



VII. Inspection program QM-MICRO

The QM-MICRO program serves as a computer support program for the inspection of micrometers according to DIN 863, VDI/VDE/DGQ guideline 2618 (pages 5,6,14,15), the Federal specification GGG-C-105C, the British Standards BS 870 „External micrometer“, BS 6468:1984 for depth micrometers, BS 959 „Internal micrometers“, respective according to customised factory standards. Therefore it can be used to inspect all kinds of external micrometers, micrometer heads and internal micrometers.

The use of the program itself, however, requires only a little knowledge of computers.

Measurement data can be entered directly from an on-line connected measuring machine or from the keyboard. But note that the "Online" connection will be disabled if the type of inspection requires solid masters (for example inspection of 3 point contact internal micrometers which will be inspected with master setting rings).

Depending on the type of micrometer and the chosen evaluation (according DIN, VDI, British standard...) the program determines the total deviation range f_{\max} , the deviation range of the micrometer thimble f_{me} and the repeatability f_w . Additionally the inspection of extension rods for internal micrometers can be made. The evaluation results can be re-produced on the screen and/or the printer. Tolerance excesses will be shown.

The program QM-MICRO can be started directly out of the database program QM-MANAG - also offered by L&W GmbH - and provided with initial data (such as ID-number, measuring range and graduation of the micrometer to be inspected etc.), in this case the inspection results are directly transmitted back to the database.

VII.1. Program start

You can start the QM-MICRO program directly from the QMSOFT command Shell (click the corresponded symbol in the shell). The other way is to start the program through the WINDOWS file manager or the explorer (WINDOWS 95, 98 ..).

Before working with the program you have the possibility to customise some things according your individual needs and wishes.

The following program settings you have to do:

- **Configuration of the Online Interface:**

If you use a direct linkage between the computer and your measuring machine to transfer measuring values, at first you should start the indication program required (RS232DRV, IK102021 or SIDDRV depended on the device and the interface connection you use) and set the correct parameters for the Online Interface (see also the manual of the used program).

- **Program settings and inspection conditions:**

Here you can set some general things for the program environment; for example: the default way to transfer measuring values (machine or keyboard) or the unit used for the evaluation. See section V.3 for this.

Attention: An incorrect selection of the parameters for the online connection (e.g. for the serial port) can produce a system crash while measure data input ! Make sure that you are informed about your computer system and the correct name of the serial port for on-line interface. For settings of the serial interface see also Appendix D.

VII.2. Program settings

Working with the program you should make different settings to define the program environment and especially program conditions. Use the menu “Settings” to do this.

VII.2.1. “Settings | Program settings”

Using this option you have the following registers to change program settings:

Register „General“

Here you can choose the program language, switch on/off the help text and select the default data input device (keyboard of the computer, on-line measuring machine). If you set “Online” as the default device the Online connection will be started automatically if a gauge measurement will start and “Online” measurement is possible for the type of inspection.

Using the option “Save certificates automatically” any calibration certificate will be saved into the “Certificate directory” (see register “directories”). The file name will be created by of the gauges identity number or the entered certificate number. You can set if you want to save the certificate as “RTF”, “PDF”,... file format.

