Melt Index

mi2 Series MI-3 MI-4 MI-ROBO

since 1962

GÖTTFERT

mi2.1

mi2.2

mi2.3

mi2 Series

- Brilliant touch screen display for the operation, program control and display of the test results
- Temperature control by 2 heater elements, resolution 0.01°C
- 5 calibration settings for set temperature with dedicated parameter files
- Storage of up to 500 parameter sets with 3000 measurements for each parameter set in stand alone operation, unlimited number of parameter sets with MFRView
- High-resolution position transducer to measure volume output, resolution: 0.025 mm/impulse
- High-precision timer, resolution better than 0.001 s
- Timer programmable on/off switch for the heaters
- Built-in USB and LAN connection
- Serial connection to communicate with the optional balance for automatic density determination
- Die quick-release and locking mechanism
- Electric weight handling system (except mi2.1)
- Base weight 0.325 kg, test loads from 1.000 to 21.600 kg (option)

The modular design allows to perform manual and automated tests according to the standards ISO 1133 and ASTM D 1238.

MI-3

- The selected test weights are internally installed; manual and therefore dangerous weight handling is eliminated
- Users may simply select test weights using a lever that activates the electrical weight handling system
- A specially designed guidance system for the test weights ensures that measurements are not influenced by weights being slightly slanted, skew, or off center, which would lead to errors
- To ensure convenient access to the test chamber, it can be swiveled by 45°. The use of a special cable system ensures many years of service and is especially designed to with stand repeated cycling, without breaking the connections
- The volume/displacement sensor has a 4 times higher accuracy than the mi2 series
- Optimized displacement sensor technology allows material packing with a reproducibility never achieved before

Semi-automated melt indexer fulfilling the highest expectations. Based on touch screen technology used for the mi2 series, it offers unprecedented handling features by simple architecture.

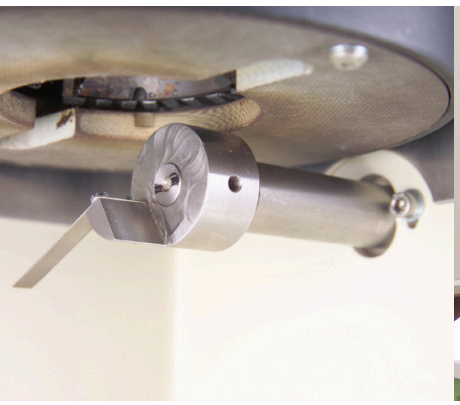
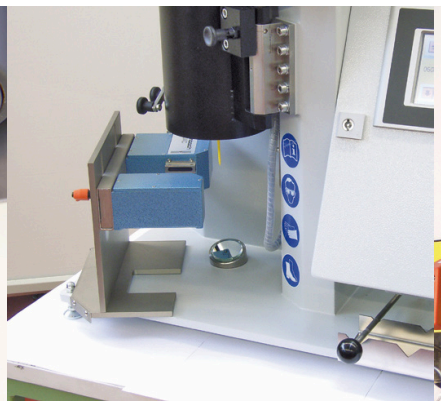
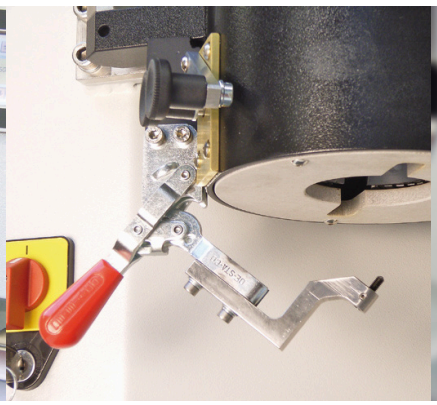
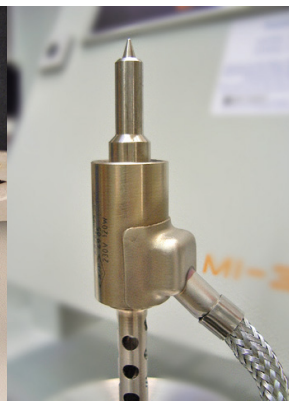
MI-4

- Multi-Load tests with up to 8 different weights
- The selection of the concentric, internally installed weights is available for different automated functions such as charging, packing, pre-loading, measurement and purging
- The Multi-Load functionality of the **MI-4** makes it behave similar to a rheometer, where up to eight different loads can be used to expose the testing material to different stresses within one test run to measure and calculate MVR and MFR
- The configuration of how the Multi-Load test shall be run is freely user definable and not restrictive, as with most other systems that offer a similar option. Many materials can be measured with better repeatability, running either with decreasing, or increasing weights and both methods are available with the MI-4.

