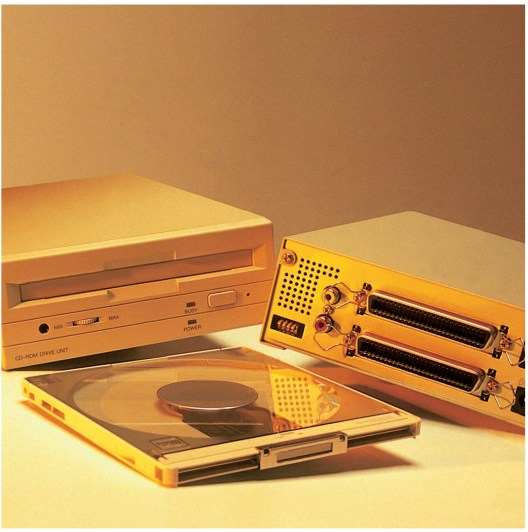
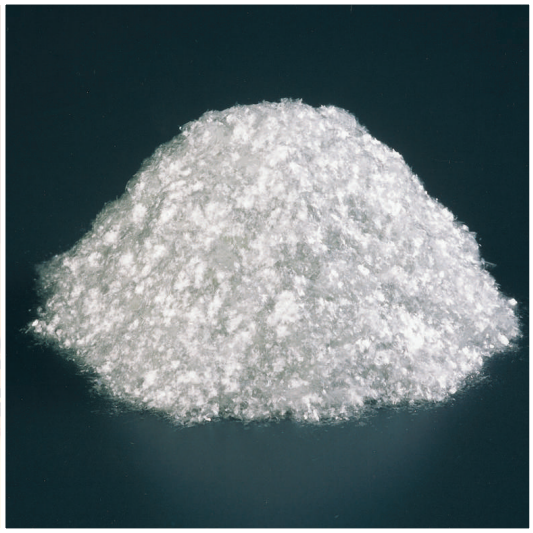
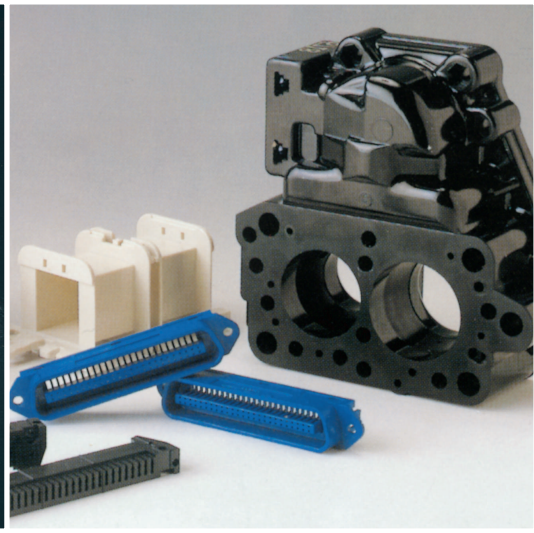
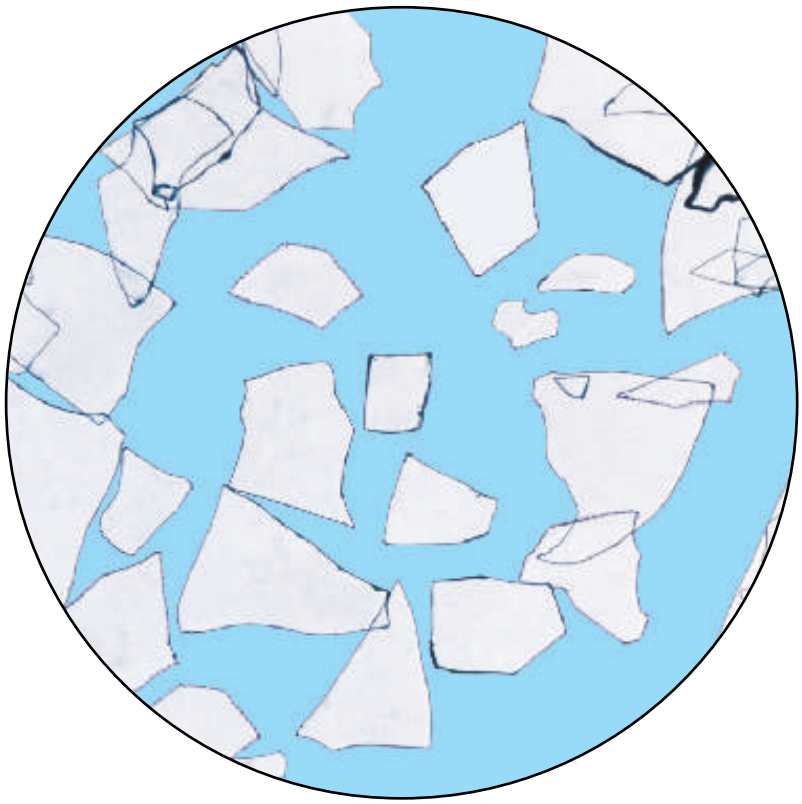






Microglas Glass Flake
Microglas Fleka

for Polymer Reinforcement



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Applications in Polymers

Microglas® Glass Flake

Microglas® Glass Flake is a glass flake approximately 5㎛thick and 10~4000 ㎛ wide. It has been developed specifically for the reinforcement of Polymers and is available in a range of particle sizes and surface treatments.

Classification of Microglas® Glass Flake

Type		Non-Surface treatment			Surface treatment	
Product Code		REF-600	REF-160	REF-015	REF-160T	REF-160N
Glass Composition		E-Glass				
Specific Gravity		2.5				
Thickness (㎛)		Ave. 5±2				
Particle Size Distribution	>1700 ㎛	0	0	0	0	0
	1700~300	80 or more	10 or less	12 or less	10 or less	10 or less
	300~150		65 or more		65 or more	65 or more
	150~45	20 or less				
	<45 ㎛		25 or less	88 or more	25 or less	25 or less
Loss on Ignition (%)		–			0.15 ± 0.10	0.15 ± 0.10
Surface Treatment Agent		–			Epoxysilane	Acrylsilane

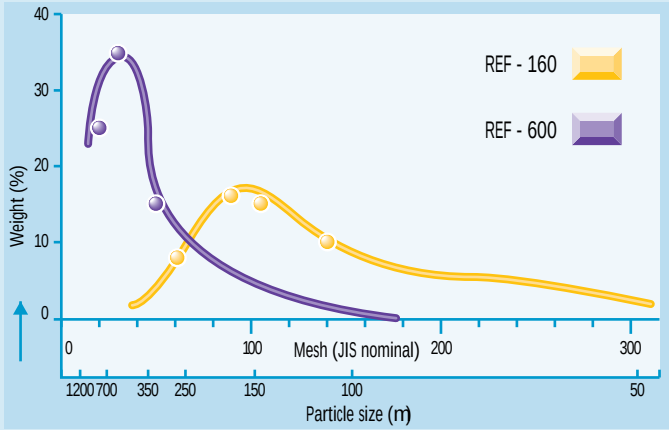
Identification of Microglas® Glass Flake

R E ——— E glass
F ——— Glass flake
600 ——— Particle size (nominal)
N ——— Type of surface treatment

Surface Treatment	Code
Vinylsilane	G
Acrylsilane	N
Aminosilane	A
Epoxysilane	T

***Microglas® Glass Flake** is available in a range of surface treatments to suit different resins.*

Particle size distribution and bulk density



	Bulk density (g / ㏄)	Bulk density after shaking (g / ㏄)
REF-600	0.20	0.30
REF-160	0.40	0.65
REF-015	0.75	1.15

The finer the grade of Microglas® Glass Flake, the greater the bulk density.

