

DC ELECTROMAGNETIC BRAKES



BCH ELECTRIC LIMITED
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DC Electromagnetic Brakes

BCH electromagnetic shoe brakes conforms to AISE and NEMA standard. Also available in matching Tk Π series have been designed for heavy industrial and mill duty applications. They are suitable for use with 400, 600 and 800 range mill motors and may also be used in conjunction with other equipments where smooth, rapid and dependable stopping is required. Use of these brakes is extended to hold the load- after stopping the hoist, elevator and similar machines.

Features

Over the wheel design

Effectively divides the force between the pull rods and pins. Effectively transmit the breaking force to other shoe lever. Provides maximum stopping power with minimum wear of shoe lining. Minimise the bearing wear.

Magnet

The magnet consists of two similar magnet steel armatures which in conjunction with the coil provides a powerful Short Stroke magnet system.

Coil

The epoxy filled Class F coil is encapsulated in a sheet steel housing for complete environmental protection.

Shoe Lining

Shoe linings are made from an asbestos base material which has a high co-efficient of friction and low rate of wear. The linings are bolted to the shoes as standard and are easily replaceable.

Shoe Adjustment

Each shoe can be adjusted independently to compensate for the lining wear.

Shoe Positioning

Brake shoe can be positioned to compensate for misalignment of brake to motor shaft/drum thus easing installation.

Torque Setting

The torque is set by turning the torque adjusting nut clockwise to a positive stop and then backing off a preset number of turns to obtain rated torque.

Adaptable to AC application

The SM Shunt brakes can be used with rectifier panel. This combination is for giving advantage of DC braking to applications using AC motor.

Operation

Electromagnetic SM brakes are electrically released and spring set. When the coil is energized the armatures are attracted together to compress the torque spring and move the shoes away from the wheel, thus releasing the brake. De-energizing the coil allows the torque spring to separate the armatures and "n press the shoes against the wheel. Setting the brake, thus making it fail safe in the event of power failure.

Available in Sizes

	Sizes of Wheel Dia						
Inch	8	10	13	16	19	23	30
mm	200	250	300	400	500	600	700/800

Braking Torque : Lbf ft 75 to 4000
Nm 100 to 5420

Type and duty rating

SM brakes are basically of two types: Shunt brake and Series brake.

Shunt

Shunt brakes have their coils separately energized from a DC source or AC source when used with rectifier. Shunt brakes are rated in voltage for intermittent or continuous duty. The recommended duties are:

Intermittent duty (1)

One hour duty with maximum torque available for a given size of brake. The coil may be energized for one hour without overheating or the brake may be operated at 15%, 25% & 40% CDF on duties S3, S4 and S5 of motors.

Continuous (C)

Continuous or 8 hour duty with 75% of the maximum torque available for a given size of brake. Coil is energized continuously without overheating or the brake may be operated at 60% CDF on duties S3, S4 & S5 and 100% CDF of motors.

Shunt brake with rectifier for AC operation

In this combination intermittent shunt brake torque ratings are obtained on continuous duty basis, i.e. maximum torque corresponding to a given size of brake is available for continuous operation.

Series brake

Series brakes have their coils in the armature circuit of a DC motor. These brakes are rated in amperes for 1/2 hour or 1 hour corresponding to rating of DC series motors. The recommended duties are :

One hour or mill duty (O)

One hour duty with 65% of maximum torque available for a given size of brake. The coil may carry either motor FLC for one hour without overheating or the brake may operate on duty cycle of 50% CDF at motor FLC.

Half hour or crane duty (H)

Half hour duty with maximum torque available for a given size of brake. The coil may carry either motor FLC for half an hour without overheating or the brake may operate on duty cycle of 33% CDF at motor FLC.



Selection of brake size

For most applications, the brake torque must be equal to or greater than motor full load torque as referred to the drum/wheel.

The formula for this figure is

$$T = \text{Torque in lbf ft} = \frac{5252 \times \text{Hp}}{\text{rpm}}$$

$$T = \text{Torque in Nm} = \frac{9552 \times \text{Kw}}{\text{rpm}}$$

Where Hp/Kw = motor output rpm = Rev/minute.

With torque requirements known and the type and duty cycle established the brake is selected accordingly from the selection table. For certain special application eg. crane, hoist and other overhauling loads the brake should be capable of providing at least 150% of motor torque. Where a specific stopping time or distance has to be achieved or in case of high inertia loads, mechanical calculations are necessary, requiring inertia details as referred to brake shaft.

Brake torque rating

For torque rating of shunt brake, refer table-I. For torque and current rating of series brake, refer table-II.

