SG Transmission

ELECTROMAGNETIC CLUTCH AND BRAKE SOLUTIONS

Permanent Magnet Brake

Installation and Operating Instructions

Contents

Target Group

This instruction manual is specified for use by techinical staff. Technical staff must have the following:

- Knowledge and understanding of safety instructions
- Skills for installation and assembly, start-up operation and maintenance of the product
- Understanding of the function in the used machine
- Detection of hazards and risks of the drive technolgy
- Knowleadge about work safety and accident prevention

Experts in electromagnetic solutions

SG Transmission specialises in the bespoke design and manufacture of electromagnetic clutch and brake solutions which are used in pioneering technology around the world. Guaranteeing safety, accuracy and performance for the power transmission and motion control applications of tomorrow.

Introduction

This manual provides the operating instructions, principles and features of SG Transmission's permanent magnet brake.

Please note: All information in regard to safety must be strictly followed.

Any queries related to torques, torque variations, installation position, wear, release range, ambient conditions and similar should be directed to SG Transmission (contact details are found on the back page).

Standards and Directives

SG Transmission brakes are designed, built and tested inline with the requirements of DIN VDE 0580:2011 which relates to electromagnetic devices and components.

The brakes are electromagnetic components are subject to the 'Low Voltage Directive 2014/35/EU' and it is the users' responsibility to employ suitable switching devices and controls to ensure conformity.

Declaration of Incorporation

In accordance with Annex II (part 1, Section B) of the Machinery Directive 2006/42/EC, SG Transmission declare that their brakes comply with health and safety requirements.

The final machinery must conform to the Machinery Directive 2006/42/EC and any partly completed machinery must not be operated.

Technical documentation may be required by relevant authorities for any partly completed machinery in accordance with Annex VII, part B of Machinery Directive 2006/42/EC.

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1.0 Safety information

The SG Transmission operating instruction provides the technical specifications of products to provide maximum safety and guidance to the user. Please note that the safety hazards can only be avoided if the equipment user adheres to the safety instructions and takes adequate precautions to avoid the hazards and check their implementation.

The machine owner MUST make sure that:

- The brakes are only used in accordance with their intended use.
- The brakes are in perfect working order and checked at regular intervals.
- This operating instruction must be available at the place of use of the brakes at all times (ensure it is not damaged and still legible).
- Start-up, maintenance and repair work must only be done by qualified personnel who is authorised to do so.
- Authorised personnel must understand occupational safety and environmental protection issues and have read and agreed to follow the safety instructions of these operating instructions.
- The brakes are not exposed to other strong magnetic fields.

1.1 Use of Brakes

The brakes must be only used as instructed in the operating requirements detailed in this manual and must only be used for their intended use and to be incorporated into electric motors for use on industrial plant.

- DO NOT operate in potentially explosive or firedamp environments.
- DO NOT exceed the rated power limits specified.
- DO NOT exceed the rated speeds.

1.2 General Safety Information

Brakes that are attached or built-in have hazardous live components and rotating parts and may have hot surfaces.
Be aware of high temperatures:

- Burning of the skin
- Cover hot surfaces and make safe to touch
- If necessary, attach warning signs on the system
- Check the temperature and allow brake to cool

Only authorized personnel should conduct any work associated with the transport, connection, start-up and periodical maintenance of the brakes.

If safety is not followed during operating and maintenance, serious personal injury and permanent damage to the equipment may occur.

If any of the instructions in this manual cannot be followed. Please contact the manufacturer before beginning to set up the machinery into which the brake is to be used.

Any queries related to torques, torque variations, installation position, wear, release range, ambient conditions and similar should be directed to SG Transmission (contact details are found on the back page).

Retrofitting or modification work to be carried out on the brake is subject to the approval from SG Transmission.

Accident prevention regulations applying to the specific field of application of the brake must be strictly observed. Torque reductions caused by factors beyond the user's control (e.g. higher ambient temperatures or humidity, contaminated ambient air and environment, etc.) cannot be excluded.

General information

Please be advised that in set up, operation and maintenance of the component the operating instructions must be observed. Components are designed, manufactured and tested in accordance with the requirements of DIN VDE 0580:2011. Additional information can be found in the technical data, drawings and operating instructions.

1.3 Set up and start-up

Failing to follow these instructions may a cause permanent negative effect on the braking effect and cause malfunctions.

Please contact the manufacturer if:

- The intended use of the brake is vertical

DO NOT operate the brakes if:

- Power supply cables / wires or connections are damaged
- The housing or insulation of the coil's lead wires are damaged
- Any other defects are suspected

1.4 Installation

The drive must be isolated and locked to prevent rotation and potential injury and damage. The voltage level and voltage type shown on the rating marking must be strictly followed when connecting the brakes.

The brake must be mounted into the motor so ample heat dissipation occurs. Precautions must be taken to avoid overvoltage during disconnection or voltage peaks. The magnetic field may cause interference outside the brake or even feedback to the brake in case of adverse installation conditions.

Contact SG Transmission should you have questions related to mounting conditions.

1.5 Operation

Live components (e.g. connecting cables of the field coil) must not be exposed to water.

The brake cable connections must not be damaged by crushing, squeezing or exposure to mechanical loads.

The friction surfaces must not be contaminated with grease, oil or other fluids to avoid substantial torque reduction (the original torque cannot be restored even if the friction surfaces are cleaned after contact with fluids.)

The wear of a permanent magnet brake in the intended application (semi dynamics, static or e-stop) which results in a torque reduction must be considered during installation and planned maintenance.

Due to the diverse ambient conditions in which the brakes may be used, the brake must be checked to ensure it is in perfect working order before start-up due to the varying ambient conditions in which the brake may be used.

Torque reductions can't be ruled out if the brake is used for applications where only minimum friction work is required. In these instances, the user should periodically ensure that the brake provides sufficient torque.

