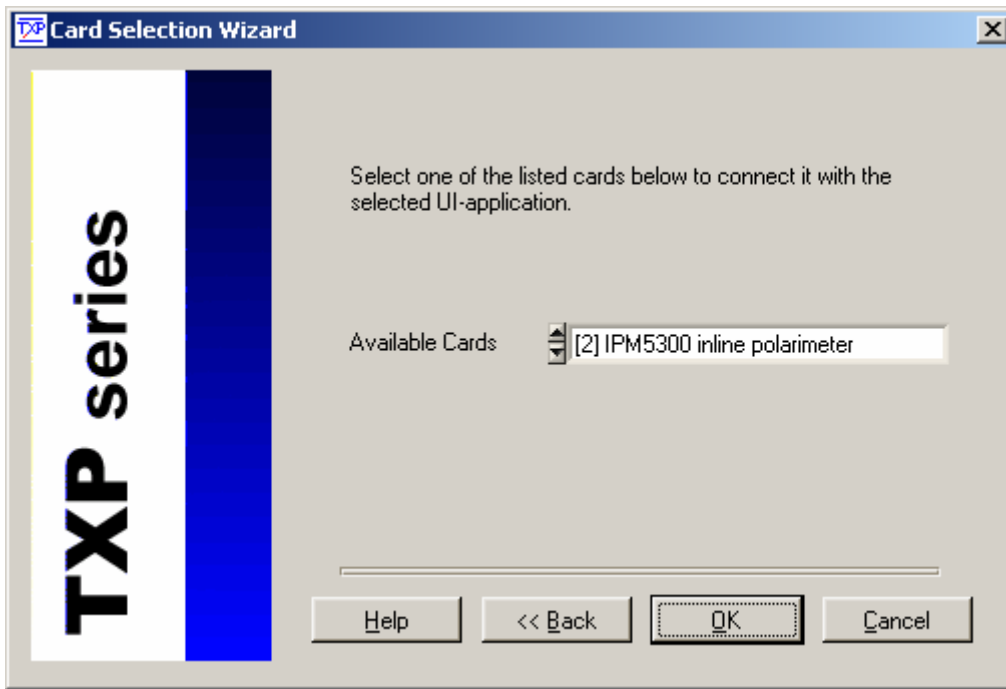


**Figure 5 Enter the IP-Address**



**Figure 6 Select Portnumber and Timeout**





**Figure 7 The card selection window**

Hitting 'OK' starts the IPM Graphics User Interface (see Figure 4 The IPM5300 GUI Surface).

### 2.2.2 Operate the IPM for the first time

Now connect a laser source with a patchcord to the optical input of the IPM. The patchcord must have FC/APC connectors.

Set the laser power to a value between  $-30$  and  $+15$  dBm (0.001 mW ... 31.6 mW).

Set the wavelength in the IPM GUI to the used laser wavelength. The power display on the GUI should show now the applied laser power. You can watch now the polarization state on the Poincaré sphere and on the polarization ellipse. Bend or stretch the connecting fiber a little bit to see changes in the input polarization state.

The operation of the unit in detail is described in the next section.

## 3 Operating the IPM5300

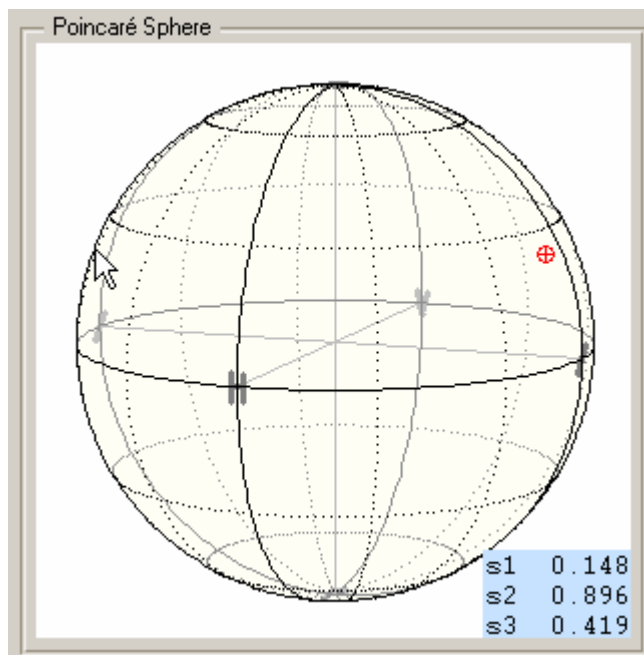
### 3.1 Principal Modes of Operation

The following operating modes are possible with the IPM5300:

- **Single Mode:** The inline polarimeter measures one state of polarization after the other. There is no defined time scale. If one measurement has finished and the data are transferred to the PC the next measurement starts. The data are displayed numerically, graphically on the Poincaré sphere and as polarization ellipse. The measurement results are also available as analog signals at the auxiliary output.
- **Array mode:** You can analyze the input polarization and show the results on the Poincaré Sphere. Sample rate and number of measurement points (max. 1024) are predetermined. The complete measurement results are transferred to the GUI after all n measurement points are registered. So you have a defined time scale for the measurements and you have the possibility of a defined hardware trigger and the registration of pre-trigger samples. The data are displayed numerically, graphically on the Poincaré sphere and as polarization ellipse. Due to the averaging the results are **not** available as analog output signals!
- **Chart mode:** Same as array mode, but the results are displayed in a linear diagram vs. time.

In all modes you can save your measurement results in an ASCII file.

## 3.2 The Poincaré Sphere



**Figure 8** The Poincaré Sphere

The window 'Poincaré Sphere' shows you the actual status of the output polarization on the sphere and also shows numerically the three stokes vectors  $s_1$ ,  $s_2$  and  $s_3$ .

The red marker represents the actual output polarization.

You can use the left mouse button, click on the sphere and rotate the sphere to a convenient viewing by moving the mouse.

You can also use the right mouse button to zoom into and out of the sphere by moving the mouse.

Polarization states on the front side of the sphere are shown in **red**, on the rear side in **blue**.

