

F24D

DOMESTIC- OR SPACE-HEATING SYSTEMS, e.g. CENTRAL HEATING SYSTEMS; DOMESTIC HOT-WATER SUPPLY SYSTEMS; ELEMENTS OR COMPONENTS THEREFOR (using steam or condensate extracted or exhausted from steam engine plants for heating purposes [F01K 17/02](#))

Definition statement

This place covers:

Systems for domestic - or space heating, in which heat is generated at one location and transmitted by a circuit to a consumer at a different location, of the following kind:

- Steam central heating systems
- Hot-water central heating systems
- Hot-air central heating systems
- Central heating systems employing heat-transfer fluids not being hot-water or hot-air, e.g. oil, salt, gas
- Central heating systems employing combinations of two or more of the above-mentioned heat transfer fluids
- District heating systems
- Central heating systems using heat accumulated in storage masses
- Other central heating systems
- Electric heating systems (central heating or domestic heating)
- Other domestic- or non-central space-heating systems
- Domestic hot-water supply systems
- Small-scale combined heat and power [CHP] generation systems specially adapted for domestic heating, space heating or domestic hot-water supply
- Details thereof, including constructional details and control means for heating systems

Relationships with other classification places

The heaters as such are covered by [F24H](#), e.g. details concerning the heaters are covered in [F24H 3/00](#).

Air-conditioning systems for cooling and heating are only covered by [F24F](#).

Arrangements for protecting plants by heating, e.g. in gardens, are only covered by [A01G 13/06](#).

Systems for space heating specially adapted for vehicles are covered by [B60](#)- [B64](#).

The components of the heating system, e.g. heat sources or central heating radiators are also classified in other relevant groups:

- burners in [F23B](#)
- arrangements for feeding fuel to burner in [F23K](#)
- air supply, air draught for burner in [F23L](#)
- electric heating means in [H05B](#)
- heat pumps in [F25B](#)
- solar collector or geothermal systems in [F24S](#), [F24T](#)
- heat exchangers in [F28](#)
- valves in [F16K](#)
- pumps [F04](#)
- water supply and sewerage in [E03B](#) and [E03C](#)

Relationships with other classification places

- arrangements for controlling temperature in [G05D 23/00](#).

References

Limiting references

This place does not cover:

Steam engine plants using steam or condensate extracted or exhausted from steam engine plants for heating purposes	F01K 17/02
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Application-oriented references

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Systems of space heating adapted for vehicles	B60H
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Informative references

Attention is drawn to the following places, which may be of interest for search:

Preventing corrosion	C23F
Water supply in general	E03
Pumps	F04
Valves	F16K
Steam traps	F16T
Combustion apparatus in general	F23
Domestic stoves or ranges	F24B , F24C
Water or air heaters having heat generating means	F24H
Apparatus using heat produced by solar, geothermal or other external chemical reaction other than combustion	F24S , F24T , F24V
Combined heating and refrigeration systems	F25B
Heat exchange apparatus or elements	F28
Heat storage plants	F28D 20/00
Cleaning heat exchange tubes	F28G
Arrangements for controlling temperature	G05D 23/00
Electric heating elements or arrangements	H05B

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Central heating system	a system in which heat is generated or stored at central sources inside a building and is distributed by means of a transfer fluid to the spaces or areas to be heated within the building
District heating system (less commonly called teleheating)	a system for distributing heat generated in a distant centralized location outside a building and distributed by means of a transfer fluid to multiple buildings or facilities

Domestic hot water heating system	a system for heating tap water coming from the main water supply for domestic use other than space heating, e.g. cooking, cleaning, bathing
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F24D 1/00

Steam central heating systems (district heating systems [F24D 10/00](#); central heating systems using heat accumulated in storage masses [F24D 11/00](#))

Definition statement

This place covers:

Central heating systems comprising steam as heat transport medium and combinations thereof:

- in combination with systems for domestic water supply
- operating with live steam (i.e. steam produced for heating)
- operating with exhaust steam of a generating power plant being used for heating
- operating with superheated steam
- feed-line arrangements thereof.

