

UIC CODE

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2nd edition, November 2004

Translation

OR

General provisions for coaches

Dispositions générales régissant les voitures
Allgemeine Bestimmungen für Reisezugwagen



UNION INTERNATIONALE DES CHEMINS DE FER
INTERNATIONALER EISENBAHNVERBAND
INTERNATIONAL UNION OF RAILWAYS

Leaflet to be classified in Volumes :

IV - Operating

V - Transport Stock

Application :

With effect from 1 January 1991, except as regards:

- point 1.5.5 (1.7.92)

- point 2.1.2.2 for newly built vehicles (1.1.94)

- point 2.3 (1.7.94)

CFF, CD, DSB, JZ and ZSR have been granted exemption from point 1.5.5 until 31.12.1999, insofar as national legislation permits.

NS has been granted exemption from point 1.5.5 until 1.6.1994 for buffer coaches numbered 51 84 88 80 001-3, 51 84 88 80 002-1, 51 84 88 80 004-7 and 51 84 88 80 006-2, provided this was not contrary to national legislation.

SNCB has been granted exemption from point 1.5.5 until 31.12.1999, provided this was not contrary to national legislation.

All members of the International Union of Railways

Record of updates

1st edition, January 1991

First issue with amendments No. 1 to 5 (no. 1 of 1.7.91, no. 2 of 1.7.92, no. 3 of 1.1.94, no. 4 of 1.7.94, no. 5 of 1.7.95 and erratum of 1.7.97)

2nd edition, November 2004

Retyped in FrameMaker and update of points 1.4, 1.5.5, 2.1.2.2, 2.1.2.5, 2.12.2, 2.13 following the decisions of SC 15 between 1997 and 1999

The person responsible for this leaflet is named in the UIC Code

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Summary

This leaflet describes the basic provisions applicable to the construction and fitting-out of coaches for use in international traffic. The other UIC provisions applicable to coaching stock must also be observed.

1 - General

o 1.1 - Validity of other UIC leaflets

1.1.1 - In addition to the provisions set out below, coaches intended for international traffic must comply with the other UIC Code regulations applicable to coaches.

1.1.2 - Unless exceptions are required for technical reasons, the interchangeable parts as defined by the UIC Code and components complying with UIC standards on quality and dimensions (Volume VIII) must be used for their construction.

1.2 - General operating provisions

o 1.2.1 - The coaches must be capable for running coupled, empty or loaded, through a 150 m-radius curve and empty, not coupled, through a 80 m-radius curve without any component having to be removed.

R 1.2.2 - The permissible axle loads, the metric loads and the distances between axles are specified for the lines of each country in the compendium "Gauges for trailing vehicles, loading gauges, axle loads, metric loads and wheel-bases of trailing stock approved for international railway traffic (TU lines and standards); see also *RIV Appendix II*.

1.3 - General marketing requirements concerning interior fittings

o 1.3.1 - The interior equipment must create a feeling of well-being and roominess.

o 1.3.2 - The interior of future vehicles must:

- offer a suitably modern and welcoming image. As far as possible, therefore, individual fittings should be designed for easy exchange (modular design),
- be designed to cater for the specific product. Comfort differences for certain products should be obvious and immediately perceptible.

R 1.3.3 - It is recommended that the interior of new coaches be designed so that, in addition to the present basic train comfort, further comfort improvements can later be introduced during major overhauls as well as a modification of the seat arrangement.

o 1.4 - Pressure tightness

Coaches used on certain line sections with many tunnels, as per *RIC, Appendix II*, must be pressure sealed. Railways are advised to list their respective line sections in *RIC, Appendix II*. Pressure tightness must comply with the conditions of *UIC Leaflet 566, point 1.5*.

The toilets must be of the retention type.

o 1.5 - General provisions to be applied to the coach body

1.5.1 - The coach design must ensure easy access from the end of one coach to the next.

1.5.2 - The coaches must comply with the conditions of *UIC Leaflet 569* (see Bibliography - page 27) for the vertical elbow angle of 2°30' formed by the movable gangway.

1.5.3 - The body underframe and frame must be of metal.

1.5.4 - The materials used for noise and thermal insulation, the internal partitions and linings must conform with *UIC Leaflet 564-2* (see Bibliography - page 27).

1.5.5 - Asbestos-containing materials are no longer authorised for use in the construction of new coaching stock.

Existing coaches worked in international traffic must not incorporate asbestos-containing materials, with the exception of bound asbestos.

Materials incorporating bound asbestos are only permitted until 1.1.2015.

1.6 - General provisions for individual components

o 1.6.1 - Equipment subject to regular inspection and maintenance must be easily accessible.

If necessary, inspection traps or doors must be provided.

o 1.6.2 - The trap doors, which are normally closed, and the cabinet doors, which only the train crew must be able to open, must be provided with locks, which can only be operated with the RIC square socket key.

R 1.6.3 - It is recommended that these locks be provided with a spring lock.

o 1.6.4 - Each entrance door must be provided with a gutter pipe above. This pipe must be longer than the clearance width of the door.

o 1.6.5 - Components of heating couplings or other connections likely to hang to a level lower than 140 mm above rail top must be capable of being screwed down or fastened so that they do not come down below this height.

2 - Constructional characteristics

2.1 - Body

○ 2.1.1 - Strength

Point 1 of *UIC Leaflet 566* (see *Bibliography - page 27*) shall apply.

2.1.2 - Noise and thermal body insulation

○ 2.1.2.1 - Surfaces surrounding passenger areas must be designed so that the comfort conditions laid down in *UIC Leaflet 553* (see *Bibliography - page 27*) are observed.

○ 2.1.2.2 - The following values for the thermal transmission coefficient (k) should not be exceeded by stationary vehicles, bearing in mind the climatic zone for which the vehicle is designed (see *UIC Leaflet 553*)

| Climate zone | Vehicle type | |
|--------------|---------------------------------------|-----------------------------------|
| | single-level (W/m ² .k) | bi-level (W/m ² .k) |
| Winter | | |
| I | 2 | 2,5 |
| II | 1,6 | 2,5 |
| III | 1,2 | - |

- coefficient k for vestibules must not exceed these values by more than 1 w/m².
- when running, these values of k can be exceeded by 0,4 W/m² at the maximum. Measurement conditions shall comply with the provisions of *UIC Leaflet 553-1, point 7.2.4*.

R 2.1.2.3 - It is recommended that the noise level in passenger areas should not exceed the values indicated below, irrespective of the coach type (i.e. coaches with or without compartments), or in the case of compartment coaches, irrespective of whether the compartments are located in the middle or at the ends of the coach:

- 1st class coaches: 65 dB (A),
- 2nd class coaches: 68 dB (A).

