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Refrigerated display cabinets —

Part 2: Classification, requirements and test conditions

AMENDMENT 1

Meubles frigorifiques de vente —

Partie 2: Classification, exigences et méthodes d'essai

AMENDEMENT 1

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Foreword

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The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

Amendment 1 to ISO 23953-2:2005 was prepared by the European Committee for Standardization (CEN) Technical Committee CEN/TC 44, *Commercial refrigerated cabinets, catering refrigerating appliances and industrial refrigeration*, in collaboration with Technical Committee ISO/TC 86, *Refrigeration and air-conditioning*, Subcommittee SC 7, *Testing and rating of commercial refrigerated display cabinets*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This corrected version of ISO 23953-2:2005/Amd.1:2012 incorporates the following correction on page 3:

Page 14, Figure 3

Replace Figure 3 with the following new Figure 2 a), b), c) and d).

has been corrected to read:

Page 14, Figure 3

Renumber Figure 3 as Figure 2.

Refrigerated display cabinets —

Part 2: Classification, requirements and test conditions

AMENDMENT 1

Page 6, 4.1.4.1

Replace “the maximum working pressure to which they will be subjected when the cabinet is in operation or at rest.” with “the maximum working pressure to which they are subjected when the cabinet is in operation or at rest.”

Page 7, 4.1.6.2

Replace the subclause with the following:

4.1.6.2 Temperature sensor location

The temperature sensor location shall be readily accessible to enable on-site testing for the correct indication of temperature and replacement of the temperature measuring instrument on site in service.

NOTE 1 The temperature sensor of a thermometer is considered to be “readily accessible” if it can be reached directly for examination. It can be necessary to remove access panel(s) to carry out replacement.

NOTE 2 For cabinets with natural convection cooling, the positioning of the temperature sensor in a guide tube is also considered to be “readily accessible” if the sensor can be introduced into and removed from the guide tube without a tool.

Wherever possible, the mounting method shall not supply heat to, or withdraw heat from, the temperature sensor.

The temperature sensor shall be protected against heat radiation from the external ambient.

The temperature sensor's location is defined as part of the temperature test of the refrigerated display cabinet. During the temperature test, air temperatures at the declared sensor location shall be measured and these values noted in the test report.

NOTE 3 For electronic controllers, it is possible to display a calculated temperature.

NOTE 4 For the recording and display of temperatures, one or two temperature sensors can be used. The temperature sensor can be the same as those used for controlling the refrigeration. An alarm can be activated in case of error. This option is not in accordance with the requirements of EN 12830.

NOTE 5 It is the responsibility of the supplier and user to ensure that the location of the temperature sensor complies with national regulation on temperature control of foodstuffs.

Page 8, Figure 2

Delete Figure 2.

Page 9, 4.2.2

Replace the Note with the following:

NOTE Annex B compares laboratory and store condition.

Page 9, Table 1

Replace the table with the following:

Table 1 — M-package temperature classes

Class	Highest temperature, θ_{ah}, of warmest M-package colder than or equal to[a]	Lowest temperature, θ_b, of coldest M-package warmer than or equal to[a]	Lowest temperature, θ_{al}, of all M-package colder than or equal to[a]
	°C		
L1	−15	—	−18
L2	−12	—	−18
L3	−12	—	−15
M1	+5	−1	—
M2	+7	−1	—
H1	+10	+1	—
H2	+10	−1	—
S	Special classification		

[a] See Figure 28.

Page 10, Table 2

In the third row of the table, replace “Annex D” with “Annex C”.

Page 11, 5.2.2

Replace the fourth and final paragraph with the following:

The total display (TDA) area is calculated according to Annex A.

