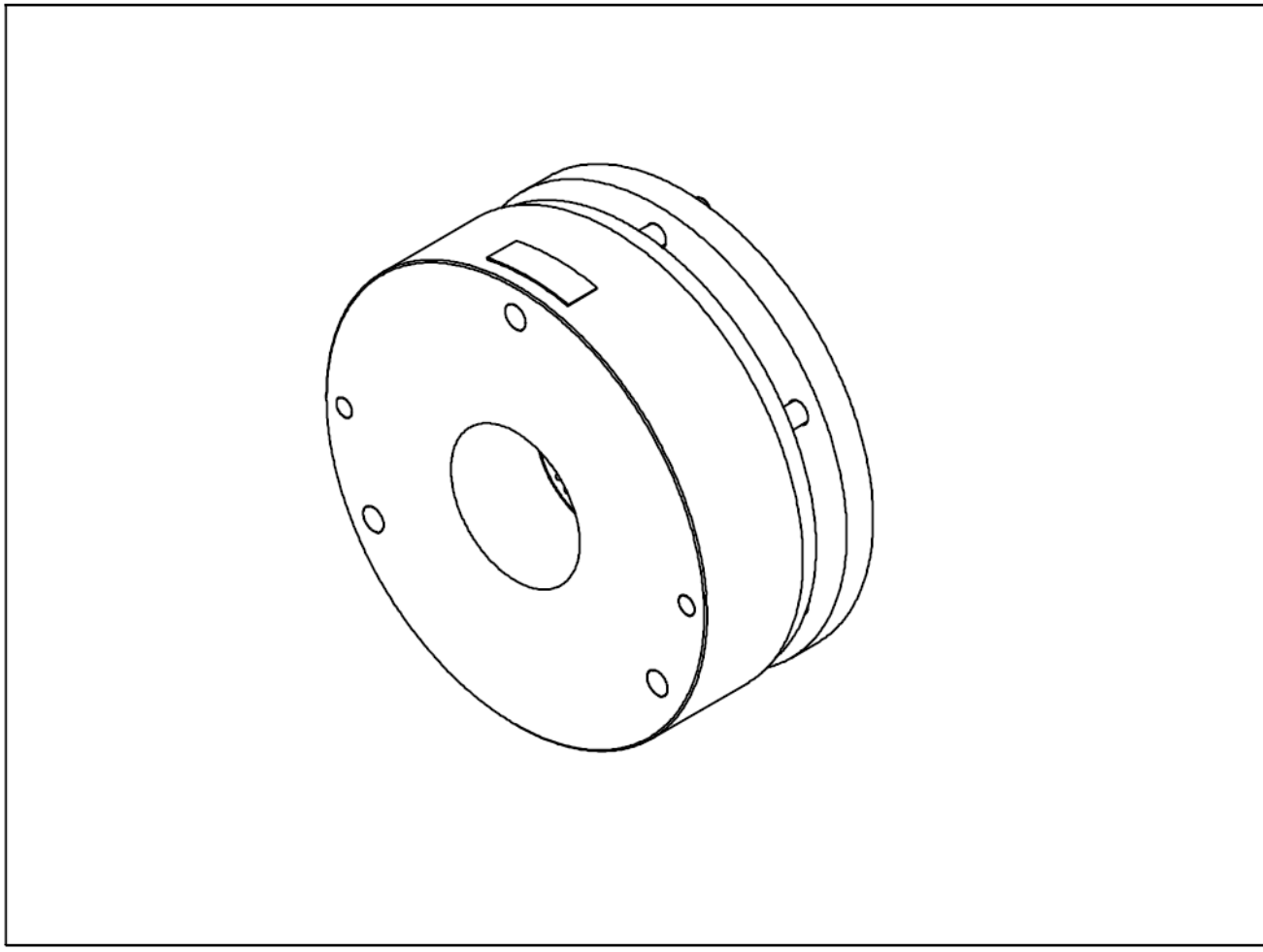
BK4697

Dings CO.
DYNAMICS GROUP

D57 Series Brake Instructions



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2 Safety information

2.1 Persons responsible for the safety

Operator

- An operator is any natural or legal person who uses the spring-applied brake on behalf of whom the drive system is used.
- The operator or his safety officer are obliged
  – to check whether all relevant regulations, notes, and laws are observed,
  – that only qualified personnel work on and with the drive system,
  – to ensure that the personnel have the Operating Instructions available for all corresponding operations and
  – to prohibit non-qualified personnel from working with and on the controller.

Qualified personnel

Qualified personnel are persons who are - because of their education, experience, instructions, and knowledge about corresponding standards and regulations, rules for the prevention of accidents, and operating conditions - authorized by the person responsible for the safety of the plant to perform the required actions and who are able to recognize and avoid potential hazards.
(see IEC 364, definition for qualified personnel).

