

**CPC****COOPERATIVE PATENT CLASSIFICATION****F01D**

**NON-POSITIVE DISPLACEMENT MACHINES OR ENGINES, e.g. STEAM TURBINES** (machines or engines for liquids [F03](#); non-positive displacement pumps [F04D](#))

**NOTES**

1. This subclass covers:
  - non-positive-displacement engines for elastic fluids, e.g. steam turbines;
  - non-positive-displacement engines for liquids and elastic fluids;
  - non-positive-displacement machines for elastic fluids;
  - non-positive-displacement machines for liquids and elastic fluids.
2. Attention is drawn to the Notes preceding class [F01](#), especially as regards the definitions of "reaction type", e.g. with airfoil-like blades, and "impulse type", e.g. bucket turbines.

**WARNING**

The following IPC groups are not used in the CPC system. Subject matter covered by these groups is classified in the following CPC groups:

[F01D 5/32](#) covered by [F01D 5/30](#)

**F01D 1/00**

**Non-positive-displacement machines or engines, e.g. steam turbines** (with working-fluid flows in opposite axial directions for balancing axial thrust [F01D 3/02](#); with other than pure rotation [F01D 23/00](#); turbines characterised by their use in special steam systems, cycles, or processes, regulating devices therefor [F01K](#))

**F01D 1/02**

- with stationary working-fluid guiding means and bladed or like rotor, {e.g. multi-bladed impulse steam turbines} ([F01D 1/24](#) takes precedence; without stationary working-fluid guiding means [F01D 1/18](#))

**F01D 1/023**

- {the working-fluid being divided into several separate flows ([F01D 3/02](#) takes precedence); several separate fluid flows being united in a single flow; the machine or engine having provision for two or more different possible fluid flow paths}

**F01D 1/026**

- {Impact turbines with buckets, i.e. impulse turbines e.g. Pelton turbines ([F01D 1/16](#), [F01D 1/34](#) take precedence)}

**F01D 1/04**

- traversed by the working-fluid substantially axially

**F01D 1/06**

- traversed by the working-fluid substantially radially

**F01D 1/08**

- having inward flow

**F01D 1/10**

- having two or more stages subjected to working-fluid flow without essential intermediate pressure change, i.e. with velocity stages ([F01D 1/12](#) takes precedence)

**F01D 1/12**

- with repeated action on same blade ring

**F01D 1/14**

- traversed by the working-fluid substantially radially

**F01D 1/16**

- characterised by having both reaction stages and impulse stages

**F01D 1/18**

- without stationary working-fluid guiding means; ([F01D 1/24](#), [F01D 1/32](#), [F01D 1/34](#) take precedence; {with pressure-velocity transformation exclusively in rotor [F01D 1/32](#)})

**F01D 1/20**

- traversed by the working-fluid substantially axially

- F01D 1/22
  - . . traversed by the working-fluid substantially radially
- F01D 1/24
  - characterised by counter-rotating rotors subjected to same working fluid stream without intermediate stator blades or the like
- F01D 1/26
  - . . traversed by the working-fluid substantially axially
- F01D 1/28
  - . . traversed by the working-fluid substantially radially
- F01D 1/30
  - characterised by having a single rotor operable in either direction of rotation, e.g. by reversing of blades ([combinations of machines or engines F01D 13/00](#))
- F01D 1/32
  - with pressure velocity transformation exclusively in rotor, e.g. the rotor rotating under the influence of jets issuing from the rotor, {e.g. [Heron turbines \(the working fluid being a combustion products F02C 3/165; jet propulsion plants per se F02K\)](#)}
- F01D 1/34
  - characterised by non-bladed rotor, e.g. with drilled holes ([F01D 1/32](#) takes precedence; [sirens G10K 7/00](#) {impact turbines with buckets [F01D 1/026](#); hand-held tools with a non-bladed rotor [F01D 15/067](#)})
- F01D 1/36
  - . . using fluid friction
- F01D 1/38
  - . . of the screw type
- F01D 3/00**

**Machines or engines with axial-thrust balancing effected by working-fluid**
- F01D 3/02
  - characterised by having one fluid flow in one axial direction and another fluid flow in the opposite direction
- F01D 3/025
  - . . {with a centrally disposed radial stage}
- F01D 3/04
  - axial thrust being compensated by thrust-balancing dummy piston or the like
- F01D 5/00**

