

UIC CODE

541-1

6th edition, November 2003

Translation

OR

Brakes - Regulations concerning the design of brake components

*Frein - Prescriptions concernant la construction des différents organes de frein
Bremse - Vorschriften für den Bau der verschiedenen Bremsteile*



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

Leaflet to be classified in Volume :

V - Rolling Stock

Application :

With effect from 1.7.1999

All members of the International Union of Railways

DB and ÖBB are nonetheless permitted, as an exceptional measure, to retain 300 mm double brake blocks on vehicles ordered prior to 1 January 1963; such vehicles must be suitable for fitting with standard 250 mm brake blocks.

Record of updates

1st edition, January 1948	Revised version of former Leaflet 185
3rd edition, January 1960	
4th edition, January 1966	
5th edition, July 1973	and 29 Amendments
6th edition, November 2003	Converted to FrameMaker: - adaptation to the editor's guide M1 - new layout. - modification of point 3.10 and of Appendix J - renumbering of points and Appendices.

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

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Printed by the International Union of Railways (UIC)
16, rue Jean Rey 75015 Paris - France, November 2003
Dépôt Légal November 2003

ISBN 2-7461-0493-8 (French version)
ISBN 2-7461-0494-6 (German version)
ISBN 2-7461-0495-4 (English version)

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Summary

This leaflet outlines the key characteristics with which brake system components must comply in so far as these are not covered in other separate leaflets in the 541-X series.

The brake must comply with all UIC regulations governing the design of the different equipment components and their fitting to the vehicles (for example, layout of the couplings, shape and position of the changeover devices, etc.).

The uniform designation of brake components is given in the Nomenclature (see Appendix A).

1 - Air brake components

1.1 - Pipes and connections

- 1.1.1 - The internal diameter of the train pipe must be equivalent to:

- 32 mm for wagons,
- 25 mm for coaches.

Sharp elbows must be avoided in train pipes.

The branch pipes connecting the train pipe to the distributor and the emergency brake valve must be as short as possible and their cross section must not exceed that of the train pipe.

- R 1.1.2 - It is recommended that the train pipe be placed under the headstock and that elbows and water pockets be avoided.

- 1.1.3 - The arrangement of air brake pipe connections of vehicles must comply with the provisions of Appendices [B.1 - page 26](#), [B.2 - page 28](#) or [C - page 31](#).

NB : It is recommended that the coupling arrangements laid down in Appendices B.1 and C of this leaflet should be made the same as those in Appendix B.2, in the event of any considerable modification to vehicles built prior to 1.1.1969.

- 1.1.4 - If the vehicle is fitted with a main feed pipe, the coupling connections of this pipe must be placed at a greater distance from the centre-line of the vehicle than those of the automatic brake train pipe.
- 1.1.5 - The shape of the ends of the pipes and their threading must comply with the indications of Appendices [D - page 33](#) and [E - page 35](#).

1.2 - Cut-off cocks

- 1.2.1 - The aperture through the cut-off cock must not be smaller than that corresponding to a pipe having an internal diameter of 25 mm.
- 1.2.2 - The threaded connection for the connection of the coupling hoses must comply with the regulations shown in Appendices [D - page 33](#) and [E - page 35](#).

The cut-off cock must include a truncated internal thread of the Whitworth type on the tubes of 1" or 1 1/4" to ensure the connection with the main brake pipe, see *UIC Leaflet 542, plates 1a and 1c* ([see Bibliography - page 47](#)).

- 1.2.3 - Brake cock design:

1.2.3.1 - The cut-off cock shall turn horizontally. The "open" and "closed" extreme positions must be limited by key-blocks allowing a rotation of the cock of at least 90° and no more than 100°. A rotation angle of 125° is permissible for cocks which are not intended to be used on vehicles fitted with automatic couplers. The square of the cock plug shall have a notch indicating the respective position of the cock (the notch placed lengthwise indicates that the cock is in the "open" position).

1.2.3.2 - In the "closed" position, the cock handle situated in front of the vehicle headstock shall be vertical towards the top and, in the "open" position, it shall be approximately horizontal and shall point away from the vehicle headstock. If a control shaft is used, it must be possible for the cock plug to be fitted with a forked lever in such a way that the rotation angle, between the extreme positions of the cock be symmetrical in relation to the perpendicular line to the longitudinal centre-line of the cock.

1.2.3.3 - The cock handle situated in front of the vehicle headstock may be to the right or left of the pipe except when the cut-off cock is situated near the draw hook (Point **B.1** - page 26, figures 13, 14 and 15 and Appendix C - page 31, figures 23 and 24), in which case the handle must exclusively be mounted on the side opposite the draw gear. The layout of the handles of cocks mounted on vehicles fitted with automatic couplers is governed by *UIC Leaflet 535-2* (see Bibliography - page 47) .

1.2.3.4 - New cocks must have an outlet of at least 80 mm². The air must begin to escape to the atmosphere as soon as the rotation of the cock plug has reduced the main pipe aperture by one third.

1.2.3.5 - Under normal operating conditions, the rotational torque of cocks with a spring locking device must be between 9 and 20 Nm to reach the extreme positions. This same torque must not damage the interlocking device when interlocked in any way. All components must comply with the overall dimensions shown in *UIC Leaflet 542, plates 1a and 1b*.

R 1.2.4 - It is recommended that all new vehicles be equipped with cut-off cocks fitted with a spring locking device in the extreme positions.

O 1.2.5 - The dimensions of cocks fitted with a spring locking device in the extreme positions must correspond to those shown in *UIC Leaflet 542, plate 1c*.

O 1.2.6 - Cut-off cocks must include a holding device for the handle in both "open" and "closed" positions:

- as from 1 January 1980 on new coaches and wagons,
- as from 1 January 1990 on existing coaches,
- as from 1 January 2000 on freight wagons and all coaches in international service.

This device may consist of:

- either an interlocking,
- or a spring lock.

O 1.2.7 - Cut-off cocks with a spring locking device in the extreme positions should be used on vehicles fitted with the automatic coupler.

O 1.2.8 - As from 1 January 2000, all vehicles running in international traffic must be fitted with a device complying with point **1.2.3.4**.

1.3 - Isolating cocks

- O** 1.3.1 - The handle of the isolating cock of the brake must be in a vertical position towards the bottom when the brake is in use. The brake must be isolated by rotating the handle at a maximum angle of 90°.

The cock handle must comply with Appendix F, fig. 35 - page 37.

- R** 1.3.2 - For new rolling stock or stock to be fitted with the air brake:

- it is recommended that the isolating cock of the brake be fitted on the distributor or in the proximity thereof and that the handle of the cock be clearly visible in its "open" or "closed" positions and can be easily operated from one side of the vehicle;
- it is recommended that the movement of the handle of the isolating cock be made parallel to the side of the solebar.

O 1.4 - Quick-release valves

The release valve must be designed and assembled so that:

1. before splitting of the train in marshalling yards takes place, with the through pipe empty, it ensures complete release of the brake after operating the chain for a short time, the air capacities being, furthermore, retained to the greatest possible degree (complete emptying of the control reservoir is permissible).

NB : It is however permissible for the auxiliary reservoir to be emptied by the quick-release valve in the case of triple valves or old-type distributors;

2. in the event of a capacity overload, it ensures that the control reservoir is emptied (also the auxiliary reservoir, if necessary) thereby bringing the capacity to the working pressure;
3. when a vehicle brake is taken out of service (following an incident, for example) or is in the workshop, it ensures complete release of the distributor by operating the chain, before any repair work on the brake components takes place.

It is recommended that the release valve should also be able to empty the air in the equipment, in this case, followed, if necessary, by the closing of the isolating cock (involving isolation of the brake);

4. only one chain is necessary, situated on or near the distributor (which can be operated from both sides of the vehicle). In order to be able to distinguish easily the quick-release valve from the conventional release valve, the control handle should comply with Appendix I - page 41 to this leaflet;
5. it resumes the loaded position as soon as the pressure in the train pipe reaches 3 kg/cm²;
6. it must not alter the characteristics of the brakes to which it is fitted;
7. it cannot operate inadvertently as a result of impacts in marshalling yards or circumstances likely to arise during running;

8. any Railway wishing to introduce a new quick-release valve for use on international services must, first, submit the latter for examination to the UIC Sub-Commission for Braking which shall be responsible for ensuring that the above technical conditions are fully complied with.

Quick-release valves which are found to comply with the above conditions will be shown in Appendix J - page 42 to this leaflet.

o 1.5 - Components for operation of the changeover apparatus

1.5.1 - The components for operation of the changeover apparatus must be very clearly visible and capable of being worked easily from each side of the vehicle.

1.5.2 - They must, furthermore, comply with the following regulations:

1.5.2.1 - "Passenger only" changeover:

- When a vehicle is fitted with several "passenger" brake systems, changeover from one to another of these systems must be made by means of a lever moving perpendicularly to the axles and the working handle of which has the shape of a loop, in conformity with the indications of Appendix F, figure 36 - page 37.
- The position of this lever, which gives a braking system complying with the conditions for passenger trains as laid down in *UIC Leaflet 540*, must be indicated by a special embossed sign, as shown in Appendix F, figure 41 - page 38.
- If the application of the "passenger" brake system, which complies with the conditions laid down, requires one or several other levers to be placed in a given position, this position must, for each of them, be indicated by the special embossed sign in conformity with Appendix F, figure 41.

1.5.2.2 - "Goods-Passenger" changeover:

- When a vehicle is fitted with one or several "passenger" brake systems and one "goods" brake system, changeover from one to another of these systems must be made by means of a lever moving perpendicularly to the axles and fitted, at its end, with a ball in conformity with the indications of Appendix F, figure 37 - page 37.
- For the "goods" brake system, the lever must be inclined towards the top on the left and occupy its extreme position on the left.
- If there is only one "passenger" brake system, the lever for this system must be in an inclined position towards the top on the right, making with the "goods" position an angle of approximately 90°. If there are several "passenger" brake systems, the position of the lever which gives the "passenger" system complying with the conditions laid down in *UIC Leaflet 540* must be indicated by the special embossed sign in conformity with Appendix F, figure 41.

1.5.2.3 - "Empty-loaded" changeover:

- When a vehicle is fitted with one "empty" brake system and one or several "loaded" brake systems, changeover from one system to another must be made by means of a cranked lever moving perpendicularly to the axles, and in conformity with the indications of Appendix F, figure 38 - page 38.

- When the vehicle is fitted with one "empty-loaded" device only, it has a simple cranked lever only, in conformity with Appendix F, figure 38 A.
- If it is fitted with two or more separate "empty-loaded" devices, the levers are cranked and have a double handle in conformity with Appendix F, figure 38 B.
- For the "empty" brake system, the lever must be inclined towards the top on the left and occupy its extreme position on the left.
- For the "loaded" brake system corresponding to the changeover maximum weight, the lever must be inclined towards the top on the right and be in its extreme position on the right, making with the "empty" position an angle of at least 90°.
- The positions corresponding to other loaded brake systems must be between these extreme positions and increasing in power as from the left.

1.5.2.4 - Release changeover (graduated release and direct release positions):

- When a vehicle is fitted with an apparatus allowing the application or the cutting out of the graduated release, this apparatus must work by means of a changeover lever moving perpendicularly to the axles in conformity with the indications of Appendix F, figure 39 - page 38.
- In the "graduated release" position, the handle must be directed vertically towards the bottom. In the "direct release" position, the handle must be horizontal and directed either towards the right or the left.

1.5.2.5 - "Plain-Mountain" changeover:

- When a vehicle is fitted with a "plain-mountain" changeover, changeover from one system to another must be made by pulling (mountain) and pushing (plain), in a direction parallel to the axles, a ring-shaped handle in conformity with the indications of Appendix F, figure 40 - page 38.
- In the "mountain" position, a red sign must be shown, and a yellow one in the "plain" position.

2 - Alarm signals and release mechanisms for emergency braking

- R 2.1** - It is recommended that a whistle be fitted to the air release valve of the train pipe in the event of the alarm signal being operated (passenger alarm signal).
- O 2.2** - The smallest cross section through which air can escape in the event of emergency braking triggered from the train must be at least equal to a 19 mm diameter cross section for new vehicles or vehicles equipped with brake pipe emptying accelerators.
- It is recommended that the same cross section be used for existing vehicles.
- O 2.3** - The emergency brake (alarm signal) handle, stipulated in *UIC Leaflet 543, point 1.2.4*, must be easily accessible and able to be sealed.
- R 2.4** - It is recommended that the release valve for emergency braking be connected directly to the train pipe and that the handle of this mechanism be fitted with an extension piece which will be in a vertical position when the valve is closed.
- If this position is adopted, the valve must be opened from the vehicle by pulling.
- O 2.5** - In all coaches built as from 1.1.1969, the alarm signal resetting device must be placed inside the vehicle and easy to operate from there. It must be designed in such a way that passengers are not able to activate it.
- O 2.6** - The release of air to atmosphere from the train pipe, when the emergency alarm is operated, must be carried out in complete safety. The release pipe must not, therefore be fitted with either isolating cocks or dust filters.
- O 2.7** - On those vehicles fitted with emergency brake override (SAFI), the release valve must be designed in such a way that, when the alarm signal is triggered, the pressure in the train pipe falls rapidly to 2 bars (+0/-0,5 bar) and remains at that level thereafter.
- R 2.8** - Release valves designed in accordance with the provisions of point **2.7** are also accepted for vehicles not equipped with SAFI.

3 - Shoes and rigging

- O **3.1** - For vehicles intended for use in international services, built or fitted as from 1 January 1930 and equipped with single brake shoes, the brake shoes must have removable brake blocks complying with the conditions set out in the drawing in Appendix G - page 39 with regard to the contact surface between the brake block and brake block holder as well as the shape of the cotter.

For vehicles equipped with single brake blocks 320 mm long made of composite material, the contact surface between the brake block and the brake block holder must meet the conditions set out in drawing in Appendix G.

Side tipping wagons must be provided with cotters incorporating a stabilising device for use in the tipping position, an example of which is given in Appendix G.

- O **3.2** - For vehicles intended for use in international services, built or fitted as from 1 January 1952 with double brake shoes, the latter must be designed for a 250 mm long removable brake block complying with the conditions set out in the drawing in Appendix H - page 40 with regard to the contact surface between the brake block and brake block holder.

Furthermore although the retaining device of the cotter and the shape of the latter are left to the choice of the Railway, it must always be possible, in the event of accidental loss of the cotter, to replace it by another of the shape defined in Appendix H.

For vehicles equipped with 250 mm long double brake blocks made of composite material, the contact surface between the brake block and the brake block holder must meet the conditions set out in the drawing in Appendix H.

- O **3.3** - For side tipping wagons, the brake block holders must be fixed to the gudgeons of the brake triangles by means of a washer kept in position by a split pin (see *UIC Leaflet 542, plate 3*).
- O **3.4** - The brake rigging of stock fitted with divided brake blocks must permit the use of 60 mm thick brake blocks, this thickness being measured from the outer face of the brake block at its longitudinal centre and from the bearing surface between the brake block holder and the brake block.

The brake rigging of stock fitted with double brake blocks (brake shoes with removable double brake block and double shoes with removable brake blocks) must permit the use of 60 mm thick brake blocks for stock built from 1 January 1957, and of 45 mm thick brake blocks for stock built prior to that date.

- R **3.5** - It is recommended that the brake rigging of stock fitted with double brake blocks and built before 1 January 1957 be arranged so that 60 mm thick brake blocks, may be used.
- O **3.6** - The brake block must have a curve with a radius of at least 10 mm on the wheel flange side.
- R **3.7** - It is recommended that the regulations contained in points 3.1 and 3.2 above be adopted for vehicles running in international services and built before 1 January 1930 and 1 January 1952 respectively.
- R **3.8** - It is recommended that open high-sided wagons built before 1 January 1963 should comply with the conditions contained in points 3.1 and 3.2 above, concerning suitability for side tipping.
- O **3.9** - The brake rigging must be adjustable.

- **3.10** - Safety shackles are required for brake rigging components which might jeopardise safety if they became detached. They must keep the component parts protected entirely safely within the vehicle clearance gauge whether the brake is active or not.

As a general rule, brake rigging shackles are shaped in a flat iron loop with a minimum cross section of 30 x 5 mm for S wagons and 40 x 6 mm for SS wagons. There must be no abrupt variations in the shape of the shackles nor any twisted parts. Special shapes of shackles (for example, steel sections or slings) are permitted subject to providing the same standard of safety. The shackles must be designed so that there is no contact between the brake rigging and the other parts of the vehicle, with new or used wheels and brake blocks. They must prevent all contact under the maximum braking force between the brake rigging and the upper surface of the rail if the brake rigging becomes detached.

The manner of securing the shackles on the vehicle chassis or on that of the bogie must be such that they can be dismantled and must be designed to avoid any fatigue cracks.

Applicable to new wagons and to modified wagons as of 1 January 1998.

