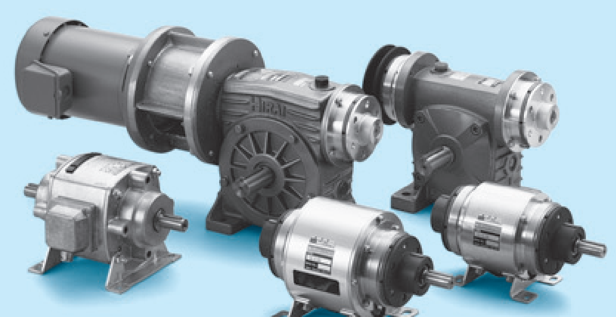
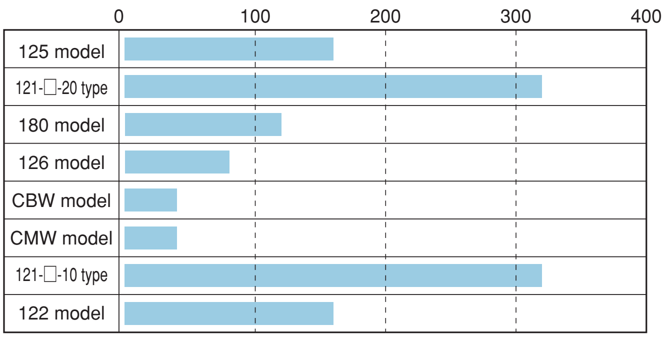
Electromagnetic actuated type clutch and brake units



- 125 model (clutch & brake)
- 121-□-20 type (clutch & brake)
- 180 model (sealed type)
- 126 model (clutch & brake + motor)
- CBW model (clutch & brake + reducer)
- CMW model (clutch & brake + motor + reducer)
- 121-□-10 type (double clutch)
- 122 model (double clutches & brake)



Selection

Select the appropriate shape and size in accordance with the use condition and the intended use.
The frictional-type clutches and brakes are useful since the performance is instantaneously exertedIf the clutch or break is not properly selected the clutch or brake may have performance problems.Fully grasp the following matters when selecting.

1 Intended use (Requirment functions for clutches brakes)
Coupling/Uncoupling, Braking / Holding, Speed change, Forward reverse operation, High-frequency operation, Positioning / Dividing, Inching, etc.

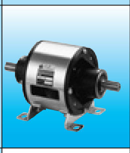
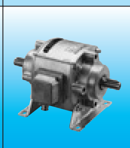
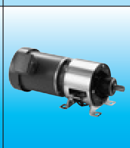
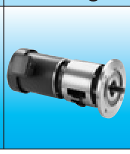
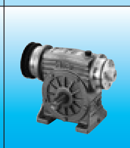
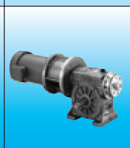
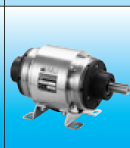
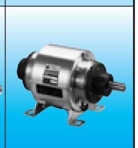
2 Required performance
Torque, Response, frequency of use, Operating life, Accuracy, Work volume, etc.

3 Load characteristic
Load torque, Load moment of inertia J, Load change, Rotation speed to be applied, etc.

4 Driving side condition
Motor (three phase, single phase, alternating current, etc.), Engine, Hydraulic・Pneumatic pressure, etc.

Model list

●…Adjustment ○…Suitable depending on applications

		Electromagnetic actuated type clutch and brake units								
Class		Clutch and brake							Double clutches	Double clutches & brake
Model・Type		125	121-□-20	180	126-4B (Base)	126-4F (B5flange)	CBW	CMW	121-□-10	122
Appearance										
Descriptive page		P43～46	P47～50	P51～54	P55～58		P59～62	P63～65	P67～70	P71～74
Adaptability	Position control	●	●	●	●	●	●	●		●
	Forward reverse operation								●	●
	Two-stage speed change								●	●
	High-frequency start・stop	●	●	●	●	●	●	●		●
	Wrapping input	●	●	●			●		●	●
	Coupling input	●		●					○	
	Wrapping output	●	●	●	●	●	●	●	●	●
	Coupling output	●	●	●	●	●	●	●	●	●
	Sealed structure (JP44)			●						
	On-CE specification product			●						
Characteristic	Optional mounting direction	●	●	●	●	●			●	●
	Shaft-to-shaft type	●		●	●	●				
	Through-shaft type		●				●	●	●	●
	Built-in general-purpose motor				●	●		●		
	Built-in worm reducer						●	●		
Environmental responsiveness		○	●						●	●

Electromagnetic actuated type clutch and brake units

Clutch Brake Unit

● 125 model

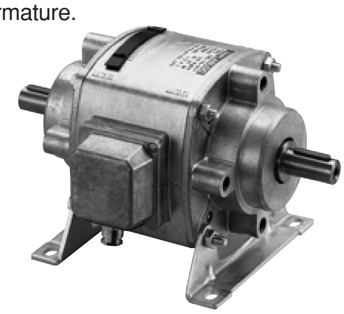
The 125 model is a drip-proof type, shaft-to-shaft construction unit. The power is applied from the input shaft, and is output constantly from the output shaft. Braking of output shaft is performed by the energization of brake in response to the current interruption of clutch.

● 121-□-20 type

The 121-□-20 type is an open type, through-shaft construction unit. The power is applied from the input hub, and is output constantly from the output shaft. Braking of output shaft is performed by the energization of brake in response to the current interruption of clutch.

● 180 model

The 180 model is a totally enclosed (JP44) shaft-to-shaft construction unit. Compactness and high torque (increased by 50 % of the conventional company products) have been implemented by one common armature.



Clutch Brake Unit (Direct-connected motor)

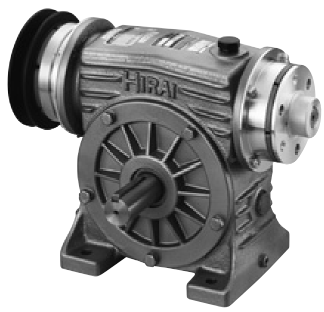
● 126 model

The 126 model includes a general-purpose three-phase motor that is directly connected with the input shaft. The base type or flange type can be selected.

Clutch Brake Unit (With a reducer integrated)

● CBW model

The clutch and brake are mounted on the input shaft of the reducer. The output is performed from the reducer, and the input is performed by belt transmission from the V-belt pulley.



Clutch Brake Unit (With a motor and reducer integrated)

● CMW model

The CMW model is an all-in-one unit integrating a reducer, motor, and clutch & brake that drives the input of CBW model by a motor through bearing.

Double clutch unit

● 121-□-10 type

The 121-□-10 type is a unit used for two-stage speed change and forward reverse operation with hub input, or for power distribution with shaft input.

Double clutch brake unit

● 122 model

The 122 model uses the hub for input, and it is used for two-stage speed change and forward reverse operation. The output shaft control is performed by the energization of brake in response to the current interruption of clutch.

125 model

Clutch Brake Unit

The 125 model is a unit in which the performances of both clutch and brake are developed to their fullest. It is robust yet lightweight. The driproof, shaft to shaft construction is easy to use and fits many general industrial applications. The steel plate base and the casting base (E type make-to-order product) are available. It is easy to mount, and has longer operating time.

■ Shaft-to-shaft construction・Drip-proof type

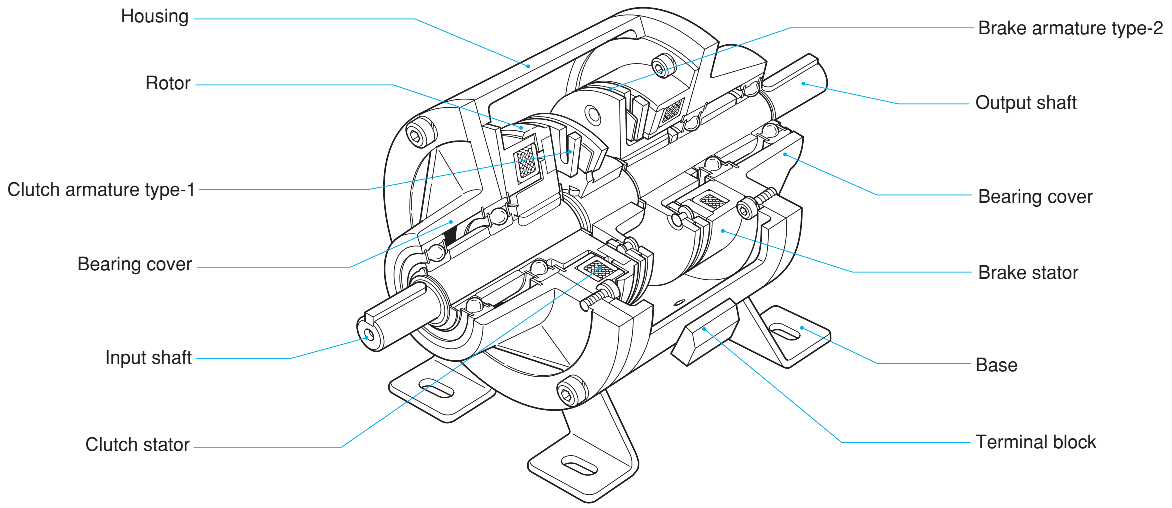
It has a drip-proof type structure which contains the clutch and brake in the light-alloy housing. It is easy to use.

■ No limit for the mounting direction

By the use of plate spring, vertical mounting can be used without difficulty.

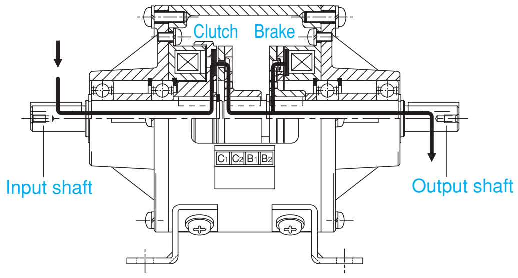
Unit type	125-□-12	125-□-12E
Clutch and brake torque [N･m]	2.4 ～ 160	5 ～160
Operational temperature [℃]	−10 ～+40	
Backlash	Zero	

■ Structure



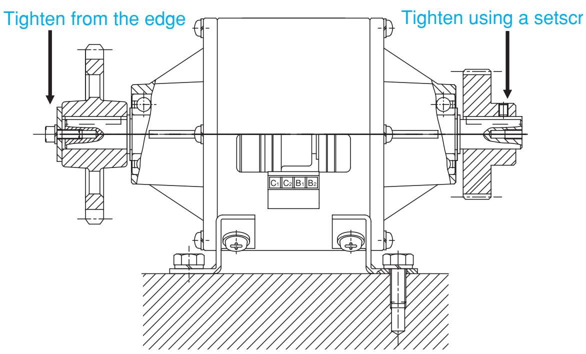
■ Power transmission

The input and output shafts are separated from each other, and they are connected with the drive by mounting a pulley (or the like) on the input shaft for constant rotation. When applying current through the clutch, both shafts are connected to transmit the rotation. When turning off the current of the clutch at the same time as applying current through the brake mounted on the output shaft, the input shaft and output shaft are decoupled from each other, and the output shaft is immediately controlled.



■ Mounting

Since there are drilled and tapped holes on the input and output shaft, a pulley, for instance, can be easily mounted with the attached jig. There are two methods of fixation, one is to use a screw to tighten from the edge and the other is to use a setscrew.

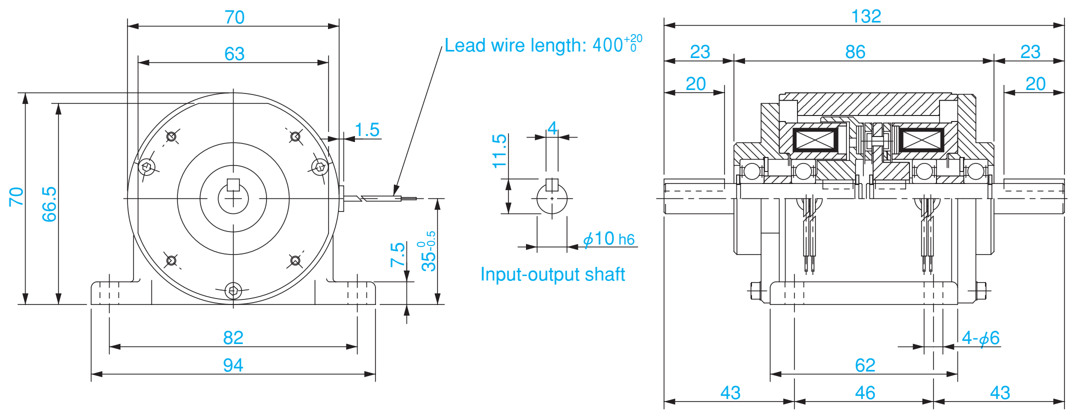


Specification

Model	Size	Dynamic friction torque T_d [N·m]	Static friction torque T_s [N·m]	Coil (at20℃) Voltage [V]	Wattage [W]	Amperage [A]	Resistance [Ω]	Heat-resistance class	Maximum rotation speed [min⁻¹]	Rotating part moment of inertia J J [kg·m²]	Total amount of work before air gap readjustment E_T [J]	Armature suction time t_a [s]	Torque risetime t_p [s]	Torque extinction time t_d [s]	Mass [kg]
125-05-12	05	2.4	—	DC24	10	0.42	58	B	3000	2.4×10^{-5}	9×10^{6}	C:0.012 B:0.010	C:0.031 B:0.023	C:0.040 B:0.012	1.2
125-06-12(E)	06	5	5.5	DC24	11	0.46	52	B	3000	1.28×10^{-4}	36×10^{6}	C:0.020 B:0.015	C:0.041 B:0.033	C:0.020 B:0.015	2.1
125-08-12(E)	08	10	11	DC24	15	0.63	38	B	3000	3.70×10^{-4}	60×10^{6}	C:0.023 B:0.016	C:0.051 B:0.042	C:0.030 B:0.025	4.2
125-10-12(E)	10	20	22	DC24	20	0.83	29	B	3000	1.40×10^{-3}	130×10^{6}	C:0.025 B:0.018	C:0.063 B:0.056	C:0.050 B:0.030	6.8
125-12-12(E)	12	40	45	DC24	25	1.09	23	B	3000	3.85×10^{-3}	250×10^{6}	C:0.040 B:0.027	C:0.115 B:0.090	C:0.065 B:0.050	12
125-16-12(E)	16	80	90	DC24	35	1.46	16	B	3000	1.35×10^{-2}	470×10^{6}	C:0.050 B:0.035	C:0.160 B:0.127	C:0.085 B:0.055	22
125-20-12E	20	160	175	DC24	45	1.88	13	B	2500	4.08×10^{-2}	10×10^{8}	C:0.090 B:0.065	C:0.250 B:0.200	C:0.130 B:0.070	49

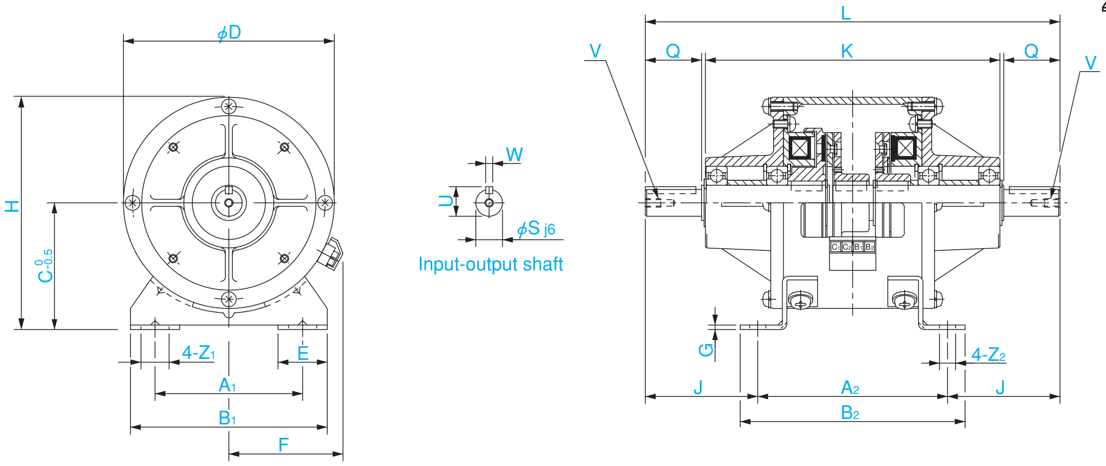
* Dynamic friction torque (Td) indicates the value when relative velocity is (100min⁻¹).

Dimensions 125-05-12



●CAD file No. 125-120

Dimensions 125-□-12

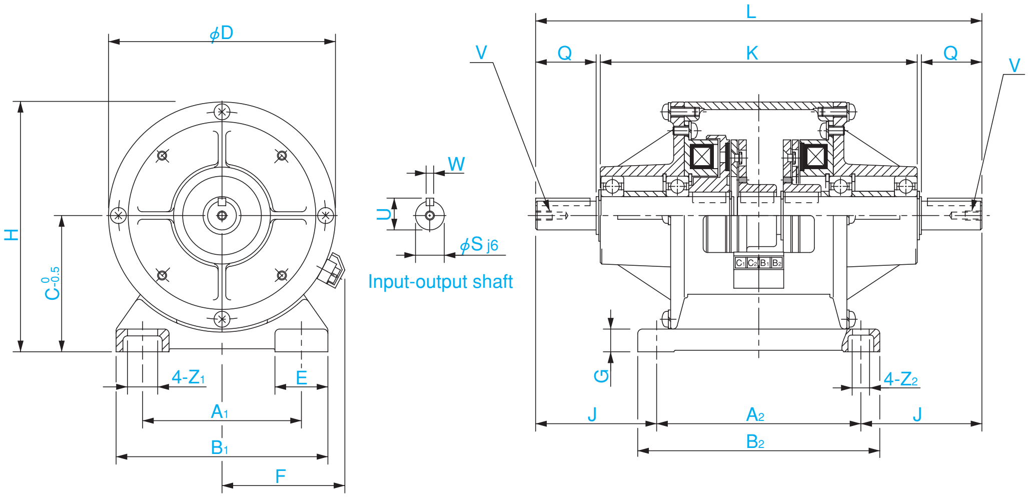


Unit [mm]

Model	Body dimensions A1	A2	B1	B2	C	D	E	F	G	H	J	K	L	Z1	Z2	Shaft dimensions Q	S	U	V	W	CAD File No.
125-06-12	65	90	90	105	65	100	27.5	61	2.6	115	48.5	132	187	13.5	6.5	25	11	12.5	M4×0.7depth 8	4	125-121
125-08-12	80	110	110	130	80	125	32.5	72	3.2	142.5	63	171	236	15.5	9	30	14	16	M4×0.7depth 8	5	125-122
125-10-12	105	135	140	160	90	150	35	81	3.2	165	80	210	295	20	11.5	40	19	21	M6×1depth 11	5	125-123
125-12-12	135	160	175	185	112	190	42.5	97	4.5	207	108	270	376	24	11	50	24	27	M6×1depth 11	7	125-124
125-16-12	155	200	200	230	132	230	45	109	6	247	145	362	490	28	14	60	28	31	M6×1depth 11	7	125-125

* The keyway of the input-output shaft corresponds to the previous edition of JIS standards second class, and the key corresponds to the now-defunct JIS standard first class.
* Use the attached set for inserting a pulley into the input-output shaft.

Dimensions 125-□-12E Available by special order



Unit［mm］

Model	Body dimensions															Shaft dimensions					CAD File No.
	A_1	A_2	B_1	B_2	C	D	E	F	G	H	J	K	L	Z_1	Z_2	Q	S	U	V	W	
125-06-12E	65	90	90	105	65	100	27.5	61	10	115	48.5	132	187	13.5	6.5	25	11	12.5	M4×0.7depth8	4	—
125-08-12E	80	110	110	130	80	125	32.5	72	12	142.5	63	171	236	15.5	9	30	14	16	M4×0.7depth8	5	—
125-10-12E	105	135	140	160	90	150	35	81	15	165	80	210	295	20	11.5	40	19	21	M6×1depth11	5	—
125-12-12E	135	160	175	185	112	190	42.5	97	15	207	108	270	376	24.5	11	50	24	27	M6×1depth11	7	—
125-16-12E	155	200	200	230	132	230	45	109	18	247	145	362	490	28	14	60	28	31	M6×1depth11	7	—
125-20-12E	195	240	240	270	160	290	47.5	124	20	305	188	448	616	28	14	80	38	41.5	M10×1.5depth17	10	—

* The keyway of the input-output shaft corresponds to the previous edition of JIS standards second class, and the key corresponds to the now-defunct JIS standard first class.
* Use the attached set for inserting a pulley into the input-output shaft.

Ordering Information

125-06-12□

Size: 06

Base: Steel plate (Standard): Blank
Casting (Available by special order): E

Stand-alone clutches and brakes list

Model	Stand-alone model of clutch	Stand-alone model of brake	Bearing number	
			Input part	Output part
125-05-12	—	—	6000	6000
125-06-12(E)	101-06-11 24V R15JIS A15JIS	111-06-12 24V A15JIS	6202	6202
125-08-12(E)	101-08-11 24V R20JIS A20JIS	111-08-12 24V A20JIS	6004	6004
125-10-12(E)	101-10-11 24V R25JIS A25JIS	111-10-12 24V A25JIS	6205	6205
125-12-12(E)	101-12-11 24V R30JIS A30JIS	111-12-12 24V A30JIS	6206	6206
125-16-12(E)	101-16-11 24V R40JIS A40JIS	111-16-12 24V A40JIS	6208	6208
125-20-12E	101-20-11 24V R50JIS A50JIS	111-20-12 24V A50JIS	6211	6211

Recommended power supply • Accessory list

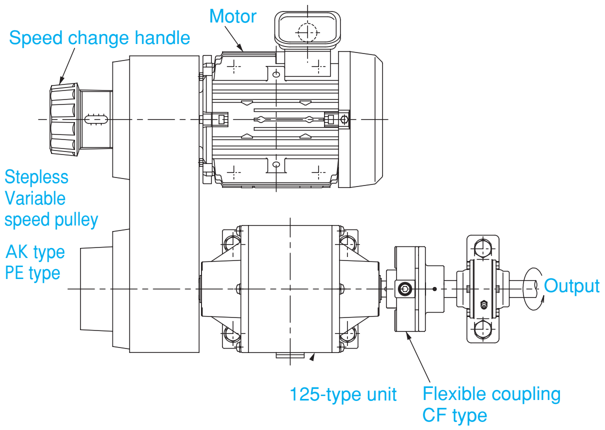
Model	Recommended power supply	Accessories			
		Protective device*1 (Varistor) 2pieces	Tightening collar	Threaded rod	Hexagon nut
125-05-12	BER-05	NVD07SCD082 or Corresponding product	—	—	—
125-06-12(E)	BER-05・BEJ-10-06	NVD07SCD082 or Corresponding product	1	M4×55（Hexagon socket bolt）1	M4 1
125-08-12(E)	BER-05・BEJ-10-08	NVD07SCD082 or Corresponding product	1	M4×55（Hexagon socket bolt）1	M4 1
125-10-12(E)	BER-05・BEJ-10-10	NVD07SCD082 or Corresponding product	1	M6×100 1	M6 2
125-12-12(E)	BER-10・BEH-20N	NVD07SCD082 or Corresponding product	1	M6×100 1	M6 2
125-16-12(E)	BER-10・BEH-20N	NVD07SCD082 or Corresponding product	1	M6×100 1	M6 2
125-20-12E	BER-20・BEH-20N	NVD07SCD082 or Corresponding product	1	M10×160 1	M10 2

* *1 The protective device NVD□SCD□ is manufactured by KOA.
* For the overexcitation electromagnetic power supply BEJ・EBEH, varistor is not required. Refer to the section of power supply for more detail.

Mounting Example

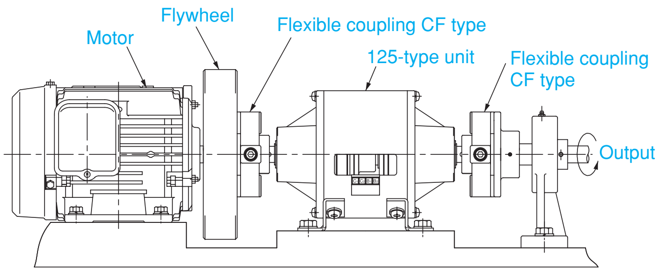
Combination with a speed changer

Clutch and brake is generally used after a motor and speed changer. This unit is designed to be able to combine with our belt-type stepless speed changer. Pre-installed set is available. Contact us for further information.



Connecting directly with motor

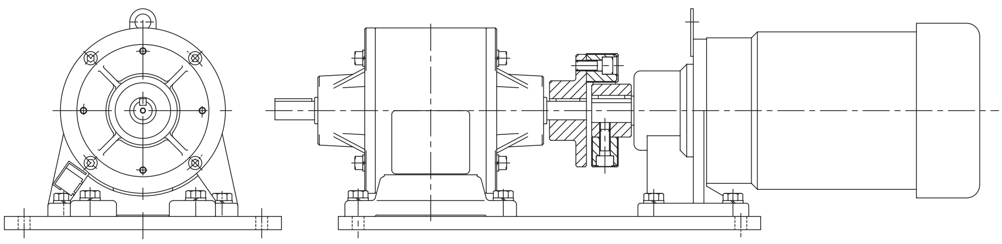
Since the moment of inertia of coupling is generally smaller compared with pulley orsprocket, it is commonly used in combination with clutch and brake. Especially, the combination of this unit and our flexible coupling (CENTA FLEX) is widely used. It isvery effective to mount the coupling on the motor side in combination with a flywheel.



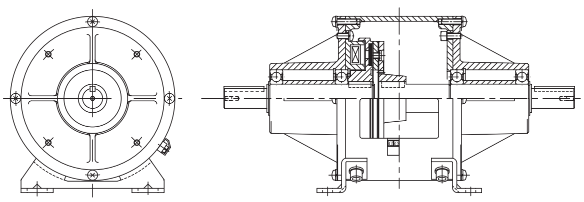
Particular Case

Special cases other than described below such as setting a drive or making a unit withpulley or sprocket are available upon request. Contact us for further information.

One base unit with a combination of geared motor and coupling



Clutch unit (with no brake)



Electromagnetic actuated type clutch and brake units

121 model 121-□-20 type

Clutch Brake Unit

The 121 model is an open type, through-shaft construction unit in which the performances of both clutch and brake are developed to their fullest. It is strong yet lightweight. It is compact, and fits in many applications of general industrial machinery. Easy to mount, and has longer operating time.

Through-shaft construction・Open type

It has an open-type through shaft construction which has the clutch and brake mounted on the outer side of the light-alloy drum.

Ideal for wrapping・gear drive

Due to its wide bearing span, it is strongly resistant to a radial loads. It can be usedwith high tension by mounting a pulley or spur gear.

The output shaft can be used for various purposes.

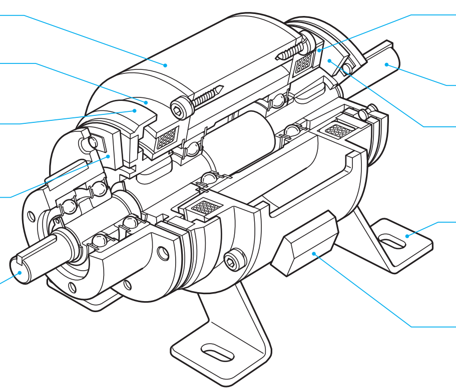
Due to the though-shaft construction, both sides of the shaft can be used for output.Mechanism layout such as using both sides for branch drive, or mounting a detection disc to one side can be performed.

Adapted to the RoHS

Adapted to the Restriction of Hazardous Substances that bans the use of 6 substances such as mercury or lead can be selected as option.

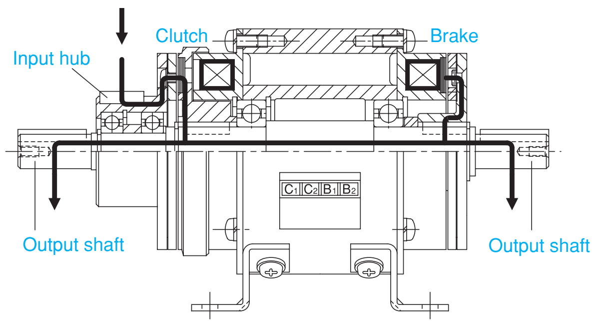
Unit type	121-□-20
Clutch and brake torque [N・m]	5 ~ 320
Operational temperature [℃]	−10 ~ +40
Backlash	Zero

Structure



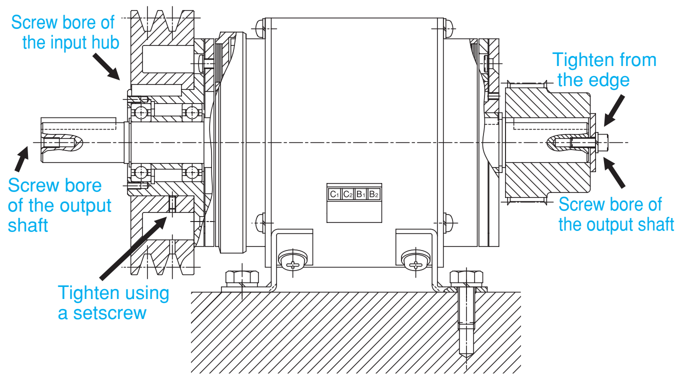
Power transmission

The input hub is hung above the shaft by the bearing, and is connected with the drive by mounting a pulley (or the like) for constant rotation. When applying current through the clutch, both shafts are connected to transmit rotation. When turning off the current of the clutch at the same time as applying current through the brake mounted on theoutput shaft, the input shaft and output shaft are separated from each other, and theoutput shaft is immediately controlled. Due to its excellent responsiveness, continued high-frequency operation can be done.



Mounting

Since there are screw bores on the edge of the input hub and output shaft, mounting can be done with the attached jig. There are two methods of fixation, one is to use a screw to tighten from the edge and the other is to use a setscrew.



