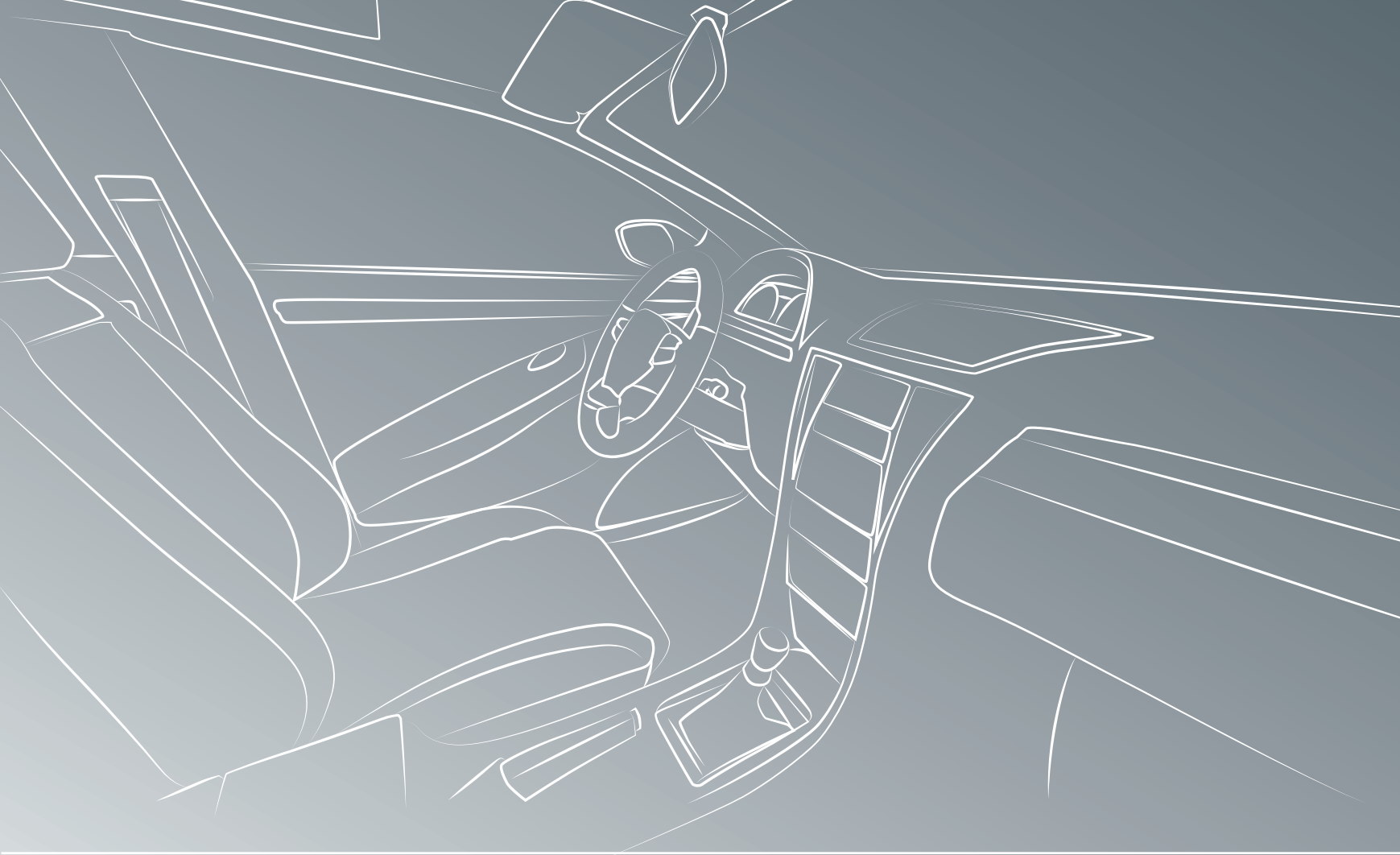


TERBLEND®
TECHNICAL REFERENCE GUIDE

Terblend N and Terblend S grades for automotive and other applications

INEOS STYROLUTION

Driving Success. Together.

TERBLEND BASICS

Terblend N (ABS/PA blends) and Terblend S (ASA/PA blends) comprise a family of styrenic grades perfect for a wide range of uses across multiple industries, including automotive, healthcare, construction, household and electronics. This technical guide focuses on Terblend N and Terblend S grades for automotive interior and exterior applications.

TERBLEND N

TERBLEND N NM-21EF | TERBLEND N NG-02EF
TERBLEND N 3154 | TERBLEND N 3158

Terblend N grades are a cost-effective solution for automotive interiors, featuring a matt surface finish that does not require painting. The EF (Excellent Flow) grades can even be used for structurally complex parts, such as loudspeaker grills, under standard conditions. The mineral-filled grades Terblend N 3154 and Terblend N 3158 offer high dimensional stability at improved isotropy.

TERBLEND S

TERBLEND S NM-31

Similar to Terblend N with regards to mechanical and processing performance (e.g. easy flow, high impact strength), Terblend S provides superior color stability combined with a matt surface appearance. The ASA component stands for higher UV resistance and better color fastness, an excellent solution for interior parts above the belt line, parts exposed to UV in convertibles, or brightly colored assemblies.

ADVANTAGES AT A GLANCE

Lower density compared to PC/ABS
Less material needed for the same part

› Fast cycle time combined with high dimensional stability
More parts can be manufactured in the same time