Page 13, Table 3

Replace the table with the following:

Table 3 — Climate classes

Test room climate class	Dry bulb temperature °C	Relative humidity %	Dew point °C	Water vapour mass in dry air g/kg
0	20	50	9,3	7,3
1	16	80	12,6	9,1
8	23,9	55	14,3	10,2
2	22	65	15,2	10,8
3	25	60	16,7	12,0
4	30	55	20,0	14,8
6	27	70	21,1	15,8
5	40	40	23,9	18,8
7	35	75	30,0	27,3

NOTE The water vapour mass in dry air is one of the main points influencing the performance and the energy consumption of the cabinets. Therefore, the order of the climate class in the table is based on the water vapour mass column. See also Annex B to compare lab and store conditions.

Page 13, 5.3.1.3.2

Replace the first paragraph with the following:

The point for measurement of ambient temperature and relative humidity shall be midway along the length of the cabinet and in accordance with Figures 2 to 5.

In the case of typical island cabinets, and island with air discharge in the middle, temperatures shall be taken at both sides [see Figure 3 a), b), c)].

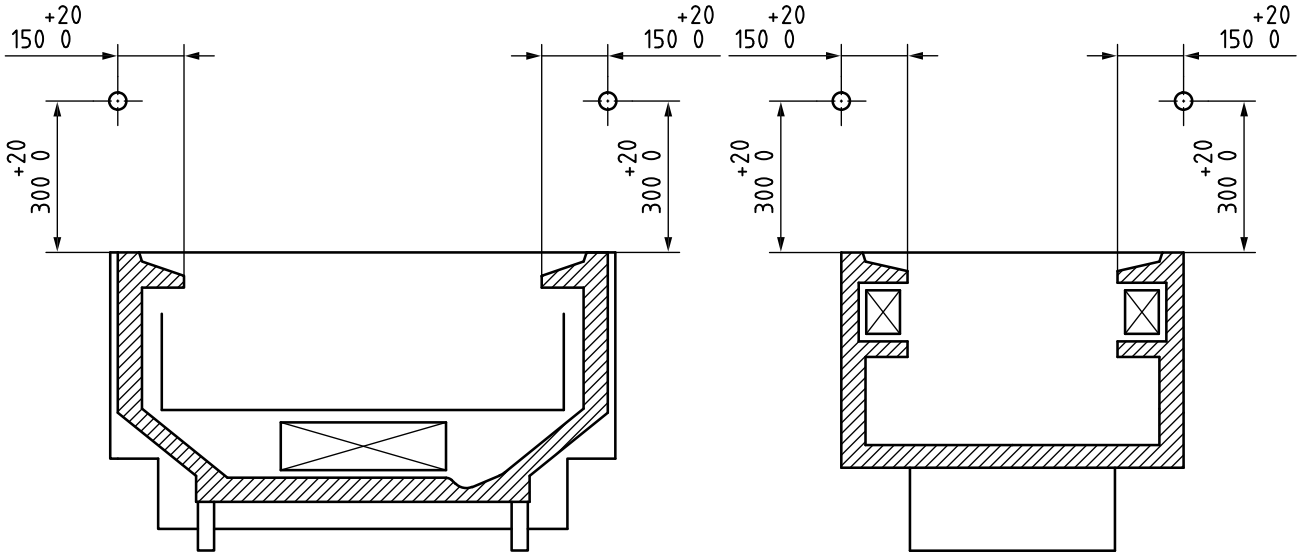
For plug-in cabinets, the warm condenser air flow shall be prevented from influencing the temperature at the measuring point by air deflectors or other suitable means (see 5.3.2.1, Figure 10).

