Metrology

MANUAL

ComGage
Software

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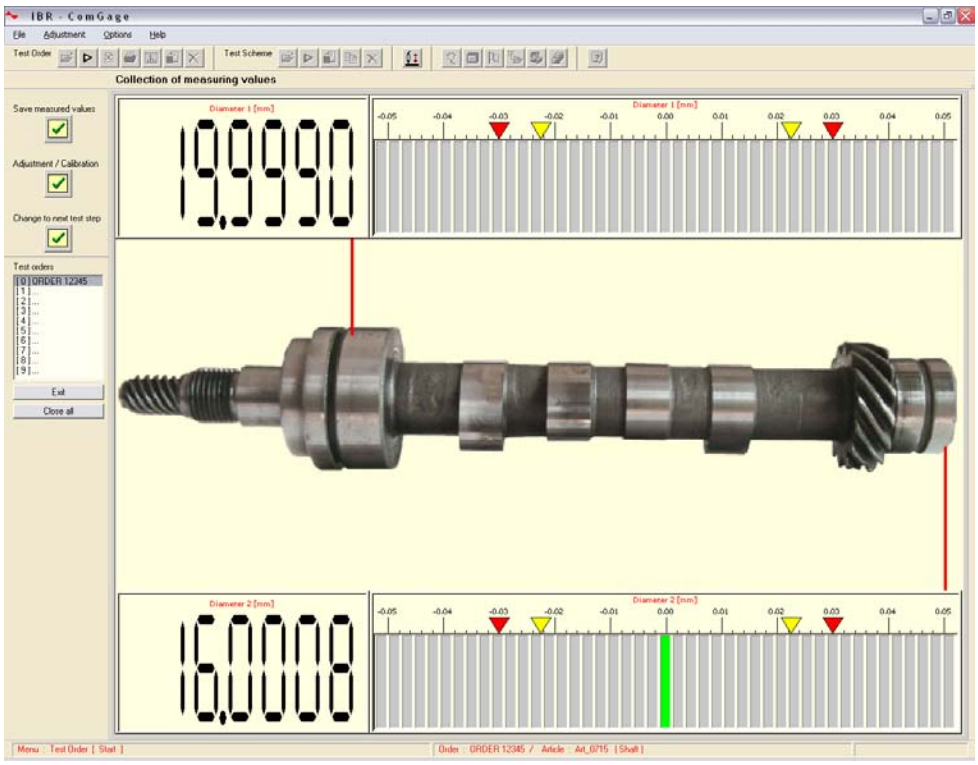
Contents

1. Introduction

ComGage is a universal software for metrology and statistical process control in manufacturing facilities.
The software allows testing of components with various characteristics. Additionally the software provides information for statistical process control by means of the statistical functions included.



2. Features

- *Connection of all gauges and sensors via IBR Instruments*
- *Test orders for saving and analysing of measurement values*
- *Test schemes for defining the characteristics of the component*
- *Inclusion of reference information (machines, operators, batch numbers, …) in test orders and schemes*
- *Simultaneous opening of several test orders or test schemes for collection of measurement data on different production lines*
- *Up to 128 characteristics can be assigned to each component*
- *Free definition of gauges with mathematical functions (such as sin, cos, tan, min, max, …)*
- *Static and dynamic measuring modes*
- *Many possibilities for the definition of the measurement displays (visual design of the display)*
- *Statistical displays (like Control Charts, Histograms, Statistical Data, Run Charts, …)*
- *Automatic and manual saving of measurement values*
- *Automatic and manual switching over of test steps*
- *Zero adjustment and calibration of gauges (on air-gauging)*
- *Opening of zero adjustment and gauge calibration window by function key, foot switch, timer or number of measured components*
- *Reference test for performing fixture check*
- *Control functions by digital inputs and outputs*
- *Converting of measurement values to different formats (Q-DAS, Excel, …)*
- *Analysis of measurement values with printout function*
- *User management (for assigning rights to the different users)*

3. General information about (working with) ComGage

ComGage is programmed with C++ using standard API functions only. This allows optimum speed, less usage of resources and the possibility to generate a Windows CE version of ComGage.

In addition to universal measuring routines and online SPC functions for the production an easy understandable shell, multiple languages (European and Asian), operation only by a small keyboard and less usage of PC resources (for working on small Windows CE PCs – e.g. Pocket PCs) were important points for the development of ComGage.

The programming in ComGage is visual. The layout and colours can be defined without limitations – always seeing the result or information on the screen.

In ComGage you can mainly programme two groups of files :

a) Test Scheme :

A test scheme contains the definition of the component with its characteristics (nominal size, tolerances, …). In addition it contains the definition of how to measure (measurement sequences, static / dynamic measurements, probe mixings, …) and the design of the display. No measurement data can be saved when running a test scheme.

b) Test Order :

A test order serves to assign measurement and test data to the corresponding production lots or customer orders. A test order must contain a test scheme (which defines all parameters for the test of the component) and the number of components to be tested.
The measurement data of a test order can be saved, converted (Excel, QS-Stat, …), analysed and printed.

Test schemes and test orders can also contain reference information (machines, operators, batch numbers, …). The programming of test schemes and test orders is described in detail in this manual.

The ComGage software consists of 5 modules :

1.) IBR_TSH (**T**est **S**cheme **H**andler) for creating test schemes.
2.) IBR_TOH (**T**est **O**rder **H**andler) for creating, analysing, printing and converting test orders
3.) IBR_WGL (**W**indow **G**auge **L**ibrary) for measuring
4.) IBR_SPC (**S**tatistical **P**rocess **C**ontrol) for online statistics and analysis of measurement data
5.) IBR_PLC (**P**rogrammable **L**ogical **C**ontrol) for controlling of digital inputs and outputs

Example of a company's usage of the 5 modules :

In the company there are a PC in the supervisors office (for creating test schemes, test orders and analysis of the measurement values) and 5 measuring PCs with online SPC.
On the supervisors PC the following modules are needed : IBR_TSH, IBR_TOH and IBR_SPC.
On the 5 measuring PCs the following modules are needed : IBR_WGL and IBR_SPC.

The integrated user management allows deactivating certain menus for different users. (e.g. the menus for creating test schemes and test orders can be deactivated for the operators at the manufacturing facilities)

ComGage – files :

*.tsf	→ Test scheme files
*.rto, *.cto	→ Test order files
*.tod	→ Measurement data files
ComGage.rif	→ Reference information files
ComGage.usr	→ User setup files
*.sch	→ Display Element design files

4. Installation and brief overview

The following chapter portrays a brief overview of the steps necessary for installing the software and adjusting the basic settings. It also describes how to create a small measuring programme (= test scheme).

4.1 Installation

Hardware requirements :
Pentium 500
≥ 64 MB Ram
≥ 100 MB free hard disk space

Software requirements :
Windows 95 … Windows 7
Windows CE

Installation from a CD :

1. Insert the CD **IBR Software for Metrology and SPC** into your CD-drive.

2. Go to **Start / Run** and enter
   <Letter of CD-Drive>: \ ComGage \ ComGage _INST.
   Start the installation by clicking the **OK** - button.

   The installation programme then requests the installation parameters in a few windows.

3. The first window allows the selection of the language desired for the installation procedure.
   Click the **Next>** - button to confirm.

4. The second and third windows display some general information concerning programme installation.
   Click the **Next>** - button to confirm.

5. The fourth window requests the destination directory for the ComGage software.
   Click the **Next>** - button to confirm.

6. In the fifth window you can select the folder for **Start / Programmes**.
   Click the **Next>** - button to confirm.

7. The sixth window displays your choice of settings once again for control purposes and can be confirmed by clicking the **Installation** - button.

   Now the installation is executed !!!

8. Close the programme installer by clicking the **Finish** - button, after the installation procedure has been completed successfully. Initial operation of the software can take place directly after completion of the installation procedure. In order to do so, leave the box **"Launch Program File"** checked and click the **Finish** - button.

Installation after downloading from website *www.IBRit.com* :

1. Download the file **COMGAGE.zip** from the Homepage ***www.IBRit.com***.
   Go to **Downloads \ Software** in order to do so. Then unzip the file.

2. Start the unzipped installation file **ComGage_Inst.exe**.

3. Execute the above-described steps 3. to 8. for Installation.

Note :
Before first programme start you must connect the IBR – interface or measuring instruments to the PC and the dongel to a USB- or COM-Port.

4.1 Brief overview

1 Installation

ComGage-CD zur Installation einlegen.
Die Installation erfolgt automatisch und es öffnet sich das Fenster für die Einstellung der Messgeräteanschlüsse.

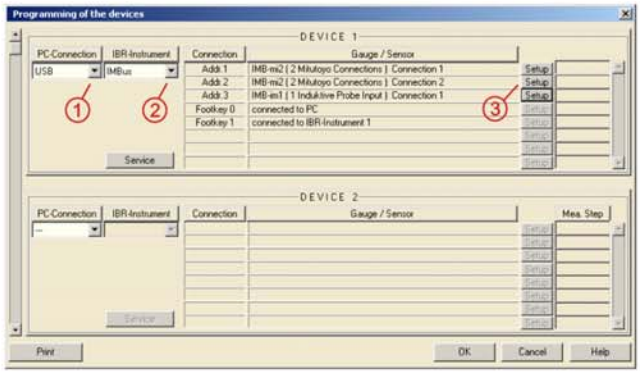
Mess- bzw. Interfacegeräte am PC anschließen.

Auswahl der angeschlossenen Mess- und Interfacegeräte :

① Auswahl des PC-Anschlusses, an dem das Messgerät bzw. Interface angeschlossen ist.

② Auswahl des angeschlossenen Gerätetypes.

③ ***Optional***
Einstellung der Messeingänge z.B. Auflösung, Messrichtung, ...



1 Installation

Insert ComGage-CD for installation.
The installation occurs automatically and a window for setting up the connected instruments opens.

Connect measuring or interface instrument to the PC.

Selection of the connected measuring and interface instruments :

① Selection of the PC connection to which the gauge or interface is connected.

② Selection of the connected gauge type.

Optional ③
Measuring input configuration i.e. resolution, direction, ...

2 Prüfplan

Beim Einsatz von Software in der Messtechnik muss für jede Prüfaufgabe ein Prüfplan erstellt werden.
Der Prüfplan erhält alle Informationen über die Messaufgabe und legt somit den Prüfablauf für die Software fest.

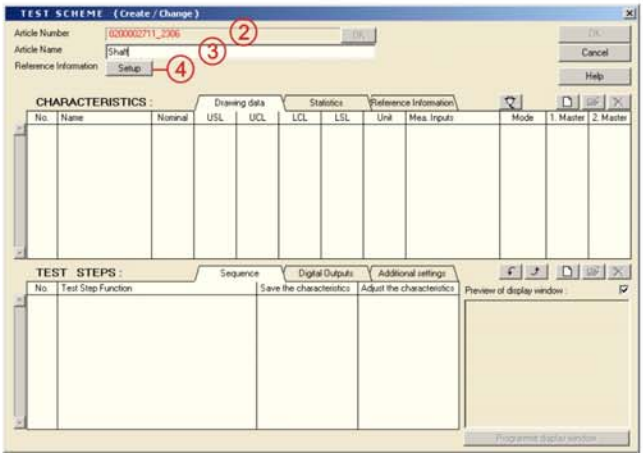
Prüfplan-Erstellung mit ComGage

① Button : *Prüfplan / Anlegen.*

② Artikelnummer eingeben.

③ Artikelbezeichnung eingeben.

④ ***Optional***
Stammdaten-Eingabe (Prüfer, Maschine, ...).



2 Test scheme

On the use of software in the metrology for each measuring application a test scheme must be created.
The test scheme contains all information about the measuring application and stipulates hence the measuring sequence for the software.

Creation of a test scheme with ComGage

① Button : *Test Scheme / Create.*

② Insert article number.

③ Insert article name.

Optional ④
Reference information input (operator, machine, ...).

3

Merkmale

In der Messtechnik werden die zu prüfenden Maße eines Teiles als Merkmale bezeichnet. Jedes Merkmal muss zunächst im Prüfplan beschrieben werden.

Characteristics

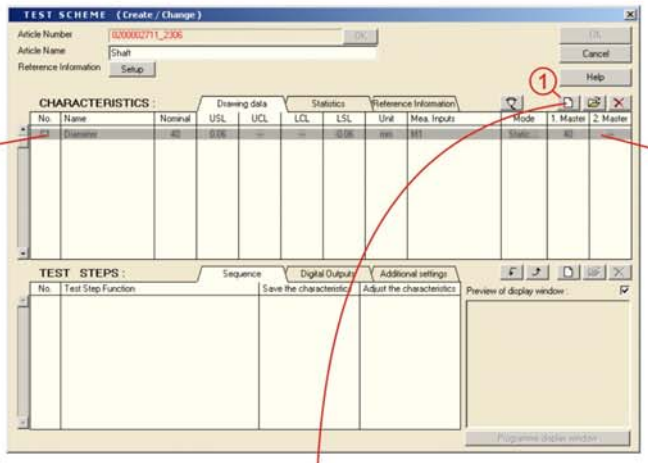
In the metrology the measured dimensions are called characteristics. Each characteristic must be described at first in the test scheme.

Merkmal - Erstellung im ComGage - Prüfplan

Creation of characteristics in ComGage test scheme

① Auf Neu-Button zum Anlegen eines Merkmals klicken.

Beispiel :
Das angelegte Merkmal C1 mit Durchmesser 40 mm und den Toleranzen +/-0.06 mm wird über Messeingang 1 erfasst.



① Click on New-Button for creating a characteristic.

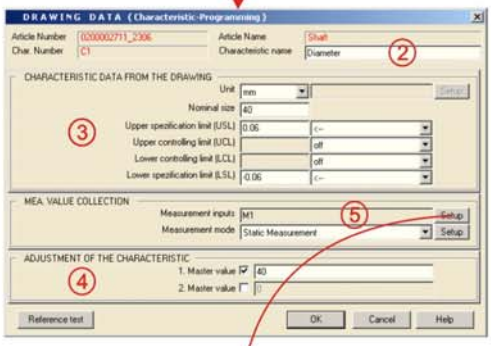
Example :
The created characteristic C1 with diameter 40 mm and tolerances of +/-0.06 mm is collected over measuring input 1.

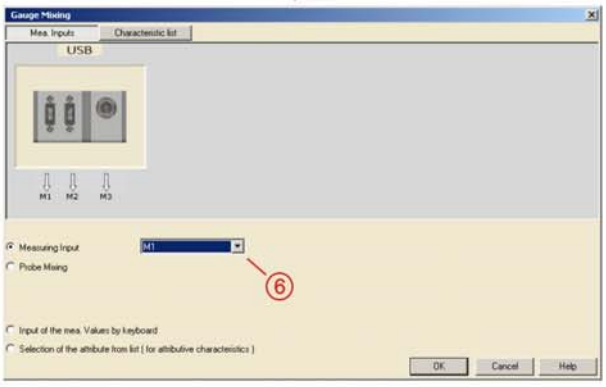
② Merkmalbezeichnung eintragen.

③ Merkmaldaten (Einheit, Nennmaß, Toleranzen) aus Zeichnung übernehmen.

④ **Optional**
1 oder 2 Meisterwerte für Induktivtaster- oder Luftmessdornkalibrierung eintragen.

⑤ Auswahl eines Messeingangs.





⑥ Messeingang eintragen.

Optional können beliebige Formeln und Verknüpfungen eingegeben werden, z.B. M1+M2.

② Insert characteristic name.

③ Insert characteristic data (unit, nominal size, tolerances) from the drawing.

④ ***Optional***
Insert 1 or 2 Master values for calibration of i.e.inductive probes or air plugs.

⑤ Selection of a measuring input.

⑥ Insert measuring input.

Optional free formulas or mixings can be inserted, i.e. M1+M2.

Durch wiederholte Betätigung des Neu-Buttons können weitere Merkmale von dem zu prüfenden Teil angelegt werden.

Repeat with the New-Button for additional characteristics of the component.

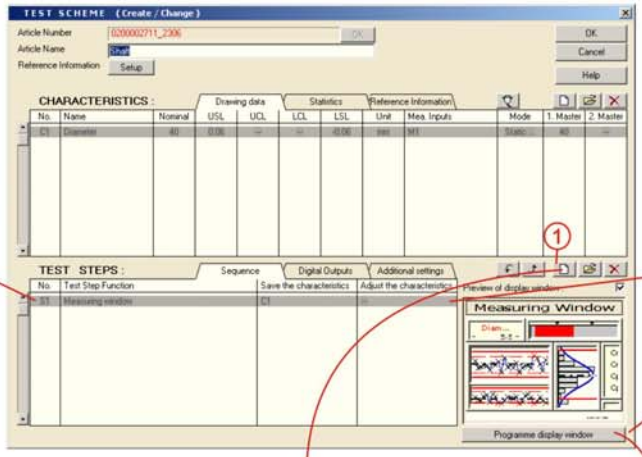
4 Prüfablauf / Test sequence

Der Prüfablauf enthält die einzelnen Prüfschritte mit den Anzeigefenstern.

The test sequence contains the single test steps with the display windows.

Prüfschritt - Erstellung im ComGage - Prüfplan

Creation of test steps in ComGage test scheme

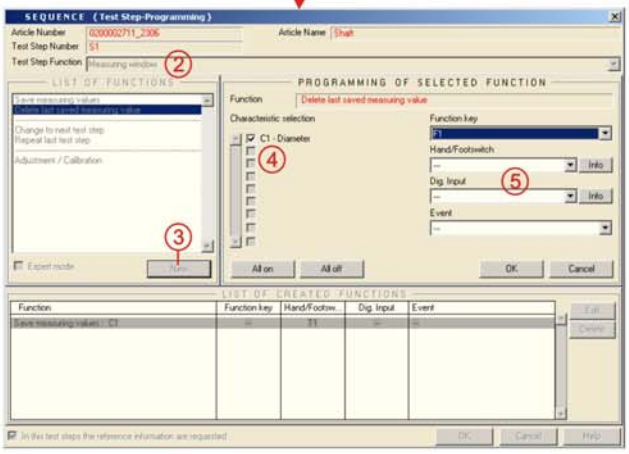


① Auf Neu-Button zum Anlegen eines Prüfschritts klicken.

Beispiel :
In dem Prüfschritt kann während der Messung Merkmal C1 über Fusstaster gespeichert werden.

① Click on New-Button for creating a test step.

Example :
In the test step the characteristic C1 can be saved by foot switch in measuring mode.



② **Optional**
Kommentar für Funktion des Prüfschritts eintragen.

③ Ausführbare Funktion für den Prüfschritt auswählen.

④ Merkmale für Funktion auswählen.

⑤ Fusstaster, Funktionstaste, ... zum Ausführen der Funktion auswählen.

Beispiel :
Im Prüfschritt S1 wird der letzte Messwert von Merkmal C1 über F1-Taste gelöscht.

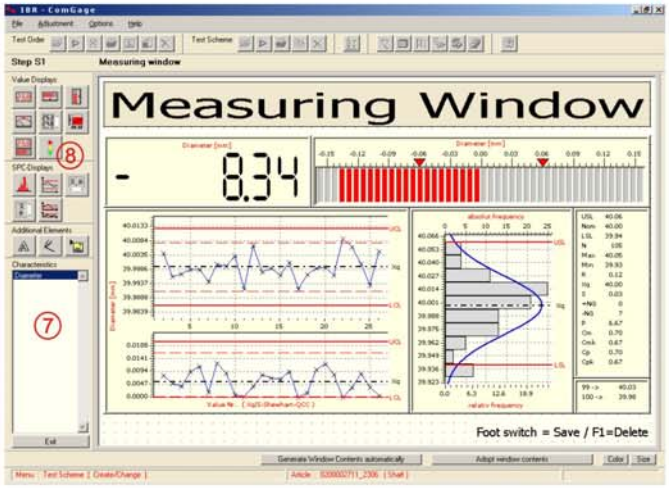
Optional ② Insert comment for function of test step.

③ Select executable function for test step.

④ Select characteristics for function.

⑤ Select foot switch, function key, ... for execution of function.

Example :
In step S1 the last measuring value of characteristic C1 is deleted by F1-key.



⑥ Gestaltung des Anzeigefensters aufrufen.

⑦ Anzuzeigendes Merkmal in Liste auswählen.

⑧ Anzeigeelement für angewähltes Merkmal auswählen und platzieren.

⑥ Call design of display window.

⑦ Select characteristic for display from list.

⑧ Select and place display element for selected characteristic.

Durch wiederholte Betätigung des Neu-Button können weitere Prüfschritte angelegt werden.

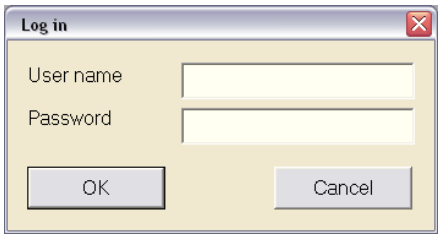
On repeated clicking on the New-Button additional test steps can be added.

Der Prüfplan ist nun erstellt und die Prüfung der Teile kann beginnen.

The test scheme is now created and the measurement of components can be started.

5. User login

On activated user management (see chapter 6.5) you must log in after starting ComGage :



On initial operation of ComGage only one user exists :

User name = admin
Password = admin

After successfully logging in, the main window of ComGage opens.

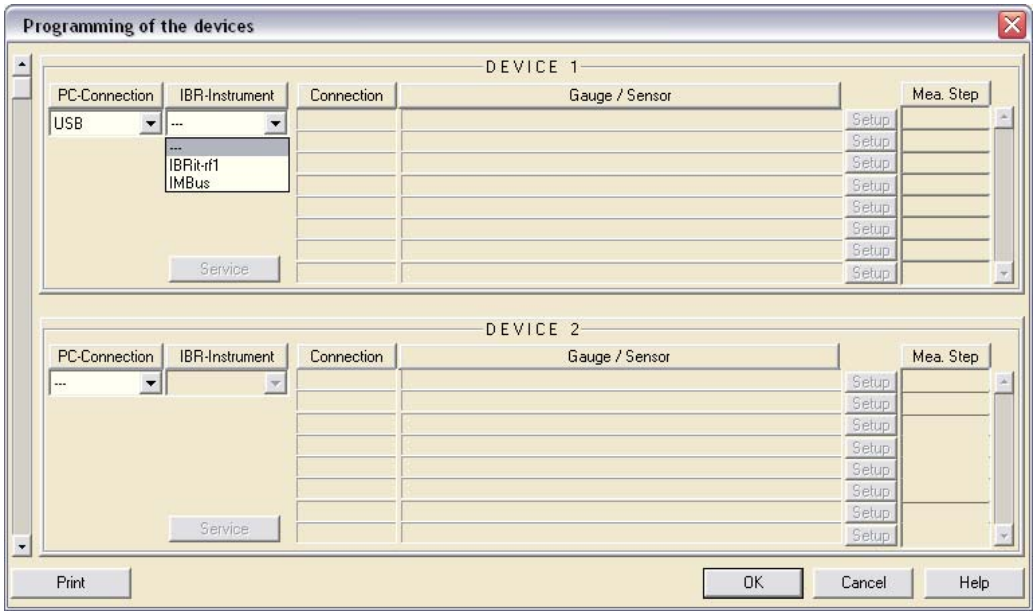
Note : ***Capitalization of user name and password is not checked.***

6. Getting started / Basic settings

On initial operation of the ComGage software there are several important settings that have to be made within the programme. By choosing the **Options** menu, these basic settings can also be modified later on. In the following the submenus of the **Options** menu are described.

6.1 Connections

In the **Options / Connections** menu (Button : ) the connected interfaces and measuring instruments are selected and configured (if necessary - by clicking the **Setup** - button).
ComGage automatically opens the window of the Options / Connections menu on initial operation.

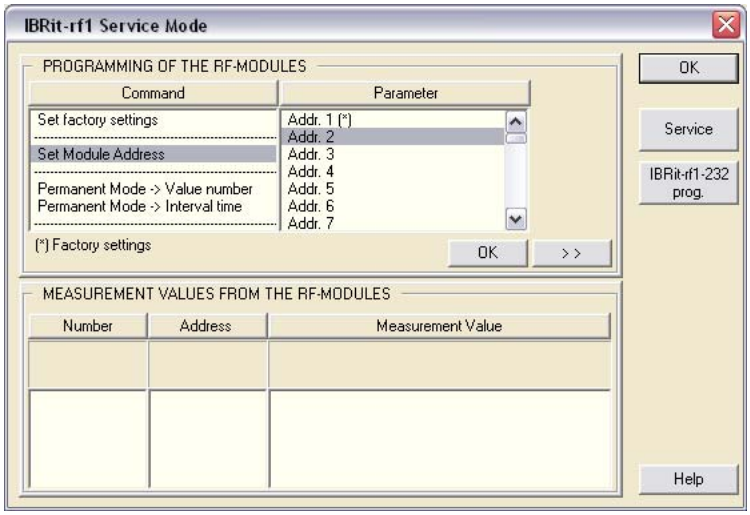


Note : *On initial operation of the software the message or window shown above is displayed in the language of the Windows operating system.*

At first select the PC-Connection and then the connected IBR-Instrument.

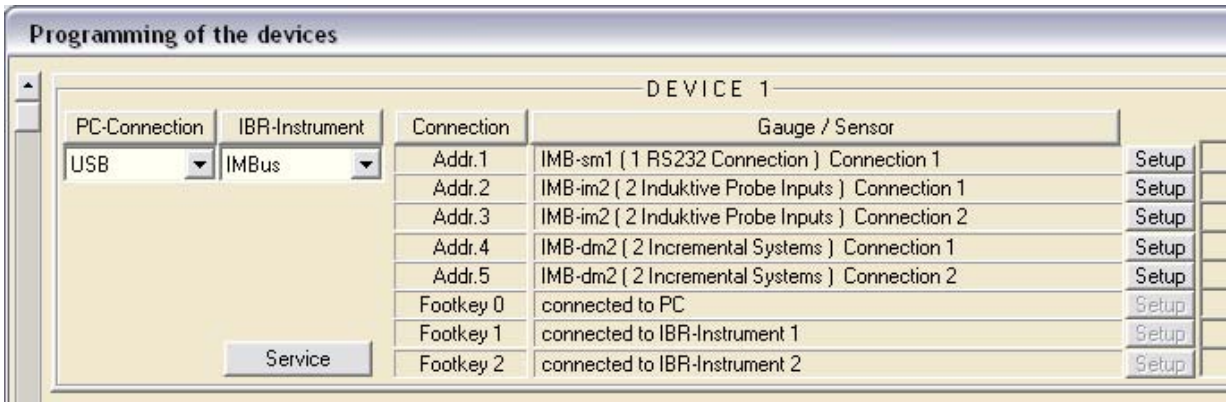
IBRit-rf1 :

In case of IBRit-rf1 radio modules you can access the menu for module configuration (e.g. setting module address) by clicking the **Service** - button. ➔ Please refer to the IBRit-rf1 manual.

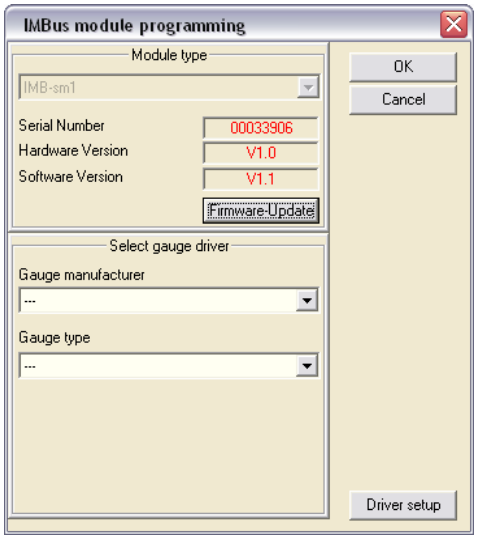


IMBus :

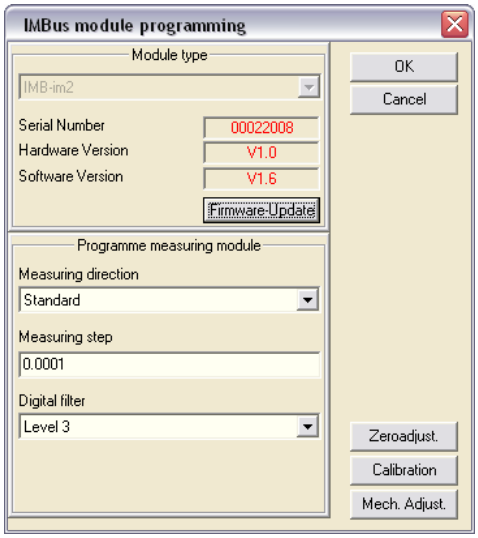
After selecting **IMBus** as setting for the **IBR-Instrument,** the measuring bus is analysed and all connected IMBus modules are displayed.



By means of the **Setup** - buttons for the individual measuring inputs you can select e.g. the gauges connected to IMBus interface modules (IMB-sm1…4, IMB-pm1, …) :



In case of IMBus measuring modules (IMB-im1…8, IMB-dm1…4, IMB-tc1…4, IMB-ai1…8, IMB-ae1, …) you can select the resolution, measuring direction and more :



In case of the devices IBRit-md1 / md2 / mc4 / mc1 / di8 / de8 / da8 / … you can select the following parameters :

Setup : By means of the **Setup**-button you can, in case of the IBRit-mc1, md2 (s) (c) and ma1/2 interfaces, select the gauge or sensor connected to the particular input of your interface from the IBR I/O catalogue.

