

CEAST



progress in testing

MODULAR MELT FLOW



The CEAST Modular Melt Flow,

an instrument for measuring, with great accuracy, the “Melt Mass-Flow Rate” (MFR) and the “Melt Volume-Flow Rate” (MVR), fundamental rheological parameters of any thermoplastic resin.

ADVANCED FIRMWARE

- User friendly man-machine interface with menus and scroll lists
- Possibility to store up to 25 sets of test parameters
- Parameters are pre-selected for ASTM D 1238 and ISO 1133 in default and can be modified and saved
- Up to 40 data points can be acquired over 30 mm of piston travel during test with the possibility to discard or restore the values out of tolerance (if necessary) for the last test performed
- Test parameters can be selected: starting point defined by piston position or elapsed time, measurement duration and steps number, etc.

- Customized test settings: automatic print of results, automatic weight lifting at test end, etc.
- Assisted Test Mode: acoustic alarms prompt the operator for mass application, extrudate cutting and end of test
- Melt Density calculation based on actual weight of the extrudate, measured at the end of the last test performed
- Password access control for: operator, supervisor, and maintenance
- Special firmware developments are available on request.

Vanguard Electronics

USER-FRIENDLY CALIBRATION

- All calibration parameters can be edited using either the keyboard, or downloaded using the serial port and PC connection
- Upgradeable Firmware: Flash Memory allows upgrading of firmware via PC connection.

BASIC FEATURES

Designed with compact and strong construction.

- Instant results on the on-board display
- Direct print-out of test report
- On board keyboard for: data input, test execution, temperature control, timing, lifting, cutting, data acquisition, calculation, and final reporting.

STANDARDS

- ISO 1133 A-B, ASTM D 1238. Procedures A, B and C (Plus Multiple-Weight Procedure D with MFM 7027.000) and other equivalents.

MODULARITY

- Upgrade from the most basic model (code 7023.000) to the most complete model (code 7026.000) in your labs
- Top model, 7027.000, has common accessories and options.

OVEN

- Unique heat sink around the barrel to ensure maximum temperature stability
- Special thick Durasil® insulation plates ensure minimum heat loss
- Minimum temperature variation when polymer is inserted into the barrel.

DATA OUTPUT

Displayed during test:

- MFI or MVR at each step
- Average MFI or MVR
- Time of each step
- Total time
- Real and Set temperatures
- Piston position
- Real Time and Position of test initiation
- A USB Port can connect the instrument directly to a printer.

SEMI-AUTOMATIC TEST CYCLES

- 7025.000, 7026.000, 7027.000 capable of performing semi-automatic test cycles
- Operator enters test parameters and inserts the material
- Piston loading and test execution follow automatically
- 7027.000 can also perform pre-heating and compacting automatically.

PC INTERFACE

- VisualMELT software can control test and instrument, see the last page of this brochure for details.
- Up to eight (8) Modular Melt Flow instruments can be independently controlled with a single PC.
- The RS232 Serial Port can be used to connect the instrument to a PC. Shortly, this will also be possible using the USB port.

CERTIFICATES

- Certification of each individual nozzle, piston and barrel using certified equipment is supplied with the instrument
- Optional certificates are available for the test masses and reference thermometers.

MODULAR MELT FLOW EVOLUTION

7023.000

7023.000



7024.000

7025.000



7026.000

7026.000



MODULAR MELT FLOW SERIES: BASE MODEL code 7023.000

This is the basic unit developed to perform tests according to ASTM D 1238 and ISO 1133 Procedure A (Melt Mass-Flow Rate "MFR"), gravitational method: perform the test, cut the extrudate on acoustical prompt by instrument (after a set time), and weigh the extrudate to calculate the results.

- Standard version includes basic accessories such as interchangeable nozzle, and cleaning tool
- Quick release toggle lets nozzle drop out of barrel for full cleaning stroke, avoiding troublesome build-up of residues.

