SG Transmission

ELECTROMAGNETIC CLUTCH AND BRAKE SOLUTIONS

Spring Applied Brakes

Fail-safe, high torque 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.

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.

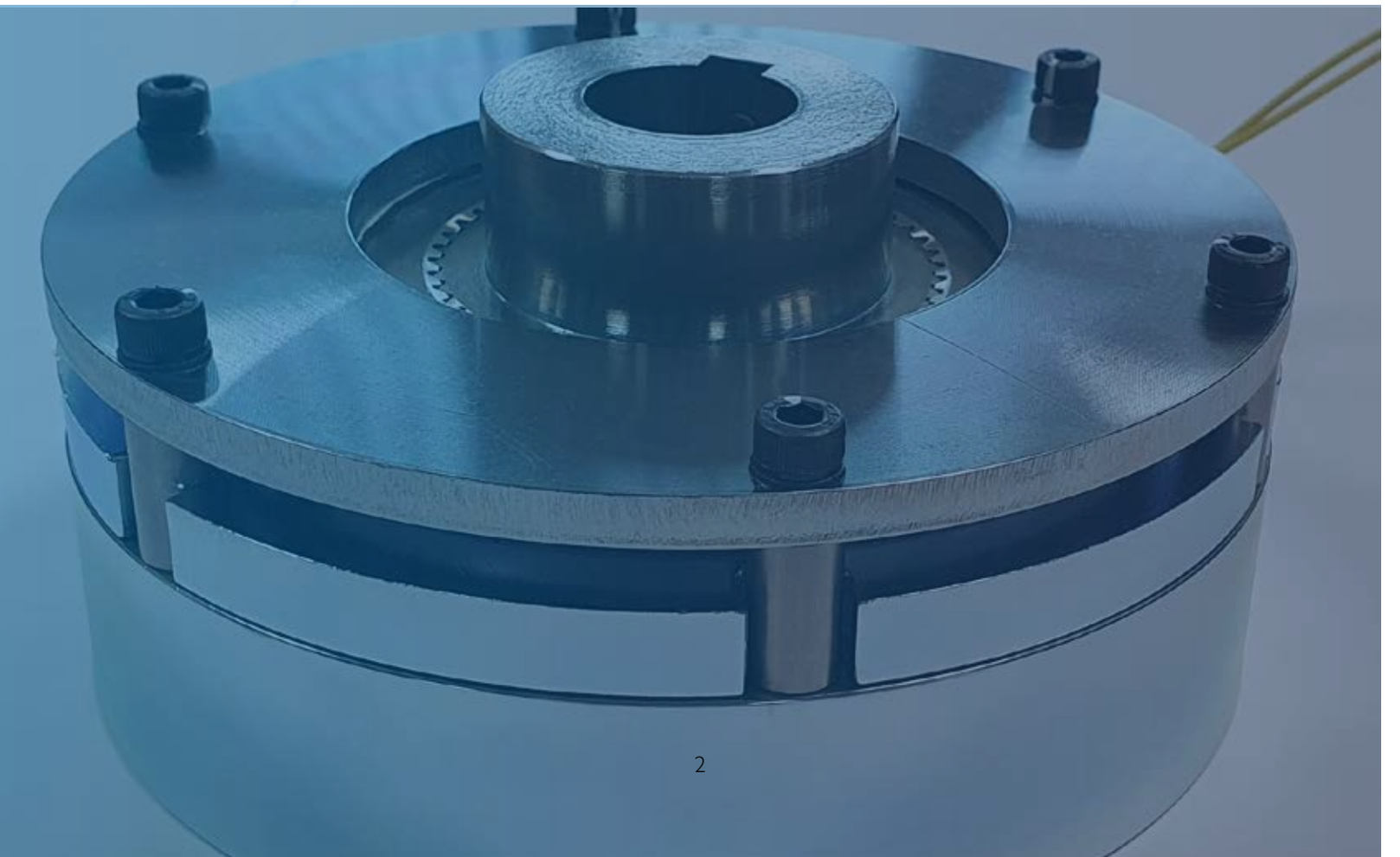
Experience

SG Transmission's experienced in-house design and technical sales 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.