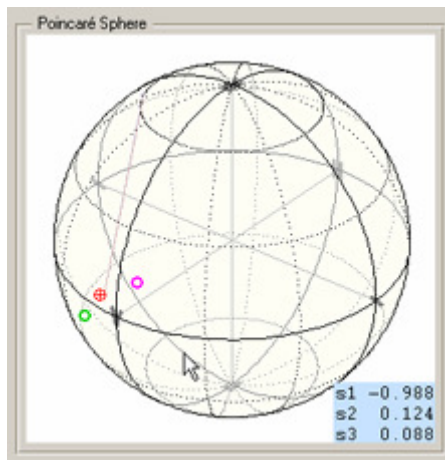


Figure 9 Rotate the Sphere

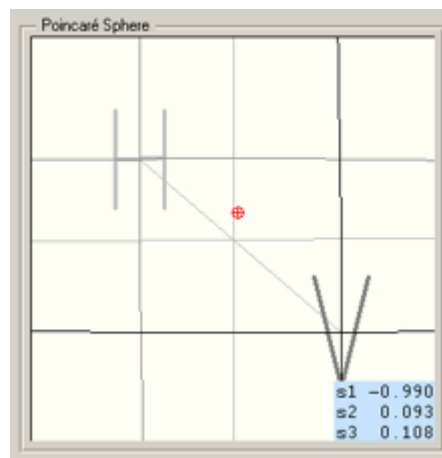
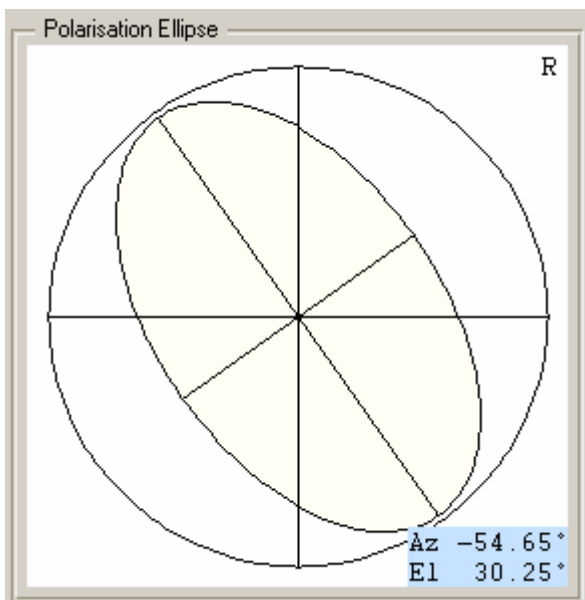


Figure 10 Zoom on the Sphere

### 3.3 The Polarization Ellipse



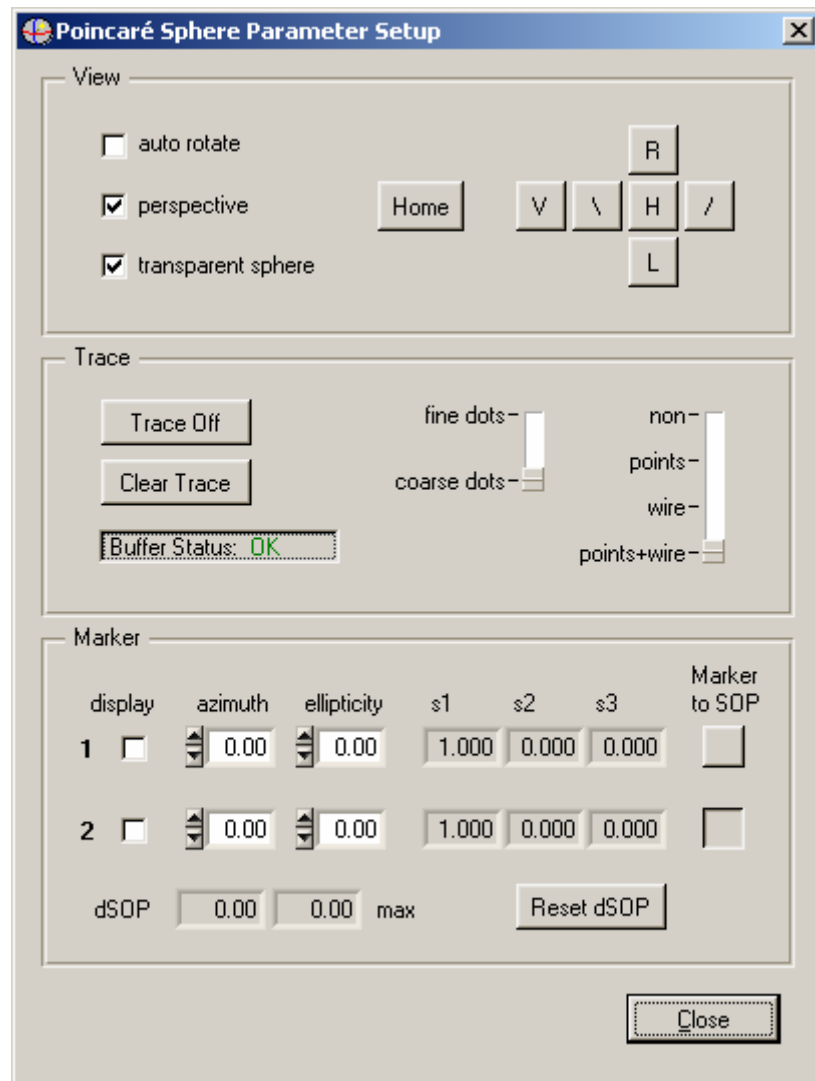
Another representation of the polarization status is shown as polarization ellipse, with numerical values for the Ellipticity and Azimuth angle. 'R' or 'L' are shown on the display for right- and left-handed polarization.

Figure 11 The Polarization Ellipse

## 3.4 Poincaré Sphere Parameter Setup

A click on the button 'View' brings you to the viewing presets.

### 3.4.1 The 'View' Panel



**Figure 12 Poincaré Sphere Parameter Setup**

- **'Auto Rotate'**: The measured Polarization state is always in front of you. If the input polarization changes, the Poincaré sphere rotates.
- **'Perspective'**: Changes between perspective and normal view of the sphere. (In perspective view e.g. circles on the rear side of the sphere are shown smaller than on the fore-side.

- **'Transparent Sphere'**: You can look through the sphere and view the rear side the same time. Points on the fore-side are shown in **red**, on the rear side in **blue**. Display of sphere and polarization points on the rear side is disabled when switching 'Transparent Sphere' off.
- **'Home'**: Standard view of the sphere with the two poles up and down.
- The buttons **H**, **V**, **/**, **\**, **R** and **L** show the sphere so that horizontal, vertical,  $\pm 45^\circ$  linear and right- /left-handed circular polarization is shown in front.

### 3.4.2 The 'Trace' panel:

The **'Trace'** function displays sequentially following polarization states on the sphere and also stores them in a buffer.

The button-text shows the actual state, that means a click on 'Trace Off' switches trace generation on and a click on 'Trace On' switches it off.

How the trace is displayed can be set on the right side of this panel:

- Show the measurements as small dots
- Show the measurements as larger circles

and

- No display of the trace
- Display the values as single points
- Display connections between points as wire segments
- Display dots and wire-segment together

The info-field **'Buffer Status'** gives information about the status of the data buffer. (The data buffer is quite large (>100 k values), so the normal status should be 'OK')

**'Clear Trace'** deletes all stored data points in the buffer.

### 3.4.3 The 'Marker' Panel:

You can use two markers on the sphere to mark certain desired polarization states. Just activate the checkboxes and enter the desired polarization states as azimuth and ellipticity. With the two checkboxes active, you can also go to the picture of the Poincaré sphere on the mainscreen, hold down the 'shift' key and right- or left click with the mouse buttons. Left-click gives a green marker circle, right click a pink circle. If the circles are on the fore-side they are shown in light color, on the rear side in dark color.

**'Marker to SOP'** Places the green marker at the position of the momentarily measured state of polarization. It remains there if not re-set.

The button at the right side of the second marker lets the pink marker follow the actual measurement values. If you release the button, the marker 'freezes' the actual SOP. Because the marker is identical in this case to the red/blue measurement marker, it is not shown.

**'dSOP'** shows the differences in the state of polarization in degrees on the Poincaré sphere between the two markers. E.g. for drift analyses in IPM mode set the first marker to the initial state and let the second marker follow the actual state of polarization. DSOP shows you the difference between both.