Page 14, Figure 3

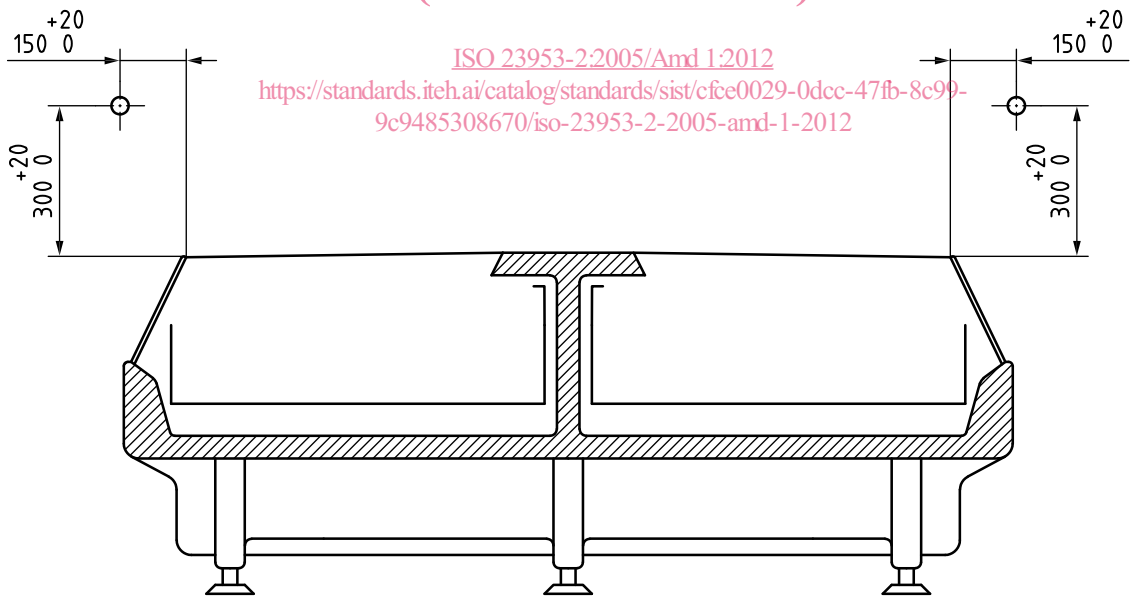
Renumber Figure 3 as Figure 2.

Page 15, Figure 4

Replace Figure 4 with the following new Figure 3 a), b), c) and d):

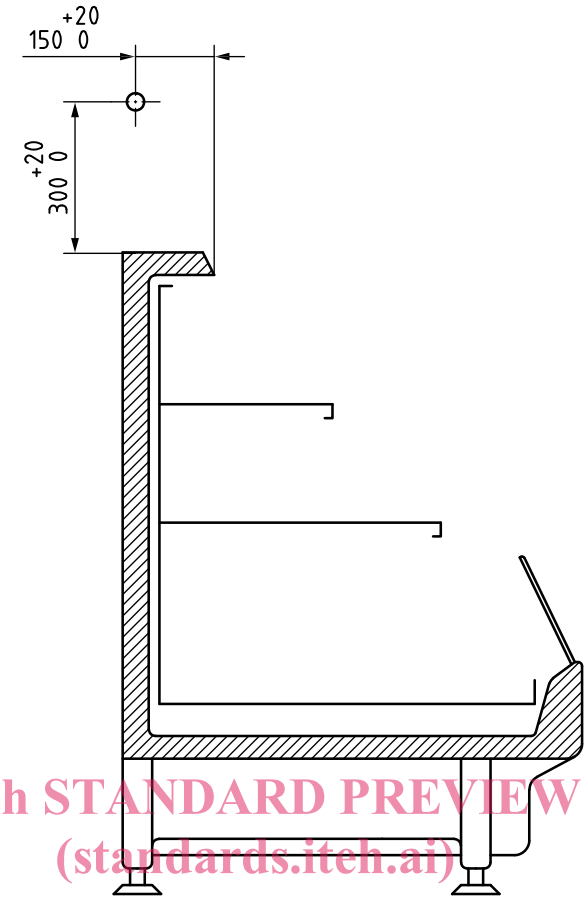


a) Horizontal, open, island site cabinet **b) Horizontal, open, island site cabinet**



c) Island with air discharge in the middle

Figure 3 (*continued*)



d) Island with semi-vertical cabinet

Figure 3 — Climate measuring point for two typical examples of horizontal, open, island site cabinets [a), b)] for island with air discharge in the middle [c)] and for semi-vertical cabinet [d)]

Pages 15 and 16, Figures 5 and 6

Renumber Figures 5 and 6 as Figures 4 and 5.

