

SIMONA



tech.info
SIMONA® PE

GLOBAL THERMOPLASTIC SOLUTIONS

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1 Introduction

1.1 Properties

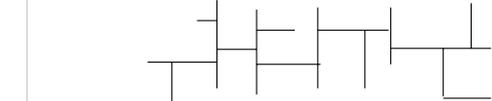
Polyethylene (PE) is classified according to various criteria: in addition to distinguishing between individual production methods (e.g. low- and high-pressure processes), polyethylene is generally categorised according to density, molecular weight and creep behaviour. Within this context, it is possible that various types of PE display different properties with regard to one of the aforementioned criteria, while they are identical in the two other areas.

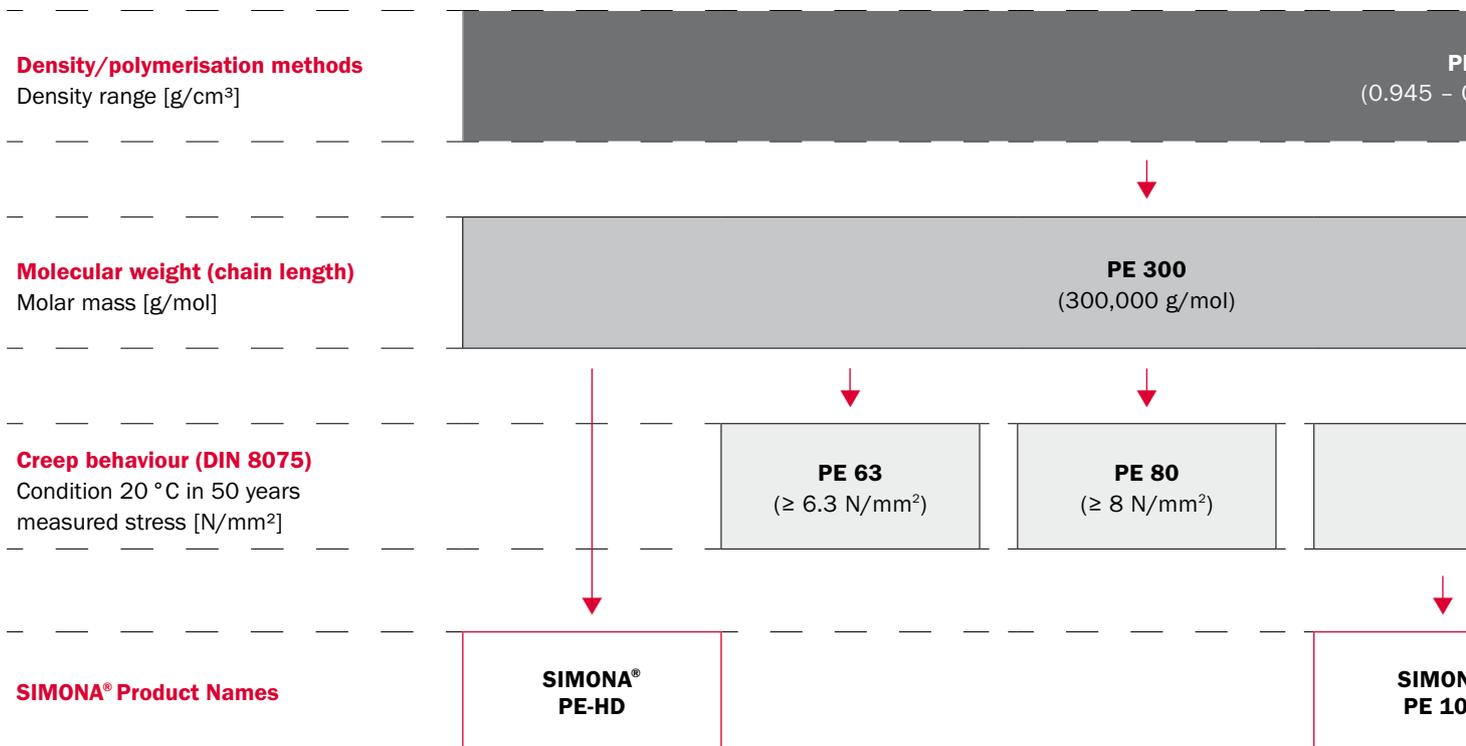
Density (= specific weight)

The density of PE is directly related to the crystallinity of the material. The higher its crystallinity, the higher the density. In turn, crystallinity is dependent on the structure of the molecular chains (e.g. the number and length of branches). The table shows the various density ranges together with their classification.