Relationships with other classification places

Constructional details of steam boilers are covered by [F22B](#).

The special case of using steam or condensate extracted or exhausted from steam engine plants for heating purposes are covered by [F01K 17/02](#).

References

Limiting references

This place does not cover:

District heating systems	F24D 10/00
Central heating systems using heat accumulated in storage masses	F24D 11/00

Informative references

Attention is drawn to the following places, which may be of interest for search:

Venting, aeration arrangements for steam heating systems	F24D 19/081
Arrangements or mounting of control or safety devices for steam heating systems	F24D 19/1003
Steam engine plants as such	F01K
Pump having characteristics not provided elsewhere	F04B 19/00
Steam generation; Steam boilers	F22B
Details concerning the heat exchanger	F28D 1/00

Special rules of classification

Details of the steam central heating systems concerning drainage, venting, aerating or control are covered by the relevant subgroup in [F24D 19/1003](#).

F24D 3/00

Hot-water central heating systems (district heating systems [F24D 10/00](#); central heating systems using heat accumulated in storage masses [F24D 11/00](#))

Definition statement

This place covers:

Hot-water central heating systems:

- combined with solar energy
- with forced circulation, e.g. by pumps
- with the water under high pressure
- in combination with systems for domestic hot-water supply
- arrangements for feeding water into the system
- tube and panel arrangements for ceiling, wall, or underfloor heating
- using heat pumps.

Relationships with other classification places

The hot-water central heating systems in this group do not comprise a storage mass for the central heating transfer fluid. Heating systems with a storage mass for the central heating transfer fluid are covered by [F24D 11/00](#).

Hot-water central heating systems in combination with systems for domestic-hot water supply, where said domestic-hot water supply arrangements are located outside the boiler are covered by [F24D 3/08](#). Devices with the domestic-hot water supply arrangements located within the boiler are covered by [F24H 1/48](#).

Domestic hot water supply systems are covered by [F24D 17/00](#).

Feed-line arrangements (filling valves, expansion tanks, pumps, distributors), which are exclusively used in hot-water central heating systems are classified in this group. An special case of feed-line arrangement concerning the connection of a water heater to circulation pipes is also covered by [F24H 9/12](#).

Component, e.g. valves, pumps, etc, which are able to be used elsewhere are classified in the relevant subclass in [F16K](#) or [F04](#).

Tube arrangements for ceiling, wall or underfloor heating, where the heating medium is hot-water are covered in [F24D 3/12](#). Floorings in general are covered by [E04F 15/00](#). Coverings or linings (walls, ceilings, etc) having conduits for fluids, in [E04F 13/0869](#). The special use of the coverings or floorings for heating is covered by the group [E04F 2290/023](#).

Electric underfloor heating is only covered by [F24D 13/02](#).

Hot-water central heating systems in which additional heating means are located within the central heating radiators are covered by [F24D 13/04](#).

Cooling ceilings are covered by [F24F 5/00](#).

Heating floor for outdoor is covered by [E01C 11/00](#).

Details of the hot-water central heating systems concerning drainage, venting, aerating or control are covered by the relevant subgroup in [F24D 19/08](#).

