

CPC**COOPERATIVE PATENT CLASSIFICATION****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".

F04C 2/00

Rotary-piston machines or pumps ([with non-parallel axes of co-operating members F04C 3/00](#); [with the working-chamber walls at least partly resiliently deformable F04C 5/00](#); [with fluid ring or the like F04C 7/00](#); [rotary-piston pumps specially adapted for elastic fluids F04C 18/00](#); [rotary-piston machines or pumps in which the working-fluid is exclusively displaced by, or exclusively displaces, one or more reciprocating pistons F04B](#))

NOTE

Group [F04C 2/30](#) takes precedence over groups [F04C 2/02](#) to [F04C 2/28](#)

- [F04C 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
- [F04C 2/025](#)
 - .. { the moving and the stationary member having co-operating elements in spiral form }
- [F04C 2/04](#)
 - .. of internal axis type
- [F04C 2/045](#)
 - ... { having a C-shaped piston }
- [F04C 2/06](#)
 - .. of other than internal-axis type ([F04C 2/063](#) takes precedence)
- [F04C 2/063](#)
 - .. with coaxially-mounted members having continuously-changing circumferential spacing between them
- [F04C 2/067](#)
 - ... having cam-and-follower type drive
- [F04C 2/07](#)
 - ... having crankshaft-and-connecting-rod type drive
- [F04C 2/073](#)
 - ... having pawl-and-ratchet type drive
- [F04C 2/077](#)
 - ... having toothed-gearing type drive
- [F04C 2/08](#)
 - of intermeshing-engagement type, i.e. with engagement of co-operating members similar to that of toothed gearing
- [F04C 2/082](#)
 - .. { Details specially related to intermeshing engagement type machines or pumps }
- [F04C 2/084](#)
 - ... { Toothed wheels }
- [F04C 2/086](#)
 - ... { Carter }

F04C 2/088	...	{ Elements in the toothed wheels or the carter for relieving the pressure of fluid imprisoned in the zones of engagement }
F04C 2/10	..	of internal-axis type with the outer member having more teeth or tooth-equivalents, e.g. rollers, than the inner member
F04C 2/101	...	{ with a crescent-shaped filler element, located between the inner and outer intermeshing members }
F04C 2/102	...	{ the two members rotating simultaneously around their respective axes }
F04C 2/103	...	{ one member having simultaneously a rotational movement about its own axis and an orbital movement }
F04C 2/104	....	{ having an articulated driving shaft }
F04C 2/105	....	{ Details concerning timing or distribution valves }
F04C 2/106	.....	{ Spool type distribution valves }
F04C 2/107	...	with helical teeth
F04C 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 }
F04C 2/1073	.....	{ where one member is stationary while the other member rotates and orbits }
F04C 2/1075	.....	{ Construction of the stationary member }
F04C 2/1076	.....	{ where one member orbits or wobbles relative to the other member which rotates around a fixed axis }
F04C 2/1078	.....	{ where one member rotates and both members are allowed to orbit or wobble }
F04C 2/113	...	the inner member carrying rollers intermeshing with the outer member
F04C 2/12	..	of other than internal-axis type
F04C 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 }
F04C 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 }
F04C 2/14	...	with toothed rotary pistons
F04C 2/16	....	with helical teeth, e.g. chevron-shaped, screw type {(for non-parallel axes of movement F04C 3/00)}
F04C 2/165	.....	{ having more than two rotary pistons with parallel axes }
F04C 2/18	....	with similar tooth forms (F04C 2/16 takes precedence)
F04C 2/20	....	with dissimilar tooth forms (F04C 2/16 takes precedence)
F04C 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
F04C 2/24	.	of counter-engagement type, i.e. the movement of co-operating members at the points of engagement being in opposite directions
F04C 2/26	..	of internal-axis type
F04C 2/28	..	of other than internal-axis type

