Lubrication Oil Filtration Systems for wind turbine gearboxes
Efficient filtration technology and lubricating oil system cleanliness is essential in extending maintenance intervals and increasing equipment reliability. Parker’s combined gearbox lubrication filtration and cooling systems do just that.

Parker’s outstanding wind turbine experience and world leading technology in filtration solutions have convinced our customers of the system reliability. The integrated gearbox filtration and lubrication systems are available for wind turbines of capacity up to 7 megawatts.

Parker’s system-matched filtration solutions have proven to be effective to extend the life time of critical components such as bearings. Lightweight, compact designs and integrated fluid functionality reduce possible leakage points. Integrated system consists of decreased number of components and less connections with piping and fitting. Electric system solutions are connected to terminal boxes.

High flow and low differential pressure provide class leading filtration performance also in extreme conditions. Systems are designed for easy installation and maintenance.

Pump-motor filter assembly  
FMB Modular Filter Manifold Block  
Early warning system

Energy efficiency and savings

New developments related to next generation media
- Includes new fibre compositions
- Focus on improved particle distribution for maintaining low constant pressure drop combined with extended life time
- Increased effective filtration media in similar space envelope
Safety and savings with condition monitoring
Parker’s innovative Condition Monitoring System integrates real-time accurate and low cost monitoring of the lubrication fluids condition. System condition monitoring and high quality filtration and cooling components extend gearbox life time and bring savings in maintenance and service costs.

Reliable partner for reliable systems
Parker provides turn key solutions with the full project responsibility – tailored design, selecting and sampling of components, time-saving kitting and pre-assembly, multiple test points and installation. Reliable functionality is assured with compatible, high quality Parker components.

Take a step to higher productivity. Parker’s advanced solutions are available world wide with support from centres of excellence in US, Europe and Asia.

Standard filtration and cooling solutions
- Gear pump with electrical 2-speed motor
- System pressure relief valve
- 5 or 10 micron filter
- Temperature control valve
- Oil cooler

Extensions of standard solutions
- Integrated manifold designs for higher power rates
- External or internal heating units
- Piping and connections
- Measuring devices for temperature, pressure and cleanliness of the oil
- Assembly on the customer site by Parker representatives
- Reservoir accessories
- Pre-connected low and high voltage cables

Environmental Condition Variances
Cold climate condition requirements:
- External heating system (5/10/15 kW)
- Heating system in suction lines
- Trace heating for electrically driven pump

Hot climate condition requirements:
- Increased cooler capacity
### Standard solutions for wind turbine gearbox lubrication