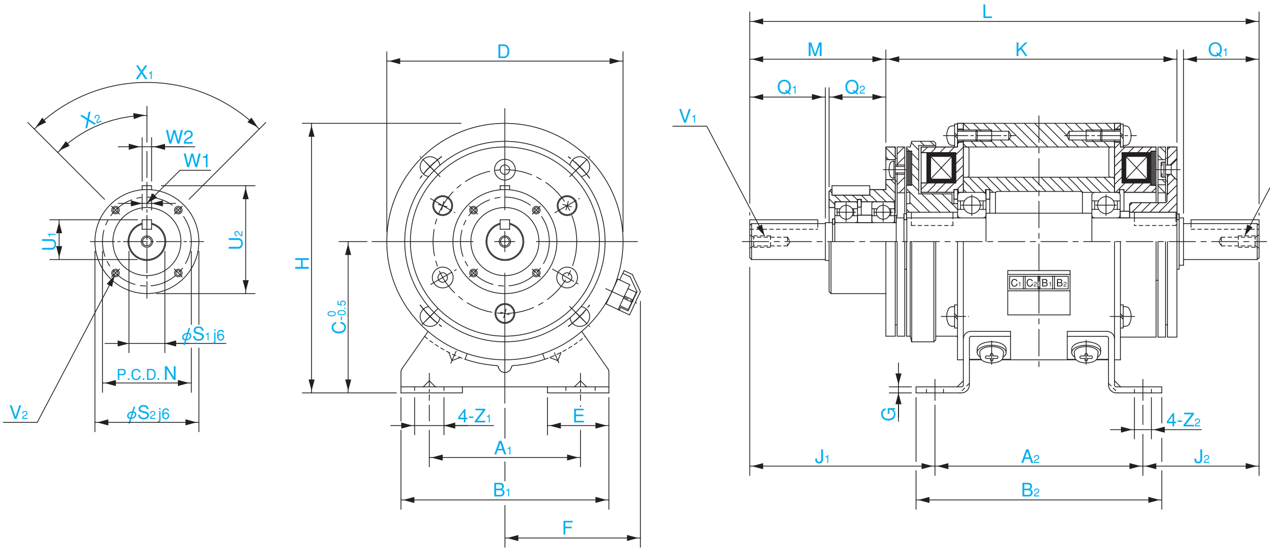
Specification

Model	Size	Dynamic friction torque T_d [N·m]	Static friction torque T_s [N·m]	Coil (at20℃) Voltage [V]	Wattage [W]	Amperage [A]	Resistance [Ω]	Heat-resistance class	Maximum rotation speed [min^{-1}]	Rotating part moment of inertia J J [kg·m²]	Total amount of work before air gap readjustment E_T [J]	Armature suction time t_a [s]	Torque risetime t_p [s]	Torque extinction time t_d [s]	Mass [kg]
121-06-20	06	5	5.5	DC24	11	0.46	52	B	3000	1.43×10^{-4}	36×10^{6}	C:0.020 B:0.015	C:0.041 B:0.033	C:0.020 B:0.015	1.5
121-08-20	08	10	11	DC24	15	0.63	38	B	3000	4.23×10^{-4}	60×10^{6}	C:0.023 B:0.016	C:0.051 B:0.042	C:0.030 B:0.025	2.7
121-10-20	10	20	22	DC24	20	0.83	29	B	3000	1.42×10^{-3}	130×10^{6}	C:0.025 B:0.018	C:0.063 B:0.056	C:0.050 B:0.030	5.5
121-12-20	12	40	45	DC24	25	1.09	23	B	3000	4.18×10^{-3}	250×10^{6}	C:0.040 B:0.027	C:0.115 B:0.090	C:0.065 B:0.050	9.6
121-16-20	16	80	90	DC24	35	1.46	16	B	3000	1.34×10^{-2}	470×10^{6}	C:0.050 B:0.035	C:0.160 B:0.127	C:0.085 B:0.055	18.5
121-20-20	20	160	175	DC24	45	1.88	13	B	2500	4.13×10^{-2}	10×10^{8}	C:0.090 B:0.065	C:0.250 B:0.200	C:0.130 B:0.070	35
121-25-20	25	320	350	DC24	60	2.50	9.6	B	2000	1.02×10^{-1}	20×10^{8}	C:0.115 B:0.085	C:0.335 B:0.275	C:0.210 B:0.125	64

* Dynamic friction torque (Td) indicates the value when relative velocity is ($100min^{-1}$).

Dimensions

CAD



Unit [mm]

Model	Body dimensions A1	A2	B1	B2	C	D	E	F	G	H	J1	J2	K	L	M	N	Z1	Z2	Shaft dimensions Q1	Q2	S1	S2	U1	U2	V1	V2	X1	X2	W1,2	CAD File No.
121-06-20	52.5	75	80	90	55	80	27.5	53	2.6	95	65.5	40.5	105.5	181	47	33	13.5	6.5	25	20	11	38	12.5	39.5	M4X0.7depth8	3-M4X0.7depth4	3-120°	60°	4	121-201
121-08-20	65	90	90	105	65	100	27.5	61	2.6	115	78.5	48.5	126.5	217	57	37	13.5	6.5	30	25	14	45	16	47	M4X0.7depth8	3-M4X0.7depth6	3-120°	60°	5	121-202
121-10-20	80	110	110	130	80	125	32.5	72	3.2	142.5	98	62	154	270	72	47	15.5	9	40	30	19	55	21	57	M6X1depth11	4-M4X0.7depth8	4-90°	45°	5	121-203
121-12-20	105	135	140	160	90	150	35	81	3.2	165	121	73.5	184	330	92	52	20	11.5	50	40	24	64	27	67	M6X1depth11	4-M4X0.7depth8	4-90°	45°	7	121-204
121-16-20	135	160	175	185	112	190	43	97	4.5	207	149	90	221	399	113	62	24.5	11.5	60	50	28	75	31	78	M6X1depth11	6-M5X0.8depth8	6-60°	30°	7	121-205
121-20-20	155	200	200	230	132	230	45	109	6	247	187	117	276	504	142	74.5	28	14	80	60	38	90	41.5	93.5	M10X1.5depth17	4-M6X1depth12	4-90°	45°	10	121-206
121-25-20	195	240	240	270	160	290	47.5	124	20	305	238	154	334	632	183	101.5	28	14	110	70	42	115	45.5	118.5	M10X1.5depth17	8-M6X1depth12	8-45°	22.5°	12	121-207

* The keyway of the input-output shaft corresponds to the previous edition of JIS standards second class, and the key corresponds to the now-defunct JIS standard first class.
* Use the attached set for inserting a pulley into the input-output shaft.
* The base of the 121-25-20 is manufactured by casting.

Ordering information

121-06-20G

06: Size

Stand-alone clutches and brakes list

Model	Stand-alone model of clutch	Stand-alone model of brake	Bearing number	
			Main shaft part	Hub part
121-06-20	101-06-15 24V R15JIS A12JIS	111-06-12 24V A15JIS	6202	6001
121-08-20	101-08-15 24V R20JIS A15JIS	111-08-12 24V A20JIS	6004	6002
121-10-20	101-10-15 24V R25JIS A20JIS	111-10-12 24V A25JIS	6205	6004
121-12-20	101-12-15 24V R30JIS A25JIS	111-12-12 24V A30JIS	6206	6005
121-16-20	101-16-15 24V R40JIS A30JIS	111-16-12 24V A40JIS	6208	6006
121-20-20	101-20-15 24V R50JIS A40JIS	111-20-12 24V A50JIS	6211	6008
121-25-20	101-25-15 24V R60JIS A50JIS	111-25-12 24V A60JIS	6214	6010

Recommended power supply/Accessory list

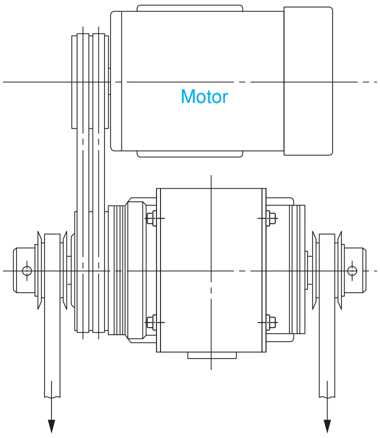
Model	Recommended power supply	Accessories				
		Protective device*1 (Varistor) 2pieces	Tightening collar	Threaded rod	Lashing wire	Hexagon nut
121-06-20	BER-05・BEJ-10-06	NVD07SCD082 or Corresponding product	1	M4×55 3	1	M4 3
121-08-20	BER-05・BEJ-10-08	NVD07SCD082 or Corresponding product	1	M4×55 3	1	M4 3
121-10-20	BER-05・BEJ-10-10	NVD07SCD082 or Corresponding product	1	M4×55 3	1	M4 3
121-12-20	BER-10・BEH-20N	NVD07SCD082 or Corresponding product	1	M4×55 2 M6×100 1	1	M4 2 M6 1
121-16-20	BER-10・BEH-20N	NVD07SCD082 or Corresponding product	1	M5×70 2 M6×100 1	1	M5 2 M6 1
121-20-20	BER-20・BEH-20N	NVD07SCD082 or Corresponding product	1	M6×160 2 M10×220 1	1	M6 4 M10 2
121-25-20	BER-20・BEH-20N	NVD07SCD082 or Corresponding product	1	M6×160 2 M10×220 1	1	M6 4 M10 2

* *1 The protective device NVD□SCD□ is manufactured by KOA.
* For the overexcitation electromagnetic power supply BEJ・EBEH, varistor is not required. Refer to the section of power supply for more detail.

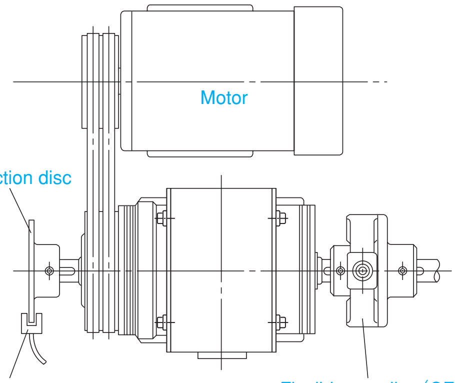
Mounting Example

Due to its structure, both sides of the shaft can be use for output in accordance with theintended use. Various channel layouts such as connecting one side to load and mounting a rotational detection disc to the other side can be performed.

● Example when using two channels for output



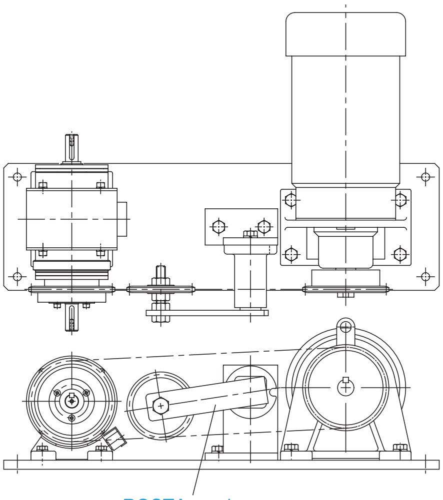
● Mounting a detection on one side



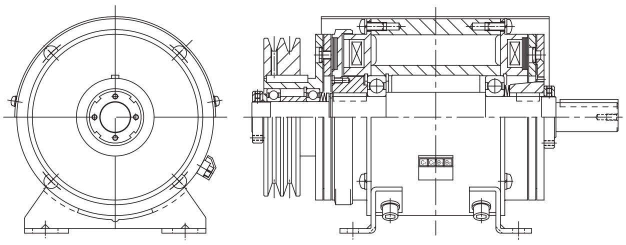
Particular Case

Special cases other than described below such as setting a drive or making a unit withpulley or sprocket are available in response to requests. Contact us for further information.

● One base unit with a combination of geared motor and coupling

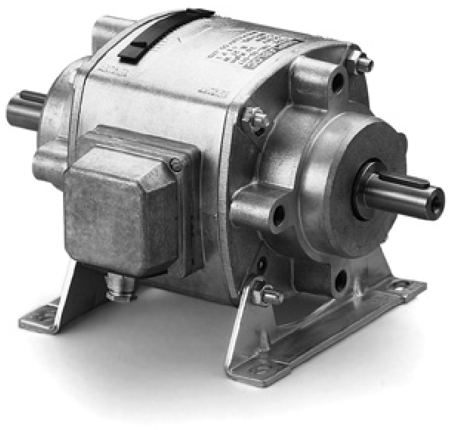


● Clutch and brake unit with V pulley on the input side



180 model

Clutch Brake Unit (Sealed type)



The 180 model is a shaft-to-shaft type unit with a combination of brake and clutch. Dueto its totally enclosed construction (JP44), it is environmentally resistant. There is no interference of torque between the clutch and brake. Also, the air gap adjustment can be easily completed. There are many other features in this unit.

High resistance to environment

Due to its totally enclosed construction (JP44 JIS C4004-1980), it responds to an hostile environment such as water, oil or dust.

High torque

Compact design, with high torque capacity. Torque is increased by 50 % of theconventional company products.

Reliable operation

The clutch and braking armature are combined into one common piece. There is no interference of switching.

Simple adjustment

The air gap adjustment can be easily completed by loosening the bolt and turning the ring. The conventional adjustment by disassembling is not necessary.

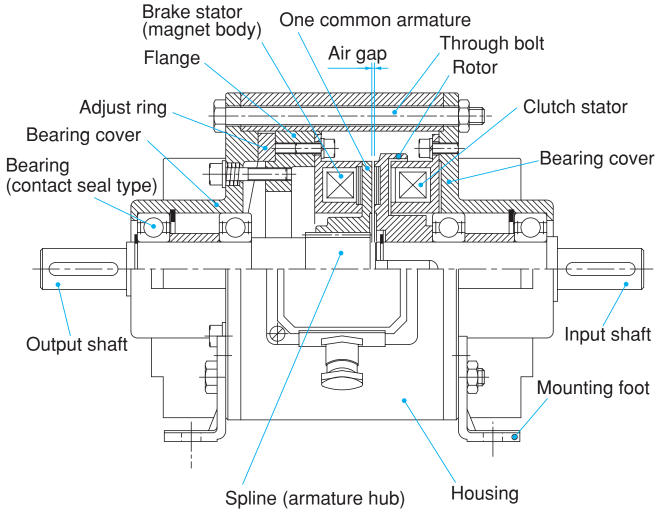
Free choice of mounting

By changing the mounting foot position, the terminal block can be moved from right to left or up and down. The center height can be selected from two high-low levels.

Unit type	180-□-011
Clutch and brake torque [N・m]	7.5 ～ 120
Operational temperature [℃]	−10 ～ +40
Backlash	Little

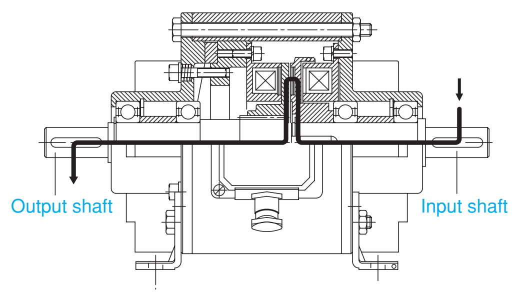
Structure

The 180 model is a shaft-to-shaft type unit with a combination of brake and clutch. Ithas a totally enclosed construction, and the air gap adjustment can be completed without disassembling the unit. The "one common armature" that combined the clutch and braking armature into one, can freely move to the shaft direction through the spline on the output shaft.
Due to its totally enclosed construction, maintenance is not necessary.



Power transmission

The input and output shafts are separated from each other, and they are connected with the drive by mounting a pulley (or the like) on the input shaft for constant rotation.When applying current through the clutch, the one common armature is suctioned and attached firmly to the rotor. Then, both shafts are connected to transmit the rotation. When turning off the current of the clutch at the same time as applying current throughthe brake, the one common armature is suctioned and attached firmly to the brakestator, and the output shaft is immediately controlled.

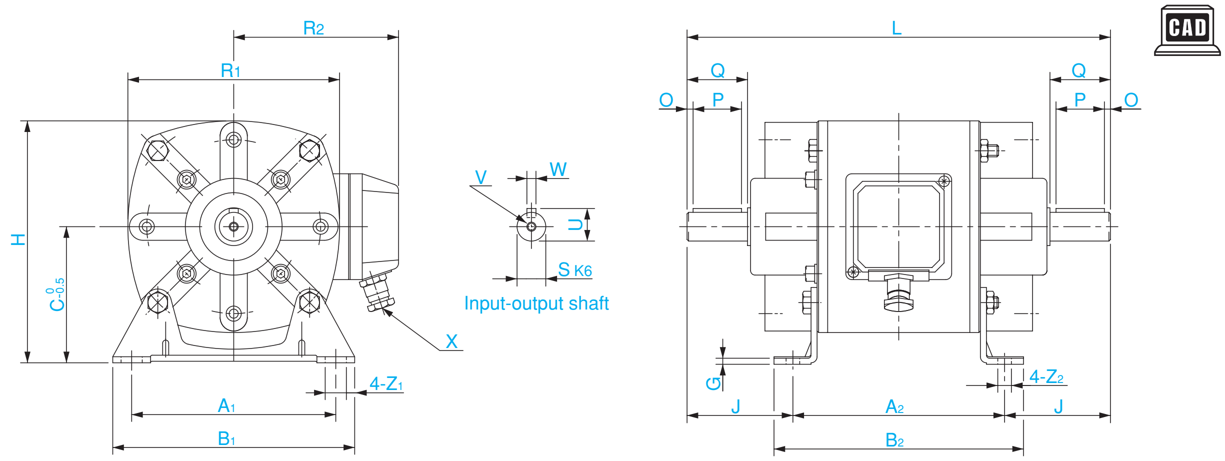


Specification

Model	Size	Clutch and brake	Dynamic friction torque T_d [N·m]	Coil (at20℃) Voltage [V]	Wattage [W]	Amperage [A]	Resistance [Ω]	Heat-resistance class	Maximum rotation speed [min⁻¹]	Rotating part moment of inertia J Rotor [kg·m²]	Armature [kg·m²]	Output shaft [kg·m²]	Allowable work E_{eal}[J] (E_{bal})[J]	Total amount of work before air gap readjustment E_T [J]	Mass [kg]
180-06-011	06	Clutch	7.5	DC24	15	0.63	38	B	1800	1.25×10^{-4}	5.00×10^{-5}	7.50×10^{-6}	36×10^{2}	24×10^{6}	2.5
		Brake			11.5	0.48	50								
180-08-011	08	Clutch	15	DC24	20	0.83	29	B	1800	2.75×10^{-4}	1.50×10^{-4}	2.50×10^{-5}	60×10^{2}	40×10^{6}	4.5
		Brake			16	0.67	36								
180-10-011	10	Clutch	30	DC24	28	1.17	21	B	1800	7.75×10^{-4}	4.25×10^{-4}	7.50×10^{-5}	100×10^{2}	62×10^{6}	8.0
		Brake			21	0.88	27								
180-12-011	12	Clutch	60	DC24	35	1.46	16	B	1800	2.25×10^{-3}	1.20×10^{-3}	1.50×10^{-4}	160×10^{2}	154×10^{6}	12.5
		Brake			28	1.17	21								
180-16-011	16	Clutch	120	DC24	50	2.08	12	B	1800	6.30×10^{-3}	3.78×10^{-3}	6.50×10^{-4}	250×10^{2}	250×10^{6}	23.5
		Brake			38	1.58	15								

* Dynamic friction torque (Td) indicates the value when relative velocity is(100min⁻¹).
* The allowable work (E_{bal}) indicates the maximum work allowed for one connection(braking).

Dimensions



Unit [mm]

Model	Body dimensions A1	A2	B1	B2	C	G	H	J	L	O	P	Q	R1	R2	X	Z1	Z2	Shaft dimensions S	U	V	W	CAD File No.
180-06-011	82.5	100	100	115	63 *71	3	108 *116	41.5	183	2.5	18	23	90	89	M16	9.5	7	11	12.5	M4×0.7depth10	4	180-0111
180-08-011	107.5	120	130	140	71 *80	3	127 *136	55	230	2.5	25	30	112	95	M16	11.5	9	14	16	M5×0.8depth12	5	180-0112
180-10-011	135	140	160	165	80 *90	4	150 *160	70	280	4	32	40	140	110	M16	14	9	19	21.5	M6×1depth16	6	180-0113
180-12-011	155	160	180	184	100 *112	5	183.5 *195.5	82	324	5	40	50	167	136	M16	16	11	24	27	M8×1.25depth19	8	180-0114
180-16-011	190	185	223	215	112 *132	6	217 *237	97.5	380	5	50	60	210	158	M16	18	13	28	31	M10×1.5depth22	8	180-0115

* The*mark indicates the dimensions when the mounting foot position is changed. It is optional. Contact us for further information. @
* Use the attached set for inserting a pulley into the input-output shaft.
* The adaptive size of the cable connecter is (φ6) ～ (φ8). (Common in all size)

Ordering Information

180-[06]-011 [63]

Size — 06

Center height (Dimensional sign C) — 63

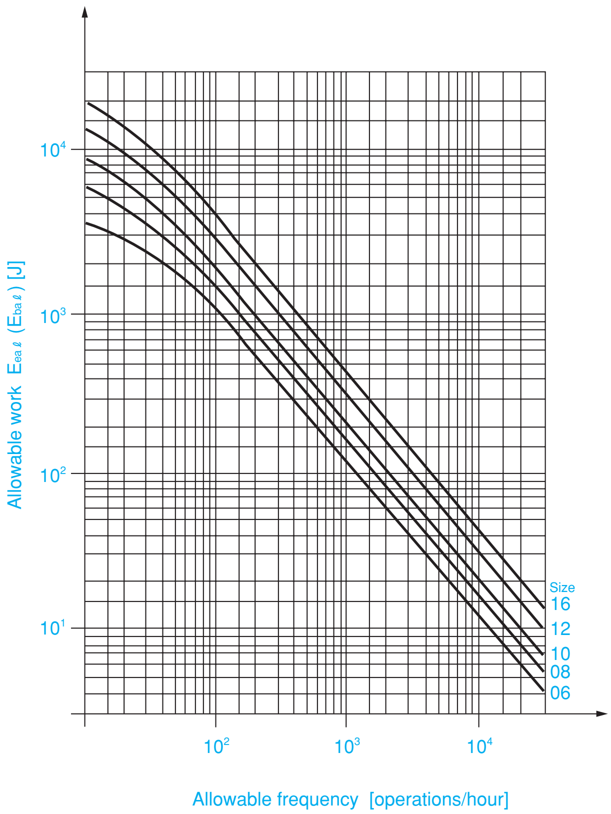
※The center height with * mark is optional. Contact us for further information.

Recommended power supply/Accessory list

Model	Recommended power supply	Accessories			
		Protective device*1 (Varistor) 2pieces	Tightening collar	Threaded rod	Hexagon nut
180-06-011	BER-05	NVD07SCD082 or Corresponding product	1	M4×55 1	M4 1
180-08-011	BER-05	NVD07SCD082 or Corresponding product	1	M5×70 1	M5 1
180-10-011	BER-10	NVD07SCD082 or Corresponding product	1	M6×100 1	M6 2
180-12-011	BER-10	NVD07SCD082 or Corresponding product	1	M8×210 1	M8 2
180-16-011	BER-20	NVD07SCD082 or Corresponding product	1	M10×160 1	M10 2

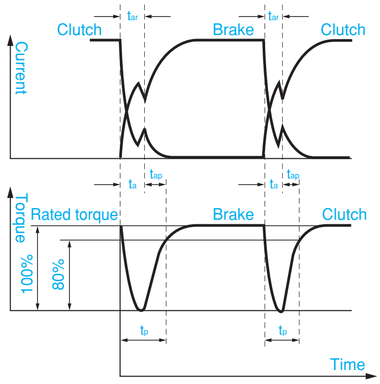
* The pulley insertion set (threaded rod, tightening collar and hexagon nut/ one each)is attached for all sizes.
* *1 The protective device NVD□SCD is manufactured by KOA.
* Refer to the section of power supply for more detail.

Allowable work characteristics



Operating characteristics

The armature is common to both clutch and brake. It is moved from one side to another by the magnetic pull of respective stators. For this reason, there is no interference of torque between the clutch and brake. Therefore, reliable and economical operation can be performed.



Operating time

Unit [s]

Model	Clutch			Brake		
	$t_a = t_{ar}$	t_{ap}	t_p	$t_a = t_{ar}$	t_{ap}	t_p
180-06-011	0.020	0.035	0.055	0.020	0.025	0.045
180-08-011	0.025	0.070	0.095	0.025	0.030	0.055
180-10-011	0.035	0.085	0.120	0.035	0.050	0.085
180-12-011	0.050	0.120	0.170	0.050	0.075	0.125
180-16-011	0.065	0.145	0.210	0.065	0.085	0.150

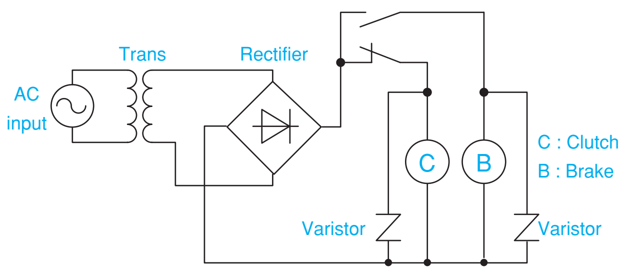
* The above value indicates the value obtained when the operation is performed on the direct-current side. In the case of alternating current, it is more than 3 times slower.

t_a —Armature suction time: Time from when the current is applied till when thearmature is suctioned and torque is generated.
t_{ap}—Torque increment time: Time from when torque is generated till when it becomes 80% of the rated torque.
t_p —Torque rise time: Time from when the current is applied till when it becomes 80% of the rated torque.
t_{ar}—Armature release time: Time from when the current is shut off till when thearmature returns to the position before suction.

Structural instructions

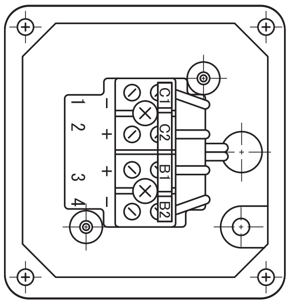
Control circuit

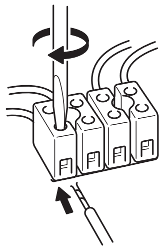
The operating power supply is DC24V. Voltage variation must be within ±10%. The varistor (accessory), a protective device for surge absorption, must be connected in parallel for the clutch and brake respectively. For use of a relay, direct-current breaking capacity over 3 or 4 times the load current (clutch and brake power supply) is required.



● Wiring • Connection

Since this unit has a polarity, follow the face plate of the terminal block to connect. Alead wire to connect to the terminal block must be below (2.5mm²).
If the JP44 of shelter density is required, use a vinyl-cap tire cable. Applicable size for the cable must be (ϕ6～ϕ8) (3 or 4 pins), which is common in all size.
(Information in this document is subject to change without notice. Contact us for updates.)





● Air gap adjustment

Since clutches and brakes transmit torque by friction force, the friction surface is worn away. The air gap is enlarged by long term use and wear of the friction surfaces. When it exceeds its limit, it disrupts the performance such as torque or operating characteristics, and therefore the air gap adjustment is necessary. Proper operation canbe obtained after adjustment.

●Time before it needs to be adjusted

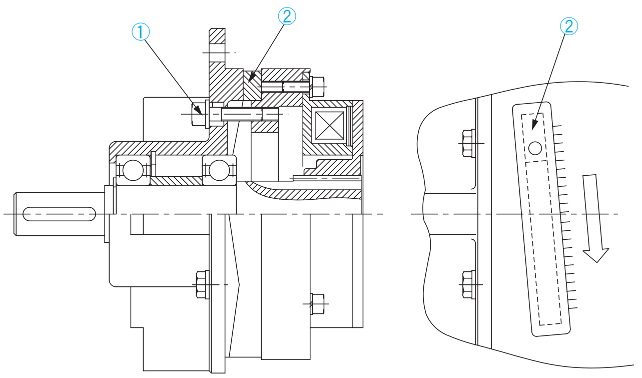
Size	Estimated air gap [mm]	Limit air gap [mm]	Total amount of work before air gap readjustment E_T [J]	Air gap of one scale [mm]
06	0.2	0.5	24×10⁶	0.2
08	0.2	0.5	40×10⁶	0.2
10	0.2	0.5	62×10⁶	0.2
12	0.3	0.75	154×10⁶	0.3
16	0.3	0.75	250×10⁶	0.3

* Total operating time: 5 to 6 readjustment after reaching the limit.

● Air gap adjustment procedure

For the adjustment by a unique cam method, follow the procedure below.

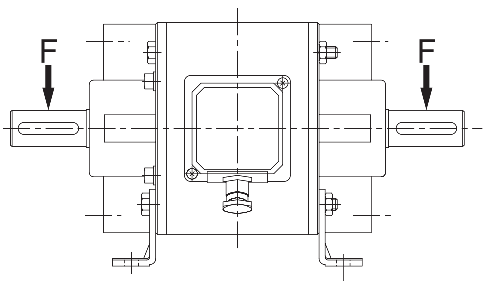
❶ Loosen the 4 hexagon socket bolts ① completely. Do not remove. The hexagon socket bolt is specified by red paint.
❷ Remove the cover on the adjust ring ②. Insert the rod into the ring bore, and turn to the direction of an arrow.
❸ When it butts, the air gap is zero. Set it back by one scale. The appropriate air gap is set.
❹ Tighten the hexagon socket bolts, and place the cover. The air gap adjustment is completed.



Other check items

❶ Allowable maximum input rotation speed is (180min⁻¹), which is common in all size.
❷ Axial tolerance is K6. The recommended bore diameter tolerance is H7.
❸ The heat-resistance class of coil is B type. The operating temperature limit is from -10 to 40℃.
❹ Perform centering completely when connecting input and output. It is convenient to use a flexible coupling.
❺ For wrapping such as pulley or sprocket, the overhung load must be considered.
❻ Direction of input and output is displayed by INOUT/OUTPUT on housing.
❼ Use the attached bolt and nut, and when mounting a pulley or sprocket on the shaft. Do not hit the shaft with a hammer.

Model	Allowable overhung loads F [N]
180-06-011	320
180-08-011	400
180-10-011	600
180-12-011	800
180-16-011	1250



※The position of F indicates the middle point of each shaft.

Electromagnetic actuated type clutch and brake units

126 model

Clutch Brake Unit（Direct-connected motor）

The 126 model is an application unit composed of an integrated combination of a general-purpose motor and clutch and brake. The 126 model can be either base mounted or flange mounted.

Easy to mount and use

The clutch brake unit is directly combined with an induction three-phase motor to save the mounting space. The trouble of centering or processing of the mounting location can also be eliminated. Setting can be completed simply by connecting the output shaft with the load side.

High-frequency operation can be performed

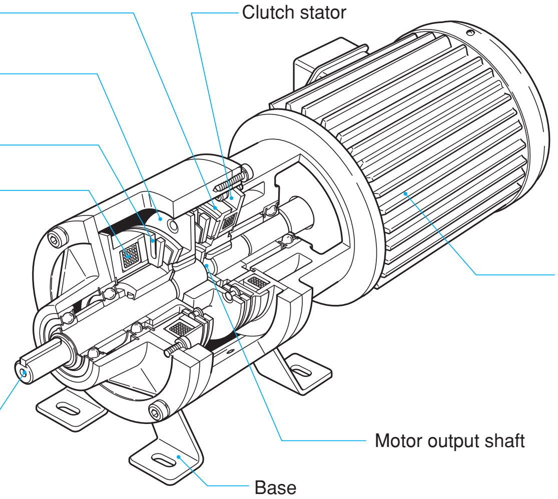
Start-and-stop operation of the output shaft can be repeatedly performed without stopping the motor. Intermittent operation can be performed more frequently compared with ON-OFF operation of a motor.

Fit in many applications

Either base type or flange type mounting can be selected in accordance with the installation site. The flange type, has the same mounting surface as general-purpose flange motors that it can be integrated with a reducer.

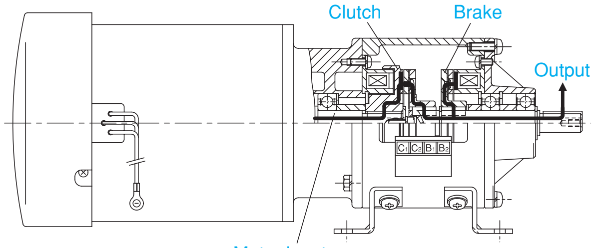
Unit type	126-□-4B	126-□-4F-N
Clutch and brake torque [N･m]	5 ～ 80	
Operational temperature [℃]	−10 ～ +40	
Backlash	Zero	
Motor output [kW]	0.2~3.7 3-phase four-pole all closed fan type	

Structure



Power transmission

The motor shaft functions as a clutch input shaft. The output shaft is separated. When applying current to the clutch, the rotation of motor is transmitted to the output shaft through the clutch. When turning off the current of the clutch at the same time as applying current through the brake, the output shaft is separated from the motor side, and it immediately stops.

