APTU Uniform Rules (Appendix F to COTIF 1999)

Uniform Technical Prescriptions (UTP) applicable to Rolling Stock, subsystem

FREIGHT WAGONS - (UTP WAG) - ANNEX I

BRAKING

INTERFACES OF BRAKING INTEROPERABILITY CONSTITUENTS

Explanatory note:

The texts of this UTP which appear across two columns are identical to corresponding texts of the European Union regulations. Texts which appear in two columns differ; the left-hand column contains the UTP regulations, the right-hand column shows the text in the corresponding EU regulations. The text in the right-hand column is for information only and is not part of the OTIF regulations.

OTIF UTP	*Corresponding text in EU regulations* [1]	*EU ref.* [2]

I.1 DISTRIBUTOR

The specification of the interoperability constituent distributor is described in 4.2.4.1.2.2 Braking Power and 4.2.4.1.2.7 Air Supply

I.1.1 DISTRIBUTOR INTERFACES

I.1.1.1 Distributor valve

A distributor is a pneumatic control valve. Its function is to control its output pressure as an inverse function of the variation of its input pressure. See Figs. I.1 and I.2. The performance of a distributor is specified by the following:

- Graduable application and release of the brakes
- Brake Application Time
- Brake Release Time
- Manual Distributor Release Valve
- Automatic operation
- Sensitivity and Insensitivity

[1] TSI Freight Wagons – The Annex to the Commission Decision 2006/861/EC published in the EU Official Journal L344 on 08.12.2006 as amended by Commission Decision 2009/107/EC published in EU Official Journal L45 on 14.02.2009.

[2] If no EU reference is indicated, it means that the chapter/section number is the same as in the OTIF text.

Fig.: I.1

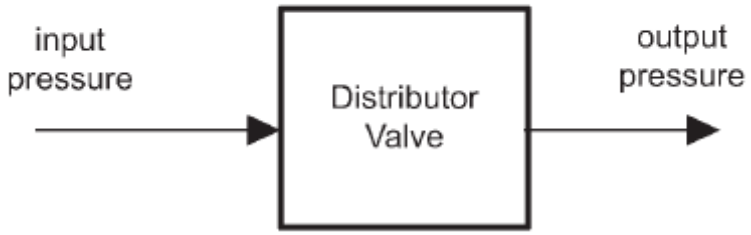
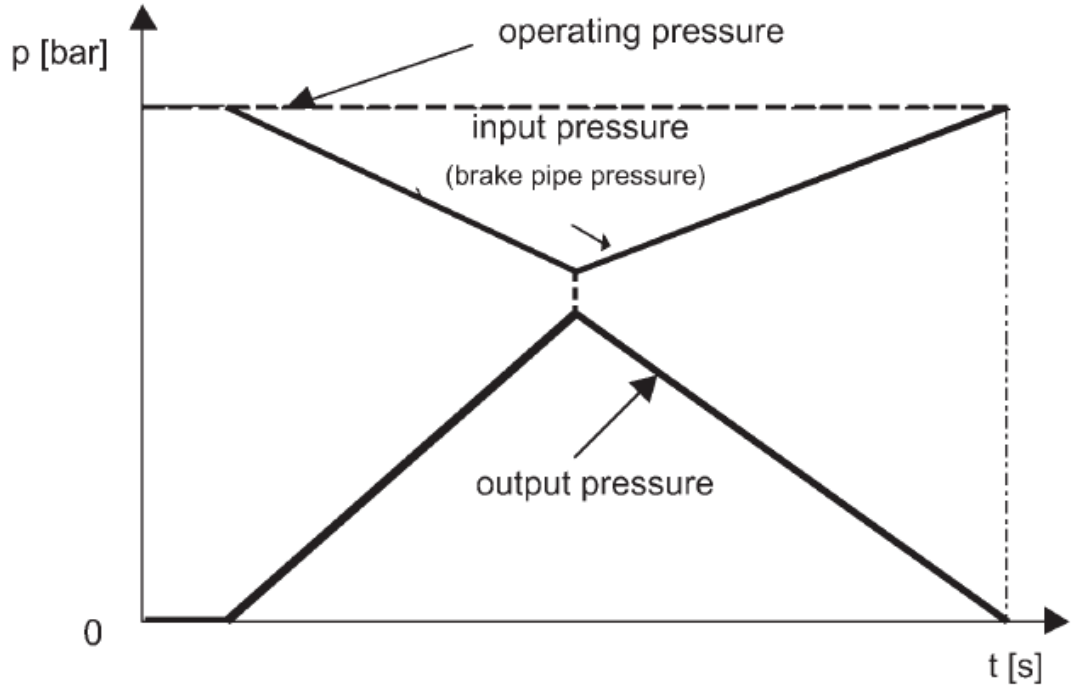


Fig.: I.2



The distributor is controlled by the pressure in the brake pipe. The normal operating pressure of the brake pipe in a train shall be 5 bar with the Driver's Brake Controller in the 'Release' position; however, the distributor shall function normally with a brake pipe pressure of 4 to 6 bar. The pressure drop in the brake pipe to obtain a full application must be 1.5 bar ± 0.1. The maximum output pressure obtained with this drop is 3.8 bar ± 0.1. The output pressure usually is limited to a maximum value. The normal operating pressure of the brake pipe is 5 bar, but the distributor must be able to operate normally with a brake pipe between 4 and 6 bar. The rate of change of the distributor output pressure shall be determined by the rate of change of the input pressure. (See Fig. I.3).

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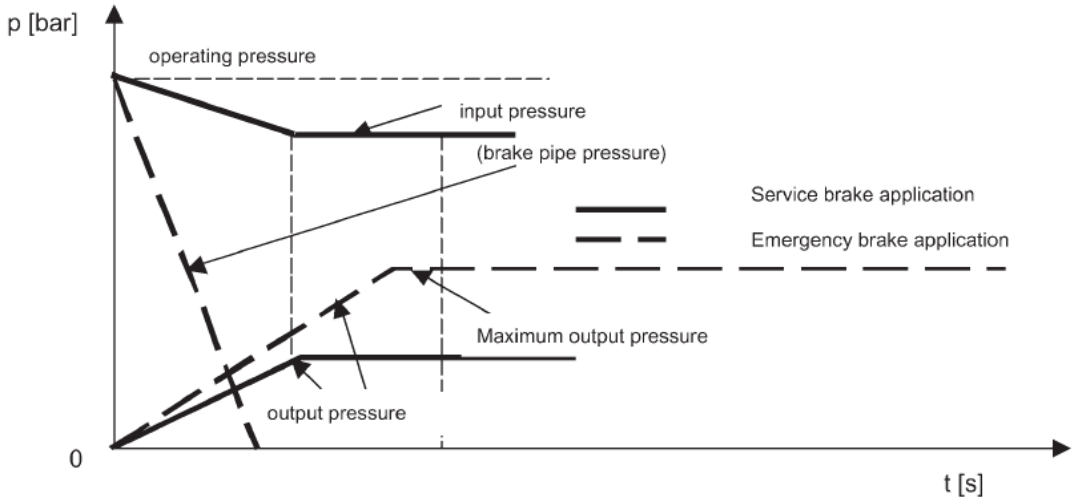
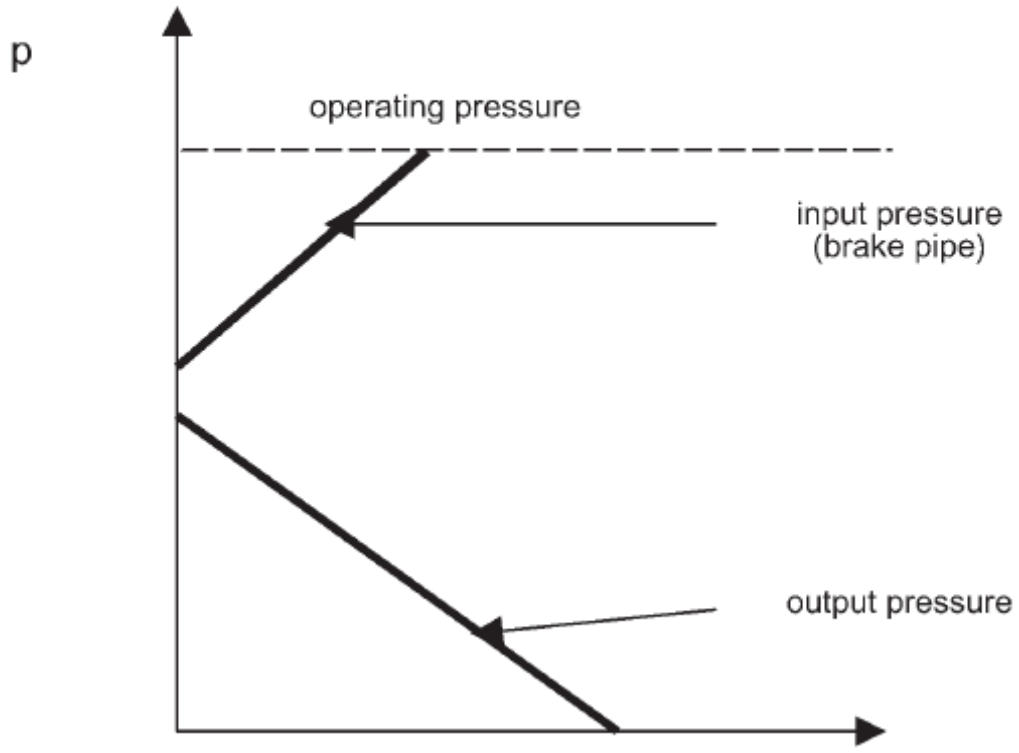
Fig.: I.3



The distributor shall cause the brakes on a wagon to release by venting the brake cylinder pipe to atmosphere in response to an increase in brake pipe pressure following a brake application, see Fig. I.4.

Fig.: I.4



It shall be possible to make small applications and releases of the output pressure by varying the input pressure and a change of 0.1 bar on the input will cause a change in the output. The variation in output pressure with the same input pressure shall not vary more than 0.1 bar between an application and release.

The distributor shall not connect the brake pipe and reference control reservoir until the output pressure is less than 0.3 bar. This connection shall be allowed when the brake

OTIF UTP	*Corresponding text in EU regulations* [1]	*EU ref.* [2]

pipe has risen to within 0.15 bar of the operating pressure.

The Brake Application Time is the time for increasing output pressure from when it starts to rise from 0 bar up to 95 % of the maximum output pressure when input pressure is reduced to 0 bar in less than 2 seconds. This is 3 to 5 seconds in 'P' single stage, or 3 to 6 seconds in 'P' with a load/empty or load proportional brake, and 18 to 30 seconds in 'G' in a single-pipe operation.

The Release Time is the time for reducing the output pressure from when it starts to fall from maximum down to 0.4 bar when input pressure is increased up to the operating pressure starting from 1.5 bar below it, in less than 2 seconds. This is 15 to 20 seconds in 'P' and 45 to 60 seconds in 'G'. For freight wagons with a total weight higher than 70 tonnes the time in 'P' can be 15 to 25 seconds.

The distributor shall be able to be utilised either as 'G', 'P' or 'G/P' or in the latter case there will be a changeover device allowing the change over between the timings.

There shall be a Manual Release Function, which requires deliberate and intentional manual action in order to cancel the brake application (to release the distributor valve).

The distributor must be Automatic and have the ability to ensure the maximum output pressure in case of loss of input pressure.

The distributor must be inexhaustible and have the capability to give at least 85 % of the maximum output pressure, by an emergency application, under all operating conditions. The distributor shall maintain the output pressure compensating for leakage in the output volumes whilst there is air in the auxiliary reservoir.

The filling of the auxiliary and control reservoirs on one vehicle shall be such that the release and filling of the reservoirs at the rear of the train are not impeded. It must also be such that there are not significant variations in the brake pipe pressure likely to cause operation of the brakes on the neighbouring vehicles.

The distributor must operate normally in response to the input pressure when adjacent distributors are isolated or not functioning.

The Sensitivity of the distributor will be such that it will come into operation within 1.2 seconds with an input pressure reduction of 0.6 bar in 6 seconds from the normal operating pressure.

The Insensitivity of the distributor is such that it will not come into operation with an input reduction from the normal operating pressure of 0.3 bar in 60 seconds.

