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**Plastics pipes and fittings — Pressure  
reduction factors for polyethylene  
pipeline systems for use at  
temperatures above 20 °C**

*Tubes et raccords en matières plastiques — Facteurs de réduction  
de pression des canalisations en polyéthylène utilisées à des  
températures supérieures à 20 °C*

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ISO copyright office  
Ch. de Blandonnet 8 • CP 401  
CH-1214 Vernier, Geneva, Switzerland  
Tel. +41 22 749 01 11  
Fax +41 22 749 09 47  
copyright@iso.org  
www.iso.org

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## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see [www.iso.org/directives](http://www.iso.org/directives)).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

This document was prepared by Technical Committee ISO/TC 138, *Plastic pipes, fittings and valves for the transport of fluids*, Subcommittee SC 5, *General properties of pipes, fittings and valves of plastic materials and their accessories — Test methods and basic specifications*.

This second edition cancels and replaces the first edition (ISO 13761:1996), which has been technically revised.

## Introduction

This document provides pressure reduction factors for an increased temperature range up to 50 °C and guidance for dealing with higher temperatures. The use of these factors allows the operating pressure of polyethylene (PE) pipeline systems to be determined for use at higher temperatures.

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# Plastics pipes and fittings — Pressure reduction factors for polyethylene pipeline systems for use at temperatures above 20 °C

## 1 Scope

This document specifies a method for the derivation of pressure reduction factors to obtain the allowable operating pressure for operation of polyethylene (PE) pipeline systems at temperatures between 20 °C and 40 °C or 50 °C, dependent on the classification of the material used for manufacture.

## 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 9080:2012, *Plastic piping and ducting systems — Determination of the long-term hydrostatic strength of thermoplastics materials in pipe form by extrapolation*

## 3 Terms and definitions

No terms and definitions are listed in this document.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <http://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

## 4 Principle

For operation of systems at temperatures between 20 °C and up to 50 °C, the allowable pressure is reduced by applying the pressure reduction factor derived from the graph in [Figure 1](#) or from [Table 1](#) to the nominal pressure for 20 °C operation.

## 5 Procedure

### 5.1 Determination of the applicable pressure reduction factor

Select the pressure reduction factor at the required operating temperature from [Table 1](#) or derive it from the graph in [Figure 1](#). [Table 1](#) and [Figure 1](#) are applicable for PE 100 and PE 80 materials up to 50 °C, and for PE 63 and PE 40 materials up to 40 °C.

Multiply the nominal operating pressure of the system for 20 °C operation by the pressure reduction factor at the required operating temperature in order to obtain the allowable operating pressure.

Allowable operating pressure at elevated temperature =  $P_N \times \text{reduction factor at that temperature}$

where  $P_N$  is the nominal pressure rating of the system at 20 °C.

The end user should take into account the maximum temperature for continuous operation and duration of operation at that temperature.

NOTE 1 Basing the design on the maximum temperature only may result in over design of the system.

NOTE 2 When the temperature profile of operation is known, ISO 13760 can be used for design purposes. Reference lines for PE are provided in ISO 13760 and ISO 15494.

## 5.2 Analysis of data by extrapolation

Factors higher than those obtained in accordance with 5.1, and hence higher operating pressures, may be applied providing the analysis of data in accordance with ISO 9080 demonstrates that less reduction is applicable.

Factors above 1,0 may be applied for temperatures up to 20 °C below the lowest test temperature of 20 °C in accordance with ISO 9080:2012, 5.1.3.

Pressure reduction factors at temperatures above 50 °C may be deduced taking into account the ISO 9080 extrapolation factors and time limits.

## 5.3 Design lifetime

This document does not specifically specify expected design life for operation. This shall be predicted by analysis in accordance with ISO 9080 taking into account the extrapolation time limits and the specific operating conditions.