MODULAR MELT FLOW SERIES: ENHANCED MODELS

For performing tests according to ASTM D 1238 and ISO 1133 Procedures A, B and C (Melt Mass-Flow Rate "MFR" and Melt Volume-Flow Rate "MVR") gravitational and volumetric methods: the instrument measures the travel of the piston in the barrel; knowing the cross section area it calculates the volume of material expelled through the orifice over time; knowing the melt density (inserted by the operator) it calculates the mass of the extrudate.

code 7024.000

This is the basic Procedure A model, 7023.000, fitted with a high resolution digital encoder (accuracy better than 0.02 mm) for the addition of Procedures B and C testing. The encoder is also very useful for testing highly fluid materials where operator error in cutting the extruded strand can cause significant variation in test results.

code 7025.000

A further expansion, the Modular Melt Flow 7025.000 is supplied with a digital encoder and weight lifting device. The weight lifting device is highly recommended for tests with test masses over 5 kg: the operator no longer needs to add the masses one at a time – they are added in a single application by the weight lifter.

code 7026.000

Equipped with a motorized lifting device, digital encoder and motorized melt cutting device, this instrument increases the repeatability and the accuracy of the Melt Flow Test, an important feature for polymer testing. Supplied with safety protection for the Automatic Cutting Device. The automatic cutting device is particularly recommended for very fluid materials where the human factor can influence the test results. Furthermore, the operator is no longer constrained to be in front of the instrument throughout the test.

General Information

- Automatic piston displacement zeroing
- Selectable type of test: assisted mode (for Procedure A), specified time or specified travel distance (for Procedure B and C)
- The weight lifting device makes the instrument more user friendly and partially eliminates the operator's influence on the test
- Swinging weight support for easy cleaning access
- The Autocheck controls the additional functions, such as the weight lifter and automatic cutting device
- Procedure C testing with optional Nozzle Plugging Device, 7023.006.

The First Step:

Melt Mass-Flow Rate (Mass Method, Basic Melt Index)
According to ASTM D 1238, ISO 1133 Procedure A
and other equivalents

Evolution and Enhancements:

Melt Volume Rate (Volume Method)
According to ASTM D 1238, ISO 1133 Procedure A, B and C
and other equivalents

7027.000



MODULAR MELT FLOW 7027.000: THE ULTIMATE EVOLUTION

The Ultimate Model for MFI/MVR: Multiple Weight Single Test

- Eliminate Operator Influence due to Automatic Compacting
- Automatic, Fully Compliant With ASTM D 1238
- Reduce Test Cycle Time with Purging After Test
- Optimum Test Conditions for High Flow Rate Polymers
- Get Basic Rheological Information

MODULAR MELT FLOW code 7027.000

An evolution in Melt Flow Testing:

A single test can be performed with one, two or three test weights in increasing OR decreasing weight order. Initial rheological data can be gained from these tests, including the shear sensitivity and the initial points of the rheologic curve.

Using our VisualMELT software, this information is automatically calculated and graphed.

FEATURES

- Single test weights or multiple test weights can be used to perform sequential tests of one, two or three weights
- Compacting, purge to test starting height, and end test purge using maximum test weight loaded OR optional Load Cell
- Optional Load Cell used at selectable force for compacting and purging eliminates operator and initial polymer charge influence
- Innovative optional Piston allows ALL WEIGHT (including piston) to be removed after purge cycle for high MFR polymers (as required by ASTM D 1238)
- Pre-programmed cycles for ASTM D 1238 Procedure A, Procedure B, ISO 1133 Procedure A, Procedure B_(Time) and Procedure B_(Position)
- Ability to configure a wide range of parameters and settings to perfectly comply with the international standard requirements and to customer's individual needs
- The high accuracy encoder and motor with N/C control permits precise and exact positioning of the lifting device
- Precise control of the position of the lifting device, along with the use of our optional Load Cell (code 7027.005), permits the application of a precise force on the material, up to a maximum of 75 kg, for compacting and purging cycles.

MODULAR MELT FLOW LINE COMMON TECHNICAL DATA

Piston Position Reading - Accuracy: ± 0.02 mm (using encoder).

Masses - Tolerance: $\pm 0.5\%$

Range of loads: from to 0.325 kg (3.19 N) to 21.600 kg (211.9 N).

Barrel (extrusion cylinder) - Nitride hardened steel

Temperature - Time to reach stable test temperature: approx. 10 minutes

Temperature range: 50 \div 400°C (on request 450°C)

Temperature display resolution: 0.1°C

Thermal stability: $\pm 0.2^\circ$ C from 50 to 400°C

A thermal fuse protects the instrument from potential fire hazard.

Nozzle - Standard nozzle (ISO 1133/ASTM D 1238): tungsten carbide

Special nozzles are available with different geometries

(for example ASTM D 3364 and ISO 292(b)).

