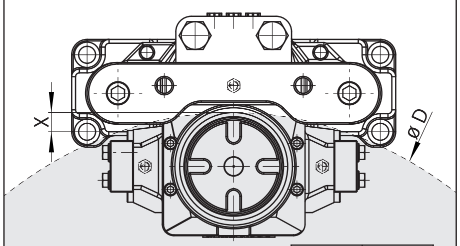
Brake Caliper HS 075 FHM

spring activated – hydraulically released
for wind turbines or conveyor systems

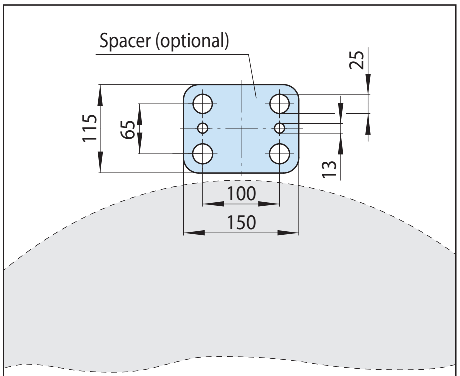
Morskate®

Mounting

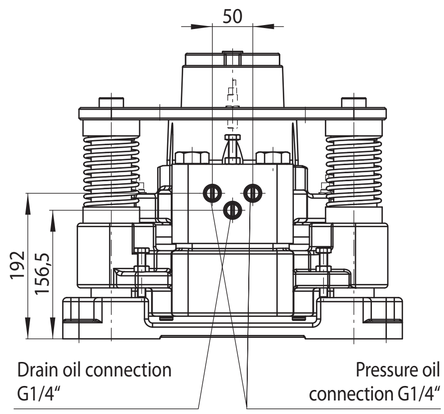


D [mm]	X [mm]
630	34
710	25
900	25
1 250	20
1 600	15

Mounting on the brake disc 51-1



Dimensions of spacer 51-2



Supply connections 51-3

Technical Data

	Brake Caliper HS 075 FHM				
	with spring package 010	with spring package 020	with spring package 030	with spring package 040	with spring package 055
Brake disc diameter [mm]	Braking torque [Nm]	Braking torque [Nm]	Braking torque [Nm]	Braking torque [Nm]	Braking torque [Nm]
630	1 900	3 800	5 700	7 600	10 400
710	2 200	4 400	6 600	8 800	12 100
900	3 000	5 900	8 900	11 900	16 300
1 250	4 400	8 700	13 100	17 500	24 000
1 600	5 800	11 500	17 300	23 100	31 800
2 000	7 400	14 700	22 100	29 500	40 500
Clamping force	10 kN	20 kN	30 kN	40 kN	55 kN
Oil pressure	min. 25 bar max. 140 bar	min. 50 bar max. 140 bar	min. 70 bar max. 140 bar	min. 95 bar max. 140 bar	min. 125 bar max. 140 bar
Oil volume per stroke	max. 82 cm^3	max. 82 cm^3	max. 82 cm^3	max. 82 cm^3	max. 82 cm^3
Weight	90 kg	90 kg	90 kg	90 kg	90 kg

The braking torques shown in the table are based on a theoretical friction coefficient of 0,4.

Other features

- High safety against leakage
- Easy change of friction blocks
- Painted with surface coating class C4-L according to ISO 12944
- For brake disc thickness W = 20 mm; brake disc thicknesses of up to 40 mm can be achieved with the use of a spacer installed by the customer

Accessories

- Inductive proximity switch for "brake released" operating status
- Inductive proximity switch for brake pad wear control
- Optional painting with surface coating class C4-H or C5M-H (offshore) according to ISO 12944

Any questions? Please contact us.

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Brake Caliper HW 075 FHM

spring activated – hydraulically released

52-1

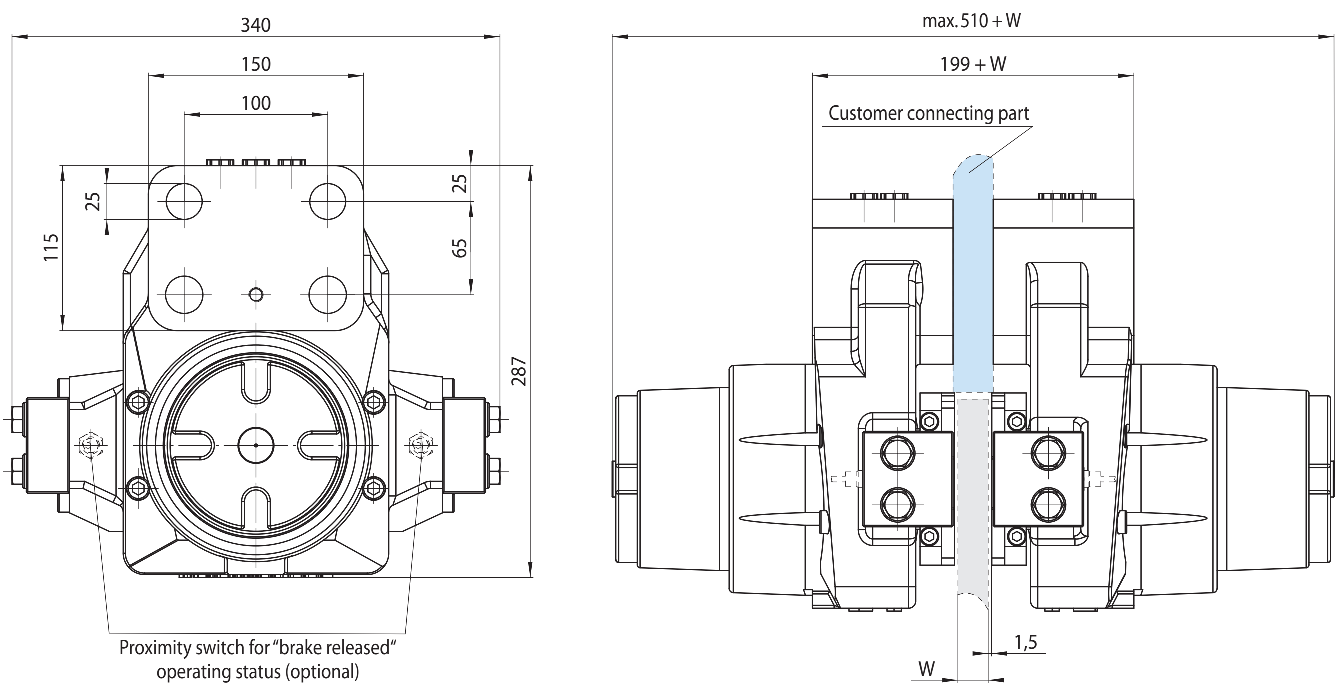
Features

Features	Code
Brake Caliper	H
Standard	W
With piston diameter 75 mm	075
Spring activated	F
Hydraulically released	H
Manual adjustment to counter friction block wear	M
Spring packages available for clamping forces of 10 kN, 20 kN, 30 kN, 40 kN or 55 kN	010 to 055

Example for ordering

Brake Caliper HW 075 FHM, spring package for clamping force 10 kN:

HW 075 FHM - 010

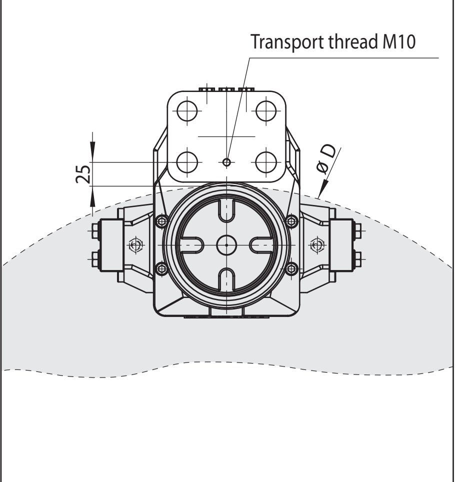


52-2

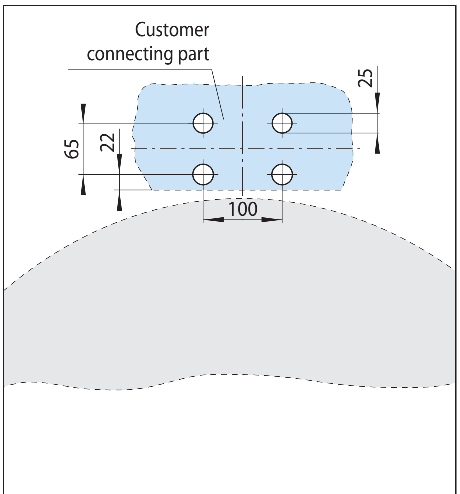
Brake Caliper HW 075 FHM

spring activated – hydraulically released

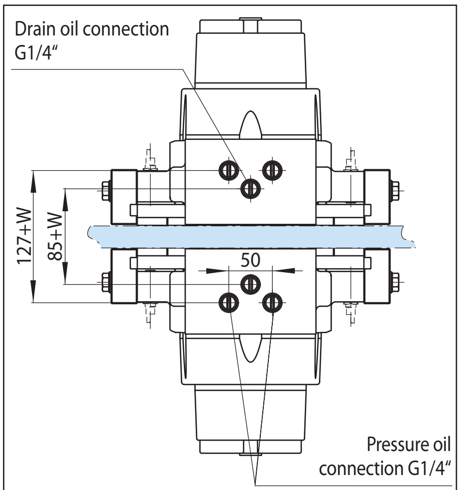
Mounting



Mounting on the brake disc 53-1



Dimensions of customer connecting part 53-2



Supply connections 53-3

Technical Data

	Brake Caliper HW 075 FHM				
	with spring package 010	with spring package 020	with spring package 030	with spring package 040	with spring package 055
Brake disc diameter [mm]	Braking torque [Nm]	Braking torque [Nm]	Braking torque [Nm]	Braking torque [Nm]	Braking torque [Nm]
630	1900	3800	5700	7600	10400
710	2200	4400	6600	8800	12100
900	3000	5900	8900	11900	16300
1250	4400	8700	13100	17500	24000
1600	5800	11500	17300	23100	31800
2000	7400	14700	22100	29500	40500
Clamping force	10 kN	20 kN	30 kN	40 kN	55 kN
Oil pressure	min. 25 bar max. 140 bar	min. 50 bar max. 140 bar	min. 70 bar max. 140 bar	min. 95 bar max. 140 bar	min. 125 bar max. 140 bar
Oil volume per stroke	max. 89 cm^3	max. 89 cm^3	max. 89 cm^3	max. 89 cm^3	max. 89 cm^3
Weight	90 kg	90 kg	90 kg	90 kg	90 kg

The braking torques shown in the table are based on a theoretical friction coefficient of 0,4.

Other features

- High safety against leakage
- Easy change of friction blocks
- Painted with surface coating class C4-L according to ISO 12944
- The thickness of the customer connecting part results from the thickness of the brake disc W plus 3 mm

Accessories

- Inductive proximity switch for "brake released" operating status
- Optional painting with surface coating class C4-H or C5M-H (offshore) according to ISO 12944

Brake Calipers HI 150 HUK and HI 180 HUK

hydraulically activated – non-releasing
as yaw brake in wind turbines

54-1

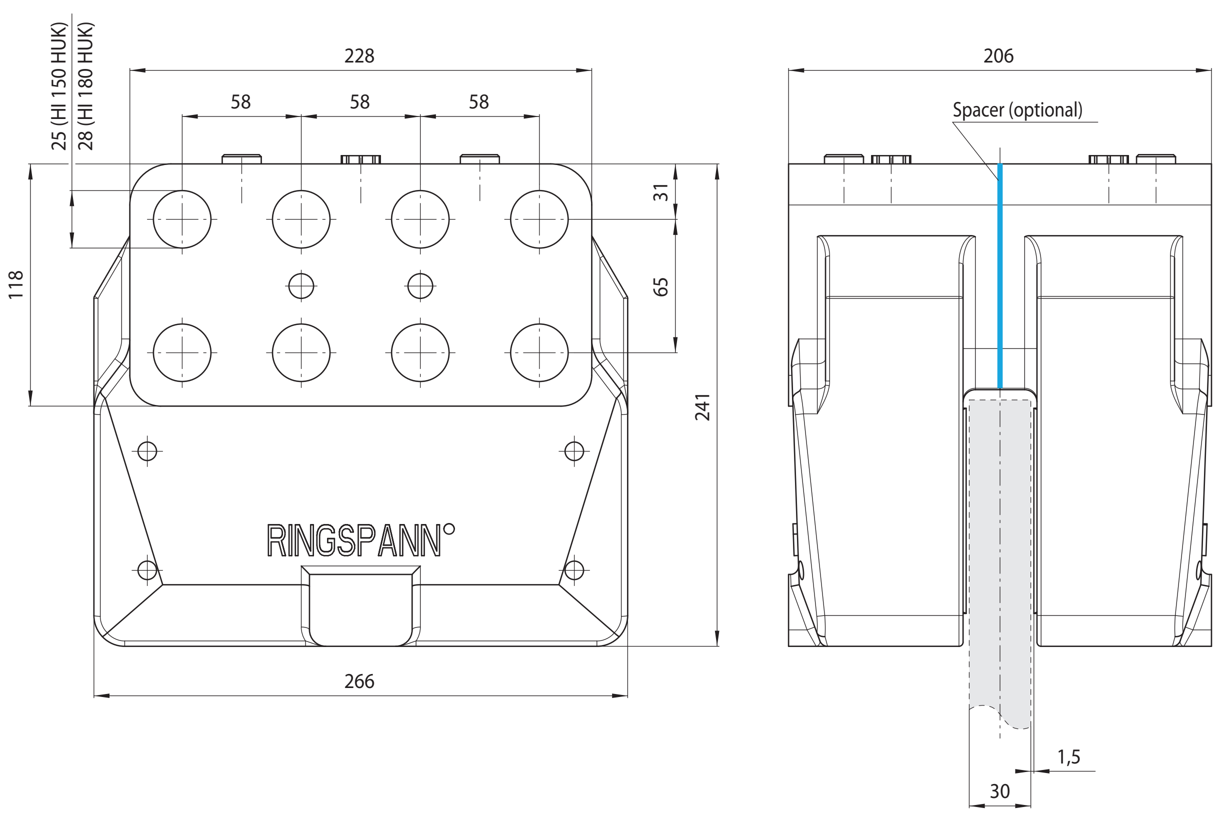
Features

Features	Code
Brake Caliper	H
With inside-mounted brake pads	I
With piston diameter 2 x 75 mm or piston diameter 2 x 90 mm	150 180
Hydraulically activated	H
Non-releasing	U
No adjustment to counter friction block wear	K
Max. clamping force 140 kN (HI 150) Max. clamping force 200 kN (HI 180)	140 200

Example for ordering

Brake Caliper HI 150 HUK, max. clamping force 140 kN:

HI 150 HUK - 140

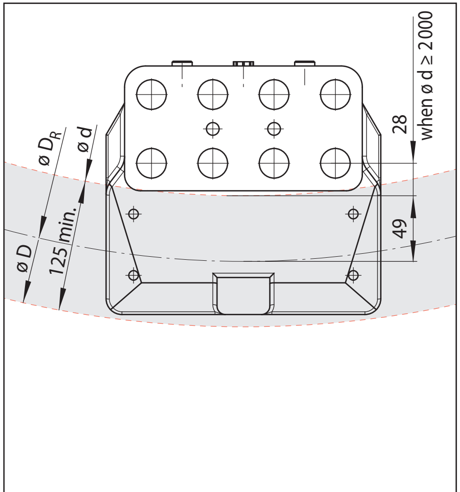


54-2

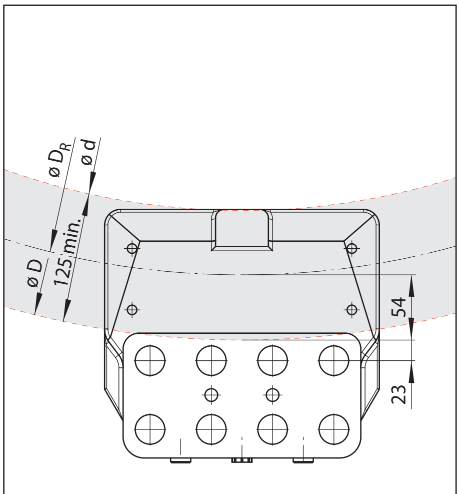
Brake Calipers HI 150 HUK and HI 180 HUK

hydraulically activated – non-releasing
as yaw brake in wind turbines

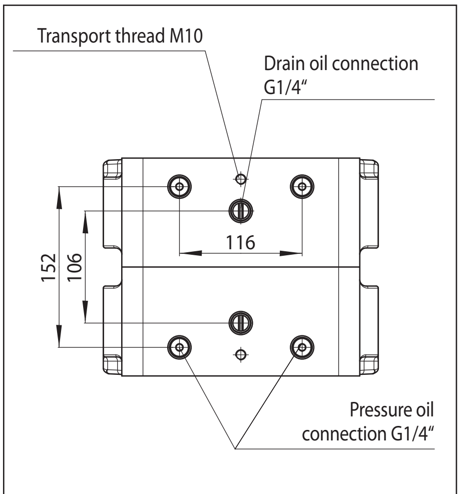
Mounting



Mounting on the inner diameter of the brake disc 55-1



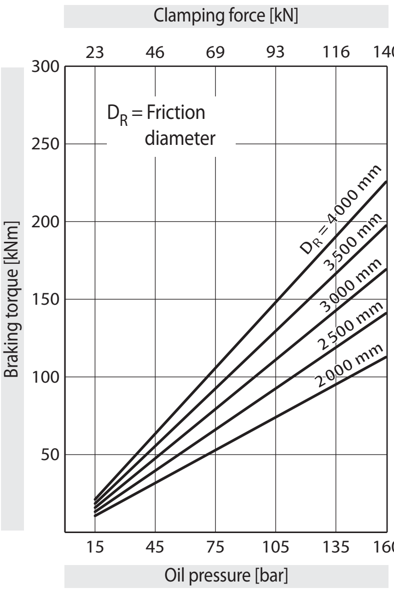
Mounting on the outer diameter of the brake disc 55-2



Supply connections 55-3

Technical Data

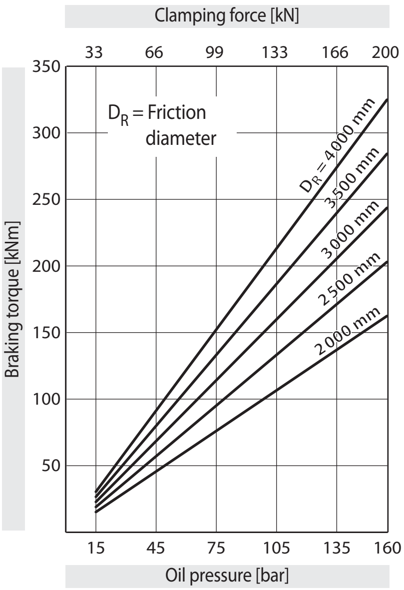
Brake Caliper HI 150 HUK



The braking torques shown in the diagram are based on a theoretical friction coefficient of 0,4.