◦ 4 - Couplings

4.1 - The couplings of automatic brakes must correspond to the provisions of Appendix D - page 33 and have rectilinear couplings with a connecting screw thread as indicated.

4.2 - The internal diameter of the coupling hose of the automatic brake must be between 25 and 30 mm. The length of the couplings must comply with the provisions of Appendix D.

4.3 - Rubber hoses will generally be used for brake couplings; metallic hoses will be used if they are flexible enough.

4.4 - The coupling heads of the automatic brake must comply with the provisions of Appendix D for all that concerns the parts to be connected.

NB : This regulation is obligatory only for new purchases.

4.5 - The opening of the coupling heads must be directed leftwards when facing the end of the vehicle.

4.6 - Vehicles must be equipped with devices enabling the unused couplings to be suspended, in order to avoid damage and prevent, as far as possible, the penetration of foreign bodies into the interior.

When suspended, the brake couplings must leave a clearance of at least 140 mm above rail level.

4.7 - The couplings must bear the mark of the owner railway.

4.8 - The coupling heads of the non-automatic air brake must comply with the provisions of Appendix E - page 35.

5 - Brake pipe emptying accelerators

- **5.1** - Brake pipe emptying accelerators - particularly those designed in accordance with the provisions of point **5.2** - must be able to operate with all compressed air brakes conforming to *UIC Leaflet 540* and with already approved types of accelerators, without modifying their operating conditions. The brake pipe emptying accelerator must be ready to operate when the train pipe has reached its rated pressure.
- **5.2** - In the event of an emergency brake application, the brake pipe emptying accelerators must induce a sufficiently rapid drop in pressure in the train pipe to ensure the required pressure increase in the brake cylinder on every vehicle in a trainset braked under "Passenger Conditions".

At a pressure in the train pipe between 2,0 and 2,5 bars, and within no more than 4 seconds of the accelerator becoming operative, the latter must interrupt the release of air in such a way that the pipe can be refilled rapidly.

- **5.3** - The brake pipe emptying accelerators must exhaust the air from the train pipe without causing any adverse effect on the running of the train.
- **5.4** - The brake pipe emptying accelerator must not be triggered inadvertently under sporadic filling strokes, as referred to in *UIC Leaflet 540, points 1.19.2 and 1.21*, irrespective of the train consist and the type of driver's brake valve used.
- **5.5** - The operation of the brake pipe emptying accelerator must be such that it cannot be affected by the presence of an individual vehicle which has either not been fitted with an emptying accelerator or on which the brake has been isolated. This applies irrespective of the position of the vehicle and of the train consist.
- **5.6** - The brake pipe emptying accelerator must be operative when an emergency brake application is made after a full brake application.
- **5.7** - The operating conditions of the brake pipe emptying accelerator are defined in relation to a rated pressure of 5 bars in the train pipe. No functional errors must arise in the operation of the brake pipe emptying accelerators at pressures of 4 or 6 bars in the train pipe.
- **5.8** - Insensitiveness

5.8.1 - The brake pipe emptying accelerator must not function when the pressure in the train pipe falls uniformly from 5 to 3,2 bars, with release to the outside atmosphere occurring within 6 seconds.

(The test conditions are based on the release of air from the train pipe through a calibrated outlet port with the brake inoperative. With the brake in use, the test is carried out until the air pressure in the train pipe reaches a level of 2,5 bars).

5.8.2 - The brake pipe emptying accelerator must not operate in the initial stage of service braking by activating the pipe emptying accelerator devices on all the distributor valves of a train. The test is carried out with a test rig¹ in accordance with Appendix **K - page 44**. The reservoirs and outlet ports used in the test rig must be such that a drop in train pipe pressure from 5,0 to 4,5 bars takes place within 1 second, with an initial rate of fall in pressure of 2,0 bars/s until a level of 4,7 bars is obtained. The brake pipe accelerator must become operative during this test.

1. The test rig simulates the pressure conditions obtained in the train pipe of the last vehicle of a train during a service brake operation.

O 5.9 - Sensitiveness

The brake emptying accelerator must become operative no later than 2 seconds after pressure in the train pipe has fallen from 5 to 3,2 bars with release to the outside atmosphere within 3 seconds.

(Test conditions are given in point 5.8. The test is carried out with the brake released).

O 5.10 - If the brake pipe emptying accelerator is fitted separately, it must be possible to release it by means of a valve enabling it to be isolated from the train pipe. It must be possible to seal this valve or isolating device in the open position and its handle is either vertical or suitably marked to indicate its position.

O 5.11 - If the brake pipe emptying accelerator is incorporated in the distributor, it must be inoperative after the brake has been immobilised.

O 5.12 - New brake emptying accelerators must comply with the above conditions and be described in a report¹ submitted to the Sub-Commission for Braking. The latter will verify whether the test conditions adopted and the results obtained are such that the equipment can qualify for acceptance. The Sub-Commission will specify the applicable conditions for submission.

In order to show that the conditions have been properly observed, the test should be carried out on a vehicle in isolation.

R 5.13 - The brake pipe emptying accelerators accepted in international traffic are shown in Appendix L - page 46. It should be noted under the column heading "Remarks" whether or not the brake pipe emptying accelerator closes the train pipe for a pressure of between 2,0 and 2,5 bars.

O 5.14 - Vehicles equipped with alarm signal override devices (SAFI) must be fitted with brake pipe emptying accelerators which, once activated, prevent air in the train pipe being released to the outside atmosphere when the pressure falls to between 2,0 and 2,5 bars.

1. 20 copies in German and 20 copies in French.

Appendix A - Nomenclature of brake components

A.1 - Compressed air brake

NB : One column has been left blank in this nomenclature so that railways working in a language other than English, French, German or Italian can enter the name of each article in the language of their country.

Table 1 : Compressed air brake components on locomotives (including multiple unit trainsets)

N°	Désignation de pièces	Benennung der Teile	Designation of the components	Nomenclatura delle parti	
1	Pompe à air Compresseur	Luftpumpe Dampfmotor mit besonderem Antrieb	Air-pump Compressor	Pompa d'aria Compressore Compressore meca- nico	
2	Régulateur de la pom- pe à air Régulateur automati- que du compresseur	Druckregler für Damp- flufpumpe Druckregler für Motor- luftpumpe	Air pump regulator Automatic regulator of the compressor	Regolatore di pressio- ne d'aria	
3	Séparateur d'huile	Ölabscheider	Oil separator	Separatore d'olio	
4	Soupape de sûreté	Sicherheitsventil	Safety valve	Valvola di sicurezza	
5	Valve de retenue	Rückschlagventil	Retaining valve	Valvola di ritenuta	
6	Réservoir principal	Hauptluftbehälter	Main reservoir	Serbatoio principale	
7	Robinet d'isolement du robinet du mécani- cien	Absperrhahn zum Führerbremventil	Isolating cock of the driver's brake valve	Robinetto d'isolamen- to del robinetto di co- mando	
8	Robinet du mécani- cien	Führerbremventil	Driver's brake valve	Robinetto di comando	
9	Soupape d'alimenta- tion automatique	Leitungsdruckregler	Automatic feed valve	Valvola regolatrice dell' alimentazione	
10	Réservoir du robinet du mécanicien	Ausgleichbehälter	Brake valve air reservoir	Serbatoio per il robi- netto di comando	
11	Manomètre	Luftdruckmesser	Air gauge	Manometro	
12	Conduite générale du frein automatique	Hauptluftleitung	Automatic brake train pipe	Condotta principale del freno automatico	
13	Poche de vidange	Tropfbecher	Drip cup	Vaso di spurgo	
14	Robinet d'arrêt	Luftabsperhahn	Cut-off cock	Robinetto di testata	
15	Accouplement pour le frein automatique	Bremskupplung für die selbsttätige Bremse	Automatic brake coupling	Accoppiamento per il freno automatico	
Nota	par "accouplement" on entend la partie qui peut être dévissée à l'une des extrémités de la conduite.	unter "Bremskupplung" ist der abschraubbare Teil für ein Leitung- sende zu verstehen	"coupling" here means that part, at one of the ends of the pipe, which can be unscrewed	per "accoppiamento" è da intendersi la parce svitabile ad una estremità della con- dotta	
15 a	Raccord d'accouple- ment	Bremsschlauchstutzen	Coupling hose pipe	Raccordo d'accoppia- mento	
15 b	Boyau	Bremsschlauch	Brake hose pipe	Tubo flessibile	

Table 1 : Compressed air brake components on locomotives (including multiple unit trainsets)

N°	Désignation de pièces	Benennung der Teile	Designation of the components	Nomenclatura delle parti
15 c	Tête d'accouplement	Bremskupplungskopf	Coupling head	Testa d'accoppiamento
16	Attrape-poussière	Staubfänger	Dust catcher	Filtro d'aria Separatore centrifugo dei detriti
17	Robinet d'isolement de frein	Absperrhahn zur Bremse	Brake isolating cock	Robinetto d'isolamento del freno
18	- Triple valve (frein Westinghouse)	- Steuerventil (Westinghouse-Bremse)	- Triple valve (Westinghouse brake)	- Valvola tripla (freno Westinghouse)
	- Triple valve à action rapide (frein Westinghouse)	- Schnellwirkendes Steuerventil (Westinghouse-Bremse)	- Rapid acting triple valve (Westinghouse brake)	- Valvola tripla ad azione rapida (freno Westinghouse)
	- Distributeur (autres freins)	- Steuerventil (andere Bremse)	- Distributor (other brakes)	- Distributore (altri freni)
19	Réservoir auxiliaire	Hilfsluftbehälter	Auxiliary reservoir	Serbatoio ausiliario
20	Cylindre à frein	Bremszylinder	Brake cylinder	Cilindro del freno
21	Valve de purge	Auslöseventil	Release valve	Valvola di scarico
22	Robinet ou valve de changement de régime M-V	G-P-Umstellhahn oder G-P-Ventil	Goods/Passenger changeover cock or valve	Robinetto o valvola d'inversione M-V
23	Valve additionnelle de changement de régime M-V	G-P-Wechselventil	Additional Goods/Passenger changeover valve	Valvola aggiuntiva M-V
24	Robinet d'urgence	Notbremshahn	Emergency brake valve	Robinetto d'allarme
25	Signal d'alarme	Notbremseinrichtung	Alarm signal	Segnale d'allarme
26	Conduite souple	Schlauchverbindung	Flexible pipe	Condotta flessibile
27	Support d'accouplement	Bremskupplungshalter	Coupling support	Falso accoppiamento
80	Robinet du mécanicien pour frein direct	Führerbremseventil für die nicht selbsttätige Bremse oder Führerbremshahn der Zusatzbremse	Driver's additional brake valve	Robinetto di comando del freno non automatico
81	Robinet d'isolement pour robinet du mécanicien du frein direct	Absperrhahn zum Führerbremseventil der nicht selbsttätigen Bremse	Isolating cock of the driver's additional brake valve	Robinetto d'isolamento del robinetto di comando del freno non automatico
83	Conduite générale du frein direct	Hauptluftleitung für die nicht selbsttätige Bremse	Additional brake train pipe	Condotta principale del freno non automatico

Table 1 : Compressed air brake components on locomotives (including multiple unit trainsets)

N°	Désignation de pièces	Benennung der Teile	Designation of the components	Nomenclatura delle parti	
84	Accouplement pour frein direct	Bremskupplung für die nicht selbsttätige Bremse	Additional brake coupling	Accoppiamento per il freno non automatico	
Nota	par "accouplement" on entend la partie qui peut être dévissée à l'une des extrémités de la conduite	unter "Bremskupplung" ist der abschraubbare Teil für ein Leitungsende zu verstehen	"coupling" here means that part, at one of the ends of the pipe, which can be unscrewed	per "accoppiamento" è da intendersi la parte svitabile ad una estremità della condotta	
84 a	Raccord d'accouplement	Bremsschlauchstutzen	Coupling hose pipe	Raccordo d'accoppiamento	
84 b	Boyau	Bremsschlauch	Brake hose pipe	Tubo flessibile	
84 c	Tête d'accouplement pour frein direct	Bremskupplungskopf für die nicht selbsttätige Bremse	Additional brake coupling head	Testa d'accoppiamento per il freno non automatico	
85	Robinet d'isolement pour frein direct	Absperrhahn für die nicht selbsttätige Bremse	Additional brake isolating cock	Robinetto d'isolamento per il freno non automatico	
86	Double valve d'arrêt	Doppelrückschlagventil	Double check valve	Doppia valvola d'arresto	

Table 2 : Components of the compressed air brake for coaches and wagons

N°	Désignation de pièces	Benennung der Teile	Designation of the components	Nomenclatura delle parti
11	Manomètre	Luftdruckmesser	Air gauge	Manometro
12	Conduite générale du frein automatique	Hauptluftleitung	Automatic brake train pipe	Condotta principale del freno automatico
14	Robinet d'arrêt	Luftabsperrhahn	Cut-off cock	Robinetto di testata
15	Accouplement pour le frein automatique	Bremskupplung für die selbsttätige Bremse	Automatic brake coupling	Accoppiamento per il freno automatico
Nota	par "accouplement" on entend la partie qui peut être dévissée à l'une des extrémités de la conduite	unter "Bremskupplung" ist der abschraubbare Teil für ein Leitungsende zu verstehen	"coupling" here means that part, at one of the ends of the pipe, which can be unscrewed	per "accoppiamento" è da intendersi la parte svitabile ad una estremità della condotta
15 a	Raccord d'accouplement	Bremsschlauchstutzen	Coupling hose pipe	Raccordo d'accoppiamento
15 b	Boyau	Bremsschlauch	Brake hose pipe	Tubo flessibile
15 c	Tête d'accouplement	Bremskupplungskopf	Brake coupling head	Testa d'accoppiamento
16	Attrape-poussière	Staubfänger	Dust catcher	Filtro d'aria Separatore centrifugo dei detriti
17	Robinet d'isolement de frein	Absperrhahn zur Bremse	Brake isolating cock	Robinetto d'isolamento del freno
18	- Triple valve (frein Westinghouse)	- Steuerventil (Westinghouse-Bremse)	- Triple valve (Westinghouse brake)	- Valvola tripla (freno Westinghouse)
	- Triple valve à action rapide (frein Westinghouse)	- Schnellwirkendes Steuerventil (Westinghouse-Bremse)	- Rapid acting triple valve (Westinghouse brake)	- Valvola tripla ad azione rapida (freno Westinghouse)
	- Distributeur (autres freins)	- Steuerventil (andere Bremsen)	- Distributor (other brakes)	- Distributore (altri freni)
19	Réservoir auxiliaire	Hilfsluftbehälter	Auxiliary reservoir	Serbatoio ausiliario
20	Cylindre à frein	Bremszylinder	Brake cylinder	Cilindro del freno
21	Valve de purge	Auslöseventil oder Auslösevorrichtung	Release valve	Valvola di scarico
23	Valve aditionnelle de changement de régime M-V	G-P-Wechselventil	Additional Goods/ Passenger changeover valve	Valvola aggiuntiva M-V
24	Robinet d'urgence	Notbremshahn oder Schaffnerbremshahn	Emergency brake valve	Robinetto d'allarme
25	Signal d'alarme	Notbremseinrichtung	Alarm signal	Segnale d'allarme
26	Conduite souple	Schlauchverbindung	Flexible pipe	Condotta flessibile
27	Support d'accouplement	Bremskupplungshalter	Coupling support	Falso accoppiamento
40	Réservoir de commande	Steuerbehälter	Control reservoir	Serbatoio di comando

Table 2 : Components of the compressed air brake for coaches and wagons

N°	Désignation de pièces	Benennung der Teile	Designation of the components	Nomenclatura delle parti
41	Réservoir supplémentaire	Vorratsbehälter	Additional reservoir	Serbatoio supplementare
42	Commande de la valve de purge	Gestänge zum Auslöseventil oder zur Auslösevorrichtung	Release valve control	Tirante di comando della valvola di scarico
43	Dispositif de changement de régime M-V	G-P-Umsteller oder Umstellvorrichtung	Goods/Passenger changeover device	Dispositivo di cambiamento di regime M-V
44	Dispositif de changement de régime G-P-S	G-P-S-Umsteller oder Umstellvorrichtung	G-P-S changeover device	Dispositivo di cambiamento di regime G-P-S
45	Dispositif "vide-charge"	Lastwechsel	Empty-loaded device	Dispositivo "vuoto-carico"
45 a	Dispositif mécanique de freinage de la charge	Lastwechsel über das Gestänge	Mechanical device for braking the load	Frenatura del carico con variazione del rapporto di moltiplicazione della timoneria
45 b	Dispositif de freinage de la charge à double cylindre	Lastwechsel mit Lastzylinder	Device for braking the load with two cylinders	Frenatura del carico con cilindro sussidiario
46	Dispositif "plaine-montagne"	Umsteller oder Umstellvorrichtung "Ebene-Gefälle"	"Plain-mountain" device	Dispositivo "pianura-montagna"
47	Commande du frein d'urgence	Notbremszugstange	Emergency brake control	Tirante di comando del freno d'urgenza
48	Régulateur de la pression du frein	Bremsdruckregler	Regulator of the brake pressure	Regolatore di pressione del freno
49	Commande du freinage automatique de la charge	Antrieb der selbsttätigen Lastabbremung	Control of the automatic braking of the load	Comando per la frenatura automatica del carico
82	Triple valve à action rapide pour le frein Westinghouse automatique et direct	Steuerventil (schnellwirkendes) für Westinghouse-Doppelbremse	Rapid acting triple valve for the automatic additional Westinghouse brake	Valvola tripla ad azione rapida per il doppio freno Westinghouse
83	Conduite générale du frein direct	Hauptluftleitung für die nicht selbsttätige Bremse	Additional brake train pipe	Condotta principale del freno non automatico
84	Accouplement pour frein direct	Bremskupplung für die nicht selbsttätige Bremse	Additional brake coupling	Accoppiamento per il freno non automatico
Nota	par "accouplement" on entend la partie qui peut être dévissée à l'une des extrémités de la conduite	unter "Bremskupplung" ist der abschraubbare Teil für ein Leitungsende zu verstehen	"coupling" here means that part, at one of the ends of the pipe, which can be unscrewed	per "accoppiamento" è da intendersi la parte svitabile ad una estremità della condotta
84 a	Raccord d'accouplement	Bremsschlauchstutzen	Coupling hose pipe	Raccordo d'accoppiamento
84 b	Boyau	Bremsschlauch	Brake hose pipe	Tubo flessibile

