

Jost, trailer (01.2014)

WABCO -brake calculation no: WPI 82579S date 09.10.2015

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trailer (full, semi-, centre-axle) with air brake system acc. to UN/ECE-R.13.11

distribution: BODEX

please note!

This brake calculation is made under consideration of the legal prescriptions mentioned above in the version valid at the time of making the program (V6 14 04 20).
The functional characteristics of our products as well as the data of the brake out of the test approvals of the axle manufacturers, and the other vehicle data included in the brake calculation.
Please check whether these data correspond to the actual vehicle data.
Our conditions of delivery apply (particularly section 9.0).
In any case we command to do a braking harmonisation!
WABCOBrake V6 14 04 20 db 17.03.2015

vehicle manufacturer: BODEX

trailer model : KIS 3 J

trailer type : 3-axle-semi-trailer

remarks : air / hydraulic / VA suspension
WABCO TRAILER - EBS
TRISTOP 2+3: 20/24
385/65 R 22,5

axle 1 + 2 + 3 : JOST-Werke GmbH, SK7, TDB 0875 ECE,

	P in kg	unladen		laden	
total mass	5500	-	9000	35500	-
king-pin	1000	-	4500	8500	-
axle 1		1000		1500	
axle 2			1500		9000
axle 3			1500		9000
total axle mass			1500		9000
wheel base			4500		27000
centre of gravity height	E in mm	4500	-	8000	
K-factor	h in mm		1250		1700
K-factor		Kv min	1,6826	Kc min	0,9826
		Kv max	1,8526	Kc max	1,1511

	axle 1	axle 2	axle 3
no. of combined axles	1	1	1
no. of brake chambers per axle line	2	2	2
The power output corresponds to	BC 0003.0BC	0010.0BC	0010.0
brake chamber manufacturer	WABCO	WABCO	WABCO
chamber size	20	20/24	20/24
lever length	1Bh in mm	76	76
brake factor	[-]	26,0%	26,0%
dyn. rolling radius	rdyn min in mm	517	517
dyn. rolling radius	rdyn max in mm	517	517
threshold torque	Co Nm	11,4	11,4

calculation:

chamber pressure (rdyn min) pH at z=22,5%bar	2,4	2,4	2,4
chamber pressure (rdyn max) pH at z=22,5%bar	2,4	2,4	2,4
chamber press. (servo) pcha at pm6,5bar bar	5,5	5,5	5,5
piston force ThA at pm6,5bar N	6538	6538	6538
brake force (rdyn min) T lad. at pm6,5bar N	49841	49841	49841
brake force (rdyn max) T lad. at pm6,5bar N	49841	49841	49841
brake force within 1 % rolling friction proportion	%	33,3	33,3

braking rate z laden
z = sum (TR)/PRmax

0,565 for rdyn min
0,565 for rdyn max

Trailer may only be operated in combination with trucks/tractors with ISO 7638 supply (5 or 7 polar).

brake diagram : 841 701 101 0

maximum pressure: 8,5 bar

axle 1:

valve 1: 971 002 ... 0 WABCO
EBS emergency valvevalve 2: 480 102 ... 0 WABCO
EBS trailer modulator

brake cylinder: WABCO 423 505 00..0 / 423 505 76x 0

axle 2:

valve 1: 971 002 ... 0 WABCO
EBS emergency valvevalve 2: 480 102 ... 0 WABCO
EBS trailer modulator