Oil pressure:	min. 15 bar max. 160 bar
Oil volume:	17 cm^3 per 1 mm stroke
Weight:	ca. 65 kg

Brake Caliper HI 180 HUK



The braking torques shown in the diagram are based on a theoretical friction coefficient of 0,4.

Oil pressure:	min. 15 bar max. 160 bar
Oil volume:	26 cm^3 per 1 mm stroke
Weight:	ca. 65 kg

Other features

- High safety against leakage
- Painted with surface coating class C4-L according to ISO 12944
- For brake disc thickness W = 30 mm; larger brake disc thicknesses can be achieved with the use of a spacer installed by the customer

Accessories

- Optional painting with surface coating class C4-H or C5M-H (offshore) according to ISO 12944

Calculation of the friction diameter

Mounting on the inner diameter of the brake disc:

$D_R = d + (2 \cdot 49 \text{ mm})$

(when d ≥ 2 000 mm)

Mounting on the outer diameter of the brake disc:

$D_R = D - (2 \cdot 54 \text{ mm})$

Calculation of the braking torque

HI 150 HUK:

$$M_B = \frac{D_R}{1{,}132} \cdot p \cdot \mu$$

HI 180 HUK:

$$M_B = \frac{D_R}{0{,}786} \cdot p \cdot \mu$$

Formula symbols

M_B = Braking torque [Nm]
D = Outer diameter brake disc [mm]
d = Inner diameter brake disc [mm]
D_R = Friction diameter [mm]
p = Oil pressure [bar]
μ = Friction coefficient

Brake Calipers HW 150 HUK and HW 180 HUK

**hydraulically activated – non-releasing
as yaw brake in wind turbines**

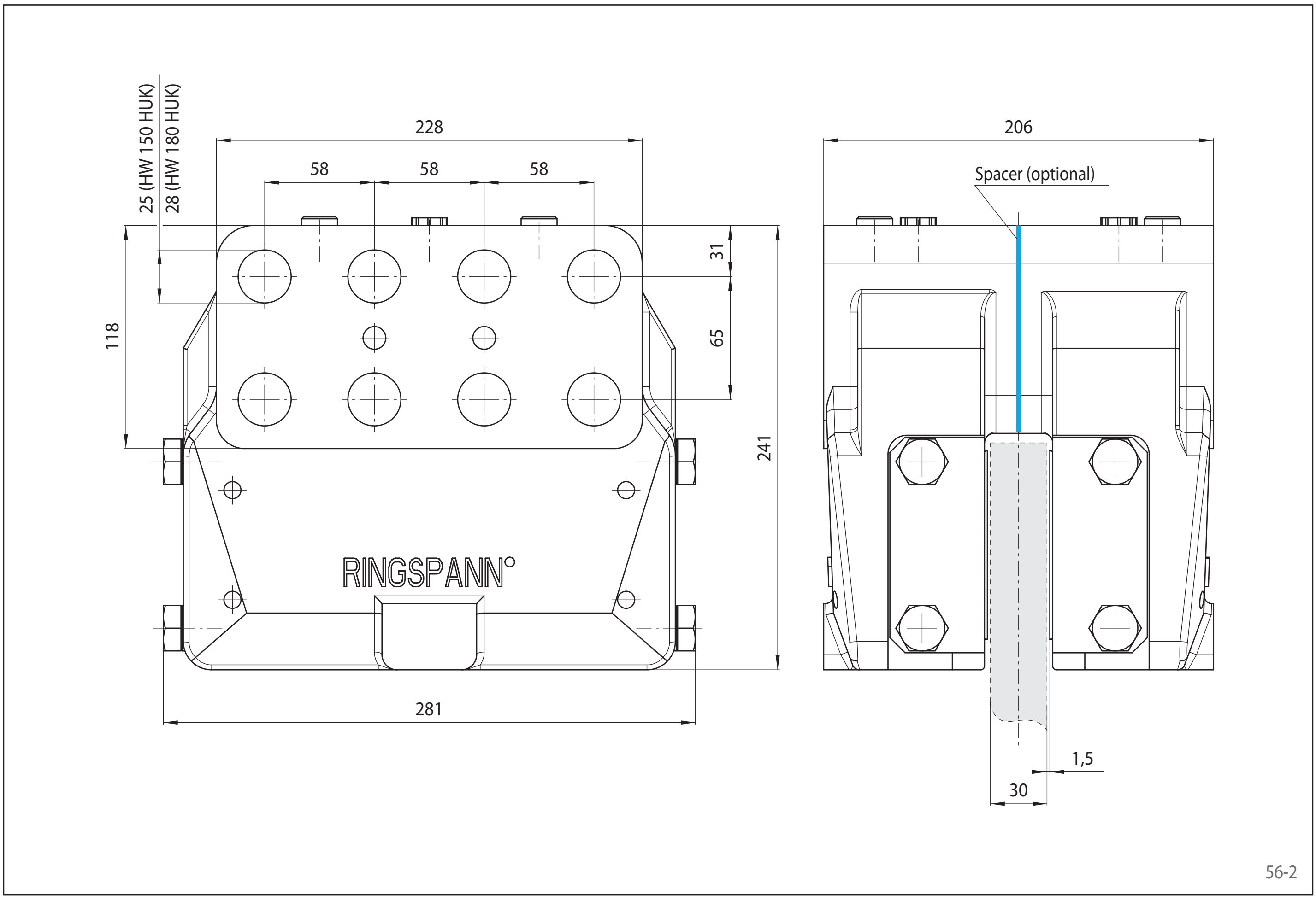
Features

Features	Code
Brake Caliper	H
Standard	W
With piston diameter 2 x 75 mm or piston diameter 2 x 90 mm	150 180
Hydraulically activated	H
Non-releasing	U
No adjustment to counter friction block wear	K
Max. clamping force 140 kN (HW 150) Max. clamping force 200 kN (HW 180)	140 200

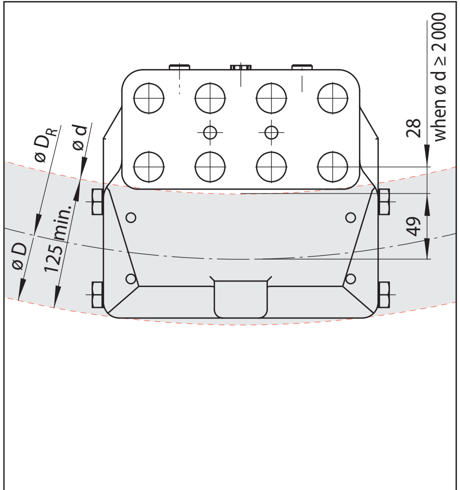
Example for ordering

Brake Caliper HW 150 HUK, max. clamping force 140 kN:

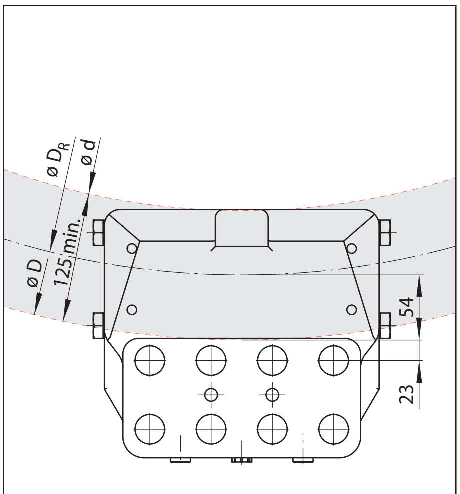
HW 150 HUK - 140



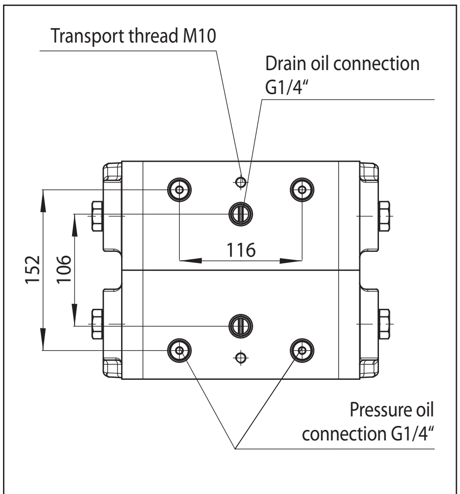
Mounting



Mounting on the inner diameter of the brake disc 57-1



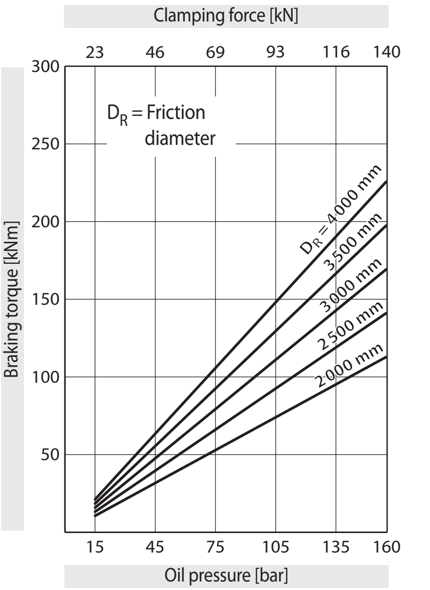
Mounting on the outer diameter of the brake disc 57-2



Supply connections 57-3

Technical Data

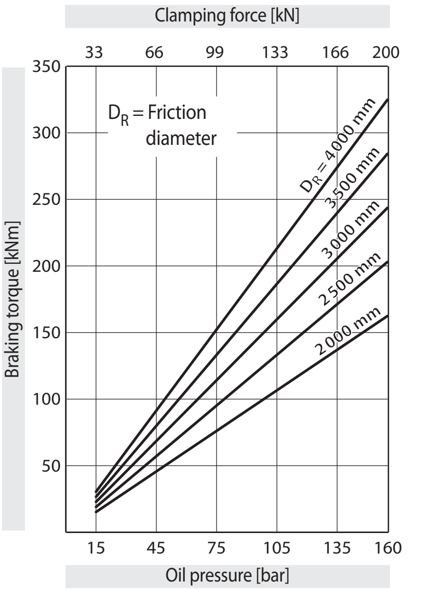
Brake Caliper HW 150 HUK



The braking torques shown in the diagram are based on a theoretical friction coefficient of 0,4.

Oil pressure:	min. 15 bar max. 160 bar
Oil volume:	17 cm^3 per 1 mm stroke
Weight:	ca. 65 kg

Brake Caliper HW 180 HUK



The braking torques shown in the diagram are based on a theoretical friction coefficient of 0,4.

Oil pressure:	min. 15 bar max. 160 bar
Oil volume:	26 cm^3 per 1 mm stroke
Weight:	ca. 65 kg

Other features

- High safety against leakage
- Easy change of friction blocks
- Painted with surface coating class C4-L according to ISO 12944
- For brake disc thickness W = 30 mm; larger brake disc thicknesses can be achieved with the use of a spacer installed by the customer

Accessories

- Optional painting with surface coating class C4-H or C5M-H (offshore) according to ISO 12944

Calculation of the friction diameter

Mounting on the inner diameter of the brake disc:

$D_R = d + (2 \cdot 49\ mm)$

(when d ≥ 2000 mm)

Mounting on the outer diameter of the brake disc:

$D_R = D - (2 \cdot 54\ mm)$

Calculation of the braking torque

HW 150 HUK:

$$M_B = \frac{D_R}{1,132} \cdot p \cdot \mu$$

HW 180 HUK:

$$M_B = \frac{D_R}{0,786} \cdot p \cdot \mu$$

Formula symbols

M_B = Braking torque [Nm]

D = Outer diameter brake disc [mm]

d = Inner diameter brake disc [mm]

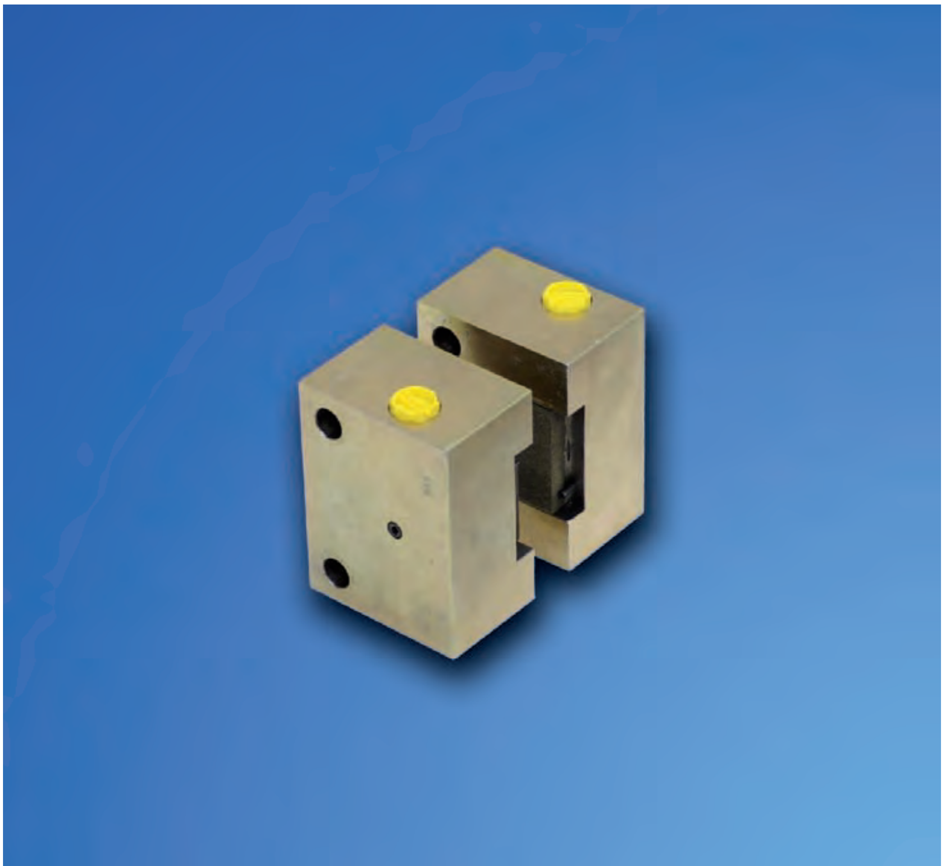
D_R = Friction diameter [mm]

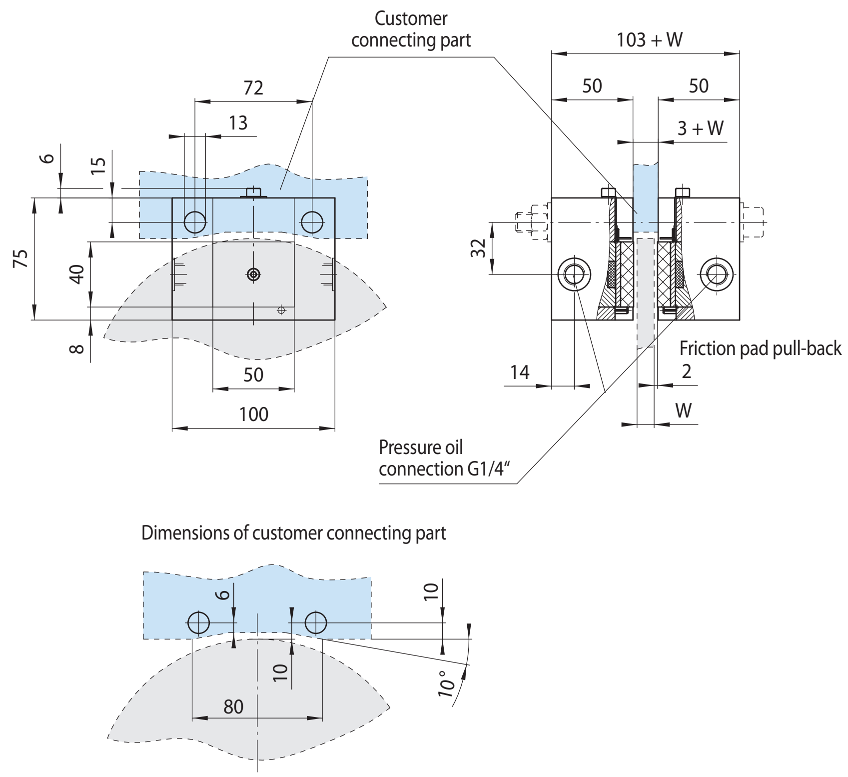
p = Oil pressure [bar]

μ = Friction coefficient

Brake Caliper HW 040 HFA

hydraulically activated – spring released


58-1



58-2

Features

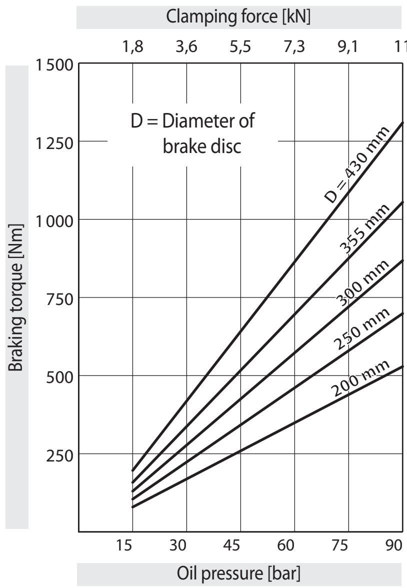
Features	Code
Brake Caliper	H
Standard	W
With piston diameter 40 mm	040
Hydraulically activated	H
Spring released	F
Automatic adjustment to counter friction block wear	A
Max. clamping force 11 kN	011

Example for ordering

Brake Caliper HW 040 HFA, max. clamping force 11 kN:

HW 040 HFA - 011

Technical Data



The braking torques shown in the diagram are based on a theoretical friction coefficient of 0,28.

