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GÖTTFERT



THIS IS RHEOLOGY

MELT FLOW INDEXER

ISO 1133 | ASTM D1238 | D3364



MELT FLOW INDEXER

Highlights mi2 serie



mi2.1



mi2.2



mi2.3

- Temperature resolution 0,01°C
- High-precision timer with a resolution better than 0.001 s
- 5 calibration settings temperature
- Storage of up to 500 parameter sets - 3000 measurements each as Stand alone
- Unlimited storage with Software MFR Host
- High-resolution position transducer resolution 0,025 mm/Impulse
- Timer setup
- USB and Ethernet (LAN) connection
- Modular extendable
- Intelligent service monitoring
- Wide range of options

MELT FLOW INDEXER

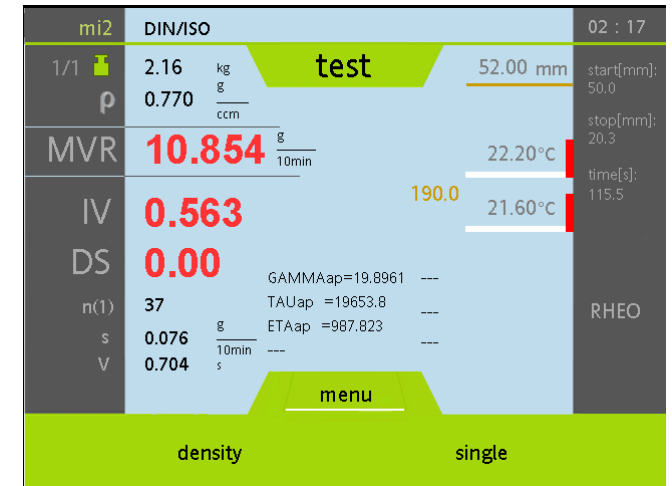
Comparison mi2 series

	mi2.1	mi2.2	mi2.3
Stand alone instrument	X	X	X
Color-VGA Touch screen	X	X	X
No air pressure required	X	X	X
Automatic measurement start after melting time	X	X	X
MFR Host – Software (optional)	X	X	X
ISO 1133 & ASTM D1238, procedure A-B-C	X	X	X
ASTM D1238, procedure A-B-C-D		X	X
Swiveled out test depot for easy cleaning		X	X
Preloading unit			X
Position setting for the drive		X	X
Test load magazine (up to 8 test-weights)			X
Resolution Displacement transducer	0,025 mm	0,025 mm	0,025 mm

MELT FLOW INDEXER

Comparison mi2 series

- Test Methods according ISO 133 / ASTM D 1238
- The touchscreen shows:
 - number of measurement points
 - Melt Density
 - MFR or MVR
 - Intrinsic Viscosity (IV)
 - Die Swell
 - Rheological Data



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Position setting drive



- Position setting / pre compression for mi2.2 and mi2.3 (optional)
- Position selectable between 100 -45 mm before capillary
- Advantages:
 - Always same test conditions in each test
 - Increased repeatability
 - Operator influence reduced



MELT FLOW INDEXER

Highlights mi2 series

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- Wide range of options



MELT FLOW INDEXER

Mi-3 single weight test according ISO 1133, ASTM D1238, procedure A-B-C-D



- Electric weight handling system - no pressure air required
- Test Load magazine – with manual weight selection
- Single weight measurement - guided test piston
- High-precision timer with a resolution better than 0.001 s
- High-resolution displacement transducer (res. 0,006mm/Imp.)
- Loading functionality
- Test chamber can be swiveled out for easy filling and cleaning
- Automatic characteristic point detection as a function of MFR/MVR optimizes the test run
- Base test load 1.200 kg, optional 0.325, 0.5, 1.0, 1.050 kg
- Test weights from 2.16 to 21.6 kg - optional 12.50 kg or 15.00 kg (max. 8 test loads in the magazine)

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mi40 *single and multi load tests according to ISO 1133 and ASTM D1238, procedure A-B-C-D*