2.2 General safety information

- These safety notes do not claim to be complete. In case of questions and problems please contact your Dings Co. representative.
- At the time of supply the spring-applied brake is state-of-the-art and ensures basically safe operation.
- The spring-applied brake is hazardous to persons, the spring-applied brake itself and other properties of the operator, if
  – that only qualified personnel work on and with the spring-applied brake.
  – that the spring applied brake is not used improperly.
- Spring-applied brakes must be designed so that they comply with their function and do not cause any hazards to personswhen correctly installed and in fault-free operation as directed. This is also effective for the interaction with the entire system.
- The spring-applied brake must only be operated in perfect state.
- Retrofittings or changes of the spring-applied brake are generally prohibited. In any case, Dings Co. must be contacted.
- The friction linings must be carefully protected from grease or oil since even small amounts of lubricants reduce the brake torque considerably.
- With application conditions according to enclosure IP54, the brake torque will usually not be reduced. Because of the great variety of applications, it is however necessary to check the functionality of all mechanical components under the specific conditions.

Possible applications of the spring-applied brake:

- No explosive or agressive atmostphere.
- Humidity, no restriction.
- Ambient temperature -20°C through +40°C.
- With high humidity and low temperatures
  – Take measures to protect armature plate and rotor from freezing.
- Electrical connections must be protected against contact.

2.3 Layout of the safety information

- All safety information given in these Operating Instructions has the same layout:

Signalword!
Note

– The icon characterizes the type of danger.
– The signal word characterizes the severity of danger.
– The note describes the danger and suggests how to avoid the danger.

Warning of danger for persons

Icons used		Signal words	
	Warning of hazardous **electrical voltage**	**Danger!**	Warns of **impending danger.** Possible consequences if disregarded: Death or very severy injuries.
		Warning!	Warns of **potential, very hazardous situations.** Possible consequences if disregarded: Death or very severe injuries.
	Warning of a general danger	**Caution!**	Warns of **potential, hazardous situations.** Possible consequences if disregarded: light or minor injuries.

Warning of material damage

Icons used	Signal words	
	**Stop!**	Warns of **potential damage to material.** Possible consequences if disregarded: Damage of the drive system/controller or its environment.

Other notes

Icons used	Signal words	
	**Note!**	Indicates a general, useful note. If you observe it, handling of the controller/drive system is made easier.

3 Technical data

3.1 Product description

1.1	Stator
1.2	Armature plate
1.4	Spring
1.6	Spacer
2.0	Rotor with friction lining
3.0	Hub
5.0	Flange
8.1	Socket kead screws DIN912

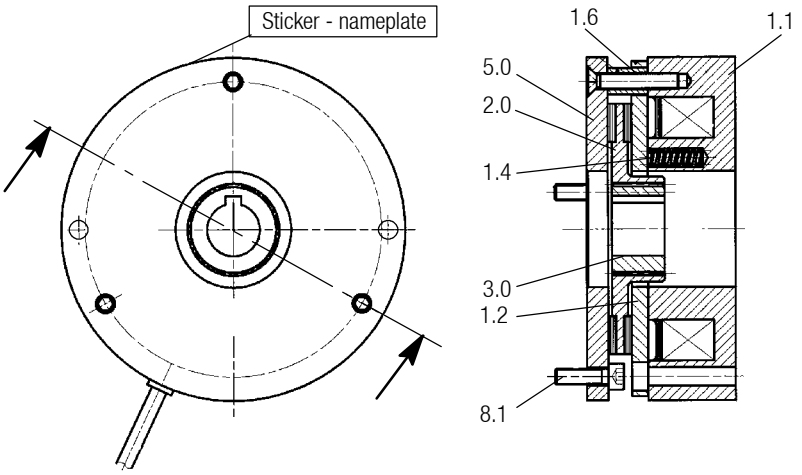


Fig. 1 Spring-applied brake: D57 Compact, completely mounted with rotor and flange

1.1	Stator
1.2	Armature plate
1.4	Spring
1.6	Spacer
2.0	Rotor with friction lining
3.0	Hub
4.0	Elastic band (shipping bracket)
8.1	Socket head screws DIN912

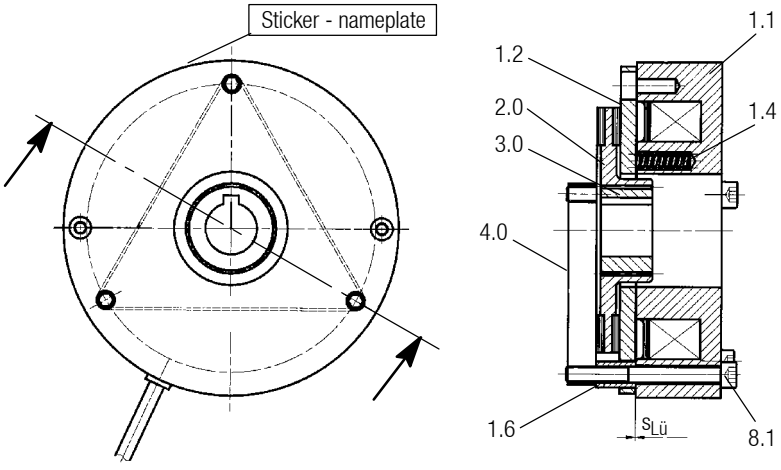
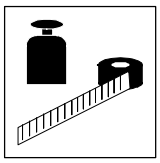


Fig. 2 Spring-applied brake: D57 Basic, Stator complete with rotor



3.1.1 General

The spring-applied brake D57-□□ is a single disc pulley with two friction surfaces. The brake torque is generated by several (size 72...170) pressure springs. The brake is released electromagnetically.