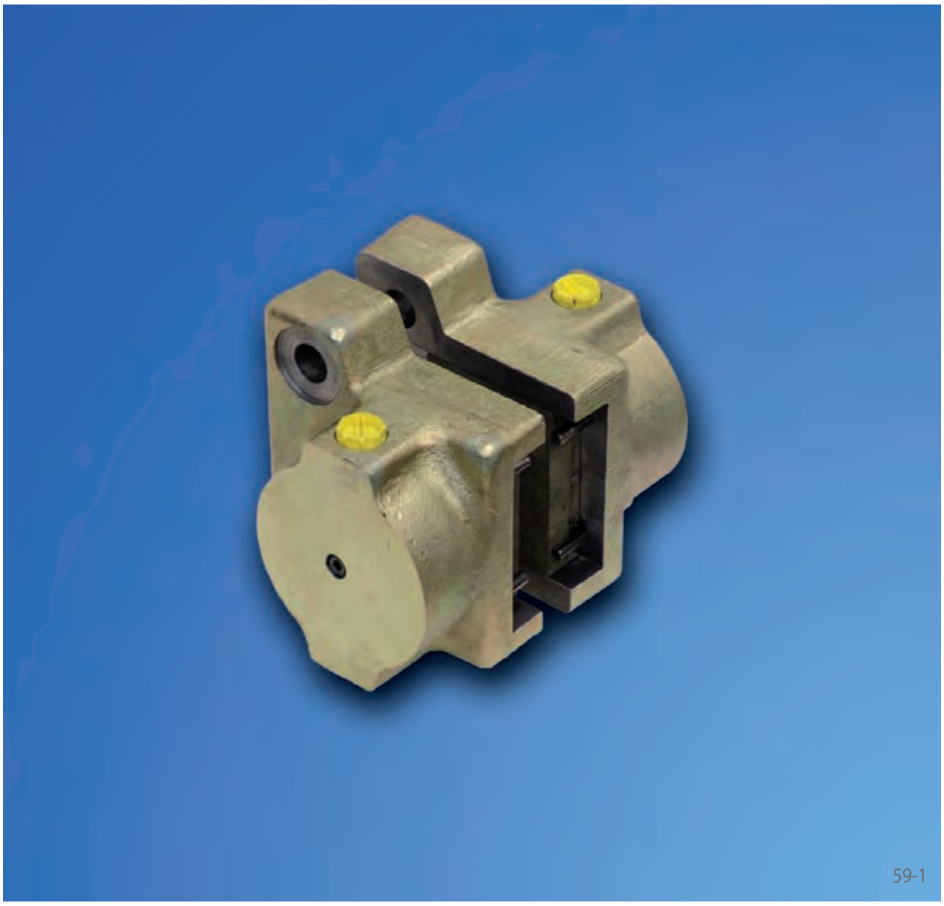
Oil pressure:	min. 5 bar max. 90 bar
Oil volume:	5 cm^3 per stroke
Weight:	5,5 kg

Other features

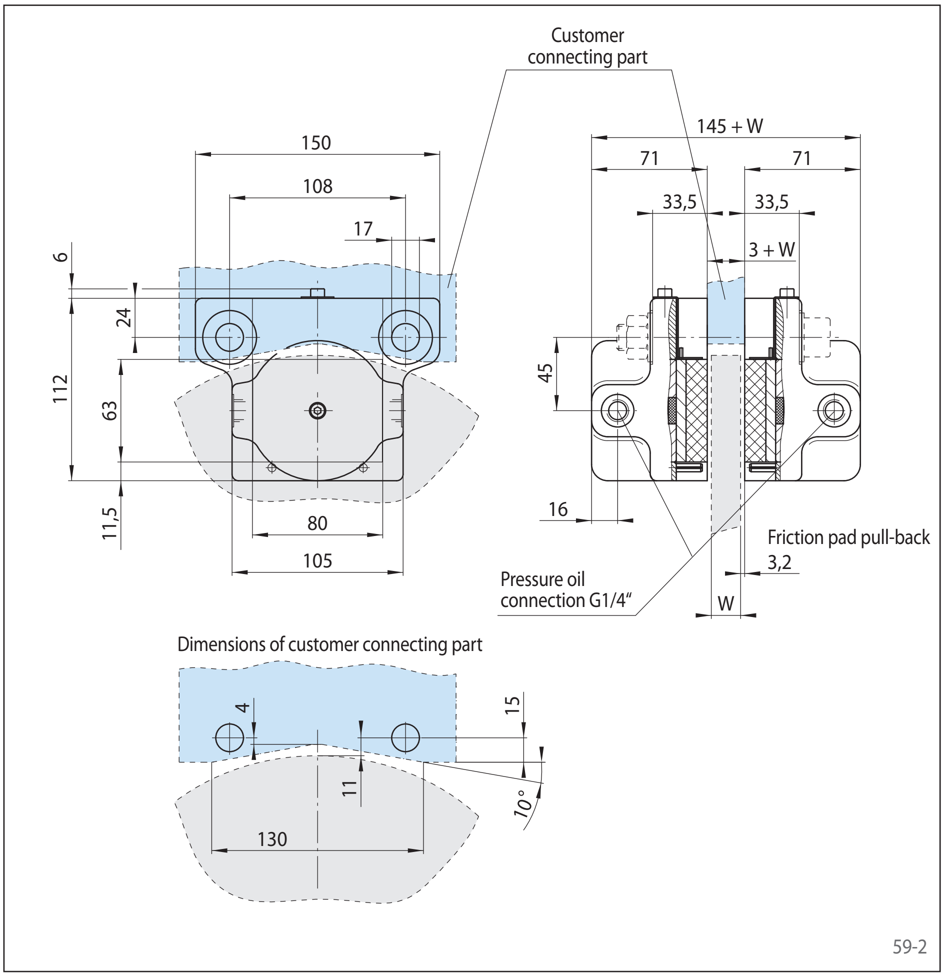
- The thickness of the customer connecting part results from the thickness of the brake disc W plus 3 mm

Brake Caliper HW 063 HFA

hydraulically activated – spring released



59-1



59-2

Features

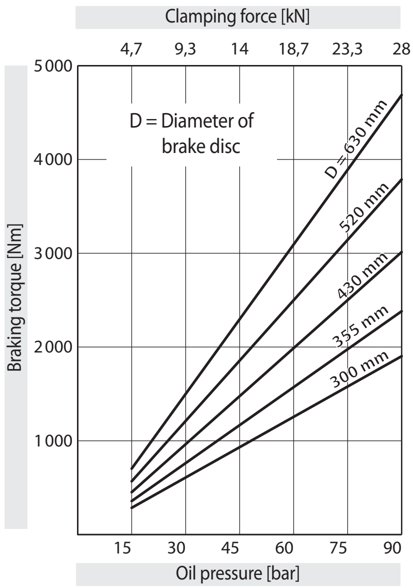
Features	Code
Brake Caliper	H
Standard	W
With piston diameter 63 mm	063
Hydraulically activated	H
Spring released	F
Automatic adjustment to counter friction block wear	A
Max. clamping force 28 kN	028

Example for ordering

Brake Caliper HW 063 HFA, max. clamping force 28 kN:

HW 063 HFA - 028

Technical Data



The braking torques shown in the diagram are based on a theoretical friction coefficient of 0,28.

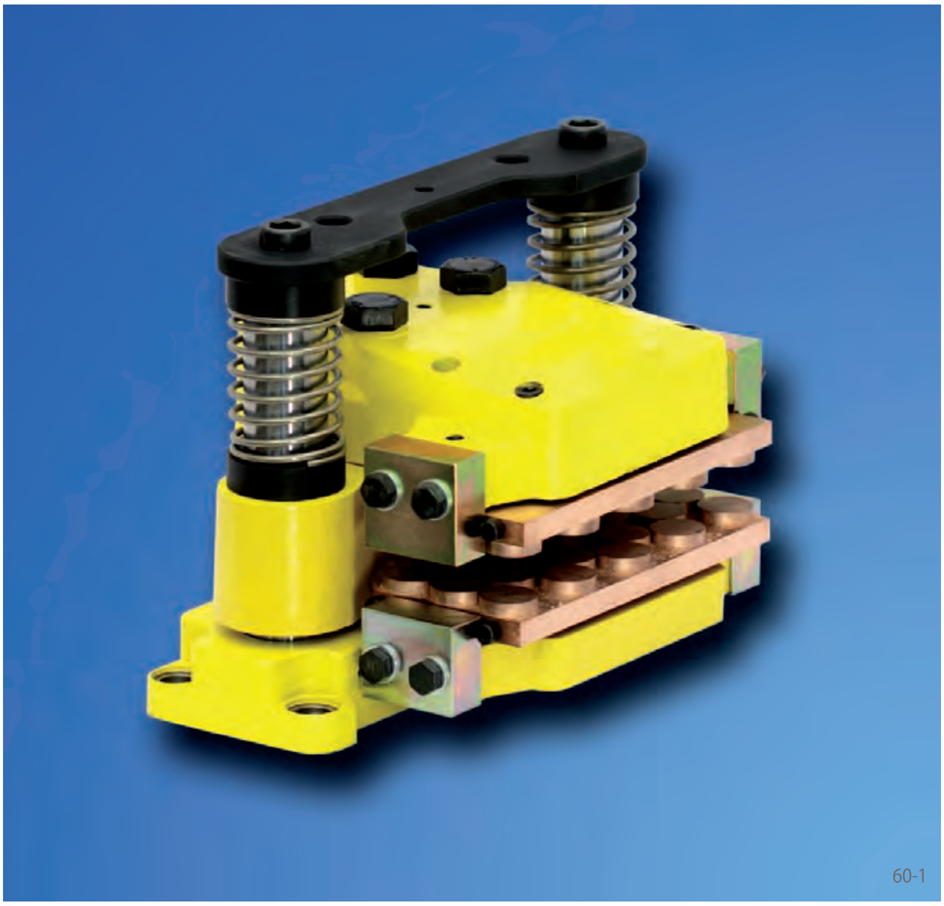
Oil pressure:	min. 5 bar max. 90 bar
Oil volume:	20 cm^3 per stroke
Weight:	8 kg

Other features

- The thickness of the customer connecting part results from the thickness of the brake disc W plus 3 mm

Brake Caliper HS 075 HFK

hydraulically activated – spring released



60-1

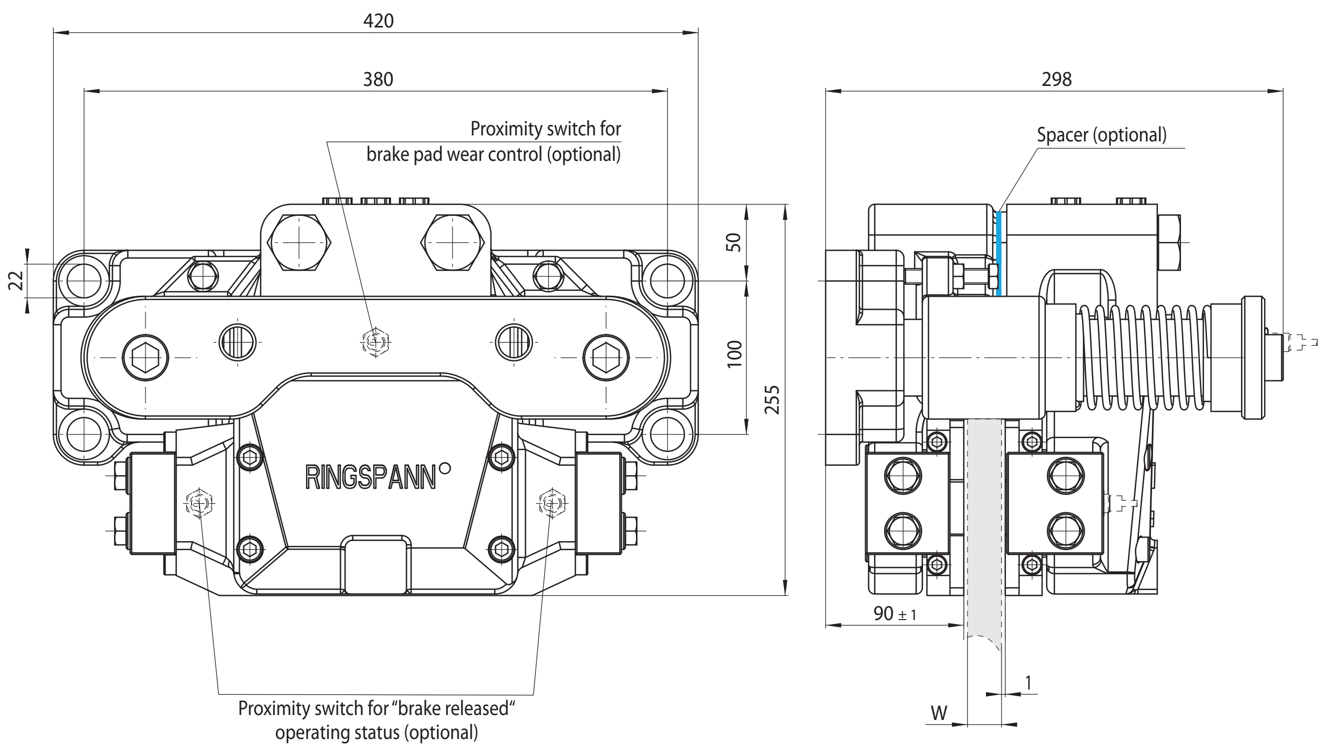
Features

Features	Code
Brake Caliper	H
Floating caliper	S
With piston diameter 75 mm	075
Hydraulically activated	H
Spring released	F
No adjustment to counter friction block wear	K
Max. clamping force 55 kN	055

Example for ordering

Brake Caliper HS 075 HFK, max. clamping force 55 kN:

HS 075 HFK - 055

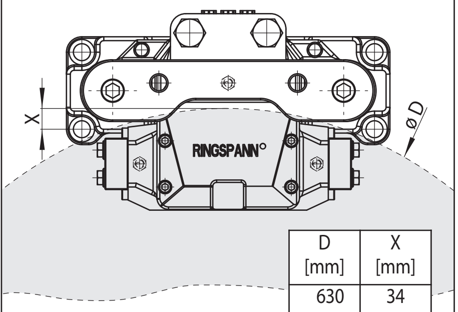


60-2

Brake Caliper HS 075 HFK

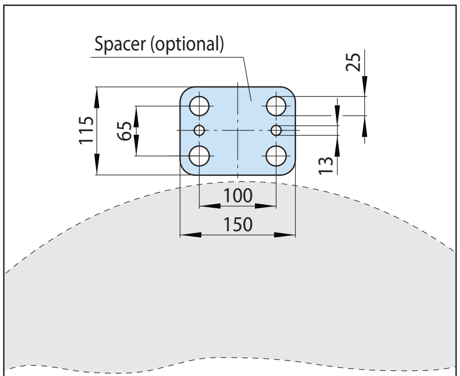
hydraulically activated – spring released

Mounting

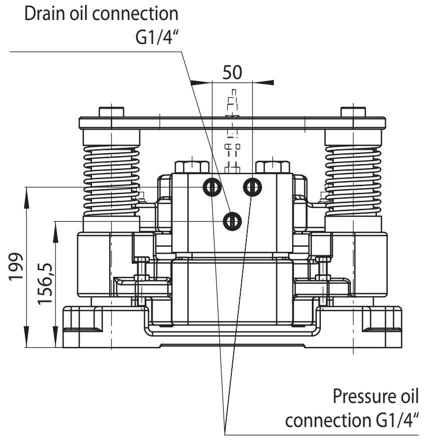


D [mm]	X [mm]
630	34
710	25
900	25
1 250	20
1 600	15

Mounting on the brake disc 61-1

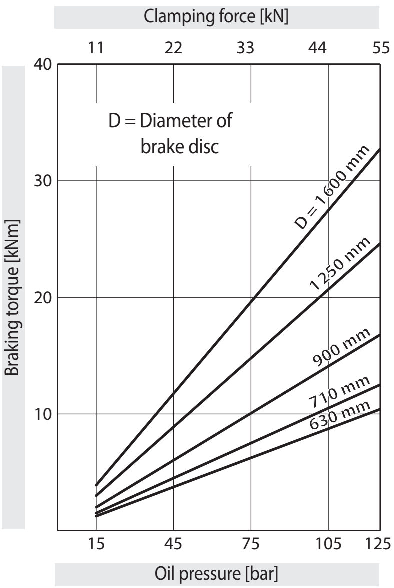


Dimensions of spacer 61-2



Supply connections 61-3

Technical Data



The braking torques shown in the diagram are based on a theoretical friction coefficient of 0,4.

