

# prod.info

SIMONA<sup>®</sup> PE 500/SIMONA<sup>®</sup> PE 1000

June 2015



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	<b>SIMONA worldwide</b>	

# 1 Introduction

## 1.1 Properties of SIMONA® PE 500/ SIMONA® PE 1000

The properties of polyethylene are determined primarily by the chain length (degree of polymerisation).

In comparison to the standard polyethylene types SIMONA® PE-HWU and SIMONA® PE-HWST (M = 250,000 g/mol), SIMONA® PE 500 and SIMONA® PE 1000 have a higher molar mass (M), which can be determined using various methods. The viscosimetric method gives a value of approx. 1.2 million g/mol for SIMONA® PE 1000, while the figure calculated by means of the light scattering method is four times as high for the same material. Today, the molar mass is in many cases specified as molar mass calculated on the basis of viscometric measurements:

### Mean molar mass

SIMONA® PE 1000	4.4 – 10.5 million g/mol
SIMONA® PE 500	500,000 g/mol

In international parlance, SIMONA® PE 500 is referred to as PE-HMW (high molecular weight) and SIMONA® PE 1000 is referred to as PE-UHMW (ultra-high molecular weight).

As the molecular weight increases, a number of properties improve in the high molecular types of PE, e.g. notched impact strength, stress crack resistance and expected service life. A decrease in rigidity and in abrasion is likewise dependent on increasing chain length, while the electrical properties and chemical resistance are generally independent of the molecular weight. The high molecular weight of SIMONA® PE 500 and SIMONA® PE 1000 translates into outstanding material-specific properties.

In addition to the general characteristics of standard PE-HD, such as

- good resistance to stress cracks,
- no water absorption,
- suitability for contact with foodstuffs,
- very good electrical and dielectric properties,
- good workability and processability,

SIMONA® PE 500 and SIMONA® PE 1000 possess properties such as

- high impact strength and notched impact strength,
- high tensile strength at break and elongation at break,
- outstanding long-term behaviour,
- good slip properties (prevents caking),
- high abrasion resistance,
- high degree of toughness and usability even at low temperatures.

The information provided in this prod.info for SIMONA® PE 500 also applies to SIMONA® PE-HML 500 (also see prod.info SIMONA® PE).

## **1.2 Applications for SIMONA® PE 500/ SIMONA® PE 1000**

### **Mechanical engineering/transport, conveying and storage technology/packaging and filling systems**

- Profiles
- Guide elements (chain and belt guides, curves and guide rails)
- Shafts (dashers, bearing shafts)
- Distributors
- Sliding elements (sliding rings, chain guides)
- Anti-vibration spacers
- (Collar) bearing bushings
- Pump bodies
- Cylindrical, worm and ball gears
- Split and roller bearings
- Supporting rails
- Deflection devices/pulleys
- Clamping devices
- Star wheels
- Bulk handling systems

### **Port and marine fender industry**

- Fender plates
- Cylindrical fenders
- Pier cladding
- Protective elements for locks
- Protective elements for bridges
- Ram protection strips
- Lock gate reinforcements

### **Food industry**

- Juicers
- Filtration systems
- Keg washing systems
- Scrapers
- Bottle washers
- Disgorging systems
- Washers for fruit vats
- Cutting boards
- Chopping blocks
- Work surfaces
- Insert panels for work tables
- Surface coverings in industrial kitchens and cold stores
- Insert panels in vacuum packing machines
- Food moulds

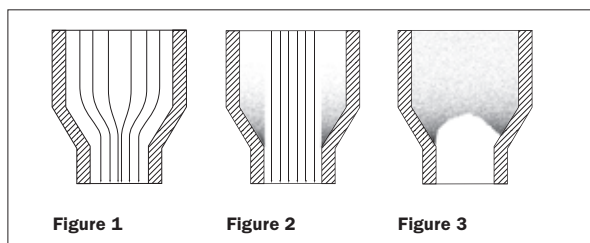
The good slip properties of SIMONA® PE 500 and SIMONA® PE 1000 significantly improve the flow characteristics of bulk materials. This helps to reduce the number of disruptions in operation due to caking or freezing.

