LEROY SOMER®

3463 en - 06.2004 / c

Brake induction motors

Frame sizes 160 to 315

Technical catalogue

Founded in 1886 by Marius PATAY, MOTEURS PATAY began by specializing in the production of electric motors and the PATAY trademark quickly became synonymous with high-performance products.

The company is based in Lyon and has benefited from the region's rapid industrial expansion to expand into electromechanics and electrical engineering. Over the years, MOTEURS PATAY has become well-known throughout the world for offering innovative, technical solutions adapted to increasingly varied requirements.

The company's reputation and expertise are especially relevant in the field of hoisting and handling applications.

A subsidiary of the LEROY-SOMER group since 1981, the company has redefined its area of expertise to include the manufacture of special induction motors and medium power electromagnetic brakes.

Combining its lengthy experience in the use of new techniques with the industrial might of the LEROY-SOMER group, MOTEURS PATAY offers original, modern solutions to the increasingly complex problems involved in driving machines.

ISO 9001 accredited, the company steadfastly continues to provide high-quality service to its customers.

MOTEURS PATAY

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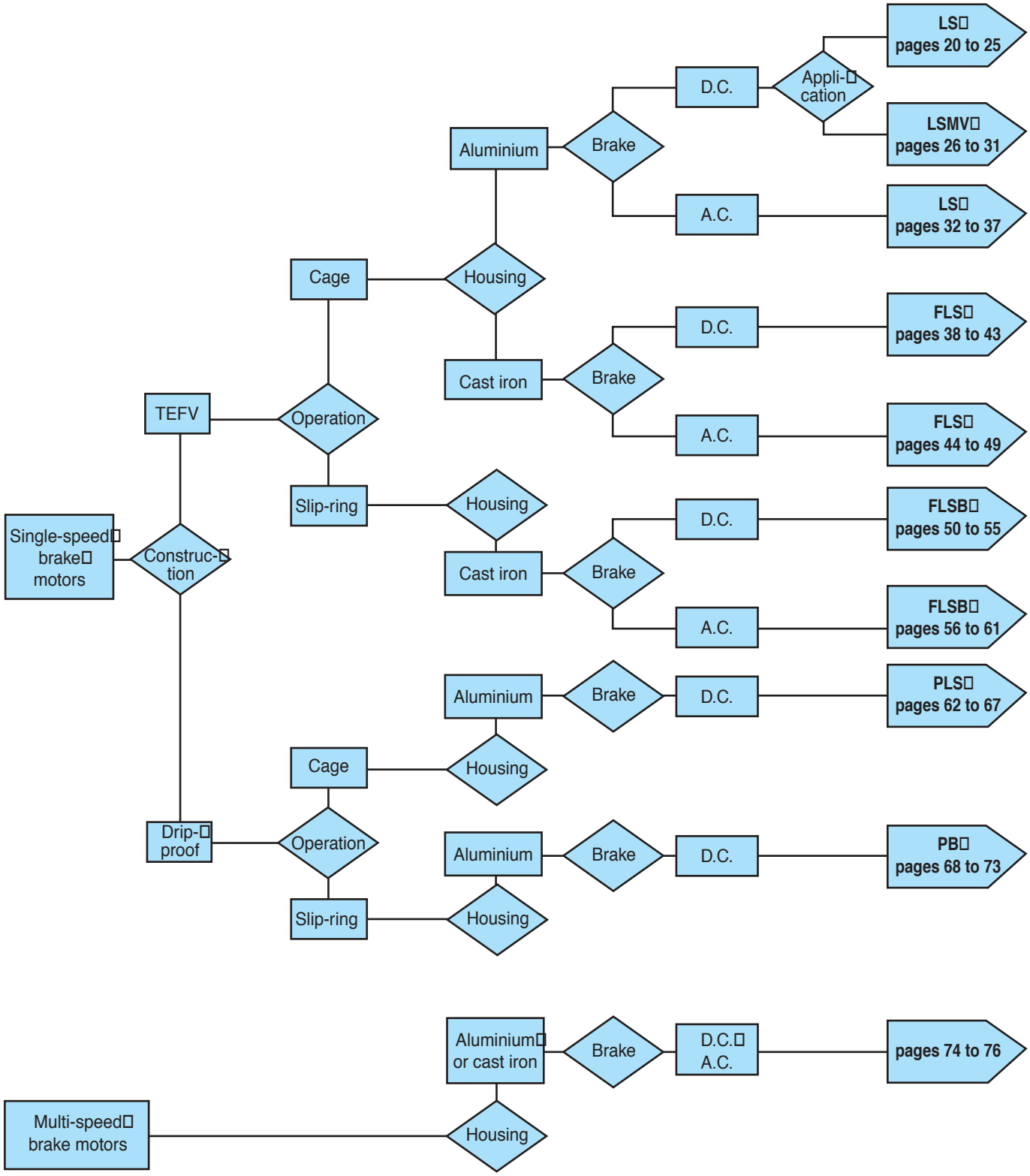
Brake induction motors

Brake induction motors

Selection chart



Motors

General

Mechanical presentation

All our brake motors can be set up to operate in the configurations shown opposite.

Due to the weight of some motors, the B5 and B14 mountings would have to be confirmed by Leroy Somer.
V1 – V5 mountings:
Please consult Leroy Somer for 2-disk brakes.
V3 mounting:
Not possible for 2-disk brakes.
B14 - B34 - V18 - V19 mountings:
Restricted to LS160 MP, MR and LR.

Motors with horizontal axis

IM B3 **IM 1001** | IM B5 **IM 3001** | IM B14 **IM 3061** | IM B34 **IM 2101** | IM B35 **IM 2001**

Motors with vertical axis

IM V1 **IM 3001** | IM V3 **IM 3031** | IM V5 **IM 1011** | IM V18 **IM 3611** | IM V19 **IM 3651**

Mechanical protection

The degree of protection for standard drip-proof motors (PLS or PB) is IP 23.
The degree of protection for standard TEFV motors (LS - LSMV - FLS - FLSB) is IP 55.

Shock resistance

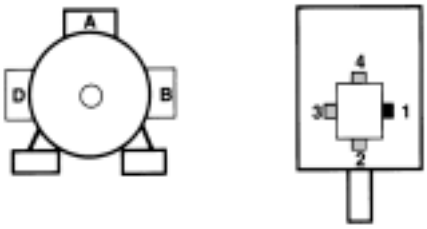
The standard mechanical protection for all Leroy Somer brake motors is IK 08.

Degree of protection	1st number Protection against solid objects	2nd number Protection against liquids
IP 23	Protected against solid objects of over 12 mm (e.g.: finger)	Protected against rain falling at up to 60° from the vertical
IP 44	Protected against solid objects of over 1 mm	Protected against water splashes from all directions
IP 54	Protected against dust (no deposits of harmful material)	Protected against water splashes from all directions
IP 55	Protected against dust (no deposits of harmful material)	Protected against jets of water from all directions

General

Motor terminal box

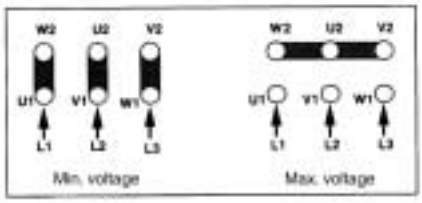
In standard versions, the terminal box is mounted on top of the motor (position A), with the cable gland on the right (1) as viewed from the drive end.
Due to the symmetrical construction of the terminal box, it can be placed in any of the four directions, except position 2 on flange-mounted motors.



Connection

Standard connection to the stator

- Single-speed motor
  Connection via 6 terminals.



- Multi-speed motors
  - 2 separate speeds
    Connection via 2 x 3 terminals, 3 terminals per speed.
  - Dahlander connection
    Connection via 6 terminals.

Standard connection to the rotor of slip-ring motors

Connection on 3 terminals, the star point is made directly within the winding.

Insulation classification

All Leroy Somer products are designed with a class F insulation system for the windings.

Balancing

All Leroy Somer standard drive end machines are balanced with a half-key. The letter H is marked on the shaft end. Other types of balancing are available on request.

Letter F: full-key balancing
Letter N: no-key balancing

The maximum value of simple displacement amplitude is expressed in μm (for sinusoidal vibration only).

The standard balancing level is class N.

For other balancing classes, the brake disk should be balanced separately. Wear on the lining or changing the brake disk can impair the vibration level over time.

Class balancing	Speed min^{-1}	Frame size in mm	
		132 < FS ≤ 225	225 < FS < 315 M
N normal	750	51	80
	1000	38	60
	1500	25	40
	3000	12.5	20
R reduced	750	20.5	32
	1000	16	24
	1500	10	16
	3000	8	12.5
S special	750	12.6	20.5
	1000	9	16
	1500	6.3	10
	3000	5	8

External finish

RAL 9005: for LSMV brake motors
RAL 6000: for all others

Maximum speeds

Cage motors

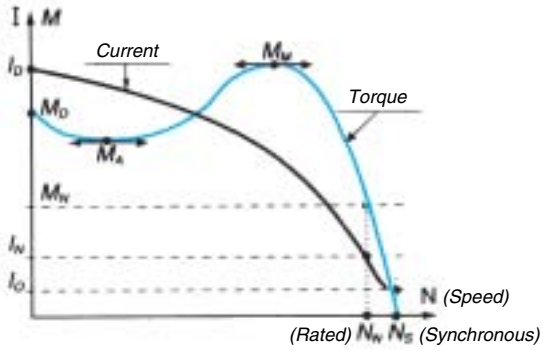
- LSMV motors can operate at up to 3600 min^{-1} subject to verification of dynamic braking conditions.
- As standard, motors with 4 poles or more can function at twice their speed.

Slip-ring motors

Slip-ring motors allow overspeed equal to 20% of their rated speed.

Characteristics

Characteristic values

Parameter	Symbol	Unit	Torque and current curve according to speed
Starting current Rated current No-load current	I_D I_N I_O	A	
Starting torque Run up torque Maximum or breakdown torque Rated torque	M_D M_A M_M M_N	Nm	
Rated speed Synchronous speed	N_N N_S	min^{-1}	

Type of rotor

Aluminium rotor - ALU

This is the most suitable type for continuous duty (S1, S2, S9 and S10) because of its optimum efficiency and power factor. However, in certain cases it can be used for intermittent duty.

DP rotor

This is the ideal rotor for periodic operation, since the starting torque is high whereas the current is low. It also reduces the torque drop of the aluminium rotor.

This is the standard rotor used for intermittent duty motors and for 2-speed motors (4/6, 4/8, 4/12, 4/16 and 4/24 poles).

Multiplication coefficients to be applied to the values for the aluminium rotor motor to obtain indicative values for the same motor with a DP rotor:

In	Id/In	Md/Mn	Nn
1	0.9	1.2	0.97

Slip-ring rotor

Slip-ring motors provide high starting characteristics (number of starts and acceleration torque) while maintaining high performance in standard operation.
They also provide the benefit of being able to adjust the number and appearance of the motor curves to respond to application requirements.

Tolerances of the main parameters

Standard IEC 34-1 specifies the tolerances for the electromechanical characteristics.

Parameters		Tolerances
Efficiency	Machines ≤ 50 kW	15% (1 – η)
	Machines > 50 kW	10% (1 – η)
Load factor		– 1.6 (1 – cos Φ)
		min 0.02 - max 0.07
Slip		± 20%
Locked rotor torque		– 15%, + 25% of rated torque
Starting current		+ 20%
Starting torque		– 15% of rated torque
Maximum torque		– 10% of rated torque
Moment of inertia		± 10%
Vibration		+ 10% of the guaranteed class

Characteristics

General

The braking torque is equal to the torque produced by the motor, increased by the resistive torque of the driven machine.

$$C_f = C_m + C_r$$

C_f = braking torque

C_m = motor torque

C_r = resistive torque

Braking time, i.e. the time required for an induction motor to change from speed N to stop, is calculated by the formula:

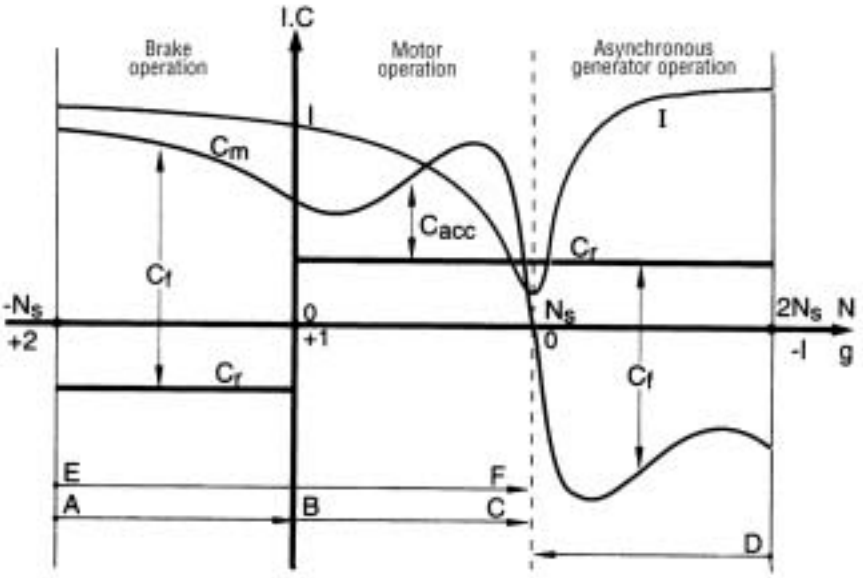
$$T_f = \frac{\Pi \cdot J \cdot N}{30 \cdot C_f(av)}$$

T_f (in s) = braking time

J (in kgm^2) = moment of inertia

N (in min^{-1}) = speed of rotation

C_f (av) (in N.m) = average braking torque during the time period



I curve: f(N), C_m: f(N), Cr = f(N), in the motor starting and braking zones.

I	=	*current absorbed*	g	=	*slip*
C	=	*torque value*	N_S	=	*synchronous speed*
D_f	=	*braking torque*	AB	=	*reverse current braking*
C_r	=	*resistive torque*	BC	=	*starting, acceleration*
C_m	=	*motor torque*	DC	=	*regenerative braking*
N	=	*speed of rotation*	EF	=	*reversal*

Operating rules

Large differences in the number of poles (e.g. 2/12, 2/16, 2/24, etc) should be avoided for the following reasons:

- The torque drop at high speed occurs at a speed greater than the synchronous speed at low speed. The motor may start to "crawl" and never reach its rated speed.
- In handling applications, because of this excessive speed difference, the operator may be tempted to start the motor repeatedly at high speed which may cause it to overheat.

It is preferable to start at low speed to enable:

- the high speed torque drop to be eliminated, thus reducing the starting time
- the release current to be reduced

For motors with two separate windings, when the delta connection is used as standard, an important precaution is to "open" the delta of the unused speed to avoid producing circulating currents which may create opposing torques and harmful overheating.

For multi-speed motors, when there is a large number of starts, the brake should be engaged at low speed, i.e. after electrical deceleration to the lowest speed.

Three-speed motors are also available. These require the operating cycle, number of starts, etc, to be defined precisely.

Intermittent duty

Operating factor

Expressed as a percentage, this is the ratio of the motor power-up time during the cycle to the total cycle time, provided that the total cycle time is less than 10 minutes.

Starting class

Class = N = Nd + K.Nf + K'.Ni

Nd: number of complete starts per hour

Nf: number of electrical braking operations (deceleration) per hour

Ni: number of pulses (incomplete starts up to a third of maximum speed) per hour

Constants K and K' have the following values:

cage motors:	K = 3	K' = 0.5
slip-ring motors:	K = 0.8	K' = 0.25

An electrical braking operation is defined as an operation directly involving the stator or rotor winding.

Reverse current braking: This is obtained by reversing two of the power supply phases. It is thermally equivalent to 3 starts. In the case of a cage motor, the braking torque is often greater than the starting torque.

Note: A reversal consists of reverse current braking followed by a start. Thermally, it is equivalent to 4 starts.

In the special case of slip-ring motors, the rotor should be connected to a special band in the rheostat. Under no circumstances should it remain short-circuited.

DC injection braking: This can apply to slip-ring or cage motors. The thermal requirement is equivalent to a complete start.

Distribution

For 2-speed motors, the number of starts and the operating factor are distributed as follows:

- number of starts:
  LSP: 2/3 HSP: 1/3
- operating factor:
  LSP: 1/3 HSP: 2/3

rms power in intermittent duty

This is the rated power absorbed by the driven machine, usually defined by the manufacturer.

If the power absorbed by the machine varies during a cycle, the rms power is defined by the equation:

$$\sqrt{\frac{P_1^2 . t_1 + P_2^2 . t_2 + \ldots + P_n^2 . t_n}{t_1 + t_2 + \ldots + t_n}}$$

The powers absorbed during the cycle are:
P_1 during time t_1
P_2 during time t_2
.....
P_n during time t_n

Values lower than 0.5 P_n are replaced by 0.5 P_n when calculating the rms power (special case for no-load operation).

For intermittent duty motors, please check the definition of your product with Leroy Somer.

Duty cycles

Standard IEC 34-5 defines the following duty cycles:

S1 duty: Continuous duty. The motor starts a maximum of 6 times per hour and supplies the full power indicated on the nameplate.

S2 duty: Short-time duty. The operating times are expressed in minutes (10, 20, 30, etc). After each operating cycle, the motor supply is turned off until the winding has completely cooled.

S3 duty: Intermittent duty with starting. The starting current has no significant effect on the total temperature rise of the machine. The cycles last for 10 minutes. Recommended values for the operating factor: 15, 25, 40 and 60%.

S4 duty: Intermittent duty. The number of starts has an effect on the temperature rise of the machine.
For S4 duties, it is important to specify the number of starts per hour with the operating factor (e.g. 150 starts/hr 40%).

S5 duty: Intermittent duty with electrical starting and braking. Starting and braking will both affect the temperature.
For S5 duties, it is important to specify the number of starting and braking operations with the operating factor.

S6 duty: Periodic continuous duty with intermittent load. Unless otherwise agreed, the pause is 10 minutes. Recommended values for the operating factor: 15, 25, 40 and 60%.

S7 duty: Continuous duty with electrical starting and braking.

S8 duty: Continuous duty with periodic changes of speed by switching poles
For S2 to S8 duties, the moment of inertia must be defined for the driven machine.

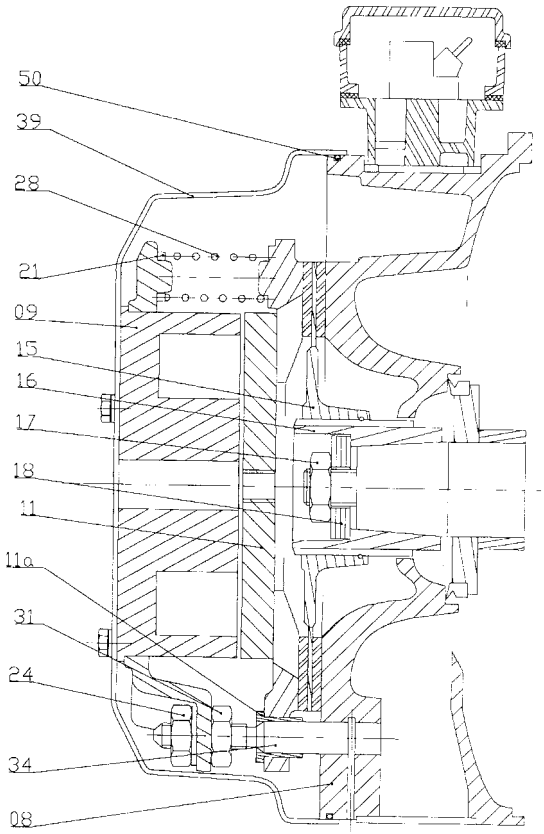
S9 duty: Duty with non-periodic variations in load and speed.

S10 duty: Operation at distinct constant loads.

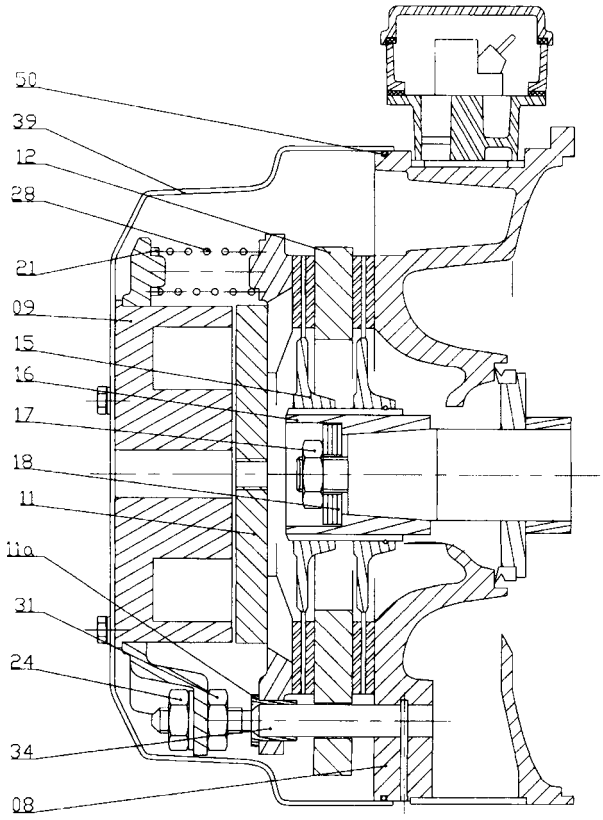
FCPL brakes

Component parts

FCPL brake - 1 disk



FCPL brake - 2 disks



Number	Description
8	brake shield
9	electromagnet
11	armature
11A	rings
12	central friction ring
15	brake disk
16	spline bore hub
17	locknut

Number	Description
18	spring washer
21	spacer
24	air gap adjusting nut
28	pressure spring
31	adjusting nut
34	guide columns
39	brake cover
50	cover seal

FCPL brakes

General

D.C. brake, FCPL series, 65 to 2400 Nm, separate power supply by rectifier or doping device depending on size.
It can be mounted on IP 23 or IP 55 cage rotor or wound rotor motors.

Brake protection
Standard version IP 44.
Brake protected by a steel cover.

Conditions of use
There are two types of coil, one for continuous duty (S1) and one for intermittent duty (S3).

When ordering, it is essential to specify the type of duty, as well as the number of starts per hour and the operating factor.

Electromagnet protection
Coated with resin to ensure complete protection of the coil.

Brake power supply
Separate. In standard versions, D.C. is supplied:
- for FCPL40, FCPL54 and FCPL60 brakes from the 400 V mains supply via an S07 rectifier built into the terminal box
- for the FCPL88 brake via an electronic CDF doping device located in the control enclosure
The coil rated voltage is 180 V.

Braking torque
Can be adjusted by changing the number of springs.
Protected against loss of adjustment once it has been set.
Our brakes have 1 or 2 disks, according to the braking torque.

Air gap adjustment
The air gap can be easily adjusted by removing the brake cover.

Friction lining
Asbestos-free lining with very low abrasion factor.

Individual checks before sending
Routine test, checks on resistors and options.
Running-in and traceability of the brake disk.
Adjusting the CDF device.

Options
Brake voltage (20 V, 100 V, 200 V).
Release by a lever (DLRA).
Brake release indicator.
Lining wear indicator.
Adaptation of an encoder, a tachogenerator or an alternator.
Second shaft end for crankshaft socket.
Special brake terminal box position available on request.

CDF power supply device for reduced brake response time.

Mechanical characteristics

1) Description

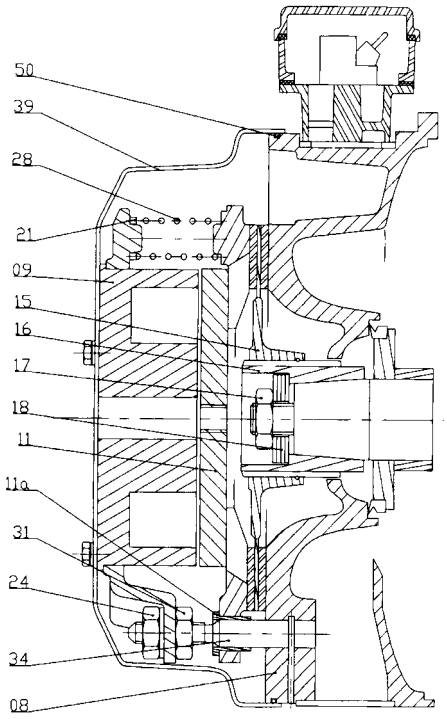
When stationary, the **coil 9** is not energised, the **disk 15** sliding on a splined sleeve is pressed between the **armature 11** and the **plate 8** by action of the **springs 28**. The motor rotor rotation is stopped. The air gap is between the **yoke 9** and the **armature 11**.

When the **coil 9** is energised, the **armature 11** is attracted, the springs are compressed, the **disk 15** and the rotor are released.

On braking, disconnection of the current eliminates the magnetic field, causing progressive tightening of the **disk 15** between the **plate 8** and the **armature 11**, slowing it down and then stopping it.

The number and length of **springs 28** determine the value of the braking torque.

Brakes FCPL 60 and 88 can have 1 or 2 disks, according to the braking torque.



2) Range

Brake	Type	Number of disks	Torque N.m ±20%	J kg.m²	S3 duty	S1 duty	Quantity	
							No. 28	No. 21
FCPL 40	106	1	65	0.01	yes	yes	3	0
FCPL 40	108	1	80	0.01	yes	yes	3	3
FCPL 40	109	1	95	0.01	yes	yes	4	2
FCPL 40	110	1	105	0.01	yes	yes	4	4
FCPL 40	112	1	125	0.01	yes	yes	6	0
FCPL 40	114	1	145	0.01	yes	*	6	3
FCPL 40	116	1	160	0.01	yes	*	6	6
FCPL 54	207	1	75	0.015	yes	yes	2	0
FCPL 54	309	1	90	0.015	yes	yes	2	2
FCPL 54	211	1	110	0.015	yes	yes	3	0
FCPL 54	313	1	130	0.015	yes	yes	3	3
FCPL 54	215	1	150	0.015	yes	yes	4	0
FCPL 54	318	1	180	0.015	yes	yes	4	4
FCPL 54	222	1	220	0.015	yes	* (1)	6	0
FCPL 54	326	1	260	0.015	*	*	6	6
FCPL 60	215	1	150	0.025	yes	yes	3	3
FCPL 60	220	1	200	0.025	yes	yes	4	4
FCPL 60	126	1	260	0.025	yes	yes	6	0
FCPL 60	230	1	300	0.025	yes	*	6	6
FCPL 60	330	2	300	0.05	yes	yes	3	3
FCPL 60	239	2	400	0.05	yes	yes	4	4
FCPL 60	152	2	520	0.05	yes	yes	6	0
FCPL 60	260	2	600	0.05	yes	*	6	6
FCPL 60		2	700	0.05	*	*	6	6
FCPL 60		2	800	0.05	*	*	6	6
FCPL 88	160	1	600	0.075	*	*	6	6
FCPL 88	180	1	800	0.075	*	*	6	6
FCPL 88	195	1	950	0.075	*	*	9	9
FCPL 88	1120	1	1200	0.075	*	*	9	9
FCPL 88	2120	2	1200	0.15	*	*	6	6
FCPL 88	2160	2	1600	0.15	*	*	6	6
FCPL 88	2190	2	1900	0.15	*	*	9	9
FCPL 88	2240	2	2400	0.15	*	*	9	9

* Operation with CDF device.

(1) Can operate without a CDF device. The maximum air gap before adjustment is limited to 1.2 mm.

For more information, please refer to the brake adjustment and maintenance manuals.

Mechanical characteristics

3) Thermal capacity of brake

Overheating of the brake and its coil is the sum of the losses caused:
- by Joule effect in the coil
- by friction when braking or starting the motor when the brake is still applied.

3-1) Losses caused by Joule effect

For a constant supply voltage, the current in the coil is constant (I = U/R). As a result, the number of starts has no effect on overheating of the coil, **only the operating factor is important (see 5-1-a)**.

3-2) Losses caused by friction

a) Thermal capacity on non periodic braking

- FCPL 40 - 1 disk: - 35 kJ
- FCPL 54 - 1 disk: - 90 kJ
- FCPL 60 - 1 disk: - 135 kJ
- FCPL 60 - 2 disks: - 240 kJ
- FCPL 88 - 1 disk: - 240 kJ
- FCPL 88 - 2 disks: - 440 kJ

b) Thermal capacity on periodic braking

Practical formulae

To determine the maximum number of braking operations (Nf) per hour that the brake can perform, the following rule should be used:

- FCPL 40 - 1 disk:
  $Nf = 94.10^6/(Jt \times N^2)$
- FCPL 54 - 1 disk:
  $Nf = 164.10^6/(Jt \times N^2)$
- FCPL 60 - 1 disk:
  $Nf = 190.10^6/(Jt \times N^2)$
- FCPL 60 -2 disks:
  $Nf = 223.10^6/(Jt \times N^2)$
- FCPL 88 - 1 disk:
  $Nf = 280.10^6/(Jt \times N^2)$
- FCPL 88 -2 disks:
  $Nf = 310.10^6/(Jt \times N^2)$

Units

Jt: total inertia on braking in $kg.m^2$

N: braking speed in rpm

If the result is less than 100 : please consult the factory.

If the result is greater than or equal to the motor's number of starts per hour : the brake is correctly sized.

4) Lining wear

Brake adjustment frequency can be determined by using the following table which gives the total dissipated energy for complete wearing of the disk and 1 mm wear of the lining.

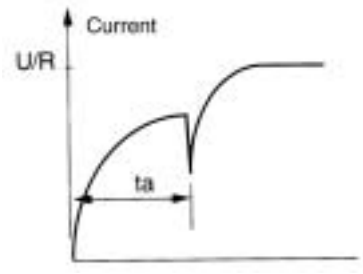
Brake	Energy in MJ for complete wearing of the disk	Energy in MJ for 1 mm wear of the lining
FCPL 40	1500	250
FCPL 54	1800	550
FCPL 60 - 1 disk	2900	850
FCPL 60 -2 disks	5800	1700
FCPL 88 - 1 disk	9100	1500
FCPL 88 - 2 disks	18300	3000

The air gaps should be adjusted after 0.6 mm wear of the lining.

