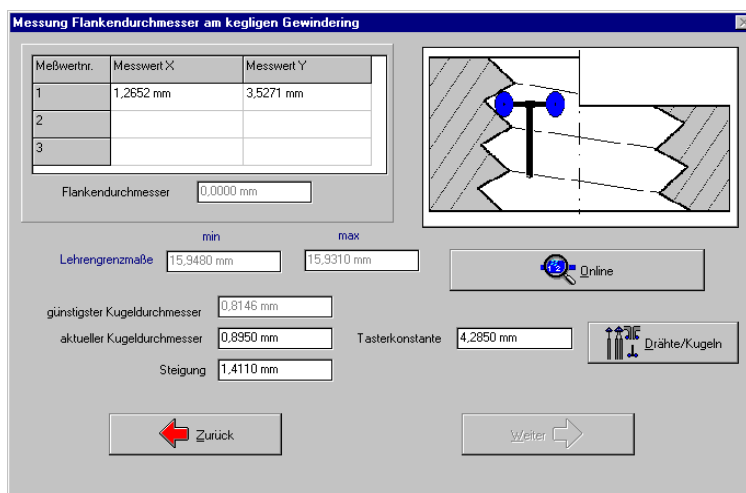


## Measurement of taper threads



Meßwertnr.	Messwert X	Messwert Y
1	1,2652 mm	3,5271 mm
2		
3		

Flankendurchmesser:

Lehrgrenzmaße: min  max

günstigster Kugeldurchmesser:

aktueller Kugeldurchmesser:

Steigung:

Tasterkonstante:

Buttons: Zurück, Weiter, Online, Drähte/Kugeln

**Helios Messtechnik  
GmbH & Co. KG**  
Max-Planck-Straße 19  
74677 Dörzbach

Tel. Nr.: +49 (0) 7937 / 804 – 0  
Fax: +49 (0) 7937 / 804 – 100

<b>Use .....</b>	<b>1</b>
<b>Measuring principle / Description .....</b>	<b>2</b>
<b>Installation &amp; Configuration .....</b>	<b>3</b>
<b>Calibration .....</b>	<b>4</b>
<b>Measurement .....</b>	<b>5</b>

**47000241**

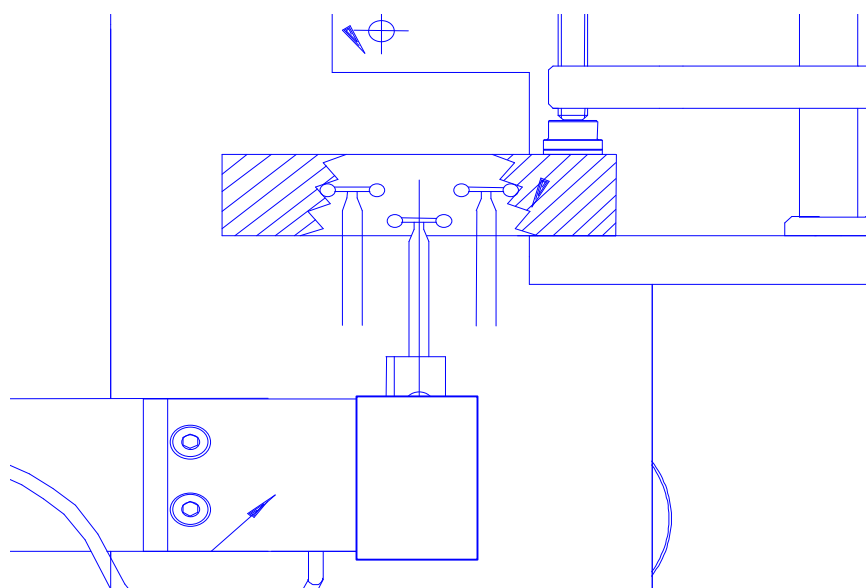
# Use

## *Rational & Uncomplicated*

### **Measuring device for checking of tapered external and internal threads**

This measuring device is optional available for the HELIO – COM SUPRA. In connection with the calculation software QM-TAPER THREAD, it is possible to check threads according to the following standards:

- tapered pipe threads acc. to BS 21
- tapered pipe threads NPT acc. to ANSI/ASME B1.20
- tapered threads acc. to ISO 7/2
- tapered threads acc. to DIN 2999
- tapered threads acc. to DIN 158



Measurement of a tapered internal thread

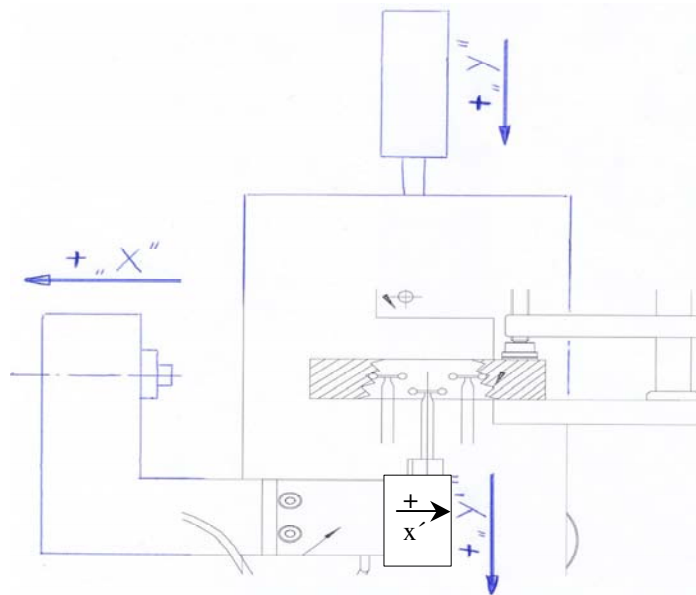
The measurement will be executed with the help of so-called T-shaped ball probes. The respective T-shaped ball probe is mounted on a special measuring caliper, with which measuring values can be received in all necessary measuring directions. Thus, the measuring sequence can be executed most rational and uncomplicated.

