

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

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

**F01B MACHINES OR ENGINES, IN GENERAL OR OF POSITIVE-DISPLACEMENT TYPE, e.g. STEAM ENGINES** (of rotary-piston or oscillating-piston type F01C; of non-positive-displacement type F01D; combustion engines F02; internal-combustion aspects of reciprocating-piston engines F02B 57/00, F02B 59/00; machines for liquids F03, F04; crankshafts, crossheads, connecting-rods F16C; flywheels F16F; gearings for interconverting rotary motion and reciprocating motion in general F16H; pistons, piston-rods, cylinders, for engines in general F16J)

#### Note(s)

- This subclass covers, with the exception of the matter provided for in subclasses F01C-F01P:
  - engines for elastic fluids, e.g. steam engines;
  - engines for liquids and elastic fluids;
  - machines for elastic fluids;
  - machines for liquids and elastic fluids.
- Attention is drawn to the Notes preceding class F01, especially as regards the definitions of "steam" and "special vapour".

#### Subclass index

##### MACHINES OR ENGINES

With reciprocating pistons characterised by

number or relative disposition of cylinders.....	1/00
disposition of cylinder axes relative to main shaft.....	3/00, 5/00
pistons reciprocating in same or coaxial cylinders; piston-main-shaft connections other than covered above.....	7/00, 1/08, 9/00
no rotary main shaft.....	11/00
rotary or other movement of cylinders.....	13/00, 15/00
uniflow principle.....	17/00

With positive displacement of flexible-wall type.....

COMBINATIONS OR ADAPTATIONS OF MACHINES OR ENGINES.....	21/00, 23/00
REGULATING, CONTROLLING, SAFETY MEANS; STARTING.....	25/00, 27/00
OTHER CHARACTERISTICS; DETAILS, ACCESSORIES.....	29/00, 31/00

<b>1/00</b>	<b>Reciprocating-piston machines or engines characterised by number or relative disposition of cylinders or by being built-up from separate cylinder-crankcase elements</b> (F01B 3/00, F01B 5/00 take precedence) [2]	3/04	• the piston motion being transmitted by curved surfaces
1/01	• with one single cylinder [2]	3/06	• • by multi-turn helical surfaces and automatic reversal
1/02	• with cylinders all in one line	3/08	• • • the helices being arranged on the pistons
1/04	• with cylinders in V-arrangement	3/10	• Control of working-fluid admission or discharge peculiar thereto (suitable for more general application F01L)
1/06	• with cylinders in star or fan arrangement		
1/08	• with cylinders arranged oppositely relative to main shaft and of "flat" type	<b>5/00</b>	<b>Reciprocating-piston machines or engines with cylinder axes arranged substantially tangentially to a circle centred on main shaft axis</b>
1/10	• with more than one main shaft, e.g. coupled to common output shaft (combinations of two or more machines or engines F01B 21/00)	<b>7/00</b>	<b>Machines or engines with two or more pistons reciprocating within same cylinder or within essentially coaxial cylinders</b> (in opposite arrangement relative to main shaft F01B 1/08)
1/12	• Separate cylinder-crankcase elements coupled together to form a unit	7/02	• with oppositely reciprocating pistons
<b>3/00</b>	<b>Reciprocating-piston machines or engines with cylinder axes coaxial with, or parallel or inclined to, main shaft axis</b>	7/04	• • acting on same main shaft
3/02	• with wobble-plate	7/06	• • • using only connecting-rods for conversion of reciprocatory into rotary motion or <u>vice versa</u>
		7/08	• • • • with side rods

