

Installation- and Operating Instruction for Disc Brake DX 230 / 280 FEA

E 09.812e



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RINGSPANN	Installation- and Operating Instructions for Disc Brake DX 230 / DX 280 FEA	E 09.812e			
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This is a translation of the original German version!

In the event of discrepancies between the original German version and other versions of these installation and operating instructions, the German version shall take precedence.

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1. Safety

1.1 General

These installation and operating instructions must be read carefully before installing and commissioning the product. Special attention must be paid to notes and hazard warnings.

These installation and operating instructions apply on condition that the product has been correctly selected for its intended use. The selection and design of the product are not the subject of these installation and operating instructions.

If these installation and operating instructions are not observed or misinterpreted, any product liability and warranty on the part of RINGSPANN GmbH shall lapse; the same shall also apply if our product is dismantled or modified.

These installation and operating instructions must be kept in a safe place and must be passed on to the user if this product is supplied to a third party - either individually or as part of a machine.

1.2 Safety information

- This product may only be installed and commissioned by trained personnel.
- Repair work may only be carried out by the manufacturer or by authorised RINGSPANN representatives.
- If a malfunction is suspected, the product or the machine in which the product is installed must be taken out of operation immediately and RINGSPANN GmbH or an authorised RINGSPANN representative must be informed.
- Switch off the power supply when working on electrical components.
- Switch off the drive unit before carrying out any work on the brake.
- Rotating parts (e.g. brake discs) must be secured by the operator against unintentional contact.
- For deliveries abroad, the safety regulations applicable there must be observed.
- All work with and on the brake must be carried out with 'safety first' in mind.



DANGER!

Indicates a dangerous situation that leads to serious injury or death.



WARNING!

Indicates a dangerous situation that could lead to serious injury or death.



ATTENTION!

Indicates a dangerous situation that could lead to minor or serious injury or damage to property




NOTE!

Indicates a situation that could lead to material damage. Additional important information can also be found here.

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1.3 Intended use

The brakes of the DX series are intended as holding and emergency stop brakes and may only be used under the operating conditions specified in the order.


	<p>WARNING!</p> <p>Any other use or modification of the brake is strictly prohibited! Failure to comply with the regulations for intended use and/or the installation and maintenance instructions endangers life and leads to the loss of any warranty claims on the part of the manufacturer!</p>
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Operation is only permitted with thrusters supplied or approved by RINGSPANN.

Intended use also includes observing the instructions and warnings regarding operation, inspection, maintenance and safety.

1.4 Improper use

Any other or additional use is considered improper and is therefore not permitted.
The operator is solely liable for any damage resulting from unauthorised use.

	<p>ATTENTION!</p> <p>The product may present hazards if it is operated incorrectly or improperly by untrained and uninstructed personnel.</p>
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1.5 Presentation of hazard warnings



ATTENTION!

General warning sign



WARNING!

Warning of electrical voltage



WARNING!

Warning of suspended load



WARNING!

Warning of hot surface



WARNING!

Warning of automatic start-up



WARNING!

Warning of crushing hazard



WARNING!

Warning of corrosive substances



WARNING!

Warning of hand injuries

2. Delivery, transport and handling

2.1 Delivery

The DX brakes are shipped ready to install and they are packaged in such a way that the highest level of safety is guaranteed during transport.

An information about the ordered options and attachment is coming with the shipping documents.

2.2 Lifting and handling

For lifting the DX brakes there are eyebolts which are mounted ex works on top of the brake.

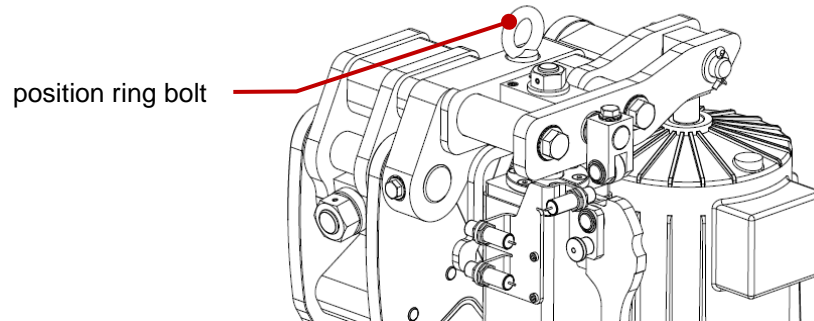


Fig. 1: lifting point DX brakes

DX 230 FEA	DX 280 FEA
120 kg	280 kg

Tab. 1: maximum weights



ATTENTION!

Use lifting equipment appropriate to the load and use the lifting points provided on the brake.

3. Product description

3.1 Product overview DX series

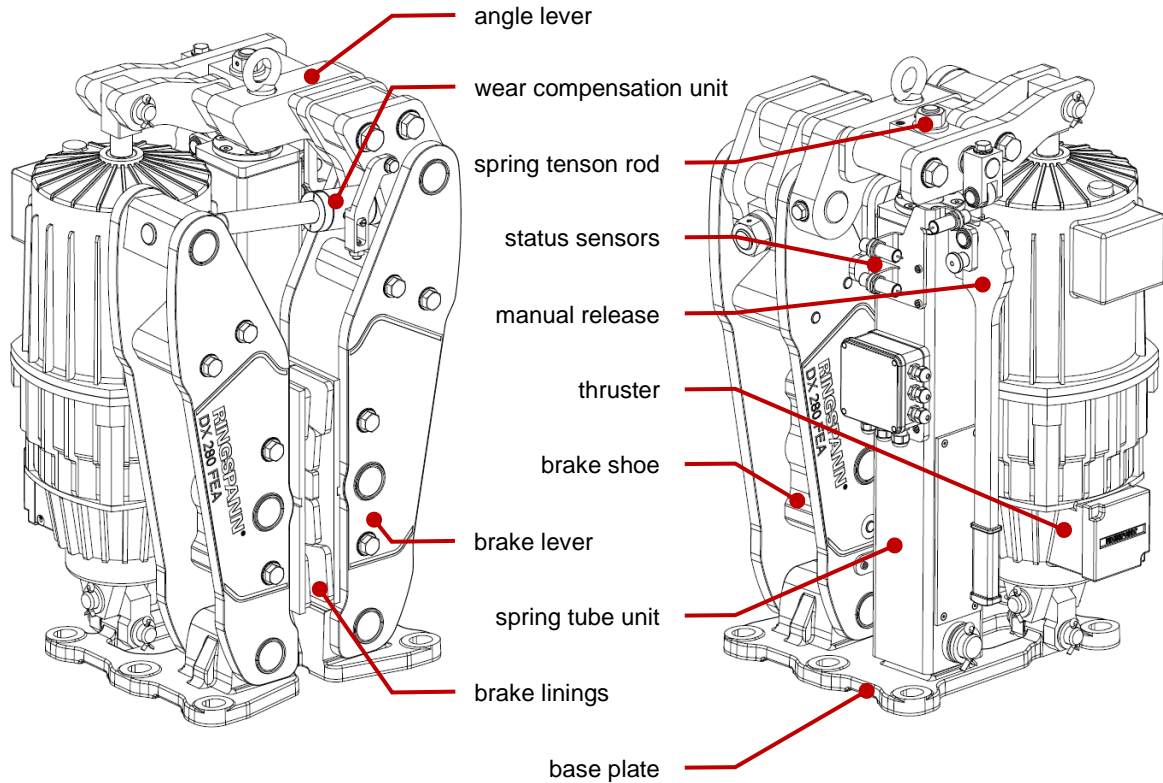


Fig. 2: overview DX series

3.2 Functional principle

The brakes in the DX series are spring-applied disc brakes that are released by means of an electro-hydraulic thruster. The basic principle of this thruster consists of a motor which, when energised, drives an impeller in a hydraulic medium. The hydraulic pressure caused by the rotation generates a defined extension force, which executes a defined stroke on the piston rod. This stroke moves the brake mechanism so that the brake linings mounted in the brake shoes lift off the brake disc, thus releasing it.

In the event of an emergency stop or a power failure, the hydraulic pressure drops, and the spiral compression spring encapsulated in a spring tube closes the brake by means of spring force. The spring preload and the associated braking torque are infinitely adjustable via an adjusting nut on the top of the spring tube unit.

Any wear that occurs at the brake linings is compensated by an automatic wear compensation unit.

As an option, the DX disc brakes can be equipped with various sensors that can, for example, report information on the operating status of the brake.

