SHORT CATALOGUE

CLARK ELECTRIC CLUTCH

CLARK ELECTRIC CLUTCH & CONTROLS LTD
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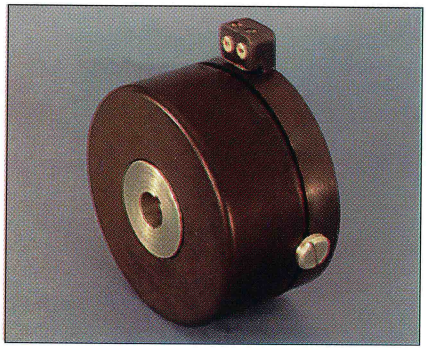
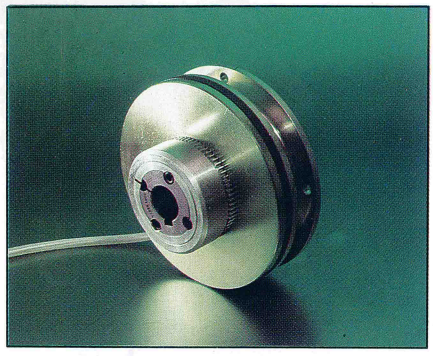
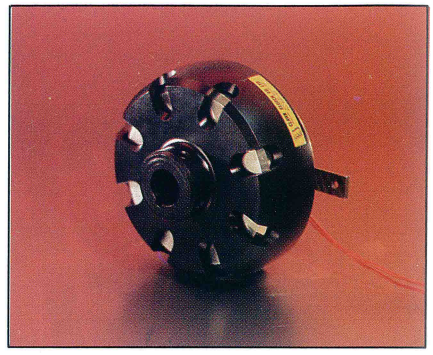
The Clark Electric Clutch & Controls Company was established in 1961 to design and manufacture electromagnetic Clutches, Brakes and Controls. Throughout the years the company has adopted a policy of continual improvement and addition to the range. Today, Clark Electric Clutch & Controls is synonymous with high quality, wide choice and reliability. In the following pages we present a brief guide to our product range. Full technical information on individual models is available on request.

Range table of Clark Electric Clutch & Controls ELECTROMAGNETIC CLUTCHES & BRAKES

All Clark Clutches and Power Brakes are self-adjusting for wear throughout their life





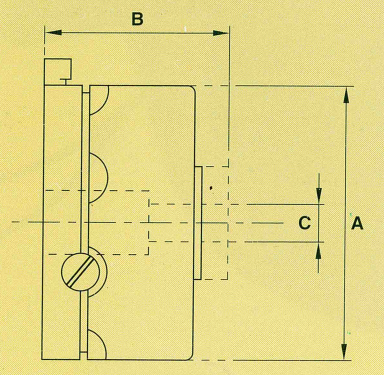


FS FAILSAFE BRAKES

The Clark Electric Clutch range includes a selection of spring-applied Fail Safe Brakes.

When de-energised the springs press the rotor plate against friction linings to bring the shaft to rest. The setting of air gap and measurement of wear can be achieved without removing the Brake from the shaft. The outer shell allows setting and measurement of wear to be measured in 0.1 mm increments.

DIMENSIONS



Sizes	A	B	C
FS 60	60	46	12
FS 80	80	53	14
FS100	100	59	25

POWER BRAKES

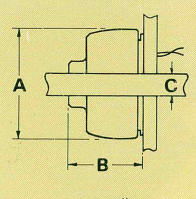
Clark range of power-on, self-adjusting Brakes.

Sizes 175 - 400 have an identical appearance to the S. type Clutches of equivalent sizes.

Sizes 600 and 800 are disc type with a choice of internal or external flange mounting.

The Brake field assembly is designed to be secured to a support plate so as to be square and concentric with the shaft. The shaft may enter from either end of the Brake or pass through.

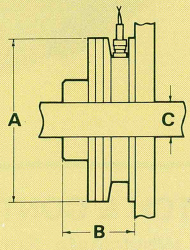
The Brakes may be operated from standard 24 volt D.C. supplies, or for greater stopping accuracy from boost circuits.



DIMENSIONS

Sizes 175 to 400

	A	B	C
175	50	35	10
250	72	48	14
400	114	58	25



'C' (Max. Shaft Size)

Sizes 600 & 800

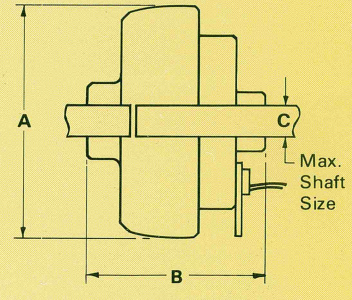
	A	B	C
600	152	67	32
800	203	73	40

BM TYPE CLUTCHES

No support required - wide selection of shaft sizes available.