All nozzles are supplied with individual serial numbers and conformance certificates.

Language - On-board program language can be selected from:

English, French, German, Italian, and Spanish.

OPTIONAL ADVANCED EQUIPMENT FEATURES FOR ALL MODELS

(See the table on the next page for further details).

Die Swell - code 7023.040/7027.040

System complete with: laser detection system, for measuring extrudate diameter and software calculation of the die swell ratio.

Nozzle Plug - code 7023.006

Die Plug for polymers with low molecular weight and quick flow to keep the polymer in the barrel during pre-heating (for Procedure C).

Automatic Cleaning Device - code 7023.030/7027.030

Cleaning device, mounted on the weight lifter, that swings into place. At the touch of a button, the pneumatically driven up-and-down movement effectively removes all traces of even the most difficult polymer from the barrel.

Nitrogen Blanket - code 7027.070

Useful for testing hygroscopic polymers (such as PET, polyamides and Nylon®), this accessory puts the polymer being tested under a Nitrogen gas blanket, keeping the polymer dry during the test.

Special Kits for Aggressive Materials

To be used when corrosive materials must be tested. Piston, barrel and nozzle are supplied in special material, resistant to corrosion from the acids evolved during testing.

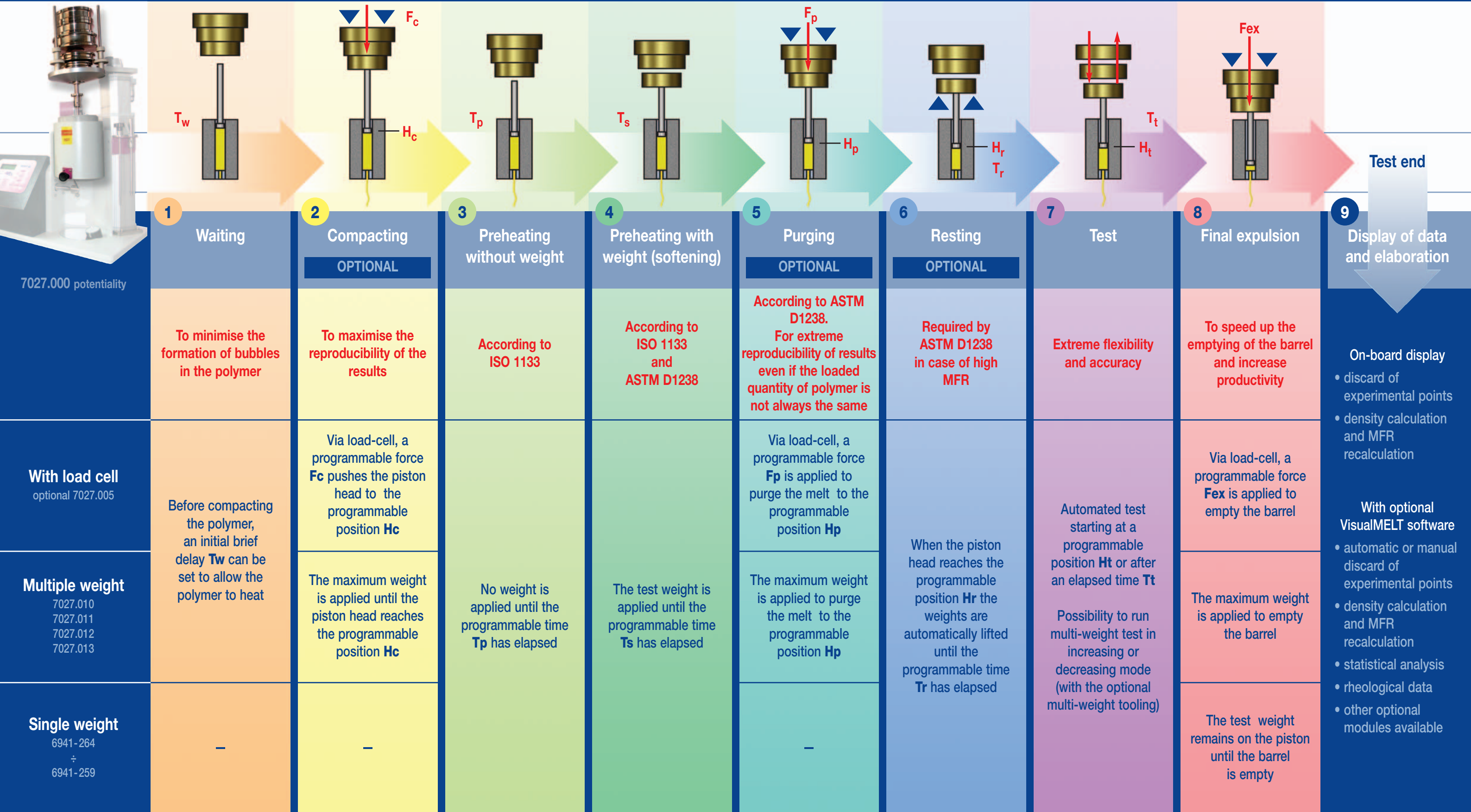
- For tests on chlorinated and fluorinated polymers: code - 6934.035
- For PVC (including special nozzle according to ASTM D 3364): code - 6934.036.

