SIBRE

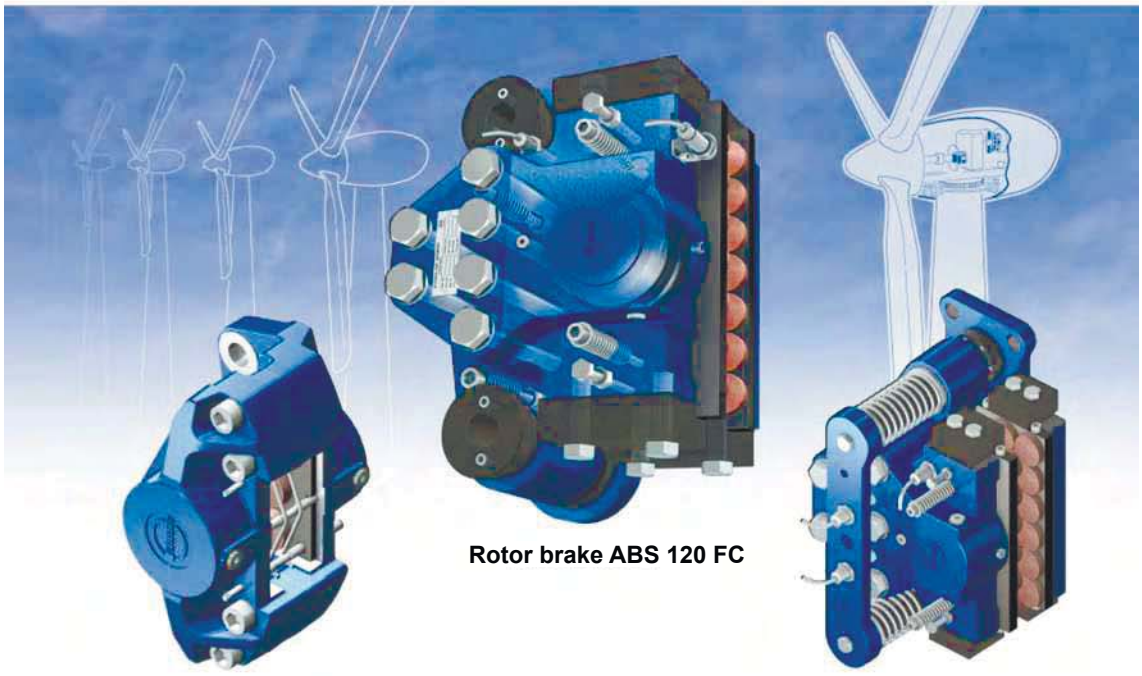
Sure to be safe

Wind Turbine Brakes
& Components

Yaw brake ABT 120 G

Yaw brake ABT 90 G

Yaw brake ABT 90 S



Rotor brake ABS 120 FC

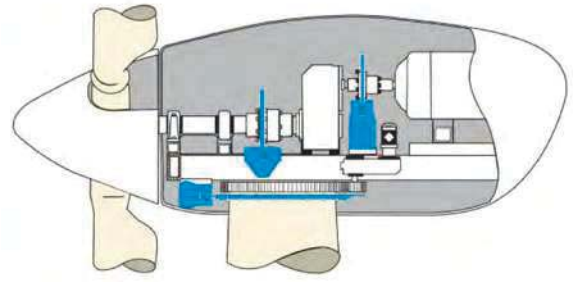
Rotor brake ABS 75 G

Rotor brake ABS 75 FC

SIBRE got the right brake for every wind turbine application

Active Yaw Brakes

Yaw brakes are used for positioning and holding of pivot-mounted nacelles of wind turbines on the tower, where sensors permanently register possible deviations between actual wind direction and actual nacelle position.
Upon exceeding a permissible deviation, the yaw brakes are completely or partially disengaged in order to allow the re-adjustment of the nacelle by means of the yaw drives.
Subsequently, the clamping force of the typically active yaw brakes is generated again by applying the equivalent hydraulic pressure.



Active Rotor Brakes

Rotor brakes are an essential safety-feature of wind turbines.
They are used for protection against overspeed as well as for stopping and holding the rotor, e.g. for maintenance purposes.
Depending on the drive concept, the brakes can be installed on the low speed rotor site, e.g. in gearless drives or on the high speed side at the gearbox output shaft.

Types

Active Yaw Brakes
- ABT 75 G
- ABT 90 G
- ABT 75 S
- ABT 90 S
- ABT 120 G

Active Rotor Brakes
- ABS 75 G
- ABS 75 FC
- ABS 120 FC
- ABT 75 G-R
- ABT 90 G-R
- ABT 75 S-R
- ABT 90 S-R

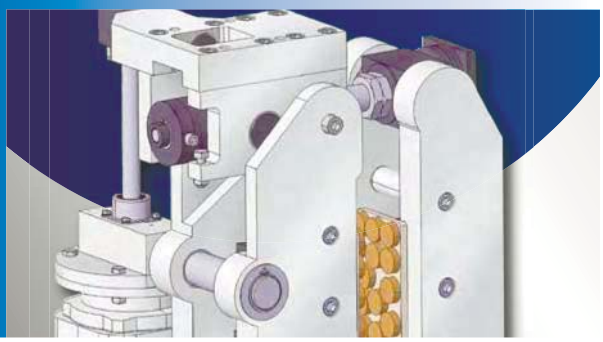
Fail-safe Rotor Brakes
- SHI 75 FC
- FSB 75 FC
- FSB 101 - 107 FC

Electromechanic Rotor Brake USB-W

Innovative SIBRE USB-Technology!

With the electromechanical rotorbrake USB-W innovative SIBRE USB-technology has been adapted for wind turbine applications!

- Adjustable braking torque thru electronic control
- Automatically target/actual-comparison of clamping force
- Automated lining wear compensation
- Easy replacement of linings thru big lifting gap
- Suitable for Low temp application
- Suitable for Offshore application



Fail-safe Rotor Brakes

Rotor brakes are an essential safety-feature of wind turbines. They are used for protection against overspeed as well as for stopping and holding the rotor, e.g. for maintenance purposes. Depending on the drive concept, the brakes can be installed on the low speed rotor site, e.g. in gearless drives or on the high speed side at the gearbox output shaft.

Components

- Rotor Lock (with / without optional manual safety system)
- Hydraulic Power Unit (hybrid hydraulic, low / high temperature version)

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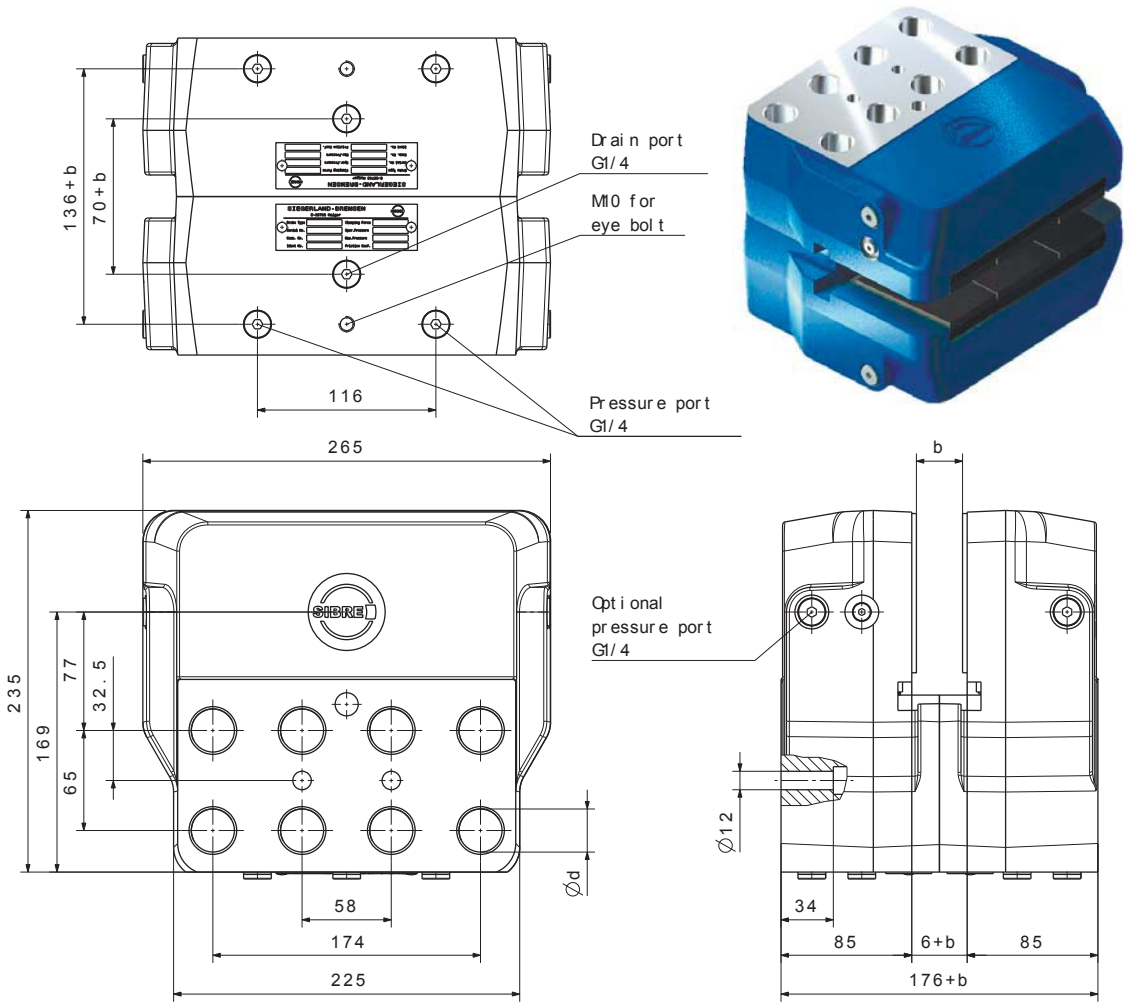

Application:

- **Stopping and/or holding brake for wind turbines**

Description:

- The ABT 75/90 G brake is an Active Brake, Hydraulically Applied; braking force produced by variation of hydraulic pressure.
- The ABT 75/90 G brake consists of two independent caliper halves with opposite hydraulic cylinders.
- ABT brakes are suitable for horizontal and vertical brake discs under any angular displacement.

Design Advantage:

- Compact and robust construction
- Fast response time, fast braking for maximum safety
- Special design to reduce braking noise
- Stainless steel piston
- High performance lining with stable friction coefficient
- Suitable for low temperature application
- Long service life
- Easy maintenance

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		ABT 75 G	ABT 90 G
Piston diameter	$\varnothing d_P$	75 mm	90 mm
Piston area each side	A_P	8835 mm²	12723 mm²
Operating pressure	p	160 bar	
Max. plant pressure	p_{max}	180 bar	
Oil volume per 1 mm stroke	V_{Oil}	18 cm³	26 cm³
Lining type		organic	
Lining surface	A_L	206 cm²	
Max. lining wear	s_L	7 mm	
Nominal friction static	μ	0.4	
Max. braking force	$F_{Br\,max}$	113 000 N	162 000 N
Disc thickness	b	20 – 70 mm	
Mounting bore	Ød	∅25 mm	∅28 mm
Temperature range (for lower temperatures please contact us)	T	-20°C to 70°C	
Weight	m	65 kg	
Mounting Bolts	M	M24-12.9	M27-12.9
Fastening Torque (μ=0,14) for mounting bolts	M_b	1200 Nm	1800 Nm

Calculation of Braking Torque for inside mounting

$$M_{Br} = F_{Br} \cdot \frac{D_1}{2} = 2 \cdot A_P \cdot p \cdot \mu \cdot \frac{D_1}{2} = A_P \cdot p \cdot \mu \cdot D_1$$

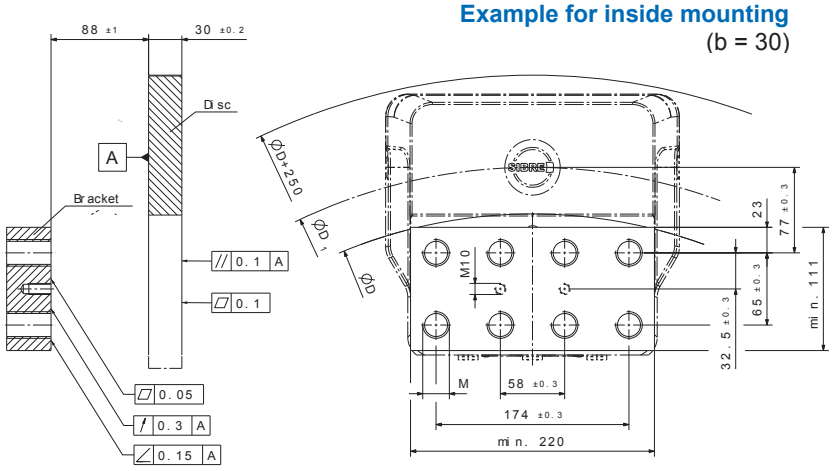
∅D	∅D1 inside	∅D1 outside
900	984	798
1000	1087	898
1200	1290	1098
1400	1493	1298
1600	1695	1498
1800	1897	1698
2000	2099	1898
>2000	D+100	D-102

Calculation of Braking Torque for outside mounting

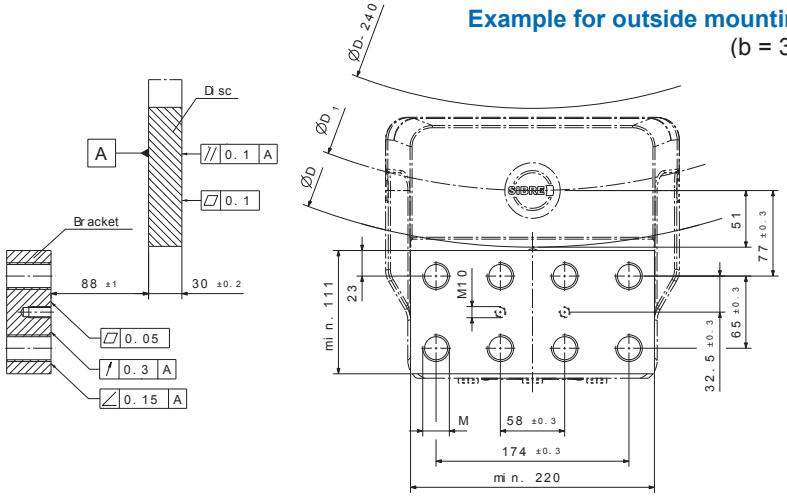
$$D_1 = D - 102$$

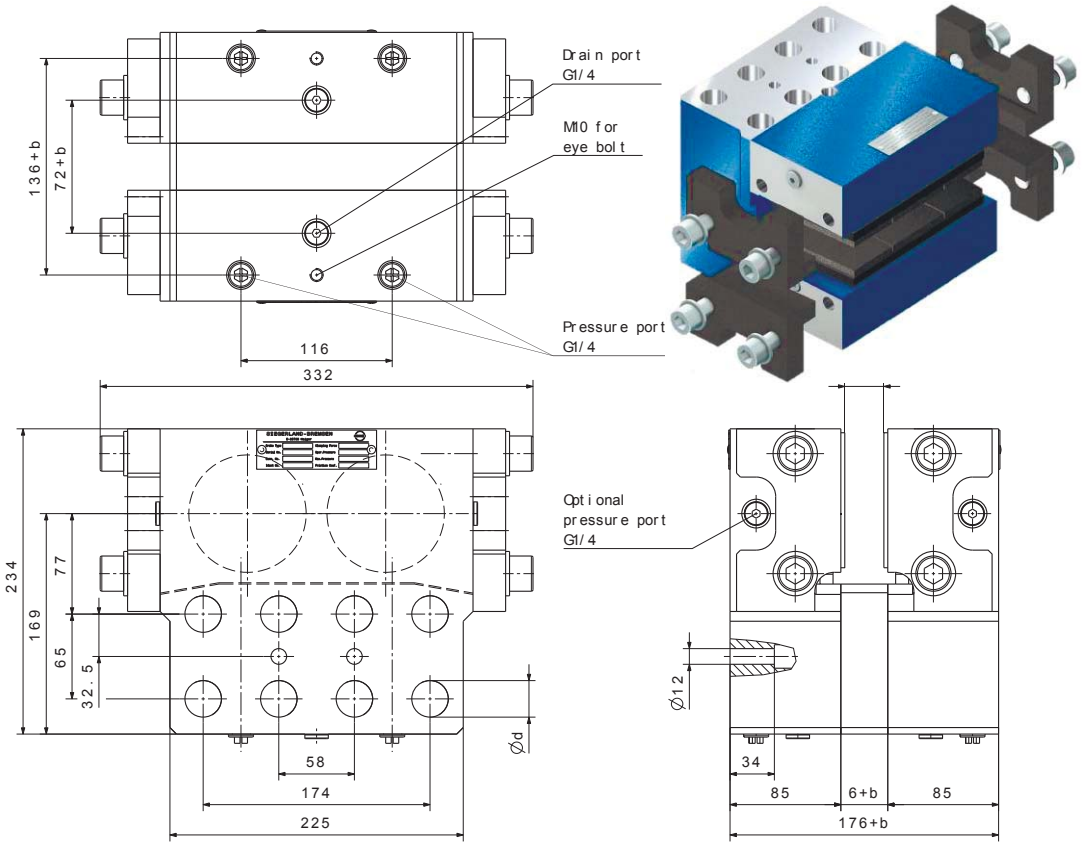
$$M_{Br} = F_{Br} \cdot \frac{D_1}{2} = 2 \cdot A_P \cdot p \cdot \mu \cdot \frac{D_1}{2} = 2 \cdot A_P \cdot p \cdot \mu \cdot \left(\frac{D}{2} - 51\right)$$