The measuring sequence itself is guided by the software QM – TAPER THREAD and will be optimal supported by graphic presentations of the respective checking positions.

## Measuring principle

The measuring principle is based on a 2 D ( two dimensional ) measurement. The diametric measurements are realized with the "X" measuring system. Owing to the large mass of the X measuring carriage, it is not possible to touch the workpiece directly with the thin T- measuring probes. Therefore the caliper arm possesses a frictionless stored additional measuring axis X' with very light mass. The movement of the universal measuring table is measured with the "Y" measuring system by a 30 mm probe. With a fourth measuring system "Y'" the position of the T - shaped ball probes are measured. Owing to the frictionless storage of the Y' axis the ball probe of the T- measuring probe can fit very closely and precise at the thread flanks.

All the measuring signals are transferred to a computer by the use of two counter cards inside of the computer.



For the thread measurement the taper thread gauges have to be measured on the plane surface and also in the thread flanks. The thread calculation and evaluation is done by a special developed software for taper thread measurement. The measuring results are displayed on the computer screen and can also be printed.

## Installation & Configuration

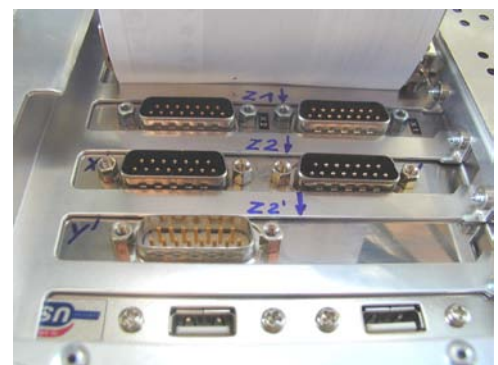
- Measuring arm has to be mounted.
- *The caliper arm should be adjusted horizontally, if possible.*

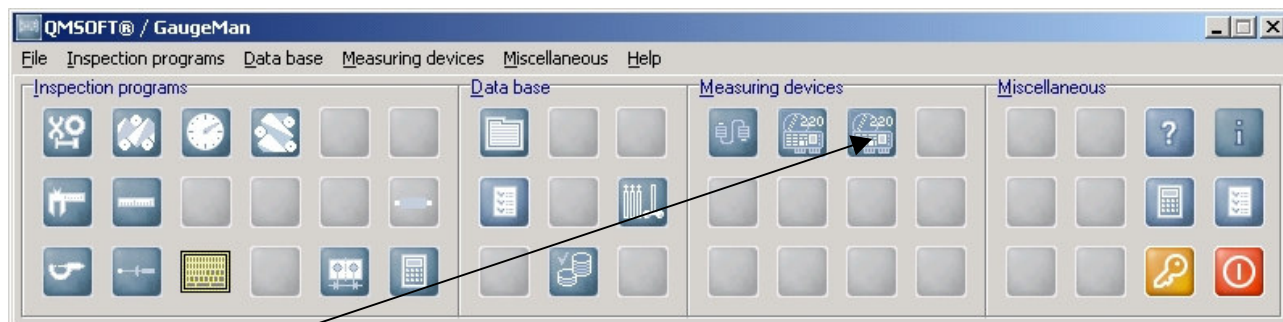


- Clamping device for taper thread ring gauges has to be mounted on the universal measuring table.