Brake control panel

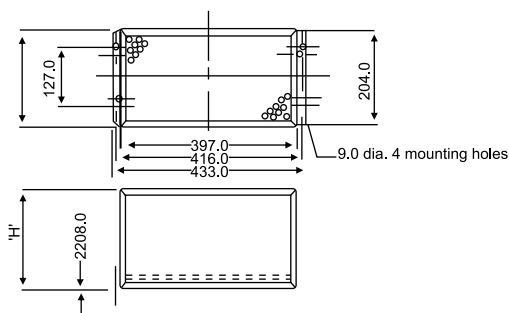
Control Panel (CD) for brakes for DC operation consists of permanent series resistances.

Control panel (CA)

are for brakes for AC operations. For details please all for publication on Rectifier panel.

Enclosure category for control panel (CD)

Enclosure for permanent series resistors as per IS 2147-(1962)-IP31.



Enclosure Dimension of Control Panel (CD)

Dimension 'H' in mm for different sizes & Voltages of 'Brakes'

Brake Size		H in mm
Inch	mm	230VDC
8	200	160
10	250	160
13	300	160
16	400	160
19	500	160
23	600	160
30	700/800	214

All brakes are supplied for Continuous Duty

Table-I
Torque rating of shunt 'Brakes'

Brake Size		Torque Rating					
		DC Operation			AC Operation		
		Cont. Duty			Cont. Duty		
AISE Inch	Metric	lbf ft.	Nm	KGM	lbf ft.	Nm	KGM
8	200	100	136	13.8	100	136	13.8
10	250	200	271.2	27.6	200	271.2	27.6
13	300	550	746	76.0	550	746	76.0
16	400	1000	1356	138.0	1000	1356	138.0
19	500	2000	2712	277.0	2000	2712	277.0
23	600	4000	5423	555.0	4000	5423.3	555.0
30	700/800	8950	12135	1242.0	8950	12135	1242.0

Table-II
Torque & current rating of Series Brakes

Brake Size		Torque & current rating					
		Motor Frame Size	Max. Torque 1/2 hr rated	Max. FLC	Max. Torque 1 hr rated	Max. FLC	
AISE Inch	Metric		lbf ft.	Nm	Amp	lbf ft.	Nm
8	200	402, 802A	100	136	29	65	88
		403, 602, 802B	100	136	44	65	88
10	250	404, 603, 802C	200	272	57	130	176
		406, 604, 803	200	272	77	130	176
13	300	408, 606, 804	550	746	126	365	495
		410, 608, 806	550	746	175	365	495
16	400	412, 610, 808	1000	1356	245	650	882
19	500	414, 612, 810	2000	2712	368	1300	1763
23	600	416, 614, 812	2000	2712	500	1300	1763
		418, 616, 814	4000	5423	740	2600	3525
		618, 816,	4000	5423	960	2600	3525

Product specifications

Class of Insulation of coil	: Class F
Insulation voltage	: 660V..
Release voltage for shunt coil	: 80% of rated voltage*
Release current for series coil	: 40% of rated current*
Brake set voltage for shunt coil	: Below 50% of rated voltage*
Brake set current for series coil	: Below 10% of rated current*
No. of operations per hour	: 600 operations**
Mechanical life	: 20 x 10 ⁵
Finish of Brakes	: Grey
Type of Resistors	: Wire wound
Enclosure	: Sheet steel enclosure

* These figures apply when the brake coils are used with the required ancillary control gear.

**The maximum rate of operation of brakes is limited by the time required by the brakes to operate and the energy dissipated per stop.

Note: All brakes can be mechanically adjusted down to 50% of their maximum rated torque.

Operating time

Energise (brake release) and de-energise (brake set) time for a particular size of brake depends upon various factors such as:

1. Inductance of the circuit and value of economy resistance used or L/R ratio.
2. Voltage applied
3. Applied torque.
4. Operating device, i.e. device to interrupt supply to the coil
5. Mode of operation-DC or AC through resistor / rectifier panel.

Approximate time for the brake to set, varies between 0.2 to 1 sec. whereas time for brake to release, varies between 0.12 to 1.2 sec. depending on the size of the brake.



For precise timings please write with details of all five factors mentioned above.

For calculation of stopping time, please send us the following details:

1. Weight of rotating mass on motor shaft with or without weight of drums.
2. Radius of gyration of the mass in feet.
3. RPM of the mass

Catalogue code

Brake: For Complete Catalogue Code please indicate the following Description Code in sequence:

Product: type; size; duty; current rating for series brake supply voltage for shunt brake; optional

Description code details

Product Series SM brake : SME
 Shunt SM brake : SMH
Type: AISE (Inch) : 1
 Metric : M
Size: Inch : 8, 10, 13, 16, 19 & 23
 Metric : 200, 250, 300, 400, 500 & 600mm

Note : BCH is also in position to offer 30" SM brake; Details on request.