Table 2 : Components of the compressed air brake for coaches and wagons

N°	Désignation de pièces	Benennung der Teile	Designation of the components	Nomenclatura delle parti	
84 c	Tête d'accouplement pour frein direct	Bremskupplungskopf für die nicht selbsttätige Bremse	Additional brake coupling head	Testa d'accoppiamento per il freno non automatico	
85	Robinet d'isolement pour frein direct	Absperrhahn für die nicht selbsttätige Bremse	Additional brake isolating cock	Robinetto d'isolamento per il freno non automatico	
86	Double valve d'arrêt	Doppelrückschlagventil	Double check valve	Doppia valvola d'arresto	

A.2 - Rigging

N°	Désignation de pièces	Benennung der Teile	Designation of the components	Nomenclatura delle parti
101	Manivelle du frein à vis ou volant du frein à vis	Bremskurbel zur Handbremse oder Handrad zur Handbremse	Screw brake handle or screw brake wheel	Manubrio del freno a mano o volantino del freno a mano
102	Vis de frein	Bremsspindel	Brake screw	Vite del freno
103	Jumelles de l'écrou de la vis du frein	Zuglasche	Double adjusting nut of the brake screw	Bielletta
104	Arbre de renvoi du frein	Bremswelle	Brake shaft	Alberello del freno a mano
105	Bielle de commande du frein à vis	Handbremszugstange	Pull rod of the screw brake	Tirante del freno a mano
106	Balancier du cylindre	Zylinderhebel	Brake cylinder lever	Leva orizzontale
107	Balancier à point fixe	Festpunkthebel	Fixed brake lever	Leva orizzontale
108	Bielle de connexion des balanciers	Bremszugstange	Brake lever coupling bar	Tirante della timoneria
109	Ressort de rappel	Rückziehfeder	Release spring	Molla di richiamo
110	Régulateur automatique	Bremsgestängesteller	Automatic rigging regulator	Dispositivo di regolazione automatica della timoneria
111	Bielle de commande de la timonerie	Hauptbremszugstange	Brake rigging master coupling bar	Tirante principale della timoneria
112	Balancier d'essieu	Bremshebel	Brake lever	Leva verticale
113	Connecteur des balanciers d'essieux	Bremshebelverbindung	Brake lever coupling rod	Tirante delle leve verticali del freno
114	Triangle d'écartement des sabots (triangle du frein)	Bremsdreieck	Trussed brake beam (brake triangle)	Tirante a triangolo
115 A	Sabot de frein monobloc	Ungeteilter Bremsklotz	Single-piece brake shoe	Zoccolo del freno in un pezzo
115 B	Sabot de frein à semelle amovible	Geteilter Bremsklotz	Renewable brake shoe	Zoccolo del freno con suola amovibile
115 C	Sabot de frein à double semelle amovible	Geteilter Bremsklotz mit zweiteiliger Sohle	Double renewable brake shoe	Zoccolo del freno con suola amovibile in due pezzi
115 D	Sabot de frein à triple semelle amovible	Geteilter Bremsklotz mit dreiteiliger Sohle	Triple renewable brake shoe	Zoccolo del freno con suola amovibile in tre pezzi
115 E	Double sabot de frein monobloc	Ungeteilter Bremsklotz in Doppelanordnung	Twin one-piece brake shoes	Doppio zoccolo del freno con zoccoli in un pezzo
115 F	Double sabot de frein à semelles amovibles	Geteilter Bremsklotz in Doppelanordnung	Twin renewable brake shoes	Doppio zoccolo del freno con zoccoli con suola amovibile
115 a	Porte-semelle de frein	Bremsklotzschuh	Brake shoe holder	Porta suola
115 b	Semelle de frein	Bremsklotzsohle	Brake shoe	Suola
115 c	Clavette	Bremsklotzkeil	Cotter	Chiavetta
116	Bielles de suspension de sabots de frein	Bremsklotzhängeisen	Brake hanger	Pendini di sospensione degli zoccoli

A.3 - Diagrams

A.3.1 - Brake for locomotives and multiple unit trainsets

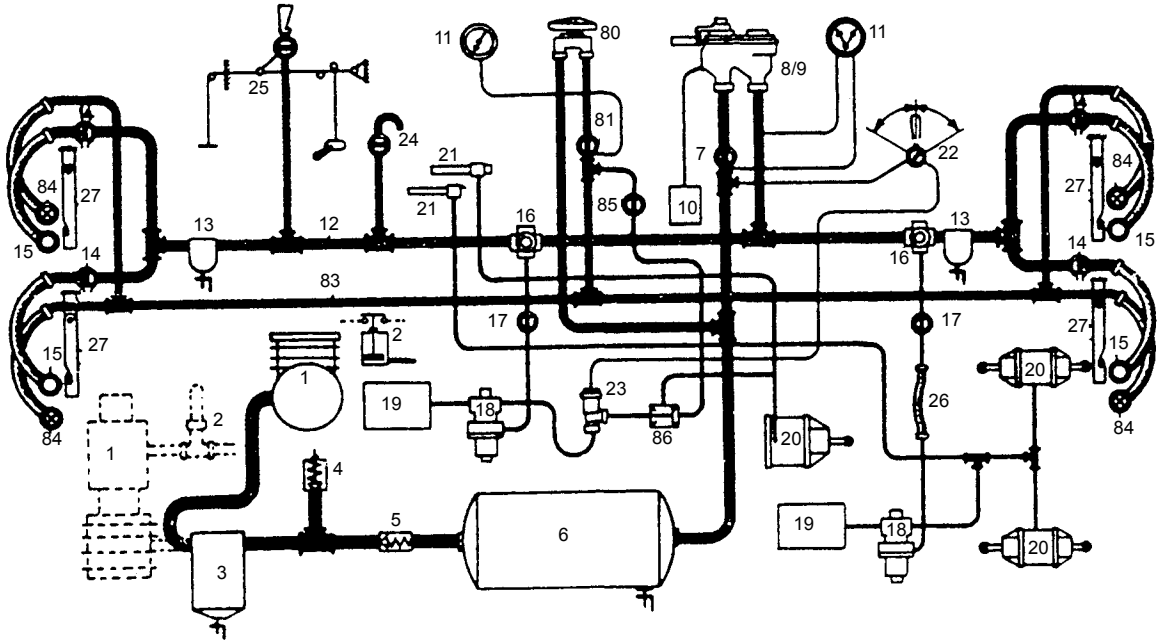


Fig. 1 - Diagram of the locomotive or multiple unit trainset brake

A.3.2 - Brake for passenger trains

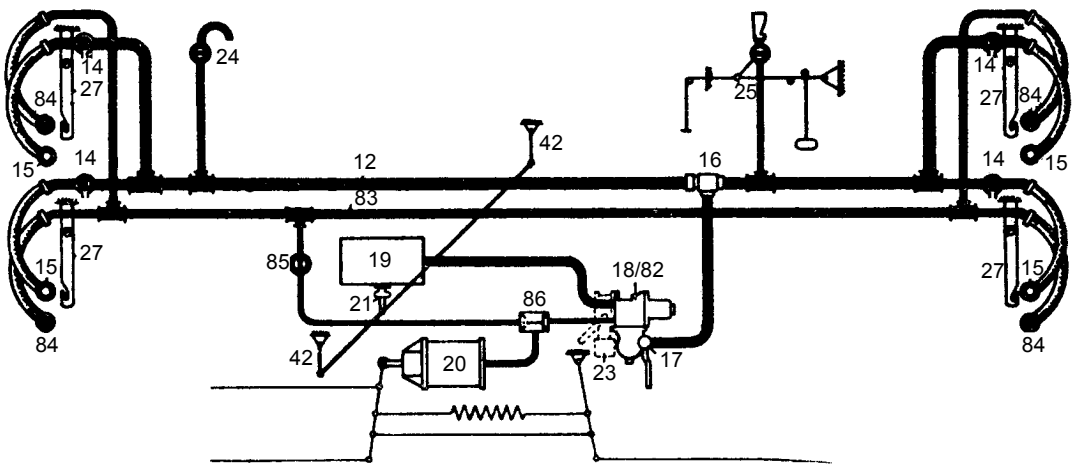


Fig. 2 - Westinghouse brake for passenger trains

Drolshammer and Božic brakes for passenger trains:

The diagrams for these brakes are identical to those for freight train brakes.