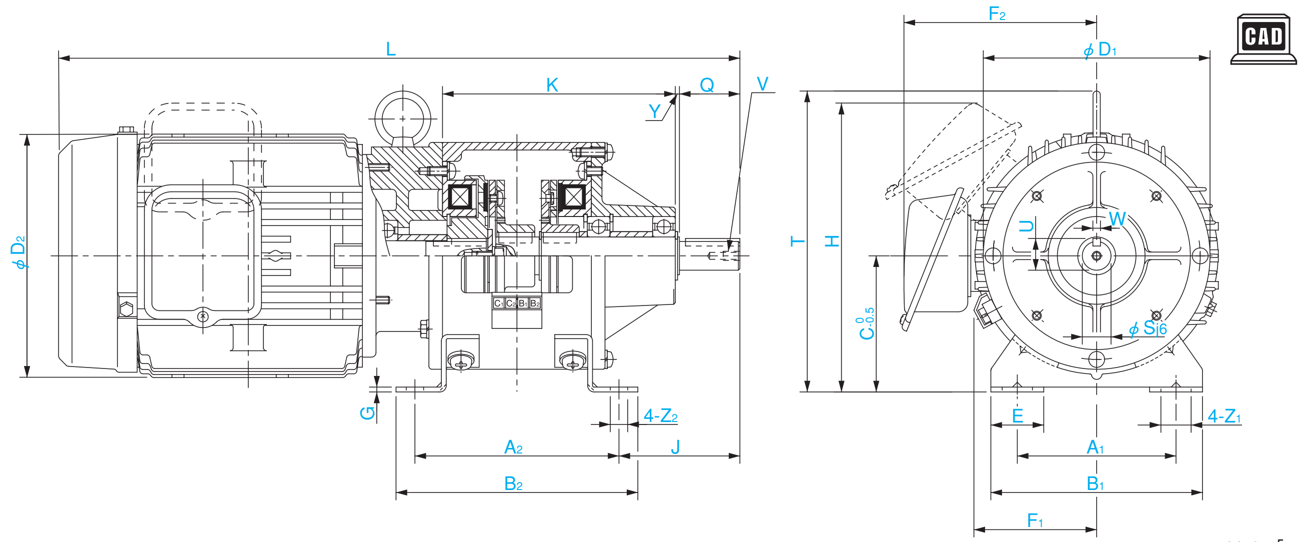


Specification 126-□-4B

Model	Size	Dynamic friction torque T_d [N·m]	Static friction torque T_s [N·m]	Coil (at20℃) Voltage [V]	Wattage [W]	Amperage [A]	Resistance [Ω]	Heat-resistance class	Motor output [kW]	Rotating part moment of inertia J J [kg·m²]	Total amount of work before air gap readjustment E_T [J]	Armature suction time t_a [s]	Torque risetime t_p [s]	Torque extinction time t_d [s]	Mass [kg]
126-06-4B	06	5	5.5	DC24	11	0.46	52	B	0.2	1.28×10^{-4}	36×10^{6}	C:0.020 B:0.015	C:0.041 B:0.033	C:0.020 B:0.015	8.9
126-08-4B	08	10	11	DC24	15	0.63	38	B	0.4	3.70×10^{-4}	60×10^{6}	C:0.023 B:0.016	C:0.051 B:0.042	C:0.030 B:0.025	13
126-10-4B	10	20	22	DC24	20	0.83	29	B	0.75	1.40×10^{-3}	130×10^{6}	C:0.025 B:0.018	C:0.063 B:0.056	C:0.050 B:0.030	18
126-12-4B	12	40	45	DC24	25	1.09	23	B	1.5	3.85×10^{-3}	250×10^{6}	C:0.040 B:0.027	C:0.115 B:0.090	C:0.065 B:0.050	36
126-16-4B	16	80	90	DC24	35	1.46	16	B	2.2 3.7	1.35×10^{-2}	470×10^{6}	C:0.050 B:0.035	C:0.160 B:0.127	C:0.085 B:0.055	42.5 57

* Dynamic friction torque (Td) indicates the value when relative velocity is (100min⁻¹).
* The general-purpose motor is a totally-enclosed-fan-cooled type. Its power supply is three-phase 200V / 200V / 220V (50Hz / 60Hz / 60Hz), and is quadrupole. (Conform to the standards of JIS C4210)
* Contact us if the specific voltage (specification of 5 power supplies) or different pole number is required.

Dimensions 126-□-4B



Unit [mm]

Model	Body dimensions A_1	A_2	B_1	B_2	C	D_1	D_2	E	F_1	F_2	G	J	K	L	H	T	Y	Z_1	Z_2	Shaft dimensions Q	S	U	V	W	CAD File No.
126-06-4B	65	90	90	105	65	100	130	27.5	61	—	2.6	48.5	102	335	—	—	3	13.5	6.5	25	11	12.5	M4×0.7 depth 8	4	126-4B1
126-08-4B	80	110	110	130	80	125	145	32.5	72	126.5	3.2	63	127.5	389	167.5	—	2.5	15.5	9	30	14	16	M4×0.7 depth 8	5	126-4B2
126-10-4B	105	135	140	160	90	150	163	35	81	133	3.2	80	154	450	182	—	3	20	11.5	40	19	21	M4×1 depth 11	5	126-4B3
126-12-4B	135	160	175	185	112	190	180	42.5	97	145	4.5	108	194	518.5	—	244.5	3	24.5	11.5	50	24	27	M4×1 depth 11	7	126-4B4
126-16-4B 2.2kW	155	200	200	230	132	230	199	45	109	153	6	135	256	629.5	—	293	4	28	14	50	24	27	M4×1 depth 11	7	126-4B5
126-16-4B 3.7kW	155	200	200	230	132	230	223	45	109	166.5	6	145	256	655.5	—	293	4	28	14	60	28	31	M4×1 depth 11	7	126-4B6

* The keyway of the output shaft corresponds to the previous edition of JIS standards second class, and the key corresponds to the now-defunct JIS standard first class.
* Use the attached set for inserting a pulley into the input-output shaft.

Ordering Information

126- 06 -4B □

Size

Mounting form
B: Base type

Motor capacity assignment

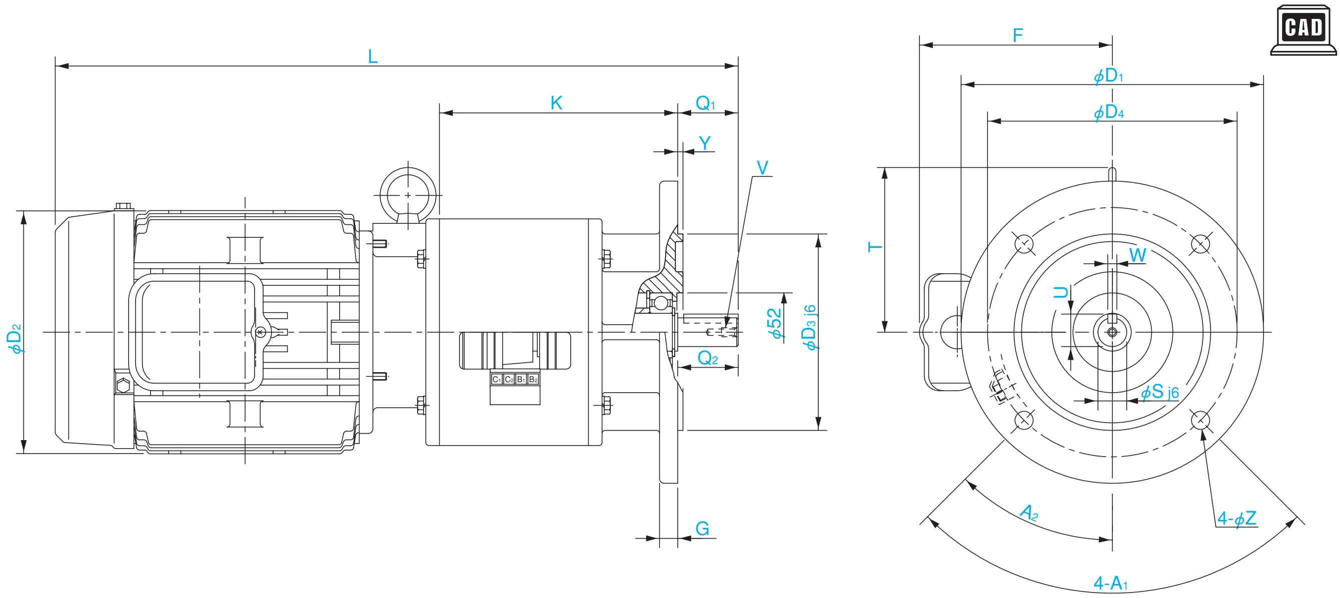
Size 06～12: Blank
Size 16: 2.2 kW or 3.7kW

Specification 126-□-4F-N

Model	Size	Dynamic friction torque T_d [N·m]	Static friction torque T_s [N·m]	Coil (at20℃)				Heat-resistance class	Motor output [kW]	Rotating part moment of inertia J J [kg·m²]	Total amount of work before air gap readjustment E_T [J]	Armature suction time t_a [s]	Torque risetime t_p [s]	Torque extinction time t_d [s]	Mass [kg]
				Voltage [V]	Wattage [W]	Amperage [A]	Resistance [Ω]								
126-06-4F-N	06	5	5.5	DC24	11	0.46	52	B	0.2	1.28×10^{-4}	36×10^{6}	C:0.020 B:0.015	C:0.041 B:0.033	C:0.020 B:0.015	8.9
126-08-4F-N	08	10	11	DC24	15	0.63	38	B	0.4	3.70×10^{-4}	60×10^{6}	C:0.023 B:0.016	C:0.051 B:0.042	C:0.030 B:0.025	13
126-10-4F-N	10	20	22	DC24	20	0.83	29	B	0.75	1.40×10^{-3}	130×10^{6}	C:0.025 B:0.018	C:0.063 B:0.056	C:0.050 B:0.030	18
126-12-4F-N	12	40	45	DC24	25	1.09	23	B	1.5	3.85×10^{-3}	250×10^{6}	C:0.040 B:0.027	C:0.115 B:0.090	C:0.065 B:0.050	36
126-16-4F-N	16	80	90	DC24	35	1.46	16	B	2.2 3.7	1.35×10^{-2}	470×10^{6}	C:0.050 B:0.035	C:0.160 B:0.127	C:0.085 B:0.055	42.5 57

* Dynamic friction torque (Td) indicates the value when relative velocity is (100min⁻¹).
* The general-purpose motor is a totally-enclosed-fan-cooled type. Its power supply is three-phase 200V / 200V / 220V (50Hz / 60Hz / 60Hz), and is quadrupole. (Conform to the standards of JIS C4210)
* Contact us if the specific voltage (specification of 5 power supplies) or different pole number is required.

Dimensions 126-□-4F-N



Model	Body dimensions													Shaft dimensions						CAD File No.
	A_1	A_2	D_1	D_2	D_3	D_4	F	G	K	L	T	Y	Z	Q_1	Q_2	S	U	V	W	
126-06-4F-N	90°	45°	160	130	110	130	—	8	107	335	—	3.5	10	23	25	11	12.5	M4×0.7 depth 8	4	126-4F1
126-08-4F-N	90°	45°	160	145	110	130	124	10	130.5	389	—	3.5	10	30	30	14	16	M4×0.7 depth 8	5	126-4F2
126-10-4F-N	90°	45°	200	163	130	165	131	12	157.5	451	—	3.5	12	40	40	19	21.5	M6×1 depth 11	6	126-4F3
126-12-4F-N	90°	45°	200	180	130	165	145	12	197.5	519	133	3.5	12	50	50	24	27	M6×1 depth 11	8	126-4F4
126-16-4F-N 2.2kW	90°	45°	250	199	180	215	153	16	260.5	640	161	4	15	60	60	28	31	M6×1 depth 11	8	126-4F5
126-16-4F-N 3.7kW	90°	45°	250	223	180	215	166.5	16	260.5	656	161	4	15	60	60	28	31	M6×1 depth 11	8	126-4F6

* The flange and output shaft diameters are compliant with the IEC and JEM-based flange motor. (Size 06 has a key and key slot.)
* Use the attached set for inserting a pulley into the input-output shaft.

Electromagnetic actuated type clutch and brake units

Ordering Information

126- 06 -4F-N □

- Size
- Mounting form
  F: Flange type
- Dimension specification of flange and output shaft
  IEC and JEM- compliant flange motor: N
  (Size 06 has a key and key slot.)
- Motor capacity assignment: Size 06〜12: Blank
  Size 16: 2.2 kW or 3.7kW

Stand-alone clutches and brakes list

Model	Stand-alone model of clutch	Stand-alone model of brake	Bearing number	
			Input part	Output part
126-06-4□	101-06-11 24V R11JIS A15JIS	111-06-12 24V A15JIS	6202	6202
126-08-4□	101-08-11 24V R14DIN A20JIS	111-08-12 24V A20JIS	6203	6004
126-10-4□	101-10-11 24V R19DIN A25JIS	111-10-12 24V A25JIS	6204	6205
126-12-4□	101-12-11 24V R24DIN A30JIS	111-12-12 24V A30JIS	6205	6206
126-16-4□ 2.2kW	101-16-11 24V R28DIN A40JIS	111-16-12 24V A40JIS	6206	6208
126-16-4□ 3.7kW	101-16-11 24V R28DIN A40JIS	111-16-12 24V A40JIS	6306	6208

Recommended power supply • Accessory list

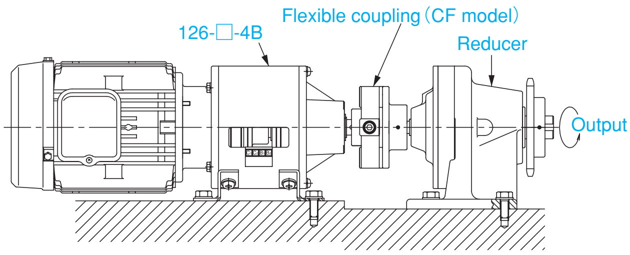
Model	Recommended power supply	Accessories			
		Protective device*1 (Varistor) 2pieces	Tightening collar	Threaded rod	Hexagon nut
126-06-4□	BER-05	NVD07SCD082 or Corresponding product	1	M4×55 (Hexagon socket bolt)	M4
				1	1
126-08-4□	BER-05	NVD07SCD082 or Corresponding product	1	M4×55 (Hexagon socket bolt)	M4
				1	1
126-10-4□	BER-05	NVD07SCD082 or Corresponding product	1	M6×100	M6
				1	2
126-12-4□	BER-10	NVD07SCD082 or Corresponding product	1	M6×100	M6
				1	2
126-16-4□ 2.2kW **126-16-4□ 3.7kW**	BER-10	NVD07SCD082 or Corresponding product	1	M6×100	M6
				1	2

* *1 The protective device NVD□SCD□ is manufactured by KOA.
* Refer to the section of power supply for detailed specification.

Mounting Example

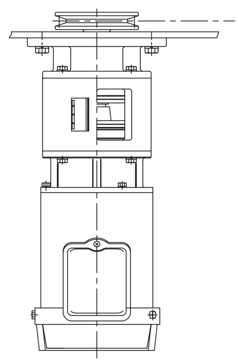
● Combination with a reducer

In the example of the right-hand figure, the clutch and brake unit with a direct-connect motor and a reducer are combined through a flexible coupling.
Due to the directly-connected motor, the rotating shaft immediately starts up, therefore inertia on the load side should be set out as small as possible. A flexible coupling with low inertia is recommended to connect with a reducer.



● Using the flange mounted type vertically

This unit can be mounted both horizontally and vertically.
Mounting space can be also saved.



CBW model

Clutch Brake Unit (with built-in reducer)

The CBW model is an application unit integrating a worm reducer and clutch and brake. As a standard part, a V-belt pulley is installed in the input section. Two output shaft directions (configurations) are available.

Compact

Due to its integrated configuration, it is very compact.
The mounting space is substantially reduced.

Easy to mount and use.

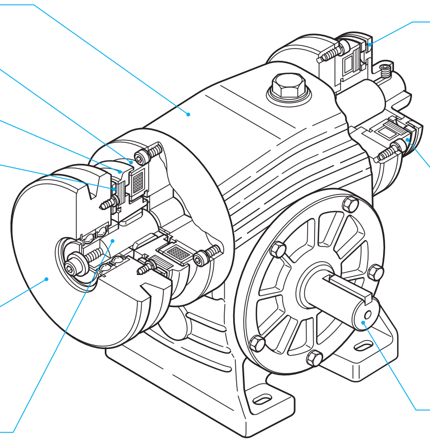
Since the V-belt pulley is on the input, setting can be completed simply by connecting the drive with a belt. Troublesome centering or processing is not necessary.

Excellent performance

Self inertia is reduced by integrating a reducer for efficient start and stop. A combination with a reducer accomplishes excellent performance for various applications such as a wide range of speed change in combination with a speed changer, or a 360-degree revolution stop of the output shaft.

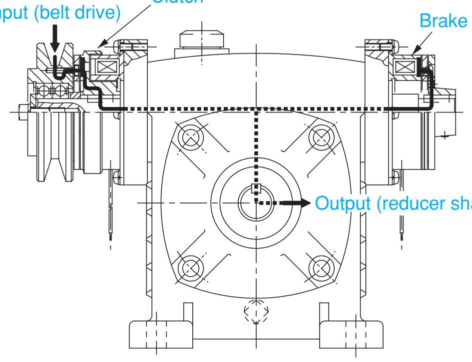
Unit type	CBW-□N-H□	CBW-□N-B□
Reducer maker	HIRAI Co., Ltd.	Bellpony Co., Ltd.
Clutch and brake torque [N･m]	5 ～ 40	
Operational temperature [℃]	0 ～ +40	
Backlash	Zero (clutch and brake part)	

Structure



Power transmission

The V-belt pulley is mounted on the clutch input part, and it rotates constantly by connecting with the drive by a belt. When applying current through the clutch, the rotation is transmitted to the worm shaft. The worm shaft then rotates the output shaft of the reducer. When turning off the current of the clutch at the same time as applying current through the brake, the output shaft stops.



Specification CBW-□N-H□

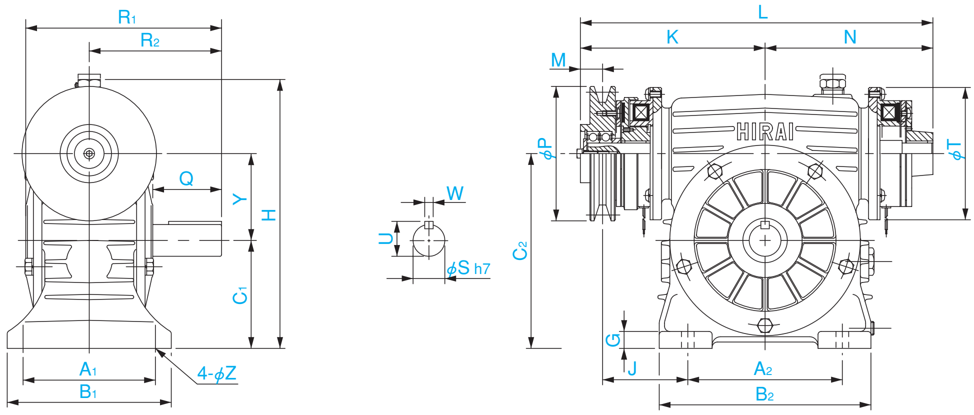
Model	Size	Dynamic friction torque T_d [N·m]	Static friction torque T_s [N·m]	Coil (at20℃)				Heat-resistance class	Maximum rotation speed [min⁻¹]	Rotating part moment of inertia J [kg·m²]	Total amount of work before air gap readjustment E_T [J]	Armature suction time t_a [s]	Torque risetime t_p [s]	Torque extinction time t_d [s]
				Voltage [V]	Wattage [W]	Amperage [A]	Resistance [Ω]							
CBW-06N-H□	06	5	5.5	DC24	11	0.46	52	B	1800	1.66×10^{-4}	36×10^{6}	C:0.020 B:0.015	C:0.041 B:0.033	C:0.020 B:0.015
CBW-08N-H□	08	10	11	DC24	15	0.63	38	B	1800	4.78×10^{-4}	60×10^{6}	C:0.023 B:0.016	C:0.051 B:0.042	C:0.030 B:0.025
CBW-10N-H□	10	20	22	DC24	20	0.83	29	B	1800	1.71×10^{-3}	130×10^{6}	C:0.025 B:0.018	C:0.063 B:0.056	C:0.050 B:0.030
CBW-12N-H□	12	40	45	DC24	25	1.09	23	B	1800	4.53×10^{-3}	250×10^{6}	C:0.040 B:0.027	C:0.115 B:0.090	C:0.065 B:0.050

* Dynamic friction torque (Td) indicates the value when relative velocity is (100min⁻¹).

Model	Size	Input part		Reducer									Mass [kg]
		Pulley diameter [mm]	Belt model	Model	Output shaft tolerance	Reduction ratio 1/□						Oil gauge [ℓ]	
						10	20	30	40	50	60		
CBW-06N-H□	06	76.2 (3inch)	A-1	N-1A	Torque [N·m]	45.3	53.4	46.7	54.7	54.2	55.4	0.25	6.5
					O.H.L. [N]	1560	1760	1760	1760	1760	1760		
CBW-08N-H□	08	101.6 (4inch)	A-1	N-2A	Torque [N·m]	79.8	102	86.9	104	98.5	100	0.5	15
					O.H.L. [N]	1760	2240	2630	2880	3140	3230		
CBW-10N-H□	10	127 (5inch)	B-1	N-3A	Torque [N·m]	165	180	180	188	187	164	1.0	24
					O.H.L. [N]	2250	2900	3370	3720	4040	4370		
CBW-12N-H□	12	152.4 (6inch)	B-1	N-4A	Torque [N·m]	292	293	301	302	284	281	2.0	38
					O.H.L. [N]	2780	3640	4210	4680	5120	5480		

Dimensions CBW-□N-H□

CAD



Model	Body dimensions																		Shaft dimensions				CAD File No.
	A_1	A_2	B_1	B_2	C_1	C_2	G	H	J	K	L	M	N	P	R_1	R_2	T	Y	Z	Q	S	U	W	
CBW-06N-H□	95	95	117	136	65	115.8	11	157	58	120.5	225	15	104.5	76.2	135	90	80	50.8	9.5	45	20	22.5	6	CBW-HR1
CBW-08N-H□	115	112	140	165	82	146	15	212	75	149	284	18	135	101.6	160	105	100	64	11	50	25	28	8	CBW-HR2
CBW-10N-H□	125	146	155	205	102	184	16	255	80.5	174.5	333	21	158.5	127	185	125	125	82	12	65	30	33	8	CBW-HR3
CBW-12N-H□	150	168	185	245	118	213	20	289	93	203	388	25.5	185	152.4	225	150	150	95	14	75	35	38	10	CBW-HR4

* The described CAD File No. is for R shape. If L shape is required, change the output shaft position before use.

Ordering Information

CBW- 06 N-H R - 10

- Size
- Reducer maker Manufactured by Hirai Co., Ltd.: H
- Output shaft orientation
  - On the right side when viewed from the input pulley: R
  - On the left side when viewed form the input pulley: L
- Reduction ratio 1／□：10、20、30、40、50、60

Specification CBW-□N-B□

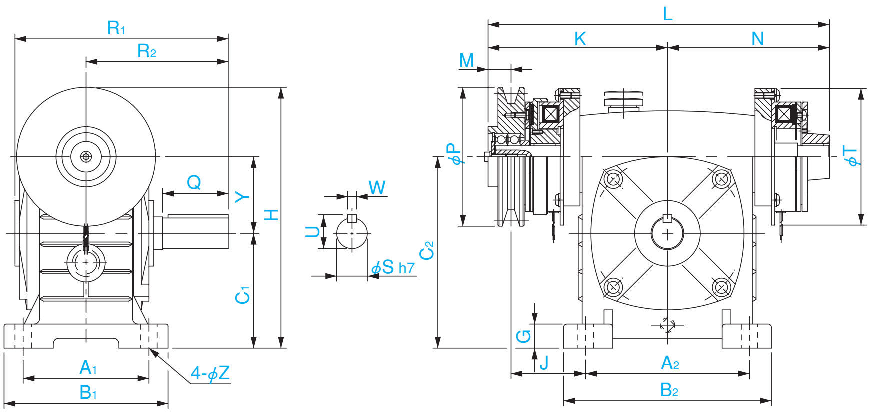
Model	Size	Dynamic friction torque T_d [N·m]	Static friction torque T_s [N·m]	Coil (at 20℃) Voltage [V]	Wattage [W]	Amperage [A]	Resistance [Ω]	Heat-resistance class	Maximum rotation speed [min⁻¹]	Rotating part moment of inertia J [kg·m²]	Total amount of work before air gap readjustment E_T [J]	Armature suction time t_a [s]	Torque risetime t_p [s]	Torque extinction time t_d [s]
CBW-06N-B□-10~30	06	5	5.5	DC24	11	0.46	52	B	1800	1.56×10^{-4}	36×10^{6}	C:0.020	C:0.041	C:0.020
CBW-06N-B□-40~60										1.76×10^{-4}		B:0.015	B:0.033	B:0.015
CBW-10N-B□-10~30	10	20	22	DC24	20	0.83	29	B	1800	1.48×10^{-3}	130×10^{6}	C:0.025	C:0.063	C:0.050
CBW-10N-B□-40~60										1.61×10^{-3}		B:0.018	B:0.056	B:0.030

* Dynamic friction torque (Td) indicates the value when relative velocity is(100min⁻¹).

Model	Size	Input part: Pulley diameter [mm]	Belt model	Reducer: Model	Output shaft tolerance	Reduction ratio 1/□: 10	20	30	40	50	60	Oil gauge [ℓ]	Mass [kg]
CBW-06N-B□-10~30	06	76.2 (3 inch)	A-1	N-PR-12	Torque [N·m]	35	38	44	–	–	–	0.3	9
					O.H.L. [N]	950	1313	1548	–	–	–		
CBW-06N-B□-40~60				N-PR-15	Torque [N·m]	–	–	–	64	56	56	0.4	11
					O.H.L. [N]	–	–	–	2450	2450	2450		
CBW-10N-B□-10~30	10	127 (5 inch)	B-1	N-PR-18	Torque [N·m]	120	126	150	–	–	–	0.7	17.5
					O.H.L. [N]	1490	2077	2440	–	–	–		
CBW-10N-B□-40~60				N-PR-22	Torque [N·m]	–	–	–	191	187	167	1.2	23.5
					O.H.L. [N]	–	–	–	3057	3146	3155		

Dimensions CBW-□N-B□

CAD



Model	Body dimensions: A₁	A₂	B₁	B₂	C₁	C₂	G	H	J	K	L	M	N	P	R₁	R₂	T	Y	Z	Shaft dimensions: Q	S	U	W	CAD File No.
CBW-06N-B□-10~30	95	110	130	140	80	130	15	175	56	126	236	15	110	76.2	145	95	80	50	11	40	17	19	5	–
CBW-06N-B□-40~60	105	120	130	150	90	150	20	200	56	131	246	15	115	76.2	165	110	80	60	11	50	22	25	6	–
CBW-08N-B□-10~30	105	120	130	150	90	150	20	201	59	137	260	18	123	101.6	165	110	100	60	11	50	22	25	6	–
CBW-08N-B□-40~60	115	150	150	190	105	175	25	230	61	154	294	18	140	101.6	195	130	100	70	15	60	28	31	8	–
CBW-10N-B□-10~30	115	150	150	190	105	175	25	238.5	68	164	312	21	148	127	195	130	125	70	15	60	28	31	8	–
CBW-10N-B□-40~60	135	180	170	220	120	200	25	265	63	174	332	21	158	127	210	140	125	80	15	65	32	35.5	10	–
CBW-12N-B□-10~30	135	180	170	220	120	200	25	276	67.5	179	345	21	166	152.4	210	140	150	80	15	65	32	35.5	10	–
CBW-12N-B□-40~60	155	220	190	270	150	250	25	370	76.5	210	405	23.5	195	152.4	260	170	150	100	15	75	38	41.5	10	–

* The described CAD File No. is for R shape. If L shape is required, change the output shaft position before use.

Ordering Information

CBW- 06 N-B R - 10

- Size (06)
- Reducer maker: Manufactured by Bell pony: B
- Output shaft orientation (R): On the right side when viewed from the input pulley: R; On the left side when viewed form the input pulley: L
- Reduction ratio 1／□：10、20、30、40、50、60

Electromagnetic actuated type clutch and brake units

Stand-alone Clutch and Brake / Recommended Power supply • Accessory list CBW-□N-H□

Model	Stand-alone model of clutch	Stand-alone model of brake	Bearing number	Recommended power supply	Accessories
					Protective device[*1] (Varistor) 2pieces
CBW-06N-H□	101-06-13-A-110	111-06-11 24V A15JIS	6002	BER-05・BEJ-10-06	NVD07SCD082 or Corresponding product
CBW-08N-H□	101-08-13-A-102	111-08-11 24V A17JIS	6003	BER-05・BEJ-10-08	NVD07SCD082 or Corresponding product
CBW-10N-H□	101-10-13-A-113	111-10-11 24V A20JIS	6004	BER-10・BEJ-10-10	NVD07SCD082 or Corresponding product
CBW-12N-H□	101-12-13-A-134	111-12-11 24V A25JIS	6005	BER-10・BEJ-10-12	NVD07SCD082 or Corresponding product

* *1 The protective device NVD□SCD□ is manufactured by KOA.
* For the overexcitation electromagnetic power supply BEJ, varistor is not required. Refer to the section of power supply for more detail.

Stand-alone Clutch and Brake / Recommended Power supply • Accessory list CBW-□N-B□

Model	Stand-alone model of clutch	Stand-alone model of brake	Bearing number	Recommended power supply	Accessories
					Protective device[*1] (Varistor) 2pieces
CBW-06N-B□-10~30	101-06-13-A-110	111-06-11 24V A15JIS	6002	BER-05・BEJ-10-06	NVD07SCD082 or Corresponding product
CBW-06N-B□-40~60	101-06-13-A-110	111-06-11 24V A15JIS	6002	BER-05・BEJ-10-06	NVD07SCD082 or Corresponding product
CBW-08N-B□-10~30	101-08-13-A-102	111-08-11 24V A17JIS	6003	BER-05・BEJ-10-08	NVD07SCD082 or Corresponding product
CBW-08N-B□-40~60	101-08-13-A-102	111-08-11 24V A17JIS	6003	BER-05・BEJ-10-08	NVD07SCD082 or Corresponding product
CBW-10N-B□-10~30	101-10-13-A-113	111-10-11 24V A20JIS	6004	BER-05・BEJ-10-10	NVD07SCD082 or Corresponding product
CBW-10N-B□-40~60	101-10-13-A-114	111-10-11 24V A25JIS	6005	BER-10・BEJ-10-10	NVD07SCD082 or Corresponding product
CBW-12N-B□-10~30	101-12-13-A-134	111-12-11 24V A25JIS	6005	BER-10・BEJ-10-12	NVD07SCD082 or Corresponding product
CBW-12N-B□-40~60	101-12-13-A-135	111-12-11 24V A30JIS	6006	BER-10・BEJ-10-12	NVD07SCD082 or Corresponding product

* *1 The protective device NVD□SCD□ is manufactured by KOA.
* For the overexcitation electromagnetic power supply BEJ, varistor is not required.Refer to the section of power supply for more detail.

Selection of the CBW worm reducer

In the case of reducer with clutch and brake, rapid start and stop of loading isperformed so that a large load is applied to the worm wheel by the inertia load. Make an appropriate selection in consideration of the operation frequency, inertia of load or operating time to ensure the safety.