References

Limiting references

This place does not cover:

District heating systems	F24D 10/00
Central heating systems using heat accumulated in storage masses	F24D 11/00

Informative references

Attention is drawn to the following places, which may be of interest for search:

Domestic hot-water supply systems	F24D 17/00
Venting, aeration arrangements for water heating systems	F24D 19/082
Arrangements or mounting of control or safety devices for water heating systems	F24D 19/1006
Heating floor for outdoor	E01C 11/00
Plumbing installations for fresh water	E03C 1/02
Floor construction with regard to insulation, Connections specially adapted therefore	E04B 5/00
Special adaptations of floors for incorporating ducts, e.g. for heating or ventilating	E04B 5/48
Ceilings, Construction of ceilings, e.g. false ceilings, Ceiling construction with regard to insulation	E04B 9/00
Building elements of block or other shape for the construction of parts of buildings characterised by special adaptations, e.g. serving for locating conduits	E04C 1/39
Building elements of relatively thin form for the construction of parts of buildings, e.g. sheet materials, slabs, or panels	E04C 2/00
Building elements of relatively thin form for the construction of parts of buildings with special adaptations for auxiliary purposes, e.g. serving for locating conduits	E04C 2/52
Coverings or linings (walls, ceilings...) having conduits for fluids	E04F 13/08
Flooring	E04F 15/00
Control, e.g. regulation, of pumps, pumping installations or systems	F04D 15/00
Multiple-way valves, e.g. mixing valves, pipe fittings incorporating such valves	F16K 11/00
Supports for pipes, cables or protective tubing, e.g. hangers, holders, clamps, cleats, clips, brackets	F16L 3/00
Branching pipes, joining pipes to walls	F16L 41/00
Air-conditioning systems, e.g. air-conditioning units using radiation from walls or panels, cool ceilings	F24F 5/00
Water heaters for central heating incorporating heater for domestic water	F24H 1/48
Connecting water heaters (not the radiator) to circulation pipes	F24H 9/13
Arrangements of inlet valves used with water heaters	F24H 9/136
Tubular heat-exchangers	F28D 7/00
Heat storage plants or apparatus in general	F28D 20/00

F24D 3/12

Tube and panel arrangements for ceiling, wall, or underfloor heating (electric underfloor heating [F24D 13/02](#))

References

Limiting references

This place does not cover:

Electric underfloor heating	F24D 13/02
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Informative references

Attention is drawn to the following places, which may be of interest for search:

Special adaptations of floors for incorporating ducts, e.g. for heating or ventilating	E04B 5/48
Building elements of block or other shape for the construction of parts of buildings characterised by special adaptations, e.g. serving for locating conduits	E04C 1/39
Building elements of relatively thin form for the construction of parts of buildings with special adaptations for auxiliary purposes, e.g. serving for locating conduits	E04C 2/52

F24D 5/00

Hot-air central heating systems (district heating systems [F24D 10/00](#); central heating systems using heat accumulated in storage masses [F24D 11/00](#); air conditioning [F24F](#)); Exhaust gas central heating systems

Definition statement

This place covers:

Hot-air central heating systems:

- the heat source being solar energy
- operating with discharge of hot air into the space or area to be heated
- operating without discharge of hot air into the space or area to be heated
- using heat pumps.

Relationships with other classification places

Air conditioning systems heating and cooling air are classified only in [F24F](#).

In the systems using a heat pump, the condenser is placed in the air channel for heating the air. There is no additional intermediate circuit between the cooling fluid of the heat pump and the air.

Arrangements with heat pumps heating a water circuit, said water circuit being used for heating air are covered in [F24D 3/18](#).

Details of the control of hot-air central heating systems are covered by the relevant subgroup in [F24D 19/1084](#).

References

Limiting references

This place does not cover:

District heating systems	F24D 10/00
Central heating systems using heat accumulated in storage masses	F24D 11/00
Air conditioning systems able for cooling and heating	F24F

Informative references

Attention is drawn to the following places, which may be of interest for search:

Central heating systems using heat pumps	F24D 3/18
Arrangements or mounting of control or safety devices for air heating systems	F24D 19/1084
Air heaters having heat generating means	F24H 3/00
Combined water and air heaters	F24H 6/00

F24D 7/00

Central heating systems employing heat-transfer fluids not covered by groups [F24D 1/00](#) - [F24D 5/00](#), e.g. oil, salt or gas (district heating systems [F24D 10/00](#); central heating systems using heat accumulated in storage masses [F24D 11/00](#))

Definition statement

This place covers:

Central heating systems employing heat-transfer fluids other than hot-water or hot-air, e.g. oil, salt, gas.