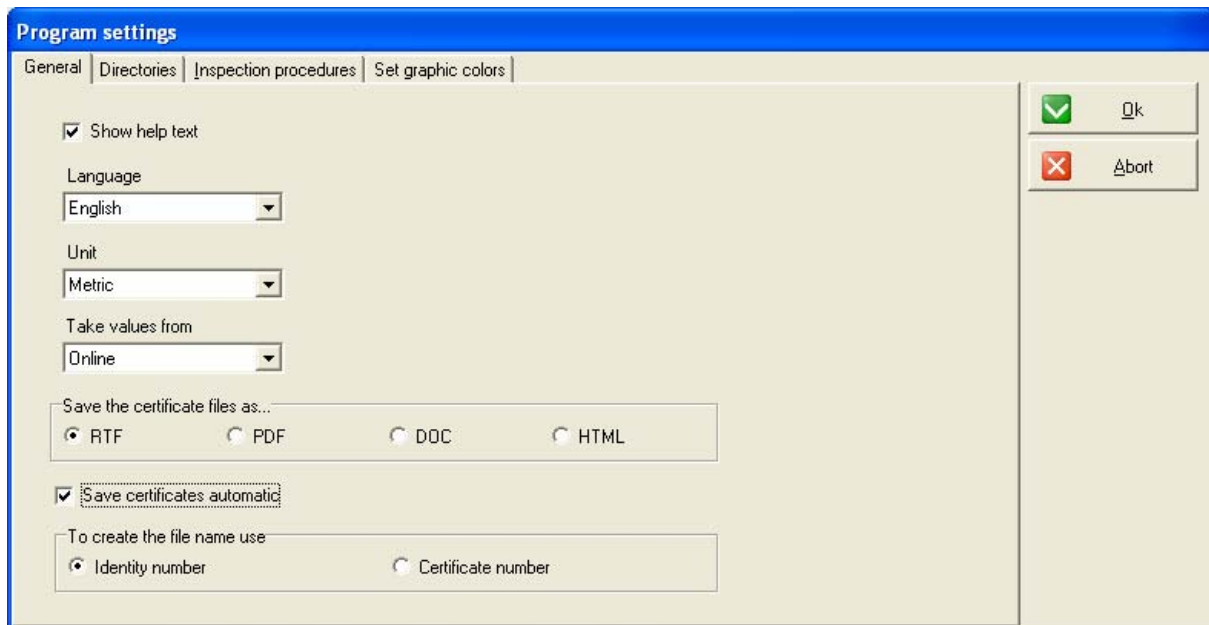


Figure: General program settings

Register „Inspection procedures“

Here you can enter for each gauge type a reference to a corresponded text file including the inspection procedure as a text. Enter your own text for the procedures here.

Note that this “inspection procedure” does not influence the inspection process.

The measuring positions will be set using the option “Inspection conditions”.

Register „Directories“

For some functions (indicating of measuring values; creation and edit of certificate layouts) external programs will be used. Here you have to enter the directory where the corresponded program can be found.

While doing the program installation all directories will be set to a correct value!

ATTENTION: Make sure that these entries are correct. Errors while operating the program may be caused by incorrect settings in the screen "Directories".

Register „Set graphic colours“

Inspecting a micrometer you will get a calibration curve on the screen which you can also print out on your certificate. Here you can set the colours for the graphic elements. Please note that you can made this settings different for the "Screen" and the "Print".