During brake operation, ensure that the coil temperature does not rise above the permissible limit temperature applicable to the insulating materials of the specified insulation class. Fast cooling of the field coil with scavenging air is not allowed. Ensure that the permissible relative humidity range is not exceeded.

1.6 Maintenance and repair

Any repair work must only be done by qualified personnel who is authorised to do so. If maintenance is done incorrectly and the requirements aren't followed may cause personal image or possibly permanently damage the equipment. No voltage should be applied to the brakes when undertaking maintenance work.

NOTE!

If there is any conflict between the information provided in the offer drawing and the information given in these operating instructions, the product drawing shall prevail.

The permanent magnet brake must be operated at the conditions specified in this document and inline with DIN VDE 0580.

The information in the relevant offer drawings of the specific brake types must be strictly observed.

Specifications subject to change without notice.

2.0 Product description

Type 62 permanent magnet brakes use rare earth magnets to create a higher flux density (tesla / gauss) than comparable, older design ferrite magnets.
These rare earth magnets allow for relatively high torque densities in small volumes.

There are many advantages to permanent magnet brakes, the main one being that these brakes are truly fail-safe devices which require no power / current to give the desired braking action.

2.1 Features

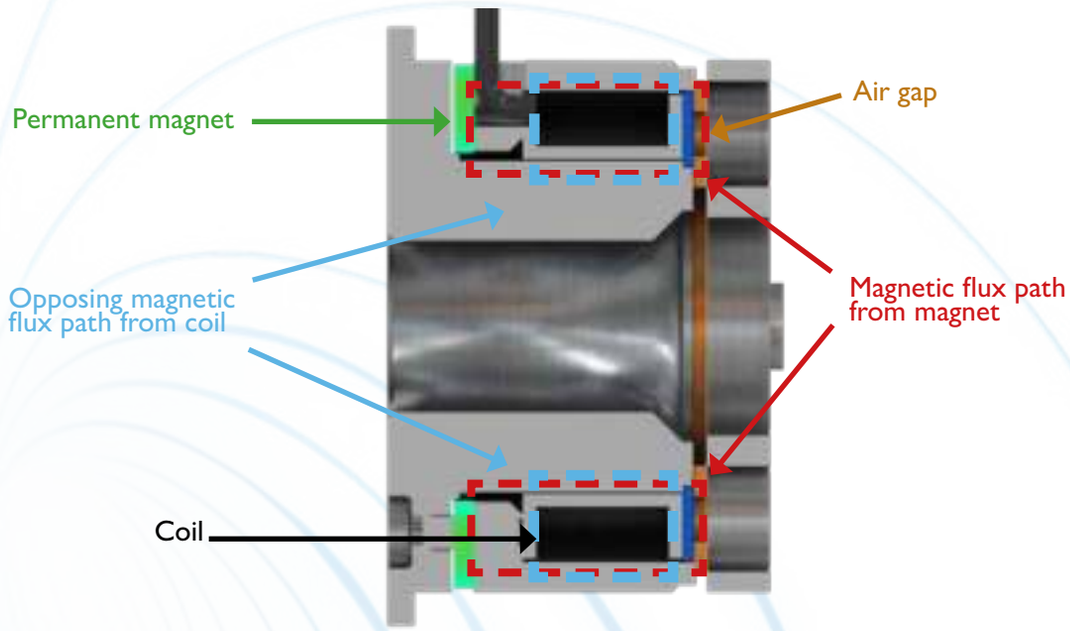
- Available in a range of sizes Ø18mm 0.05Nm- Ø250mm 360Nm
- Energy saving through power off holding
- Fail-safe in the event of power failure
- High holding force
- High torque versions available
- Horizontal and vertical mounting
- From ultra flat to in-built styles (with housing)
- Covering shaft heights of servo motor series from 28mm to 132mm
- Customisable armature plates: standard, external shaft adapted, internal shaft adapted
- Special voltages / forces / mountings available on request

2.2 Brake Operation

Brakes are engaged magnetically and disengaged electrically.

When power is removed the internal coil is de-energised, the armature disk is attracted across the air gap and onto the pole face of the brake magnet, through the action of the internal permanent magnet field. In a de-energized state a frictionally engaged and virtually backlash free connection is created between the stationary field and the rotating armature assembly.

In contrast when a current is applied through the brake's internal field coil, the magnetic field generated is equal in magnitude to that of the permanent magnets, but opposite therefore, cancelling each other out. The brake will disengage as the armature plate is pulled off the brake surface. It is vital that the correct polarity is made, otherwise disengagement will not occur.



Permanent magnet brakes tend to be more compact than comparable spring applied brakes. The ‘power off` devices are designed so that when the power is removed, the magnetic energy of the internal permanent magnetic elements are channelled and controlled to give the required braking effect.

The brake field is fitted to a stationary surface of a machine structure and the armature plate or drive hub is fixed to the rotating machine element. Between the working faces of these two elements there is a small air gap. (defined in our technical data)