Microglas Fleka®

Microglas Fleka® is a granulated form of Microglas® Glass Flake with improved processing characteristics. Microglas Fleka® granules are made from untreated glass flakes bonded together with a special binder and surface treated.

Classification of Microglas Fleka®

Product Code	REFG - 101	REFG - 301	REFG - 302
Glass Composition	E Glass	E Glass	E Glass
Base Glass Flake (untreated)	REF - 600	REF - 160	REF - 160
Average Particle Size (mm)	1.0	0.5	0.6
Binder Type	Epoxy	Epoxy	Urethane
Coupling Agent	Amino silane/Epoxy silane	Amino silane/Epoxy silane	Amino silane
Loss on Ignition (%)	0.6	0.6	0.6
Applicable Resins	PPS, PET, PA, PC, PBT	PPS, PET, PA, PC, PBT	M-PPO, PA, PPE

Identification of Microglas Fleka®

R E ——— E glass
F ——— Glass flake
G ——— Granulated
1 ——— Type of Glass Flake
01 ——— Type of binder

Glass Composition

Type of glass	SiO_2	Al_2O_3	CaO	MgO	B_2O_3	Na_2O+K_2O	ZnO
C glass (%)	65~72	1~7	4~11	0~5	0~8	9~13	0~6
E glass (%)	52~56	12~16	16~25	0~6	5~13	0-0.8	–––

Major Applications of Microglas® Products in Polymers

Polymer	Application	Characteristics	Advantages	Page
Polycarbonate (PC)	• Office Equipment	• Weather Resistance • Mechanical Properties	• Reduced Warpage • Improved Dimensional Stability • Reduced Anisotropy	6
Polyphenylene Ether (PPE)	• Office Equipment • Computer Parts	• Close Dimensional Tolerances	• Reduced Warpage • Reduced Shrinkage • Improved Dimensional Stability	7
Acrylonitrile - Butadiene - Styrene (ABS)	• Office Equipment	• Weather Resistance • Mechanical Properties	• Reduced Warpage • Improved Dimensional Stability • Reduced Water Absorption • Reduced Water Permeability	8
Engineering Polymers: Polyethylene Terephthalate (PET) Polybutylene Terephthalate (PBT)	• Electrical Parts • Automotive Parts	• Heat Resistance • Chemical Resistance • Mechanical Properties	• Reduced Warpage • Isotropic Properties • Improved Dimensional Stability • High Weld Strength • Impact Strength • Colour Flexibility • Will not React with Polymer at High Processing Temperatures	9-11
Polypropylene (PP)	• Automotive Parts	• Weld Strength • Weather Resistance • Heat Resistance • Isotropic Mechanical Properties	• Reduced Warpage • Improved Dimensional Stability	12
All Polymers	• In-Situ Barrier within the Component	• Multi-Barrier Layer in Sub Surface Region	• Reduced Water / Fluid Absorption • Chemical Resistance • Wear Resistance	13
Glass Reinforced Composites Gel Coats	• In-Situ Barrier within the Structure	• Multi-Barrier Layer in Sub Surface Region	• Reduced Water / Fluid Absorption • Chemical Resistance • Wear Resistance	14
Polyurethane	• Reaction Reinforced Injection Moulding (R RIM) for Automotive Parts	• Close Dimensional Tolerances • Isotropic Mechanical Properties • Fatigue Resistance • High Quality Surface Finish • Low Thermal Expansion Coefficient	• Dimensional Stability • Isotropic Mechanical Properties • Impact Properties • High Elongation • High Toughness • Good Surface Finish • Reduced Thermal Expansion Coefficient	15-16

Microglas® Glass Flake in Polycarbonate Applications

Description

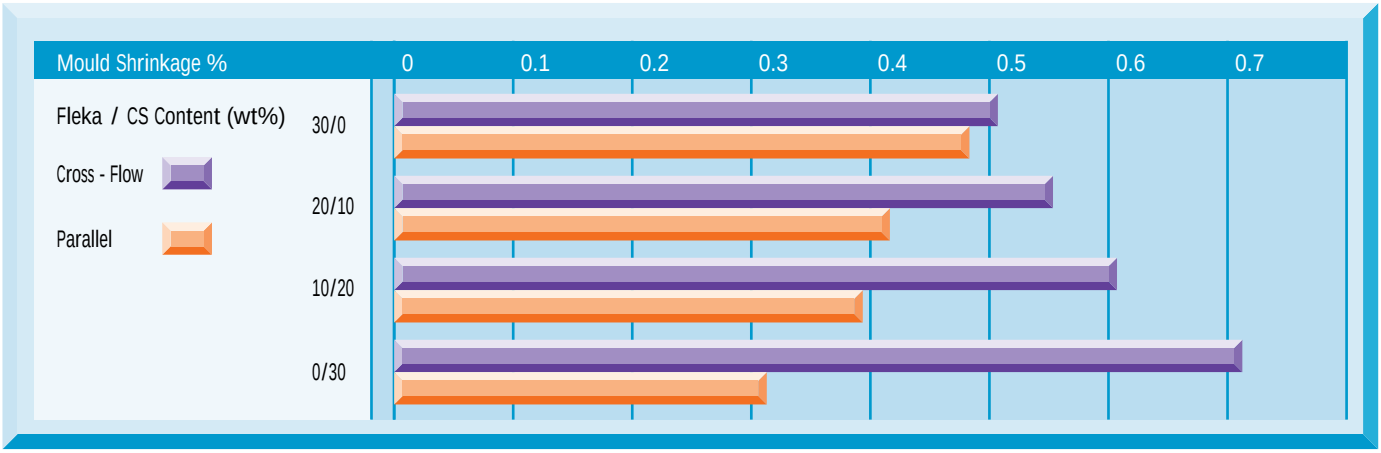
Polycarbonate components typically require high heat deflection temperatures and good mechanical properties. ***Microglas® Glass Flake*** products can be used solely or together with chopped glass strand to provide these characteristics.

The principal additional benefits of using ***Microglas® Glass Flake*** products are:

- **Reduced warpage**
- **Improved dimensional stability**
- **Reduced anisotropy of shrinkage and mechanical properties**

Typical Properties

The graph below shows the effect of ***Microglas Fleka®*** in reducing mould shrinkage.



Resin	: PC
Chopped strand (CS)	: fibre dia. 13㎜, cut length 3mm
Fleka	: REFG – 302
Total Glass content	: 30wt%

Packaging

Microglas® Glass Flake and ***Microglas Fleka®*** are packed in moisture-proof paper bags each containing 20kg nett weight.