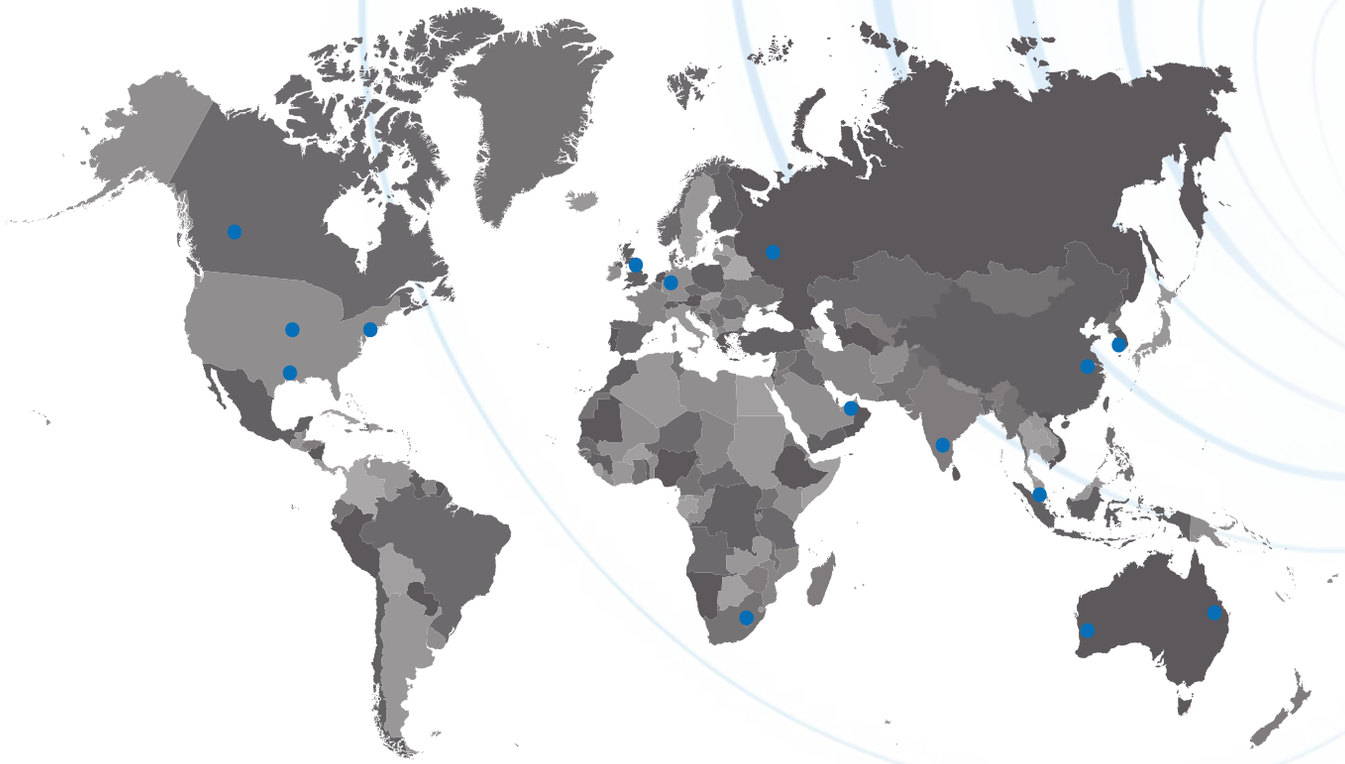
Our Network

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, 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. SG Transmission 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.

Spring applied brakes

Fail-safe, spring applied power off brakes are used in demanding applications. Designed with power off brake engagement, activating the brake when electrical power supply is removed.
The electromagnetic spring applied, power off brake (sometimes known as a safety brake or fail-safe brake) is designed so that when the electrical power supply is removed, the brake engages (power off brake engagement).

The spring applied brake can be designed to be used as a holding brake (parking), or dynamically where an emergency stop functionality is required (E-stop). Available as a standard option, customised to suit a specific installation or designed as a completely bespoke solution, spring applied brakes are manufactured with performance at the forefront.

Features

- Sizes ranging from Ø26mm, 0.15Nm - 270mm, 250Nm
- Fail-safe in the event of power failure
- High torque versions
- Horizontal and vertical mounting
- Low moment of inertia
- Energy saving through power off holding
- High operating speeds
- Precise holding

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

Spring applied brakes have a rotary movement between mating parts, providing an increased level of safety and accuracy when in use. In comparison, permanent magnet brakes which are free of play and have a linear movement generated by the deformation of a diaphragm spring.

There has been a trend towards the use of spring applied brakes in servo motors as these can be used for a static position and with suitably adapted friction linings can also be used as a working brake for highly dynamic emergency stops. Also, there is reduced danger of damaging the lead by the rotating elements, as the friction disc is smaller in diameter than the brake and therefore rotates with the load 'inside'.