Mea. Step : In case of the IBRit-di8 / de8 / da8 measuring instruments you can programme the measuring steps (resolution) of the measuring inputs.

With the selection of the **PC-connections** and connected **IBR-instruments** done and the configuration of the instruments completed, you can confirm the settings and close the window by clicking the **OK** - button.

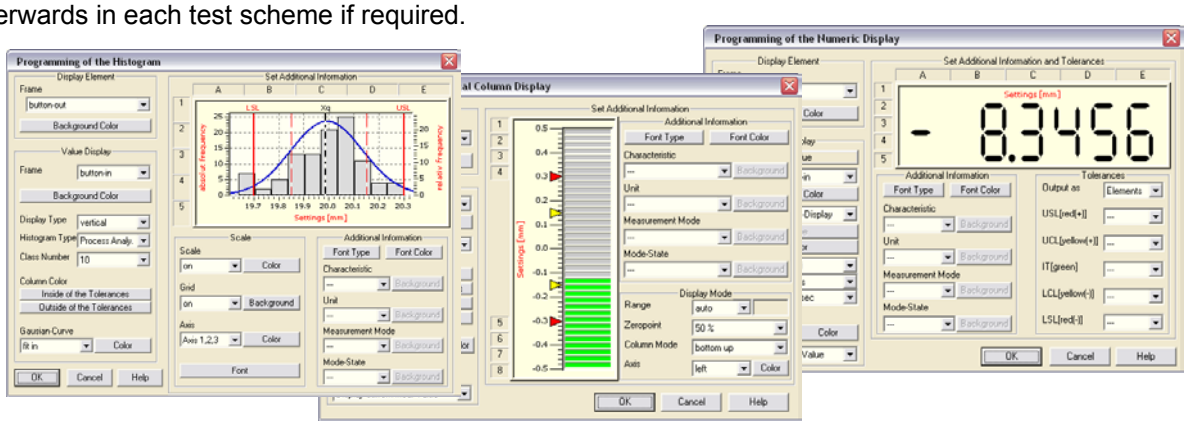
6.2 Display elements

By choosing the **Options / Display Elements** menu (Button : ) the window for the definition of the measurement display colours and the individual design of all measurement- and statistical display elements is opened.

In the main window you get a preview of the display elements, when you use your mouse to point at a particular button or when a button is selected. The Programming of the display elements is self-explanatory and is supported by a preview of the display element in the programming window. (see illustration below)

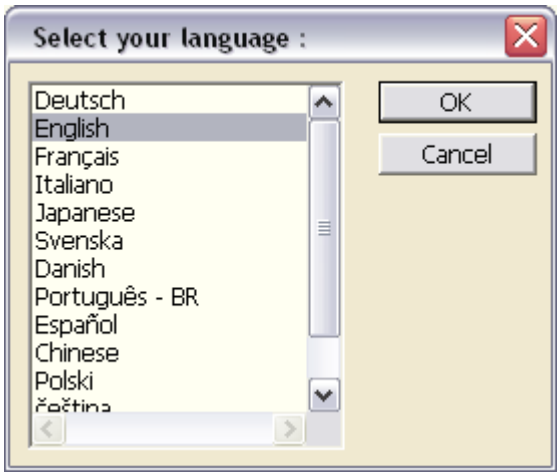
In addition you can define, save and delete schemes including a colour palette and the settings of the display elements.

The defined colours and settings of the display elements are copied into each test scheme when inserting the display elements in the menu *create test scheme*. The settings of the display elements can be changed afterwards in each test scheme if required.



6.3 Language selection

You can select the language by choosing the **Options / Language** menu (Button : ). On language selection a window containing a list of the available languages is displayed.



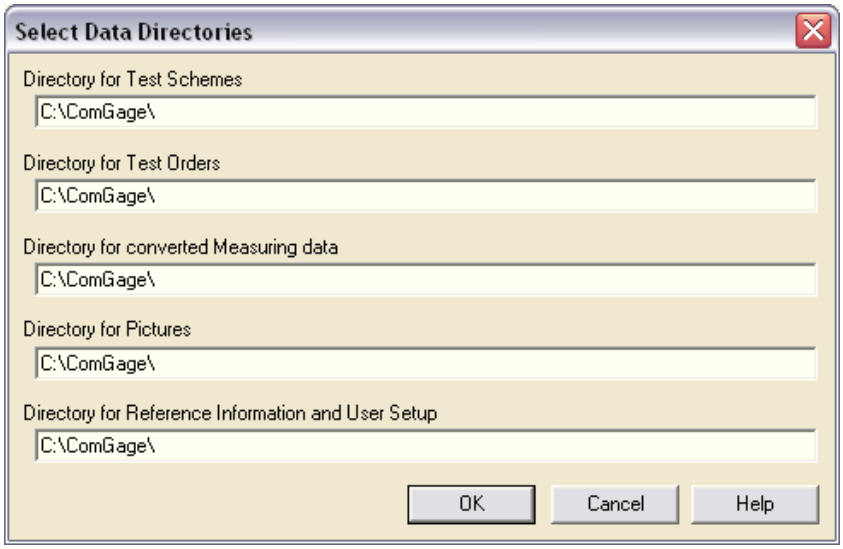
Select your language and confirm by clicking the **OK** - button.

Note : *On initial operation of the software the language is automatically set according to the language settings of the Windows operating system.*

6.4 Selection of data directories

By choosing the **Options / Data Directories** menu (Button : ) you can choose the directories, to which ComGage saves its data or from where ComGage loads its data :

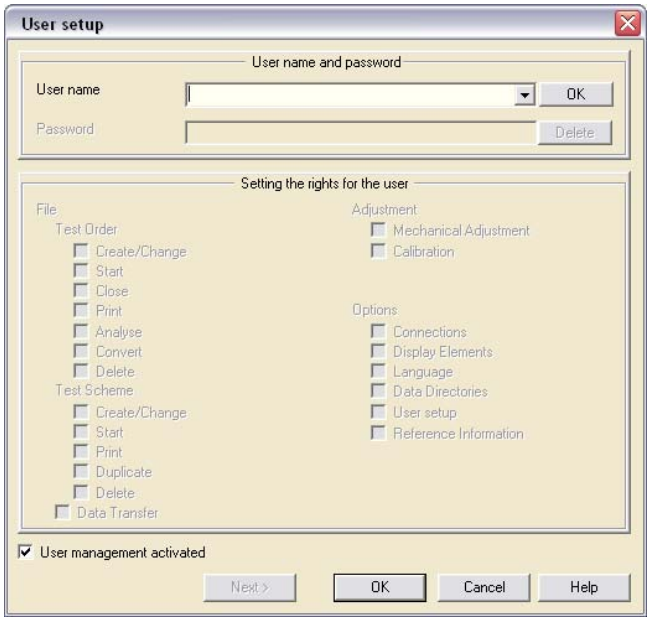
- Directory for the test scheme files
- Directory for the test order files and collected measurement data
- Directory for the converted test orders (Excel - files, QDAS - files, …)
- Directory for the pictures (*.bmp - files)
- Directory for the reference information and user management data



Note : *You can type in only the names of existing directories. The ComGage software will not create any new directories.*

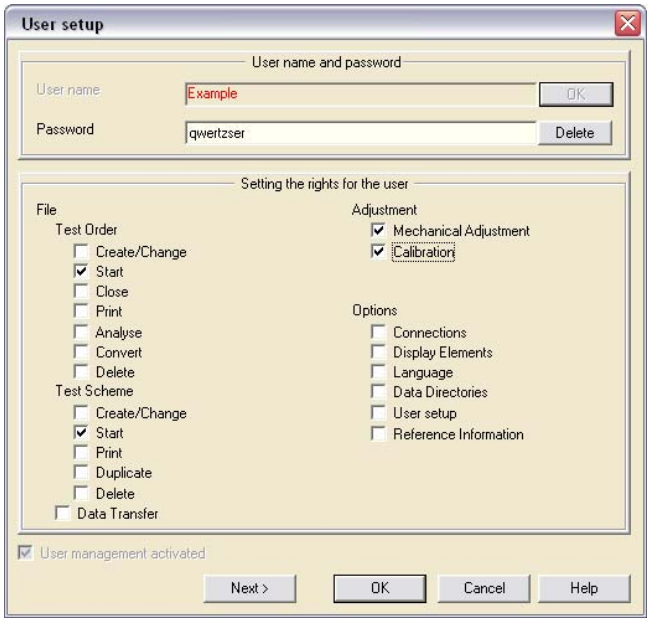
6.5 User management

In the window of the **Options / User setup** menu (Button : ) you can create and change user data.



The checkbox **User management activated** (left bottom window corner) allows you to generally activate / deactivate the user management.

In order to change user data, please select the user from the list and press the **OK** - button.
In order to create a new user, please input the new user name and press the **OK** - button.

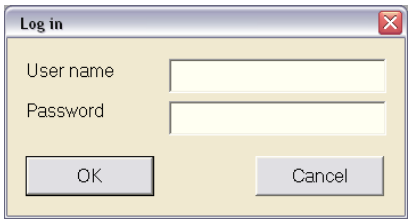


After selecting the user you can :

- input a login password for this user
- choose which menus are activated / deactivated for this user
- delete this user

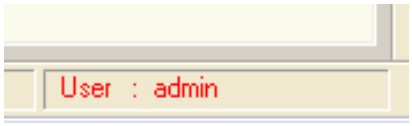
By clicking the **Next >** - button the new settings of the currently programmed user are saved and you can go on programming the next user.

By choosing the **Options / New login** menu you can log in as an other user :



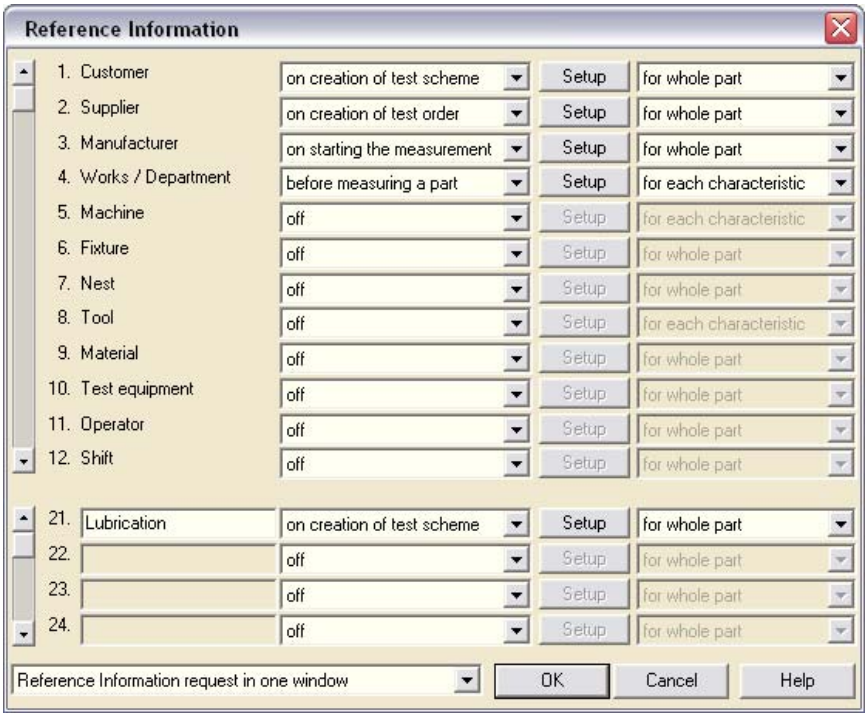
Note : ***Capitalization of user name and password is not checked.***

The name of the user currently logged in is shown in the status bar at the right bottom corner :



6.6 Reference information (operators, machines, batch numbers, etc.)

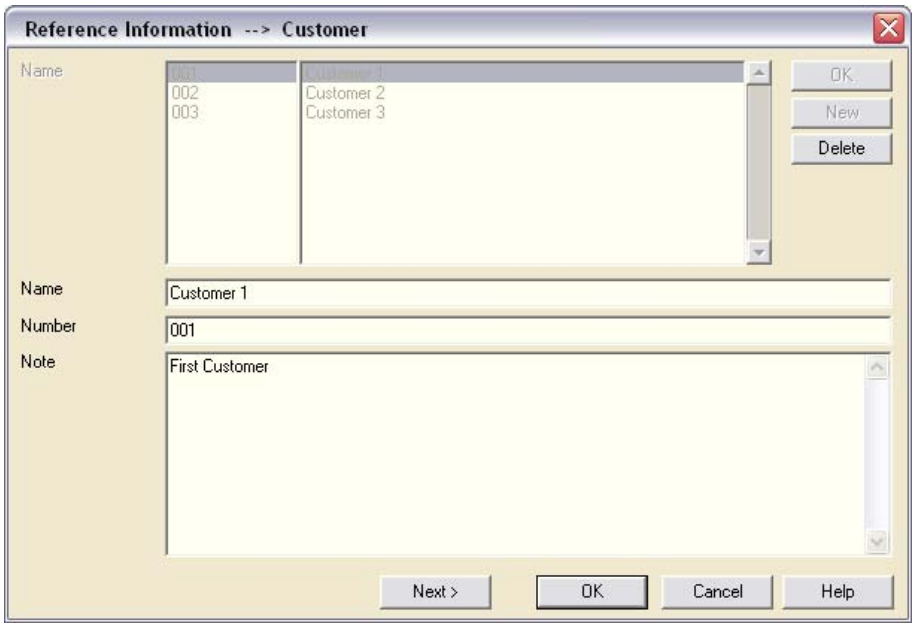
In the **Options / Reference Information** menu (Button :) the window for programming the reference information tables is opened.
All reference information - except the batch / serial number and the last 5 user defined reference information types (no. 26 – 30) - are selected from the reference information tables (see below). Only the batch / serial number and the last 5 user defined reference information types can be input in an editable field - they are not selected from a reference information table.



1.) For each data type the data request mode can be selected :

off	- The data type is not used
on creation of test scheme	- The data type is requested when the test scheme is created
on creation of test order	- The data type is requested when the test order is created
on starting the measurement	- The data type is requested when the measuring mode is started
before measuring a part	- The data type is requested for every part in measuring mode (e.g. for serial numbers)

2.) By clicking the **Setup** - Button you can programme the tables of the selected data type.



First of all you must select a data set in the list or create a new one by clicking the **New -** Button. After selecting it, you can change the data set or delete it by clicking the **Delete** - button.

For each data set you can programme the following :

Name (90 characters)
Number (10 characters)
Note (650 characters)

After programming one data set you can save the settings and leave the window by clicking the **OK** - button. The **Next >** - button allows you to store the settings and directly go on with programming the next data set.

Note : All settings stored by clicking the "Next >" - button do not get lost when the "Cancel" - button is clicked.

3.) For each data type you can choose whether the data is to be collected for the whole part (component) or for each characteristic separately (e.g. one characteristic is measured using a calliper and an other one using a dial gauge).

4.) "Reference information request in one window" should be activated, if the reference information is to be selected using a mouse. "Sequential reference information request" should be activated, if the reference information is to be selected using a keyboard.

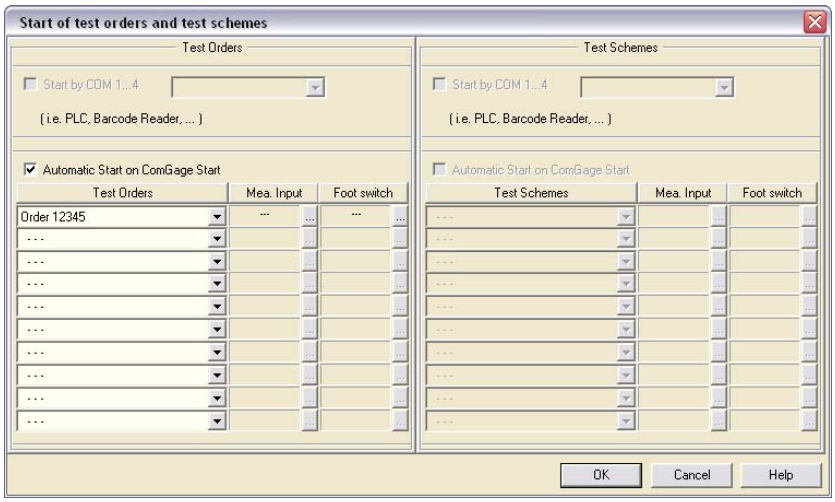
Note : In ComGage you can programme the following reference information data types :

- Customer
- Supplier
- Manufacturer
- Works / Department
- Machine
- Fixture
- Nest
- Tool
- Material
- Test equipment
- Operator
- Shift
- Test place
- Storage place
- Production instruction
- Test instruction
- Events (why a measurement value is out of tolerance)
- Batch / Serial number
- Action

- 5 user defined data types (Selection by tables in measuring mode)
- 5 user defined data types (Direct input by keyboard in measuring mode)

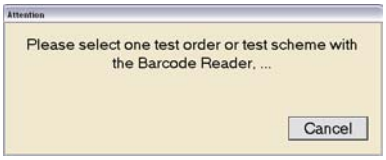
6.7 Automatic start

In the **Options / Automatic Start** menu you can activate automatic starting of test schemes or test orders when ComGage is started or by a barcode reader. In measuring mode, the selection of a test scheme or test order can be done by keyboard (keys : 0 … 9), foot switch, measuring input or barcode reader.



Test Orders & Start by COM1...4

→ On ComGage Start or on choosing the Menu *File / Test Order / Start* you are requested to select a test order by the Barcode Reader :



The barcodes used must be available in the Format : **CODE128** and contain the test order name.

Test Orders & Automatic Start on ComGage Start

→ After starting ComGage all selected test orders are started automatically for measurement data collection

→ If an assigned measurement input (**Mea. Input**) **Mxx** detects a measurement value change then the test order belonging to it is automatically executed in the foreground. The measuring input can be selected by clicking the button ...

→ If an assigned **foot switch Txx** is activated then the test order belonging to it is automatically executed in the foreground. The foot switch can be selected by clicking the button ...

Test Schemes & Start by COM1...4

→ On ComGage Start or on choosing the Menu *File / Test Scheme / Start* you are requested to select a test scheme by the Barcode Reader. (see *Test Orders & Start …)*

Test Schemes & Automatic Start on ComGage Start

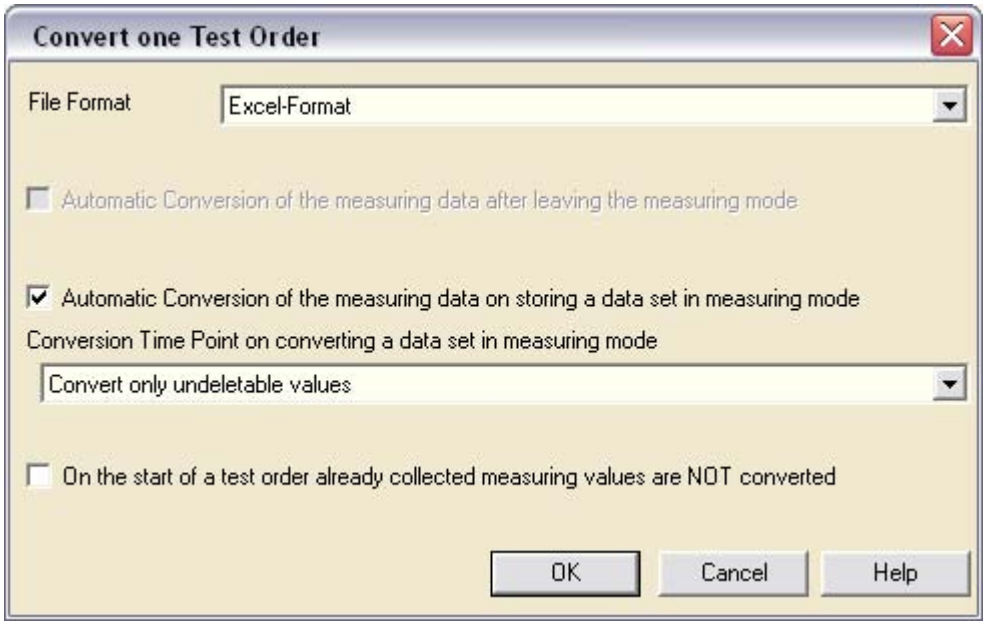
→ After starting ComGage all selected test schemes are started automatically.

→ If an assigned measurement input (**Mea. Input**) **Mxx** detects a measurement value change then the test scheme belonging to it is automatically executed in the foreground. The measuring input can be selected by clicking the button ...

→ If an assigned **foot switch Txx** is activated then the test scheme belonging to it is automatically executed in the foreground. The foot switch can be selected by clicking the button ...

6.8 Convert

In the menu **Options / Convert** the automatic conversion of measurement data can be activated for the measuring mode.



File format

→ Selection of the data format, into which the conversion shall occur :

QDAS – Format (File name : *Test order name .dfq*)
Excel – Format (File name : *Test order name .xls*)
Special Format (File name : *Test order name .txt*
→ An UDI Script for SPC Light from Lighthouse is available on request)

Automatic conversion of the measuring data after leaving the measuring mode

→ The conversion of the measuring data into the selected format occurs after leaving the measuring mode

Automatic conversion of the measuring data on storing a data set in measuring mode

→ The conversion of the measuring data into the selected format occurs while measuring

Conversion Time Point on converting a data set in measuring mode

Convert only undeletable values

During measuring, the operator is authorised to delete only the last collected measurement value of a characteristic. All measurement values collected before cannot be deleted anymore. Hence, measurement values are automatically converted as soon as a further measurement value is collected, because they are then undeletable.

Convert all values directly

All measurement data is automatically converted when the “save measured values” function is executed

Convert the values after measuring the complete part

The measurement data is converted as soon as all characteristics of the component to be measured have been saved.

On the start of a test order already collected measuring values are NOT converted

→ Measuring values that are already saved when the test order is started, are not converted.
→ This function only makes sense in connection with *File Format* = Special Format.

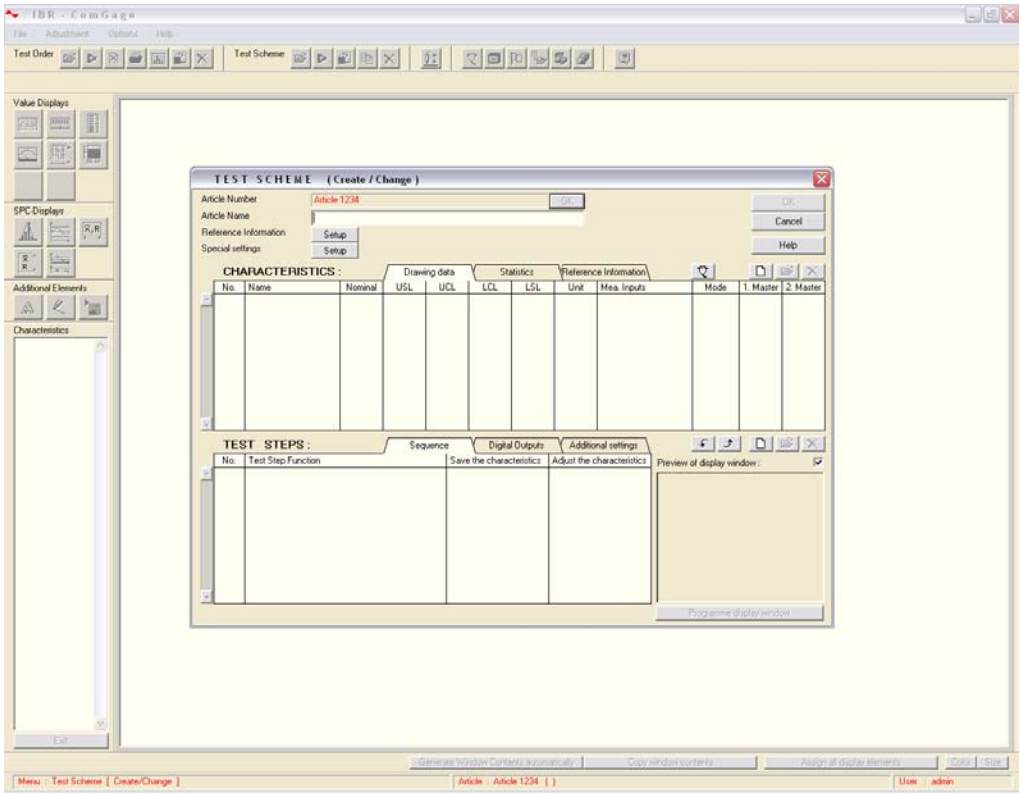
7. Creating a test scheme

In a test scheme the part, its characteristics and the measuring sequence are defined :

- *In the test scheme head the article number, the part name and the part-reference information (operator, machine, batch, …) are entered.*
- *Up to 128 characteristics can be created :*
  - *Characteristic name*
  - *Nominal size and tolerances*
  - *Probe mixing (with mathematical functions, such as sin, cos, tan, Min, Max, …)*
  - *Measuring modes (for static, dynamic [Min, Max, TIR, Mean], … measurements)*
  - *Master values for zero-adjustment or automatic gauge-calibration (for air gauging)*
  - *Sample size*
  - *Settings for the statistics (plausibility limits, distribution form, ...)*
- *Up to 128 test steps can be created :*
  - *Free design of display windows with numeric displays, column displays, analogue meters, control charts, histograms, ..., lines, texts, pictures*
  - *Assignment of foot switches, function keys, digital inputs and free definable conditions (with mathematical operators, logical operators, trigonometric functions, timers, ...) to the executable functions (e.g. saving of measurement values, deleting of measurement values, adjustment, …)*
  - *Setting of digital outputs*

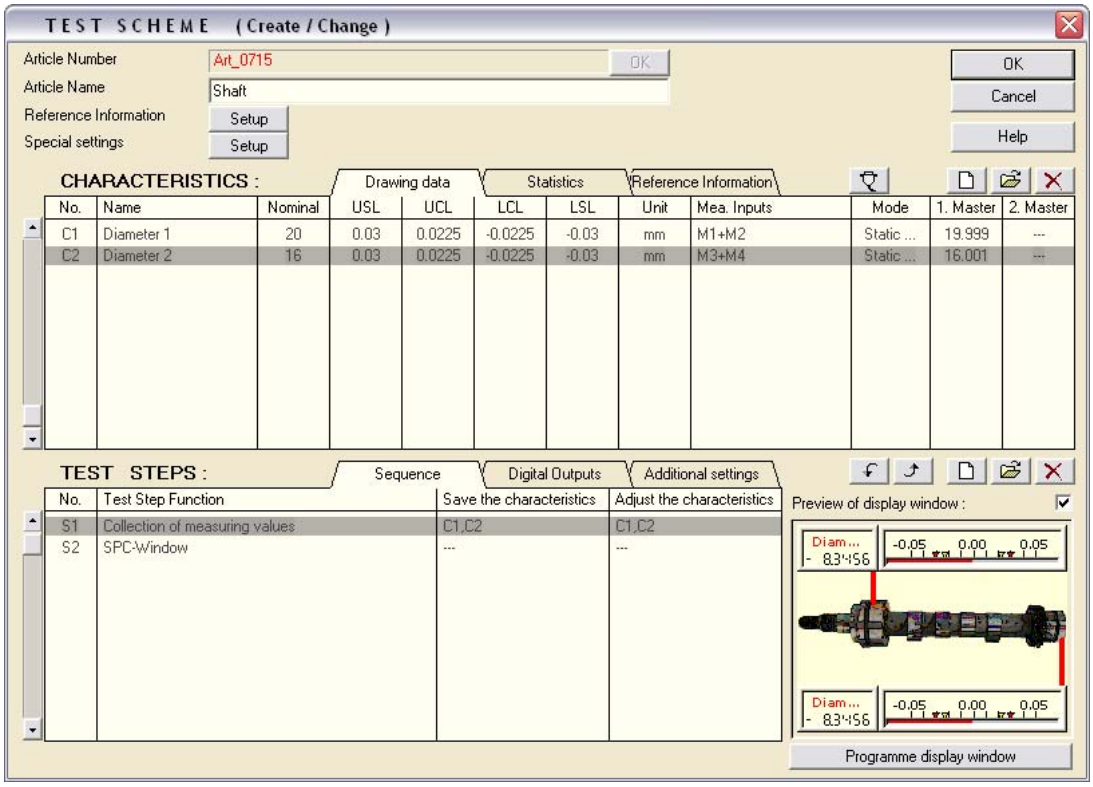
7.1 Programming the test scheme head

In the **File / Test Scheme / Create & Change** menu (Button : ) test schemes can be programmed :



At first you have to enter the *Article Number*. If you input an existing *Article Number* you can modify the particular test scheme, otherwise you create a new one.