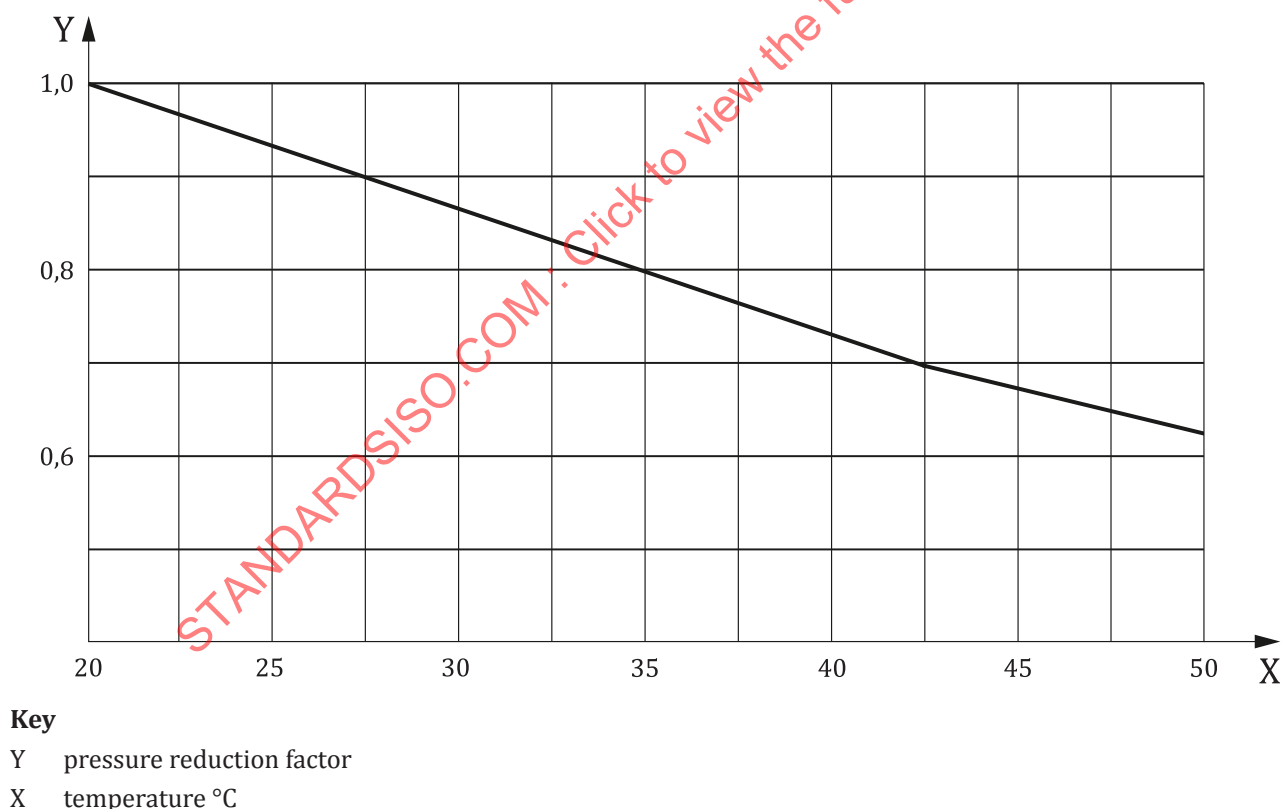


Figure 1 — Pressure reduction factor versus temperature

**Table 1 — Pressure reduction factors for temperatures between 20 °C and 50 °C**

| Material classification                                                                                                                                                                                                                                                                                                                                                                        | Pressure reduction factors <sup>a b</sup> |       |       |       |       |       |       |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|-------|-------|-------|-------|-------|-------|
|                                                                                                                                                                                                                                                                                                                                                                                                | 20 °C                                     | 25 °C | 30 °C | 35 °C | 40 °C | 45 °C | 50 °C |
| PE 100<br>PE 80                                                                                                                                                                                                                                                                                                                                                                                | 1,00                                      | 0,92  | 0,85  | 0,79  | 0,73  | 0,67  | 0,63  |
| PE 63                                                                                                                                                                                                                                                                                                                                                                                          | 1,00                                      | 0,92  | 0,85  | 0,79  | 0,73  |       |       |
| PE 40                                                                                                                                                                                                                                                                                                                                                                                          | 1,00                                      | 0,92  | 0,85  | 0,77  | 0,70  |       |       |
| <sup>a</sup> Reference to ISO 9080:2012 shall be made for extrapolation time limits, see <a href="#">5.3</a> .<br><sup>b</sup> The ISO 9080:2012 extrapolation factors are 50 for 40 °C, 30 for 45 °C and 18 for 50 °C when the material is tested at a maximum temperature of 80 °C. If the material is tested at a higher temperature than 80 °C then other extrapolation factors may apply. |                                           |       |       |       |       |       |       |