



**LSMV**



**High-efficiency 3-phase induction motors  
for variable speed control  
0,75 to 132 kW**



**LEROY-SOMER™**

***Nidec***  
All for dreams



### A world-class product



#### Guaranteed variable speed performance

Leroy-Somer is expanding its induction motor offer with a range specially adapted for variable speed. Combined with any type of frequency inverter, the LSMV offers solutions adapted to the industrial environment by producing electrical performance with IE2 efficiency level and mechanical performance by guaranteeing constant torque over a wide operating range without forced ventilation and without derating.

#### Interchangeability

The LSMV motor retains the IEC60072-1 dimensions (frame size, mounting distance and shaft diameter) while an induction motor designed to operate on the mains would be derated according to the operating range.

#### Modularity and simplicity

In order to satisfy the demands of the process, the LSMV easily integrates speed sensors (incremental or absolute encoders, resolvers, bearing sensors, etc), as well as brakes and/or forced ventilation.



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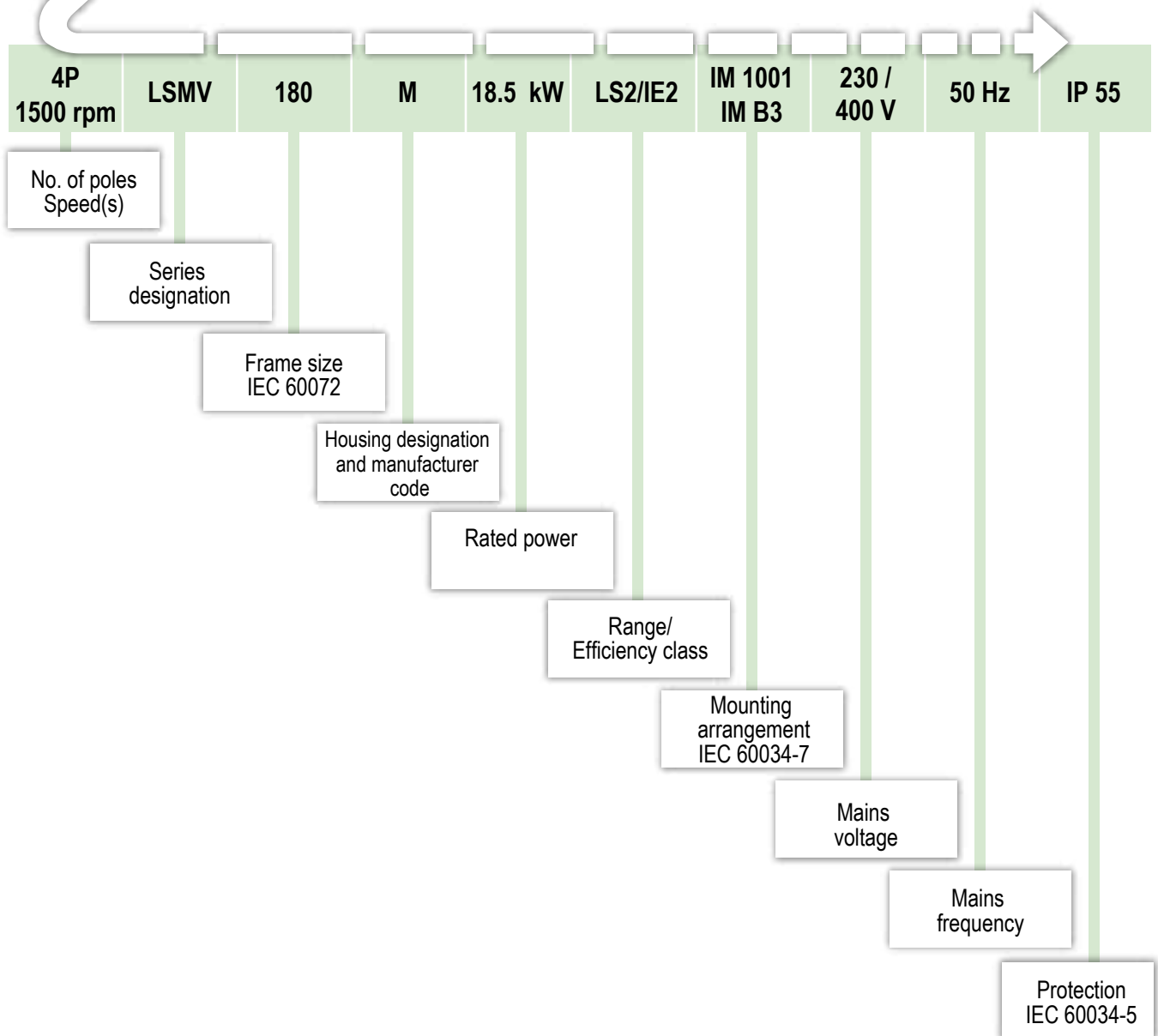
## Designation



IP 55  
Cl. F -  $\Delta T$  80 K

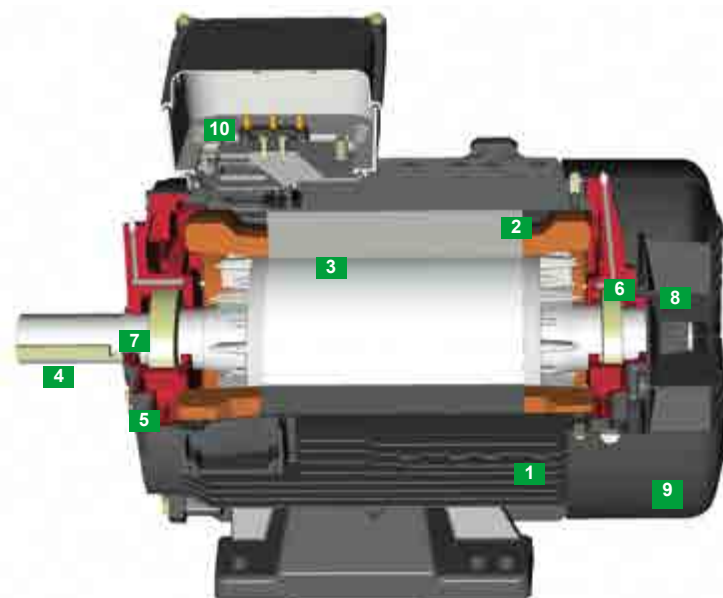
The complete motor reference described below will enable you to order the desired equipment.

The selection method consists of following the terms in the designation.



### Description

Description	Materials	Comments
<b>1</b> Housing with cooling fins	Aluminium alloy	<ul style="list-style-type: none"> <li>- with integral or screw-on feet, or without feet</li> <li>- die-cast for frame size <math>\leq 180</math></li> <li>- gravity die-cast for frame size <math>\geq 200</math></li> <li>• 4 or 6 fixing holes for housings with feet</li> <li>• lifting rings for frame size <math>\geq 100</math></li> <li>- earth terminal with an optional jumper screw</li> </ul>
<b>2</b> Stator	Insulated low-carbon magnetic steel laminations Electroplated copper	<ul style="list-style-type: none"> <li>- low carbon content guarantees long-term lamination pack stability</li> <li>- semi-enclosed slots</li> <li>- magnetic circuit based on acquired experience in frequency control</li> <li>- impregnation making it possible to withstand the sudden voltage variations caused by the high switching frequencies of IGBT transistor drives in accordance with IEC 34-17</li> <li>- class F insulation</li> <li>- thermal protection provided by 3 PTC probes (1 per phase)</li> </ul>
<b>3</b> Rotor	Insulated low-carbon magnetic steel laminations Aluminium	<ul style="list-style-type: none"> <li>- inclined cage bars</li> <li>- rotor cage pressure die-cast in aluminium (or alloy for special applications)</li> <li>- shrink-fitted to shaft and keyed for hoisting applications</li> <li>- rotor balanced dynamically, class B for frame size <math>\leq 132</math></li> </ul>
<b>4</b> Shaft	Steel	
<b>5</b> End shields	Cast iron	- frame size 80 to 315
<b>6</b> Bearings and lubrication		<ul style="list-style-type: none"> <li>- permanently greased bearings frame size 80 to 225</li> <li>- regreasable bearings frame size 250 to 315</li> <li>- bearings preloaded at non drive end</li> </ul>
<b>7</b> Labyrinth seal Lipseals	Plastic or steel Synthetic rubber	<ul style="list-style-type: none"> <li>- lipseal or deflector at drive end for all flange mounted motors</li> <li>- lipseal, deflector or labyrinth seal for foot mounted motors</li> </ul>
<b>8</b> Fan	Composite material	- 2 directions of rotation: straight blades
<b>9</b> Fan cover	Pressed steel	- fitted, on request, with a drip cover for operation in vertical position, shaft end facing down (steel cover)
<b>10</b> Terminal box	Aluminium alloy	<ul style="list-style-type: none"> <li>- fitted with a terminal block with steel terminals as standard (brass as an option)</li> <li>- terminal box fitted with plugs, supplied without cable glands (cable glands as an option)</li> <li>- 1 earth terminal in each terminal box</li> <li>- fixing system consisting of a cover with captive screws</li> </ul>



#### Choice of application type

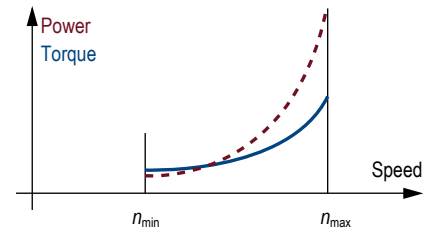
In principle, there are three typical types of load. It is essential to determine the speed range and the application torque (or power) in order to select the drive system:

#### CENTRIFUGAL MACHINES

The torque varies as the square of the speed (or cube of the power). The torque required for acceleration is low (about 20% of rated torque). The starting torque is low.

- Sizing: depends on the power or torque at maximum speed
- Drive selected for normal duty

Typical applications: ventilation, pumping, etc

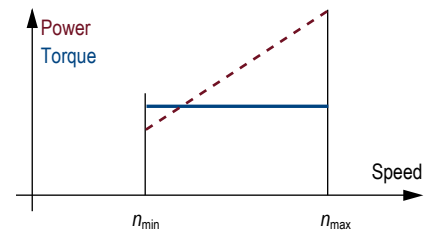


#### CONSTANT TORQUE MACHINES

The torque remains constant throughout the speed range. The torque required for acceleration may be high, depending on the machine (higher than the rated torque).

- Sizing: depends on the torque required over the entire speed range
- Drive selected for heavy duty

Typical machines: extruding machines, grinders, travelling cranes, presses, etc

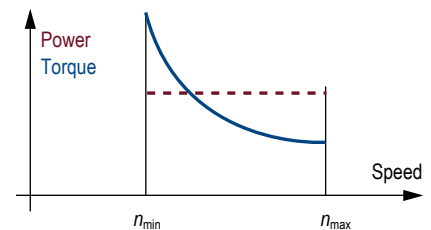


#### CONSTANT POWER MACHINES

The torque decreases as the speed increases. The torque required for acceleration is no more than the rated torque. The starting torque is at its maximum.

- Sizing: depends on the torque required at minimum speed and the range of operating speeds.
- Drive selected for heavy duty
- An encoder feedback is advisable for improved regulation

Typical machines: winders, machine tool spindles, etc

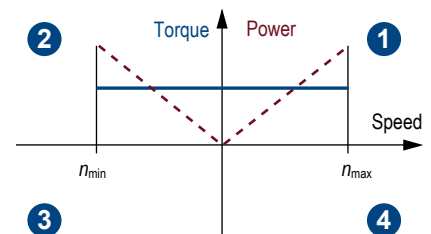


#### 4-QUADRANT MACHINES

These applications have a torque/speed operating type as described above, but the load becomes a driving load in certain stages of the cycle.

- Sizing: see above depending on the load
- In the case of repetitive braking, install a reinforced insulation system (RIS)
- Drive selection: to dissipate the power from a driving load, it is possible to use a braking resistor, or to send power back to the grid. In the latter case, a regenerative or 4-quadrant drive should be used.

Typical machines: centrifuges, travelling cranes, presses, machine tool spindles, etc





# LSMV

## High-efficiency 3-phase induction motors for variable speed control

### Selection

### Choice of number of poles, optional features and brake

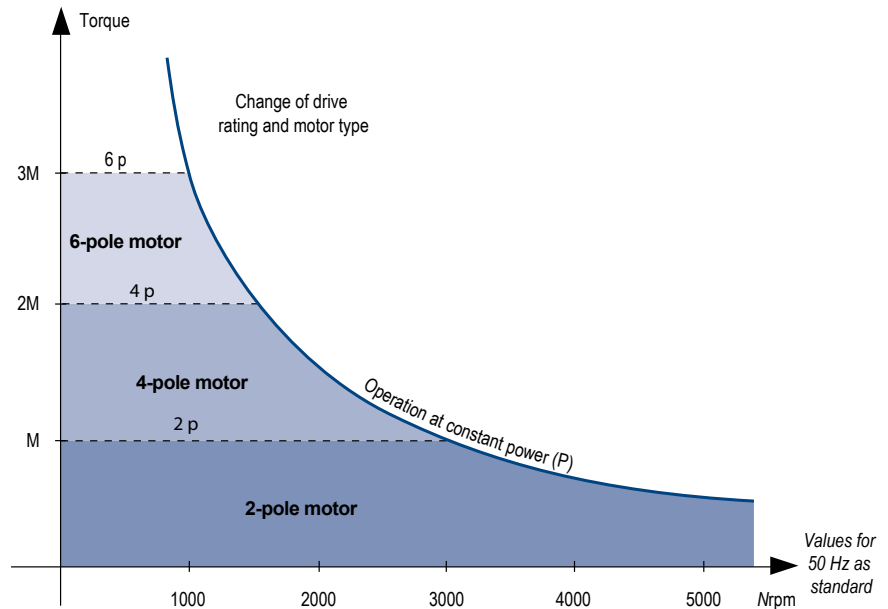
#### NUMBER OF POLES

The number of poles is one of the main criteria.

In fact, as can be seen in the graph opposite, the torque is distributed differently depending on the number of motor poles used.

Therefore, for use only at low speed, a 6-pole motor should be chosen.

Conversely, for overspeed operation the 2-pole motor should be selected.



#### OPERATING EXTENSIONS

Depending on the applications and speed controllers, certain accessories are needed:

##### Forced ventilation unit:

- For low-speed operation ( $< n_N/2^*$  for the LSES motor and  $< n_N/10^*$  for the LSMV) in continuous duty
- For high-speed operation (special design)

##### Encoder:

- For operation on a flux vector drive
- For speeds below  $n_N/10^*$
- To obtain the speed accuracy needed by some servo systems

\* $n_N$  = rated speed

#### BRAKE

For operation on a drive, the brake is determined according to the number of starts per hour and the inertia factor.

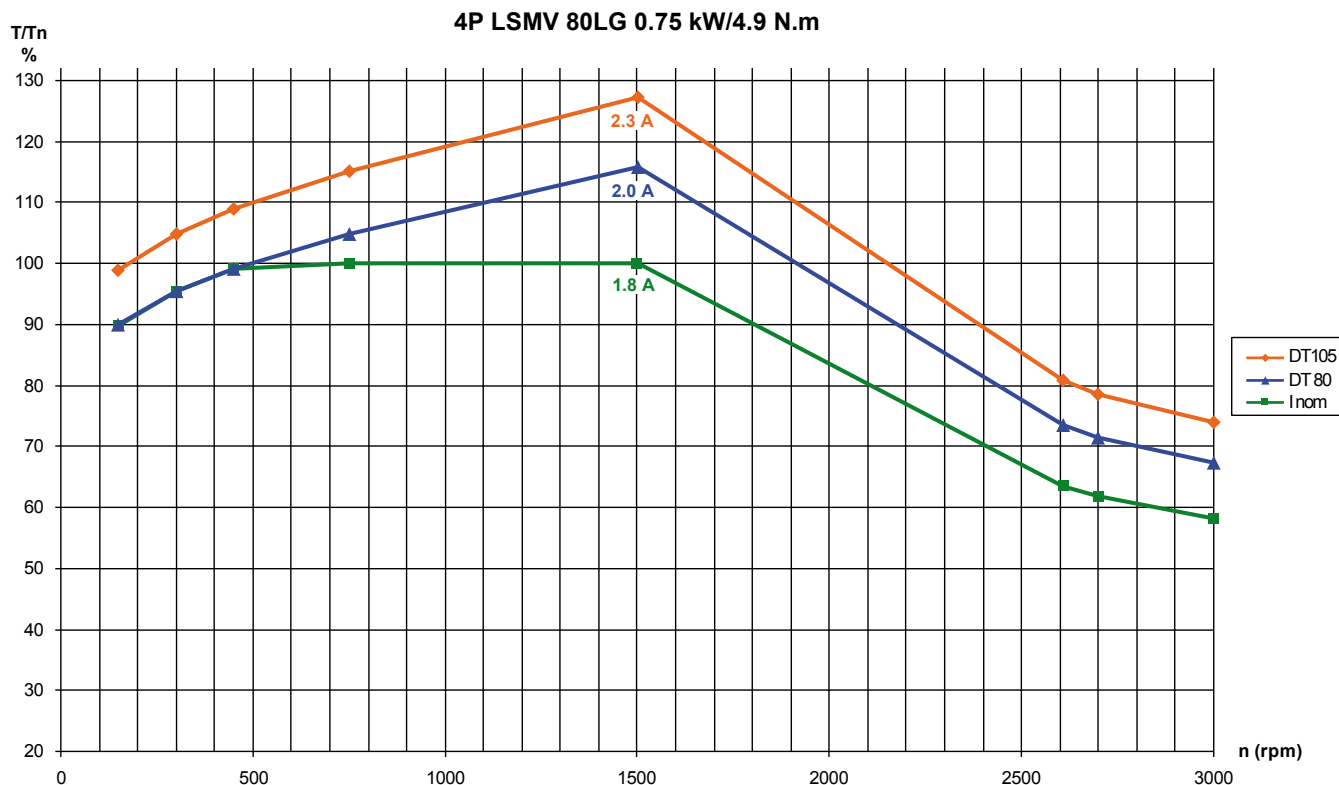
$$\text{Inertia factor} = (J_c + J_m) / J_m$$

$J_m$ : Brake motor inertia

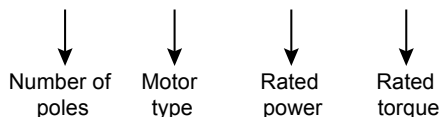
$J_c$ : Load inertia on the motor

		Inertia factor		
		0.1	1	10
Emergency stops per hour	1	BK	BK	FCR - FCPL
	10	BK	FCR - FCPL	FCR - FCPL
	100	BK	FCR - FCPL	FCR - FCPL

#### MOTOR PERFORMANCE AS A FUNCTION OF THE TORQUE AND THE SPEED RANGE IN S1 CONTINUOUS DUTY - 4P 1500 rpm



**4P LSMV 80LG 0.75 kW / 4.9 N.m**



**DT105** = Temperature rise F curve

**DT80** = Temperature rise B curve

**Tnom** = Rated torque curve

**2.3 A** = Current on drive at DT105

**2.0 A** = Current on drive at DT80

**1.8 A** = Current on drive at rated torque

To guarantee the LSMV motor performance, the drive rating should be compatible with the current of the selected curve.

All the performance curves have been carried out with a self-cooled LSMV motor and a drive supplied on a 400 V-50Hz mains power supply in open loop flux vector mode and under normal operating conditions:

- Ambient temperature 40°C max.
- Altitude 1000 m max.

#### Selection example:

For a torque of 5.4 Nm (i.e. 110% of T/Tn) from 500 to 1800 rpm:

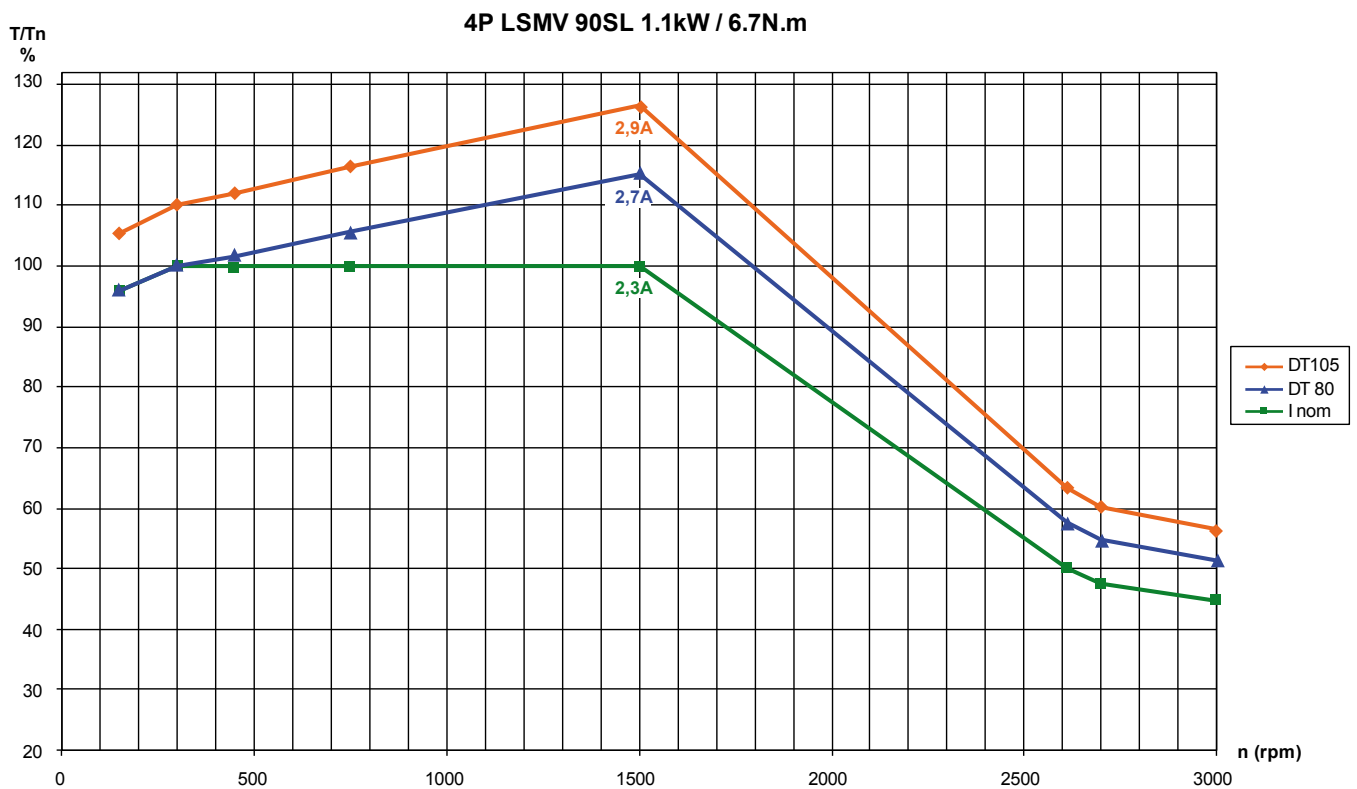
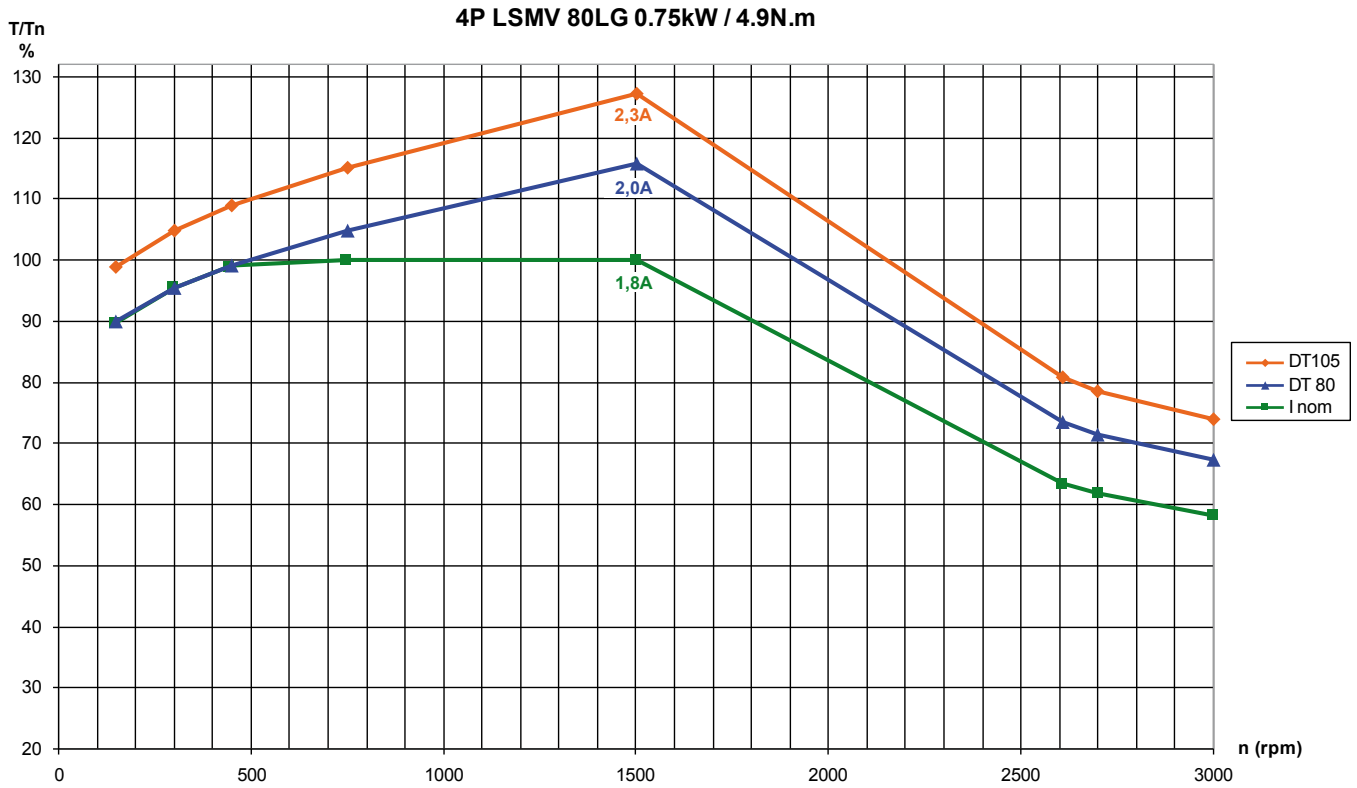
- selection: standard 1.1 kW motor + drive
- selection: 0.75 kW LSMV motor + 2.3 A drive

# LSMV

## High-efficiency 3-phase induction motors for variable speed control

### Performance

#### Load capacity of LSMV motors on a drive

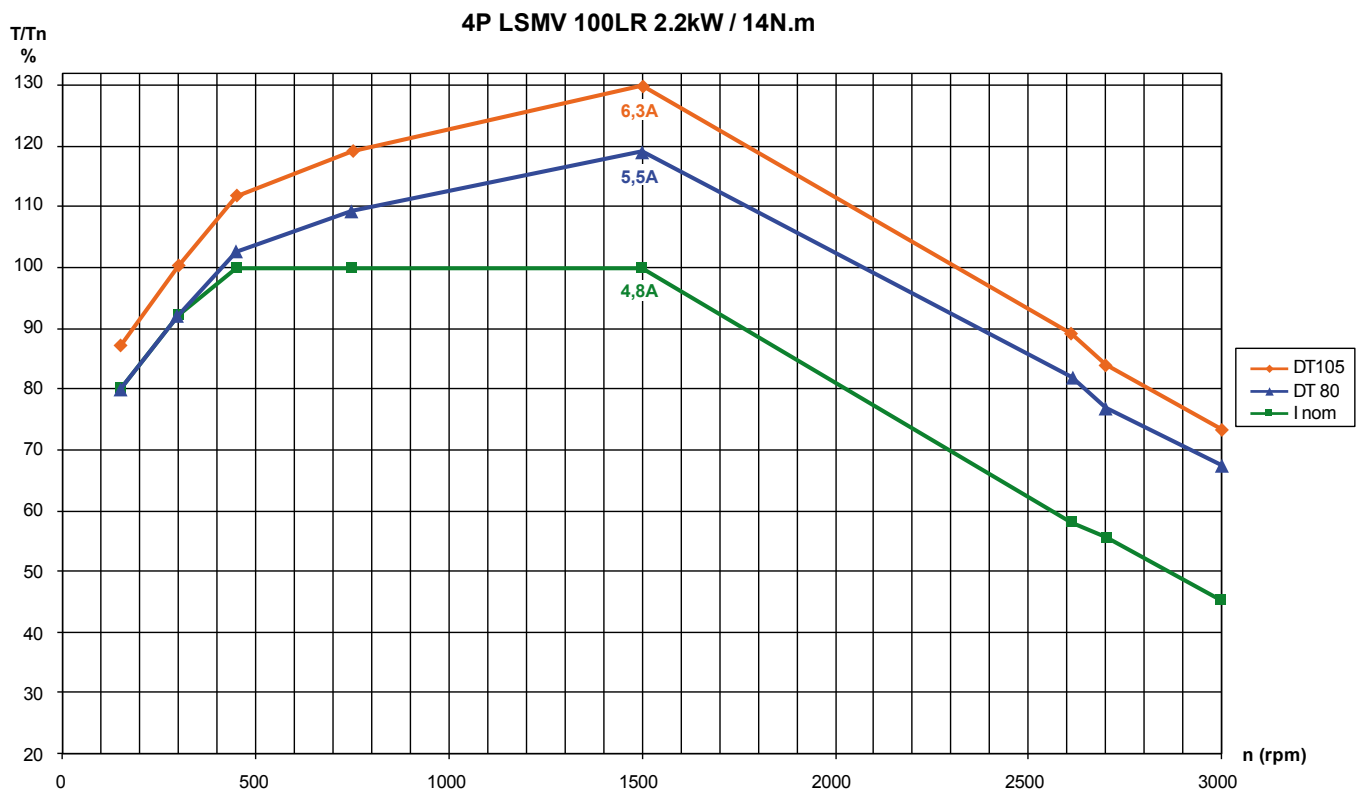
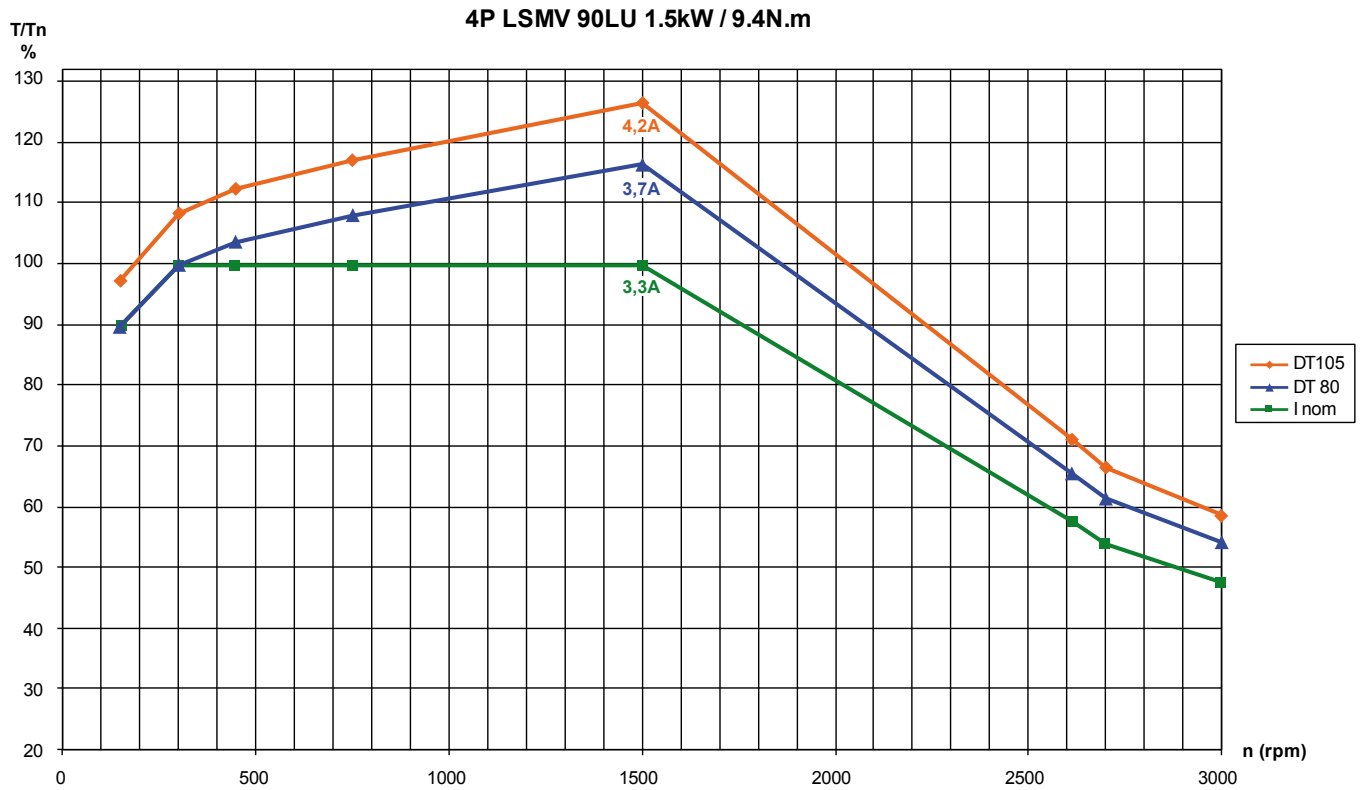