Spring applied brakes in servo motors are reliable with load and give excellent wear characteristics; they can be adjusted to meet the specific application requirements and can be supplied with a manual-release option.

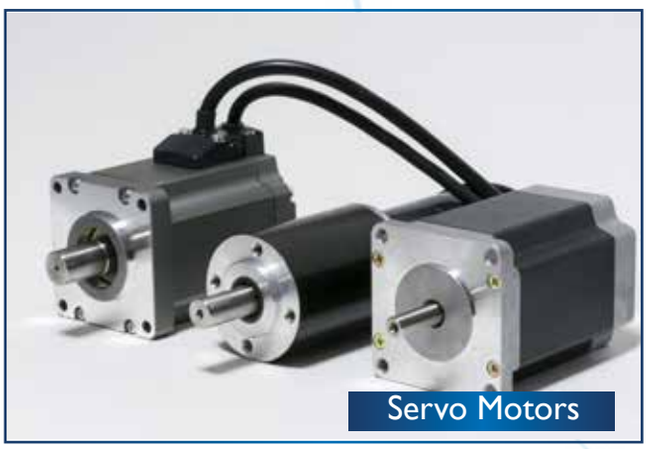
As a combined unit the flexibility of the spring applied brake means it is easy to install. The brakes engage in an unpowered condition and release when power is applied. In this released state, power can actually be reduced to achieve energy savings, helping with operational costs.

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.

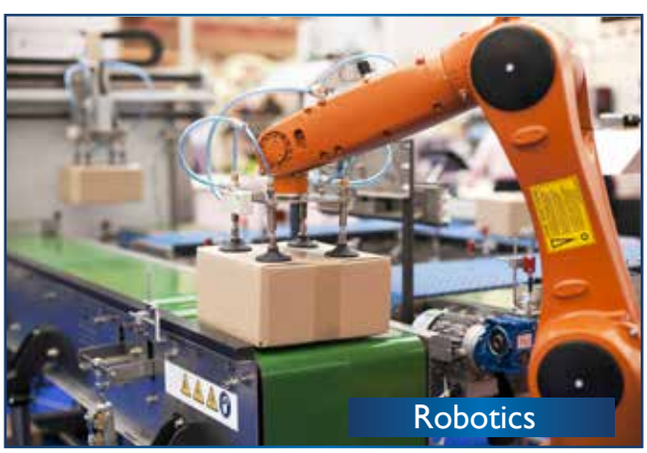
Applications

Spring applied brakes are the best option for demanding, precise and accurate applications such as: automation and robotics, intralogistics, medical technology, general servo motor applications, machinery and renewable energies.
Spring applied 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 braking for high quality medical technology.



Safety is paramount with single and multi-axis robotics. 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.

Spring Applied Brake

TYPE 56

Our spring applied power off brakes are robust and reliable, generally incorporating multiple internal compression springs.
The multiple springs provide an added safety feature, ensuring that the brake will still function should one spring fail prematurely. When power is cut the coil's magnetic field ceases, the springs force an axially moving armature plate forwards to engage and lock the rotating friction disc.
The electromagnetic spring applied brake is ideal for integration into many applications and can be mounted externally or integrated into a motor housing.

Features

- Available in a range of sizes Ø26mm, 0.15Nm - 270mm, 250Nm
- Fail-safe in the event of power failure
- Energy saving through power off holding
- Precise holding
- High braking torque
- Horizontal and vertical mounting
- Manual release versions
- Splined hub / friction disc connection
- High operating speed
- Special voltages / forces / styles available on request

Key applications

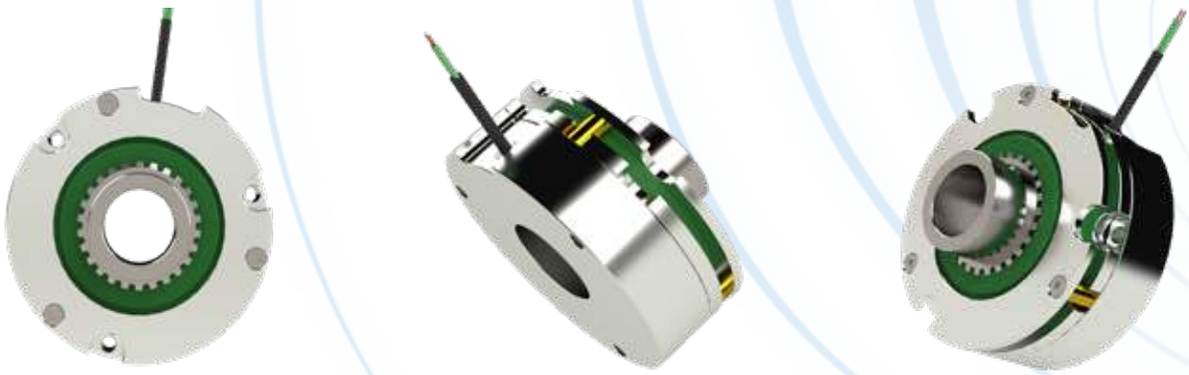
- Servo motors
- Medical treatment technology
- AGV's, AMR's, robots and cobots
- Material handling and industrial vehicles
- Warehouse logistics
- Lifting hoists and crane sytems

