

# 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 (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.

2/00	<b>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> )	2/082	. . . {Details specially related to intermeshing engagement type machines or pumps}
		2/084	. . . {Toothed wheels}
		2/086	. . . {Carter}
		2/088	. . . {Elements in the toothed wheels or the carter for relieving the pressure of fluid imprisoned in the zones of engagement}
		2/10	. . of internal-axis type with the outer member having more teeth or tooth-equivalents, e.g. rollers, than the inner member
		2/101	. . . {with a crescent-shaped filler element, located between the inner and outer intermeshing members}
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	2/102	. . . {the two members rotating simultaneously around their respective axes}
2/025	. . {the moving and the stationary member having co-operating elements in spiral form}	2/103	. . . {one member having simultaneously a rotational movement about its own axis and an orbital movement}
2/04	. . of internal axis type	2/104	. . . . {having an articulated driving shaft}
2/045	. . . {having a C-shaped piston}	2/105	. . . . {Details concerning timing or distribution valves}
2/06	. . of other than internal-axis type ( <a href="#">F04C 2/063</a> takes precedence)	2/106	. . . . . {Spool type distribution valves}
2/063	. . with coaxially-mounted members having continuously-changing circumferential spacing between them	2/107	. . . with helical teeth
2/067	. . . having cam-and-follower type drive	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}
2/07	. . . having crankshaft-and-connecting-rod type drive	2/1073	. . . . . {where one member is stationary while the other member rotates and orbits}
2/073	. . . having pawl-and-ratchet type drive	2/1075	. . . . . {Construction of the stationary member}
2/077	. . . having toothed-gearing type drive	2/1076	. . . . . {where one member orbits or wobbles relative to the other member which rotates around a fixed axis}
2/08	. of intermeshing-engagement type, i.e. with engagement of co-operating members similar to that of toothed gearing	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 Rotary-piston machines or pumps with the working-chamber walls at least partly resiliently deformable (such pumps specially adapted for elastic fluids [F04C 18/00](#))**
- 7/00 Rotary-piston machines or pumps with fluid ring or the like (such pumps specially adapted for elastic fluids [F04C 19/00](#))**
- 9/00 Oscillating-piston machines or pumps (such pumps specially adapted for elastic fluids [F04C 21/00](#))**
- 9/002 . {the piston oscillating around a fixed axis}

- 9/005 . {the piston oscillating in the space, e.g. around a fixed point (rotary-piston machines or pumps with non-parallel axes of movement between cooperating members [F04C 3/00](#))}
- 9/007 . {the points of the moving element describing approximately an alternating movement in axial direction with respect to the other element}
- 11/00 Combinations of two or more machines or pumps, each being of rotary-piston or oscillating-piston type** (combinations of such pumps specially adapted for elastic fluids [F04C 23/00](#)); **Pumping installations** ([F04C 13/00](#) takes precedence; specially adapted for elastic fluids [F04C 23/00](#); fluid gearing [F16H](#))
- NOTE**
- Multi-stage engines, motors, pumps or compressors with stages connected in series or in parallel are not considered as having complementary function
- 11/001 . {of similar working principle}
- 11/003 . . {having complementary function}
- 11/005 . {of dissimilar working principle}
- 11/006 . . {having complementary function}
- 11/008 . {Enclosed motor pump units}
- 13/00 Adaptations of machines or pumps for special use, e.g. for extremely high pressures** (of pumps specially adapted for elastic fluids [F04C 25/00](#))
- 13/001 . {Pumps for particular liquids}
- 13/002 . . {for homogeneous viscous liquids}
- 13/004 . . . {with means for fluidising or diluting the material being pumped}
- 13/005 . {Removing contaminants, deposits or scale from the pump; Cleaning}
- 13/007 . {Venting; Gas and vapour separation during pumping (preventing vapour lock in fuel pumps [F02M 37/20](#), in centrifugal pumps [F04D 9/00](#))}
- 13/008 . {Pumps for submersible use, i.e. down-hole pumping}
- 14/00 Control of, monitoring of, or safety arrangements for, machines, pumps or pumping installations** (of pumps or pumping installations specially adapted for elastic fluids [F04C 28/00](#))