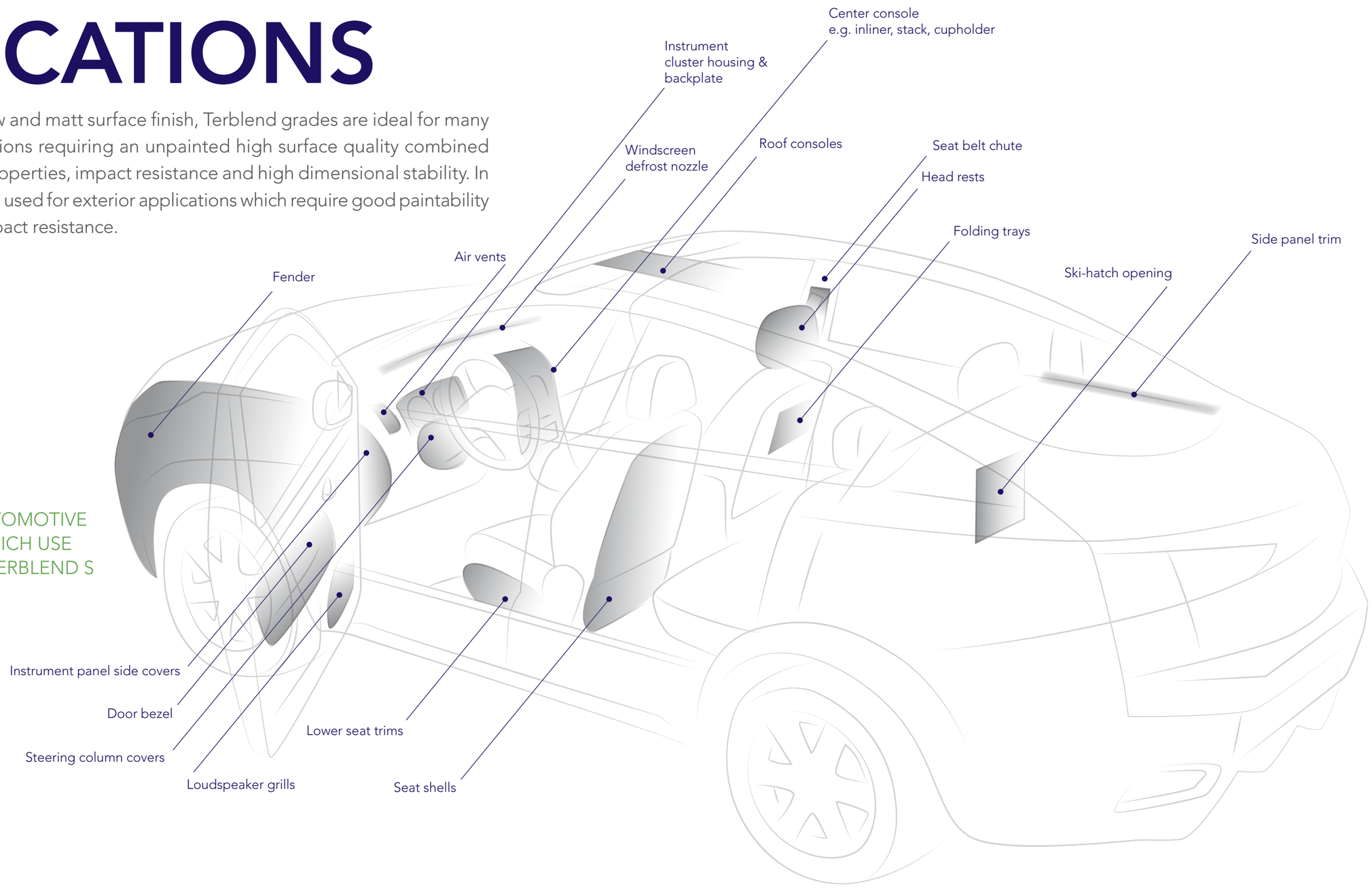
› High-quality, low-gloss surface finish without painting
Elimination of painting costs

› System cost advantage of Terblend N and Terblend S

KEY APPLICATIONS

Thanks to their excellent flow and matt surface finish, Terblend grades are ideal for many automotive interior applications requiring an unpainted high surface quality combined with outstanding acoustic properties, impact resistance and high dimensional stability. In some cases, Terblend may be used for exterior applications which require good paintability in combination with high impact resistance.

EXAMPLES OF AUTOMOTIVE APPLICATIONS WHICH USE TERBLEND N OR TERBLEND S GRADES.



TERBLEND'S EXCELLENT FLOWABILITY SUPPORTS INJECTION MOLDING OF VERY FINELY MESHED OR THIN-WALLED STRUCTURES

Jaguar Land Rover seat trims (Range Rover)

SEAT TRIMS

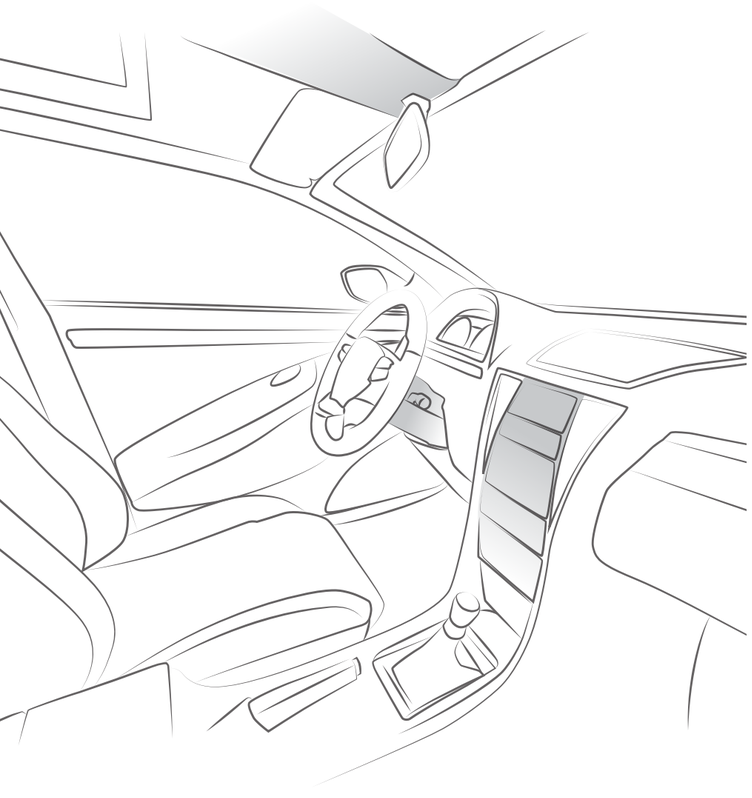
Terblend N NM-21EF is the most popular grade for interior applications, such as unpainted seat trims combining low gloss with an excellent aesthetic appearance, very good acoustic dampening, low emissions and high impact strength suited for the door entry area.

LOUDSPEAKER GRILLS

Terblend N NM-21EF enables you to create low-gloss loudspeaker grills with a very fine mesh for a "high tech" aesthetic. These features are enabled thanks to the polymer's high impact strength and excellent processing characteristics like easy flowing and low weld line visibility.