The spring-applied brake D57-□□ is designed for the conversion of mechanical work and kinetic energy into heat energy. For operating speeds see chapter 3.2, Rated data. Due to the static brake torque, the brake can hold loads without speed difference. Emergency braking is possible at high speed, see chapter 3.2, Rated Data. The more friction work, the higher the wear. Please take into account that the friction value and thus the torque depend on the speed.

Stop!

The spring-applied brakes D57, sizes 72 to 170 use spacers. It is not possible to readjust the brake in the event of wear. If necessary, the rotor must be replaced.

3.1.2 Braking

When braking, the rotor (2.0), which is moveable on the hub (3.0), is pressed against the friction surface by the inner and outer springs (1.4) via the armature plate (1.2). The asbestos-free friction linings ensure a high brake torque with low wear. The brake torque is transmitted between hub (3.0) and rotor (2.0) via the splines.

3.1.3 Brake release

In braked state, there is an air gap $s_{Lü}$ between stator (1.1) and armature plate (1.2). To release the brake, the stator coil (1.1) is excited with the DC voltage provided. The resulting magnetic force attracts the armature plate (1.2) towards the stator (1.1) against the spring load. The rotor (2.0) is released from the spring load and can rotate freely.

3.2 Rated Data

Model	Brake torque rated value at Δn=100min^{-1} M_K 1) [Nm]	Air gap S_{LU} ± 0.1 [mm]		Tightening torque of the fixing screws [Nm]	Moment of interia of the rotor [kg cm^2]	Brake mass [kg]		Outer Diameter [mm]	Pitch circle	
		rated 2)	max.			Compact	Basic		Ø[mm]	weight
D57-072	4	0.2	0.6	2.8	0.130	1.1	0.9	84	72	3 x M4
	6		0.4							
D57-090	8		0.6	5.5	0.450	1.9	1.5	102	90	3 x M5
	12		0.45							
D57-112	16		0.7	9.5	2.000	3.8	3.0	130	112	3 x M6
	23		0.5							
D57-132	32	0.3	0.8		4.500	5.7	4.7	150	132	
	46		0.5							
D57-145	60		0.8	23.0	6.300	8.6	7.1	165	145	3 x M8
	90		0.5							
D57-170	80		0.9		15.000	12.0	10.0	190	170	
	125		0.6							

Model	Electrical power P_{20} [W]	Voltage U [V]	Coil resistance R_{20} [Ω]			Maximum speed Δn_{omax} [min^{-1}]
			Rated	Max.	Min.	
D57-072	20	24 205	28.8 2101	30.24 2269	27.36 1933	12400
D57-090	28 25	24 205	20.57 1681	21.6 1807	19.54 1955	10100
D57-112	30 33	24 205	19.2 1273	20.16 1356	18.24 1191	8300
D57-132	40	24 205	14.4 1051	14.83 1082	13.97 1019	6700
D57-145	50 53 55	24 42 205	11.52 33.28 764	11.87 34.28 787	11.17 33.28 741	6000
D57-170	55	24 42 205	10.47 32.07 765	10.78 33.03 787	10.16 31.11 742	5300

4 Installation

Warning!

Toothed hub or screws must not be lubricated with grease or oil!

4.1 Required tools

Model	Torque wrench Measuring range [Nm]	**Insert for hexagon socket screws** Opening [Inch]
	0.5 - 13	3x1/4" square 55mm long
D57-090		4x1/4" square 55mm long
D57-112	3 - 40	5x1/2" square 180mm long
D57-132		
D57-145	20 - 100	6x1/2" square 140mm long
D57-170		