- 14/02 . specially adapted for several machines or pumps connected in series or in parallel
- 14/04 . specially adapted for reversible machines or pumps
- 14/06 . specially adapted for stopping, starting, idling or no-load operation
- 14/065 . . {Capacity control using a multiplicity of units or pumping capacities, e.g. multiple chambers, individually switchable or controllable}
- 14/08 . characterised by varying the rotational speed
- 14/10 . characterised by changing the positions of the inlet or outlet openings with respect to the working chamber
- 14/12 . . using sliding valves
- 14/14 . . using rotating valves
- 14/16 . . using lift valves
- 14/18 . characterised by varying the volume of the working chamber (by changing the positions of inlet or outlet openings [F04C 14/10](#))
- 14/185 . . {by varying the useful pumping length of the cooperating members in the axial direction}
- 14/20 . . by changing the form of the inner or outer contour of the working chamber
- 14/22 . . by changing the eccentricity between cooperating members
- 14/223 . . . {using a movable cam}
- 14/226 . . . . {by pivoting the cam around an eccentric axis}
- 14/24 . characterised by using valves controlling pressure or flow rate, e.g. discharge valves {or unloading valves} ([F04C 14/10](#) takes precedence)
- 14/26 . . using bypass channels
- 14/265 . . . {being obtained by displacing a lateral sealing face}
- 14/28 . Safety arrangements; Monitoring
- 15/00 Component parts, details or accessories of machines, pumps or pumping installations, not provided for in groups [F04C 2/00](#) - [F04C 14/00](#)** (of pumps specially adapted for elastic fluids [F04C 18/00](#) - [F04C 29/00](#))
- 15/0003 . {Sealing arrangements in rotary-piston machines or pumps (sealing in general [F16J](#))}
- 15/0007 . . {Radial sealings for working fluid}
- 15/0011 . . . {of rigid material}
- 15/0015 . . . {of resilient material}
- 15/0019 . . . {Radial sealing elements specially adapted for intermeshing-engagement type machines or pumps, e.g. gear machines or pumps}
- 15/0023 . . {Axial sealings for working fluid}
- 15/0026 . . . {Elements specially adapted for sealing of the lateral faces of intermeshing-engagement type machines or pumps, e.g. gear machines or pumps}
- 15/003 . . {Sealings for working fluid between radially and axially moving parts}
- 15/0034 . . {for other than the working fluid, i.e. the sealing arrangements are not between working chambers of the machine}
- 15/0038 . . . {Shaft sealings specially adapted for rotary-piston machines or pumps}
- 15/0042 . {Systems for the equilibration of forces acting on the machines or pump (interstice adjustment other than by fluid pressure [F01C 21/102](#))}
- 15/0046 . . {Internal leakage control}
- 15/0049 . . {Equalization of pressure pulses (silencing for compressors [F04C 29/06](#))}
- 15/0053 . {Venting means for starting}
- 15/0057 . {Driving elements, brakes, couplings, transmission specially adapted for machines or pumps (brakes, couplings, transmissions *per se* [F16](#), [B60](#))}
- 15/0061 . . {Means for transmitting movement from the prime mover to driven parts of the pump, e.g. clutches, couplings, transmissions}
- 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 translatory 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 <a href="#">F04C 18/08</a> or <a href="#">F04C 18/22</a> and relative reciprocation between the co-operating members	19/002	. {with rotating outer members}
18/344	. . . with vanes reciprocating with respect to the inner member	19/004	. {Details concerning the operating liquid, e.g. nature, separation, cooling, cleaning, control of the supply}
18/3441	. . . . {the inner and outer member being in contact along one line or continuous surface substantially parallel to the axis of rotation}	19/005	. {Details concerning the admission or discharge}
18/3442	. . . . . {the surfaces of the inner and outer member, forming the inlet and outlet opening}	19/007	. . {Port members in the form of side plates}
18/3443	. . . . . {with a separation element located between the inlet and outlet opening}	19/008	. . {Port members in the form of conical or cylindrical pieces situated in the centre of the impeller}
18/3445	. . . . . {the vanes having the form of rollers, slippers or the like}	<b>21/00</b>	<b>Oscillating-piston pumps specially adapted for elastic fluids</b>
18/3446	. . . . . {the inner and outer member being in contact along more than one line or surface}	21/002	. {the piston oscillating around a fixed axis}
