BRITISH STANDARD

BS EN
50216-6:2002

Power transformer and reactor fittings —

Part 6: Cooling equipment — Removable radiators for oil-immersed transformers

The European Standard EN 50216-6:2002 has the status of a British Standard

ICS 29.180

National foreword

This British Standard is the official English language version of EN 50216-6:2002.

The UK participation in its preparation was entrusted to Technical Committee PEL/14, Power transformers, which has the responsibility to:

— aid enquirers to understand the text;

— present to the responsible European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;

— monitor related international and European developments and promulgate them in the UK.

A list of organizations represented on this committee can be obtained on request to its secretary.

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This British Standard, having been prepared under the direction of the Electrotechnical Sector Policy and Strategy Committee, was published under the authority of the Standards Policy and Strategy Committee on 22 March 2002

Summary of pages

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 15 and a back cover.

The BSI copyright date displayed in this document indicates when the document was last issued.

Amendments issued since publication

Amd. No.	Date	Comments

ISBN 0 580 39319 4

EUROPEAN STANDARD **EN 50216-6**

NORME EUROPÉENNE

EUROPÄISCHE NORM January 2002

ICS 29.180

English version

Power transformer and reactor fittings
Part 6: Cooling equipment -
Removable radiators for oil-immersed transformers

Accessoires pour transformateurs
de puissance et bobines d'inductance
Partie 6: Appareillage de refroidissement -
Radiateurs détachables
pour transformateurs immergés dans l'huile

Zubehör für Transformatoren
und Drosselspulen
Teil 6: Kühlungseinrichtungen -
Abbaubare Radiatoren
für Öltransformatoren

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CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

Ref. No. EN 50216-6:2002 E

Foreword

This European Standard was prepared by the Technical Committee CENELEC TC 14, Power transformers.

The text of the draft was submitted to the formal vote and was approved by CENELEC as EN 50216-6 on 2001-07-01.

The following dates were fixed:

- latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2002-08-01
- latest date by which the national standards conflicting with the EN have to be withdrawn	(dow)	2004-08-01

EN 50216-6 is to be read in conjunction with EN 50216-1.

Contents

1 Scope

EN 50216-6 covers radiators, i.e. the thermal exchangers for the oil cooling with natural ambient air circulation. Such radiators are made with several elements with cooling channels connected in parallel.

This standard defines the overall dimensions and ensures the mechanical interchangeability achieving the same thermal performances.

2 Normative references

Addition to EN 50216-1:

ISO 4406	1999	Hydraulic fluid power - Fluids - Method for coding the level of contamination by solid particles

3 Manufacturing prescription

3.1 Radiator types defined in this document

The designations to identify the types of radiator are

FA radiators with square flanges and elements of unequal length (see Figure 1)

FG radiators with square flanges and elements of equal length (see Figure 2)

FTR radiators with square flanges and elements of equal length and with several elements with reduced width (see Figure 3)

FTTO tangential radiators with oval flanges and elements of equal length (see Figure 4)

FR radiators with square flanges with lowered upper header (see Figure 5)

FTT tangential radiators with square flanges and elements of equal length (see Figure 6)

3.2 General characteristics

The main radiator components are

- headers,
- connection flanges,
- elements.

The headers shall be made in such a way to guarantee a complete filling and a complete draining. Oblique elements or reduced elements are acceptable.

The layout is given in Figures 1 to 6.

The radiators shall be provided with an air vent device on the top header and a draining device on the bottom header.

3.3 Material

The radiator elements shall be made of stamped steel plates or steel pipes (round or ovaled) with a thickness of 1,2 mm, in conformity with ISO, EN or equivalent standards. Other thicknesses may be applicable.

3.4 Dimensions and tolerances

To ensure interchangeability between radiators of different manufacturers, the tolerances given in the figures shall be maintained.

The radiators shall not deflect from horizontal by more than 2 mm per meter without oil.

The radiators shall be vacuum resistant if required.

3.5 Lifting attachments and mechanical connections

3.5.1 Lifting attachments

The radiators shall have a lifting attachment. This lifting attachment shall have at least one lifting lug consisting of a hole with a diameter not less than 30 mm.

3.5.2 Mechanical connections

A facility to make a mechanical connection between radiators shall be provided.

3.6 Surface protection

3.6.1 Internal surfaces

The internal surfaces shall be free of foreign bodies and transformer oil contaminants according to IEC 60296.

They shall be washed with oil for transformers according to ISO 4406. The oil shall conform to IEC 60296.

An appropriate velocity of the oil during the washing operation is required.

If the cooling liquid is different from transformer oil according to IEC 60296, the radiators shall be treated in agreement with the purchaser.

Internal painting shall be as agreed between the manufacturer and the purchaser.

3.6.2 External surfaces

The process of anti-rust treatment and painting shall be agreed between manufacturer and purchaser.

Due regard is to be paid to environmental conditions.

The environmental conditions shall be according to EN 60721-3-4.

4 Tests

4.1 Routine tests

4.1.1 Visual inspection of surfaces

4.1.1.1 External surfaces

When carrying out the visual inspection, there shall be no excessive flexibility and deformations. Fillers of any nature are not acceptable.

4.1.1.2 Internal surfaces

The inspection shall be carried out by visual means where possible and then in addition by flushing using a filter to detect the presence of any foreign bodies or contaminations. If this inspection is not satisfactory, further flushing shall be carried out.