As with the MI-3, all test weights are internally installed. However the selection of the test weights are performed fully automatically.
This function enables the MI-4 to perform tests similar to a rheometer with different loads.

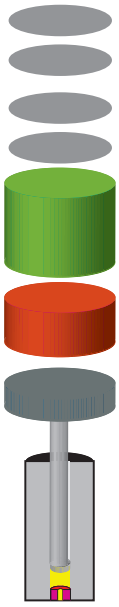
mi2 series, MI-3, MI-4

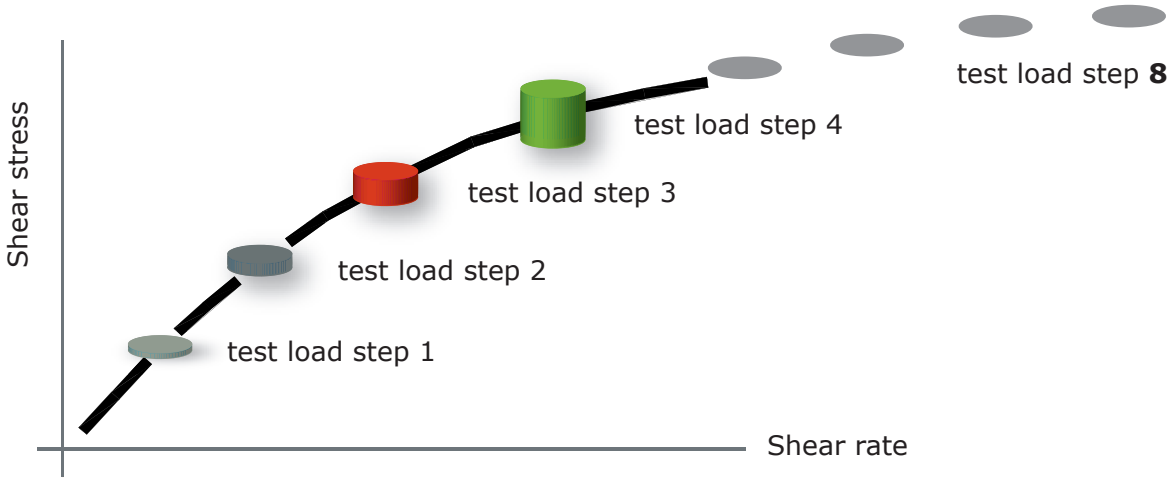
- Die swell unit
- Manual die plug (also heatable for polymers with high temperature)
- Automated die plug
- Manual or automated melt cutting unit (also for sticky polymers)
- Interfaced melt density determination by integrated balance
- Time saving: Pneumatic compress and press through device for high viscous materials (MI-3 and MI-4)
- Nitrogen purging for hygroscopic polymers
- Barrel and piston in corrosion resistant or abrasion resistant design
- Automated backup of all values in the event of power failure via UPS