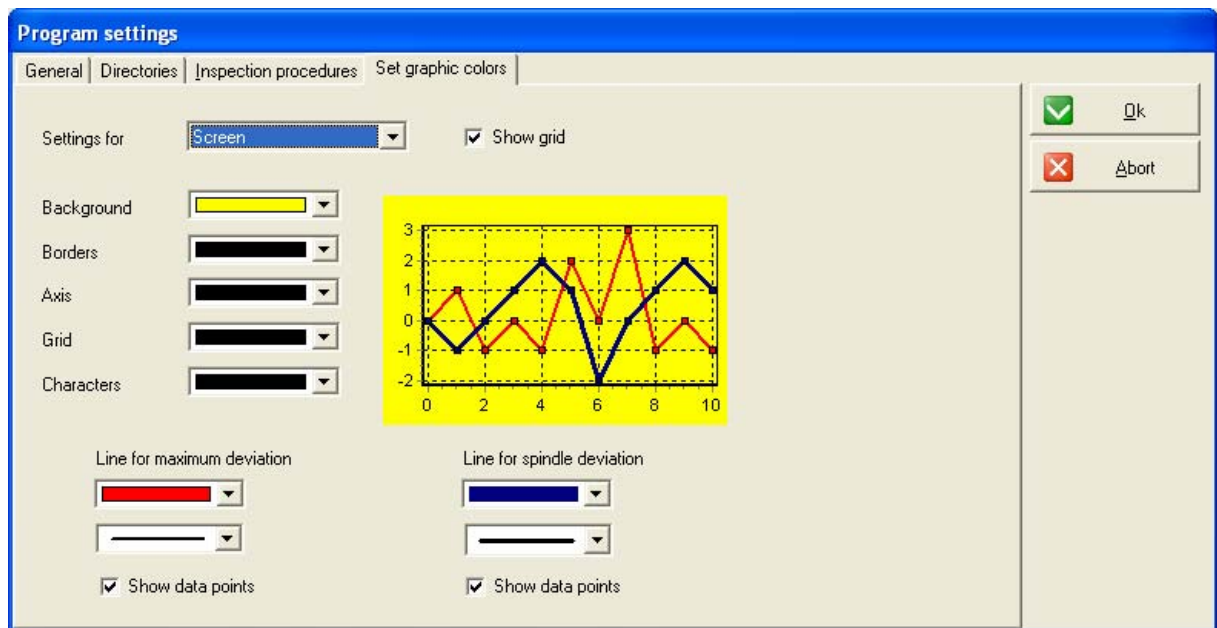
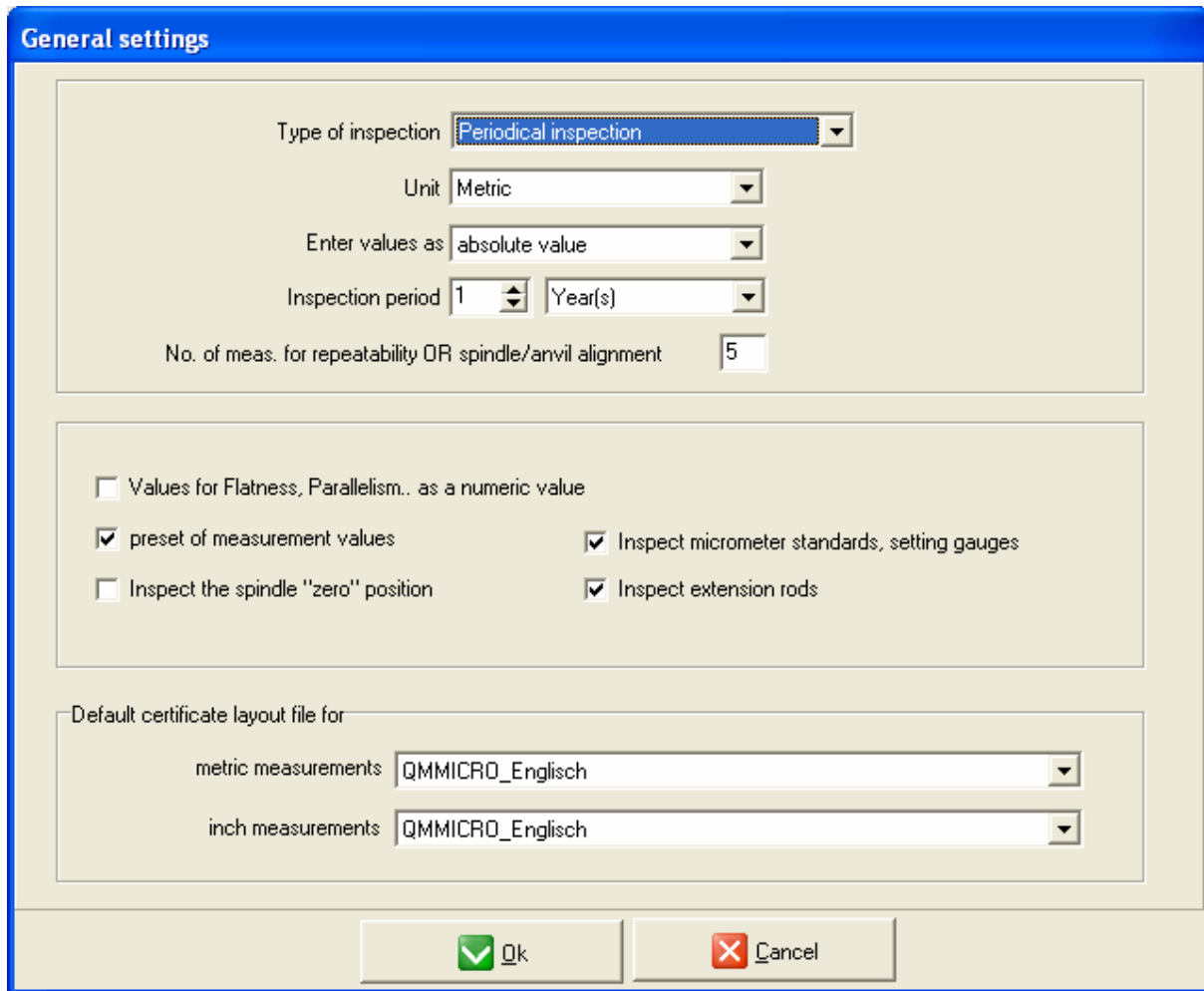


Figure: Set graphic colours

VII.2.2. “Settings | Inspection conditions”

Here you can set some general conditions for the micrometer inspection and also the reading position you want to use.