These values should not be exceeded on track in a good state of repair, with the coach running at 160 km/h.

○ 2.1.2.4 - Permissible noise level when the coaches are stationary. See *UIC Leaflet 553*.

2.1.2.5 - The transmission factor (τ) for windows must not exceed 60%.

R 2.1.3 - Heights of windows above rail top, of the bottom of the roof curve and the paintwork.

2.1.3.1 - In order to give passenger trains as uniform an exterior image as possible, height dimensions b, c and d (see Appendix A - page 14) should be observed.



2.1.3.2 - It is recommended that dimensions f, g and h (see Appendix B - page 15) be observed for coaches painted in two colours and with decorative bands and skirting.

O 2.1.4 - The underframe must be equipped with:

- rings for coach tie-down on train ferry in accordance with *UIC Leaflet 569*.
- 4 body-lifting points level with the load cross-members.

Furthermore, non-combustible materials must be used in the area around the brakes where heat is released.

O 2.1.5 - Coaches running on track with overhead lines must be designed so that there is no need to climb on the roof or to climb steps or ladders located at a high level, in order to carry out work arising regularly during operations, such as installing facilities, filling water reservoirs, etc.

Coaches on which the steps or ladders exceed a height of 2 000 mm above rail top, must be provided with the sign  or  immediately adjacent to this equipment in accordance with *RIC, point 36.2 (Appendix V/7)*.

O 2.1.6 - In accordance with *UIC Leaflet 580* (see Bibliography - page 27), fasteners for route and number plates shall be placed on each side of the coach. If possible, these plates must be flush with the outer side-wall and remain completely visible, even when the entrance door is open.

It must be possible for these plates to be put in position from outside.

O 2.1.7 - On coaches intended for speeds above 160 km/h, the plates must not protrude from the surface of the outer coach wall. They must be held by fixing devices, which ensure with certainty that the plates will not become detached.

O 2.2 - Buffing and draw gear

2.2.1 - The buffing gear must conform with *UIC Leaflet 527-1 and 528* (see Bibliography - page 27).

2.2.2 - The couplers must conform with *UIC Leaflet 520* (see Bibliography - page 27).

2.2.3 - The conditions for coupler clearance as set out in *UIC Leaflet 521* (see Bibliography - page 27) must be observed.

2.2.4 - When new, and with the vehicle empty, the centre line of the side buffers must lie $1\ 060 \pm 5$ mm above rail top.

2.2.5 - Coaches intended for fitting with the automatic coupler must conform with the provisions of *UIC Leaflet 567-3* (see Bibliography - page 27).

2.3 - Running gear

- O 2.3.1 - Coaches must be equipped with bogies conforming with *UIC Leaflet 515-0* (see Bibliography - page 27).
- R 2.3.2 - Coach running gear must be constructed to conform with the ride qualities, maximum-speed and travelling-comfort conditions stipulated in *UIC Leaflet 515-0*.
- R 2.3.3 - Bogies shall be equipped with standard wheelsets conforming with *UIC Leaflet 515-1* (see Bibliography - page 27).

2.4 - Braking system, 2nd brake pipe

- 2.4.1 - Coaches must observe the UIC conditions for brake equipment (*Sub-section 54, UIC Code*).
- 2.4.2 - Coaches must be equipped with a second brake pipe.

2.5 - Interconnecting gangways and end doors

- O 2.5.1 - Coaches shall be provided with interconnecting gangways in accordance with *UIC Leaflet 561* (see Bibliography - page 27).
- R 2.5.2 - It is desirable that the design of future interconnecting gangways should incorporate the improved comfort standards as defined in *UIC Leaflet 561* (i.e. watertight, draught-free, low noise, snow-proof, bright and easy-to-maintain gangways).
- O 2.5.3 - The end doors must conform with *UIC Leaflet 560*.

2.6 - Entrance steps

See *UIC Leaflet 560* (see Bibliography - page 27).

2.7 - Handrails and steps

See *UIC Leaflet 560*.

2.8 - Entrance doors, compartment doors, side-corridor doors, WC doors, compartment and side corridor windows, WC and vestibule windows

In accordance with *UIC Leaflet 560 and 564-1* (see Bibliography - page 27).

2.9 - Layout of passenger areas

2.9.1 - General passenger areas

2.9.1.1 - Division into smoking and non-smoking areas

- O 2.9.1.1.1 - The division of accommodation into "smoker" and "non-smoker" areas is to be made in accordance with RIC provisions.
- R 2.9.1.1.2 - It is recommended that "smoker" and "non-smoker" areas are separated by doors or glass partitions.

R 2.9.1.2 - General principles applicable to seats

Appendix C - page 16 contains the basic principles and requirements that should be observed.

R 2.9.1.3 - Seats and their fittings

2.9.1.3.1 - As a rule, fixed seats shall be used.

Mobile seats shall be allowed in special coaches (dining-cars, for example) providing they comply with the provisions of *UIC Leaflet 566*.

2.9.1.3.2 - Appendix C - page 16 sets out the arrangements recommended for fixed seats.

Appendix D - page 18 contains the basic principles and requirements that should be observed.

2.9.1.4 - Tables

- R 2.9.1.4.1 - If seats are in face-to-face arrangement, it is recommended that each seat be provided with a (folding) table measuring at least 225 x 320 mm.
- R 2.9.1.4.2 - If seats are not in a face-to-face arrangement, it is recommended that (folding) tables measuring at least 400 x 340 mm be provided.
- R 2.9.1.4.3 - When seats are arranged in rows, it is recommended that the folding tables - together with a hold-back facility - be fixed to the back of each seat (for use by the passenger occupying the seat behind).
- O 2.9.1.4.4 - When folded back, the tables must not obstruct seat access.

O 2.9.1.5 - Curtains

2.9.1.5.1 - The outside windows of compartments and lounges must be provided with curtains of one of the following types:

- 2 sliding curtains with sufficient overlap to exclude the light, when closed,
- blinds,
- Venetian blinds or similar.

2.9.1.5.2 - Curtains or blinds must be provided in passenger areas, even if infrared-absorbing glass reflecting solar radiation is used.

O 2.9.1.6 - Coat lockers

The provisions of *UIC Leaflet 562* (see [Bibliography - page 27](#)) shall apply.

O 2.9.1.7 - Luggage space

2.9.1.7.1 - Luggage racks

In accordance with *UIC Leaflet 562*.

2.9.1.7.2 - Luggage shelves

In accordance with *UIC Leaflet 562*.

O 2.9.1.8 - Litter bins and ash-trays

2.9.1.8.1 - In accordance with *UIC Leaflet 563* (see [Bibliography - page 27](#)).

