ENGINEERED MATERIALS | Automotive

TRINSEO

Customized TPE Solutions for Automotive

Materials. Powering Ideas.

trinseo.com

Meet the Challenges of Future Mobility

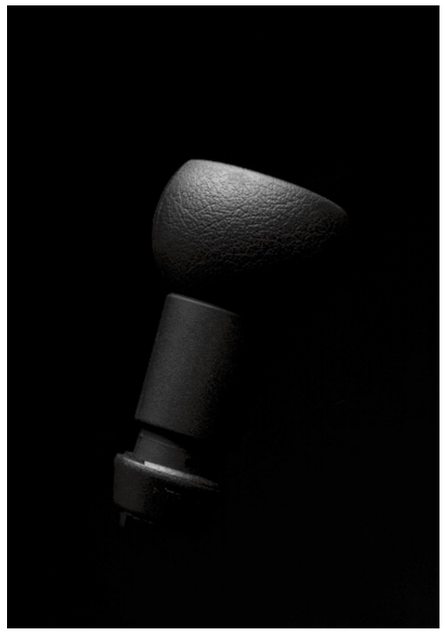
Trinseo's customized TPE Solutions and EVA-based compounds for automotive applications

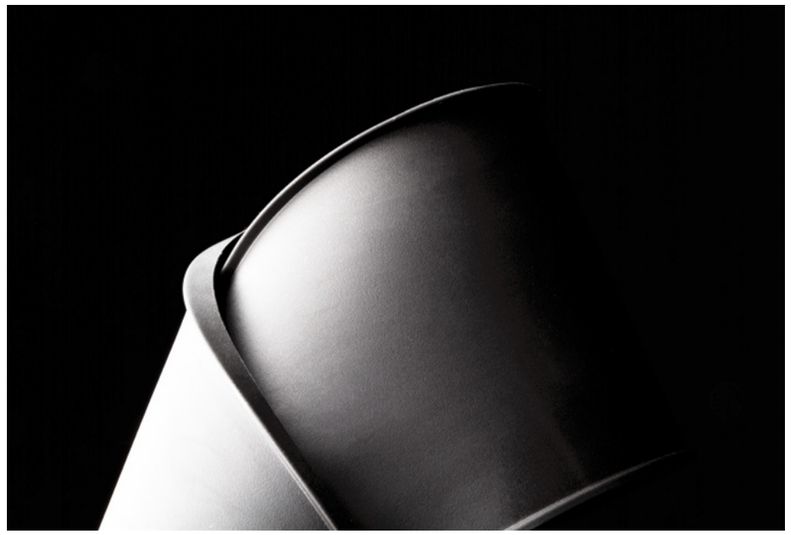
Trinseo is a leading global partner for the automotive industry. Our rigid and soft-touch plastics are optimized for lightweight construction, enabling low VOC levels, best-in-class scratch and heat resistance, long-term durability, high design flexibility, excellent haptics and high-end aesthetics.

Car manufacturers and suppliers trust our broad variety of innovative materials for automotive applications, particularly for a functional and aesthetic interior experience. Trinseo is quick to respond to our customers' needs with our 26 manufacturing sites, 11 R&D facilities and approximately 3,400 employees worldwide.

With the acquisition of API Applicazioni Plastiche Industriali S.p.A. in 2017, Trinseo became your one-stop partner for both rigid and soft-touch polymers to support your development and manufacturing of future-oriented automotive applications.

You can benefit from our expertise in customizing our products focused on specific needs. We invite you to learn more about our Thermosets and TPE solutions for interior and exterior automotive applications.





Contents

Customized Thermoplastic Elastomers

Properties and advantages to meet increased consumer needs

Shorter cycle time

→ Shorter processing time compared to rubber

Optimized appearance

→ Colorability in all color shades, wide gloss range, and suitable for different graining

Durability

→ Good resistance in the range -40 °C to +125 °C
→ Excellent aging resistance: heat, UV, ozone, weather
→ Long term dimensional stability due to good compression set and tensile strength

Recyclability

→ Scrap can be recycled

Bio-based

→ Alternative grades based on renewable resources are available for specific applications

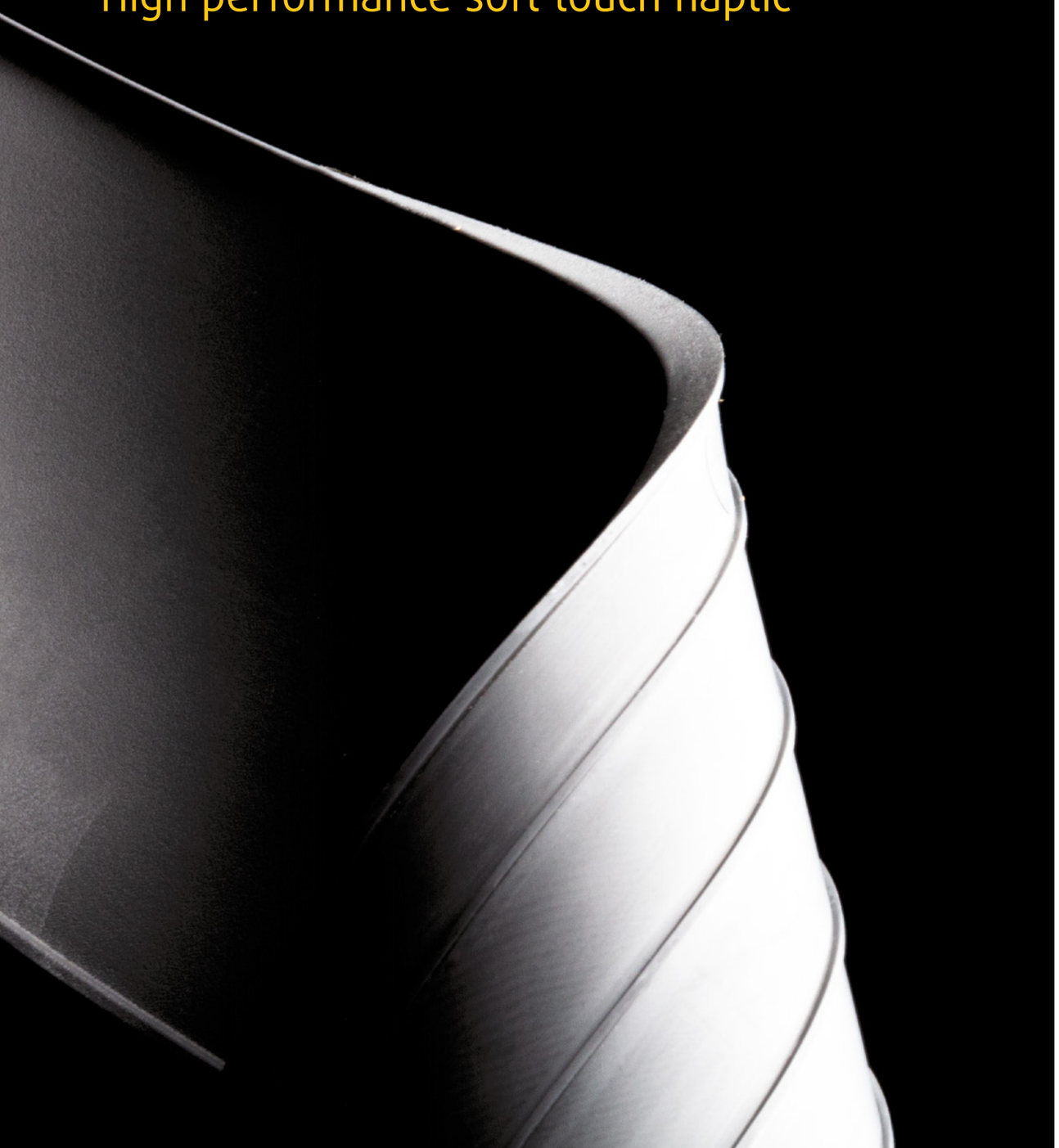
Weight reduction

→ Low specific gravity
→ Lower weight than thermoset rubber

Design flexibility

→ Suitable for co-injection and co-extrusion with other substrates for multi-component parts

MEGOL™
TPS-SEBS Compounds
High performance soft touch haptic



The MEGOL™ family of TPE compounds offers the ideal combination of the elasticity and look and feel of rubber with the low processing costs of thermoplastics. Typically based on SEBS, the MEGOL™ range offers optimum cold and hot elasticity, UV and age resistance, low emissions and low fogging as well as a large processing window.