Page 16, Table 4

Replace the last row with the following (thus deleting the dimension and mass of test packages "(37,5 × 100 × 200) 750":

The following package may be used as fillers to complete the cabinet loading:	
25 × 100 × 200	500

Page 18, Figure 7

Renumber Figure 7 as Figure 6.

Page 20, Figure 8

Renumber Figure 8 as Figure 7.

Page 20, 5.3.1.6

Insert the following new subclause after renumbered Figure 8 (M-package):

5.3.1.6 Alternative for filling test packages

Alternative filling test packages having the dimensions shown in Table 4 and density of (480 ± 80) kg/m^3 may be used, except for rows and columns on transverse section containing M-packages.

This test package may be a box made of plastic material, of any density, and of 1 mm nominal thickness. Cellular or foam material shall not be used. The case shall not incorporate any protrusions that would cause the vertical separation of packages in a stack. Opposite faces shall be substantially parallel and moulding draft shall be the minimum practicable. Seams or joints shall not result in protrusions sufficient to cause significant air gaps between adjacent packages.

Colour can be important, if dark enough to be affected by ambient heat radiation; however, a pastel colour, such as light pink, pale blue or pale green, shall have no significant effect in normal surroundings.

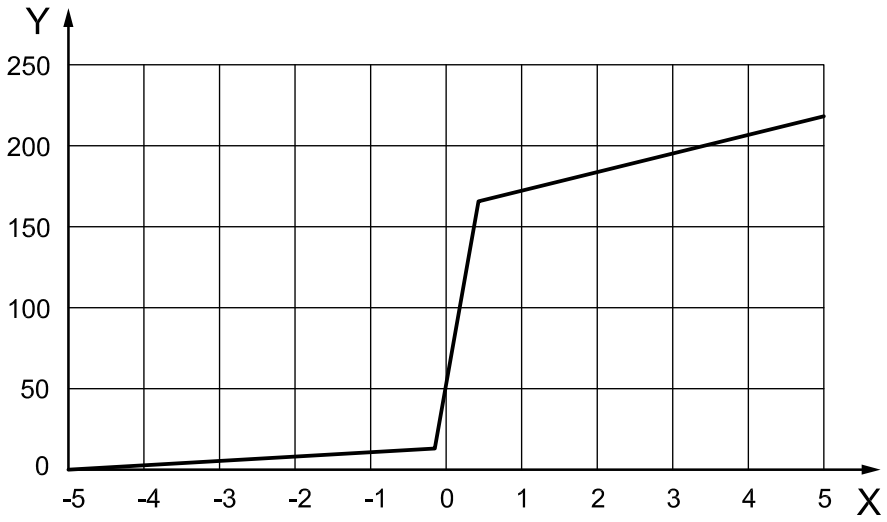
The contents shall be water soaked into a porous material, such as a natural, plastics or cellulose sponge.

Table 7 — Temperature and specific enthalpy of filler packages

Temperature °C	Specific enthalpy kJ/kg
–5	0
–4	3
–3	4
–2	7
–1	10
0	45
+1	172
+2	183
+3	194
+4	206
+5	218

Table 8 — Temperature and increase in specific enthalpy of filler packages

Temperature range °C	Increase in specific enthalpy kJ/kg
–5 to –1	10
–1 to +1	162
+1 to +5	46
–5 to +5	218



Key

X temperature, °C

Y specific enthalpy, kJ/kg

Figure 8 — Thermal characteristics of filler packages

Page 20, 5.3.1.6

Renumber 5.3.1.6 as 5.3.1.7.

