

ECLA**EUROPEAN 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".

F04C2/00

Rotary-piston machines or pumps (with non-parallel axes of co-operating members [F04C3/00](#); with the working-chamber walls at least partly resiliently deformable [F04C5/00](#); with fluid ring or the like [F04C7/00](#); rotary-piston pumps specially adapted for elastic fluids [F04C18/00](#); rotary-piston machines or pumps in which the working-fluid is exclusively displaced by, or exclusively displaces, one or more reciprocating pistons [F04B](#)) **[M1109]**

Note

Group [F04C2/30](#) takes precedence over groups [F04C2/02](#) to [F04C2/28](#)

F04C2/02

- 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

F04C2/02B

- . [\[N: the moving and the stationary member having co-operating elements in spiral form\]](#)

F04C2/04

- . of internal axis type

F04C2/04B

- . . [\[N: having a C-shaped piston\]](#) [\[N1204\]](#)

F04C2/06

- . of other than internal-axis type

F04C2/063

- . . with coaxially-mounted members having continuously-changing circumferential spacing between them

F04C2/067

- . . . having cam-and-follower type drive

F04C2/07

- . . . having crankshaft-and-connecting-rod type drive

F04C2/073

- . . . having pawl-and-ratchet type drive

F04C2/077

- . . . having toothed-gearing type drive

F04C2/08

- of intermeshing-engagement type, i.e. with engagement of co-operating members similar to that of toothed gearing

F04C2/08B

- . [\[N: Details specially related to intermeshing engagement type machines or pumps\]](#)

F04C2/08B2

- . . [\[N: Toothed wheels\]](#)

F04C2/08B4

- . . [\[N: Carter\]](#)

F04C2/08B6

- . . [\[N: Elements in the toothed wheels or the carter for relieving the pressure of fluid imprisoned in the zones of engagement\]](#) [\[M1109\]](#)

F04C2/10

- . of internal-axis type with the outer member having more teeth or tooth-equivalents, e.g. rollers, than the inner member

F04C2/10C

- . . [\[N: with a crescent-shaped filler element, located between the inner and outer intermeshing members\]](#)

F04C2/10D	. . .	[N: the two members rotating simultaneously around their respective axes]
F04C2/10E	. . .	[N: one member having simultaneously a rotational movement about its own axis and an orbital movement]
F04C2/10E2	. . . .	[N: having an articulated driving shaft]
F04C2/10E4	. . . .	[N: Details concerning timing or distribution valves] [N9707]
F04C2/10E4B	. . . . .	[N: Spool type distribution valves] [N0103]
F04C2/107	. . .	with helical teeth
F04C2/107B	. . . .	[N: 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]
F04C2/107B2	. . . . .	[N: where one member is stationary while the other member rotates and orbits] [N9507]
F04C2/107B2B	. . . . .	[N: Construction of the stationary member] [N9509]
F04C2/107B4	. . . . .	[N: where one member orbits or wobbles relative to the other member which rotates around a fixed axis] [N9507]
F04C2/107B6	. . . . .	[N: where one member rotates and both members are allowed to orbit or wobble] [N9507]
F04C2/113	. . .	the inner member carrying rollers intermeshing with the outer member
F04C2/12	. .	of other than internal-axis type
F04C2/12B	. . .	[N: 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]
F04C2/12D	. . .	[N: with radially from the rotor body extending elements, not necessarily co-operating with corresponding recesses in the other rotor, e.g. lobes, Roots type]
F04C2/14	. . .	with toothed rotary pistons
F04C2/16	. . . .	with helical teeth, e.g. chevron-shaped, screw type [N: (for non-parallel axes of movement F04C3/00)] [C9604]
F04C2/16B	. . . . .	[N: having more than two rotary pistons with parallel axes] [N9604]
F04C2/18	. . . .	with similar tooth forms (F04C2/16 takes precedence)
F04C2/20	. . . .	with dissimilar tooth forms (F04C2/16 takes precedence)
F04C2/22	. .	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
F04C2/24	. .	of counter-engagement type, i.e. the movement of co-operating members at the points of engagement being in opposite directions
F04C2/26	. .	of internal-axis type
F04C2/28	. .	of other than internal-axis type
F04C2/30	. .	having the characteristics covered by two or more groups F04C2/02 , F04C2/08 , F04C2/22 , F04C2/24 or having the characteristics covered by one of these groups together with some other type of movement between co-operating members
F04C2/32	. .	having both the movement defined in groups F04C2/02 and relative reciprocation between co-operating members
F04C2/32A	. . .	[N: with vanes hinged to the inner member and reciprocating with respect to the inner member] [N1205]
F04C2/32B	. . .	[N: with vanes hinged to the outer member and reciprocating with respect to the outer member] [N1205]