- F04C 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
- F04C 2/32 . . having both the movement defined in groups [F04C 2/02](#) and relative reciprocation between co-operating members
- F04C 2/321 . . . { with vanes hinged to the inner member and reciprocating with respect to the inner member }
- F04C 2/322 . . . { with vanes hinged to the outer member and reciprocating with respect to the outer member }
- F04C 2/324 . . . with vanes hinged to the inner member and reciprocating with respect to the outer member
- F04C 2/328 and hinged to the outer member
- F04C 2/332 . . . with vanes hinged to the outer member and reciprocating with respect to the inner member
- F04C 2/336 and hinged to the inner member
- F04C 2/34 . . having the movement defined in groups [F04C 2/08](#) or [F04C 2/22](#) and relative reciprocation between the co-operating members
- F04C 2/344 . . . with vanes reciprocating with respect to the inner member
- F04C 2/3441 { the inner and outer member being in contact along one line or continuous surface substantially parallel to the axis of rotation }
- F04C 2/3442 { the surfaces of the inner and outer member, forming the working space, being surfaces of revolution }
- F04C 2/3443 { with a separation element located between the inlet and outlet opening }
- F04C 2/3445 { the vanes having the form of rollers, slippers or the like }
- F04C 2/3446 { the inner and outer member being in contact along more than one line or surface }
- F04C 2/3447 { the vanes having the form of rollers, slippers or the like }
- F04C 2/3448 { with axially movable vanes }
- F04C 2/348 . . . the vanes positively engaging, with circumferential play, an outer rotatable member
- F04C 2/352 the vanes being pivoted on the axis of the outer member
- F04C 2/356 . . . with vanes reciprocating with respect to the outer member
- F04C 2/3562 { the inner and outer member being in contact along one line or continuous surface substantially parallel to the axis of rotation }
- F04C 2/3564 { the surfaces of the inner and outer member, forming the working space, being surfaces of revolution }
- F04C 2/3566 { the inner and outer member being in contact along more than one line or surface }
- F04C 2/3568 { with axially movable vanes }
- F04C 2/36 . . having both the movements defined in groups [F04C 2/22](#) and [F04C 2/24](#)
- F04C 2/38 . . having the movement defined in group [F04C 2/02](#) and having a hinged member ([F04C 2/32](#) takes precedence)
- F04C 2/39 . . . with vanes hinged to the inner as well as to the outer member

- F04C 2/40 . . having the movement defined in group [F04C 2/08](#) or [F04C 2/22](#) and having a hinged member
- F04C 2/44 . . . with vanes hinged to the inner member
- F04C 2/46 . . . with vanes hinged to the outer member

- F04C 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](#))

- F04C 3/02 . the axes being arranged at an angle of 90 degrees
- F04C 3/04 . . of intermeshing engagement type, i.e. with engagement of co-operating members similar to that of toothed gearing

- F04C 3/06 . the axes being arranged otherwise than at an angle of 90 degrees
- F04C 3/08 . . of intermeshing engagement type, i.e. with engagement of co-operating members similar to that of toothed gearing
- F04C 3/085 . . . { the axes of cooperating members being on the same plane }

- F04C 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](#))

- F04C 7/00** **Rotary-piston machines or pumps with fluid ring or the like** (such pumps specially adapted for elastic fluids [F04C 19/00](#))

- F04C 9/00** **Oscillating-piston machines or pumps** (such pumps specially adapted for elastic fluids [F04C 21/00](#))

- F04C 9/002 . { the piston oscillating around a fixed axis }
- F04C 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 co-operating members [F04C 3/00](#))}
- F04C 9/007 . { the points of the moving element describing approximately an alternating movement in axial direction with respect to the other element }

- F04C 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

- F04C 11/001 . { of similar working principle }
- F04C 11/003 . . { having complementary function }
- F04C 11/005 . { of dissimilar working principle }
- F04C 11/006 . . { having complementary function }
- F04C 11/008 . { Enclosed motor pump units }
- F04C 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](#))
- F04C 13/001 . { Pumps for particular liquids }
- F04C 13/002 . . { for homogeneous viscous liquids }
- F04C 13/004 . . . { with means for fluidising or diluting the material being pumped }
- F04C 13/005 . { Removing contaminants, deposits or scale from the pump; Cleaning }
- F04C 13/007 . { Venting; Gas and vapour separation during pumping (preventing vapour lock in fuel pumps [F02M 37/20](#), in centrifugal pumps [F04D 9/00](#)) }
- F04C 13/008 . { Pumps for submersible use, i.e. down-hole pumping }
- F04C 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](#))
- F04C 14/02 . specially adapted for several machines or pumps connected in series or in parallel
- F04C 14/04 . specially adapted for reversible machines or pumps
- F04C 14/06 . specially adapted for stopping, starting, idling or no-load operation
- F04C 14/065 . . { Capacity control using a multiplicity of units or pumping capacities, e.g. multiple chambers, individually switchable or controllable }
- F04C 14/08 . characterised by varying the rotational speed
- F04C 14/10 . characterised by changing the positions of the inlet or outlet openings with respect to the working chamber
- F04C 14/12 . . using sliding valves
- F04C 14/14 . . using rotating valves
- F04C 14/16 . . using lift valves
- F04C 14/18 . characterised by varying the volume of the working chamber (by changing the positions of inlet or outlet openings [F04C 14/10](#))
- F04C 14/185 . . { by varying the useful pumping length of the cooperating members in the axial direction }

