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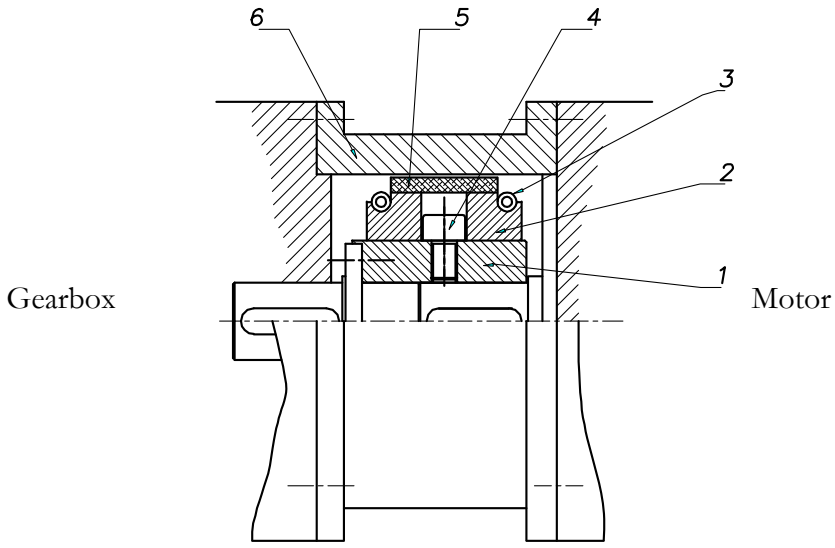
CENTRIFUGAL BRAKE EC TYPE

Construction

The centrifugal brakes consist, basically, in a central nucleus (1) that tour solidarily with the axis of the motor. In their periphery are distributed a series of masses in sectors (2) that they are dragged for the guides (4).
The masses could move in radial form along their own guide. The force of the springs (3) is opposed to this movement. The masses are covered externally with friction material free of amianthus (5).
Finally, the whole system is mounted inside a concentric drum or flange (6) fixed directly to the frame of the reducer. The own flange is used as support of the motor.



Operation

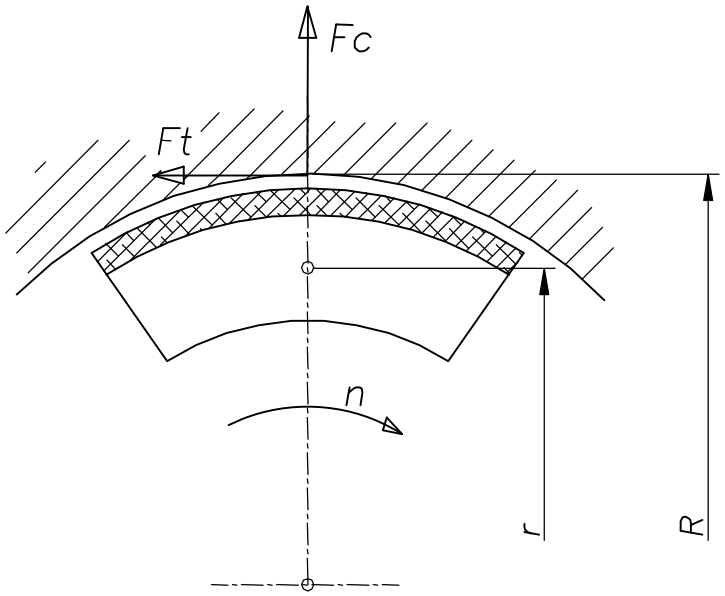
- Motor and nucleus of the brake rotating at their normal speed

In these circumstances the brake springs (3) are calculate in such a form that its action compensates the centrifugal force of the masses, maintaining them fixed to the nucleus, behaving the brake like a totally passive element.

- Motor and brake nucleus rotating at a superior speed to the normal

When for any circumstance the turning speed of the nucleus surpasses the nominal (1500 rpm) in a 3% $^{\pm 2}$ the masses (2) surpass the action of the springs and friction against the internal wall of the fixed drum (6) producing the brake action.