18/3447	. . . . . {the vanes having the form of rollers, slippers or the like}	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 <a href="#">F04C 18/48</a> )}
18/3448	. . . . . {with axially movable vanes}	21/007	. {the points of the moving element describing approximately an alternating movement in axial direction with respect to the other element}
18/348	. . . . the vanes positively engaging, with circumferential play, an outer rotatable member	<b>23/00</b>	<b>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 (<a href="#">F04C 25/00</a> takes precedence)</b>
18/352	. . . . the vanes being pivoted on the axis of the outer member		<b>NOTE</b>
18/356	. . . with vanes reciprocating with respect to the outer member		Multi-stage pumps or compressors with stages connected in series or in parallel are not considered as having complementary function
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}	23/001	. {of similar working principle}
18/3566	. . . . . {the inner and outer member being in contact along more than one line or surface}	23/003	. . {having complementary function}
18/3568	. . . . . {with axially movable vanes}	23/005	. {of dissimilar working principle}
18/36	. . having both the movements defined in groups <a href="#">F04C 18/22</a> and <a href="#">F04C 18/24</a>	23/006	. . {having complementary function}
18/38	. . having the movement defined in group <a href="#">F04C 18/02</a> and having a hinged member ( <a href="#">F04C 18/32</a> takes precedence)	23/008	. {Hermetic pumps}
18/39	. . . with vanes hinged to the inner as well as to the outer member		<b>NOTE</b>
18/40	. . having the movement defined in group <a href="#">F04C 18/08</a> or <a href="#">F04C 18/22</a> and having a hinged member		Multi-stage steam engines, motors, pumps or compressors with stages connected in series or in parallel are not considered as having complementary function
18/44	. . . with vanes hinged to the inner member	23/02	. Pumps characterised by combination with, or adaptation to, specific driving engines or motors
18/46	. . . with vanes hinged to the outer member	<b>25/00</b>	<b>Adaptations of pumps for special use of pumps for elastic fluids</b>
18/48	. Rotary-piston pumps with non-parallel axes of movement of co-operating members	25/02	. for producing high vacuum (sealing arrangements <a href="#">F04C 27/00</a> ; silencing <a href="#">F04C 29/06</a> )
18/50	. . the axes being arranged at an angle of 90 degrees	<b>27/00</b>	<b>Sealing arrangements in rotary-piston pumps specially adapted for elastic fluids</b>
18/52	. . . of intermeshing engagement type, i.e. with engagement of co-operating members similar to that of toothed gearing	27/001	. {Radial sealings for working fluid}
18/54	. . the axes being arranged otherwise than at an angle of 90 degrees	27/002	. . {of rigid material}
18/56	. . . of intermeshing engagement type, i.e. with engagement of co-operating members similar to that of toothed gearing	27/003	. . {of resilient material}
18/565	. . . . . {the axes of cooperating members being on the same plane}	27/004	. . {Radial sealing elements specially adapted for intermeshing-engagement type pumps, e.g. gear pumps}
<b>19/00</b>	<b>Rotary-piston pumps with fluid ring or the like, specially adapted for elastic fluids</b>	27/005	. {Axial sealings for working fluid}
19/001	. {General arrangements, plants, flowsheets}	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}	29/0057	. . . {for eccentric movement}
27/009	. . {Shaft sealings specially adapted for pumps}	29/0064	. . . {Magnetic couplings}
27/02	. Liquid sealing for high-vacuum pumps {or for compressors}	29/0071	. . . {Couplings between rotors and input or output shafts acting by interengaging or mating parts, i.e. positive coupling of rotor and shaft}
<b>28/00</b>	<b>Control of, monitoring of, or safety arrangements for, pumps or pumping installations specially adapted for elastic fluids</b>	29/0078	. . {Fixing rotors on shafts, e.g. by clamping together hub and shaft}
28/02	. specially adapted for several pumps connected in series or in parallel	29/0085	. . {Prime movers}
28/04	. specially adapted for reversible pumps	29/0092	. {Removing solid or liquid contaminants from the gas under pumping, e.g. by filtering or deposition; Purging; Scrubbing; Cleaning}
28/06	. specially adapted for stopping, starting, idling or no-load operation	29/02	. Lubrication (of machines or engines in general <a href="#">F01M</a> ); Lubricant separation (separation in general <a href="#">B01D</a> )
