



SG Transmission

ELECTROMAGNETIC CLUTCH AND BRAKE SOLUTIONS



Permanent Magnet Brakes

Fail-safe, zero backlash permanent magnet power-off brakes.

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.

History

SG Transmission (SGT) has designed, manufactured and developed electromagnetic clutches, brakes and holding magnets since 1972 in the north east of England.

The company's Bishop Auckland manufacturing facilities were purpose built to meet the existing and future capacity demands of the business and the capability for small or large volume orders.

In 2000 SG Transmission joined the British Engines Group, increasing access to a wealth of experience, services and expanding our global network.

Experience

SG Transmission's experienced in-house design team work alongside customers to develop solutions to meet specific holding forces, space requirements or develop new innovative solutions. The team provide a full project management service from design, manufacture and test. With a commitment to innovation, our customised design service delivers the best solution to our global customer base.

Quality

A strong focus is placed on process measurement and control using quality management systems. By placing a high importance on continuous improvement, we exceed our customer's quality expectations in the most highly demanding market places.

SGT hold internationally recognised certificates such as; BS EN ISO 9001, BN EN ISO 45001 and BS EN ISO 14001.

The company continues to invest in the latest CNC machinery, automation and testing facilities and has a clear focus on continuous improvement in lean cellular manufacturing.

