

EUROMAP 31

Extrusion

Melt Temperature Measurement

Version 1.0, February 2006
(7 pages)

This recommendation was prepared by the Technical Commission of EUROMAP.

Content

Page

- 1. **Scope and application** 3
- 2. **Description**..... 3
- 3. **Test of melt temperature sensors** 3
 - 3.1 **Test unit** 3
 - 3.2 **Connection of the melt temperature sensor** 4
 - 3.3 **Test temperature measurement** 4
- 4. **Selection of tip length** 5
- 5. **Connection to the indicating instrument**..... 5
- 6. **Melt temperature measurement** 5
- 7. **Measurement results**..... 6
- 8. **Suppliers** 6

1. Scope and application

This EUROMAP recommendation defines the method to measure the melt temperature in extrusion. It allows the comparison of measuring data from different sources.

2. Description

Melt temperature sensors based on thermal insulated Fe-CuNi-thermocouples type J (EN 60584-1), error limit class 1 or 2 (EN 60584-2), shall be used for the melt temperature measurement. The sensors shall have a ceramic insulation to reduce measurement failures due to conductivity. Only sensors with conic tips shall be applied. For suppliers see clause 8.

3. Test of melt temperature sensors

3.1 Test unit

An oil bath with agitator, heating/cooling elements, thermal insulation and a precision thermometer according to figure 1 shall be used. The use of the agitator ensures that the temperature difference between the precision thermometer and the melt temperature sensor is negligible.

Key

- 1 Bath box
- 2 Thermal insulation
- 3 Internal flow pipe
- 4 External heating or cooling
- 5 Overflow
- 6 Internal heating
- 7 Agitator drive
- 8 Precision thermometer
- 9 Oil bath
- 10 Melt temperature sensor

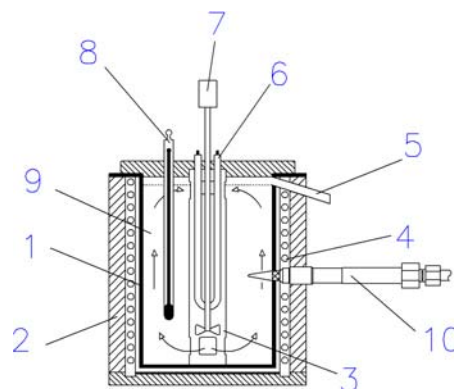
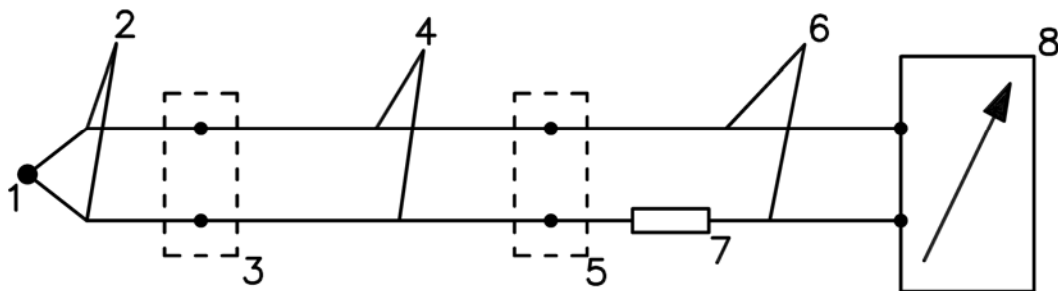


Figure 1: Oil bath with agitator

3.2 Connection of the melt temperature sensor

The melt temperature sensor in the oil bath shall be connected to the indicating instrument according to figure 2.



- Key
- 1 Measuring junction
 - 2 Thermocouple
 - 3 Connecting point
 - 4 Compensating conductor
 - 5 Reference junction
 - 6 Connecting conductor
 - 7 Adjuster resistor
 - 8 Indicating instrument

Figure 2 : Measurement arrangement

The following shall be used:

Compensating conductors JX according to EN 60583-3. Pt100 resistance thermometer for temperature measurement at the reference junction according to EN 60751 and EN 60751-A2.