- Force controlled pre-loading / ejection via drive and test weights
- Multi-Load tests with up to 8 different weights, ascending, descending or freely selectable
- High-precision timer with a resolution better than 0.001 s
- Temperature detection with 0.01 resolution
- High-resolution position transducer to measure volume output
- Automatic computation of resolution

MELT FLOW INDEXER

mi40 *single and multi load tests according to ISO 1133 and ASTM D1238, procedure A-B-C-D*



- Electric weight handling system - no pressure air required
- Measuring section is additional free selectable
- Digital encoder, resolution 0.006 mm / impulse
- Automatic characteristic point detection as a function of MFR/MVR optimizes the test run
- High precision timer, resolution < 0.001s
- Force controlled loading functionality
- Best possible reproducibility of measurements
- Multi load measurements **up to 8 test loads** in increasing, decreasing and random sequence
- Automatic Flow Rate Ratio (**FRR**) evaluation (procedure D)

MELT FLOW INDEXER

MI-Robo 89.16



- Fully automated Melt Indexer built to meet ISO1133 and ASTM D1238 specification
- Integrated magazine for 30 single tests
- Internal Controller with 5,7" color-QVGA-touchscreen:
- 5 calibration settings for the set temperature
- Filling procedure and cleaning cycles can be specified for each test material
- Cleaning of the test piston and the ejection piston
- Precise digital position sensor to measure volume output
- Precision of time measurement better than 0.001 s

MELT FLOW INDEXER

MI-Robo 89.16



Fully automated MFI/MVR measurements with:

- barrel cleaning
- piston cleaning
- die cleaning



MELT FLOW INDEXER

Displacement measurement

Automatic characteristic point detection as a function of MFR/MVR optimizes the test run



MVR ccm/10 min	Mode	Position Measuring mm / measuring point	Process windows
< 1	HIGH resolution	0,1	Optimal time slot (window)
1 > < 100	NORMAL resolution	0,7	Optimal Combination of Displacement + time slot (window)
> 100	Low resolution	2	Optimal displacement window

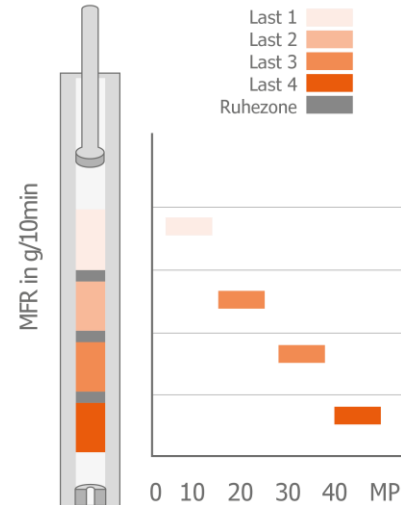
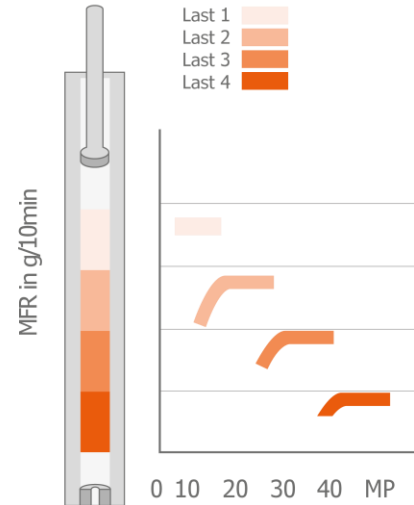
Resolution of the displacement transducer:

Mi2 series = 0,025mm

Mi-3, mi40 = 0,006mm

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Improved multi-load accuracy