- F04C2/324 . . . with vanes hinged to the inner member and reciprocating with respect to the outer member
- F04C2/328 and hinged to the outer member
- F04C2/332 . . . with vanes hinged to the outer member and reciprocating with respect to the inner member
- F04C2/336 and hinged to the inner member
- F04C2/34 . . having the movement defined in groups [F04C2/08](#) or [F04C2/22](#) and relative reciprocation between the co-operating members
- F04C2/344 . . . with vanes reciprocating with respect to the inner member
- F04C2/344B [N: the inner and outer member being in contact along one line or continuous surface substantially parallel to the axis of rotation]
- F04C2/344B2 [N: the surfaces of the inner and outer member, forming the working space, being surfaces of revolution]
- F04C2/344B4 [N: with a separation element located between the inlet and outlet opening]
- F04C2/344B6 [N: the vanes having the form of rollers, slippers or the like]
- F04C2/344C [N: the inner and outer member being in contact along more than one line or surface]
- F04C2/344C2 [N: the vanes having the form of rollers, slippers or the like]
- F04C2/344D [N: with axially movable vanes]
- F04C2/348 the vanes positively engaging, with circumferential play, an outer rotatable member
- F04C2/352 the vanes being pivoted on the axis of the outer member
- F04C2/356 . . . with vanes reciprocating with respect to the outer member
- F04C2/356B [N: the inner and outer member being in contact along one line or continuous surface substantially parallel to the axis of rotation]
- F04C2/356B2 [N: the surfaces of the inner and outer member, forming the working space, being surfaces of revolution]
- F04C2/356C [N: the inner and outer member being in contact along more than one line or surface]
- F04C2/356D [N: with axially movable vanes]
- F04C2/36 . . having both the movements defined in groups [F04C2/22](#) and [F04C2/24](#)
- F04C2/38 . . having the movement defined in group [F04C2/02](#) and having a hinged member ([F04C2/32](#) takes precedence)
- F04C2/39 . . . with vanes hinged to the inner as well as to the outer member
- F04C2/40 . . having the movement defined in group [F04C2/08](#) or [F04C2/22](#) and having a hinged member
- F04C2/44 . . . with vanes hinged to the inner member
- F04C2/46 . . . with vanes hinged to the outer member

- F04C3/00** **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 [F04C5/00](#); rotary-piston pumps with non-parallel axes of movement of co-operating members specially adapted for elastic fluids [F04C18/48](#)) [\[C0509\]](#)

- F04C3/02 . the axes being arranged at an angle of 90 degrees

- F04C3/04
 - . . of intermeshing engagement type, i.e. with engagement of co-operating members similar to that of toothed gearing
- F04C3/06
 - . the axes being arranged otherwise than at an angle of 90 degrees
- F04C3/08
 - . . of intermeshing engagement type, i.e. with engagement of co-operating members similar to that of toothed gearing
- F04C3/08B
 - . . . [N: the axes of cooperating members being on the same plane] [N9604]
- F04C5/00**

Rotary-piston machines or pumps with the working-chamber walls at least partly resiliently deformable (such pumps specially adapted for elastic fluids [F04C18/00](#)) [M1109]
- F04C7/00**