4.1.2 Leakage test

The leakage test shall be carried out according to one of the following two methods. Other methods with other testing values may be carried out by agreement between manufacturer and purchaser.

4.1.2.1 Test with oil

The radiators are filled with transformer oil at a temperature of (60 ± 5) °C and are kept at a pressure of 200 kPa for 3 h. There shall be no oil leaks.

Compliance is checked by visual inspection.

4.1.2.2 Test with compressed air

The radiators are filled with air at a pressure of 200 kPa. There shall be no air leaks, however small.

Compliance is checked by immersing the radiator in a tank filled with water.

4.2 Type tests

4.2.1 Inspection of the external paint

The paint thickness shall be checked by means of a scratch thickness gauge in the accessible points and by means of a magnetic thickness gauge in the invisible points.

The thickness of the single coats shall comply with that specified when ordering. Regarding the surface protection specified in 3.6, a checker-work test can be applied or another test defined by agreement between manufacturer and purchaser.

5 Preparation for transport and storage

Radiators shall be clean and free of all foreign bodies and other contaminations.

Radiator flanges shall be covered to prevent the ingress of contamination during transport or storage and steps shall be taken to ensure that there is no deterioration caused by condensation.

All measures shall be taken to avoid mechanical damage to the elements.

Dimensions in mm

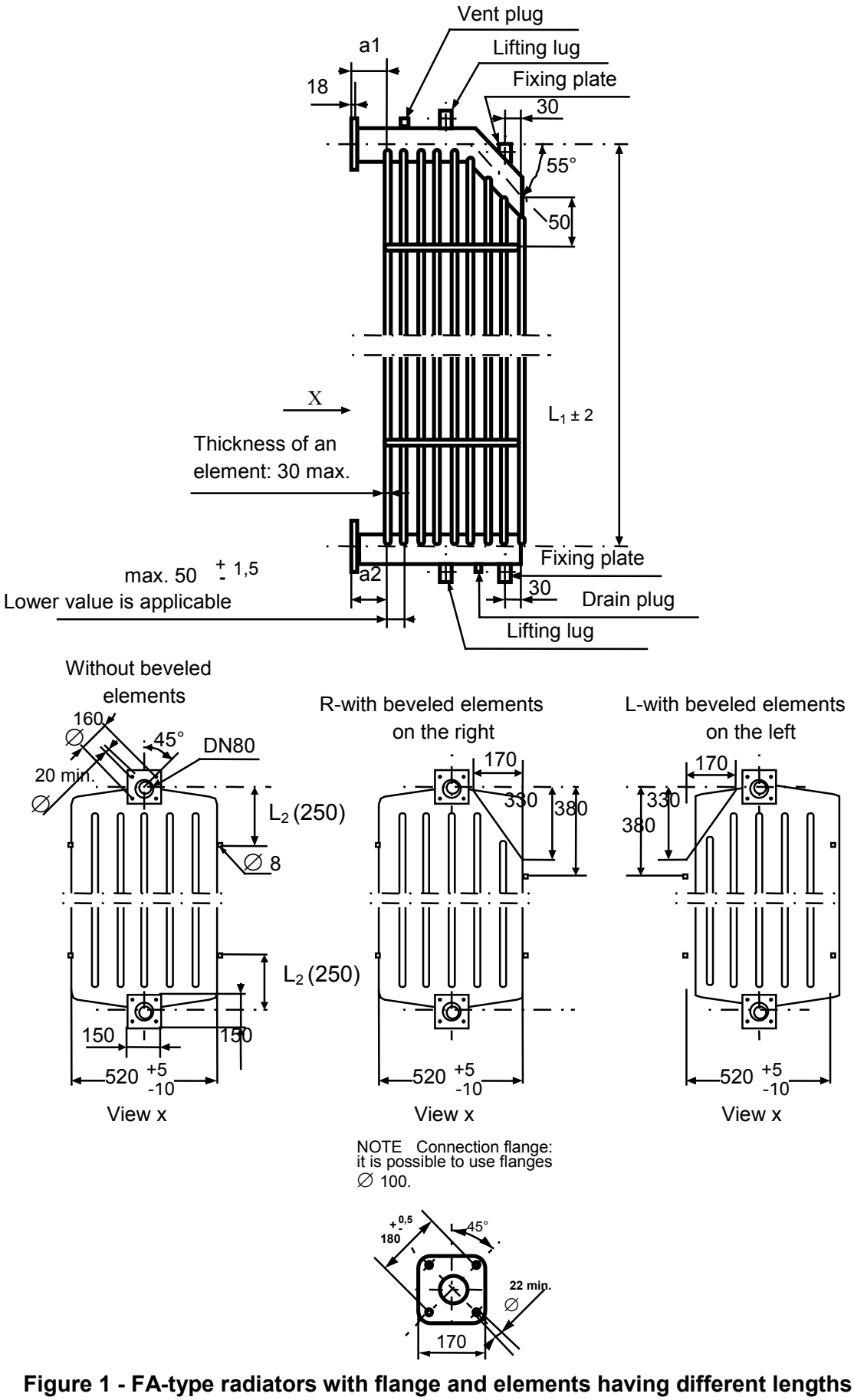


Figure 1 - FA-type radiators with flange and elements having different lengths

Dimensions in mm

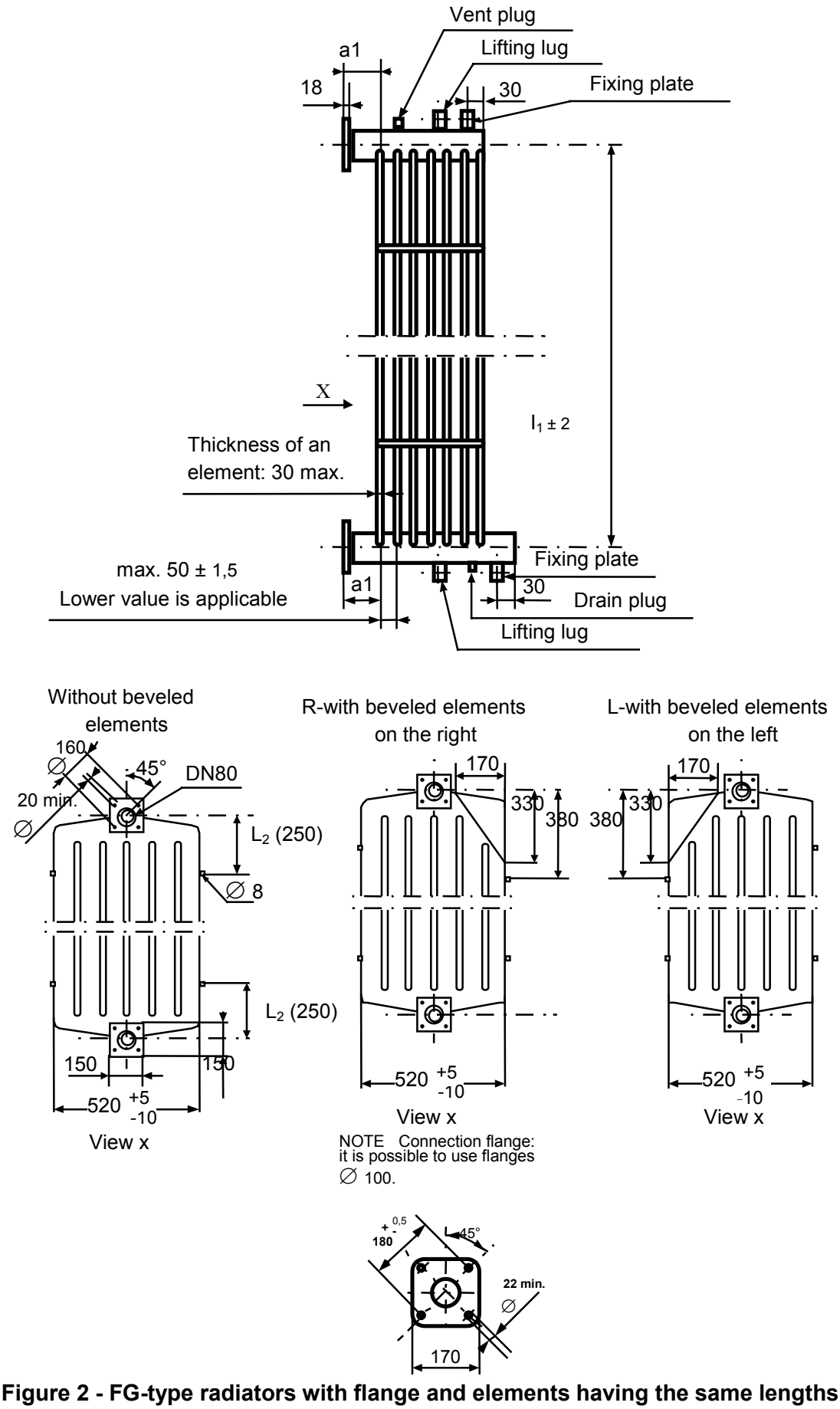
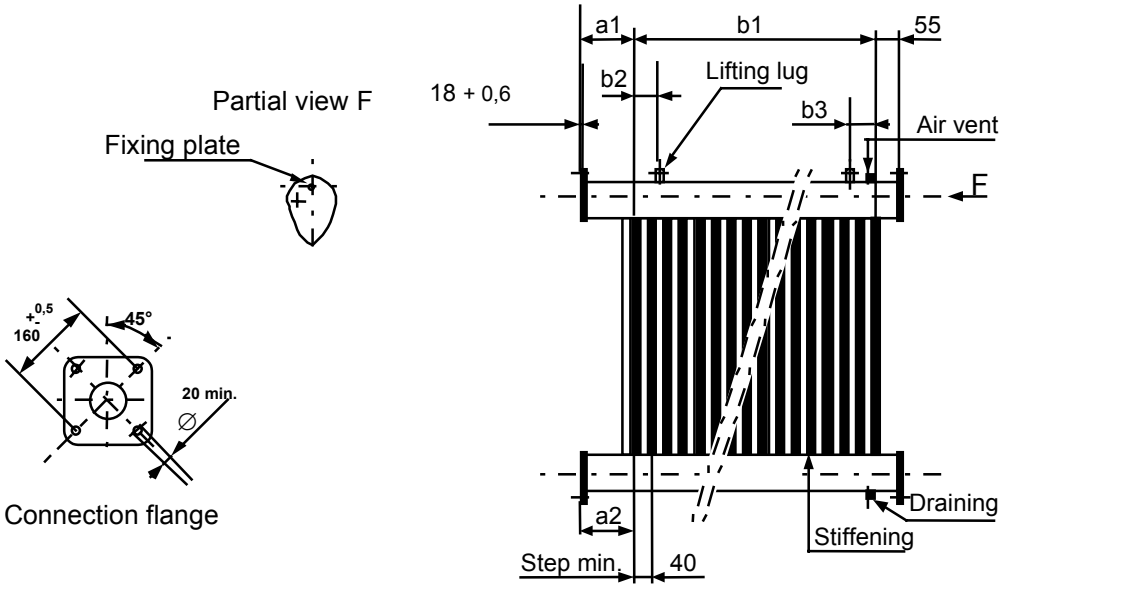
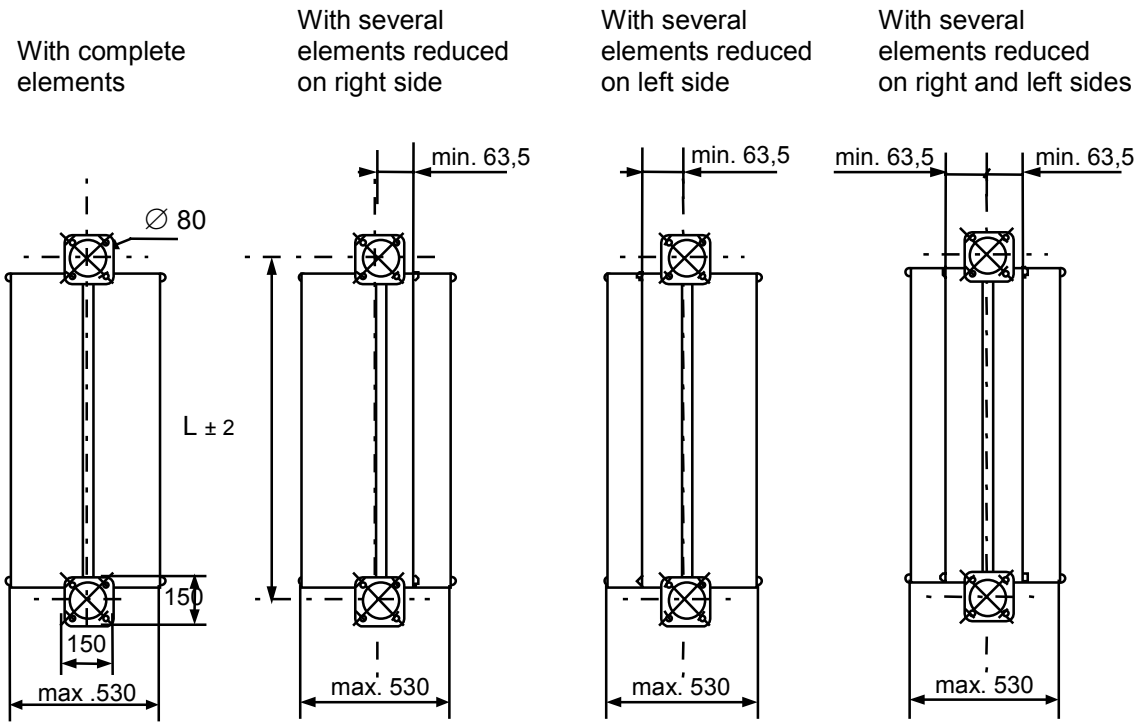