❶Determination of reduction ratio I

$$\text{Reduction ratio} = \frac{\text{Output shaft rotation speed } N_2\ [\text{min}^{-1}]}{\text{Input shaft rotation speed } N_1\ [\text{min}^{-1}]}$$

❷Calculation of equivalent torque

Equivalent torque Te=Load torque Tf × Load factor Sf× Frequency factor Sh

◆Torque T [N・m] =Working radius R [m] ×Load W [N]

◆Load torque Tf [N・m]

$$Tf = \frac{9550 \times kW \times E}{N_2}$$

kW : Input capacitance [kW]
E : Reducer efficiency [%] /100
* Refer to the catalog of the reducer maker for efficiency.
N_2 : Output rotation speed [min⁻¹]

◆Load factor Sf and Frequency factor Sh

Evaluate the equivalent value in accordance with the terms such as loading type, time or operation frequency.

Load factor Sf

Loading type / Continuous time	Uniform load	Normal impact	Strong impact
Up to 2 hours	0.80	1.00	1.25
Up to 8 hours	1.00	1.25	1.50
Up to 24 hours	1.25	1.50	1.75

Frequency factor Sh

In the case of a rapid stop-start by clutch and brake	1.5

❸Provisional selection of reducers

Select a reducer from the specification table in order that the allowable output torque T becomes greater than the equivalent torque Te.

❹Calculation of equivalent overhung load (O.H.L)

O.H.L is a load that works to bend the shaft during power transmission by a chain or the like.

$$\text{Equivalent O.H.L} = \frac{Te \times K \times (L + 0.57 \times Ls)}{R \times 1.07 \times Ls}$$

Te : Equivalent torque [N・m]
K : Factor by type of transmission device
R : Pitch circle radius of transmission device [m]
Ls : Standard shaft length [mm]
L : Distance from the root of shaft to the load center [mm]

Transmission device	Chain timing belt	Gear	V belt	Flat belt
K	1.00	1.25	1.50	2.50

By the specification table, confirm that the allowable O.H.L is greater than the equivalent O.H.L. If it's not satisfied, change the Te, L or R, or enlarge the selection output.

Operating Instructions

❶ Confirm if there is an appropriate amount of reducer oil before operation.
❷ Loosen or remove an air-bleeding screw (bis) or pin.
❸ Perform a test operation in reference to the operation manual of the reducer manufacture.
❹ Perform an oil change periodically. At this time, keep oil away from the clutch and brake part.

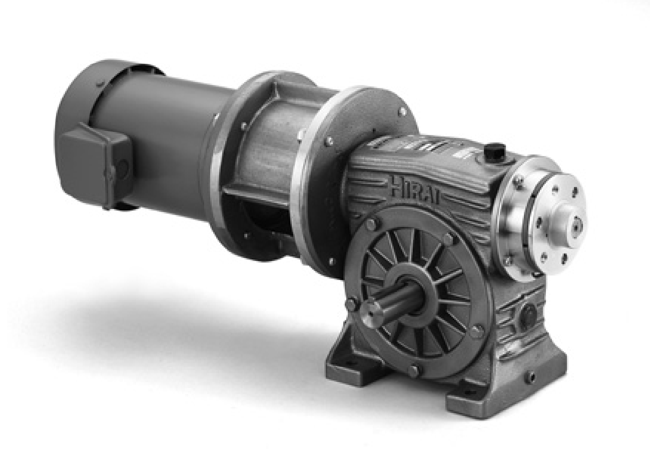
Recommended lubricant list for reducer

Ambient temperature [℃]	0~40
ISO viscosity grade	VG320
Idemitsu	Duffnice Gear oil 320
ENEOS	Bonnock M320
Cosmo oil	Cosmo gear SE320
Showa shell	Omara 320
JOMO	Legxtus 320
Mobil oil	Mobil gear 632 (320)

* Refer to the specification table for the oil quantity of the reducer.

CMW model

Clutch Brake Unit (with built-in reducer and motor)



The CBW model is a multifunctional drive unit integrating a motor, reducer and clutch and brake. The general-purpose motor and clutch are connected through the CF coupling with a feature of impact absorption. A worm reducer is integrated.

Easy to mount and use.

Due to its integrated configuration mounting space can be saved. The trouble ofcentering or processing can also be saved. Setting can be completed simply by connecting the output shaft with the load side.

Good performance

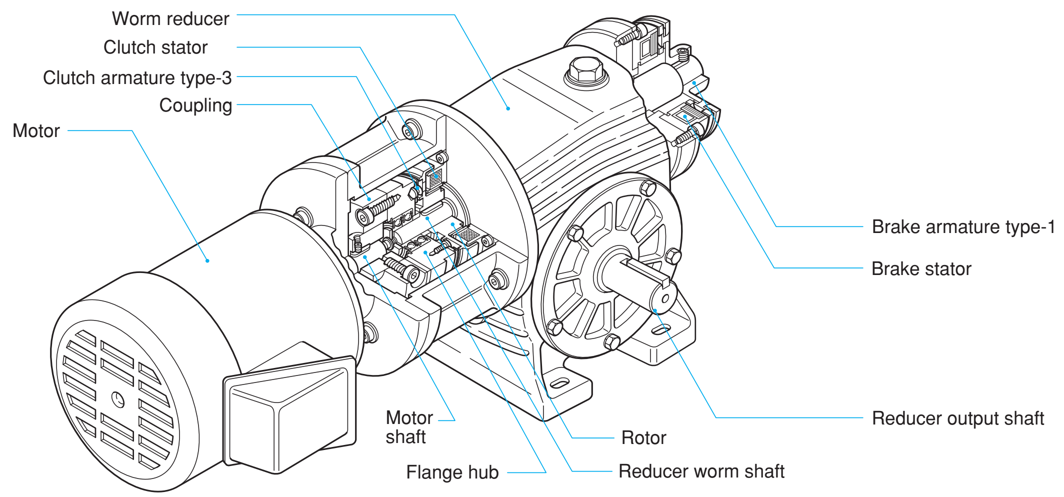
Self inertia is reduced by integrating a reducer and motor for efficient start and stop.

High-frequency operation

Start-and-stop operation of the output shaft can be repeatedly performed without stopping the motor. Intermittent operation can be performed more frequently compared with ON-OFF operation of a motor.

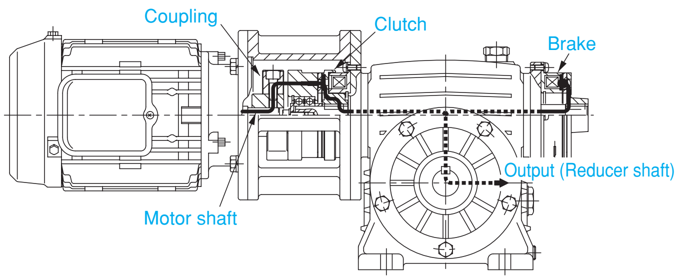
Unit type	CMW-□N-H□H
Reducer maker	Hirai Co., Ltd.
Clutch and brake torque [N・m]	5 ～ 40
Operational temperature [℃]	0～ +40
Backlash	Zero (clutch and brake part)
Motor output [kW]	0.2～1.5 3-phase four-pole all closed fan type

Structure



Power transmission

The motor shaft functions as a clutch input shaft through the CENTA-FLEX coupling.The output shaft is separated. When applying current to the clutch, the rotation of motor is transmitted to the worm shaft through the clutch to rotate the output shaft of reducer. When turning off the current of the clutch at the same time as applying current through the brake, the output shaft stops.



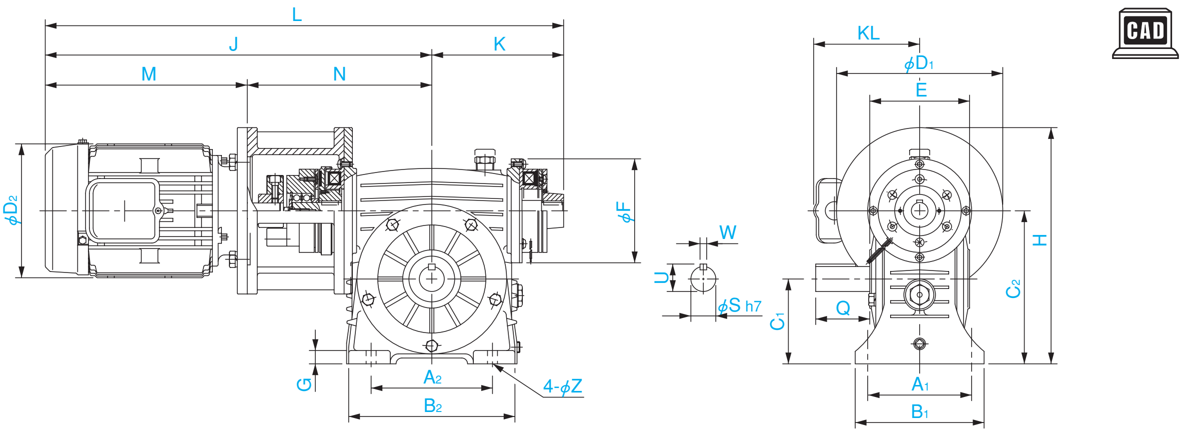
Specification

Model	Size	Dynamic friction torque T_d [N·m]	Static friction torque T_s [N·m]	Coil (at 20℃)				Heat-resistance class	Rotating part moment of inertia J [kg·m²]	Total amount of work before air gap readjustment E_T [J]	Armature suction time t_a [s]	Torque risetime t_p [s]	Torque extinction time t_d [s]
				Voltage [V]	Wattage [W]	Amperage [A]	Resistance [Ω]						
CMW-06N-H□H	06	5	5.5	DC24	11	0.46	52	B	1.66×10^{-4}	36×10^{6}	C:0.020 B:0.015	C:0.041 B:0.033	C:0.020 B:0.015
CMW-08N-H□H	08	10	11	DC24	15	0.63	38	B	4.78×10^{-4}	60×10^{6}	C:0.023 B:0.016	C:0.051 B:0.042	C:0.030 B:0.025
CMW-10N-H□H	10	20	22	DC24	20	0.83	29	B	1.71×10^{-3}	130×10^{6}	C:0.025 B:0.018	C:0.063 B:0.056	C:0.050 B:0.030
CBW-12N-H□H	12	40	45	DC24	25	1.09	23	B	4.53×10^{-3}	250×10^{6}	C:0.040 B:0.027	C:0.115 B:0.090	C:0.065 B:0.050

* Dynamic friction torque (Td) indicates the value when relative velocity is(100min⁻¹).

Model	Size	Motor output [kW] 3-phse four poles	Reducer									Mass [kg]
			Model	Output shaft tolerance	Reduction ratio 1/□						Oil gauge [ℓ]	
					10	20	30	40	50	60		
CMW-06N-H□H	06	0.2	N-2SA	Torque [N·m]	78.2	79.9	85.3	78.6	88.9	76.1	0.5	16
				O.H.L. [N]	1770	2280	2620	2930	3160	3230		
CMW-08N-H□H	08	0.4	N-2A	Torque [N·m]	79.8	102	86.9	104	98.5	100	0.5	32
				O.H.L. [N]	1760	2240	2630	2880	3140	3230		
CMW-10N-H□H	10	0.75	N-3A	Torque [N·m]	165	180	180	188	187	164	1.0	42
				O.H.L. [N]	2250	2900	3370	3720	4040	4370		
CMW-12N-H□H	12	1.5	N-4A	Torque [N·m]	292	293	301	302	284	281	2.0	67
				O.H.L. [N]	2780	3640	4210	4680	5120	5480		

Dimensions



Unit [mm]

Model	Body dimensions																		Shaft dimensions				CAD File No.
	A_1	A_2	B_1	B_2	C_1	C_2	D_1	D_2	E	F	G	H	J	K	KL	L	M	N	Z	Q	S	U	W	
CMW-06N-H□H	105	105	132	162	75	135	160	130	110	86	15	215	375	117	—	492	205	170	12	50	25	28	8	CMW-HRH1
CMW-08N-H□H	115	112	140	165	82	146	160	145	110	100	15	226	412	135	124	547	225	187	11	50	25	28	8	CMW-HRH2
CMW-10N-H□H	125	146	155	205	102	184	200	163	120	125	16	284	465	159	131	624	243	222	12	65	30	33	8	CMW-HRH3
CMW-12N-H□H	150	168	186	245	118	213	210	180	150	150	20	318	509	185	145	694	254	255	14	75	35	38	10	CMW-HRH4

* The described CAD File No. is for R shape. If L shape is required, change the output shaft position before use.

Ordering Information

CMW-06 N-H R H-10

Size — 06

Reduction ratio 1／□：10、20、30、40、50、60

Output shaft orientation
On the right side when viewed from the input shaft: R
On the left side when viewed form the input shaft: L

Stand-alone Clutch and Brake / Recommended Power supply • Accessory list

Model	Stand-alone model of clutch	Stand-alone model of brake	Bearing number	Coupling type	Recommended power supply	Accessories Protective device*1 (Varistor) 2pieces
CMW-06N-H□H	101-06-13 24V R15JIS	111-06-11 24V A15JIS	6002	CF-A-001-01-T5	BER-05	NVD07SCD082 or Corresponding product
CMW-08N-H□H	101-08-13 24V R17JIS	111-08-11 24V A17JIS	6003	CF-A-002-01-1360-14N	BER-05	NVD07SCD082 or Corresponding product
CMW-10N-H□H	101-10-13 24V R20JIS	111-10-11 24V A20JIS	6004	CF-A-002-01-1360-19N	BER-05	NVD07SCD082 or Corresponding product
CMW-12N-H□H	101-12-13 24V R25JIS	111-12-11 24V A25JIS	6005	CF-A-004-01-1360-24N	BER-10	NVD07SCD082 or Corresponding product

* *1 The protective device NVD□SCD□ is manufactured by KOA.
* For the overexcitation electromagnetic power supply BEJ, varistor is not required. Refer to the section of power supply for more detail.

Selection of the CMW worm reducer

In the case of reducer with clutch and brake, rapid start and stop of loading is performed so that a large load is applied to the worm wheel by the inertia load.
Make an appropriate selection in consideration of the operation frequency, inertia of load or operating time to ensure the safety.

❶Determination of reduction ratio I

$$\text{Reduction ratio } I = \frac{\text{Output shaft rotation speed } N_2\ [min^{-1}]}{\text{Input shaft rotation speed } N_1\ [min^{-1}]}$$

❷Calculation of equivalent torque

Equivalent torque Te=Load torque Tf × Load factor Sf × Frequency factor Sh

◆Torque T [N・m] = Working radius R [m] × Load W [N]

◆Load torque Tf [N・m]

$$Tf = \frac{9550 \times kW \times E}{N_2}$$

kW : Input capacitance [kW]
E : Reducer efficiency [%] /100
* Refer to the catalog of the reducer maker for efficiency.
N_2 : Output rotation speed [min^{-1}]

◆Load factor Sf and Frequency factor Sh

Evaluate the equivalent value in accordance with the terms such as loading type, time or operation frequency.

Load factor Sf

Loading type / Continuous time	Uniform load	Normal impact	Strong impact
Up to 2 hours	0.80	1.00	1.25
Up to 8 hours	1.00	1.25	1.50
Up to 24 hours	1.25	1.50	1.75

Frequency factor Sh

In the case of a rapid stop-start by clutch and brake	1.5

❸Provisional selection of reducers

Select a reducer from the specification table in order that the allowable output torque T becomes greater than the equivalent torque Te.

❹Calculation of equivalent overhung load (O.H.L)

O.H.L is a load that works to bend the shaft during power transmission by a chain or the like.

$$\text{Equivalent O.H.L} = \frac{Te \times K \times (L + 0.57 \times Ls)}{R \times 1.07 \times Ls}$$

Te : Equivalent torque [N・m]
K : Factor by type of transmission device
R : Pitch circle radius of transmission device [m]
Ls : Standard shaft length [mm]
L : Distance from the root of shaft to the load center [mm]

Transmission device	Chain timing belt	Gear	V belt	Flat belt
K	1.00	1.25	1.50	2.50

By the specification table, confirm that the allowable O.H.L is greater than the equivalent O.H.L. If it's not satisfied, change the Te, L or R, or enlarge the selection output.

Operating Instructions

❶ Confirm if there is an appropriate amount of reducer oil before operation.
❷ Loosen or remove an air-bleeding screw (bis) or pin.
❸ Perform a test operation in reference to the operation manual of the reducer maker.
❹ Perform an oil change periodically. At this time, keep oil away from the clutch and brake part.

Recommended lubricant list for reducer

Ambient temperature [℃]	0～40
ISO viscosity grade	VG320
Idemitsu	Duffnice Gear oil 320
ENEOS	Bonnock M320
Cosmo oil	Cosmo gear SE320
Showa shell	Omara 320
JOMO	Legxtus 320
Mobil oil	Mobil gear 632 (320)

List of oil amount for reducer

Type of reducer	Amount [ℓ]
N-2SA	0.5
N-2A	0.5
N-3A	1.0
N-4A	2.0

Electromagnetic actuated type clutch and brake units

Memo

121 model 121-□-10 type

Double clutch unit

It is an open-type compact unit with two clutches (101-□-15) set on the through shaft. One unit can handle various features to simplify the transmission mechanism. Easy to mount and use.

Compact through shaft construction

This model is a rational unit with the same basic design as the clutch and brake type 121. It is strong in wrapping and gear drive.

Perform multiple functions

Various functions such as two-stage speed change, forward-reverse operation or power transmission can be performed by this single unit, which leads to simplification of transmission mechanism.

Easy to mount and use

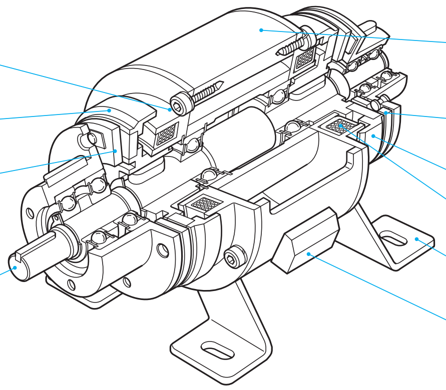
The installation is easy compared with mounting two clutches in combination.

Adapted to the RoHS

Adapted to the Restriction of Hazardous Substances that bans the use of 6 substances such as mercury or lead can be selected as option.

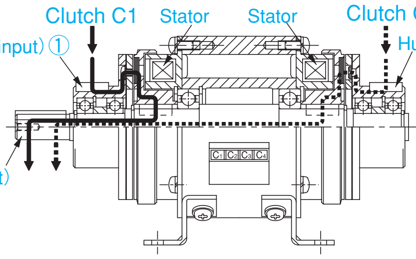
Unit type	121-□-10
Clutch torque [N･m]	5 ～ 320
Operational temperature [℃]	−10 ～ +40
Backlash	Zero

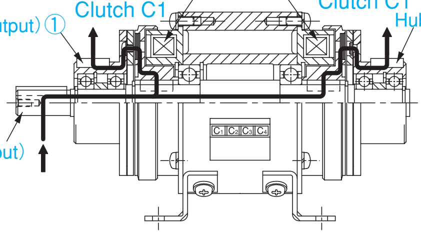
Structure



Power transmission

Both clutches, C1 and C2, have a hub configuration on their armature side for mounting a V-belt pulley (or the like) respectively. If the hub is used for input, connect two different powers to their respective hubs to rotate them constantly. When applying current through the C1 clutch, the power is transmitted to the shaft via the rotor. When turning off the current of C1 at the same time as applying current through the C2 clutch, the power is immediately switched and transmitted to the shaft. If the shaft is used for input, connect the drive with the shaft for constant rotation. When applying current though both the clutches, the power is transmitted to the output hub through the armature.





Installation

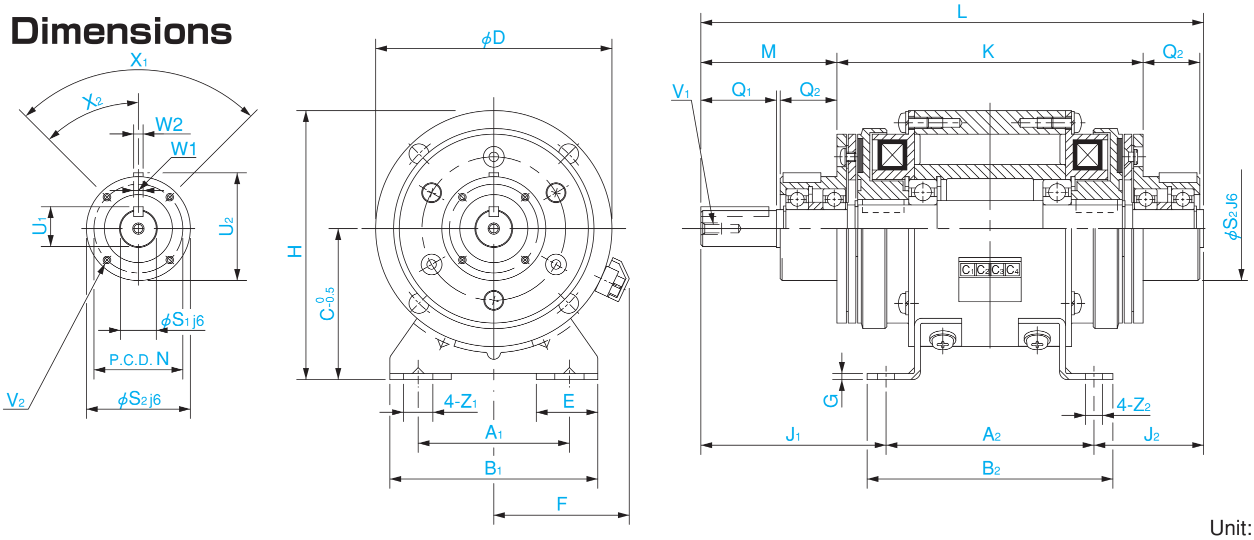
The installation of this unit and the mounting of the component are the same as the clutch brake unit 121 model.

Specification

Model	Size	Dynamic friction torque Td [N·m]	Static friction torque Ts [N·m]	Coil (at 20℃) Voltage [V]	Wattage [W]	Amperage [A]	Resistance [Ω]	Heat-resistance class	Max rotation speed [min^{-1}]	Rotating part moment of inertia J [$kg·m^2$] Hub input	Shaft input	Total amount of work before air gap readjustment E_T [J]	Armature suction time t_a [s]	Torque risetime t_p [s]	Torque extinction time t_d [s]	Mass [kg]
121-06-10	06	5	5.5	DC24	11	0.46	52	B	3000	1.55×10^{-4}	1.05×10^{-4}	36×10^{6}	C:0.020 B:0.015	C:0.041 B:0.033	C:0.020 B:0.015	1.7
121-08-10	08	10	11	DC24	15	0.63	38	B	3000	4.75×10^{-4}	3.00×10^{-4}	60×10^{6}	C:0.023 B:0.016	C:0.051 B:0.042	C:0.030 B:0.025	3.1
121-10-10	10	20	22	DC24	20	0.83	29	B	3000	1.44×10^{-3}	9.45×10^{-4}	130×10^{6}	C:0.025 B:0.018	C:0.063 B:0.056	C:0.050 B:0.030	6.5
121-12-10	12	40	45	DC24	25	1.09	23	B	3000	4.50×10^{-3}	2.75×10^{-3}	250×10^{6}	C:0.040 B:0.027	C:0.115 B:0.090	C:0.065 B:0.050	10.5
121-16-10	16	80	90	DC24	35	1.46	16	B	3000	1.34×10^{-2}	9.05×10^{-3}	470×10^{6}	C:0.050 B:0.035	C:0.160 B:0.127	C:0.085 B:0.055	21
121-20-10	20	160	175	DC24	45	1.88	13	B	2500	4.18×10^{-2}	2.65×10^{-2}	10×10^{8}	C:0.090 B:0.065	C:0.250 B:0.200	C:0.130 B:0.070	38.5
121-25-10	25	320	350	DC24	60	2.50	9.6	B	2000	9.80×10^{-2}	7.45×10^{-2}	20×10^{8}	C:0.115 B:0.085	C:0.335 B:0.275	C:0.210 B:0.125	70

* Dynamic friction torque (Td) indicates the value when relative velocity is(100min^{-1}).
* Inertia moment of the rotating part during shaft input is the value of single armature type-5.

Dimensions



CAD

Unit: [mm]

Model	Body dimensions A1	A2	B1	B2	C	D	E	F	G	H	J1	J2	K	L	M	N	Z1	Z2
121-06-10	52.5	75	80	90	55	80	27.5	53	2.6	95	65.5	40.5	111.5	181	47	33	13.5	6.5
121-08-10	65	90	90	105	65	100	27.5	61	2.6	115	78.5	48.5	133	217	57	37	13.5	6.5
121-10-10	80	110	110	130	80	125	32.5	72	3.2	142.5	98	58	162	266	72	47	15.5	9
121-12-10	105	135	140	160	90	150	35	81	3.2	165	121	71	193	327	92	52	20	11.5
121-16-10	135	160	175	185	112	190	42.5	97	4.5	207	149	87.5	232	397	113	62	24.5	11.5
121-20-10	155	200	200	230	132	230	45	109	6	247	187	105	290	492	142	74.5	28	14
121-25-10	195	240	240	270	160	290	47.5	124	20	305	238	125	350	603	183	101.5	28	14

Model	Shaft dimensions Q1	Q2	S1	S2	U1	U2	V1	V2	X1	X2	W1, 2	CAD File No.
121-06-10	25	20	11	38	12.5	39.5	M4×0.7depth 8	3-M4×0.7depth 4	3-120°	60°	4	121-101
121-08-10	30	25	14	45	16	47	M4×0.7depth 8	3-M4×0.7depth 6	3-120°	60°	5	121-102
121-10-10	40	30	19	55	21	57	M6×1depth 11	4-M4×0.7depth 8	4-90°	45°	5	121-103
121-12-10	50	40	24	64	27	67	M6×1depth 11	4-M4×0.7depth 8	4-90°	45°	7	121-104
121-16-10	60	50	28	75	31	78	M6×1depth 11	6-M5×0.8depth 8	6-60°	30°	7	121-105
121-20-10	80	60	38	90	41.5	93.5	M10×1.5depth 17	4-M6×1depth 12	4-90°	45°	10	121-106
121-25-10	110	70	42	115	45.5	118.5	M10×1.5depth 17	8-M6×1depth 12	8-45°	22.5°	12	121-107

* The keyway of the input-output shaft corresponds to the previous edition of JIS standards second class, and the key corresponds to the now-defunct JIS standard first class. The keyway of the unit hub part is not within the specified range of the now-defunct JIS standard. Refer to the above measurement table.
* Use the attached set for inserting a pulley into the input-output shaft.
* The base of the 121-25-10 is manufactured by casting.

Ordering Information

121-06-10G

06: Size

Stand-alone clutches and brakes list

Model	Stand-alone model of clutch	Bearing number	
		Main shaft part	Hub part
121-06-10	101-06-15 24V R15JIS A12JIS	6202	6001
121-08-10	101-08-15 24V R20JIS A15JIS	6004	6002
121-10-10	101-10-15 24V R25JIS A20JIS	6205	6004
121-12-10	101-12-15 24V R30JIS A25JIS	6206	6005
121-16-10	101-16-15 24V R40JIS A30JIS	6208	6006
121-20-10	101-20-15 24V R50JIS A40JIS	6211	6008
121-25-10	101-25-15 24V R60JIS A50JIS	6214	6010

Recommended power supply • Accessory list

Model	Recommended power supply	Accessories				
		Protective device*1 (Varistor) 2 pcs	Tightening collar	Threaded rod	Lashing wire	Hexagon nut
121-06-10	BE-05 (BE-10)	NVD07SCD082 or Corresponding product	1	M4×55 3	1	M4 3
121-08-10	BE-05 (BE-10)	NVD07SCD082 or Corresponding product	1	M4×55 3	1	M4 3
121-10-10	BE-05 (BE-10)	NVD07SCD082 or Corresponding product	1	M4×55 3	1	M4 3
121-12-10	BE-10 (BE-20)	NVD07SCD082 or Corresponding product	1	M4×55 2	1	M4 2
				M6×100 1		M6 1
121-16-10	BE-10 (BE-20)	NVD07SCD082 or Corresponding product	1	M5×70 2	1	M5 2
				M6×100 1		M6 1
121-20-10	BE-20 (BE-40)	NVD07SCD082 or Corresponding product	1	M6×160 2	1	M6 4
				M10×220 1		M10 2
121-25-10	BE-20 (BE-40)	NVD07SCD082 or Corresponding product	1	M6×160 2	1	M6 4
				M10×220 1		M10 2

* The pulley insertion set (threaded rod, tightening collar and hexagon nut) is attached for all sizes.
* The recommended power supply in parentheses is for when applying current through 2 clutches at the same time.
* *1 The protective device NVD□SCD is manufactured by KOA.
* Refer to the section of power supply for more detail.

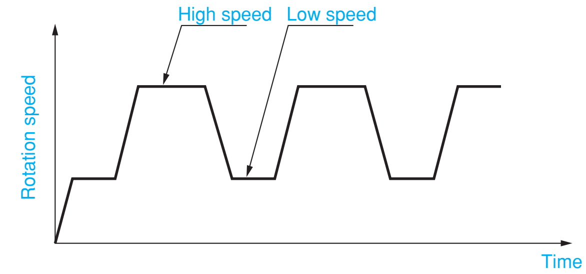
Mounting Example

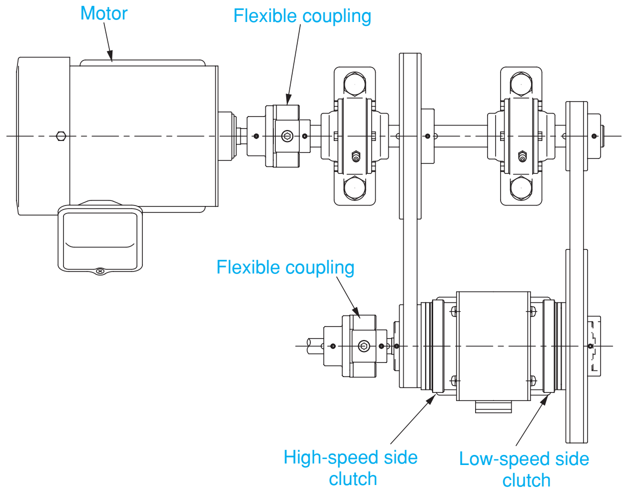
Example used in two-stage speed change

For two-speed speed change, the output shaft is rotated at a high speed or low speed by connecting a high and low speed power to the two hubs respectively to change the clutches.

Note

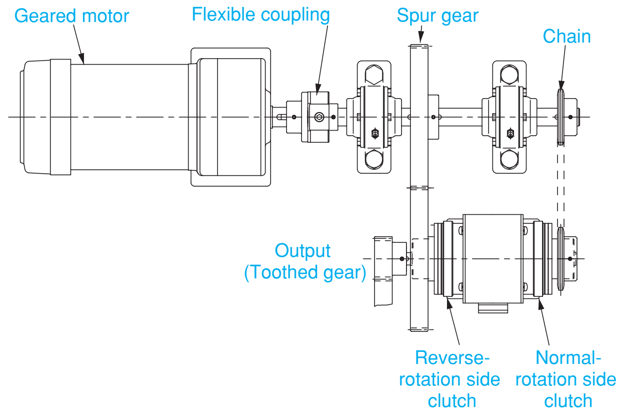
When the shaft is used for output, either of clutches is rotated at high speed depending on its transmission ratio, which may damage the bearing.