Grades for overmolding and co-extrusion with technopolymers (PP, PE, ABS, SAN, PPMA, PC, PET, PA6, PA66, TPU, POM, etc).

MEGOL™ provides great looking, excellent soft-touch properties, and a good compression set.

Typical characteristics:

- → Remarkable range of hardness (5 ShA – 60 ShD) and elastic modulus
- → Excellent resistance to ageing (UV, ozone and weathering)
- → Almost white base color allows very wide color range
- → Excellent performance at low temperatures (Tg = -50 °C)
- → High temperature resistance (120 °C)
- → Chemical resistance to acids, detergents, bases and aqueous solutions

Specific grades have special characteristics:

- → High temperature resistance and low compression set (MEGOL™ HT)
- → Suitable for co-molding and co-extrusion (MEGOL™ SV) for hard/soft compositions, also to non-polyolefinic substrates to which conventional MEGOL™ is compatible
- → Calendering grades (MEGOL™ TA)
- → Types for automotive interior with low emissions and high scratch resistance

MEGOL™ Main Features and Processing Basics

TRANSFORMATION PROCESS
MEGOL™ products can be transformed by molding using conventional machinery for injection and extrusion. For process parameters see the adjoining illustrations.

SPECIAL PROCESS
Not required.

COLORING
MEGOL™ compounds are available in a natural base color, and we can supply specific masterbatches for MEGOL™. It is important that the masterbatch used is suitable for the single grade and the end application regarding properties such as UV resistance, processing temperatures, etc. We can also produce MEGOL™ in customized colors mixed according to customer specifications.

PRE-DRYING
MEGOL™ compounds are not hygroscopic and do not require pre-drying for processing. For some special hygroscopic grades, we recommend 1.5 to 2 hours at 75 °C to 80 °C.

RECYCLING
Reground material can be mixed with virgin compound.

PACKAGING
MEGOL™ products are supplied in 25 kg polyethylene bags on standard 1,250 kg pallets. Octabin packaging is also available upon request.

STORAGE
MEGOL™ should be stored in cool, dry, well-ventilated conditions, away from heat sources and open flames. Although not hygroscopic, exposure to humidity should be avoided.

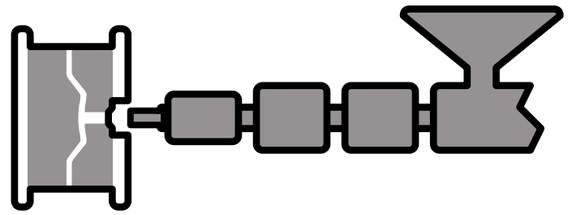
SHRINKAGE
Post-mold shrinkage of MEGOL™ is dependent on various factors: the polymer is non-isotropic, therefore shrinkage is greater depending on the line of flow. The position of the injection point will thus have a great influence. Also, factors such as cooling time, injection speed and pressure, the shape and thickness of the product will contribute to the final value. Typical shrinkage of a plate 110 x 60 x 3 mm may vary, according to grade, from 0.7–1.2 % (filled compound); 1.0–2.2 % (very soft, unfilled compound).

TECHNICAL ASSISTANCE
Our technical assistance department is at your disposal to support you with all the necessary information on how to transform MEGOL™ correctly and help you to choose the best MEGOL™ type to suit your specific needs.

PROCESSING

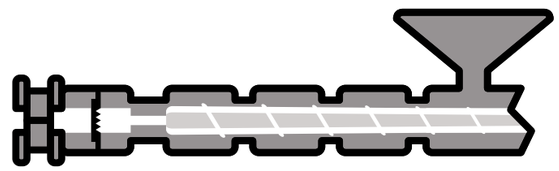
Injection molding
Conventional type with general purpose screw

Injection pressure	**Medium**					
Back pressure	**Low–Medium**					
Injection speed	**Medium–Fast**					
Temperature °C	**Soft**	**35**	**190**	**185**	**180**	**170**
	Rigid	**65**	**220**	**210**	**200**	**190**



Extrusion
Single screw, general purpose

L/D ratio	**>20**					
Compression ratio	**1:2.5**					
Temperature °C	**Soft**	**190**	**180**	**175**	**170**	**160**
	Rigid	**210**	**210**	**190**	**190**	**180**



The processing details shown above are intended only as a guide. Actual conditions will vary considerably from machine to machine and will very much depend on the moldings or extrusion being produced.

MEGOL™ AUTO A

Features:

- Adhesion on polyolefins (PP, PE, EVA)
- Good mechanical performances
- Good scratch and abrasion resistance
- Low emissions grades available for automotive interior applications
- In-process recycling
- Recyclable in closed-loop systems
- Very good behaviour on heat and light aging
- Available in black or customizable colors on request

Applications:

- Mats in the dashboard, door, middle console or glove box
- Floor Mats
- Handles
- Knobs
- Air management and venting components
- Spoilers
- Gaskets and seals

		PROPERTIES	METHOD	CONDITIONS	UNIT	MEGOL™ AUTO A50 BK Process: Injection Moulding	MEGOL™ AUTO A60 BK Process: Injection Moulding	MEGOL™ AUTO A70 BK Process: Injection Moulding	MEGOL™ AUTO A80 BK Process: Injection Moulding	MEGOL™ AUTO A90 BK Process: Injection Moulding
INTERIOR	GENERAL CHARACTERISTICS	Density	ISO 1183-1		g/cm³	0.97	0.97	0.97	0.97	0.97
		Hardness	ISO 7619-1		ShA	50	60	70	80	90
		Tensile strength	ISO 37[1]	200 mm/min	MPa	8.4	9.4	10.7	12.6	13.7
		Elongation @ break	ISO 37[1]	200 mm/min	MPa	740	710	680	650	650
		Tear strength	ISO 34 - A	100 mm/min	MPa	10	13	16	20	25
	EMISSIONS	Fogging	ISO 6452-B		mg	0.93	0.78	1.02	1.34	1.30
		VDA 277	PV 3341		ppm	1.2	1.7	2.0	8.3	11.9
		VDA 278		VOC	ppm	74	73	104	165	187
				FOG	ppm	≤ 1200[2]	≤ 1200[2]	≤ 1200[2]	≤ 1200[2]	≤ 1200[2]
		Odor test	VDA 270 - B3		Rate	3	3	3	3	3
	SURFACE TESTS	Scratch	PV 3952	10N – API Surface	ΔL	-0.5	-0.9	-1.3	-1.3	-1.2
		Mar	PV 3974	F= 3N – v 1000 mm/min	ΔGloss	-1.1	-0,.3	-0.4	0.1	0.4
		Resistance to Care Products	DBL 5562 - 7.8	Crockmeter (30 double strokes) – Plastics cleaner (MB No. A 001 986 9471)	Rating	2	2	2	1	2
	LIGHT AGING FOR INTERIOR		PV 1303	5 cycles	Gray Scale	4–5	4–5	4–5	4–5	4–5
				10 cycles	Gray Scale	4–5	4–5	4–5	4–5	5
			ISO 105-B06	3 cycles	Gray Scale	5	5	5	5	5
				4 cycles	Gray Scale	4	4	5	4–5	5
			SAE J 2412	1st cycle – 601 kJ/m²	Gray Scale	5	5	5	5	5
				2nd cycle – 902,4 kJ/m²	Gray Scale	5	5	4–5	4–5	4–5
				3rd cycle – 1240,8 kJ/m²	Gray Scale	5	5	4–5	4–5	4–5
EXTERIOR	LIGHT AGING FOR EXTERIOR	Kalahari	PV 3929	1 cycle	Gray Scale	5	4–5	4–5	4–5	5
				2 cycles	Gray Scale	5	5	5	4–5	5
		Florida	PV 3930	1 cycle	Gray Scale	4–5	4–5	4–5	4–5	5
				2 cycles	Gray Scale	5	5	5	5	5
			SAE J 2527	1st cycle – 1250 kJ/m²	Gray Scale	5	5	5	5	5
				2nd cycle – 2500 kJ/m²	Gray Scale	4–5	5	4–5	4–5	5
				3rd cycle – 3500 kJ/m²	Gray Scale	4–5	4–5	4–5	4–5	4–5
				4th cycle – 4500 kJ/m²	Gray Scale	4–5	5	4–5	4–5	4–5

