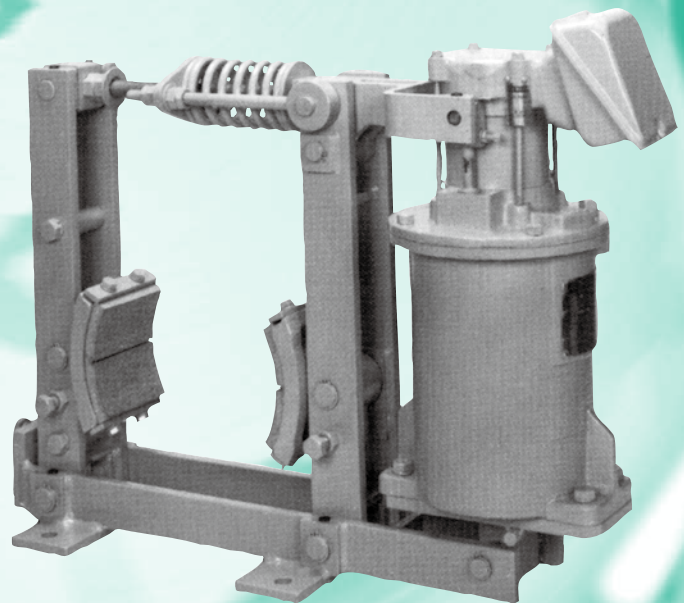
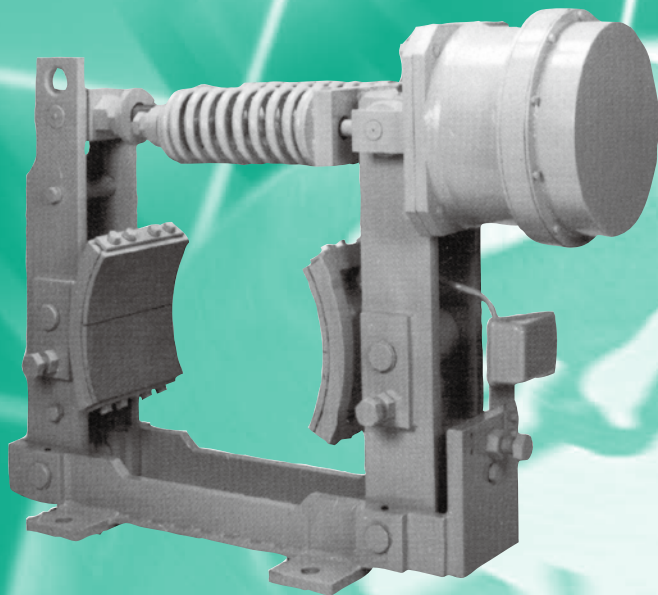




No.SC-191

Drum-type brakes

For cranes, general industrial machinery,
and auxiliary steel-rolling machines



Satuma Electric Mfg. Co., Ltd.

Drum-type brakes

For cranes, general industrial machinery,
and auxiliary steel-rolling machines

This series of brakes has been developed based on our years of manufacturing experience and a new design concept. The features of this long-life brake series include simplified maintenance, shockless operation and low noise achieved by an air damper (standard equipment on large electromagnetic brakes.)

Types and Ratings of Drum Type Brakes

Table 1 Types and ratings of Brakes

Brake type	BRS5 type AC-operated DC electromagnetic brakes	BMS5-T type MEW Lifter brakes	BMS5-WT type MEW Lifter brakes
Applicable standard	JEM 1240 (AC. operated brakes for totally-enclosed fan-cooled low-voltage three-phase wound-rotor induction motor for crane use)		
A c t u a t i o n	Off brake (Instantaneous strong-excitation type)	No-voltage operation	
A p p l i c a t i o n	For crane hoisting and industrial machinery		For traversing and traveling of cranes, for conveyers
Ambient temperature	−10℃～+40℃		
Protective structure of operation unit	Dustproof type (Main unit: Unprotected type)		
Insulation class of operation unit	Class B insulation	Class E insulation	
Rated voltage and frequency	200V 50Hz、220V 60Hz、400V 50Hz、440V 60Hz		
Usage rate of operation unit	60%		
A c t u a t i n g c y c l e	400 (cycle/hour)	400 (cycle/hour) BMS5-2840 (W) T or smaller, 250 (cycle/hour) BMS5-3145 (W) T or larger	
C o a t i n g c o l o r	Munsell 5B5/0.5		

Note 1: See the page of each brake for shared voltage and frequency.

Application of Drum Type Brakes to motors

Table 2 Application of Brakes to motors (JEM1202 Totally-enclosed fan-cooled low-voltage three-phase wound-rotor induction motor for cranes)

Motor		AC-operated DC electromagnetic brakes and MEW Lifter brakes							
Frame No.	Number of poles	Type of AC-operated DC electromagnetic brake	Type of MEW Lifter brake	Motor output and rated braking torque					
				25%ED		40%ED		60%ED	
				Motor output (kW)	Rated braking torque (N·m)	Motor output (kW)	Rated braking torque (N·m)	Motor output (kW)	Rated braking torque (N·m)
132M	6	BRS5-1316	BMS5-1316T	2.5	49	2.2	49	1.8	49
				4	66	3.7	66	3	49
160M	6	BRS5-1620	BMS5-1620T-1	6.3	98	5.5	98	4.5/6.3	98
			BMS5-1620T-2	8.5	137	7.5	137	---	---
160 L	6	BRS5-1620	BMS5-1620T-2	13	208	11	208	9	137
180 L	6	BRS5-1825	BMS5-1825T	17	294	15	294	13	208
200 L	6	BRS5-2025	BMS5-2025T	25	392	22	392	18.5	294
225M	6	BRS5-2231	BMS5-2231T	33	519	30	519	25	392
250M	6	BRS5-2535	BMS5-2535T	40	617	37	617	30	519
				50	784	45	784	37	617
280M	8	BRS5-2840	BMS5-2840T	63	1290	55	1290	45	980
315M	8	BRS5-3145	BMS5-3145T	85	1760	75	1760	63	1290
				100	2080	90	1760	75	1760
355 L	10	BRS5-3550L-1	BMS5-3550T	125	3280	110	3280	90	2600
		BRS5-3550L-2		150	3920	---	---	---	---
400 L	10	BRS5-4056L-1	BMS5-4056T	185	4660	160	3920	132	3920
		BRS5-4056L-2		220	5490	200	5490	160	3920

Note 2: The rated braking torque of brakes has been selected as 150% or more of the rated motor torque (JEM 1202) at 50 Hz and 25% ED or more.

Note 3: When the motor is to be used at an output of 15% ED, select a brake to be used on a case-by-case basis.

Note 4: For motors with a frame No. of 315 M or more, use the brake alongside another braking system such as electric braking.

Features of Drum Type Brakes

1. A brake lining with a contact angle of 60° is adopted.
 - Excellent initial braking torque characteristics and easy replacement
2. Automatic vertical gap adjustment of brake lining
 - Simple maintenance and inspection
3. Can be manually opened
 - This no-voltage actuation brake can be manually opened using a special auxiliary nut (bolt.)
4. Large electromagnetic brakes come with an air damper (which can be optionally mounted to other electromagnetic brakes. Please refer to the note column of each specification/external dimension table for the standard equipment scope.)
 - Mounting the air damper helps ensure shockless and low-noise operation.

BFS5-T type AL brakes	BDS5 type DC electromagnetic brakes			Brake type
	Operating power source : AC		Operating power source : DC	
-----	-----	JEM 1120 (DC electromagnetic brakes for DC motors of auxiliary rolling mill and cranes)		Applicable standard
AL control	Off brake (Instantaneous strong-excitation type)			A c t u a t i o n
For speed control	For crane hoisting and industrial machinery			A p p l i c a t i o n
-10℃~+40℃				Ambient temperature
Dustproof type (Main unit: Unprotected type)				Protective structure of operation unit
Class E insulation	Class B insulation			Insulation class of operation unit
200V 50Hz、220V 60Hz、400V 50Hz、440V 60Hz		DC220V (110V)		Rated voltage and frequency
15% ED (150 sec. cycle)	60%	Time rating	Continuous	Usage rate of operation unit
-----	400 (cycle/hour)	600 (cycle/hour)		A c t u a t i n g c y c l e
Munsell 5B5/0.5				C o a t i n g c o l o r

AL brake	DC electromagnetic brake							Motor	
Type of AL brake	Type of the DC electromagnetic brake	Motor output and rated braking torque of brake						Frame No.	Number of poles
		40%ED		60%ED		Continuous rating			
		Motor output (kW)	Rated braking torque (N·m)	Motor output (kW)	Rated braking torque (N·m)	Motor output (kW)	Rated braking torque (N·m)		
-----	BDS5-1720	2.2	98	1.8	98	1.5	98	132M	6
		3.7	98	3	98	2.8	98		
BFS5-1620T-1		5.5	98	4.5	98	4	98	160M	6
		7.5	127	6.3	98	5.5	98		
BFS5-1620T-2	BDS5-2125	11	196	9	196	7.5	196	160 L	6
BFS5-1825T		15	255	13	196	11	196	180 L	6
BFS5-2025T		22	333	18.5	333	15	255	200 L	6
BFS5-2231T	BDS5-2533	30	539	25	539	22	539	225M	6
BFS5-2535T		37	706	30	539	25	539	250M	6
		45	706	37	706	33	539		
BFS5-2840T	BDS5-3040	55	1270	45	980	37	980	280M	8
BFS5-3145T	BDS5-3348L	75	1960	63	1960	50	1960	315M	8
-----		90	1960	75	1960	63	1960		
		110	3430	90	2550	75	1960	355 L	10
-----		132	3430	110	3430	90	2550		
		---	----	---	----	---	----		
-----	BDS5-4058L	160	3920	132	3920	110	3920	400 L	10
		---	----	160	3920	---	----		
		200	5100	---	----	132	3920		

Note 5: The AL brake is applicable when the intermittent service rating of the motor is 40% ED or lower.