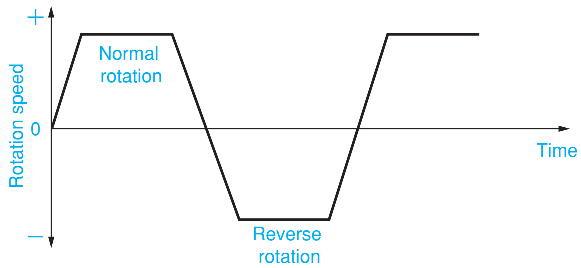




Example used in forward-reverse operation

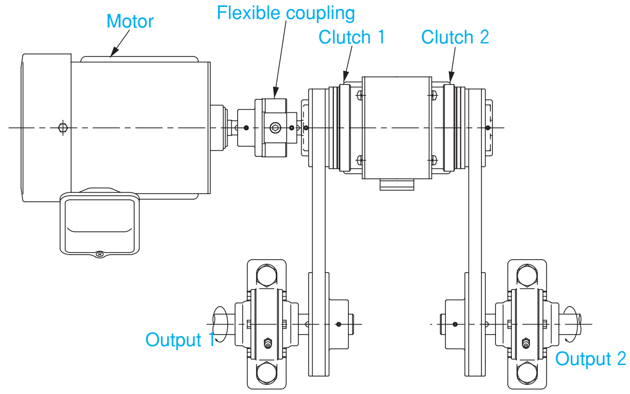
Since there is no brake in this unit, forward-reverse operation is effective for relatively low speed or light load. In the example of the right-hand figure, the forward-reverse rotation is obtained from the driving-side rotating shaft by a chain and spur gear, and connected with the hubs respectively. The output shaft repeats the normal and reverse rotation by changing the clutches. Forward-reverse operation can also be performed by two motors.

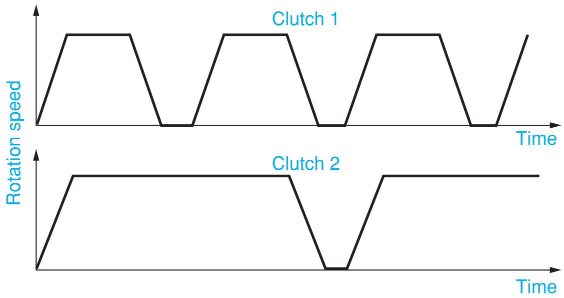




Example used in power transfer

Since each clutch can be switched to ON or OFF at any time by shaft input, it works twice the power with a single device. Also, simple synchronized operation becomes possible by setting detection mechanism for each output shaft.





122 model

Double clutch brake unit

This 122 model is a unique unit with two clutches (101-□-15) and one brake (111-□-12).
Various application controls such as high precision positioning or complex operation can be performed by itself. It is easy to mount and handle as well as other units.

Compact through shaft construction

This model is a unique unit that has each part logically set on a through shaft. It is suitable for wrapping and gear drive.

Multiple functions

Various controls that require complexity and high accuracy such as two-stage speed change, stopping in constant positions or high-frequency forward reverse operation can be performed by this single unit, which leads to simplification of transmission mechanism.

Easy to mount and use

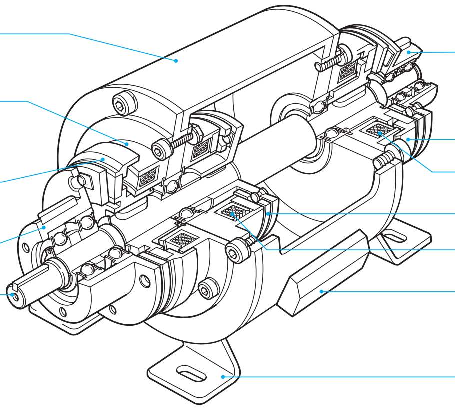
There are many features in this unit, yet the installation is easy as other units.

Adapted to the RoHS

Adapted to the Restriction of Hazardous Substances that bans the use of 6 substances such as mercury or lead can be selected as option.

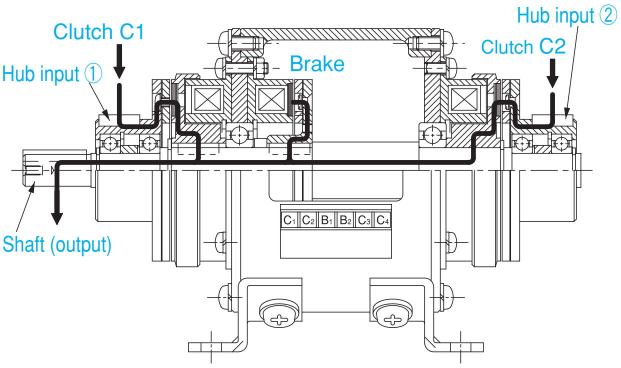
Unit type	122-□-20
Clutch torque [N･m]	5 ～ 160
Operational temperature [℃]	−10 ～ +40
Backlash	Zero

Structure



Power transmission

Two different powers are connected to the input hubs of C1 and C2 respectively to rotate them constantly. When applying current through the C1 clutch, the power is transmitted to the output shaft to rotate. When turning off the current of C1 at the same time as applying current through the C2 clutch, the power is immediately switched and transmitted to the shaft. When turning off the current of the clutch at the same time as applying current through the brake, the shaft immediately stops.



Installation

The installation of this unit and the mounting of the component are the same as the clutch brake unit 121 model.

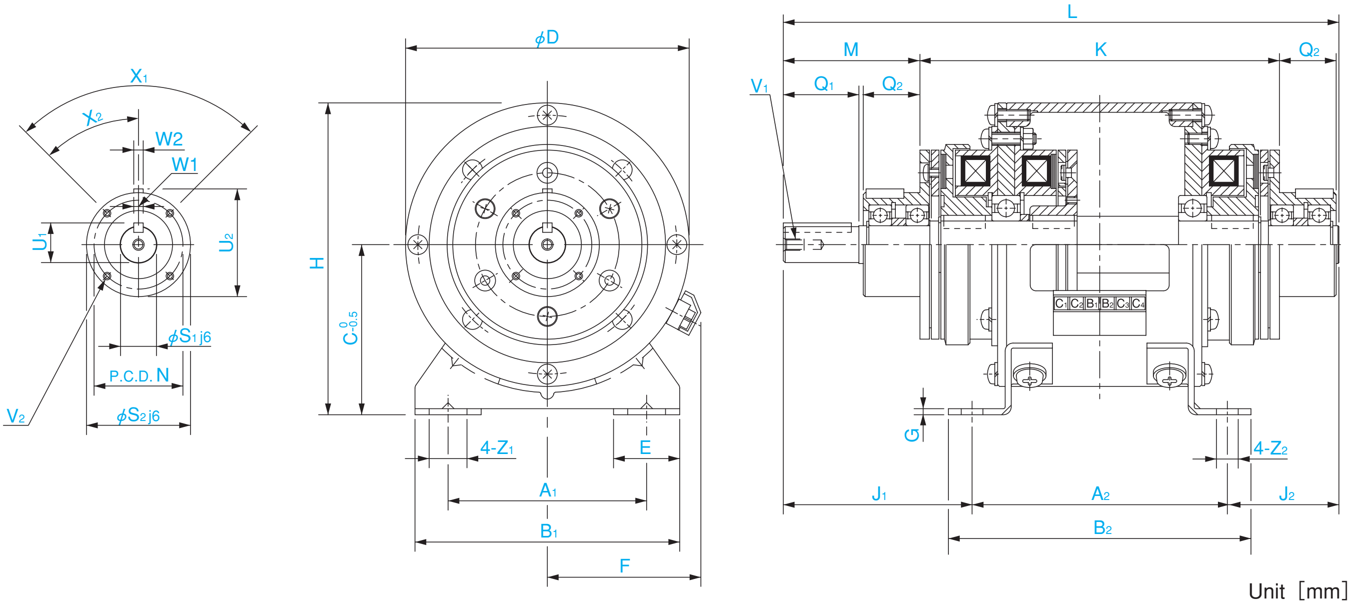
Specification

Model	Size	Dynamic friction torque Td [N·m]	Static friction torque Ts [N·m]	Coil (at 20℃) Voltage [V]	Wattage [W]	Amperage [A]	Resistance [Ω]	Heat-resistance class	Max rotation speed [min⁻¹]	Rotating part moment of inertia J [kg·m²]	Total amount of work before air gap readjustment E_T [J]	Armature suction time t_a [s]	Torque risetime t_p [s]	Torque extinction time t_d [s]	Mass [kg]
122-06-20	06	5	5.5	DC24	11	0.46	52	B	3000	2.19×10^{-4}	36×10^{6}	C:0.020 B:0.015	C:0.041 B:0.033	C:0.020 B:0.015	4
122-08-20	08	10	11	DC24	15	0.63	38	B	3000	6.55×10^{-4}	60×10^{6}	C:0.023 B:0.016	C:0.051 B:0.042	C:0.030 B:0.025	6
122-10-20	10	20	22	DC24	20	0.83	29	B	3000	2.12×10^{-3}	130×10^{6}	C:0.025 B:0.018	C:0.063 B:0.056	C:0.050 B:0.030	9
122-12-20	12	40	45	DC24	25	1.09	23	B	3000	6.35×10^{-3}	250×10^{6}	C:0.040 B:0.027	C:0.115 B:0.090	C:0.065 B:0.050	17
122-16-20	16	80	90	DC24	35	1.46	16	B	3000	1.99×10^{-2}	470×10^{6}	C:0.050 B:0.035	C:0.160 B:0.127	C:0.085 B:0.055	29
122-20-20	20	160	175	DC24	45	1.88	13	B	2500	6.15×10^{-2}	10×10^{8}	C:0.090 B:0.065	C:0.250 B:0.200	C:0.130 B:0.070	58

* Dynamic friction torque (Td) indicates the value when relative velocity is (100min⁻¹).

Dimensions

CAD



Unit [mm]

Model	A1	A2	B1	B2	C	D	E	F	G	H	J1	J2	K	L	M	N	Z1	Z2
	Body dimensions																	
122-06-20	65	90	90	105	65	100	27.5	61	2.6	115	73	48	142	211	47	33	13.5	6.5
122-08-20	80	110	110	130	80	125	32.5	72	3.2	142.5	83	53	162	246	57	37	15.5	9
122-10-20	105	135	140	160	90	150	35	81	3.2	165	100	59	190	294	72	47	20	11.5
122-12-20	135	160	175	185	112	190	42.5	97	4.5	207	124	74	222	358	93	52	24.5	11.5
122-16-20	155	200	200	230	132	230	45	109	6	247	150.5	89.5	272	440	114.5	62	28	14
122-20-20	195	240	240	270	160	290	47.5	124	20	305	197	114	348	551	143	74.5	28	14

Model	Shaft dimensions Q1	Q2	S1	S2	U1	U2	V1	V2	X1	X2	W1, 2	CAD File No.
122-06-20	25	20	11	38	12.5	39.5	M4×0.7depth 8	3-M4×0.7depth 4	3-120°	60°	4	122-201
122-08-20	30	25	14	45	16	47	M4×0.7depth 8	3-M4×0.7depth 6	3-120°	60°	5	122-202
122-10-20	40	30	19	55	21	57	M6×1depth 11	4-M4×0.7depth 8	4-90°	45°	5	122-203
122-12-20	50	40	24	64	27	67	M6×1depth 11	4-M4×0.7depth 8	4-90°	45°	7	122-204
122-16-20	60	50	28	75	31	78	M6×1depth 11	6-M5×0.8depth 8	6-60°	30°	7	122-205
122-20-20	80	60	38	90	41.5	93.5	M10×1.5depth 17	4-M6×1depth 12	4-90°	45°	10	122-206

* The keyway of the input-output shaft corresponds to the previous edition of JIS standards second class, and the key corresponds to the now-defunct JIS standard first class. The keyway of the unit hub part is not within the specified range of the now-defunct JIS standard. Refer to the above measurement table.
* Use the attached set for inserting a pulley into the input-output shaft.
* The base of the 122-20-10 is manufactured by casting.

Ordering Information

122- 06 -20G

Size

Stand-alone clutches and brakes list

Type	Stand-alone model of clutch	Stand-alone model of brake	Bearing number	
			Main shaft part	Hub part
122-06-20	101-06-15 24V R15JIS A12JIS	111-06-12 24V A15JIS	6202	6001
122-08-20	101-08-15 24V R20JIS A15JIS	111-08-12 24V A20JIS	6004	6002
122-10-20	101-10-15 24V R25JIS A20JIS	111-10-12 24V A25JIS	6205	6004
122-12-20	101-12-15 24V R30JIS A25JIS	111-12-12 24V A30JIS	6206	6005
122-16-20	101-16-15 24V R40JIS A30JIS	111-16-12 24V A40JIS	6208	6006
122-20-20	101-20-15 24V R50JIS A40JIS	111-20-12 24V A55JIS	6211	6008

Recommended power supply/Accessory list

Model	Recommended power supply	Accessories				
		Protective device*1 (Varistor) 2 pcs	Tightening collar	Threaded rod	Lashing wire	Hexagon nut
122-06-20	BE-05 (BE-10)	NVD07SCD082 or Corresponding product	1	M4×55 3	1	M4 3
122-08-20	BE-05 (BE-10)	NVD07SCD082 or Corresponding product	1	M4×55 3	1	M4 3
122-10-20	BE-05 (BE-10)	NVD07SCD082 or Corresponding product	1	M4×55 2 M6×100 1	1	M4 2 M6 2
122-12-20	BE-10 (BE-20)	NVD07SCD082 or Corresponding product	1	M4×55 2 M6×100 1	1	M4 2 M6 2
122-16-20	BE-10 (BE-20)	NVD07SCD082 or Corresponding product	1	M5×70 2 M6×100 1	1	M5 2 M6 2
122-20-20	BE-20 (BE-40)	NVD07SCD082 or Corresponding product	1	M6×160 2 M10×220 1	1	M6 2 M10 2

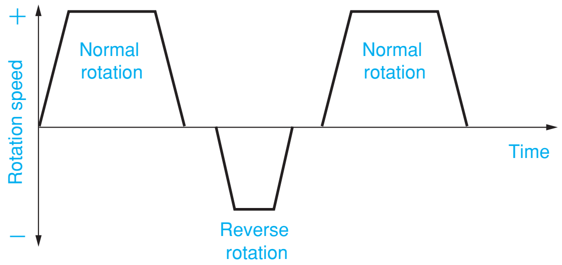
* The pulley insertion set (threaded rod, tightening collar and hexagon nut) is attached for all sizes.
* The recommended power supply in parentheses is for when applying current through 2 clutches at the same time.
* *1 The protective device NVD□SCD is manufactured by KOA.
* Refer to the section of power supply for more detail.

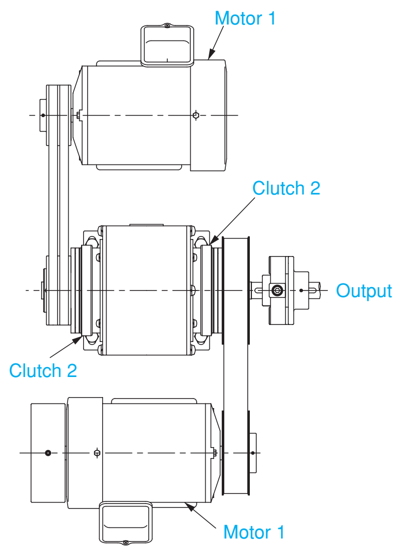
Electromagnetic actuated type clutch and brake units

Mounting Example

● Example used in forward-reverse operation

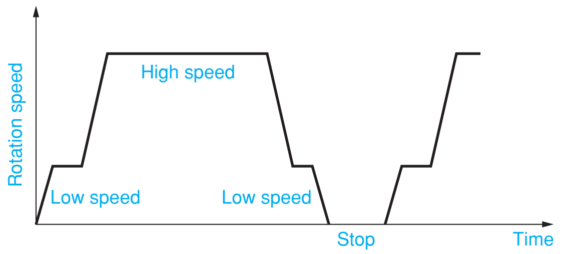
This is an example when two motors are used for forward-reverse rotation. The motors repeat the normal or reverse rotation by changing the clutches, which can be stopped at any time optionally.

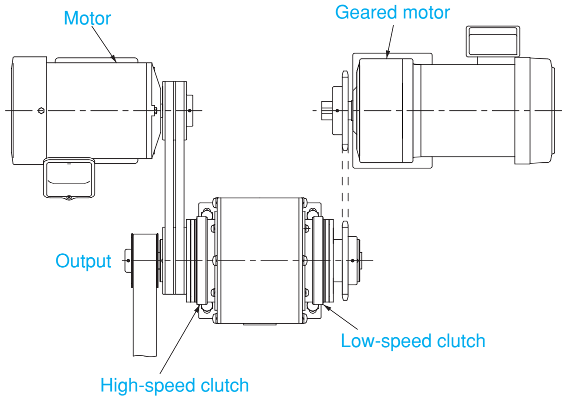




● Example used in two-stage speed change and stopping

For precise and accurate position stopping or winding number control of a winding machine, easy and high accuracy controls can be done with this unit by a series of operations such as low speed - high speed- low speed- stop.





Particular case correspondence

Example

Friction material (lining) specification
A high-torque lining or long-life lining are available in addition to the standard friction material. If a lining other than nonstandard material is used, the friction torque or total amount of work will be different from the specification table. Contact us for details.

Voltage specification
The standard voltage of clutch and brake is DC24V. Other than the standard voltage, particular voltage such as DC12V, DC90V or DC180 is available.

Input-output shaft part New JIS standard correspondence
Other than the model 126-□-4-N, CBW-□N-□ and CMW-□N-H□H, the input-output shaft part is Now-defunct JIS standard correspondence. New JIS standard is available on request. Contact us for further information.

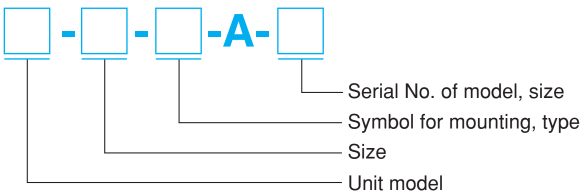
* Please note that these specifications may not be responded depending on the use conditions, constraint dimensions, clutch and brake sizes or installation conditions.

V-belt pulley and sprocket, etc
Design of the input part or output part such as attaching a V-belt pulley (reducing pulley included), sprocket or timing pulley is available in accordance with the demand.

Integration and unitization
The desired motor, reducer or coupling can be unitized as request.

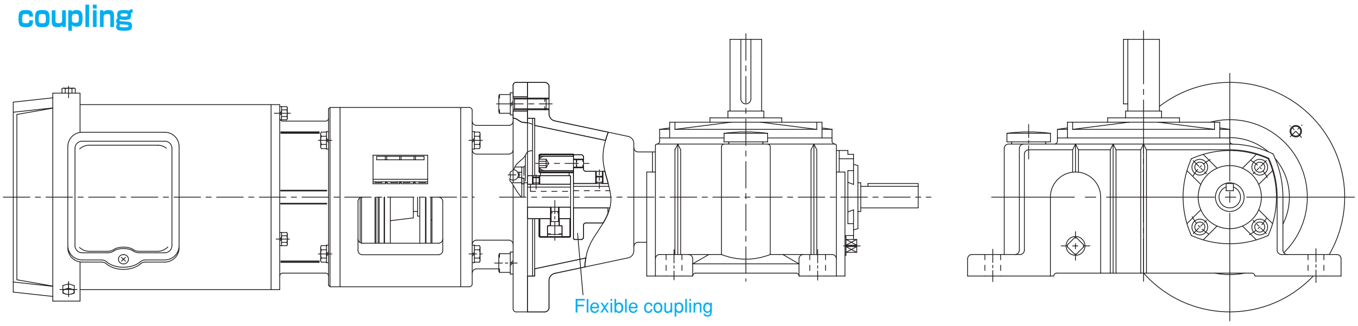
Ordering Information

The custom-designed item (particular case correspondence) is accepted as an order by exchanging the delivery specification document according to the designated form described on the right.

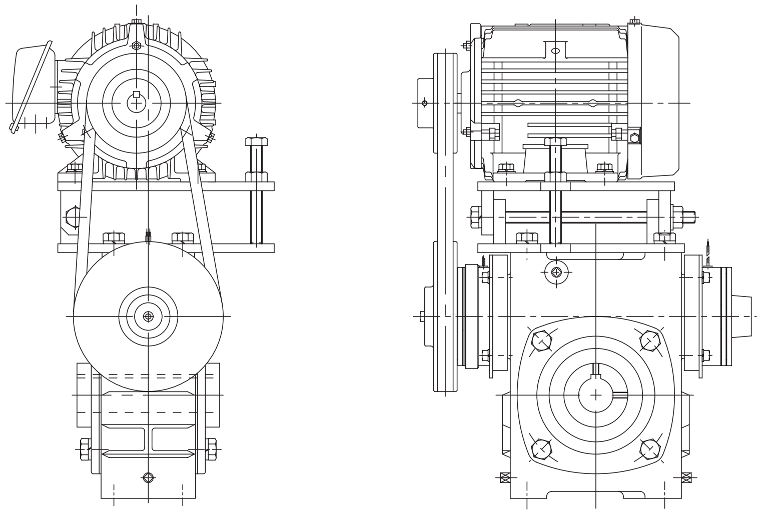


Application example

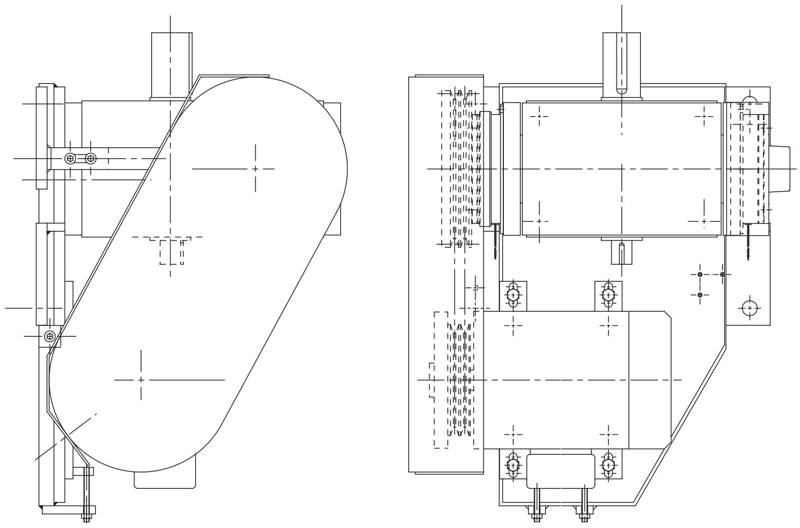
● **Integrated unit composed of the model 126 and a shaft-mounted worm reducer connected by a coupling**



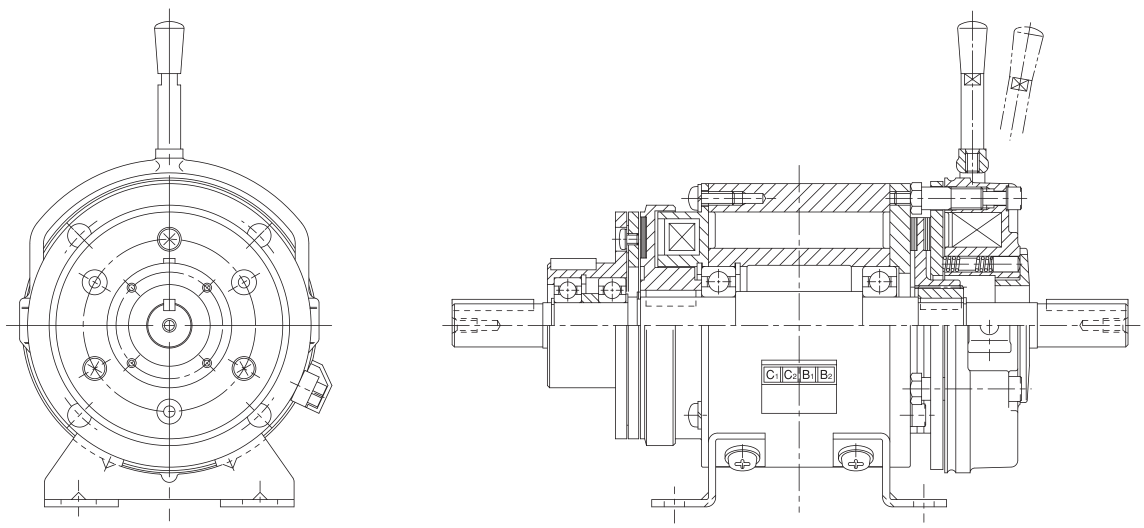
● Integrated drive unit composed of a special CBW model (hollow shafting worm reducer) and motor connected by a belt



● Integrated drive unit composed of a special worm reducer of the model CMW and motor connected by a belt and attached a safety cover



● Using a non-excited brake for the clutch and brake unit model 121.



Torque characteristics

Static friction torque and dynamic friction torque

Clutches and brakes transmit torque by sliding with a certain relative velocity in the process of coupling and braking. The relative velocity gradually becomes smaller, and they are completely connected. The transmittable torque when coupling and braking are completed is called "dynamic torque" of the relative velocity. The static friction torque becomes about the same value and the dynamic friction torque changes measurably with the relative velocity.

Dynamic friction torque characteristics

The relationship between relative sliding velocity and dynamic friction torque is indicated in the right diagram. As indicated in the diagram, the difference between the static friction torque and the dynamic friction torque is small, which indicates that the effect in actual use becomes small. The value shown in the specification is when the sliding velocity is $100min^{-1}$.

Initial torque characteristics

For the friction type clutches and brakes, the friction surface does not sufficiently conform when initially used. It may not reach the rated torque, which is called initial torque condition. The value of initial torque is 60˜ 70% of the indicated torque, however, it will reach the normal value by a short test operation. Please confirm if the indicated torque is needed from the beginning of use. It may take longer time for a test operation for use by light load or low revolution speed.

The duration time of the residual torque (remaining torque after current interruption) is very short due to the plate spring action so that a particular circuit such as reverse excitation is not necessary for normal use.

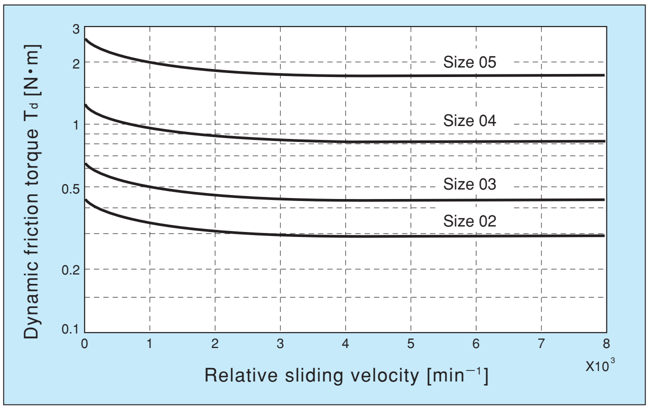
Torque current characteristics

Size of torque (magnitude of torque) is determined by the formula of T= μ (frictional factor) X r (mean radius of frictional surface) X P(suction power).

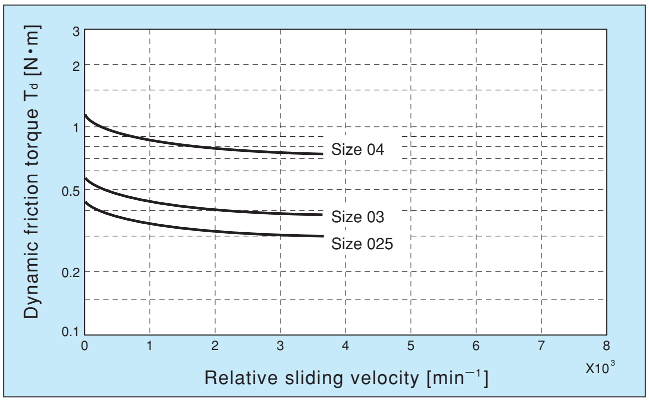
$T=\mu \times r \times P$

μ are determined at this time, but P changes depending on the current magnitude (amount of the current) to apply. A current is proportional to a voltage that the friction torque varies by changing the voltage applied to a coil. The relationship between friction torque and excitation current is indicated in the right diagram. Around the rated current value, torque increases and decreases in proportion to the current. As the current increases above the rated value, the magnetic flux density reaches a point of saturation in the magnetic circuit. There is no torque increment after then, and only the calorific power increases. On the other hand, torque decreases as the current decreases.

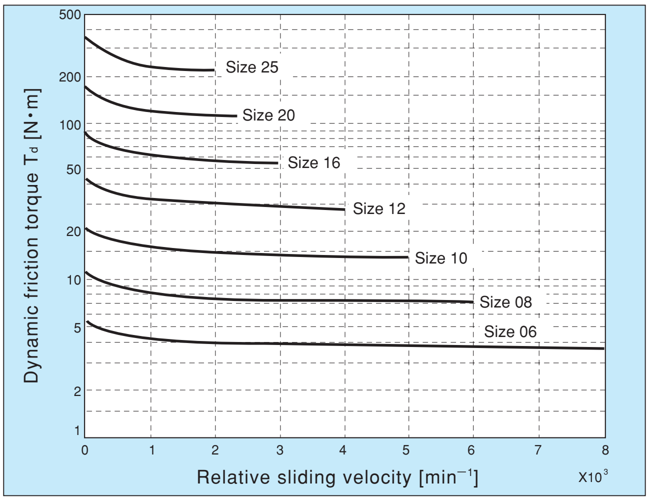
When it becomes closer to the minimum current value to draw the armature, torque becomes unstable. By decreasing more current, the armature becomes unable to draw and torque fades away. To generate torque below the suction current, some procedures are needed. Meanwhile, the diagram is for the specified air gap that the characteristic curve changes as the air gap value changes.



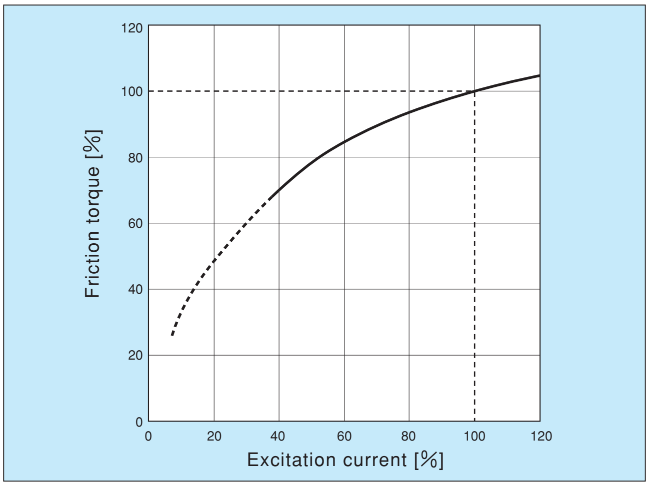
Dynamic friction torque characteristic Micro size 102・112 model



Dynamic friction torque characteristic Micro size CYT model



Dynamic friction torque characteristic Normal size 101・111・CS model, etc.