Bearing mounted field spool Clutches may be used to couple two rigidly supported in-line shafts, but since the field spool is bearing mounted the assembly requires no other fixing than to prevent the torque arm turning with the light bearing drag.

DIMENSIONS



AVAILABLE SIZES

	A	B	C
BM175	50	43	10
BM250	72	59	14
BM400	114	84	20
BM600	152	125	32
BM800	203	131	40

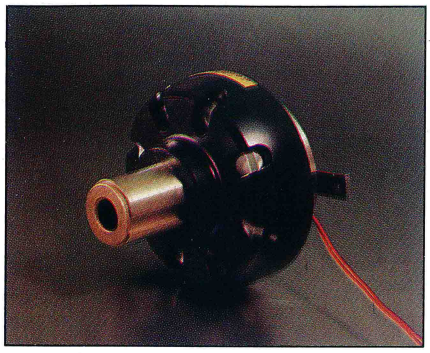
FS FAILSAFE BRAKES STATIC TORQUE RATINGS

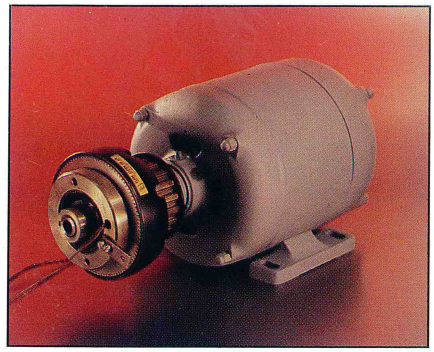
Size	Torque
FS60	2 Nm
FS80	5.5 Nm
FS100	17.5 Nm

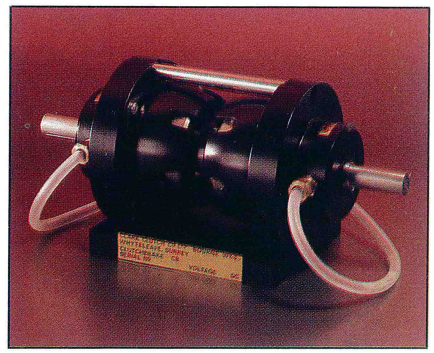
The range of Clark Electromagnetic Clutches and Brakes outlined below offers an inexpensive approach to automatic motion control systems for a wide variety of drives. The Clutches are low powered devices relative to the motor power transmitted i.e. the largest Clutch will transmit 7.5 kW at 1440 r.p.m. and requires a 24 volt D.C. supply of 1.5 A. They may be switched by relays or solid state devices in conjunction with micro-switches, reed switches, proximity detectors, photo-electric controls and processors.

CLUTCH & BRAKE STATIC TORQUE RATINGS

Size	Torque
175	1.1 Nm
250	5.6 Nm
365	11.5 Nm
400	23 Nm
600	61 Nm
800	122 Nm







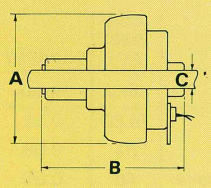
EXTENDED HUB AND PULLEY CLUTCHES FOR THROUGH SHAFT MOUNTING

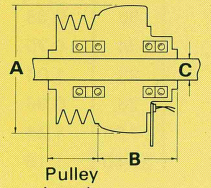
No shaft alignment required. Wide choice of shaft diameter

This type of Clutch is ideal for use where a Clutch is required to transmit a drive to or from a shaft via a pulley etc. These Clutches are designed to be fitted to a 'through shaft' which avoids having to align separate shafts.

The extended hub versions of the 175, 250 and 400 Clutches are supplied with a keywayed steel hub containing oil reservoir bearings. The drive pulley etc., is then secured to the hub.

Pulley Clutch versions of the size 600 and 800 are supplied complete with the specified pulley etc., and use sealed ball races throughout.





DIMENSIONS

Sizes 175 to 400

	A	B	C
175	49	60	10
250	71	92	14
400	114	122	20

'C' (Max. Shaft Size)

Sizes 600 & 800

	A	B	C
600	152	125	32
800	203	131	40

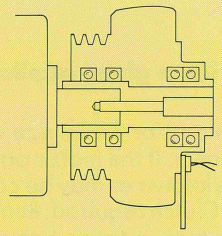
MOTOR MOUNTING PULLEY CLUTCHES FITTED DIRECTLY TO MOTORSHAFT

Avoids aligning shaft extensions - accepts any pulley, sprocket, gearwheel etc.

