ECLA EUROPEAN CLASSIFICATION

F02C GAS-TURBINE PLANTS; AIR INTAKES FOR JET-PROPULSION PLANTS; CONTROLLING FUEL SUPPLY IN AIR-BREATHING JET-PROPULSION PLANTS (construction of turbines F01D; jet-propulsion plants F02K; construction of compressors or fans F04; gas-turbine combustion chambers F23R; using gas turbines in compression refrigeration plants F25B11/00; using gas-turbine plants in vehicles, see the relevant vehicle classes)

Notes

1. This subclass covers:

- combustion product or hot gas turbine plants;
- internal combustion turbines or turbine plants;
- turbine plants in which the working fluid is an unheated, pressurised gas.

2. This subclass does not cover:

- steam turbine plants, which are covered by subclass F01K;
- special vapour plants, which are covered by subclass F01K.
- [N: combined cycle plants, which are covered by subclass F01K 23/00]

3. In this subclass, the following expression is used with the meaning indicated:

- "gas-turbine plants" covers all the subject matter of Note (1) above and covers also features of jet-propulsion plants common to gas-turbine plants.

4. Attention is drawn to the Notes preceding class F01.

F02C1/00 **Gas-turbine plants characterised by the use of hot gases or unheated pressurised gases, as the working fluid** (by the use of combustion product F02C3/00, F02C5/00)

F02C1/00B . [N: using an auxiliary fluid]
F02C1/00B2 . . [N: being recirculated]

F02C1/00D . [N: combination of cycles]

F02C1/02 . the working fluid being an unheated pressurised gas

F02C1/04 . the working fluid being heated indirectly [N: (in a fluidised-bed combustor F02C3/20F)]
F02C1/05 . . characterised by the type or source of heat, e.g. using nuclear or solar energy
F02C1/06 . . . using reheated exhaust gas (F02C1/08 takes precedence)
F02C1/08 . . Semi-closed cycles
F02C1/10 . . Closed cycles

F02C1/10C . . . [N: construction; details]

F02C3/00 **Gas-turbine plants characterised by the use of combustion products as the working fluid** (generated by intermittent combustion F02C5/00)

F02C3/02 . using exhaust-gas pressure in a pressure exchanger to compress combustion-air (pressure exchangers per se F04F13/00) [C0903]

F02C3/04 . having a turbine driving a compressor (power transmission arrangements F02C7/36; control of working fluid flow F02C9/16)

F02C3/045 . . having compressor and turbine passages in a single rotor-module (F02C3/073 takes precedence)

F02C3/05 . . . the compressor and the turbine being of the radial flow type

F02C3/055 . . the compressor being of the positive-displacement type

F02C3/06 . . the compressor comprising only axial stages (F02C3/10 takes precedence)

F02C3/06B . . . [N: the turbine being of the radial-flow type]

F02C3/06C . . . [N: the compressor having concentric stages]

F02C3/067 . . . having counter-rotating rotors (F02C3/073 takes precedence)

F02C3/073 . . . the compressor and turbine stages being concentric

F02C3/08 . . the compressor comprising at least one radial stage (F02C3/10 takes precedence)

F02C3/08C . . . [N: the turbine being of the radial-flow type (radial-radial) (F02C3/05 takes precedence)]

F02C3/09 . . . of the centripetal type

F02C3/10 . . with another turbine driving an output shaft but not driving the compressor

F02C3/10B . . . [N: the compressor being of the centrifugal type]

F02C3/107 . . with two or more rotors connected by power transmission

F02C3/113 . . . with variable power transmission between rotors

F02C3/13 . . having variable working fluid interconnections between turbines or compressors or stages of different rotors [N: (controlling flow ratio between different flows of multi-flow jet-propulsion plant, e.g. ducted fan F02K3/075)]

F02C3/14 . characterised by the arrangement of the combustion chamber in the plant (combustion chambers per se F23R; F02C3/20F takes precedence)

F02C3/14B . . [N: the combustion chamber being in the reverse flow-type]

F02C3/16 . . the combustion chambers being formed at least partly in the turbine rotor [N: or in an other rotating part of the plant]

F02C3/16B . . . [N: the combustion chamber contributes to the driving force by creating reactive thrust]

F02C3/20 . using a special fuel, oxidant, or dilution fluid to generate the combustion products

F02C3/20F . . [N: in a fluidised-bed combustor (in combination with a steam cycle see F01K23/06B; fluidised-bed apparatus in general B01J8/18; fluidised-bed combustors in general F23C11/02)]

F02C3/22 . . the fuel or oxidant being gaseous at standard temperature and pressure (F02C3/28 takes precedence)

F02C3/24 . . the fuel or oxidant being liquid at standard temperature and pressure

F02C3/26 . . the fuel or oxidant being solid or pulverulent, e.g. in slurry or suspension