Oil pressure:	min. 15 bar max. 125 bar
Oil volume:	53 cm^3 per stroke
Weight:	ca. 80 kg

Other features

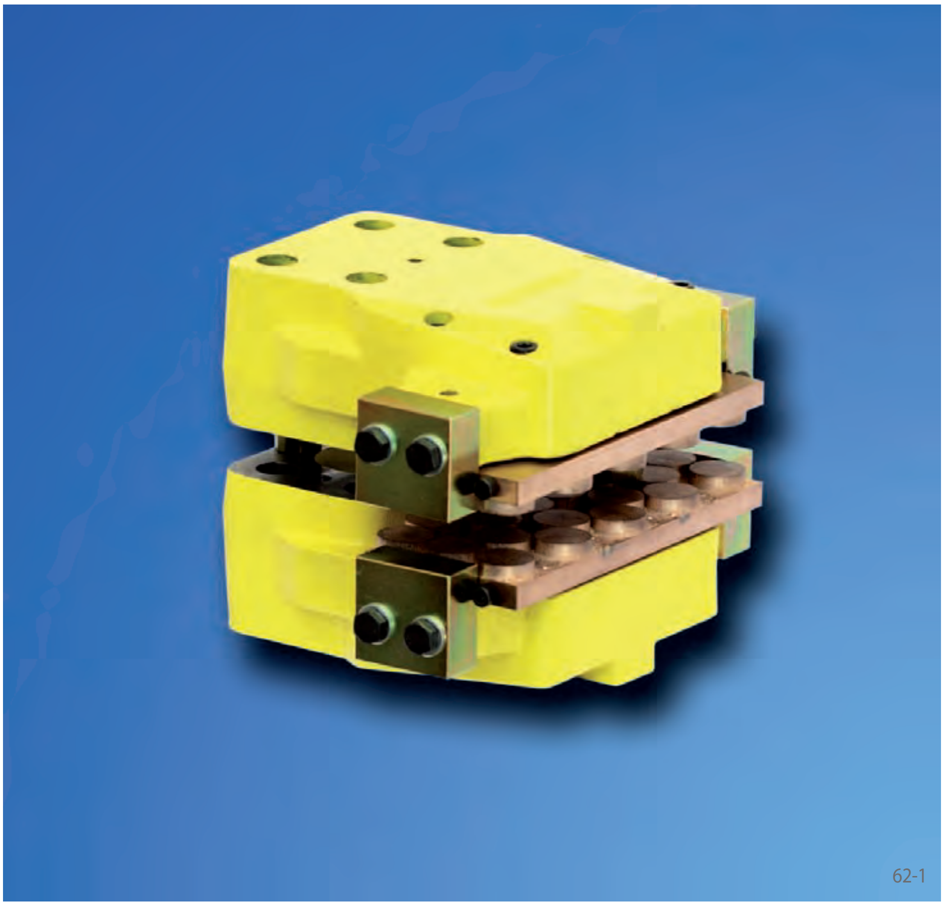
- High safety against leakage
- Easy change of friction blocks
- Painted with surface coating class C4-L according to ISO 12944
- For brake disc thickness W = 20 mm; brake disc thicknesses of up to 40 mm can be achieved with the use of a spacer installed by the customer

Accessories

- Inductive proximity switch for "brake released" operating status
- Inductive proximity switch for brake pad wear control
- Optional painting with surface coating class C4-H or C5M-H (offshore) according to ISO 12944

Brake Caliper HW 075 HFK

hydraulically activated – spring released



62-1

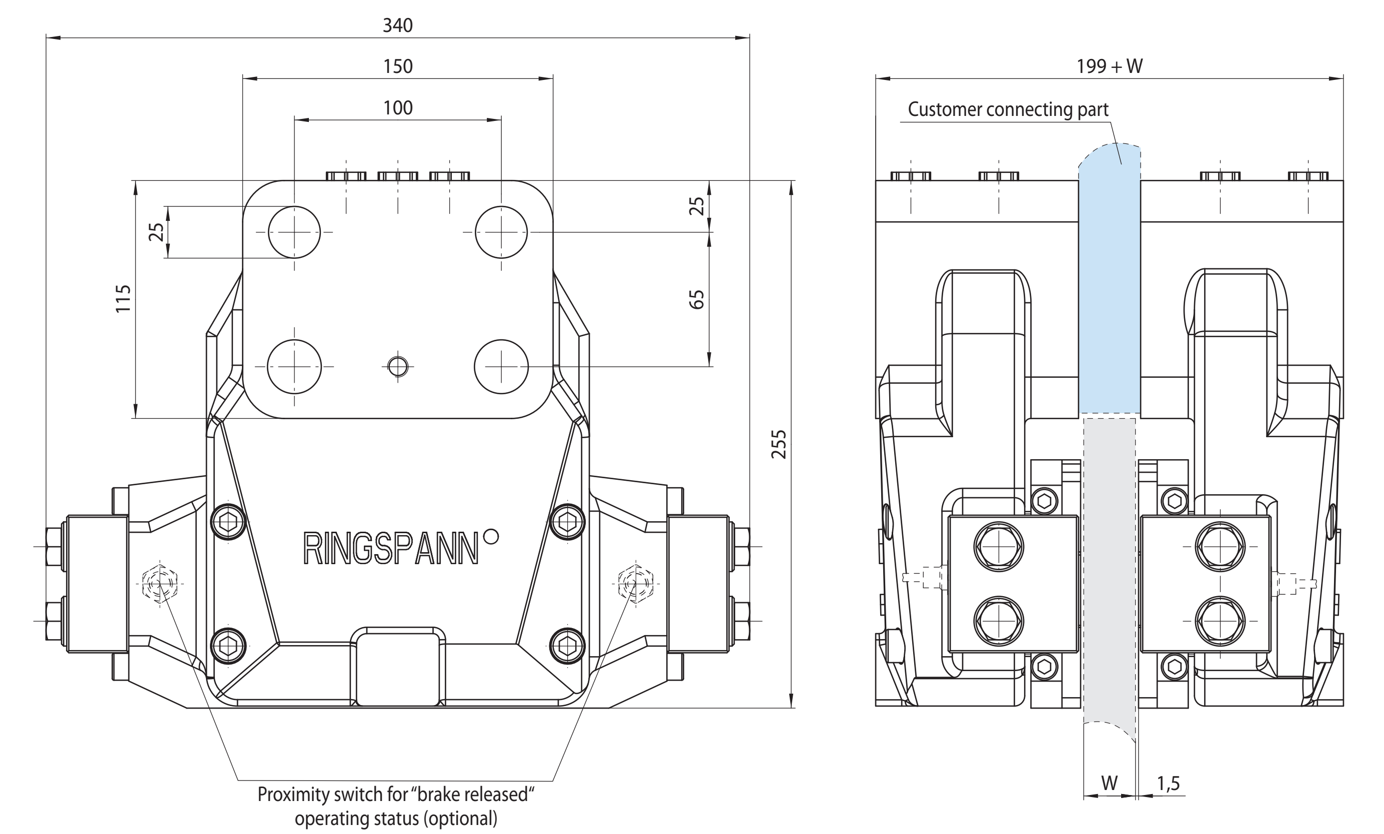
Features

Features	Code
Brake Caliper	H
Standard	W
With piston diameter 75 mm	075
Hydraulically activated	H
Spring released	F
No adjustment to counter friction block wear	K
Max. clamping force 55 kN	055

Example for ordering

Brake Caliper HW 075 HFK, max. clamping force 55 kN:

HW 075 HFK - 055

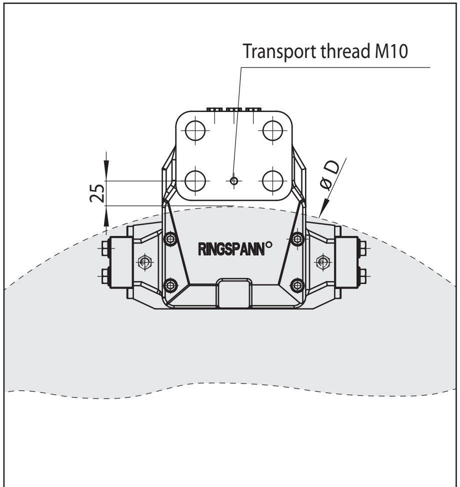


62-2

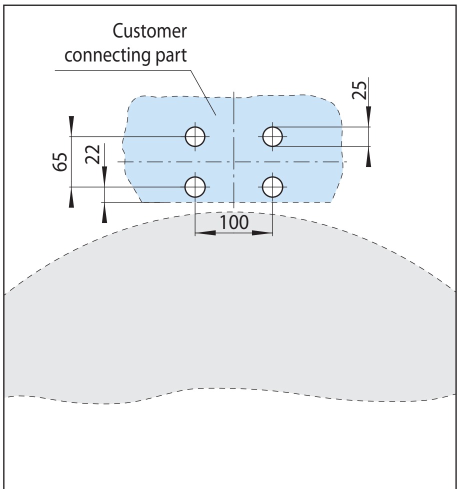
Brake Caliper HW 075 HFK

hydraulically activated – spring released

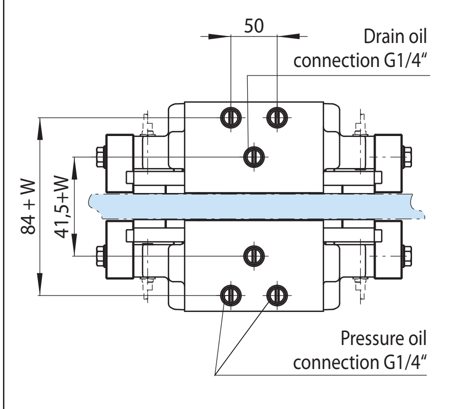
Mounting



Mounting on the brake disc 63-1

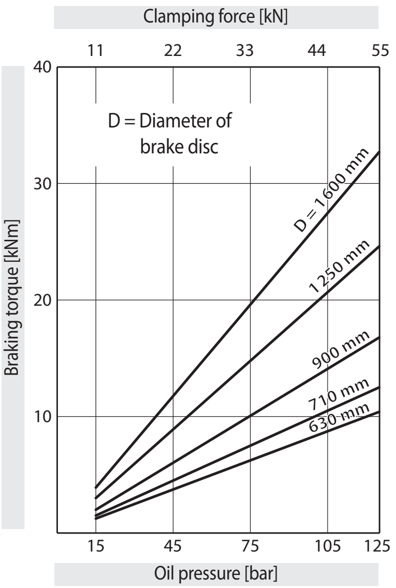


Dimensions of customer connecting part 63-2



Supply connections 63-3

Technical Data



The braking torques shown in the diagram are based on a theoretical friction coefficient of 0,4.

Oil pressure:	min. 15 bar max. 125 bar
Oil volume:	57 cm^3 per stroke
Weight:	ca. 60 kg

Other features

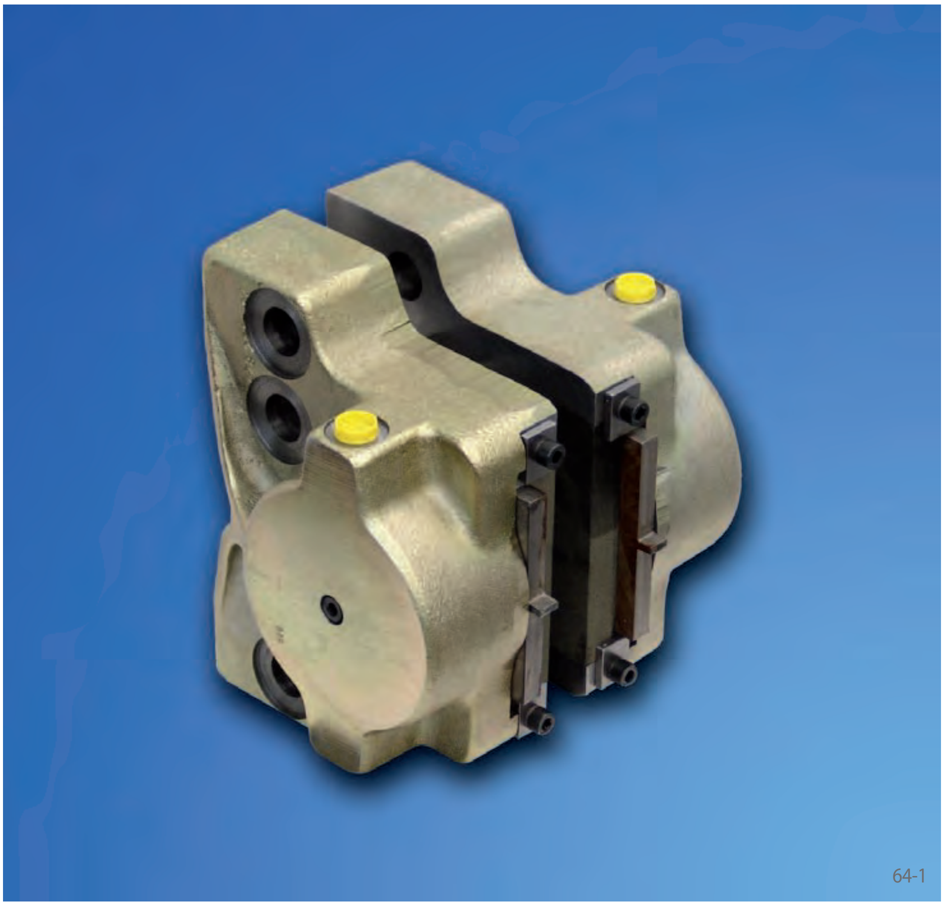
- High safety against leakage
- Easy change of friction blocks
- Painted with surface coating class C4-L according to ISO 12944
- The thickness of the customer connecting part results from the thickness of the brake disc W plus 3 mm

Accessories

- Inductive proximity switch for "brake released" operating status
- Optional painting with surface coating class C4-H or C5M-H (offshore) according to ISO 12944

Brake Caliper HW 100 HFA

hydraulically activated – spring released


64-1

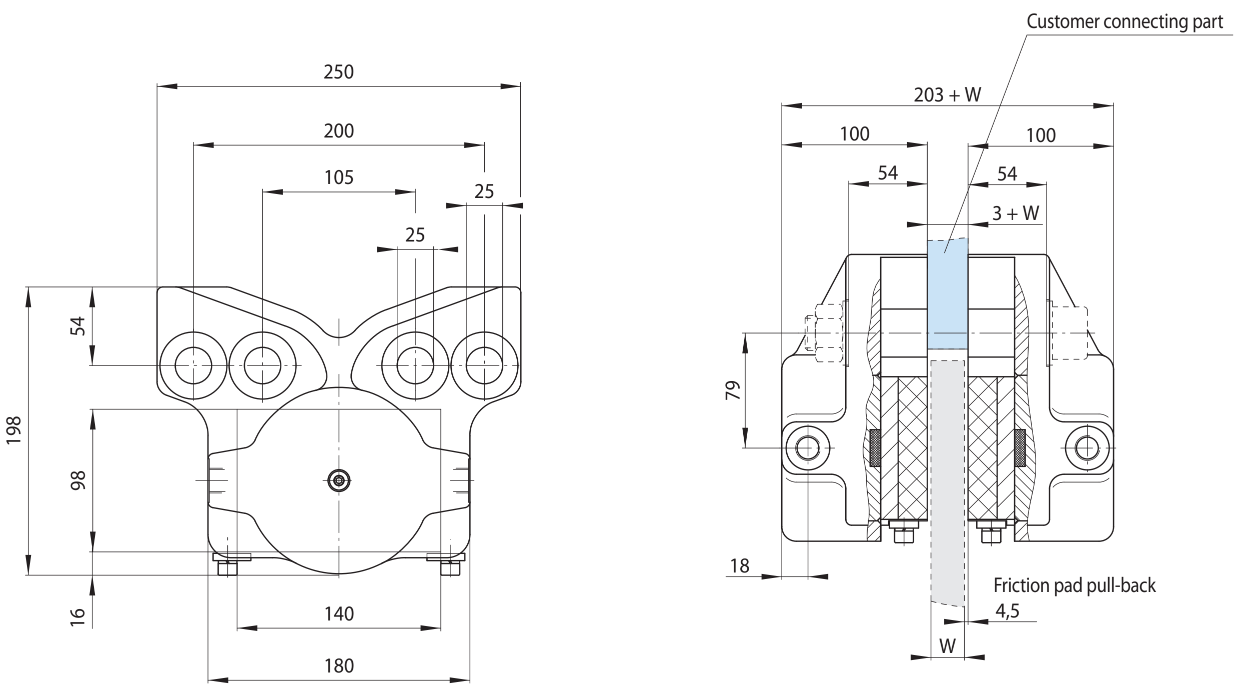
Features

Features	Code
Brake Caliper	H
Standard	W
With piston diameter 100 mm	100
Hydraulically activated	H
Spring released	F
Automatic adjustment to counter friction block wear	A
Max. clamping force 70 kN	070

