

 **MOSTEN[®]**

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The **ORLEN Unipetrol** group is the biggest refinery and petrochemical company in the Czech Republic and the country's only crude oil processor. **ORLEN Unipetrol** is an indispensable part of Czech industry, and its specialization gives the group a unique position on the market. **ORLEN Unipetrol** is a significant producer and distributor of fuels, plastics, oils, lubricants, fertilisers and other products. It also operates ORLEN, the biggest network of petrol stations in the Czech Republic. **ORLEN Unipetrol** has been part of the multinational **ORLEN** refinery and petrochemical group since 2005.



PP MOSTEN®

ORLEN UNIPETROL

MATERIAL CHARACTERISTICS AND PRODUCTION TECHNOLOGY

PP MOSTEN® is produced by **ORLEN Unipetrol RPA** using **Innovene™ PP gas phase technology with a capacity of 300 kta**. The **PP MOSTEN®** range includes **homopolymers and block and random copolymers** in both reactor and CR (controlled-rheology) grades. CR grades are prepared through the controlled thermo-oxidative degradation of PP reactor powder, thus controlling the polymer's molecular weight.

PP MOSTEN® is manufactured in natural pellet form. It is stabilized with an additive package that protects material during processing, extends its service life and modifies product application properties.



PP MOSTEN®

INTEGRATED MANAGEMENT SYSTEM

ORLEN Unipetrol RPA produces **PP MOSTEN®** using an Integrated Management System (IMS) which includes processes for managing quality, the environment, safety and energy.

The IMS has been certified by Lloyd's Register Quality Assurance Limited (LRQA) according to the following standards:

ISO 9001:2015 (Quality Management System – QMS)

ISO 14001:2015 (Environmental Management System – EMS)

ISO 45001:2018 (Occupational Health and Safety Management System – HSMS)

ISO 50001:2018 (Energy Management System – EnMS)

