

**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](#).

**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