Connecting conductors of copper or similar materials (both connecting conductors have to be of the same material).

3.3 Test temperature measurement

The melt temperature sensor connected according to 3.2 shall be put in the oil bath. When a constant value on the indicating instrument has been reached, the temperature measurement can be compared with the temperature given on the precision thermometer in figure 1 to decide if the melt temperature sensor is still in the tolerance field or if it has to be replaced.

4. Selection of tip length

To measure the representative mean value of the melt temperature in a flow channel with a circular cross-section, the measuring point in the tip of the melt temperature sensor shall be located in distances from the channel wall according to table 1.

D Diameter of flow channel [mm]	≤ 20	20 ÷ 75	>75
Tip length T [mm]	$\sim D/2$	10	15

Table 1: Tip length

With the processing of certain materials high forces on the sensor tip caused by the melt flow may require to reduce this length.

5. Connection to the indicating instrument

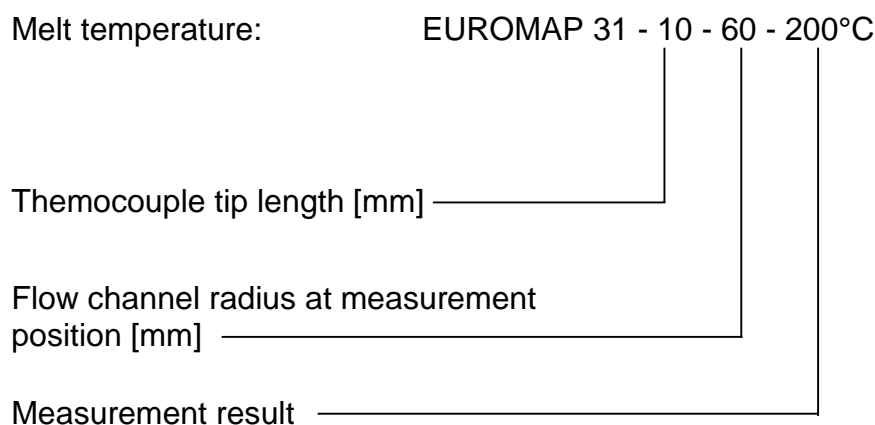
In principle the connection of the melt temperature sensor to the indicating instrument shall follow 3.2, but it is not standardized under this EUROMAP recommendation. Of course, the kind of wiring and the plugs, not made of the thermocouple material, (if used at all) will have an influence on the measuring result achieved. But this is usually negligible, e.g. $\pm 3^{\circ}\text{C}$.

6. Melt temperature measurement

Measurement shall take place only when stationary conditions are reached. This may take quite a while depending e.g. on the processing parameters, the extruded material, the installed screw, the barrel diameter.

7. Measurement results

The measured temperatures shall be given in °C as follows, e.g.:



In addition all details necessary for the complete identification of the used temperature sensor, e.g. type, origin, manufacturer's code number and the thermocouple tip length shall be indicated.

8. Suppliers

Melt temperature sensors required for the measurement according to this EUROMAP recommendation are available from:

Gefran spa, Via Sebina 74, 25050 Probaglio d'Iseo (BS) ITALY www.gefran.it

Gneuß Kunststofftechnik GmbH, 32549 Bad Oeynhausen, Germany www.gneuss.com

JUMO GmbH & Co. KG, 36039 Fulda, Germany www.jumo.net

TEMATEC GmbH, 53759 Hennef, Germany www.tematec.de

NOTE: Further supplier are invited to be listed

EUROMAP

Europäisches Komitee der Hersteller von Kunststoff- und Gummimaschinen

European Committee of Machinery Manufacturers for the Plastics and Rubber Industries

Comité Européen des Constructeurs de Machines pour Plastiques et Caoutchouc

Comitato Europeo Costruttori Macchine per Materie Plastiche e Gomma

See you again

<http://www.euromap.org>

Copyright by EUROMAP