Relationships with other classification places

Systems with steam as heat-transfer are covered by [F24D 1/00](#).

References

Limiting references

This place does not cover:

District heating systems	F24D 10/00
Central heating systems using heat accumulated in storage masses	F24D 11/00

F24D 9/00

Central heating systems employing combinations of heat transfer fluids covered by two or more of groups [F24D 1/00](#) - [F24D 7/00](#) (district heating systems [F24D 10/00](#); central heating systems using heat accumulated in storage masses [F24D 11/00](#))

Definition statement

This place covers:

Central heating systems employing combinations of heat transfer fluids covered by two or more of the prior groups.

References

Limiting references

This place does not cover:

District heating systems	F24D 10/00
Central heating systems using heat accumulated in storage masses	F24D 11/00

F24D 10/00

District heating systems

Definition statement

This place covers:

District heating systems with:

- domestic delivery stations having a heat exchanger
- direct domestic delivery stations

"District heating system" (less commonly called teleheating) is a system for distributing heat generated in a distant centralized location outside a building and distributed by means of a transfer fluid to multiple buildings or facilities. In the normal central heating systems, the heat source is located within the building.

Relationships with other classification places

District heating systems with heat accumulated in storage masses are covered by [F24D 11/001](#).

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

District heating systems with heat accumulated in storage masses	F24D 11/001
District heating systems with heat accumulated in storage masses and using a heat pump	F24D 11/0207
Arrangements of mounting of control or safety devices for steam heating systems	F24D 19/1003
Steam engine plants, steam accumulators, engine plants not otherwise provided for, engines using special working fluids or cycles	F01K
Air conditioning	F24F

Heat exchanger	F28
Systems for controlling or regulating non-electric variables	G05D

F24D 11/00

Central heating systems using heat accumulated in storage masses (self-contained storage heating units [F24D 15/02](#))

Definition statement

This place covers:

Central heating systems using heat accumulated in storage masses, in particular:

- district heating systems
- water heating systems
- air heating systems
- using heat pumps

Relationships with other classification places

The central heating systems in this group comprise a storage mass for the central heating transfer fluid. This storage mass can stay in the tank or be able to flow outside for being used. Details concerning tanks of the storage mass per se are covered by [F24H 7/00](#). Details concerning water storage tanks with water being able to flow outside for being used are covered by [F24H 1/18](#). Details of the tanks as such are covered by [F28D 20/00](#)

Details of storage heaters heating a fluid using a heat pump are also covered by [F24H 4/04](#).

Storage masses in general are classified in the relevant subclasses, e.g. [C04B](#).

References

Limiting references

This place does not cover:

Self-contained storage heating units	F24D 15/02
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Informative references

Attention is drawn to the following places, which may be of interest for search:

Central heating system with domestic hot water storage tank	F24D 3/08
Other central heating systems not covered by groups F24D 1/00 - F24D 11/00 , in particular systems with more than one heat source	F24D 12/00
Domestic hot water supply system with accumulation of heated water	F24D 17/00
Arrangement or mounting of control or safety devices for water heating systems	F24D 19/1006
Air-conditioning systems or apparatus not covered by F24F 1/00 or F24F 3/00	F24F 5/00
Details of water storage tanks with water being able to flow outside the tank for being used	F24H 1/48
Storage heaters for fluids using heat pumps	F24H 4/04

Storage heaters with storage masses staying in the tank and with the transfer fluid being a liquid	F24H 7/0233 , F24H 7/0441
Use of solar heat, e.g. solar heat collectors	F24S 21/00
Other production or use of heat, not derived from combustion	F24V 30/00 , F24V 99/00
Combined heating and refrigeration systems, e.g. operating alternately or simultaneously	F25B 29/00
Heat pumps as such	F25B 30/00
Heat storage plants or apparatus in general	F28D 20/00

Special rules of classification

Central heating systems using heat accumulated in storage masses using heat pumps are covered by [F24D 11/02](#).