2.9.1.8.2 - Installation of litter bins in compartments and lounges in accordance with *UIC Leaflet 567-1 and 567-2* (see [Bibliography - page 27](#)).

2.9.1.8.3 - In "smoker" accommodation ash-trays must be arranged within reach of the seats.

2.9.2 - Additional provisions for compartments

R 2.9.2.1 - Length of compartments

The following dimensions are recommended:

- 1st class: 2 300 mm,
- 2nd class: at least 1 850 mm.

O 2.9.2.2 - Compartment fittings

Each compartment must be equipped with:

- window-tables,
- 2 luggage racks (in accordance with *UIC Leaflet 562*),
- 2 cane and umbrella stands¹; if necessary, several units,
- at least 2 ash-trays in "smoker" compartments,
- 1 or 2 mirrors made of safety glass¹,

1. In compartments with sleeping accommodation, provision of cane and umbrella stands as well as mirrors is not mandatory.

- 1 removable or tip-up litter bin,
- coat hooks.

O 2.9.2.3 - Interior fittings must also conform with *UIC Leaflet 564-2*.

O 2.9.2.4 - The glazed part of the partition separating the compartments from the corridor must be provided with 2 sliding curtains or similar fittings.

R 2.9.2.5 - It is recommended that the curtains should overlap in front of the handle of the closed door.

R 2.9.2.6 - It is recommended that a device be mounted on the door, enabling the curtains and door to open at the same time.

O 2.9.2.7 - The emergency brake, the light and loudspeaker switches as well as, if applicable, ventilation control devices together with the corresponding descriptions or pictograms, must be located above the door.

O 2.9.2.8 - The compartment marking must specify the class, assignment of the compartment to "smoker" or "non-smoker", as well as the compartment number.

R 2.9.2.9 - It is recommended that a horizontal protection bar be fitted to serve as a hand rail, before the outer windows of the side corridor.

O 2.9.2.10 - If this bar is provided, it must not block the emergency exit.

O 2.9.2.11 - The partitions above the luggage racks must be lined with protective strips.

R 2.9.2.12 - It is recommended that the ash-trays be incorporated into the arm-rests of seats in "smoker" compartments.

2.9.3 - Additional arrangements for lounge coaches

2.9.3.1 - Passenger lounges - transverse partition

O 2.9.3.1.1 - The space reserved for passengers shall be divided into a "smoker" area and a "non-smoker" area.

R 2.9.3.1.2 - It is recommended that lounges be separated by a half-open partition or by a closed partition (made of glass) containing a door.

O 2.9.3.1.3 - If there is no door between the two lounges, it must be ensured by appropriate ventilation that no used air can move from the "smoker" area to the "non-smoker" area.

2.9.3.2 - Lounge fittings

R 2.9.3.2.1 - The seats may be arranged face-to-face or facing the same direction. A combination of the two arrangements may also be used.

O 2.9.3.2.2 - The end seats must not be arranged so that they face the partition.

O 2.9.3.2.3 - Each bay must be provided with removable or tip-up litter bins.

- O 2.9.3.2.4** - The lounges must be equipped with longitudinal luggage racks positioned above the windows, and their dimensional characteristics and strength values must conform with *UIC Leaflet 562*.
- R 2.9.3.2.5** - It is recommended that the partitions above the luggage racks be lined with protective strips or a similar means of protection.
- R 2.9.3.2.6** - It is recommended that at least one luggage storage area be provided at the end of each lounge, on the footboard side, for storing heavy or bulky luggage.
- O 2.9.3.2.7** - On air-conditioned coaches at least 4 windows that may be opened must be provided on each side of the coach in accordance with *UIC Leaflet 560*.
- O 2.9.3.2.8** - At least one easily-seen and readily-accessible emergency-brake control device must be provided in each lounge (smoker and non-smoker).
- O 2.9.3.2.9** - The light and loudspeaker switches, as well as the ventilation control devices, if provided, must be located, together with the corresponding descriptions or pictograms, near the lounge entrance doors.
- O 2.9.3.2.10** - The main regulators for the heating or air-conditioning systems must be situated on the panel inside the control cabinet.
- O 2.9.3.2.11** - The occupation of each WC must be identified by an illuminated indicator positioned above the coach door at the end where the WC is located, in accordance with *UIC Leaflet 555* (see [Bibliography - page 27](#)).

O 2.9.3.3 - Lounge doors

The provisions of *UIC Leaflet 560* must be observed.

2.10 - Layout of side corridors and centre aisles

2.10.1 - Width of corridor

- O 2.10.1.1** - The minimum width of the corridor shall be:

| | |
|--|--------|
| - for side corridors without folding seats | 680 mm |
| - for side corridors with folding seats, which are set into the wall (dimension between the outer wall and the frame of the inner wall - not taking into account the door thickness) | 720 mm |
| - centre aisles (measured between seat arm rests) | 520 mm |
- R 2.10.1.2** - It is recommended, as far as possible, that the width of the side corridors be larger than the respective minimum dimension.

O 2.10.2 - Fittings in the side corridor

In conformity with *UIC Leaflet 567-1 and 567-2*.

2.11 - Layout of coach end platforms

- R 2.11.1 - It is recommended that the platform area be designed in the form of a vestibule, with its furnishings matching the inside area of the coach.
- R 2.11.2 - It is recommended that the vestibule be fitted out in a manner which will generate a pleasant and attractive atmosphere. It is therefore advisable to use, on the floor and walls, materials that are resistant to wear and ageing, as well as easy to clean and maintain.
- O 2.11.3 - The fittings of vestibules must conform with *UIC Leaflet 567-1 or 567-2*.
- O 2.11.4 - Provision of litter bins in vestibules must conform with *UIC Leaflet 563*.
- R 2.11.5 - To prevent the accumulation of dirt in winter, it is recommended that the entrance area be provided with floor mats which can be replaced in winter with grates.

O 2.12 - Sanitary facilities

2.12.1 - Number of toilets in relation to seats: as per *UIC Leaflet 563*.

Design and fittings: as per *UIC Leaflet 563*.

2.12.2 - As of 1.1.2000, all coaches must be equipped with vacuum toilets. Agreements for exemptions are authorised until 1.1.2005 insofar as they comply with legal provisions.