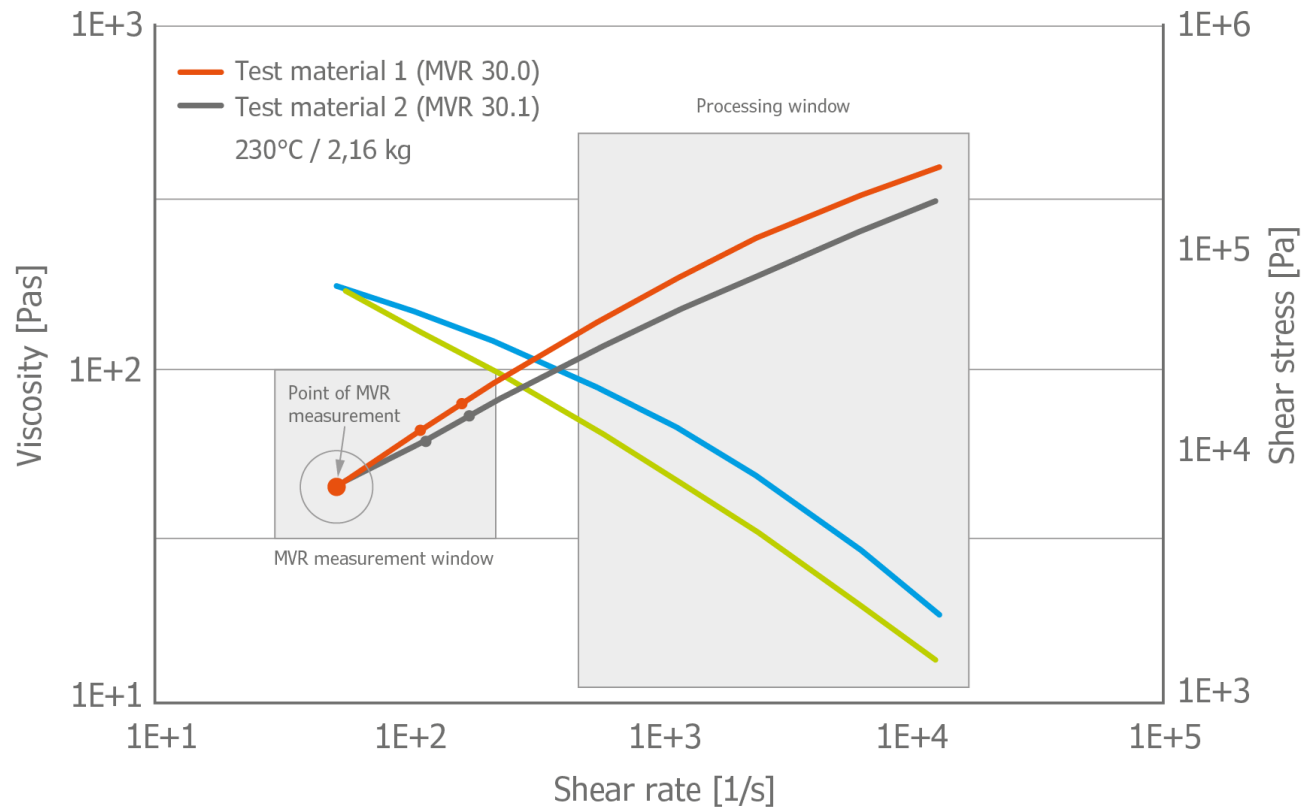


ASTM D1238, procedure D

- Offering an area of relaxation
- Minimizes the effects based on shear history
- Multi load measurements up to 8 test loads in increasing, decreasing and random sequence
- Better comparison to single-load tests
- Automatic FRR – Evaluation

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Multi-load MFR vs. Viscosity Measurements



Measurement Data:

- 230 °C test temperature
- Test Loads 2,16 kg-5,00 kg (10,0 kg 21,6 kg)
- Automatic FRR - Evaluation