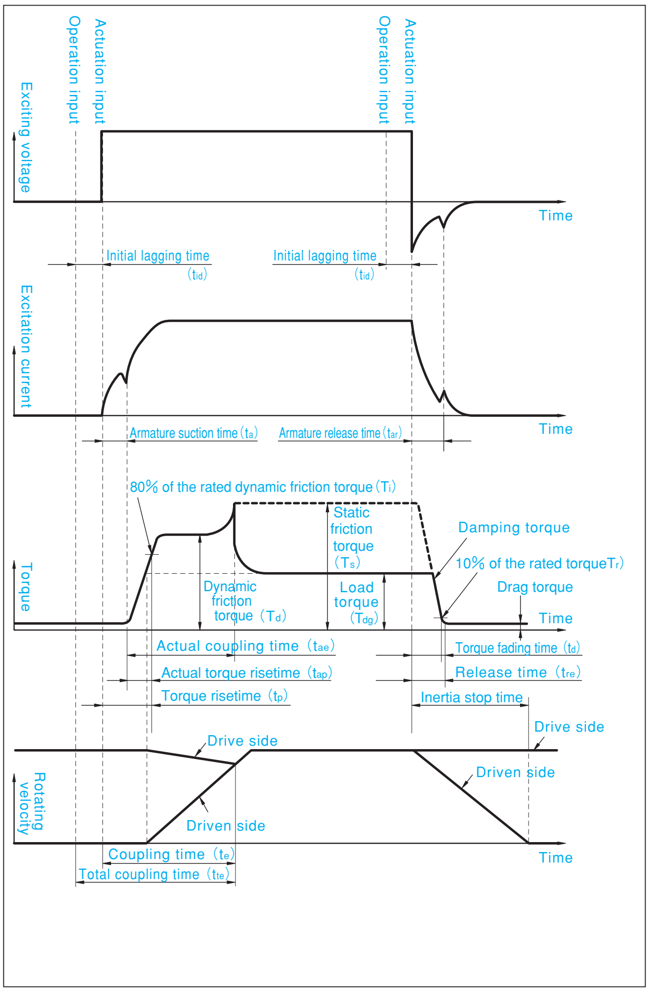
Torque current characteristic

Operating characteristics

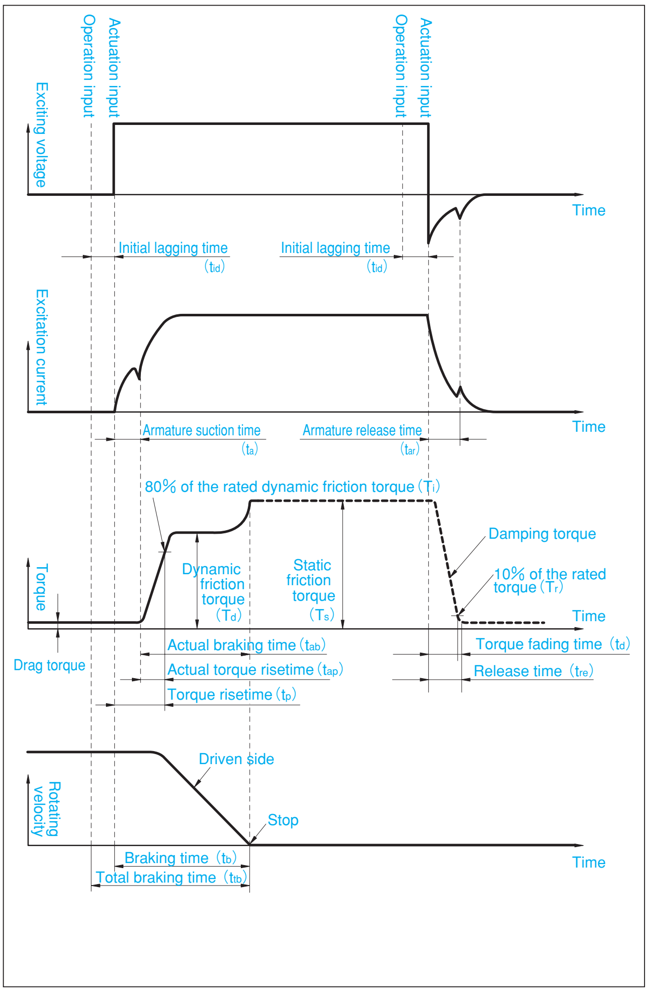
Transient characteristics of clutches and brakes in working condition

The following figure shows the transient phenomena of torque and current when the clutch and brake is connected (braking) and released. It is generally called operating characteristics. When applying a voltage through the clutch and brake, the current increases according to the time constant that is determined by the coil. When the current reaches a certain value, the armature is suctioned and the friction torque is generated. The frictional torque increases as the current increases, and reaches the rated value. As well as when releasing the clutch and brake, the armature starts separation by the releasing action of the plate spring as the current decreases, and torque fades away.

Clutch operating characteristics



Brake operating characteristics



T_a: Armature suction time: Time from when the current is applied till when the armature is suctioned and torque is generated.

T_{ap}: Actual torque rise time: Time from when torque is generated till when it becomes 80% of the rated torque.

T_p: Torque rise time: Time from when the current is applied till when it becomes 80% of the rated torque.

T_d: Torque fading time: Time from when the current is shut off till when it decreases to 10% of the rated torque.

T_{id}: Initial lagging time: Time from when the operation input is on by the clutch and brake till when the actuating input or releasing input is on for the clutch or brake body.

T_{ae}: Actual coupling time: Time from when torque is generated by clutch till when connection is completed.

T_{ab}: Actual braking time: Time from when torque is generated by brake till when braking is completed.

Operating characteristics

● Control circuit and operating time

The standard voltage is DC24V. If there is no DC source, use the direct current that is obtained by step-down and commutation (full-wave rectification) of alternating source. (Refer to the section of power supply.) The on-off operation is generally done on the direct-current side. The following table indicates the operating time at the time. The direct-current side operation allows a quick response, however extremely high surge voltage is generated when the current is shut off, which may cause burnout of the contact in the control circuit or a dielectric breakdown of the coil, therefore, a protective device for surge absorption is recommended. When switching operation is performed on the alternating-current side, torque fading time becomes long, which may cause interference with next operation. In such case, take a time lag. The torque rise time is the same as when operation is performed on the direct-current side.

■Micro size

Clutch operating time (Applicable power supply type: BE, BER)

Clutch size	Operating time [s]			
	ta	tap	tp	td
102-02	0.009	0.010	0.019	0.017
102-03	0.009	0.013	0.022	0.020
102-04	0.011	0.017	0.028	0.030
102-05	0.012	0.019	0.031	0.040
CYT-025	0.014	0.014	0.028	0.030
CYT-03	0.015	0.015	0.030	0.040
CYT-04	0.030	0.010	0.040	0.040

Brake operating time (Applicable power supply type: BE, BER)

Brake size	Operating time [s]			
	ta	tap	tp	td
112-02	0.004	0.006	0.010	0.010
112-03	0.005	0.007	0.012	0.008
112-04	0.007	0.009	0.016	0.010
112-05	0.010	0.013	0.023	0.012

■Standard size

Clutch operating time (Applicable power supply type: BE, BER)

Clutch size	Operating time [s]			
	ta	tap	tp	td
101-06	0.020	0.021	0.041	0.020
101-08	0.023	0.028	0.051	0.030
101-10	0.025	0.038	0.063	0.050
101-12	0.040	0.075	0.115	0.065
101-16	0.050	0.110	0.160	0.085
101-20	0.090	0.160	0.250	0.130
101-25	0.115	0.220	0.335	0.210

*The above values correspond to the CS, CSZ model and various clutch and brake units.

*Brake operating time (Applicable power supply type: BE, BER)

Brake size	Operating time [s]			
	ta	tap	tp	td
111-06	0.015	0.018	0.033	0.015
111-08	0.016	0.026	0.042	0.025
111-10	0.018	0.038	0.056	0.030
111-12	0.027	0.063	0.090	0.050
111-16	0.035	0.092	0.127	0.055
111-20	0.065	0.135	0.200	0.070
111-25	0.085	0.190	0.275	0.125

The above values correspond to the BSZ model and various clutch brake units.

● Shorten the coupling • braking time

The current conforms to the specified time constant, but if especially fast rise is required, the operating characteristic can be changed by using an excitation method such as overexcitation. Overexcitation method is the means to quicken the rise by applying overvoltage to the coil. The following table indicates the operating time when overexcitation. Refer to the section of power supply for more detail.

Operating time in the case of clutch overexcitation
(Applicable power supply type: BEJ, BEH, BEJ, BEH)

Clutch size	Operating time [s]				
	BEJ-10,BEH-20N			BEJ-10	BEH-20N
	ta	tap	tp	td	td
101-06	0.008	0.005	0.013	0.025	0.005
101-08	0.009	0.008	0.017	0.033	0.008
101-10	0.010	0.010	0.020	0.053	0.011
101-12	0.013	0.012	0.025	0.070	0.018
101-16	0.018	0.016	0.034	0.090	0.023
101-20	0.027	0.020	0.047	—	0.037
101-25	0.045	0.026	0.071	—	0.045

*The above values correspond to the CS, CSZ model and various clutch and brake units.

Operating time in the case of brake overexcitation
(Applicable power supply type: BEJ, BEH)

Brake size	Operating time [s]				
	BEJ-10,BEH-20N			BEJ-10	BEH-20N
	ta	tap	tp	td	td
111-06	0.005	0.007	0.012	0.017	0.004
111-08	0.005	0.007	0.012	0.027	0.005
111-10	0.007	0.008	0.015	0.032	0.007
111-12	0.009	0.009	0.018	0.055	0.007
111-16	0.014	0.010	0.024	0.060	0.011
111-20	0.015	0.025	0.040	—	0.020
111-25	0.021	0.034	0.055	—	0.038

*The above values correspond to the BSZ model and various clutch and brake units.

T_a- Armature suction time: Time from when the current is applied till when the armature is suctioned and torque is generated.

T_{ap}- Actual torque rise time: Time from when torque is generated till when it becomes 80% of the rated torque.

T_p- Torque rise time: Time from when the current is applied till when it becomes 80% of the rated torque.

T_d- Torque fading time: Time from when the current is shut off till when it decreases to 10% of the rated torque.

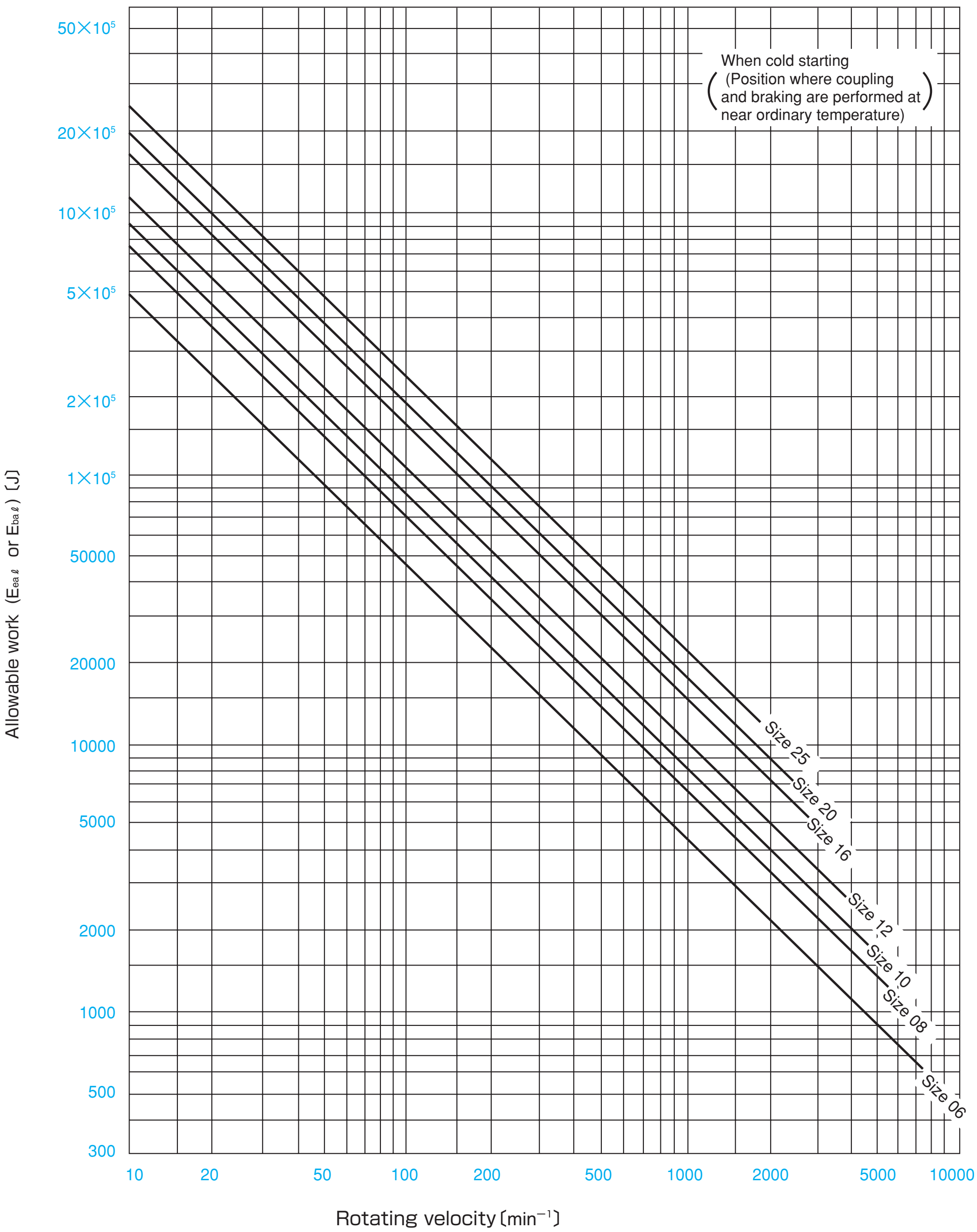
Heat dissipation characteristics

● Allowable work （$E_{ea\ell}$ or $E_{ba\ell}$）

When accelerating or decelerating a load by clutch and brake, heat is generated by sliding friction. The amount of heat changes according to the use condition. A clutch and brake works best if the heat can be disappated. However, if the core temperature exceeds the operational temperature limit, this may cause an operation trouble or damage. As stated above, the limit of frictional load by heat is called allowable work.
The tolerance is specified for each size. Heat dissipation depends on the mounting condition, rpm's and environment.
When accelerating or decelerating a large load, heat generation of the friction surface is greatly increased due to the intensive slippage. The friction material or armature could be damaged by single connection. The right table indicates the allowable work (allowable friction energy) for each size. Despite its operation frequency, if the work volume is large, apply the value much below the indicated value. For the standard size, apply below the limit line of the following diagram.

Allowable work of the micro clutch and brake s

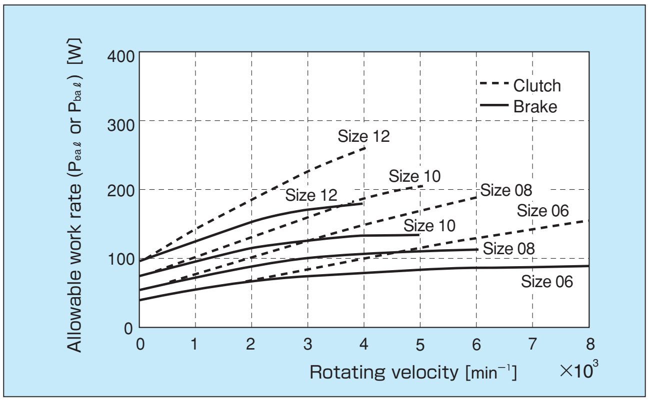
Model size	Allowable work (coupling · braking) （$E_{ea\ell}$ or $E_{ba\ell}$）[J]
102/112-02	1500
102/112-03	2300
102/112-04	4500
102/112-05	9000
CYT-025	800
CYT-03	900
CYT-04	1900



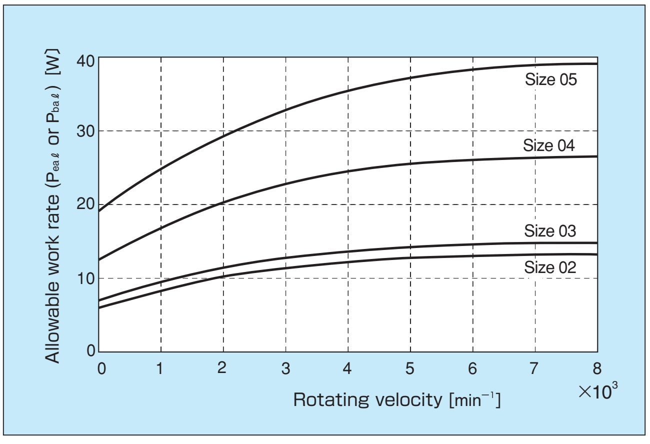
Heat dissipation characteristics

Allowable work rate (Peaℓ or Pbaℓ)

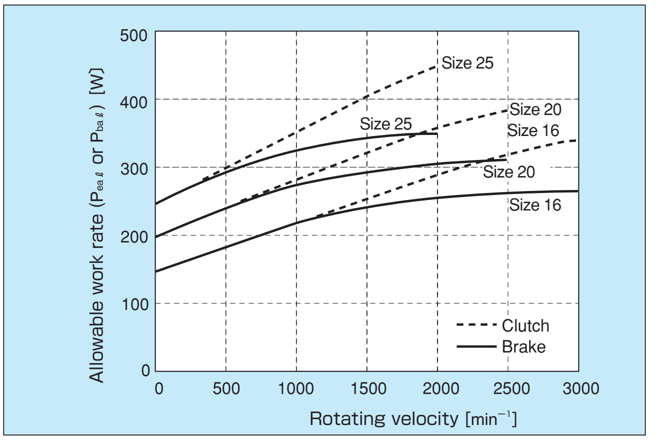
For high-frequency coupling and braking, the heat dissipation must be fully taken into account. The maximum mount of work per minute is called allowable work rate, and it is determined for each size as indicated in the diagram. For actual use, apply the value much below the permissible value in consideration of the changes of condition.
The diagram shows the value when wall mounting. When it is fixed on the shaft like bearing mounting, 80% of each diagram is equal to the permissible value.



Standard size



Micro size (Except CYT model)



Standard size

Electromagnetic actuated type cluthes and brakes

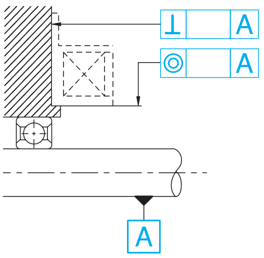
Structural instructions

When using a clutch and brake for machinery, how to maximize the performances and features in design. From the point of view of design, describe some useful factors to improve the liability of machinery.

● Mounting method of stator and rotor

1 Flange mounted type stator (Model: □-□-1□)

This stator must be fixed by an accurate positioning for the rotating shaft. For the inner and outer circumferences of the stator, class of fit (tolerance quality) is set for positioning. For the mounting surface, the concentricity and squareness of the positioning diameter must be below the permissible value to the rotating shaft.

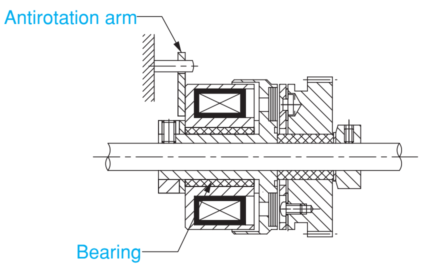


Unit [mm]

Size	Concentricity (T.I.R.)	Squareness (T.I.R.)
02	0.05	0.03
03	0.05	0.04
04	0.06	0.04
05	0.06	0.05
06	0.08	0.05
08	0.08	0.05
10	0.1	0.05
12	0.1	0.07
16	0.12	0.08
20	0.12	0.13
25	0.14	0.13

2 Bearing mounted type stator (Model:□-□-3□)

This stator is subjected to a small amount of torque by a built-in bearing or sliding bearing. Therefore, maintain an antirotation arm in the static part of the machine to prevent corotation.



3 Magnetic shield of stator

When mounting a stator in combination with clutch and brake, the performance may become unstable by the effect of each other's magnetism. Also, if there is an instrument or equipment around the clutch and brake, it could cause a negative effect such as noise or error. In such a case, appropriate measures to shut off the magnetism should be taken. Generally, nonmagnetic material is used for the mounting surface or shaft.

4 Lead wire protection

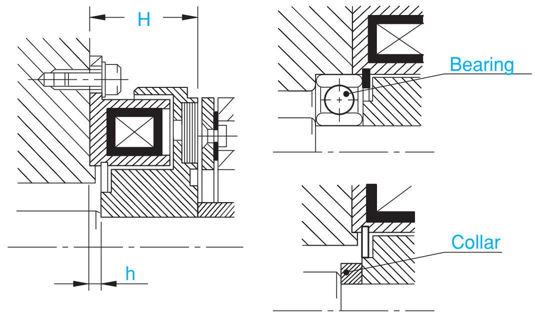
If the coated layer is damaged, it could become the source of troubles such as short circuit or burnout. Therefore, take into consideration the protection of the lead wire in the design phase.

5 Rotor mounting

The rotor is a part of the magnetic circuit. Any bore modifications may cause performance degradation. For rotor bore diameters other than the indicated standard bore diameters, contact us for further information.

6 Relationship between rotor and stator (Model: □-□-1□)

For the flange mounted type clutches, the positional relationship between the stator and rotor is very important. If the H measurement shown in the figure below is too small, the stator and rotor will come into contact with each other. If the H measurement shown is too big, the suction power decreases. The following table indicates the tolerance for each size. The design should be performed by not exceeding the value. As for the permissible value of h, follow the JIS standard tolerance.



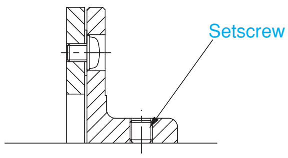
Unit [mm]

Clutch size	H		h
	Standard value	Tolerance	Standard value
102-02	18.0	±0.2	1.6
102-03	22.2		2.0
102-04	25.4		2.0
102-05	28.1		2.0
101-06	24.0		2.0
101-08	26.5		2.5
101-10	30.0	±0.3	3.0
101-12	33.5		3.5
101-16	37.5		3.5
101-20	44.0	±0.4	4.0
101-25	51.0		4.0

● Mounting method of armature

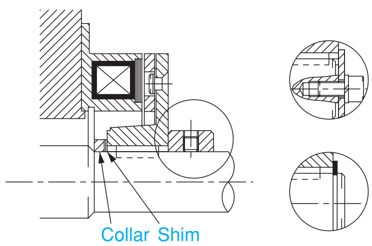
1 Installation of the armature type-1

Tighten completely with the attached hexagon socket bolt to fix. If it comes loose, apply an adhesive thread lock to the threaded part.



2 Installation of the armature type-2

It has a unique configuration that hides the boss in the inside stator. By using a C-shaped retaining ring or collar, fix completely as the figure below indicates.



3 Installation of the armature type-5

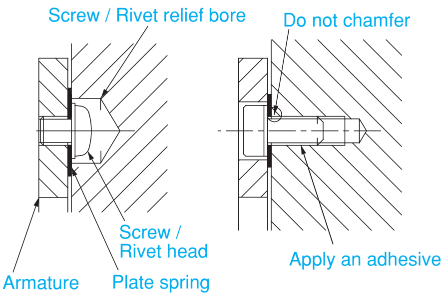
Insert directly if the micro size is below 0.5. As well as the armature type-2, use a C-shaped retaining ring or collar to fix the end face.

4 Installation of the armature type-3

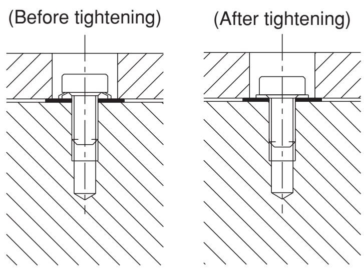
Apply a bore processing to screw or a runout processing for the rivet head on the mounting surface. Mounting is performed with the attached special hexagon socket bolt and disc spring washer. For the thread part, apply a small amount of adhesive to prevent loosening. (Do not apply too much adhesive, which may disrupt the operation if it is attached to the plate spring.) For the mounting screw bore, chamfering is not necessary just remove the burr. The attached hexagon socket bolt is a special bolt with a low head. For the size below 0.4, the JIS standard cross-recessed pan head machine screw is attached. The disc spring washer must be used as the following figure. The tightening force decreases if it is used in reverse. For the armature type-3, the concentricity and squareness of the positioning diameter must be below the permissible value to the rotating shaft.

Unit [mm]

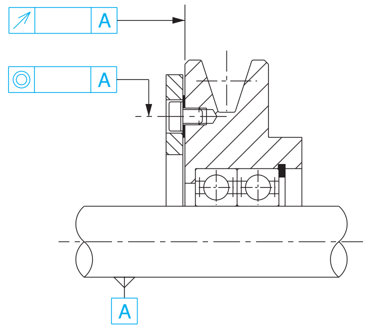
Size	Concentricity (T.I.R.)	Squareness (T.I.R.)
02	0.1	0.02
03	0.1	0.03
04	0.1	0.04
05	0.1	0.04
06	0.16	0.04
08	0.16	0.05
10	0.16	0.05
12	0.16	0.06
16	0.16	0.07
20	0.24	0.11
25	0.24	0.11



Armature type-3 mounting dimensions

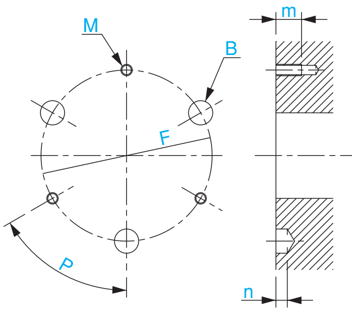


How to use washer



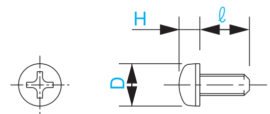
Mounting accuracy

Armature type-3 mounting dimensions

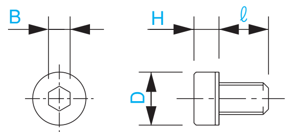


Clutch and brake size	Mounting pitch diameter F (P.C.D)	Tolerance	Mounting angle P (degree)	Tolerance (min)	Mounting screw bore No. of bores X M (Nominal designation)	Pitch	Effective screw	Screw / rivet relief bore No. of bores x Bore diameter	Depth of counterbore
02	19.5	±0.05	90	±5	2XM2	0.4	4	2X5	2.5
03	23		60		3XM2.5	0.45	5	3X6	3
04	30				3XM3	0.5	7	3X6	3.5
05	38							3X7	
06	46	±0.05	60		3XM3	0.5	7	3X7	3.5
08	60				3XM4	0.7	9	3X8.5	3.5
10	76				3XM5	0.8	11	3X10.5	4
12	95				3XM6	1.0	11	3X12.5	4
16	120				3XM8	1.25	16	3X15.5	4.5
20	158				3XM10	1.5	18	3X19	5.5
25	210	±0.1	45		4XM12	1.75	22	4X22	6

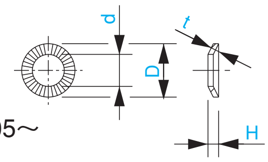
Armature type-3 mounting parts



Size 02~04



Size 05~



Size 05~

Clutch and brake size	Hexagon socket special bolt (cross-recessed pan head machine screw) Nominal dimension x Pitch	ϕD	H	B	ℓ	Disc spring washer ϕD	ϕd	H	t
02	※M2X0.4	3.5	1.3		3	Disc spring washer is not used			
03	※M2.5X0.45	4.5	1.7		4				
04	※M3X0.5	5.5	2.0		6				
05	M3X0.5	5.5	2.0	2.0	6	6	3.2	0.55	0.36
06									
08	M4X0.7	7	2.8	2.5	8	7	4.25	0.7	0.5
10	M5X0.8	8.5	3.5	3.0	10	8.5	5.25	0.85	0.6
12	M6X1.0	10	4.0	4.0	10	10	6.4	1.0	0.7
16	M8X1.25	13	5.0	5.0	15	13	8.4	1.2	0.8
20	M10X1.5	16	6.0	6.0	18	16	10.6	1.9	1.5
25	M12X1.75	18	7.0	8.0	22	18	12.6	2.2	1.8

● Air gap design and adjustment

Set the air gap [a] between the frictional surfaces (Figure below) in order that it becomes its specified value when released. At this time, adjustable layout should bedone for further convenience. As a method of that, the layout with a combination of collar and shim as indicated in the figure below is recommended. (A shim is regularly stocked. Contact us if necessary.)

1 Set the air gap [a]

Prepare a slightly shorter collar than the required length ℓ to maintain the air gap [a], and adjust the remaining gap with a shim to obtain the specified value. At this time, the collar length is determined approximately by the following formula.

L≒ℓ-2a [mm]

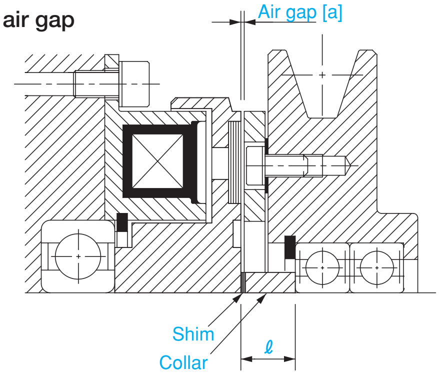
L: length of the collar

ℓ: required length to maintain the air gap

a: specified air gap value

Prepare the collar with appropriate length based on the estimated value. If the layout is done by the above method, the air gap adjustment after a long period of use can be performed simply by removing the required number of shims.

Setting of air gap

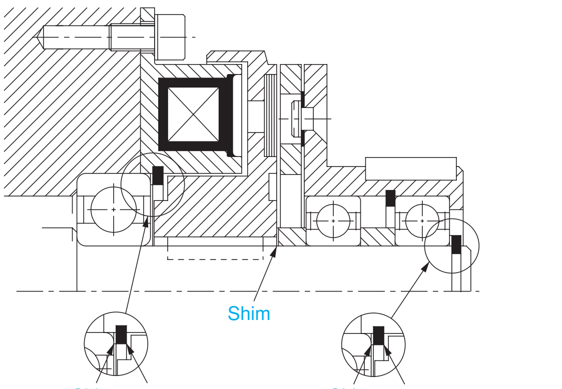


*Refer to the section of technical data for shim dimensions.

2 Remove the allowance of the shaft direction

For the clutch and brake also the parts used in combination, the performance degradation may occur if there is an allowance in the shaft direction after assembling. Therefore, reduce the allowance as much as possible. For controlling a little amount of allowance, various types of shims are available. They correspond to the often-used shaft diameter or bearing outside diameter. In addition, reliable fixing with a spring action can be performed when used in combination with a C-shaped retaining ring.

How to use shims

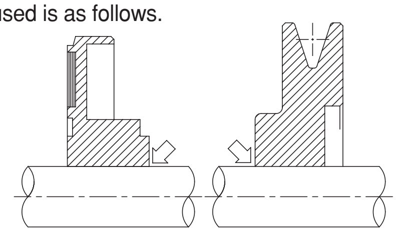


● Coupling tolerance

Clutches and brakes perform substantial work in a moment, but high accuracy control is also required at the same time. Therefore, the appropriate integration of each part is necessary for not generating a friction or vibration. For that purpose, the coupling tolerance is needed to determine in accordance with the use condition.

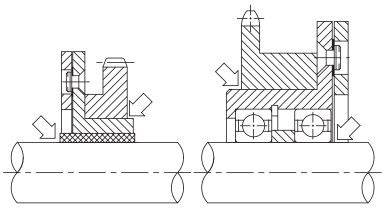
1 Coupling tolerance between rotor / armature type 1 & 2 / V-belt pulley and shaft

The standard bore tolerance is H7 class. For the CYT model, a special bore diameter tolerance is applied. The shaft dimensional tolerance used is as follows.



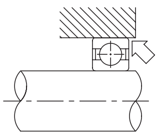
Load condition	Shaft tolerance		Remarks
Shaft below 10 ϕ	h6	h7	H5 for high accuracy
Light, normal and variable load	h6		h6 j6 for motor shaft Clutch and brake j6 for unit shaft
	js6	js7	
	j6	j7	
Heavy load and impact load	k6	k7	
	m6		

2 Coupling tolerance between armature type-5 and sprocket / armature type-5 and shaft



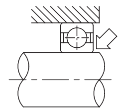
Clutch and brake size	Armature type-5		Bore tolerance of sprocket, etc.	Shaft tolerance
	Boss part tolerance	Bore tolerance		
02～05	h7	H7	H7	h7 h8
06 or more	j6	Conforms to table below	H7	Conforms to table above

3 Coupling tolerance between ball bearing and housing

Load condition		Bore tolerance	Remarks
Outer-ring rotational load	Heavy load	N7	
	Normal load and variable load	M7	
Unstable load in direction	Heavy impact load	M7	
	Heavy load and normal load	K7	
	Heavy load and normal load	J7	
Inner-ring rotational load	Impact load	J7	
	General load	H7	When it does not have impact from clutch and brake

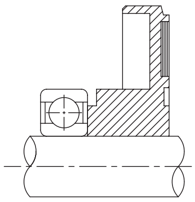
*Apply to the iron-steel or cast-iron housing. For light-alloy housing, tighter coupling is required.

