EMERSON
Industrial Automation






LEROY SOMER®

DYNEO® VARIABLE SPEED DRIVES
Unidrive SP variable speed drives LSRPM - PLSRPM permanent magnet synchronous motors

0.75 kW to 400 kW

Technical catalogue

4936 en - 2012.10 / b

Simplicity

Install and start using your system quickly and easily, without any special training

Performance

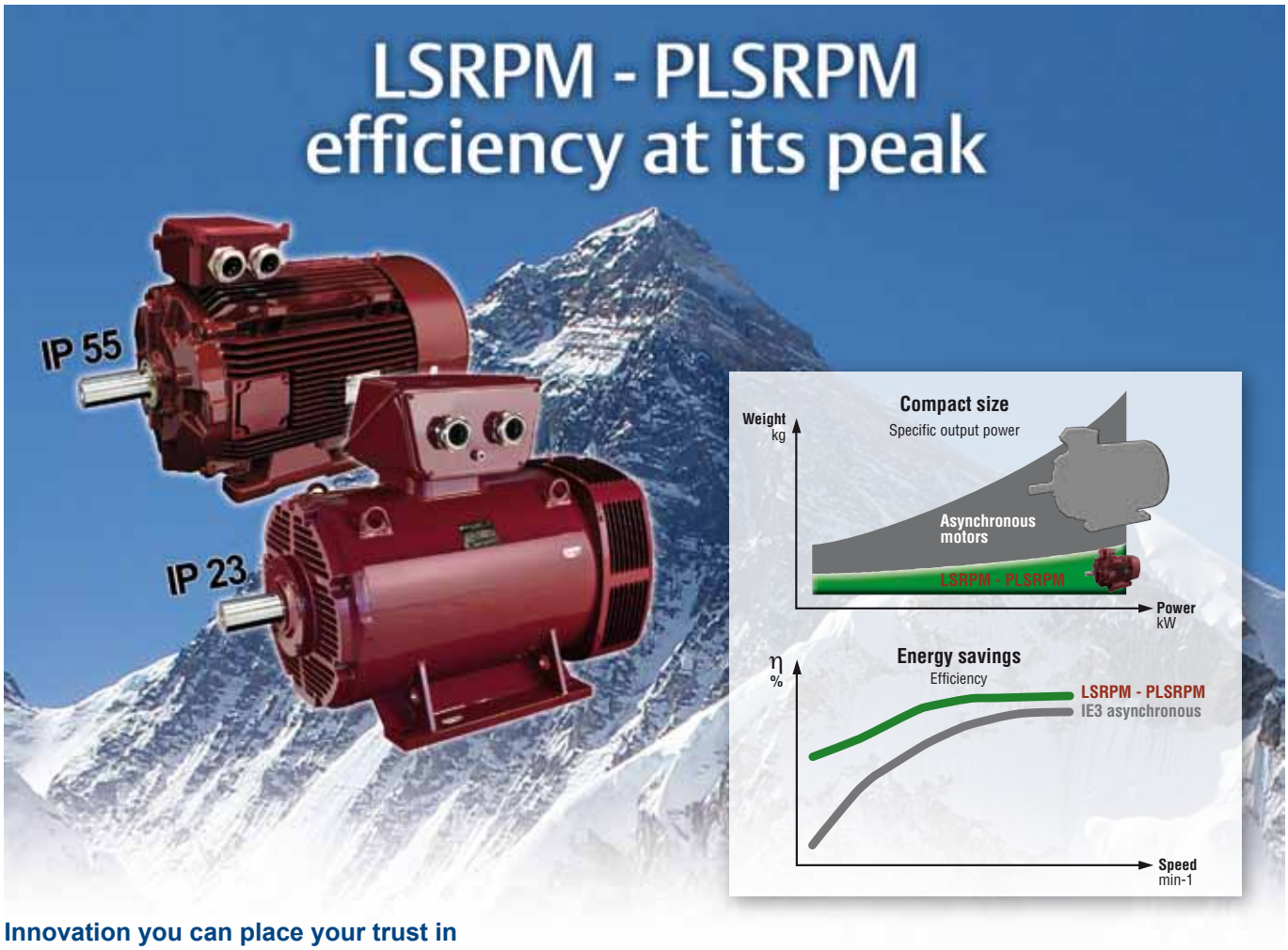
Manipulate, position, synchronise, cut and print rapidly, with repeat accuracy, in complete safety

Flexibility

Adapt your system to the various production constraints in a responsive yet inexpensive way

Minimising costs

Integrate the control system functions relating to the application
Reduce the number of components and associated wiring



Innovation you can place your trust in

Alliance of magnet rotor technology and the asynchronous motor's tried and tested mechanism

Exceptional savings

On the purchase price

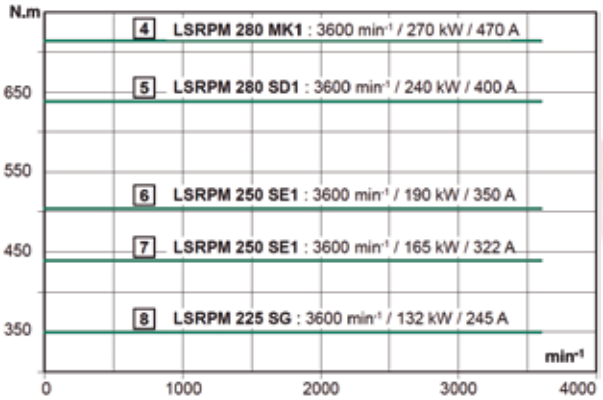
- Reduction in the weight and dimensions of the driven machine: up to 3 frame sizes smaller
- Simplification through elimination of transmission devices (pulleys, belts, etc)
- Longer service life: Lower bearing temperature, etc

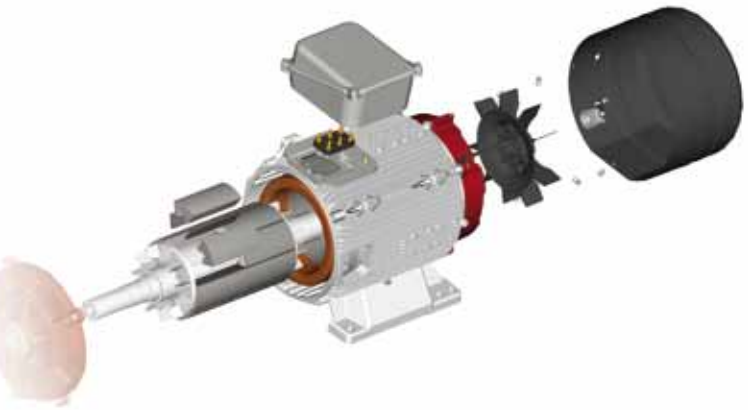
On energy bills: High efficiency over the entire speed range

On maintenance: Less stress on the mechanism

Performance

- Constant torque over the entire speed range
- Optimised power with centrifugal torque operation





Innovative solutions

DYNEO® offers innovative, high-performance solutions consisting of permanent magnet synchronous motors used in conjunction with Leroy-Somer variable speed drives.

Combined with the UNIDRIVE SP drive, the innovative LSRPM and PLSRPM permanent magnet synchronous motor technology is revolutionising the electric motor by offering solutions adapted to the industrial environment, and produces optimum electrical and mechanical performance:

- Extended speed range
- High torque
- Very high efficiency
- Compact design

The UNIDRIVE SP - LSRPM/PLSRPM combinations described in this manual are suitable for most applications: ventilation, pumping, compression, materials handling, conveying, centrifuging, extrusion, etc.

Add-ons or options for drives and motors can be included to satisfy the particular demands of the process.

For further information about the products described in this manual, please consult the corresponding technical documentation.

LEROY-SOMER reserves the right to modify the design, technical specifications and dimensions of the products and solutions shown in this document. The descriptions cannot in any way be considered contractual.

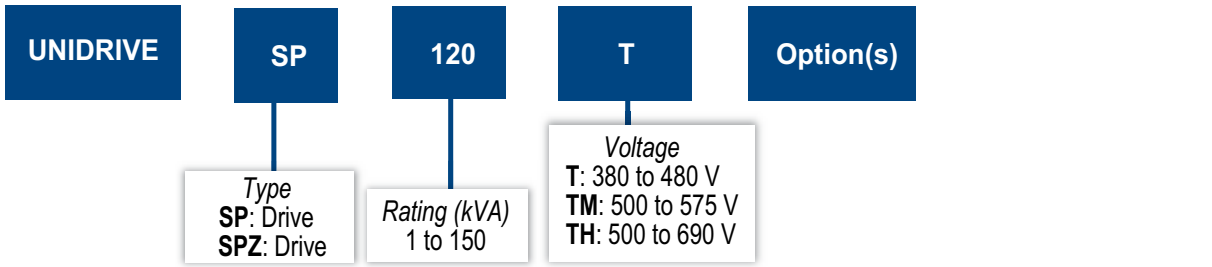
Contents

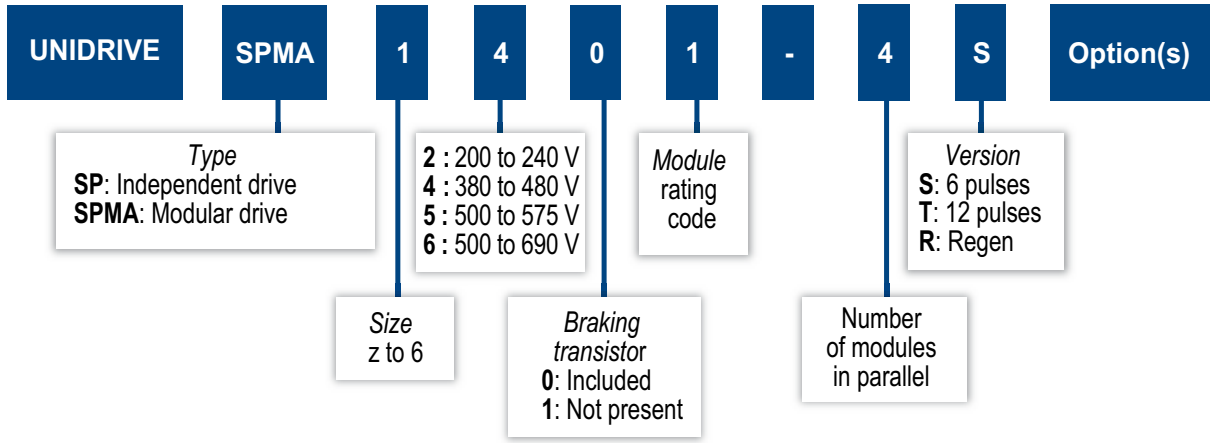
Modular offer

The option characteristics are described in the technical documents for the relevant products.

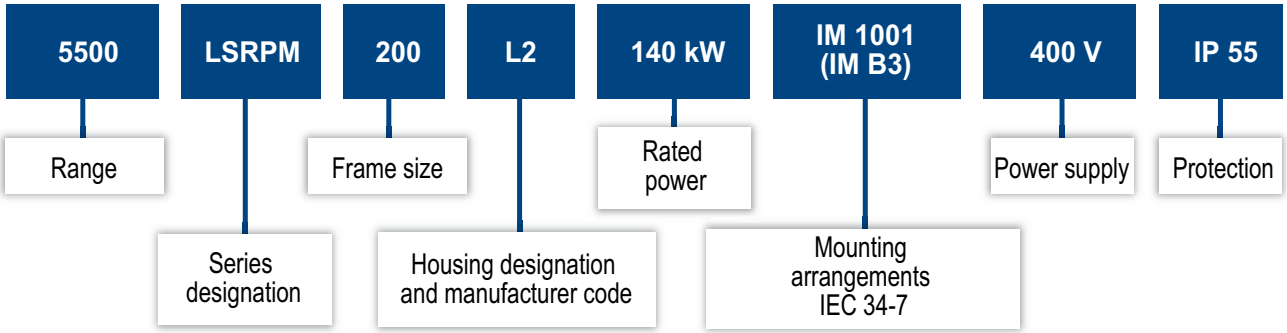
Variable speed drive designation

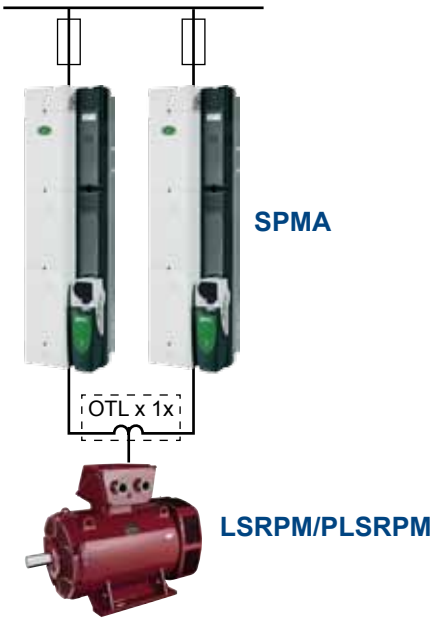
Drive





Motor





Unidrive SP drive

The Unidrive SP is a universal drive, designed for controlling asynchronous, servo or synchronous motors such as LSRPM and PLSRPM. This feature gives the Unidrive SP a vast field of applications, and it has therefore been endowed with a level of performance and functionality to cope with the most demanding systems.

Heavy duty or normal duty: The UNIDRIVE SP continuous output current and maximum transient current depend on the operating conditions.

Heavy duty: To obtain the maximum transient overload current available (applications at constant torque, or at rated torque required at low speed), the continuous output current (Ico) is limited.

Normal duty: If the operating conditions are not very demanding (for example, centrifugal applications: fans, pumps, etc), the output current can be increased and a motor with a higher output power can be controlled. However, the maximum transient current is limited.

Output selection tables

Drive type		Normal duty				Heavy duty			
LS	CT	Continuous current Ico (A)			Imax	Continuous current Ico (A)			Imax
		3 kHz	4 kHz	6 kHz	(A)	3 kHz	4 kHz	6 kHz	(A)
SPz 1T	SP 0401	-	-	-		1.3	1.3	1.3	2.2
SPz 1.2T	SP 0402	-	-	-		1.7	1.7	1.7	2.9
SPz 1.5T	SP 0403	-	-	-		2.1	2.1	2.1	3.6
SPz 2T	SP 0404	-	-	-		3	3	3	5.2
SPz 2.5T	SP 0405	-	-	-		4.2	4.2	4.2	7.3
SP 3.5T	SP 1404	6.9	6.9	6.9	7.5	5.8	5.8	5.8	10.1
SP 4.5T	SP 1405	8.8	8.8	8.8	9.6	7.6	7.6	7.6	13.3
SP 5.5T	SP 1406	11	11	11	12.1	9.5	9.5	9.2	16.6
SP 8T	SP 2401	15.3	15.3	15.3	16.8	13	13	13	22.7
SP 11T	SP 2402	21	21	19.5	23	16.5	16.5	14.9	28.8
SP 16T	SP 2403	29	27.2	23.2	31	25	23.7	19.9	40.2
SP 22T	SP 3401	35	35	35	38	32	32	30.3	56
SP 33T	SP 3402	56	48.7	39.5	47	46	41.8	33.8	70
SP 27T	SP 3403	43	43	39.5	61	40	40	33.8	80.5
SP 40T	SP 4401	68	68	68	74	60	60	51.9	105
SP 50T	SP 4402	83	83	74	91	74	65	51.9	129.5
SP 60T	SP 4403	104	104	95.1	114	96	83.6	66.6	168
SP 75T	SP 5401	138	138	118	151	124	106.5	82.4	217
SP 100T	SP 5402	168	158	129	184	156	137	109	273
SP 120T	SP 6401	205	205	164.1	225	180	174.4	134.5	269
SP 150T	SP 6402	236	210.4	157.7	259	210	174.8	129.7	315
SPMA 14x1_2S		389	389	311	428	342	330	256	513
SPMA 14x2_2S		448	399	300	493	399	332	247	599
SPMA 14x1_3S		584	584	467	642	513	495	384	770
SPMA 14x2_3S		672	598	450	739	598	498	370	897
SPMA 14x1_4S		779	779	623	857	684	661	513	1026

SPMA: Provide OTL reactors at the output. See details in the "Unidrive SPM commissioning manual"

Conformance

- Storage and transport temperature: -40°C to +50°C (12 months maximum)
- Operating temperature: 0°C to +40°C, up to +50°C with derating
- Altitude: 0 to 3,000 m, with derating of 1% per 100 m between 1,000 and 3,000 m
- Relative humidity in accordance with IEC standard 60068-2-56: < 95% non condensing
- Ingress protection: IP20 in accordance with EN 60529
- Vibrations: EN 60068-2-6
- Mechanical shocks: Tested in compliance with IEC standard 60068-2-29
- Electromagnetic immunity complies with EN 61800-3 and EN 61000-6-2 standards
- Safe Torque Off input:
  Complies with the following standards (when installed appropriately)
  - ISO 13849-1 levels PLb and PLe
  - IEC 62061 levels SIL1 and SIL3
  - I/O: IEC 61131-2
- Emissions: EN 61800-3, levels depending on the switching frequencies.
  Refer to the drive documentation.

LSRPM - PLSRPM motors

Description of motors

Description	Materials	Comments
Frame	LSRPM: Aluminium alloy PLSRPM: Steel	- With integral or screw-on feet, or without feet - 4 or 6 fixing holes for housings with feet - Lifting rings - Earth terminal with an optional jumper screw
Stator	Insulated low-carbon magnetic steel laminations Electroplated copper	- Low carbon content guarantees long-term lamination pack stability - Welded laminations - Optimised magnetic circuit - Insulation or coating system 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 - Class F insulation - Thermal protection provided by PTC probes (1 per phase, 2-wire output)
Rotor	Insulated low-carbon magnetic steel laminations Aluminium alloy Nd-Fe-B magnet	- Magnet fixing system. LS patented - Dynamically balanced rotor: • level A for speeds ≤ 3000 min^{-1} • level B for speeds > 3000 min^{-1}
Shaft	Steel	
End shields	Cast iron	
Bearings and lubrication		- Ball bearings, C3 play - Preloaded NDE bearings - Greased for life up to frame size 225 - Open type, regreasable from frame size 250 upwards - Insulated bearings depending on the range
Labyrinth seal Lipseals	Plastic or steel Synthetic rubber	- Lipseal or deflector at drive end for all flange mounted motors - Lipseal, deflector or labyrinth seal for foot mounted motors
Fan	Composite material or aluminium alloy or steel	- Bi-directional
Fan cover	Pressed steel	- Fitted, on request, with a drip cover for operation in vertical position, shaft end facing down
Terminal box	Aluminium alloy	- Fitted with a terminal block with 3 or 6 steel terminals as standard (brass as an option) - Pre-drilled terminal box without cable glands except for PLSRPM with undrilled mounting plate - 1 earth terminal in each terminal box

The motor rotor contains a powerful magnetic field. When the rotor is separated from the motor, its field may affect pacemakers or disturb digital devices such as watches, mobile phones, etc.

Assembly or maintenance of the rotor must not be carried out by people with a pacemaker or any other implanted medical electronic device.

The assembled motor presents no risk.

Selection method

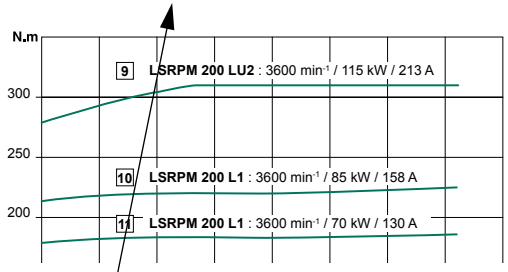
Example:
A machine requires a torque of 270 N.m over a speed range of 800 to 3,200 min^{-1} in continuous duty.
The maximum torque is 110%.

Step 1: Choice of motor

a) Selecting the torque range

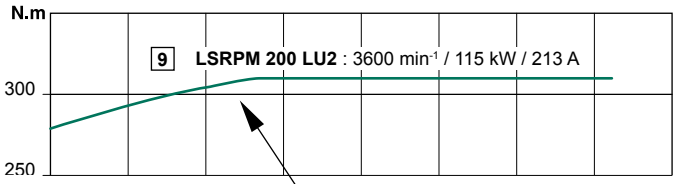
3600 range

Torque from 130 to 305 N.m



Example: Selection of the torque range 130 to 305 N.m for a torque requirement of 270 N.m and 3200 min^{-1}

b) Selecting the motor: choose the curve with a torque rating immediately above that required by the application



Example: Selection of curve 9 for an application requirement of 270 N.m

LSRPM 200 LU2 / 3600 min^{-1} / 115 kW / 213A

Motor type	Rated speed	Rated power	Rated current

Step 2: Choice of drive

3600 range

	IP 55	50	95,5	SP 75T	SP 5401	50	133	1,35	97	1,45
				SP 60T	SP 4403	56	149	1,02	104	1,10
LSRPM 200 L1	IP 55	70	96,0	SP 75T	SP 5401	70	186	1,08	130	1,16
				SP 100T	SP 5402			1,35		1,45
				SP 75T	SP 5401	74	197	1,02	138	1,09
LSRPM 200 L1	IP 55	85	96,4	SP 100T	SP 5402	85	225	1,08	158	1,16
				SP 150T	SP 6401			1,35		1,45
				SP 120T	SP 6401	111	294	1,02	205	1,10
LSRPM 200 LU2	IP 55	115	96,8	SP 150T	SP 6402	114	301	1,15	210	1,23
				SPMA 1401-2S		115	305	1,35	213	1,45
LSRPM 225 SG	IP 55	132	96,8	SPMA 1401-2S		132	350	1,35	250	1,45
LSRPM 250 SE1	IP 55	165	96,9	SPMA 1401-2S		165	438	1,35	310	1,45
LSRPM 250 SE1	IP 55	190	97,1	SPMA 1401-2S		190	504	1,14	350	1,22
				SPMA 1402-2S				1,35		1,45
LSRPM 280 SD1	IP 55	240	97,1	SPMA 1401-2S		230	612	1,04	384	1,11
				SPMA 1402-2S		240	637	1,35	400	1,45
LSRPM 280 MK1	IP 55	270	97,2	SPMA 1401-3S		270	716	1,35	480	1,45
PLSRPM 315 LD	IP 55	325	97,3	SPMA 1401-3S		325	862	1,04	575	1,12
				SPMA 1402-3S				1,20		1,29
				SPMA 1401-4S				1,35		1,45
PLSRPM 315 LD	IP 55	350	97.4	SPMA 1401-4S		350	928	1,35	630	1,45

Select the drive rating according to the rated and maximum torque required by the application

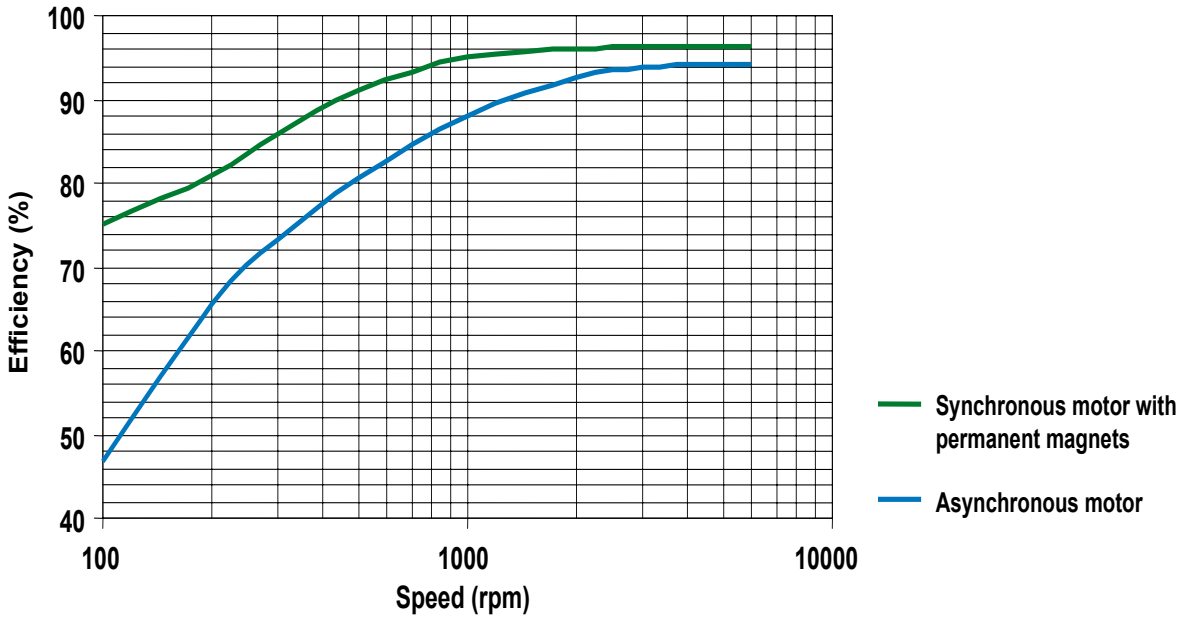
Example: Selection of drive for an application requiring rated torque of 270 N.m.
Mmax/Mn = 1.10
*Choice of drive: where Mn= 294 N.m and Mm/Mn = 102%**

SP	120T
Drive type	*Drive rating*

** for Mn = 270 N.m, Mmax/Mn = 1.11*

Efficiency

LEROY-SOMER permanent magnet synchronous motors have efficiencies that are higher than those of asynchronous motors and more stable over the entire selected speed range (see graph below).



Efficiency of permanent magnet synchronous motors

Apart from a few exceptions, synchronous motors cannot operate correctly on a traditional sinusoidal mains supply. They are practically always supplied via a drive. This catalogue gives the efficiencies of motors supplied via Leroy-Somer drives.

Efficiencies of asynchronous motors supplied via drives

As a general rule, the efficiencies of asynchronous motors given in the catalogues are values measured on a sinusoidal mains supply at the rated speed.

The voltage and current waveforms created by the drive are not sinusoidal. Supplying power via a drive therefore results in additional losses in the motor. According to specifications 60034-17, these are estimated at 20% of the total losses. These losses have a direct impact on the "displayed" efficiency of the motor.