F24D 11/02

using heat pumps

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Heat pumps for producing heat in general	F25B 29/00
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F24D 12/00

Other central heating systems

Definition statement

This place covers:

Arrangements of central heating systems in which a combination of more than one heat source is disclosed.

In particular, this class covers central heating systems without an storage mass recuperating waste heat source with a separate flue gas condenser.

The cases in which one of the heat sources is a heat pump are classified in other relevant subclasses.

Relationships with other classification places

Condensing boilers, in which the means adapted for extracting latent heat from the flue gases by means of condensation are located within the boiler are classified in [F24H 8/00](#).

Cogeneration machines are classified in [F02G](#).

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Cogeneration machines	F02G
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Condensing boilers, in which the means adapted for extracting latent heat from the flue gases by means of condensation are located within the boiler are classified	F24H 8/00
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F24D 13/00

Electric heating systems

Definition statement

This place covers:

- Electric heating systems solely using resistance heating, e.g. under-floor heating
- Electric heating systems using electric heating of heat-transfer fluid in separate units of the system, e.g. radiators connected to the central heating systems by fluid pipes comprising additional electric heating means.

Relationships with other classification places

Self-contained air heaters are classified in [F24H 3/00](#).

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Arrangements or mounting of control of safety devices for electric heating systems	F24D 19/1096
Layered products essentially comprising sheet glass, or glass, slag, or like fibres	B32B 17/00
Flooring	E04F 15/00
Electric water or air heaters	F24H
Ohmic-resistance heating	H05B 3/00

Special rules of classification

Central heating radiators comprising additional heating means located within the radiator are covered by [F24D 13/04](#).

F24D 15/00

Other domestic- or space-heating systems

Definition statement

This place covers:

Other domestic- or non-central space-heating systems, in particular:

- self-contained heating units, e.g. storage heaters
- using heat pumps. This class covers arrangements in which the refrigerant of the heat pump flows directly through the radiator or the heating panel and transfers heat to the space to be heated without an intermediate hot water central heating circuit being located between the heat pump loop and the space to be heated.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Fluid heaters using heat pumps, the fluid being a liquid, comprising storage means	F24H 4/04
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F24D 17/00

Domestic hot-water supply systems

Definition statement

This place covers:

Domestic hot-water supply systems using

- solar energy
- heat pumps
- conventional heating means
- combination of different kinds of heating means.

Domestic hot-water supply systems comprising arrangements for preventing the occurrence or proliferation of microorganisms in the water

Domestic hot-water supply systems comprising recirculation systems.

Relationships with other classification places

Treatments of water for preventing the occurrence of microorganisms in general is covered by [C02F 1/00](#). Devices for preventing the contamination of domestic plumbing installation are covered in [E03C 1/00](#).

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Combined with domestic- or space-heating systems	F24D 1/00 - F24D 15/00
Arrangement or mounting of control or safety devices for water heating systems and for domestic hot water	F24D 19/10
Treatment of water, waste water, or sewage	C02F 1/00
Methods or layout of installations for water supply	E03B 1/00
Water main or service pipe systems	E03B 7/00
Domestic plumbing installations for fresh water or waste water, Sinks	E03C 1/00
Air-conditioning systems or apparatus not covered by F24F 1/00 or F24F 3/00 e.g. using solar heat, combined with household units such as an oven or water heater	F24F 5/00
Fluid heaters using heat pumps	F24H 4/00
Use of solar heat, e.g. solar heat collectors	F24S
Combined heating and refrigeration systems, e.g. operating alternately or simultaneously	F25B 29/00
Heat pumps	F25B 30/00

Heat storage plants or apparatus in general	F28D 20/00
Heat-exchange apparatus not covered by any of the groups F28D 1/00 - F28D 20/00	F28D 21/00

Special rules of classification

Hot-water central heating systems combined with systems for domestic hot water supply are covered by [F24D 3/08](#).