Multi-Load-Test

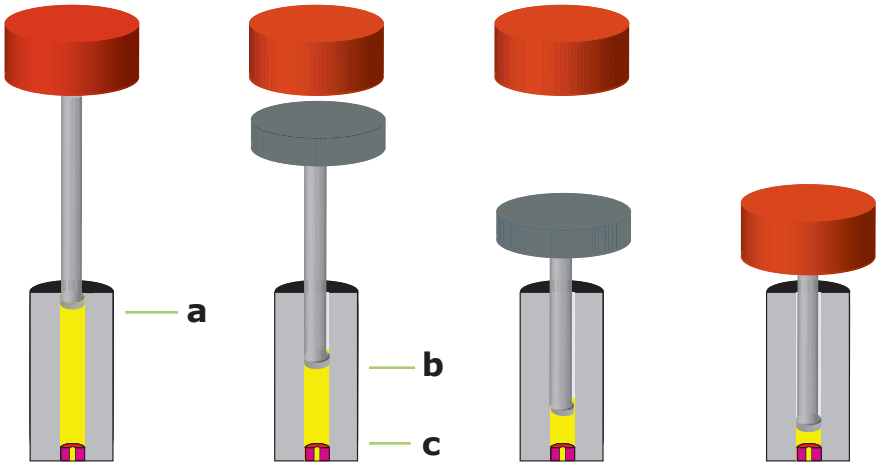
Glancing at the MI-4, one would never notice a difference to the MI-3. However, the big difference is inside, where all the special functionality for its multi-load test mode, often referred to as a "Flow Rate Ratio Test", is hidden.
Like with the MI-3, all test weights are internally installed. With the MI-4, however, the selection of the up to 8 test weights are fully automated based on preprogrammed test procedures selected via the user friendly touch screen.





Compressing

Many polymers are very sensitive when it comes to packing and pre-loading, where handling differences directly impact measurement accuracy and repeatability.
The test devices offer different ways to pack and how to apply a pre-load to the test material.
This control covers the complete pre-heat/melt time.
Either the time spent on each is controlled, or the position of the piston /material at a specific point in the barrel.
The loads used are chosen manually with the mi2.3 and MI-3, automatically with the MI-4.



	Melting time		Measurement	Post measurement
	First compression	**Re-compression**		
 **MI-3**	First compression of the material by a manually chosen weight. Position controlled (see Pos.**a**) or time controlled	Re-compression by a manually chosen weight to a user defined position (see Pos.**b**) or to 55 mm above the die (see Pos.**c**), 5 mm above the ISO 1133 piston travel.	Automated measurement with a single weight and manual selection of such	Purging of material after the measurement with a manually selectable test weight
 **MI-4**	First compression of the material by a automatically chosen weight. Position controlled (see Pos.**a**) or time controlled	Re-compression by a automatically chosen weight to a user defined position (see Pos.**b**) or to 55 mm above the die (see Pos.**c**), 5 mm above the ISO 1133 piston travel.	Automated measurement and test weight election, additional possibility to run Multi-Load measurements with up to **8** weights selectable in any sequence	Automated purging of material with a pre-programmed and freely selectable test weight

MI-ROBO in Standard design,
here with option nitrogen purging

The next generation of the

Fully Automated Melt Indexer

which meets the standards

ISO 1133, **ASTM D 1238**, **BS 2782** and **NF 51-016**

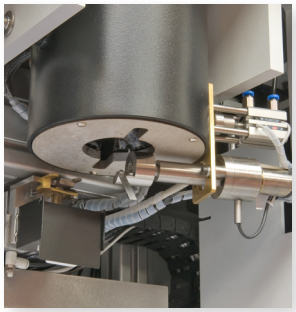
to measure pellets, powders and similar material profiles.

Achievable **Precision** / Reproducibility:

Target value reference material:	**7.63**
Tolerance:	**+/- 0.2**
Tolerance MI-ROBO:	**+/- 0.1**
Standard deviation:	**< 0.04**

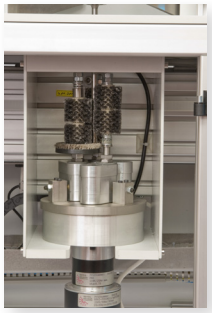
(number of tests: 50)

All standard or individual
weight combinations possible

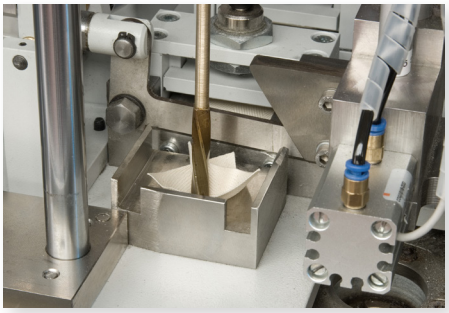


Well proven technology,
less maintenance efforts

Compact design
for a minimum on room space

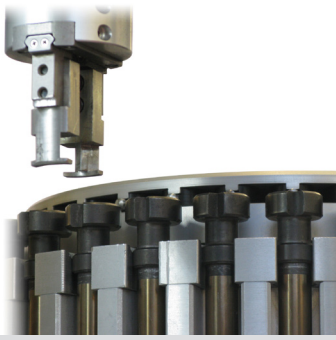


Cleaning unit placed in user
friendly position,
easy to clean and maintain



Optimized cleaning procedure
for test piston and test barrel

Precise manufacturing
for reliable operation



> Automated measuring mode
> Automated material feeding
> Automated cleaning
> Automated die change