5) Response time

5-1) Brake release time (pick-up time)

When the coil is energised, the current enters the coil in two stages:
- In the first stage, the flux is created and magnetises the yoke and the armature by closing the air gap. The attraction force increases until it compensates the force opposed by the springs. The armature starts to move. This time "ta" corresponds to the coil response time.
- In the second stage, the air gap is eliminated. The circuit reluctance changes and the current is established according to a second ratio before reaching its final value.



The brake release time depends on a number of parameters:

a) The type of coil (S1 or S3)

The brake release response time can have a significant effect on the temperature rise of the motor. A short response time is essential for applications which require a large number of starts (> 30 starts/hr).

Two types of coil are defined according to the application:

• Coil for continuous duty (S1): FM ≥ 60%
These can be continuously supplied with rated voltage. The response time is the longest.

• Coils for intermittent duty (S3): FM ≤ 60%
These are intended for applications which require numerous starts. The brake release response time is shorter than for the S1 coil.

Single-speed aluminium rotor motors are fitted with an S1 duty coil as standard. Multi-speed or DP rotor motors are fitted with S3 duty coils.

Note: Using a CDF doping device enables the use of:
- an S1 coil for a large number of starts
- an S3 coil for a continuous duty power supply by setting the holding voltage to 50% of the brake coil rated voltage.

Practical formulae

The following formulae give an indication of the brake release time in milliseconds for an air gap of 1 mm.

FCPL 40:
- ta = 1.15 × Cf for an S3 coil
- ta = 2.3 × Cf for an S1 coil

FCPL 54:
- ta = Cf for an S3 coil
- ta = 1.3 × Cf for an S1 coil

FCPL 60 - 1 disk:
- ta = 0.8 × Cf for an S3 coil
- ta = Cf for an S1 coil

Electrical characteristics

FCPL 60 - 2 disks:
The brake release time is the same as for the 1-disk FCPL set to half the torque of the 2-disk FCPL.

These values are given for a rectifier power supply.

FCPL 88 - 1 or 2 disks:
- ta = 150 ms

b) The tolerance on the voltage supply

The tolerance on the supply voltage to the coil terminals is ± 10 %. A reduced power supply increases the response time.

The CDF doping device helps to avoid the effects of supply voltage fluctuations.

c) The size of the air gap

The brake response time depends on the size of the air gap setting. This time can be multiplied by 3 when the air gap is doubled. It is therefore important that its size should be regularly checked (see lining wear in section 4).

d) The braking torque

For a given coil, the response time is a function of the braking torque which is directly proportional to the force exerted by the springs. A low torque brake will have a faster release time than the same brake adjusted to give maximum torque.

5-2) Braking time (brake engage time)

Practical formulae

The following formulae indicate the value of the brake armature engage time “tr” in milliseconds when the D.C. supply is cut.

FCPL 40:
- tr = 12500/Cf for an S3 coil
- tr = 12200/Cf for an S1 coil

Cf: braking torque in Nm

FCPL 54:
- tr = 10400/Cf for an S3 coil
- tr = 9000/Cf for an S1 coil

Cf: braking torque in Nm

FCPL 60 - 1 disk:
- tr = 22000/Cf for an S3 coil
- tr = 18000/Cf for an S1 coil

Cf: braking torque in Nm

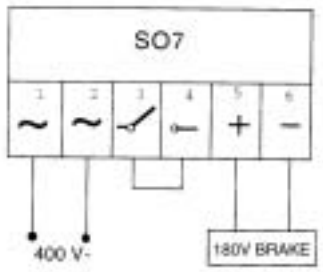
FCPL 60 - 2 disks:
The brake engage time is the same as for the 1-disk FCPL set to half the torque of the 2-disk FCPL.
E.g.: The brake engage time is the same for a 1-disk FCPL 60 at 300 Nm and a 2-disk FCPL at 600 Nm.

FCPL 88 - 1 or 2 disks:
- tr = 150 ms

6) Power supply

6-1) Rectifier

Standard S07 rectifier block, half wave.
Output voltage = input voltage × 0.45
Maximum primary voltage: 480 V
Max. current: 2 A



Disconnection of the D.C. supply is obligatory in hoisting applications. To do this, remove the connection between terminals 3 and 4 and replace it with a contactor in parallel on the motor control.

6-2) Brake doping device - CDF

This block supplies the brake directly from the A.C. supply. The electronics contained in the box control two functions:

Doping on brake release: An overvoltage of several tens of milliseconds is applied to the terminals of the brake coil. This initial doping reduces the brake release time by 2 or 3 times.

Reduced holding voltage: With the brake applied, the voltage is reduced which reduces the coil temperature rise.

To use this product, please refer to the data sheet supplied with it.

6-3) Connections

In order to distinguish between the coil duty and voltage, a colour code is used on the two power cables on the yoke output.

Voltage V	S3 coil	S1 coil
20	Green/Green	-
100	Yellow/Yellow	Yellow/White
180	Blue/Blue	Blue/White
200	Black/Black	Black/White

Electrical characteristics

7) Electromagnet characteristics

Type brake	Voltage V	S3 coil Ω	Current A	S1 coil Ω	Current A
FCPL 40	180	185	1.0	350	0.5
FCPL 40	100	57	1.75	108	0.93
FCPL 40	20	3.4	5.9	*	*
FCPL 54	180	195	0.9	340	0.5
FCPL 54	100	61	1.6	120	0.8
FCPL 54	20	2.25	8.9	4.5	*
FCPL 60	180	160	1.1	320	0.6
FCPL 60	100	55	1.8	102	1.0
FCPL 60	20	1.9	10.5	*	*
FCPL 88	180	114	1.6	114	1.6

* voltages not available for S1 duty

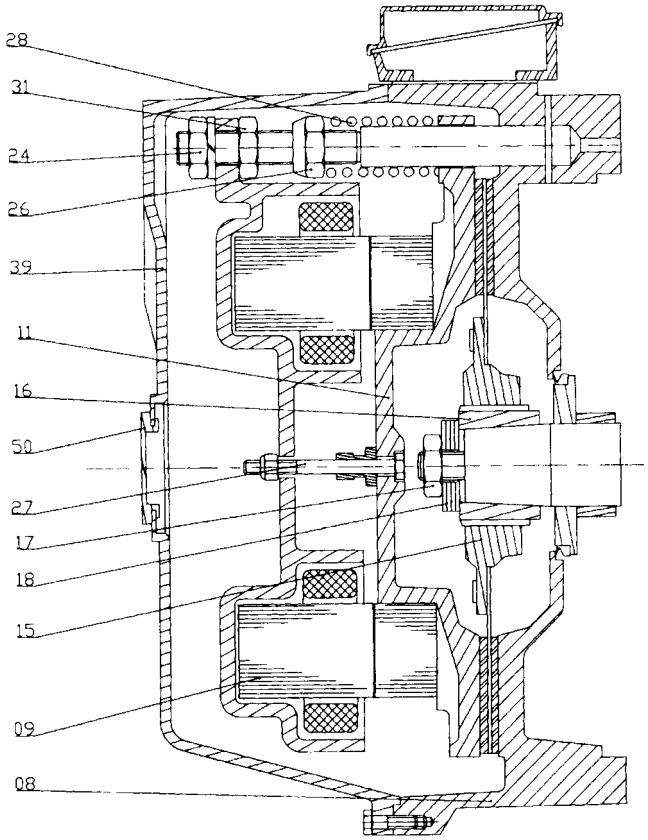
As the FCPL 88 brake is supplied by a CDF device, the same coil is used for S1 and S3 duties.

Note: The practical formulae are given for information only to enable you to make your selection. They do not represent any commitment on behalf of Leroy Somer.

Leroy Somer engineers are available to help you with your selection, if required.

Component parts

FAP brake - 1 disk

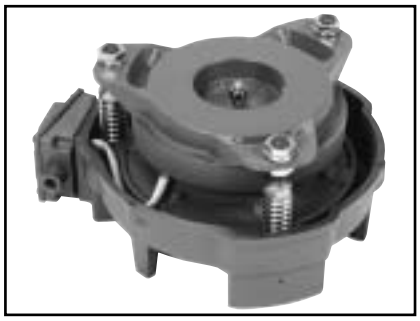


Number	Description
8	brake shield
9	electromagnet
11	armature
15	brake disk
16	spline bore hub
17	hub locknut
18	spring washer

Number	Description
24	electromagnet locknut
26	spring adjusting nut
27	rod release
28	springs
31	air gap adjusting nut
39	cover
50	plug

FAP brakes

General



3-phase A.C. brake, FAP series, 25 to 540 Nm, with separate motor power supply.
It can be mounted on IP 55, LS or FLS series cage rotor motors or FLSB wound rotor motors.

Brake protection
Standard version IP 44.
Brake protected by a cast iron cover.

Conditions of use
Same functions for S1 or S3 duty.
Very short response time enabling precise and repetitive periodic braking movements.

Electromagnet protection
Coated with resin to ensure complete protection of the coil.

Brake power supply
From the 230/400 V 50 Hz supply.

Braking torque
Can be adjusted by modifying the length of the 3 compression springs.
Our brakes have 1 or 2 disks, according to the braking torque.

Air gap adjustment
The air gap can be easily adjusted by removing the brake cover.

Metal terminal box
Sealed, fitted with cable gland mounted on top of the brake shield and containing the connection terminal plate.

Friction lining
Asbestos-free lining with very low abrasion factor.

Individual checks before sending
Routine test, checks on resistors and options.
Running-in and traceability of the brake disk.

Options
Other voltages.
IP 55 protection.
Removable release lever (DLRA).
Brake release indicator.
Lining wear indicator.
Adaptation of a tachogenerator or an alternator.
Second shaft end for crankshaft socket.
Special brake terminal box position.

Mechanical characteristics

1) Description

When stationary, the **electromagnet 9** is not energised, the pressure of the **springs 28** keeps **disk 15** pressed between the **plate 8** and the **armature 11**, thus locking the motor rotor.

When powered up, the armature assembly, moving away from **plate 8**, releases the **disk 15** enabling the motor to rotate freely.

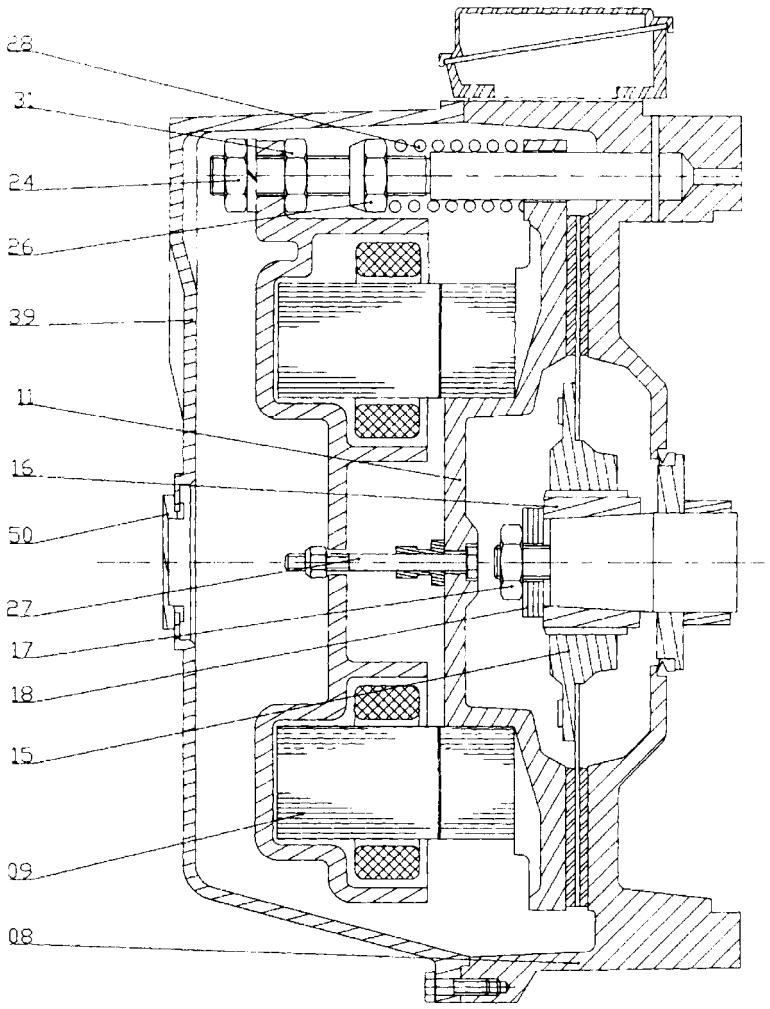
As soon as the **electromagnet 9** is de-energised, the armature is released, the **armature assembly 11** following a single compression of the **springs 28** presses the **disk 15** against the **plate 8**, thus ensuring braking which stops and locks the rotor.

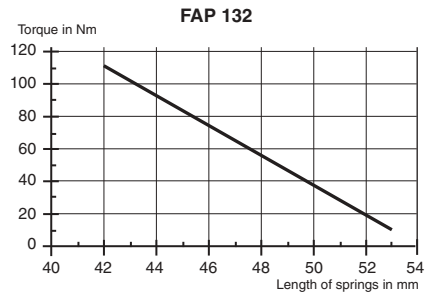
The braking torque is determined by the amount of compression in the springs. Please refer to the adjustment charts.

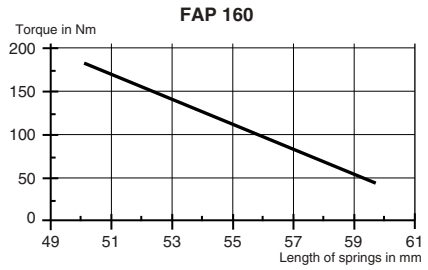
2) Range

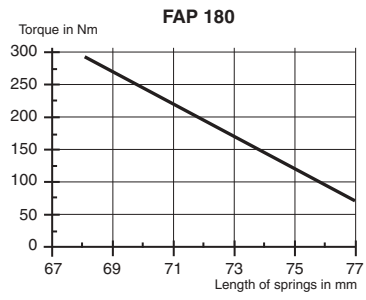
Brake	Number of disks	J kg.m²	Torque (Nm) ±20%	
			min.	max.
FAP 132	1	0.015	35	110
FAP 160	1	0.025	50	180
FAP 180	1	0.027	100	290
FAP 200/1	1	0.037	125	375
FAP 200/2	2	0.074	210	540

3) Braking torque



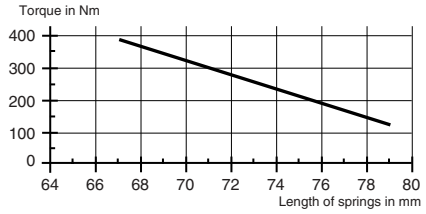




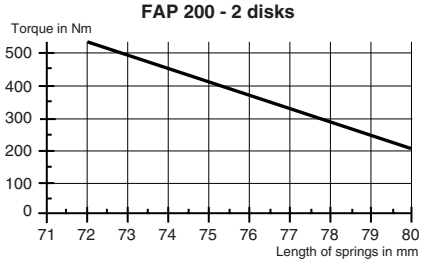


Mechanical characteristics

FAP 200 - 1 disk



FAP 200 - 2 disks



For more information, please refer to the FAP brake adjustment and maintenance manuals.

4) Thermal capacity of brake

Overheating of the brake and its coil is the sum of the losses caused:
- by Joule effect in the coil
- by friction when braking or starting the motor when the brake is still applied.

4-1) Losses caused by Joule effect

For a constant supply voltage, the current in the coil depends on its impedance (I = U/Z). Therefore, the following factors can affect its overheating:
- fluctuations in the supply voltage
- the number of starts
- the size of the air gap

4-2) Losses caused by friction

Thermal capacity on non periodic braking

- FAP 132 - 1 disk: 90 kJ
- FAP 160 - 1 disk: 130 kJ
- FAP 180 - 1 disk: 180 kJ
- FAP 200 - 1 disk: 220 kJ
- FAP 200 - 2 disks: 420 kJ

Thermal capacity on periodic braking

Response times of A.C. brakes are shorter than those of D.C. brakes. When the motor starts, they are subjected to the applied brake phases for only a few milliseconds.

5) Lining wear

Brake adjustment frequency can be determined by using the following table which gives the total dissipated energy (E) for complete wearing of the disk as well as for 1 mm wear of the lining.

The air gaps should be adjusted after 0.6 mm wear of the lining.

Brake	Energy in MJ for complete wearing of the disk	Energy in MJ for 1 mm wear of the lining
FAP 132	4000	800
FAP 160	5200	860
FAP 180	6800	1100
FAP 200 - 1 disk	8200	1300
FAP 200 - 2 disks	16500	2700

Electrical characteristics

6) Response time

6-1) Brake release time (pick-up time)

When the coil is energised, the current enters the coil in two stages:
- In the first stage, the flux is created and magnetises the electromagnet and the armature by closing the air gap. The coil inductance is low because the circuit reluctance is at maximum. The current flowing through the coil is high.
- In the second stage, the air gap is eliminated and reduces the circuit reluctance. The coil impedance increases to reach its maximum value with the brake applied. The current settles to its final value, 4 to 6 times less than the starting value.

These principles show that the number of starts can have a significant effect on the coil temperature rise.

The brake release time depends on a number of parameters:

a) The size of the air gap

The brake release response time depends on the size of the air gap. This time can be multiplied by 3 when the air gap is doubled. It is therefore important that the size of the gap is checked regularly (see lining wear in section 5).

b) The braking torque

For a given coil, the response time is a function of the braking torque which is directly proportional to the force exerted by the springs. A low torque brake will be faster than the same brake adjusted to give maximum torque.

On a correctly adjusted A.C. brake, supplied at its rated voltage, the response time is 20 to 30 ms.

6-2) Braking time (engage time)

The engage time is also very short since it varies between 10 and 20 ms, depending on the type of brake and its braking torque.

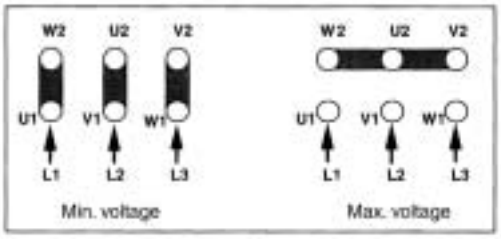
7) Power supply

7-1) Tolerances

Our brakes have a voltage of 230/400 V - 50 Hz as standard.
Tolerance: + 5 % – 10 %

7-2) Connections

The connection terminal block is located in the brake terminal box.



The colours of the connecting wires are as follows:

FAP 132

U1	Green		W2	Red
V1	Yellow		U2	Black
W1	Brown		V2	White

FAP 160 - 180 and 200

U1	Black		W2	Red
V1	White		U2	Black
W1	Brown		V2	White

8) Electromagnet characteristics

Operating voltage: 400 V 50 Hz

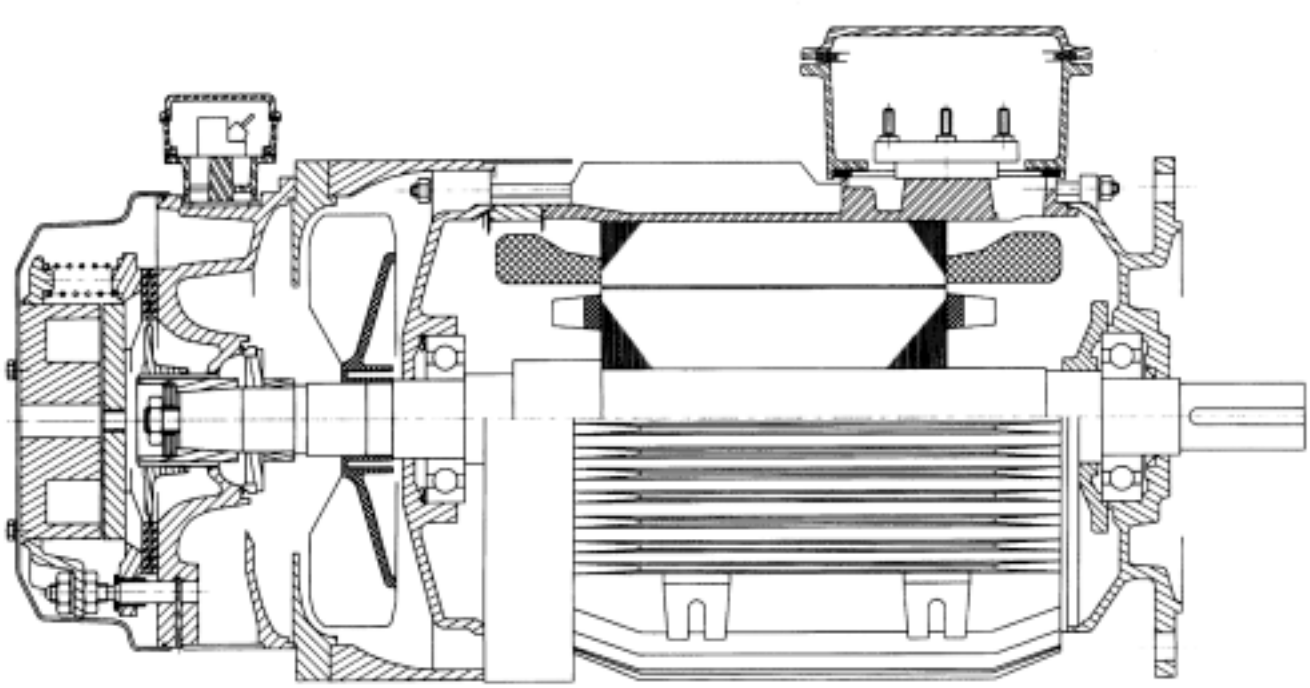
Type of brake	I (release) A	I (applied) A	Resistance Ω	P app VA
FAP 132	3.9	1.2	4.5	831
FAP 160	6.1	1.4	2.0	970
FAP 180	7.9	1.8	1.5	1247
FAP 200/1	11	2.9	1.0	2009
FAP 200/2	11	2.9	1.0	2009

Notes

LS motor - FCPL brake

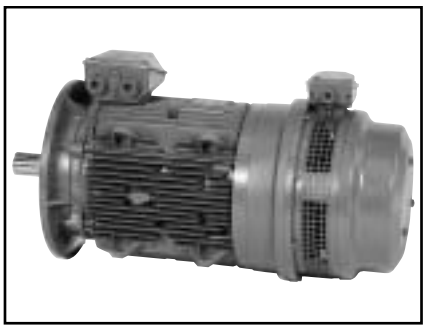
Cross-sectional view of motor

LS motor - FCPL brake - B5 mounting



LS motor - FCPL brake

General



D.C. brake induction motors, LS series, failsafe, power rating 4 to 90 kW, frame sizes 160 to 280 mm, 4, 6 and 8 poles; 230/400 V 50 Hz.

Motor protection
Standard version IP 55.

Brake protection
Standard version IP 44.

Motor housing
With cooling fins, pressure die-cast in aluminium alloy.

End shields and brake shield
In cast iron fixed using tie rods.

Brake housing
In cast iron, screwed to the brake shield.
Brake protected by a steel cover.

Bearings
C3 sealed ball bearings (type 2RS) from 160 to 225 MR.
Regreasable from 225 MK to 280.

Bearings fitted:
- as a thrust at the front
- heavily preloaded at the rear to eliminate axial oscillation

Finish
Assembly using zinc bichromate or cadmium finish on screws.
RAL 6000 (green) paint finish.
Identification on a riveted aluminium plate.

Motor power supply
Standard 230/400 V at 50 Hz.

Brake power supply
Separate: In the standard version D.C. is supplied from the 400 V supply via an S07 rectifier or a CDF device.

Winding
Standard, class F.

Rotor
With squirrel cage pressure die-cast in aluminium for operation in S1 duty, in special alloy for operation in S3 duty (DP rotor).

Metal terminal boxes (motor and brake)
Sealed, fitted with cable gland, mounted on top of the motor or brake shield.

Connection of the A.C. supply
- Stator: terminal block with 6 terminals enabling connection to the supply via connector links (see diagram inside the terminal box).
- Brake:
FCPL 40, 54 and 60: When the rectifier is provided, it is mounted inside the motor or brake terminal box.
FCPL 88: terminal box integrated in the brake shield under the cover.

Individual checks before sending
Routine tests, no-load test, short-circuit test, dielectric test, checks on options and direction of rotation.
Running-in and traceability of the brake disk.

Conditions of use
Number of starts allowed:
- For continuous duty:
6 starts per hour.
• For an operating factor of 40%:
- LS 160-180 = 180 (DP rotor compulsory)
- LS 200-225 = 150 (DP rotor compulsory)
Higher operating rates: please contact Leroy Somer, larger frame sizes: please contact Leroy-Somer.

Options

Motor
Multi-speed (see section 2 speeds).
Construction allowing Y/Δ starting.
PTO, PTF, PTC protection sensors.
Space heaters.
Regreasable bearings (except LS 160 MP and LR).
Roller bearings (except LS160MP and LR).
Forced ventilation.

Brake
Brake voltage (20 V, 100 V, 200 V).
Release by a lever (DLRA).
Brake release indicator.
Lining wear indicator.
Adaptation of an encoder, a tachogenerator or an alternator.
Second shaft end for crankshaft socket.
Special brake terminal box position available on request.

CDF power supply device for reduced brake response time.

LS motor - FCPL brake

Selection

4 poles 1500 min^{-1}

• LS motor - IP 55 - 50 Hz - Class F - 230/400 V - Aluminium rotor, S1 duty
• D.C. brake - IP 44 - Separate brake power supply
High braking torque

Type of motor	Type of brake	Rated power at 50 Hz P_N kW	Rated speed N_N min^{-1}	Rated current I_N (400 V) A	Power factor cos φ 4/4	Efficiency η % 4/4	Starting current/ Rated current I_D/I_N	Starting torque/ Rated torque M_D/M_N	Rated torque M_N N.m	Moment of inertia J kg.m^2	Braking torque M_f ± 20% N.m	Weight IM B3 kg
LS 160 MP	**40 - 112**	11	1456	21.1	0.85	88.4	7.7	2.9	72	0.050	125	100
LS 160 LR	**40 - 112**	15	1456	28.8	0.84	89.4	8.3	2.9	99	0.058	125	105
LS 160 L	**54 - 215**	15	1455	28.6	0.85	89.1	6.5	2.7	98	0.094	150	140
LS 180 MT	**54 - 318**	18.5	1456	35.4	0.84	90.3	7.4	2.9	121	0.104	180	140
LS 180 LR	**54 - 222**[1]	22	1456	41.7	0.84	90.7	7.4	3.2	144	0.117	220	150
LS 200 LT	**60 - 230**[1]	30	1460	56.3	0.84	91.5	6.6	2.7	196	0.187	300	240
LS 225 ST	**60 - 239**	37	1470	68.7	0.84	92.5	6.5	2.6	239	0.306	390	290
LS 225 MR	**60 - 152**	45	1470	83.3	0.84	92.8	6.5	2.8	292	0.365	520	320
LS 250 ME	**60 - 260**[1]	55	1 478	101	0,84	93,6	7	2,7	355	0,749	590	400
LS 280 SC	**88 - 180**[1]	75	1 478	137	0,84	94,2	7,2	2,8	485	1,084	800	550
LS 280 MD	**88 - 195**[1]	90	1 478	164	0,84	94,4	7,6	3	581	1,274	950	620
LS 315	For larger sizes, please consult Leroy Somer.											