- F04C 14/20 . . by changing the form of the inner or outer contour of the working chamber
- F04C 14/22 . . by changing the eccentricity between cooperating members
- F04C 14/223 . . . { using a movable cam }
- F04C 14/226 { by pivoting the cam around an eccentric axis }
- F04C 14/24 . characterised by using valves regulating pressure or flow rate, e.g. discharge valves, { unloading valves } (F04C 14/10 takes precedence)
- F04C 14/26 . . using bypass channels
- F04C 14/265 . . . { being obtained by displacing a lateral sealing face }
- F04C 14/28 . Safety arrangements; Monitoring
- F04C 15/00** **Component parts, details or accessories of machines, pumps or pumping installations, not provided for in groups F04C 2/00 to F04C 14/00 (of pumps specially adapted for elastic fluids F04C 18/00 to F04C 29/00)**
- F04C 15/0003 . { Sealing arrangements in rotary-piston machines or pumps (sealing in general F16J)}
- F04C 15/0007 . . { Radial sealings for working fluid }
- F04C 15/0011 . . . { of rigid material }
- F04C 15/0015 . . . { of resilient material }
- F04C 15/0019 . . . { Radial sealing elements specially adapted for intermeshing-engagement type machines or pumps, e.g. gear machines or pumps }
- F04C 15/0023 . . { Axial sealings for working fluid }
- F04C 15/0026 . . . { Elements specially adapted for sealing of the lateral faces of intermeshing-engagement type machines or pumps, e.g. gear machines or pumps }
- F04C 15/003 . . { Sealings for working fluid between radially and axially moving parts }
- F04C 15/0034 . . { for other than the working fluid, i.e. the sealing arrangements are not between working chambers of the machine }
- F04C 15/0038 . . . { Shaft sealings specially adapted for rotary-piston machines or pumps }
- F04C 15/0042 . { Systems for the equilibration of forces acting on the machines or pump (interstice adjustment other than by fluid pressure F01C 21/102)}
- F04C 15/0046 . . { Internal leakage control }
- F04C 15/0049 . . { Equalization of pressure pulses (silencing for compressors F04C 29/06)}
- F04C 15/0053 . { Venting means for starting }
- F04C 15/0057 . { Driving elements, brakes, couplings, transmission specially adapted for machines or pumps (brakes, couplings, transmissions per se F16, B60)}
- F04C 15/0061 . . { Means for transmitting movement from the prime mover to driven parts of the pump, e.g. clutches, couplings, transmissions }
- F04C 15/0065 . . . { for eccentric movement }
- F04C 15/0069 . . . { Magnetic couplings }
- F04C 15/0073 . . . { Couplings between rotors and input or output shafts acting by interengaging or mating parts, i.e. positive coupling of rotor and shaft }

- F04C 15/0076 .. { Fixing rotors on shafts, e.g. by clamping together hub and shaft }
- F04C 15/008 .. { Prime movers }
- F04C 15/0084 .. { Brakes, braking assemblies }
- F04C 15/0088 . { Lubrication (of machines or engines in general [F01M](#)) }
- F04C 15/0092 .. { Control systems for the circulation of the lubricant }
- F04C 15/0096 . { Heating; Cooling (of machines or engines in general [F01P](#)) }
- F04C 15/06 . Arrangements for admission or discharge of the working fluid, e.g. constructional features of the inlet or outlet
- F04C 15/062 .. { Arrangements for supercharging the working space (similar arrangements for internal combustion engines [F02B 33/00](#), [F02B 37/00](#)) }
- F04C 15/064 .. { with inlet and outlet valves specially adapted for rotary or oscillating piston machines or pumps }
- F04C 15/066 ... { of the non-return type }
- F04C 15/068 { of the elastic type, e.g. reed valves }

F04C 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](#) to [F04C 18/28](#) and [F04C 18/48](#) to [F04C 18/56](#).

- F04C 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
- F04C 18/0207 .. { both members having co-operating elements in spiral form }
- F04C 18/0215 ... { where only one member is moving }
- F04C 18/0223 { with symmetrical double wraps }
- F04C 18/023 .. { where both members are moving }
- F04C 18/0238 { with symmetrical double wraps }
- F04C 18/0246 ... { Details concerning the involute wraps or their base, e.g. geometry }
- F04C 18/0253 { Details concerning the base }
- F04C 18/0261 { Details of the ports, e.g. location, number, geometry }
- F04C 18/0269 { Details concerning the involute wraps }
- F04C 18/0276 { Different wall heights }
- F04C 18/0284 { Details of the wrap tips }
- F04C 18/0292 { Ports or channels located in the wrap }
- F04C 18/04 .. of internal-axis type
- F04C 18/045 ... { having a C-shaped piston }
- F04C 18/06 .. of other than internal-axis type