# LSMV

## High-efficiency 3-phase induction motors for variable speed control

### Performance

#### Load capacity of LSMV motors on a drive

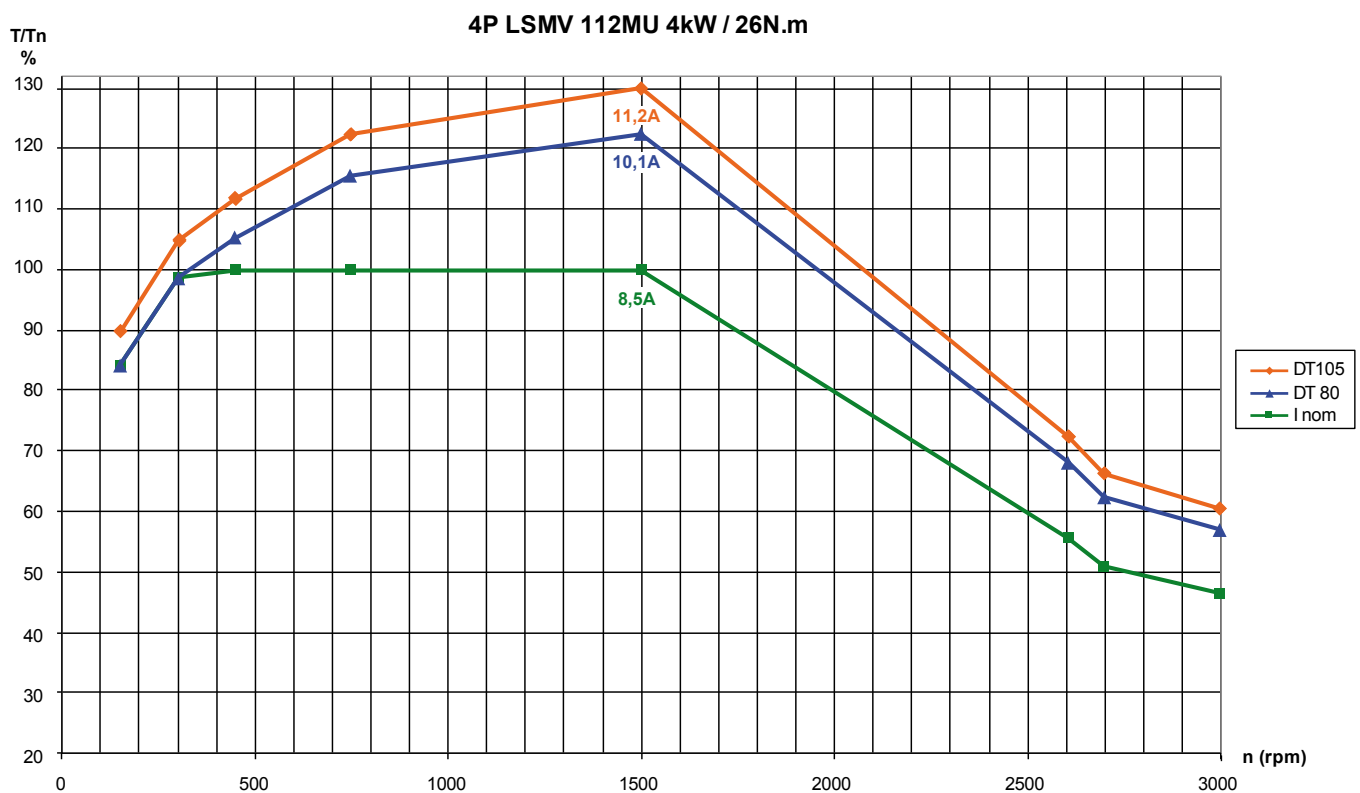
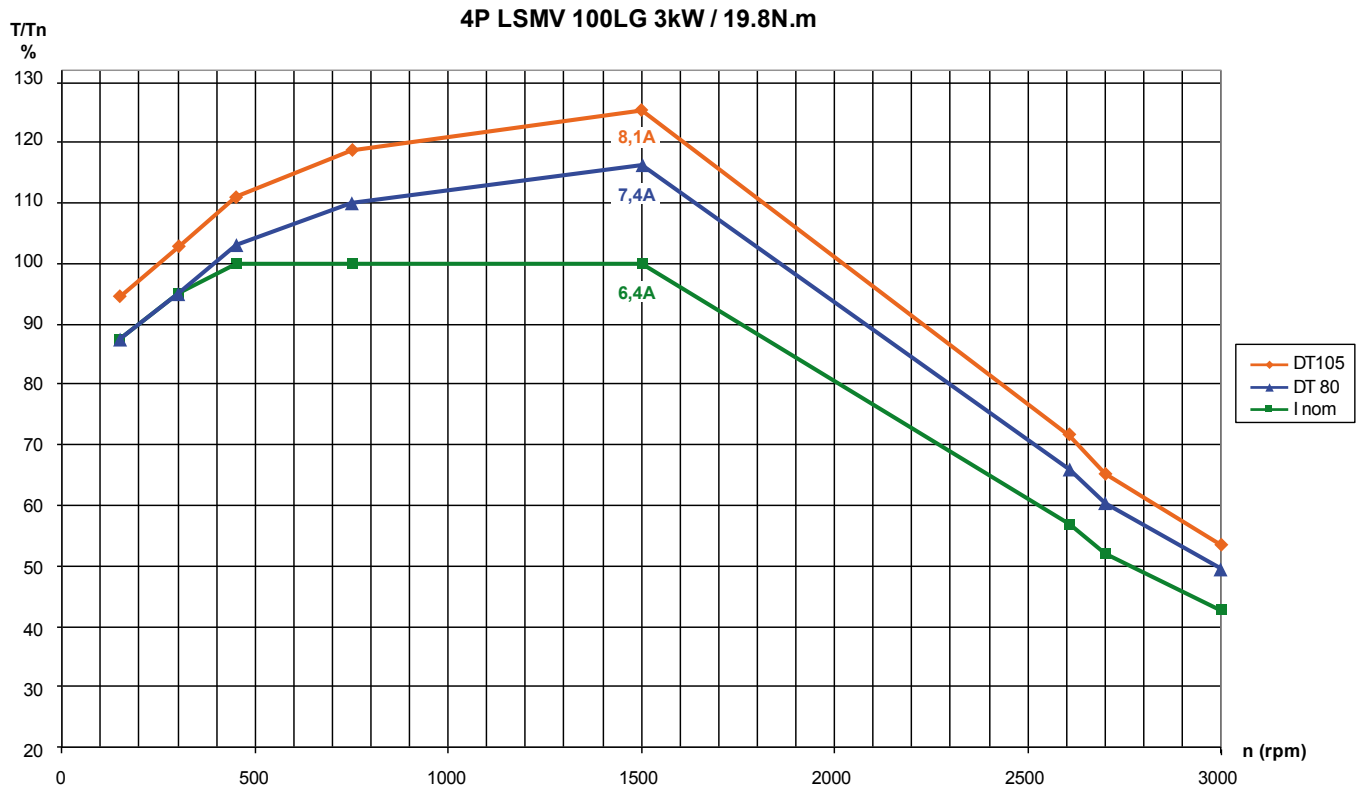


# LSMV

## High-efficiency 3-phase induction motors for variable speed control

### Performance

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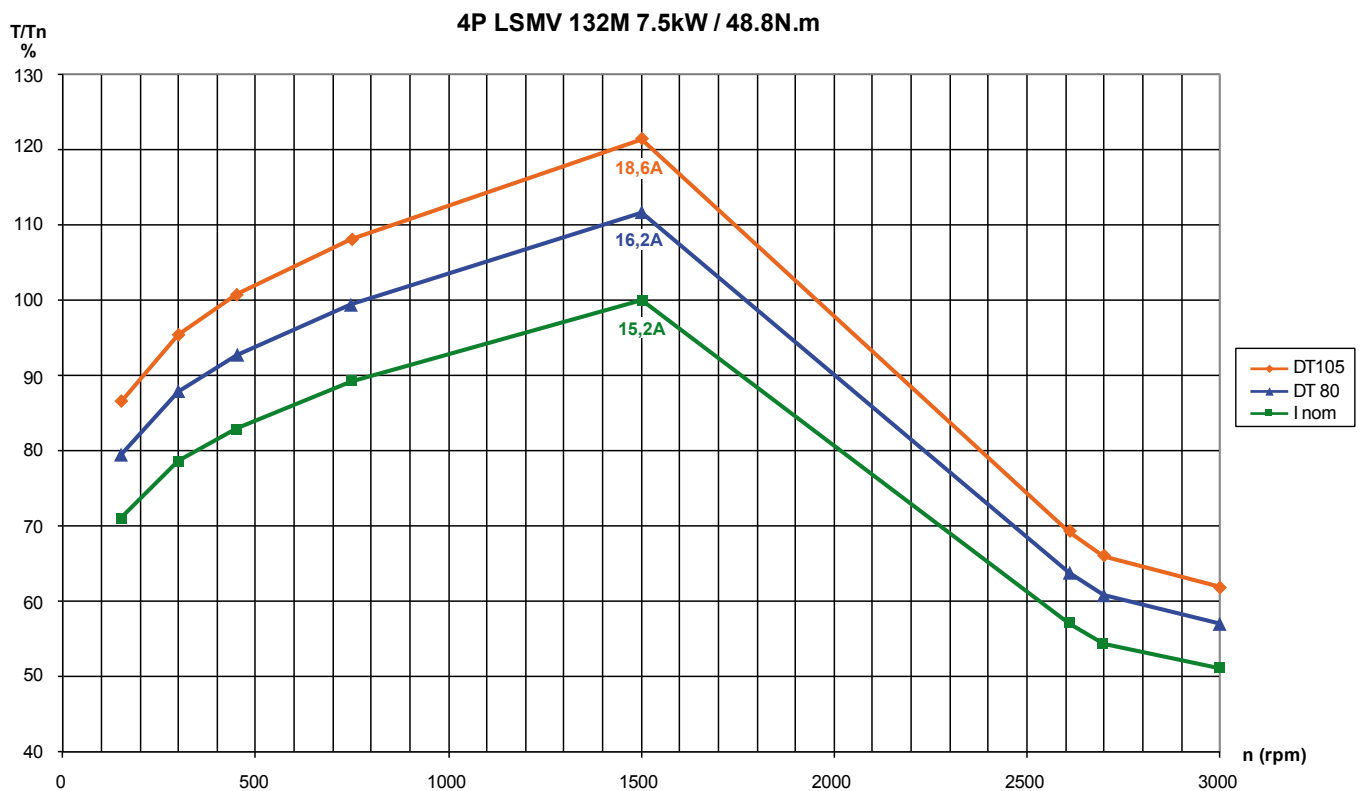
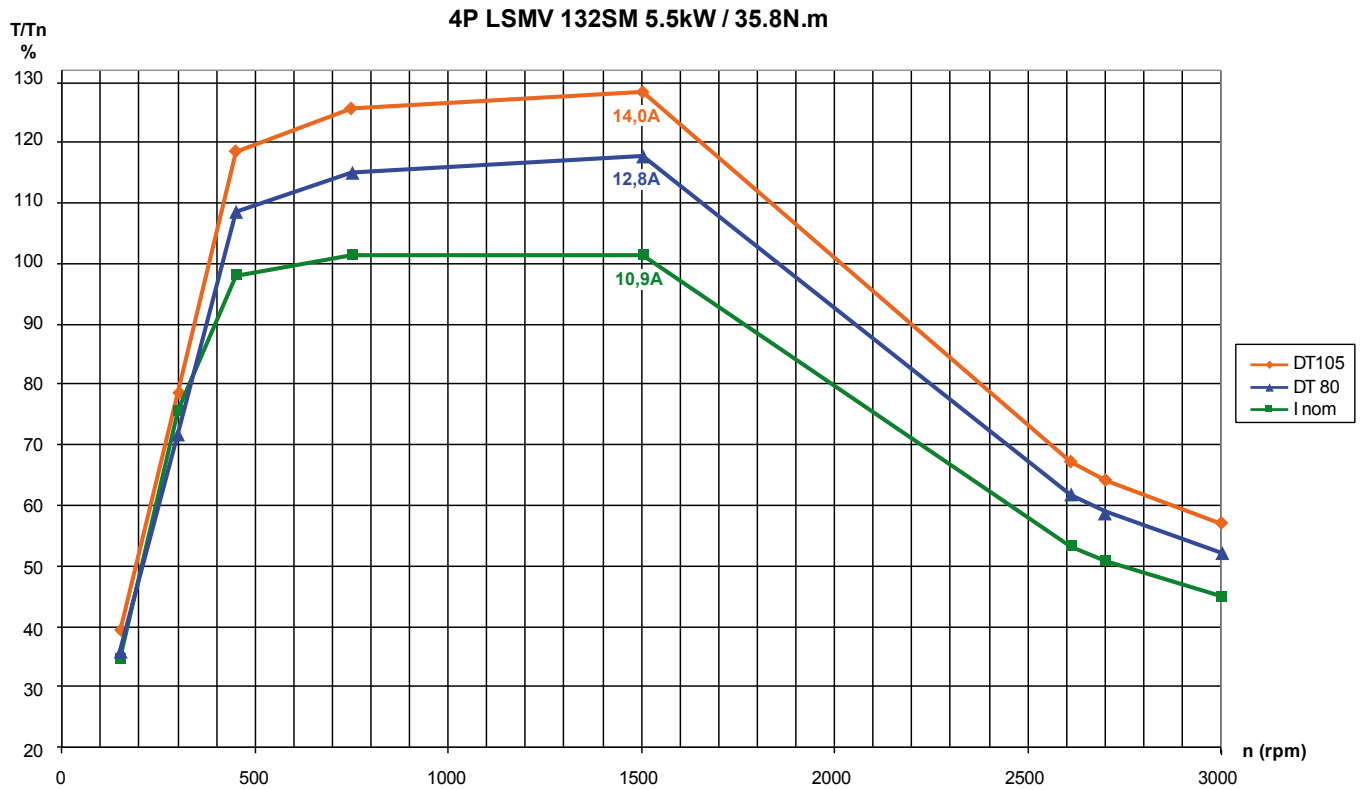


# LSMV

## High-efficiency 3-phase induction motors for variable speed control

### Performance

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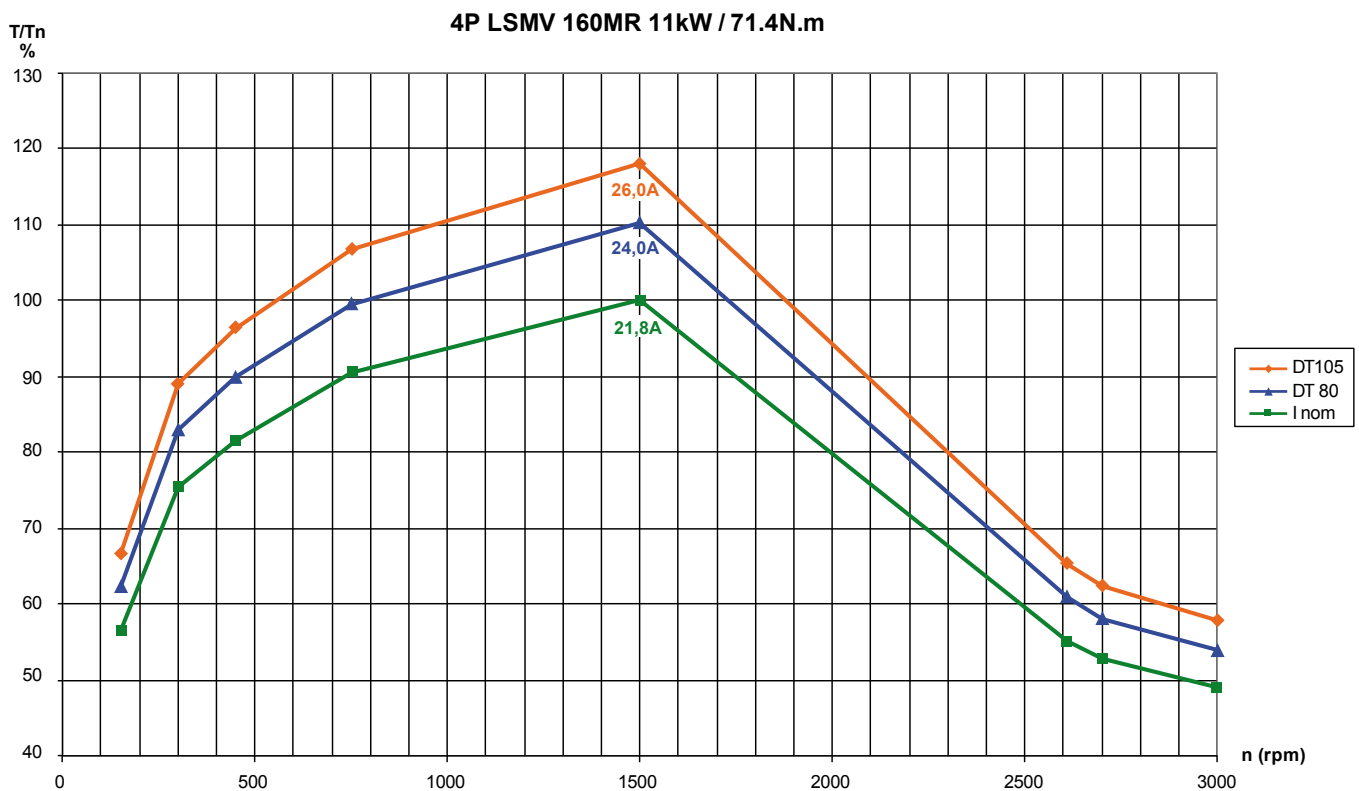
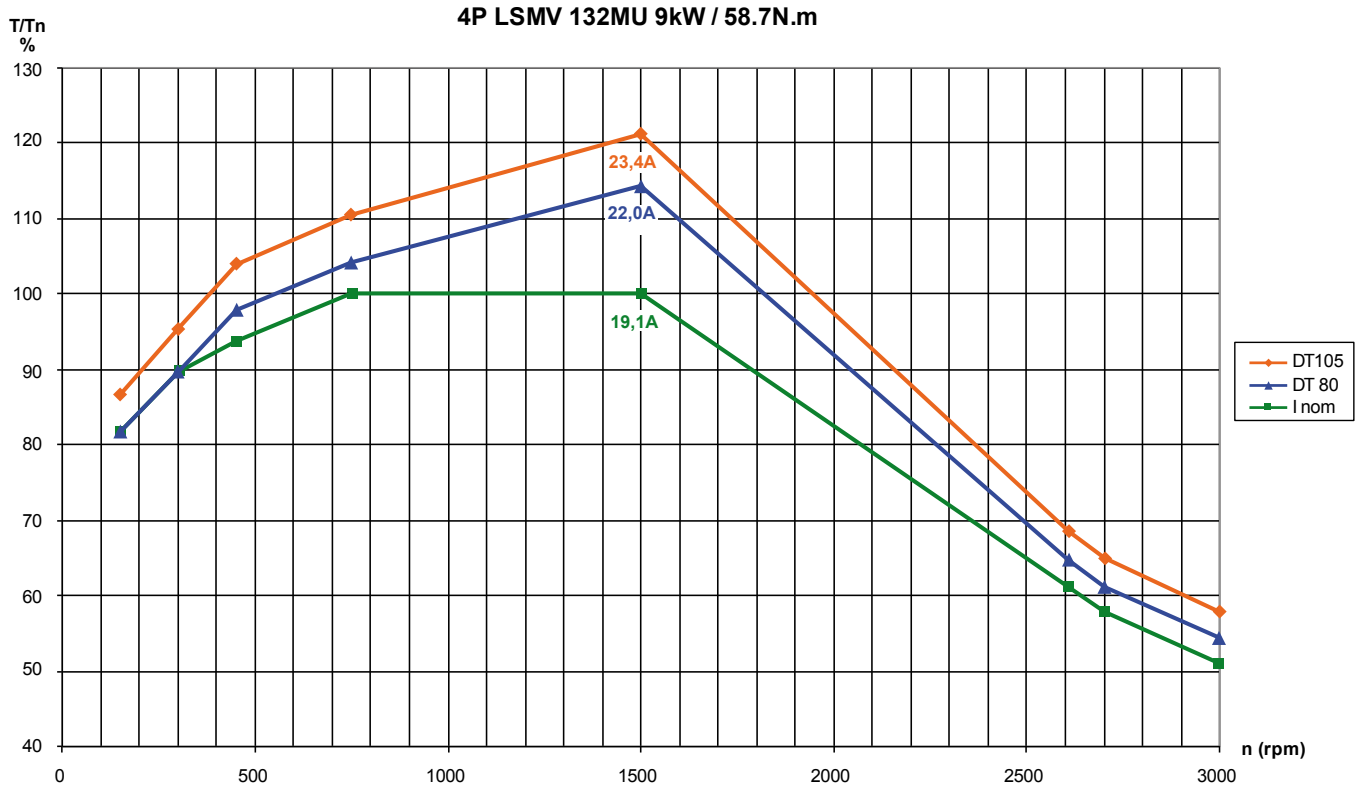


# LSMV

## High-efficiency 3-phase induction motors for variable speed control

### Performance

#### Load capacity of LSMV motors on a drive

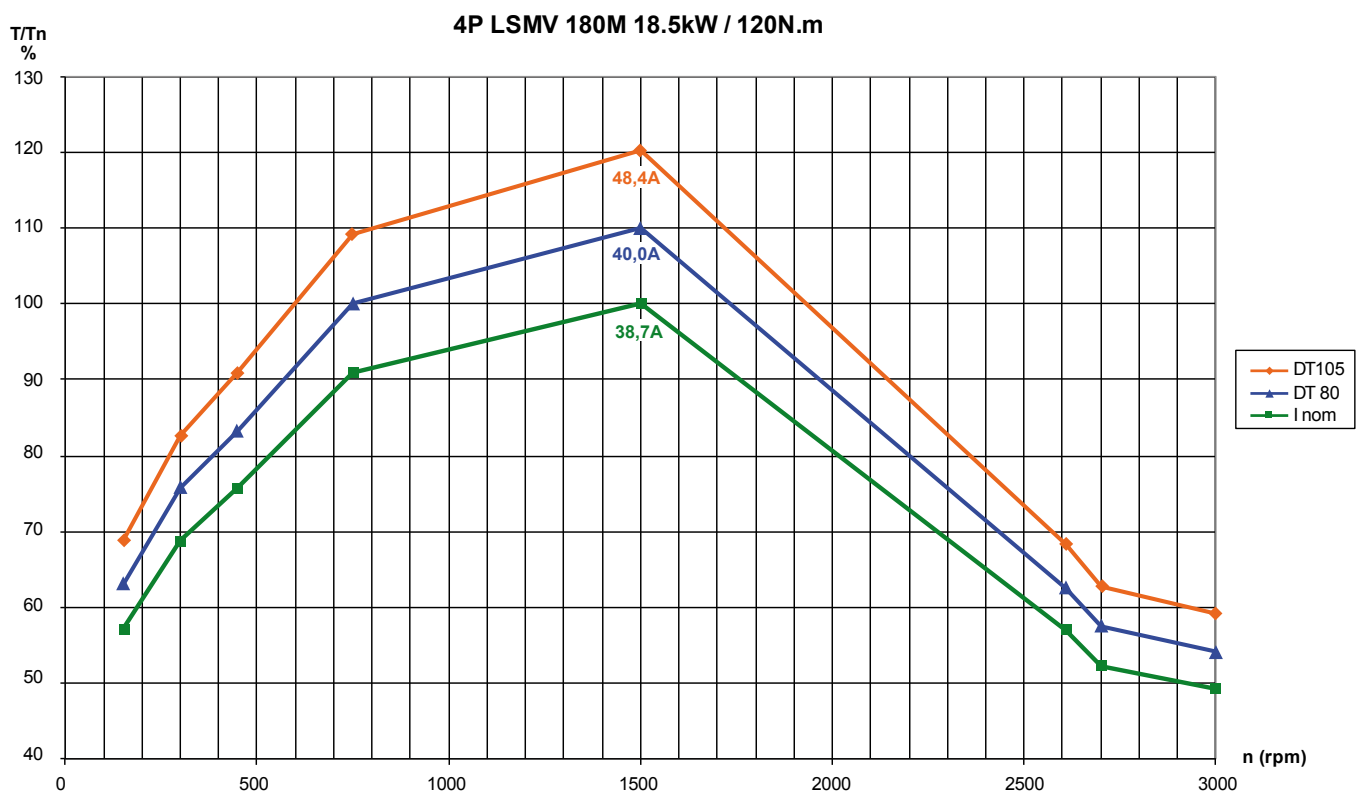
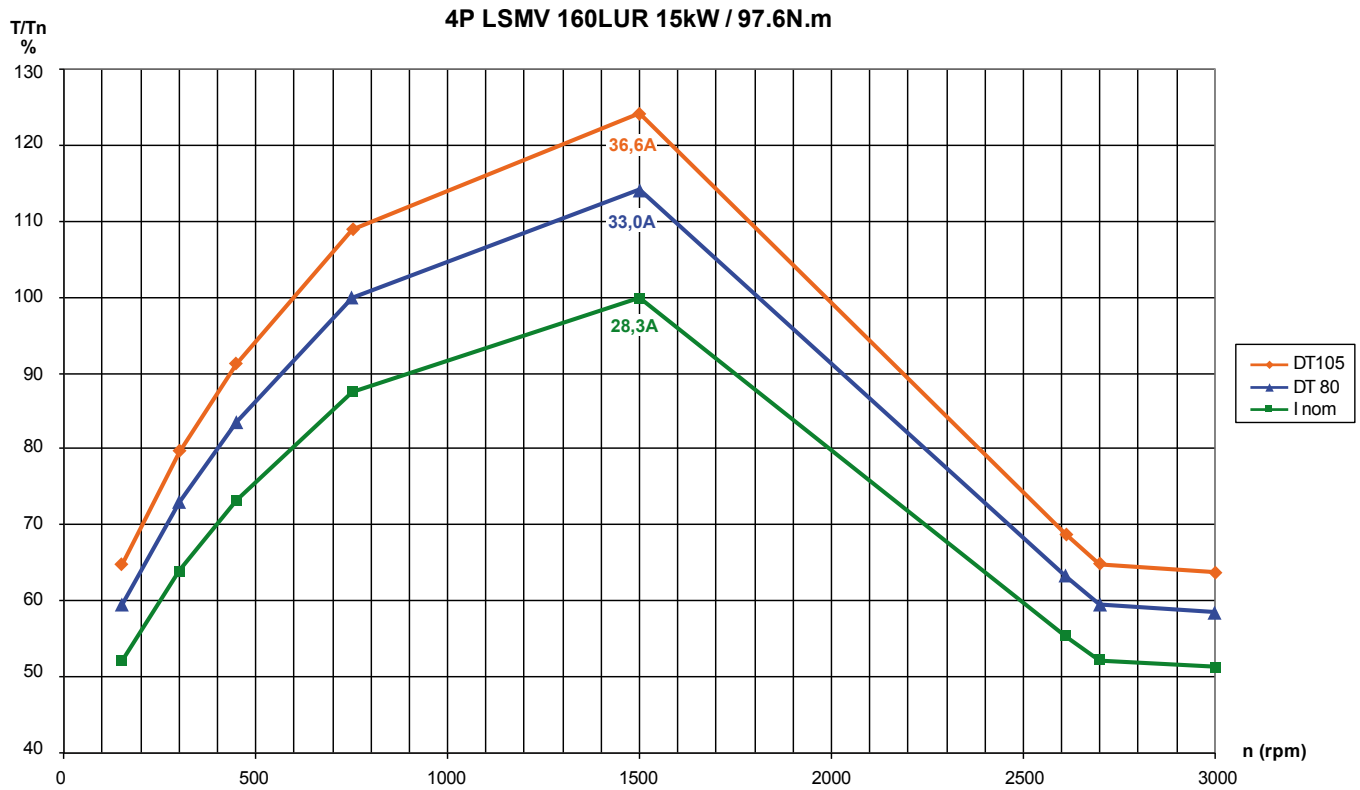


# LSMV

## High-efficiency 3-phase induction motors for variable speed control

### Performance

#### Load capacity of LSMV motors on a drive



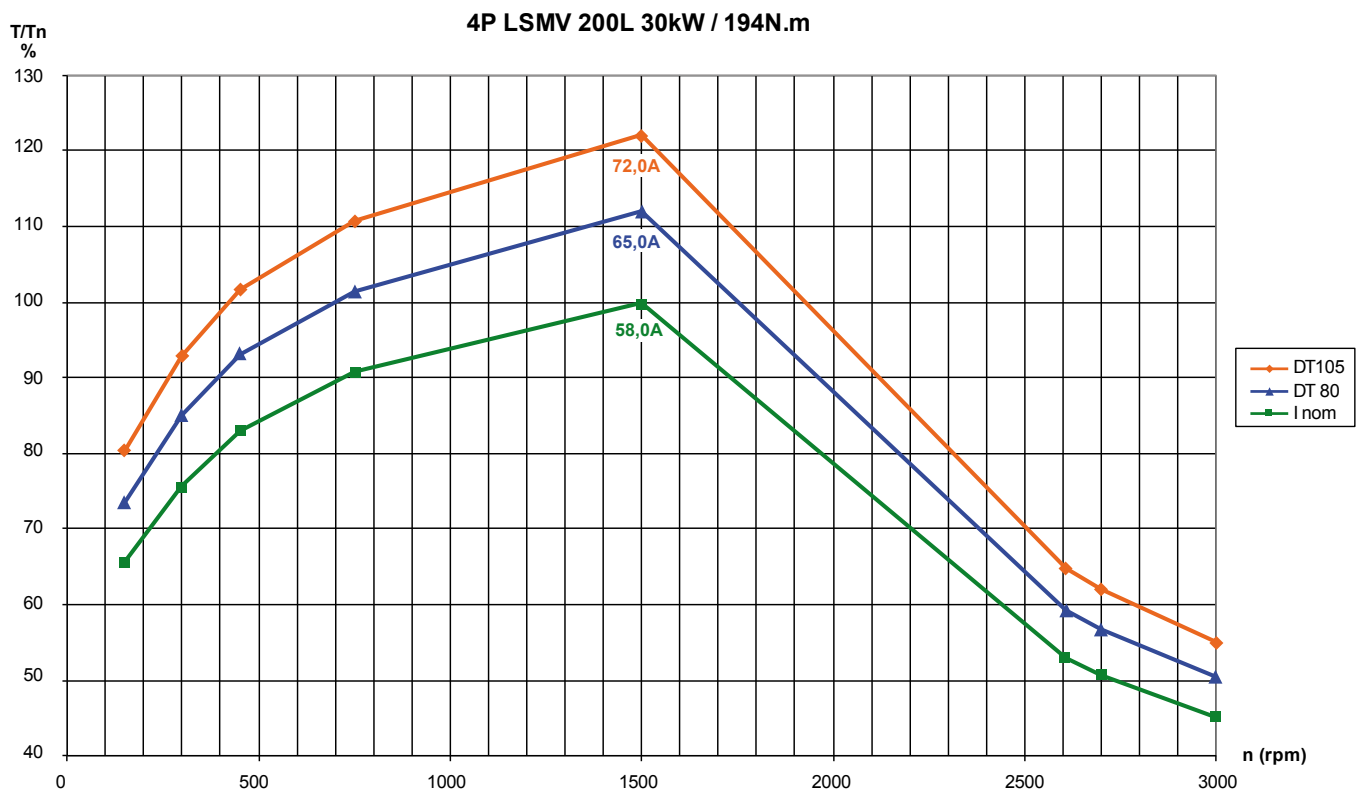
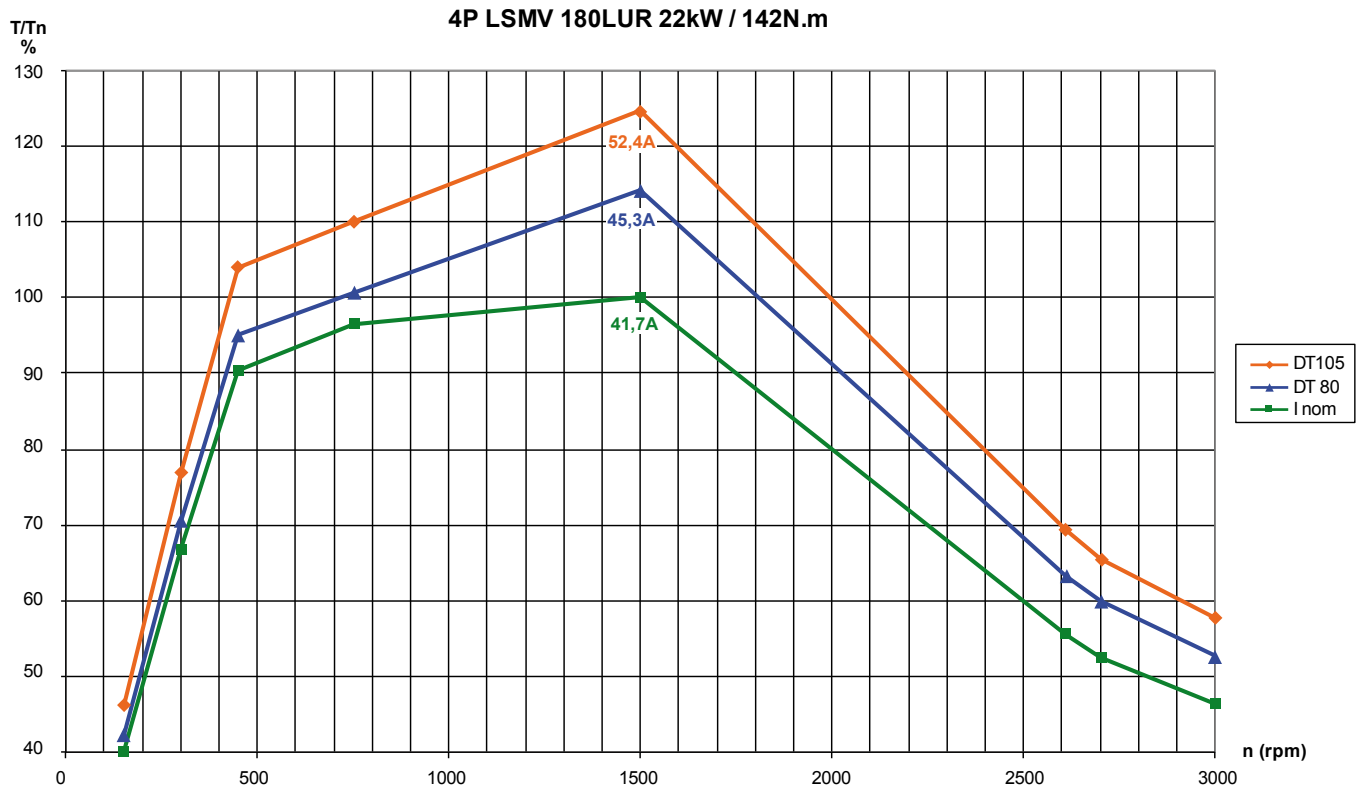