1. Requires a CDF power supply device.

6 poles 1000 min^{-1}

• LS motor - IP 55 - 50 Hz - Class F - 230/400 V - Aluminium rotor, S1 duty
• D.C. brake - IP 44 - Separate brake power supply
High braking torque

Type of motor	Type of brake	Rated power at 50 Hz P_N kW	Rated speed N_N min^{-1}	Rated current I_N (400 V) A	Power factor cos φ 4/4	Efficiency η % 4/4	Starting current/ Rated current I_D/I_N	Starting torque/ Rated torque M_D/M_N	Rated torque M_N N.m	Moment of inertia J kg.m^2	Braking torque M_f ± 20% N.m	Weight IM B3 kg
LS 160 M	**40 - 112**	7.5	967	16.1	0.79	85.2	4.7	1.5	74	0.100	125	120
LS 160 L	**54 - 318**	11	967	23.3	0.79	86.3	4.6	1.6	109	0.140	180	140
LS 180 L	**60 - 126**	15	972	30.1	0.81	88.7	6.8	2.3	147	0.232	260	200
LS 200 LT	**60 - 230**[1]	18.5	970	37	0.81	89.0	6.4	2.4	182	0.281	300	240
LS 200 L	**60 - 239**	22	972	43.6	0.81	89.9	6.0	2.0	216	0.366	390	280
LS 225 MR	**60 - 152**	30	968	59.5	0.81	89.9	6.0	2.2	296	0.475	520	320
LS 250 ME	**60 - 260**[1]	37	978	71,1	0,81	92,7	6,2	2,3	361	0,994	590	385
LS 280 SC	**88 - 180**[1]	45	978	86,5	0,81	92,7	6,2	2,3	439	1,268	800	510
LS 280 MC	**88 - 195**[1]	55	978	106	0,81	92,6	6	2,4	537	1,463	950	650
LS 315	Please consult Leroy-Somer											

1. Requires a CDF power supply device.

LS motor - FCPL brake

Selection

• LS motor - IP 55 - 50 Hz - Class F - 230/400 V - Aluminium rotor, S1 duty
• D.C. brake - IP 44 - Separate brake power supply
High braking torque

		Rated power at 50 Hz	Rated speed	Rated current	Power factor	Efficiency	Starting current/ Rated current	Starting torque/ Rated torque	Rated torque	Moment of inertia	Braking torque	Weight
Type of motor	**Type of brake**	P_N kW	N_N min^{-1}	I_N (400 V) A	cos φ 4/4	η % 4/4	I_D/I_N	M_D/M_N	M_N N.m	J $kg.m^2$	M_r ± 20% N.m	IM B3 kg
LS 160 M	**40 - 109**	4	715	11.1	0.65	80.0	3.2	1.9	53	0.078	95	110
LS 160 M	**40 - 112**	5.5	715	14.8	0.65	82.4	3.5	1.9	74	0.082	125	120
LS 160 L	**54 - 215**	7.5	715	19.7	0.67	82.1	3.4	1.9	102	0.111	150	140
LS 180 L	**60 - 126**	11	720	25.6	0.72	86.0	3.8	1.4	145	0.247	260	210
LS 200 L	**60 - 230[1]**	15	725	32.9	0.75	87.7	4.4	1.6	198	0.327	300	260
LS 225 ST	**60 - 239**	18.5	725	42.4	0.72	87.5	4.2	1.6	244	0.421	390	300
LS 225 MR	**60 - 152**	22	725	51.9	0.70	87.4	4.4	1.9	288	0.489	520	330
LS 250 ME	**60 - 260[1]**	30	730	60,3	0,79	90,9	5,8	1,9	392	0,994	590	410
LS 280 SC	**88 - 180[1]**	37	730	74,3	0,79	91	5,6	1,8	484	1,268	800	540
LS 280 MD	**88 - 195[1]**	45	728	91,4	0,78	91,1	5,4	1,8	590	1,463	950	600
LS 315	Please consult Leroy-Somer											

1. Requires a CDF power supply device.

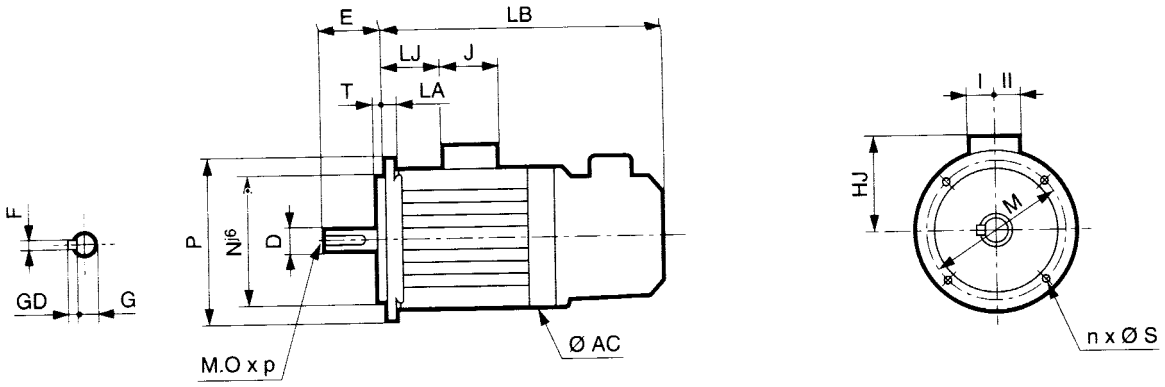
LS motor - FCPL brake

Dimensions

Dimensions of FCPL brake induction motors - 4, 6, 8 poles
IP 55 motor protection, IP 44 brake protection

Dimensions in millimetres

- Flange mounted (FF)



Type	Brake induction motors							
	LB	AC	HJ	LJ	J	I	II	Symbol
LS 160 MP	603	264	200	55	160	55	55	FF 300
LS 160 LR	603	264	200	55	160	55	55	FF 300
LS 160 M	668	345	235	44	134	92	63	FF 300
LS 160 L	668	345	235	44	134	92	63	FF 300
LS 180 MT	668	345	235	44	134	92	63	FF 300
LS 180 LR	683	345	235	44	134	92	63	FF 300
LS 180 L	795	384	255	54	205	100	95	FF 300
LS 200 LT	828	384	255	60	205	100	95	FF 350
LS 200 L	874[1]	410	275	68	205	100	95	FF 350
LS 225 ST	911	410	275	74	205	100	95	FF 400
LS 225 MR	953	410	275	74	205	100	95	FF 400
LS 250 SE	1 180	481	404	68	292	148	180	FF 500
LS 250 ME	1 180	481	404	68	292	148	180	FF 500
LS 280 SC/MD	1 246	505	404	68	292	148	180	FF 500
LS 280 MC/MD	1 246	505	404	68	292	148	180	FF 500

1. Dimension for FCPL 60-230. For the FCPL 60-239: LB = 905.

Type	Flanges							
	Symbol	M	N	P	T	n	S	LA
LS 160/180	FF 300	300	250	350	5	4	18.5	14
LS 200	FF 350	350	300	400	5	4	18.5	15
LS 225	FF 400	400	350	450	5	8	18.5	16
LS 250/280	FF 500	500	450	550	5	8	18.5	18

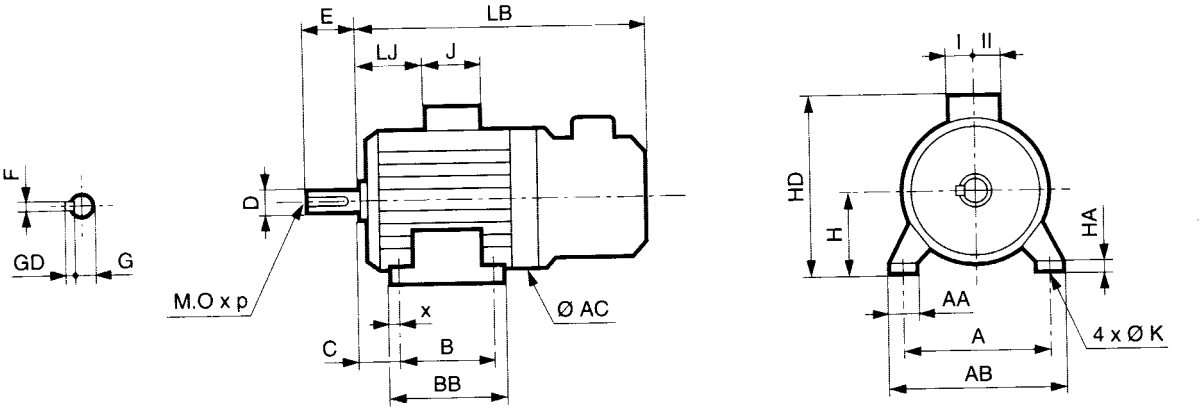
LS motor - FCPL brake

Dimensions

Dimensions of FCPL brake induction motors - 4, 6, 8 poles
IP 55 motor protection, IP 44 brake protection

Dimensions in millimetres

- Foot mounted



Type	Brake induction motors																
	A	AB	B	BB	C	X	AA	K	HA	H	AC	HD	LB	LJ	J	I	II
LS 160 MP	254	294	210	294	108	20	64	14.5	25	160	264	360	603	55	160	55	55
LS 160 LR	254	294	254	294	108	20	64	14.5	25	160	264	360	603	55	160	55	55
LS 160 M	254	294	210	294	108	20	60	14.5	25	160	345	395	668	44	134	92	63
LS 160 L	254	294	254	294	108	20	60	14.5	25	160	345	395	668	44	134	92	63
LS 180 MT	279	324	241	316	121	20	79	14.5	28	180	345	415	668	44	134	92	63
LS 180 LR	279	324	279	316	121	20	79	14.5	28	180	345	415	683	44	134	92	63
LS 180 L	279	339	279	329	121	25	86	14.5	25	180	384	435	795	54	205	100	95
LS 200 LT	318	378	305	365	133	30	108	18.5	32	200	384	455	828	60	205	100	95
LS 200 L	318	388	305	375	133	35	103	18.5	36	200	410	475	874[1]	68	205	100	95
LS 225 ST	356	431	286	386	149	50	127	18.5	36	225	410	500	911	74	205	100	95
LS 225 MR	356	431	311	386	149	50	127	18.5	36	225	410	500	953	74	205	100	95
LS 250 SE	406	470	311	420	168	35	90	24	36	250	481	654	1 180	68	292	148	180
LS 250 ME	406	470	349	420	168	35	90	24	36	250	481	654	1 180	68	292	148	180
LS 280 SC/SD	457	520	368	478	190	35	90	24	35	280	505	684	1 246	68	292	148	180
LS 280 MC/MD	457	520	419	478	190	35	90	24	35	280	505	684	1 246	68	292	148	180

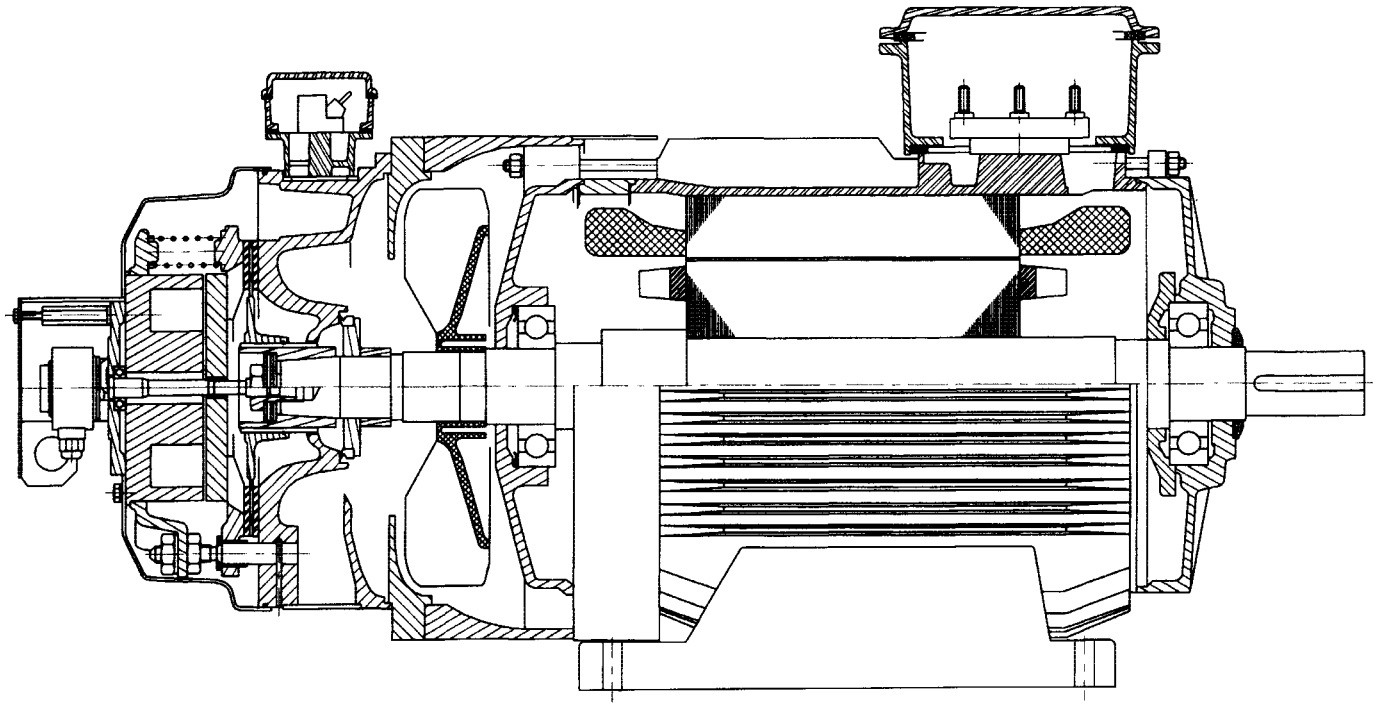
1. Dimension for FCPL 60-230. For the FCPL 60-239: LB = 905.

Type	Output shaft						
	F	GD	D	G	E	O	p
LS 160 MP/LR/M/L	12	8	42 k6	37	110	16	36
LS 180 MT/LR/L	14	9	48 k6	42.5	110	16	36
LS 200 LT/L	16	10	55 m6	49	110	20	42
LS 225 ST/MR	18	11	60 m6	53	140	20	42
LS 250 SE/ME	18	11	65 m6	58	140	20	42
LS 280 SC/MC/SD/MD	20	12	75 m6	67.5	140	20	42

LSMV motor - FCPL brake

Cross-sectional view of motor

LSMV motor - FCPL brake - B3 mounting - Encoder



LSMV motor - FCPL brake

General

D.C. brake induction motors, LSMV series, failsafe, power rating 7.5 to 90 kW, frame sizes 160 to 280 mm, 4, and 6 poles; 230/400 V 50 Hz.

Motor protection
Standard version IP 55.

Brake protection
Standard version IP 44.

Thermal protection
Via PTC sensor.

Motor housing
With cooling fins, pressure die-cast in aluminium alloy.

End shields and brake shield
In cast iron fixed using tie rods.

Brake housing
In cast iron, screwed to the shield.
Brake protected by a steel cover.

Bearings
Sealed C3 type ball bearings (type 2RS) from 160 to 225 SR.
Regreasable from 225 MK to 280.

Bearings fitted:
- as a thrust at the front
- heavily preloaded at the rear to eliminate axial oscillation

Finish
Assembly using zinc bichromate or cadmium finish on screws.
RAL 9005 (black) paint finish.
Identification on a riveted aluminium plate.

Motor power supply
Via frequency inverter.

Brake power supply
Separate: In the standard version D.C. is supplied from the 400 V supply via an S07 rectifier or a CDF doping device.

Winding
Class F as standard, with reinforced insulation.

Rotor
Squirrel cage pressure die-cast in aluminium.

Metal terminal boxes (motor and brake)
Sealed, fitted with cable gland, mounted on top of the motor or brake shield.

Connection of the A.C. supply
- Stator: terminal block with 6 terminals enabling connection to the supply via connector links (see diagram inside the terminal box).
- Brake:
FCPL 40, 54 and 60: When the rectifier is provided, it is mounted inside the motor or brake terminal box.
FCPL 88: terminal box integrated in the brake shield under the cover.

Individual checks before sending
Routine tests, no-load test, short-circuit test, dielectric test, checks on options and direction of rotation.
Running-in and traceability of the brake disk.

Options

Motor
Motor with cast iron body and shields.
Forced ventilation.

Encoder
Standard, 1024 pulses, 5 V power supply.
2-channel encoder + 0 marker + additional channels.
Connection via 12-pin connector.

Brake
Braking torque = rated torque. The brake can be smaller, please consult Leroy Somer.
Brake voltage (20 V, 100 V, 200 V).
Manual release.
Brake release indicator.
Lining wear indicator.
Special brake terminal box position available on request.

CDF power supply device for reduced brake response time.

LSMV motor - FCPL brake

Selection

4 poles 1500 min^{-1}

• LSMV motor - IP 55 - 50 Hz - Class F - 230/400 V - Aluminium rotor, S1 duty
• D.C. brake - IP 44 - Separate brake power supply
High braking torque

Type of motor	Type of brake	Rated power at 50 Hz P_N kW	Rated speed N_N min^{-1}	Rated current I_N (400 V) A	Power factor cos φ 4/4	Efficiency η % 4/4	Starting torque/ Rated torque M_D/M_N	Rated torque M_N N.m	Moment of inertia J kg.m^2	Braking torque M_f ± 20% N.m	Weight IM B3 kg
LSMV 160 MR	**40 - 112**	11	1460	20.2	0.88	89	2.5	72	0.058	125	105
LSMV 160 LU	**54 - 215**	15	1465	28.1	0.85	90.6	3.6	100	0.117	150	150
LSMV 180 M	**54 - 318**	18.5	1468	34.4	0.84	92.4	2.9	120	0.150	180	200
LSMV 180 LU	**54 - 222**	22	1465	40.8	0.86	90.6	2.8	144	0.171	220	205
LSMV 200 L	**60 - 330**	30	1475	55.1	0.85	92.4	2.9	195	0.306	300	255
LSMV 225 SR	**60 - 239**	37	1475	66.8	0.86	93	2.8	235	0.365	390	320
LSMV 225 MG	**60 - 152**	45	1 482	83,1	0,83	94,2	3,1	290	0,749	520	400
LSMV 250 ME	**60 - 260**[1]	55	1 482	100	0,84	94,4	2,9	354	0,988	590	420
LSMV 280 SD	**88 - 180**[1]	75	1 482	138	0,83	94,7	3,3	483	1,132	800	600
LSMV 280 MK	**88 - 195**[1]	90	1490	164	0.84	94.3	3.1	577	2.793	950	860
LSMV 315	Please consult Leroy-Somer										

1. Requires a CDF power supply device.

6 poles 1000 min^{-1}

• LSMV motor - IP 55 - 50 Hz - Class F - 230/400 V - Aluminium rotor, S1 duty
• D.C. brake - IP 44 - Separate brake power supply
High braking torque

Type of motor	Type of brake	Rated power at 50 Hz P_N kW	Rated speed N_N min^{-1}	Rated current I_N (400 V) A	Power factor cos φ 4/4	Efficiency η % 4/4	Starting torque/ Rated torque M_D/M_N	Rated torque M_N N.m	Moment of inertia J kg.m^2	Braking torque M_f ± 20% N.m	Weight IM B3 kg
LSMV 160 M	**40 - 112**	7.5	967	16.1	0.79	85.2	2.1	74	0.100	125	120
LSMV 160 L	**54 - 318**	11	967	23.3	0.79	86.3	2.1	109	0.140	180	140
LSMV 180 L	**60 - 126**	15	972	30.1	0.81	88.7	2.8	147	0.232	260	200
LSMV 200 LT	**60 - 230**[1]	18.5	970	37	0.81	89	2.8	182	0.281	300	240
LSMV 200 L	**60 - 239**	22	972	43.6	0.81	89.9	2.7	215	0.366	390	280
LSMV 225 MR	**60 - 152**	30	968	59.5	0.81	89.9	2.5	296	0.475	520	320
LSMV 250 ME	**60 - 260**[1]	37	978	71,1	0,81	92,7	2,3	361	0,994	590	385
LSMV 280 SC	**88 - 180**[1]	45	978	86,5	0,81	92,7	2,3	439	1,268	800	510
LSMV 280 MC	**88 - 195**[1]	55	978	106	0,81	92,6	2,4	537	1,463	950	555
LSMV 315	Please consult Leroy-Somer										

1. Requires a CDF power supply device.

Weights and dimensions are given for information only.

LSMV motor - FCPL brake

Selection guide

Speed variation range from 25 to 50 Hz (ratio of 1 to 2):
The standard motor from the LS - FCPL range is suitable for your application.

Speed variation range from 5 to 50 Hz (ratio of 1 to 10):
Select a motor from the LSMV- FCPL range.

Extended speed variation range. Frequency less than 5 Hz[1] and greater than 70 Hz[2]:
Select a motor from the LSMV- FCPL range.

Speed variation range from 0 to 50 Hz - intermittent duty [1]:
Select a motor from the LSMV- FCPL range with encoder.

Speed variation range from 0 to 50 Hz - continuous duty:
Select a motor from the LSMV- FCPL range with encoder and forced ventilation.

1. When the reduced speed duty is greater than 10%, forced ventilation should be provided for the motor.
2. For hoisting applications above 50 Hz, your selection should be confirmed by Leroy Somer.

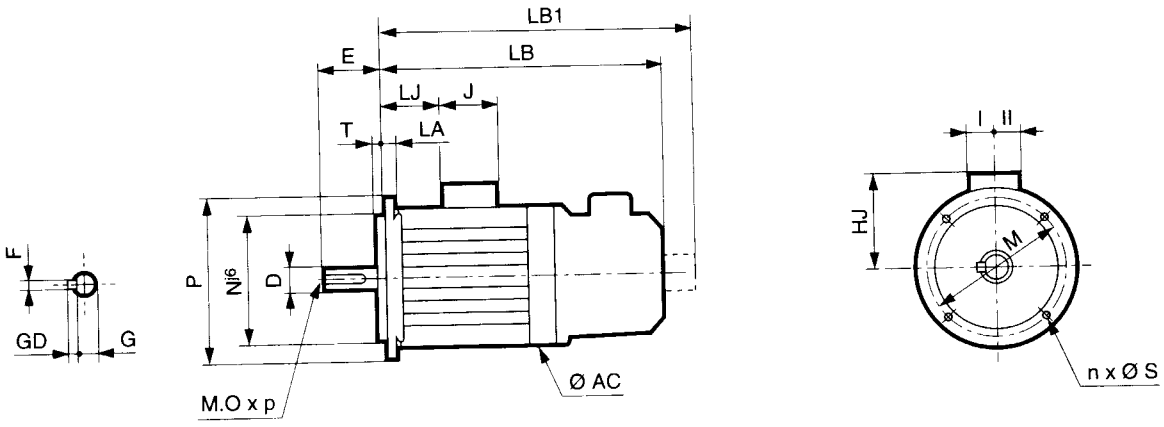
LSMV motor - FCPL brake

Dimensions

Dimensions of FCPL brake induction motors - 4, 6 poles
IP 55 motor protection, IP 44 brake protection

Dimensions in millimetres

- Flange mounted (FF)



	Brake induction motors								
Type	LB	AC	LB1[1]	HJ	LJ	J	I	II	Symbol
LSMV 160 MR	603	264	673	200	55	160	55	55	FF 300
LSMV 160 M	668	345	748	235	44	134	92	63	FF 300
LSMV 160 L	668	345	748	235	44	134	92	63	FF 300
LSMV 160 LU	683	345	763	235	44	134	92	63	FF 300
LSMV 180 M	752	384	859	255	54	205	100	95	FF 300
LSMV 180 L	795	384	875	255	54	205	100	95	FF 300
LSMV 180 LU	779	384	859	255	54	205	100	95	FF 300
LSMV 200 LT	828	384	908	255	60	205	100	95	FF 350
LSMV 200 L	905	410	985	275	68	205	100	95	FF 350
LSMV 225 SR	953	410	1033	275	74	205	100	95	FF 400
LSMV 225 MR	953	410	1033	275	74	205	100	95	FF 400
LSMV 225 MG	1 180	481	1 180	404	68	292	148	180	FF 400
LSMV 250 ME	1 180	481	1 180	404	68	292	148	180	FF 500
LSMV 280 SC/SD	1 246	505	1 246	404	68	292	148	180	FF 500
LSMV 280 MC/MD	1 246	505	1 246	404	68	292	148	180	FF 500
LSMV 280 MK	1310	586	1310	465	99	292	148	180	FF 500

1. Encoder included.

	Flanges							
Type	Symbol	M	N	P	T	n	S	LA
LSMV 160	FF 300	300	250	350	5	4	18.5	14
LSMV 180	FF 300	300	250	350	5	4	18.5	14
LSMV 200	FF 350	350	300	400	5	4	18.5	15
LSMV 225	FF 400	400	350	450	5	8	18.5	16
LSMV 250	FF 500	500	450	550	5	8	18.5	18
LSMV 280	FF 500	500	450	550	5	8	18.5	18

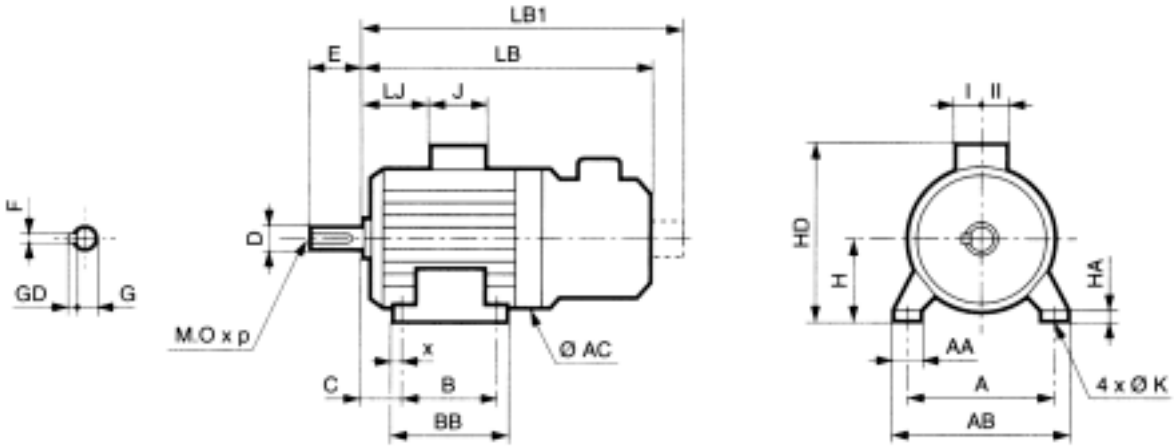
LSMV motor - FCPL brake

Dimensions

Dimensions of FCPL brake induction motors - 4, 6 poles
IP 55 motor protection, IP 44 brake protection

Dimensions in millimetres

- Foot mounted



	Brake induction motors																	
Type	A	AB	B	BB	C	X	AA	K	HA	H	AC	HD	LB	LB1'	LJ	J	I	II
LSMV 160 MR	254	294	210	294	108	20	64	14.5	25	160	264	360	603	673	55	160	55	55
LSMV 160 M	254	294	210	294	108	20	60	14.5	25	160	345	395	668	748	44	134	92	63
LSMV 160 L	254	294	254	294	108	20	60	14.5	25	160	345	395	668	748	44	134	92	63
LSMV 160 LU	254	294	254	294	108	20	60	14.5	25	160	345	395	683	763	44	134	92	63
LSMV 180 M	279	339	241	291	121	25	86	14.5	25	180	384	435	752	859	54	205	100	95
LSMV 180 L	279	339	279	329	121	25	86	14.5	25	180	384	435	795	875	54	205	100	95
LSMV 180 LU	279	339	279	329	121	25	86	14.5	25	180	384	435	779	859	54	205	100	95
LSMV 200 LT	318	378	305	365	133	30	108	18.5	32	200	384	455	828	908	60	205	100	95
LLSMV 200 L	318	388	305	375	133	35	103	18.5	36	200	410	475	905	985	68	205	100	95
LSMV 225 SR	356	431	286	386	149	50	127	18.5	36	225	410	500	953	1033	74	205	100	95
LSMV225 MR	356	431	311	386	149	50	127	18.5	36	225	410	500	953	1033	74	205	100	95
LSMV 225 MG	356	420	311	375	149	30	65	18,5	30	225	481	629	1 180	1 180	68	292	148	180
LSMV 250 ME	406	470	349	420	168	35	90	24	36	250	481	654	1 180	1 180	68	292	148	180
LSMV 280 SC/SD	457	520	368	478	190	35	90	24	35	280	505	684	1 246	1 246	68	292	148	180
LSMV 280 MC/MD	457	520	419	478	190	35	90	24	35	280	505	684	1 246	1 246	68	292	148	180
LSMV 280 MK	457	533	419	495	190	40	85	24	35	280	586	745	1310	1310	99	292	148	180

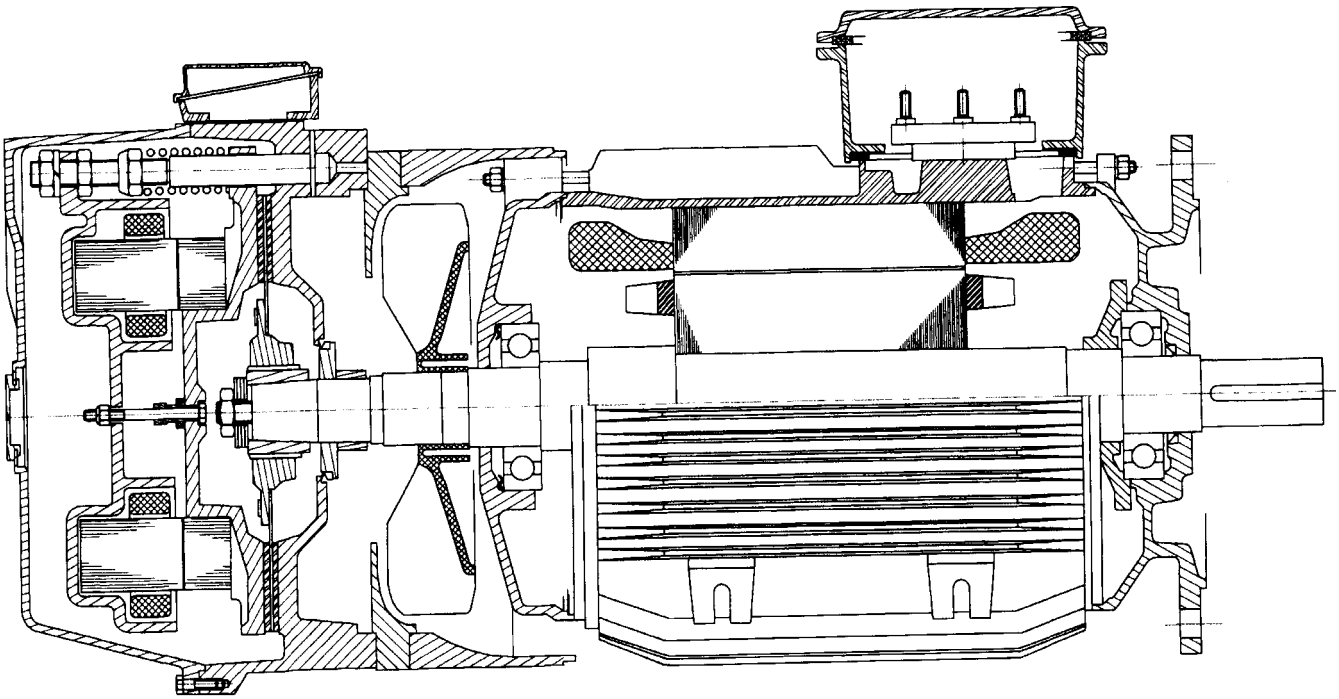
1. Encoder included.

	Output shaft						
Type	F	GD	D	G	E	O	p
LSMV 160 M/L/LU/MR	12	8	42 k6	37	110	16	36
LSMV 180 M/L/LU	14	9	48 k6	42,5	110	16	36
LSMV 200 LT/L	16	10	55 m6	49	110	20	42
LSMV 225 SR/MR/MG	18	11	60 m6	53	140	20	42
LSMV 250 ME	18	11	65 m6	58	140	20	42
LSMV 280 SC/SD/MC/MD/MK	20	12	75 m6	67,5	140	20	42

LS motor - FAP brake

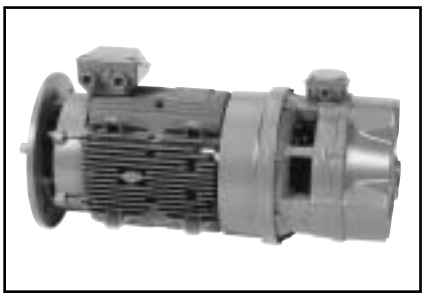
Cross-sectional view of motor

LS motor - FAP brake - B5 mounting



LS motor - FAP brake

General



3-phase brake induction motors, LS series, failsafe, power rating 4 to 37 kW, frame sizes 160 to 225 mm, 4, 6 and 8 poles; 230/400 V 50 Hz.