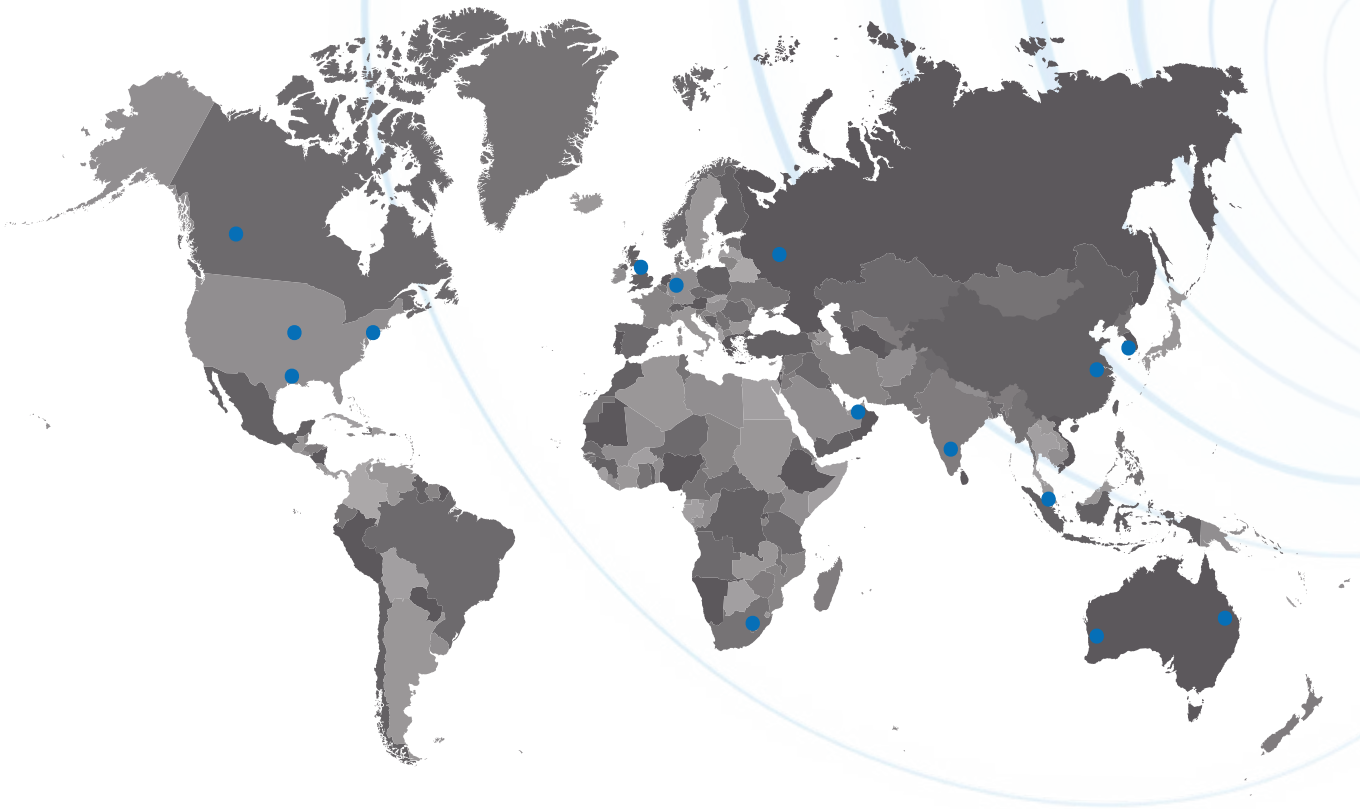
Our Network

SG Transmission is part of the British Engines Group, based in the north east of England. Within the group, there are 8 businesses which employ over 1,200 people across a network of offices in 16 countries including; America, Australia, South Africa, Singapore, Russia, India and throughout Europe.

SGT benefit from the core services and people orientated culture of our parent company.

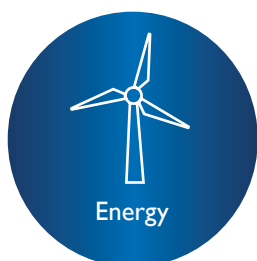
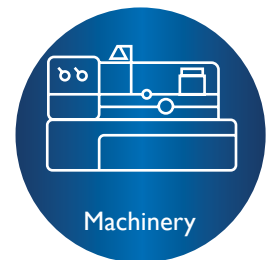
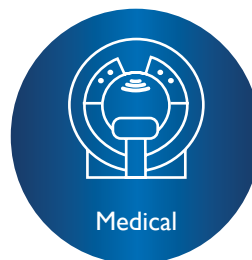
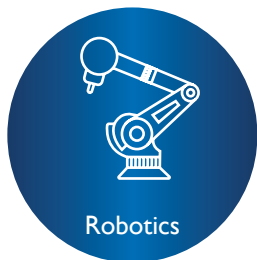


Worldwide network



Sectors we work in

Our electromagnetic clutch and brake solutions are used in pioneering technology around the world. SGTransmission understand that across all the sectors we supply, safety, accuracy, performance and reliability is essential. SGT's 50 years of engineering expertise, allows us to work closely with customers to understand the unique needs of each application. Ensuring that we provide the best electromagnetic solutions for power transmission and motion control applications.



Permanent magnet brakes

The permanent magnet brakes from SG Transmission offer high power density, accuracy and durability within a compact model. Available as a standard option, customised to suit a specific installation position or designed as a completely bespoke solution, permanent magnet brakes are manufactured with performance at the forefront.

These 'power-off' devices are designed so that when the power is removed from the unit, the magnetic energy is channelled and controlled to give the required braking effect. When the power is returned to the brake coil, the armature plate is released allowing free movement.

Features

- Sizes ranging from 18mm, 0.05Nm - 250mm, 360Nm
- Fail safe in the event of power failure
- From ultra flat to in-built styles (with housing)
- High torque versions available (specific / multipole)
- Horizontal and vertical mounting
- Customisable armature plates
- Optimised size / power ratio
- Specific weight requests
- High holding force
- UK Manufactured

Due to the way the permanent magnet brake functions, they are mostly used as safety brakes or fail-safe brakes (emergency stop / emergency off).

Permanent magnet brakes are free of play, which means an increased level of safety and accuracy in use. When compared to conventional fail-safe brakes (spring-applied brakes), permanent magnet brakes have a linear movement generated by the deformation of a diaphragm spring, spring applied brakes have a rotary movement between mating parts.

A multi-pole version of the permanent magnet brake provides increased torque in the same size casing.

The torque is boosted by doubling the number of working magnetic poles and this technology can also be applied to clutches and power-on brakes.

Permanent magnet brakes are ideal for use in robotics, intralogistics, access control systems, medical technology and general servo motor applications. The simple structure, the mass (weight) / performance ratio and the abrasion resistance, classify this type of brake.