In variable speed mode, this efficiency should therefore be corrected in accordance with the formula below.

$$\eta_2 = 1 - (1 - \eta_1) \times 1.2$$

η_2 = efficiency of asynchronous motor obtained on a drive
η_1 = efficiency of asynchronous motor supplied from the mains

Example of asynchronous/synchronous efficiency: 200 kW application at 3000 min^{-1}

η_1: Efficiency of the 200 kW, 2-pole asynchronous motor on 50 Hz mains supply = 96%

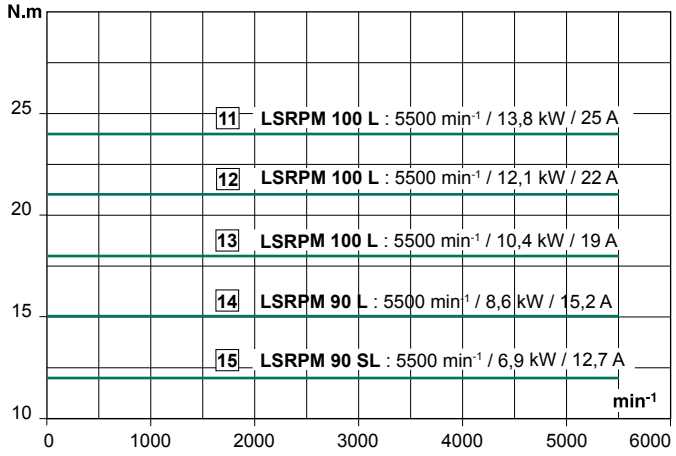
η_2: Estimated efficiency of the same asynchronous motor supplied via a drive at 50 Hz

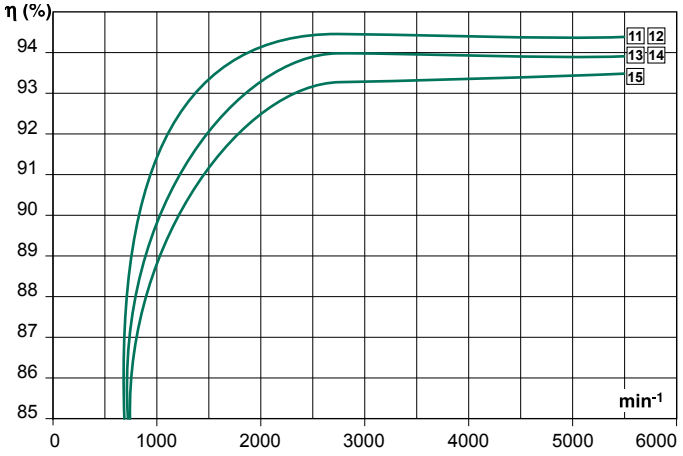
$\eta_2 = 1 - (1 - 0.96) \times 1.2 = 0.952$ i.e. 95.2%