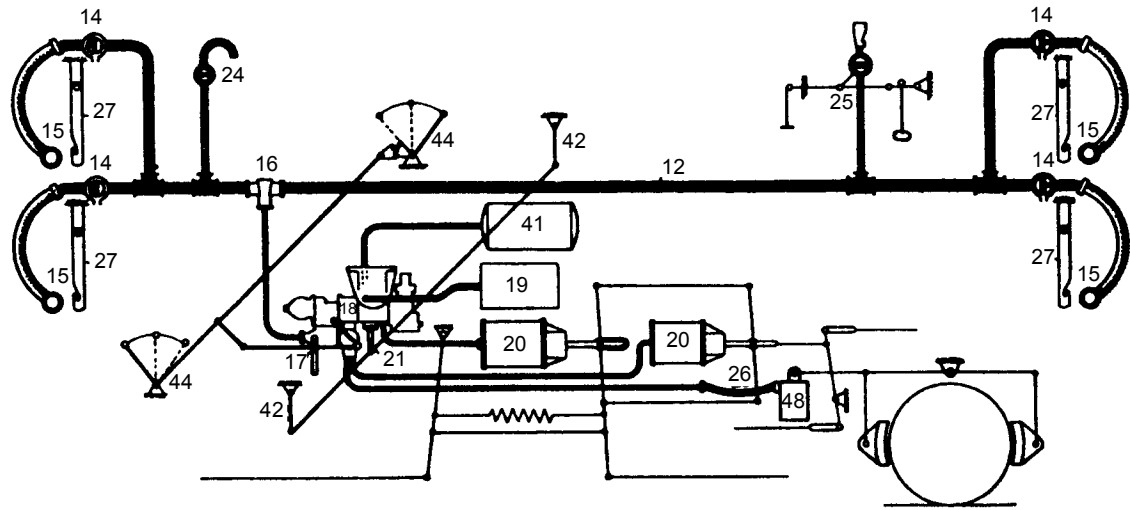


Fig. 3 - Hildebrand-Knorr brake for ordinary and express passenger trains

A.3.3 - Brakes for goods trains

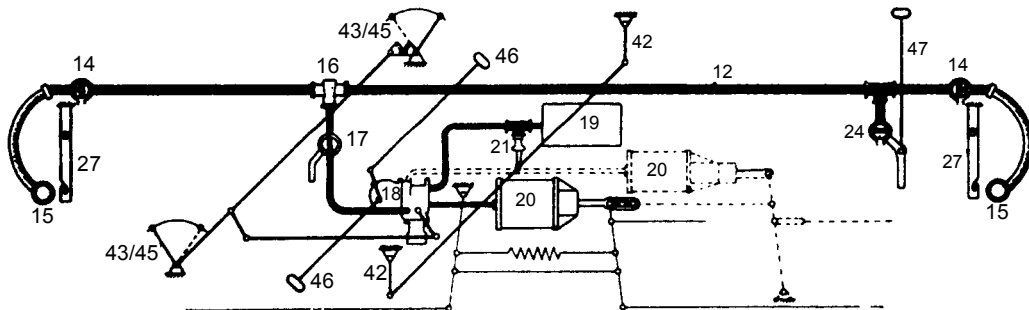


Fig. 4 - Westinghouse brake for freight trains

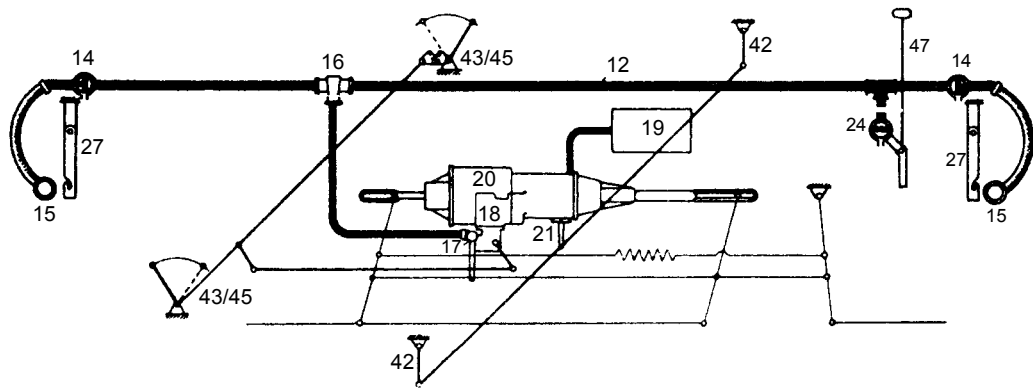


Fig. 5 - Kunze-Knorr brake for freight trains

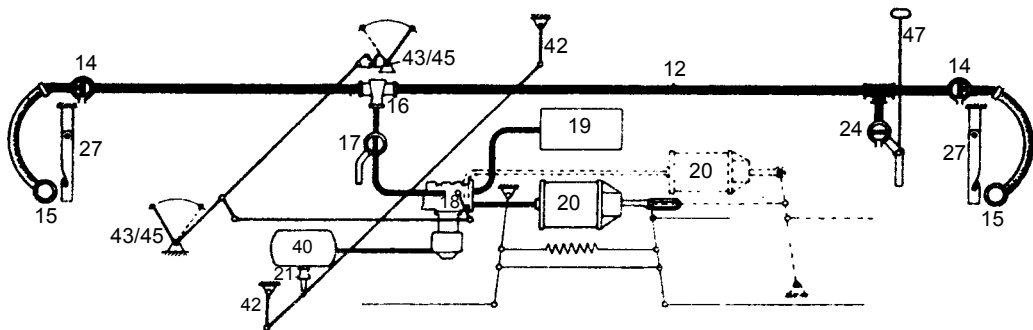


Fig. 6 - Drolshammer brake for freight trains

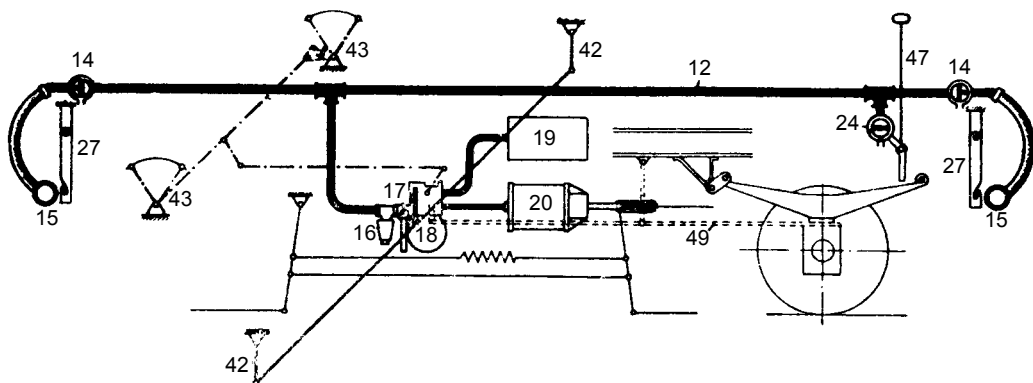


Fig. 7 - Božić brake for freight trains

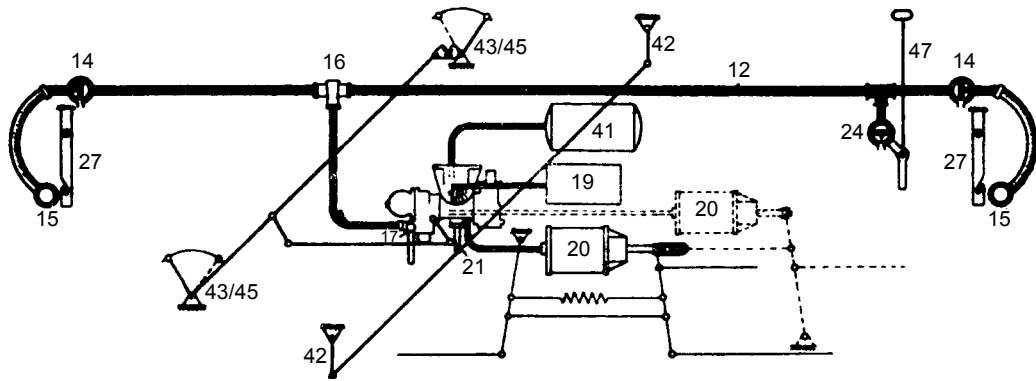


Fig. 8 - Hildebrand-Knorr brake for freight trains

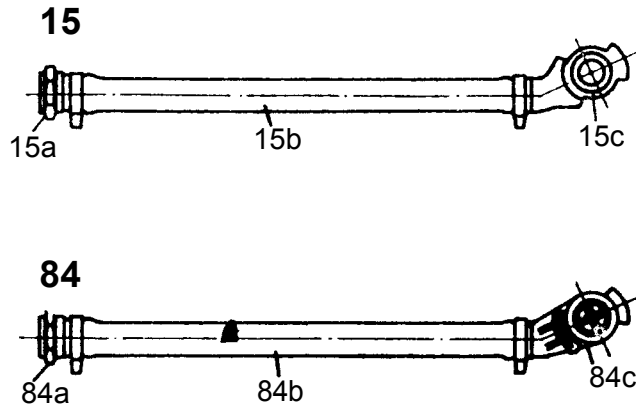


Fig. 9 - Details of air brakes

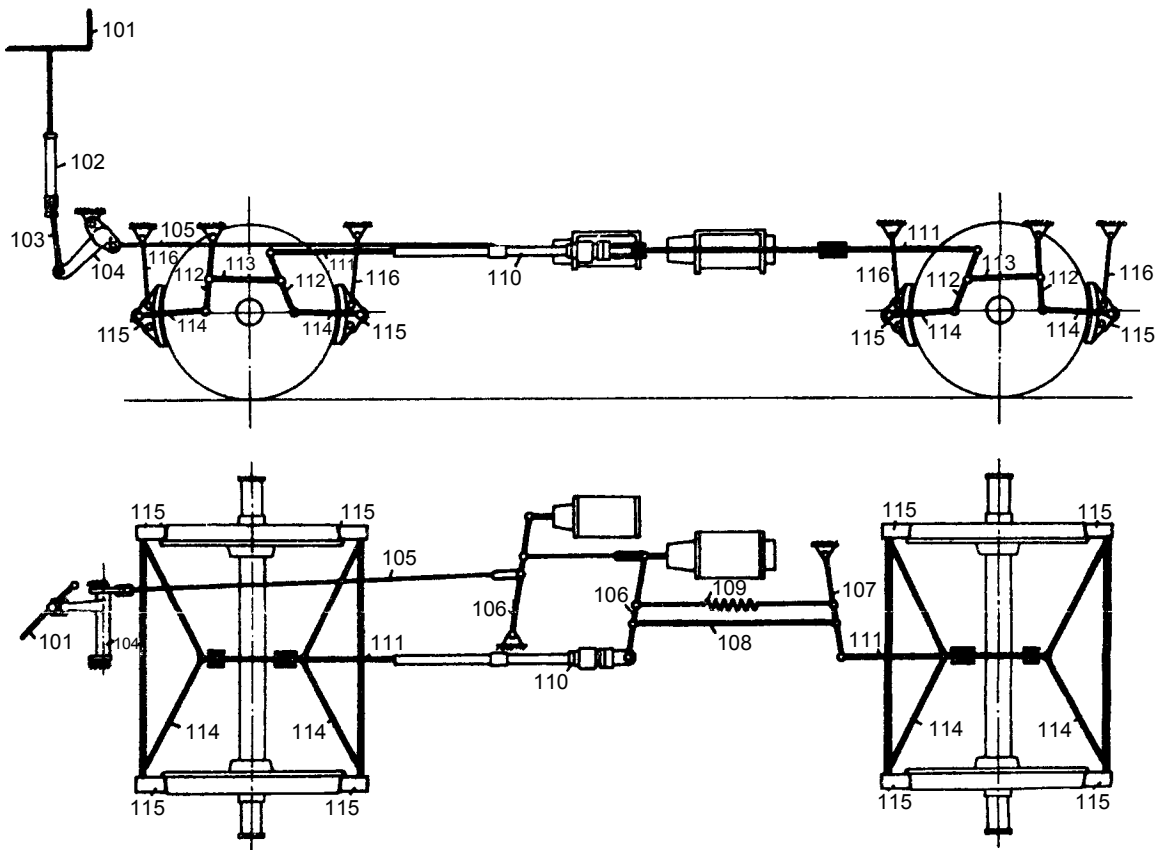


Fig. 10 - Diagram of the rigging

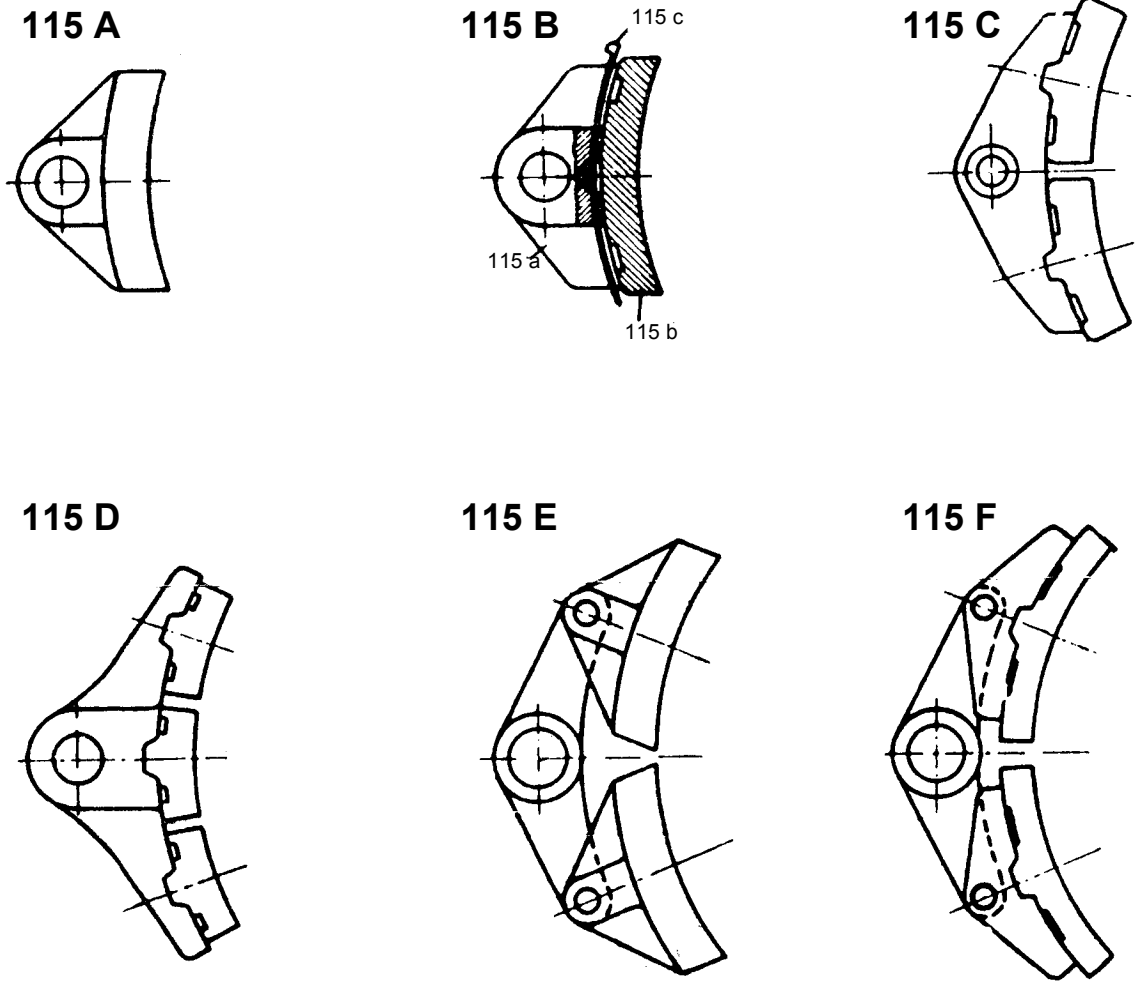


Fig. 11 - Details of the rigging

Appendix B - Arrangement of air brake pipe connections

B.1 - Arrangement permissible only for vehicles fitted at 1.1.1969 with a continuous brake or only a train pipe

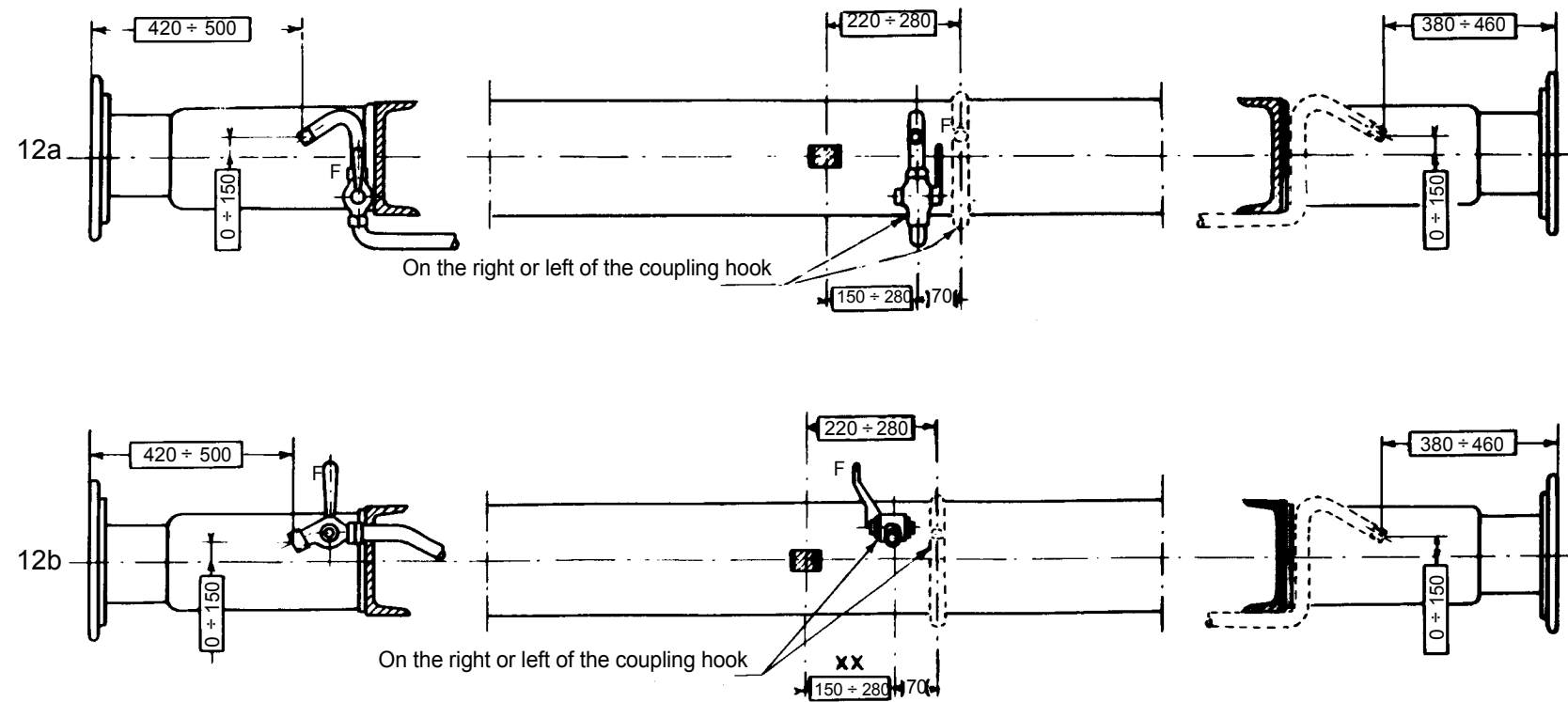


Fig. 12 - Arrangements permissible for coaches, vans and wagons

	Obligatory dimensions
	Minimum dimensions
X	Recommended dimensions
F	Closed
XX	For wagons not fitted with a second brake pipe, the obligatory dimensions are 200 ± 300
NB : The handle of the cut-off cock may be placed on the right or on the left of the connection.	

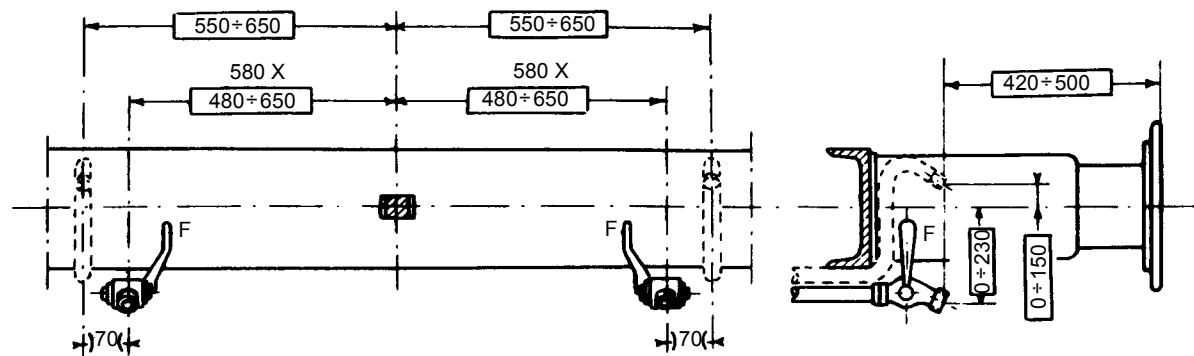


Fig. 13 - Arrangement permissible only for coaches, vans and wagons bearing the marks S and SS