Rotary-piston machines or pumps with fluid ring or the like (such pumps specially adapted for elastic fluids [F04C19/00](#)) [M1109]
- F04C9/00**

Oscillating-piston machines or pumps (such pumps specially adapted for elastic fluids [F04C21/00](#)) [M1109]
- F04C9/00B
 - . [N: the piston oscillating around a fixed axis]
- F04C9/00C
 - . [N: 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 [F04C3/00](#))]
- F04C9/00D
 - . [N: the points of the moving element describing approximately an alternating movement in axial direction with respect to the other element]
- F04C11/00**

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 [F04C23/00](#)); **Pumping installations** ([F04C13/00](#) takes precedence; specially adapted for elastic fluids [F04C23/00](#); fluid gearing F16H) [M1109]

[N: **Note**
Multi-stage engines, motors, pumps or compressors with stages connected in series or in parallel are not considered as having complementary function
]
- F04C11/00B
 - . [N: of similar working principle] [C9410]
- F04C11/00B2
 - . . [N: having complementary function]
- F04C11/00C
 - . [N: of dissimilar working principle] [C9410]
- F04C11/00C2
 - . . [N: having complementary function]
- F04C11/00D
 - . [N: Enclosed motor pump units] [N9605]
- F04C13/00**

Adaptations of machines or pumps for special use, e.g. for extremely high pressures (of pumps specially adapted for elastic fluids [F04C25/00](#)) [M1109]
- F04C13/00B
 - . [N: Pumps for particular liquids]

- F04C13/00B2 . . [N: for homogeneous viscous liquids] [C9601]
- F04C13/00B2B . . . [N: with means for fluidising or diluting the material being pumped] [N9601]
- F04C13/00C . [N: Removing contaminants, deposits or scale from the pump; Cleaning] [N9601]
[M1109]
- F04C13/00D . [N: Venting; Gas and vapour separation during pumping (preventing vapour lock in
fuel pumps [F02M37/20](#), in centrifugal pumps [F04D9/00](#))] [N9601]
- F04C13/00E . [N: Pumps for submersible use, i.e. down-hole pumping] [N0103]
- F04C14/00** **Control of, monitoring of, or safety arrangements for, machines, pumps or**
pumping installations (of pumps or pumping installations specially adapted for elastic
fluids [F04C28/00](#)) [N0509]
- F04C14/02 . specially adapted for several machines or pumps connected in series or in parallel
[N0509]
- F04C14/04 . specially adapted for reversible machines or pumps [N0509]
- F04C14/06 . specially adapted for stopping, starting, idling or no-load operation [N0509]
- F04C14/06B . . [N: Capacity control using a multiplicity of units or pumping capacities, e.g. multiple
chambers, individually switchable or controllable] [N0702]
- F04C14/08 . characterised by varying the rotational speed [N0509]
- F04C14/10 . characterised by changing the positions of the inlet or outlet openings with respect to
the working chamber [N0509]
- F04C14/12 . . using sliding valves [N0509]
- F04C14/14 . . using rotating valves [N0509]
- F04C14/16 . . using lift valves [N0509]
- F04C14/18 . characterised by varying the volume of the working chamber (by changing the
positions of inlet or outlet openings [F04C14/10](#)) [N0509]
- F04C14/18B . . [N: by varying the useful pumping length of the cooperating members in the axial
direction] [N0605]
- F04C14/20 . . by changing the form of the inner or outer contour of the working chamber [N0509]
- F04C14/22 . . by changing the eccentricity between cooperating members [N0509]
- F04C14/22B . . . [N: using a movable cam] [N0509]
- F04C14/22B2 [N: by pivoting the cam around an eccentric axis] [N0509]
- F04C14/24 . characterised by using valves regulating pressure or flow rate, e.g. discharge valves,
[N: unloading valves] ([F04C14/10](#) takes precedence) [N0509]
- F04C14/26 . . using bypass channels [N0509]
- F04C14/26B . . . [N: being obtained by displacing a lateral sealing face] [N0509]
- F04C14/28 . Safety arrangements; Monitoring [N0509]
- F04C15/00** **Component parts, details or accessories of machines, pumps or pumping**
installations, not provided for in groups [F04C2/00](#) to [F04C14/00](#) (of pumps specially
adapted for elastic fluids [F04C18/00](#) to [F04C29/00](#)) [M1109]