Clark offer this 'tailor' built Clutch for frequent start/stop operation, complete with specified pulley or plate-wheel as one assembly bored and keywayed for fitting directly to the short shaft of a motor or gearbox.

The arrangement avoids the necessity of aligning motor shaft extension to accommodate the Clutch.

Where smooth starting is desired, the Silkstart Acceleration Controller may be used in conjunction with a Power Unit.



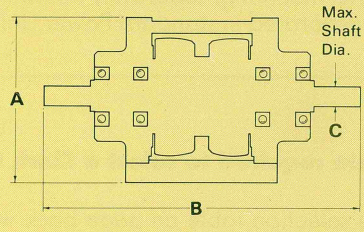
Size	Torque Transmitted
250	0.3 kW at 1440 rpm.
400	1.5 kW at 1440 rpm.
600	3.7 kW at 1440 rpm.
800	7.0 kW at 1440 rpm.

COMPOSITE CLUTCHBRAKES

For ease of installation. Choice of mounting position.

These units provide the ultimate in simplicity of installation where it is required to stop/start a motor frequently i.e. in indexing drives. The Clutchbrake can be bolted into position between a motor and gearbox and the shafts connected via couplings or belt drives. The unit is factory assembled and no adjustments or shaft alignment are necessary for correct installation.

DIMENSIONS



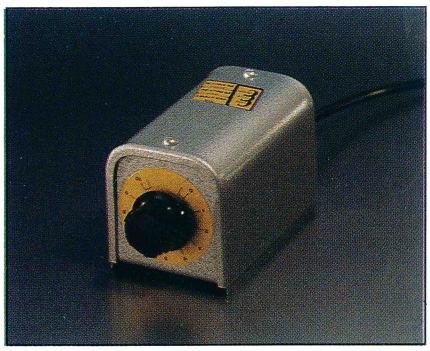
AVAILABLE SIZES

	A	B	C
CB175	73	168	8
CB250	102	227	12
CB365	126	248	20
CB400	160	303	20
CB600	197	307	28
CB800	257	435	40

The use of Electromagnetic Clutches and Brakes in industrial applications requires consideration not only of the mechanical requirements in terms of motor power, speed and frequency of operation and method of installation, but also in the method of control. Clark engineers have a wide experience in offering advice and the facility to produce special control units as required.

Below are featured a few examples of our specialist control gear. Whatever your requirement our design team is always on call to help and advise.

Range table of Clark CONTROLS



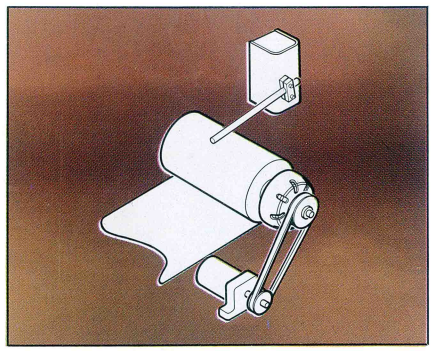
ACCELERATION CONTROL - SILKSTART

The Clark Silkstart Control is a low cost solid state device which when used with a Clark Electromagnetic Clutch avoids engagement snatch.

The advantage of frequent starting and ease of control of an Electromagnetic Clutch is retained and the smooth start characteristic of a fluid coupling is added. The effect of the Silkstart eliminates shock acceleration which causes jerking and belt slip.

Furthermore, the reduced load on starting, in addition to the smooth acceleration, means that standard squirrel cage motors may be used rather than expensive high torque motors.

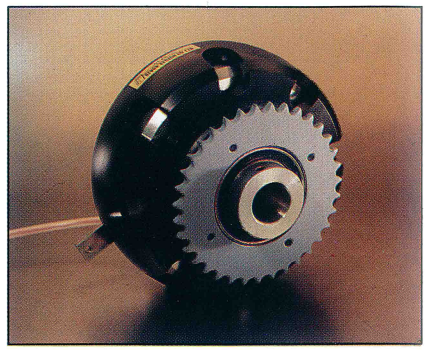
Silkstarts are available for remote panel mounting, separately housed or incorporated in standard Power Units.