General settings

Type of inspection: Periodical inspection

Unit: Metric

Enter values as: absolute value

Inspection period: 1 Year(s)

No. of meas. for repeatability OR spindle/anvil alignment: 5

☐ Values for Flatness, Parallelism.. as a numeric value

☒ preset of measurement values

☒ Inspect micrometer standards, setting gauges

☐ Inspect the spindle "zero" position

☒ Inspect extension rods

Default certificate layout file for:

metric measurements: QMMICRO_Englisch

inch measurements: QMMICRO_Englisch

Ok Cancel

Figure: Inspection conditions - general

Set the following parameters:

Type of inspection:

Select “Periodical..” or “Incoming inspection”. For an “Incoming inspection” some additional inspections (e.g. hardness inspection) have to be done.

Unit:

Chose the unit for the micrometer.

Enter measuring values as:

Select if you want to enter the measures as direct readings or if you want to enter the “deviation”. In the most cases if you use the keyboard to enter measuring values the second option is more convenient.

Inspection period:

Enter a default “Inspection period” to calculate the date for the next inspection. This can be print on the certificate. If the program is called from the database the “Next inspection date” value given from the database will be used.

Measures for repeatability:

Type here the number of readings you want to enter if you inspect the repeatability f_w of a micrometer screw.

- Values for flatness, parallelism... as numeric values:** If you inspect any type of micrometer you have also to check parameters like "Flatness of measuring faces", "Parallelism of measuring faces" and others. If you activate this option you can enter the results for this inspection as numerical values. Otherwise you have only a "Pass" / "Fail" decision for this parameters.
- Pre set of measuring values:** Switch "on" this to fill the column "Measure" in the measuring table with the nominal values.
- Inspect the "Spindle zero position":** Especially while inspecting according to the German "DIN" standard the inspection does not start on the "Zero" position. In this case it is expected that the spindles "zero" position is exact on "Zero". Otherwise you have to adjust the spindle. Switch on this option if you want to start the inspection with the spindles "Zero" position. This option is ineffective for inside micrometers which will be inspected with master rings.
- Inspect micrometer standards, setting gauges:** Often you have for a micrometer a standard or a master ring for the adjustment. If you activate this switch here you can enter the nominal sizes of this standards while entering the micrometer nominal data. The inspection of this standards will than be a part of the micrometer inspection.
- Inspect extension rods...:** If you activate this switch here you can enter the nominal sizes of extension rods or interchangeable anvils. The inspection of this extensions will than be a part of the micrometer inspection.
- Default certificate layout file(s):** Enter here the name and directory for the certificate layout files you want to use to create your calibration certificates. For "mm" and "inch" measurements different files are used.

NOTE: Because the program will be installed to support different languages you will find a number of "L32" files in the related directory. The file name (for example "QMMICRO-English.L32") will show you the used language. Using the related program features you can delete all certificate layout files you do not need.

VII.2.3. Settings | Inspection positions

The accuracy of readings of a micrometer is usually checked by taking readings on a series of slip gauges (gauge blocks) or by taking readings with an indication device on different positions.

The British Standards and also other standards will give you recommendations about the readings you have to take. Otherwise the program does offer the possibility to define you own reading positions.

Use the option "Settings | Inspection positions" to define the related positions for different types of micrometers.

The tables with all entered reading positions will be saved into the "Inspection position file" (see also section VII.2.1. 'Directories'). The default file name is "POSITIONS.XML".