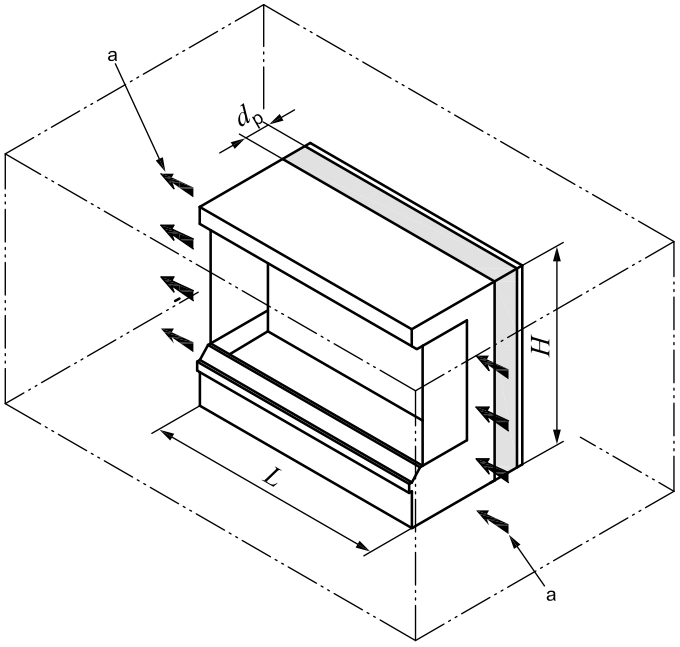
Page 21, 5.3.2.1

Replace the fourth paragraph with the following:

> For cabinets intended to be placed against a wall, and in order to check the running of cabinets with incorporated condensing unit correctly according to 5.3.2 or the water vapour condensation according to 5.3.4, a vertical partition shall be placed either against the rear of the cabinet or at a distance, d_p, from the rear as specified by the manufacturer [see Figure 9 and 7.3 b)].

Add the following two paragraphs and new Figure 10 at the end of the subclause:

> For all vertical and semi-vertical cabinets, when the warm condenser air flow direction is across the testing room air flow direction, from the front to the back of the cabinet, an air deflector positioned as shown in Figure 10 shall be used in such a way to create a duct between the back of the cabinet and the vertical panel. This duct shall be closed in the front end side towards the testing room airflow discharge direction and open in the opposite side. On the top, this duct shall be closed at the same height of the cabinet.
>
> The distance, d_p, between the back of the cabinet and the vertical panel shall be specified by the manufacturer [see 7.3 b)].



Key

d_p depth of the air back duct

H height of the air back duct equals height of the cabinet

L length of the air back duct equals length of the cabinet

a Air currents parallel to the plane of the opening (in longitudinal direction).

Figure 10 — Size and position of the air back duct

For horizontal plug-in cabinets, a back duct is not required.