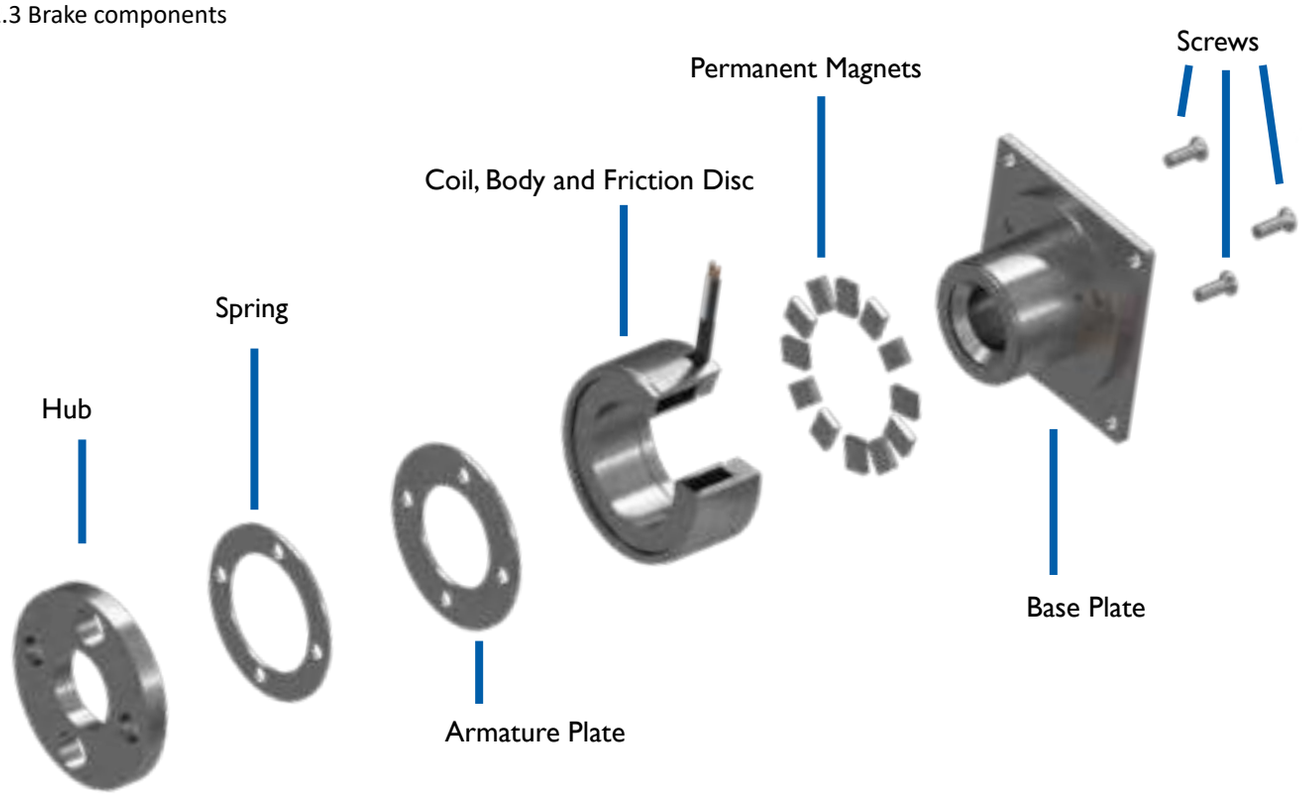
The braking effect is generated in the de-energized state by means of built-in permanent magnets. Like conventional permanent magnets, these pull the armature disk across an air gap to the magnet body. A magnetic field of opposite polarity generated by the power supply neutralises the holding force and releases the disc for rotation using the customer's drive.

Multi-pole versions are also possible and can lead to increased performance. The mutiple pole surfaces provide an optimization of the iron-copper ratio, i.e. the proportion of iron in the holding surface is increased by design, thus increasing the usable iron surface.

The permanent magnet power off brake is essentially zero backlash creating an increased level of safety and accuracy. Whilst there are various fail-safe alternatives including conventional spring applied brakes, there are many advantages to our permanent magnet brakes. These brakes are truly fail-safe devices which require no power / current to give the desired braking action.

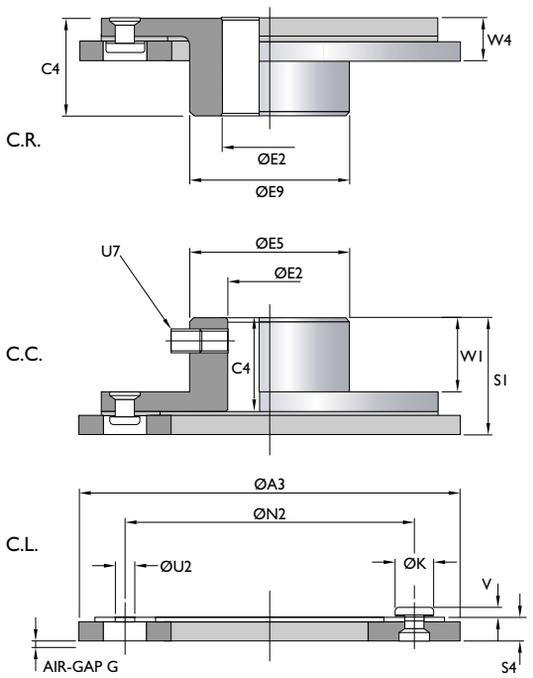
This brake can be used in fail-safe applications to automatically stop the motion when the electrical power fails, this means that when the power is removed from the unit, the rotating armature or drive hub engages with the brake field.