**Blades; Blade-carrying members ([nozzle boxes F01D 9/02](#)); Heating, heat-insulating, cooling or anti-vibration means on the blades or the members {(special arrangements in rotors dealing with breaking off of part thereof [F01D 21/045](#))}**
- F01D 5/005
  - {Repairing methods or devices}
- F01D 5/02
  - Blade-carrying members, e.g. rotors ([rotors of non-bladed type F01D 1/34](#); [stators F01D 9/00](#) {selecting particular materials [F01D 5/28](#)})
- F01D 5/021
  - . . {for flow machines or engines with only one axial stage (for more than one stage [F01D 5/06](#))}
- F01D 5/022
  - . . {with concentric rows of axial blades}
- F01D 5/023
  - . . {of the screw type}
- F01D 5/025
  - . . {Fixing blade carrying members on shafts (attachment of a member on a shaft in general [F16D 1/06](#); for non-positive displacement pumps [F04D 29/00](#))}
- F01D 5/026
  - . . {Shaft to shaft connections}
- F01D 5/027
  - . . {Arrangements for balancing (for balancing rotating bodies in general [F16F 15/32](#); for compensating unbalance [G01M 1/36](#))}
- F01D 5/028
  - . . {the rotor disc being formed of sheet laminae (rotor blade aggregates of unitary construction [F01D 5/34](#))}
- F01D 5/03
  - . . Annular blade-carrying members having blades on the inner periphery of the annulus and extending inwardly radially, i.e. inverted rotors
- F01D 5/04
  - . . for radial-flow machines or engines
- F01D 5/041
  - . . . {of the [Ljungström](#) type}

- F01D 5/043 . . . {of the axial inlet- radial outlet, or vice-versa, type}
- F01D 5/045 . . . . {the wheel comprising two adjacent bladed wheel portions e.g. with interengaging blades for damping vibrations}
- F01D 5/046 . . . . {Heating, heat insulation or cooling means}
- F01D 5/048 . . . . {Form or construction}
- F01D 5/06 . . Rotors for more than one axial stage, e.g. of drum or multiple disc type; Details thereof, e.g. shafts, shaft connections {(F01D 5/022, F01D 5/023 take precedence)}
- F01D 5/063 . . . {Welded rotors (welding per se B23K)}
- F01D 5/066 . . . {Connecting means for joining rotor-discs or rotor-elements together, e.g. by a central bolt, by clamps}
- F01D 5/08 . . Heating, heat-insulating or cooling means {(specially adapted for radial flow machines or engines F01D 5/04)}
- F01D 5/081 . . . {Cooling fluid being directed on the side of the rotor disc or at the roots of the blades (F01D 5/087 takes precedence)}
- F01D 5/082 . . . . {on the side of the rotor disc}
- F01D 5/084 . . . . {the fluid circulating at the periphery of a multistage rotor, e.g. of drum type}
- F01D 5/085 . . . {cooling fluid circulating inside the rotor}
- F01D 5/087 . . . . {in the radial passages of the rotor disc}
- F01D 5/088 . . . . {in a closed cavity}
- F01D 5/10 . . Anti- vibration means {(specially adapted for radial flow machines or engines F01D 5/04)}
- F01D 5/12 . . Blades {(specially adapted for radial flow machines or engines F01D 5/04}; blade roots F01D 5/30; rotors with blades adjustable in operation F01D 7/00; stator blades F01D 9/02)}
- F01D 5/14 . . Form or construction (selecting particular materials, measures against erosion or corrosion F01D 5/28)
- F01D 5/141 . . . {Shape, i.e. outer, aerodynamic form (F01D 5/148 to F01D 5/20 take precedence; blade construction F01D 5/147)}
- F01D 5/142 . . . . {of the blades of successive rotor or stator blade-rows}
- F01D 5/143 . . . . . {Contour of the outer or inner working fluid flow path wall, i.e. shroud or hub contour}
- F01D 5/145 . . . . {Means for influencing boundary layers or secondary circulations (for compressors F04D 29/68)}
- F01D 5/146 . . . . {of blades with tandem configuration, split blades or slotted blades}
- F01D 5/147 . . . {Construction, i.e. structural features, e.g. of weight-saving hollow blades (F01D 5/148, F01D 5/16 and F01D 5/20 take precedence; blade shape F01D 5/141; blades with cooling or heating channels or cavities F01D 5/18; heating, heat-insulating or cooling means on blades F01D 5/18)}
- F01D 5/148 . . . {Blades with variable camber, e.g. by ejection of fluid}
- F01D 5/16 . . . for counteracting blade vibration
- F01D 5/18 . . . Hollow blades, {i.e. blades with cooling or heating channels or cavities (structure of hollow blades in general F01D 5/147)}; Heating, heat-insulating or cooling means on blades