Rating DBL 5562 - 7.8:

1: very slight, i.e. just perceptible change
2: slight, i.e. clearly perceptible change

Cycles SAE J 2412:

1st cycle: 601 kJ/m² – TESLA TP-0000701 - FCA MS-DC-242 - GM GMW14162
2nd cycle: 902,4 kJ/m² – TESLA TP-0000701
3rd cycle: 1240,8 kJ/m² – TESLA TP-0000701 - GM GMW 14162

Cycles SAE J 2527:

1st cycle: 1250 kJ/m² – GM GMW14650 (class 4)
2nd cycle: 2500 kJ/m² – GM GMW14650 (class 3) – FCA LP.7M035 Part A – TESLA TP-0000701
3rd cycle: 3500 kJ/m² – GM GMW14650 (class 2)
4th cycle: 4500 kJ/m² – GM GMW14650 (class 1)

[1] Deviating from ISO 37: standard samples S2 (cross flow) are tested with traverse speed of 200 mm/min
[2] specific low emission version (MUL1)

MEGOL™ AUTO AD-G

Features:

- Adhesion on polar surfaces (ABS, PC, PC/ABS, ASA)
- Excellent scratch resistance
- Excellent mechanical properties
- Good haptics
- Silky effect
- In-process recycling
- Controlled level of emission and odor
- Available in black or customizable colors on request

Applications:

- Mats
- Cup holder
- Handles
- Interior surfaces and trims

		PROPERTIES	METHOD	CONDITIONS	UNIT	MEGOL™ AUTO AD-G 60 U BK Process: Injection Moulding	MEGOL™ AUTO AD-G 70 U BK Process: Injection Moulding	MEGOL™ AUTO AD-G 80 U BK Process: Injection Moulding
INTERIOR	GENERAL CHARACTERISTICS	Density	ISO 1183-1		g/cm³	1.11	1.11	1.16
		Hardness	ISO 7619-1		ShA	60	70	80
		Tensile strength	ISO 37[1]	200 mm/min	MPa	7.3	17.0	14.2
		Elongation @ break	ISO 37[1]	200 mm/min	MPa	560	590	627
		Tear strength	ISO 34 - A	100 mm/min	MPa	22	18	37
	EMISSIONS	Fogging	ISO 6452-B		mg	1.30	0.79	0.73
		VDA 277	PV 3341		ppm	2.2	1.5	2.7
		VDA 278		VOC	ppm	109	132	125
				FOG	ppm	≤ 1200[2]	≤ 1200[2]	≤ 1200[2]
		Odor test	VDA 270 - B3		Rate	3	3	3
	SURFACE TESTS	Scratch	PV 3952	10N – API Surface	ΔL	-0.50	0.86	-0.03
		Mar	PV 3974	F= 3N – v 1000 mm/min	ΔGloss	-0.3	0.1	0.1
		Resistance to Care Products	DBL 5562 - 7.8	Crockmeter (30 double strokes) – Plastics cleaner (MB No. A 001 986 9471)	Rating	2	0	1
	LIGHT AGING FOR INTERIOR		PV 1303	5 cycles	Gray Scale	4	4–5	5
				10 cycles	Gray Scale	4	4	5
			ISO 105-B06	3 cycles	Gray Scale	4–5	4	5
				4 cycles	Gray Scale	4	4	4
	ADHESION	Adhesion on POLAR Substrate acc. to VDI 2019	DIN ISO 6133	Trinseo MAGNUM™ ABS	N/mm	5	4.8	10
					Fracture pattern	D	B	C/D
				Trinseo PULSE™ PC/ABS	N/mm	5	6.5	7.5
					Fracture pattern	C/D	C/D	D

Rating DBL 5562 - 7.8:

1: very slight, i.e. just perceptible change
2: slight, i.e. clearly perceptible change

[1] Deviating from ISO 37: standard samples S2 (cross flow) are tested with traverse speed of 200 mm/min
[2] specific low emission version

MEGOL™ AUTO AD-B

Features:

- Adhesion on polar surfaces (ABS, PC, PC/ABS, ASA, PMMA)
- Low gloss appearance
- Easy processability with short cycle time
- Excellent UV resistance perfect for exterior applications
- Available in black or customizable colors on request

Applications:

- Mirror triangles
- Quarter and fixed glass sealings
- Spoilers
- Profiles
- Gaskets and seals

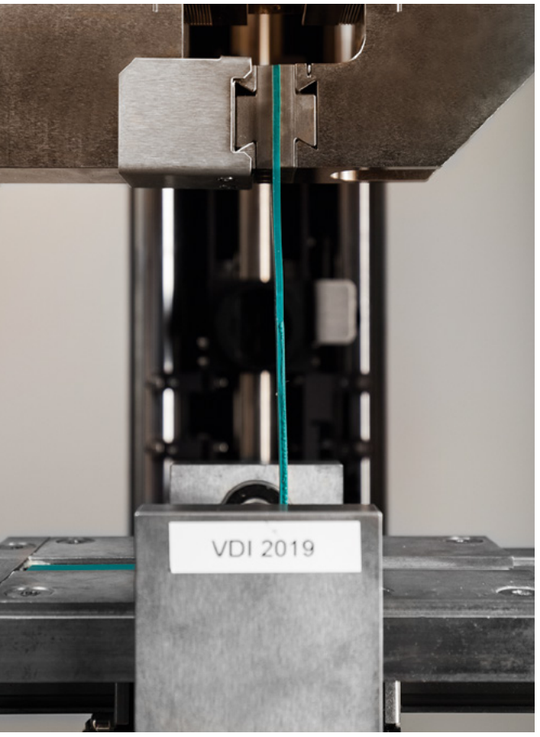
					MEGOL™ AUTO AD-B 50 U BK	MEGOL™ AUTO AD-B 60 U BK	MEGOL™ AUTO AD-B 70 U BK	MEGOL™ AUTO AD-B 80 U BK
					Process: Injection Moulding	**Process:** Injection Moulding	**Process:** Injection Moulding	**Process:** Injection Moulding
	PROPERTIES	**METHOD**	**CONDITIONS**	**UNIT**	**TPE-S**	**TPE-S**	**TPE-S**	**TPE-S**
GENERAL CHARACTERISTICS	Density	ISO 1183-1		g/cm³	1.00	1.02	1.01	1.06
	Hardness	ISO 7619-1		ShA	50	60	70	80
	Tensile strength	ISO 37[1]	200 mm/min	MPa	3.05	3.59	5.22	5.33
	Elongation @ break	ISO 37[1]	200 mm/min	MPa	386	396	356	330
	Tear strength	ISO 34 - A	100 mm/min	MPa	4	5	8	8
EXTERIOR	Kalahari	PV 3929	1 cycle	Gray Scale	4–5	4–5	4	4
	Florida	PV 3930	1 cycle	Gray Scale	5	4–5	4–5	4–5
LIGHT AGING FOR EXTERIOR		SAE J 2527	1st cycle – 1250 kJ/m²	Gray Scale	4–5	4–5	4–5	4
			2nd cycle – 2500 kJ/m²	Gray Scale	4–5	4–5	4–5	4–5
			3rd cycle – 3500 kJ/m²	Gray Scale	4	4–5	4–5	4
			4th cycle – 4500 kJ/m²	Gray Scale	4	4–5	4–5	4
ADHESION	Adhesion on POLAR Substrate acc. to VDI 2019	DIN ISO 6133	Trinseo PULSE™ PC/ABS	N/mm	2.5	3	7	9
				Fracture pattern	B	B	C/D	D

Cycles SAE J 2527:
1st cycle: 1250 kJ/m² – GM GMW14650 (class 4)
2nd cycle: 2500 kJ/m² – GM GMW14650 (class 3) – FCA LP.7M035 Part A – TESLA TP-0000701
3rd cycle: 3500 kJ/m² – GM GMW14650 (class 2)
4th cycle: 4500 kJ/m² – GM GMW14650 (class 1)

[1] Deviating from ISO 37: standard samples S2 (cross flow) are tested with traverse speed of 200 mm/min
[2] specific low emission version (MUL1)

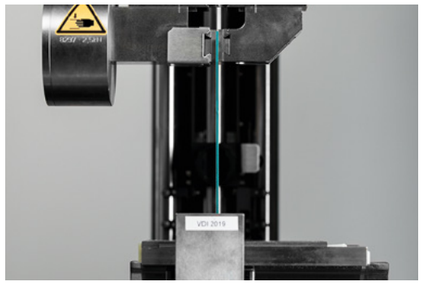
MEGOL™ AM – Adhesion Modified TPE for Overmolding

The overmolding of rigid plastics with soft TPEs delivers genuine advantages in the functional, visual, acoustic and tactile properties of a plastic application.