- F04C15/00B . [N: Sealing arrangements in rotary-piston machines or pumps (sealing in general [F16J](#))]
- F04C15/00B2 . . [N: Radial sealings for working fluid]
- F04C15/00B2B . . . [N: of rigid material]
- F04C15/00B2C . . . [N: of resilient material]
- F04C15/00B2D . . . [N: Radial sealing elements specially adapted for intermeshing-engagement type machines or pumps, e.g. gear machines or pumps]
- F04C15/00B4 . . [N: Axial sealings for working fluid]
- F04C15/00B4B . . . [N: Elements specially adapted for sealing of the lateral faces of intermeshing-engagement type machines or pumps, e.g. gear machines or pumps]
- F04C15/00B6 . . [N: Sealings for working fluid between radially and axially moving parts]
- F04C15/00B8 . . [N: for other than the working fluid, i.e. the sealing arrangements are not between working chambers of the machine] [C0608]
- F04C15/00B8B . . . [N: Shaft sealings specially adapted for rotary-piston machines or pumps]
- F04C15/00C . [N: Systems for the equilibration of forces acting on the machines or pump (interstice adjustment other than by fluid pressure [F01C21/10B](#))]
- F04C15/00C2 . . [N: Internal leakage control]
- F04C15/00C4 . . [N: Equalization of pressure pulses (silencing for compressors [F04C29/06](#))] [M1109]
- F04C15/00D . [N: Venting means for starting]
- F04C15/00E . [N: Driving elements, brakes, couplings, transmission specially adapted for machines or pumps (brakes, couplings, transmissions per se [F16](#), [B60](#))]
- F04C15/00E2 . . [N: Means for transmitting movement from the prime mover to driven parts of the pump, e.g. clutches, couplings, transmissions]
- F04C15/00E2B . . . [N: for eccentric movement]
- F04C15/00E2D . . . [N: Magnetic couplings]
- F04C15/00E2F . . . [N: Couplings between rotors and input or output shafts acting by interengaging or mating parts, i.e. positive coupling of rotor and shaft] [N0008]
- F04C15/00E4 . . [N: Fixing rotors on shafts, e.g. by clamping together hub and shaft] [C0008]
- F04C15/00E6 . . [N: Prime movers]
- F04C15/00E8 . . [N: Brakes, braking assemblies] [N0605]
- F04C15/00F . [N: Lubrication (of machines or engines in general [F01M](#))]
- F04C15/00F2 . . [N: Control systems for the circulation of the lubricant]
- F04C15/00G . [N: Heating; Cooling (of machines or engines in general [F01P](#))]
- F04C15/06 . Arrangements for admission or discharge of the working fluid, e.g. constructional features of the inlet or outlet [N0509]
- F04C15/06B . . [N: Arrangements for supercharging the working space (similar arrangements for internal combustion engines [F02B33/00](#), [F02B37/00](#))] [N0509]
- F04C15/06D . . [N: with inlet and outlet valves specially adapted for rotary or oscillating piston machines or pumps] [N0509]
- F04C15/06D2 . . . [N: of the non-return type] [N0509]

F04C15/06D2B [N: of the elastic type, e.g. reed valves] [N0509]

F04C18/00

Rotary-piston pumps specially adapted for elastic fluids (with fluid ring or the like [F04C19/00](#); rotary-piston pumps in which the working-fluid is exclusively displaced by one or more reciprocating pistons [F04B](#)) [C0509]

Note

Group [F04C18/30](#) takes precedence over groups [F04C18/02](#) to [F04C18/28](#) and [F04C18/48](#) to [F04C18/56](#).