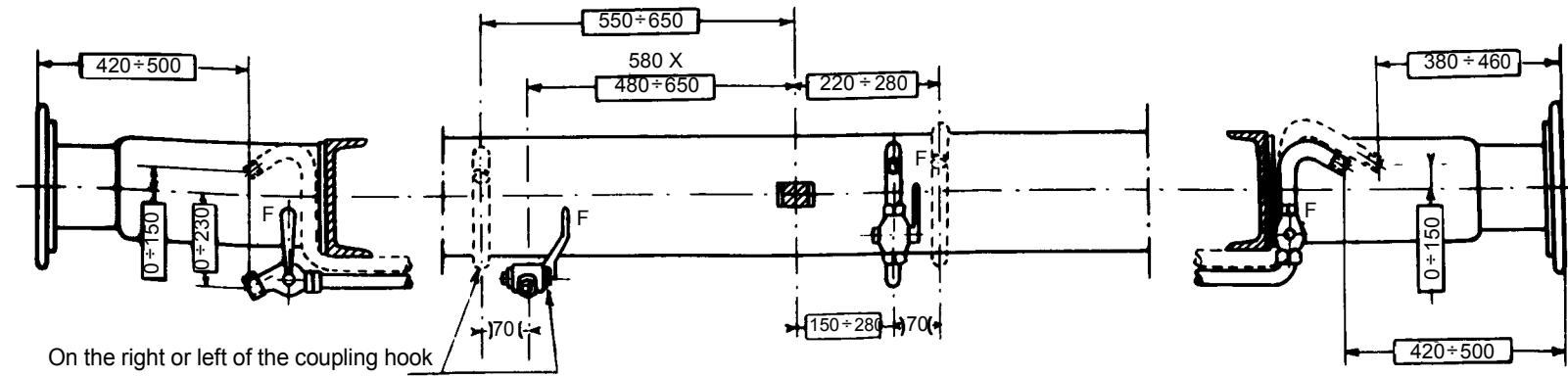


Fig. 14 - Arrangement permissible only for coaches

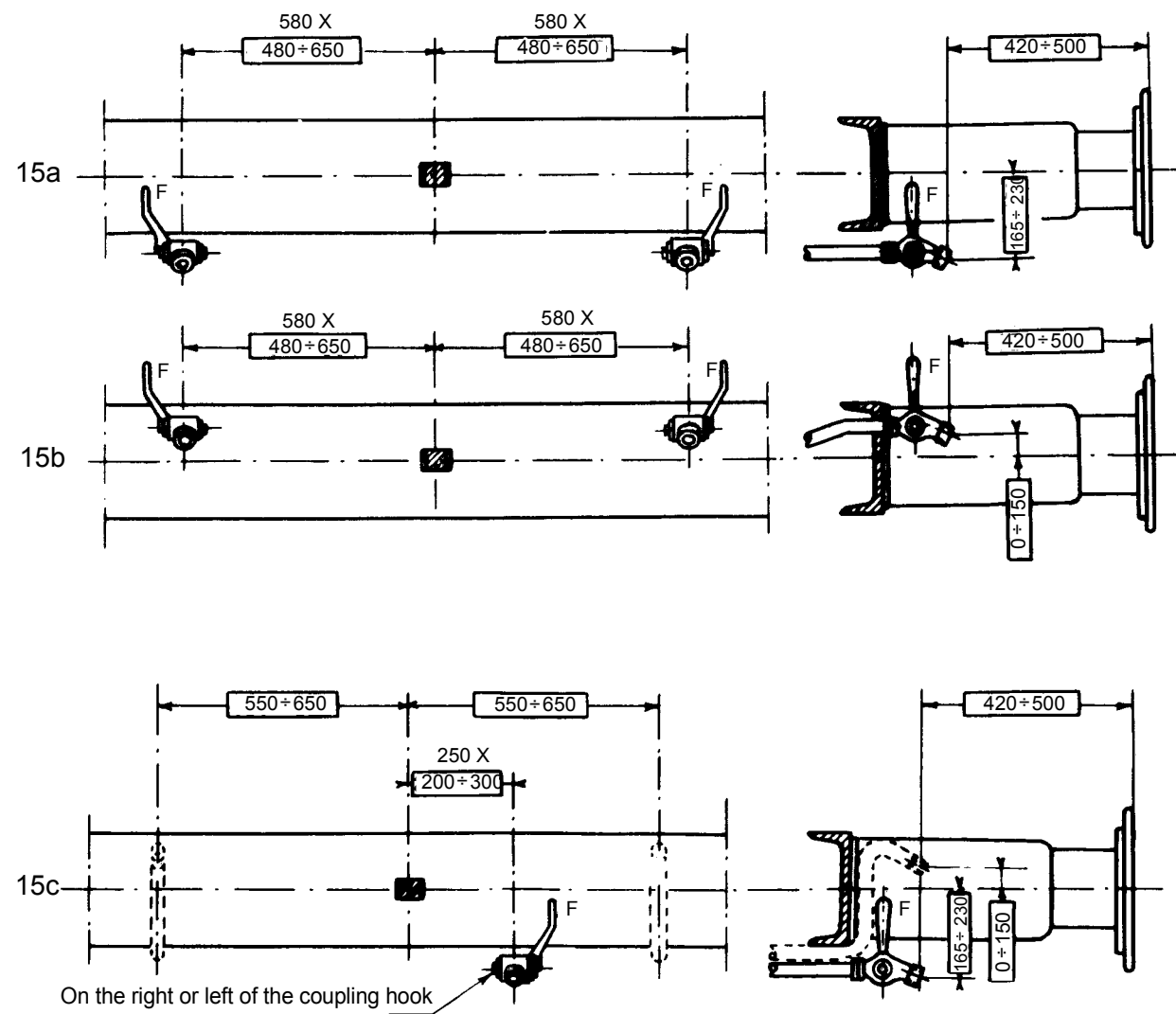
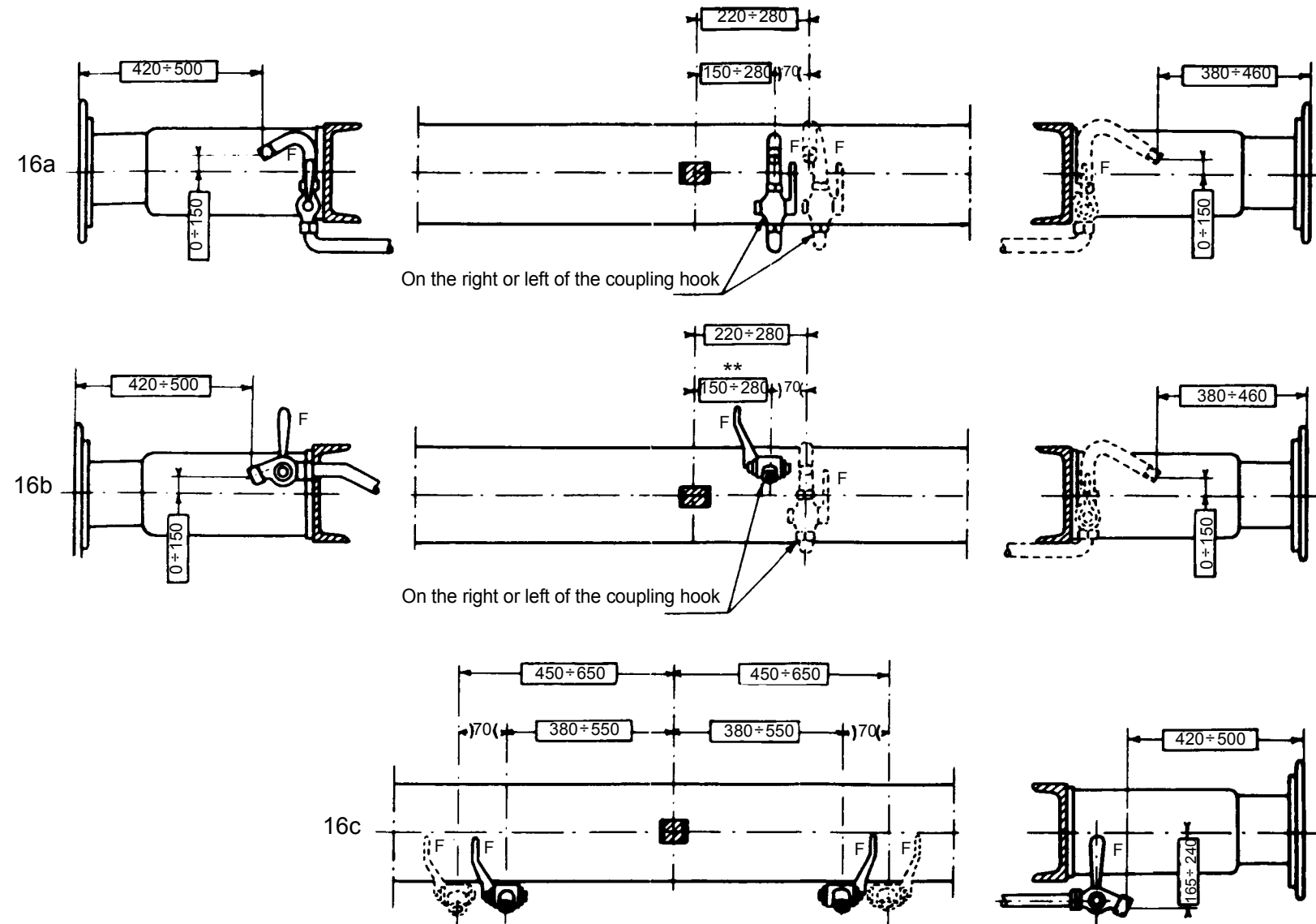


Fig. 15 - Arrangements permissible only for wagons

	Obligatory dimensions
).....(Minimum dimensions
X	Recommended dimensions
F	Closed
XX	For wagons not fitted with a second brake pipe, the obligatory dimensions are 200 ÷ 300

NB : The handle of the cut-off cock may be placed on the right or on the left of the connection.

B.2 - Obligatory arrangement as of 1.1.1969 for new vehicles or vehicles equipped with a continuous brake and, where relevant, a main feed pipe



	Obligatory dimensions
).....(Minimum dimensions
*	Recommended dimensions
F	Closed
**	For wagons not equipped with a main feed pipe, the obligatory dimensions are 200 ÷ 300
————	Main brake pipe
- - - -	Main feed pipe
NB : The handle of the cut-off cock may be placed on the right or on the left of the connection.	

Fig. 16 - Arrangement permissible for coaches, vans and wagons

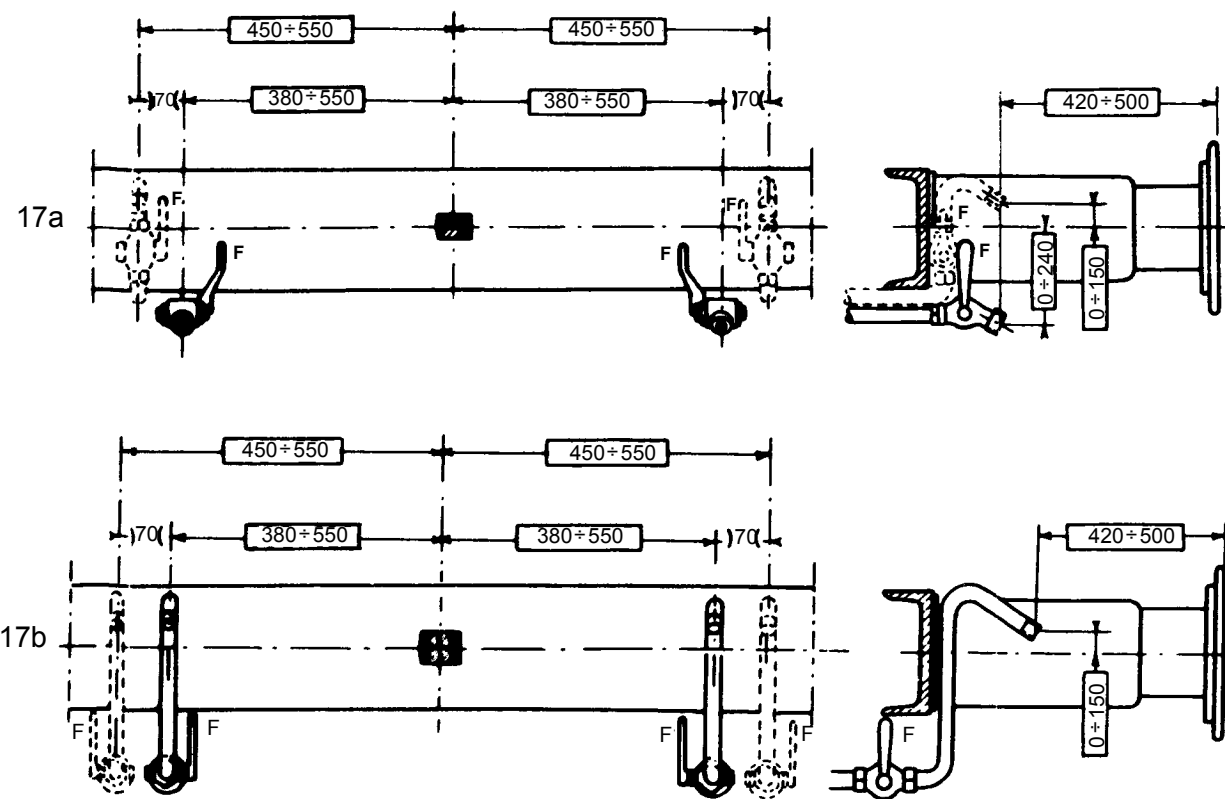


Fig. 17 - Arrangements permissible only for coaches, vans and wagons bearing the marks S and SS

	Obligatory dimensions
).....(Minimum dimensions
*	Recommended dimensions
F	Closed
**	For wagons not equipped with a main feed pipe, the obligatory dimensions are 200 ÷ 300
————	Main brake pipe
- - - -	Main feed pipe
NB : The handle of the cut-off cock may be placed on the right or on the left of the connection.	

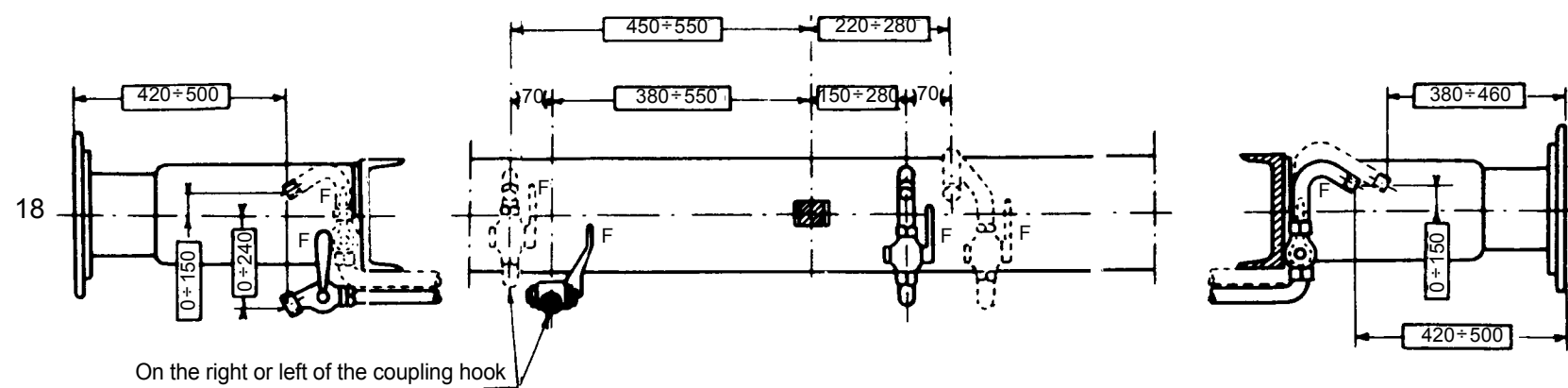


Fig. 18 - Arrangement permissible for coaches only

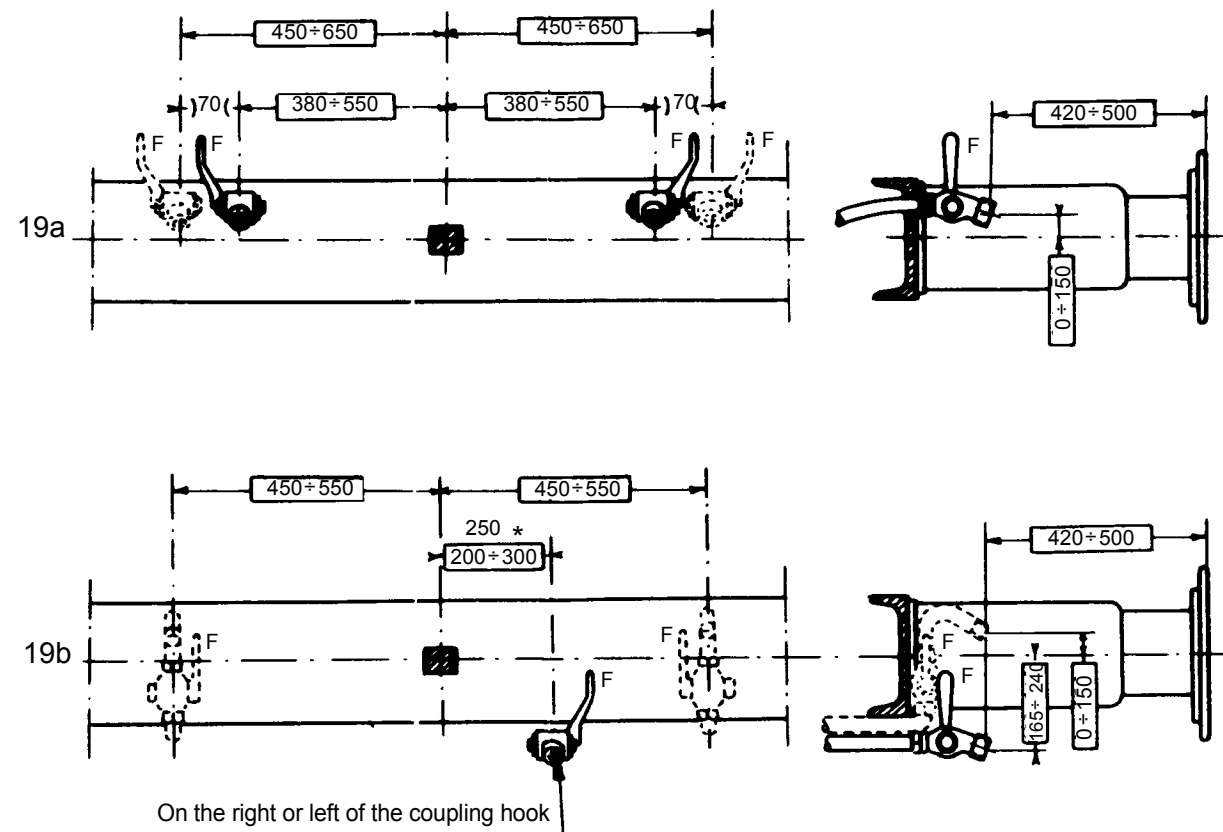
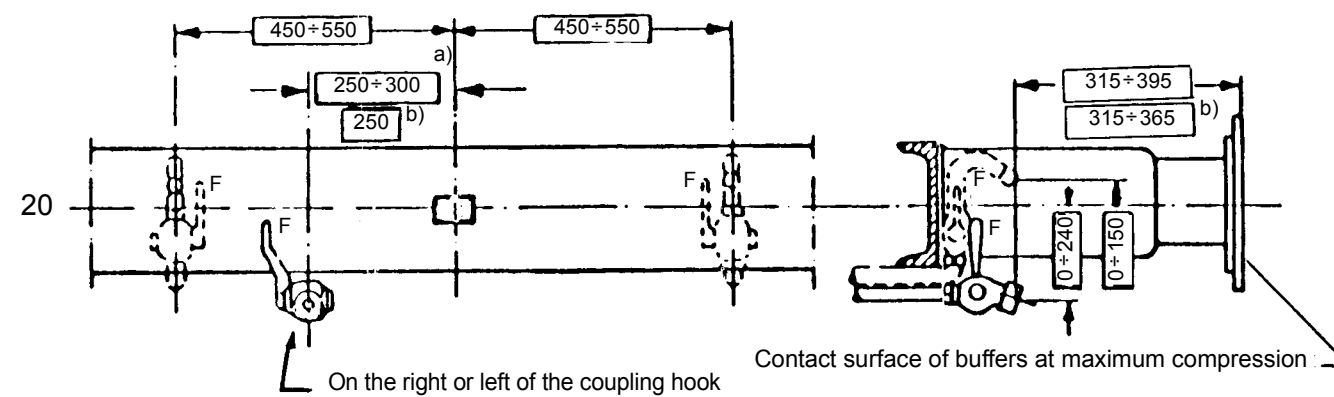