- F01D 5/181 . . . . {Blades having a closed internal cavity containing a cooling medium, e.g. sodium}
- F01D 5/182 . . . . {Transpiration cooling}
- F01D 5/183 . . . . . {Blade walls being porous}
- F01D 5/184 . . . . . {Blade walls being made of perforated sheet laminae}
- F01D 5/185 . . . . {Liquid cooling ([F01D 5/181](#) takes precedence)}
- F01D 5/186 . . . . {Film cooling ([F01D 5/187](#) takes precedence)}
- F01D 5/187 . . . . {Convection cooling}
- F01D 5/188 . . . . . {with an insert in the blade cavity to guide the cooling fluid, e.g. forming a separation wall}
- F01D 5/189 . . . . . . {the insert having a tubular cross-section, e.g. airfoil shape}
- F01D 5/20 . . . Specially-shaped blade tips to seal space between tips and stator  
{([F01D 5/225](#) takes precedence)}
- F01D 5/22 . . Blade-to-blade connections, {e.g. for damping vibrations}
- F01D 5/225 . . . {by shrouding}
- F01D 5/24 . . . using wire or the like
- F01D 5/26 . . Antivibration means not restricted to blade form or construction or to blade-to-blade connections {or to the use of particular materials}
- F01D 5/28 . . Selecting particular materials; {Particular measures relating thereto;}  
Measures against erosion or corrosion
- F01D 5/282 . . . {Selecting composite materials, e.g. blades with reinforcing filaments}
- F01D 5/284 . . . {Selection of ceramic materials}
- F01D 5/286 . . . {Particular treatment of blades, e.g. to increase durability or resistance against corrosion or erosion ([F01D 5/288](#) takes precedence)}
- F01D 5/288 . . . {Protective coatings for blades}
- F01D 5/30 . . Fixing blades to rotors; Blade roots; {Blade spacers}
- F01D 5/3007 . . {of axial insertion type}
- F01D 5/3015 . . . {with side plates}
- F01D 5/3023 . . {of radial insertion type, e.g. in individual recesses}
- F01D 5/303 . . . {in a circumferential slot}
- F01D 5/3038 . . . . {the slot having inwardly directed abutment faces on both sides}
- F01D 5/3046 . . . {the rotor having ribs around the circumference}
- F01D 5/3053 . . {by means of pins}
- F01D 5/3061 . . {by welding, brazing}
- F01D 5/3069 . . {between two discs or rings}
- F01D 5/3076 . . {Sheet metal discs}
- F01D 5/3084 . . {the blades being made of ceramics}
- F01D 5/3092 . . {Protective layers between blade root and rotor disc surfaces, e.g. anti-friction layers ([F01D 5/288](#) takes precedence)}
- F01D 5/32 . . Locking, e.g. by final locking blades or keys
- F01D 5/323 . . {Locking of axial insertion type blades by means of a key or the like parallel to the axis of the rotor}

