

# CPC COOPERATIVE PATENT CLASSIFICATION

## F MECHANICAL ENGINEERING; LIGHTING; HEATING; WEAPONS; BLASTING (NOTE omitted)

### ENGINES OR PUMPS

**F04 POSITIVE DISPLACEMENT MACHINES FOR LIQUIDS; PUMPS FOR LIQUIDS OR ELASTIC FLUIDS** (portable fire-extinguishers with manually-operated pumps [A62C 11/00](#), with power-driven pumps [A62C 25/00](#); charging or scavenging combustion engines by pumps [F02B](#); engines fuel-injection pumps [F02M](#); ion pumps [H01J 41/00](#); electro-dynamic pumps [H02K 44/02](#))  
(NOTE omitted)

**F04C ROTARY-PISTON, OR OSCILLATING-PISTON, POSITIVE-DISPLACEMENT MACHINES FOR LIQUIDS** (engines [F03C](#)); **ROTARY-PISTON, OR OSCILLATING-PISTON, POSITIVE-DISPLACEMENT PUMPS**

#### NOTE

Attention is drawn to the notes preceding class [F01](#) especially as regards the definitions of "machines", "pumps", "positive displacement", "rotary-piston machines", "oscillating-piston machines", "rotary piston", "co-operating members", "movement of co-operating members", "teeth or tooth-equivalents" and "internal axis".

#### WARNING

In this subclass non-limiting references (in the sense of paragraph 39 of the Guide to the IPC) may still be displayed in the scheme.

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|---|---|
| <p><b>2/00 Rotary-piston machines or pumps</b> (with non-parallel axes of co-operating members <a href="#">F04C 3/00</a>; with the working-chamber walls at least partly resiliently deformable <a href="#">F04C 5/00</a>; with fluid ring or the like <a href="#">F04C 7/00</a>; rotary-piston pumps specially adapted for elastic fluids <a href="#">F04C 18/00</a>; rotary-piston machines or pumps in which the working-fluid is exclusively displaced by, or exclusively displaces, one or more reciprocating pistons <a href="#">F04B</a>)</p> <p><b>NOTE</b></p> <p>Group <a href="#">F04C 2/30</a> takes precedence over groups <a href="#">F04C 2/02</a> - <a href="#">F04C 2/28</a></p>   | <p>2/08 . of intermeshing-engagement type, i.e. with engagement of co-operating members similar to that of toothed gearing</p> <p>2/082 . . {Details specially related to intermeshing engagement type machines or pumps}</p> <p>2/084 . . . {Toothed wheels}</p> <p>2/086 . . . {Carter}</p> <p>2/088 . . . {Elements in the toothed wheels or the carter for relieving the pressure of fluid imprisoned in the zones of engagement}</p> <p>2/10 . . of internal-axis type with the outer member having more teeth or tooth-equivalents, e.g. rollers, than the inner member</p> <p>2/101 . . . {with a crescent-shaped filler element, located between the inner and outer intermeshing members}</p> <p>2/102 . . . {the two members rotating simultaneously around their respective axes}</p> <p>2/103 . . . {one member having simultaneously a rotational movement about its own axis and an orbital movement}</p> <p>2/104 . . . . {having an articulated driving shaft}</p> <p>2/105 . . . . {Details concerning timing or distribution valves}</p> <p>2/106 . . . . . {Spool type distribution valves}</p> <p>2/107 . . . with helical teeth</p> <p>2/1071 . . . . {the inner and outer member having a different number of threads and one of the two being made of elastic materials, e.g. Moineau type}</p> <p>2/1073 . . . . . {where one member is stationary while the other member rotates and orbits}</p> |
| <p>2/02 . of arcuate-engagement type, i.e. with circular translatory movement of co-operating members, each member having the same number of teeth or tooth-equivalents</p> <p>2/025 . . {the moving and the stationary member having co-operating elements in spiral form}</p> <p>2/04 . . of internal axis type</p> <p>2/045 . . . {having a C-shaped piston}</p> <p>2/06 . . of other than internal-axis type (<a href="#">F04C 2/063</a> takes precedence)</p> <p>2/063 . . with coaxially-mounted members having continuously-changing circumferential spacing between them</p> <p>2/067 . . . having cam-and-follower type drive</p> <p>2/07 . . . having crankshaft-and-connecting-rod type drive</p> <p>2/073 . . . having pawl-and-ratchet type drive</p> <p>2/077 . . . having toothed-gearing type drive</p> |   |