The Technical Highlights

- Integrated sample magazine for 30 single tests, to fill with plastic granules, powder and similar material profiles
- Control by Panel-PC with real-time oprating system and 5,7" Touch Screen Display
- MFRHost PC-Software for parameterization, online-monitoring and evaluation of MFR/MVR values
- Temperature control algorithm, resolution 0 up to 320°C: 0.01 °C, 320 up to 500°C: 0.1°C
- Precise digital position sensor to measure volume output
- Precision of time measurement better than 0.001s
- Single load mode for measurements with one load
- Multi load mode with one barrel filling, either for tests with two different loads or with one pre load and one test load

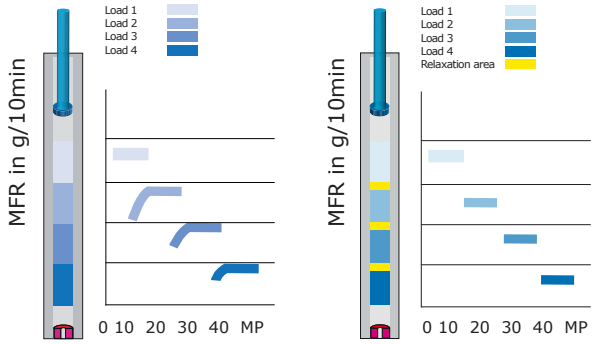
MI-ROBO in Inlet Design

Further...

- Fixed cleaning tools assure optimized cleaning procedures
- Individual filling and cleaning procedures specified for each material
- Automatic melt cutting unit
- Test chamber electrically heated with easy changeable test barrel
- 5 temperature calibration data sets each with separate control parameters for optimal adaptation
- Sample magazine in Standard or Inlet Design for sticky materials (option)
- Additionally fixed loads with automatic load selection, for pre load and test load selection (option)
- Magazine heating (option)
- Nitrogen purge (option)
- Automatic sampler feeding (option for sample magazine in Standard Design)

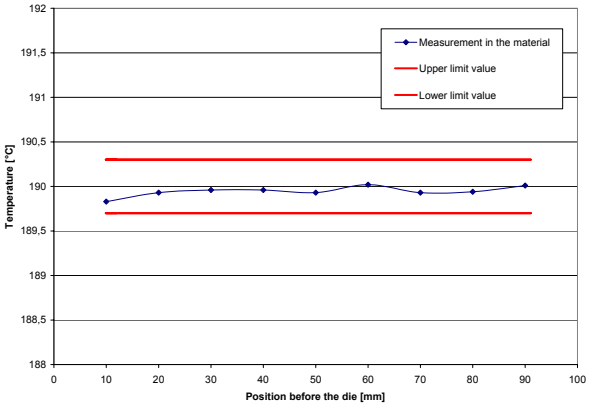
Load-Diagramm

Conventional multiple load tests do not provide any relaxation phase while load changing: this results in higher dispersed test values compared to single test load measurements (figure at left). With our new multiple load function (up to 8 weights), being integrated in the MI-4, the material is given enough relaxation time between load changes to minimize any pre-shearing influences.
The result is that both, single load tests and multiple load tests are now in high conformity (figure at right).