F01D 5/326	<ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li>{Locking of axial insertion type blades by other means}</li> </ul> </li> </ul>
F01D 5/34	<ul style="list-style-type: none"> <li>Rotor-blade aggregates of unitary construction {e.g. formed of sheet laminae; (discs formed of sheet laminae <a href="#">F01D 5/028</a>; Ceramic materials <a href="#">F01D 5/284</a>, composite materials <a href="#">F01D 5/282</a>)}</li> </ul>
<b>F01D 7/00</b>	<b>Rotors with blades adjustable in operation; Control thereof (for reversing <a href="#">F01D 1/30</a>)</b>
F01D 7/02	<ul style="list-style-type: none"> <li>having adjustment responsive to speed</li> </ul>
<b>F01D 9/00</b>	<b>Stators (non-fluid guiding aspects of casings, regulating, controlling, or safety aspects, see the relevant groups)</b>
F01D 9/02	<ul style="list-style-type: none"> <li>Nozzles; Nozzle boxes; Stator blades; Guide conduits {e.g. individual nozzles (nozzle boxes <a href="#">F01D 9/047</a>)}</li> </ul>
F01D 9/023	<ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li>{Transition ducts between combustor cans and first stage of the turbine in gas-turbine engines; their cooling or sealings}</li> </ul> </li> </ul>
F01D 9/026	<ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li>{Scrolls for radial machines or engines}</li> </ul> </li> </ul>
F01D 9/04	<ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li>forming ring or sector</li> </ul> </li> </ul>
F01D 9/041	<ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li>{using blades (<a href="#">F01D 5/148</a> takes precedence)}</li> </ul> </li> </ul> </li> </ul>
F01D 9/042	<ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li>{fixing blades to stators (fixing stator-rings in the casing or to each other <a href="#">F01D 25/246</a>)}</li> </ul> </li> </ul> </li> </ul>
F01D 9/044	<ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li>{permanently, e.g. by welding, brazing, casting or the like}</li> </ul> </li> </ul> </li> </ul> </li> </ul>
F01D 9/045	<ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li>{for radial flow machines or engines}</li> </ul> </li> </ul> </li> </ul>
F01D 9/047	<ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li>{Nozzle boxes}</li> </ul> </li> </ul> </li> </ul>
F01D 9/048	<ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li>{for radial admission}</li> </ul> </li> </ul> </li> </ul>
F01D 9/06	<ul style="list-style-type: none"> <li>Fluid supply conduits to nozzles or the like</li> </ul>
F01D 9/065	<ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li>{Fluid supply or removal conduits traversing the working fluid flow, e.g. for lubrication-, cooling-, or sealing fluids (see also <a href="#">F01D 25/16</a>, <a href="#">F01D 25/24</a> and <a href="#">F01D 25/26</a>)}</li> </ul> </li> </ul>
<b>F01D 11/00</b>	<b>Preventing or minimising internal leakage of working-fluid, e.g. between stages (sealings in general <a href="#">F16J</a> {sealing arrangements for transition ducts of combustor cans <a href="#">F01D 9/023</a>})</b>
F01D 11/001	<ul style="list-style-type: none"> <li>{for sealing space between stator blade and rotor}</li> </ul>
F01D 11/003	<ul style="list-style-type: none"> <li>{by packing rings; Mechanical seals}</li> </ul>
F01D 11/005	<ul style="list-style-type: none"> <li>{Sealing means between non relatively rotating elements}</li> </ul>
F01D 11/006	<ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li>{Sealing the gap between rotor blades or blades and rotor}</li> </ul> </li> </ul>
F01D 11/008	<ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li>{by spacer elements between the blades, e.g. independent interblade platforms}</li> </ul> </li> </ul> </li> </ul>
F01D 11/02	<ul style="list-style-type: none"> <li>by non-contact sealings, e.g. of labyrinth type (for sealing space between rotor blade tips and stator <a href="#">F01D 11/08</a>)</li> </ul>
F01D 11/025	<ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li>{Seal clearance control; Floating assembly; Adaptation means to differential thermal dilatations}</li> </ul> </li> </ul>
F01D 11/04	<ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li>using sealing fluid, e.g. steam</li> </ul> </li> </ul>
F01D 11/06	<ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li>Control thereof</li> </ul> </li> </ul> </li> </ul>

- F01D 11/08
  - for sealing space between rotor blade tips and stator ([specially-shaped blade tips therefor F01D 5/20](#))
- F01D 11/10
  - . using sealing fluid, e.g. steam
- F01D 11/12
  - . using a rubstrip, e.g. erodible. deformable or resiliently-biased part
- F01D 11/122
  - . . {with erodable or abradable material ([blades having cutting or grinding tips F01D 5/20](#))}
- F01D 11/125
  - . . . {with a reinforcing structure}
- F01D 11/127
  - . . . {with a deformable or crushable structure, e.g. honeycomb}
- F01D 11/14
  - . Adjusting or regulating tip-clearance, i.e distance between rotor-blade tips and stator casing ([rotors with blades adjustable in operation F01D 7/00](#))
- F01D 11/16
  - . . by self-adjusting means ([F01D 11/12 takes precedence](#))
- F01D 11/18
  - . . . using stator or rotor components with predetermined thermal response, e.g. selective insulation, thermal inertia, differential expansion
- F01D 11/20
  - . . . Actively adjusting tip-clearance
- F01D 11/22
  - . . . . by mechanically actuating the stator or rotor components, e.g. moving shroud sections relative to the rotor
- F01D 11/24
  - . . . . by selectively cooling-heating stator or rotor components
- F01D 13/00**