Example for inside mounting
(b = 30)



Example for outside mounting
(b = 30)





Application:

- **Stopping and/or holding brake for wind turbines**

Description:

- The ABT 75/90 S brake is an Active Brake, Hydraulically Applied; braking force produced by variation of hydraulic pressure.
- The ABT 75/90 S brake consists of two independent caliper halves with opposite hydraulic cylinders.
- ABT brakes are suitable for horizontal and vertical brake discs under any angular displacement
- The ABT 75/90 S is equipped with removable lining retainer plates and sideways lining retraction springs

Design Advantage:

- Compact and robust construction
- Fast response time, fast braking for maximum safety
- Special design to reduce braking noise
- Stainless steel piston
- High performance lining with stable friction coefficient
- Suitable for extreme low temperature application
- Long service life
- Easy maintenance
- Unique removable lining retainer plates provide easy lining replacement

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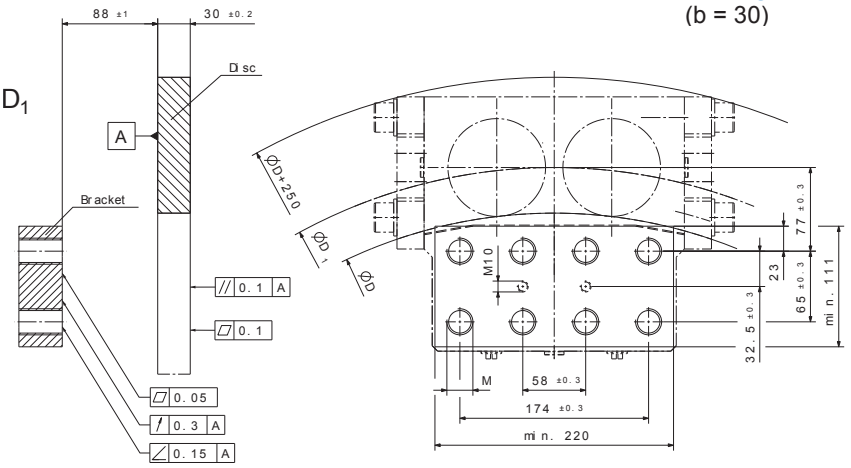
		ABT 75 S	ABT 90 S
Piston diameter	$\varnothing d_P$	75 mm	90 mm
Piston area each side	A_P	8835 mm²	12723 mm²
Operating pressure	p	160 bar	
Max. plant pressure	p_{max}	180 bar	
Oil volume per 1 mm stroke	V_{Oil}	18 cm³	26 cm³
Lining type		organic	
Lining surface	A_L	206 cm²	
Max. lining wear	s_L	7 mm	
Nominal friction static	μ	0.4	
Max. braking force	$F_{Br\,max}$	113 000 N	162 000 N
Disc thickness	b	20 – 70 mm	
Mounting bore	∅d	∅25 mm	∅28 mm
Temperature range	T	-40°C to 70°C	
Weight	m	75 kg	
Mounting Bolts	M	M24-12.9	M27-12.9
Fastening Torque (μ=0,14) for mounting bolts	M_b	1200 Nm	1800 Nm

Calculation of Braking Torque for inside mounting

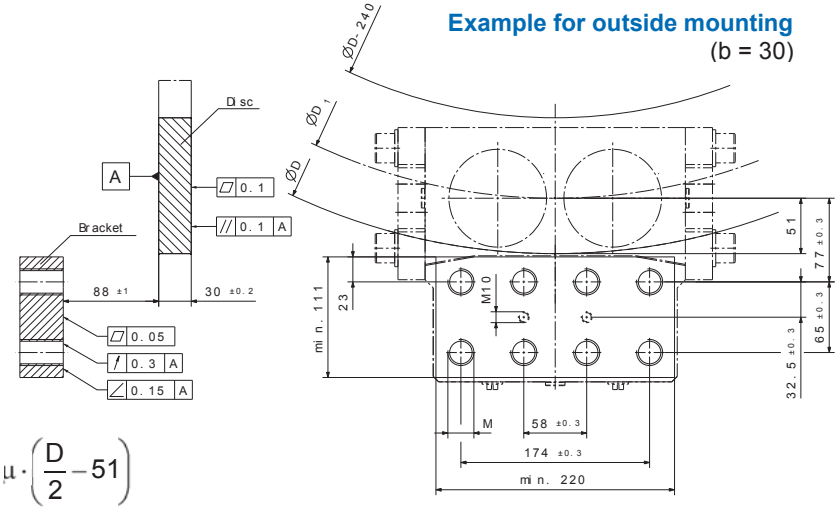
$$M_{Br} = F_{Br} \cdot \frac{D_1}{2} = 2 \cdot A_P \cdot p \cdot \mu \cdot \frac{D_1}{2} = A_P \cdot p \cdot \mu \cdot D_1$$

∅D	∅D1 inside	∅D1 outside
900	984	798
1000	1087	898
1200	1290	1098
1400	1493	1298
1600	1695	1498
1800	1897	1698
2000	2099	1898
>2000	D+100	D-102

Example for inside mounting
(b = 30)



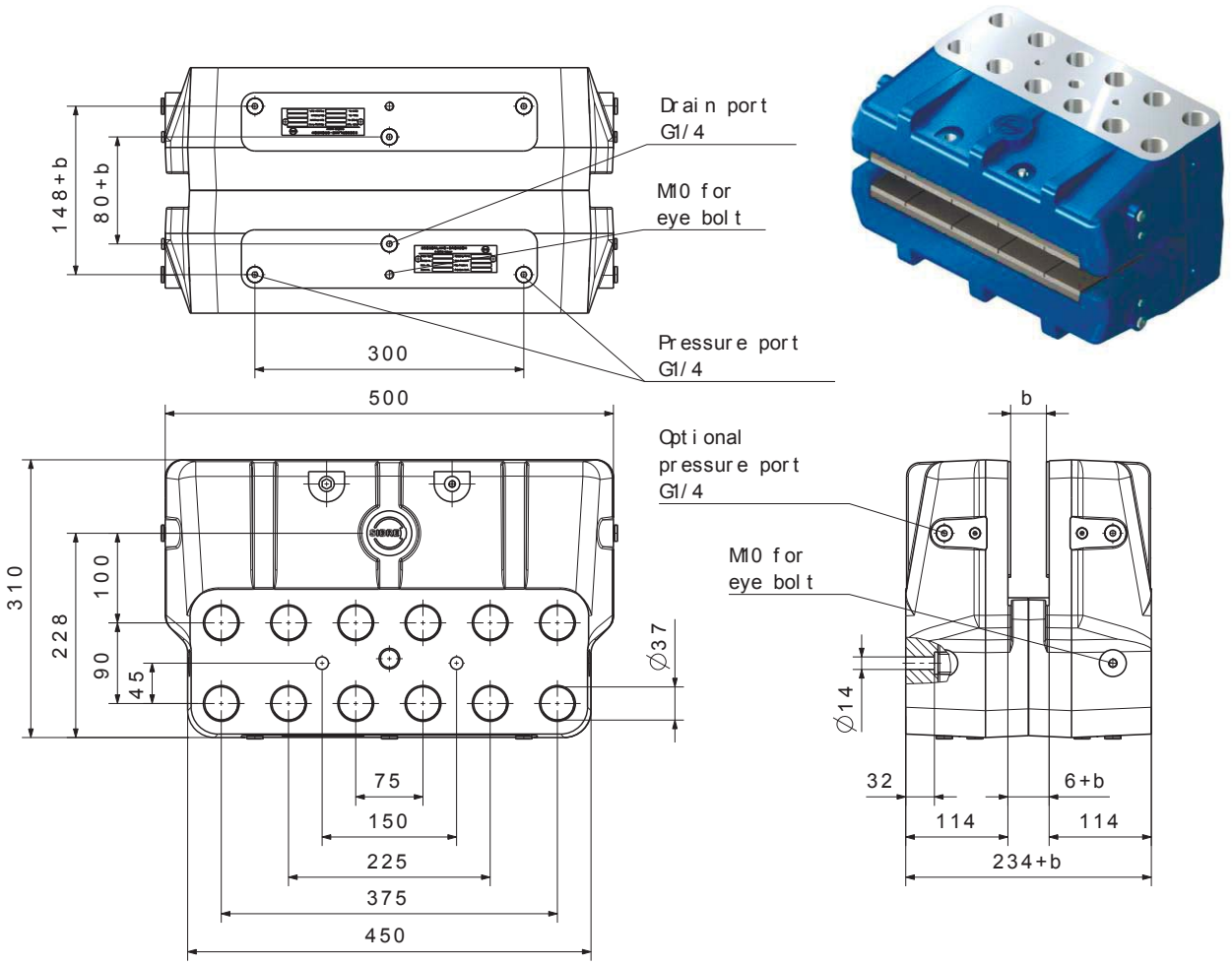
Example for outside mounting
(b = 30)



Calculation of Braking Torque for outside mounting

$$D_1 = D - 102$$

$$M_{Br} = F_{Br} \cdot \frac{D_1}{2} = 2 \cdot A_P \cdot p \cdot \mu \cdot \frac{D_1}{2} = 2 \cdot A_P \cdot p \cdot \mu \cdot \left(\frac{D}{2} - 51\right)$$



Application:

- **Stopping and/or holding brake for wind turbines**

Description:

- The ABT 120 G brake is an Active Brake, Hydraulically Applied; braking force produced by variation of hydraulic pressure.
- The ABT 120 G brake consists of two independent caliper halves with opposite hydraulic cylinders.
- ABT brakes are suitable for horizontal and vertical brake discs under any angular displacement

Design Advantage:

- Compact and robust construction
- Fast response time, fast braking for maximum safety
- Special design to reduce braking noise
- Stainless steel piston
- High performance lining with stable friction coefficient
- Suitable for low temperature application
- Long service life
- Easy maintenance

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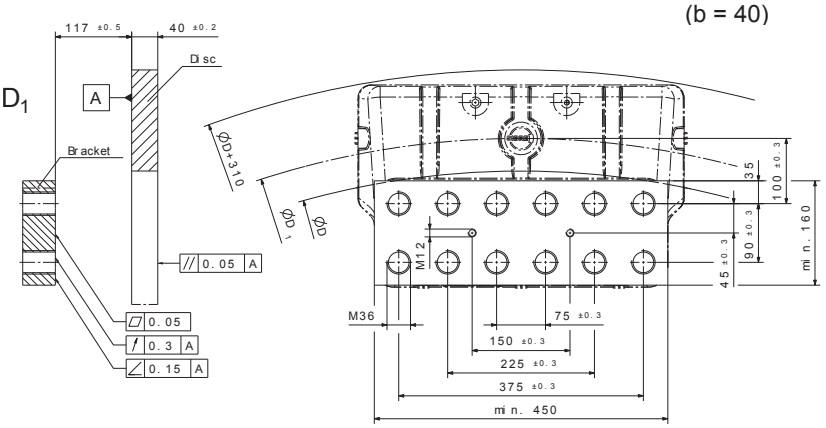
		ABT 120 G
Piston diameter	$\varnothing d_P$	120 mm
Piston area each side	A_P	33929 mm²
Operating pressure	p	160 bar
Max. plant pressure	p_{max}	180 bar
Oil volume per 1 mm stroke	V_{Oil}	68cm³
Lining type		organic
Lining surface	A_L	522 cm²
Max. lining wear	s_L	7 mm
Nominal friction static	μ	0.4
Max. braking force	$F_{Br\,max}$	434 000 N
Disc thickness	b	40 – 60 mm
Min. disc diameter	$\varnothing D_{min}$	2000 mm
Temperature range (for lower temperatures please contact us)	T	-20°C to 70°C
Weight	m	195 kg
Mounting Bolts	M	M36-10.9
Fastening Torque (μ=0,14) for mounting bolts	M_b	2560 Nm

Calculation of Braking Torque for inside mounting

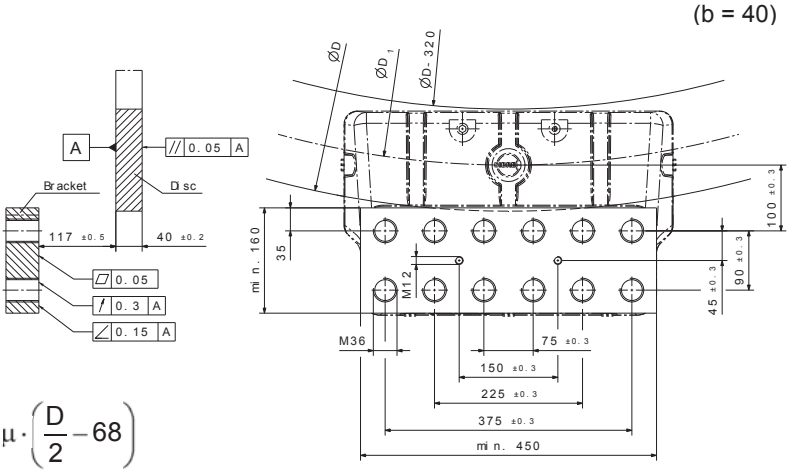
$$M_{Br} = F_{Br} \cdot \frac{D_1}{2} = 2 \cdot A_P \cdot p \cdot \mu \cdot \frac{D_1}{2} = A_P \cdot p \cdot \mu \cdot D_1$$