BRS5 Type AC-operated DC electromagnetic brakes

The AC-operated DC electromagnetic brake is actuated by applying AC power to a DC instantaneous strong-excitation circuit using an exclusive control box. This is an off brake, which is disengaged when the power is set to on and engaged when it is set to off.

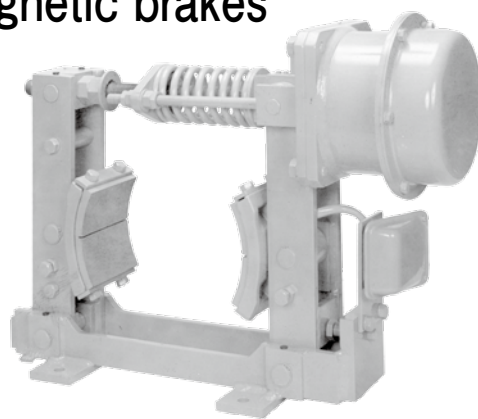


Fig. 1
BRS5-1316
}
BRS5-2231

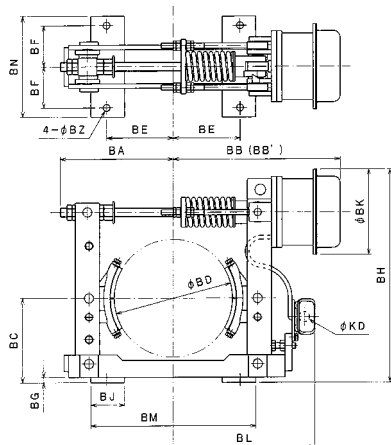


Fig. 2
BRS5-2535
}
BRS5-3145

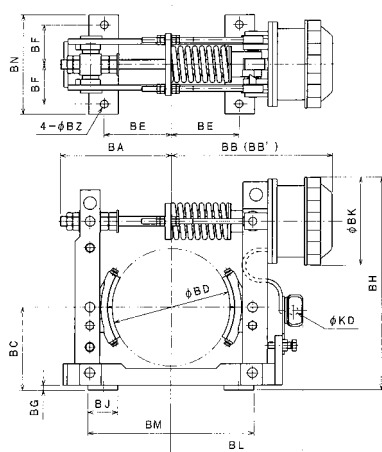


Fig. 3
BRS5-3550L
}
BRS5-4056L

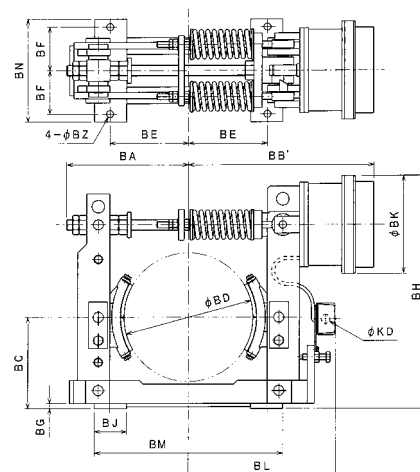


Fig. 4
Brake drum

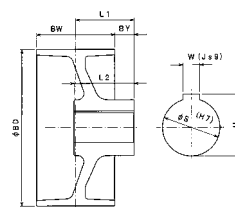


Table 3 Specifications and external dimensions of BRS5 Type AC-operated DC electromagnetic brakes

Brake type	Frame No.	Rated braking torque (N·m)		Frame No. of motor	Electro-magnet type	Control box (outline drawing)	Mass (kg)		Moment of inertia of drum (kg · m ²)	Permissible braking workload (kJ / min)		Permissible braking rotational speed (min ⁻¹)
							Main body	Drum		50Hz	60Hz	
BRS5-1316	B132	66	49	132M	MD13D	BRD-SC (Fig. 5)	28	4.5	0.02	20	22	3600
BRS5-1620	B160	208	137	98	160M	BRD-SC (Fig. 5)	45	8	0.05	33	35	2900
BRS5-1825	B180	294	208	180 L	MD17D	BRD-SC (Fig. 5)	66	15	0.15	57	60	2300
BRS5-2025	B200	392	294	200 L	MD17D	BRD-SC (Fig. 5)	70	15	0.15	57	60	2300
BRS5-2231	B225	519	392	225M	MD17D	BRD-SC (Fig. 5)	78	25	0.48	97	104	1800
BRS5-2535	B250	784	617	519	250M	BRD-SC (Fig. 5)	126	35	0.80	126	129	1600
BRS5-2840	B280	1290	980	280M	MD24D	BRD-SC (Fig. 5)	180	50	1.50	143	153	1400
BRS5-3145	B315	2080	1760	1290	315M	BRD-SC (Fig. 5)	241	78	2.80	176	188	1300
BRS5-3550L-1	B355	3280	2600	355 L	MD31D	BRD-LC (Fig. 6)	410	108	4.80	196	209	1150
BRS5-3550L-2	B355	3920		355 L	MD31D	BRD-LC (Fig. 6)	410	108	4.80	196	209	1150
BRS5-4056L-1	B400	4660	3920	400 L	MD35D	BRD-LC (Fig. 6)	630	145	9.90	224	239	1000
BRS5-4056L-2	B400	5490		400 L	MD35D	BRD-LC (Fig. 6)	630	145	9.90	224	239	1000

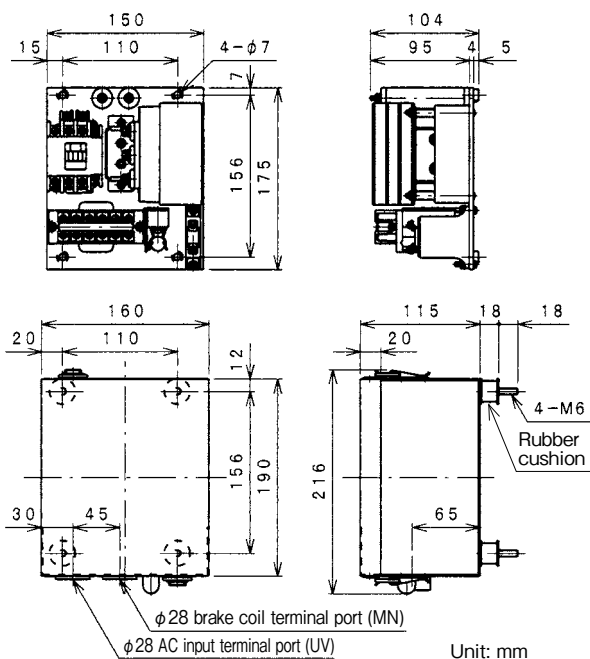
Note 6: See Table 1 (P. 1 and 2) for major ratings.

Note 7: The control box is to be separately installed and placed in the operation panel.

Note 8: The control box BRD-SC (Fig. 5) cannot be used for both 200- and 400 V-class brakes. (Control boxes of voltages and frequencies other than those listed in Table 1 are special items.)

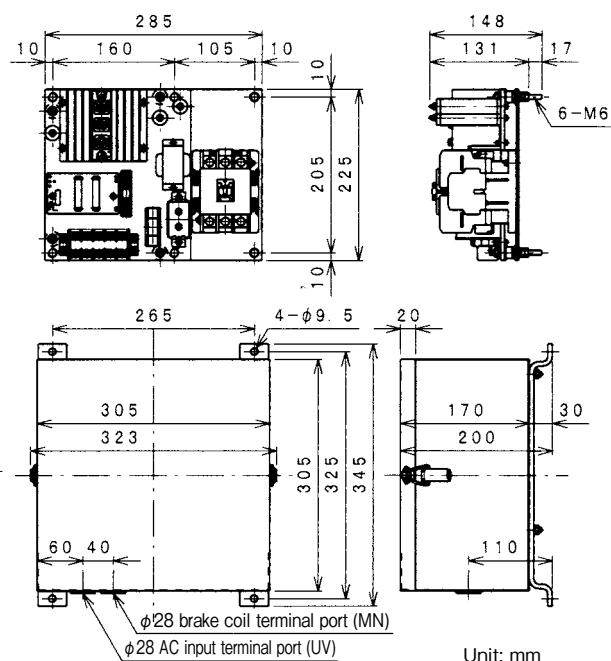
Note 9: The control box BRD-LC (Fig. 6) is exclusive for each voltage and frequency.