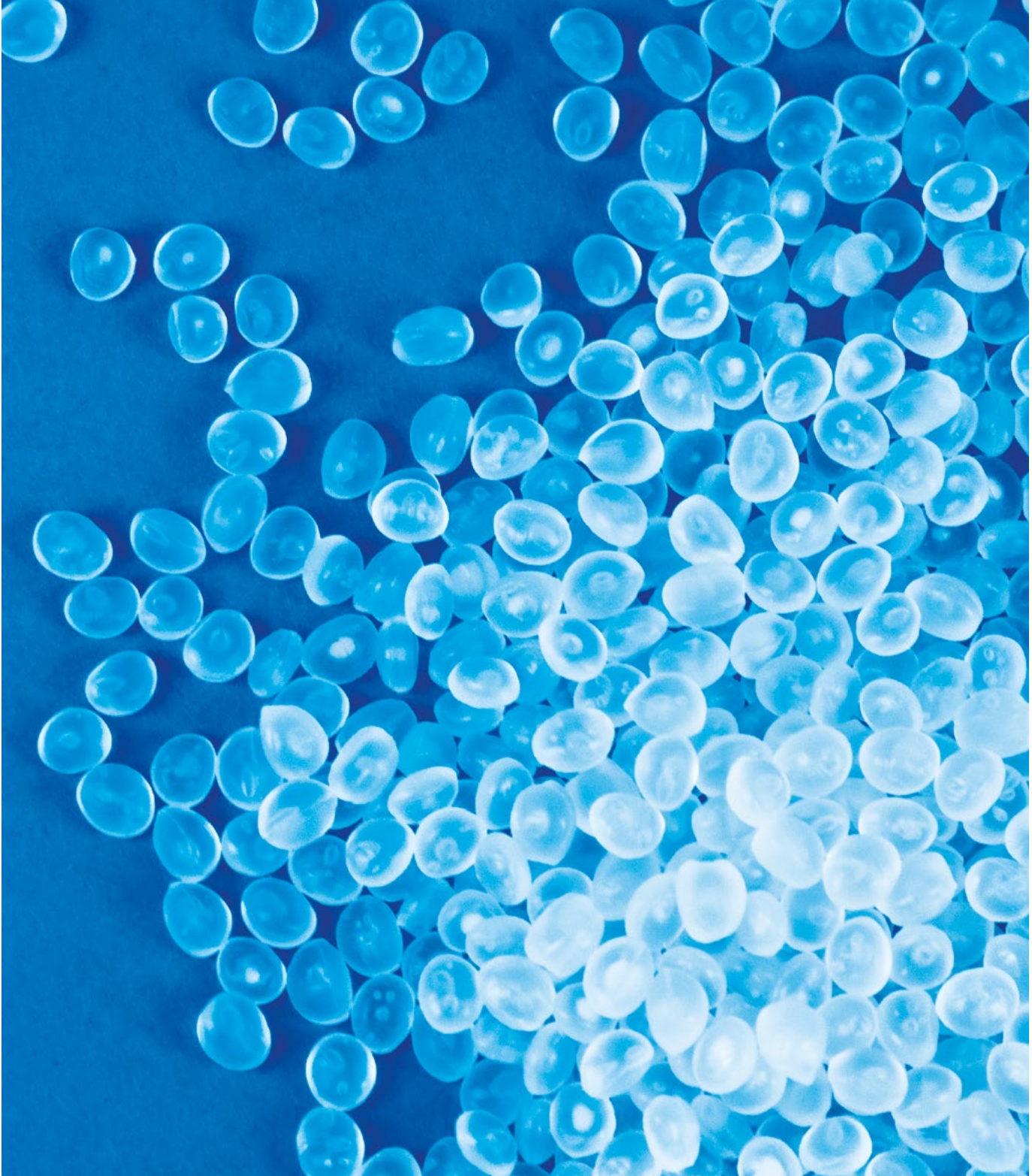
Original QMS approval: 12 June 2008

Original EMS approval: 1 June 2008

Original SMS approval: 9 August 2020

Original EnMS approval: 25 July 2016

Current certificate number: 10302953



REGULATORY COMPLIANCE

PP MOSTEN® grades meet the Czech and European hygienic requirements for contact with foodstuffs, and other regulations (as amended):

- ▶ Decree of the Ministry of Health No. 38/2001 of the Journal of Laws
- ▶ Regulation of the European Parliament and of the Council No. 1935/2004
- ▶ Commission regulation (EU) No. 10/2011
- ▶ REACH: **PP MOSTEN®** is not classified as a dangerous substance in accordance with Regulation (EC) 1272/2008 (CLP), nor does it contravene any of the other conditions set out in Article 31 of Regulation (EC) 1907/2006 (REACH). The document titled "Announcement" which replaces the Material Safety Datasheets contains information in accordance with Article 32 of Regulation 1907/2006 (REACH).

Full regulatory compliance of individual grades is available upon request.