**Combinations of two or more machines or engines** ([F01D 15/00 takes precedence; regulating or controlling, see the relevant groups; combinations of two or more pumps F04; fluid gearing F16H](#))
- F01D 13/003
  - {with at least two independent shafts, i.e. cross-compound}
- F01D 13/006
  - {one being a reverse turbine}
- F01D 13/02
  - Working-fluid interconnection of machines or engines
- F01D 15/00**

**Adaptations of machines or engines for special use; Combinations of engines with devices driven thereby** ([regulating or controlling see the relevant groups; aspects predominantly concerning driven devices, see the relevant classes for the devices](#))
- F01D 15/005
  - {Adaptations for refrigeration plants}
- F01D 15/02
  - Adaptations for driving vehicles, e.g. locomotives ([arrangement in vehicles, see the relevant vehicle classes](#))
- F01D 15/04
  - . the vehicles being waterborne vessels
- F01D 15/045
  - . . {Control thereof}
- F01D 15/06
  - Adaptations for driving, or combinations with, hand-held tools or the like {control thereof}
- F01D 15/062
  - . {Controlling means specially adapted therefor}
- F01D 15/065
  - . {with pressure-velocity transformation exclusively in rotor}
- F01D 15/067
  - . {characterised by non-bladed rotor}
- F01D 15/08
  - Adaptations for driving, or combinations with, pumps
- F01D 15/10
  - Adaptations for driving, or combinations with, electric generators
- F01D 15/12
  - Combinations with mechanical gearing ([driven by multiple engines F01D 13/00](#))

