

CPC**COOPERATIVE PATENT 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 [F25B 11/00](#); using gas-turbine plants in vehicles, see the relevant vehicle classes)

NOTE

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.

This subclass does not cover:

- steam turbine plants, which are covered by subclass [F01K](#) ;
- special vapour plants, which are covered by subclass [F01K](#) .
- { combined cycle plants, which are covered by subclass [F01K 23/00](#) }

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.

Attention is drawn to the Notes preceding class [F01](#) .

Guidance heading:**F02C 1/00**

Gas-turbine plants characterised by the use of hot gases or unheated pressurised gases, as the working fluid (by the use of combustion product [F02C 3/00](#), [F02C 5/00](#))

[F02C 1/002](#)

- . {using an auxiliary fluid }

[F02C 1/005](#)

- .. {being recirculated }

[F02C 1/007](#)

- . {combination of cycles }

[F02C 1/02](#)

- . the working fluid being an unheated pressurised gas

[F02C 1/04](#)

- . the working fluid being heated indirectly { (in a fluidised-bed combustor [F02C 3/205](#)) }

[F02C 1/05](#)

- .. characterised by the type or source of heat, e.g. using nuclear or solar energy

[F02C 1/06](#)

- ... using reheated exhaust gas ([F02C 1/08](#) takes precedence)

[F02C 1/08](#)

- .. Semi-closed cycles

[F02C 1/10](#)

- .. Closed cycles

- F02C 1/105 . . . {construction; details }
- F02C 3/00** **Gas-turbine plants characterised by the use of combustion products as the working fluid** (generated by intermittent combustion [F02C 5/00](#))
- F02C 3/02 . . using exhaust-gas pressure in a pressure exchanger to compress combustion-air (pressure exchangers per se [F04F 13/00](#))
- F02C 3/04 . . having a turbine driving a compressor (power transmission arrangements [F02C 7/36](#); control of working fluid flow [F02C 9/16](#))
- F02C 3/045 . . . having compressor and turbine passages in a single rotor-module ([F02C 3/073](#) takes precedence)
- F02C 3/05 . . . the compressor and the turbine being of the radial flow type
- F02C 3/055 . . the compressor being of the positive-displacement type
- F02C 3/06 . . the compressor comprising only axial stages ([F02C 3/10](#) takes precedence)
- F02C 3/062 . . . {the turbine being of the radial-flow type }
- F02C 3/064 . . . {the compressor having concentric stages }
- F02C 3/067 . . . having counter-rotating rotors ([F02C 3/073](#) takes precedence)
- F02C 3/073 . . . the compressor and turbine stages being concentric
- F02C 3/08 . . the compressor comprising at least one radial stage ([F02C 3/10](#) takes precedence)
- F02C 3/085 . . . {the turbine being of the radial-flow type (radial-radial) ([F02C 3/05](#) takes precedence) }
- F02C 3/09 . . . of the centripetal type
- F02C 3/10 . . with another turbine driving an output shaft but not driving the compressor
- F02C 3/103 . . . {the compressor being of the centrifugal type }
- F02C 3/107 . . with two or more rotors connected by power transmission
- F02C 3/113 . . . with variable power transmission between rotors
- F02C 3/13 . . having variable working fluid interconnections between turbines or compressors or stages of different rotors { (controlling flow ratio between different flows of multi-flow jet-propulsion plant, e.g. ducted fan [F02K 3/075](#)) }
- F02C 3/14 . . characterised by the arrangement of the combustion chamber in the plant (combustion chambers per se [F23R](#) ; [F02C 3/205](#) takes precedence)
- F02C 3/145 . . . {the combustion chamber being in the reverse flow-type }
- F02C 3/16 . . the combustion chambers being formed at least partly in the turbine rotor {or in an other rotating part of the plant }
- F02C 3/165 . . . {the combustion chamber contributes to the driving force by creating reactive thrust }
- F02C 3/20 . . using a special fuel, oxidant, or dilution fluid to generate the combustion products
- F02C 3/205 . . . {in a fluidised-bed combustor (in combination with a steam cycle see [F01K 23/061](#); fluidised-bed apparatus in general [B01J 8/18](#); fluidised-bed combustors in general [F23C 11/02](#)) }
- F02C 3/22 . . the fuel or oxidant being gaseous at standard temperature and pressure ([F02C 3/28](#) takes precedence)
- F02C 3/24 . . the fuel or oxidant being liquid at standard temperature and pressure
- F02C 3/26 . . the fuel or oxidant being solid or pulverulent, e.g. in slurry or suspension