Feeler gauge	**Caliper gauge**	**Multimeter**
		

4.2 Assembly

4.2.1 Preparation

1. Unpack spring-applied brake.
2. Check for completeness
3. Check nameplate data, especially rated voltage.

4.3 Installation

4.3.1 Installation of the hub onto the shaft

3.0	Hub
3.1	Circlip
10.0	Endshield

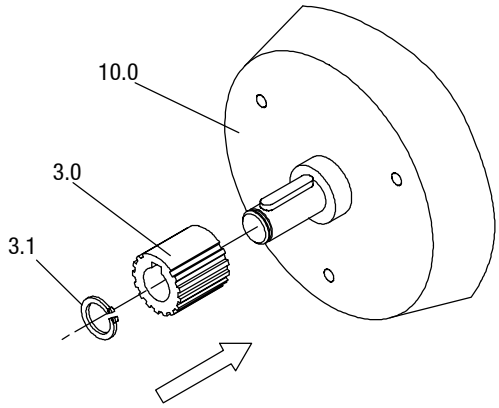
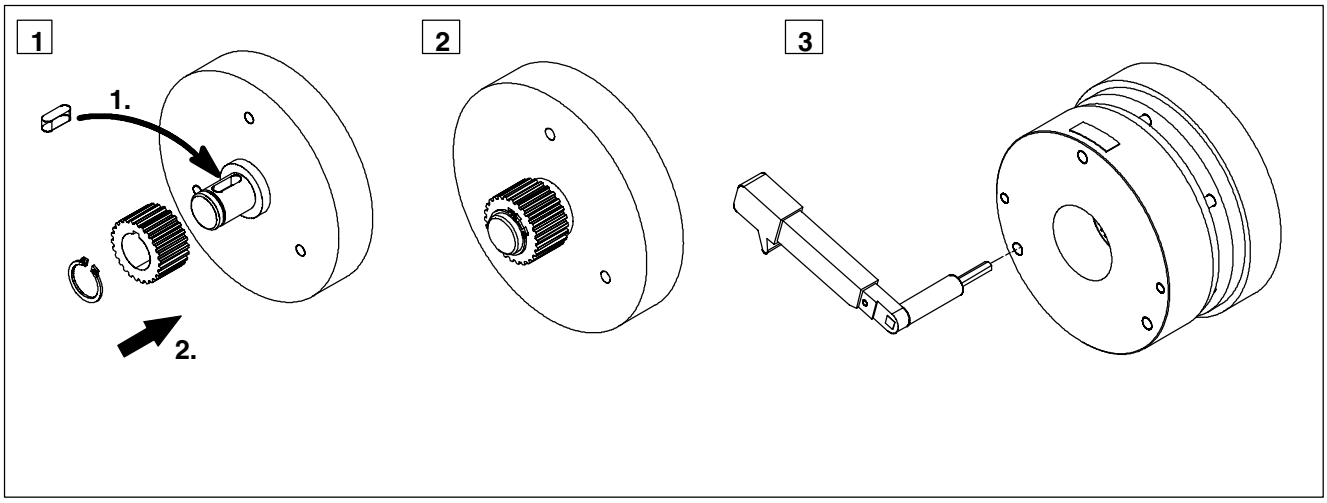


Fig. 5 Installation of the hub onto the shaft

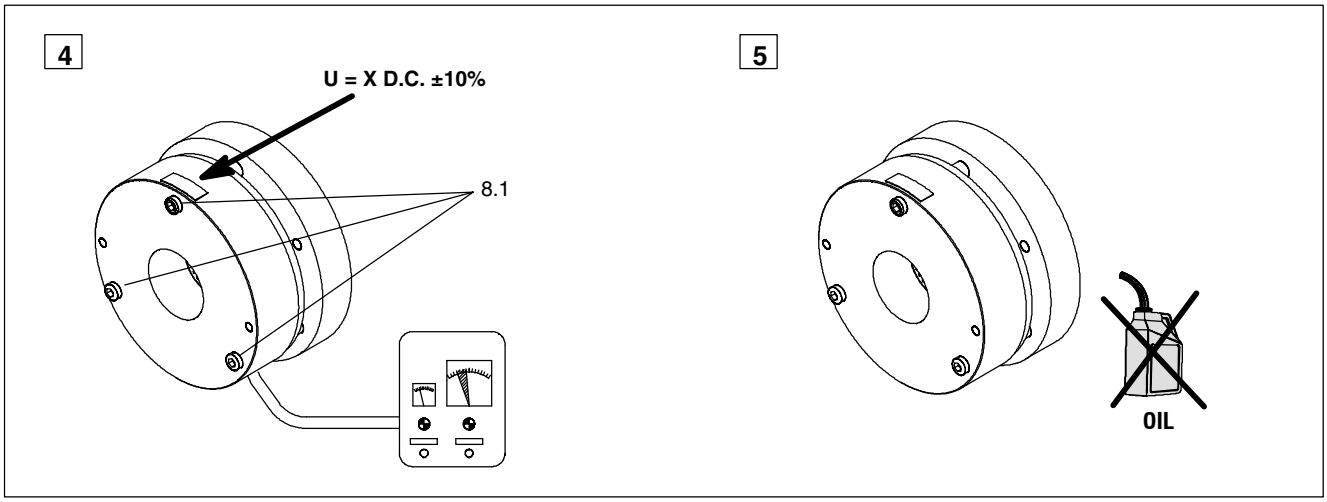
1. Press hub (3.0) onto the shaft.
2. Secure hub against axial displacement (e.g. using a circlip - 3.1).