Note 10: Brakes BRS5-3550L or larger come with an air damper, which is also optionally available for brakes BRS5-3145 or smaller. (Sub-symbol L is attached to the symbol of electromagnetic brakes with an air damper.)



Top: Main body (Mass: 2.4 kg) Bottom: With case (Mass: 3.9 kg)

Fig. 5 External dimensions of control box (BRD-SC)



Top: Main body (Mass: 5.2 kg) Bottom: With case (Mass: 10.5 kg)

Fig. 6 External dimensions of control box (BRD-LC)

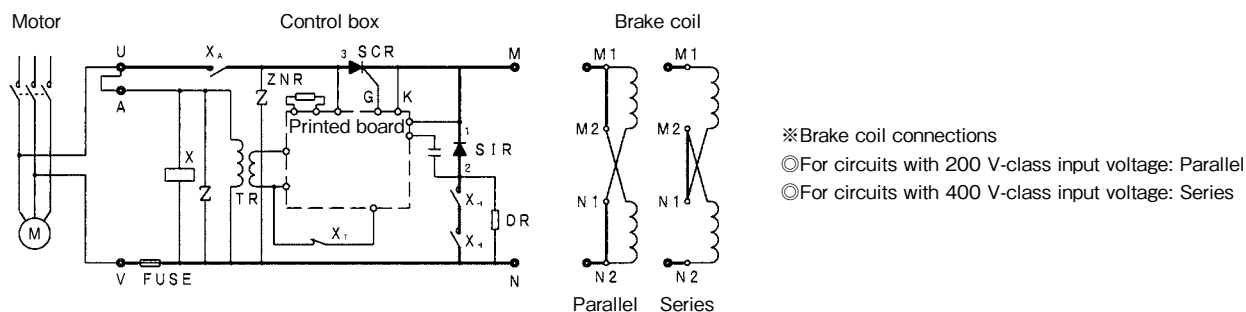


Fig. 7 Control box circuit diagram

Brake main body (mm)															Brake drum (mm) (Fig. 4)								Outline drawing	Brake type
BA	BB	BB'	BC	BG	BH	BK	BL	BE	BF	BM	BN	BJ	BZ	KD	BD	BW	BY	L ₁	L ₂	S	W	H		
173	287	312	132	11	372	180	249	108	75	256	180	50	12	28	160	80	40	80	82	32	10	35.3	Fig. 1	BRS5-1316
210	344	369	160	11	425	209	282	127	85	310	210	65	15	28	200	100	37	87	112	42	12	45.3	Fig. 1	BRS5-1620
256	402	437	180	11	489	228	335	139.5	90	350	220	65	15	28	250	125	22	84.5	112	48	14	51.8	Fig. 1	BRS5-1825
256	402	437	200	14	509	228	335	159	95	400	250	75	19	28	250	125	32	94.5	112	55	16	59.3	Fig. 1	BRS5-2025
303	445	480	225	14	569	228	378	178	110	440	270	90	19	28	315	160	35	115	112	55	16	59.3	Fig. 1	BRS5-2231
335	484	519	250	15	643	266	396	203	120	500	300	90	24	28	355	180	40	130	142	60	18	64.4	Fig. 2	BRS5-2535
405	546	581	280	17	733	306	451	228.5	130	560	320	100	24	28	400	200	40	140	142	70	20	74.9	Fig. 2	BRS5-2840
415	600	635	315	20	826	362	491	254	150	630	360	125	28	28	450	225	55	167.5	172	85	22	90.4	Fig. 2	BRS5-3145
473	719		355	20	906	382	571	305	170	730	400	125	28	34	500	250	60	185	212	100	28	106.4	Fig. 3	BRS5-3550L-1
473	719		355	20	906	382	571	305	170	730	400	125	28	34	500	250	60	185	212	100	28	106.4	Fig. 3	BRS5-3550L-2
563	814		400	25	1020	419	635	343	180	820	440	140	35	34	560	280	65	205	212	110	28	116.4	Fig. 3	BRS5-4056L-1
563	814		400	25	1020	419	635	343	180	820	440	140	35	34	560	280	65	205	212	110	28	116.4	Fig. 3	BRS5-4056L-2

Note 11: BB' is the dimension of the brake equipped with an air damper (option.)

Note 12: The brake drum (Fig. 4) is made of gray cast iron (FC250.)

BMS5-T Type MEW Lifter brakes

BMS5-WT Type MEW Lifter brakes

The MEW Lifter brake uses a MEW Lifter (trade name of an electro-hydraulic lifter) instead of the electromagnet used by an electromagnetic brake. The MEW Lifter characteristics mean a slower operation with less impact than electromagnetic brakes.

To further decrease the operational speed, type BMS5-WT decreases the braking torque, and uses a MEW Lifter equipped with a lowering time-adjustment mechanism, which is ideal for traversing and traveling of cranes and stopping of conveyers.

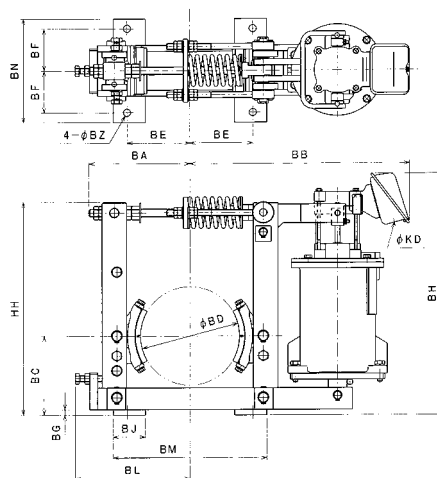


Fig. 8

BMS5-1316 (W) T, 1620 (W) T

Table 4 Specifications and external dimensions of BMS5-T Type MEW Lifter brakes

Brake type	Frame No.	Rated braking torque (N·m)			Frame No. of motor	MEW Lifter type	Mass (kg)		Moment of inertia of drum (kg · m ²)	Permissible braking workload (kJ / min)		Permissible braking rotational speed (min ⁻¹)
							Main body	Drum		50Hz	60Hz	
BMS5-1316T	B132	66	49		132M	MLD-15HS	31	4.5	0.02	20	22	3600
BMS5-1620T-1	B160	98			160M 160 L	MLD-25HS	51	8	0.05	33	35	2900
BMS5-1620T-2	B160	208	137		160 L	MLD-25HS	52	8	0.05	33	35	2900
BMS5-1825T	B180	294	208		180 L	MLD-40HS	71	15	0.15	57	60	2300
BMS5-2025T	B200	392	294		200 L	MLD-40HS	75	15	0.15	57	60	2300
BMS5-2231T	B225	519	392		225M	MLD-40HS	84	25	0.48	97	104	1800
BMS5-2535T	B250	784	617	519	250M	MLD-60HS	135	35	0.80	126	129	1600
BMS5-2840T	B280	1290		980	280M	MLD-60HS	178	50	1.50	143	153	1400
BMS5-3145T	B315	2080	1760	1290	315M	MLD-120HS	221	78	2.80	176	188	1300
BMS5-3550T	B355	3920	3280	2600	355 L	MLD-120HS	371	108	4.80	196	209	1150
BMS5-4056T	B400	5490	4660	3920	400 L	MLD-120HS	511	145	9.90	224	239	1000
BMS5-5276T	---	11800		8820	---	MLD-200HS	1035	---	(36.0)	(298)	(310)	750

Table 5 Specifications and external dimensions of BMS5-WT Type MEW Lifter brakes

Brake type	Frame No.	Rated braking torque (N·m)			Frame No. of motor	MEW Lifter type	Mass (kg)		Moment of inertia of drum (kg · m ²)	Permissible braking workload (kJ / min)		Permissible maximum braking workload (kJ)	Permissible braking rotational speed (min ⁻¹)
							Main body	Drum		50Hz	60Hz		
BMS5-1316WT	B132	39	29	20	132M	MLD-25HN	41	4.5	0.02	20	22	137	3600
BMS5-1620WT	B160	98	66	39	160M 160 L	MLD-25HN	52	8	0.05	33	35	216	2900
BMS5-1825WT	B180	176	137	98	180 L	MLD-25HN	67	15	0.15	57	60	314	2300
BMS5-2025WT	B200	265	206	147	200 L	MLD-25HN	72	15	0.15	57	60	314	2300
BMS5-2231WT	B225	382	294	206	225M	MLD-40HN	85	25	0.48	97	104	549	1800
BMS5-2535WT	B250	510	392	274	250M	MLD-40HN	120	35	0.80	126	129	686	1600
BMS5-2840WT	B280	804	617	431	280M	MLD-40HN	163	50	1.50	143	153	882	1400
BMS5-3145WT	B315	1270	980	686	315M	MLD-60HN	200	78	2.80	176	188	1180	1300
BMS5-3550WT	B355	2250	1760	1230	355 L	MLD-120HN	369	108	4.80	196	209	1370	1150
BMS5-4056WT	B400	3330	2600	1810	400 L	MLD-120HN	506	145	9.90	224	239	1670	1000
BMS5-5276WT	---	7840	6860	5880	---	MLD-200HN	1033	---	(36.0)	(298)	(310)	(2940)	750

Note 13: See Table 1 (P.1 and 2) for major ratings.