Example for ordering

Brake Caliper HW 100 HFA, max. clamping force 70 kN:

HW 100 HFA - 070

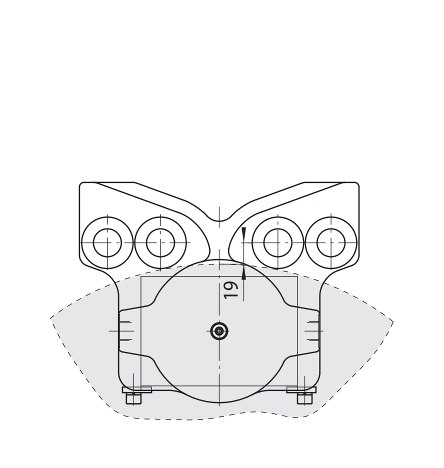


64-2

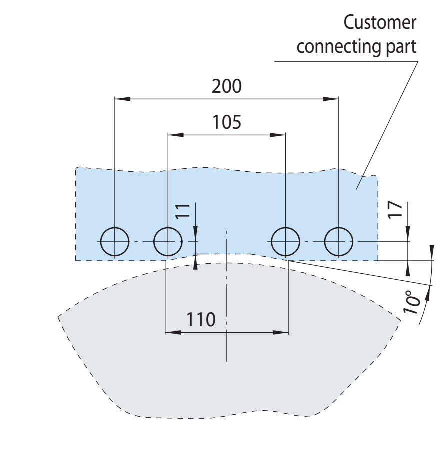
Brake Caliper HW 100 HFA

hydraulically activated – spring released

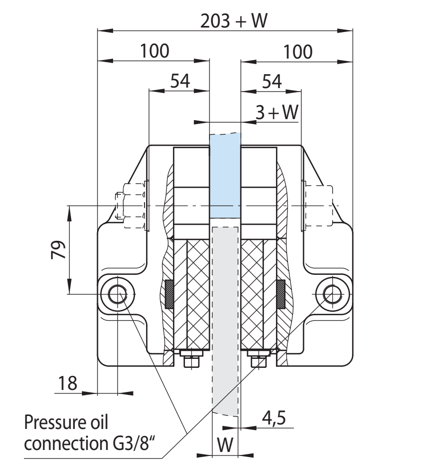
Mounting



Mounting on the brake disc 65-1

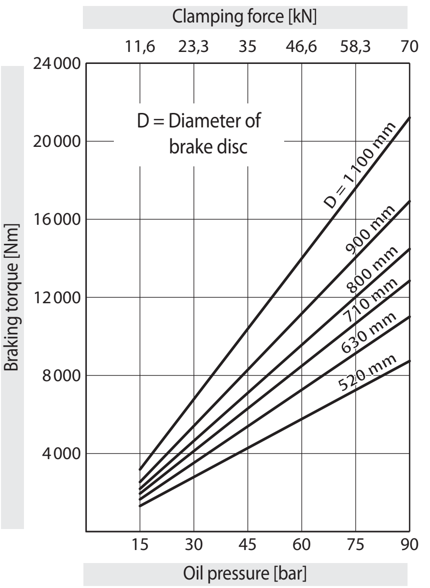


Dimensions of customer connecting part 65-2



Supply connections 65-3

Technical Data



The braking torques shown in the diagram are based on a theoretical friction coefficient of 0,28.

Oil pressure:	min. 5 bar max. 90 bar
Oil volume:	71 cm^3 per stroke
Weight:	30 kg

Other features

- The thickness of the customer connecting part results from the thickness of the brake disc W plus 3 mm

Brake Calipers HW 150 HFA and HW 180 HFA

hydraulically activated – spring released

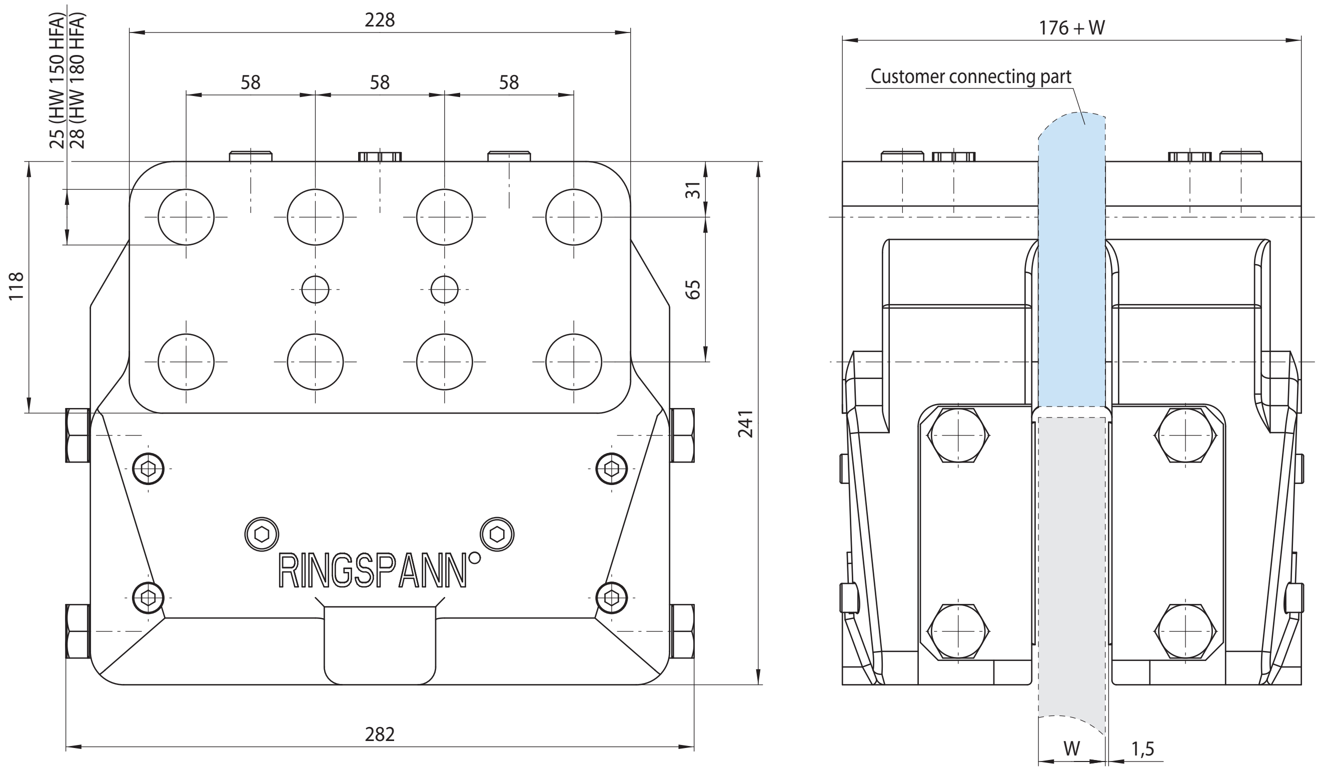
66-1

Features	Code
Brake Caliper	H
Standard	W
With piston diameter 2 x 75 mm or piston diameter 2 x 90 mm	150 180
Hydraulically activated	H
Spring released	F
Automatic adjustment to counter friction block wear	A
Max. clamping force 140 kN (HW 150) Max. clamping force 200 kN (HW 180)	140 200

Example for ordering

Brake Caliper HW 150 HFA, max. clamping force 140 kN:

HW 150 HFA - 140

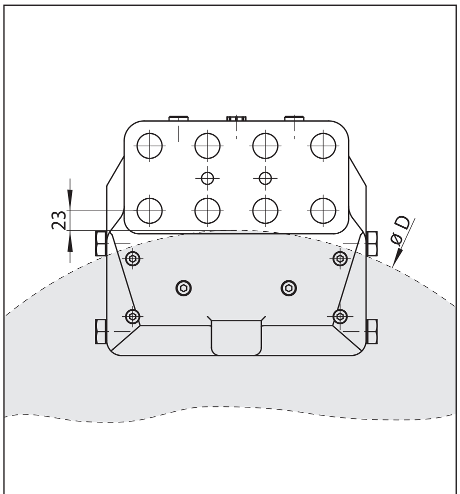


66-2

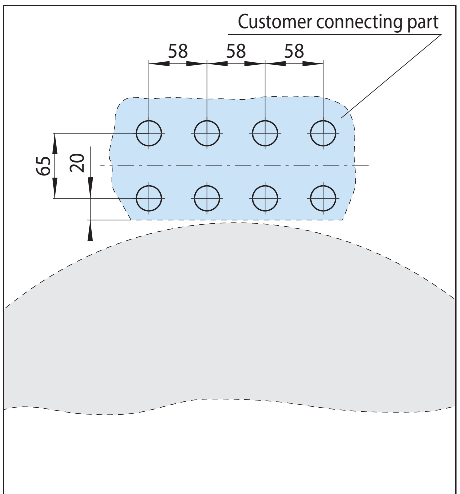
Brake Calipers HW 150 HFA and HW 180 HFA

hydraulically activated – spring released

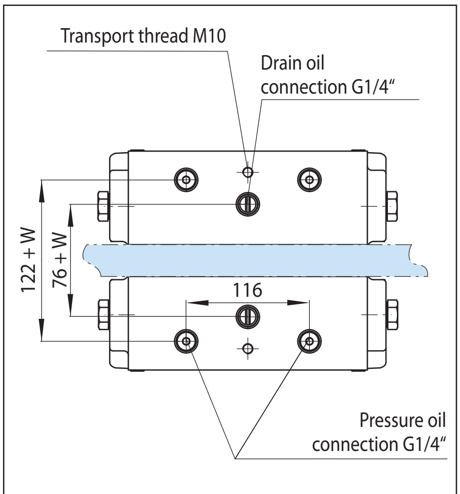
Mounting



Mounting on the outer diameter of the brake disc 67-1



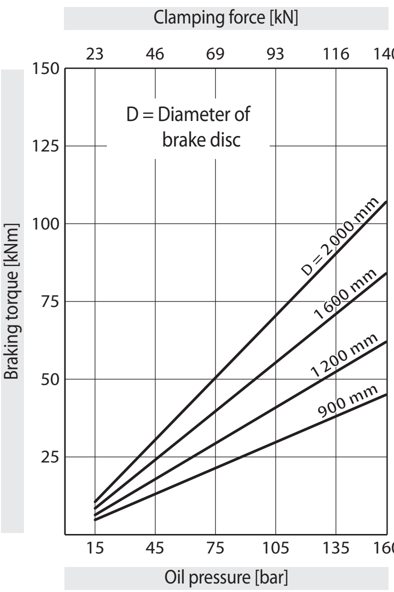
Dimensions of customer connecting part 67-2



Supply connections 67-3

Technical Data

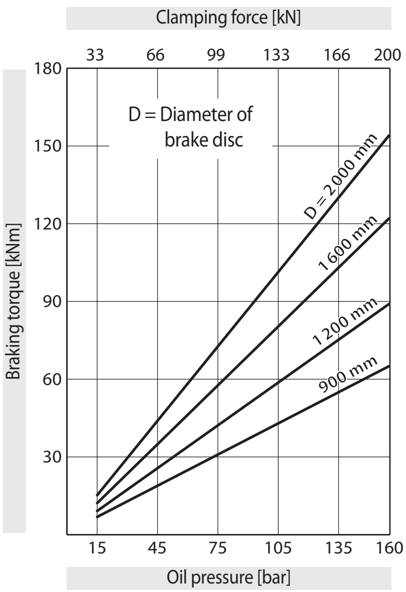
Brake Caliper HW 150 HFA



The braking torques shown in the diagram are based on a theoretical friction coefficient of 0,4.

Oil pressure:	min. 15 bar max. 160 bar
Oil volume:	51 cm^3 per stroke
Weight:	ca. 65 kg

Brake Caliper HW 180 HFA



The braking torques shown in the diagram are based on a theoretical friction coefficient of 0,4.

Oil pressure:	min. 15 bar max. 160 bar
Oil volume:	104 cm^3 per stroke
Weight:	ca. 65 kg

Other features

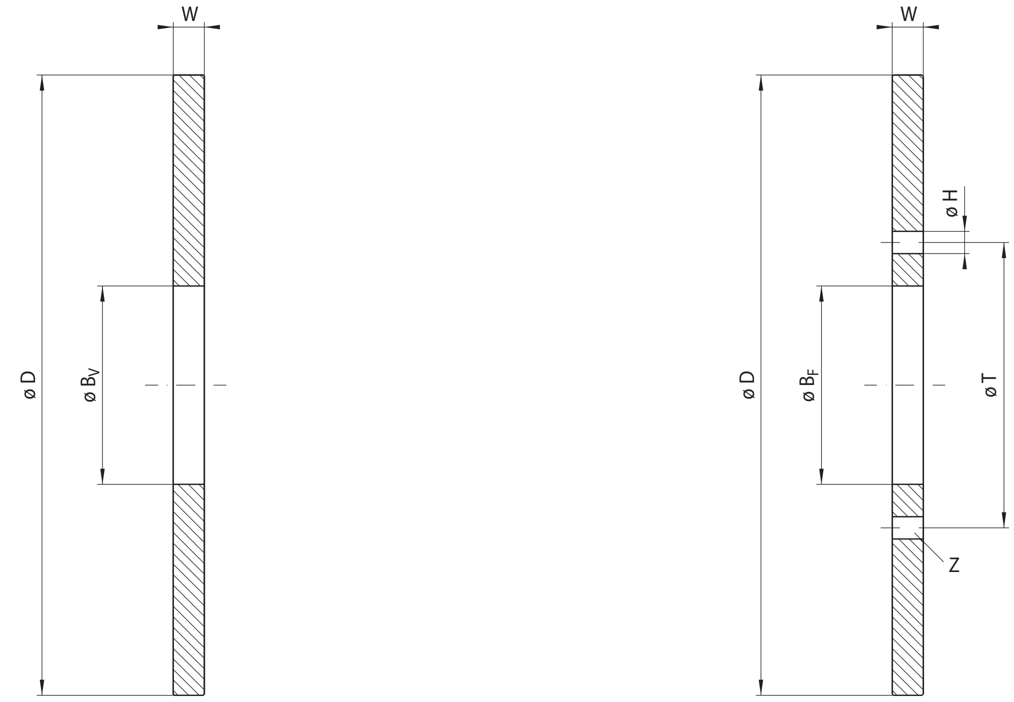
- High safety against leakage
- Painted with surface coating class C4-L according to ISO 12944
- The thickness of the customer connecting part results from the thickness of the brake disc W plus 3 mm

Accessories

- Optional painting with surface coating class C4-H or C5M-H (offshore) according to ISO 12944

Brake Discs

Form F



Type without bore
(from size F 430 roughbored)

Type with centre bore

Size	D	W	Type without bore/roughbored		Type with centre bore					Permissible speed	Inertia moment
	mm	mm	Article number	Bore B_V mm	Article number	Bore B_F^{H7} mm	H mm	T mm	Z	min^{-1}	kgm^2
F 125/12,5	125	12,5	2471.125.150	-	2471.125.152	40	9	56	4	14 500	0,0022
F 150/12,5	150	12,5	2471.150.150	-	2471.150.152	50	9	66	4	12 100	0,0045
F 200/12,5	200	12,5	2471.200.150	-	2471.200.151	63	11	83	8	9 100	0,0141
F 250/12,5	250	12,5	2471.250.150	-	2471.250.159	80	11	100	8	7 300	0,0345
F 300/12,5	300	12,5	2471.300.150	-	2471.300.155	100	14	122	8	6 000	0,072
F 355/12,5	355	12,5	2471.355.150	-	2471.355.152	110	14	132	10	5 100	0,140
F 430/12,5	430	12,5	2471.430.150	50	2471.430.157	125	14	147	12	4 200	0,302
F 520/12,5	520	12,5	2471.520.150	50	2471.520.158	160	14	182	16	3 500	0,646
F 630/25	630	25	2471.630.150	75	-	-	-	-	-	2 900	2,78
F 710/25	710	25	2471.710.150	95	-	-	-	-	-	2 600	4,49
F 800/25	800	25	2471.800.150	95	-	-	-	-	-	2 300	7,24
F 900/25	900	25	2471.900.150	120	-	-	-	-	-	2 000	11,59
F 1000/25	1 000	25	2471.990.150	120	-	-	-	-	-	1 800	17,7

Other sizes of brake discs

For Brake Calipers DV 030 and DH 030, brake discs with diameters ranging from D = 200 mm up to 520 mm are also available with a disc thickness of W = 25 mm.