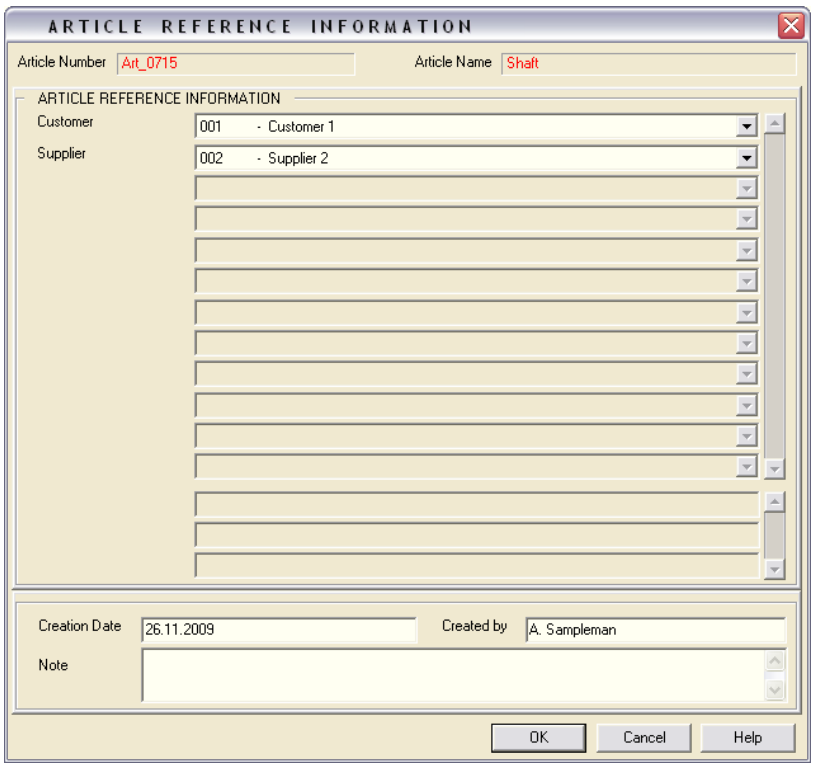
A data path can be entered preceding the article number. This entered data path is relative to the data directory (see chapter 6.4) and must already exist. ComGage does not create any new subdirectories.
*(Example : **Machine 1\Art-1234** ➔ The test scheme **Art-1234** is created in the subdirectory **Machine 1**)*



The following settings can be programmed in the test scheme :

1) **Article Name** (Name of the measured part, e.g. cylinder, bore, …)
2) **Article Reference Information** (Additional data for test scheme documentation, e.g. manufacturer, distributor, customer, operator, batch, ... ➔ *See chapter 7.2*)
3) **Special settings** (Special settings for the test scheme, such as output of tolerances on the IBRit-rf1-LEDs, test of probe validity, ... ➔ *See chapter 7.3*)
4) **Characteristics – Drawing data** (The drawing data of the characteristics consists of the characteristics basic data, such as e.g. name, nominal size and tolerances, master values, probe-mixing, … . ➔ *See chapter 7.4*)
5) **Characteristics – Statistics** (The statistical data consists of the optional settings for the statistical analysis of characteristics, such as sample size, plausibility limits, … . ➔ *See chapter 7.5*)
6) **Characteristics – Reference Information** (Data entered as characteristics – reference information can be e.g. the test equipment used. ➔ *See chapter 7.6*)
7) **Test Steps – Sequence** (Programming of the test sequence, e.g. : *In which test step of the test sequence is characteristic 2 saved ? How is the saving of the characteristics called in the current test step ?* … . ➔ *See chapter 7.7*)
8) **Test Steps – Digital Outputs** (Programming of the output values of the digital outputs in the particular test steps, for controlling external lamps, motors, … . ➔ *See chapter 7.8*)
9) **Test Steps – Additional settings** (Programmable additional settings are for example : a sample plan or automatic recognition of plug gauges. ➔ *See chapter 7.9*)
10) **Test steps – Programme display window** (Design of the display windows for the particular test steps. ➔ *See chapter 7.10*)

7.2 Programming the article reference information



Article Reference Information

In this window a data set must be selected or input for all reference information activated for the test scheme. The programming and activating of the reference information for the test scheme is described in chapter 6.6.

Creation date

Creation date of the test scheme.

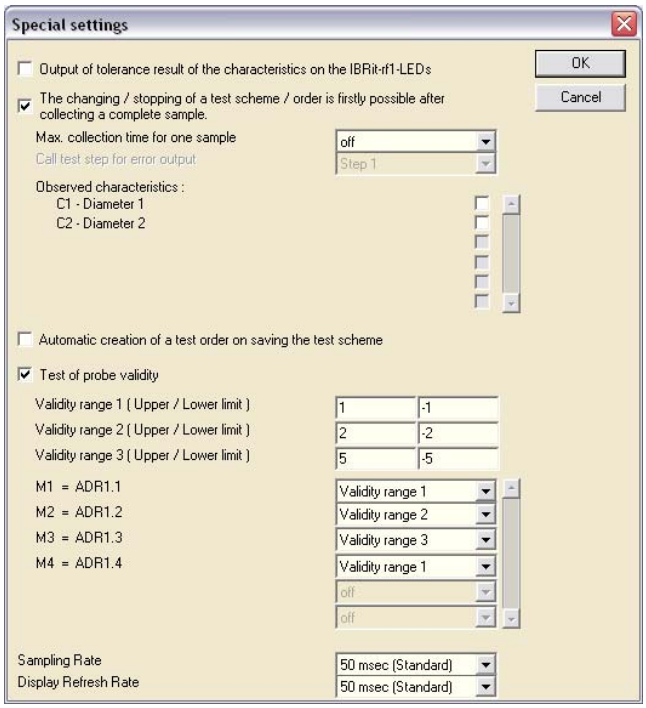
Created by

Name of the operator, who has created the test scheme.

Note

Free editable field for documentation (e.g. entry of test scheme history).

7.3 Programming the special settings



Output of tolerance result of the characteristics on the IBRit-rf1-LEDs

With this option activated, the tolerance status of the currently measured characteristic is output on the LEDs of the IBRit-rf1 radio module on transmission and simultaneous saving of the measurement values by a IBRit-rf1 radio module (red = not okay / yellow = corrective action / green = okay).

The changing / stopping of a test scheme / order is firstly possible after collecting a complete sample

With this option activated, changing / stopping of a test scheme / order is prevented, as long as there is an incomplete sample collection. In the submenu you can define a maximum collection time for one sample (in minutes) as well as the test step to be called for error output in case the defined collection time has been exceeded (on doing so, ComGage deletes the measurement values of the incomplete sample). Additionally you can define which characteristics are to be observed by the sample supervision.

Automatic creation of a test order on saving the test scheme

With this option activated, a test order is automatically created when the test scheme is saved. The order number then corresponds to the article number of the test scheme.

Test of probe validity

With this option activated, the validity of the measurement inputs needed for measuring a particular characteristic is checked, as soon as the data of this particular characteristic is saved. For this, the raw-values of the probes are used. In the submenu you can define up to three validity ranges (values in mm). Additionally you can assign a validity range to every particular measurement input. If a measurement input is outside the validity range on data saving, then the characteristics are not saved and an error message is output.

Sampling rate

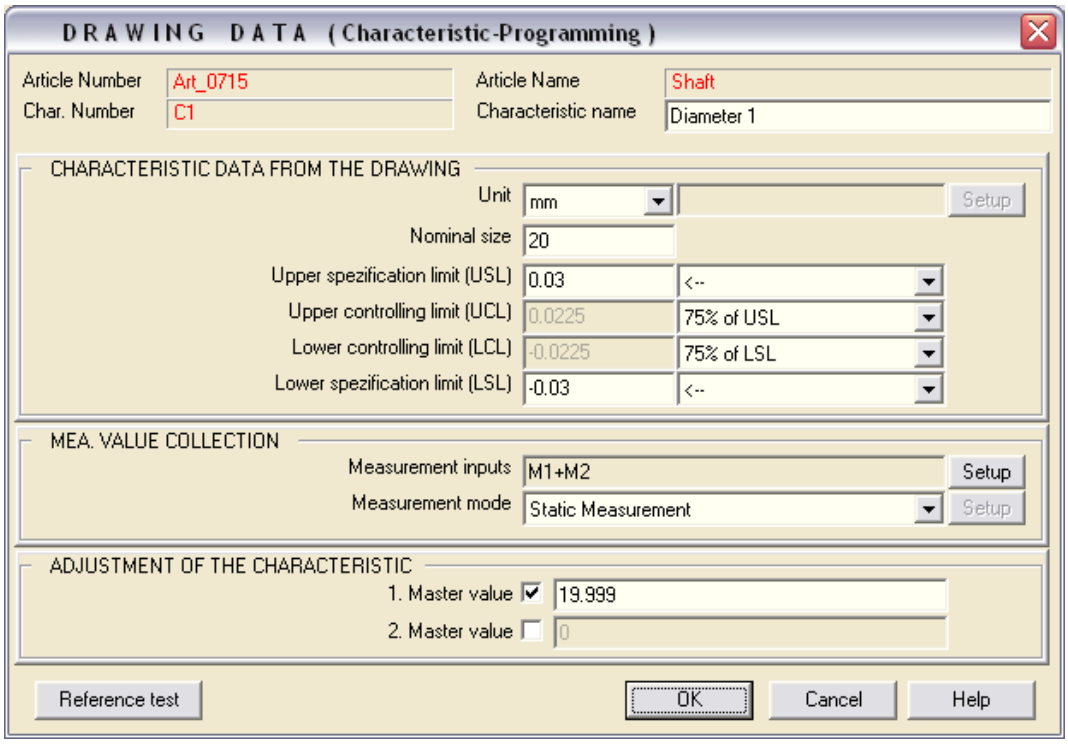
Adjustment of measurement speed. This parameter must be changed only in case of special applications. (Example : The connected gauge allows data request only every 300 msec.)

Display refresh rate

Adjustment of the display refresh rate. This parameter must be changed only in case of slow processors (e.g. Pentium 400 or less), in order to keep the measurement rate as high as possible.

7.4 Programming the characteristics (drawing data)

For programming the drawing data of a characteristic the following window is opened :



1.) **Characteristic name :**
Name of the characteristic (e.g. diameter, length, …)

2.) **Unit :**
Selection of the Unit.
In the list you find the standard units.
Special units (**Setup →**) can be defined by clicking the **Setup** - Button. For a “special” unit you can define a *conversion offset* and a *conversion factor* (e.g. for converting °F to °C the factor is 5/9 and the offset is –160/9).

3.) **Nominal size** (of the characteristic)

4.) **Tolerances** (of the characteristic / are input relatively to the nominal size)

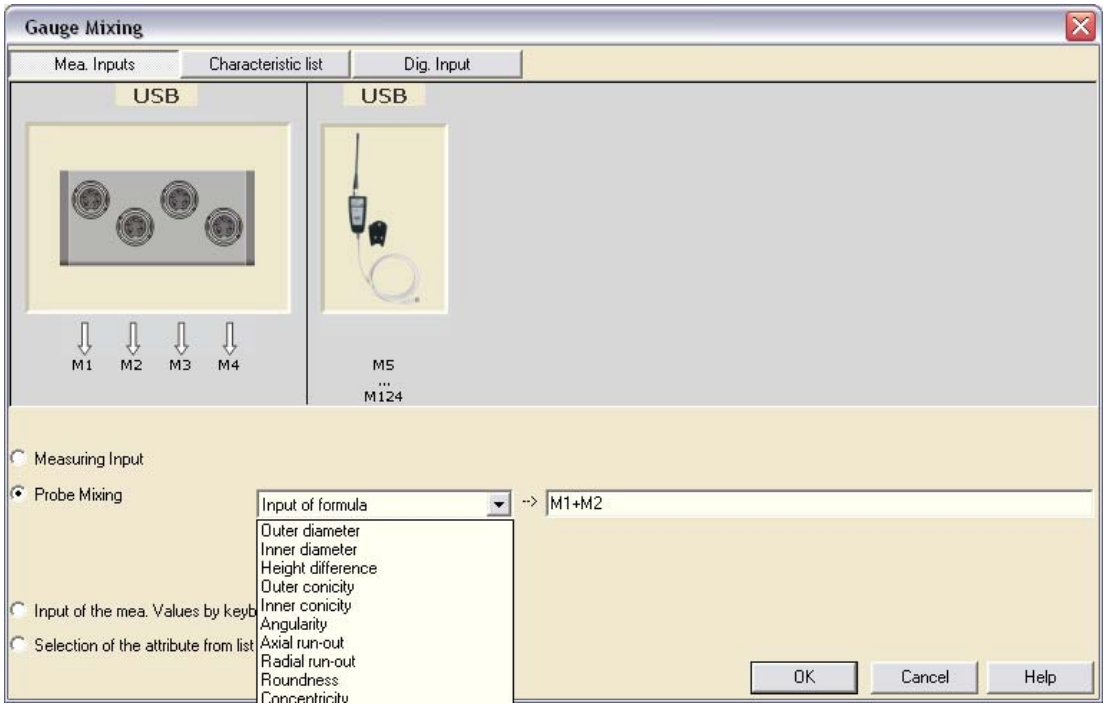
5.) **Measurement inputs :**
Connection of measurement inputs (probe mixing) for gauge definition → see below

6.) **Measurement mode :**
Measurement mode for calculating the measurement result (e.g. static, dynamic) → see below

7.) **Master values :**
Input of the master values for this characteristic.
The input of *one* master value is necessary to perform a *zero adjustment*, for performing a *gauge calibration* (e.g. air gauging) the input of *two* master values is necessary.

8.) **Reference test :**
Allows activating calibration tolerances (referring to the master value(s)). An upper and lower tolerance value is defined, using the unit of the characteristic. If the function “Adjustment / Calibration” is executed during the test sequence, then the tolerances defined here are used. If the defined tolerance values are exceeded, then an error message is displayed and the register R990 is set (R990=1). Hence, this function is used to supervise the fixture (typical defects : probe got loose / masterpiece dirty).

Measurement inputs (→ Setup)



The following selection is possible for the calculation of the measuring value of a characteristic :

a) Selection of a single measurement input whose measurement values are adopted as measurement values of the characteristic
b) Selection of a probe mixing, e.g. measurement of outer diameter by the two measurement inputs M1 and M2 or input of a formula for any combination of measurement inputs, characteristics values etc. (see below)
c) Input of a measurement value by keyboard
d) Selection of an attribute from a list (e.g. red, green, blue) including the assignment of a numeric value as characteristics value (1. entry = 0 / 2. entry = 1 etc.).

It is possible to switch between the display of the available measurement inputs, the characteristics list or the available digital inputs (see the tabs at the upper edge of the window).

Formula :

In a formula for probe mixing the measurement inputs, results of other characteristics, footswitch inputs, digital inputs, register values, other numeric values and the time values can be combined in any way.

In the formulas the following *inputs* can be used :

Address	Input
Mx	Measuring input x
Cx	Current measuring value of characteristic x
Cx_File	Last measuring value from file of characteristic x
Cx_USL	If measuring value of characteristic x is > USL, then Cx_USL = 1
Cx_UCL	If measuring value of characteristic x is > UCL and < USL, then Cx_UCL = 1
Cx_ok	If measuring value of characteristic x is inside the controlling limits, then Cx_ok = 1
Cx_LCL	If measuring value of characteristic x is > LSL and < LCL, then Cx_LCL = 1
Cx_LSL	If measuring value of characteristic x is < LSL, then Cx_LSL = 1
Ix	Digital input x (State „set“ = 1 / State „not set“ = 0)
Tx	Hand / Foot switch x (State „pressed“ = 1 / State „not pressed“ = 0)
Rx	Register x
Fx	Function key F1... F12

In the formulas the following *operators* can be used :

Operator	Function	Example
+	Addition of inputs, characteristics and numbers	M1+M10-34
-	Subtraction of inputs, characteristics and numbers	M1-M2+1.1e-4
*	Multiplication of inputs, characteristics and numbers	M3*0.5+M2*M1
/	Division of inputs, characteristics and numbers	M2/3
^	'x power by y' (e.g. 2^3 = 2*2*2 = 8)	M2^(1/2) = Square root of M2
%	Modulo-operator = carryover of a division (e.g. 5%3 = 2)	M2%2
ABS()	Absolute value	ABS(M1)
SIGN()	Delivers the sign of the parameter	SIGN(-5.23)=-1
ROUND()	Rounds to the next integer	ROUND(5.43)=5 / ROUND(5.53)=6
INT()	Rounds down to the next integer	INT(5.43)=5 / INT(5.53)=5
CEIL()	Rounds up to the next integer	CEIL(5.43)=5 / CEIL(5.53)=5
SIN()	Sine (unit : degree)	SIN(M2)
COS()	Cosine (unit : degree)	COS(M2)
TAN()	Tangent (unit : degree)	TAN(M2*3+M1)
ASIN()	Arc – Sine (unit : degree)	ASIN(M2/50.4)
ACOS()	Arc – Cosine (unit : degree)	ACOS(M2/50.4)
ATAN()	Arc – Tangent (unit : degree)	ATAN(M2/50.4)
PI	Pi (=3,141592654)	SIN(M2*180/PI)
EXP()	Exponential function (2.7182818 ^ x)	EXP(M1)
LOG()	Natural logarithm	LOG(M1)
TIME(0)	Returns the number of milliseconds since midnight	TIME(0)
MONTH	Current month (1=January, 2=February, ...)	MONTH
DAY	Current day of month (1... 31)	DAY
DAYOFWEEK	Current day of week (0=Sunday, 1=Monday, ..., 6=Saturday)	DAYOFWEEK
HOUR	Current time : Hour (0... 23)	HOUR
MINUTE	Current time : Minute (0... 59)	MINUTE
SECOND	Current time : Second (0... 59)	SECOND
Min(;;;) Min()	Min-value of all elements in the list Min-value of all saved measuring values of the characteristic	Min(M1;M2;C3;M4+C5) Min(C3)
Max(;;;) or Max()	Max-value (see Min-function)	Max(M1;M2;C3;M4+C5) or Max(C3)
Avr(;;;) or Avr()	Average (see Min-function)	Avr(M1;M2;C3;M4+C5) or Avr(C3)
Tir(;;;) or Tir()	Max-value minus Min-value (see Min-function)	Tir(M1;M2;C3;M4+C5) or Tir(C3)
SD(;;;) or SD()	Standard deviation (see Min-function)	SD(M1;M2;C3;M4+C5) or SD(C3)

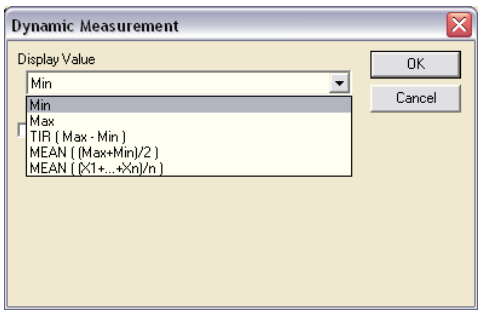
Measurement mode

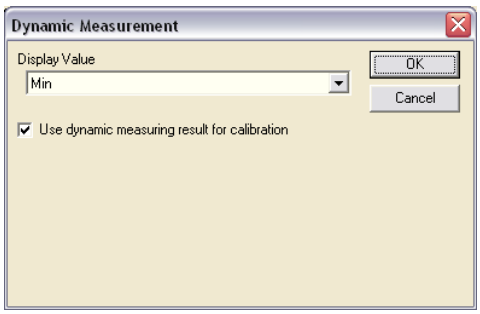
a) Static measurement

The component is measured statically, it is for example lying in a fixture during measurement. ComGage continuously measures and calculates the result of the characteristic. The display continuously outputs the current measurement value.

b) Dynamic measurement

The component is moved (e.g. rotated) during measurement. During this movement of the component, the Minimum, Maximum, TIR and Mean values are searched.



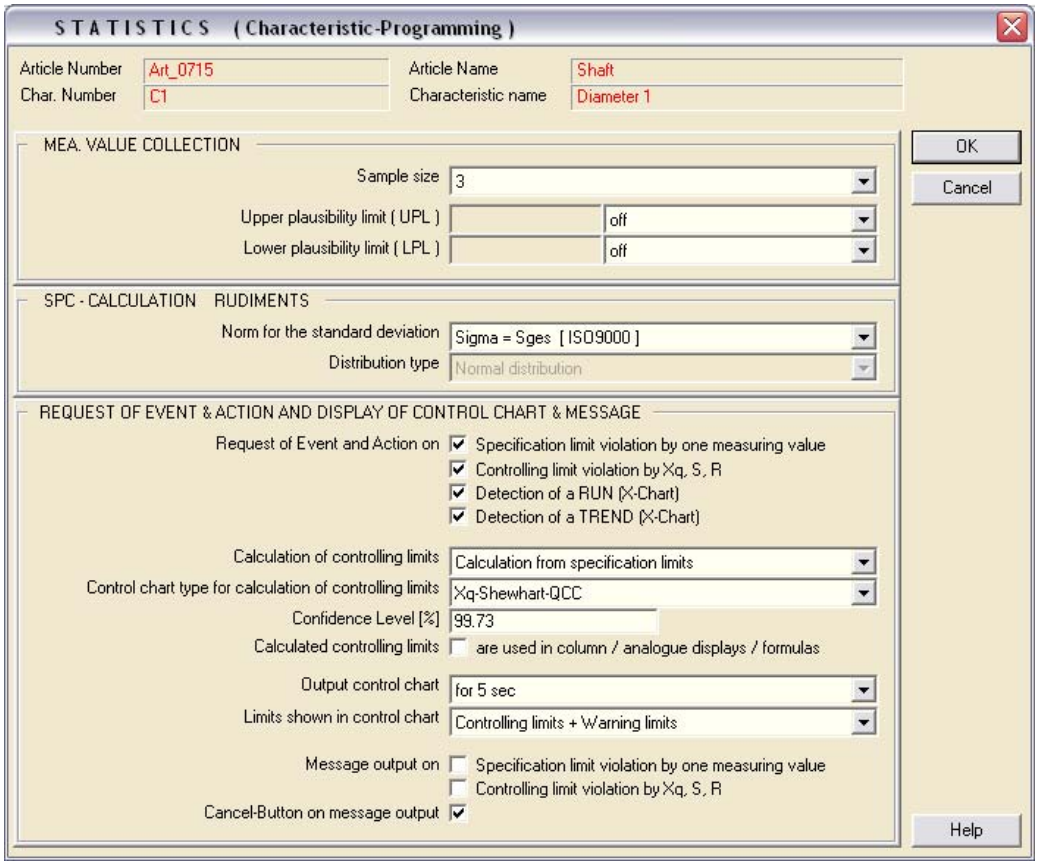


Min	→	Search for the smallest measurement value
Max	→	Search for the biggest measurement value
TIR	→	Search for the TIR Value (Max-Min)
MEAN ((Max+Min)/2)	→	Calculation of the Mean value ((Max+Min)/2)
MEAN ((X1+...+Xn)/n)	→	Calculation of the Mean value (Addition of all measurement values and division by the number of values)

Use dynamic measuring result for calibration
In this mode adjustment / calibration is performed using the result of the last dynamic measurement. In order to do so, you must programme a corresponding test step in your test sequence performing a dynamic measurement followed by the function “Adjustment / Calibration”.

c) **Gauge Triggered**
Only those measurement values are shown, which are transmitted by data key on the gauge. This mode is especially for hand gauges on which the measuring values are sent by the data key of the gauge or for e.g. balances which automatically send their measuring value at the end of measurement.

7.5 Programming the characteristics (statistics)



1.) **Sample size** (for measurement of the characteristic)
Note : *In case of 100% control it is not possible to display a control chart and Cp / Cpk*

2.) **Plausibility limits :**
If a measuring value is outside the plausibility limits on data saving, then the operator is asked, whether the measuring value should be saved or rejected. If the measuring value is rejected, then the measurement can be directly repeated.

3.) **Norm for the standard deviation :**
Selection of the norm for calculating of the standard deviation (ISO9000 / QS9000).

4.) **Distribution type :**

Not available at this time. All statistical analysis is performed based on the normal distribution.

5.) **Request of event and action :**

You can choose when the event and the action are to be requested

6.) **Calculation of controlling limits :**

Off (inserted controlling limits are used)

The controlling limits defined in the characteristics “drawing data” are used.

Calculation from specification limits

The controlling limits are calculated from the tolerance limits, based on the Cp-formula and the control chart formulas.

Calculation by the first 125 collected samples

The controlling limits are calculated from the first 125 collected samples, based on the control chart formulas. Afterwards they are fixed.

Continuous calculation by all samples

The controlling limits are calculated from all collected samples every time a new sample was collected. Calculation is based on the control chart formulas.

7.) **Control chart type for calculation of controlling limits :**

Selection of the control chart type to be used (Xq = average chart, Xm = median chart, X = raw value chart, S = standard deviation and R = range), as well as calculation method for controlling limits (Shewhart or Acceptance).

8.) **Confidence level :**

Setting for calculation of controlling limits.

9.) **Calculated controlling limits are used in column / analogue displays / formulas :**

With this option deactivated, the controlling limits entered in the **drawing data** are used for tolerance interpretation by the column / analogue displays and formulas.
With this option activated, the calculated controlling limits are used for tolerance interpretation by the column / analogue displays and formulas.

10.)**Output control chart :**

Activates fade in of the control chart for the span of time selected.

11.)**Limits shown in control chart :**

Selection of the following settings can be made for the control chart that is faded in : “Controlling limits + Warning limits” or “ Specification limits + Controlling limits”.

12.)**Message output :**

You can select when a warning message is to be output.

13.)**Cancel-Button on message output :**

The cancel - button can be enabled / disabled. If it is enabled, then the measurement values are not saved in case the cancel - button is clicked. The operator can repeat the measurement. (cf. plausibility limits)

7.6 Programming the characteristics (reference information)

Characteristic Reference Information

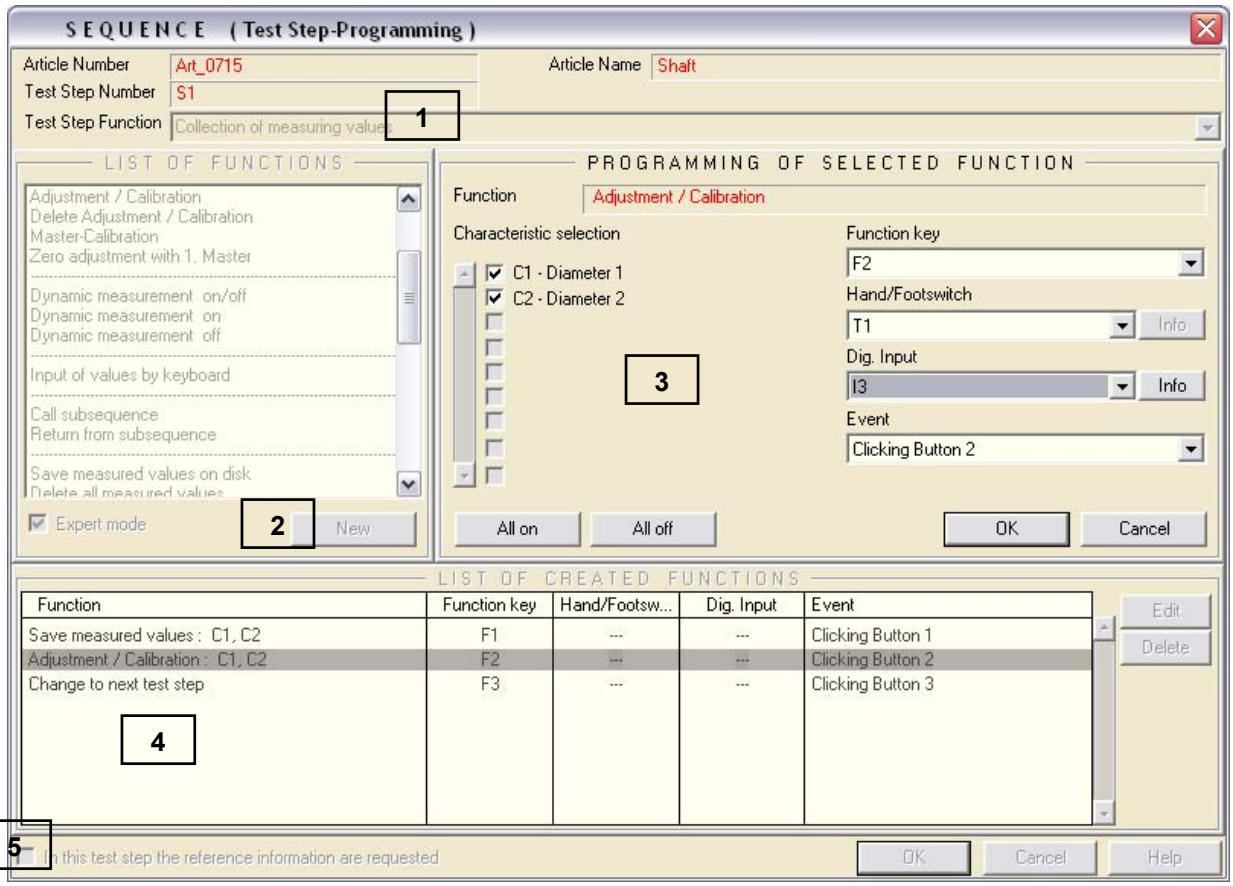
In this window a data set must be selected or input for all reference information activated for the characteristic. The programming and activating of the reference information for the characteristic is described in chapter 6.6.

Note

Free editable field for documentation.

7.7 Programming the test steps (sequence control)

In this window the foot switches, function keys, digital inputs and events are assigned to the particular functions (save measured values, delete measured values, adjustment / calibration, ...) that are to be executed by them.



1. Input of test step function (e.g. Collection of characteristic C1...C5, Statistic window, …)
   Text field for documentation of the test step function !!