ØD	ØD1 inside	ØD1 outside
2500	2600	2364
2700	2804	2564
3000	3106	2864
3300	3408	3164
3600	3710	3464
3900	4012	3764
4200	4314	4064
≥ 4500	D+116	D-136

Example for inside mounting
(b = 40)



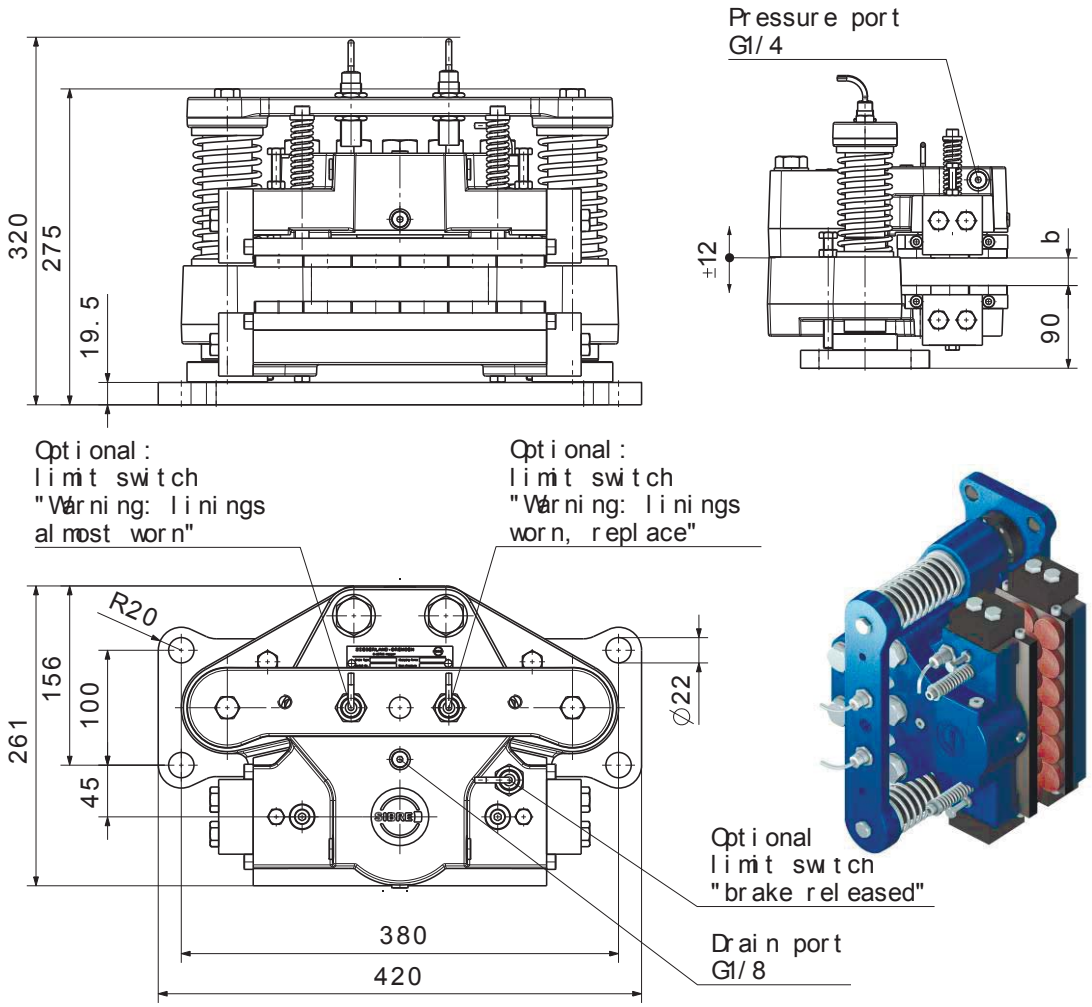
Example for outside mounting
(b = 40)



Calculation of Braking Torque for outside mounting

$$D_1 = D - 136$$

$$M_{Br} = F_{Br} \cdot \frac{D_1}{2} = 2 \cdot A_P \cdot p \cdot \mu \cdot \frac{D_1}{2} = 2 \cdot A_P \cdot p \cdot \mu \cdot \left(\frac{D}{2} - 68\right)$$



Application:

- **Stopping and/or holding brake for rotor of wind turbines**

Description:

- The ABS 75 FC brake is an Active Brake, Hydraulically Applied; braking force produced by variation of hydraulic pressure.
- The ABS 75 FC brake is designed as a floating caliper with one hydraulic cylinder.
- ABS brakes are suitable for horizontal and vertical brake discs under any angular displacement.

Design Advantage:

- Compact and robust construction
- Fast response time, fast braking for maximum safety
- Stainless steel piston
- Sinter linings for high speed/high energy application
- Lining retraction springs ensure air gap between lining and disc, when brake is open
- Removable retainers allow easy change of linings
- Suitable for low temperature application
- Long service life
- Easy maintenance

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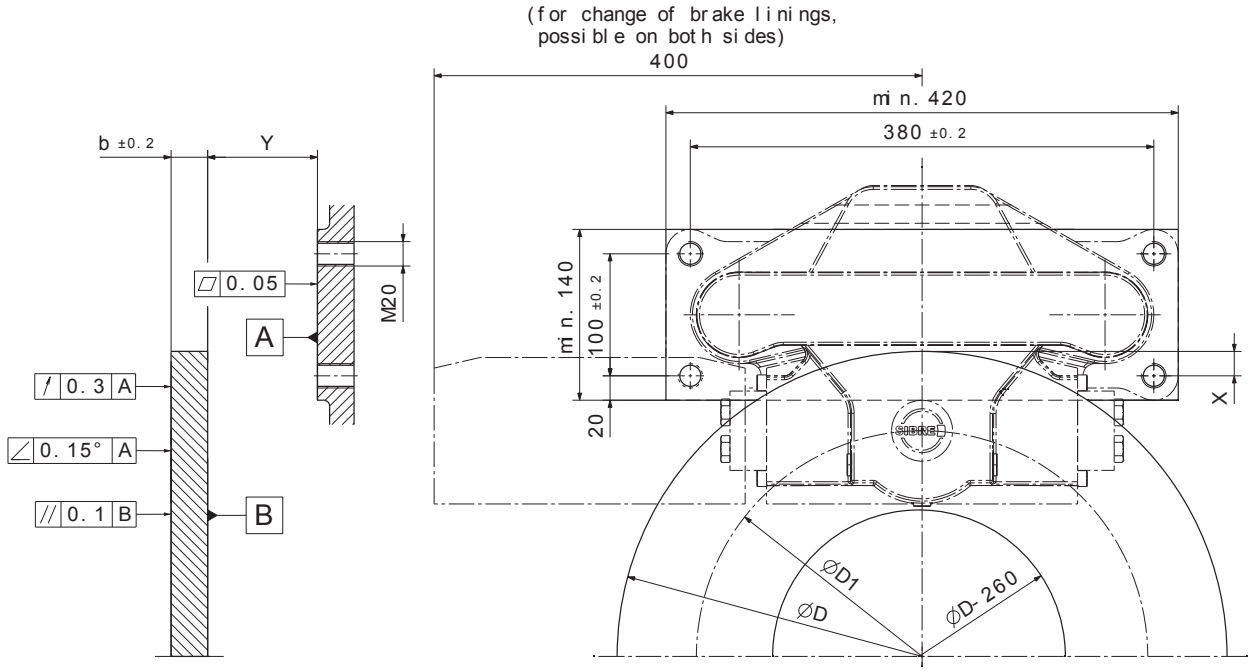
		ABS 75 FC
Piston diameter	$\varnothing d_P$	75 mm
Piston area each side	A_P	4418 mm²
Operating pressure	p	125 bar
Max. plant pressure	p_{max}	140 bar
Oil volume per 1 mm stroke	V_{Oil}	4,4 cm³
Lining type		sinter
Lining surface	A_L	200 cm²
Max. lining wear	s_L	7 mm
Nominal friction static	μ	0.4
Max. braking force	$F_{Br\ max}$	44 000 N
Disc thickness	b	20 – 40 mm
Min. disc diameter	$\varnothing D_{min}$	500 mm
Floating range on guidance pins	r	± 12 mm
Temperature range (for lower temperatures please contact us)	T	-20°C to 70°C
Weight	m	80 kg

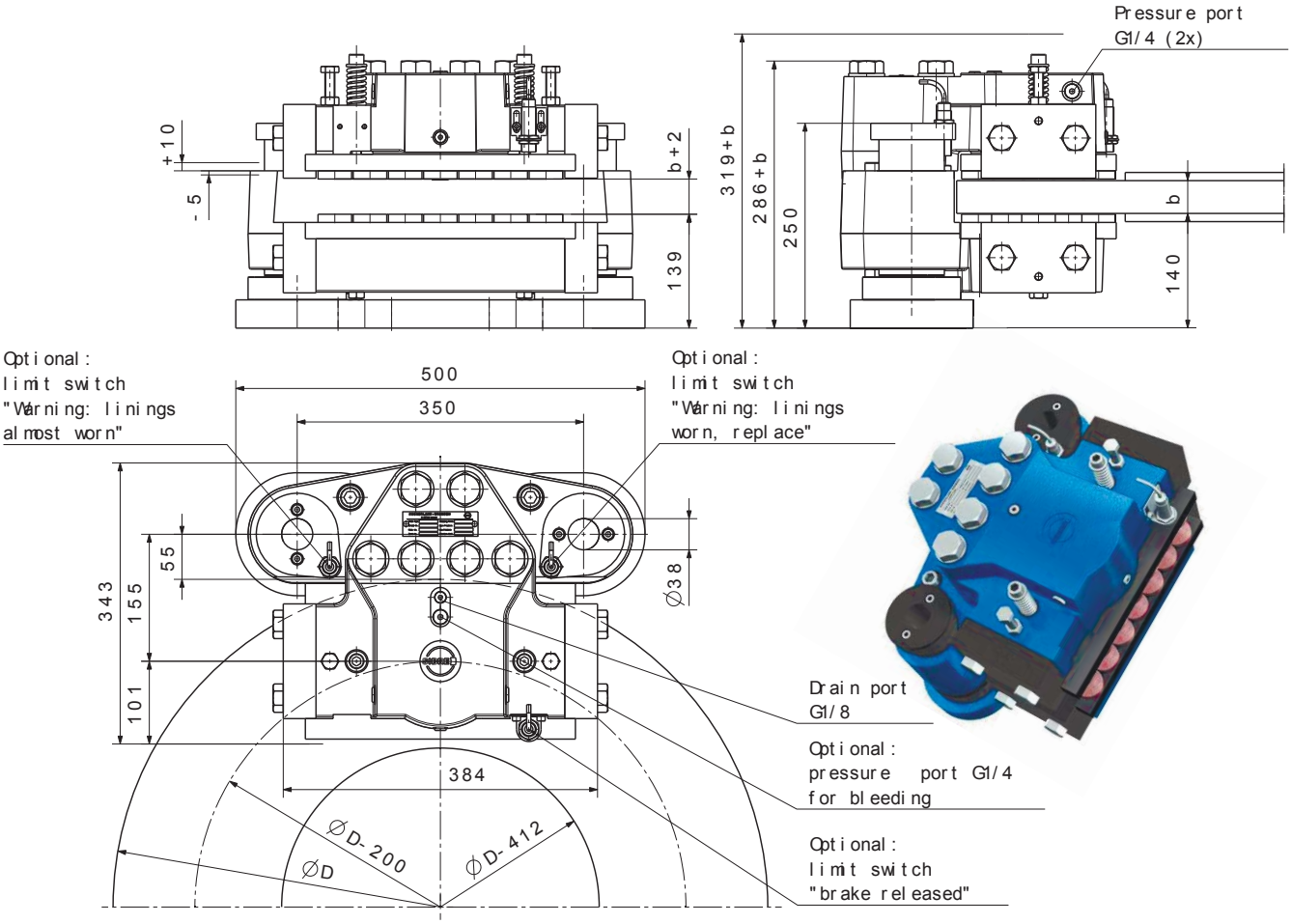
Mounting: Y = 90 ± 12



Calculation of Braking Torque

$$M_{Br} = F_{Br} \cdot \frac{D_1}{2} = 2 \cdot A_P \cdot p \cdot \mu \cdot \frac{D_1}{2} = A_P \cdot p \cdot \mu \cdot D_1$$

ØD	ØD1	X
500 ≤ ØD < 1500	ØD1 = ØD – 130	20
1500 ≤ ØD < 1600	ØD1 = ØD – 126	18
1600 ≤ ØD < 2000	ØD1 = ØD – 120	15
2000 ≤ ØD < 4000	ØD1 = ØD – 110	10



Application:

- **Stopping and/or holding brake for rotor of wind turbines**

Description:

- The ABS 120 FC brake is an Active Brake, Hydraulically Applied; braking force produced by variation of hydraulic pressure.
- The ABS 120 FC brake is designed as a floating caliper with one hydraulic cylinder.
- ABS brakes are suitable for horizontal and vertical brake discs under any angular displacement.

Design Advantage:

- Compact and robust construction
- Fast response time, fast braking for maximum safety
- Stainless steel piston
- Sinter linings for high speed/high energy application
- Lining retraction springs ensure air gap between lining and disc, when brake is open
- Removable retainers allow easy change of linings
- Suitable for low temperature application
- Long service life
- Easy maintenance