- 2/1075 . . . . . {Construction of the stationary member}
- 2/1076 . . . . . {where one member orbits or wobbles relative to the other member which rotates around a fixed axis}
- 2/1078 . . . . . {where one member rotates and both members are allowed to orbit or wobble}
- 2/113 . . . the inner member carrying rollers intermeshing with the outer member
- 2/12 . . of other than internal-axis type
- 2/123 . . . {with radially or approximately radially from the rotor body extending tooth-like elements, co-operating with recesses in the other rotor, e.g. one tooth}
- 2/126 . . . {with radially from the rotor body extending elements, not necessarily co-operating with corresponding recesses in the other rotor, e.g. lobes, Roots type}
- 2/14 . . . with toothed rotary pistons
- 2/16 . . . with helical teeth, e.g. chevron-shaped, screw type {(for non-parallel axes of movement [F04C 3/00](#))}
- 2/165 . . . . . {having more than two rotary pistons with parallel axes}
- 2/18 . . . . with similar tooth forms ([F04C 2/16](#) takes precedence)
- 2/20 . . . . with dissimilar tooth forms ([F04C 2/16](#) takes precedence)
- 2/22 . . of internal-axis type with equidirectional movement of co-operating members at the points of engagement, or with one of the co-operating members being stationary, the inner member having more teeth or tooth-equivalents than the outer member
- 2/24 . . of counter-engagement type, i.e. the movement of co-operating members at the points of engagement being in opposite directions
- 2/26 . . of internal-axis type
- 2/28 . . of other than internal-axis type
- 2/30 . . having the characteristics covered by two or more groups [F04C 2/02](#), [F04C 2/08](#), [F04C 2/22](#), [F04C 2/24](#) or having the characteristics covered by one of these groups together with some other type of movement between co-operating members
- 2/32 . . having both the movement defined in groups [F04C 2/02](#) and relative reciprocation between co-operating members
- 2/321 . . . {with vanes hinged to the inner member and reciprocating with respect to the inner member}
- 2/322 . . . {with vanes hinged to the outer member and reciprocating with respect to the outer member}
- 2/324 . . . with vanes hinged to the inner member and reciprocating with respect to the outer member
- 2/328 . . . . and hinged to the outer member
- 2/332 . . . with vanes hinged to the outer member and reciprocating with respect to the inner member
- 2/336 . . . . and hinged to the inner member
- 2/34 . . having the movement defined in groups [F04C 2/08](#) or [F04C 2/22](#) and relative reciprocation between the co-operating members
- 2/344 . . . with vanes reciprocating with respect to the inner member
- 2/3441 . . . . {the inner and outer member being in contact along one line or continuous surface substantially parallel to the axis of rotation}
- 2/3442 . . . . . {the surfaces of the inner and outer member, forming the working space, being surfaces of revolution}
- 2/3443 . . . . . {with a separation element located between the inlet and outlet opening}
- 2/3445 . . . . . {the vanes having the form of rollers, slippers or the like}
- 2/3446 . . . . {the inner and outer member being in contact along more than one line or surface}
- 2/3447 . . . . . {the vanes having the form of rollers, slippers or the like}
- 2/3448 . . . . {with axially movable vanes}
- 2/348 . . . . the vanes positively engaging, with circumferential play, an outer rotatable member
- 2/352 . . . . the vanes being pivoted on the axis of the outer member
- 2/356 . . . with vanes reciprocating with respect to the outer member
- 2/3562 . . . . {the inner and outer member being in contact along one line or continuous surface substantially parallel to the axis of rotation}
- 2/3564 . . . . . {the surfaces of the inner and outer member, forming the working space, being surfaces of revolution}
- 2/3566 . . . . {the inner and outer member being in contact along more than one line or surface}
- 2/3568 . . . . {with axially movable vanes}
- 2/36 . . having both the movements defined in groups [F04C 2/22](#) and [F04C 2/24](#)
- 2/38 . . having the movement defined in group [F04C 2/02](#) and having a hinged member ([F04C 2/32](#) takes precedence)
- 2/39 . . . with vanes hinged to the inner as well as to the outer member
- 2/40 . . having the movement defined in group [F04C 2/08](#) or [F04C 2/22](#) and having a hinged member
- 2/44 . . . with vanes hinged to the inner member
- 2/46 . . . with vanes hinged to the outer member
- 3/00 Rotary-piston machines or pumps, with non-parallel axes of movement of co-operating members, e.g. of screw type (with the working-chamber walls at least partly resiliently deformable [F04C 5/00](#); rotary-piston pumps with non-parallel axes of movement of co-operating members specially adapted for elastic fluids [F04C 18/48](#))**
- 3/02 . . the axes being arranged at an angle of 90 degrees
- 3/04 . . of intermeshing engagement type, i.e. with engagement of co-operating members similar to that of toothed gearing
- 3/06 . . the axes being arranged otherwise than at an angle of 90 degrees
- 3/08 . . of intermeshing engagement type, i.e. with engagement of co-operating members similar to that of toothed gearing
- 3/085 . . . {the axes of cooperating members being on the same plane}