2. Select a function from the list and click the **New** – Button
   (All functions are available in the **Expert mode**.)

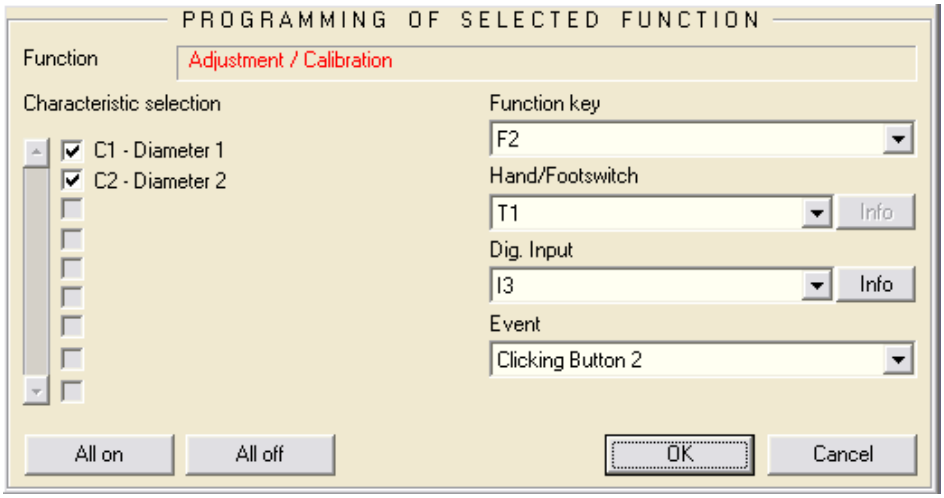
   Table of available functions :

Name of function	Description of function
Save measured values	The current measured values of the selected characteristics are saved.
Delete last saved measured value	The last saved measured value of the selected characteristics is deleted. But it is only possible to delete the last collected measured value. All measured values collected before are undeletable.
Change to next test step	Change to next test step or in Expert mode to a specified test step. By adding the function several times within one test step it is possible to branch to several test steps.
Repeat last test step	The previous test step is called.
Adjustment / Calibration	Adjustment / Calibration of the selected characteristics. A possibly activated reference test is executed before (*see chapter 7.4*).
Delete Adjustment / Calibration	The stored offset values of the selected characteristics are deleted. On characteristics with 2 master values activated, stored calibration factors are also deleted. (The raw values of the measuring inputs are visible again.)
Master-Calibration	The Adjustment / Calibration of the selected characteristics is executed without the calibration tolerance check of the reference test (*see chapter 7.4*). The function serves for the initial calibration of a fixture.

Name of function	Description of function
Zero adjustment with 1. Master	Allows the zero adjustment of the selected characteristics with one master, even if two master values are assigned to these characteristics.
Dynamic measurement on / off	The dynamic measurement of the selected characteristics is switched on and on second function call switched off again.
Dynamic measurement on	The dynamic measurement of the selected characteristics is switched on.
Dynamic measurement off	The dynamic measurement of the selected characteristics is switched off.
Input of values by keyboard	The measuring values of the selected characteristics or the attributive list of the characteristics are requested by keyboard. The values input by keyboard are automatically saved when the input is completed.
Call subsequence	Change to next test step or to a specified test step as subsequence (after that return to origin). By this function you can change from several test steps to e.g. a calibration test step. After completion of the subsequence ComGage automatically changes back to the original test step.
Return from subsequence	End of subsequence and return to original test step.
Save measured values on disk	The function „Save measured values“ saves the measured values only in RAM. On leaving the measurement the measured values are stored on disk. This function also allows the saving of measured values on disk during the measurement.
Delete all measured values	All collected measured values of the selected characteristics are deleted.
Excel-Export and delete all values	All collected measured values of the selected characteristics are at first exported into an Excel-file and then deleted. The Excel-file has as filename the test order number with an appended counter, which is incremented on each call of the function.
Assign event & action	It is possible to assign an event to the collected measured data (e.g. breaking of the tool) as well as a corrective action (e.g. exchange of the tool).
Print the characteristics	The last dataset of the selected characteristics is printed out in tabular form. On repeated call of the function all datasets are printed on one sheet, as long as enough space is available on page. After that a paging occurs.
Print the characteristics on new page	The last dataset of the selected characteristics is printed out in tabular form. On repeated call of the function each dataset is printed on a new page.
Simulation of a function key	The function which is assigned to the simulated function key in the test scheme is executed. It is possible to e.g. simulate the keys “0…9” to call another test order or to simulate the key “/” to change to full screen mode.
Change characteristic parameter	By this function the operator is given the possibility to change characteristics data (e.g. master values, nominal size, tolerances, …) during the measurement.
Printout of the screen contents	The current display window contents are printed out as form of screen-shot.
Output optical and acoustical message	It is possible to superimpose a message using a pop-up-window for an adjustable period of time (e.g. “calibration is executed”). In addition an acoustical signal can be output by the sound card of the PC (if not available by the PC-speaker).
Set current reference info. data set	By this function it is possible to assign reference information (operator, machine, …) to measured data.
Q-DAS Konverter	Export of measured data as Q-DAS-file. By this function it is possible to create an own Q-DAS-file per dataset, which has as filename the test order number and a counter. It is also possible to create Q-DAS-files with several datasets. Additionally the exported K-Fields can be modified.
Setting a register	A specific register is set to a definable value or the register value is incremented / decremented.
Messwerte kopieren	It is possible to copy the measured values of a characteristic into the measure value memory of a second characteristic.
Output of values over RS232	It is possible to output the measured values of a characteristic using different multiplexer protocols on a RS232. The different protocols are described in the Setup window of the function.
Control by barcode reader	It is possible to call an other test order by a barcode-reader. The barcode must contain the test order number.

Name of function	Description of function
Save calibration data in file	It is possible to save the calibration (offsets + factors) of the current test scheme into a file and to adopt the calibration to another test scheme. By this means no separated calibration is necessary in each test scheme.
Execution of a file	It is possible to execute a file (e.g. PDF, MP3, AVI, EXE, ...) and so it is possible to bestow the operator additional assistance during the measuring process.
Duplicate test order for parallel access from 2nd PC	During the measurement the current test order cannot be accessed for analysis by a second PC. By this function all measured data can be written into a second test order in parallel, which can be opened on second PC for analysis.

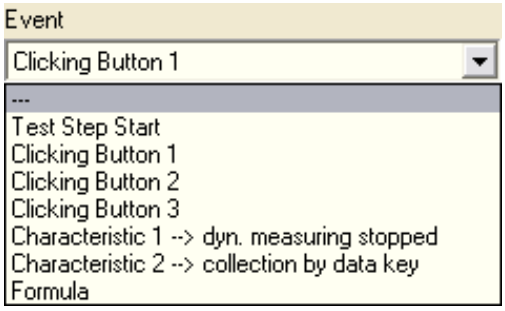
3. Assignment of characteristics to the function and assignment of foot switches, function keys, digital inputs and events for execution of the function :



Notes :

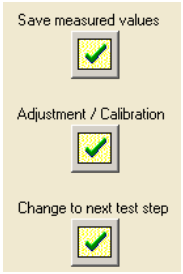
a) By clicking the **Info** - Button the available digital inputs are graphically illustrated in a picture.

b) Available events :



Test Step Start : The function is executed automatically on the start of the test step, i.e. when ComGage changes to the test step.
With this event it is possible e.g. to start a dynamic measurement, when ComGage changes to the test step for dynamic measurement.

Clicking Button 1..3 : In the measuring window three buttons are available, which can be assigned to a function in the test scheme for execution of that particular function.



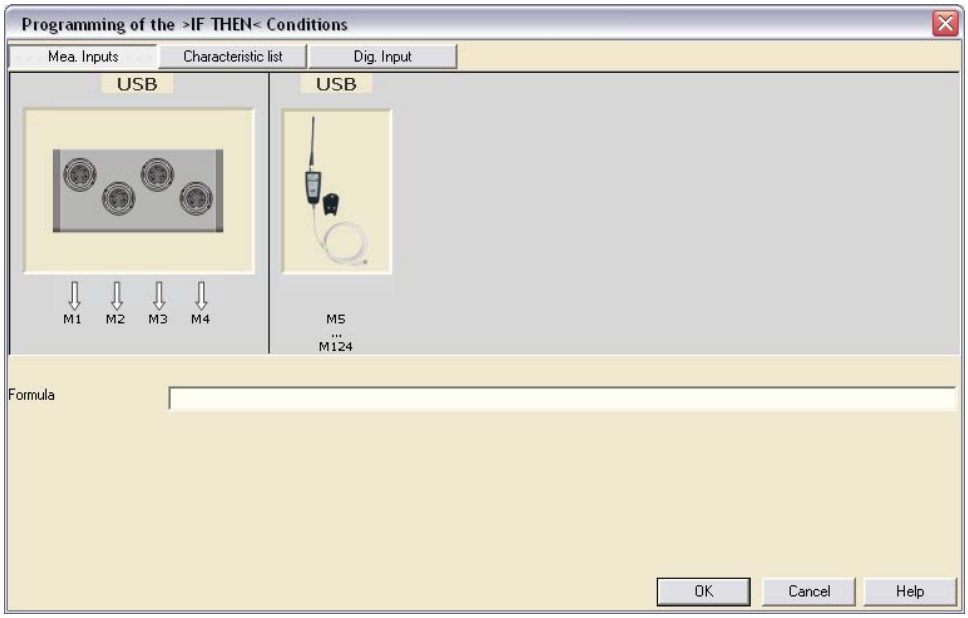
Characteristic x → dyn. meas.. : If the dynamic measurement of characteristic x is stopped, then the assigned functions are executed.
With this event it is possible e.g. to save the result of all characteristics when the dynamic measurement is stopped :

Dynamic measurement on : C1	---	---	---	Test Step Start
Dynamic measurement off : C1	---	---	---	Formula : Timer(17000,0)=1
Save measured values : C1	---	---	---	Characteristic 1 --> dyn. measuring ...

Characteristic x → collection … : If a value from characteristic x is received, which is automatically sent from the gauge or transmitted by the data key of the gauge, then the function is executed.
With this event it is possible e.g. to directly save the received measuring value :

Save measured values : C2	F1	---	---	Characteristic 2 --> collection by dat...

Formula : Free Input of a condition for executing the function
(by clicking the **Setup** - button).



The inputted formula always consists of logical conditions : x>y, z=1, ... These logical conditions can be combined by Boolean operators (AND, OR, …). If the logical conditions of a formula are fulfilled, then the assigned function is executed.

It is possible to switch between the display of the available measurement inputs, the characteristics list or the available digital inputs (see the tabs at the upper edge of the window).

As logical operators are available :

Operator	Function
&	AND conjunction between 2 conditions
|	OR conjunction between 2 conditions
=	The condition is fulfilled, if both parameters are equal
<	The condition is fulfilled, if parameter 1 is smaller than parameter 2
>	The condition is fulfilled, if parameter 1 is bigger than parameter 2
>=	The condition is fulfilled, if parameter 1 is equal or bigger than parameter 2
<=	The condition is fulfilled, if parameter 1 is equal or smaller than parameter 2

Example for a formula : (x>5 & y<=3) \| z=1

In the formulas the following *inputs* can be used :

Address	Input
Mx	Measuring input x
Cx	Current measuring value of characteristic x
Cx_File	Last measuring value from file of characteristic x
Cx_USL	If measuring value of characteristic x is > USL, then Cx_USL = 1
Cx_UCL	If measuring value of characteristic x is > UCL and < USL, then Cx_UCL = 1
Cx_ok	If measuring value of characteristic x is inside the controlling limits, then Cx_ok = 1
Cx_LCL	If measuring value of characteristic x is > LSL and < LCL, then Cx_LCL = 1
Cx_LSL	If measuring value of characteristic x is < LSL, then Cx_LSL = 1
Cx_USL_File	If last measuring value from file of characteristic x is> USL, then Cx_USL_File = 1
Cx_UCL_File	If last measuring value from file of characteristic x is > UCL and < USL, then Cx_UCL_File = 1
Cx_ok_File	If last measuring value from file of characteristic x is inside the controlling limits, then Cx_ok_File = 1
Cx_LCL_File	If last measuring value from file of characteristic x is > LSL and < LCL, then Cx_LCL_File = 1
Cx_LSL_File	If last measuring value from file of characteristic x is < LSL, then Cx_LSL_File = 1
Tx	If an actuation of hand / foot switch x is detected, then Tx = 1 is set
Tx_State	Current state of hand / foot switch x (State „pressed“ = 1 / State „not pressed“ = 0)
Ix	If a setting of digital input x is detected, then Ix = 1 is set
Ix_State	Current state of digital input x (State „set“ = 1 / State „not set“ = 0)
F1 ... F12	If an actuation of function key x is detected, then Fx = 1 is set
F1_State ... F12_State	Current state of function key x (State „pressed“ = 1 / State „not pressed“ = 0)
Rx	Register x

In the formulas the following mathematical *operators* can be used :

Operator	Function	Example
+	Addition of inputs, characteristics and numbers	M1+M10-34
-	Subtraction of inputs, characteristics and numbers	M1-M2+1.1e-4
*	Multiplication of inputs, characteristics and numbers	M3*0.5+M2*M1
/	Division of inputs, characteristics and numbers	M2/3
^	‘x power by y’ (i.e. 2^3 = 2*2*2 = 8)	M2^(1/2) = Square root of M2
%	Modulo-operator = carryover of a division (e.g. 5%3 = 2)	M2%2
ABS()	Absolute value	ABS(M1)
SIGN()	Delivers the sign of the parameter	SIGN(-5.23)=-1
ROUND()	Rounds to the next integer	ROUND(5.43)=5 / ROUND(5.53)=6
INT()	Rounds down to the next integer	INT(5.43)=5 / INT(5.53)=5
CEIL()	Rounds up to the next integer	CEIL(5.43)=5 / CEIL(5.53)=5
SIN()	Sine (unit : degree)	SIN(M2)
COS()	Cosine (unit : degree)	COS(M2)
TAN()	Tangent (unit : degree)	TAN(M2*3+M1)
ASIN()	Arc – Sine (unit : degree)	ASIN(M2/50.4)
ACOS()	Arc – Cosine (unit : degree)	ACOS(M2/50.4)
ATAN()	Arc – Tangent (unit : degree)	ATAN(M2/50.4)
PI	Pi (=3,141592654)	SIN(M2*180/PI)
MONTH	Current month (1=January, 2=February, ...)	MONTH
DAY	Current day of month (1... 31)	DAY
DAYOFWEEK	Current day of week (0=Sunday, 1=Monday, ..., 6=Saturday)	DAYOFWEEK
HOUR	Current time : Hour (0... 23)	HOUR
MINUTE	Current time : Minute (0... 59)	MINUTE
SECOND	Current time : Second (0... 59)	SECOND
EXP()	Exponential function (2.7182818 ^ x)	EXP(M1)

Operator	Function	Example
LOG()	Natural logarithm	LOG(M1)
Min(;;;) Min()	Min-value of all elements in the list Min-value of all saved measuring values of the characteristic	Min(M1;M2;C3;M4+C5) Min(C3)
Max(;;;) or Max()	Max-value (see Min-function)	Max(M1;M2;C3;M4+C5) or Max(C3)
Avr(;;;) or Avr()	Average (see Min-function)	Avr(M1;M2;C3;M4+C5) or Avr(C3)
Tir(;;;) or Tir()	Max-value minus Min-value (see Min-function)	Tir(M1;M2;C3;M4+C5) or Tir(C3)
SD(;;;) or SD()	Standard deviation (see Min-function)	SD(M1;M2;C3;M4+C5) or SD(C3)
PartOK	=0, if the current measuring value of at minimum one characteristic is outside the tolerances =1, if the current measuring values of all characteristics are inside the tolerances	PartOK=1
PartOK_File	=0, if the last measuring value from file of at minimum one characteristic is outside the tolerances =1, if the last measuring values from file of all characteristics are inside the tolerances	PartOK_File=1

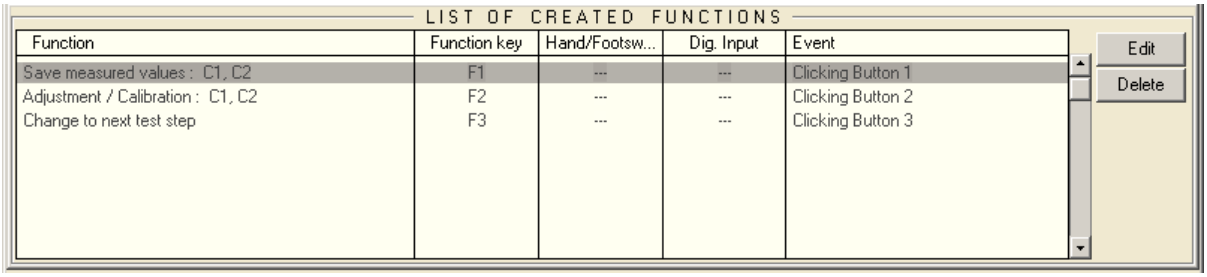
Example of a formula : *45e-5 + sin(5*M1/M2)*cos(4*M3) – (C2+M3+4.5)^(1 / 2) + Min(sin(C1);cos(M2)/3;M2+M3;5) > 1000*

Additionally there are the following special functions for the formulas available :

Special function	Description
Timer	**Timer (time interval, num. of calls)** The Timer is initialised on the start of the particular test step and triggers the event on expiration of the time. On each leaving and new call of the test step the Timer is reset. *time interval → Time interval after which the Timer triggers the event [in msec]* *num. of calls → Number of calls of the Timer (e.g. 100 measuring values shall be saved all 100 msec)* *0 = Special case : The Timer triggers the event unlimited times* *1 = The Timer triggers the event 1-time after test step start* *2 = The Timer triggers the event 2-times after test step start* *…*
GlobalTimer	**GlobalTimer (time interval, num. of calls)** The Timer is initialised on the FIRST start of the particular test step and triggers the event on expiration of the time, when the test step is currently active. It varies from the normal “Timer” in that way, that it is NOT reset after leaving and new call of the test step. *time interval → Time interval after which the Timer triggers the event [in msec]* *num. of calls → Number of calls of the Timer (see Timer)*
PartCounter	**PartCounter (reset size)** The Part Counter counts the measured parts since the start of the test scheme / test order. When the counter reaches the reset size then the counter is reset. (serves for e.g. a call on a part forced calibration) *reset size → Number of parts after which the PartCounter is reset* *0 = Special case : The counter is never reset* *1 = The counter is reset after one part* *2 = The counter is reset after two parts* *…*
NumOfVal	**NumOfVal (Number of the characteristic)** Returns the number of measuring values in file of the characteristic.
StableValue	**StableValue (Number of the characteristic, begin, end, time, max. jump)** Detection of a stable value. *Characteristic → Number 1...128 of the observed characteristic* *begin & end → Measuring range in which the observation for a stable value takes place. After detection of a stable value the measuring range must be first left, before a new stable value can be detected.* *time & jump → Time period „time“ in msec, in which the measuring value must not jump more than „jump“ for detecting a stable value.* *Example : StableValue (3, 19.99, 20.01, 1000, 0.005) =1* The event is triggered, if the measuring value of characteristic *3* is within the measuring range of *19.99* to *20.01* and is stable, i.e. it jumps less than *0.005* for a time of *1000* msec.
MVChange	**MVChange (Number of the characteristic, Changing, Time)** Detection of a changing value. *Characteristic → Number 1...128 of the observed characteristic* *Changing → Minimal-required change of the measuring value for triggering the event* *Time → Time period in msec, within which the measuring value must change for „Changing“* *Example : MVChange (3, 0.1, 1000) =1* The event is triggered, if characteristic 3 changes in *1000* msec at minimum for *0.1*.

Example for a formula : Timer(1000,1)=1

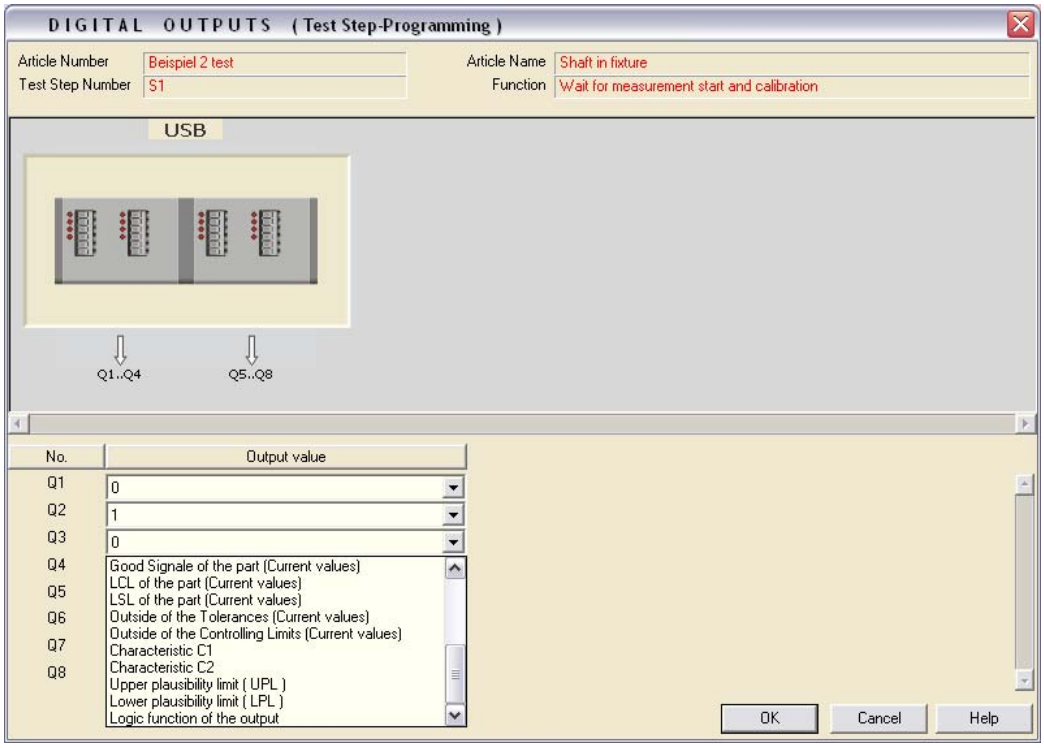
4. All the created functions are shown in the table. These can be modified or deleted :



5. In the “Reference information – menu” (see chapter 6.6) you can select that certain types of reference information are requested at the start of a component measurement. This could be for example the serial number of the component. By checking the box “In this test step the reference information are requested” you can define the test step in which these reference information types are requested.

7.8 Programming the test steps (digital outputs)

In this window the output values of the digital outputs can be assigned to the single test steps.
(e.g. for controlling a machine) :



The digital outputs and their addresses are shown in the picture.

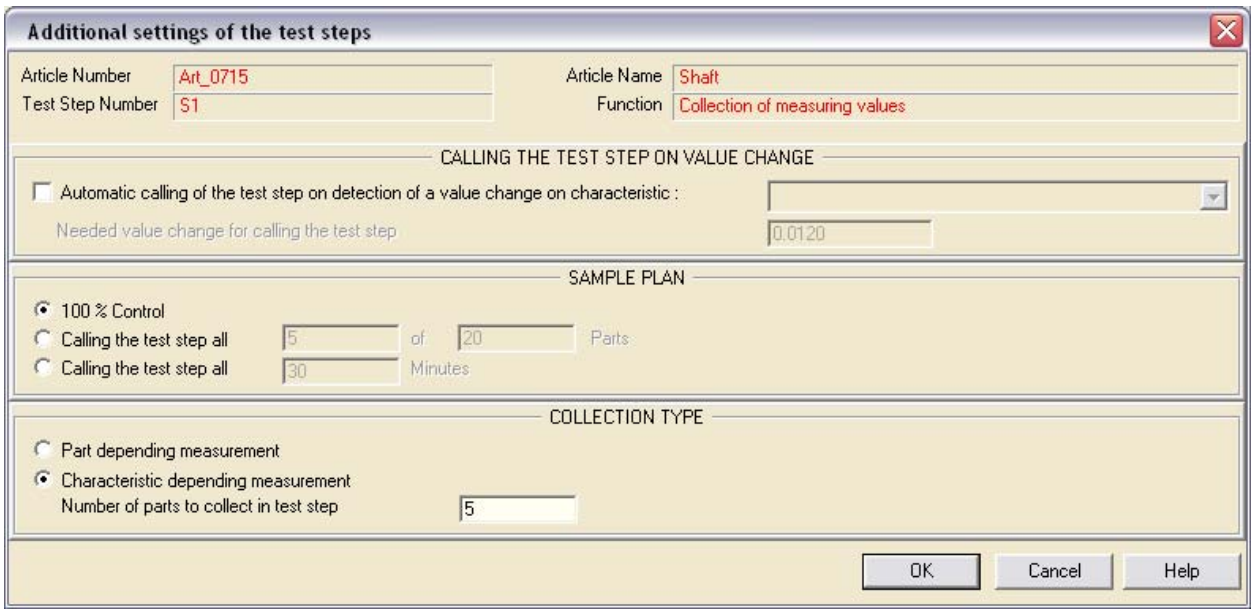
For the digital outputs the following output values are available :

Output value	Output
0	The digital output is not set.
1	The digital output is set.
USL of the part (Values from file)	The digital output is set, if the last saved measuring value of at minimum one characteristic is outside the upper specification limit (USL).
UCL of the part (Values from file)	The digital output is set, if the last saved measuring value of at minimum one characteristic is outside the upper controlling limit (UCL) and if no measuring value is outside the specification limits (USL & LSL).
Good Signale of the part (Values from file)	The digital output is set, if the last saved measuring value of all characteristics is within the controlling limits and within the specification limits.

Continuation of values for the digital outputs :

Output value	Output
LCL of the part (Values from file)	The digital output is set, if the last saved measuring value of at minimum one characteristic is outside the lower controlling limit (LCL) and if no measuring value is outside the specification limits (USL & LSL).
LSL of the part (Values from file)	The digital output is set, if the last saved measuring value of at minimum one characteristic is outside the lower specification limit (LSL).
Outside of the Tolerances (Values from file)	The digital output is set, if the last saved measuring value of at minimum one characteristic is outside the specification limits (USL & LSL).
Outside of the Controlling Limits (Values from file)	The digital output is set, if the last saved measuring value of at minimum one characteristic is outside the controlling limits (UCL & LCL) and if no measuring value is outside the specification limits (USL & LSL).
USL of the part (Current values)	The digital output is set, if the current measuring value of at minimum one characteristic is outside the upper specification limit (USL).
UCL of the part (Current values)	The digital output is set, if the current measuring value of at minimum one characteristic is outside the upper controlling limit (UCL) and if no measuring value is outside the specification limits (USL & LSL).
Good Signale of the part (Current values)	The digital output is set, if the current measuring value of all characteristics is within the controlling limits and within the specification limits.
LCL of the part (Current values)	The digital output is set, if the current measuring value of at minimum one characteristic is outside the lower controlling limit (LCL) and if no measuring value is outside the specification limits (USL & LSL).
LSL of the part (Current values)	The digital output is set, if the current measuring value of at minimum one characteristic is outside the lower specification limit (LSL).
Outside of the tolerances (Current values)	The digital output is set, if the current measuring value of at minimum one characteristic is outside the specification limits (USL & LSL).
Outside of the Controlling Limits (Current values)	The digital output is set, if the current measuring value of at minimum one characteristic is outside the controlling limits (UCL & LCL) and if no measuring value is outside the specification limits (USL & LSL).
Characteristic Cx	The digital output is set, if the current measuring value of characteristic Cx is within the specification limits.
Upper plausibility limit (UPL)	The digital output is set, if the current measuring value of at minimum one characteristic is outside the upper plausibility limit (UPL).
Lower plausibility limit (LPL)	The digital output is set, if the current measuring value of at minimum one characteristic is outside the lower plausibility limit (LPL).
Logic function of the output	Input of a formula → see formula editor in chapter 7.7

7.9 Programming the test steps (additional settings)



Automatic calling of the test step on detection of a value change on characteristic :

With this option activated and a characteristic assigned to it, the particular test step is automatically called if the measurement value of the assigned characteristic changes. Additionally you can define a minimum value change which serves as trigger level for the automatic call of the test step.

Example :

There are 3 bore gauges connected. For each one of them a test step with display window is created in ComGage. If you now assign characteristic 1 to the first test step, characteristic 2 to the second test step and so on, then ComGage always displays the measurement values of the active bore gauge.

Sample plan :

100 % Control

The test step is always called.

Calling the test step all x of y parts

The test step is only called x-times out of y-times, i.e. with this function the collection of uncritical characteristics can be skipped, so that these characteristics do not have to be collected for each part.

Calling the test step all x Minutes

The test step is only called all x minutes, i.e. with this function a time-controlled execution of the test step can be programmed. This can be useful for example to execute a forced periodical calibration.