) brake cylinder: WABCO 925 460 10..0 / 925 480 96x 0

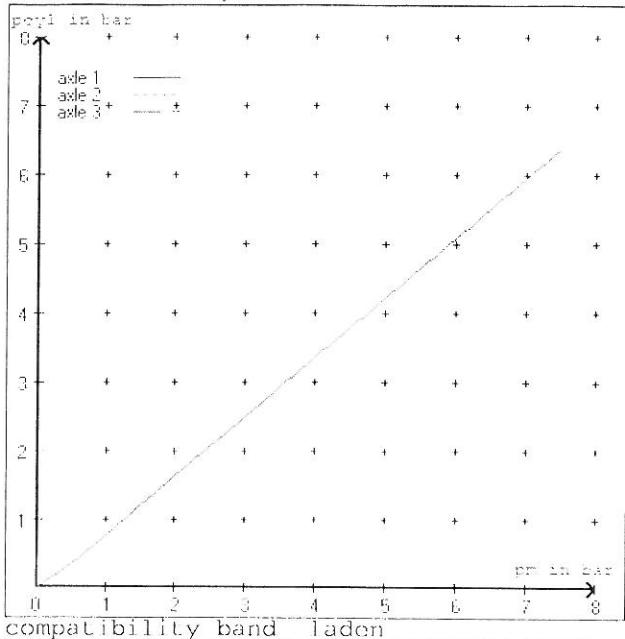
axle 3:

valve 1: 971 002 ... 0 WABCO
EBS emergency valvevalve 2: 480 102 ... 0 () WABCO or 480 207 0..0 / 2..0
EBS trailer modulator

brake cylinder: WABCO 925 460 10..0 / 925 480 96x 0

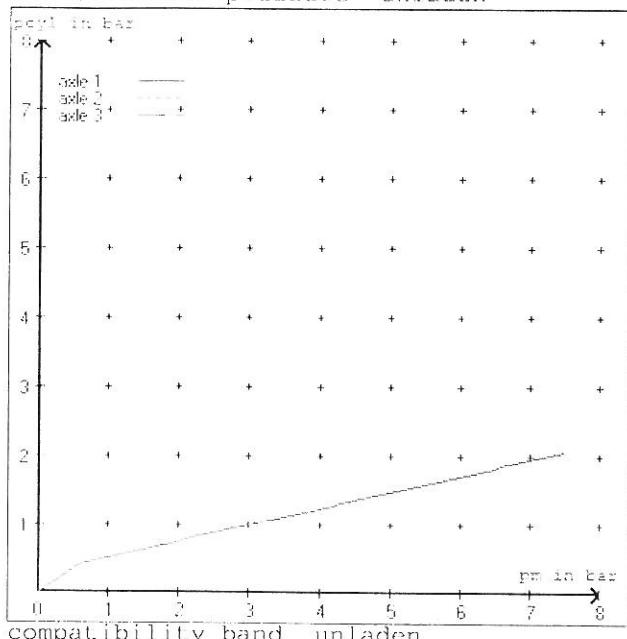
test type III (zIII = 0,30) for rdyn min : axle1 axle2 axle3
at pm 3,7 bar => pcha in bar : 3,1 3,1 3,1
test type III (zIII = 0,06) for rdyn min : axle1 axle2 axle3
at pm 1,1 bar => pcha in bar : 0,9 0,9 0,9

brake chamber pressure laden

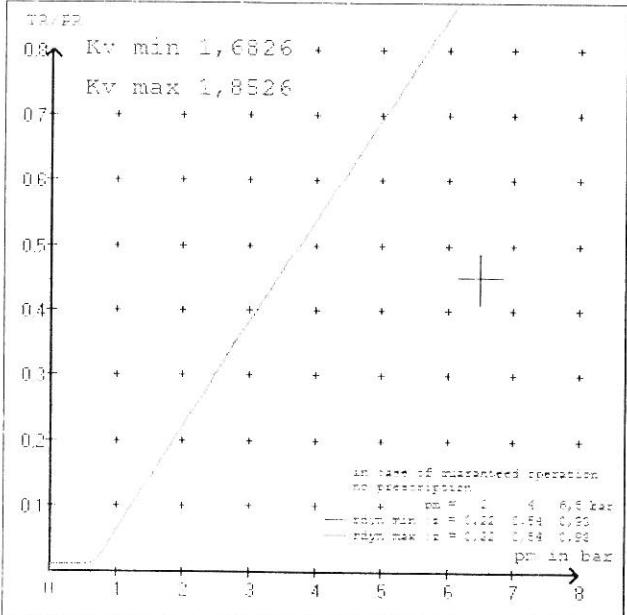
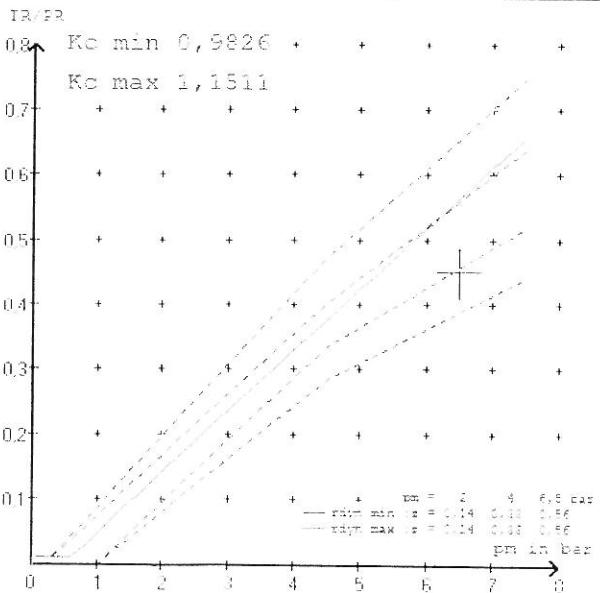