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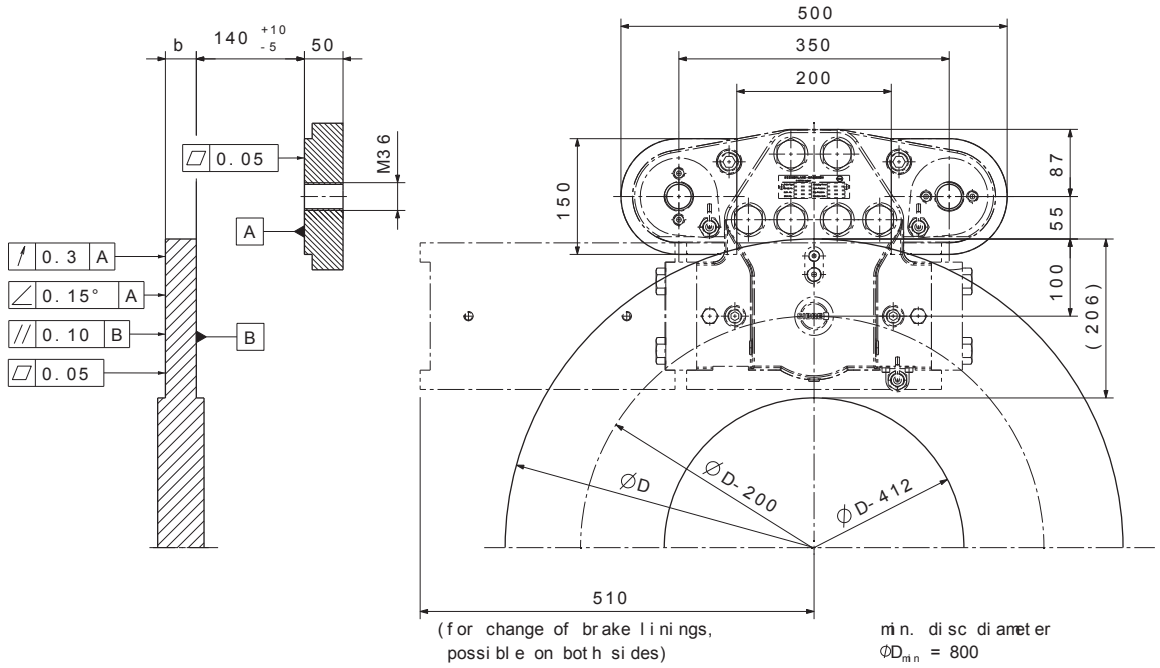
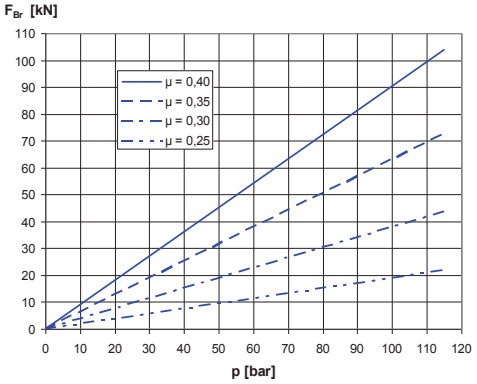
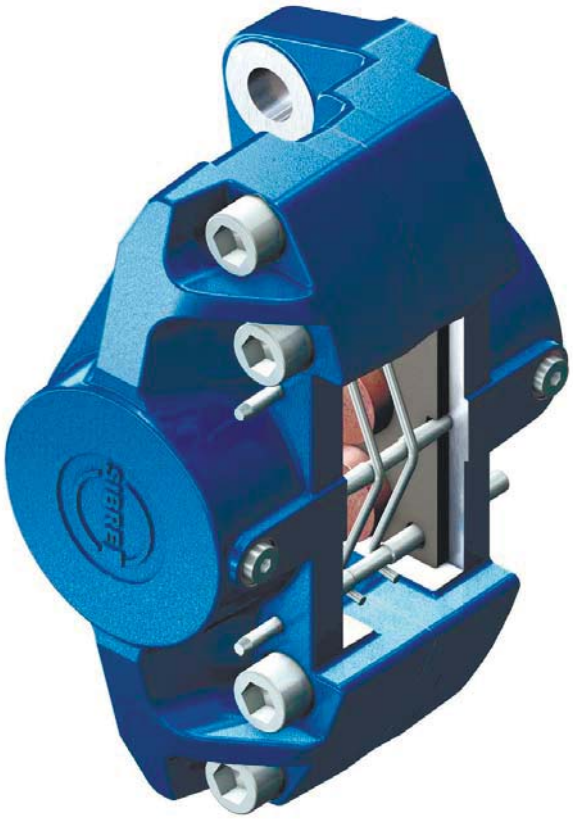
		ABS 120 FC
Piston diameter	$\varnothing d_P$	120 mm
Piston area each side	A_P	11310 mm²
Operating pressure	p	115 bar
Max. plant pressure	p_{max}	130 bar
Oil volume per 1 mm stroke	V_{Oil}	11,3 cm³
Lining type		sinter
Lining surface	A_L	363 cm²
Max. lining wear	s_L	7 mm
Nominal friction static	μ	0.4
Max. braking force	$F_{Br\ max}$	104 000 N
Disc thickness	b	40 mm
Min. disc diameter	$\varnothing D_{min}$	800 mm
Floating range on guidance pins	r	-5mm / +10 mm
Temperature range (for lower temperatures please contact us)	T	-20°C to 70°C
Weight	m	180 kg



Calculation of Braking Torque

$$M_{Br} = F_{Br} \cdot \frac{D-200}{2} = 2 \cdot A_P \cdot p \cdot \mu \cdot \frac{D-200}{2} = A_P \cdot p \cdot \mu \cdot (D-200)$$





Application:

- **Stopping and/or holding brake for rotor of wind turbines**

Description:

- The ABS 75 G brake is an Active Brake, Hydraulically Applied; braking force produced by variation of hydraulic pressure.
- The ABS 75 G brake consists of two independent caliper halves with opposite hydraulic cylinders.
- ABS brakes are suitable for horizontal and vertical brake discs under any angular displacement

Design Advantage:

- Compact and robust construction
- Fast response time, fast braking for maximum safety
- Special design to reduce braking noise
- Stainless steel piston
- High performance lining with stable friction coefficient
- Suitable for low temperature application
- Long service life
- Easy access for minimal maintenance

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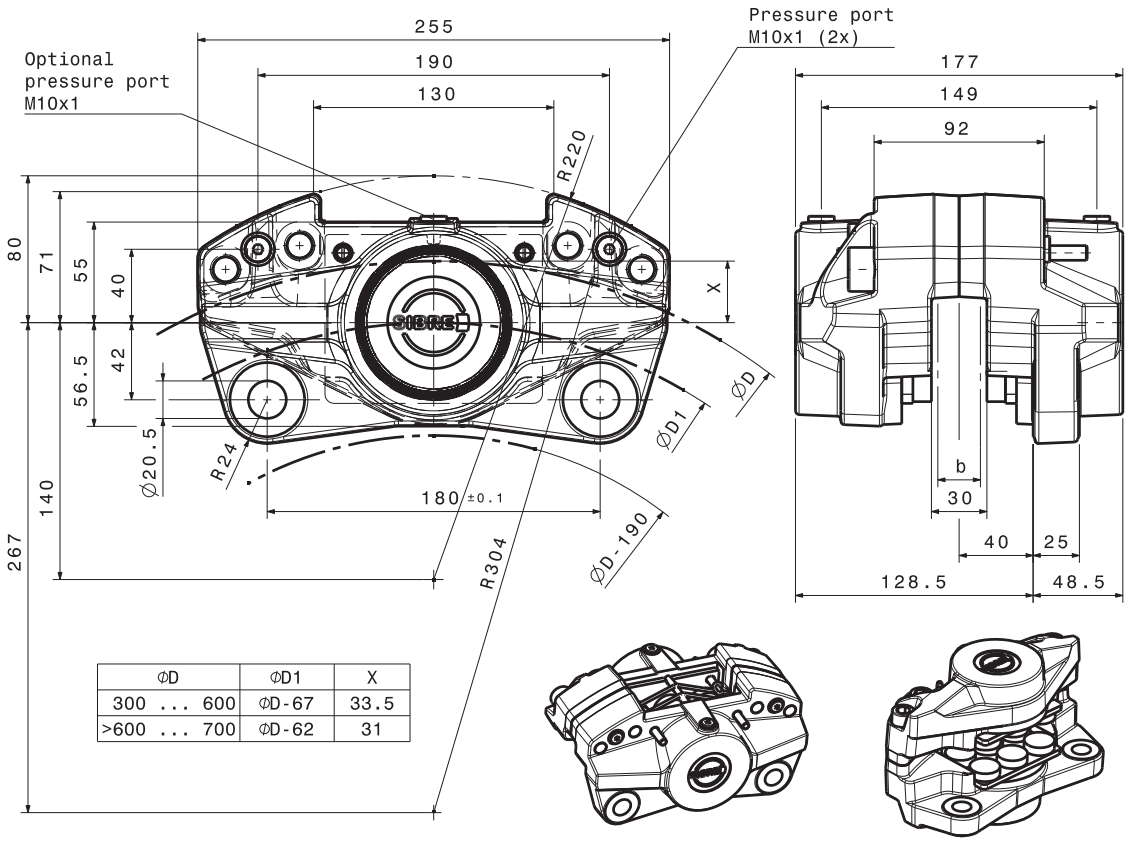
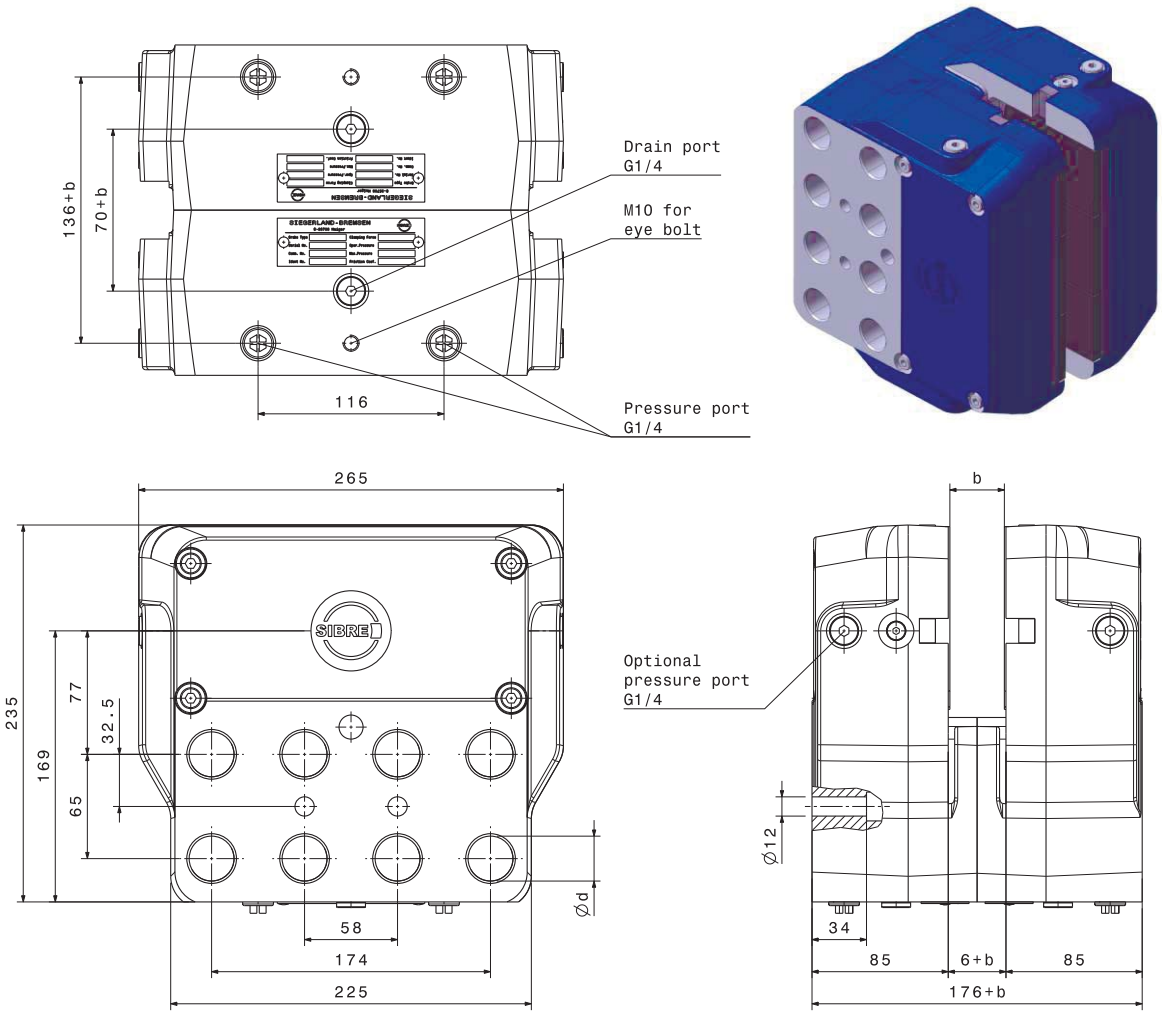
		ABS 75 G
Piston diameter	$\varnothing d_P$	75 mm
Piston area each side	A_P	4417 mm²
Operating pressure	p	150 bar
Max. plant pressure	p_{max}	180 bar
Oil volume per 1 mm stroke	V_{Oil}	9 cm³
Lining type		sinter
Lining surface	A_L	52 cm²
Max. lining wear	s_L	8 mm
Nominal friction static	μ	0.4
Max. braking force	$F_{Br\ max}$	53 000 N
Disc thickness	b	20 – 25 mm
Min. disc diameter	$\varnothing D_{min}$	300 mm
Max. disc diameter	$\varnothing D_{max}$	700 mm
Temperature range (for lower temperatures please contact us)	T	-20°C to 70°C
Weight	m	18 kg



Calculation of Braking Torque

$$M_{Br} = F_{Br} \cdot \frac{D_1}{2} = A_P \cdot p \cdot \mu \cdot D_1$$



Application:

- **Stopping and/or holding brake for rotors of wind turbines**

Description:

- The ABT 75/90 G-R brake is an Active Brake, Hydraulically Applied; braking force produced by variation of hydraulic pressure.
- The ABT 75/90 G-R brake consists of two independent caliper halves with opposite hydraulic cylinders.
- The ABT 75/90 G-R is equipped with lining retraction springs.
- ABT brakes are suitable for horizontal and vertical brake discs under any angular displacement.

Design Advantage:

- Compact and robust construction
- Fast response time, fast braking for maximum safety
- Stainless steel piston
- High performance lining with stable friction coefficient
- Suitable for low temperature application
- Long service life
- Easy maintenance
- Lining retraction springs for guaranteed air gap between lining and disc when brake is open
- Suitable as rotor brake on the slow speed shaft

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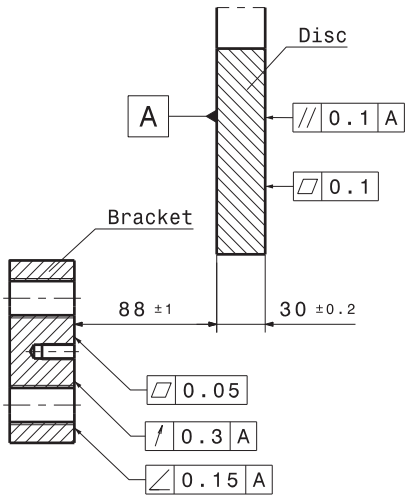
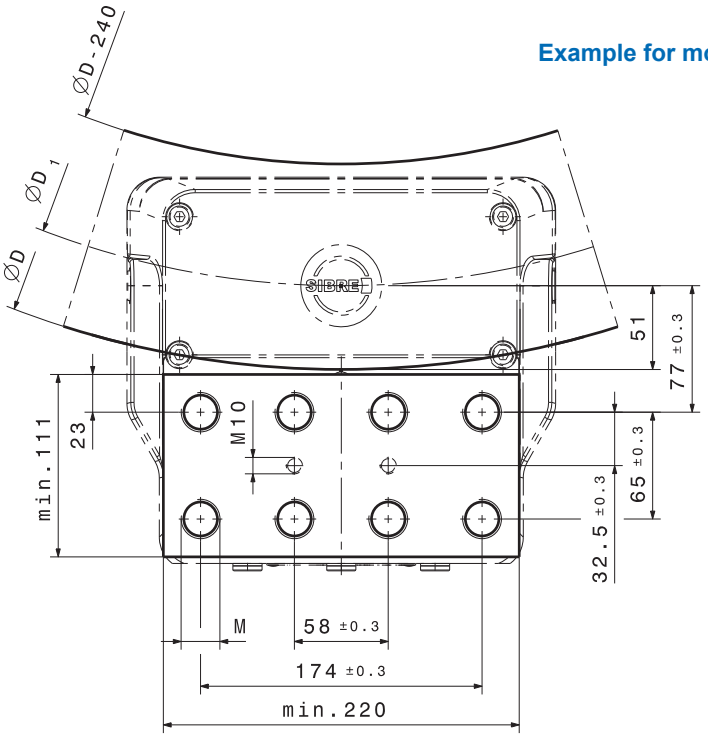
		ABT 75 G-R	ABT 90 G-R
Piston diameter	$\varnothing d_P$	75 mm	90 mm
Piston area each side	A_P	8835 mm²	12723 mm²
Operating pressure	p	160 bar	
Max. plant pressure	p_{max}	180 bar	
Oil volume per 1 mm stroke	V_{Oil}	18 cm³	26 cm³
Lining type		organic (sinter optional)	
Lining surface	A_L	225 cm²	
Max. lining wear	s_L	7 mm	
Nominal friction static	μ	0.4	
Max. braking force	$F_{Br\ max}$	113 000 N	162 000 N
Min. disc diameter	$\varnothing D_{min}$	1000 mm	
Disc thickness	b	20 – 70 mm	
Mounting bore	∅d	∅25 mm	∅28 mm
Temperature range (for lower temperatures please contact us)	T	-20°C to 70°C	
Weight	m	65 kg	
Mounting Bolts	M	M24-12.9	M27-12.9
Fastening Torque (μ=0,14) for mounting bolts	M_b	1200 Nm	1800 Nm



