

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

### F27 FURNACES; KILNS; OVENS; RETORTS

#### Note(s)

- This class covers:
  - furnaces, kilns, ovens, retorts, open sintering apparatus and other similar apparatus for heat treatment of materials or articles, and details or accessories therefor, in general;
  - the arrangement of electrical heating elements in or on furnaces.
- This class does not cover:
  - combustion apparatus per se, i.e. apparatus for direct combination of oxygen gas and a burnable substance;
  - electrical heating elements per se;
  - processes carried on within the furnaces.
- In this class, the following term is used with the meaning indicated:
  - "furnaces" covers kilns, ovens, or retorts.

**F27B FURNACES, KILNS, OVENS, OR RETORTS IN GENERAL; OPEN SINTERING OR LIKE APPARATUS** (combustion apparatus F23; electric heating H05B)

#### Note(s)

Attention is drawn to the references and Notes following the title of class F27 and the Note(3)of section H.

#### Subclass index

##### FURNACES WITH STATIONARY CHARGE

Shaft furnaces.....	1/00
Horizontal furnaces.....	3/00, 5/00
Bell-type furnaces.....	11/00
With progression of heating.....	13/00
Crucible furnaces, tank furnaces.....	14/00

##### STATIONARY FURNACES WITH MECHANICALLY-MOVED CHARGE.....9/00

##### ROTARY FURNACES.....7/00, 13/00

##### OTHER FURNACES; COMBINATIONS.....15/00, 17/00, 19/00

##### OPEN SINTERING OR LIKE APPARATUS.....21/00

<b>1/00</b>	<b>Shaft or like vertical or substantially vertical furnaces</b> (for preheating, burning, calcining or cooling lime, magnesia or dolomite C04B 2/12)	1/22	• • Arrangements of heat-exchange apparatus (heat-exchangers in general F28C, F28D)
1/02	• with two or more shafts or chambers, e.g. multi-storey	1/24	• • Cooling arrangements
1/04	• • Combinations or arrangements of shafts	1/26	• • Arrangements of controlling devices
1/06	• of other than up-draught type	1/28	• • Arrangements of monitoring devices, of indicators, of alarm devices
1/08	• heated otherwise than by solid fuel mixed with charge	<b>3/00</b>	<b>Hearth-type furnaces, e.g. of reverberatory type</b> (F27B 9/00-F27B 15/00, F27B 21/00 take precedence); <b>Electric arc furnaces [4]</b>
1/09	• • heated electrically [4]	3/02	• of single-chamber fixed-hearth type
1/10	• Details, accessories, or equipment peculiar to furnaces of these types	3/04	• of multiple-hearth type; of multiple-chamber type; Combinations of hearth-type furnaces
1/12	• • Shells or casings; Supports therefor	3/06	• with movable working chambers or hearths, e.g. tiltable
1/14	• • • Arrangements of linings (linings in general F27D 1/00)	3/08	• heated electrically, e.g. electric arc furnaces, with or without any other source of heat
1/16	• • Arrangements of tuyères	3/10	• Details, accessories, or equipment, e.g. dust-collectors, peculiar to hearth-type furnaces
1/18	• • Arrangements of dust collectors	3/12	• • Working chambers or casings; Supports therefor
1/20	• • Arrangement of devices for charging [4]		
1/21	• • Arrangement of devices for discharging [4]		

## F27B

- 3/14 • • • Arrangements of linings
- 3/16 • • • Walls; Roofs
- 3/18 • • Arrangement of devices for charging [4]
- 3/19 • • Arrangement of devices for discharging [4]
- 3/20 • • Arrangements of heating devices
- 3/22 • • Arrangements of air or gas supply devices
- 3/24 • • Cooling arrangements
- 3/26 • • Arrangements of heat-exchange apparatus
- 3/28 • • Arrangement of controlling, monitoring, alarm or like devices [4]
  