3.3 Technical data

3.3.1 DX 230 FEA

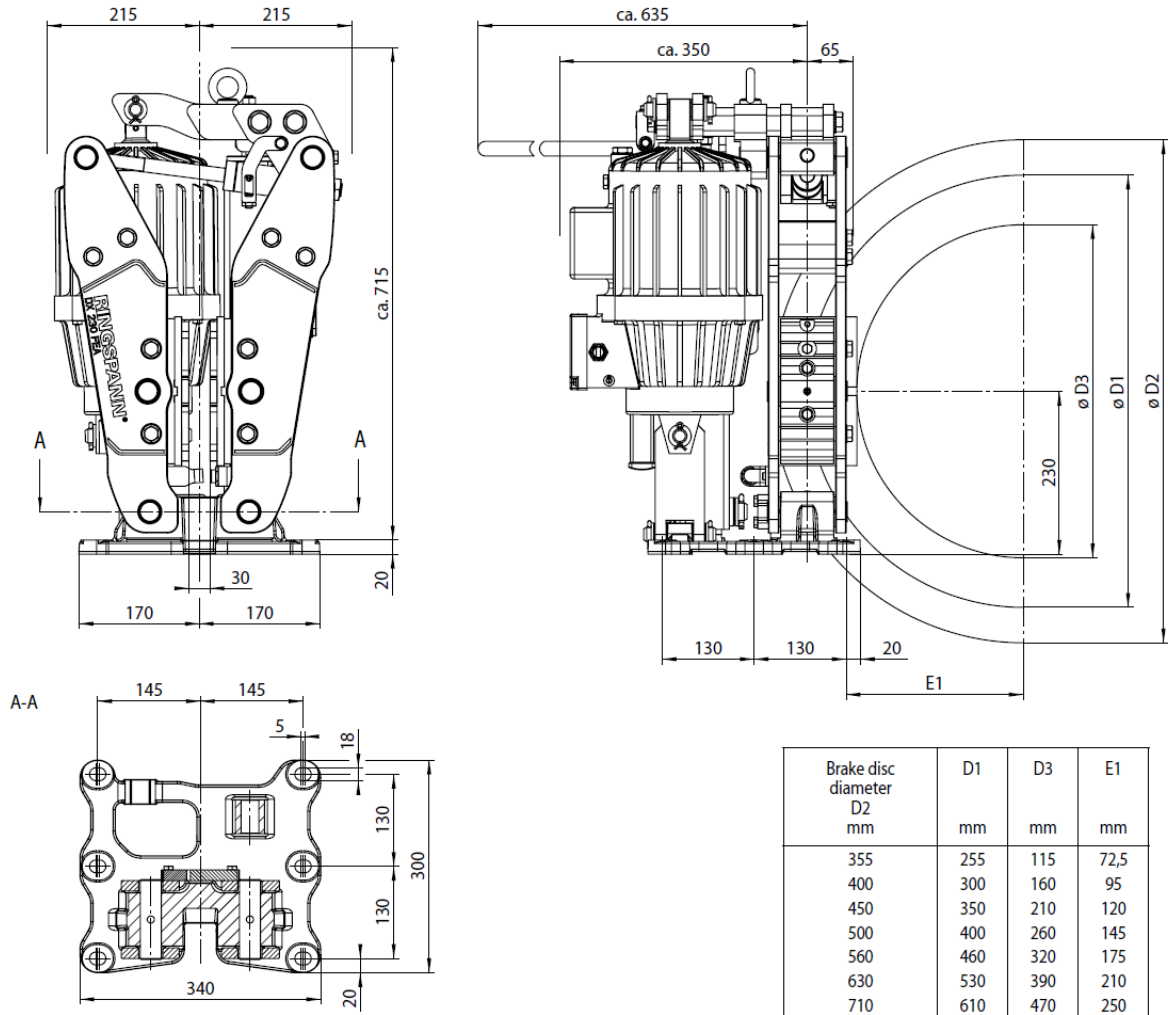


Fig. 3: data sheet DX 230 FEA

brake disc-Ø	with thruster 454		with thruster 455		with thruster 465	
	braking torque [Nm]		braking torque [Nm]		braking torque [Nm]	
	min.	max.	min.	max.	min.	max.
355	400	960	650	1.670	800	2.600
400	470	1.130	770	1.970	950	3.050
450	550	1.320	900	2.300	1.100	3.550
500	630	1.510	1.030	2.650	1.250	4.050
560	730	1.740	1.190	3.030	1.450	4.650
630	840	2.000	1.370	3.450	1.650	5.400
710	970	2.310	1.580	4.020	1.950	6.200

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

Tab. 2: data sheet DX 230 FEA

3.3.2 DX 280 FEA

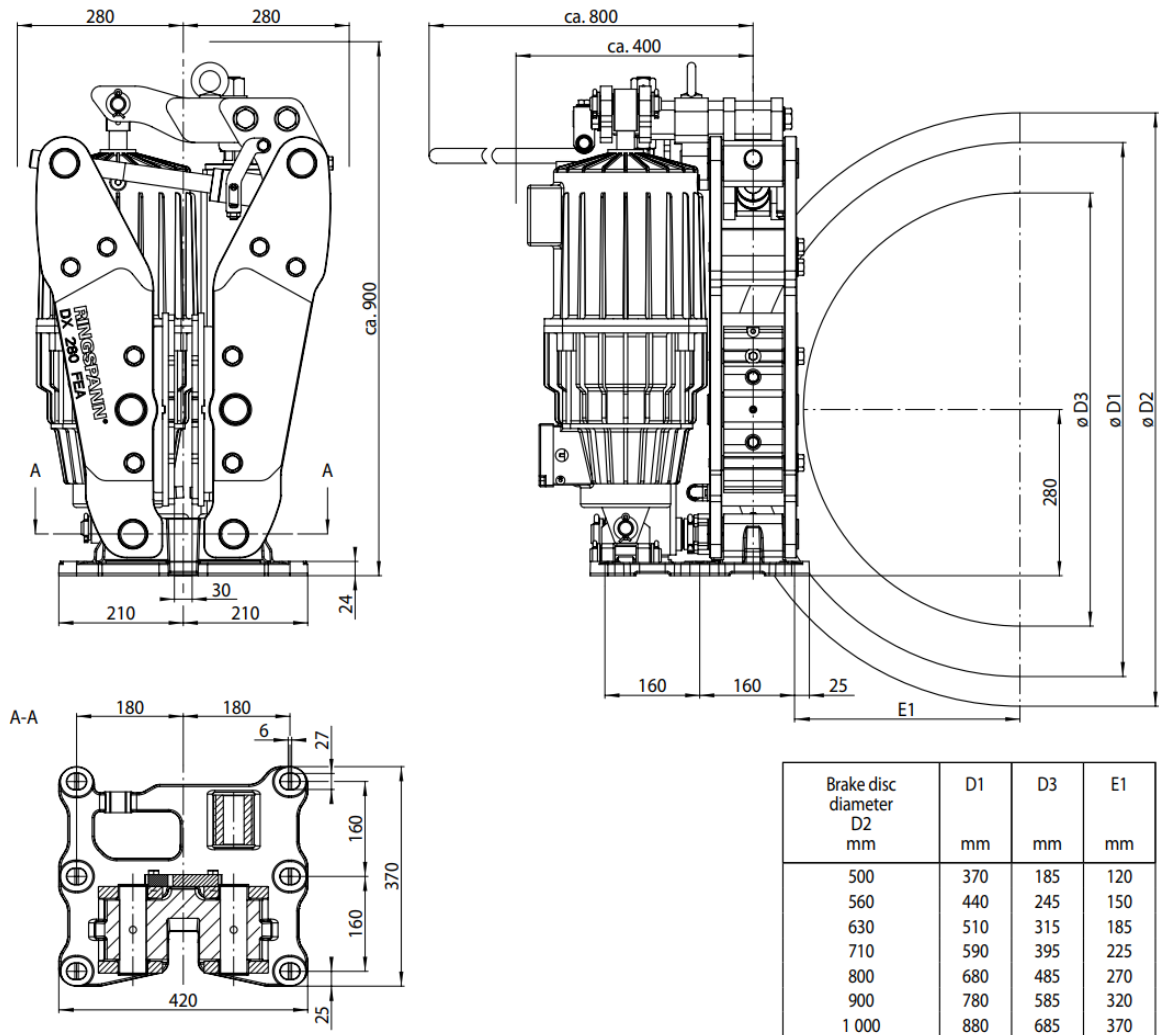


Fig. 4: data sheet DX 280 FEA

brake disc-Ø	with thruster 464		with thruster 463		with thruster 475	
	braking torque [Nm]		braking torque [Nm]		braking torque [Nm]	
	min.	max.	min.	max.	min.	max.
500	1.700	3.400	3.000	6.000	-	-
560	1.900	3.900	3.500	7.000	-	-
630	2.200	4.500	4.000	8.100	-	-
710	2.600	5.300	4.700	9.400	7.600	15.300
800	3.000	6.100	5.400	10.800	8.800	17.600
900	3.500	7.000	6.200	12.400	10.100	20.200
1000	3.900	7.900	7.000	14.000	11.400	22.800

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

Tab. 3: data sheet DX 280 FEA

3.4 Type plate

The type plate is attached to the side of the brake spring tube. This type plate contains a 16-digit material code (e.g. 4459-xxxxxx-xxxxxx). The exact design of the brake is only defined by this material number.