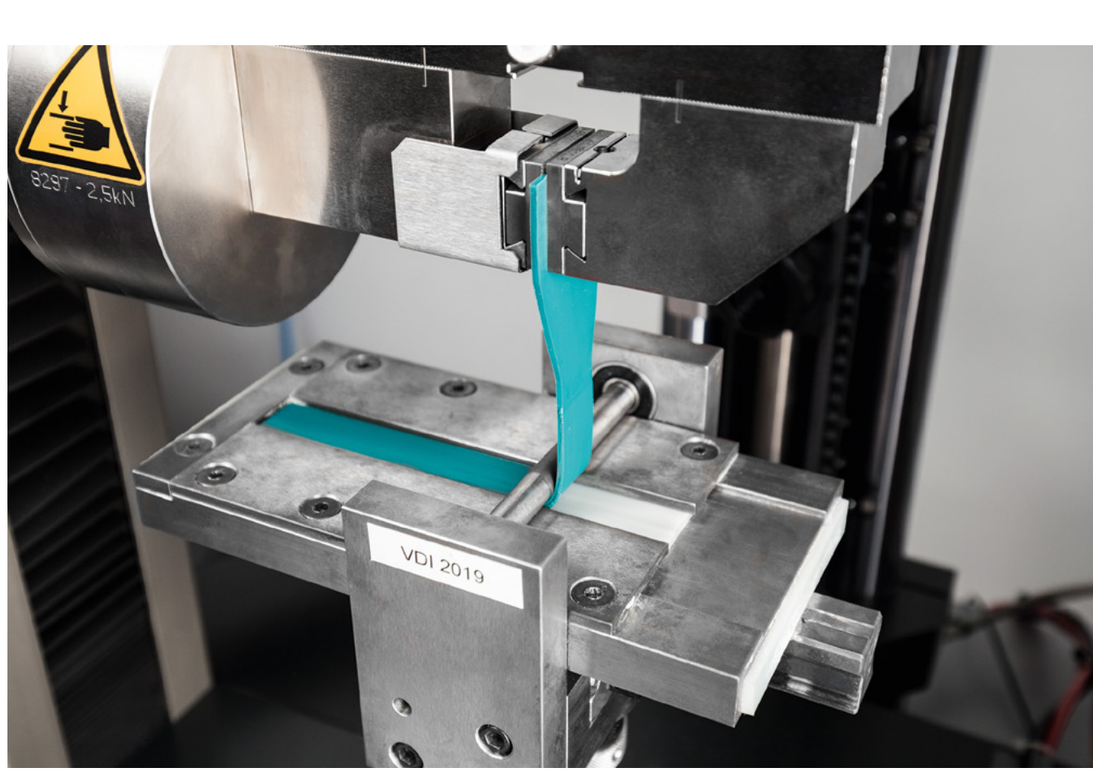
As in other markets, there is an increased demand in the automotive business for plastics that enable a premium surface appearance and excellent haptics available in a wide range of colors. We therefore expanded the MEGOL™ and the APILON™ 52 products families to produce grades suitable for overmolding on polar polymers (ABS, PC, PC/ABS, ASA, PMMA, TPU), polyamides (PA6, PA66, PA12), and polyester-based techno-polymers (PBT, PET) as well as for glass fiber reinforced grades.

Overmolding technology allows for the creation of composite finished products in a single step, removing the need for successive gluing or mechanical fixing phases. This additionally reduces the environmental impact as there are no VOC emissions from adhesives and because the components are not made from a range of incompatible materials, their recycling after a useful life is much easier. The development of this technology enables the overmolding process to be extended to highly technical applications such as complex components for the automotive industry.



The vast range of products for overmolding such as MEGOL™ AM (Adhesion Modified) or APILON™ 52 developed by API, now a Trinseo company, means that we can satisfy the most diverse requirements for both surface appearance (finish, opacity, shine, color and transparency) and haptics (softness, rubberlike feel). Another unique aspect is their ease of processability with the type of technopolymer they are to be molded to.

We are also working on developing of control systems and certification protocols for gauging bond strength in over-molding. We were part of an international work group (coordinated by VDI in Germany) tasked with redefining the standards and norms governing this field of application.



APIGO™

TPO Compounds

Lightness, elasticity, and superior at low temperatures

APIGO™ products were created to meet market demands for light products that are highly resistant to low temperatures. We have continually improved the APIGO™ grades, which have been very successful over the years and are excellent alternatives to flexible PVC wherever halogen-free materials are required.

APIGO™ materials are polyolefin-based compounds modified with elastomers. We developed these products to meet the market requirements for alloys with rigidity lower than conventional polypropylene but with customized characteristics for specific applications.

Typical characteristics:

- → Large range of hardnesses (30 ShA – 60 ShD) and elastic modulus
- → Excellent performance at low temperatures
- → Chemical resistance to acids and bases
- → Co-molding to polyolifinic substrates
- → Extrusion and injection molding transformation

APIGO™ Main Features and Processing Basics

TRANSFORMATION PROCESS
APIGO™ products can be transformed by molding using conventional machinery for injection and extrusion. See the adjacent graphics for process parameters.

SPECIAL PROCESS
APIGO™ products can be co-molded onto polyolefin or onto themselves with excellent adhesion results.

COLORING
APIGO™ is supplied as neutral pellets and can be colored later using masterbatches. For the coloring of APIGO™, we recommend the use of specific masterbatches from the APICOLOR™ PE series. We can also produce APIGO™ in customized colors mixed according to customer specifications.

PRE-DRYING
APIGO™ compounds are not hygroscopic and do not require pre-drying for processing.

RECYCLING
Reground material can be mixed with virgin compound.

PACKAGING
APIGO™ products are available in 25 kg bags and 1,250 kg pallets. Octabin packaging is also available upon request.

STORAGE
We recommend storing APIGO™ in a cool, dry and well-ventilated place. Exposing the product to high temperatures, open flames or any other heat source should be avoided. APIGO™ is not sensitive to humidity.

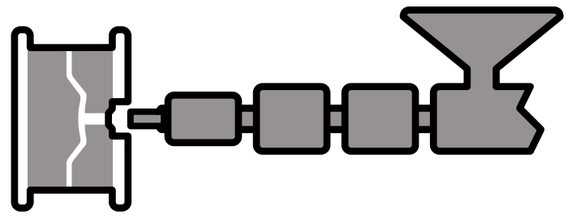
SHRINKAGE
Post-mold shrinkage of APIGO™ is dependent on various factors: the polymer is non-isotropic, therefore shrinkage is greater depending on the line of flow. The position of the injection point will thus have a great influence. Also, factors such as cooling time, injection speed and pressure, the shape and thickness of the product will contribute to the final value. Typical shrinkage of a plate 110 x 60 x 3 mm may vary, according to grade, from 0.5 % to 1,5 %.

TECHNICAL ASSISTANCE
Our technical assistance department is at your disposal to support you with all the necessary information on how to transform APIGO™ correctly and help you to choose the best APIGO™ type to suit your specific needs.

PROCESSING

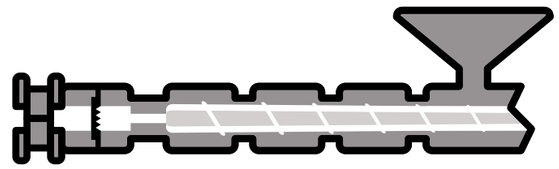
Injection molding
Conventional type with general purpose screw

Injection pressure	**High**					
Back pressure	**Medium**					
Injection speed	**Medium–Low**					
Temperature °C	**Soft**	**20÷40**	**180**	**170**	**160**	**150**
	Rigid	**40÷60**	**200**	**190**	**180**	**170**



Extrusion
Single screw, general purpose

L/D ratio	**>20**					
Compression ratio	**1:2.5–3**					
Temperature °C	**Soft**	**180**	**180**	**170**	**160**	**150**
	Rigid	**200**	**190**	**190**	**190**	**180**



The processing details shown above are intended only as a guide. Actual conditions will vary considerably from machine to machine and will very much depend on the moldings or extrusion being produced.

