

## Melt Flow Plastometers with new functions



# Operating principle

Melt flow rates represent the speed of extrusion of a polymer under defined temperature, through a defined die and under a defined constant pressure.



## Method A

The melt-mass flow-rate is determined by weighting extrudates cut-off in known intervals.

### Method A – MFR (Melt Mass Flow Rate)

The extrudates are cut off at constant time intervals.

- cut-off lengths between 10 and 20mm (ISO),  
Cut-off time interval must not exceed 240s (ISO)

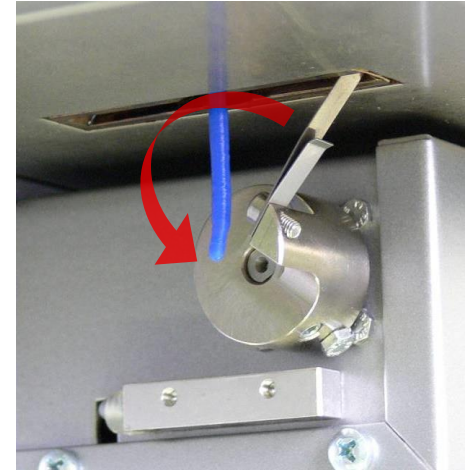
ASTM:	MFR range (g/10min)	Cut-off times
	0.15 to 1	360 s
	> 1 to 3.5	180 s
	> 3.5 to 10	60 s
	> 10 to 25	30 s
	> 25	15 s

- maximum test time 25 min.

The cut-offs are weighed on analytical scales and the result is stated in **g/10min**.

### Range of application

- simple manual testing (low specimen volumes)
- filled plastics



## Method B

The melt volume rate is determined from piston travel measurement.

### Method B – MVR (Melt Volume Rate)

Measurement of piston travel per time and conversion to extruded volume per time

- measurement interval can be travel or time-controlled
- time interval shall not exceed 240s (ISO)

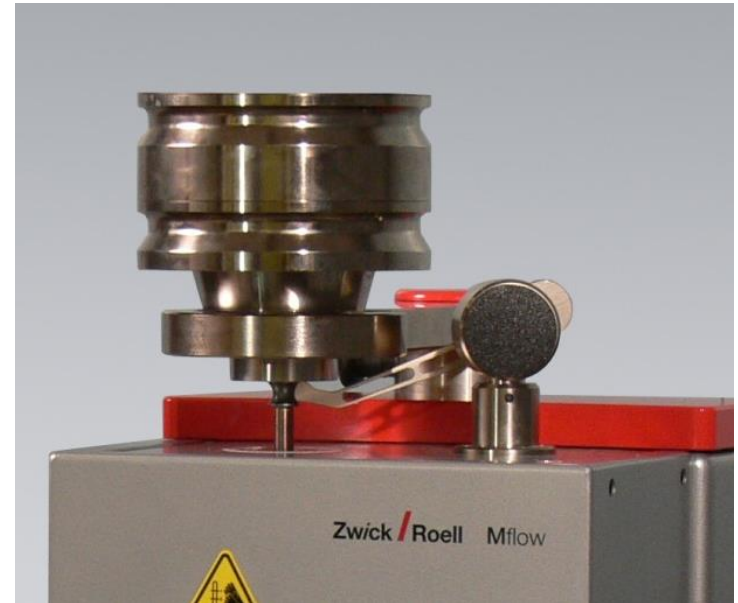
ASTM:	MFR range (g/10min)	Measurement parameter
	up to 10	6.35 mm (1/4 inch)
	over 10	25.4 mm (1 inch)

- maximum test time 25 min.

The result is stated in **cm<sup>3</sup>/10min.**

### Range of application

- medium to high specimen volumes
- more automatic test sequences



The Xflow series – the ideal extrusion plastometer for every testing situation.

**Cflow**  
Compact



- manual instrument for goods inwards checks
- fast, reliable testing to Method A

**Mflow**  
Modular



- modular instrument for higher testing volumes
- low-cost entry, capable of successive expansion

**Aflow**  
All-round



- handy all-rounder for 24-hour operation
- optimum test sequence - efficient and reliable

Higher testing volume, higher level of automation, greater convenience



# Cflow – the Compact

Cflow is a compact, cost-efficient extrusion plastometer for manual testing.