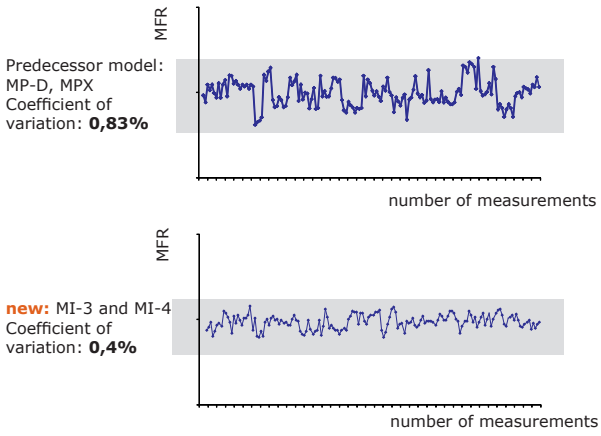
Better than ISO 1133

The temperature process: stability and accuracy much better than the new ISO 1133 requests.
The standard concept of the ISO 1133:2011, part 2 demands for the temperature profile +/- 0.3°C at a distance up to 70 mm above the die.
This high accuracy requirement is exceeded by far with the devices as shown in both diagrams and is given for each device, even if measured according to part 1.



Improved Accuracy

Variance reduced by half – accuracy doubled.
Easier said than done.
The combination of our goal oriented development process, uncompromising engineering and longterm manufacturing experience resulted in our new MI Series having 100 % improved accuracy and machine conformity (see graphics).
The results are based on internal quality tests that each machine has to pass before shipment.
Test records of at least 40 machines are evaluated and standardized.
Tests with a PE material performed having an MFR value of 7.5.
Where as the predecessor models MP and MPX already achieved good minimum dispersion values of 0.83%, the new generation of the mi2 series, MI-3 and MI-4 now reduces the difference to only **0.4 %**.
Variance reduced by half – accuracy doubled :
that is a great advantage.



Additional Highlight from the MI-3 and MI-4

Automatic determination of the resolution!
The distance transducer in the device has a resolution of 0.006 mm per impulse. For optimal test results (grabbing single test points) it can be selected in 3 levels (high, regular, low), depending of the MVR value. For the ideal determination of the resolution of the test piston displacement (mm/ measuring point) this value can also to be detected automatically. This is a big advantage in case of unknown materials.





Model characteristics	mi2.1	mi2.2	mi2.3	MI-3	MI-4
Test procedure	**Automated** measurement with single load		**Automated** measurement with single load and manual weight selection		• **Automated** measurement and software controlled weight selection • Multi load measurement
Test chamber	• Two heater circuits, electrically heated, temperature sensor PT100 1/3 DIN • Temperature difference over time: < ± 0.1 °C • Temperature difference over distance (0-70 mm before the die) < ± 0.2 °C of set temperature (temperature range 60 °C to 400 °C) < ± 0.3 °C of set temperature (option: temperature range 400 °C to 500 °C)				
Load steps in kg	0.325 - 21.6				
Weight guidance	Piston guidance according to ISO/ASTM			Piston guidance according to ISO/ASTM and internally installed test weights	
Weight handling system	--	Yes	Yes	Yes	Yes
Material purge function	--	--	Manually, with weights		Automatically, with weights
Multi-Load function	--				**8** weight steps, selectable in any sequence
Actual temperature display	0.0 - 500.00 °C on touch screen monitor				
Temperature acquisition	via 16-bit converter, resolution 0 - 320 °C: 0.01 °C, 320 - 500 °C: 0.1 °C				
Test barrel	9.555 (- 0.01) mm diameter				
Touchscreen Display	14.48 cm (5.7") Color VGA touch screen				
Die	2.095 (± 0.003) mm diameter, 8 (± 0.025) mm length 1.048 (± 0.005) mm diameter, 4 (± 0.025) mm length (Option)				
Test value acquisition	Electronically Resolution: 0.025 mm / impulse			Electronically Resolution: 0.006 mm / impulse	
Advanced evaluation 1	IV calculation to characterize on polyester and polyamid based plastics				
Advanced evaluation 2	--				FRR- Flow rate ratio calculation for multi load tests
Melt cutting unit	Option				
Die locking mechanism	Option				
Die swell measurement	Option				
Nitrogen purge	Option				
Corrosion resistant version	Option				
Abrasion resistant version	Option				
Pre-load function	--	Manual pre loading (option)		Semi-automatic	Fully automatic
Test data display	Numerical				
Data input	At touch screen monitor				
Interfaces	Ethernet, serial, 1 or 2 x USB (printer, memory)				
Power supply	115 V or 230 V				
Ambient temperature	+10 to +40 °C				
Ambient humidity	max. 90% not condensing				
Dimensions	Width: 510 mm Depth: 380 mm Height: 625 mm	Width: 510 mm Depth: 430 mm Height: 1025 mm	Width: 510 mm Depth: 430 mm Height: 1120 mm	Width: 700 mm Depth: 450 mm Height: 1220 mm	Width: 700 mm Depth: 450 mm Height: 1220 mm
Weight	Approx. 45 kg	Approx. 75 kg	Approx. 105 kg	Approx. 170 kg	Approx. 170 kg