2.13 - Remote-control and loudspeaker cable, loudspeaker and telephone system

- O 2.13.1 - Coaches must be equipped with the remote-control and loudspeaker cable as specified in *UIC Leaflet 568 (see Bibliography - page 27)*. The use of the UIC 12-conductor cable is permitted for existing coaches.
- 2.13.2 - Coaches must be provided with loudspeaker systems conforming with the provisions of *UIC Leaflet 440 and 568 (see Bibliography - page 27)*.
- 2.13.3 - The public address point should be placed in a low-noise location.
- 2.13.4 - In order to prepare for the eventuality of a system of "information transmission by train cable" it is recommended that coaches be designed to allow for selective loudspeaker operation. This would make it possible to communicate with individual coaches, or a group of coaches, independently of the loudspeaker system of the whole train.

o 2.14 - Partitions and interior linings

2.14.1 - The partitions separating compartments must ensure adequate noise insulation between the different spaces.

2.14.2 - The partition separating the compartments from the corridor must be provided with fixed glazing in its upper part. Its lower part must be provided with openings to permit underseat air circulation between compartments and corridor.

2.14.3 - All interior linings and partitions must be easy to maintain and scratch-resistant.

2.14.4 - The joint covers and trimmings must retain their stiffness at a temperature of +50°C.

o 2.15 - Floor and floor covering

2.15.1 - Except in WCs, the floor must be provided with:

- a covering of easy-to-clean plastic material, synthetic rubber or linoleum,
- in first class accommodation the floor of corridor and compartments, where visible, must be covered with a carpet.

Carpets shall be made of a material that is easy to clean. If the carpets are fastened to the floor so that they cannot be removed quickly for cleaning, they shall be laid in a manner which will prevent underneath accumulation of water or dirt.

2.15.2 - Floor of WC

The provision of *UIC Leaflet 563* must be observed.

2.16 - Energy supply

o 2.16.1 - The electrical installations must conform with the provisions of *UIC Leaflet 550 and 552* (see [Bibliography - page 27](#)).

o 2.16.2 - If it is desired to supply coaches from the 220/380 V, 50 Hz, local mains when the coaches are stationary, type 63A connectors as specified in *UIC Leaflet 554-1* must be used for air-conditioned coaches. The sockets must be arranged along the coach at the centre, only on one side, or on both sides.

o 2.16.3 - The distribution and control panel must conform with the provisions of *UIC Leaflet 550-1* (see [Bibliography - page 27](#)).

R 2.16.4 - It is recommended that new coaches be provided with sockets for the connection of cleaning apparatus.

o 2.16.5 - Electrical supply points must comply with *UIC Leaflet 550*.

o 2.16.6 - Sockets shall be fitted in the vestibules, or near them, so that they are easily accessible to cleaners without attracting the attention of passengers.

o **2.17 - Lighting**

Light installations must comply with *UIC Leaflet 555*.

o **2.18 - Air-conditioning installation**

Air-conditioning installations must comply with *UIC Leaflet 553*.

o **2.19 - Washing-water heating**

The provision of *UIC Leaflet 563* must be observed.

R **2.20 - Equipment mounted on the vehicle exterior**

2.20.1 - Equipment installed without covering should, as far as possible, have smooth surfaces.

The equipment must be positioned in such a way that there are no gaps in which snow and ice might accumulate.

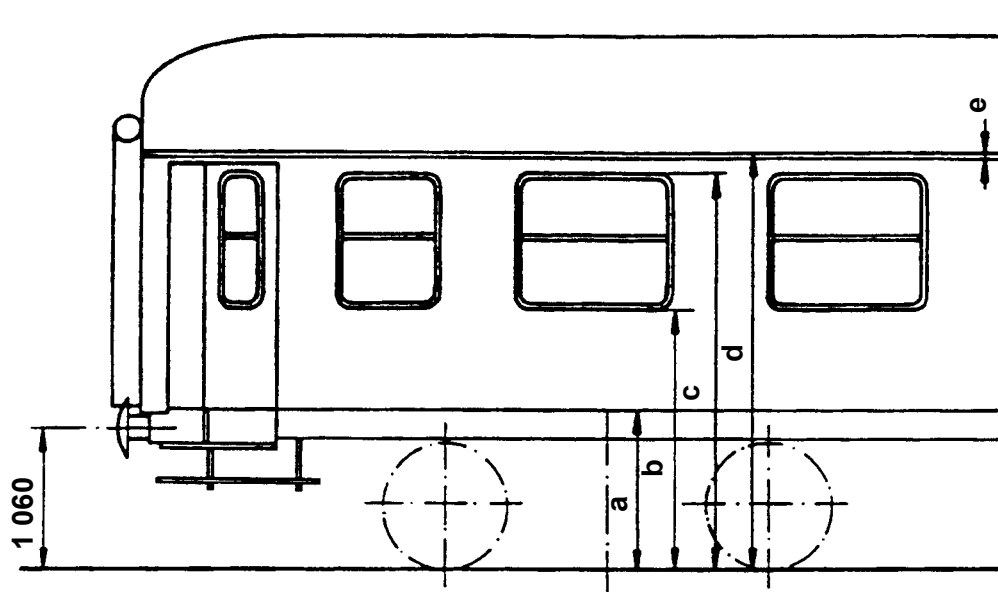
In order to protect the equipment more effectively, where possible watertight partitions, low-position partial casings and/or sealed housings must be fitted.

Low-position partial casings must consist of several parts and be designed for quick removal (quick seal) and in such a way that they cannot become detached accidentally, etc.

Low-position partial covers should be fitted in such a way that snow, ice and water cannot accumulate in them.

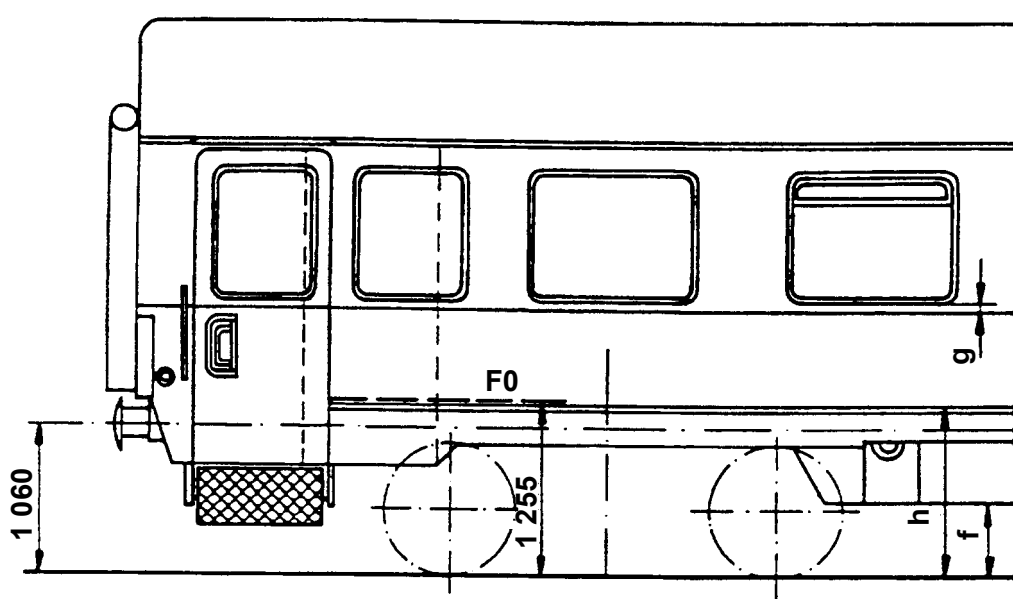
2.20.2 - The protection of all equipment in a closed streamlined environment is recommended. The environment must be insulated, heated and ventilated sufficiently to maintain a minimum constant temperature of +5°C within the housing. As far as possible, the environment inside the housing should be slightly over-pressurised to prevent powder snow from penetrating.