Terblend N NG-02EF may also be used for loudspeaker grills requiring additional dimensional stability with reasonable impact strength.

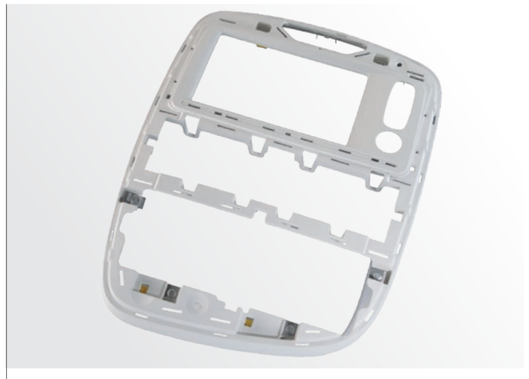
TERBLEND'S LOW-GLOSS SURFACES ARE IDEAL FOR UNPAINTED CAR INTERIOR APPLICATIONS



OVERHEAD CONSOLES

Terblend N NG-02EF is used for overhead compartments which require a combination of high stiffness, low gloss, superb aesthetics, excellent processability, and very good acoustic dampening. Furthermore, because of the polyamide component there is no need for a permanent antistatic package.

Terblend N NG-04 provides a higher degree of glass fiber reinforcement. It is used for hidden structural parts like overhead carrier applications due to its high stiffness, good dimensional stability and reduced thermal coefficient of expansion.



CENTER CONSOLE FRAMES

Terblend S NM-31 is ideal for unpainted center console frames that require a low-gloss surface, fine texture, chemical resistance, and enhanced color fastness, in particular for bright colors. A fairly wide, textured frame enables implementation of the part without the need for additional painting

STEERING COLUMN COVERS

Terblend N NM-21EF produces highly aesthetic unpainted steering column covers with a low-gloss surface, fine texture, chemical resistance, and high impact strength which is critical due to the position and function of the application.

OPTIMIZING AESTHETICS

FURTHER SOLUTIONS PROVIDED BY TERBLEND N
FOR THE OPTIMIZATION OF AESTHETIC APPEARANCE.

PARTLY DECORATED

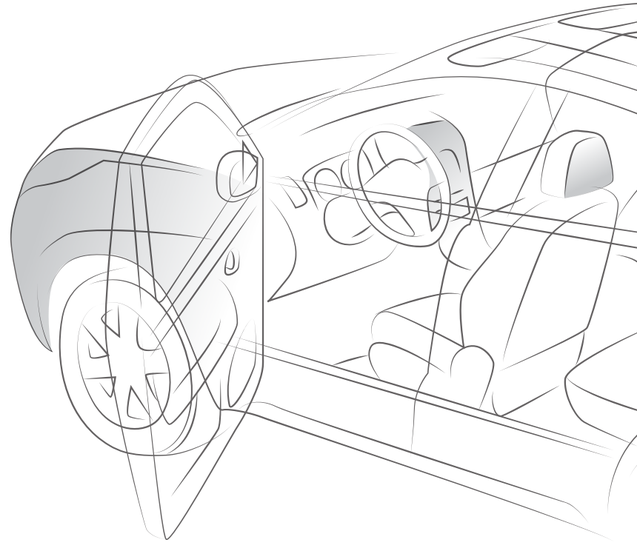
Due to their high surface polarity, **Terblend N** grades are ideal for partly decorated parts which are processed via hot stamp decoration or in-mold coating. Furthermore, partly glossy and partly matt surfaces can be easily combined.

PAINTED

Terblend N 3158 is currently being used by BMW for exterior online painted fenders, thanks to its good adhesion to paint systems, good impact behavior, and in particular high heat resistance for online painting at 190°C.

PU ADHESION

Terblend N grades exhibit excellent adhesion to PU (polyurethane) while also delivering high impact strength and good processability, such as for these head rests made of **Terblend N NM-21EF** carrier and overmolded by PU.



CHARACTERISTIC PROPERTIES

COMMON TERBLEND PROPERTIES AND DIFFERENTIATION BETWEEN GRADES

- **Low-gloss surface finish**
- **Pleasant haptics and acoustics**
- **High impact strength**
- **Easy processing and demolding**
- **Chemical resistance**
- **Good adhesion to soft components**
- **Painting without pre-treatment feasible**
- **Potential for accelerated cycle times**

Highest color fastness	**S NM-31**
High impact strength and easy flow	**N NM-21 EF**
Enhanced stiffness, glass fiber reinforced, easy flow	**N NG-02 EF**
Enhanced dimensional stability, mineral reinforced	**N 3154**
Highest heat resistance (online paintable)	**N 3158**

PHYSICAL AND THERMAL DATA*

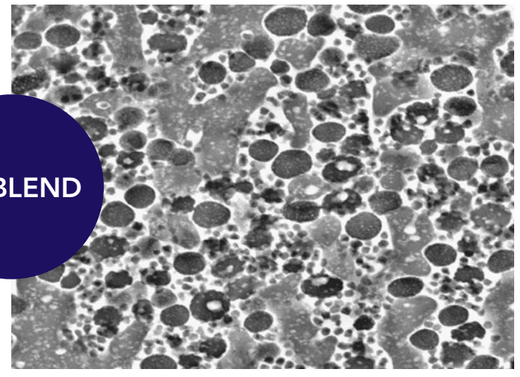
	TEST METHOD	UNIT	TERBLEND N NM21-EF	TERBLEND N NG02-EF	TERBLEND S NM-31	TERBLEND N 3154	TERBLEND N 3158
PROPERTIES							
POLYMER ABBREVIATION			ABS / PA	ABS / PA GF8	ASA / PA	ABS / PA MF8	ABS / PA MF9
DENSITY	ISO 1183	kg/m³	1070	1120	1070	1110	1150
MOISTURE ABSORPTION, EQUILIBRIUM 23°C / 50% r.h.	ISO 62	%	1.3	1.1	1.5	1.1	1.3
PROCESSING							
MELT VOLUME RATE MVR 240°C / 10KG	ISO 1133	cm³/10min	60	40	60	8 (260/5)	10 (280/10)
MELT TEMPERATURE RECOMMENDATION		°C	240 – 270	240 – 270	240 – 270	250 – 285	280
MOLD TEMPERATURE RECOMMENDATION		°C	40 – 80	40 – 80	40 – 80	60 – 80	60 – 80
MOLD SHRINKAGE	ISO 294-4	%	0.7 – 0.8	0.6	0.7 – 0.8	0.6	1.1 – 1.4
MECHANICAL PROPERTIES							
TENSILE MODULUS	ISO 527-1/-2	MPa	2100	3100	2100	2700	2900
STRESS AT BREAK	ISO 527-1/-2	MPa	45	55	50	55	50
STRAIN AT BREAK	ISO 527-1/-2	%	25	6	25	35	>10
FLEXURAL STRENGTH	ISO 178	MPa	65	85	65	80	88
FLEXURAL MODULUS	ISO 178	MPa	2000	2800	2000	2500	3000
CHARPY NOTCHED IMPACT STRENGTH (23°C)	ISO 179/1eA	kJ/m²	70	11	70	6	10 (IZOD)
CHARPY NOTCHED IMPACT STRENGTH (-30°C)	ISO 179/1eA	kJ/m²	12	6	9	8	8 (IZOD)
THERMAL PROPERTIES							
HEAT DEFLECTION TEMPERATURE HDT A (1.80 MPA)	ISO 75-1/-2	°C	63	80	65	83	92
HEAT DEFLECTION TEMPERATURE HDT B (0.45 MPA)	ISO 75-1/-2	°C	88	130	92	97	132
VICAT SOFTENING TEMPERATURE VST/B/50	ISO 306	°C	110	118	110	105	160