Duty

Shunt brake. Continuous duty : C
 One hour duty : H1
 Series brake (Mill duty)
 Half hour duty : H2
 (crane duty)

Current rating for series brake				
Size	1/2 Hour duty		1 Hour duty	
	Current rating Amps	Code	Current rating Amps	Code
8"/200 mm	29	1	21	3
	44	2	31	4
10"/250 mm	57	1	40	3
	77	2	57	4
13"/300 mm	126	1	95	3
	175	2	132	4
16"/400 mm	245	1	185	3
19"/500 mm	368	1	272	3
	500	2	360	4
23"/600 mm	740	1	540	3
	960	2	730	4

700 mm size is also available on request

Supply voltage (for shunt brake)

230 V DC : 1 240 V 50 Hz : 3
 460 V DC : 2 415 V 50 Hz : 4

Brakes for DC supply voltages are always to be operated along with permanent series resistance. The brakes for use with AC supply voltage are to be operated through brake control panel comprising of resistor and rectifiers.

Brake control panel-DC input

For complete Catalogue Code please indicate the following description code in sequence:

Product supply voltage

Product Control Panel DC:CD
 Supply Voltage : 230 V DC : 1

e.g. 300 mm metric series SM brake suitable for 1/2, hour/crane duty with 175A full load current will be termed as **SME300H2**

Note 1. Enclosure for resistors for DC supply (Permanent Series resistors) are as per IP 31 Category of IS 2147. 1962.

2. Basically SM brakes are DC brakes but shunt brakes having continuous duty coil can be used for AC Supply through resistors rectifier panel. In that case continuous duty coil delivers maximum torque corresponding to torque of intermittent duty coil. The detail of Brake Control Panel-AC input are given in 'Rectifier Leaflet'

3. For description code of optional items please refer below.

Optional Features (on request)

Residual magnetic gap adjustment

This adjustment allows the residual magnetic gap to be increased to reduce brake application time. (Code-RMA)

Manual release

The Electromagnetic brakes are electrically released and spring set. The Manual/Hand release allows the brake to be released when no power is available for electrical release, or other failure in the system. (Code-MR)

Limit switch attachment

This attachment facilitates operation of limit switch at the instant of brake releasing or brake setting which can be used for interlocking, controlling and indicating. (Code-LSA)

Special epoxy paints

The brakes and Control Panel can be painted by special epoxy paint to withstand corrosive atmosphere. (Code-SP)



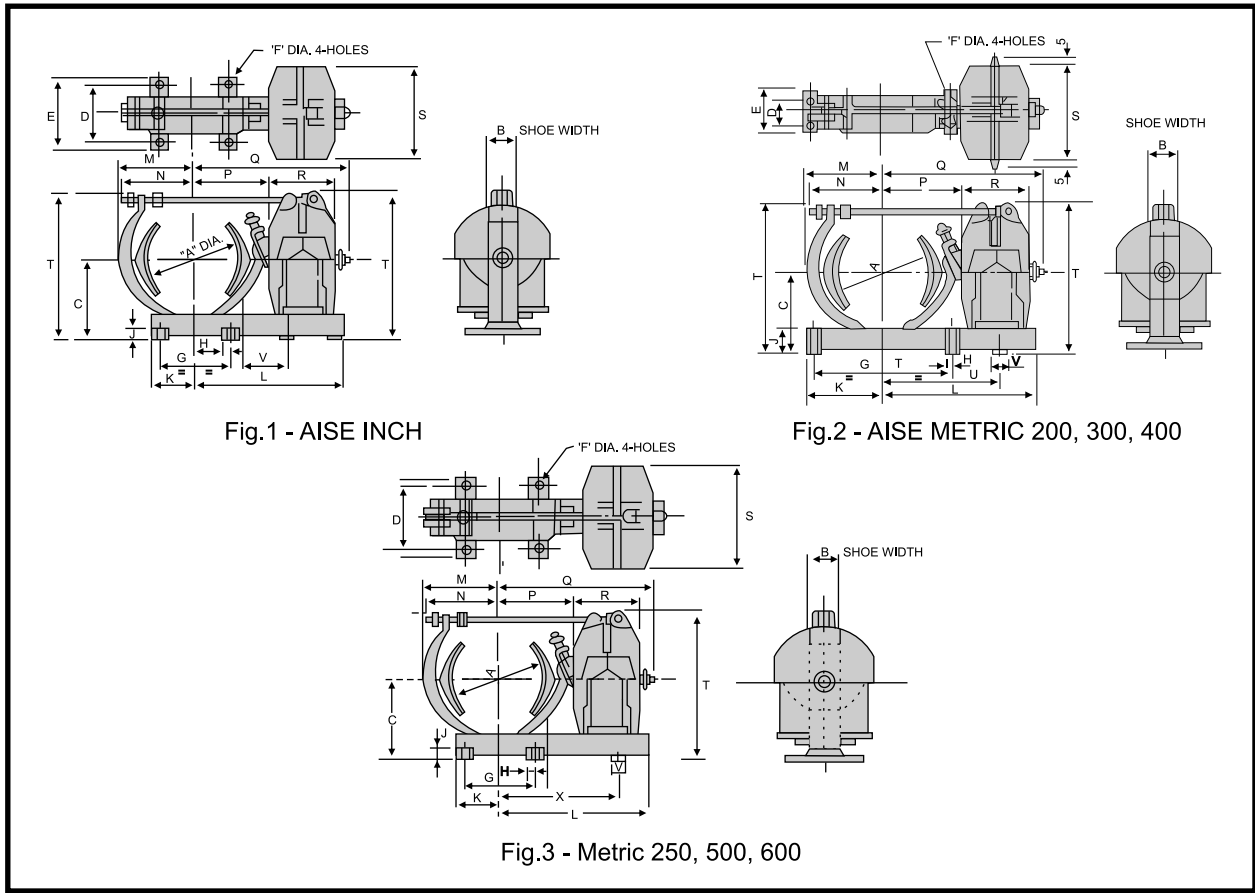
AISE INCH (Dimensions)