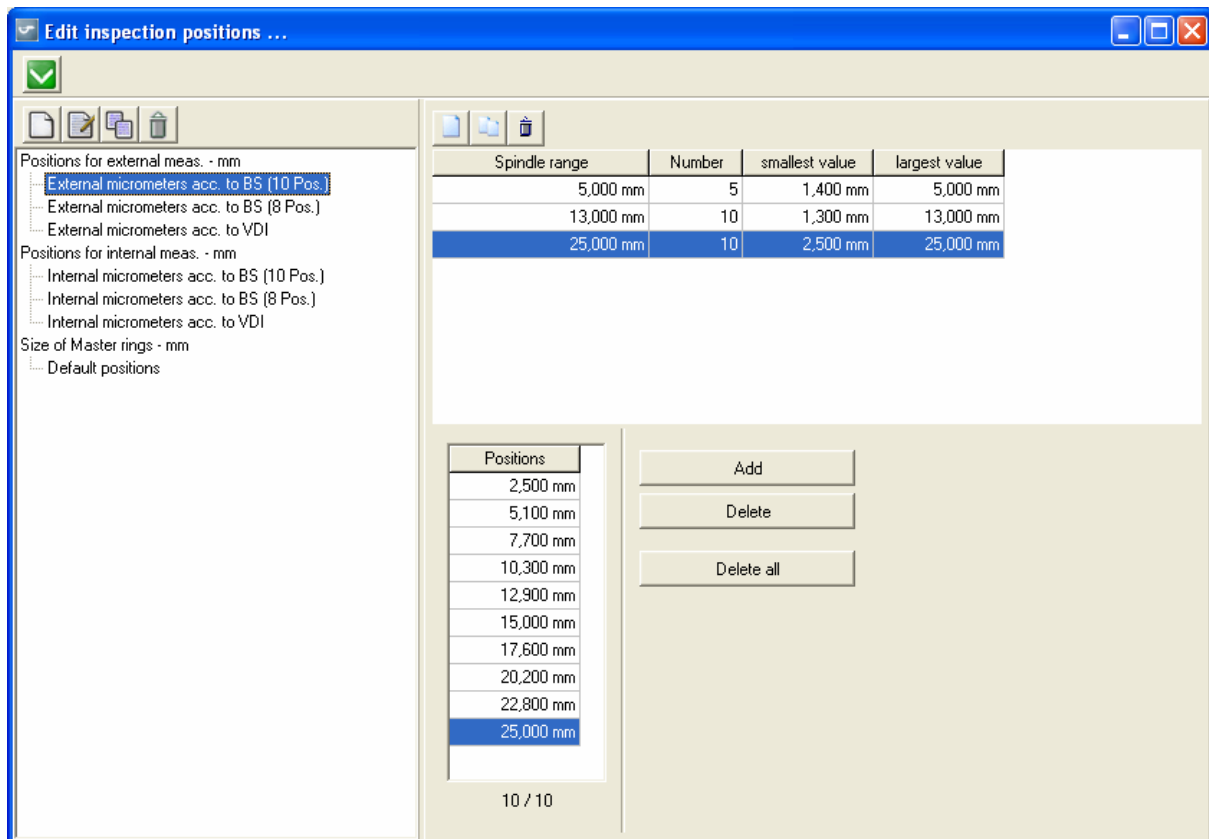


Figure: Entering inspection positions for "mm" micrometer

The position tables are divided in three categories:

VII.2.3.1. Inspection positions for external, depth micrometers and micrometer heads:

For the inspection of external, depth micrometers and micrometer heads the DIN standard respective the VDI-guidelines or the BS standards gives a recommendation for the inspection positions should be used. These positions are pre-defined in the program in the related position tables.

In the shown table you can enter values for different spindle ranges. So you can also define reading positions for micrometers which does not correspond with a known standard. For an inspection according to factory standard you can define new tables with your customised positions.

Pay attention, that the entered positions are always related to the start of the micrometers measuring range (for example: start of range is 25 mm the inspection position "5.100 mm" does mean the absolute position is "30.10 mm").

VII.2.3.2. Reading positions to inspect internal micrometer with an indicator

Some types of internal micrometers may be able to be inspected with an indicator. If you want to do this enter here the appropriate reading positions. Similar the external micrometers does this positions correspond with the spindle range. The entered positions are always related to the start of the micrometers measuring range.

VII.2.3.3. Master ring diameters to inspect internal micrometers:

The inspection of internal micrometers should be made on different positions of the applicable measuring range. For this, often (for example for inspection of 3-point contact micrometers) appropriated setting rings will be used. The readings you get on the inspected micrometers have to be compared with the sizes of your reference gauges. To make this comparison the program must be informed about the inspection positions you use. The entering of master ring values will be made as described above.

Make sure that the inspection positions can only be assigned to the micrometer inspected if the "Start" and the "End" of the measuring range match to an entry made in the table above.

VII.2.4. "Settings | Factory tolerances"

If you have chosen the option "Factory tolerances" a list of already existing tolerance entries (see Figure) will appear on the screen.

For each type of micrometer (external, internal..) you have an separate list to enter factory tolerances.