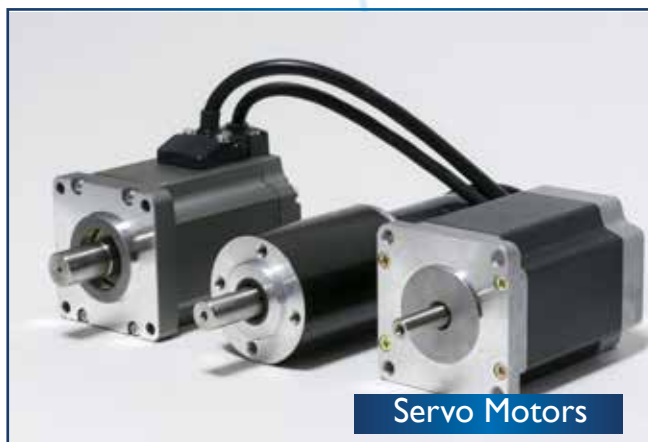


General information

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.

Applications

Permanent magnet brakes from SG Transmission are usually the best option for demanding, precise and accurate applications. Permanent magnet brakes can be used in fail-safe applications to automatically stop the motion when the electrical power fails.



Controlling movement, speed and power, brake reliability is essential within motor and technology.



Precise, zero backlash braking for high quality medical technology.



Safety is paramount with single and multi-axis technology; safe braking protects people and ensures smooth production processes.



Supporting intralogistics to improve the accurate and reliable transport of goods.



Ensuring the safe operation of access control and security applications.



Accurate and reliable braking for precise movement and holding in AGV's and AMR's.



Permanent Magnet Brake

TYPE 62

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.

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

Key applications

- Security / fire access gates and doors
- X-ray tables and medical applications
- Robots and cobots
- Warehouse logistics
- Servo motors

Technical specification

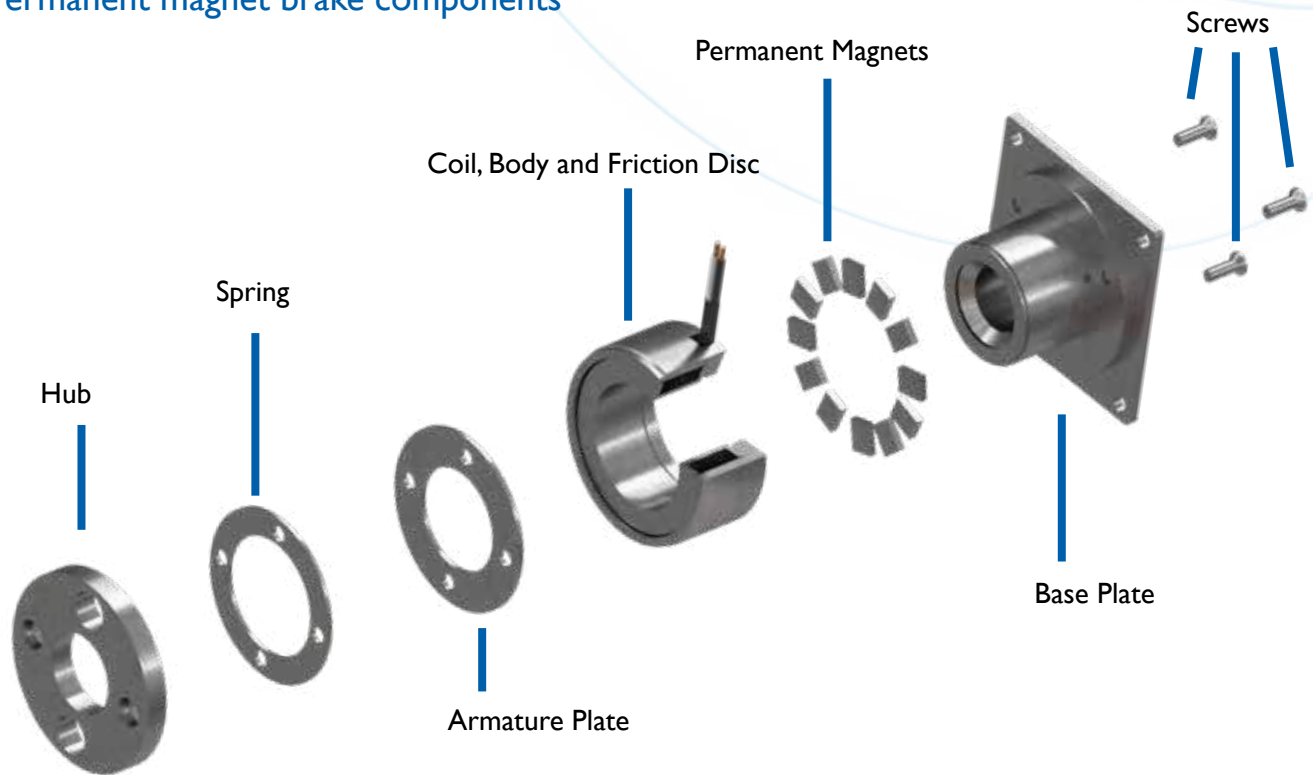
Voltage	24v DC *
Voltage Tolerance	+5 / -10%
Duty cycle	100% ED *
Ambient temp.	-5 to +120°C *
Humidity	20 to 70% without condensation
Protection Class	Standard IP00
Standard finish	Bright zinc
Insulation	Class F
Keyway	DIN6885/I
Classification	Holding brake with emergency stop capability