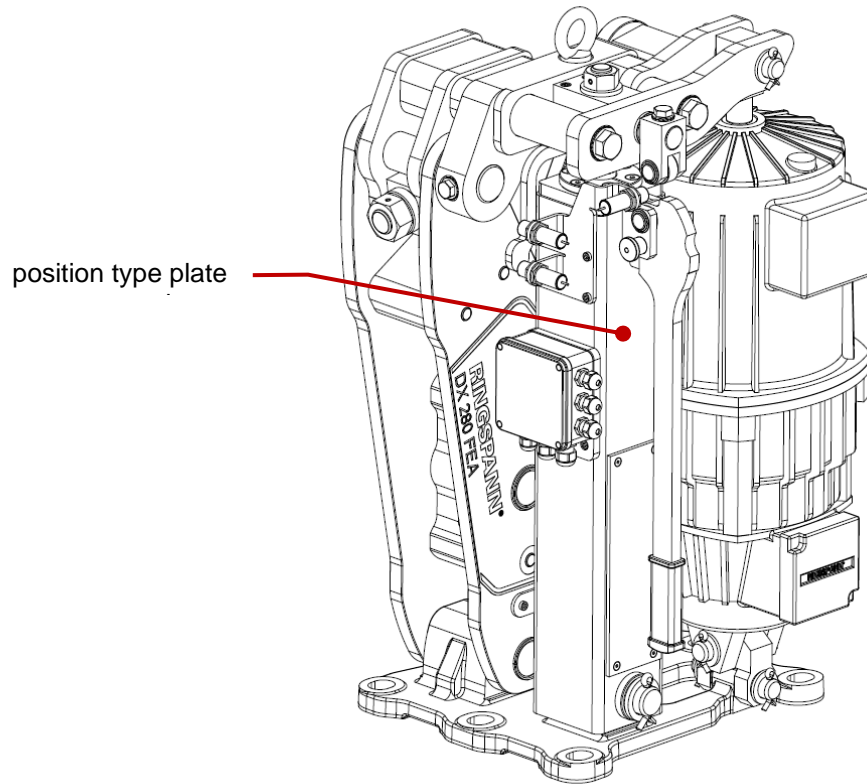


Fig. 5: position type plate

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4. Installation



ATTENTION!

The following settings may only be made by qualified and trained personnel. Incorrect settings can cause the brake to malfunction.

4.1 Preparatory work

4.1.1 Cleaning

Before installing the brakes, the brake disc and the mounting surface must be cleaned. It is advisable to clean both with alcohol, e.g. ethyl alcohol or isopropyl alcohol.

When cleaning the brake disc with thinner, acetone or brake cleaning agents, it must be ensured that these agents and no residues of these agents come into direct contact with the brake linings.



ATTENTION!

Oil and rust inhibitor residues reduce the friction coefficient and thus the braking and holding torque considerably!



WARNING!

Solvents can be flammable and toxic and can cause burns. To avoid serious injury, read the manufacturer's instructions carefully before using a solvent cleaner and follow them. Also wear eye protection and protective clothing and work in well-ventilated areas.



NOTE!

Use suitable lifting gear for the loads and use the lifting points provided on the brake.

4.1.2 Handling of the brake linings

Different brake lining materials can be used depending on the application. All brake linings supplied by RINGSPANN are free from asbestos and lead.

The DX brakes are fitted with sintered brake linings as standard.



ATTENTION!

Brake linings must be free of grease or oil of any kind. Even small amounts can lead to a reduction in braking torque.

4.1.3 Mounting tolerances

Before installing the brakes, the mounting surface must be checked for evenness and perpendicularity to the brake disc. The axial movement of the brake disc should also be checked, as well as the dimensional accuracy of the mounting holes.

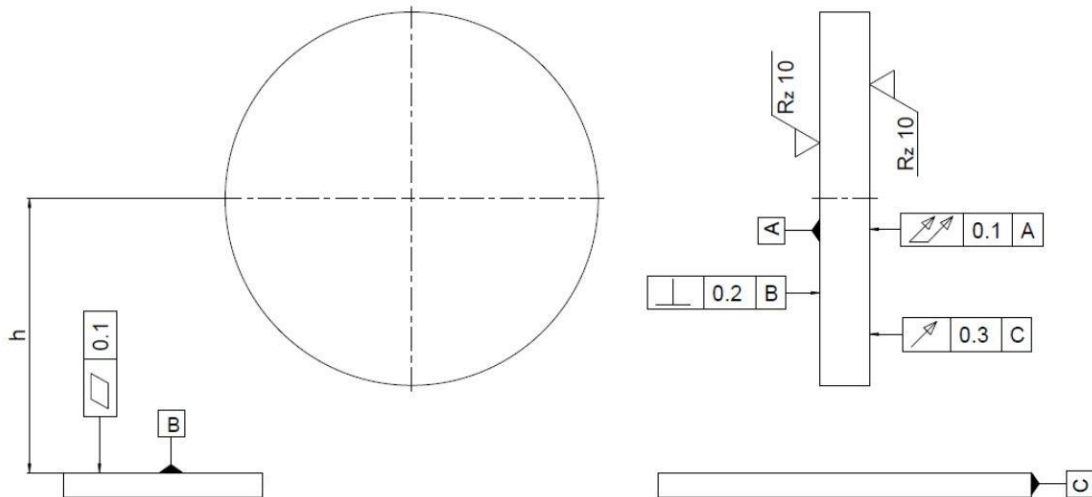


Fig. 6: installation tolerances

	DX 230 FEA	DX 280 FEA
h (± 1 mm)	230 mm	280 mm

Tab. 4: centre line DX brakes

4.2 Installation of the DX brakes

The DX brakes are set at the factory with an enlarged air gap between the brake linings so that the brakes can be placed over the existing brake disc on the mounting surface.


4.2.1 Positioning

- Lift the brake to the intended installation location. If necessary, use shims to comply with the required installation dimensions.

	<p>WARNING!</p> <p>Use suitable lifting gear for the load and use the lifting points provided on the brake. Do not use ropes, chains or similar around the brake to avoid damaging the brake.</p>
--	----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

- Place the mounting bolts in the mounting holes provided. Only tighten the mounting bolts to such an extent that the brake is still able to align itself as soon as the brake linings are pressed against the brake disc.

NOTE!



The mounting bolts are not included in the scope of delivery of RINGSPANN. Use bolts with strength class 8.8 or higher to fasten the brake. Use washers with a minimum hardness of 200HV.

	DX 230 FEA	DX 280 FEA
mounting bolts	4x M16 (8.8, 205Nm, $\mu=0,12$)	6x M24 (8.8, 715Nm, $\mu=0,12$)


Tab. 5: mounting bolts DX brakes

- Check the position of the brake in relation to the brake disc. The brake linings must be completely covered by the brake disc.

4.2.2 Electrical connection


- Connect the thruster electrically.

WARNING!



Work on electrical connections should only be carried out by trained specialists.

NOTE!



Observe the operating instructions for the ventilation unit and the information provided there regarding the electrical connection