Efficiency of the equivalent synchronous motor = 97.3%

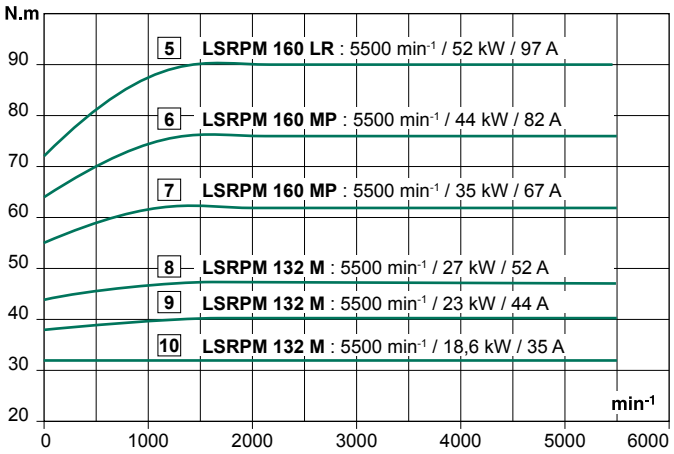
5500 range - 0 to 5,500 min^{-1}

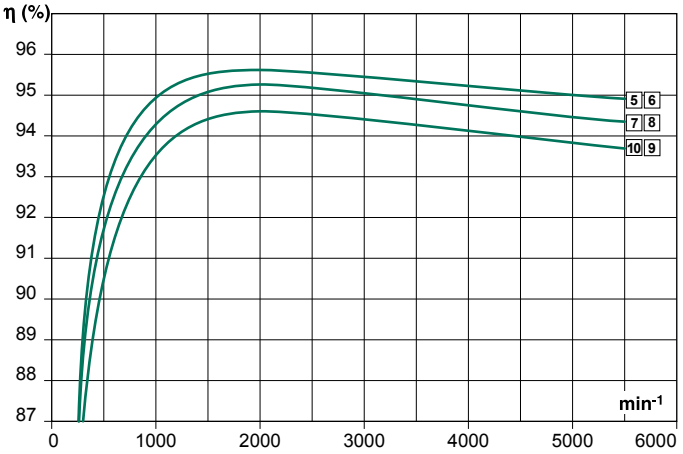
Torque from 0 to 24 N.m



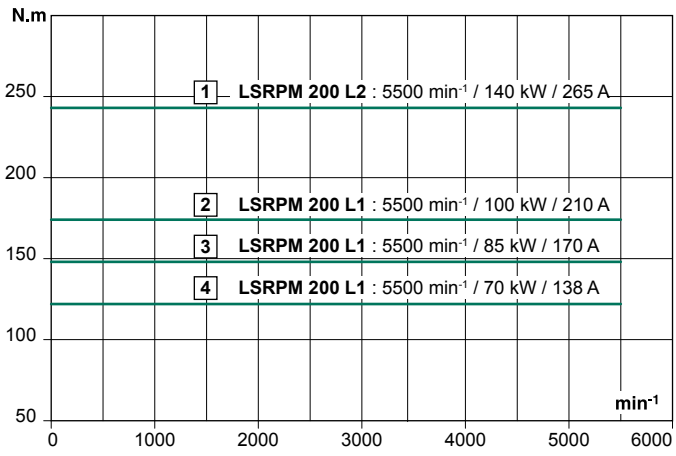


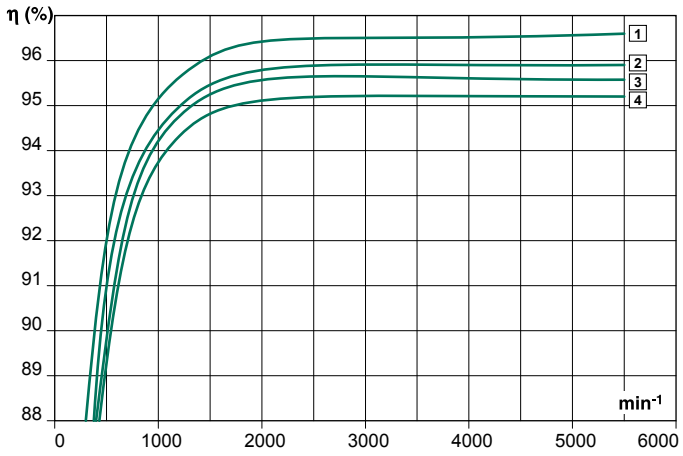
Torque from 24 to 90 N.m





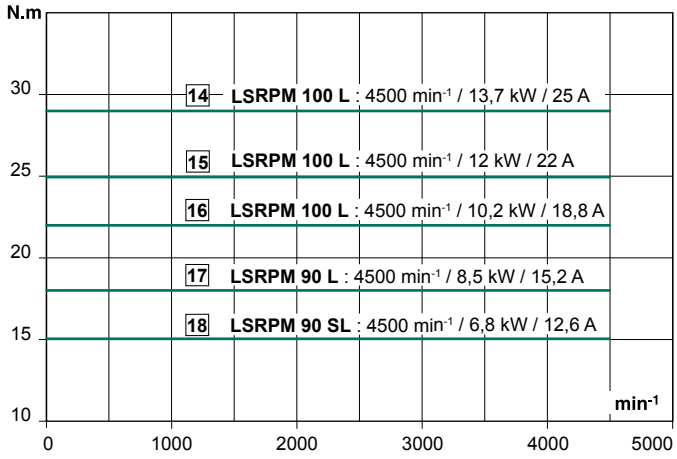
Torque from 90 to 240 N.m

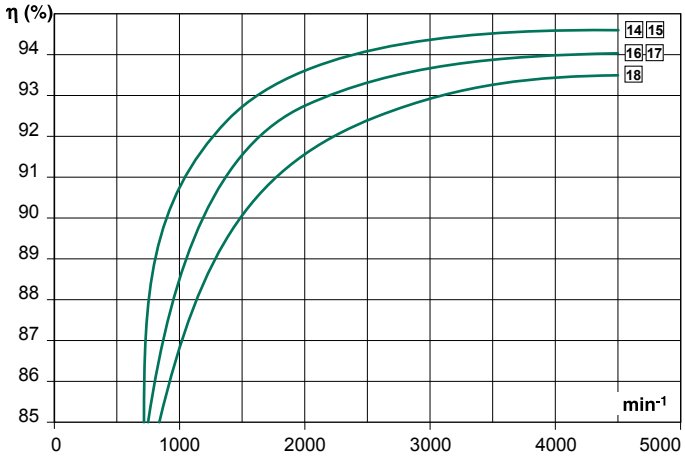




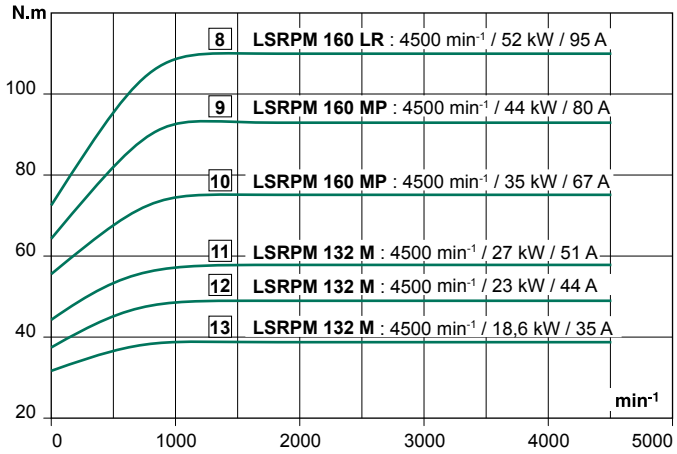
4500 range - 0 to 4,500 min^{-1}

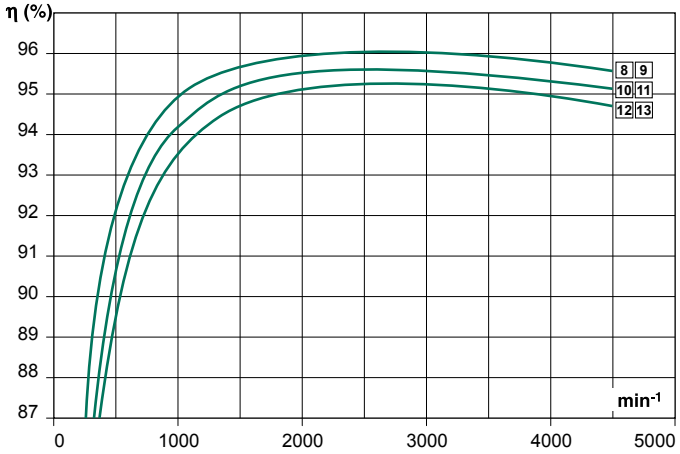
Torque from 0 to 29 N.m



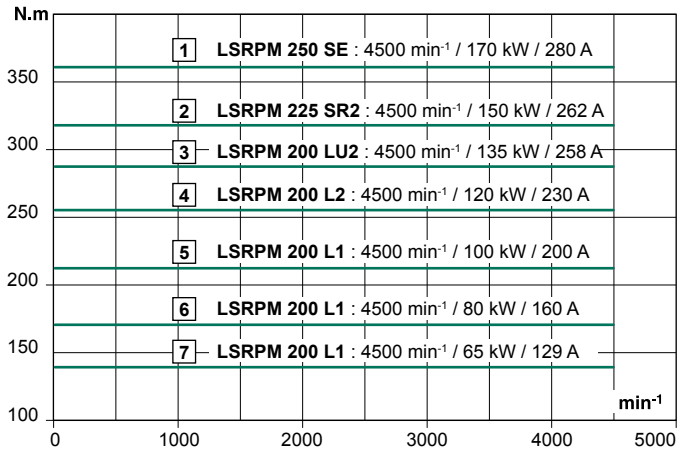


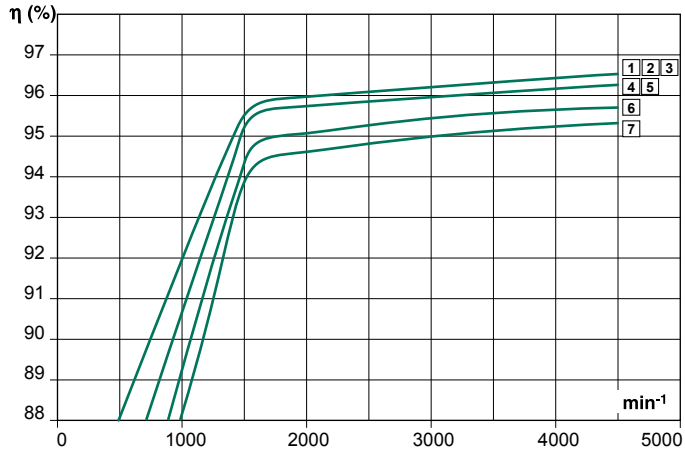
Torque from 29 to 110 N.m





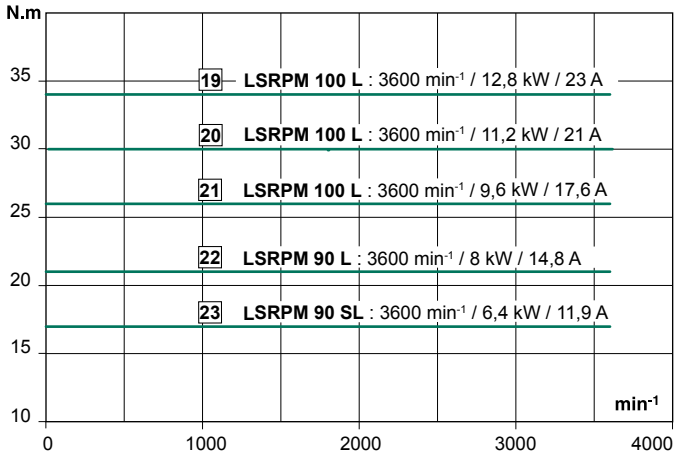
Torque from 110 to 360 N.m

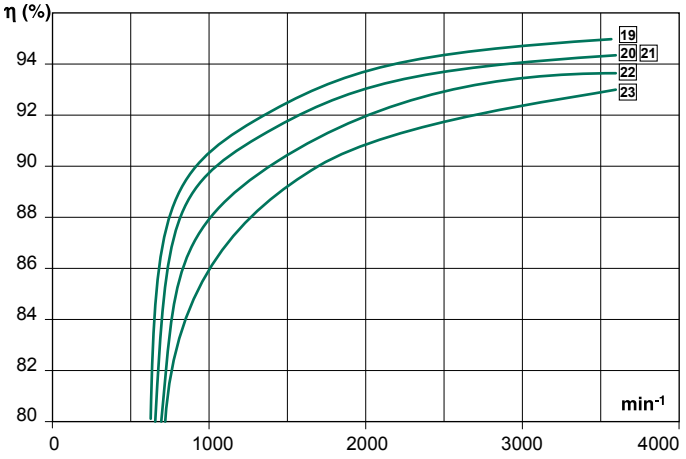




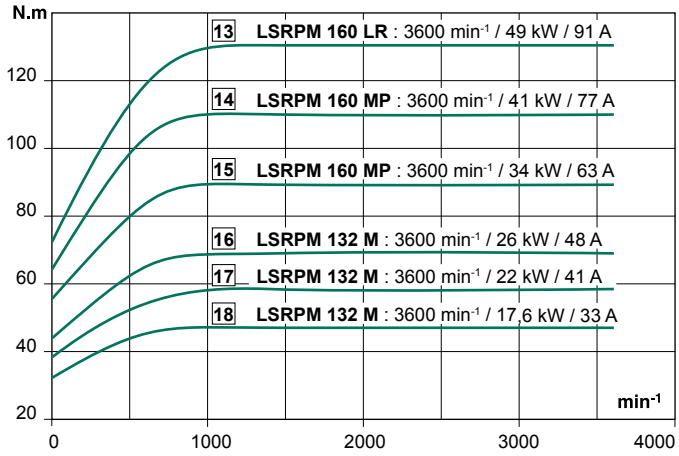
3600 range - 0 to 3,600 min^{-1}

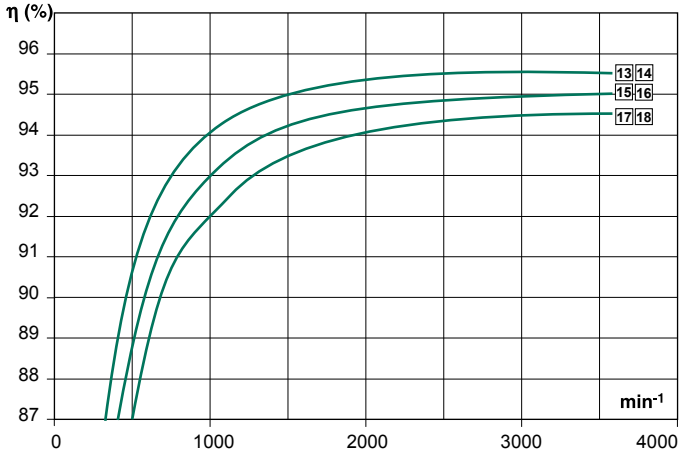
Torque from 0 to 34 N.m



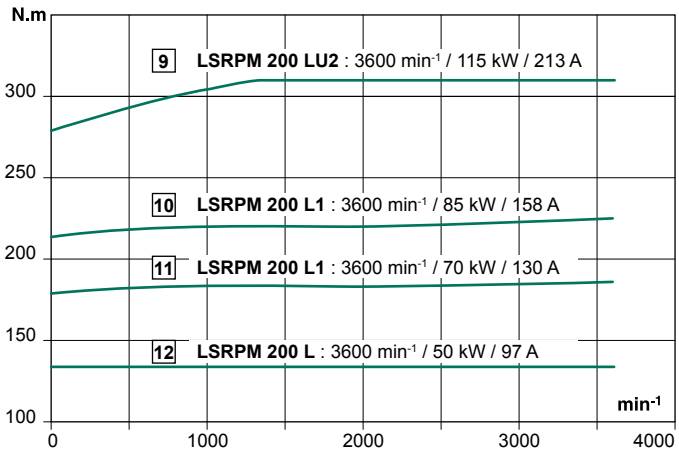


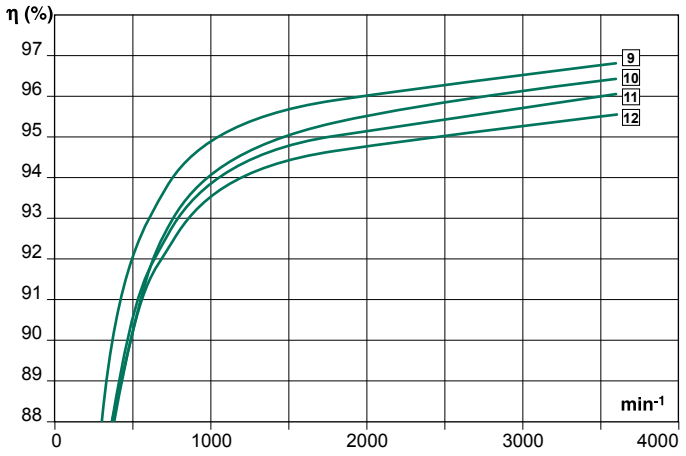
Torque from 34 to 130 N.m





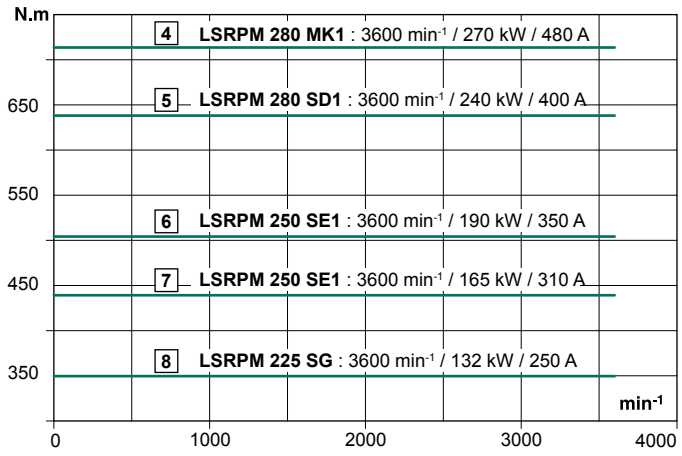
Torque from 130 to 305 N.m

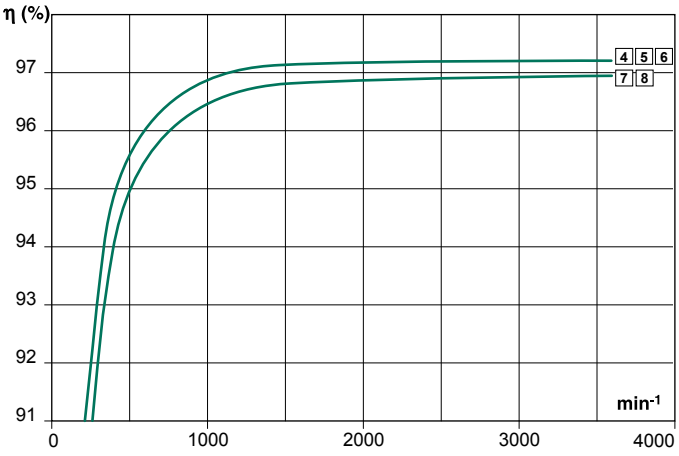




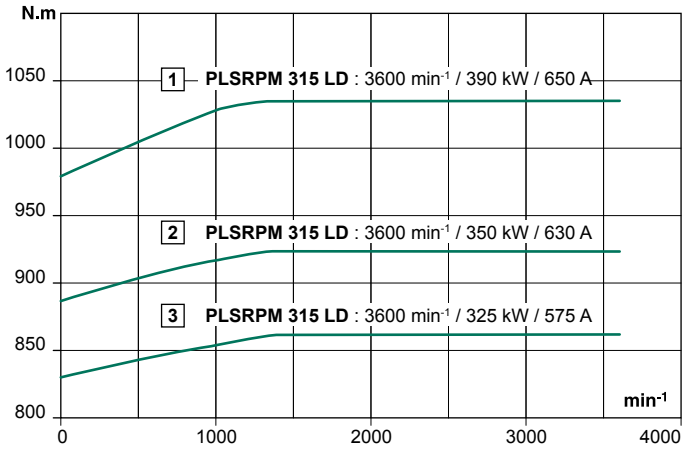
3600 range - 0 to 3,600 min^{-1}

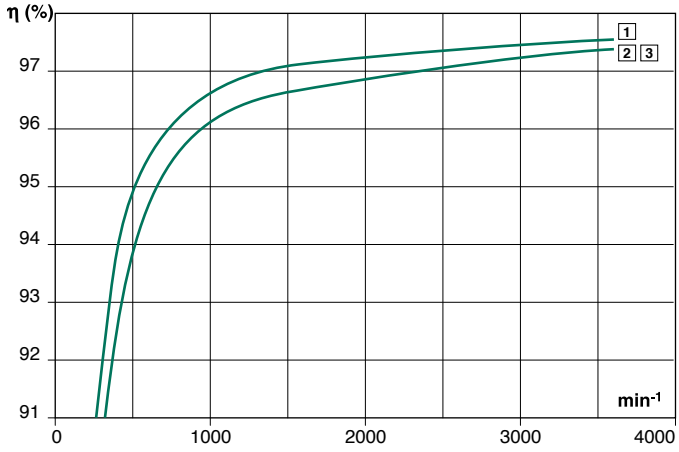
Torque from 305 to 715 N.m





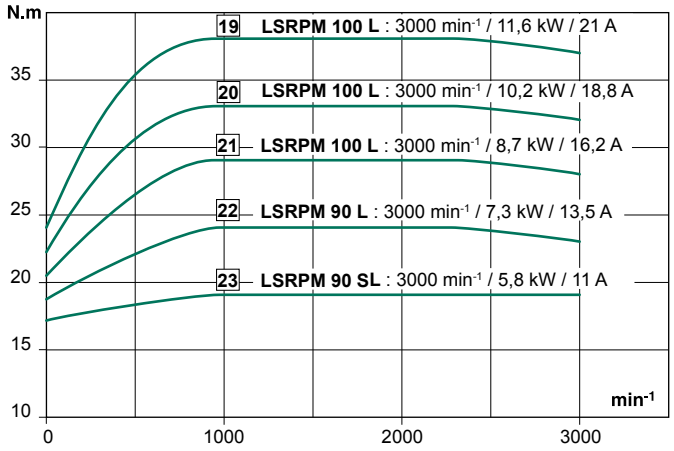
Torque from 715 to 1,035 N.m

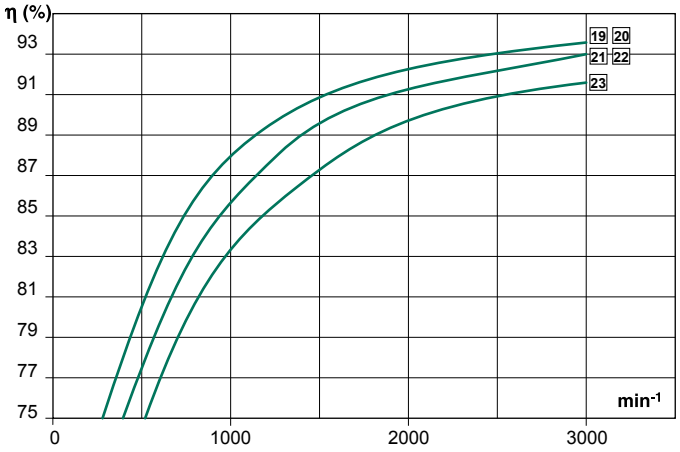




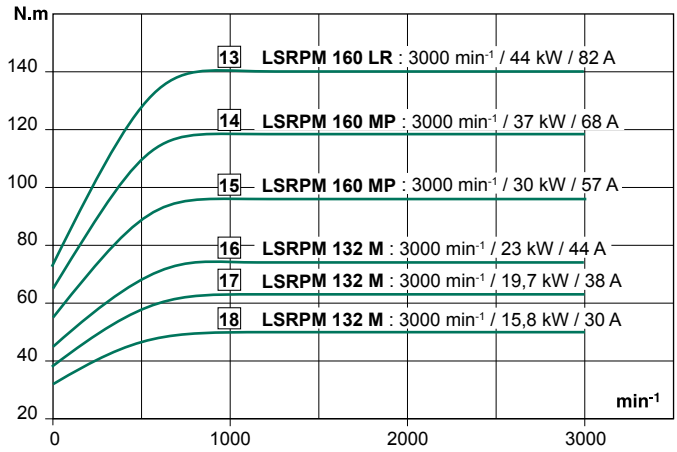
3000 range - 0 to 3,000 min^{-1}

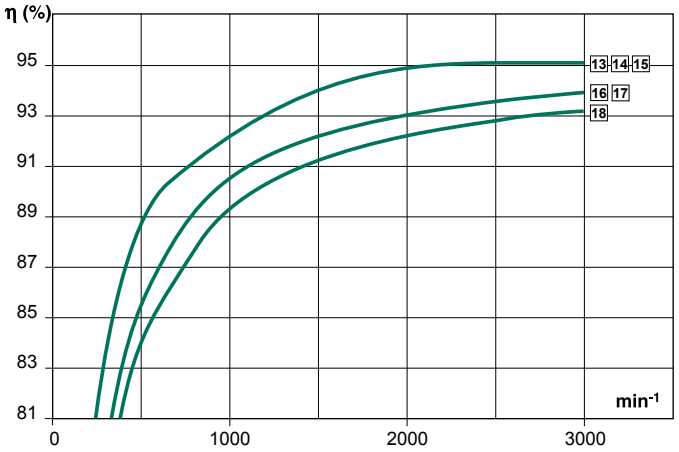
Torque from 0 to 37 N.m



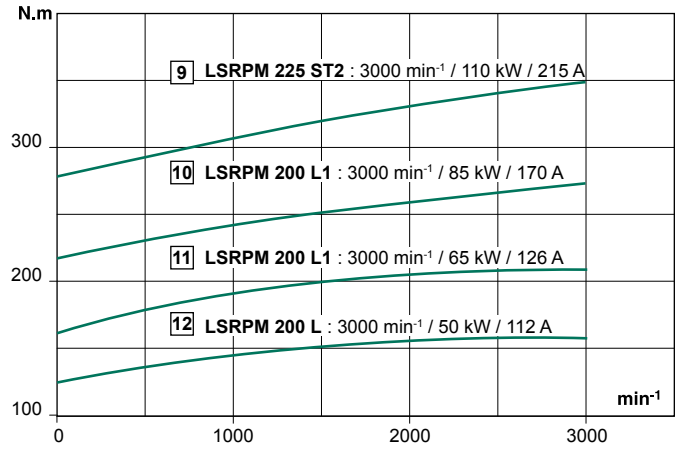


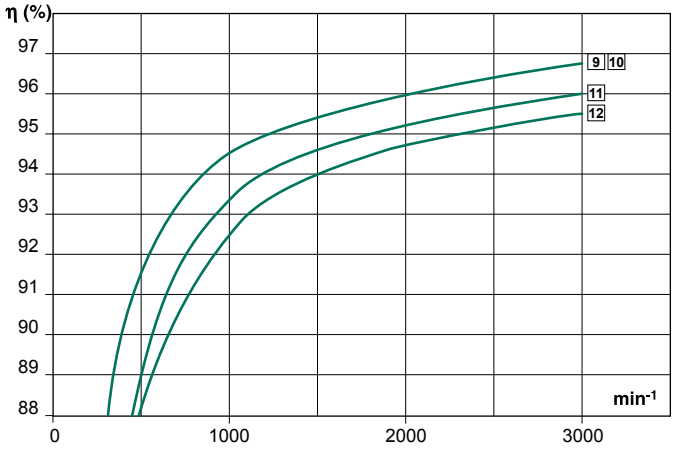
Torque from 37 to 140 N.m





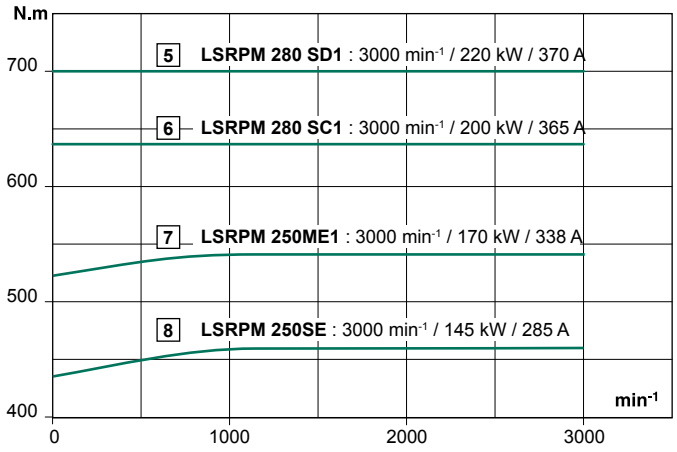
Torque from 140 to 350 N.m

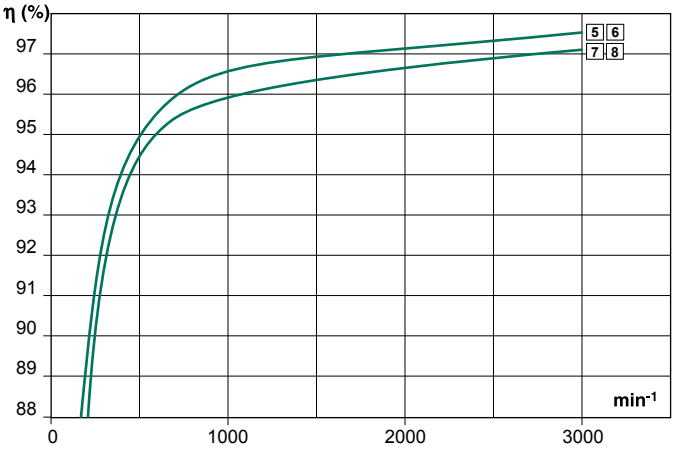




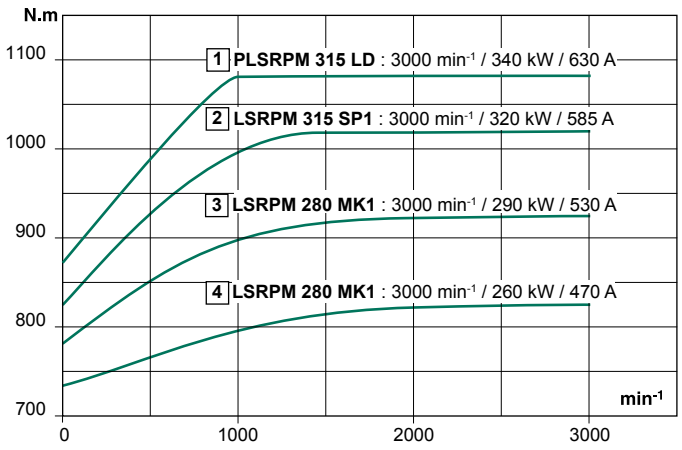
3000 range - 0 to 3,000 min^{-1}

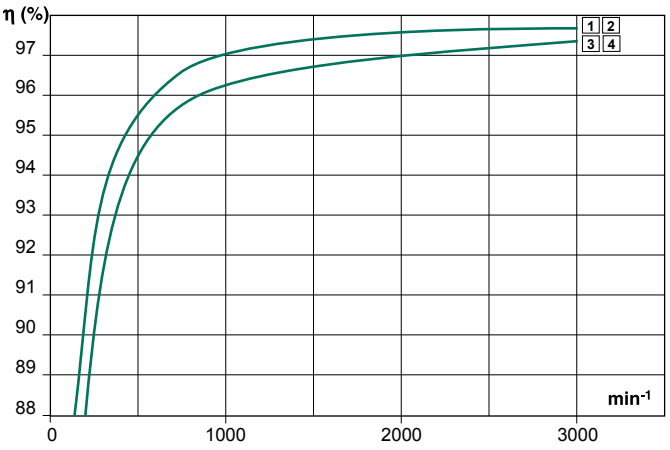
Torque from 350 to 700 N.m





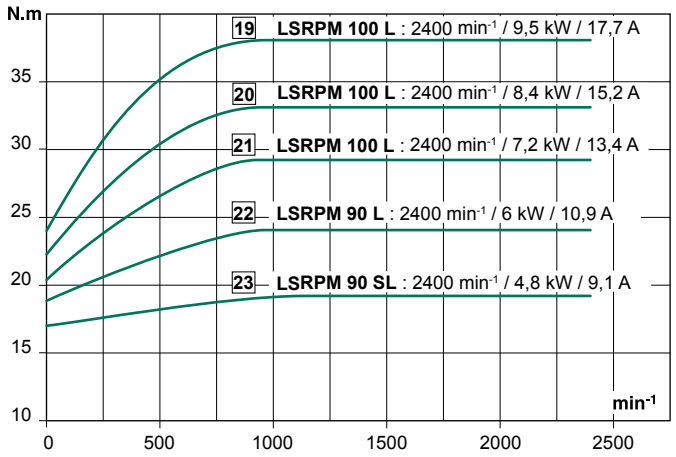
Torque from 700 to 1,080 N.m

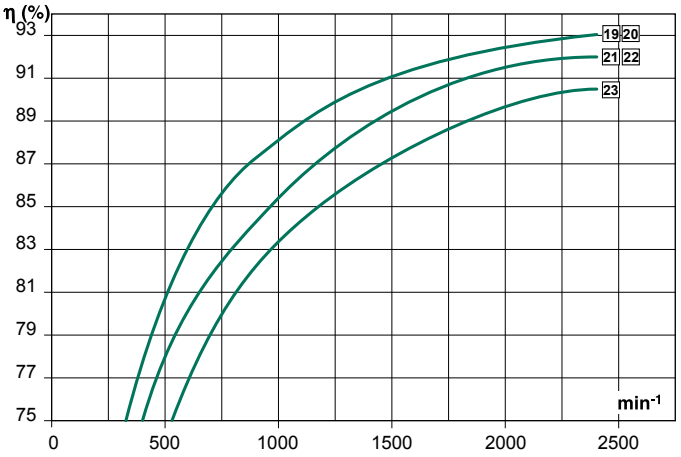




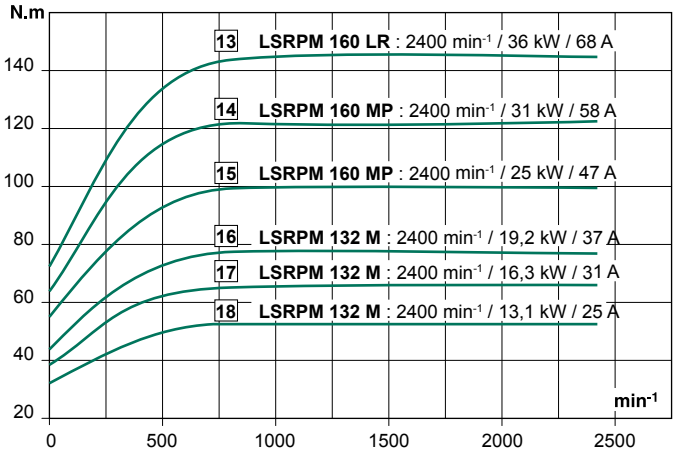
2400 range - 0 to 2,400 min^{-1}

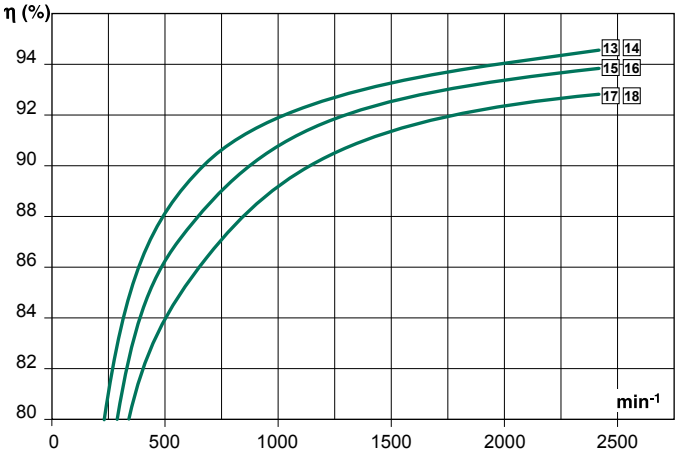
Torque from 0 to 38 N.m



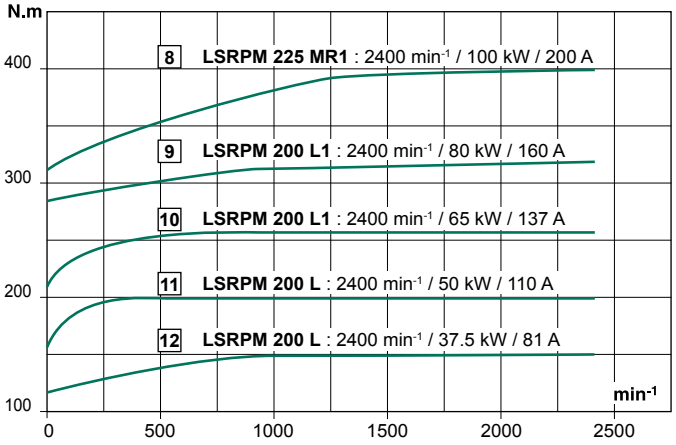


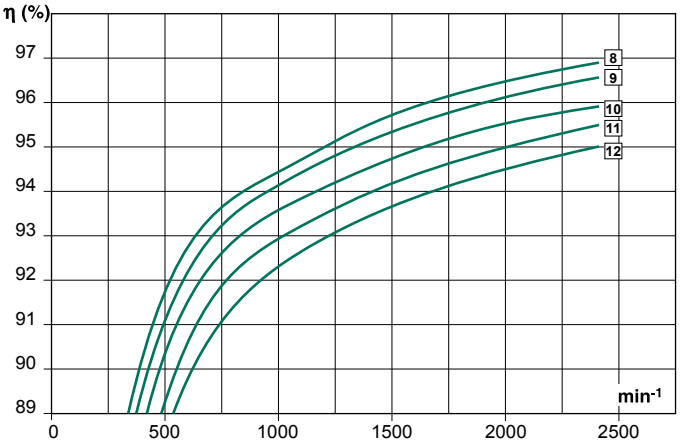
Torque from 38 to 145 N.m





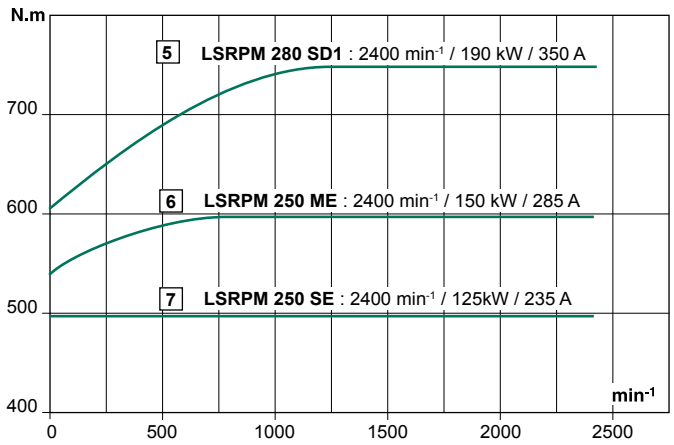
Torque from 145 to 400 N.m

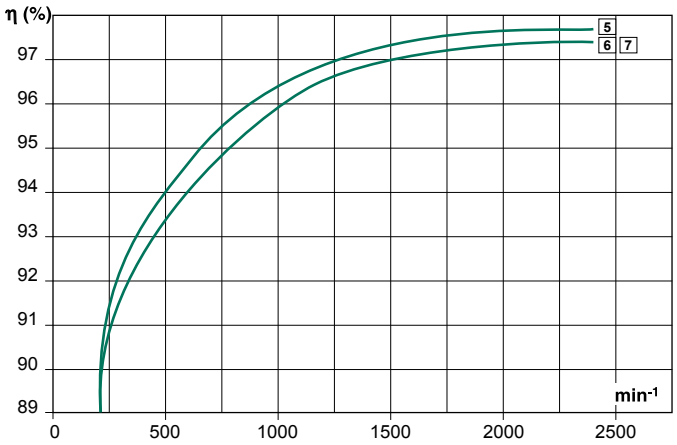




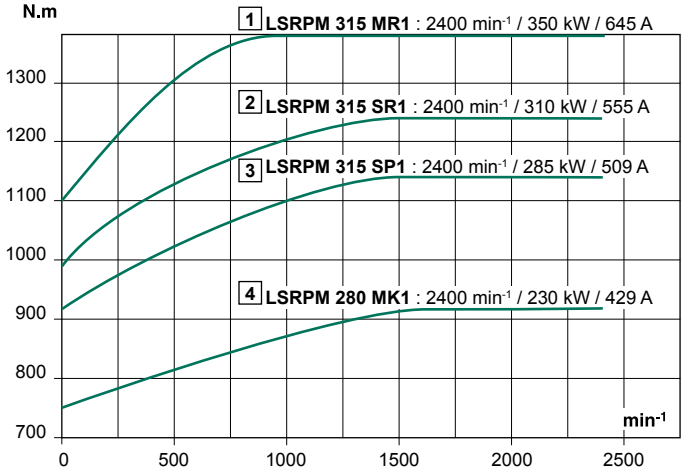
2400 range - 0 to 2,400 min^{-1}

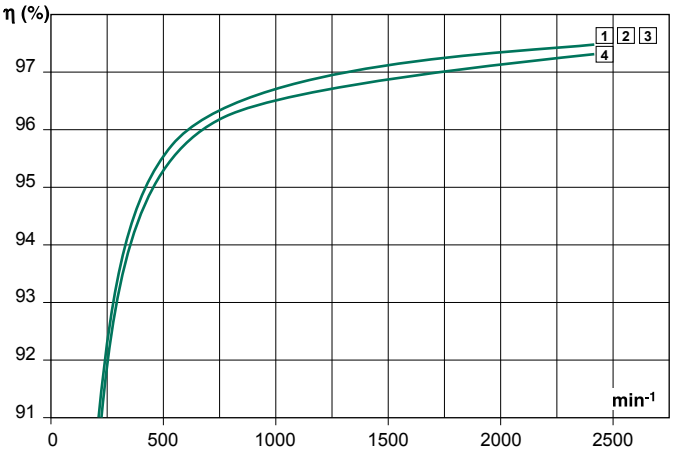
Torque from 400 to 755 N.m





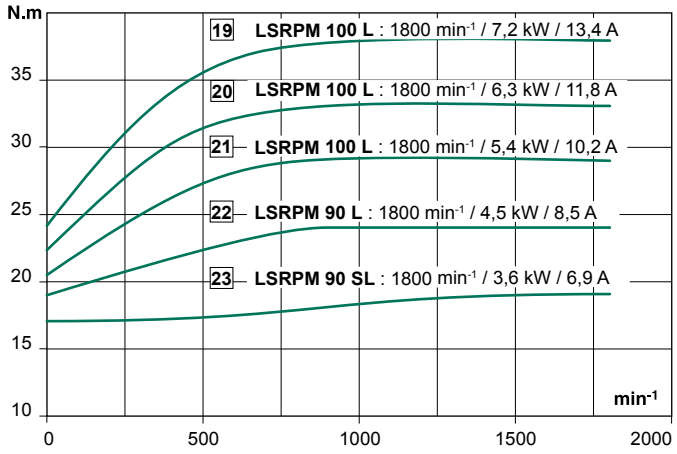
Torque from 755 to 1,390 N.m

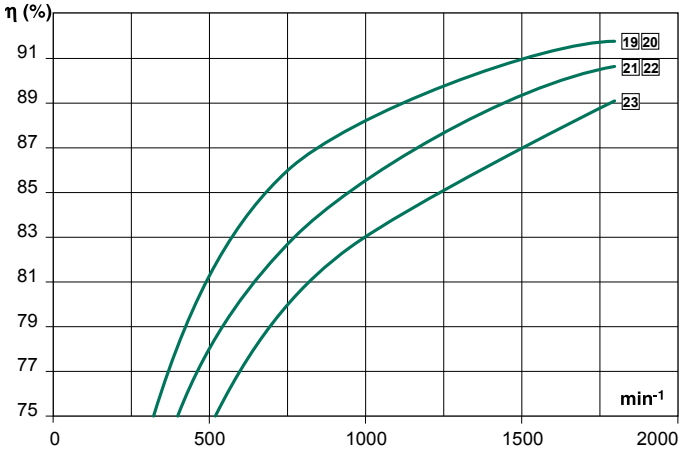




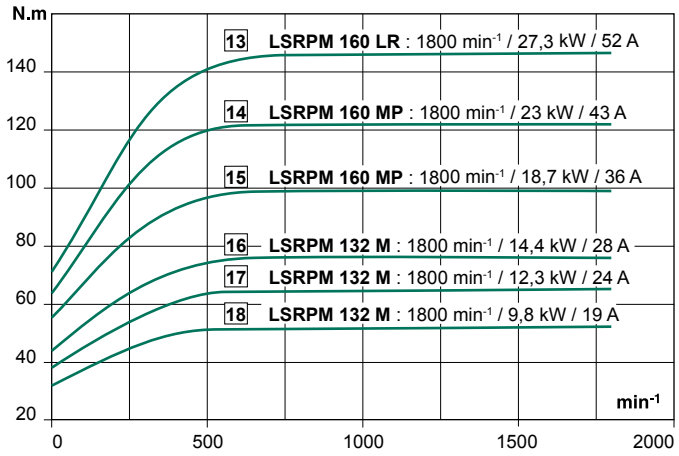