<table>
<thead>
<tr>
<th>Turbine gearbox power</th>
<th>Main specification for lubricating and cooling system</th>
<th>Electrically driven pump</th>
<th>Mechanically driven pump</th>
<th>Integrated filter functions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1.0 MW</strong></td>
<td>Heat loss 30kW Flow 75 l/min (pump ratio 40/60) Max pressure 15 bar Cleanliness level -15/13 (ISO DIN 4406) Oil ISO VG320 Order code: LOFS10-S001</td>
<td>Cast iron pump: PG-P350A178ERAB511 Volumetric displacement: 21cc Motor power: 1.0kW/1.5kW, 2-speed IEC 100 LX 8-4 Voltage: 400/690 VAC, 50/60Hz Viscosity: 5000cSt (0°C)</td>
<td>Bi-directional pump: KF32 Volumetric displacement: 32cc Nominal speed 1500rpm Max speed 2000rpm Viscosity: 20000cSt (0°C)</td>
<td>Filter element length: 1 Number of filter housings: 1 Main element: 10μm Secondary element: 50μm By pass valve opening: 5 bar ΔP indication at 3 bar System pressure valve: 15 bar Temperature control valve opening: 45°C Order code: FMBCH110QBBF3S5R32E4</td>
</tr>
<tr>
<td><strong>1.5 MW</strong></td>
<td>Heat loss 45kW Flow 125 l/min (pump ratio 40/60) Max pressure 15 bar Cleanliness level -15/13 (ISO DIN 4406) Oil ISO VG320 Order code: LOFS15-S001</td>
<td>Cast iron pump: PG-P350A178ERAB1011 Volumetric displacement: 42cc Motor power: 2.2kW/3.3kW, 2-speed IEC 132 S 8-4 Voltage: 400/690 VAC, 50/60Hz Viscosity: 5000cSt (0°C)</td>
<td>Bi-directional pump: KF50 Volumetric displacement: 50.2cc Nominal speed 1500rpm Max speed 2000rpm Viscosity: 20000cSt (0°C)</td>
<td>Filter element length: 1 Number of filter housings: 1 Main element: 10μm Secondary element: 50μm By pass valve opening: 5 bar ΔP indication at 3 bar System pressure valve: 15 bar Temperature control valve opening: 45°C Order code: FMBCH110QBBF3S5R32E4</td>
</tr>
<tr>
<td><strong>2.0 MW</strong></td>
<td>Heat loss 60kW Flow 160 l/min (pump ratio 40/60) Max pressure 15 bar Cleanliness level -15/13 (ISO DIN 4406) Oil ISO VG320 Order code: LOFS20-S001</td>
<td>Cast iron pump: PG-P350A178ERAB1211 Volumetric displacement: 52cc Motor power: 2.2kW/3.3kW, 2-speed IEC 132 M 8-4 Voltage: 400/690 VAC, 50/60Hz Viscosity: 5000cSt (0°C)</td>
<td>Bi-directional pump: SS-20-200 Volumetric displacement: 66cc Nominal speed 1500rpm Max speed 2000rpm Viscosity: 20000cSt (0°C)</td>
<td>Filter element length: 2 Number of filter housings: 2 Main element: 10μm Secondary element: 50μm By pass valve opening: 5 bar ΔP indication at 3 bar System pressure valve: 15 bar Temperature control valve opening: 45°C Order code: FMBCH210QBBF3S5R32E4</td>
</tr>
<tr>
<td><strong>3.0 MW</strong></td>
<td>Heat loss 100kW Flow 220 l/min (pump ratio 40/60) Max pressure 15 bar Cleanliness level -15/13 (ISO DIN 4406) Oil ISO VG320 Order code: LOFS30-S001</td>
<td>Cast iron pump: PG-P350A178ERAB1511 Volumetric displacement: 63cc Motor power: 2.8kW/4.2kW, 2-speed IEC 132 M 8-4 Voltage: 400/690 VAC, 50/60Hz Viscosity: 5000cSt (0°C)</td>
<td>Bi-directional pump: SS-20-250 Volumetric displacement: 83cc Nominal speed 1500rpm Max speed 2000rpm Viscosity: 20000cSt (0°C)</td>
<td>Filter element length: 2 Number of filter housings: 2 Main element: 10μm Secondary element: 50μm By pass valve opening: 5 bar ΔP indication at 3 bar System pressure valve: 15 bar Temperature control valve opening: 45°C Order code: FMBCH310QBBF3S5R32E4</td>
</tr>
<tr>
<td><strong>3.6 MW</strong></td>
<td>Heat loss 120kW Flow 290 l/min (pump ratio 40/60) Max pressure 15 bar Cleanliness level -15/13 (ISO DIN 4406) Oil ISO VG320 Order code: LOFS36-S001</td>
<td>Cast iron pump: PG-P350A178ERAB2011 Volumetric displacement: 84cc Motor power: 4.0kW/6.0kW, 2-speed IEC 132 MX 8-4 Voltage: 400/690 VAC, 50/60Hz Viscosity: 5000cSt (0°C)</td>
<td>Bi-directional pump: SS-20-350 Volumetric displacement: 116cc Nominal speed 1500rpm Max speed 2000rpm Viscosity: 20000cSt (0°C)</td>
<td>Filter element length: 2 Number of filter housings: 2 in manifold Main element: 10μm Secondary element: 50μm By pass valve opening: 5 bar ΔP indication at 3 bar System pressure valve: 15 bar Temperature control valve opening: 45°C Order code: FMBCH310QBBF3S5R32E4</td>
</tr>
<tr>
<td><strong>5.0 MW</strong></td>
<td>Heat loss 180kW Flow 390 l/min (pump ratio 40/60) Max pressure 15 bar Cleanliness level -15/13 (ISO DIN 4406) Oil ISO VG320 Order code: LOFS50-S001</td>
<td>Cast iron pump: PG-P356A178ERAB2011 Volumetric displacement: 118cc Motor power: 5.0kW/7.5kW, 2-speed IEC 160 M 8-4 Voltage: 400/690 VAC, 50/60Hz Viscosity: 5000cSt (0°C)</td>
<td>Bi-directional pump: SS-20-450 Volumetric displacement: 148cc Nominal speed 1500rpm Max speed 2000rpm Viscosity: 20000cSt (0°C)</td>
<td>Filter element length: 2 Number of filter housings: 3 in manifold Main element: 10μm Secondary element: 50μm By pass valve opening: 5 bar ΔP indication at 3 bar System pressure valve: 15 bar Temperature control valve opening: 45°C Order code: FMBCH310QBBF3S5R32E4</td>
</tr>
</tbody>
</table>

