



Shell Immersion Cooling Fluid

MATERIAL COMPATIBILITY GUIDE

This compatibility guide is intended to aid end users with the selection of materials for use in conjunction with Shell Immersion Cooling Fluids.

This guide is aligned with the work of Open Computer Project's Advanced Cooling Solutions (ACS) Immersion Cooling Sub-Project (www.opencompute.org/projects/acs-immersion) and may be updated without prior notification.

This guide uses the terms defined below to identify materials compatibility for each tested material.

Acceptable

A material that has been tested and has successfully passed a compatibility check according to a Shell in-house test or for which we can confirm the acceptable compatibility with Shell liquids based on experience and knowledge.

Marginally Acceptable

A material that has been tested and for which marginal compatibility issues have been identified but the material function is not affected.

Unacceptable

Materials that have been tested and for which compatibility issues have been identified. Without mitigation, these materials are not recommended for direct immersion applications using Shell fluids.

This is a generic compatibility guide based on tests performed at our laboratories, and experience and knowledge. The components tested are available from different suppliers and materials and formulations may vary, therefore the compatibility behaviour may differ for each component supplier.

The information in the list serves as an initial evaluation of compatibility using an accelerated laboratory ageing method. Radiation, heat (temperature change), air (oxidation), electrical processes and mechanical loads (static and dynamic processes), often in combination, can influence the suitability of a material. To determine lifetime compatibility, finished parts or test specimens should be tested in practice by exposing them to the actual conditions in the application.

For detailed investigation of component compatibility performance, Shell is ready to perform detailed compatibility testing if the parts are sent to our laboratories.

Contact us at www.shell.com/immersion.

Shell Immersion Cooling Fluids are stabilised hydrocarbon fluids based on Shell gas-to-liquids (GTL) technology. They are dielectric fluids that are virtually free from impurities such as aromatics and nitrogen.

Shell Immersion Cooling Fluids are designed for optimised operations for both data centres and blockchain computing, and have demonstrated high cooling efficiency, excellent flow behaviour and outstanding thermodynamic properties.

Technical data sheets and material safety data sheets for Shell Immersion Cooling Fluids are available here: <http://www.epc.shell.com/>.

Seals and O-rings Rubbers	Compatibility
Nitrile rubber (>35% nitrile content)	Acceptable
Fluorocarbon rubber (Viton/fluoroelastomer)	Acceptable
Polyurethane rubber	Acceptable
PTFE (Teflon)	Acceptable
Nylon	Acceptable
EPDM	Unacceptable
Silicone rubber	Unacceptable
Neoprene rubber	Marginally Acceptable
Natural rubber	Unacceptable
CR (chloroprene rubber)	Marginally Acceptable
Gaskets and jointing	Compatibility
Cork bonded with nitrile (Nebar Grey and Nebar Purple)	Acceptable
Cork bonded with neoprene rubber (Nebar White and Nebar Orange)	Acceptable
Nitrile	Acceptable
Expanded PTFE	Acceptable
Metals	Compatibility
Copper	Acceptable
Phosphor bronze	Acceptable
Aluminium	Acceptable
Iron	Acceptable
Brass	Acceptable
Zinc-plated steel	Acceptable
Silver	Acceptable
Sleeving	Compatibility
Epoxy/glass	Acceptable
Silicone glass	Acceptable
Polyurethane/glass	Acceptable
Polyester/glass	Acceptable
Nylon	Acceptable
Plastics	Compatibility
BoPET (Mylar)	Acceptable
Cellulose triacetate	Acceptable
Polyester (Melinex)	Acceptable
Cotton/epoxy resin (Tufnol 4F/45)	Acceptable
Glass/epoxy resin (HGW)	Acceptable
Polyetheretherketone film (APTIV grade 1000)	Acceptable
Fibre-reinforced epoxy glass (FRP)	Acceptable
Acetal copolymer (Ertacetal C)	Acceptable
Nylon	Acceptable
Polymethyl methacrylate (Perspex)	Acceptable
Polypropylene	Marginally Acceptable
PVC	Marginally Acceptable
c-PVC	Marginally Acceptable
Cross-linked polyethylene	Acceptable
Cross-linked polyolefin	Acceptable
Polycarbonates	Acceptable

Low-density polyethylene	Marginally Acceptable
ABS	Acceptable
High-density polyethylene without plasticiser	Acceptable
PETG	Acceptable
Polyoxymethylene (POM)	Acceptable
PS (polystyrene)	Acceptable
3D-printed plastics	Compatibility
Thermoplastic polyurethane (TPU)	Acceptable
Acrylonitrile butadiene styrene (ABS)	Acceptable
Polypropylene 30% glass fibre (PP GF)	Marginally Acceptable
Polypropylene (PP)	Marginally Acceptable
Polyamide (PA)	Acceptable
High-temperature polyamide, carbon fibre reinforced (CF PA)	Acceptable
Polyethylene terephthalate glycol-modified (PETG)	Acceptable
Cable	Compatibility
Fluoropolymer (Raychem FlexLite)	Acceptable
PVC (Soflex TQ)	Acceptable
Cross-linked modified polyester (Raychem 99M)	Acceptable
Polyurethane (PUR/PU/TPU)	Acceptable
Polyolefin (LSZH)	Marginally Acceptable
Thermoplastic elastomer (TPE)	Acceptable
Chloroprene (PCP)	Marginally Acceptable
Fluorinated ethylene propylene (FEP)	Acceptable
Hose Piping Cooling tubes	Compatibility
UHMW polyethylene (Trelleborg Chemikler D-UPE - inner only compatible)	Acceptable
Aramid-reinforced fluoroelastomer (Goodyear SAE J30R3 - inner only compatible)	Acceptable
EPDM	Unacceptable
Polyamide	Acceptable
PTFE	Acceptable
PVC	Unacceptable
Adhesives Sealants	Compatibility
Loctite 243	Acceptable
Kafuter K-703	Acceptable
Bisphenol F epoxy resin (Araldite 2014)	Acceptable
Dimethacrylate ester (Loctite 601)	Acceptable
Gum arabic adhesive	Acceptable
Polysiloxane	Acceptable
Cyanoacrylate (Loctite 435)	Acceptable
Polyimide tape (Kapton)	Acceptable
Thermal insulation	Compatibility
Polyisocyanurate (PIR) 40, aluminium coated	Acceptable
Polyisocyanurate (PIR) B	Acceptable
Polyisocyanurate (PIR) (CASSPIR)	Acceptable
Extruded polystyrene (XPS)	Acceptable
Polyurethane foam (PUR)	Acceptable
Mineral wool (Rockwool)	Acceptable

Labels	Compatibility
GA International Lab Tag part no. FTT233C13WH "Extended Exposure Xylene and Chemical Resistant Labels"	Acceptable
Others	Compatibility
Fabric hook-and-loop fastener (polyester)	Acceptable
Bakelite FR2 PCB	Acceptable
FR4 PCB	Acceptable
Porcelain	Acceptable
Mica insulation (Mica)	Acceptable
Polyurethane casting resin	Acceptable

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