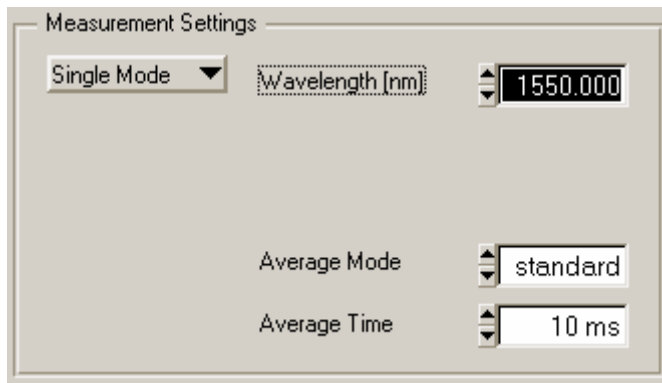
Note that an azimuth or ellipticity difference of 1 deg corresponds to the double value expressed in degree on the Poincaré sphere.

The 'max.' dSOP indicator is useful for drift or polarization noise measurements and can be reset to the actual dSOP value by **'Reset dSOP'**.

## 3.5 Measurement Settings

### 3.5.1 Single Mode

For precise measurement results, please enter the correct laser wavelength!



The '**Average mode**' field selects between '**Standard**' and '**DOP**'. Purpose: if you have a signal with fast changing polarization properties like a polarization scrambler output and want to measure the depolarization effect select 'Standard' to average the different

polarization states (e.g. if the changes in the polarization are uniquely distributed, you will measure DOP=0%).

If you want to determine the degree of polarization of the used laser source regardless of the polarization changes, then chose 'DOP' as averaging mode. Then the DOP is determined for every single measurement point and those values are averaged afterwards. The calculated DOP is not affected by the polarization fluctuations.

Note that the calculated normalized Stokes parameters are double normalized. That means the total vector length  $\sqrt{s_1^2 + s_2^2 + s_3^2}$  is equal to 1 regardless of the degree of polarization. Therefore it can be seen as the normalized Stokes parameters of the polarized part of light.

#### 'Average Time':

Selects the time interval used to measure one measurement point. The measurement values taken (about one per  $\mu\text{s}$ ) are averaged during this time interval.

The spacing of two successive measurement points is at least this average time plus time for data transmission and display.

Averaging is done with a time constant entered in the field 'Average Time'



### 3.5.2 Array Mode

For precise measurement results, please enter the correct laser wavelength!

The screenshot shows a 'Measurement Settings' dialog box with the following controls:

- Array Mode:** A dropdown menu currently showing 'Array Mode'.
- Wavelength [nm]:** A numeric input field with the value '1550.000'.
- Pre Trig. Sampl.:** A numeric input field with the value '0'.
- Samples:** A numeric input field with the value '100'.
- Rate:** A numeric input field with the value '1'.
- Gain Low:** A dropdown menu.
- No Trigger:** A dropdown menu.
- Average Mode:** A dropdown menu currently showing 'standard'.
- Average Time:** A numeric input field with the value '1.000 ms'.

The array mode allows to register sequential measurements in a defined time raster. Enter the number of samples to be shown, (max. 1024) and an average time for the samples.

The '**Average mode**' selects between '**Standard**' and '**DOP**'. Purpose: see 3.5.1.

Use 'Standard' to see depolarization effects in case of fast changing polarization during the 'Average Time' or use 'DOP' for determining the DOP of the source regardless these polarization changes. Both averaging modes work with respect to the 'Average Time'.

**'Average Time':** Selects the time interval used to measure one measurement point. The measurement values taken (about one per  $\mu$ s) are averaged during this time interval.

Averaging is done with a time constant entered in the field 'Average Time'

**'Rate'** defines if you want to take every or only every n'th measurement point. *Purpose:* if you have a signal with fast changing polarization properties and do not want to lose this information due to averaging, you can set a short averaging time and only take every n'th sample.

#### Gain:

To obtain the highest possible accuracy in measurement, the internal signal amplifiers should not change their amplification during measurement. If you have a strong optical signal select 'Gain Low' (more than +5dBm), whereas 'Gain High' is advised for weaker signals. If the measurement time is no problem, start a first measurement with 'Gain High'. Switch to 'Gain Low' if you get an error message (Optical power too high) during this first run.

**Trigger:**

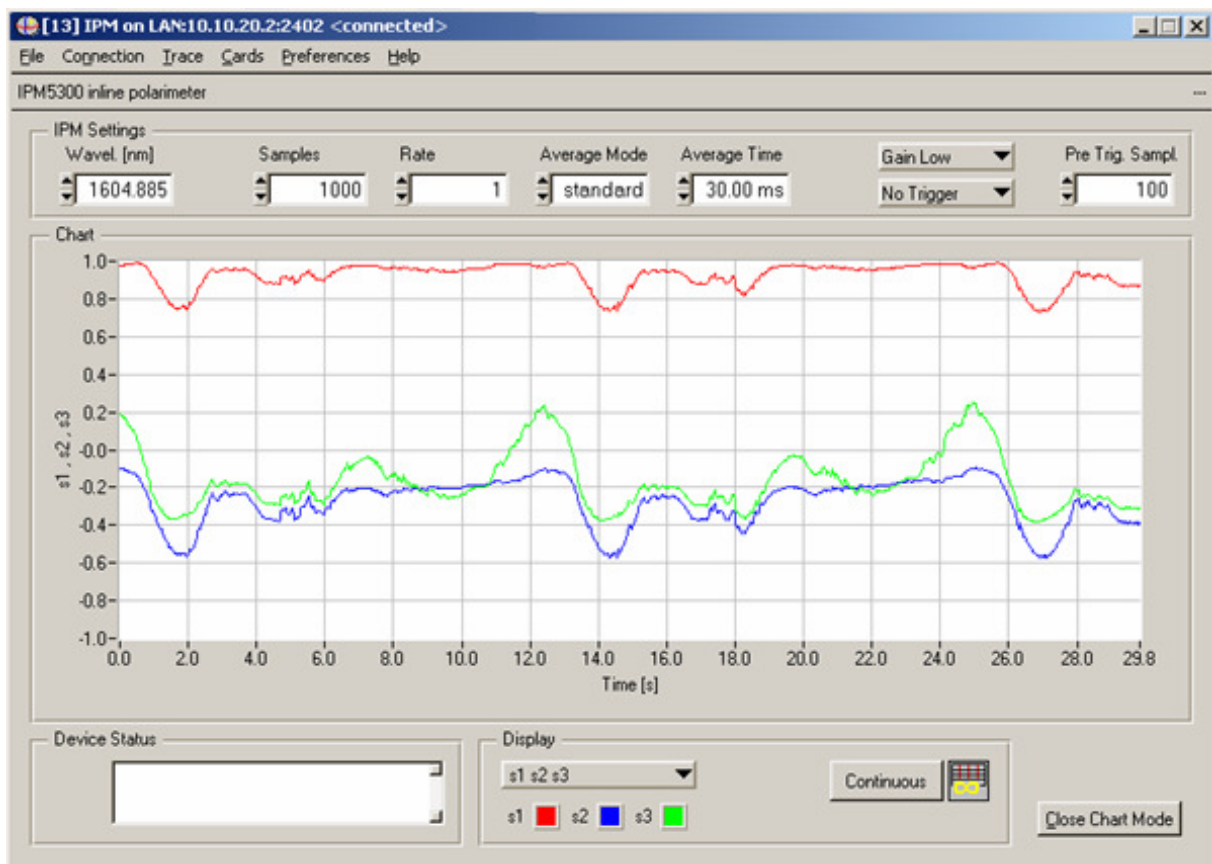
No Trigger: After a measurement is finished the data are displayed and a new measurement starts

Falling Slope: The measurement starts at the High -> Low transition of the control input signal (see 1.5).