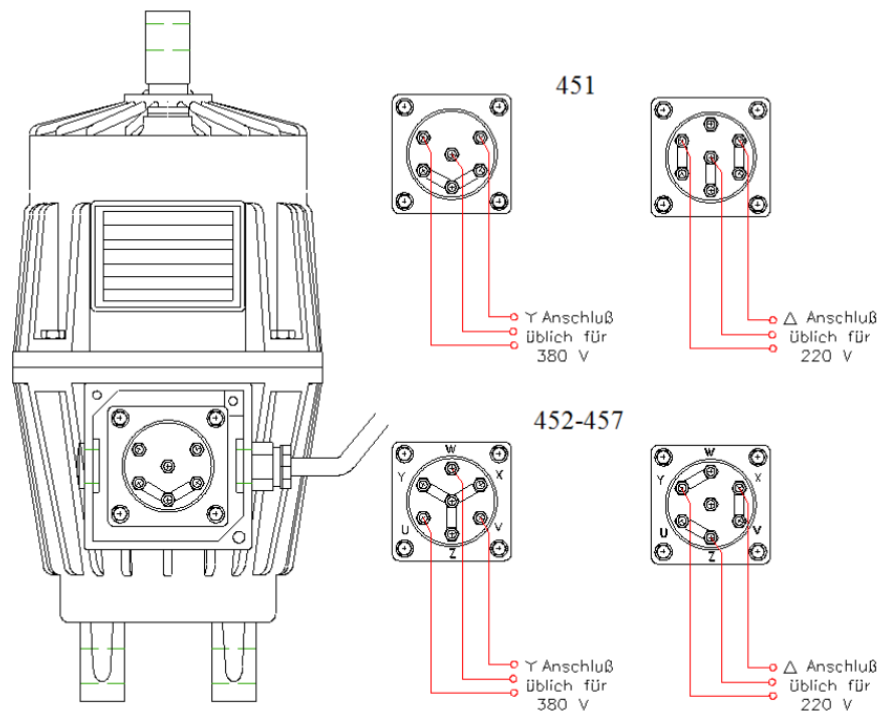


Fig. 7: electrical connection RINGSPANN thruster

4.2.3 Pre-setting braking torque

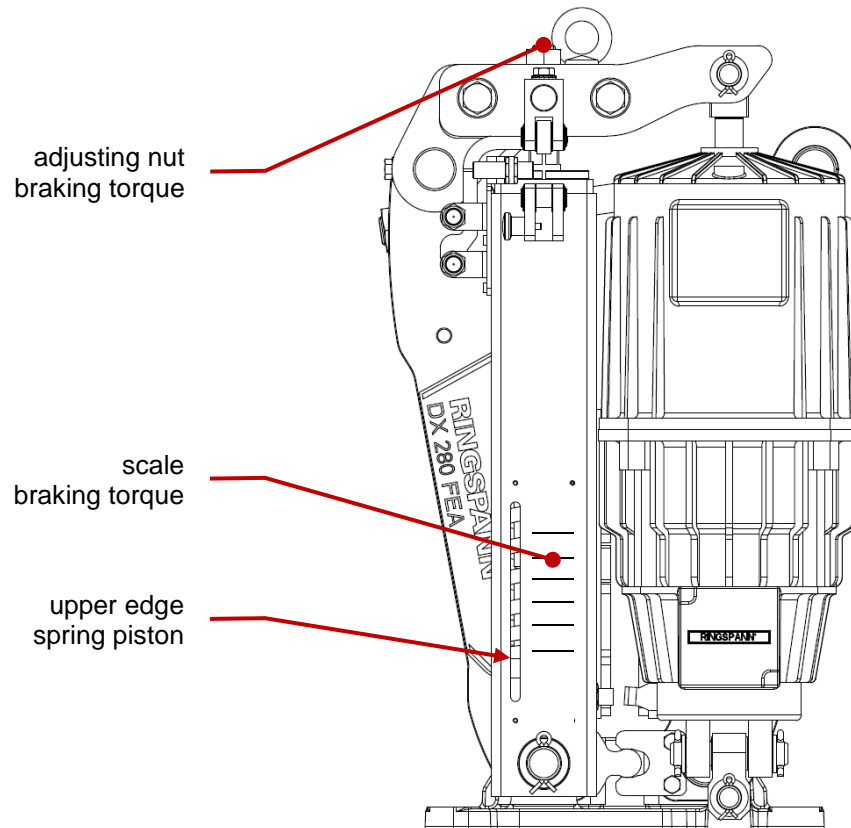


Fig. 8: adjusting nut braking torque

- By turning the adjusting nut, the spring preload of the brake can be changed and thus the braking torque generated. The upper edge of the spring piston serves as a pointer for the braking torque scale next to the slot.
For a presetting, turn the adjusting nut clockwise and set the braking torque approx. 5 mm below the required value.

4.2.4 Pre-setting reserve stroke



NOTE!

Please refer to the appendix for the exact measurement of the reserve stroke.



ATTENTION!

A reserve stroke prevents the thruster and therefore the brake from going on block. The brake would no longer be able to generate a clamping force or braking torque.



WARNING!

Never place your hands or fingers between moving parts while the brake is opening or closing.

- Dismantle the activation flag of the wear compensation (see Fig. 9).

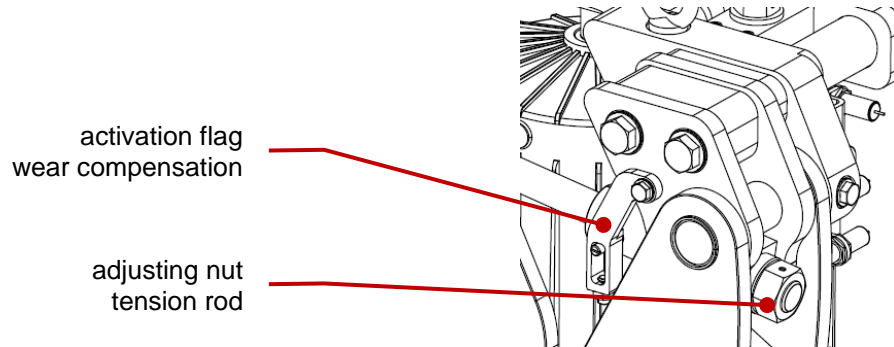


Fig. 9: adjustment wear compensation

- Turn the adjusting nut of the tension rod clockwise. The brake will close, and the brake linings will come into contact with the brake disc.
- Switch on the power supply and open the brake electrically.



NOTE!

If no power supply is available, the brake can also be released manually.

- With the brake open, turn the adjusting nut of the tension rod by approx. half a turn. Then switch off the power supply again. The brake will now close.
- Check the reserve stroke at the thruster with the brake closed. The target value here is 10 mm. To complete the pre-setting, the reserve stroke should be approx. 8-12 mm.

4.2.5 Self-alignment and fastening

- The brake now has sufficient force to align itself on the mounting surface. To do this, open and close the brake several times.

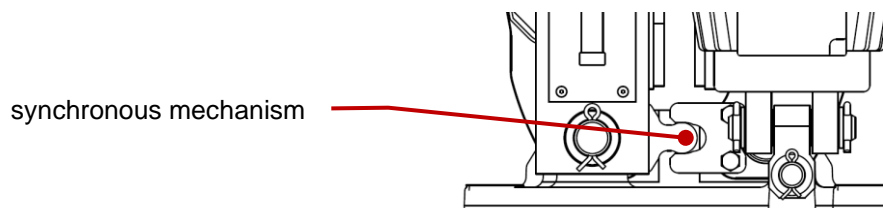


Fig. 10: synchronous mechanism

- For complete fastening, tighten the mounting bolts when the brake is closed to the specified tightening torque (see Tab. 5 and Chap. 12.3 Tightening torques for regular threads).
- Check the alignment of the brake in relation to the brake disc. If necessary, realign the brake again.



NOTE!

The permissible axial displacement of the brake along the drive axis is ± 0.3 mm.

4.3 Final inspection of reserve stroke and braking torque



NOTE!

If the braking torque is increased, the reserve stroke decreases at the same time, as more spring preload acts on the brake.

If you increase the reserve, the set braking torque increases at the same time, as the spring is connected to the brake at the same lever as the thruster.

- Check the set braking torque with the brake applied and correct it if necessary.
- Now set the reserve stroke to the target value of 10 mm and check the set braking torque if necessary.
- If both values, reserve stroke and braking torque, are set correctly, refit the activation flag lug of the wear compensation.

Make sure that the activation pin of the wear compensation unit is in the window of the activation flag (see Fig. 11). The activation pin is screwed into the sleeve of the wear compensation unit and can be turned counterclockwise with the sleeve in the freewheel.

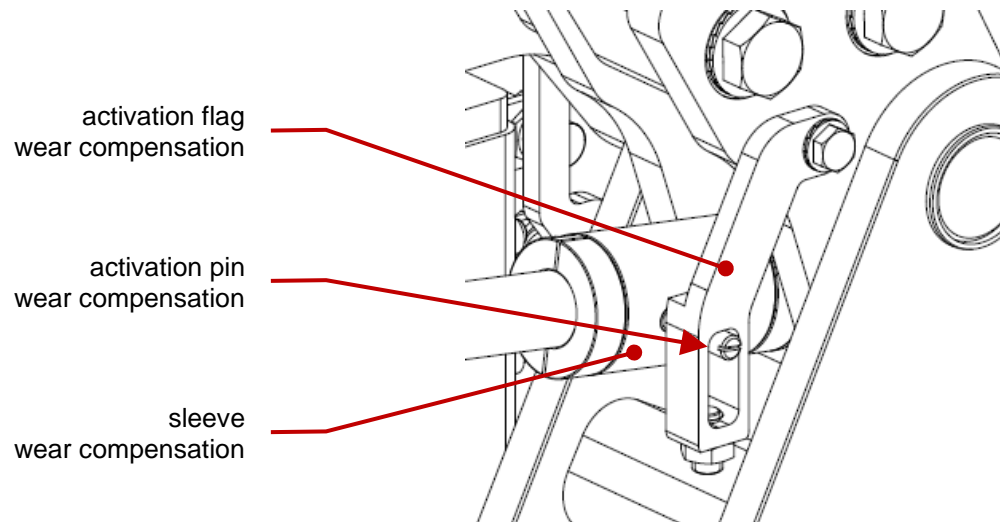


Fig. 11: activation flag wear compensation



ATTENTION!