SIMONA® PE Semi-Finished Parts have a number of outstanding properties:

- High toughness (also at low temperatures)
- Low density (compared to other materials)
- High chemical resistance
- High corrosion resistance
- Good sliding properties
- Anti-adhesive properties, thus no incrustation
- High wear resistance
- Long service life
- Physiological safety
- Very low water absorption
- Universal application
- Excellent electrical insulation properties
- Good fabrication and processing capability
- High UV stability (PE-HD black/PE 100 black)

Abbreviation	Description	Density range g/cm ³	Molecular structure
PE-HD	High density	0.945 – 0.970	
PE-MD	Medium density	0.935 – 0.945	
PE-LD	Low density	0.915 – 0.935	
PE-LLD	Linear low density	0.915 – 0.935	
PE-VLD	Very low density	0.890 – 0.915	



1.2 Applications

Construction industry

- Concrete moulds
- Formwork for special-purpose concrete
- Window frames (skylights)
- Washbasins

Apparatus, equipment, machines

- Extraction systems
- Drip pans
- Battery cells
- Pickling baths
- Chemical piping
- Ventilators

Storage systems

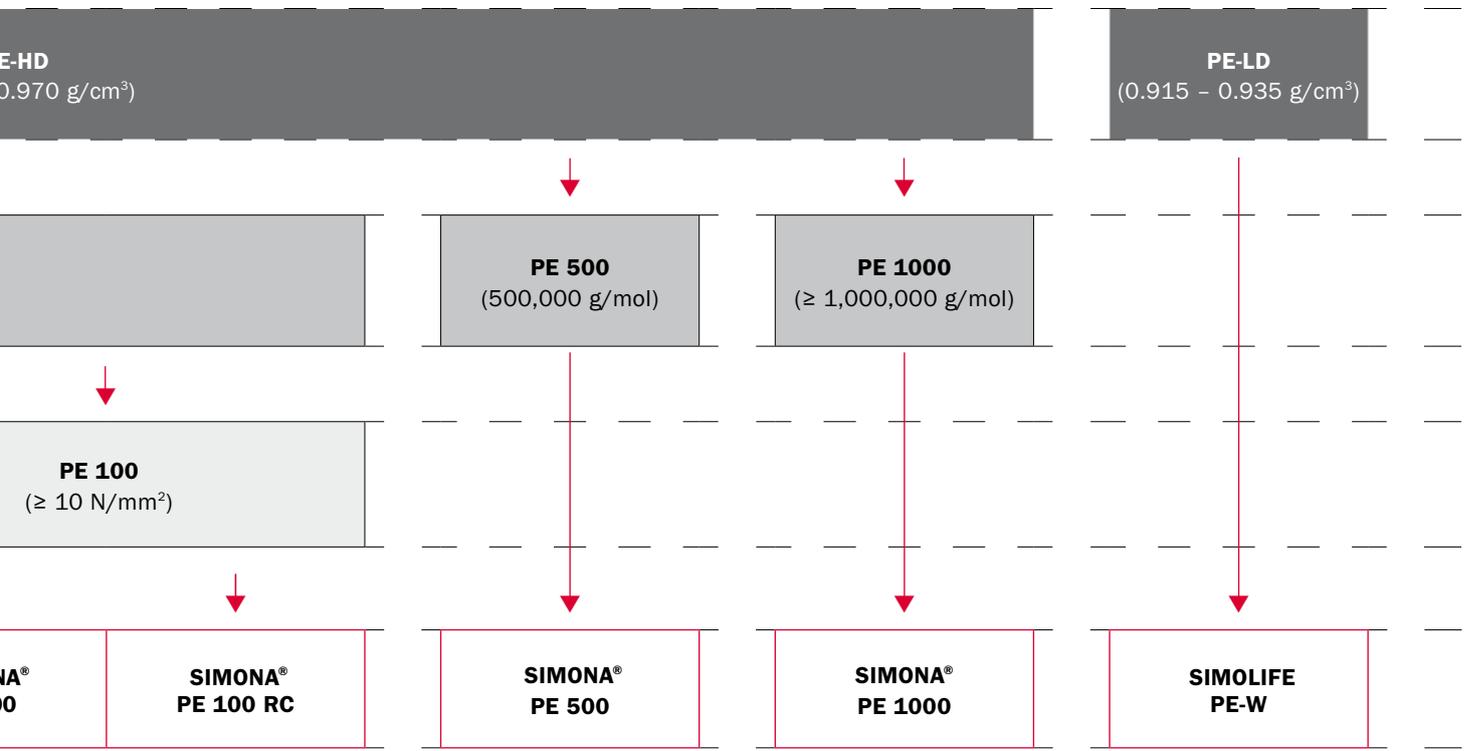
- Sorting boxes
- Transport pallets
- Packaging elements
- Toolboxes
- Shelves