## Application in bunker and silo design

For bulk goods such as coal, salt, gravel, gypsum, etc. bunkers and silos are the simplest and most economical type of storage. Due to caking and bridging, however, faults can occur in the discharge process – even in the case of optimal system design. Normally, the bulk material is discharged across the entire bunker cross-section (mass flow, see Figure 1).

Due to narrowing of the cross-section and an unfavourable friction ratio, the mass flow shifts to a funnel flow (see Figure 2).

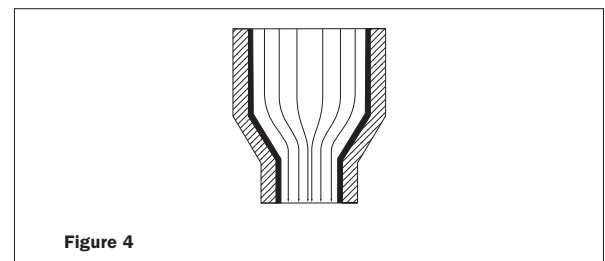
The additional incoming material compacts and forms a dome, which is positioned on the inclined planes of the bunker (bridge, see Figure 3).



Such disruptions have adverse effects on operations, as removing the material bridge is time-consuming and there is also a danger of dust explosions.

## Lining

Lining the bunker or silo with SIMONA® PE 500 and SIMONA® PE 1000 helps to avoid disruptions (see Figure 4). Sheets from 8 to 20 mm thick in standard dimension 2000 x 1000 mm are particularly popular. Our product range also includes other sizes, i.e. the sheet dimension can be adapted to the building or installation.

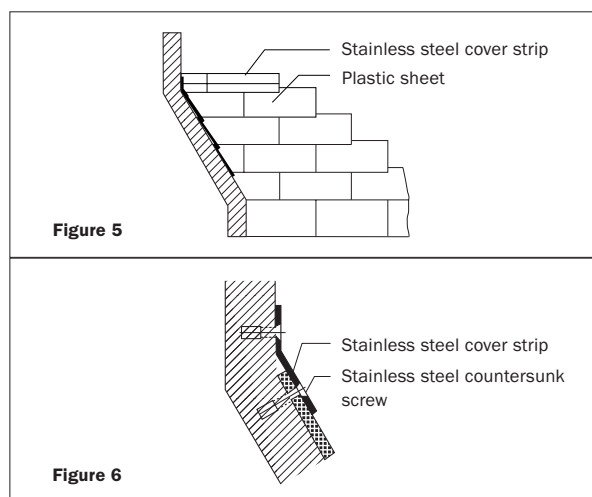


The lining costs quickly pay for themselves thanks to the considerably improved material flow. The service life of the lining is generally much longer than the period of amortisation. This is attributable to the low level of wear, which in turn is due to the very high abrasion resistance of the high-molecular-weight polyethylene sheets.

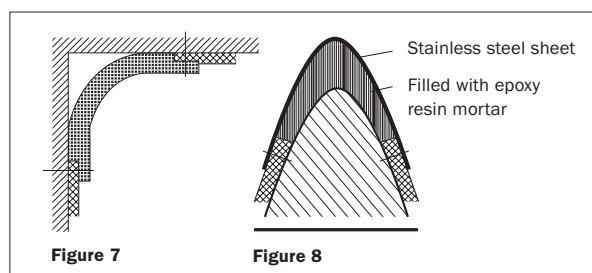
When filling the bunker, one wall is often more highly stressed than the others. In order to achieve a roughly identical service life of the entire lining, the wall thickness on this side is increased by up to 5 mm.