Note 14: Shared use for 200 V and 400 V is possible by changing the connection of the MEW Lifter, but shared use for 50- and 60-Hz frequencies is not allowed.

Note 15: MLD-15HS (used for BMS5-1316T) is exclusive for each voltage and frequency.

Note 16: The moment of inertia and each braking workload of the brake drum for BMS5-5276 (W)T are for your reference.

Note 17: Contact us when using the brake for crane hoisting. Some brakes are not appropriate for this purpose.

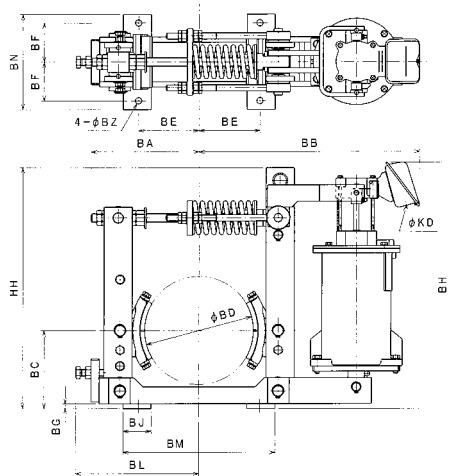


Fig. 9

BMS5-1825(W)T~3145(W)T

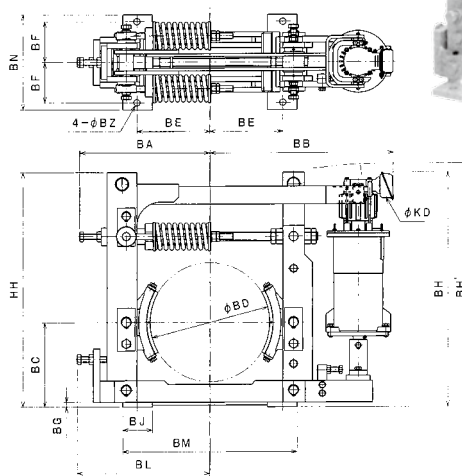


Fig. 10

BMS5-3550(W)T~5276(W)T

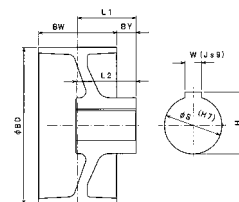
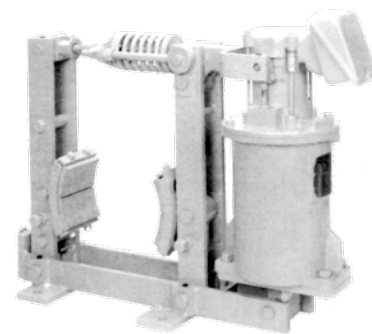


Fig. 11

Brake drum

Brake main body (mm)														Brake drum (mm) (Fig. 11)										Outline drawing	Brake type
BA	BB	BC	BG	BH	HH	BH'	BL	BE	BF	BM	BN	BJ	BZ	KD	BD	BW	BY	L ₁	L ₂	S	W	H			
172	395	132	11	384	302	---	200	108	75	256	180	50	12	27	160	80	40	80	82	32	10	35.3	Fig. 8	BMS5-1316T	
204	443	160	11	489	432	---	232	127	85	310	210	65	15	27	200	100	37	87	112	42	12	45.3	Fig. 8	BMS5-1620T-1	
204	443	160	11	489	432	---	232	127	85	310	210	65	15	27	200	100	37	87	112	42	12	45.3	Fig. 8	BMS5-1620T-2	
249	507	180	11	568	556	---	284	139.5	90	350	220	65	15	27	250	125	22	84.5	112	48	14	51.8	Fig. 9	BMS5-1825T	
249	507	200	14	571	584	---	284	159	95	400	250	75	19	27	250	125	32	94.5	112	55	16	59.3	Fig. 9	BMS5-2025T	
296	580	225	14	571	586	---	327	178	110	440	270	90	19	27	315	160	35	115	112	55	16	59.3	Fig. 9	BMS5-2231T	
322	621	250	15	717	673	---	378	203	120	500	300	90	24	27	355	180	40	130	142	60	18	64.4	Fig. 9	BMS5-2535T	
373	728	280	17	718	744	---	440	228.5	130	560	320	100	24	27	400	200	40	140	142	70	20	74.9	Fig. 9	BMS5-2840T	
400	756	315	20	796	820	---	455	254	150	630	360	125	28	27	450	225	55	167.5	172	85	22	90.4	Fig. 9	BMS5-3145T	
545	766	355	20	983	985	1020	555	305	170	730	400	125	28	27	500	250	60	185	212	100	28	106.4	Fig. 10	BMS5-3550T	
625	846	400	25	1088	1080	1125	639	343	180	820	440	140	35	27	560	280	65	205	212	110	28	116.4	Fig. 10	BMS5-4056T	
784	1026	527	30	1310	1357	1425	818	381	241	944	580	180	42	27	762	362	---	---	---	---	---	---	Fig. 10	BMS5-5276T	

Brake main body (mm)															Brake drum (mm) (Fig. 11)									Outline drawing	Brake type
BA	BB	BC	BG	BH	HH	BH'	BL	BE	BF	BM	BN	BJ	BZ	KD	BD	BW	BY	L ₁	L ₂	S	W	H			
172	415	132	11	483	352	---	200	108	75	256	180	50	12	27	160	80	40	80	82	32	10	35.3	Fig. 8	BMS5-1316WT	
204	443	160	11	489	432	---	232	127	85	310	210	65	15	27	200	100	37	87	112	42	12	45.3	Fig. 8	BMS5-1620WT	
249	507	180	11	505	556	---	284	139.5	90	350	220	65	15	27	250	125	22	84.5	112	48	14	51.8	Fig. 9	BMS5-1825WT	
249	507	200	14	507	584	---	284	159	95	400	250	75	19	27	250	125	32	94.5	112	55	16	59.3	Fig. 9	BMS5-2025WT	
296	580	225	14	571	586	---	327	178	110	440	270	90	19	27	315	160	35	115	112	55	16	59.3	Fig. 9	BMS5-2231WT	
322	620	250	15	578	673	---	378	203	120	500	300	90	24	27	355	180	40	130	142	60	18	64.4	Fig. 9	BMS5-2535WT	
373	727	280	17	579	744	---	440	228.5	130	560	320	100	24	27	400	200	40	140	142	70	20	74.9	Fig. 9	BMS5-2840WT	
400	756	315	20	731	820	---	455	254	150	630	360	125	28	27	450	225	55	167.5	172	85	22	90.4	Fig. 9	BMS5-3145WT	
545	766	355	20	983	985	1020	555	305	170	730	400	125	28	27	500	250	60	185	212	100	28	106.4	Fig. 10	BMS5-3550WT	
625	846	400	25	1088	1080	1125	639	343	180	820	440	140	35	27	560	280	65	205	212	110	28	116.4	Fig. 10	BMS5-4056WT	
784	1026	527	30	1310	1357	1425	818	381	241	944	580	180	42	27	762	362	---	---	---	---	---	---	Fig. 10	BMS5-5276WT	

Note 18: The brake drum (Fig. 11) is made of gray cast iron (FC250.)

BFS5-T Type AL brakes

The AL brake is a special MEW Lifter brake used to control speed (AL control) by connecting a MEW Lifter to the secondary side of a wound-rotor induction motor. When the AL brake is to be used, place a brake for stopping on the coupling side of the motor, and the AL brake on the anti-coupling side.