AUTOMATIC REEL TENSION CONTROL

There are many industrial processes where material is pulled off a stock reel and re-reeled. To maintain a constant tension in the material as the diameter of the reel reduces the unwind Brake torque also has to be decreased. Similarly,when re-reeling the torque of the Clutch driving the reel has to be increased as the reel diameter increases.

Clark offer a low cost package which automatically maintains constant tension throughout an un-reeling or re-reeling process. Any size Clark Clutch or Brake may be used in conjunction with a Power Unit and the Tension Control Arm to provide automatic reel tension control for many types of material. Consult Clark engineers for a quotation.



TORQUE LIMITERS

On many machines where it is necessary to prevent damage caused by a stall condition, mechanical Torque Limiters are difficult to adjust to a safe lower limit where the machine has a high starting torque.

This is overcome by using a Clark Clutch as a Torque Limiter. A control is available which operates the Clutch at full torque during the time taken to accelerate the machine up to speed. After a short time delay, the Clutch torque is reduced to a pre-set level which will prevent damage should a stall condition occur and the Clutch slips. Where the slip torque would cause overheating at the Clutch, an r.p.m. sensor will switch off the Clutch.

Data required to select a Clark Clutch or Brake for a given application

The selection table on page back will give the Clutch and/or Brake size where the motor power in kW and the r.p.m. at the Clutch are known. If the motor power is not known but the torque to be transmitted by the Clutch is known or may be calculated, consult the torque rating table on page 3 for the size of Clutch required. Remember to include a factor of safety and select a Clutch having a torque rating between 1.5 to 2.5 x the actual torque required. The brief dimension notes on pages 2 and 3 will indicate if the shaft size can be accommodated in the selected Clutch.

Clark Clutch Co. will forward copies of data sheets containing fully dimensioned drawings and technical specification on any size of Clutch or Brake, upon request.

We invite you to telephone our Technical Sales department to discuss your application with one of our engineers.

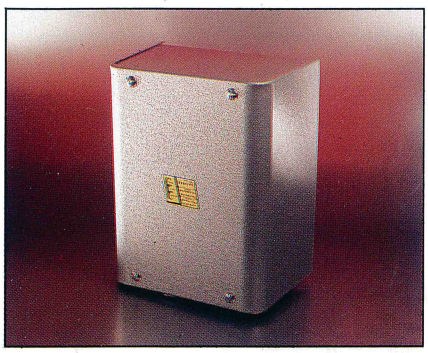
Clutch & Brake Coil Data	COIL RES' 24V	CURRENT
Clutch & Brake	ohms	Amps
175	76.80	0.31
250 BM Clutch	63	0.38
250 S. Clutch & Brake	48	0.50
365	38	0.63
400	34	0.70
600 Clutch	23	1.04
600 Brake	25	0.96
800 Clutch	17.85	1.34
800 Brake	20.40	1.16

Other coil voltages are available.

RESPONSE TIMES

The times given in the table below represent the time taken for the magnetic field in the Clutch and Brake to build up to produce 100% or 50% full torque. Also included is a column which shows the time taken for the torque to decay on de-energisation. When estimating the time taken for a Clutch to accelerate a load up to speed, or for a Brake to bring a load to rest, consideration should be given to the torque requirement. Since we recommend a 2.5 times safety factor, the selected clutch torque is usually greater than the torque required to overcome the load. Hence, the time taken for the torque to build up to the point where it will start accelerating the load, will be considerably less than the time taken to reach 100% torque. This will also be true for a Brake bringing a load to rest. Where a Clutch and/or Brake are to be used on a fast on/off cycle, use may be made of the Clark boost technique, where the Clutch and Brake coils are switched via capacitors across which a voltage is stored. The use of this technique effectively reduces the figures in the table for 50% and 100% torque by half.

Specials-adaptations for your applications



POWER UNITS

Clark have standardized on 24 volts D.C. to operate the Clutch and Brake coils, these are all low power devices and the current drain is small.

Clark Power Units are available to operate Clutches and Brakes from remote on/off contacts.

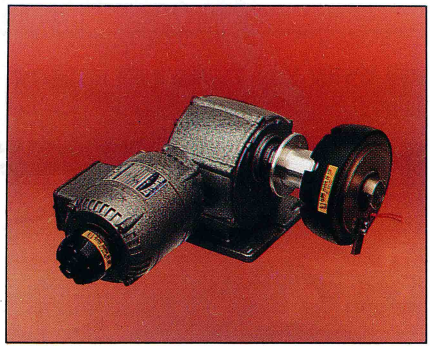
Composite Clutchbrakes are operated from change-over contacts

Power Units may be supplied complete with Silkstart Acceleration Controllers incorporated in the Clutch coil circuits and torque limiting rheostats for the Brake.