The value of braking obeys the following general mathematician concepts that we expose next:



N = Number of masses
n = angular Speed (rev. per second)
r = Distance between the mass centre of gravity to the centre of turn (m)
R = Radius of the drum (m)
Fc = Force centrifugal (N)
Ft = Force tangential (N)
Cf = Coefficient of friction
m = Mass (kg)

Brake torque = $N \cdot Ft \cdot R = Nm.$

$Ft = Fc \cdot Cf = N$

$$Fc = \frac{m \cdot v^2}{r} = \frac{m}{r} (2 \pi r n)^2 = N$$

Finally:

$$Torque = 39{,}478 \cdot N \cdot Cf \cdot R \cdot m \cdot r \cdot n^2 = k \cdot n^2 = Nm.$$

Being k the factor that includes all the constant terms.

Since for action of the springs the torque of brake is zero at the motor nominal speed n0, the torque of the brake will it come expressed by the following formulate:

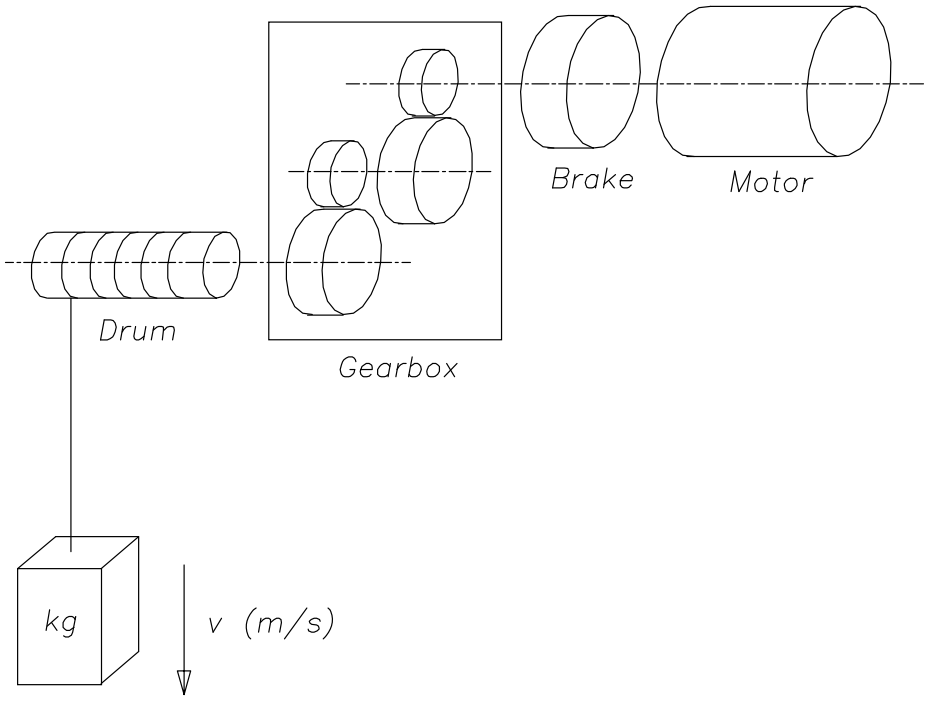
$$Torque = k (n^2 - n_0^2) = \quad Nm.$$

To calculate the absorbed power and become heat on the drum we used:

$$Power = \frac{Torque \cdot n}{159{,}17} = \quad kW.$$

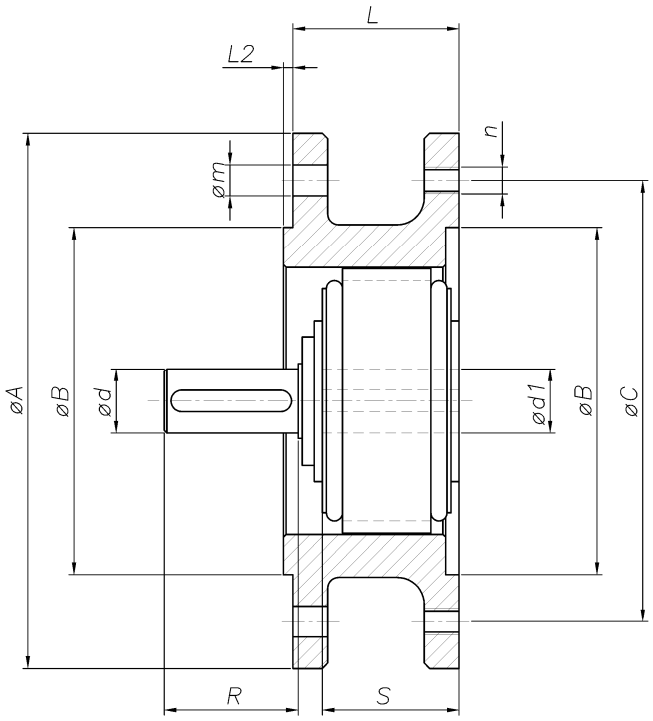
Application to a system of elevation

In an approach in which consider $n_0 = 0$ would have that the torque increase with n^2 and the power with n^3.
The intrinsic security of the system is based on at greater speed greater braking power with an exponential increase, therefore is easily deducible that any system will tend to stabilise to the speed in which there is a balance between the descending power and the power of the brake.



The balance becomes at descent speeds between 10 to 25% higher to the nominal, depending on the load, efficiency of the transmission and temperature of the system.