1800 range - 0 to 1,800 min^{-1}

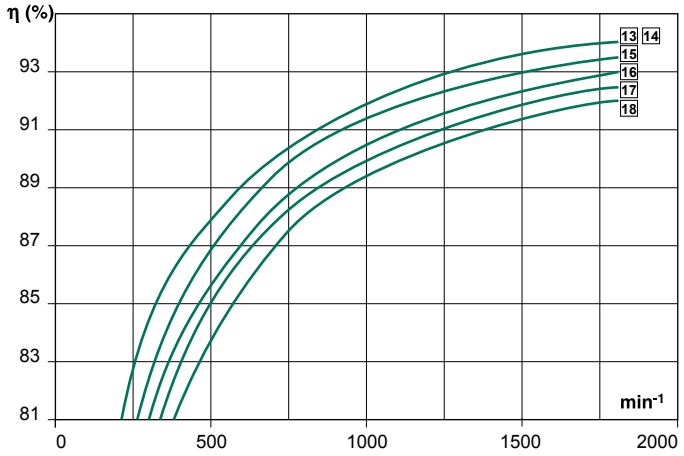
Torque from 0 to 38 N.m



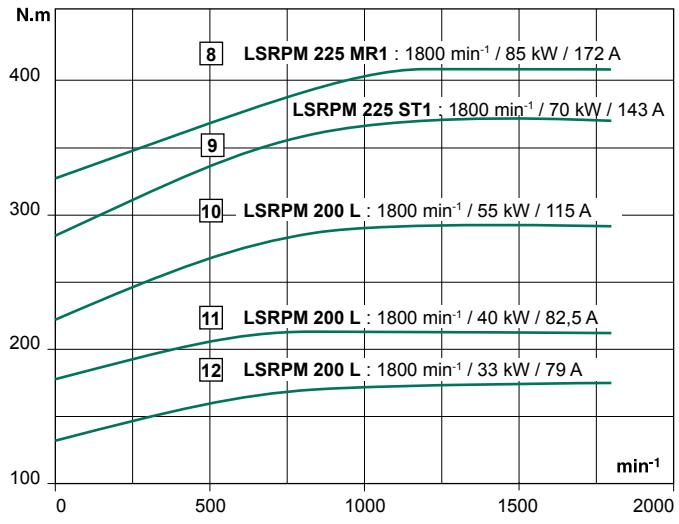


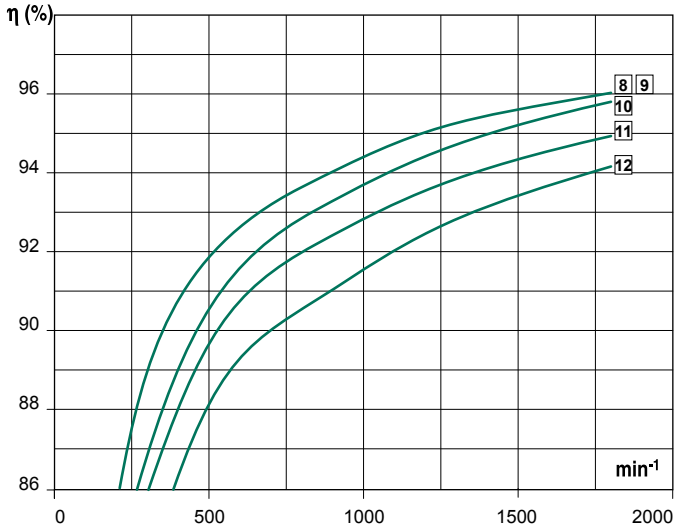
Torque from 38 to 145 N.m





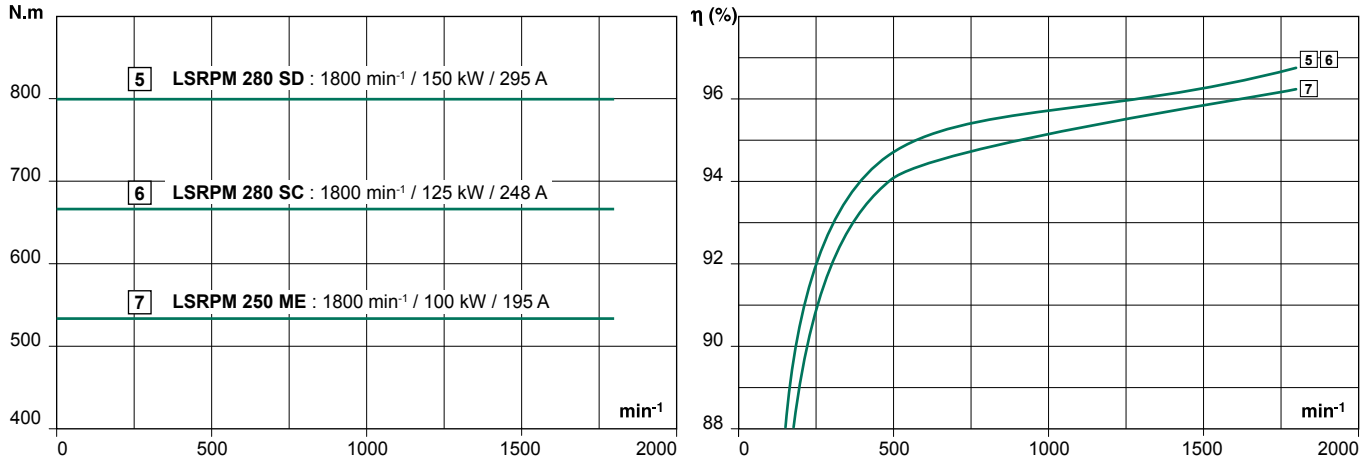
Torque from 145 to 370 N.m



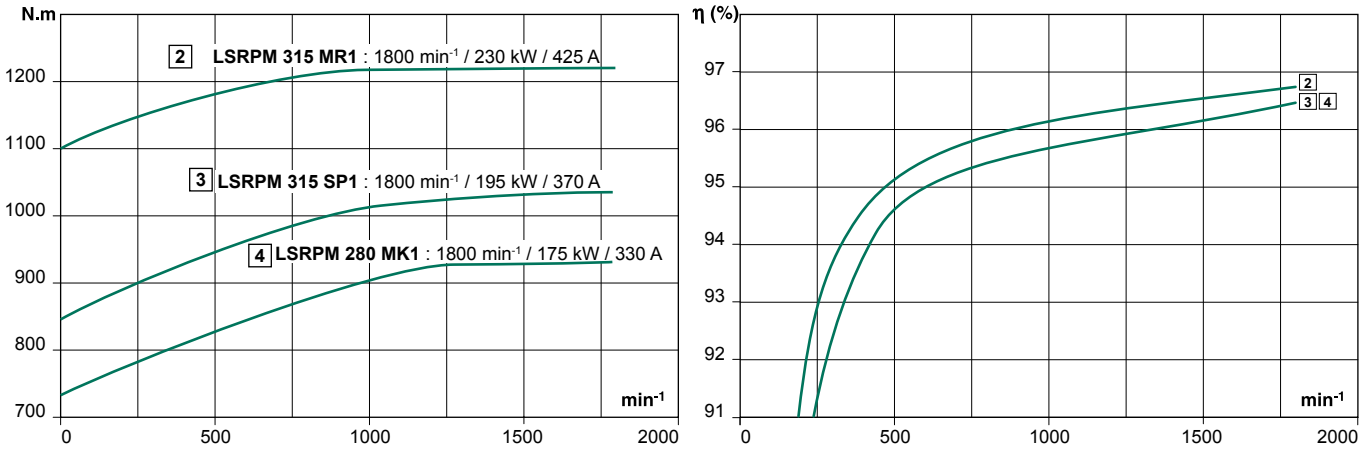


1800 range - 0 to 1,800 min^{-1}

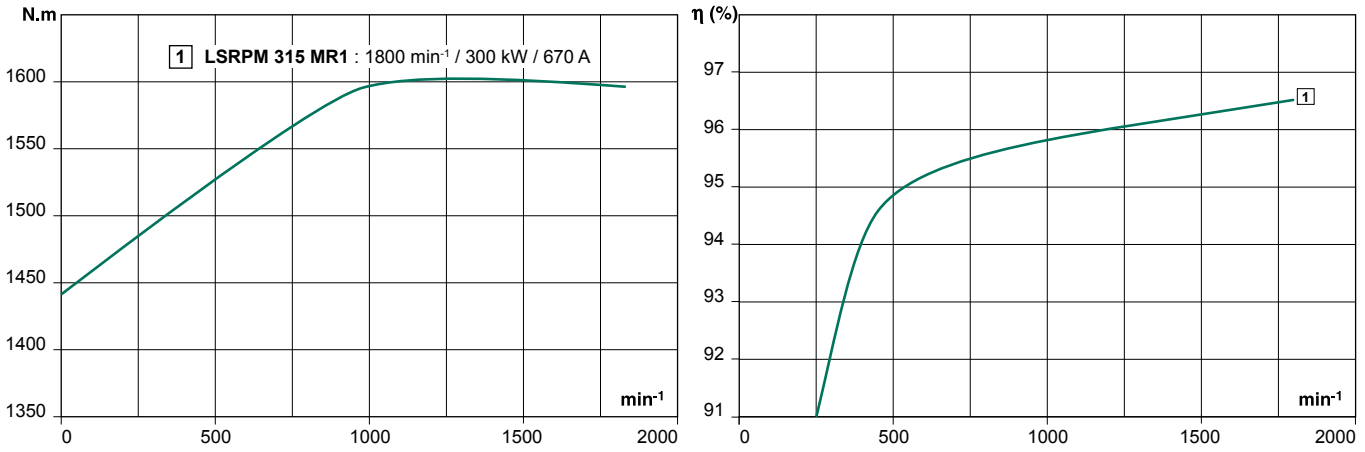
Torque from 370 to 800 N.m



Torque from 800 to 1,220 N.m

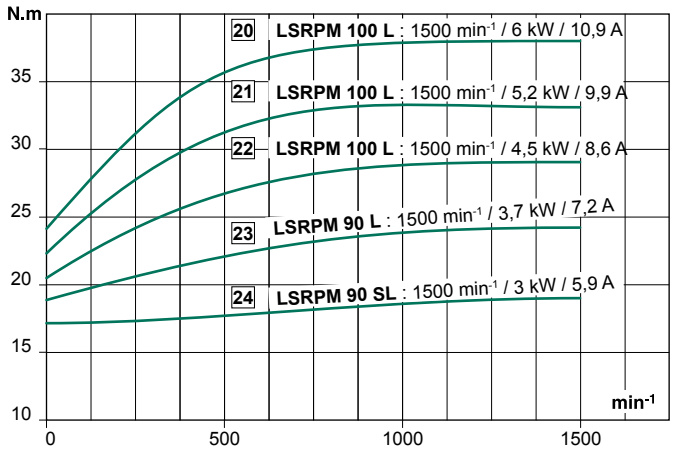


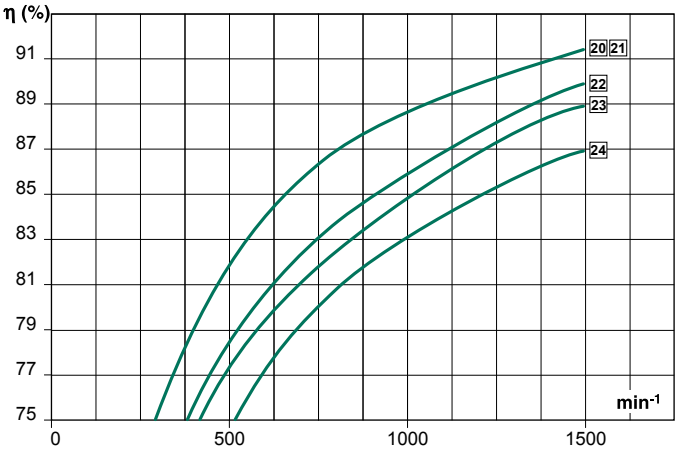
Torque from 1,220 to 1,592 N.m



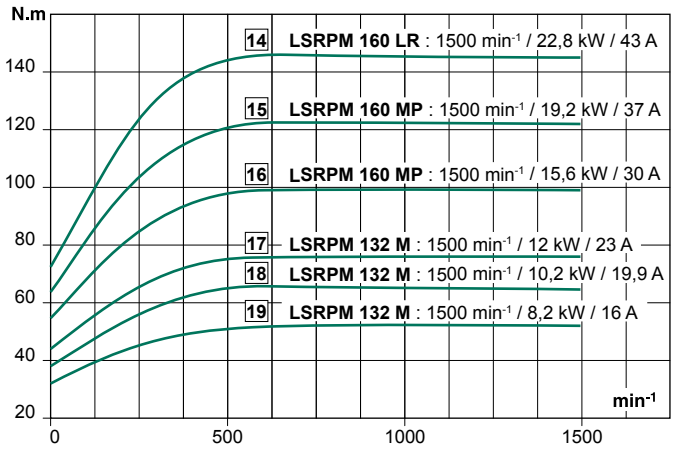
1500 range - 0 to 1,500 min^{-1}

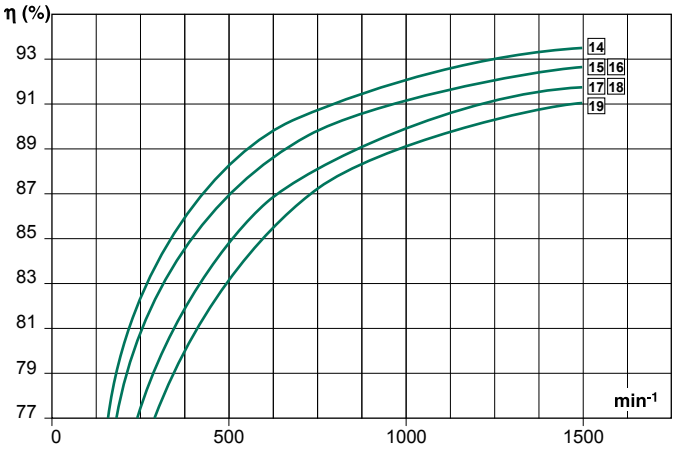
Torque from 0 to 38 N.m



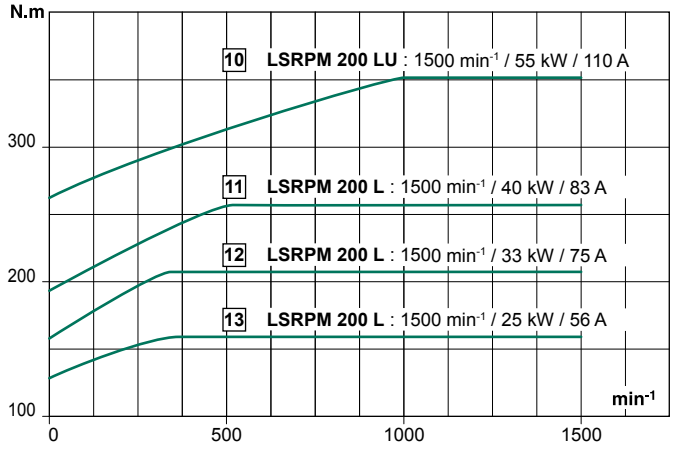


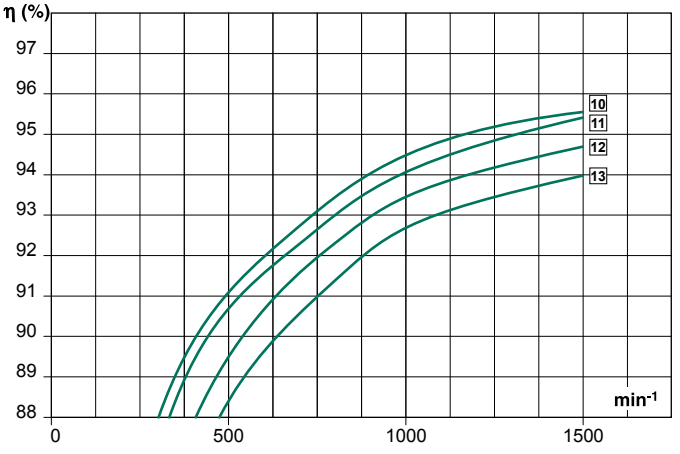
Torque from 38 to 145 N.m





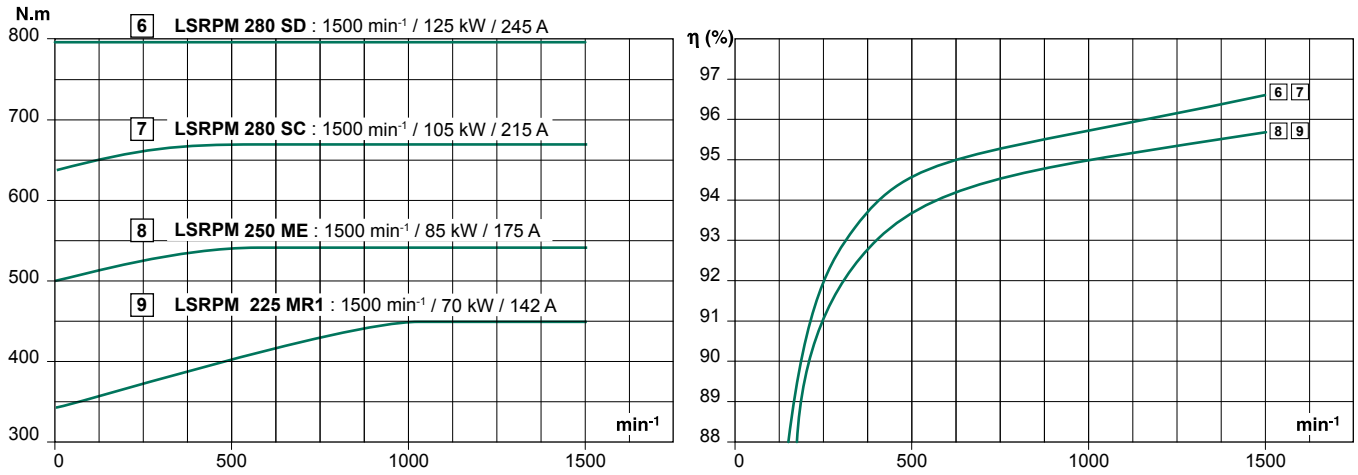
Torque from 145 to 350 N.m



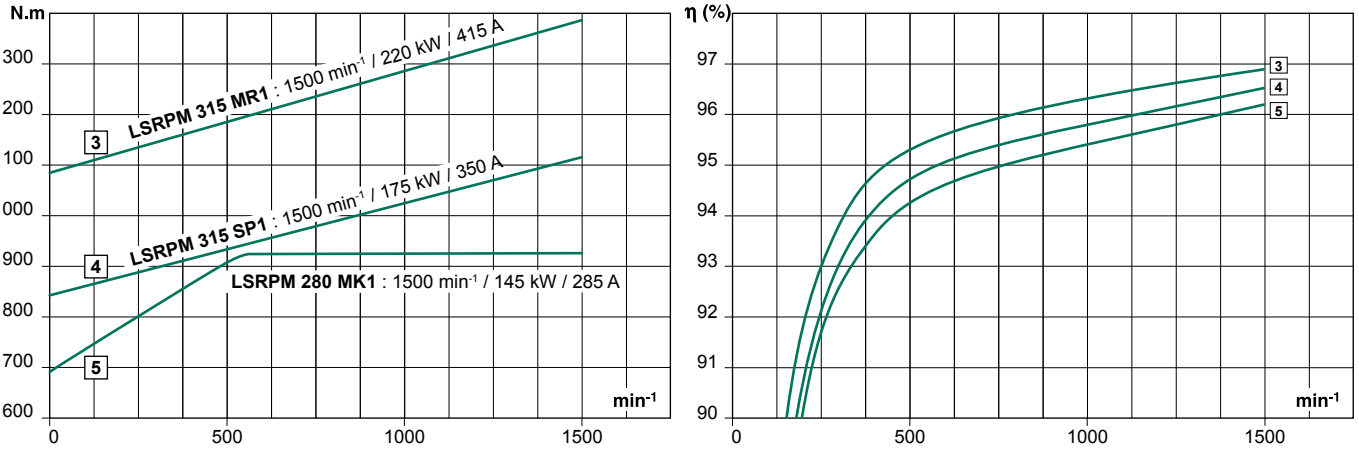


1500 range - 0 to 1,500 min^{-1}

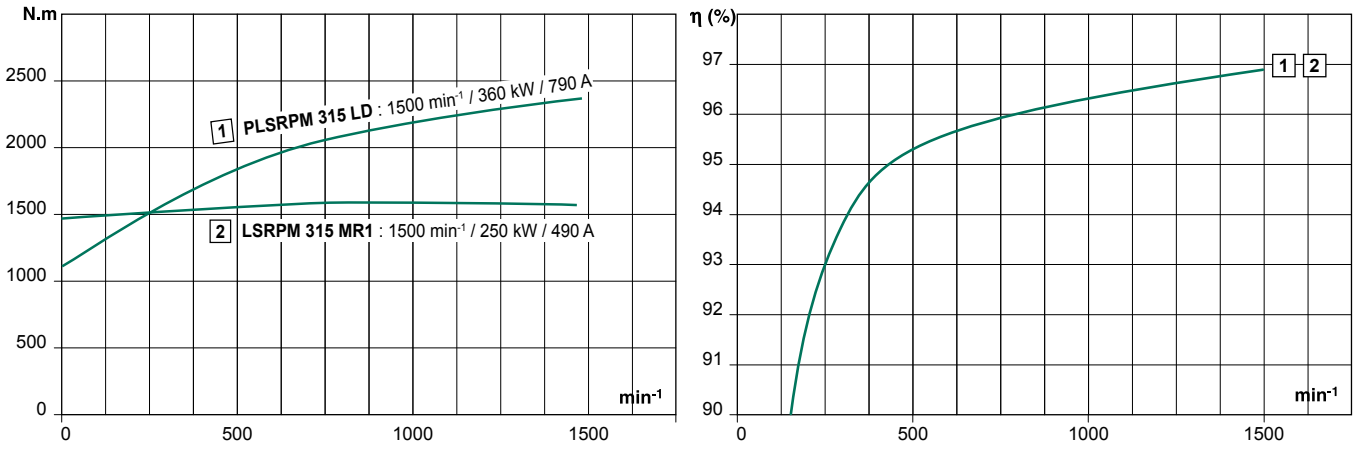
Torque from 350 to 800 N.m



Torque from 800 to 1,400 N.m

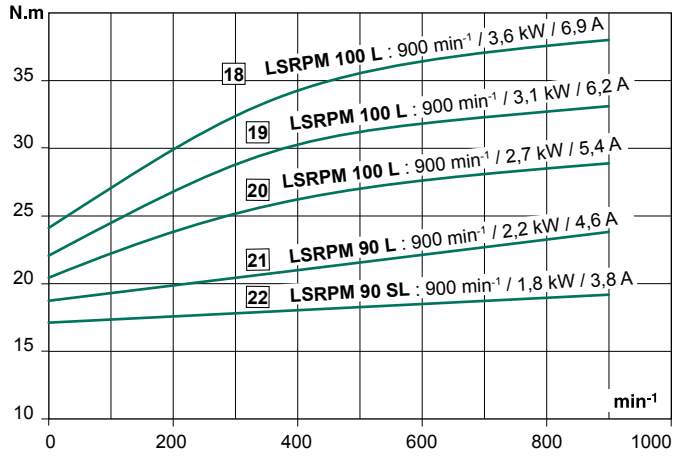


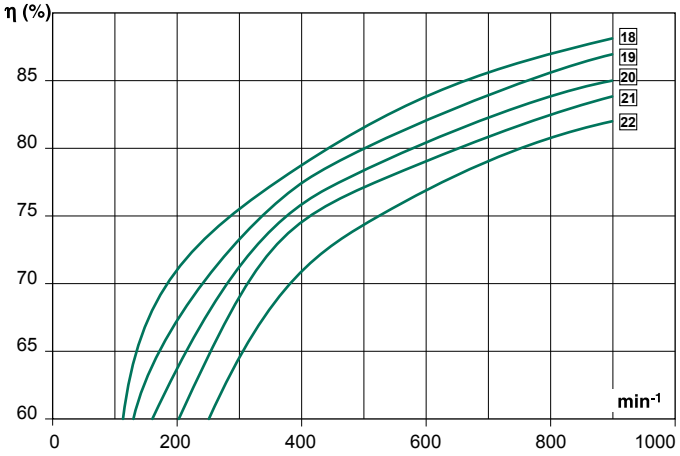
Torque from 1,400 to 2,290 N.m



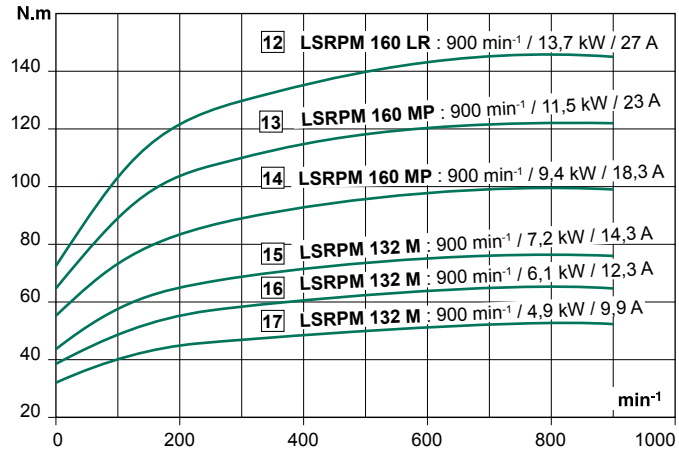
900 range - 0 to 900 min^{-1}

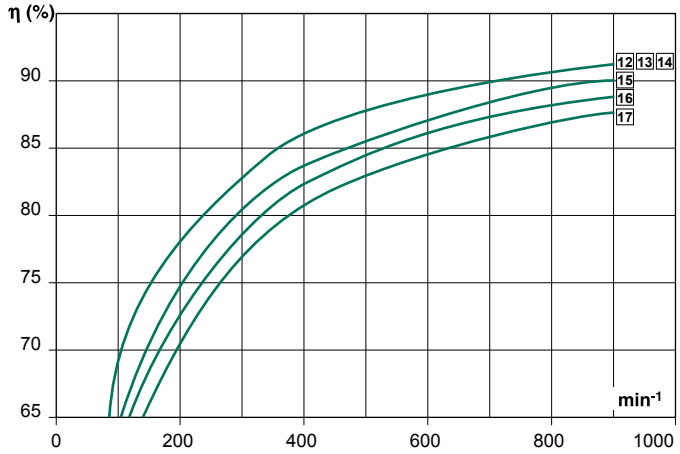
Torque from 0 to 38 N.m



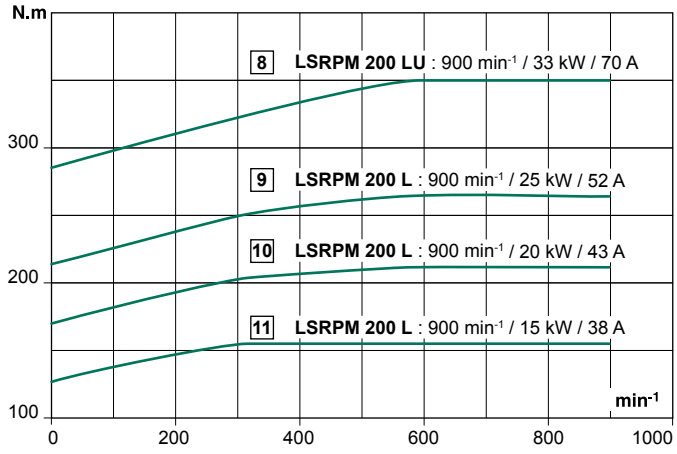


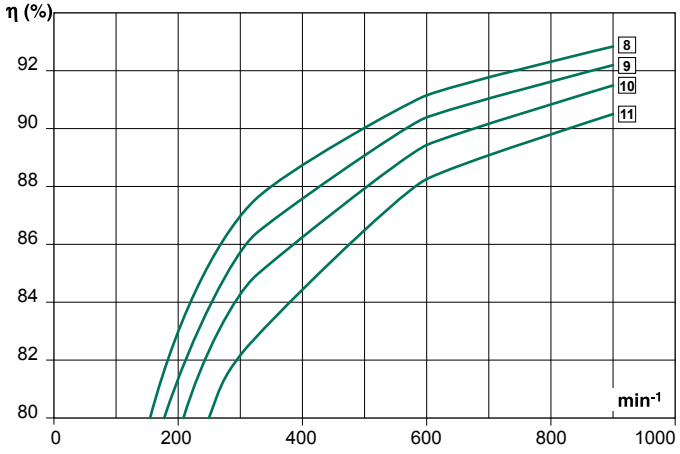
Torque from 38 to 145 N.m





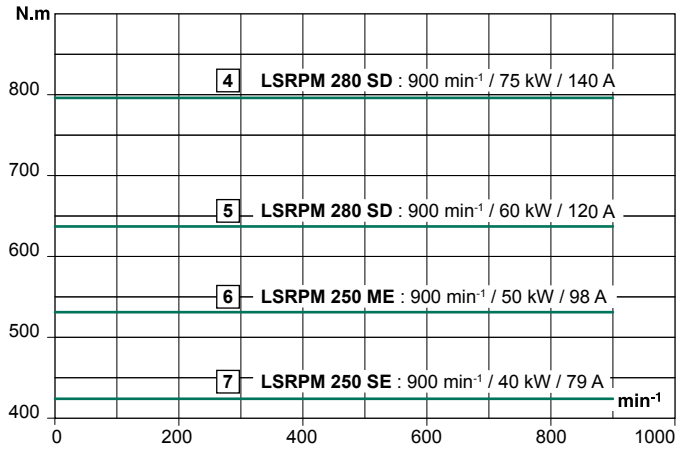
Torque from 145 to 350 N.m

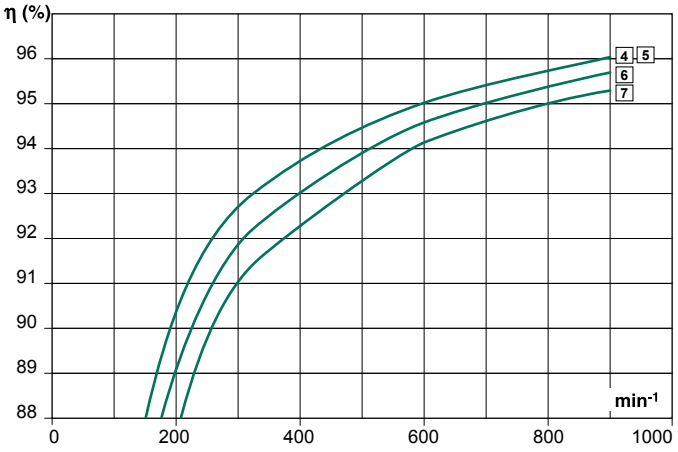




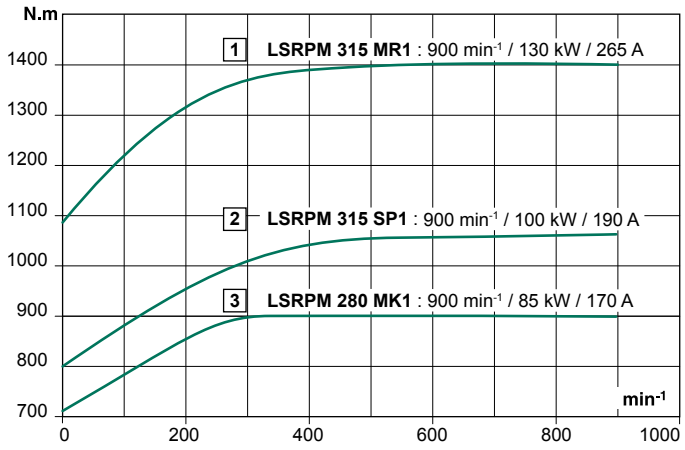
900 range - 0 to 900 min^{-1}

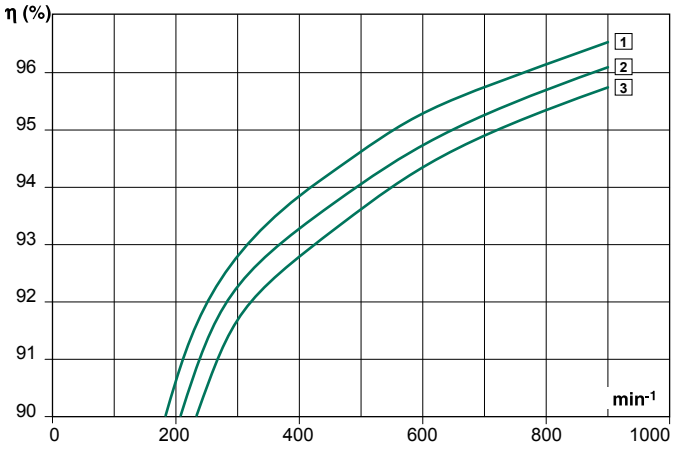
Torque from 350 to 800 N.m





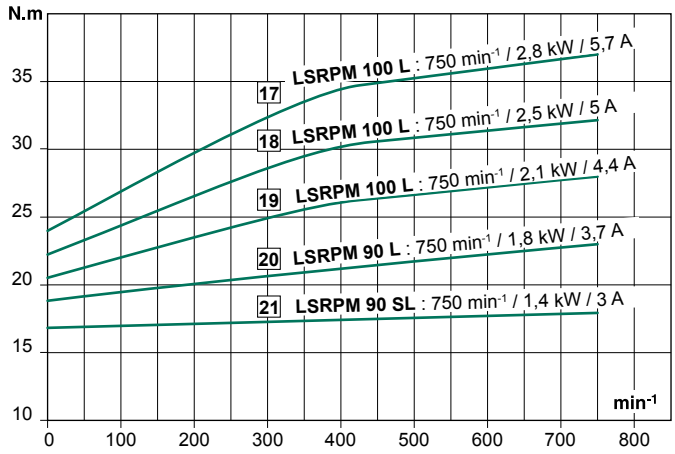
Torque from 800 to 1,380 N.m

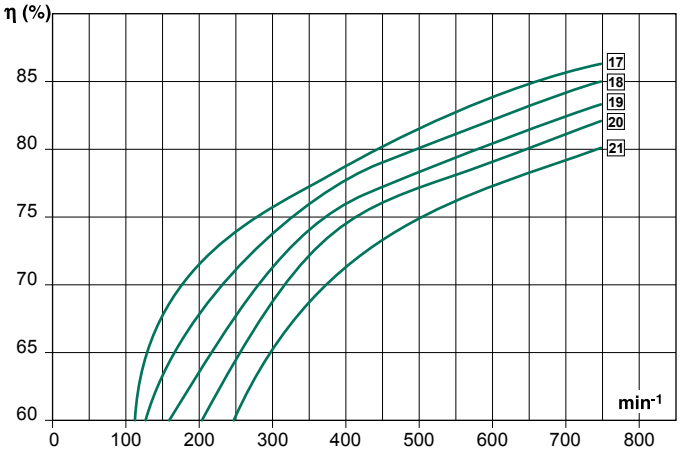




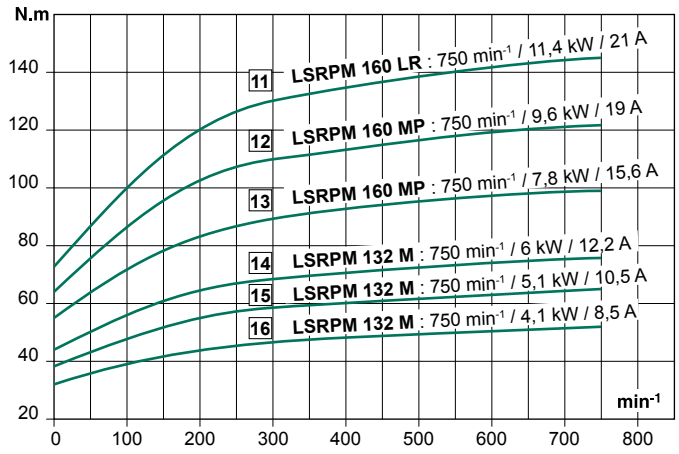
750 range - 0 to 750 min^{-1}

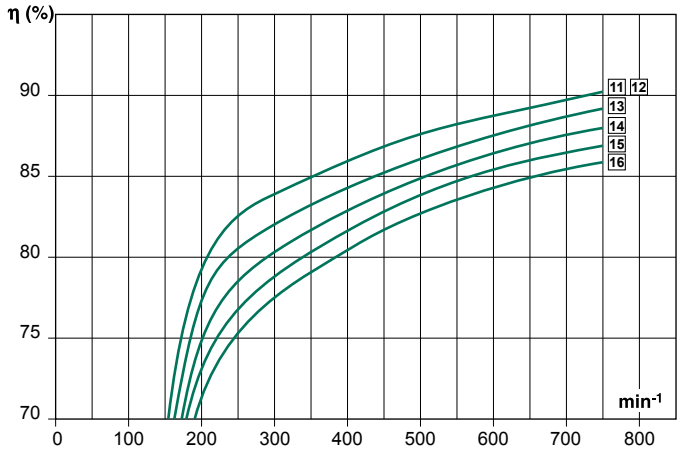
Torque from 0 to 37 N.m



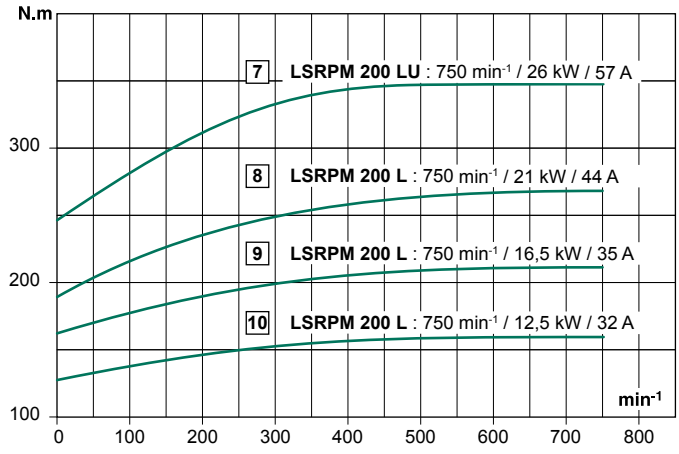


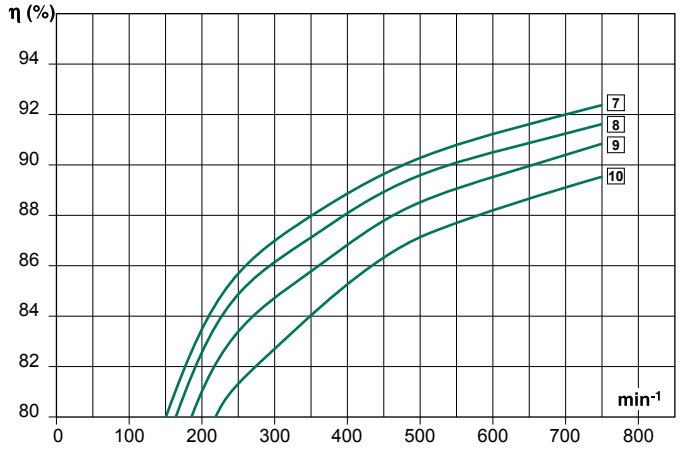
Torque from 37 to 145 N.m





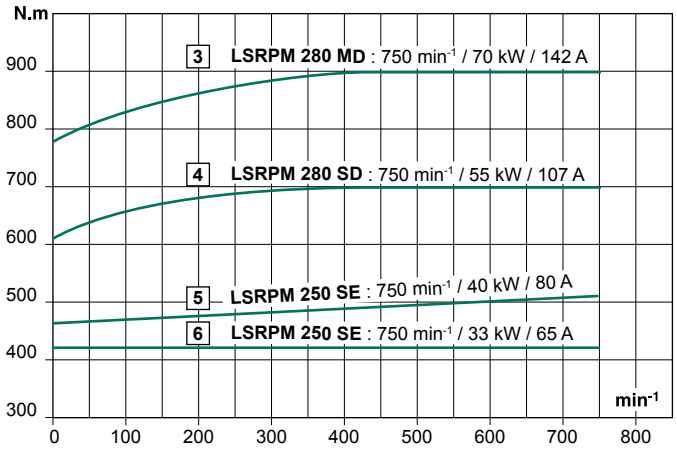
Torque from 145 to 345 N.m

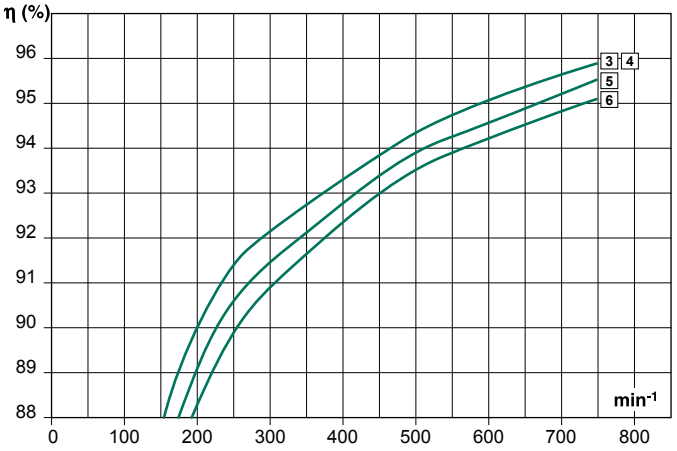




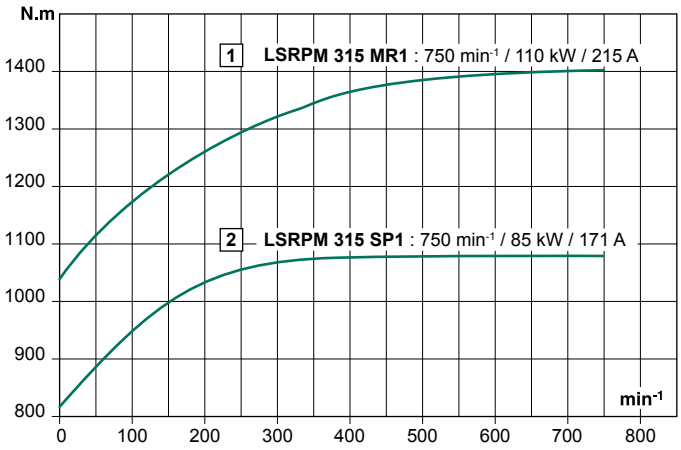
750 range - 0 to 750 min^{-1}

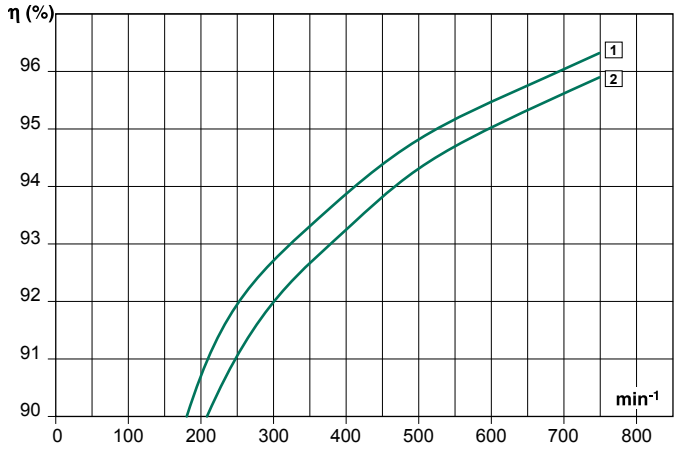
Torque from 345 to 890 N.m





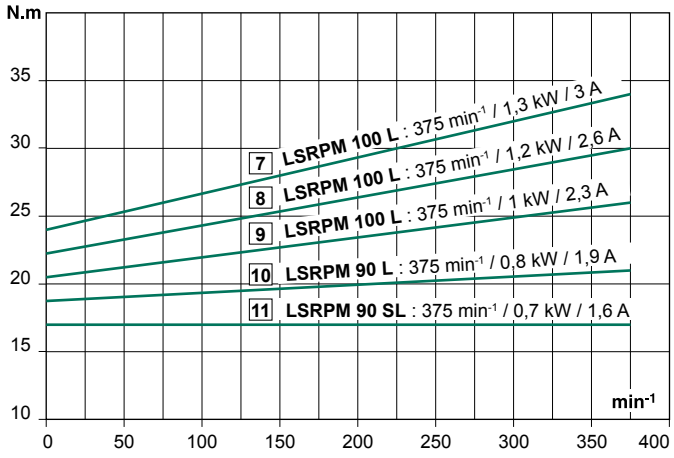
Torque from 890 to 1,400 N.m

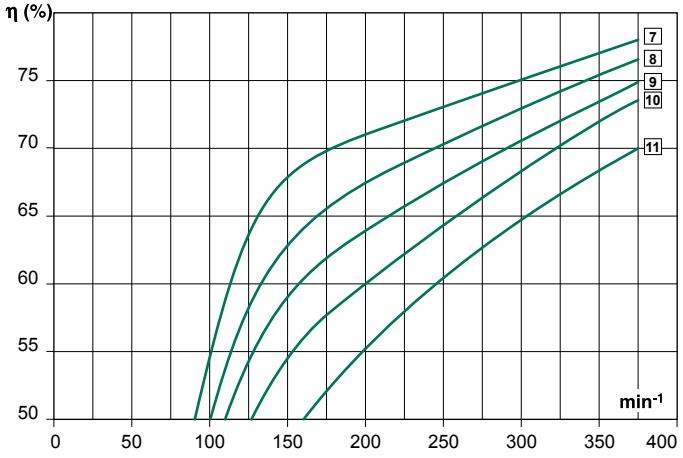




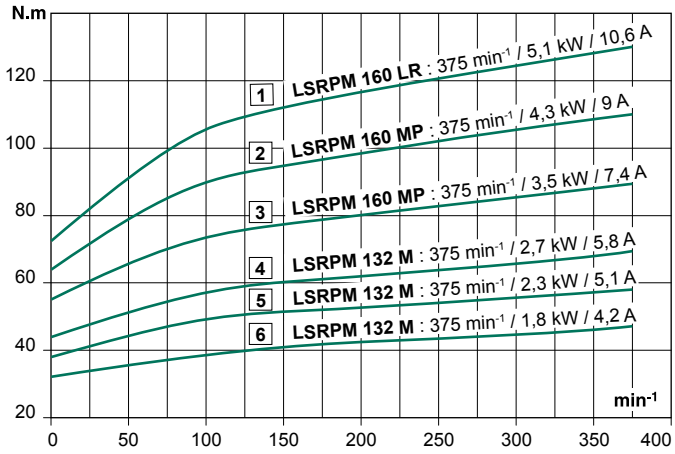
Performance of 375 range - 0 to 375 min^{-1}

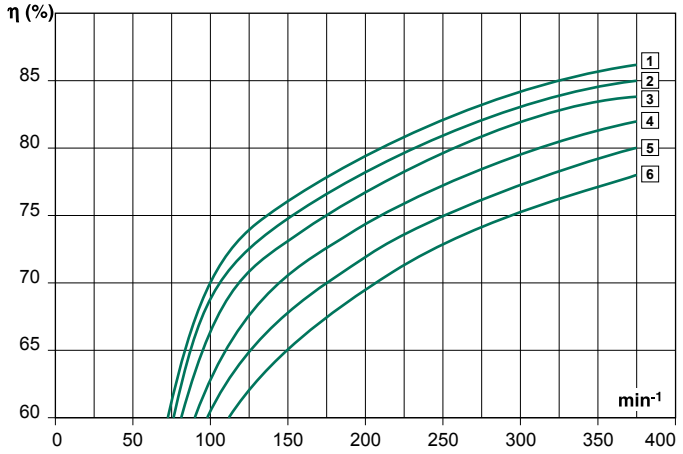
Torque from 0 to 34 N.m





Torque from 34 to 130 N.m





5500 range

Class F - DT80K - S1 Self-Cooled - Altitude 1000 m max - Ambient temperature 40°C max