The reserve stroke should continue to be monitored during operation. Although the brakes are equipped with automatic wear compensation, this is limited in its compensation capacity per cycle. If there are several braking cycles with a high level of wear, the brakes must be adjusted manually.



WARNING!

Never place your hands or fingers between moving parts while the brake is opening or closing.

4.4 Adjustment activation window

- The size of the activation window of the automatic wear compensation must be adjusted (see Fig. 12). To do this, loosen the lock nut of the adjustment screw and, if necessary, turn the adjustment screw back until it opens the activation window to the maximum. The screw should be turned back as far as possible at the factory.
- Open the brake using the thruster.
- Turn in the adjustment screw of the activation until it touches the activation pin of the wear compensation. Now turn the adjustment screw back approx. ½ turn and secure this position with the counter nut.

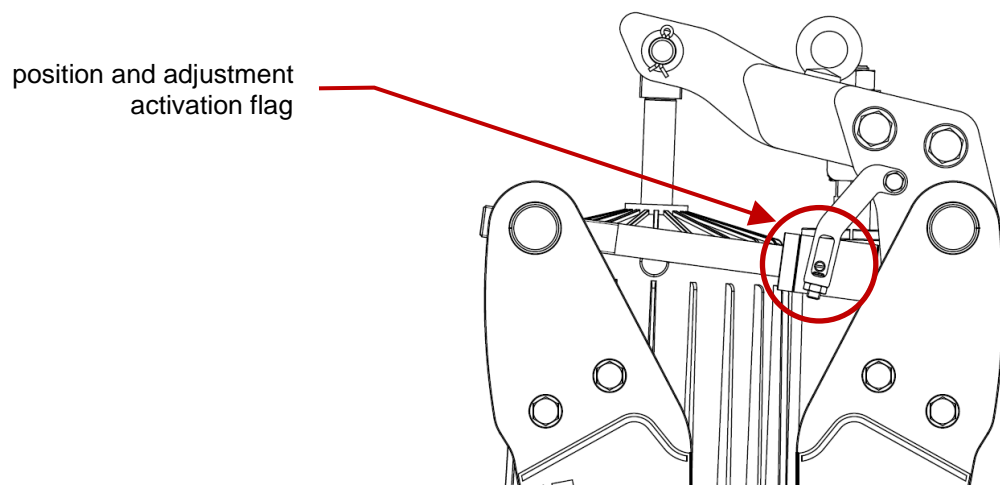


Fig. 12: adjustment activation flag in open condition

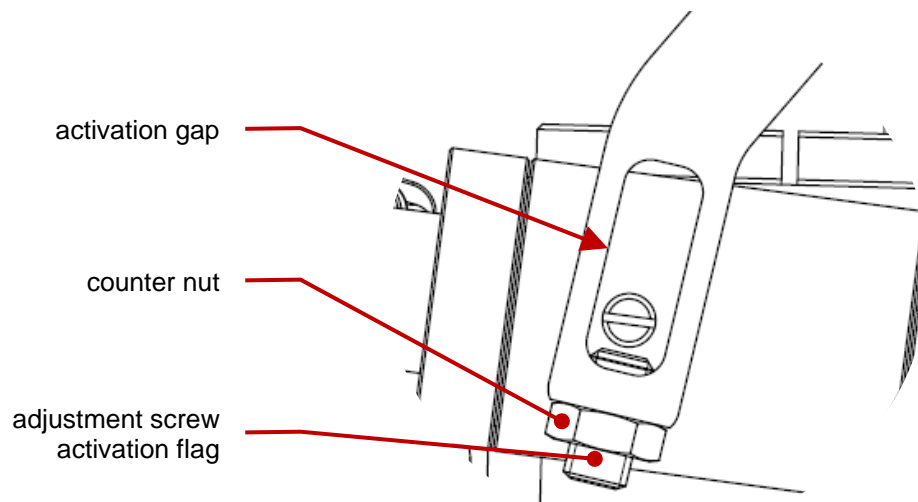


Fig. 13: adjustment activation gap wear compensation

NOTE!



If the reserve stroke of the brake decreases or increases too much during operation, the sensitivity of the wear compensation can be controlled by adjusting the activation window. If the window is enlarged, the wear compensation is rather sluggish. If the window is reduced, the wear compensation is more active.

4.5 Adjustment parallel air gap

The DX series has an adjustment option that can be used to set the parallelism of the air gap between the brake lining and brake disc when the brake is open.

There is an adjustment screw on the rear of each brake shoe, which is supported by a spacer sleeve that connects the brake lever halves. When the brake is open, the brake shoe wants to fall towards the brake disc due to the influence of gravity. The adjusting screw prevents this, so that the parallelism can be adjusted here.

- To adjust the parallelism, open the brake and loosen the countered adjusting screw.
- Turn the adjusting screw until there is a parallel gap between the brake pad and brake disc.
- Repeat this procedure on the opposite brake shoe.

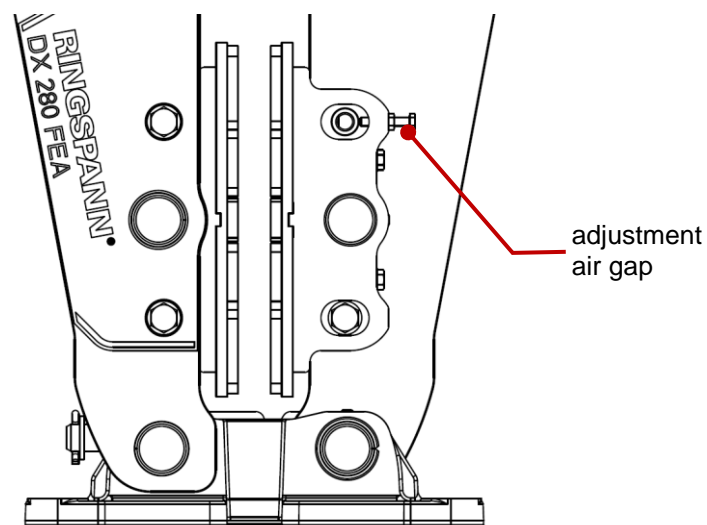


Fig. 14: adjustment screw air gap



NOTE!

This adjustment option can only be used to set the parallelism of the brake linings in relation to the brake disc. The absolute value of the air gap is not adjustable but is based on the design of the brake.



ATTENTION!

This setting must be checked if the brake linings are subject to increased wear and adjusted if necessary.



WARNING!

Never place your hands or fingers between moving parts while the brake is opening or closing.

5. Options

5.1 Manual release

The DX brakes can be ordered with an optional manual release. In the rest position, the manual release is located on the side of the spring tube and is secured with a locking pin. If this locking pin is pulled, the manual release can be moved by a maximum of 90°. A roller mounted on the angle lever is set in a contour so that the manual release can hold the brake open independently in the released position.

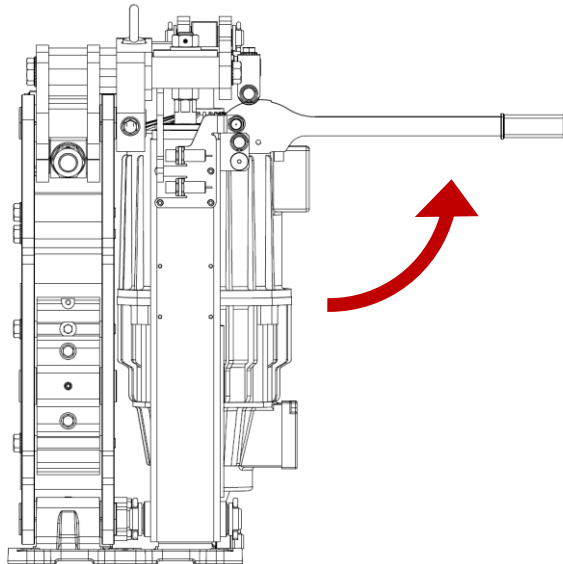


Fig. 15: manual release



NOTE!

The manual release does not open the brake to the same extent as the thruster. The thruster causes a larger stroke on the spring tube so that the manual release returns to its original position due to its weight when the thruster is switched on.



DANGER!

Work on the manual release may only be carried out when the drive is stopped and secured.

5.2 Sensors

The brakes in the DX series can be equipped with various sensors. Standardised options include limit switches for status monitoring.