Collection type :

Part depending measurement

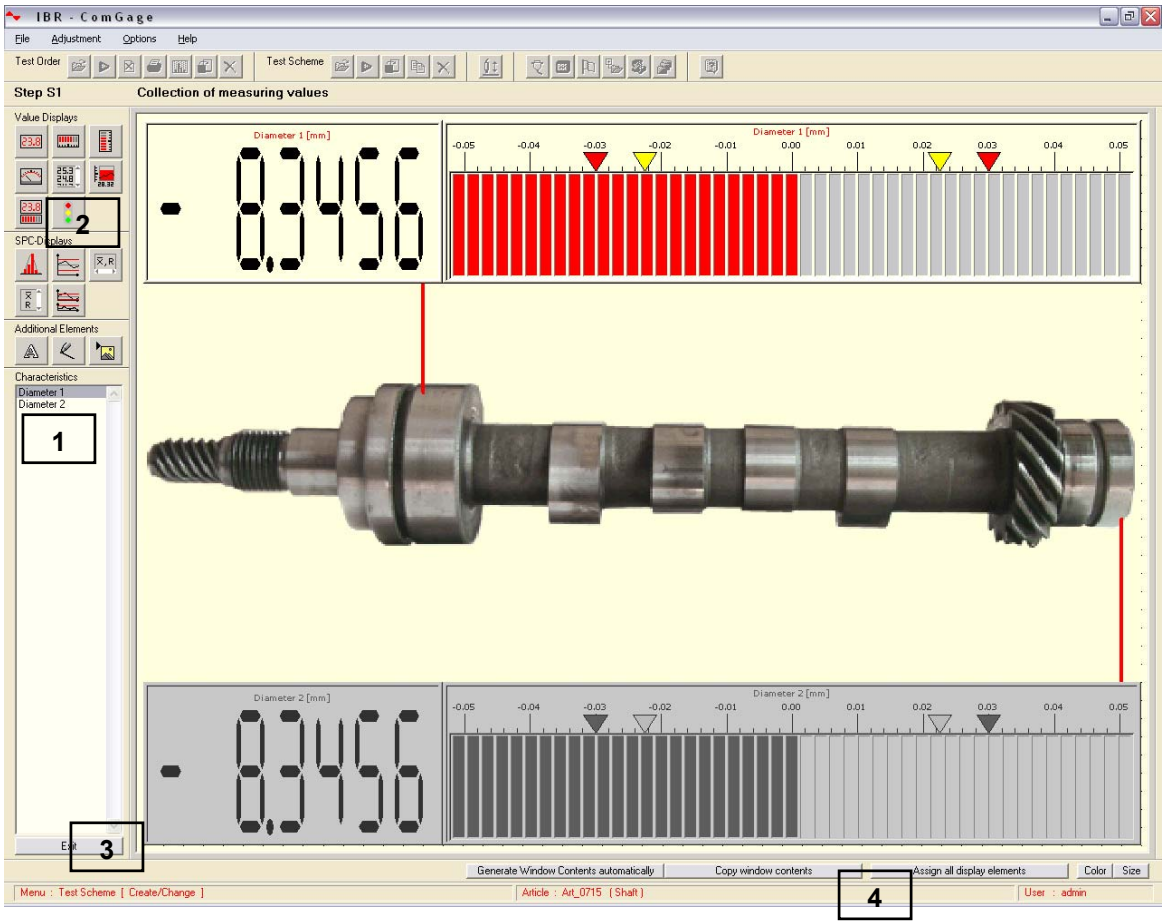
All characteristics of a part are measured one after the other before the next part is measured.

Characteristic depending measurement

At first characteristic 1 of x parts is measured, then characteristic 2 of x parts is measured and so on. With this option activated, ComGage firstly allows leaving the test step, when x parts have been measured.

7.10 Programming the test steps (programming the display windows)

In this menu the display windows for the individual test steps can be created.



1.) Selection of the characteristic

Before creating a display element the characteristic must be selected, to which the new display elements shall belong.

2.) Creating display elements

You can create a display element by using the buttons. The new display elements belong to the currently selected characteristic. (see 1.) The new display element is placed at the centre of the display and can then be moved.

3.) Leaving the programming menu

By clicking the **Exit** - button you can leave the menu for programming the display window.

4.) Additional buttons

On clicking the **Generate Window Contents automatically** - button, ComGage automatically creates the display window with the display elements for a list of characteristics, which can be selected on clicking the button.

By clicking the **Copy window contents** - button the display window contents of another test step can be copied.

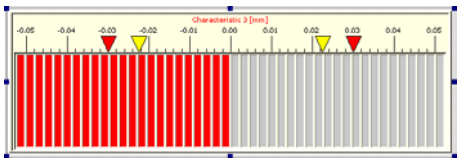
By clicking the **Assign all display elements** - button all display elements of a display window can be assigned to a particular characteristic.

By clicking the **Color** - button you can select the background colour of the window.

By clicking the **Size** - button you can adapt the display window to different screen sizes.

5.) Moving display elements

If you click on a display element then it gets activated. When it is activated you can move it or change its size using the mouse. (alternative **cursor keys** : move the element / **shift+cursor keys** : change its size)

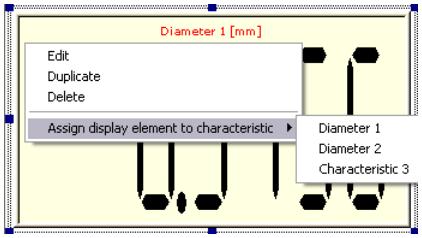


6.) Grey display elements

All display elements of the currently selected characteristic are shown in colour, the display elements of other characteristics are shown in grey.

7.) Editing, duplicating or deleting a display element

By clicking the right mouse button or pressing the ENTER key the following menu for programming the selected display element is opened :



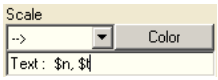
By means of this menu the display elements can be edited (e.g. colour), duplicated, deleted or assigned to an other characteristic.

Editing of display elements :

Measurement value displays and SPC displays

Most parameters of the display elements (such as colour or font) are independent from the characteristic. There are few parameters of the single display elements which are depending on the characteristic.

Display element	Parameters depending on the characteristic
Numeric Display	- Resolution, number of digits
Column Display	- Zero point of the column (= nominal size) - Column range (A user defined range is possible)
Analogue Meter	- Zero point (= nominal size) - Display range (A user defined range is possible)
Histogram	- Histogram type (for process control or process analysis) - Number of classes
Run Chart	- Number of values shown in the chart - Scrollbar on / off
Statistical Data	- Selection of the statistical data (min, cp, cpk, …) to be shown
Combination Display	- Resolution - Number of digits - Zero point of the Column (= nominal size) - Number of values shown in the chart
Control Chart	- Chart types (average chart [Xq], median chart [Xm], raw value chart [X], standard deviation chart [S], range chart [R]) - Calculation of the controlling limits (Shewhart, Acceptance) - Number of values shown in the chart - Scrollbar on / off



On control or run charts you can input a text which is used as axis label for each value :
In this text you can use the following variables :

Variable	Contents
$n	Number of the displayed measured value
$t	Time on which the measured value was collected
$d	Date on which the measured value was collected
$r1	Customer
$r2	Supplier
$r3	Manufacturer
$r4	Works / Department
$r5	Machine
$r6	Fixture
$r7	Nest
$r8	Tool
$r9	Material
$r10	Test equipment
$r11	Operator
$r12	Shift
$r13	Test place
$r14	Storage place
$r15	Production instruction
$r16	Test instruction
$r17	Events
$r18	Batch number
$r19	Action
$r21 - $r30	User definable reference information 1…10

Note : All variables (except $n) are only shown when you measure using a test order.

Text Elements

You can input freely definable text to a text element and select the font colour and the element colour.
The text elements additionally allow the linking of variables. The variables always belong to the characteristic the text element was assigned to :

Variable	Contents
$n	Number of measured components
$s	Number of measured components from current sample On sample size of 5 $s is assigned the values 0...4
$o0	Order number
$o1	Article number
$o2	Article name
$o3	Quantity
$o4	Creation date
$o5	Created by
$o6	Article text
$r1 - $r30	See table above

Note : All variables (except $n) are only shown when working with test orders.

Line Elements

You can create line elements and define the thickness and colour of the line.

Picture Elements

A bitmap (picture) can be selected. (Only pictures in ***.bmp** format can be used)

8.) Keys

The programming of the display elements can be done by using the following keys :

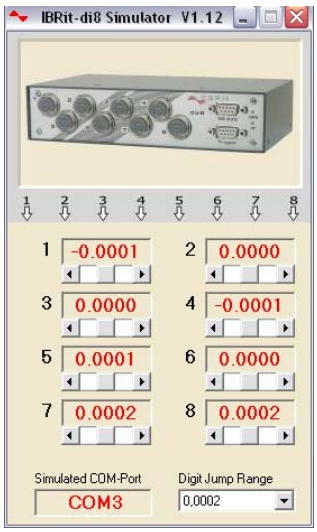
Key	Function
TAB	Moves the cursor from button to button and from display element to display element
SPACEBAR	Presses a button
Cursor	Moves a display element / Selection of menu points
Shift+Cursor	Changes the size of a display element
Enter	Opens the menu for editing and deleting the currently selected display element
Del	Deletes the currently selected display element
D	Duplicates the currently selected display element
L	Loads a saved display window (.dwc-file) into the current test scheme
S	Saves the current display window as .dwc-file to the chosen directory

8. Programming examples

8.1 Example 1 (Multi gauging application with DI8_Simulator.EXE)

Basic settings :

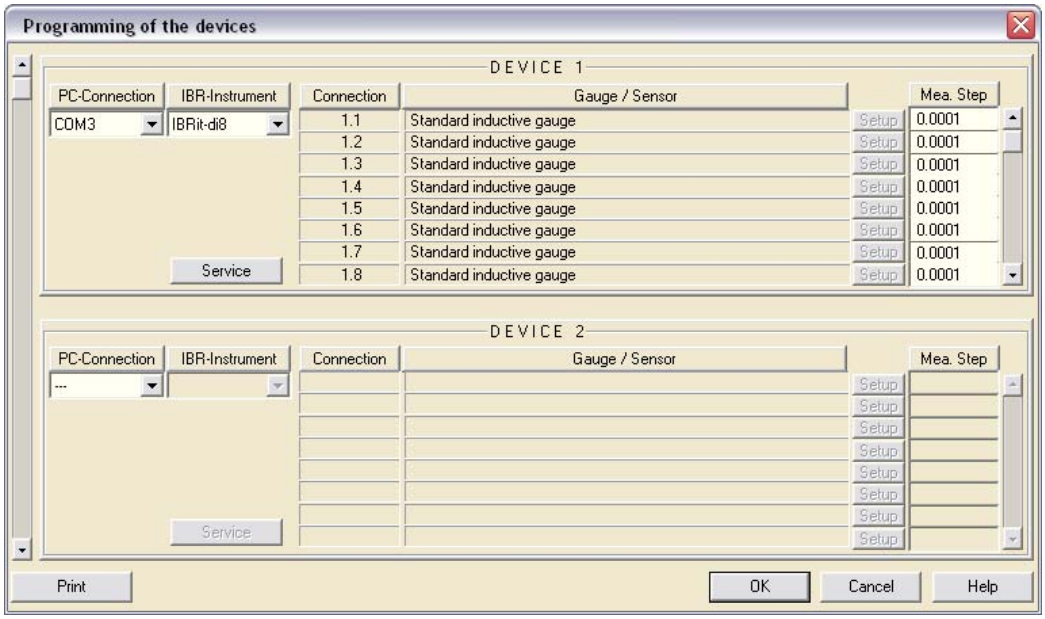
The programme „DI8_Simulator.EXE“ simulates an IBRit-di8, so that each customer, who does not have an IBR instrument, can test ComGage with „DI8_Simulator“ Software.



In the „DI8_Simulator“ Software the measuring values of the 8 channels of the simulated IBRit-di8 can be selected by the scrollbars.

The simulated COM-Port must be selected in ComGage.

After Installation (self explaining) and Start of „DI8_Simulator“-Software „COM3“ must be selected as PC-Connection and „IBRit-di8“ as IBR-Instrument in the „Options / Connections“ menu of ComGage.

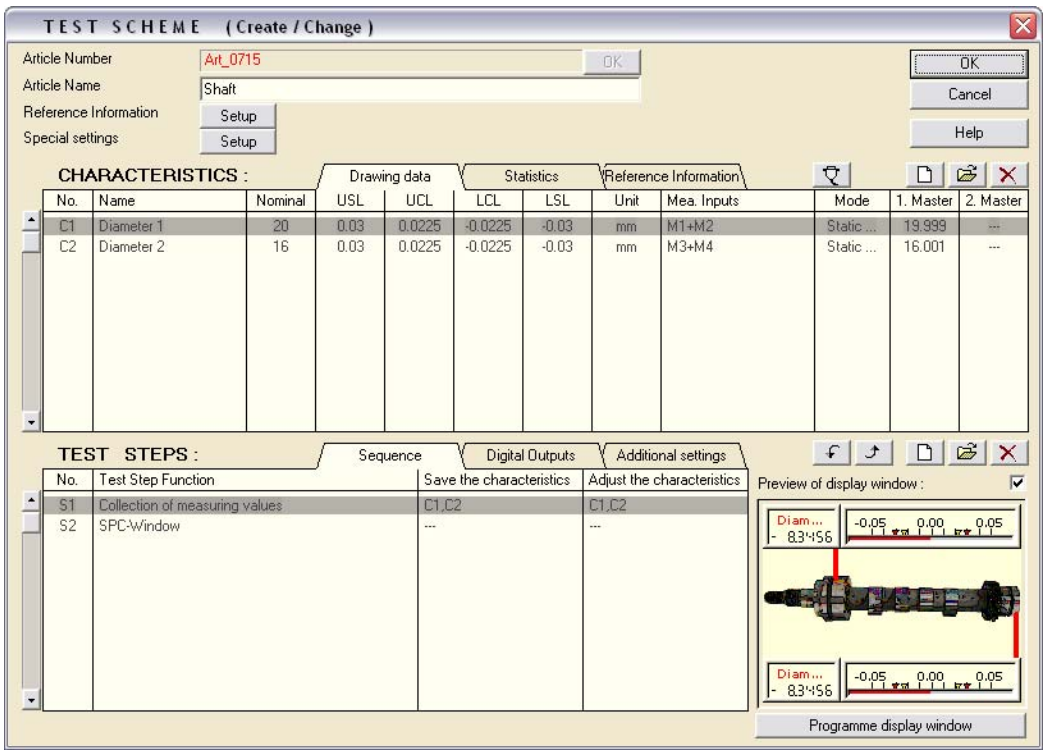


Application :

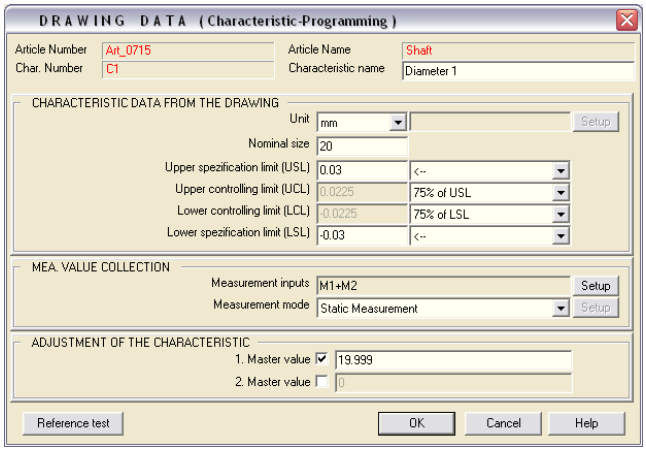
- Measurement of two diameters of a shaft.
- On pressing the **F1** - key the measuring values shall be stored in file.
- On pressing the **F2** - key the characteristics shall be calibrated.
- On pressing the **F3** - key the statistic window shall be opened.

Creation of the test scheme :

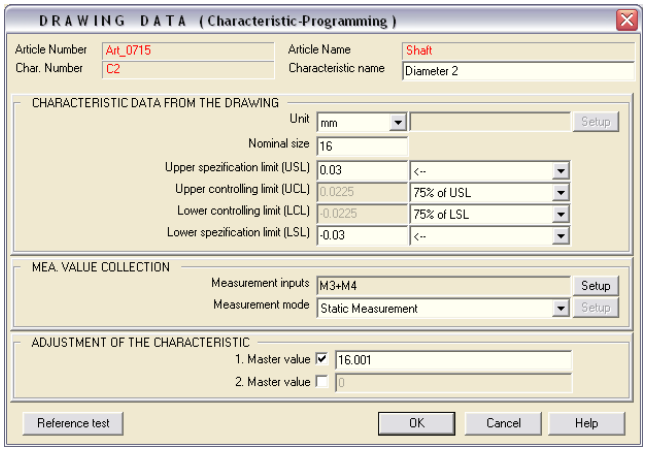
Creation of a test scheme with article number „Art_0715“ and article name „Shaft“ :



Creation of both characteristics for measuring two diameters (see brief overview - page 7) :

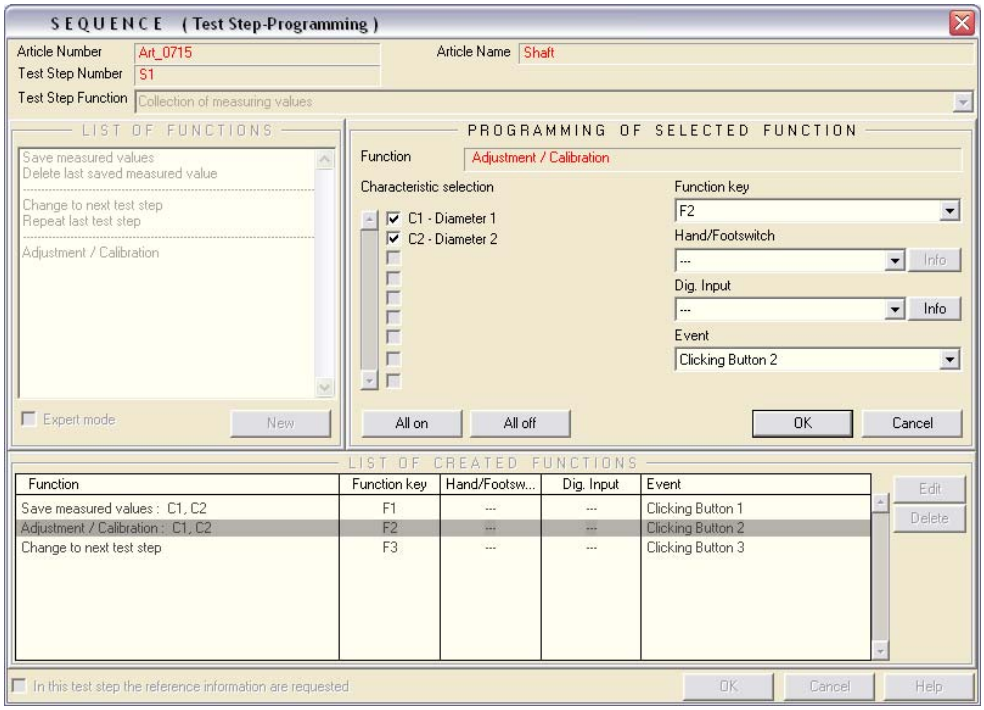


The diameter is calculated by the formula M1+M2 and is collected by a static measurement.



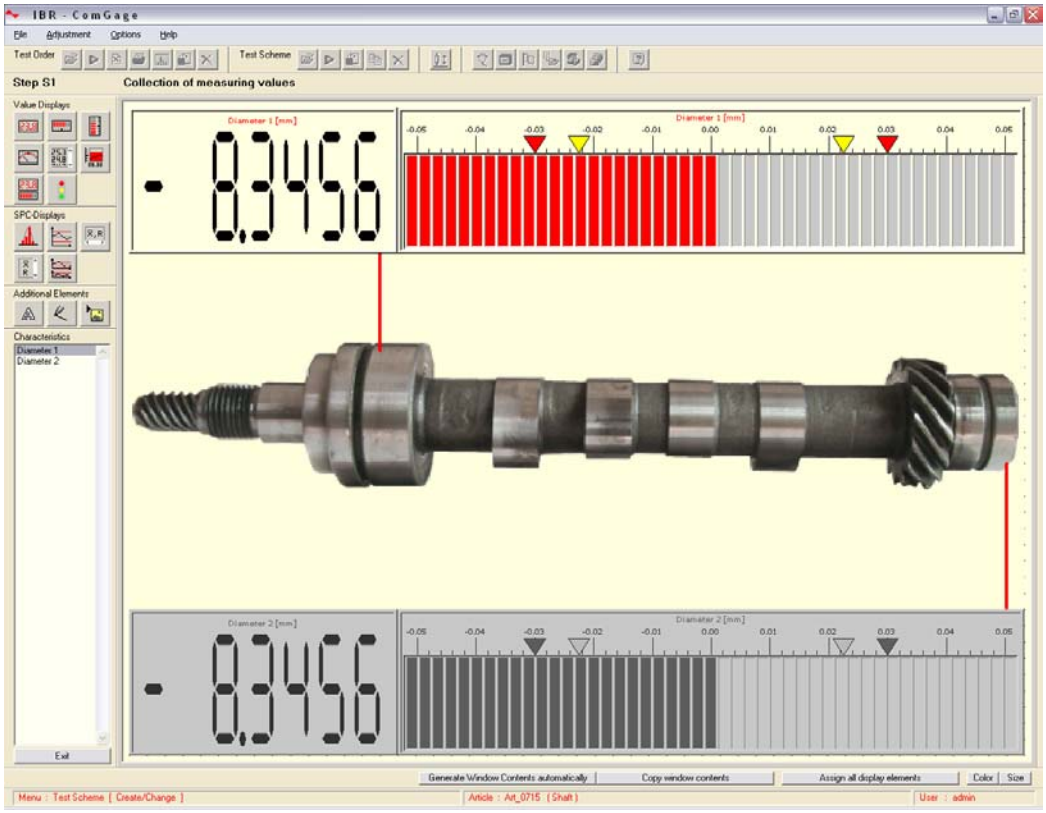
The diameter is calculated by the formula M3+M4 and is collected by a static measurement.

Creation of a test step for collecting the measuring values (see brief overview - page 8) :

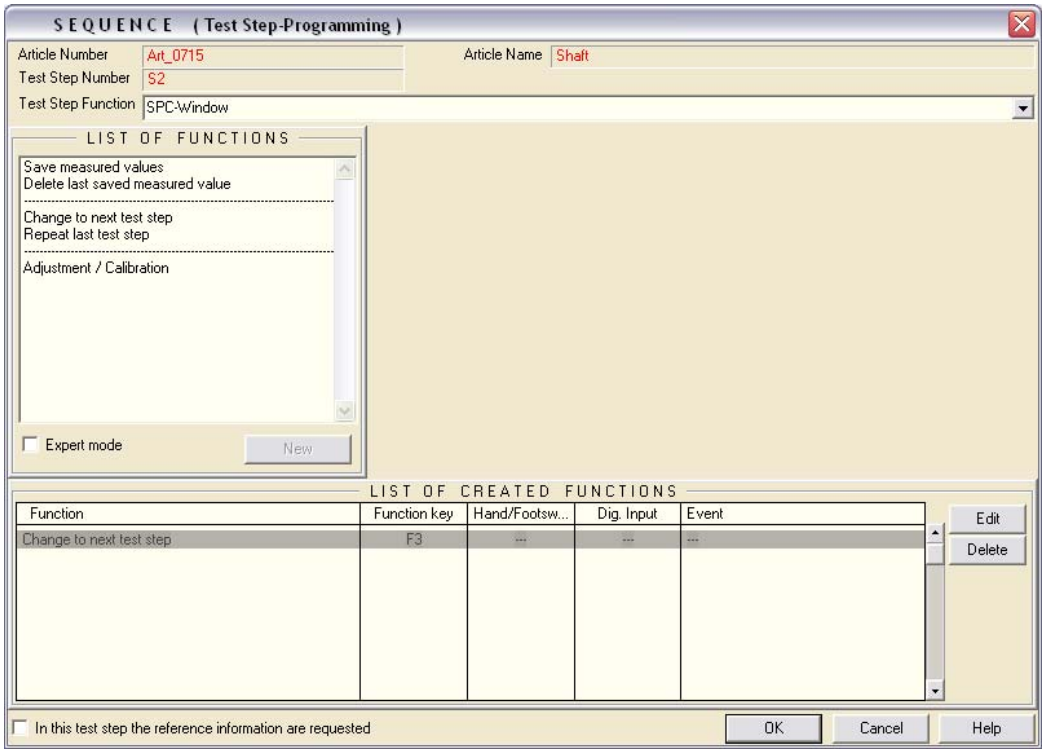


- On pressing the **F1** - key the measuring values are stored in file.
- On pressing the **F2** - key the characteristics are calibrated.
- On pressing the **F3** - key the statistic window is opened.

Creation of the following display window for test step S1 :

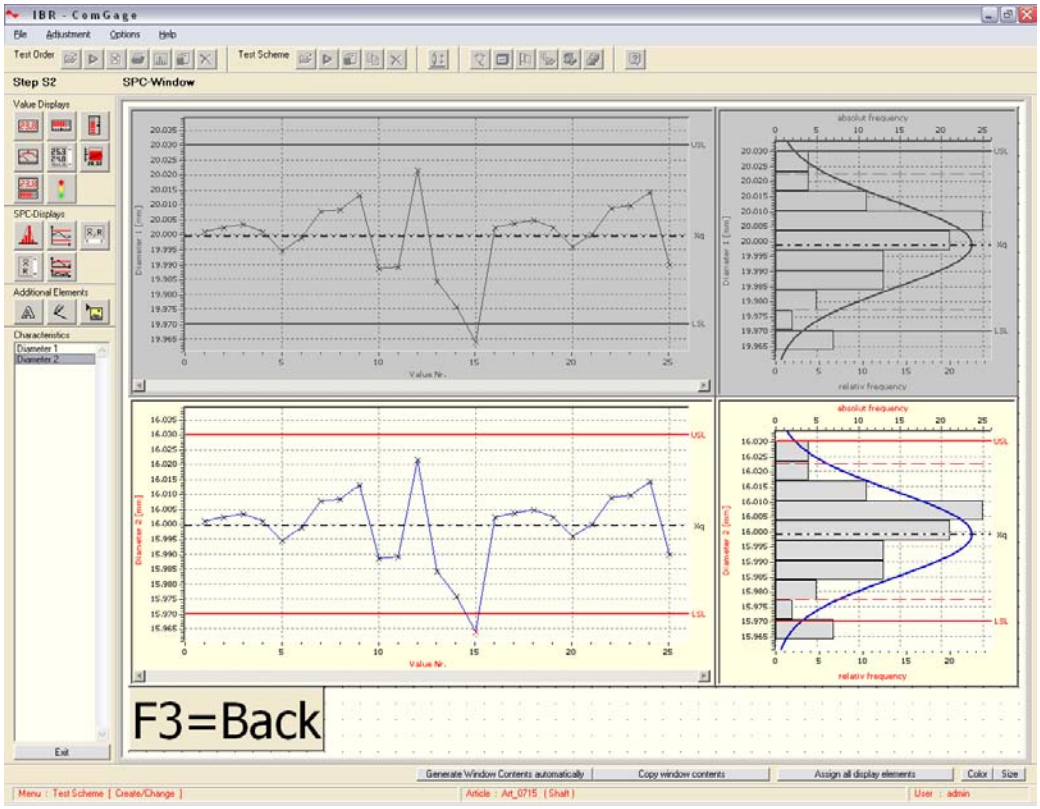


Creation of a second test step for statistic display (see brief overview - page 8) :



- On pressing the **F3** - key ComGage returns to measurement window (= test step S1).