PP MOSTEN® DESIGNATION SYSTEM

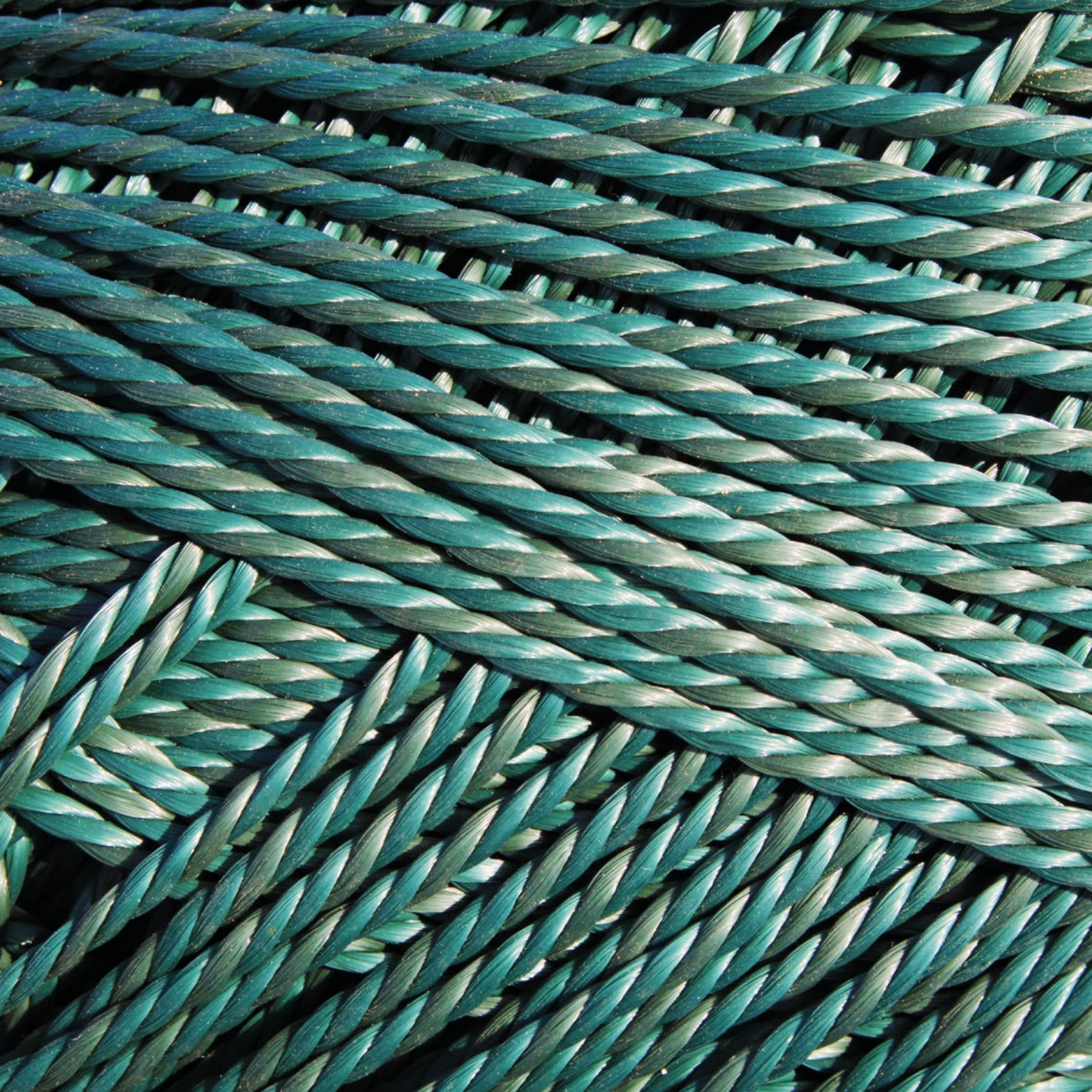
PP MOSTEN® grades are designated with an internal code consisting of two letters and three digits:

MOSTEN MB 720

Injection moulding Basic Stabilization Block Copolymer MFR = 20 g/10 min

The first letter indicates the main recommended application. The second letter indicates type of main stabilization. The first digit indicates polymer type (homopolymer/copolymer). The second and the third digits indicate the mean value of the melt mass flow rate (MFR).

	APPLICATION		STABILIZATION		MELT MASS FLOW RATE AT 230 °C; 2.16 kg MEAN VALUE (MFR)		POLYMER TYPE
E	Extrusion	A	Antistatic	1	1 g/10 min	0	Homopolymer
F	Film	B	Basic	2	2 g/10 min	1	Homopolymer
G	General purpose	C	Slip agent	9	9 g/10 min	2	Homopolymer
M	Injection moulding	H	Long-term heat	16	16 g/10 min	3	Homopolymer
N	Non-wovens	L	UV	30	30 g/10 min	4	Homopolymer
T	Tapes	T	Transparent		etc.	5	Block copolymer
X	Transition grade homogenized					6	Block copolymer
						7	Block copolymer
						8	Random copolymer
						9	Random copolymer



PP MOSTEN®

PROPERTIES

BASIC PROPERTIES

PP MOSTEN® is a thermoplastic material, solid, odourless and tasteless at room temperature. It exhibits a high degree of crystallinity, high temperature stability and resistance to most chemicals.

APPEARANCE

PP MOSTEN® does not contain any mechanical impurities. it is delivered in natural pellet form. Typical pellet length range is 2 – 7 mm and typical bulk density range is 450 – 600 kg/m³.

PHYSICAL AND MECHANICAL PROPERTIES

PP MOSTEN®'s physical and mechanical properties depend on its molecular weight, molecular structure and stabilization system. **PP MOSTEN®** is a sufficiently tough, rigid and thermally resistant material for both common and demanding technical applications.