Figure 2 - FG-type radiators with flange and elements having the same lengths

Dimensions in mm





Distance between centers L ± 2	600 to 800 = length from 100 to 100 > 800 = length from 50 to 50
a1 - a2	90 to 200 = Step 10 in 10
b1	According to number of elements (4 to 32)
b2 . b3	According to b1

NOTE Connection flange: it is possible to use flanges ∅ 100.

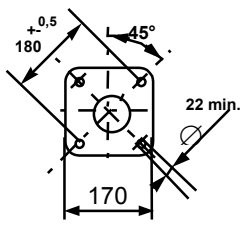
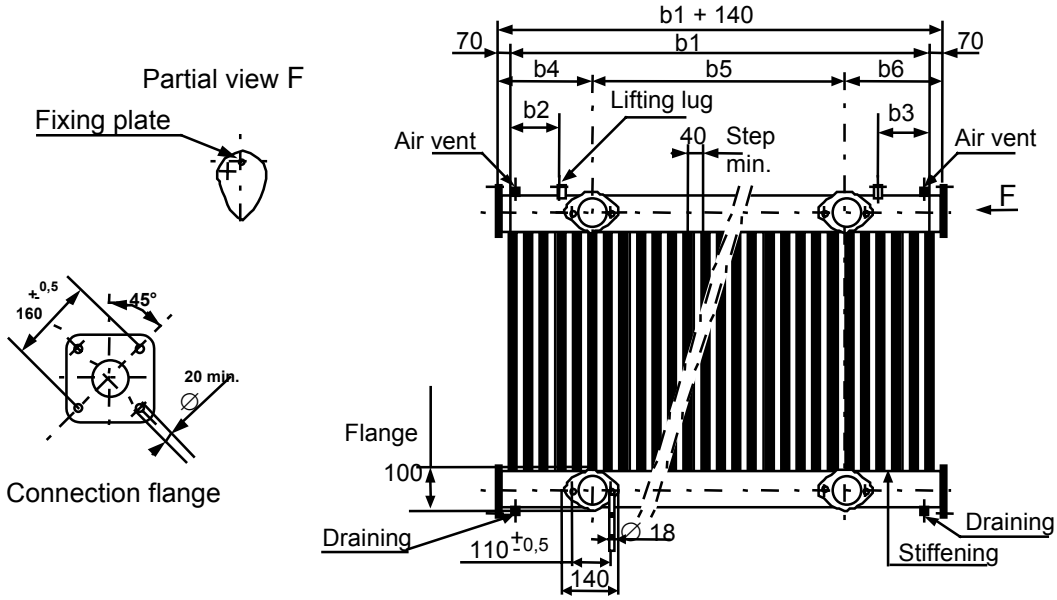
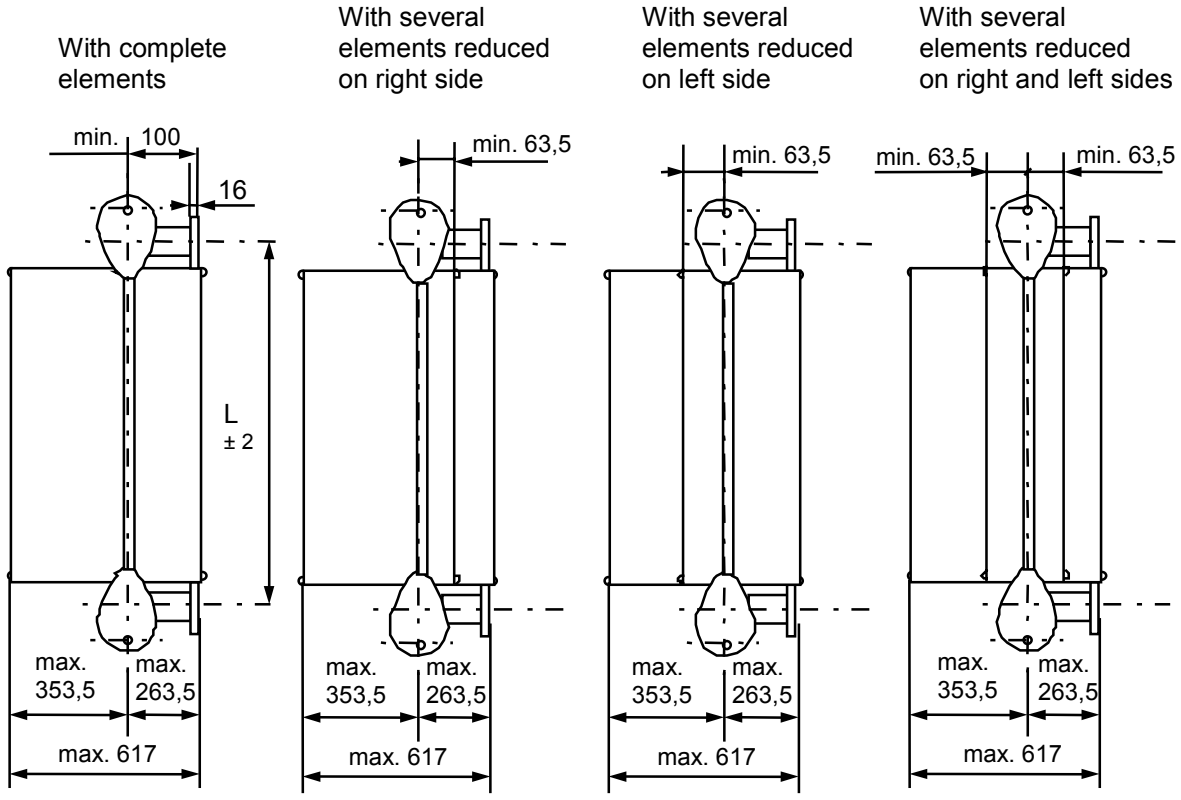


Figure 3 – FTR-type radiators

Dimensions in mm





Distance between centers L ± 2	600 to 800 = length from 100 ± 10 to 100 ± 10 > 800 = length from 50 ± 10 to 50 ± 10
a1	Minimum 9 = Step 10 in 10
b1	Maximum 2 360 = Minimum Step 40
b2 . b3	According to number of elements
b4 . b5 . b6	According to mounting on material