BOOST UNITS

Where greater stopping accuracy is required, the repeat stopping accuracy of the Brake will be improved by the use of boost techniques. The boost Power Unit discharges energy stored in a capacitor each time the Brake operates.

Clark can supply Power Units incorporating this feature.



SPECIAL CLUTCHES AND BRAKES

This leaflet gives brief details of standard Clutch and Brake units currently available.

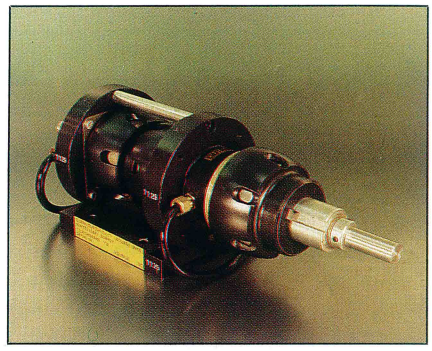
Clark have many customers for whom special Clutch/Brake arrangements are produced.

Consult our engineers for special requirements.

SPECIAL POWER UNITS

Clark specialize not only in Clutches and Brakes, but also the necessary controls.

Our engineers will design special control systems to meet specific control requirements.



TWO-SPEED CONTROL

For accurate cut-to-length applications.

Where fast production speeds are involved, Clark can provide Clutches and Brakes for a 2-speed system. *A repeat stopping accuracy equal to plus or minus the distance travelled in 0.010 seconds is obtainable.

The 2-speed system offers a fast production·cycle with a cut to length accuracy of plus or minus 0.010" in certain cases.

Two Clutches and a Brake are required, one Clutch drives the material at the fast speed and when a pre-stop signal is given the creep speed Clutch drives the material to the stop position at a speed which will provide an acceptable stopping error calculated from the figure given*. The Brake is applied at the stop position. The use of the creep speed Clutch means that the speed change is shockless and as soon as the Clutch operates, the material speed is reduced, hence the actual travel at creep speed may be very short.

Boost techniques may be applied to the Brake effectively halving the repeat stopping error at any given creep speed.

RESPONSE TIMES Clutch & Brake

Size	50% Torque	100% Torque	Decay	Size	50% Torque	100% Torque	Decay
175	10 ms	25 ms	18 ms	**400**	25 ms	50 ms	40 ms
250	12 ms	35 ms	25 ms	**600**	35 ms	60 ms	50 ms
365	18 ms	40 ms	30 ms	**800**	40 ms	75 ms	60 ms

A helpful guide to applications

SOME TYPICAL EXAMPLES ARE GIVEN HERE AS A GUIDE TO OUR PRODUCT APPLICATION.

The Bearing Mounted extended hub type Clutches (BM EH) are simple to fit, since they are mounted to a through shaft. They are supplied complete with a steel hub, keywayed for fitting a pulley/sprocket etc. The hub contains oil reservoir bearings which give a good life when run on a ground stock shaft.

We list on these pages, suggested methods of using this type of Clutch in a variety of automatic transmission applications.

In the applications where a Brake is required, the BM EH Clutch is adapted by locking the hub with a clamp. The Clutch will now act as a Brake to the shaft passing throught it. This avoids having to erect a support plate for a standard type Brake and reduces the need for different spares.

The Clutches are low power devices and can be operated from relay contacts or static switching, in conjunction with many types of sensors i.e. micro switches, reed switches, proximity detectors, photo-electric controls etc.

A DIRECT DRIVE OFF MOTOR CAN ENGAGE OVER 100 TIMES PER MINUTE

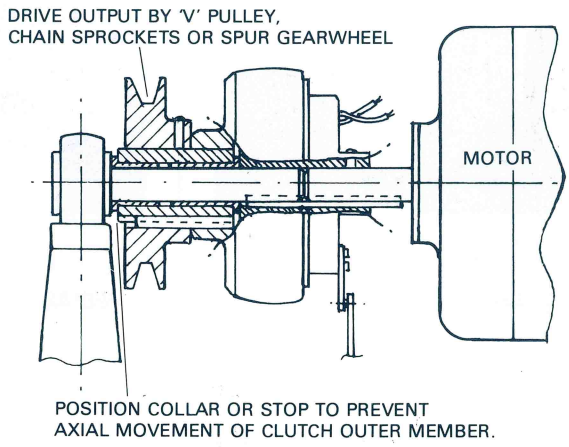
Typical Applications

Frequent start/stop drives - especially single phase - avoids motor starting surges. Sewing machines, coil winding machines etc. can be controlled with sensitive foot controlled rheostat which does not tire operator.