- F04C 18/063 . . with coaxially-mounted members having continuously-changing circumferential spacing between them
- F04C 18/067 . . . having cam-and-follower type drive
- F04C 18/07 . . . having crankshaft-and-connecting-rod type drive
- F04C 18/073 . . . having pawl-and-ratchet type drive
- F04C 18/077 . . . having toothed-gearing type drive

- F04C 18/08 . of intermeshing-engagement type, i.e. with engagement of co-operating members similar to that of toothed gearing
- F04C 18/082 . . { Details specially related to intermeshing engagement type pumps }
- F04C 18/084 . . . { Toothed wheels }
- F04C 18/086 . . . { Carter }
- F04C 18/088 . . . { Elements in the toothed wheels or the carter for relieving the pressure of fluid imprisoned in the zones of engagement }
- F04C 18/10 . . of internal-axis type with the outer member having more teeth or tooth equivalents, e.g. rollers, than the inner member
- F04C 18/103 . . . { with a crescent shaped filler element, located between the inner and outer intermeshing elements }
- F04C 18/107 . . . with helical teeth
- F04C 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 }
- F04C 18/113 . . . the inner member carrying rollers intermeshing with the outer member
- F04C 18/12 . . of other than internal-axis type
- F04C 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 }
- F04C 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 }
- F04C 18/14 . . . with toothed rotary pistons
- F04C 18/16 with helical teeth, e.g. chevron-shaped, screw type {(for non-parallel axes of movement [F04C 18/48](#))}
- F04C 18/165 { having more than two rotary pistons with parallel axes }
- F04C 18/18 with similar tooth forms ([F04C 18/16](#) takes precedence)
- F04C 18/20 with dissimilar tooth forms ([F04C 18/16](#) takes precedence)

- F04C 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

- F04C 18/24 . of counter-engagement type, i.e. the movement of co-operating members at the points of engagement being in opposite directions

- F04C 18/26 . . of internal-axis type
- F04C 18/28 . . of other than internal-axis type

- F04C 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
- F04C 18/32 .. having both the movement defined in group [F04C 18/02](#) and relative reciprocation between the co-operating members
- F04C 18/321 ... { with vanes hinged to the inner member and reciprocating with respect to the inner member }
- F04C 18/322 ... { with vanes hinged to the outer member and reciprocating with respect to the outer member }
- F04C 18/324 ... with vanes hinged to the inner member and reciprocating with respect to the outer member
- F04C 18/328 and hinged to the outer member
- F04C 18/332 ... with vanes hinged to the outer member and reciprocating with respect to the inner member
- F04C 18/336 and hinged to the inner member
- F04C 18/34 .. having the movement defined in group [F04C 18/08](#) or [F04C 18/22](#) and relative reciprocation between the co-operating members
- F04C 18/344 ... with vanes reciprocating with respect to the inner member
- F04C 18/3441 { the inner and outer member being in contact along one line or continuous surface substantially parallel to the axis of rotation }
- F04C 18/3442 { the surfaces of the inner and outer member, forming the inlet and outlet opening }
- F04C 18/3443 { with a separation element located between the inlet and outlet opening }
- F04C 18/3445 { the vanes having the form of rollers, slippers or the like }
- F04C 18/3446 { the inner and outer member being in contact along more than one line or surface }
- F04C 18/3447 { the vanes having the form of rollers, slippers or the like }
- F04C 18/3448 { with axially movable vanes }
- F04C 18/348 the vanes positively engaging, with circumferential play, an outer rotatable member
- F04C 18/352 the vanes being pivoted on the axis of the outer member
- F04C 18/356 ... with vanes reciprocating with respect to the outer member
- F04C 18/3562 { the inner and outer member being in contact along one line or continuous surfaces substantially parallel to the axis of rotation }
- F04C 18/3564 { the surfaces of the inner and outer member, forming the working space, being surfaces of revolution }
- F04C 18/3566 { the inner and outer member being in contact along more than line or surface }
- F04C 18/3568 { with axially movable vanes }
- F04C 18/36 .. having both the movement defined in groups [F04C 18/22](#) and [F04C 18/24](#)
- F04C 18/38 .. having the movement defined in group [F04C 18/02](#) and having a hinged member ([F04C 18/32](#) takes precedence)
- F04C 18/39 ... with vanes hinged to the inner as well as to the outer member