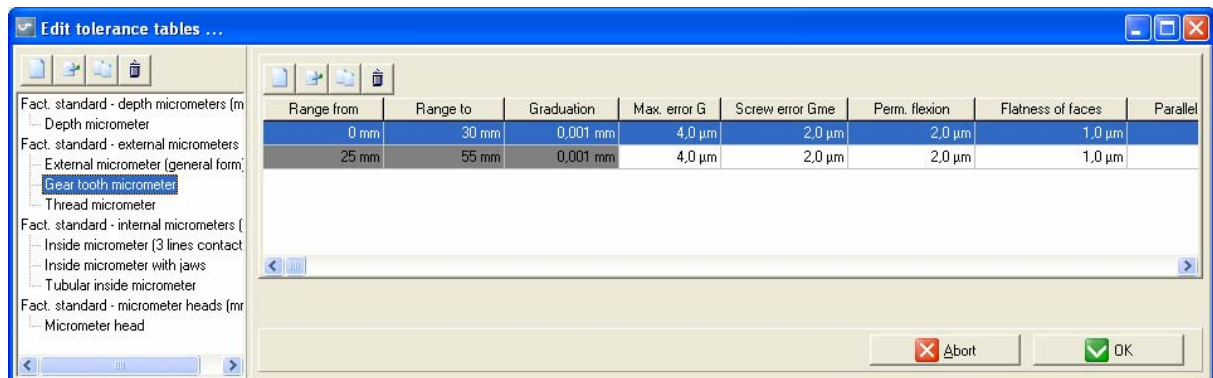


Figure: Entering of factory tolerances

Here you can insert new tolerances, delete existing tolerances or change it.

With the functions "Copy the tolerance table" and "Create a new factory tolerance table" you can copy a tolerance table from one micrometer type to another.

The tolerance tables will be saved in the file „**TOLERANCES.XML**". When doing a micrometer inspection according factory standard this values are used for the valuation of the micrometer being inspected. The entered values are related to the type of micrometer, the „Measuring range up ..to" and the „Graduation".

If you want to do a micrometer inspection acc. to „Factory standard" make sure that a corresponding tolerance entry is available. Otherwise the „Continue" button will be locked.

VII.3. Certificate layout files

The program gives you the possibility to customise the layout of your calibration certificates. The layout of these certificates is based on the so called "certificate layout file" (template). This file contains all information about the form of the certificate and the values that should appear in this. By editing this certificate layout file you can change the layout. Saving this file with another file name gives you the possibility to work with different record layouts.

All certificate layout files you have created will be saved in the selected directory (see program settings). The files have the extension ".L32".

Using the option "**Certificate layouts / Show / edit a certificate layout**" you can load an existing certificate layout file into the editor program.

ATTENTION: Do not open a certificate layout file ("L32" extension) directly with the QMSOFT editor or with any other program! In this case the program dependent fields will be removed !!

A certificate layout file is consisting of three different types of information:

- "normal" text: is text information just like in a known text processing application; you can change the text as you want and you can set the different text parameters;
- "Placeholders" ("Fields"): a "Field" is including a variable information about the gauge, the measuring process or the measuring environment. A "field" will be fulfilled with the actual information while executing the program. Editing a certificate layout file you can change "field" positions, delete "fields" (if you do not need the related information) and insert new "fields". To insert a new "field" in your certificate layout use the menu "Insert | Fields". Using this menu you can also see all available "Fields" and the related information. For numerical fields you can set the number of decimal points using the menu "Insert | Fields".
- "Line conditions": A line condition gives you the possibility to control the certificate layout in dependence of different program situations. A text or field following to an line condition will be printed out on the certificate only if the condition is "true". For example you can print a special text only if an "External measurement" was done. Please open an existing certificate layout and see the comments for the "Line conditions" available.

VII.4. Micrometer inspection

VII.4.1. Entering of parameters

After selecting the type of micrometer in the main menu a series of parameters must be entered that describe the micrometer and the inspection conditions. The input of these parameters is done in a separate dialog box with a corresponding number of input fields.

Figure: Entering parameters for the micrometer inspection

Identity number:

This field is used to establish an identity for the calliper by entering a number. This number will be noted in the record.

Reading positions acc. to:

The shown list is depended on the selected micrometer type. Select the reading positions proposed by the VDI rules or the BS or on your self defined positions. If you want to use your own positions (factory standard) make sure that you have insert the positions for the used measuring range (see also section VII.2.3).

Calculate tolerances acc. to:

The shown list is depended on the selected micrometer type. Select the standard you want to use for the micrometer tolerances. If you select „Factory standard“ make sure that the required tolerances are entered in the tolerance table.

Type of indication:

Choose here, from the list provided, the type of the indication (Vernier scale, Dial, Digital). Depended on the chosen option you have to enter in the next field the vernier scale, the graduation or the resolution of the micrometer.