Microglas® Glass Flake for Polyphenylene Ether (PPE) Applications

Description

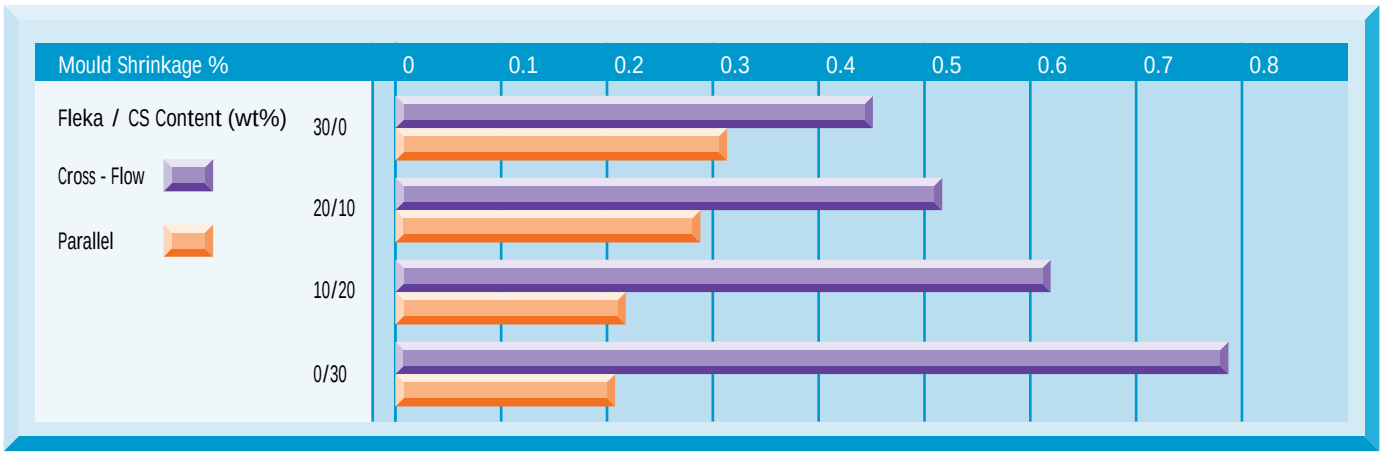
Polyphenylene ether is often used to mould complex components, requiring high mechanical properties and close dimensional tolerances. ***Microglas® Glass Flake*** products can be used solely or together with chopped glass strand to provide these characteristics.

The principal additional benefits of using ***Microglas® Glass Flake*** products are:

- **Reduced warpage**
- **Improved dimensional stability**
- **Reduced anisotropy of shrinkage and mechanical properties**

Typical Properties

The graph below shows the effect of ***Microglas Fleka®*** in reducing mould shrinkage.



Resin	: PPE
Chopped strand (CS)	: fibre dia. 13㎜ ø, cut length 3mm
Fleka	: REFG – 302
Total Glass content	: 30wt%

Packaging

Microglas® Glass Flake and ***Microglas Fleka®*** are packed in moisture-proof paper bags each containing 20kg nett weight.

Microglas® Glass Flake for Acrylonitrile Butadiene Styrene (ABS) Applications

Description

ABS components are used in a broad range of applications due to their high mechanical properties, processing flexibility, high gloss and colour flexibility. ABS is often used to form complex shapes in transport, electronics and business machine applications.

Microglas® Glass Flake products can be used solely or together with chopped glass strand to provide these characteristics.

The principal additional benefits of using ***Microglas® Glass Flake*** products are:

- **Reduced warpage**
- **Improved dimensional stability**
- **Improved flexural strength and modulus**
- **Reduced water absorption**
- **Reduced vapour permeability**

Typical Properties

The table below shows the effects of ***Microglas Fleka®*** grade ***REFG-101*** on a number of key characteristics

		REFG – 101				
Fleka content		0%	10%	15%	20%	25%
Tensile strength	(MPa)	40.2	38.7	39.5	40.8	42.0
Flexural strength	(MPa)	68.2	72.2	73.6	74.9	74.8
Flexural modulus	(MPa)	2470	3610	4210	4950	4680
Izod impact	(J/M) 1/8" notched	105	50	45	41	39
	(J/M) 1/8" unnotched	556	243	211	180	155
Water absorption	(wt%)	0.113	0.093	0.084	0.074	0.066
Boiled water absorption	(wt%)	0.249	0.200	0.194	0.177	0.157
Water vapour permeability	(g/m^2 / 24Hr)	1.80	1.22	1.05	0.90	0.77
Melt flow	(g/10min)	58.9	47.2	43.0	39.2	35.3

Packaging

Microglas® Glass Flake and ***Microglas Fleka®*** are packed in moisture-proof paper bags each containing 20kg nett weight.

Microglas® Glass Flake in Engineering Thermoplastic Applications

Description

Engineering Thermoplastics e.g. PET and PBT are increasingly used as replacements for traditional metal components and thermoset materials. They are characterised by high mechanical properties combined with heat and chemical resistance.

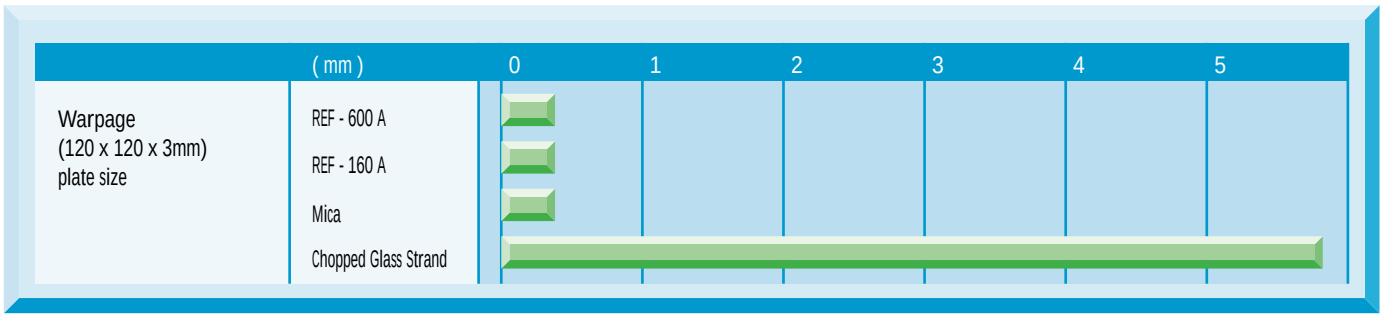
Microglas® Glass Flake products can be used solely or together with chopped glass strand to provide these characteristics.

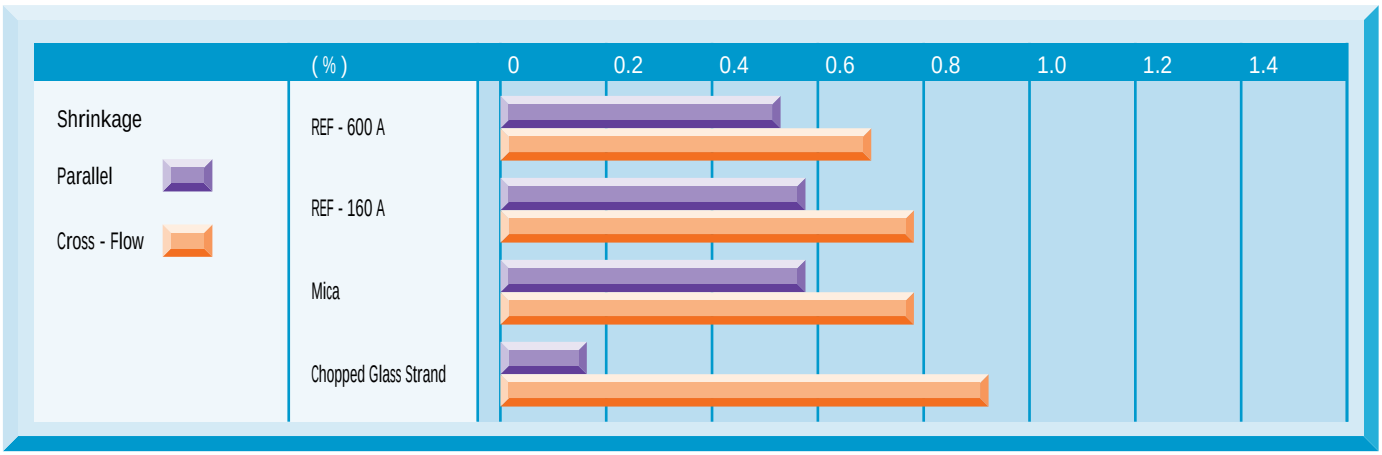
The principal additional benefits of using ***Microglas® Glass Flake*** products are:

- **Reduced warpage**
- **Improved dimensional stability**
- **Reduced anisotropy of shrinkage and mechanical properties**
- **High weld strength**
- **High impact properties compared to mineral fillers**
- **Colour flexibility and consistency**
- **Cleanliness - *Microglas® Glass Flake* products will not degrade polymers even at high processing temperatures**

Typical Properties

The graphs below illustrate the advantages of ***Microglas® Glass Flake*** solely compared to alternative fillers in glass reinforced PBT.