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

Permanent magnet brake 360°

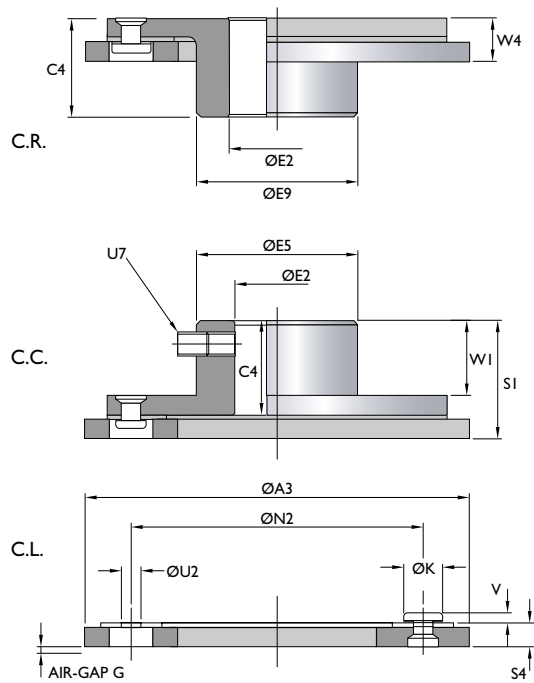


Permanent magnet brake components

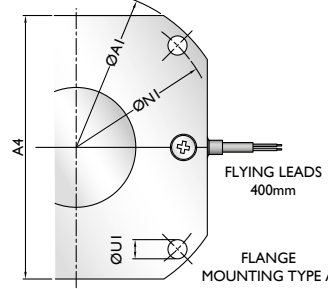


Technical data

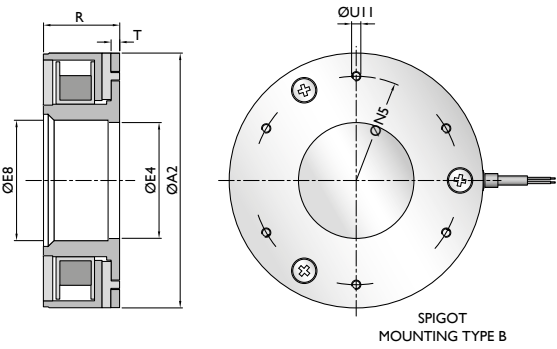
Armature / Hub mounting options



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	Times					
	Torque (Nm)	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

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	NI	N2	N5	R	SI	S4	T	UI	U2	U7	UI1	V	WI	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	NI	N2	N5	R	SI	S4	T	UI	U2	U7	UI1	V	WI	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	*	*

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.

Product Numbering System



* 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 commissioned and confirmed for critical applications.

Permanent magnet brake

Brake design

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 multiple 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.