MFRView – Measure- and Visualization Program with Management-System

The successor program package of MFRHost is used to configure and control the whole measurement process, the graphical presentation, the evaluation and of course the report generation.

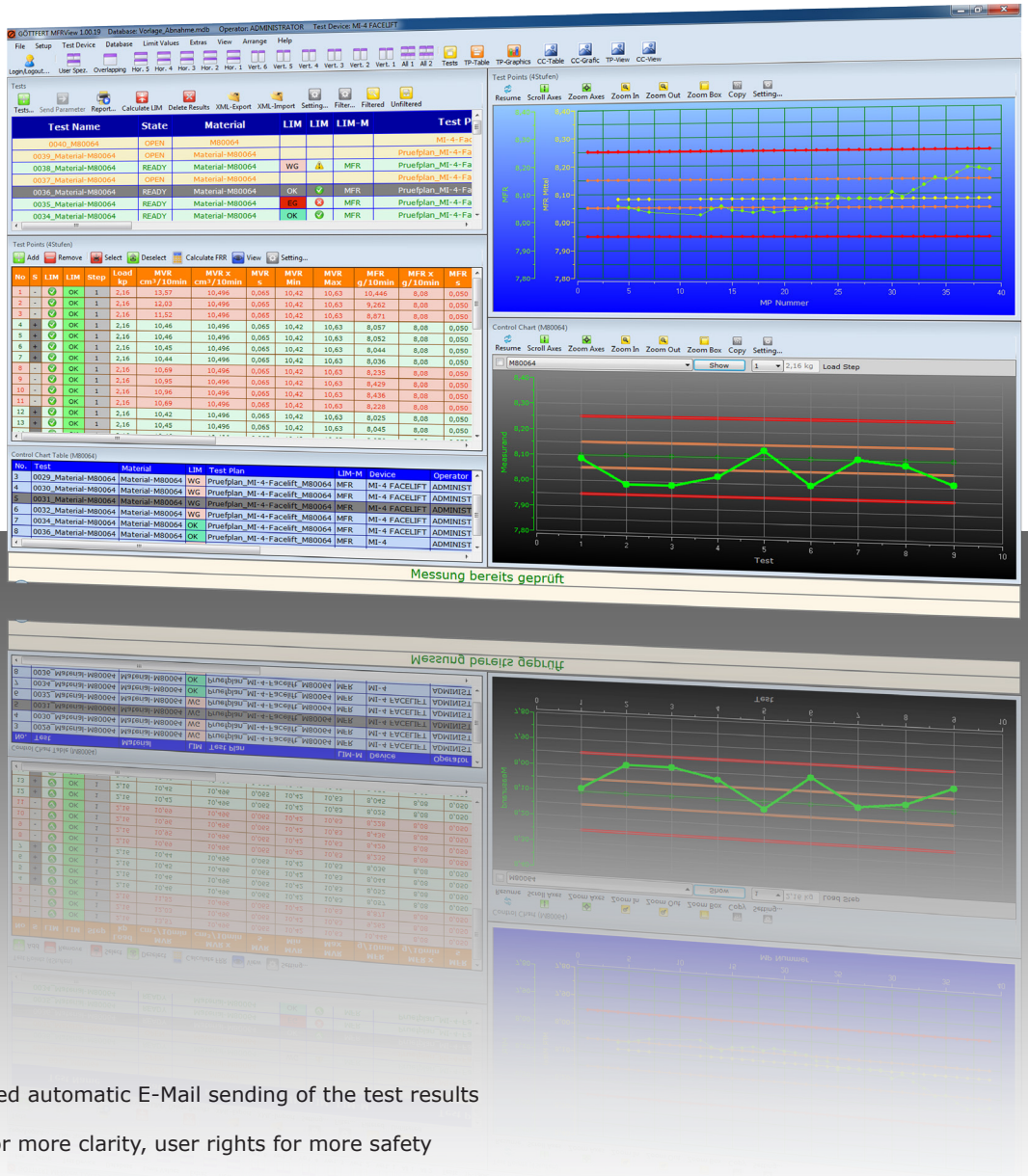
Many useful methods were integrated to fulfill the user demands.