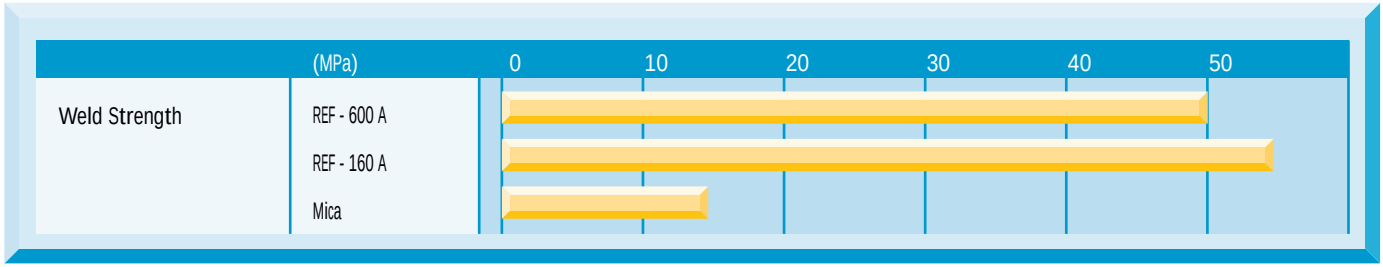


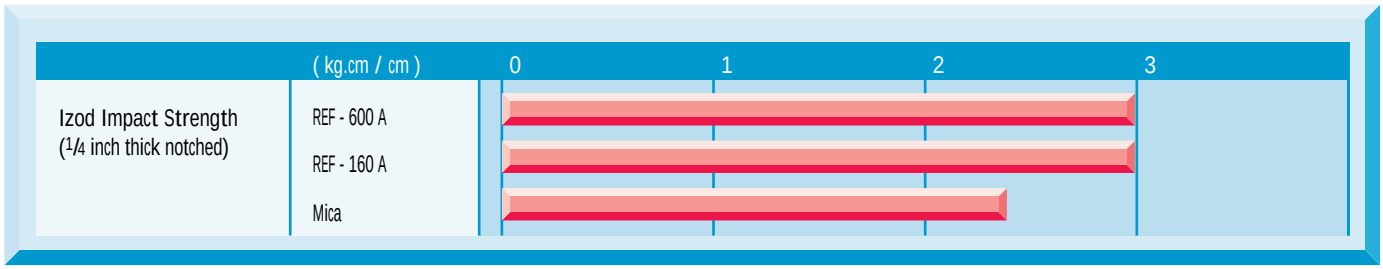


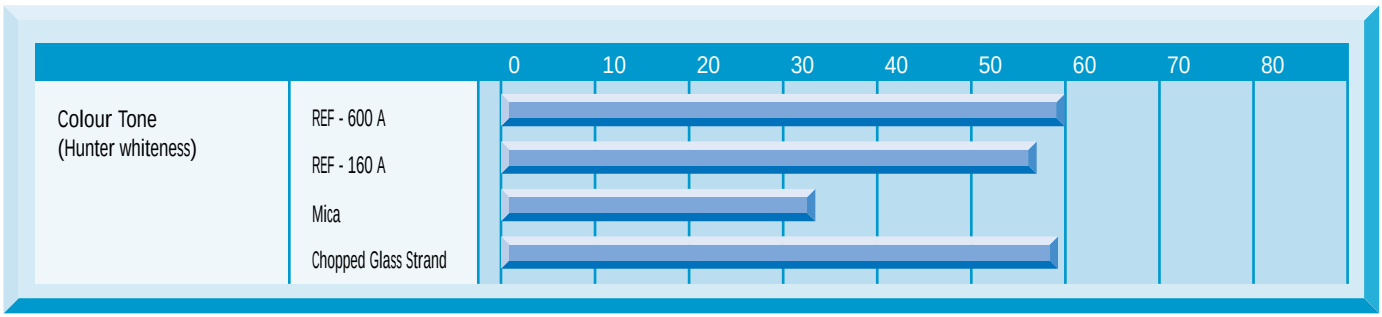
Microglas® Glass Flake for Engineering Thermoplastic Applications

Typical Properties

The graphs below illustrate the advantages of ***Microglas® Glass Flake*** compared to alternative fillers in glass reinforced PBT.