- Tests according Method A
- weights up to 21.6 kg
- precise temperature control
- stand-alone operation
- manual and automatic extrudate cutter
- optional die-plug
- optional supplementary weights
- optional safety door



Mflow's modular design enables easy upgrading. It was developed to meet the needs of R&D, QA and goods inwards checks.

- the modular design allows upgrades and retrofits
  - extrudate cutters (manual/motorized)
  - displacement transducer for MVR measurement
  - weight-lifting unit / weight pre-selector
- weights up to 21.6 kg
- testXpert connection via Ethernet
- multiple Xflow instrument operation with one PC
- precise temperature control to ISO 1133-2
- stand-alone or PC controlled operation



# Aflow – the Allrounder

The Aflow is a semi-automatic plastometer designed for extensive use with changing operators.

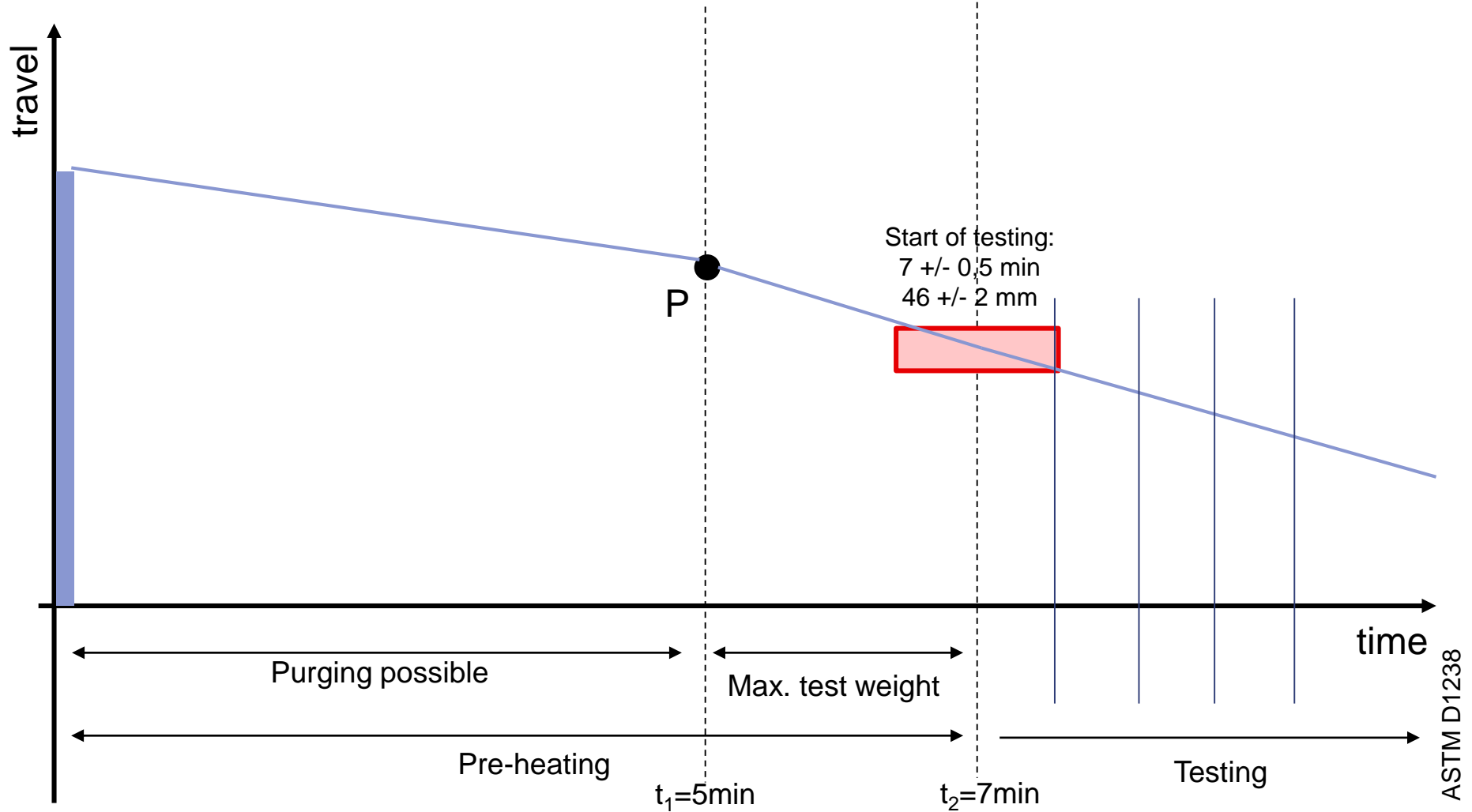




ISO and ASTM procedures are different in several conditions, but the same equipment can be used for both standards.

Topic	ISO 1133-1	ISO 1133-2 (moisture sensitive & time dependend materials)	ASTM
<b>Filling Quantity</b>	3 to 5 g for flowrates 0.1 to 0.5 g/10min 4 to 6 g for flowrates > 0.5 g/10min 4 to 8 g for flowrates > 3.5 g/10min	not standardized not standardized 4 - 5 g for flowrates 10 to 20 g/10min 5 - 6 g for flowrates > 20 g/10min 6 - 7 g for flowrates > 30 g/10min > 7 g for flowrates > 40 g/10min	2.5 to 3 g for flowrates 0.15 to 1 g/10min 3 to 5g for flowrates > 1 g/10min 4 to 8 g for flowrates > 3.5 g/10 min