<b>F01D 17/00</b>	<b>Regulating or controlling by varying flow</b> (for reversing <a href="#">F01D 1/30</a> ; by varying rotor-blade position <a href="#">F01D 7/00</a> ; specially for starting <a href="#">F01D 19/00</a> ; shutting-down <a href="#">F01D 21/00</a> ; regulating or controlling in general <a href="#">G05</a> {specially adapted for hand-held tools or the like <a href="#">F01D 15/06</a> })
<a href="#">F01D 17/02</a>	<ul style="list-style-type: none"> <li>Arrangement of sensing elements (sensing elements per se: see the relevant subclasses)</li> </ul>
<a href="#">F01D 17/04</a>	<ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li>responsive to load</li> </ul> </li> </ul>
<a href="#">F01D 17/06</a>	<ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li>responsive to speed</li> </ul> </li> </ul>
<a href="#">F01D 17/08</a>	<ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li>responsive to condition of working-fluid, e.g. pressure</li> </ul> </li> </ul>
<a href="#">F01D 17/085</a>	<ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li>{to temperature}</li> </ul> </li> </ul> </li> </ul>
<a href="#">F01D 17/10</a>	<ul style="list-style-type: none"> <li>Final actuators (valves in general <a href="#">F16K</a> {blades with variable camber <a href="#">F01D 5/148</a>})</li> </ul>
<a href="#">F01D 17/105</a>	<ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li>{by passing part of the fluid}</li> </ul> </li> </ul>
<a href="#">F01D 17/12</a>	<ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li>arranged in stator parts</li> </ul> </li> </ul>
<a href="#">F01D 17/14</a>	<ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li>varying effective cross-sectional area of nozzles or guide conduits</li> </ul> </li> </ul> </li> </ul>
<a href="#">F01D 17/141</a>	<ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li>{by means of shiftable members or valves obturating part of the flow path}</li> </ul> </li> </ul> </li> </ul> </li> </ul>
<a href="#">F01D 17/143</a>	<ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li>{the shiftable member being a wall, or part thereof of a radial diffuser}</li> </ul> </li> </ul> </li> </ul> </li> </ul> </li> </ul>
<a href="#">F01D 17/145</a>	<ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li>{by means of valves, e.g. for steam turbines (valves in general <a href="#">F16K</a>})</li> </ul> </li> </ul> </li> </ul> </li> </ul> </li> </ul>
<a href="#">F01D 17/146</a>	<ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li>{by throttling the volute inlet of radial machines or engines}</li> </ul> </li> </ul> </li> </ul> </li> </ul> </li> </ul>
<a href="#">F01D 17/148</a>	<ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li>{by means of rotatable members, e.g. butterfly valves}</li> </ul> </li> </ul> </li> </ul> </li> </ul> </li> </ul>
<a href="#">F01D 17/16</a>	<ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li>by means of nozzle vanes</li> </ul> </li> </ul> </li> </ul> </li> </ul> </li> </ul>
<a href="#">F01D 17/162</a>	<ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li>{for axial flow; i.e. the vanes turning around axes which are essentially perpendicular to the rotor centre line (<a href="#">F01D 17/167</a> takes precedence)}</li> </ul> </li> </ul> </li> </ul> </li> </ul> </li> </ul> </li> </ul>
<a href="#">F01D 17/165</a>	<ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li>{for radial flow; i.e. the vanes turning around axes which are essentially parallel to the rotor centre line (<a href="#">F01D 17/167</a> takes precedence)}</li> </ul> </li> </ul> </li> </ul> </li> </ul> </li> </ul> </li> </ul>
<a href="#">F01D 17/167</a>	<ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li>{of vanes moving in translation}</li> </ul> </li> </ul> </li> </ul> </li> </ul> </li> </ul> </li> </ul>
<a href="#">F01D 17/18</a>	<ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li>varying effective number of nozzles or guide conduits {e.g. sequentially operable valves for steam turbines}</li> </ul> </li> </ul> </li> </ul> </li> </ul> </li> </ul>
<a href="#">F01D 17/20</a>	<ul style="list-style-type: none"> <li>Devices dealing with sensing elements or final actuators or transmitting means between them, e.g. power-assisted (sensing elements alone <a href="#">F01D 17/02</a>; final actuators alone <a href="#">F01D 17/10</a>)</li> </ul>
<a href="#">F01D 17/205</a>	<ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li>{Centrifugal governors directly linked to valves}</li> </ul> </li> </ul>
<a href="#">F01D 17/22</a>	<ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li>the operation or power assistance being predominantly non-mechanical</li> </ul> </li> </ul>
<a href="#">F01D 17/24</a>	<ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li>electrical</li> </ul> </li> </ul> </li> </ul>
<a href="#">F01D 17/26</a>	<ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li>fluid, e.g. hydraulic</li> </ul> </li> </ul> </li> </ul>
<b>F01D 19/00</b>	<b>Starting of machines or engines; Regulating, controlling, or safety means in connection therewith</b> (warming-up before starting <a href="#">F01D 25/10</a> ; turning or inching gear <a href="#">F01D 25/34</a> )
<a href="#">F01D 19/02</a>	<ul style="list-style-type: none"> <li>dependent on temperature of component parts, e.g. of turbine-casing</li> </ul>