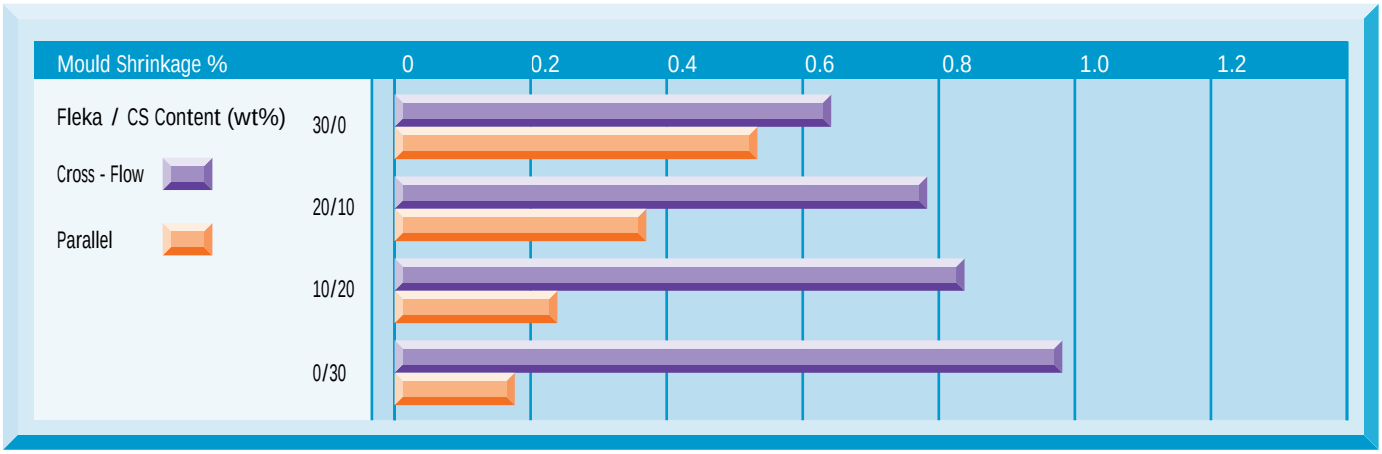




Microglas Fleka® for Engineering Thermoplastic Applications

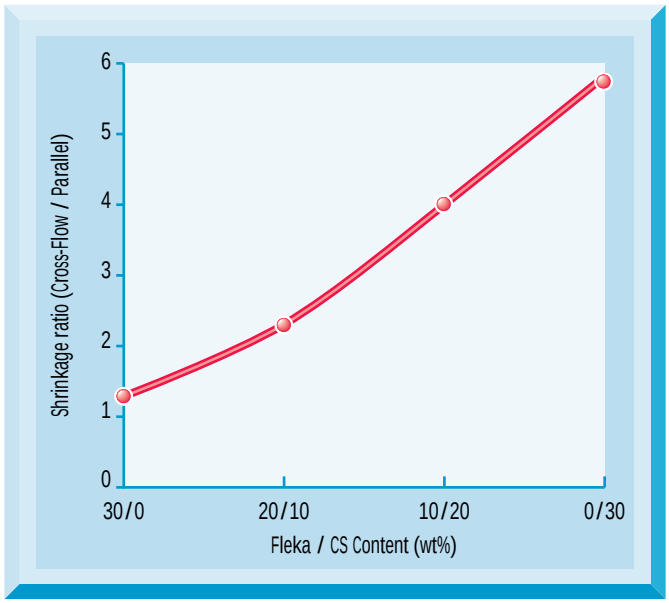
Typical Properties

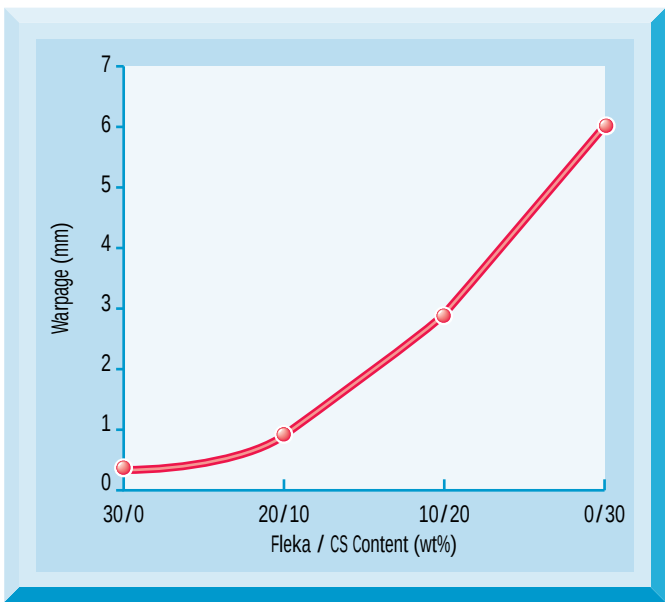
Microglas Fleka® can be used together with chopped glass strand in Engineering Thermoplastic applications, as shown in the graph below:

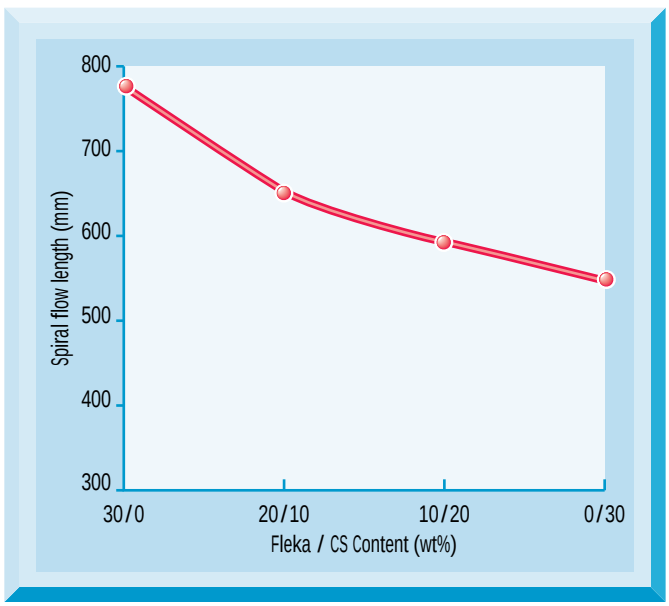


The graphs below illustrate the advantages of ***Microglas Fleka®*** grade ***REFG-101*** when used together with chopped glass strand in PBT.

Resin : PBT
Chopped strand (CS) : fibre dia. 13mm ø, cut length 3mm
Fleka : REFG – 101
Total Glass content : 30wt%







Microglas® Glass Flake for Polypropylene Applications

Description

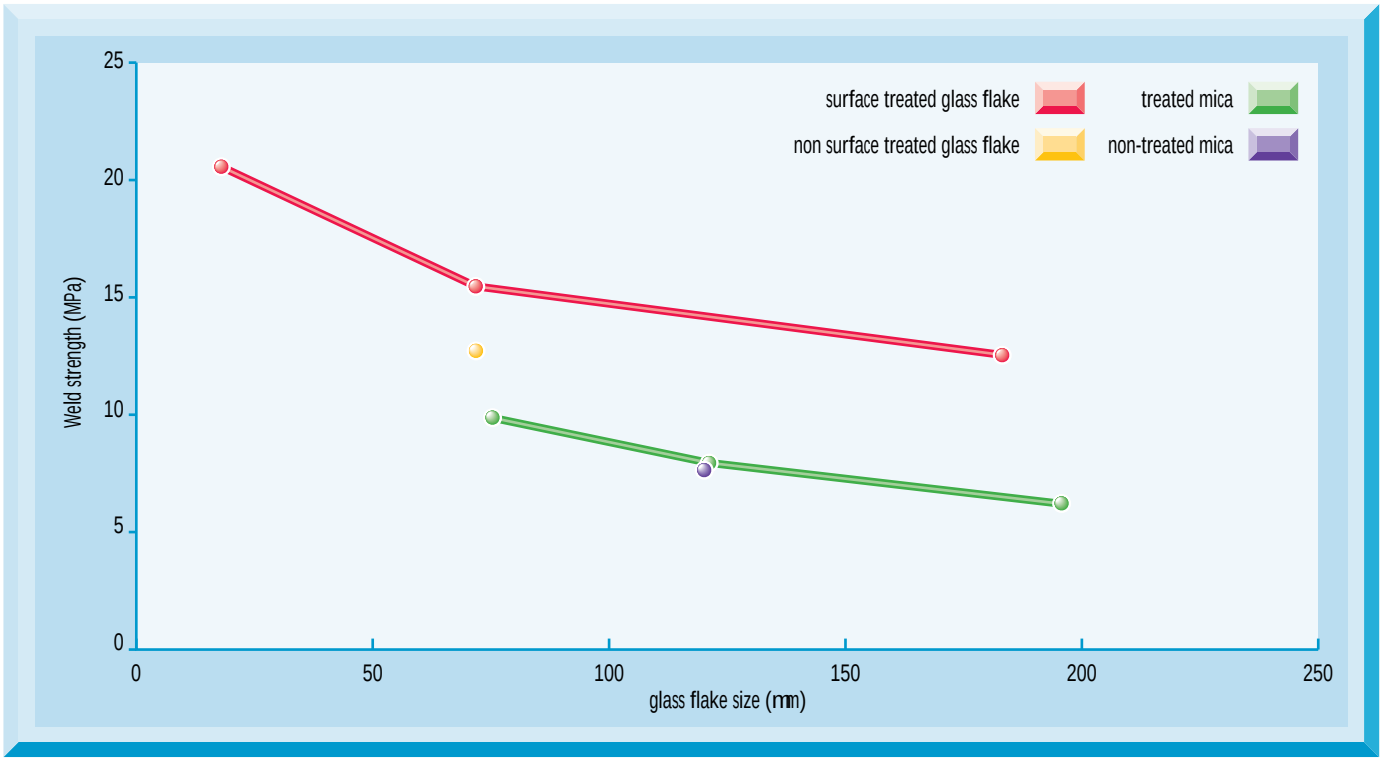
Polypropylene components require good mechanical properties and colour flexibility, combined with low density and ease of processing. ***Microglas® Glass Flake*** products can be used solely or together with other fillers to provide these characteristics.