- F04C 18/40 . . . having the movement defined in group [F04C 18/08](#) or [F04C 18/22](#) and having a hinged member
- F04C 18/44 . . . with vanes hinged to the inner member
- F04C 18/46 . . . with vanes hinged to the outer member
- F04C 18/48 . Rotary-piston pumps with non-parallel axes of movement of co-operating members
- F04C 18/50 . . the axes being arranged at an angle of 90 degrees
- F04C 18/52 . . . of intermeshing engagement type, i.e. with engagement of co-operating members similar to that of toothed gearing
- F04C 18/54 . . the axes being arranged otherwise than at an angle of 90 degrees
- F04C 18/56 . . . of intermeshing engagement type, i.e. with engagement of co-operating members similar to that of toothed gearing
- F04C 18/565 . . . { the axes of cooperating members being on the same plane }
- F04C 19/00 Rotary-piston pumps with fluid ring or the like, specially adapted for elastic fluids**
- F04C 19/001 . { General arrangements, plants, flowsheets }
- F04C 19/002 . { with rotating outer members }
- F04C 19/004 . { Details concerning the operating liquid, e.g. nature, separation, cooling, cleaning, control of the supply }
- F04C 19/005 . { Details concerning the admission or discharge }
- F04C 19/007 . . { Port members in the form of side plates }
- F04C 19/008 . . { Port members in the form of conical or cylindrical pieces situated in the centre of the impeller }
- F04C 21/00 Oscillating-piston pumps specially adapted for elastic fluids**
- F04C 21/002 . { the piston oscillating around a fixed axis }
- F04C 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](#)) }
- F04C 21/007 . { the points of the moving element describing approximately an alternating movement in axial direction with respect to the other element }
- F04C 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

- F04C 23/001 . { of similar working principle }
- F04C 23/003 . . { having complementary function }
- F04C 23/005 . { of dissimilar working principle }
- F04C 23/006 . . { having complementary function }
- F04C 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

- F04C 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](#))

F04C 25/00 Adaptations of pumps for special use of pumps for elastic fluids

- F04C 25/02 . for producing high vacuum ([sealing arrangements F04C 27/00](#); [silencing F04C 29/06](#))

F04C 27/00 Sealing arrangements in rotary-piston pumps specially adapted for elastic fluids

- F04C 27/001 . { Radial sealings for working fluid }
- F04C 27/002 . . { of rigid material }
- F04C 27/003 . . { of resilient material }
- F04C 27/004 . . { Radial sealing elements specially adapted for intermeshing-engagement type pumps, e.g. gear pumps }
- F04C 27/005 . { Axial sealings for working fluid }
- F04C 27/006 . . { Elements specially adapted for sealing of the lateral faces of intermeshing-engagement type pumps, e.g. gear pumps }
- F04C 27/007 . { Sealings for working fluid between radially and axially moving parts }
- F04C 27/008 . { for other than working fluid, i.e. the sealing arrangements are not between working chambers of the machine }
- F04C 27/009 . . { Shaft sealings specially adapted for pumps }
- F04C 27/02 . Liquid sealing for high-vacuum pumps { or for compressors }

F04C 28/00	Control of, monitoring of, or safety arrangements for, pumps or pumping installations specially adapted for elastic fluids
F04C 28/02	. specially adapted for several pumps connected in series or in parallel
F04C 28/04	. specially adapted for reversible pumps
F04C 28/06	. specially adapted for stopping, starting, idling or no-load operation
F04C 28/065	.. { Capacity control using a multiplicity of units or pumping capacities, e.g. multiple chambers, individually switchable or controllable }
F04C 28/08	. characterised by varying the rotational speed
F04C 28/10	. characterised by changing the positions of the inlet or outlet openings with respect to the working chamber
F04C 28/12	.. using sliding valves
F04C 28/125	... { with sliding valves controlled by the use of fluid other than the working fluid }
F04C 28/14	.. using rotating valves
F04C 28/16	.. using lift valves
F04C 28/18	. characterised by varying the volume of the working chamber (by changing the positions of inlet or outlet openings F04C 28/10)
F04C 28/185	.. { by varying the useful pumping length of the cooperating members in the axial direction }
F04C 28/20	.. by changing the form of the inner or outer contour of the working chamber
F04C 28/22	.. by changing the eccentricity between cooperating members
F04C 28/24	. characterised by using valves regulating pressure or flow rate, e.g. discharge valves { unloading valves } (F04C 28/10 takes precedence)
F04C 28/26	.. using bypass channels
F04C 28/265	... { being obtained by displacing a lateral sealing face }
F04C 28/28	. Safety arrangements; Monitoring
F04C 29/00	Component parts, details or accessories of pumps or pumping installations, not provided for in groups F04C 18/00 to F04C 28/00
F04C 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) }
F04C 29/0014	.. { with control systems for the injection of the fluid }
F04C 29/0021	. { Systems for the equilibration of forces acting on the pump } (interstice adjustment other than by fluid pressure F01C 21/102)
F04C 29/0028	.. { Internal leakage control }
F04C 29/0035	.. { Equalization of pressure pulses (silencing F04C 29/06) }