Single disc technical specification

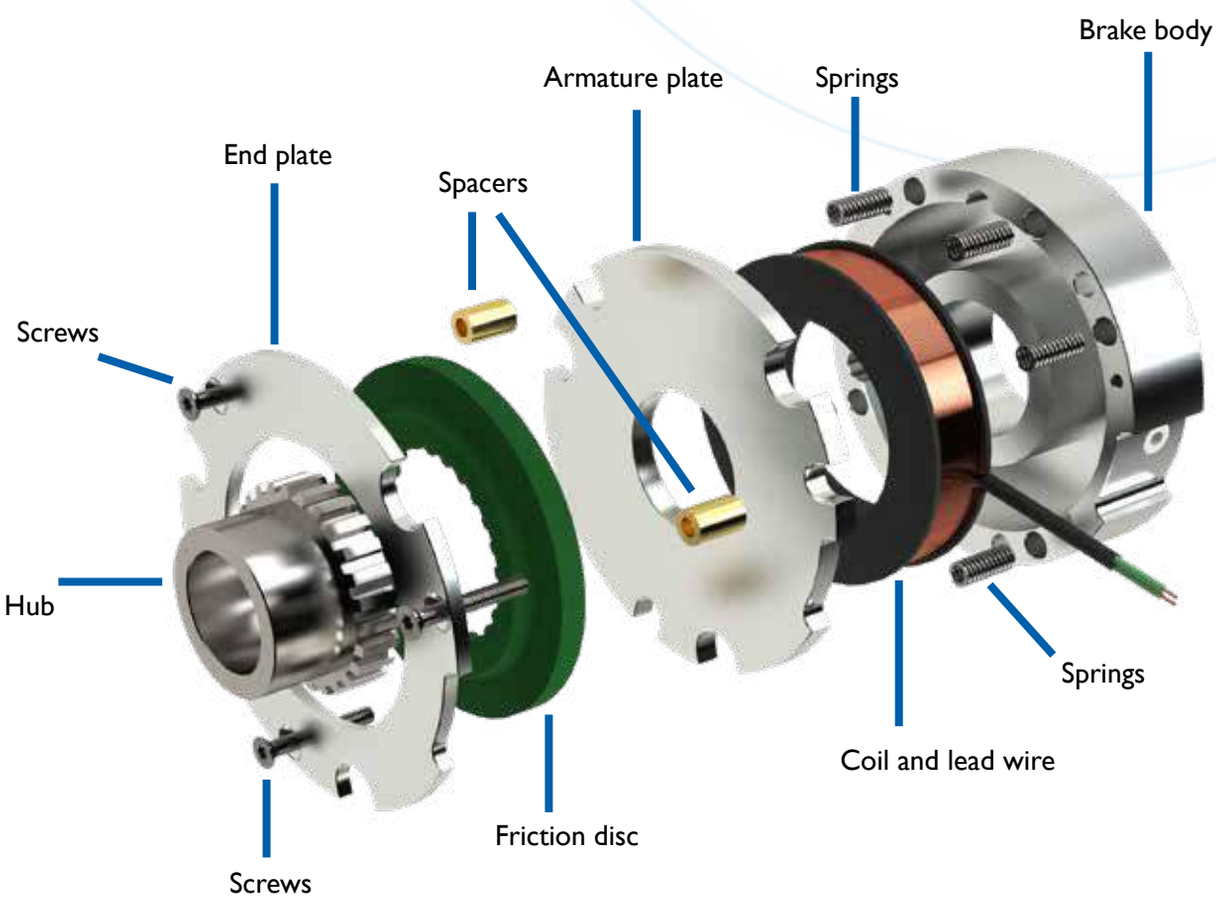
Voltage	24v DC *
Voltage Tolerance	+5 / -10%
Duty cycle	100% ED *
Ambient temp.	-20°C - 120°C *
Humidity	0% to 80% without condensation
Protection Class	Standard IP00
Standard finish	Bright zinc / nickel
Insulation	Class F
Keyway	DIN6885/1
Classification	Holding brake with emergency stop capability

