

1. This heading is primarily concerned with processes and apparatus for making articles (*including* intermediate products such as ingots) by casting molten metallic material, for which it is the general heading

It is the main heading for sub-systems and components of the aforementioned processes and apparatus and also for processes and apparatus for casting molten metallic material derived from, *inter alia*, electroslag refining or melting processes

This heading further includes:

- . certain associations of casting with functionally different operations
- . ladles, tundishes and other equipment for handling molten metallic material prior to, normally preparatory to, casting; and certain functions associated with such equipment
- . ingots
- . residually, machine elements and materials which are not essentially peculiar to casting

#### Definition

Casting is that material-forming operation in which a supply of molten metallic material is provided in or to a zone, the shaping zone, where it is given some physical shape or form (normally more or less corresponding to the shape or form desired in the solidified material) and allowed or caused to solidify, at least sufficiently to retain that shape; *and includes* such other stages as are essential complements to the shaping and solidification stage, *eg* cooling the artefact, extracting the artefact from the mould. The shaping zone may include more than one solidification surface or mould

#### Explanation of heading subject-matter and relationships with other headings

### 2. General

- 2.1 Materials This heading is concerned with subject-matter in which the working material is molten metallic material. For similar subject-matter concerned with other working materials—*See* such headings as:

B5A, Moulding plastic substances &c  
 B5B, Making artificial fibres, films &c  
 C1M, Glass and vitreous enamels  
 H1K, Electric solid-state devices &c

Moreover the casting of printing and embossing surfaces is not subject-matter for this heading, but is to be found in B6C, Printing &c

- 2.2 Artefacts In general disclosures relating to the manufacture of specified cast artefacts are classified in this heading when:

- either* (a) the construction of the artefact *per se* lacks classifying interest
- or* (b) the general character of the artefact is known and its manufacture by a process or technique involving casting is known. In such circumstances, classification will invariably be made in this heading when the detailed construction of the artefact reflects the need to improve or modify castability or as-cast structure. Classification may be made in this heading when the detailed construction reflects other needs, *eg* as in many cases concerned with making composite artefacts. Thus, classification of cases in this category is necessarily somewhat arbitrary: classification may alternatively, or additionally, be made in the heading, if any, appropriate to the specific artefact
- or* (c) the artefact is of its own right properly classifiable in this heading as an element of casting apparatus, *eg* mould

3. Subject to the above explanation, the heading comprises the following subject-matter:

### 3.1 Association of casting with one or more functionally different operations

Classified here are disclosures concerned with the association of casting with one or more operations which are functionally different, *but not subordinate to the casting operation*

In general, such disclosures are classified here only when:

- (a) the centre of interest lies in the casting operation *and*
- (b) none of the discrete operations has *separate* classifying interest

Explanation of heading—cont

When this is not the case and the functionally different operation is a metal-working or metal-treating operation, disclosures are classified in B3A, Multi-operation metal article manufacture, if the general character of the association is of interest, or the relevant B3 (*including* elsewhere in *this* heading) or C7 heading when interest resides in any one of the discrete operations. Where the functionally different operation is not a metal-working or metal-treating operation, classification is made, in an appropriate heading, for each operation which is of interest *per se*; if no operation is of interest *per se*, classification may be made here residually, though this is necessarily somewhat arbitrary and consideration should be given to both this heading and the heading(s) for the functionally different operations

## 3.2 Control and command

Classified here are disclosures concerned with the control and command of processes, apparatus and equipment relating to casting or otherwise falling within this heading, *with the exception of the associative subject-matter outlined above*

Also classified here are disclosures concerned with monitoring, indicating or observing the operation of processes or apparatus mentioned in the preceding paragraph

Disclosures relating to the control system or monitoring system *per se* are not subject-matter for this heading, but are to be found in the relevant control, detection or measurement heading *eg*:

- . G1A, Radiation and radiation-utilising measurement &c
- . G1H, Liquid level control and indication &c
- . G1M, Determining dimensions and shapes
- . G3N, Automatic electric control systems
- . G3R, Electric retroactive control
- . G4N, Supervisory, alarm and safety systems

## 3.3 Association of distinguishable casting processes, techniques or apparatus, or of distinguishable shaping and solidification stages

This is not intended to include processes, techniques or apparatus by which a plurality of moulds is filled sequentially in an identical or substantially identical manner

Exceptionally, disclosures in which the centre of interest lies in the control or command of an association (which otherwise satisfies the criteria for classification under this sub-division) are classified elsewhere in this heading (*See* Control and command)

## 3.4 Overall organisation of casting process or technique

(a) association between the shaping and solidification stage and one or more subordinate operations.