2.3 Brake components

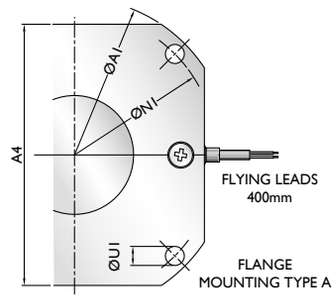


3.0 Technical data

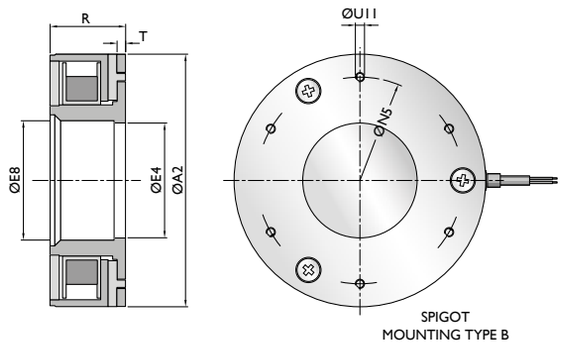
Armature / Hub mounting options



Flange mounted style



Spigot mounted style



Type 62 (Standard) Dimensions

Size	A1 (H9)	A2 (H8)	A3	A4 (AF)	C4	E2 max (H7)	E4 (H8)	E5	E8	E9	G	K	N1	N2	N5	R	S1	S4	T	U1	U2	U7	U11	V	W1	W4
03	38.5	28	28.5	30	7.8	8	9.2	17	9	-	0.15	4	33.5	19.5	22	16	10.5	2.7	1.5	2.6	2.15	M3	M2	1.6	5.3	-
04	62.5	40	40	45	14.2	8	13	16	13	12	0.15	6	54	29	32.5	21	17.5	3	3	3.5	3.2	M3	M2	1.5	12.2	5.3
05	75	53	56	56	17	15	24	24	24	23	0.20	6.5	61	46	48	20.8	20.5	3.4	3.3	4.5	3.1	M5	M3	1.5	13.5	7.0
06	80	63	63	66	15	17	35	27	32	27	0.20	6.5 8.0	72	46.0 50.0	49	26.6	19	4.1 3.8	3	4.5	3.1 4.1	M5	M4	1.5	11.5	7.5
07	90	70	73	70	20	20	30	30	32	30	0.25	8	79.5	60	61	25.3	24.2	4.2	3.5	5.5	4.1	M5	M3	1.5	15.0	9.2
09	115	85.5	90	90	25	30	40	40	43	40	0.25	10	102	76	75	26.6	30	5.0	3.5	6.5	5.1	M5	M3	2.0	20.0	10.0
11	132	110	110	110	30	35	50	49	52	49	0.30	13	121	95	90	33.0	36.2	6.2	3.75	6.5	6.1	M6	M4	4.7	24.0	12.2
12	150	126	126	128	30	40	62	57	62	49	0.40	12.5	137	95	106	37.8	37.2	7.1	5	6.6	6.1	M6	M6	3.2	20.0	13.0

Type 62 (Standard) Technical Data**

Size	Torque (Nm)	Times Max Rotational Speed (rpm)	Coupling Times (ms) (typical)	Seperation time (ms) (typical)	Weight (kg) (C.L Armature)	Max 20° (W)
03	0.4	12000	14	30	0,07	6
04	1.25	10000	18	35	0,18	8
05	2.5	10000	21	38	0,29	12
06	9	10000	28	58	0,55	20
07	5	10000	29	83	0,65	20
09	12	8000	40	91	1,15	18
11	30	8000	50	150	1,7	22
12	60	8000	51	200	3,1	28

* Available upon request

** All stated torques, switching times are based on SG Transmission assemblies and tested under laboratory conditions, related to standard operating conditions. There is no guarantee for serial use. Individual detailed test reports can be commisioned and confirmed for critical applications.

Type 62 (High Torque Special) Dimensions

Size	A1 (H9)	A2 (H8)	A3	A4 (AF)	C4	E2 max (H7)	E4 (H8)	E5	E8	E9	G	K	N1	N2	N5	R	S1	S4	T	U1	U2	U7	U11	V	W1	W4
4 (HT)	62.5	*	40	45	*	*	15	*	13	*	0.15	6.5	54	29	32	23	*	5.05	2	3.5	3.2	*	*	1.5	*	*
6 (HT)	88.9	66	67.7	66	*	*	35/34	27	35/34	*	0.2	8	79.4	46	56	27.6	18.5	3.9	3	4.5	3.1	M5	3xM4	1.5	11.1	*
9 (HT)	115	*	90	90	*	*	40	*	43	*	0.25	10	102	76	*	26.6	*	5	3.5	6.5	5.1	*	*	2	*	*
11 (HT)	*	104	110	*	30	35	50 (56)	49	56	49	0.3	13	*	95	90	30.7	*	5.8	6	*	6.3	*	6xM4	2	*	12
16	190	*	160	ROUND	*	*	68	*	63	*	0.4	13	175	120	*	41.2	*	9.4	10	6x6.4	8.3	*	*	6	*	*

Type 62 (High Torque Special) Technical Data**

Size	Torque (Nm)	Max Rotational speed (rpm)	Coupling Times (with parallel varistor)	Seperation times (ms) (typical)	Weight (kg)	Max 20° (W)
4 (HT)	2.2	12000	15	29	0,2	8
6 (HT)	12	10000	20	35	0,7	20
9 (HT)	22	10000	27	52	1,1	18
11 (HT)	40	10000	29	76	1,5	22
16	120	8000	82	154	6,1	40

Type 62 (Multi-pole) Dimensions

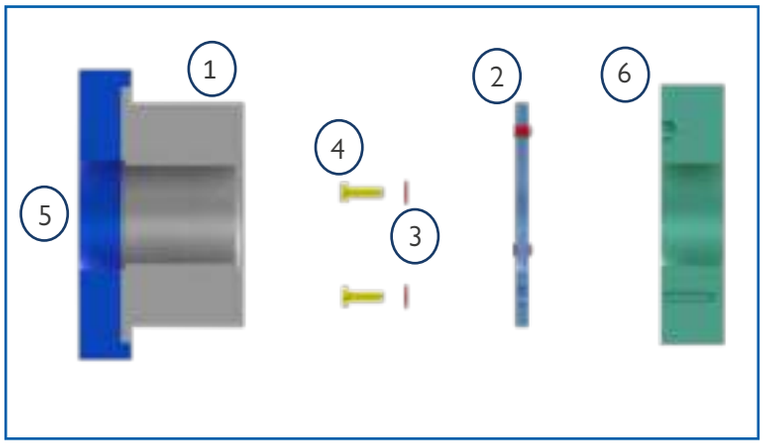
Size	Torque (Nm)	Max 20° (W)	A1 (H9)	A2 (H8)	A3	A4 (AF)	C4	E2 max (H7)	E4 (H8)	E5	E8	E9	G	K	N1	N2	N5	R	S1	S4	T	U1	U2	U7	U11	V	W1	W4
08	18	24	100	80	80.2	80	20	22	35/42	38	38	32	0.25	8	90	60	63	29.9	24.7	4.7	3	5.5	4.1	M5	M4	1.5	16	8.7
09	22	18	115	*	90	90	*	*	40	*	43	*	0.25	10	102	76	*	26.7	*	5	3	6.5	5.2	*	*	2	*	*
10	35	22	*	100	100	*	*	*	52	*	52	*	0.3	10	*	78	76	37.5	*	5.8	5	*	5.1	*	M5	2	*	*
11	40	24	*	104 (H9)	109.6	*	*	*	56	*	58.5	*	0.3	12.8	*	95	90	30.7	*	5.8	6	*	6.4	*	M4	4.7	*	*