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

Spring applied brake 360°

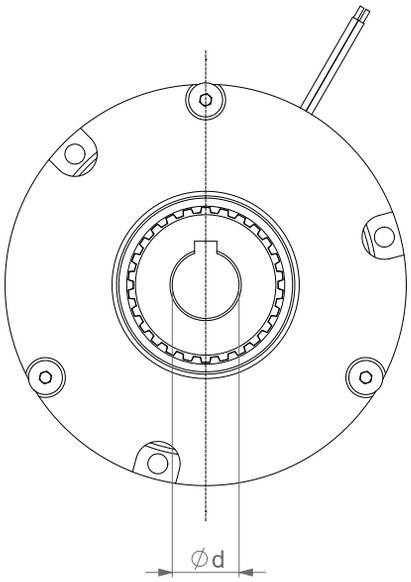


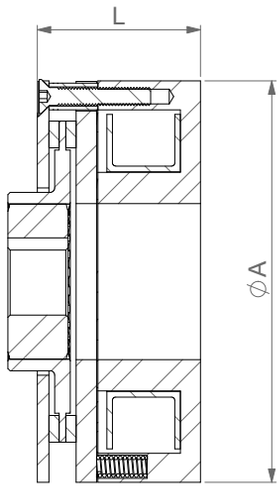
Spring applied brake components



Technical data

Dimensions





Type 56 (standard) technical data

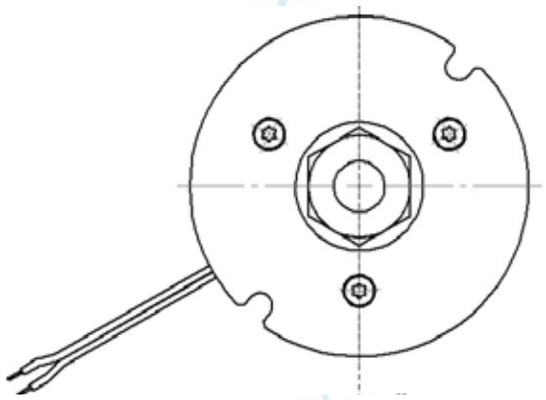
Size	Torque (Nm)**	A Diameter Outside (mm)	L Length (mm)	d Maximum Bore Diameter (mm)	Power (W)	Voltage (V)	Max. Rotational Speed (rpm)	Weight (g)	Switching Times (ms)	
03	0.15	35	19.3	7.5	5.1	12 or 24	8000	250	20	35
04	0.7	42	22.0	15.5	6.9	12 or 24	8000	145	25	35
05	1.5	55	32.1	18.0	10.7	12 or 24	8000	350	25	75
06	4.0	60	32.0	22.0	13.9	12 or 24	8000	420	30	75
07	4.0	75	28.4	26.0	14.9	12 or 24	6000	700	<50	<150
08	10.0	83	38.6	22.0	17.6	12 or 24	5000	750	80	180
10	20.0	106	38.5	29.0	23.0	12 or 24	5000	-	75	135
14	100	140	53.4	40.0	43.2	12 or 24	3000	-	120	250

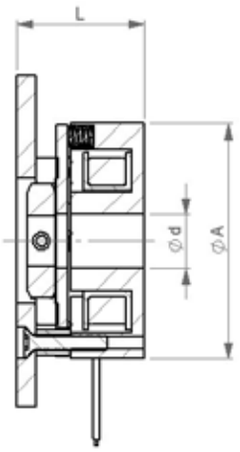
Product numbering system

TYPE SIZE D.C. VOLTAGE BORE

56 - 05 - S.A. BRAKE - 24 - 00

** 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 56 (flange mounted) technical data

Size	Torque (Nm)**	A Diameter Outside (mm)	L Length (mm)	d Maximum Bore Diameter (mm)	Drive Type	Power (W)	Voltage (V)	Max. Rotational Speed (rpm)	Weight (g)	Switching Times (ms)	
03	0.08	32	28	5.6	Square	8.7	12 or 24	8000	90	20	30
04	1.4	42	21.9	15.5	Spline	6.96	12 or 24	8000	145	25	30
04	1.0	45	21	10	Hexagonal	7.5	12 or 24	8000	164	35	35
05	2.0	56	31.1	12	Hexagonal	10.42	12 or 24	6000	325	35	75
10	6.0	103	42.2	Closed	Spline / Pin	25.8	12 or 24	5000	1700	75	150

Hub style options

The spring applied power off brake can be magnet mounted or flange mounted in any orientation and due to its reliability, is suited to safety critical applications in the material handling and medical sectors. They are often used in automation and robotic applications as well as packaging machines, storage systems and in renewable energy.

