

## Fomblin PFPE: Greases

### Product Data Sheet

Chemically inert lubricating greases are required when handling corrosive or oxidizing substances. Fomblin fluorinated fluids are excellent base oils for high temperature, high performance greases. Fomblin greases are derived by thickening Fomblin fluids with tetrafluoroethylene telomers, silicates, etc. Many of the greases have USDA H1 listing.

Some formulations incorporate soluble fluorinated additives, for example in low noise applications, where rust prevention is required. However, more commonly used additive packages including sodium nitrite and benzotriazole are also possible. In Fomblin-hybrid greases, PFPEs may be added along with standard base oils, such as mineral oil and synthetics, to make stable greases containing conventional thickeners.

#### General Properties

Fomblin greases are homogenous, white, thick and particularly resistance to oxidation and to chemical agents. Further, they are compatible with all types of material (glass, metals, elastomers, plastics, ceramics) and their properties remain unaltered over wide temperature ranges. Fomblin greases can be used in the presence of water, oils, vapor and, in general, with all organic substances and solvents which are not highly fluorinated, without being removed, dissolved or modified in any way. Fomblin grades are:

**OT 20:** OT 20 is a homogenous white grease suitable for lubricating mechanical parts subjected to low loads, used at low operating temperatures and high thermal ranges (from -70° to 100°C). OT 20 is particularly suitable for lubricating roller bearings of conveyor belts or suspended conveyor belts used in cold storage rooms.

**UT 18:** UT 18 is a homogeneous white grease suitable for lubricating mechanical parts used in wide temperature intervals (from -30° to 150°C with peak temp. up to 200°C). UT 18 is particularly suitable for lubricating friction mechanical parts subjected to

medium loads, where standard mineral and synthetic lubricants are not resistant to temperature and air degradation. UT 18 is also used in lubricating special optical and micromechanical equipment.

**RT 15:** RT 15 is a homogeneous white grease suitable for lubricating mechanical parts requiring boundary (extreme pressure) lubricating properties. Shell four ball EP tests that Fomblin RT 15's welding point is 800 Kg. Its operating temperature range is from -20° to 200°C. Its properties make it suitable in "lubricating for life" applications.

**Y VAC 3:** Y VAC 3 is a homogeneous white grease particularly suitable for use as a lubricant of mechanical parts operating at high vacuum and in contact with aggressive chemicals or oxygen. Y VAC 3 is used in "lubricating for life" applications; its lubricating properties make it suitable for parts requiring boundary (extreme pressure) lubricating properties. Its welding point, in Shell four ball EP tests, is 620 Kg. Y VAC 3 can be used to lubricate mechanical parts subjected to high thermo-mechanical stress. Y VAC 3 can be used for long periods of time, and at very high operating temperatures (from -20° to 200°C) and is therefore widely used in the manufacturing, aeronautical and electromechanical industries.

**YRT 2:** YRT 2 is a homogeneous off-white colored grease having excellent rust inhibiting and solvent wash-out resistance properties. YRT 2 is suitable for lubricating mechanical couplings subjected to heavy loads. Due to its good boundary lubricating properties YRT 2 can be used in various applications, especially for lubricating roller bearings of suspended conveyors of conveyor belts in furnaces or painting/varnishing coating plants.

**YUH2:** YUH 2 is a homogeneous off-white colored grease having excellent rust inhibiting properties. Its chemical, physical and mechanical properties make it suitable for "long life" lubrication of mechanical parts.

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**YNX:** YNX is a homogeneous gray colored grease particularly stable with oxygen at high pressures. It has good wear resistance properties and is particularly indicated for use in static operating conditions, such as the lubrication of valves, valve stems, and seals operating at high air pressure, liquid or gaseous oxygen pressure and at temperatures ranging from  $-40^{\circ}\text{C}$  to  $200^{\circ}\text{C}$ .

**ZLHT:** ZLHT is a homogeneous white grease having excellent lubricating properties. It can be used in continuous operating conditions, at temperature intervals ranging from  $-80^{\circ}$  to  $200^{\circ}$  (the widest operating temperature of the range of greases). Its chemical and physical properties make it suitable for use in the aerospace industry or in chemical plants where lubricating parts are subjected to very wide thermal cycles.

**ZNF:** ZNF is a homogeneous white grease having good surface adhesion and wear resistance properties. ZNF grease has extremely low vapor pressure and is ideal under vacuum in a wide temperature range.

#### Standard Properties of Fomblin Grease

**Thermal stability:** Fomblin greases have dropping points above  $300^{\circ}\text{C}$  and can be used at high temperatures and in oxidizing conditions.

**Chemical resistance:** Fomblin greases are inert and do not react even at high temperature with fuels, acids, inorganic alkalis, halogens, fuming nitric acid and oxidizing solutions.

**Lubricating properties:** Shell Four Ball EP tests results are given in the table below.

**Solubility/wash-out:** Fomblin greases are stable, do not emulsify with water, and are resistant to all solvents except highly fluorinated solvents. Therefore Delifrene LS (1, 1, 3Trichlorotrifluoroethane) and

Galden SV, can be used to clean surfaces lubricated with Fomblin greases. The compatibility of Fomblin greases with common solvents is given in the table below.

**Oxygen compatibility:** Bundesanstalt für Materialprüfung, Berlin (BAM), has approved the use of Fomblin fluids and greases in the presence of oxygen. Furthermore the National Aeronautics and Space Administration (NASA) and the Naval Ship Engineering Center of the US Navy have both approved the use of Fomblin fluids and greases in liquid oxygen applications. Temperature and pressure limits of oxygen with Fomblin greases are given in the table below.