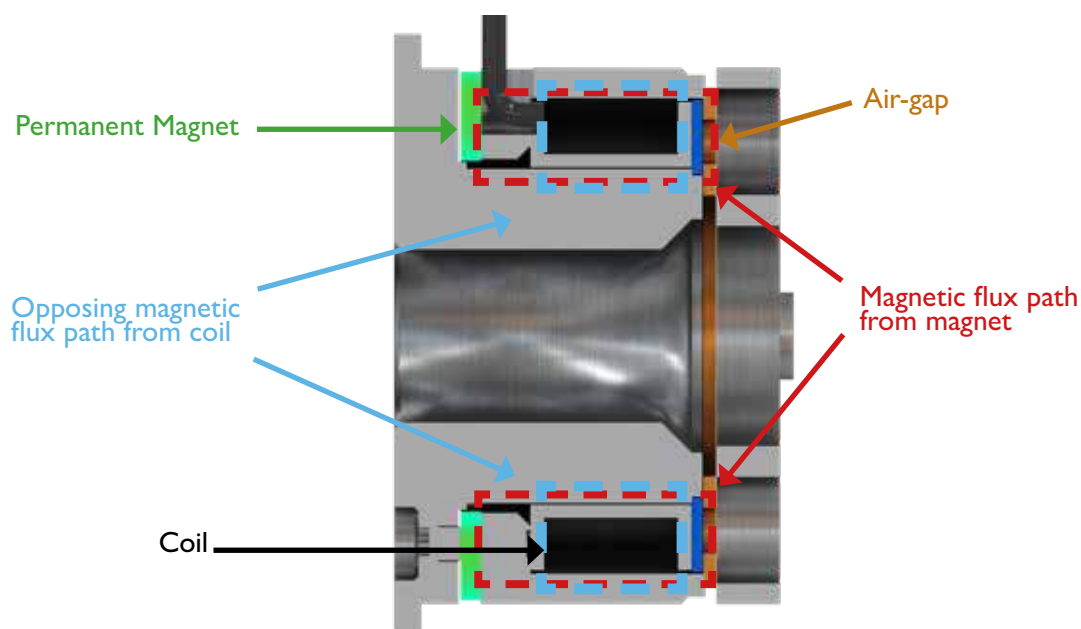
Brake Operation

Brakes are engaged magnetically and disengaged electrically.

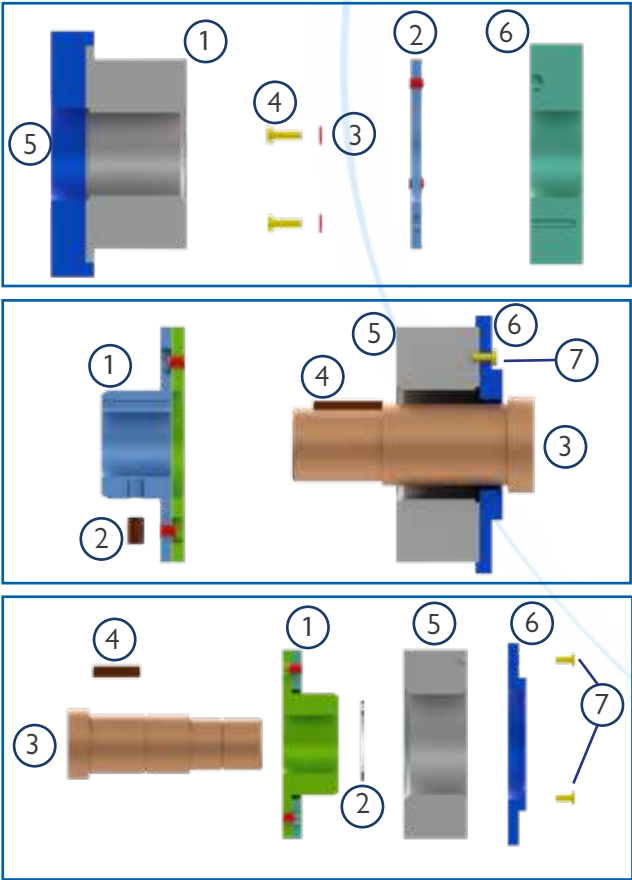
When power is removed the internal coil is de-energised, the armature disk is attracted across the air-gap and onto the pole face of the brake magnet, through the action of the internal permanent magnet field. In a de-energized state a frictionally engaged and virtually backlash-free connection is created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



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

Air gap

The mean distance between the brake body and the amature plate. The air gap size can be determined by profile shape, roughness and non-magnetic substances such as dust and paint.

Insulation class

The maximum temperature used during manufacture, insulation classes are defined according to IEC 60085.

Class	Maximum permitted limit temperature
Y	95°C
A	105°C
E	120°C
B	130°C
F	155°C
H	180°C

Demagnetisation

The decreasing of remnant magnetic field, often through polarity reversal with decreasing amplitude.