## Arrangement of the sheets

The sheets are laid horizontally from bottom to top. We recommend offsetting the vertical joints of the sheets and milling the horizontal edges of the sheets at an angle of 45°. This saves overlapping the sheets in the flow direction of the bulk material and prevents infiltration by the bulk material. The top row of sheets is protected from infiltration by bulk material by a stainless steel end strip (Figures 5 and 6).



The corners should be as rounded as possible, as there is a risk of caking on sharp angles. The sheets are heated with a gas flame before bending. For thicker walls, specialist companies offer prefabricated semi-circular arches (Figure 7).



Covering the upper edge with stainless steel protects the bunker saddles from damage caused by the impact of the bulk material (Figure 8).

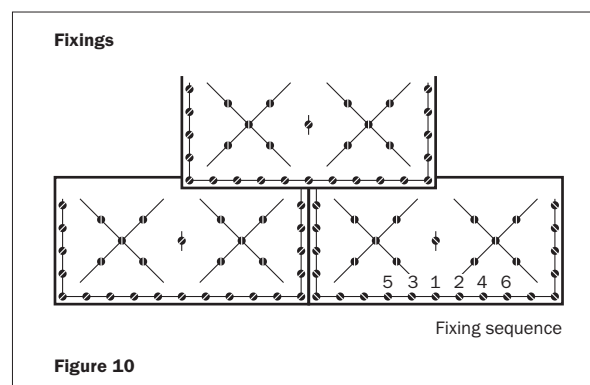
## Fixing the sheets

The fixing material should always comprise stainless steel.

**Figure 9: Steel vs. concrete**

Steel bunker	Concrete bunker
Time-saving connection with head bolts is most common. Generally, K8/60 bolts are recommended (60 mm long).	Bolting on with stainless internally threaded bolts is the most frequently used method for concrete bunkers.
Riveting	Connecting with K8/30 head bolts is only recommended for concrete with a good, even consistency; this must be checked beforehand.
Bolting on with carriage bolts and countersunk head bolts	Bolting on with brass expansion plugs

The number and distribution of the fixing material depends on requirements. As a rule of thumb, approx. 25 fixing points are used per m<sup>2</sup> of concrete and approx. 20 fixing points per m<sup>2</sup> of steel. The most suitable distribution is illustrated in Figure 10. A distance of max. 30 mm must be maintained from the edge of the plastic sheet, and the spacing between the edge holes should be approx. 200 mm.

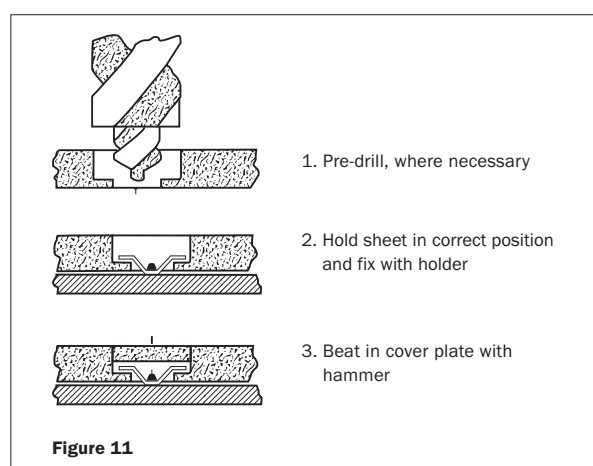


## Bolting

Sheet thickness	Sheet preparation	Head bolt	Cartridges	Remarks
8 – 15 mm	Countersink with bolt head diameter	22 mm	Calibre 6.3 mm	Straight bolt guidance; bolt penetration depth up to approx. 1/3 of sheet thickness
20 – 30 mm	Drill through with bolt shaft diameter	32 mm		

Tests were performed by connecting SIMONA® PE 1000 to 10 mm steel.

When bolting thicker sheets, mechanical preparation of the lining material is recommended for optimal fixing (see table above).