Power supply upstream from the drive 400 V (in accordance with IEC 60034-1)

11	Drive limit
12.7	Motor limit

MOTOR				DRIVE		VARIABLE SPEED MOTOR							*Motor* moment of inertia	*Motor* weight
Type	Ingress Protection	Rated power	Efficiency IEC 60034-2-1 2007	Type		Available power	Rated torque	Maximum torque/ Rated torque	Rated current[1]	Maximum current/ Rated current[1]	Minimum switching frequency	Efficiency		
		P_n	η			P_n	M_n	M_m/M_n	I_n	I_m/I_n	F_D	η	J	IM B3
		kW	4/4	LS	CT	kW	N.m		A		kHz	4/4	$kg.m^2$	kg
LSRPM 90 SL	IP 55	6.9	93.5	**SP 5.5T**	**SP 1406**	6	10.4	1.10	11	1.10	6	91.6	0.0032	14
				SP 8T	**SP 2401**	6.9	12	1.50	12.7	1.50				
LSRPM 90 L	IP 55	8.6	94.0	**SP 8T**	**SP 2401**	8.6	14.5	1.11	15.2	1.11	6	92.1	0.0051	17
				SP 11T	**SP 2402**			1.50		1.50				
LSRPM 100 L	IP 55	10.4	94.0	**SP 11T**	**SP 2402**	10.4	18	1.21	19	1.21	6	92.1	0.0066	19
				SP 16T	**SP 2403**			1.50		1.50				
LSRPM 100 L	IP 55	12.1	94.5	**SP 16T**	**SP 2403**	12.1	21	1.41	22	1.41	6	92.6	0.0078	24
LSRPM 100 L	IP 55	13.8	94.5	**SP 16T**	**SP 2403**	12.8	22.3	1.34	23.2	1.34	6	92.6	0.009	26
				SP 22T	**SP 3401**	13.8	24	1.50	25	1.50				
LSRPM 132 M	IP 55	18.6	94.0	**SP 22T**	**SP 3401**	18.6	32	1.09	35	1.09	6	92.1	0.0165	40
				SP 27T	**SP 3402**			1.50		1.50				
LSRPM 132 M	IP 55	23	94.0	**SP 27T**	**SP 3402**	20.6	36	1.19	40	1.19	6	92.1	0.0231	44
				SP 40T	**SP 4401**	23	40	1.50	44	1.50				
LSRPM 132 M	IP 55	27	94.5	**SP 40T**	**SP 4401**	27	47	1.42	52	1.42	6	92.6	0.0311	49
LSRPM 160 MP	IP 55	35	94.5	**SP 40T**	**SP 4401**	35	61	1.10	67	1.10	6	92.6	0.0418	60
				SP 50T	**SP 4402**			1.36		1.36				
				SP 60T	**SP 4403**			1.50		1.50				
LSRPM 160 MP	IP 55	44	95.0	**SP 50T**	**SP 4402**	40	69	1.23	74	1.23	6	93.1	0.0514	69
				SP 60T	**SP 4403**	44	76	1.39	82	1.39				
				SP 75T	**SP 5401**			1.50		1.50				
LSRPM 160 LR	IP 55	52	95.0	**SP 60T**	**SP 4403**	51	88	1.20	95.1	1.20	6	93.1	0.0626	79
				SP 75T	**SP 5401**	52	90	1.50	97	1.50				
LSRPM 200 L1	IP 55	70	95.2	**SP 75T**	**SP 5401**	56	98	1.19	118	1.28	6	93.3	0.13	138
				SP 100T	**SP 5401**	65	114	1.33	129	1.43				
				SP 120T	**SP 6401**	70	122	1.40	138	1.50				
LSRPM 200 L1	IP 55	85	95.4	**SP 120T**	**SP 6401**	82	143	1.28	164	1.37	6	93.5	0.15	148
				SPMA 1401-2S		85	148	1.40	170	1.50				
LSRPM 200 L1	IP 55	100	95.8	**SPMA 1401-2S**		100	174	1.40	210	1.50	6	93.9	0.17	153
LSRPM 200 L2	IP 55	140	96.6	**SPMA 1401-2S**		140	243	1.40	265	1.50	6	94.7	0.22	180

[1] The drive parameters must comply with the rated current values to ensure thermal control is maintained, as must the maximum current values to avoid the risk of demagnetisation

4500 range

Class F - DT80K - S1 Self-Cooled - Altitude 1000 m max - Ambient temperature 40°C max

Power supply upstream from the drive 400 V (in accordance with IEC 60034-1)

11	Drive limit
12.6	Motor limit

MOTOR				DRIVE		VARIABLE SPEED MOTOR							*Motor* moment of inertia	*Motor* weight
Type	Ingress Protection	Rated power	Efficiency IEC 60034-2-1 2007	Type		Available power	Rated torque	Maximum torque/ Rated torque	Rated current[1]	Maximum current/ Rated current[1]	Minimum switching frequency	Efficiency		
		P_n	η			P_n	M_n	M_m/M_n	I_n	I_m/I_n	F_D	η	J	IM B3
		kW	4/4	LS	CT	kW	N.m		A		kHz	4/4	$kg.m^2$	kg
LSRPM 90 SL	IP 55	6.8	93.5	SP 5.5T	SP 1406	5.9	13.1	1.10	11	1.10	6	91.6	0.0032	14
				SP 8T	SP 2401	6.8	15	1.50	12.6	1.50				
LSRPM 90 L	IP 55	8.5	94	SP 8T	SP 2401	8.5	18	1.11	15.2	1.11	6	92.1	0.0051	17
				SP 11T	SP 2402			1.50		1.50				
LSRPM 100 L	IP 55	10.2	94	SP 11T	SP 2402	10.2	22	1.22	18.8	1.22	6	92.1	0.0066	19
				SP 16T	SP 2403			1.50		1.50				
LSRPM 100 L	IP 55	12	94.5	SP 11T	SP 2402	10.6	22.2	1.18	19.5	1.18	6	92.6	0.0078	24
				SP 16T	SP 2403	12	25	1.41	22	1.41				
LSRPM 100 L	IP 55	13.7	94.5	SP 16T	SP 2403	12.7	26.9	1.34	23.2	1.34	6	92.6	0.009	26
				SP 22T	SP 3401	13.7	29	1.50	25	1.50				
LSRPM 132 M	IP 55	18.6	94.5	SP 22T	SP 3401	18.6	39	1.09	35	1.09	6	92.6	0.0165	40
				SP 27T	SP 3402			1.50		1.50				
LSRPM 132 M	IP 55	23	94.5	SP 27T	SP 3402	20.6	44	1.19	40	1.19	6	92.6	0.0231	44
				SP 40T	SP 4401	23	49	1.47	44	1.47				
LSRPM 132 M	IP 55	27	95	SP 40T	SP 4401	27	58	1.50	51	1.50	6	93.1	0.0311	49
LSRPM 160 MP	IP 55	35	95	SP 40T	SP 4401	35	75	1.10	67	1.10	6	93.1	0.0418	60
				SP 50T	SP 4402			1.40		1.50				
LSRPM 160 MP	IP 55	44	95.5	SP 50T	SP 4402	41	86	1.23	74	1.23	6	93.6	0.0514	69
				SP 60T	SP 4403	44	93	1.43	80	1.43				
LSRPM 160 LR	IP 55	52	95.5	SP 60T	SP 4403	52	110	1.20	95	1.20	6	93.6	0.0626	79
LSRPM 200 L1	IP 55	65	95.3	SP 75T	SP 5401	60	126	1.19	118	1.28	6	93.4	0.13	138
				SP 100T	SP 5402	65	138	1.33	129	1.43				
LSRPM 200 L1	IP 55	80	95.7	SP 120T	SP 6401	80	170	1.31	160	1.41	6	93.8	0.15	148
LSRPM 200 L1	IP 55	100	96.2	SPMA 1401-2S		100	212	1.40	200	1.50	6	94.3	0.2	168
LSRPM 200 L2	IP 55	120	96.4	SPMA 1401-2S		120	255	1.40	230	1.50	6	94.5	0.24	185
LSRPM 200 LU2	IP 55	135	96.5	SPMA 1401-2S		135	287	1.40	258	1.50	6	94.6	0.26	195
LSRPM 225 SR2	IP 55	150	96.6	SPMA 1401-2S		150	318	1.40	262	1.50	6	94.7	0.32	225
LSRPM 250 SE	IP 55	170	96.5	SPMA 1401-2S		170	361	1.40	280	1.50	6	94.6	0.76	310

[1] The drive parameters must comply with the rated current values to ensure thermal control is maintained, as must the maximum current values to avoid the risk of demagnetisation

3600 range

Class F - DT80K - S1 Self-Cooled - Altitude 1000 m max - Ambient temperature 40°C max

Power supply upstream from the drive 400 V (in accordance with IEC 60034-1)

11	Drive limit
11.9	Motor limit

MOTOR				DRIVE		VARIABLE SPEED MOTOR							*Motor* moment of inertia	*Motor* weight
Type	Ingress Protection	Rated power	Efficiency IEC 60034-2-1 2007	Type		Available power	Rated torque	Maximum torque/ Rated torque	Rated current[1]	Maximum current Rated current[1]	Minimum switching frequency	Efficiency		
		P_n	η			P_n	M_n	M_m/M_n	I_n	I_m/I_n	F_D	η	J	IM B3
		kW	4/4	LS	CT	kW	N.m		A		kHz	4/4	$kg.m^2$	kg
LSRPM 90 SL	IP 55	6.4	93.0	SP 5.5T	SP 1406	5.9	15.7	1.10	11	1.10	4	91.1	0.0032	14
				SP 8T	SP 2401	6.4	17	1.50	11.9	1.50				
LSRPM 90 L	IP 55	8	93.5	SP 8T	SP 2401	8	21	1.14	14.8	1.14	4	91.6	0.0051	17
				SP 11T	SP 2402			1.50		1.50				
LSRPM 100 L	IP 55	9.6	94.0	SP 8T	SP 2401	8.3	22.6	1.10	15.3	1.10	4	92.1	0.0066	19
				SP 11T	SP 2402	9.6	26	1.31	17.6	1.31				
LSRPM 100 L	IP 55	11.2	94.0	SP 11T	SP 2402	11.2	30	1.10	21	1.10	4	92.1	0.0078	24
				SP 16T	SP 2403			1.50		1.50				
LSRPM 100 L	IP 55	12.8	94.5	SP 16T	SP 2403	12.8	34	1.50	23	1.50	4	92.6	0.009	26
LSRPM 132 M	IP 55	17.6	94.5	SP 16T	SP 2403	14.5	39	1.14	27.2	1.14	4	92.6	0.0165	40
				SP 22T	SP 3401	17.6	47	1.50	33	1.50				
LSRPM 132 M	IP 55	22	94.5	SP 22T	SP 3401	18.8	50	1.09	35	1.09	4	92.6	0.0231	44
				SP 27T	SP 3402	22	58	1.50	41	1.50				
LSRPM 132 M	IP 55	26	95.0	SP 27T	SP 3402	23.3	62	1.09	43	1.09	4	93.1	0.0311	49
				SP 33T	SP 3403	26	69	1.27	48	1.27				
				SP 40T	SP 4401			1.50		1.50				
LSRPM 160 MP	IP 55	34	95.0	SP 40T	SP 4401	34	89	1.17	63	1.17	4	93.1	0.0418	60
				SP 50T	SP 4402			1.50		1.50				
LSRPM 160 MP	IP 55	41	95.5	SP 40T	SP 4401	36.2	96	1.09	68	1.09	4	93.6	0.0514	69
				SP 50T	SP 4402	41	109	1.18	77	1.18				
				SP 60T	SP 4403			1.50		1.50				
LSRPM 160 LR	IP 55	49	95.5	SP 50T	SP 4402	45	119	1.10	83	1.10	4	93.6	0.0626	79
				SP 60T	SP 4403	49	130	1.25	91	1.25				
				SP 75T	SP 5401			1.50		1.50				
LSRPM 200 L	IP 55	50	95.5	SP 60T	SP 4403	50	133	1.09	97	1.18	4	93.6	0.13	135
				SP 75T	SP 5401			1.35		1.45				
LSRPM 200 L1	IP 55	70	96.0	SP 60T	SP 4403	56	149	1.02	104	1.10	4	94.1	0.17	153
				SP 75T	SP 5401	70	186	1.08	130	1.16				
				SP 100T	SP 5402			1.35		1.45				
LSRPM 200 L1	IP 55	85	96.4	SP 75T	SP 5401	74	197	1.02	138	1.09	4	94.5	0.22	178
				SP 100T	SP 5402	85	225	1.08	158	1.16				
				SP 150T	SP 6401			1.35		1.45				
LSRPM 200 LU2	IP 55	115	96.8	SP 120T	SP 6401	111	294	1.02	205	1.10	4	94.9	0.26	195
				SP 150T	SP 6402	114	301	1.15	210	1.23				
				SPMA 1401-2S		115	305	1.35	213	1.45				
LSRPM 225 SG	IP 55	132	96.8	SPMA 1401-2S		132	350	1.35	250	1.45	4	94.9	0.54	250
LSRPM 250 SE1	IP 55	165	96.9	SPMA 1401-2S		165	438	1.35	310	1.45	4	95.0	0.57	268
LSRPM 250 SE1	IP 55	190	97.1	SPMA 1401-2S		190	504	1.14	350	1.22	4	95.2	0.65	288
				SPMA 1402-2S				1.35		1.45				
LSRPM 280 SD1	IP 55	240	97.1	SPMA 1401-2S		230	612	1.04	384	1.11	4	95.2	1.0	383
				SPMA 1402-2S		240	637	1.35	400	1.45				
LSRPM 280 MK1	IP 55	270	97.2	SPMA 1401-3S		270	716	1.35	480	1.45	4	95.3	2.1	620
PLSRPM 315 LD	IP 23	325	97.3	SPMA 1401-3S		325	862	1.04	575	1.12	4	95.4	2.3	735
				SPMA 1402-3S				1.20		1.29				
				SPMA 1401-4S				1.35		1.45				
PLSRPM 315 LD	IP 23	350	97.4	SPMA 1401-4S		350	928	1.35	630	1.45	4	95.5	2.4	750
PLSRPM 315 LD	IP 23	390	97.5	SPMA 1401-4S		390	1035	1.35	650	1.45	4	95.6	2.7	800

[1] *The drive parameters must comply with the rated current values to ensure thermal control is maintained, as must the maximum current values to avoid the risk of demagnetisation*

3000 range

Class F - DT80K - S1 Self-Cooled - Altitude 1000 m max - Ambient temperature 40°C max

Power supply upstream from the drive 400 V (in accordance with IEC 60034-1)

15.3 Drive limit
16.2 Motor limit

MOTOR				DRIVE		VARIABLE SPEED MOTOR							Motor moment of inertia	Motor weight
Type	Ingress Protection	Rated power P_n	Efficiency IEC 60034-2-1 2007 η	Type		Available power P_n	Rated torque M_n	Maximum torque/ Rated torque M_m/M_n	Rated current[1] I_n	Maximum current/ Rated current[1] I_m/I_n	Minimum switching frequency F_D	Efficiency η	J	IM B3
		kW	4/4	LS	CT	kW	N.m		A		kHz	4/4	kg.m²	kg
LSRPM 90 SL	IP 55	5.8	91.5	SP 5.5T	SP 1406	5.8	19	1.10	11	1.10	4	89.7	0.0032	14
				SP 8T	SP 2401			1.50		1.50				
LSRPM 90 L	IP 55	7.3	93.0	SP 8T	SP 2401	7.3	23	1.44	13.5	1.44	4	91.1	0.0051	17
LSRPM 100 L	IP 55	8.7	93.0	SP 8T	SP 2401	8.2	26.4	1.10	15.3	1.10	4	91.1	0.0066	19
				SP 11T	SP 2402	8.7	28	1.50	16.2	1.50				
LSRPM 100 L	IP 55	10.2	93.5	SP 11T	SP 2402	10.2	32	1.22	18.8	1.22	4	91.6	0.0078	24
				SP 16T	SP 2403			1.50		1.50				
LSRPM 100 L	IP 55	11.6	93.5	SP 11T	SP 2402	11.6	37	1.10	21	1.10	4	91.6	0.009	26
				SP 16T	SP 2403			1.50		1.50				
LSRPM 132 M	IP 55	15.8	93.0	SP 16T	SP 2403	14.3	48	1.14	27.2	1.14	4	91.1	0.0165	40
				SP 22T	SP 3401	15.8	50	1.50	30	1.50				
LSRPM 132 M	IP 55	19.7	93.5	SP 22T	SP 3401	18.1	58	1.09	35	1.09	4	91.6	0.0231	44
				SP 27T	SP 3402	19.7	63	1.50	38	1.50				
LSRPM 132 M	IP 55	23	94.0	SP 27T	SP 3402	22.5	72	1.09	43	1.09	4	92.1	0.0311	49
				SP 33T	SP 3403	23	74	1.50	44	1.50				
LSRPM 160 MP	IP 55	30	94.5	SP 33T	SP 3403	25.6	82	1.25	49	1.25	4	92.6	0.0418	60
				SP 40T	SP 4401	30	96	1.50	57	1.50				
LSRPM 160 MP	IP 55	37	95.0	SP 40T	SP 4401	37	118	1.09	68	1.09	4	93.1	0.0514	69
				SP 50T	SP 4402			1.50		1.50				
LSRPM 160 LR	IP 55	44	95.0	SP 50T	SP 4402	44	140	1.11	82	1.11	4	93.1	0.0626	79
				SP 60T	SP 4403			1.50		1.50				
LSRPM 200 L	IP 55	50	95.5	SP 60T	SP 4403	46	148	1.02	104	1.10	4	93.6	0.13	135
				SP 75T	SP 5401	50	159	1.26	112	1.35				
LSRPM 200 L1	IP 55	65	96.0	SP 60T	SP 4403	54	171	1.02	104	1.10	4	94.1	0.17	153
				SP 75T	SP 5401	65	207	1.12	126	1.20				
				SP 100T	SP 5402			1.35		1.45				
LSRPM 200 L1	IP 55	85	96.5	SP 100T	SP 5402	79	252	1.08	158	1.16	4	94.6	0.22	178
				SP 120T	SP 6401	85	271	1.35	170	1.45				
LSRPM 225 ST2	IP 55	110	96.6	SP 150T	SP 6402	107	342	1.15	210	1.23	4	94.7	0.24	195
				SPMA 1401-2S		110	350	1.35	215	1.45				
LSRPM 250 SE	IP 55	145	97.1	SPMA 1401-2S		145	462	1.35	285	1.45	4	95.2	0.57	265
LSRPM 250 ME1	IP 55	170	97.2	SPMA 1401-2S		170	541	1.35	338	1.45	4	95.3	0.65	288
LSRPM 280 SC1	IP 55	200	97.3	SPMA 1401-2S		200	637	1.09	365	1.17	4	95.4	0.84	333
				SPMA 1401-3S				1.35		1.45				
LSRPM 280 SD1	IP 55	220	97.4	SPMA 1401-2S		220	700	1.08	370	1.16	4	95.5	1.0	383
				SPMA 1401-3S				1.35		1.45				
LSRPM 280 MK1	IP 55	260	97.4	SPMA 1401-3S		260	828	1.35	470	1.45	4	95.5	2.1	620
LSRPM 280 MK1	IP 55	290	97.4	SPMA 1401-3S		290	923	1.13	530	1.21	4	95.5	2.1	620
				SPMA 1402-3S				1.30		1.39				
LSRPM 315 SP1	IP 55	320	97.5	SPMA 1401-3S		319	1017	1.02	584	1.10	4	95.6	2.5	670
				SPMA 1401-4S		320	1019	1.35	585	1.45				
PLSRPM 315 LD	IP 23	340	97.5	SPMA 1402-3S		324	1030	1.15	600	1.23	4	95.6	2.7	800
				SPMA 1401-4S		340	1082	1.35	630	1.45				

[1] *The drive parameters must comply with the rated current values to ensure thermal control is maintained, as must the maximum current values to avoid the risk of demagnetisation*

2400 range

Class F - DT80K - S1 Self-Cooled - Altitude 1000 m max - Ambient temperature 40°C max

Power supply upstream from the drive 400 V (in accordance with IEC 60034-1)

8.8	Drive limit
9.1	Motor limit

MOTOR				DRIVE		VARIABLE SPEED MOTOR							*Motor* moment of inertia	*Motor* weight
Type	Ingress Protection	Rated power	Efficiency IEC 60034-2-1 2007	Type		Available power	Rated torque	Maximum torque/ Rated torque	Rated current[1]	Maximum current/ Rated current[1]	Minimum switching frequency	Efficiency		
		P_n	η			P_n	M_n	M_m/M_n	I_n	I_m/I_n	F_D	η	J	IM B3
		kW	4/4	LS	CT	kW	N.m		A		kHz	4/4	$kg.m^2$	kg
LSRPM 90 SL	IP 55	4.8	90.5	SP 4.5T	SP 1405	4.6	18.4	1.09	8.8	1.09	4	88.7	0.0032	14
				SP 5.5T	SP 1406	4.8	19	1.50	9.1	1.50				
LSRPM 90 L	IP 55	6	91.5	SP 5.5T	SP 1406	6	24	1.11	10.9	1.11	4	89.7	0.0051	17
				SP 8T	SP 2401			1.50		1.50				
LSRPM 100 L	IP 55	7.2	92.0	SP 8T	SP 2401	7.2	29	1.50	13	1.50	4	90.2	0.0066	19
LSRPM 100 L	IP 55	8.4	92.5	SP 8T	SP 2401	8.4	33	1.11	15.2	1.11	4	90.7	0.0078	24
				SP 11T	SP 2402			1.50		1.50				
LSRPM 100 L	IP 55	9.5	93.0	SP 11T	SP 2402	9.5	38	1.30	17.7	1.30	4	91.1	0.009	26
LSRPM 132 M	IP 55	13.1	92.5	SP 11T	SP 2402	11	43	1.10	21	1.10	4	90.7	0.0165	40
				SP 16T	SP 2403	13.1	52	1.24	25	1.24				
LSRPM 132 M	IP 55	16.3	93.0	SP 16T	SP 2403	14.2	61	1.15	27	1.15	4	91.1	0.0231	44
				SP 22T	SP 3401	16.3	65	1.50	31	1.50				
LSRPM 132 M	IP 55	19.2	93.5	SP 22T	SP 3401	18.2	72	1.09	35	1.09	4	91.6	0.0311	49
				SP 27T	SP 3402	19.2	76	1.50	37	1.50				
LSRPM 160 MP	IP 55	25	94.0	SP 27T	SP 3402	22.9	91	1.09	43	1.09	4	92.1	0.0418	60
				SP 33T	SP 3403	25	99	1.30	47	1.30				
				SP 40T	SP 4401			1.50		1.50				
LSRPM 160 MP	IP 55	31	94.5	SP 40T	SP 4401	31	122	1.50	58	1.50	4	92.6	0.0514	69
LSRPM 160 LR	IP 55	36	94.5	SP 40T	SP 4401	36	143	1.09	68	1.09	4	92.6	0.0626	79
				SP 50T	SP 4402			1.50		1.50				
LSRPM 200 L	IP 55	37.5	95.0	SP 50T	SP 4402	38	149	1.05	81	1.12	4	93.1	0.13	135
				SP 60T	SP 4403			1.35		1.45				
LSRPM 200 L	IP 55	50	95.4	SP 60T	SP 4403	47	188	1.02	104	1.10	4	93.5	0.17	150
				SP 75T	SP 5401	50	199	1.28	110	1.37				
LSRPM 200 L1	IP 55	65	95.9	SP 75T	SP 5401	65	259	1.03	137	1.10	4	94.0	0.20	168
				SP 100T	SP 5402			1.35		1.45				
LSRPM 200 L1	IP 55	80	96.6	SP 100T	SP 5402	79	314	1.08	158	1.16	4	94.7	0.24	183
				SP 150T	SP 6402	80	318	1.35	160	1.45				
LSRPM 225 MR1	IP 55	100	96.9	SP 120T	SP 6401	100	398	1.05	200	1.13	4	95.0	0.30	218
				SPMA 1401-2S				1.35		1.45				
LSRPM 250 SE	IP 55	125	97.2	SP 150T	SP 6402	112	444	1.15	210	1.23	4	95.3	0.65	285
				SPMA 1401-2S		125	497	1.35	235	1.45				
LSRPM 250 ME	IP 55	150	97.3	SPMA 1401-2S		150	597	1.35	285	1.45	4	95.4	0.75	310
LSRPM 280 SD1	IP 55	190	97.5	SPMA 1401-2S		190	756	1.14	350	1.22	4	95.6	1.0	383
				SPMA 1402-2S				1.35		1.45				
LSRPM 280 MK1	IP 55	230	97.4	SPMA 1402-2S		214	851	1.15	399	1.24	4	95.5	1.9	591
				SPMA 1401-3S		230	915	1.35	429	1.45				
LSRPM 315 SP1	IP 55	285	97.6	SPMA 1401-3S		285	1134	1.17	509	1.26	4	95.7	2.5	675
				SPMA 1402-3S				1.35		1.45				
LSRPM 315 SR1	IP 55	310	97.7	SPMA 1401-3S		310	1233	1.08	555	1.16	4	95.8	2.6	715
				SPMA 1401-4S				1.35		1.45				
LSRPM 315 MR1	IP 55	350	97.5	SPMA 1401-4S		350	1393	1.35	645	1.45	4	95.6	2.7	720

[1] *The drive parameters must comply with the rated current values to ensure thermal control is maintained, as must the maximum current values to avoid the risk of demagnetisation*

1800 range

Class F - DT80K - S1 Self-Cooled - Altitude 1000 m max - Ambient temperature 40°C max

Power supply upstream from the drive 400 V (in accordance with IEC 60034-1)

8.8	Drive limit
10.2	Motor limit

MOTOR				DRIVE		VARIABLE SPEED MOTOR							*Motor* moment of inertia	*Motor* weight
Type	Ingress Protection	Rated power P_n	Efficiency IEC 60034-2-1 2007 η	Type		Available power P_n	Rated torque M_n	Maximum torque/ Rated torque M_m/M_n	Rated current[1] I_n	Maximum current/ Rated current[1] I_m/I_n	Minimum switching frequency F_D	Efficiency η	J	IM B3
		kW	4/4	LS	CT	kW	N.m		A		kHz	4/4	kg.m²	kg
LSRPM 90 SL	IP 55	3.6	89.0	SP 3.5T	SP 1404	3.6	19	1.09	6.9	1.09	3	87.2	0.0032	14
				SP 4.5T	SP 1405			1.50		1.50				
LSRPM 90 L	IP 55	4.5	90.5	SP 4.5T	SP 1405	4.5	24	1.13	8.5	1.13	3	88.7	0.0051	17
				SP 5.5T	SP 1406			1.50		1.50				
LSRPM 100 L	IP 55	5.4	91.0	SP 4.5T	SP 1405	4.7	25	1.09	8.8	1.09	3	89.2	0.0066	19
				SP 5.5T	SP 1406	5.4	29	1.19	10.2	1.19				
				SP 8T	SP 2401			1.50		1.50				
LSRPM 100 L	IP 55	6.3	91.5	SP 5.5T	SP 1406	5.9	31	1.10	11	1.10	3	89.7	0.0078	24
				SP 8T	SP 2401	6.3	33	1.50	11.8	1.50				
LSRPM 100 L	IP 55	7.2	92.0	SP 8T	SP 2401	7.2	38	1.50	13.4	1.50	3	90.2	0.009	26
LSRPM 132 M	IP 55	9.8	92.0	SP 8T	SP 2401	7.9	42	1.10	15.3	1.10	3	90.2	0.0165	40
				SP 11T	SP 2402	9.8	52	1.21	19	1.21				
				SP 16T	SP 2403			1.50		1.50				
LSRPM 132 M	IP 55	12.3	92.5	SP 11T	SP 2402	10.8	57	1.10	21	1.10	3	90.7	0.0231	44
				SP 16T	SP 2403	12.3	65	1.50	24	1.50				
LSRPM 132 M	IP 55	14.4	93.0	SP 16T	SP 2403	14.4	76	1.11	28	1.11	3	91.1	0.0311	49
				SP 22T	SP 3401			1.50		1.50				
LSRPM 160 MP	IP 55	18.7	93.5	SP 22T	SP 3401	18.1	96	1.09	35	1.09	3	91.6	0.0418	60
				SP 27T	SP 3402	18.7	99	1.50	36	1.50				
LSRPM 160 MP	IP 55	23	94.0	SP 27T	SP 3402	23	122	1.09	43	1.09	3	92.1	0.0514	69
				SP 33T	SP 3403			1.51		1.51				
LSRPM 160 LR	IP 55	27.3	94.0	SP 33T	SP 3403	27.3	145	1.17	52	1.17	3	92.1	0.0626	79
				SP 40T	SP 4401			1.50		1.50				
LSRPM 200 L	IP 55	33	94.0	SP 40T	SP 4401	28.4	151	1.01	68	1.09	3	92.1	0.13	135
				SP 50T	SP 4402	33	175	1.35	79	1.45				
LSRPM 200 L	IP 55	40	94.8	SP 50T	SP 4402	40	212	1.03	82.5	1.10	3	92.9	0.17	150
				SP 60T	SP 4403			1.35		1.45				
LSRPM 200 L	IP 55	55	95.7	SP 60T	SP 4403	50	264	1.02	104	1.10	3	93.8	0.20	165
				SP 75T	SP 5401	55	292	1.35	115	1.45				
LSRPM 225 ST1	IP 55	70	96.1	SP 75T	SP 5401	68	358	1.02	138	1.09	3	94.2	0.26	193
				SP 100T	SP 5402	70	371	1.35	143	1.45				
LSRPM 225 MR1	IP 55	85	96.0	SP 100T	SP 5402	83	441	1.02	168	1.10	3	94.1	0.32	223
				SP 120T	SP 6401	85	451	1.35	172	1.45				
LSRPM 250 ME	IP 55	100	96.1	SP 120T	SP 6401	100	530	1.07	195	1.15	3	94.2	0.65	285
				SP 150T	SP 6402			1.35		1.45				
LSRPM 280 SC	IP 55	125	96.3	SP 150T	SP 6402	119	631	1.02	236	1.10	3	94.4	0.84	330
				SPMA 1401-2S		125	663	1.35	248	1.45				
LSRPM 280 SD	IP 55	150	96.4	SPMA 1401-2S		150	796	1.35	295	1.45	3	94.5	1.0	380
LSRPM 280 MK1	IP 55	175	96.5	SPMA 1401-2S		175	928	1.35	330	1.45	3	94.6	1.8	568
LSRPM 315 SP1	IP 55	195	96.7	SPMA 1401-2S		195	1035	1.08	370	1.16	3	94.8	2.13	635
				SPMA 1402-2S				1.35		1.45				
LSRPM 315 MR1	IP 55	230	96.9	SPMA 1402-2S		230	1220	1.08	425	1.16	3	95.0	2.7	720
				SPMA 1401-3S				1.35		1.45				
LSRPM 315 MR1	IP 55	300	96.4	SPMA 1402-3S		300	1592	1.03	670	1.10	3	94.6	2.7	720
				11/04/12				1.35		1.45				

