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# Thermoplastic elastomers — Nomenclature and abbreviated terms

*Élastomères thermoplastiques — Nomenclature et termes abrégés*



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# Foreword

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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).

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information



The committee responsible for this document is ISO/TC 45, *Rubber and rubber products*.

This second edition cancels and replaces the first edition (ISO 18064:2003), of which it constitutes a minor revision with the following changes:



— replacement of the term "abbreviation" with "abbreviated term" in Subclauses 6.3, 6.6 and Annex A, and

— deletion of "TECEA" in Annex A.

 

# Introduction

Thermoplastic elastomers combine many of the attributes and features of both vulcanized thermoset rubber and thermoplastic materials. It is, therefore, important that any system of classification and nomenclature for this rapidly expanding polymer sector should be acceptable to both the rubber and plastics industries. Neither of the existing International Standards for the nomenclature and abbreviated terms for rubber (ISO 1629) and for plastics (ISO 1043-1) is suitable for this purpose. The system in this International Standard has been devised to avoid any conflict of interests or ambiguity, permit the use of existing terms in the construction of abbreviations for thermoplastic elastomers, and allow for future developments or expansion.

This International Standard uses established abbreviated terms. Its aim is both to prevent the occurrence of more than one abbreviated term for a given thermoplastic elastomer term, and to prevent the interpretation of more than one meaning for a given abbreviated term. For this reason, this International Standard makes appropriate use of the terms and symbols listed in ISO 1043-1 and ISO 1629.

# Thermoplastic elastomers — Nomenclature and abbreviated terms

## 1 Scope

This International Standard establishes a nomenclature system for thermoplastic elastomers based on the chemical composition of the polymer or polymers involved. It defines symbols and abbreviated terms used to identify thermoplastic elastomers in industry, commerce, and government. It is not intended to conflict with, but to supplement, existing trade names and trademarks.

NOTE 1 The name of the thermoplastic elastomer should be used in technical papers and presentations followed by the abbreviated term used to designate the elastomer in this International Standard.

NOTE 2 Annex A gives thermoplastic-elastomer abbreviated terms that have been used in the past in materials standards, technical bulletins, textbooks, patents, and trade literature.

## 2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.



ISO 1043-1, *Plastics — Symbols and abbreviated terms — Part 1: Basic polymers and their special characteristics*



ISO 1629, *Rubber and latices — Nomenclature*

## 3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

**3.1**
**thermoplastic elastomer**
**TPE**
polymer or blend of polymers that has properties at its service temperature similar to those of vulcanized rubber but can be processed and reprocessed at elevated temperature like a thermoplastic

Note 1 to entry: Thermoplastic rubber is a commonly used term for thermoplastic elastomer.

## 4 Nomenclature system

**4.1** The prefix TP is used to indicate that the abbreviated term is for a thermoplastic elastomer and shall be followed by a letter representing each category of thermoplastic elastomer, as detailed in Clause 5.

**4.2** The abbreviated term for each category of thermoplastic elastomer shall be followed, after a hyphen, by a combination of symbols to describe a specific member of each category, as detailed in Clause 6.

# 5 Categories of thermoplastic elastomer

## 5.1 TPA

Polyamide thermoplastic elastomer, comprising a block copolymer of alternating hard and soft segments with amide chemical linkages in the hard blocks and ether and/or ester linkages in the soft blocks.

## 5.2 TPC

Copolyester thermoplastic elastomer, consisting of a block copolymer of alternating hard segments and soft segments, the chemical linkages in the main chain being ester and/or ether.

## 5.3 TPO

Olefinic thermoplastic elastomer, consisting of a blend of a polyolefin and a conventional rubber, the rubber phase in the blend having little or no crosslinking.

## 5.4 TPS

Styrenic thermoplastic elastomer, consisting of at least a triblock copolymer of styrene and a specific diene, where the two end blocks (hard blocks) are polystyrene and the internal block (soft block or blocks) is a polydiene or hydrogenated polydiene.

## 5.5 TPU



Urethane thermoplastic elastomer, consisting of a block copolymer of alternating hard and soft segments with urethane chemical linkages in the hard blocks and ether, ester or carbonate linkages or mixtures of them in the soft blocks.



## 5.6 TPV

Thermoplastic rubber vulcanizate, consisting of a blend of a thermoplastic material and a conventional rubber in which the rubber has been crosslinked by the process of dynamic vulcanization during the blending and mixing step.

## 5.7 TPZ

Unclassified thermoplastic elastomer, comprising any composition or structure other than those grouped in TPA, TPC, TPO, TPS, TPU, and TPV.

# 6 Materials in each TPE category

## 6.1 Polyamide TPEs (TPAs)

The "TPA" group is sub-categorized into groups according to the linkages in the soft blocks. The following symbols are used:

**TPA-EE** soft segment with both ether and ester linkages;

**TPA-ES** polyester soft segment;

**TPA-ET** polyether soft segment.

## 6.2 Copolyester TPEs (TPCs)

The "TPC" group is sub-categorized into groups according to the linkages in the soft blocks. The following symbols are used:

**TPC-EE** soft segment with ester and ether linkages;

**TPC-ES** polyester soft segment;

**TPC-ET** polyether soft segment.

## 6.3 Olefinic TPEs (TPOs)

The "TPO" group varies according to the nature of the thermoplastic polyolefin being used and the rubber type.

A specific TPO is identified by a bracketed term comprising the standard abbreviated term for the rubber type (see ISO 1629), a "+" sign and the standard abbreviated term for the thermoplastic type (see ISO 1043-1). The thermoplastic and the rubber type shall be listed in decreasing order of abundance in the TPO.

A commercially available TPO type is described as follows:

**TPO-(EPDM+PP)** blend of ethylene-propylene-diene terpolymer with polypropylene, with no or little crosslinking of the EPDM phase, the amount of EPDM present being greater than that of PP.



## 6.4 Styrenic TPEs (TPSs)

The following symbols are used for the "TPS" group:



**TPS-SBS** block copolymer of styrene and butadiene;

**TPS-SEBS** polystyrene-poly(ethylene-butylene)-polystyrene;

**TPS-SEPS** polystyrene-poly(ethylene-propylene)-polystyrene;

**TPS-SIS** block copolymer of styrene and isoprene.

NOTE TPS-SEBS is a block copolymer of styrene and butadiene in which the soft block comprises a mixture of hydrogenated *cis*-1,4-polybutadiene and 1,2-polybutadiene units. TPS-SEPS is a block copolymer of styrene and isoprene in which the polyisoprene block has been hydrogenated.

## 6.5 Urethane TPEs (TPUs)

The "TPU" group is sub-categorized into types according to the nature of the hydrocarbon moiety (aromatic or aliphatic) between the urethane linkages of the hard blocks, and according to the chemical linkages (ether, ester, carbonate) in the soft blocks. The following symbols are used:

**TPU-ARES** aromatic hard segment, polyester soft segment;

**TPU-ARET** aromatic hard segment, polyether soft segment;

**TPU-AREE** aromatic hard segment, soft segment with ester and ether linkages;

**TPU-ARCE** aromatic hard segment, polycarbonate soft segment;

**TPU-ARCL** aromatic hard segment, polycaprolactone soft segment;

**TPU-ALES** aliphatic hard segment, polyester soft segment;

**TPU-ALET** aliphatic hard segment, polyether soft segment.