5.2.1 Status-sensors (inductive)

The status sensors 'brake open', 'brake closed' and 'manual release applied' are easily accessible on a bracket on the side of the spring tube and are activated by moving the angle lever.

The 'brake lining worn' status sensor is attached to the side of the brake levers between the spring tube and brake lever. If wear occurs on the brake linings, the brake levers move closer together, causing the sensor to be activated.

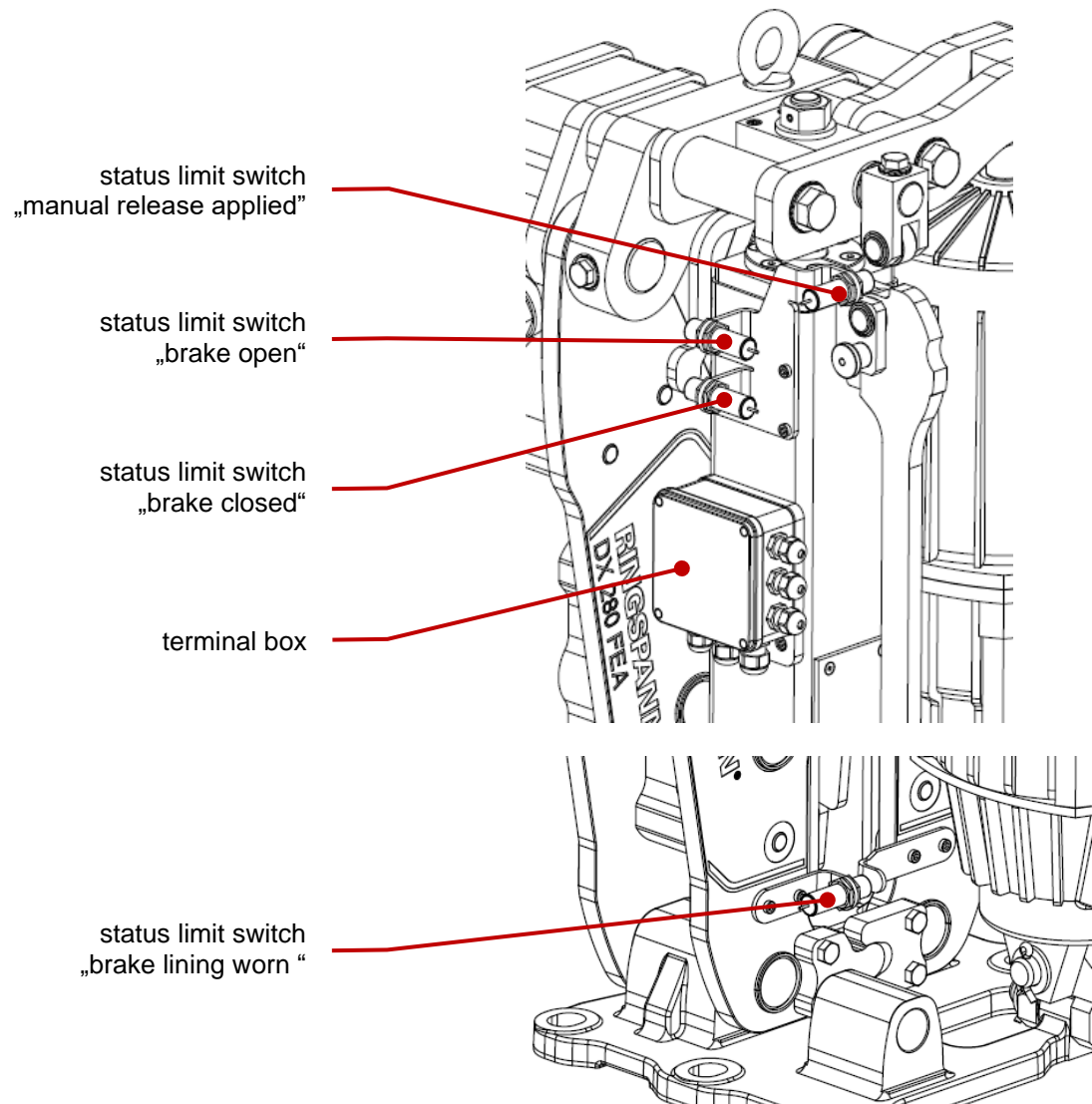


Fig. 16: status limit switches

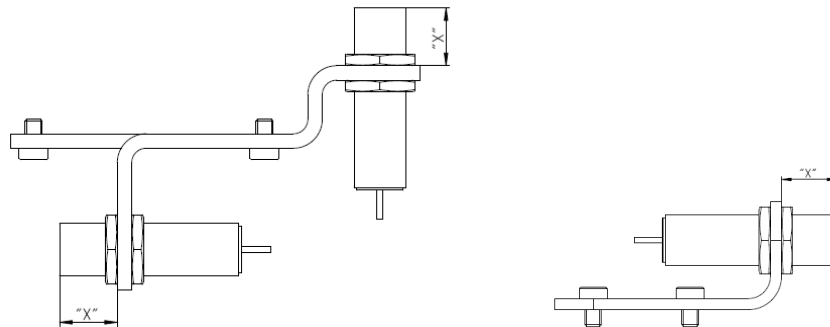


WARNING!

Work on electrical connections should only be carried out by trained specialists.

NOTE!

Observe the electrical connection instructions on the data sheets of the sensors used. The sensors are fitted with an M18x1 external thread and are locked onto the mounting plates with 2 nuts.



status	DX 230 FEA "X"	DX 280 FEA "X"
brake open	10mm	20 mm
brake closed		
brake lining worn		
manual release applied	25 mm	

Fig. 17: mechanical settings limit switches

Status-sensor "brake open" (optional):

This sensor is designed as an inductive proximity switch as standard and is normally open. It signals whether the brake is open.

Status-sensor "brake closed" (optional):

This sensor is designed as an inductive proximity switch as standard and is normally open. It signals whether the brake is applied.

Status-sensor "brake lining worn" (optional):

This sensor is designed as an inductive proximity switch as standard. This proximity switch ensures the operational safety of the brake. It is designed as normally closed to ensure that this sensor still signals in the event of a cable defect.

As soon as the remaining brake lining thickness has reached a value of approx. 3 mm, this proximity switch is actuated.

Status-sensor "manual release applied" (optional):

This sensor is designed as an inductive proximity switch as standard and is normally open. The sensor signals when the brake is released by means of the manual release.

5.2.2 Monitoring-sensors

In addition to the optional status sensors, optional monitoring sensors can be installed to provide information on the operating behaviour of the brake.

PT100 temperature-sensors (optional):

These sensors are screwed directly into the two brake shoes. They provide feedback on the temperature in the area of the brake linings.

DMS-load pin (optional):

This sensor is installed directly in the brake shoe and replaces the actual brake shoe bolt, which is located in the brake lever. The load pin provides feedback on the clamping force of the brake when it is applied.

Stroke sensor (optional):

This sensor is attached to the side of the spring tube. It provides feedback on the stroke of the thruster via the lever arm of the spring tension rod and the connection of the thruster.

5.2.3 Terminal box

Terminal box size 1 (optional):

The brakes of the DX series can be equipped with a terminal box for simplified installation of the sensors and wiring. Size 1 is designed for a maximum of 4 status sensors. There are 4x PG09 as input connections for the sensors and 2x PG11 as output connections.

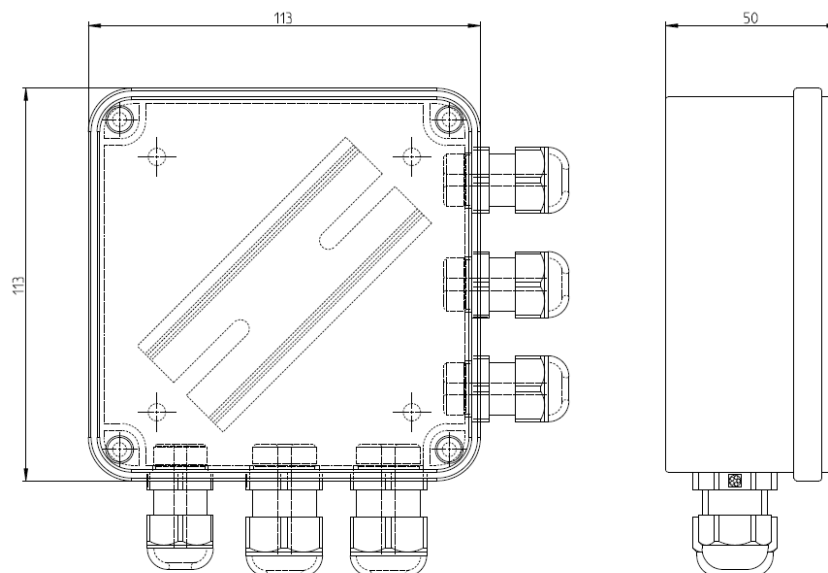


Fig. 18: terminal box size 1

6. Commissioning

6.1 Bedding-in process

The purpose of bedding-in the brake linings with the brake disc is to achieve the highest and most stable friction coefficient possible. The brake can only achieve the braking torques specified in the data sheet based on optimally conditioned brake linings.

	sinter brake linings on steel brake disc
Max. friction speed; emergency stop	90 m/s
Max. friction speed; continuous braking	45 m/s
Max. friction time (per braking cycle)	15 s
Max. brake disc temperature; emergency stop	300°C
Max. brake disc temperature; continuous braking	200°C

Tab. 6: maximum values bedding-in process



WARNING!