# LSMV

## High-efficiency 3-phase induction motors for variable speed control

### Performance

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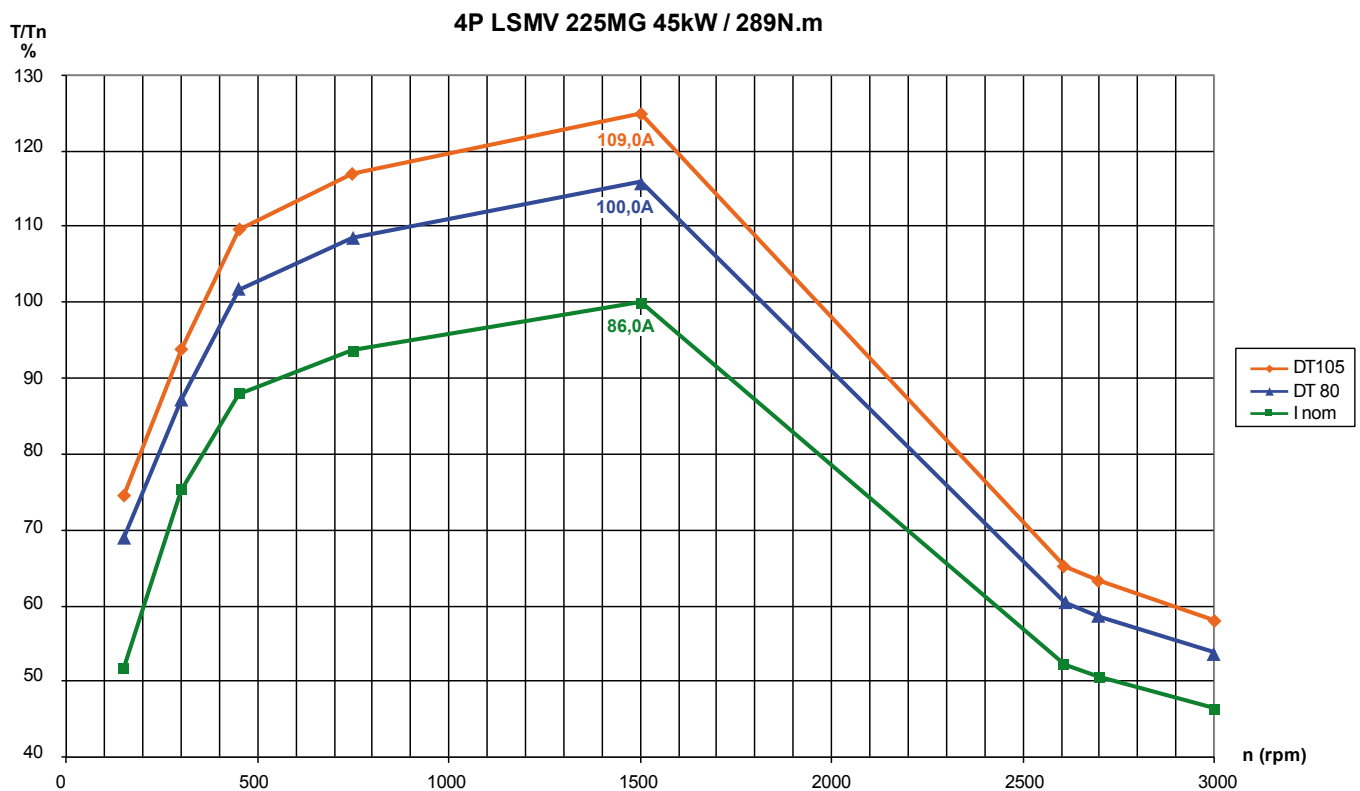
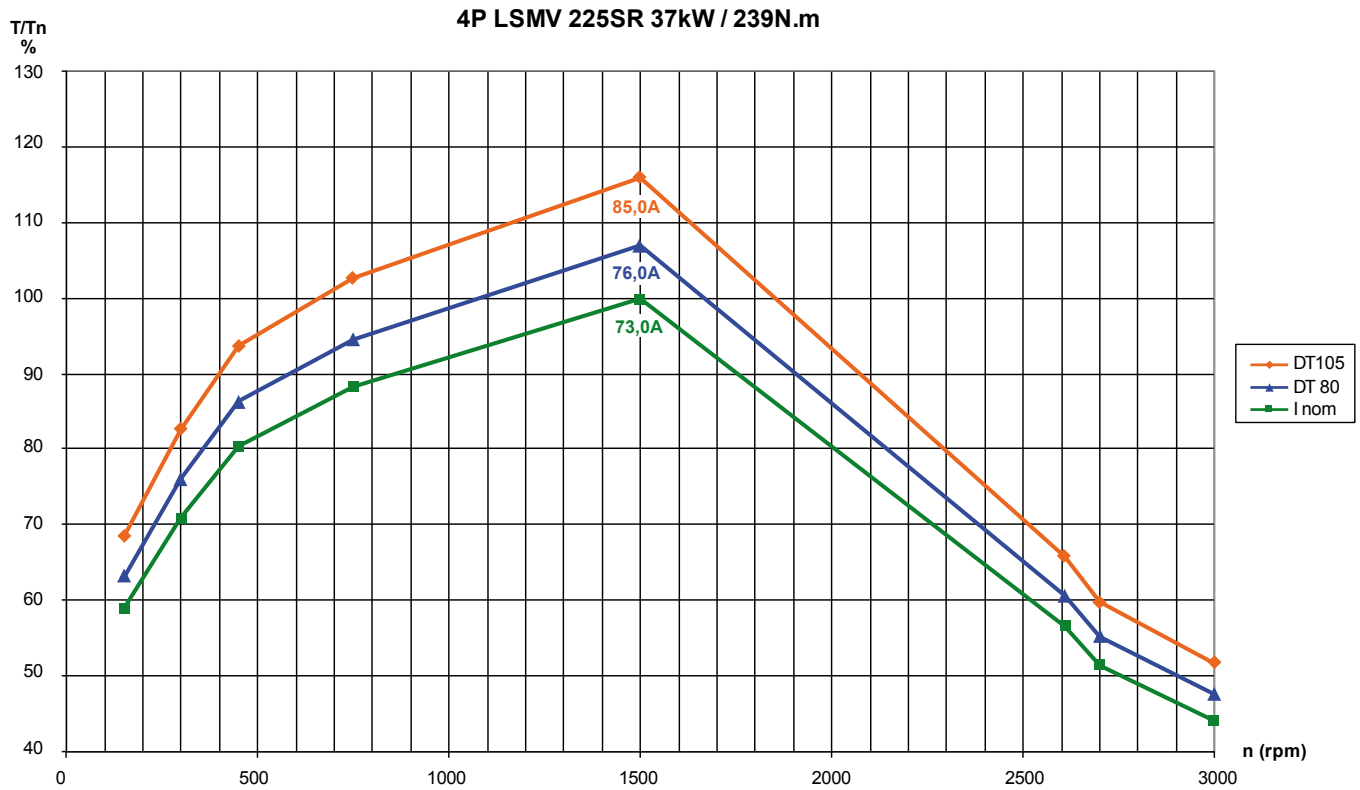


# LSMV

## High-efficiency 3-phase induction motors for variable speed control

### Performance

#### Load capacity of LSMV motors on a drive

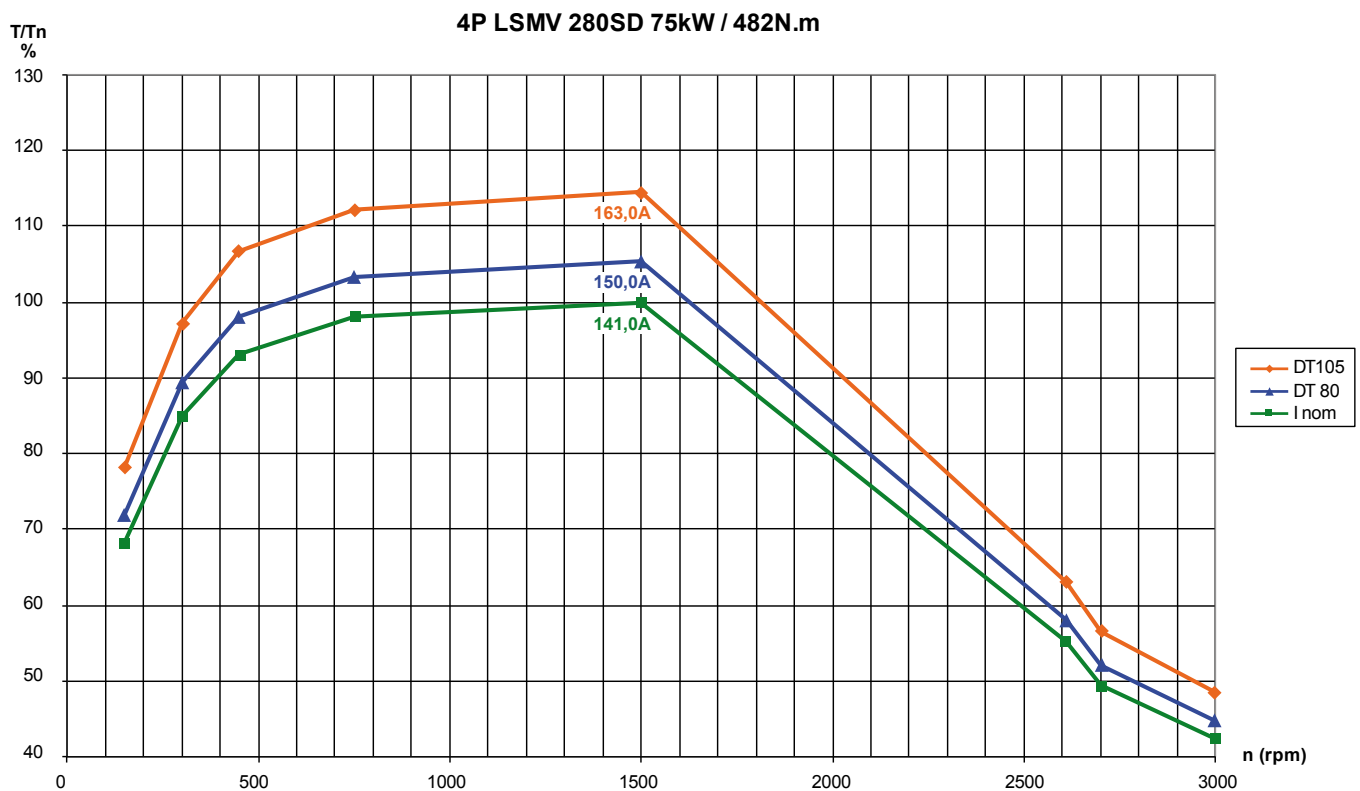
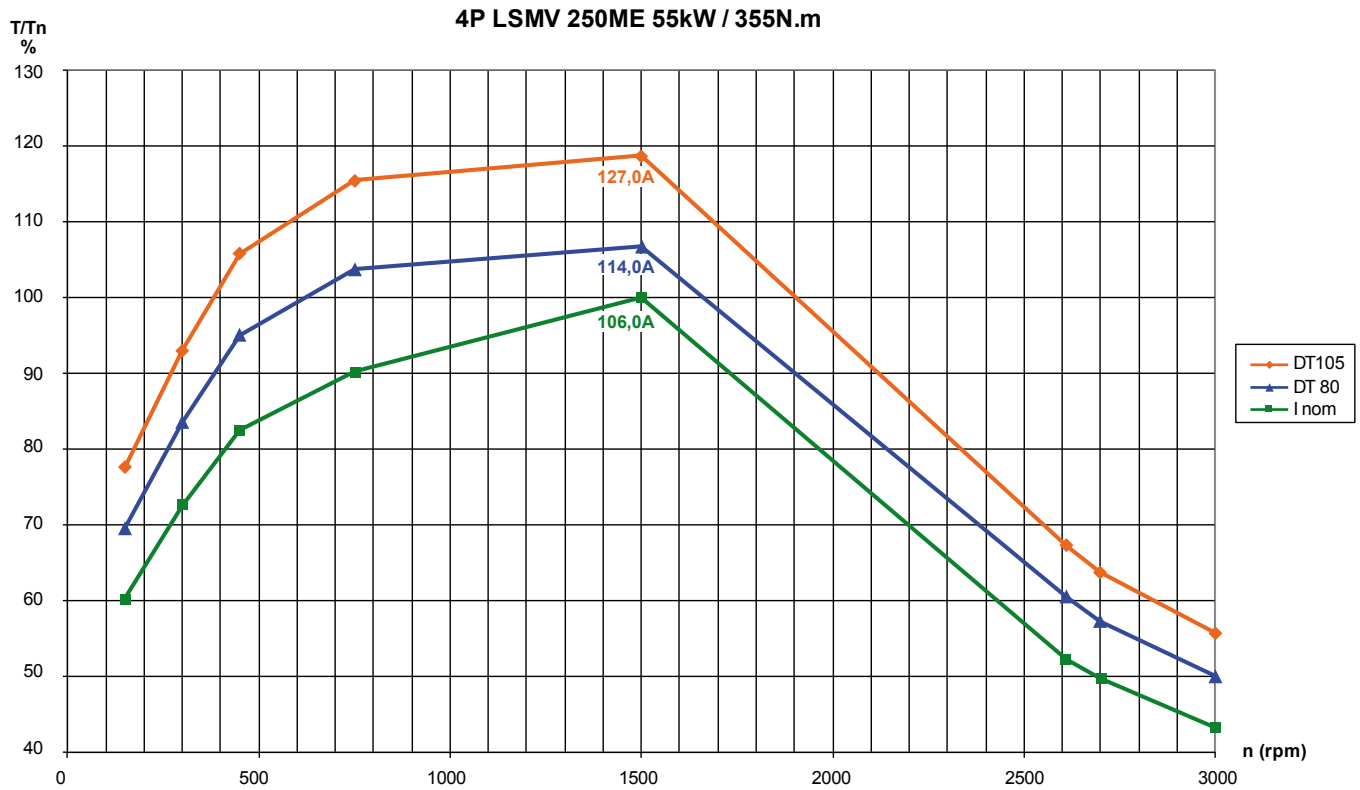


# LSMV

High-efficiency 3-phase induction motors for variable speed control

## Performance

### Load capacity of LSMV motors on a drive

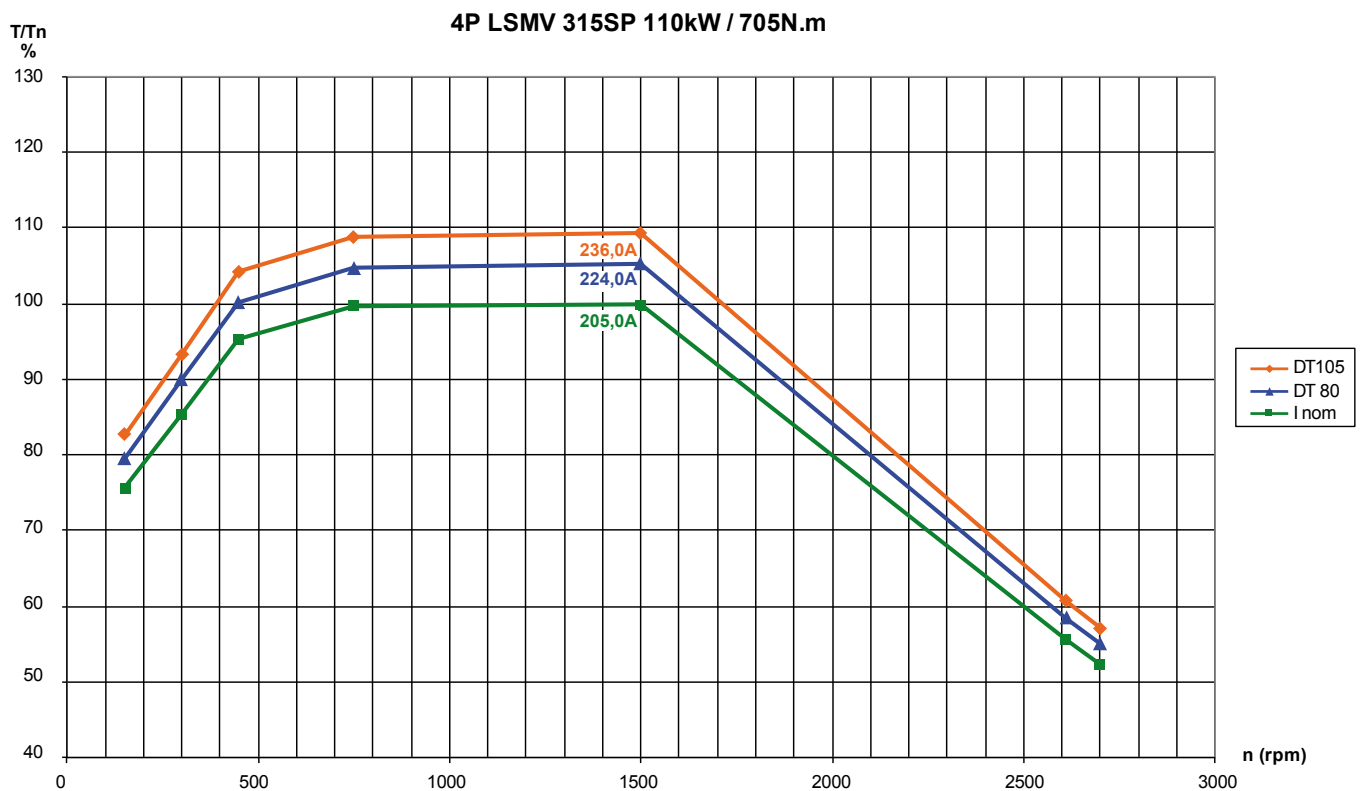
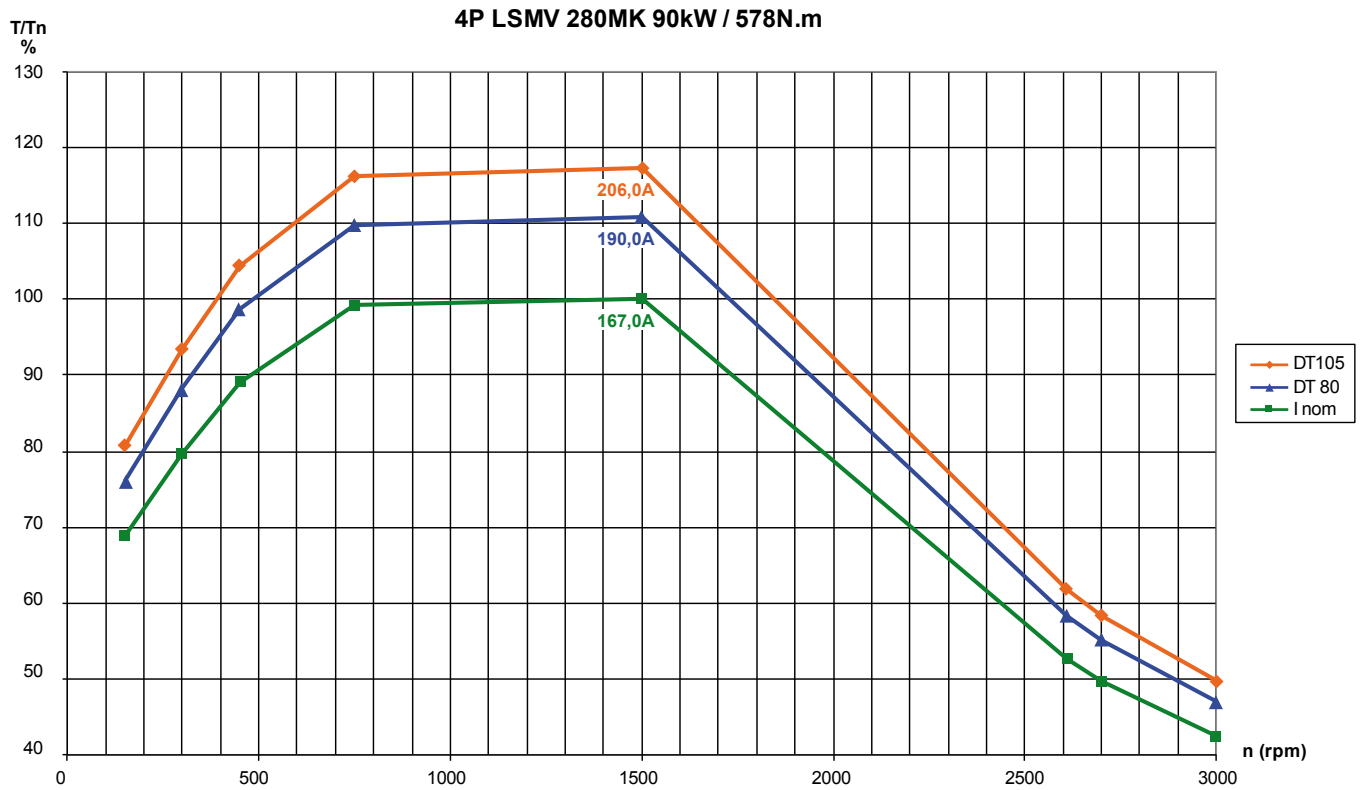


# LSMV

High-efficiency 3-phase induction motors for variable speed control

## Performance

### Load capacity of LSMV motors on a drive

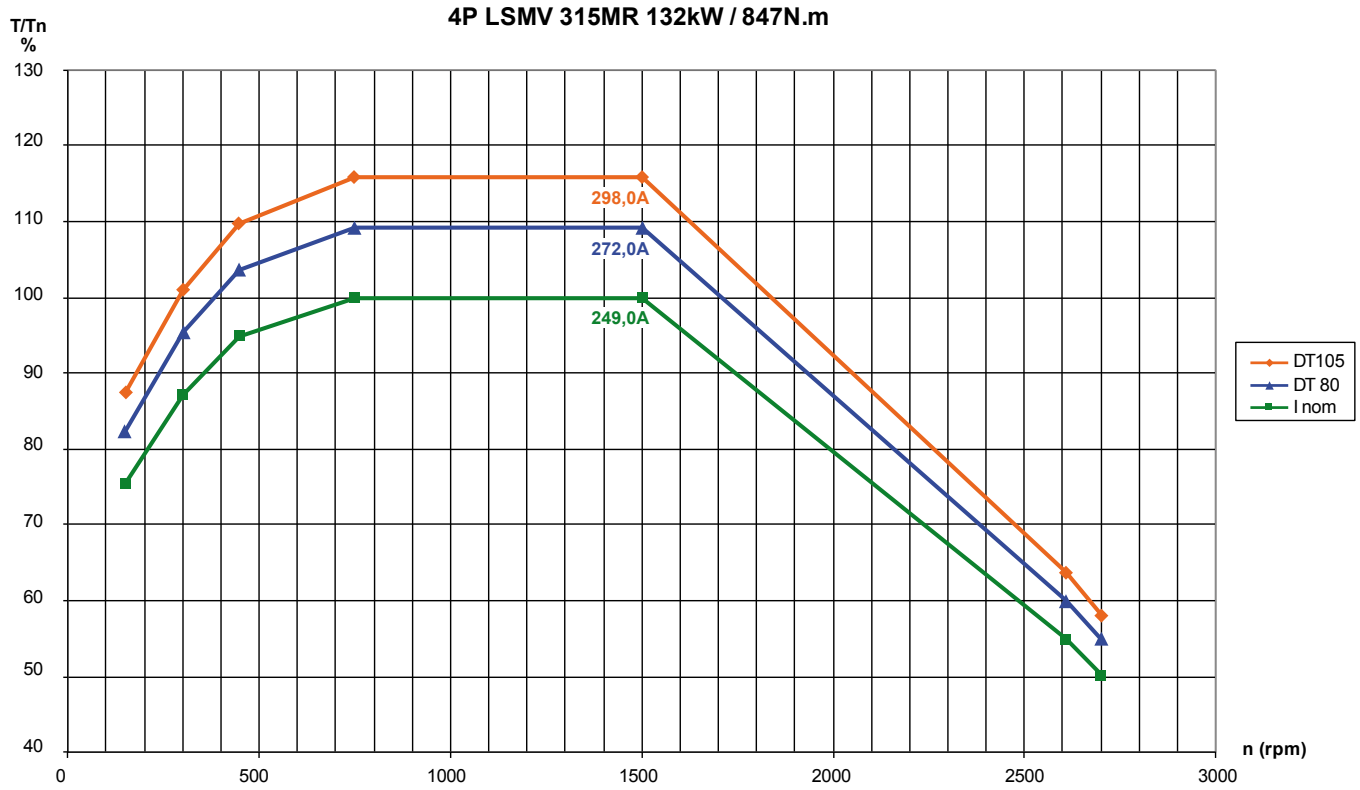


# LSMV

High-efficiency 3-phase induction motors for variable speed control

Performance

## Load capacity of LSMV motors on a drive



# LSMV

## High-efficiency 3-phase induction motors for variable speed control

### Performance

### Selection tables for motors operating on the mains

#### 2 POLES - 3000 rpm - IP55 - CLASS F - ΔT80K - S1 - CLASS IE2

Type	400 V MAINS SUPPLY <b>50 Hz</b>													
	Rated power	Rated speed	Rated torque	Rated current	Power factor			Efficiency IEC 60034-2-1 2007			Maximum torque/ Rated torque	Moment of inertia	Weight	Noise
	P <sub>N</sub> kW	N <sub>N</sub> rpm	M <sub>N</sub> N.m	I <sub>N(400V)</sub> A	Cos φ			η			M <sub>M</sub> /M <sub>N</sub>	J kg.m <sup>2</sup>	IM B3 kg	LP db(A)
					4/4	3/4	2/4	4/4	3/4	2/4				
LSMV 80 L	0.75	2859	2.51	1.68	0.85	0.77	0.66	78.6	78.8	77.2	3.0	0.00840	9.5	61
LSMV 80 L	1.1	2845	3.7	2.34	0.85	0.78	0.78	79.7	80.9	79.2	3.4	0.00095	10.7	61
LSMV 90 S	1.5	2860	4.91	3.16	0.84	0.76	0.62	81.7	82.3	80.6	4.5	0.00149	12.9	64
LSMV 90 L	2.2	2870	7.13	4.46	0.84	0.76	0.63	83.7	83.7	81.6	4.1	0.00197	16.1	64
LSMV 100 L	3	2870	10.0	5.87	0.87	0.81	0.69	84.8	85.6	84.5	4.0	0.00267	22.2	66
LSMV 112 MR	4	2864	13.4	7.9	0.85	0.79	0.66	86.1	86.8	86.0	3.7	0.00323	26.5	66
LSMV 132 S	5.5	2923	17.9	9.98	0.9	0.86	0.76	88.1	88.9	88.4	3.5	0.00881	35	72
LSMV 132 SU	7.5	2923	24.1	13.3	0.91	0.88	0.79	88.1	88.9	88.9	3.1	0.01096	41	72
LSMV 132 M	9	2925	29.2	17.7	0.82	0.75	0.63	89.5	89.8	89.2	3.6	0.01640	50	72
LSMV 160 MP	11	2927	35.9	21.2	0.84	0.77	0.66	89.6	90.1	89.4	4.6	0.01940	63	72
LSMV 160 MR	15	2924	49.22	27.2	0.89	0.84	0.75	90.4	91.4	91.3	3.8	0.02560	75	72
LSMV 160 L	18.5	2944	60.1	32.9	0.89	0.86	0.79	91.5	91.9	91.4	3.0	0.05000	101	72
LSMV 180 MT	22	2938	71.9	38.9	0.89	0.87	0.8	91.8	92.3	91.9	3.2	0.06000	105	69
LSMV 200 LR	30	2952	97.3	51.2	0.92	0.9	0.85	92.3	92.7	92.1	3.5	0.10000	155	77
LSMV 200 L	37	2943	119.0	64.8	0.89	0.87	0.81	92.6	93.1	92.7	2.5	0.12000	182	73
LSMV 225 MT	45	2953	145.0	79.5	0.88	0.85	0.78	93.1	93.4	92.8	3.4	0.14000	203	73

# LSMV

## High-efficiency 3-phase induction motors for variable speed control

### Performance

### Selection tables for motors operating on the mains

#### 4 POLES - 1500 rpm - IP55 - CLASS F - ΔT80K - S1 - CLASS IE2

Type	400 V MAINS SUPPLY <b>50 Hz</b>													
	Rated power	Rated speed	Rated torque	Rated current	Power factor			Efficiency IEC 60034-2-1 2007			Maximum torque/ Rated torque	Moment of inertia	Weight	Noise
	P <sub>N</sub>	N <sub>N</sub>	M <sub>N</sub>	I <sub>N(400V)</sub>	Cos φ			η			M <sub>M</sub> /M <sub>N</sub>	J	IM B3	LP
	kW	rpm	N.m	A	4/4	3/4	2/4	4/4	3/4	2/4		kg.m <sup>2</sup>	kg	db(A)
LSMV 80 LG	0.75	1445	4.9	1.7	0.71	0.72	0.56	79.7	79.7	76.8	2.6	0.00265	11.7	47
LSMV 90 SL	1.1	1455	6.7	2.2	0.81	0.72	0.57	83.5	84.2	83.1	3.2	0.00418	17.1	48
LSMV 90 LU	1.5	1455	9.4	3.1	0.80	0.71	0.56	84.7	85.3	83.7	4.0	0.00488	20.4	48
LSMV 100 LR	2.2	1455	14.0	4.5	0.79	0.68	0.53	85.9	86.4	84.9	3.8	0.00426	24.9	48
LSMV 100 LG	3	1460	19.8	6.2	0.81	0.75	0.64	86.9	88.1	87.9	3.4	0.0108	32.4	48
LSMV 112 MU	4	1465	26.0	8.4	0.78	0.70	0.57	87.5	88.2	87.5	3.8	0.01373	40.4	49
LSMV 132 SM	5.5	1455	35.8	10.5	0.86	0.82	0.72	87.9	88.6	88.0	3.8	0.02257	60.1	62
LSMV 132 M	7.5	1455	48.8	14.2	0.85	0.79	0.68	89.2	90.0	89.9	4.2	0.02722	70.2	62
LSMV 132 MU	9	1465	58.7	18.2	0.8	0.73	0.6	89.3	89.3	87.8	5.3	0.02928	70.2	62
LSMV 160 MR	11	1460	71.4	21.3	0.83	0.77	0.66	89.9	90.7	90.4	4.1	0.03529	78.2	62
LSMV 160 LUR	15	1466	97.6	27.4	0.86	0.81	0.7	92.0	92.4	92.0	3.6	0.0955	103.0	62
LSMV 180 M	18.5	1469	120	35.2	0.82	0.8	0.67	92.4	92.6	91.8	3.0	0.1229	136.0	64
LSMV 180 LUR	22	1470	142	40.2	0.85	0.8	0.7	92.1	92.6	92.2	3.2	0.1451	155.0	64
LSMV 200L	30	1474	194	55.9	0.83	0.79	0.68	93.4	93.8	93.4	2.6	0.2365	200.0	64
LSMV 225 SR	37	1477	239	68.0	0.84	0.80	0.71	93.7	94.4	94.5	2.9	0.2885	235.0	64
LSMV 225 MG	45	1485	289	82.0	0.83	0.79	0.69	94.1	94.3	94.2	2.9	0.6341	320.0	64
LSMV 250 ME	55	1484	355	100.0	0.84	0.79	0.68	94.5	94.9	94.6	3.0	0.732	340.0	66
LSMV 280 SD	75	1485	482	136.0	0.84	0.79	0.68	94.9	94.9	94.2	3.0	0.9612	495.0	69
LSMV 280 MK	90	1489	578	161.0	0.85	0.8	0.71	94.9	94.7	93.7	3.1	2.3099	655.0	69
LSMV 315 SP	110	1490	705	196.0	0.85	0.8	0.7	95.2	94.8	93.5	3.6	3.2642	845.0	74
LSMV 315 MR	132	1489	847	238.0	0.84	0.8	0.7	95.3	94.9	93.8	3.8	2.7844	750.0	70

# LSMV

High-efficiency 3-phase induction motors for variable speed control

Performance

## Selection tables for motors operating on the mains

**6 POLES - 1000 rpm - IP55 - CLASS F -  $\Delta$ T80K - S1 - CLASS IE2**

Type	400 V MAINS SUPPLY <b>50 Hz</b>													
	Rated power	Rated speed	Rated torque	Rated current	Power factor			Efficiency IEC 60034-2-1 2007			Maximum torque/ Rated torque	Moment of inertia	Weight	Noise
	$P_N$ kW	$N_N$ rpm	$M_N$ N.m	$I_{N(400V)}$ A	Cos $\varphi$			$\eta$			$M_M/M_N$	J kg.m <sup>2</sup>	IM B3 kg	LP db(A)
					4/4	3/4	2/4	4/4	3/4	2/4				
<b>LSMV 90 S</b>	0.75	953	7.6	2.1	0.68	0.59	0.46	76.6	77.1	74.4	2.1	0.00319	14	51
<b>LSMV 90 L</b>	1.1	955	11.0	3.0	0.67	0.58	0.45	79.1	79.5	77.4	3.1	0.0044	16.6	51
<b>LSMV 100 L</b>	1.5	957	14.9	4.0	0.66	0.58	0.45	80.5	81.1	79.0	2.2	0.00587	22.1	50
<b>LSMV 112 MG</b>	2.2	957	20.9	5.0	0.73	0.65	0.51	82.2	83.3	82.0	2.4	0.011	28	51
<b>LSMV 132 S</b>	3	962	29.1	7.0	0.72	0.64	0.50	83.8	84.5	83.1	3.1	0.0154	38	55
<b>LSMV 132 M</b>	4	963	39.4	9.0	0.75	0.68	0.56	85.2	86.7	86.4	2.6	0.0249	48	55
<b>LSMV 132 MU</b>	5.5	963	55.0	12.9	0.72	0.66	0.54	86.4	87.4	86.9	2.8	0.0364	63	55



# LSMV

## High-efficiency 3-phase induction motors for variable speed control

### Performance

#### Using the motor at constant torque from 0 to 87 Hz

An LSMV motor used with a  $\Delta$  connection combined with a frequency inverter increases the constant torque range from 50 to 87 Hz, which can increase the power by the same ratio.

The size of the frequency inverter is determined by the current value in 230 V and programmed with a voltage/frequency ratio of 400 V 87 Hz.

