

ECLA**EUROPEAN CLASSIFICATION****F01P**

COOLING OF MACHINES OR ENGINES IN GENERAL; COOLING OF INTERNAL-COMBUSTION ENGINES (arrangements in connection with cooling of propulsion units in vehicles [B60K11/00](#); heat-transfer, heat-exchange or heat-storage materials [C09K5/00](#); [N: cooling of gas-turbine engines [F02C7/12](#)]; heat exchange in general, radiators [F28](#))

Notes

1. In this subclass, the following terms or expressions are used with the meanings indicated:
 - "air" also includes other gaseous cooling fluids;
 - "liquid cooling" also includes cooling where liquid is used as the heat transferring fluid between parts to be cooled and the air, e.g. using radiators;
 - "air cooling" means direct air cooling and thus excludes indirect air cooling occurring in liquid cooling systems as explained herefore;
 - "cooling-air" includes directly or indirectly acting cooling-air.
2. Attention is drawn to the notes preceding class [F01](#), especially as regards Note (3).
3. Cooling by lubricant is classified in subclass [F01M](#) when the lubrication aspect predominates and in subclass [F01P](#) when the cooling aspect predominates.

Guide heading:

Air cooling; Liquid cooling ([propelling cooling-air or liquid coolants F01P5/00](#); [controlling supply or circulation of coolants F01P7/00](#); [cylinders, pistons, valves, fuel injectors, sparking-plugs, or other engine or machine parts, modified to facilitate cooling, see the relevant classes for such parts](#))

F01P1/00**Air cooling****F01P1/02**

- . Arrangements for cooling cylinders or cylinder heads, e.g. ducting cooling-air from its pressure source to cylinders or along cylinders

F01P1/04

- . Arrangements for cooling pistons

F01P1/06

- . Arrangements for cooling other engine or machine parts

F01P1/08

- . . for cooling intake or exhaust valves

F01P1/10

- . . for cooling fuel injectors or sparking-plugs

F01P3/00**Liquid cooling****F01P3/02**

- . Arrangements for cooling cylinders or cylinder heads

F01P3/04

- . . Liquid-to-air heat-exchangers combined with, or arranged on, cylinders or cylinder heads

F01P3/06

- . Arrangements for cooling pistons

- F01P3/08 . . Cooling of piston exterior only, e.g. by jets
- F01P3/10 . . Cooling by flow of coolant through pistons
- F01P3/12 . Arrangements for cooling other engine or machine parts
- F01P3/14 . . for cooling intake or exhaust valves
- F01P3/16 . . for cooling fuel injectors or sparking-plugs
- F01P3/18 . Arrangements or mounting of liquid-to-air heat-exchangers (such arrangements on cylinders or cylinder heads [F01P3/04](#); relative to vehicles [B60K11/04](#))
- F01P3/20 . Cooling circuits not specific to a single part of engine or machine ([F01P3/22](#) takes precedence)
- F01P3/20B . . [N: for outboard marine engines]
- F01P3/20B2 . . . [N: Flushing]
- F01P3/20C . . [N: liquid-to-liquid heat-exchanging relative to marine vessels]
- F01P3/22 . characterised by evaporation and condensation of coolant in closed cycles (other cooling by evaporation [F01P9/02](#)); characterised by the coolant reaching higher temperatures than normal atmospheric boiling-point
- F01P3/22B . . [N: characterised by the coolant reaching temperatures higher than the normal atmospheric boiling point]
- F01P3/22E . . [N: Closed cycles with separator and liquid return]
- F01P3/22N . . [N: Closed cycles with condenser and feed pump]

Guide heading: **Pumping cooling-air or liquid coolants; Controlling circulation or supply of coolants**

F01P5/00 **Pumping cooling-air or liquid coolants** (controlling circulation or supply of coolants by influencing drive of pumps [F01P7/00](#))

- F01P5/02 . Pumping cooling-air; Arrangements of cooling-air pumps, e.g. fans or blowers
- F01P5/04 . . Pump-driving arrangements
- F01P5/04B . . . [N: Pump reversing arrangements]
- F01P5/06 . . Guiding or ducting air to, or from, ducted fans
- F01P5/08 . . Use of engine exhaust gases for pumping cooling-air
- F01P5/10 . Pumping liquid coolant; Arrangements of coolant pumps
- F01P5/12 . . Pump-driving arrangements
- F01P5/14 . Safety means against, or active at, failure of coolant-pump drives, e.g. shutting engine down; Means for indicating functioning of coolant pump