LABORATORY TEST METHODS

PARAMETER	STANDARD
Melt mass flow rate (MFR)	ISO 1133-1
Tensile test	ISO 527-1,2
Flexural modulus of elasticity	ISO 178
Charpy notched impact strength	ISO 179-1
HDT (1.8 MPa)	ISO 75-1,2
Vicat softening temperature (10 N)	ISO 306

SHRINKAGE

The degree of shrinkage depends on the processing parameters (temperature, hold pressure, mould temperature, product thickness, etc.). Typical **PP MOSTEN®** shrinkage range is 1 – 2 %. Shrinkage can be determined with higher precision 24 hours after processing.

THERMAL AND BURNING CHARACTERISTICS

PP MOSTEN® exhibits good thermal insulation properties. The crystalline fraction melting temperature range for homopolymers and block copolymers is 160 – 168 °C. The crystalline fraction melting temperature range for random copolymers is 144 – 152 °C. The glass-transition temperature (Tg) for homopolymers is 0 °C. Copolymers are recommended for subzero temperatures because their Tg temperatures are shifted to substantially lower values. Products made of **PP MOSTEN®** may be used permanently in temperatures up to 100 °C and grades with thermal stabilization up to 105 °C. The degree of thermal stability of all **PP MOSTEN®** grades guarantees that no material degradation will occur under the recommended processing conditions.

PARAMETER	UNIT	STANDARD	INFORMATIVE VALUES	MATERIAL/ SPECIMEN	TEST CONDITIONS
Melting temperature	°C	ISO 11357-3	160 – 168	Homopolymers	DSC, method C 10 °C/min
			160 – 168	Block copolymers	DSC, method C 10 °C/min
			144 – 152	Random copolymers	DSC, method C 10 °C/min
Coefficient of linear thermal expansion (-30 °C to +100 °C)	1/°C	ISO 11359	85 – 150 × 10 ⁻⁶	10 x 6 x 4 mm	–
Flammability	mm/min	UL 94 HB	30.5	125 × 13 × 1.6 mm	horizontal specimen
Oxygen index	%	ISO 4589-2	19.1	80 × 10 × 1.6 mm	Block copolymer
Hot wire ignition	°C	EN 60695-2-10	750	60 × 60 × 2 mm	procedure A - top surface ignition