**Necessary accessories:**
- Sight glass
- Drain valve
-Temperature probe
-Oil level sensor

**Cross wall labyrinth for air separation**
- Material: coated steel, painted
- Typical oil volume: 1400 litres

**Typical oil volume:**
- 1000 litres
- 770 litres
- 440 litres
## Gearbox Filtration and Cooling Systems

<table>
<thead>
<tr>
<th>Cooler (as examples)</th>
<th>Oil reservoir as part of gearbox casting</th>
<th>Oil reservoir as separate tank</th>
<th>Example of main component assemblies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type: oil/air</td>
<td>Typical oil volume: 260 litres</td>
<td>Typical oil volume: 260 litres</td>
<td><img src="image1.png" alt="Image 1" /></td>
</tr>
<tr>
<td>Number of coolers: 1</td>
<td>Necessary accessories:</td>
<td>Material: coated steel, painted</td>
<td><img src="image2.png" alt="Image 2" /></td>
</tr>
<tr>
<td>Max working pressure: 20 bar</td>
<td>- immersion heaters - oil level sensor - temperature probe - drain valve - sight glass</td>
<td>Cross wall labyrinth for air separation Necessary accessories:</td>
<td><img src="image3.png" alt="Image 3" /></td>
</tr>
<tr>
<td>Number of coolers: 1</td>
<td>Max working pressure: 20 bar</td>
<td>- immersion heaters - oil level sensor - temperature probe - drain valve - sight glass</td>
<td><img src="image4.png" alt="Image 4" /></td>
</tr>
<tr>
<td>By pass setting: 5 bar</td>
<td>Normal &amp; cold climate up to 35°C</td>
<td>- immersion heaters - oil level sensor - temperature probe - drain valve - sight glass</td>
<td><img src="image5.png" alt="Image 5" /></td>
</tr>
<tr>
<td>LAC-033-4 (27,5kW)</td>
<td>LAC-085-6 (30kW)</td>
<td>- immersion heaters - oil level sensor - temperature probe - drain valve - sight glass</td>
<td><img src="image6.png" alt="Image 6" /></td>
</tr>
<tr>
<td>Normal &amp; cold climate up to 35°C</td>
<td>LAC-078-6 (50kW)</td>
<td>- immersion heaters - oil level sensor - temperature probe - drain valve - sight glass</td>
<td><img src="image7.png" alt="Image 7" /></td>
</tr>
<tr>
<td>Hot climate up to 45°C</td>
<td>LAC-088-6 (45kW)</td>
<td>- immersion heaters - oil level sensor - temperature probe - drain valve - sight glass</td>
<td><img src="image8.png" alt="Image 8" /></td>
</tr>
<tr>
<td>Number of coolers: 2</td>
<td>Typical oil volume: 440 litres</td>
<td>Typical oil volume: 440 litres</td>
<td><img src="image9.png" alt="Image 9" /></td>
</tr>
<tr>
<td>Max working pressure: 20 bar</td>
<td>Necessary accessories:</td>
<td>Material: coated steel, painted</td>
<td><img src="image10.png" alt="Image 10" /></td>
</tr>
<tr>
<td>By pass setting: 5 bar</td>
<td>- immersion heaters - oil level sensor - temperature probe - drain valve - sight glass</td>
<td>Cross wall labyrinth for air separation Necessary accessories:</td>
<td><img src="image11.png" alt="Image 11" /></td>
</tr>
<tr>
<td>Normal &amp; cold climate up to 35°C</td>
<td>LAC-078-6 (50kW)</td>
<td>- immersion heaters - oil level sensor - temperature probe - drain valve - sight glass</td>
<td><img src="image12.png" alt="Image 12" /></td>
</tr>
<tr>
<td>Hot climate up to 45°C</td>
<td>LAC-088-6 (45kW)</td>
<td>- immersion heaters - oil level sensor - temperature probe - drain valve - sight glass</td>
<td><img src="image13.png" alt="Image 13" /></td>
</tr>
<tr>
<td>Number of coolers: 2</td>
<td>Typical oil volume: 560 litres</td>
<td>Typical oil volume: 560 litres</td>
<td><img src="image14.png" alt="Image 14" /></td>
</tr>
<tr>
<td>Max working pressure: 20 bar</td>
<td>Necessary accessories:</td>
<td>Material: coated steel, painted</td>
<td><img src="image15.png" alt="Image 15" /></td>
</tr>
<tr>
<td>By pass setting: 5 bar</td>
<td>- immersion heaters - oil level sensor - temperature probe - drain valve - sight glass</td>
<td>Cross wall labyrinth for air separation Necessary accessories:</td>
<td><img src="image16.png" alt="Image 16" /></td>
</tr>
<tr>
<td>Normal &amp; cold climate up to 35°C</td>
<td>LAC-078-6 (50kW)</td>