<b>Preheat</b>	loading of the material charge within 1 min 5 min of preheat time, followed by the time needed to reach the start position 50 mm (no exact tolerance for the maximum preheat time)	loading of the material charge within 1 min 5 min of preheat time, start position 50 mm must be reached at $5.75 \pm 0.25$ min after charging was completed	loading of the material charge within 1 min $7 \pm 0.5$ min until start of measurements at a position of $46 \pm 2$ mm (double condition!)
<b>Pre-compaction</b>	Piston may be loaded, unloaded or partly loaded durin pre-heat. Purging must be completed latest 2 min before measurements begin and shall not take longer 1 min.	No specific limitations. Piston may be loaded, unloaded or partly loaded during pre-heat.	Purging must be completed latest 2 min before measurements begin.
<b>Method A</b>	Maximum time per measurement = 240 s Maximum time im the barrel = 25 min Any cutting time allowed, preferred filament length is 10 to 20 mm	Maximum time per measurement = 240 s Maximum time im the barrel = 25 min Any cutting time allowed, provided that the filament length is > 10 mm. Use all cut filaments within the avail. 30 mm of piston travel for the result calculation.	Measurement at fixed time intervals: 6 min for MFR 0,15 to 1 g/10min 3 min for MFR 1 to 3.5 g/10min 1 min for MFR 3.5 to 10 g/10min 0.5 min for MFR 10 to 25 g/10 min 0.25 min for MFR > 25 g/10 min
<b>Method B</b>	Maximum time per measurement = 240 s Maximum time im the barrel = 25 min Every possible measurement travel and times are allowed. Standard indicates preferred values.	Maximum time per measurement = 240 s Maximum time im the barrel = 25 min Fixed measurement travel between 20 and 30 mm	MVR up to 10 --> $6.35 \pm 0.25$ mm MVR > 10 --> $25.4 \pm 0.25$ mm

# Test procedure ASTM D1238



It is necessary to do pre-tests or have good knowledge of the material to set the right parameters.