Rising Slope: The measurement starts at the Low -> High transition of the control input signal (see 1.5).

**3.5.3 The Chart Mode**

The chart mode shows the data registered in the array mode in rectangular format: measurement parameter(s) vs. time. In the upper part of the screen the IPM settings are shown and can also be manipulated here.



**Wavelength:**

To obtain highest precision in your measurements, it is necessary to enter the operation wavelength of your laser source as precise as possible before starting a measurement. You can use the up- and down arrows or enter the value numerically.

**Samples:**

Gives the number of measurement points you want to be registered.

**Rate:**

Defines if you want to take every or only every n'th measurement point. **Purpose:** if you have a signal with fast changing polarization properties and do not want to lose this information due to averaging, you can set a short averaging time and only take every n'th sample.

**Average Mode:**

Select between 'Standard' and 'DOP'. Purpose: see 3.5.1.

Use 'Standard' to see depolarization effects in case of fast changing polarization during the 'Average Time' or use 'DOP' for determining the DOP of the source regardless these polarization changes. Both averaging modes work with respect to the 'Average Time'.

**Average Time:**

Selects the time interval used to measure one measurement point. The measurement values taken (about one per  $\mu\text{s}$ ) are averaged during this time interval.

**Pre Trig. Samples:**

Defines how many samples are stored just before the trigger signal starts the measurement. This function is not available if 'No Trigger' is selected.

**Gain:**

To obtain the highest possible accuracy in measurement, the internal signal amplifiers should not change their amplification during measurement. If you have a strong optical signal select 'Gain Low' (more than +5dBm), whereas 'Gain High' is advised for weaker signals. If the measurement time is no problem, start a first measurement with 'Gain High'. Switch to 'Gain Low' if you get an error message 'Optical Power too high' during this first run.

### Trigger:

Select the form of your trigger signal:

No Trigger: the measurement starts immediately, if one is finished the next one starts.

Falling Slope: single measurement, it starts at the falling edge of your (TTL) trigger signal.

Rising Slope: single measurement, it starts at the rising edge of your (TTL) trigger signal.

### The device status panel

Any warnings, status messages or error messages occurring are displayed in the 'Device Status' window. Severe Errors will produce a pop-up window which must be acknowledged. Messages of minor importance only show up in this window and disappear if the condition causing this message has vanished.

### The Display panel

The drop down menu allows to select which measurement values are shown on the chart and in which color. Possible values:

Total optical power

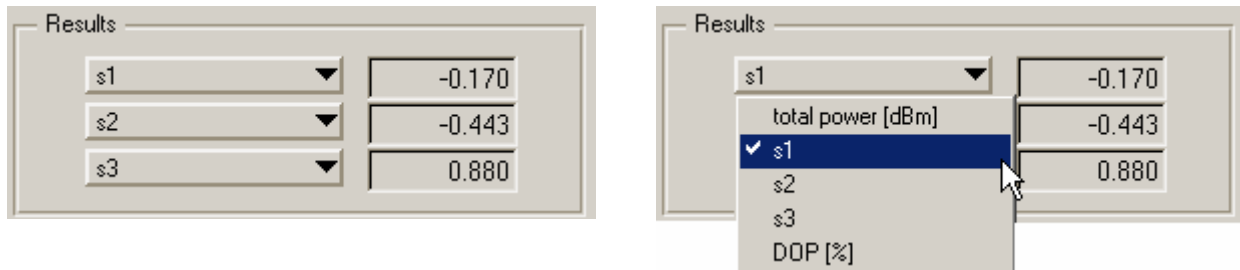
$s_1, s_2, s_3$ , the stokes parameters

DOP, the degree of polarization

By clicking the Button '**Continuous**' or '**Single**' you can toggle between single shot measurement and continuous measurement. In single shot mode click '**Trigger**' to activate the trigger (If 'No Trigger' is set as trigger type the measurement starts immediately; here pre-trigger samples are not available!). In the hardware trigger modes the message 'Trigger active' appears in the status field. If you have entered pre-trigger samples, this activation of the trigger may take some time (until the unit has collected at least this number of pre-trigger samples).

### 3.6 The Results Panel

Here three measurement parameters are displayed:



Clicking on the arrows on the fields gives you the possibility to select between 5 different parameters:

- Total optical power in dBm
- Normalized Stokes parameter  $s_1$
- Normalized Stokes parameter  $s_2$
- Normalized Stokes parameter  $s_3$
- Degree of Polarization (DOP) in percent

### 3.7 Analog Monitor Output

The auxiliary output gives the possibility (refer to 1.5) to monitor 5 measurement values in analog form:

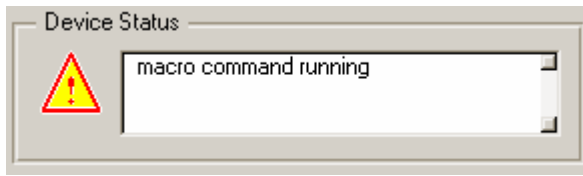
1. Optical Power
2. DOP
3.  $s_1$
4.  $s_2$
5.  $s_3$

The analog output range is -2.5 V ... +2.5 V with an update rate of maximally 100 kS/s (depends on the average time selected).

#### NOTE

The output values are only available in the single measurement mode!

### 3.8 Device Status Panel

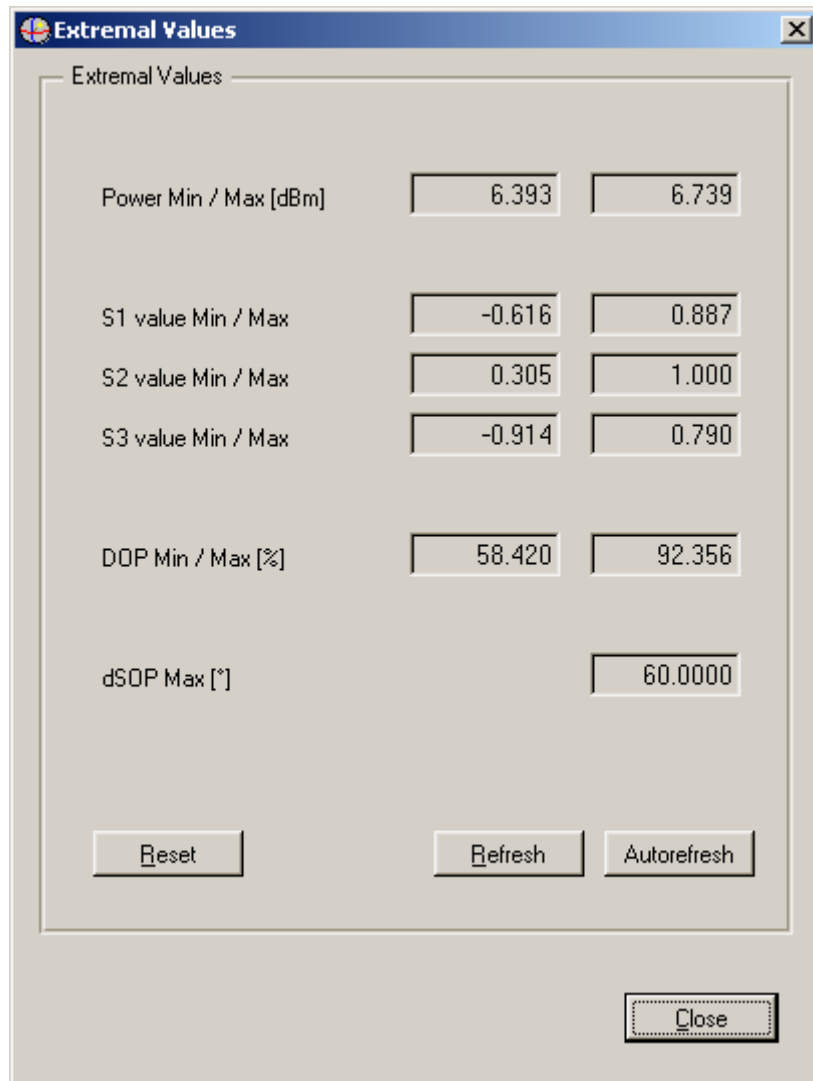


Any Status message or warning or occurring error is displayed in the Device Status field. E.g. if the measurement runs in the array mode, the status field shows 'macro command running'.