Appendix A - Outside appearance of coaches



| Designation | Measurements | Tolerances |
|---|--------------|--------------|
| a Distance from edge of black paint layer to rail level | 1 200 | ± 20 |
| b Distance from bottom of glazed window to rail level | 1 990 | + 50 - 60 |
| c Distance from top of glazed window to rail level | 3 030 | ± 40 |
| d Distance from roof edge to rail level | 3 165 | + 60 - 30 |
| e Edging fillet of side wall or strip black paint | 30 | ± 5 |
| The surface of side walls shall be smooth, unbroken by longitudinal strips or edging fillets. | | |

Appendix B - Exterior configuration of coaches



| | Designation | Measurements | Tolerances |
|---|---|--------------|------------|
| f | Distance from bottom edge of streamline skirting to top of rail | 570 | ± 10 |
| g | Distance from colour separating line to bottom edge of window | 40 | - |
| h | Distance from top of rail to top edge of ornamental strip | 1 240 | ± 20 |
| The surface of side walls shall be smooth, unbroken by longitudinal strips or edging fillets. | | | |

Appendix C - General seat characteristics

For definition and dimensions, refer to point [C.3 - page 17](#).

o C.1 - Free leg room when seats are arranged face to face

For seats in a face-to-face arrangement the free leg room is measured as the distance between seat backs. When the seats are in their basic position, this distance must be at least 1 450 mm.

C.2 - Pitch of seats arranged in row formation

R C.2.1 - The following dimensions are recommended:

- 1st class: at least 1 010 mm,
- 2nd class: at least 940 mm.

o C.2.2 - The seats shall be designed so that with any inclination of the back rests, the free space K at knee level (see point [C.3](#)) is not less than:

- 790 mm in 1st class,
- 700 mm in 2nd class.

o C.2.3 - Conditions to be met when installing mobile seats in special coaches

Mobile seats should only be used in special coaches. They should meet the following requirements:

C.2.3.1 - General design

Seats should be constructed to have the necessary static strength and resistance to overturning (*UIC Leaflet 566 point 2.3*). The edges, corners and protruding parts should be smoothly rounded and, if possible, padded.

As mobile seats, it is advisable to use swivel chairs or chairs whose supporting surface is a base, frame or plate (see also *UIC Leaflet 566, point 2.3.2.4*).

Within the reach of passengers sitting in such seats there should be either tables attached firmly to the body in accordance with *UIC Leaflet 565-2* (see [Bibliography - page 27](#)) or some other object they can grasp.

C.2.3.2 - Stability against overturning

Mobile seats should meet the requirements of *UIC Leaflet 566, Appendix 10.2*.

C.3 - Layout of seats

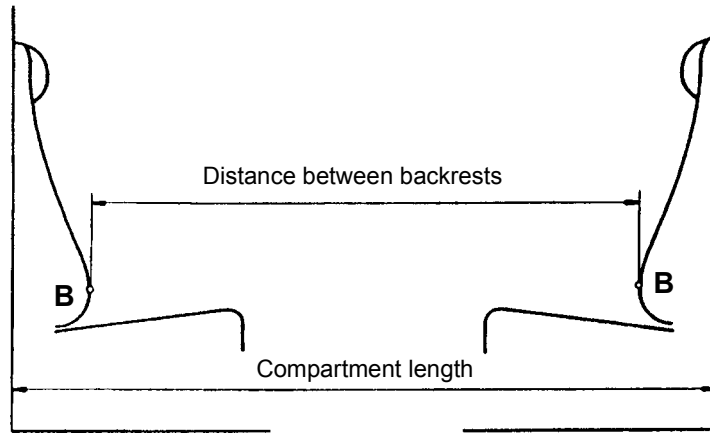


Fig. 1 - Face-to-face arrangement

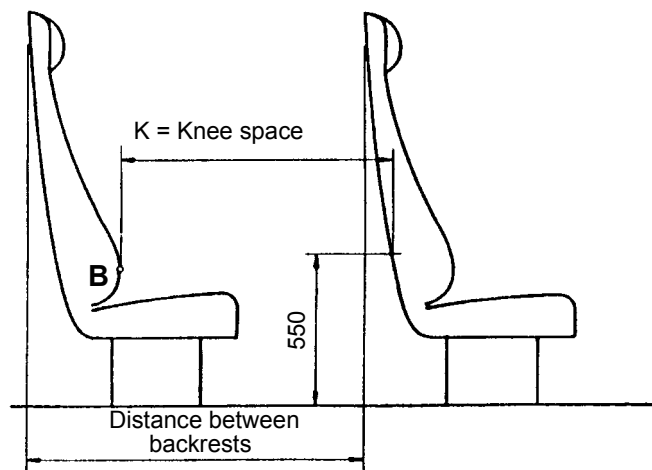


Fig. 2 - Row-type arrangement

Appendix D - Seats and their fittings

D.1 - General principles and requirements applicable to seats

O D.1.1 - The seats must be:

- individual,
- covered with high-strength fabric in the seat and back-rest areas,
- provided with flexible head-rests which
 - a. do not push the head forward,
 - b. provide for head support irrespective of the height of the passenger, when he/she leans sideways or sits back in his/her seat,
- provided with arm rests. If there are three seats abreast, one of the middle arm rests, and when there are two seats abreast, the middle arm rest, must be retractable.

D.1.2 - Head rests

O D.1.2.1 - The head rests must be covered:

- in 1st class: with fabric,
- in 2nd class: with imitation leather or fabric.

To this end it is necessary in 1st class to provide a loose fabric cover or a cushion.

R D.1.2.2 - If a fabric covering is used in 2nd class, it is recommended that the head rest be protected with a loose fabric or throw-away cover.

R D.1.3 - In 1st and 2nd class it is recommended that adjustable foot-rests be installed for seats arranged in row formation, provided this does not impair comfort.