compatibility band laden

brake chamber pressure unladen



compatibility band unladen



in case of uncontrolled operation
no preselection

+	pm = 1	4	6.5 bar
—	pm min z = 0.14	0.39	0.56
—	pm max z = 1.14	0.39	0.56

pm in bar

vehicle manufacturer: BODEX
 trailer model : KIS 3 J
 trailer type : 3-axle-semi-trailer

brake chamber and lever length :

axle 1 : 2 x type/diameter 20 (WABCO) lever length 76 mm
 axle 2 : 2 x type/diameter 20/24 (WABCO) lever length 76 mm
 axle 3 : 2 x type/diameter 20/24 (WABCO) lever length 76 mm

brake diagram : 841 701 101 0

valve :

971 002 ... 0 WABCO EBS emergency valve
 480 102 ... 0 WABCO EBS trailer modulator
 480 102 ... 0 WABCO EBS trailer modulator or 480 207 0.. 0 / 2.. 0

EBS input data

vehicle manufacturer: BODEX
 trailer model : KIS 3 J
 trailer type : 3-axle-semi-trailer
 brake calculation no. : WPI 82579S

tire circumference main axle : 3250 for rdyn max
 tire circumference auxiliary axle : 3250 for rdyn max

assignment pm / deceleration z: pm 0,6 bar z = 0,010
 (laden condition) 2,0 bar z = 0,142
 6,5 bar z = 0,565

axle	control pressure pm			axle load laden	control pressure pm			brake pr. laden
	axle load unladen	bellow pr. unladen	brake pr. unladen		axle load laden	bellow pr. laden	brake pr. laden	
1	1500	to be	1,8	9000	to be	0,4	1,6	5,5
2	1500	entered by	1,8	9000	entered by	0,4	1,6	5,5
3	1500	the vehicle	1,8	9000	the vehicle	0,4	1,6	5,5
4	0	manufact.	0,0	0	manufact.	0,0	0,0	0,0
5	0		0,0	0		0,0	0,0	0,0

The unladen values indicated in the above table are values for the basic parameter set. Higher unladen axle loads and liftaxles are automatically recognized and do not require separate adjustment. The above unladen axle loads must not be fallen below.

axle 1	axle 2	axle 3
axle load pcyl	axle load pcyl	axle load pcyl
1500	1,8	1500
2000	2,0	2000
2500	2,3	2500
3000	2,5	3000
3500	2,8	3500
4000	3,0	4000
4500	3,3	4500
5000	3,5	5000
8000	4,9	8000
9000	5,5	9000

data sheet to ECE vehicle type-approval certificate concerning braking equipment: according to ECE R13 annex 11

axle 1 : reference axle: JOST Werke TAB - TES - TLS - TZS GmbH
test report : TDB 08/15 ECE

axle 2 : reference axle: JOST Werke TAB - TES - TLS - TZS GmbH
test report : TDB 08/15 ECE

