PRODUCT CATALOGUE

# LOW DENSITY POLYETHYLENE

tipolen
by MOL GROUP CHEMICALS

bralen+
by MOL GROUP CHEMICALS

MOLGROUP CHEMICALS | Sustainable Reliability

MOLGROUP CHEMICALS
Working together to win tomorrow's challenges

# WHY CHOOSE MOL GROUP?

## WE PROVIDE RELIABILITY OF SUPPLY

As an integrated oil, gas and petrochemicals company, **we** can **rely on the efficiency benefits of the refinery integration process**:

- Secured feedstock supply
- Robust financial background
- Strong position in the regional markets
- **High-quality** products provided by **state-of-the-art technologies**

## WE INTEND TO BE YOUR PARTNER IN CARBON FOOTPRINT REDUCTION

- By offering **sustainable materials**
- By converting ~2 m tons of fuels to more valuable petrochemical feedstock by 2030
- Through **investments using highly efficient technologies** that integrate circular economy technologies into our core business: Danube refinery acquired the **Together for Sustainability** and the Tiszaújváros petrochemicals site got the **ISCC+ certification**
- Through bio and waste-based streams in production and scaling-up recycling

## YOU CAN FIND US EVERYWHERE

- **Our offices are located in nine European countries**, including Hungary, Slovakia, Austria, Germany, Italy, Poland, Romania, Croatia and Ukraine

# LOW DENSITY POLYETHYLENE

## GENERAL INFORMATION

Low density polyethylene LDPE is ductile and flexible material. It is stable in the temperature range from −50 to 85°C, the melting point is from 105 to 115°C. In the oxygen absence LDPE is stable up to 290°C. It decomposes within 290 to 350°C and thermoplastic products of lower molecular weight are formed. Gaseous products are formed in greater quantities above 350°C and these gases contain as main component rather butene than ethylene. In the oxygen presence LDPE is less stable. During high temperature processing of LDPE in the presence of air thermal oxidation occurs.

During outdoor exposure of LDPE the photochemical oxidation caused by UV radiation occurs. Due to the oxidation by thermal or light effects on the surface of the products fine cracks are formed. They may deteriorate the physical and mechanical properties. In order to eliminate these negative phenomena light stabilizers should be added to LDPE granulates while processing.

Non-oxidizing acids, bases, salts and their solutions practically have no effect on polyethylene. However, oxidizing chemicals attack the polymer. LDPE is insoluble at normal temperature but is soluble at higher temperatures in aliphatic, aromatic and halogenated hydrocarbons. In the case that articles made of LDPE are exposed to the effect of chemical substances along with mechanical stress, on the surface cracks can be formed – this phenomenon is called environmental stress cracking.

LDPE has advantageous properties in permeability. It practically does not permeate water and steam, but it has a good permeability to carbon dioxide and oxygen. These characteristics are specially beneficial in packaging.

LDPE is an excellent insulator with good dielectric properties and a high voltage resistance. The low dissipation factor predetermines LDPE for the use at high frequencies particularly where very low dielectric loss is required.



# I APPLICATION

The excellent physical and mechanical properties provide the wide range of applications of this polymer. BRALEN+ and TIPOLEN are available in number of grades for all processing technologies as follows:

- blown and cast films
- injection moulding
- extrusion of tubes and pipes
- blow moulding
- foaming

# CODING SYSTEM

## BRALEN+

BRALEN+ IS REGISTERED TRADEMARK OF SLOVNAFT, A.S. PRODUCED ON BRATISLAVA SITE. BRALEN+ COMMERCIAL GRADES PRODUCED BY LYONDELLBASELL TUBULAR REACTOR PROCESS ARE DESIGNATED BY TWO LETTERS AND TWO GROUPS OF DIGITS. THE SIGNIFICATION IS AS FOLLOWS:

**FB 2 - 16**

The first letter in the code of BRALEN+ grade indicates the main application area:

F = Film

The second letter in the code of BRALEN+ grade indicates the range of density in kg/m³ at 23°C:

A = 918 – 921
B = 922 – 925
C = 926 – 929
D = 930 and more

The first group of digits indicates MFR in g/10 min at 190°C and 2.16 kg:

– if MFR is below 1, the code is in shape like 02
– if MFR is over 1, then the figure in the code is according to mathematical rounding (e.g. MFR 1.7 = code 2)

The second group of digits represents internal code:

01 – 39 non-additivated grades
40 – 99 additivated grades



## TIPOLEN

TIPOLEN IS THE REGISTERED TRADEMARK FOR LOW DENSITY POLYETHYLENE PRODUCED BY MOL PETROCHEMICALS CO. LTD. ON TISZA SITE. TO IDENTIFY TIPOLEN PRODUCTS MANUFACTURED BY LYONDELLBASELL TUBULAR REACTOR PROCESS A CODE OF TWO LETTERS AND FIVE DIGITS IS APPLIED.