[1] *The drive parameters must comply with the rated current values to ensure thermal control is maintained, as must the maximum current values to avoid the risk of demagnetisation*

1500 range

Class F - DT80K - S1 Self-Cooled - Altitude 1000 m max - Ambient temperature 40°C max

Power supply upstream from the drive 400 V (in accordance with IEC 60034-1)

15.3	Drive limit
16	Motor limit

MOTOR				DRIVE		VARIABLE SPEED MOTOR							*Motor* moment of inertia	*Motor* weight
Type	Ingress Protection	Rated power	Efficiency IEC 60034-2-1 2007	Type		Available power	Rated torque	Maximum torque/ Rated torque	Rated current[1]	Maximum current/ Rated current[1]	Minimum switching frequency	Efficiency		
		P_n	η			P_n	M_n	M_m/M_n	I_n	I_m/I_n	F_D	η	J	IM B3
		kW	4/4	LS	CT	kW	N.m		A		kHz	4/4	$kg.m^2$	kg
LSRPM 90 SL	IP 55	3	87.0	SPz 2.5T	SP 0405	2.1	13.5	1.74	4.2	1.74	3	85.3	0.0032	14
				SP 3.5T	SP 1404	3	19	1.50	5.9	1.50				
LSRPM 90 L	IP 55	3.7	89.0	SP 3.5T	SP 1404	3.5	23	1.09	6.9	1.09	3	87.2	0.0051	17
				SP 4.5T	SP 1405	3.7	24	1.50	7.2	1.50				
LSRPM 100 L	IP 55	4.5	90.0	SP 4.5T	SP 1405	4.5	29	1.12	8.6	1.12	3	88.2	0.0066	19
				SP 5.5T	SP 1406			1.50		1.50				
LSRPM 100 L	IP 55	5.2	91.0	SP 5.5T	SP 1406	5.2	33	1.22	9.9	1.22	3	89.2	0.0078	24
				SP 8T	SP 2401			1.50		1.50				
LSRPM 100 L	IP 55	6	91.5	SP 5.5T	SP 1406	6	38	1.11	10.9	1.11	3	89.7	0.009	26
				SP 8T	SP 2401			1.50		1.50				
LSRPM 132 M	IP 55	8.2	91.0	SP 8T	SP 2401	7.8	50	1.10	15.3	1.10	3	89.2	0.0165	40
				SP 11T	SP 2402	8.2	52	1.50	16	1.50				
LSRPM 132 M	IP 55	10.2	91.5	SP 11T	SP 2402	10.2	65	1.16	19.9	1.16	3	89.7	0.0231	44
				SP 16T	SP 2403			1.50		1.50				
LSRPM 132 M	IP 55	12	92.0	SP 11T	SP 2402	11	69	1.10	21	1.10	3	90.2	0.0311	49
				SP 16T	SP 2403	12	76	1.50	23	1.50				
LSRPM 160 MP	IP 55	15.6	92.5	SP 16T	SP 2403	15.1	96	1.07	29	1.07	3	90.7	0.0418	60
				SP 22T	SP 3401	15.6	99	1.50	30	1.50				
LSRPM 160 MP	IP 55	19.2	93.0	SP 22T	SP 3401	18.2	115	1.09	35	1.09	3	91.1	0.0514	69
				SP 27T	SP 3402	19.2	122	1.50	37	1.50				
LSRPM 160 LR	IP 55	22.8	93.5	SP 27T	SP 3402	22.8	145	1.09	43	1.09	3	91.7	0.0626	79
				SP 33T	SP 3403			1.50		1.50				
LSRPM 200 L	IP 55	25	94.0	SP 33T	SP 3403	25	159	1.01	56	1.09	3	92.1	0.13	135
				SP 40T	SP 4401			1.35		1.45				
LSRPM 200 L	IP 55	33	94.6	SP 40T	SP 4401	29.9	190	1.01	68	1.09	3	92.7	0.17	150
				SP 50T	SP 4402	33	210	1.35	75	1.45				
LSRPM 200 L	IP 55	40	95.2	SP 50T	SP 4402	40	255	1.02	83	1.10	3	93.3	0.2	165
				SP 60T	SP 4403			1.35		1.45				
LSRPM 200 LU	IP 55	55	95.5	SP 60T	SP 4403	52	331	1.02	104	1.10	3	93.7	0.26	190
				SP 75T	SP 5401	55	350	1.35	110	1.45				
LSRPM 225 MR1	IP 55	70	95.7	SP 75T	SP 5401	68	433	1.02	138	1.09	3	93.8	0.32	223
				SP 100T	SP 5402	70	446	1.35	142	1.45				
LSRPM 250 ME	IP 55	85	95.6	SP 100T	SP 5402	82	519	1.02	168	1.10	3	93.7	0.65	285
				SP 120T	SP 6401	85	541	1.35	175	1.45				
LSRPM 280 SC	IP 55	105	96.3	SP 120T	SP 6401	100	637	1.02	205	1.10	3	94.4	0.84	330
				SP 150T	SP 6402	105	668	1.35	215	1.45				
LSRPM 280 SD	IP 55	125	96.4	SP 150T	SP 6402	120	767	1.02	236	1.10	3	94.5	1.0	380
				SPMA 1401-2S		125	796	1.35	245	1.45				
LSRPM 280 MK1	IP 55	145	96.3	SPMA 1401-2S		145	923	1.35	285	1.45	3	94.4	1.8	568
LSRPM 315 SP1	IP 55	175	96.5	SPMA 1401-2S		175	1114	1.35	350	1.45	3	94.6	2.24	635
LSRPM 315 MR1	IP 55	220	96.7	SPMA 1402-2S		220	1401	1.11	415	1.19	3	94.8	2.7	720
				SPMA 1401-3S				1.35		1.45				
LSRPM 315 MR1	IP 55	250	97.0	SPMA 1401-3S		250	1592	1.35	490	1.45	3	95.1	2.7	720
PLSRPM 315 LD	IP 23	360	97.0	SPMA 1401-3S		266	1694	1.02	584	1.10	3	95.1	3	910
				SPMA 1402-3S		306	1950	1.02	672	1.10				
				SPMA 1401-4S		355	2260	1.03	779	1.10				
				SPMA 1402-4S		360	2292	1.35	790	1.45				

[1] *The drive parameters must comply with the rated current values to ensure thermal control is maintained, as must the maximum current values to avoid the risk of demagnetisation*

900 range

Class F - DT80K - S1 Self-Cooled - Altitude 1000 m max - Ambient temperature 40°C max

Power supply upstream from the drive 400 V (in accordance with IEC 60034-1)

12.1	Drive limit
18.9	Motor limit

MOTOR				DRIVE		VARIABLE SPEED MOTOR							*Motor* moment of inertia	*Motor* weight
Type	Ingress Protection	Rated power	Efficiency IEC 60034-2-1 2007	Type		Available power	Rated torque	Maximum torque/ Rated torque	Rated current[1]	Maximum current/ Rated current[1]	Minimum switching frequency	Efficiency		
		P_n	η			P_n	M_n	M_m/M_n	I_n	I_m/I_n	F_D	η	J	IM B3
		kW	4/4	LS	CT	kW	N.m		A		kHz	4/4	$kg.m^2$	kg
LSRPM 90 SL	IP 55	1.8	82.0	SPz 2T	SP 0404	1.4	15	1.50	3	1.50	3	80.4	0.0032	14
				SPz 2.5T	SP 0405	1.8	19	1.50	3.8	1.50				
LSRPM 90 L	IP 55	2.2	84.0	SPz 2.5T	SP 0405	2	21.9	1.50	4.2	1.50	3	82.3	0.0051	17
				SP 3.5T	SP 1404	2.2	24	1.50	4.6	1.50				
LSRPM 100 L	IP 55	2.7	85.0	SP 3.5T	SP 1404	2.7	29	1.50	5.4	1.50	3	83.3	0.0066	19
LSRPM 100 L	IP 55	3.1	87.0	SP 3.5T	SP 1404	3.1	33	1.21	6.2	1.21	3	85.3	0.0078	24
				SP 4.5T	SP 1405			1.50		1.50				
LSRPM 100 L	IP 55	3.6	88.0	SP 3.5T	SP 1404	3.6	38	1.09	6.9	1.09	3	86.2	0.009	26
				SP 4.5T	SP 1405			1.50		1.50				
LSRPM 132 M	IP 55	4.9	88.0	SP 4.5T	SP 1405	4.4	46	1.09	8.8	1.09	3	86.2	0.0165	40
				SP 5.5T	SP 1406	4.9	52	1.50	9.9	1.50				
LSRPM 132 M	IP 55	6.1	89.0	SP 5.5T	SP 1406	5.5	58	1.10	11	1.10	3	87.2	0.0231	44
				SP 8T	SP 2401	6.1	65	1.50	12.3	1.50				
LSRPM 132 M	IP 55	7.2	90.0	SP 8T	SP2401	7.2	76	1.17	14.3	1.17	3	88.2	0.0311	49
				SP 11T	SP 2402			1.50		1.50				
LSRPM 160 MP	IP 55	9.4	90.5	SP 8T	SP 2401	7.9	83	1.10	15.3	1.10	3	89.2	0.0418	60
				SP 11T	SP 2402	9.4	99	1.26	18.3	1.26				
				SP 16T	SP 2403			1.50		1.50				
LSRPM 160 MP	IP 55	11.5	91.0	SP 11T	SP 2402	10.5	111	1.10	21	1.10	3	89.7	0.0514	69
				SP 16T	SP 2403	11.5	122	1.50	23	1.50				
LSRPM 160 LR	IP 55	13.7	91.0	SP 16T	SP 2403	13.7	145	1.15	27	1.15	3	89.7	0.0626	79
				SP 22T	SP 3401			1.50		1.50				
LSRPM 200 L	IP 55	15	90.6	SP 27T	SP 3402	15	159	1.35	38	1.45	3	88.8	0.13	135
LSRPM 200 L	IP 55	20	91.6	SP 27T	SP 3402	20	212	1.02	43	1.09	3	89.8	0.17	150
				SP 33T	SP 3403			1.35		1.45				
LSRPM 200 L	IP 55	25	92.3	SP 33T	SP 3403	25	265	1.09	52	1.17	3	90.5	0.2	165
				SP 40T	SP 4401			1.35		1.45				
LSRPM 200 LU	IP 55	33	92.9	SP 33T	SP 3403	26.4	280	1.01	56	1.09	3	91.0	0.26	190
				SP 40T	SP 4401	32	340	1.01	68	1.09				
				SP 50T	SP 4402	33	350	1.35	70	1.45				
LSRPM 250 SE	IP 55	40	95.5	SP 50T	SP 4402	40	424	1.07	79	1.15	3	93.6	0.54	250
				SP 60T	SP 4403			1.35		1.45				
LSRPM 250 ME	IP 55	50	95.8	SP 50T	SP 4402	42	450	1.02	83	1.10	3	93.9	0.65	285
				SP 60T	SP 4403	50	531	1.35	98	1.45				
LSRPM 280 SD	IP 55	60	96.2	SP 60T	SP 4403	52	552	1.02	104	1.10	3	94.3	0.9	271
				SP 75T	SP 5401	60	637	1.35	120	1.45				
LSRPM 280 SD	IP 55	75	96.0	SP 75T	SP 5401	74	785	1.02	138	1.09	3	94.1	1	380
				SP 100T	SP 5402	75	796	1.35	140	1.45				
LSRPM 280 MK1	IP 55	85	95.9	SP 100T	SP 5402	84	891	1.02	168	1.10	3	94.0	1.67	545
				SP 120T	SP 6401	85	902	1.35	170	1.45				
LSRPM 315 SP1	IP 55	100	96.2	SP 120T	SP 6401	100	1061	1.10	190	1.18	3	94.3	2.09	625
				SP 150T	SP 6402			1.35		1.45				
LSRPM 315 MR1	IP 55	130	96.6	SP 150T	SP 6402	116	1228	1.02	236	1.10	3	94.7	2.6	715
				SPMA 1401-2S		130	1379	1.35	265	1.45				

[1] The drive parameters must comply with the rated current values to ensure thermal control is maintained, as must the maximum current values to avoid the risk of demagnetisation

750 range

Class F - DT80K - S1 Self-Cooled - Altitude 1000 m max - Ambient temperature 40°C max

Power supply upstream from the drive 400 V (in accordance with IEC 60034-1)

12.1	Drive limit
18.9	Motor limit

MOTOR				DRIVE		VARIABLE SPEED MOTOR							*Motor* moment of inertia	*Motor* weight
Type	Ingress Protection	Rated power	Efficiency IEC 60034-2-1 2007	Type		Available power	Rated torque	Maximum torque/ Rated torque	Rated current[1]	Maximum current/ Rated current[1]	Minimum switching frequency	Efficiency		
		P_n	η			P_n	M_n	M_m/M_n	I_n	I_m/I_n	F_D	η	J	IM B3
		kW	4/4	LS	CT	kW	N.m		A		kHz	4/4	$kg.m^2$	kg
LSRPM 90 SL	IP 55	1.4	80.0	SPz 1.5T	SP 0403	1	12.6	1.50	2.1	1.50	3	78.4	0.0032	14
				SPz 2T	SP 0404	1.4	18	1.50	3	1.50				
LSRPM 90 L	IP 55	1.8	83.0	SPz 2T	SP 0404	1.5	19	1.50	3	1.50	3	81.3	0.0051	17
				SPz 2.5T	SP 0405	1.8	23	1.50	3.7	1.50				
LSRPM 100 L	IP 55	2.1	84.0	SPz 2.5T	SP 0405	2	26	1.50	4.2	1.50	3	82.3	0.0066	19
				SP 3.5T	SP 1404	2.1	27	1.50	4.4	1.50				
LSRPM 100 L	IP 55	2.5	85.0	SP 3.5T	SP 1404	2.5	32	1.50	5	1.50	3	83.3	0.0078	24
LSRPM 100 L	IP 55	2.8	86.0	SP 3.5T	SP 1404	2.8	36	1.50	5.7	1.50	3	84.3	0.009	26
LSRPM 132 M	IP 55	4.1	86.0	SP 3.5T	SP 1404	3.3	42	1.09	6.9	1.09	3	84.3	0.0165	40
				SP 4.5T	SP 1405	4.1	52	1.13	8.5	1.13				
				SP 5.5T	SP 1406			1.50		1.50				
LSRPM 132 M	IP 55	5.1	87.0	SP 4.5T	SP 1405	4.3	54	1.09	8.8	1.09	3	85.3	0.0231	44
				SP 5.5T	SP 1406	5.1	65	1.15	10.5	1.15				
				SP 8T	SP 2401			1.50		1.50				
LSRPM 132 M	IP 55	6	88.0	SP 5.5T	SP 1406	5.4	69	1.10	11	1.10	3	86.2	0.0311	49
				SP 8T	SP 2401	6	76	1.50	12.2	1.50				
LSRPM 160 MP	IP 55	7.8	89.0	SP 8T	SP 2401	7.7	97	1.10	15.3	1.10	3	87.2	0.0418	60
				SP 11T	SP 2402	7.8	99	1.50	15.6	1.50				
LSRPM 160 MP	IP 55	9.6	90.0	SP 11T	SP 2402	8.3	106	1.50	16.5	1.50	3	88.2	0.0514	69
				SP 16T	SP 2403	9.6	122	1.50	19	1.50				
LSRPM 160 LR	IP 55	11.4	90.5	SP 11T	SP 2402	11.4	145	1.10	21	1.10	3	88.7	0.0626	79
				SP 16T	SP 2403			1.50		1.50				
LSRPM 200 L	IP 55	12,5	89.5	SP 22T	SP 3401	12,5	159	1.35	32	1.45	3	87.7	0.13	135
LSRPM 200 L	IP 55	16.5	90.8	SP 22T	SP 3401	16.5	204	1.01	35	1.09	3	89.0	0.17	150
				SP 27T	SP 3402			1.35		1.45				
LSRPM 200 L	IP 55	21	91.4	SP 27T	SP 3402	20.5	261	1.02	43	1.09	3	89.6	0.2	165
				SP 33T	SP 3403	21	267	1.35	44	1.45				
LSRPM 200 LU	IP 55	26	92.2	SP 33T	SP 3403	25.5	331	1.01	56	1.09	3	91.1	0.26	190
				SP 40T	SP 4401	26	337	1.35	57	1.45				
LSRPM 250 SE	IP 55	33	94.8	SP 33T	SP 3403	28.4	362	1.01	56	1.09	3	92.9	0.54	250
				SP 40T	SP 4401	33	420	1.06	65	1.14				
				SP 50T	SP 4402			1.35		1.45				
LSRPM 250 SE	IP 55	40	95.3	SP 40T	SP 4401	34	433	1.01	68	1.09	3	93.4	0.65	285
				SP 50T	SP 4402	40	509	1.06	80	1.14				
				SP 60T	SP 4403			1.35		1.45				
LSRPM 280 SD	IP 55	55	95.5	SP 50T	SP 4402	43	543	1.02	83	1.10	3	93.6	0.9	350
				SP 60T	SP 4403	53	680	1.02	104	1.10				
				SP 75T	SP 5401	55	700	1.35	107	1.45				
LSRPM 280 MD	IP 55	70	95.6	SP 75T	SP 5401	68	866	1.02	138	1.09	3	93.7	1	380
				SP 100T	SP 5402	70	891	1.35	142	1.45				
LSRPM 315 SP1	IP 55	85	95.9	SP 100T	SP 5402	84	1063	1.02	168	1.10	3	94.0	2.09	625
				SP 120T	SP 6401	85	1082	1.35	171	1.45				
LSRPM 315 MR1	IP 55	110	96.3	SP 120T	SP 6401	105	1336	1.02	205	1.10	3	94.4	2.6	715
				SP 150T	SP 6402	110	1401	1.35	215	1.45				

[1] *The drive parameters must comply with the rated current values to ensure thermal control is maintained, as must the maximum current values to avoid the risk of demagnetisation*

375 range

Class F - DT80K - S1 Self-Cooled - Altitude 1000 m max - Ambient temperature 40°C max

Power supply upstream from the drive 400 V (in accordance with IEC 60034-1)

12.1	Drive limit
18.9	Motor limit

MOTOR				DRIVE		VARIABLE SPEED MOTOR							*Motor* moment of inertia	*Motor* weight
Type	Ingress Protection	Rated power	Efficiency IEC 60034-2-1 2007	Type		Available power	Rated torque	Maximum torque/ Rated torque	Rated current[1]	Maximum current/ Rated current[1]	Minimum switching frequency	Efficiency		
		P_n	η			P_n	M_n	M_m/M_n	I_n	I_m/I_n	F_D	η	J	IM B3
		kW	4/4	LS	CT	kW	N.m		A		kHz	4/4	$kg.m^2$	kg
LSRPM 90 SL	IP 55	0.7	70	**SPz 1.2T**	**SP 0402**	0.7	17	1.50	1.6	1.50	3	68.6	0.003	14
LSRPM 90 L	IP 55	0.8	74	**SPz 1.5T**	**SP 0403**	0.8	21	1.50	1.9	1.50	3	72.5	0.005	17
LSRPM 100 L	IP 55	1	75	**SPz 1.5T**	**SP 0403**	0.91	23.7	1.50	2.1	1.50	3	73.5	0.006	19
				SPz 2T	**SP 0404**	1	26	1.50	2.3	1.50				
LSRPM 100 L	IP 55	1.2	77	**SPz 2T**	**SP 0404**	1.2	30	1.50	2.6	1.50	3	75.5	0.008	24
LSRPM 100 L	IP 55	1.3	78	**SPz 2T**	**SP 0404**	1.3	34	1.50	3	1.50	3	76.4	0.009	26
LSRPM 132 M	IP 55	1.8	78	**SPz 2.5T**	**SP 0405**	1.8	47	1.50	4.2	1.50	3	76.4	0.017	40
LSRPM 132 M	IP 55	2.3	80	**SP 3.5T**	**SP 1404**	2.3	58	1.50	5.1	1.50	3	78.4	0.023	44
LSRPM 132 M	IP 55	2.7	82	**SP 3.5T**	**SP 1404**	2.7	69	1.50	5.8	1.50	3	80.4	0.031	49
LSRPM 160 MP	IP 55	3.5	84	**SP 4.5T**	**SP 1405**	3.5	89	1.50	7.4	1.50	3	82.3	0.042	60
LSRPM 160 MP	IP 55	4.3	85	**SP 4.5T**	**SP 1405**	4.2	108	1.09	8.8	1.09	3	83.3	0.051	69
				SP 5.5T	**SP 1406**	4.3	110	1.50	9	1.50				
LSRPM 160 LR	IP 55	5.1	86	**SP 5.5T**	**SP 1406**	5.1	130	1.14	10.6	1.14	3	84.3	0.063	79
				SP 8T	**SP 2401**			1.50		1.50				

[1] The drive parameters must comply with the rated current values to ensure thermal control is maintained, as must the maximum current values to avoid the risk of demagnetisation

General information

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.
Unidrive SP drives are designed to operate with a mains supply typically found on industrial sites throughout the world.However, for each installation, it is important to know the characteristics of the mains supply in order to carry out corrective measures in the event of abnormal conditions.

TRANSIENT OVERVOLTAGES

There are numerous sources of overvoltages on an electrical installation:
• Connection/disconnection of banks of power factor correction capacitors
• High-power thyristor-controlled equipment (oven, DC drive, etc)
• Overhead power supply

Connection/disconnection of a bank of cos □ correction capacitors

Connecting power factor correction capacitors in parallel on the drive power supply line when the drive is running can generate transient overvoltages that are likely to trip the drive safety devices, or even damage it in extreme cases.
If banks of power factor correction capacitors are used on the power supply line, make sure that:
• The threshold between steps is low enough to avoid causing overvoltage on the line
• The capacitors are not permanently connected

Presence of commutation notches on the line

When high-power thyristor-controlled equipment is connected on the same line as the drive, it is essential to ensure that the harmonics generated by the commutation notches do not excessively distort the mains voltage and do not create voltage peaks with amplitude higher than 1.6 x mains Vrms. If this is the case, it is essential to take corrective measures to guarantee the mains quality.

UNBALANCED POWER SUPPLY

In the same way as can be seen on an electric motor, the line phase voltage imbalance of a drive may have consequences on its operation. Please refer to the drive installation manual.

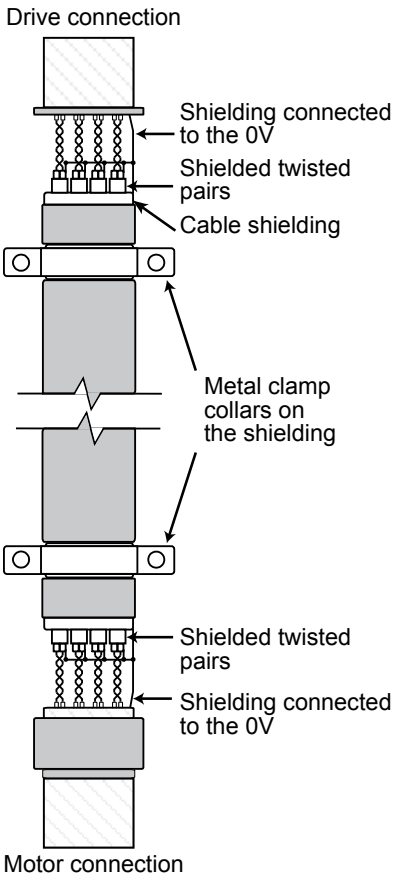
EQUIPOTENTIAL BONDING

The equipotential earth bonding of some industrial sites is not always observed. This lack of equipotential 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 the earth connections designed to protect people, by linking metal grounds to earth via a cable, serve as a substitute for the 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 AND ENCODER CABLES

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



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:

Switch-fuse : a padlockable breaking device must be installed to isolate the installation should operator intervention be necessary. This device must provide protection against overheating and short-circuits. The fuse rating is stated in the drive documentation. The switch-fuse can be replaced with a circuit-breaker (with appropriate breaking capacity).

RFI filter : its role is to reduce the drive electromagnetic emissions, and thus comply with EMC standards. Leroy-Somer drives are, as standard, equipped with an internal RFI filter. Some environments require the addition of an external filter. Please consult the drive documentation to find out the drive conformance levels, with and without an external RFI filter.

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, the cable length (voltage drop), etc. See below "Sizing the power cables".

Line reactor: its role is to reduce the risk of damage to the drives following phase imbalance or significant disturbance on the electrical mains supply. The line reactor can also reduce low-frequency harmonics.

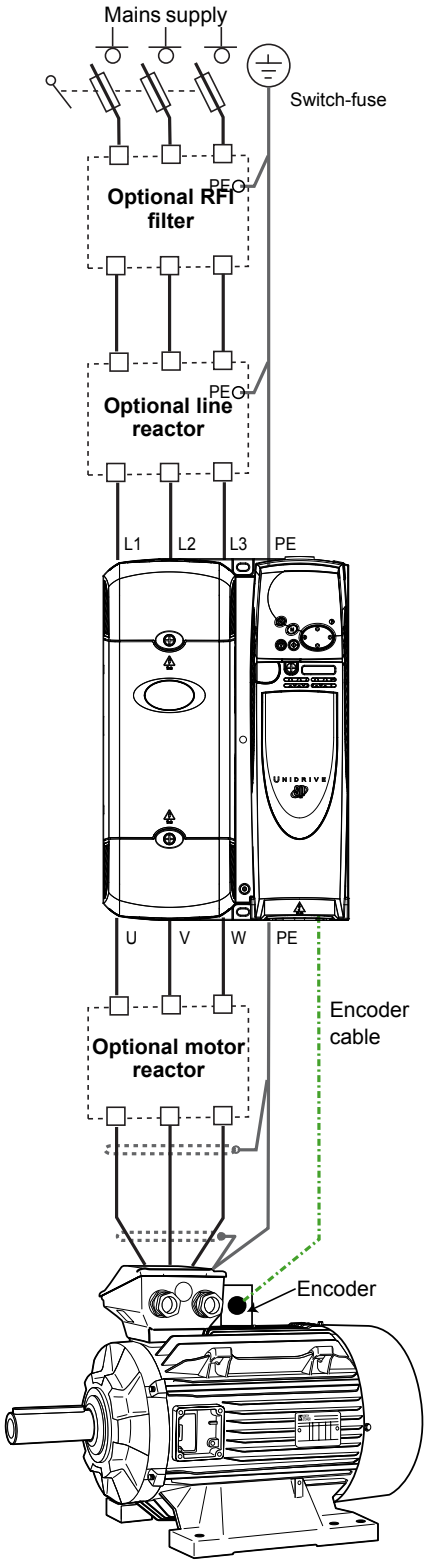
Motor reactor: different types of reactor or filter are available. The motor reactor can, depending on the circumstances, reduce high-frequency earth leakage currents, residual currents between phases, dV/dt voltage peaks, etc. The choice of reactor depends on the distance between motor and drive.

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, the cable length (voltage drop), etc. See below "Sizing the 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 the power cables: the drive and motor power supply cables must be sized according to the applicable standard, and according to 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
- The correction factors, depending on the installation method:
- K1 correction factor, depending on the installation
- K2 correction factor, depending on the number of conductors
- K3 correction factor, depending on the ambient temperature and the cable insulation.
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 (overheating).

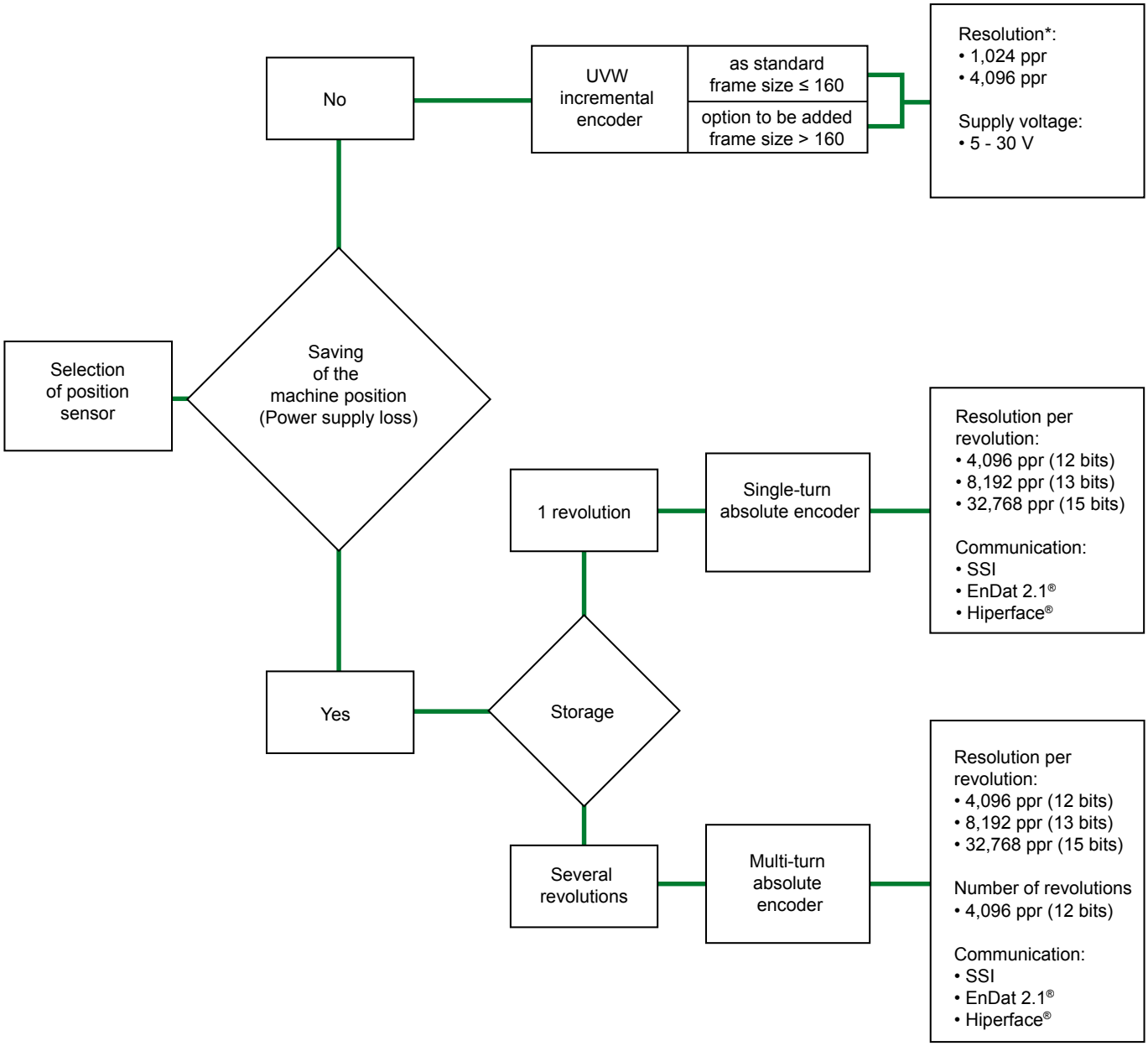
A motor-drive and transformer system which has been earthed in accordance with good practice will contribute significantly to reducing the voltage on the shaft and the motor casing, resulting in fewer high-frequency leakage currents. Premature breakage of bearings and auxiliary equipment, such as encoders,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



Selection of position sensor

In order to operate correctly, the Unidrive SP drive must know the position of the rotor with respect to the stator at all times.