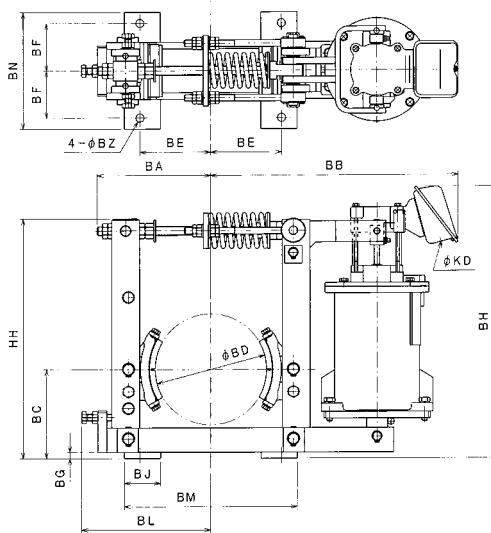
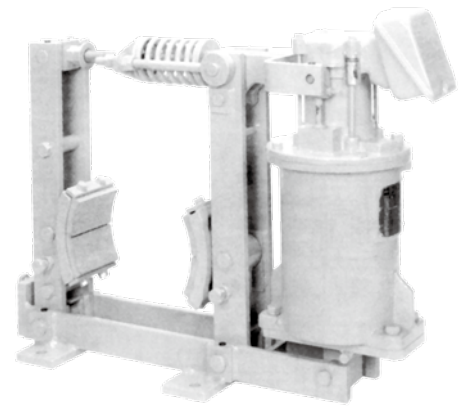


Fig. 12 BFS5-1620T-1,2

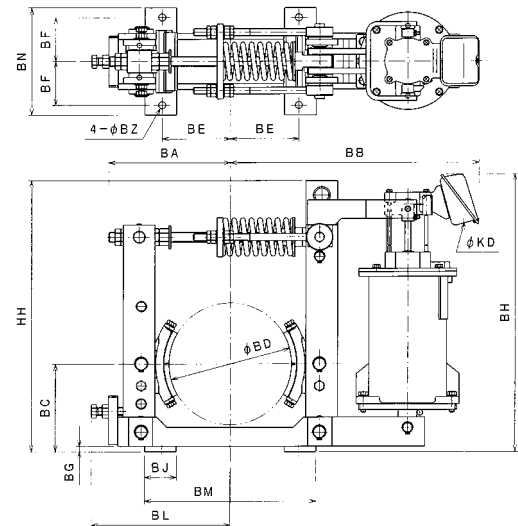


Fig. 13 BFS5-1825T~3145T

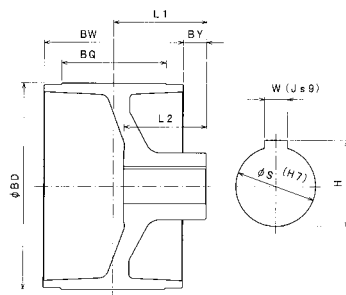
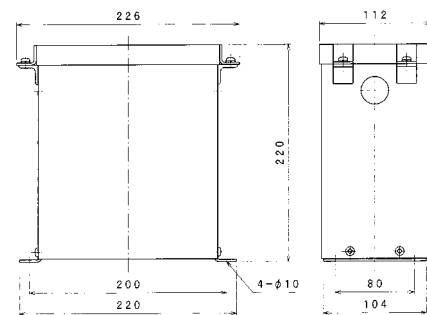


Fig. 14 Brake drum



Mass: 9 kg Unit: mm

Fig. 15 External dimensions of AL transformer

Table 6 Specifications and external dimensions of BFS5-T type AL brakes

Brake type	Brake frame No. (reference) (Equivalent to JEM 1240)	Motor frame No. (reference) (Equivalent to JEM 1202)	MEW Lifter type	Capacity of AL transformer (kVA) (Fig. 15)	Mass (kg)		Moment of inertia of drum (kg·m ²)
					Main body	Drum	
BFS5-1620T-1	B160	160M	MLD-25HS	0.5	51	10	0.09
BFS5-1620T-2	B160	160 L	MLD-25HS	0.5	52	10	0.09
BFS5-1825T	B180	180 L	MLD-40HS	0.5	71	22	0.25
BFS5-2025T	B200	200 L	MLD-40HS	0.5	75	22	0.25
BFS5-2231T	B225	225M	MLD-40HS	0.5	84	39	0.68
BFS5-2535T	B250	250M	MLD-60HS	0.5	135	59	1.30
BFS5-2840T	B280	280M	MLD-60HS	0.5	178	85	2.50
BFS5-3145T	B315	315M	MLD-120HS	0.5	221	131	4.80

Note 19: See Table 1 (P.1 and 2) for major ratings.

Note 20: Shared use for 200 V and 400 V is possible by changing the connection of the MEW Lifter, but shared use for 50- and 60-Hz frequencies is not allowed.

Speed control of crane motors using MEW Lifter

(AL-control : Adjustable lowering control)

With a MEW Lifter (electro-hydraulic lifter), the hydraulic pressure of the cylinder room changes by altering the rotation speed of the pilot motor at the top of the lifter, while the lifting force increases or decreases in proportion to the square of the rotation speed of the pilot motor. The AL-control system controls the speed of the wound-rotor motor using this property.

Figure A demonstrates the mechanism and connection. By moving the controller from the stop position to the first lowering notch, the wound-rotor motor IM and electromagnetic brake MB are connected to the power supply, the switch SW for MEW Lifter is connected to the R side respectively and the MEW Lifter of the AL brake is excited by the secondary frequency (like the power supply frequency when stopped) via a transformer TR to adjust voltage, generate lifting power and open the brake, whereupon the motor starts rotating. Since the secondary frequency declines with increasing motor-rotation speed, the lifting force of the MEW Lifter suddenly falls, as shown by curve A in Fig. B, and becomes 0 at the synchronous rotation speed.

Meanwhile, the spring strength for braking the AL brake is shown by linear line B. As shown, there is a state at a certain motor-rotation speed where the lifting force of the MEW Lifter is in equilibrium with the spring strength, allowing the brake shoe to rotate while slightly in contact with the brake drum.

If the motor-rotation speed increases slightly further from this state, the lifting force declines below the spring strength, allowing an increase in braking force and reducing the motor-rotation speed. If the motor-rotation speed declines slightly, the braking power decreases to increase the rotation speed, and the motor continues stable operation accordingly.

Specifically, assuming the synthetic torque of curves A and B to be C, the sum of the generated torque D of the motor and curve C when a resistor is inserted is shown by curve E (fedba.) When the load is 0, winding operation is performed at the speed of point d. At stable speed under a rated load, the lowering characteristics are improved as shown by point b, allowing stable low-speed lowering torque characteristics to be obtained.

