Brakes & Clutches

Combinorm - Power On

The Combinorm are electro-magnetically actuated, single face, clutches and brakes for dry operation.

On the brake, the current is applied and the force due to the magnetic field is used to produce the brake torque. The armature is pulled axially against the brake magnet resulting in a friction locked connection without backlash. When the current is switched off the armature is separated from the brake magnet by a riveted steel spring. This separation ensures that no residual torque occurs regardless of the installation position, so that even at high idling speeds no friction losses occur.

With the clutches, the current is applied and the force due to the magnetic field is used to transmit torque. The armature is pulled axially against the rotor resulting in a friction locked connection without backlash. When the current is switched off the armature is separated from the rotor by a riveted steel spring. This separation ensures that no residual torque occurs regardless of the installation position, so that even at high idling speeds no friction losses occur.

Hub supplied with a pilot bore.

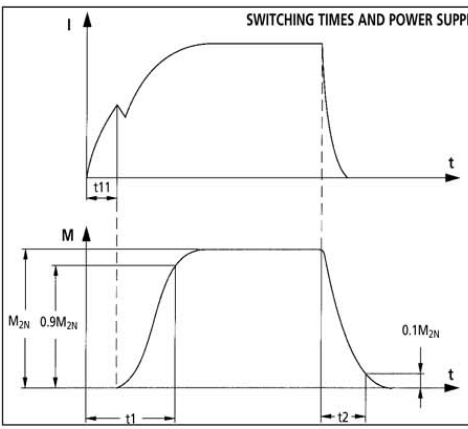
Combinorm Electro-magnetic Brakes and Clutches

- Asbestos free wear resistant and temperature stable Friction Linings
- 100% duty, unlimited 'on' period.
- Short switching times with low operating noise
- Backlash free
- No residual torque
- Maintenance Free
- High stable torque capacity
- CSA, VDE & TUV certification, LV CE, Insulation class B
- Excellent repeatability, long life and ease of installation
- Operates at 24V DC

Applications

- Stairlifts
- Wheelchairs
- Start/Stop applications
- Automation Systems
- Indexing Machines
- Rotary Tables
- Machine Tools
- Pick and Place

SWITCHING TIMES AND POWER SUPPLY



Current/time and torque/time diagrams

t1 Engaging Time
t11 Engaging Delay Time
t2 Release Time
IN Rated Magnet Current
M_{2N} Nominal Torque

Average switching times (ms) with nominal air gap.

Standard voltage 24 V DC
Special voltages on request.

The DC voltage required by Combinorm can be supplied by different rectifiers, trafo-rectifiers as well as electronic switches of the Combitron series.

Short time over excitation results into short switching times and high switching accuracy.

Size			01	02	03	05	06	07	08	09	10	11	12
CLUTCHES	t11	nominal voltage	4	5	7	10	14	18	23	25	29	37	55
	t1		10	14	17	32	48	74	81	90	161	201	295
	t11	3 x nominal voltage	2	2	3	5	6	8	10	12	14	16	25
	t1		5	6	7	16	22	33	37	42	69	91	125
	t2	DC	5	6	7	10	14	19	40	68	100	130	200
	t2	AC	17	19	22	30	39	61	115	220	400	650	900
BRAKES	t11	nominal voltage	2	3	3	5	6	8	10	13	15	23	35
	t1		5	8	8	17	24	38	42	48	85	118	155
	t11	3 x nominal voltage	1	2	2	3	3	4	5	6	8	10	16
	t1		3	4	4	8	11	17	20	22	38	50	76
	t2	DC	3	4	5	8	10	15	50	85	100	140	200
	t2	AC	17	20	25	40	70	95	240	300	400	600	800