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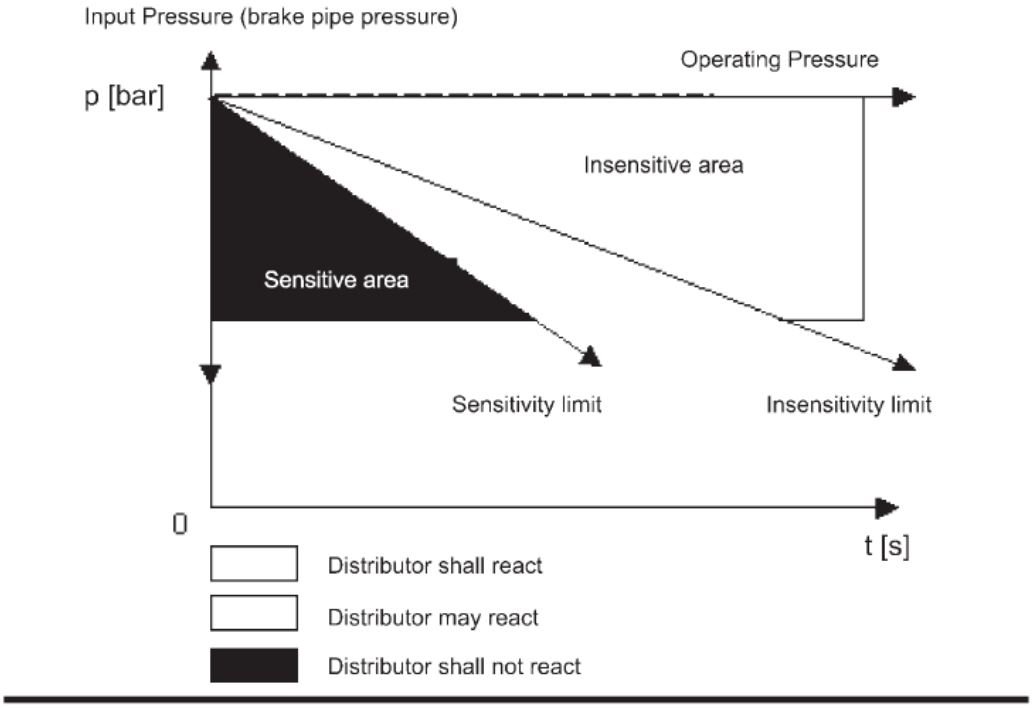
Fig.: I.5



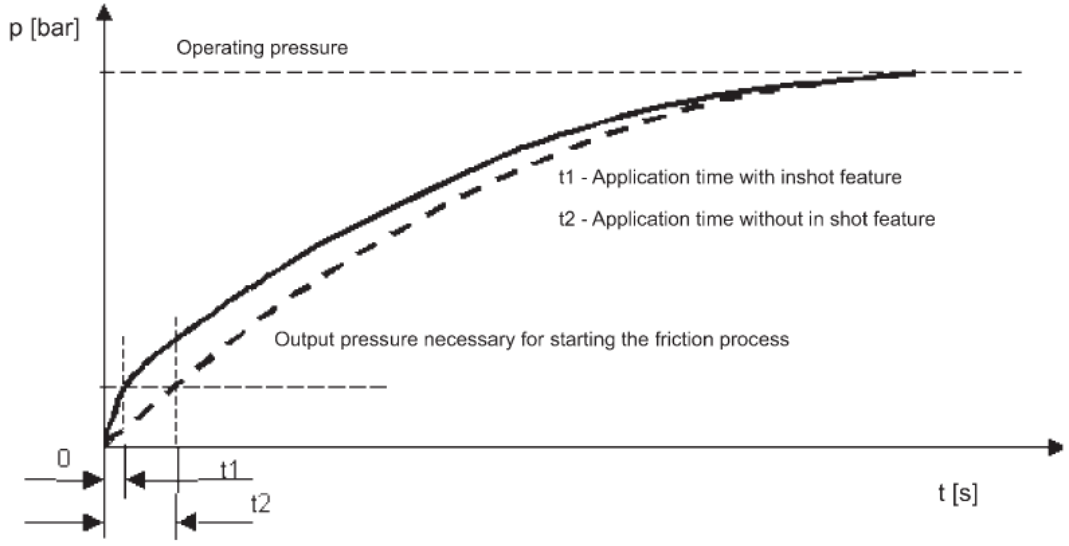
There shall be a Quick Service Function (accelerator) in a distributor valve which allows, when first applying the brake from the released position, the local fast venting of brake pipe pressure by a maximum of 0.4 bar when the brake pipe pressure at the front of the train falls by 0.3 bar. This is to provide pneumatic brake signal transmission through a train.

There can be an Operating pressure overcharge which allows a build up of brake pipe pressure above normal operating pressure to 6 bar to reduce the release time and this can be present for up to 40 seconds in 'G' mode and 10 seconds in 'P' mode. The distributor shall not overcharge the control reservoir during this brake pipe overcharge period. After a full release of the brakes the distributor shall not operate when the brake pipe pressure is raised to 6 bar for 2 seconds, then reduced to 5.2 bar in 1 second followed by a return to normal operating pressure.

The distributor shall have an Inshot function, which allows, when operated in the braking mode 'G', a faster increase of the output pressure at the beginning of brake application. This will be about 10 % of the maximum output pressure. The purpose is quick build up of the necessary pressure for initiating the friction braking process.

OTIF UTP	*Corresponding text in EU regulations* [1]	*EU ref.* [2]

Fig.: I.6



I.2 RELAY VALVE FOR VARIABLE LOAD/AUTOMATIC EMPTY-LOAD CHANGE OVER BRAKE

I.2.1 RELAY VALVE FOR VARIABLE LOAD

A relay valve is a device that varies the application force of the brake system according to the mass of the wagon. Changes in the mass of the wagon shall automatically and continuously cause the brake force to be varied without significant delay. It shall not react to short shocks or short variations of the load at the wheels. It shall not alter the performance characteristics of the air-brake
(see UTP WAG point 5.4.3.3) | (see TSI, ch. 5.3.3.1).[wrong ref]
except in the case of brakes with pneumatically-controlled devices for the variation of the braking power, the release time is the time which must elapse before a pressure of 0.4 bar is seen in the relay control chamber (pilot pressure). During braking, the established brake force due to a brake demand shall not be changed by this device. It shall provide a minimum of 5 steps of brake in the service range between minimum and maximum brake force in all cases from an empty to a loaded wagon. Any air consumption of this device shall be as low as possible and not have any effect on the braking of the vehicle.

I.2.2 RELAY VALVE FOR AUTOMATIC EMPTY/LOAD CHANGE OVER

An Empty/Load relay valve is a device that varies the application force of the brake system at a single point in the mass range of a wagon. The empty or loaded position of this relay valve shall be automatically obtained when the mass of the wagon becomes respectively lower or higher than the changeover mass. Its performance shall not be affected by shocks and vibrations. A relay valve for empty/load must not alter the performance characteristics of the air brake
(see UTP WAG point 5.4.3.3) | (see TSI, ch. 5.3.3.1).[wrong ref]

I.3 WHEEL SLIDE PROTECTION DEVICE

A Wheel slide protection (WSP) device is part of a system designed to make the best use of available adhesion by a controlled reduction and restoration of the brake force to prevent wheel sets from locking and uncontrolled sliding, thereby optimising stopping

OTIF UTP	*Corresponding text in EU regulations* [1]	*EU ref.* [2]

distance. The WSP device shall not alter the functional characteristics of the brakes.

The speed of rotation of the wheelsets is calculated on the basis of information provided by sensors, and monitored by an automatic control system. These transmit commands to the WSP dump valves to reduce or restore braking power, either totally or partially.

The system shall take permitted wheel diameter differences on a given vehicle into account when evaluating speed.

The power supply to the WSP shall be so designed to ensure that the WSP powers up and that power is available when the vehicle is set in motion. WSP systems require a power supply to function and this can be provided by the vehicles or by the WSP itself.

WSP systems shall be designed to function correctly allowing for fluctuations in voltage of ± 30 %. If the voltage fluctuation exceeds this limit, the WSP shall shut down without disturbing the braking system. As soon as the supply voltage reverts to the permitted range, the WSP shall automatically return to normal functioning.

The WSP installation shall have its own protected circuit. Fuses or circuit breakers for the WSP shall be separated from others on the vehicle such that they cannot be confused with or operated in the same manner. Whenever there is power available, the WSP shall be supplied. Automatic cut-off of the supply is only permissible in the case of sleep-mode (no movement) or battery protection for battery safety reasons (degraded battery situation or low voltage caused by long-term lack of supply).

The WSP shall be designed to minimise air consumption.

Further specification of the interoperability constituent, wheel slide protection device, is described in 4.2.4.1.2.6 and 4.2.4.1.2.7 within the
UTP WAG. | TSI.

I.4 SLACK ADJUSTER

Slack adjusters are necessary to automatically maintain a nominally constant clearance between the friction pair (wheel and brake block or disc and brake pad) in order to maintain the braking characteristics and guarantee the braking performance.

The slack adjuster shall not absorb more than 2 kN of the brake application force. The performance characteristics of the slack adjuster shall not be varied by environmental conditions (vibrations, winter conditions, etc.).

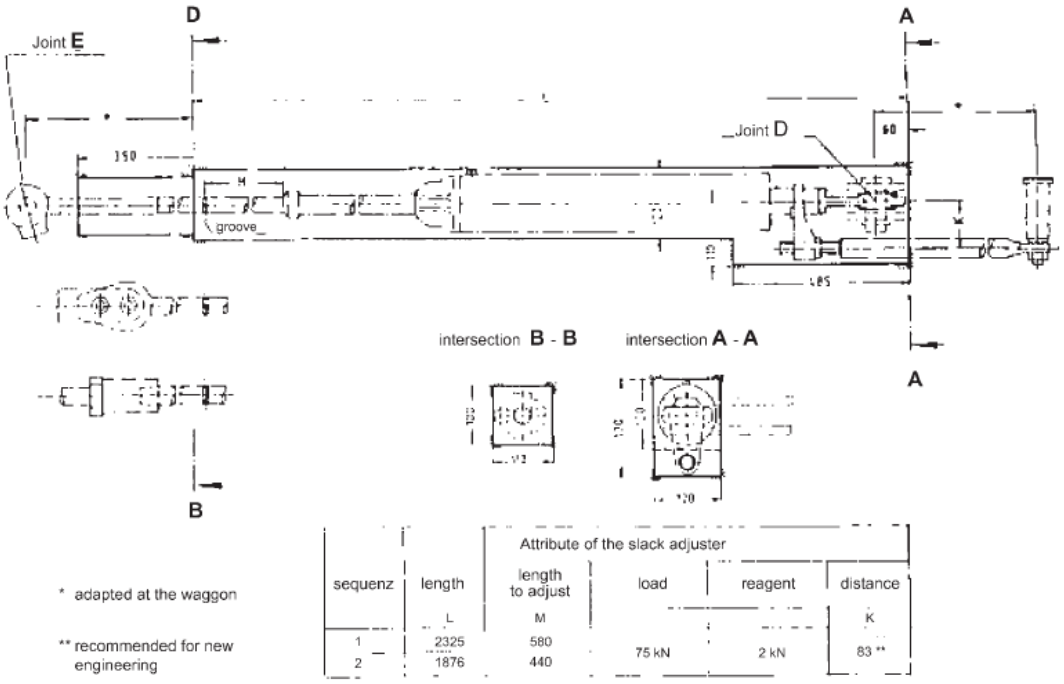
There is no requirement for interchangeability of slack adjuster, but if they are to be interchangeable the following space envelopes apply (only the values in the table are necessary).

Interchangeable Slack adjusters which are placed within the underframe shall not exceed the following space envelope :

– for loads up to a maximum of 75 kN.

OTIF UTP | *Corresponding text in EU regulations* [1] *EU ref.* [2]

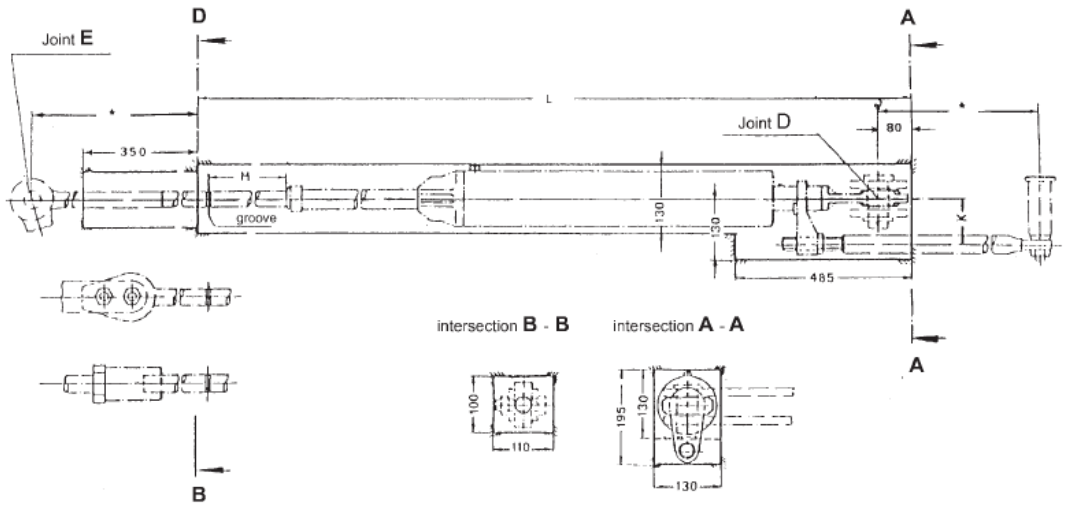
Fig.: I.7



sequenz	length	Attribute of the slack adjuster: length to adjust	load	reagent	distance
	L	M			K
1	2325	580	75 kN	2 kN	83 **
2	1876	440			

– for loads greater than 75 kN.