F02C3/28 . . . using a separate gas producer for gasifying the fuel before combustion

F02C3/30 . . Adding water, steam or other fluids [N: for influencing combustion, e.g. to obtain cleaner exhaust gases (F02C7/141, F02C7/30, F01D21/00, F01K21/04, F23D11/10 take precedence)]

F02C3/30B . . . [N: Increasing the power, speed, torque or efficiency of a gas turbine or the thrust of a turbojet engine by injecting or adding water, steam or other fluids (F01K21/04 takes precedence)]

F02C3/32 . Inducing air flow by fluid jet, e.g. ejector action

F02C3/34 . with recycling of part of the working fluid, i.e. semi-closed cycles with combustion products in the closed part of the cycle

F02C3/36 . Open cycles

F02C3/36B . . [N: a part of the compressed air being burned, the other part being heated indirectly (in a fluidised-bed combustor F02C3/20F)]

F02C5/00 **Gas-turbine plants characterised by the working fluid being generated by intermittent combustion**

F02C5/02 . characterised by the arrangement of the combustion chamber in the chamber in the plant (combustion chambers per se F23R)

F02C5/04 . . the combustion chambers being formed at least partly in the turbine rotor

F02C5/06 . the working fluid being generated in an internal-combustion gas generated of the positive-displacement type having essentially no mechanical power output (internal-combustion engines with prolonged expansion using exhaust gas turbines F02B)

F02C5/08 . . the gas generator being of the free-piston type

F02C5/10 . the working fluid forming a resonating or oscillating gas column, i.e. the combustion chambers having no positively actuated valves, e.g. using Helmholtz effect

F02C5/11 . . using valveless combustion chambers

F02C5/12 . the combustion chambers having inlet or outlet valves, e.g. Holzwarth gas-turbine plants

F02C6/00 **Plural gas-turbine plants; Combinations of gas-turbine plants with other apparatus (aspects predominantly concerning such apparatus, see the relevant classes for the apparatus); Adaptations of gas- turbine plants for special use**

F02C6/00B . [N: Gas-turbine plants with heaters between turbine stages]

F02C6/00F . [N: Open cycle gas-turbine in which the working fluid is expanded to a pressure below the atmospheric pressure and then compressed to atmosperic pressure]

F02C6/02 . Plural gas-turbine plants having a common power output

F02C6/04 . Gas-turbine plants providing heated or pressurised working fluid for other apparatus, e.g. without mechanical power output (F02C6/18 takes precedence; [N: for a fluidised-bed combustor F02C3/20F])

F02C6/06 . . providing compressed gas (F02C6/10 takes precedence)
F02C6/08 . . . the gas being bled from the gas-turbine compressor
F02C6/10 . . supplying working fluid to a user, e.g. a chemical process, which returns working fluid to a turbine of the plant
F02C6/12 . . . Turbochargers, i.e. plants for augmenting mechanical power output of internal-combustion piston engines by increase of charge pressure

F02C6/14 . Gas-turbine plants having means for storing energy, e.g. for meeting peak loads
F02C6/16 . . for storing compressed air

F02C6/18 . Using the waste heat of gas-turbine plants outside the plants themselves, e.g. gas-turbine power heat plants (using waste heat as source of energy for refrigeration plants F25B27/02; using the waste heat of a gasturbine for steam generation or in a steam cycle see F01K23/10)

F02C6/20 . Adaptations of gas-turbine plants for driving vehicles
F02C6/20B . . [N: the vehicles being waterborne vessels]
F02C6/20C . . [N: the vehicles being airscrew driven]

F02C7/00 **Features, components parts, details or accessories, not provided for in, or of interest apart form groups F02C1/00 to F02C6/00; Air intakes for jet-propulsion plants** (controlling F02C9/00)

F02C7/04 . Air intakes for gas-turbine plants or jet-propulsion plants
F02C7/042 . . having variable geometry
F02C7/045 . . having provisions for noise suppression
F02C7/047 . . Heating to prevent icing
F02C7/05 . . having provisions for obviating the penetration of damaging objects or particles
F02C7/052 . . . with dust-separation devices
F02C7/055 . . . with intake grids, screens or guards
F02C7/057 . . Control or regulation (conjointly with fuel supply control F02C9/50, with nozzle area control F02K1/16)

F02C7/06 . Arrangements of bearings (bearings F16C); Lubricating ([N: of turbo machines F01D25/18; of machines or] engines in general F01M)

F02C7/08 . Heating air supply before combustion, e.g. by exhaust gases
F02C7/10 . . by means of regenerative heat-exchangers
F02C7/105 . . . of the rotary type (rotary heat exchangers per se F28D)