4.3.2 Installation of the brake D57, compact design

1. Hub (3.0) installation, chapter 4.3.1.
2. Push spring-applied brake (1.0) onto the hub (3.0). Secure hub against axial displacement (e.g. using a circlip - 3.1).
3. Bolt the spring-applied brake (1.0) to the endshield using the fixing screws (8.1).

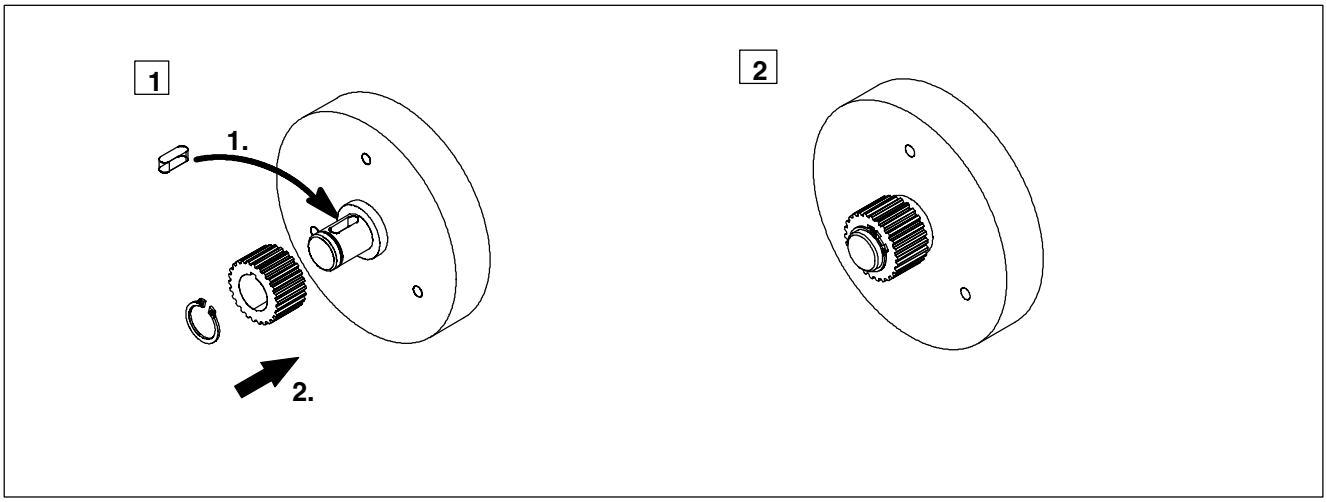


4. Tighten the screws (8.1) evenly (for torques see the table Rated data, chapter 3.2).

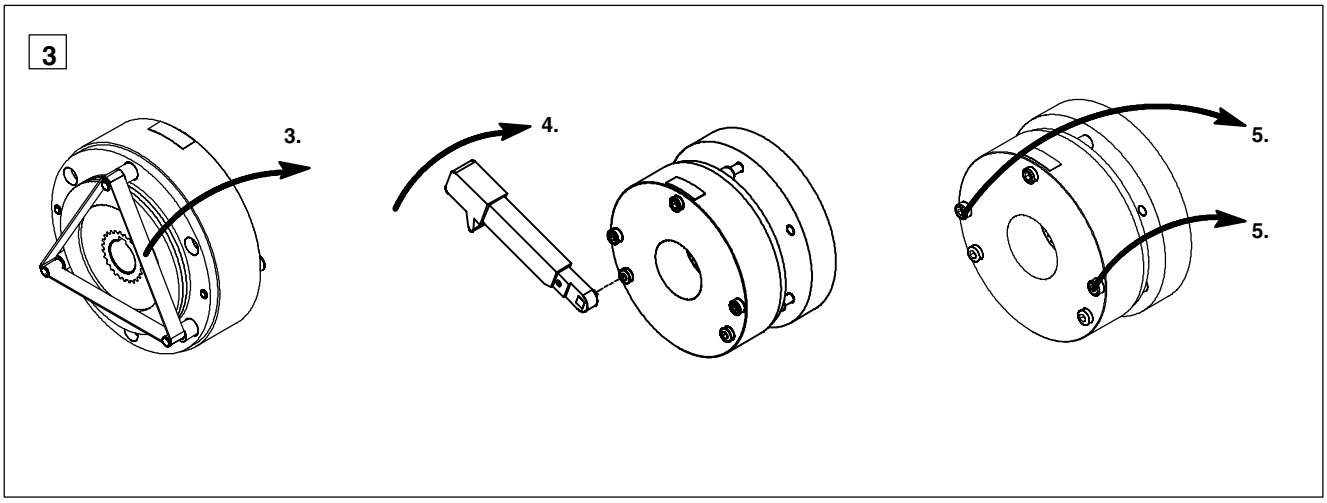


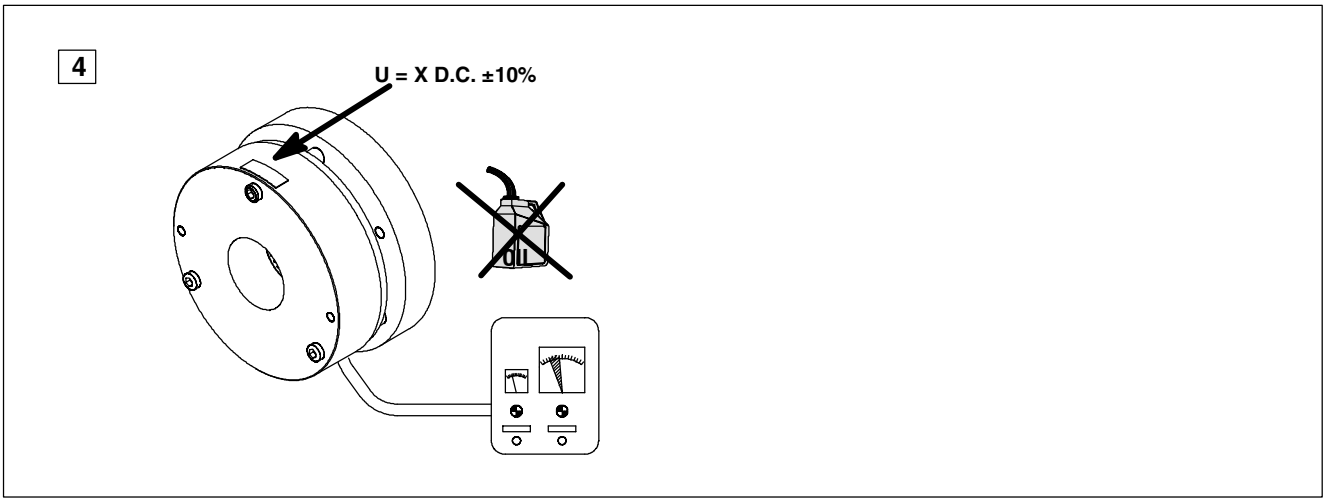
4.3.3 Installation of the brake D57, basic design

1. Mount the hub (3.0), chapter 4.3.1
2. Push the spring-applied brake onto the hub (3.0), secure the hub against axial displacement with a circlip (3.1).



3. Tighten the brake fixing screws lightly and remove the shipping brace (elastic band).
4. Tighten the screws (8.1) evenly (for torques see the table Rated data, chapter 3.2).
5. Remove the cheese head screws.





4.4 Electrical connection

Warning!

The brake must only be electrically connected when no voltage is applied.