Classified here are disclosures concerned with the association of the stage of shaping and initial solidification of the metallic melt (*ie* the establishing of an incipient cast artefact) with one or more diverse other operations which is (are) subordinate, *eg* preparatory, pre-conditioning or perfecting, operation(s); and disclosures concerned with the organisation of apparatus to provide a particular sequence of operations *including* at least shaping and initial solidification *and* one or more subordinate operations, insofar as such apparatus essentially involves an improvement or modification in the casting process or technique

For the purposes of this sub-division:

- (i) the melting (with or without further treatment) of metallic material for casting may be regarded as a subordinate operation in appropriate cases. In general, this will be when the disclosure essentially involves an association between metal melting and casting, *eg* as in melting an electrode in a mould, as opposed to casting from metallic melt ordinarily provided. (Note, however, that headings C7D, Process metallurgy &c and F4B, Furnaces &c take precedence for metal melting)
- (ii) the following are *not* regarded as subordinate operations:
  - . other casting operations
  - . the mere provision in the shaping zone of another material or body against which molten metallic material is to be cast to form a composite artefact
  - . the heating and/or cooling of the cast melt or cast artefact
  - . other stages which are necessary complements to the shaping and solidification stage

Associations between the above operations and the shaping/initial solidification stage are classified elsewhere as appropriate *eg* under term FAB for plural distinguishable casting operations, term FCC for composite casting and, residually, term FCXA

Explanation of heading—cont

(b) characterised by specific artefact or type of artefact

Classification here is limited to those disclosures in which the organisation of interest *either*:

(a) is essentially determined by the physical form, *eg* shape, of the artefact produced *or*

(b) resides in the application of casting or a particular casting technique to the manufacture of a specific artefact  
*See also* paragraph 2.2 *above*

(c) other overall organisation of casting process or technique

Classified here are disclosures concerned with the general organisation of the casting process (ie sequence of method steps performed in effecting casting (*qv*) or of the casting technique itself (*ie* general manner in which casting is performed *eg* centrifugal, continuous), *not provided for elsewhere in this heading*

Further, this sub-division embraces disclosures concerned with the general organisation of apparatus providing an improvement or modification in the casting process or technique (*including* new processes and techniques); and also associations between sub-systems or unit functions of casting apparatus, which provide such an improvement or modification, *and for which no specific provision exists elsewhere in this heading*

### 3.5 Overall organisation peculiar to making composite artefacts

Classified here are disclosures concerned with the overall organisation of processes or apparatus for making composite artefacts by casting molten metallic material against another material or body, *not otherwise provided for elsewhere in this heading*. *See also* paragraph 2.2 *above*

### 3.6 Overall organisation of casting apparatus *not otherwise provided for*

Classified here are disclosures concerned with the general organisation of casting apparatus, or associations between sub-systems or unit functions of casting apparatus (and for which no specific provision exists elsewhere in this heading) *where essentially no improvement or modification in the casting process or technique is involved*

### 3.7 Perfecting, ancillary, transcending and unit subjects

Classified here are disclosures concerned with the perfecting, ancillary, transcending (*ie* transcending the broad areas into which the unit subjects are divided) and unit subjects listed in the corresponding part of the Schedule

Also classified here are improvements or modifications in the casting process, technique or apparatus attained wholly through individual ones of the perfecting &c subjects listed in the corresponding part of the Schedule  
Excluded are

- . foundry moulding machines and processes, flasks, patterns, shell moulds and cores—B3G, Foundry moulding
- . welding, soldering and brazing where a mould is used for mere containment—B3R, Welding, soldering and brazing (where a mould is used for shaping however, this is subject matter for B3F)
- . processes or apparatus for making moulds from mouldable materials *other than* metallic material or foundry sand—B5A, Moulding plastic substances &c
- . roll stands for conveying and guiding castings; constructions and arrangements of conveyors—B8A, Conveyors &c
- . moulds and cores insofar as novelty resides in the composition of the material thereof—headings for materials, *eg* C1A, Inorganic substances; C3N, Plastic compositions &c; C3V, Miscellaneous polymer compositions, articles and uses
- . enamelling *other than* by lined moulds—C1M, Glass and vitreous enamels;
- . expelling gases from metal prior to pouring—C7D, Process metallurgy &c;
- . thixotropic metals or metallic slurries and their preparation—C7D, Process metallurgy &c; B1C, Mixing &c
- . treating molten metal, *otherwise than* in moulds, and castings with electric currents—C7D, Process metallurgy &c; C7N, Heat treatment of metals;
- . melting metals—C7D, Process metallurgy &c; F4B, Furnaces &c
- . vibration generating mechanism—F1S, Miscellaneous prime movers; F2S, Energy absorbing and storing; vibrating; H2A, Dynamo-electric machines &c;
- . pipe joints secured by casting metals—F2G, Pipe and rod couplings &c
- . linings for ladles and tundishes, *including* their repair and replacement—F4B, Furnaces &c
- . construction of crucibles and melting pots—F4B, Furnaces &c
- . melting furnaces and stoves—F4B, Furnaces &c; F4W Stoves and fireplaces;
- . fluid circulating closed-cycle cooling systems—F4U, Heating and cooling systems &c
- . constructions and arrangements of electrodes used in electro-slag remelting (ESR) casting processes—H5H, Electric heating; microwave heating &c

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Explanation of heading—*cont*

4. Exclusion references

The exclusion references listed in this heading are not exhaustive. Reference should be made to the appropriate general heading/s for processes, materials, elements or devices which may be more widely applicable than can appropriately be classified in this heading

5. Relationship with the Universal Indexing Schedules (heading U1S)

In addition to recording the nature of broader processes and apparatus with or in which inventions classified here may be used, U1S is used, subject to its indexing rules, to index useful products obtained (except that products not in their final form, *eg* ingots, continuous rods, are not indexed) and specified metals operated on (except for steel, which is regarded as commonplace).