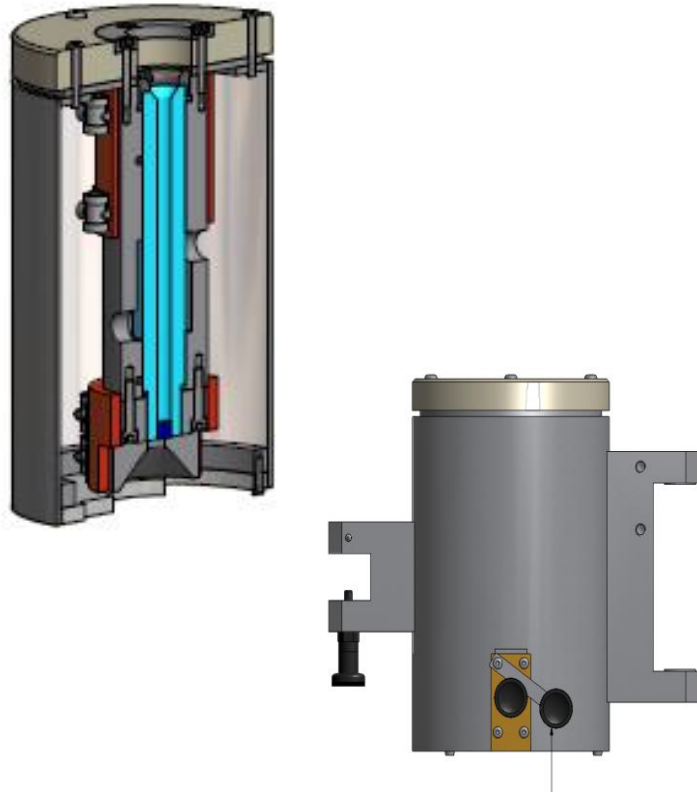
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Optional Add-Ons

- Melt Cutting Unit
- Die Swell Measuring Unit
- Die Plug Unit
- Nitrogen Purge
- Exhaust Connection

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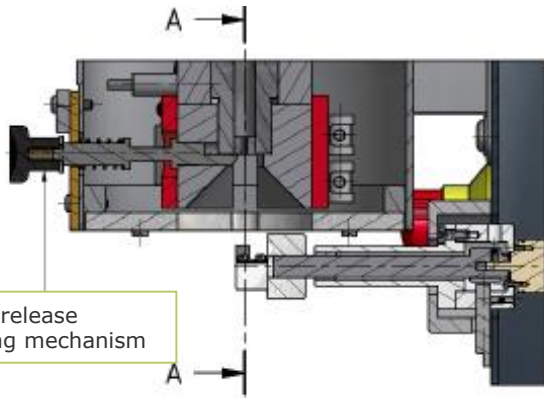
Multi-load MFR vs. Viscosity Measurements



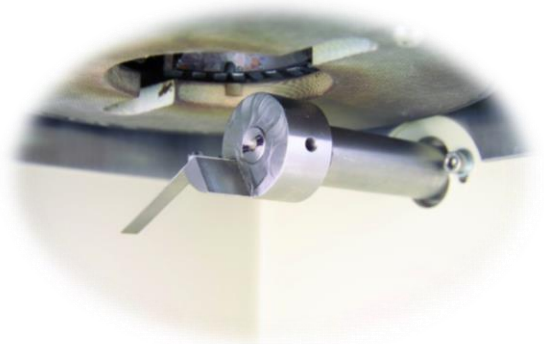
- Test temperature profile, controlled by two heater elements/zones
- Temperature profile according ISO 1133 Part 2
- Precise temperature display
- Resolution via 16 bit A/D converter range
 - 0 to 320°C: 0.01°C
 - 320 to 500°C: 0.1°C (option)
- Spatial temperature distribution over the used barrel range; 0-70mm before the die)
 - 0.2°C (60 ... 400 °C)
 - 0.3°C (400 ... 500 °C) (option)
- 5 calibration settings for set temperatures
- High safety standard - Both heaters controlled by a watchdog circuit

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Melt Cutting Unit (*optional*)



- manual melt cutting unit
- automated melt cutting unit
- Special design - modified for sticky polymers
- Position or time controlled
- controlled by the mi system
- Knives in special design (e.g. coated)