axle 3 : reference axle: JOST Werke TAB - TES - TLS - TZS GmbH
test report : TDB 08/15 ECE

brake lining: Jurid 539
date : A:20120822 06.02.2015
brake lining: Jurid 539
date : A:20120822 06.02.2015
brake lining: Jurid 539
date : A:20120822 06.02.2015

calc. verif. of residual (hot) braking force type III
(item 4.2.1 of appendix 2 to annex 11)

axle 1 (rdyn 517 mm) T = 22,5 % Fe
 axle 2 (rdyn 517 mm) T = 22,5 % Fe
 axle 3 (rdyn 517 mm) T = 22,5 % Fe

calculated actuator stroke in mm

(item 4.3.1.1 of appendix 2 to annex 11)

axle 1	(sp = 52 mm)	s = 43 mm
axle 2	(sp = 58 mm)	s = 43 mm
axle 3	(sp = 58 mm)	s = 43 mm

average thrust output in N at $p_m = 6,5$ bar (however max. $p_{cha} = 7,0$ bar)

axle1 ThA = 6538 N
 axle2 ThA = 6538 N
 axle3 ThA = 6538 N

calc. residual (hot) braking force in N
(item 4.3.1.4 of appendix 2 to annex 11)

axle 1 (rdyn 517 mm) T = 41591 N
 axle 2 (rdyn 517 mm) T = 41591 N
 axle 3 (rdyn 517 mm) T = 41591 N

basic test type III
of subject (calculated)
trailer (E) residual

braking rate of the vehicle
(item 4.3.2 to appendix 2 to annex 11) 0.56
0.47

required braking rate
(items 1.5.3 and 1.7.2 to annex 11) $\geq 0,4$ and
 $\geq 0,6 \cdot E$ ($0,34$)

axle 1 (rdyn 517 mm) T = 41591 N
 axle 2 (rdyn 517 mm) T = 41591 N
 axle 3 (rdyn 517 mm) T = 41591 N

basic test type III
of subject (calculated)
trailer (E) residual

braking rate of the vehicle trailer (E) residual
(item 4.3.3 to appendix 3 to annex 11) 0.56 (hot)braking 0.42

required braking rate
(items 1.5.3 and 1.7.2 to annex 11) $\geq 0,4$ and
 $\leq 0,6 \cdot k_c$ ($0,34$)

data sheet to ECE vehicle type-approval certificate concerning braking equipment: according to ECE R13 annex 11

axle 1 : reference axle: JOST Werke TAS - TES - TLS - TZ5GmbH
 test report : TDB 0875 ECE
 axle 2 : reference axle: JOST Werke TAS - TES - TLS - TZ5GmbH
 test report : TDB 0875 ECE
 axle 3 : reference axle: JOST Werke TAS - TES - TLS - TZ5GmbH
 test report : TDB 0875 ECE

brake lining: FER 4550
 date : B:20120823 06.02.2015
 brake lining: FER 4550
 date : B:20120823 06.02.2015
 brake lining: FER 4550
 date : B:20120823 06.02.2015

calc. verif. of residual (hot) braking force type III
 (item 4.2.1 of appendix 2 to annex 11)

axle 1	(rdyn 517 mm)	T = 22,5 % Fe
axle 2	(rdyn 517 mm)	T = 22,5 % Fe
axle 3	(rdyn 517 mm)	T = 22,5 % Fe

calculated actuator stroke in mm

(item 4.3.1.1 of appendix 2 to annex 11)

axle 1	(sp = 52 mm)	s = 44 mm
axle 2	(sp = 58 mm)	s = 44 mm
axle 3	(sp = 58 mm)	s = 44 mm

average thrust output in N at pm = 6,5 bar (however max. pcha = 7,0 bar)

axle1	ThA = 6538 N
axle2	ThA = 6538 N
axle3	ThA = 6538 N

calc. residual (hot) braking force in N

(item 4.3.1.4 of appendix 2 to annex 11)

axle 1	(rdyn 517 mm)	T = 44418 N
axle 2	(rdyn 517 mm)	T = 44418 N
axle 3	(rdyn 517 mm)	T = 44418 N

basic test type III
 of subject (calculated)
 trailer (E) residual
 (hot)braking

braking rate of the vehicle

(item 4.3.2 to appendix 2 to annex 11)