<td>- immersion heaters - oil level sensor - temperature probe - drain valve - sight glass</td>
<td><img src="image17.png" alt="Image 17" /></td>
</tr>
<tr>
<td>Hot climate up to 45°C</td>
<td>LAC-088-6 (45kW)</td>
<td>- immersion heaters - oil level sensor - temperature probe - drain valve - sight glass</td>
<td><img src="image18.png" alt="Image 18" /></td>
</tr>
<tr>
<td>Number of coolers: 2</td>
<td>Typical oil volume: 770 litres</td>
<td>Typical oil volume: 770 litres</td>
<td><img src="image19.png" alt="Image 19" /></td>
</tr>
<tr>
<td>Max working pressure: 20 bar</td>
<td>Necessary accessories:</td>
<td>Material: coated steel, painted</td>
<td><img src="image20.png" alt="Image 20" /></td>
</tr>
<tr>
<td>By pass setting: 5 bar</td>
<td>- immersion heaters - oil level sensor - temperature probe - drain valve - sight glass</td>
<td>Cross wall labyrinth for air separation Necessary accessories:</td>
<td><img src="image21.png" alt="Image 21" /></td>
</tr>
<tr>
<td>Normal &amp; cold climate up to 35°C</td>
<td>LAC-078-6 (50kW)</td>
<td>- immersion heaters - oil level sensor - temperature probe - drain valve - sight glass</td>
<td><img src="image22.png" alt="Image 22" /></td>
</tr>
<tr>
<td>Hot climate up to 45°C</td>
<td>LAC-088-6 (45kW)</td>
<td>- immersion heaters - oil level sensor - temperature probe - drain valve - sight glass</td>
<td><img src="image23.png" alt="Image 23" /></td>
</tr>
<tr>
<td>Type: oil/water</td>
<td>Typical oil volume: 1000 litres</td>
<td>Typical oil volume: 1000 litres</td>
<td><img src="image24.png" alt="Image 24" /></td>
</tr>
<tr>
<td>Number of coolers: 1</td>
<td>Necessary accessories:</td>
<td>Material: coated steel, painted</td>
<td><img src="image25.png" alt="Image 25" /></td>
</tr>
<tr>
<td>Max working pressure: 16 bar</td>
<td>- immersion heaters - oil level sensor - temperature probe - drain valve - sight glass</td>
<td>Cross wall labyrinth for air separation Necessary accessories:</td>
<td><img src="image26.png" alt="Image 26" /></td>
</tr>
<tr>
<td>By pass setting: 5 bar</td>
<td>GCD-016-M-5-P-111-151786 (120kW)</td>
<td>- immersion heaters - oil level sensor - temperature probe - drain valve - sight glass</td>
<td><img src="image27.png" alt="Image 27" /></td>
</tr>
<tr>
<td>Normal &amp; cold climate up to 50°C</td>
<td></td>
<td>- immersion heaters - oil level sensor - temperature probe - drain valve - sight glass</td>
<td><img src="image28.png" alt="Image 28" /></td>
</tr>
<tr>
<td>Inlet water temp: 50°C (typical)</td>
<td>GCD-016-M-5-P-111-151786 (120kW)</td>
<td>- immersion heaters - oil level sensor - temperature probe - drain valve - sight glass</td>
<td><img src="image29.png" alt="Image 29" /></td>
</tr>
<tr>
<td>Type: oil/water</td>
<td>Typical oil volume: 1400 litres</td>
<td>Typical oil volume: 1400 litres</td>
<td><img src="image30.png" alt="Image 30" /></td>
</tr>
<tr>
<td>Number of coolers: 2</td>
<td>Necessary accessories:</td>
<td>Material: coated steel, painted</td>
<td><img src="image31.png" alt="Image 31" /></td>
</tr>
<tr>
<td>Max working pressure: 16 bar</td>
<td>- immersion heaters - oil level sensor - temperature probe - drain valve - sight glass</td>
<td>Cross wall labyrinth for air separation Necessary accessories:</td>
<td><img src="image32.png" alt="Image 32" /></td>
</tr>
<tr>
<td>By pass setting: 5 bar</td>
<td>GCD-016-M-5-P-111-151786 (120kW)</td>
<td>- immersion heaters - oil level sensor - temperature probe - drain valve - sight glass</td>
<td><img src="image33.png" alt="Image 33" /></td>
</tr>
<tr>
<td>Normal &amp; cold climate up to 50°C</td>
<td></td>
<td>- immersion heaters - oil level sensor - temperature probe - drain valve - sight glass</td>
<td><img src="image34.png" alt="Image 34" /></td>
</tr>
<tr>
<td>Inlet water temp: 50°C (typical)</td>
<td>GCD-016-M-5-P-111-151786 (120kW)</td>
<td>- immersion heaters - oil level sensor - temperature probe - drain valve - sight glass</td>
<td><img src="image35.png" alt="Image 35" /></td>
</tr>
</tbody>
</table>
Turn key application solution