PP MOSTEN®

PROPERTIES

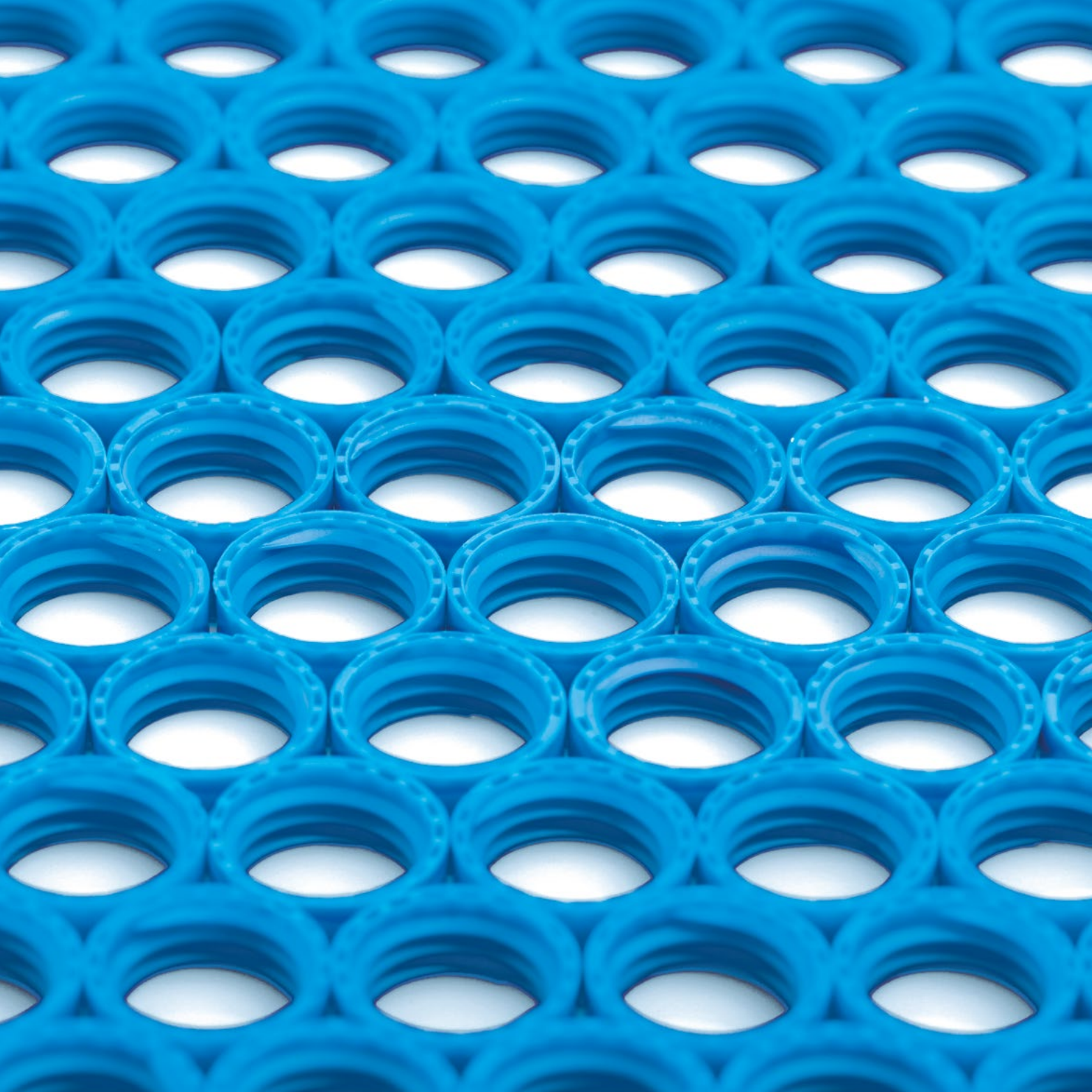
CHEMICAL PROPERTIES

PP MOSTEN® is generally chemically stable due to its non-polar characteristics. It is resistant to most inorganic salt solutions, acids and alkalis across a broad range of temperatures and concentrations. It dissolves only in certain solvents at higher temperatures (e.g., in halogenated and aromatic hydrocarbons) and is not resistant to strong oxidants such as concentrated nitric acid, oleum, halogens, etc. It swells in halogenated and aromatic hydrocarbons and some other solvents. It is necessary to verify material resistance in the final product. Water adsorption relates to the material's surface only. Moisture condensation problems may arise during processing when the material is transferred to a colder environment.

ELECTRICAL PROPERTIES

PP MOSTEN® exhibits very good electrical insulating and dielectric properties and a high specific volume resistance because of its non-polar molecular structure and relatively high chemical purity.

PARAMETER	UNIT	STANDARD	INFORMATIVE VALUES	SPECIMEN mm	TEST CONDITIONS
Relative permittivity	–	IEC 250	2.38 2.23	80 × 80 × 1	100 Hz 1 MHz
Dissipation factor (10 ⁻⁴)	–	IEC 250	4 1.3	80 × 80 × 1	100 Hz 1 MHz
Volume resistivity	Ω.m	IEC 93	10 ¹⁴	80 × 80 × 1	voltage 100 V
Surface resistivity	Ω	IEC 93	10 ¹⁶	80 × 80 × 1	voltage 100 V
Electric strength	kV/mm	IEC 243-1	20	80 × 80 × 1	25/75 mm electrode configuration
Comparative tracking index	–	IEC 112	min. 600	15 × 15 × 4	solution A



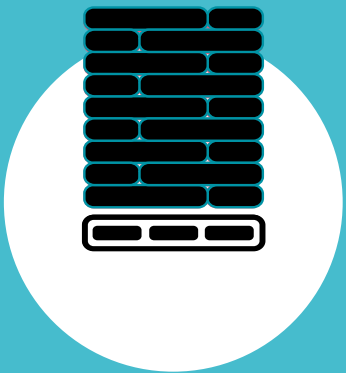
PP MOSTEN® LOGISTICS

PACKAGING, DELIVERY AND STORAGE

PP MOSTEN® is delivered in 25 kg PE bags or bulk loaded into trailer tanks. Bags are placed on pallets (net weight 1375 kg) and secured with PE shrink film to protect from damage and extend product lifetime. Pallets are designed to be stacked in a maximum of two layers.