TIVILON™
TPV Compounds
Excellent compression set

TIVILON™ is a family of TPE products based on dynamically Vulcanized Thermoplastic Elastomers (TPVs). It provides high elasticity at low and high temperatures, excellent compression set, UV resistance and high melt flow.

TIVILON™ is particularly well-suited to bonding with other materials for co-molding and co-extrusion with polyolefins and their compounds. The improved processability of the TIVILON™ range means that it is easier to transform both for molding and extrusion as compared to traditional TPV products. The creation of customized grades highlights other impressive features of this product such as its resistance to scratches and solvents, its performance when exposed to fire, its increased thermo-resistance and the ability to produce it in a wide range of colors.

Typical characteristics:

- Large range of hardnesses (30 ShA – 60 ShD)
- High temperature resistance
- Excellent compression set
- Chemical resistance to acids and bases
- Oil resistance better than MEGOL™ and APIGO™
- Co-molding to polyolefinic substrates
- Extrusion and injection molding transformation

TIVILON™ Main Features and Processing Basics

TRANSFORMATION PROCESS
TIVILON™ products can be transformed by molding using conventional machinery for injection and extrusion.
See the adjacent graphics for process parameters.

SPECIAL PROCESS
TIVILON™ products can be co-molded onto polyolefin or onto themselves with excellent adhesion results.

COLORING
TIVILON™ compounds are available in a natural base color, and we can supply specific masterbatches for TIVILON™.
It is important that the masterbatch used be suitable for the specific grade and end application regarding properties such as UV resistance, processing temperatures, etc. We can also produce TIVILON™ in customized colors mixed according to customer specifications.

PRE-DRYING
TIVILON™ compounds are hygroscopic.
We recommend 1.5 to 2 hours at 75 °C to 80 °C.

RECYCLING
Reground material can be mixed with virgin compound.

PACKAGING
TIVILON™ products are supplied in 25 kg aluminum bags on standard 1,250 kg pallets. Octabin packaging is also available upon request.

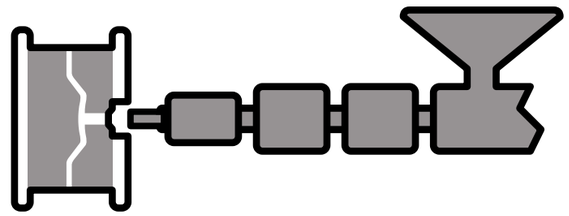
STORAGE
TIVILON™ should be stored in cool, dry, well-ventilated conditions, away from heat sources and open flames.

SHRINKAGE
The post-mold shrinkage of TIVILON™ depends on various factors. The polymer is non-isotropic, therefore shrinkage is greater depending on the line of flow. The position of the injection point will thus have a great influence. Also, factors such as cooling time, injection speed and pressure, the shape and thickness of the product will contribute to the final value. Typical shrinkage of a plate 110 x 60 x 3 mm may vary, according to grade, from 0,7–1,2 % (filled compound); 1,0–2,2 % (very soft, unfilled compound).

TECHNICAL ASSISTANCE
Our technical assistance department is at your disposal to support you with all the necessary information on how to transform TIVILON™ correctly and help you to choose the best TIVILON™ type to suit your specific needs.

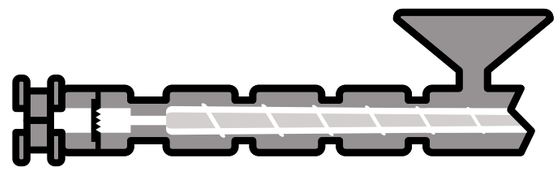
PROCESSING

Injection molding
Conventional type with general purpose screw



Injection pressure	**Medium**					
Back pressure	**Low – Medium**					
Injection speed	**Medium – Fast**					
Temperature °C	**Soft**	**35**	**190**	**185**	**180**	**170**
	Rigid	**50**	**210**	**200**	**190**	**180**

Extrusion
Single screw, general purpose



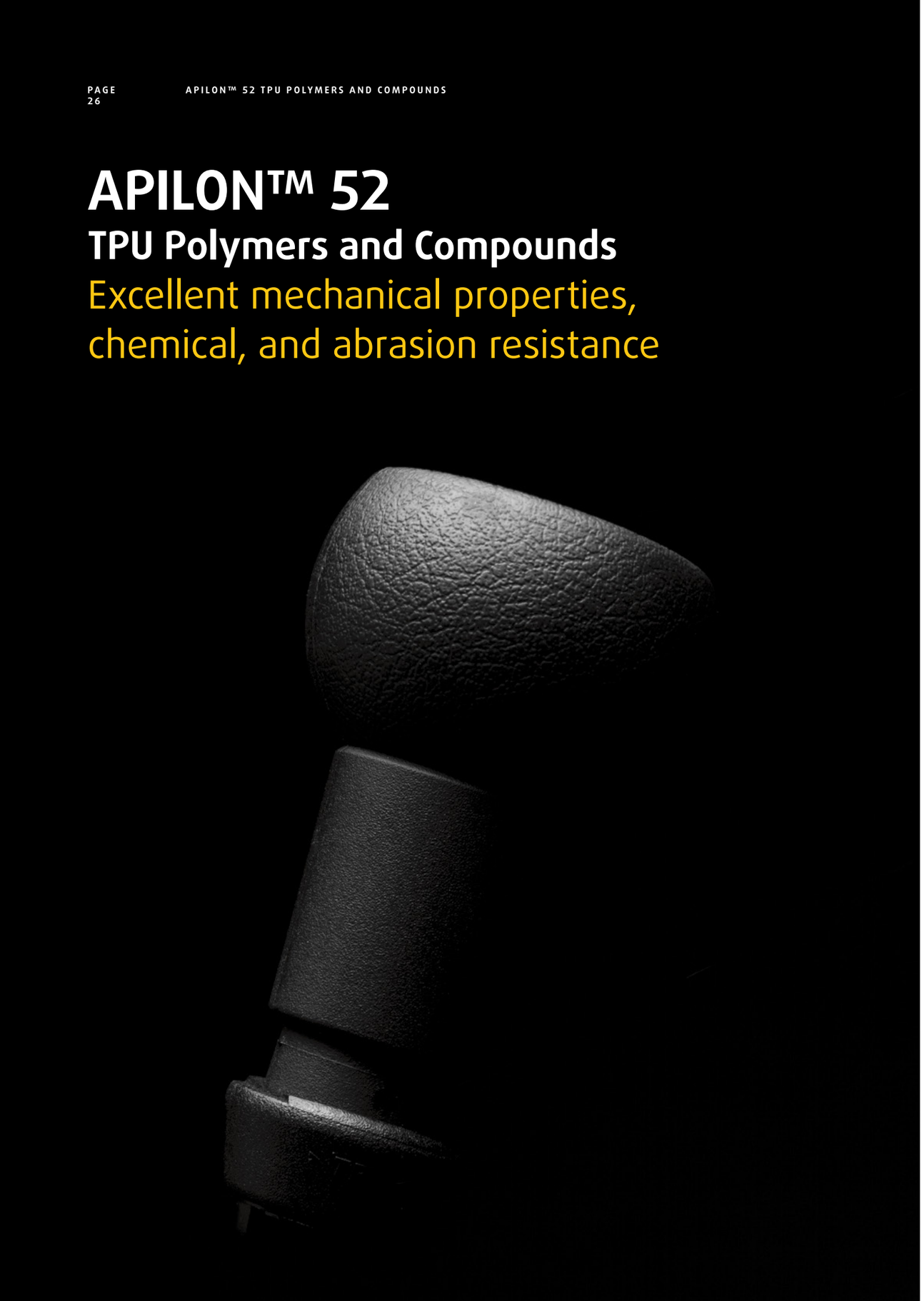
L/D ratio	**>20**					
Compression ratio	**1:2.5**					
Temperature °C	**Soft**	**190**	**180**	**175**	**170**	**160**
	Rigid	**200**	**190**	**185**	**180**	**170**

The processing details shown above are intended only as a guide. Actual conditions will vary considerably from machine to machine and will very much depend on the moldings or extrusion being produced.

APILON™ 52

TPU Polymers and Compounds

Excellent mechanical properties, chemical, and abrasion resistance



APILON™ 52 is a line of thermoplastic polyurethanes with excellent mechanical properties, high elasticity and superior resistance to low temperatures. They are very durable and suitable for applications where a high level of resistance to abrasion, oils and fats is necessary and can be customized to suit specific application requirements.