- F04C 29/0042 . { Driving elements, brakes, couplings, transmissions specially adapted for pumps (brakes, couplings, transmissions per se [F16](#), [B60](#))}
- F04C 29/005 .. { Means for transmitting movement from the prime mover to driven parts of the pump, e.g. clutches, couplings, transmissions }
- F04C 29/0057 ... { for eccentric movement }
- F04C 29/0064 ... { Magnetic couplings }
- F04C 29/0071 ... { Couplings between rotors and input or output shafts acting by interengaging or mating parts, i.e. positive coupling of rotor and shaft }
- F04C 29/0078 .. { Fixing rotors on shafts, e.g. by clamping together hub and shaft }
- F04C 29/0085 .. { Prime movers }
- F04C 29/0092 . { Removing solid or liquid contaminants from the gas under pumping, e.g. by filtering or deposition; Purging; Scrubbing; Cleaning }
- F04C 29/02 . Lubrication (of machines or engines in general [F01M](#)); Lubricant separation (separation in general [B01D](#))
- F04C 29/021 .. { Control systems for the circulation of the lubricant }
- F04C 29/023 .. { Lubricant distribution through a hollow driving shaft ([F04C 29/025](#) takes precedence)}
- F04C 29/025 .. { using a lubricant pump }
- F04C 29/026 .. { Lubricant separation }
- F04C 29/028 .. { Means for improving or restricting lubricant flow }
- F04C 29/04 . Heating; Cooling (of machines or engines in general [F01P](#)); Heat insulation (heat insulation in general [F16L 59/00](#))
- F04C 29/042 .. { by injecting a fluid (injection of fluid for sealing, cooling or lubrication [F04C 29/0007](#))}
- F04C 29/045 .. { of the electric motor in hermetic pumps }
- F04C 29/047 .. { Cooling of electronic devices installed inside the pump housing, e.g. inverters }

WARNING

WARNING this group is pending a reorganisation, see also [F04C 29/04](#)

- F04C 29/06 . Silencing (gas-flow silencers or exhaust apparatus for machines or engines in general [F01N](#))

WARNING

{ WARNING Subgroups [F04C 29/061](#) to [F04C 29/068](#) pending a reorganisation, see also [F04C 29/06](#) }

- F04C 29/061 .. { Silencers using overlapping frequencies, e.g. Helmholtz resonators }
- F04C 29/063 .. { Sound absorbing materials }
- F04C 29/065 .. { Noise dampening volumes, e.g. muffler chambers }
- F04C 29/066 ... { with means to enclose the source of noise }

- F04C 29/068 .. { the silencing means being arranged inside the pump housing }
- F04C 29/12 . Arrangements for admission or discharge of the working fluid, e.g. constructional features of the inlet or outlet
- F04C 29/122 .. { Arrangements for supercharging the working space (similar arrangements for internal combustion engines [F02B 33/00](#), [F02B 37/00](#)) }
- F04C 29/124 .. { with inlet and outlet valves specially adapted for rotary or oscillating piston pumps }
- F04C 29/126 ... { of the non-return type }
- F04C 29/128 { of the elastic type, e.g. reed valves }

F04C 2210/00 Fluid

- F04C 2210/10 . working
- F04C 2210/1005 .. Air
- F04C 2210/1011 .. Amine
- F04C 2210/1016 .. Blood
- F04C 2210/1022 .. C3HmFn
- F04C 2210/1027 .. CO₂
- F04C 2210/1033 .. Concrete
- F04C 2210/1038 .. Cooking oil
- F04C 2210/1044 .. Fuel
- F04C 2210/105 .. Helium (He)
- F04C 2210/1055 .. Hydrogen (H₂)
- F04C 2210/1061 .. LPG
- F04C 2210/1066 .. Nitrogen (N₂)
- F04C 2210/1072 .. O_xygen (O₂)
- F04C 2210/1077 .. Steam
- F04C 2210/1083 .. Urea
- F04C 2210/1088 .. Vegetable oil
- F04C 2210/1094 .. Water
- F04C 2210/12 . auxiliary
- F04C 2210/122 .. Nitrogen (N₂)
- F04C 2210/124 .. Sodium (Na)
- F04C 2210/126 .. Tin
- F04C 2210/128 .. Water
- F04C 2210/14 . Lubricant
- F04C 2210/142 .. Ester
- F04C 2210/145 .. PAG
- F04C 2210/147 .. Water