See 5.5 List of possible Error / Status Messages.

### 3.9 View Polarization Statistics

The button '**Extremals**' on the IPM main-screen shows you the polarization statistics window:



**Figure 13 The Polarization Statistics Window**

All changes in power, SOP and DOP since the last reset are shown as minimum / maximum values.

Field '**dSOP Max [°]**' gives the maximum SOP difference in degrees on the Poincaré sphere with respect to the first measurement point taken after 'Reset'. This is useful for SOP drift or noise measurement.

'**Reset**' sets all to 0, refresh includes the just actual measured values.

'**Autorefresh**' refreshes the values about once a second.

This polarization statistics is based not only on the few measurements transmitted to the GUI but on all measurement results taken by the IPM card. Therefore this statistics does not miss any single extremal value.

### 3.10 The User Calibration

If you use the IPM outside the factory calibrated wavelength range or want to obtain highest measurement performance, you can do a self-calibration of the IPM.

#### NOTE

The user calibration data are only valid as long as you do not switch off the IPM. They are lost if you switch the device off!

Connect a laser source with well known wavelength and an output power of max. 4.0 dBm to the IPM by means of a fiber polarization controller (mickey ears)  
Enter the wavelength in the IPM wavelength field as precise as possible  
Click on 'Start IPM User Adjust' in the 'User' drop down menu

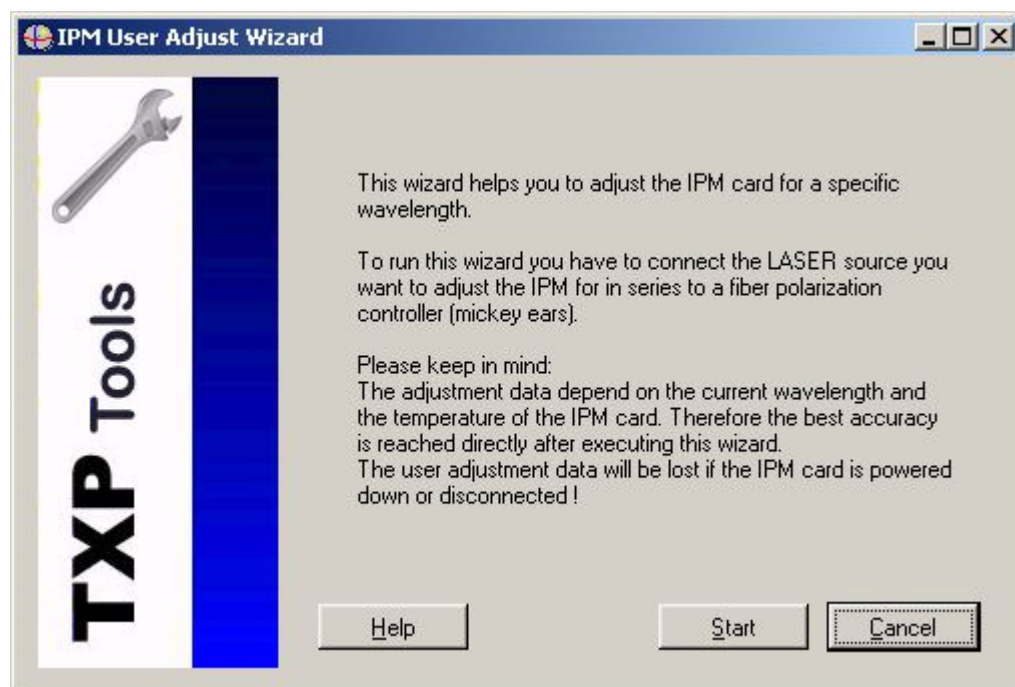


Figure 14 Start the User Calibration

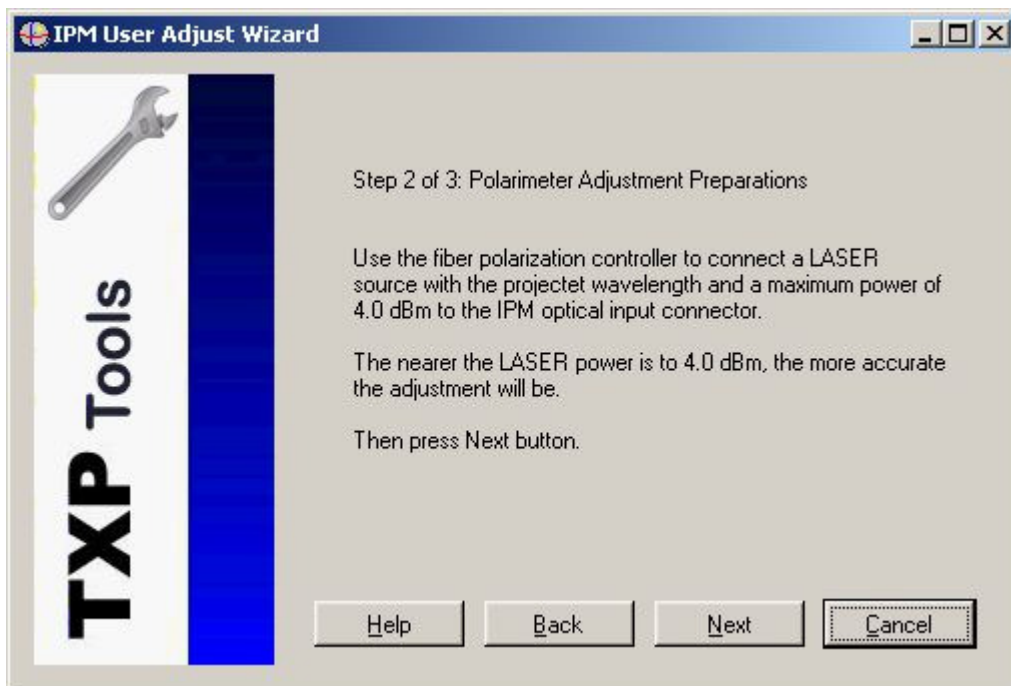
Click 'Start'





**Figure 15 Step 1 of the User Calibration**

Switch off your laser source or darken the IPM input (please keep in mind that a standard FC/APC or FC/PC cap is not totally intransparent to infra-red radiation! Then click 'Next'.



**Figure 16 Step 2 of the User Calibration**

If not yet done, connect the laser source with an output power of max. 4 dBm via a fiber polarization controller to the input of the IPM card. Then click 'Next'.