5/00	<b>Rotary-piston machines or pumps with the working-chamber walls at least partly resiliently deformable</b> (such pumps specially adapted for elastic fluids <a href="#">F04C 18/00</a> )	14/10	<ul style="list-style-type: none"> <li>characterised by changing the positions of the inlet or outlet openings with respect to the working chamber</li> </ul>
7/00	<b>Rotary-piston machines or pumps with fluid ring or the like</b> (such pumps specially adapted for elastic fluids <a href="#">F04C 19/00</a> )	14/12	<ul style="list-style-type: none"> <li>using sliding valves</li> </ul>
		14/14	<ul style="list-style-type: none"> <li>using rotating valves</li> </ul>
		14/16	<ul style="list-style-type: none"> <li>using lift valves</li> </ul>
		14/18	<ul style="list-style-type: none"> <li>characterised by varying the volume of the working chamber (by changing the positions of inlet or outlet openings <a href="#">F04C 14/10</a>)</li> </ul>
9/00	<b>Oscillating-piston machines or pumps</b> (such pumps specially adapted for elastic fluids <a href="#">F04C 21/00</a> )	14/185	<ul style="list-style-type: none"> <li>{by varying the useful pumping length of the cooperating members in the axial direction}</li> </ul>
9/002	<ul style="list-style-type: none"> <li>{the piston oscillating around a fixed axis}</li> </ul>	14/20	<ul style="list-style-type: none"> <li>by changing the form of the inner or outer contour of the working chamber</li> </ul>
9/005	<ul style="list-style-type: none"> <li>{the piston oscillating in the space, e.g. around a fixed point (rotary-piston machines or pumps with non-parallel axes of movement between co-operating members <a href="#">F04C 3/00</a>)}</li> </ul>	14/22	<ul style="list-style-type: none"> <li>by changing the eccentricity between cooperating members</li> </ul>
9/007	<ul style="list-style-type: none"> <li>{the points of the moving element describing approximately an alternating movement in axial direction with respect to the other element}</li> </ul>	14/223	<ul style="list-style-type: none"> <li>{using a movable cam}</li> </ul>
		14/226	<ul style="list-style-type: none"> <li>{by pivoting the cam around an eccentric axis}</li> </ul>
11/00	<b>Combinations of two or more machines or pumps, each being of rotary-piston or oscillating-piston type</b> (combinations of such pumps specially adapted for elastic fluids <a href="#">F04C 23/00</a> ); <b>Pumping installations</b> ( <a href="#">F04C 13/00</a> takes precedence; specially adapted for elastic fluids <a href="#">F04C 23/00</a> ; fluid gearing <a href="#">F16H</a> )	14/24	<ul style="list-style-type: none"> <li>characterised by using valves controlling pressure or flow rate, e.g. discharge valves {or unloading valves} (<a href="#">F04C 14/10</a> takes precedence)</li> </ul>
		14/26	<ul style="list-style-type: none"> <li>using bypass channels</li> </ul>
		14/265	<ul style="list-style-type: none"> <li>{being obtained by displacing a lateral sealing face}</li> </ul>
		14/28	<ul style="list-style-type: none"> <li>Safety arrangements; Monitoring</li> </ul>
	<b>NOTE</b>	15/00	<b>Component parts, details or accessories of machines, pumps or pumping installations, not provided for in groups <a href="#">F04C 2/00</a> - <a href="#">F04C 14/00</a> (of pumps specially adapted for elastic fluids <a href="#">F04C 18/00</a> - <a href="#">F04C 29/00</a>)</b>
	Multi-stage engines, motors, pumps or compressors with stages connected in series or in parallel are not considered as having complementary function	15/0003	<ul style="list-style-type: none"> <li>{Sealing arrangements in rotary-piston machines or pumps (sealing in general <a href="#">F16J</a>)}</li> </ul>
11/001	<ul style="list-style-type: none"> <li>{of similar working principle}</li> </ul>	15/0007	<ul style="list-style-type: none"> <li>{Radial sealings for working fluid}</li> </ul>
11/003	<ul style="list-style-type: none"> <li>{having complementary function}</li> </ul>	15/0011	<ul style="list-style-type: none"> <li>{of rigid material}</li> </ul>
11/005	<ul style="list-style-type: none"> <li>{of dissimilar working principle}</li> </ul>	15/0015	<ul style="list-style-type: none"> <li>{of resilient material}</li> </ul>
11/006	<ul style="list-style-type: none"> <li>{having complementary function}</li> </ul>	15/0019	<ul style="list-style-type: none"> <li>{Radial sealing elements specially adapted for intermeshing-engagement type machines or pumps, e.g. gear machines or pumps}</li> </ul>
11/008	<ul style="list-style-type: none"> <li>{Enclosed motor pump units}</li> </ul>	15/0023	<ul style="list-style-type: none"> <li>{Axial sealings for working fluid}</li> </ul>
13/00	<b>Adaptations of machines or pumps for special use, e.g. for extremely high pressures</b> (of pumps specially adapted for elastic fluids <a href="#">F04C 25/00</a> )	15/0026	<ul style="list-style-type: none"> <li>{Elements specially adapted for sealing of the lateral faces of intermeshing-engagement type machines or pumps, e.g. gear machines or pumps}</li> </ul>
13/001	<ul style="list-style-type: none"> <li>{Pumps for particular liquids}</li> </ul>	15/003	<ul style="list-style-type: none"> <li>{Sealings for working fluid between radially and axially moving parts}</li> </ul>
13/002	<ul style="list-style-type: none"> <li>{for homogeneous viscous liquids}</li> </ul>	15/0034	<ul style="list-style-type: none"> <li>{for other than the working fluid, i.e. the sealing arrangements are not between working chambers of the machine}</li> </ul>
13/004	<ul style="list-style-type: none"> <li>{with means for fluidising or diluting the material being pumped}</li> </ul>	15/0038	<ul style="list-style-type: none"> <li>{Shaft sealings specially adapted for rotary-piston machines or pumps}</li> </ul>
13/005	<ul style="list-style-type: none"> <li>{Removing contaminants, deposits or scale from the pump; Cleaning}</li> </ul>	15/0042	<ul style="list-style-type: none"> <li>{Systems for the equilibration of forces acting on the machines or pump (interstice adjustment other than by fluid pressure <a href="#">F01C 21/102</a>)}</li> </ul>
13/007	<ul style="list-style-type: none"> <li>{Venting; Gas and vapour separation during pumping (preventing vapour lock in fuel pumps <a href="#">F02M 37/20</a>, in centrifugal pumps <a href="#">F04D 9/00</a>)}</li> </ul>	15/0046	<ul style="list-style-type: none"> <li>{Internal leakage control}</li> </ul>
13/008	<ul style="list-style-type: none"> <li>{Pumps for submersible use, i.e. down-hole pumping}</li> </ul>	15/0049	<ul style="list-style-type: none"> <li>{Equalization of pressure pulses (silencing for compressors <a href="#">F04C 29/06</a>)}</li> </ul>
14/00	<b>Control of, monitoring of, or safety arrangements for, machines, pumps or pumping installations</b> (of pumps or pumping installations specially adapted for elastic fluids <a href="#">F04C 28/00</a> )	15/0053	<ul style="list-style-type: none"> <li>{Venting means for starting}</li> </ul>
14/02	<ul style="list-style-type: none"> <li>specially adapted for several machines or pumps connected in series or in parallel</li> </ul>	15/0057	<ul style="list-style-type: none"> <li>{Driving elements, brakes, couplings, transmission specially adapted for machines or pumps (brakes, couplings, transmissions per se <a href="#">F16</a>, <a href="#">B60</a>)}</li> </ul>
14/04	<ul style="list-style-type: none"> <li>specially adapted for reversible machines or pumps</li> </ul>	15/0061	<ul style="list-style-type: none"> <li>{Means for transmitting movement from the prime mover to driven parts of the pump, e.g. clutches, couplings, transmissions}</li> </ul>
14/06	<ul style="list-style-type: none"> <li>specially adapted for stopping, starting, idling or no-load operation</li> </ul>		
14/065	<ul style="list-style-type: none"> <li>{Capacity control using a multiplicity of units or pumping capacities, e.g. multiple chambers, individually switchable or controllable}</li> </ul>		
14/08	<ul style="list-style-type: none"> <li>characterised by varying the rotational speed</li> </ul>		