Motor protection
Standard version IP 55.

Brake protection
Standard version IP 44.

Motor housing
With cooling fins, pressure die-cast in aluminium alloy.

End shields and brake shield
In cast iron fixed using tie rods.

Brake housing
In cast iron, screwed to the shield.
Brake protected by a cast iron cover.

Bearings
Sealed C3 ball bearings (type 2RS), greased for life.

Bearings fitted:
- as a thrust at the front
- heavily preloaded at the rear to eliminate axial oscillation

Finish
Assembly using zinc bichromate or cadmium finish on screws.
RAL 6000 (green) paint finish.
Identification on a riveted aluminium plate.

Motor power supply
Standard 230/400 V at 50 Hz.

Brake power supply
Separate: 230/400 V at 50 Hz.

Winding
Standard: class F.

Rotor
With squirrel cage pressure die-cast in aluminium for operation in S1 duty, in special alloy for operation in S3 duty (DP rotor).

Metal terminal boxes (motor and brake)
Sealed, fitted with cable gland, mounted on top of the motor and brake shield.

Connection of the A.C. supply
- Stator: terminal block with 6 terminals enabling connection to the supply via connector links (see diagram inside the terminal box).
- Brake: terminal block with 6 terminals enabling connection to the supply via connector links.

Individual checks before sending
Routine tests, no-load test, short-circuit test, dielectric test, checks on options and direction of rotation.
Running-in and traceability of brake disk.

Conditions of use
Number of starts allowed:
- For continuous duty:
6 starts per hour.
• For an operating factor of 40%:
- LS 160-180 = 180 (DP rotor compulsory)
- LS 200-225 = 150 (DP rotor compulsory)
Higher operating rates: please contact Leroy-Somer.

Options

Motor
Multi-speed (see section 2 speeds).
Construction allowing Y/Δ starting.
PTO, PTF, PTC protection sensors.
Space heaters.
Roller bearing (except LS 160MP).
Forced ventilation as required.

Brake
IP 55 protection.
Release by lever.
Brake release indicator.
Lining wear indicator.
Tachogenerator or alternator.
Second shaft end for crankshaft socket.
Special brake terminal box position available on request.

LS motor - FAP brake

Selection

4 poles 1500 min^{-1}

• LS motor - IP 55 - 50 Hz - Class F - 230/400 V - Aluminium rotor, S1 duty
• 3-phase A.C. brake - IP 44 or IP 55 - Separate brake power supply
High braking torque

Type of motor	Type of brake	Rated power at 50 Hz P_N kW	Rated speed N_N min^{-1}	Rated current I_N (400 V) A	Power factor cos φ 4/4	Efficiency η % 4/4	Starting current/ Rated current I_D/I_N	Starting torque/ Rated torque M_D/M_N	Rated torque M_N N.m	Moment of inertia J kg.m^2	Braking torque M_r ± 20% N.m	Weight IM B3 kg
LS 160 MP	**FAP 132**	11	1456	21.1	0.85	88.4	7.7	2.9	72	0.055	110	115
LS 160 L	**FAP 160**	15	1455	28.6	0.85	89.1	6.5	2.7	98	0.104	150	150
LS 180 MT	**FAP 160**	18.5	1456	35.4	0.84	90.3	7.4	2.9	121	0.116	180	150
LS 180 L	**FAP 180**	22	1456	41.7	0.84	90.7	7.4	3.2	144	0.158	220	200
LS 200 LT	**FAP 180**	30	1460	56.3	0.84	91.5	6.6	2.7	196	0.189	290	240
LS 225 ST	**FAP 200/2**	37	1470	68.7	0.84	92.5	6.5	2.6	239	0.330	390	320

For larger sizes, please consult Leroy Somer.

6 poles 1000 min^{-1}

• LS motor - IP 55 - 50 Hz - Class F - 230/400 V - Aluminium rotor, S1 duty
• 3-phase A.C. brake - IP 44 or IP 55 - Separate brake power supply
High braking torque

Type of motor	Type of brake	Rated power at 50 Hz P_N kW	Rated speed N_N min^{-1}	Rated current I_N (400 V) A	Power factor cos φ 4/4	Efficiency η % 4/4	Starting current/ Rated current I_D/I_N	Starting torque/ Rated torque M_D/M_N	Rated torque M_N N.m	Moment of inertia J kg.m^2	Braking torque M_r ± 20% N.m	Weight IM B3 kg
LS 160 M	**FAP 132**	7.5	967	16.1	0.79	85.2	4.7	1.5	74	0.105	110	130
LS 160 L	**FAP 160**	11	967	23.3	0.79	86.3	4.6	1.6	109	0.150	180	160
LS 180 L	**FAP 180**	15	972	30.1	0.81	88.7	6.8	2.3	147	0.234	260	200
LS 200 LT	**FAP 180**	18.5	970	37.0	0.81	89.0	6.4	2.4	182	0.283	290	230
LS 200 L	**FAP 200/1**	22	972	43.6	0.81	89.9	6.0	2.0	216	0.353	390	280
LS 225 MR	**FAP 200/2**	30	968	59.5	0.81	89.9	6.0	2.2	296	0.499	470	350

For larger sizes, please consult Leroy Somer.

Weights and dimensions are given for information only.

LS motor - FAP brake

Selection

• LS motor - IP 55 - 50 Hz - Class F - 230/400 V - Aluminium rotor, S1 duty
• 3-phase A.C. brake - IP 44 or IP 55 - Separate brake power supply
High braking torque

		Rated power at 50 Hz	Rated speed	Rated current	Power factor	Efficiency	Starting current/ Rated current	Starting torque/ Rated torque	Rated torque	Moment of inertia	Braking torque	Weight
Type of motor	**Type of brake**	P_N kW	N_N min^{-1}	I_N (400 V) A	cos φ 4/4	η % 4/4	I_D/I_N	M_D/M_N	M_N N.m	J $kg.m^2$	M_f ± 20% N.m	IM B3 kg
LS 160 M	**FAP 132**	4	715	11.1	0.65	80.0	3.2	1.9	53	0.083	90	110
LS 160 M	**FAP 132**	5.5	715	14.8	0.65	82.4	3.5	1.9	74	0.087	110	130
LS 160 L	**FAP 160**	7.5	715	19.7	0.67	82.1	3.4	1.9	100	0.121	150	160
LS 180 L	**FAP 180**	11	720	25.6	0.72	86.0	3.8	1.4	147	0.249	260	210
LS 200 L	**FAP 200/1**	15	725	32.9	0.75	87.7	4.4	1.6	198	0.339	290	270
LS 225 ST	**FAP 200/2**	18.5	725	42.4	0.72	87.5	4.2	1.6	244	0.445	390	320

For larger sizes, please consult Leroy Somer.

Weights and dimensions are given for information only.

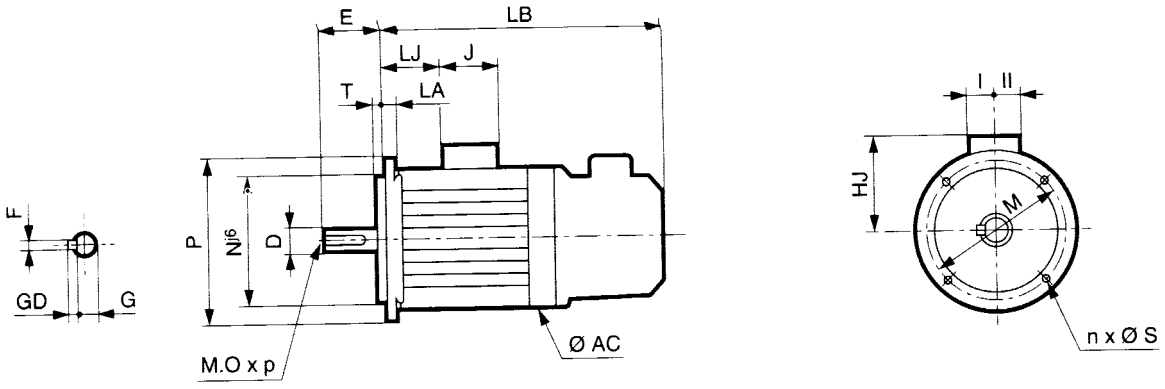
LS motor - FAP brake

Dimensions

Dimensions of FAP brake induction motors - 4, 6, 8 poles
IP 55 motor protection, IP 44 or IP 55 brake protection

Dimensions in millimetres

- Flange mounted (FF)



	Brake induction motors							
Type	LB	AC	HJ	LJ	J	I	II	Symbol
LS 160 MP	608	270	208	44	134	92	63	FF 300
LS 160 M	680	345	235	44	134	92	63	FF 300
LS 160 L	708	345	235	44	134	92	63	FF 300
LS 180 MT	708	345	235	44	134	92	63	FF 300
LS 180 L	784	384	255	54	205	100	95	FF 300
LS 200 LT	817	384	255	60	205	100	95	FF 350
LS 200 L	874	410	275	68	205	100	95	FF 350
LS 225 ST	907	410	275	74	205	100	95	FF 400
LS 225 MR	949	410	275	74	205	100	95	FF 400

	Flanges							
Type	Symbol	M	N	P	T	n	S	LA
LS 160/180	FF 300	300	250	350	5	4	18.5	14
LS 200	FF 350	350	300	400	5	4	18.5	15
LS 225	FF 400	400	350	450	5	8	18.5	16

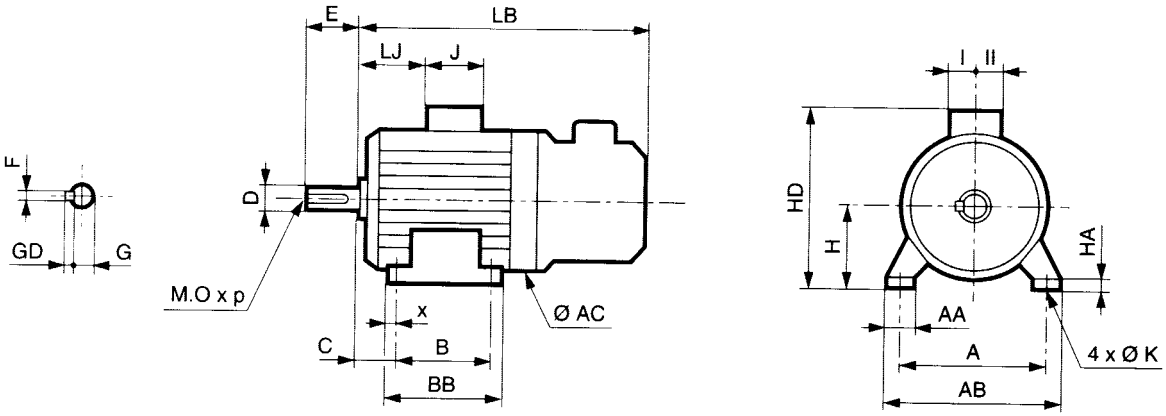
LS motor - FAP brake

Dimensions

Dimensions of FAP brake induction motors - 4, 6, 8 poles
IP 55 motor protection, IP 44 and IP 55 brake protection

Dimensions in millimetres

- Foot mounted



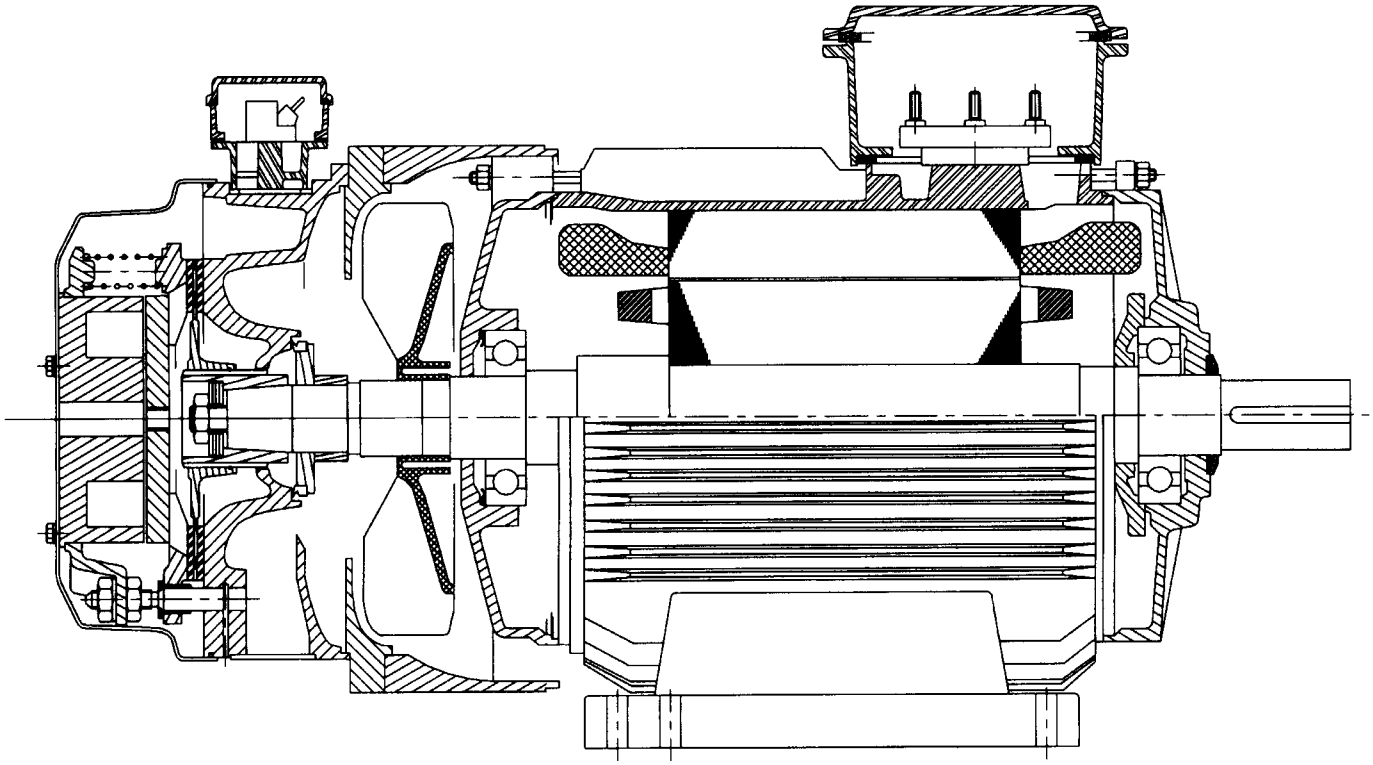
	Brake induction motors																
Type	A	AB	B	BB	C	X	AA	K	HA	H	AC	HD	LB	LJ	J	I	II
LS 160 MP	254	294	210	294	108	20	64	14.5	25	160	270	368	608	44	134	92	63
LS 160 M	254	294	210	294	108	20	60	14.5	25	160	345	395	680	44	134	92	63
LS 160 L	254	294	254	294	108	20	60	14.5	25	160	345	395	708	44	134	92	63
LS 180 MT	279	324	241	316	121	20	79	14.5	28	180	345	415	708	44	134	92	63
LS 180 L	279	339	279	329	121	25	86	14.5	25	180	384	435	784	54	205	100	95
LS 200 LT	318	378	305	365	133	30	108	18.5	32	200	384	455	817	60	205	100	95
LS 200 L	318	388	305	375	133	35	103	18.5	36	200	410	475	874	68	205	100	95
LS 225 ST	356	431	286	386	149	50	127	18.5	36	225	410	500	907	74	205	100	95
LS225 MR	356	431	311	386	149	50	127	18.5	36	225	410	500	949	74	205	100	95

	Output shaft						
Type	F	GD	D	G	E	O	p
LS 160 MP/M	12	8	42 k6	37	110	16	36
LS 160 L	12	8	42 k6	37	110	16	36
LS 180 MT	14	9	48 k6	42.5	110	16	36
LS 180 L	14	9	48 k6	42.5	110	16	36
LS 200 LT	16	10	55 m6	49	110	20	42
LS 200 L	16	10	55 m6	49	110	20	42
LS 225 ST	18	11	60 m6	53	140	20	42
LS 225 MR	18	11	60 m6	53	140	20	42

FLS motor - FCPL brake

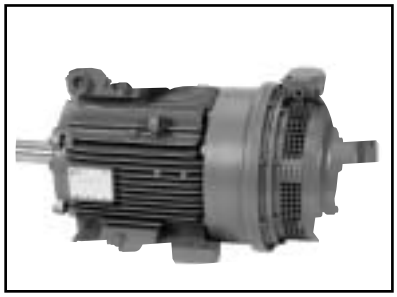
Cross-sectional view of motor

FLS motor - FCPL brake - B3 mounting



FLS motor - FCPL brake

General



D.C. brake induction motors, FLS series, failsafe, power rating 4 to 90 kW, frame sizes 160 to 280 mm, 4, 6 and 8 poles; 230/400 V 50 Hz.

Motor protection
Standard version IP 55.

Brake protection
Standard version IP 44.

Motor housing
With cast iron cooling fins.

End shields and brake shield
In cast iron, fixed by screws.

Brake housing
In cast iron, screwed to the shield.
Brake protected by a steel cover.

Bearings
Sealed C3 ball bearings (type 2RS) from 160 to 180.
Regreasable from 200.

Bearings fitted:
- as a thrust at the front
- heavily preloaded at the rear to eliminate axial oscillation

Finish
Assembly using zinc bichromate or cadmium finish on screws.
RAL 6000 (green) paint finish.
Identification on a riveted aluminium plate.

Motor power supply
Standard 230/400 V.

Brake power supply
Separate : In the standard version D.C. is supplied from the 400 V supply via an S07 rectifier or a CDF doping device.

Winding
Standard, class F.

Rotor
With squirrel cage pressure die-cast in aluminium for operation in S1 duty, in special alloy for operation in S3 duty (DP rotor).

Metal terminal boxes (motor and brake)
Sealed, fitted with cable gland, mounted on top of the motor and brake shield.

Connection of the A.C. supply
- Stator: terminal block with 6 terminals for single-speed motors enabling connection to the supply via connector links.
- Brake:
FCPL 40, 54 and 60: When the rectifier is provided it is mounted inside the brake terminal box.
FCPL 88: terminal box integrated in the brake shield under the cover.

Individual checks before sending
Routine tests, no-load test, short-circuit test, dielectric test, checks on options and direction of rotation.
Running-in and traceability of brake disk.

Conditions of use
Number of starts permissible:
- For continuous duty:
- 6 starts per hour.
• For an operating factor of 40%:
- FLS 160-180 = 180 (DP rotor compulsory)
- FLS 200-280 = 150 (DP rotor compulsory)
Higher operating rates: please contact Leroy-Somer.
Larger frame sizes: please contact Leroy-Somer.

Options

Motor
Multi-speed (see section 2 speeds).
IP 56 non-ventilated motor
Construction allowing Y/Δ starting.
PTO, PTF, PTC protection sensors.
Space heaters.
Regreasable bearings.
Roller bearings.
Forced ventilation.

Brake
Brake voltage (20 V, 100 V, 200 V).
Release by a lever (DLRA).
Brake release indicator.
Lining wear indicator.
Adaptation of an encoder, a tachogenerator or an alternator.
Second shaft end for crankshaft socket.
Special brake terminal box position available on request.

CDF power supply device for reduced brake response time.

FLS motor - FCPL brake

Selection

4 poles 1500 min^{-1}

• FLS motor - IP 55 - 50 Hz - Class F - 230/400 V - Aluminium rotor, S1 duty
• D.C. brake - IP 44 - Separate brake power supply
High braking torque

Type of motor	Type of brake	Rated power at 50 Hz P_N kW	Rated speed N_N min^{-1}	Rated current I_N (400 V) A	Power factor cos φ 4/4	Efficiency η % 4/4	Starting current/ Rated current I_D/I_N	Starting torque/ Rated torque M_D/M_N	Rated torque M_N N.m	Moment of inertia J kg.m^2	Braking torque M_r ± 20% N.m	Weight IM B3 kg
FLS 160 M	**40 - 112**	11	1455	21	0.86	88.5	7.8	2.6	72.2	0.074	125	140
FLS 160 L	**54 - 215**	15	1455	28	0.86	89.5	7.8	2.6	98.5	0.100	150	160
FLS 180 MR	**54 - 318**	18.5	1465	35	0.86	90	7.8	2.6	121	0.117	180	180
FLS 180 L	**54 - 222**	22	1465	40.5	0.86	91.4	7.4	2.6	143	0.161	220	220
FLS 200 L	**60 - 230[1]**	30	1471	56	0.85	91.9	6.5	2.5	195	0.261	300	330
FLS 225 ST	**60 - 239**	37	1476	70	0.82	93.5	7	2.5	240	0.336	390	380
FLS 225 M	**60 - 152**	45	1483	79	0.87	94.5	7	2.4	290	0.733	520	470
FLS 250 M	**60 - 260[1]**	55	1479	101	0.84	94.5	6.5	2.5	355	0.733	590	480
FLS 280 S	**88 - 180[1]**	75	1483	137	0.84	94.9	7.7	2.9	484	0.986	800	650
FLS 280 M	**88 - 195[1]**	90	1478	162	0.85	95	7.6	3	581	1.213	950	740
FLS 315	Please consult Leroy-Somer.											

1. Requires a CDF brake power supply device.

6 poles 1000 min^{-1}

• FLS motor - IP 55 - 50 Hz - Class F - 230/400 V - Aluminium rotor, S1 duty
• D.C. brake - IP 44 - Separate brake power supply
High braking torque

Type of motor	Type of brake	Rated power at 50 Hz P_N kW	Rated speed N_N min^{-1}	Rated current I_N (400 V) A	Power factor cos φ 4/4	Efficiency η % 4/4	Starting current/ Rated current I_D/I_N	Starting torque/ Rated torque M_D/M_N	Rated torque M_N N.m	Moment of inertia J kg.m^2	Braking torque M_r ± 20% N.m	Weight IM B3 kg
FLS 160 M	**40 - 112**	7.5	965	15.8	0.80	86	5	1.5	74	0.100	125	140
FLS 160 L	**54 - 318**	11	965	22.7	0.81	87	5	1.5	109	0.140	180	170
FLS 180 L	**54 - 326[1]**	15	975	29.6	0.82	89.5	7.1	2.1	147	0.222	260	210
FLS 200 L	**60 - 230[1]**	18.5	975	36	0.83	90.7	7	2.2	181	0.308	300	310
FLS 200 L	**60 - 239**	22	973	43	0.81	91.5	7	2.2	215	0.359	390	350
FLS 225 M	**60 - 152**	30	977	59	0.80	92	6	2	293	0.991	520	470
FLS 250 M	**60 - 260[1]**	37	977	72	0.80	92.5	6.2	2.2	362	0.991	590	480
FLS 280 S	**88 - 180[1]**	45	971	84	0.84	93	6	1.9	440	1.228	800	630
FLS 280 M	**88 - 195[1]**	55	977	109	0.79	93	6.9	2.8	538	1.477	950	700
FLS 315	Please consult Leroy-Somer.											

1. Requires a CDF brake power supply device.

Weights and dimensions are given for information only.

FLS motor - FCPL brake

Selection

• FLS motor - IP 55 - 50 Hz - Class F - 230/400 V - Aluminium rotor, S1 duty
• D.C. brake - IP 44 - Separate brake power supply
High braking torque

		Rated power at 50 Hz	Rated speed	Rated current	Power factor	Efficiency	Starting current/ Rated current	Starting torque/ Rated torque	Rated torque	Moment of inertia	Braking torque	Weight
Type of motor	**Type of brake**	P_N kW	N_N min^{-1}	I_N (400 V) A	cos φ 4/4	η % 4/4	I_D/I_N	M_D/M_N	M_N N.m	J $kg.m^2$	M_f ± 20% N.m	IM B3 kg
FLS 160 M	**40 - 109**	4	710	11.3	0.63	81.5	3.8	1.6	54	0.078	95	140
FLS 160 M	**40 - 112**	5.5	710	14.9	0.65	82	3.7	1.7	74	0.089	125	140
FLS 160 L	**54 - 215**	7.5	715	19.5	0.65	83	3.7	1.8	100	0.111	150	170
FLS 180 L	**54 - 326[1]**	11	724	26.6	0.70	85.1	3.9	1.4	147	0.237	260	210
FLS 200 L	**60 - 230[1]**	15	730	34	0.72	88.1	5	1.8	196	0.368	300	330
FLS 225 ST	**60 - 239**	18.5	730	41	0.73	89	5	1.6	242	0.448	390	370
FLS 225 M	**60 - 152**	22	730	48	0.72	92.1	5.9	1.6	288	1.172	520	470
FLS 250 M	**60 - 260[1]**	30	730	61	0.78	92	6.2	1.75	392	1.221	600	480
FLS 280 S	**88 - 180[1]**	37	726	74.4	0.78	91.7	4.5	1.6	487	-	800	640
FLS 280 M	**88 - 195[1]**	45	726	102	0.7	94.2	6	1.65	592	-	950	730
FLS 315		Please consult Leroy-Somer.										

1. Requires a CDF brake power supply device.

Weights and dimensions are given for information only.

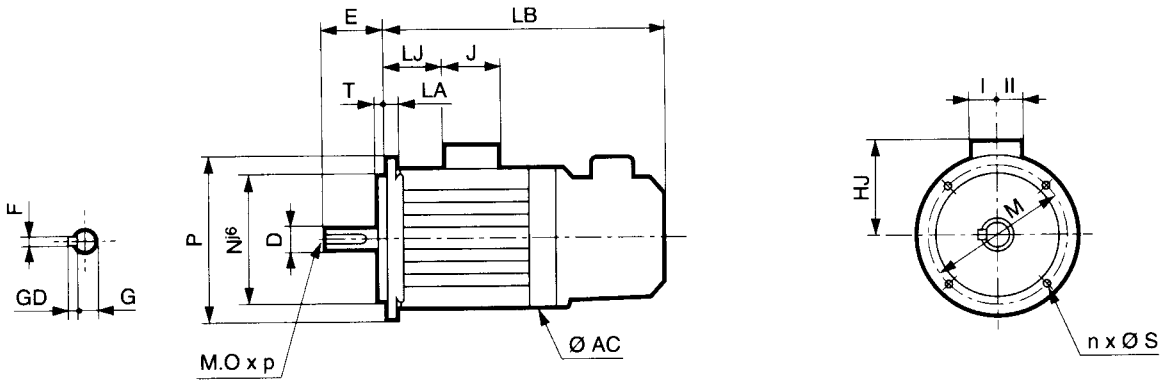
FLS motor - FCPL brake

Dimensions

Dimensions of FCPL brake induction motors - 4, 6, 8 poles
IP 55 motor protection, IP 44 brake protection

Dimensions in millimetres

- Flange mounted (FF)



Type	Brake induction motors							
	LB	AC	HJ	LJ	J	I	II	Symbol
FLS 160 M	668	345	225	50	160	80	80	FF 300
FLS 160 L	668	345	225	50	160	80	80	FF 300
FLS 180 MR	683	345	225	50	160	80	80	FF 300
FLS 180 L	752	384	280	55	220	128	128	FF 300
FLS 200 L	882	410	315	65	220	128	128	FF 350
FLS 225 ST	955	410	315	65	220	128	128	FF 400
FLS 225 M	1 078	481	431	70	352	173	210	FF 400
FLS 250 M	1 158	481	431	70	352	173	210	FF 500
FLS 280 S	1 224	505	431	70	352	173	210	FF 500
FLS 280 M	1 324	505	431	70	352	173	210	FF 500

Type	Flanges							
	Symbol	M	N	P	T	n	S	LA
FLS 160/180	FF 300	300	250	350	5	4	18	15
FLS 200	FF 350	350	300	400	5	4	18	15
FLS 225	FF 400	400	350	450	5	8	18	16
FLS 250	FF 500	500	450	550	5	8	18	18
FLS 280	FF 500	500	450	550	5	8	18	22

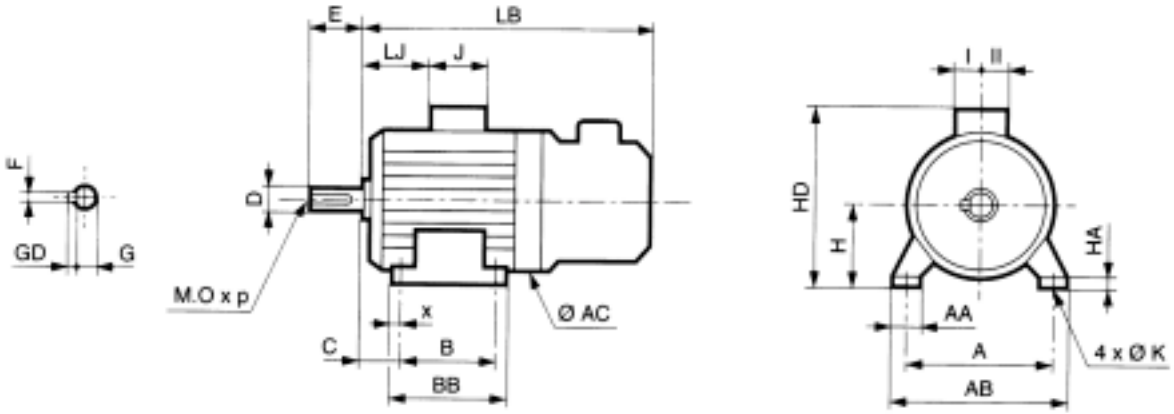
FLS motor - FCPL brake

Dimensions

Dimensions of FCPL brake induction motors - 4, 6, 8 poles
IP 55 motor protection, IP 44 brake protection