When storing or transporting warm/hot (bulk) materials, SIMONA® PE 500 and SIMONA® PE 1000 expand as the temperature increases, like almost all materials. To avoid bulges resulting from thermal stresses, the creation of tolerance spaces in the fixing points is recommended (Figure 11).

## Material selection criteria

The extraction, transport, size reduction and downstream processing of solid, granular materials results in abrasive wear of the system parts. This process mainly occurs in the “micro range”. The extent of wear is dependent on a wide range of influencing factors.

The following can be used as a rule of thumb for application:

SIMONA® PE 500 is predominantly used for solving problems relating to slide/slip properties. By contrast, SIMONA® PE 1000 is best suited to applications that include handling of extremely sharp-edged coarse grains.

Any occurring wear problem can be analysed in greater detail where a wide range of information on influencing variables is available.

In practice, system linings should be checked at regular intervals in order to detect any changes in the requirement profile or to determine the degree of wear.

## 2 Product range

For detailed information on the current product range of SIMONA® PE 500/SIMONA® PE 1000 as well as other products, please visit [www.simona.de](http://www.simona.de).

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## 3 Technical information

### 3.1 Material specifications

		SIMONA® PE 500	SIMONA® PE 1000
<b>Technical data</b>			
Density, g/cm <sup>3</sup> , DIN EN ISO 1183		0.96	0.93
Yield stress, MPa, DIN EN ISO 527		28	19
Elongation at yield, %, DIN EN ISO 527		8	11
Tensile modulus of elasticity, MPa, DIN EN ISO 527		1,100	700
Impact strength, kJ/m <sup>2</sup> , DIN EN ISO 179		no break	no break
Notched impact strength, kJ/m <sup>2</sup>	DIN EN ISO 179	—	—
	DIN EN ISO 11542-2	18	180
Ball indentation hardness, MPa, DIN EN ISO 2039-1		—	30
Shore hardness D, DIN EN ISO 868		66	60
Mean coefficient of linear thermal expansion, K <sup>-1</sup> , ISO 11359-2		1.8 x 10 <sup>-4</sup>	1.8 x 10 <sup>-4</sup>
Thermal conductivity, W/m · K, DIN 52612		0.38	0.38
Fire behaviour, DIN 4102		normal flammability	normal flammability
Dielectric strength, kV/mm, DIN IEC 60243-1		44	44
Specific surface resistance, Ohm, IEC 60093		> 10 <sup>14</sup>	> 10 <sup>14</sup>
Temperature range, °C		- 100 to + 80	- 260 to + 80
Chemical resistance		excellent in contact with many acids, alkalis and solvents	
Physiologically safe	BfR	✓	✓
	EU	✓	✓
	FDA	✓	✓

The figures are approximate and may vary depending on fabrication processes and how test specimens are made. 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. Please note that this information is not necessarily applicable to products that have undergone downstream processing. The suitability of a material for a specific area of application must be checked by the processor or 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.

### 3.2 Fire behaviour

SIMONA® PE 500 and SIMONA® PE 1000 are classified as materials with normal flammability levels (B2) according to DIN 4102. The ignition temperature is approx. 350°C. Polyethylene continues burning even after removal of the ignition source and produces burning droplets.

Please refer to Section 7 for the EC Safety Data Sheet.

### 3.3 Performance in outdoor use

SIMONA® PE 500 (natural) and SIMONA® PE 1000 (natural) are not specially stabilised for outdoor use and are therefore only intended for indoor use. In the case of SIMONA® PE 500 (black), light and UV resistance are particularly high thanks to the addition of special types of soot. In addition to the formula, fabrication methods, fabrication conditions and the design of the fittings have a significant influence on the material's service life. In this context, special attention must be paid to the stress conditions in the specific part.

### 3.4 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 500 and SIMONA® PE 1000 for manufacturing commodities as defined by Section 2, paragraph 6, no. 1 of the German Food, Commodities and Feedstuffs Act (LFGB, as amended by an Announcement 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.