Automotive industry

- Boot linings
- Motorcycle fenders
- Moulded seats
- Stone chip guards

Uses where physiological safety is required

- Inserts in deep freezers
- Stackable crates for cold stores
- Refrigeration truck linings
- Moulds, e. g. for ice cream, chocolate, cheese
- Prostheses and orthotic devices



1.3 Product range

For detailed information on the current product range of SIMONA® PE Semi-Finished Parts as well as other products, please visit www.simona.de.

Our sales team looks forward to assisting you:

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sales@simona.de

2 Technical information

2.1 Material specifications

Technical data

	SIMONA® PE 100 black	SIMONA® PE 100 natural	SIMONA® PE-HD black	SIMONA® PE-HD natural	SIMONA® PE 500
Density, g/cm ³ , DIN EN ISO 1183	0.96	0.96	0.96	0.95	0.95
Yield stress, MPa, DIN EN ISO 527	23	23	23	23	28
Elongation at yield, %, DIN EN ISO 527	9	9	9	9	8
Tensile modulus of elasticity, MPa, DIN EN ISO 527	1,100	1,100	1,100	1,100	1,100
Impact strength, kJ/m ² , DIN EN ISO 179	no break				
Notched impact strength, kJ/m ² , – DIN EN ISO 179	25	21	16	16	–
– DIN EN ISO 11542-2	–	–	–	–	18
Ball indentation hardness, MPa, DIN EN ISO 2039-1	40	40	43	43	–
Shore hardness D (15 s), DIN EN ISO 868	64	64	65	65	65
Mean coefficient of linear thermal expansion, K ⁻¹ , ISO 11359-2	1.8 x 10 ⁻⁴				
Thermal conductivity, W/m · K, DIN 52612	0.38	0.38	0.38	0.38	0.38
Fire behaviour, DIN 4102	B2 normal flammability (self-assessment without test certificate)				
Dielectric strength, kV/mm, DIN IEC 60243-1	47	47	–	–	44
Specific surface resistance, Ohm, DIN IEC 60093	≥ 10 ¹⁴				
Volume resistivity (annular electrode), Ohm · cm, DIN IEC 60093	> 10 ¹⁴				
Temperature range, °C	-50 to +80	-50 to +80	-50 to +80	-50 to +80	-100 to +80
Chemical resistance	excellent in contact with many acids, alkalis and solvents				
Physiologically safe	BfR	✓	✓	✓	✓
Food conformity	EU	✓	✓	✓	✓ ^①
	FDA		✓		✓ ^②

① In the colours natural, black, green, dark blue, light blue, red, yellow, red brown and grey.

② In the colours natural and green.