PP MOSTEN® must be stored in a dry and ventilated roofed warehouse and protected from direct sunlight. The recommended warehouse temperature range is between -20 °C and +50 °C. Product must be kept at least 1 metre away from any heat source. The recommended maximum product storage time under the above-mentioned conditions in closed packages is 1 year. After longer storage periods, we recommend checking the material's condition before processing. When stored at temperatures below 20 °C, we recommend conditioning the material at least 24 hours before processing in the production hall.

In case of surface moisture, the recommended drying temperature is 90 – 100 °C for 1 – 2 hours.



PACKAGING:

5 bags (25 kg each) per layer
11 layers
pallet 1375 kg net
pallet dimensions L1100 mm × W1850 mm × H1850 mm
protected by a stretch hood



DELIVERY:

delivered in bags on pallets
or bulk loaded in a trailer or IBC tanks



STORAGE:

pallets are stacked in a maximum of two layers
stored in a dry and ventilated roofed warehouse
protected from direct sunlight
recommended temperature range -20 °C to +50 °C
recommended storage time max. 1 year, then retesting
is recommended before processing

PP MOSTEN®

APPLICATIONS

INJECTION MOULDING

Typical products: food containers, thin-wall and rigid packaging, caps and closures, buckets, crates, industrial storage and tool boxes, household articles, toys, furniture, battery cases.

PP MOSTEN® grades for injection moulding contain homopolymers, block and random copolymers. **PP MOSTEN®** grades are generally highly crystalline, exhibit a high stiffness and allow for considerable wall thickness reduction.

PP MOSTEN® grades are available in a wide range of melt flow rates (from medium to high flow), and some of them contain antistatic and nucleating agents which enable faster cycle times and high clarity articles.

Block copolymers which exhibit high impact resistance at both room and subzero temperatures and grades with special additives for pharmaceutical use are also available.

Optimal processing conditions depend on the respective application and equipment. Good product quality requires homogeneous melting of pellets in an extruder with a screw of a minimum length of 25D.

RECOMMENDED MOULDING CONDITIONS

						
Melt temperature (°C)	Mould temperature (°C)	Injection pressure (MPa)	Hold pressure (MPa)	Hold pressure time (s/1mm of wall thickness)	Circumferential screw speed (m/s)	Cooling time (s)
220 – 280	15 – 40	maximum (without surface defects)	75 – 85% of maximum injection pressure	4 – 5	max. 0.6	proportional to squared wall thickness (mm)





PP MOSTEN® APPLICATIONS

FIBRES AND NON-WOVENS

Typical products: spunbond non-wovens, staple fibres, multifilaments, yarns.

Fibres produced from **PP MOSTEN®** exhibit excellent strength due to high polymer isotacticity. Fibre grades are produced in a broad range of melt flow rates and have a high gel purity level.

Fibre grades are stabilized against gas fading (AGF and AGF+), and their additive package is optimised for obtaining processing stability and stability of the final products.

PP MOSTEN® NB 425 for spunbond technology is used in combination with **HDPE LITEN® LS 87** to produce bi-component fibres with improved soft touch characteristics.

Optimal processing conditions depend on the respective application and equipment. Good product quality requires homogeneous melting of pellets in an extruder with a screw of a minimum length of 25D.

RECOMMENDED MOULDING CONDITIONS



Melt
temperature (°C)

230 – 260



Titer range

fibres 1.5 – 80 dtex



Stretch ratio

staple fibres 1:2 – 1:4

PP MOSTEN®

APPLICATIONS

SHEETS, PIPES AND PROFILES

Typical products: thermoforming sheets for rigid packaging, construction sheets for welded tanks, reservoirs and swimming pools, sanitary system pipes, conduits and profiles, corrugated pipes.

PP MOSTEN® extrusion grades are suitable for use in the food and construction industries and for sheets processed by welding or thermoforming.

Optimal processing conditions depend on the respective application and equipment. Good product quality requires homogeneous melting of pellets in an extruder with a screw of a minimum length of 25D.

RECOMMENDED MOULDING CONDITIONS



Melt
temperature (°C)

180 – 225



Cooling
water (°C)

15 – 25





PP MOSTEN® APPLICATIONS

TAPES

Typical products: household and industrial woven textiles such as carpet backing and big-bags, agricultural fabrics, twines and ropes.