APILON™ 52 is divided into polyester-based and polyether-based series with a scale of hardnesses from 40 Shore A to 75 Shore D and are available in a range of formulations based on the performance required. The range includes:

- Plasticized APILON™ 52 – with optimum flexibility even at low temperatures, medium-low range of hardnesses and easy processability.
- Modified APILON™ 52 – as polymeric alloys of soft materials ideal for co- and overmolding or extrusion, where a rubberier haptic and grippy surface is required while maintaining the high mechanical performance.
- Special APILON™ 52 is a customized formula with properties designed to meet the needs of specific applications (e.g. increased resistance to hydrolysis, microbes and aging).
- Bio-based grades, both ether and ester, with the same mechanical properties and durability of traditional grades, and a high content of renewable resources (up to 70 %)

Automotive customers can use APILON™ 52 products for applications such as scratch-resistant interior surfaces, gaskets, abrasion-resistant tubes and cables, bellows, impact protections, etc. Modified APILON™ 52 grades (because of their optimum bonding properties with various structural techno-polymers) are used as the soft component in items that are constructed from a combination of materials with different hardnesses. They fit wherever the desired effect is to combine the superior durability of TPU with the appearance and haptics of rubber.

Typical characteristics:

- Large range of hardnesses (30 ShA – 60 ShD)
- High temperature resistance
- Good compression set
- Chemical resistance to acids and bases
- Better oil resistance as compared to MEGOL™ and APIGO™
- Co-molding to polyolefinic substrates
- Extrusion and injection molding transformation
- Excellent abrasion resistance

APILON™ 52 Main Features and Processing Basics

TRANSFORMATION PROCESS
APILON™ 52 products can be transformed with all known technology used for plastic materials.

SPECIAL PROCESS
Post-curing of the parts at 80 °C to 110 °C for 15 to 20 hours in an oven allows the product to reach optimum mechanical characteristics even faster. APILON™ 52 products can be glued with the help of special adhesives.

COLORING
APILON™ 52 are supplied as natural pellets and can be colored later using masterbatches. For the coloring of APILON™ 52, APICOLOR™ MASTERBATCHES are already available in a very wide variety of tones, shades, and special effects like metallized, pearlescent, or photoluminescent. APICOLOR™ MASTERBATCHES can be based both on ester and ether APILON™ 52, using a carrier identical or a very similar to the APILON™ 52 type that needs to be colored, which optimizes homogenization.

PRE-DRYING
Being hygroscopic, the APILON™ 52 humidity rate must be kept lower than 0.05 % in order not to cause problems during transformation. It is always advisable to pre-dry APILON™ 52 as follows: 2 hours at 80 °C to 100 °C for softer types; 2 hours at 90 °C to 120 °C for harder types. See the adjacent graphics for process parameters.

RECYCLING
APILON™ 52 products are thermoplastic technopolymers and therefore totally recyclable. We recommend reusing the reground material in a blend with the virgin material and to pre-dry it before reuse.

PACKAGING
APILON™ 52 products are normally supplied in 25 kg aluminum bags on standard 1,250 kg pallets.

STORAGE
We recommend storing the products in a cool, dry and ventilated place. Exposure to high temperatures, humidity, open flames or any other heat source should be avoided. The product is hygroscopic. Should the original packaging be opened, an adequate drying treatment is required.

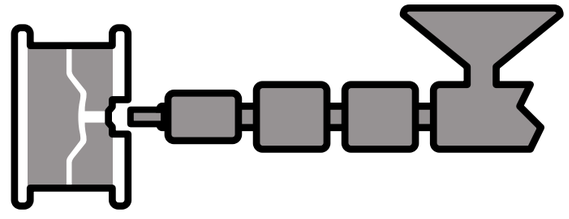
SHRINKAGE
Post-mold shrinkage of APILON 52™ is dependent on various factors: the polymer is non-isotropic, therefore shrinkage is greater depending on the line of flow. The position of the injection point will thus have a great influence. Also, factors such as cooling time, injection speed and pressure, the shape and thickness of the product will contribute to the final value. Typical shrinkage of a plate 110 x 60 x 3 mm may vary, according to grade, from 0,2 % to 2 %.

TECHNICAL ASSISTANCE
Our technical assistance department is at your disposal to support you with all the necessary information on how to transform APILON™ 52 correctly and help you to choose the best APILON™ 52 type to suit your specific needs

PROCESSING

Injection molding
Conventional type with general purpose screw

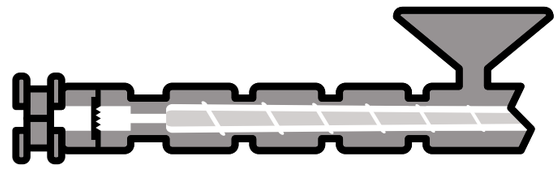
Injection pressure	**500 ÷ 1000 bar**
Back pressure	**Medium – Low**
Locking pressure	**High**
Injection speed	**Medium – Low**



Temperature °C	**Min**	Mold	**200**	**190**	**185**	**180**
	Max	**30 ÷ 60 °C**	**230**	**215**	**200**	**190**

Extrusion
Single screw, general purpose

L/D ratio	**20 – 30**
Compression ratio	**1 : 2.5 – 3**



Temperature °C	**Min**	**170**	**180**	**175**	**170**	**160**
	Max	**210**	**220**	**210**	**200**	**185**

The processing details shown above are intended only as a guide. Actual conditions will vary considerably from machine to machine and will very much depend on the moldings or extrusion being produced.

APIZERO™
EVA-based, crosslinkable, and expandable TPE compounds
A light and resistant alternative for PVC

Our APIZERO™ products are crosslinkable and expandable products based on EVA (ethyl-vinyl acetate) for injection molding. We developed APIZERO™ to meet the market needs for materials to produce light and sustainable applications. APIZERO™ products can successfully compete with conventional products such as two-component polyurethane.

Some typical applications in the automotive field are expandable plugs and acoustic insulation in the chassis.

Typical characteristics:

- → Lightweight
- → Abrasion resistance
- → Resistance to high and low temperatures
- → Excellent aesthetic qualities
- → Suitable for injection molding

APIZERO™ Main Features and Processing Basics

TRANSFORMATION PROCESS
The injection process is similar to that used for conventional thermoplastic materials: the material is injected into molds thermo-regulated at 180 °C where, after about 5 or 6 minutes, the cross-linking takes place. As soon as the mold is opened, based on the type of material used, the volume of the piece can expand up to five times the volume of the original mold. This expansion is completely homogenous across all three dimensions and gives a linear increase of up to 1.8 times. A wide variety of molding machines are available on the market that, when used with accurately constructed molds, will enable the production of any shape while maintaining high levels of productivity. The molding process of APIZERO™ is shown, with its operating conditions, in the adjoining illustrations.

SPECIAL PROCESS
With special APIZERO™ types designed for automotive plugs and insulation components, the material can be injected in the mold with a molten mass temperature of approximately 90 °C to 105 °C, and parts can be extracted from the mold without any expansion taking place: expansion can then be activated later in an environment with a temperature varying from approximately 120 °C to 200 °C. Exact conditions depend significantly, in such cases, from the specific customer's equipment and process.

COLORING
APIZERO™ compounds are available in natural base color. We can also produce APIZERO™ in customized colors mixed according to the customer's specifications.

PRE-DRYING
Not required.

RECYCLING
After cross-linking, APIZERO™ materials can no longer be recycled.

PACKAGING
APIZERO™ products are supplied in 25 kg polyethylene bags on standard 1250 kg pallets.

STORAGE
We recommend storing the products in a cool, dry and ventilated place. Exposure to high temperatures, humidity, open flames or any other heat source should be avoided. The product is hygroscopic. Should the original packaging be opened, an adequate drying treatment is required.