Fig.: I.8



sequenz	length	Attribute of the slack adjuster: length to adjust	load	reagent	distance
	L	M			K
1	2 390	580	85 until 130 kN	2 kN	83 **
2	1 940	440			
2	1 640	280			

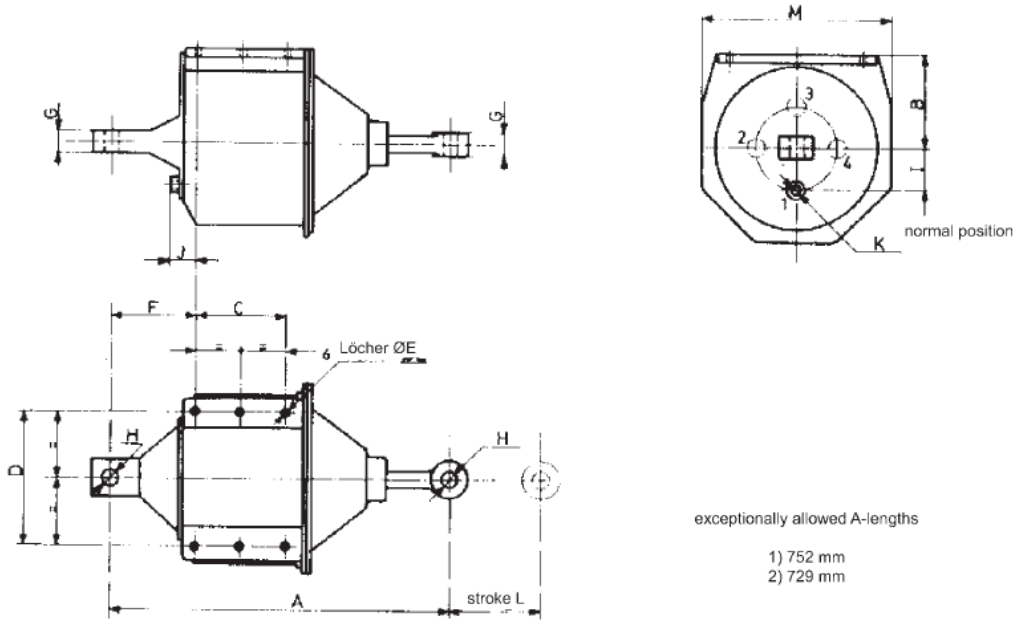
OTIF UTP | *Corresponding text in EU regulations* [1] *EU ref.* [2]

I.5 BRAKE CYLINDER/ACTUATOR

There is no requirement for interchangeability of brake cylinders/actuators, but if they are to be interchangeable the following clause applies (only the values in the table are necessary).

Interchangeable brake cylinders for use with a tread brake, that are placed in the underframe or in a bogie have to have the following connecting dimensions in figure I.9.1:

Fig.: I.9.1



exceptionally allowed A-lengths

1) 752 mm
2) 729 mm

Brake-Cylinder construction	Dimensions												
	A	B	C	D	E	F	G	H	I	J	K	L	M
Ø 406 (16")	1) 890	224	228	334	27	207	40	31	100	68	1"*	230	(476)
Ø 300/305 (12")	2) 814	170	228	254	18	182	30	31	90	44	1"*	220	(364)

* cylindric drilling GAZ - G 1 H

The diameters of the pins and bushes of the articulated joints of the interchangeable brake cylinders shall conform to the following figure I.9.2.

OTIF UTP | *Corresponding text in EU regulations* [1] *EU ref.* [2]

Fig.: I.9.2

2-AXLE AND BOGIE WAGONS SUITABLE FOR ORDINARY, S AND SS (20+ PER AXLE) RUNNING CONDITIONS
STANDARDISATION OF THE DIMENSIONS OF THE BRAKE RIGGING ARTICULATED JOINTS

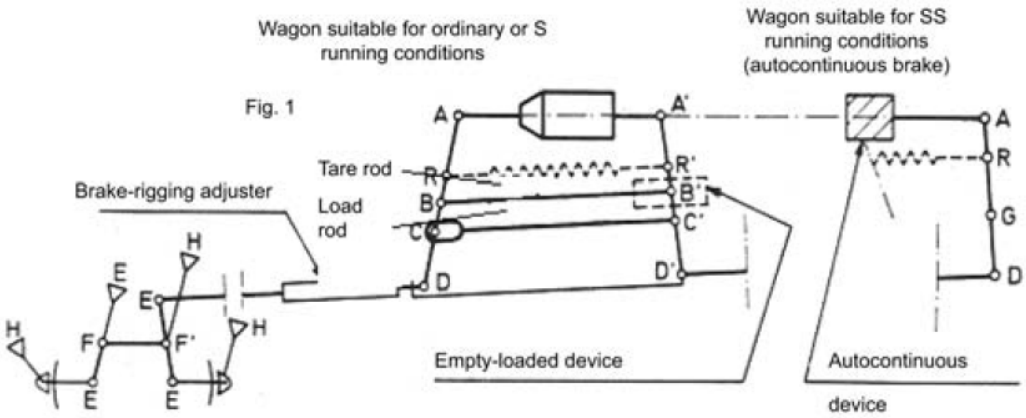
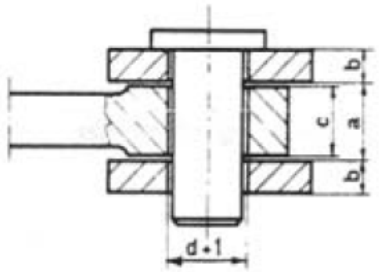


Fig. 2



		Diameter «d» of the pin (1)										
		Articulated joints										
		A	B	C	D	E	F	G	H	R(4)	b	c
Ordinary and S running conditions	Horizontal lever (2)	30	36	50	36	-	-	-	-	30	15	30 or 40 (6)
	Vertical lever (2)	-	-	-	-	36	50	-	24	-	20	40
SS running conditions	Horizontal lever (2)	36	-	-	40	-	-	60	-	30	20	40
	Vertical lever (3)	-	-	-	-	40	60	-	24	-	20 (5)	40

(1) Steel Rm ≥ 370 N/mm² subjected to a suitable superficial hardening treatment.
(2) Steel Rm ≥ 370 N/mm².
(3) Steel Rm ≥ 520 N/mm².
(4) In the case of an external return spring.
(5) Thickness increased to 30 mm in the centre part.
(6) 30 mm for 2-axle wagons (12" cylinder); 40 mm for bogie wagons (16" cylinder).

I.6 PNEUMATIC HALF COUPLING

The pneumatic half couplings for the automatic air brake pipe shall conform to Figs. I.10, I.12 and either I.13 or I.15. The nipple to connect to the end cock shall be as shown in Fig. I.10 and have a truncated internal Whitworth (BSPP) G 1 1/4" pipe thread.

The pneumatic half couplings for the main reservoir pipe shall conform to Figs. I.11, I.14 and either I.13 or I.15. The nipple to connect to the end cock shall be as shown in Fig. I.10 (and is the same as for the automatic air brake pipe) and have a truncated internal Whitworth (BSPP) G 1 1/4" pipe thread.

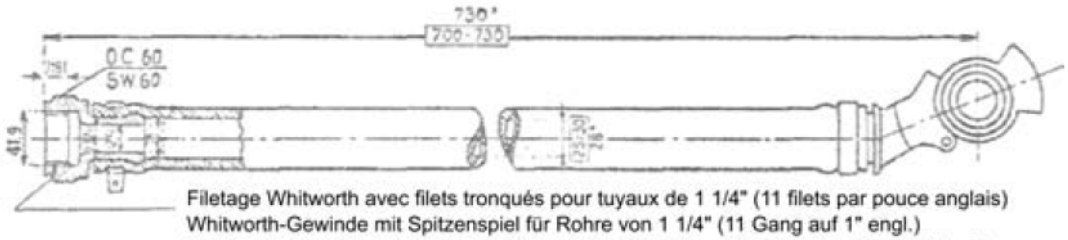
The internal diameter of the coupling hoses for both pipes shall be between 25 and 30 mm. The length shall be as shown in Figs. I.10 and I.11. The length of these hoses when used with a swing head autocoupler shall be increased to 1080 mm for the automatic air brake pipe and 930 mm for the main reservoir pipe instead of the dimensions shown in I.10 and I.11. Rubber hoses will generally be used for these couplings, but metallic hoses may be used if they are flexible enough.

The coupling heads for the automatic air brake pipe shall conform to Fig. I.12. The coupling head for the main reservoir pipe shall conform to Fig. I.13. Both Figs. show the mandatory dimensions to ensure coupling, but the shape and the other dimensions are able to be varied provided the heads are designed to offer the least possible resistance to air flow. The coupling heads can be made as a single piece or two pieces as shown by the * in Figs. I.12 and I.14. If the coupling head is made in a single piece the seal shown in I.13 shall be used, otherwise the seal shown in Fig. I.15 shall be used.

Fig. I.10

Note : Key to symbols used with dimensions in the Figs.

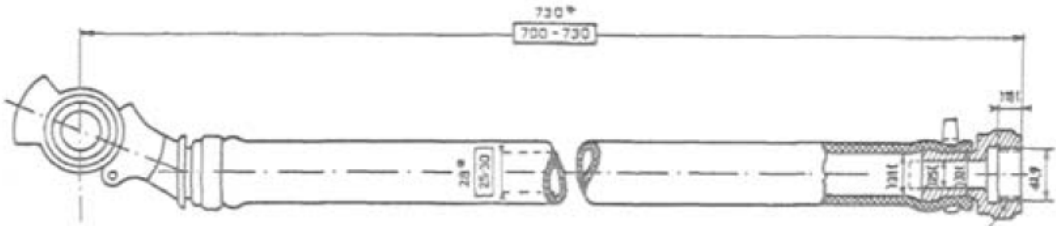
▭	Mandatory dimensions
)....(	Minimum dimensions
(.....)	Maximum dimensions
*	Recommended dimensions



Filetage Whitworth avec filets tronqués pour tuyaux de 1 1/4" (11 filets par pouce anglais)
Whitworth-Gewinde mit Spitzenspiel für Rohre von 1 1/4" (11 Gang auf 1" engl.)
Whitworth threading with truncated threads for 1 1/4" pipe (11 threads per English inch)

Fig. I.11

Pneumatic half coupling — Main Reservoir Pipe



Filetage Whitworth avec filets tronqués pour tuyaux de 1 1/4" (11 filets par pouce anglais)
Whitworth-Gewinde mit Spitzenspiel für Rohre von 1 1/4" (11 Gang auf 1" engl.)
Whitworth threading with truncated threads for 1 1/4" pipe (11 threads per English inch)

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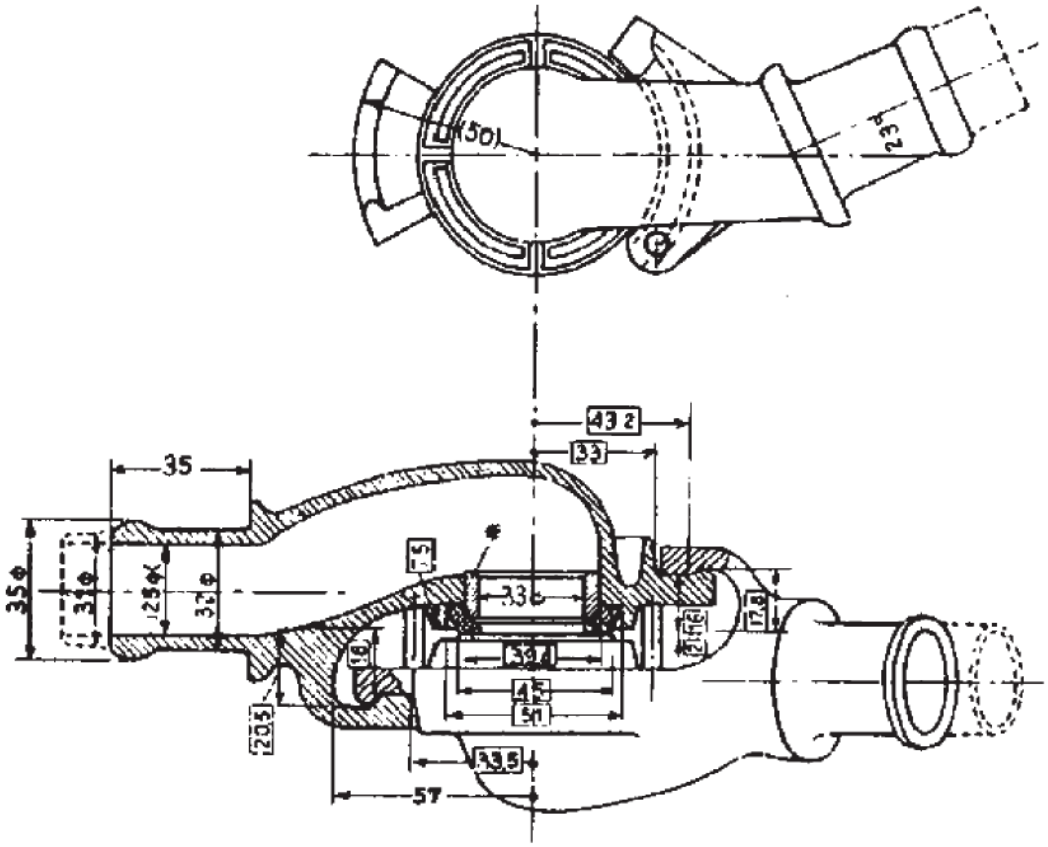
Fig. I.12