4 Coupling tolerance between ball bearing and shaft

Load condition		Bore tolerance		Remarks
Outer-ring rotational load		h6		H5 for high accuracy
Unstable load in direction Inner-ring rotational load	Light load, normal load and variable load	ϕ 18 or less	h5	
		ϕ 100 or less	j6	
	Heavy load and impact load	ϕ 18 or less	j5	
		ϕ 100 or less	k5	

5 Coupling tolerance between bearing and other parts

As for the shaft with bearing and rotor or V-belt pulley mounted in the same part, prioritize the bearing and follow the coupling tolerance between ball bearing and shaft.



● Bore diameter and keyway

1 Bore diameter

The standard bore diameter is determined for each size as indicated in the measurement. To apply the bore diameter other than the standard, a pilot bore is prepared for the 101 & 111 type rotor and the armature type 1 & 2. Please follow bore specifications and precautions ❶~ ❹. The bore range is indicated in the table below.

❶ The tolerance of bore must be H7 class.

❷ When machining a bore care must be taken with respect to the concentricity and perpendicularity of the bore.

❸ Since the outer part of the rotor is deformed by applying force, do not chuck when machining.

❹ Remove all cutting oil or wash oil and dry completely before mounting.

2 Key and keyway

Our company specification based on JIS standard is applied for the keyway of the rotor and armature. (Refer to the page of clutch and brake standard bore processing specification.)

For the CYT model, a special keyway tolerance (shown in the measurement table below) is applied. For use of the key and keyway of the shaft, the JIS standard is suitable. Refer to the page of the technical data excerpted from JIS B 1301-1996. When performing a keyway processing on the rotor or armature, follow the above as well.

Bore diameter processing range for rotor and armature type 1 & 2

Unit [mm]

Clutch and brake size		5	6	8	(8.5)	10	12	(12.5)	15	17	(18.5)	20	(24)	25	28	30	32	35	40	48	50	60	70	75	80
02	R · A	■																							
03	R · A		■																						
04	R · A			■		■																			
05	R · A					■			■																
06	R				▨	▨	■	▨	■	▨															
	A				▨	▨	■	▨	■	▨															
08	R				▨	▨	▨	▨	■	▨	▨	■													
	A				▨	▨	▨	▨	■	▨	▨	■													
10	R							▨	▨	▨	▨	■	▨	■	▨	▨									
	A							▨	▨	▨	▨	■	▨	■	▨										
12	R							▨	▨	▨	▨	▨	▨	■	▨	■	▨	▨							
	A							▨	▨	▨	▨	▨	▨	■	▨	■	▨								
16	R										▨	▨	▨	▨	▨	■	▨	▨	■	▨	▨				
	A										▨	▨	▨	▨	▨	■	▨	▨	■	▨					
20	R												▨	▨	▨	▨	▨	▨	■	▨	■	▨			
	A												▨	▨	▨	▨	▨	▨	■	▨	■	▨			
25	R												▨	▨	▨	▨	▨	▨	▨	▨	■	■	▨	▨	
	A												▨	▨	▨	▨	▨	▨	▨	▨	■	■	▨	▨	

■ Standard bore diameter
▨ Processable range
( ) indicates a pilot bore
(Finish process is not performed.)
R: Rotor
A: Armature type 1 & 2

*The above table does not correspond to the CYT, CSZ and BSZ model.

● Environment of the mounting part

When selecting a clutches or brakes careful consideration of the operating environment must be taken.

1 Temperature

The heat-resistant class of clutch and brake is B type, and the allowable operating temperature is -10°C～ 40°C. When the clutch or brake is used at high temperatures, the heat generated by actual clutching and braking operations does not dissapate, this may cause damage to the coil or friction part. Even if it is used below -10°C, there is no problem if the temperature becomes over -10°C by heat generation of the clutch and brake. However, if the water of crystalline frosts generated by a longtime stoppage or low-frequency operation is attached on the device, it may cause performance degradation.

2 Humidity and water drop

As in the case of temperature, if water drops are attached on the friction surface, the coefficient of friction decreases temporally until it dries. Also, water contamination causes oxidation as well. Therefore, take appropriate measures such as using a cover.

3 Intorduction of foreign body such as dust or oil

The friction surface has a susceptibility to foreign body. If any oil is mixed, the coefficient of friction significantly decreases. Metal dust especially damages the friction surface or rotating part. In addition, an agent could also cause oxidation. For such environment, use of a protective cover is recommended.

4 Air ventilation

Since the clutch and brake converts the friction work into heat proper ventilation is required to dissipate the heat build up. Forced cooling is a effective way for increasing an allowable amount of work. Confirm the temperature if the device is used in the place with poor ventilation.

● Maximum rotation speed (RPM)

The maximum rotation speed (rpm) of clutches and brakes is indicated in the specification table. This value is determined by the peripheral velocity of the friction surface. If the speed exceeds the maximum rpm, this may cause premature wear and premature failure of the clutch or brake. Overspeed applications will not transmit rated torque.

● Ball bearing

A ball bearing is generally used in combination with clutches and brakes, and a deep-grooved ball bearing is the mos common. Since dry-type clutches and brakes have a susceptibility to oils and fats attached on the frictional surface, use a double sealed bearing which does not require lubrication. A double sealed bearing with contactless rubber seal is effective for preventing dust. For a compact bearing or rare bearing, a metallic double sealed type is also available.

● Mechanical strength

Due to the operating characteristics of clutches and brakes, coupling and braking of load can be immediately performed, thus impactive forces may be applied to each part of the machine, therefore to allow enough strength is important.
(Undue safety design could cause a load torque increase, or affect the coupling and braking accuracy.)

● Vibration and backlash

Both clutch and brake assemblies are balanced to reduce vibration. However, if the device is applied impactive forces repeatedly, backlash could occur to generate vibration noises. Perform the layout with no backlash.

● Antirust

An antioxidation treatment is applied to the clutches and brakes. However, oxidation may be generated depending on the storage condition or environment. Please attempt to prevent oxidation. A small amount of oxidation is acceptable.

● Occurrence of sparks

During the use process of clutches and brakes, sparks may occur by the friction between the magnetic pole part of the frictional surface and the armature. Make sure not to use in a flammable environment.

● Structural design with maintability

Maintenance of clutches and brakes is not generally required for a long period of time.
By performing maintenance on a ball bearing, for instance, it can be used for a prolonged period. A structural design that can be easily disassembled and reassembled is recommended. Refer to the instruction manual for more detail.

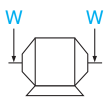
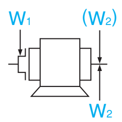
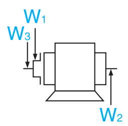
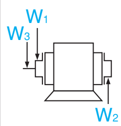
● Use of micro clutches

If a bearing mounted type micro clutch (oil retaining metal) is used, there is a possibility to be regulated by the current-carrying rate or temperature. Contact us for further information.

● Overhung load of the unit

he permissible value of the radial load applied on the shaft is indicated below. For the though shaft type unit, the permissible value slightly changes due to the direction of action of the input-output load. (The indicated value is when the most stringent condition is applied. The load point is the midpoint of the shaft.)

Unit: [N]

Size	125-□-12 126-□-4B	121-□-20		121-□-10 122-□-20
				
05	250	—	—	—
06	320	300 (320)	140	140
08	480	450 (500)	250	250
10	700	700 (800)	450	450
12	900	900 (1000)	700	700
16	1300	1400 (1600)	1000	1000
20	1800	2000 (2500)	1800	1800
25		2900 (3600)	2600	2600

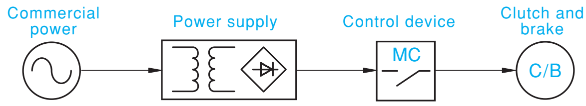
*( ) for load in both directions.

Control circuit

Basic configuration of a control circuit

When designing an electric circuit to control the clutch and brake, the selection of control method and control device is very important. The appropriate selection and circuit design stabilize the performance of the clutch and brake and strengthen the reliability of the machine.

To run the clutch and brake, DC24V (standard specification) power is required. There are two methods to run the clutch and brake. One is to use a direct current, and the other is to commutate an alternating current by stepping down the power. Various power supplies for exclusive use are available. Refer to the section of power supply for more details.



Standard wiring

Selection of parts of power supply

1 Transformer

Adjust the primary side to the power supply voltage. For the secondary side, use a transformer that has enough capacity to apply the rated voltage to the clutch or brake coil. To get a rough idea, choose a transformer with a capacity of more than 1.25-times the rating capacity of the clutch in temperature of 20°C. In addition, the secondary side output voltage is generally required to be set in accordance with the voltage drop of the rectifier and the impedance of the transformer, however it can be evaluated simply by the formula below (Formula ① and ②).

$$V_2 = \frac{V+1.4}{0.9} \text{ [V]} \quad \cdots\cdots ①$$

Formula is a method of single-phase full-wave rectification.

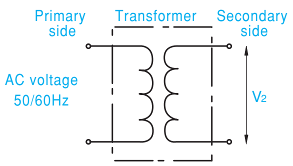
$$P \geqq W_{CB} \times 1.25 \text{ [VA]} \quad \cdots\cdots ②$$

V_2: Transformer secondary side voltage [V]

V: Direct voltage [V]

P: Transformer capacity [VA]

W_{CB}: Clutch (brake) capacity [VA]



2 Rectifier

The "single-phase full-wave rectification (bridge method)" is adopted from various types of rectification methods. For the selection, the maximum rated value of the rectifiers must be followed. It can be evaluated simply by the formula below.

❶Determination of the reverse withstand voltage VRM

$$VRM = V_L \cdot \sqrt{2} \cdot K \quad \cdots\cdots ③$$

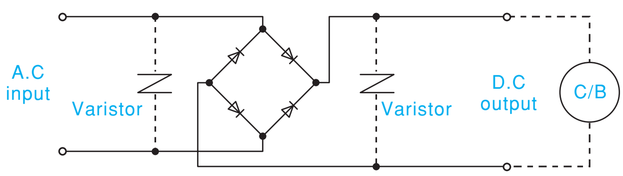
V_L: Current input voltage [V]

K: Factor of safety (take 2～3)

Protection of rectifier is required if there is a possibility of commingling of more than the withstand voltage of surge.

❷Determination of the average rectified current

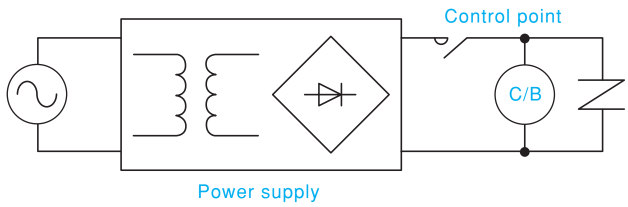
Select a rectifier that has more than 1.5-times the clutch or brake rated current. In the case of high current, temperature rise becomes a problem. Take measures to dissapate the heat and prevent the rise of temperature.



Single-phase full-wave rectification method

3 Relay (Control contact)

Since the electromagnetic clutches and brakes have a magnetic coil inside, they must be used within the conditions of the applied relay direct-current inductive load. This is because the contact erosion occurs by the surge voltage generated when the electromagnetic clutch and brake is controlled. In the case that the operating life or operation frequency is a problem in use, a static relay is required. For details, refer to the section of electromagnetic clutch and brake control for power supply.



Direct-current switching

4 Control circuit structural points to remember

❶Control of clutch and brake

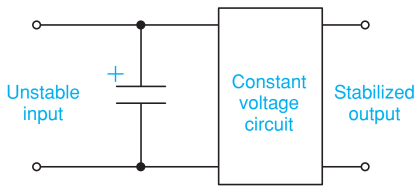
When the clutches and brakes are controlled on the alternating-current side, the armature release time becomes late and high-frequency operation becomes unable to perform. Therefore, set the control contact on the direct-current side.

❷Power supply voltage of clutch and brake

Variation of the exciting voltage must be within ±10% of the clutch and brake rated voltage.

❸Smooth the exciting voltage

A single-phase full-wave rectification is generally used for a clutch and brake power supply. If high accuracy is required, a sufficient result can be obtained by smoothing.



Stabilized power supply circuit

❹Protection of the control contact

When a protection circuit is set for the clutch and brake, the control contact is also protected. In addition, if a CR absorber is applied between the contact points as below, the protection effect increases. C (condenser) and R (resistance) become approximately as below.

Condenser C [μF] : ratio to contact current is;

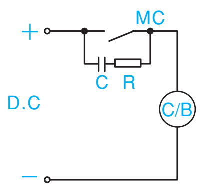
$$\frac{C\ [\mu F]}{I\ [A]} = \frac{0.5 \sim 1}{1}$$

Withstand pressure: 600 [V]

Resistance R [Ω]: ratio to contact current is;

$$\frac{R\ [\Omega]}{E\ [V]} = 1$$

Capacity:1 [W]

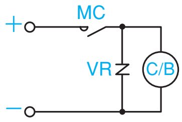
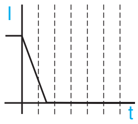
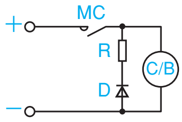
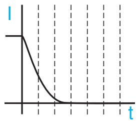
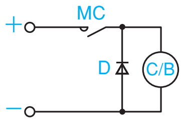
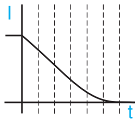
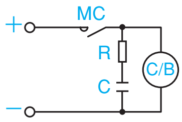
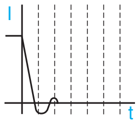


Relay protection circuit

5 Discharge circuit

When a direct exciting current is applied to electromagnetic clutches and brakes, the energy is stored in the inside coil. When interrupting the current, surge energy is generated between the coil terminals by the stored energy. This surge energy could reach more than 1000V by the breaking speed or current, which may cause a dielectric breakdown of the coil or contact burnout of the switch. Therefore, to set an appropriate discharge circuit to prevent these troubles is required.

In addition, the effect to control the armature release time or surge voltage is different depending on the types of discharge circuits. For the characteristics of discharge circuits, refer to the table below. Each discharge circuit has both merits and demerits. We recommend using a varistor.

	Circuit diagram	Current decay	Characteristics
Varistor			It has a significant effect to reduce a surge voltage. There is no delay of the armature release time.
Resistance + diode			The power consumption of the power section can be reduced as well as its resistance capacitance. Since the armature release time becomes slow in a measure, caution is demanded for high-frequency use.
Diode			It is effective to reduce a surge voltage. However, the armature release time becomes slow, and there is a high possibility of occurrence of mutual interference of the clutch and brake. It is not suitable for high-frequency use.
Resistance + condenser			The armature release time becomes faster, but a condenser with high pressure tightness is required.

Applicable power supply specifications

Model	Rectification method	Frequ-ency [Hz]	AC input voltage AC [V]	DC input voltage *1 DC [V]	Capacity	Recommended protective device *2 (Varistor)	Applicable clutch and brake size
BE-05	Single-phase full-wave	50/60	100/200	24	25	NVD07SCD082 or TNR7V820K	02~10
BE-10	Single-phase full-wave	50/60	100/200	24	50	NVD07SCD082 or TNR7V820K	12~16
BE-20	Single-phase full-wave	50/60	100/200	24	100	NVD07SCD082 or TNR7V820K	20~25
BER-05 Built-in relay	Single-phase full-wave	50/60	100/200	24	25	Not required	02~10
BER-10 Built-in relay	Single-phase full-wave	50/60	100/200	24	50	Not required	12~16
BER-20 Built-in relay	Single-phase full-wave	50/60	100/200	24	100	Not required	20~25

※ *1 indicates the value when applying current to the brake coil.
※ *2 The protective device NVD□SCD□ is manufactured by KOA, and TNR□V□K is manufactured by Nippon Chemi-Con Corporation.
※ Refer to the section of power supply for more detail.

Accessories

The attached components of clutches and brakes are different depending on the model and type. Refer to the accessory list below. Besides, information in this document is subjected to change without notice.

Micro size

Model	Varistor		Screw*1		Shim	
	Model	Qty	Specification	Qty	Inside dia. x outside dia. x thickness	Qty
102-02-□1,□5	NVD07SCD082 or equivalent	1	—	—	No accessories	—
102/112-02-□3		1	M2×3	2		—
112-02-□1,□2		1	—	—		—
102-03-□1,□5		1	—	—		—
102/112-03-□3		1	M2.5×4	3		—
112-03-□1,□2		1	—	—		—
102-04-□1,□5		1	—	—		—
102/112-04-□3		1	M3×6	3		—
112-04-□1,□2		1	—	—		—
102-05-□1,□5		1	—	—		—
102/112-05-□3		1	Low-head bolt M3×6	3		—
			Disc spring washer for M3	3		—
112-05-□1,□2		1	—	—		—
CYT-025-□ ϕ6		1	M2.5×4	3	6.3×8.7×0.1t	3
CYT-03-□ ϕ6		1			6.3×8.7×0.1t	3
CYT-03-□ ϕ8		1			8.3×11.7×0.1t	3
CYT-04-□ ϕ8		1	M3×6	3	8.3×11.7×0.1t	3
CYT-04-□ ϕ10		1			10.3×13.7×0.1t	3
CSZ/BSZ-05-□		1	—	—	No accessories	—

* *1 For the size 05, a hexagon socket special bolt is attached. For other sizes, a cross-recessed pan head machine screw is attached.

Standard size

Model	Varistor		Screw		Shim		Color	
	Model	Qty	Specification	Qty	Inside dia. x outside dia. x thickness	Qty	Inside dia. x outside dia. x thickness	Qty
101/CS-06-□1	NVD07SCD082 or equivalent	1	—	—	—	—	—	—
101/CS-06-□3 ϕ12		1	Low-head bolt M3×6 Disc spring washer forM3	each 3	12.3×15.7×0.1t	3	—	—
101-06-13 ϕ15		1		each 3	15.3×20.7×0.1t	3	—	—
101/CS-06-□5 ϕ12		1	—	—	12.3×15.7×0.1t	5	12.2×18×5.5	1
					12.3×15.7×0.5t	1		
111-06-11 ϕ12,15		1	—	—	—	—	—	—
111-06-12 ϕ12		1	—	—	12.3×15.7×0.1t	3	—	—
111-06-12 ϕ15		1	—	—	15.3×20.7×0.1t	3	—	—
111-06-13		1	Low-head bolt M3×6 Disc spring washer for M3	each 3	—	—	—	—
CSZ/BSZ-06-□		1	—	—	—	—	—	—
101/CS-08-□1	NVD07SCD082 or equivalent	1	—	—	—	—	—	—
101/CS-08-□3 ϕ15		1	Low-head bolt M4×8 Disc spring washer for M4	each 3	15.3×20.7×0.1t	3	—	—
101-08-13 ϕ20		1		each 3	20.3×27.7×0.1t	3	—	—
101/CS-08-□5 ϕ15		1	—	—	15.3×20.7×0.1t	5	15.2×22×5.5	1
					15.3×20.7×0.5t	1		
111-08-11 ϕ15,20		1	—	—	—	—	—	—
111-08-12 ϕ15		1	—	—	15.3×20.7×0.1t	3	—	—
111-08-12 ϕ20		1	—	—	20.3×27.7×0.1t	3	—	—
111-08-13		1	Low-head bolt M4×8 Disc spring washer for M4	each 3	—	—	—	—
CSZ/BSZ-08-□		1	—	—	—	—	—	—

Standard size

Model	Varistor		Screw		Shim		Color	
	Model	Qty	Specification	Qty	Inside dia. x outside dia. x thickness	Qty	Inside dia. x outside dia. x thickness	Qty
101/CS-10-□1	NVD07SCD082 or equivalent	1	—	—	—	—	—	—
101/CS-10-□3 ϕ20		1	Low-head bolt M5×10 Disc spring washer for M5	each 3	20.3×27.7×0.1t	3	—	—
101-10-13 ϕ25		1		each 3	25.3×34.7×0.1t	3	—	—
101/CS-10-□5 ϕ20		1	—	—	20.3×27.7×0.1t 20.3×27.7×0.5t	5 2	20.2×28×5.9	1
111-10-11 ϕ20,25		1	—	—	—	—	—	—
111-10-12 ϕ20		1	—	—	20.3×27.7×0.1t	3	—	—
111-10-12 ϕ25		1	—	—	25.3×34.7×0.1t	3	—	—
111-10-13		1	Low-head bolt M5×10 Disc spring washer for M5	each 3	—	—	—	—
101/CS-12-□1	NVD07SCD082 or equivalent	1	—	—	—	—	—	—
101-12-13 ϕ25		1	Low-head bolt M6×10 Disc spring washer for M6	each 3	25.3×34.7×0.1t	3	—	—
101-12-13 ϕ30		1		each 3	30.3×39.7×0.1t	3	—	—
CS-12-33 ϕ25		1		each 3	25.3×31.7×0.1t	3	—	—
101/CS-12-□5 ϕ25		1	—	—	25.3×31.7×0.1t 25.3×31.7×0.5t	5 2	25.2×32×7.5	1
111-12-11 ϕ25,30		1	—	—	—	—	—	—
111-12-12 ϕ25		1	—	—	25.3×31.7×0.1t	3	—	—
111-12-12 ϕ30		1	—	—	30.3×39.7×0.1t	3	—	—
111-12-13		1	Low-head bolt M6×10 Disc spring washer for M6	each 3	—	—	—	—
101/CS-16-□1	NVD07SCD082 or equivalent	1	—	—	—	—	—	—
101-16-13 ϕ30		1	Low-head bolt M8×15 Disc spring washer for M8	each 3	30.3×41.7×0.1t	3	—	—
101-16-13 ϕ40		1		each 3	40.3×51.7×0.1t	3	—	—
CS-16-33 ϕ30		1		each 3	30.3×39.7×0.1t	3	—	—
101/CS-16-□5 ϕ30		1	—	—	30.3×39.7×0.1t 30.3×39.7×0.5t	5 2	30.2×40×11.2	1
111-16-11 ϕ30,40		1	—	—	—	—	—	—
111-16-12 ϕ30		1	—	—	30.3×39.7×0.1t	3	—	—
111-16-12 ϕ40		1	—	—	40.3×51.7×0.1t	3	—	—
111-16-13		1	Low-head bolt M8×15 Disc spring washer for M8	each 3	—	—	—	—
101-20-11	NVD07SCD082 or equivalent	1	—	—	—	—	—	—
101-20-13 ϕ40		1	Low-head bolt M10×18 Disc spring washer for M10	each 3	40.3×51.7×0.1t	3	—	—
101-20-13 ϕ50		1		each 3	50.3×67.7×0.1t	3	—	—
CS-20-33 ϕ40		1		each 3	40.3×51.7×0.1t	5	—	—
101-20-15 ϕ40		1	—	—	40.3×51.7×0.1t 40.3×51.7×0.5t	5 2	40.2×50×11.7	1
111-20-11 ϕ40,50		1	—	—	—	—	—	—
111-20-12 ϕ40		1	—	—	40.3×51.7×0.1t	3	—	—
111-20-12 ϕ50		1	—	—	50.3×67.7×0.1t	3	—	—
111-20-13		1	Low-head bolt M10×18 Disc spring washer for M10	each 3	—	—	—	—
101-25-11	NVD07SCD082 or equivalent	1	—	—	—	—	—	—
101-25-13 ϕ50		1	Low-head bolt M12×22 Disc spring washer for M12	each 4	50.3×67.7×0.1t	3	—	—
101-25-13 ϕ60		1		each 4	60.3×84.7×0.1t	3	—	—
CS-25-33 ϕ50		1	—	each 4	50.3×67.7×0.1t	5	—	—
101-25-15 ϕ50		1	—	—	50.3×61.7×0.1t 50.3×61.7×0.5t	5 2	50.2×60×12.2	1
111-25-11 ϕ50,60		1	—	—	—	—	—	—
111-25-12 ϕ50		1	—	—	50.3×67.7×0.1t	3	—	—
111-25-12 ϕ60		1	—	—	60.3×84.7×0.1t	3	—	—
111-25-13		1	Low-head bolt M12×22 Disc spring washer for M12	each 4	—	—	—	—

Selection

● Points for selection

Due to the high controllability, clutches and brakes are used not only for on-off control but also complex operation. If the size is determined simply by its torque, an unexpected trouble may occur. When selecting the size, a careful examination from several points of view such as load characteristic or layout of the mechanism where the clutch and brake is assembled is required. This section describes the situational selection methods, calculation examples and required information.

1 Motor and clutch & brake

❶Relationship between motor output and torque

Motor HP is indicated by output, but it is indicated by torque in clutches and brakes.The following relationship is formed between the torque and motor output.

$$T_M = \frac{9550 \cdot P}{n_r}\,\eta \ [N\cdot m] \quad \cdots\cdots ①$$

P: Motor HP [kW]

n_r: RPM of the clutch and brake shaft [min^{-1}]

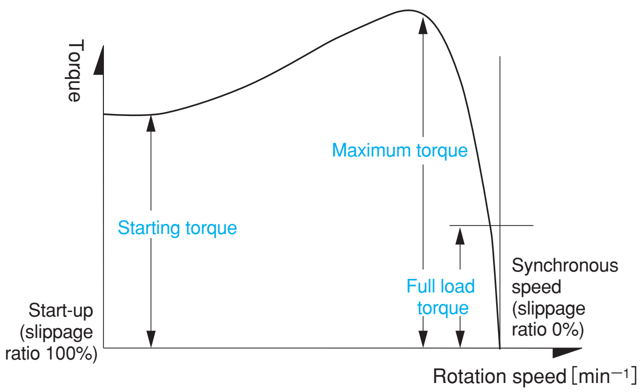
η: Transmission efficiency from the motor to clutch and brake

❷Difference of characteristic

Motor and clutch & brake have different characteristics. Therefore, if a motor is used as a drive source and the start-and-stop control of load is performed by a clutch and brake, the selection must be done in consideration of respective characteristics.

A) Motor characteristics

A motor can generate over 200% of the full-load torque at start-up. After passing through the maximum torque while accelerating, it drives the load near the full-load torque until stable operation can be obtained. When the load increases while running the motor RPM will be reduced, the motor momentum will continue to drive the load and the motor will generate additional torque. The following diagram indicates the relationship between motor torque and rotating velocity characteristic.



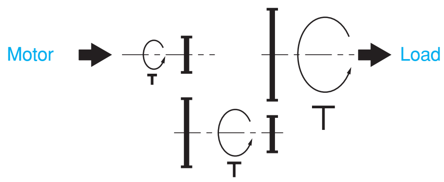
B) Clutch and brake characteristics

As described in the section of torque characteristics, the upper limit of coupling and braking torque is determined, and if more of the load torque is applied, it slips on the friction surface. An appropriate selection can be performed by confirming the difference of characteristic in advance. For a wide range of application, a clutch and brake with a torque value of 200˜ 250% of the full load torque of the motor is recommended.

2 Relationship between torque and RPM

❶Difference of characteristic

The shaft in the machine with a high RPM can be rotated by a small force, but the decelerated low-speed shaft needs a large force to rotate. That is, torque is inverse proportion to RPM. This is very important in selecting a clutch and brake. The size or operating life changes depending on the RPM of the shaft.



❷Combination with a speed changer

Like a non-stage speed changer, when a clutch and brake is used in the mechanism that can change the RPM, the torque requirement during low speed and the responsiveness and operating life requirement during high speed must be considered in advance.

3 Understanding of load characteristics

The coupling time or wear life of clutch and brake varies depending on the coupling and braking load characteristics. Therefore, to understand the load characteristics is important to maintain a consistent operation. However, the load characteristics vary in definition and a complete understanding is difficult. As it is now, the size is often determined from an experimental point of view.

❶Importance of safety factor

When the size of clutch and brake is determined, the required torque is evaluated by multiplying the factor empirically. If the driving part is already set, use the factor K empirically depending on the motor to be used. When the factor is too small, it could cause trouble such as slippage when worsening of the condition. Conversely, if the factor is too big, the motor load increases. An excessive load may lead to motor problems.

	Motor turbine	Gasoline engine	Diesel engine (1~2 cylinder gasoline engine)
K	2~2.5	2.5~2.8	2.8~3.4

❷Load torque and moment of inertia

In load torque, there are resistance forces in machine and resistance forces added after coupling (such as cutting resistance). Since load torque is difficult to evaluate the size selection is sometimes calculated incorrectly, this may cause torque insufficiency in the case of clutch. The selection must be done with due caution. Moment of inertia is also called flywheel effect, which indicates the amount of power required to stop or start a rotating object. Overload of clutch and brake can be prevented by reducing the load on the clutch as much as possible. In the design phase apply a measurably larger load for brake. In addition this will minimize the inertia moment and improve responsiveness and operating life. Be sure include the inertia of clutch and brake in your inertia calculations.

Selection

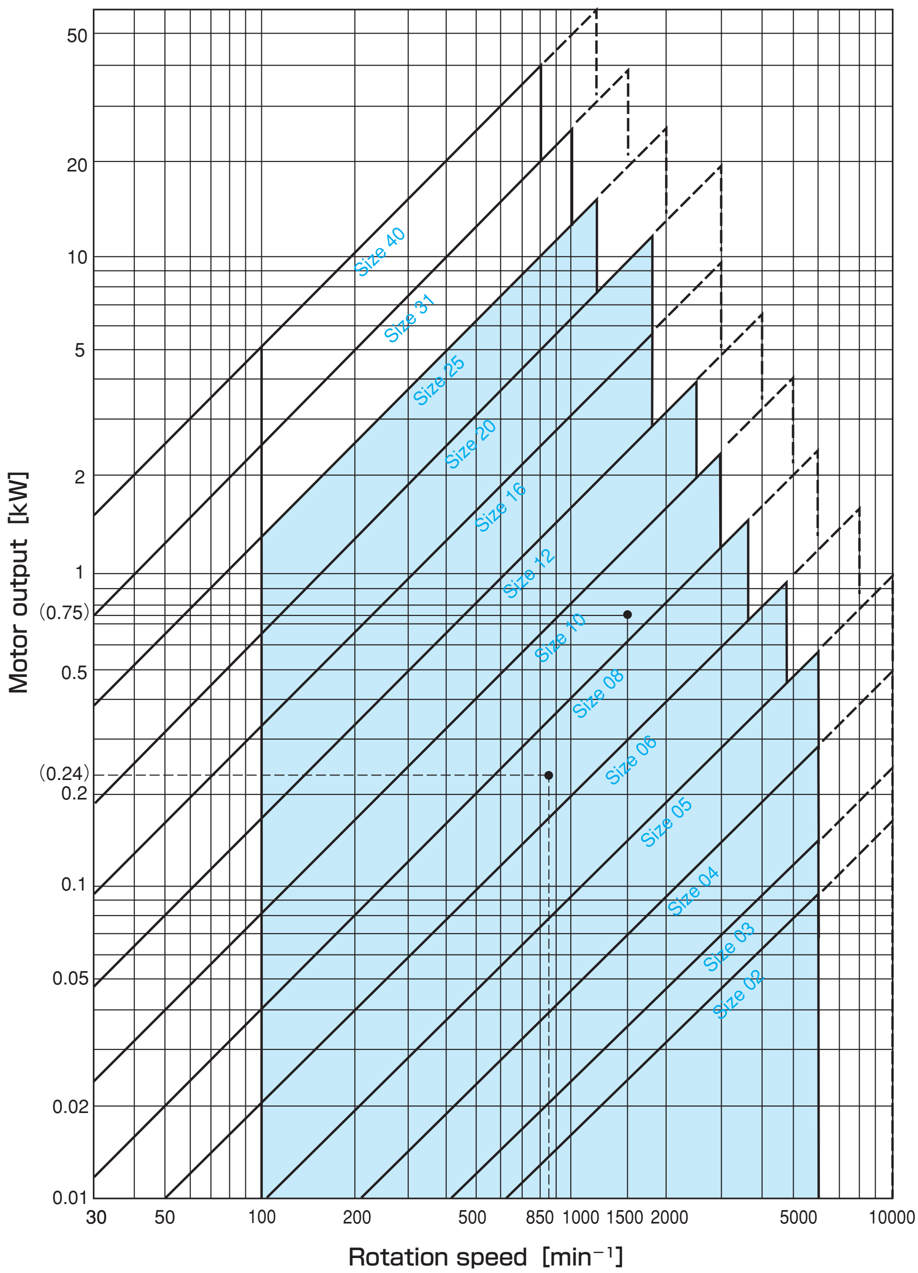
Simplified selection graph

This selection graph is applied to a relatively light load and low frequency and when a motor is used as a drive source. The size of clutch and brake can be determined by a simplified way if the motor to be used is set appropriately to the load condition, and when there is no complicated mechanism or large inertial system to help the drive between the motor and clutch and brake. The safety factor K is 2.5 in this graph.
If other factors are required, use the value evaluated by multiplying the motor output by K/2.5 as kW of the vertical axis.