Up to the operative date of Edition G, indexing terms from B3F were assigned to identify useful products obtained; U1S now fulfills this function.

6. Operative date for Key entries

Operative date of the terms in this heading are:

1. for terms indicated by a marginal code that of the Edition corresponding to the code and
  2. for all other terms that of Edition E
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Classifying Schedule

- g FAA association of casting with one or more functionally different operations *which are not subordinate to the casting operation*  
 . See paragraph 3.1 of introduction  
 . See also Indexing Schedules 1 and 2
- control and command—  
 . See paragraph 3.2 of introduction  
 . See also Indexing Schedule 1
- FBA . of processes or apparatus classifiable under term FAA—See term FAA above
- FBD . of overall process or apparatus  
 . of perfecting, ancillary, transcending or unit functions—  
 . . programmed control systems
- g FBE . . other systems, *including* combinations of control systems
- FBH . monitoring, indicating and observing the operation of processes or apparatus necessarily involving casting or handling molten metal prior to casting
- FAB association of distinguishable casting processes, techniques or apparatus; or of distinguishable shaping and solidification stages  
 . See paragraph 3.3 of introduction  
 . See also Indexing Schedules 1 and 2  
 . peculiar to making composite articles—See term FCC below  
 . association of moulds, mould cavities, or cavity-defining parts—See term FMA below
- overall organisation—  
 . See paragraphs 3.4 to 3.6 of introduction  
 . See also Indexing Schedules 1 and 2  
 . where the concern is with operating a directionally-oriented thermal exchange-and-solidification regime—See terms FGF to FGP below  
 . **NB** Improvements or modifications in the casting process, technique or apparatus attained wholly through any individual perfecting, ancillary, transcending or unit subject are classified solely under the appropriate term(s) for the perfecting &c subject below. See also paragraph 3.7 of introduction
- . for associations of—  
 . . cooling with transport/support means—See term FHX below  
 . . melt supply system or part thereof with solidification surface or shaping zone—See term FJE below  
 . . electrical/magnetic agitation of cast melt with mould or with means which withdraw, guide or support a cast strand—See terms FEB, FEC below
- . of casting process or technique; of apparatus necessarily providing an improvement or modification in the casting process or technique—  
 . . association between shaping and solidification stage and one or more subordinate operations, the subordinate operation(s) being—  
 . . . preparatory or pre-conditioning operation(s), *including* operation(s) carried out prior to, but having effect during, the shaping and solidification stage  
 . . . . See also Indexing Schedule 3
- g FCP . . . conditioning or perfecting operation(s) carried out during the shaping and solidification stage and effective on the unsolidified portion only, or on the liquid-solid interface, of an incipient cast artefact
- j FCM . . . finishing or post-conditioning operation(s) carried out on the cast artefact *outside the mould*, (*including* removal of excess metal deliberately cast locally in addition to that finally desired)  
 . . . . term FCM above takes precedence
- j FCF . . . combination of subordinate operations as identified by more than one of the terms FCP-FCF above  
 . . . . See also Indexing Schedule 3
- j FCU . . characterised by specific artefact or type of artefact *other than* continuous or indefinite length plain, solid blanks  
 . . . See also Indexing Schedule 4
- g FCXA . . composite artefacts—See term FCC below  
 . . other  
 . . . See also Indexing Schedule 4
- g FCC . of processes, techniques and apparatus peculiar to making composite artefacts by casting molten metallic material against another material or body  
 . . See also Indexing Schedule 4  
 . . unit subjects peculiar to composite casting—See terms FNP-FNX below
- g FCXB . of casting apparatus *not otherwise provided for*

Perfecting, ancillary, transcending and unit subjects: summary of main entries

- . perfecting ancillary and transcending subjects—
  - .. environmental protection measures; hoods; enclosures
  - .. sealing against melt seepage
  - .. venting, extracting fume, gas or vapour
  - .. dealing with breakout or spillage of melt; dealing with excess or surplus melt
  - .. taking and solidifying molten metal samples
  - .. melt-contacting surfaces in general (*including* such surfaces of specified items of equipment, *eg* moulds, runners) characterised by physical and/or chemical composition
  - .. heating
  - .. cooling
- . unit subjects concerning melt—
  - .. supplying, handling metallic melt; feeding metallic melt towards, or introducing metallic melt into, the shaping zone
  - .. treating (*including* protecting) the metallic melt in order to influence its character, composition, or the solidification process
  - .. agitating, stirring cast melt
- . unit subjects concerning solidification surface *eg* mould—
  - .. solidification surface, *eg* mould or mould assembly; shaping the melt, *including* setting cores or inserts for encasting; making mould
  - .. disposition, mounting, supporting mould for casting
  - .. closing, opening mould for casting
  - .. transporting, bringing together, separating or similarly manipulating moulds, mould parts or other associated components
  - .. means for imparting motion to solidification surface during casting
  - .. operations performed on solidification surface *eg* mould, preparatory to, or after, casting *including* apparatus peculiar to such operations
- . unit subjects concerning cast artefact—
  - .. extracting, freeing cast artefact from mould or core *including* organisation of mould or core to permit or facilitate extraction
  - .. handling, *eg* turning, inverting, conveying cast artefact outside mould or shaping zone
  - .. finishing operations performed on newly-cast artefact
- . unit subjects peculiar to continuous casting—
  - .. lubricating the mould-casting interface
  - .. starting the cast
  - .. altering the cross-sectional shape or size of strand during casting
  - .. withdrawing cast strand from the shaping zone, *eg* mould
  - .. guiding and/or supporting metallic material after shaping
- . unit subjects peculiar to making composite artefacts by casting molten metallic material against another material or body—
  - .. preparation, pre-treatment of material or body against which molten metallic material is to be cast
  - .. material or body against which molten metallic material is to be cast
  - .. other perfecting &c subjects *including* ingots *per se*