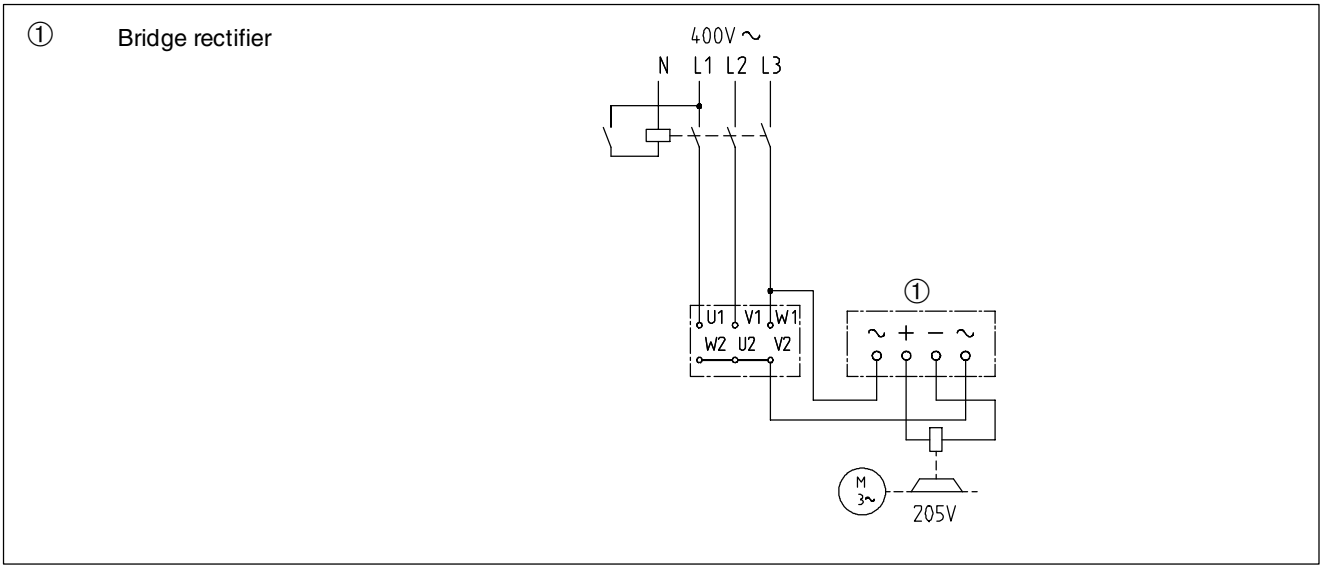


Fig. 6 Switching parallel to motor, extremely delayed engagement

① Bridge rectifier

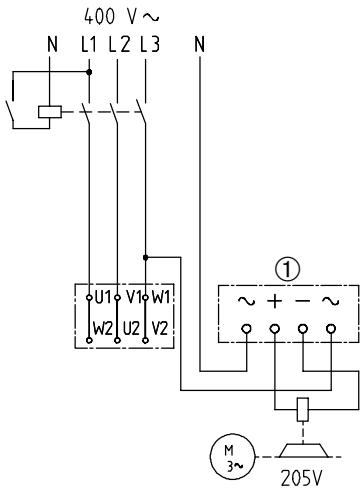


Fig. 7 DC switching, delayed engagement

① Bridge rectifier

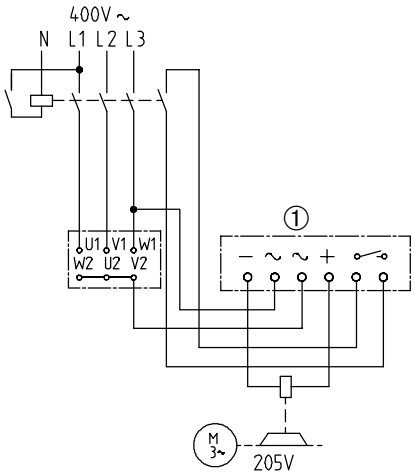


Fig. 8 DC switching, normal engagement

① DC voltage (e. g. 24V)

② Spark suppressor

Connection diagram also valid for star connection

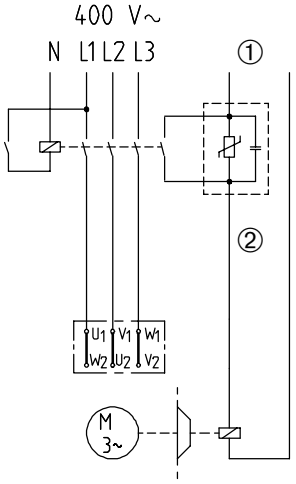
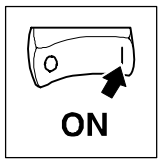


Fig. 9 Separated DC voltage, DC switching.



5 Commissioning and operation

Warning!

Live connections must not be touched.
The motor must not be connected when checking the brake.

5.1 Operational test

In the events of faults see chapter 7 Troubleshooting and elimination.

5.1.1 Release / voltage check

Warning!

The brake must be free of torque. The motor must not rotate.

Warning!

Live connections must not be touched.

1. Remove two bridges from the motor terminals. Do not switch of the DC brake supply. When connecting the rectifier to the star point of the motor, the PEN conductor must also be connected at this point.
2. Switch on the current.
3. Measure the DC voltage at the brake.
4. Compare the DC voltage with the voltage indicated on the nameplate. A 10% deviation is permissible.
5. The air gap must be zero and the rotor must rotate freely.
6. Switch off the current.
7. Bolt bridges to the motor terminals. Remove additional PEN conductor.

5.2 During operation

- Check the brake regularly during operation. Take special care of:
  – unusual noises and temperatures
  – loose fixing elements
  – the state of the cables.
- In the event of failures, refer to the trouble shooting table in chapter 7. If the fault cannot be eliminated, please contact the Dings representative.

6 Maintenance / repair

6.1 Inspection intervals

The wear of the friction lining of the rotor depends of the operating conditions. The running time of the brake depends on the friction work per switching operation and on the differential speed. The inspection intervals must be adapted to the operating conditions and can be prolonged if the brake shows minimum wear.

6.2 Inspections

6.2.1 Inspection of brake D57

6.2.1.1 Air gap

Warning!

The motor must be at standstill when checking the air gap.

1. Measure the air gap "$s_{Lü}$" between armature plate and stator using a feeler gauge.
2. Compare the measured air gap with the maximum permissible air gap "$s_{Lümax}$". (See table Rated Data, chapter 3.2).
3. If necessary, replace the rotor.

6.2.1.2 Releasing / voltage

Warning!

The running rotor must not be touched.

Warning!

Live connections must not be touched.

1. Observe air gap "$s_{Lü}$" during operation of the drive. It must be zero.
2. Measure DC voltage at the brake during operation.The voltage must be the same as indicated on the nameplate. A 10% deviation is permissible.

6.3 Maintenance

6.3.1 Maintenance of brake D57

Warning!
Switch off the voltage. The brake must be free of residual torque.

1. Loosen connection cable.
2. Unbolt fixing screws and remove brake from endshield. Observe connection cable.
3. Pull rotor from hub.
4. Check hub splining. In the event of wear, replace hub.
5. Check rake function according to the description of the inspection given in chapter 6.2.1.
6. If necessary, install new brake.

6.4 Spare-parts list

Only parts with order numbers available.
The order numbers are only valid for standard versions.