3.1 Technical specification

Voltage	24v DC ***
Voltage Tolerance	+5 /-10%
Duty cycle	100% ED ***
Ambient temp.	-5 to +120°C ***
Humidity	20 to 70% without condensation
Protection Class	Standard IP00
Standard finish	Bright zinc
Insulation	Class F
Keyway	DIN6885/1
Classification	Holding brake with emergency stop capability
Delivery air gap (mm)	Set to specification
Release Voltage 20°c	21.6
Max speed (rpm)	8000

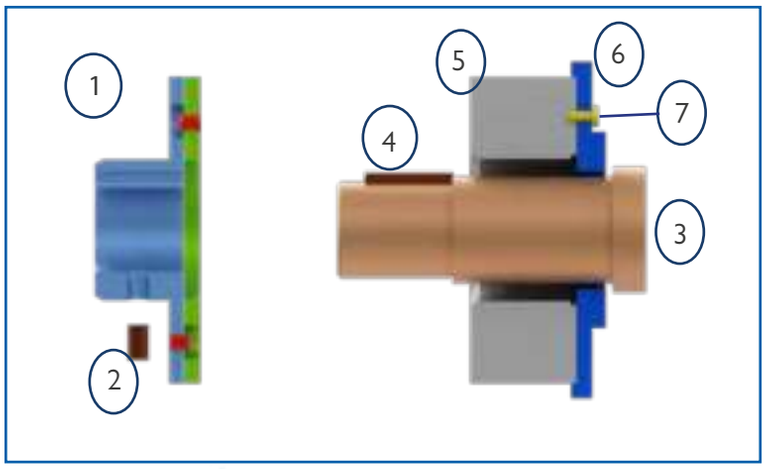
*** Other voltages and sizes available upon request. Ambient temperature has to be checked individually, the specified range does not apply to the complete program and also affect the cancellation voltages

4.0 Mounting options



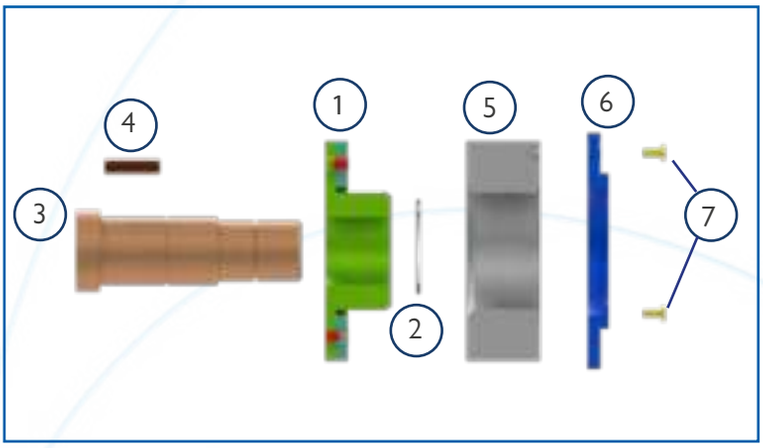
C.L Armature

1. Brake body
2. Armature without hub
3. Security washers
4. Mounting screws
5. Mounting surface
6. Mounting interface determined by customer (e.g pulley, hub, sproket)



C.C Armature

1. Armature hub shoulder outside
2. Set screw
3. Motor shaft
4. Steel key
5. Brake body
6. Motor flange
7. Mounting screws



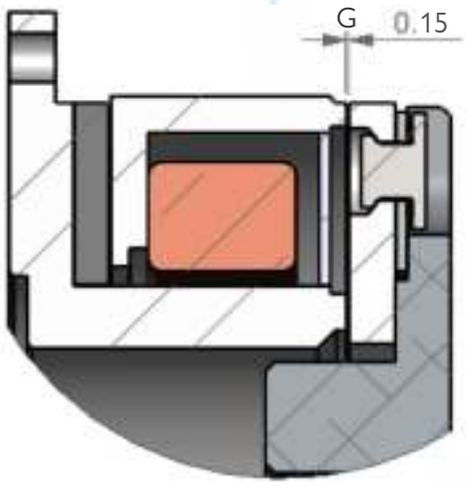
C.R Armature

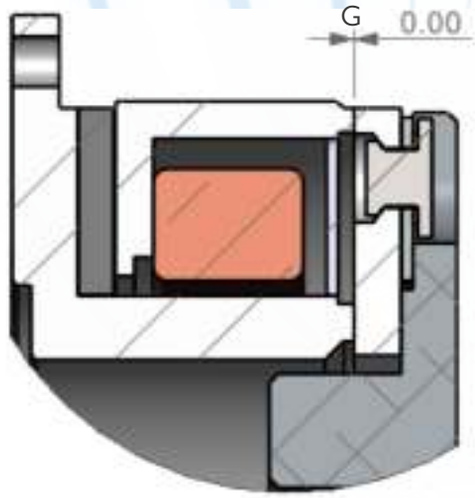
1. Armature hub shoulder inside
2. Circlip / retaining ring
3. Motor shaft
4. Steel key
5. Brake body
6. Motor flange
7. Mounting screws

The armature disks can be ordered in the version C.L., C.C. or C.R. The base of the armature disk is a diaphragm spring (C.L. version) or, optionally, different designs of the shaft mount. Adjustments are possible.

4.1 Checking the air gap

As a result of wear through operation, the air gap will increase. To ensure proper functionality the air gap (G) needs to be checked at regular intervals.
Use a feeler guage to check the air gap.