perfecting, ancillary and transcending subjects—

- FDA . environmental protection measures; hoods; enclosures  
 FDB . sealing against melt seepage  
     . venting, extracting fume, gas or vapour—  
 FDC . . from mould cavity only  
 FDD . . from casting area *other than* mould cavity only  
 FDE . dealing with breakout or spillage of melt; dealing with excess or surplus melt  
 FDW . taking and solidifying molten metal samples  
 FDF . melt-contacting surfaces in general (*including* such surfaces of specified items of equipment *eg* moulds, runners) characterised by physical character and/or chemical composition *including* composition of coating or lining affording the melt-contacting surface  
     . . composition selected to effect treatment of the metallic melt—*See* term FFD *below*  
     . . concerning material or body against which molten metallic material is to be cast for making composite artefact—*See* term FNQ *below*
- FDV . heating *not otherwise provided for eg* heating melt-dispensing nozzles, ladles or tundishes, casting charges  
     . . heating as part of overall organisation—*See* terms FC- *above*  
     . . heating as a unit operation—  
     . . . heating melt, mould or cast artefact to effect treatment of metallic melt—*See* unit subjects concerning melt *below (eg* terms FGF, FGK)  
     . . . heating of newly-cast artefact—*See* unit subjects concerning cast artefact *below (eg* term FDQ)  
     . . . pre-heating mould—*See* unit subjects concerning mould *below (eg* term FDM)  
     . . . metal melting operations of interest *per se*—*See* C7D, Process metallurgy &c; F4B, Furnaces &c  
     . . cooling; heat extraction in general—  
     . . cooling as part of overall organisation—*See* terms FC- *above*  
     . . cooling as a unit operation—  
     . . . cooling melt, mould or cast artefact to effect treatment of metallic melt—*See* unit subjects concerning melt *below (eg* term FGL)  
     . . . cooling of newly-cast artefact—*See* unit subjects concerning cast artefact *below (eg* term FDQ)
- FHA . . . conditions or parameters selected to achieve another specified effect, *other than* a treatment, upon the cast artefact, *eg* bending
- FHB . . . influencing heat flow; modifying cooling rate *eg* preventing overcooling by use of wipers  
 FHR . . . coolant media  
     . . . organisation of cooling processes, systems and apparatus-  
     . . . . cooling melt, mould or cast artefact-  
     . . . . . by direct contact of fluent coolant with melt or cast artefact
- FHC . . . . . *other than* by direct contact of fluent coolant with melt or cast artefact  
 FHD . . . . . combinations of the *above*  
 FHE . . . . . cooling *other than* melt, mould or cast artefact  
 FHG . . . details, sub-elements and sub-systems of cooling systems and apparatus
- FHK . . . arrangements of fluid coolant passages; forming coolant passages *eg* parts modified to form coolant passages on assembly
- FHM . . . arrangements of fluid discharge nozzles; producing particular spray forms, patterns and effects  
     . . . . variation or adjustment of nozzle discharge or position to modify cooling. *See* term FHN *below*
- FHN . . . providing variable or adjustable cooling means or effect  
 FHS . . . other details  
 FHX . . . other subjects relating to cooling *eg* association of cooling system with transport means for mould, or with support means for cast artefact  
     . other perfecting &c subjects—*See* appropriate term *below (term* FPX *for subjects not otherwise provided for)*