[Selection Example]
qWhen the motor output is 0.75 kW and the clutch and brake rotating velocity is 1500min^{-1}, select the size 10 where the intersecting point is.
wWhen the motor output is 1.4kW, the clutch and brake rotating velocity is 850min^{-1}, and the safety factor is 1.5,

$$0.4\ [kW] \times \frac{1.5}{2.5} = 0.24\ [kW]$$

evaluate the value as below. The point at intersection of 0.24 of the vertical axis and 850min^{-1} is in the range of the size 08.



* Perform the selection within the [shaded] range. If the intersecting point is in the dashed line, the amount of work, heat dissipation or wear could become below the specified level.
For the heavy-line frame of below 100min^{-1}, confirm the required torque by the formula.
*For the size 31 and 40, contact us for further information.

● Study of torque

1 Full load torque of motor (T_M)

The full load torque converted to the clutch and brake mounting shaft is;

$$T_M = \frac{9550 \cdot P}{n_r} \cdot \eta \ \ [N \cdot m] \quad \cdots\cdots ①$$

P: Motor output [kW]

n_r: Rotating velocity of the clutch and brake shaft [min^{-1}]

η : Transmission efficiency from the motor to clutch and brake

2 Load torque (T_ℓ)

Load torque is difficult to evaluate by a formula. Therefore, the value is estimated empirically or evaluated by measuring directly.

❶Determine form the motor capacity

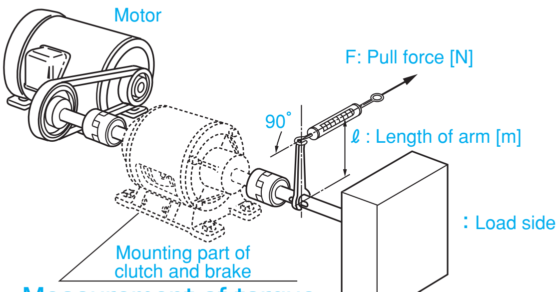
Assume that the motor is correctly selected for the load condition. Use the evaluatedvalue T_M of ① as its load torque.

$$T_\ell = T_M \ \ [N{\cdot}m] \quad \cdots\cdots ②$$

❷In a case of direct measurement

A correct T_ℓ can be determined by actual measurement of load. For the measurement, use a torque wrench or rotate the shaft to mount the clutch and brake, and evaluate the product of F (force when the load starts to rotate) and ℓ (length of the arm).

$$T_\ell = \ell \cdot F \ \ [N{\cdot}m] \quad \cdots\cdots ③$$



Measurement of torque

❸Load torque sign

In the formula, the load torque is indicated by a plus-minus (+/-) sign. In a case of clutch, the load torque works on the direction of counteracting the rotation so that it is subtracted from the clutch torque T_d. In a case of brake, the load torque works on the direction of enhancing the braking so that it is added to the brake torque T_d. (It is relatively rare, but it may work the other way. In such a case, change the sign to calculate.) In the formula, it is indicated as $\pm T_\ell$.

3 Acceleration/deceleration torque (T_a)

❶The required torque to accelerate the load is;

$$T_a = \frac{J \cdot n_r}{9.55 t_{ae}} \ \ [N \cdot m] \quad \cdots\cdots ④$$

t_{ae}: Actual coupling time of clutch (Acceleration time) [s]

J: Total amount of inertia moment coupled by clutch [kg·m^2]

❷The required torque to accelerate the load is;

$$T_a = \frac{J \cdot n_r}{9.55 t_{ab}} \ \ [N \cdot m] \quad \cdots\cdots ⑤$$

t_{ab}: Actual braking time of brake (Deceleration time) [s]

J: Total amount of inertia moment decelerated by brake [kg·m^2]

4 Required torque (T)

The required torque to drive (brake) the load by condition is as follows.

❶When J and T_ℓ are applied when coupled

$$T = (T_a \pm T_\ell)\ K \ \ [N{\cdot}m] \quad \cdots\cdots ⑥$$

K is a factor by load condition. Refer to the table below and select the value empirically. In a case of clutch, the load torque works on the direction of counteracting the drive so that T_ℓ is plus (+). In a case of clutch, the load torque works on the direction of enhancing the braking so that T_ℓ is minus (-).

❷When T_ℓ is mostly applied

$$T = T_\ell \cdot K \ \ [N{\cdot}m] \quad \cdots\cdots ⑦$$

❸When J is mostly applied

$$T = T_a \cdot K \ \ [N{\cdot}m] \quad \cdots\cdots ⑧$$

❹In a case of static coupling

If the clutch is coupled during stationary state and the load is accelerated by a motor, the required torque to prevent a slip of clutch during acceleration is;

$$T = \left\{ \frac{J_\ell}{J_d + J_\ell} (T_M - T_\ell) + T_\ell \right\} K \ \ [N{\cdot}m] \quad \cdots\cdots ⑨$$

J_d: Total amount of J on the driving side from the clutch [kg·m^2]

J_ℓ : Total amount of J on the loading side from the clutch [kg·m^2]

Safety factor by load condition: K

Use condition		Factor K
Light load	Low-frequency use of a small inertial body	1.5
	High-frequency use of a relatively small inertial body	2～2.2
	General use of a standard inertial body	
	High-frequency use	2.2～2.4
Standard load	Low-frequency use of a small inertial body	2～2.4
	General use of a standard inertial body	2.4～2.6
	Drive a large inertial body	2.7～3.2
Heavy load	Operation that involved impact (Large load fluctuations)	3.5～4.5

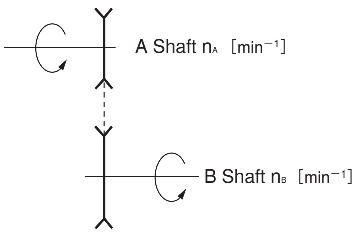
5 Conversion of torque to the other shaft

To convert the torque of B shaft to the A shaft

$$T_A = T_B \cdot \frac{n_B}{n_A} \ \ [N \cdot m] \quad \cdots\cdots ⑩$$

T_A: Torque of A shaft, T_B: torque of B shaft

n_A: Rotation speed of A shaft, n_B: Rotation speed of B shaft



● Study of work

1 Coupling or braking work (E_e, E_b)

The work volume of single coupling or braking by clutch and brake is;

❶During acceleration, the coupling work E_e is;

$$E_e=\frac{J\cdot n_r^2}{182}\cdot\frac{T_d}{T_d-T_\ell}\ [J] \quad \cdots(11)$$

❷During deceleration, the braking work E_b is;

$$E_b=\frac{J\cdot n_r^2}{182}\cdot\frac{T_d}{T_d+T_\ell}\ [J] \quad \cdots(12)$$

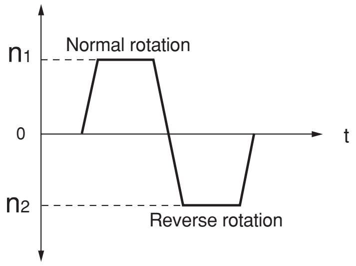
❸Normal/Reverse rotation

The clutch coupling work when the rotational direction is switched by clutch is;

$$E_e=\frac{J}{182}\left\{(n_1^2+2\cdot n_1\cdot n_2)\frac{T_d}{T_d+T_\ell}+n_2^2\frac{T_d}{T_d-T_\ell}\right\}[J] \quad \cdots(13)$$

n_1: Normal rotation velocity [min^{-1}]

n_2: Reverse rotation velocity[min^{-1}]



❹Work during slip

$$E_e=\frac{2\pi}{60}\cdot n\cdot t\cdot T_d\ [J] \quad \cdots(14)$$

$$E_b=\frac{2\pi}{60}\cdot n\cdot t\cdot T_d\ [J] \quad \cdots(15)$$

t : Slipping time [s]

n: Rotating velocity to slip min^{-1}]

T_d: Dynamic torque at n [min^{-1}][N・m]

When clutch and brake is used while slipping, an undesirable condition such as heat generation may occur.

❺Allowable work

The allowable work $E_{ea\ell}$ and $E_{ba\ell}$ are the values under and ideal condition that the values of E_e and E_b must be sufficiently smaller than them.

$$E_e \ll E_{ea\ell} \quad \cdots(16)$$

$$E_b \ll E_{ba\ell} \quad \cdots(17)$$

* For the values of $E_{ea\ell}$ and $E_{ba\ell}$, refer to the page of heat dissipation characteristics.

2 Work rate

A clutch and brake repeats an on-off operation with a high frequency that examination of capability of heat dissipation is important.

❶Coupling work rate (P_e)

$$P_e=\frac{E_e\cdot S}{60}\ll P_{ea\ell}\ [W] \quad \cdots(18)$$

❷Braking work rate (P_b)

$$P_b=\frac{E_e\cdot S}{60}\ll P_{ba\ell}\ [W] \quad \cdots(19)$$

S: Operation frequency [operations/min]

The allowable work rate $P_{ea\ell}$ and $P_{ba\ell}$ are the values under an ideal condition. Therefore, determine E_e and E_b and S in order that they become sufficiently smaller than them.

* For the values of $E_{ea\ell}$ and $E_{ba\ell}$, refer to the page of heat dissipation characteristics.

3 Coupling/braking frequency (S_a)

The allowable operation frequency determined by heat dissipation S_a is;

$$S_a\ll\frac{60P_{ea\ell}}{E_e}[operation/min] \quad \cdots(20)$$

$$S_a\ll\frac{60P_{ba\ell}}{E_b}[operation/min] \quad \cdots(21)$$

This allowable frequency is determined only by heat dissipation. For actual use, consider the operating time also.

● Study of operating time

1 Total coupling and total braking time (t_{te}, t_{tb})

The coupling and braking time of load by clutch and brake is the sum of the clutch and brake operating time itself and the accelerating and decelerating time of load.

❶Total coupling time

$$t_{te}=t_{id}+t_a+t_{ae}\ [s] \quad \cdots(22)$$

t_{id}: Initial lagging time

t_a: Armature suction time [s]

T_{ab}: Clutch actual coupling time (Acceleration time)[s]

❷Total braking time

$$t_{tb}=t_{id}+t_a+t_{ab}\ [s] \quad \cdots(23)$$

t_{id}: Initial lagging time

t_a: Armature suction time [s]

T_{ab}: Brake actual braking time [s]

T_{ae} and t_{ab} are evaluated by the formulas below by the condition.

❸During acceleration/deceleration

Actual coupling time is;

$$t_{ae}=\frac{J\cdot n_r}{9.55\ (T_d-T_\ell)}[s] \quad \cdots(24)$$

Actual braking time is;

$$t_{ab}=\frac{J\cdot n_r}{9.55\ (T_d+T_\ell)}[s] \quad \cdots(25)$$

❹During normal rotation

The actual coupling time (acceleration time) when switched the normal rotation into reverse rotation is;

$$t_{ae}=\frac{J}{9.55}\left(\frac{n_1}{T_d+T_\ell}+\frac{n_2}{T_d+T_\ell}\right)[s] \quad \cdots(26)$$

n_1: Normal rotation velocity [min^{-1}]

n_2: Reverse rotation velocity [min^{-1}]

2 The coupling/braking time when the coupling/braking is completed in the process of torque rise

In this case, the coupling/braking time is the sum of the armature suction time t_a and t_{ae} or t_a and t_{ab}.

❶Total coupling time

$$t_{te}=t_{id}+t_a+t_{ae}\ [s] \quad \text{······} ㉗$$

$$t_{ae}'=\sqrt{\frac{J\cdot n_r}{4.77}\cdot\frac{t_{ap}}{0.8\cdot T_d}}\ [s] \quad \text{······} ㉘$$

❷Total braking time

$$t_{tb}=t_{id}+t_a+t_{ab}'\ [s] \quad \text{······} ㉙$$

$$t_{ab}'=\sqrt{\frac{J\cdot n_r}{4.77}\cdot\frac{t_{ap}}{0.8\cdot T_d}}\ [s] \quad \text{······} ㉚$$

They are applied in the case of $T_\ell=0$. Generally, the above formulas are used when the load torque (T_ℓ) is small in full measure. Besides, if the calculated value becomes $t_{ae}>t_{ap}$, $t_{ab}>t_{ap}$, apply the formula ㉒ ~ ㉖.

● Study of operation number

The available amount of work of clutch and brake before air gap adjustment is determined. If more volume is required, the space adjustment is necessary.

The operable number before space adjustment is;

❶In a case of clutch

$$L_e=\frac{E_T}{E_e}[\text{opetation}] \quad \text{······} ㉛$$

E_T: Total amount of work before space readjustment [J]

❷In a case of brake

$$L_b=\frac{E_T}{E_b}[\text{operation}] \quad \text{······} ㉜$$

● Study of stopping accuracy

To evaluate the stopping accuracy by a formula is difficult since the friction work or control system variation is involved. Generally, it is evaluated empirically by the formula below to use as a measure.

1 Stopping angle (θ)

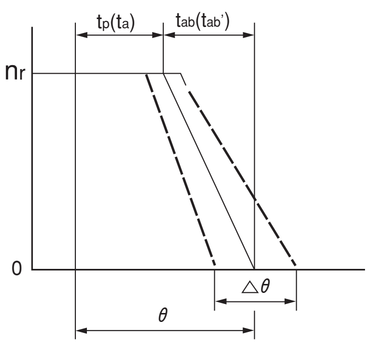
$$\theta=6n_r\left(t_{id}+t_p+\frac{1}{2}t_{ab}\right)\ [^\circ] \quad \text{······} ㉝$$

$$\text{OR}\ \theta=6n_r\left(t_{id}+t_a+\frac{2}{3}t_{ab}'\right)\ [^\circ] \quad \text{······} ㉞$$

2 Stopping accuracy ($\triangle\theta$)

$$\triangle\theta=\pm0.15\theta\ [^\circ] \quad \text{······} ㉟$$

If there is a factor to disturb the braking effect such as load fluctuation, change the constant of the formula ㉟ to 0.2～ 0.25. The system delay or variation caused by a backlash of chain or gear is not included in the stopping angle and accuracy.



Total amount of work before air gap readjustment E_T

Micro electromagnetic clutch and brake
102・112 model

Size	Total amount of work E_T [J]
02	2×10^6
03	3×10^6
04	6×10^6
05	9×10^6

CYT model

Size	Total amount of work E_T [J]
025	1×10^6
03	1.5×10^6
04	2×10^6

Micro electromagnetic clutch and brake (unit)
101・CS・111 model*

Size	Total amount of work E_T [J]
06	36×10^6
08	60×10^6
10	130×10^6
12	250×10^6
16	470×10^6
20	10×10^8
25	20×10^8

※ Applicable to each model of the unit (except 180 model)

CSZ・ BSZ model

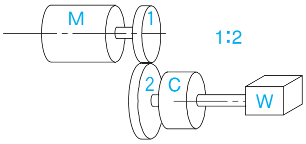
Size	Total amount of work E_T [J]
05	9×10^6
06	29×10^6
08	60×10^6

180 model

Size	Total amount of work E_T [J]
06	24×10^6
08	40×10^6
10	62×10^6
12	154×10^6
16	250×10^6

● Selection Example 1

Clutch used for a continued operation of load



The selection of clutches used for a continued operation of load as above figure is performed as follows.

Use conditions

Used motor output	P	0.4kW (Standard three-phase, 4P)
Clutch operation frequency	S	20 [operations/min]
Load moment of inertia	J_A	0.0208 [kg・m²]
Load torque	T_ℓ	Unknown [N・m]
Rotating velocity of the clutch mounting shaft	n	750 [min⁻¹]
Transmission efficiency	η	90%

1 Study of torque

By the above use conditions, evaluate the torque required for coupling. Evaluate the load torque first. Assume that the motor is correctly selected. By the formula ①, the load torque Tx is;

$$T_\ell=\frac{9550\times0.4}{750}\times0.9=4.58\ [\mathrm{N\cdot m}]$$

Form the formula ④, the acceleration torque is;

$$T_a=\frac{0.0208\times750}{9.55\times0.5}=3.27\ [\mathrm{N\cdot m}]$$

The acceleration torque is given as a condition, but in the above formula, it is estimated from the operation frequency as t_{ae}= 0.5 [s]. Therefore, by the formula ⑥, the required torque is;

$$T=(4.58+3.27)\times2=15.7\ [\mathrm{N\cdot m}]$$

The sign of the load torque T_ℓ is plus (+). The factor K by load condition is empirically determined as K= 2 for general use of standard load. According to the above information, select the clutch size 10 (torque 20N・m) that has more than the required torque 15.7 [N・m].

2 Study of work

Determine the model and evaluate the total load moment of inertia by the self-moment of inertia J and load moment of inertia of the model. In the case of model 101-10-13, the rotating part moment of inertia J is 0.00678 [kg・m²].

Therefore, the total moment of inertia J is;

$$J_T'=0.0208+0.000678=0.02148\ [\mathrm{kg\cdot m^2}]$$

By the formula ⑪, evaluate the single coupling work E_e.

$$E_e=\frac{0.02148\times750^2}{182}\times\frac{20}{(20-4.58)}=86.1\ [\mathrm{J}]$$

The sign of the load torque T_ℓ is minus (-). The coupling work E_e is smaller than the allowable work $E_{ea\ell}$ in full measure.

$$E_e \ll E_{ea\ell}$$

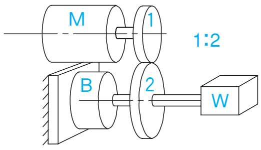
Then, evaluate the work rate by the formula ⑱.

$$P_e=\frac{86.1\times20}{60}=28.7\ [\mathrm{W}]$$

This value is smaller than the allowable work rate $P_{ea\ell}$ in full measure, which means that the clutch corresponds to the use condition, therefore select the model 101-10-13.

● Selection Example 2

Brake to stop the inertia when turning off a motor



The selection of clutches to stop the inertia when turning off a motor as above figure is performed as follows.

Use conditions

Used motor output	P	0.75kW (Standard three-phase, 4P)
Motor rotating velocity	n_1	1800 [min⁻¹]
Motor moment of inertia	J_M	0.00205 [kg・m²]
V-belt pulley (motor side) moment of inertia	J_1	0.00075 [kg・m²]
V-belt pulley (brake side) moment of inertia	J_2	0.00243 [kg・m²]
Load moment of inertia	J_A	0.05 [kg・m²]
Load torque	T_ℓ	5.0 [N・m]
Rotating velocity of the brake mounting shaft	n	900 [min⁻¹]
Stop time	t	Within 0.5 [s]

1 Study of torque

By the above use conditions, evaluate the total moment of inertia of the brake shaft conversion.

$$J_T\ \left(\frac{1800}{900}\right)^2\times(0.00205+0.00075)+0.00243+0.05=0.06363\ [\mathrm{kg\cdot m^2}]$$

Evaluate the deceleration torque. Since the operating time of the brake itself is included in the deceleration time, calculate as 1/2 of the given stop time.

By the formula ⑤

$$T_a=\frac{0.06363\times900}{9.55\times0.25}=24.0\ [\mathrm{N\cdot m}]$$

By the formula ⑥, the required torque is;

$$T=(24.0-5.0)\times2.4=45.6\ [\mathrm{N\cdot m}]$$

The sign of the load torque T_ℓ is minus (-). The factor K by load condition is determined empirically as K =2.4 for general use of standard load. By the above information, temporally select the brake size 12 (torque 40N・m) that has brake torque equivalent to the required torque 45.6 [N・m].

2 Study of work

Determine the model and evaluate the total load moment of inertia by the self-moment of inertia J and load moment of inertia. In the case of model 111-12-11, the moment of inertia of the armature is 0.00181 [kg・m²].

Therefore, the total moment of inertia $J_{T'}$ is;

$$J_T'=0.06363+0.00181=0.06544\ [\mathrm{kg\cdot m^2}]$$

By the formula ⑫, evaluate the single braking work E_b.

$$E_b=\frac{0.06544\times900^2}{182}\times\frac{40}{(40+5)}=258.9\ [\mathrm{J}]$$

The sign of the load torque T_ℓ is plus (+). The braking work E_b is smaller than the allowable work $E_{bea\ell}$ in full measure.

$$E_b \ll E_{ba\ell}$$

3 Study of operating time

By the formula ㉕, evaluate the braking time.

$$t_{ab}=\frac{0.06544\times900}{9.55\times(40+5)}=0.137\ [s]$$

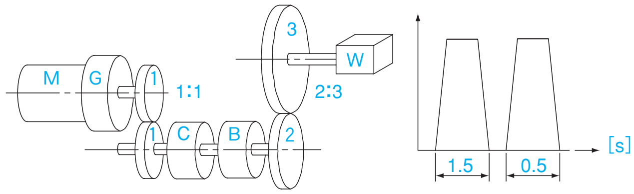
The sign of the load torque T_ℓ is plus (+). And the armature suction time of the size 12 is 0.027 [s] by the specification table. And the initial lagging time is 0.05 [s].
By the formula ㉓,

$$t_{tb}=0.05+0.027+0.137=0.214\ [s]$$

This value meets the requirement of below 0.5 [s], which means that the brake corresponds to the use conditions, therefore select the model 111-12-11.

● Selection Example 3

Clutch and brake to drive a load



The selection of clutches and brakes to drive a load as above figure is performed as follows.

Use conditions

Operation frequency	S	30 [operation/min]
Required operating life number *1	L	810×10⁴ [operation] or more
V-belt pulley A moment of inertia	J_1	0.00195 [kg・m ^{2}]
V-belt pulley B moment of inertia	J_2	0.01668 [kg・m ^{2}]
Load moment of inertia	J_A	0.5075 [kg・m ^{2}]
Load torque	T_ℓ	22.0 [N・m]
Rotating velocity of the clutch and brake mounting shaft	n	150 [min $^{-1}$]
Rotating velocity of the load shaft	n_2	100 [min $^{-1}$]
Coupling time	t_1	Within 0.3 [s]
Stop time	t_2	Within 0.3 [s]

※ *1 When it is used 15 hours a day with no adjustment over a year, L= 30 x 60 min x 15 hours x 300 days= 8,100,000 times

1 Study of torque

By the above conditions, convert the load torque into the clutch and brake shaft. Form the formula ⑩,

$$T_\ell=22.0\times\frac{2}{3}=14.7\ [N\cdot m]$$

Convert all the inertia moment of rotating part into the clutch and brake shaft.

$$J_T=J_1+(J_2+J_A)\times\left(\frac{2}{3}\right)^2$$
$$=0.00195+(0.01668+0.5075)\times\left(\frac{2}{3}\right)^2$$
$$=0.2349\ [kg\cdot m^2]$$

Since the operating time of the clutch and brake is included in the acceleration time, calculate as 1/2 of the given coupling time 0.3 [s].
By the formula ④,

$$T_a=\frac{0.2349\times150}{9.55\times0.15}=24.6\ [N\cdot m]$$

By the formula ⑥, the required torque T is;

$$T=(24.5\pm14.7)\times K\ [N\cdot m]$$

When the factor K by load condition is determined empirically as K= 2 for general use of standard load, the clutch is;

$$T=(24.5+14.7)\times2=78.4\ [N\cdot m]$$

The brake is;

$$T=(24.5-14.7)\times2=19.6\ [N\cdot m]$$

According to the above information select the clutch size 16 (torque 80N・m) and the brake size 10 (torque 20N・m).

2 Study of work

Determine the model and evaluate the total load moment of inertia by the self-moment of inertia J and load moment of inertia of the model. In the case of clutch model 101-16-15, the rotating part moment of inertia J is 0.0063 [kg・m^2]. And in the case of brake model 111-10-11, the armature moment of inertia is 0.000663 [kg・m^2].
Therefore, the total moment of inertia J_T is;

$$J_T'=0.2349+0.0063+0.000663=0.2419\ [kg\cdot m^2]$$

By the formula ⑪, evaluate the single coupling work of clutch E_e.

$$E_e=\frac{0.2419\times150^2}{182}\times\frac{80}{(80-14.7)}=36.6\ [J]$$

By the formula ⑫, evaluate the single braking work of brake E_b.

$$E_b=\frac{0.2419\times150^2}{182}\times\frac{20}{(20+14.7)}=17.2\ [J]$$

This value meets the requirements for the allowable work and the amount of work per minute of the selected model.

3 Study of operation number

Evaluate the number of operations next. By the specification table for each model, the total work of the size 16 is (470×10^6) [J], and for the size 10 is (130×10^6) [J]. Therefore, by the formula ㉛ and ㉜, the clutch is;

$$L=\frac{470\times10^6}{36.6}=1284\times10^4\ [operations]$$

The brake is;

$$L=\frac{130\times10^6}{17.2}=756\times10^4\ [operations]$$

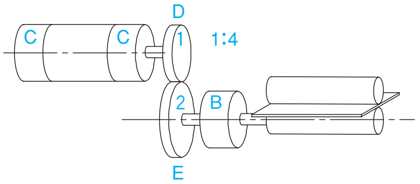
The required operating number is approximately 8,100,000 that the size 10 can't meet the requirement. When changing the model to 111-12-11 for a review, it becomes as below and meets the requirement. (The calculation process is omitted.)

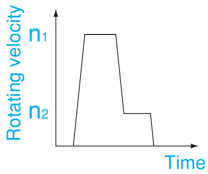
$$L=\frac{250\times10^6}{22.0}=1136\times10^4\ [operations]$$

Therefore, the appropriate clutch model is 101-16-15 and brake model is 111-12-11 for this example.

● Selection example 4

Clutch and brake used for two-stage speed change single-stop mechanism





The selection that includes the stopping accuracy of the clutch and brake to drive a load is performed as follows.

Use conditions

Maximum input rotating velocity	n_1	1500 [min $^{-1}$]
Minimum input rotating velocity	n_2	200 [min $^{-1}$]
Roll shaft rotating velocity	n_3	50 [min $^{-1}$]
Operation frequency	S	12 [operations/min]
Required operating life number*1	L	130×10^4 [operation] or more
Pulley D moment of inertia	J_1	0.000025 [kg・m ^{2}]
Pulley E moment of inertia	J_2	0.005375 [kg・m ^{2}]
Roll moment of inertia	J_A	0.0133 [kg・m ^{2}]
Roll load torque	T_ℓ	8.0 [N・m]
Roll diameter	R	60 [mm]

※ *1 When it is used 6 hours a day with no adjustment over a year, L= 12 x 60 min x 300 days= 1,300,000 times

1 Study of brake

❶Study of work

By the above conditions, evaluate the total moment of inertia for conversion of the feed roll shaft. Assuming that the inertia of rotating part of the clutch brake unit type 121-08-10 is 0.000475 [kg・m^2], and the armature inertia moment of the brake model 111-12-12 is 0.00181 [kg・m^2],

$$J_T=0.0133\times2+0.00181+0.005375$$
$$+(0.000025+0.000475)\times\left(\frac{4}{1}\right)^2$$
$$=0.04179\ [kg\cdot m^2]$$

By the formula ⑫, evaluate the single braking work E_b.

$$E_b=\frac{0.04179\times50^2}{182}\times\frac{40}{(40+8)}=0.48\ [J]$$

The sign of the load torque T_ℓ is Plus (+). This value meets the requirements for the allowable work and the amount of work per minute of the selected model.

❷Study of operation number

Evaluate the number of operations next. The total work of the size 12 is (250×10^6) [J] that by the formula ㉜,

$$L=\frac{250\times10^6}{0.48}=52083\times10^4\ [operations]$$

This value meets the requirement in full measure.

❸Study of operating time

Evaluate the braking time. Either the formula ㉕ or ㉚ is applied. In this case, apply the formula ㉚ to shorten the braking time. Assume that the torque increment time t_{ap} is 0.063 [s].

By the formula ㉚, the braking time t_{ab}' is;

$$t_{ab}'=\sqrt{\frac{0.04179\times50}{4.77}\times\frac{0.063}{(0.8\times40)}}=0.0294\ [s]$$

❹Study of stopping accuracy

Initial lagging time is 0.05 [s].

By the formula ㉞, the stopping angle is;

$$\theta=6\times50\times\left(0.05+0.027+\frac{2}{3\times0.0294}\right)=28.98\ [^\circ]$$

Form the formula ㉟, the stopping accuracy is;

$$\triangle\theta=\pm0.15\times28.98=\pm4.35\ [^\circ]$$

When converting the roll diameter to the circumferential length, it becomes ±1.1 [mm].

2 Study of clutch

❶Study of work

By the above conditions, evaluate the total moment of inertia converted to the clutch shaft.

$$J_T'=0.000475+0.000025+$$
$$(0.00181+0.0133\times2+0.005375)\times\left(\frac{1}{4}\right)^2$$
$$=0.0026\ [kg\cdot m^2]$$

By using the formula ⑩, convert the load torque to the clutch shaft.

$$T_\ell=8.0\times\frac{1}{4}=2.0\ [N\cdot m]$$

By the formula ⑪, the single coupling work E_e of the high-speed side clutch is;

$$E_e=\frac{0.0026\times1500^2}{182}\times\frac{10}{(10-2)}=40.2\ [J]$$

This value meets the requirement for the allowable work of the selected model. Evaluate the coupling work rate P_e next. By the formula ⑱,

$$P_e=\frac{40.2\times12}{60}=8.04\ [W]$$

This value is smaller than the allowable work rate P_ℓ in full measure.

❷Study of operation number

Evaluate the number of operations by the formula ㉛.

$$L=\frac{60\times10^6}{40.2}=149\times10^4\ [operations]$$

The number of operations in one year is about 1,300,000, which satisfies the requirement.

By the formula ⑫, the single coupling work E_e of the low-speed side clutch is;

$$E_e=\frac{0.0026\times(1500-200)^2}{182}\times\frac{10}{(10+2)}=20.1\ [J]$$

This clutch decelerates the load from 1500 [min^{-1}] to 200 [min^{-1}], which is similar actions as brake. Therefore, the sign of the load torque is Plus (+).

Also, it is clear that the value meets the requirements of operating life number since it is smaller than the high-speed side clutch.

By the above information, both clutch and brake meet the requirements.