R D.1.4 - It is recommended that swivelling seats be provided in 1st class, if they are arranged in row formation.

O D.1.5 - The other general requirements for seats must conform with most recent ergonomic concepts.

- Relaxed position

This is understood to mean the tilt angle of the back rest creating the physiological conditions for dozing comfortably. It varies with the individual and lies within a range between:

- a. 35° and 40° (angle β according to point [D.4.1 - page 22](#), dimension related to point x) and
- b. 40° and 45° (angle β according to point [D.4.2 - page 23](#), dimension related to point H).

- Freedom of leg movement

The seat (taking into account its possibilities and adjustment range) and, especially, the form of the back of seats in row formation must ensure freedom of leg movement (for a range from the 5th percentile of females to the 95th percentile of males).

For recommendations concerning the dimensions, see point [C.2 - page 16](#).

- Sitting diagonally on the seat should be possible.
- Distribution of pressure on the seat
 - a. Optimum physiological distribution without crushing.
 - b. Lumbar support.
- Dynamic comfort of seats

The seat support, when fixed to a solid floor, should not have a natural vibration frequency below 30 Hz.

- Physiological characteristics of the seat upholstery

The structure of the seat and seat back upholstery must be selected by reference to permeability and heat/humidity dissipation so that the micro-climate generated in the contact area between the occupant and the support system remains physiologically pleasant, even when occupation is prolonged (after seat occupation of 2 hours: increase of temperature to a maximum 35° and relative humidity to a maximum 70% under the conditions described in more detail in point [D.4.3 - page 23](#)).

D.2 - Seat dimensions

O D.2.1 - Definition of measurements

See points [D.4.1 - page 22](#) and [D.4.2 - page 23](#).

O D.2.2 - Height of seat pan

In 1st and 2nd class the seat-pan height must be between 390 and 430 mm (dimension "h" in points [D.4.1](#) and [D.4.2](#) from the floor).

D.2.3 - Width of seat pan

O D.2.3.1 - The free space between the arm rests must be, for each seat:

- at least 500 mm in 1st class,
- at least 450 mm in 2nd class.

R D.2.3.2 - It is recommended that a minimum seat width of 480 mm be provided in 2nd class.

D.2.4 - Depth of seats

O D.2.4.1 - The depth of seats (dimension "a" in points [D.4.1](#) and [D.4.2](#)) must be at least 430 mm at the base of the seats.

R D.2.4.2 - In order to increase comfort it is recommended that a seat surface with variable length be provided, with the possibility of adjusting the depth of seats within the 410 and 530 mm range.

O D.2.5 - Height of back rest

The height of back rest (dimension "c" in point [D.4.1 - page 22](#)) must be at least 580 mm.

O D.2.6 - Height of the lumbar support

The height of back rest must contain a lumbar support situated at a height of:

- 180 ± 10 mm above point x, depressed (dimension "b" as per point [D.4.1](#)) and
- 240 ± 10 mm, measured to point C (dimension "f" as per point [D.4.2 - page 23](#)).

O D.2.7 - Height of head rest

Between 550 and 800 mm (at most 850 mm), measured from point x, depressed, (dimension "d" in point [D.4.1](#)), a head rest must be provided.

D.2.8 - Width of back rest

O D.2.8.1 - In its lower section the back rest must be as wide as the seat pan.

R D.2.8.2 - Its width may decrease upward, but must not fall below the width required for the shoulders.

O D.2.9 - Height of arm rests

The distance from the seat pan (above point x in points [D.4.1](#) and [D.4.2](#)) must be between 190 and 220 mm.

D.2.10 - Width of arm rests

O D.2.10.1 - The minimum width must be:

- 80 mm in 1st class,
- 50 mm in 2nd class (minimum recommended width: 60 mm).

R D.2.10.2 - The arm rests may partially overlap the seat pan.

O D.2.10.3 - The upholstery of the arm rests must be resilient and not contain any protruding metallic or hard parts.

D.2.11 - Length of arm rests

- O **D.2.11.1** - The arm rests (useful length from seat-back: see dimension "l" in point [D.4.2](#)) should have a length of at least 300 mm.
- R **D.2.11.2** - An arm-rest length of 330 mm is recommended.

D.3 - Seat inclination conditions

O **D.3.1 - Definition of dimensions**

See points [D.4.1 - page 22](#) and [D.4.2 - page 23](#).

D.3.2 - Inclination of seat back

- O **D.3.2.1** - For increased comfort the inclination of the back rest must be adjustable. In 1st and 2nd class and with seats arranged in row formation, the angle of inclination of the back rest shall be adjustable between:

| | | |
|---|---|--|
| 20° at maximum (basic position) to 40° at minimum (reclining position) | } | angle "β" in point D.4.1 |
|---|---|--|

and, respectively,

| | | |
|--|---|--|
| 25° (original position) to 45° (reclining position) | } | angle "β" in point D.4.2 |
|--|---|--|

- R **D.3.2.2** - The adjustment range above may be reduced for seats in 1st and 2nd class compartments.

D.3.3 - Seat-pan inclination

- R **D.3.3.1** - The angle of inclination of the seat pan (angle "α" in points [D.4.1](#) and [D.4.2](#)) shall be adjustable in relation to the inclination of the back rest ([see point D.4.4 - page 26](#)).
- O **D.3.3.2** - In the basic position the angle of inclination shall be a minimum of 5° and, in the reclining position, a maximum of 20°.

R **D.3.4 - Seat angle of opening**

D.3.4.1 - The angle of opening of seats (angle "γ" in points [D.4.1](#) and [D.4.2](#)) depends on the inclinations of the back rest and seat pan (see point [D.4.4](#)).

D.3.4.2 - It varies between 105° and 110° (with layout in point [D.4.1](#)) or between 110° and 115° (with layout in point [D.4.2](#)).