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- unit subjects concerning melt—
- . supplying, handling metallic melt; feeding metallic melt towards, or introducing metallic melt into, the shaping zone—
  - FJA . . . overall organisation of melt supplying or handling system; melt supplying, handling, feeding or introducing procedure *not otherwise provided for*
  - g FJE . . . of in-mould passage system—*See term FJH below*
  - . . . association between melt supplying system or part thereof, *eg* melt vessel, melt vessel outlet, launder, and solidification surface, *eg* mould, or shaping zone
  - . . . concerning melt vessel—
  - FJB . . . overall organisation of ladle, tundish or other melt vessel; association between melt vessel and immediate mountings or motion thereof
  - . . . . handling, manipulating, positioning melt vessel—*See term FJC below*
  - . . . . organisation of melt vessel for treatment of melt therein—*See term FFF below*
  - . . . discharging melt from vessel by flow through restricted outlet(s)—
  - g FJGD . . . . overall organisation of outlet-and-closure assembly
  - . . . . . outlet nozzle element *per se*—*See term FJJ below*
  - . . . . . outlet valve element *per se*—*See term FJGA below*
  - g FJGA . . . . organisation of stopper rod or outlet valve element
  - . . . . . destructible or temporary stopper—*See term FJGC below*
  - g FJGB . . . . organisation or arrangement of operating mechanism for stopper rod or other valve element; operating stopper rod or other valve element
  - g FJGC . . . . means or techniques concerned essentially with commencement (*including* re-commencement after interruption or delaying commencement) of discharge, *eg* destructible or temporary stoppers, outlet fillers, clearing blockage of outlet
  - FJC . . . handling, manipulating, positioning melt vessel, *eg* transporting, exchanging, tilting, adjusting position of
  - FJD . . . details of melt vessel, *not otherwise provided for*
  - . . . . outlet nozzle element *per se*—*See term FJJ below*
  - . . . . arrangement or mounting of outlet nozzle element(s)—*See terms FJL, FJP below*
  - . . . transferring melt between locations *not otherwise provided for above*—
  - . . . melt-propelling or -injecting *other than* merely by gravitational force—
  - FKA . . . . by fluid pressure *including* suction
  - . . . . . included here are both (i) the direct use of fluid pressure, generally gas pressure, to move the melt, and (ii) the use of fluid pressure to provide motive power for any other melt moving arrangement, but in the latter case only where the interest centres on the fluid-pressure system
  - g FKD . . . . by electromagnetic force
  - . . . . . other—
  - FKB . . . . . overall organisation
  - FKC . . . . . details
  - . . . . . shot-ducts, goosenecks and other melt-conducting elements—*See terms FJK to FJJ below*
  - . . . melt-conducting apparatus—
  - . . . composition or material of melt-contacting surface—*See term FDF above*
  - FJH . . . . overall organisation of in-mould passage system, *whether or not including* aperture elements, *eg* gates
  - . . . . . channels, ducts, nozzles, runners, tubes—
  - g FJK . . . . . organisation concerned essentially with introduction of fluent material, *eg* gas, into contact with melt
  - g FJL . . . . . mounting, demounting; adjusting position; exchanging
  - g FJP . . . . . associations or arrangements *not otherwise provided for*
  - . . . . . association between melt supply and mould—*See term FJE above*
  - . . . . . overall organisation of outlet-and-closure assembly—*See term FJGD above*
  - FJJ . . . . organisation of single such element
  - . . . . . concerned with introduction of fluent material—*See term FJK above*
  - . . . . . serving as filters, strainers or traps—*See term FGA below*
  - FJV . . . . distributors, *eg* pouring blocks, charge cups, distributor floats
  - FJS . . . . splash guards and other devices which intercept and essentially reduce the kinetic energy of a poured melt stream
  - FKG . . . influencing melt flow, distribution of melt, parameter of melt stream (*including* establishing, facilitating or maintaining melt flow) *not otherwise provided for above*
  - FKL . . . other subjects relating to supplying, handling metallic melt; feeding metallic melt towards, or introducing metallic melt into, the shaping zone

- . agitating, stirring cast melt—
- . . by moving mould during casting—*See* terms FKP, FKQ, FLB *below*
- . . mechanical treatment in general of metallic melt to influence its character, composition or the solidification process—*See* term FGT *below*
- . . by application of electric current, electric field or magnetic field—
- FEA . . . disposition, mounting, adjusting position of the applying means
- . . . association of the applying means with—
- FEB . . . . mould *including* adaptation or modification of mould or mould part to enhance or facilitate the action
- FEC . . . . means which withdraw, guide or support a continuous cast strand *including* adaptation or modification of such means to enhance or facilitate the action
- FEH . . . other subjects relating to electric and/or magnetic agitation or stirring
- FEX . . by other means
  
- . treating (*including* protecting) the metallic melt in order to influence its physical character and/or chemical composition, or to influence the solidification process—
- FFA . . plural different distinguishable treatments
- . . single treatments *including* repeated identical treatments and plural indistinguishable treatments—
- . . . contacting melt with treatment materials *including* seeds *per se*, their introduction and arrangement, and treatments involving exothermic, insulating, or fluxing materials or slag—
- . . . . details of treatments—
- . . . . . applying linings to mould *eg* mounting lining members—*See* terms FDJA, FDJB *below*
- FFD . . . . . treatment materials, *including* carrier materials; material of feeder or hot-top element
- FFE . . . . . shape, form or construction of article (*including* feeder or hot-top element) into which treatment material is incorporated
- FFF . . . . . methods of and means for introducing treatment material into, or contacting treatment material with, melt; organisation of melt vessel for treatment of melt therein
- . . . . . establishing and/or confining shielding gas about a melt stream—*See* term FGE *below*
- . . . . . melt vessel discharge outlet constructed or arranged for injection of gas into, or into contact with, melt for whatever purpose—*See* term FJK *above*
- FFG . . . . . arrangement or location of treatment material or article
- FFM . . . . . other details
- . . . . . other subjects—*See* appropriate term *below* (residually term FFX)
- . . preventing or reducing contamination by impurity—
- FGA . . . . skimmers, filters, strainers, traps and their operation
- . . . . . **NB** affinity exists with heading F4B, Furnaces &c for skimming melt in metallurgical handling vessel, *eg* ladle
- FGE . . . . treatment with gas, reduced pressure or vacuum *eg* purging, degassing; melt shrouds and their operation; gas shielding of melt
- . . . influencing the nature or rate of the solidification process—
- . . . . heating; reducing heat loss, delaying solidification, *including* feeding of castings—
- FGF . . . . . feeders, headers, hot-tops, *including* their use or operation, *not otherwise provided for above*
- FGK . . . . . other subjects relating to heating, reducing heat loss, delaying solidification
- FGL . . . . chilling; quenching
- FGM . . . . influencing initial development of grain or crystal structure, *eg* by selection or nucleation
- . . . . . seeds or nucleating materials *per se*, their introduction and arrangement—*See* contacting melt &c *above*
- FGP . . . . influencing nature or rate of the solidification process, *eg* influencing grain or crystal structure, *not otherwise provided for above*
- FFX . . . involving contacting the melt with treatment material, *not otherwise provided for above*
- . . . single treatments *not provided for above*—
- . . . . agitating—*See* terms FE- *above*
- FGQ . . . . application of electric current, electric field or magnetic field
- FGT . . . . mechanical treatment (*eg* pressurising, squeezing the melt during solidification)
- FGX . . . . other
  