The brake disc and brake heat up during the bedding-in process. Allow the components to cool down before continuing work on the brake.



ATTENTION!

Check the brake settings. Incorrect settings can cause the brake to fail. Please refer to the previous chapters.

After successfully bedding-in the brake linings, a contact pattern of approx. 70% should be present. Remove the brake linings for inspection.

Two bedding-in processes are described below as examples. The respective procedure is in responsibility of the operator.

6.1.1 Bedding-in by means of emergency stops

- Perform 3 emergency stops with approx. 50% load and approx. 50% speed.
- Monitor the reserve stroke and adjust if necessary.
- Perform 3 emergency stops with approx. 75% load and approx. 75% speed.
- Monitor the reserve stroke and adjust if necessary.
- Perform an emergency stop with nominal load and nominal speed.



ATTENTION!

The brake settings should be checked between emergency stops. The brake disc should cool down to approx. 30°C.

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6.1.2 Bedding-in by means of continuous braking

- Set the brake to approx. 75% of the rated load torque.
- Deactivate the sensors that report the status 'brake open' / 'brake closed' or ensure that the brake remains closed during a motor start-up.
- Drive the motor for approx. 10-15s at 50% rated speed against the closed brake.
- Monitor the temperature and allow it to cool down if necessary.
- Repeat the process up to 5 times and increase the speed in the process
- Check the contact pattern and repeat the bedding-in process if necessary.



ATTENTION!

After the bedding-in process, the brake and its settings must be checked. Correct them if necessary.

6.2 Load test

A load test must be conducted in accordance with the drive manufacturer's specifications. If the required braking time or the required braking distance is not achieved, it is recommended to run through a new bedding-in process and then repeat the load test.



ATTENTION!

The correct brake settings must be observed so that the required braking torque can be applied by the brake.

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7. Operation

The brakes of the DX series are spring-operated and closed when de-energised. If the thruster is energised, the brake opens, and the drive can start up.



DANGER!

Work on the brake may only be conducted when the drive is stationary and secured



WARNING!

Beware of moving parts of the brake during operation. Never place your hands or fingers between the brake disc and brake linings.



NOTE!

It is the responsibility of the plant operator to cordon off the area of the drive and the brake as far as possible.

Please also observe the plant manufacturer's instructions.

8. Maintenance

8.1 General maintenance

maintenance task	time interval
visual check of the entire brake unit including brake disc	daily
visual check of the bearing points	weekly
check of reserve stroke	
check of braking torque adjustment	
check of air gap	
check of sensor settings	monthly
check of electrical connections	
check of brake lining thickness	

Tab. 7: maintenance schedule



ATTENTION!

The brake should be checked in the event of anomalies such as increased noise, etc.



ATTENTION!

In the event of an emergency stop, the brake should be checked before further operation.

8.2 Lubrication

The brakes in the DX series are equipped with maintenance-free bushings. Additional lubrication is not necessary here.

8.3 Replacement of brake linings



ATTENTION!

The brake pads should be replaced when the remaining lining thickness is <3 mm.

- Dismantle the activation flag of the wear compensation (see Fig. 9).
- Switch on the power supply and open the brake electrically.

- Turn the tension rod adjusting nut counterclockwise. The brake will turn further. Turn until there are approx. 6-7 mm per side between the brake linings and brake disc.
- Switch off the power supply. The brake will close and an air gap of approx. 5 mm will remain between the brake lining and brake disc.
- Remove the mounting bolts and washers of the brake linings at the brake shoes and remove the brake linings.
- Remove the brake linings in the direction of the disc axle. If this is not possible, the brake linings should be able to be removed easily upwards over the keyway with the air gap now set.

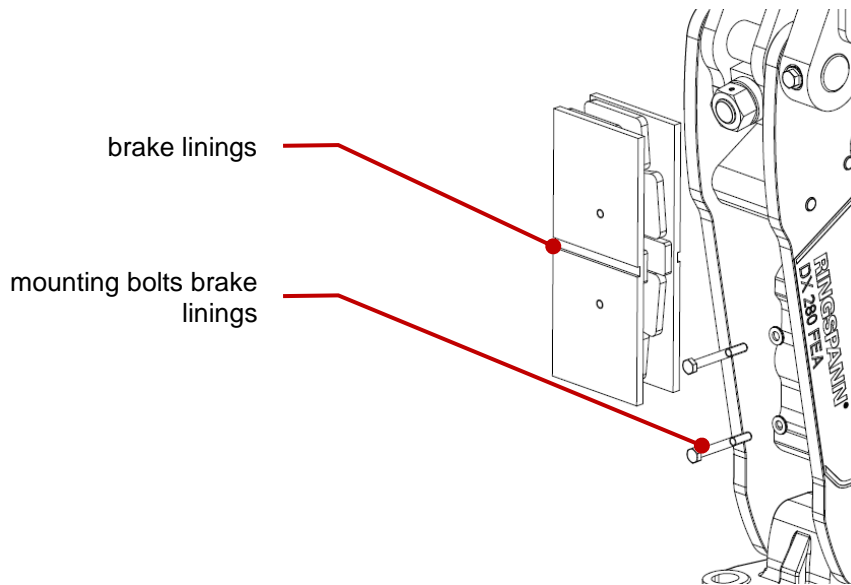


Fig. 19: replacement brake linings

- Insert new brake pads and secure them with the mounting bolts. The corresponding tightening torques can be found in Appendix 12.3.



NOTE!

Use new screws and new washers!

	DX 230 FEA	DX 280 FEA
brake lining mounting per brake shoe	2x DIN 931 M8x65 (A4-80, 22 Nm, $\mu=0,12$) 2x HEICO HLB-8S	2x DIN 931 M10x85 (A4-80, 43 Nm, $\mu=0,12$) 2x HEICO HLB-10S

Tab. 8: brake lining mounting

- - Set the reserve stroke of the brake again and conduct a new bedding-in process. The brake is then ready for operation again.



NOTE!

When replacing the brake disc, it is recommended that the brake linings are also replaced.



WARNING!

Beware of moving parts of the brake during operation. Never place your hands or fingers between the brake disc and brake linings.

8.4 Spare parts



NOTE!

Only use original spare parts. RINGSPANN accepts no liability for the use of unauthorised spare parts. In addition, the warranty for the product expires.

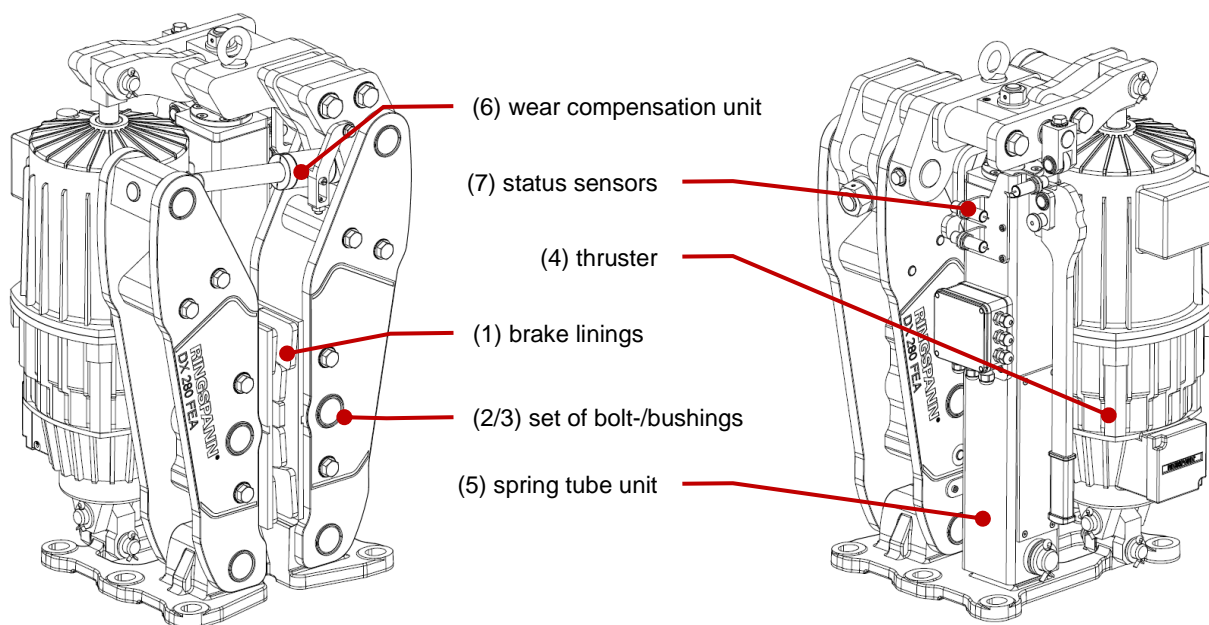


Fig. 20: spare parts



NOTE!