Dimensions in millimetres

- Foot mounted



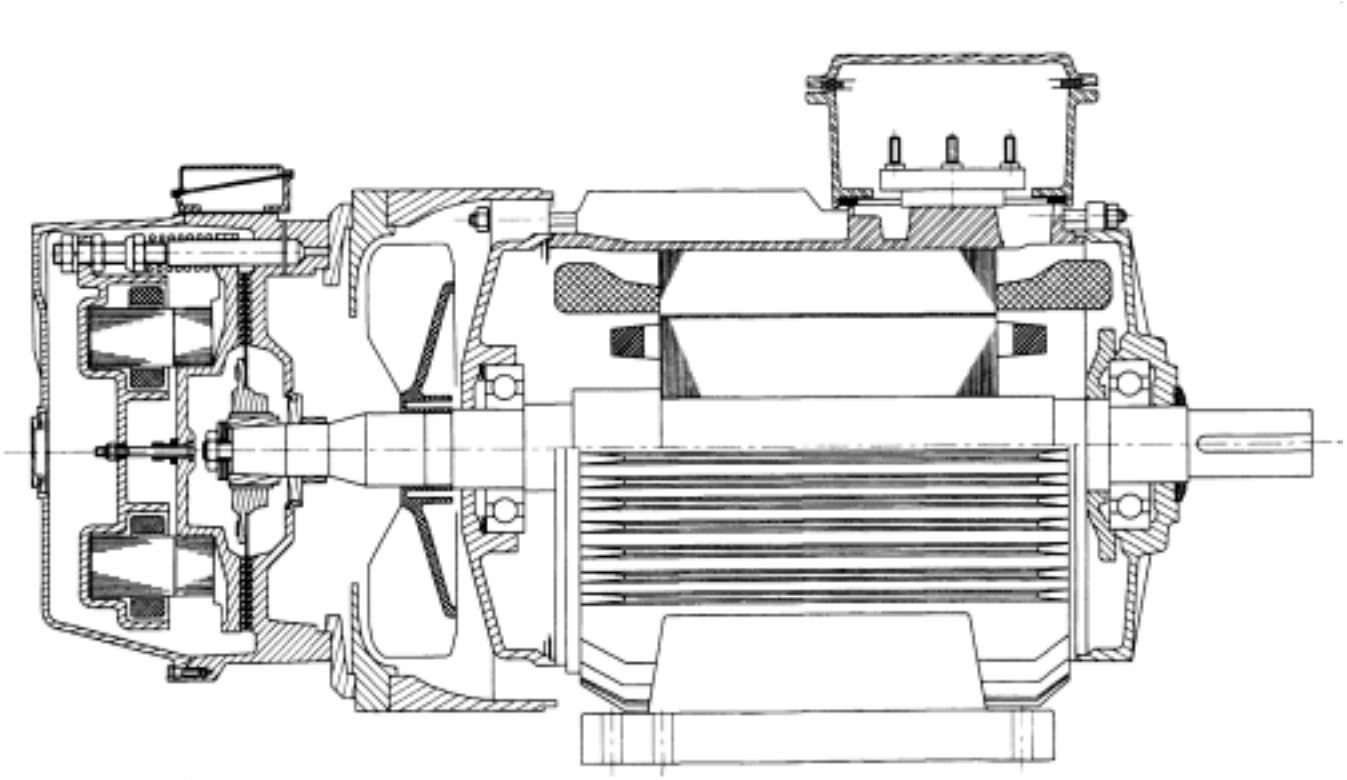
	Brake induction motors																
Type	A	AB	B	BB	C	X	AA	K	HA	H	AC	HD	LB	LJ	J	I	II
FLS 160 M	254	294	210	294	108	20	65	14	24	160	345	385	668	50	160	80	80
FLS 160 L	254	294	254	294	108	20	65	14	24	160	345	385	668	50	160	80	80
FLS 180 MR	279	324	241	295	121	25	80	14	28	180	345	405	683	50	160	80	80
FLS 180 L	279	330	279	335	121	25	68	14	40	180	384	460	752	55	220	128	128
FLS 200 L	318	374	305	361	133	28	80	18	50	200	410	515	882	65	220	128	128
FLS 225 ST	356	420	286	367	149	28	100	18	35	225	410	540	955	65	220	128	128
FLS 225 M	356	426	311	375	149	32	80	18	27	225	481	656	1 078	70	352	173	210
FLS 250 M	406	476	349	413	168	32	80	22	27	250	481	681	1 158	70	352	173	210
FLS 280 S	457	527	368	432	190	32	80	22	27	280	505	711	1 224	70	352	173	210
FLS 280 M	457	527	419	483	190	32	80	22	27	280	505	711	1 324	70	352	173	210

	Output shaft						
Type	F	GD	D	G	E	O	p
FLS 160 M	12	8	42 k6	37	110	16	36
FLS 160 L	12	8	42 k6	37	110	16	36
FLS 180 MR	14	9	48 k6	42.5	110	16	36
FLS 180 L	14	9	48 k6	42.5	110	16	36
FLS 200 L	16	10	55 m6	49	110	20	42
FLS 225 ST	18	11	60 m6	53	140	20	42
FLS 225 M	18	11	60 m6	53	140	20	42
FLS 250 M	18	11	65 m6	58	140	20	42
FLS 280 S	20	12	75 m6	67.5	140	20	42
FLS 280 M	20	12	75 m6	67.5	140	20	42

FLS motor - FAP brake

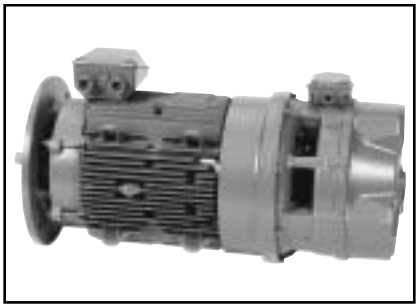
Cross-sectional view of motor

FLS motor - FAP brake - B3 mounting



FLS motor - FAP brake

General



3 phase brake induction motors, FLS series, failsafe, power rating 4 to 37 kW, frame sizes 160 to 225 mm, 4, 6 and 8 poles; 230/400 V 50 Hz.

Motor protection
Standard version IP 55.

Brake protection
Standard version IP 44.

Motor housing
With cast iron cooling fins.

End shields and brake shield
In cast iron, fixed by screws.

Brake housing
In cast iron, screwed to the shield.
Brake protected by a cast iron cover.

Bearings
Sealed C3 ball bearings (type 2RS) for the 160 and 180.
Regreasable for the 200 and 225.

Bearings fitted:
- as a thrust at the front
- heavily preloaded at the rear to eliminate axial oscillation

Finish
Assembly using zinc bichromate or cadmium finish on screws.
RAL 6000 (green) paint finish.
Identification on a riveted aluminium plate.

Motor power supply
Standard 230/400 V at 50 Hz.

Brake power supply
Separate: 230/400 V at 50 Hz.

Winding
Standard: class F.

Rotor
With squirrel cage pressure die-cast in aluminium for operation in S1 duty, in special alloy for operation in S3 duty (DP rotor).

Metal terminal boxes (motor and brake)
Sealed, fitted with cable gland, mounted on top of the motor and brake shield.

Connection of the A.C. supply
- Stator: terminal block with 6 terminals enabling connection to the supply via connector links (see diagram inside the terminal box).
- Brake : terminal block with 6 terminals enabling connection to the supply via connector links.

Individual checks before sending
Routine tests, no-load test, short-circuit test, dielectric test, checks on options and the direction of rotation.
Running-in and traceability of brake disk.

Conditions of use
Number of starts permissible:
- For continuous duty:
6 starts per hour.
• For an operating factor of 40%:
- FLS 160-180 = 180 (DP rotor compulsory)
- FLS 200-225 = 150 (DP rotor compulsory)
Higher operating rates: please contact Leroy-Somer.

Options

Motor
Multi-speed (see section 2 speeds).
Construction allowing starting Y/Δ.
PTO, PTF, PTC protection sensors.
Space heaters.
Roller bearing.
Forced ventilation as required.

Brake
IP 55 protection.
Release by lever.
Brake release indicator.
Lining wear indicator.
Tachogenerator or alternator.
Special terminal box position available on request.

FLS motor - FAP brake

Selection

4 poles 1500 min^{-1}

• FLS motor - IP 55 - 50 Hz - Class F - 230/400 V - Aluminium rotor, S1 duty
• 3-phase A.C. brake - IP 44 or IP 55 - Separate brake power supply
High braking torque

Type of motor	Type of brake	Rated power at 50 Hz P_N kW	Rated speed N_N min^{-1}	Rated current I_N (400 V) A	Power factor cos φ 4/4	Efficiency η % 4/4	Starting current/ Rated current I_D/I_N	Starting torque/ Rated torque M_D/M_N	Rated torque M_N N.m	Moment of inertia J kg.m^2	Braking torque M_f ± 20% N.m	Weight IM B3 kg
FLS 160 M	**FAP 132**	11	1455	21	0.86	88.3	7.8	2.6	72.2	0.089	110	150
FLS 160 L	**FAP 160**	15	1455	28.2	0.86	89.5	7.8	2.6	98.5	0.110	150	170
FLS 180 MR	**FAP 160**	18.5	1465	34.5	0.86	90	7.8	2.6	121	0.127	180	190
FLS 180 L	**FAP 180**	22	1465	40.5	0.86	91.4	7.4	2.6	143	0.173	220	250
FLS 200 L	**FAP 200/1**	30	1471	56	0.85	91.9	6.5	2.5	195	0.273	300	350
FLS 225 ST	**FAP 200/2**	37	1476	70	0.82	93.1	7	2.5	240	0.360	390	400

For larger sizes, please consult Leroy Somer.

6 poles 1000 min^{-1}

• FLS motor - IP 55 - 50 Hz - Class F - 230/400 V - Aluminium rotor, S1 duty
• 3-phase A.C. brake - IP 44 or IP 55 - Separate brake power supply
High braking torque

Type of motor	Type of brake	Rated power at 50 Hz P_N kW	Rated speed N_N min^{-1}	Rated current I_N (400 V) A	Power factor cos φ 4/4	Efficiency η % 4/4	Starting current/ Rated current I_D/I_N	Starting torque/ Rated torque M_D/M_N	Rated torque M_N N.m	Moment of inertia J kg.m^2	Braking torque M_f ± 20% N.m	Weight IM B3 kg
FLS 160 M	**FAP 132**	7.5	965	15.8	0.80	86	5	1.5	74	0.115	110	150
FLS 160 L	**FAP 160**	11	965	22.7	0.81	87	5	1.5	109	0.150	180	180
FLS 180 L	**FAP 180**	15	975	29.6	0.82	89.5	7.1	2.1	147	0.234	260	240
FLS 200 L	**FAP 200/1**	18.5	975	36	0.83	90.7	7	2.2	181	0.320	300	330
FLS 200 L	**FAP 200/1**	22	973	43	0.81	91.5	7	2.2	215	0.346	390	350

For larger sizes, please consult Leroy Somer.

Weights and dimensions are given for information only.

FLS motor - FAP brake

Selection

• FLS motor - IP 55 - 50 Hz - Class F - 230/400 V - Aluminium rotor, S1 duty
• 3-phase A.C. brake - IP 44 or IP 55 - Separate brake power supply
High braking torque

		Rated power at 50 Hz	Rated speed	Rated current	Power factor	Efficiency	Starting current/ Rated current	Starting torque/ Rated torque	Rated torque	Moment of inertia	Braking torque	Weight
Type of motor	**Type of brake**	P_N kW	N_N min^{-1}	I_N (400 V) A	cos φ 4/4	η % 4/4	I_D/I_N	M_D/M_N	M_N N.m	J $kg.m^2$	M_f ± 20% N.m	IM B3 kg
FLS 160 M	**FAP 132**	4	710	11.3	0.63	81.5	3.8	1.6	54	0.093	90	150
FLS 160 M	**FAP 132**	5.5	710	14.9	0.65	82	3.7	1.7	74	0.104	110	160
FLS 160 L	**FAP 160**	7.5	715	19.5	0.65	83	3.7	1.8	100	0.121	180	180
FLS 180 L	**FAP 180**	11	724	26.6	0.70	85.1	3.9	1.4	147	0.249	260	250
FLS 200 L	**FAP 200/1**	15	730	34	0.72	88.1	5	1.8	196	0.380	300	360
FLS 225 ST	**FAP 200/2**	18.5	730	41	0.73	89	5	1.6	242	0.472	390	400

For larger sizes. please consult Leroy Somer.

Weights and dimensions are given for information only.

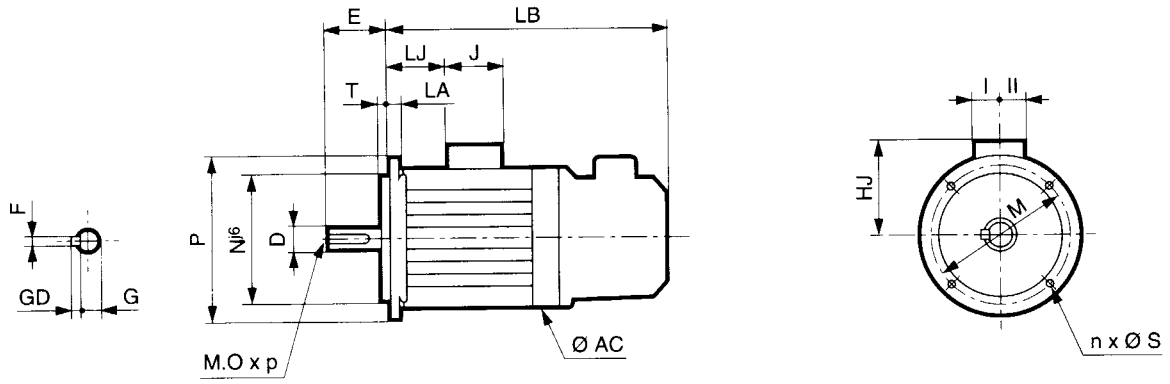
FLS motor - FAP brake

Dimensions

Dimensions of FAP brake induction motors - 4, 6, 8 poles
IP 55 motor protection, IP 44 or IP 55 brake protection

Dimensions in millimetres

- Flange mounted (FF)



	Brake induction motors							
Type	LB	AC	HJ	LJ	J	I	II	Symbol
FLS 160 M	680	345	225	50	160	80	80	FF 300
FLS 160 L	708	345	225	50	160	80	80	FF 300
FLS 180 MR	723	345	225	50	160	80	80	FF 300
FLS 180 L	784	384	280	55	220	128	128	FF 300
FLS 200 L	882	410	315	65	220	128	128	FF 350
FLS 225 ST	950	410	315	65	220	128	128	FF 400

	Flanges							
Type	Symbol	M	N	D	T	n	S	LA
FLS 160-180	FF 300	300	250	350	5	4	18	15
FLS 200	FF 350	350	300	400	5	4	18	15
FLS 225	FF 400	400	350	450	5	8	18	16

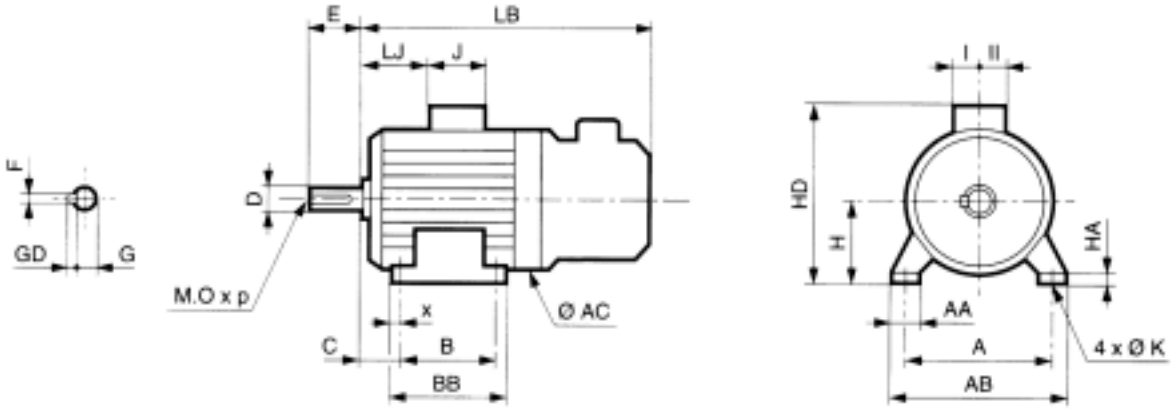
FLS motor - FAP brake

Dimensions

Dimensions of FAP brake induction motors - 4, 6, 8 poles
IP 55 motor protection, IP 44 or IP 55 brake protection

Dimensions in millimetres

- Foot mounted



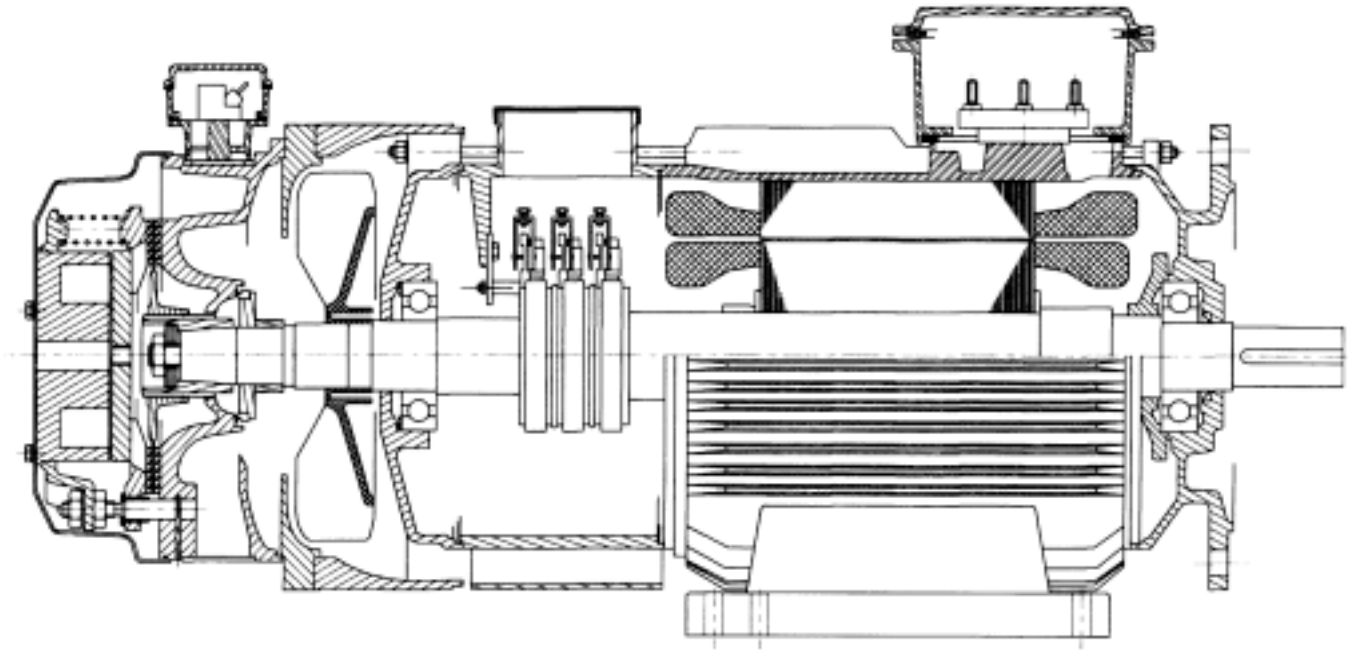
	Brake induction motors																
Type	A	AB	B	BB	C	X	AA	K	HA	H	AC	HD	LB	LJ	J	I	II
FLS 160 M	254	294	210	294	108	20	65	14	24	160	345	385	680	50	160	80	80
FLS 160 L	254	294	254	294	108	20	65	14	24	160	345	385	708	50	160	80	80
FLS 180 MR	279	324	241	295	121	25	80	14	28	180	345	385	723	50	160	80	80
FLS 180 L	279	330	279	335	121	25	68	14	40	180	384	460	784	55	220	128	128
FLS 200 L	318	374	305	361	133	28	80	18	50	200	410	515	882	65	220	128	128
FLS 225 ST	356	420	286	367	149	28	100	18	35	225	410	540	950	65	220	128	128

	Output shaft						
Type	F	GD	D	G	E	O	D
FLS 160 M	12	8	42 k6	37	110	16	36
FLS 160 L	12	8	42 k6	37	110	16	36
FLS 180 MR	14	9	48 k6	42.5	110	16	36
FLS 180 L	14	9	48 k6	42.5	110	16	36
FLS 200 L	16	10	55 m6	49	110	20	42
FLS 225 ST	18	11	60 m6	53	140	20	42

FLSB motor - FCPL brake

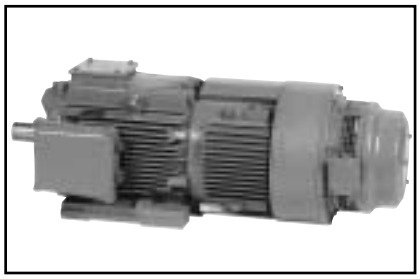
Cross-sectional view of motor

FLSB motor - FCPL brake - B35 mounting



FLSB motor - FCPL brake

General



D.C. brake slip-ring induction motors, FLSB series, failsafe, power rating 4 to 75 kW, frame sizes 160 to 280 mm, 4, 6 and 8 poles; 230/400 V 50 Hz.

Motor protection
Standard version IP 55.

Brake protection
Standard version IP 44.

Motor housing
Steel for 160 and 280.
With cast iron fins from 180 to 250.

Slip-ring housing
Cast iron, located between the housing and the NDE shield.

End shields and brake shield
In steel or cast iron, fixed by screws.

Brake housing
In cast iron, screwed to the shield.
Brake protected by a steel cover.

Bearings
Sealed C3 ball bearings (type 2RS) for the 160 and 180.
Regreasable from 200.

Bearings fitted:
- as a thrust at the front
- heavily preloaded at the rear to eliminate axial oscillation

Finish
Assembly using zinc bichromate or cadmium finish on screws.
RAL 6000 (green) paint finish.
Identification on a riveted aluminium plate.

Motor power supply
Standard 230/400 V at 50 Hz.

Brake power supply
Separate: In the standard version D.C. is supplied from the 400 V supply via an S07 rectifier or a CDF doping device.

Winding
Standard, class F.

Rotor
Coiled wire up to 200 frame size.
Coiled bar from 225 frame size.

Metal terminal boxes (motor and brake)
Sealed, fitted with cable gland, mounted on top of the motor or brake shield.
From the FLSB 250 M, the motors have a second terminal box for connecting the rotor.

Connection of the A.C. supply
- Stator: terminal block with 6 terminals enabling connection to the supply via connector links (see diagram inside the terminal box).
- Rotor: on brush holder from 160 to 200, on 3-terminal block from 225.
- Brake:
FCPL 54 and 60: When the rectifier is provided, it is mounted inside the brake terminal box.
FCPL 88: terminal box integrated in the brake shield under the cover.

Individual checks before sending
Routine tests, no-load test, short-circuit test, dielectric test, checks on options, rotor voltage and direction of rotation.
Running-in and traceability of brake disk.

Conditions of use
Number of starts allowed:
150 starts/hr 60%.
Higher operating rates: please contact Leroy-Somer.

Options

Motor
PTO, PTF, PTC protection sensors.
Space heaters.
Regreasable bearings.
Roller bearings.
Forced ventilation as required.

Brake
Brake voltage (20 V, 100 V, 200 V).
Release by a lever (DLRA).
Brake release indicator.
Lining wear indicator.
Adaptation of a tachogenerator or an alternator.
Second shaft end for crankshaft socket.
Special brake terminal box position.

CDF power supply device for reduced brake response time.

FLSB motor - FCPL brake

Selection

4 poles 1500 min^{-1}

• FLSB motor - IP 55 - 50 Hz - Class F - 230/400 V - Wound rotor, S1 duty
• D.C. brake - IP 44 - Separate brake power supply
High braking torque

Type of motor	Type of brake	Rated power at 50 Hz P_N kW	Rated speed N_N min^{-1}	Rated current I_N (400 V) A	Power factor cos φ 4/4	Efficiency η % 4/4	Rotor voltage/ Rotor current UR/IR V/A	Maximum torque/ Rated torque M_M / M_N	Rated torque M_N N.m	Moment of inertia J kg.m^2	Braking torque M_f ± 20% N.m	Weight IM B3 kg
FLSB 160 M	**54 - 309**	7.5	1420	16.2	0.84	84	176/28	3.3	50	0.135	90	240
FLSB 160 L	**54 - 211**	11	1450	23	0.84	84.5	283/25	3.4	72	0.209	110	270
FLSB 180 L	**54 - 215**	15	1450	28.5	0.84	87	275/34	4	99	0.258	150	290
FLSB 200 L	**60 - 220**	18.5	1455	36.1	0.86	87.5	250/45	3.5	121	0.366	200	360
FLSB 200 L	**60 - 126**	22	1465	42.8	0.85	89	290/49	3.6	143	0.421	260	400
FLSB 225 M	**60 - 330**	30	1465	56	0.86	89.6	177/103	3.8	196	0.620	300	-
FLSB 250 M	**60 - 239**	37	1480	69.4	0.86	89	157/146	3.2	239	0.794	400	-
FLSB 250 M	**60 - 152**	45	1485	85.5	0.85	90	190/145	3.4	289	0.916	520	-
FLSB 280 S	**88 - 160**	55	1470	109	0.85	90.5	205/164	3.5	357	1.485	600	-
FLSB 280 M	**88 - 160**	75	1475	140	0.85	91.5	276/162	4	486	1.873	800	-

For larger sizes, please consult Leroy Somer.

6 poles 1000 min^{-1}

• FLSB motor - IP 55 - 50 Hz - Class F - 230/400 V - Wound rotor, S1 duty
• D.C. brake - IP 44 - Separate brake power supply
High braking torque

Type of motor	Type of brake	Rated power at 50 Hz P_N kW	Rated speed N_N min^{-1}	Rated current I_N (400 V) A	Power factor cos φ 4/4	Efficiency η % 4/4	Rotor voltage/ Rotor current UR/IR V/A	Maximum torque/ Rated torque M_M / M_N	Rated torque M_N N.m	Moment of inertia J kg.m^2	Braking torque M_f ± 20% N.m	Weight IM B3 kg
FLSB 160 M	**54 - 309**	5.5	940	12.9	0.77	84	174/20	3	56	0.165	90	260
FLSB 160 L	**54 - 313**	7.5	945	17.3	0.76	85	230/20	3.3	76	0.209	130	270
FLSB 180 L	**54 - 318**	11	960	26	0.75	86	240/29	3.4	109	0.273	180	300
FLSB 200 L	**60 - 126**	15	965	34	0.76	87	260/36	3.5	148	0.495	260	400
FLSB 225 M	**60 - 330**	18.5	970	40	0.76	87	130/106	2.8	182	0.715	300	-
FLSB 225 M	**60 - 239**	22	975	47	0.77	88	125/148	2.9	215	0.850	400	-
FLSB 250 M	**60 - 152**	30	970	62	0.82	88	125/148	2.9	295	1.039	520	-
FLSB 250 M	**60 - 260**	37	975	76.5	0.81	90	155/138	2.8	362	1.187	600	-
FLSB 280 S	**88 - 180**	45	980	92	0.83	91	185/147	3.2	439	2.281	800	-
FLSB 280 M	**88 - 180**	55	980	110	0.83	91.5	225/150	3.4	536	2.779	800	-

For larger sizes, please consult Leroy Somer.

Weights and dimensions are given for information only.

FLSB motor - FCPL brake

Selection

• FLSB motor - IP 55 - 50 Hz - Class F - 230/400 V - Wound rotor, S1 duty
• D.C. brake - IP 44 - Separate brake power supply
High braking torque

Type of motor	Type of brake	Rated power at 50 Hz P_N kW	Rated speed N_N min^{-1}	Rated current I_N (400 V) A	Power factor cos φ 4/4	Efficiency η % 4/4	Rotor voltage/ Rotor current UR/IR V/A	Maximum torque/ Rated torque M_M / M_N	Rated torque M_N N.m	Moment of inertia J $kg.m^2$	Braking torque M_F ± 20% N.m	Weight IM B3 kg
FLSB 160 M	**54 - 309**	4	685	11	0.71	81	90/26	2.4	56	0.219	90	250
FLSB 160 L	**54 - 313**	5.5	695	15	0.72	82	135/26	2.5	76	0.281	110	270
FLSB 180 L	**54 - 315**	7.5	715	20.5	0.66	84	196/25	2.9	100	0.370	150	300
FLSB 200 L	**60 - 126**	11	710	26	0.67	86	230/30	2.8	148	0.528	260	405
FLSB 225 M	**60 - 330**	15	720	34	0.67	87	200/46	3	199	0.915	300	-
FLSB 225 M	**60 - 239**	18.5	725	44	0.69	88	240/48	3.1	244	1.038	400	-
FLSB 250 M	**60 - 152**	22	725	50.5	0.74	87.5	133/100	3	290	1.329	520	-
FLSB 250 M	**60 - 260**	30	725	62	0.75	88	170/100	3	395	1.601	600	-
FLSB 280 S	**88 - 180**	37	725	77	0.76	88	173/133	2.9	487	3.233	800	-
FLSB 280 M	**88 - 180**	45	725	98	0.76	88.5	220/135	2.9	593	3.683	950	-

For larger sizes, please consult Leroy Somer.

Weights and dimensions are given for information only.