- 15/0065 . . . {for eccentric movement}
- 15/0069 . . . {Magnetic couplings}
- 15/0073 . . . {Couplings between rotors and input or output shafts acting by interengaging or mating parts, i.e. positive coupling of rotor and shaft}
- 15/0076 . . {Fixing rotors on shafts, e.g. by clamping together hub and shaft}
- 15/008 . . {Prime movers}
- 15/0084 . . {Brakes, braking assemblies}
- 15/0088 . {Lubrication (of machines or engines in general [F01M](#))}
- 15/0092 . . {Control systems for the circulation of the lubricant}
- 15/0096 . {Heating; Cooling (of machines or engines in general [F01P](#))}
- 15/06 . Arrangements for admission or discharge of the working fluid, e.g. constructional features of the inlet or outlet
- 15/062 . . {Arrangements for supercharging the working space (similar arrangements for internal combustion engines [F02B 33/00](#), [F02B 37/00](#))}
- 15/064 . . {with inlet and outlet valves specially adapted for rotary or oscillating piston machines or pumps}
- 15/066 . . . {of the non-return type}
- 15/068 . . . . {of the elastic type, e.g. reed valves}
- 18/00 Rotary-piston pumps specially adapted for elastic fluids (with fluid ring or the like [F04C 19/00](#); rotary-piston pumps in which the working-fluid is exclusively displaced by one or more reciprocating pistons [F04B](#))**
- NOTE**
- Group [F04C 18/30](#) takes precedence over groups [F04C 18/02](#) - [F04C 18/28](#) and [F04C 18/48](#) - [F04C 18/56](#).
- 18/02 . of arcuate-engagement type, i.e. with circular translatable movement of co-operating members, each member having the same number of teeth or tooth-equivalents
- 18/0207 . . {both members having co-operating elements in spiral form}
- 18/0215 . . . {where only one member is moving}
- 18/0223 . . . . {with symmetrical double wraps}
- 18/023 . . . {where both members are moving}
- 18/0238 . . . . {with symmetrical double wraps}
- 18/0246 . . . {Details concerning the involute wraps or their base, e.g. geometry}
- 18/0253 . . . . {Details concerning the base}
- 18/0261 . . . . . {Details of the ports, e.g. location, number, geometry}
- 18/0269 . . . . . {Details concerning the involute wraps}
- 18/0276 . . . . . {Different wall heights}
- 18/0284 . . . . . {Details of the wrap tips}
- 18/0292 . . . . . {Ports or channels located in the wrap}
- 18/04 . . of internal-axis type
- 18/045 . . . {having a C-shaped piston}
- 18/06 . . of other than internal-axis type
- 18/063 . . with coaxially-mounted members having continuously-changing circumferential spacing between them
- 18/067 . . . having cam-and-follower type drive
- 18/07 . . . having crankshaft-and-connecting-rod type drive
- 18/073 . . . having pawl-and-ratchet type drive
- 18/077 . . . having toothed-gearing type drive
- 18/08 . of intermeshing-engagement type, i.e. with engagement of co-operating members similar to that of toothed gearing
- 18/082 . . {Details specially related to intermeshing engagement type pumps}
- 18/084 . . . {Toothed wheels}
- 18/086 . . . {Carter}
- 18/088 . . . {Elements in the toothed wheels or the carter for relieving the pressure of fluid imprisoned in the zones of engagement}
- 18/10 . . of internal-axis type with the outer member having more teeth or tooth equivalents, e.g. rollers, than the inner member
- 18/103 . . . {with a crescent shaped filler element, located between the inner and outer intermeshing elements}
- 18/107 . . . with helical teeth
- 18/1075 . . . . {the inner and outer member having a different number of threads and one of the two being made of elastic material, e.g. Moineau type}
- 18/113 . . . the inner member carrying rollers intermeshing with the outer member
- 18/12 . . of other than internal-axis type
- 18/123 . . . {with radially or approximately radially from the rotor body extending tooth-like elements, co-operating with recesses in the other rotor, e.g. one tooth}
- 18/126 . . . {with radially from the rotor body extending elements, not necessarily co-operating with corresponding recesses in the other rotor, e.g. lobes, Roots type}
- 18/14 . . . with toothed rotary pistons
- 18/16 . . . . with helical teeth, e.g. chevron-shaped, screw type ({for non-parallel axes of movement [F04C 18/48](#))}
- 18/165 . . . . . {having more than two rotary pistons with parallel axes}
- 18/18 . . . . with similar tooth forms ([F04C 18/16](#) takes precedence)
- 18/20 . . . . with dissimilar tooth forms ([F04C 18/16](#) takes precedence)
- 18/22 . of internal-axis type with equidirectional movement of co-operating members at the points of engagement, or with one of the co-operating members being stationary, the inner member having more teeth or tooth equivalents than the outer member
- 18/24 . of counter-engagement type, i.e. the movement of co-operating members at the points of engagement being in opposite directions
- 18/26 . . of internal-axis type
- 18/28 . . of other than internal-axis type
- 18/30 . having the characteristics covered by two or more of groups [F04C 18/02](#), [F04C 18/08](#), [F04C 18/22](#), [F04C 18/24](#), [F04C 18/48](#), or having the characteristics covered by one of these groups together with some other type of movement between co-operating members
- 18/32 . . having both the movement defined in group [F04C 18/02](#) and relative reciprocation between the co-operating members