* Typical values for uncolored product at 23°C, dry as molded

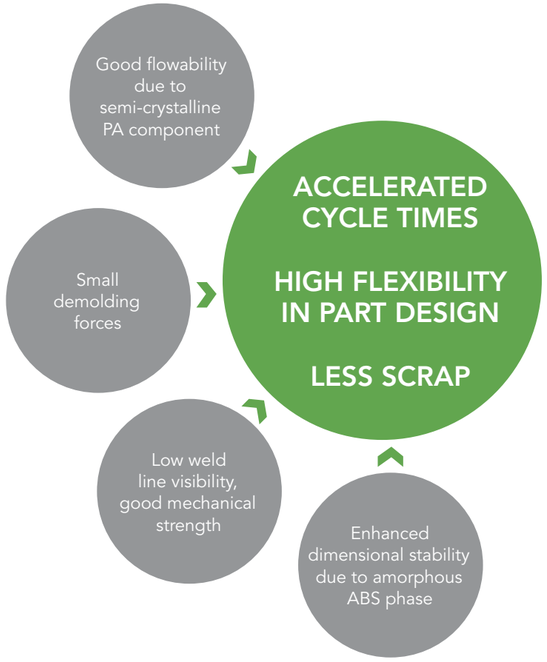
IMPACT RESISTANCE

Terblend polymers are especially impact resistant due to a compatibilizer technology that optimizes the morphology during the compounding process. Terblend N grades are a ABS/polyamide blend while Terblend S grades are a compound of ASA/polyamide.

- Ductile breaking behavior, even at sub zero temperatures
- Charpy notched impact strength > 50 kJ/m²
- Charpy notched at -30°C > 10 kJ/m²
- High energy absorption in case of impact or crash



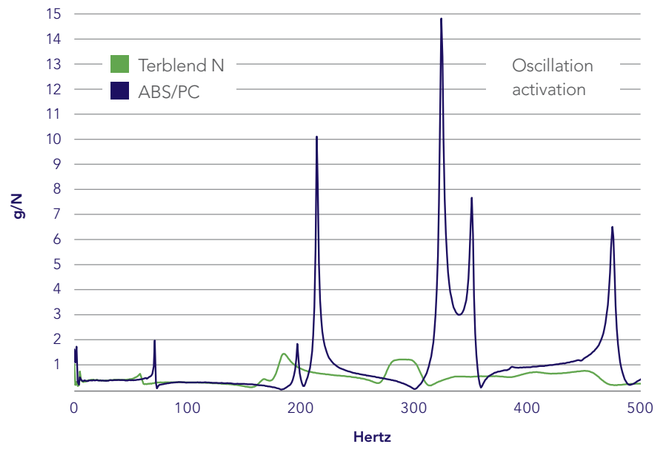
* ABS (acrylonitrile butadiene styrene)
ASA (acrylonitrile styrene acrylate)



EASY PROCESSING

The processing of Terblend benefits from good flow and demolding characteristics, which enables complex part geometry, such as fine-mesh loudspeaker grills.

TERBLEND N ACOUSTIC BEHAVIOR COMPARED TO ABS/PC



ACOUSTIC DAMPENING

All Terblend grades are characterized by enhanced acoustic dampening in comparison to ABS or PC/ABS for a higher acoustic loss factor along a broad frequency range leading to:

- Reduced squeaking tendency
- Less noise and reduced rattling
- Higher solidity and quality impression of parts

CHEMICAL RESISTANCE

All Terblend products exhibit high resistance to media. This has been demonstrated in tests in which Terblend N NM-21EF and S NM-31 were put under flexural stress (with 1% strain) and exposed to different chemical substances for 8 hours.

After 24 hours of stress the specimens were tested for impact behavior. None of the chemicals has a negative effect on the impact strength of the specimens, reconfirming the outstanding chemical resistance and robustness of both grades.

IMPACT TEST RESULTS AFTER CHEMICAL EXPOSURE AND CLAMPING

	Control (notched Izod ISO 180/1A at RT in kJ/m²)	1% outer fiber strain with the following media						
		Benzine	Diesel	Grease	Olive oil	Isopropanol	Toothpaste	Sulfuric Acid
Terblend N NM-21EF	71	72	72	69	69	70	73	70
Terblend S NM-31	69	71	74	65	72	75	75	68

Drying conditions: 4 h / 80°C
Processing conditions: Melt 250°C / Mold 70°C

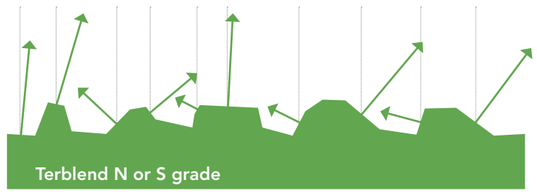
LOW-GLOSS SURFACE FINISH

Terblend allows for a very matt surface finish. For best results, high injection speed and enhanced mold temperature are to be applied.