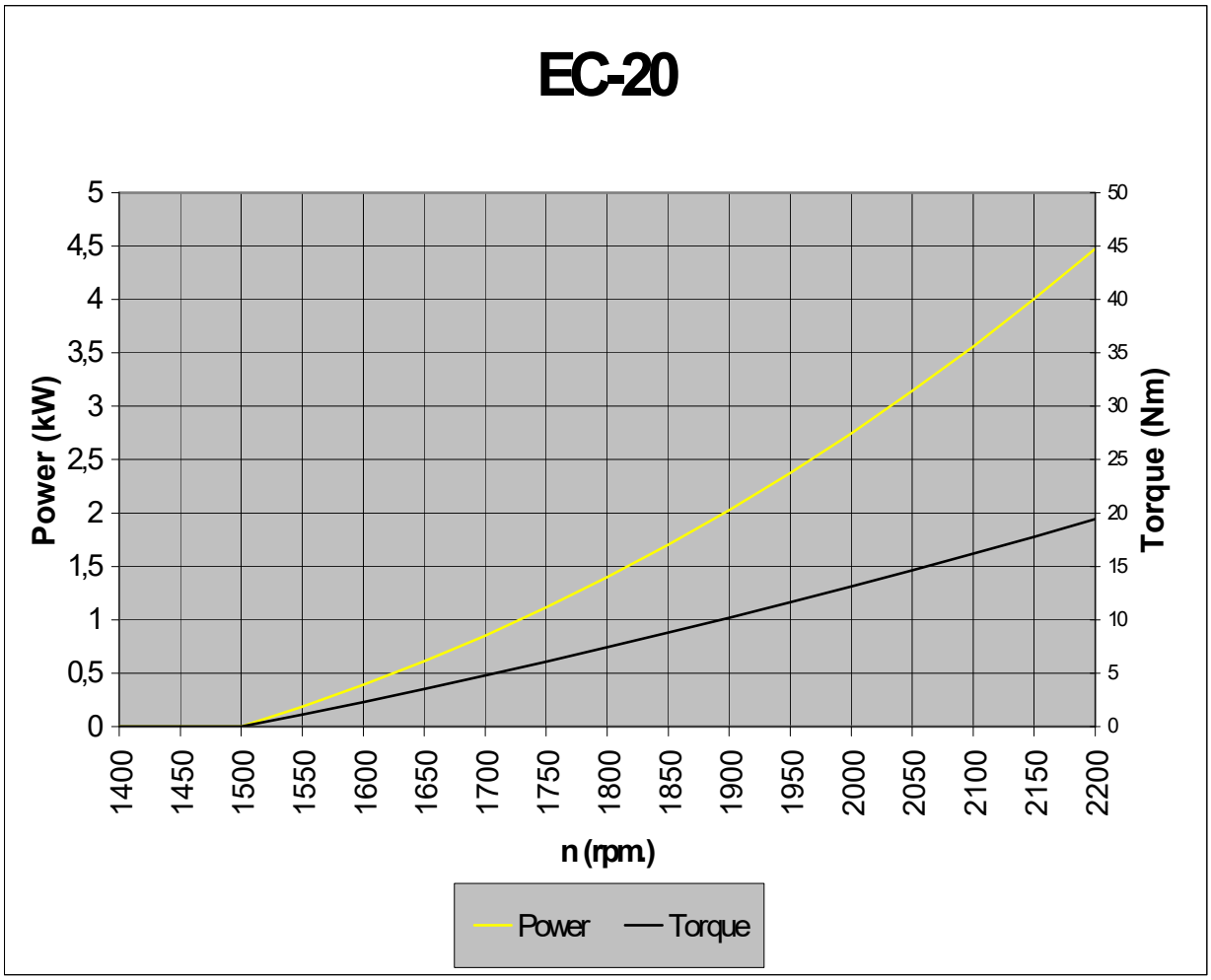
Dimensions



SIZE	EC-20	EC-40	EC-80
Max. Power kW	4,5	12	24
Max. Torque Nm	45	130	260
Beginning of brake rpm	1550	1550	1550
Motor kW	2,2	5,5	11
Weight kg	8,58	15,7	60
Inertia kg.cm2	23	170	205

SIZE	EC-20		EC-40	EC-80	
A	160	200	250	300	350
B	110	130	180	230	250
C	130	165	215	265	300
d	19/24	24	28	38/42	42
d1	19/24	24	28	38/42	42
L	61	62	72	100	124
L2	3,5	3,5	4	4	5
m	8,5	11,5	14	14	17
n	M8	M10	M12	M12	M16
R	40/50	50	60	80/110	110
S	51	51	61	83	112