28/065	. . {Capacity control using a multiplicity of units or pumping capacities, e.g. multiple chambers, individually switchable or controllable}	29/021	. . {Control systems for the circulation of the lubricant}
28/08	. characterised by varying the rotational speed	29/023	. . {Lubricant distribution through a hollow driving shaft ( <a href="#">F04C 29/025</a> takes precedence)}
28/10	. characterised by changing the positions of the inlet or outlet openings with respect to the working chamber	29/025	. . {using a lubricant pump}
28/12	. . using sliding valves	29/026	. . {Lubricant separation}
28/125	. . . {with sliding valves controlled by the use of fluid other than the working fluid}	29/028	. . {Means for improving or restricting lubricant flow}
28/14	. . using rotating valves	29/04	. Heating; Cooling (of machines or engines in general <a href="#">F01P</a> ); Heat insulation (heat insulation in general <a href="#">F16L 59/00</a> )
28/16	. . using lift valves	29/042	. . {by injecting a fluid (injection of fluid for sealing, cooling or lubrication <a href="#">F04C 29/0007</a> )}
28/18	. characterised by varying the volume of the working chamber (by changing the positions of inlet or outlet openings <a href="#">F04C 28/10</a> )	29/045	. . {of the electric motor in hermetic pumps}
28/185	. . {by varying the useful pumping length of the cooperating members in the axial direction}	29/047	. . {Cooling of electronic devices installed inside the pump housing, e.g. inverters}
28/20	. . by changing the form of the inner or outer contour of the working chamber	29/06	. Silencing (gas-flow silencers or exhaust apparatus for machines or engines in general <a href="#">F01N</a> )
28/22	. . by changing the eccentricity between cooperating members	29/061	. . {Silencers using overlapping frequencies, e.g. Helmholtz resonators}
28/24	. characterised by using valves controlling pressure or flow rate, e.g. discharge valves {or unloading valves} ( <a href="#">F04C 28/10</a> takes precedence)	29/063	. . {Sound absorbing materials}
28/26	. . using bypass channels	29/065	. . {Noise dampening volumes, e.g. muffler chambers}
28/265	. . . {being obtained by displacing a lateral sealing face}	29/066	. . . {with means to enclose the source of noise}
28/28	. Safety arrangements; Monitoring	29/068	. . {the silencing means being arranged inside the pump housing}
<b>29/00</b>	<b>Component parts, details or accessories of pumps or pumping installations, not provided for in groups <a href="#">F04C 18/00</a> - <a href="#">F04C 28/00</a></b>	29/12	. Arrangements for admission or discharge of the working fluid, e.g. constructional features of the inlet or outlet
29/0007	. {Injection of a fluid in the working chamber for sealing, cooling and lubricating (sealing only <a href="#">F04C 27/00</a> ; lubrication only <a href="#">F04C 29/02</a> ; cooling <a href="#">F02B 47/02</a> , <a href="#">F02D 21/00</a> , <a href="#">F02M 25/00</a> )}	29/122	. . {Arrangements for supercharging the working space (similar arrangements for internal combustion engines <a href="#">F02B 33/00</a> , <a href="#">F02B 37/00</a> )}
29/0014	. . {with control systems for the injection of the fluid}	29/124	. . {with inlet and outlet valves specially adapted for rotary or oscillating piston pumps}
29/0021	. {Systems for the equilibration of forces acting on the pump (interstice adjustment other than by fluid pressure <a href="#">F01C 21/102</a> )}	29/126	. . . {of the non-return type}
29/0028	. . {Internal leakage control}	29/128	. . . . {of the elastic type, e.g. reed valves}
29/0035	. . {Equalization of pressure pulses (silencing <a href="#">F04C 29/06</a> )}	<b>2210/00</b>	<b>Fluid</b>
29/0042	. {Driving elements, brakes, couplings, transmissions specially adapted for pumps (brakes, couplings, transmissions per se <a href="#">F16</a> , <a href="#">B60</a> )}	2210/10	. working
29/005	. . {Means for transmitting movement from the prime mover to driven parts of the pump, e.g. clutches, couplings, transmissions}	2210/1005	. . Air
		2210/1011	. . Amine
		2210/1016	. . Blood
		2210/1022	. . C <sub>3</sub> H <sub>m</sub> F <sub>n</sub>
		2210/1027	. . CO <sub>2</sub>
		2210/1033	. . Concrete
		2210/1038	. . Cooking oil
		2210/1044	. . Fuel
		2210/105	. . Helium (He)
		2210/1055	. . Hydrogen (H <sub>2</sub> )

2210/1061	. . LPG	<b>2230/00</b>	<b>Manufacture</b>
2210/1066	. . Nitrogen (N <sub>2</sub> )		<b>NOTE</b>
2210/1072	. . Oxygen (O <sub>2</sub> )		Manufacture comprises also treatment, assembly or disassembly methods, repairing, handling or the like.