- 18/321 . . . {with vanes hinged to the inner member and reciprocating with respect to the inner member}
- 18/322 . . . {with vanes hinged to the outer member and reciprocating with respect to the outer member}
- 18/324 . . . with vanes hinged to the inner member and reciprocating with respect to the outer member
- 18/328 . . . . and hinged to the outer member
- 18/332 . . . with vanes hinged to the outer member and reciprocating with respect to the inner member
- 18/336 . . . . and hinged to the inner member
- 18/34 . . having the movement defined in group [F04C 18/08](#) or [F04C 18/22](#) and relative reciprocation between the co-operating members
- 18/344 . . . with vanes reciprocating with respect to the inner member
- 18/3441 . . . . {the inner and outer member being in contact along one line or continuous surface substantially parallel to the axis of rotation}
- 18/3442 . . . . . {the surfaces of the inner and outer member, forming the inlet and outlet opening}
- 18/3443 . . . . . {with a separation element located between the inlet and outlet opening}
- 18/3445 . . . . . {the vanes having the form of rollers, slippers or the like}
- 18/3446 . . . . {the inner and outer member being in contact along more than one line or surface}
- 18/3447 . . . . . {the vanes having the form of rollers, slippers or the like}
- 18/3448 . . . . {with axially movable vanes}
- 18/348 . . . . the vanes positively engaging, with circumferential play, an outer rotatable member
- 18/352 . . . . the vanes being pivoted on the axis of the outer member
- 18/356 . . . with vanes reciprocating with respect to the outer member
- 18/3562 . . . . {the inner and outer member being in contact along one line or continuous surfaces substantially parallel to the axis of rotation}
- 18/3564 . . . . . {the surfaces of the inner and outer member, forming the working space, being surfaces of revolution}
- 18/3566 . . . . {the inner and outer member being in contact along more than line or surface}
- 18/3568 . . . . {with axially movable vanes}
- 18/36 . . having both the movements defined in groups [F04C 18/22](#) and [F04C 18/24](#)
- 18/38 . . having the movement defined in group [F04C 18/02](#) and having a hinged member ([F04C 18/32](#) takes precedence)
- 18/39 . . with vanes hinged to the inner as well as to the outer member
- 18/40 . . having the movement defined in group [F04C 18/08](#) or [F04C 18/22](#) and having a hinged member
- 18/44 . . . with vanes hinged to the inner member
- 18/46 . . . with vanes hinged to the outer member
- 18/48 . Rotary-piston pumps with non-parallel axes of movement of co-operating members
- 18/50 . . the axes being arranged at an angle of 90 degrees
- 18/52 . . . of intermeshing engagement type, i.e. with engagement of co-operating members similar to that of toothed gearing
- 18/54 . . the axes being arranged otherwise than at an angle of 90 degrees
- 18/56 . . . of intermeshing engagement type, i.e. with engagement of co-operating members similar to that of toothed gearing
- 18/565 . . . . {the axes of cooperating members being on the same plane}
- 19/00 Rotary-piston pumps with fluid ring or the like, specially adapted for elastic fluids**
- 19/001 . {General arrangements, plants, flowsheets}
- 19/002 . {with rotating outer members}
- 19/004 . {Details concerning the operating liquid, e.g. nature, separation, cooling, cleaning, control of the supply}
- 19/005 . {Details concerning the admission or discharge}
- 19/007 . . {Port members in the form of side plates}
- 19/008 . . {Port members in the form of conical or cylindrical pieces situated in the centre of the impeller}
- 21/00 Oscillating-piston pumps specially adapted for elastic fluids**
- 21/002 . {the piston oscillating around a fixed axis}
- 21/005 . {the piston oscillating in the space, e.g. around a fixed point (rotary-piston pumps with non-parallel axes of rotation between co-operating members [F04C 18/48](#))}
- 21/007 . {the points of the moving element describing approximately an alternating movement in axial direction with respect to the other element}
- 23/00 Combinations of two or more pumps, each being of rotary-piston or oscillating-piston type, specially adapted for elastic fluids; Pumping installations specially adapted for elastic fluids; Multi-stage pumps specially adapted for elastic fluids ([F04C 25/00](#) takes precedence)**
- NOTE**
- Multi-stage pumps or compressors with stages connected in series or in parallel are not considered as having complementary function
- 23/001 . {of similar working principle}
- 23/003 . . {having complementary function}
- 23/005 . {of dissimilar working principle}
- 23/006 . . {having complementary function}
- 23/008 . {Hermetic pumps}
- NOTE**
- Multi-stage steam engines, motors, pumps or compressors with stages connected in series or in parallel are not considered as having complementary function
- 23/02 . Pumps characterised by combination with or adaptation to specific driving engines or motors ([predominant aspects of the engines or motors, see the relevant classes](#))
- 25/00 Adaptations of pumps for special use of pumps for elastic fluids**
- 25/02 . for producing high vacuum ([sealing arrangements \[F04C 27/00\]\(#\); silencing \[F04C 29/06\]\(#\)](#))
- 27/00 Sealing arrangements in rotary-piston pumps specially adapted for elastic fluids**
- 27/001 . {Radial sealings for working fluid}