Fig. 19 - Arrangements permissible for wagons only

	Obligatory dimensions
).....(Minimum dimensions
*	Recommended dimensions
F	Closed
**	For wagons not equipped with a main feed pipe, the obligatory dimensions are 200 ÷ 300
—	Main brake pipe
- - - -	Main feed pipe
NB : The handle of the cut-off cock may be placed on the right or on the left of the connection.	



a) 275 mm recommended dimension
 b) For wagons with 150 mm - stroke buffers

Fig. 20 - Arrangement permissible only on wagons with a chassis prepared for automatic couplers

Appendix C - Arrangement of air brake pipe connections

Arrangement permissible only for vehicles fitted at 1.1.1933 with a continuous brake or only a train pipe

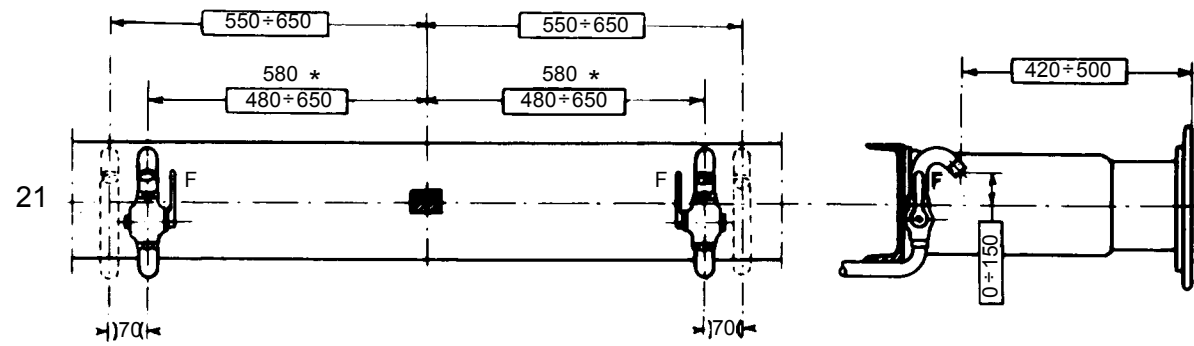


Fig. 21 - Arrangement applicable to all vehicles

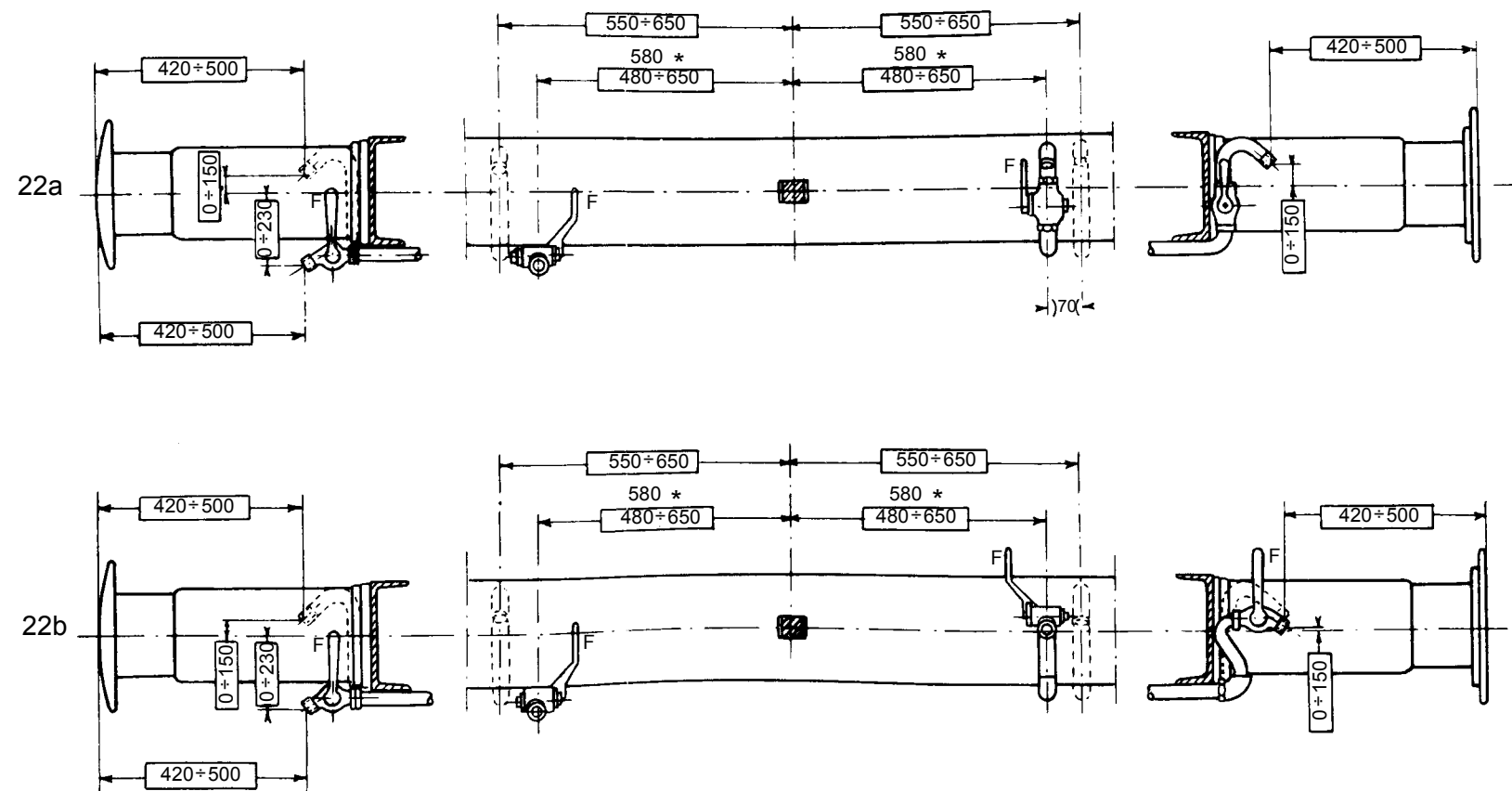


Fig. 22 - These arrangements are permissible only for coaches

	Obligatory dimensions
).....(Minimum dimensions
*	Recommended dimensions
F	Closed
**	For wagons not fitted with a second brake pipe on the right of the coupling hook, the obligatory dimensions are 200 ÷ 300
NB : The handle of the cut-off cock may be placed on the right or left of the connection.	

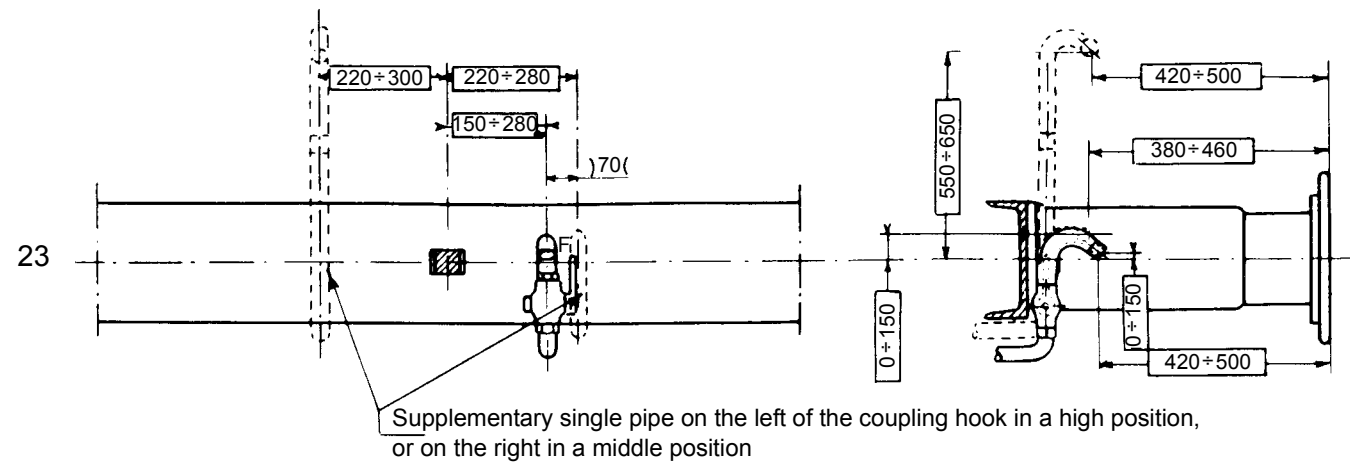


Fig. 23 - Permissible arrangement only for wagons fitted with a heating pipe

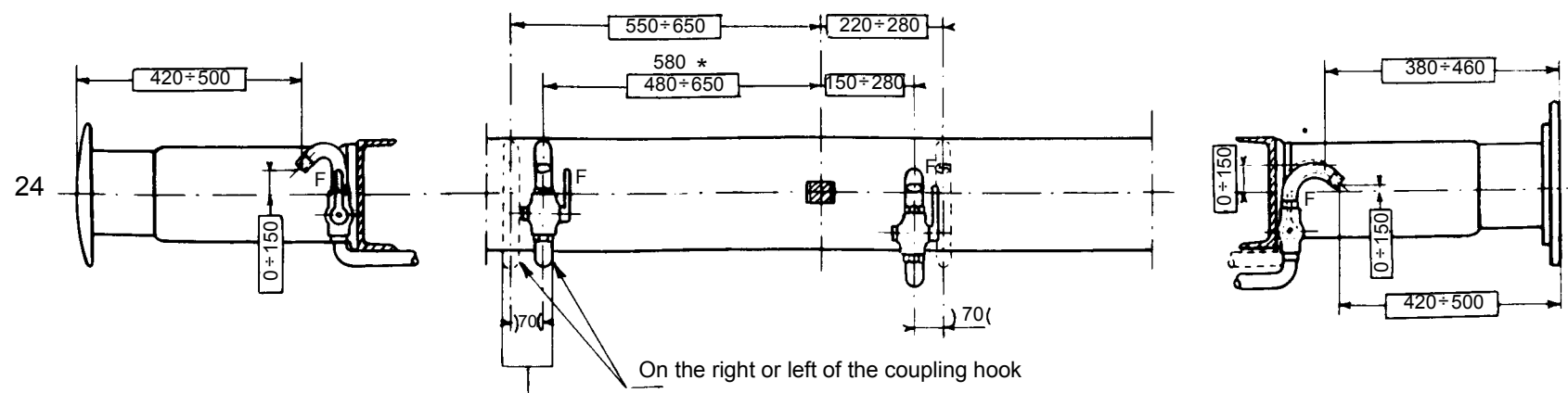
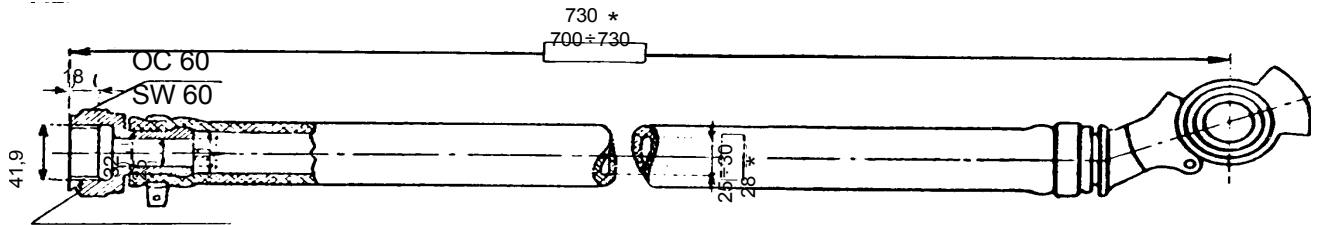


Fig. 24 - These arrangements are permissible only for vehicles not fitted with a central safety coupling

	Obligatory dimensions
).....(Minimum dimensions
*	Recommended dimensions
F	Closed
**	For wagons not fitted with a second brake pipe on the right of the coupling hook, the obligatory dimensions are 200 ÷ 300
NB : The handle of the cut-off cock may be placed on the right or left of the connection.	

Appendix D - Coupling for automatic air brakes

Obligatory for new supplies



Whitworth threading with truncated threads for 1 1/4" (11 threads per English inch)

Fig. 25 -

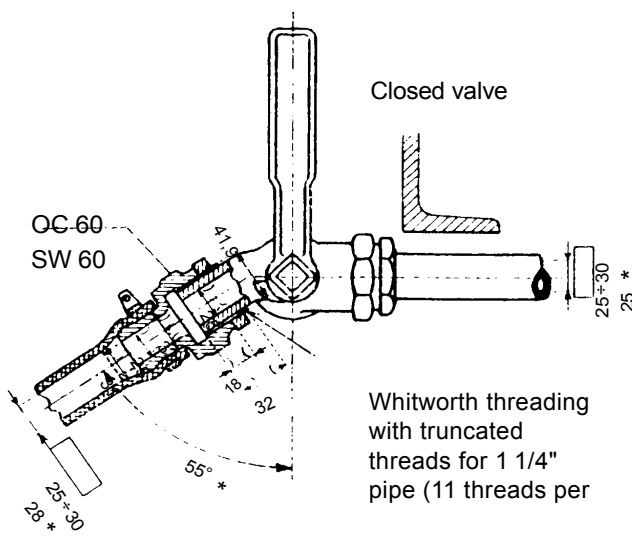


Fig. 26 -

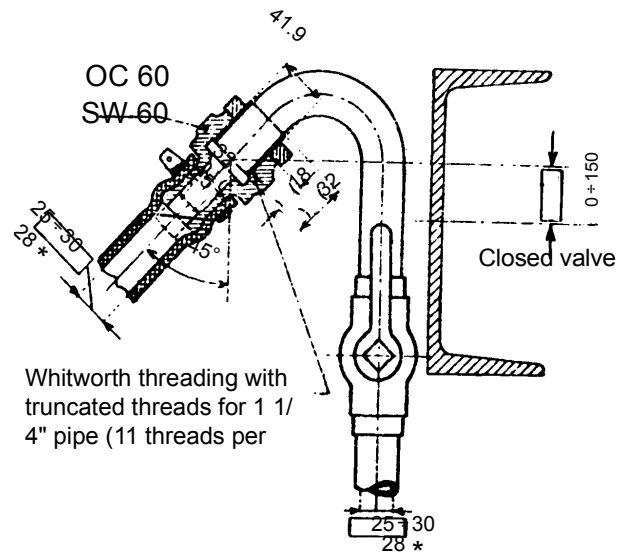


Fig. 27 - This arrangement is only permissible for coaches not fitted with a central safety coupler

	Mandatory dimensions
)... (Minimum dimensions
(...)	Maximum dimensions
*	Recommended dimensions

NB : This drawing only gives the general shape of the head. For all dimensions which are not mandatory, variations are permitted. The heads must be designed in such a way as to offer the least possible resistance to air.

The coupler head may be manufactured with a ring (see *) or as a single component. If it is made as a single component, the laying surfaces of the packing ring must be in keeping with the dimensions specified here.