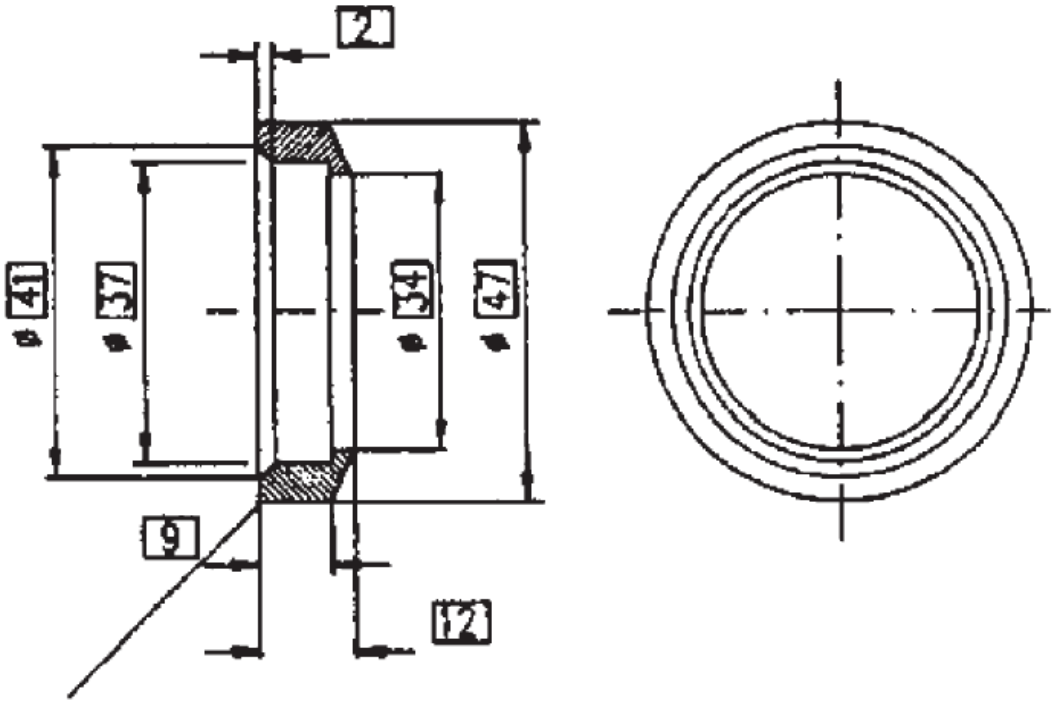
Coupling Head — Brake Pipe



OTIF UTP | *Corresponding text in EU regulations* [1] *EU ref.* [2]

Fig. I.13

Seal — Single piece coupling head



Bord chanfreiné
Kante gebrochen
Bevelled edge

OTIF UTP | *Corresponding text in EU regulations* [1] *EU ref.* [2]

Fig. I.14

Coupling Head — Main Reservoir Pipe

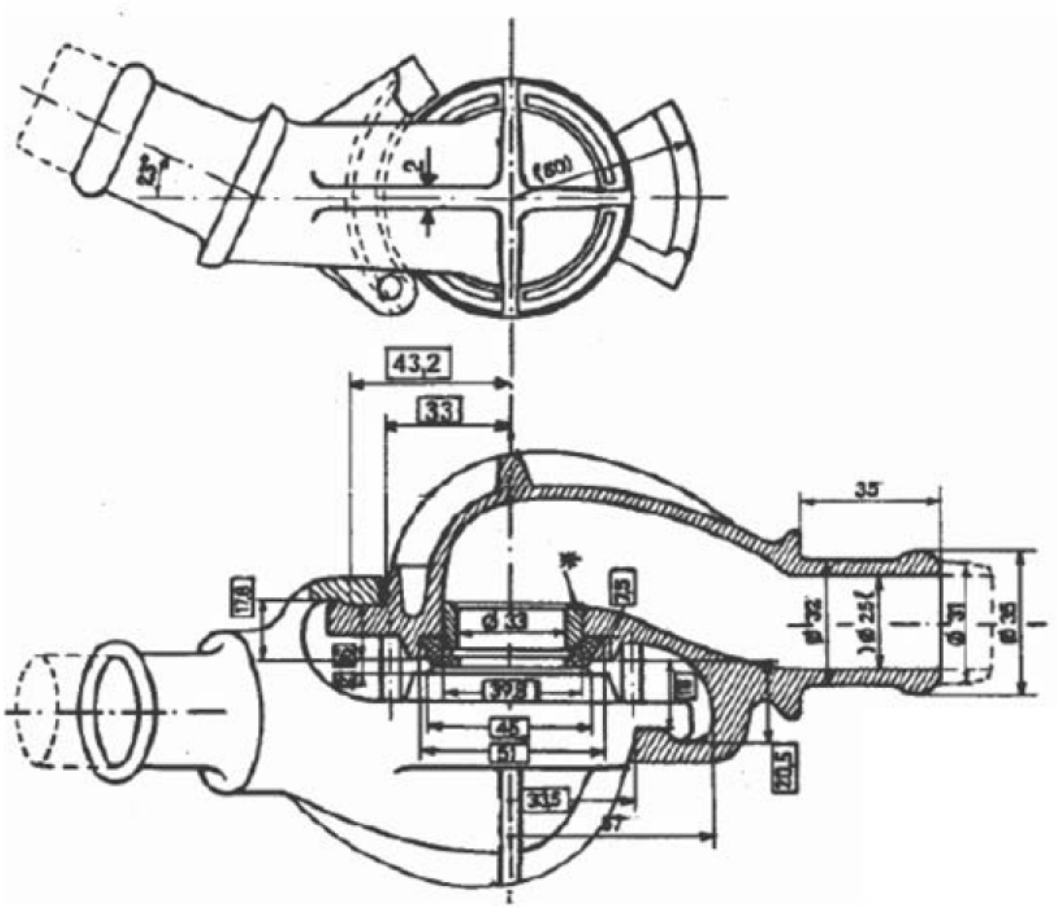
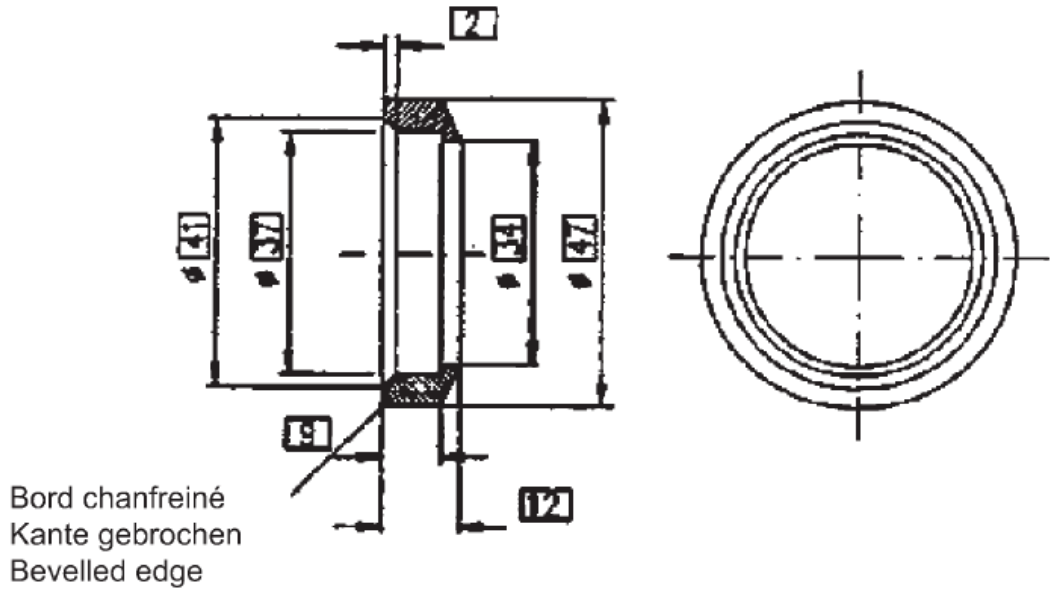


Fig. I.15

Seal — Two piece coupling head



I.7 END COCK

An end cock is a device mounted in a pipe that will allow airflow through the pipe when the end cock is in the open position. When moved to the closed position it will prevent flow through the pipe and will vent the pipe on one side on the end cock.

The following functional requirements are defined for the end cock to ensure the airflow through the brake pipe and main reservoir pipe. The overall dimensions of the end cocks shall comply with Figs. I.17 and I.18 or I.19 and I.20 depending on the application on a vehicle with out or with an automatic coupler.

Open and Closed positions: The handle position shall be the same on any vehicle, so the opening and closing of the cock shall be achieved by turning its spindle through a minimum of 90º and not more than 100º, although a rotation angle of 125º is permissible for cocks to be fitted to wagons without automatic couplers. Stops shall be provided at the extremes of rotation, so that the open and closed positions are achieved positively. The closed position is where the flow path between inlet and outlet ports is closed and the venting passage is open and connected to the pipe on the hose and coupling side of the cock. The cock handle is closed in the vertically upward position on the vehicle. The open position is where the flow path between inlet and outlet ports is fully open, and the venting passage is closed. The cock handle is open in the approximately horizontal position.

Where a control shaft is used to operate the end cock it must be possible for the plug to be fitted with a forked lever in such a way that the rotation angle between the extreme conditions of the cock be symmetrical in relation to the perpendicular line to the longitudinal centre line of the cock (see Fig. I.20).

Venting port: The end cock shall incorporate a venting port with a minimum area of 80 mm^2, arranged so that when the cock is closed the compressed air from the coupling hose end of the cock (intake connection to vehicle) can be exhausted to atmosphere. Venting shall have commenced when the operation of the end cock has reduced the

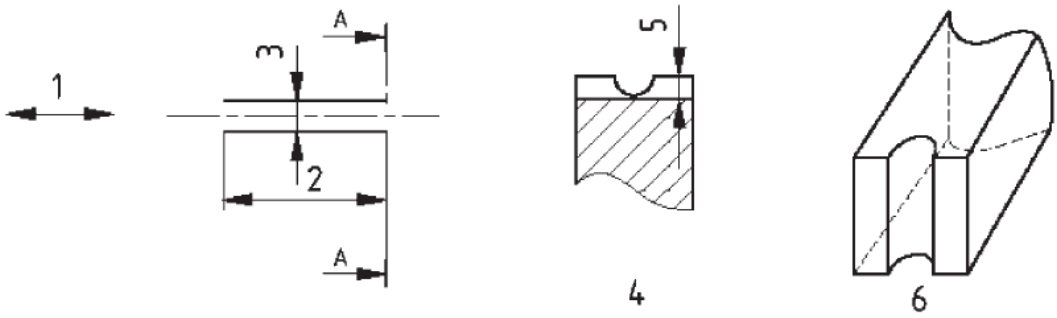
cross-sectional area of the bore of the end cock by one third. The venting port shall not be able to be obstructed when the cock is mounted on the end vehicle.

Torque: All end cocks with mechanical detent, or with latch engaged shall not be operated by vibration or shocks. The end cock shall be able to be manually operated so the torque shall reach a value in the range of 9 Nm to 20 Nm for end cocks with detent and a maximum of 6 Nm for cocks with latch.

Spindle handle of the end cock: Where the handle is detachable and the unique angular relationship between it and the spindle is not construction ally assured, it shall not be possible to assemble the handle to the spindle except where the axis of the handle and the diametrical spindle mark are aligned and the spindle shall be marked in accordance with Fig. I.16 or as otherwise specified by the purchaser. The relative position of the handle and spindle when assembled shall remain under all conditions of operation and environment. If the handle of the end cock is detachable from the spindle it shall be positively located.

Fig. I.16

Marking on end of the spindle



1: Axis of through way in spindle
2: Minimum of half the diametral dimension of the spindle at the handle
3: 1,5 to 2 mm
4: section A-A
5: 1 to 1,5 mm
6: Example

Fall time: The air passages shall be designed to minimise the losses within the cock and the cross-sectional area shall not be smaller than the cross-sectional area of a plain pipe of 25 mm internal diameter. The fall time in pressure on opening the end cock should not be longer than that for an equivalent pipe of the same nominal diameter.

Pneumatic shocks: The components shall be able to resist the pneumatic shocks to which the cock is subject when opening quickly.