- 5/00 Muffle furnaces; Retort furnaces; Other furnaces in which the charge is held completely isolated** (F27B 9/00 takes precedence)
- 5/02 • of multiple-chamber type
- 5/04 • adapted for treating the charge in vacuum or special atmosphere
- 5/05 • • in vacuum [5]
- 5/06 • Details, accessories, or equipment peculiar to furnaces of these types
- 5/08 • • Arrangements of linings
- 5/10 • • Muffles
- 5/12 • • Arrangement of devices for charging [4]
- 5/13 • • Arrangement of devices for discharging [4]
- 5/14 • • Arrangements of heating devices
- 5/16 • • Arrangements of air or gas supply devices
- 5/18 • • Arrangement of controlling, monitoring, alarm or like devices [4]
  
- 7/00 Rotary-drum furnaces, i.e. horizontal or slightly inclined**
- 7/02 • of multiple-chamber or multiple-drum type
- 7/04 • • with longitudinal divisions
- 7/06 • adapted for treating the charge in vacuum or special atmosphere
- 7/08 • externally heated
- 7/10 • internally heated, e.g. by means of passages in the wall
- 7/12 • tiltable
- 7/14 • with means for agitating or moving the charge
- 7/16 • • the means being fixed relatively to the drum (F27B 7/04 takes precedence)
- 7/18 • • the means being movable within the drum
- 7/20 • Details, accessories, or equipment peculiar to rotary-drum furnaces
- 7/22 • • Rotary drums; Supports therefor
- 7/24 • • • Seals between rotary and stationary parts
- 7/26 • • Drives
- 7/28 • • Arrangements of linings
- 7/30 • • Arrangements of partitions
- 7/32 • • Arrangement of devices for charging [4]
- 7/33 • • Arrangement of devices for discharging [4]
- 7/34 • • Arrangements of heating devices
- 7/36 • • Arrangements of air or gas supply devices
- 7/38 • • Arrangements of cooling devices
- 7/40 • • • Planetary coolers [4]
- 7/42 • • Arrangement of controlling, monitoring, alarm or like devices [4]
  
- 9/00 Furnaces through which the charge is moved mechanically, e.g. of tunnel type** (F27B 7/14 takes precedence); **Similar furnaces in which the charge moves by gravity**
- 9/02 • of multiple-track type; of multiple-chamber type; Combinations of furnaces
- 9/04 • adapted for treating the charge in vacuum or special atmosphere
- 9/06 • heated without contact between combustion gases and charge; electrically heated
- 9/08 • • heated through chamber walls
- 9/10 • • heated by hot air or gas
- 9/12 • with special arrangements for preheating or cooling the charge
- 9/14 • characterised by the path of the charge during treatment; characterised by the means by which the charge is moved during treatment (F27B 9/28 takes precedence; travelling or movable supports or containers for the charge F27D 3/12)
- 9/16 • • the charge moving in a circular or arcuate path
- 9/18 • • • under the action of scrapers or pushers
- 9/20 • • the charge moving in a substantially straight path
- 9/22 • • • under the action of scrapers or pushers (F27B 9/26 takes precedence)
- 9/24 • • • being carried by a conveyer
- 9/26 • • • on or in trucks, sleds, or containers
- 9/28 • for treating continuous lengths of work
- 9/30 • Details, accessories, or equipment peculiar to furnaces of these types
- 9/32 • • Casings
- 9/34 • • • Arrangements of linings
- 9/36 • • Arrangements of heating devices
- 9/38 • • Arrangement of devices for charging [4]
- 9/39 • • Arrangement of devices for discharging [4]
- 9/40 • • Arrangements of controlling or monitoring devices
  
- 11/00 Bell-type furnaces** (for treating metal strips or wire C21D 9/663)
  
- 13/00 Furnaces with both stationary charge and progression of heating, e.g. of ring type, of type in which segmental kiln moves over stationary charge**
- 13/02 • of multiple-chamber type with permanent partitions; Combinations of furnaces
- 13/04 • of single-chamber type with temporary partitions
- 13/06 • Details, accessories, or equipment peculiar to furnaces of this type
- 13/08 • • Casings
- 13/10 • • • Arrangements of linings
- 13/12 • • Arrangements of heating devices
- 13/14 • • Arrangement of controlling, monitoring, alarm or like devices [4]
  