Characteristic curves of the EC-20 brakes

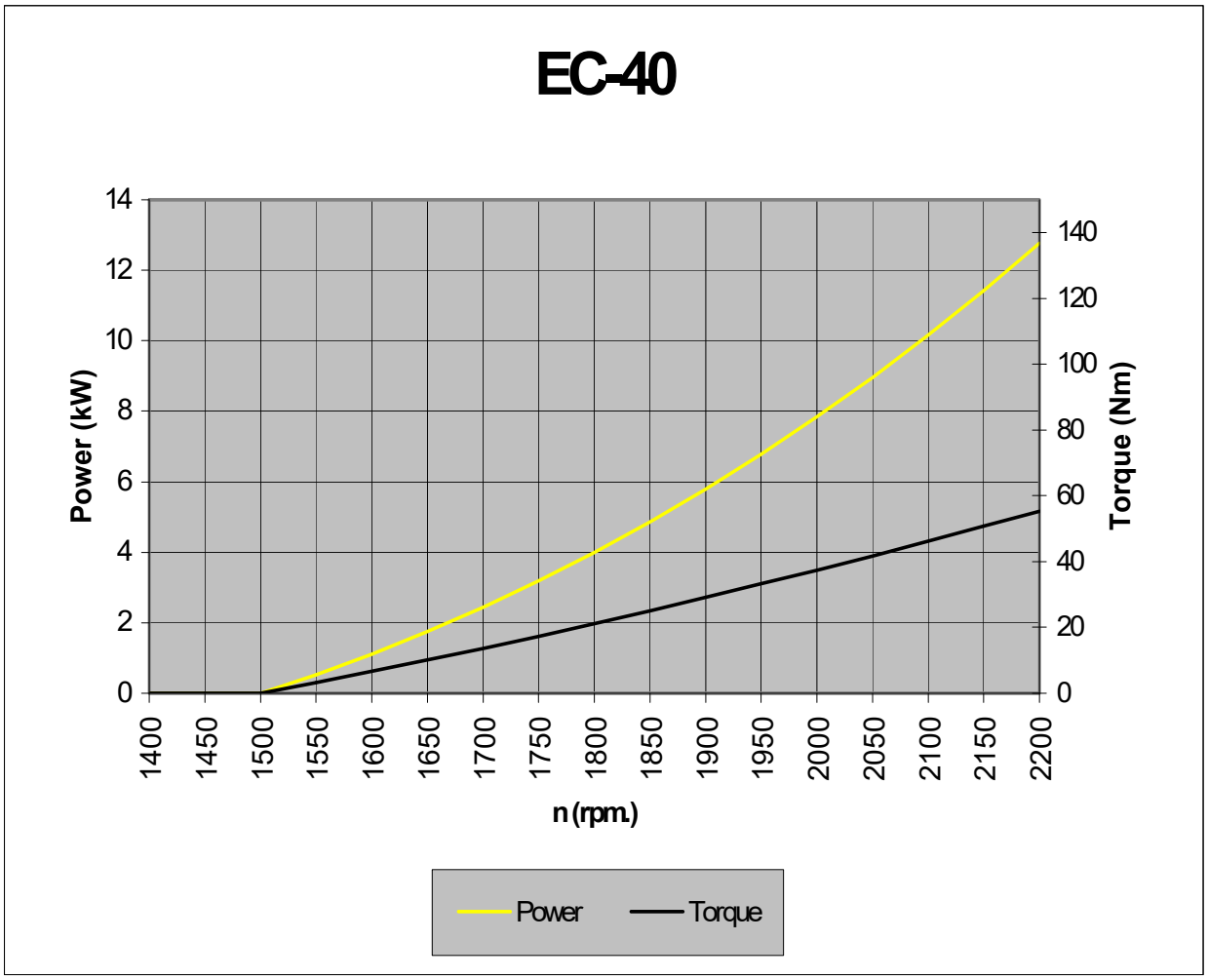


Friction material consumption ~ 50 mm^3/ kWh

Lost material volume for a waste of 1 mm.= 9100 mm^3 aprox. (182 kWh).

Maximum recommended motor 2,2 kW.