TERBLEND GRADES
› GOOD REPRODUCIBILITY

Textured tool surface

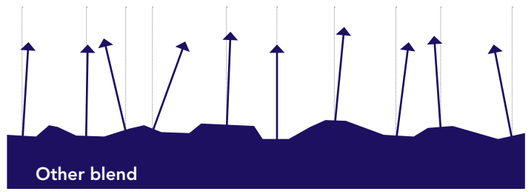
Reproduced surface (low gloss)



OTHER BLENDS
› POOR REPRODUCIBILITY

Textured tool surface

Reproduced surface (glossy)
(or uneven, meaning irregularly partly glossy, partly matte)



MAR RESISTANCE

The resistance of materials and textures to marring can be measured by a variety of test methods. A change in brightness of about 0.5 and less is considered acceptable by most automotive manufacturers. The image shows the surface change after mar resistance testing according to VW PV3974. Tests were performed on unpainted, grained Terblend N plaques with a metal disc with rounded edges. Change in brightness and change in surface gloss were determined on selected Terblend N plaques before and after mar resistance testing. The table shows that mar resistance of Terblend depends on the texture and initial gloss level.

TERBLEND N NM-21EF (ABS/PA)		GLOSS LEVEL		CHANGE IN BRIGHTNESS
		before marring	after marring	Delta L (CIELAB)
Grey	medium rough texture 1	4.6	4.9	-0.31
Beige	medium rough texture 2	2.5	2.8	-0.19
Black	fine texture 1	3.8	4.2	-0.25
Black	fine texture 2	2.4	3.3	-0.41

Fine texture Terblend N plaque after mar test (left) and reference plaque (right)

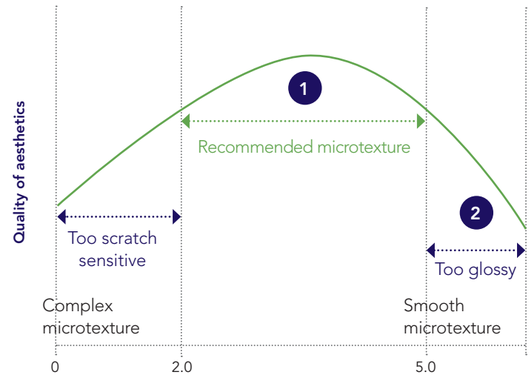
HIGH-QUALITY GRAIN AND TEXTURE

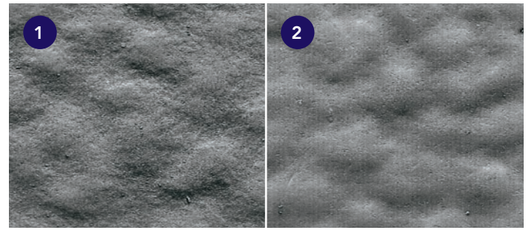
The basic texture of a part is defined by the OEM. Independent of its basic texture, the microtexture needs to be in a balanced range to enable an even low gloss and good scratch resistance. This requires the microtexture of the cavity surface to be fine-tuned by professional etching (or eroding) in order to achieve the desired gloss level on the final part.

In general, the lower the gloss level, the better the matt surface appearance. However, if the microtexture of the surface is too fine, it will have a dull, low-gloss appearance and be highly scratch sensitive. Further, processing parameters such as tool temperature and injection speed may also influence the gloss level of the plastic part. Another factor which needs to be considered in tool texturing is that eroded mold surfaces are superior to etched mold surfaces in terms of scratch resistance.

At gloss levels below 2, Terblend parts show a certain scratch sensitivity. The best balance between aesthetics and scratch resistance is achieved at gloss levels roughly between 2 and 5.

RECOMMENDED MICROTEXTURE FOR TERBLEND PARTS





Close-ups of microtextures

GLOSS TEST PERFORMED WITH TEXTURED TERBLEND N NM-21EF PLAQUES

GLOSS LEVEL OF STEEL INSERT	2.1	4.0	11.5	16.2
GLOSS LEVEL OF TERBLEND N NM-21EF PLAQUE	0.8	1.2	2.9	3.7

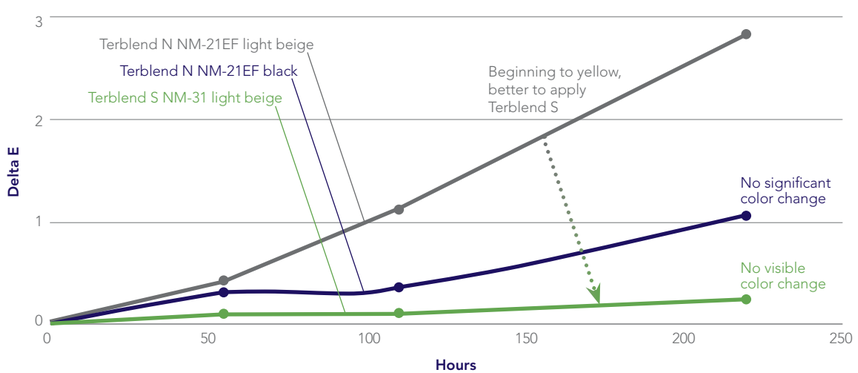
Gloss levels measured at a 60° illumination angle by BYK-Gardner Micro-Tri-Gloss. Steel inserts for the family mold were professionally etched with the texture design "Feinfarbe". The higher the gloss level of the steel insert, the higher the gloss level of the Terblend plaque. Titan-nitrile treatment of the tool insert was performed as wear protection during processing. These plaques were injection molded in a family mold with identical molding conditions.

Overview of color samples on display at Styrolution's CEC

COLOR FASTNESS

For dark colors, Terblend N provides good color fastness, making it suitable for many interior applications. In case of applications heavily exposed to sunlight or brightly colored assemblies, Terblend S provides additional benefits.

ACCELERATED UV EXPOSURE ACCORDING TO SAE J2412 (exemplary measurement)



COLOR VARIETY

Styrolution provides custom-made colors for all Terblend grades. The Styrolution CEC (Color Excellence Center) enables prototyping and sampling of customer specific colors. Many OEM interior colors have already been developed for Terblend N and Terblend S. Styrolution also supplies natural Terblend to customers who prefer self-coloring solutions with Terblend N.