5.0 Electrical connection

AC power supply
A rectifier must be used when connecting the brake directly to an AC power source. The opening and closing times directly relates to the switching type (DC or AC switching).

Full-wave bridge rectification
Bridge rectifiers provide voltage with minimum residual ripple which can avoid brake noise (humming) even if the brakes used are small. With full-wave bridge rectification, the field coil voltage is lowered to a factor of 0.89 of the rectifier input voltage (i.e 24Vac x 0.89 = 21.4Vdc). We do not recommend half-wave rectification for the permanent magnet brakes.

AC side switching
AC side switching is the simplest way to connect the rectifier in parallel with the motor connecting cables, e.g. wiring within the motor terminal box. However, it is possible that the motor may act as a generator after AC voltage has been withdrawn which lengthens the coupling / closing times by factor 5 or over. The disconnection and opening times remain constant. Alternatively, the rectifier can be connected directly to two phases of the supply voltage for AC side switching of the brake leading to longer coupling or closing times in comparison to the DC side switching.

DC side switching
DC side brake switching, an auxiliary switch may be used to interrupt the power supply on the DC side, this is the fastest form of switching.

IMPORTANT WARNING
The brake is a direct current operated system. Permanent voltage variations on the power source of the electromagnetic brake must be limited to +5/-10% of the rated voltage for correct operation.

When connecting the brake check the following:

- Are the connecting cables suitable for the application (i.e. Voltage and power current)?

- Are the connecting cables secured adequately?
- Are the connecting cables the right length for application?
- Does the application require any strain relief to prevent cables from being damaged?
- Is an earth connection (ground) required for this application?
- Is it free from oil, dirt or moisture in the terminal box?
- Do all electrical connections have adequate electrical insulation?

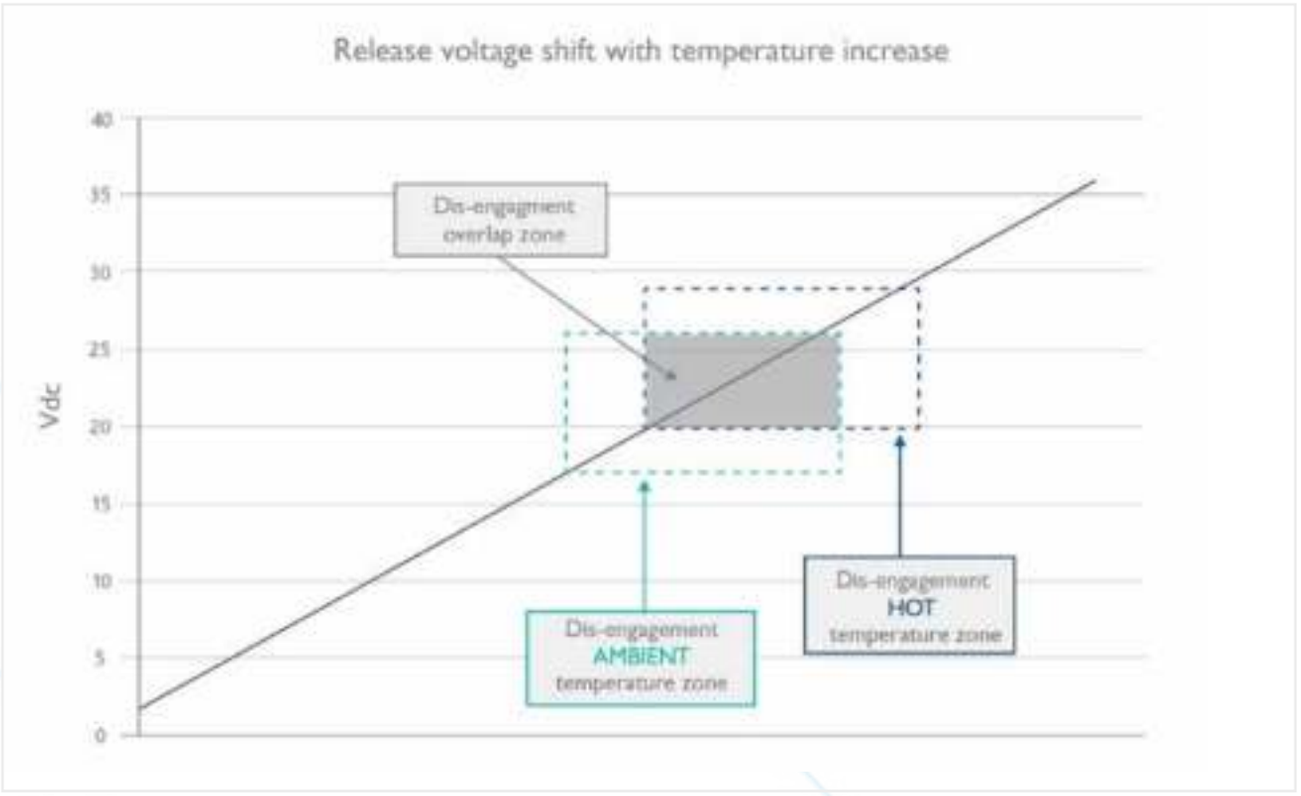
5.1 Electrical operation

The permanent magnet brake is intended to be supplied from a DC power source, by connecting the lead wires in the correct polarity to the power supply. The power supply must be suitable for the brakes consumed power as indicated on the brake markings. Connection to an AC power source is only possible by means of a full-wave bridge or half-wave rectifier with appropriate voltage reduction and regulation.

The resistance of a metal conductor is affected by temperature (higher temperature equals higher resistance, and vice-versa), and since current is inversely proportional to resistance, a change in temperature will affect the amount of current that is produced.

If electrical power fails, an unintentional switching off of the voltage, the brake "falls" into the safe state (brakes) and holds the load. At the same time, the function as a parking brake is used where long holding times and downtimes lead to energy savings, this means that when the power is removed from the unit, the rotating armature or drive hub engages with the brake field.