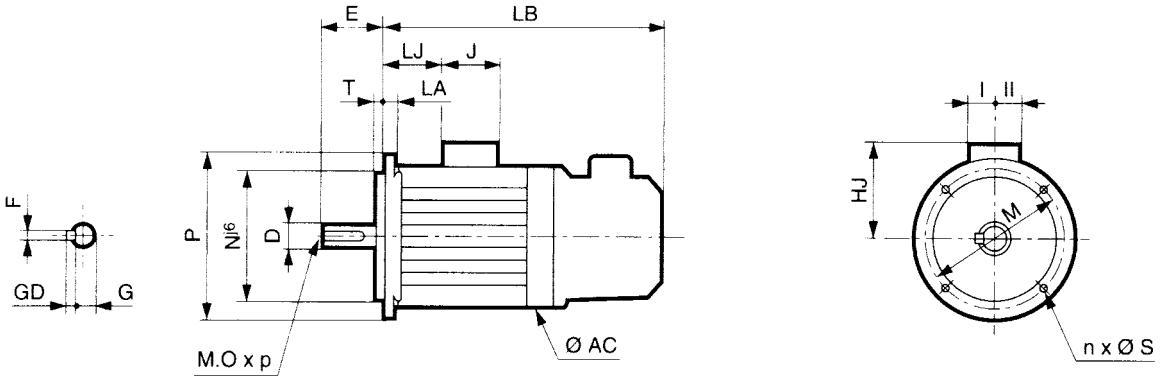
FLSB motor - FCPL brake

Dimensions

Dimensions of FCPL brake slip-ring induction motors - 4, 6, 8 poles
IP 55 motor protection, IP 44 or IP 55 brake protection

Dimensions in millimetres

- Flange mounted (FF)



	Brake induction motors							
Type	LB	AC	HJ	LJ	J	I	II	Symbol
FLSB 160 M	957	384	280	55	220	128	128	FF 300
FLSB 160 L	957	384	280	55	220	128	128	FF 300
FLSB 180 L	957	384	280	55	220	128	128	FF 300
FLSB 200 L	1117	410	315	65	220	128	128	FF 350
FLSB 225 M	1363	496	431	70	352	173	210	FF 400
FLSB 250 M	1282	520	395	99	255	128	185	FF 500
FLSB 280 S	1550	570	440	116	255	128	185	FF 500
FLSB 280 M	1550	570	440	116	255	128	185	FF 500

Note: From the FLSB 225 M, the motors have a 2nd terminal box for connecting the rotor.

	Flanges							
Type	Symbol	M	N	P	T	n	S	LA
FLSB 160/180	FF 300	300	250	350	5	4	18	15
FLSB 200	FF 350	350	300	400	5	4	18	15
FLSB 225	FF 400	400	350	450	5	8	18	22
FLSB 250/280	FF 500	500	450	550	5	8	18	22

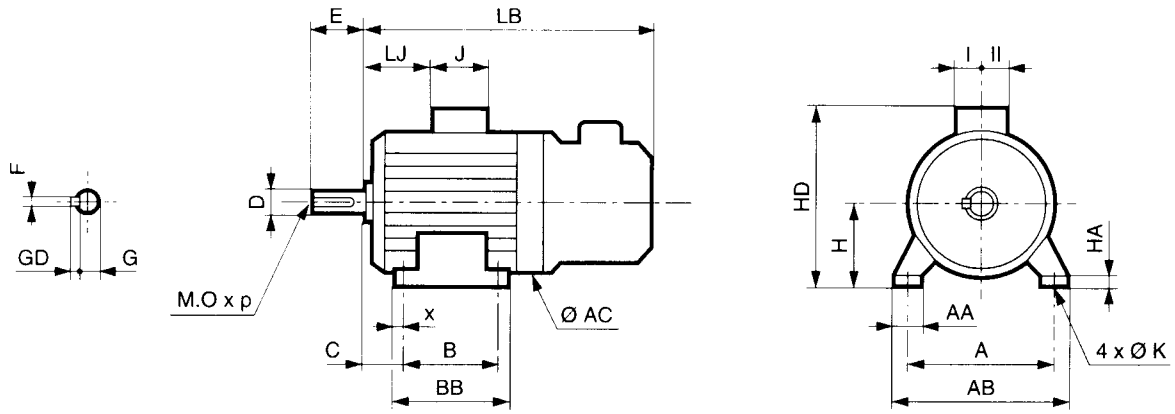
FLSB motor - FCPL brake

Dimensions

Dimensions of FCPL brake slip-ring induction motors - 4, 6, 8 poles
IP 55 motor protection, IP 44 or IP 55 brake protection

Dimensions in millimetres

- Foot mounted



Type	Brake induction motors																
	A	AB	B	BB	C	X	AA	K	HA	H	AC	HD	LB	LJ	J	I	II
FLSB 160 M	254	324	210	310	108	28	70	14	21	160[1]	384	440	957	55	220	128	128
FLSB 160 L	254	324	254	310	108	28	70	14	21	160[1]	384	440	957	55	220	128	128
FLSB 180 L	279	330	279	335	121	25	68	14	40	180	384	460	957	55	220	128	128
FLSB 200 L	318	374	305	361	133	28	80	18	50	200	410	515	1117	65	220	128	128
FLSB 225 M	356	426	311	375	149	32	80	18	27	225	496	656	1363	70	352	173	210
FLSB 250 M	406	504	349	409	168	30	95	22	35	250	520	645	1282	99	255	128	185
FLSB 280 S	457	527	368	489	190	35	117	22	31	280	570	720	1550	116	255	128	185
FLSB 280 M	457	527	419	489	190	35	117	22	31	280	570	720	1550	116	255	128	185

1. FLSB 160 M/L: The brake size exceeds the motor feet size by 20 mm.
Note: From the FLSB 225 M, the motors have a 2nd terminal box for connecting the rotor.

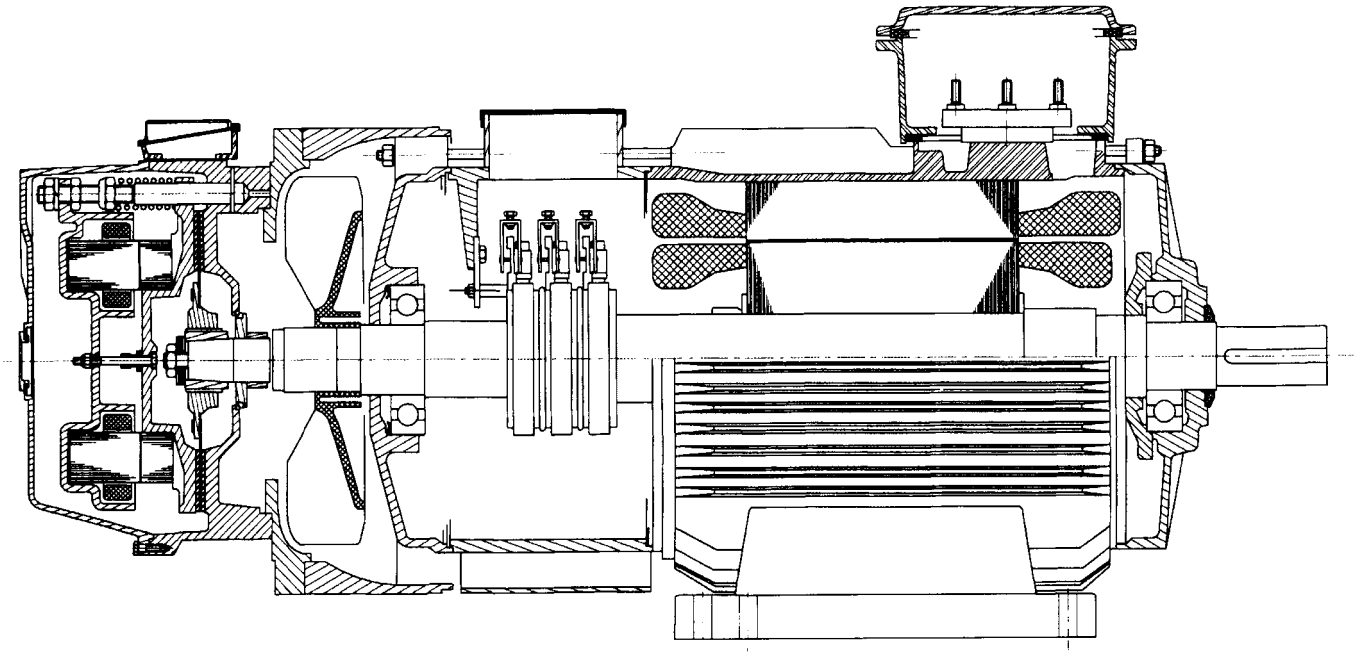
Type	Output shaft						
	F	GD	D	G	E	O	P
FLSB 160 M/L	12	8	42	37	110	16	40
FLSB 180 L	14	9	48	42.5	110	16	40
FLSB 200 L	16	10	55	49	110	20	42
FLSB 225 M	18	11	60	53	140	20	42
FLSB 250 M	20	12	70	62.5	140	20	42
FLSB 280 S/M	22	14	80	71	170	20	42

Note: FLSB 250 M and 280 S/M, the shaft has a wider diameter and corresponds to the shaft for the hoisting range.

FLSB motor - FAP brake

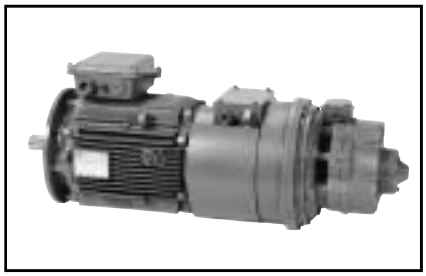
Cross-sectional view of motor

FLSB motor - FAP brake - B3 mounting



FLSB motor - FAP brake

General



3-phase brake slip-ring induction motors,
FLSB series, failsafe, power rating 4 to 30 kW, frame sizes 160 to 225 mm, 4, 6 and 8 poles; 230/400 V 50 Hz.

Motor protection
Standard version IP 55.

Brake protection
Standard version IP 44.

Motor housing
Steel, with fins for the 160.
With cast iron fins for the others.

Slip-ring housing
Cast iron, located between the housing and the NDE shield.

End shields and brake shield
In cast iron, fixed by screws.

Brake housing
In cast iron, screwed to the shield.
Brake protected by a cast iron cover.

Bearings
Sealed C3 ball bearings (type 2RS) for the 160 and 180.
Regreasable for the 200 and 225.

Bearings fitted:
- as a thrust at the front
- heavily preloaded at the rear to eliminate axial oscillation

Finish
Assembly using zinc bichromate or cadmium finish on screws.
RAL 6000 (green) paint finish.
Identification on a riveted aluminium plate.

Motor power supply
Standard 230/400 V at 50 Hz.

Brake power supply
Separate: 230/400 V at 50 Hz.

Winding
Standard, class F.

Rotor
Coiled wire up to 200 frame size.
Coiled bar for the 225.

Metal terminal boxes
(motor and brake)
Sealed, fitted with cable gland, mounted on top of the motor and brake shield.

Connection of the A.C. supply
- Stator: terminal block with 6 terminals enabling connection to the supply via connector links (see diagram inside the terminal box).
- Rotor: on brush holder from 160 to 200, on 3-terminal block for 225.
- Brake: terminal block with 6 terminals enabling connection to the supply via connector links.

Individual checks before sending
Routine tests, no-load test, short-circuit test, dielectric test, checks on options, rotor voltage and the direction of rotation.
Running-in and traceability of brake disk.

Conditions of use
Number of starts allowed:
150 starts/hr 60%.
Higher operating rates: please contact Leroy-Somer.

Options

Motor
PTO, PTF, PTC protection sensors.
Space heaters.
Roller bearing.
Forced ventilation as required.

Brake
IP 55 protection.
Release by lever.
Brake release indicator.
Lining wear indicator.
Tachogenerator or alternator.

FLSB motor - FAP brake

Selection

4 poles 1500 min^{-1}

• FLSB motor - IP 55 - 50 Hz - Class F - 230/400 V - Wound rotor, S1 duty
• 3-phase A.C. brake - IP 44 or IP 55 - Separate brake power supply
High braking torque

Type of motor	Type of brake	Rated power at 50 Hz P_N kW	Rated speed N_N min^{-1}	Rated current I_N (400 V) A	Power factor cos φ 4/4	Efficiency η % 4/4	Rotor voltage/ Rotor current UR/IR V/A	Maximum torque/ Rated torque M_M / M_N	Rated torque M_N N.m	Moment of inertia J kg.m^2	Braking torque M_f ± 20% N.m	Weight IM B3 kg
FLSB 160 M	**FAP 132**	7.5	1420	16.2	0.84	84	176/28	3.3	50	0.145	81	250
FLSB 160 L	**FAP 160**	11	1450	23	0.84	84.5	283/25	3.4	72	0.219	116	280
FLSB 180 L	**FAP 180**	15	1450	28.5	0.84	87	275/34	4	99	0.270	158	320
FLSB 200 L	**FAP 180**	18.5	1455	36.1	0.86	87.5	250/45	3.5	121	0.368	194	260
FLSB 200 L	**FAP 180**	22	1465	42.8	0.85	89	290/49	3.6	143	0.423	229	395
FLSB 225 M	**FAP 200/1**	30	1465	56	0.86	89.6	177/103	3.8	196	0.632	313	530

For larger sizes, please consult Leroy Somer.

6 poles 1000 min^{-1}

• FLSB motor - IP 55 - 50 Hz - Class F - 230/400 V - Wound rotor, S1 duty
• 3-phase A.C. brake - IP 44 or IP 55 - Separate brake power supply
High braking torque

Type of motor	Type of brake	Rated power at 50 Hz P_N kW	Rated speed N_N min^{-1}	Rated current I_N (400 V) A	Power factor cos φ 4/4	Efficiency η % 4/4	Rotor voltage/ Rotor current UR/IR V/A	Maximum torque/ Rated torque M_M / M_N	Rated torque M_N N.m	Moment of inertia J kg.m^2	Braking torque M_f ± 20% N.m	Weight IM B3 kg
FLSB 160 M	**FAP 132**	5.5	940	12.9	0.77	84	174/20	3	56	0.175	90	270
FLSB 160 L	**FAP 160**	7.5	945	17.3	0.76	85	230/20	3.3	76	0.219	121	280
FLSB 180 L	**FAP 180**	11	960	26	0.75	86	240/29	3.4	109	0.285	175	330
FLSB 200 L	**FAP 180**	15	965	34	0.76	87	260/36	3.5	148	0.497	238	400
FLSB 225 M	**FAP 200/1**	18.5	970	40	0.76	87	130/106	2.8	182	0.702	291	500
FLSB 225 M	**FAP 200/1**	22	975	47	0.77	88	125/148	2.9	215	0.837	345	530

For larger sizes, please consult Leroy Somer.

Weights and dimensions are given for information only.

FLSB motor - FAP brake

Selection

8 poles 750 min^{-1}

• FLSB motor - IP 55 - 50 Hz - Class F - 230/400 V - Wound rotor, S1 duty
• 3-phase A.C. brake - IP 44 or IP 55 - Separate brake power supply
High braking torque

		Rated power at 50 Hz	Rated speed	Rated current	Power factor	Efficiency	Rotor voltage/ Rotor current	Maximum torque/ Rated torque	Rated torque	Moment of inertia	Braking torque	Weight
Type of motor	**Type of brake**	P_N kW	N_N min^{-1}	I_N (400 V) A	cos φ 4/4	η % 4/4	UR/IR V/A	M_M / M_N	M_N N.m	J kg.m^2	M_f ± 20% N.m	IM B3 kg
FLSB 160 M	**FAP 132**	4	685	11	0.71	81	90/26	2.4	56	0.229	89	260
FLSB 160 L	**FAP 160**	5.5	695	15	0.72	82	135/26	2.5	76	0.291	121	280
FLSB 180 L	**FAP 180**	7.5	715	20.5	0.66	84	196/25	2.9	100	0.382	160	320
FLSB 200 L	**FAP 180**	11	710	26	0.67	86	230/30	2.8	148	0.530	237	410
FLSB 225 M	**FAP 200/1**	15	720	34	0.67	87	200/46	3	199	0.927	300	530
FLSB 225 M	**FAP 200/1**	18.5	725	44	0.69	88	240/48	3.1	244	1.025	400	560

For larger sizes, please consult Leroy Somer.

Weights and dimensions are given for information only.

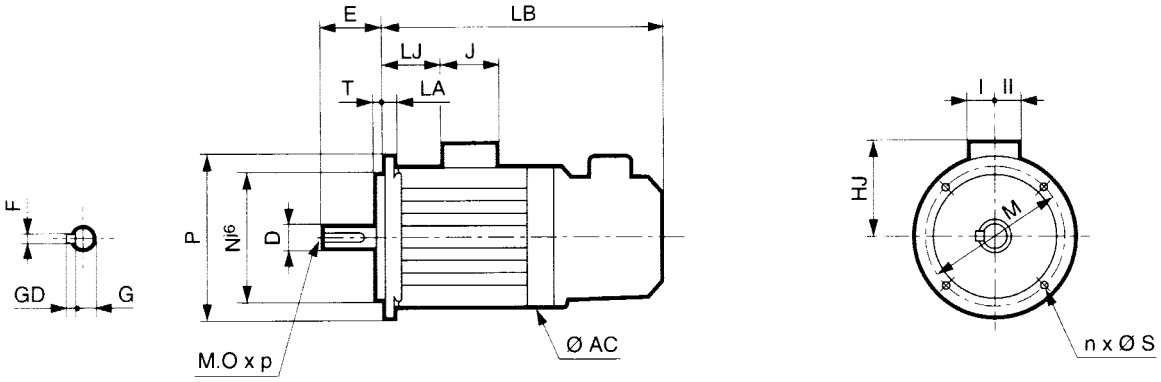
FLSB motor - FAP brake

Dimensions

Dimensions of FAP brake slip-ring induction motors - 4, 6, 8 poles
IP 55 motor protection, IP 44 or IP 55 brake protection

Dimensions in millimetres

- Flange mounted (FF)



	Brake induction motors							
Type	LB	AC	HJ	LJ	J	I	II	Symbol
FLSB 160 M	969	384	280	55	220	128	128	FF 300
FLSB 160 L	997	384	280	55	220	128	128	FF 300
FLSB 180 L	989	384	280	55	220	128	128	FF 300
FLSB 200 L	1091	410	315	65	220	128	128	FF 350
FLSB 225 M	1259	540	431	70	352	173	210	FF 400

Note: The FLSB 225 M has a 2nd terminal box for connecting the rotor.

	Flanges							
Type	Symbol	M	N	P	T	n	S	LA
FLSB 160	FF 300	300	250	350	5	4	18	15
FLSB 180	FF 300	300	250	350	5	4	18	15
FLSB 200	FF 350	350	300	400	5	4	18	15
FLSB 225	FF 400	400	350	450	5	8	18	22

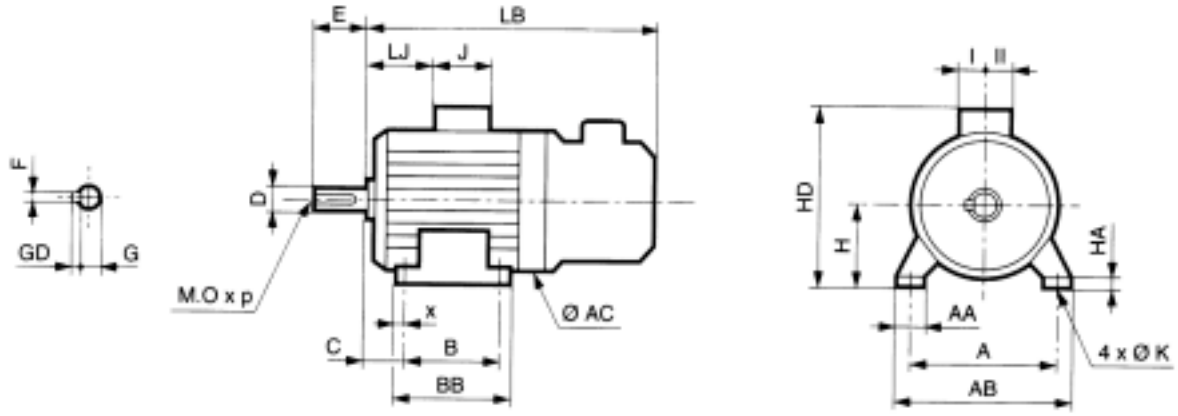
FLSB motor - FAP brake

Dimensions

Dimensions of FAP brake slip-ring induction motors - 4, 6, 8 poles
IP 55 motor protection, IP 44 or IP 55 brake protection

Dimensions in millimetres

- Foot mounted



	Brake induction motors																
Type	A	AB	B	BB	C	X	AA	K	HA	H	AC	HD	LB	LJ	J	I	II
FLSB 160 M	254	324	210	310	108	28	70	14	21	160[1]	384	440	969	55	220	128	128
FLSB 160 L	254	324	254	310	108	28	70	14	21	160[1]	384	440	997	55	220	128	128
FLSB 180 L	279	330	279	335	121	25	68	14	40	180	384	460	989	55	220	128	128
FLSB 200 L	318	374	305	361	133	28	80	18	50	200	410	515	1091	65	220	128	128
FLSB 225 M	356	426	311	375	149	32	80	18	27	225	540	656	1259	70	352	173	210

1. FLSB 160 M/L: The brake size exceeds the motor feet size by 20 mm.

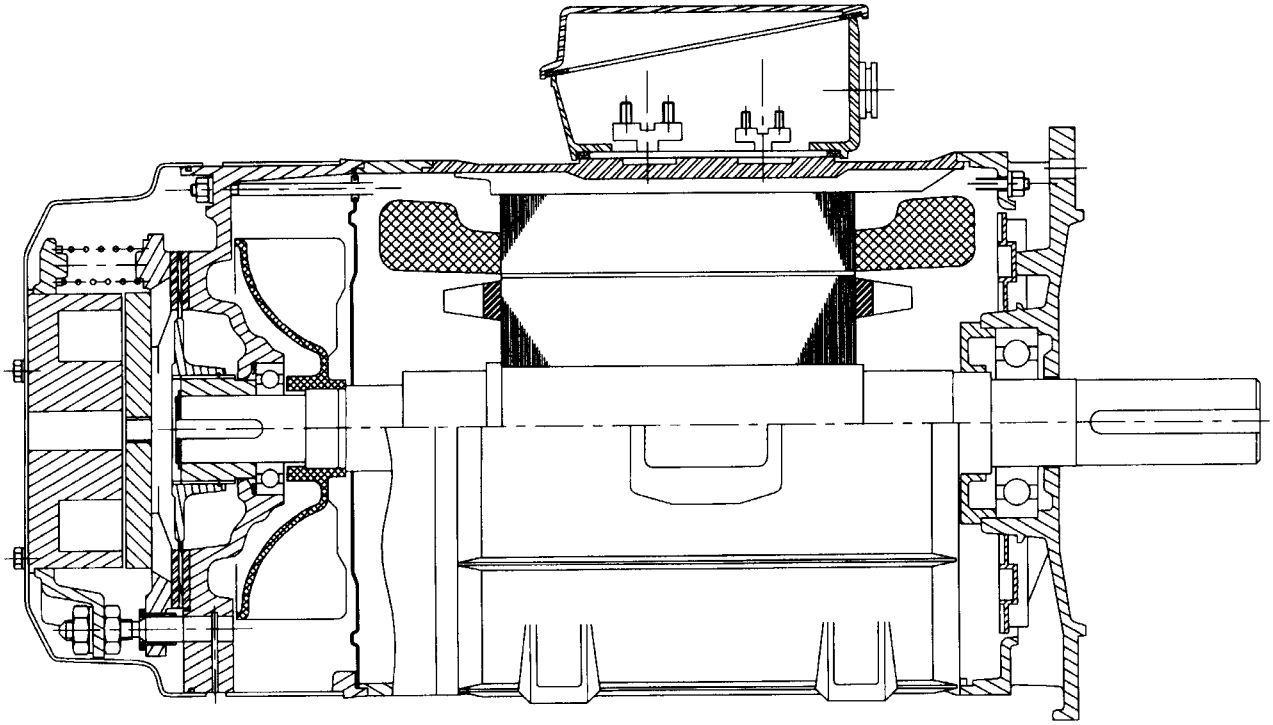
Note: The FLSB 225 M has a 2nd terminal box for connecting the rotor.

	Output shaft						
Type	F	GD	D	G	E	O	P
FLSB 160 M/L	12	8	42	37	110	16	40
FLSB 180 L	14	9	48	42.5	110	16	40
FLSB 200 L	16	10	55	49	110	20	42
FLSB 225 M	18	11	60	53	140	20	42

PLS motor - FCPL brake

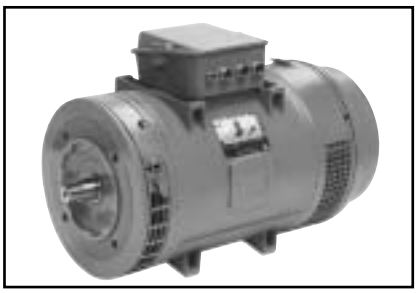
Cross-sectional view of motor

PLS motor - FCPL brake - B5 mounting



PLS motor - FCPL brake

General



DC brake induction motors, PLS series, failsafe, power rating 5.5 to 200 kW, frame sizes 160 to 315 mm, 4, 6 and 8 poles.

Motor protection
Standard version IP 23.

Brake protection
Standard version IP 44.

Motor housing
Round and smooth in aluminium alloy, frame size up to 225.
With aluminium alloy cooling fins for frame sizes 250 and 280.
Round and smooth in steel for frame size 315.

End shields and brake shield
In cast iron fixed using tie rods.

Brake housing
In cast iron, screwed to the shield.
Brake protected by a steel cover.

Bearings
C3 ball bearings:
- sealed (type 2RS) from 160 to 180 inclusive
- regreasable in larger sizes

Bearings fitted:
- as a thrust at the front
- heavily preloaded at the rear to eliminate axial oscillation

Finish
Assembly using zinc bichromate or cadmium finish on screws.
RAL 6000 (green) paint finish.
Identification on a riveted aluminium plate.

Motor power supply
Standard 230/400 V at 50 Hz.

Brake power supply
Separate: In the standard version D.C. is supplied from the 400 V supply via an S07 rectifier or a CDF doping device.

Winding
Standard, class F.

Rotor
Squirrel cage pressure die-cast in aluminium for operation in S1 continuous duty, in special alloy for operation in S3 duty (DP rotor).

Metal terminal box
Motor: Sealed, fitted with cable gland, mounted on top of the motor.

Connection of the A.C. supply
- Motor: terminal block with 6 terminals enabling connection to the supply via connector links (see diagram inside the terminal box).
- Brake : in the motor terminal box containing the rectifier for sizes 160 to 225 inclusive. Terminal block integrated in brake for 250 to 315 (FCPL 88).

Individual checks before sending
Routine tests, no-load test, short-circuit test, dielectric test, checks on options and the direction of rotation.
Running-in and traceability of brake disk.

Conditions of use
Number of starts allowed:
- For continuous duty:
6 starts per hour.
• For an operating factor of 40%:
- PLS 160-180 = 180 (DP rotor compulsory)
- PLS 200-225 = 150 (DP rotor compulsory)
- PLS 250 to 315 : please contact Leroy-Somer.

Higher operating rates: please contact Leroy-Somer.

Options

Motor
Multi-speed (see section 2 speeds).
Construction allowing Y/Δ starting.
PTO, PTF, PTC protection sensors.
Space heaters.
Regreasable bearings from 250.
Roller bearings from 250.
Radial forced ventilation for the 160 and 180 M.
Axial forced ventilation for the 180 LG, 200 and 225.
Available on request for other sizes.

Brake
Brake voltage (20 V, 100 V, 200 V).
Release by a lever (DLRA).
Brake release indicator.
Lining wear indicator.
Adaptation of a tachogenerator or an alternator.
Second shaft end for crankshaft socket.

CDF power supply device for reduced brake response time.

PLS motor - FCPL brake

Selection

4 poles 1500 min^{-1}

• PLS motor - IP 23 - 50 Hz - Class F - 230/400 V - Aluminium rotor, S1 duty
• D.C. brake - IP 44 - Separate brake power supply
High braking torque

Type of motor	Type of brake	Rated power at 50 Hz P_N kW	Rated speed N_N min^{-1}	Rated current I_N (400 V) A	Power factor cos φ 4/4	Efficiency η % 4/4	Starting current/ Rated current I_D/I_N	Starting torque/ Rated torque M_D/M_N	Rated torque M_N N.m	Moment of inertia J kg.m^2	Braking torque M_f ± 20% N.m	Weight IM B3 kg
PLS 160 M	**40 - 112**	11	1435	23.6	0.81	83	6.5	2.5	73	0.065	125	100
PLS 160 L	**54 - 215**	15	1450	30.2	0.83	86.4	5.9	2.0	99	0.070	150	120
PLS 160 L	**54 - 318**	18.5	1445	36.9	0.83	87.2	6.0	2.1	122	0.079	180	130
PLS 180 M	**54 - 222**	22	1450	43.5	0.83	88	6.4	2.3	145	0.094	220	140
PLS 180 LG	**60 - 230**[1]	30	1450	57.1	0.85	89.2	5.7	2.4	198	0.156	300	200
PLS 200 M	**60 - 239**	37	1445	71	0.84	89	5.4	2.3	245	0.206	390	250
PLS 200 LP	**60 - 252**	45	1465	85	0.84	91.3	6.1	2.5	293	0.296	520	280
PLS 225 MR	**60 - 260**[1]	55	1465	101	0.86	91.5	5.9	2.2	359	0.426	590	320
PLS 250 SP	**88 - 180**[1]	75	1475	143	0.82	92.6	6.2	2.4	486	0.756	800	500
PLS 250 MP	**88 - 195**[1]	90	1475	167	0.84	92.8	6.5	2.5	583	0.869	950	530
PLS 280 SC	**88 - 1120**[1]	110	1472	207	0.82	93.4	5.7	2.2	710	1.344	1200	650
PLS 280 SD	**88 - 2160**[1]	132	1470	245	0.83	93.7	6.2	2.4	858	1.663	1600	700
PLS 315 S	**88 - 2160**[1]	160	1470	284	0.87	93.4	6.5	2.1	1039	2.324	1600	830
PLS 315 M	**88 - 2190**[1]	200	1475	355	0.87	93.6	7.1	2.4	1295	2.790	1900	920

1. Requires a CDF power supply device.

6 poles 1000 min^{-1}

• PLS motor - IP 23 - 50 Hz - Class F - 230/400 V - Aluminium rotor, S1 duty
• D.C. brake - IP 44 - Separate brake power supply
High braking torque

Type of motor	Type of brake	Rated power at 50 Hz P_N kW	Rated speed N_N min^{-1}	Rated current I_N (400 V) A	Power factor cos φ 4/4	Efficiency η % 4/4	Starting current/ Rated current I_D/I_N	Starting torque/ Rated torque M_D/M_N	Rated torque M_N N.m	Moment of inertia J kg.m^2	Braking torque M_f ± 20% N.m	Weight IM B3 kg
PLS 160 M	**40 - 112**	7.5	970	17.1	0.75	84.5	5.0	1.7	74	0.100	125	120
PLS 160 LU	**54 - 318**	11	960	22.6	0.80	87.9	5.2	1.8	109	0.140	180	140
PLS 180 M	**54 - 222**	15	960	30.4	0.81	88.0	5.2	2.1	149	0.197	220	150
PLS 180 LG	**60 - 230**[1]	18.5	960	37.3	0.82	87.2	5.2	2.0	184	0.232	300	210
PLS 200 M	**60 - 239**	22	980	45.3	0.79	88.8	6.5	2.2	214	0.338	390	250
PLS 200 L	**60 - 252**	30	965	57.9	0.83	90.1	6.1	2.0	297	0.393	520	310
PLS 225 MU	**60 - 260**[1]	37	970	76	0.77	90.9	5.0	1.8	364	0.592	590	360
PLS 250 SP	**88 - 180**[1]	45	975	92	0.78	90.5	5.1	2.0	441	0.959	800	480
PLS 250 MP	**88 - 195**[1]	55	975	114	0.76	91.6	5.3	1.8	539	1.074	950	510
PLS 280 SC	**88 - 1 120**[1]	75	974	152	0.77	92.2	5.9	2.2	727	2.094	1200	580
PLS 280 SD	**88 - 2 160**[1]	90	978	173	0.81	92.8	5.2	2.1	873	2.635	1600	670
PLS 315 SU	**88 - 2 160**[1]	110	985	206	0.83	92.8	6.1	2.0	1066	3.491	1600	920
PLS 315 MU	**88 - 2 190**[1]	132	975	252	0.82	92.2	5.6	2.1	1293	3.740	1900	940

1. Requires a CDF power supply device.

Weights and dimensions are given for information only.