F02C7/12 . Cooling of plants (of component parts, see the relevant subclasses, e.g. F01D; cooling of engines in general F01P)
F02C7/12C . . [N: by partial arc admission of the working fluid or by intermittent admission of working and cooling fluid]
F02C7/14 . . of fluids in the plant, [N: e.g. lubricant or fuel (F02C7/18C takes precedence)]
F02C7/141 . . . of working fluid
F02C7/143 . . . . before or between the compressor stages
F02C7/143C . . . . . [N: by water injection]

F02C7/16 . . characterised by cooling medium

F02C7/18 . . . the medium being gaseous, e.g. air [N: (F02C7/12C takes precedence)]

F02C7/18C . . . . [N: Cooling means for reducing the temperature of the cooling air or gas]

F02C7/20 . Mounting or supporting of plant; Accomodating heat expansion or creep

F02C7/22 . Fuel supply systems

F02C7/22C . . [N: Fuel flow conduits, e.g. manifolds]

F02C7/224 . . Heating fuel before feeding to the burner

F02C7/228 . . Dividing fuel between various burners

F02C7/232 . . Fuel valves [N: (control of fuel supply by means of fuel metering valves F02C9/26B)]; Draining valves or systems (valves in general F16K) [C9506]

F02C7/236 . . Fuel delivery systems comprising two or more pumps

F02C7/236B . . . [N: comprising an air supply system for the atomisation of fuel]

F02C7/24 . Heat or noise insulation (air intakes having provisions for noise suppression F02C7/045; turbine exhaust heads, chambers, or the like F01D25/30; silencing nozzles of jet-propulsion plants F02K1/00)

F02C7/25 . . Fire protection or prevention (in general A62)

F02C7/26 . Starting; Ignition

F02C7/262 . . Restarting after flame-out

F02C7/264 . . Ignition

F02C7/266 . . . Electric (sparking plugs H01T)

F02C7/268 . . Starting drives for the rotor, [N: acting directly on the rotor of the gas turbine to be started] [C9610]

F02C7/27 . . . Fluid drives (turbine starters F02C7/277)

F02C7/272 . . . . generated by cartridges

F02C7/275 . . . Mechanical drives

F02C7/277 . . . . the starter being a [N: separate] turbine

F02C7/28 . Arrangement of seals

F02C7/30 . Preventing corrosion [N: or unwanted deposits] in gas-swept spaces

F02C7/32 . Arrangement, mounting, or driving, of auxiliaries

F02C7/36 . Power transmission arrangements between the different shafts of the gas turbine plant, or between the gas-turbine plant and the power user ([N: F02C3/107 to F02C3/13 and] F02C7/32 take precedence; couplings for transmitting rotation F16D; gearing in general F16H)

F02C9/00 **Controlling gas-turbine plants; Controlling fuel supply in air- breathing jet-propulsion plants** (controlling air intakes F02C7/057; controlling turbines F01D; controlling compressors F04D27/00; controlling in general G05)

F02C9/16 . Control of working fluid flow (F02C9/48 takes precedence; control of air-intake flow F02C7/057)

F02C9/18 . . by bleeding, bypassing or acting on variable working fluid interconnections between turbines or compressors or their stages [N: (F02C3/113 takes precedence)]

F02C9/20 . . by throttling; by adjusting vanes

F02C9/22 . . . by adjusting turbine vanes

F02C9/24 . . Control of the pressure level in closed cycles

F02C9/26 . Control of fuel supply (F02C9/48 takes precedence; fuel valves F02C7/232)

F02C9/26B . . [N: by means of fuel metering valves] [N9506]

F02C9/26C . . [N: specially adapted for gas turbines with intermittent fuel injection] [N0202]

F02C9/28 . . Regulating systems responsive to plant or ambient parameters, e.g. temperature, pressure, rotor speed (F02C9/30 to F02C9/38, F02C9/44 take precedence)

F02C9/28B . . . [N: Mechanical command devices linked to the throttle lever] [N0202]

F02C9/30 . . characterised by variable fuel pump output

F02C9/32 . . characterised by throttling of fuel (F02C9/38 takes precedence)

F02C9/34 . . . Joint control of separate flows to main and auxiliary burners

F02C9/36 . . characterised by returning of fuel to sump (F02C9/38 takes precedence)

F02C9/38 . . characterised by throttling and returning of fuel to sump

F02C9/40 . . specially adapted to the use of a special fuel or a plurality of fuels

F02C9/42 . . specially adapted for the control of two or more plants simultaneously

F02C9/44 . . responsive to the speed of aircraft, e.g. Mach number control, optimisation of fuel consumption

F02C9/46 . . Emergency fuel control

F02C9/48 . Control of fuel supply conjointly with another control of the plant (with nozzle section control F02K1/17)

F02C9/50 . . with control of working fluid flow

F02C9/52 . . . by bleeding or by-passing the working fluid

F02C9/54 . . . by throttling the working fluid, by adjusting vanes

F02C9/56 . . with power transmission control

F02C9/58 . . . with control of a variable-pitch propeller