F04C 2210/20	. liquid, i.e. incompressible
F04C 2210/201	.. DME
F04C 2210/203	.. Fuel
F04C 2210/205	.. Ink
F04C 2210/206	.. Oil
F04C 2210/208	.. Water
F04C 2210/22	. gaseous, i.e. compressible
F04C 2210/221	.. Air
F04C 2210/222	.. Carbon dioxide (CO ₂)
F04C 2210/224	.. Hydrogen (H ₂)
F04C 2210/225	.. Nitrogen (N ₂)
F04C 2210/227	.. Steam
F04C 2210/228	.. Vapour
F04C 2210/24	. mixed, e.g. two-phase fluid
F04C 2210/242	.. Steam
F04C 2210/245	.. Vapour
F04C 2210/247	.. Water
F04C 2210/26	. Refrigerants with particular properties, e.g. HFC-134a
F04C 2210/261	.. Carbon dioxide (CO ₂)
F04C 2210/263	.. HFO1234YF
F04C 2210/265	.. Ammoniac (NH ₃)
F04C 2210/266	.. Propane
F04C 2210/268	.. R32
F04C 2210/40	. Properties
F04C 2210/42	.. magnetic or ferromagnetic; Ferrofluids
F04C 2210/44	.. Viscosity
F04C 2210/60	. Condition
F04C 2210/62	.. Purity
F04C 2220/00	Application
F04C 2220/10	. Vacuum
F04C 2220/12	.. Dry running
F04C 2220/20	. Pumps with means for separating and evacuating the gaseous phase
F04C 2220/22	. for very low temperatures, i.e. cryogenic

- F04C 2220/24 . for metering throughflow
- F04C 2220/26 . for step-by-step output movement
- F04C 2220/28 . for pulsed fluid flow
- F04C 2220/30 . Use in a chemical vapor deposition (CVD) process or in a similar process
- F04C 2220/40 . Pumps with means for venting areas other than the working chamber, e.g. bearings, gear chambers, shaft seals
- F04C 2220/50 . Pumps with means for introducing gas under pressure for ballasting

F04C 2230/00 Manufacture

NOTE

Manufacture comprises also treatment, assembly or disassembly methods, repairing, handling or the like.

- F04C 2230/10 . by removing material
- F04C 2230/101 .. by electrochemical methods
- F04C 2230/102 .. by spark erosion methods
- F04C 2230/103 .. using lasers
- F04C 2230/20 . essentially without removing material
- F04C 2230/21 .. by casting
- F04C 2230/22 .. by sintering
- F04C 2230/23 .. by permanently joining parts together
- F04C 2230/231 ... by welding
- F04C 2230/24 .. by extrusion
- F04C 2230/25 .. by forging
- F04C 2230/26 .. by rolling
- F04C 2230/27 .. by hydroforming
- F04C 2230/40 . Heat treatment
- F04C 2230/41 .. Hardening; Annealing
- F04C 2230/60 . Assembly methods
- F04C 2230/601 .. Adjustment
- F04C 2230/602 .. Gap; Clearance
- F04C 2230/603 .. Centering; Aligning
- F04C 2230/604 .. Mounting devices for pumps or compressors
- F04C 2230/605 .. Balancing

F04C 2230/70	. Disassembly methods
F04C 2230/80	. Repairing methods
F04C 2230/85	. Methods for improvement by repair or exchange of parts
F04C 2230/90	. Improving properties of machine parts
F04C 2230/91	.. Coating
F04C 2230/92	.. Surface treatment
F04C 2240/00	Components
F04C 2240/10	. Stators
F04C 2240/102	.. with means for discharging condensate or liquid separated from the gas pumped
F04C 2240/20	. Rotors
F04C 2240/30	. Casings or housings
F04C 2240/40	. Electric motor
F04C 2240/401	.. Linear motor
F04C 2240/402	.. Plurality of electronically synchronised motors
F04C 2240/403	.. with inverter for speed control
F04C 2240/45	. Hybrid prime mover
F04C 2240/50	. Bearings
F04C 2240/51	.. for cantilever assemblies
F04C 2240/52	.. for assemblies with supports on both sides
F04C 2240/54	.. Hydrostatic or hydrodynamic bearing assemblies specially adapted for rotary positive displacement pumps or compressors
F04C 2240/56	.. Bearing bushings or details thereof
F04C 2240/60	. Shafts
F04C 2240/601	.. Shaft flexion
F04C 2240/603	.. with internal channels for fluid distribution, e.g. hollow shaft
F04C 2240/605	.. Shaft sleeves or details thereof
F04C 2240/70	. Use of multiplicity of similar components; Modular construction
F04C 2240/80	. Other components
F04C 2240/801	.. Wear plates
F04C 2240/802	.. Liners
F04C 2240/803	.. Electric connectors or cables; Fittings therefor

F04C 2240/804	..	Accumulators for refrigerant circuits
F04C 2240/805	..	Fastening means, e.g. bolts
F04C 2240/806	..	Pipes for fluids; Fittings therefor
F04C 2240/807	..	Balance weight, counterweight
F04C 2240/808	..	Electronic circuits (e.g. inverters) installed inside the machine
F04C 2240/809	..	Lubricant sump
F04C 2240/81	..	Sensor, e.g. electronic sensor for control or monitoring
F04C 2240/811	..	Actuator for control, e.g. pneumatic, hydraulic, electric