- 27/002 . . {of rigid material}
- 27/003 . . {of resilient material}
- 27/004 . . {Radial sealing elements specially adapted for intermeshing-engagement type pumps, e.g. gear pumps}
- 27/005 . {Axial sealings for working fluid}
- 27/006 . . {Elements specially adapted for sealing of the lateral faces of intermeshing-engagement type pumps, e.g. gear pumps}
- 27/007 . {Sealings for working fluid between radially and axially moving parts}
- 27/008 . {for other than working fluid, i.e. the sealing arrangements are not between working chambers of the machine}
- 27/009 . . {Shaft sealings specially adapted for pumps}
- 27/02 . Liquid sealing for high-vacuum pumps {or for compressors}
- 28/00 Control of, monitoring of, or safety arrangements for, pumps or pumping installations specially adapted for elastic fluids**
- 28/02 . specially adapted for several pumps connected in series or in parallel
- 28/04 . specially adapted for reversible pumps
- 28/06 . specially adapted for stopping, starting, idling or no-load operation
- 28/065 . . {Capacity control using a multiplicity of units or pumping capacities, e.g. multiple chambers, individually switchable or controllable}
- 28/08 . characterised by varying the rotational speed
- 28/10 . characterised by changing the positions of the inlet or outlet openings with respect to the working chamber
- 28/12 . . using sliding valves
- 28/125 . . . {with sliding valves controlled by the use of fluid other than the working fluid}
- 28/14 . . using rotating valves
- 28/16 . . using lift valves
- 28/18 . characterised by varying the volume of the working chamber (by changing the positions of inlet or outlet openings F04C 28/10)
- 28/185 . . {by varying the useful pumping length of the cooperating members in the axial direction}
- 28/20 . . by changing the form of the inner or outer contour of the working chamber
- 28/22 . . by changing the eccentricity between cooperating members
- 28/24 . characterised by using valves controlling pressure or flow rate, e.g. discharge valves {or unloading valves} (F04C 28/10 takes precedence)
- 28/26 . . using bypass channels
- 28/265 . . . {being obtained by displacing a lateral sealing face}
- 28/28 . Safety arrangements; Monitoring
- 29/00 Component parts, details or accessories of pumps or pumping installations, not provided for in groups F04C 18/00 - F04C 28/00**
- 29/0007 . {Injection of a fluid in the working chamber for sealing, cooling and lubricating (sealing only F04C 27/00; lubrication only F04C 29/02; cooling F02B 47/02, F02D 21/00, F02M 25/00)}
- 29/0014 . . {with control systems for the injection of the fluid}
- 29/0021 . {Systems for the equilibration of forces acting on the pump (interstice adjustment other than by fluid pressure F01C 21/102)}
- 29/0028 . . {Internal leakage control}
- 29/0035 . . {Equalization of pressure pulses (silencing F04C 29/06)}
- 29/0042 . {Driving elements, brakes, couplings, transmissions specially adapted for pumps (brakes, couplings, transmissions per se F16, B60)}
- 29/005 . . {Means for transmitting movement from the prime mover to driven parts of the pump, e.g. clutches, couplings, transmissions}
- 29/0057 . . . {for eccentric movement}
- 29/0064 . . . {Magnetic couplings}
- 29/0071 . . . {Couplings between rotors and input or output shafts acting by interengaging or mating parts, i.e. positive coupling of rotor and shaft}
- 29/0078 . . {Fixing rotors on shafts, e.g. by clamping together hub and shaft}
- 29/0085 . . {Prime movers}
- 29/0092 . {Removing solid or liquid contaminants from the gas under pumping, e.g. by filtering or deposition; Purging; Scrubbing; Cleaning}
- 29/02 . Lubrication (of machines or engines in general F01M); Lubricant separation (separation in general B01D)
- 29/021 . . {Control systems for the circulation of the lubricant}
- 29/023 . . {Lubricant distribution through a hollow driving shaft (F04C 29/025 takes precedence)}
- 29/025 . . {using a lubricant pump}
- 29/026 . . {Lubricant separation}
- 29/028 . . {Means for improving or restricting lubricant flow}
- 29/04 . Heating; Cooling (of machines or engines in general F01P); Heat insulation (heat insulation in general F16L 59/00)
- 29/042 . . {by injecting a fluid (injection of fluid for sealing, cooling or lubrication F04C 29/0007)}
- 29/045 . . {of the electric motor in hermetic pumps}
- 29/047 . . {Cooling of electronic devices installed inside the pump housing, e.g. inverters}
- 29/06 . Silencing (gas-flow silencers or exhaust apparatus for machines or engines in general F01N)
- 29/061 . . {Silencers using overlapping frequencies, e.g. Helmholtz resonators}
- 29/063 . . {Sound absorbing materials}
- 29/065 . . {Noise dampening volumes, e.g. muffler chambers}
- 29/066 . . . {with means to enclose the source of noise}
- 29/068 . . {the silencing means being arranged inside the pump housing}
- 29/12 . Arrangements for admission or discharge of the working fluid, e.g. constructional features of the inlet or outlet
- 29/122 . . {Arrangements for supercharging the working space (similar arrangements for internal combustion engines F02B 33/00, F02B 37/00)}
- 29/124 . . {with inlet and outlet valves specially adapted for rotary or oscillating piston pumps}
- 29/126 . . . {of the non-return type}
- 29/128 . . . . {of the elastic type, e.g. reed valves}