Automated –motor powered



Manual handling

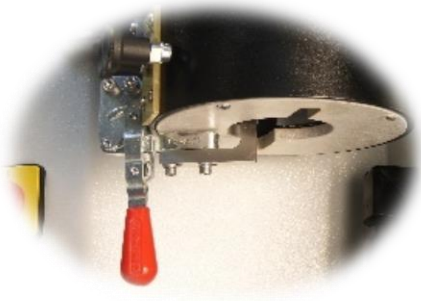
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Die Plug (*optional*)



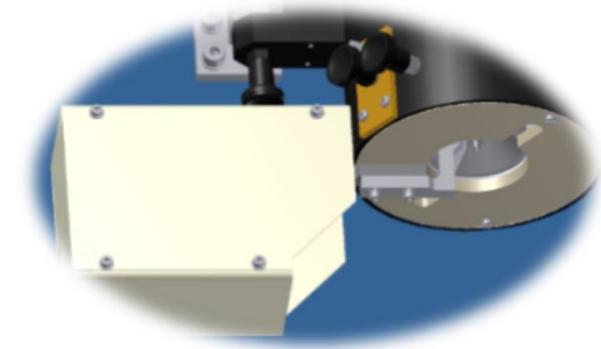
Manual die plug

- Manual handling



Manual and heated Die plug for MI-3 and mi40

- Manual handling and heated
- The actual temperature (die plug) is displayed in the main menu between test chamber temperatures.

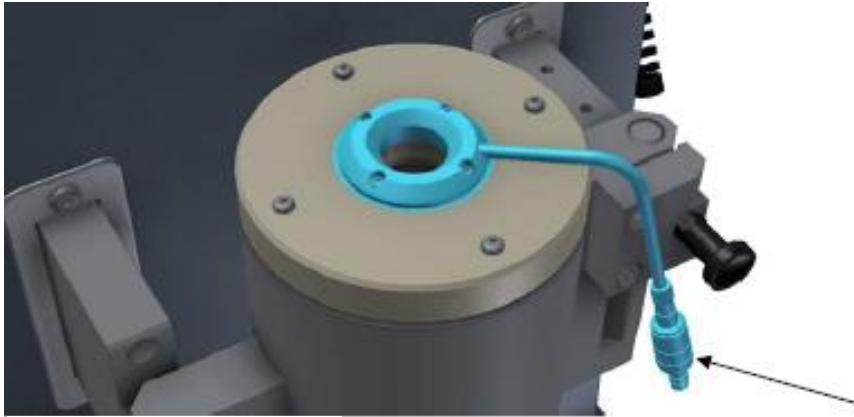


Automatic die plug controlled for MI-3 and mi40

- activated by the Software in the test plan menu
- At the right time the die closing unit opens automatically and the test material can flow out of the test barrel

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Nitrogen Purge (*optional*)



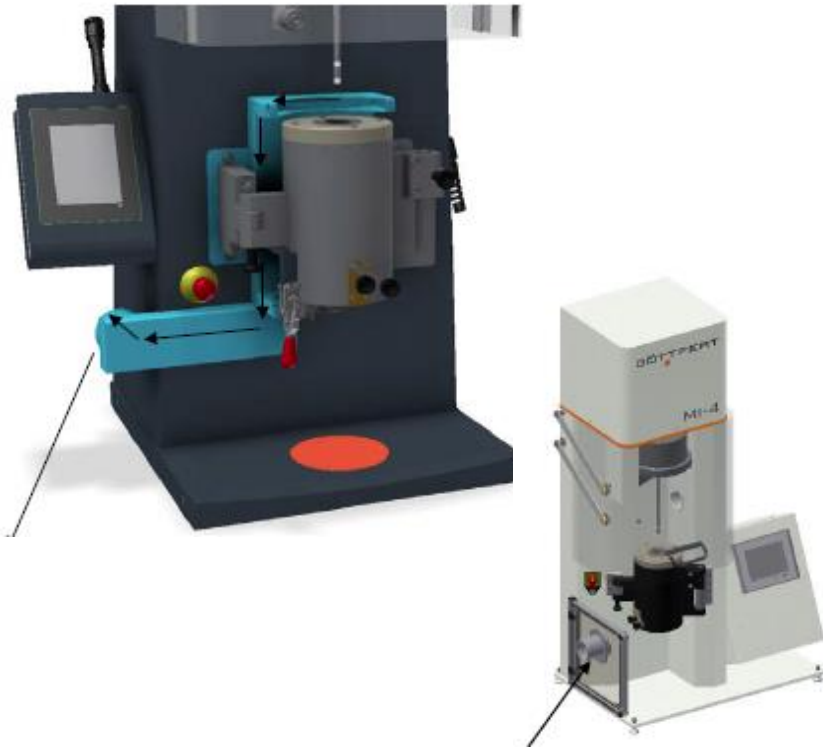
- During rheological testing of polymers the correct preparation is absolutely essential. Especially materials which are moisture-sensitive the residual humidity has influence to the test result.
- This has a great influence on the measuring result, which is why we recommend the use of a drying oven.
- Even by dried samples , the filling the test barrel is a challenge. Moisture will be formed again on the surface of the test material.
- The "nitrogen purging" option is designed to reduce moisture absorption.