Duty cycle ED

The value achieved by calculating the time and total cycle duration as a percentage (% ED). Typically electromagnetic brakes are designed for a 100% ED duty cycle.

Protection class

Designates the kind of shielding of the device against outer influences.



Code no. 1	Protection level
0	No protection
1	Protection against large foreign substances
2	Protection against medium sized foreign substances
3	Protection against small foreign substances
4	Protection against grain-shaped foreign substances
5	Protection against dust deposit
6	Protection against dust penetration

Code no. 2	Protection level
0	No protection
1	Protection against vertical dripping water
2	Protection against dripping water at an angle
3	Protection against spray water
4	Protection against splashing water
5	Protection against hose water
6	Protection against flooding
7	Protection against immersion
8	Protection against submersion

Permanent magnet brake styles and bespoke options

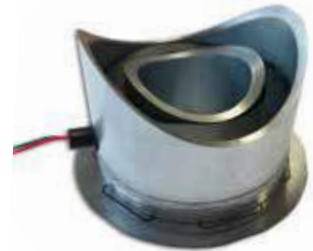
The permanent magnet brake is available in flange or spigot mounting options thus, making it easier to incorporate into existing designs.

Due to its precision, it is suited to high safety applications in a huge variety of sectors..

- Customisable armature plates: standard, external shaft adapted, internal shaft adapted



- Bespoke sub-assembly available. From ultra flat to in-built style (with housing)



- Special voltages / forces / mountings available on request



Permanent magnet brakes can be used in fail-safe applications to automatically stop motion when the electrical power fails. Permanent magnet brakes may be considered as virtually backlash free as the diaphragm spring and fasteners are torsionally rigid, where spring applied brakes tend to utilise splines or hexagonal drive elements which need to slide, so inherently have internal clearances.

Examples of Type 62 bespoke options

Brake Size	Part No.	Diameter	BORE	All Length	Torque	Armature Style	Classification
00	PEB018-14	18	4	14	0.05	CC	Miniature High Performance
02	PEB023-15	23	4	14.5	0.15	CC	Miniature High Performance
03	PEB028-18	28.5	9	18	0.8	CC	Servo Performance Industry
03	PEB032-19	32	9.6	19	0.7	CC	Servo Performance
04	PEB040-23	40	13	23	2.2	CL	Serial Standard
04	PEB041-23	41	19	22.7	2.4	CC	Servo Performance
04	PEB048-12	47.5	17.3	11.8	0.3	CL	Slim Performance
05	PEB052-29	51.5	28.5	28.5	4.5	CR	Servo Performance Industry
05	PEB053-12	53	11.5	11.5	0.6	CR	Slim Performance
05	PEB053-21	53	20.8	20.8	2.5	CR	Servo Performance
05	PEB056-13	56	12.5	12.5	2.3	CC	Slim Performance Joint
05	PEB056-19	56	18.6	18.6	7	CC	Servo Performance Ultra Torque
06	PEB062-21	61.9	32	21	2.4	CL	Slim Performance Joint
06	PEB063-27	63	32	26.6	9	CR	Serial Standard
06	PEB067-28	67	35	27.65	12	CC	Serial Standard
08	PEB080-30	80	38	29.9	25	CL	Serial Standard
08	PEB080-30	80	38	29.9	18	CL	Multipole
08	PEB081-32	80.8	38	32.05	30	CR	Servo Performance Industry
08	PEB084-19	84	53	18.4	1.5	CL	Slim Performance Joint
08	PEB084-34	84	53	33.5	12	CL	Slim Performance Joint
09	PEB090-27	90	40	26.7	22	CC	Serial Standard Industry
10	PEB100-34	100	48.5	33.9	37	CL	Multipole
10	PEB100-33	100	48.5	32.9	55	CL	Servo Performance
11	PEB110-33	110	50	33.25	30	CR	Serial Standard Industry
11	PEB112-35	111.5	56	34.6	45	CR	Servo Performance Industry
12	PEB125-38	125	62	37.8	70	CC	Serial Standard Industry
12	PEB125-32	125	62	32	80	CR	Servo Performance Industry
12	PEB126-30	126	62	30	70	CL	Serial Standard Industry
14	PEB140-37	140	72	37.2	50	CR	Serial Standard Industry
14	PEB140-44	140	72	44	80	CL	Serial Standard Industry
16	PEB162-41	162	74	41.2	160	CR	Servo Performance Industry
18	PEB178-34	178	109	34	40	CL	Slim Performance Joint
20	PEB200-45	200	100	44.6	200	CL	Extra Large
25	PEB250-35	250	125	35	360	CR	Extra Large