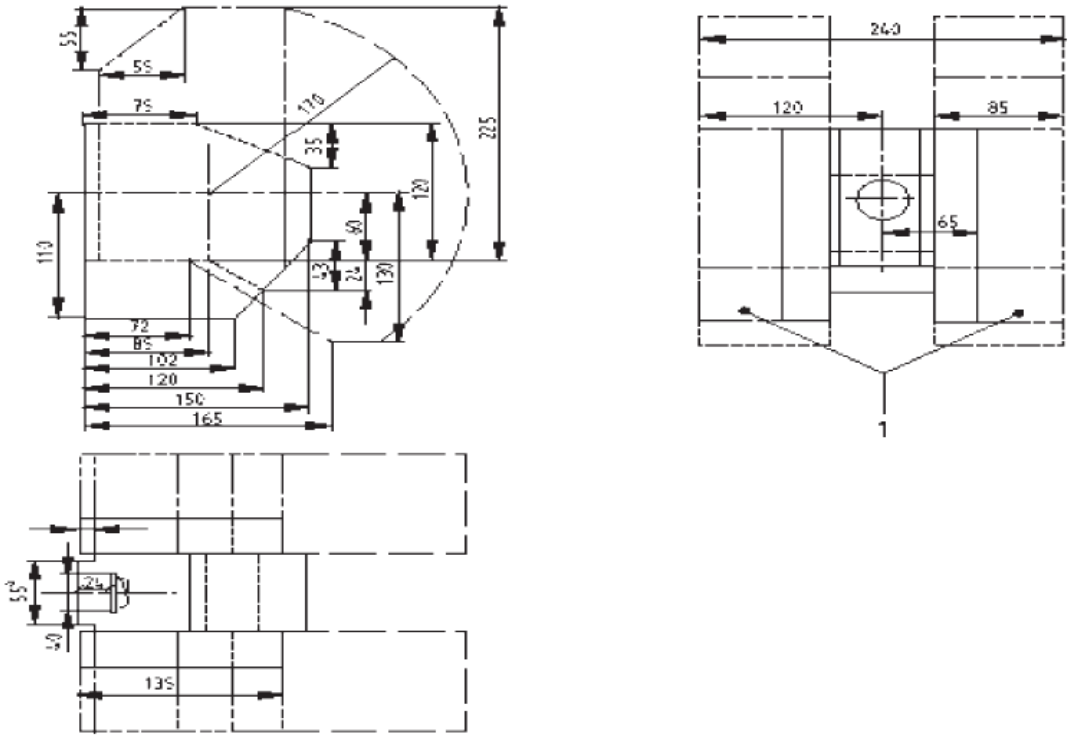
Connections: The body of the end cock shall have an internal Whitworth (BSPP) G1” or G1.1/4” thread, for connection to the brake or main reservoir pipe. The end of the body adjacent to the internal threads shall be of hexagonal form or have flats (see Fig. I.17). If required by the Purchaser, the body end can have a flat sealing face for Flange type of connections. The body of the end cock shall have an external thread for connection to the coupling hose in accordance with Fig. I.18.

OTIF UTP	*Corresponding text in EU regulations* [1]	*EU ref.* [2]

Fig. I.17

Diagram showing the overall dimensions of the end cock

(Dimensional length unit is millimetre)



1: The necessary space for operating the stop-cock handle is required either at left or right only.
R = 1" or R = 1¼"
11 threads to the inch

NOTE: The dot-and-dash line —·—·— indicates the maximum radius within which the handle can be manouvered.

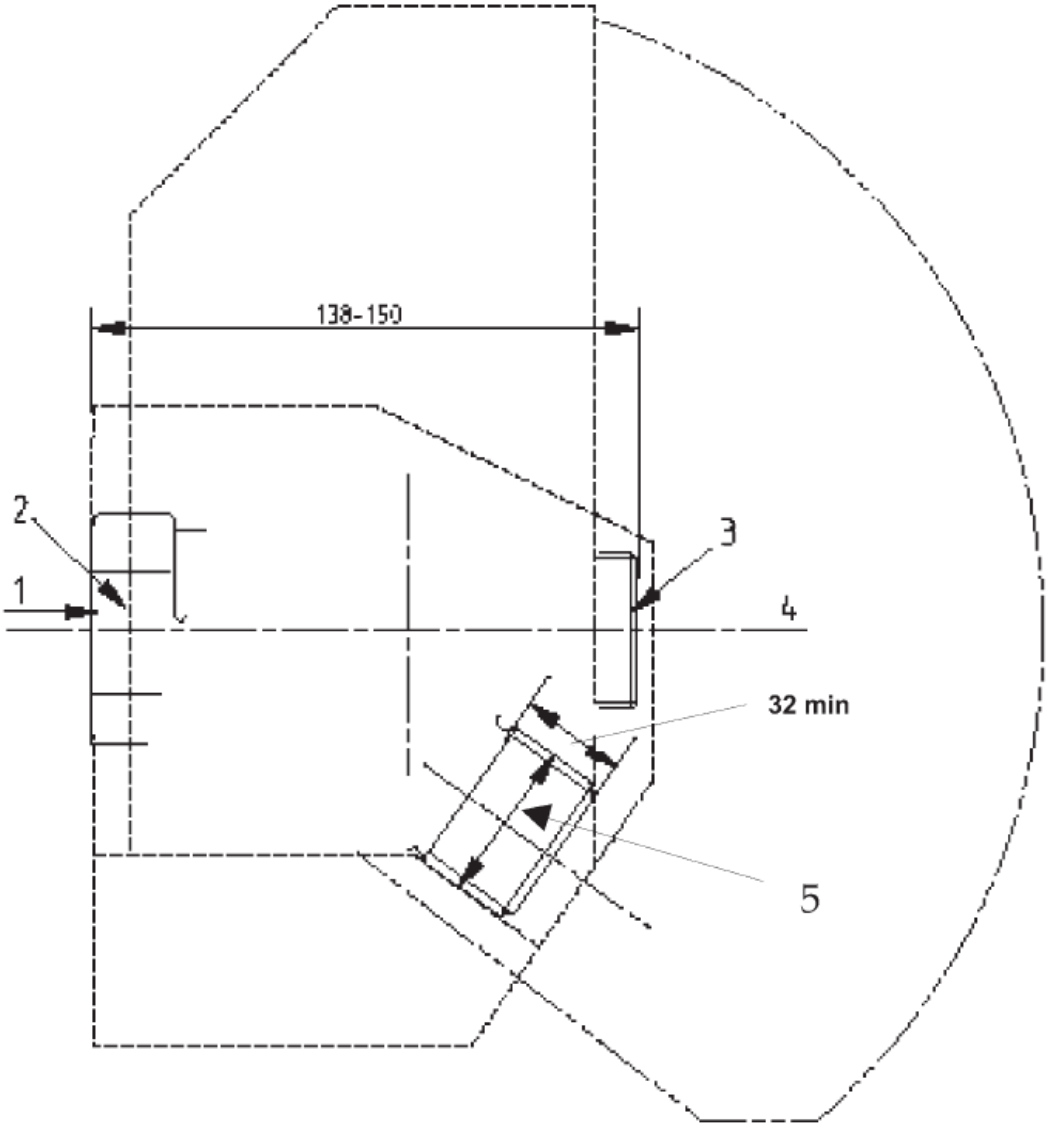
(a) 60 mm may be used as an alternative

OTIF UTP | *Corresponding text in EU regulations* [1] *EU ref.* [2]

Fig. I.18

End cock fitted with a spring locking device in the end positions

(Dimensional length unit is millimetre)



1: R = 1" or 1¼"
11 threads to the inch

2: Key opening width 55 mm
The key opening width of 55 mm is the standard value. The opening width of 60 mm is permitted as an alternative.

3: Stop-cock in horizontal position.

4: Longitudinal centre line.

5: Whitworth threading with truncated threads for 1¼" pipes.

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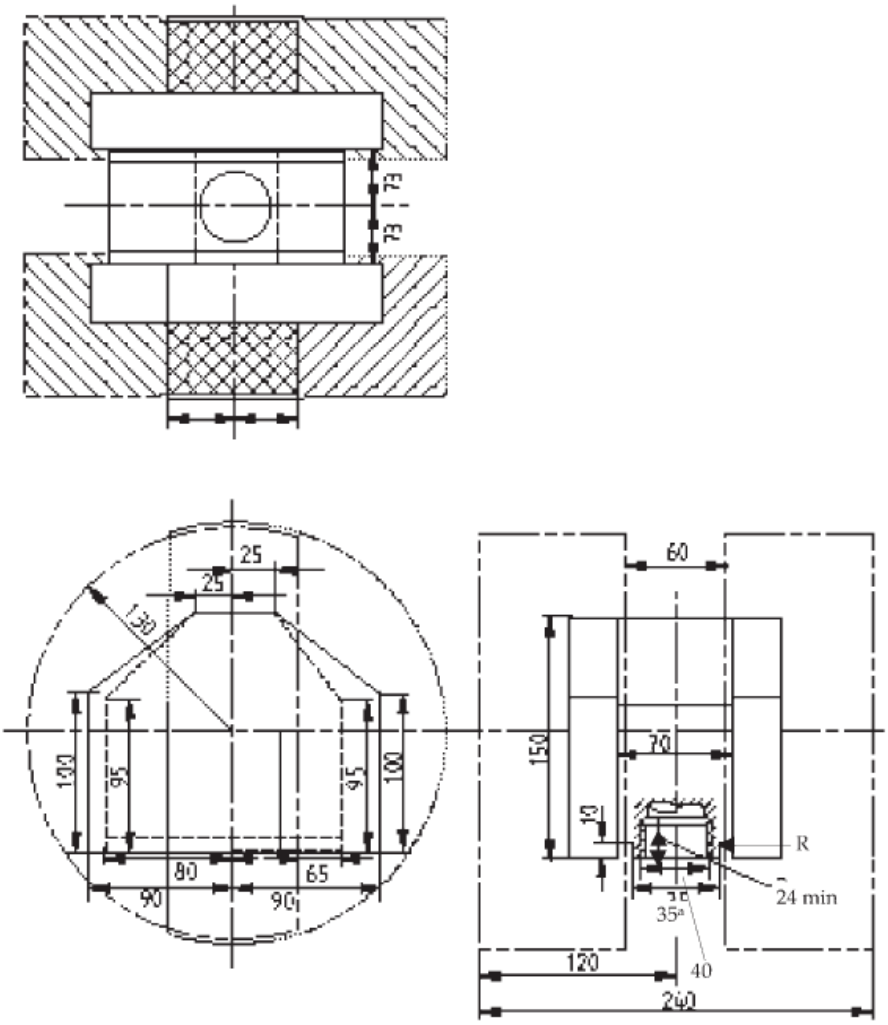
Fig. I.19

Diagram showing the overall dimensions of the end cock on vehicles fitted with automatic couplers

(Dimensional length unit is millimetre)



1: The necessary space for operating the stop-cock handle is required either at bottom or top of right-hand side or at bottom or top of left-hand side.
R = 1" or R = 1¼"
11 threads to the inch
NOTE: The dot-and-dash line —·—·— indicates the maximum radius within which the handle can be manouvered.

[a] 60 mm may be used as an alternative

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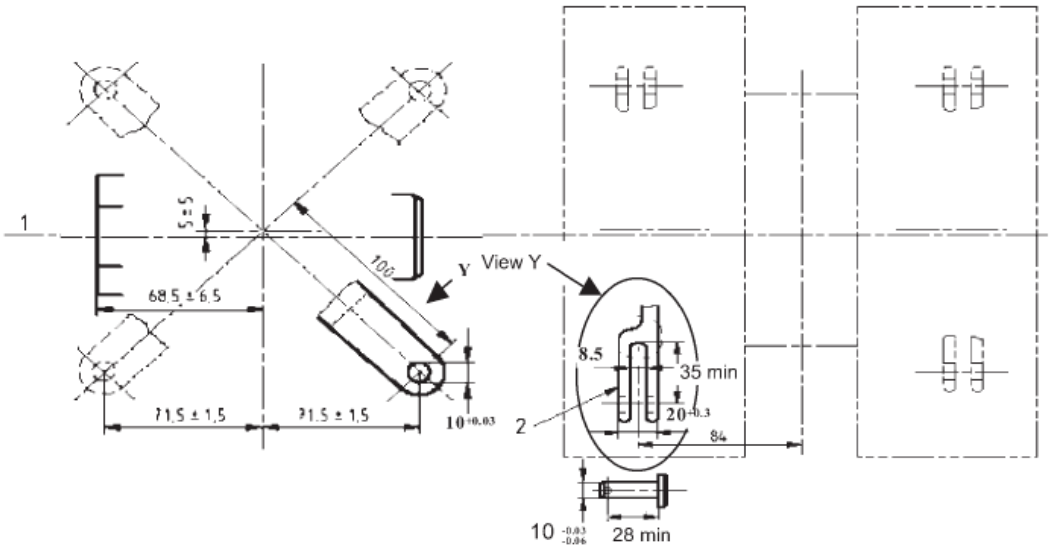
Fig. I.20

Connection dimensions for the end cock controls on vehicles equipped with automatic coupler

(Dimensional length unit is millimetre)

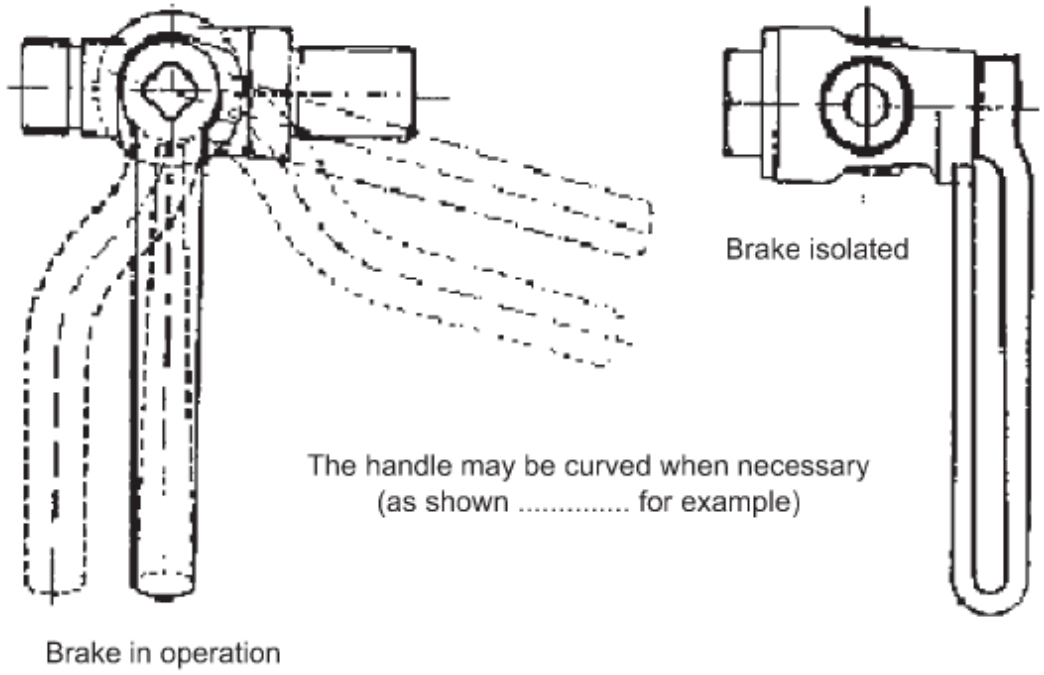


1:	Stop-cock
2:	Forked lever in vertical position
X:	The forked lever may be shaped differently in the X area if this proves to be necessary to keep within th distance from the stop-cock centre line (84 mm). The other end of the lever must be adapted to the stop-cock used.