The system is designed and built using high quality Parker compatible components.

1. Hose fittings
   - Chrome 6- free fittings
   - Several elbow options
   - Available in several connection types
   - Together with Parker hoses ensure leakfree connections between components

2. Mechanically driven pump
   - External gear pump with cast iron housing
   - Direct drive from gearbox to secure oil delivery during idling
   - Excellent suction capabilities with high viscosity oils

3. Electrically driven oil pump
   - High performance gear pump with cast iron housing
   - Excellent suction capabilities with high viscosity oils
   - One or two speed electrical motors with heating for cold climate installations
   - Frequency drive as option for optimized flow control

4. Suction hoses
   - Specially designed for high viscosity applications
   - Low friction to avoid pressure losses

5. Filter manifold
   - 5 or 10 micron filtration with integrated bypass filtration with low pressure drop and high dirt holding capacity
   - Two different element lengths
   - Integrated differential pressure switch / sensor
   - Integrated pressure and temperature control valves
   - Modular construction
   - Optional offline filter module without additional pump-motor assembly
   - No tools required for element change

6. Flow and temperature control valves
   - Cartridge type valves designed for high viscosity fluids
   - Low pressure drop with minimized hysteresis
   - Surface or block mounted
   - LVDT sensors as option

7. Temperature controller
   - Available as tank mounted or online
   - Analogue 4..20 mA signal with local display
   - Programmable limit switches for alarm functions

8. Pressure hoses
   - Minimized bend radius
   - High abrasion resistance
   - World wide availability

9. Coolers
   - Air or water cooled heat exchangers
   - Corrosion resistant materials
   - Low pressure drop with high cooling capacity
   - Low noise levels
   - By pass valve as option

10. Ball valves
    - Available in several different sizes
    - Special seals for cold climate conditions

11. Oil level sight glasses
    - Rigid design for visual oil level monitoring
    - Available with integrated temperature indicator
    - Several heights ensures right monitoring levels

12. Electrically driven oil pump
    - High performance gear pump with cast iron housing
    - Excellent suction capabilities with high viscosity oils
    - One or two speed electrical motors with heating for cold climate installations
    - Frequency drive as option for optimized flow control

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    - 5 or 10 micron filtration with integrated bypass filtration with low pressure drop and high dirt holding capacity
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    - Specially designed for high viscosity applications
    - Low friction to avoid pressure losses

22. Filter manifold
    - 5 or 10 micron filtration with integrated bypass filtration with low pressure drop and high dirt holding capacity
    - Two different element lengths
    - Integrated differential pressure switch / sensor
    - Integrated pressure and temperature control valves
    - Modular construction
    - Optional offline filter module without additional pump-motor assembly
    - No tools required for element change

23. Temperature controller
    - Available as tank mounted or online
    - Analogue 4..20 mA signal with local display
    - Programmable limit switches for alarm functions

24. Pressure hoses
    - Minimized bend radius
    - High abrasion resistance
    - World wide availability

25. Coolers
    - Air or water cooled heat exchangers
    - Corrosion resistant materials
    - Low pressure drop with high cooling capacity
    - Low noise levels
    - By pass valve as option

26. Ball valves
    - Available in several different sizes
    - Special seals for cold climate conditions

27. Oil level sight glasses
    - Rigid design for visual oil level monitoring
    - Available with integrated temperature indicator
    - Several heights ensures right monitoring levels
Parker provides a complete system solution and takes responsibility of design, functionality and reliability of the lubrication system. Furthermore, with project management, system condition monitoring and global after sales service, Parker provides the Total Health Management System, which frees our customers’ resources and helps ensure operation without downtime.

Parker solutions meet every need – from component supply to total health management.