Comfortable functions, like for example only-mous-click paramterization as well as self definable menues make the preparation and measuring work easier and faster.

The new Software, which is also available for previous melt index test device models, works with ACCESS® databases and can also handle several devices by only one program module.

Options and indiviual customer applications can be integrated.

The XML-connection for higher level systems is already embedded.



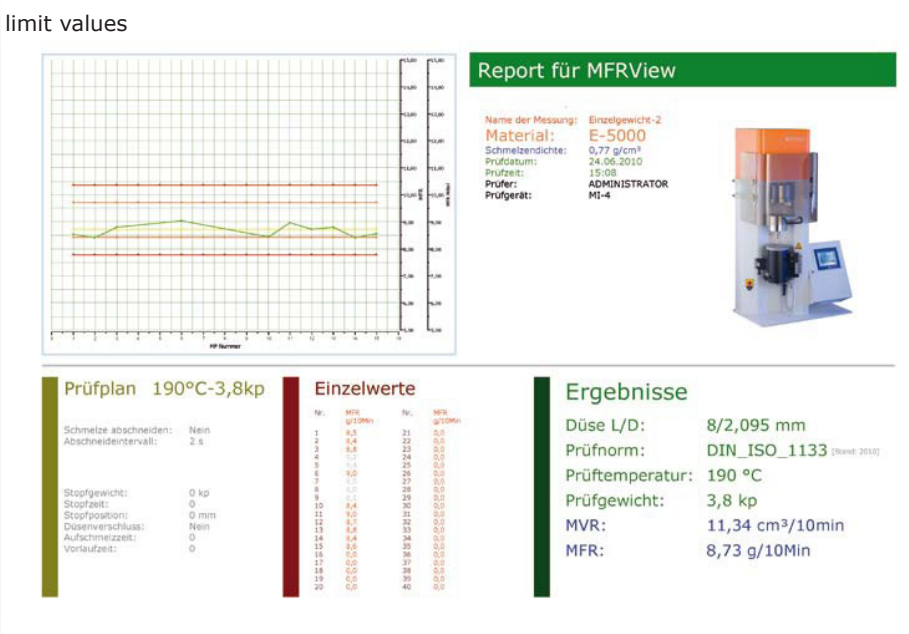
Pleasant:

- Integrated automatic E-Mail sending of the test results
- Filters for more clarity, user rights for more safety
- Own Toolbar definition

MFRView

The top highlights in overview:

- Easy to use desktop with big, clear and well-arranged symbols
- Only one program module for several testing devices
- Basic- or Expert mode (editable)
- Self explaining menues and dialogue windows
- Pre-definable menues for faster parameterization, like automatic data set names, user or often used textes
- Continuous display of all test device information
- MS Access® data base for all materials (incl. test plans, test results, ...)
- Numerical and graphical display of all data during the measurement (free selectable)
- Creating of own colour reports
- Comfortable possibilities for editing limit values
- Typical evaluation functions



... and much more:

- 30 day trial version for getting to know
- Standard- or Free-Run-Mode (measurements are be created manually or automatically)
- Creation of simple control cards (replacement for long term graphic)
- Dialogue with integrated help textes as well as PDF documentation with hyperlinks
- Standard dialogue (also own standards definable)
- Simple creation of templates for tables, graphics and measuring process
- Free arrangement and creation of the report
- Network capable
- Conversion of older MFRHost measurements into the MFRView format

We take care of our instruments; you take care of its measurements.
Our reputation in each other's hands.

THIS IS RHEOLOGY

since 1962

02. June 2014

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