#### Example of selection with 4 poles:

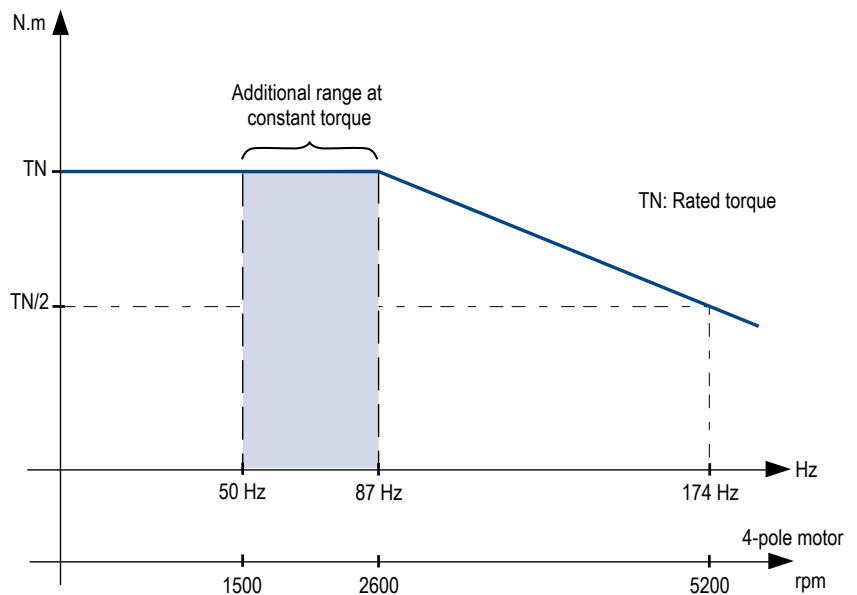
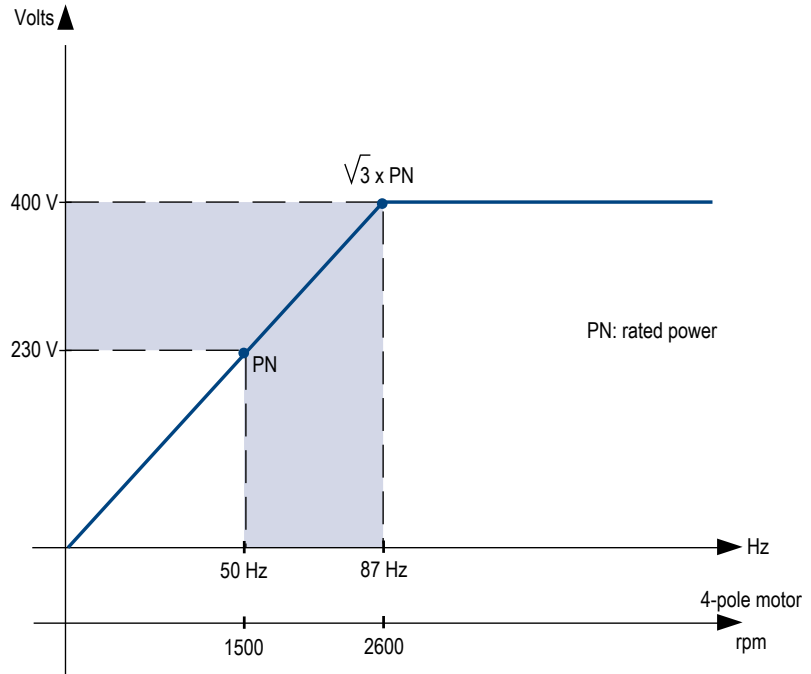
- For constant torque of 195 Nm from 600 to 2500 rpm:
- > selection: 30 kW 4P LSMV motor + 100 A drive

#### Example of selection with 2 poles:

- For constant power of 4 kW from 6000 to 8500 rpm:
- > selection: 3 kW 2P LSMV motor + 11 A drive

**CAUTION: Max. mechanical speed to be complied with (see "Vibration level and maximum speeds" section).**

**Characteristics of motors on drives**  
**230 V  $\Delta$  connection 400 V 50 Hz supply**



# LSMV

High-efficiency 3-phase induction motors for variable speed control

Performance

## Selection tables for drives using 400 V 87 Hz ratio

### 2 POLES - 3000 rpm

Type	400 V POWER SUPPLY <b>50 Hz</b>		400 V POWER SUPPLY <b>87 Hz</b>					
	Motor star connection (Y)		Motor delta connection ( $\Delta$ )					
	Rated power	Rated torque	Rated power	Rated torque	Motor current	Speed 50 Hz	Speed 87 Hz	Power factor
	$P_N$ kW	$T_N$ N.m	$P_N$ kW	$T_N$ N.m	$I_{MOTOR}$ A	N rpm	N rpm	Cos $\varphi$
LSMV 80 L	0.75	2.5	1.3	2.5	3.1	2860	5026	0.85
LSMV 80 L	1.1	3.7	1.9	3.7	4.3	2845	5005	0.85
LSMV 90 S	1.5	5	2.6	5	5.9	2860	5026	0.84
LSMV 90 L	2.2	7.2	3.8	7.2	8.3	2870	5039	0.84
LSMV 100 L	3	10	5.2	10	10.9	2870	5039	0.87
LSMV 112 MR	4	13.4	6.9	13.4	14.6	2864	5031	0.85
LSMV 132 S	5.5	17.9	9.5	17.9	18.5	2923	5112	0.90
LSMV 132 SU	7.5	24.1	13.0	24.1	24.6	2923	5112	0.91
LSMV 132 M	9	29.2	15.6	29.2	32.7	2925	5115	0.82
LSMV 160 MP	11	35.9	19.1	35.9	39.2	2927	5117	0.84
LSMV 160 MR	15	49.2	26.0	49.2	50.3	2928	5119	0.89
LSMV 160 L	18.5	60.1	32.0	60.1	60.9	2944	5123	0.89
LSMV 180 MT	22	71.9	38.1	71.9	72.0	2938	5112	0.89
LSMV 200 LR	30	97.3	52.0	97.3	94.7	2952	5137	0.92
LSMV 200 L	37	119	64.1	119	119.9	2943	5121	0.89
LSMV 225 MT	45	145	77.9	145	147.1	2953	5138	0.88

# LSMV

## High-efficiency 3-phase induction motors for variable speed control

### Performance

### Selection tables for drives using 400 V 87 Hz ratio

#### 4 POLES - 1500 rpm

Type	400 V POWER SUPPLY <b>50 Hz</b>		400 V POWER SUPPLY <b>87 Hz</b>					
	Motor star connection (Y)		Motor delta connection ( $\Delta$ )					
	Rated power	Rated torque	Rated power	Rated torque	Motor current	Speed 50 Hz	Speed 87 Hz	Power factor
	$P_N$ kW	$T_N$ N.m	$P_N$ kW	$T_N$ N.m	$I_{MOTOR}$ A	N rpm	N rpm	Cos $\varphi$
LSMV 80 LG	0.75	4.9	1.3	4.9	3.5	1445	2533	0.71
LSMV 90 SL	1.1	7.2	1.9	7.2	4.1	1445	2533	0.81
LSMV 90 LU	1.5	9.9	2.6	9.9	5.6	1450	2540	0.8
LSMV 100 LR	2.2	14.4	3.8	14.4	8.1	1450	2540	0.79
LSMV 100 LG	3	19.6	5.2	19.6	11.7	1460	2554	0.81
LSMV 112 MU	4	26.1	6.9	26.1	16.5	1465	2561	0.78
LSMV 132 SM	5.5	36.1	9.5	36.1	19.1	1455	2547	0.86
LSMV 132 M	7.5	49.1	13.0	49.1	25.7	1455	2547	0.85
LSMV 132 MU	9	58.7	15.6	58.7	33.7	1465	2561	0.8
LSMV 160 MR	11	71.4	19.1	71.4	39.2	1460	2554	0.83
LSMV 160 LUR	15	97.6	26.0	97.6	50.7	1466	2551	0.86
LSMV 180 M	18.5	120	32.0	120	65.1	1469	2556	0.82
LSMV 180 LUR	22	143	38.1	143	74.4	1470	2558	0.85
LSMV 200 L	30	194	52.0	194	100.8	1474	2565	0.83
LSMV 225 SR	37	239	64.1	239	127.3	1477	2570	0.84
LSMV 225 MG	45	290	77.9	290	152.4	1485	2584	0.83
LSMV 250 ME	55	354	95.3	354	183.3	1484	2582	0.84
LSMV 280 SD	75	483	129.9	483	251.6	1485	2584	0.84
LSMV 280 MK	90	578	155.9	578	297.9	1489	2591	0.85
LSMV 315 SP	110	706	190.5	706	362.6	1490	2593	0.85
LSMV 315 MR	132	847	228.6	847	440.3	1489	2591	0.84

#### 6 POLES - 1000 rpm

Type	400 V POWER SUPPLY <b>50 Hz</b>		400 V POWER SUPPLY <b>87 Hz</b>					
	Motor star connection (Y)		Motor delta connection ( $\Delta$ )					
	Rated power	Rated torque	Rated power	Rated torque	Motor current	Speed 50 Hz	Speed 87 Hz	Power factor
	$P_N$ kW	$T_N$ N.m	$P_N$ kW	$T_N$ N.m	$I_{MOTOR}$ A	N rpm	N rpm	Cos $\varphi$
LSMV 90S	0.75	7.6	1.3	7.6	3.9	953	1675	0.68
LSMV 90 L	1.1	11	1.9	11	5.6	955	1678	0.67
LSMV 100 L	1.5	14.9	2.6	14.9	7.4	957	1680	0.66
LSMV 112 MG	2.2	20.9	3.8	20.9	9.3	957	1680	0.73
LSMV 132 S	3	29.1	5.2	29.1	13.0	962	1687	0.72
LSMV 132 M	4	39.4	6.9	39.4	16.7	963	1688	0.75
LSMV 132 MU	5.5	55	9.5	55	23.9	963	1688	0.72

**INFLUENCE OF THE MAINS SUPPLY**

Each industrial power supply has its own intrinsic characteristics (short-circuit capability, voltage value and fluctuation, phase imbalance, etc) and supplies equipment some of which can distort its voltage either permanently or temporarily (notches, voltage dips, overvoltage, etc).

The quality of the mains supply has an impact on the performance and reliability of electronic equipment, especially variable speed drives.

**EQUIPOTENTIAL BONDING**

The equipotential earth bonding of some industrial sites is sometimes neglected.

This lack of equipotentiality leads to leakage currents which flow via the earth cables (green/yellow), the machine chassis, the pipework, etc and also via the electrical equipment.

In some extreme cases, these currents can trip the drive.

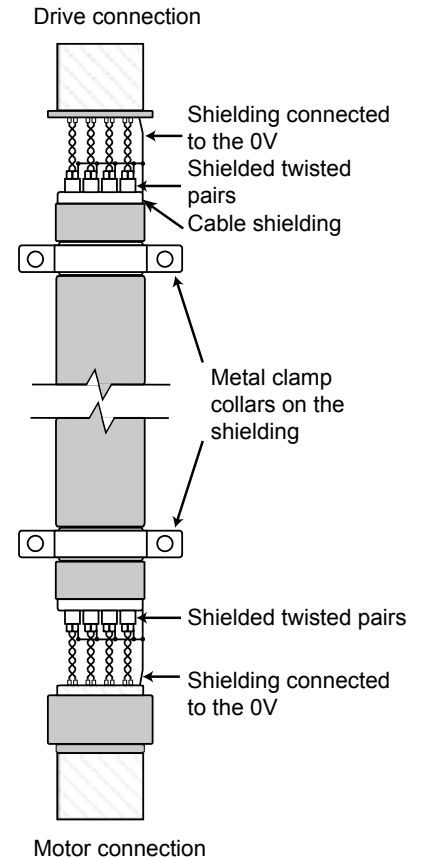
It is essential that the earth network is designed and implemented by the installation supervisor so that its impedance is as low as possible, so as to distribute the fault currents and high-frequency currents without them passing through electrical equipment. Metal grounds must be mechanically connected to each other with the largest possible electrical contact area.

Under no circumstances can earth connections designed to protect people, by linking metal grounds to earth via a cable, serve as a substitute for ground connections (see IEC 61000-5-2).

The immunity and radio-frequency emission level are directly linked to the quality of the ground connections.

**CONNECTION OF CONTROL CABLES AND ENCODER CABLES**

**CAUTION:** Strip back the shielding on the metal clamp collars in order to ensure 360° contact.



# LSMV

## High-efficiency 3-phase induction motors for variable speed control

### Motor-drive installation

#### Installation

The following information is given for guidance only, and should never be used as a substitute for the current standards, nor does it relieve the installer of his responsibility.

Depending on the installation, more optional elements can be added to the installation:

**Drive power supply cables:** These cables do not necessarily need shielding. Their cross-section is recommended in the drive documentation, however, it can be adapted according to the type of cable, installation method, cable length (voltage drop), etc. See section below "Sizing power cables".

**Motor power supply cables:** These cables must be shielded to ensure EMC conformance of the installation. The cable shielding must be connected over 360° at both ends. At the motor end, special EMC cable glands are available as an option. The cable cross-section is recommended in the drive documentation, however, it can be adapted according to the type of cable, installation method, cable length (voltage drop), etc. See section below "Sizing power cables".

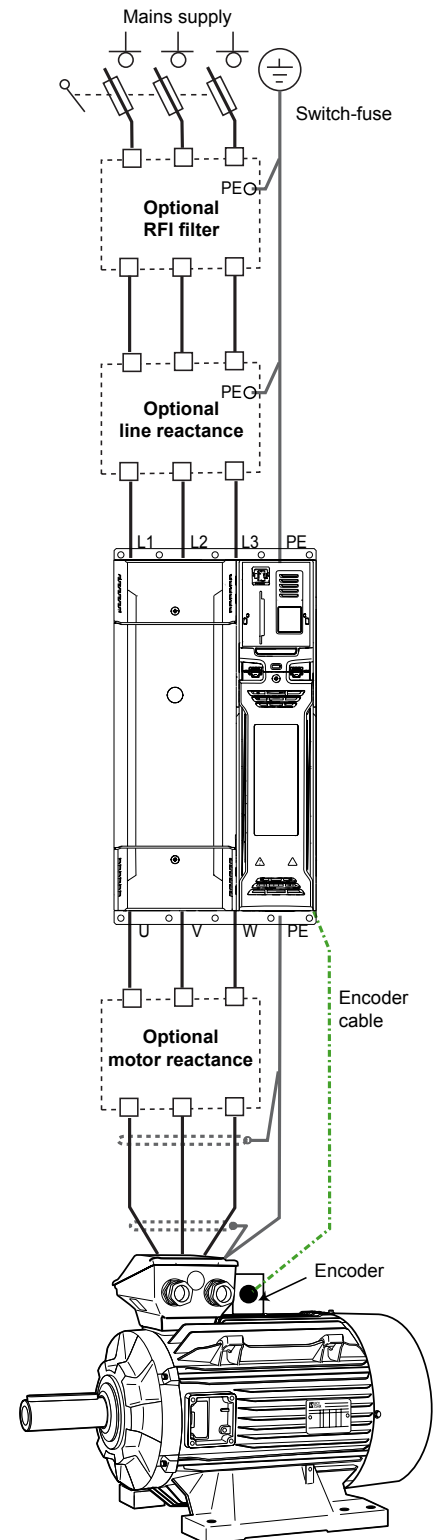
**Encoder cables:** Shielding the sensor cables is important due to the high voltages and currents present at the drive output. This cable must be laid at least 30 cm away from any power cables. See "Encoders" section.

**Sizing power cables:** The drive and motor power supply cables must be sized according to the applicable standard, depending on the design current stated in the drive documentation. The different factors to be taken into account are:

- The installation method: in a conduit, a cable tray, suspended, etc
- The type of conductor: copper or aluminium.

Once the cable cross-section has been determined, check the voltage drop at the motor terminals. A significant voltage drop results in an increase in the current and additional losses in the motor (temperature rise).

A variable speed drive and transformer system which have been earthed in accordance with good practice will contribute significantly to reducing the voltage on the shaft and the motor casing, resulting in fewer high-frequency leakage currents. Premature breakage of bearings and auxiliary equipment, such as encoders, should also be avoided wherever possible.



A motor is always characterised by the following parameters, which depend on the design:

- Temperature class
- Voltage range
- Frequency range
- Thermal reserve

#### CHANGES IN MOTOR PERFORMANCE

When power is supplied by a drive, changes are observed in the above parameters due to certain phenomena:

- Voltage drops in the drive components
- Current increase in proportion with the decrease in voltage
- Difference in motor power supply according to the type of control (flux vector or  $U/F$ )

The main consequence is an increase in the motor current resulting in increased copper losses and therefore a higher temperature rise in the winding (even at 50 Hz).

Reducing the speed leads to a reduction in air flow and hence a reduction in cooling efficiency, and as a result the motor temperature rise will increase again. Conversely, in prolonged operation at high speed, the fan may make excessive noise, and it is advisable to install a forced ventilation system.

Above the synchronous speed, the iron losses increase and hence cause further temperature rise in the motor.

The type of control mode influences temperature rise in the motor:

- A  $U/F$  ratio gives the fundamental voltage maximum at 50 Hz but requires more current at low speed to obtain a high starting torque and therefore generates a temperature rise at low speed when the motor is poorly ventilated.

- Flux vector control requires less current at low speed while providing significant torque but regulates the voltage at 50 Hz and causes a voltage drop at the motor terminals, therefore requiring more current at the same power.

#### Consequences on the motor

**Reminder: Leroy-Somer recommends the connection of PTC sensors, monitored by the drive, to protect the motor as much as possible.**

#### CONSEQUENCES OF POWER SUPPLIED BY DRIVES

When power is supplied to the motor by a variable speed drive with diode rectifier, this causes a voltage drop (~5%).

Some PWM techniques can be used to limit this voltage drop (~2%), to the detriment of the machine temperature rise (injection of harmonics of orders 5 and 7).

The non-sinusoidal signal (PWM) provided by the drive generates voltage peaks at the winding terminals due to the significant voltage variations relating to switching of the IGBTs (also called  $dV/dt$ ). Repeated overvoltages can eventually damage the windings depending on their value and/or the motor design.

The value of the voltage peaks is proportional to the supply voltage. This value can exceed the minimum voltage for the windings which is related to the wire grade, the impregnation type and the insulation that may or may not be present in the slot bottoms or between phases.

Another reason for attaining high voltage values is when regeneration phenomena occur in the case of a driving load, hence the need to prioritise freewheel stops or following the longest permissible ramp.

#### Recommendations concerning the motor winding depending on the supply voltage

LEROY-SOMER applies a range of motor solutions in order to minimise risks:

- "Star" connections whenever possible
- Serial winding whenever possible
- Deceleration following the longest possible ramp
- Ideally, do not use the motor at the limits of its insulation class

These solutions are preferable to filters at the drive output, which accentuate the voltage drop and thus increase the current in the motor.

The insulation system for Leroy-Somer motors can be used on a drive without modification, regardless of the size of the machine or the application, at a supply voltage  $\leq 480$  V 50/60 Hz and can tolerate voltage peaks up to 1500 V and variations of 3500 V/ $\mu$ s. These values are guaranteed without using a filter at the motor terminals.

For a supply voltage  $> 480$  V, other precautions should be taken to maximise motor life. Leroy-Somer's reinforced insulation system (RIS) must be used unless otherwise agreed by Leroy-Somer or a sine filter is used, taking account of the voltage drop at the motor terminals (only compatible with a  $U/F$  control mode).

#### Recommendations for rotating parts

The voltage wave form at the drive output (PWM) can generate high-frequency leakage currents which can, in certain situations, damage the motor bearings.

This phenomenon is amplified with:

- High mains supply voltages
- Increased motor size
- Incorrectly earthed variable speed drive system
- Long cable length between the drive and the motor
- Motor incorrectly aligned with the driven machine

Leroy-Somer machines which have been earthed in accordance with good practice need no special options except in the situations listed below:

- For voltage  $\leq 480$  V 50/60 Hz, and frame size  $\geq 315$  mm, we recommend using an insulated NDE bearing.
- For voltage  $> 480$  V 50/60 Hz, and frame size  $\geq 315$  mm, it is advisable to fit the motor with two insulated bearings, especially if there is no filter at the drive output.

If there is one, only one insulated NDE bearing is recommended.

# LSMV

## High-efficiency 3-phase induction motors for variable speed control

### Installation and motor options

#### Adaptation of the LSMV motor

##### Good wiring practice

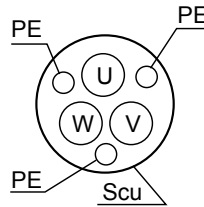
It is the responsibility of the user and/or the installer to connect the variable speed drive system in accordance with the current legislation and regulations in the country of use. This is particularly important as concerns cable size and connection of earths and grounds.

The following information is given for guidance only, and should never be used as a substitute for the current standards, nor does it relieve the installer of his responsibility. For more information, please refer to technical specification IEC 60034-25.

A variable speed drive and transformer system which have been earthed in accordance with good practice will contribute significantly to reducing the voltage on the shaft and the motor casing, resulting in fewer high-frequency leakage currents. Premature breakage of bearings and auxiliary equipment, such as encoders, should also be avoided wherever possible.

To ensure the safety of personnel, the size of the earthing cables should be determined individually in accordance with local regulations.

For compliance with standard EN 61800-3, the power conductors between drive and motor must be shielded. Use a special variable speed cable: shielded with low stray capacity and with 3 PE conductors 120° apart (diagram below). There is no need to shield the drive power supply cables.



The variable speed drive wiring must be symmetrical (U,V,W at the motor end must correspond to U,V,W at the drive end) with the cable shielding earthed at both the drive end and motor end over 360°.

In the second industrial environment (if the user has an HV/LV transformer), the shielded motor power supply cable can be replaced with a 3-core + earth cable placed in a fully-enclosed metal conduit (metal cable duct for example). This metal conduit should be mechanically connected to the electrical cabinet and the structure supporting the motor. If the conduit consists of several pieces, these should be interconnected by braids to ensure earth continuity. The cables must be fixed securely at the bottom of the conduit.

The motor earth terminal (PE) must be connected directly to the drive earth terminal. A separate PE protective conductor is mandatory if the conductivity of the cable shielding is less than 50% of the conductivity of the phase conductor.

#### SUMMARY OF RECOMMENDED PROTECTION DEVICES

Mains voltage	Cable length <sup>(1)</sup>	Frame size	Winding protection	Insulated bearings
≤ 480 V	< 20 m	All frame sizes	Standard <sup>(2)</sup>	No
	< 250 m	< 315	Standard <sup>(2)</sup>	No
	> 20 m and < 250 m	≥ 315	RIS or drive filter <sup>(3)</sup>	NDE
> 480 V and ≤ 690 V	< 20 m	≤ 160	Standard <sup>(2)</sup>	No
	< 250 m	> 160 and < 315	RIS or drive filter <sup>(3)</sup>	No
		> 160 and < 315		NDE
		≥ 315		NDE (or DE + NDE if no filter)

(1) Length of shielded cable, cumulative (length) per phase between motor and drive, for a drive with 3 kHz switching frequency.

(2) Standard insulation = 1500 V peak and 3500 V/μs.

(3) Drive filter: dV/dt reactance or sine wave filter.

##### Adjusting the switching frequency

The variable speed drive switching frequency has an impact on losses in the motor and the drive, on the acoustic noise and the torque ripple.

A low switching frequency has an adverse effect on temperature rise in motors.

LEROY-SOMER recommends a drive switching frequency of 3 kHz minimum.

In addition, a high switching frequency optimises the acoustic noise and torque ripple level.

# LSMV

## High-efficiency 3-phase induction motors for variable speed control

### Installation and motor options

#### Reinforced insulation

LSMV motors are compatible with power supplies with the following characteristics:

- $U_{rms} = 480 \text{ V max.}$
- Value of voltage peaks generated at the terminals: 1500 V max.
- Switching frequency: 2.5 kHz min.

However, they can be supplied under more severe conditions if additional protection is provided.

#### REINFORCED WINDING INSULATION

The main effect connected with supplying power via an electronic drive is overheating of the motor due to the non-sinusoidal shape of the signal. In addition, this can result in accelerated aging of the winding through the voltage peaks generated at each pulse in the power supply signal (see Figure 1).

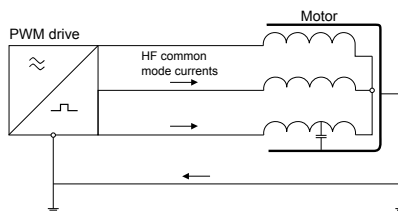
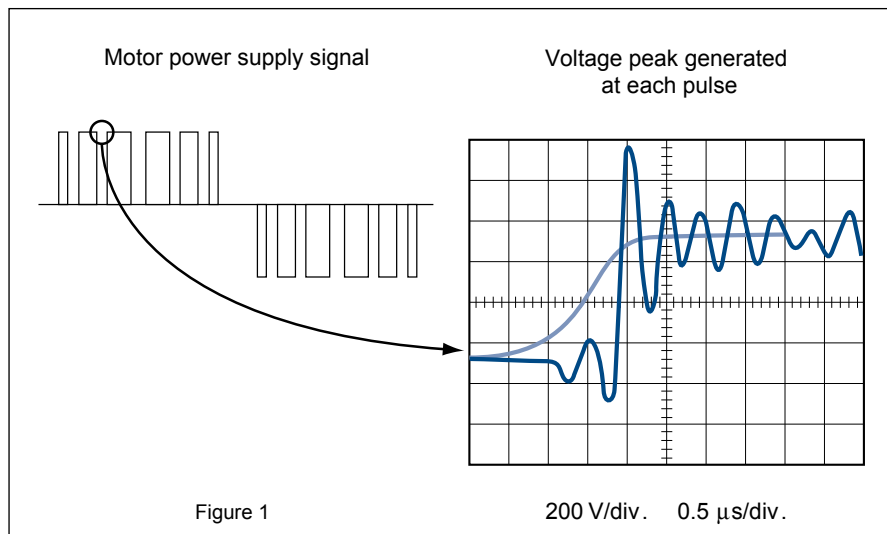
For peak values greater than 1500 V, a super-insulation option for the winding is available over the entire range.

#### REINFORCED INSULATION OF THE MECHANICAL PARTS

Supplying power via a drive may affect the mechanical parts and can lead to premature wear of the bearings.

This is because, in any motor, a shaft voltage exists with respect to earth. This voltage, due to electro-mechanical asymmetry, creates a potential difference between the rotor and the stator. This effect may generate electrical discharges between balls and races and lead to a reduction in bearing life.

If power is supplied via a PWM drive, a second effect is added: high frequency currents generated by the IGBT output bridges of the drives. These currents attempt to spread towards the drive and therefore flow through the stator and via earth where the link between the casing, machine chassis and earth is correctly made.



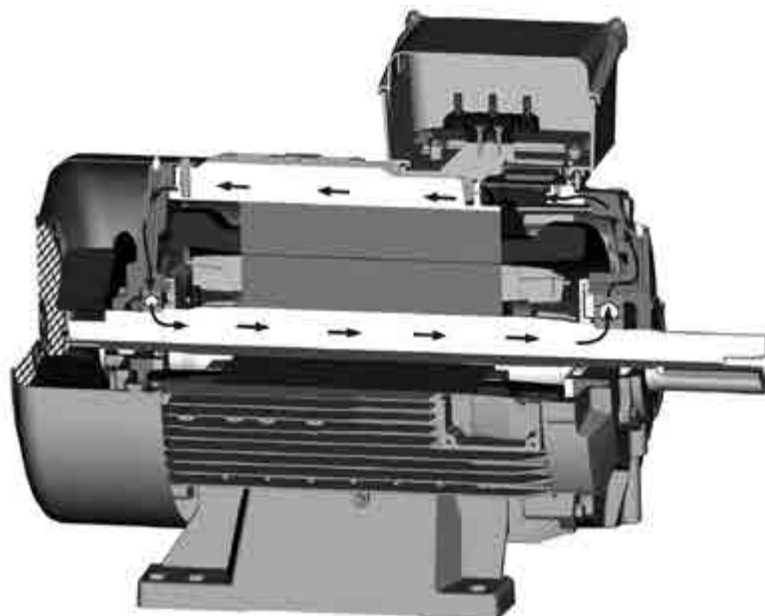
Otherwise, it will flow via the least resistive path: end shields /bearings/ shaft/machine coupled to the motor. In these situations, therefore, protection for the bearings must be provided.

For this reason, an "insulated bearing" option is available over the entire range from a frame size of 200.

#### Insulated bearing characteristics

The outer races of the bearings are coated with a layer of electrically insulating ceramic.

The dimensions and tolerances of these bearings are identical to the standard ones used and can therefore be fitted instead, with no modifications to the motors. The breakdown voltage is 500 V.





# LSMV

## High-efficiency 3-phase induction motors for variable speed control

### Installation and motor options

#### Speed feedback

##### SELECTION OF POSITION SENSOR

The role of the encoder in a drive system is to improve the quality of motor-drive speed regulation irrespective of the load variation at the motor shaft or to enable positioning.

There are three different types of encoder:

Incremental		Absolute		Analogue
Binary	Analogue	Binary	Analogue	
Single-turn encoder TTL (5 V) HTL (10-30 V)	Single-turn encoder Sin/Cos	Single-turn/Multi-turn encoder SSI; BiSS-C; EnDat; Hiperface	Single-turn resolver	Single-turn D.C. Tachogenerator

The main encoder types are incremental encoders which in the event of a power cut do not memorise the position, or absolute, meaning that the driven machine can be restarted without taking the reference again.

Built into the motor, they are designed to work at high ambient temperatures and at a vibration level compatible with the motor requirements.

The mechanical design of the LSMV allows it to be self-cooled as standard and the brake and forced ventilation unit options, which are needed for the thermal aspect, to be combined at low speed  $\leq 5$  Hz and at high speed  $\geq 75$  Hz.

Incremental and absolute encoders are supplied as standard with male/female M23 connectors.



# LSMV

## High-efficiency 3-phase induction motors for variable speed control

### Installation and motor options

#### Speed feedback

##### INCREMENTAL ENCODERS

This pulse generator supplies a number of pulses on channels A,A/, B,B/, 0 marker, 0/ marker proportional to the speed.

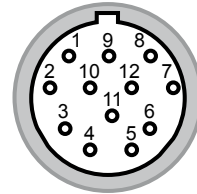
A 1024-point encoder is sufficient for most applications. However, where stability at very low speed (<10 rpm) is required, use of a higher resolution encoder is recommended.

##### Connector wiring:

Terminal 1: 0V	Terminal 8: 0/
Terminal 2: +VDC	Terminal 9: NC
Terminal 3: A	Terminal 10: NC
Terminal 4: B	Terminal 11: NC
Terminal 5: 0	Terminal 12: NC
Terminal 6: A/	
Terminal 7: B/	Shielding/housing connector



View of M23 female connector base (anti-clockwise) at the user end



##### ABSOLUTE ENCODERS

Absolute encoders save the position in the revolution, or over several revolutions, in the event of a power cut. A reference point is no longer necessary.

Data is transmitted via different communication protocols (EnDat, Hiperface, SSI, BiSS-C, etc); some protocols are owned by a particular supplier (EnDat/Heidenhain and Hiperface/Sick).

In certain cases, SinCos or incremental data is also available.

##### Single-turn absolute encoders

The single-turn absolute encoder converts a rotation of the drive shaft into a series of "electrical encoded steps".

The number of steps per revolution is determined by an optical disk.

In general, one shaft rotation consists of 8192 steps, which corresponds to 13 bits. At the end of a complete encoder shaft revolution, the same values are repeated.

##### Multi-turn absolute encoders

The multi-turn absolute encoder saves the position in the revolution and also over several revolutions, with a maximum of 4096 revolutions.

##### Resolver

Powered by an A.C. voltage and consisting of a stator and a wound rotor, it produces two voltages which, when combined can be used to determine the rotor position.

The advantage of this sensor is its ruggedness (no electronics) and its excellent reliability in severe environments (high temperature, vibration, etc).



##### D.C. TACHOGENERATOR

The D.C. tachogenerator is a generator that delivers a DC voltage proportional to the speed. As standard, we propose type KTD3 hollow shaft Ø14 mm 20 V/1000 rpm.