- F04C18/02 . . . 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
- F04C18/02B . . . [N: both members having co-operating elements in spiral form]
- F04C18/02B2 [N: where only one member is moving]
- F04C18/02B2B [N: with symmetrical double wraps]
- F04C18/02B4 [N: where both members are moving]
- F04C18/02B4B [N: with symmetrical double wraps]
- F04C18/02B6 [N: Details concerning the involute wraps or their base, e.g. geometry]
- F04C18/02B6B [N: Details concerning the base] [N1204]
- F04C18/02B6B2 [N: Details of the ports, e.g. location, number, geometry] [N1204]
- F04C18/02B6D [N: Details concerning the involute wraps] [N1204]
- F04C18/02B6D2 [N: Different wall heights] [N1204]
- F04C18/02B6D4 [N: Details of the wrap tips] [N1204]
- F04C18/02B6D6 [N: Ports or channels located in the wrap] [N1204]
- F04C18/04 . . . of internal-axis type
- F04C18/04B [N: having a C-shaped piston] [N1204]
- F04C18/06 . . . of other than internal-axis type
- F04C18/063 with coaxially-mounted members having continuously-changing circumferential spacing between them
- F04C18/067 having cam-and-follower type drive
- F04C18/07 having crankshaft-and-connecting-rod type drive
- F04C18/073 having pawl-and-ratchet type drive
- F04C18/077 having toothed-gearing type drive
- F04C18/08 . . . of intermeshing-engagement type, i.e. with engagement of co-operating members similar to that of toothed gearing
- F04C18/08B [N: Details specially related to intermeshing engagement type pumps]
- F04C18/08B2 [N: Toothed wheels]
- F04C18/08B4 [N: Carter]
- F04C18/08B6 [N: Elements in the toothed wheels or the carter for relieving the pressure of fluid imprisoned in the zones of engagement] [M1109]
- F04C18/10 . . . of internal-axis type with the outer member having more teeth or tooth equivalents, e.g. rollers, than the inner member
- F04C18/10C [N: with a crescent shaped filler element, located between the inner and outer intermeshing elements]
- F04C18/107 with helical teeth

- F04C18/107B [N: 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]
- F04C18/113 . . . the inner member carrying rollers intermeshing with the outer member
- F04C18/12 . . of other than internal-axis type
- F04C18/12B . . . [N: 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]
- F04C18/12D . . . [N: with radially from the rotor body extending elements, not necessarily co-operating with corresponding recesses in the other rotor, e.g. lobes, Roots type]
- F04C18/14 . . . with toothed rotary pistons
- F04C18/16 with helical teeth, e.g. chevron-shaped, screw type [N: (for non-parallel axes of movement [F04C18/48](#))] [C9604]
- F04C18/16B [N: having more than two rotary pistons with parallel axes] [N9604]
- F04C18/18 with similar tooth forms ([F04C18/16](#) takes precedence)
- F04C18/20 with dissimilar tooth forms ([F04C18/16](#) takes precedence)
- F04C18/22 . 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
- F04C18/24 . of counter-engagement type, i.e. the movement of co-operating members at the points of engagement being in opposite directions
- F04C18/26 . . of internal-axis type
- F04C18/28 . . of other than internal-axis type
- F04C18/30 . having the characteristics covered by two or more of groups [F04C18/02](#), [F04C18/08](#), [F04C18/22](#), [F04C18/24](#), [F04C18/48](#), or having the characteristics covered by one of these groups together with some other type of movement between co-operating members
- F04C18/32 . . having both the movement defined in group [F04C18/02](#) and relative reciprocation between the co-operating members
- F04C18/32A . . . [N: with vanes hinged to the inner member and reciprocating with respect to the inner member] [N1205]
- F04C18/32B . . . [N: with vanes hinged to the outer member and reciprocating with respect to the outer member] [N1205]
- F04C18/324 . . . with vanes hinged to the inner member and reciprocating with respect to the outer member
- F04C18/328 and hinged to the outer member
- F04C18/332 . . . with vanes hinged to the outer member and reciprocating with respect to the inner member
- F04C18/336 and hinged to the inner member
- F04C18/34 . . having the movement defined in group [F04C18/08](#) or [F04C18/22](#) and relative reciprocation between the co-operating members
- F04C18/344 . . . with vanes reciprocating with respect to the inner member
- F04C18/344B [N: the inner and outer member being in contact along one line or continuous surface substantially parallel to the axis of rotation]
- F04C18/344B2 [N: the surfaces of the inner and outer member, forming the inlet and outlet opening]
- F04C18/344B4 [N: with a separation element located between the inlet and outlet]