Fail safe i.e. disengages on mains failure. Safety interlock switches easily connected. All "inching" motions. Tension control for winding spools etc. Loop take up for tension free winding.

Operation Notes

Motor runs continuously, pulley idles until Clutch is switched on. Up to 100 engagements per minute if necessary, depending on load inertias and r.p.m. Clutch takes only low power low voltage d.c. easily switched by small relays or direct from transistor. Full range torque control. Gentle slipping take up with Silkstart control or high acceleration with "boost" circuit.



B 2-SPEED DRIVE-ANY RATIO THROUGH GEARBOX CAN CHANGE SPEEDS, STOP AND START OVER 100 TIMES PER MINUTE

'Fast' - 'Creep' - 'Stop' 100 times per minute. i.e. run at 12" per second, creep at ¼" per second and always stop to ± .010".

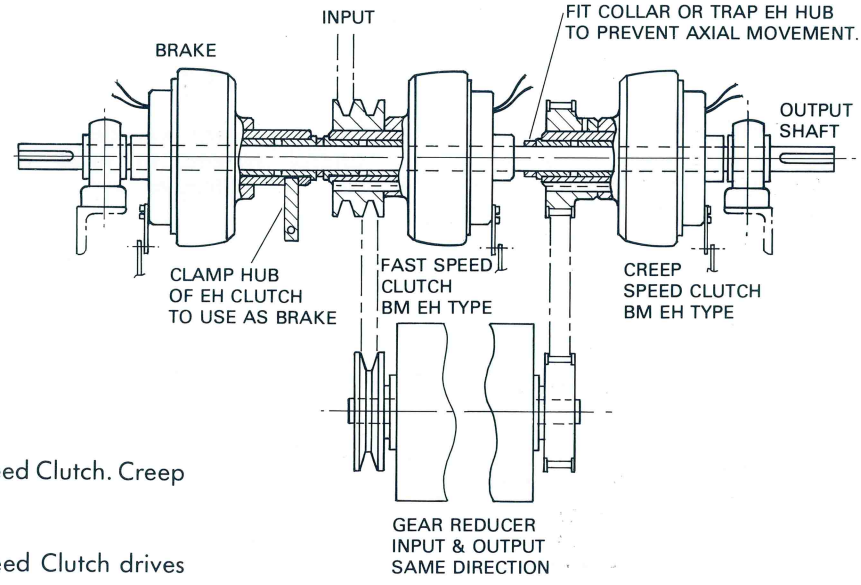
Typical Applications

Accurate controls for automatic length cropping. Precision indexing. Precision instrument drives. Machine tools. Guillotine back gauge control. Positioning control.

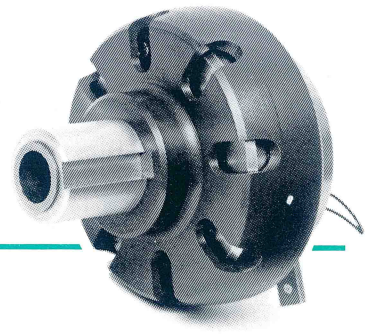
Operation Notes

Input is to Pulley on high speed Clutch.

1. BOTH CLUTCHES OFF. BRAKE ENERGISED.
   High speed Clutch idles on shaft. Creep speed Clutch idles on shaft at creep speed via drive through reduction unit. Output shaft stationary.
2. HIGH SPEED CLUTCH ENERGISED. BRAKE OFF.
   Output shaft driven at input r.p.m. by high speed Clutch. Creep speed Clutch idles on shaft.
3. CREEP SPEED CLUTCH ENERGISED
   High Speed Clutch idles on shaft. Creep speed Clutch drives shaft via belt drive from reduction unit.
4. BRAKE ENERGISED
   Both High and creep speed Clutches idle on shaft. Brake brings shaft to rest.



By introducing a rheostat in the creep speed Clutch coil circuit the speed change will be without snatch.