# LSMV

## High-efficiency 3-phase induction motors for variable speed control

### Installation and motor options

### Speed feedback

#### INCREMENTAL ENCODER CHARACTERISTICS

Encoder type	Incremental encoders									
	Standard								SinCos	
Encoder reference	ERN420	ERN430	RI64		DHO5S		5020		ERN480	DHO 514
Supply voltage	5 VDC	10/30 VDC	5 VDC	5/26 VDC	5 VDC	11/30 VDC	5/30 VDC	10/30 VDC	5 VDC	5 VDC
Output stage	TTL (RS422)	HTL	TTL (RS422)	HTL	TTL (RS422)	HTL	TTL (RS422)	HTL	1 V ~	1 V ~
Max. current (no load)	150 mA		40 mA	24 mA	75 mA		90 mA	100 mA	150 mA	75 mA
Positions per revolution as standard (on request 1 to 5000 points)	1024 or 4096		1024 or 4096		1024 or 4096		1024 or 4096		1024 or 4096	1024 or 4096
Max. mechanical speed in continuous operation	10,000 rpm		6,000 rpm		6,000 rpm		6,000 rpm		10,000 rpm	6,000 rpm
Shaft diameter	14 mm <sup>(1)</sup>		14 mm <sup>(1)</sup>		14 mm <sup>(1)</sup>		14 mm <sup>(1)</sup>		14 mm <sup>(1)</sup>	14 mm <sup>(1)</sup>
Protection	IP64		IP64		IP65		IP65		IP64	IP65
Operating temperature	-40° +85°C		-40° +100°C		-30° +100°C		-40° +85°C		-30° +100°C	-30° +100°C
Cable termination at motor end	M23 12 pins		M23 12 pins		M23 12 pins		M23 12 pins		M23 12 pins	M23 12 pins
Approval	CE, cURus, UL/CSA		CE		CE		CE, cURus		CE, cURus, UL/CSA	CE

(1) Through hollow shaft

#### ABSOLUTE ENCODER CHARACTERISTICS

Encoder type	Absolute encoders										
	Single-turn					Multi-turn (4096 turns)					
Data interface (2)	EnDat 2.1 <sup>®</sup>	SSI			SinCos SSI/BISS-C <sup>®</sup>	SinCos Hiperface <sup>®</sup>	EnDat 2.1 <sup>®</sup>	SSI		SinCos SSI/BISS-C <sup>®</sup>	SinCos Hiperface <sup>®</sup>
Encoder reference	ECN 413	ECN 413	AFS 60	5873	SFS 60	EQN 425	EQN 425	AFM 60	5883	SFM 60	
Supply voltage	3.6/14 VDC	10/30 VDC	4.5/32 VDC	5 VDC 10/30 VDC	7/12 VDC	3.6/14 VDC	10/30 VDC	4.5/32 VDC	5 VDC 10/30 VDC	7/12 VDC	
Output stage	1 V ~		1 V ~	1 V ~	1 V ~	1 V ~		1 V ~	1 V ~	1 V ~	
Max. current (no load)	110 mA	45 mA	30 mA	70 mA 45 mA	80 mA	140 mA	55 mA	30 mA	80 mA 50 mA	80 mA	
Positions per revolution as standard (on request 1 to 5000 points)	4096 max.: 8192	4096 max.: 8192	4096 max.: 16,384	4096 max.: 32,768	4096 max.: 8192	4096 max.: 8192	4096 max.: 16,384	4096 max.: 32,768	4096 max.: 8192	4096 max.: 16,384	
Max. mechanical speed in continuous operation	12,000 rpm	9,000 rpm	6,000 rpm	6,000 rpm	12,000 rpm	9,000 rpm	6,000 rpm	6,000 rpm	12,000 rpm	9,000 rpm	
Shaft diameter	14 mm <sup>(1)</sup>	14 mm <sup>(1)</sup>	14 mm <sup>(1)</sup>	14 mm <sup>(1)</sup>	14 mm <sup>(1)</sup>	14 mm <sup>(1)</sup>	14 mm <sup>(1)</sup>	14 mm <sup>(1)</sup>	14 mm <sup>(1)</sup>	14 mm <sup>(1)</sup>	
Protection	IP64	IP65	IP65	IP65	IP65	IP64	IP65	IP65	IP65	IP65	
Operating temperature	-40° +85°C	-30° +100°C	-40° +90°C	-30° +115°C	-40° +85°C	-30° +100°C	-40° +90°C	-30° +115°C	-40° +85°C	-30° +100°C	
Cable termination at motor end	M23 17 pins	M23 12 pins	M23 12 pins	M23 12 pins	M23 12 pins	M23 17 pins	M23 12 pins	M23 12 pins	M23 12 pins	M23 12 pins	
Approval	CE, cURus, UL/CSA	CE, cURus	CE, cURus	CE, cURus	CE, cURus	CE, cURus, UL/CSA	CE, cURus	CE, cURus	CE, cURus	CE, cURus	

(1) Through hollow shaft

(2) EnDat 2.2 on request

**Brake**

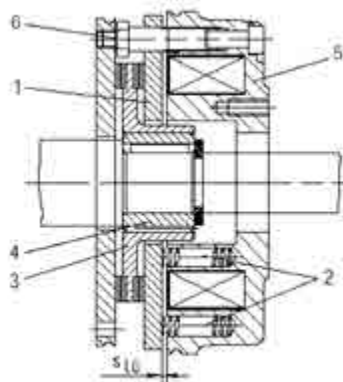
**BK BRAKE**

The BK brake is a single-disc (1) failsafe brake with two friction surfaces, which is used as a deceleration brake and/or an emergency brake.

**Operating principle**

Friction produced by a number of springs (2) generates a braking torque that can be used to hold different loads. The braking torque is transmitted from the hub (4) to the rotor 3 via splines. The friction linings provide a high level of braking torque with minimal wear. This component does not require either servicing or adjustment.

The brake is released by an electromagnetic field produced by the coil (5) when voltage is present at its terminals. The brakes are supplied ready to use (preset air gap) with the control cell mounted in the terminal box. A "manual release" option is available on request.



- 1 - Armature disc
- 2 - Pressure springs
- 3 - Rotor
- 4 - Hub
- 5 - Stator
- 6 - Socket screws

**Power supply at 230 V:**

Cell type: S08  
 Rectified voltage: 210 V full wave  
 Brake coil rated voltage: 190 V

Voltage at the brake terminals:  
 1 - UDC = 0.45 x UAC (400 V)  
 2 - UDC = 0.9 x UAC (230 V)

**Power supply at 400 V:**

Cell type: S08  
 Rectified voltage: 210 V half wave  
 Brake coil rated voltage: 190 V

Voltage at the brake terminals:  
 1 - UDC = 0.45 x UAC (400 V)  
 2 - UDC = 0.9 x UAC (230 V)



Brake	Frame size
BK type	80 to 132
FCR type	80 to 132
FCPL type	160 to 250

# LSMV

## High-efficiency 3-phase induction motors for variable speed control

### Installation and motor options

## Brake

### Characteristics

Type	Power at 20°C W	Resistance Ohm	Current absorbed mA	Braking torque			Max. speed rpm
				1000 rpm N.m	1500 rpm N.m	3000 rpm N.m	
BK 08	25	1444	131.5	8	6.8	6.24	10100
BK 16	30	1203	157.8	16	9.96	9.12	8300
BK 32	40	902.5	210.5	32	25.92	23.68	6700
BK 60	50	722	263.1	60	48	43.8	6000
BK 80	60	601.7	315.7	80	63.2	57.6	5300

### Operating time

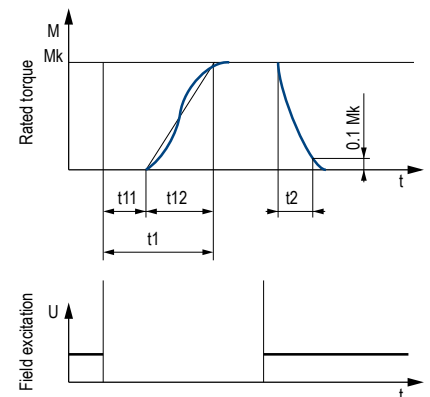
Type	Braking torque at 1000 rpm N.m	Max. friction work J	Operating rate per hour h <sup>-1</sup>	DC switching Response time			
				t <sub>11</sub> ms	t <sub>12</sub> ms	t <sub>1</sub> ms	t <sub>2</sub> ms
BK 08	8	7500	50	15	16	31	57
BK 16	16	12000	40	28	19	47	76
BK 32	32	24000	30	28	25	53	115
BK 60	60	30000	28	17	25	42	210
BK 80	80	36000	27	27	30	57	220

There is usually a delay before braking torque changes to continuous torque.

The trip times correspond to DC switching with induction voltage some five to ten times higher than the rated voltage.

The figure opposite shows the delay time t<sub>11</sub>, rise time of braking torque t<sub>12</sub>, engagement time t<sub>1</sub> = t<sub>11</sub> + t<sub>12</sub> and the time t<sub>2</sub>.

The disengagement time is not changed by DC or AC switching. It can be made shorter with special devices with rapid excitation or overexcitation board.

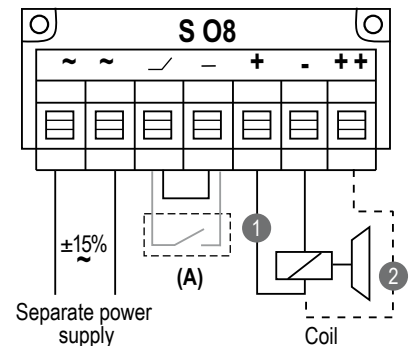


- t<sub>1</sub> Engagement time
- t<sub>2</sub> Disengagement time (until M = 0.1 M<sub>K</sub>)
- t<sub>11</sub> Delay time
- t<sub>12</sub> Rise time of braking torque

### Braking time/Tolerable limit of inertia

Type	Inertia at 1000 rpm kg.m <sup>2</sup>	Braking time ms	Inertia at 1500 rpm kg.m <sup>2</sup>	Braking time ms	Inertia at 3000 rpm kg.m <sup>2</sup>	Braking time ms
BK 08	1.367	17.89	0.607	12	0.152	6
BK 16	2.188	14.32	0.973	9.45	0.243	4.7
BK 32	4.37	14.3	1.945	9.547	0.486	4.7
BK 60	5.47	9.54	2.431	6.364	0.608	3.18
BK 80	6.565	8.59	2.92	5.73	0.73	2.86

### Wiring scheme



Power supply	Coil	Wiring*
400 VAC	180 VDC	①
230 VAC	180 VDC	②

\*depending on power supply and coil

# LSMV

## High-efficiency 3-phase induction motors for variable speed control

### Installation and motor options

## Brake

### LSMV + BK BRAKE CHARACTERISTICS

#### 2 poles - 3000 rpm

Motor type	Brake type	230 or 400 V AC/205 V DC BRAKE POWER SUPPLY								
		Rated power	Max. mechanical speed	Rated torque	Braking torque	Brake consumption	Pick-up time	Brake engage time on DC break	Moment of inertia	Weight
		$P_N$ kW	$N_S$ rpm	$M_N$ N.m	$M_F$ N.m	$I_F$ A	$t_1$ ms	$t_2$ ms	J kg.m <sup>2</sup>	IM B3 kg
LSMV 80 L	BK 8	0.75	10,100	2.5	8	0.13	32	60	0.0009	13
LSMV 80 L	BK 8	1.1	10,100	3.7	8	0.13	32	60	0.001	14
LSMV 90 S	BK 16	1.5	10,100	4.9	16	0.15	47	73	0.0017	16
LSMV 90 L	BK 16	2.2	8,300	7.1	16	0.15	47	73	0.0022	22
LSMV 100 L	BK 32	3	8,300	10.0	32	0.21	57	111	0.0031	30
LSMV 112 MR	BK 32	4	8,300	13.4	32	0.21	57	111	0.0037	35
LSMV 132 S	BK 60	5.5	6,700	17.9	60	0.26	38	213	0.015	45
LSMV 132 SU	BK 60	7.5	6,700	24.1	60	0.26	38	213	0.016	51
LSMV 132 M	BK 60	9	6,000	29.2	60	0.26	38	213	0.017	60
LSMV 160 MP	BK 80	11	5,300	35.9	80	0.31	53	221	0.019	73
LSMV 160 MR	BK 80	15	5,300	49.2	80	0.31	53	221	0.026	85

#### 4 poles - 1500 rpm

Motor type	Brake type	230 or 400 V AC/205 V DC BRAKE POWER SUPPLY								
		Rated power	Max. mechanical speed	Rated torque	Braking torque	Brake consumption	Pick-up time	Brake engage time on DC break	Moment of inertia	Weight
		$P_N$ kW	$N_S$ rpm	$M_N$ N.m	$M_F$ N.m	$I_F$ A	$t_1$ ms	$t_2$ ms	J kg.m <sup>2</sup>	IM B3 kg
LSMV 80 LG	BK 8	0.75	10,100	4.9	8	0.13	32	60	0.0027	16
LSMV 90 SL	BK 16	1.1	8,300	6.7	16	0.15	47	73	0.0044	20.9
LSMV 90 LU	BK 16	1.5	8,300	9.4	16	0.15	47	73	0.0051	22
LSMV 100 LR	BK 32	2.2	6,700	14.0	32	0.21	57	111	0.0047	30
LSMV 100 LG	BK 32	3	6,700	19.8	32	0.21	57	111	0.0011	38
LSMV 112 MU	BK 32	4	6,700	26.0	32	0.21	57	111	0.015	45
LSMV 132 SM	BK 60	5.5	6,000	35.8	60	0.26	38	213	0.023	72
LSMV 132 M	BK 60	7.5	6,000	48.8	60	0.26	38	213	0.028	84
LSMV 132 MU	BK 80	9	5,300	58.7	80	0.31	53	221	0.030	95
LSMV 160 MR	BK 80	11	5,300	71.4	80	0.31	53	221	0.035	103

#### 6 poles - 1000 rpm

Motor type	Brake type	230 or 400 V AC/205 V DC BRAKE POWER SUPPLY								
		Rated power	Max. mechanical speed	Rated torque	Braking torque	Brake consumption	Pick-up time	Brake engage time on DC break	Moment of inertia	Weight
		$P_N$ kW	$N_S$ rpm	$M_N$ N.m	$M_F$ N.m	$I_F$ A	$t_1$ ms	$t_2$ ms	J kg.m <sup>2</sup>	IM B3 kg
LSMV 90 S	BK 16	0.75	8,300	7.6	16	0.15	47	73	0.005	18
LSMV 90 L	BK 16	1.1	8,300	11.0	16	0.15	47	73	0.005	21
LSMV 100 L	BK 32	1.5	6,700	14.9	32	0.21	57	111	0.006	27
LSMV 112 MG	BK 32	2.2	6,700	20.9	32	0.21	57	111	0.01	34
LSMV 132 S	BK 60	3	6,000	29.1	60	0.26	38	213	0.02	52
LSMV 132 M	BK 60	4	6,000	39.4	60	0.26	38	213	0.03	62
LSMV 132 MU	BK 60	5.5	6,000	55	60	0.26	38	213	0.04	77

# LSMV

## High-efficiency 3-phase induction motors for variable speed control

### Installation and motor options

#### Forced ventilation

The motors are self-cooled as standard

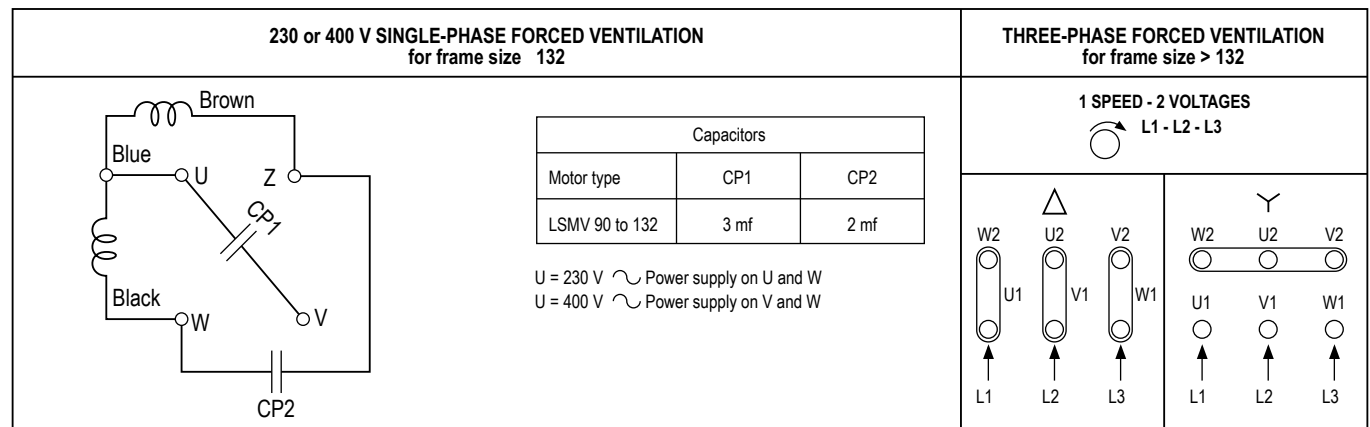
To maintain the rated torque over the entire speed range, forced ventilation may be necessary.

#### Characteristics of forced ventilation units

Motor type	FV Supply voltage <sup>(1)</sup>	FV consumption		Ingress protection <sup>(2)</sup> FV
		P (W)	I (A)	
LSMV 80 to 132	single-phase 230 or 400 V	100	0.43/0.25	IP55
LSMV 160 to 280 SD	three-phase 230/400 V 50 Hz 254/460 V 60 Hz	150	0.94/0.55	IP55
LSMV 280 MK LSMV 315 M	three-phase 230/400 V 50 Hz 254/460 V 60 Hz	750	3.6/2.1	IP55

(1) ± 10% for voltage, ± 2% for frequency.

(2) Ingress protection of the forced ventilation unit installed on the motor.



#### Thermal protection

**The motors are fitted with PTC sensors as standard**

The motors are protected by the variable speed drive, placed between the isolating switch and the motor. The variable speed drive provides total protection of the motor against overloads.

The motors are fitted with PTC sensors in the winding. As an option, specific thermal protection sensors can be selected from the table below.

**It must be emphasized that under no circumstances can these sensors be used to carry out direct regulation of the motor operating cycles.**

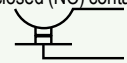
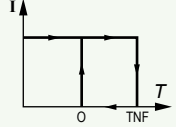
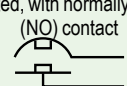
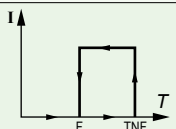
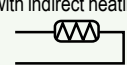
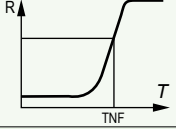
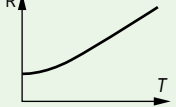
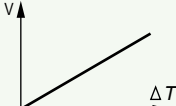
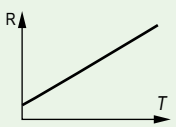
#### Fitting thermal protection

- PTO or PTF, in the control circuits
- PTC, with relay, in the control circuits
- PT 100 or thermocouples, with reading equipment or recorder, in the installation control panel for continuous surveillance

#### Alarm and early warning

All protective equipment can be backed up by another type of protection (with different NRTs): the first device will then act as an early warning (light or sound signals given without shutting down the power circuits), and the second device will be the alarm (shutting down the power circuits).

#### Built-in indirect thermal protection

Type	Operating principle	Operating curve	Breaking capacity (A)	Protection provided	Mounting Number of devices*
Normally closed thermal protection <b>PTO</b>	Bimetallic strip, indirectly heated, with normally closed (NC) contact 		2.5 A at 250 V with $\cos \varphi 0.4$	General monitoring for non-transient overloads	Mounting in control circuit 2 or 3 in series
Normally open thermal protection <b>PTF</b>	Bimetallic strip, indirectly heated, with normally open (NO) contact 		2.5 A at 250 V with $\cos \varphi 0.4$	General monitoring for non-transient overloads	Mounting in control circuit 2 or 3 in parallel
Positive temperature coefficient thermistor <b>PTC</b>	Variable non-linear resistor with indirect heating 		0	General monitoring for transient overloads	Mounted with associated relay in control circuit 3 in series
Temperature sensor <b>KT Y</b>	Resistance depends on the winding temperature		0	High accuracy continuous surveillance of key hot spots	Mounted in control boards with associated reading equipment (or recorder) 1 per hot spot
Thermocouples <b>T</b> ( $T < 150^\circ\text{C}$ ) Copper Constantan <b>K</b> ( $T < 1000^\circ\text{C}$ ) Copper-nickel	Peltier effect		0	Continuous surveillance of hot spots at regular intervals	Mounted in control boards with associated reading equipment (or recorder) 1 per hot spot
Platinum resistance thermometer <b>PT 100</b>	Variable linear resistor with indirect heating		0	High accuracy continuous surveillance of key hot spots	Mounted in control boards with associated reading equipment (or recorder) 1 per hot spot

- NRT: nominal running temperature.
- The NRTs are chosen according to the position of the sensor in the motor and the temperature rise class.
- standard  $kTy = 84/130$

\* The number of devices relates to the winding protection.



# LSMV

High-efficiency 3-phase induction motors for variable speed control

Installation and motor options

## Mains connection

The motors are supplied with pre-drilled and tapped terminal boxes or an undrilled mounting plate for mounting cable glands

### CABLE GLANDS

In certain applications, it is necessary for there to be earth continuity between the cable and the motor earth to ensure the installation is protected in accordance

with EMC directive 89/336/EU. An optional **cable gland with anchorage on shielded cable** is therefore available over the entire range.

### Number and type of cable gland

Series	Type	Number of poles	Terminal box material	Power + auxiliaries	
				Number of drill holes	Drill hole diameter
LSMV	80 L/LG	2; 4; 6	Aluminium alloy	2	1 x M20 + 1 x M16
	90 S/SL/L	2; 4; 6			
	100 L/LR/LG	2; 4; 6			
	112 MR/MG/MU	2; 4; 6		2	1 x M25 + 1 x M16
	132 S/SM/M/MU	2; 4; 6			
	160 MP/MR	2; 4; 6		3	2 x M25 + 1 x M16
	160 L/LUR	2; 4			
	180 MT/M/LUR	2; 4			
	200 LR/L	2; 4		2 x M40 + 1 x M16	
	225 SR/MT/MG	2; 4			
	250 ME	4			
	280 SD/MK	4		2 x M50 + 1 x M16	
	315 SP/MR	4			0

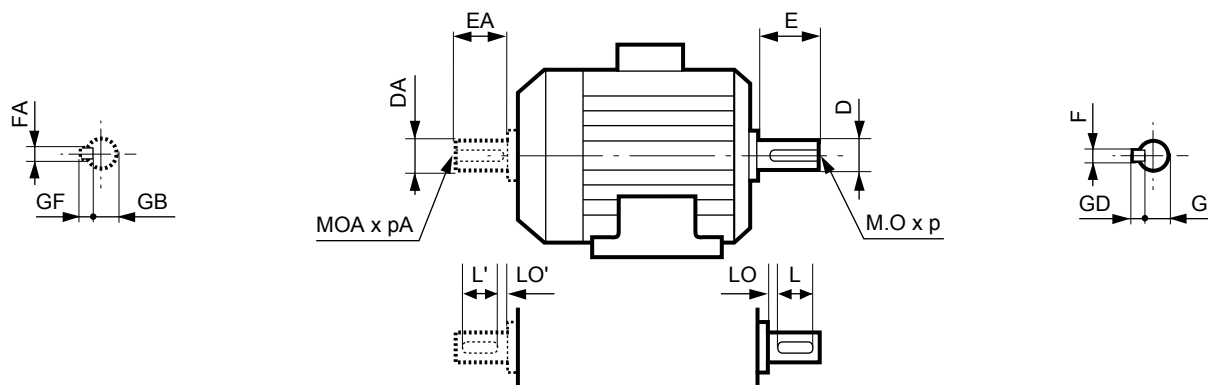
# LSMV

## High-efficiency 3-phase induction motors for variable speed control

### Dimensions

### Shaft extensions

Dimensions in millimetres



Type	Main shaft extensions																	
	4 and 6 poles									2 poles								
	F	GD	D	G	E	O	p	L	LO	F	GD	D	G	E	O	p	L	LO
LSMV 80 L/LG	6	6	19j6	15.5	40	6	16	30	6	6	6	19j6	15.5	40	6	16	30	6
LSMV 90 S/SL/L/LU	8	7	24j6	20	50	8	19	40	6	8	7	24j6	20	50	8	19	40	6
LSMV 100 L/LR/LG	8	7	28j6	24	60	10	22	50	6	8	7	28j6	24	60	10	22	50	6
LSMV 112 MR/MG/MU	8	7	28j6	24	60	10	22	50	6	8	7	28j6	24	60	10	22	50	6
LSMV 132 S/SU/SM/M/MU	10	8	38k6	33	80	12	28	63	10	10	8	38k6	33	80	12	28	63	10
LSMV 160 MP/MR/LUR	12	8	42k6	37	110	16	36	100	6	12	8	42k6	37	110	16	36	100	6
LSMV 180 M/LUR	14	9	48k6	42.5	110	16	36	98	12	14	9	48k6	42.5	110	16	36	98	12
LSMV 200 L	16	10	55m6	49	110	20	42	97	13	16	10	55m6	49	110	20	42	97	13
LSMV 225 SR/MR	18	11	60m6	53	140	20	42	126	14	16	10	55m6	49	110	20	42	97	13
LSMV 250 ME	18	11	65m6	58	140	20	42	126	14									
LSMV 280 SD/MK	20	12	75m6	67.5	140	20	42	125	15									
LSMV 315 SP/MR	22	14	80m6	71	170	20	42	155	15									

Type	Secondary shaft extensions																	
	4 and 6 poles									2 poles								
	FA	GF	DA	GB	EA	OA	pA	L'	LO'	FA	GF	DA	GB	EA	OA	pA	L'	LO'
LSMV 80 L/LG	5	5	14j6	11	30	5	15	25	3.5	5	5	14j6	11	30	5	15	25	3.5
LSMV 90 S/SL/L/LU	6	6	19j6	15.5	40	6	16	30	6	6	6	19j6	15.5	40	6	16	30	6
LSMV 100 L/LR/LG	8	7	24j6	20	50	8	19	40	6	8	7	24j6	20	50	8	19	40	6
LSMV 112 MR/MG/MU	8	7	24j6	20	50	8	19	40	6	8	7	24j6	20	50	8	19	40	6
LSMV 132 S/SU/SM/M/MU	8	7	28k6	24	60	10	22	50	6	8	7	28k6	24	60	10	22	50	6
LSMV 160 MP/MR	12	8	38k6	37	80	16	36	100	6	12	8	38k6	37	80	16	36	100	6
LSMV 160 LUR	12	8	42k6	37	110	16	36	100	6	12	8	42k6	37	110	16	36	100	6
LSMV 180 M/L/LU	14	9	48k6	42.5	110	16	36	98	12	14	9	48k6	42.5	110	16	36	98	12
LSMV 200 LT/L	16	10	55m6	49	110	20	42	97	13	16	10	55m6	49	110	20	42	97	13
LSMV 225 SR/MR/MG	18	11	60m6	53	140	20	42	126	14	16	10	55m6	49	110	20	42	97	13
LSMV 250 ME	18	11	60m6	53	140	20	42	126	14	18	11	60m6	53	140	20	42	126	14
LSMV 280 SD/SC/MC/MK	18	11	65m6	58	140	20	42	126	14									
LSMV 315 SP/MP/MR	22	14	80m6	71	170	24	42	155	15									

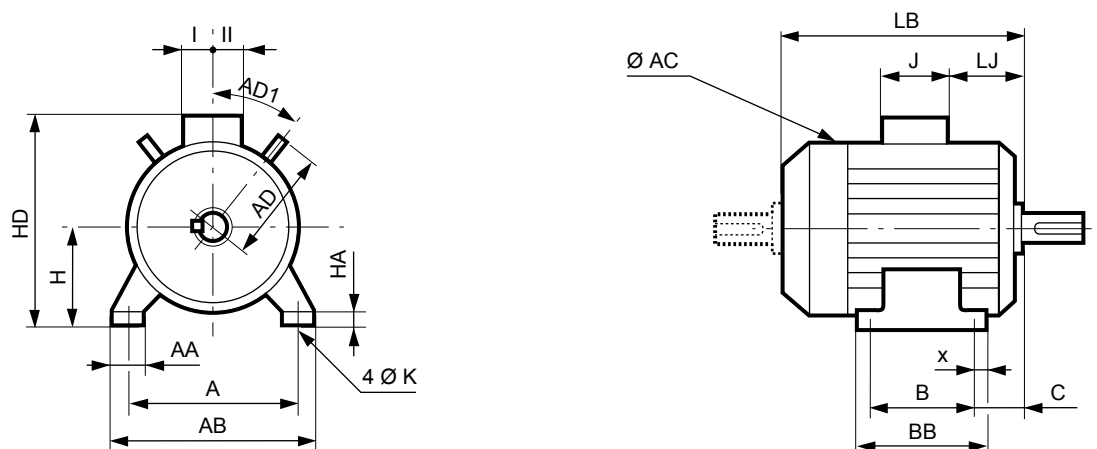
# LSMV

## High-efficiency 3-phase induction motors for variable speed control

### Dimensions

#### Foot mounted IM 1001 (IM B3)

Dimensions in millimetres



Type	Main dimensions																		
	A	AB	B	BB	C	x	AA	K	HA	H	AC*	HD	LB	LJ	J	I	II	AD	AD1
LSMV 80 L	125	157	100	120	50	10	29	9	10	80	170	221	212	13.5	160	55	55	-	-
LSMV 80 LG	125	157	100	125	50	14	31	9	10	80	185	231	243	13.5	160	55	55	-	-
LSMV 90 S	140	172	100	120	56	10	37	10	11	90	190	241	212	13.5	160	55	55	-	-
LSMV 90 SL	140	172	100	162	56	28	39	10	11	90	190	241	239	13.5	160	55	55	-	-
LSMV 90 L	140	172	125	162	56	28	39	10	11	90	190	241	239	13.5	160	55	55	-	-
LSMV 90 LU	140	172	125	162	56	28	39	10	11	90	190	241	265	13.5	160	55	55	-	-
LSMV 100 L	160	196	140	165	63	12	40	12	13	100	200	256	288	14.5	160	55	55	118	45
LSMV 100 LR	160	196	140	165	63	12	40	12	13	100	200	256	314	14.5	160	55	55	118	45
LSMV 100 LG	160	196	140	170	63	11	49	12	13	100	230	265	305	23.5	160	55	55	-	-
LSMV 112 MR	190	220	140	165	70	13	45	12	14	112	200	268	314	14.5	160	55	55	-	-
LSMV 112 MG	190	220	140	165	70	12	52	12	14	112	235	277	305	23.5	160	55	55	118	45
LSMV 112 MU	190	220	140	165	70	12	52	12	14	112	235	277	333	23.5	160	55	55	-	-
LSMV 132 S	216	250	140	170	89	16	42	12	16	132	220	300	350	40.5	160	55	55	130	45
LSMV 132 SU	216	250	140	170	89	16	42	12	16	132	220	300	377	40.5	160	55	55	130	45
LSMV 132 SM	216	250	140	208	89	15	50	12	15	132	265	318	410	50	160	55	55	140	45
LSMV 132 M	216	250	178	208	89	15	50	12	15	132	265	318	385	25	160	55	55	140	45
LSMV 132 MU	216	250	178	208	89	15	50	12	15	132	265	318	412	25	160	55	55	140	45
LSMV 160 MP	254	294	210	294	108	20	64	14	25	160	264	346	468	66.5	160	55	55	155	45
LSMV 160 MR	254	294	210	294	108	20	64	14	25	160	264	346	495	66.5	160	55	55	155	45
LSMV 160 LUR	254	294	254	294	108	20	60	14.5	25	160	312	395	510	42.75	135	88	64	-	-
LSMV 180 M	279	339	241	329	121	25	86	14.5	25	180	350	456	546	94.5	186	112	98	-	-
LSMV 180 LUR	279	339	279	329	121	25	86	14.5	25	180	350	436	614	63.5	186	112	98	-	-
LSMV 200 L	318	388	305	375	133	35	103	18.5	36	200	390	476	621	77	186	112	98	-	-
LSMV 225 SR	356	431	286	386	149	50	127	18.5	36	225	390	535	675.5	61	231	119	142	-	-
LSMV 225 MG	356	420	311	375	149	30	65	18.5	30	225	479	631	803.5	61	292	151	181	-	-
LSMV 250 ME	406	470	349	420	168	35	90	24	36	250	479	656	810	67.5	292	151	181	-	-
LSMV 280 SD	457	520	368	478	190	35	90	24	35	280	479	686	870	67.5	292	151	181	-	-
LSMV 280 MK	457	533	419	495	190	40	85	24	35	280	586	765	921	98.5	292	151	181	-	-
LSMV 315 SP	508	594	406	537	216	40	114	28	70	315	586	867	947	61.5	418	180	235	-	-
LSMV 315 MR	508	594	457	537	216	40	114	28	70	315	586	867	1017	61.5	418	180	235	-	-

\* AC: housing diameter without lifting rings

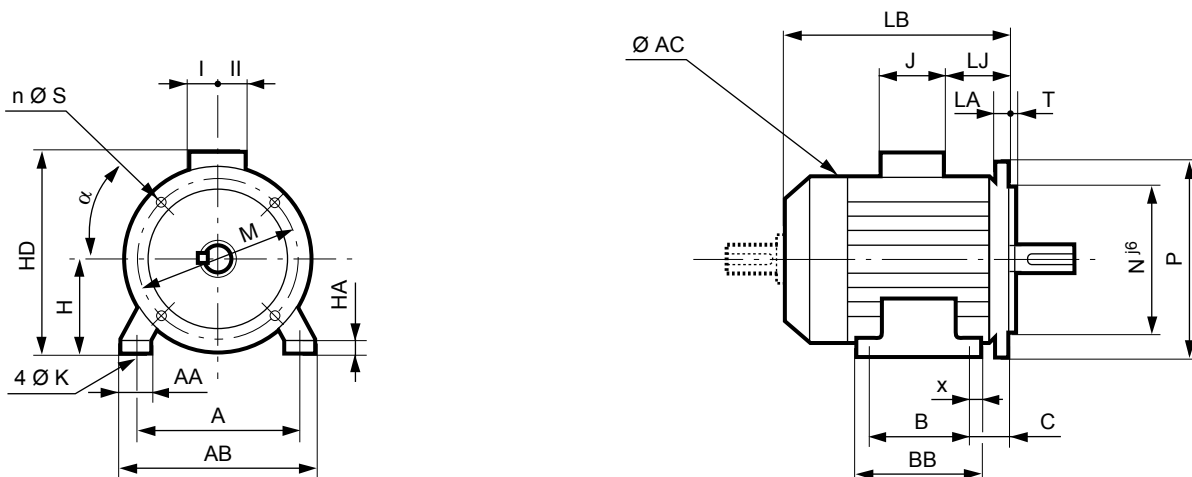
# LSMV

## High-efficiency 3-phase induction motors for variable speed control

### Dimensions

### Foot and flange mounted IM 2001 (IM B35)

Dimensions in millimetres



Type	Main dimensions																	
	A	AB	B	BB	C	x	AA	K	HA	H	AC*	HD	LB	LJ	J	I	II	Symbol
LSMV 80 L	125	157	100	120	50	10	29	9	10	80	170	221	212	14.5	160	55	55	FF 165
LSMV 80 LG	125	157	100	125	70	14	31	9	10	80	185	237	262	34.5	160	55	55	FF 165
LSMV 90 S	140	172	100	120	76	10	37	10	11	90	190	241	232	33.5	160	55	55	FF 165
LSMV 90 SL	140	172	125	162	76	28	39	10	11	90	190	241	259	33.5	160	55	55	FF 165
LSMV 90 L	140	172	125	162	76	28	39	10	11	90	190	241	259	33.5	160	55	55	FF 165
LSMV 90 LU	140	172	125	162	76	28	39	10	11	90	190	241	285	33.5	160	55	55	FF 165
LSMV 100 L	160	196	140	165	63	12	40	12	13	100	200	256	288	14.5	160	55	55	FF 215
LSMV 100 LR	160	196	140	165	63	12	40	12	13	100	200	262	307	14.5	160	55	55	FF 215
LSMV 100 LG	160	196	140	170	63	11	49	12	13	100	230	265	305	13.5	160	55	55	FF 215
LSMV 112 MR	190	220	140	165	70	13	45	12	14	112	200	268	314	14.5	160	55	55	FF 215
LSMV 112 MG	190	220	140	165	69	12	52	12	14	112	235	277	305	23.5	160	55	55	FF 215
LSMV 112 MU	190	220	140	165	70	12	52	12	14	112	235	277	333	23.5	160	55	55	FF 215
LSMV 132 S	216	250	140	170	89	16	42	12	16	132	220	300	350	40.5	160	55	55	FF 265
LSMV 132 SU	216	250	140	170	89	16	42	12	16	132	220	300	377	40.5	160	55	55	FF 265
LSMV 132 SM	216	250	178	208	89	15	50	12	15	132	265	318	410	50	160	55	55	FF 265
LSMV 132 M	216	250	178	208	89	15	50	12	15	132	265	318	385	25	160	55	55	FF 265
LSMV 132 MU	216	250	178	208	89	15	50	12	15	132	265	318	412	25	160	55	55	FF 265
LSMV 160 MP	254	294	210	294	108	20	64	14	25	160	264	346	468	66.5	160	55	55	FF 300
LSMV 160 MR	254	294	210	294	108	20	64	14	25	160	264	346	495	66.5	160	55	55	FF 300
LSMV 160 LUR	254	294	254	294	108	20	60	14.5	25	160	312	395	510	42.75	135	88	64	FF 300
LSMV 180 M	279	339	241	329	121	25	86	14.5	25	180	350	456	546	94.5	186	112	98	FF 300
LSMV 180 LUR	279	339	279	329	121	25	86	14.5	25	180	350	436	614	63.5	186	112	98	FF 300
LSMV 200 L	318	388	305	375	133	35	103	18.5	36	200	390	476	621	77	186	112	98	FF 350
LSMV 225 SR	356	431	286	386	149	50	127	18.5	36	225	390	535	675.5	61	231	119	142	FF 400
LSMV 225 MG	356	420	311	375	149	30	65	18.5	30	225	479	631	803.5	61	292	151	181	FF 400
LSMV 250 ME	406	470	349	420	168	35	90	24	36	250	479	656	810	67.5	292	151	181	FF 500
LSMV 280 SD	457	520	368	478	168	35	90	24	35	280	479	686	870	67.5	292	151	181	FF 500
LSMV 280 MK	457	533	419	495	190	40	85	24	35	280	586	765	921	98.5	292	151	181	FF 500
LSMV 315 SP	508	594	406	537	216	40	114	28	70	315	586	867	947	61.5	418	180	235	FF 600
LSMV 315 MR	508	594	457	537	216	40	114	28	70	315	586	867	1017	61.5	418	180	235	FF 600