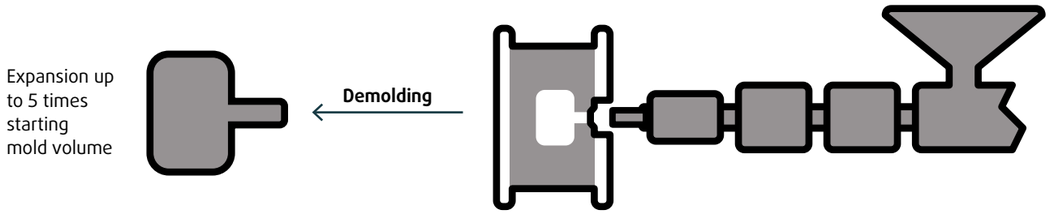
TECHNICAL ASSISTANCE
Our technical assistance department is at your disposal to give you all the necessary information on how to transform APIZERO™ correctly and help you to choose the best APIZERO™ type to suit your specific needs.

SAFETY
While in its pellet form, APIZERO™ presents no risks of toxicity either by contact or inhalation. During the processing stage, however, contact with the product and inhalation of the fumes should be avoided. We advise proper ventilation of the areas where processing takes place. For further information, please refer to our material safety sheets.

PROCESSING

Injection molding
Conventional type with general purpose screw

Injection speed	**6–15 g/sec**	Screw length	**L/D = 18/20**
Injection pressure	**80 ÷ 100 bar**	Molten Mass Temp.	**90–105 °C**
Back pressure	**0 ÷ 20 bar**	*Mold in aluminum*	

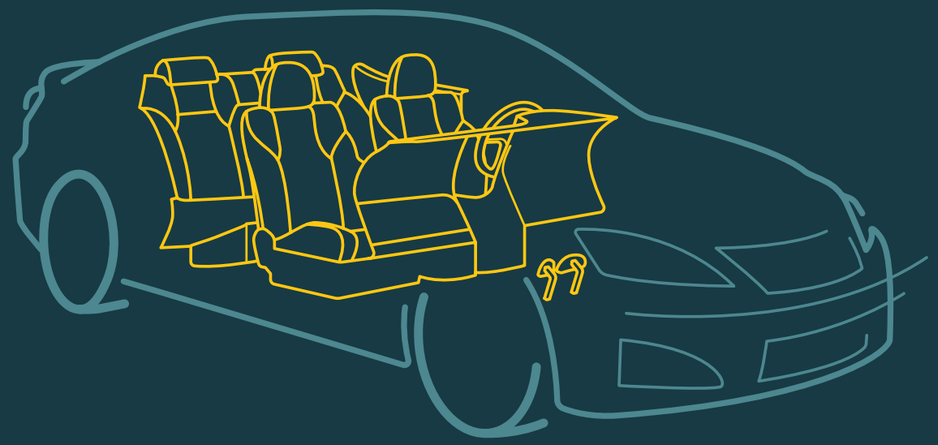


Density	Cycle Time: **5–7 min**	**Free nozzle**	Injector
0.15–0.5 g/cc	Mold Temp.: **175–185 °C**	**(w/o valve)**	**90–100 °C**

The processing details shown above are intended only as a guide. Actual conditions will vary considerably from machine to machine and will very much depend on the moldings being produced.

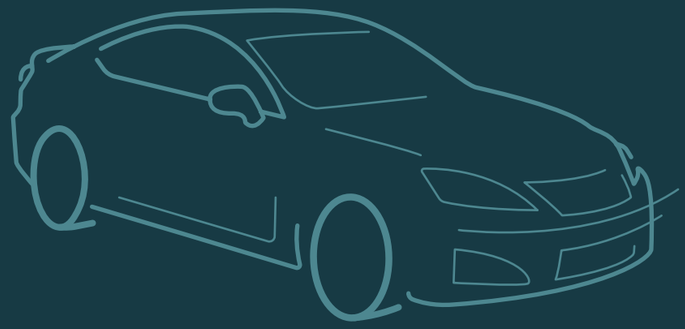
Technical Specifications

Ecological, lightweight, and energy efficient solutions for all automotive construction areas.



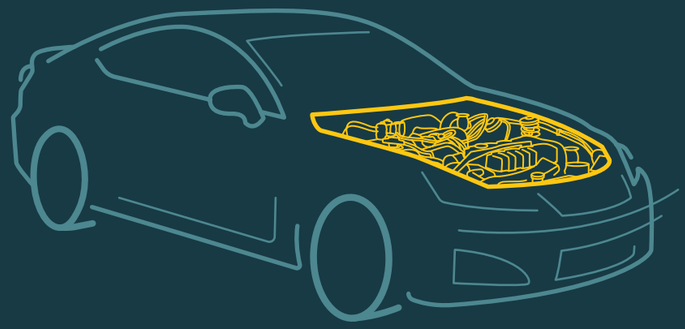
Vehicle interior

Dark and light colors, easy dyeing, low emissions, low odor, high UV resistance, high scratch resistance, and vibration damping for applications in automotive interior parts that can be processed by conventional thermoplastic equipment for injection and extrusion. Soft/hard combinations allow lower-weight solutions while maintaining optimized haptic and stiffness. Special grades are available for sensitive applications in safety systems.



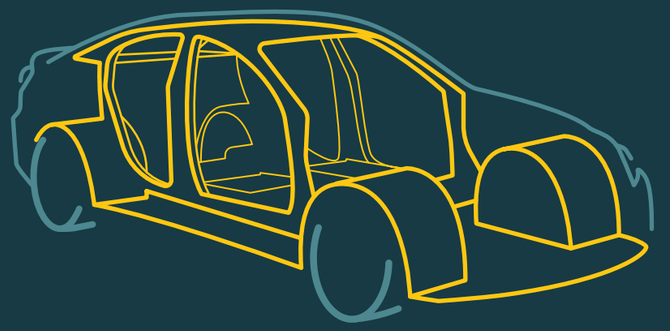
Vehicle exterior

Weather-resistant grades with high impact and scratch resistance, which are widely applied in the automotive exterior, for roof and glass sealing applications as well as for applications below the belt line like mud flaps, wheel arches, side bars. They are suitable both for injection and for extrusion processing.



Under the hood

Heat- and oil-resistant grades with excellent compression set and elasticity are used under the hood for seals, dampers, boots, air ducts, air baffles, tubes and hoses, fasteners, and others. They are suitable for injection and blow molding, and for extrusion processing.



Chassis

Excellent sealing behavior, paint indifference and aging resistance for both foamed and compact solutions in car body plugs and assembly pins. Waterproof qualities and long-term hydrolysis resistance are the features of the grades used in water channeling and cable protection applications. They are suitable for injection, extrusion, and specific processing technologies.