	opening]
F04C18/344B6	. . . . . [N: the vanes having the form of rollers, slippers or the like]
F04C18/344C	. . . . . [N: the inner and outer member being in contact along more than one line or surface]
F04C18/344C2	. . . . . [N: the vanes having the form of rollers, slippers or the like]
F04C18/344D	. . . . . [N: with axially movable vanes]
F04C18/348	. . . . . the vanes positively engaging, with circumferential play, an outer rotatable member
F04C18/352	. . . . . the vanes being pivoted on the axis of the outer member
F04C18/356	. . . . . with vanes reciprocating with respect to the outer member
F04C18/356B	. . . . . [N: the inner and outer member being in contact along one line or continuous surfaces substantially parallel to the axis of rotation]
F04C18/356B2	. . . . . [N: the surfaces of the inner and outer member, forming the working space, being surfaces of revolution]
F04C18/356C	. . . . . [N: the inner and outer member being in contact along more than line or surface]
F04C18/356D	. . . . . [N: with axially movable vanes]
F04C18/36	. . . . . having both the movement defined in groups F04C18/22 and F04C18/24
F04C18/38	. . . . . having the movement defined in group F04C18/02 and having a hinged member (F04C18/32 takes precedence)
F04C18/39	. . . . . with vanes hinged to the inner as well as to the outer member
F04C18/40	. . . . . having the movement defined in group F04C18/08 or F04C18/22 and having a hinged member
F04C18/44	. . . . . with vanes hinged to the inner member
F04C18/46	. . . . . with vanes hinged to the outer member
F04C18/48	. . . . . Rotary-piston pumps with non-parallel axes of movement of co-operating members
F04C18/50	. . . . . the axes being arranged at an angle of 90 degrees
F04C18/52	. . . . . of intermeshing engagement type, i.e. with engagement of co-operating members similar to that of toothed gearing
F04C18/54	. . . . . the axes being arranged otherwise than at an angle of 90 degrees
F04C18/56	. . . . . of intermeshing engagement type, i.e. with engagement of co-operating members similar to that of toothed gearing
F04C18/56B	. . . . . [N: the axes of cooperating members being on the same plane] [N9604]
F04C19/00	Rotary-piston pumps with fluid ring or the like, specially adapted for elastic fluids [C0509]
F04C19/00B	. . . . . [N: General arrangements, plants, flowsheets]
F04C19/00D	. . . . . [N: with rotating outer members]
F04C19/00F	. . . . . [N: Details concerning the operating liquid, e.g. nature, separation, cooling, cleaning, control of the supply]
F04C19/00H	. . . . . [N: Details concerning the admission or discharge]
F04C19/00H2	. . . . . [N: Port members in the form of side plates]

- F04C19/00H4 . . [N: Port members in the form of conical or cylindrical pieces situated in the centre of the impeller]

F04C21/00 Oscillating-piston pumps specially adapted for elastic fluids [C0509]

- F04C21/00B . [N: the piston oscillating around a fixed axis]
- F04C21/00C . [N: 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 [F04C18/48](#))]
- F04C21/00D . [N: the points of the moving element describing approximately an alternating movement in axial direction with respect to the other element]

F04C23/00 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 ([F04C25/00](#) takes precedence) [C0509]

[N: **Note**

Multi-stage pumps or compressors with stages connected in series or in parallel are not considered as having complementary function
]