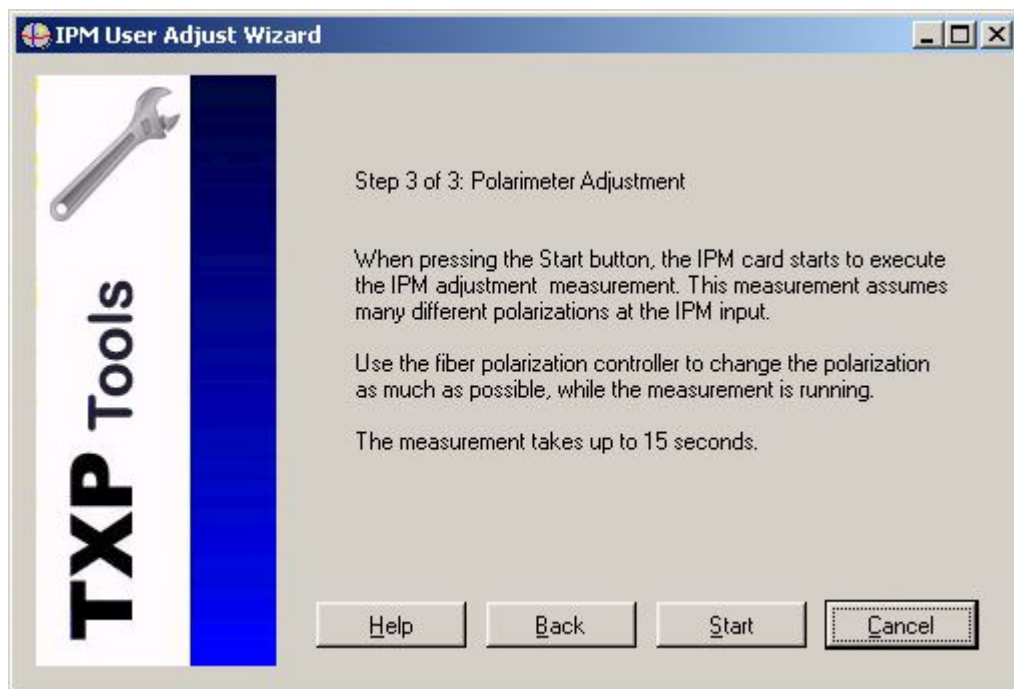
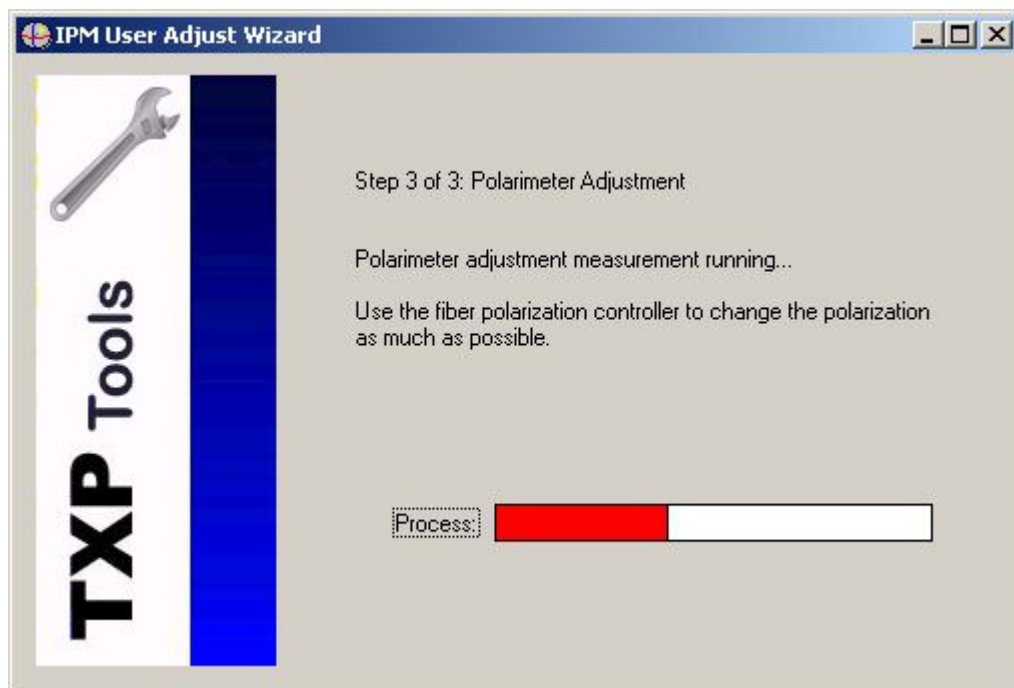
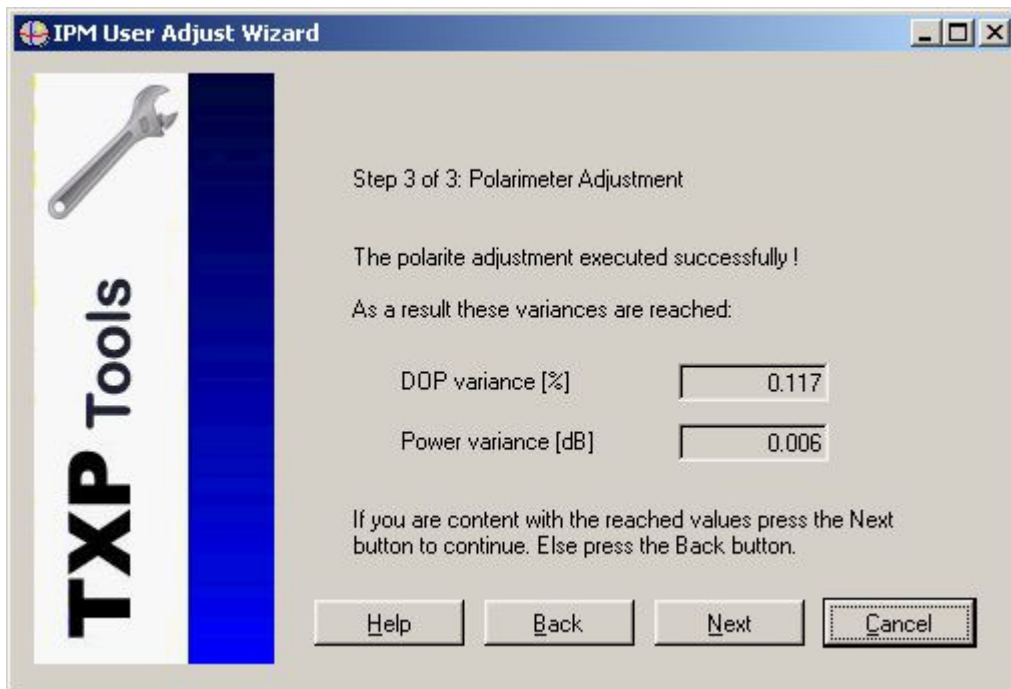


Figure 17 Step 3 of the User Calibration

After clicking 'Start' you have about 15 seconds in which you should change the input polarization as much as possible. A running bar-graph shows the progress:

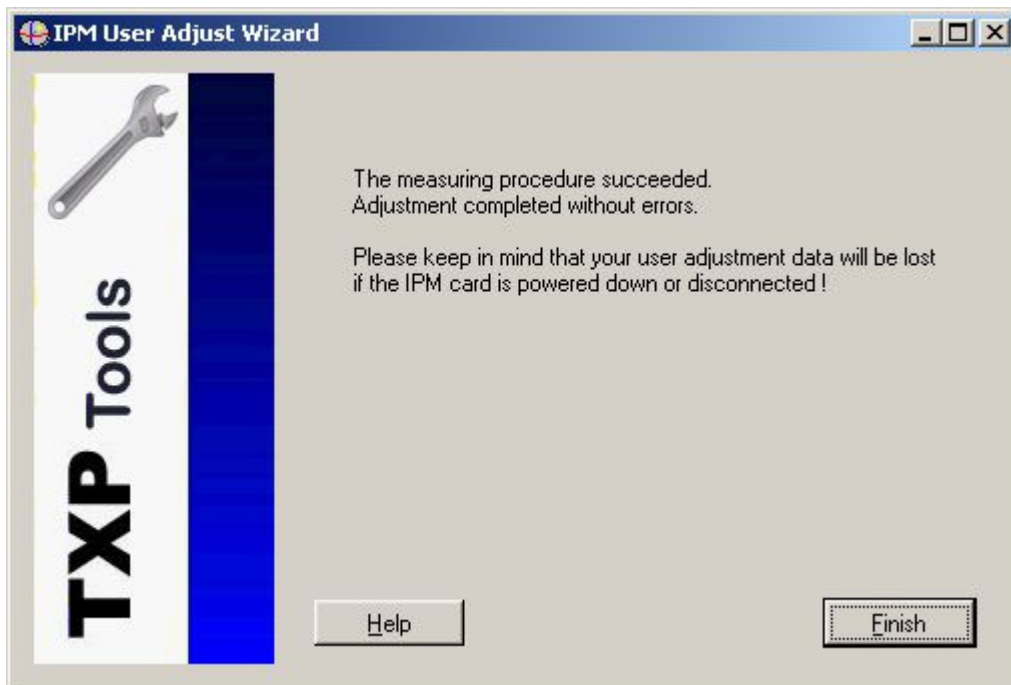


After 15 seconds you can see whether or not the calibration was successful



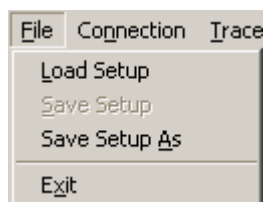
**Figure 18 The Calibration Results**

'Next' and 'Finish' finishes the calibration procedure.



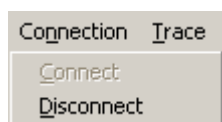
## 3.11 Menu Items

### 3.11.1 Save and Load the IPM Setup



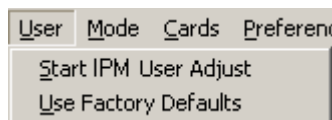
These menu items allow to store and recall the current settings in a file. File extension is '.txs'.

### 3.11.2 Connect and Disconnect from the card



Use these items to connect to a IPM card in a specified TXP or to disconnect from this unit.

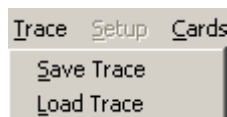
### 3.11.3 The user Calibration



You can make a self-calibration for highest accuracy, especially when using wavelength outside the specified window. Connect a laser source with an output power of 4dBm to the IPM and click 'Start IPM User Adjust'.

The following procedure is self-explaining but you can see the details in 3.10, "The User Calibration".

### 3.11.4 Save and Load a Trace



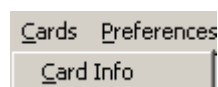
This item stores or recalls a registered history of polarization values. The data are stored as ASCII text-file.

e.g.:

```
-0.990216,0.093213,0.103845,8.603065,99.013025
-0.990204,0.093419,0.103770,8.603271,99.015649
-0.990221,0.093379,0.103644,8.603180,99.011949
-0.990225,0.093395,0.103597,8.603264,99.011583
-0.990237,0.093346,0.103521,8.603180,99.011232
```

It stores the three s-parameters, the power in dBm and the DOP in %.

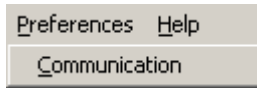
### 3.11.5 Card Info



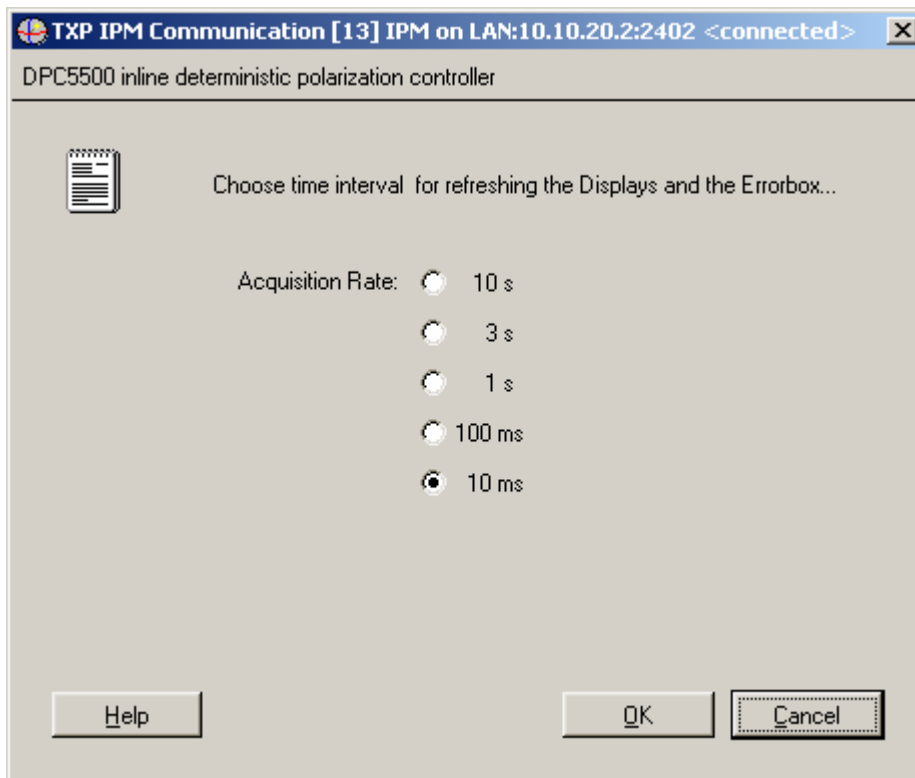
Menu Item 'Card Info' shows detailed information about your IPM card:

Card Name	IPM5300 inline polarimeter
Serial Number	E00510032
User Text	Made by Thorlabs GmbH
Card Type	40
Assembly Option	0
Hardware Option	0
Software Option	0
Protocol Version	1.1
Version Name	TXP DPC5000/IPM5000 - 08.205 - Ver. 0.11 - built Mar 29 2004
Pow. Consumpt.	15.00 W
Assembly Date	Feb 25 2004 12:25
Last Repair Date	- not set -
Last Adjust Date	- not set -
Last Calib Date	- not set -
Next Calib Date	- not set -
card temperature	heat sink temperature: 23.0°C

### 3.11.6 Communication Settings



Set the refresh rate of your GUI according to the properties of your connecting network:

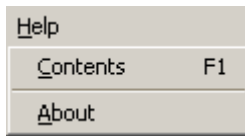


**Figure 19 Set the data refresh rate**

Depending on the bandwidth and reliability of your connection between TXP and PC, you can select update rates from 10 seconds down to 10 ms.