0,56 0,50

required braking rate

(items 1.5.3 and 1.7.2 to annex 11)

>= 0,4 and

>= 0,6*E (0,34)

axle 1	(rdyn 517 mm)	T = 44418 N
axle 2	(rdyn 517 mm)	T = 44418 N
axle 3	(rdyn 517 mm)	T = 44418 N

basic test type III
 of subject (calculated)
 trailer (E) residual
 (hot)braking

braking rate of the vehicle

(item 4.3.2 to appendix 2 to annex 11)

0,56 0,50

required braking rate

(items 1.5.3 and 1.7.2 to annex 11)

>= 0,4 and

>= 0,6*E (0,34)

data sheet to ECE vehicle type-approval certificate concerning braking equipment: according to ECE R13 annex 11

axle 1 : reference axle: JOST Werke TA5 - TB5 - TL5 - TZ5GmbH
 test report : TDB 0875 ECE
 axle 2 : reference axle: JOST-Werke TA5 - TB5 - TL5 - TZ5GmbH
 test report : TDB 0875 ECE
 axle 3 : reference axle: JOST Werke TA5 - TB5 - TL5 - TZ5GmbH
 test report : TDB 0875 ECE

brake lining: Textar T3060
 date : C:20120824 06.02.2015
 brake lining: Textar T3060
 date : C:20120824 06.02.2015
 brake lining: Textar T3060
 date : C:20120824 06.02.2015

calc. verif. of residual (hot) braking force type III
 (item 4.2.1 of appendix 2 to annex 11)

axle 1	(rdyn 517 mm)	T = 22,5 % Fc
axle 2	(rdyn 517 mm)	T = 22,5 % Fc
axle 3	(rdyn 517 mm)	T = 22,5 % Fc

calculated actuator stroke in mm

(item 4.3.1.1 of appendix 2 to annex 11)

axle 1	(sp = 52 mm)	s = 44 mm
axle 2	(sp = 58 mm)	s = 44 mm
axle 3	(sp = 58 mm)	s = 44 mm

average thrust output in N at pm = 6,5 bar (however max. pcha = 7,0 bar)

axle1	ThA = 6538 N
axle2	ThA = 6538 N
axle3	ThA = 6538 N

calc. residual (hot) braking force in N

(item 4.3.1.4 of appendix 2 to annex 11)

axle 1	(rdyn 517 mm)	T = 41432 N
axle 2	(rdyn 517 mm)	T = 41432 N
axle 3	(rdyn 517 mm)	T = 41432 N

basic test type III
 of subject (calculated)
 trailer (E) residual

braking rate of the vehicle
 (item 4.3.2 to appendix 2 to annex 11) 0,56 0,47

required braking rate
 (items 1.5.3 and 1.7.2 to annex 11) >= 0,4 and
 >= 0,6*E (0,34)

axle 1	(rdyn 517 mm)	T = 41432 N
axle 2	(rdyn 517 mm)	T = 41432 N
axle 3	(rdyn 517 mm)	T = 41432 N

basic test type III
 of subject (calculated)
 trailer (E) residual

braking rate of the vehicle
 (item 4.3.2 to appendix 2 to annex 11) 0,56 0,47

required braking rate
 (items 1.5.3 and 1.7.2 to annex 11) >= 0,4 and
 >= 0,6*E (0,34)

spring parking brake

		axle 2	axle 3
no of TRISTOP-actuators per axle line KDZ		2	2
TRISTOP-actuator type		20/24	20/24
lever length	lBh in mm	76	76
stat. tyre radius	rstat max in mm	494	494
at a stroke of	s in mm	30	30
min. force of spring brake	TFZ in N	7827	7827
sp.brake chamber no 925		460 10.	460 10. 0
sp.brake chamber no 925		480 96x	480 96x 0
release pressure	pLs in bar	4,8	4,8

calculation:

ratio until road
 $iFb = lBh * Kta * C * rBt / (rBn * rstat)$

for rstat in mm

) brake force of spring br. Tf in N

$Tf = (TFZ * KDZ - 2 * Co / lBh) * iFb$

braking rate zf laden

0,332

$zf = \text{sum } (Tf) / P + 0,01$

Test of the frictional connection required by the parking brake

minimum wheelbase/minimum supporting width min Ef necessary to fulfil the regulations

$$\text{min Ef} = E * (1 - PR/P + zferf * h/E) / (1 - zferf / (fzul * nf/ng))$$

$$\text{min Ef} = 2552 \text{ mm} \quad \text{for } E = 4500 \text{ mm}$$

$$\text{min Ef} = 4177 \text{ mm} \quad \text{for } E = 8000 \text{ mm}$$

min Ef =	minimum distance between front axle(s) (trailer) or support (semitrailer)
and the rear axle(s) (resultant of the bogie)	
E =	wheel base
fzul = 0,80	maximum permissible frictional connection required
zferf = 0,18	maximum required braking ratio of the parking brake
h = 1700 mm	height of center of gravity - laden
PR = 27000 kg	maximum bogie mass - laden
P = 39000 kg	maximum total mass - laden
nf = 2	no. of axle(s) with TRISTOP spring brake actuators
ng = 3	no. of bogie axle(s)