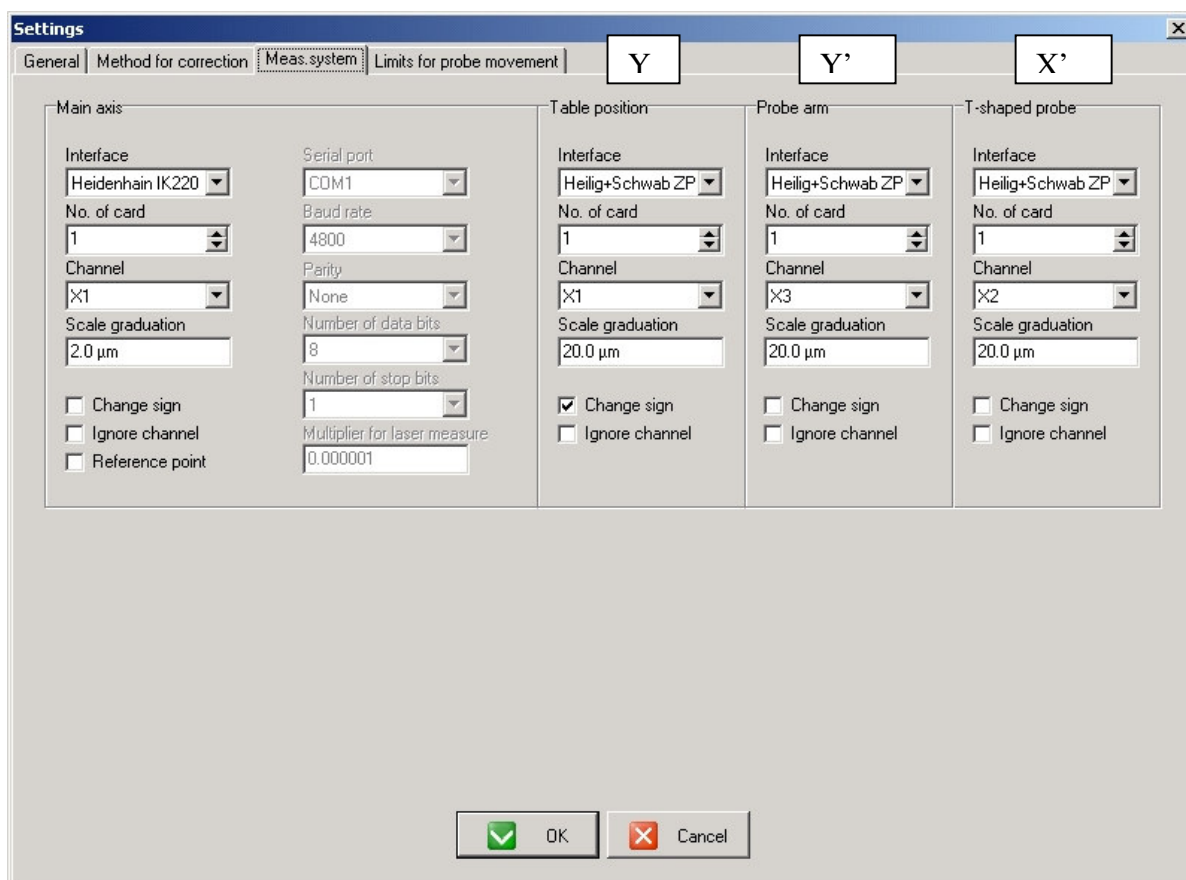
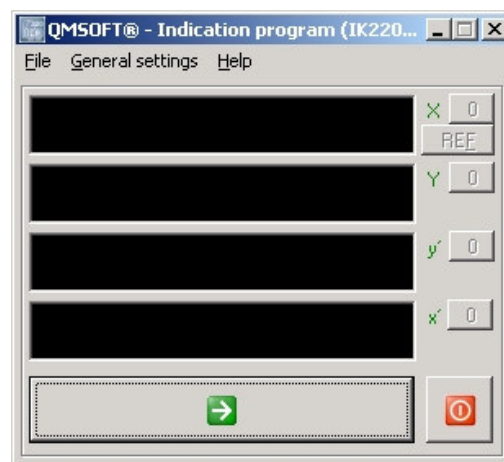


- Plug-in of the cables of the measuring systems to the computer-counter-cards.
  - HELIO – SIP measuring system *X- axis* counter-card no. 1 channel 1 (x1)
  - table measuring system *Z-axis* to counter-card no. 1 channel 2 (x2)
  - measuring system of measuring arm to counter card no. 2 channel *X'*
  - measuring system of measuring arm to counter card no. 2'; channel *Y'*
  - measuring system of table *Y* direction to counter card no. 2; channel *Y*.





- Open the QMSOFT indication program “IK220, taper” and click on “Generalsettings” and “meas.system” configuration must be equal. If not, please change appropriately.



- Please check also the right “counting direction” of all measuring channels.

- Open the QMSOFT indication program "IK220, taper" and click on the arrow button.
- Zero all three displays by using the zero button.



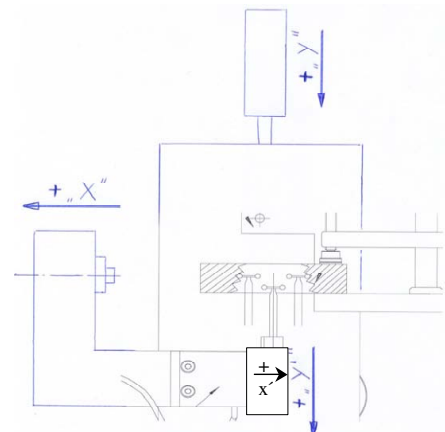
- Move by hand all three measuring systems to plus direction accordingly.
- The display has to show values also with "plus". If not, configuration has to be changed in "Generalsettings", "settings", "meas.system".

*X = Main measuring carriage*

*X' = Small sensitive measuring system at the caliper arm in X direction*

*Y = Measuring table*

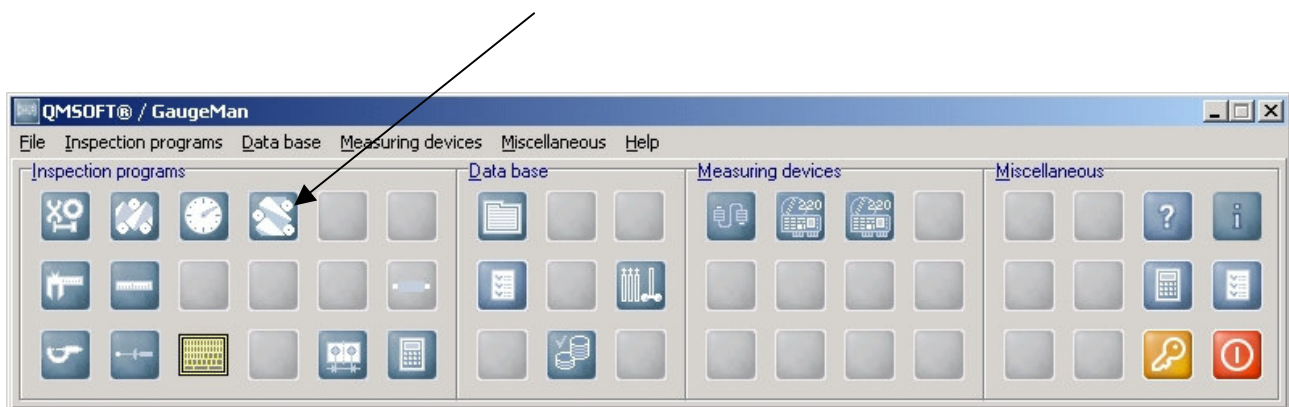
*Y' = Small measuring system at measuring arm in Y direction*



## Calibration

Before the measurement of taper thread gauges, the measuring inserts ( T-shaped ball probes ) have to be calibrated. The calibration must be done with the taper threads software for probe management. The calibration of the T-shaped ball probes must be done with a plain setting ring gauge with a precise known dimension.