Figure 4 - FTTO-type radiators

Table 1 – Characteristics and dimensions of the radiators whose width is 520 mm

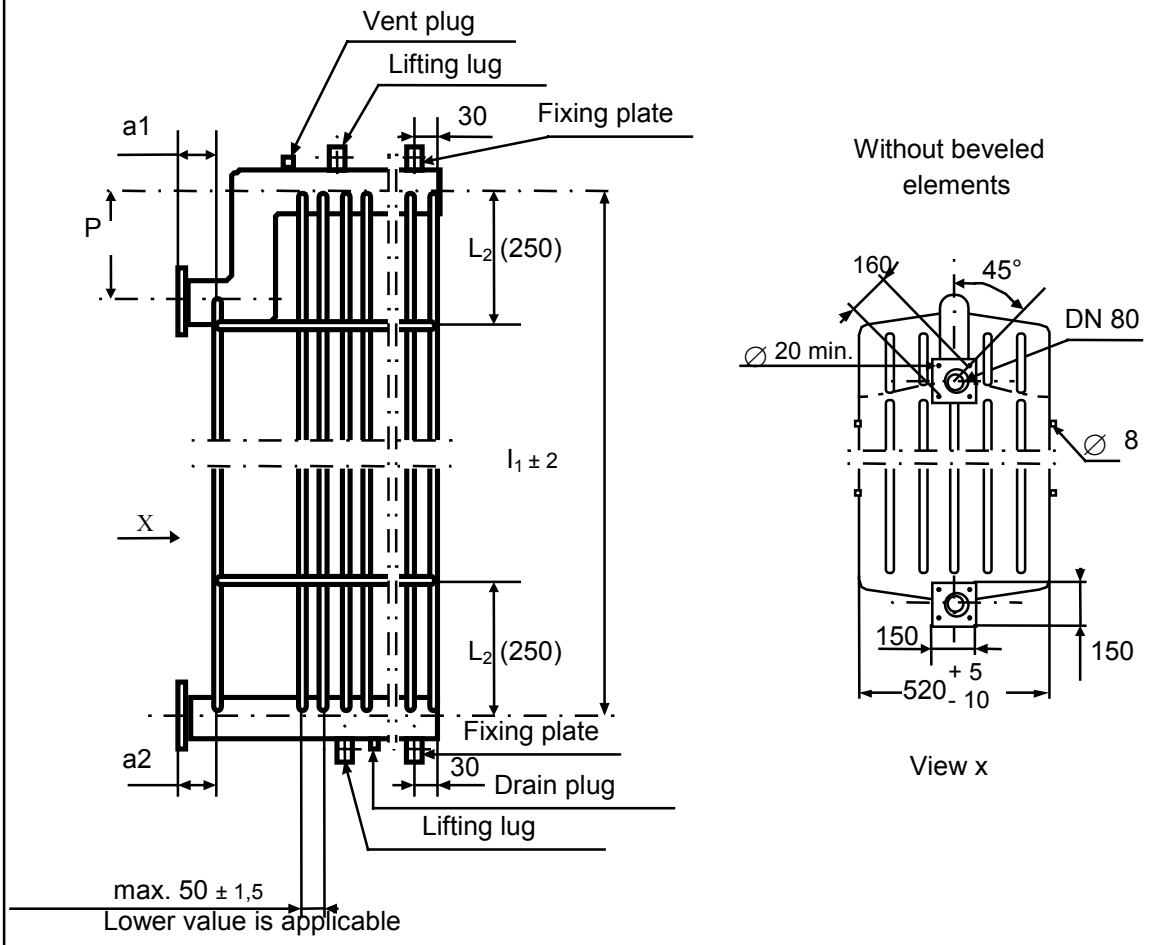
Distance between centres l_1		800 to 3 500 having different length from 100 to 100		
Number of elements		4 to 32		
Length of tubes a1 and a2		60 to 200 having different length from 10 to 10		
Number [a] off stiffenings one each side	dimension l_1	800 - 1 500	1 600 - 2 500	2 600 - 3 500
	number (minimum) [b]	2 (0 - 1)	3 (1 - 2)	4 (2 - 3)
	(dimension l_2)	(l_1/2)	(l_1/3) [b]	(l_1/4)

a The number and position of stiffenings can be modified for possible applications of the electric fans.

b The minimum number of stiffenings on each side can be, as an alternative, the one indicated in brackets. In this case, refer to the dimension (l_2) indicated for the distances among the stiffenings.

7

Dimensions in mm



NOTE See Table 1 for the dimensions that are not indicated in the figure, the number of elements and the number of stiffenings.

NOTE Connection flange: it is possible to use flanges ∅ 100.