For this reason, synchronous motors with magnets must be fitted with a position sensor.



* Caution, if the speed is greater than or equal to 3000 min-1, the resolution must not exceed 1024 ppr.

Encoders

UVW incremental encoders

This pulse generator supplies a number of pulses on channels A,A/, B,B/, 0 marker, 0 marker/ proportional to the speed. The information on commutation channels UVW enables the position of the rotor to be known to within about 60° (electrical degrees).

A 1024 ppr 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.

Absolute encoders

Absolute encoders save the position in the revolution and also 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, etc). In some 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.

ENCODER CHARACTERISTICS

Encoder type	UVW INCREMENTAL ENCODERS		ABSOLUTE ENCODERS							
			Single-turn				Multi-turn (4096)			
Data interface			EnDat 2.1®	SSI		SinCos Hiperface®	EnDat 2.1®	SSI		SinCos Hiperface®
Encoder reference	KHO5	KHK5S	ECN 413 EnDat	ECN 413 SSI	AFS 60	SFS60	EQN 425 EnDat	EQN 425 SSI	AFM 60	SFM 60
Supply voltage	5/30 VDC	5/30 VDC	3.6/14 VDC	10/30 VDC	4.5/32 VDC	7/12 VDC	3.6/14 VDC	10/30 VDC	4.5/32 VDC	7/12 VDC
Positions per revolution	1024 or 4096	1024 or 4096	4096 max: 8192	4096 max: 8192	4096 max: 8192		4096 max: 8192	4096 max: 8192	4096 max: 8192	
Output stage	TTL (RS422)	TTL (RS422)	1 V ~	1 V ~	1 V ~	1 V ~	1 V ~	1 V ~	1 V ~	1 V ~
Max. current (no load)	140 mA	140 mA	110 mA	45 mA	30 mA	80 mA	140 mA	55 mA	30 mA	80 mA
Max. mechanical speed in continuous operation	6,000 min^{-1}	6,000 min^{-1}	12,000 min^{-1}		9,000 min^{-1}	6,000 min^{-1}	12,000 min^{-1}		9,000 min^{-1}	6,000 min^{-1}
Shaft diameter	14 mm (1)	14 mm (1)	14 mm (1)		14 mm (1)	14 mm (1)	14 mm (1)		14 mm (1)	14 mm (1)
Protection	IP65	IP67	IP64		IP65	IP65	IP64		IP65	IP65
Operating temperature	-30° +80°C	-30° +80°C	-40° +100°C		-30° +100°C	-30° +115°C	-40° +100°C		-30° +100°C	-30° +115°C
Certification	CE	CE	CE, cURus, UL/CSA		CE, cURus	CE, cURus	CE, cURus, UL/CSA		CE, cURus	CE, cURus
Type of cable to be used with it	SYBBA___	SYBBA___	SFBAA___	SFBAA___	SSBBD___	SSBBD___	SFBAA___	SFBAA___	SSBBD___	SSBBD___
Motor end finish	M23 17 pins	M23 17 pins	M23 17 pins	M23 17 pins	M23 12 pins	M23 12 pins	M23 17 pins	M23 17 pins	M23 12 pins	M23 12 pins
Drive end finish	HD15	HD15	HD15	HD15	HD15	HD15	HD15	HD15	HD15	HD15

(1) THS: Through Hollow Shaft

Encoder - drive connecting cables

For each encoder, a specific cable, guaranteeing optimum performance of the drive connection can be proposed. Different cable finishes are possible. Please consult Leroy-Somer.

Type of cable		Insulation	Option		Finish		Length
					Motor	Drive	
SY	incremental UVW	Class 6 PUR insulation	A	Without PTC	A	M23 17p	HD15	1 to 100 m
SF	EnDat		B	With PTC	B	M23 12 or 17p	Bare wire	
SS	Hiperface		not used on LSRPM		C	M23 12 or 17p	Marked ferrules	

Example of cable name: SYBBA005

Reinforced insulation

Motors fitted with insulated bearings are specified on page 58

Standard motors are compatible with power supplies with the following characteristics:
• U rms = 480 V max.
• Value of voltage peaks generated at the terminals: 1500 V max.
• Switching frequency: 2.5 kHz min.
However, they may 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 ageing 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 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 casing, machine chassis and earth is correctly made.

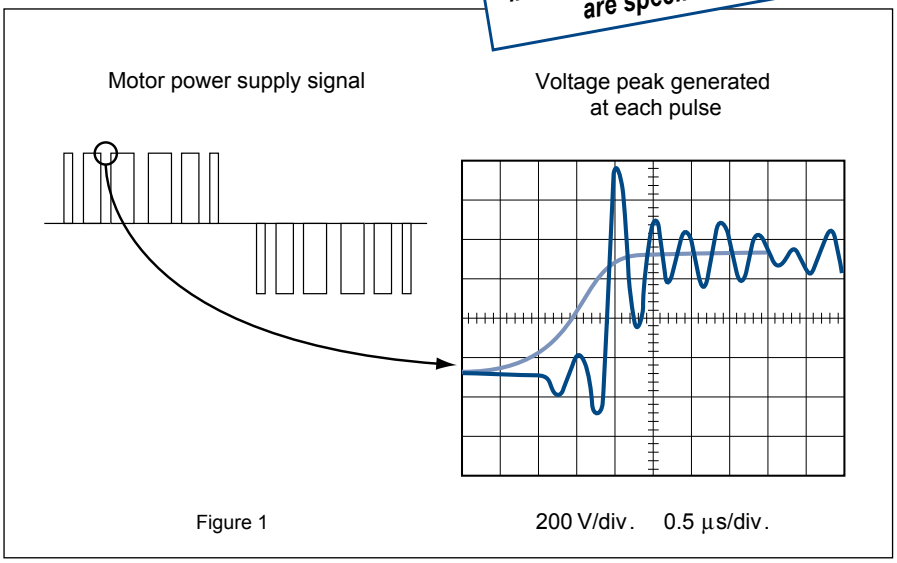
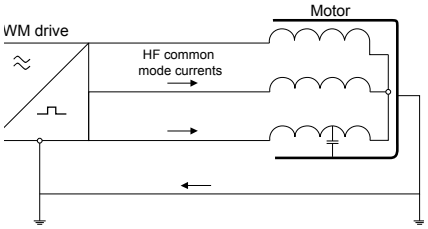


Figure 1

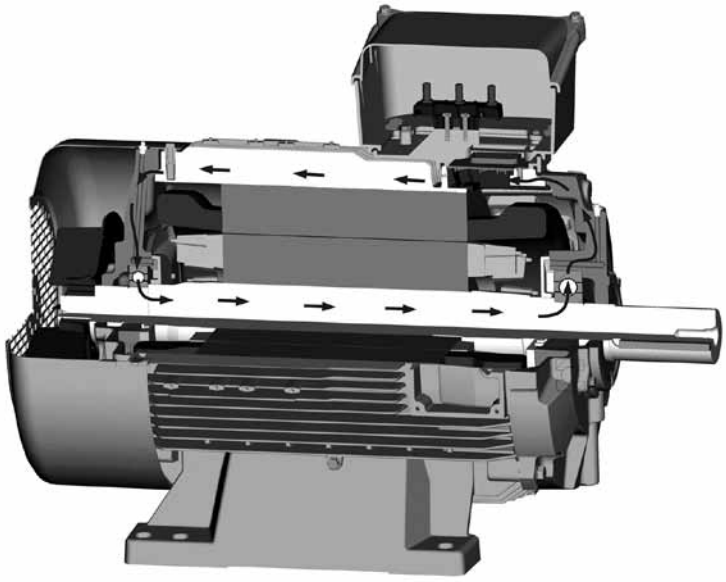


Otherwise, it will flow via the least resistive path: end shields/bearings/shaft/machine coupled to the motor. In these situations, therefore, protection for the bearings must be provided.

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.



Forced ventilation

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

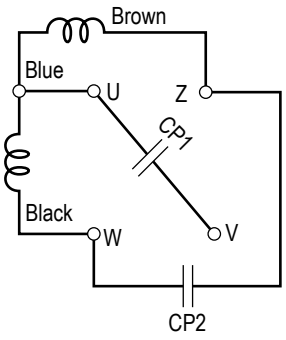
Forced ventilation characteristics for ranges up to 3600 inclusive
(please consult Leroy-Somer for 4500 and 5500 ranges)

Motor type	FV supply voltage[1]	FV consumption		FV protection index[2]
		P (W) W	I (A) A	
LSRPM 90 to 132	single-phase 230 or 400V	100	0.43/0.25	IP 55
LSRPM 160 to 280S	3-phase 230/400 V 50 Hz 254/460 V 60 Hz	150	0.94/0.55	IP 55
LSRPM 280M and 315	3-phase 230/400 V 50 Hz 254/460 V 60 Hz	200	1.4/0.8	IP 55
LSRPM 315M	3-phase 230/400 V 50 Hz 254/460 V 60 Hz	750	3.6/2.1	IP 55
PLSRPM 315LD	3-phase 230/400 V 50 Hz 254/460 V 60 Hz	3000	10.9/6.3	IP 55

1. ± 10% for voltage, ± 2% for frequency.
2. Protection index of the forced ventilation installed on the motor.

The motors are self-cooled as standard

230 or 400 V SINGLE-PHASE FORCED VENTILATION for frame size ≤ 132

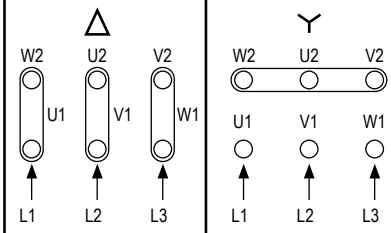


Capacitors		
Motor type	CP1	CP2
LSRPM 90 to 132	3 mf	2 mf

U = 230 V ~ Power supply on U and W
U = 400 V ~ Power supply on V and W

3-PHASE FORCED VENTILATION for frame size > 132

1 SPEED - 2 VOLTAGES
L1 - L2 - L3



Cable glands

In certain applications, it is necessary for there to be earth continuity between the cable and the motor earth to guarantee protection of the installation in accordance with the EMC directive, 89/336/EEC. An option of **cable gland with anchorage on screened cable** is therefore available over the entire LSRPM range.

The motors are supplied with pre-drilled and tapped terminal boxes or undrilled mounting plate for mounting cable glands
see page 59

Type and cable size of cable glands

Cable gland type	Cable size	
	Min. cable Ø (mm) W	Max. cable Ø (mm) A
ISO 16	6	11
ISO 20	7.5	13
ISO 25	12.5	18
ISO 32	17.5	25
ISO 40	24.5	33.5
ISO 50	33	43
ISO 63	42.5	55

Thermal protection

The motors are fitted with PTC sensors as standard

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.

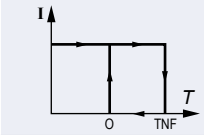
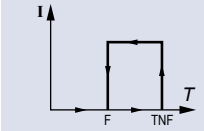
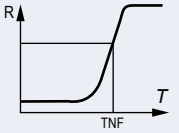
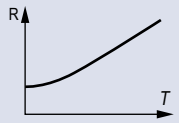
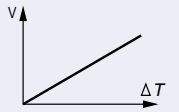
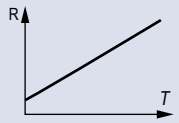
Fitting thermal protection

- PTO or PTF, in the control circuits.
- PTC, with relay, in the control circuits.
- PT 100 or Thermocouples, with associated reading equipment (or recorder), in the control board of the installation for continuous surveillance.

Alarm and early warning

All protective equipment can be 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).

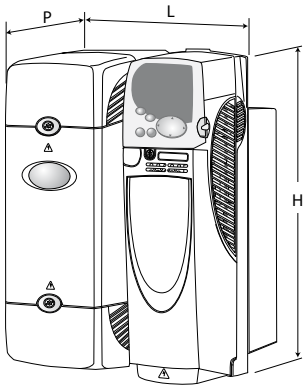
Built-in indirect thermal protection

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

Unidrive SP

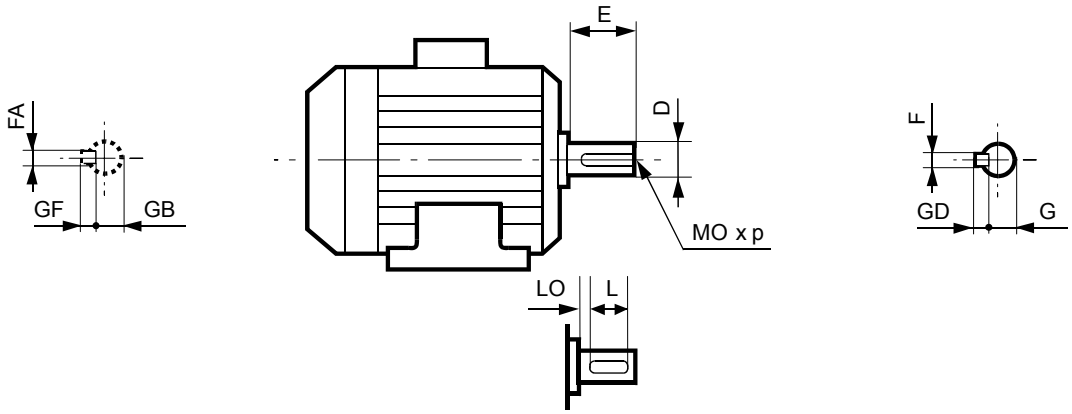


Drive type		Dimensions and weight			
LS	CT	H	W	D	Weight
		(mm)	(mm)	(mm)	(kg)
SPz 1T	SP 0401	322	62	226	2.1
SPz 1.2T	SP 0402				
SPz 1.5T	SP 0403				
SPz 2T	SP 0404				
SPz 2.5T	SP 0405				
SP 3.5T	SP 1404	368	100	219	5
SP 4.5T	SP 1405				
SP 5.5T	SP 1406				
SP 8T	SP 2401	368	155	219	7
SP 11T	SP 2402				
SP 16T	SP 2403				
SP 22T	SP 3401	368	250	260	15
SP 33T	SP 3402				
SP 27T	SP 3403				
SP 40T	SP 4401	510	310	298	30
SP 50T	SP 4402				
SP 60T	SP 4403				
SP 75T	SP 5401	820	310	298	55
SP 100T	SP 5402				
SP 120T	SP 6401	1131	310	298	75
SP 150T	SP 6402				
SPMA 14x1_2S		1169 *	310 *	298 *	80 *
SPMA 14x2_2S					
SPMA 14x1_3S					
SPMA 14x2_3S					
SPMA 14x1_4S					

* SPMA: dimensions of each module. Provide OTL reactors at the output. See details in the "Unidrive SPM commissioning manual"

Shaft extensions

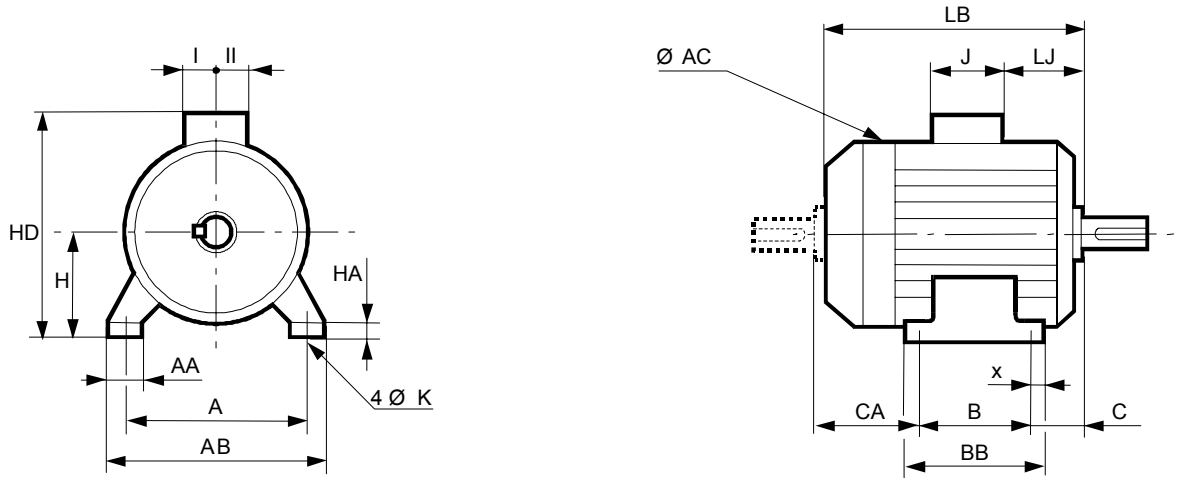
Dimensions in millimetres



Type	Main shaft extensions																	
	375 to 1800 range									2400 to 5500 range								
	F	GD	D	G	E	O	p	L	LO	F	GD	D	G	E	O	p	L	LO
LSRPM 90 SL/L	8	7	28j6	24	60	10	22	50	6	8	7	28j6	24	60	10	22	50	6
LSRPM 100 L	10	8	32k6	27	80	12	28	63	8.5	10	8	32k6	27	80	12	28	63	8.5
LSRPM 132 M	10	8	38k6	33	80	12	28	63	7	10	8	38k6	33	80	12	28	63	7
LSRPM 160 MP/LR	14	9	48k6	42.5	110	16	36	98	6	14	9	48k6	42.5	110	16	36	98	6
LSRPM 200 L/L1/L2/LU/LU2	16	10	55m6	49	110	20	42	97	13	16	10	55m6	49	110	20	42	97	13
LSRPM 225 ST1/ST2/SR2/SG/MR1	18	11	60m6	53	140	20	42	126	14	18	11	60m6	53	140	20	42	126	14
LSRPM 250 SE/SE1/ME/ME1	18	11	65m6	58	140	20	42	126	14	18	11	65m6	58	140	20	42	126	14
LSRPM 280 SC/SC1/SD/SD1	20	12	70m6	62.5	140	20	42	125	15	20	12	70m6	62.5	140	20	42	125	15
LSRPM 280 MD/MK1	20	12	75m6	67.5	140	20	42	125	15	20	12	75m6	67.5	140	20	42	125	15
LSRPM 315 SP1	22	14	80m6	71	170	20	42	155	15	22	14	80m6	71	170	20	42	155	15
LSRPM 315 SR1/MR1	22	14	85m6	76	170	20	42	155	15	22	14	85m6	76	170	20	42	155	15
PLSRPM 315 LD	22	14	95m6	85	170	16	36	152	15	22	14	80m6	71	170	20	42	155	15

Foot mounted IM B3 (IM 1001)

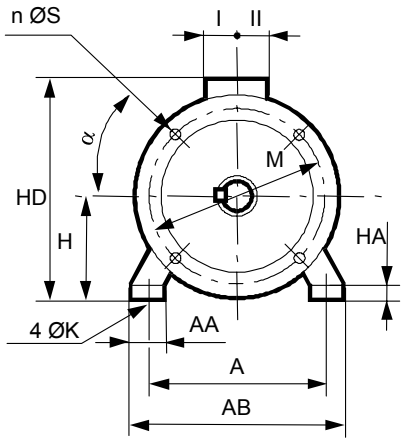
Dimensions in millimetres

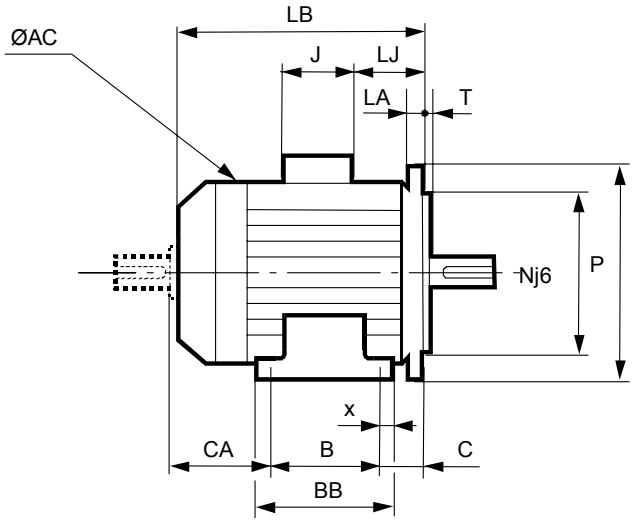


Type	Main dimensions																	
	A	AB	B	BB	C	X	AA	K	HA	H	AC	HD	LB	LJ	J	I	II	CA
LSRPM 90 SL	140	172	100	166	56	29	39	10	11	90	200	245	329	14	160	55	55	66
LSRPM 90 L	140	172	125	166	56	29	39	10	11	90	200	245	329	14	160	55	55	68
LSRPM 100 L	160	196	140	167	63	13	40	13	13	100	236	260	376	15	160	55	55	93
LSRPM 132 M	216	250	178	211	89	16	50	12	15	132	280	341	461	23	194	79	78	126
LSRPM 160 MP	254	294	254	298	108	22	64	14	25	160	310	391	555	53	186	112	95	154
LSRPM 160 LR	254	294	254	298	108	22	64	14	25	160	310	391	571	53	186	112	95	138
LSRPM 200 L	318	388	305	375	133	35	103	18.5	36	200	390	476	621	77	186	112	98	194
LSRPM 200 L1	318	388	305	375	133	35	103	18.5	36	200	390	510	621	55	231	119	141	194
LSRPM 200 L2	318	388	305	375	133	35	103	18.5	36	200	390	571	621	59	292	148	180	194
LSRPM 200 LU	318	388	305	375	133	35	103	18.5	36	200	390	476	669	77	186	112	98	244
LSRPM 200 LU2	318	388	305	375	133	35	103	18.5	36	200	390	571	669	59	292	148	180	244
LSRPM 225 ST1	356	431	286	386	149	50	127	18.5	36	225	390	535	627	62	231	119	141	203
LSRPM 225 ST2	356	431	286	386	149	50	127	18.5	36	225	390	596	627	62	292	148	180	203
LSRPM 225 SR2	356	431	286	386	149	50	127	18.5	36	225	390	596	676	66	292	148	180	253
LSRPM 225 SG	356	420	286	375	149	30	65	18.5	30	225	479	629	810	68	292	148	180	360
LSRPM 225 MR1	356	431	311	386	149	50	127	18.5	36	225	390	535	676	68	231	119	141	253
LSRPM 250 SE	406	470	311	420	168	35	90	24	36	250	479	655	810	68	292	148	180	341
LSRPM 250 SE1	406	470	311	420	168	35	90	24	36	250	479	744	810	4	420	180	235	341
LSRPM 250 ME	406	470	349	420	168	35	90	24	36	250	479	655	810	68	292	148	180	303
LSRPM 250 ME1	406	470	349	420	168	35	90	24	36	250	479	744	810	4	420	180	235	303
LSRPM 280 SC	457	520	368	478	190	35	90	24	35	280	479	685	810	68	292	148	180	262
LSRPM 280 SC1	457	520	368	478	190	35	90	24	35	280	479	774	810	4	420	180	235	262
LSRPM 280 SD	457	520	368	478	190	35	90	24	35	280	479	685	870	68	292	148	180	322
LSRPM 280 SD1	457	520	368	478	190	35	90	24	35	280	479	774	870	4	420	180	235	322
LSRPM 280 MD	457	520	419	478	190	35	90	24	35	280	479	685	870	68	292	148	180	271
LSRPM 280 MK1	457	520	419	495	190	40	85	24	35	280	586	834	921	35	420	180	235	328
LSRPM 315 SP1	508	594	406	537	216	40	114	28	70	315	586	870	947	61	420	180	235	341
LSRPM 315 SR1	508	594	406	537	216	40	114	28	70	315	586	870	1017	61	420	180	235	360
LSRPM 315 MR1	508	594	457	537	216	40	114	28	70	315	586	870	1017	61	420	180	235	360
PLSRPM 315 LD	508	608	508	588	216	40	100	28	26	315	680	865	1085	241	420	180	235	374

Foot and flange mounted IM B35 (IM 2001)

Dimensions in millimetres

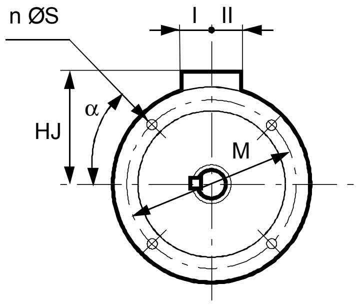


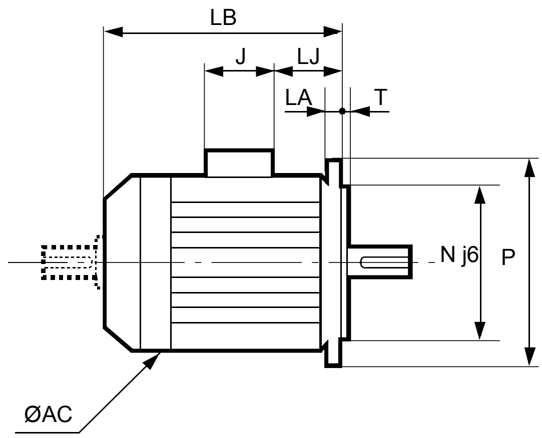


Type	Main dimensions																		
	A	AB	B	BB	C	X	AA	K	HA	H	AC	HD	LB	LJ	J	I	II	CA	Sym.
LSRPM 90 SL	140	172	100	166	56	29	39	10	11	90	200	245	351	14	160	55	55	66	FF165
LSRPM 90 L	140	172	125	166	56	29	39	10	11	90	200	245	351	14	160	55	55	68	FF165
LSRPM 100 L	160	196	140	167	63	13	40	13	13	100	236	260	376	15	160	55	55	93	FF215
LSRPM 132 M	216	250	178	211	89	16	50	12	15	132	280	341	461	23	194	79	78	126	FF265
LSRPM 160 MP	254	294	254	298	108	22	64	14	25	160	310	391	555	53	186	112	95	154	FF300
LSRPM 160 LR	254	294	254	298	108	22	64	14	25	160	310	391	571	53	186	112	95	138	FF300
LSRPM 200 L	318	388	305	375	133	35	103	18.5	36	200	390	476	621	77	186	112	98	194	FF350
LSRPM 200 L1	318	388	305	375	133	35	103	18.5	36	200	390	510	621	55	231	119	141	194	FF350
LSRPM 200 L2	318	388	305	375	133	35	103	18.5	36	200	390	571	621	59	292	148	180	194	FF350
LSRPM 200 LU	318	388	305	375	133	35	103	18.5	36	200	390	476	669	77	186	112	98	244	FF350
LSRPM 200 LU2	318	388	305	375	133	35	103	18.5	36	200	390	571	669	59	292	148	180	244	FF350
LSRPM 225 ST1	356	431	286	386	149	50	127	18.5	36	225	390	535	627	62	231	119	141	203	FF400
LSRPM 225 ST2	356	431	286	386	149	50	127	18.5	36	225	390	596	627	62	292	148	180	203	FF400
LSRPM 225 SR2	356	431	286	386	149	50	127	18.5	36	225	390	596	676	66	292	148	180	253	FF400
LSRPM 225 SG	356	420	286	375	149	50	65	18.5	30	225	479	629	810	68	292	148	180	360	FF400
LSRPM 225 MR1	356	431	311	386	149	50	127	18.5	36	225	390	535	676	68	231	119	141	253	FF400
LSRPM 250 SE	406	470	311	420	168	35	90	24	36	250	479	655	810	68	292	148	180	341	FF500
LSRPM 250 SE1	406	470	311	420	168	35	90	24	36	250	479	744	810	4	420	180	235	341	FF500
LSRPM 250 ME	406	470	349	420	168	35	90	24	36	250	479	655	810	68	292	148	180	303	FF500
LSRPM 250 ME1	406	470	349	420	168	35	90	24	36	250	479	744	810	4	420	180	235	303	FF500
LSRPM 280 SC	457	520	368	478	190	35	90	24	35	280	479	685	810	68	292	148	180	262	FF500
LSRPM 280 SC1	457	520	368	478	190	35	90	24	35	280	479	774	810	4	420	180	235	262	FF500
LSRPM 280 SD	457	520	368	478	190	35	90	24	35	280	479	685	870	68	292	148	180	322	FF500
LSRPM 280 SD1	457	520	368	478	190	35	90	24	35	280	479	774	870	4	420	180	235	322	FF500
LSRPM 280 MD	457	520	419	478	190	35	90	24	35	280	479	685	870	68	292	148	180	271	FF500
LSRPM 280 MK1	457	520	419	495	190	40	85	24	35	280	586	834	921	35	420	180	235	328	FF500
LSRPM 315 SP1	508	594	406	537	216	40	114	28	70	315	586	870	947	61	420	180	235	341	FF600
LSRPM 315 SR1	508	594	406	537	216	40	114	28	70	315	586	870	1017	61	420	180	235	360	FF600
LSRPM 315 MR1	508	594	457	537	216	40	114	28	70	315	586	870	1017	61	420	180	235	360	FF600
PLSRPM 315 LD	508	608	508	588	216	40	100	28	26	315	680	865	1085	241	420	180	235	374	FF740

