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मानक

IS 10810-23 (1984): Methods of test for cables, Part 23: Melt-flow index [ETD 9: Power Cables]



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**4.1** Extrusion Plastometer (see Fig. 1) — Polyethylene, which is contained in a vertical metal cylinder, is extruded through a jet by a loaded piston under controlled temperature conditions. The essential parts of the apparatus are given in **4.1.1** to **4.1.6**.

**4.1.1** Cylinder of hardened steel — Fixed in a vertical position and suitably lagged for operation at 190°C. The cylinder shall be at least 115 mm long of internal diameter 9 550  $\pm$  0.025 mm and uniform along its length. The base of the cylinder shall be thermally insulated if the area of exposed metal exceeds 4 mm.

Adopted 14 March 1984	© July 1985, ISI	Gr 2		

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**4.1.2** Hollow piston — Of mild steel having length not less than length of the cylinder. The piston shall have a head of length  $6.35 \pm 0.10$  mm. The diameter of the head shall be less than the internal diameter of the cylinder at all points along the working length of the cylinder by  $0.075 \pm 0.015$  mm. The lower edge of the head shall have radius of 0.4 mm and the upper edge shall have its sharpness removed. Above the head, the piston shall be relieved to about 9.0 mm diameter. A stud may be added at the top of the piston to support the removable load, but the piston shall be thermally insulated from the load.

**4.1.3** Removable load on top of the piston — The combined mass shall be 2 160  $\pm$  10 g.

**4.1.4** Heater — To maintain the polyethylene in the cylinder at a temperature of  $190 \pm 0.5^{\circ}$ C. Automatic temperature control is recommended.

**4.1.5** Temperature measuring device — Of accuracy 0.1°C, located as close as possible to the jet and within the body of the cylinder.

Note — It is recommended that the temperature measuring device may be a mercury-in-glass thermometer located permanently within the mass of the cylinder. If any other measuring device is used, then it shall be calibrated at  $190 \pm 0.5^{\circ}$ C before the commencement of each series of tests with reference to a mercury-in-glass thermometer, placed in the cylinder and immersed in polyethylene to its appropriate depth.

**4.1.6** Jet — Of length 8:000  $\pm$  0:025 mm and internal diameter 2:095  $\pm$  0:005 mm made of hardened steel ( see Fig. 2 ). The jet shall not project beyond the base of the cylinder.



All dimensions in millimetres.

FIG. 2 PART OF APPARATUS FOR MELT-FLOW INDEX SHOWING SMALL EXTERNAL DIAMETER CYLINDER WITH AN ALTERNATIVE METHOD OF RETAINING THE JET

4.2 Physical Balance — Accuracy 0.000 5 g.

5. Material - No material other than test specimen is required for performing this test.

6. Test Specimen — The test specimen may be in any form which can be introduced into the apparatus, for example, granules, powder or moulded pieces.

7. Conditioning — No preconditioning of the test specimen is required.

#### 8. Procedure

**8.1** The apparatus shall be cleaned. Before a series of tests is begun, the temperature of the cylinder and piston shall have been  $190^{\circ} \pm 0.5^{\circ}$ C, for 15 minutes. This temperature shall be maintained during the extrusion of the polyethylene.

8.2 The cylinder shall then be charged with a portion of the test sample as given below and the unloaded piston reinserted into the top of the cylinder. Four minutes after introducing the sample, during which time, it should attain temperature equilibrium the load shall be placed on the piston to extrude the polyethylene through the jet. The rate of extrusion shall be measured by cutting the extrusion at regular intervals of time at the jet with a suitable sharp edged instrument to give short lengths referred to as 'cut-offs'. The time intervals at which each cut-off is taken shall be as given below.

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Melt-Flow Index	Cylinder Charge	Time Interval
MFI	g	s
0.15 to 1.0	3 to 4	240
Above 1 <sup>.</sup> 0	4 to 5	60

**8.3** Several cut-offs shall be taken within 20 min of the introduction of the sample into the cylinder. The first cut-off shall be ignored, as shall be any other which contains air bubbles. The remaining successive cut-offs (3, *Min*), shall be weighted individually to the nearest milligram and the average mass shall be determined. If the difference between the maximum and the minimum values of the individual weighings exceeds 10 percent of the average, the test results shall be discarded and the test repeated on a fresh sample.

### 9. Tabulation of Observations

Description of Sample	Melt Flow	Time Interva	
	g	S	
	a)		
	b)		
	c)		
10. Calculation			
MFI =600	× Average mass of cut off (g) Time interval (s)		
11. Report			
<b>11.1</b> <i>Reference Specification</i>			
Specimen	Melt Fl	Melt Flow Index	
Number	Obtained	Specified	

11.2 Conclusion - Specimen meets/does not meet the requirements of the specification.

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