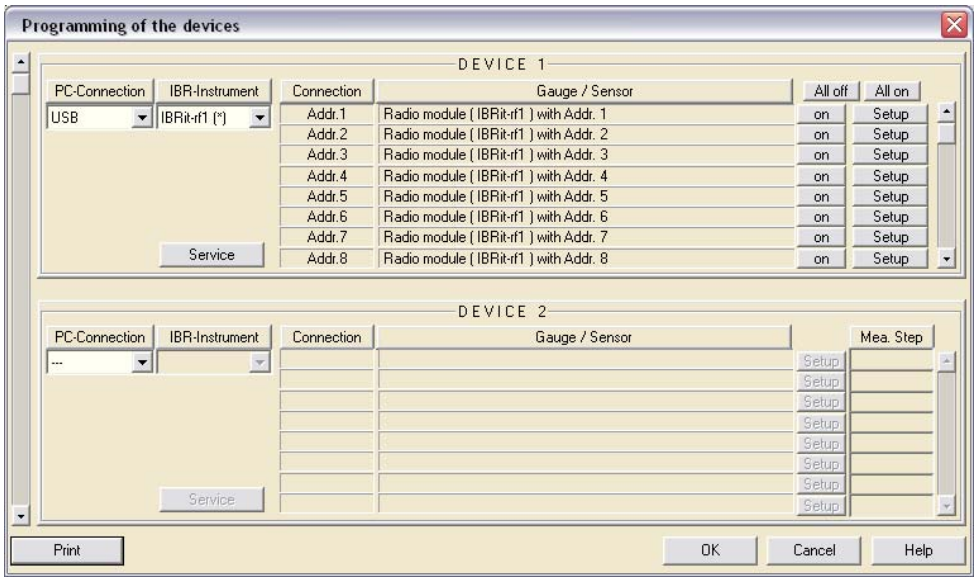
Creation of the following display window for test step S2 :



8.2 Example 2 (Collection of several characteristics one after the other with IBRit-rf1)

Basic settings :

After connecting the IBRit-rf1-usb radio module to the PC you must select „USB“ as PC-Connection and „IBRit-rf1“ as IBR-Instrument in the „Options / Connections“ menu of ComGage :

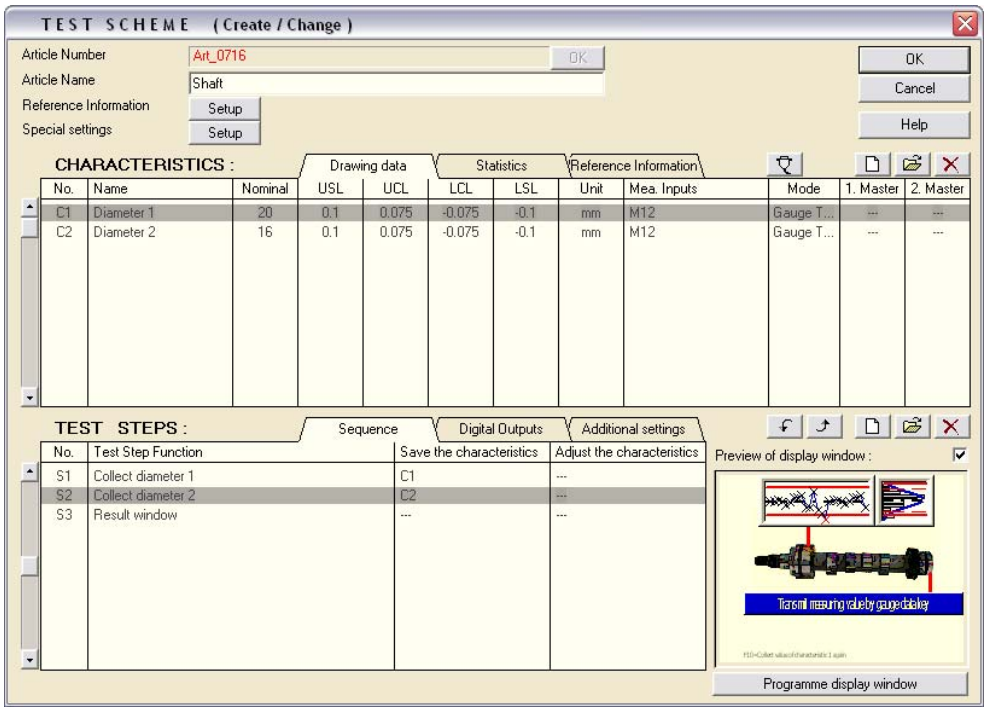


Application :

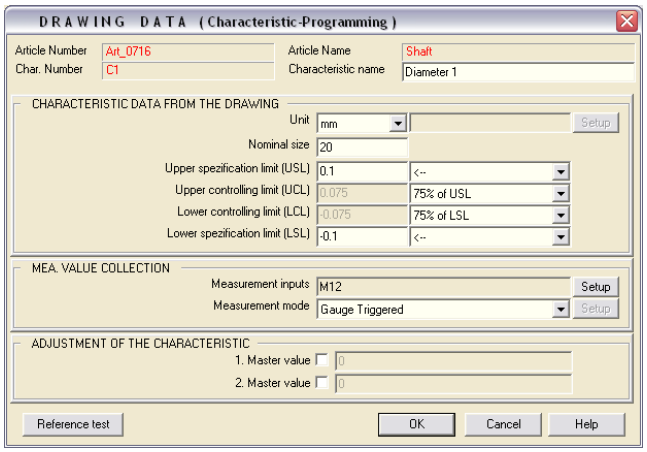
- Measurement of two diameters one after the other with calliper.
- On pressing the **F10** - key the last collected measuring value shall be deleted and the collection shall be repeated.

Creation of the test scheme :

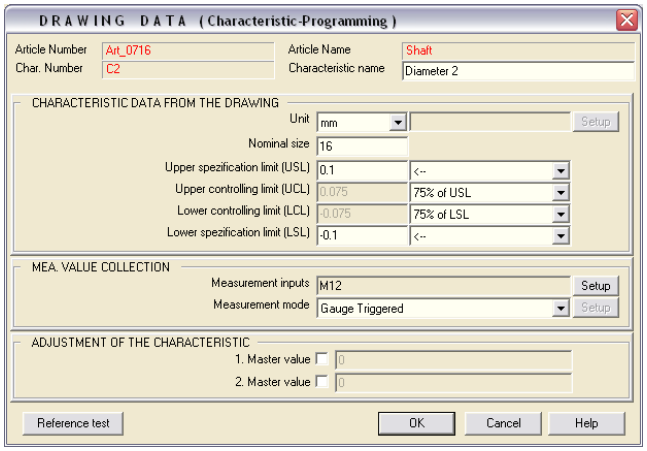
Creation of a test scheme with article number „Art_0716“ and article name „Shaft“ :



Creation of both characteristics for measuring two diameters (see brief overview - page 7) :

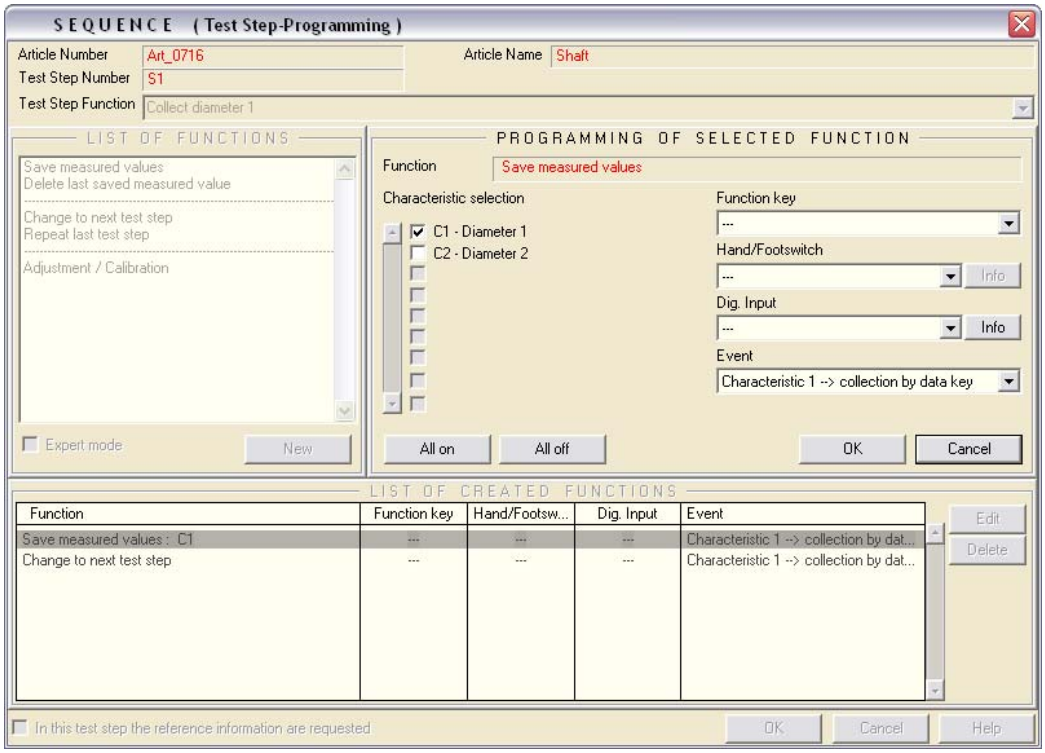


The diameter is transmitted by data key (gauge triggered mode) of radio module with addr. 12.
The zero adjustment does not occur in software but directly on calliper – so no master values are input.



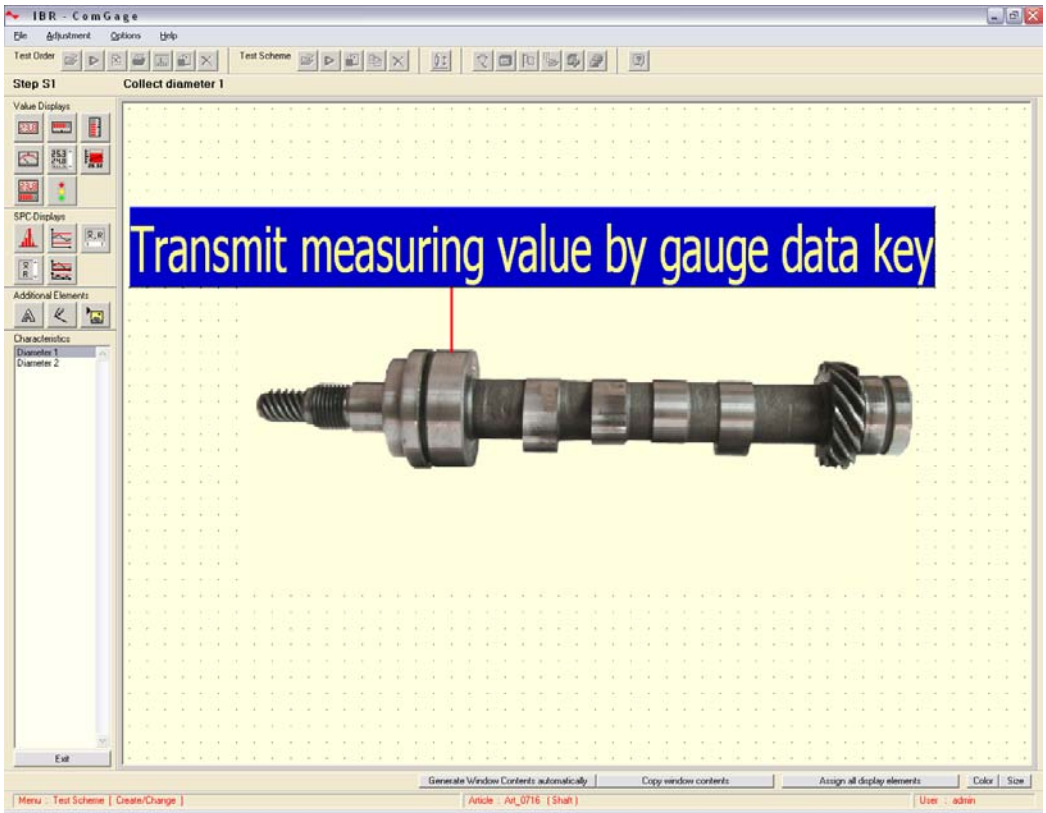
The diameter is transmitted by data key (gauge triggered mode) of same radio module.
The zero adjustment does not occur in software but directly on calliper – so no master values are input.

Creation of a test step for collecting diameter 1 (see brief overview - page 8) :

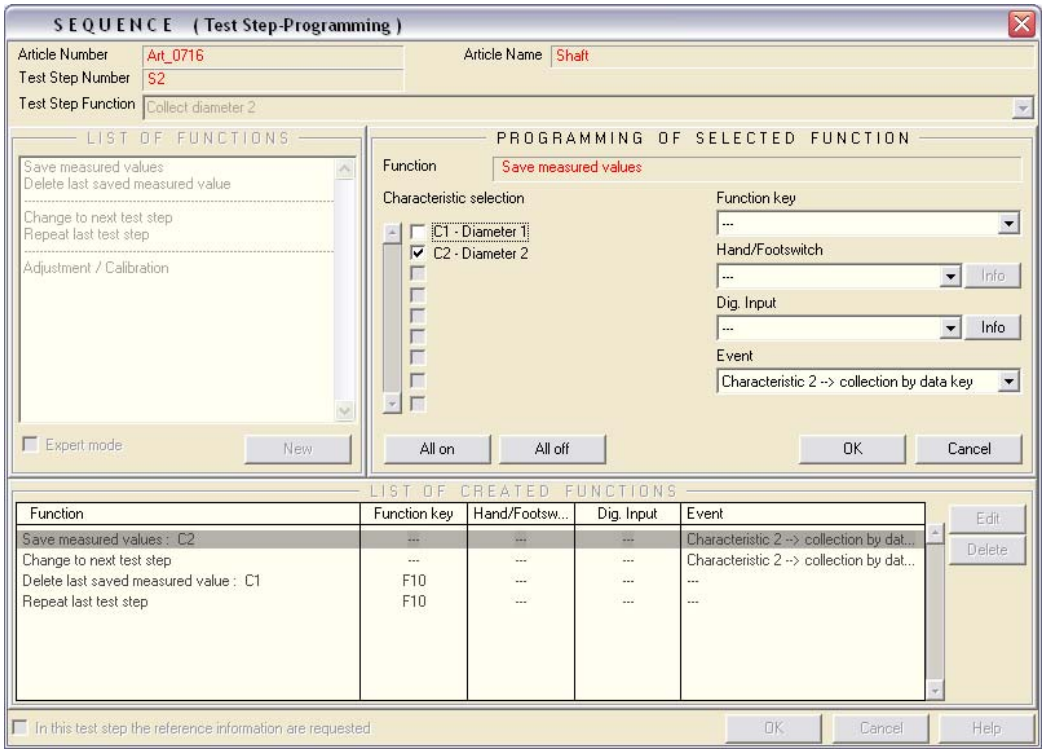


On transmission of a measuring value by data key of the radio module or calliper the received measuring value is automatically stored for characteristic 1. Then ComGage automatically switches to the next test step for collection of characteristic 2.

Creation of the following display window for test step S1 :

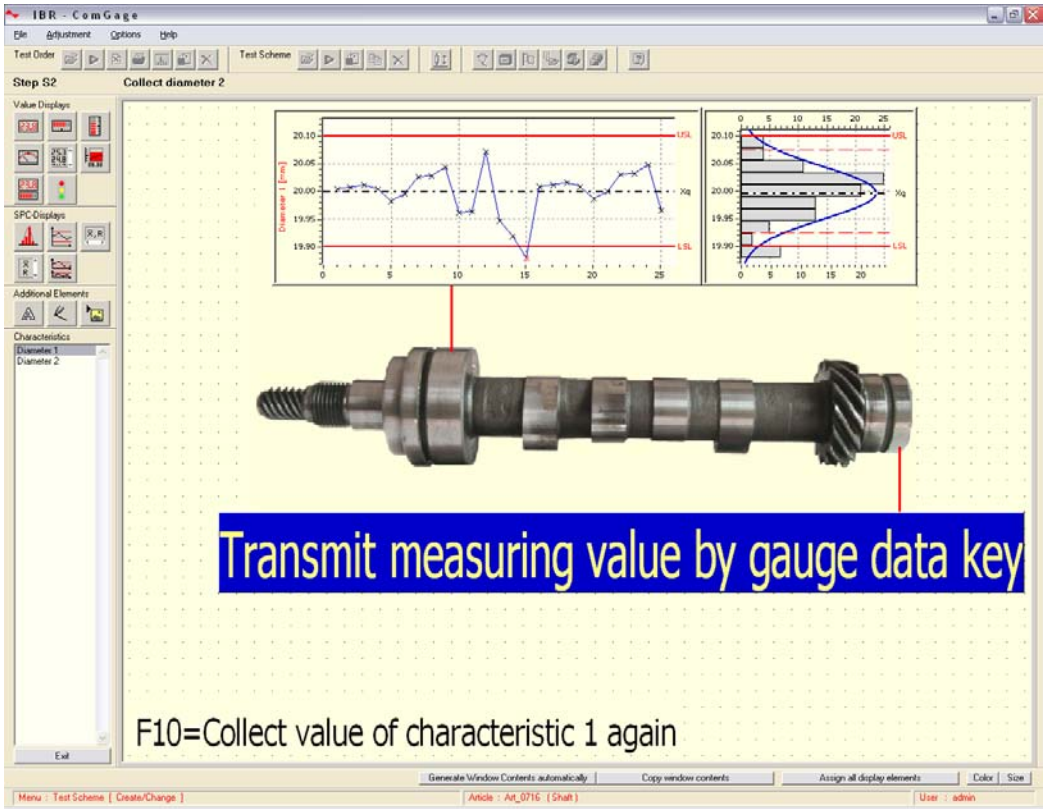


Creation of a second test step for collecting diameter 2 (see brief overview - page 8) :

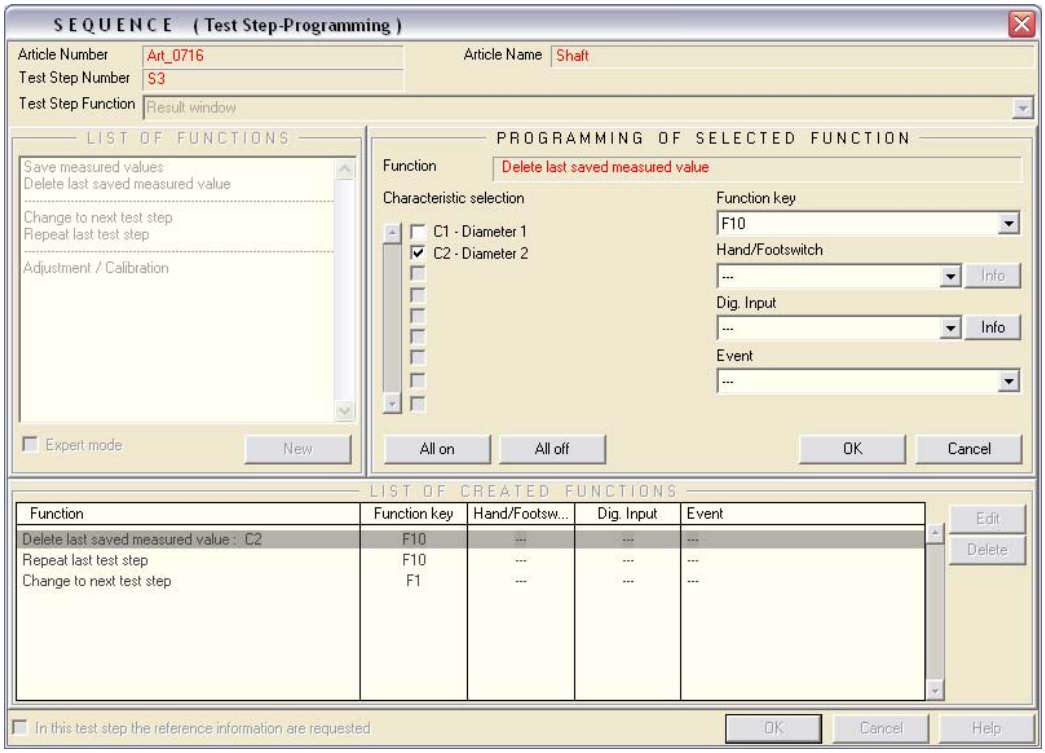


On transmission of a measuring value by data key of the radio module or calliper the received measuring value is automatically stored for characteristic 2. Then ComGage automatically switches to the next test step. On pressing the **F10** - key the last measuring value of characteristic 1 is deleted and ComGage returns to the previous test step for new measurement of characteristic 1.

Creation of the following display window for test step S2 :

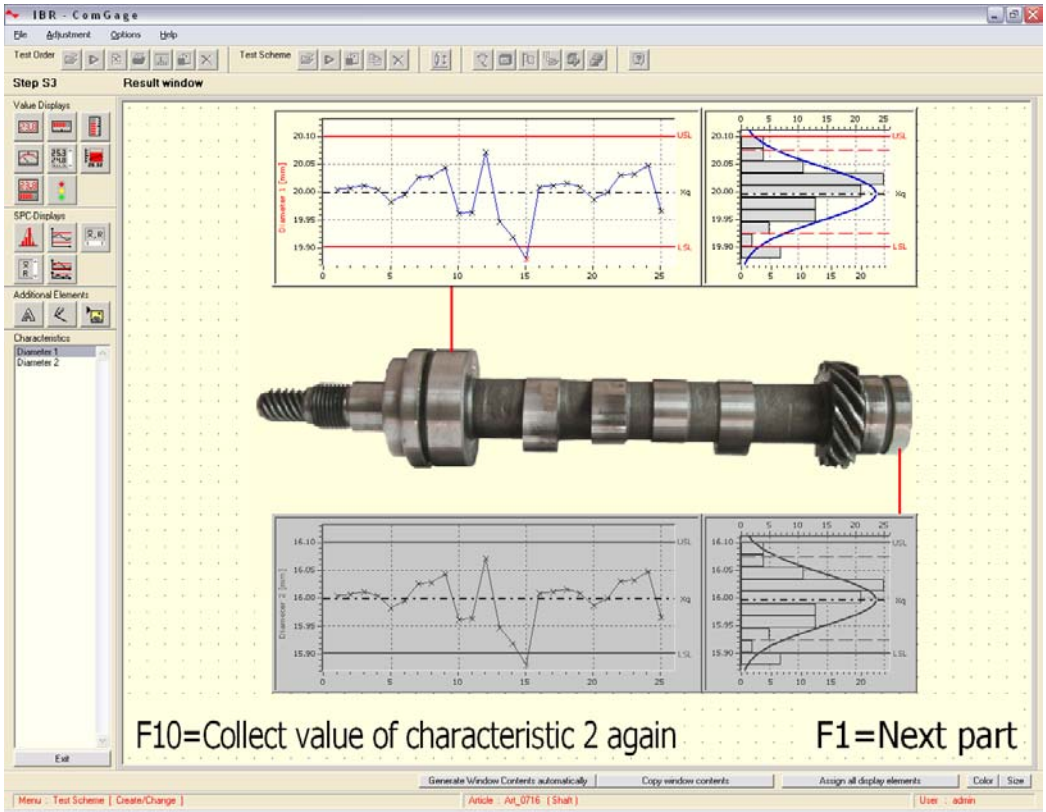


Creation of a third test step for displaying the collected measuring results of diameter 1 and diameter 2 :



On pressing the **F10** - key the last measuring value of characteristic 2 is deleted and ComGage returns to the previous test step for new measurement of characteristic 2. On pressing the **F1** - key the measurement of the next part is started.

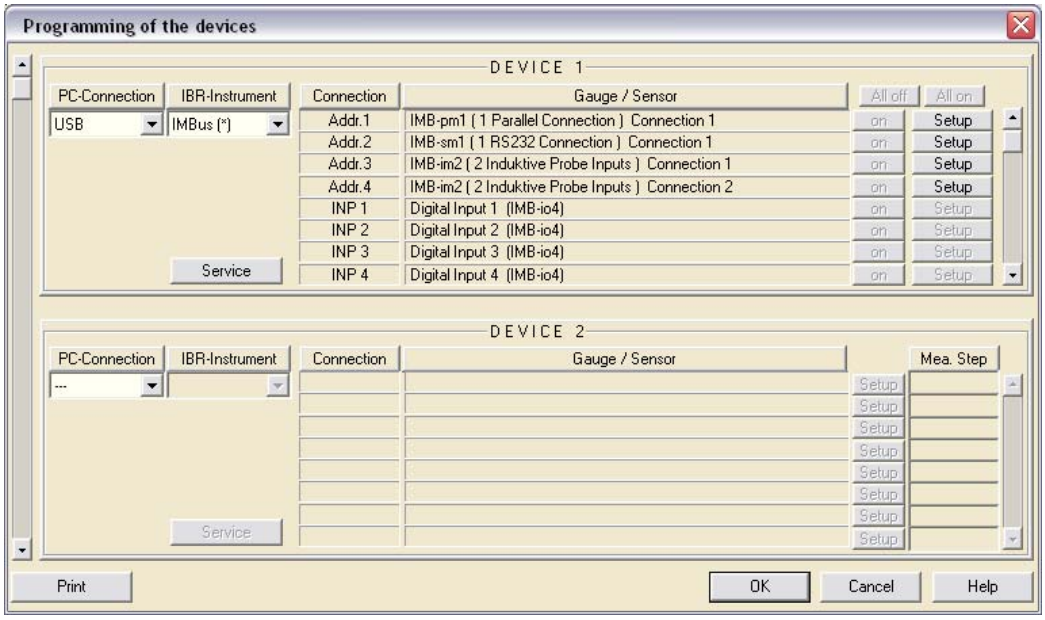
Creation of the following display window for test step S3 :



8.3 Example 3 (Keyboard input, static and dynamic measurements with IMBus)

Basic settings :

After connecting the IMBus to the PC you must select „USB“ as PC-Connection and „IMBus“ as IBR-Instrument in the „Options / Connections“ menu of ComGage :

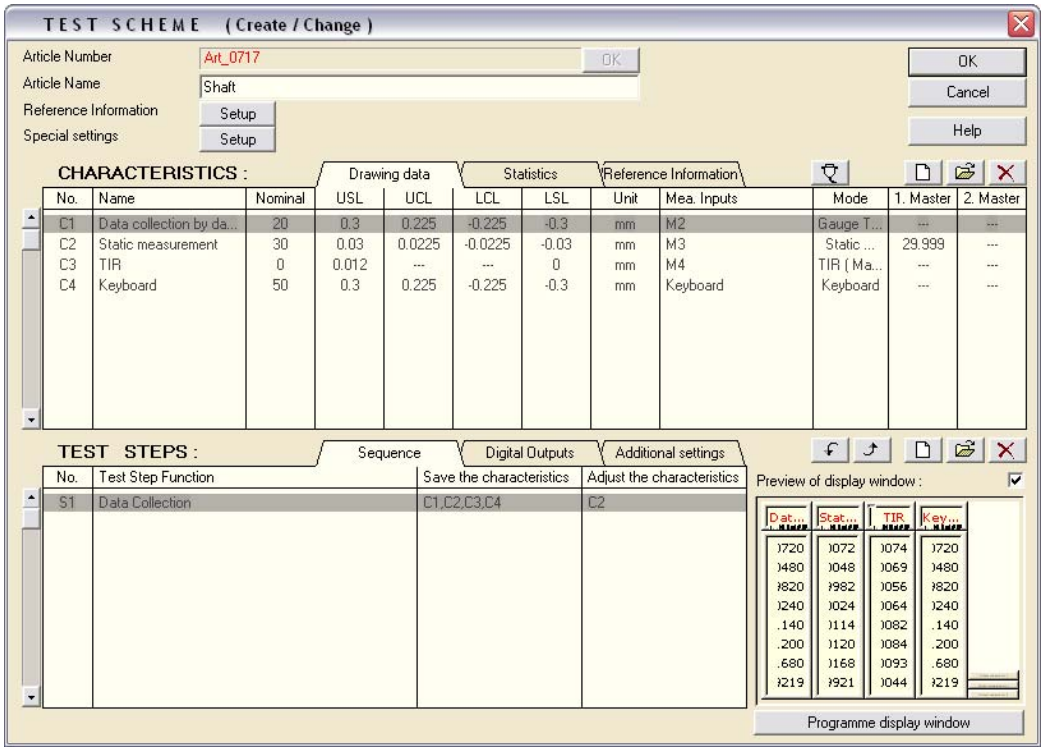


Application :

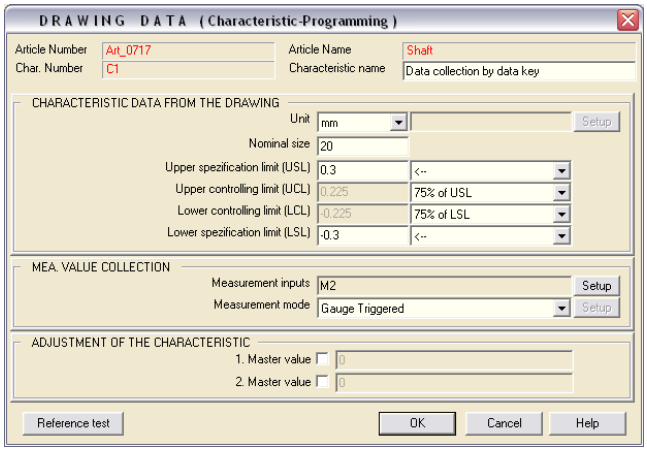
Collection of several characteristics by different measurement modes or keyboard input.

Creation of the test scheme :

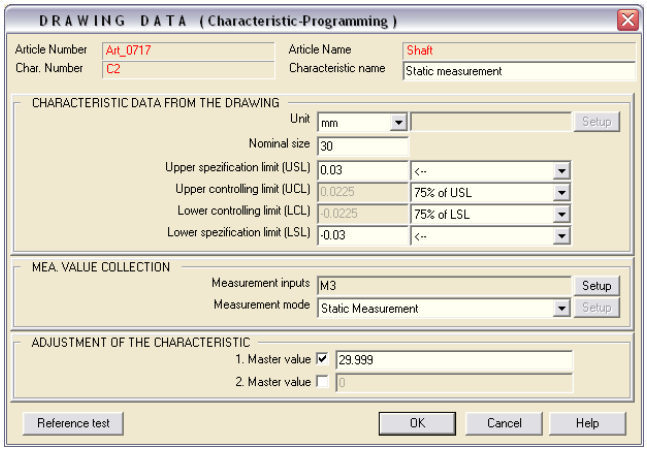
Creation of a test scheme with article number „Art_0717“ and article name „Shaft“ :



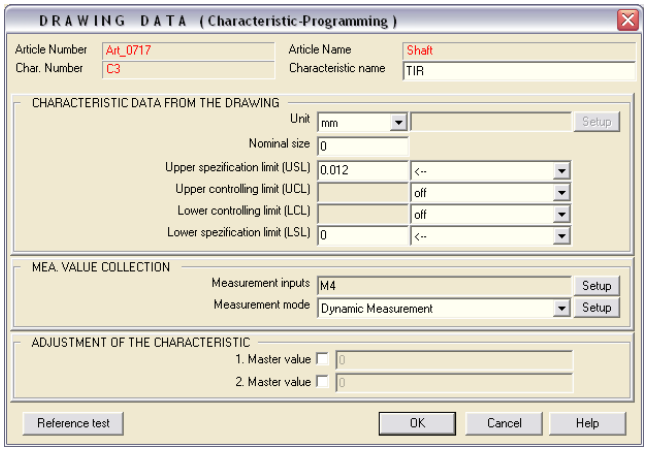
Creation of the characteristics for the measurements planned (see brief overview - page 7) :



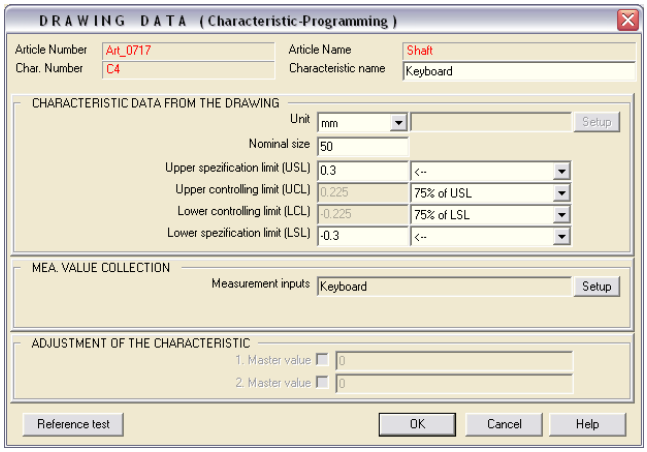
The measuring values of characteristic 1 are transmitted by data key of gauge. (Gauge triggered mode)



The measuring values of characteristic 2 are displayed continuously and shall be stored by function key (static mode).