- . other unit subjects concerning melt—*See* term FPX *below*

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- unit subjects concerning solidification surface *eg* mould—
  - . solidification surface, *eg* mould or mould assembly; shaping the melt, *including* setting cores or inserts for encasting; procedures for making mould or mould assembly *not otherwise provided for*—
  - . . . mould or mould part modified to enhance or facilitate—
  - . . . agitation or stirring of melt—*See* term FEB *above*
  - . . . extraction of artefact—*See* terms FPA, FPB *below*
  - . . . runners, sprues, gates—*See* terms FJH, FJJ *above*
  - . . . skimmers, filters, strainers, traps and their operation—*See* term FGA *above*
  - . . . feeders, headers, hot-tops and their operation—*See* terms FFD, FFE, FGF *above*
  - . . . inserts for encasting—*See* terms FNP to FNX *below*
  - . . . association of melt supply system or part thereof with solidification surface or shaping zone—*See* term FJE *above*
- FMA
  - . . . association of moulds, mould cavities or cavity-defining parts
  - . . . association between mould and core—*See* term FMG *below*
  - . . . **NB** included here are disclosures where the centre of interest concerns constructing the mould cavity of inter-related sections. Other aspects of such moulds are classified elsewhere as appropriate
  - . . . general character of mould, core or other member affording a solidification surface—
- FMB
  - . . . characterised by shape and/or dimensions, *including* component parts so characterised
- FMC
  - . . . characterised by material, *including* component parts so characterised
  - . . . . material of melt-contacting surface only—*See* term FDF *above*
- FMF
  - . . . general character *not otherwise provided for*
  - . . . subjects concerned with core *not otherwise provided for above*; *including* setting inserts for encasting—
- FMG
  - . . . association between mould and core
  - . . . setting cores, *including* setting inserts—
  - . . . . fixing, mounting or supporting core or insert in the mould; chaplets
- FMH
  - . . . . other subjects relating to setting cores and inserts *eg* introducing into mould
- FMK
  - . . . other subjects relating to cores, *including* core-bars and similar supports
- FMN
  - . . . details relating to the solidification surface, *eg* mould *not otherwise provided for above*—
- FMQ
  - . . . surface details of melt-contacting surface
  - . . . . surface details of parts for encasting, *eg* inserts—*See* term FNR *below*
- FMP
  - . . . adjustable walls; adjustment means
  - . . . . methods of setting or adjusting cavity—*See* term FDG *below*
  - . . . . altering shape or size of continuous cast strand during casting—*See* term FNH *below*
- FMS
  - . . . other details
- FMT
  - . . . electromagnetic shaping of the melt
  - . . . disposition, mounting, supporting mould for casting *including* dismantling mould, *eg* for repair or replacement—
  - . . . permanent secured moulds—
- FLA
  - . . . disposition or orientation relative to other plant or apparatus component
- FLB
  - . . . mounting means permitting or facilitating motion, *eg* reciprocation, of otherwise fixed mould during casting
- FLC
  - . . . effecting or facilitating dismantling (with or without associated apparatus), *eg* for repair or replacement, *including* provision of readily disconnectible services *eg* coolant supply pipework; organisation of mounting structure to enable moulds of different shapes and/or sizes to be accommodated
- FLF
  - . . . other subjects
  - . . . non-permanent or unsecured mould—
- FLG
  - . . . foundation or base-plate for free-standing mould, *eg* ingot mould stool
- FLH
  - . . . supporting shell or other weak or easily frangible mould, *eg* in bed of particles
- FLL
  - . . . other subjects
  - . . . closing, opening mould for casting—
- FLM
  - . . . aligning, guiding mould parts
- FLN
  - . . . preventing premature opening after filling
- FLQ
  - . . . securing in closed condition
- FLX
  - . . . other subjects relating to closing and opening mould
- FKM
  - . . . transporting, bringing together, separating or similarly manipulating moulds, mould parts or other associated components
  - . . . means for imparting motion to solidification surface, *eg* mould, during casting *other than* conveyance or transfer between locations—
- FKP
  - . . . means imparting vibratory, reciprocatory or similar motion
- FKQ
  - . . . means imparting other motion, *eg* linear advancement, continuous rotation