The principal additional benefits of using ***Microglas® Glass Flake*** products are:

- **Reduced warpage**
- **Improved dimensional stability**
- **Reduced anisotropy of shrinkage and mechanical properties**
- **Improved weld strength**
- **Improved thermal properties eg. HDT and VICAT**

Typical Properties

The graph below illustrates the advantages of ***Microglas® Glass Flake*** compared to alternative fillers in terms of weld strength of Polypropylene.



Resin : natural PP glass flake content : 30wt%

Packaging

Microglas® Glass Flake and ***Microglas Fleka®*** are packed in moisture-proof paper bags each containing 20kg nett weight.

Microglas® Glass Flake as an In-Situ Barrier within Polymers

Description

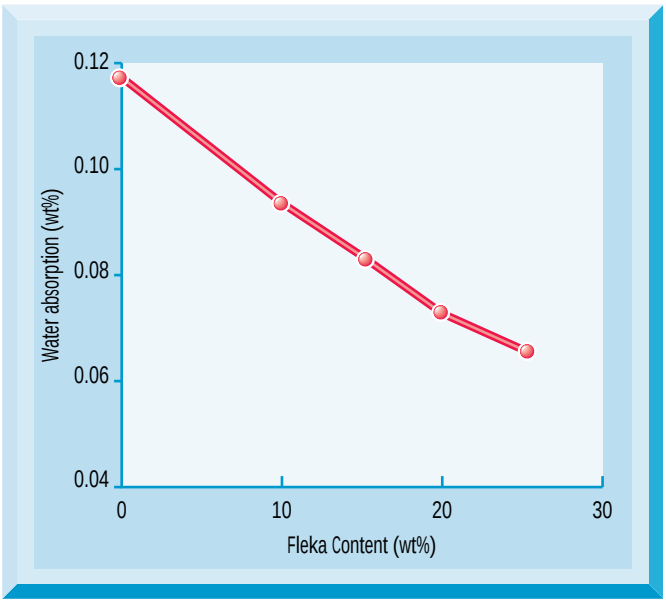
The addition of ***Microglas® Glass Flake*** products will result in the glass flakes forming a multi-barrier layer within the polymer. This ability to form a multi-barrier layer is also exploited in anti-corrosion coatings.

The principal additional benefits of using ***Microglas® Glass Flake*** products are:

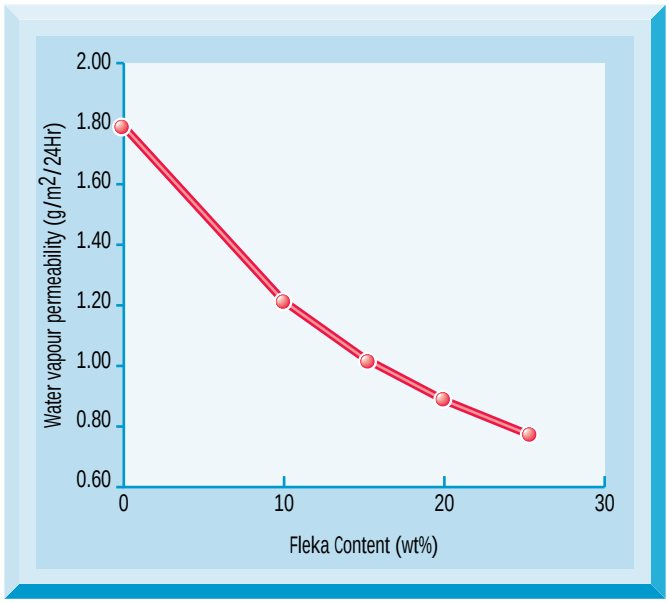
- **Reduced warpage**
- **Improved dimensional stability**
- **Reduced anisotropy of shrinkage and mechanical properties**
- **Reduced liquid and vapour permeability**
- **Reduced water absorption**
- **Improved wear and damage resistance**

Typical Properties

The graphs below illustrate the effect of ***Microglas Fleka®*** grade ***REFG-101*** on the water absorption and vapour permeability of ABS.



Water absorption in ABS



Water vapour permeability in ABS

Packaging

Microglas® Glass Flake and ***Microglas Fleka®*** are packed in moisture-proof paper bags each containing 20kg nett weight.

Microglas® Glass Flake as an In-Situ Barrier within Composites

Description

Many composite structures consist of an E-glass chopped strand mat or gun roving in a resin matrix. These structures are often used to contain fluids internally or exclude fluids externally e.g. tanks, pipework and boat hulls.

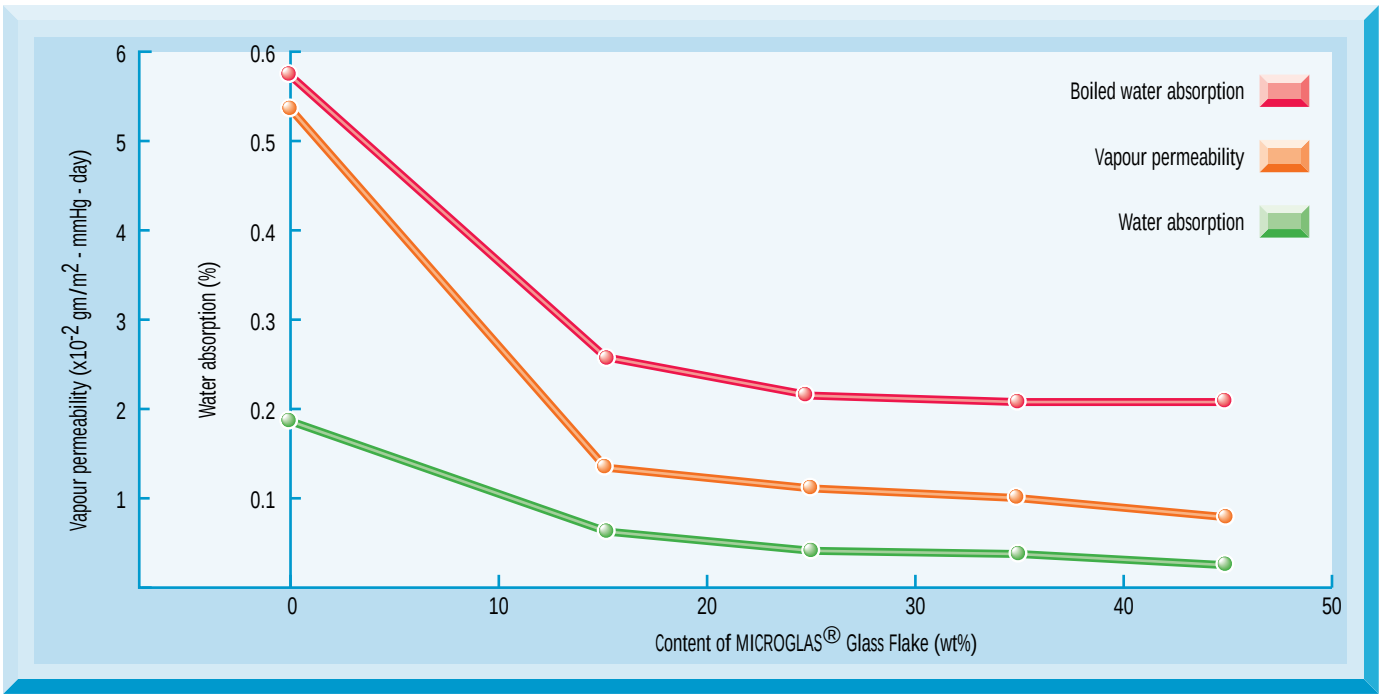
The addition of ***Microglas® Glass Flake*** products during the manufacture of the component will result in the glass flakes forming a multi-barrier layer. This ability to form a multi-barrier layer is also exploited in anti-corrosion coatings.