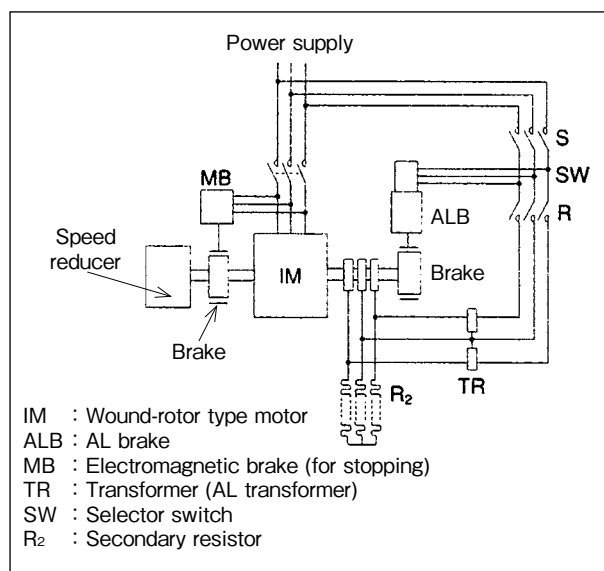


Fig. A Mechanism and connection

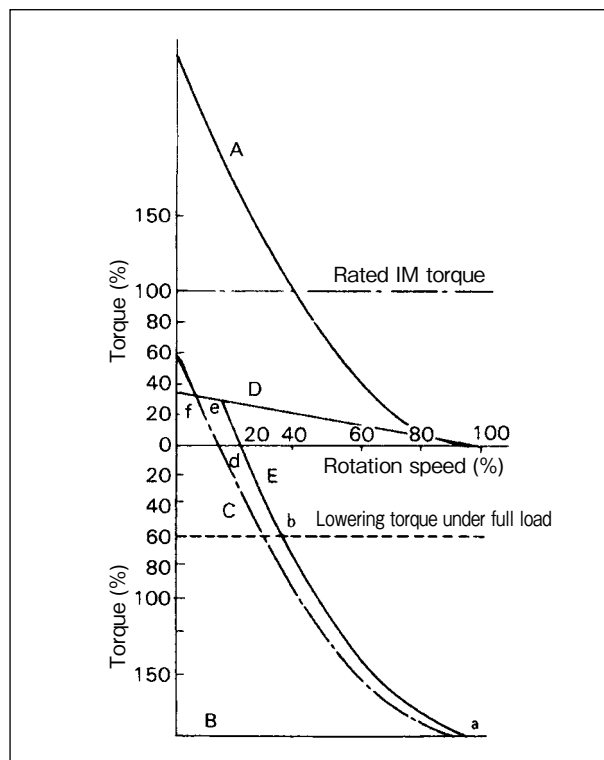


Fig. B Operation characteristics of AL brake

Brake main body (mm)													Brake drum(mm) (Fig. 14)										Outline	Brake type
BA	BB	BC	BG	BH	HH	BL	BE	BF	BM	BN	BJ	BZ	KD	BD	BW	BQ	BY	L ₁	L ₂	S	W	H	drawing	
204	443	160	11	489	432	232	127	85	310	210	65	15	27	200	160	100	37	117	112	42	12	45.3	Fig. 12	BFS5-1620T-1
204	443	160	11	489	432	232	127	85	310	210	65	15	27	200	160	100	37	117	112	42	12	45.3	Fig. 12	BFS5-1620T-2
249	507	180	11	568	556	284	139.5	90	350	220	65	15	27	250	180	125	22	112	112	48	14	51.8	Fig. 13	BFS5-1825T
249	507	200	14	571	584	284	159	95	400	250	75	19	27	250	180	125	32	122	112	55	16	59.3	Fig. 13	BFS5-2025T
296	580	225	14	571	586	327	178	110	440	270	90	19	27	315	200	160	35	135	112	55	16	59.3	Fig. 13	BFS5-2231T
322	621	250	15	717	673	378	203	120	500	300	90	24	27	355	240	180	40	160	142	60	18	64.4	Fig. 13	BFS5-2535T
373	728	280	17	718	744	440	228.5	130	560	320	100	24	27	400	300	200	40	190	142	70	20	74.9	Fig. 13	BFS5-2840T
400	756	315	20	796	820	455	254	150	630	360	125	28	27	450	340	225	54.5	224.5	172	85	22	90.4	Fig. 13	BFS5-3145T

Note 21: Use the brake drum for the AL brake as specified by Satuma (Fig. 14.) The brake drums for BFS5-1620T to 2231T are made of gray cast iron (FC250), and those for BFS5-2535T to 3145T are made of spherical graphite cast iron (FCD400.)

BDS5 Type DC electromagnetic brakes

Since the DC electromagnetic brake is of the DC instantaneous strong-excitation type, it must be strongly excited when the electromagnet is pulled, and weakly excited thereafter. Refer to Fig. 20 and Table 9 when planning an operational circuit.

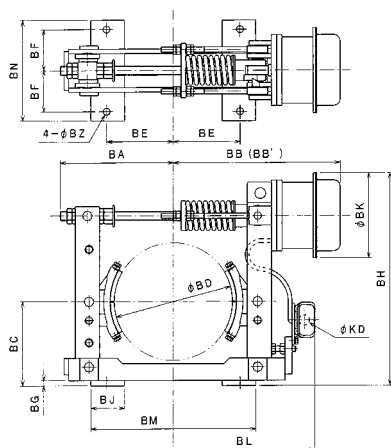


Fig. 16
BDS5-1720
BDS5-2125

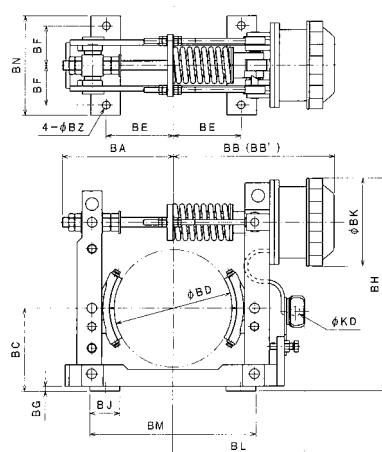


Fig. 17
BDS5-2533
BDS5-3040

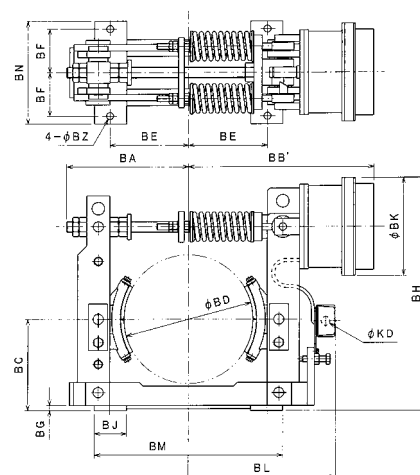
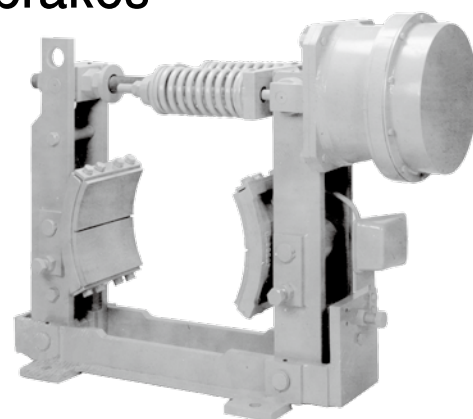


Fig. 18
BDS5-3348L
BDS5-5276L

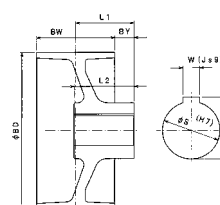


Fig. 19
Brake drum

Table 7 Specifications and external dimensions of the BDS5 Type DC electromagnetic brakes

Brake type	Frame No.	Rated braking torque (N·m)			Frame No. of motor		Electro-magnet type	Mass (kg)		Moment of inertia of drum (kg · m ²)	Permissible braking workload (KJ/min)	Permissible braking rotational speed (min ⁻¹)
		category 0	category 1	category 2	DC	AC		Main body	Drum			
BDS5-1720	B802	147	127	98	802 A 802 B 802 C	132M 160M	MD15D	45	8.5	0.06	28	2800
BDS5-2125	B803 B804	333	255	196	803 804	160M 180 L 200 L	MD17D	68	15	0.15	44	2300
BDS5-2533	B806 B808	1030	706	539	806 808	225M 250M	MD24D	140	45	0.63	94	1800
BDS5-3040	B810	1520	1270	980	810	280M	MD29D	225	70	1.60	139	1400
BDS5-3348L	B812 B814	3430	2550	1960	812 814	315M 355 L	MD31D	380	110	4.00	176	1200
BDS5-4058L	B816 B818	6470	5100	3920	816 818	400 L	MD35D	620	160	10.0	231	1000
BDS5-5276L	B620 B622 B624	---	11800	8820	620 622 624	---	MD40D	1070	---	36.0	298	750

Note 22: See Table 1 (P. 1 and 2) for major rating.

Note 23: Inform us of the brake type and DC voltage shown in Table 9 when ordering a resistor box. (The one for DC 110 V is also available.)

Note 24: AC operation of the BDS5 type DC electromagnetic brake is permissible using a control box. Use the control box BRD-SC (Fig. 5 on P. 4) for BDS5-1720 to BDS5-3040, and use control box BRD-LC (Fig. 6 on P. 4) for BDS-3348L to BDS5-4058L.

Note 25: Brakes BDS5-3348L or larger come with an air damper, which is also optionally available for brakes BDS5-3040 or smaller. (The sub-symbol L is attached to the symbol of electromagnetic brakes with an air damper.)

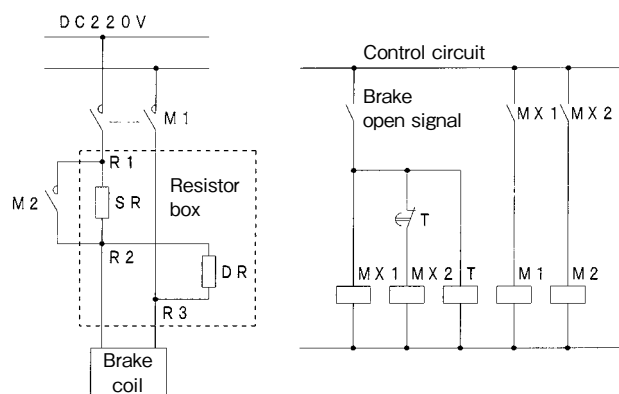


Fig. 20 Operation circuit of the DC electromagnetic brake

Description of symbols

- SR : Series resistor to be added at the time of weak excitation
- DR : Discharging resistor for brake
- M1 : Electromagnetic contactor for excitation
- M2 : Electromagnetic contactor for SR short circuit
- T : Time-limit operation timer 0.5 or 1.0 sec.
- MX1 : Auxiliary relay
- MX2 : Auxiliary relay

Table 8 External dimensions of the resistor box (mm)

Resistor box	A	B	H	C	D	E
ED-11	155	175	137	277	32	51
ED-21	265	285	177	337	30	91
ED-31	347	367	177	419	30	91
ED-41	347	367	227	419	30	91