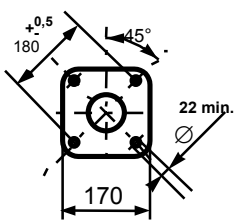
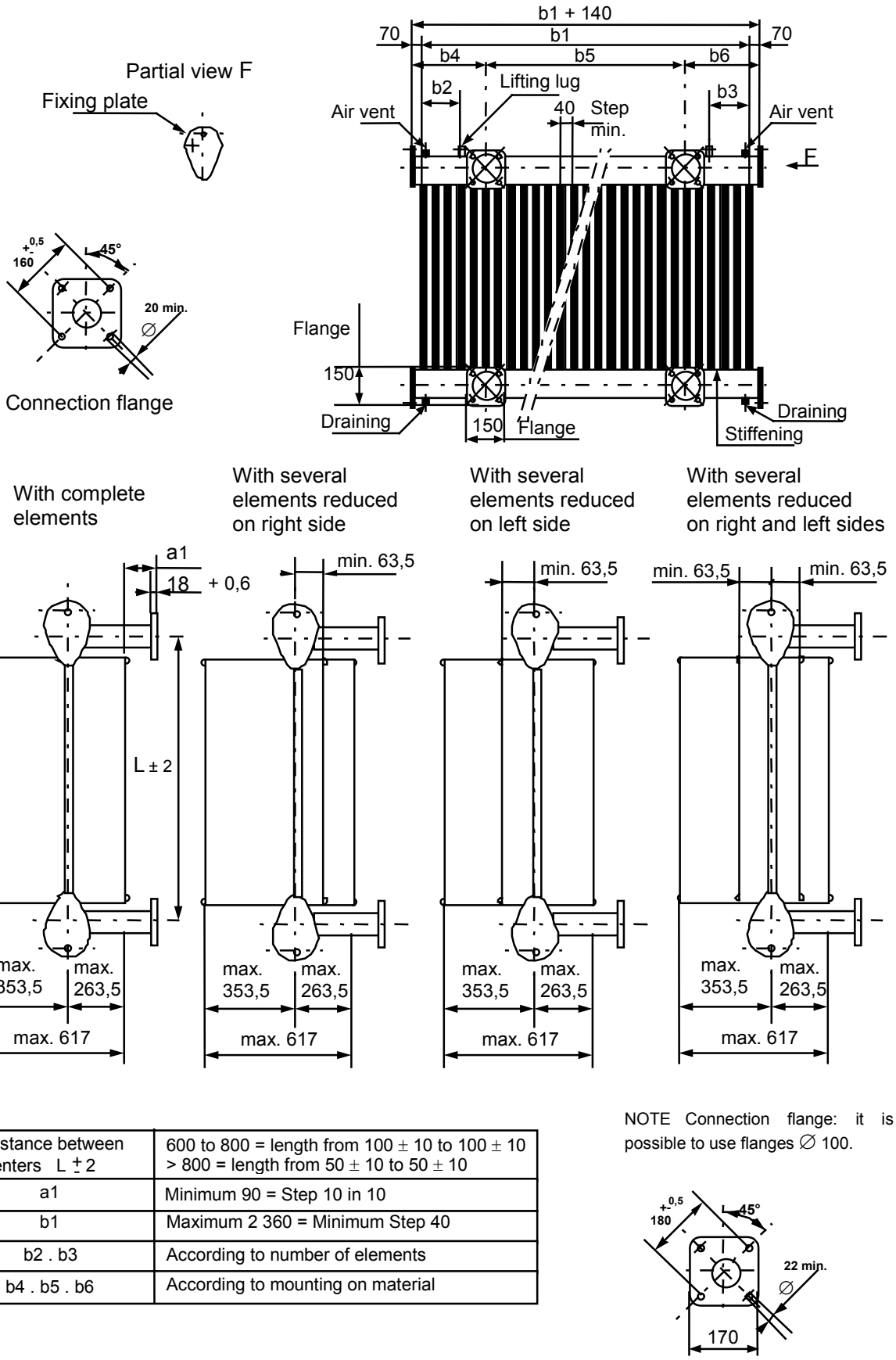


Figure 5 - FR-type radiators with flange and upper connection depressed

Dimensions in mm



Distance between centers L ± 2	600 to 800 = length from 100 ± 10 to 100 ± 10 > 800 = length from 50 ± 10 to 50 ± 10
a1	Minimum 90 = Step 10 in 10
b1	Maximum 2 360 = Minimum Step 40
b2 . b3	According to number of elements
b4 . b5 . b6	According to mounting on material

NOTE Connection flange: it is possible to use flanges ∅ 100.