Tapes produced from **PP MOSTEN®** exhibit excellent strength due to high polymer isotacticity. Tape grades have a high level of gel purity. Tape grades are stabilized against gas fading, and their additive package is optimised for obtaining processing stability and stability of the final product.

Optimal processing conditions depend on the respective application and equipment. Good product quality requires homogeneous melting of pellets in an extruder with a screw of a minimum length of 25D.

RECOMMENDED MOULDING CONDITIONS



Melt
temperature (°C)

230 – 260



Titer
range

filaments 300 – 20 000 dtex



Stretch
ratio

filaments 1:6 – 1:12

PP MOSTEN® APPLICATIONS

COMPOUNDING

Typical products: automotive and electronic compounds.

PP MOSTEN® grades are used as a matrix for compound production using different fillers and reinforcing agents.

Compounds can be processed by extrusion, injection moulding and thermoforming.



FILM

Typical products: mono/multilayer and laminated cast film.

PP MOSTEN® homopolymer film grades are successfully used for cast film production. Their additive package is optimised for obtaining processing stability and stability of final products. **PP MOSTEN®** film grades exhibit narrow molecular weight distribution, and some grades contain slip agents. **PP MOSTEN® FC 110** also contains an anti-blocking agent.

Optimal processing conditions depend on the respective application and equipment. Good product quality requires homogeneous melting of pellets in an extruder with a screw of a minimum length of 25D.

RECOMMENDED MOULDING CONDITIONS

			
Melt temperature (°C)	Die temperature (°C)	Chill roll temperature (°C)	Thickness (µm)
230 – 260	220 – 240	10 – 60	20 – 200



PP MOSTEN®

RECYCLING AND WASTE DISPOSAL FROM PP PROCESSING

PP MOSTEN® can be easily recycled, but because the materials are subject to thermal degradation during initial processing, their mechanical properties may change. Semi-products, final products and non-contaminated waste during the processing of polypropylene can be recycled and further processed into other technical products. Material designation >PP< is used in compliance with ISO 11469. Material designation on products made of PP allows materials to be identified for the collection, classification, use or disposal of consumer waste.

PP MOSTEN® does not contain any lead, cadmium, mercury or hexavalent chromium, i.e., the total amount of these heavy metals does not exceed 100 ppm.

Waste from polypropylene is classified by the waste producer in accordance with applicable legal regulations.

Recommended waste processing methods are material or energy use.



PP MOSTEN®CHEMICAL RESISTANCE

SUBSTANCE AND CONCENTRATION	CHEMICAL RESISTANCE AT 20 °C	CHEMICAL RESISTANCE AT 60 °C
ACIDS		
Acetic acid 10%	+	+
Citric acid	+	+
Formic acid	+	/
Hydrochloric acid (of any concentration)	+	+
Nitric acid 25%	+	/
Nitric acid 50%	/	-
Oleum	-	-
Oxalic acid 50%	+	+
Perchloric acid 50%	+	/
Perchloric acid 70%	/	-
Phosphoric acid 25%	/	-
Phosphoric acid 50%	+	+
Phosphoric acid 85%	+	+
Silicic acid	+	+
Stearic acid	+	+
Sulphuric acid 10%	+	
Sulphuric acid 50%	+	+
Sulphuric acid 98%	/	-
ALKALIS		
Ammonium hydroxide 30%	+	+
Calcium hydroxide 30%	+	+
Potassium hydroxide	+	+
Potassium hydroxide 30% aqueous solution	+	+
Sodium hydroxide	+	+
Sodium hydroxide 30%	+	+
HOUSEHOLD CHEMICALS		
Bleaches	+	+
Detergent	+	+
Hand creams	+	+
Face makeup	+	
Shampoo	+	
Soap	+	

SUBSTANCE AND CONCENTRATION	CHEMICAL RESISTANCE AT 20 °C	CHEMICAL RESISTANCE AT 60 °C
INDUSTRIAL CHEMICALS		
Acetaldehyde	+	/
Alkyl alcohol, 96%	+	+
Aluminium chloride	+	+
Ammonia gas	+	+
Ammonium chloride	+	+
Amyl acetate	+	+
Amyl nitrite	/	/
Aniline	+	+
Beeswax	+	/
Anisole	/	
Benzaldehyde	+	/
Benzene	/	-
Benzyl alcohol	+	/
Benzyl chloride	/	
Borax	+	+
Butyl glycol	+	
Butyl acetate	/	-
Butyl alcohol	+	
Calcium hypochlorite	+	+
Calcium chloride	+	+
Calcium nitrate 50%	+	+
Carbon dioxide	+	+
Cresol	+	/
Cyclohexane	+	
Cyclohexanol	+	/
Cyclohexanone	+	/
Decalin	/	/
Dibutyl ether	/	
Dibutyl phthalate	+	/
Diesel oil	/	/
Diethyl ether	+	
Dioxane	/	/