METRIC (Dimensions in mm)

	Reference diagram						Reference diagram					
	Figure 1			Figure 2			Figure 3					
Size	8"	10"	13"	16"	19"	23"	200	300	400	500	600	250
Code	I-8	I-10	I-13	I-16	I-19	I-23	M-200	M-300	M-400	M-500	M-600	BM-250
Wt. Kg.	65	105	190	300	500	750	65	190	300	600	875	105
A	8	10	13	16	19	23	200	300	400	500	600	250.0
B	3-1/8	3-1/2	5-1/2	6-1/2	8-1/2	11	80.0	140.0	165.1	216.0	279.4	88.9
C	7	8-3/8	9-7/8	12-1/8	13-1/4	15-7/8	170	240	320	336.5	403.2	212.7
D	5-3/4	6-1/4	9	10-3/4	13	16	60	80	90	330.2	406.2	158.7
E	7-1/4	7-3/4	11	13	15-3/4	19	121	165	184	400	482.6	196.8
F	11/16	11/16	13/16	1-1/16	1-1/16	1-5/16	17.4	22.2	25.0	27	33.3	17.5
G	6-1/2	8	11-1/2	15	18-1/2	23-1/2	350	500	340	469.9	596.9	203.2
H/H	5/8	3/4	7/8	1	1-1/4	1-1/2	19	25	25	31.7	38.1	19.0
J/J	13/16	3/4	3/4	15/16	1-5/16	1-5/16	50	68	57	33.3	33.3	19.0
K	4-1/4	5-1/8	7	8-1/2	10-1/2	13-1/4	194	275	195	266.7	336.5	130.2
L	15	16-5/8	19-1/2	21-1/8	25-1/8	28-3/4	406	514	538	642	740	422.3
M	6-1/2	8	9-7/8	12-1/4	14-1/2	18-1/8	166	239	311	377	469	203.2
N	6-1/2	7-7/8	9-1/2	12	14-1/2	16-3/4	164	238	305	360	418.2	200.0
P	7-3/8	8-5/8	10-3/8	12-3/8	14-7/8	17-3/8	209	284	315	386.4	448.2	219.1
Q	15-3/8	17	19-7/8	21-7/8	26-1/2	30-3/8	417	524	556	683	781	431.8
R	7-1/8	7-3/8	8-1/2	8-1/2	10-1/8	11-3/8	181	216	216	257.2	289	187.3
S	9-1/2	10-3/4	13	15	18	20-1/2	242	331	381	457.2	520.7	273.1
T	13-5/8	15-3/4	19	22-3/4	25-5/8	30-3/8	338	480	590	650.9	771.5	400.0
U/U	-	-	-	-	-	-	298.4	390.0	419.0	430.2	492.9	-
V	4-9/16 4-13/16	4-59/64 5-11/64	5-55/64 6-7/64	6-7/32 6-15/32	8-3/32 8-11/32	9-7/32 9-5/32	38	38	38	38	27	38

* All metric brakes except BM- 250 is equivalent to Russian ТКπ series.

Dimension (mm)



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Since product improvement is a continuous process, the data furnished in this brochure may undergo revision without prior notice.