- F02C 3/28 . . . using a separate gas producer for gasifying the fuel before combustion
- F02C 3/30 . . Adding water, steam or other fluids {for influencing combustion, e.g. to obtain cleaner exhaust gases ([F02C 7/141](#), [F02C 7/30](#), [F01D 21/00](#), [F01K 21/04](#), [F23D 11/10](#) take precedence) }
- F02C 3/305 . . . {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 ([F01K 21/04](#) takes precedence) }
- F02C 3/32 . Inducing air flow by fluid jet, e.g. ejector action
- F02C 3/34 . with recycling of part of the working fluid, i.e. semi-closed cycles with combustion products in the closed part of the cycle
- F02C 3/36 . Open cycles
- F02C 3/365 . . {a part of the compressed air being burned, the other part being heated indirectly (in a fluidised-bed combustor [F02C 3/205](#)) }
- F02C 5/00 Gas-turbine plants characterised by the working fluid being generated by intermittent combustion**
- F02C 5/02 . characterised by the arrangement of the combustion chamber in the chamber in the plant (combustion chambers per se [F23R](#))
- F02C 5/04 . . the combustion chambers being formed at least partly in the turbine rotor
- F02C 5/06 . 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](#))
- F02C 5/08 . . the gas generator being of the free-piston type
- F02C 5/10 . 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
- F02C 5/11 . . using valveless combustion chambers
- F02C 5/12 . the combustion chambers having inlet or outlet valves, e.g. Holzwarth gas-turbine plants
- F02C 6/00 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**
- F02C 6/003 . {Gas-turbine plants with heaters between turbine stages }
- F02C 6/006 . {Open cycle gas-turbine in which the working fluid is expanded to a pressure below the atmospheric pressure and then compressed to atmospheric pressure }
- F02C 6/02 . Plural gas-turbine plants having a common power output
- F02C 6/04 . Gas-turbine plants providing heated or pressurised working fluid for other apparatus, e.g. without mechanical power output ([F02C 6/18](#) takes precedence; {for a fluidised-bed combustor [F02C 3/205](#) })

- F02C 6/06 . . . providing compressed gas ([F02C 6/10 takes precedence](#))
- F02C 6/08 . . . the gas being bled from the gas-turbine compressor
- F02C 6/10 . . . supplying working fluid to a user, e.g. a chemical process, which returns working fluid to a turbine of the plant
- F02C 6/12 . . . Turbochargers, i.e. plants for augmenting mechanical power output of internal-combustion piston engines by increase of charge pressure
- F02C 6/14 . Gas-turbine plants having means for storing energy, e.g. for meeting peak loads
- F02C 6/16 . . for storing compressed air
- F02C 6/18 . 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 F25B 27/02](#); [using the waste heat of a gasturbine for steam generation or in a steam cycle see F01K 23/10](#))
- F02C 6/20 . Adaptations of gas-turbine plants for driving vehicles
- F02C 6/203 . . {the vehicles being waterborne vessels }
- F02C 6/206 . . {the vehicles being airscrew driven }
- F02C 7/00** **Features, components parts, details or accessories, not provided for in, or of interest apart form groups [F02C 1/00](#) to [F02C 6/00](#); Air intakes for jet-propulsion plants ([controlling F02C 9/00](#))**
- F02C 7/04 . Air intakes for gas-turbine plants or jet-propulsion plants
- F02C 7/042 . . having variable geometry
- F02C 7/045 . . having provisions for noise suppression
- F02C 7/047 . . Heating to prevent icing
- F02C 7/05 . . having provisions for obviating the penetration of damaging objects or particles
- F02C 7/052 . . . with dust-separation devices
- F02C 7/055 . . . with intake grids, screens or guards
- F02C 7/057 . . Control or regulation ([conjointly with fuel supply control F02C 9/50](#), [with nozzle area control F02K 1/16](#))
- F02C 7/06 . Arrangements of bearings ([bearings F16C](#)) ; Lubricating ({[of turbo machines F01D 25/18](#); [of machines or](#) } [engines in general F01M](#))
- F02C 7/08 . Heating air supply before combustion, e.g. by exhaust gases
- F02C 7/10 . . by means of regenerative heat-exchangers
- F02C 7/105 . . . of the rotary type ([rotary heat exchangers per se F28D](#))
- F02C 7/12 . Cooling of plants ([of component parts, see the relevant subclasses, e.g. F01D](#) ; [cooling of engines in general F01P](#))
- F02C 7/125 . . {[by partial arc admission of the working fluid or by intermittent admission of working and cooling fluid](#) }
- F02C 7/14 . . of fluids in the plant, {e.g. [lubricant or fuel \(F02C 7/185 takes precedence\)](#) }
- F02C 7/141 . . . of working fluid
- F02C 7/143 before or between the compressor stages
- F02C 7/1435 {[by water injection](#) }

