

## SECTION F — MECHANICAL ENGINEERING; LIGHTING; HEATING; WEAPONS; BLASTING

### F01 MACHINES OR ENGINES IN GENERAL; ENGINE PLANTS IN GENERAL; STEAM ENGINES

#### F01P COOLING OF MACHINES OR ENGINES IN GENERAL; COOLING OF INTERNAL-COMBUSTION ENGINES (arrangements in connection with cooling of propulsion units in vehicles B60K 11/00; heat-transfer, heat-exchange or heat-storage materials C09K 5/00; heat-exchange in general, radiators F28)

##### Note(s)

- 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 under liquid cooling above;
  - "cooling-air" includes directly- or indirectly-acting cooling-air.
- Attention is drawn to the Notes preceding class F01, especially as regards Note (3).
- Cooling by lubricant is classified in subclass F01M when the lubrication aspect predominates, and in subclass F01P when the cooling aspect predominates.

##### Air cooling; Liquid cooling

- 1/00 Air cooling** (propelling cooling-air or liquid coolants F01P 5/00; controlling supply or circulation of coolants F01P 7/00) [1, 2006.01]
- 1/02 • Arrangements for cooling cylinders or cylinder heads, e.g. ducting cooling-air from its pressure source to cylinders or along cylinders [1, 2006.01]
- 1/04 • Arrangements for cooling pistons [1, 2006.01]
- 1/06 • Arrangements for cooling other engine or machine parts [1, 2006.01]
- 1/08 • • for cooling intake or exhaust valves [1, 2006.01]
- 1/10 • • for cooling fuel injectors or sparking-plugs [1, 2006.01]
- 3/00 Liquid cooling** (propelling cooling-air or liquid coolants F01P 5/00; controlling supply or circulation of coolants F01P 7/00) [1, 2006.01]
- 3/02 • Arrangements for cooling cylinders or cylinder heads [1, 2006.01]
- 3/04 • • Liquid-to-air heat-exchangers combined with, or arranged on, cylinders or cylinder heads [1, 2006.01]
- 3/06 • Arrangements for cooling pistons [1, 2006.01]
- 3/08 • • Cooling of piston exterior only, e.g. by jets [1, 2006.01]
- 3/10 • • Cooling by flow of coolant through pistons [1, 2006.01]
- 3/12 • Arrangements for cooling other engine or machine parts [1, 2006.01]
- 3/14 • • for cooling intake or exhaust valves [1, 2006.01]
- 3/16 • • for cooling fuel injectors or sparking-plugs [1, 2006.01]
- 3/18 • Arrangement or mounting of liquid-to-air heat-exchangers (such arrangements on cylinders or cylinder heads F01P 3/04; relative to vehicles B60K 11/04) [1, 2006.01]

- 3/20 • Cooling circuits not specific to a single part of engine or machine (F01P 3/22 takes precedence) [1, 2006.01]
- 3/22 • characterised by evaporation and condensation of coolant in closed cycles (other cooling by evaporation F01P 9/02); characterised by the coolant reaching higher temperatures than normal atmospheric boiling-point [1, 2006.01]

##### Pumping cooling-air or liquid coolants; Controlling circulation or supply of coolants

- 5/00 Pumping cooling-air or liquid coolants** (controlling circulation or supply of coolants by influencing drive of pumps F01P 7/00) [1, 2006.01]
- 5/02 • Pumping cooling-air; Arrangements of cooling-air pumps, e.g. fans or blowers [1, 2006.01]
- 5/04 • • Pump-driving arrangements [1, 2006.01]
- 5/06 • • Guiding or ducting air to or from ducted fans [1, 2006.01]
- 5/08 • • Use of engine exhaust gases for pumping cooling-air [1, 2006.01]
- 5/10 • Pumping liquid coolant; Arrangements of coolant pumps [1, 2006.01]
- 5/12 • • Pump-driving arrangements [1, 2006.01]
- 5/14 • Safety means against, or active at, failure of coolant-pump drives, e.g. shutting engine down; Means for indicating functioning of coolant pumps [1, 2006.01]
- 7/00 Controlling of coolant flow** [1, 2006.01]
- 7/02 • the coolant being cooling-air [1, 2006.01]
- 7/04 • • by varying pump speed, e.g. by changing pump-drive gear ratio [1, 2006.01]
- 7/06 • • by varying blade pitch [1, 2006.01]
- 7/08 • • by cutting in or out of pumps [1, 2006.01]

F01P

7/10	<ul style="list-style-type: none"><li>• • by throttling amount of air flowing through liquid-to-air heat-exchangers [1, 2006.01]</li></ul>	11/00	<b>Component parts, details, or accessories, not provided for in, or of interest apart from, groups F01P 1/00-F01P 9/00 [1, 2006.01]</b>
7/12	<ul style="list-style-type: none"><li>• • • by thermostatic control [1, 2006.01]</li></ul>	11/02	<ul style="list-style-type: none"><li>• Liquid-coolant overflow, venting, or draining devices (automatic draining during freezing conditions F01P 11/20) [1, 2006.01]</li></ul>
7/14	<ul style="list-style-type: none"><li>• the coolant being liquid [1, 2006.01]</li></ul>	11/04	<ul style="list-style-type: none"><li>• Arrangements of liquid pipes or hoses [1, 2006.01]</li></ul>
7/16	<ul style="list-style-type: none"><li>• • by thermostatic control [1, 2006.01]</li></ul>	11/06	<ul style="list-style-type: none"><li>• Cleaning (in general B08B); Combating corrosion (in general C23F) [1, 2006.01]</li></ul>
9/00	<b>Cooling having pertinent characteristics not provided for in, or of interest apart from, groups F01P 1/00-F01P 7/00 (profiting from waste heat of combustion-engine cooling F02G 5/00) [1, 2006.01]</b>	11/08	<ul style="list-style-type: none"><li>• Arrangements of lubricant coolers (in lubrication apparatus F01M) [1, 2006.01]</li></ul>
9/02	<ul style="list-style-type: none"><li>• Cooling by evaporation, e.g. by spraying water on to cylinders (evaporation and condensation of liquid coolant in closed cycles F01P 3/22) [1, 2006.01]</li></ul>	11/10	<ul style="list-style-type: none"><li>• Guiding or ducting cooling-air to or from liquid-to-air heat-exchangers [1, 2006.01]</li></ul>
9/04	<ul style="list-style-type: none"><li>• by simultaneous or alternative use of direct air cooling and liquid cooling (F01P 9/02 takes precedence) [1, 2006.01]</li></ul>	11/12	<ul style="list-style-type: none"><li>• Filtering, cooling, or silencing cooling-air [1, 2006.01]</li></ul>
9/06	<ul style="list-style-type: none"><li>• by use of refrigerating apparatus, e.g. of compressor or absorber type [1, 2006.01]</li></ul>	11/14	<ul style="list-style-type: none"><li>• Indicating devices; Other safety devices [1, 2006.01]</li></ul>
		11/16	<ul style="list-style-type: none"><li>• • concerning coolant temperature (F01P 11/20 takes precedence) [1, 2006.01]</li></ul>
		11/18	<ul style="list-style-type: none"><li>• • concerning coolant pressure, coolant flow, or liquid-coolant level [1, 2006.01]</li></ul>
		11/20	<ul style="list-style-type: none"><li>• • concerning atmospheric freezing conditions, e.g. automatically draining or heating during frosty weather [1, 2006.01]</li></ul>