2210/1077	. . Steam	2230/10	. by removing material
2210/1083	. . Urea	2230/101	. . by electrochemical methods
2210/1088	. . Vegetable oil	2230/102	. . by spark erosion methods
2210/1094	. . Water	2230/103	. . using lasers
2210/12	. auxiliary	2230/20	. essentially without removing material
2210/122	. . Nitrogen (N <sub>2</sub> )	2230/21	. . by casting
2210/124	. . Sodium (Na)	2230/22	. . by sintering
2210/126	. . Tin	2230/23	. . by permanently joining parts together
2210/128	. . Water	2230/231	. . . by welding
2210/14	. Lubricant	2230/24	. . by extrusion
2210/142	. . Ester	2230/25	. . by forging
2210/145	. . PAG	2230/26	. . by rolling
2210/147	. . Water	2230/27	. . by hydroforming
2210/20	. liquid, i.e. incompressible	2230/40	. Heat treatment
2210/201	. . DME	2230/41	. . Hardening; Annealing
2210/203	. . Fuel	2230/60	. Assembly methods
2210/205	. . Ink	2230/601	. . Adjustment
2210/206	. . Oil	2230/602	. . Gap; Clearance
2210/208	. . Water	2230/603	. . Centering; Aligning
2210/22	. gaseous, i.e. compressible	2230/604	. . Mounting devices for pumps or compressors
2210/221	. . Air	2230/605	. . Balancing
2210/222	. . Carbon dioxide (CO <sub>2</sub> )	2230/70	. Disassembly methods
2210/224	. . Hydrogen (H <sub>2</sub> )	2230/80	. Repairing methods
2210/225	. . Nitrogen (N <sub>2</sub> )	2230/85	. Methods for improvement by repair or exchange of parts
2210/227	. . Steam	2230/90	. Improving properties of machine parts
2210/228	. . Vapour	2230/91	. . Coating
2210/24	. mixed, e.g. two-phase fluid	2230/92	. . Surface treatment
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	2240/54	. . Hydrostatic or hydrodynamic bearing assemblies specially adapted for rotary positive displacement pumps or compressors
<b>2220/00</b>	<b>Application</b>	2240/56	. . Bearing bushings or details thereof
2220/10	. Vacuum	2240/60	. Shafts
2220/12	. . Dry running	2240/601	. . Shaft flexion
2220/20	. Pumps with means for separating and evacuating the gaseous phase	2240/603	. . with internal channels for fluid distribution, e.g. hollow shaft
2220/22	. for very low temperatures, i.e. cryogenic	2240/605	. . Shaft sleeves or details thereof
2220/24	. for metering throughflow	2240/70	. Use of multiplicity of similar components; Modular construction
2220/26	. for step-by-step output movement	2240/80	. Other components
2220/28	. for pulsed fluid flow	2240/801	. . Wear plates
2220/30	. Use in a chemical vapor deposition [CVD] process or in a similar process		
2220/40	. Pumps with means for venting areas other than the working chamber, e.g. bearings, gear chambers, shaft seals		
2220/50	. Pumps with means for introducing gas under pressure for ballasting		

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