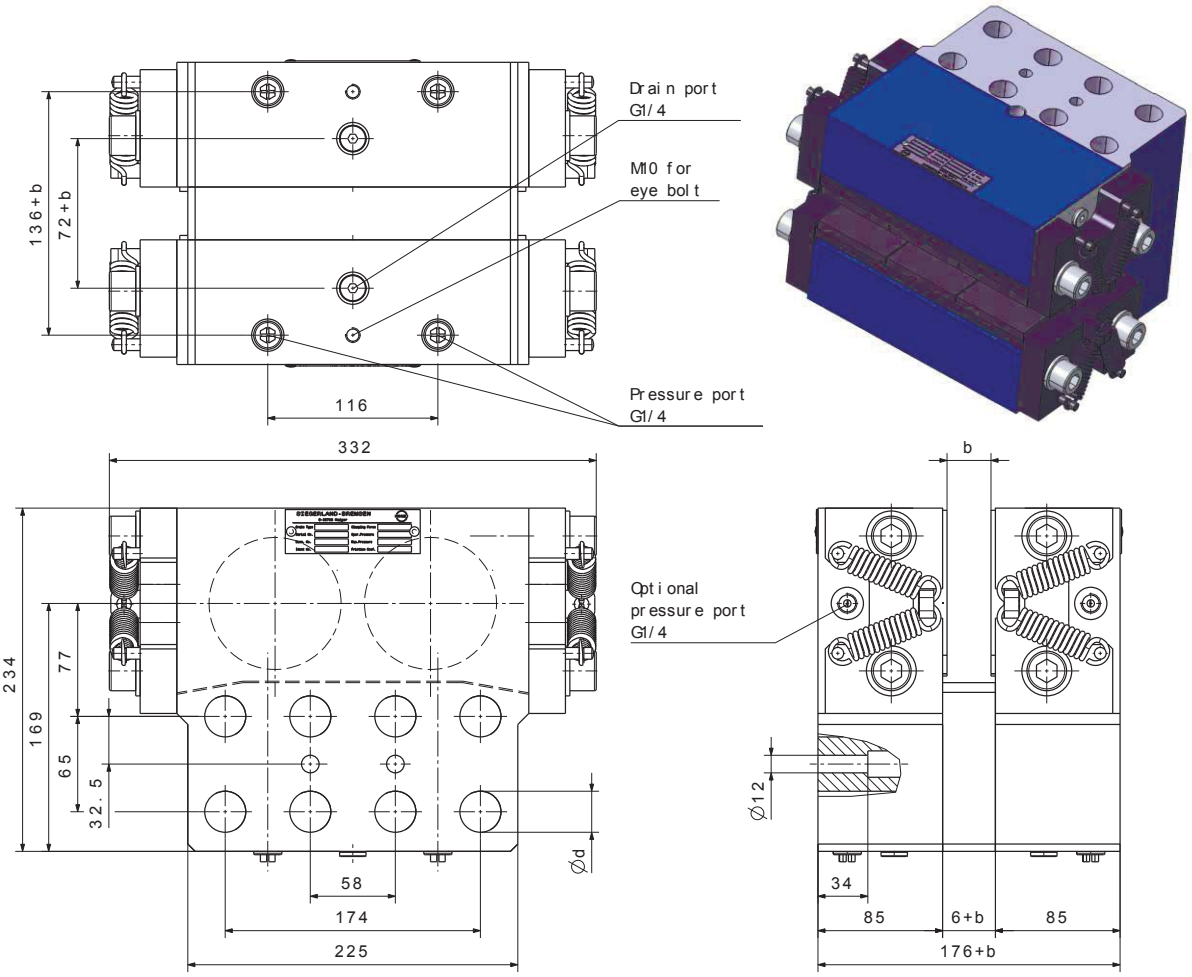
Example for mounting
(b = 30)



Calculation of Braking Torque

$D_1 = D - 102$

$$M_{Br} = F_{Br} \cdot \frac{D_1}{2} = 2 \cdot A_P \cdot p \cdot \mu \cdot \frac{D_1}{2} = 2 \cdot A_P \cdot p \cdot \mu \cdot \left(\frac{D}{2} - 51\right)$$



Application:

- **Stopping and/or holding brake for rotors of wind turbines**

Description:

- The ABT 75/90 S-R brake is an Active Brake, Hydraulically Applied; braking force produced by variation of hydraulic pressure.
- The ABT 75/90 S-R brake consists of two independent caliper halves with opposite hydraulic cylinders.
- ABT brakes are suitable for horizontal and vertical brake discs under any angular displacement.
- The ABT 75/90 S-R is equipped with removable lining retainer plates and sideways lining retraction springs.

Design Advantage:

- Compact and robust construction
- Fast response time, fast braking for maximum safety
- Stainless steel piston
- High performance lining with stable friction coefficient
- Suitable for extreme low temperature application
- Long service life
- Easy maintenance
- Unique removable lining retainer plates provide easy lining replacement
- Lining retraction springs for guaranteed air gap between lining and disc when brake is open
- Suitable as rotor brake on the slow speed shaft

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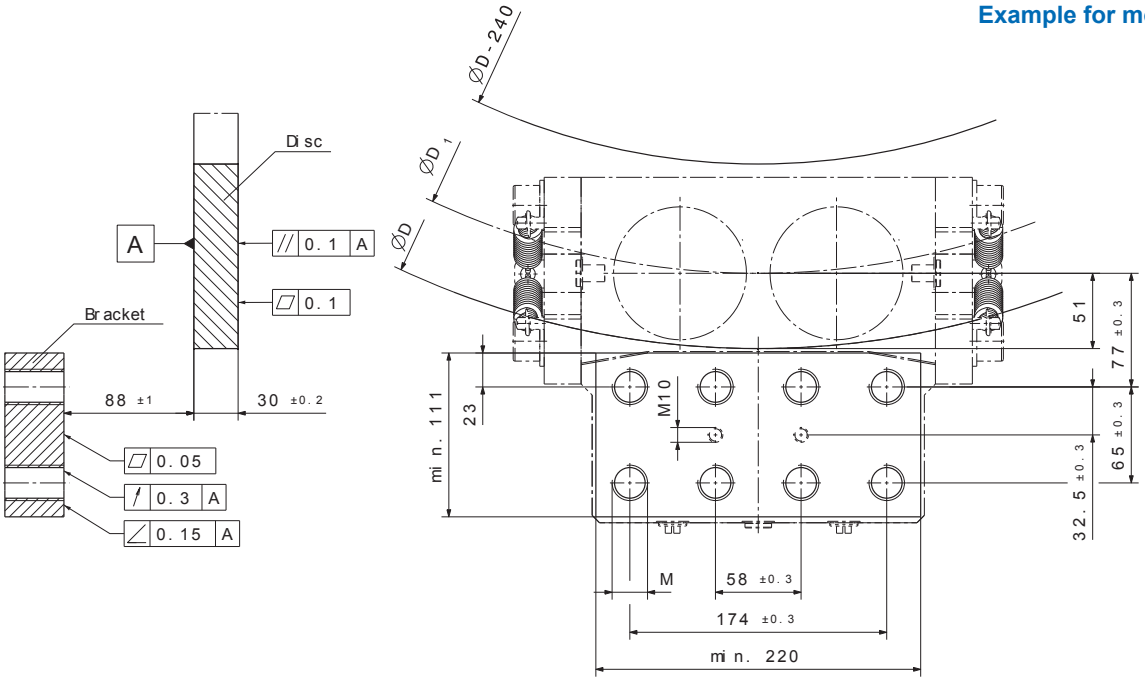
		ABT 75 S-R	ABT 90 S-R
Piston diameter	$\varnothing d_P$	75 mm	90 mm
Piston area each side	A_P	8835 mm²	12723 mm²
Operating pressure	p	160 bar	
Max. plant pressure	p_{max}	180 bar	
Oil volume per 1 mm stroke	V_{Oil}	18 cm³	26 cm³
Lining type		organic (sinter optional)	
Lining surface	A_L	250 cm²	
Max. lining wear	s_L	7 mm	
Nominal friction static	μ	0.4	
Max. braking force	$F_{Br\ max}$	113 000 N	162 000 N
Min. disc diameter	$\varnothing D_{min}$	1000 mm	
Disc thickness	b	20 – 70 mm	
Mounting bore	Ød	∅25 mm	∅28 mm
Temperature range	T	-40°C to 70°C	
Weight	m	75 kg	
Mounting Bolts	M	M24-12.9	M27-12.9
Fastening Torque (μ=0,14) for mounting bolts	M_b	1200 Nm	1800 Nm

Example for mounting
(b = 30)



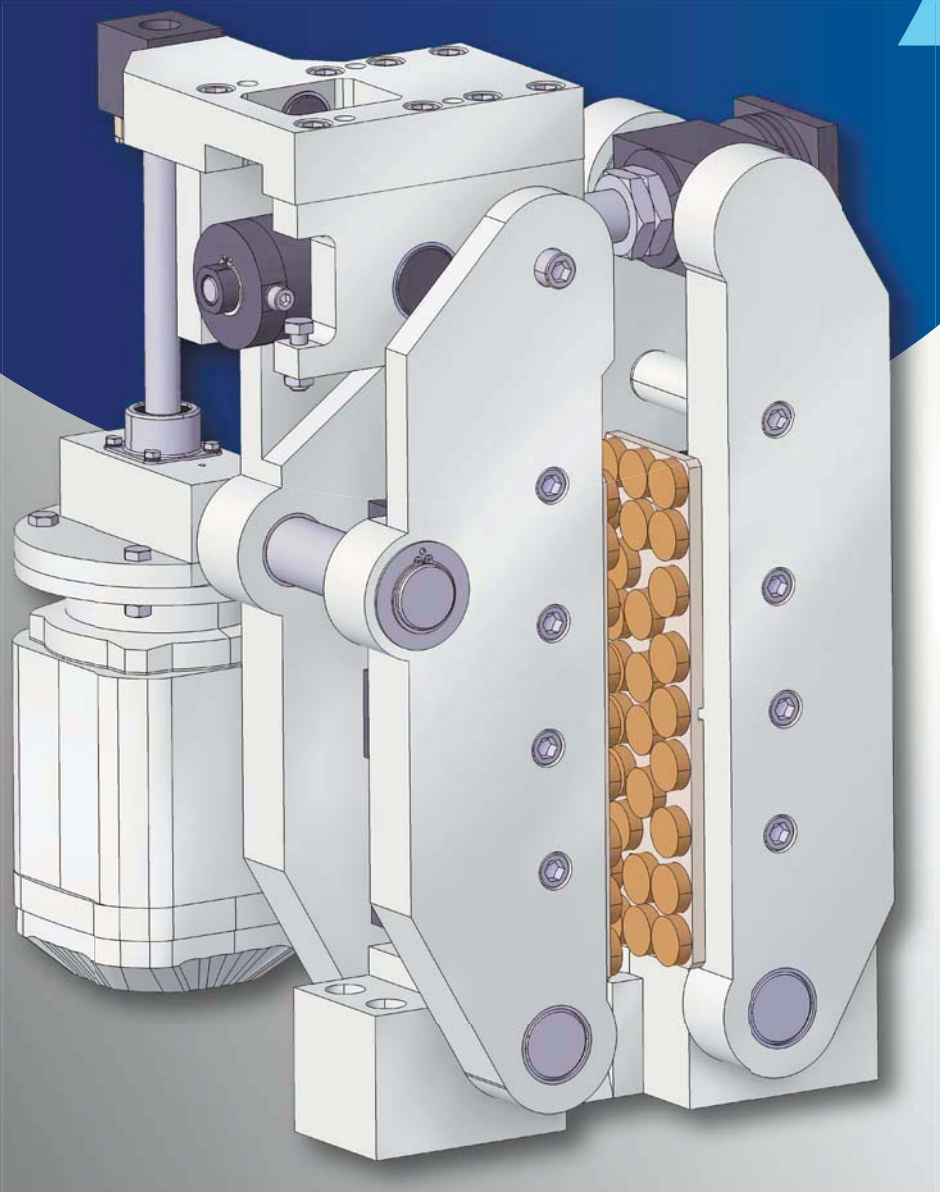
Calculation of Braking Torque

$D_1 = D - 102$

$$M_{Br} = F_{Br} \cdot \frac{D_1}{2} = 2 \cdot A_P \cdot p \cdot \mu \cdot \frac{D_1}{2} = 2 \cdot A_P \cdot p \cdot \mu \cdot \left(\frac{D}{2} - 51\right)$$

Rotor Brake USB-W

Innovative Brake Technology for Wind Turbine Applications



SIBRE

Sure to be Safe

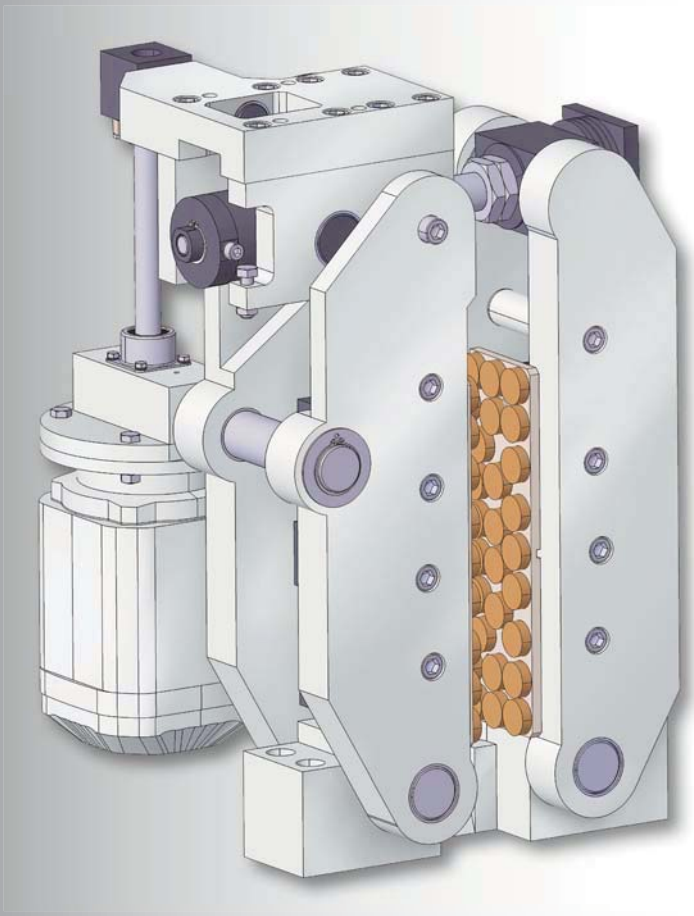
SIBRE Siegerland Bremsen GmbH is offering innovative, robust and high-end brake solutions for Wind turbine applications.

We are gaining our knowledge from more than 50 years of experience in the sector of advanced brake technology.