Start the software taper thread with button:



In this selection window select the kind of gauge, which you eventually want to check afterwards.



Enter a thread dimension and select the kind of gauge..

Press this button

The gauge data will be calculated.

Press the key „Continue“

Then you are entering into the operation menu for the taper thread measurement.

Please observe, that in the field current ball diameter there is a number  $> 0$ .

Via the button „Select Probe“ you are entering into the selection table of the T-shaped ball probes.

No. of meas.	Measure
1	

Nominal value gauge length: 2.500 mm  
Distance of paging notch (L2): 10.1000 mm

Test ball diameter: 0.000 mm  
Current ball diameter: 0.000 mm  
Probe constant: 0.000 mm

Buttons: Back, Drive, Select Probe

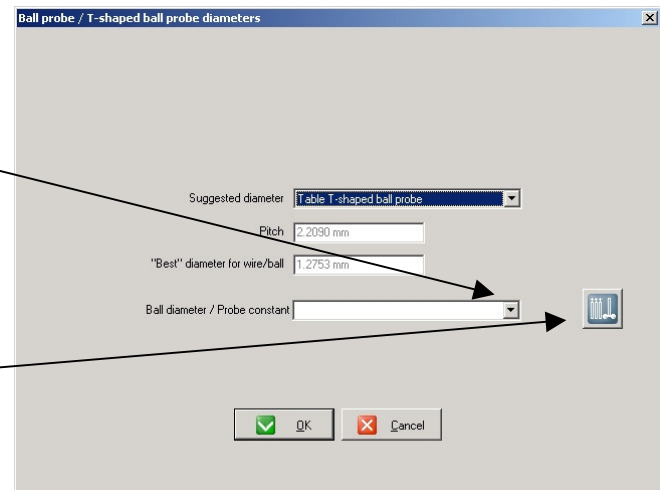
Probe	Value
0.0000 mm	0.0000 mm
-0.0009 mm	-0.0009 mm
-0.0009 mm	-0.0009 mm
0.0002 mm	0.0002 mm



The „Best Diameter“ will be calculated.

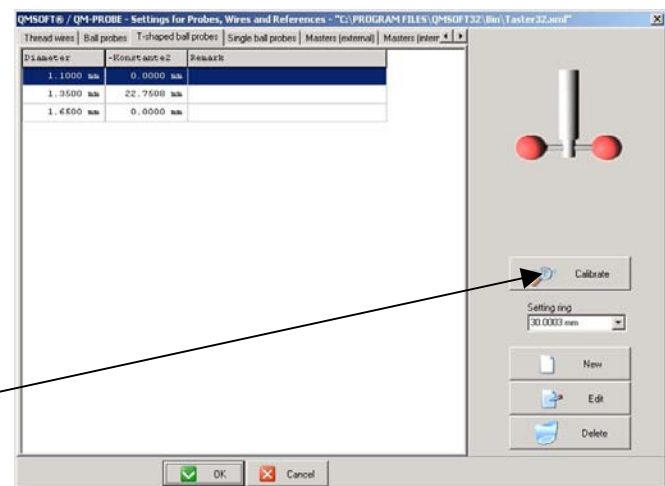
At this place the nearest lying diameter can be selected, if in the selection table suited probe diameters are entered.

Via the button „Select Probe“ you are entering then into the actual selection table.



In this table all probe ball diameters can be entered in the left column, which you use for the taper thread measurement.

Regarding the single probes now the probe constants must be found. In order to start the calibration sequence, the corresponding probe must be marked. Then press button „Calibrate“.

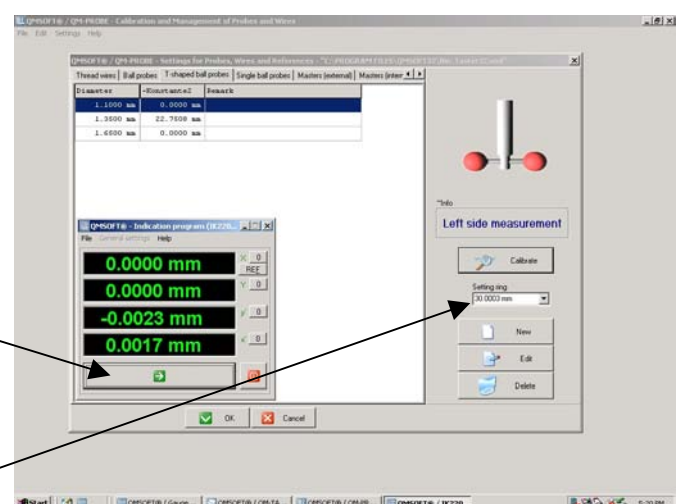


Follow now the operation menu.

Observe the detailed remarks on the following pages.

The taking over of the measuring values for calculation of the probe constant is now effected with the arrow button.