Start of meas. range:

Enter the start of the measuring range of the micrometer. The unit is "mm". For micrometers according a given standard make sure the validity of this standard.

End of meas. range:

Enter the end of the measuring range of the micrometer have to be inspected. The unit is "mm". For micrometer without extensions or interchangeable anvils the „End of measuring range“ will be set automatically.

Spindle range:

Select the range of the spindle from the shown list.

Graduation:

Select the spindle graduation from the shown list.

Inspection of: Here you can select, from the list provided, the micrometer parameters you want to inspect. The entering of measuring values is depended on the chosen option.

Inspection with: Here you can select, how you want to do the inspection of internal micrometers with 2-Point contact. The standard give you the possibility to do this with setting rings or with an indication device (measuring machine).

NOTE: *To change the Unit from "inch" to "mm" or back – press the button "Inspection conditions". Then select the page "General"; here you can change the gauges unit (see also section VII.2.2)*

The buttons „Setting gauges“ and „Extensions“

If you have activate an option „Inspect micrometer standards“ or „Inspect extensions“ (see section VII.2.3.) than you can here enter the nominal values of the micrometer standards or the extension or interchangeable anvils.

The inspection of this standards and/or extension will be a part of the inspection.

NOTE: If the “continue” Button is disabled check the following parameters:

- does the entered values for “Spindle range” and “Graduation” correspond with the standard selected; (for example the BS 870 standard is defining only a graduation of 0.001 inch or 0.01 mm); if you are not sure switch to “Factory standard”
- if you select the option “Reading positions according to: Factory standard” be sure that you have entered the positions required; otherwise use the function “Inspection conditions” to do it;
- if you select the option “Tolerances according to: Factory standard” be sure that you have entered the related tolerances for the “Measuring range” and the “Graduation”; otherwise use the function “Factory tolerances” to do it;

VII.4.2. Inspection of functionality, “Flatness”, “Parallelism” and more

An important part of a micrometer inspection is it to check the general functionality and some other parameters depended on the type of micrometer and/or the selected standard.

These are the:

- Function and Visual inspection;
- Flatness of measuring faces;
- Parallelism of measuring faces;
- Measuring force of the spindle friction;
- Hardness

Depended on the measuring conditions you have selected (see section VII.2.2) you can do this as a “Pass” / “Fail” decision or you enter the results of the inspection in form of the actual numerical values.

	Valuation / Actual value	Tolerances	Valuation
Visual inspection	ok		
Functionality (friction drive..)	ok		
Flatness of spindle face	0,60 µm	1,0 µm	ok
Flatness of anvil face	0,40 µm	1,0 µm	ok
Parallelism of measuring faces	1,00 µm	3,0 µm	ok
Parallelism (2nd position)	1,50 µm		
Parallelism (3rd position)	0,00		
Parallelism (4th position)	0,00		
Flatness of datum face	0,00		not inspected
Inspection of "Zero" reading	0,00	1,0 µm	ok
Measuring force	0,00	1½ lb. - 2¼ lb.	ok
Hardness inspection	not inspected		

Figure: Checking micrometer functionality and additional parameters

To enter the inspection results the input mask shown in the figure will appear on your screen including the corresponding tolerances of this parameters. Now you have to enter the inspection result for each parameter or if the “Pass” / “Fail” option is selected to check, if the actual values of the micrometer inspected are inside the shown tolerance or not.

If you choose "not inspected" the related parameter will not be shown/printed in the calibration certificate.

The “Reject” button

If the inspection of the functionality or of any other parameter fails it may be useless to inspect the traverse or spindle error of the micrometer. In this case you can use the “Reject” button to skip the following steps of the inspection. In this case you will go directly to the creation of the inspection certificate.

VII.4.3. Entering measuring values

The input of the measuring values must be done in the order: measuring value 1 to n for increasing readings. The valid inspection position (depended on the VDI guidelines, the British standard or the entered inspection positions) is displayed. The measuring values are inspected on their plausibility.