From the product idea over the start-up till worldwide technical support we accompany you.

Now SIBRE USB-technology adapted for Wind turbine application!

Rotor Brake USB-W



Technical features:

- Active principle of USB series adapted to Wind turbine application
- Adjustable braking torque thru electronic control
- Automatically target/actual-comparison of clamping force
- Automated lining wear compensation
- Easy replacement of linings thru big lifting gap
- Suitable for Low temp application
- Suitable for Offshore application
- Dimensions: 500 x 750 x 400 mm
- Weight: approx. 250 kg

Options:

- SIBRE Status Monitoring System (SMS)
- Manual release
- 220 - 400 VAC (IP55, further upon request)

SIBRE *Sure to be Safe*

Siegerland Bremsen

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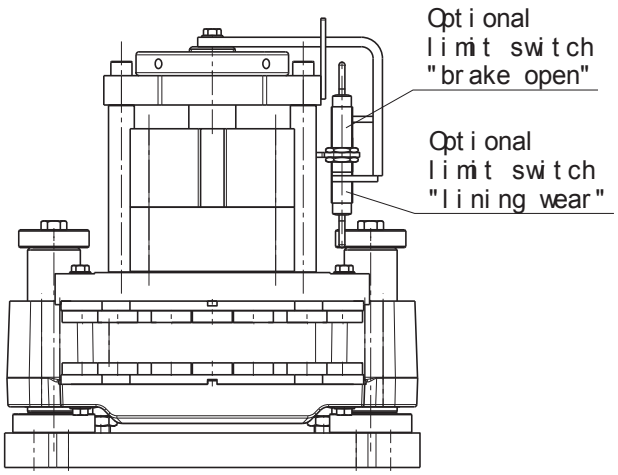
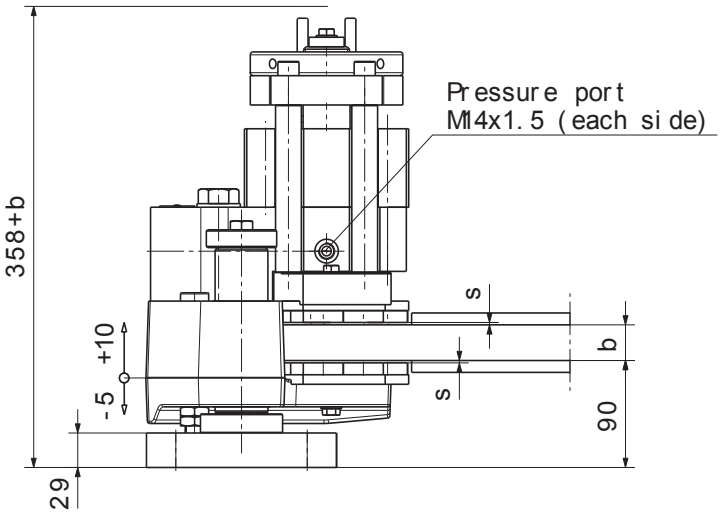
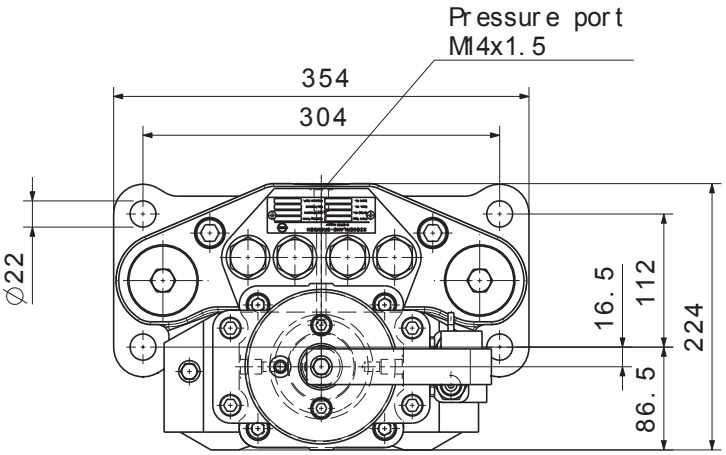
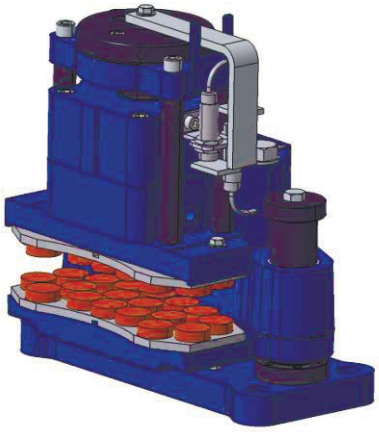
SIBRE Group









Application:

- **Stopping and/or holding brake for rotors of wind turbines**

Description:

- The SHI 75 FC brake is a Fail Safe Brake, Spring Applied, Hydraulically Released; braking force adjustable by variation of air gap and by variation of spring package.
- The SHI 75 FC brake is designed as a floating caliper.
- SHI brakes are suitable for horizontal and vertical brake discs under any angular displacement.

Design Advantage:

- Compact and robust construction
- Fast response time; fast braking for maximum safety
- Stainless steel piston
- Sinter linings for high speed/high energy application
- Retraction springs ensure air gap between lining and disc when brake is open
- Optimized lining pressure distribution by innovative force transmission
- Optimized isolation of lateral forces
- Minimized risk of leakage
- Suitable for low temperature applications
- Long service life
- Easy maintenance

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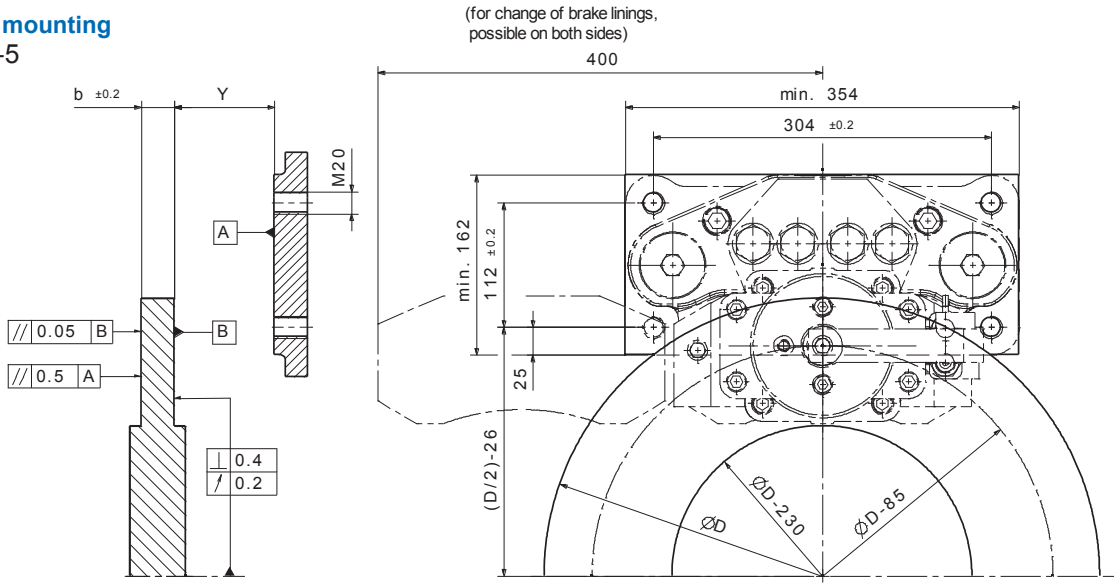
		SHI 75-FC
Piston area	A_P	50,3 cm²
Oil volume per 1 mm stroke	V_{Oil}	5,0 cm³
Adjustable air gap (each side)	s	0,75 – 1,5 mm
Lining type		sinter
Lining surface	A_L	163 cm²
Max. lining wear	s_L	8 mm
Nominal friction coefficient	μ	0.4
Disc thickness	b	20 – 40 mm
Min. disc diameter	$\varnothing D_{min}$	500 mm
Max. disc diameter	$\varnothing D_{max}$	1600 mm
Floating range on guidance pins	r	-5 / +10 mm
Temperature range (for lower temperatures please contact us)	T	-20°C to 70°C
Weight	m	85 kg

Example for mounting

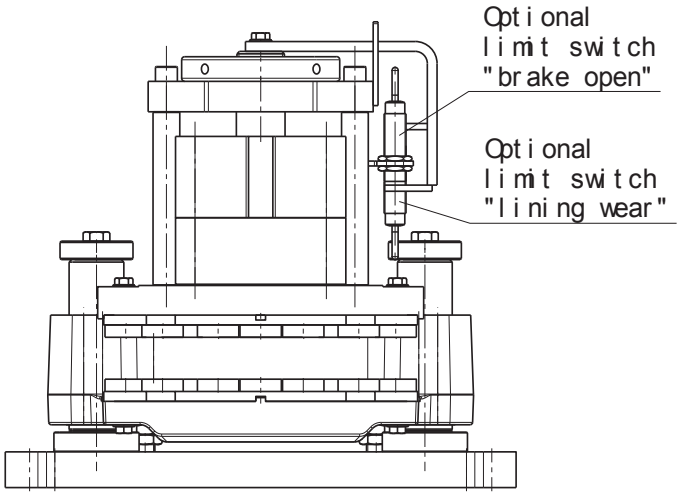
Y = 90 +10/-5

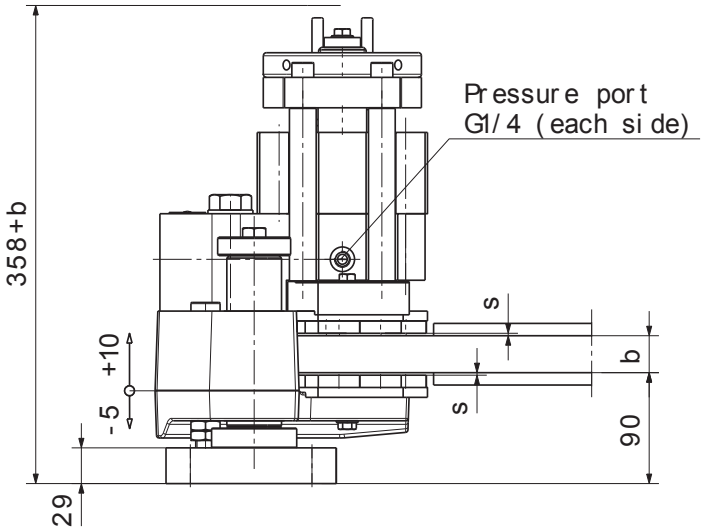


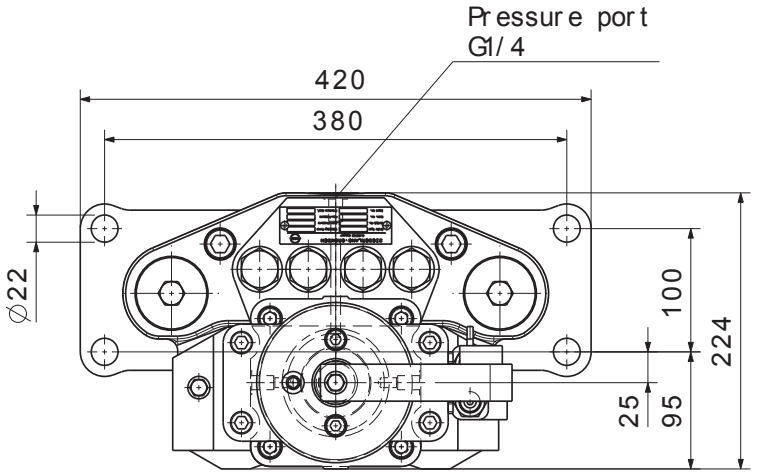
Calculation of Braking Torque

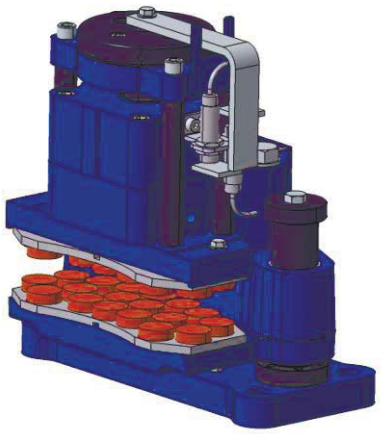
$$M_{Br} = F_{Br} \cdot \frac{D_1}{2} = 2 \cdot Fc \cdot \mu \cdot \frac{D_1}{2} = Fc \cdot \mu \cdot D_1$$

Clamping Force F_C [kN]	75-1	75-2	75-3	75-4	75-5	75-6
F_C (s = 0,75 mm)	18,1	21,6	24,6	29,1	42,8	48,6
F_C (s = 1,00 mm)	17,9	20,7	23,9	27,6	41,0	47,3
F_C (s = 1,25 mm)	17,7	19,9	23,1	26,1	39,1	46,0
F_C (s = 1,50 mm)	17,6	19,0	22,4	24,6	37,0	44,4
F_C (brake released)	21,0	26,0	30,0	37,0	56,0	61,0
Release pressure p [bar]	45	55	65	80	120	135
Max. operating pressure p_{max} [bar]	85	85	110	110	150	175









Application:

- **Stopping and/or holding brake for rotors of wind turbines**

Description:

- The FSB 75 FC brake is a Fail Safe Brake, Spring Applied, Hydraulically Released; braking force adjustable by variation of air gap and by variation of spring package
- The FSB 75 FC brake is designed as a floating caliper
- FSB brakes are suitable for horizontal and vertical brake discs under any angular displacement.