For more information, or to speak to our expert engineering team, call us at +44 (0)1388 770 360 or send an email to enquiries@sgtransmission.com

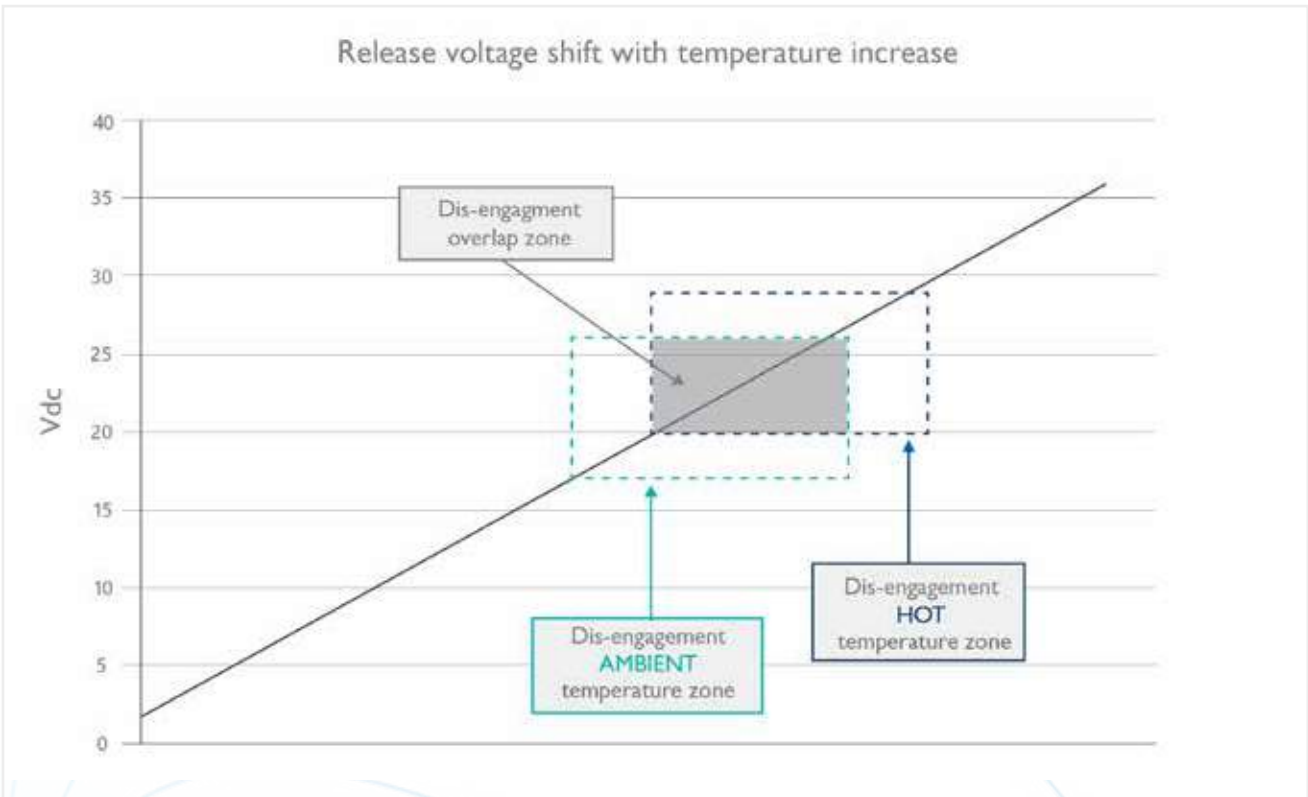
Electrical connection and operation

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 constant operation, a constant current supply should be used. If this fluctuates then the coil resistance will increase as the temperature increases. This will affect 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.

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



Permanent magnet brake information

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.

A re-burnishing process after mounting or in defined intervals 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.

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 Temperature: -25 to +55 C

Humidity: <50% without condensation

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.



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