Please note the information on the type plate of the brake. Please include this information when ordering spare parts.
Please note that the thruster has a separate type plate.

description	position
set of brake linings	(1)
set of bolts	(2)
set of bushings	(3)
thruster	(4)
spring tube unit	(5)
wear compensation unit	(6.1)
activation flag wear compensation	(6.2)
status sensor "brake open"	(7.1)
status sensor "brake closed"	(7.2)
status sensor "brake lining worn"	(7.3)
status sensor "manual release applied"	(7.4)

Tab. 9: spare parts

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9. Decommissioning and disposal

9.1 Decommissioning

- Disconnect the thruster and the sensors from the power supply.
- Follow the steps in section 4.2 in reverse order.



ATTENTION!

The brake should only be removed by qualified and adequately trained personnel.



WARNING!

When dismantling the brake, ensure that the entire drive train is secured against accidental activation. Rotating parts can cause serious injury. Rotating parts (e.g. brake disc) must be secured by the operator to prevent accidental contact.



ATTENTION!

Use suitable lifting gear for the loads and use the designated lifting points on the brake

9.2 Disposal

The operator is responsible for the proper disposal of the product and its components.

9.2.1 Brake frame

The mechanical components of the brake are mostly made of cast iron and ordinary structural steel and can therefore be considered as scrap metal.

9.2.2 Brake linings

The brake linings consist of a steel carrier plate and the respective brake lining material. All RINGSPANN brake linings are free of asbestos and lead. The brake linings can therefore be treated like normal scrap metal.

9.2.3 Sensors

Attached sensors can be disposed of as electronic scrap.

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9.2.4 Thruster

A thruster contains a certain amount of hydraulic oil. This must be drained and disposed of separately in accordance with the relevant regulations.

Electrical and electronic components, such as motors, valves and sensors can be disposed of as electronic scrap.

The housing parts of the thrusters are made of an aluminum alloy. Other components are made of ordinary steel. Both can be disposed of as aluminum or metal scrap.

The manual of the thruster must also be observed.

10. Troubleshooting

fault	cause	action
brake does not hold the load	braking torque incorrect or not set	readjustment of braking torque necessary
	reserve stroke incorrect or not set	readjustment of reserve stroke necessary
	brake pads are not bedded in or contact pattern is not sufficient	bedding-in process must be carried out
	brake is mechanically blocked	check installation conditions; brake must move freely
	brake pads are worn beyond the wear limit	replacement of brake linings necessary
	brake spring defect	replacement of brake spring necessary
brake does not open	brake is mechanically blocked	check installation conditions; brake must move freely
	power supply to thruster incorrect or not available	check the electrical connection of the brake
	thruster does not release the brake	Check the function of the thruster and replace if necessary
Air gap is uneven	incorrect alignment of the brake	realign brake if necessary
	incorrect or unadjusted parallel air gap	readjustment of parallel air gap necessary
	synchronous mechanism worn	replacement of synchronous mechanism necessary
Wear adjustment doesn't work correctly	activation flag incorrectly or not fitted	correct mounting of the activation flag is necessary
	reserve stroke increases steadily due to strong vibrations	Minimise unacceptable vibrations in the drivetrain
	reserve stroke decreases due to successive braking cycles	wear compensation per braking cycle is limited. Manual wear compensation must also be carried out
Sensor output faulty	sensors are incorrect or not set	Readjustment of sensors necessary
	sensor defect	replacement of sensor necessary
brake has excessive play in the bearings	bushings are worn	replacement of bushing necessary
	bolts are worn	replacement of bolts necessary

Tab. 10: troubleshooting

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12. Appendix

12.1 Measuring reserve stroke

The reserve stroke can be measured directly on the thruster. If you measure from the top edge of the pressure strap to the top flange of the thruster body, an offset (S_0) results when the thruster is on block, to which the residual stroke (S_R) to be set must be added. Different thrusters result in different values here. The information can be found in the following figure Fig. 21.

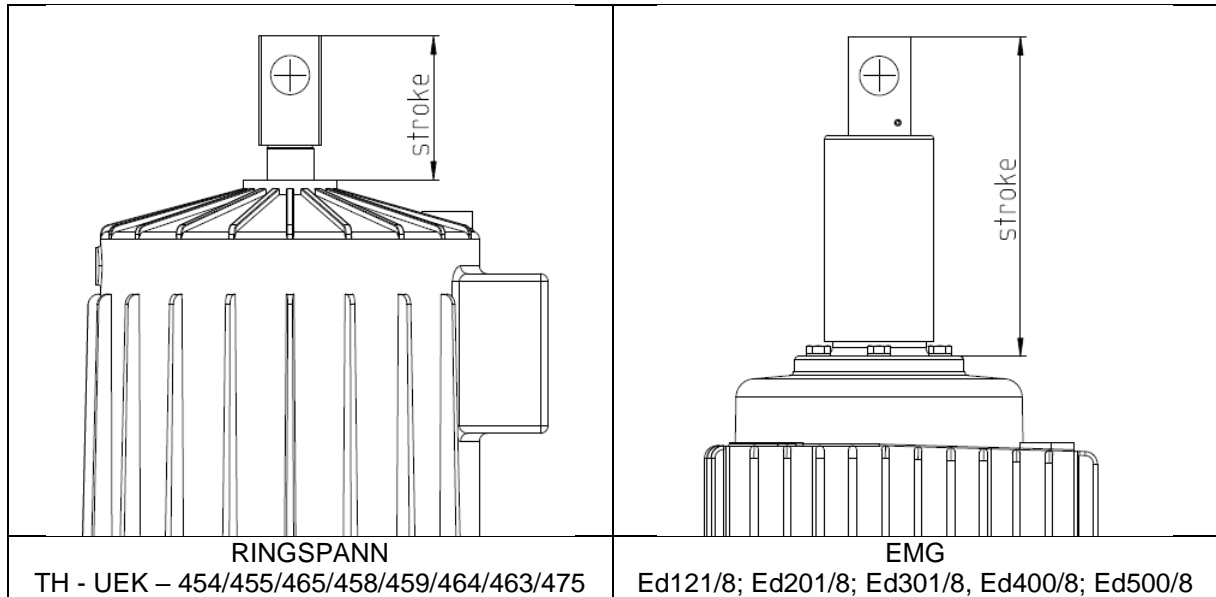


Fig. 21: measuring reserve stroke

thruster	offset S_0 [mm]	res. stroke S_R [mm]	S_0+S_R [mm]
TH – UEK - 454	57	10	67
TH – UEK – 455/465	57		67
TH – UEK - 458	62		72
TH – UEK – 459/464/463	92		102
TH – UEK – 475	57		67
Ed121/8; Ed201/8; Ed301/8	205		215
Ed400/8; Ed500/8	145		155

Tab. 11: measuring reserve stroke



ATTENTION!

A reserve stroke prevents the thruster and therefore the brake from going on block. The brake would no longer be able to generate a clamping force or braking torque

12.2 List of tools

function	DX 230 FEA		DX 280 FEA	
	thread	wrench size [mm]	thread	wrench size [mm]
activation flag wear compensation	M8	13mm	M10	17mm
mounting bolts brake lining	M8		M10	
adjustment parallel air gap	M8		M10	
adjustment braking torque	M12	19mm	M24	36mm
mounting bolts brake	M16	24mm	M24	
mounting nuts for for inductive sensors	M18x1			M18x1
adjustment wear compensation	M20	30mm	M30	46mm

** It is recommended to use a socket wrench with extension for these settings.

Tab. 12: list of tools

12.3 Tightening torques for regular threads

thread	tightening torques M_A [Nm]		wrench size [mm]
	8.8	10.9	
M6	10,2	15	10
M8	24,7	36,6	13
M10	48,6	71	17 (16)
M12	84	123	19 (18)
M16	205	301	24
M20	415	591	27
M24	715	1.018	36
M30	1.432	2.040	46

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The shown values are valid for a total friction coefficient of $\mu=0,12$.

Tab. 13: tightening torques