The principal additional benefits of using ***Microglas® Glass Flake*** products to create this layer are:

- **Reduced liquid and vapour permeability**
- **Reduced water absorption**
- **Improved wear and damage resistance**
- **Improved dimensional stability**

Typical Properties

The graphs below illustrate the effect of ***Microglas® Glass Flake*** products on water absorption and vapour permeability in a discrete layer.



Packaging

Microglas® Glass Flake and ***Microglas Fleka®*** are packed in moisture-proof paper bags each containing 20kg nett weight.

Microglas® Glass Flake for Polyurethane Applications

Description

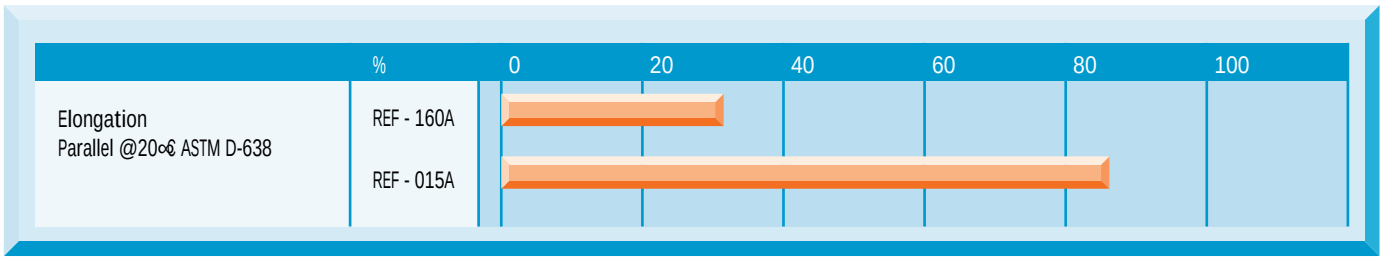
Polyurethane components manufactured by reinforced reaction injection moulding (RRIM) are used in automotive body components where they offer weight savings, corrosion resistance and design flexibility. They are required to achieve close dimensional tolerances, high thermal stability and high mechanical properties. ***Microglas® Glass Flake*** can be used solely or together with other fillers to provide these characteristics.

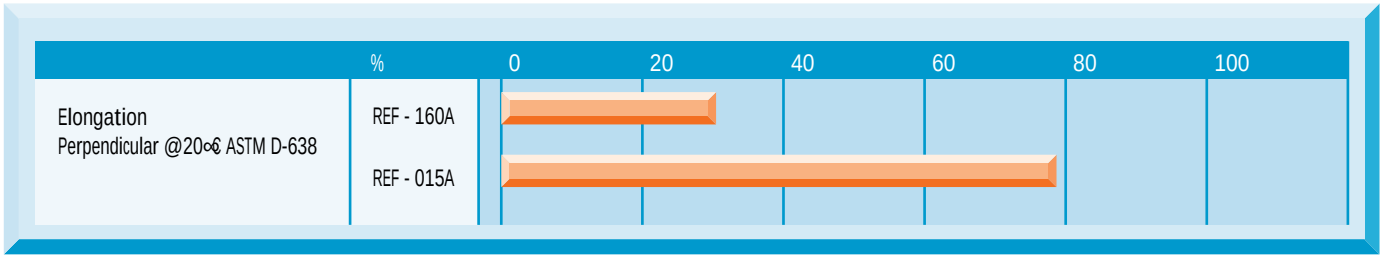
The principal additional benefits of using ***Microglas® Glass Flake*** are:

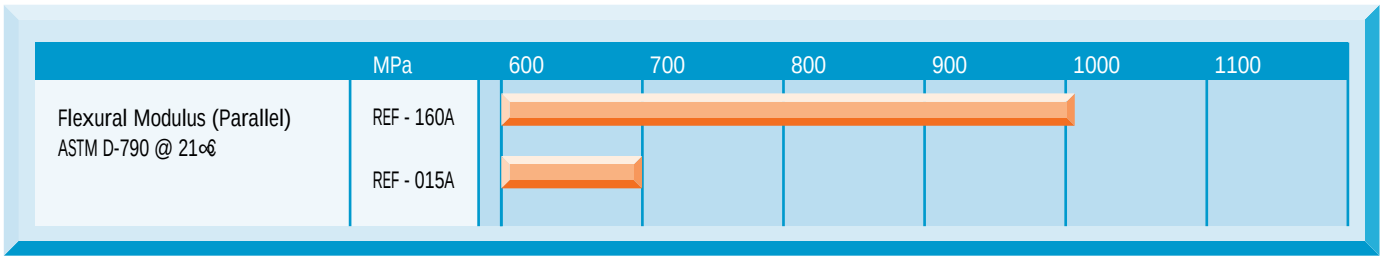
- **Reduced warpage**
- **Improved dimensional stability**
- **Reduced anisotropy of shrinkage and mechanical properties**
- **Improved weld strength**
- **Improved fatigue resistance**
- **Improved mechanical properties, especially elongation**

Typical Properties

The graphs below illustrate the effect of two grades of ***Microglas® Glass Flake*** on important component characteristics.