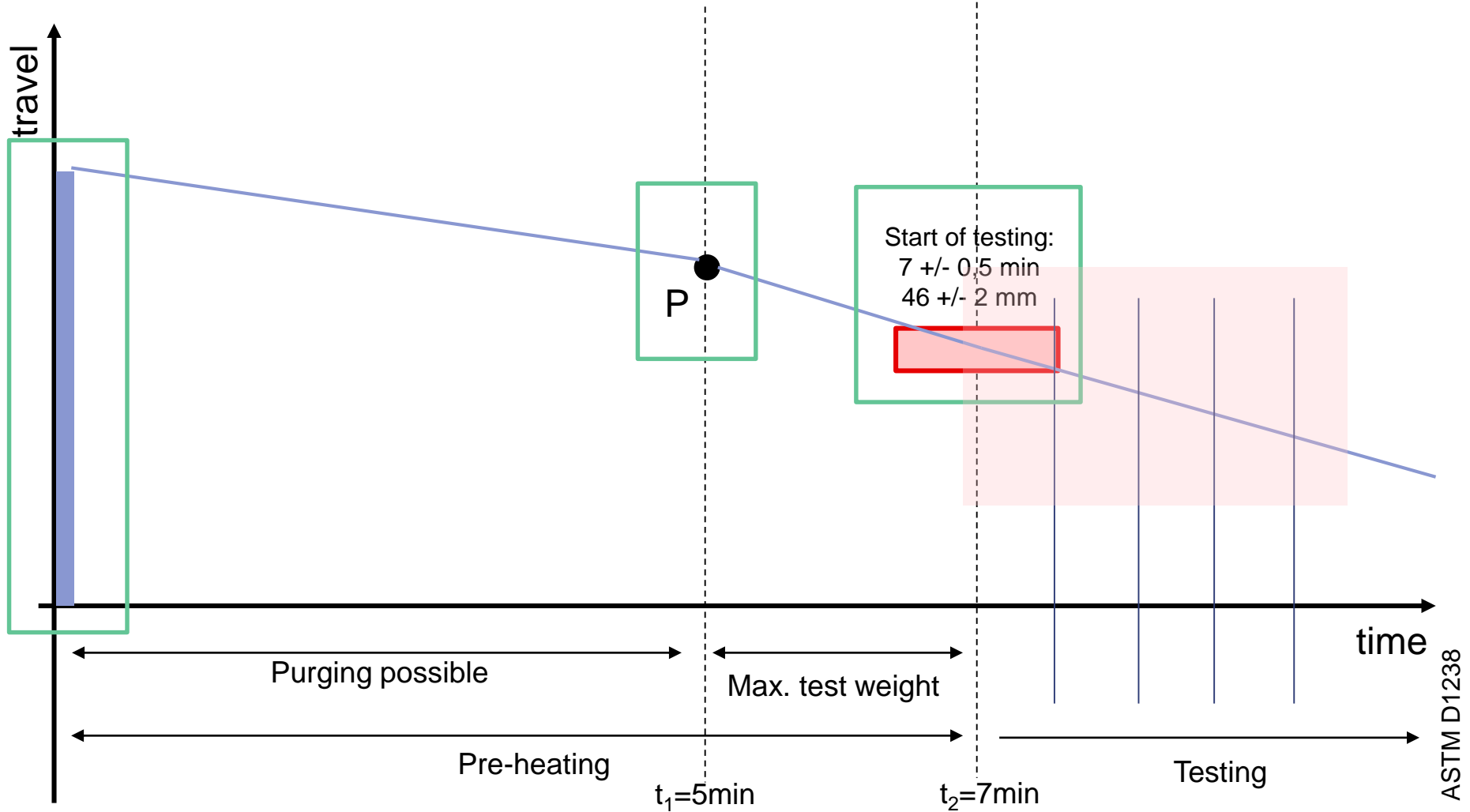
- What is the challenge on the testing procedure?
  - Take the right amount of material
  - Set the correct purging force / weight
  - Set the right pre-heating position
  - Meet the starting point in tolerance
  - Set the right test parameters

With our new Aflow functionalities we set the right parameters automatically and always meet the start of test in tolerance.

- Thanks to the new software functions, the test parameters can be defined automatically. This means that there is no need for pre-tests to determine the parameters any more. In addition, measurements can also be carried out in accordance with standards if the filling quantity was not optimally selected.
- The advantages are as follows:
  - Save time, especially with new / unknown materials
  - Make material testable at all, especially if little material is available (e.g. from test service providers)
  - Even inexperienced testers can carry out a standard-compliant test
  - Simple, quick and clear test execution with one test program. This saves time and reduces complexity.