**FB 243 - 55**

The **first letter** in the code of TIPOLEN grade indicates the main application area:

F = Film
M = Injection moulding, masterbatches

The **second letter** shows MFR range in g/10 min at 190°C and 2.16 kg:

A = 0.20 – 0.35
B = 0.6 – 0.90
C = 1.7 – 2.2
D = 3.4 – 4.6
E = 5 – 10
F = 10 – 22

The **first, second** and **third digits** are internal plant codes

The **fourth** and **fifth digits** are indicating the presence of additives

**TYPICAL PROPERTIES, CANNOT BE CONSIDERED AS SPECIFICATION**

| | Grade/ Parameter | Melt Mass – Flow Rate (MFR) 190°C/2.16 kg | Density (23°C)[1] | Tensile Stress at Break (MD/TD)[2] | Tensile Strain at Break (MD/TD)[2] | Dart Drop[2] | Haze[2] | Hardness Shore D[3] | Vicat Softening Tempera-ture[3] | Additives | Recommended Film Thickness | Recommended Processing Conditions | Application |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Unit | g/10 min | kg/m³ | MPa | % | g | % | – | °C | ppm | mm | °C | – |
| | Test method | ISO 1133-1 | ISO 1183-1 | ISO 527-1,3 | ISO 527-1,3 | ISO 7765-1 method A | ASTM D1003 | ISO 868 | ISO 306/A 50 | – | – | – | – |
| FILM GRADES | BRALEN+ FA 03-01 | 0.30 | 920 | 26/27 | 500/570 | 290 | 9.5 | 45 | 93 | – | 0.070–0.220 | 170–220 | Heavy duty packaging, shrink hoods, agricultural films |
| | BRALEN+ FB 03-02 | 0.30 | 923 | 28/28 | 500/580 | 270 | 9 | 46 | 96 | – | 0.070–0.220 | 170–220 | Heavy duty packaging, shrink hoods, agricultural films |
| | BRALEN+ FC 03-03 | 0.30 | 927 | 29/28 | 550/600 | 150 | 5 | 50 | 104 | – | 0.060–0.220 | 170–220 | Heavy duty packaging, blown films, shrink films |
| | BRALEN+ FB 08-12 | 0.80 | 923 | 27/26 | 480/610 | 200 | 6.5 | 46 | 96 | – | 0.025–0.100 | 170–220 | Shopper bags, surface protection films |
| | BRALEN+ FB 08-50 | 0.80 | 924 | 21/21 | 400/550 | 200 | 7 | 45 | 96 | SA (E) 500 AB 900 | 0.025–0.080 | 170–220 | Freezer films, laminating films, shopper bags |
| | BRALEN+ FC 08-13 | 0.80 | 929 | 28/25 | 550/650 | 120 | 5 | 49 | 103 | – | 0.025–0.080 | 170–220 | Blown films, shrink films, bags and pouches |
| | BRALEN+ FB 2-16 | 2.0 | 923 | 23/23 | 540/620 | 140 | 5 | 45 | 93 | – | 0.020–0.100 | 160–200 | General purpose films, fine shrink films, high clarity films |
| | BRALEN+ FB 2-51 | 2.0 | 923 | 20/19 | 450/580 | 140 | 6 | 44 | 93 | SA (E) 500 AB 1000 | 0.020–0.060 | 160–200 | General purpose films, freezer films, FFS films |
| | BRALEN+ FC 2-18 | 2.0 | 929 | 24/23 | 620/680 | 105 | 6 | 49 | 103 | – | 0.020–0.060 | 160–200 | Bags and pouches, laminating films, blown films, bubble films, shrink films and surface protection films |
| | BRALEN+ FB 4-31 | 4.0 | 922 | 20/19 | 570/640 | 115 | 5 | 44 | 91 | – | 0.015–0.040 | 150–190 | Cast films, surface protection films and injection moulding applications |
| | BRALEN+ FB 4-52 | 4.0 | 923 | 17/17 | 470/590 | 115 | 6.5 | 43 | 91 | SA (E) 600 AB 1800 | 0.015–0.040 | 150–190 | Cast films, high clarity films, clothes protection films, very thin gauge films, thin gauge and laminating films, cling films |
| | BRALEN+ FC 4-32 | 4.0 | 929 | 20/19 | 620/680 | 95 | 7 | 50 | 102 | – | 0.015–0.060 | 160–200 | Bags and pouches, laminating films and surface protection films |