PP MOSTEN®CHEMICAL RESISTANCE

SUBSTANCE AND CONCENTRATION	CHEMICAL RESISTANCE AT 20 °C	CHEMICAL RESISTANCE AT 60 °C
Ethyl acetate	+	/
Ethyl alcohol 96%	+	+
Ethylbenzene	/	-
Ethylene dichloride	/	
Ethylene glycol	+	+
Formaldehyde 40%	+	+
Glycerol	+	+
Glycol	+	+
Glycolic acid butyl ester	+	+
Hydrazine hydrate	+	+
Hydrogen chloride (dry and moist)	+	+
Hydrogen peroxide 30%	+	/
Hydrogen peroxide 4%	+	+
Kerosene	/	/
Mercury	+	+
Methyl alcohol	+	+
Petrol	/	+
Phosphate	+	+
Propylene glycol	+	+
Sea water	+	+
Silver nitrate	+	+
Sodium chloride, saturated aqueous solution	+	+
Sulphates	+	+
Sulphur	+	+
Sulphur dioxide (dry)	+	+
Sulphur dioxide (moist)	+	+
Tallow	+	+
Tannin 10%	+	+
Toluene	/	-
Urea 33%	+	+
Vaseline	+	/

SUBSTANCE AND CONCENTRATION	CHEMICAL RESISTANCE AT 20 °C	CHEMICAL RESISTANCE AT 60 °C
FOOD		
Apple juice	+	
Beer	+	
Butter	+	
Carrot juice	+	
Grape juice	+	
Jam	+	
Ketchup	+	
Lemon juice	+	
Milk	+	
Orange juice	+	
Salt	+	
Sugar	+	
Tea	+	
Tomato juice	+	
Vinegar	+	
Wine	+	
Yeast	+	
OILS		
Hydraulic oil	+	/
Coconut oil	+	/
Maize oil	+	/
Linseed oil	+	+
Mineral oil	+	/
Engine oil	+	/
Paraffin oil	+	+
Vegetable and animal oils	+	/
Silicon oil	+	+
Turpentine oil	-	-
Transformer oil	/	-
Spindle oil	/	/

+ resistant (polymer swelling <3 % or mass drop of polymer <0.5 %, elongation does not change substantially)
/ resistant partially (polymer swelling 3 – 8 % or mass drop of polymer 0.5 – 5 %, polymer elongation decreases by 50 %)
- not resistant (polymer swelling > 8% or mass drop of polymer >5 %, polymer elongation decreases by >50 %)

ORLEN UNIPETROL RPA CONTACTS

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BUSINESS DEVELOPMENT UNIT

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PRODUCT INTELLIGENCE POLYOLEFINS

- ▶ Provision of basic application and technical information about manufactured products
- ▶ Consultation for the processability of PP MOSTEN and HDPE LITEN
- ▶ Participation in trials at the customer's site
- ▶ Arrangement of sample analyses for determining optimal solutions
- ▶ Measurement and interpretation of flow behaviour of polyolefin melt
- ▶ Collection and handling of customer requirements
- ▶ Arrangement of external tests at testing institutes
- ▶ Management of material specifications and other product documentation
- ▶ Development and modification of product portfolio

ORLEN UNIPETROL RPA – POLYMER INSTITUTE BRNO, R&D CENTRE

- ▶ Structural analyses of polymer matrices
- ▶ Analyses of chemical properties of plastics and composite materials
- ▶ Evaluation of polymer processing stability
- ▶ Optimisation of stabilisation compositions
- ▶ Determination of polymer matrix lifespans using accelerated methods of artificial ageing
- ▶ Determination of long-term mechanical properties using standard tests or alternative methods (on test specimens or products)



www.pp-mosten.com