Furthermore, SIMONA® PE 500 and SIMONA® PE 1000 are manufactured from raw materials that meet the requirements of the "Food and Drug Administration" (FDA) in the United States (Code of Federal Regulations, title 21, chapter 1, part 177.1520) for contact with foods.

### 3.5 Chemical resistance

Owing to the non-polar nature of SIMONA® PE 500 and SIMONA® PE 1000, these thermoplastics (at temperatures of approx. 20°C) display a high level of chemical resistance to the following substances:

- Salts (aqueous solutions)
- Acids
- Alkalies
- 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.

### 3.6 Water absorption

SIMONA® PE 500 and SIMONA® PE 1000 generally absorb negligible quantities of water. Therefore, they do not swell when immersed in water. The properties of SIMONA® PE 500 and SIMONA® PE 1000 are not dependent on the moisture content of the environment.

### 3.7 Temperature range

Due to their extreme toughness, SIMONA® PE 1000 can be used in continuous operation from –260 °C to +80 °C and SIMONA® PE 500 from –100 °C to +80 °C. An extension of the upper operating temperature by approx. 10 % is permissible if the finished parts are not subjected to substantial mechanical loads. The crystalline melting range of SIMONA® PE 500 and SIMONA® PE 1000 is between 130 °C and 135 °C.

### 3.8 Resistance to microorganisms

SIMONA® PE 500 and SIMONA® PE 1000 do not constitute a source of nutrition for:

- Microorganisms
- Bacteria
- Fungi
- Spores
- Gnawing insects

### 3.9 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).

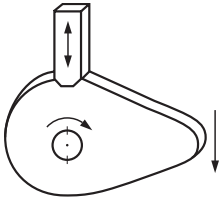
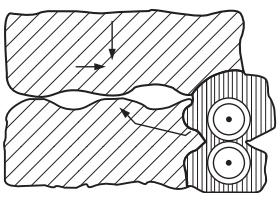
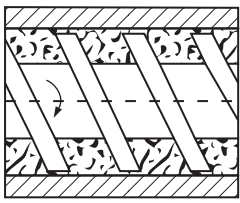
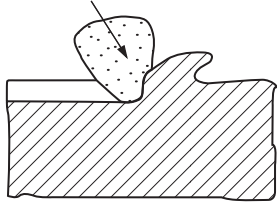
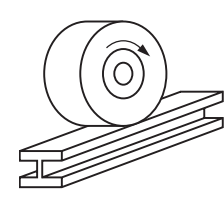
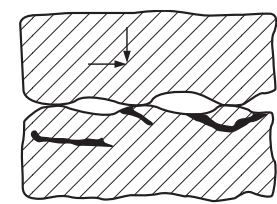
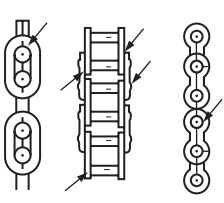
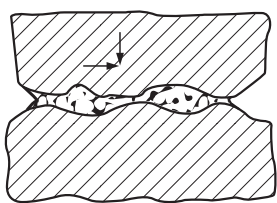
The general debate about the toxicity of fumes from burning plastics often fails to mention that all combustion fumes have a toxic effect. Therefore, any claim that plastics exposed to fire develop particularly toxic gases is incorrect.

The most suitable extinguishment to combat burning PE is water.