On request

- Water Content Analyzer for Solids
- Drying oven

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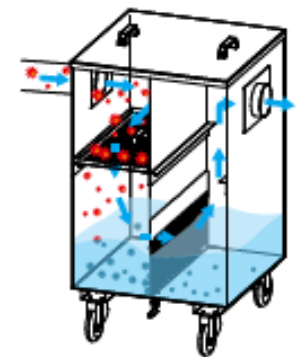
Exhaust connectivity (*optional*)



Exhaust connection above and below the test chamber for MI-3 and mi40

- for external aspiration of gases, smokes etc. in the test chamber area
- The connecting tube is right above and left below the test chamber
- Connection diameter 70 mm, length 95 mm.

..... mobile exhaust systems on request



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Die Swell Tester(*optional*)



Measuring head,
low resolution




Die Swell Measuring Head:

- to measure the diameter of the extruded strand
- determination of static and dynamic die swell (fixed measuring position)
- Power supply and data acquisition are controlled by the instrument and Software
- Laser measuring head with Standard or high resolution is selectable
- Measuring range depending on the model / resolution 0,014 – 32,0 mm

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Die Swell Tester(*optional*)



	MVR ccm/10 min	Mode	Position Measuring mm / measuring point	Process windows
	< 1	HIGH resolution	0,1	Optimal time slot (window)
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	> 100	Low resolution	2	Optimal displacement window

Automatic characteristic point detection as a function of MFR/MVR optimizes the test run.

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Intrinsic Viscosity (*optional*)