F24D 18/00

Small-scale combined heat and power [CHP] generation systems specially adapted for domestic heating, space heating or domestic hot-water supply

Definition statement

This place covers:

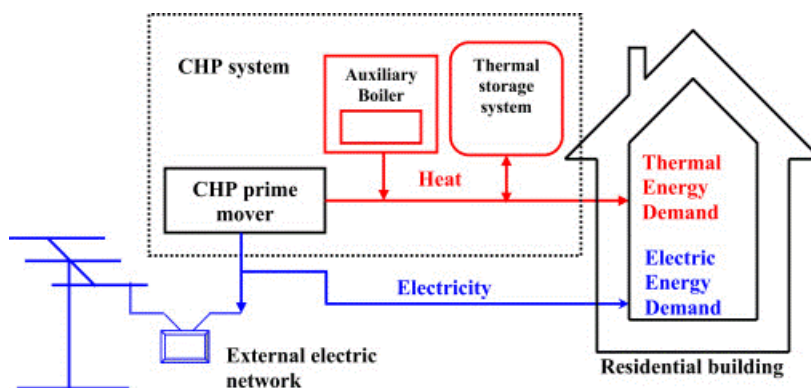
Combined heat and power [CHP] generation systems, also known as cogeneration systems [CGS], which are specially adapted for heating of, or for supplying hot-water to, homes, offices and small buildings, i.e. systems providing both heat for heating fluids and electrical power.

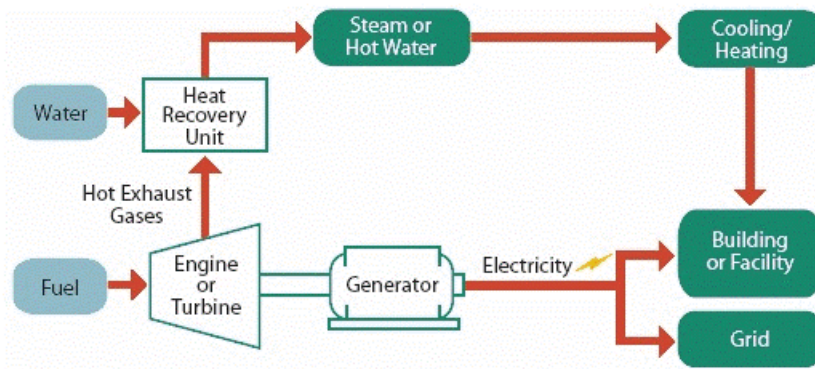
A small-scale CHP system usually comprises the following units:

- a small heat generator or a fuel cell;
- an electric generator which provides electric power; and
- a heat recovery unit which utilises heat for domestic or space heating.

The small-scale CHP system can also optionally comprise:

- a "generate-and-resell" (also called "net-metering") unit which distributes (part of) the generated electric power over the electrical grid; or
- a thermal storage unit; or
- an electric storage unit.





References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Profiting from waste heat of combustion engines	F02G 5/00
Fluid heaters having electrical generators	F24H 2240/00
Utilising heat energy produced by photovoltaic [PV] modules	H02S 40/44

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

CGS	Cogeneration system
CHP	Combined heat and power

F24D 19/00

Details (of water or air heaters [F24H 9/00](#); of heat-exchange or heat-transfer apparatus, of general application [F28F](#))

Definition statement

This place covers:

Details concerning the heating system and the central heating radiators, in particular:

- Arrangements for connecting central heating radiators to circulation pipes
- Details related to central heating radiators: e.g. humidifiers for radiators, fan arrangements, magnets for attaching a cover, etc.
- devices for preventing or removing corrosion, slime or scale
- devices for preventing damage by freezing
- arrangement of mountings or supports for radiators
- casings, cover lids or ornamental panels, for radiators
- arrangements for drainage, venting or aerating
- arrangement or mounting of control or safety devices.

