ACRYPET™

MITSUBISHI RAYON

# PMMA

# From

performanceplastics

ACRYPET™

MITSUBISHI RAYON

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# THE PROPERTIES OF ACRYPET

| MAIN CHARACTERISTICS | TEST METHODS | | | UNITS | DATA (*) | | | |
|---|---|---|---|---|---|---|---|---|
| | ASTM | DIN | ISO | | MF | VH | IR D50 | IR S404 |
| **Rheology** | | | | | | | | |
| Melt flow rate MFR (230/3,8 Kg) | D-1238 (I) | 53735 | R1133 | g/10 min. | 14 | 2,0 | 2,5 | 8 |
| **Optical properties** | | | | | | | | |
| 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 |
| **Mechanical properties** | | | | | | | | |
| 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 |
| **Thermal properties** | | | | | | | | |
| 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 | $6X10^{-5}$ | $6X10^{-5}$ | $10X10^{-5}$ | $9X10^{-5}$ |
| Coefficient of thermal conductivity | S-177 | | | W/ (m°C) | 0.2 | 0.2 | 0.2 | 0.2 |
| **Electrical properties** | | | | | | | | |
| Surface resistivity | D-527 | 53482 | | Ω | $>10^{16}$ | $>10^{16}$ | $>10^{16}$ | $>10^{16}$ |
| Volume resistivity | D-527 | 53482 | | Ω/cm | $>10^{15}$ | $>10^{15}$ | $>10^{15}$ | $>10^{15}$ |
| 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 |
| **Other properties** | | | | | | | | |
| 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 |

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# 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<br>Dilute acids<br>Dilute alkali<br>Aqueous solution of inorganic salts<br>Aqueous solution of surface-active agent<br>Milk, Soy sauce, Worcester sauce<br>Vinegar<br>Beer, Sake | Aliphatic hydrocarbon<br>Alcohol<br>Methanol<br>Ethanol<br>Ethylene glycol<br>Glycerine<br><br>Oil, Grease<br>Gasoline<br>Engine oil<br>Kerosene<br>Wax remover<br>Rape-seed oil<br>Butter<br><br>Surface-active agents<br>Shampoo (undiluted)<br>Kitchen cleaning agents (undiluted)<br><br>Others<br>Hair dressing agents<br>Insecticide | Aromatic hydrocarbon<br>Benzene<br>Toluene<br>Xylene<br><br>Ketone<br>Acetone<br>Methyl ethyl ketone<br><br>Ether<br>Diethyl ether<br>Tetrahydrofuran<br><br>Halogenated hydrocarbon<br>Chloroform<br>Carbon tetrachloride<br>Ethylene dichloride<br><br>Ester<br>Aldehyde<br>Amide<br>Organic acid<br>Formic acid<br>Acetic acid<br><br>Strong concentrated acid<br>▪ Concentrated hydrochloric acid<br>▪ Concentrated sulphuric acid<br>▪ Concentrated nitric acid |

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

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