- . operations performed on solidification surface, *eg* mould, preparatory to, or after casting *including* apparatus peculiar to such operations—
- . . in general, this heading is residual for the subject-matter of this sub-division and affinity exists with other headings, particularly in the metal-working (B3-) area. However, this heading is the main heading for the nominal subject-matter embraced by term FDJB *below* but methods of applying coatings employing coating liquids which are of general interest are classified also in B2E, Coated products
- . . for the purposes of this sub-division, preliminary stages of an operation are subsumed within the term for the overall operation unless of interest *per se*. For instance, an assembling operation with a preliminary cleaning step would be classified under term FDG and not FDH unless the interest centred on the cleaning step *per se*. This should be borne in mind when searching
- . . organisation of the solidification surface, *eg* mould, to facilitate performance of such operation(s) is, in general, classified elsewhere *eg* under terms FM- *above*
- FDG . . assembling, re-assembling; disassembling; adjusting
  - . . . closing, opening mould for casting—*See* terms FLM—FLX *above*
  - . . . transporting, manipulating &c mould or mould parts—*See* term FKM *above*
  - . . . mounting and maintaining position of preformed lining elements (*eg* hot-top slabs) in mould—*See* term FDJA *below*
- FDH . . cleaning; removing non-metallic coatings or linings; surface finishing *eg* polishing, deburring
  - . . . coating; lining—
- g FDJA . . devices for mounting *and* maintaining position of preformed lining elements *eg* hot-top slabs, in mould, and their use or operation; self-suspension of such lining elements
  - . . . . jigs or similar devices not remaining in position during casting—*See* term FDJB *below*
- g FDJB . . applying or installing coatings or linings or elements thereof, *not otherwise provided for above*
  - . . . . lubricating the mould-casting interface in continuous casting—*See* term FNA *below*
  - . . . . coating or lining materials—*See* term FDF *above*
- g FDM . . drying; heating
- FDK . . repairing, *ie* restoring, renovating (*including* trueing)
- FDN . . other operations; combinations of operations, *not otherwise provided for above*
  - . . . classified here are, *inter alia*, multi-step operations in which, subject to any relevant notes above, cooling which lacks interest *per se* is included as one of the steps
  - . . . cooling of interest *per se*—*See* terms FH- *above*
  - . . other unit subjects concerning solidification surface—*See* term FPX *below*
- unit subjects concerning cast artefact—
  - . extracting, freeing cast artefact from mould or core, *including* organisation of mould or core to permit or facilitate extraction—
    - . . melt-contacting surface of mould or core characterised by physical character and/or chemical composition—*See* term FDF *above*
  - FPA . . organisation of mould for the purpose, *eg* ejector
  - FPB . . organisation of core for the purpose; soluble and fusible cores; expansible and/or collapsible cores
  - FPC . . vibratory shake-out apparatus
  - FPG . . other subjects relating to extracting, freeing cast artefact from mould or core
  - g FDU . handling, *eg* turning, inverting, conveying cast artefact or portion thereof (whether or not involving handling of starter member in the case of continuous casting) outside mould or shaping zone
    - . . in continuous casting, withdrawing cast strand from shaping zone or guiding/supporting metallic material after shaping—*See* terms FNK, FNL *below*
  - . finishing operations performed on newly-cast artefact *including* keeping warm, equalising temperature—
    - . . unitary plural-function apparatus, *eg* rotary drum apparatus
  - FDL . . division of artefact *including* casting in of separators and the organisation of such separators, or the organisation of the artefact, *eg* provision of notches, to facilitate division; separation of individual artefacts from a “tree”; removing runners or flash
  - FDP . . keeping warm, equalising temperature; modifying nature or properties of the solidified metal by heat-treatment (*including* regulated cooling)
  - FDQ . . keeping warm, equalising temperature; modifying nature or properties of the solidified metal by heat-treatment (*including* regulated cooling)
  - FDR . . cleaning newly-cast artefact
  - FDS . . rectifying defects in newly-cast artefact
  - FDT . . other finishing operations on newly-cast artefact; combinations of operations
    - . . . unitary plural-function apparatus—*See* term FDL *above*
    - . . other unit subjects concerning cast artefact—*See* term FPX *below*