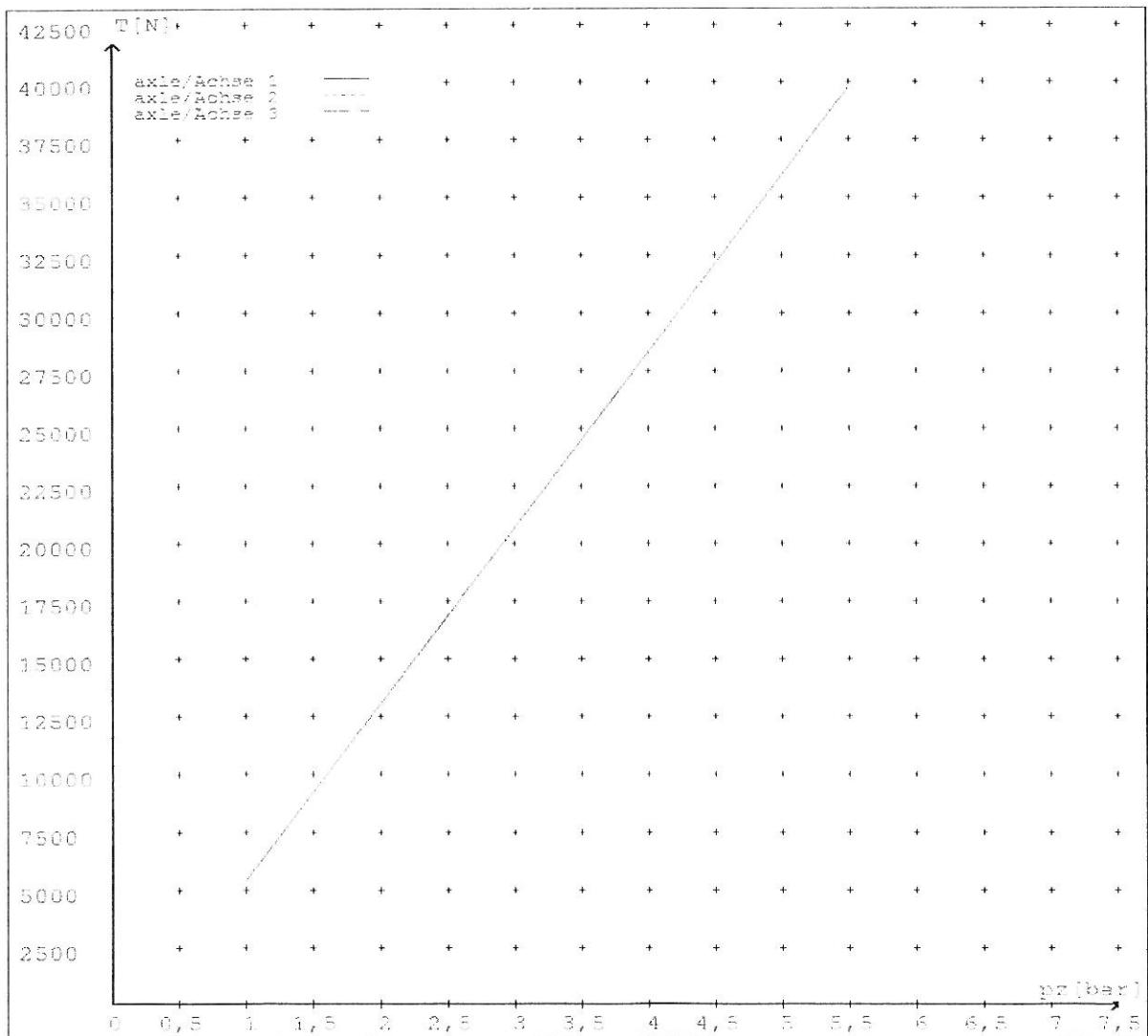
reference values

reference values for z = 45% for max rdyn: 517 mm

	pz [bar]	T [N]	T [N]
axle 1	1,0 5,5		5330 39696
axle 2	1,0 5,5		5330 39696
axle 3	1,0 5,5		5330 39696

VIN - no.:

	Axle(s) / Achse(n)				
brake cylinder type (service / parking) Bremszylinder Typ (Betrieb / Fest)	20/	20/24	20/24	/	/
Maximum stroke smax = ...mm maximaler Hub smax = ...mm	63	67	67		
Lever length = ...mm Hebellänge = ...mm	76	76	76		



reference values for $z = 0,45$

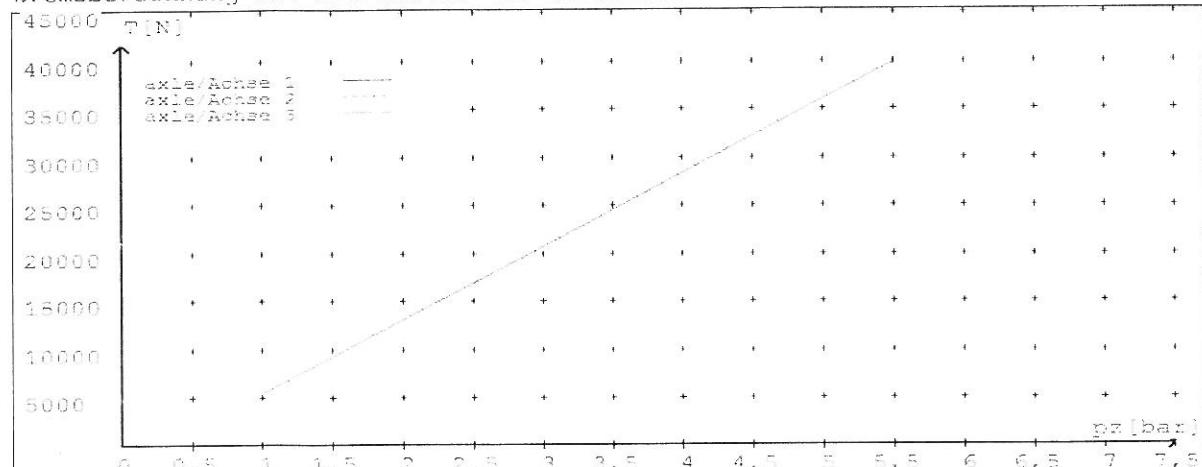
Angabe der Referenzwerte für $z = 0,45$

brake calculation no: WPL 82579S date 09.10.2015

Bremsberechnung Nr: WPL 82579S vom 09.10.2015

for max rdyn: 517 mm

für max rdyn: 517 mm



Axe(s) / Achse(n)					
brake cylinder type (service / parking) Bremszylinder Typ (Betrieb / Fest)	20/	20/24	20/24	/	/
Maximum stroke smax = ... mm maximaler Hub smax = ... mm	63	67	67		
Lever length = ... mm Hebellänge = ... mm	76	76	76		