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**Brazing — Fluxes for brazing —  
Classification and technical delivery  
conditions**

*Brasage fort — Flux pour le brasage fort — Classification et  
conditions techniques de livraison*

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Published in Switzerland

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## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see [www.iso.org/directives](http://www.iso.org/directives)).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

This document was prepared by Technical Committee ISO/TC 44, *Welding and allied processes*, Subcommittee SC 13, *Brazing materials and processes*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at [www.iso.org/members.html](http://www.iso.org/members.html).

Official interpretations of ISO/TC 44 documents, where they exist, are available from this page: <https://committee.iso.org/sites/tc44/home/interpretation.html>.

# Brazing — Fluxes for brazing — Classification and technical delivery conditions

## 1 Scope

This document specifies the classification of fluxes used for brazing metals and characterizes these fluxes on the basis of their properties and use, and gives technical delivery conditions and health and safety precautions.

This document covers two classes of flux, FH and FL. Class FH is used for the brazing of heavy metals (steels, stainless steels, copper and its alloys, nickel and its alloys, precious metals, molybdenum and tungsten). Class FL is used for the brazing of aluminium and its alloys.

## 2 Normative references

There are no normative references in this document.

## 3 Terms and definitions

No terms and definitions are listed in this document.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

## 4 Classification

### 4.1 General

The form of the fluxes shall be classified according to [Table 1](#) A, B or C. The effective temperature range can be determined according to [Annex A](#).

### 4.2 Fluxes for brazing heavy metals (Class FH)

#### 4.2.1 General

Class FH covers nine types of flux. The code for each type consists of the class letters FH followed by two digits.

#### 4.2.2 Type FH10

Fluxes with an effective temperature range from about 550 °C up to about 800 °C. They contain boron compounds, simple and complex fluorides and are used at brazing temperatures above 600 °C. These are general purpose fluxes. The residues are usually corrosive and have to be removed by washing or pickling.

#### 4.2.3 Type FH11

Fluxes with an effective temperature range from about 550 °C up to about 800 °C. They contain boron compounds, simple and complex fluorides and chlorides and are used at brazing temperatures above

600 °C. These fluxes are mainly used for brazing nonferrous metal with small amount of Al and Ti or refractory metal oxides, aluminium bronze and aluminium silicon type metals. The residues are usually corrosive and shall be removed by washing and pickling.

#### 4.2.4 Type FH12

Fluxes with an effective temperature range from about 550 °C up to about 850 °C. They contain boron compounds, elemental boron and simple and complex fluorides and are used at brazing temperatures above 600 °C. These fluxes are mainly used for brazing stainless and other alloy steels and hard metals. The residues are usually corrosive and shall be removed by washing and pickling.

#### 4.2.5 Type FH20

Fluxes with an effective temperature range from about 700 °C up to about 1 000 °C. They contain boron compounds and fluorides and are used at brazing temperatures above 750 °C. These are general purpose fluxes. The residues are usually corrosive and shall be removed by washing and pickling.

#### 4.2.6 Type FH21

Fluxes with an effective temperature range from about 750 °C up to about 1 100 °C. They contain boron compounds and are used at brazing temperatures above 800 °C. These are general purpose fluxes. The residues are usually non-corrosive but can be removed mechanically or by pickling.

#### 4.2.7 Type FH22

Fluxes with an effective temperature range from about 700 °C up to about 1 050 °C. They contain boron compounds, elemental boron as well as simple and complex fluorides and are used at brazing temperatures above 750 °C. These fluxes are mainly used for brazing stainless and other alloy steels and hard metals. The residues are usually corrosive and shall be removed by washing and pickling.

#### 4.2.8 Type FH23

Fluxes with an effective temperature range from about 700 °C up to about 1 200 °C. They contain borates and are general purpose fluxes. The residues are boron compounds.

#### 4.2.9 Type FH30

Fluxes with an effective temperature from about 1 000 °C upwards. They generally contain boron compounds, phosphates and silicates and are intended mainly for use with copper and nickel brazing filler metals. The residues are usually non-corrosive but can be removed mechanically or by pickling.

#### 4.2.10 Type FH40

Fluxes with an effective temperature range from about 600 °C up to about 1 000 °C. They generally contain chlorides and fluorides but are boron-free and are intended for applications where the presence of boron is not permitted. The residues are usually corrosive and shall be removed by washing or pickling.

### 4.3 Fluxes for brazing light metals (Class FL)

#### 4.3.1 General

Class FL covers three types of flux. The code for each type consists of the class letters FL followed by two digits. These fluxes have effective temperatures from about 550 °C upwards.