All specifications are deemed to be approximate values in respect of the specific material and may vary depending on the processing methods used. In general, data specified applies to average values measured on extruded sheets with a thickness of 4 mm. In the case of sheets manufactured by means of pressing, testing is generally performed on sheets with a thickness of 20 mm. Deviations from the values specified are possible if the sheets in this thickness are not available. In the case of backed sheets, all technical specifications relate to the non-backed base sheets. Information presented herein is not necessarily applicable to other products (e.g. pipes, solid rods) of the same material or products that have undergone downstream processing. Suitability of materials for a specific field of application must be assessed by the party responsible for processing or the end-user. All technical specifications presented herein are designed merely to provide assistance in terms of project planning. They do not constitute a guarantee of specific properties or qualities. For further information, please contact our Technical Service Centre at tsc@simona.de.

2.2 Fire behaviour

SIMONA® PE Semi-Finished Parts are normal-flammability construction materials in accordance with DIN 4102 B2.

- Auto-ignition temperature approx. 350 °C
- Oxygen index approx. 18 % (minimum oxygen concentration required for combustion)

Please refer to Section 6 for the EC Safety Data Sheet.

2.3 Performance in outdoor use

- SIMONA® PE-HD black und SIMONA® PE 100 black specially stabilised for outdoor use
- SIMONA® PE-HD natural and SIMONA® PE 100 natural suitable solely for indoor use
- SIMONA® PE 500 suitable solely for indoor use

However, service life is dependent not only on the actual formula. Other factors include

- fabrication processes
- processing conditions
- the design of fittings

and the resulting states of stress.

SIMONA® PE 100 black has produced excellent results in outdoor applications for many years now. By adding special grades of carbon black (approx. 2%), it is possible to very effectively increase the light and weather resistance and counteract the damaging impact of ultraviolet radiation in sunlight in conjunction with atmospheric oxygen. Outdoor applications usually allow a life expectancy of 10 years or more for PE 100 black parts.

2.4 Physiological safety

According to Recommendation III by the German “Federal Institute for Risk Assessment” (BfR, previously BgVV) there are no reservations about using SIMONA® PE Semi-Finished Parts for manufacturing commodities as defined by Section 2, paragraph 6, no. 1 of the German Food, Commodities and Feed-stuffs Act (LFGB, in the version published on 26 April 2006 in the German Federal Gazette I, p. 945).

All the monomers and additives used are listed in European Directive 2002/72/EC and addenda.

2.5 Chemical resistance

Owing to the non-polar nature of SIMONA® PE Semi-Finished Parts, these thermoplastics (at temperatures of approx. 20°C) display a high level of chemical resistance to the following substances:

- Salts (aqueous solutions)
- Acids
- Alkalis
- Alcohols
- Various solvents
- Fats
- Oils
- Waxes

In continuous contact with these media a small amount of swelling may occur. However, this does not generally affect the operational capability of these materials.

There is limited chemical resistance (swelling) to:

- Aromatic compounds
- Halogenated hydrocarbons

There is no chemical resistance to strong oxidants such as:

- Nitric acid
- Chromic acid
- Halogens

Consequently, there is a higher risk of stress cracks, especially in the region of weld seams.

For detailed information, please refer to our SIMCHEM database on chemical resistance of our materials (www.simchem.de).

2.6 Water absorption

SIMONA® PE Semi-Finished Parts generally absorb negligible quantities of water. Therefore, they do not swell when immersed in water.

In the special application of extruder welding, moisture can have an impact on welding results. Due to the geometry (surface area in relation to volume) and the extruder processing conditions, even very small amounts of water can be enough to prevent the welding seam from being made in an optimal manner (see work.info Welding).

2.7 Temperature range

The service temperature ranges of SIMONA® PE Semi-Finished Parts are as follows*:

Temperature ranges

	PE
Continuous service temperature	-50 to +70 °C
Without any significant mechanical stress in air as the ambient medium	up to +80 °C
Crystalline melting temperature	approx. +130 °C

* The above figures do not apply to applications in tanks – such cases are subject to special design rules that have to be agreed on an individual basis.

