

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 10/00)}
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 from 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