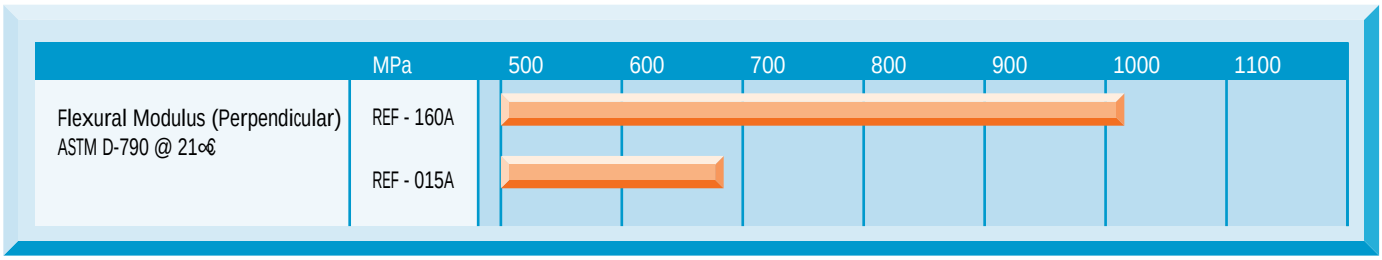


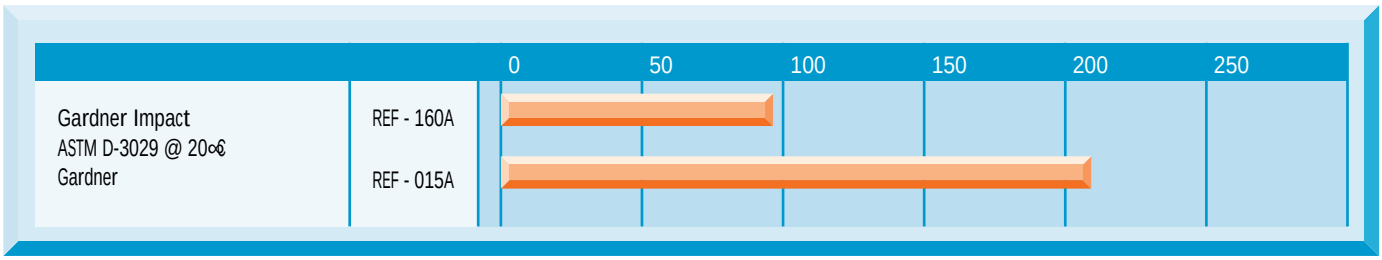


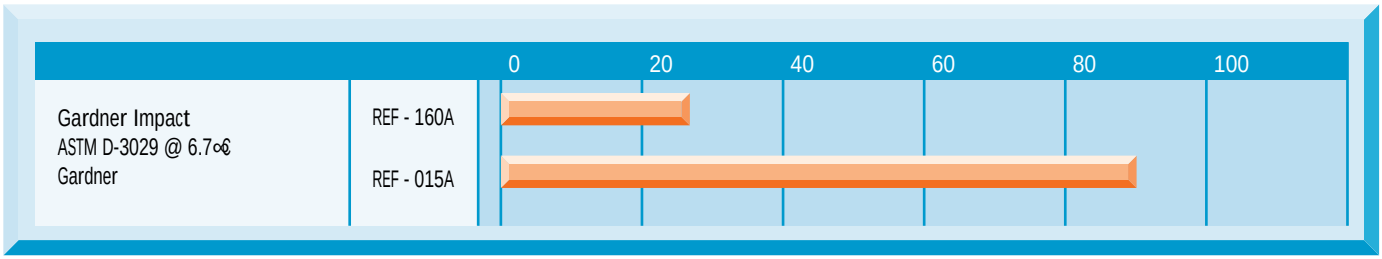
Microglas® Glass Flake for Polyurethane Applications

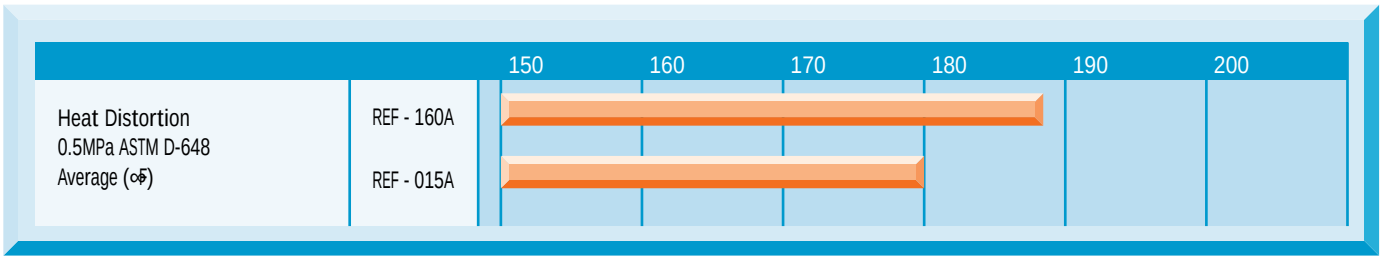
Typical Properties

The graphs below illustrate the effect of two grades of ***Microglas® Glass Flake*** on important component characteristics.









Packaging

Microglas® Glass Flake is supplied in moisture-proof paper bags each containing 20kg nett weight.

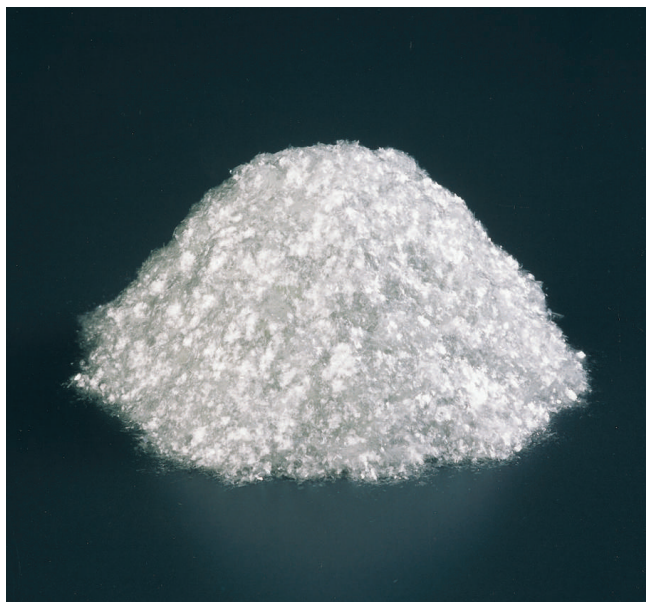
Packaging

Microglas® Glass Flake products are supplied in moisture-proof paper bags, each containing 20kg nett weight.

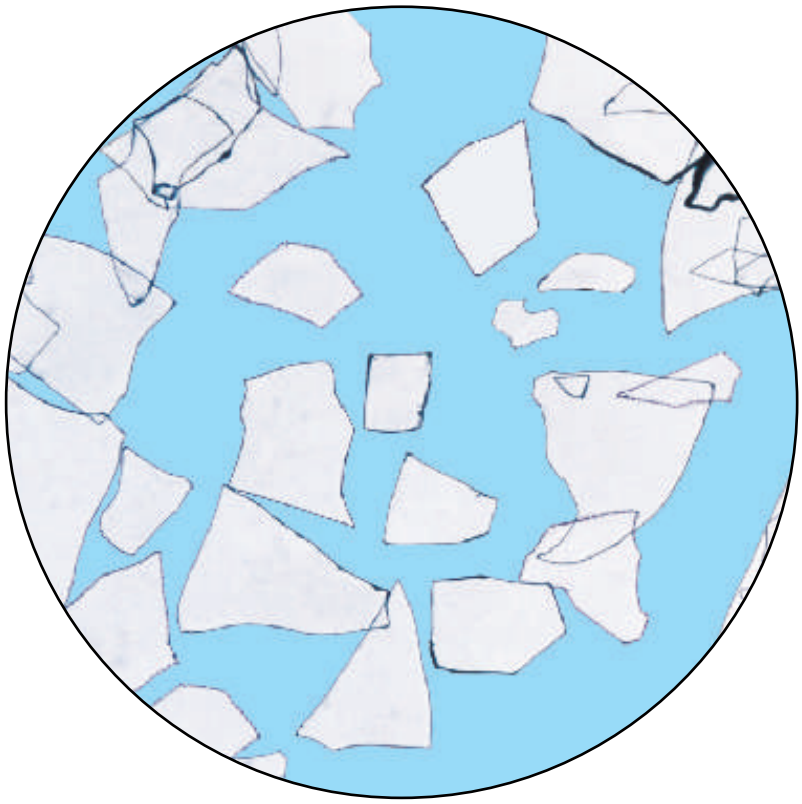
For bulk shipments, the bags of glass flake products are palletised and further protected by cardboard and polythene wrapping. The overall dimensions of a fully loaded pallet are 1100 x 1160 x 1020mm high.

Pallet Loadings				
Glass Flake REF - 160	:	30	x	20 kg bags (600 Kg total nett weight)
Glass Flake REF - 600	:	14	x	20 kg bags (280 Kg total nett weight)
Glass Flake REF - 015	:	48	x	20 kg bags (960 Kg total nett weight)

Shipping container loadings, nett weights		
	20' Container	40' Container
Glass Flake REF - 160	12 tonnes	-
Glass Flake REF - 600	5.6 tonnes	11.2 tonnes
Glass Flake REF - 015	19.2 tonnes	-



Microglas® Glass Flake



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