Figure 6 - FTT-type radiators

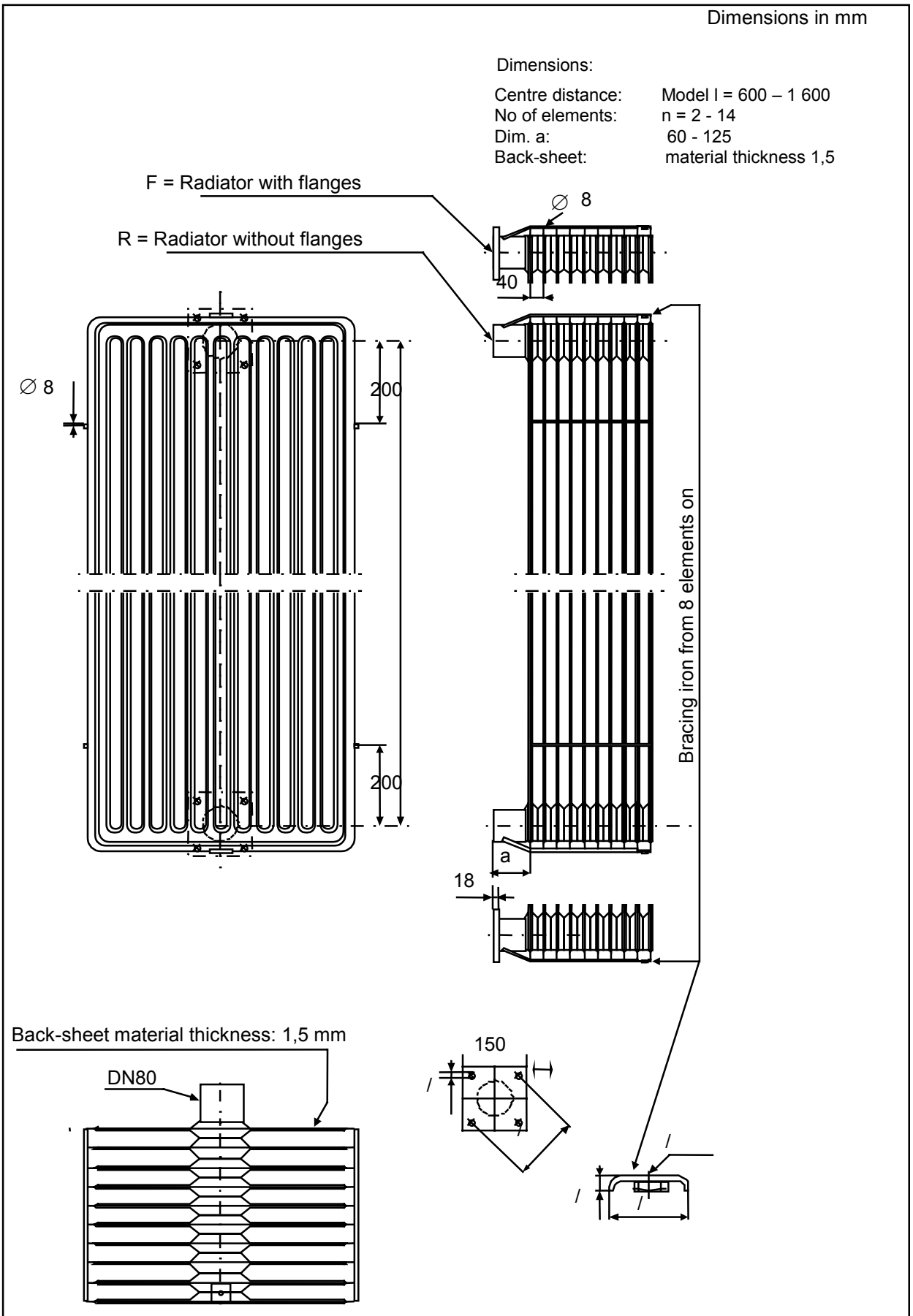


Figure 7 - FG1A-type radiators (integral header positioned centrally)

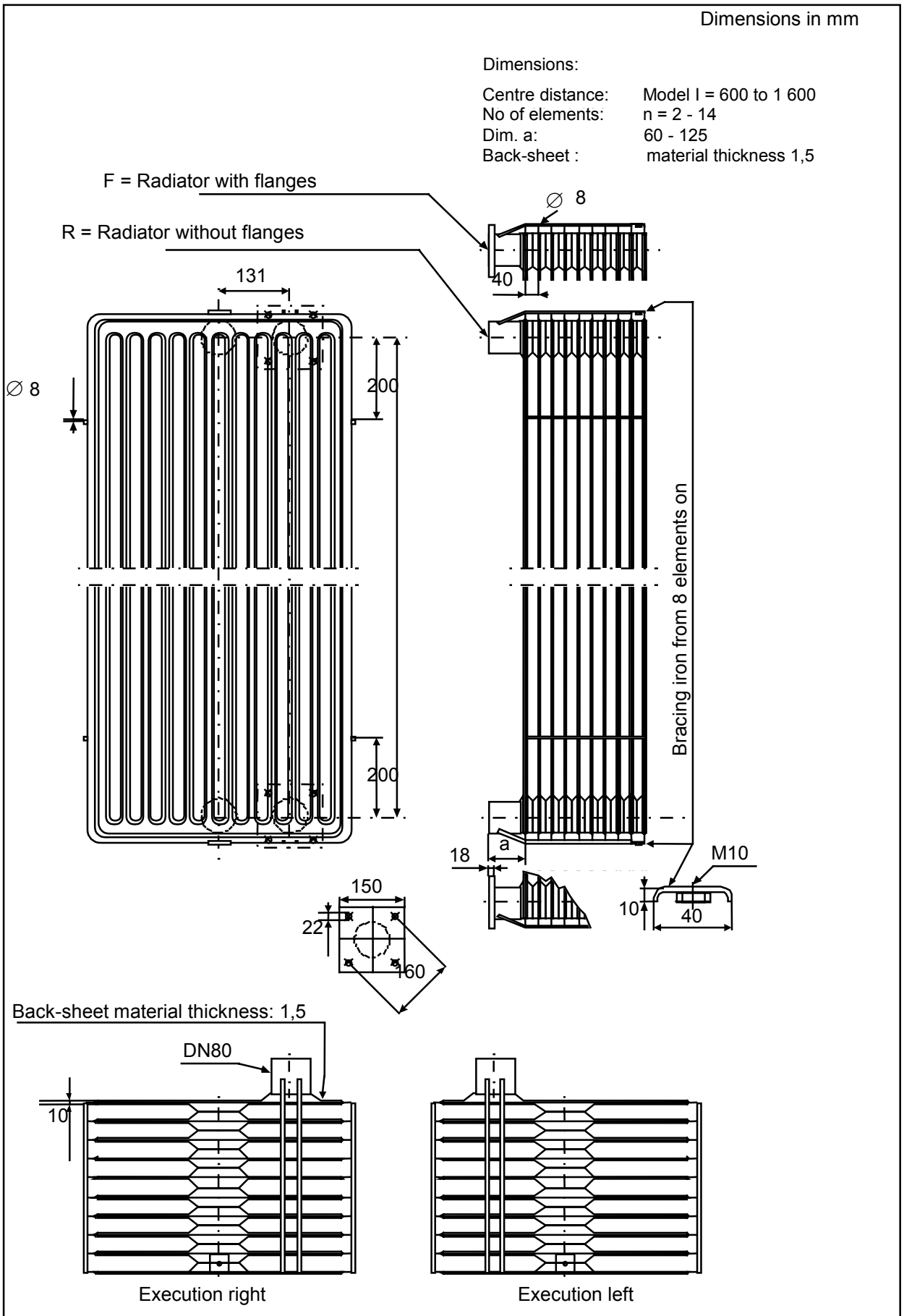


Figure 8 - FG1A-type radiators (integral header offset horizontally 131 mm)

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