The operating temperature range of both permanent magnet brakes and spring-loaded brakes must be observed! Voltage tolerances that influence the electrical neutralization behavior of the PE magnetic field & reduction of the electromagnetic force through self-heating of the coil, in combination with the force / temperature behavior of the permanent magnets, result in an intersection of the functional tolerance and require specific expert knowledge to ensure permanent process reliability.



As shown in the table above; when voltage / current is applied, the brake will disengage. For consistant operation, a constant current supply should be used. If this fluxtuates then the coil resistance will increse as the temperature increases. This will effect the dis-engagement of the brake. Therefore, the dis-engagement window of the brake will be different at an ambient temperature to a higher temperature.

SG Transmission permanent magnet brakes are tested at an ambient temperature of 20°C when hot to optimise the dis-engagement window. To eliminate the effects of temperature a constant current power source could be employed.

5.2 Back EMF

Electromagnetic devices, particularly large ones, show the phenomenon of reverse polarity voltage transients (or back EMF) when the operating current is disconnected.

Energy can be dissipated by placing a voltage dependant resistor (VDR) or diode with a Zener diode across the field coil.

The situation is aggravated with semiconductor switches as the switching times are very short and semiconductor devices are very sensitive to voltage transient.

1. Diode with Zener Diode (fig.1)

The diode is only effective as long as the value of the spike to be dissipated is higher than the nominal voltage of the zener-diode. The additional diode ensures that no current flows via the zener-diode in the conducting direction.

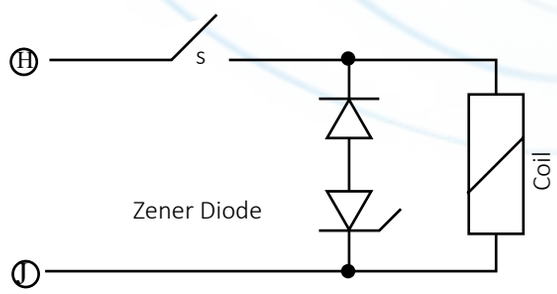


Fig1. Diode with the zener diode

Advantages
- Very short release time
- Small transient voltage
- Defined transient voltage

Disadvantages
- For small electrical power only

2. Varistor method (fig.2) (VDR)

The varistor (VDR) has a high resistance at nominal voltage. Only a very small current flows through the varistor while the coil is energised. However, when the voltage transient occurs the resistance of the varistor drops considerably, thus damping the peak voltage.

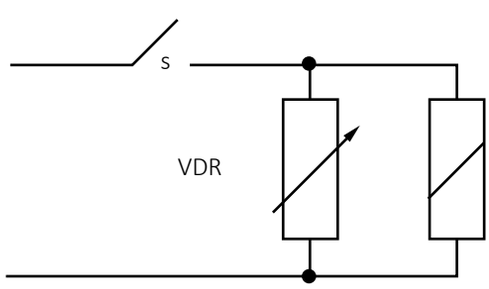


Fig2. Varistor method

Advantages
- Low cost
- Small delay in armature movement

Disadvantages
- Not suited to all electrical power
- Not qualified for high switching frequences

6.0 Set up and start-up

Brake Surfaces Warning

The temperature of the brake surface may become hot during use and display a significant rise above ambient, so sensitive electrical components should not be fixed directly to these surfaces. Accidental contact with these hot surfaces must be prevented through suitable protections such as hand guards.
Rotation of the motor during set up should only be made when the brake is electrically disengaged (power on).

High Voltage Tests Warning
This product has already been tested for electrical insulation (high voltage fault test) subsequent retesting may result in damage to the field coil and / or integrated electronic components where fitted.

Check connections in accordance with the specifications provided on the brake marking as operation outside the specified supply voltage limits may cause permanent damage to the brake which may not be evident immediately.

DC side brake switching without a protective circuit may cause damage to electronic rectifiers and accessories, switching contacts and to the field coil.

6.1 Maintenance - Checks and service

Warning! If inspection and maintenance work is carried out, make sure;

- Is the motor secured against accidental or unintentional start-up?
- Does the motor shaft have no load torque acting upon it?
- Are the friction surfaces free of grease and oil? (NB: An oily or greasy friction disc cannot be cleaned)

6.2 Maintenance - Refreshing the brake surface

If the brake is used as a “holding brake”, without any dynamic load, it is possible that the static torque of the brake may drop over time. To correct static torque, the brake friction surfaces will need refreshing, (also known as run-in, or burnishing). This operation should be carried out as required, however, it is recommended that it should be part of a monthly maintenance cycle.

Brake size	03	04	05	06	08	09	10	11	12	16
Duty	50% - 0.5 seconds engaged / 0.5 seconds released									
Cycles	5	5	5	5	5	5	3	3	3	3
Speed (RPM)	200	200	150	100	75	75	50	50	25	25

6.3 Emissions

As the brake operates, a gradual heating of the field coil will cause the temperature of the housing to increase above ambient.

CAUTION: This may lead to burns if the hot surfaces are touched.

Reduce the risk of injury from accidental contact with suitable protective equipment such as covers and hand guards.

7.0 Compliance and quality

SG Transmission is committed to creating a safe environment for all of our employees. We continually invest in people, processes and equipment to ensure efficiency and maintain a clear focus on continuous improvement in lean and efficient cellular manufacturing.

Our management systems and processes have been developed and approved to the following standards:

ISO 9001:2015, ISO 14001:2015 and ISO 45001:2018

7.1 Transport / Delivery Condition

Permanent magnet brake is delivered ready for mounting as a loose item and has been verified to achieve the rated torque (burnishing as required). A brief burnishing process is completed at SG Transmission's factory before shipment.
Please note the rated air gap is set during the manufacturing process.
Please check the brake for any transport related damage as soon as you have received the delivery. Immediately report transport damages to the transport company and the manufacturer.
A re-burnishing process after mounting or in defined intervalls could be necessary, according to manufacturer instruction, depending on the mounting process and the conditions of use.
The manufacture does not take responsibility for incorrect assembled units.