- 14/00 Crucible or pot furnaces; Tank furnaces [4]**
- 14/02 • with tilting or rocking arrangements (F27B 14/04 takes precedence)
- 14/04 • adapted for treating the charge in vacuum or special atmosphere
- 14/06 • heated electrically, e.g. induction crucible furnaces, with or without any other source of heat (F27B 14/04 takes precedence)
- 14/08 • Details peculiar to crucible, pot or tank furnaces [4]
- 14/10 • • Crucibles
- 14/12 • • • Covers therefor
- 14/14 • • Arrangements of heating devices
- 14/16 • • Arrangement of devices for charging [4]
- 14/18 • • Arrangement of devices for discharging [4]
- 14/20 • • Arrangement of controlling, monitoring, alarm or like devices [4]

<p><b>15/00 Fluidised-bed furnaces; Other furnaces using or treating finely-divided materials in dispersion</b> (combustion apparatus in which combustion takes place in a fluidised bed of fuel or other particles F23C 10/00)</p> <p>15/02 • Details, accessories, or equipment peculiar to furnaces of these types</p> <p>15/04 • • Casings; Supports therefor</p> <p>15/06 • • • Arrangements of linings</p> <p>15/08 • • Arrangement of devices for charging [4]</p> <p>15/09 • • Arrangement of devices for discharging [4]</p> <p>15/10 • • Arrangements of air or gas supply devices</p> <p>15/12 • • Arrangements of dust collectors</p> <p>15/14 • • Arrangements of heating devices</p> <p>15/16 • • Arrangements of cooling devices</p> <p>15/18 • • Arrangements of controlling devices</p> <p>15/20 • • Arrangements of monitoring devices, of indicators, of alarm devices</p> <p><b>17/00 Furnaces of a kind not covered by any of groups F27B 1/00-F27B 15/00</b> (structural combinations of furnaces F27B 19/02)</p>	<p>17/02 • specially designed for laboratory use</p> <p><b>19/00 Combinations of different kinds of furnaces that are not all covered by any single one of main groups F27B 1/00-F27B 17/00</b></p> <p>19/02 • combined in one structure</p> <p>19/04 • arranged for associated working</p> <p><b>21/00 Open or uncovered sintering apparatus; Other heat-treatment apparatus of like construction</b></p> <p>21/02 • Sintering grates or tables</p> <p>21/04 • Sintering pots or sintering pans</p> <p>21/06 • Endless-strand sintering machines</p> <p>21/08 • Details, accessories, or equipment peculiar to sintering or like apparatus [4]</p> <p>21/10 • • Arrangement of devices for charging [4]</p> <p>21/12 • • Arrangement of devices for discharging [4]</p> <p>21/14 • • Arrangement of controlling, monitoring, alarm or like devices [4]</p>
<p><b>F27D DETAILS OR ACCESSORIES OF FURNACES, KILNS, OVENS, OR RETORTS, IN SO FAR AS THEY ARE OF KINDS OCCURRING IN MORE THAN ONE KIND OF FURNACE</b> (combustion apparatus F23; electric heating H05B)</p>	

#### Note(s)

Attention is drawn to the references and Notes following the title of class F27 and Note(3) of section H.