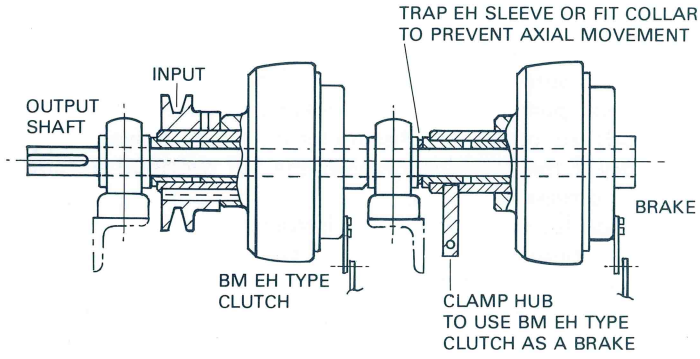
C CLUTCH/BRAKE SYSTEM USING 2 - BM TYPE EXTENDED - HUB CLUTCHES

Typical Applications

High rate start/stop drives. Shockless 1 rev. drive (with associated cam switch). Festoon control for all types of material. Conveyor positioning. Precision inching. Precision feeding of strip etc. Indexing. Crank operated thrusters. Light presses. Variable feed rates by adjustable intermittent motion from timer control. Geneva mechanism drives.

Operation Notes

Input pulley runs continuously and idles on shaft when Clutch "off". When Clutch is engaged, shaft rotates with pulley. Changeover switching from Clutch to Brake provides rapid precise stop. No power wastage and excess over-run from starting and stopping the motor. Control from relay, static switching unit, photo-electric unit etc. Single revolution drives and indexing control readily arranged using cam operated contacts or proximity switch.



D HIGH SPEED HIGH RATE REVERSING CAN REVERSE ROTATION STOP AND START OVER 100 TIMES PER MINUTE

Typical Applications

Automatic following mechanisms. Automatic regulator drives. 'Tenter' control for carpet etc. manufacture. Web guidance on paper, textile etc. processing machinery. Fast acting modulating valve drives. Lead screw drives.

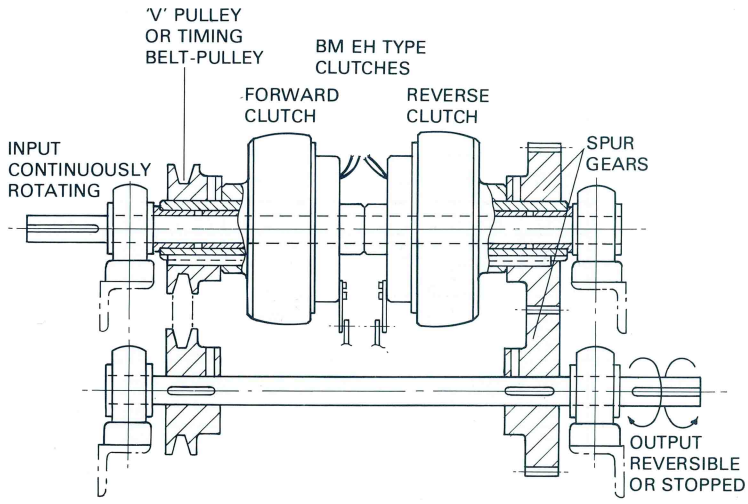
Operation Notes

Input shaft rotates continuously.

Both Clutches de-energised Clutches idle on input shaft. No drive to output shaft.

'Forward' Clutch energised Pulley on 'forward' Clutch rotates with input shaft and drives output shaft in same direction of rotation through belt.

'Reverse' Clutch energised Spur gear on 'reverse' Clutch rotates with input shaft and drives spur gear keyed to output shaft in reverse rotation from input.



E BEARING MOUNTED EXTENDED HUB CLUTCH FITTED WITH FLEXIBLE COUPLING

Typical Applications

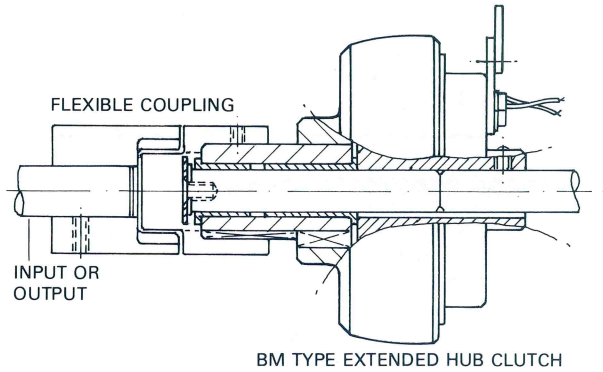
Clutch used as a coupling between two shafts NOT rigidly supported on a good alignment, this arrangement introduces a flexible coupling to take up mis-alignment.

Installation Notes

This is a common requirement. The arrangement allows some shaft mis-alignment but the Clutch is supported on its own shaft and is not damaged by running out of alignment.