Hexagonal hub

- Single hole / press fit connection
- With or without set screws
- With or without keyway
- Specific dimensions on request

Spline hub

- Single hole / press fit connection
- With or without set screws
- With or without keyway
- Specific dimensions on request

Hubs can be designed to suit specific spring applied brakes. Hubs are the connecting element between the shaft and the brake, they can be long or short with various hub diameters and keyway designs.

Spring applied brakes

Brake design

The spring applied single-disc brake is designed to be operated dry. The housing of the brake holds the securely fitted field coil and the compression springs. These compression springs press firmly against the armature plate, pushing the friction disc against the end plate. The resistance to rotation achieved between the surfaces of the friction disc, the armature plate and the end plate, results in the braking action.
The air gap is pre-set in the manufacturing process. The friction disc and the hub have a hexagonal / splined connection, making sure the friction disc is driven by the hub when both are in the correct fixed position. This correct position is important to ensure free axial movement.

Our engineering expertise in brake design and high class manufacturing technologies enables us to develop a solution for specific size, voltage, temperature and torque requirements.

Brake operation

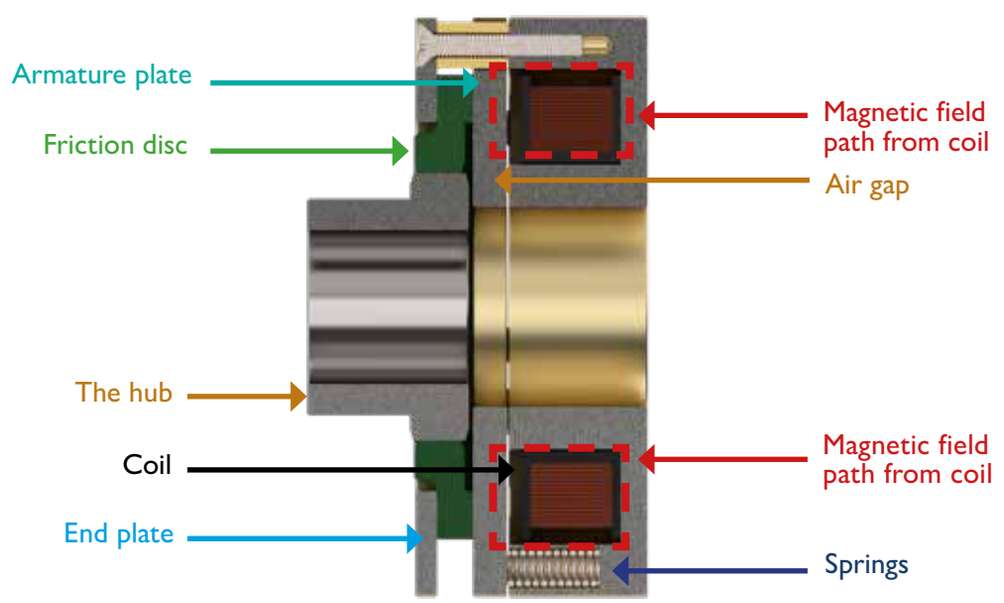
Spring applied brakes use multiple springs, a magnet coil body, armature, friction rotor and end plate. When power is applied to the coil the magnetic force pulls an armature plate away from the friction rotor. The springs in the magnet coil body are compressed and the friction rotor is free to rotate.

The strength produced by an electromagnetic field is used to overcome the braking effect generated by the spring force. The spring applied single-disc brake engages when there is no power and is released when a direct current voltage is applied (the magnetic force generated by the electromagnetic field counter balances the spring force to overcome the spring force, which causes the armature plate to move axially towards the brake housing releasing the friction disc).

When the brake is engaged, the spring force which is produced by the compression springs causes the friction disc to be clamped between the armature and end plate generating the braking action.

The spring applied single-disc brake is a component, mainly used for integration into electric motors.