2.8 Resistance to microorganisms

SIMONA® PE Semi-Finished Parts do not constitute a source of nutrition for:

- Microorganisms
- Bacteria
- Fungi
- Spores
- Gnawing insects

2.9 Health aspects

As far as its chemical composition is concerned, PE essentially only contains carbon and hydrogen. During combustion – provided there is a supply of atmospheric oxygen – carbon dioxide, carbon monoxide and water are virtually the only substances to be produced, accompanied by very small quantities of soot and low-molecular-weight volumes of the respective plastics. The ratio of carbon dioxide to carbon monoxide depends largely on the circumstances of combustion – temperature, ventilation and an unobstructed supply of atmospheric oxygen. Consequently, the combustion fumes that develop resemble those of stearin (candle wax).

The general debate about the toxicity of fumes from burning plastics often fails to mention that all combustion fumes have a toxic effect. Therefore, any claim that plastics exposed to fire develop particularly toxic gases is incorrect.

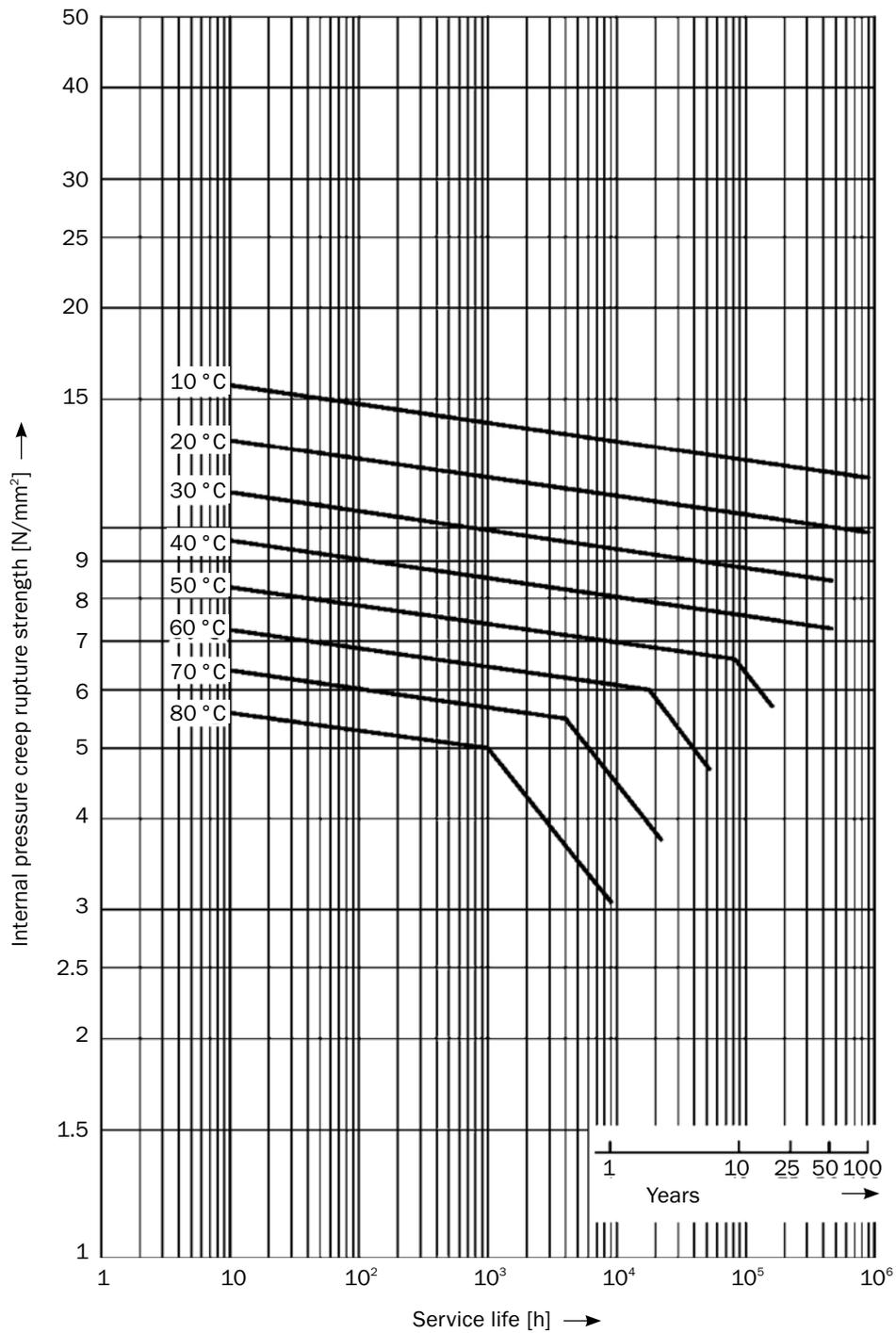
The most suitable extinguishment to combat burning PE is water.