F04C 2250/00**Geometry**

F04C 2250/10	.	of the inlet or outlet
F04C 2250/101	..	of the inlet
F04C 2250/102	..	of the outlet
F04C 2250/20	.	of the rotor
F04C 2250/201	..	conical shape
F04C 2250/30	.	of the stator
F04C 2250/301	..	compression chamber profile defined by a mathematical expression or by parameters

F04C 2270/00**Control; Monitoring or safety arrangements**

F04C 2270/01	.	Load
F04C 2270/015	..	Controlled or regulated
F04C 2270/02	.	Power
F04C 2270/025	..	Controlled or regulated
F04C 2270/03	.	Torque
F04C 2270/035	..	Controlled or regulated
F04C 2270/04	.	Force
F04C 2270/041	..	Controlled or regulated
F04C 2270/042	..	radial
F04C 2270/0421	...	Controlled or regulated
F04C 2270/0422	...	centrifugal
F04C 2270/04225	....	Controlled or regulated
F04C 2270/044	..	axial
F04C 2270/0445	...	Controlled or regulated
F04C 2270/05	.	Speed

F04C 2270/051	..	Controlled or regulated
F04C 2270/052	..	angular
F04C 2270/0525	...	Controlled or regulated
F04C 2270/054	..	linear
F04C 2270/0545	...	Controlled or regulated
F04C 2270/06	.	Acceleration
F04C 2270/065	..	Controlled or regulated
F04C 2270/07	.	Electric current
F04C 2270/075	..	Controlled or regulated
F04C 2270/08	.	Amplitude of electric current
F04C 2270/085	..	Controlled or regulated
F04C 2270/09	.	Electric current frequency
F04C 2270/095	..	Controlled or regulated
F04C 2270/10	.	Voltage
F04C 2270/105	..	Controlled or regulated
F04C 2270/11	.	Magnetic flux
F04C 2270/115	..	Controlled or regulated
F04C 2270/12	.	Vibration
F04C 2270/125	..	Controlled or regulated
F04C 2270/13	.	Noise
F04C 2270/135	..	Controlled or regulated
F04C 2270/14	.	Pulsations
F04C 2270/145	..	Controlled or regulated
F04C 2270/15	.	Resonance
F04C 2270/155	..	Controlled or regulated
F04C 2270/16	.	Wear
F04C 2270/165	..	Controlled or regulated
F04C 2270/17	.	Tolerance; Play; Gap
F04C 2270/175	..	Controlled or regulated
F04C 2270/18	.	Pressure
F04C 2270/185	..	Controlled or regulated
F04C 2270/19	.	Temperature

F04C 2270/195	..	Controlled or regulated
F04C 2270/20	.	Flow
F04C 2270/205	..	Controlled or regulated
F04C 2270/21	.	Pressure difference
F04C 2270/215	..	Controlled or regulated
F04C 2270/22	.	Temperature difference
F04C 2270/225	..	Controlled or regulated
F04C 2270/23	.	Working cycle timing control
F04C 2270/24	.	Level of liquid, e.g. lubricant or cooling liquid
F04C 2270/40	.	Conditions across a pump or machine
F04C 2270/42	.	Conditions at the inlet of a pump or machine
F04C 2270/44	.	Conditions at the outlet of a pump or machine
F04C 2270/46	.	Conditions in the working chamber
F04C 2270/48	.	Conditions of a reservoir linked to a pump or machine
F04C 2270/50	.	Conditions before a throttle
F04C 2270/52	.	Conditions after a throttle
F04C 2270/54	.	Conditions in a control cylinder/piston unit
F04C 2270/56	.	Number of pump/machine units in operation
F04C 2270/58	.	Valve parameters
F04C 2270/585	..	Controlled or regulated
F04C 2270/60	.	Prime mover parameters
F04C 2270/605	..	Controlled or regulated
F04C 2270/70	.	Safety, emergency conditions or requirements
F04C 2270/701	..	Cold start
F04C 2270/72	..	preventing reverse rotation
F04C 2270/78	.	Warnings
F04C 2270/782	..	Sound
F04C 2270/784	..	Light
F04C 2270/80	.	Diagnostics

- F04C 2270/86
 - . Detection
- F04C 2270/90
 - . Remote control, e.g. wireless, via LAN, by radio, or by a wired connection from a central computer
- F04C 2280/00**
 - Arrangements for preventing or removing deposits or corrosion**
- F04C 2280/02
 - . Preventing solid deposits in pumps, e.g. in vacuum pumps with chemical vapour deposition (CVD) processes
- F04C 2280/04
 - . Preventing corrosion