Spring applied brake operation



Friction options

The electromagnetic spring applied brake is one of our most versatile brakes with a torque range of 0.15Nm to 250Nm. The non-asbestos lining construction of the rotating friction element is available in three different types (depending upon the application and torque required):

1. Mainly static applications – single piece friction disc assembly, with drive interface direct into friction discs. Rubber dust sealing rings may be incorporated to prevent ingress of foreign matter. Drive hubs are supplied with the brakes, complete with bore and keyways to suit the specific application.

2. Mainly semi-dynamic applications – aluminum carriers with double bonded friction discs for increased shear strength and shock loading.

3. Higher strength applications – steel carriers of hardened steel with double bonded friction discs, for more demanding and dynamic applications can be implemented to meet the customers dynamic requirements. Depending on the acceptable level of backlash, some spring applied power off brakes have the option to have either a spline or hexagonal drive ensuring minimal circumferential backlash.

Temperature tolerance

As the spring applied brake does not contain permanent magnetic material, it is more tolerant of high temperatures than the permanent magnet brake. Its temperature range is between –15°C to 120°C. An 'IP' water (or "Ingress Protection") resistant design may also be available for installation into moist environments.

Terminology

Air gap

The mean distance between the brake body and the amature plate. During its manufacture, the air gap is pre-set on the spring applied brake for ease of installation. Where longer term `in-situ` air gap resetting is required, this can be achieved with adjustable spacers, without needing to totally remove the brake from the motor.

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

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.

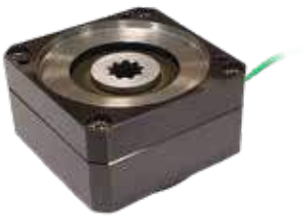
Code no. 1	Protection level
0	No protection
1	Protection against large foreign substances
2	Protection against medium sized foreign substances
3	Protection against small foreign substances
4	Protection against grain-shaped foreign substances
5	Protection against dust deposit
6	Protection against dust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

Spring applied brake styles and bespoke options

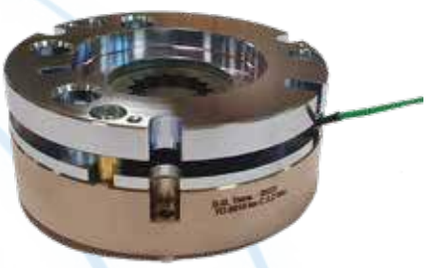
The spring applied brake is available in a variety of bespoke options, making it easier to incorporate into existing designs.
Due to its precision, it is suited to high level safety applications in a huge variety of sectors.

- Customisable magnet or flange mounted. Double disc or single-disc styles.



- Bespoke sub-assembly available. From ultra slimline to integrated spline rotor hubs.

- Extra large diameters / manual release levers. Specially designed to suit the application.



Fail-safe spring applied brakes can be lightweight and slimline in construction with either small / large hexagonal or splined hubs. They can be designed to fit within specific compact applications, have a high performance density and wear resistance.
Spring applied brakes are delivered ready to install with fixed air gaps that tolerate minor bearing backlash and temperature expansions.