## | NOTES |

[1] Density has been measured on press moulded specimens prepared according to internal method.
[2] Typical properties tested using 0.050 mm thick blown film extruded at melt temperature of 200°C (for MFR 0.30 g/10 min), at 180°C (for MFR 0.80 and 2.0 g/10 min), or at 170°C (for MFR 4.0 g/10 min), and at blow up ratio 2.5:1.
[3] Typical properties measured on standard injection moulded test specimen according to ISO 294-1

## | ADDITIVES |

**SA (E)** Slip agent Erucamide
**AB** Antiblocking agent



For the actual values and product portfolio please check
www.molgroupchemicals.com

**TYPICAL PROPERTIES, CANNOT BE CONSIDERED AS SPECIFICATION**

| | Grade/ Parameter | Melt Mass – Flow Rate (MFR) 190°C/2.16 kg | Density (23°C)[2] | Tensile Stress at Break (MD/TD)[1] | Tensile Strain at Break (MD/TD)[1] | Dart Drop[1] | Haze[1] | Hardness Shore D[2] | Vicat Softening Tempera-ture[2] | Flexural modulus[4] | Notched Izod impact (+23°C)[4] | Additives | Recommended Film Thickness | Recommended Processing Conditions | Application |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Unit** | g/10 min | kg/m³ | MPa | % | g | % | – | °C | MPa | kJ/m² | ppm | mm | °C | – |
| | **Test method** | ISO 1133-1 | ISO 1183-2 | ISO 527 | ISO 527 | ISO 7765-1 method A | ISO 14 782 | ISO 868 | ISO 306/A120 | ISO 178 | ISO 180/A | – | – | – | – |
| FILM GRADES | TIPOLEN FA 244-51[3] | 0.30 | 920 | 21/20 | 390/580 | 310 | 13 | 49 | 95 | – | – | – | 0.070–0.220 | 170–220 | Heavy duty bags, shrink films, carrier bags, packaging films, household films, films for laminating, agricultural films, silage films, blow moulded products, bottles, extrusion of pipes and tubes |
| | TIPOLEN FB 243-51 | 0.80 | 921 | 25/20 | 290/600 | 116 | 10 | 50 | 96 | – | – | – | 0.025–0.100 | 170–220 | Carrier bags, household films, packaging films, films for laminating, small blow moulded products, bottles |
| | TIPOLEN FB 243-55 | 0.80 | 922 | 22/17 | 230/550 | 110 | 10 | 51 | 96 | – | – | SA (E) 400 AB 800 | 0.025–0.080 | 170–220 | Carrier bags, household films, packaging films |
| | TIPOLEN FC 243-51 | 2.0 | 922 | 24/19 | 300/600 | 80 | 10 | 51 | 94 | – | – | – | 0.020–0.100 | 160–200 | General purpose films, bubble films, foamed sheets |
| | TIPOLEN FC 243-55 | 2.0 | 922 | 22/16 | 230/560 | 84 | 10 | 50 | 95 | – | – | SA (E) 400 AB 800 | 0.020–0.060 | 160–200 | General purpose films |
| | TIPOLEN FD 243-51 | 4.0 | 922 | 22/16 | 330/570 | 80 | 9 | 50 | 92 | – | – | – | 0.015–0.040 | 150–190 | High clarity fine films, caps |
| | TIPOLEN FD 243-55 | 4.0 | 922 | 19/15 | 270/500 | 80 | 10 | 48 | 94 | – | – | SA (E) 700 AB 1400 | 0.015–0.040 | 150–190 | High clarity fine films, caps |
| FOAM GRADE | TIPOLEN FD 244-55[3] | 4.75 | 922 | 20/14 | 313/532 | 86 | 9 | 49 | 90 | – | – | SA (E) 400 AB 800 | 0.015–0.040 | 170–190 | Crosslink-able and foam-able grade for extrusion foamed sheets |
| INJECTION MOULDING GRADE | TIPOLEN MF 243-51 | 20 | 922 | 9[4] | 140[4] | – | – | 49[4] | 90[4] | 240 | 48 | – | – | 170–220 | Injection moulding of general purpose goods and technical items, masterbatches |