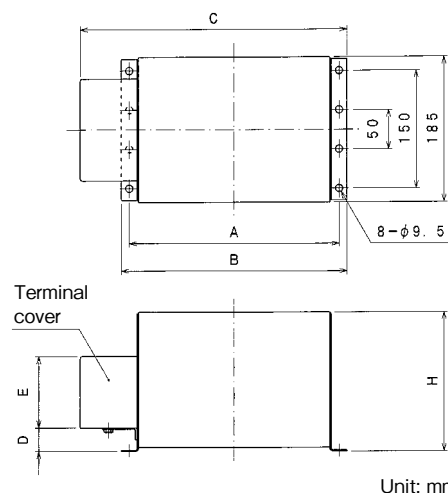


Fig. 21 Outline drawing of the resistor box

Table 9 Specifications of brakes for DC power supply

Brake type	Electro-magnet type	Coil resistance (Ω) at 75°C	Strong excitation			Weak excitation		External resistance value		Resistor box (Fig. 21)	Mass of the resistor box (kg)
			Voltage (V)	Current (A)	Time (s)	Voltage (V)	Current (A)	SR (Ω)	DR (Ω)		
BDS5-1720	MD15D	28.0	220	7.86	0.5	29	1.04	180	600	ED-11	3
BDS5-2125	MD17D	21.8	220	10.1	0.5	30	1.38	137	440	ED-21	4.5
BDS5-2533	MD24D	19.0	220	11.6	0.5	41	2.16	80.7	400	ED-21	5
BDS5-3040	MD29D	14.4	220	15.3	0.5	39	2.71	64.8	300	ED-21	6
BDS5-3348L	MD31D	12.4	220	17.7	1.0	39	3.15	55.5	260	ED-21	6.3
BDS5-4058L	MD35D	9.15	220	24.0	1.0	40	4.37	39.4	200	ED-31	7.5
BDS5-5276L	MD40D	5.84	220	37.7	1.0	33	5.65	32.0	120	ED-41	10

Brake main body (mm)															Brake drum for AC motor (mm) (Fig. 19)										Outline	Brake type
BA	BB	BB ¹	BC	BG	BH	BK	BL	BE	BF	BM	BN	BJ	BZ	KD	BD	BW	BY	L ₁	L ₂	S	W	H	drawing			
208	346	371	178	11	443	209	282	82	73	224	190	65	19	28	203	83	23.5 33.5	65 75	82 112	32 42	10 12	35.3 45.3	Fig. 16	BDS5-1720		
253	405	440	213	14	522	228	335	102	80	270	200	65	19	28	254	95	32.5 32.5 37.5	80 80 85	112 112 112	42 48 55	12 14 16	45.3 51.8 59.3	Fig. 16	BDS5-2125		
326	511	546	250	15	663	306	406	146	114	370	280	75	24	28	330	146	35 37	108 110	112 142	55 60	16 18	59.3 64.4	Fig. 17	BDS5-2533		
386	579	614	308	20	789	362	461	190	136	490	340	110	28	28	406	171	34.5	120	142	70	20	74.9	Fig. 17	BDS5-3040		
448	704		336	20	879	382	556	235	165	580	400	110	28	34	483	222	34 49	145 160	172 212	85 100	22 28	90.4 106.4	Fig. 18	BDS5-3348L		
553	824		403	25	1023	419	645	298	203	736	480	140	35	34	584	286	37	180	212	110	28	116.4	Fig. 18	BDS5-4058L		
685	1018		527	30	1282	470	789	381	241	944	580	180	42	34	762	362	---	---	---	---	---	---	Fig. 18	BDS5-5276L		

Note 26: BB' is the dimension of the brake equipped with an air damper (option.)

Note 27: The brake drums (Fig. 19) for BDS5-1720 to 2125 are made of gray cast iron (FC250), and those for BDS5-2533 to 5276L are made of ductile cast iron (FCD400.)

Combination of a motor and drum-type brakes

See Table 2 on P. 1 for the standard application of drum-type brakes to totally-enclosed fan-cooled, low-voltage three-phase wound-rotor induction motor for cranes (JEM1202). See Fig. 22, Table 10, Fig. 23, and Table 11 for the mounting dimensions of motors and various brakes.

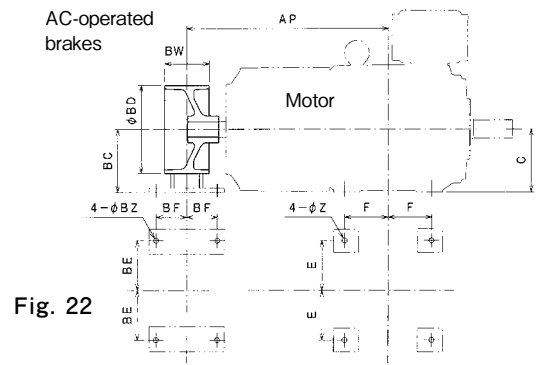


Fig. 22

1. Combination of motors and AC-operated DC electromagnetic brakes, or MEW Lifter brakes

Table 10 Dimensions for combination of motors (JEM1202) and AC-operated brakes (BRS5 type/BMS5-T type)

Applicable model				Dimension (mm) (Fig. 22)										
Motor (40%ED)			Type of AC-operated brake	Motor				Brake						Related dimensions
Frame No.	Number of poles	Output (kW)		C	E	F	Z	BC	BD	BW	BE	BF	BZ	
132M	6	2.2 / 3.7	BRS5-1316 / BMS5-1316T	132	108	89	12	132	160	80	108	75	12	469
160M	6	5.5	BRS5-1620 / BMS5-1620T-1	160	127	105	15	160	200	100	127	85	15	522
		7.5	BRS5-1620 / BMS5-1620T-2											
160 L	6	11	BRS5-1620 / BMS5-1620T-2	160	127	127	15	160	200	100	127	85	15	544
180 L	6	15	BRS5-1825 / BMS5-1825T	180	139.5	139.5	15	180	250	125	139.5	90	15	584
200 L	6	22	BRS5-2025 / BMS5-2025T	200	159	152.5	19	200	250	125	159	95	19	647
225M	6	30	BRS5-2231 / BMS5-2231T	225	178	155.5	19	225	315	160	178	110	19	720.5
250M	6	37 / 45	BRS5-2535 / BMS5-2535T	250	203	174.5	24	250	355	180	203	120	24	844.5
280M	8	55	BRS5-2840 / BMS5-2840T	280	228.5	209.5	24	280	400	200	228.5	130	24	889.5
315M	8	75 / 90	BRS5-3145 / BMS5-3145T	315	254	228.5	28	315	450	225	254	150	28	996
355 L	10	110 / 132	BRS5-3550L-1 / BMS5-3550T	355	305	315	28	355	500	250	305	170	28	1130
400 L	10	160	BRS5-4056L-1/BMS5-4056T	400	343	355	35	400	560	280	343	180	35	1190
		200	BRS5-4046L-2/BMS5-4056T											

2. Combination of motors and AL brakes/AC-operated DC electromagnetic brakes, or MEW Lifter brakes

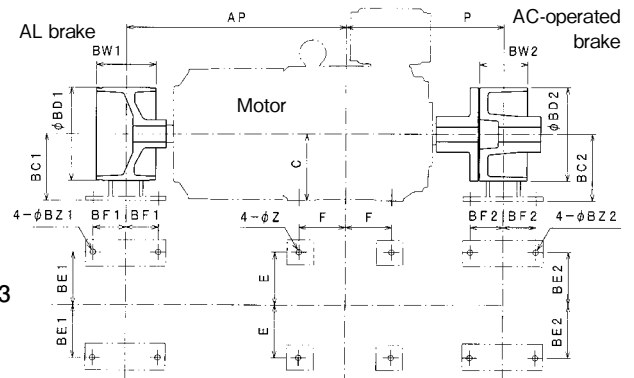


Fig. 23

Table 11 Dimensions for combination of motors (JEM 1202) and AL brakes (BFS5-T type)/AC-operated brakes (BRS5 type/BMS5-T type/)