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- unit subjects peculiar to continuous casting, *not otherwise provided for*—
- FNA . lubricating the mould-casting interface
  - . starting the cast—
  - FNB . . manipulating the starter member, *eg* introducing it into mould or storage place
  - FNC . . separating cast strand or portion thereof from starter member *including* starter member organisation, concerned with attachment to or detachment from cast strand; separating starter member parts, *eg* head and body
  - FND . . organisation and details of starter member *not otherwise provided for*
  - FNG . . other subjects relating to starting the cast
  - FNH . altering the cross-sectional shape or size of strand during casting
  - FNK . withdrawing cast strand from the shaping zone, *eg* mould
  - FNL . guiding and/or supporting metallic material after shaping
- unit subjects peculiar to making composite artefacts by casting molten metallic material against another material or body, *not otherwise provided for*—
- FNP . preparation, pre-treatment of material or body against which molten metallic material is to be cast
  - . material or body against which molten metallic material is to be cast—
  - . . setting, fixing insert in mould—*See* terms FMH, FMK *above*
  - FNQ . . physical and/or chemical character or composition; substance of
  - . . physical form of body, *eg* insert—
  - FNR . . . surface details; features to promote adhesion or locking at interface with cast melt
  - FNS . . . general character; overall shape and/or dimensions
  - FNX . . other subjects relating to material or body against which molten metallic material is to be cast
- FPX other perfecting, ancillary, transcending and unit subjects (*including* ingots *per se*; although where concerned with division of ingots—*See* term FDP *above*)
- . *See* paragraph 3.7 of introduction for exclusions

Indexing Schedule 1

*Terms from this schedule are assignable with any of the terms FA-, FB-, and FC- from the Classifying Schedule*

	casting technique—
F200	. centrifugal casting
F202	. composite casting
	. . <i>Note: this term is not assigned with classifying term FCC</i>
	. continuous casting—
F204	. . electromagnetic shaping
F206	. . melt extraction <i>ie</i> taking a streamer from a bath of melt continuously <i>other than</i> by forcing melt through a constricting orifice
F208	. . melt extrusion <i>ie</i> expelling a jet through a constricting orifice
F210	. . melt spinning <i>ie</i> impinging a stream upon a moving chill surface
F212	. . upward casting
F214	. . horizontal direct chill casting
F216	. . other
F218	. . directional solidification; single crystal solidification
	. . <b>NB</b> Affinity exists with heading B1S, Zone-melting, crystal-pulling &c
F221	. . electroslag melting and casting
F222	. . squeeze casting; squeeze forming of melt
F226	. . casting by chilling a layer of melt adjacent a mould wall and discarding surplus melt from the mould
F228	. . investment casting <i>eg</i> lost-wax casting
F230	. . spray casting
F224	. . chill-mould casting <i>not provided for above</i> ; pressure die-casting

Indexing Schedule 2

*Terms from this schedule are assignable with any of the terms FA-, and FC- from the Classifying Schedule*

*Asterisked terms are only assigned for disclosure of significance*

	continuous casting—
	. advancing solidification surface or mould—
*	F300 . . twin-belt type
*	F302 . . wheel-and-band type
*	F308 . . other type
*	F310 . . using mandrel or core
*	F312 . . multi-strand casting
*	F318 . . material of solidification surface, liner or coating
	. physical form of as-cast strand—
	. . hollow
	F322 . . strip
	F324 . . wire
*	F326 . . unusual form or cross-sectional shape
*	F330 . . specified metallic material cast <i>excluding</i> steel
*	F332 . . steel
	. withdrawing apparatus—
*	F340 . . fixed-location strand-contacting rolls
*	F342 . . recirculating strand-contacting means <i>eg</i> endless belt
*	F344 . . apparatus of other type, <i>eg</i> “walking” beam
	. guiding and/or supporting apparatus—
	. . mechanical means—
*	F350 . . . strand-contacting rolls
*	F352 . . . strand-contacting members or means <i>other than</i> rolls
*	F354 . . non-mechanical means, <i>eg</i> fluid pressure, electromagnetic force
	F358 . . combination of mechanical and non-mechanical guiding and/or supporting means

Indexing Schedule 3

*Terms from this schedule are assignable only with terms FCP and FCU from the Classifying Schedule*

*Terms are assigned only to identify the subordinate operation(s) which give rise to the assigned classifying term*

subordinate operation—

- j F410 . preparation or preconditioning of the bulk melt to be cast—
  - . . melting material to form bulk melt, *including* vacuum melting-and-casting
  - . . . electroslag melting—*See* term F412 *below*
- j F412 . . electroslag refining *whether or not involving melting*
- j F414 . . heating melt to specified temperature or to within specified temperature range
- j F416 . . other
  - . preparation or preconditioning of the solidification surface or mould—
- j F420 . . coating, lining (*including* applying lubricant)
- j F422 . . bringing mould to casting station; assembling from pre-formed parts *eg* inserting cores
- j F424 . . pre-heating or otherwise adjusting temperature (*including* heating to dry or cure mould)
- j F426 . . pressurising, evacuating, or providing special atmosphere in, mould cavity or casting area
- j F428 . . other
- j F429 . preparatory or pre-conditioning operation *not provided for above*

Indexing Schedule 4

*Terms from this schedule are assignable only with terms FCB, FCC and FCXA from the Classifying Schedule*

*Terms are only assigned for disclosure of significance*

- j F510 process parameters or features—
  - . cooling rate; solidification rate
- j F511 . pouring rate; mould-filling rate; casting rate
- j F512 . pressure in general
  - . . NB This term is *not* assigned if term F513 and/or term F514 *below* is/are assigned
- j F513 . pressure above ambient
- j F514 . pressure below ambient (*including* suction)
- j F515 . special atmosphere
- j F516 . temperature
- j F520 material cast—
  - . amorphous metal
- j F522 . thixotropic metal
- j F524 . material having particular as-cast structure
- j F526 . other specified material; material having other specified property or properties