I.8 ISOLATING DEVICE FOR DISTRIBUTOR

The handle of the isolating device must be in a vertical downward position when the brake is in use. Rotating the handle through a maximum angle of 90º shall isolate the brake. The cock handle shape shall conform to Fig. I.21

Fig. I.21



The isolating device shall be fitted to the vehicle in such a way that the isolated (closed) and active (open) positions are clearly visible and the device can be easily operated from one side of the vehicle.

It is recommended that the cock be fitted on the distributor or in close proximity to it.

I.9 BRAKE PAD

I.9.1 PURPOSE

The pad is to be used as part of the friction brake of a vehicle, which is capable of providing pre-defined retardation levels as specified by the purchaser, by being applied to a brake disc friction face. The pad shall fulfil the following requirements:

- Permit a braking moment or torque to be generated
- Permit, by frictional engagement with a brake disc friction face, the conversion into heat of the kinetic and potential energy involved in retarding the vehicle or vehicles, which is attributed to the use of the disc brake.
- Act as part of a holding or parking brake by frictional engagement with a brake disc friction face.

I.9.2 OPERATIONAL

The design and manufacture of the pad shall, for all intended operating conditions, take into account the following criteria.

Performance

- The maximum specified retardation to be achieved in full service and emergency braking conditions
- The rotational speed range of the brake disc
- The specified requirements for any holding or parking brake facility.

– The range of specific pressure of the pad friction surface on the disc friction face
– The type of material used in the manufacture of the brake disc friction face.
– The quantity of brake energy to be converted and its rate of conversion and dissipation
– The temperature of the brake disc friction face

Service and life cycle costs

– The integrity and wear rate of the pad friction material and brake disc friction face
– The need to prevent the detachment of any part of the friction material from the pad throughout its useable thickness.
– The need to prevent deformation of the pad backplane in any plane throughout the useable thickness of the friction material.

I.9.3 PAD DESIGN

The interface dimensions for the Interoperability Constituent brake pad shall conform to figures I.9.3.1 and I.9.3.2 for 200 cm^2 and 175 cm^2 brake pads.

The interface dimensions for the Interoperability Constituent brake pad shall conform to figures I.9.3.1 and I.9.3.2 for 200 cm^2 and 175 cm^2 brake pads.

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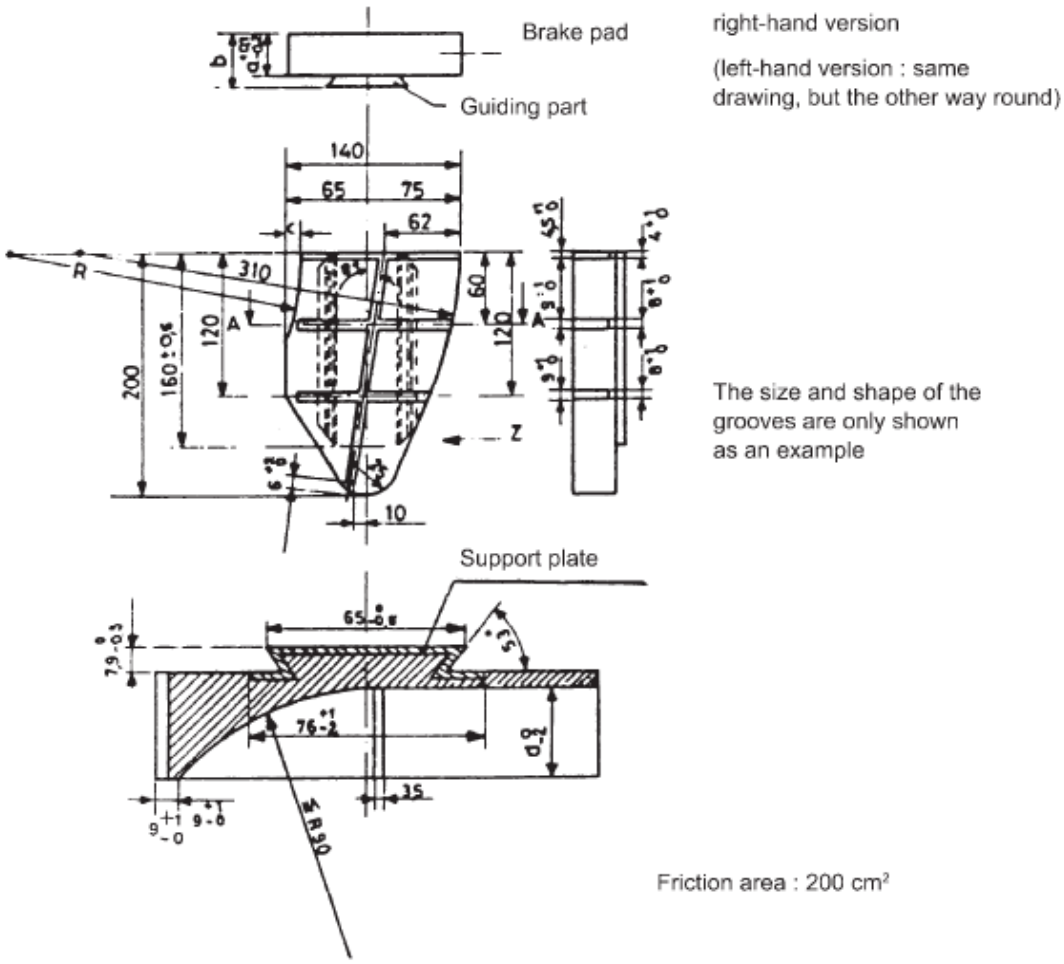
Figure 9.3.1

BRAKE PAD (200 cm²)



24	31,9	19	7,5	232,5
35	42,9	30	7,5	232,5
24	31,9	19	15	240
35	42,9	30	15	240
a	b	d	c	R

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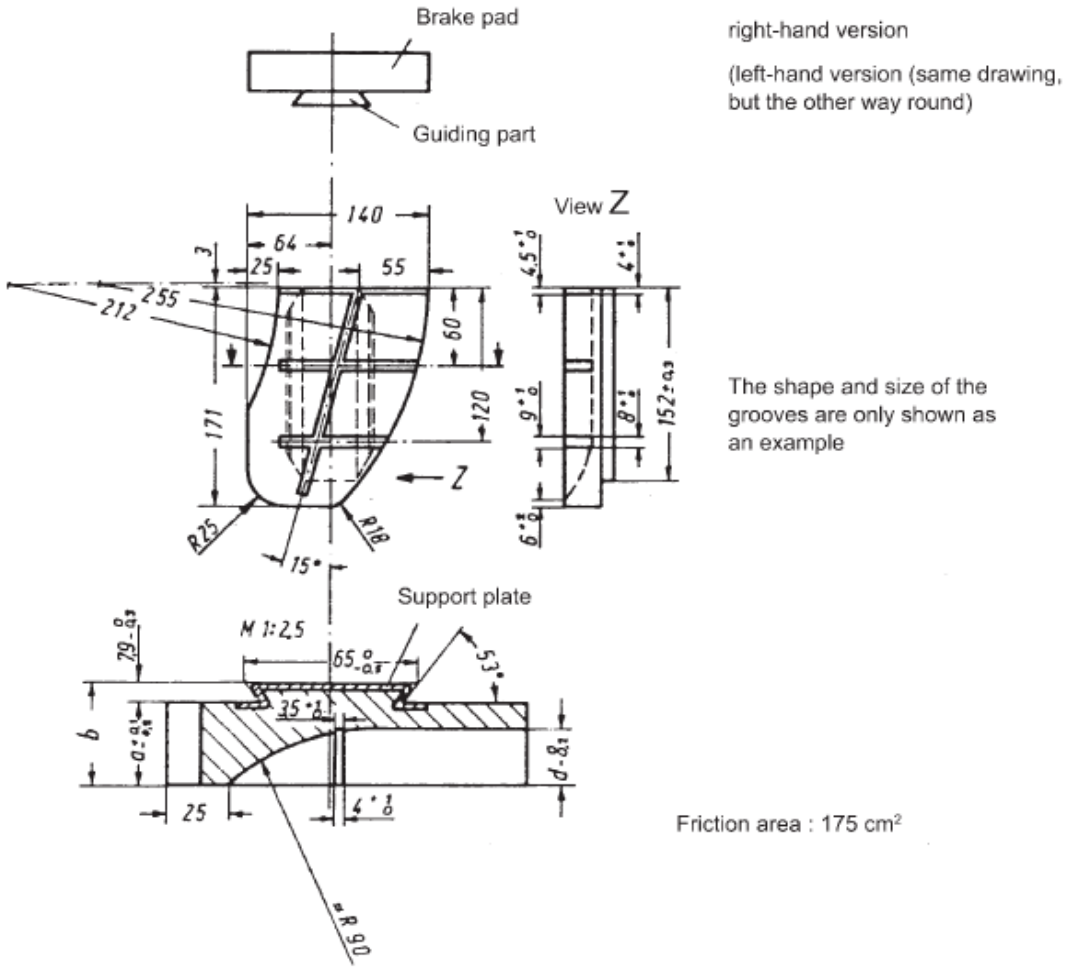
Figure 9.3.2

BRAKE PAD (175 cm²)



24	31,9	19
35	42,9	30
a	b	d

I.9.4 FRICTIONAL PERFORMANCE

General requirements

Pads of the same size, with the same nominal friction coefficient and used in the same application may produce different frictional characteristics depending on the pad material type and formulation.

As far as possible, the friction coefficient must be independent of the initial braking speed, the specific pressure on the brake disc friction face, the temperature of the friction face and atmospheric conditions. The friction coefficient should also be independent of the degree of bedding of the pad friction surface on the brake disc friction face

Specific requirements

The purchaser shall supply details of the range of duty level (maximum speed/braked load per disc/deceleration/disc type and material/any other specific requirements) that the pad should be capable of meeting.

I.10 BRAKE BLOCKS

I.10.1 PURPOSE

The block is to be used as part of the friction brake of a vehicle, which is capable of providing pre-defined retardation levels as specified by the purchaser, by being applied to the tread of the wheel. The block shall fulfil the following requirements:

- Permit a braking moment or torque to be generated
- Permit, by frictional engagement with the wheel tread, the conversion into heat of the kinetic and potential energy involved in retarding the vehicle, or vehicles, which is attributed to the use of the tread brake.
- Act as part of a holding or parking brake by frictional engagement with the wheel tread.

I.10.2 MATERIALS

The brake block, in the case of maintenance related replacement only, can be manufactured in cast iron, composite or sintered material. For sintered blocks, as far as possible, the friction coefficient must be independent of the initial braking speed, the specific pressure on the wheel tread, the temperature of the friction face and atmospheric conditions. The friction coefficient should also be independent of the degree of bedding of the block friction surface on the wheel tread.

This Annex does not provide any specification related to composite blocks.

I.10.3 INTERFACE WITH BLOCK HOLDER

The interface dimensions for the single block and double block format, and the key to secure them shall conform to Fig I.10.3.1 for cast iron blocks 320 mm long and Fig I.10.3.2 for double blocks 250 mm long. Fig I.10.3.3 shows the special features to be observed in order to ensure interchangeability of composite blocks of the same type and noninterchangeability with cast iron blocks for blocks 320 mm long. Fig I.10.3.4 shows the equivalent features for double composite blocks 250 mm long.