## | NOTES |

[1] Haze, Dart Drop, Tensile Stress at Break and Tensile Strain at Break have been measured on film – thickness of 0.07 mm (MFR = 0.30 g/10 min), and 0.04 mm (MFR > 0.30 g/10 min), blow up ratio 2:1
[2] Density, Vicat Softening Temperature and Hardness Shore D have been measured on standard pressed specimens (ISO 293) conditioned at room temperature (ISO 291)
[3] n-butyl-acrylate copolymer
[4] Typical properties measured on standard injection moulded test specimen prepared according to ISO 294-1

## | ADDITIVES |

**SA (E)** Slip agent Erucamide
**AB** Antiblocking agent

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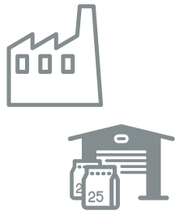
# STORAGE & HANDLING

## PACKAGING



- 25 kg polyethylene bags
- Transported on shrink-wrapped or stretch-wrapped pallets
  - eligible load of polymer 1375 kg
- Adhesive is used between the bags in case of TIPOLEN to avoid their slipping
  - pay attention during the removal of the bags from the pallets
  - lift the bag at first without rotation
- Heat-treated pallets from PRS
  - a member of the Faber Halbertma Group, operating a pooling system that collects the pallets after use and organises reuse as part of a sustainable, circular system
  - PRS pallets remain the property of PRS at all times

## TRANSPORTATION

- By truck
- Road silo
- Rail silo
- For details please see Services on www.molgroupchemicals.com

## STORAGE

- Polyethylene is a combustible substance
  - adhere to the fire safety rules
- Do not store polyethylene in conditions of high humidity and fluctuating temperatures
  - atmospheric moisture can condense inside the packing
  - if it happens, dry the pellets before use
- Do not expose to UV radiation and temperatures above 40°C
- The producer does not take responsibility for any damages caused by adverse storage



# STATEMENTS

## REACH COMPLIANCE


- Polymers are exempt from registration
- SLOVNAFT, a.s. and MOL Petrochemicals Co. Ltd. use REACH-compliant raw materials (monomers and relevant additives)
- BRALEN+ and TIPOLEN grades do not contain any substances specifically identified as SVHC at levels greater than 0.1%
- For more detailed information see REACH/SVHC statement on www.molgroupchemicals.com

## APPLICATION FOR FOODS


- Most BRALEN+ and TIPOLEN grades satisfy the regulations applied by European countries (EEC)
- In case of country-specific regulations or food industrial product licenses, contact MOL Petrochemicals Co. Ltd. and SLOVNAFT, a.s. for special information
- For more detailed information related to product safety, see Declaration data sheets on www.molgroupchemicals.com

## SAFETY


- Polyethylene is not regarded as hazardous material when in contact with the skin or inhaled
- Any contact with the molten polymer or the inhalation of the released gases should be avoided during processing
- Install exhaust unit over processing machine and secure good ventilation of the area.
- For further information see Material Safety Data Sheets on www.molgroupchemicals.com.

## RECYCLING

- Polyethylene resins are suitable for recycling using modern recycling methods.
- In-house production waste should be kept clean to facilitate direct recycling.

# DISCLAIMER



# CERTIFICATES

MOL PETROCHEMICALS

SYSTEM CERTIFICATION ISO 50001 SGS
SYSTEM CERTIFICATION ISO 14001 SGS
SYSTEM CERTIFICATION ISO 9001 SGS
SYSTEM CERTIFICATION ISO 45001 SGS

SLOVNAFT

SYSTEM CERTIFICATION ISO 14001 SGS
SYSTEM CERTIFICATION ISO 9001 SGS
SYSTEM CERTIFICATION ISO 45001 SGS



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MOLGROUP CHEMICALS

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