- F04C23/00B . [N: of similar working principle] [C9410]
- F04C23/00B2 . . [N: having complementary function]
- F04C23/00C . [N: of dissimilar working principle] [C9410]
- F04C23/00C2 . . [N: having complementary function]
- F04C23/00D . [N: Hermetic pumps]

[N: **Note**

Multi-stage steam engines, motors, pumps or compressors with stages connected in series or in parallel are not considered as having complementary function
]

- F04C23/02 . Pumps characterised by combination with or adaptation to specific driving engines or motors (predominant aspects of the engines or motors, see the relevant classes)

F04C25/00 Adaptations of pumps for special use of pumps for elastic fluids [C0509]

- F04C25/02 . for producing high vacuum (sealing arrangements [F04C27/00](#); silencing [F04C29/06](#))

F04C27/00 Sealing arrangements in rotary-piston pumps specially adapted for elastic fluids [C0509]

- F04C27/00B . [N: Radial sealings for working fluid]
- F04C27/00B2 . . [N: of rigid material]
- F04C27/00B4 . . [N: of resilient material]
- F04C27/00B6 . . [N: Radial sealing elements specially adapted for intermeshing-engagement type]

pumps, e.g. gear pumps]

- F04C27/00C . [N: Axial sealings for working fluid]
- F04C27/00C2 . . [N: Elements specially adapted for sealing of the lateral faces of intermeshing-engagement type pumps, e.g. gear pumps]
- F04C27/00D . [N: Sealings for working fluid between radially and axially moving parts]
- F04C27/00E . [N: for other than working fluid, i.e. the sealing arrangements are not between working chambers of the machine] [C0608]
- F04C27/00E2 . . [N: Shaft sealings specially adapted for pumps]
- F04C27/02 . Liquid sealing for high-vacuum pumps [N: or for compressors]
- F04C28/00** **Control of, monitoring of, or safety arrangements for, pumps or pumping installations specially adapted for elastic fluids [N0509] [M1109]**
- F04C28/02 . specially adapted for several pumps connected in series or in parallel [N0509]
- F04C28/04 . specially adapted for reversible pumps [N0509]
- F04C28/06 . specially adapted for stopping, starting, idling or no-load operation [N0509]
- F04C28/06B . . [N: Capacity control using a multiplicity of units or pumping capacities, e.g. multiple chambers, individually switchable or controllable] [N0702]
- F04C28/08 . characterised by varying the rotational speed [N0509]
- F04C28/10 . characterised by changing the positions of the inlet or outlet openings with respect to the working chamber [N0509] [M1109]
- F04C28/12 . . using sliding valves [N0509]
- F04C28/12B . . . [N: with sliding valves controlled by the use of fluid other than the working fluid] [N0509]
- F04C28/14 . . using rotating valves [N0509]
- F04C28/16 . . using lift valves [N0509]
- F04C28/18 . characterised by varying the volume of the working chamber (by changing the positions of inlet or outlet openings F04C28/10) [N0509] [M1109]
- F04C28/18B . . [N: by varying the useful pumping length of the cooperating members in the axial direction] [N0605]
- F04C28/20 . . by changing the form of the inner or outer contour of the working chamber [N0509]
- F04C28/22 . . by changing the eccentricity between cooperating members [N0509]
- F04C28/24 . characterised by using valves regulating pressure or flow rate, e.g. discharge valves [N: unloading valves] (F04C28/10 takes precedence) [N0509]
- F04C28/26 . . using bypass channels [N0509]
- F04C28/26B . . . [N: being obtained by displacing a lateral sealing face] [N0509]
- F04C28/28 . Safety arrangements; Monitoring [N0509]
- F04C29/00** **Component parts, details or accessories of pumps or pumping installations, not**

provided for in groups [F04C18/00](#) to [F04C28/00](#)