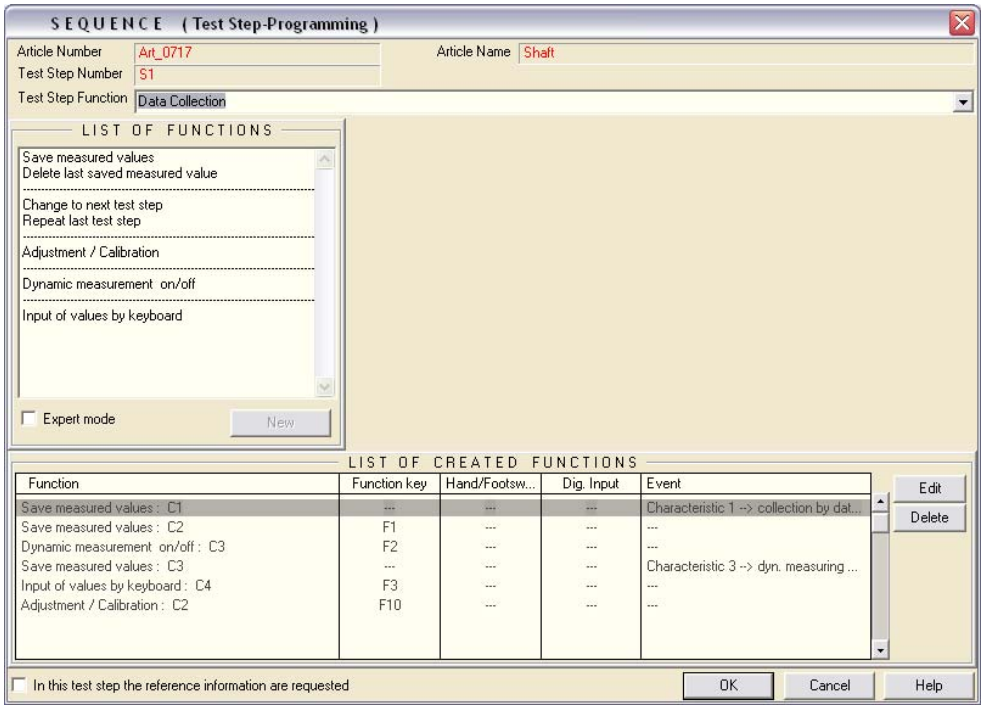


The TIR measurement of characteristic 3 shall be started by function key and stopped by a second pressing of function key. The TIR value shall be automatically saved on stopping the dynamic measurement (dynamic mode).



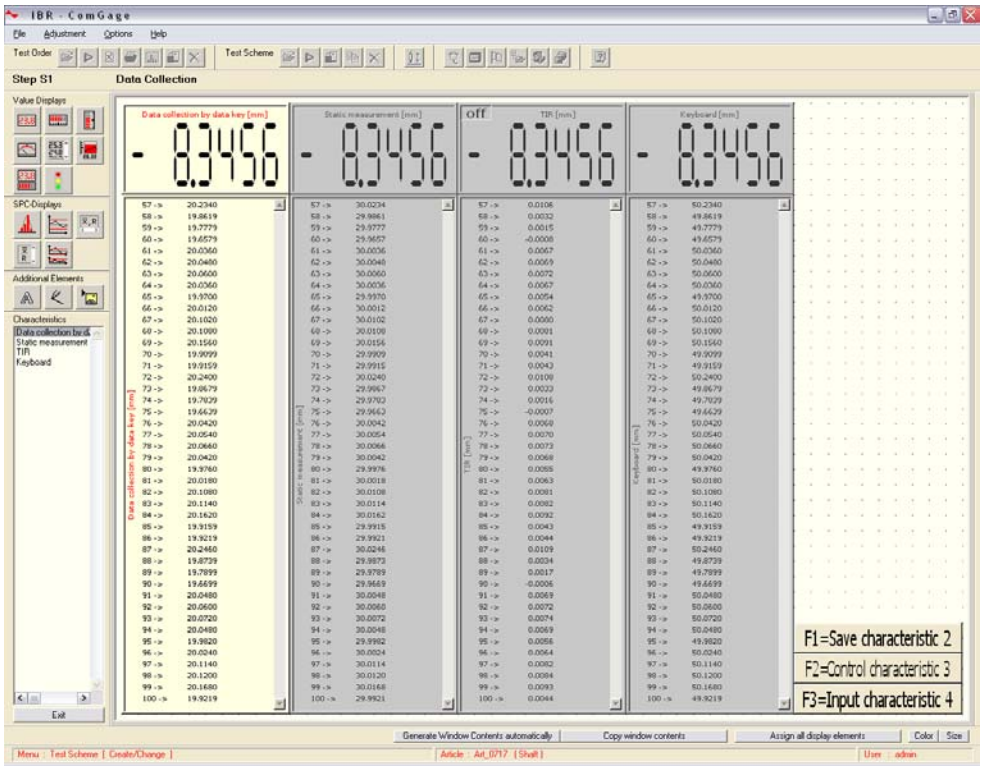
On pressing a function key the window for keyboard input shall be opened.

Creation of a test step for data collection (see brief overview - page 8) :



- All measuring values of characteristic 1 transmitted by data key of gauge are saved in file.
- On pressing the **F1** - key the measuring values of characteristic 2 are saved in file.
- On pressing the **F2** - key the dynamic measurement of characteristic 3 is started or stopped. On stopping the dynamic measurement the found TIR value is automatically saved in file.
- On pressing the **F3** - key the window for input of characteristic 4 by keyboard is opened.
- On pressing the **F10** - key the characteristic 2 is calibrated.

Creation of the display window :



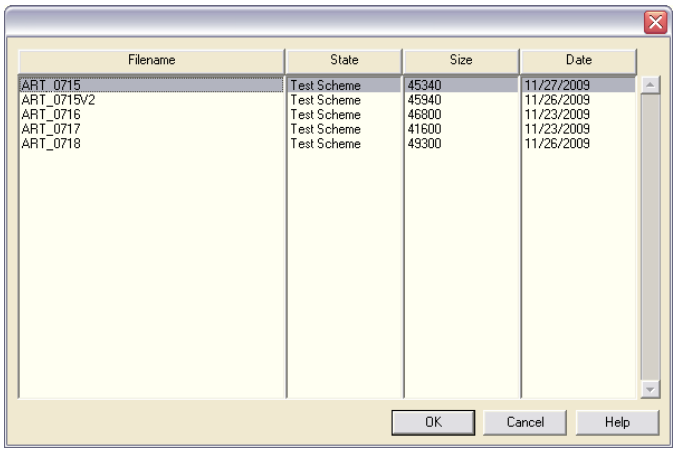
9. Starting the test scheme (measuring)

This menu is created for testing the function of the test scheme before you create the test orders.

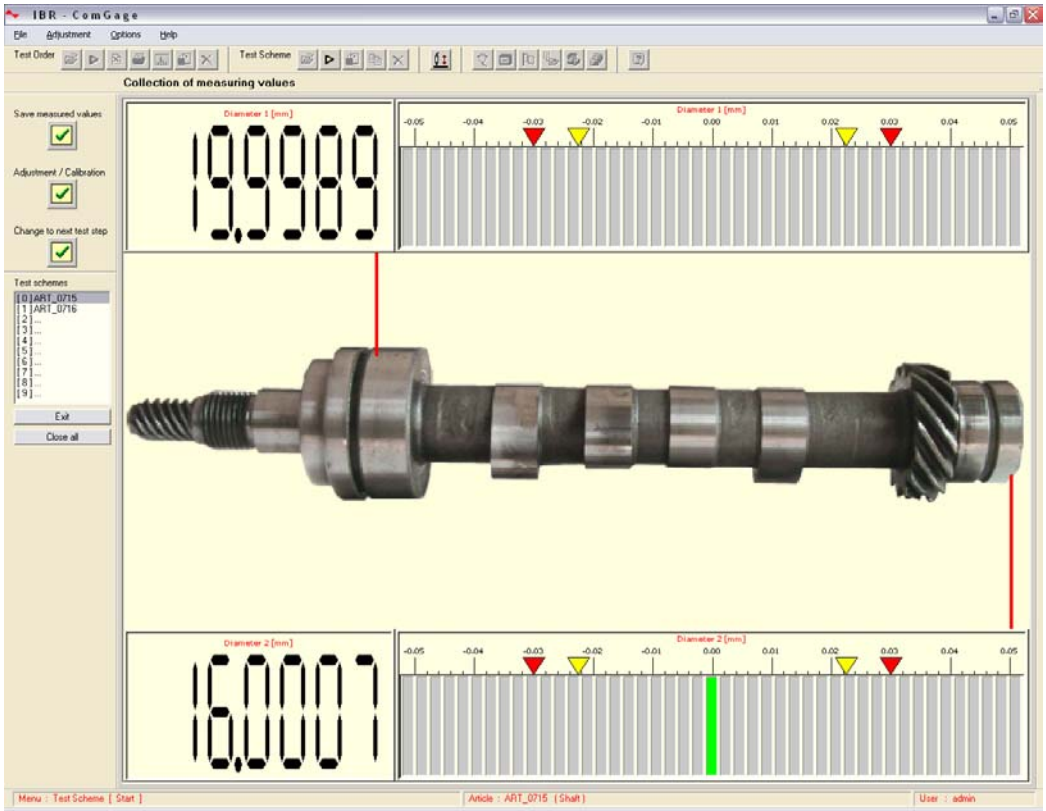
The measurement values you have collected in this menu are not saved and get lost, when you stop measurement operation.

You start the test scheme by clicking the **File / Test Scheme / Start** menu (Button : ).

After you have selected the menu you must select the test scheme you want to start :



In this menu it is possible to start up to 10 test schemes at the same time.
After the start of a test scheme ComGage automatically assigns one of the keys 0 .. 9 to the test scheme.

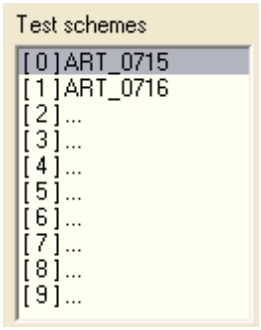


1.) Starting an additional test scheme

You can start an additional test scheme by clicking the **File / Test Scheme / Start** menu (Button: ). One of the keys 0 … 9 is then automatically assigned to the test scheme.

2.) List of started test schemes

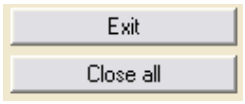
The started test schemes and their keys 0..9 are shown in following list :



The Number left of the article numbers (e.g. [0]) informs you which key you must press to start measuring with the particular test scheme. By clicking on the test scheme it is automatically started.

3.) Closing of one test scheme or all test schemes

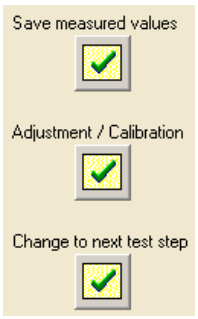
By clicking the **Exit** - Button you can close the currently measuring test scheme.
By clicking the **Close all** - Button you can close all started test schemes.



When all test schemes are closed the menu is left automatically.

4.) Buttons

The buttons are assigned to a function in the test scheme for execution of that particular function (see chapter 7.7).

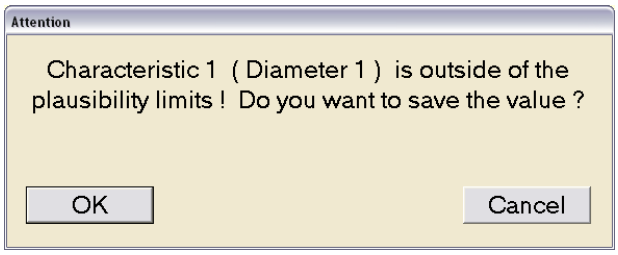


5.) Adjustment Button

By clicking the following button in the menu bar you can open the window *mechanical adjustment of inductive probes*. (See chapter 14 for menu description)

6.) Saving values

If a measurement value is outside the plausibility limits, then the following window is displayed.



By clicking the **Cancel** - button the measurement value is rejected, i.e. it is not saved.

!!! When this window is open, ComGage stops further measuring until the window is closed.

7.) Deleting values

If the operator has done a faulty measurement, he can delete the wrong measurement values of the last part and can repeat the measurement. But he cannot delete the measurement values of previously measured parts.

8.) Zero adjustment and gauge calibration

If you press the button, function key or foot switch assigned to the function “Adjustment / Calibration”, then a zero adjustment or gauge calibration is executed.

On zero adjustment the programmed master values are adopted as measurement values of the particular characteristics.

On gauge calibration the value is stored as first master value as soon as the button, function key or foot switch assigned to the function “Adjustment / Calibration” is actuated the first time. Afterwards the numeric display alternately indicates “Cal” and the measured value. As soon as the button, function key or foot switch assigned to the function “Adjustment / Calibration” is actuated the second time, the measurement value of the second master is adopted and the corresponding parameters are calculated.
The gauge calibration is completed.
So you must insert the first master into the fixture before the first actuation of the button, function key or foot switch and the second master before the second actuation.

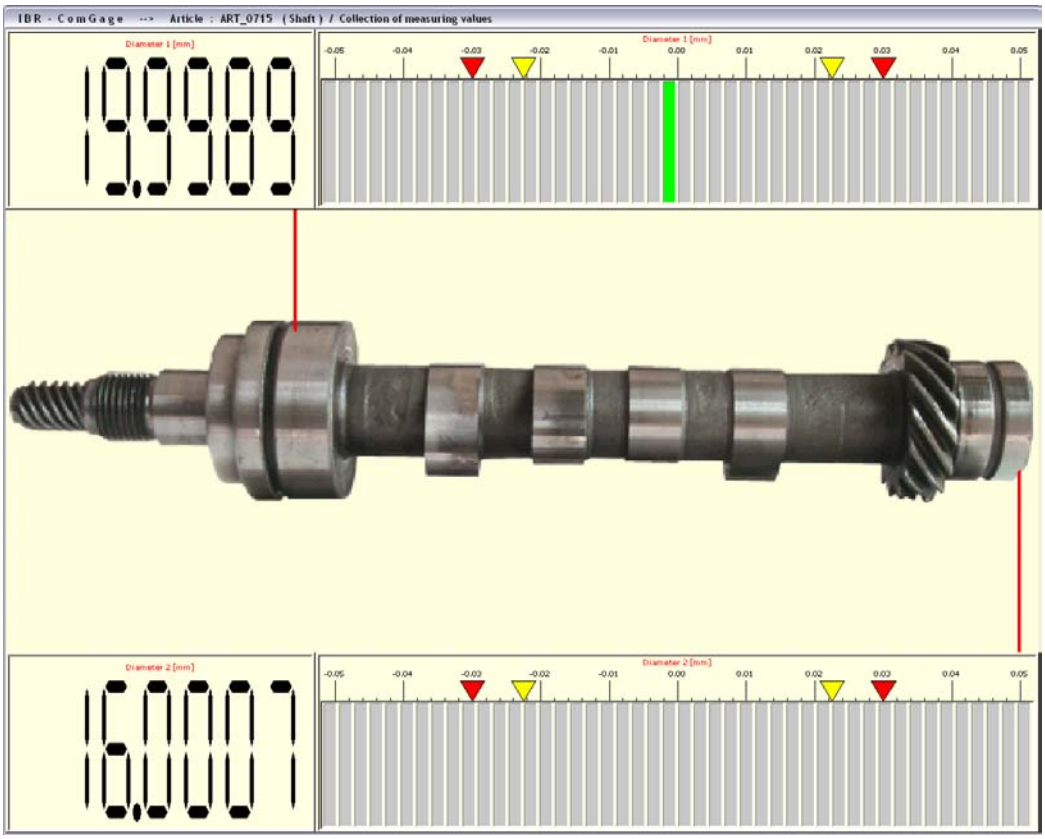
9.) Keys

The following function keys are available for operating the measurement mode :

Key	Function
TAB, +	Moves the cursor from button to button
SPACEBAR, ENTER	Presses the selected button
F1, F2, ...	The functions of the function keys are defined in the test scheme
/	Switches the window to full screen mode and back to normal mode
Cursor	Scrolling within the statistical display elements (with scrollbar)
0 … 9	Selection of a test scheme

10.)Full screen mode

Example of full screen mode :



10. Additional test scheme menus

10.1 Convert

By clicking the **File / Test Scheme / Convert** menu (Button : ) you can convert your test scheme into a Word-file for documentation purposes. At first you must select the test scheme, which you want to convert. At the beginning of the conversion process the message shown below will appear.

10.2 Duplicate

By clicking the **File / Test Scheme / Duplicate** menu (Button : ) you can duplicate a test scheme. At first you must select the test scheme, which you want to duplicate. After this you have to enter the article number of the new test scheme and at last you can modify the test scheme settings.

10.3 Delete

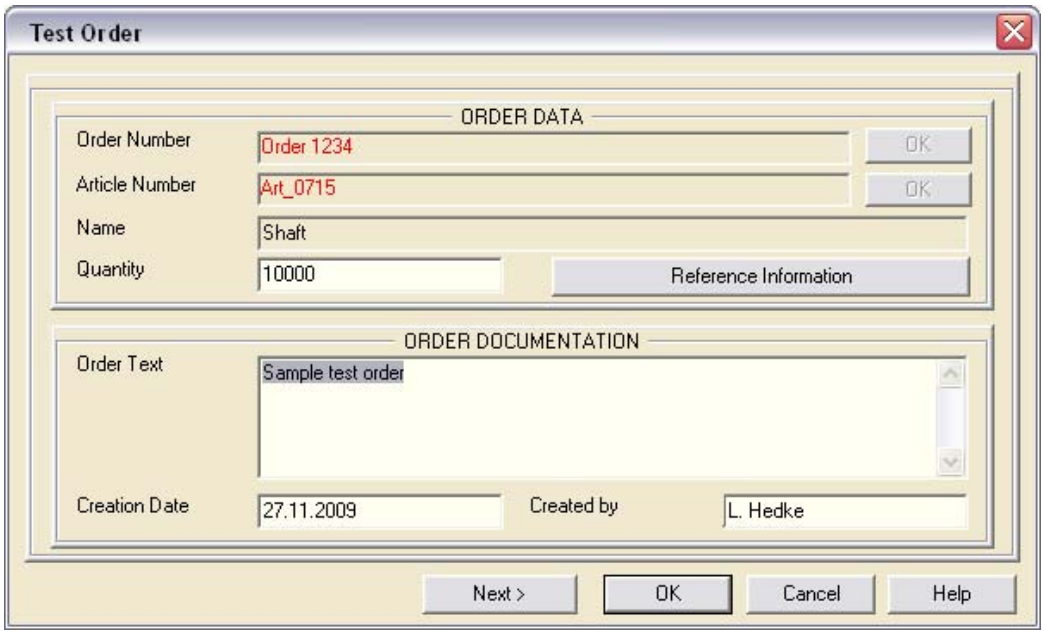
By clicking the **File / Test Scheme / Delete** menu (Button : ) you can delete test schemes.

11. Creating a test order

A test order serves to assign measurement and test data to the corresponding production lots or customer orders.

At first the data of the test order head must be entered and then the test scheme of the component you want to produce and test is selected.

In the **File / Test Order / Create & Change** menu (Button : ) test orders can be programmed. For that, the window shown below is opened.



At first you have to enter the *Order Number*. If you input an existing *Order Number* you can modify the particular test order, otherwise you create a new one.

A data path can be entered preceding the order number. This entered data path is relative to the data directory (see chapter 6.4) and must already exist. ComGage does not create any new subdirectories.
*(Example : **Machine 1\Art-1234** → The test order **Art-1234** is created in the subdirectory **Machine 1**)*

The next step is the selection of the test scheme. (Component you want to produce and measure)

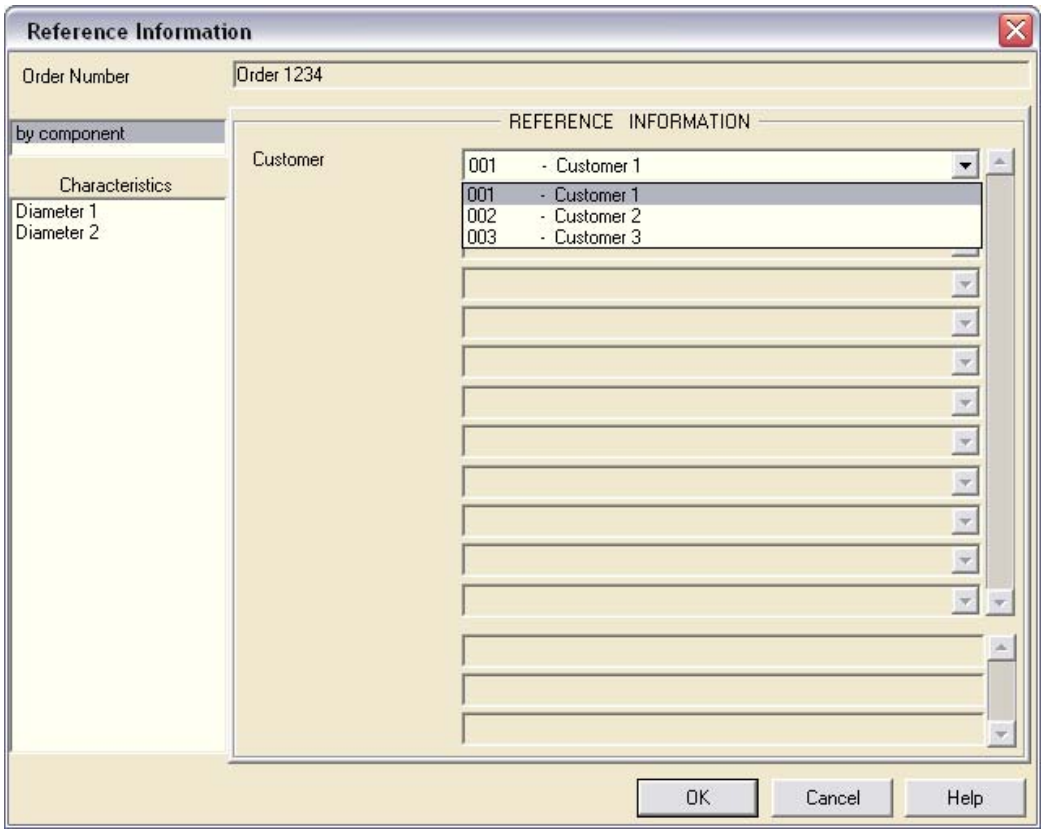
!!! Attention : When you have created a test order, the test scheme assigned to it can only be modified by clicking the **Update** - button. It is not possible to assign an other test scheme to the test order at any later time.
So you should at first test the test scheme, before assigning it to a test order.

On creating a test order, you can make the following entries :

1.) **Name** (Name of the component, e.g. cylinder, bore, …)
2.) **Quantity** (Number of components you have to produce [depends on the customers order])
3.) **Order Text** (Free editable text field for documentation of the test order)
4.) **Creation Date** (Creation date of the test order)
5.) **Created by** (Name of the operator, who created the test order)

By clicking the **NEXT>** - Button the settings of the current test order are saved and you can go on creating the next test order.

By clicking the **Reference Information** - button the window for selecting the reference information assigned to request in the test order is opened :



In this window a data set must be selected or input for all reference information activated for the test order. They are valid for the whole test order.
The entry **by component** in the left column says that this reference information is assigned to all characteristics. After that you can select or input the reference information for each characteristic. In order to do so, please select the particular characteristic in the left column and programme its reference information.
The programming and activating of the reference information for the test order is described in chapter 6.6.

Note : ***Once you have started to collect measurement data with a test order, you cannot change the reference information of this test order any more.***
If reference information is to be requested at every beginning of measurement operation, it must have the mode 'on starting the measurement' assigned to it. (see chapter 6.6)

12. Starting the test order (measuring)

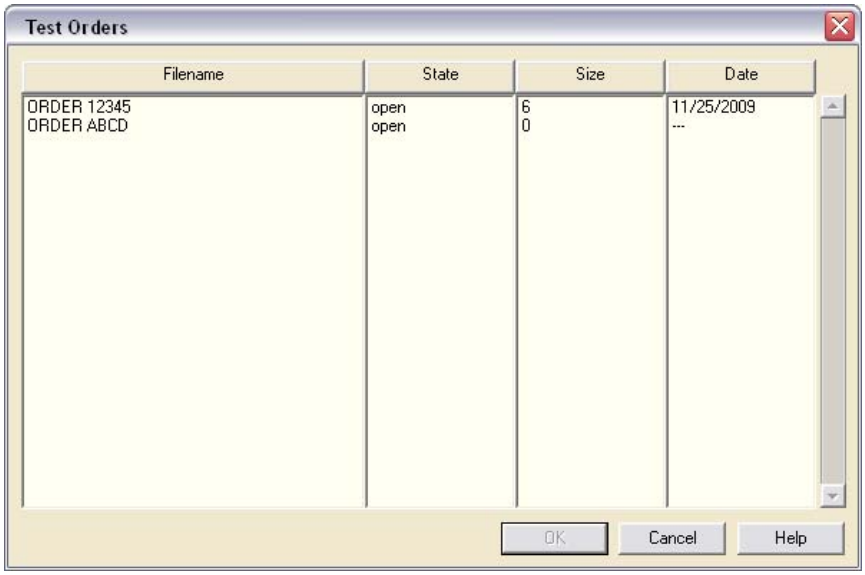
This menu contains the measurement mode of ComGage.

In this menu it is possible to start up to 10 test orders at the same time (for different production lines). After the start of a test order ComGage automatically assigns one of the keys 0 .. 9 to the test order.

If an operator has to measure a component, he can select his test order by one of the keys 0 … 9 and can measure his sample. After this a second operator from a second production line can measure his component after by pressing the key assigned to his test order.

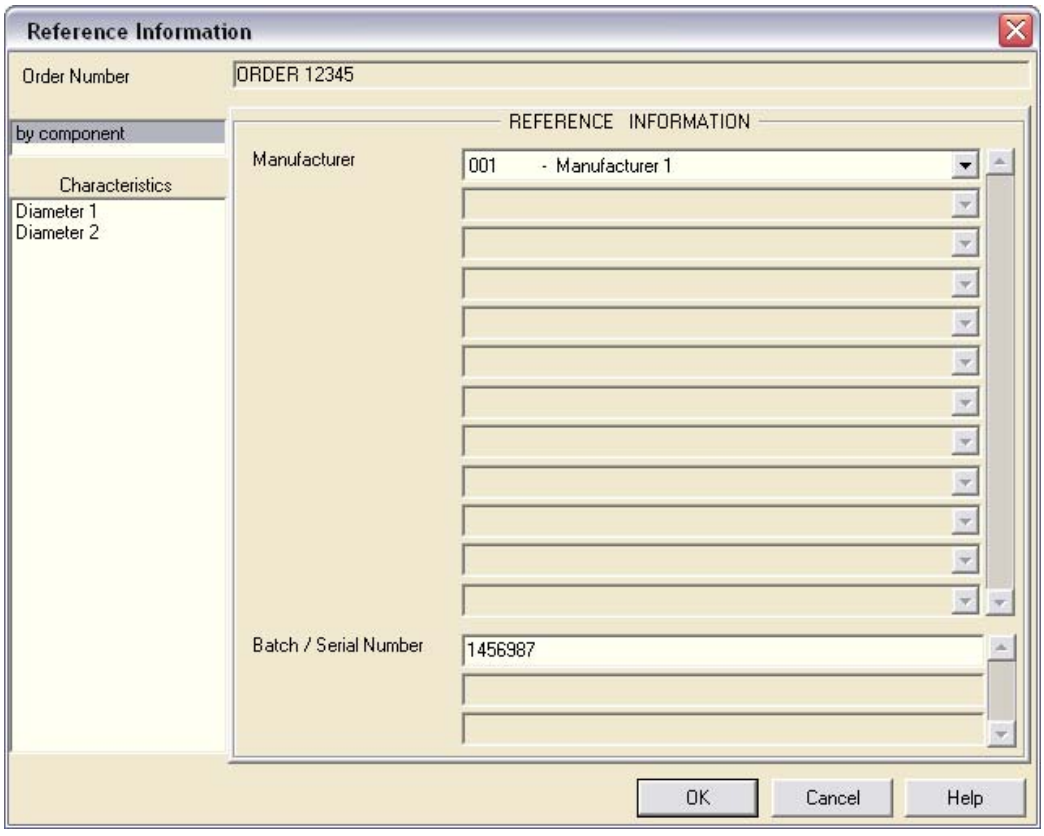
A test order can be started by clicking the **File / Test Order / Start** menu (Button : ).