D.4 - Appendices

D.4.1 - Seat - Designation of measurement points

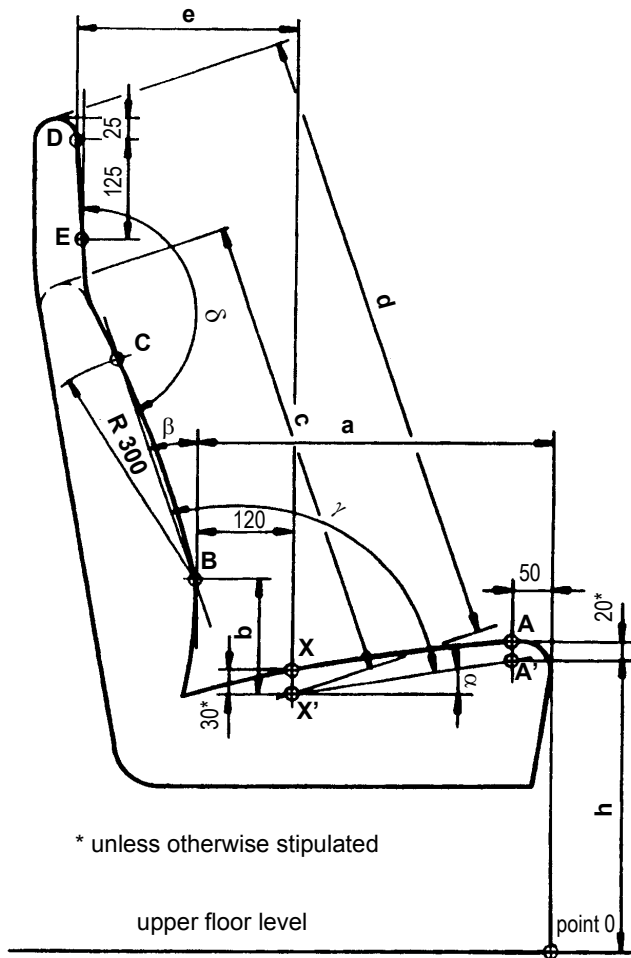


Fig. 3 -

Designation of angles and dimensions

- α = angle of inclination of seat pan (compressed)
- β = angle of inclination of back rest
- γ = angle of opening of seat
- δ = angle of inclination of head rest
- a = depth of seat pan
- b = height of point B
- c = height of back rest without head rest (measured parallel to the angle of inclination of back rest)
- d = height of head rest - lower edge and upper edge or height of back rest with built-in head rest (measured parallel to the angle of inclination of back rest)
- e = distance D - X
- h = height of seat pan (compressed)

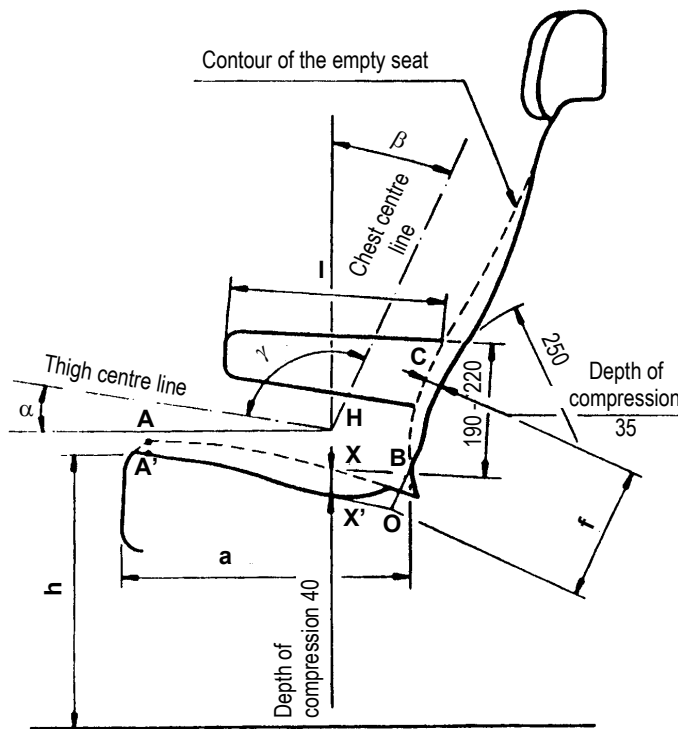
All other dimensions are given with reference to point 0 or point X.

The above mentioned dimensions from a to h are only valid if indicated with a value for angles α and β (when the seat is in a position where $\alpha > 5^\circ$, the dimensions must, where relevant, be specifically defined).

Points in the centre cross-section of the seat

- A = 50 mm from the front edge of the seat on the contour of the padding (not compressed)
- A' = point A, compressed
- B = foremost point of the back rest and centre of lumbar support
- C = point of intersection of a 300 mm radius about centre B with the contour of the back rest
- D = 25 mm below the upper edge of the head rest on the contour of the head rest
- E = 125 mm below point D on the contour of the head rest
- X = point of intersection of a vertical line with the contour of the padding = point X 120 mm before the foremost point of the back (point B)
- X' = point X (compressed)

D.4.2 - Centre cross-section of seat



Points in the centre cross-section of the seat

- A = highest point of the seat pan
- B = foremost point of the back rest
- O = the tangent on the contour of the back point 230-250 mm distant from point O
- C = parallel to the chest centre line
- H = joint of thigh with the back of the model
- X = point of seat contour on a vertical line through point H
- A', X' = points on the contour of the occupied seat on vertical lines through points A and X

Angles and dimensions

- α = angle of thigh with horizontal plane
- β = angle of chest with vertical plane
- γ = angle of bend of body: $\gamma = 90^\circ + \beta - \alpha$
- a = depth of seat pan
- h = height of seat pan
- l = length of arm rest
- f = distance OC, position of lumbar support

Fig. 4 - Point H - Dimensions of seats

D.4.3 - Examination of seat padding in passenger coaches and power cars

Examination of the physiological characteristics of padded seats

D.4.3.1 - General

The object of the examination of the physiological characteristics of padded seats is to make an assessment of the seats in human terms and as regards aspects of the micro-climate. The micro-climate largely depends on the properties of the system supporting the human body, such as the conduction and dissipation of heat and humidity through the padding. These material properties are determined indirectly by long-term monitoring of the development of relative humidity and temperature between the human body and the supporting system in the contact area.

D.4.3.2 - Selection of test persons

D.4.3.2.1 - Selection criteria

- persons representing the range of people using passenger coaches in terms of age, size/weight and origin,
- consideration of 5, 50 and 95 percentiles in respect of the degree of perspiration.

D.4.3.2.2 - Number of test persons

These requirements can be fulfilled with 6 test persons (2 for each perspiration type percentile mentioned above).

D.4.3.3 - Test procedure and execution

- The tests are performed in an air-conditioned room with an air temperature of 23°C, a relative humidity of 60% and an air flow of 0,2 m/s.
- The test persons are dressed in the following clothes, while the tests are carried out:
 - a short-sleeve vest made of 100% cotton,
 - 100% cotton briefs,
 - shirt made of 50% polyester and 50% cotton,
 - suit made of 55% polyester and 45% wool.
- The results are recorded every ten minutes over a period of at least 2 hours and at most 3 hours. The measurements can cease when the curves drawn from the values measured indicate saturation.
- The test persons are instructed not to change their posture too much so that continuous contact between the person's back and the back rest or between bottom and seat pan is always ensured.
- The measurements are obtained at two points, in the area of the bottom between the buttocks and at the middle of the back of the right thigh approximately 10 cm behind the front edge of the seat, using a combination probe for measuring temperature and humidity. These probes should be as small as possible in size and the housing must prevent direct contact of the probe with the measuring points. The probes are arranged between the clothing and the surface of the padding. The skin temperature is measured by sticking probes directly to the skin near the measuring points (see Fig. 5 - page 25).