See figures below

OTIF UTP	*Corresponding text in EU regulations* [1]	*EU ref.* [2]

Fig I.10.3.1

Part 1

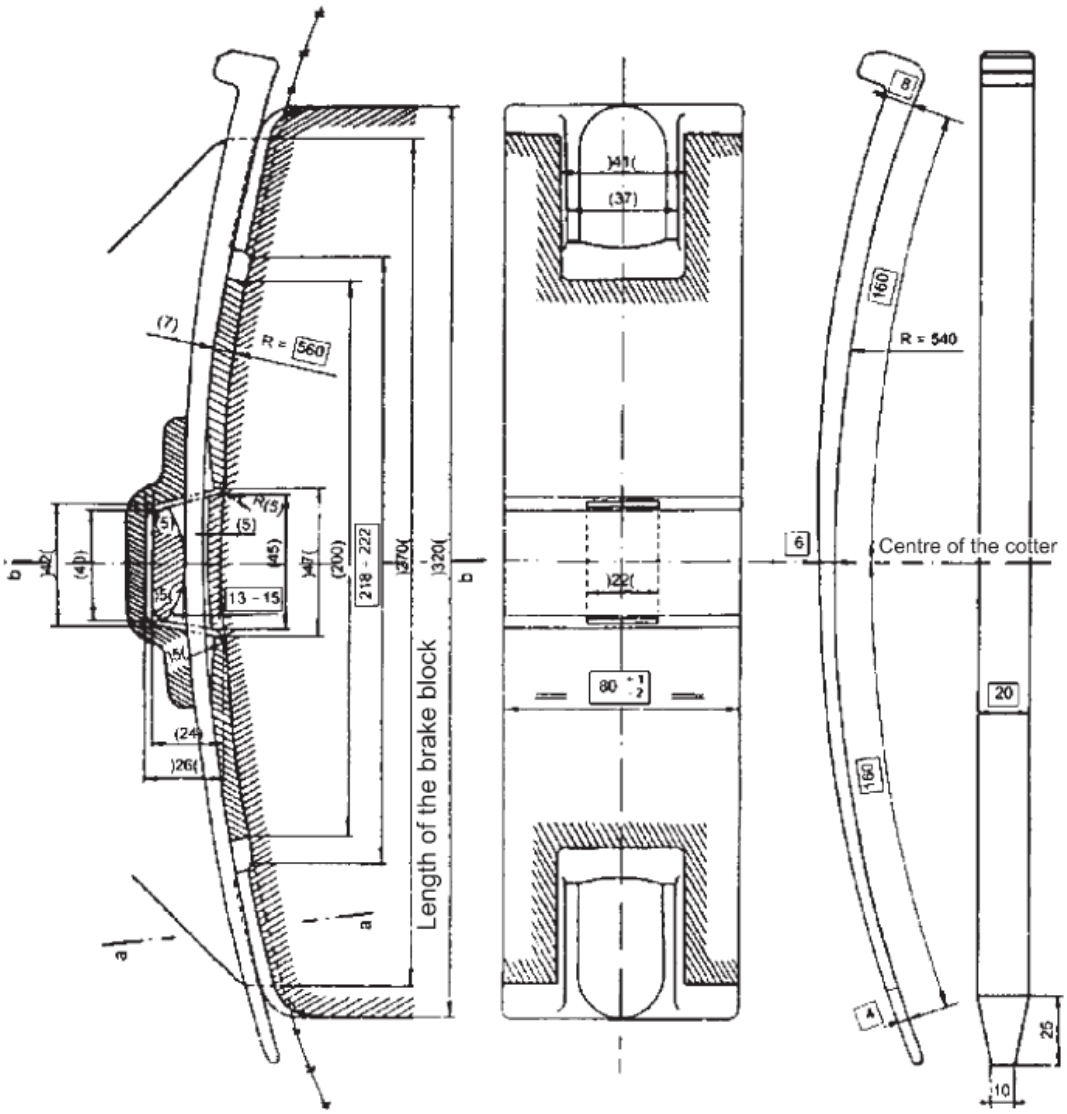


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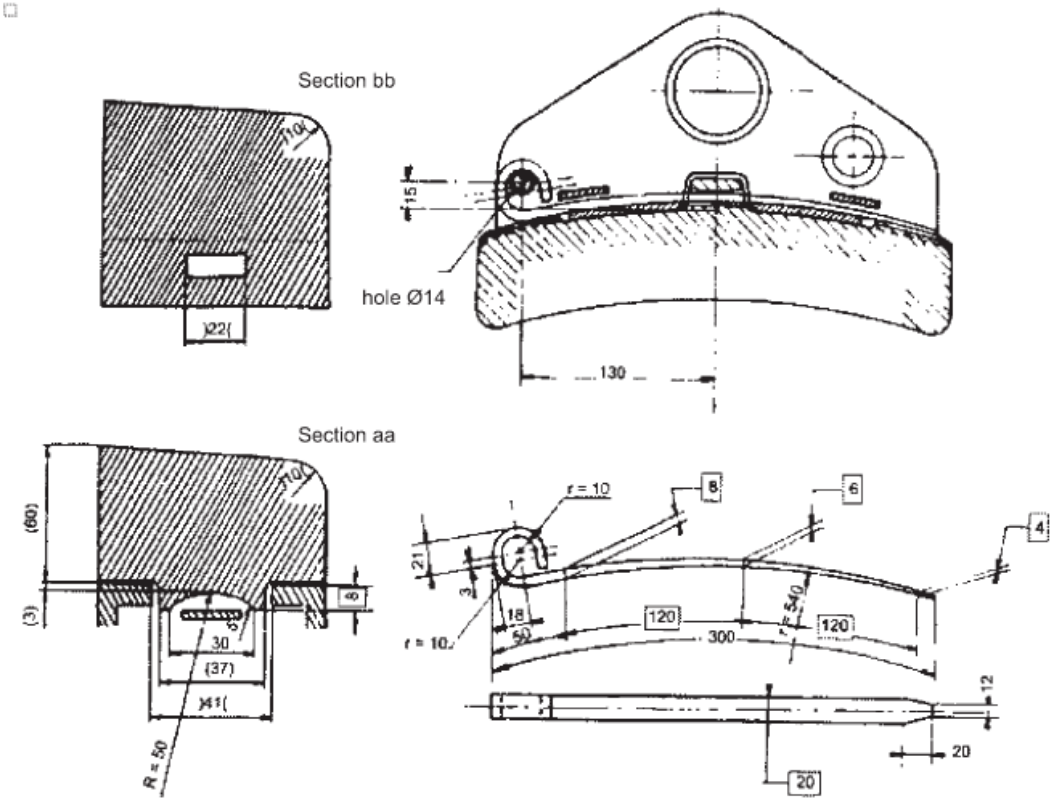
Fig I.10.3.1

Part 2



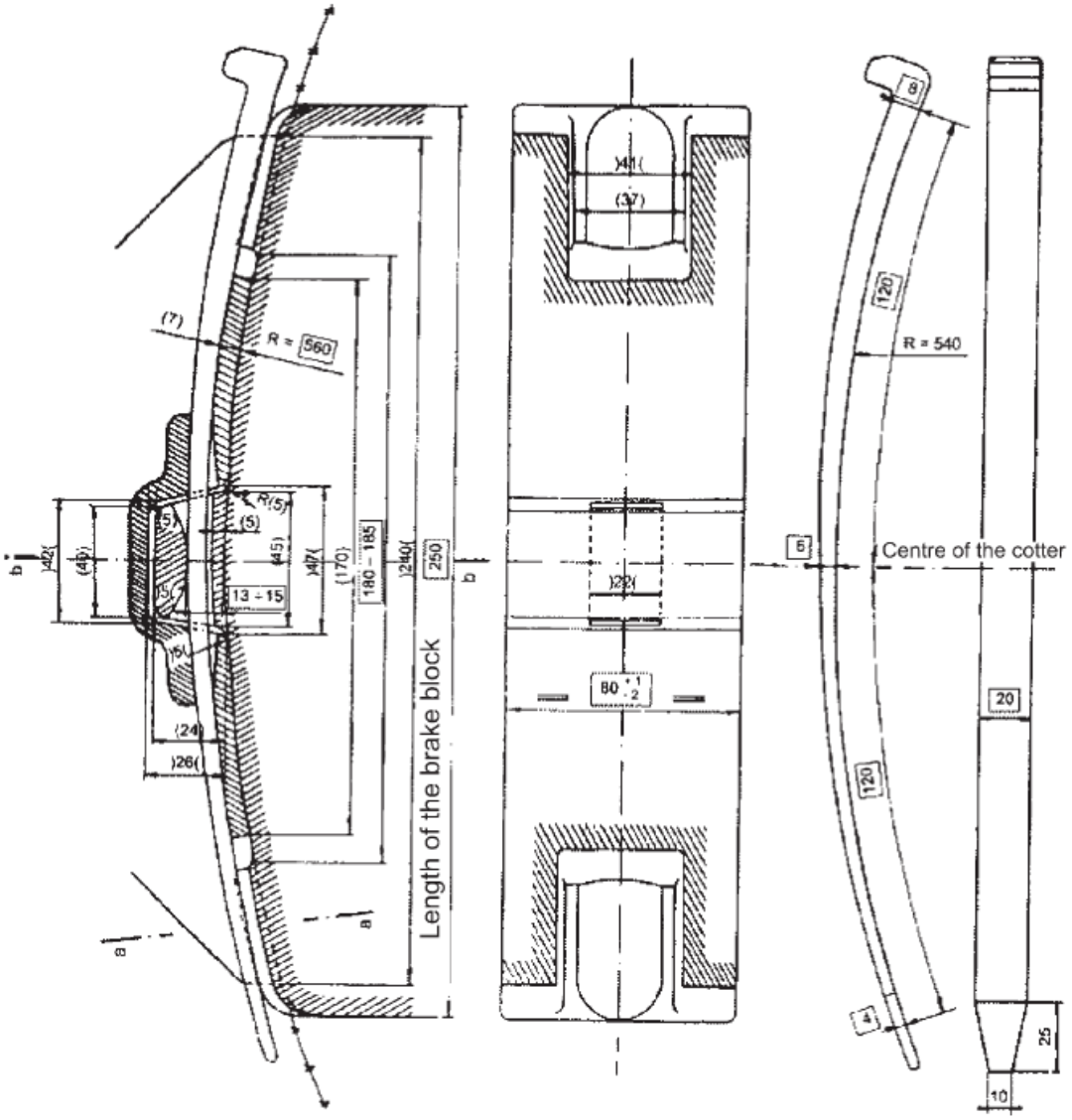
Type of cotter for side tipping wagon

———	Minimum bearing surface of the brake block holder and the brake block
–x–x–x	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

OTIF UTP	*Corresponding text in EU regulations* [1]	*EU ref.* [2]

Fig I.10.3.2

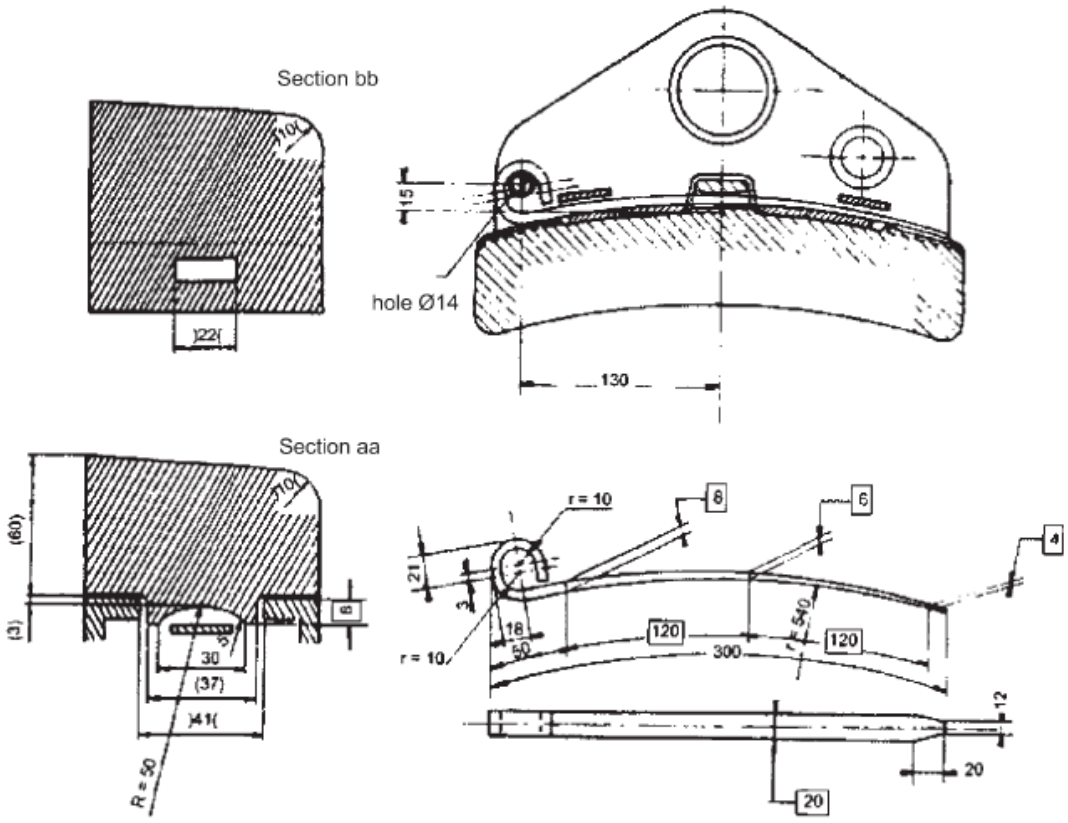
part 1



OTIF UTP | *Corresponding text in EU regulations* [1] *EU ref.* [2]