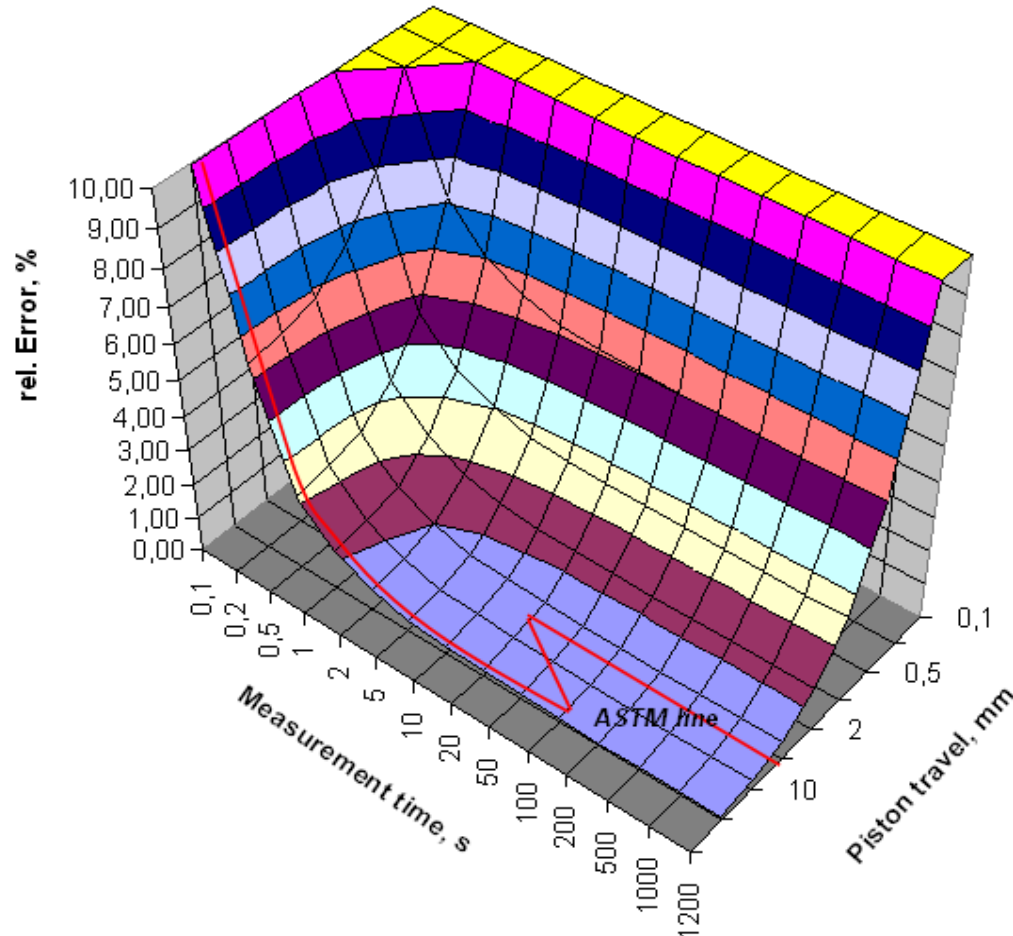
# Test procedure ASTM D1238



The measurement error can be calculated for each travel-time point

## Relative measurement error of MVR, %

Calculation for accuracy level: travel  $\pm 0.025\text{mm}$ , time  $\pm 0.01\text{s}$  (Conditions of ASTM D1238, B, 1/4")



The plastometer can automatically detect the best fitting parameters for MVR determination by its unique method of “Adaptive Parameter Control, APC”.

- The test parameters to be set normally depend on the expected MVR result and influence the accuracy that can be achieved.
- Example: ASTM D 1238  
MVR < 10 cm<sup>3</sup>/10min → travel = 6.35 mm  
MVR ≥ 10 cm<sup>3</sup>/10min → travel = 25.4 mm
- The operator just selects “ASTM” or “ISO” or creates an individual parameter field that can consist several stages each.

Expected MVR in g/10min		time / travel	Set-point	Unit
0,0	0,4	time	240	s
0,4	1,0	travel	2	mm
1,0	20,0	travel	5	mm
20	∞	travel	10	mm

## Melt Flow Plastometers with new functions

Plastics

**A4**