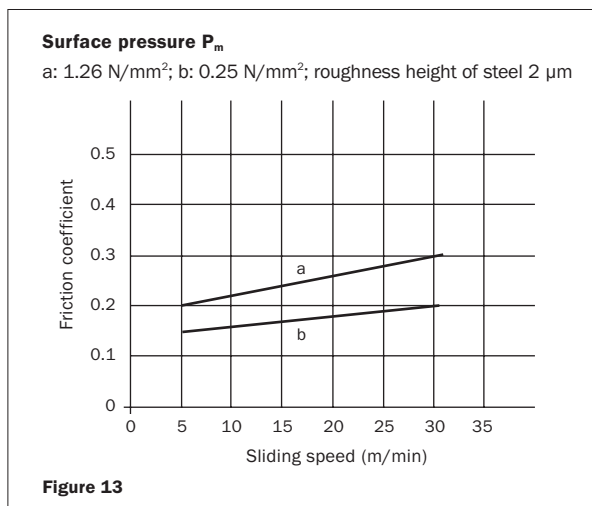
### 3.10 Sliding and wear characteristics

In many sectors of industry certain types of stress cause considerable wear relating to structural parts, thus resulting in functional and financial issues:

**Figure 12: Types of wear**

<b>Adhesion</b> (Sliding wear)		
<b>Abrasion</b> (Grooving wear)		
<b>Surface fatigue</b> (Rolling contact wear)		
<b>Tribochemical reaction</b> (Vibration wear)		

SIMONA® PE 500 and SIMONA® PE 1000 display favourable sliding characteristics (low friction coefficient thanks to anti-adhesive properties) and are therefore particularly suited to applications that require low friction or wear.



Source: Fein, Kunz: Neue Konstruktionsmöglichkeiten mit Kunststoffen, Volume 2, Part 9, Chapter 18, May 91, Weka-Fachverlage, Kissing

The wear of a sliding element can also be specified as wear per distance travelled. If using SIMONA® PE 1000 for bearing bushes, adequate heat removal should be ensured.

Various test methods are used to determine the wear resistance of materials (e.g. Taber abrasion, steel wear method). The Sand Slurry method has proved most suitable for differentiation in the plastics sector, especially for polyethylenes.

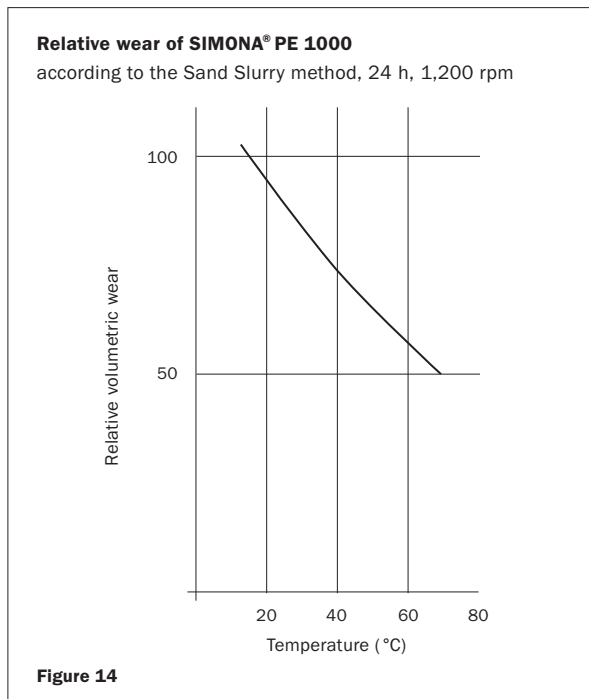
The tested materials differ considerably in their density, which is why the data is specified as “relative volumetric wear”. The wear value of Hostalen GUR 4120 was arbitrarily set to 100 and all other data related to this.

#### Wear behaviour of different materials

	Density g/cm <sup>3</sup>	Relative wear Sand Slurry* 24 h, RT, 1200 rpm
SIMONA® PE 1000	0.93	100
Hostalen GUR 4120	0.94	100
Cast polyamide	1.14	150
Polyamide 6/6	1.13	160
ST 37	7.45	160
SIMONA® PE 55	0.94	200
Polyamide 12	1.02	260
SIMONA® PE-HML 500	0.95	310
SIMONA® PE-HWST	0.95	450
SIMONA® PE-HWU	0.96	600
PTFE	2.26	530
Polyethylene terephthalate	1.40	610
Polyoxymethylene	1.42	700
SIMONA® PP-C	0.91	700
SIMONA® PVDF	1.78	700
SIMONA® SIMREC PE	0.96	800
SIMONA® PP-DWU AlphaPlus®	0.92	850
SIMONA® PP-DWST	0.91	850
Polyvinyl chloride - normal impact strength	1.44	920
- increased impact strength	1.42	1,000
PMMA	1.31	1,800
Pertinax (phenolic resin)	1.40	2,500
Beechwood	0.83	2,700
Epoxy resin/silica flour 1:1	1.53	3,400