Material

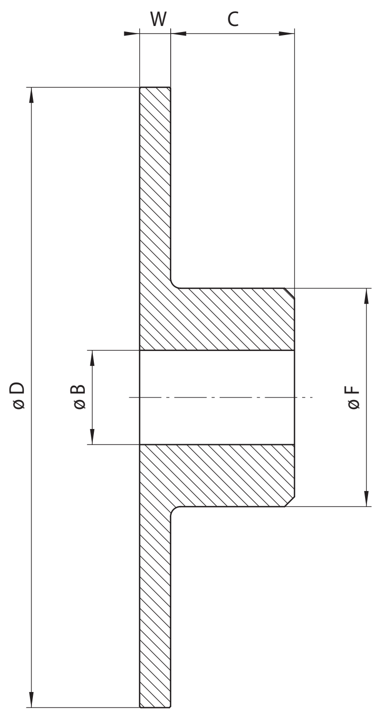
The Brake Discs are made from GGG-50 (DIN 1693).

Dimensioning

Please refer to the technical points on pages 76 to 78 when dimensioning the brake disc size.

Brake Discs

Form B



Size	Bore B roughbored mm	D mm	F mm	C mm	W mm	Article number	Permissible speed min^{-1}	Inertia moment kgm^2
B 125/12,5	-	125	50	25	12,5	2471.125.250	14 500	0,0023
B 150/12,5	-	150	60	30	12,5	2471.150.250	12 100	0,0047
B 200/12,5	-	200	65	40	12,5	2471.200.250	9 100	0,0146
B 250/12,5	-	250	100	50	12,5	2471.250.250	7 300	0,0380
B 300/12,5	-	300	120	60	12,5	2471.300.250	6 000	0,080
B 355/12,5	-	355	145	70	12,5	2471.355.250	5 100	0,162
B 430/12,5	48	430	170	85	12,5	2471.430.250	4 200	0,352
B 520/12,5	48	520	210	105	12,5	2471.520.250	3 500	0,790
B 630/25	75	630	250	125	25	2471.630.250	2 900	3,13
B 710/25	95	710	280	140	25	2471.710.250	2 600	5,09
B 800/25	95	800	320	160	25	2471.800.250	2 300	8,42
B 900/25	120	900	360	180	25	2471.900.250	2 000	13,70
B 1000/25	120	1 000	400	200	25	2471.990.250	1 800	21,3

Other sizes of brake discs

For Brake Calipers DV 030 and DH 030, brake discs with diameters ranging from D = 200 mm up to 520 mm are also available with a disc thickness of W = 25 mm.

Material

The Brake Discs are made from GGG-50 (DIN 1693).

Dimensioning

Please refer to the technical points on pages 76 to 78 when dimensioning the brake disc size.

Friction Block Wear Control

Function

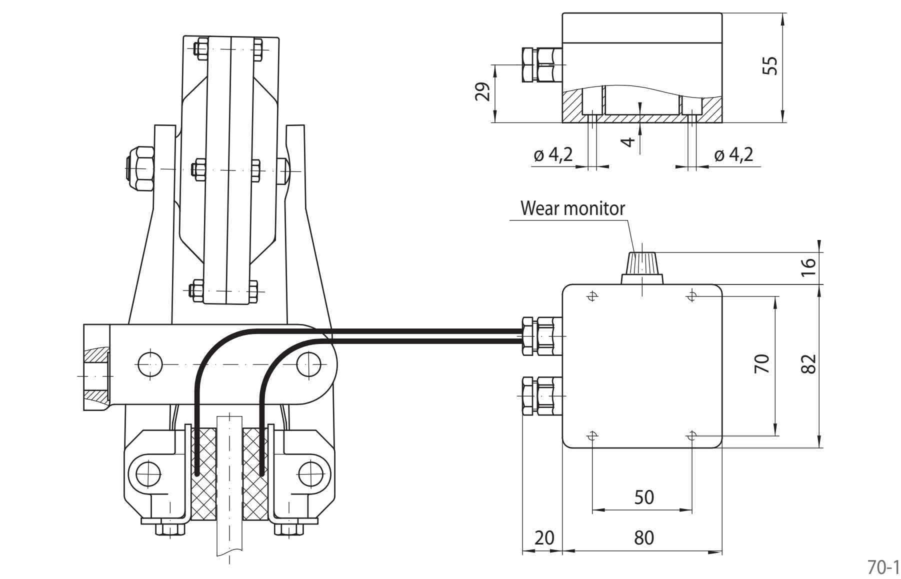
All brakes can be supplied on request with an electrical wear indicator which signals the limit of the friction block wear. The control lamp in the wear monitor indicates when the friction blocks need to be replaced. In addition, the output relay can trigger a signal in the central control station.

Friction Blocks with Signal Cable

Friction blocks with signal cable are used to monitor wear. Cable length 25 cm with plug connection.

Wear indicator

Housing:	Makrolon
Insulation:	IP 65
Colour:	Grey, RAL 7035
Temperature range:	-50° C to 60° C
Output relay:	(Changer) Reverser max. 6 A, max. 220 V



70-1

Article Number for supply voltage	
24 V DC	220 V AC, 50 Hz
3511.000.001.B024VG	3511.000.001.B220VW

Universal Transformer

The Universal Transformer is used to operate a DH 012 FEM or DV 020 FEM Brake Caliper.

Output: 0,25 kVA

Primary voltages:

200 V, 220 V, 240 V, 260 V, 280 V, 300 V, 310 V, 330 V, 350 V, 360 V, 380 V, 400 V, 420 V, 440 V, 480 V, 500 V, 530 V and 550 V

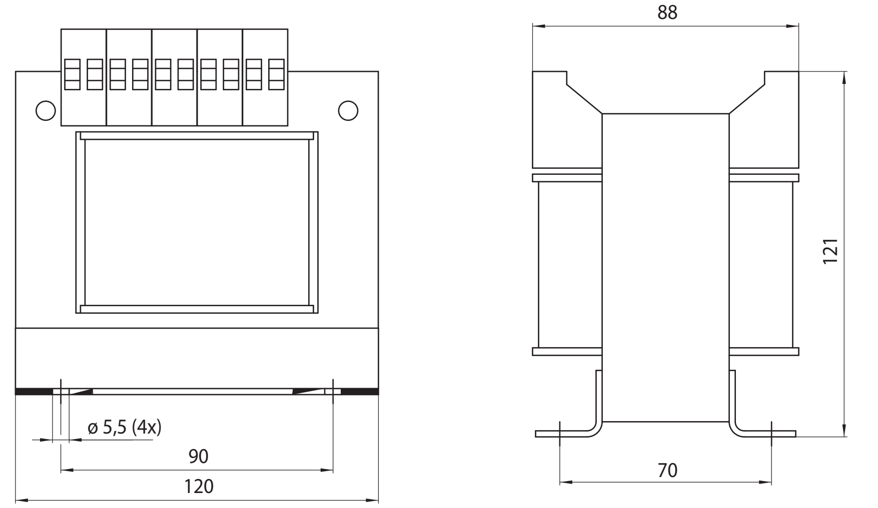
Secondary voltages:

115 V or 230 V

The Universal Transformer is manufactured in accordance with EN 61558 / VDE 0570:

- Clamps in accordance with VDGB-4
- Insulation class T40/E
- Safety class 1

Article Number: 3503.000.001.000000



70-2

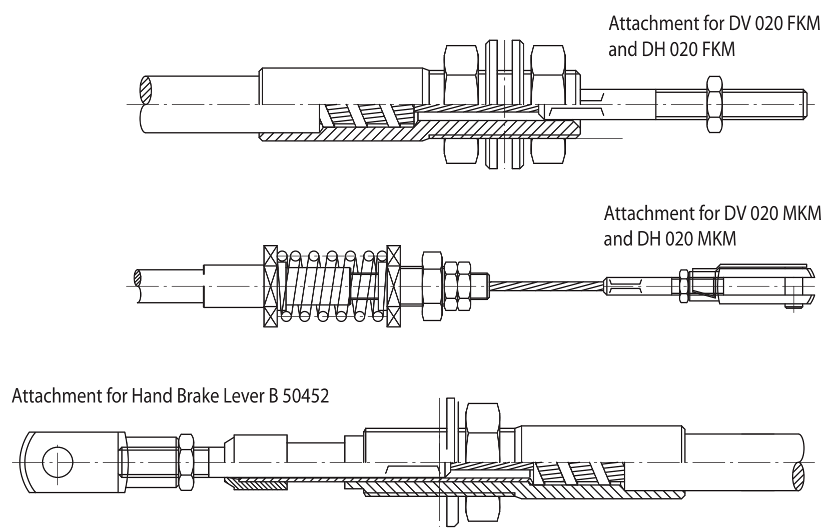
Pull Cable

Pull Cable for Brake Calipers DV 020 FKM and DH 020 FKM as well as DV 020 MKM and DH 020 MKM are available in variable cable lengths.

Cable ends are designed for attachment to Brake Calipers or Hand Brake Lever B 50452.

Features

- Slide ease
- Inner member stainless steel wrap
- Suitable for small bending radii
- Steel elements galvanized
- Stainless steel drawbar



71-1

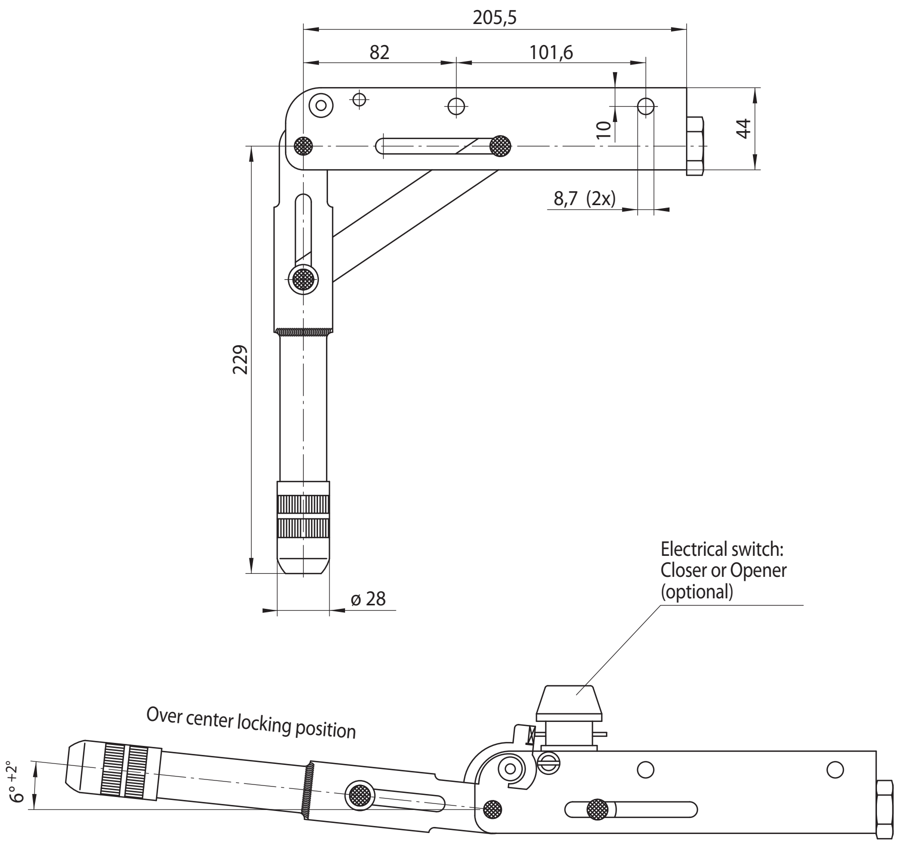
Hand Brake Lever B 50452

The Hand Brake Lever B 50452 is used to operate Brake Calipers DV 020 FKM and DH 020 FKM as well as DV 020 MKM and DH 020 MKM.

Article Number: 4561.000.001.R50452

Features

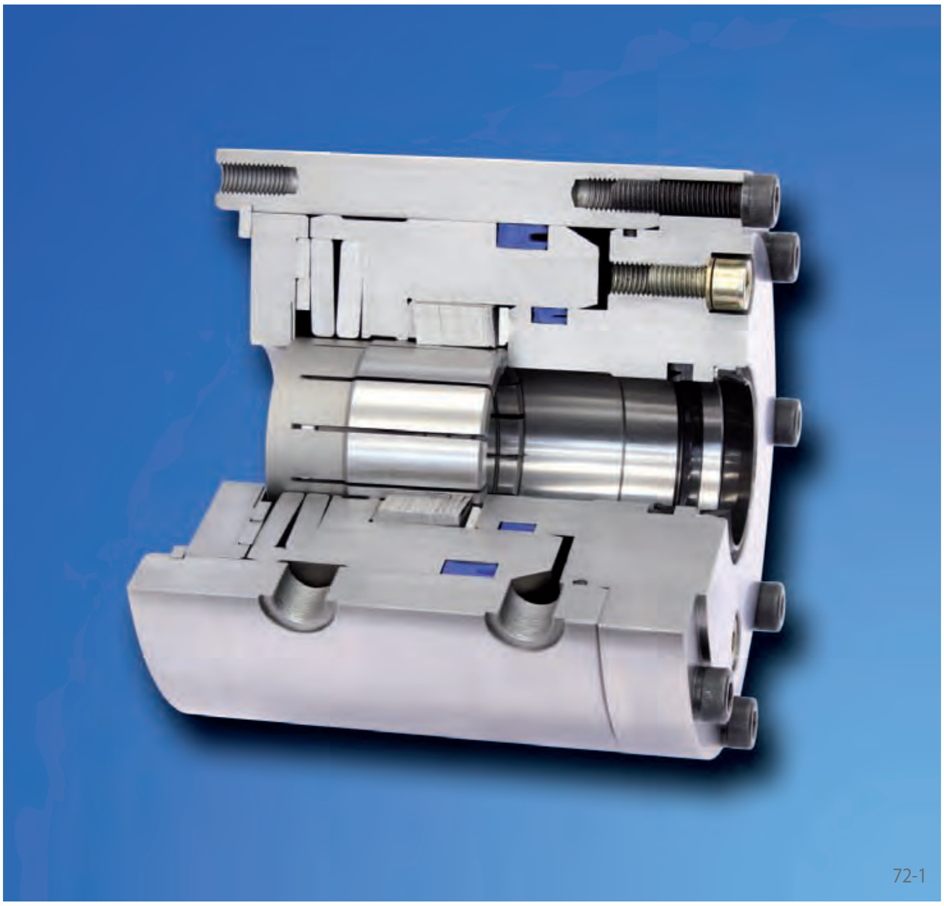
- Two positions: "open" or "closed"
- Over center locking
- Brake pad wear compensation
- Attachment for pull cables
- Optional with electric switch available



71-2

Clamping Unit KFH

spring activated – hydraulically released



72-1

Features

- For continuous piston rod clamping
- Spring activated, hydraulically released
- Holding forces transmissible in both directions of movement
- No application of force (lifting) to the piston rod required for release

Description

The Clamping Unit KFH clamps and holds hydraulic cylinder drawbars with a calculated clamping force in both directions of movement.

The clamping force is generated via built-in disc springs. The Clamping Unit is released by hydraulic pressure.

The units are fitted to cylinders and other machine parts with a connecting flange by the customer.

Operation

During the working stroke of the hydraulic cylinder, pressure is exerted onto the Clamping Unit. Through this pressure the disc springs are compressed via the piston. In this position, the clamping discs are free of axial tension and thus allow the piston rod to move freely.

When the pressure on the Clamping Unit is removed, the force of the springs works fully onto the piston and therefore also on to the disc pack. The clamping discs translate the axial spring pressure into a radial force applied to the slotted clamping sleeve that is equal to at least five times the axial pressure. The clamping sleeve transmits the radial clamping forces to the piston rod, thereby holding the piston rod firmly in place.

Each time the pressure falls – even when this was not planned – the Clamping Unit can be relied upon to respond immediately.