Other options are available upon request.

TEST CAPABILITIES of MMF 7027 Multi-Weight System

International standards have introduced a number of options in the MVR and MFR test methods, in order to achieve the best repeatability and reproducibility of results. The advanced (yet user-friendly) test parameter management and hardware of the 7027 series allows full compliance of an extremely wide choice of procedures. You can compact the sample with a programmed force, you can lift or apply the weights automatically - and

even the piston - to customize the preheating stage, you can choose a position-mastered or time-mastered test procedure, you can run single-weight or multiple-weight tests. The instrument is equipped with a high resolution encoder, an automatic lifter and an automatic cutting device. It is possible to create parameter sets, run tests and save results also through the versatile dedicated Windows-based software interface, which gives more possibilities for data elaboration.



Specialists in rheology and data processing
... not all Melt Flow Testers are alike

See two complete test examples on following page



ROUTINE APPLICATIONS

EXAMPLE 1 – single weight, ASTM D1238

(Each number refers to the relevant phase on the preceding diagram)

(operator loads the barrel with sample)

Wait for 5 s

1

Compact with a force of 350 N (load cell), reaching a height of 70 mm above die

2

Continue preheating with test mass (softening) until 180 s from test start have elapsed

4

Lift mass and piston and wait another 180 s (resting)

6

Apply 2.16 kg test mass and start measuring at 46 mm, cut the extrudate at the beginning

7

Measure over a length of 25.4 mm, cut the extrudate at the end

7

Purge the remaining sample

8

Operator cleans barrel with Automatic Cleaning Tool after test



EXAMPLE 2 – multiple weight, ISO 1133-type

(Each number refers to the relevant phase on the preceding diagram)

(operator loads the barrel with sample)

Preheat with all masses applied reaching a height of 75 mm above die

2

Preheat another 180 s without load

3

When 300 s have elapsed since test start, apply 2.16 kg test mass and measure over a length of 6 mm, with 6 acquisition steps

4

7

Apply 5 kg test mass and measure over a length of 10 mm with 10 acquisition steps

7

Apply 21.6 kg test weight and measure over a length of 14 mm with 14 acquisition steps

7

Purge the remaining sample

8

Test running with Multiple Weight Set



MODULAR MELT FLOW MAIN OPTIONS

Model		MODULAR MELT FLOW					
Part Description	Photo/Details	Code	7023.000	7024.000	7025.000	7026.000	7027.000
Encoder – Piston Displacement Transducer (for Procedure B and C testing)		7023.003	○	●	●	●	●
Motorized Weight Lifter with Swing Away Weight Platform		7023.001	○	○	●	●	●
Automatic Cutting Device		7023.002	○	○	○	●	○
Manual Cutting Device		7021.005	○	○	○	○	○
Single Weight Tests using Standard CEAST Masses for test masses from 0.325 kg to 21.6 kg (Total test mass including piston indicated unless specified as Additional)	 <p>500 g 1000 g 1050 g 1200 g 2160 g 3800 g 5000 g Additional 5000 g Additional 1600 g Additional 2500 g</p>	6941.264 6941.251 6941.252 6941.253 6941.254 6941.255 6941.256 6941.257 6941.258 6941.259	○	○	○	○	○
Multiple Weight Tests with Increasing and Decreasing Weights (Max. 3 Masses)	 <p>Weight Set For 2.16 – 5.0 - 21.6 kg Support for 1 mass Support for 2 masses Support for 3 masses Other weight sets available on request</p>	7027.010 7027.011 7027.012 7027.013	—	—	—	—	○ ○ ○ ○
Load Cell for Compacting, Start and End Purge (up to 75 kg)		7027.005	—	—	—	—	○
Special Piston for Removing all Load during Pre-Heat Phase of Test		7027.006	—	—	—	—	○
Nozzle Plugging Device		7023.006	○	○	○	○	○
Nitrogen Blanket Accessory		7023.070	○	○	○	○	○
Die Swell System		7023.040 7027.040	○ —	○ —	○ —	○ —	— ○
Acid Resistant set	Chloro and Fluoro Polymers PVC	6934.035 6934.036	○ ○	○ ○	○ ○	○ ○	○ ○
Cleaning Tools	 <p>Manual Pneumatic AUTOMATIC</p>	6542.035 6542.096 7023.030 7027.030	○ ○ — —	○ ○ — —	○ ○ ○ —	○ ○ ○ —	
Special Nozzles for	ASTM D 3364 ISO 292(b)	6542.565 6542.078	○	○	○	○	○