2.10 Tank construction requiring mandatory test certificates

SIMONA® PE 100 has been approved by the German Institute of Building Technology (DIBt) in Berlin for use in tank construction requiring mandatory test certificates.

On the following page you will find the creep strength data required by DIN 8075 for PE 100 when calculating tanks and components in accordance with DVS Guideline 2205 Part 1. With the aid of this creep curve it is possible to determine the amount of stress for a specified service life and service temperature.

However, the levels of stress that have been calculated in this way do not take into account the actual loads in practice, which are caused by more or less aggressive media and welding methods. These must then be determined separately (see also DVS Guideline 2205 Part 1, Media Lists of the German Institute of Building Technology, Berlin).



Reference characteristics of internal pressure creep rupture strength (minimum curves) for pipes made of PE 100

3 Processing information

For further information on processing, please refer to our work.infos:

- Welding
- Thermoforming, Vacuum Forming, Deep-drawing, Hot-forming, Bending
- Machining
- Adhesive Bonding
- Lining and Composite Construction

These and other publications you can find free of charge in our download centre at www.simona.de/download.

4 Storage

General information on how to store SIMONA® Semi-Finished Plastic Parts

- SIMONA® Semi-Finished Plastic Parts should always be stored in a building devoid of moisture, sudden temperature fluctuations and direct sunlight.
- Packaging straps should, where possible, be loosened after transport. If the packaging is new, steel straps should preferably not be used.
- Exposure to a heat source from one side should be avoided.
- PVC products, welding rods and electrically conductive plastics should be protected against moisture.
- Non-UV-stabilised materials should be protected against direct sunlight.
- For storage, it is advisable to use plastic film to protect against dust.
- Sheet products should be stored on a sturdy, flat pallet that provides ample support and is at least as large as the size of the sheet. Single sheets should be stored horizontally.
- A liner (made of cardboard for example) placed between the pallet and the semi-finished plastic parts is recommended.
- If a block of pallets is assembled one on top of the other, we recommend placing a pallet upside down in between in order to improve load distribution.
- Special caution is required with blocks if the sheets are thin and/or foamed material is being stored.

5 Legal note and advice

Legal note

Upon publication of a new edition all previous editions shall become void. The authoritative version of this publication can be found on our website at www.simona.de.

All information furnished in this publication reflects our current scope of knowledge on the date of publication and is designed to provide details of our products and potential fields of application (errors and omissions excepted, including typographical mistakes). This shall not be deemed as constituting the provision of legally binding guarantees or warranties as to specific properties of the products or their suitability for specific areas of application.

We provide warranty for the faultless quality of our products solely within the framework of our Standard Terms and Conditions of Business and only within the scope specified therein.

We shall assume no liability for the application, utilisation, processing or other use of this information or of our products. Furthermore, we shall assume no liability for any consequences related thereto. The purchaser is obliged to examine the quality and properties of these products; he shall be responsible in full for selecting, applying, utilising and processing said products as well as applying any information relating thereto, which shall also include all consequences associated with such actions. Third-party property rights shall be observed accordingly.