EXAMPLES OF TERBLEND N AND TERBLEND S AUTOMOTIVE COLORS

OEM	COLOR NAME
AUDI	Soul Black
AUDI	Steelgrey
BMW	Black
BMW	Oyster
BMW	Venetobeige
Daimler	Oriongrey
FIAT	Grigio
FIAT	Black
FORD	Dark Shaddow
FORD	Syracuse
FORD	Warm Neutral Grey
OPEL	Jet Black
OPEL	Charcoal
OPEL	Light Neutral Ravenna
Hyundai KIA	Black
Landrover	Ebony Black

OEM	COLOR NAME
Landrover	Almond
Landrover	Cirrus
Landrover	Espresso
Landrover	Ivory
Landrover	Lunar
Landrover	Nutmeg
Porsche	Achatgrau
Porsche	Carrerarot
Porsche	Cognac
Porsche	Crema
Porsche	Espresso
Porsche	Luxorbeige
Porsche	Platingrau
Porsche	Schwarz
Porsche	Titanblau
Porsche	Yachtingblau

OEM	COLOR NAME
PSA	Tramontane Grey
PSA	Noir
PSA	Mistral
PSA	Guerande
PSA	Blanc Sonic
RSA	Noir Graphite
RSA	Noir Titane
RSA	Anis
RSA	Carbon Foncé
RSA	Carbon Très Foncé
RSA	Ivoire
Volvo	Off Black
Volvo	Granite
…..	…..

DESIGN & MOLDING

Based on extensive testing and experience, Styrolution recommends design and molding parameters in order to achieve the best possible performance of parts made by Terblend grades, as well as to avoid molding faults like marks and streaks.

MOLD SHRINKAGE

Shrinkage behavior of unreinforced Terblend N and unreinforced Terblend S are comparable (N NM-21EF and S NM-31 shown here). Glass-fiber reinforced Terblend grades such as N NG-02EF exhibit lower shrinkage and, as a result, higher dimensional stability.

SHRINKAGE BEHAVIOR OF UNREINFORCED TERBLEND N / TERBLEND S

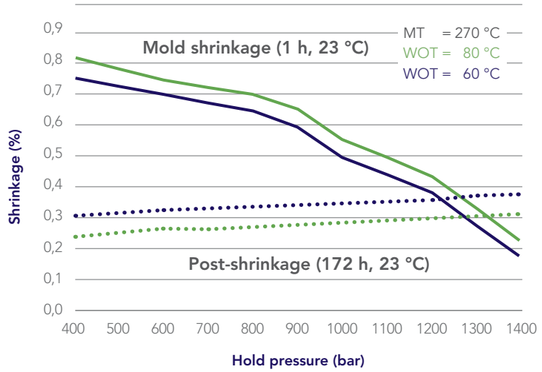
MOLD SHRINKAGE (%)	TERBLEND N NM-21EF	TERBLEND S NM-31
Longitudinal central measured	0.7	0.74
Transverse central measured	0.86	0.79

SHRINKAGE BEHAVIOR OF GLASS-FIBER REINFORCED TERBLEND N

MOLD SHRINKAGE (%)	TERBLEND NG-02EF (ABS/PA GF8)
Longitudinal central measured	0,6
Transverse central measured	0,65

Mold shrinkage according to ISO 294
Conditioning: 24h at 23°C / 50% relative humidity
Test plaques 60 x 60 x 2mm
Holding pressure 650 bar
Melt temperature 260°C
Mold temperature 60°C

MOLD SHRINKAGE AND POST SHRINKAGE OF TERBLEND N NM-21EF AS A FUNCTION OF HOLD PRESSURE AND MOLD SURFACE TEMPERATURE



Other factors affecting shrinkage are the shape of the molding (molding design, wall thickness, gating) and processing conditions, particularly hold pressure and mold surface temperature. Besides mold shrinkage, also post mold shrinkage of Terblend grades can be influenced. Mold shrinkage decreases considerably with increasing hold pressure, but post mold shrinkage shows less variation. Higher mold surface temperature leads to higher mold shrinkage and to lower post mold shrinkage.

SHRINKAGE AFTER ANNEALING

In the event that finished parts are stored, the storage temperature will affect the total shrinkage. The total shrinkage is the sum of mold shrinkage and post mold shrinkage. In case of glass fiber reinforcement (Terblend N NG-02EF shown here) the total shrinkage after annealing is reduced.

SHRINKAGE OF UNREINFORCED TERBLEND N AFTER ANNEALING

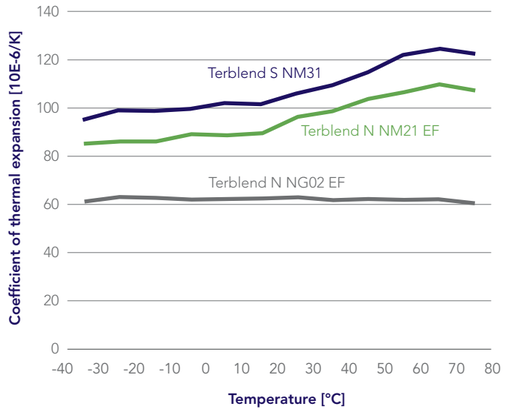
Terblend N NM-21EF (ABS/PA)				
CONDITIONING	6h 23°C / 50% rel. humidity	6h at 80°C	6h at 100°C	6h at 120°C
TOTAL SHRINKAGE (%)				
Longitudinal central measured	0.7	1.17	1.48	1.56
Transverse central measured	0.86	1.22	1.52	1.62

SHRINKAGE OF GLASS-FIBER REINFORCED TERBLEND N AFTER ANNEALING

Terblend N NG-02EF (ABS/PA GF8)				
CONDITIONING	6h 23°C / 50% rel. humidity	6h at 80°C	6h at 100°C	6h at 120°C
TOTAL SHRINKAGE (%)				
Longitudinal central measured	0.6	0.71	0.78	0.82
Transverse central measured	0.65	0.88	1	1.03

Total shrinkage (mold shrinkage and post shrinkage)
Test plaques 60 x 60 x 2mm
Holding pressure 650 bar
Melt temperature 260°C
Mold temperature 60°C

COEFFICIENT OF THERMAL EXPANSION
(LONGITUDINAL)



DIMENSIONAL STABILITY

The coefficient of linear thermal expansion describes how the length of an object will change with steadily increasing temperature. The following graphs show the coefficient of linear thermal expansion for Terblend N NM-21 EF, Terblend N NG-02 EF, and Terblend S NM-31. The coefficient of linear thermal expansion of Terblend N and Terblend S is comparable. Only a glass-fiber reinforced blend (represented here by Terblend N NG-02 EF) leads to lower values, resulting in a better dimensional stability.