Applicable model				Dimension (mm) (Fig. 23)																		
Motor (40%ED)			Type of AL brake	Type of AC- operated brake	Motor				AL brake					AC-operated brake					Related dimensions			
Frame No.	Number of poles	Output (kW)			C	E	F	Z	BC ₁	BD ₁	BW ₁	BE ₁	BF ₁	BZ ₁	BC ₂	BD ₂	BW ₂	BE ₂	BF ₂	BZ ₂	AP	P
160M	6	5.5	BFS5-1620T-1	BRS5-1620 BMS5-1620T-1	160	127	105	15	160	200	160	127	85	15	160	200	100	127	85	15	522	379
		7.5	BFS5-1620T-1	BRS5-1620 BMS5-1620T-2																		
160 L	6	11	BFS5-1620T-2	BRS5-1620 BMS5-1620T-2	160	127	127	15	160	200	160	127	85	15	160	200	100	127	85	15	574	401
180 L	6	15	BFS5-1825T	BRS5-1825 BMS5-1825T	180	139.5	139.5	15	180	250	180	139.5	90	15	180	250	125	139.5	90	15	611.5	439
200 L	6	22	BFS5-2025T	BRS5-2025 BMS5-2025T	200	159	152.5	19	200	250	180	159	95	19	200	250	125	159	95	19	674.5	494
225M	6	30	BFS5-2231T	BRS5-2231 BMS5-2231T	225	178	155.5	19	225	315	200	178	110	19	225	315	160	178	110	19	740.5	530.5
250M	6	37 45	BFS5-2535T	BRS5-2535 BMS5-2535T	250	203	174.5	24	250	355	240	203	120	24	250	355	180	203	120	24	874.5	578.5
280M	8	55	BFS5-2840T	BRS5-2840 BMS5-2840T	280	228.5	209.5	24	280	400	300	228.5	130	24	280	400	200	228.5	130	24	939.5	676.5
315M	8	75	BFS5-3145T	BRS5-3145	315	254	228.5	28	315	450	340	254	150	28	315	450	225	254	150	28	1053	734
		90	-----	BMS5-3145T																		

Brake-type descriptions

●Structure and arrangement of Brake type

1. Type symbol	2. Size symbol	3. Sub symbol
----------------	----------------	---------------

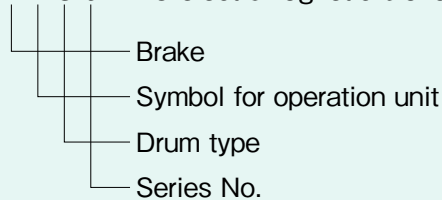
1. Type symbol

● B R S 5 ...AC-operated DC electromagnetic brake

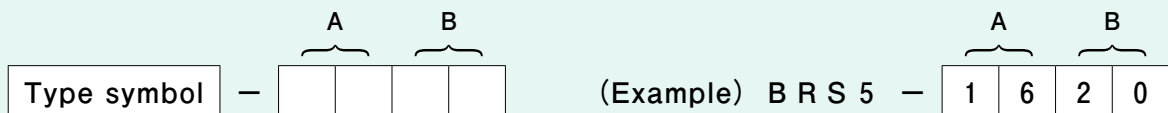
● B M S 5 ...MEW Lifter brake

● B F S 5 ...AL brake

● B D S 5 ...DC electromagnetic brake



2. Size symbol



● A ...Initial 2 digits of the brake center height

● B ...Initial 2 digits of the brake drum diameter

● Brake center height...160mm

● Brake drum diameter...200mm

3. Sub symbols

- A : Reverse operation type (braking when applying current)
- B : Unlubricated type (using bush for pin holes)
- E : With limit switch for checking brake release
- G : With limit switch for checking brake release by manual release operation
- K : Brake with mounting dimensions equivalent to those of old brakes
- L : Electromagnetic brake with air damper
- M : Electromagnetic brake with control box mounted to the brake main body
- P : With outdoor cover
- S : With handle for manual release
- T : Brake using MLD type MEW Lifter, or brake with special dimensions
- U : Brake with unitized brake drum and shaft
- W : Weak braking torque type

General expressions used for brake calculations

1. Braking torque

$$T_B = \frac{9550 \times kW}{n} \times F \text{ (N} \cdot \text{m)}$$

$$T'_B = \frac{974 \times kW}{n} \times F \text{ (kgf} \cdot \text{m)}$$

2. Braking time

$$t_B = \frac{J \times n}{9.55 \times (T_B \pm T_L)} \text{ (s)}$$

$$= \frac{GD^2 \times n}{375 \times (T_B \pm T_L)} \text{ (s)}$$

3. Rotation speed at start of braking

$$n_B = n + \Delta n$$

$$= n + \frac{9.55 \times (\pm T_L) \times \Delta t}{J} \text{ (min}^{-1}\text{)}$$

$$= n + \frac{375 \times (\pm T_L) \times \Delta t}{GD^2} \text{ (min}^{-1}\text{)}$$

4. Braking distance

To determine the braking distance, calculate the rotation volume of the motor up to stop, and perform a proportional calculation based on the motor-rotation speed and the speed of the load.

- Rotation volume of the motor up to stop

$$R = \frac{n + n_B}{60} \times \frac{1}{2} \times \Delta t + \frac{n_B}{60} \times \frac{1}{2} \times t_B \text{ (Rotation)}$$

- Braking distance

$$S = V \times \frac{R}{n} \text{ (m)}$$

5. Braking workload

- Braking workload for an operation

$$A_B = \frac{J \times n^2}{183} \times \frac{T_B}{T_B \pm T_L} \text{ (J)}$$

$$A'_B = \frac{GD^2 \times n^2}{7160} \times \frac{T'_B}{T'_B \pm T'_L} \text{ (kgf} \cdot \text{m)}$$

- Braking workload per minute

$$E_B = A_B \times Z \text{ (J/min)}$$

$$E'_B = A'_B \times Z \text{ (kgf} \cdot \text{m/min)}$$

T_B : Braking torque (N·m)

T'_B : Braking torque (kgf·m)

kW : Motor output (kW)

n : Motor-rotation speed (min⁻¹)

F : Constant related to load conditions and stopping time

(Hoisting 1.5 and over)
(Traversing, traveling 1.0~0.7)

J : Total moment of inertia converted to brake shaft (kg·m²)

$GD^2 = 4J \cdots$ Balance wheel effect (kgf·m²)

t_B : Braking time (s)

T_L : Load torque (N·m)

T'_L : Load torque (kgf·m)

Value converted into brake shaft

Code - represents the direction reverse to brake torque (lowering)

Code + represents the same direction as brake torque (hoisting)

Δn : Change in motor-rotation speed due to dead time (min⁻¹)

Δt : Dead time up to start of braking operation (s)

n_B : Rotation speed at the start of braking operation (min⁻¹)

R : Rotation volume of motor up to stop (rotation)

S : Braking distance (m)

V : Speed of load (m/min)

Z : Braking frequency (cycle/minute)

A_B : Braking workload per operation (J)

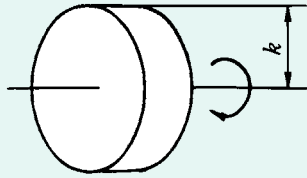
A'_B : Braking workload per operation (kgf·m)

E_B : Braking workload per minute (J/min)

E'_B : Braking workload per minute (kgf·m/min)

Calculation of the moment of inertia J

1. Right circular Cylinder

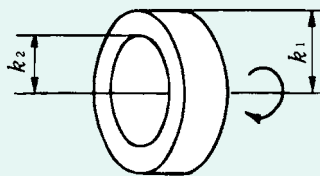


$$J = m \times \frac{k^2}{2} \text{ (kg} \cdot \text{m}^2\text{)}$$

k : Radius of rotating body [m]

m : Mass of rotating body [kg]

2. Hollow right circular cylinder



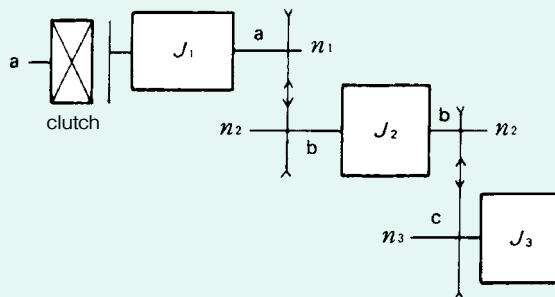
$$J = m \times \frac{k_1^2 + k_2^2}{2} \text{ (kg} \cdot \text{m}^2\text{)}$$

k_1 : Outer radius of rotating body (m)

k_2 : Inner radius of rotating body (m)

m : Mass of rotating body (kg)

To convert J of shaft a of the clutch having different rotation speed :



$$J = J_1 + \left(\frac{n_2}{n_1}\right)^2 \times J_2 + \left(\frac{n_3}{n_1}\right)^2 \times J_3 \text{ (kg} \cdot \text{m}^2\text{)}$$

n_1 Rotation speed of clutch shaft (min^{-1})

n_2 Rotation speed of shaft with second shaft J_2 (min^{-1})

n_3 Rotation speed of shaft with third shaft J_3 (min^{-1})

When ordering and making an inquiry

Please inform us of the following:

1. Application: Crane type, classification (hoisting, traversing, and traveling), usage rate, Rating of operations (cycle/hour), moment of inertia of the load
2. Operation environment: Indoor/outdoor use, ambient temperature
3. Brake type
4. Motor rating: Output/load hour rate, voltage, frequency (availability of inverter control regenerative braking)
5. Braking torque
6. Operation power supply: AC or DC, voltage, frequency
7. Special accessory (as applicable): Air damper, cover for outdoor use, manual opening device, AL transformer, control box, etc.
8. Spare parts



Safety precautions

Be sure to read the "Instruction Manual" or equivalent carefully before using the brake.

Contact for inquiries:

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