\* AC: housing diameter without lifting rings

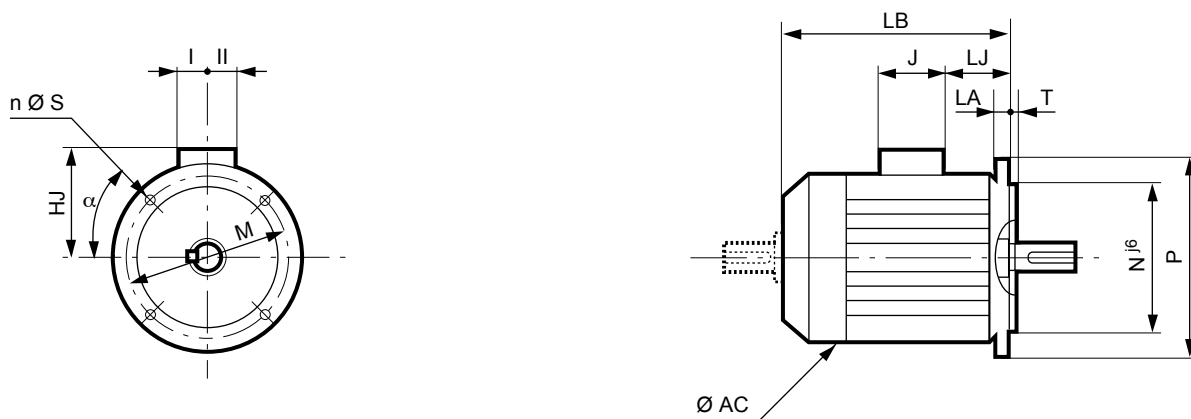
# LSMV

## High-efficiency 3-phase induction motors for variable speed control

### Dimensions

#### Flange mounted IM 3001 (IM B5) IM 3011 (IM V1)

Dimensions in millimetres



IEC symbol	Flange dimensions							
	M	N	P	T	n	α°	S	LA
FF 165	165	130	200	3.5	4	45	12	10
FF 165	165	130	200	3.5	4	45	12	10
FF 165	165	130	200	3.5	4	45	12	10
FF 165	165	130	200	3.5	4	45	12	10
FF 165	165	130	200	3.5	4	45	12	10
FF 165	165	130	200	3.5	4	45	12	10
FF 215	215	180	250	4	4	45	14.5	12
FF 215	215	180	250	4	4	45	14.5	12
FF 215	215	180	250	4	4	45	14.5	12
FF 215	215	180	250	4	4	45	14.5	11
FF 215	215	180	250	4	4	45	14.5	11
FF 215	215	180	250	4	4	45	14.5	11
FF 265	265	230	300	4	4	45	14.5	12
FF 265	265	230	300	4	4	45	14.5	12
FF 265	265	230	300	4	4	45	14.5	12
FF 265	265	230	300	4	4	45	14.5	12
FF 265	265	230	300	4	4	45	14.5	12
FF 300	300	250	350	5	4	45	18.5	14
FF 300	300	250	350	5	4	45	18.5	14
FF 300	300	250	350	5	4	45	18.5	14
FF 300	300	250	350	5	4	45	18.5	14
FF 350	350	300	400	5	4	45	18.5	15
FF 400	400	350	450	5	8	22.5	18.5	16
FF 400	400	350	450	5	8	22.5	18.5	16
FF 500	500	450	550	5	8	22.5	18.5	18
FF 500	500	450	550	5	8	22.5	18.5	18
FF 500	500	450	550	5	8	22.5	18.5	18
FF 600	600	550	660	6	8	22.5	24	22
FF 600	600	550	660	6	8	22.5	24	22

Type	Main dimensions						
	AC*	LB	HJ	LJ	J	I	II
LSMV 80 L	170	212	141	14.5	160	55	55
LSMV 80 LG	185	263	151	34.5	160	55	55
LSMV 90 S	190	232	151	33.5	160	55	55
LSMV 90 SL	190	259	151	33.5	160	55	55
LSMV 90 L	190	259	151	33.5	160	55	55
LSMV 90 LU	190	285	151	33.5	160	55	55
LSMV 100 L	200	288	156	14.5	160	55	55
LSMV 100 LR	200	314	156	14.5	160	55	55
LSMV 100 LG	230	305	165	13.5	160	55	55
LSMV 112 MR	200	314	156	14.5	160	55	55
LSMV 112 MG	235	305	165	23.5	160	55	55
LSMV 112 MU	235	333	165	23.5	160	55	55
LSMV 132 S	220	350	168	40.5	160	55	55
LSMV 132 SU	220	377	168	40.5	160	55	55
LSMV 132 SM	265	410	186	50	160	55	55
LSMV 132 M	265	385	186	25	160	55	55
LSMV 132 MU	265	412	186	25	160	55	55
LSMV 160 MP	264	468	186	66.5	160	55	55
LSMV 160 MR	264	495	186	66.5	160	55	55
LSMV 160 LUR	312	510	235	42.75	135	88	64
LSMV 180 M	350	546	276	94.5	186	112	98
LSMV 180 LUR	350	614	256	63.5	186	112	98
LSMV 200 L	390	621	276	77	186	112	98
LSMV 225 SR	390	675.5	310	61	231	119	142
LSMV 225 MG	479	803.5	406	61	292	151	181
LSMV 250 ME	479	810	406	67.5	292	151	181
LSMV 280 SD	479	870	406	67.5	292	151	181
LSMV 280 MK	586	921	466	98.5	292	151	181
LSMV 315 SP	586	947	555	61.5	418	180	235
LSMV 315 MR	586	1017	555	61.5	418	180	235

\* AC: housing diameter without lifting rings

FF flange mounted motors in position IM 3001 are only available up to frame size 225. Dimensions of shaft extensions identical to those for foot mounted motors.

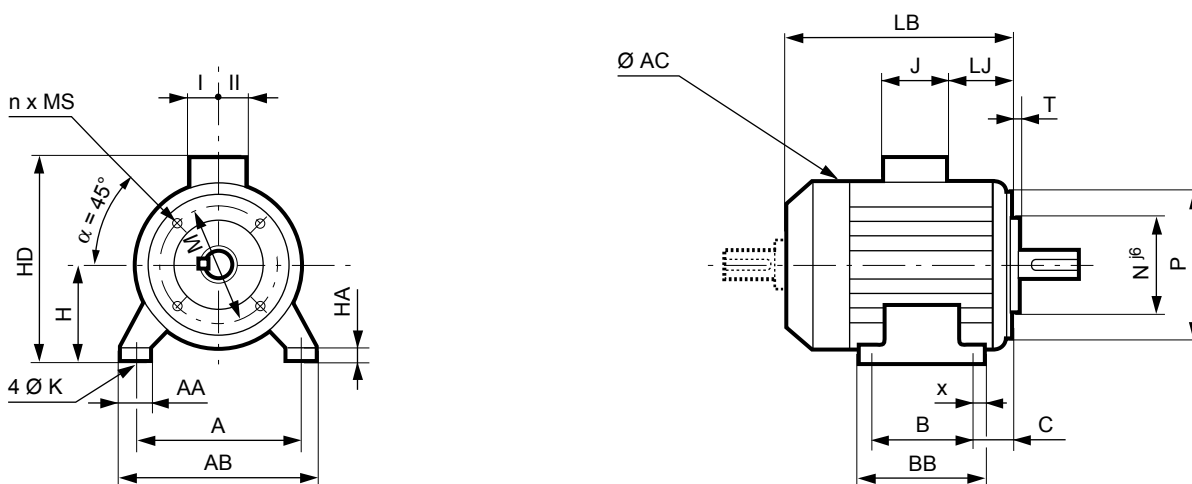
# LSMV

## High-efficiency 3-phase induction motors for variable speed control

### Dimensions

### Foot and face mounted IM 2101 (IM B34)

Dimensions in millimetres



Type	Main dimensions																	
	A	AB	B	BB	C	x	AA	K	HA	H	AC*	HD	LB	LJ	J	I	II	Symbol
LSMV 80 L	125	157	100	120	50	10	29	9	10	80	170	221	212	13.5	160	55	55	FT 100
LSMV 80 LG	125	157	100	125	50	14	31	9	10	80	185	231	243	13.5	160	55	55	FT 100
LSMV 90 S	140	172	100	120	56	10	37	10	11	90	190	241	212	13.5	160	55	55	FT 115
LSMV 90 SL	140	172	125	162	56	28	39	10	11	90	190	241	239	13.5	160	55	55	FT 115
LSMV 90 L	140	172	125	162	56	28	39	10	11	90	190	241	239	13.5	160	55	55	FT 115
LSMV 90 LU	140	172	125	162	56	28	39	10	11	90	190	241	265	13.5	160	55	55	FT 115
LSMV 100 L	160	196	140	165	63	12	40	12	13	100	200	256	288	14.5	160	55	55	FT 130
LSMV 100 LR	160	196	140	165	63	12	40	12	13	100	200	256	314	14.5	160	55	55	FT 130
LSMV 100 LG	160	196	140	170	63	11	49	12	13	100	230	265	305	23.5	160	55	55	FT 130
LSMV 112 MR	190	220	140	165	70	13	45	12	14	112	200	268	314	14.5	160	55	55	FT 130
LSMV 112 MG	190	220	140	165	70	12	52	12	14	112	235	277	305	23.5	160	55	55	FT 130
LSMV 112 MU	190	220	140	165	70	12	52	12	14	112	235	277	333	23.5	160	55	55	FT 130
LSMV 132 S	216	250	140	170	89	16	42	12	16	132	220	300	350	40.5	160	55	55	FT 215
LSMV 132 SU	216	250	140	170	89	16	42	12	16	132	220	300	377	40.5	160	55	55	FT 215
LSMV 132 SM	216	250	178	208	89	15	50	12	15	132	265	318	410	50	160	55	55	FT 215
LSMV 132 M	216	250	178	208	89	15	50	12	15	132	265	318	385	25	160	55	55	FT 215
LSMV 132 MU	216	250	178	208	89	15	50	12	15	132	265	318	412	25	160	55	55	FT 215
LSMV 160 MP	254	294	210	294	108	20	64	14	25	160	264	346	468	66.5	160	55	55	FT 265
LSMV 160 MR	254	294	210	294	108	20	64	14	25	160	264	346	495	66.5	160	55	55	FT 265

\* AC: housing diameter without lifting rings

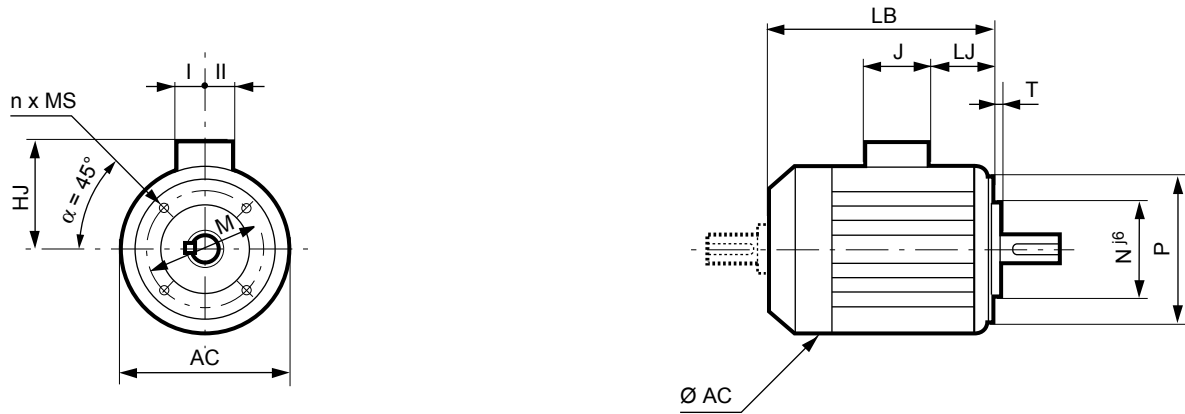
# LSMV

## High-efficiency 3-phase induction motors for variable speed control

### Dimensions

#### Face mounted IM 3601 (IM B14)

Dimensions in millimetres



IEC symbol	Faceplate dimensions					
	M	N	P	T	n	MS
FT 100	100	80	120	3	4	M6
FT 100	100	80	120	3	4	M6
FT 115	115	95	140	3	4	M8
FT 115	115	95	140	3	4	M8
FT 115	115	95	140	3	4	M8
FT 115	115	95	140	3	4	M8
FT 115	115	95	140	3	4	M8
FT 130	130	110	160	3.5	4	M8
FT 130	130	110	160	3.5	4	M8
FT 130	130	110	160	3.5	4	M8
FT 130	130	110	160	3.5	4	M8
FT 130	130	110	160	3.5	4	M8
FT 130	130	110	160	3.5	4	M8
FT 215	215	180	250	4	4	M12
FT 215	215	180	250	4	4	M12
FT 215	215	180	250	4	4	M12
FT 215	215	180	250	4	4	M12
FT 215	215	180	250	4	4	M12
FT 215	215	180	250	4	4	M12
FT 215	215	180	250	4	4	M12
FT 215	215	180	250	4	4	M12

Type	Main dimensions						
	AC*	LB	HJ	LJ	J	I	II
LSMV 80 L	170	212	141	13.5	160	55	55
LSMV 80 LG	185	243	151	13.5	160	55	55
LSMV 90 S	190	212	151	13.5	160	55	55
LSMV 90 SL	190	239	151	13.5	160	55	55
LSMV 90 L	190	239	151	13.5	160	55	55
LSMV 90 LU	190	265	151	13.5	160	55	55
LSMV 100 L	200	288	156	14.5	160	55	55
LSMV 100 LR	200	314	156	14.5	160	55	55
LSMV 100 LG	230	305	165	23.5	160	55	55
LSMV 112 MR	200	314	156	14.5	160	55	55
LSMV 112 MG	235	305	165	23.5	160	55	55
LSMV 112 MU	235	333	165	23.5	160	55	55
LSMV 132 S	220	350	168	40.5	160	55	55
LSMV 132 SU	220	377	168	40.5	160	55	55
LSMV 132 SM	265	410	186	50	160	55	55
LSMV 132 M	265	385	186	25	160	55	55
LSMV 132 MU	265	412	186	25	160	55	55
LSMV 160 MP	264	468	186	66.5	160	55	55
LSMV 160 MR	264	495	186	66.5	160	55	55

\* AC: housing diameter without lifting rings

# LSMV

## High-efficiency 3-phase induction motors for variable speed control

### Dimensions

### Dimensions of optional features

#### LSMV MOTORS WITH OPTIONAL FEATURES

The integration of LSMV motors within a process often requires accessories to make operation easier:

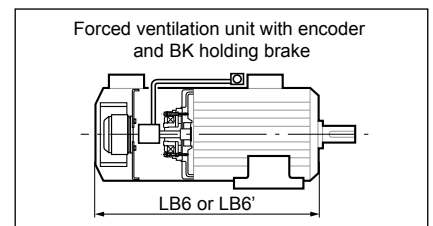
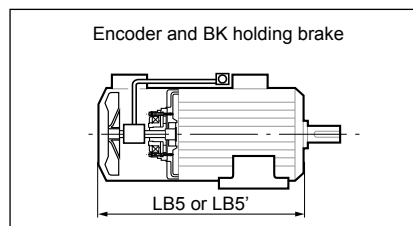
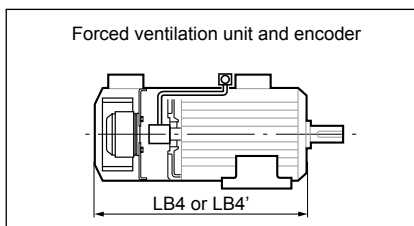
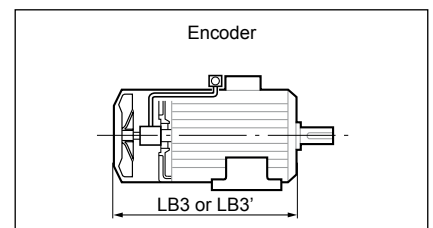
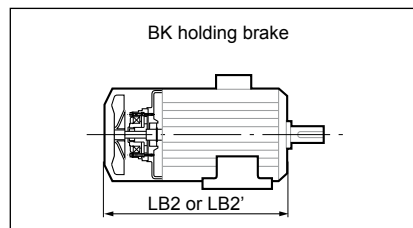
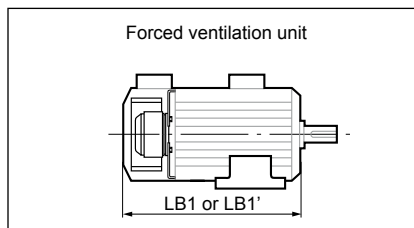
- Forced ventilation for motors used at high or low speeds.

- Holding brakes for maintaining the rotor in the stop position without needing to leave the motor switched on.

- Emergency stop brakes to immobilise loads in case of failure of the motor torque control or loss of power supply.

- Encoders which provide digital information for accurate speed maintenance and position control.

These options can be used singly or in combination as shown in the table below.





# LSMV

High-efficiency 3-phase induction motors for variable speed control

## Dimensions

### Dimensions of optional features

Dimensions in millimetres

#### FOOT OR (FT) FACE MOUNTED MOTORS

Type	Main dimensions					
	LB1	LB2	LB3	LB4	LB5	LB6
LSMV 80 L	317	254	296	352	362	419
LSMV 80 LG	322	304	330	385	389	446
LSMV 90 S	304	279	302	357	352	389
LSMV 90 SL	331	304	329	384	379	416
LSMV 90 L	331	304	329	384	379	416
LSMV 90 LU	342	326	352	402	379	416
LSMV 100 L	373	358	376	430	444	499
LSMV 100 LR	381	365	386	431	443	488
LSMV 100 LG	411	405	394	455	479	518
LSMV 112 MR	407	380	391	438	459	497
LSMV 112 MG	412	385	396	443	464	502
LSMV 112 MU	426	402	419	466	464	502
LSMV 132 S	453	426	437	484	505	543
LSMV 132 SU	453	426	437	484	505	543
LSMV 132 SM	458	487	454	499	540	578
LSMV 132 M	458	487	454	499	540	578
LSMV 132 MU	458	511	494	499	540	578
LSMV 160 MP	709	527	555	709	615	653
LSMV 160 MR	704	580	576	709	615	653
LSMV 160 LUR	702	-	574	702	-	-
LSMV 180 M	735	-	596	735	-	-
LSMV 180 LUR	769	-	629	769	-	-
LSMV 200 L	802	-	674	802	-	-
LSMV 225 SR	854	-	730	854	-	-
LSMV 225 MG	1006	-	854	1006	-	-
LSMV 250 ME	1012	-	860	1012	-	-
LSMV 280 SD	1072	-	920	1072	-	-
LSMV 280 MK	1111	-	965	1111	-	-
LSMV 315 SP	1181	-	991	1181	-	-
LSMV 315 MR	1251	-	1061	1251	-	-

#### (FF) FLANGE OR FOOT AND (FF) FLANGE MOUNTED MOTORS

Type	Main dimensions					
	LB1'	LB2'	LB3'	LB4'	LB5'	LB6'
LSMV 80 L	317	254	296	352	362	419
LSMV 80 LG	342	324	350	405	409	466
LSMV 90 S	324	299	322	377	372	409
LSMV 90 SL	351	324	349	404	399	436
LSMV 90 L	351	324	349	404	399	436
LSMV 90 LU	362	346	372	422	399	436
LSMV 100 L	373	358	376	430	444	499
LSMV 100 LR	381	365	386	431	443	488
LSMV 100 LG	401	395	384	445	469	508
LSMV 112 MR	407	380	391	438	459	497
LSMV 112 MG	412	385	396	443	464	502
LSMV 112 MU	426	402	419	466	464	502
LSMV 132 S	453	426	437	484	505	543
LSMV 132 SU	453	426	437	484	505	543
LSMV 132 SM	458	487	454	499	540	578
LSMV 132 M	458	487	454	499	540	578
LSMV 132 MU	458	511	494	499	540	578
LSMV 160 MP	709	527	555	709	615	653
LSMV 160 MR	704	580	576	709	615	653
LSMV 160 LUR	702	-	574	702	-	-
LSMV 180 M	735	-	596	735	-	-
LSMV 180 LUR	769	-	629	769	-	-
LSMV 200 L	802	-	674	802	-	-
LSMV 225 SR	854	-	730	854	-	-
LSMV 225 MG	1006	-	854	1006	-	-
LSMV 250 ME	1012	-	860	1012	-	-
LSMV 280 SD	1072	-	920	1072	-	-
LSMV 280 MK	1111	-	965	1111	-	-
LSMV 315 SP	1181	-	991	1181	-	-
LSMV 315 MR	1251	-	1061	1251	-	-

# LSMV

## High-efficiency 3-phase induction motors for variable speed control

### Construction

### External finish

Leroy-Somer motors are protected with a range of surface finishes. The surfaces receive appropriate special treatments, as shown below.

#### Preparation of surfaces

SURFACE	PARTS	TREATMENT
Cast iron	End shields	Shot blasting + Primer
Steel	Accessories	Phosphatization + Primer
	Terminal boxes - Fan covers	Electrostatic painting or Epoxy powder
Aluminium alloy	Housings - Terminal boxes	Shot blasting

#### DEFINITION OF ATMOSPHERES

An atmosphere is said to be harsh when components are attacked by bases, acids or salts. It is said to be corrosive when components are attacked by oxygen.

#### Paint systems

ATMOSPHERE	SYSTEM	APPLICATIONS	CORROSIVITY CATEGORY * ACC. TO ISO 12944-2
Non-harsh and not very harsh (indoors, rural, industrial)	<b>Ia</b> LSMV standard	1 polyurethane top coat, 20/30 µm	<b>C3L</b>
Moderately corrosive: humid, and outdoors (temperate climate)	<b>IIa</b>	1 Epoxy base coat, 30/40 µm 1 polyurethane top coat, 20/30 µm	<b>C3M</b>
Corrosive: maritime, very humid (tropical climate)	<b>IIIa</b>	1 Epoxy base coat, 30/40 µm 1 Epoxy intermediate coat, 30/40 µm 1 polyurethane top coat, 20/30 µm	<b>C4M</b>
Substantial chemical attack: frequent contact with bases, acids, alkalis <b>Surroundings - neutral environment</b> (not in contact with chlorinated or sulphurous products)	<b>IIIb**</b>	1 Epoxy base coat, 30/40 µm 1 Epoxy intermediate coat, 30/40 µm 1 Epoxy top coat, 25/35 µm	<b>C4H</b>
Special conditions. Very harsh, polluted with chlorinated or sulphurous products	<b>Ve**</b>	1 Epoxy base coat, 20/30 µm 2 Epoxy intermediate coats, each 35/40 µm 1 polyurethane top coat, 35/40 µm	<b>C5I-M</b>
	<b>161b**</b>	1 base coat, 50 µm 2 Epoxy intermediate coats, 80 µm 1 Epoxy top coat, 50 µm	<b>C5M-M</b>

System **Ia** is for moderate climates and System **IIa** is for general climates as defined in standard IEC 60721.2.1.

\* Values given for information only since the surfaces vary in nature whereas the standard only takes account of steel surfaces.


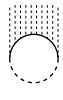
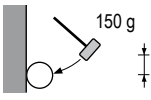

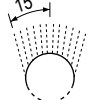
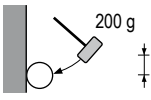
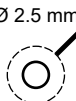
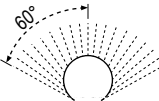
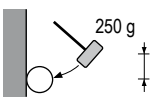
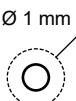

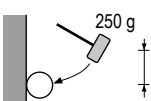

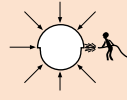
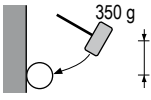
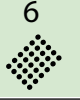
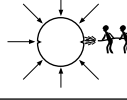
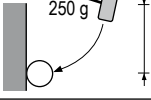

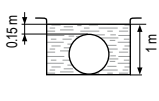
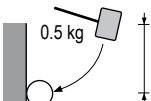
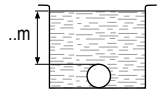
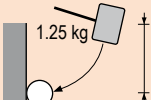
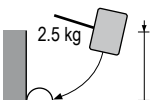

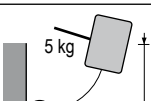
\*\* Evaluation of the degree of rusting in accordance with ISO 4628 (rusted area between 1 and 0.5%)

Leroy-Somer standard paint colour reference for LSMV motor range:

**RAL 9005**

In standard configuration, the LSMV motors are IP 55

Ingress protection of electrical equipment enclosures  
In accordance with IEC 60034-5 - EN 60034-5 (IP) - IEC 62262 (IK)

1st number: Protection against solid objects			2nd number: Protection against liquids			3rd number: Mechanical protection		
IP	Tests	Definition	IP	Tests	Definition	IK	Tests	Definition
0		No protection	0		No protection	00		No protection
1		Protected against solid objects of over 50 mm (example: accidental contact with the hand)	1		Protected against water drops falling vertically (condensation)	01		Impact energy: 0.15 J
2		Protected against solid objects of over 12 mm (example: a finger)	2		Protected against water drops falling at up to 15° from the vertical	02		Impact energy: 0.20 J
3		Protected against solid objects of over 2.5 mm (examples: tools, wires)	3		Protected against rain falling at up to 60° from the vertical	03		Impact energy: 0.37 J
4		Protected against solid objects of over 1 mm (examples: thin tools, small wires)	4		Protected against projected water from all directions	04		Impact energy: 0.50 J
5		Protected against dust (no deposits of harmful material)	5		Protected against jets of water from all directions from a hose	05		Impact energy: 0.70 J
6		Protected against any dust penetration	6		Protected against projected water comparable to big waves	06		Impact energy: 1 J
Example:  Example of an IP55 machine			7		Protected against the effects of immersion between 0.15 and 1 m	07		Impact energy: 2 J
			8		Protected against prolonged effects of immersion under pressure	08		Impact energy: 5 J
			9			09		Impact energy: 10 J
Example:  Example of an IP55 machine			10			10		Impact energy: 20 J

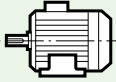
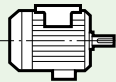
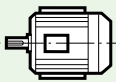
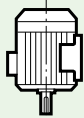
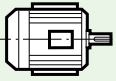
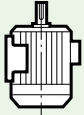
IP : Ingress protection

- 5. : Machine protected against dust and accidental contact.  
Test result: no dust enters in harmful quantities, no risk of direct contact with rotating parts. The test will last for 2 hours.
- 5. : Machine protected against jets of water from all directions from hoses at 3 m distance with a flow rate of 12.5 l/min at 0.3 bar.  
The test will last for 3 minutes.  
Test result: no damage from water projected onto the machine.

#### Mountings and positions (IEC standard 60034-7)


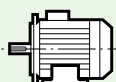




##### Foot mounted motors

- all frame sizes

<b>IM 1001 (IM B3)</b> - Horizontal shaft - Feet on floor		<b>IM 1071 (IM B8)</b> - Horizontal shaft - Feet on top	
<b>IM 1051 (IM B6)</b> - Horizontal shaft - Wall mounted with feet on left when viewed from drive end		<b>IM 1011 (IM V5)</b> - Vertical shaft facing down - Feet on wall	
<b>IM 1061 (IM B7)</b> - Horizontal shaft - Wall mounted with feet on right when viewed from drive end		<b>IM 1031 (IM V6)</b> - Vertical shaft facing up - Feet on wall	


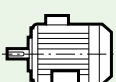
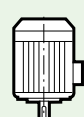



##### (FF) flange mounted motors

- all frame sizes (except IM 3001, which is limited to frame size 225 mm)

<b>IM 3001 (IM B5)</b> - Horizontal shaft		<b>IM 2001 (IM B35)</b> - Horizontal shaft - Feet on floor	
<b>IM 3011 (IM V1)</b> - Vertical shaft facing down		<b>IM 2011 (IM V15)</b> - Vertical shaft facing down - Feet on wall	
<b>IM 3031 (IM V3)</b> - Vertical shaft facing up		<b>IM 2031 (IM V36)</b> - Vertical shaft facing up - Feet on wall	

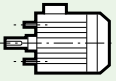
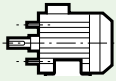
##### (FT) face mounted motors

- all frame sizes ≤ 132 mm

<b>IM 3601 (IM B14)</b> - Horizontal shaft		<b>IM 2101 (IM B34)</b> - Horizontal shaft - Feet on floor	
<b>IM 3611 (IM V18)</b> - Vertical shaft facing down		<b>IM 2111 (IM V58)</b> - Vertical shaft facing down - Feet on wall	
<b>IM 3631 (IM V19)</b> - Vertical shaft facing up		<b>IM 2131 (IM V69)</b> - Vertical shaft facing up - Feet on wall	

##### Motors without drive end shield

Caution: The protection (IP) specified on the IM B9 and IM B15 motor nameplates is provided by the customer when the motor is assembled.

<b>IM 9101 (IM B9)</b> - Threaded tie rods - Horizontal shaft		<b>IM 1201 (IM B15)</b> - Foot mounted with threaded tie rods - Horizontal shaft	
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Frame size (mm)	Mounting positions											
	IM 1001	IM 1051	IM 1061	IM 1071	IM 1011	IM 1031	IM 3001	IM 3011	IM 3031	IM 2001	IM 2011	IM 2031
≤ 200	●	●	●	●	●	●	●	●	●	●	●	●
225 and 250	●	●	●	●	●	●	■	●	●	●	●	●
≥ 280	●	■	■	■	■	■	■	●	●	●	●	■

●: possible positions.

■: please consult Leroy-Somer specifying the coupling method and the axial and radial loads if applicable

# LSMV

## High-efficiency 3-phase induction motors for variable speed control

### Construction

### Lubrication

#### PERMANENTLY GREASED BEARINGS

Under normal operating conditions, the service life in hours of the lubricant is indicated in the table below for ambient temperatures less than 55°C.

Series	Type	Number of poles	Types of permanently greased bearing		Grease life L <sub>50g</sub> according to speed of rotation								
					3000 rpm			1500 rpm			1000 rpm		
					25°C	40°C	55°C	25°C	40°C	55°C	25°C	40°C	55°C
LSMV	80 L	2	6203 CN	6204 C3	≥40000	≥40000	25000	-	-	-	-	-	-
	80 LG	4	6204 C3	6205 C3	-	-	-	≥40000	≥40000	31000	-	-	-
	90 S/SL/L	2; 4; 6			≥40000	≥40000	24000	-	-	-	≥40000	≥40000	34000
	90 LU	4	6205 C3	6205 C3	-	-	-	≥40000	≥40000	30000	-	-	-
	100 L	2; 6	6205 C3	6206 C3	≥40000	≥40000	22000	-	-	-	≥40000	≥40000	33000
	100 LR/LG	4			-	-	-	≥40000	≥40000	30000	-	-	-
	112 MR	2	6205 C3	6206 C3	≥40000	≥40000	22000	-	-	-	-	-	-
	112 MG	6			-	-	-	-	-	-	≥40000	≥40000	33000
	112 MU	4	6206 C3	6206 C3	-	-	-	≥40000	≥40000	30000	-	-	-
	132 S	2; 6			≥40000	≥40000	19000	-	-	-	≥40000	≥40000	30000
	132 SU	2			-	-	-	-	-	-	-	-	
	132 SM/M	2; 4; 6	6207 C3	6308 C3	≥40000	≥40000	19000	≥40000	≥40000	25000	≥40000	≥40000	30000
	132 MU	4; 6	6307 C3	6308 C3	-	-	-	≥40000	≥40000	25000	≥40000	≥40000	30000
	160 MP	2	6208 C3	6309 C3	≥40000	35000	18000	-	-	-	-	-	-
	160 MR/LR	2; 4	6308 C3	6309 C3	≥40000	35000	15000	≥40000	≥40000	24000	-	-	-
	160 L	2	6210 C3	6309 C3	≥40000	30000	15000	-	-	-	-	-	-
	160 LUR	4	6210 C3	6310 C3	-	-	-	≥40000	≥40000	25000	-	-	-
	180 M	4	6212 C3	6310 C3	-	-	-	≥40000	≥40000	24000	-	-	-
	180 MT	2	6210 C3	6310 C3	≥40000	30000	15000	-	-	-	-	-	-
	180 LUR	4	6312 C3	6310 C3	-	-	-	≥40000	≥40000	22000	-	-	-
200 L	2; 4	6214 C3	6312 C3	≥40000	25000	12500	≥40000	≥40000	22000	-	-	-	
225 SR	4	6312 C3	6313 C3	-	-	-	≥40000	≥40000	21000	-	-	-	
225 MT	2	6214 C3		≥40000	22000	11000	-	-	-	-	-	-	
225 MG	4	6216 C3	6314 C3	-	-	-	40000	40000	20000	-	-	-	

NB: On request, motors can be fitted with one or two grease nipples depending on the type, except the 132 S/SU.