\*Method according to J. Berzen, Hoechst AG, Oberhausen

As the temperature increases, the relative wear of SIMONA® PE 500 and SIMONA® PE 1000 decreases, as both materials show (rubber-)elastic behaviour and detachment of particles is impeded.



Wear measurements according to the Sand Slurry test indicate outstanding wear resistance of SIMONA® PE 500 and SIMONA® PE 1000, also in comparison to other materials. As this figure is dependent on several factors, laboratory tests are of limited value. A test under practical conditions gives a precise picture of the suitability for use, thanks to the multitude of parameters available.

## 4 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

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[www.simona.de](http://www.simona.de)

## 5 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.

Under such conditions long-term storage of SIMONA® Semi-Finished Plastic Parts will be no problem.



## 6 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](http://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 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.

We provide warranty for the faultless quality of our products within the framework of our Standard Terms and Conditions of Sale.

### 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. 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 Center look forward to advising you on all issues relating to the processing and application of semi-finished thermoplastics.

Phone +49(0)67 52 14-587

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# 7 EC Safety Data Sheet (page 1)

in accordance with 1907/2006/EC Article 31

Trade names: **SIMONA® PE 500, SIMONA® PE 1000**

## 1. Identification of substance/preparation and company

- Manufacturer details:  
SIMONA AG  
Teichweg 16  
D-55606 Kirn  
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

## 7 EC Safety Data Sheet (page 2)

in accordance with 1907/2006/EC Article 31

Trade names: **SIMONA® PE 500, SIMONA® PE 1000**

### 9. Physical and chemical properties

	<b>SIMONA® PE 500</b>	<b>SIMONA® PE 1000</b>
Appearance	solid state, semi-finished part	solid state, semi-finished part
Colour	natural, black, green	natural, black, green, grey, skin-coloured
Odour	not applicable	not applicable
Crystalline melting range	130 - 135 °C	130 - 135 °C
Flash point	not applicable	not applicable
Density	0.96 g/cm <sup>3</sup>	0.93 g/cm <sup>3</sup>

### 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.

## 8 Form for the lining of bulk material and conveyor systems

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tsc@simona.de

### Customer

Street

Postal Code/Town

Phone

Fax

E-Mail

### Contact person

Phone

Fax

E-Mail

### Project description

☐ Truck cargo area ☐ Shaking conveyor

Silo: ☐ Infeed unit

☐ Round ☐ Funnel

☐ Square ☐ Butterfly valve

☐ Rectangular ☐ Excavator trough lining

☐ Opening/outlet ☐ Chute

☐ Asymmetric ☐ Rail wagon

Miscellaneous

### Geometries (in mm)

L = W= H=

Ø = Max. filling height =

Inlet angle (to the vertical) = °

Outlet angle (to the vertical) = °

### Operating conditions

☐ Outdoor applications ☐ Indoor applications

Loading:

☐ Continuous ☐ Discontinuous

Unloading:

☐ Continuous ☐ Discontinuous

☐ Throughput t/h

☐ Drop height mm

☐ Remaining material height in hopper on loading,  
approx. mm

☐ Impact wear on various parts or zones

☐ Explosion hazard due to dust capable of provoking ignition

☐ Service temperature:  
min. °C max. °C

If possible, please enclose a sketch or technical drawing.

Date/Signature

# SIMONA worldwide

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