The diameter of the calibration ring must be entered in the field „Setting Ring“ or selected.



### Procedure for the calibration of the measuring probes:

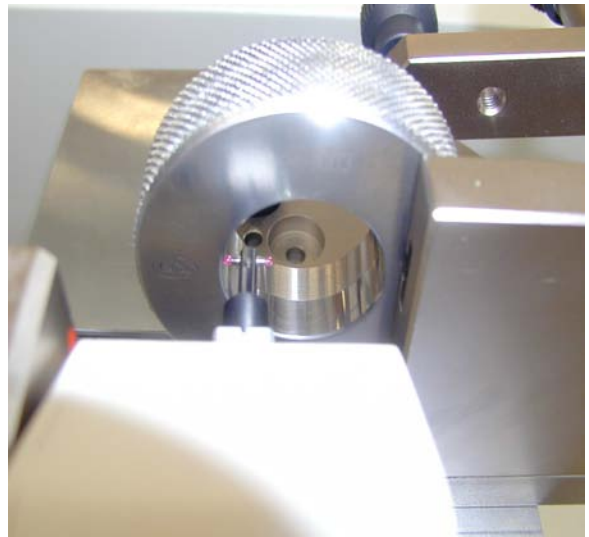
For all T – shaped ball probes must be found the probe constant as shown in the picture below.

Fix plain calibration ring on the clamping angle.  
 With the measuring insert touch the plain surface of the calibration ring.  
 Reset axis Y' to zero.  
 Drive measuring carriage in X direction.  
 Swivel the measuring table in such a way via the Y axis, until the plain surface of the ring gauge is adjusted parallel to the X axis..  
 (Adjusting procedure must be often repeated).  
 Admissible adjustment deviation is approx. 0.01mm/ 10mm.



The parallel alignment of the clamping angle must be maintained for the following measurements.

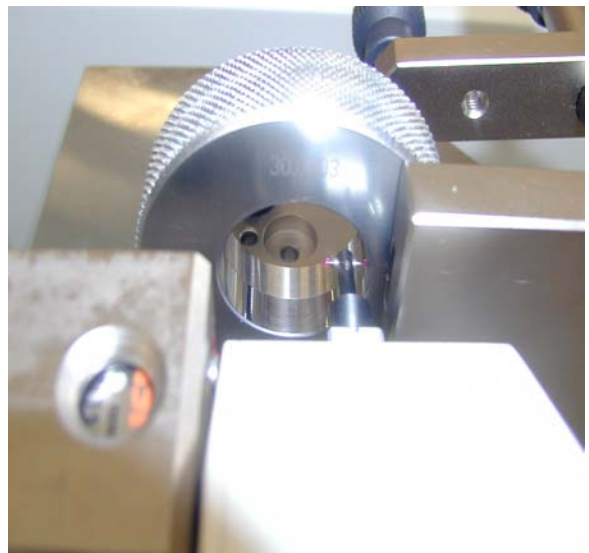
Reset the measuring axis X' in neutral position to zero.  
 Touch with the T- shaped ball probe the left side of the calibration diameter.  
 Search the reversal point by driving in Z direction.  
 By means of the fine adjustment of the X axis adjust the excursion of the measuring probe X' exactly to 0.1000 mm.  
 Reset measuring axis X to zero.



Touch with the T- shaped ball probe the right side of the calibration diameter.  
 By means of the fine adjustment of the X axis adjust the excursion of the measuring probe X' exactly to –0.1000 mm.

Probe constant = Calibration diameter – displayed measuring value. The software calculate the probe constant.

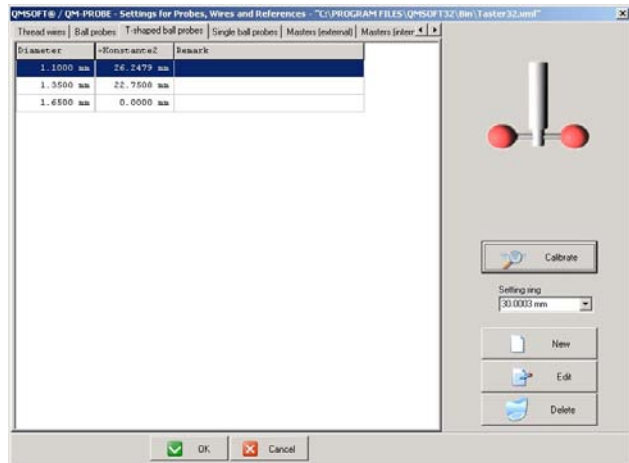
The received probe constant will be considered at the following taper threads measurements.



As soon as the contact values of the “Setting Rings” have been taken over, the probe constant will be calculated and then taken over in the selection table.

If you always use the same probes, it is not necessary to find the probe constant new at each time. However, a checking in regular intervals should be made.

In order to attain the maximum of accuracy, the anew finding of the probe constant is necessary before each taper thread measurement.