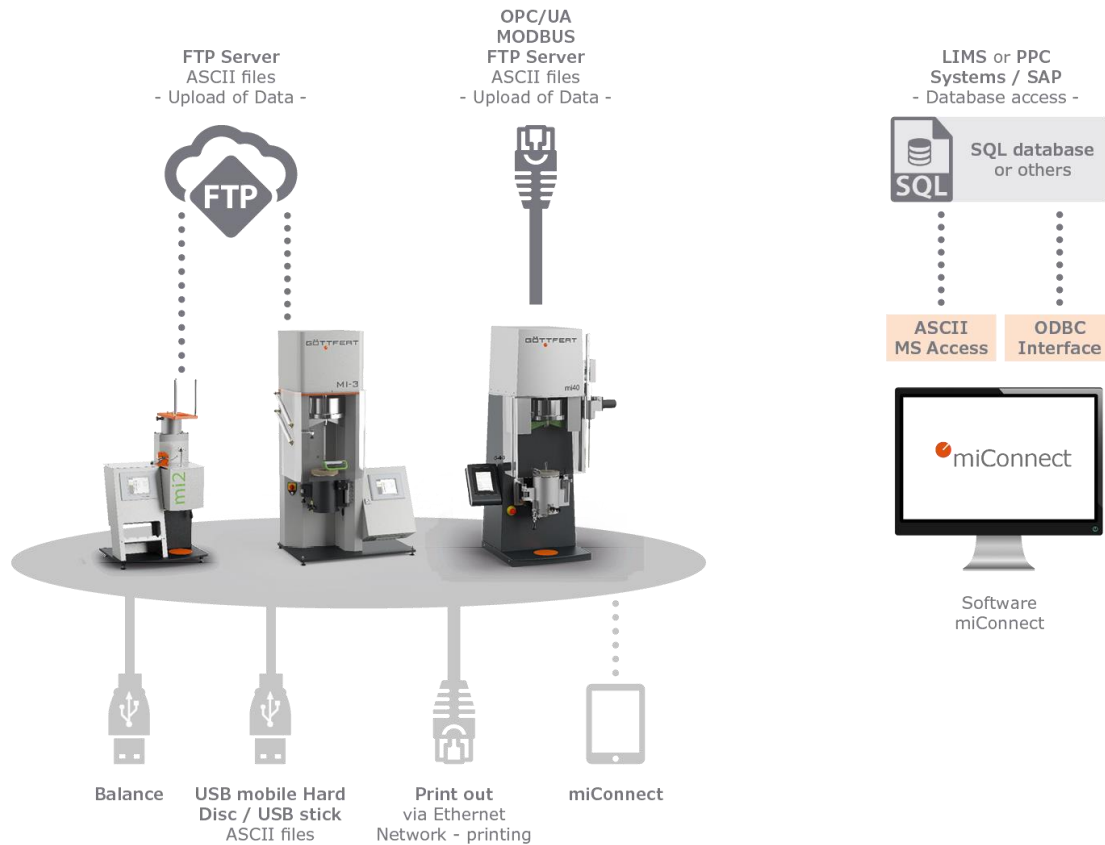


Die Swell Measuring Head:

- to measure the diameter of the extruded strand
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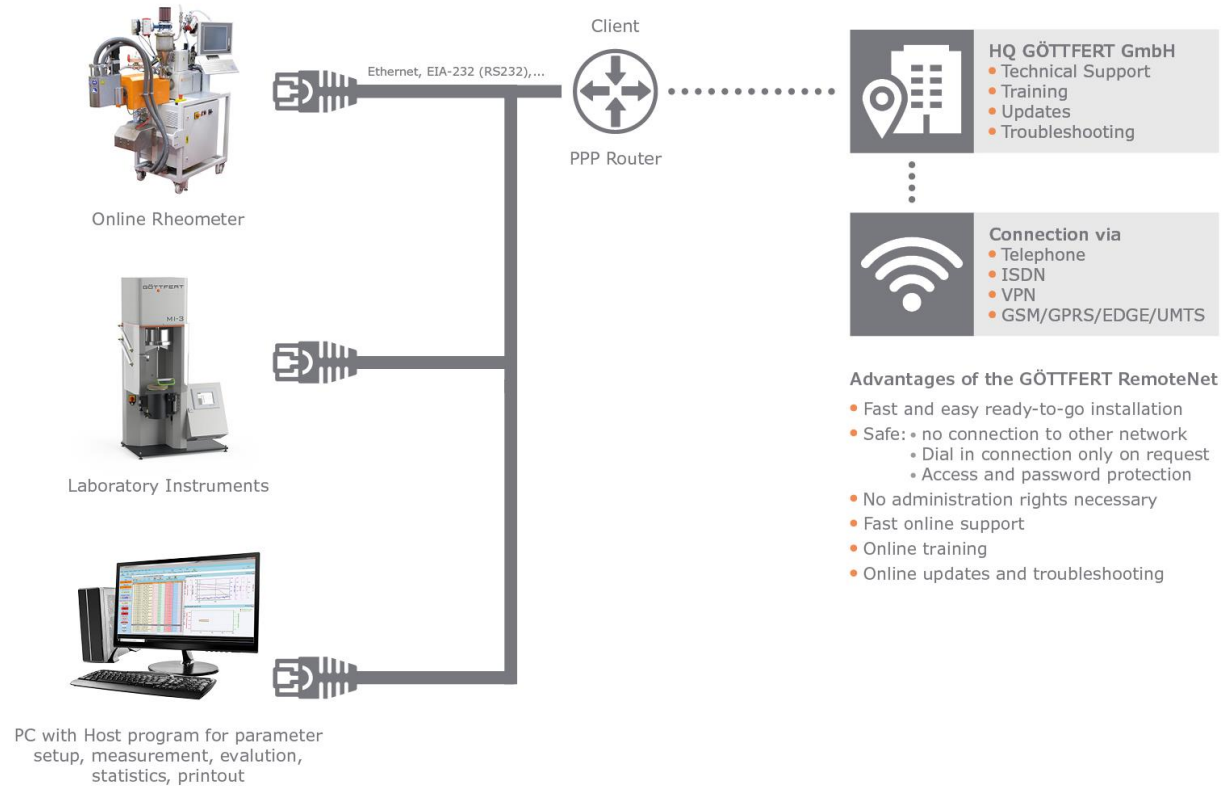
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Different Interfaces