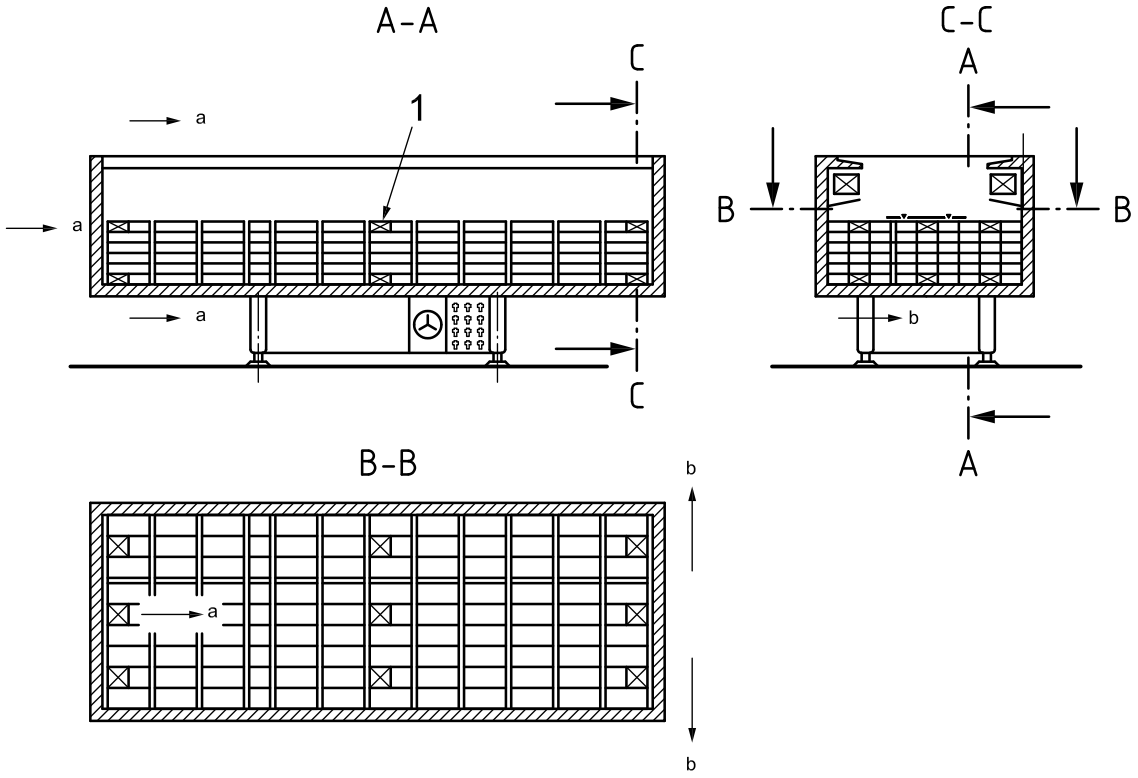
NOTE In general, the power of horizontal cabinets is much lower than that of vertical cases.

The warm condenser air can be removed by the test room airflow.

The air movement of the test room shall be parallel to the longitudinal axis according to 5.3.2.2.

The direction of the warm condenser airflow should be the same as the test room air flow direction and not opposed to it.

If this is not possible because of the cabinet's design, the condenser airflow should be across the test room airflow direction (see Figure 11).



Key

1 M-package

a Air currents parallel to the plane of the opening (in longitudinal direction).

b Air flow direction of condensing unit.

Figure 11 — Condensing air with test room air flow, or across, but not opposed the test room air flow

Page 22, 5.3.2.2

At the end of the first paragraph, replace “shown in Figure 10 shall be 0,2 m/s” with “shown in Figure 12 shall be $0{,}2^{+0}_{-0{,}1}$ m/s ”.

Page 23, 5.3.2.2

Replace the second and third paragraphs with the following:

For closed refrigerated cabinets with lids or doors hinged in such a way that the rotation axis is perpendicular to the longitudinal axis of the cabinet, the direction of air flow shall be such that the air movement is parallel to the plane of the cabinet display opening and the air enters the cabinet when the door(s) or lid(s) is (are) open.

The majority of the doors or lids shall open in order to allow the air entry into the cabinet; if doors or lids can be indifferently hinged left and right, all doors or lids shall open in the same direction.

Test room air movement shall be checked during the test in order to be sure that the test room is running correctly. The method of checking is left to the discretion of the testing authority.

Page 23, Figure 10

Renumber Figure 10 as Figure 12.

Page 24, 5.3.2.3.1

Replace in the first sentence “up to the load limit, as illustrated in Figures 11 to 24” with “up to the load limit, as illustrated in Figures 13 to 26”.

Replace the fourth paragraph with the following (thus deleting the “37,5 mm × 100 mm × 200 mm” size):

To complete the loading, use test packages of the following size as fillers: 25 mm × 100 mm × 200 mm.