PREDRYING

Styrolution recommends the following predrying conditions and methods:

Moisture content

In order to prevent moisture streaks on the parts, the moisture content before processing should be less than 0.05 %.
This is to be achieved by drying with a vacuum or desiccant dryer, preferably under nitrogen.

Drying conditions

Drying should be performed approximately 4 hours at 80 – 90 °C (freshly opened bags)

Sealing & covering

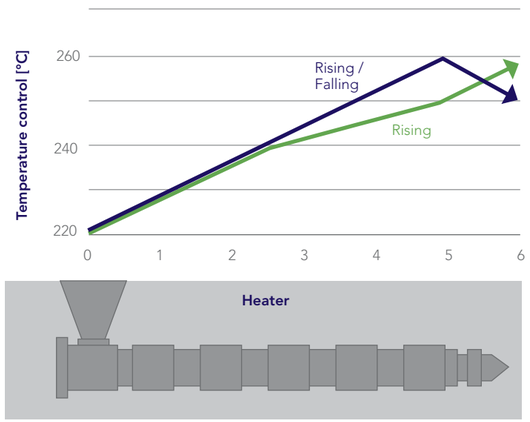
After removal of pellets, the partly-filled packs need to be immediately and carefully sealed. The hopper on the machine should be covered by a lid.

MOLD SURFACE TEMPERATURE

Mold surface temperature is one of the most important parameters in the entire injection molding process.
For Terblend it should be 50 – 80°C. High mold surface temperature improves the surface quality (even low gloss, pronounced surface structure, low visibility of flowlines) and leads to better weld line strength. The risk of tiger lines is also minimized. Mold surface temperature also affects the dimensional tolerances for the molding. The higher the mold surface temperature, the higher the mold shrinkage and the lower the post shrinkage.

Recommended mold temperature range: 50 – 80 °C

TYPICAL PLASTIFICATION UNIT
TEMPERATURE PROFILES



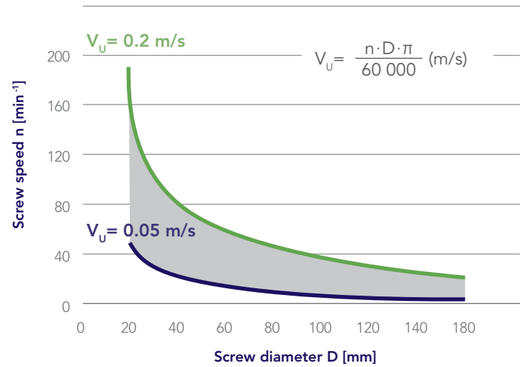
INJECTION MOLDING TEMPERATURE & CONTROL PROFILE

The recommended melt temperature for processing Terblend is 240 – 270 °C. It is advisable to check the melt temperature by using a needle thermometer within the melt down-stream of the screw. For reasons of better flowability and to achieve high surface quality and good mechanical properties, the upper range of the relevant temperature range is always preferable.

PLASTICIZING SCREW SPEED

The peripheral screw speed during plasticizing (V_U) should account for 0.05 – 0.2 m/s. The screw rotation speed needs to be adapted to the screw diameter. The higher the screw diameter, the smaller the suitable range of the screw rotation speed. This avoids excessive shear stress during the plasticizing process.

OPTIMAL SCREW SPEED:
0.05 – 0.2 m/s



RIBS

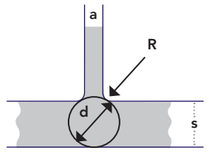
Ribs should have 0.4 – 0.6 times the thickness of the base wall in order to prevent material accumulation. In many cases, material accumulation leads to sink marks. To reduce or eliminate sink marks, the gate should ideally be set into the region of the highest wall thickness.

Radii on the base of a rib are necessary in order to prevent notch effects and flow problems. A radius of about 0.3 – 0.5 mm is sufficient. In case radii are wider, material accumulation could occur.

In visible surface areas, complex rib designs and ribs across the flow direction should be avoided.

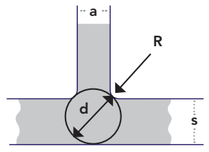
Wall thickness = **s**
Rib thickness = **a**
Radius = **R**
Control circle = **d**

RIB DESIGN VARIATIONS



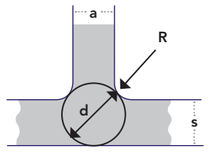
Recommended

s 2.0
a 1.0
R 0.3
d 2.24 ≙ 1.12·s
Setting time 11.1 sec



Not recommended (too thick)

s 2.0
a 2.0
R 0.5
d 2.7 ≙ 1.35·s
Setting time 15.9 sec



Not recommended (radius too large)

s 2.0
a 2.0
R 2.0
d 3.5 ≙ 1.75·s
Setting time 26.1 sec

DEMOLDING

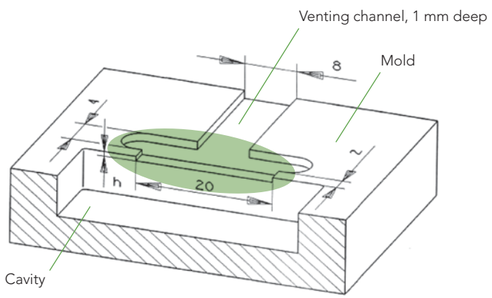
As a rule, the draft on injection molds for Terblend grades should be 1° to 2°. A draft of 2° or more is needed for rough textures. A draft of 1° and less causes an increase in the demolding forces, which could result in pressure marks from the ejector pins.

Ejector pins or stripper plates should be designed with the largest possible area. To reduce demolding forces, it may be helpful to use a PVD (physical vapor deposition) process to apply a surface coating such as TiN or CrN.

MOLD VENTING

Venting channels usually need to be incorporated into the injection mold in the mold parting line at the end of the flow path and in weld line areas. Inadequate mold venting can lead to mold filling problems, mold deposit or even a higher tendency for scorch marks, the so-called "Diesel" effect. Furthermore, good mold venting facilitates fast injection.