## Measurement

*The measuring head, on which the T- shaped ball probes are mounted, has only the function to secure a slight tracing mass and a repeatable measuring force.*

*The determination of the probe constant for the different T- shaped ball probes were destined for an excursion of  $\pm 0.1000\text{mm}$ .*

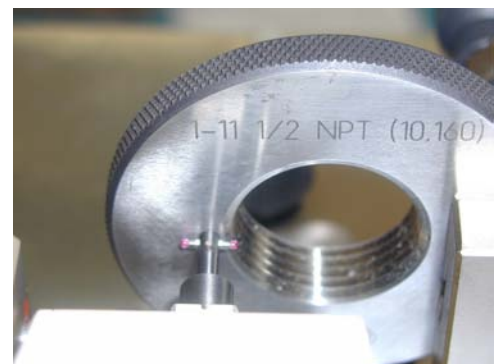
*After you have searched for the reversal points in the thread grooves, the X' excursion must be adjusted depending on the touching direction generally to  $+ 0.1000\text{mm}$  or  $- 0.1000\text{mm}$ .*

*As this procedure repeats itself more often, it is not necessary to write it always new on the following pages.*

*At the taper thread measurement you will be assisted by a graphic operation menu.*

### Measurement of taper thread ring gauges:

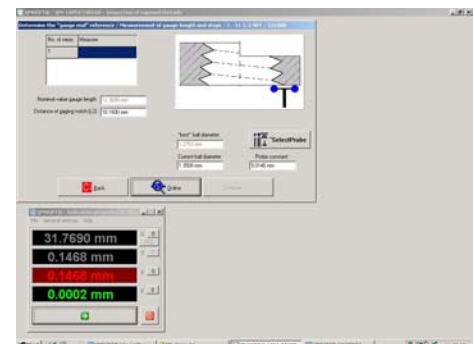
1. Open the inspection program for taper threads.
2. Select gauge type you would like to measure.
3. Complete the first 2 empty fields (identity no., thread designation).
4. Select thread standard in third field.
5. Push button "calculate tolerances" (software calculates the gauge tolerances automatically).
6. Push "continue" button.
7. Skip the info window: "gauge alignment".
8. Open indication program "QMSOFT 4W/IK220KEG".
9. Set Y'-display value to "Zero".
10. Move measuring table in Y-direction (+ direction to operator), until the probe head touches the plane surface of the ring gauge  
Please notice: "Y" Display should not switch to red after touching the gauge.
11. Now move with the carriage (X-axis) along the surface of the gauge to check the alignment of the gauge. Adjust the gauge by turning the table around z-axis until the deviation in the Y'-display is not more than  $1\text{ }\mu\text{m}$ .



12. Touch with right ball of the T-probe the plane surface of the ring gauge in the way it is shown on the schematic drawing on the screen window. Value in Y'-display should not turn to red at this point!

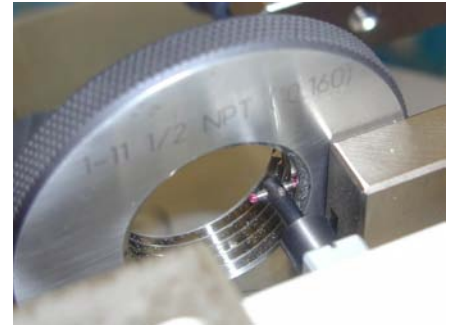


13. Push the blue “transfer measuring value” button in the measuring display.



14. Push “continue” button in program.
15. Touch with the right ball probe the thread gauge in the way it is shown on the schematic drawing on the screen window.

16. If the Y'-axis display colour shows still a red value, please adjust the measuring table in Y-direction, until the display colour changes to green.



17. Now you have to search the maximum value in the X-axis by adjusting the measuring table Z direction (table up/down). While adjusting it can happen that the display of Y' switches again from green to red. In that case please adjust once more the Y-axis until the Y'-display shows green again.

18. If above mentioned values are correct shown in green colour please move the probe again out of the thread and touch again the thread. This is necessary to guarantee the right measuring force!
19. Push the blue “transfer measuring value” button in the measuring display.
20. Move with the probe into the middle of the thread gauge and adjust the measuring table in the Y (+) direction for the length of one thread pitch. Touch the thread gauge again, according to schematic drawing on screen window .
21. With measuring table please adjust once more the Y-axis until the Y' and the Y display shows green again.
22. Push the blue “transfer measuring value” button in the measuring display.
23. Now the Y-axis display will switch to red.
24. Adjust the measuring table in the Y (-) axis (away from operator) for the length of a half thread pitch until the Y-display will switch to green.
25. Now touch with the right ball from the T-probe the right side of the thread gauge, according to schematic drawing on screen window. After touching the gauge it can happen, that the display of Y' switches again from green to red. In that case please adjust once more the Y-axis until the Y'-display shows green again.
26. Move with the probe into the middle of the thread gauge and touch again on to the right side of the thread gauge.  
  
Please notice: All values in display must be shown in green colour!
27. Push the blue “transfer measuring value” button in the measuring display.
28. Push “continue” button.



29. If you like to generate a certificate please push the corresponding button.

Calibration Certificate

Measurement Laboratory  
< customize here your name and logo >

QMSOFT

QM-TTAP

Gauge type: Taper full form thread ring gauge  
Identify number: 1346879

Thread designation: NPT 1 - 11 1/2  
Standard: Pipe threads acc. to ANSI/ASME B1.20.1-1  
1. Flank angle: 30.0°  
2. Flank angle: 30.0°  
Pitch: 2.2090 mm  
Used ball diameter: 1.3500 mm  
Probe constant: 0.0453 mm

Gauge nominal values:  
Major diameter - minimum value: 33.1759 mm  
Effective diameter new (min): 31.4536 mm  
Effective diameter new (max): 31.4688 mm  
Effective diameter - wear limit: 31.4686 mm  
Minor diameter (min): 29.9503 mm  
Minor diameter (max): 30.0209 mm  
Taper of thread: 0° - 3 Min. 45 Sek.  
Ring thickness: 12.368 mm  
Distance gaging notch L1 (L2): 10.160 mm

Inspection results:

Measure No.	Effective diam. at measur. plane [mm]	Distance to gauge plane [mm]	Effective diameter at Tolerance graphic / gauge plane [mm]	Exclusion
1	31.1502	4.9813	31.4997	

Measure No.	Nominal pitch [mm]	Actual pitch [mm]
1	2.2090	2.2098

Table of single readings:

Eff. diam. (Effective diameter)	Measure No.	Value X Coordinate [mm]	Value Y Coordinate [mm]
1	1	-6.2295	10.2193
1	2	-6.2916	12.4691
1	3	-29.9285	11.3451

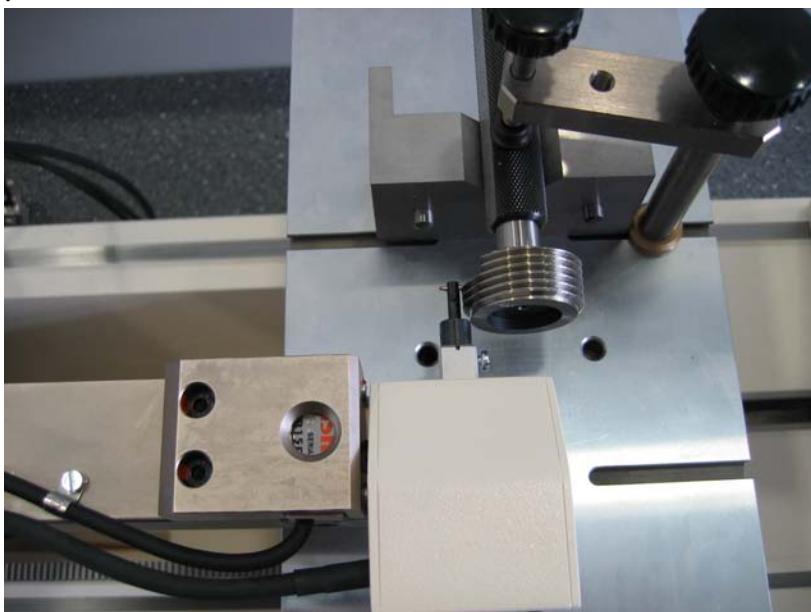
Valuation:

Inspection device: Measuring device no. 4711 (Calibr. Certificate No. 901)  
Inspection date: 10.05.2005  
Next inspection date:  
Operator:

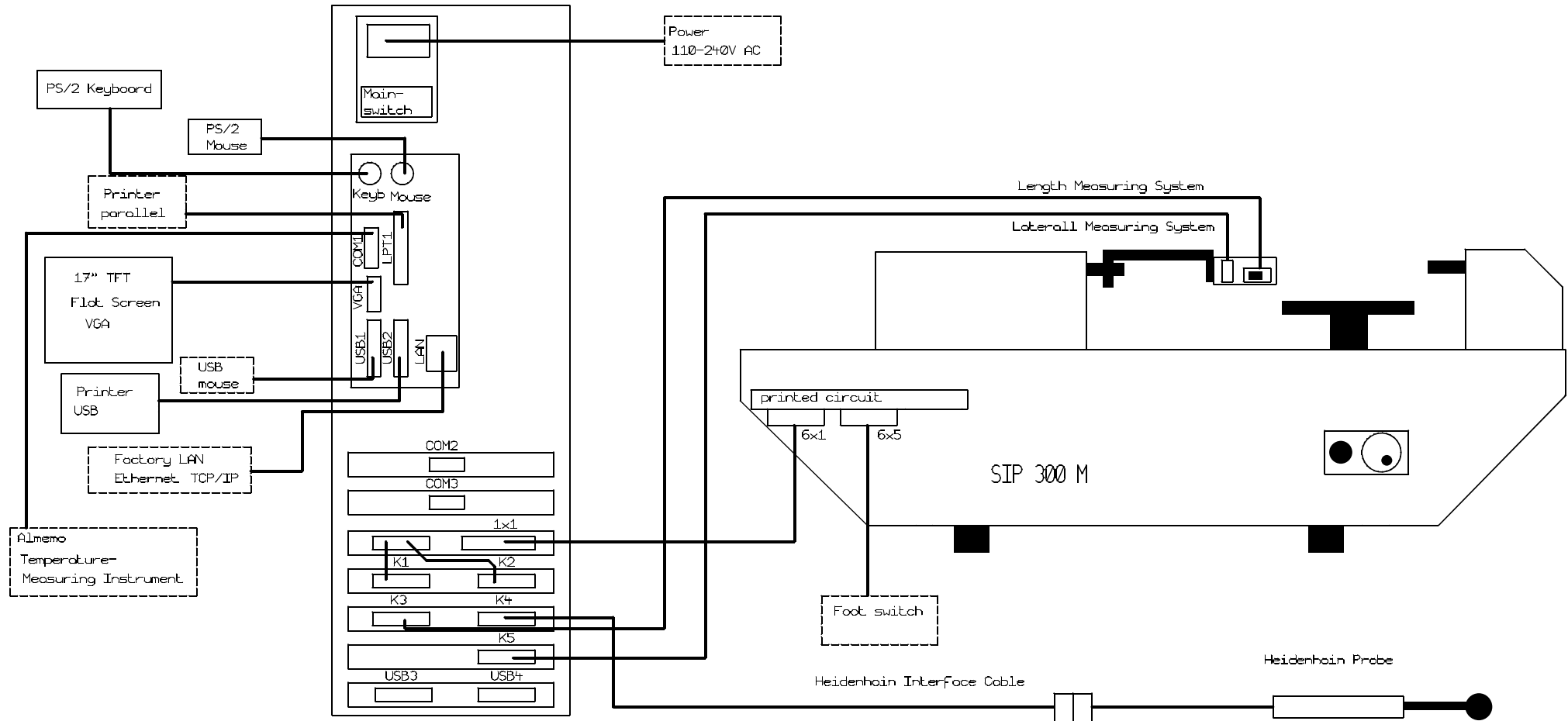
Gauge in tolerances

## Measurement of taper thread plug gauges :

This is in principle the same step as the measurement of internal thread gauges. The measurement is done with the same caliper arm and the same ball probes. For the plug gauges please use the special clamping device for plug gauges.



