

# ACRYIPET™

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PMMA

From

performanceplastics

## THE PROPERTIES OF ACRYPET

MAIN CHARACTERISTICS	TEST METHODS			UNITS	DATA (*)			
	ASTM	DIN	ISO		MF	VH	IR D50	IR S404
<b>Rheology</b>								
Melt flow rate MFR (230/3,8 Kg)	D-1238 (I)	53735	R1133	g/10 min.	14	2,0	2,5	8
<b>Optical properties</b>								
Refractive index	D-542	52491	R489	-	1,49	1,49	1,49	1,49
Total white light transmission	D-1003	5036		%	93	93	92	92
Haze				%	0,5	0,5	0,5	0,5
<b>Mechanical properties</b>								
Tensile strength	D-638	53455	R527	MPa	66	73	41	46
Flexural strength	D-790	53452	R178	MPa	98	108	57	67
Flexural modulus	D-790	53452	R178	GPa	3,0	3,1	1,8	1,9
Elongation	D-638			%	7	7	90	90
Izod impact strength	D-256			J/m	16	17	44	39
Rockwell hardness	D-785			M	90	100	50	68
<b>Thermal properties</b>								
Vicat softening temperature (9.8N)	D-1525	53460	R-306	°C	97	116	98	99
HDT (1.82Mpa)	D-648	53461	75-2	°C	82	102	83	84
Coefficient of linear expansion	D-696	53752A		l/°C	6X10 <sup>-5</sup>	6X10 <sup>-5</sup>	10X10 <sup>-5</sup>	9X10 <sup>-5</sup>
Coefficient of thermal conductivity	S-177			W/ (m°C)	0.2	0.2	0.2	0.2
<b>Electrical properties</b>								
Surface resistivity	D-527	53482		Ω	>10 <sup>16</sup>	>10 <sup>16</sup>	>10 <sup>16</sup>	>10 <sup>16</sup>
Volume resistivity	D-527	53482		Ω/cm	>10 <sup>15</sup>	>10 <sup>15</sup>	>10 <sup>15</sup>	>10 <sup>15</sup>
Dielectric strength	D-149	53581		MV/m	20	20	15	15
Dielectric constant 50Hz	D-150	53483			3.7	3.7	3.9	3.9
Dissipation factor, 1MHz	D-150	53483			0.04	0.04	0.04	0.04
<b>Other properties</b>								
Density	D-792	53479	R1183		1,19	1,19	1,16	1,16
Water absorption	D-570	53495	62	%	0.3	0.3	0.4	0.4
Mould shrinkage (48h)	D-955			%	0.2-0.6	0.2-0.6	0.4-0.8	0.3-0.7

(\*) The values quoted are the average of results obtained under laboratory conditions and are given only as an indication to enable customers to make us of our products.

MF	Medium heat resistance and easy flow
VH	Excellent heat resistance
IR D50	High-impact acrylic with good chemical resistance and improved mould ability
IR S404	Easy flow high-impact resistance

## **Material Handling Consideration**

### **Contamination and Material Handling**

The excellent colour, clarity and sparkle of Performance Plastics supplied acrylic resins can be jeopardised by poor material handling.

Hopper loaders must be assembled and cleaned before loading if previously used for anything other than acrylic. Similarly, the machine hoppers should be vacuumed and wiped down before use. A small amount of polystyrene, polycarbonate or other plastic resins can contaminate an entire hopper load. Drying ovens must also be checked to avoid contamination from blowing fines and stray resins. Moulded lenses and edge lighted parts require the most extreme care in material handling to avoid visible contamination.

### **Drying**

Excessive moisture will cause surface defects. Critical jobs or old material will require drying. Absorbed moisture in acrylic moulding resins does not affect the physical properties of the moulded parts but thin parts may show a surface defect sometimes referred to as splash; thick parts may contain bubbles. These defects can be overcome by drying the moulding resins in warm air circulating ovens, vacuum dryers or in hopper dryers. If drying trays are used, the layer of moulding resin should be no more than 25mm deep. Recommended drying temperatures are given in the table.

Acrylic Resin Grade	Hopper Dryer	Shallow Trays	Time Hours
MF	70°C	75°C	2 – 4
VH	85°C	90°C	2 – 4
IR D50	75°C	80°C	2 - 4
IR S404	75°C	80°C	2 - 4

Moisture levels should be 0.05% or less for demanding jobs. Non-critical jobs may tolerate as much as 0.1% moisture in the resins. Circulating air must be dehumidified to a dew point of -40°C or less for effective drying.

Drying times range from one to four hours depending on the method and temperature employed, prevailing weather conditions, initial moisture content of the moulding resins and moisture content that can be tolerated in producing acceptable parts.

Failure to properly dry the material will result in moulding defects known as splay, splash or silver streak.

## **Processing Temperatures**

### **Start-Up Temperatures**

Starting conditions depend on the Acrypet resin used. Typical cylinder and mould temperatures are listed below.

The high end of the mould temperature range produces parts with minimised moulded-in stress, but at the cost of longer cycle times. Temperatures lower than those suggested should be avoided for thick parts, as higher stress levels can lead to part failure due to "crazing".

Melt temperatures can be varied to suit the part.

With proper drying and reasonable residence time, melt temperatures up to 270°C can be tolerated. At this temperature, flow is maximised, stress is minimised but cycles are longer.

Acrypet Grade	Rear °C	Centre °C	Front °C	Nozzle °C	Mould Temp. °C	Melt Temp. °C
MF	170 – 190	175 – 195	185 – 200	180 – 195	40 – 60	200
VH	205 – 225	215 – 235	225 – 245	225 – 240	40 – 80	240
IR D50	205 – 225	215 – 235	225 – 245	225 – 240	40 – 80	240
IR S404	205 – 225	215 – 225	225 – 235	215 – 225	40 – 80	230

## Chemical Resistance of PMMA:

Chemicals which can be used:	Chemicals requiring careful handling:	Chemicals which cannot be used:
Water Dilute acids Dilute alkali Aqueous solution of inorganic salts Aqueous solution of surface-active agent Milk, Soy sauce, Worcester sauce Vinegar Beer, Sake	<b>Aliphatic hydrocarbon</b> <b>Alcohol</b> Methanol Ethanol Ethylene glycol Glycerine  <b>Oil, Grease</b> Gasoline Engine oil Kerosene Wax remover Rape-seed oil Butter  <b>Surface-active agents</b> Shampoo (undiluted) Kitchen cleaning agents (undiluted)  <b>Others</b> Hair dressing agents Insecticide	<b>Aromatic hydrocarbon</b> Benzene Toluene Xylene  <b>Ketone</b> Acetone Methyl ethyl ketone  <b>Ether</b> Diethyl ether Tetrahydrofuran  <b>Halogenated hydrocarbon</b> Chloroform Carbon tetrachloride Ethylene dichloride  <b>Ester</b> <b>Aldehyde</b> <b>Amide</b> <b>Organic acid</b> Formic acid Acetic acid  <b>Strong concentrated acid</b> <ul style="list-style-type: none"> <li>▪ Concentrated hydrochloric acid</li> <li>▪ Concentrated sulphuric acid</li> <li>▪ Concentrated nitric acid</li> </ul>

Assistance in grade selection and further technical information and support is available from Performance Plastics.