Brakes & Clutches

Combinorm - Power On

TECHNICAL DATA

Size			01	02	03	05	06	07	08	09	10	11	12
Moments of inertia J	ROTORS												
	Picture	B4, B5, B7, B10	0.025	0.035	0.15	0.375	0.825	2.38	7.25	21.9	67.4	200	450
		B7, B11	0.027	0.038	0.17	0.40	0.9	2.6	8.0	24.0	73.0	220	500
		B8 B10					1.02	30.5	8.76	26.0	82.5	230	520
	ARMATURES												
	Picture	B2, B5, B6, B7, B8, B10, B11 a)	0.010	0.045	0.045	0.122	0.366	1.07	3.72	10.6	40.0	115	311
		B2, B5, B6, B7, B10, B11 b)	0.013	0.068	0.068	0.18	0.53	1.57	5.29	15.1	50.1	159	437
		B3 b)					0.82	2.6	10.3	27.0	101		
		B4 b)					0.99	2.7	9.12	25.4	88.9	272	814
	HUB						0.16	0.49	0.89	3.77	19.9	41.2	118
	INTERMEDIATE RING		Picture			B9	1.5	5.0	11.0	30.0	112	253	814
	RUBBER ELEMENT						0.35	1.25	3.3	7.0	50.2	102	450
Switching work, wear	$W_{R\,max}$		0.04	0.05	0.08	0.12	0.19	0.31	0.48	0.75	1.25	2.0	2.9
	$W_{R0.1}$		0.23	0.30	0.43	0.63	0.95	1.63	2.53	4.09	6.66	10.4	16.3
	$P_{R\,max}$	clutch	20.3	28.6	40.6	58.3	80.6	114	161	228	322	458	647
	$P_{R\,max}$	brake	12.8	18.6	26.9	38.9	58.3	79.2	114	164	236	339	489
	X_n		0.3	0.45	0.45	0.6	0.7	0.7	0.7	0.9	1.0	1.2	1.2
	X		0.1	0.15	0.15	0.2	0.2	0.2	0.2	0.3	0.3	0.4	0.4
n max			10000	10000	10000	10000	8000	6000	5000	4000	3000	3000	2000

Legend

$W_{R\,max}$	permissible friction per switching operation 10^4J
$W_{R0.1}$	friction work up to 0.1mm wear 10^7J
$P_{R\,max}$	permissible friction work per second
X_n	clearance at which an adjustment is recommended mm
X	rated air gap mm
n	speed

Single-face clutches and brakes obtain the torques listed in the table without difficulty after a run-in phase of 100 min-1. In the new state or in case of substantially higher speed the torque may under certain circumstances be smaller.

Dimensioning
Decisive for the dimensioning of the Combinorm are the required torque, thermal load, braking time and service life.

Rated Torque M_{2N}
To ensure that Combinorm safely works even under extreme conditions, the required torque must be multiplied by a safety factor. The selection of the safety factor depends essentially on the application.

$M_{2N} = M_{erf} \bullet K \quad K \geq 2 \quad M_{erf}$ = required torque (Nm)

Required Torque M_{erf}
The required torque very often is a mixture of dynamic and static load. Observe sign!

$$M_{erf} = M_A \pm M_L$$
$$M_A = J \bullet \alpha$$

Rough Definition of the required Torque
If the mass moment of inertia is unknown and the driving power is fixed then the required torque is calculated as follows:

$$M_{erf} = 9550 \bullet \frac{P}{n}$$

Thermal Load
The dimensioning solely on the basis of the required torque is permissible only in very few cases. When decelerating or accelerating the load and the mass moment of inertia reduced to the shaft, the kinetic energy is converted into heat (friction work). The permissible friction work may not be exceeded.

$$W_R = \frac{J \bullet n^2}{182.5} \bullet \frac{M_{2N}}{M_{2N} \pm M_L} \qquad W_R \leq W_{Rmax}$$

Slip time t_3 (ms)

$$t_3 = 104.6 \bullet \frac{J \bullet \Delta n}{M_{2N} \pm M_L} + t_{11}$$

Service Life in Switching Operations until Readjustment
With the variable Xn the service life can be calculated until the readjustment.
The variable Xn is a recommended value. According to the application it must be checked when the readjustment has to be made.

$$L_n = \frac{(X_n - X) \bullet W_{R0.1}}{0.1 \bullet W_R}$$