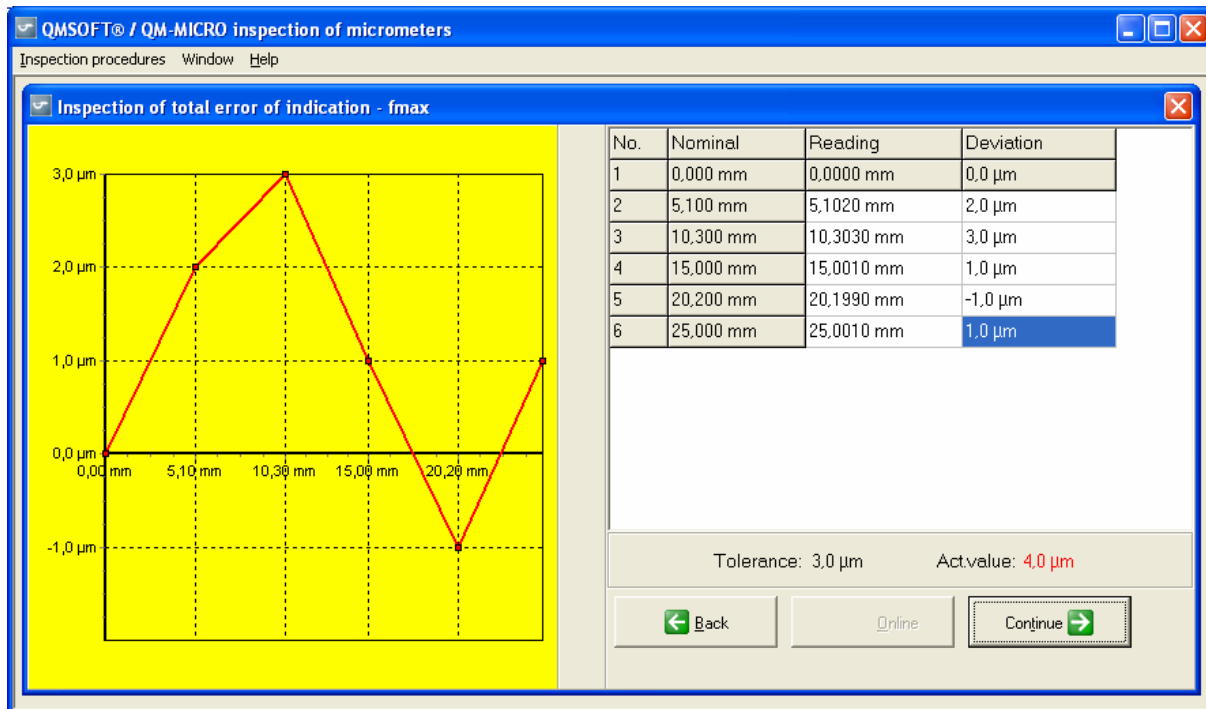


Figure: Entering measuring values

Depended on the current program settings, the input of measuring values will be done directly by an indication device or by the keyboard. Pay attention, that the inspection with gauge blocks or setting rings always needs a data input by the keyboard.

a) Input of measuring values using the computer keyboard

The input of the measuring values has to be given as deviation values from the nominal values (incorrect-correct) in micrometers! This minimises the keystrokes. The measuring values must be put into a separate field, which is marked with a special input request. If the input shall be interrupted the ESC key must be used.

b) Input of measuring values via a measuring machine

The on-line data input via a measuring machine is the most effective form of inspection. Some handling actions depend on the used measuring machine (see the corresponding producer documentation). The transfer of the data has to be started at the measuring device (handle or pedal).

VII.4.4. Evaluation and working with the results

The corresponding deviation ranges will be calculated from the measuring values received. The valuation of the micrometer inspected will be done according the following criteria:

- making a inspection for a micrometer according the DIN-standard (inspection can be made according DIN or VDI) or according the AS/BS-standards the standardised error limits will be used for the micrometer valuation;
- for a non standardised micrometer the tolerance assessment is done only if the type of micrometer and the start and end of the measuring range match the corresponding entry in the factory standard tolerance table;
- if neither of the above is filled in, no tolerance assessment will be made.

The result of the tolerance assessment will be noted in the record.

VII.5. Output of results

After entry of the measurement data has been completed, the screen "End of inspection" will appear.

Figure: End of inspection – show / print certificate

If the inspection is finished you get the screen shown above. The summary result of the inspection is shown. Here you can enter the name of the customer, the date for the next inspection and also some remarks to the inspection.

Before creating the calibration certificate you can change the certificate layout file will be used.

To start the output of the results press the "Show certificate" button.

All functions for the editing and the output of calibration certificates will be controlled by the EDITOR - program. See the manual of this program ("Appendix B") to see how to operate this.

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