#### 4.3.2 Type FL10

These fluxes contain hygroscopic chlorides and fluorides, primarily lithium compounds. The residues are corrosive and shall be removed by washing or pickling.

#### 4.3.3 Type FL20

These fluxes contain non-hygroscopic fluorides. The residues are generally non-corrosive and can be left on the workpiece.

#### 4.3.4 Type FL30

These fluxes contain non-hygroscopic fluorides and caesium fluoroaluminates. The residues are generally non-corrosive and can be left on the workpiece. They can be used for aluminium alloys with up to 0,5 weight-% Mg.

An overview of all fluxes is given in [Table 1](#).

Table 1 — Overview of fluxes

| Flux type                                                                                                                                             | Flux basis                                                     | Effective temperature range <sup>a,b</sup><br>°C | Filler metal type <sup>d</sup> | Parent materials                                                                         | Reaction and removal of flux residues   | Form                            |
|-------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------|--------------------------------------------------|--------------------------------|------------------------------------------------------------------------------------------|-----------------------------------------|---------------------------------|
| FH10                                                                                                                                                  | Boron compounds, simple and complex fluorides                  | 550 to 800                                       | Ag, CuP                        | Steel, copper, copper alloys, nickel and nickel alloys                                   | Corrosive; washing or pickling          | A powder<br>B paste<br>C liquid |
| FH11                                                                                                                                                  | Boron compounds, simple and complex fluorides and chlorides    | 550 to 800                                       | Ag, CuP                        | Copper alloys and other base materials containing up to 6 % aluminium and maximum 1 % Ti | Corrosive; washing or pickling          |                                 |
| FH12                                                                                                                                                  | Boron compounds, elemental boron, simple and complex fluorides | 550 to 850                                       | Ag                             | Stainless steels, alloyed steels and cemented carbides.                                  | Corrosive; washing or pickling          |                                 |
| FH20                                                                                                                                                  | Boron compounds and complex fluorides                          | 700 to 1 000                                     | Ag, Cu, Ni                     | Steel, copper, copper alloys, nickel and nickel alloys                                   | Corrosive; washing or pickling          |                                 |
| FH21                                                                                                                                                  | Boron compounds and boric acid                                 | 750 to 1 100                                     | Ag, Cu, Ni                     | Steel, copper, copper alloys, nickel and nickel alloys                                   | Non-corrosive, mechanically or pickling |                                 |
| FH22                                                                                                                                                  | Boron compounds, elemental boron, simple and complex fluorides | 700 to 1 050                                     | Ag, Cu, Ni                     | Stainless steels, alloyed steels and cemented carbides.                                  | Corrosive; washing or pickling          |                                 |
| FH23                                                                                                                                                  | Boron compounds, borates                                       | 700 to 1 200                                     | Ag, Cu, CuP                    | Steel, copper, copper alloys, nickel and nickel alloys                                   | Non-corrosive; washing or pickling      |                                 |
| FH30                                                                                                                                                  | Boron compounds, phosphates, silicates                         | Above 1 000                                      | Cu, Pd, Au                     | Steel, nickel and nickel alloys, refractory metals                                       | Non-corrosive, mechanically or pickling |                                 |
| FH40                                                                                                                                                  | Chlorides and fluorides                                        | 600 to 1 000                                     | Ag, Cu, CuP                    | Steel, stainless steel, copper, copper alloys, nickel and nickel alloys                  | Corrosive; washing or pickling          |                                 |
| FL10                                                                                                                                                  | Hygroscopic chlorides and fluorides                            | 500 to 630                                       | Al                             | Aluminium and its brazable alloys.                                                       | Corrosive; washing or pickling          |                                 |
| FL20                                                                                                                                                  | Non-hygroscopic fluorides                                      | 570 to 660                                       | Al                             | Aluminium and its brazable alloys.                                                       | Non-corrosive, mechanically or pickling |                                 |
| FL30                                                                                                                                                  | Non-hygroscopic fluorides<br>Caesium fluoroaluminates          | 450 to 600                                       | Al, Zn                         | Aluminium alloys containing up to 0,5 % magnesium.                                       | Non-corrosive, mechanically or pickling |                                 |
| a The determination of the effective temperature range is mandatory. The test method can be defined by the manufacturer. For an example, see Annex A. |                                                                |                                                  |                                |                                                                                          |                                         |                                 |
| b Flux shall be active in the temperature range. The effective range shall be determined for each product by the manufacturer.                        |                                                                |                                                  |                                |                                                                                          |                                         |                                 |
| d See ISO 17672.                                                                                                                                      |                                                                |                                                  |                                |                                                                                          |                                         |                                 |

## 5 Designation

Fluxes supplied in accordance with this document and the flux code detailed in [Clause 4](#).