Application

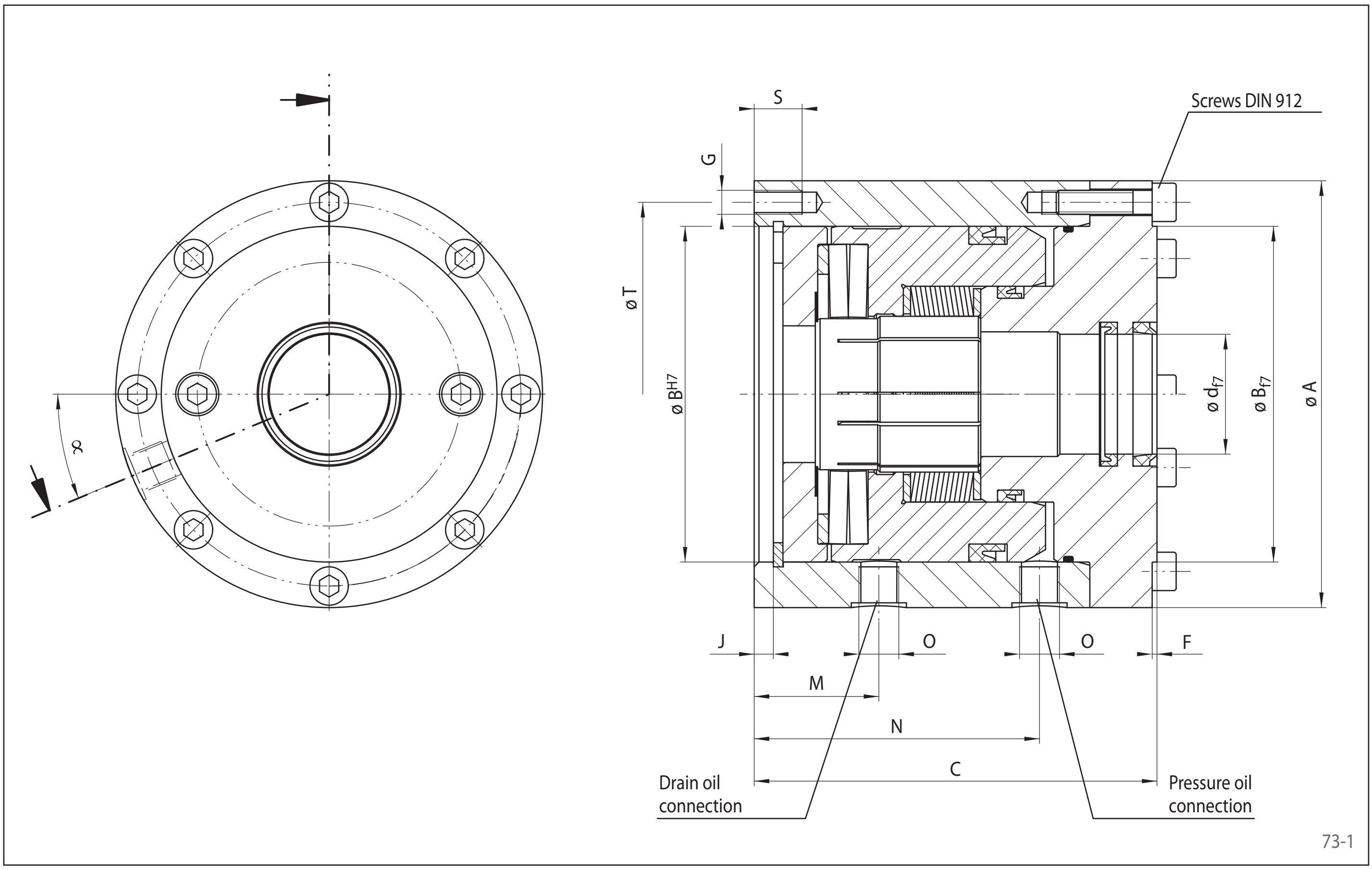
The Clamping Unit secures the piston rod with precision against unintentional axial movements.

For example, on machines with cylinders or linear motors a certain position can be driven in one continuous movement. With the Clamping Unit this position can then be held accurately mechanically.

The accuracy of the safety Clamping Unit is independent of the size and the direction of the force on the piston rod up to the maximum holding force indicated. No movement of the piston rod is required for the holding force to become effective; on the contrary, the clamping force is effective immediately and does not - depend on outside forces. If it is necessary to brake the movement of the piston rod, the Clamping Unit would, when pressure falls, produce virtually without delay a constant friction force independent of time. The slowing down of the piston rod is therefore even and protects the slowed-down components of the installation.

Clamping Unit KFH

spring activated – hydraulically released

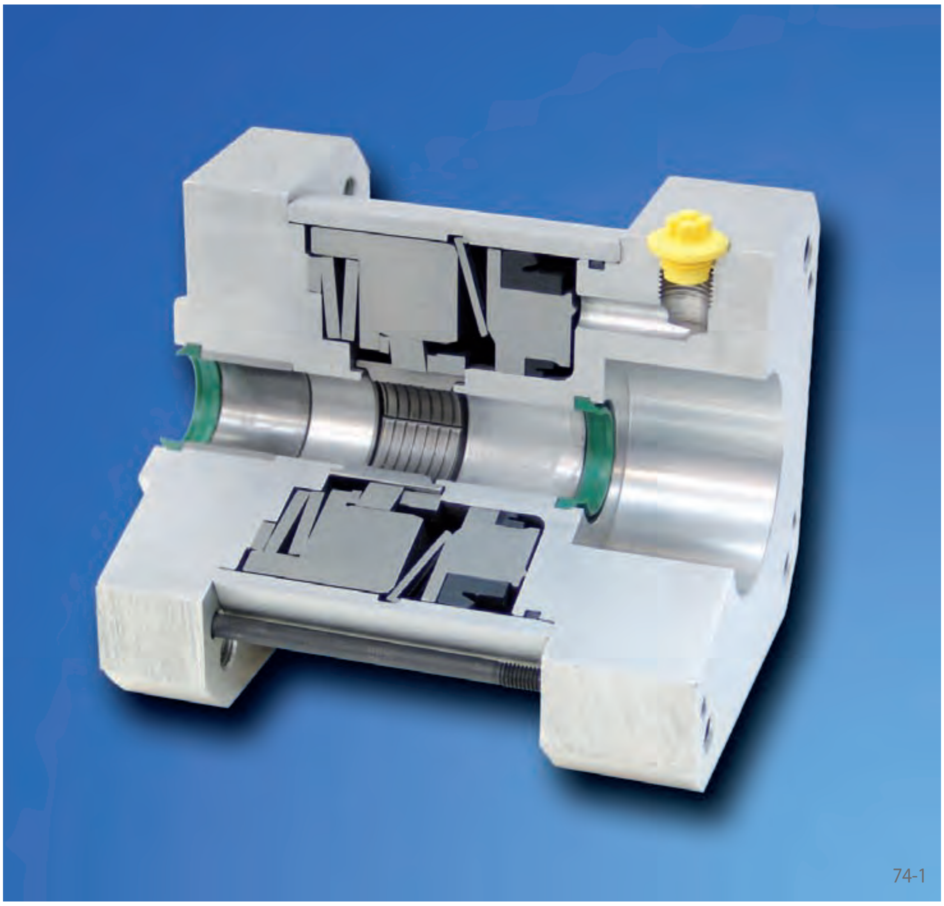


Piston rod-ø d[1]	Article number	Holding force FH[2]	A	B	C	F	G	J	M	N	O	S	T	X[3]	Necess. release press.	Max. perm. press.	Oil vol. per stroke	
mm		N	mm	mm	mm	mm		mm	mm	mm		mm	mm		bar	bar	cm^3	Degree
12	4133.032.900	2500	72	48	76	2	M 5	5	26	54	R1/8″	9	60	4	57	120	1	22,5
14	4133.037.902																	
16	4133.037.900	5000	85	60	88	2	M 6	6	31	64	R1/8″	11	72	4	68	120	2	22,5
18	4133.037.901																	
20	4133.042.900	8000	100	68	100	2	M 6	6	34	72	R1/8″	11	85	4	82	120	2	22,5
22	4133.042.901																	
25	4133.047.900	12500	110	80	115	2	M 6	7	42	85	R1/8″	15	92	6	84	120	3	22,5
28	4133.047.901																	
(30)	4133.057.900																	
32	4133.057.901	19000	130	95	130	2	M 8	7	48	96	R1/4″	16	112	6	88	120	5	22,5
34	4133.057.902																	
36	4133.070.902																	
40	4133.070.900	30000	150	116	148	3	M 8	4	52	108	R1/4″	16	132	8	102	120	6	22,5
45	4133.070.903																	
50	4133.090.900																	
(55)	4133.090.901	48000	178	140	168	3	M 10	8	52	119	R3/8″	20	160	8	108	160	13	22,5
56	4133.090.902																	
60	4133.105.900																	
63	4133.105.901	68000	210	168	185	3	M 12	10	60	133	R3/8″	22	190	8	122	160	17	22,5
70	4133.105.902																	
80	4133.140.900																	
(85)	4133.140.901	120000	273	220	230	3	M 14	12	75	172	R3/8″	25	250	12	115	160	39	15
90	4133.140.902																	
100	4133.160.900																	
110	4133.160.901	200000	330	270	270	5	M 18	16	90	200	R3/8″	38	300	12	110	160	64	15
(115)	4133.160.902																	

[1] Diameter printed in bold to be preferred. Diameter line without ( ) corresponds to DIN 24334.
[2] Please note recommendations on page 79.
[3] Number of tapped holes G and srews DIN 912 on pitch øT.

Clamping Unit KFP

spring activated – pneumatically released


74-1

Features

- For continuous piston rod clamping
- Spring activated, pneumatically released
- Connection dimensions compatible with pneumatic cylinders according to ISO
- Holding forces transmissible in both directions of movement
- No application of force (lifting) to the piston rod required for release

Description

The Clamping Unit KFP clamps and holds pneumatic cylinder piston rods with a calculated clamping force in both directions of movement. The clamping force is applied by disc springs. Clamping force is released by pneumatic pressure.

The Clamping Units can be bolted directly to any cylinder of the ISO series or attached to other machine components with a connection flange provided by the customer.

Operation

Pneumatic pressure is applied to the Clamping Unit during the working stroke of the pneumatic cylinder. This pressure is transmitted by the piston via the lever spring to the mount and presses the disc springs together. The lever spring translates the pressure into clamping force. In this position, the clamping discs are free of axial tension and thus allow the piston rod to move freely.

When the pressure on the Clamping Unit is removed, the force of the springs works fully onto the piston and therefore also on to the disc pack. The clamping discs translate the axial spring pressure into a radial force applied to the slotted clamping sleeve that is equal to at least five times the axial pressure. The clamping sleeve transmits the radial clamping forces to the piston rod, thereby holding the piston rod firmly in place.

Each time the pressure falls - even when this was not planned - the Clamping Unit can be relied upon to respond immediately.

Application

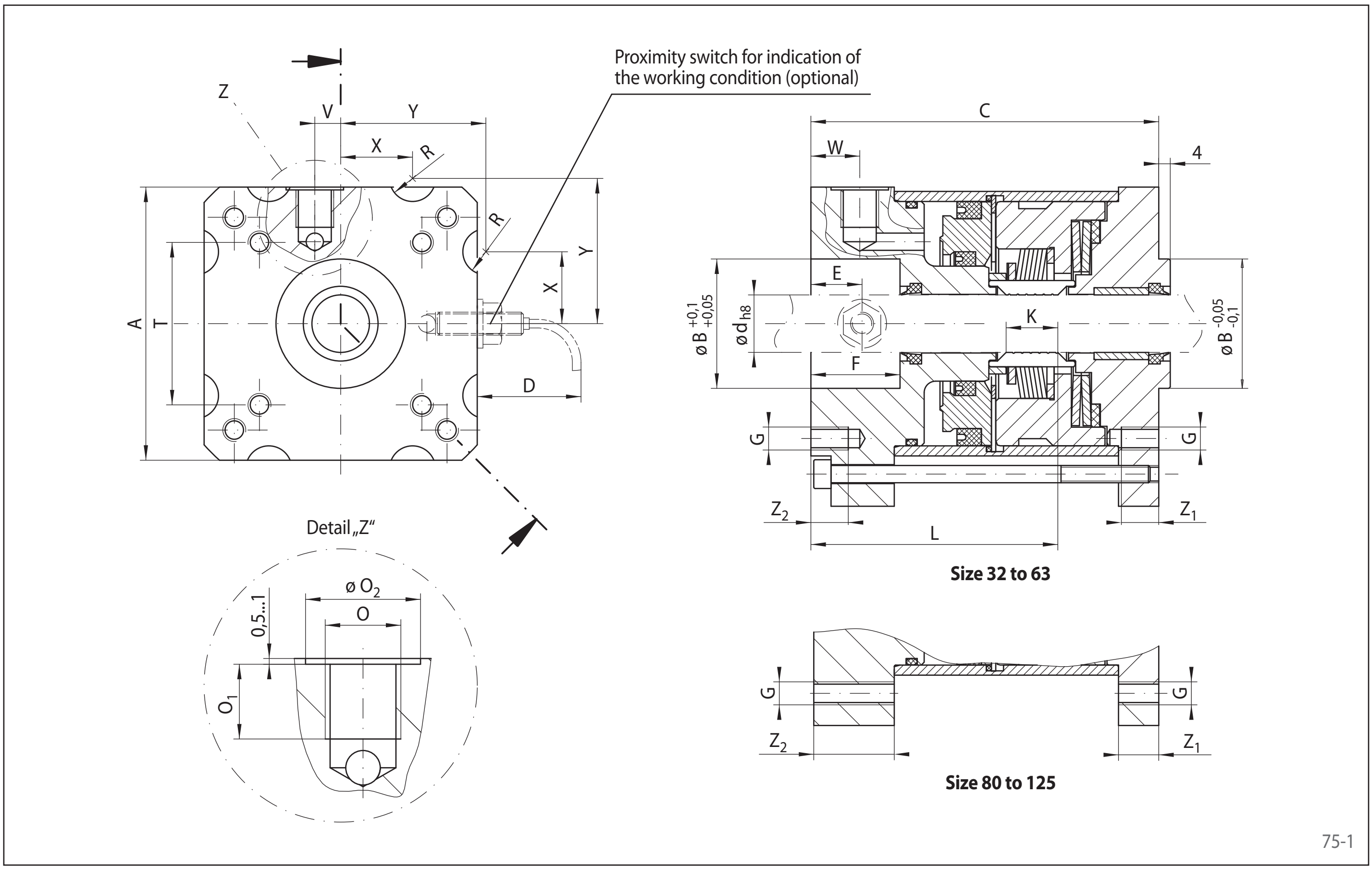
The Clamping Unit secures the piston rod with precision against unintentional axial move-ments.

For example, on machines with cylinders or linear motors a certain position can be driven in one continuous movement. With the Clamping Unit this position can then be held accurately mechanically.

The accuracy of the safety Clamping Unit is independent of the size and the direction of the force on the piston rod up to the maximum holding force indicated. No movement of the piston rod is required for the holding force to become effective; on the contrary, the clamping force is effective immediately and does not depend on outside forces.

Accessories

- Sensors for indication of the working condition



Cylinder-ø	Article number	Piston rod-ø d	Holding force FH[2]	A	B	C	D*	E	F	G	K	L	O	O_1	O_2	R[1]	T	V	W	X[1]	Y[1]	Z_1	Z_2	Air vol. per activation	Weight
mm		mm	N	mm	mm	mm	mm	mm	mm		mm	mm		mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	cm^3	kg
32	4133.037.953	12	650	60	30	82	25	16,5	22	M 6	10,2	56,7	G1/8	19,5	16	5,5	32,5	7,5	14,0	16	32,0	10,0	10,0	5,5	0,85
40	4133.037.954	16	1 000	70	35	95	21	16,5	24	M 6	10,2	59,7	G1/8	10,5	16	7,0	38,0	0	15,5	18	36,5	13,0	13,0	5,5	1,10
50	4133.037.952	20	1 600	75	40	112	22	25	30	M 8	14,0	76,0	G1/4	12,5	20	-	46,5	12,0	22,9	-	-	13,0	13,0	13,5	1,50
63	4133.052.952	20	2 500	95	45	120	17	17	30	M 8	18,0	84,9	G1/4	14,0	20	8,0	56,5	0	15,0	25	50,5	14,0	13,0	27,0	3,20
80	4133.052.953	25	4 000	95	45	140	17	23	36	M 10	21,0	92,4	G1/4	14,0	20	-	72,0	0	21,0	-	-	28,0	34,0	27,0	3,50
100	4133.052.954	25	6 300	120	55	150	15	27	40	M 10	20,5	101,3	G1/4	14,0	20	-	89,0	0	21,0	-	-	28,0	37,0	59,0	5,80
125	4133.057.951	32	9 800	150	60	178	11	32,5	43	M 12	25,0	109,5	G1/4	14,0	20	-	110,0	0	25,0	-	-	42,5	41,5	85,0	10,90

* Minimum required installation space for the optional proximity switch.
[1] The dimensions R, X and Y are valid only for the flange on the right side.
[2] Please note recommendations on page 79.
Release pressure: min. 4 bar, max. 8 bar

Technical Points Brake Calipers

Selection of Brake Calipers

When selecting RINGSPANN Brakes, two criteria need to be considered:

- Is the selected combination of brake caliper/brake disc capable of braking the torque requirement of the application?
- Can the brake disc transfer the frictional heat without damage to adjacent parts?