Design Advantage:

- Compact and robust construction
- Fast response time; fast braking for maximum safety
- Stainless steel piston
- Sinter linings for high speed/high energy application
- Retraction springs ensure air gap between lining and disc when brake is open
- Optimized lining pressure distribution by innovative force transmission
- Optimized isolation of lateral forces
- Minimized risk of leakage
- Suitable for low temperature applications
- Long service life
- Easy maintenance

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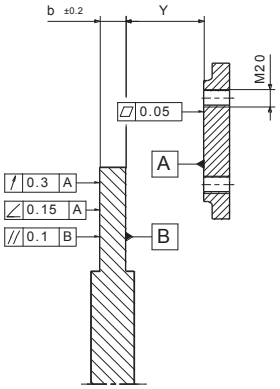
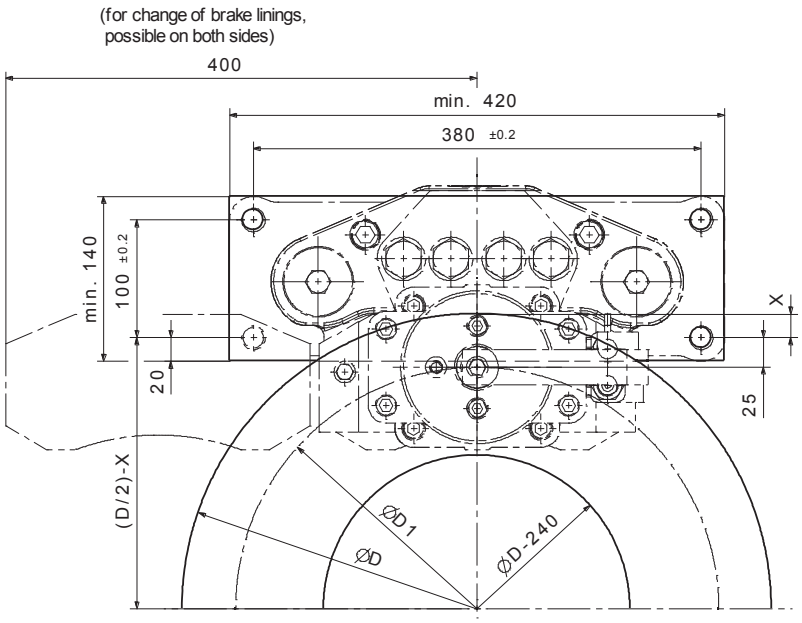
		FSB 75-FC
Piston area	A_P	50,3 cm²
Oil volume per 1 mm stroke	V_{Oil}	5,0 cm³
Adjustable air gap (each side)	s	0,75 – 1,5 mm
Lining type		sinter
Lining surface	A_L	163 cm²
Max. lining wear	s_L	8 mm
Nominal friction coefficient	μ	0.4
Disc thickness	b	20 – 40 mm
Min. disc diameter	$\varnothing D_{min}$	500 mm
Max. disc diameter	$\varnothing D_{max}$	4000 mm
Floating range on guidance pins	r	-5 / +10 mm
Temperature range (for lower temperatures please contact us)	T	-20°C to 70°C
Weight	m	85 kg

Example for mounting
Y = 90 +10/-5



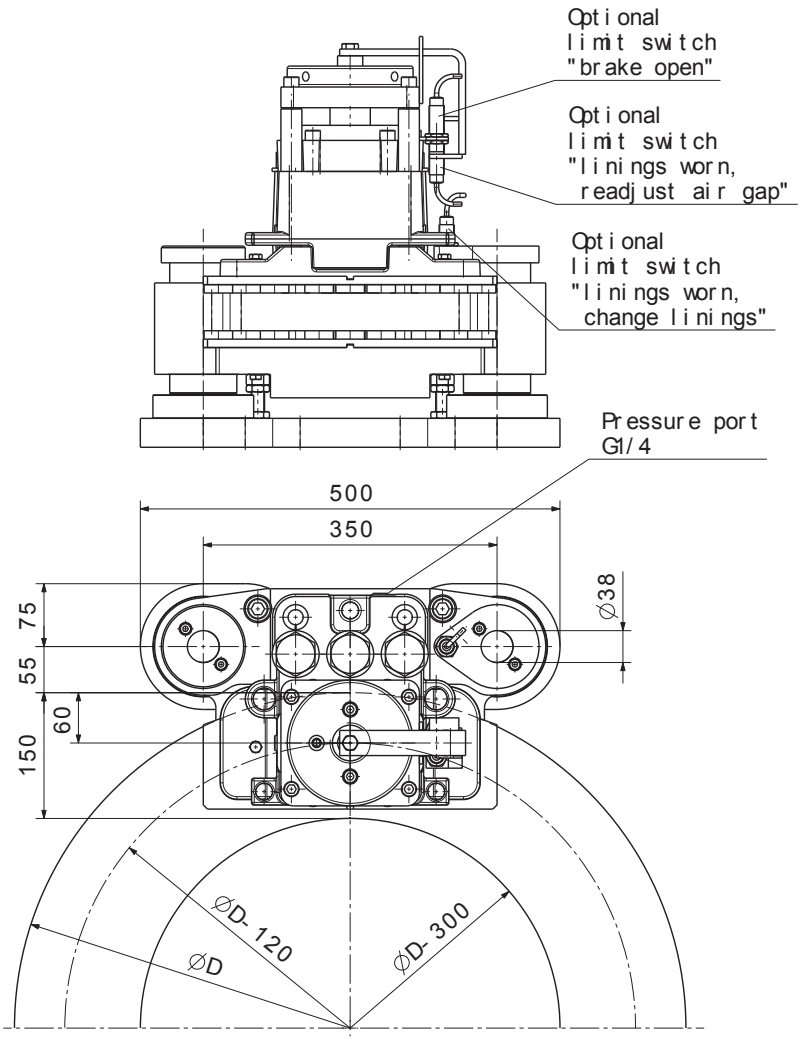


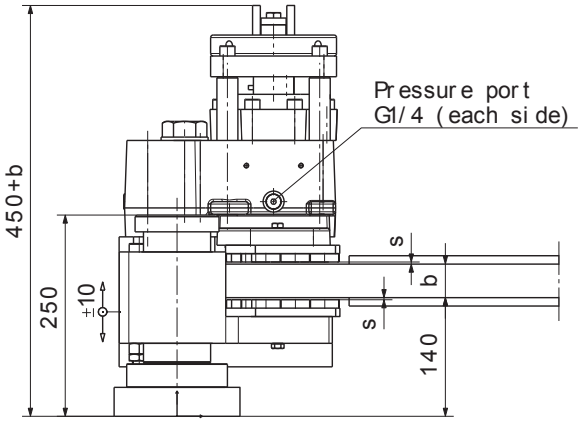
Calculation of Braking Torque

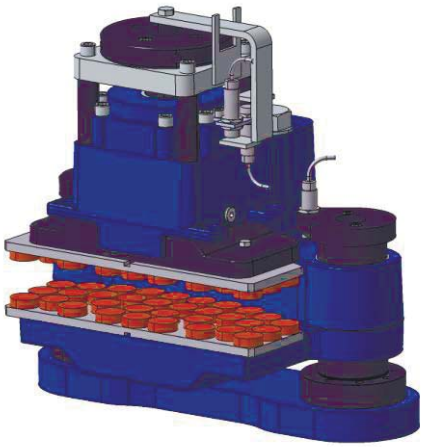
$$M_{Br} = F_{Br} \cdot \frac{D_1}{2} = 2 \cdot Fc \cdot \mu \cdot \frac{D_1}{2} = Fc \cdot \mu \cdot D1$$

ØD	ØD1	X
500 ≤ ØD < 1500	ØD1 = ØD – 90	20
1500 ≤ ØD < 1600	ØD1 = ØD – 86	18
1600 ≤ ØD < 2000	ØD1 = ØD – 80	15
2000 ≤ ØD < 4000	ØD1 = ØD – 70	10

Clamping Force F_C [kN]	75-1	75-2	75-3	75-4	75-5	75-6
F_C (s = 0,75 mm)	18,1	21,6	24,6	29,1	42,8	48,6
F_C (s = 1,00 mm)	17,9	20,7	23,9	27,6	41,0	47,3
F_C (s = 1,25 mm)	17,7	19,9	23,1	26,1	39,1	46,0
F_C (s = 1,50 mm)	17,6	19,0	22,4	24,6	37,0	44,4
F_C (brake released)	21,0	26,0	30,0	37,0	56,0	61,0
Release pressure p [bar]	45	55	65	80	120	135
Max. operating pressure p_{max} [bar]	85	85	110	110	150	175







Application:

- **Stopping and/or holding brake for rotors of wind turbines**

Description:

- The FSB 101-107 FC brake is a Fail Safe Brake, Spring Applied, Hydraulically Released; braking force adjustable by variation of air gap and by variation of spring package.
- The FSB 101-107 FC brake is designed as a floating caliper.
- FSB brakes are suitable for horizontal and vertical brake discs under any angular displacement.

Design Advantage:

- Compact and robust construction
- Fast response time, fast braking for maximum safety
- Stainless steel piston
- Sinter linings for high speed/high energy application
- Retraction springs ensure air gap between lining and disc when brake is open
- Optimized lining pressure distribution by innovative force transmission
- Optimized isolation of lateral forces
- Minimized risk of leakage
- Suitable for low temperature applications
- Long service life
- Easy maintenance

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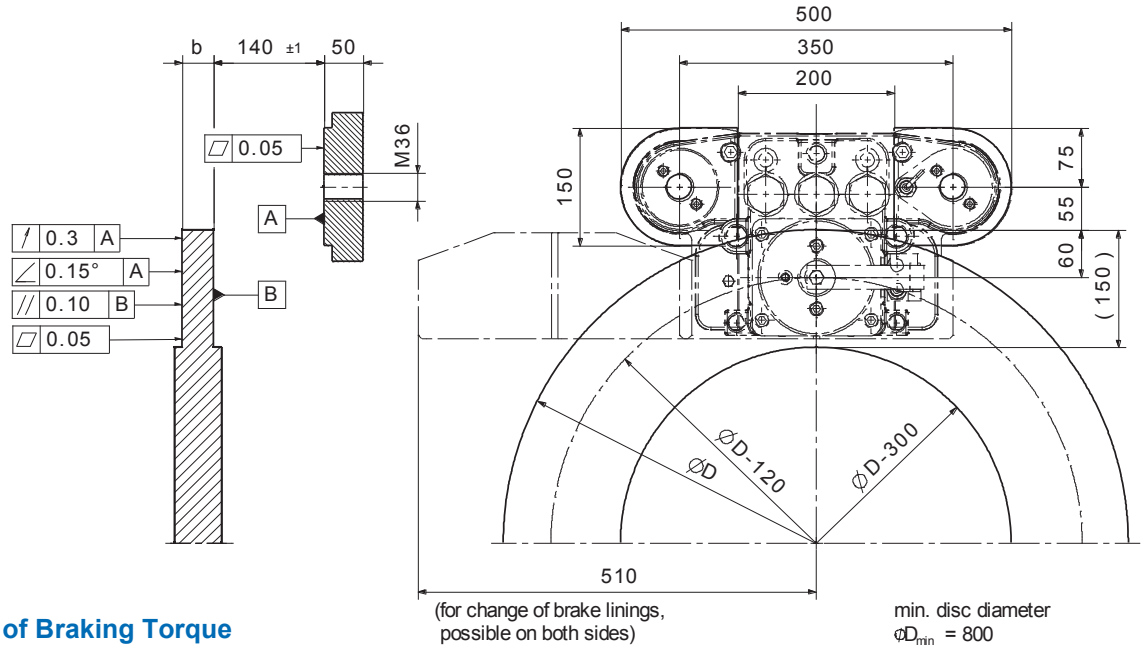
		FSB 101-107 FC
Piston area	A_P	113 cm²
Oil volume per 1 mm stroke	V_{Oil}	11,3 cm³
Adjustable air gap (each side)	s	0,5 – 2,0 mm
Lining type		sinter
Lining surface	A_L	300 cm²
Max. lining wear	s_L	8 mm
Nominal friction coefficient	μ	0.4
Disc thickness	b	20 – 50 mm
Min. disc diameter	$\varnothing D_{min}$	800 mm
Floating range on guidance pins	r	± 10 mm
Temperature range (for lower temperatures please contact us)	T	-20°C to 70°C
Weight	m	150 kg

Example for mounting

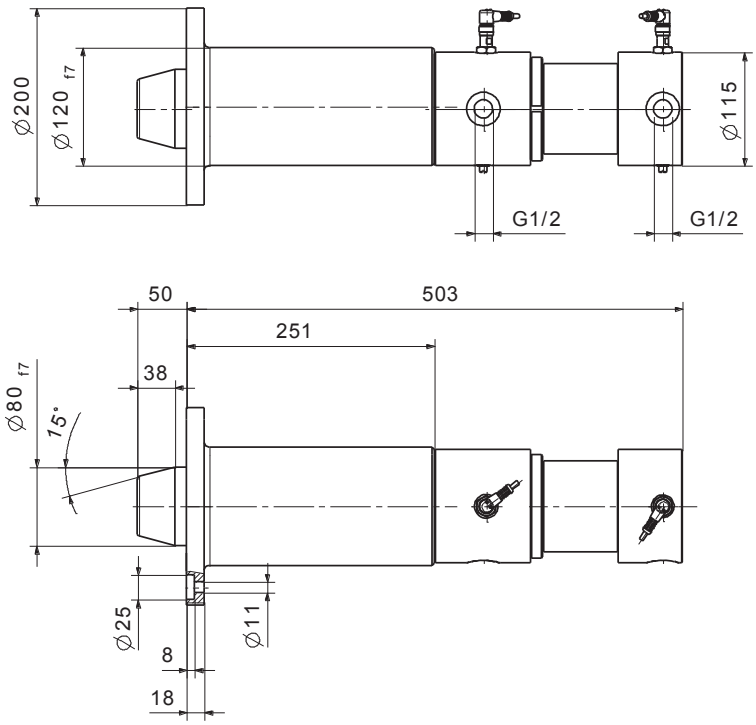


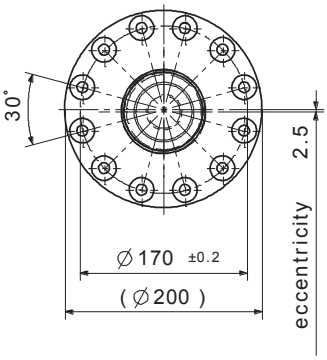
Calculation of Braking Torque

$$M_{Br} = F_{Br} \cdot \frac{D-120}{2} = 2 \cdot F_C \cdot \mu \cdot \frac{D-120}{2} = F_C \cdot \mu \cdot (D-120)$$

Clamping Force F_C	101 FC	102 FC	103 FC	104 FC	105 FC	106 FC	107 FC
F_C (s = 0,5 mm)	29,0 kN	45,1 kN	55,4 kN	74,1 kN	83,2 kN	110,0 kN	140,0 kN
F_C (s = 1,0 mm)	28,0 kN	43,7 kN	52,2 kN	68,7 kN	77,0 kN	98,0 kN	115,0 kN
F_C (s = 1,5 mm)	27,0 kN	41,3 kN	48,8 kN	62,7 kN	74,4 kN	88,0 kN	94,0 kN
F_C (s = 2,0 mm)	26,0 kN	40,3 kN	44,8 kN	58,7 kN	69,3 kN	73,0 kN	67,0 kN
F_C (brake released)	32 kN	50 kN	62 kN	84 kN	98,5 kN	150 kN	189 kN
Release pressure p	35 bar	50 bar	60 bar	80 bar	95 bar	145 bar	175 bar
Max. operating pressure p_{max}	110 bar	110 bar	110 bar	110 bar	150 bar	175 bar	205 bar

Rotor lock without optional manual safety system





Piston diameter	$\varnothing d_P$	80 mm
Stroke	s	50 mm
Operating pressure	p	200 bar
Max. plant pressure	p_{max}	250 bar
Weight	m	50 kg

Application:

- **Rotor Lock for wind turbines**

Description:

- The rotor lock RLH80 is a Hydraulically Applied, Form-Closed lock for wind turbine rotors.
- The RLH80 consists of a double action hydraulic cylinder that pushes a conical locking stud into a support on the rotor. Any further rotation is blocked until the stud is hydraulically retracted.
- Optionally, the RLH80 can be equipped with a manually activated safety system that keeps the end position of the stud fixed independent from hydraulic pressure.