7.2 Storage

Store the brake in a dry, dust-free and vibration-proof environment. Please contact manufacturer for advice if you plan for long term storage.
Ambient Tempaerature: -25 to +55 C
Humidity: <50% without condensation

7.3 Use of Brakes

The brakes must be only used as instructed and are detailed in the 'operating instructions'. They must only be used for their intended use and to be incorporated into electric motors for use on industrial plant.

- DO NOT operate in potentially explosive or firedamp environments.
- DO NOT exceed the rated power limits specified.
- DO NOT exceed the rated speeds.

This product is custom designed therefore assembly is controlled in the final product.
Particular attention must be paid to the following points:

1. Keep grease and oil away from the friction surface (use only sealed bearings).
2. The armature disks should be cleaned thoroughly prior to mounting. Don’t apply oil-based solvents to the friction surface.
3. The armature disk must be free to move axially across the air gap. It is fitted with a circular diaphragm spring on the reverse side to allow it to move.
4. For armatures without a hub, the customer must provide clearing holes for the bolt and rivet heads in the counterpart.
5. The fastening screws of the armature without a hub must be secured (e.g. retaining washers).

Ideally the units should be controlled by a constant current power supply, particularly in applications where the environmental temperature can be very hot or cold. However, in most applications the use of a controlled voltage source is sufficient.

Please note that the values of this brochure are only valid with official written confirmation.
Design is subject to change.
Components are designed, manufactured and tested in accordance with the requirements of DIN VDE 0580:2011. Please be advised that in set-up, operation and maintenance of the component the operating instructions must be observed.
Additional information can be found in the technical data, drawings and operating instructions.

8.0 Troubleshooting

Here is a list of possible faults and how to correct the problems.

THE BRAKE FAILS TO RELEASE

Problem	Action
No voltage	Are there faults in the power supply connection?
Low voltage applied to field coil	Correct fault if found with the supply voltage of the field coil
Field coil damaged	The resistance of the field coil should be checked and a new brake should be installed if necessary
Defect in power supply connection	The power supply should be checked and the defect corrected as required

DELAY IN BRAKE RELEASE

Problem	Action
Low voltage to field coil	Correct the fault if the supply voltage is too low
Airgap too small	Replace the sub-assembly

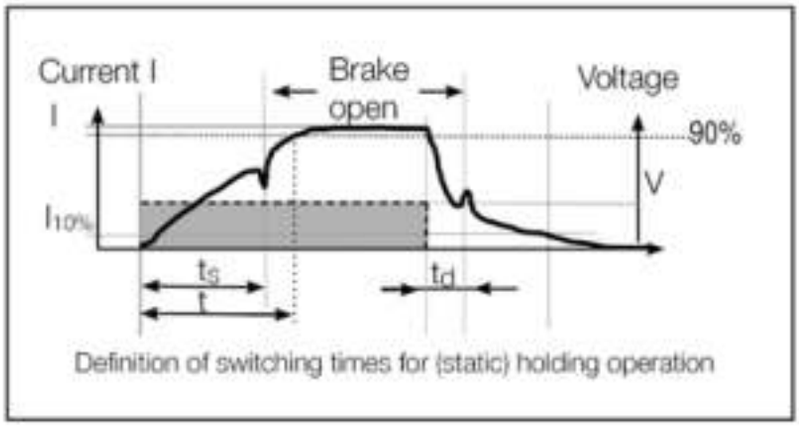
BRAKE FAILS TO ENGAGE

Problem	Action
Voltage still applied in unpowered condition	Is residual voltage still being applied, correct or replace switch
Airgap too big	Replace the sub-assembly

BRAKE TORQUE TOO LOW

Problem	Action
Friction surface greasy, oily or dirty	Install a new brake
Air gap too large- If too large	Install a new brake

Switching times using static systems (holding operation), the switching times can also be determined on the basis of the current (see image below) instead of using the DIN VDE 0580 definition.



Definition of switching times for (static) holding operation

9.0 Definitions

Rated torque	The rated torque is the minimum value the brake is designed to provide at the point of slip
Residual torque	Remaining torque after brake has been released
Switching work	Heat generated by friction inside the brake as a result of the switching operation
Coil ON time	Time between power on and power off
Coil OFF time	Time between power off and power on
Total cycle time	Coil ON time + coil OFF time
Duty Cycle	Percentage relationship of coil ON time to total cycle time
Switching operation	One complete switching on and off operation
Switching frequency	Number of regular switching on and off operation
Operating condition at operating temperature	The condition at which the steady state temperature is reached. The operating temperature corresponds to the over temperature according to DIN VDE 0580 plus the ambient temperature. Unless otherwise specified, the ambient temperature is 35°C
Temperature rise	Difference between the temperature of the electromagnetic device or a part thereof and the ambient temperature
Limit temperatures of field coil insulating materials	In accordance with DIN VDE 0580. The individual insulating materials are classified by insulation classes to DIN IEC 60085
Rated voltage	Supply voltage specified by the manufacturer for voltage windings to identify the device or component
Rated current	Amperage determined by the manufacturer for the specified operating conditions. Unless other specified, the rated current refers to the rated voltage, 20°C winding temperature and to the rated frequency for a given operating mode of voltage windings
Rated power	Power value to identify the device or component
Rated power at 20°C winding temperature	Determined from the rated current of voltage-controlled devices and components and the R_{20} resistance at 20°C winding temperature

Opening time	Time it takes for the brake to open mechanically
Closing time	Time it takes for the brake to close mechanically
Activation time	Time it takes for the brake to close mechanically and for the full holding torque to be reached almost completely
Power	Rated power of the brake at 20°C coil temperature
Release voltage	Voltage at which the brake opens
Re-engagement voltage	Voltage at which the brake closes at 20°C
Holding voltage	Voltage at which the brake will remain open at 20°C

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BRITISH ENGINES

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