In the first sentence of the eleventh paragraph, before the Example, replace “loading height above 500 mm (see Figure 23)” with “loading height above 500 mm (see Figure 25)”.

Add the following two paragraphs and Note at the end of the subclause:

If not otherwise stated in the manufacturer's handbook/instructions or marked inside the cabinet, the packages and the wood shall be loaded on standard Euro pallets (1 200 × 800 × 144) mm or, if not applicable, on a similar tray of the same height. The surface of the pallet should be covered by a sheet of plastic or carton so that the packages can be loaded properly.

If the cabinet is designed for the use of special storage trolleys, these trolleys shall be used for testing. In this case, the M-packages shall be positioned as specified in Figure 25, but inside the trolleys.

NOTE Sensitive foodstuff loading type can be possible only for the top part (shelves) of this type of cabinet.

Page 24, 5.3.2.3.2 a)

Replace “a tolerance of $^{0}_{-15}$ mm (see Figure 11 and Figures 13 to 18)” with “a tolerance of $^{0}_{-25}$ mm (see Figure 13 and Figures 15 to 20)”.

Page 24, 5.3.2.3.2 b)

Replace “(see Figures 19 to 21 and Figure 23)” with “(see Figures 21 to 23 and Figure 25)”.

Page 24, 5.3.2.3.2 c)

Replace the text with the following:

c) For all open cabinets, intended for sensitive foodstuffs not suitable for multiple layer stacking, the loading shall be equal to 100 mm (for an example, see Figures 14 and 24).

NOTE The meaning of “intended for sensitive foodstuffs not suitable for multiple layer stacking” is that the foodstuffs are displayed on tilted shelves, where it is not possible to make a load level over 100 mm. This type of loading can also be used for horizontal shelves. It is intended that manufacturers indicate the load limit in the technical documentation and also specify the type of loading used for testing the cabinet.

Page 25, 5.3.2.3.2 d)

Replace “(see Figure 24)” with “(see Figure 26)”.

Page 25, 5.3.2.3.3

Replace "(see Figures 11 to 24)" with "(see Figures 15 to 26)" at the end of the sentence.

Page 25, 5.3.2.3.3.2

Replace the text with the following:

5.3.2.3.3.2 Cross-section

For refrigerated base deck depths of less than or equal to 550 mm, or any shelf depth, M-packages shall be located in two longitudinal sections, such that the M-package axis is situated 50 mm from the back panel and 50 mm from the front limit of loading (see Figures 13 to 26).

For refrigerated base deck depths of more than 550 mm, a third longitudinal section shall be placed midway across the base deck depth with a tolerance of

— $d/2\ ^{+100}_{-0}$ mm from the air-discharge side for cabinets with forced-air cooling [see Figures 13 to 15, Figure 17 a) and b) and Figures 21 to 25], or

— $d/2 \pm 50$ mm for natural-convection-cooled cabinets equipped with two evaporators or having a symmetrical layout (see Figures 18 to 20), or

— $d/2\ ^{+100}_{-0}$ mm from the evaporator side for other natural-convection-cooled cabinets (see Figure 16).

In the height, for the base deck and each refrigerated shelf, M-packages shall be located in the lower and upper loading layers. Where the distance between the axes of M-packages is more than 400 mm, another M-package layer shall be introduced (see Figures 22, 23 and 25).

For cabinets with a minimum of four superimposed refrigerated shelves, of which two are strictly identical and have

a) the same shape and sizes (length, depth and loading height),

b) the same air flow design (discharge and return), and

c) the same radiation heat transfer conditions, more particularly, the same location and intensity of the lower and upper lighting devices,

M-packages shall be located in the following places:

— with two identical refrigerated shelves: on the lower shelf (see Figure 22, where the second and the third shelves from the top are identical);

— with three identical refrigerated shelves: on the central shelf (see Figures 23 and 26, where the second, third and fourth shelves from the top are identical).