#### BEARINGS WITH GREASE NIPPLES

Series	Type	Number of poles	Types of bearing for bearings with grease nipples		Quantity of grease	Regreasing intervals in hours								
						3000 rpm			1500 rpm			1000 rpm		
						25°C	40°C	55°C	25°C	40°C	55°C	25°C	40°C	55°C
LSMV	250 ME	4	6216 C3	6314 C3	25	-	-	-	22000	11000	5500	-	-	-
	280 SD	4	6218 C3	6316 C3		-	-	-	20000	10000	5000	-	-	-
	280 MK	4	6317 C3	6317 C3	40	-	-	-	19000	9800	4900	-	-	-
	315 SP	4	6317 C3	6320 C3	50	-	-	-	15000	7500	3750	-	-	-
	315 MR	4				-	-	-	-	-	-	-	-	-

# LSMV

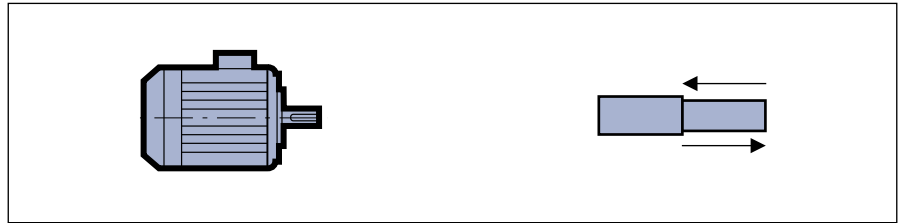
## High-efficiency 3-phase induction motors for variable speed control

### Construction

### Axial loads

#### Horizontal motor

For a bearing life  $L_{10h}$  of 25,000 hours and 40,000 hours



Series	Type	Number of poles	Permissible axial load (in daN) on main shaft extension for standard bearing assembly											
			3000 rpm				1500 rpm				1000 rpm			
			25,000 hours	40,000 hours	25,000 hours	40,000 hours	25,000 hours	40,000 hours	25,000 hours	40,000 hours	25,000 hours	40,000 hours	25,000 hours	40,000 hours
LSMV	80 L	2	32	23	62	53	-	-	-	-	-	-	-	-
	80 LG	4	-	-	-	-	47	34	87	74	-	-	-	-
	90 S/SL/L	2; 4; 6	29	20	69	59	45	32	85	72	60	44	100	84
	90 LU	4	-	-	-	-	42	28	92	78	-	-	-	-
	100 L	2; 6	43	30	93	80	-	-	-	-	85	63	135	113
	100 LR	4	-	-	-	-	63	45	113	95	-	-	-	-
	100 LG	4	-	-	-	-	67	49	117	99	-	-	-	-
	112 MR	2	42	29	92	79	-	-	-	-	-	-	-	-
	112 MG	6	-	-	-	-	-	-	-	-	81	60	131	110
	112 MU	4	-	-	-	-	56	39	116	98	-	-	-	-
	132 S/SU	2; 6	74	54	134	114	-	-	-	-	131	99	191	159
	132 SM/M	2; 4; 6	110	82	180	152	157	120	227	190	190	146	260	216
	132 MU	4; 6	-	-	-	-	150	113	230	193	180	136	260	216
	160 MP	2	149	113	229	193	-	-	-	-	-	-	-	-
	160 MR/LR	2; 4	144	108	234	198	204	156	294	246	-	-	-	-
	160 L	2	126	91	226	191	-	-	-	-	-	-	-	-
	160 LUR	4	-	-	-	-	230	176	278	224	-	-	-	-
	180 M	4	-	-	-	-	243	188	291	236	-	-	-	-
	180 MT	2	158	117	258	217	-	-	-	-	-	-	-	-
	180 LUR	4	-	-	-	-	199	147	262	210	-	-	-	-
	200 LR	2	237	184	300	247	-	-	-	-	-	-	-	-
	200 L	2; 4	249	195	315	261	325	253	391	319	-	-	-	-
	225 SR	4	-	-	-	-	339	261	402	324	-	-	-	-
	225 MT	2	279	219	345	285	-	-	-	-	-	-	-	-
	225 MG	4	-	-	-	-	378	290	448	360	-	-	-	-
	250 ME	4	-	-	-	-	392	303	462	373	-	-	-	-
	280 SD	4	-	-	-	-	429	246	517	246	-	-	-	-
	280 MK	4	-	-	-	-	632	521	452	341	-	-	-	-
315 SP	4	-	-	-	-	792	650	612	470	-	-	-	-	
315 MR	4	-	-	-	-	753	613	573	433	-	-	-	-	

# LSMV

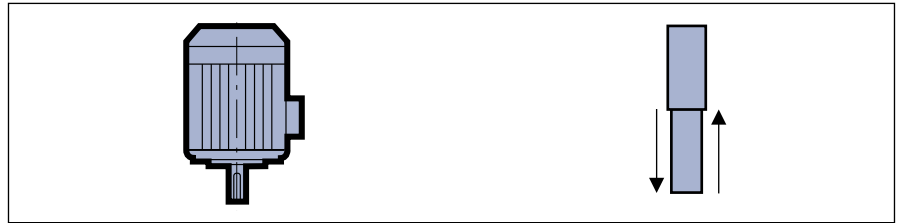
## High-efficiency 3-phase induction motors for variable speed control

### Construction

### Axial loads

Vertical motor  
Shaft facing down

For a bearing life  $L_{10h}$  of 25,000 hours  
and 40,000 hours



Series	Type	Number of poles	Permissible axial load (in daN) on main shaft extension for standard bearing assembly											
			3000 rpm				1500 rpm				1000 rpm			
			25,000 hours	40,000 hours	25,000 hours	40,000 hours	25,000 hours	40,000 hours	25,000 hours	40,000 hours	25,000 hours	40,000 hours	25,000 hours	40,000 hours
LSMV	80 L	2	30	21	64	55	-	-	-	-	-	-	-	-
	80 LG	4	-	-	-	-	45	32	92	78	-	-	-	-
	90 S/SL/L	2; 4; 6	27	17	74	64	42	29	91	78	56	41	106	90
	90 LU	4	-	-	-	-	38	24	85	98	-	-	-	-
	100 L	2; 6	40	26	99	86	-	-	-	-	80	58	143	121
	100 LR	4	-	-	-	-	57	39	122	104	-	-	-	-
	100 LG	4	-	-	-	-	61	42	128	110	-	-	-	-
	112 MR	2	38	25	99	86	-	-	-	-	-	-	-	-
	112 MG	6	-	-	-	-	-	-	-	-	75	53	143	121
	112 MU	4	-	-	-	-	49	31	129	111	-	-	-	-
	132 S/SU	2; 6	67	47	145	125	-	-	-	-	122	90	207	175
	132 SM/M	2; 4; 6	101	73	196	168	145	108	247	210	179	134	279	235
	132 MU	4; 6	-	-	-	-	136	98	253	215	165	121	286	242
	160 MP	2	137	101	249	212	-	-	-	-	-	-	-	-
	160 MR/LR	2; 4	129	93	257	221	187	138	323	274	-	-	-	-
	160 L	2	104	69	262	226	156	109	317	270	-	-	-	-
	160 LUR	4	-	-	-	-	204	149	328	274	-	-	-	-
	180 M	4	-	-	-	-	210	156	345	290	-	-	-	-
	180 MT	2	134	93	196	255	-	-	-	-	-	-	-	-
	180 LUR	4	-	-	-	-	163	110	334	280	-	-	-	-
	200 LR	2	202	148	358	304	-	-	-	-	-	-	-	-
	200 L	2; 4	211	156	370	316	276	203	472	400	-	-	-	-
	225 SR	4	-	-	-	-	284	204	503	426	-	-	-	-
	225 MT	2	238	177	408	347	-	-	-	-	-	-	-	-
	225 MG	4	-	-	-	-	276	186	419	529	-	-	-	-
	250 ME	4	-	-	-	-	299	208	626	535	-	-	-	-
	280 SD	4	-	-	-	-	310	125	726	453	-	-	-	-
	280 MK	4	-	-	-	-	453	340	725	612	-	-	-	-
	315 SP	4	-	-	-	-	607	463	892	748	-	-	-	-
	315 MR	4	-	-	-	-	521	378	952	808	-	-	-	-

# LSMV

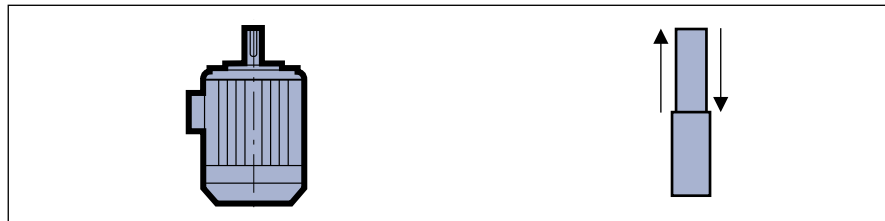
## High-efficiency 3-phase induction motors for variable speed control

### Construction

### Axial loads

Vertical motor  
Shaft facing up

For a bearing life  $L_{10h}$  of 25,000 hours  
and 40,000 hours



Series	Type	Number of poles	Permissible axial load (in daN) on main shaft extension for standard bearing assembly											
			3000 rpm				1500 rpm				1000 rpm			
			25,000 hours	40,000 hours	25,000 hours	40,000 hours	25,000 hours	40,000 hours	25,000 hours	40,000 hours	25,000 hours	40,000 hours	25,000 hours	40,000 hours
LSMV	80 L	2	60	51	34	25	-	-	-	-	-	-	-	-
	80LG	4	69	59	35	25	-	-	-	-	-	-	-	-
	90 S/SL/L	2; 4; 6	67	57	34	24	82	69	51	38	96	81	66	50
	90 LU	4	-	-	-	-	87	74	48	35	-	-	-	-
	100 L	2; 6	90	76	49	36	-	-	-	-	130	108	93	72
	100 LR	4	-	-	-	-	107	89	72	54	-	-	-	-
	100 LG	4	-	-	-	-	111	92	78	60	-	-	-	-
	112 MR	2	88	75	49	36	-	-	-	-	-	-	-	-
	112 MG	6	-	-	-	-	-	-	-	-	125	103	93	71
	112 MU	4	-	-	-	-	109	91	69	51	-	-	-	-
	132 S	2; 6	127	107	86	66	-	-	-	-	182	150	147	115
	132 SU	2	-	-	-	-	151	90	116	124	-	-	-	-
	132 SM/M	2; 4; 6	171	143	126	98	215	178	177	140	249	205	209	165
	132 MU	4; 6	-	-	-	-	216	179	173	135	245	201	206	162
	160 MP	2	217	181	169	132	-	-	-	-	-	-	-	-
	160 MR/LR	2; 4	219	183	167	131	277	228	233	184	-	-	-	-
	160 L	2	204	169	162	126	-	-	-	-	-	-	-	-
	160 LUR	4	-	-	-	-	252	197	280	226	-	-	-	-
	180 M	4	-	-	-	-	258	204	297	242	-	-	-	-
	180 MT	2	234	193	196	155	-	-	-	-	-	-	-	-
	180 LUR	4	-	-	-	-	248	194	285	231	-	-	-	-
	200 LR	2	265	211	295	241	-	-	-	-	-	-	-	-
	200 L	2; 4	277	222	304	250	342	269	406	334	-	-	-	-
	225 SR	4	-	-	-	-	347	267	440	360	-	-	-	-
	225 MT	2	304	243	342	281	-	-	-	-	-	-	-	-
	225 MG	4	-	-	-	-	346	256	549	459	-	-	-	-
	250 ME	4	-	-	-	-	369	278	556	465	-	-	-	-
	280 SD	4	-	-	-	-	398	125	638	453	-	-	-	-
	280 MK	4	-	-	-	-	273	160	905	792	-	-	-	-
	315 SP	4	-	-	-	-	427	283	1072	928	-	-	-	-
315 MR	4	-	-	-	-	341	198	1132	988	-	-	-	-	



# LSMV

## High-efficiency 3-phase induction motors for variable speed control

### Construction

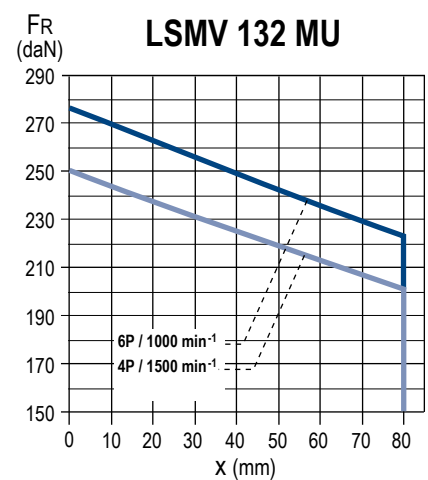
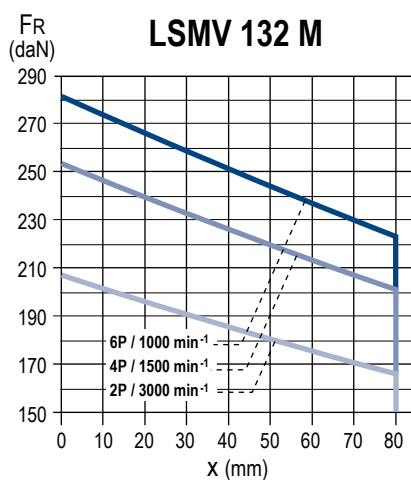
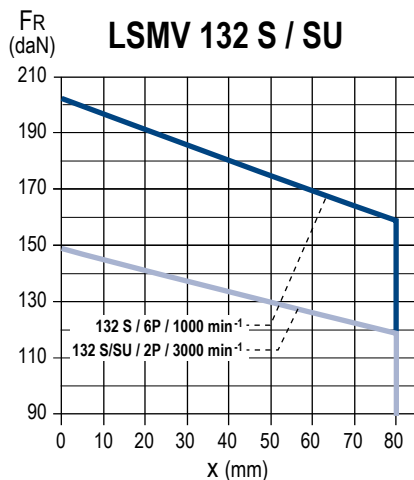
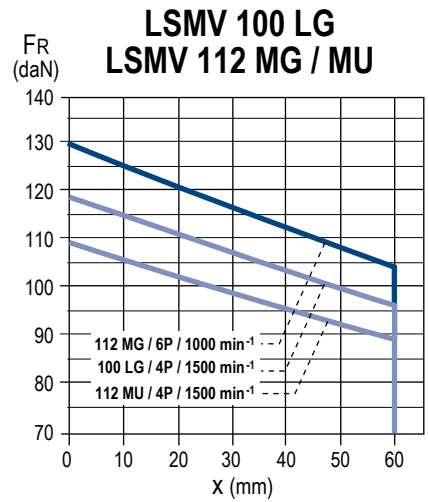
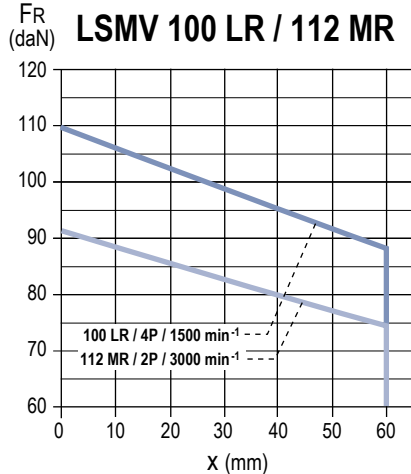
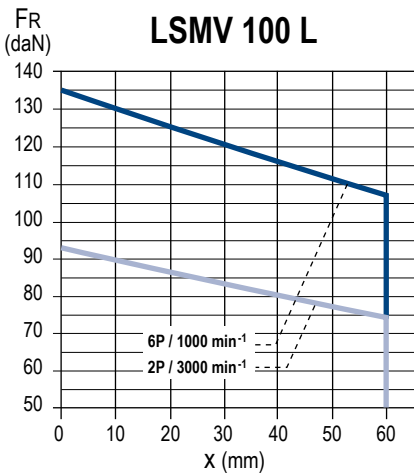
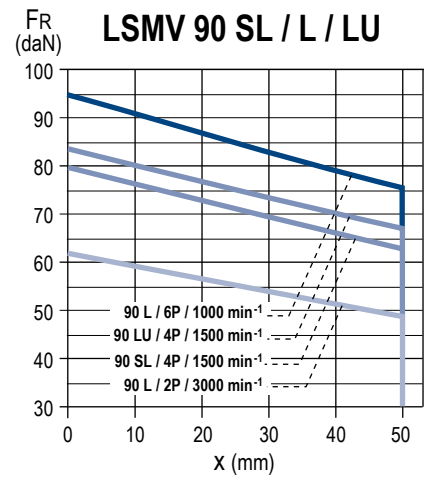
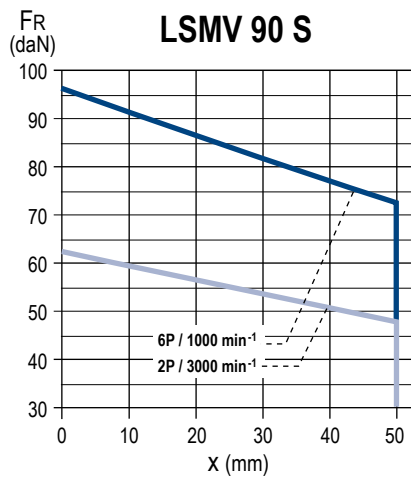
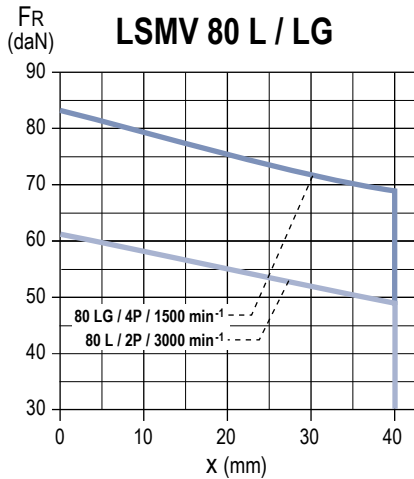
### Radial loads

#### STANDARD FITTING ARRANGEMENT

Permissible radial load on main shaft extension with a bearing life L10h of 25,000 hours.

FR: Radial Force

X: Distance with respect to the shaft shoulder



# LSMV

## High-efficiency 3-phase induction motors for variable speed control

### Construction

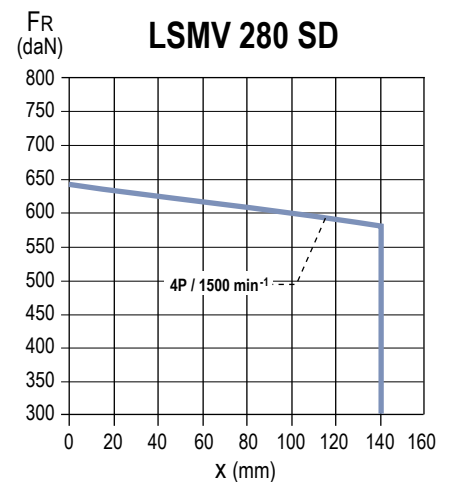
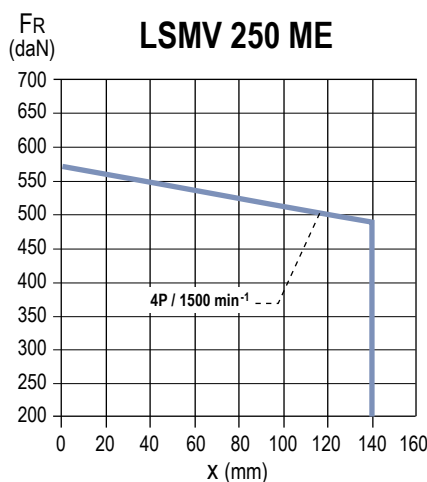
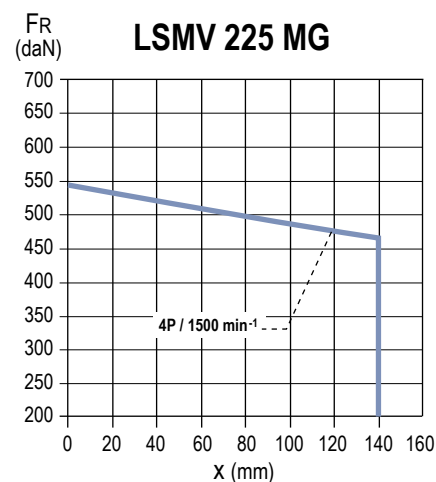
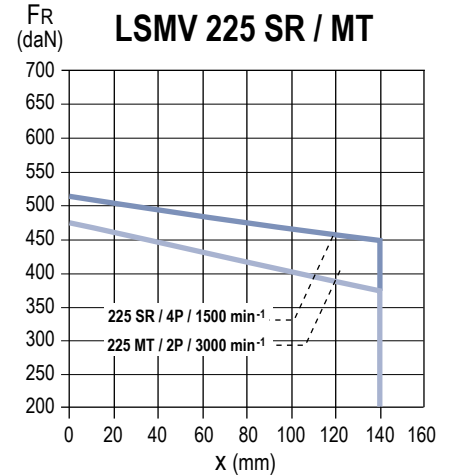
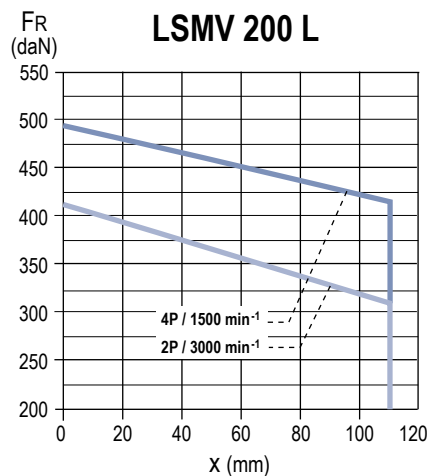
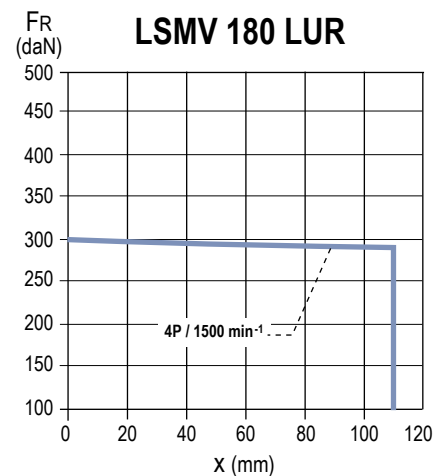
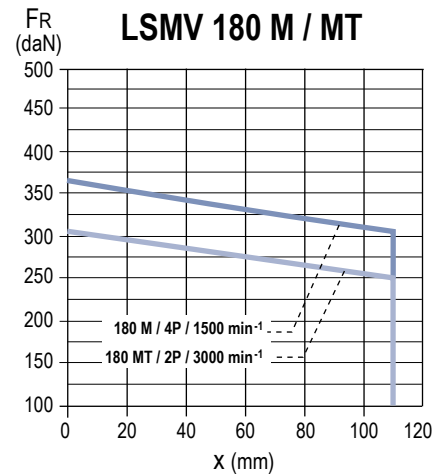
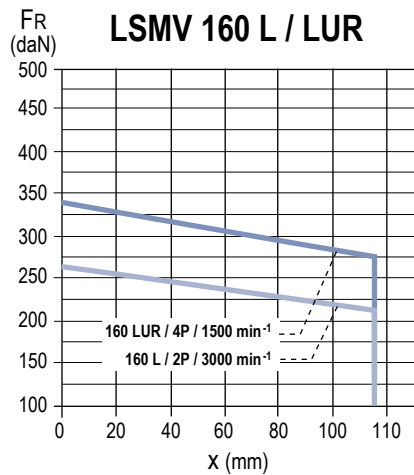
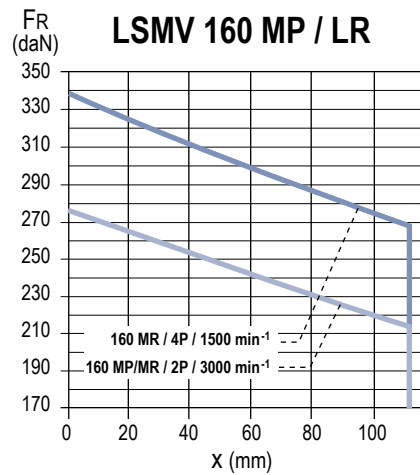
### Radial loads

#### STANDARD FITTING ARRANGEMENT

Permissible radial load on main shaft extension with a bearing life L10h of 25,000 hours.

FR: Radial Force

X: Distance with respect to the shaft shoulder



# LSMV

## High-efficiency 3-phase induction motors for variable speed control

### Construction

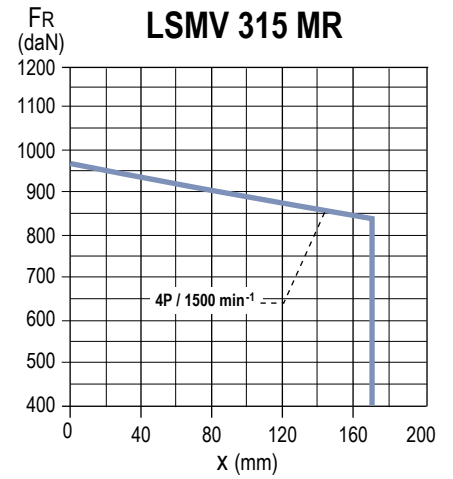
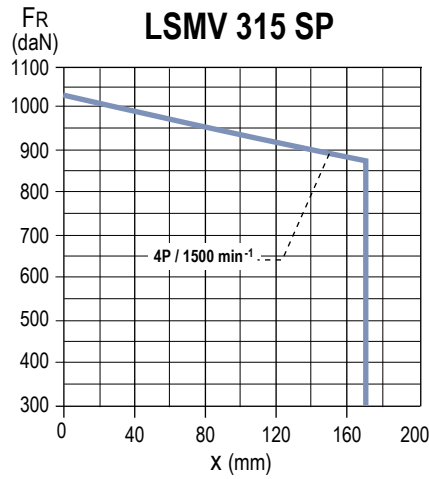
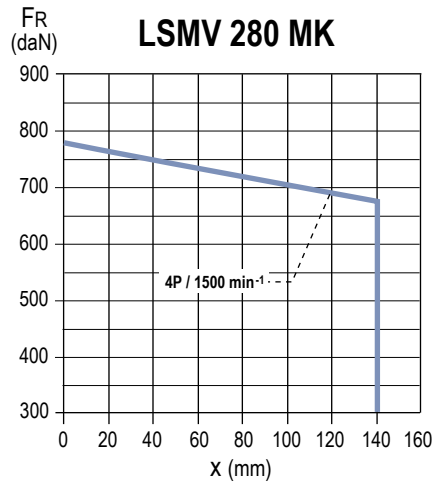
### Radial loads

#### STANDARD FITTING ARRANGEMENT

Permissible radial load on main shaft extension with a bearing life L<sub>10h</sub> of 25,000 hours.

FR: Radial Force

X: Distance with respect to the shaft shoulder



# LSMV

High-efficiency 3-phase induction motors for variable speed control

## Construction

### Radial loads

#### SPECIAL FITTING ARRANGEMENT

##### Type of drive end roller bearings

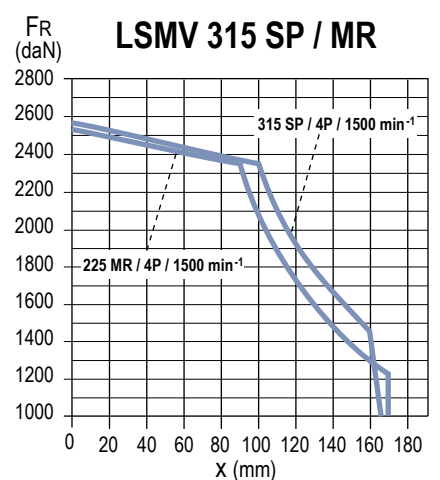
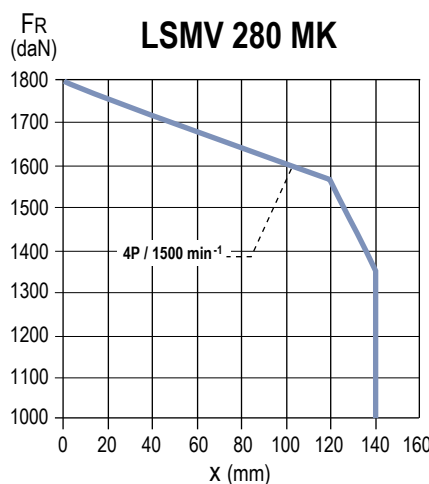
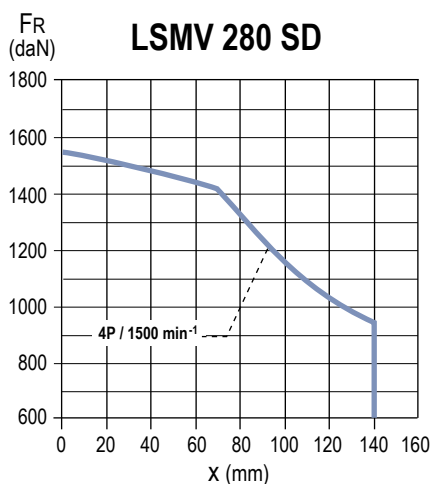
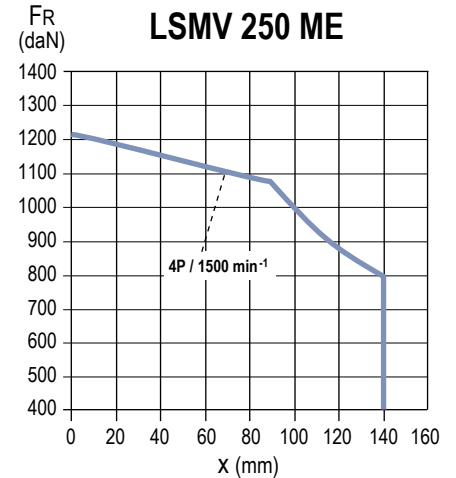
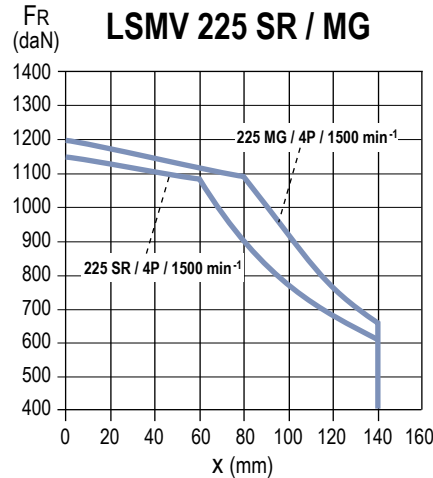
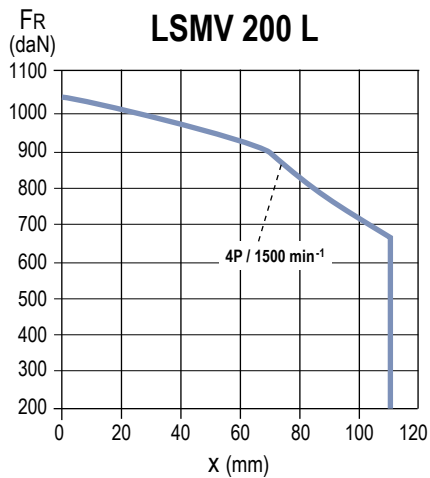
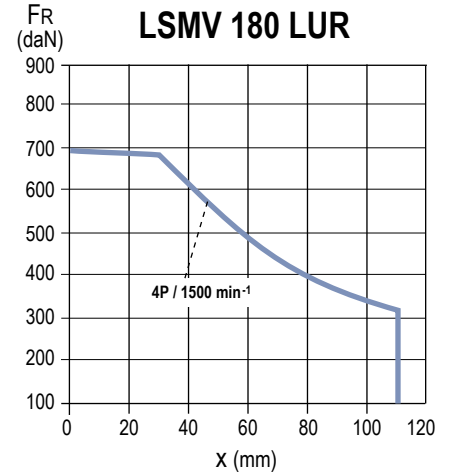
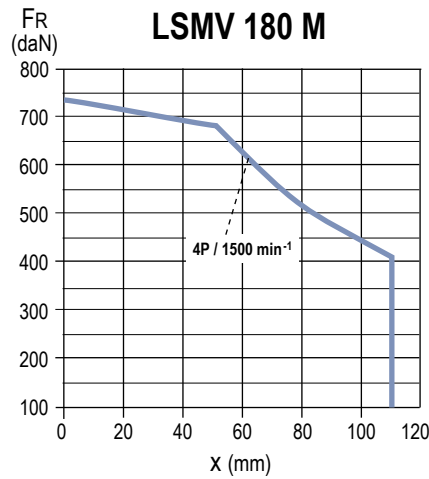
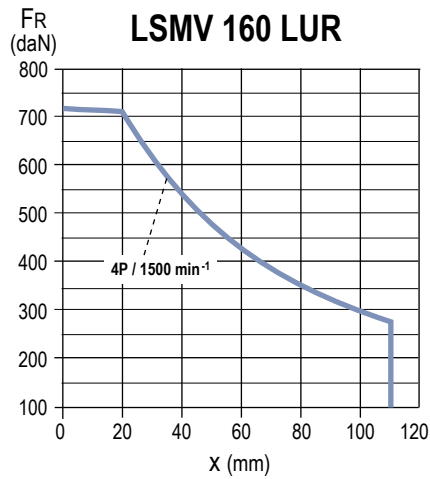
Series	Type	Number of poles	Permanently greased bearings	
			N.D.E.	D.E.
LSMV	160 LUR	4	6210 C3	NU 310
	180 M	4	6212 C3	NU 310
	180 LUR	4	6312 C3	NU 310
	200 L	4	6214 C3	NU 312
	225 ST	4	6214 C3	NU 313
	225 SR	4	6312 C3	NU 313
	225 MT	4	6214 C3	NU 313
	225 MG	4	6216 C3	NU 314
	250 ME	4	6216 C3	NU 314
	280 SD	4	6218 C3	NU 316
	280 MK	4	6317 C3	NU 317
	315 SP/MR	4	6317 C3	NU 320

#### SPECIAL FITTING ARRANGEMENT

Permissible radial load on main shaft extension with a bearing life L10h of 25,000 hours.