#### Subclass index

CONSTRUCTIONAL FEATURES.....	1/00
HANDLING AND SUPPORTING CHARGE.....	3/00, 5/00, 15/00
PREHEATING CHARGE; COOLING; USING WASTE HEAT OR GASES.....	13/00, 9/00, 15/02, 17/00
ARRANGEMENTS OF ELECTRIC HEATING ELEMENTS.....	11/00
ARRANGEMENTS OF CONTROL AND SAFETY DEVICES.....	19/00, 21/00
OTHER FEATURES; OTHER DETAILS.....	7/00, 25/00, 27/00, 99/00

<p><b>1/00 Casings; Linings; Walls; Roofs</b> (refractory materials C04B; firebridges for combustion chambers F23M 3/00)</p> <p>1/02 • Crowns; Roofs</p> <p>1/04 • characterised by the form of the bricks or blocks used</p> <p>1/06 • • Composite bricks or blocks</p> <p>1/08 • • • Bricks or blocks with internal reinforcement or metal backing</p> <p>1/10 • Monolithic linings; Supports therefor</p> <p>1/12 • incorporating cooling arrangements (constructions of tube assemblies in general F28)</p> <p>1/14 • Supports for linings (F27D 1/10 takes precedence)</p> <p>1/16 • Making or repairing linings</p> <p>1/18 • Door frames; Doors, lids, removable covers</p> <p><b>3/00 Charging; Discharging; Manipulation of charge</b> (conveying systems characterised by their application for specified purposes not otherwise provided for B65G 49/00; moving charge through a furnace F27B 9/14)</p> <p>3/02 • Skids or tracks for heavy objects</p> <p>3/04 • Ram or pusher apparatus</p> <p>3/06 • Charging or discharging machines on travelling carriages</p> <p>3/08 • Screw feeders; Screw dischargers</p> <p>3/10 • Charging directly from hoppers or shoots</p>	<p>3/12 • Travelling or movable supports or containers for the charge</p> <p>3/14 • Charging or discharging liquid or molten material</p> <p>3/15 • Tapping equipment; Equipment for removing slag</p> <p>3/16 • Introducing a fluid jet or current into the charge (F27D 3/18 takes precedence) [3]</p> <p>3/18 • Charging particulate material using a fluid carrier [3]</p> <p><b>5/00 Supports, screens, or the like for the charge within the furnace</b> (travelling or movable supports F27D 3/12)</p> <p><b>7/00 Forming, maintaining, or circulating atmospheres in heating chambers</b></p> <p>7/02 • Supplying steam, vapour, gases, or liquids</p> <p>7/04 • Circulating atmospheres by mechanical means</p> <p>7/06 • Forming or maintaining special atmospheres or vacuum within heating chambers (F27D 7/02 takes precedence)</p> <p><b>9/00 Cooling of furnaces or of charges therein</b> (F27D 1/00, F27D 3/00 take precedence)</p> <p><b>11/00 Arrangement of elements for electric heating in or on furnaces</b> (electric heating <i>per se</i> H05B)</p> <p>11/02 • Ohmic resistance heating</p> <p>11/04 • • with direct passage of current through the material being heated</p>
---	---

**F27D**

- 11/06 • Induction heating, i.e. in which the material being heated, or its container or elements embodied therein, form the secondary of a transformer
- 11/08 • Heating by electric discharge, e.g. arc discharge
- 11/10 • • Disposition of electrodes (automatic control of temperature G05D 23/00; electric discharge apparatus H01T; arrangements for feeding or guiding electrodes H05B 7/10; automatic control of power by positioning of electrodes H05B 7/144) [3]
- 11/12 • with electromagnetic fields acting directly on the material being heated
- 13/00 Apparatus for preheating charges; Arrangements for preheating charges**
- 15/00 Handling or treating discharged material; Supports or receiving chambers therefor**
- 15/02 • Cooling
- 17/00 Arrangement for using waste heat** (heat-exchangers per se F28); **Arrangement for using, or disposing of, waste gases** (removing fumes in general B08B 15/00)
- 19/00 Arrangement of controlling devices**
- 21/00 Arrangement of monitoring devices; Arrangements of safety devices**
- 21/02 • Observation or illuminating devices
- 21/04 • Arrangements of indicators or alarms
- 25/00 Devices for removing incrustations [2010.01]**
- 27/00 Stirring devices for molten material** (F27D 3/14 takes precedence) [2010.01]
- 99/00 Subject matter not provided for in other groups of this subclass [2010.01]**