RECOMMENDED VENTING DESIGN



REGRIND PROCESSING

Sprue waste, such as reject parts or cold runners from the processing of Terblend, can be reused in limited amounts. The maximum permissible amount of regrind that can be added should be determined in trials by the customer.

In order to produce defect-free, injection-molded parts containing regrind material, the scrap material must be clean and dry. Moisture can give rise to molecular degradation during processing. It is also essential that no thermal degradation has occurred in the preceding processing.

The addition of regrind material to the original pellets can result in changes in feed and flow properties, as well as affect demolding and shrinkage behavior. Regrind processing may especially change mechanical properties.

AVOIDING PRESSURE MARKS, MOISTURE STREAKS AND HESITATION MARKS

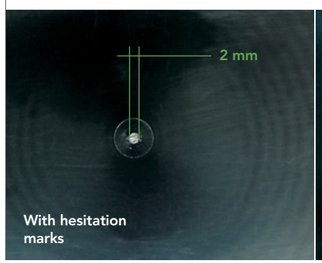
Example of a pressure mark caused by a change in wall thickness

Pressure marks are visible surface marks resulting from high holding pressure levels, especially in combination with fine textures. These can be avoided by:

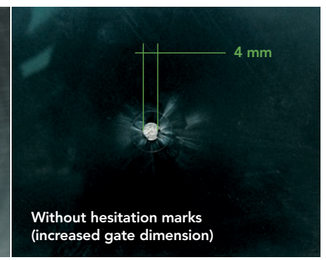
- Reducing the holding pressure and adjusting the holding pressure time
- Avoiding material accumulations and changes in wall thickness
- Avoiding ribs, snap fits, bosses too far from the injection point
- Gating the part in the thick walled area
- Opting for a medium rough or rough texture

Moisture streaks appear in the opposite direction of the flow. These can be avoided by:

- Adequately predrying material to a residual moisture content of < 0.05%
- Drying for 4 hours at 80 – 90°C (freshly opened bags)
- Increasing the back pressure



With hesitation marks



Without hesitation marks (increased gate dimension)

Hesitation marks and lines on the part that cross the flow direction. These can be avoided by:

- Enlarging the sprue and/or runner cross section
- Reducing pressure losses in the machine and hot runner nozzle
- Employing a better flowing material grade
- Optimizing the processing parameters (high melt temperature, high mold surface temperature, medium to low injection speed and high holding pressure)

INEOS STYROLUTION AT A GLANCE

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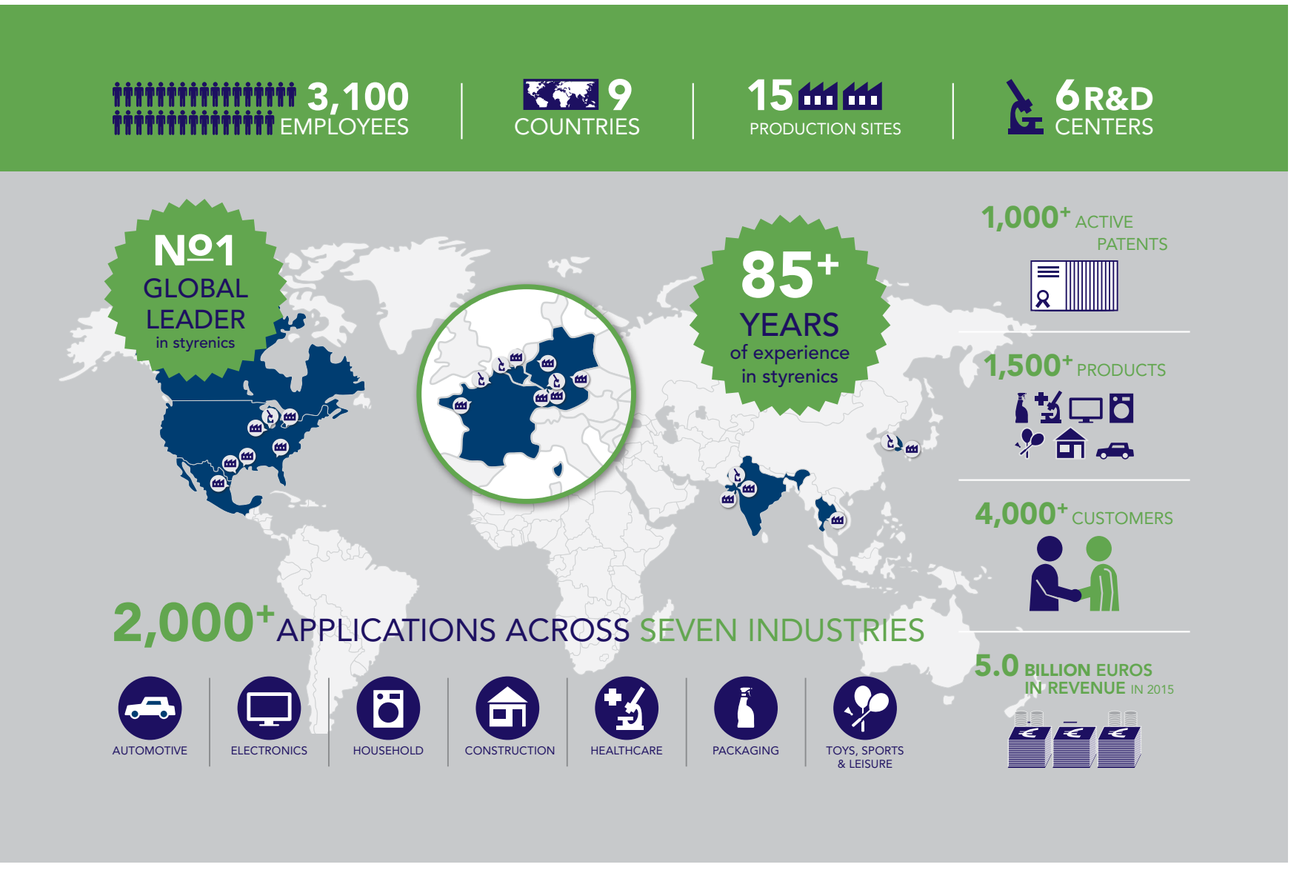

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