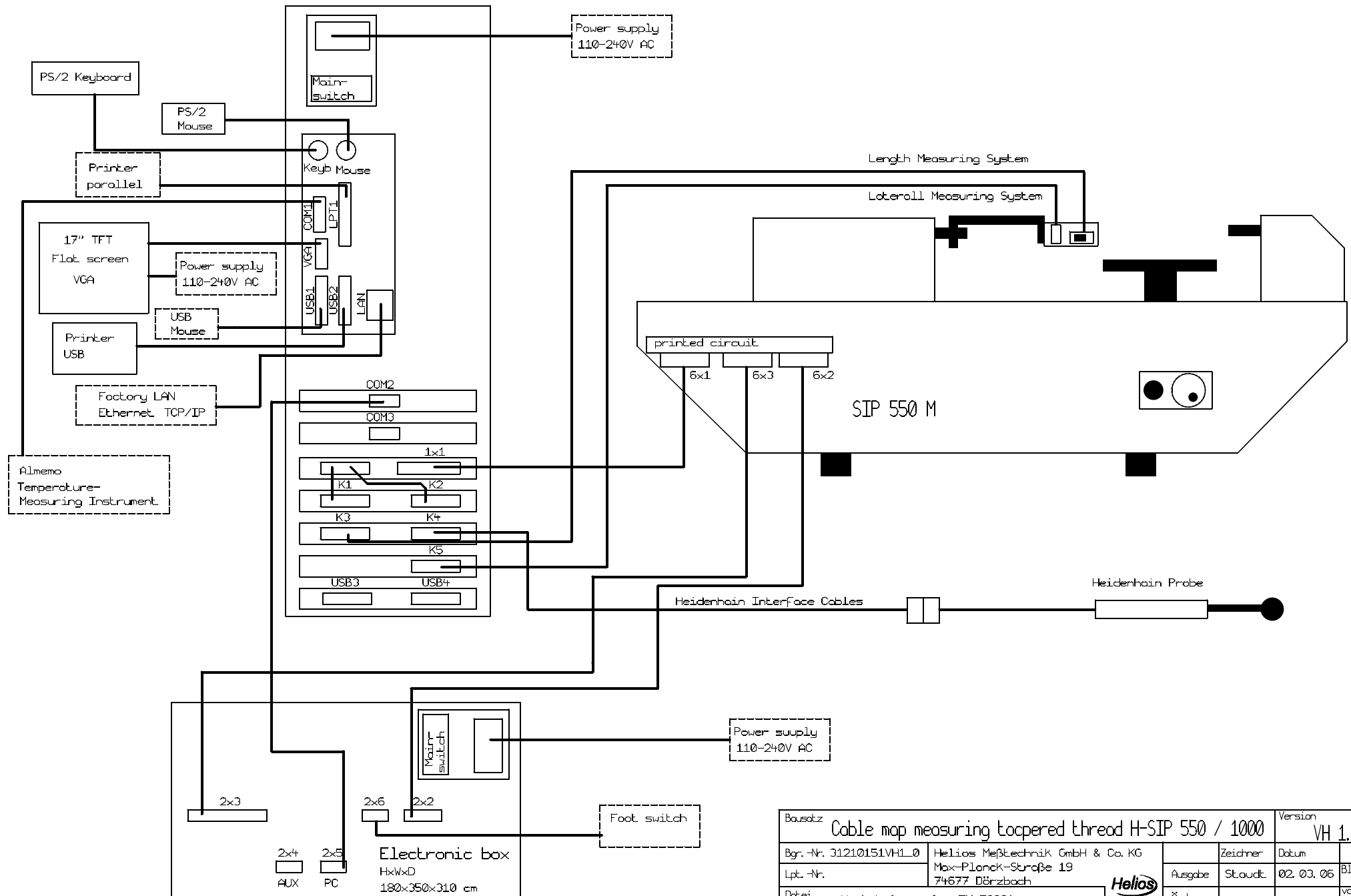
Industrial Desktop PC  
back view



Bausatz		Cable Map Measuring Coopered thread H-SIP 300		Version		VH 1.0	
Bgr.-Nr. 31210151VH1_0	Helios Messtechnik GmbH & Co. KG			Zeichner	Datum		
Lpt.-Nr.	Max-Planck-Straße 19 74677 Dörzbach			Ausgabe	Staudt	03.03.06	Blatt 1
Datei	Verkabelungsplan EN T3001			Änderung			von 1



# Industrial Desktop PC back view



Bausatz Cable map measuring tapered thread H-SIP 550 / 1000				Version VH 1.0	
Bgr.-Nr. 31210151VH1.0	Helios Meßtechnik GmbH & Co. KG		Zeichner	Datum	
Lpt.-Nr.	Max-Planck-Straße 19		Ausgabe	Staudt	02.03.06 Blatt 2
74677 Dörzbach			Änderung		von 2
Filei	Verkabelungsplan EN T3001				