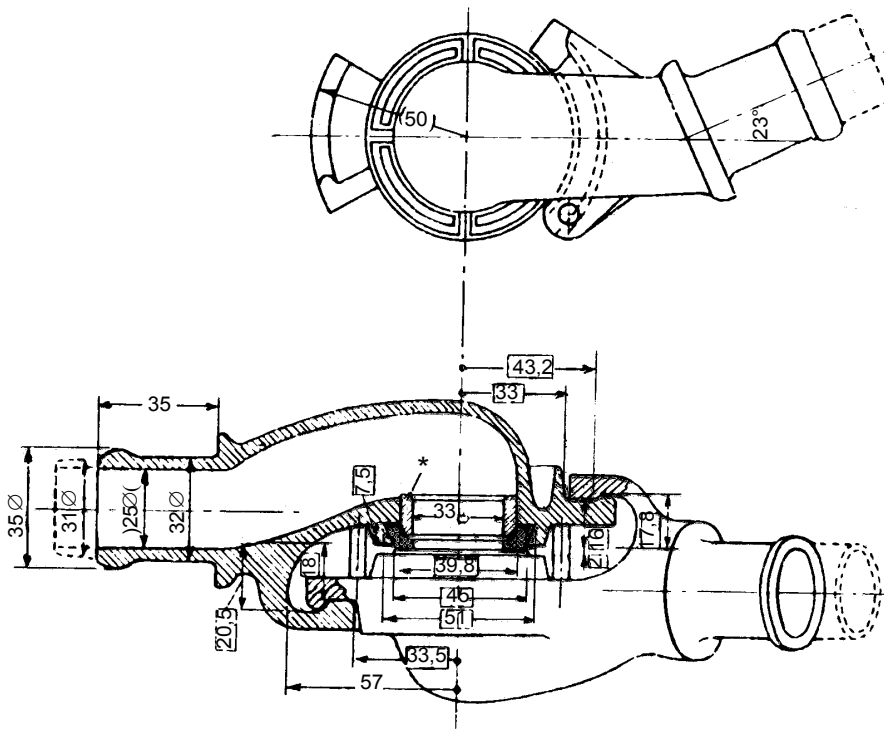


Fig. 28 - Coupling head for main brake pipe

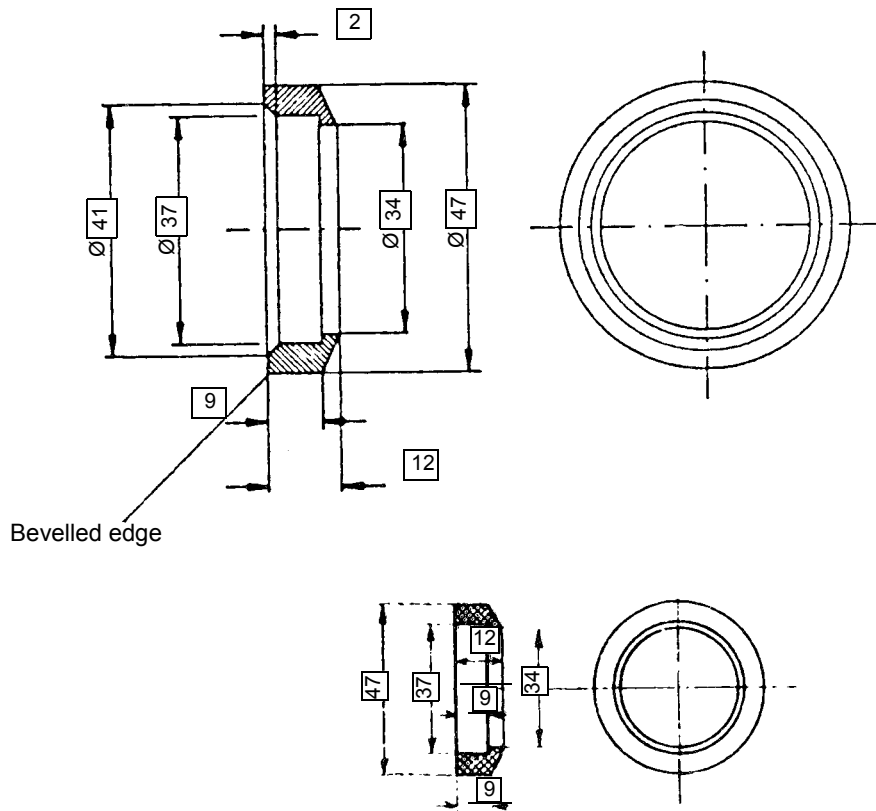


Fig. 29 - Washer

Appendix E - Brake hose coupling for main feed pipe

Obligatory for new supplies

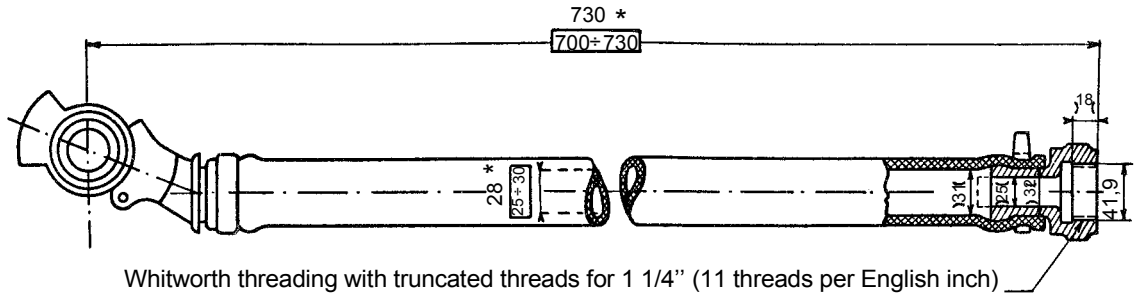


Fig. 30 -

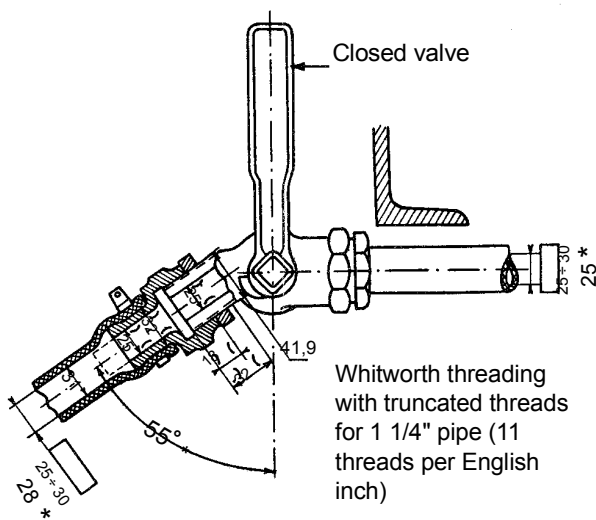


Fig. 31 -

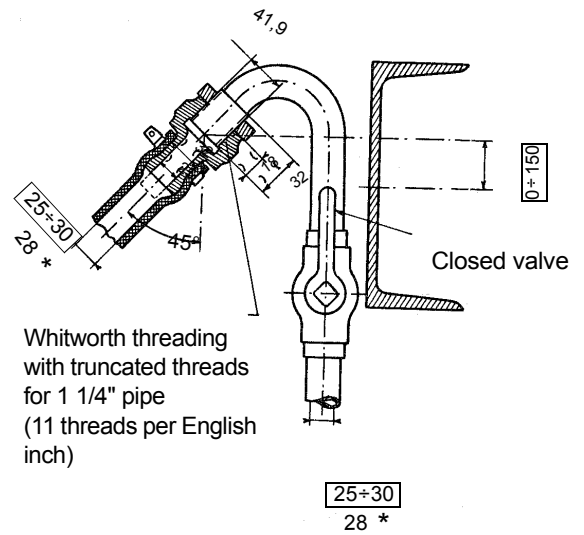


Fig. 32 - This arrangement is permissible only for coaches not fitted with a central safety coupler

	Mandatory dimensions
)... (Minimum dimensions
(...)	Maximum dimensions
*	Recommended dimensions

Appendix F - Handle of the brake isolating cock

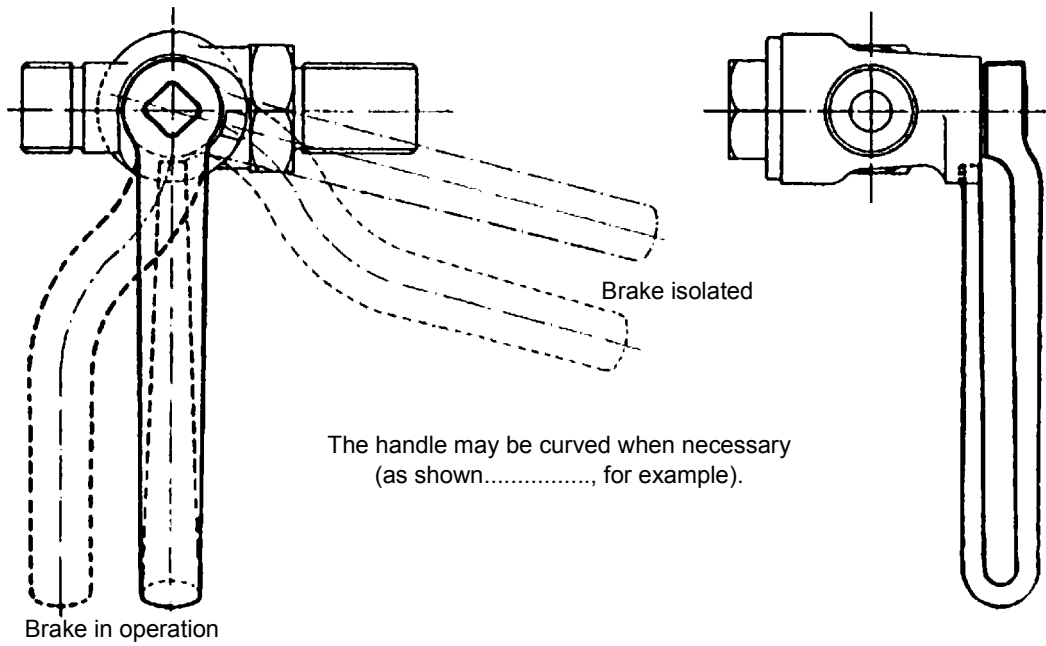


Fig. 35 - Diagram of the handle

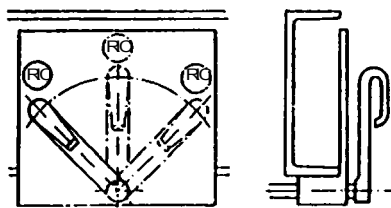


Fig. 36 - "passenger only"

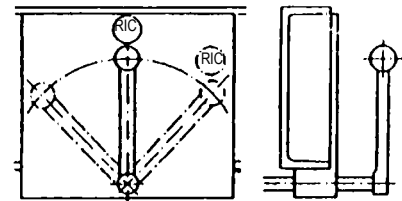


Fig. 37 - "goods-passenger"

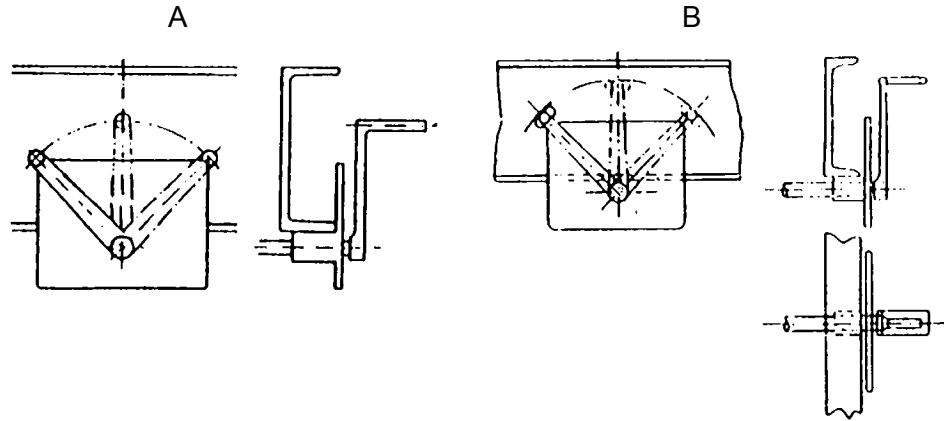


Fig. 38 - "empty-loaded"

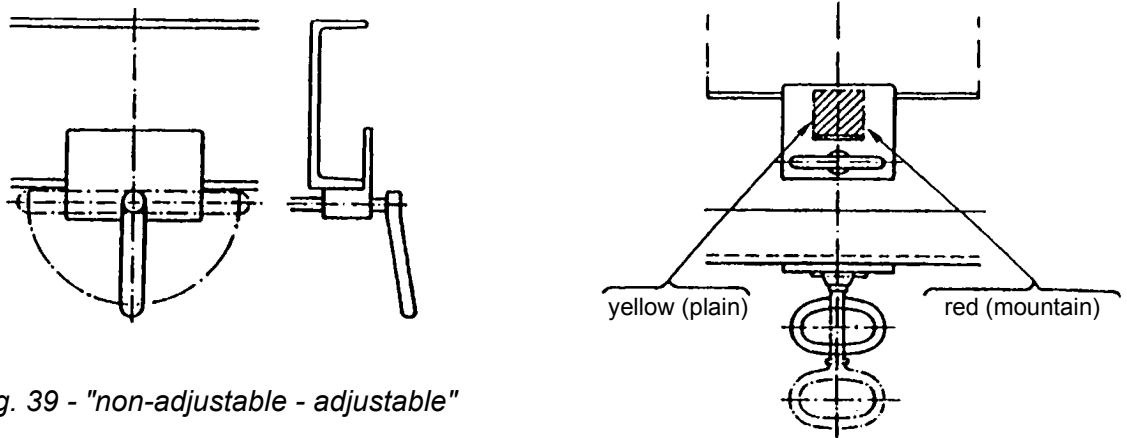


Fig. 39 - "non-adjustable - adjustable"

Fig. 40 - "plain-mountain"

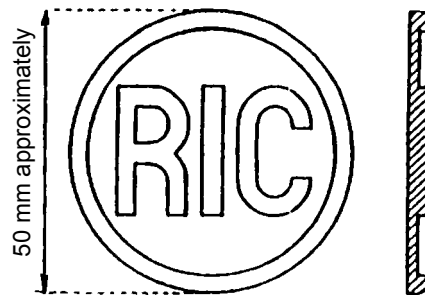


Fig. 41 - Marking

Appendix G - Standard contact surface and cotter shape for brake shoes in two parts