Calculation of the braking torque

Braking of rotating masses

The necessary braking torque results from the mass inertia moment relative to the brake shaft J_{red}. When braking to a stop n_2=0.

$$M_B = M_R = \frac{J_{red}}{t_B} \cdot \frac{n_1 - n_2}{9{,}55}$$

Braking of rotating masses with additional motor braking

If an additional braking torque M_{Bf} is available, e.g. from a braked electric motor, then the formula for the necessary braking torque is:

$$M_B = M_R - M_{Bf} = \frac{J_{red}}{t_B} \cdot \frac{n_1 - n_2}{9{,}55} - M_{Bf}$$

Braking of chassis

The required braking torque for a deceleration is made up of the load torque M_L originating from the net weight G of the installation, the braking torque for the deceleration of the rotating masses M_R and the braking torque for decelerating the linear-moving masses M_V (referred to the braking shaft).

$$M_B = M_L + M_R + M_V$$

$$M_{Lmax} = (G \sin\gamma + F_W - F_F) \cdot \frac{D_L \cdot \eta}{2 \cdot i}$$

$$M_R = \frac{J_{red}}{t_B} \cdot \frac{n_1 - n_2}{9{,}55}$$

$$M_V = \frac{m}{t_B} \cdot \frac{n_1 - n_2}{38{,}25} \cdot \left(\frac{D_L}{i}\right)^2 \cdot \eta$$

After completing this calculation, check whether the braking torque M_B can be transmitted via the chassis wheel friction.

$$M_B < \mu_R \cdot m \cdot g \cdot \frac{D_L}{2}$$

Controlled braking for winding processes

The required braking torque varies between the value M_{Bi} with minimum winding diameter d_i and M_{Ba} with maximum winding diameter d_a.

$$M_{Bi} = \frac{S \cdot d_i}{2}$$

$$M_{Ba} = \frac{S \cdot d_a}{2}$$

Braking torques and parking torques

The braking torques given in this catalogue are dynamic braking torques. They only apply:

- When the brake linings are run in,
- original RINGSPANN brake discs, or brakes discs made from the recommended material are used and
- friction linings have been selected for the particular application.

If the disc brakes are used as holding brakes then the given brake torques are only applicable as parking torques if the above conditions are met. If running-in is not possible or if the running-in process is omitted, the braking torques given will not be achieved; torque reductions of up to 50% are possible. If static parking torques in accordance with the catalogue torques are required but without running-in, then special friction linings are needed. For such applications, please refer the matter to us for advice.

Formula symbols

d_i	[m]	Smallest diameter of roller
d_a	[m]	Largest diameter of roller
D	[mm]	Diameter of brake disc
D_L	[m]	Chassis wheel diameter
F_F	[N]	Tractional resistance on the chassis wheel
F_W	[N]	Wind reaction force on chassis
G	[N]	Total weight of chassis
J_{red}	[kg m²]	Reduced inertia moment
i	-	Gear ratio between chassis wheel and brake shaft
m	[kg]	Mass of complete chassis
M_B	[Nm]	Required braking torque
M_{Bf}	[Nm]	Braking torque of the motor
M_{Ba}	[Nm]	Braking torque for roller diameter d_a
M_{Bi}	[Nm]	Braking torque for roller diameter d_i
M_L	[Nm]	Load torque
M_R	[Nm]	Deceleration torque of rotating masses
M_V	[Nm]	Deceleration torque of linear moving masses

Technical Points Brake Calipers

Verification of Heat Absorption

Permissible Braking Action with Single Braking Operation

Unusual braking processes should be checked to ensure that the brake disc is not heated to above 300° C by the energy absorbed. The braking time in this case should not exceed 10 seconds.

The maximum energy of braking to be absorbed for brake discs made from GGG-50 is given in the table. We recommend that this additional calculation be carried out in the case of indexing operations. The absorbed energy for the deceleration of rotating masses in this case is:

$$W_B = \frac{J_{red}\,(n_1 - n_2)^2}{182{,}5}$$

Ensure that:

$$W_{BSzul} \geq W_B$$

W_{BSzul} is shown in the following table:

D mm	W_{BSzul} Nm
125	185 000
150	270 000
200	460 000
250	760 000
300	1 300 000
355	1 900 000
430	3 000 000
520	5 000 000
630	11 000 000
710	15 000 000
800	20 000 000
900	27 000 000
1 000	35 000 000

Verification of Heat Dissipation

The transmissible brake power of the disc according to the diagram on page 78 applies to the types of braking operation described below:

$$P_{BSzul} \geq P_B$$

Braking with low frequency z ≤ 40 per hour

If „z" actuations occur within one hour, then the brake power capacity required is as follows:

$$P_B = \frac{M_B\,(n_1 - n_2)}{6{,}88 \cdot 10^7} \cdot z \cdot t_B$$

Braking with high frequency z > 40 per hour

For such cases we would ask you to enclose with your enquiry exact details of the time slope of speed and braking torque, as well as the completed questionnaire on page 80. We will check the design of the brake disc in respect of the heat emission on your behalf.

Continuous Slipping

Winding operations may require a variety of processes regarding tension of the wound material and winding speed. We therefore recommend an initial rough calculation of M_{Ba} and M_{Bi}.

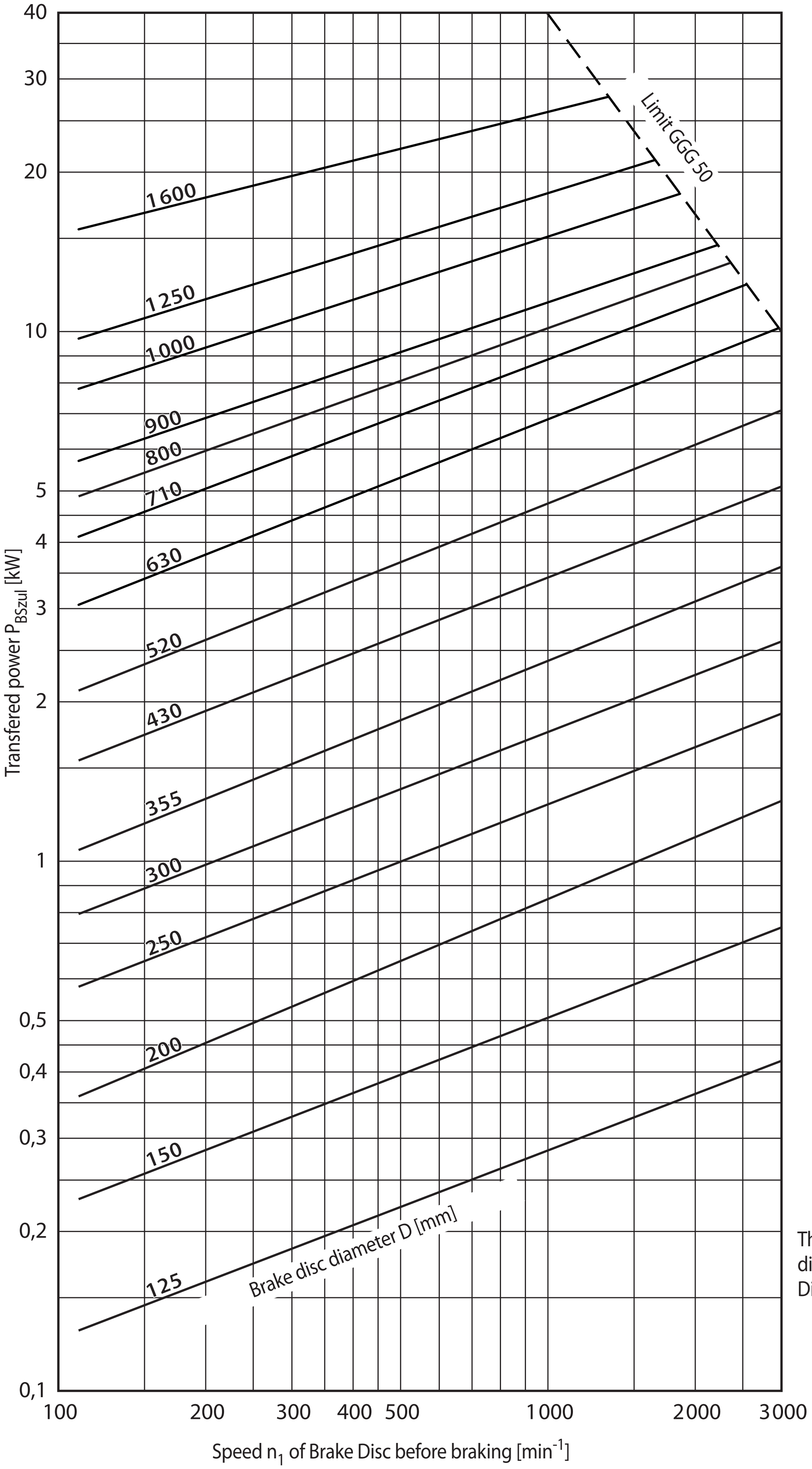
Please send us the completed questionnaire on page 80 for a more accurate evaluation.

$$P_{Bi} = \frac{M_{Bi} \cdot n_i}{9550} \quad \text{or} \quad P_{Bi} = \frac{S \cdot d_i \cdot n_i}{19\,100}$$

$$P_{Ba} = \frac{M_{Ba} \cdot n_a}{9550} \quad \text{or} \quad P_{Ba} = \frac{S \cdot d_a \cdot n_a}{19\,100}$$

n_1	[min^{-1}]	Speed before braking
n_2	[min^{-1}]	Speed after braking
n_i	[min^{-1}]	Speed at d_i
n_a	[min^{-1}]	Speed at d_a
P_B	[kW]	Brake power generated by application, average with one braking cycle
P_{Bi}	[kW]	Brake power with winding diameter d_i
P_{Ba}	[kW]	Brake power with winding diameter d_a
P_{BSzul}	[kW]	Brake power capacity of brake
S	[N]	Tension on the winding material
t_B	[s]	Braking time
W_B	[Nm]	Braking energy generated by application
W_{BSzul}	[Nm]	Braking energy capacity of the disc brake
z	[h^{-1}]	Number of braking cycles per hour
γ	[°]	Angle of inclination
η	-	Gear efficiency – if known, calculation with η=0,85 is advised
μ_R		Roller friction value on the chassis wheel

Transferred power of the Brake Discs



The transferred power is based on a maximum disc temperature of 300° C applicable to Brake Disc thicknesses of up to 25 mm.

Holding Force F_H

If the system is driven with hydraulic fluid, it is likely that after a certain operating time the piston rod will have a film of oil from the installation. Therefore the holding force is affected by the hydraulic oil being used.

The following applies to hydraulic oils H and HL, and to unalloyed oils:

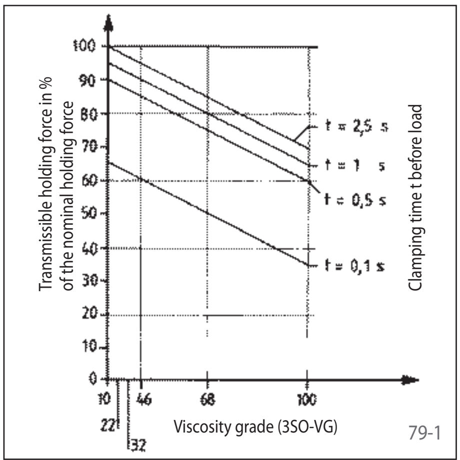
nominal holding force $F_{Nenn} = F_H$

For hydraulic oils HLP and HL-XP this applies:

$$F_{Nenn} = F_H \cdot 0{,}8$$

The nominal holding force thus calculated is reached when the clamping time t between removal of the release pressure and the application of the load does not fall below a minimum value of 5 seconds. This applies to oils up to VG 100 with a minimum temperature of 20° C at the piston rod.

If the clamping time t is shorter, then the holding force F transmissible depending on viscosity should be taken from the diagram.



Holding force depending on oil viscosity and clamping period prior to load (temperature at the piston rod 20 °C)

If the hydraulic oil has a large amount of EP additives (eg V 6710, DH 46) the nominal holding force can fall below 80% of the table value. In such a case it would be necessary to carry out field tests. **Solid lubricants like MoS_2, Graphite or Teflon should never be allowed near the clamping position.**

Safety

$$\text{Safety } S = \frac{F}{F_a}$$

F = Holding force taking account of hydraulic oil and clamping duration (see above)

F_a = Maximum axial force including dynamic forces occurring during operation

Positioning accuracy

Clamping is effected without any axial movement between rod and clamping unit.

Under axial force F_H an axial shift of up to 0,1 mm may occur in hydraulically released Clamping Units and up to 0,05 mm in pneumatically released Clamping Units between the rod and the clamping unit. This shift is reversed when pressure is released.

The rod to be clamped

The rod to be clamped should be made of material with a tensile strength of at least 600 N/mm² (e. g. C 45). It must be chromium plated or surfacehardened and ground. Its diameter must be designed with fit f7 in hydraulically released Clamping Units and with fit h8 in pneumatically released Clamping Units and a peak-to-valley height of Rt = 5 µm. With normal use the maximum pressure at the point of clamping between the piston rod and the clamping unit is 150 N/mm².

Sealing and Centering

Hydraulically released Clamping Units

Are equipped with a rod gasket and stripper on the cover side.

A seal against waste oil should be provided by the customer on the side of the machine or cylinder where the clamping connection is to be located.

Pneumatically released Clamping Units

Are equipped with strippers on both sides.

In order to ensure a lasting and troublefree operation and to avoid damage to the rod to be clamped, the exact concentricity of the bar towards the machine centering must be observed. (Max. circular runout 0,04 mm.)

Release to facilitate Mounting

To insert the rod hydraulic or pneumatic pressure is applied on the clamping unit.

Special Types

If special types with a higher positioning accuracy, higher holding forces or lower release pressures are required, please let us have your enquirys together with the completed questionnaire on the page 81.

RINGSPANN®
Power Transmission

Freewheels

Backstops
Automatic protection against reverse running of conveyor belts, elevators, pumps and fans.

Catalogue 84

Overrunning Clutches
Automatic engaging and disengaging of drives.

Catalogue 84

Indexing Freewheels
For gradual feed of materials.

Catalogue 84

Housing Freewheels
Automatic engaging and disengaging of multi-motor drives for installations with continuous operation.

Catalogue 84

Cage Freewheels
For installation between customer-supplied inner and outer rings.

Catalogue 84

Brakes

Industrial Disc Brakes
Spring activated – pneumatically, hydraulically or manually released.

Catalogue 46

Industrial Disc Brakes
Pneumatically activated – spring released.

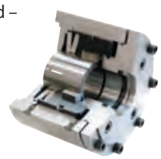
Catalogue 46

Industrial Disc Brakes
Hydraulically activated – non-releasing.

Catalogue 46

Industrial Disc Brakes
Spring activated – hydraulically released.

Catalogue 46

Clamping Units
Spring activated – hydraulically or pneumatically released. For secure and precise positioning of piston rods.

Catalogue 46

Shaft-Hub-Connections

Two-part Shrink Discs
External clamping connection. Advantages: Simple, secure mounting even without torque wrench.

Catalogue 36

Three-part Shrink Discs
External clamping connection for the fastening of hollow shafts on solid shafts.

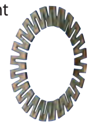
Catalogue 36

Cone Clamping Elements
For Shaft-Hub-Connections. High torques with small dimensions.

Catalogue 36

Star and Clamping Discs
Ideal for Shaft-Hub-Connections for frequent release.

Catalogue 36

Star Spring Washers
Axial spring element for preloading of ball bearings.

Catalogue 20

Torque and Force Limiters

Torque Limiters with Screw Face
Reliable overload protection for tough operating conditions.

Catalogue 45

Torque Limiters with Rollers
With double or single Rollers. Through ratcheting or disengaging, also for 360° synchronous running.

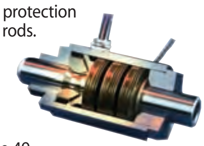
Catalogue 45

Torque Limiters with Balls
Reliable overload protection with maximum response accuracy. Also backlash free.

Catalogue 45

Torque Limiters with Friction Linings
RIMOSTAT® Torque Limiter for constant torque. Belleville Spring Torque Limiter for simple release.

Catalogue 45

Force Limiters
Reliable axial overload protection in piston rods.

Catalogue 49

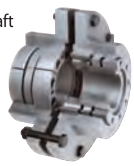
Couplings

Flexible Couplings
Large, allowed radial and angular misalignements. Minimum resiliency.

Catalogue 44

Flexible Couplings
Large, allowed radial and angular misalignements. Minimum resiliency.

Catalogue 44

Flange-Couplings
Rigid, easily removable shaft coupling with backlash free cone clamping elements.

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Rigid Couplings
Rigid, easily removable shaft coupling with backlash free cone clamping elements.

Catalogue 36

RINGSPANN®
Workholding Technology

Precision Clamping Fixtures

Bonded Disc Pack
Precision Clamping Fixtures based on the unique method of the RINGSPANN clamping disc.

Catalogue 10

Taper Collet
Precision Clamping Fixtures for clamping thin or thick walled workpieces on long clamping length.

Catalogue 10

Taper Sleeve
Precision Clamping Fixtures for clamping compact workpieces with short or long clamping lengths.

Catalogue 10

Flat Element
Very short Precision Clamping Fixtures for clamping thick walled workpieces with large clamping diameter and very short clamping depths.

Catalogue 10

Clamping Clutches
For the automatic coupling of rolls. Fast, safe and free from slipping connection.

Catalogue 10

46e 20 Kronberger Offsetdruck 08/2011 · Printed in Germany

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BIC: ABNANL2A