Design Advantage:

- Compact and robust construction
- Long service life
- Virtually maintenance free
- Eccentric bearing seat for easy adjustment
- Limit switches for lock status - “rotor locked” or “rotor unlocked”
- Optionally, equipped with manual safety system for maximum safety
- Basic design easily adaptable to different mounting requirements

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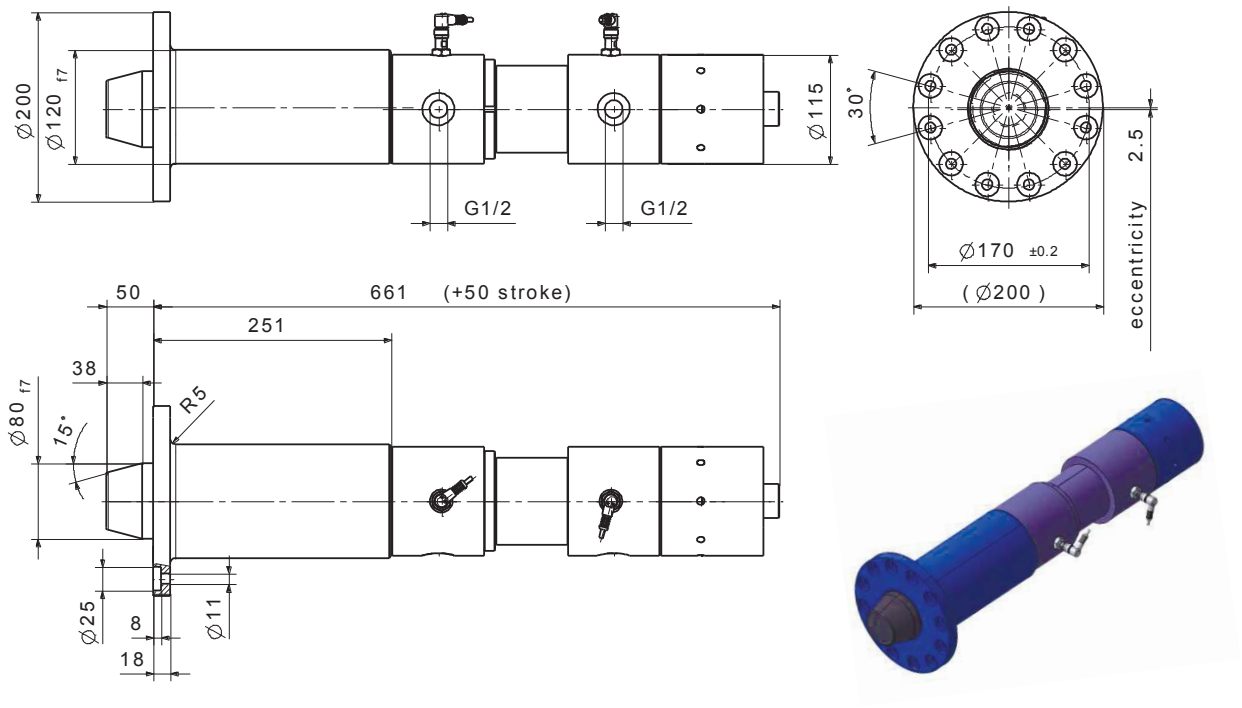
Rotor lock with optional manual safety system



Piston diameter	$\varnothing d_P$	80 mm
Stroke	s	50 mm
Operating pressure	p	200 bar
Max. plant pressure	p_{max}	250 bar
Weight	m	62 kg

Application:

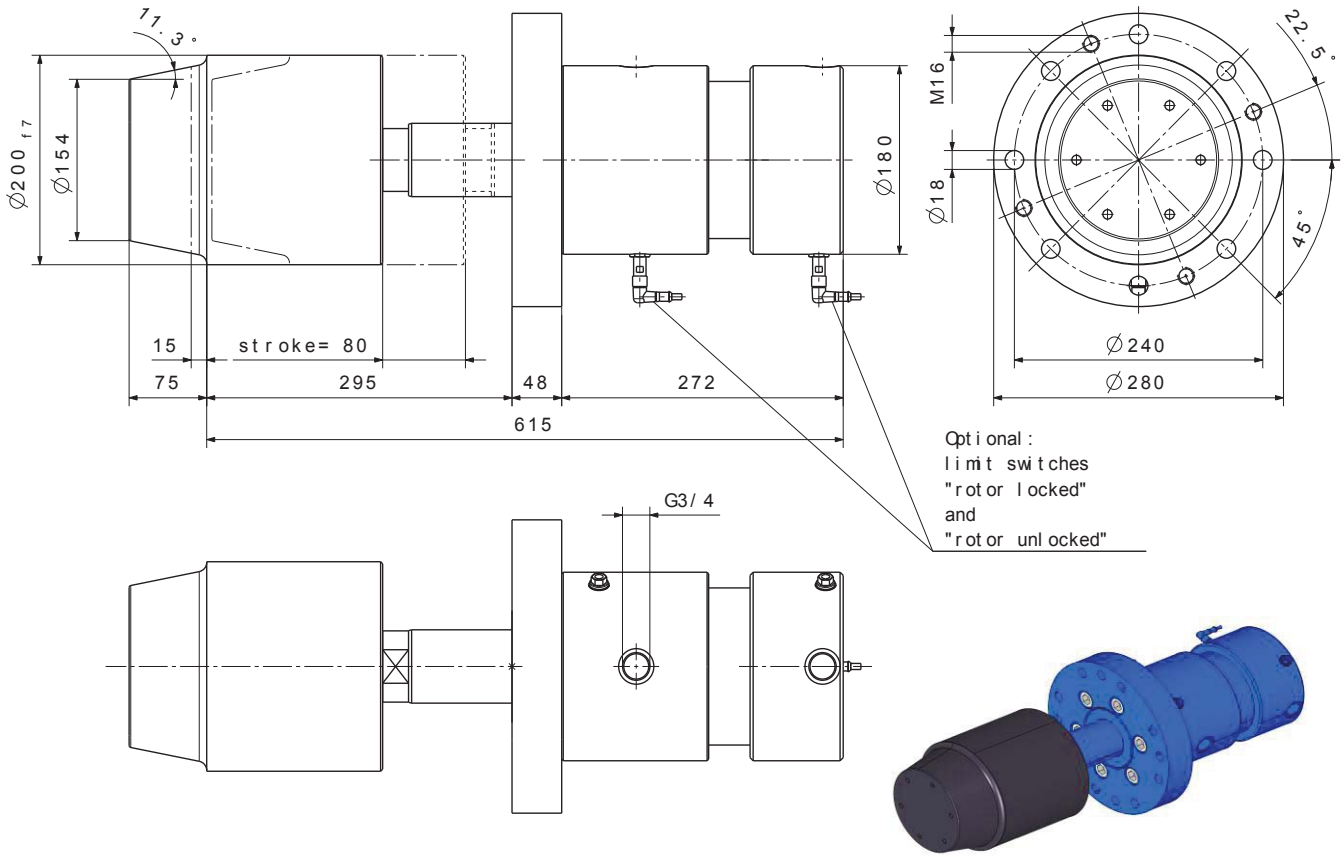
- **Rotor Lock for wind turbines**

Description:

- The rotor lock RLH80 is a Hydraulically Applied, Form-Closed lock for wind turbine rotors.
- The RLH80 consists of a double action hydraulic cylinder that pushes a conical locking stud into a support on the rotor. Any further rotation is blocked until the stud is hydraulically retracted.
- Optionally, the RLH80 can be equipped with a manually activated safety system that keeps the end position of the stud fixed independent from hydraulic pressure.

Design Advantage:

- Compact and robust construction
- Long service life
- Virtually maintenance free
- Eccentric bearing seat for easy adjustment
- Limit switches for lock status - “rotor locked” or “rotor unlocked”
- Optionally, equipped with manual safety system for maximum safety
- Basic design easily adaptable to different mounting requirements



Piston diameter	$\varnothing d_P$	125 mm
Stroke	s	80 mm
Max. operating pressure	p_{max}	250 bar
Max. cylinder force pushing	$F_{max\ push}$	306 kN
Max. cylinder force pulling	$F_{max\ pull}$	210 kN
Weight	m	130 kg

Application:

- **Rotor Lock for wind turbines**

Description:

- The rotor lock RLH125 is a Hydraulically Applied, Form-Closed lock for wind turbine rotors.
- The RLH125 consists of a double action hydraulic cylinder that pushes a conical locking stud into a support on the rotor. Any further rotation is blocked until the stud is hydraulically retracted.
- Optionally the RLH125 can be equipped with a manually activated safety system that keeps the end position of the stud fixed independent from hydraulic pressure.

Design Advantage:

- Compact and robust construction
- Long service life
- Virtually maintenance free
- Limit switches for lock status - “rotor locked” and/or “rotor unlocked”
- Optionally equipped with manual safety system for maximum safety
- Basic design easily adaptable to different mounting requirements

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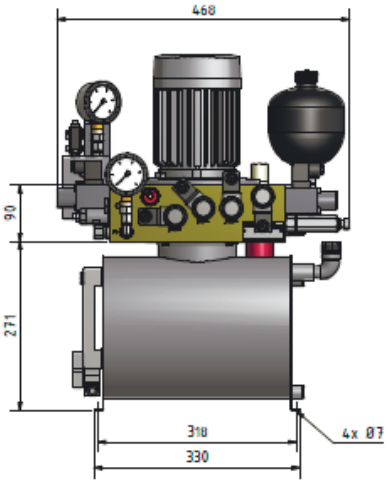

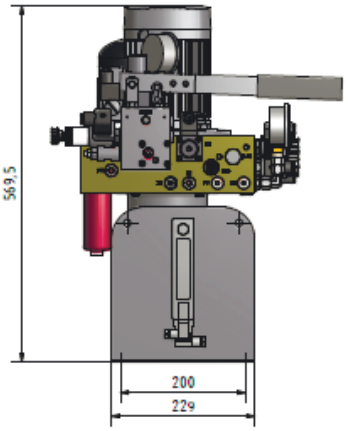

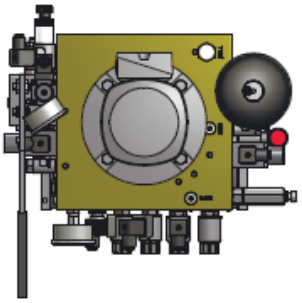

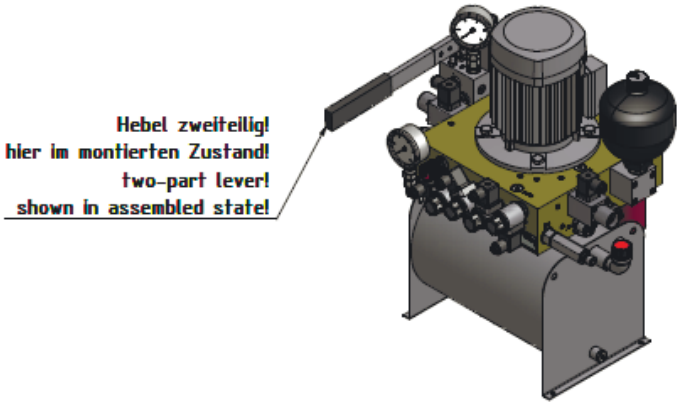

Technical Data

• Weight without oil-filling	ca. 70 kg
• Tank volume	10 l
• Ambient temperature ranges	-15°C … +50°C in standard version -40°C … +40°C in low temperature version -15°C … +75°C in high temperature version
• humidity	≤ 90%
• recommended operating fluid	HLP Hydraulic oil acc DIN51524-T2 - for standard version: HLP Synth 32 - others version: upon request
• protection class	Standard = IP55, optional IP65
• max. no. of operating cycles per hour	200
• motor supply voltage range	rotating clockwise when looking from ventilator: 50 Hz / 380-420 V 60 Hz / 440-480 V
• valve voltages	P = 24 V DC (Standard) V = 115 V AC ; 50/60 Hz (optional) W = 230 V AC ; 50/60 Hz (optional) (others upon request)
• valve capacity per valve	standard: 35 l/min at Δp 4 bar optional: 70 l/min at Δp 10 bar
• mounting position of HPU	horizontal

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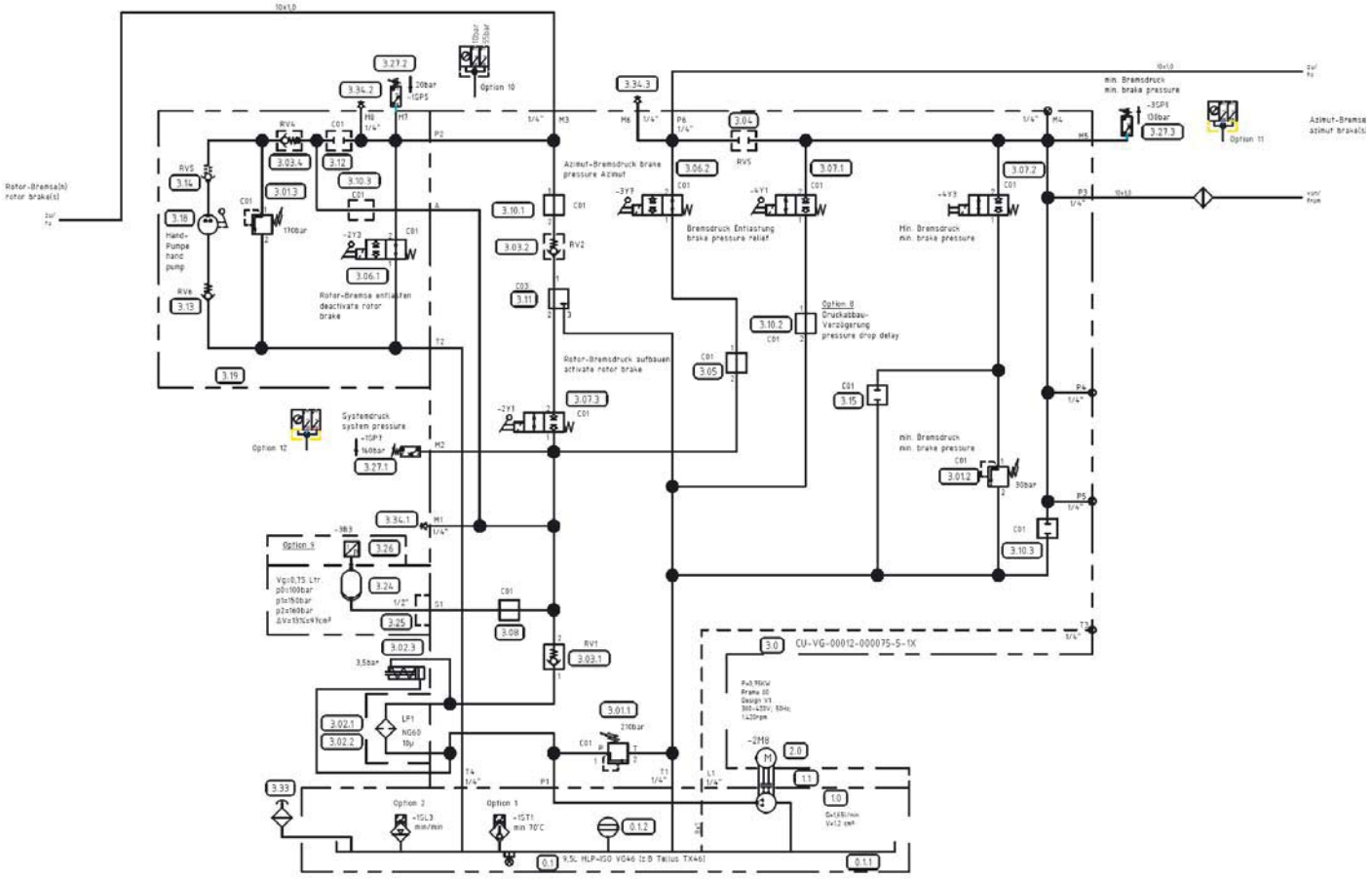
Pressure switch		Pressure relieve valve setting (DBV)	Release pressure	Pump capacity	Motor power
min	max				
bar		bar	bar	l/min	kW
customized solution					



Suitable for				
ABT 75 G	ABT 90 G	ABT 75 S	ABT 90 S	ABT 120 S
ABS 75 G	ABS 75 FC	ABS 120 FC	ABS 75 G-R	ABS 90 G-R
ABT 75 S-R	ABT 90 S-R			
SHI 75 FC	FSB 75 FC	FSB 101 - 107 FC		
RLH 80				