NOTE However, for each flux code, there are fluxes available commercially which behave significantly differently, e.g. in fluidity, resistance to overheating and out gassing. Therefore, in certain cases, it can be necessary to specify a flux by the trade name as well as the code detailed in [Clause 4](#).

EXAMPLE Designation of a flux paste of class FH, type FH20 in accordance with this document:

Flux ISO 18496 — FH20 B

## 6 Technical delivery conditions

### 6.1 Forms of delivery

The following forms of delivery are possible:

- a) powder;
- b) paste;
- c) liquid.

See [Annex B](#) for additional possible forms of delivery (see [B.2](#)).

### 6.2 Packaging and marking

Fluxes and filler metal-flux mixtures supplied in accordance with this document shall be packed in suitable containers resistant to the flux they contain and shall be labelled with:

- a) the supplier's name and address;
- b) the trade name;
- c) the designation in accordance with [Clause 5](#);
- d) the batch number;
- e) the volume or net weight
- f) any hazard warning as applicable.

## 7 Health and safety precautions

When working with fluxes, refer to the manufacturer safety data sheet (SDS) before use.

NOTE National legislation can exist regarding transportation, storage, use and disposal of fluxes.

Information on fluxes can be summarized in technical data sheets as shown in [B.1](#).

## Annex A (informative)

### Determination of the effective temperature range

#### A.1 General conditions

This annex describes a method to define the effective temperature range for FH fluxes. For FL fluxes, manufacturers shall define their own test method.

Parent material: Plate of material according to [Table A.1](#)

Size of parent material: 80 mm × 35 mm × 1 mm

Flux amount: 0,2 g

Size of filler metal: Diameter: 1,5 mm; Length: 10 mm

**Table A.1 — Parent material for different flux types**

| Flux type                                                                                     | Parent material <sup>a</sup>    |
|-----------------------------------------------------------------------------------------------|---------------------------------|
| FH10                                                                                          | carbon steel plate (S235; 1008) |
| FH11                                                                                          | Cu-Al alloy CW301G              |
| FH12                                                                                          | carbon steel plate (S235; 1008) |
| FH20                                                                                          | carbon steel plate (S235; 1008) |
| FH21                                                                                          | carbon steel plate (S235; 1008) |
| FH22                                                                                          | carbon steel plate (S235; 1008) |
| FH23                                                                                          | carbon steel plate (S235; 1008) |
| FH30                                                                                          | carbon steel plate (S235; 1008) |
| FH40                                                                                          | carbon steel plate (S235; 1008) |
| <sup>a</sup> S235 according to EN 10025; 1008 according to AISI; CW301G according to EN 1412. |                                 |

#### A.2 Lower effective temperature

##### A.2.1 General

Filler metal: According to [Table A.2](#)

Temperature: Starting with the lowest temperature depending on the flux type

**Table A.2 — Start temperatures for determining the lower effective temperature depending on the flux type**

| Temperature<br>°C                                             | Filler metal        |
|---------------------------------------------------------------|---------------------|
| 520                                                           | ZnAg12 <sup>a</sup> |
| 550                                                           | ZnAg12              |
| 580                                                           | ZnAg12              |
| 610                                                           | ZnAg12              |
| 630                                                           | ZnAg12              |
| 660                                                           | Ag 156              |
| 680                                                           | Ag 156              |
| 700                                                           | Ag 145              |
| 730                                                           | Ag 140              |
| 750                                                           | Ag 244              |
| 780                                                           | Ag 244              |
| 800                                                           | Ag 225              |
| 830                                                           | Ag 220              |
| <sup>a</sup> ZnAg12 = B-Zn88Ag-430/520 according to ISO 3677. |                     |

### A.2.2 Procedure

The flux is to be applied onto the parent material as defined in [Table A.1](#) and the filler metal is to be placed into the flux. This specimen is placed on a steel block inside a furnace with ambient air at desired temperature. The temperature is measured with a thermocouple placed inside the steel block, on which the specimen is placed. After 2 min the specimen is taken out the furnace and evaluated after cooling.

### A.2.3 Evaluation

If the brazing filler metal melted and the wetting angle is below 30°, this temperature is to be recorded.

In case of non-melting or wetting angles above 30°, the temperature can be increased to the next testing level.

## A.3 Upper effective temperature

### A.3.1 General

Filler metal: According to [Table A.3](#)

Temperature: Starting with the lowest temperature depending on the flux type