D.4.3.4 - Minimum requirements

The values obtained in these measurements should not exceed 35°C and 70% relative humidity in the contact area and should not remain lower than the corresponding skin temperatures in the contact area.

Figure 6 - page 25 shows the ideal curves of limiting values for the temperature and relative humidity during the measuring period. The corresponding values for the tests made with padded seats can then be derived from these curves by considering that the values are only valid for some time.

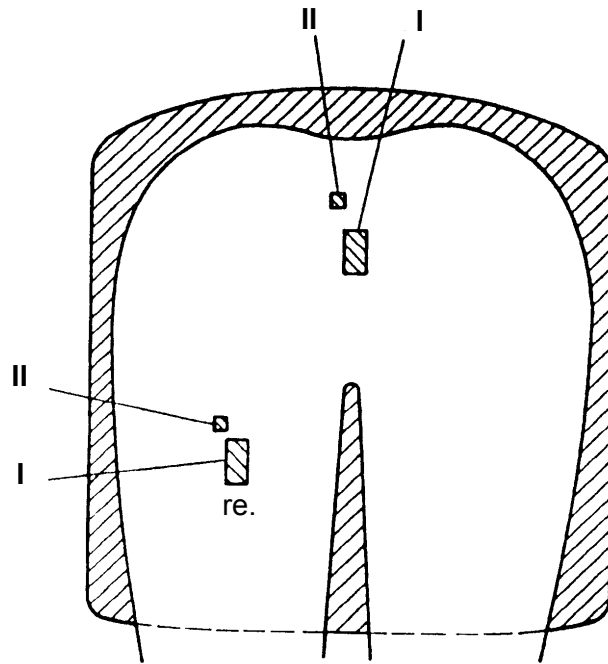


Fig. 5 - Position of probes for measuring the temperature and relative humidity in the contact area (I) and skin temperature (II)

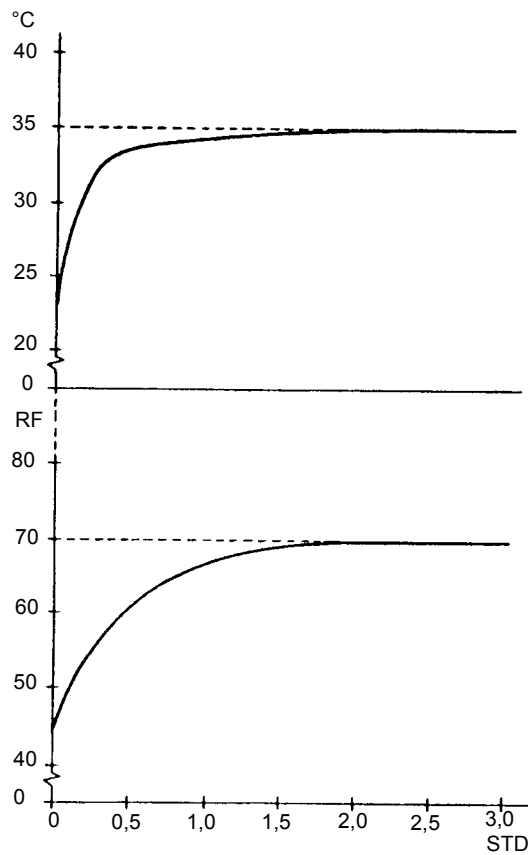
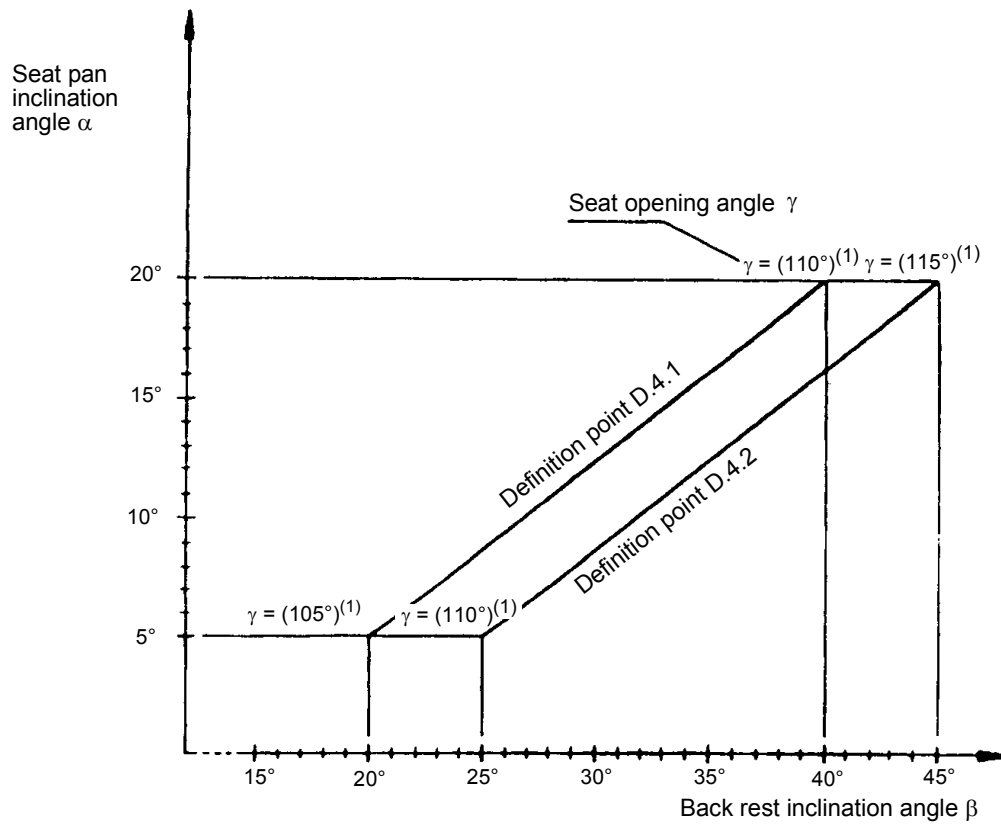


Fig. 6 - Limiting values for the temperature in °C (top) and relative humidity in % (bottom) shown as ideal curves in relation to time

D.4.4 - Relationship of seat angles



(1) Body aperture angle

Fig. 7 - Relationship between back-rest inclination, seat pan and seat-opening angles

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