After you have selected the menu you must select the test order you want to start :



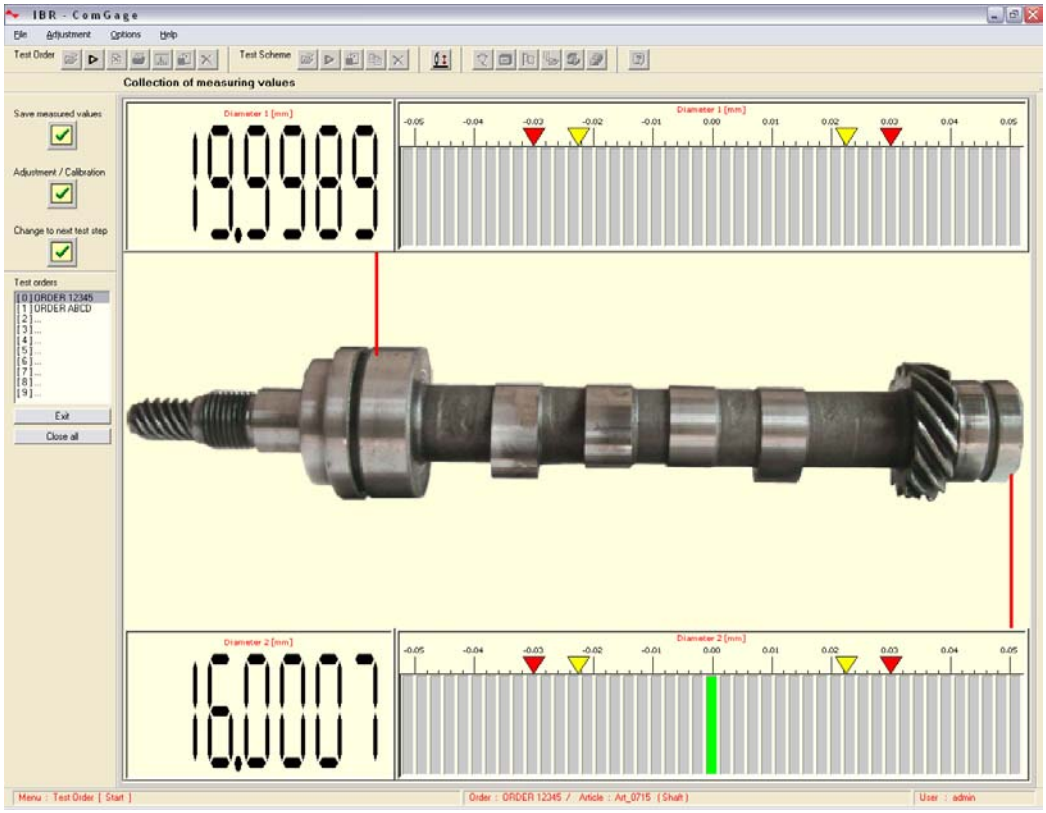
In this menu it is possible to start up to 10 test orders at the same time.
After the start of a test order ComGage automatically assigns one of the keys 0 .. 9 to the test order.

On the start of a test order, the reference information which has the mode *'on starting the measurement'* assigned to it, is requested :



For documentation of the window : See previous page.

After starting a test order, the main window of the measurement mode is opened as shown below.

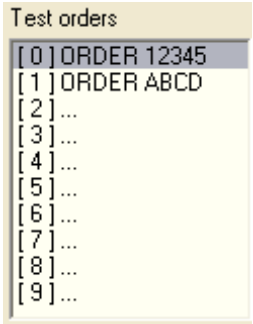


1.) Starting an additional test order

You can start an additional test order by clicking the **File / Test Order / Start** menu (Button: ). One of the keys 0 … 9 is then automatically assigned to the test order.

2.) List of started test orders

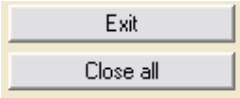
The started test orders and their keys 0..9 are shown in following list :



The Number left of the order numbers (e.g. [0]) informs you which key you must press to start measuring with the particular test order. By clicking on the test order it is automatically started.

3.) Closing of one test order or all test orders

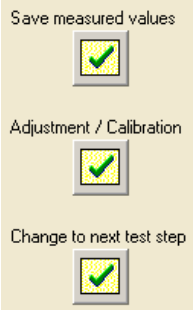
By clicking the **Exit** - Button you can close the currently measuring test order.
By clicking the **Close all** - Button you can close all started test orders.



When all test orders are closed the menu is left automatically.

4.) Buttons

The buttons are assigned to a function in the test scheme for execution of that particular function. (see chapter 7.7).

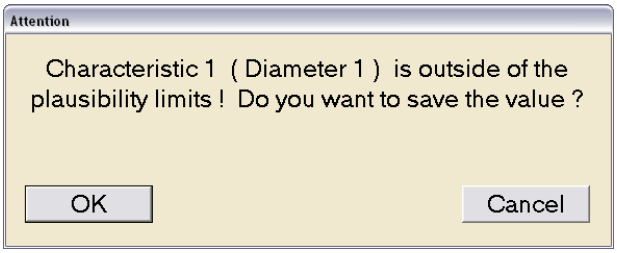


5.) Adjustment Button

By clicking the following button in the menu bar you can open the window *mechanical adjustment of inductive probes*. (See chapter 14 for menu description)

6.) Saving values

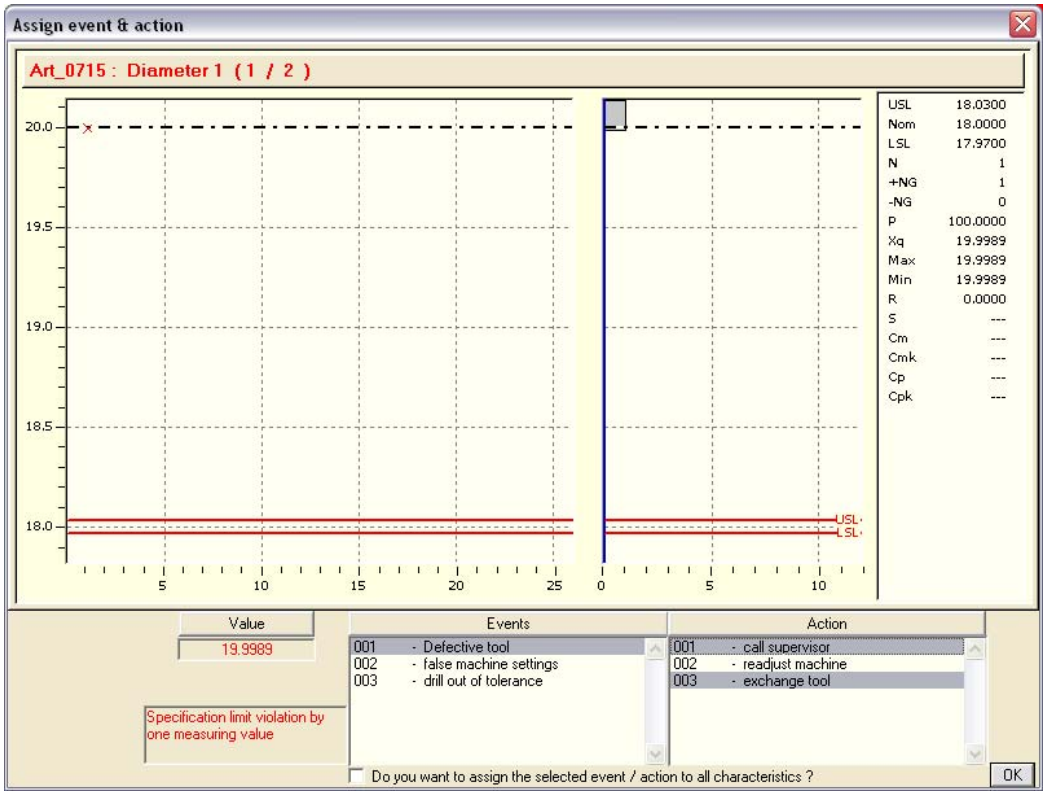
If a measurement value is outside the plausibility limits, then the following window opens.



By clicking the **Cancel** - button the measurement value is rejected, i.e. it is not saved.

!!! When this window is open, ComGage stops further measuring until the window is closed.

If you have activated **Events** and **Actions** (see chapter 6.6) and the measurement value is out of range, then you must select the event causing the measurement to run out of range (e.g. defective tool, …) and the corrective actions that have been taken (e.g. the supervisor was called, …).
A multiple choice is possible.



7.) Deleting values

If the operator has done a faulty measurement, he can delete the wrong measurement values of the last part and can repeat the measurement. But he cannot delete the measurement values of previously measured parts.

8.) Zero adjustment and gauge calibration

If you press the button, function key or foot switch assigned to the function “Adjustment / Calibration”, then a zero adjustment or gauge calibration is executed.

On zero adjustment the programmed master values are adopted as measurement values of the particular characteristics.

On gauge calibration the value is stored as first master value as soon as the button, function key or foot switch assigned to the function “Adjustment / Calibration” is actuated the first time. Afterwards the numeric display alternately indicates “Cal” and the measured value. As soon as the button, function key or foot switch assigned to the function “Adjustment / Calibration” is actuated the second time, the measurement value of the second master is adopted and the corresponding parameters are calculated.
The gauge calibration is completed.
So you must insert the first master into the fixture before the first actuation of the button, function key or foot switch and the second master before the second actuation.

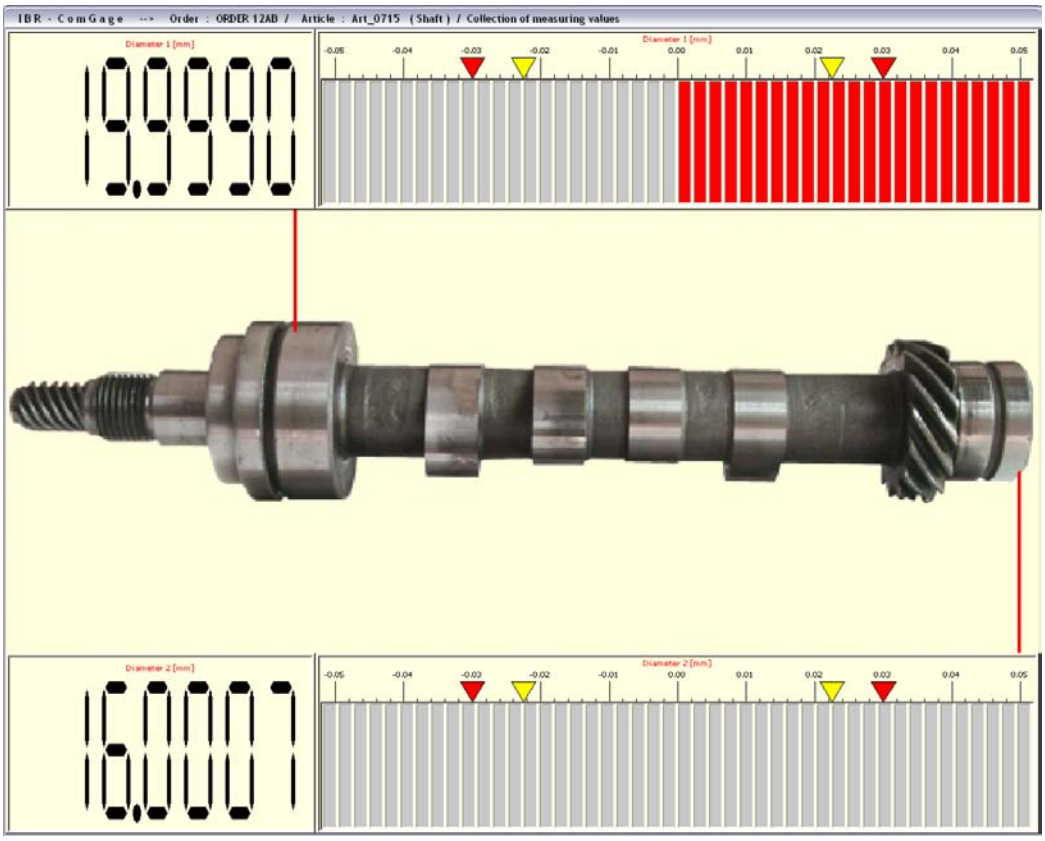
9.) Keys

The following function keys are available for operating the measurement mode :

Key	Function
TAB, +	Moves the cursor from button to button
SPACEBAR, ENTER	Presses the selected button
F1, F2, ...	The functions of the function keys are defined in the test scheme
/	Switches the window to full screen mode and back to normal mode
Cursor	Scrolling within the statistical display elements (with scrollbar)
0 … 9	Selection of a test scheme
*	Look at, change and delete measuring values

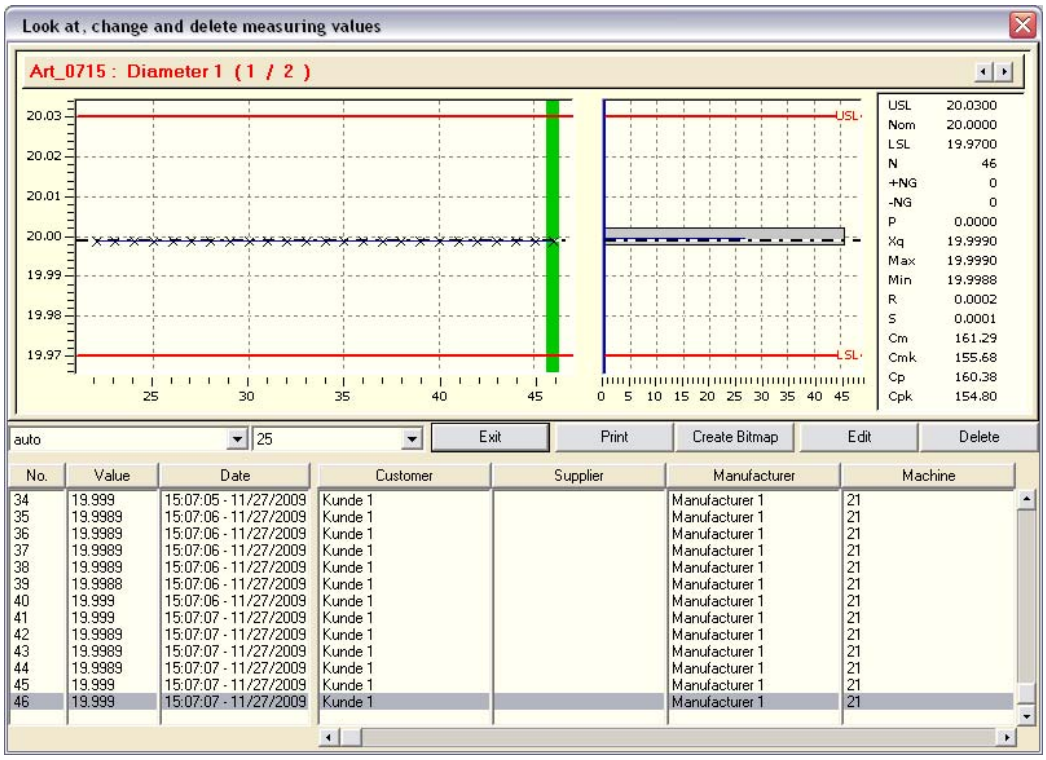
10.) Full Screen Mode

Example of full screen mode :



11.) Look at, change and delete measuring values

By pressing the * - key the **Look at, change and delete measuring values** menu is opened.



You can select the characteristic by clicking the **arrow** - buttons in the upper right window corner.

By pressing the **cursor** keys **left** and **right** you can scroll in the run chart / control chart of the current characteristic and have the reference information of the currently selected measurement value displayed. The **cursor** keys **up** and **down** can be used to scroll in the reference information table.

Additionally the most important statistical data and a histogram of the current characteristic are shown.

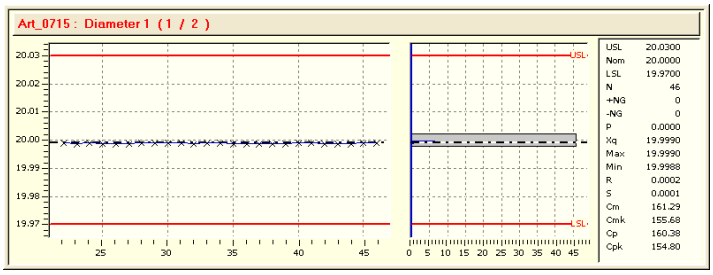
By the **left hand dropdown field** (standard entry : auto) you can select which chart type is to be used for displaying the run chart / control chart.

By the **right hand dropdown field** (standard entry : 25) you can select how many measurement values are to be displayed in the run chart / control chart.

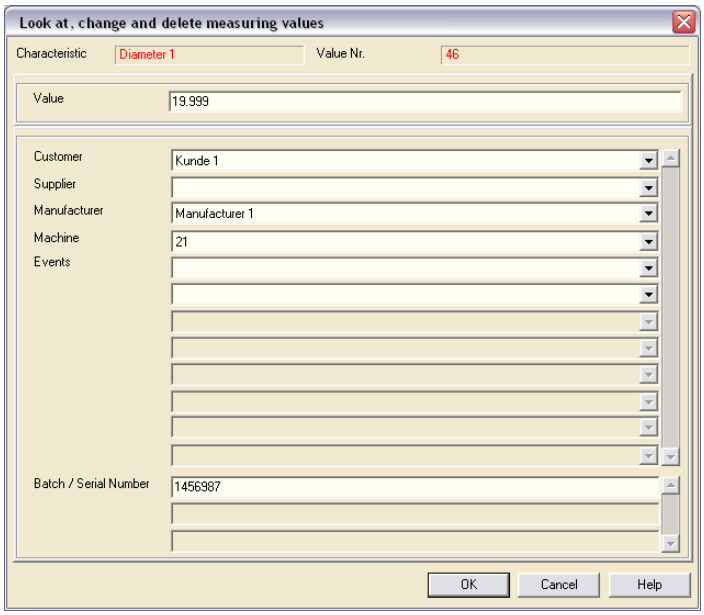
By clicking the **Exit** - button you can exit the **Look at, change and delete measuring values** menu. The window will then be closed automatically.

By clicking the **Print** - button you can generate a print-out of the run chart / control chart and the histogram of the current characteristic.

By clicking the **Create Bitmap** - button you can generate and save a bitmap picture of the run chart / control chart and the histogram of the current characteristic. An example is shown below.



By clicking the **Edit** - button the current measurement value can be modified.
Before, the entry of a password is requested.



Note : The Password for editing and deleting is "sval"

By clicking the **Delete** - button the current measurement value can be deleted.
Before, the entry of a password is requested.

13. Additional test order menus

13.1 Close

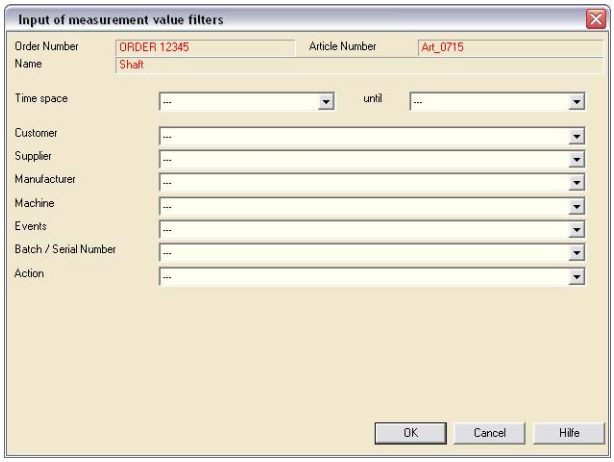
By clicking the **File / Test Order / Close** menu (Button : ) you can close a test order (when all components are produced).
Test orders which you have closed cannot be used for further measurements anymore, but they can be analysed or converted to different formats.

13.2 Print

By clicking the **File / Test Order / Print** menu (Button : ) you can print the collected measurement values of a test order in tabular form.
After selection of the test order, you select which characteristics shall be printed.
At last you have to select the printer.

13.3 Analyse

In the **File / Test Order / Analyse** menu (Button : ) you can analyse the measured values of a test order. First of all you can select filters for the data you want to analyse. See the window below.



After clicking the **OK** - button the analysis window is opened, as shown below.

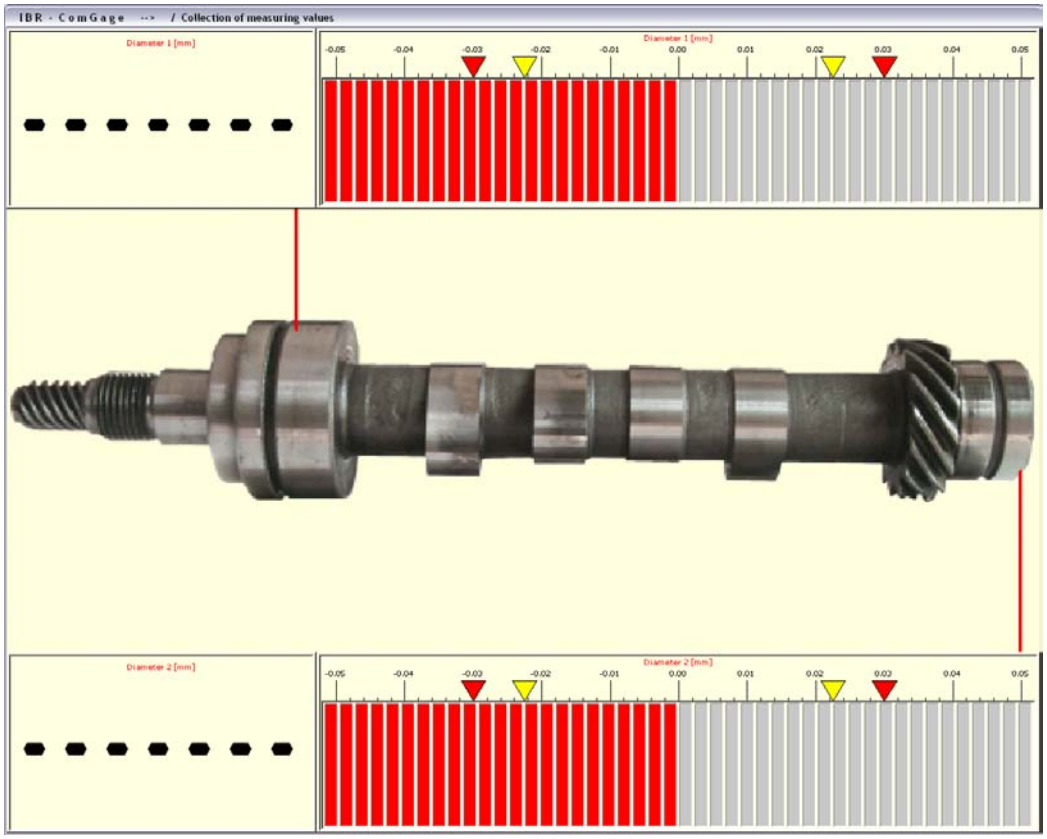
You can scroll through the individual characteristics by using the scrollbar at the right window side.

By the **left hand dropdown field** (standard entry : auto) you can select which chart type is to be used for displaying the run chart / control chart.

By clicking the **Analyse** - button you can open the **Look at, change and delete measuring values** menu (see description in chapter 12.11).

By clicking the **Print** - button you can generate a print-out of the run charts / control charts and the histograms of the current test order.

By clicking the **Display window** - button the measurement windows (without measuring) are opened in full screen mode.
By pressing the **PgUp** and **PgDn** keys you can switch to the SPC windows that have been defined in the test scheme :



By pressing the **P** key you can print the window contents. You can exit the full screen mode and return to the previous window by pressing the **ESC** key.

By clicking the **Exit** - button you can exit the **Analysation of test order** menu.
The window will then be closed automatically.

13.4 Convert

By clicking the **File / Test Order / Convert** menu (Button : ) you can convert the measurement values of a test order into a different format. After selecting the test order you want to convert in the selection window, the window shown below is opened :

Now you can select the desired file format. Then output file is displayed. This automatically suggested path and file name can be edited by the user. By clicking the **OK** - button the conversion is triggered.

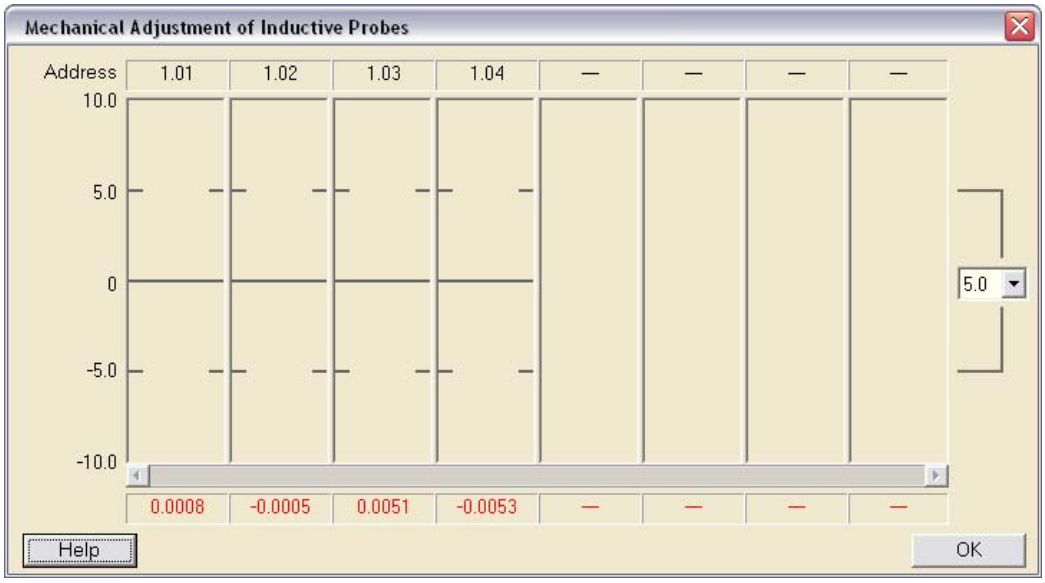
13.5 Delete

By clicking the **File / Test Order / Delete** menu (Button : ) you can delete one or more test orders. After selecting the test orders you want to delete in the selection window, these will be deleted by clicking the **OK** - button. Before, you have to confirm a warning message in order to avoid deleting by mistake.

14. Adjustment window

14.1 Mechanical adjustment of inductive probes

By clicking on the **Adjustment / Mechanical Adjustment** menu (Button : ) the window for the mechanical adjustment of inductive probes in the fixture is opened.
(This is necessary because inductive probes only work optimal near their electrical zero-point.)



Adjustment process :

1. Selection of the probe which shall be adjusted **(Address).** If there are more than eight probes present, then you can scroll through the connected probes by using the scrollbar.
2. Insert the masterpiece or a working piece into the fixture.
3. Mechanical adjustment of the probes until all bars are within the green area. The green area of the bars is selectable (from +/- 0,01 mm to +/- 5 mm, default +/- 0.05 mm) by using the selection field at the right side of the window.
4. By clicking the **OK** - button you can exit the window.

15. Important conditions concerning the use of ComGage

1. IBR Software products are not developed and tested for the high demands in the medical field, in combination with applications in the medical field or in critical components in life-saving systems whose malfunctions or failure can lead to personal injury.

2. On absolutely all applications the stability of the software can be influenced by different factors, i.e. fluctuations in the power supply, computer hardware errors, operating system errors, compiler errors, installation errors, software and hardware compatibility problems, not defined use or misuse or errors by the operator. (All kinds of these errors are called in the following document : SYSTEMERRORS)

3. All applications which contain the risk that SYSTEMERRORS can lead to damages or personal injuries should not only depend on electronic systems. To prevent damages or injuries the operator or system developer should create reasonable precautions against SYSTEMERRORS or their consequents (including backup or shutoff mechanisms).

4. Because all computer systems are adapted for the operator the systems are different in compare to the IBR test systems. Because the IBR products can also be integrated in applications not tested or not intended in this way by IBR the operator or system developer is completely responsible for the test and release of the applications in which IBR products are embedded. This contains the structure, the procedure and the security level of the application.

5. In no event IBR will be liable for any damages including lost profits for any special, indirect, incidental or consequential damages arising out of the use or inability to use the product, whether claimed under the safety instructions or otherwise.

6. Corporate guidelines and safety regulations enforced by the industrial trade associations for the prevention of industrial accidents must be strictly observed. Make sure to consult the safety officer at your company.

7. All rights depend on German law.

8. All rights for the ComGage belong to **IBR Messtechnik GmbH & Co. KG**

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