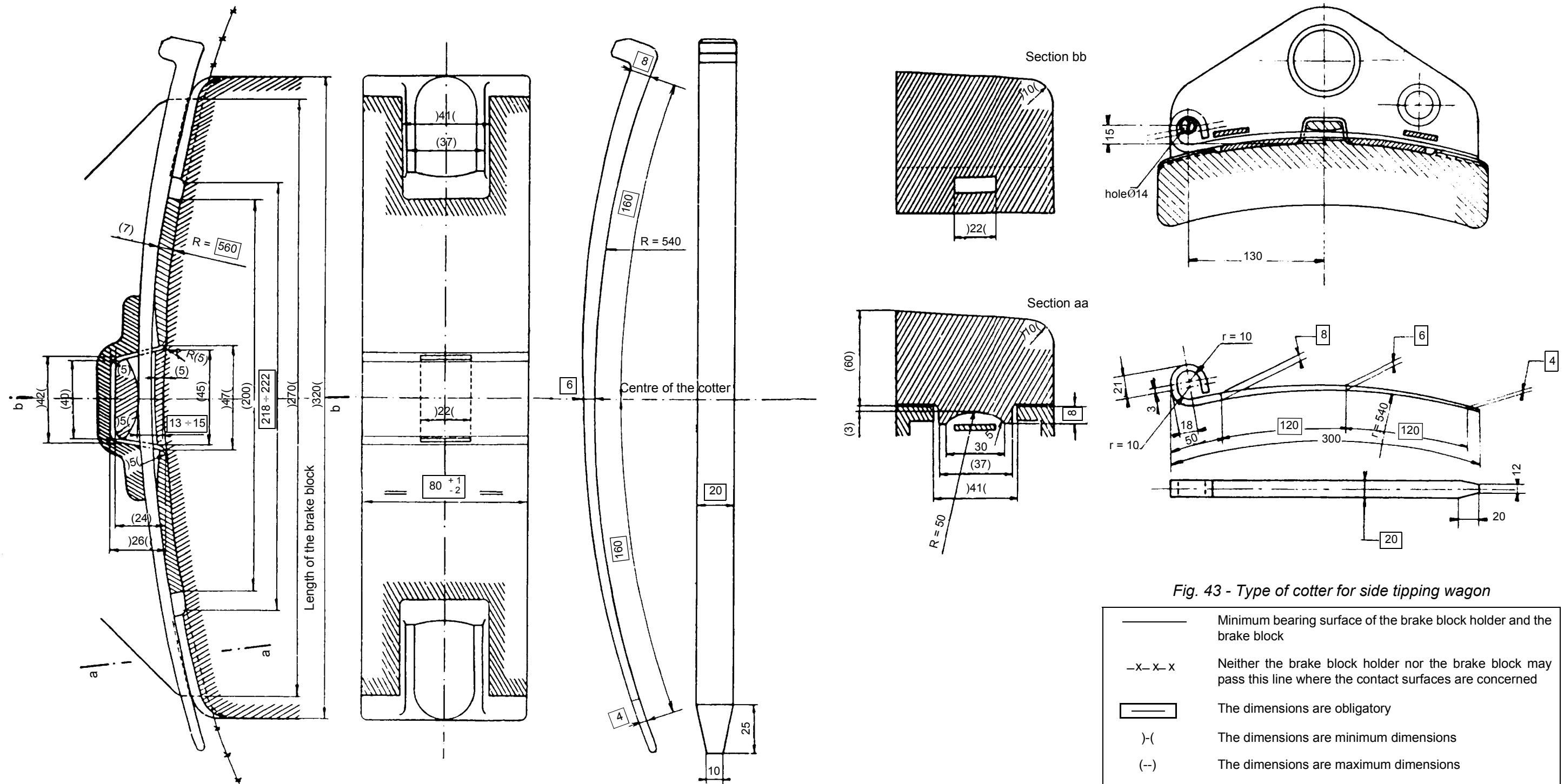
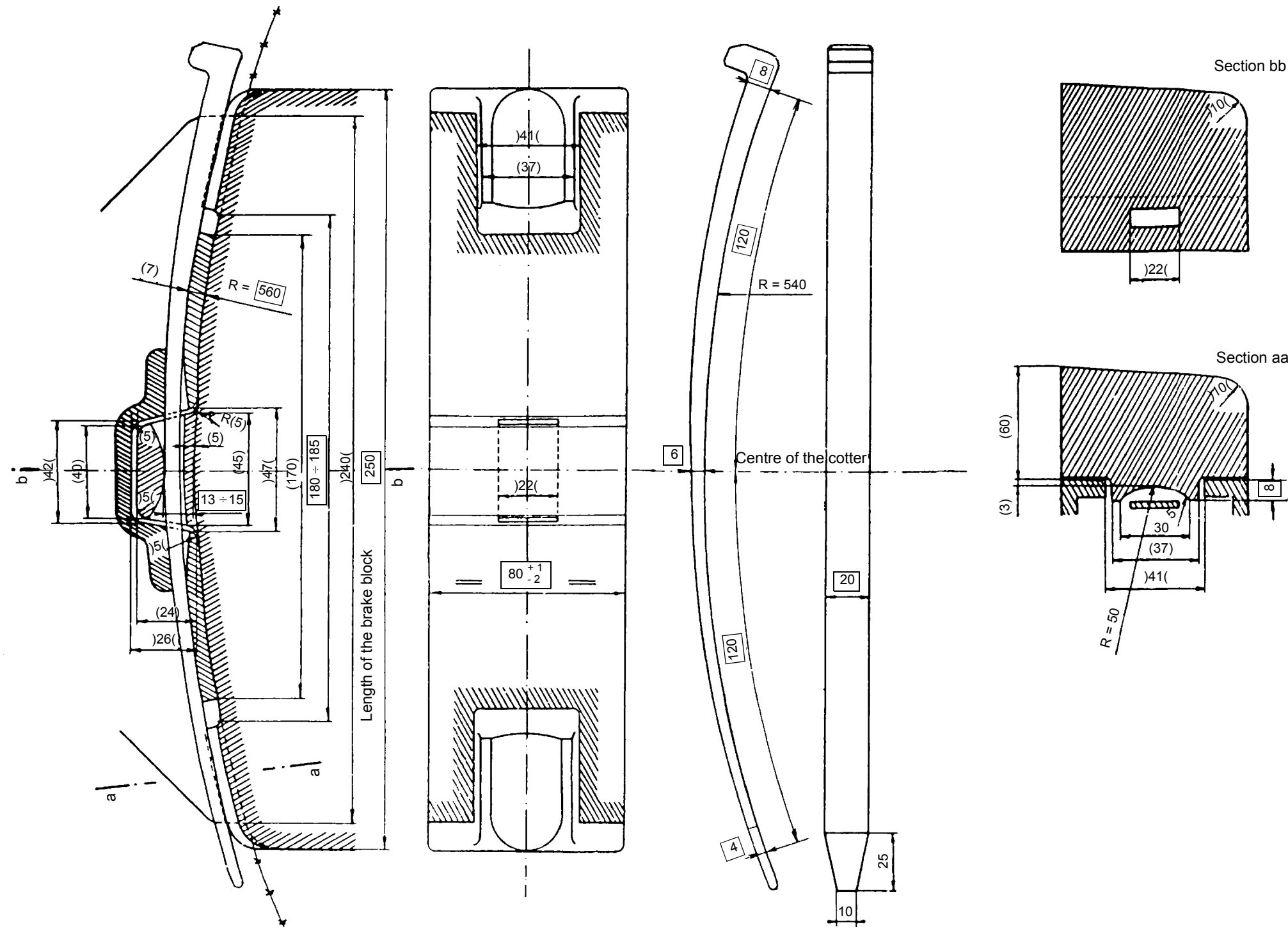


Fig. 42 - Brake shoe

Fig. 43 - Type of cotter for side tipping wagon

	Minimum bearing surface of the brake block holder and the brake block
	Neither the brake block holder nor the brake block may pass this line where the contact surfaces are concerned
	The dimensions are obligatory
	The dimensions are minimum dimensions
	The dimensions are maximum dimensions
	Equal dimensions
NB : The other dimensions are recommended	

Appendix H - Standard contact surface and cotter shape for double brake shoes in two parts



	Minimum bearing surface of the brake block holder and the brake block
	Neither the brake block holder nor the brake block may pass this line where the contact surfaces are concerned
	The dimensions are obligatory
	The dimensions are minimum dimensions
	The dimensions are maximum dimensions
	Equal dimensions
NB : The other dimensions are recommended	

Fig. 44 - Brake shoe

Appendix I - Control handle for quick-release valves

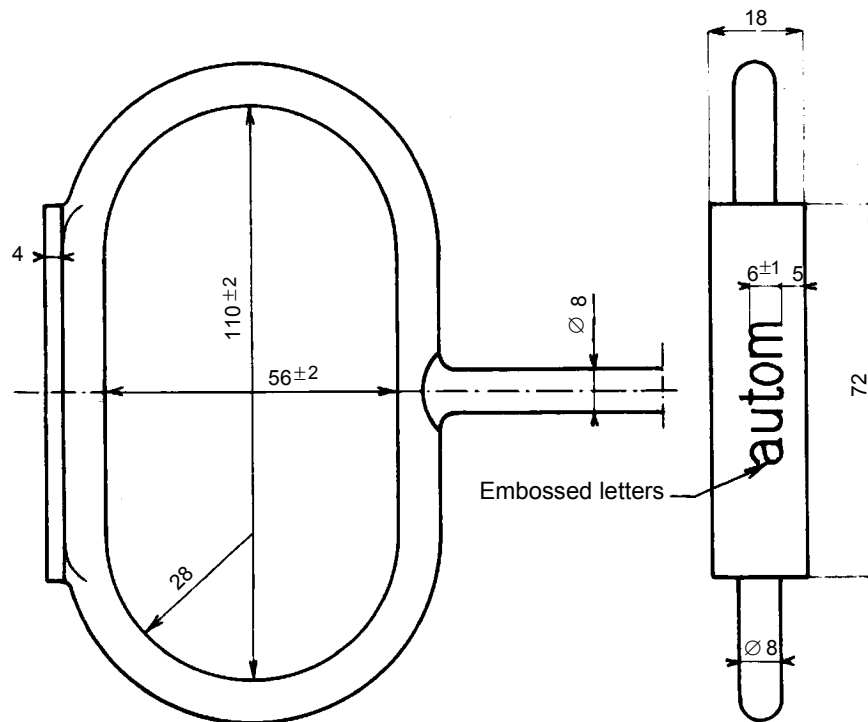


Fig. 45 -

Appendix J - Quick-release valves accepted in international services

Table 1 - Quick-release valves for modern brakes^a

Manufacturer	Type	Date of acceptance tests	
<i>Installed in the distributor</i>			
OERLIKON	LV3 : LV3F	March	1961
OERLIKON	LV7	May	1963
CHARMILLES	C3P1	December	1962
CHARMILLES	C3P2	May	1963
KNORR	ALV3a, ALV7, ALV9, ALV9a	May	1963
WESTINGHOUSE (Italy)	SA1	May	1963
WESTINGHOUSE (Italy)	SA1V	April	1966
KNORR	ALV11	March	1968
WESTINGHOUSE (Great Britain)	A1 and A2	September	1968
<i>Applicable to existing distributors, when their circuits provide for the emptying of the control reservoir only</i>			
OERLIKON	LV3	March	1961
OERLIKON	LV4F	December	1962
WESTINGHOUSE (France)	W 104, W 204	December	1962
WESTINGHOUSE (Italy)	SA1	May	1963
WESTINGHOUSE (Italy)	SA1V	April	1966

a. Modern brakes are understood as being those approved for international services after 1.1.1948.

Table 2 - Quick-release valves for old-type brakes

Manufacturer	Type	Date of acceptance tests	
KNORR	ALV4 ^a	March	1961
OERLIKON	LV3	March	1961
OERLIKON	LV4F	December	1962
WESTINGHOUSE (France)	W 104, W 204	December	1962
WESTINGHOUSE (Italy)	SA/CG, SA/RA	December	1962
WESTINGHOUSE (Italy)	SA1	May	1963
KNORR	L2 ^b	May	1965
WESTINGHOUSE (Italy)	SARAV	April	1966
HARDY	L3 ^b	February	1967

a. The KNORR ALV4 quick-release valve is applicable to the modern KNORR KE distributor since the latter's release valve only empties the control reservoir (the auxiliary reservoir is emptied by another means: isolating cock).

b. Applicable only to the HIK distributor.

Table 3 - Quick-release valves for modern^a or old-type brakes

Manufacturer	Type	Date of acceptance tests	
WESTINGHOUSE (France)	W3, W4	March	1961
DAKO	OS1	December	1962
KNORR	ALV4b	March	1961
BDZ	BRV ^b	April	1976

a. Modern brakes are understood as being those approved for international services after 1.1.1948.

b. Applicable only to the HIK distributor.

Appendix K - Tests to determine the insensitiveness of brake pipe emptying accelerators

(see point 5.8.2 - page 11)

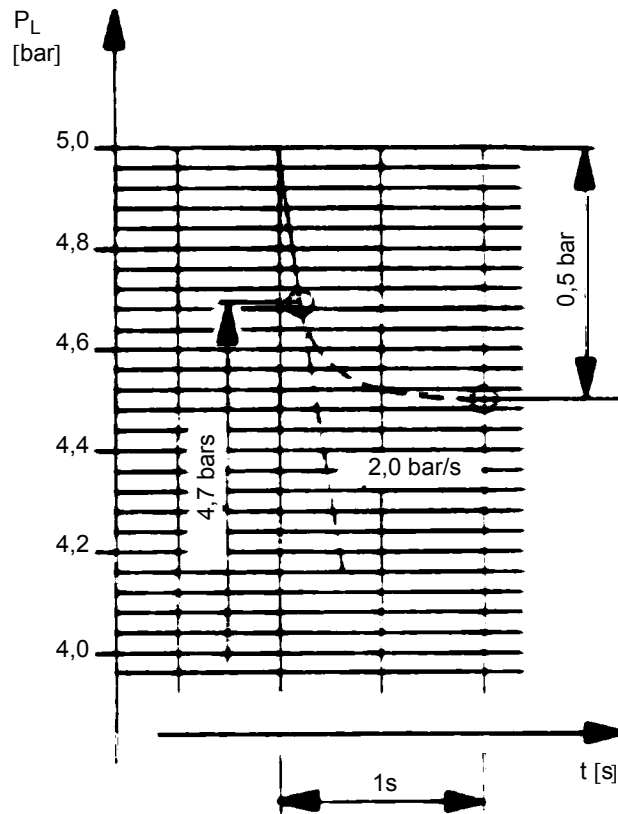


Fig. 46 - Test conditions to be met at the train pipe inlet to the brake pipe emptying accelerator.

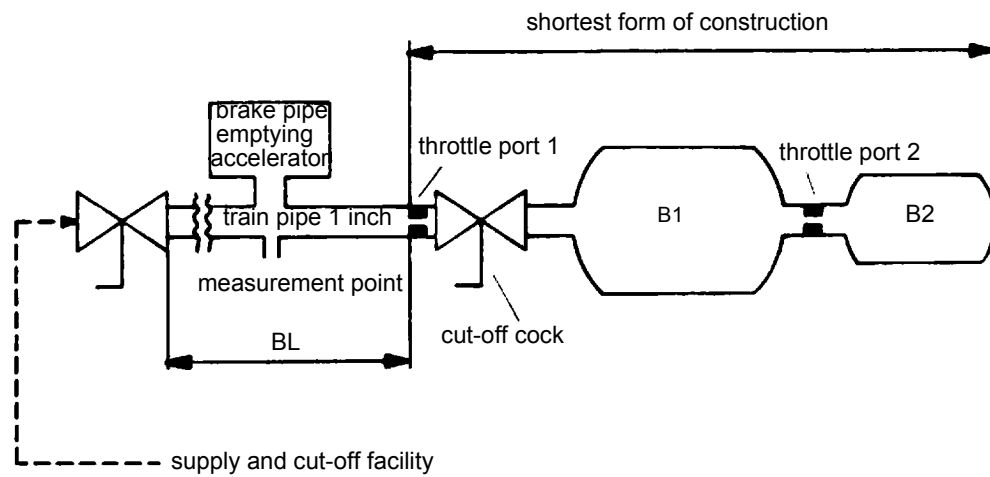


Fig. 47 - Construction of test rig to reproduce the test condition specified in figure 46

Practical example:

train pipe volume 8 l (reference level)

B1 : 645 ml ; B2 : 155 ml

t/p 1 : \varnothing 4,5 mm ; t/p 2 : \varnothing 1,5 mm

cut-off cock 1/2 inch

reservoir inlets 1/2 inch

Appendix L - Brake pipe emptying accelerators accepted in international services

Manufacturer	Type	Date of presentation	Remarks
Dako-Kovalis	Dako-Z	November 1959	Accepted for use in conjunction with the CV1-R type brake
Knorr-Bremse	EB3	Mai 1956	Accepted for use in conjunction with the KEs type brake
	EB3-S	March 1985	Fit for use with the NBÜ (~ SAFI)
	EB3-S/L	January 1987	Fit for use with the NBÜ (~ SAFI)
Oerlikon-Bührle	SB 3	May 1959	Accepted for use in conjunction with the Est 3e type brake
	SBS 100	March 1986	
Davies and Metcalfe	BPA 1	December 1995	Fit for use with the NBÜ (~ SAFI)
MZT HEPOS	VBK 100	September 1998	Fit for use with the NBÜ (~ SAFI)

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Leaflet 535-2: Standardisation and positioning of steps, end platforms, gangways, handrails, tow hooks, automatic coupler and brake valve controls on wagons, 3rd edition, January 1978 and 7 Amendments

Leaflet 540: Brakes, air brakes for freight trains and passenger trains, 4th edition, June 2002

Leaflet 542: Brake parts - Interchangeability, 4th edition, January 1982 and 4 Amendments

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Leaflet 580: Inscriptions and markings, route indicators and number plates to be affixed to coaching stock used in international traffic, 6th edition, January 1990 and 3 Amendments

2. Minutes of meetings

International Union of Railways

Sub-Commission for Braking (Study 5/T/FIC - Revision of leaflets. Addition to Leaflet 541-1 - Section IV), January 1989

Sub-Commission for Braking (Study 5/T/FIC - Revision of leaflets. Revision of Section V and new provisions relating to brake pipe emptying accelerators), April 1989

Sub-Commission for Braking (Study 5/T/FIC - Revision of leaflets. Request by DB to change the shape of the packing ring of the coupling heads and the contours of the thread links, with amendment to Appendices 4 and 5 of Leaflet 541-1), January 1990

Sub-Commission for Braking (Study 5/T/FIC - Revision of leaflets. Examination of the layout of brake coupling links mounted on wagons fitted with 150 mm stroke side buffers), January 1991

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Sub-Commission for Braking (Study 5/T/FIC - Revision of Leaflet 541-1. Section II - Alarm signals and air release devices for emergency braking. Section V - Brake pipe emptying accelerators. Adapt conditions to the operation of the emergency brake override device (SAFI) so that when the emergency brake is applied, the train pipe pressure does not fall below 2 bars), January 1994

Sub-Commission 5T for Braking (Study 5/T/36 - Acceptance conditions for brake gear.

a) JZ request for acceptance of the VBK 100 type of quick-release pipe manufactured by the firm MZT-HEPOS, September/October 1998

b) BR request for approval of a quick-release pipe (type BPA1) developed by Davies and Metcalfe), January 1996

Joint Sub-Commission for Wagons (Study 45/B/FIC - Introduction of the use of 150 mm stroke buffers), January 1990

Rolling Stock Committee (Study 45/B/40 - Examination of the following points concerning brake isolating cocks at the request of SC 4D for Safety:

- stabilisation of the "open" and "closed" positions,*
- the possibility of increasing the diameter of the air release outlet in order to obtain a more significant braking effect if brakes are activated inadvertently), September 1989*