## F01B

- 7/10
  - • • • having piston-rod of one piston passed through other piston
- 7/12
  - • • using rockers and connecting-rods
- 7/14
  - • acting on different main shafts
- 7/16
  - with pistons synchronously moving in tandem arrangement
- 7/18
  - with differential piston (F01B 7/20 takes precedence)
- 7/20
  - with two or more pistons reciprocating one within another, e.g. one piston forming cylinder of the other
- 9/00 Reciprocating-piston machines or engines characterised by connections between pistons and main shafts and not specific to groups F01B 1/00-F01B 7/00** (connections disengageable during idling F01B 31/24)
  - 9/02
    - with crankshaft
  - 9/04
    - with rotary main shaft other than crankshaft
  - 9/06
    - • the piston motion being transmitted by curved surfaces
  - 9/08
    - • with ratchet and pawl
- 11/00 Reciprocating-piston machines or engines without rotary main shaft, e.g. of free-piston type**
  - 11/02
    - Equalising or cushioning devices
  - 11/04
    - Engines combined with reciprocating driven devices, e.g. hammers (with pumps F01B 23/08; predominating aspects of driven devices, see the relevant classes for the devices)
  - 11/06
    - • for generating vibration only
  - 11/08
    - with direct fluid transmission link (F01B 11/02 takes precedence)
- 13/00 Reciprocating-piston machines or engines with rotating cylinders in order to obtain the reciprocating-piston motion** (machines or engines of flexible-wall type F01B 19/00) [2]
  - 13/02
    - with one cylinder only
  - 13/04
    - with more than one cylinder
  - 13/06
    - • in star arrangement
- 15/00 Reciprocating-piston machines or engines with movable cylinders other than provided for in group F01B 13/00** (with movable cylinder sleeves for working-fluid control F01L)
  - 15/02
    - with reciprocating cylinders (with one piston within another F01B 7/20)
  - 15/04
    - with oscillating cylinder
  - 15/06
    - • Control of working-fluid admission or discharge peculiar thereto
- 17/00 Reciprocating-piston machines or engines characterised by use of uniflow principle**
  - 17/02
    - Engines
  - 17/04
    - • Steam engines
- 19/00 Positive-displacement machines or engines of flexible-wall type**
  - 19/02
    - with plate-like flexible members
  - 19/04
    - with tubular flexible members
- 21/00 Combinations of two or more machines or engines** (F01B 23/00 takes precedence; combinations of two or more pumps F04; fluid gearing F16H; regulating or controlling, see the relevant groups)
  - 21/02
    - the machines or engines being all of reciprocating-piston type
  - 21/04
    - the machines or engines being not all of reciprocating-piston type, e.g. of reciprocating steam engine with steam turbine
- 23/00 Adaptations of machines or engines for special use; Combinations of engines with devices driven thereby** (F01B 11/00 takes precedence; fluid gearing F16H; aspects predominantly concerning driven devices, see the relevant classes for these devices; regulating or controlling, see the relevant groups)
  - 23/02
    - Adaptations for driving vehicles, e.g. locomotives (arrangements in vehicles, see the relevant classes for vehicles)
  - 23/04
    - • the vehicles being waterborne vessels
  - 23/06
    - Adaptations for driving, or combinations with, hand-held tools or the like
  - 23/08
    - Adaptations for driving, or combinations with, pumps
  - 23/10
    - Adaptations for driving, or combinations with, electric generators
  - 23/12
    - Adaptations for driving rolling mills or other heavy reversing machinery
- 25/00 Regulating, controlling, or safety means** (regulating or controlling in general G05)
  - 25/02
    - Regulating or controlling by varying working-fluid admission or exhaust, e.g. by varying pressure or quantity (distributing or expansion valve gear F01L)
  - 25/04
    - • Sensing elements
  - 25/06
    - • • responsive to speed
  - 25/08
    - • Final actuators
  - 25/10
    - • • Arrangements or adaptations of working-fluid admission or discharge valves (valves in general F16K)
  - 25/12
    - • Devices dealing with sensing elements or final actuators or transmitting means between them, e.g. power-assisted (sensing elements alone F01B 25/04; final actuators alone F01B 25/08)
  - 25/14
    - • peculiar to particular kinds of machines or engines
  - 25/16
    - Safety means responsive to specific conditions (against water hammer or the like in steam engines F01B 31/34)
  - 25/18
    - • preventing rotation in wrong direction
  - 25/20
    - Checking operation of safety devices
  - 25/22
    - Braking by redirecting working fluid
  - 25/24
    - • thereby regenerating energy
  - 25/26
    - Warning devices
- 27/00 Starting of machines or engines** (starting combustion engines F02N)
  - 27/02
    - of reciprocating-piston engines
  - 27/04
    - • by directing working-fluid supply, e.g. by aid of by-pass steam conduits
  - 27/06
    - • • specially for compound engines
  - 27/08
    - • Means for moving crank off dead-centre (turning-gear in general F16H)
- 29/00 Machines or engines with pertinent characteristics other than those provided for in main groups F01B 1/00-F01B 27/00**
  - 29/02
    - Atmospheric engines, i.e. atmosphere acting against vacuum
  - 29/04
    - characterised by means for converting from one type to a different one
  - 29/06
    - • from steam engine into combustion engine
  - 29/08
    - Reciprocating-piston machines or engines not otherwise provided for
  - 29/10
    - • Engines (refrigeration machines F25B)

- 29/12 • • • Steam engines (toy steam engines A63H 25/00)
- 31/00 Component parts, details, or accessories not provided for in, or of interest apart from, other groups** (machine or engine casings, other than those peculiar to steam engines, F16M)
- 31/02 • De-icing means for engines having icing phenomena
- 31/04 • Means for equalising torque in reciprocating-piston machines or engines (compensation of inertial forces, suppression of vibration in systems F16F)
- 31/06 • Means for compensating relative expansion of component parts
- 31/08 • Cooling of steam engines (cooling of fluid machines or engines in general F01P); Heating; Heat insulation (heat insulation in general F16L 59/00)
- 31/10 • Lubricating arrangements of steam engines (of fluid machines or engines in general F01M)
- 31/12 • Arrangements of measuring or indicating devices (warning apparatus F01B 25/26; measuring instruments or the like per se G01)
- 31/14 • Changing of compression ratio
- 31/16 • Silencers specially adapted for steam engines (arrangements of exhaust pipes or tubes on steam engines F01B 31/30; gas-flow silencers or exhaust silencers for machines or engines in general F01N)
- 31/18 • Draining
- 31/20 • • of cylinders
- 31/22 • Idling devices, e.g. having by-passing valves
- 31/24 • • Disengagement of connections between pistons and main shafts
- 31/26 • Other component parts, details, or accessories, peculiar to steam engines
- 31/28 • • Cylinders or cylinder covers
- 31/30 • • Arrangements of steam conduits
- 31/32 • • Arrangements or adaptations of vacuum breakers
- 31/34 • • Safety means against water hammer or against the penetration of water (steam traps F16T)
- 31/36 • • • automatically cutting-off steam supply