**2210/00 Fluid**

2210/10	. working	2220/20	. Pumps with means for separating and evacuating the gaseous phase
2210/1005	. . Air	2220/22	. for very low temperatures, i.e. cryogenic
2210/1011	. . Amine	2220/24	. for metering throughflow
2210/1016	. . Blood	2220/26	. for step-by-step output movement
2210/1022	. . C <sub>3</sub> H <sub>m</sub> F <sub>n</sub>	2220/28	. for pulsed fluid flow
2210/1027	. . CO <sub>2</sub>	2220/30	. Use in a chemical vapor deposition [CVD] process or in a similar process
2210/1033	. . Concrete	2220/40	. Pumps with means for venting areas other than the working chamber, e.g. bearings, gear chambers, shaft seals
2210/1038	. . Cooking oil	2220/50	. Pumps with means for introducing gas under pressure for ballasting
2210/1044	. . Fuel		
2210/105	. . Helium (He)	<b>2230/00</b>	<b>Manufacture</b>
2210/1055	. . Hydrogen (H <sub>2</sub> )		<b>NOTE</b>
2210/1061	. . LPG		Manufacture comprises also treatment, assembly or disassembly methods, repairing, handling or the like.
2210/1066	. . Nitrogen (N <sub>2</sub> )		
2210/1072	. . Oxygen (O <sub>2</sub> )	2230/10	. by removing material
2210/1077	. . Steam	2230/101	. . by electrochemical methods
2210/1083	. . Urea	2230/102	. . by spark erosion methods
2210/1088	. . Vegetable oil	2230/103	. . using lasers
2210/1094	. . Water	2230/20	. essentially without removing material
2210/12	. auxiliary	2230/21	. . by casting
2210/122	. . Nitrogen (N <sub>2</sub> )	2230/22	. . by sintering
2210/124	. . Sodium (Na)	2230/23	. . by permanently joining parts together
2210/126	. . Tin	2230/231	. . . by welding
2210/128	. . Water	2230/24	. . by extrusion
2210/14	. Lubricant	2230/25	. . by forging
2210/142	. . Ester	2230/26	. . by rolling
2210/145	. . PAG	2230/27	. . by hydroforming
2210/147	. . Water	2230/40	. Heat treatment
2210/20	. liquid, i.e. incompressible	2230/41	. . Hardening; Annealing
2210/201	. . DME	2230/60	. Assembly methods
2210/203	. . Fuel	2230/601	. . Adjustment
2210/205	. . Ink	2230/602	. . Gap; Clearance
2210/206	. . Oil	2230/603	. . Centering; Aligning
2210/208	. . Water	2230/604	. . Mounting devices for pumps or compressors
2210/22	. gaseous, i.e. compressible	2230/605	. . Balancing
2210/221	. . Air	2230/70	. Disassembly methods
2210/222	. . Carbon dioxide (CO <sub>2</sub> )	2230/80	. Repairing methods
2210/224	. . Hydrogen (H <sub>2</sub> )	2230/85	. Methods for improvement by repair or exchange of parts
2210/225	. . Nitrogen (N <sub>2</sub> )	2230/90	. Improving properties of machine parts
2210/227	. . Steam	2230/91	. . Coating
2210/228	. . Vapour	2230/92	. . Surface treatment
2210/24	. mixed, e.g. two-phase fluid		
2210/242	. . Steam	<b>2240/00</b>	<b>Components</b>
2210/245	. . Vapour	2240/10	. Stators
2210/247	. . Water	2240/102	. . with means for discharging condensate or liquid separated from the gas pumped
2210/26	. Refrigerants with particular properties, e.g. HFC-134a	2240/20	. Rotors
2210/261	. . Carbon dioxide (CO <sub>2</sub> )	2240/30	. Casings or housings
2210/263	. . HFO1234YF	2240/40	. Electric motor
2210/265	. . Ammoniac (NH <sub>3</sub> )	2240/401	. . Linear motor
2210/266	. . Propane	2240/402	. . Plurality of electronically synchronised motors
2210/268	. . R32	2240/403	. . with inverter for speed control
2210/40	. Properties	2240/45	. Hybrid prime mover
2210/42	. . magnetic or ferromagnetic; Ferrofluids	2240/50	. Bearings
2210/44	. . Viscosity	2240/51	. . for cantilever assemblies
2210/60	. Condition	2240/52	. . for assemblies with supports on both sides
2210/62	. . Purity		
<b>2220/00</b>	<b>Application</b>		
2220/10	. Vacuum		
2220/12	. . Dry running		