- F02C 7/16 . . characterised by cooling medium
- F02C 7/18 . . . the medium being gaseous, e.g. air { [F02C 7/125](#) takes precedence } }
- F02C 7/185 {Cooling means for reducing the temperature of the cooling air or gas }
- F02C 7/20 . Mounting or supporting of plant; Accomodating heat expansion or creep
- F02C 7/22 . Fuel supply systems
- F02C 7/222 . . {Fuel flow conduits, e.g. manifolds }
- F02C 7/224 . . Heating fuel before feeding to the burner
- F02C 7/228 . . Dividing fuel between various burners
- F02C 7/232 . . Fuel valves { (control of fuel supply by means of fuel metering valves [F02C 9/263](#))
}; Draining valves or systems (valves in general [F16K](#))
- F02C 7/236 . . Fuel delivery systems comprising two or more pumps
- F02C 7/2365 . . . {comprising an air supply system for the atomisation of fuel }
- F02C 7/24 . Heat or noise insulation (air intakes having provisions for noise suppression [F02C 7/045](#); turbine exhaust heads, chambers, or the like [F01D 25/30](#); silencing nozzles of jet-propulsion plants [F02K 1/00](#))
- F02C 7/25 . . Fire protection or prevention (in general [A62](#))
- F02C 7/26 . Starting; Ignition
- F02C 7/262 . . Restarting after flame-out
- F02C 7/264 . . Ignition
- F02C 7/266 . . . Electric (sparking plugs [H01T](#))
- F02C 7/268 . . Starting drives for the rotor, {acting directly on the rotor of the gas turbine to be started }
- F02C 7/27 . . . Fluid drives (turbine starters [F02C 7/277](#))
- F02C 7/272 generated by cartridges
- F02C 7/275 . . . Mechanical drives
- F02C 7/277 the starter being a {separate } turbine
- F02C 7/28 . Arrangement of seals
- F02C 7/30 . Preventing corrosion {or unwanted deposits } in gas-swept spaces
- F02C 7/32 . Arrangement, mounting, or driving, of auxiliaries
- F02C 7/36 . Power transmission arrangements between the different shafts of the gas turbine plant, or between the gas-turbine plant and the power user ({[F02C 3/107](#) to [F02C 3/13](#) and } [F02C 7/32](#) take precedence; couplings for transmitting rotation [F16D](#) ; gearing in general [F16H](#))
- F02C 9/00** **Controlling gas-turbine plants; Controlling fuel supply in air- breathing jet-propulsion plants** (controlling air intakes [F02C 7/057](#); controlling turbines [F01D](#) ; controlling compressors [F04D 27/00](#); controlling in general [G05](#))
- F02C 9/16 . Control of working fluid flow ([F02C 9/48](#) takes precedence; control of air-intake flow [F02C 7/057](#))

- F02C 9/18 .. by bleeding, bypassing or acting on variable working fluid interconnections between turbines or compressors or their stages { [\(F02C 3/113 takes precedence\)](#) }
- F02C 9/20 .. by throttling; by adjusting vanes
- F02C 9/22 ... by adjusting turbine vanes
- F02C 9/24 .. Control of the pressure level in closed cycles
- F02C 9/26 . Control of fuel supply [\(F02C 9/48 takes precedence; fuel valves F02C 7/232\)](#)
- F02C 9/263 .. {by means of fuel metering valves }
- F02C 9/266 .. {specially adapted for gas turbines with intermittent fuel injection }
- F02C 9/28 .. Regulating systems responsive to plant or ambient parameters, e.g. temperature, pressure, rotor speed [\(F02C 9/30 to F02C 9/38, F02C 9/44 take precedence\)](#)
- F02C 9/285 ... {Mechanical command devices linked to the throttle lever }
- F02C 9/30 .. characterised by variable fuel pump output
- F02C 9/32 .. characterised by throttling of fuel [\(F02C 9/38 takes precedence\)](#)
- F02C 9/34 ... Joint control of separate flows to main and auxiliary burners
- F02C 9/36 .. characterised by returning of fuel to sump [\(F02C 9/38 takes precedence\)](#)
- F02C 9/38 .. characterised by throttling and returning of fuel to sump
- F02C 9/40 .. specially adapted to the use of a special fuel or a plurality of fuels
- F02C 9/42 .. specially adapted for the control of two or more plants simultaneously
- F02C 9/44 .. responsive to the speed of aircraft, e.g. Mach number control, optimisation of fuel consumption
- F02C 9/46 .. Emergency fuel control
- F02C 9/48 . Control of fuel supply conjointly with another control of the plant [\(with nozzle section control F02K 1/17\)](#)
- F02C 9/50 .. with control of working fluid flow
- F02C 9/52 ... by bleeding or by-passing the working fluid
- F02C 9/54 ... by throttling the working fluid, by adjusting vanes
- F02C 9/56 .. with power transmission control
- F02C 9/58 ... with control of a variable-pitch propeller