<b>F01D 21/00</b>	<b>Shutting-down of machines or engines, e.g. in emergency; Regulating, controlling, or safety means not otherwise provided for</b>
F01D 21/003	<ul style="list-style-type: none"> <li>• {Arrangements for testing or measuring (for measuring vibrations <a href="#">G01H</a>)}</li> </ul>
F01D 21/006	<ul style="list-style-type: none"> <li>• {Arrangements of brakes (brakes per se <a href="#">F16D</a>)}</li> </ul>
F01D 21/02	<ul style="list-style-type: none"> <li>• Shutting-down responsive to overspeed</li> </ul>
F01D 21/04	<ul style="list-style-type: none"> <li>• responsive to undesired position of rotor relative to stator {or to breaking-off of a part of the rotor}, e.g. indicating such position</li> </ul>
F01D 21/045	<ul style="list-style-type: none"> <li>• . {special arrangements in stators or in rotors dealing with breaking-off of part of rotor}</li> </ul>
F01D 21/06	<ul style="list-style-type: none"> <li>• . Shutting-down</li> </ul>
F01D 21/08	<ul style="list-style-type: none"> <li>• . Restoring position</li> </ul>
F01D 21/10	<ul style="list-style-type: none"> <li>• responsive to unwanted deposits on blades, in working-fluid conduits or the like</li> </ul>
F01D 21/12	<ul style="list-style-type: none"> <li>• responsive to temperature</li> </ul>
F01D 21/14	<ul style="list-style-type: none"> <li>• responsive to other specific conditions</li> </ul>
F01D 21/16	<ul style="list-style-type: none"> <li>• Trip gear</li> </ul>
F01D 21/18	<ul style="list-style-type: none"> <li>• . involving hydraulic means</li> </ul>
F01D 21/20	<ul style="list-style-type: none"> <li>• Checking operation of shut-down devices</li> </ul>
<b>F01D 23/00</b>	<b>Non-positive-displacement machines or engines with movement other than pure rotation, e.g. of endless-chain type</b>
<b>F01D 25/00</b>	<b>Component parts, details, or accessories, not provided for in, or of interest apart from, other groups</b>
F01D 25/002	<ul style="list-style-type: none"> <li>• {Cleaning of turbomachines}</li> </ul>
F01D 25/005	<ul style="list-style-type: none"> <li>• {Selecting particular materials}</li> </ul>
F01D 25/007	<ul style="list-style-type: none"> <li>• {Preventing corrosion}</li> </ul>
F01D 25/02	<ul style="list-style-type: none"> <li>• De-icing means for engines having icing phenomena</li> </ul>
F01D 25/04	<ul style="list-style-type: none"> <li>• Antivibration arrangements</li> </ul>
F01D 25/06	<ul style="list-style-type: none"> <li>• . for preventing blade vibration (means on blade-carrying members or blades <a href="#">F01D 5/00</a>)</li> </ul>
F01D 25/08	<ul style="list-style-type: none"> <li>• Cooling (of machines or engines in general <a href="#">F01P</a>); Heating; Heat-insulation (of blade-carrying members, of blades <a href="#">F01D 5/00</a>)</li> </ul>
F01D 25/10	<ul style="list-style-type: none"> <li>• . Heating, e.g. warming-up before starting</li> </ul>
F01D 25/12	<ul style="list-style-type: none"> <li>• . Cooling</li> </ul>
F01D 25/125	<ul style="list-style-type: none"> <li>• . . {of bearings}</li> </ul>
F01D 25/14	<ul style="list-style-type: none"> <li>• . Casings modified therefor (double casings <a href="#">F01D 25/26</a>)</li> </ul>
F01D 25/145	<ul style="list-style-type: none"> <li>• . . {Thermally insulated casings}</li> </ul>
F01D 25/16	<ul style="list-style-type: none"> <li>• Arrangement of bearings; Supporting or mounting bearings in casings (bearings per se <a href="#">F16C</a>)</li> </ul>
F01D 25/162	<ul style="list-style-type: none"> <li>• . {Bearing supports}</li> </ul>
F01D 25/164	<ul style="list-style-type: none"> <li>• . . {Flexible supports; Vibration damping means associated with the bearing}</li> </ul>
F01D 25/166	<ul style="list-style-type: none"> <li>• . {Sliding contact bearing (gas bearings <a href="#">F01D 25/22</a>)}</li> </ul>



- F01D 25/168 . . . {for axial load mainly}
- F01D 25/18 . Lubricating arrangements (of machines or engines in general [F01M](#))
- F01D 25/183 . . {Sealing means}
- F01D 25/186 . . . {for sliding contact bearing}
- F01D 25/20 . . using lubrication pumps
- F01D 25/22 . . using working-fluid or other gaseous fluid as lubricant
- F01D 25/24 . Casings (modified for heating or cooling [F01D 25/14](#)); Casing parts, e.g. diaphragms, casing fastenings (casings for rotary machines or engines in general [F16M](#) {special arrangements in stators dealing with breaking-off of part of rotor [F01D 21/045](#)})
- F01D 25/243 . . {Flange connections; Bolting arrangements ([F01D 25/265](#) takes precedence)}
- F01D 25/246 . . {Fastening of diaphragms or stator-rings}
- F01D 25/26 . . Double casings; Measures against temperature strain in casings
- F01D 25/265 . . . {Vertically split casings; Clamping arrangements therefor}
- F01D 25/28 . Supporting or mounting arrangements, e.g. for turbine casing
- F01D 25/285 . . {Temporary support structures, e.g. for testing, assembling, installing, repairing; Assembly methods using such structures}
- F01D 25/30 . Exhaust heads, chambers, or the like
- F01D 25/305 . . {with fluid, e.g. liquid injection}
- F01D 25/32 . Collecting of condensation water; Drainage {Removing solid particles}
- F01D 25/34 . Turning or inching gear
- F01D 25/36 . . using electric motors