Characteristic curves of the EC-40 brakes

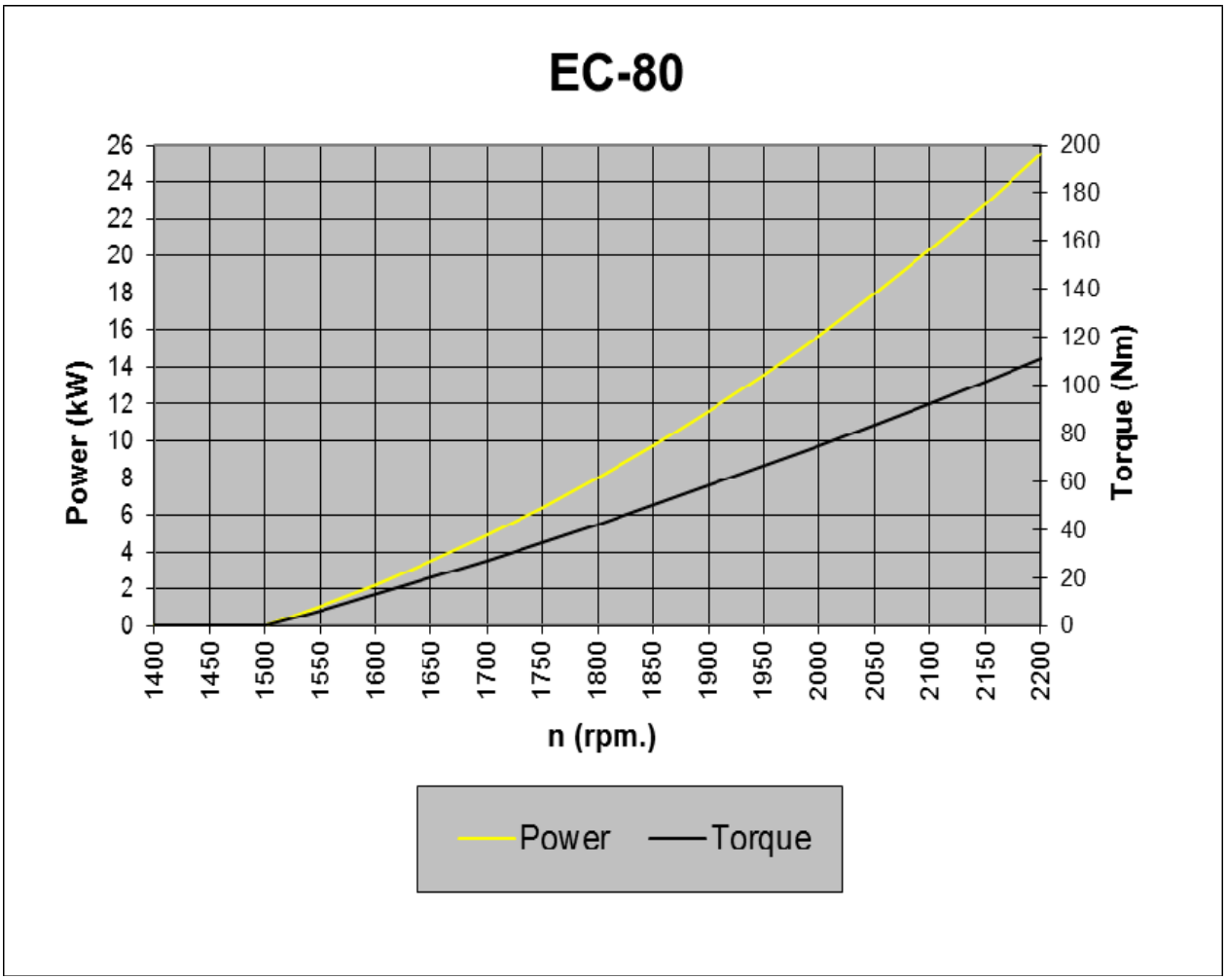


Friction material consumption ~ 50 mm^3/ kWh

Lost material volume for a waste of 1 mm= 11500 mm^3 aprox. (230 kWh).

Maximum recommended motor 5,5 kW.

Characteristic curves of the EC-80 brakes



Friction material consumption ~ 50 mm^3/ kWh

Lost material volume for a waste of 1 mm = 23000 mm^3 aprox. (460 kWh).

Maximum recommended motor 11 kW.

Centrifugal brakes maintenance in lifting machines

- Periodic maintenance and adjustment

The adjustment operation is regulated by factory and must not be modified.

- Verification of operation

It is recommended to verify proper operation performing a maneuver least a year of descent with centrifugal brakes. This descent should be two to three meters.

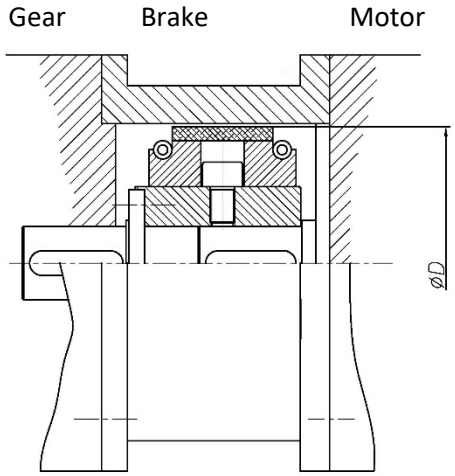
- Review of friction material

Check the wear of the friction material. The review is to verify that the diameter has not reached its minimum.

Frequency: After 20 operations or 5 years, whichever of this is first, proceeding to remove the motor reducer to access the brake.

This revision is mandatory after a single performance if 100 meter descent brake is exceeded.

It will proceed to change the brake when it reaches its minimum diameter.



Brake	Diameter (mm)	
	Normal	Minimum
EC-20	98 ±0.5	95
EC-40	155 ±0.5	152
EC-80	155 ±0.5	152

Safety

Additional security measures are not necessary because by design, centrifugal brakes are located between motor and gear forming with them a sealed box that protects the rotating movement of the internal elements and prevents the output of any particle. The friction material does not contain asbestos.