FR: Radial Force

X: Distance with respect to the shaft shoulder



**VIBRATION LEVELS - BALANCING**

Inaccuracies due to construction (magnetic, mechanical and air-flow) lead to sinusoidal (or pseudo sinusoidal) vibrations over a wide range of frequencies. Other sources of vibration can also affect motor operation: such as poor mounting, incorrect drive coupling, end shield misalignment, etc.

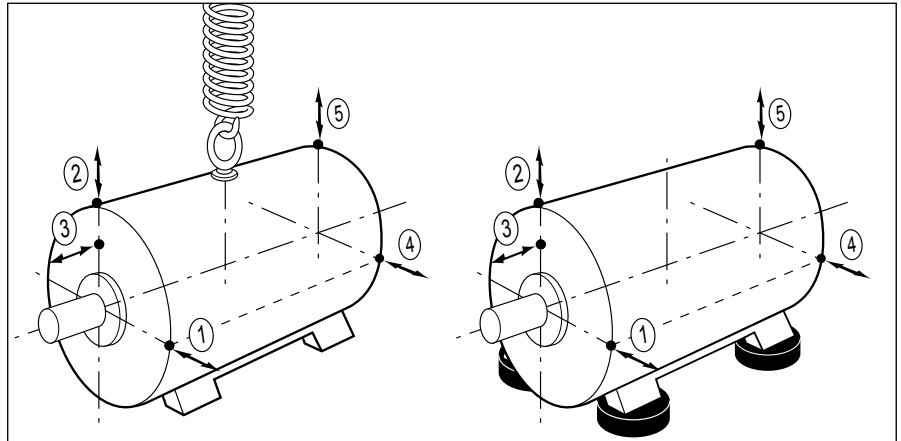
We shall first of all look at the vibrations emitted at the operating frequency, corresponding to an unbalanced load, whose amplitude swamps all other frequencies and on which the dynamic balancing of the mass in rotation has a decisive effect.

Under standard ISO 8821, rotating machines can be balanced with or without a key or with a half-key on the shaft extension.

Standard ISO 8821 requires the balancing method to be marked on the shaft extension as follows:

- Half-key balancing: letter H
- Full key balancing: letter F
- No-key balancing: letter N

The machines in this catalogue are in vibration class level A - level B is available on request.



**Measuring system for suspended machines**

**Measuring system for machines on flexible mountings**

The measurement points quoted in the standards are indicated in the drawings above.

At each point, the results should be lower than those given in the tables below for each balancing class and only the highest value is to be taken as the "vibration level".

**Measured parameters**

The vibration speed can be chosen as the variable to be measured. This is the speed at which the machine moves either side of its static position. It is measured in mm/s.

As the vibratory movements are complex and non-harmonic, it is the root mean square (rms) value of the speed of vibration which is used to express the vibration level.

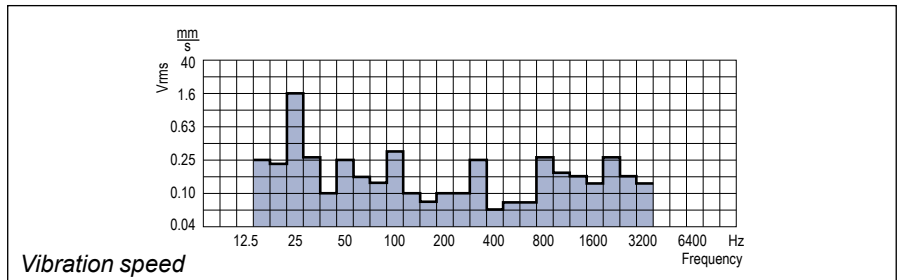
Other variables that could also be measured are the vibratory displacement amplitude (in  $\mu\text{m}$ ) or vibratory acceleration (in  $\text{m/s}^2$ ).

If the vibratory displacement is measured against frequency, the measured value decreases with the frequency: high-frequency vibrations cannot be measured.

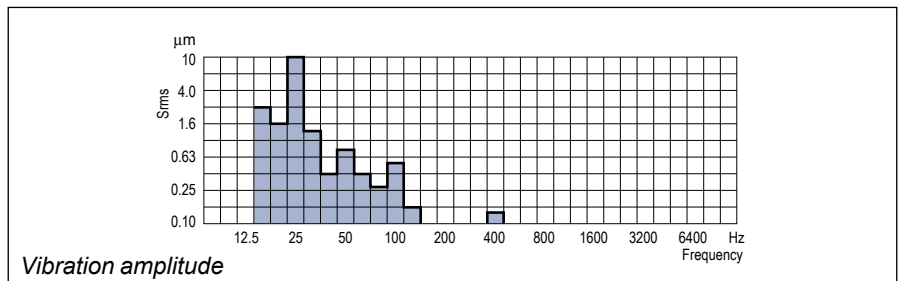
If the vibratory acceleration is measured, the measured value increases with the frequency: low-frequency vibrations (unbalanced loads) cannot be measured here.

The rms speed of vibration is the variable chosen by the standards.

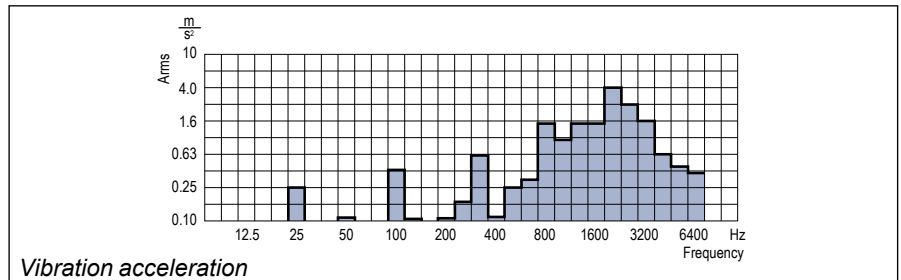
However, if preferred, the table of vibration amplitudes may still be used (for measuring sinusoidal and similar vibrations).



**Vibration speed**



**Vibration amplitude**



**Vibration acceleration**

# LSMV

High-efficiency 3-phase induction motors for variable speed control

## Construction

### Vibration level and maximum speeds

The motors are vibration level class B at 100 Hz

#### MAXIMUM VIBRATION MAGNITUDE LIMITS (RMS VALUES) IN TERMS OF DISPLACEMENT, SPEED AND ACCELERATION FOR A FRAME SIZE H (IEC 60034-14)

Vibration level	Frame size H (mm)								
	80 < H ≤ 132			132 < H ≤ 280			H > 280		
	Displacement µm	Speed mm/s	Acceleration m/s <sup>2</sup>	Displacement µm	Speed mm/s	Acceleration m/s <sup>2</sup>	Displacement µm	Speed mm/s	Acceleration m/s <sup>2</sup>
A	25	1.6	2.5	35	2.2	3.5	45	2.8	4.4
B	11	0.7	1.1	18	1.1	1.7	29	1.8	2.8

For large machines and special requirements with regard to vibration, balancing can be carried out *in situ* (finished assembly). Prior consultation is essential, as the machine dimensions may be modified by the necessary addition of balancing disks mounted on the shaft extensions.

#### MECHANICAL SPEED LIMITS FOR MOTORS WITH VARIABLE FREQUENCY

With increasingly extensive frequency ranges, frequency inverters can, in theory, control a motor at 2 to 3 times its rated speed.

However, the bearings and type of balancing selected for the rotor dictate a maximum mechanical speed which

cannot be exceeded without endangering the motor and its service life.

The table below specifies the maximum speeds that LSMV motors operating in a horizontal and vertical position can withstand.

These speed limit values are given for motors coupled directly to the machine being driven (without radial or axial load).

The formula for calculating the greasing interval *l'g* at frequency *f* is on average:

$$l'g = \frac{25lg}{f}$$

*l'g* = greasing interval

#### Maximum mechanical speeds for LSMV 2, 4 and 6 P motors

Type	80	90	100	112	132	160	160 LUR	180	200	225 SR/MT	225 MG*	250	280 SD	280 MK	315
Speeds	15000	12000	10000	10000	7500	6000	6000	5600	4500	4300	4000	4000	3400	3200	2700

\* For *n* > 3000 rpm, fit roller bearings with grease nipples.

Any motor running at 4000 rpm has to be specially designed.

In the case of brake motors, see the brake selection tables to find the mechanical speed limits.

For encoder options, operation at high speed can generate saturated signals.

# LSMV

## High-efficiency 3-phase induction motors for variable speed control

### General information

### Quality commitment

Leroy-Somer's quality management system is based on:

- Control of procedures right from the initial sales offering until delivery to the customer, including design, manufacturing start-up and production

- A total quality policy based on making continuous progress in improving operational procedures, involving all departments in the company in order to give customer satisfaction as regards delivery times, conformity and cost

- Indicators used to monitor procedural performance

- Corrective actions and advancements with tools such as FMECA, QFD, MAVP, MSP/MSQ and Hoshin type improvement workshops on flows, process re-engineering, plus Lean Manufacturing and Lean Office

- Annual surveys, opinion polls and regular visits to customers in order to ascertain and detect their expectations.

Personnel are trained and take part in analyses and actions for continuous improvement of our procedures.

Leroy-Somer has entrusted the certification of its expertise to various international organisations.

Certification is granted by independent professional auditors, and recognises the high standards of the **company's quality assurance procedures**. All activities resulting in the final version of the machine have therefore received official certification **ISO 9001: 2008 from the DNV**. Similarly, our environmental approach has enabled us to obtain certification ISO 14001: 2004. Products for particular applications or those designed to operate in specific environments are also approved or certified by the following organisations: LCIE, DNV, INERIS, UL, CSA, BSRIA, TUV, GOST, which check their technical performance against the various standards or recommendations.



# ISO 9001 : 2008





**Our motors comply with the standards quoted in this catalogue**

**LIST OF STANDARDS QUOTED IN THIS DOCUMENT**

Reference		International standards
IEC 60034-1	EN 60034-1	Rotating electrical machines: rating and performance.
IEC 60034-2		Rotating electrical machines: methods for determining losses and efficiency from tests (additional losses added as a fixed percentage)
IEC 60034-2-1		Rotating electrical machines: methods for determining losses and efficiency from tests (measured additional losses)
IEC 60034-5	EN 60034-5	Rotating electrical machines: degrees of protection provided by the integral design of rotating electrical machines
IEC 60034-6	EN 60034-6	Rotating electrical machines (except traction): methods of cooling.
IEC 60034-7	EN 60034-7	Rotating electrical machines (except traction): classification of types of construction, mounting arrangements and terminal box position.
IEC 60034-8		Rotating electrical machines: terminal markings and direction of rotation.
IEC 60034-9	EN 60034-9	Rotating electrical machines: noise limits.
IEC 60034-12	EN 60034-12	Starting performance of single-speed three-phase cage induction motors for voltages up to and including 660 V.
IEC 60034-14	EN 60034-14	Rotating electrical machines: mechanical vibration of certain machines with shaft heights 56 mm and higher. Measurement, evaluation and limits of vibration severity.
IEC 60034-17		Cage induction motors when fed from converters - Application guide
IEC 60034-30-1		Rotating electrical machines: efficiency classes of single-speed, three-phase cage-induction motors (IE-code).
IEC 60038		IEC standard voltages.
IEC 60072-1		Dimensions and output series for rotating electrical machines: frame numbers 56 to 400 and flange numbers 55 to 1080.
IEC 60085		Electrical insulation - thermal evaluation and designation.
IEC 60721-2-1		Classification of environmental conditions. Temperature and humidity.
IEC 60892		Effects of unbalanced voltages on the performance of 3-phase cage induction motors
IEC 61000-2-10/11 and 2-2		Electromagnetic compatibility (EMC): environment.
IEC guide 106		Guidelines on the specification of environmental conditions for the determination of operating characteristics of equipment.
ISO 281		Bearings - Dynamic load ratings and nominal bearing life.
ISO 1680	EN 21680	Acoustics - Test code for the measurement of airborne noise emitted by rotating electrical machines: Engineering method for free-field conditions over a reflecting plane.
ISO 8821		Mechanical vibration - Balancing. Shaft and fitment key conventions.
	EN 50102	Degree of protection provided by enclosures for electrical equipment against external mechanical impacts.
ISO 12944-2		Corrosion protection.



**APPROVALS**

Certain countries recommend or insist on approval from national organizations. Approved products must carry the recognized mark on their nameplates.

Country	Acronym	Organization
USA	UL	Underwriters Laboratories
CANADA	CSA	Canadian Standards Association
etc.		

**Approvals for LEROY-SOMER motors (versions derived from standard construction):**

Country	Initials	Certification No.	Application
USA + CANADA		E 68554 E206450	Impregnation systems Complete motors
SAUDI ARABIA	SASO		Standard range
FRANCE	LCIE INERIS	Various n <sup>os</sup>	Sealing, shocks, safety

For approved special products, see the relevant documents.

**International and national standard equivalents**

International reference standards		National standards				
IEC	Title (summary)	FRANCE	GERMANY	U.K.	ITALY	SWITZERLAND
60034-1	Ratings and operating characteristics	NFEN 60034-1 NFC 51-120 NFC 51-200	DIN/VDE 0530	BS 4999	CEI 2.3.VI.	SEV ASE 3009
60034-5	Classification of degrees of protection	NFEN 60034-5	DIN/EN 60034-5	BS EN 60034-5	UNEL B 1781	
60034-6	Cooling methods	NFEN 60034-6	DIN/EN 60034-6	BS EN 60034-6		
60034-7	Mounting arrangements and assembly layouts	NFEN 60034-7	DIN/EN 60034-7	BS EN 60034-7		
60034-8	Terminal markings and direction of rotation	NFC 51 118	DIN/VDE 0530 Teil 8	BS 4999-108		
60034-9	Noise limits	NFEN 60034-9	DIN/EN 60034-9	BS EN 60034-9		
60034-12	Starting characteristics for single-speed motors for supply voltages ≤ 660 V	NFEN 60034-12	DIN/EN 60034-12	BS EN 60034-12		SEV ASE 3009-12
60034-14	Mechanical vibrations of machines with frame size ≥ 56 mm	EN 60034-14	DIN/EN 60034-14	BS EN 60034-14		
60072-1	Dimensions and output powers for machines of between 56 and 400 frame and flanges of between 55 and 1080	NFC 51 104 NFC 51 105	DIN 748 (-) DIN 42672 DIN 42673 DIN 42631 DIN 42676 DIN 42677	BS 4999		
60085	Evaluation and thermal classification of electrical insulation	NFC 26206	DIN/EN 60085	BS 2757		SEV ASE 3584

NB: DIN 748 tolerances do not conform to IEC 60072-1.

Duty cycle - Definitions

DUTY CYCLES

(IEC 60034-1)

The typical duty cycles are described below:

1 - Continuous duty - Type S1

Operation at constant load of sufficient duration for thermal equilibrium to be reached (see figure 1).

2 - Short-time duty - Type S2

Operation at constant load during a given time, less than that required for thermal equilibrium to be reached, followed by a rest and de-energized period of sufficient duration to re-establish machine temperatures within 2 K of the coolant (see figure 2).

3 - Intermittent periodic duty - Type S3

A sequence of identical duty cycles, each consisting of a period of operation at constant load and a rest and de-energized period (see figure 3). Here, the cycle is such that the starting current does not significantly affect the temperature rise (see figure 3).

4 - Intermittent periodic duty with starting - Type S4

A sequence of identical duty cycles, each consisting of a significant starting period, a period of operation at constant load and a rest and de-energized period (see figure 4).

5 - Intermittent periodic duty with electrical braking - Type S5

A sequence of periodic duty cycles, each consisting of a starting period, a period of operation at constant load, a period of rapid electrical braking and a rest and de-energized period (see figure 5).

6 - Periodic continuous duty with intermittent load - Type S6

A sequence of identical duty cycles, each consisting of a period of operation at constant load and a period of operation at no load. There is no rest and de-energized period (see figure 6).

7 - Periodic continuous duty with electrical braking - Type S7

A sequence of identical duty cycles, each consisting of a starting period, a period of operation at constant load and a period of electrical braking. There is no rest and de-energized period (see figure 7).

8 - Periodic continuous duty with related changes of load and speed - Type S8

A sequence of identical duty cycles, each consisting of a period of operation at constant load corresponding to a predetermined rotation speed, followed by one or more periods of operation at other constant loads corresponding to different rotation speeds (in induction

motors, this can be done by changing the number of poles). There is no rest and de-energized period (see figure 8).

9 - Duty with non-periodic variations in load and speed - Type S9

This is a duty in which the load and speed generally vary non-periodically within the permissible operating range. This duty frequently includes applied overloads which may be much higher than the full load or loads (see figure 9).

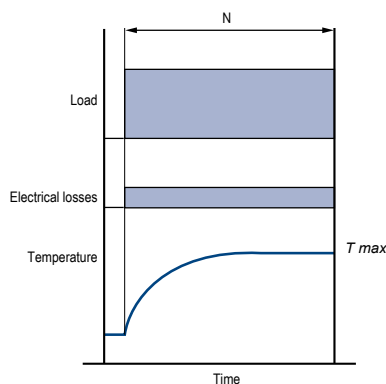
*Note - For this type of duty, the appropriate full load values must be used as the basis for calculating overload.*

10 - Operation at discrete constant loads - Type S10

This duty consists of a maximum of 4 discrete load values (or equivalent loads), each value being applied for sufficient time for the machine to reach thermal equilibrium. The minimum load during a load cycle may be zero (no-load operation or rest and de-energized period) (see figure 10).

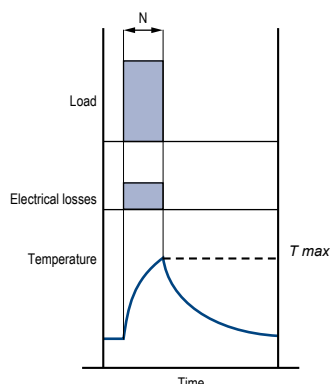
**Note: Only S1 and S3 duty types with a duty factor of 80% or more are affected by IEC 60034-30**

Fig. 1 - Continuous duty, Type S1.



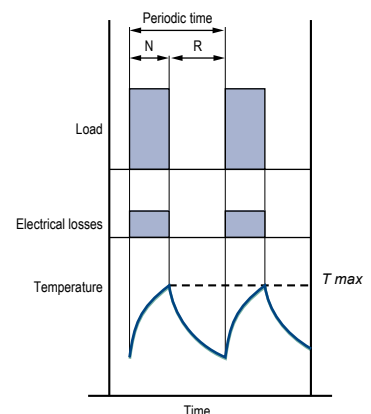
N = operation at constant load  
 T<sub>max</sub> = maximum temperature attained

Fig. 2 - Short-time duty, Type S2.



N = operation at constant load  
 T<sub>max</sub> = maximum temperature attained

Fig. 3 - Intermittent periodic duty, Type S3.



N = operation at constant load  
 R = rest  
 T<sub>max</sub> = maximum temperature attained  
 Operating factor (%) =  $\frac{N}{N + R} \cdot 100$

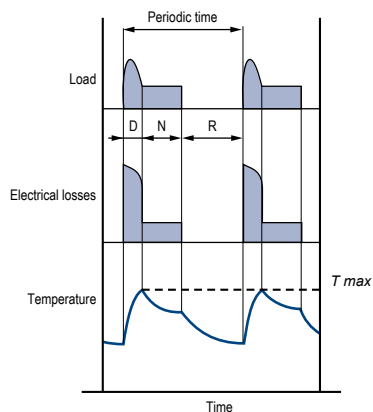
# LSMV

## High-efficiency 3-phase induction motors for variable speed control

### General information

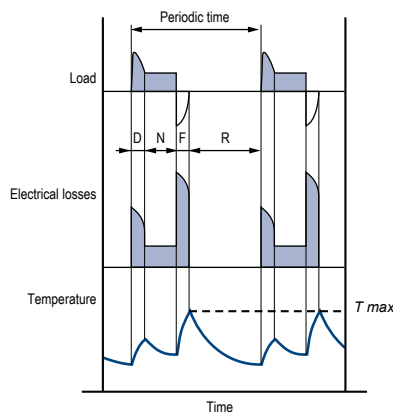
### Duty cycle - Definitions

**Fig. 4. - Intermittent periodic duty with starting, Type S4.**



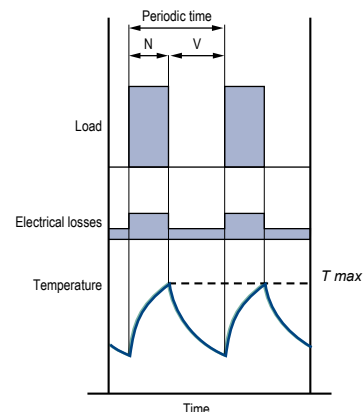
D = starting  
 N = operation at constant load  
 R = rest  
 $T_{max}$  = maximum temperature attained during cycle  
 Operating factor (%) =  $\frac{D + N}{N + R + D} \cdot 100$

**Fig. 5. - Intermittent periodic duty with electrical braking, Type S5.**



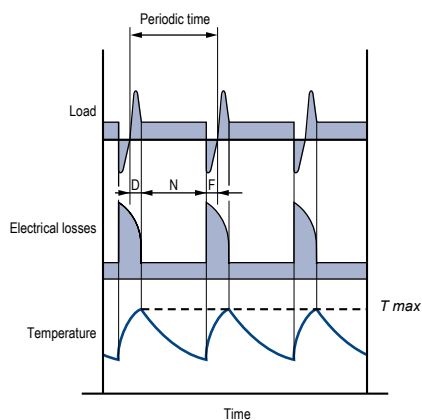
D = starting  
 N = operation at constant load  
 F = electrical braking  
 R = rest  
 $T_{max}$  = maximum temperature attained during cycle  
 Operating factor (%) =  $\frac{D + N + F}{D + N + F + R} \cdot 100$

**Fig. 6. - Periodic continuous duty with intermittent load, Type S6.**



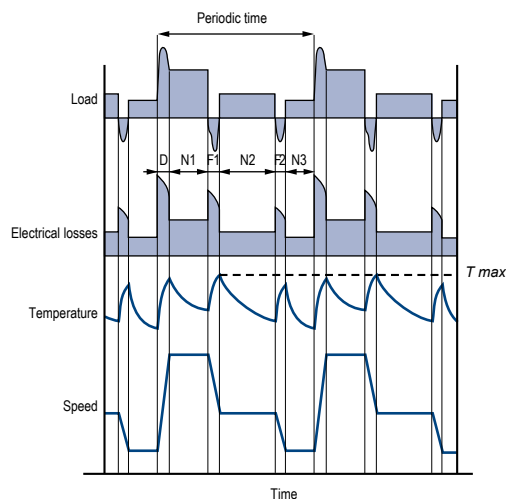
N = operation at constant load  
 V = no-load operation  
 $T_{max}$  = maximum temperature attained during cycle  
 Operating factor (%) =  $\frac{N}{N + V} \cdot 100$

**Fig. 7. - Periodic continuous duty with electrical braking, Type S7.**



D = starting  
 N = operation at constant load  
 F = electrical braking  
 $T_{max}$  = maximum temperature attained during cycle  
 Operating factor = 1

**Fig. 8. - Periodic continuous duty with related changes of load and speed, Type S8.**



F<sub>1</sub>F<sub>2</sub> = electrical braking  
 D = starting  
 N<sub>1</sub>N<sub>2</sub>N<sub>3</sub> = operation at constant loads  
 $T_{max}$  = maximum temperature attained during cycle  
 Operating factor =  $\frac{D + N_1}{D + N_1 + F_1 + N_2 + F_2 + N_3} \cdot 100\%$   
 $\frac{F_1 + N_2}{D + N_1 + F_1 + N_2 + F_2 + N_3} \cdot 100\%$   
 $\frac{F_2 + N_3}{D + N_1 + F_1 + N_2 + F_2 + N_3} \cdot 100\%$

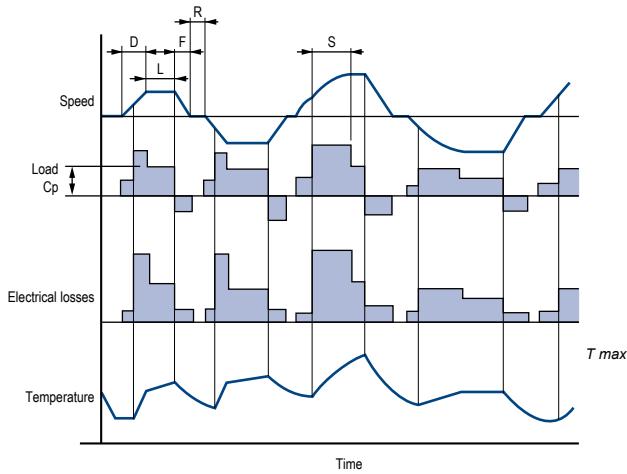
# LSMV

## High-efficiency 3-phase induction motors for variable speed control

### General information

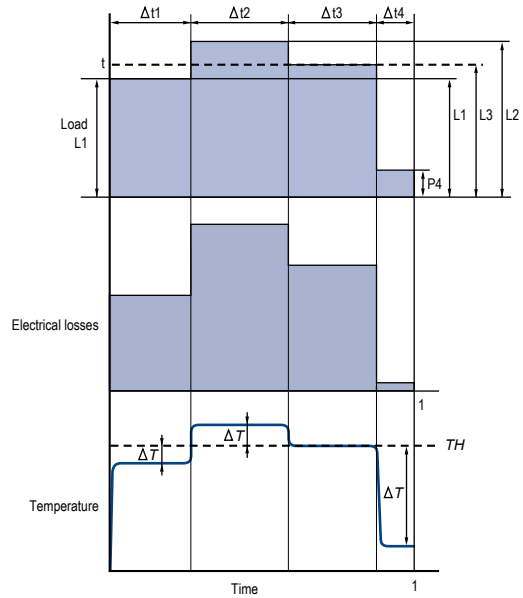
### Duty cycle - Definitions

**Fig. 9. - Duty with non-periodic variations in load and speed, Type S9.**



- D = starting
- L = operation at variable loads
- F = electrical braking
- R = rest
- S = operation at overload
- C<sub>p</sub> = full load
- T<sub>max</sub> = maximum temperature attained

**Fig. 10 - Duty at discrete constant loads, Type S10.**



- L = load
- N = rated power for type S1 duty
- $p = p / \frac{L}{N}$  = reduced load
- t = time
- T<sub>p</sub> = total cycle time
- t<sub>i</sub> = discrete period within a cycle
- $\Delta t_i = t_i / T_p$  = relative duration of period within a cycle
- P<sub>u</sub> = electrical losses
- H<sub>N</sub> = temperature at rated power for type S1 duty
- $\Delta H_i$  = increase or decrease in temperature rise during the ith period of the cycle

# LSMV

High-efficiency 3-phase induction motors for variable speed control

General information

## Identification

The motors are certified  as standard up to frame size 160MR/MP

### NAMEPLATES

#### LSMV 132 M IE2

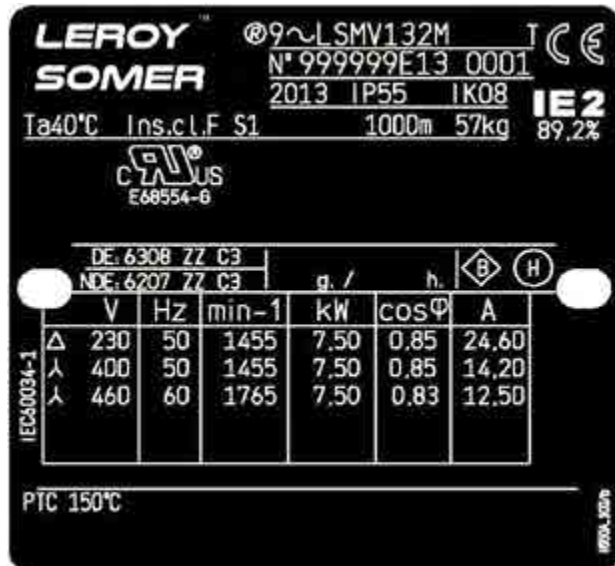


Plate 1

#### LSMV 132 M

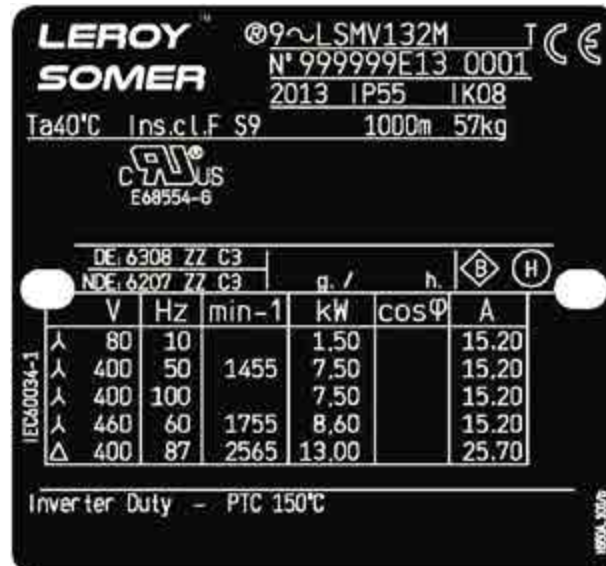


Plate 2

### DEFINITION OF SYMBOLS USED ON NAMEPLATES



Legal mark of conformity of product to the requirements of European Directives



Conformity of product to the requirements of Canadian and American Directives



**MOT 3 ~** : Three-phase A.C. motor  
**LSMV** : Series  
**132** : Frame size  
**M** : Housing symbol  
**T** : Impregnation index

#### Motor no.

**999999** : Motor batch number  
**N** : Month of production  
**12** : Year of production  
**0001** : Serial number  
**IE2** : Efficiency class  
**89.2%** : Efficiency at 4/4 load

**IP55 IK08** : Ingress protection  
**I cl. F** : Insulation class F  
**40°C** : Ambient operating temperature  
**S1 or S9** : Duty - Duty (operating) factor  
**kg** : Weight  
**V** : Supply voltage  
**Hz** : Supply frequency  
**rpm** : Revolutions per minute (rpm)  
**kW** : Rated output power  
**cos φ** : Power factor  
**A** : Rated current  
 - Plate 1: on the mains  
 - Plate 2: on frequency inverter  
**Δ** : Delta connection  
**Y** : Star connection

#### Bearings

**DE** : Drive end bearing  
**NDE** : Non drive end bearing  
 : Vibration level  
 : Balancing mode

Please quote when ordering spare parts

# LSMV

## High-efficiency 3-phase induction motors for variable speed control

### General information

### Configurator

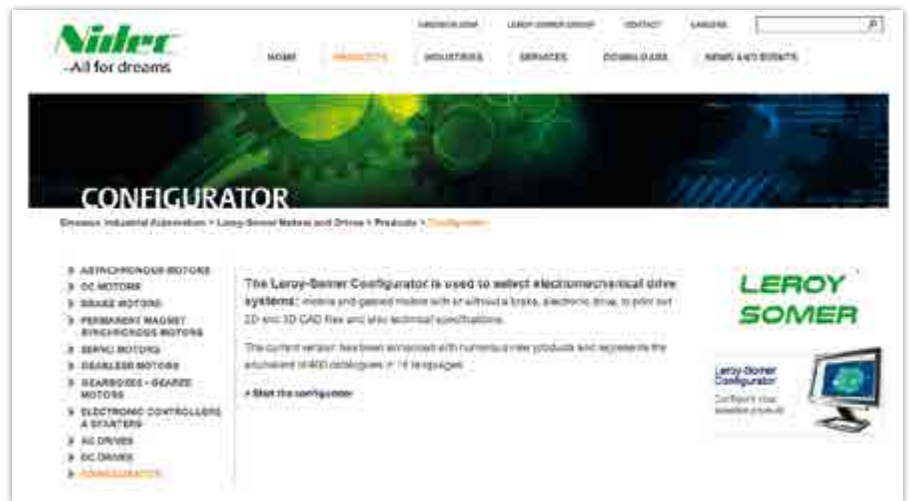


The configurator can be used to choose the most suitable motor and variable speed and provides the technical specifications and corresponding drawings.

- Help with product selection
- Print-outs of technical specifications
- Print-outs of 2D and 3D CAD files
- The equivalent of 400 catalogues in 16 languages

To register online:

<http://www.nidecautomation.com/EN-EN/LEROY-SOMER-MOTORS-DRIVES/PRODUCTS/CONFIGURATOR/>



### Product availability



**DELIVERY TIMES EX WORKS (FRANCE), IN WORKING DAYS**  
Orders placed before 11:30 am of the order is placed after 11:30 am, add one working day to the delivery times

Product availability	2 days	5 days
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Please consult Leroy-Somer

Being able both to respond to urgent requests and adhere to promised customer lead times calls for a powerful logistics system.

The availability of motors is ensured by the network of approved partners and Leroy-Somer central services all working together.

The selection data in the "Guaranteed Availability Drive systems" catalogue specify for each family in the form of a colour code and according to the quantities per order, the product delivery time.

*Please consult Leroy-Somer.*

## Notes

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## Notes

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## Notes

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***Nidec***  
All for dreams

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