Advice

Our applied technical advice is given according to our best knowledge and is based on the information you have provided and the state of the art known to us at the time such advice is furnished. The advice shall not constitute a guarantee or warranty of specific characteristics or qualities and shall not establish an independent contractual legal relationship.

We are only liable for intent or gross negligence. Under no circumstances shall we be held liable for the correctness or completeness of information you have provided or the advisory/consulting services rendered by us on the basis of such information. Any information provided by us shall not release you from your obligation to conduct your own assessments and evaluations.

We reserve the right to update information without notice as part of our continuous research and development programme.

Our sales staff and members of the Technical Service Centre look forward to advising you on all issues relating to the processing and application of semi-finished thermoplastics.

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6 EC Safety Data Sheet

in accordance with 1907/2006/EC Article 31

Trade names: **SIMONA® PE 100, SIMONA® PE-HD, SIMONA® PE 500**

1. Identification of substance/preparation and company

- Manufacturer details:
SIMONA AG
Teichweg 16
55606 Kirn
Germany
Phone +49(0)67 52 14-0
Fax +49(0)67 52 14-211
-

2. Hazards identification

- none known
-

3. Composition/information on ingredients

- Chemical characteristics: polymer of ethylene
 - CAS number: not required
-

4. First-aid measures

- General information: no medical aid required
 - First-aid measures: none
 - Routes of exposure: none
 - Symptoms/effects: none
-

5. Fire-fighting measures

- Suitable extinguishing media: water mist, foam, fire extinguishing powder, carbon dioxide
 - Hazard warning notice: not applicable
-

6. Accidental release measures

- Person-related measures: none
 - Environmental protection measures: not applicable
 - Cleaning equipment: not applicable
 - Unsuitable cleaning products: not applicable
-

7. Handling and storage

- Handling: no special regulations to be observed
 - Storage: storage for an unlimited period
-

8. Exposure controls/personal protection

- Special design of technical processing systems: not required
 - Exposure limit values: none
 - Exposure measurement procedures: none
 - Respiratory protection: not required
 - Eye protection: not required
 - Body protection: not required
-

9. Physical and chemical properties

	PE 100	PE-HD	PE 500
Appearance	solid state, semi-finished part	solid state, semi-finished part	solid state, semi-finished part
Colour	black, natural	black, natural	natural
Odour	not applicable	not applicable	not applicable
Temperature range	-50 to +80 °C	-50 to +80 °C	-100 to +80 °C
Flash point	not applicable	not applicable	not applicable
Density	0.96 g/cm ³	0.95 g/cm ³	0.95 g/cm ³

10. Stability and reactivity

- Thermal decomposition: above approx. 300 °C
- Hazardous decomposition products:
Combustion is accompanied not only by soot but also by carbon dioxide, water and low-molecular-weight constituents of the PE; carbon monoxide may be produced if combustion is incomplete
- Use of stabilisers: none
- Exothermic reactions: none
- Notices regarding the physical form: none
- Conditions to be avoided: none
- Substances/media to be avoided: none

11. Toxicological information

During extensive use of this product over many years there have been no reports of any harm to health.

12. Ecological information

Non-biodegradable, insoluble in water, no detrimental effects on the environment are to be expected.

- Mobility: not applicable
- Accumulation: not applicable
- Eco-toxicity: not applicable

13. Disposal considerations

Can be recycled or disposed of with household refuse (observe local regulations).

- Waste code for unused product:
EWC Code 120 105
- Designation of waste: polyolefin waste

14. Transport information

No hazardous product as defined by transport regulations.

- Notice/symbol transport containers: none
- Special marking for containers: none

15. Regulatory information

- Labelling according to GefStoffV/EC:
no labelling obligation
- Water pollution classification:
Class 0 (self-classification)
- Specific national requirements: none

16. Other information

This information solely describes the safety requirements of the product(s) and is based on our current state of knowledge. It does not give any assurance concerning the product(s) described within the meaning of statutory warranty regulations.

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