Examples of Type 56 bespoke options

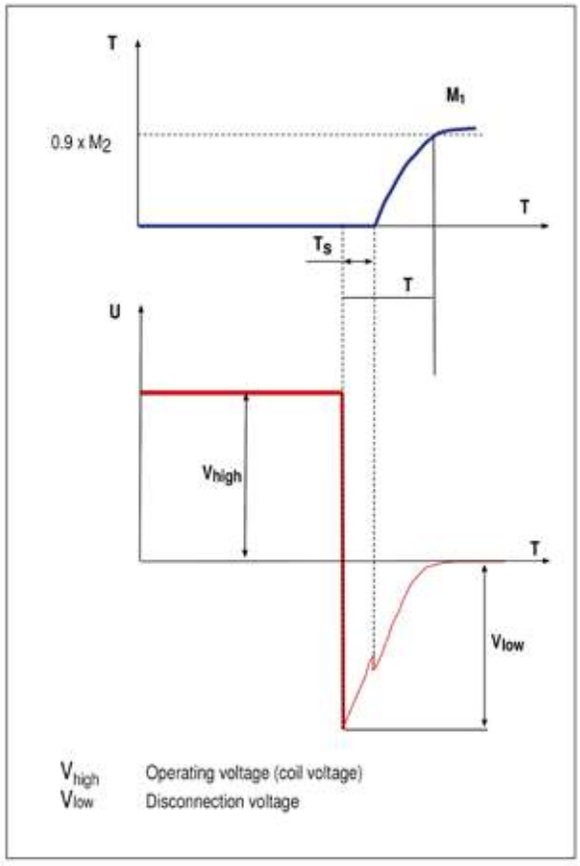
Brake Size	Part No.	Diameter	Bore	All Length	Torque	Classification
01	SAB026-17	26	0	17.35	0.15	Integrated special
03	SAB030-23	30	0	23.2	0.085	Square drive hub
03	SAB038-27	38	13	27	1.2	Compact special
03	SAB039-30	39	8.3	30	0.3	Dynamic
04	SAB042-21	42	15.5	21.9	1.4	Flanged special features
04	SAB045-21	45	10	21	1.0	Slimline
04	SAB048-30	48	14	30.5	1.3	Special finish
05	SAB056-31-2	56	12	31.1	2	Special
05	SAB056-31-1	56	14	31.1	1	Special
05	SAB058-20	58	15	20 (+2)	1	Slimline
06	SAB060-30	60	22	30.6	4	Servo performance
06	SAB067-24	67	30	24	1.7	AGV
07	SAB075-28	75	26	28.4	4	Low backlash
07	SAB077-37	77	30	37.2	12.2	Servo performance
08	SAB082-44	82	0	44	10	Rotary manual release
08	SAB083-49	83	22.5	49	20	Automation performance
08	SAB083-54	83	18	54.5	50	Double disc
09	SAB093-26	93.5	49	26	12	Slimline double disc
10	SAB102-52	102	0	52.3	12	Rotary manual release
10	SAB110-55	110.5	55	55	67	Servo double disc
12	SAB125-22	125	83	22.5	5+	Slimline
14	SAB140-53	140	40	53.4	100	Slimline
16	SAB157-48	157	0 (50)	48	45	Double disc
16	SAB162-73	162	59	73.8	52	Slimline

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 spring applied single-disc brake is intended to be supplied from a DC power source, by connecting the lead wires 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.
Various rectifier types can be used i.e. full wave and half wave.

Depending on the brake size and torque, voltage ripple due to intermittent power supply may cause humming or incorrect operation. Perfect operation must be ensured by the user or system manufacturer by providing suitable electrical controls.



The peak reverse transient voltage during disconnection, without protective circuit, may reach a very high voltage but only for a period of milliseconds. This could cause permanent damage to the field coil, switching contacts and electronic components.

Please note that sparking may occur on the switch during disconnection so a protective circuit may be appropriate to reduce the current during disconnection and to limit this transient voltage.

Boost

When a product requires cycling at 50 times per minute or more, it is recommended that solid state switching by means of 'boost' is used. A boost voltage of three times the nominal voltage could be applied to the brake for only as long as absolutely necessary to perform the required function, whilst preventing field coil damage.

Pulse-Width Modulation (PWM) control

The power supply to the brake can be controlled by PWM to enhance the operation of the brake. PWM allows control of the voltage supplied to the brake over an extensive input voltage and temperature range or to keep the voltage level constant. This enables temporary electronic over excitation of the brake. This will result in a significant improvement in performace in the pull-in behaviour and disengagement of the brake therefore extending the brakes life. After the selected over excitation time has elapsed, the voltage is reduced to holding voltage by an electronic control. This means the operating temperature of the brake will be significantly reduced, providing substantial energy savings.

For energy savings

Typically PWM control may be an applied (ie. 100% voltage for 250ms then reduction to 50% voltage for the brake to remain disengaged). Please note that the actual values are subject to the application's environment and the required response time. PWM control with boost may be employed to accelerate disengagement or improve response times. This can extend life and provide energy savings during brake operation.

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

Spring applied brake information

Delivery Condition

The electromagnetic single-disc spring applied 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.
The manufacturer 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.

Use of Brakes

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

- DO NOT operate in potentially explosive or firedamp environments
- DO NOT exceed the rated power limits specified
- DO NOT exceed the rated speeds
- DO NOT operate the brakes if the housing or insulation of the lead wires are damaged

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

1. Do not release the brake electromagnetically until installation has been completed.
2. Connect lead wires during overall motor assembly as specified by the motor manufacturer.
3. Avoid any damage to the lead wires such as bending or trapping.
4. Install the brake away from magnetic fields which may interfere with the brake performance.
5. During operation, ensure the assembled brake components including the friction surfaces are free from grease and oil by making sure that lubricants and fluids cannot leak (such as a sealed bearing) from the motor bearing into the brake.
6. The rated air gap of the brake is preset in the factory at SG Transmission.
7. Following the completion of the installation, axial movement of the shaft must be minimized so the safety and reliability of the brake is maintained.

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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