2240/54	. . Hydrostatic or hydrodynamic bearing assemblies specially adapted for rotary positive displacement pumps or compressors	2270/085	. . Controlled or regulated
2240/56	. . Bearing bushings or details thereof	2270/09	. Electric current frequency
2240/60	. Shafts	2270/095	. . Controlled or regulated
2240/601	. . Shaft flexion	2270/10	. Voltage
2240/603	. . with internal channels for fluid distribution, e.g. hollow shaft	2270/105	. . Controlled or regulated
2240/605	. . Shaft sleeves or details thereof	2270/11	. Magnetic flux
2240/70	. Use of multiplicity of similar components; Modular construction	2270/115	. . Controlled or regulated
2240/80	. Other components	2270/12	. Vibration
2240/801	. . Wear plates	2270/125	. . Controlled or regulated
2240/802	. . Liners	2270/13	. Noise
2240/803	. . Electric connectors or cables; Fittings therefor	2270/135	. . Controlled or regulated
2240/804	. . Accumulators for refrigerant circuits	2270/14	. Pulsations
2240/805	. . Fastening means, e.g. bolts	2270/145	. . Controlled or regulated
2240/806	. . Pipes for fluids; Fittings therefor	2270/15	. Resonance
2240/807	. . Balance weight, counterweight	2270/155	. . Controlled or regulated
2240/808	. . Electronic circuits (e.g. inverters) installed inside the machine	2270/16	. Wear
2240/809	. . Lubricant sump	2270/165	. . Controlled or regulated
2240/81	. . Sensor, e.g. electronic sensor for control or monitoring	2270/17	. Tolerance; Play; Gap
2240/811	. . Actuator for control, e.g. pneumatic, hydraulic, electric	2270/175	. . Controlled or regulated
<b>2250/00</b>	<b>Geometry</b>	2270/18	. Pressure
2250/10	. of the inlet or outlet	2270/185	. . Controlled or regulated
2250/101	. . of the inlet	2270/19	. Temperature
2250/102	. . of the outlet	2270/195	. . Controlled or regulated
2250/20	. of the rotor	2270/20	. Flow
2250/201	. . conical shape	2270/205	. . Controlled or regulated
2250/30	. of the stator	2270/21	. Pressure difference
2250/301	. . compression chamber profile defined by a mathematical expression or by parameters	2270/215	. . Controlled or regulated
<b>2270/00</b>	<b>Control; Monitoring or safety arrangements</b>	2270/22	. Temperature difference
2270/01	. Load	2270/225	. . Controlled or regulated
2270/015	. . Controlled or regulated	2270/23	. Working cycle timing control
2270/02	. Power	2270/24	. Level of liquid, e.g. lubricant or cooling liquid
2270/025	. . Controlled or regulated	2270/40	. Conditions across a pump or machine
2270/03	. Torque	2270/42	. Conditions at the inlet of a pump or machine
2270/035	. . Controlled or regulated	2270/44	. Conditions at the outlet of a pump or machine
2270/04	. Force	2270/46	. Conditions in the working chamber
2270/041	. . Controlled or regulated	2270/48	. Conditions of a reservoir linked to a pump or machine
2270/042	. . radial	2270/50	. Conditions before a throttle
2270/0421	. . . Controlled or regulated	2270/52	. Conditions after a throttle
2270/0422	. . . centrifugal	2270/54	. Conditions in a control cylinder/piston unit
2270/04225	. . . . Controlled or regulated	2270/56	. Number of pump/machine units in operation
2270/044	. . axial	2270/58	. Valve parameters
2270/0445	. . . Controlled or regulated	2270/585	. . Controlled or regulated
2270/05	. Speed	2270/60	. Prime mover parameters
2270/051	. . Controlled or regulated	2270/605	. . Controlled or regulated
2270/052	. . angular	2270/70	. Safety, emergency conditions or requirements
2270/0525	. . . Controlled or regulated	2270/701	. . Cold start
2270/054	. . linear	2270/72	. . preventing reverse rotation
2270/0545	. . . Controlled or regulated	2270/78	. Warnings
2270/06	. Acceleration	2270/782	. . Sound
2270/065	. . Controlled or regulated	2270/784	. . Light
2270/07	. Electric current	2270/80	. Diagnostics
2270/075	. . Controlled or regulated	2270/86	. Detection
2270/08	. Amplitude of electric current	2270/90	. Remote control, e.g. wireless, via LAN, by radio, or by a wired connection from a central computer
		<b>2280/00</b>	<b>Arrangements for preventing or removing deposits or corrosion</b>
		2280/02	. Preventing solid deposits in pumps, e.g. in vacuum pumps with chemical vapour deposition [CVD] processes
		2280/04	. Preventing corrosion