PLS motor - FCPL brake

Selection

• PLS motor - IP 23 - 50 Hz - Class F - 230/400 V - Aluminium rotor, S1 duty
• D.C. brake - IP 44 - Separate brake power supply
High braking torque

Type of motor	Type of brake	Power rated at 50 Hz P_N kW	Speed rated N_N min^{-1}	Current rated I_N (400 V) A	Factor power cos φ 4/4	Efficiency η % 4/4	Starting current/ Rated current I_D/I_N	Starting torque/ Rated torque M_D/M_N	Torque rated M_N N.m	Moment of inertia J kg.m^2	Moment braking M_f ± 20% N.m	Weight IM B3 kg
PLS 160 M	**40 - 112**	5.5	690	15	0.67	80	2.5	1.6	76	0.087	125	140
PLS 160 L	**54 - 318**	7.5	690	21	0.66	79	2.6	1.6	104	0.108	180	150
PLS 180 L	**60 - 126**	11	710	28	0.69	84	3.6	1.4	148	0.216	260	190
PLS 180 LG	**60 - 230[1]**	15	720	33	0.74	86	4	1.4	199	0.346	300	240
PLS 200 M	**60 - 239**	18.5	725	41	0.75	88	4.4	1.4	244	0.435	400	290
PLS 200 L	**60 - 152**	22	725	49	0.76	88	4.4	1.4	290	0.451	520	310
PLS 225 MU	**60 - 260[1]**	30	725	68	0.73	89	3.9	1.4	395	0.859	600	390
PLS 250 SP	**88 - 180[1]**	37	730	82	0.75	89	5	1.6	484	1.560	800	530
PLS 250 SP	**88 - 195[1]**	45	725	95	0.76	89	5.1	1.7	593	1.941	950	570
PLS 280 SP	**88 - 1120[1]**	55	735	102	0.79	91.5	5.6	1.4	715	2.715	1200	810
PLS 280 MP	**88 - 2160[1]**	75	735	149	0.78	92	5.4	1.5	975	3.450	1600	880
For larger sizes, please consult Leroy Somer.												

1. Requires a CDF power supply device.

Weights and dimensions are given for information only.

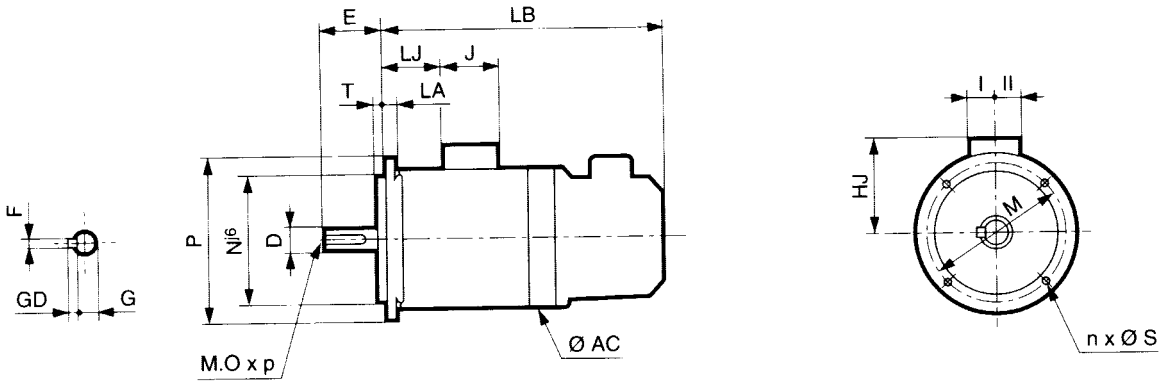
PLS motor - FCPL brake

Dimensions

Dimensions of FCPL brake induction motors - 4, 6, 8 poles
IP 23 motor protection, IP 44 brake protection

Dimensions in millimetres

- Flange mounted (FF)



Type	Brake induction motors							
	LB	AC	HJ	LJ	J	I	II	Symbol
PLS 160 M	596	320	242	118	205	100	95	FF 350
PLS 160 L	596	320	242	118	205	100	95	FF 350
PLS 160 LU	641	320	242	118	205	100	95	FF 350
PLS 180 M	596	320	242	118	205	100	95	FF 350
PLS 180 LG	790	359	270	168	205	100	95	FF 350
PLS 200 M	821	359	270	168	205	100	95	FF 400
PLS 200 LP	821	359	270	168	205	100	95	FF 400
PLS 225 MR	910	420	320	198	217	103	145	FF 500
PLS 225 MU	910	420	320	198	217	103	145	FF 500
PLS 250 SP	1101	516	393	159	292	148	180	FF 600
PLS 250 MP	1101	516	393	159	292	148	180	FF 600
PLS 280 SC	1 146	520	404	209	292	148	180	FF 600
PLS 280 MD	1 226	520	404	209	292	148	180	FF 600
PLS 280 SP	1 146	530	416	115	292	148	180	FF 600
PLS 280 MP	1 146	530	416	115	292	148	180	FF 600
PLS 315 S	1193	600	455	305	292	148	180	FF 740
PLS 315 SU	1253	600	455	305	292	148	180	FF 740
PLS 315 M	1253	600	455	305	292	148	180	FF 740
PLS 315 MU	1338	600	455	305	292	148	180	FF 740

Installing an encoder increases the LB dimension by 80 mm.

Type	Flanges							
	Symbol	M	N	P	T	n	S	LA
PLS 160/180	FF 350	350	300	400	5	4	19	15
PLS 200	FF 400	400	350	450	5	8	19	16
PLS 225	FF 500	500	450	550	5	8	19	18
PLS 250/280	FF 600	600	550	660	6	8	24	22
PLS 315	FF 740	740	680	800	6	8	24	25

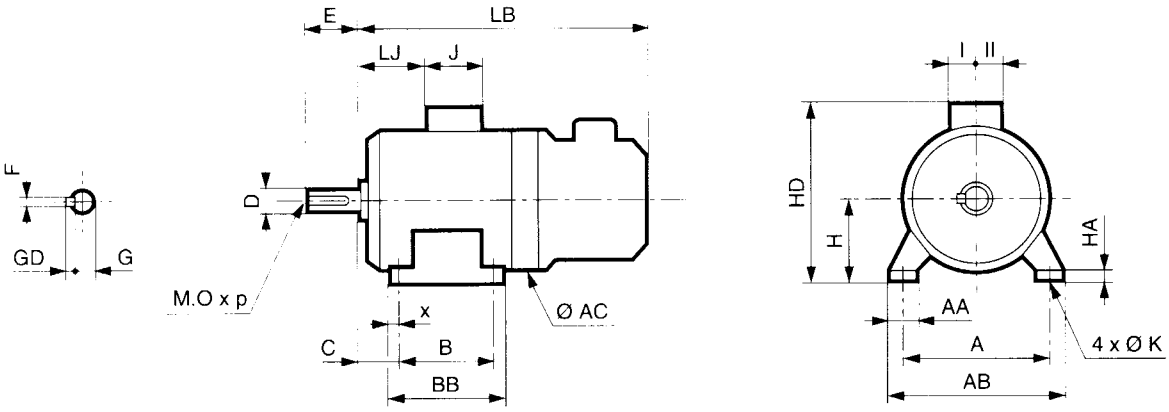
PLS motor - FCPL brake

Dimensions

Dimensions of FCPL brake induction motors - 4, 6, 8 poles
IP 23 motor protection, IP 44 brake protection

Dimensions in millimetres

- Foot mounted



Type	Brake induction motors																
	A	AB	B	BB	C	X	AA	K	HA	H	AC	HD	LB	LJ	J	I	II
PLS 160 M	254	294	210	298	108	22	44	14	24	160	320	402	596	138	118	100	95
PLS 160 L	254	294	254	298	108	22	44	14	24	160	320	402	596	138	118	100	95
PLS 160 LU	254	294	254	298	108	22	44	14	24	160	320	402	641	138	118	100	95
PLS 180 M	279	324	241	319	121	20	68	14	30	180	320	422	596	118	205	100	95
PLS 180 LG	279	344	279	323	121	22	60	14	30	180	359	450	790	168	205	100	95
PLS 200 M	318	378	267	347	133	20	60	19	30	200	359	470	821	168	205	100	95
PLS 200 LP	318	378	305	347	133	20	60	19	30	200	359	470	821	168	205	100	95
PLS 225 MR	356	416	311	351	149	20	60	19	32	225	420	545	910	198	217	103	145
PLS 225 MU	356	416	311	351	149	20	60	19	32	225	420	545	910	198	217	103	145
PLS 250 SP	406	470	311	400	168	26	94	24	40	250	516	643	1101	159	292	148	180
PLS 250 MP	406	470	349	400	168	26	94	24	40	250	516	643	1101	159	292	148	180
PLS 280 SC	457	517	368	467	190	24	60	24	26	280	520	684	1146	209	292	148	180
PLS 280 MD	457	517	419	467	190	24	60	24	26	280	520	684	1226	209	292	148	180
PLS 280 SP	457	520	368	480	190	26	95	24	39	280	530	696	1 146	115	292	148	180
PLS 280 MP	457	520	419	480	190	26	95	24	39	280	530	696	1 146	115	292	148	180
PLS 315 S	508	608	406	486	216	40	100	28	26	315	600	770	1193	305	292	148	180
PLS 315 SU	508	608	406	486	216	40	100	28	26	315	600	770	1253	305	292	148	180
PLS 315 M	508	608	457	537	216	40	100	28	26	315	600	770	1253	305	292	148	180
PLS 315 MU	508	608	457	537	216	40	100	28	26	315	600	770	1338	305	292	148	180

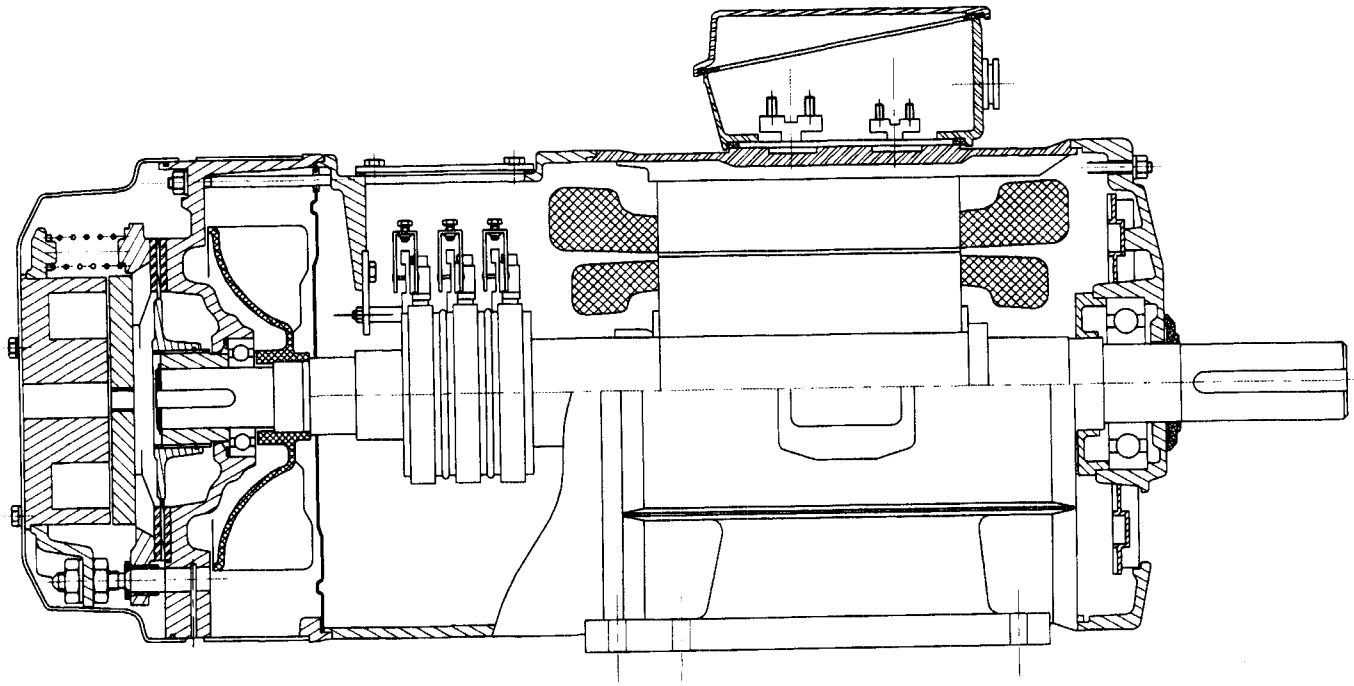
Installing an encoder increases the LB dimension by 80 mm.

Type	Output shaft						
	F	GD	D	G	E	O	P
PLS 160 M/L/LU	14	9	48 k6	42.5	110	16	36
PLS 180 M/LG	16	10	55 m6	49	110	20	42
PLS 200 M/LP	18	11	60 m6	53	140	20	42
PLS 225 MU/MR	18	11	65 m6	58	140	20	42
PLS 250 SP/MP	20	12	75 m6	67.5	140	20	42
PLS 280 SP/MP/SC/MD	22	14	80 m6	71	170	20	42
PLS 315 S/SU	25	14	90 m6	81	170	24	50
PLS 315 M/MU	25	14	90 m6	81	170	24	50

PB motor - FCPL brake

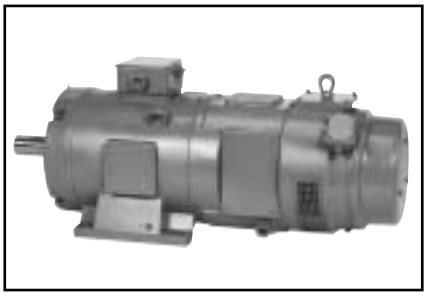
Cross-sectional view of motor

PB motor - FCPL brake - B3 mounting



PB motor - FCPL brake

General



DC brake slip-ring induction motors, PB series, failsafe, power rating 4 to 200 kW, frame sizes 160 to 315 mm, 4, 6 and 8 poles; 230/400 V 50 Hz.

Motor protection
Standard version IP 23.

Brake protection
Standard version IP 44.

Motor housing
Round and smooth in aluminium alloy, frame size up to 225.
With aluminium alloy cooling fins for frame size 250.
Round and smooth in steel for frame sizes 280 and 315.

Slip-ring housing
Cast iron or steel, located between the housing and the NDE shield.

End shields and brake shield
Cast iron or steel, fixed by tie rods.

Brake housing
In cast iron, screwed to the shield.
Brake protected by a steel cover.

Bearings
C3 ball bearings:
- sealed (type 2RS) from 160 to 180 inclusive
- regreasable in larger sizes

Bearings fitted:
- as a thrust at the front
- heavily preloaded at the rear to eliminate axial oscillation

Finish
Assembly using zinc bichromate or cadmium finish on screws.
RAL 6000 (green) paint finish.
Identification on a riveted aluminium plate.

Brake motor power supply
Standard 230/400 V at 50 Hz.

Brake power supply
Separate: In the standard version D.C. is supplied from the 400 V supply via an S07 rectifier or a CDF doping device.

Winding
Standard, class F.

Rotor
Coiled wire up to 225 frame size.
Coiled bar from 250 frame size.

Metal terminal box
Motor: Sealed, fitted with cable gland, mounted on top of the motor.

Connection of the A.C. supply
- Stator: terminal block with 6 terminals enabling connection to the supply via connector links (see diagram inside the terminal box).
- Rotor: on the brush holder.
- Brake: in the motor terminal box containing the rectifier for sizes 160 to 225 inclusive. Terminal block integrated in brake for 250 to 315 (FCPL 88).

Individual checks before sending
Routine tests, no-load test, short-circuit test, dielectric test, checks on resistors, rotor voltage and direction of rotation.
Running-in and traceability of brake disk.

Conditions of use
Number of starts allowed:
150 starts/hr 60%.
Higher operating rates: please contact Leroy-Somer.

Options

Motor
Construction allowing Y/Δ starting.
PTO, PTF, PTC protection sensors.
Space heaters.
Regreasable bearings from 250.
Roller bearings from 250.
Radial forced ventilation for the 160 and 180 MT.
Axial forced ventilation for the 180 M/L, 200 and 225.
Available on request for other sizes.

Brake
Brake voltage (20 V, 100 V, 200 V).
Release by a lever (DLRA).
Brake release indicator.
Lining wear indicator.
Adaptation of a tachogenerator or an alternator.
Second shaft end for crankshaft socket.
Special brake terminal box position.

CDF power supply device for reduced brake response time.

PB motor - FCPL brake

Selection

4 poles 1500 min^{-1}

• PB motor - IP 23 - 50 Hz - Class F - 230/400 V - Wound rotor, S1 duty
• FCPL D.C. brake - IP 44 - Separate brake power supply
High braking torque

Type of motor	Type of brake	Rated power at 50 Hz P_N kW	Rated speed N_N min^{-1}	Rated current I_N (400 V) A	Power factor cos φ 4/4	Efficiency η % 4/4	Rotor voltage/ Rotor current UR/IR V/A	Maximum torque/ Rated torque M_M / M_N	Rated torque M_N N.m	Moment of inertia J kg.m^2	Braking torque M_f ± 20% N.m	Weight IM B3 kg
PB 160 M	**54 - 309**	7.5	1425	14.9	0.88	82.5	150/31	2.6	50	0.123	90	140
PB 160 L	**54 - 211**	11	1440	20.6	0.88	87.4	265/26	3.3	73	0.176	110	160
PB 160 L	**54 - 215**	15	1430	29.3	0.86	85.8	320/29	2.8	100	0.176	150	160
PB 180 MT	**54 - 222**[1]	18.5	1450	34.5	0.87	89	248/48	3.3	122	0.205	220	220
PB 180 L	**60 - 126**	22	1440	42.8	0.84	88.4	311/45	2.6	146	0.239	260	250
PB 200 MT	**60 - 330**	30	1453	54.2	0.89	89.7	310/60	3.4	197	0.452	300	300
PB 200 L	**60 - 239**	37	1462	68.2	0.86	91	390/60	3.7	242	0.549	400	380
PB 225 M	**60 - 152**	45	1450	80.5	0.88	91.7	367/75	3.2	296	0.588	520	400
PB 225 M	**60 - 260**[1]	55	1460	103	0.84	91.8	465/74	3.2	360	0.646	600	440
PB 250 SG	**88 - 180**[1]	75	1453	139.7	0.86	90.1	220/202	2.7	493	1.017	800	620
PB 250 MG	**88 - 195**[1]	90	1460	171.6	0.83	91.2	280/204	3	589	1160	950	670
PB 280 SG	**88 - 1120**[1]	110	1460	197	0.87	92.7	283/243	3.3	720	1.752	1200	860
PB 280 MG	**88 - 2160**[1]	132	1468	241.8	0.85	92.7	340/240	3.1	859	2.167	1600	930
PB 315 SU	-	160	For larger sizes, please consult Leroy Somer.									
PB 315 MU	-	200										

1. Requires a CDF power supply device.

6 poles 1000 min^{-1}

• PB motor - IP 23 - 50 Hz - Class F - 230/400 V - Wound rotor, S1 duty
• FCPL D.C. brake - IP 44 - Separate brake power supply
High braking torque

Type of motor	Type of brake	Rated power at 50 Hz P_N kW	Rated speed N_N min^{-1}	Rated current I_N (400 V) A	Power factor cos φ 4/4	Efficiency η % 4/4	Rotor voltage/ Rotor current UR/IR V/A	Maximum torque/ Rated torque M_M / M_N	Rated torque M_N N.m	Moment of inertia J kg.m^2	Braking torque M_f ± 20% N.m	Weight IM B3 kg
PB 160 M	**54 - 309**	5.5	936	12.5	0.77	82.8	100/35	2.7	56	0.133	90	150
PB 160 L	**54 - 313**	7.5	938	16.3	0.78	85.1	147/32	2.8	76	0.176	130	170
PB 180 M	**60 - 220**	11	960	23.5	0.78	86.5	202/36	3.2	109	0.309	200	240
PB 180 L	**60 - 126**	15	957	30.9	0.79	88.8	256/36	3	150	0.389	260	270
PB 200 M	**60 - 330**	18.5	963	36.7	0.80	91	265/42	2.7	183	0.562	300	370
PB 200 L	**60 - 239**	22	967	46	0.77	89.7	315/43	2.8	217	0.674	400	390
PB 225 M	**60 - 152**	30	960	57	0.84	90.4	320/58	2.6	298	0.813	520	410
PB 225 M	**60 - 260**[1]	37	964	77.8	0.77	89.2	370/63	2.8	367	0.896	600	430
PB 250 SG	**88 - 180**[1]	45	969	87.9	0.83	89	148/190	2.3	443	1.163	800	620
PB 250 MG	**88 - 195**[1]	55	972	107.5	0.81	91.2	185/190	2.3	540	1.454	950	670
PB 280 SG	**88 - 1120**[1]	75	974	145	0.82	91.1	205/226	2.3	735	2.423	1200	850
PB 280 MG	**88 - 2160**[1]	90	975	173.6	0.81	92.4	237/240	2.4	882	2.887	1600	940
PB 315 SU	-	110	For larger sizes, please consult Leroy Somer.									
PB 315 MU	-	132										

1. Requires a CDF power supply device.

Weights and dimensions are given for information only.

PB motor - FCPL brake

Selection

• PB motor - IP 23 - 50 Hz - Class F - 230/400 V - Wound rotor, S1 duty
• FCPL D.C. brake - IP 44 - Separate brake power supply
High braking torque

Type of motor	Type of brake	Rated power at 50 Hz P_N kW	Rated speed N_N min^{-1}	Rated current I_N (400 V) A	Power factor cos φ 4/4	Efficiency η % 4/4	Rotor voltage/ Rotor current UR/IR V/A	Maximum torque/ Rated torque M_M / M_N	Rated torque M_N N.m	Moment of inertia J $kg.m^2$	Braking torque M_f ± 20% N.m	Weight IM B3 kg
PB 160 M	**54 - 309**	4	685	10.6	0.69	78.9	86/30	2.3	56	0.188	90	150
PB 160 L	**54 - 313**	5.5	714	13.6	0.7	83.2	124/29	2.7	74	0.236	130	170
PB 180 M	**60 - 215**	7.5	700	17.1	0.73	85	152/33	2.5	102	0.286	150	-
PB 180 L	**60 - 126**	11	715	25.3	0.72	87.1	182/40	2.7	147	0.405	260	270
PB 200 M	**60 - 330**	15	716	34.1	0.72	88.3	190/51	2.3	200	0.674	300	370
PB 200 L	**60 - 239**	18.5	724	41.6	0.72	89.1	220/50	2.3	244	0.757	400	380
PB 225 M	**60 - 152**	22	722	49.4	0.72	89.2	280/50	2.4	291	0.952	520	440
PB 225 M	**60 - 260[1]**	30	720	67.5	0.83	88.5	340/55	2.1	398	0.952	600	-
PB 250 SG	**88 - 180[1]**	37	731	71.3	0.83	90.3	180/121	2.7	489	1.664	800	620
PB 250 MG	**88 - 195[1]**	45	720	98.2	0.78	87	215/127	2.3	597	1.951	950	660
PB 280 SG	**88 - 1120[1]**	55	725	117	0.78	91.5	190/185	2.2	724	2.940	1200	-
PB 280 MGU	**88 - 2160[1]**	75	730	149.4	0.79	91.7	250/190	2	981	4.223	1600	920
PB 315 MU	-	90	For larger sizes, please consult Leroy Somer.									

1. Requires a CDF power supply device.

Weights and dimensions are given for information only.

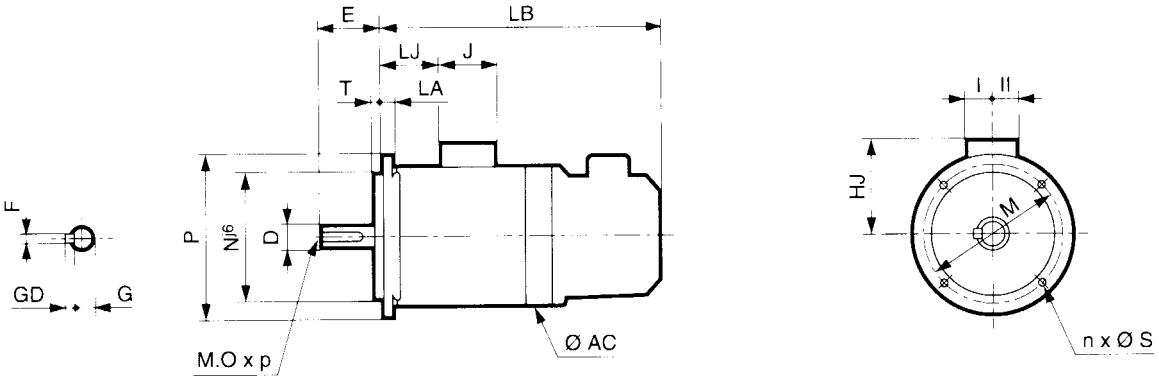
PB motor - FCPL brake

Dimensions

Dimensions of FCPL brake slip-ring induction motors - 4, 6, 8 poles
IP 23 motor protection, IP 44 brake protection

Dimensions in millimetres

- Flange mounted (FF)



	Brake induction motors							
Type	LB	AC	HJ	LJ	J	I	II	Symbol
PB 160 M	784	320	242	118	205	110	95	FF 350
PB 160 L	784	320	242	118	205	100	95	FF 350
PB 180 MT	784	320	242	118	205	100	95	FF 350
PB 180 M	921	359	270	168	205	100	95	FF 350
PB 180 L	921	359	270	168	205	100	95	FF 350
PB 200 MT	952	359	270	168	205	100	95	FF 400
PB 200 M	1095	397	320	198	217	103	145	FF 400
PB 200 L	1095	397	320	198	217	103	145	FF 400
PB 225 M	1095	397	320	198	217	103	145	FF 500
PB 250 SG	1361	530	416	63	292	148	180	FF 600
PB 250 MG	1361	530	416	63	292	148	180	FF 600
PB 280 SG	1433	600	450	305	292	148	180	FF 600
PB 280 MG	1433	600	450	305	292	148	180	FF 600
PB 280 MGU	1493	600	450	305	292	148	180	FF 600

	Flanges							
Type	Symbol	M	N	P	T	n	S	LA
PB 160 M/L	FF 350	350	300	400	5	4	19	15
PB 180 MT/M/L	FF 350	350	300	400	5	4	19	15
PB 200 MT/M/L	FF 400	400	350	450	5	8	19	16
PB 225 M	FF 500	500	450	550	5	8	19	18
PB 250 SG/MG	FF 600	600	550	660	6	8	24	25
PB 280 SG/MG	FF 600	600	550	660	6	8	24	25
PB 280 MGU	FF 600	600	550	660	6	8	24	25

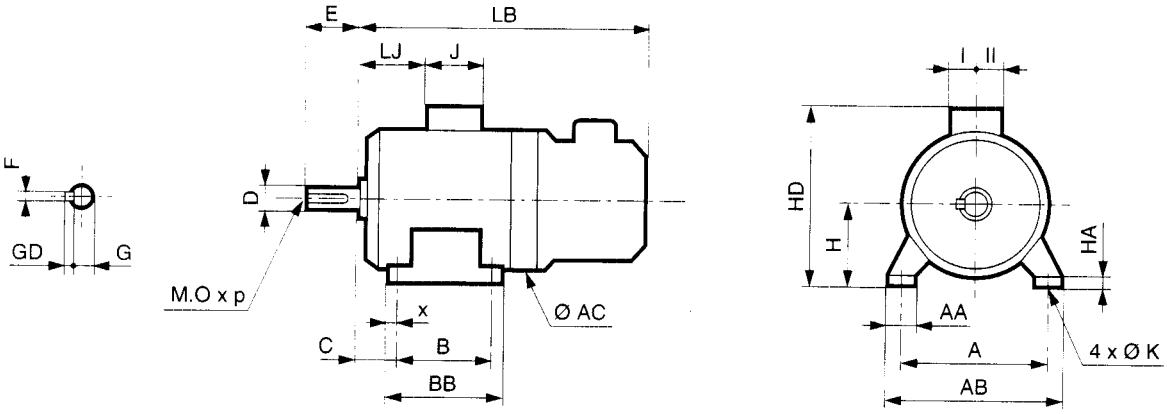
PB motor - FCPL brake

Dimensions

Dimensions of FCPL brake slip-ring induction motors - 4, 6, 8 poles
IP 23 motor protection, IP 44 brake protection

Dimensions in millimetres

- Foot mounted



	Brake induction motors																
Type	A	AB	B	BB	C	X	AA	K	HA	H	AC	HD	LB	LJ	J	I	II
PB 160 M	254	294	210	298	108	22	44	14	24	160	320	402	784	118	205	100	95
PB 160 L	254	294	254	298	108	22	44	14	24	160	320	402	784	118	205	100	95
PB 180 MT	279	324	241	319	121	20	68	14	30	180	320	422	784	118	205	100	95
PB 180 M	279	344	241	323	121	22	60	14	30	180	359	450	921	168	205	100	95
PB 180 L	279	344	279	323	121	22	60	14	30	180	359	450	921	168	205	100	95
PB 200 MT	318	378	267	347	133	20	60	19	30	200	359	470	952	168	205	100	95
PB 200 M	318	378	267	345	133	20	60	19	32	200	397	520	1095	198	217	103	145
PB 200 L	318	378	305	345	133	20	60	19	32	200	397	520	1095	198	217	103	145
PB 225 M	356	416	311	351	149	20	60	19	32	225	397	545	1095	198	217	103	145
PB 250 SG	406	480	311	417	168	34	75	22	35	250	530	666	1361	63	292	148	180
PB 250 MG	406	480	349	417	168	34	75	22	35	250	530	666	1361	63	292	148	180
PB 280 SG	457	537	368	499	190	40	80	24	27	280	600	730	1433	305	292	148	180
PB 280 MG	457	537	419	499	190	40	80	24	27	280	600	730	1433	305	292	148	180
PB 280 MGU	457	537	419	499	190	40	80	24	27	280	600	730	1493	305	292	148	180

	Output shaft						
Type	F	GD	D	G	E	O	p
PB 160 M/L	14	9	48 m6	42.5	110	16	36
PB 180 MT	14	9	48 m6	42.5	110	16	36
PB 180 M/L	16	10	55 m6	49	110	20	42
PB 200 MT	16	10	55 m6	49	110	20	42
PB 200 M/L	18	11	60 m6	53	140	20	42
PB 225 MT/M	18	11	65 m6	58	140	20	42
PB 250 SG/MG	20	12	75 m6	67.5	140	20	42
PB 280 SG/MG	22	14	80 m6	71	170	20	42
PB 280 MGU	22	14	80 m6	71	170	20	42

IP 55 motors - 2-speed

Selection

• LS or FLS motor - IP 55 - 50 Hz - Class F - DP rotor - S3 duty 40%
• FCPL D.C. brake or FAP 3-phase A.C. brake
• Separate brake power supply - High braking torque

1500 min^{-1} 750 min^{-1} - 4/8 poles (Dahlander connection)

Type of alu motor	Type of cast iron motor	Rated power at 50 Hz	High speed values				Low speed values				Braking torque[1]
			Torque (Nm)	Current (A)	Starting torque/ Rated torque	Starting current/ Rated current	Torque (Nm)	Current (A)	Starting torque/ Rated torque	Starting current/ Rated current	
		P_N kW	M_N N.m	I_N (400 V) A	M_D/M_N	I_D / I_N	M_N N.m	I_N (400 V) A	M_D/M_N	I_D / I_N	M_f ± 20% N.m
LS 160 M	**FLS 160 M**	8.1 / 4.5	54	16.4	1.8	4.9	59	13.8	1.9	3.4	90
LS 160 L	**FLS 160 L**	11 / 6	75	22	2	4.8	82	18	2.1	3.3	130
LS 180 M	**FLS 180 M**	14.5 / 9	94	30	1.8	4.5	117	24	1.9	3.5	180
LS 180 L	**FLS 180 L**	16.5 / 11	108	32.5	2	5.2	143	29	1.8	3.5	220
LS 200 M	**FLS 200 M**	18.5 / 12.5	118	34	1.8	7.2	165	31	1.8	4.9	260
LS 200 L	**FLS 200 L**	22 / 15	145	42.5	1.8	6.5	195	37	1.7	5	290
LS 225 M	**FLS 225 M**	28 / 19.5	184	57.5	2	6.3	253	54	1.8	4.8	390
LS 225 M	**FLS 225 M**	34 / 24	217	65.6	2.2	6.5	312	67	1.8	4	520

For larger sizes, please consult Leroy Somer.