MODULAR MELT FLOW PHYSICAL CHARACTERISTICS

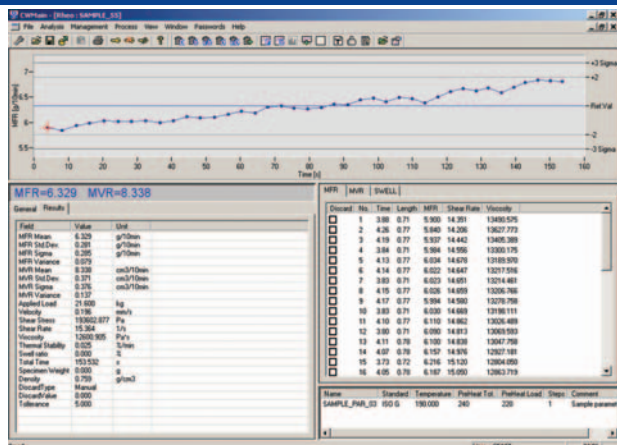
Overall Dimensions (LxDxH) [mm]		540 x 420 x 470	540 x 420 x 680	
Mass [kg]		40	50	60
Electric Supply		230V/50Hz or 110V/60Hz		
Power [W]		700	1000	
Paint		White RAL 7035 – Fuchsia RAL 4006 – Anthracite RAL 7016		

— Not Available ○ Optional ● Included



CEAST's VisualMELT,

a software program in CeastVIEW for maximising your benefits from your MFI and MVR tests. Up to 40 data points can be stored for each test, edited for reporting and added back. Multi-Modules are available to enable testing on up to 8 instruments using software in the CeastVIEW platform – including our Modular Melt Flow.



VisualMELT SOFTWARE code 0710.650

The main programme controls all functions of the Modular Melt Flow. From a library of international standards you may select any test parameters, or enter your own. Graphs and tables can be easily stored and recalled. It is also possible, manually or automatically, to discard and restore values that are not in tolerance as required. Test results include: MFR and MVR, values and graphic of single steps, test time, statistical data, velocity and variance, thermal stability, shear rate, shear stress and viscosity. For tests performed with our model 7027.000 it is also possible to calculate the shear sensitivity and graph the initial part of the rheological curve.

Full details can be found in our VisualMELT Brochure.

40 Points test data report

Model		MODULAR MELT FLOW				
Part Description	Code	7023.000	7024.000	7025.000	7026.000	7027.000
VisualMELT Software	0710.650	—	○	○	○	○
MultiModules for Connecting two, four or eight MMF	0710.653.2 0710.653.4 0710.653.8	—	○	○	○	○
VisualMELT Software Modules:						
Operator (Password levels)	0710.651	—	○	○	○	○
SQC (Statistics Package)	0710.657	—	○	○	○	○
Transfer (to Excel® or ASCII)	0710.652	—	○	○	○	○
Weight (correct Melt Density)	0710.658	—	○	○	○	○

— Not Available ○ Optional ● Included

Expanded Data Analysis

With advanced processing of the experimental data further rheological and processing information may be obtained:

- Melt Density
- Estimate of filler content
- Flow Rate Ratio
- Thermal Stability

"Due to the continuous development policy of CEAST's Research and Development Department, changes may be introduced without notice"

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