Fig I.10.3.2

part 2



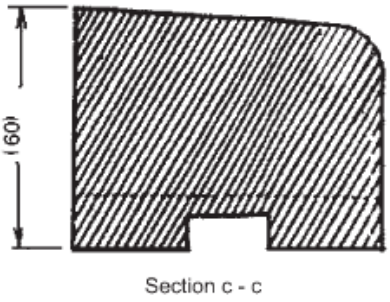
Type of cotter for side tipping wagon

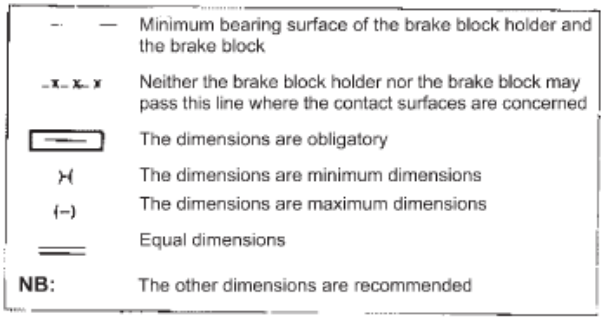
———	Minimum bearing surface of the brake block holder and the brake block
–x– x– x	Neither the brake block holder nor the brake block may pass this line where the contact surfaces are concerned
▭	The dimensions are obligatory
)(	The dimensions are minimum dimensions
(--)	The dimensions are maximum dimensions
═══	Equal dimensions
NB:	The other dimensions are recommended

OTIF UTP	*Corresponding text in EU regulations* [1]	*EU ref.* [2]

Fig I.10.3.3

All other dimensions as Fig I.10.3.1





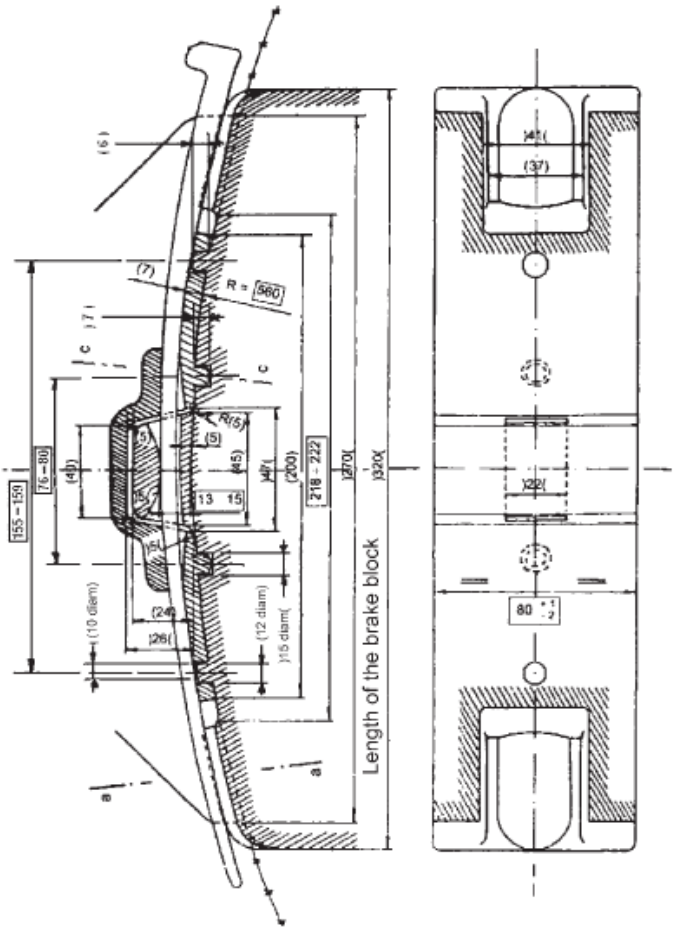


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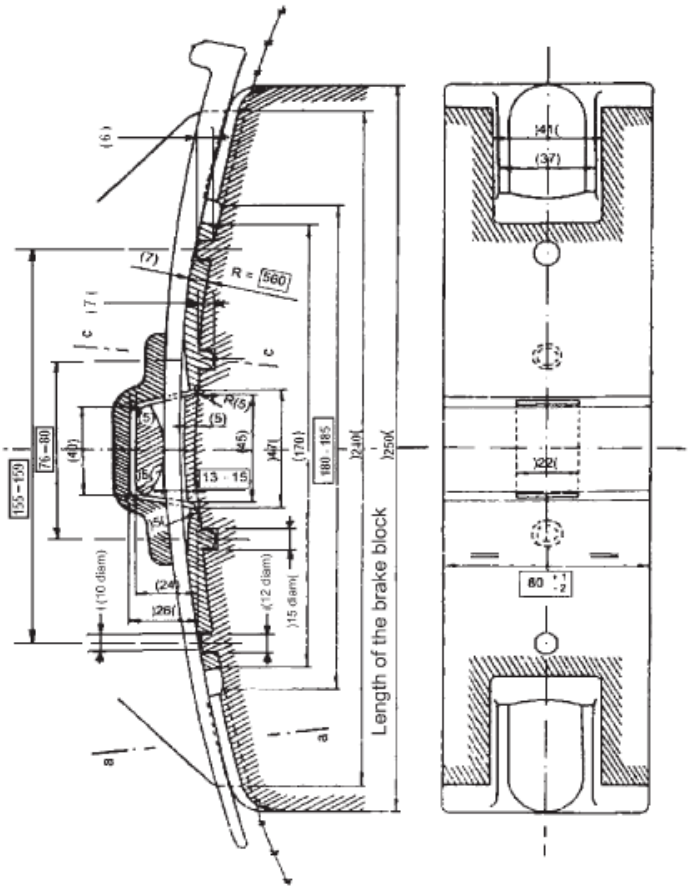
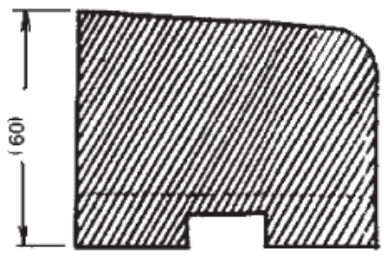
Fig I.10.3.4

All other dimensions as Fig I.10.3.2





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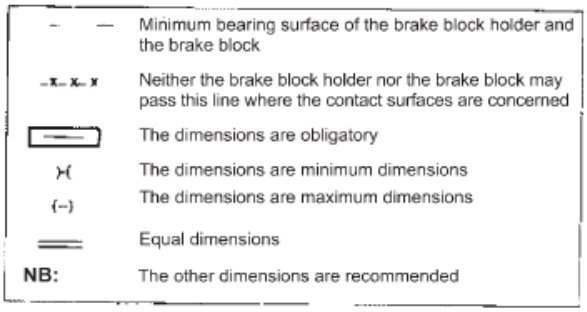


I.1.1 BRAKE PIPE EMPTYING ACCELERATOR VALVE

A brake pipe emptying accelerator valve is a device connected to the brake pipe of a vehicle, which operates in response to seeing a rapid fall in brake pipe pressure to ensure a continuing rapid fall to below 2.5 bar.

Brake pipe emptying accelerators shall be able to operate with all interoperable distributors and existing interoperable brake pipe emptying accelerators. The brake pipe-emptying accelerator shall be ready to operate when the brake pipe has reached its operating (running) pressure. The following operating conditions are defined in relation to a 5 bar brake pipe operating (running) pressure, but no functional errors shall occur in

the operation of brake pipe emptying accelerator at operating (running) pressures of between 4 and 6 bar.

When an emergency brake application occurs, the brake pipe emptying accelerators shall create a sufficiently rapid reduction in brake pipe pressure to ensure the rapid increase in brake cylinder pressure on every vehicle in the train set. When the pressure in the brake pipe has fallen quickly to below 2.5 bar, and within no more than 4 seconds after the accelerator commences operation, the accelerator shall stop venting air in such a way that the brake pipe can rapidly be refilled.

The brake pipe-emptying accelerator shall exhaust the air from the brake pipe without causing any adverse effect on vehicle/train behaviour.

The brake pipe emptying accelerator shall not come into operation due to the effect of an operating pressure overcharge, which allows a build up of brake pipe pressure above normal operating pressure to 6 bar and this can be present for up to 40 seconds in 'G' mode and 10 seconds in 'P' mode. The brake pipe emptying accelerator shall not come into operation after a full release if the brake pipe is raised to 6 bar for 2 seconds and reducing it to 5.2 bar in 1 second followed by a return to normal operating pressure.

The operation of the brake pipe-emptying accelerator shall not be affected by an individual vehicle, where a brake pipe emptying accelerator is not fitted or the brake has been isolated. This shall apply irrespective of the position of that vehicle and of the train consist.

The brake pipe emptying accelerator shall not come into operation when an emergency brake application is made after a full service brake application.

The brake pipe emptying accelerator shall come into operation no later than 2 seconds after the pressure in the brake pipe has fallen from 5 to 3.2 bar within 3 seconds.

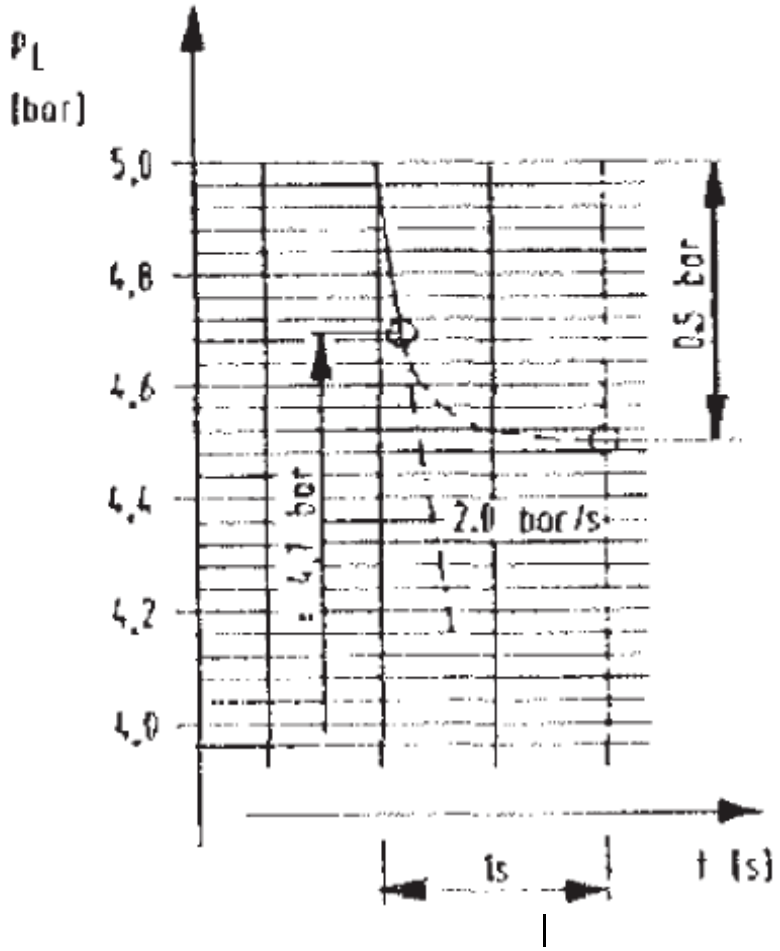
The brake pipe emptying accelerator shall not come into operation when the pressure in the brake pipe falls uniformly from 5 to 3.2 bar over 6 seconds with the brake inoperative. When the brake is operative the brake pipe is to fall at the same rate (5 to 3.2 bar over 6 seconds), but down to 2.5 bar without the brake pipe emptying accelerator operating.

The brake pipe emptying accelerator shall not operate during the initial stage of service braking due to operation of the internal distributor accelerator valve. This test is carried out on a test rig giving the brake pipe fall as shown on Fig. I.22. The test rig shall drop the brake pipe from 5 to 4.5 bar within 1 second, with the initial rate of 2 bar/second from 5 to 4.7 bar. The brake pipe emptying accelerator shall not come into operation during this test.

If the brake pipe emptying accelerator is incorporated in the distributor, it must be inoperative after the brake has been isolated.

Fig. I.22

Insensitivity test conditions



I.12 AUTOMATIC LOAD SENSING & EMPTY/LOAD CHANGE-OVER DEVICE

I.12.1 CONTINUOUS LOAD SENSING DEVICE

The transmission of the variation in load to the braking control system (variable load relay) can be purely mechanical or pneumatic. The method of producing the pneumatic signal can be a mechanically operated pneumatic device, a hydraulic to pneumatic converter device or an elastomeric to pneumatic converter device. The maximum control pressure produced by any pneumatic system when the wagon is fully loaded shall not exceed 4.6 bar.

I.12.2 EMPTY/LOAD CHANGEOVER DEVICE

The transmission of the variation in load (empty or loaded) to the braking control system (empty/load relay) can be purely mechanical or pneumatic. The method of producing the pneumatic signal can be a mechanically operated pneumatic device, a hydraulic to

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pneumatic converter device or an elastomeric to pneumatic converter device. If the pneumatic device is one producing a step in signal pressure between empty and loaded, the automatic empty/loaded changeover device shall operate safely — correctly with a minimum control pressure of 3 bar in ‘loaded’.