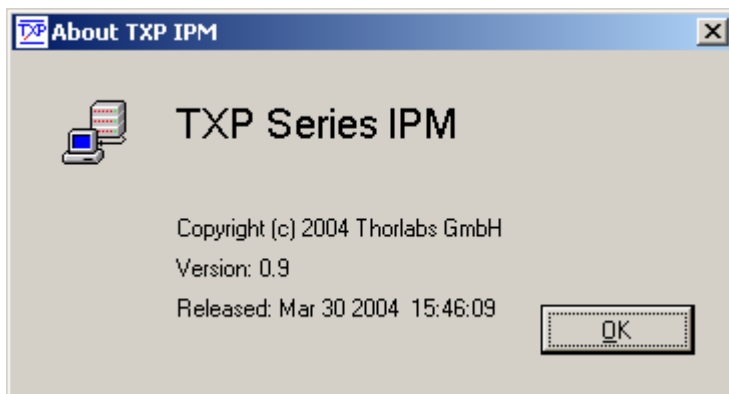
This means, that all actual data you see on the GUI are updated with this time constant.

### 3.11.7 The Help Menu



With the item 'Contents' or the Function key 'F1' you can open the IPM help-file.

'About' shows general information about your IPM GUI software:







## 4 Service and Maintenance

### 4.1 Troubleshooting

◆ Card does not work at all :

- Look if the Card is inserted properly into the TXP mainframe and the ejector handle has snapped into its position.
  
- Look if the mainframe is powered up (does any LED light up)
  - If not check the power cord
  - Check the external fuses of the TXP (see TXP mainframe manual)
  
- If the other modules are working, only the IPM not:
  - Change the IPM card to another slot. If it is working, probably the internal fuse of the used slot has opened. To exchange the internal fuse see the TXP mainframe manual.

### 4.2 Service

In normal operation the IPM5300 card does not need any Service. If highest precision of the measurements is vital for you, you should have recalibrated the IPM5300 every two years. You can see the due date of calibration in the card info-menu of the card driver (refer to 3.11.5 Card Info).

## 5 Listings

### 5.1 Warranty

*Thorlabs* warrants material and production of the IPM5300 for a period of 24 months starting with the date of shipment. During this warranty period *Thorlabs* will see to defaults by repair or by exchange if these are entitled to warranty.

For warranty repairs or service the unit must be sent back to *Thorlabs (Germany)* or to a place determined by *Thorlabs*. The customer will carry the shipping costs to *Thorlabs*, in case of warranty repairs *Thorlabs* will carry the shipping costs back to the customer.

If no warranty repair is applicable the customer also has to carry the costs for back shipment.

In case of shipment from outside EU duties, taxes etc. which should arise have to be carried by the customer.

*Thorlabs* warrants the hard- and software determined by *Thorlabs* for this unit to operate fault-free provided that they are handled according to our requirements. However, *Thorlabs* does not warrant a faulty free and uninterrupted operation of the unit, of the soft- or firmware for special applications nor this instruction manual to be error free. *Thorlabs* is not liable for consequential damages.

#### **Restriction of warranty**

The warranty mentioned before does not cover errors and defects being the result of improper treatment, software or interface not supplied by us, modification, misuse or operation outside the defined ambient conditions stated by us or unauthorized maintenance.

Further claims will not be consented to and will not be acknowledged. *Thorlabs* does explicitly not warrant the usability or the economical use for certain cases of application.

*Thorlabs* reserves the right to change this instruction manual or the technical data of the described unit at any time.

## **5.2 Thorlabs "End of Life" policy (WEEE)**

As required by the WEEE (Waste Electrical and Electronic Equipment Directive) of the European Community and the corresponding national laws, Thorlabs offers all end users in the EC the possibility to return "end of life" units without incurring disposal charges.

This offer is valid for Thorlabs electrical and electronic equipment

- sold after August 13<sup>th</sup> 2005
- marked correspondingly with the crossed out "wheelie bin" logo (see Figure 20)
- sold to a company or institute within the EC
- currently owned by a company or institute within the EC
- still complete, not disassembled and not contaminated

As the WEEE directive applies to self contained operational electrical and electronic products, this "end of life" take back service does not refer to other Thorlabs products, such as

- pure OEM products, that means assemblies to be built into a unit by the user (e. g. OEM laser driver cards)
- components
- mechanics and optics
- left over parts of units disassembled by the user (PCB's, housings etc.).

If you wish to return a Thorlabs unit for waste recovery, please contact Thorlabs or your nearest dealer for further information.

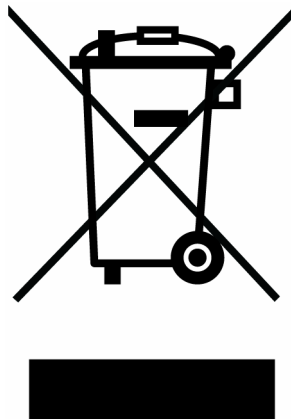
### 5.2.1 Waste treatment on your own responsibility

If you do not return an “end of life” unit to Thorlabs, you must hand it to a company specialized in waste recovery. Do not dispose of the unit in a litter bin or at a public waste disposal site.

### 5.2.2 Ecological background

It is well known that WEEE pollutes the environment by releasing toxic products during decomposition. The aim of the European RoHS directive is to reduce the content of toxic substances in electronic products in the future.

The intent of the WEEE directive is to enforce the recycling of WEEE. A controlled recycling of end of live products will thereby avoid negative impacts on the environment.



**Figure 20** Crossed out “wheeler bin” symbol

### 5.3 List of Acronyms

The following acronyms and abbreviations are used in this manual:

ASCII	<u>A</u> merican <u>S</u> tandard <u>C</u> ode for <u>I</u> nformation <u>I</u> nterchange
CR	<u>C</u> arriage <u>R</u> eturn
DAC	<u>D</u> igital to <u>A</u> nalog <u>C</u> onverter
DPC	<u>D</u> eterministic <u>P</u> olarization <u>C</u> ontroller
GUI	<u>G</u> raphical <u>U</u> ser <u>I</u> nterface
IPM	<u>I</u> nline <u>P</u> olari <u>M</u> eter
LED	<u>L</u> ight <u>E</u> mitting <u>D</u> iode
PC	<u>P</u> ersonal <u>C</u> omputer
SW	<u>S</u> oft <u>W</u> are

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## 5.5 List of possible Error / Status Messages

“Card Missing”	This status message shows if you have established a connection between the corresponding software module and a card and then remove the card from the TXP.
“Supply Voltage Failed”	Internal hardware error.
“Optical Power too high”	Reduce input power or switch to ‘Gain Low’ mode.
“Optical Power too low”	Enhance input power or switch to ‘Gain High’ mode.
“Cooling changed”	If the thermal load within the TXP changed strongly
“POLA temperature overflow”	Hardware error in the temperature measurement system
“POLA temperature too low”	Temperature inside the polarimeter outside the specified range. Accuracy may be degraded.
“POLA temperature too high”	Temperature inside the polarimeter outside the specified range. Accuracy may be degraded.
“Trigger activated”	The measurement waits for your trigger signal to start the measurement
“Macro command running”	Array measurement in progress

## 5.6 Addresses

For technical support or sales inquiries, please visit us at [www.thorlabs.com/contact](http://www.thorlabs.com/contact) for our most up-to-date contact information.



### **USA, Canada, and South America**

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