The assembly may be supplied complete with flexible coupling. Alternatively the basic Clutch may be adapted by the customer.

The shaft extension is supported in the Clutch inner rotor and the flexible coupling is mounted on the steel hub. The hub contains oil reservoir bearings which allows the hub to idle on the shaft when the Clutch is disengaged.



SIZE SELECTION - CLUTCH TORQUE

The basic relationship between TORQUE, MOTOR POWER Pin kW and SPEED : $M = \frac{9550 \times P}{RPM}$ = Nm provides a torque value for normal full load running of a machine. The Clutch must, however, have a reserve of torque for intermittent over-loads and a factor of safety must be allowed so that torque is based on $M = \frac{K \times 9550 \times P}{RPM}$ = Nm where K is the safety over-load factor and M the static torque of the Clutch. For electric motor drives (3 phase squirrel cage) the pull out torque of the motor is usually about 2.5 × Full Load Torque and this factor of 2.5 may be used for K for many machines driven by electric motors and give an adequate reserve of clutch torque. The factor can, of course, be safely reduced, say to 1.5 for such loads as centrifugal pumps or light conveyors where only small overloads can occur. A higher factor for K may, however, be necessary if the machine requires the full overload torque *before it attains full speed.*

The reason for this is that at the instant of engagement and during acceleration of the machine the Clutch is developing less than its normal static torque since it is actually slipping until it has brought the machine up to the same speed as the driving shaft. The speed/torque curves appearing on each data sheet enable a suitable safety factor to be adopted.

Special consideration must be given when dealing with :

(a) Machines which incorporate flywheels to deal with high peak torque, i.e. presses and guillotines.

(b) Machines with high inertias which need to be started and stopped very frequently. For this duty the heat dissipation during each start must be calculated to ensure that it comes within the thermal capacity of the Clutch.

For these applications we suggest that details are passed to our local engineer or head office in order that a suitable size can be recommended.

BRAKE TORQUE

The selection of a Brake to stop a machine in a given time may be determined from the following formula : $Ma = \frac{J\,n}{9.55t}$ where Ma = Torque in Nm to stop the machine in time t seconds.

J = Weight of rotating masses x effective radius squared expressed kgm^2. n = initial speed in RPM. It will be noted from the speed/torque curves that the Brake Torque will automatically increase as the machine is slowed down. If M is therefore taken as the value at the initial speed then the Brake will have a reserve of torque for the job. As in the case of Clutches, we suggest that details are passed to us for size recommendation where machines have high energy or inertias, i.e. Centrifuges, or where the machine is started and stopped very frequently.

SELECTION TABLE

Allowing for 250% torque overloads after Clutch has brought load to full speed.

	SHAFT SPEED AT CLUTCH IN R.P.M.																	
Motor kW	**100**	**200**	**300**	**400**	**500**	**600**	**700**	**800**	**900**	**1000**	**1250**	**1440**	**1750**	**2000**	**2500**	**2800**	**3000**	**4000**
0.015	250	250	250	175	175	175	175	175	175	175	175	175	175	175	175	175	175	175
0.037	365	250	250	250	250	250	250	175	175	175	175	175	175	175	175	175	175	175
0.06	400	365	250	250	250	250	250	250	250	250	250	175	175	175	175	175	175	175
0.09	400	400	365	250	250	250	250	250	250	250	250	250	250	175	175	175	175	175
0.12	600	400	365	365	365	250	250	250	250	250	250	250	250	250	250	175	175	175
0.18	600	400	400	400	365	365	365	250	250	250	250	250	250	250	250	250	250	175
0.25	600	600	400	400	400	365	365	365	365	365	250	250	250	250	250	250	250	250
0.37	800	600	600	400	400	400	400	400	365	365	365	365	250	250	250	250	250	250
0.55	800	800	600	600	600	400	400	400	400	400	365	365	365	365	250	250	250	250
0.75		800	600	600	600	600	600	400	400	400	400	400	365	365	365	365	365	250
1.1		800	800	600	600	600	600	600	600	600	400	400	400	400	365	365	365	365
1.5			800	800	800	600	600	600	600	600	600	600	400	400	400	400	400	365
2.2				800	800	800	800	600	600	600	600	600	600	600	400	400	400	400
3.0							800	800	800	800	800	600	600	600	600	600	600	400
5.5				**CLUTCH SIZE**							800	800	800	800	600	600	600	600
7.5												800	800	800	800	600	600	600
9.3													800	800	800	800	800	600
11.0														800	800	800	800	800

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