- F04C29/00B . [N: Injection of a fluid in the working chamber for sealing, cooling and lubricating (sealing only [F04C27/00](#); lubrication only [F04C29/02](#); cooling [F02B47/02](#), [F02D21/00](#), [F02M25/00](#))]
- F04C29/00B2 . . [N: with control systems for the injection of the fluid]
- F04C29/00C . [N: Systems for the equilibration of forces acting on the pump] (interstice adjustment other than by fluid pressure [F01C21/10B](#))
- F04C29/00C2 . . [N: Internal leakage control]
- F04C29/00C4 . . [N: Equalization of pressure pulses (silencing [F04C29/06](#))]
- F04C29/00D . [N: Driving elements, brakes, couplings, transmissions specially adapted for pumps (brakes, couplings, transmissions per se [F16](#), [B60](#))]
- F04C29/00D2 . . [N: Means for transmitting movement from the prime mover to driven parts of the pump, e.g. clutches, couplings, transmissions]
- F04C29/00D2B . . . [N: for eccentric movement]
- F04C29/00D2D . . . [N: Magnetic couplings]
- F04C29/00D2F . . . [N: Couplings between rotors and input or output shafts acting by interengaging or mating parts, i.e. positive coupling of rotor and shaft] [N0107]
- F04C29/00D4 . . [N: Fixing rotors on shafts, e.g. by clamping together hub and shaft] [C0107]
- F04C29/00D6 . . [N: Prime movers]
- F04C29/00F . [N: Removing solid or liquid contaminants from the gas under pumping, e.g. by filtering or deposition; Purging; Scrubbing; Cleaning] [N9705]
- F04C29/02 . Lubrication (of machines or engines in general [F01M](#)); Lubricant separation (separation in general [B01D](#))
- F04C29/02B . . [N: Control systems for the circulation of the lubricant]
- F04C29/02C . . [N: Lubricant distribution through a hollow driving shaft ([F04C29/02D](#) takes precedence)]
- F04C29/02D . . [N: using a lubricant pump]
- F04C29/02E . . [N: Lubricant separation]
- F04C29/02F . . [N: Means for improving or restricting lubricant flow]
- F04C29/04 . Heating; Cooling (of machines or engines in general [F01P](#)); Heat insulation (heat insulation in general [F16L59/00](#))
- F04C29/04B . . [N: by injecting a fluid (injection of fluid for sealing, cooling or lubrication [F04C29/00B](#))] [N9807] [C9809]
- F04C29/04D . . [N: of the electric motor in hermetic pumps] [N9807]
- F04C29/04F . . [N: Cooling of electronic devices installed inside the pump housing, e.g. inverters]
- [N: **WARNING** [N1205]
- [N: WARNING this group is pending a reorganisation, see also [F04C29/04](#)]
- F04C29/06 . Silencing (gas-flow silencers or exhaust apparatus for machines or engines in general [F01N](#)) [N1205]

[N: **WARNING** [N1205]

[N: WARNING Subgroups [F04C29/06F](#) to [F04C29/06J](#) pending a reorganisation, see also [F04C29/06](#)

]

- F04C29/06F

 - · [N: Silencers using overlapping frequencies, e.g. Helmholtz resonators] [N1102] [N1205]
- F04C29/06G

 - · [N: Sound absorbing materials] [N1102] [N1205]
- F04C29/06H

 - · [N: Noise dampening volumes, e.g. muffler chambers] [N1102] [N1205]
- F04C29/06I

 - · · [N: with means to enclose the source of noise] [N1205]
- F04C29/06J

 - · [N: the silencing means being arranged inside the pump housing] [N1102] [N1205]
- F04C29/12

 - Arrangements for admission or discharge of the working fluid, e.g. constructional features of the inlet or outlet [N0509]
- F04C29/12B

 - · [N: Arrangements for supercharging the working space (similar arrangements for internal combustion engines [F02B33/00](#), [F02B37/00](#))] [N0509]
- F04C29/12D

 - · [N: with inlet and outlet valves specially adapted for rotary or oscillating piston pumps] [N0509]
- F04C29/12D2

 - · · [N: of the non-return type] [N0509]
- F04C29/12D2B

 - · · · [N: of the elastic type, e.g. reed valves] [N0509]