F01P7/00 **Controlling of coolant flow**

- F01P7/02 . the coolant being cooling-air
- F01P7/02B . . [N: Cowlings for airplane engines]
- F01P7/02C . . [N: Thermostatic control]

- F01P7/04 . . by varying pump speed, e.g. by changing pump-drive gear ratio
- F01P7/04B . . . [N: using fluid couplings (couplings or clutches of this type per se [F16D35/00](#))]
- F01P7/04C . . . [N: using hydraulic drives] [N9509]
- F01P7/04D . . . [N: using mechanical drives] [N9509]
- F01P7/04E . . . [N: using electrical drives] [N9509]
- F01P7/06 . . by varying blade pitch
- F01P7/08 . . by cutting in or out of pumps
- F01P7/08B . . . [N: using clutches, e.g. electro-magnetic or induction clutches]
- F01P7/08B2 [N: using friction clutches]
- F01P7/08B2B [N: actuated electromagnetically]
- F01P7/08B2C [N: actuated by fluid pressure]
- F01P7/08B2D [N: actuated directly by deformation of a thermostatic device]
- F01P7/08B2F [N: actuated in response to driving speed, e.g. by centrifugal devices]
- F01P7/10 . . by throttling amount of air flowing through liquid-to-air heat exchangers
- F01P7/12 . . . by thermostatic control

- F01P7/14 . the coolant being liquid
- F01P7/16 . . by thermostatic control
- F01P7/16A . . . [N: by bypassing pumps]
- F01P7/16B . . . [N: by cutting in and out of pumps]
- F01P7/16C . . . [N: by varying pump speed]
- F01P7/16D . . . [N: characterised by systems with two or more loops]
- F01P7/16E . . . [N: by adjusting the pre-set temperature according to engine parameters, e.g. engine load, engine speed]

- F01P9/00** **Cooling having pertinent characteristics not provided for in, or of interest apart from, groups [F01P1/00](#) to [F01P7/00](#) (profiting from waste heat of combustion-engine cooling [F02G5/00](#))**

- F01P9/02 . Cooling by evaporation, e.g. by spraying water on to cylinders (evaporation and condensation of liquid coolant in closed cycles [F01P3/22](#); [N: evaporation or evaporation apparatus for physical or chemical purposes, e.g. evaporation of liquids for gas phase reactions [B01B1/00B](#)]) [C0311]
- F01P9/04 . by simultaneous or alternative use of direct air-cooling and liquid cooling ([F01P9/02](#) takes precedence)
- F01P9/06 . by use of refrigerating apparatus, e.g. of compressor or absorber type

- F01P11/00** **Component parts, details, or accessories not provided for in, or of interest apart from, groups [F01P1/00](#) to [F01P9/00](#)**

- F01P11/02 . Liquid-coolant [N: filling], overflow, venting, or draining devices (automatic draining during freezing conditions [F01P11/20](#)) [C9509]
- F01P11/02A . . [N: Filling] [N9509]
- F01P11/02A2 . . . [N: Closure caps] [N9812]

- F01P11/02A2B [N: Mounting] [N9812]
- F01P11/02A2C [N: with overpressure valves or vent valves] [N9812]
- F01P11/02A2D [N: Safety; Locking against opening] [N9812]
- F01P11/02B . . [N: Draining or purging] [C9509]
- F01P11/02C . . [N: Deaeration devices]
- F01P11/02D . . [N: Venting devices]
- F01P11/02E . . [N: Expansion reservoirs]
- F01P11/02F . . [N: Condensers for radiators]

- F01P11/04 . Arrangements of liquid pipes or hoses

- F01P11/06 . Cleaning ([in general B08B](#)); Combating corrosion ([in general C23F](#))

- F01P11/08 . Arrangements of lubricant coolers ([in lubrication apparatus F01M](#))

- F01P11/10 . Guiding or ducting cooling-air, to, or from, liquid-to-air heat exchangers

- F01P11/12 . Filtering, cooling, or silencing cooling-air

- F01P11/14 . Indicating devices; Other safety devices
- F01P11/16 . . concerning coolant temperature ([F01P11/20 takes precedence](#))
- F01P11/18 . . concerning coolant pressure, coolant flow, or liquid-coolant level
- F01P11/20 . . concerning atmospheric freezing conditions, e.g. automatically draining or heating during frosty weather