OEM Specifications for Trinseo TPE

Grade name	Grade descriptor	Grade type	Descriptor	Audi	BMW	Ford	Mercedes-Benz	PSA	Volkswagen	Jaguar Land Rover	General Motors	FCA	Volvo	Hyundai-KIA
APIGO™	TPO	E/350	TPO Compounds	-	-	-	-	-	-	-	-	-	-	-
APIGO™	TPO	DP1478UV	TPO Compounds	-	-	-	-	GMW 15702	-	-	GMW 15702	-	-	-
APIGO™	TPO	DP2476	TPO Compounds	VW 50123	-	WSS M4D979	DBL 5562	B62 0300	VW 50123	-	-	MS-DC 242	-	-
APILON™ 52	TPU	DP2998/60	TPU Polymers & Compounds	VW 50123	-	-	-	-	-	-	-	-	-	-
APILON™ 52	TPU	8013/UV	TPU Polymers & Compounds	VW 50123	-	-	-	-	-	-	-	-	-	-
APILON™ 52	TPU	T L 20 UV NERO	TPU Polymers & Compounds	VW 50123	-	-	-	-	VW 50123	-	-	-	-	-
APILON™ 52	TPU	T 60 18 UV NERO	TPU Polymers & Compounds	VW 50123	-	-	-	-	-	-	-	-	-	-
APILON™ 52	TPU	T 70 18 UV NERO	TPU Polymers & Compounds	VW 50123	-	-	-	-	-	-	-	-	-	-
MEGOL™	TPE-S	I A 60 C UG	TPS-SEBS Compounds	-	-	-	-	QK 007022	-	-	-	-	-	-
MEGOL™	TPE-S	DP1411	TPS-SEBS Compounds	-	-	-	-	-	-	-	-	-	-	-
MEGOL™	TPE-S	DP0512/50	TPS-SEBS Compounds	-	-	-	-	QK 007013	-	-	-	-	-	-
MEGOL™	TPE-S	DP2334/70FL/1 UVR1	TPS-SEBS Compounds	-	-	-	-	-	-	-	-	-	-	MS 210-06
MEGOL™	TPE-S	DP2722/3/90 UVR	TPS-SEBS Compounds	-	-	WSS M2D505	-	-	-	-	-	-	-	-
MEGOL™	TPE-S	DP2722/140 UVI	TPS-SEBS Compounds	-	-	WSS M98P13-C	-	-	-	-	-	-	-	-
MEGOL™	TPE-S	A 70 C1/FLUVR	TPS-SEBS Compounds	-	-	-	-	GMW 3013 - QK 007024U	-	-	GMW 3013	-	-	-
MEGOL™	TPE-S	DP2722/85	TPS-SEBS Compounds	-	-	-	-	-	-	-	-	-	-	-
MEGOL™	TPE-S	DP2154/27	TPS-SEBS Compounds	-	-	-	-	-	-	-	-	MS-DC 242	-	-
MEGOL™	TPE-S	DP2758/47UVR	TPS-SEBS Compounds	-	-	-	DBL 5562	-	-	-	-	-	-	-
MEGOL™	TPE-S	DP3105/67	TPS-SEBS Compounds	-	GS 93042	-	-	-	-	-	-	-	-	-
MEGOL™	TPE-S	DP3105/85	TPS-SEBS Compounds	-	GS 93042	-	-	-	-	-	-	-	-	-
MEGOL™	TPE-S	HT1 55 SV/P/UVR	TPS-SEBS Compounds	-	-	-	-	-	VW 50123	-	-	-	-	-
MEGOL™	TPE-S	I A 57 E UG	TPS-SEBS Compounds	-	-	-	-	-	-	-	-	MS-DC 242	-	-
MEGOL™	TPE-S	I A 70 P UG/FLUVR/S4	TPS-SEBS Compounds	-	-	-	-	GMW 3013 - QK 007024U	-	-	GMW 3013	-	-	-
MEGOL™	TPE-S	DP1741/70SVPA/UVR	TPS-SEBS Compounds	-	-	-	-	-	-	-	-	-	-	MS 210-06
MEGOL™	TPE-S	A 90 C1/FL	TPS-SEBS Compounds	-	-	-	-	-	VW 50123	-	-	-	-	-
MEGOL™	TPE-S	I A 55 C UG	TPS-SEBS Compounds	-	-	-	-	-	VW 50123	-	-	-	-	-
MEGOL™	TPE-S	I A 60 E UG	TPS-SEBS Compounds	-	-	-	-	-	-	-	-	MS-DC 242	-	-
MEGOL™	TPE-S	I A 70 P UG	TPS-SEBS Compounds	-	-	-	-	-	VW 50123	-	-	-	-	-
MEGOL™	TPE-S	AUTO A87 2 A001/FL BLACK	TPS-SEBS Compounds	VW 50123	-	-	-	-	VW 50123	-	-	-	-	-

OEM Specifications for Trinseo TPE

Grade name	Grade descriptor	Grade type	Descriptor	Audi	BMW	Ford	Mercedes-Benz	PSA	Volkswagen	Jaguar Land Rover	General Motors	FCA	Volvo	Hyundai-KIA
MEGOL™	TPE-S	DP3104/50 FL	TPS-SEBS Compounds	-	-	-	-	B62 0300	-	-	-	-	-	-
MEGOL™	TPE-S	DP2923/50/FLUVR	TPS-SEBS Compounds	-	-	-	DBL 5562	-	-	-	-	-	-	-
MEGOL™	TPE-S	DP2923/60/FLUVR	TPS-SEBS Compounds	-	-	-	DBL 5562	-	-	-	-	-	-	-
MEGOL™	TPE-S	AUTO A90 2 A001/FLUVR	TPS-SEBS Compounds	-	-	-	-	-	-	-	-	-	-	-
MEGOL™	TPE-S	AUTO AD-G 60	TPS-SEBS Compounds	VW 50123	-	-	-	-	VW 50123	STJLR-51-5306	-	-	-	-
MEGOL™	TPE-S	AUTO AD-G 70	TPS-SEBS Compounds	-	-	-	-	-	-	-	-	MS-DC 242	-	-
MEGOL™	TPE-S	BIO A67 2 007/FL NERO	TPS-SEBS Compounds	-	-	-	-	-	-	-	-	-	TR 33904779-005	-
MEGOL™	TPE-S	AUTO AD-B 50	TPS-SEBS Compounds	-	GS 93042	-	-	-	-	-	-	-	-	-
MEGOL™	TPE-S	AUTO AD-B 60	TPS-SEBS Compounds	-	GS 93042	-	-	-	-	-	-	-	-	-
MEGOL™	TPE-S	AUTO AD-B 70	TPS-SEBS Compounds	-	GS 93042	-	-	-	-	-	-	-	-	-
MEGOL™	TPE-S	AUTO AD-B 80	TPS-SEBS Compounds	-	GS 93042	-	-	-	-	-	-	-	-	-
MEGOL™	TPE-S	AUTO A50 2 A001 BLACK	TPS-SEBS Compounds	-	GS 93042	-	-	-	VW 50123	-	-	-	-	-
MEGOL™	TPE-S	AUTO A60 2 A001 BLACK	TPS-SEBS Compounds	-	GS 93042	-	-	-	VW 50123	-	-	-	-	-
MEGOL™	TPE-S	AUTO A70 2 A001 BLACK	TPS-SEBS Compounds	-	GS 93042	-	-	-	VW 50123	-	-	-	-	-
MEGOL™	TPE-S	AUTO A80 2 A001 BLACK	TPS-SEBS Compounds	-	GS 93042	-	-	-	VW 50123	-	-	-	-	-
MEGOL™	TPE-S	AUTO A90 2 A001 BLACK	TPS-SEBS Compounds	-	GS 93042	-	-	-	VW 50123	-	-	-	-	-
MEGOL™	TPE-S	DP3175/60FL	TPS-SEBS Compounds	-	GS 93042	-	-	-	-	-	-	-	-	-
MEGOL™	TPE-S	DP3175/67	TPS-SEBS Compounds	-	GS 93042	-	-	-	-	-	-	-	-	-
MEGOL™	TPE-S	DP2586/60SVPA/UVR	TPS-SEBS Compounds	-	-	-	DBL 5562	-	-	-	-	-	-	-
TIVILON™	TPV	D 40 DE 1	TPV Compounds	-	-	-	DBL 5562	-	-	-	-	-	-	-
TIVILON™	TPV	M 36 DE 4	TPV Compounds	-	-	-	-	-	-	-	-	-	-	-
TIVILON™	TPV	F 55 DE 4 NERO	TPV Compounds	-	-	-	-	-	-	-	-	EMP-50	-	-
TIVILON™	TPV	F 80 DE 4 NERO	TPV Compounds	-	-	-	-	-	-	-	-	EMP-80	-	-
TIVILON™	TPV	F 80 YDR 2	TPV Compounds	-	-	-	-	-	-	-	-	-	TR 21351245	-
TIVILON™	TPV	M 45 DE 2 NEUTRO	TPV Compounds	-	-	-	-	QK 003511H	-	-	-	-	-	-
TIVILON™	TPV	M 70 DE 4	TPV Compounds	VW 50123	-	-	-	QK 003522	VW 50123	-	-	-	-	-
TIVILON™	TPV	M 75 DR 1	TPV Compounds	-	-	-	DBL 5562	-	-	-	-	-	-	-
TIVILON™	TPV	M 30 DE 4	TPV Compounds	-	-	-	-	-	-	-	-	-	-	-
TIVILON™	TPV	M 45 DE 4	TPV Compounds	-	-	-	-	-	-	-	-	-	-	-

trinseo.com

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Product Stewardship

Trinseo and its affiliated companies have a fundamental concern for all who make, distribute, and use their products and for the environment in which we live. This concern is the basis for our Product Stewardship philosophy by which we assess the safety, health, and environmental information on our products so that appropriate steps may be taken to protect employee and public health and our environment. The success of our product stewardship program rests with each and every individual involved with Trinseo products – from the initial concept and research, to manufacture, use, sale, disposal, and recycle of each product.

Customer Notice

Customers are responsible for reviewing their manufacturing processes and their applications of Trinseo products from the standpoint of human health and environmental quality to ensure that Trinseo products are not used in ways for which they are not suitable. Trinseo personnel are available to answer questions and to provide reasonable technical support. Trinseo product literature, including safety data sheets, should be consulted prior to the use of Trinseo products. Current safety data sheets are available from Trinseo.

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