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MI-ROBO



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Different steel grades

Steel grade	Hardness	Abrasion resistance	Acid resistance	Temperature range / Test material
Steel grade 1S	★	★	★★★★★★	Up to 500°C, e.g. ETFE or PVDF (up to 250°C)
Steel grade 2	★★	★★	★★★★★	Up to 500°C, e.g. PVDF (up to 250°C)
Steel grade 3	★★★	★★★	★★★★★	Up to 500°C, e.g. PVDF (up to 250°C), PVC, PLA, Bio polymers
Steel grade 4	★★★★★	★★★★★	★★★★	Up to 500°C, e.g. PEEK
Steel grade 5S (Standard)	★★★★★	★★★	★	Up to 500°C

★ = less suitable
★★★★★★ = very good suitable

Different steel grades for different applications:

- Hardness
- Abrasion resistance
- Acid resistance
- 400°C and 500°C temperature range

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Accessories

- Cleaning sets and filling tools
- Short capillary 4 / 1.048 available for procedure C
- Battery driven cleaning device
- Inconel test barrel set (corrosion constant design) as well wear resistant barrel design
- Bar-Code Scanner (with MFR Host – Software)
- Upgrade-kit for measurement acc. ASTM D3364
- Machine table

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Cleaning sets and filling tools

Standard accessories

- Manual cleaning set
- Die cleaning tool
- Funnel for a optimal filling of the barrel
- Go No Go gauge

Optional tools

- Battery cleaning device
- Feeding tools for low viscosity testmaterials



MELT FLOW INDEXER

Summary - measurement

- Measurement according to **ISO 1133 / ASTM D1238 / D3364**
- Digital encoder, resolution 0.006 mm / impulse
- Resolution **reversible** manually and automatically by Software
- Determination of the optimal resolution of the test piston displacement
- High precision timer, resolution < 0.001s
- Time measurement
- Pre-loading unit / position sensor mi2
- Loading functionality for MI-3 and mi40
- Best possible reproducibility of measurements
- Multi load measurements **up to 8 test loads** in increasing, decreasing and random order with MI-4
- Flow Rate Ratio (**FRR**) evaluation (procedure D)

MELT FLOW INDEXER

Summary - general

- Built-in USB-connection (data stick) for data back-up
- USB printer port
- Serial connection to communicate with the optional scale
- Ethernet - connection (LAN, TCP/IP, VNC, Web-Server)
- FTP client - data can be transferred directly via a network
- Integrated Web-Server
- Determination of IV (Intrinsic Viscosity)
- Intelligent service monitoring
- Network – printing in Stand alone Modus
- 0.325 kg or 0.5 kg weight available (optional)
- Automatic backup of the test results by voltage breakdown (optional)
- Electronic timer, freely programmable ON/OFF switch of the heaters

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