- Bore diameter in mm
- Standard keyway to DIN 6885/1 P9

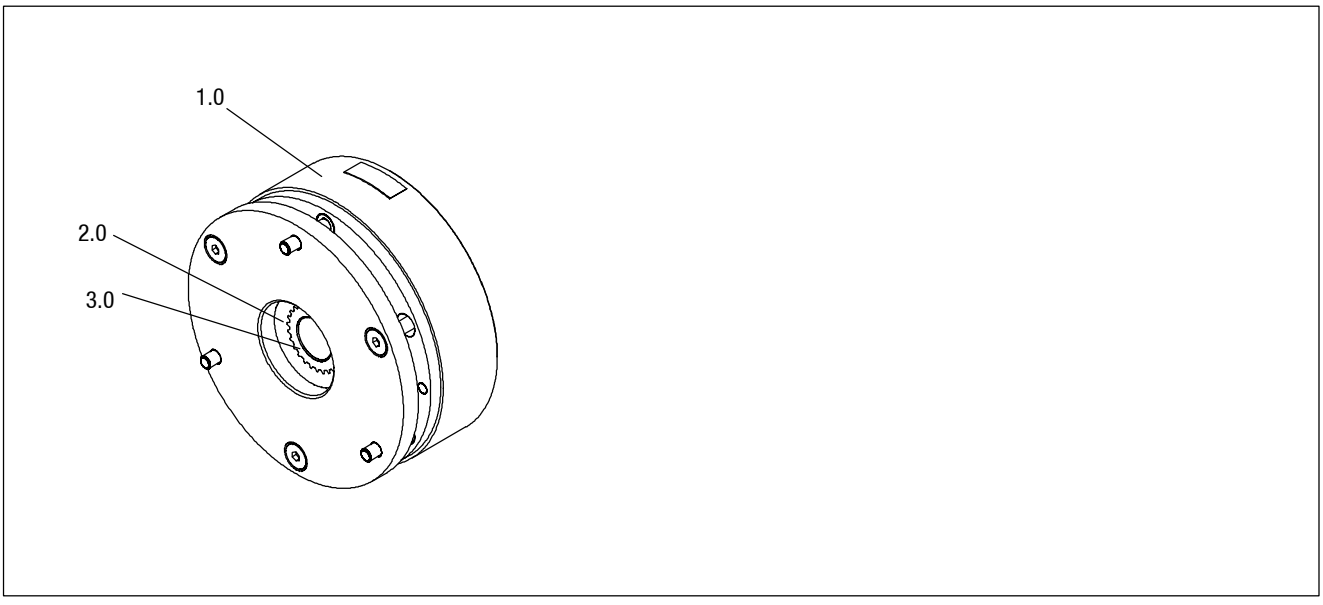
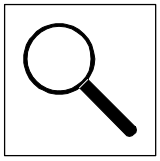


Fig. 10 Spare parts for spring-applied brakes

Pos.	Name	Variant				
1.0	Spring-applied brake	Size	Voltage	Brake torque	Basic	Compact
2.0	Rotor	Size	-----	-----	-----	-----
3.0	Hub	Size	Bore	-----	-----	-----



7 Troubleshooting and fault elimination

Fault	Cause	Remedy
Spring-applied brake does not release,air gap is not zero	Coil is interrupted	• Measure the coil resistance using a multimeter: – If the resistance is too high, replace the spring-applied brake.
	Coil has contact to ground or between the windings	• Measure the coil resistance using a multimeter: – Compare measured resistance to rated resistance. For values see chapter 3.2 Rated data. If the resistance is too low, replace the spring-applied brake. • Check coild for contact to ground using a multimeter: – In case of contact to ground, replace the spring-applied brake. • Check brake voltage (see defective rectifier, voltage too low).
	Wiring wrong or defective	• Check and correct wiring. • Check cable for continuity using a multimeter: – Replace defective cable.
	Rectifier defective or wrong	• Measure DC voltage at the rectifier using a multimeter: If DC voltage is zero: • Measure AC voltage at the rectifier. If AC voltage is zero: – Apply voltage, – check fuse, – check wiring If AC voltage is o.k.: – Check rectifier, – replace defective rectifier If DC voltage is too low: – Check rectifier, – Use half-wave rectifier instead of bridge rectifier. – If diode is defective, use suitable new rectifier • Check coil for contact to ground or between the phases. • If a rectifier defect occurs more than once, replace the spring-applied brake even if a contact to ground or between the windings cannot be measured. The fault may occur only in the warm state.
	Air gap too large	Replace the rotor.
Rotor thickness too small	Spring-applied brake was not replaced in time	Replace spring-applied brake (chapter 4.3.1 and 4.3.2).
Voltage too high	Brake voltage does not match with rectifier	Adapt rectifier and brake voltage to each other.
Voltage too low	Brake voltage does not match with rectifier	Adapt rectifier and brake voltage to each other.
	Defective rectifier diode	Replace rectifier by a suitable new one.
AC voltage is not mains voltage	Fuse missing or defective	Select connection where fuse has not been removed and is o.k.