Relationships with other classification places

Details concerning the heater, i.e. the device generating the heat, as such are covered by [F24H 9/00](#).

Central heating radiators as such are covered in [F28D 1/00](#).

Relationships with other classification places

Arrangements for connecting heat exchanger in general to flow lines are covered by [F28F 9/0246](#).

Arrangements for connecting different sections within a heat exchanger, e.g. radiators, are covered by [F28F 9/26](#).

Mounting arrangements for special applications fixed on a central heating radiator are classified in the relevant subclass:

- Towel racks: [A47K 10/06](#)
- Towel grips or hooks: [A47K 10/12](#)
- drying lines for attachment to central heating radiators: [D06F 57/127](#).

Arrangements for drainage, venting or aerating specially adapted for heating systems are covered in this group.

Draining valves or venting valves being used elsewhere are classified in the relevant subclass in [F16K](#).

Arrangements for control of temperature and algorithm therefore are also covered by [G05D 23/00](#).

References

Limiting references

This place does not cover:

Details of water or air heaters, e.g. casings, cover lids or ornamental panel for heaters (not central heating radiators) and arrangements of mountings or supports of heaters (not central heating radiators)	F24H 9/00 , F24H 9/02 , F24H 9/06
Details of heat-exchange or heat-transfer apparatus, of general application	F28F

Informative references

Attention is drawn to the following places, which may be of interest for search:

Grips, hooks or the like for hanging-up towels (on a central heating radiator)	A47K 10/12
Degasification of liquids	B01D 19/00
Filters	B01D 29/00
Anodic or cathodic protection	C23F 13/00
Supporting means for linen or garments to be dried or aired on attachments or suspension to central heating radiators	D06F 57/12
Priming, Preventing vapour lock	F04D 9/00
Devices, e.g. valves, for venting or aerating enclosures	F16K 24/00
Construction of housing, use of materials therefore	F16K 27/00
Devices or appurtenances for use in, or in connection with, pipes or pipe systems	F16L 55/00
Regulating fuel supply	F23N 1/00
Control or safety systems or apparatus	F24F 11/00
Central heating radiators as such	F28D 1/00
Measuring quantity of heat conveyed by flowing mediums, e.g. in heating systems	G01K 17/06
Control of temperature	G05D 23/00

Special rules of classification

Central heating radiators comprising additional heating means located within the radiator are covered by [F24D 13/04](#).

Details of the control for heating systems are covered by the relevant subgroup in [F24D 19/00](#).

Arrangements for connecting central heating radiators to circulation pipes are covered by [F24D 19/0002](#).

Devices for preventing or removing corrosion, slime or scale are covered by [F24D 19/0092](#).

Arrangements of mounting or support for central heating radiators are covered by [F24D 19/02](#).

F24D 19/08

Arrangements for drainage, venting or aerating (valves for venting or aerating [F16K 24/00](#))

References

Limiting references

This place does not cover:

Valves for venting or aerating	F16K 24/00
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Informative references

Attention is drawn to the following places, which may be of interest for search:

Valves for drainage	F16K
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F24D 19/10

Arrangement or mounting of control or safety devices (only the heater being controlled [F24H 9/20](#))

References

Limiting references

This place does not cover:

Arrangements where only the heater is controlled	F24H 9/20
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Informative references

Attention is drawn to the following places, which may be of interest for search:

Control valves	F16K
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Special rules of classification

Looping references between [F24D 19/10](#) and [F24H 9/20](#) have been identified. Until this inconsistency is resolved in IPC, the current classification practice in CPC is as follows: Please follow the limiting reference as it is in [F24D 19/10](#). The limiting reference in [F24H 9/20](#) is an informative reference.