#### Compatibility with metals and structural

**materials:** Fomblin greases are compatible with all types of polymers, plastomers and elastomers. During tests over one month at  $20^{\circ}\text{C}$  none of these materials (nitrile, butyl, polyfluorosiloxane, EPDM rubber) revealed swelling, mechanical or physical alterations. Melamine, phenolic, polyoxymethylene, polyoleofin resins are not altered after contact with Fomblin greases for one month at  $100^{\circ}\text{C}$ . Fomblin greases can be used in continuous contact with metal, and oxygen, at temperatures up to  $200^{\circ}\text{C}$ .

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### Typical properties of Fomblin Greases

| Grease Type  | OT 20      | UT 18      | RT 15      | YVAC 3     | YRT 2      | YUH 2      | YNX        | ZLHT       | ZNF        |
|--|------------|------------|------------|------------|------------|------------|------------|------------|------------|
| Viscosity of base fluid at 20°C (ASTM D 445) (cSt)             | 35         | 500        | 1300       | 1500       | 1300       | 450        | 250        | 150        | 250        |
| Thickener  | PTFE       | PTFE       | PTFE       | PTFE       | PTFE       | PTFE       | TALC       | PTFE       | PTFE       |
| Penetration unworked after 60 strokes (ASTM D 217) mm/10       | 280<br>285 | 280<br>285 | 276<br>278 | 240<br>245 | 280<br>285 | 265<br>295 | 280<br>310 | 280<br>280 | 240<br>40  |
| NLGI Class   | 2          | 2          | 2          | 3          | 2          | 2          | /          | 2          | 3          |
| Stability after 10000 strokes (ASTM D 217) (mm/10)             | 300        | 295        | 290        | 260        | 290        | 295        | 300        | 285        | 245        |
| Anti Rust Additivation   | no         | no         | no         | no         | yes        | yes        | no         | no         | no         |
| Anti rust properties EMCOR test                                | —          | —          | —          | —          | 0/0        | 0/0        |            |            |            |
| Apparent viscosity Poise at 20°C                               |            |            |            |            |            |            |            |            |            |
| Shear rate 100 sec <sup>-1</sup>                               | 90         | 130        | 190        | 280        | 190        | 190        | —          | 150        | 240        |
| Shear rate 300 sec <sup>-1</sup>                               | 40         | 80         | 100        | 140        | 140        | 130        | —          | 60         | 100        |
| Oil separation FTMS 791-321 Weight loss (%) at 66°C / 30 hrs   | 3          | —          | —          | —          | —          | —          | —          | —          | —          |
| at 149°C / 30 hrs  | —          | 6          | —          | —          | —          | —          | 6.8        | —          | —          |
| at 204°C / 30 hrs  | —          | —          | 7.7        | 8          | 7.9        | 8.4        | —          | 6.6        | 8          |
| Evaporation (ASTM D 972) Weight loss (%) at 66°C/22h/120 l/h   | 0.2        | —          | —          | —          | —          | —          | —          | —          | —          |
| at 149°C/22h/120 l/h   | —          | 0.4        | —          | —          | —          | —          | 1.4        | —          | —          |
| Evaporation (ASTM D 2595) Weight loss (%) at 204°C/22h/120 l/h | —          | —          | 0.5        | 0.3        | 0.9        | 1.3        | —          | 2.8        | 0.2        |
| Range of Continuous Use Temperature (°C)                       | -70<br>120 | -30<br>250 | -20<br>250 | -20<br>250 | -20<br>250 | -30<br>250 | -40<br>220 | -80<br>200 | -60<br>220 |

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### Extreme Pressure properties of Fomblin lubricating greases (typical values)

Shell four ball EP test—method IP 239: operating conditions: 1450RPM 10 seconds duration

| Fomblin Grease | Seizure Load kg./cm <sup>2</sup> | Welding Load kg./cm <sup>2</sup> | M.Hertz Load kg./cm <sup>2</sup> |
|----------------|----------------------------------|----------------------------------|----------------------------------|
| OT 20          | 251                              | 501                              | 96                               |
| UT 18          | 224                              | 794                              | 108                              |
| RT 15          | 224                              | >794                             | 102                              |
| YRT 2          | 355                              | >794                             | 99                               |
| YUH 2          | 251                              | 631                              | 111                              |
| YNX            | 501                              | 631                              | 120                              |
| YVAC 3         | 178                              | 794                              | 100                              |
| ZLHT           | 355                              | 794                              | 106                              |
| ZNF            | 355                              | 794                              | 107                              |

### Compatibility With Solvents

| Solvent                   | Fomblin Grease Behavior |
|---------------------------|-------------------------|
| Petroleum ether           | Unaltered               |
| octane                    | Unaltered               |
| Benzene                   | Unaltered               |
| Ethyl ether               | Unaltered               |
| Dioxane                   | Unaltered               |
| Ethyl acetate             | Unaltered               |
| Dimethylketone            | Unaltered               |
| Trichloroethylene         | Unaltered               |
| Chloroform                | Unaltered               |
| Carbon tetrachloride      | Unaltered               |
| Methanol                  | Unaltered               |
| Water                     | Unaltered               |
| Perfluorooctane           | Soluble                 |
| Delifrene LS <sup>®</sup> | Soluble                 |
| Galden <sup>®</sup> SV    | Soluble                 |

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#### **B. A. M. Oxygen Impact test at 60 degrees C.**

| Grease               | OT<br>20 | UT<br>18 | RT<br>15 | YVAC<br>3 | YNX | YR<br>T2 | YUH<br>2 | ZLHT | ZNF |
|----------------------|----------|----------|----------|-----------|-----|----------|----------|------|-----|
| Limit pressure (bar) | 100      | 100      | 130      | 80        | 240 | 150      | 100      | 110  | 100 |

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