1. Size for 1.6 3 rated torque for 8 poles.

1500 min^{-1} 500 min^{-1} - 4/12 poles

Type of alu motor	Type of cast iron motor	Rated power at 50 Hz	High speed values				Low speed values				Braking torque
			Torque (Nm)	Current (A)	Starting torque/ Rated torque	Starting current/ Rated current	Torque (Nm)	Current (A)	Starting torque/ Rated torque	Starting current/ Rated current	
		P_N kW	M_N N.m	I_N (400 V) A	M_D/M_N	I_D / I_N	M_N N.m	I_N (400 V) A	M_D/M_N	I_D / I_N	M_f ± 20% N.m
LS 160 M	**FLS 160 M**	4.8 / 1.6	31	12	2.4	5.9	31	8	2	2.5	50[2]
LS 160 L	**FLS 160 L**	6.6 / 2.2	42	15	2.2	6.3	42	10	2.1	3	75
LS 180 M	**FLS 180 M**	8.5 / 2.8	56	19	2.2	6.2	56	12	1.8	3	90
LS 180 L	**FLS 180 L**	11 / 3.7	72	25	2.1	5.8	72	15	1.9	2.8	110
LS 200 M	**FLS 200 M**	15 / 5	103	30	2.6	7.2	107	17	2	3.4	150
LS 200 L	**FLS 200 L**	18 / 6	118	36	2.4	6.9	118	23	2	3.1	180
LS 225 M	**FLS 225 M**	22 / 7.3	148	44	2.5	7.2	149	32	2.1	3	260

For larger sizes, please consult Leroy Somer.

2. For hoisting applications an FAP brake would be preferred.

For 2-speed brake motor dimensions, please consult Leroy Somer.

IP 55 motors - 2-speed

Selection

• LS or FLS motor - IP 55 - 50 Hz - Class F - DP rotor - S3 duty 40%
• FCPL D.C. brake or FAP 3-phase A.C. brake
• Separate brake power supply - High braking torque

1500 min^{-1} 750 min^{-1} - 4/8 poles (Dahlander connection)

Type of alu motor	Type of cast iron motor	Rated power at 50 Hz	High speed values				Low speed values				Braking torque[1]
			Torque (Nm)	Current (A)	Starting torque/ Rated torque	Starting current/ Rated current	Torque (Nm)	Current (A)	Starting torque/ Rated torque	Starting current/ Rated current	
		P_N kW	M_N N.m	I_N (400 V) A	M_D/M_N	I_D / I_N	M_N N.m	I_N (400 V) A	M_D/M_N	I_D / I_N	M_f ± 20% N.m
LS 160 M	**FLS 160 M**	8.1 / 4.5	54	16.4	1.8	4.9	59	13.8	1.9	3.4	90
LS 160 L	**FLS 160 L**	11 / 6	75	22	2	4.8	82	18	2.1	3.3	130
LS 180 M	**FLS 180 M**	14.5 / 9	94	30	1.8	4.5	117	24	1.9	3.5	180
LS 180 L	**FLS 180 L**	16.5 / 11	108	32.5	2	5.2	143	29	1.8	3.5	220
LS 200 M	**FLS 200 M**	18.5 / 12.5	118	34	1.8	7.2	165	31	1.8	4.9	260
LS 200 L	**FLS 200 L**	22 / 15	145	42.5	1.8	6.5	195	37	1.7	5	290
LS 225 M	**FLS 225 M**	28 / 19.5	184	57.5	2	6.3	253	54	1.8	4.8	390
LS 225 M	**FLS 225 M**	34 / 24	217	65.6	2.2	6.5	312	67	1.8	4	520

For larger sizes, please consult Leroy Somer.

1. Size for 1.6 3 rated torque for 8 poles.

1500 min^{-1} 500 min^{-1} - 4/12 poles

Type of alu motor	Type of cast iron motor	Rated power at 50 Hz	High speed values				Low speed values				Braking torque
			Torque (Nm)	Current (A)	Starting torque/ Rated torque	Starting current/ Rated current	Torque (Nm)	Current (A)	Starting torque/ Rated torque	Starting current/ Rated current	
		P_N kW	M_N N.m	I_N (400 V) A	M_D/M_N	I_D / I_N	M_N N.m	I_N (400 V) A	M_D/M_N	I_D / I_N	M_f ± 20% N.m
LS 160 M	**FLS 160 M**	4.8 / 1.6	31	12	2.4	5.9	31	8	2	2.5	50[2]
LS 160 L	**FLS 160 L**	6.6 / 2.2	42	15	2.2	6.3	42	10	2.1	3	75
LS 180 M	**FLS 180 M**	8.5 / 2.8	56	19	2.2	6.2	56	12	1.8	3	90
LS 180 L	**FLS 180 L**	11 / 3.7	72	25	2.1	5.8	72	15	1.9	2.8	110
LS 200 M	**FLS 200 M**	15 / 5	103	30	2.6	7.2	107	17	2	3.4	150
LS 200 L	**FLS 200 L**	18 / 6	118	36	2.4	6.9	118	23	2	3.1	180
LS 225 M	**FLS 225 M**	22 / 7.3	148	44	2.5	7.2	149	32	2.1	3	260

For larger sizes, please consult Leroy Somer.

2. For hoisting applications an FAP brake would be preferred.

For 2-speed brake motor dimensions, please consult Leroy Somer.

IP 55 motors - 2-speed

Selection

• LS or FLS motor - IP 55 - 50 Hz - Class F - DP rotor - S3 duty 40%
• FCPL D.C. brake or FAP 3-phase A.C. brake
• Separate brake power supply - High braking torque

1500 min^{-1} 375 min^{-1} - 4/16 poles

Type of alu motor	Type of cast iron motor	Rated power at 50 Hz	High speed values				Low speed values				Braking torque
			Torque (Nm)	Current (A)	Starting torque/ Rated torque	Starting current/ Rated current	Torque (Nm)	Current (A)	Starting torque/ Rated torque	Starting current/ Rated current	
		P_N kW	M_N N.m	I_N (400 V) A	M_D/M_N	I_D / I_N	M_N N.m	I_N (400 V) A	M_D/M_N	I_D / I_N	M_f ± 20% N.m
LS 160 M	**FLS 160 M**	5.5 / 1.3	36	13	2.7	6.6	36	11,5	2.2	1.8	50[1]
LS 160 L	**FLS 160 L**	7.3 / 1.8	48	16	2.3	7	46	15	2	1.9	75
LS 180 L	**FLS 180 L**	11 / 2.8	70	22	3	6.4	70	18	2.1	1.7	110
LS 180 M	**FLS 180 M**	16 / 4	102	32	2.3	5.9	102	18	2.2	2.5	180
LS 200 L	**FLS 200 L**	18.5 / 4.6	118	37	2.4	6.1	118	25	2.1	1.8	200
LS 225 M	**FLS 225 M**	24 / 6	152	49	2.1	5	152	35	2.1	2	250
For larger sizes, please consult Leroy Somer.											

1. For hoisting applications an FAP brake would be preferred.

For 2-speed brake motor dimensions, please consult Leroy Somer.

IP 23 motors - 2-speed

All the power ratings available for TEFV motors are available for drip-proof motors and, in most cases, in smaller frame sizes.

It is possible to obtain different speed ratios from TEFV motors.

A complete range of 3-speed IP 23 hoisting motors is available, specially designed for use with building cranes.

Formulae

Definition

1) Defining parameters

A brake should be selected according to its end use. You should therefore know and calculate the mechanical and electrical parameters which will determine the minimum capacity required for the brake to best meet the application requirements. These parameters are:
- the required braking torque
- the inertia of the mechanism to be braked
- the duty factor

The following information will enable you to determine the best brake for your application.

2) Braking torque

Reminder: The rated motor torque is given by the formula:

$$Cn = P \times 9\,550/N \qquad (1)$$

P: power in kW
N: speed in rpm
Cn: torque in Nm

Depending on the application and mechanical efficiency, the braking torque will be a multiple of this calculated value:

Example:
Hoisting movement:

$$Cf = 1.6 \times Cn \qquad (2)$$

Translational motion:

$$Cf = Cn$$

Holding brake:

$$Cf = Cn$$

Other values may be retained according to requirements.

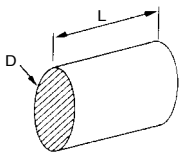
However, the braking torque in relation to the rated torque should never be overestimated as this may cause increased mechanical stress during braking phases. The maximum value should be less than Cf = 2.5 × Cn.

3) Inertia of the mechanism to be locked

The definition of this parameter is important since it represents the braking energy that the brake will have to dissipate.

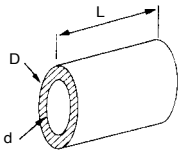
Practical formulae:
Inertia of a solid cylinder:

$$J = 0.098 \times \rho \times L \times D^4$$



Inertia of a tube:

$$J = 0.098 \times \rho \times L \times (D^4 - d^4)$$

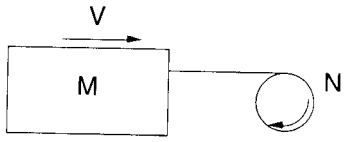


Inertia at different speeds:

$$J1 = J2 \times (w_2/w_1)^2$$

Inertia of a mass in rectilinear motion applied to the motor speed:

$$J = 91.2 \times M \times V^2/N^2 \qquad (3)$$



The total inertia to be taken into account is the sum of the inertia applied at the motor shaft end. This result should be used to check the thermal capacity of the brake.

4) Duty factor

In the case of an FCPL brake, the operating factor determines the type of coil to be used. Please refer to the FCPL brakes section (page 10).

5) Response time

The braking time Tr equals the sum of:
- the contactor response time “tc”, which can be disregarded in many cases
- the brake engage time “tr” when the power supply is disconnected
- the time “tf” required to brake and bring the load to a standstill

$$tf = J \times N/(9.55 \times (Cf \pm Cn)) \qquad (4)$$

+Cn if it is a resistive load
-Cn if it is a driving load

In the case of static braking:

$$Tr = tc + tr$$

In the case of dynamic braking:

$$Tr = tc + tr + tf \qquad (5)$$

Note: The shortest coil response time will be obtained by direct disconnection of the D.C. supply. Our rectifiers are fitted with a terminal which performs this operation via a contactor.

Disconnection of the D.C. supply is obligatory in hoisting applications.

6) Units used

J, J1, J2	Inertias	$kg.m^2$
D, d, L	Dimensions	m
M	Mass	kg
N	Rotation speed	min^{-1}
w_1, w_2	Angular speed	rd/s
V	Speed	m/s
ρ	Density	kg/dm^3
P	Power	W
Cn, Cf	Torque	Nm
ta, tr	Response time	ms
tf	Braking time	s

7) Example

A 5000 kg load is moved vertically at a speed of 15 m/min (0.25 m/s). The cycle comprises 60 starts per hour for an operating factor of 40%. The mechanism is composed of a 15 kW geared motor with the following characteristics:
LS 15 kW - 4 poles - 1455 min^{-1}
Motor inertia: 0.09 $kg.m^2$
Gearbox inertia: 0.01 $kg.m^2$

An FCPL D.C. brake is required.

Calculations:
• Rated motor torque:
Cn = (15 × 9550)/1450 = 99 Nm (1)
Hoisting movement
=> Cf =1.6 × Cn =158 Nm (2)

The FCPL54 - 215 brake can be used.

• Inertia of the load applied to the motor:
$J = 91.2 \times 5000 \times 0.25^2/1450^2$
$= 0.013\ 5\ kg.m^2$ (3)
Total J =
$0.013\ 5 + 0.094 + 0.01 = 0.117\ 5\ kg.m^2$

• 40% duty => S3 brake coil

• Checking the thermal capacity of the brake (page 11):
FCPL 54 - 1 disk:
$Nf = 164.10^6/(0.118\ 5 \times 1450^2) = 659$

The calculated braking amount is much greater than required by the cycle. There is no thermal limit on the brake.

• Lining wear:
FCPL54 - 1 disk:
E = 550 MJ for 1 mm of wear

For 0.6 mm of wear:
E = 550 × 0.6 = 330 MJ

Definition

This energy therefore corresponds to N_f braking at 1455 rpm (152 rd/s) with an inertia of 0.117 5 kg.m^2, ie:

- $E = N_f \times 0.5 \times \text{total } J \times w^2$

so - $N_f = (E \times 2)/(\text{total } J \times w^2)$

therefore N_f = 241,000

241,000 braking actions can be performed before the air gap needs to be adjusted.

• Coil response time
(see page 12)

FCPL 54 yoke, S3 duty.
ta = 150 ms brake release time
(p. 12 section 5-1-a)

tr = 10,400/150 = 70 ms braking time
(p. 12 section 5-2)

• Braking time:
The worst situation will occur in the downward direction with a driving load.
tf = 0.118 5 × 1455/(9.55 × (150 – 99))
= 0.35 s (4)

Assuming 10 ms is the contactor response time.

Load stopped in:
350 + 70 + 10 = 430 ms. (5)

Notes

Notes

I - APPLICATION AREA
Acceptance of our tenders or the placing of any order with us implies acceptance of the following conditions without exception or reservation. These conditions of sale shall prevail over all stipulations appearing on the customer's purchase order, his general conditions of purchase or any other document emanating from him and / or a third party.
A dispensation from these General Conditions of Sale applies to sales concerning foundry parts, which are subject to the European Foundries General Conditions of Sale, latest edition.

II - ORDERS
All orders, including those taken by our agents and representatives, by whatever mode of transmission, become valid only after we have accepted them in writing.
We reserve the right to modify the characteristics of our goods without prior warning. However, the customer reserves the possibility to specify technical specifications in the order. Unless such requirements have been notified in writing, the customer will not be able to refuse delivery of new modified goods.
Our company will not accept responsibility for an incorrect choice of goods if this incorrect choice results from incomplete and / or erroneous conditions of use, or conditions that have not been conveyed to the vendor by the customer.
Unless otherwise specified, our tenders and estimates are only valid for thirty days from the date of issue.
When the goods have to satisfy standards, particular regulations and / or be inspected by standards or control organisations, the price request must be accompanied by full specifications with which we must comply with. This is mentioned in the estimate. All test and inspection fees are the customer's responsibility.

III - PRICE
Our prices and price lists are shown exclusive of tax and may be revised without prior notice.
Our prices are either firm for the duration specified on the estimate, or subject to revision according to a formula accompanying the tender which, depending on the regulations, covers a change in the cost of raw materials, products, various services and salaries, an index of which is published in the B.O.C.C.R.F. ("Bulletin Officiel de la Concurrence, de la Consommation et de la Répression des Fraudes").
For any order of goods not found in our catalogue, requiring special manufacture, the invoice will include a minimum fixed sum of 600 FRF (six hundred French Francs) exclusive of tax, to cover start - up costs. Any tax due will be charged to the customer.
All related costs, such as customs clearance and special inspections, will be added on.
Customers should remember that the French Franc (or other currency) is being replaced by the Single European Currency (EURO) according to a European Community ruling. In accordance with the general principles of monetary law, references to the French Franc will then as of right be considered to refer to the Euro. This substitution will be enforced on the date and in accordance with the conditions defined by the European Community ruling.

IV - DELIVERY
Our export sales are governed by the INCOTERMS published by the International Chamber of Commerce ("I.C.C. INCOTERMS"), latest edition.
Goods are despatched in accordance with the conditions indicated on our order acknowledgement, sent out in response to any order for goods and / or services.
Unless otherwise specified, our prices refer to goods put at customer's disposal in our factories, and include standard packaging.
Unless otherwise specified, goods are always transported at the consignee's risk. Without exception, it is up to the purchaser to raise with the transporter, in the legal form and time limits, any claim concerning the condition or the number of packages received and also to send us at the same time a copy of this declaration. Failure to respect this procedure will relieve us of all responsibility.
In the case of CIF (Cost, Insurance & Freight) or CIP (Carriage & Insurance Paid to) sales, etc…, in the event of damage, our responsibility will only be engaged if any reservations and required declarations have been notified in the required time period, and will not in any case exceed the indemnity sum received from our insurers.
If the arrangements for despatch are modified, we reserve the right to invoice any additional costs arising from such changes. Packages cannot be returned.
Should the delivery of goods be delayed for a reason not attributable to the vendor, goods will be stored on the vendor's premises, at the own risk of the customer, at a charge for storage of 1% (one per cent) of the total order sum per week, beginning, without a grace period, on the day after the scheduled date of delivery indicated in the contract. After thirty days from this date, the vendor has the right to dispose of these goods as he wishes and arrange a new delivery date for the said goods with the customer. In all instances, all down payments received remain the property of the vendor as indemnity, without prejudice to other claims for damages that the vendor may wish to bring.

V - DELIVERY DATES
Delivery times are stated for information only, and do not include the month of August.
Delivery dates are counted from the issue date of the order acknowledgement from the vendor and are subject to compliance with the provisions indicated on the order acknowledgement, notably receipt of the down payment for the order, notification of the issuance of an irrevocable letter of credit conforming to all vendor requirements (especially as regards the amount, currency, validity, licence, etc.) and acceptance of the terms of payment with any guarantees which may be required, etc…
In no case does late delivery automatically entitle the customer to damages and / or penalties.
Unless otherwise specified, we reserve the right to make partial deliveries.
Delivery dates are automatically suspended without formal notice, and the vendor shall have no responsibility in cases of Force Majeure, or events beyond the control of the vendor or his suppliers such as delays, saturation, or unavailability of the planned transport methods, energy, raw materials etc., serious accidents such as fires, explosions, strikes, lock out, or emergency measures taken by the Authorities occurring after the conclusion of the order and preventing its normal execution. Similarly, delivery dates are automatically suspended without formal notice in all cases of failure to perform or late payment by the customer.

VI - TESTS
All goods manufactured by the vendor are tested before leaving the factory in accordance with vendor's ISO 9001 certifications. Customers may attend these tests : they simply have to convey the wish to do so in writing when the order is placed.
Specific tests and acceptance tests requested by the customer, whether conducted on the customer's premises, in our factories, on-site, or by inspection organisations, must be noted on the order and are to be paid for by the customer.
Goods specially developed for a customer will have to be approved by the latter before any delivery of mass - produced goods, notified by signing and returning to us the Product Approval Schedule reference Q1. T. 034.
In the event of the customer's insistence on delivery without having signed this form beforehand, the goods will then still be considered as prototypes and the customer will assume sole responsibility for using it or supplying it to his own customers.

VII -TERMS OF PAYMENT
All our sales are considered as carried out and payable at the registered office of the vendor, without exception, whatever the method of payment, the place of conclusion of the sale and delivery.
When the customer is based in France, our invoices are payable on receipt in cash, by banker's draft, or by L.C.R. ("Lettre de Change - Relevé"), within thirty days from the end of the month following the invoice date, net and without discount.
When the customer is based outside France, our invoices are payable in cash against delivery of the dispatching documents or by irrevocable documentary credit confirmed by a first class French bank with all bank charges payable by the customer.
Payments must be made in the currency of the invoice.
In accordance with French Law N° 92.1442 dated December 31,1992, non-payment of an invoice by its due date will give rise, after formal notice, to a penalty equal to one and a half times (1.5) the official rate of interest, and to late payment interest at the bank base rate plus five per cent. If the invoice carries V.A.T. (Value Added Tax), this is calculated on the amount, inclusive of tax, of the remaining sum due and comes into force from the due date.
Should steps have to be taken to recover the said amount, a surcharge of 15% (fifteen per cent) of the sum demanded will be payable.
Moreover, as a consequence of non - payment of an invoice or any term of payment, whatever the method of payment envisaged, the customer shall pay immediately for the whole of the outstanding amount owed to the vendor (including his subsidiaries, sister or parent companies, whether in France or overseas) for all deliveries or services, whatever their initial due date.
Notwithstanding any particular terms of payment arranged between the parties concerned, the vendor reserves the right to demand :

– payment in cash, before the goods leave the factory, for all orders in the process of manufacture, in the event of a problem with payment, or if the customer's financial situation justifies it,
– a down payment for the order.

Unless we are at fault, all down payments are non - returnable, without prejudice to our right to claim damages.
Any payment made in advance of the fixed payment date will lead to a discount of 0.2 % (zero point two per cent) per month of the amount concerned.

VIII - COMPENSATION CLAUSE
Unless prohibited by law, the vendor and the customer expressly agree between one another to compensate their respective debts arising from their commercial relationship, even if the conditions defined by law for legal compensation are not all satisfied.
In applying this clause, by vendor we mean any company in the LEROY SOMER group.

IX - TRANSFER OF RISKS - TRANSFERT OF TITLE
Transfer of risks occurs upon the handing over of the goods, according to the delivery conditions agreed at the time of ordering.
THE TRANSFER OF TITLE OF THE GOODS SOLD TO THE CUSTOMER OCCURS UPON PAYMENT OF THE WHOLE PRINCIPAL SUM AND INTEREST.
The provision of a document creating an obligation to pay (bank draft or similar) does not constitute payment.
So long as the price has not been paid in full, the customer is obliged to inform the vendor, within twenty - four hours, of the seizure, requisition or confiscation of goods to the benefit of a third party, and to take all safety measures to acquaint others with and respect our right of title in the event of intervention by creditors.
Failure to pay the amount due, whether total or partial, on the due date, for whatever reason and on whatever grounds, authorises the vendor to demand as of right and without formal notice, the return of the goods, wherever they may be, at the customer's expense and risk.
Return of the goods does not imply to cancellation of the sale .However, we reserve the option to apply the cancellation clause contained in these General Conditions of Sale.

X - CONFIDENTIALITY
The vendor and the customer undertake to maintain confidentiality of information of a technical, commercial or other nature, obtained during negotiations and / or the execution of any order.

XI - INDUSTRIAL AND INTELLECTUAL PROPERTY RIGHTS
The results, data, studies and information (whether patentable or not), or software developed by the vendor during execution of any order, and delivered to the customer, are the sole property of the vendor.
Apart from the instructions for use, servicing and maintenance, reports and documents of any type that we deliver to our customers remain our property and must be returned to us on request, even when design fees have been charged for them, and they shall not be communicated to third parties or used without the prior written agreement of the vendor.

XII - CANCELLATION CLAUSE
We reserve the right to cancel immediately, as of right and without formal notice, the sale of our goods in case of non-payment of any part of the price by the due date, or in case of any breach in the contractual obligations of the customer. In this case, the goods will have to be returned to us immediately, at the customer's own risk and expense, subject to a penalty of 10% (ten per cent) of its value per week of delay. All payments already received shall remain our property as indemnity, without prejudice to our rights to claim damages.

XIII -WARRANTY
The vendor warrants the goods against any defect, arising from a default in material or in workmanship, for twelve months starting from the date on which they are made available, according to the conditions defined below.
The warranty for goods with special applications, or goods used 24 hours a day, is automatically reduced by half.
On the other hand, parts or accessories of other origin, which bear their own brand name, are included in our warranty only to the extent of the warranty conditions granted by the suppliers of these parts.
The vendor's warranty will only apply insofar as the goods have been stored, used and maintained in accordance with the vendor's instructions and documentation. It cannot be invoked when the default results from :

– failure to monitor, maintain or store the goods correctly,
– normal wear and tear of goods,
– intervention on or modification to the goods without the vendor's prior authorisation in writing,
– abnormal use, or use not conforming to the intended purpose,
– defective installation at the customer's and / or the final user's premises,
– non-communication, by the customer, of the intended purpose or the conditions of use of the goods,
– failure to use original manufacturer's spare parts,
– Force Majeure or any event beyond the control of the vendor,
– etc …

In all cases, the warranty is limited to the replacement or the repair of parts or goods recognised as defective by our technical departments. If the repair is entrusted to a third party, it should only be carried out after acceptance by the vendor of the estimate for repair.
No goods should be returned without the vendor's prior authorisation in writing .
Goods to be repaired should be sent prepaid, to the address indicated by the vendor. If the goods have not been repaired under warranty, the cost of dispatching it back will be invoiced to the customer or to the end purchaser.
This warranty applies to our goods in accessible form and therefore does not cover the cost of dismantling and reinstallation of the said goods in the equipment in which they are integrated .
Repair, modification, or replacement of spare parts or goods during the warranty period will not extend the duration of the warranty.
The provisions of this article constitute the only obligation on the part of the vendor concerning the warranty for the goods supplied.

XIV -LIABILITY
The vendor will be liable for bodily injury caused by his goods or personnel.
The repair of property damages attributable to the vendor is expressly limited to a sum which may not exceed the amount of the goods found as defective.
It is expressly agreed that the vendor and the customer each waive any right to claim for indirect, consequential and / or punitive damages of any kind, such as loss of production, loss of profit, costs of withdrawal from the market or costs of recall, costs of dismantling and reinstallation of goods, loss of contracts, etc.

XV - SPARE PARTS AND ACCESSORIES
Spare parts and accessories are provided on request insofar as they are available. Related costs (carriage and any other costs) are always added to the invoice.
We reserve the right to demand a minimum quantity or invoice a minimum per order.

XVI - PARTIAL INVALIDITY
If any provision of these General Conditions of Sale is held to be unenforceable for any reason, it shall be adjusted rather than voided, if possible, in order to achieve the intent of the parties to the extent possible. In any event, all other provisions shall be deemed valid and enforceable to the full extent possible.

XVII -DISPUTES
THESE GENERAL CONDITIONS OF SALE ARE GOVERNED BY FRENCH LAW.
ANY DISPUTE RELATING TO OUR SALES, EVEN IN THE CASE OF MULTIPLE DEFENDANTS, SHALL BE, IN THE ABSENCE OF AMICABLE SETTLEMENT AND NOTWITHSTANDING ANY CLAUSE TO THE CONTRARY, SUBJECT TO THE JURISDICTION OF THE COURTS OF ANGOULEME (France).

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