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

Dimensions in millimetres





Symbol IEC	Faceplate dimensions							
	M	N	P	T	n	a	S	LA
FF165	165	130	200	3.5	4	45	12	10
FF165	165	130	200	3.5	4	45	12	10
FF215	215	180	250	4	4	45	14.5	12
FF265	265	230	300	4	4	45	14.5	14
FF300	300	250	350	5	4	45	18.5	14
FF300	300	250	350	5	4	45	18.5	14
FF350	350	300	400	5	4	45	18.5	15
FF350	350	300	400	5	4	45	18.5	15
FF350	350	300	400	5	4	45	18.5	15
FF350	350	300	400	5	4	45	18.5	15
FF350	350	300	400	5	4	45	18.5	15
FF400	400	350	450	5	8	22.5	18.5	15
FF400	400	350	450	5	8	22.5	18.5	15
FF400	400	350	450	5	8	22.5	18.5	15
FF400	400	350	450	5	8	22.5	18.5	15
FF400	400	350	450	5	8	22.5	18.5	15
FF500	500	450	550	5	8	22.5	18.5	22
FF500	500	450	550	5	8	22.5	18.5	22
FF500	500	450	550	5	8	22.5	18.5	22
FF500	500	450	550	5	8	22.5	18.5	22
FF500	500	450	550	5	8	22.5	18.5	22
FF500	500	450	550	5	8	22.5	18.5	22
FF500	500	450	550	5	8	22.5	18.5	22
FF500	500	450	550	5	8	22.5	18.5	22
FF500	500	450	550	5	8	22.5	18.5	22
FF500	500	450	550	5	8	22.5	18.5	22
FF600	600	550	660	6	8	22.5	24	22
FF600	600	550	660	6	8	22.5	24	22
FF600	600	550	660	6	8	22.5	24	22
FF740	740	680	800	6	8	22.5	24	25

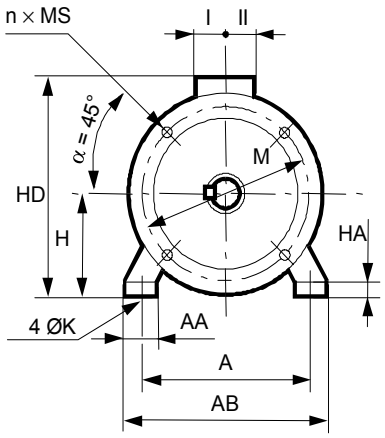
Type	Main dimensions						
	AC	LB	HJ	LJ	J	I	II
LSRPM 90 SL	200	351	155	34	160	55	55
LSRPM 90 L	200	351	155	34	160	55	55
LSRPM 100 L	200	376	160	15	160	55	55
LSRPM 132 M	264	461	209	23	194	79	78
LSRPM 160 MP	264	555	231	53	186	112	95
LSRPM 160 LR	264	571	231	53	186	112	95
LSRPM 200 L	390	621	276	77	186	112	98
LSRPM 200 L1	390	621	310	55	231	119	141
LSRPM 200 L2	390	621	371	59	292	148	180
LSRPM 200 LU	390	669	276	77	186	112	98
LSRPM 200 LU2	390	669	371	59	292	148	180
LSRPM 225 ST1	390	627	310	61.5	231	119	141
LSRPM 225 ST2	390	627	371	-	292	148	180
LSRPM 225 SR2	390	676	371	-	292	148	180
LSRPM 225 SG	479	810	404	68	292	148	180
LSRPM 225 MR1	390	535	276	61.5	231	119	141
LSRPM 250 SE	479	810	405	68	292	148	180
LSRPM 250 SE1	479	810	494	4	420	180	235
LSRPM 250 ME	479	810	405	68	292	148	180
LSRPM 250 ME1	479	810	494	4	420	180	235
LSRPM 280 SC	479	810	405	68	292	148	180
LSRPM 280 SC1	479	810	494	4	420	180	235
LSRPM 280 SD	479	870	405	68	292	148	180
LSRPM 280 SD1	479	870	494	4	420	180	235
LSRPM 280 MD	479	870	405	68	292	148	180
LSRPM 280 MK1	586	921	554	35	420	180	235
LSRPM 315 SP1	586	947	554	61	420	180	235
LSRPM 315 SR1	586	1017	554	61	420	180	235
LSRPM 315 MR1	586	1017	554	61	420	180	235

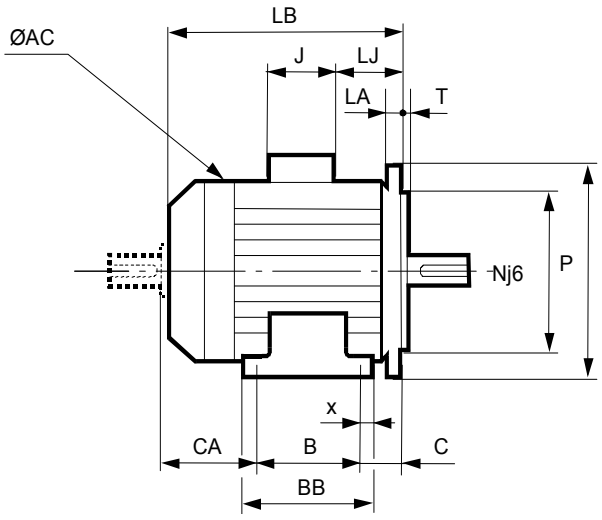
* For a frame size ≥ 250 mm for IM 3001 use, please consult Leroy Somer.

Dimensions of shaft extensions identical to those for foot mounted motors.

Foot and face mounted IM B34 (IM 2101)

Dimensions in millimetres

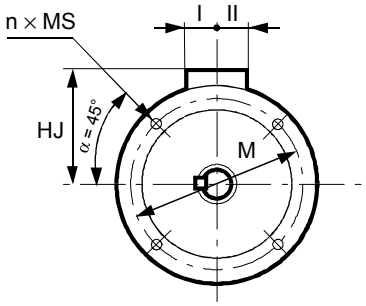


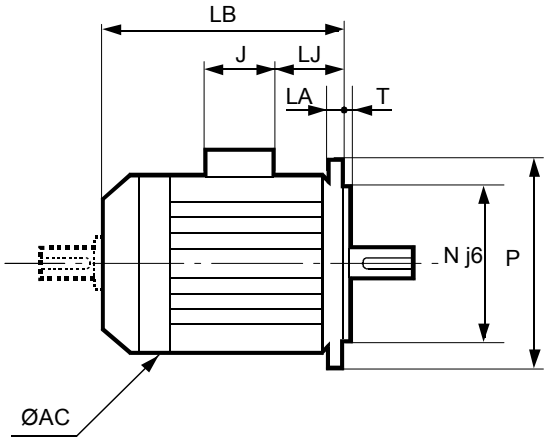


	Main dimensions																		
Type	**A**	**AB**	**B**	**BB**	**C**	**X**	**AA**	**K**	**HA**	**H**	**AC**	**HD**	**LB**	**LJ**	**J**	**I**	**II**	**CA**	**Sym.**
LSRPM 90 SL	140	172	100	166	56	29	39	10	11	90	200	245	329	14	160	55	55	66	FT115
LSRPM 90 L	140	172	125	166	56	29	39	10	11	90	200	245	329	14	160	55	55	68	FT115
LSRPM 100 L	160	196	140	167	63	13	40	13	13	100	236	260	376	15	160	55	55	93	FT130
LSRPM 132 M	216	250	178	211	89	16	50	12	15	132	264	341	461	23	194	79	78	126	FT215
LSRPM 160 MP **LSRPM 160 LR**	PLEASE CONSULT LEROY-SOMER																		

Face mounted IM B14 (IM 3601)

Dimensions in millimetres





Symbol IEC	Flange dimensions					
	M	N	P	T	n	MS
FT115	115	95	140	3	4	M8
FT115	115	95	140	3	4	M8
FT130	130	110	160	3.5	4	M8
FT215	215	180	250	4	4	M12
PLEASE CONSULT LEROY-SOMER						

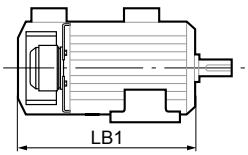
Type	Main dimensions							
	AC	LB	HJ	LJ	J	I	II	CA
LSRPM 90 SL	200	329	155	14	160	55	55	-
LSRPM 90 L	200	329	155	14	160	55	55	-
LSRPM 100 L	236	376	160	15	160	55	55	-
LSRPM 132 M	264	461	209	23	194	79	78	126
LSRPM 160 MP **LSRPM 160 LR**	PLEASE CONSULT LEROY-SOMER							

Dimensions of shaft extensions identical to those for foot mounted motors.

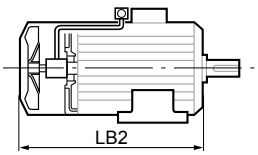
Motors with options

Dimensions in millimetres

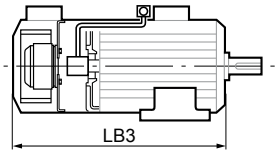
Forced ventilation
B3 & B5



Incremental encoder
B3 & B5



Forced ventilation and incremental encoder
B3 & B5



Type	LB_1	LB_2*	LB_3
LSRPM 90 SL	-	329	383
LSRPM 90 L	-	329	383
LSRPM 100 L	-	376	431
LSRPM 132 M	-	461	499
LSRPM 160 MP	-	555	710
LSRPM 160 LR	-	571	730
LSRPM 200 L/L1	802	674	802
LSRPM 200 LU/LU1	847	723	847
LSRPM 225 ST/ST1	808	681	808
LSRPM 225 SR/SR1	854	730	854
LSRPM 225 MR	854	730	854
LSRPM 250 SE	1012	860	1012
LSRPM 250 ME	1012	860	1012
LSRPM 280 SC	1012	860	1012
LSRPM 280 SD	1072	920	1072
LSRPM 280 MD	1072	920	1072
LSRPM 280 MK	1075	965	1075
LSRPM 315 SP	1137	991	1137
LSRPM 315 MR/SR	1251	1061	1251
PLSRPM 315 LD	1304	1164	1304

**LB2: standard mounting frame sizes 90 to 160*

NB: Dimensions of motors with single-turn and multi-turn absolute encoders will be supplied on request.

Definition of “Index of Protection” (IP/IK)

In standard configuration the motors are IP 55/IK 08 for LSRPM and IP 23/IK 08 for PLSRPM

Indices of 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	Ø 50 mm	Protected against solid objects larger than 50 mm (e.g. accidental contact with the hand)	1		Protected against water drops falling vertically (condensation)	01	150 g, 10 cm	Impact energy: 0.15 J
2	Ø 12 mm	Protected against solid objects larger than 12 mm (e.g. a finger)	2	15°	Protected against water drops falling at up to 15° from the vertical	02	200 g, 10 cm	Impact energy: 0.20 J
3	Ø 2.5 mm	Protected against solid objects larger than 2.5 mm (e.g. tools, wires)	3	60°	Protected against rain falling at up to 60° from the vertical	03	250 g, 15 cm	Impact energy: 0.37 J
4	Ø 1 mm	Protected against solid objects larger than 1 mm (e.g. thin tools, small wires)	4		Protected against projected water from all directions	04	250 g, 20 cm	Impact energy: 0.50 J
5		Protected against dust (no deposits of harmful material)	5		Projected against jets of water from all directions from a hose	05	350 g, 20 cm	Impact energy: 0.70 J
6		Protected against any dust penetration	6		Protected against projected water comparable to big waves	06	250 g, 40 cm	Impact energy: 1 J
			7	0.15 m, 1 m	Protected against the effects of immersion between 0.15 and 1 m	07	0.5 kg, 40 cm	Impact energy: 2 J
			8	..m	Protected against prolonged effects of immersion under pressure	08	1.25 kg, 40 cm	Impact energy: 5 J
						09	2.5 kg, 40 cm	Impact energy: 10 J
						10	5 kg, 40 cm	Impact energy: 20 J

Example:

Example of an IP 55 machine

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.

External finishing

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

Preparation of surfaces

SUPPORT	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)	**Ia** LSRPM - PLSRPM standard	1 polyurethane top coat 20/30 µm	**C3L**
Moderately corrosive: humid, and outdoors (temperate climate)	**IIa**	1 Epoxy base coat 30/40 µm 1 polyurethane top coat 20/30 µm	**C3M**
Corrosive: maritime, very humid (tropical climate)	**IIIa**	1 Epoxy base coat 30/40 µm 1 Epoxy intermediate coat 30/40 µm 1 polyurethane top coat 20/30 µm	**C4M**
Substantial chemical attack: frequent contact with bases, acids, alkali **Surroundings - neutral environment** (not in contact with chlorinated or sulphurous products)	**IIIb****	1 Epoxy base coat 30/40 µm 1 Epoxy intermediate coat 30/40 µm 1 Epoxy top coat 25/35 µm	**C4H**
Special conditions Very harsh, polluted with chlorinated or sulphurous products	**Ve****	1 Epoxy base coat 20/30 µm 2 Epoxy intermediate coats, each 35/40 µm 1 polyurethane top coat 35/40 µm	**C5I-M**
	161b**	1 base coat 50 µm 2 intermediate coats Epoxy 80 µm 1 Epoxy top coat 50 µm	**C5M-M**

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 substrates vary in nature whereas the standard only takes account of steel substrates.
* * Assessment of degree of rusting in accordance with standard ISO 4628 (rust over 1 to 0.5% of the surface)

Leroy-Somer standard paint colour reference:

RAL 3005

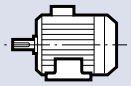
Mounting arrangements

Mountings and positions (IEC standard 60034-7)

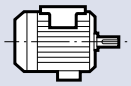
Foot mounted motors

• all frame sizes

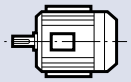
IM 1001 (IM B3)
- Horizontal shaft
- Feet on floor



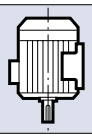
IM 1071 (IM B8)
- Horizontal shaft
- Feet on top



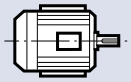
IM 1051 (IM B6)
- Horizontal shaft
- Wall mounted with feet on left when viewed from drive end



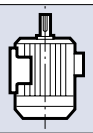
IM 1011 (IM V5)
- Vertical shaft facing down
- Feet on wall



IM 1061 (IM B7)
- Horizontal shaft
- Wall mounted with feet on right when viewed from drive end



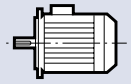
IM 1031 (IM V6)
- Vertical shaft facing up
- Feet on wall



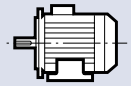
(FF) flange mounted motors

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

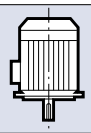
IM 3001 (IM B5)
- Horizontal shaft



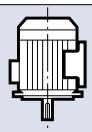
IM 2001 (IM B35)
- Horizontal shaft
- Feet on floor



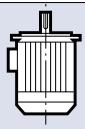
IM 3011 (IM V1)
- Vertical shaft facing down



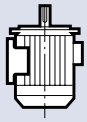
IM 2011 (IM V15)
- Vertical shaft facing down
- Feet on wall



IM 3031 (IM V3)
- Vertical shaft facing up



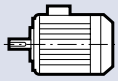
IM 2031 (IM V36)
- Vertical shaft facing up
- Feet on wall



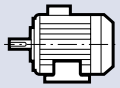
(FT) face mounted motors

• all frame sizes ≤ 132 mm

IM 3601 (IM B14)
- Horizontal shaft

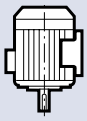


IM 2101 (IM B34)
- Horizontal shaft
- Feet on floor

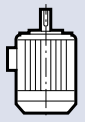


IM 3611 (IM V18)
- Vertical shaft facing down

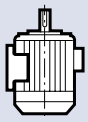
IM 2111 (IM V58)
- Vertical shaft facing down
- Feet on wall



IM 3631 (IM V19)
- Vertical shaft facing up



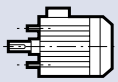
IM 2131 (IM V69)
- Vertical shaft facing up
- Feet on wall



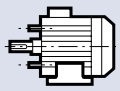
Motors without drive end shield

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

IM 9101 (IM B9)
- Threaded tie rods
- Horizontal shaft



IM 1201 (IM B15)
- Foot mounted with threaded tie rods
- Horizontal shaft



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

Bearings and lubrication

Type of grease

When the bearings are not greased for life, the type of grease is indicated on the nameplate. As standard, this grease is EXXON MOBILE POLYREX EM103 and we recommend that this is used for subsequent lubrication.
Avoid mixing greases

Permanently greased bearings

Under normal operating conditions, the service life (L10h) of the lubricant is 25,000 hours for a machine installed horizontally and for temperatures less than 25°C.

Bearings with grease nipples

The bearings are lubricated in the factory
The end shields are fitted with bearings lubricated by Técalémit grease nipples.

⚠ **The frequency of lubrication and quantity and quality of grease are indicated on the nameplates. Refer to these to ensure correct lubrication of the bearings.**

⚠ **Even in the event of prolonged storage or downtime, the interval between 2 greasing operations should never exceed 2 years.**

Permissible loads

Permissible loads: Motors in the 750 to 3600 series are designed to operate with direct or indirect coupling: permissible loads on request.
Motors in the 4500 and 5500 series are designed to operate with direct coupling. For other cases, please consult Leroy Somer.

Precautions

For the 4500 and 5500 series, a running-in period is necessary. Please refer to the installation and maintenance manual.

Bearings and types of grease nipple

Range	Frame size (mm)	Lubrication type	Ball bearing type	
		N.D.E./D.E.	N.D.E.	D.E.
5500	≤ 160	Greased for life in the factory	Standard	Standard
	200	Bearings with grease nipples	Insulated	Insulated
4500	≤ 160	Greased for life in the factory	Standard	Standard
	200	Bearings with grease nipples	Insulated	Standard
	> 200	Bearings with grease nipples	Insulated	Insulated
3600	≤ 200	Greased for life in the factory	Standard	Standard
	> 200	Bearings with grease nipples	Insulated for frame size > 250	Standard
3000	≤ 200	Greased for life in the factory	Standard	Standard
	> 200	Bearings with grease nipples	Insulated for frame size > 250	Standard
2400	≤ 200	Greased for life in the factory	Standard	Standard
	> 200	Bearings with grease nipples	Insulated for frame size > 280SD	Standard
1800	≤ 200	Greased for life in the factory	Standard	Standard
	> 200	Bearings with grease nipples	Insulated for frame size > 280	Standard
1500	≤ 200	Greased for life in the factory	Standard	Standard
	> 200	Bearings with grease nipples	Insulated for frame size > 280	Standard
900	≤ 200	Greased for life in the factory	Standard	Standard
	> 200	Bearings with grease nipples	Standard	Standard
750	≤ 200	Greased for life in the factory	Standard	Standard
	> 200	Bearings with grease nipples	Standard	Standard
375	≤ 160	Greased for life in the factory	Standard	Standard

Connection

Terminal box

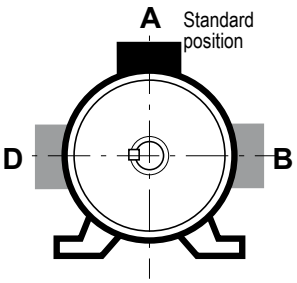
Placed as standard on the top of the motor near the drive end, the terminal box has IP55 protection.

The standard position of the cable gland baseplate is on the right, seen from the drive end, position A1.

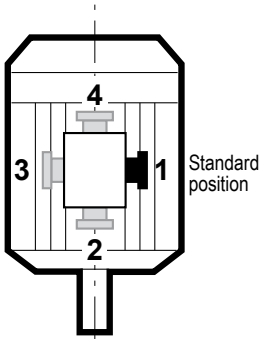
Tightening torque for the nuts on the terminal blocks

Terminal	M4	M5	M6	M8	M10	M12	M16
Torque N.m	2	3.2	5	10	20	35	65

▼ ***Terminal box positions in relation to the drive end***



▼ ***Positions of the cable gland in relation to the drive end***



Only positions 1 and 3 are possible

Terminal box drilling for cable glands

Motor type	Power + auxiliaries	
	Number of drill holes	Drill hole diameter
LSRPM 90 S/SL	2	ISO M25x1.5 + 1xM16
LSRPM 100 L		
LSRPM 132 M		ISO M40x1.5 + 1xM16
LSRPM 160 LR/MP		ISO M50x1.5 + 1xM16
LSRPM 200 L/LU	3	2xM40 + 1xM16
LSRPM 200 L1		2xM50 + 1xM16
LSRPM 200 L2/LU2		2xM63 + 1xM16
LSRPM 225 ST1/MR1		2xM50 + 1xM16
LSRPM 225 SG/ST2/SR2		2xM63 + 1xM16
LSRPM 250 SE/ME		2xM63 + 1xM16
LSRPM 250 SE1/ME1		Removable undrilled mounting plate
LSRPM 280 SD/MD		2xM63 + 1xM16
LSRPM 280 SC1/SD1/MK1	0	Removable undrilled mounting plate
LSRPM 315 SP1/SR1/MR1		
PLSRPM 315 LD		

Motor vibration levels

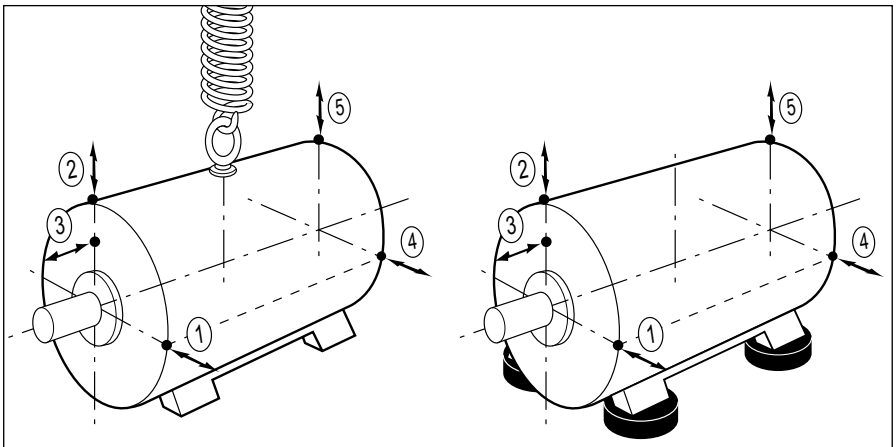
Motor vibration levels - Balancing

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

Measured parameters

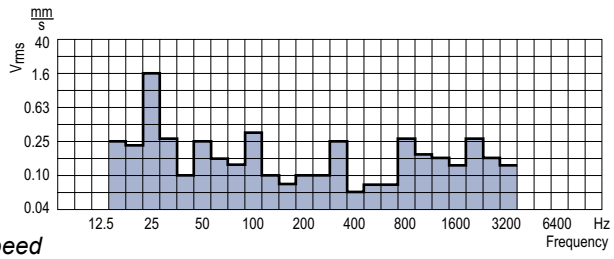
The vibration speed can be chosen as the variable to be measured. This is the speed at which the machine moves either side of its static position. It is measured in mm/s.
As the vibratory movements are complex and non-harmonic, it is the root mean square (rms) value of the speed of vibration which is used to express the vibration level.
Other variables that could also be measured are the vibratory displacement amplitude (in µm) or vibratory acceleration (in 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).

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

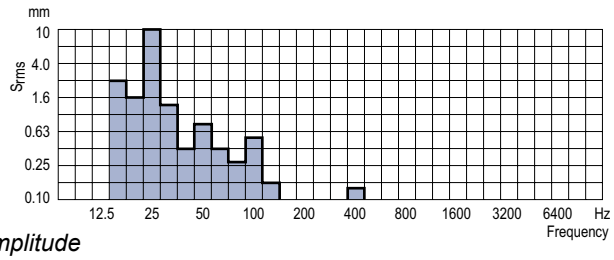


Measuring system for suspended machines ***Measuring system for machines on flexible mountings***

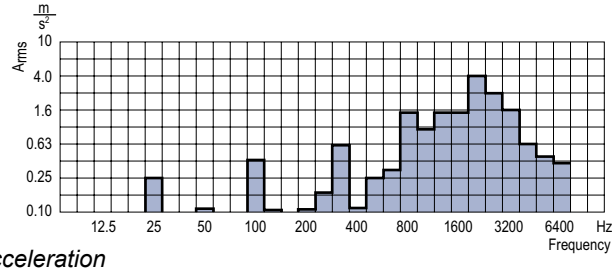
The measurement points quoted in the standards are indicated in the drawings above.
At each point, the results should be lower than those given in the tables below for each balancing class and only the highest value is to be taken as the " vibration level".



Vibration speed



Vibration amplitude



Vibration acceleration

Motor vibration levels

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)								
	56 < H ≤ 132			132 < H ≤ 280			H > 280		
	Displacement µm	Speed mm/s	Acceleration m/s²	Displacement µm	Speed mm/s	Acceleration m/s²	Displacement µm	Speed mm/s	Acceleration m/s²
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

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 procedure 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, EFECTIS, UL, BSRIA, TUV, GOST, which check their technical performance against the various standards or recommendations.

Standards and approvals

List of standards quoted in this document

LS2 motors comply with the standards quoted in this catalogue

Reference		International standards
IEC 60034-1	EN 60034-1	Electrical rotating machines: ratings and operating characteristics.
IEC 60034-2		Electrical rotating machines: methods for determining losses and efficiency from tests (additional losses added as a fixed percentage)
IEC 60034-2-1		Electrical rotating machines: methods for determining losses and efficiency from tests (measured additional losses)
IEC 60034-5	EN 60034-5	Electrical rotating machines: classification of degrees of protection provided by casings of rotating machines
IEC 60034-6	EN 60034-6	Electrical rotating machines (except traction): cooling methods.
IEC 60034-7	EN 60034-7	Electrical rotating machines (except traction): symbols for mounting positions and assembly layouts
IEC 60034-8		Electrical rotating machines: terminal markings and direction of rotation.
IEC 60034-9	EN 60034-9	Electrical rotating machines: noise limits.
IEC 60034-12	EN 60034-12	Starting characteristics for single-speed 3-phase cage induction motors for supply voltages less than or equal to 660V
IEC 60034-14	EN 60034-14	Electrical rotating machines: mechanical vibrations of certain machines with a frame size above or equal to 56 mm. Measurement, evaluation and limits of vibrational intensity.
IEC 60034-17		Cage induction motors supplied by inverters - Application guide
IEC 60034-30		Electrical rotating machines: efficiency classes for single-speed three-phase cage induction motors (Code IE)
IEC 60038		IEC standard voltages.
IEC 60072-1		Dimensions and power series for electrical rotating machines: designation of casings between 56 and 400 and flanges between 55 and 1080
IEC 60085		Evaluation and thermal classification of electrical insulation
IEC 60721-2-1		Classification of natural environment conditions. Temperature and humidity.
IEC 60892		Effects of an imbalance in the voltage system on the characteristics of three-phase squirrel-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 measuring airborne noise emitted by electrical rotating machines: a method for establishing an expert opinion for free field conditions over a reflective surface
ISO 8821		Mechanical vibration - Balancing. Conventions on shaft keys and related parts
	EN 50102	Degree of protection provided by electrical enclosures against extreme mechanical impacts.
ISO 12944-2		Corrosivity category

Standards and approvals

Approvals

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

Country	Initials	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
CANADA	**CSA**	LR 57 008	Standard adapted range (see "Supply voltage" section)
USA	**UL** or **FU**	E 68554 SA 6704 E 206450	Impregnation systems Stator/rotor assemblies for sealed units Complete motors up to 160 size
SAUDI ARABIA	**SASO**		Standard range
FRANCE	**LCIE** **INERIS**	Various n^{os}	Sealing, shocks, safety

For approved specific products, see the relevant documents.

International and national standard equivalents

International reference standards		National standards				
IEC	**Title** (summary)	**FRANCE**	**GERMANY**	**UK**	**ITALY**	**SWITZERLAND**
60034-1	Ratings and operating characteristics	NFEN 60034-1 NFC 51-120 NFC 51-200	DIN/VDE O530	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	NFEN 60034-14	DIN/EN 60034-14	BS EN 60034-14		
60072-1	Dimensions and output powers for machines of between 56 and 400 frame size 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.

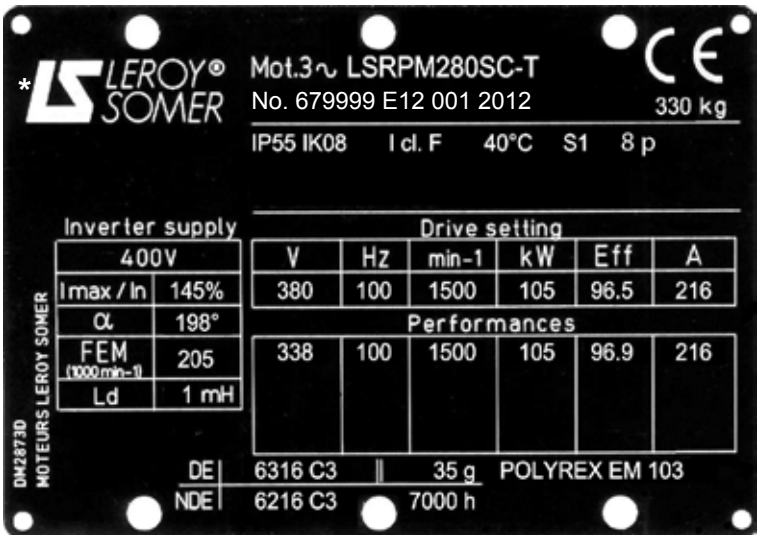
Nameplates

Receipt

On receipt of your motor, check that it has not suffered any damage in transit.
If there are obvious signs of damage, contact the carrier (you may able to claim on their insurance) and after a visual check, turn the motor to detect any malfunction.

Identification

As soon as you receive the motor, check that the nameplate on the machine conforms to your order.



* Other logos can optionally be provided: agreement prior to ordering is essential.

Definition of symbols used on nameplates:

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

MOT 3 ~ : Three-phase A.C. motor
LSRPM : Series
280 : Frame size
SC : Housing designation and manufacturer code
T : Impregnation index

Motor

67999 : Serial number

For motor types 200 to 315:
O : Month of production
12 : Year of production
001 : Batch number

IP55 IK08 : Degree of protection
(I) cl. F : Insulation class F
40°C : Ambient operating temperature
S : Duty
% : Operating factor
8 p : Number of poles

...d/h : Number of cycles per hour
kg : Weight

FEM : Electromotive force
∝ : Phase angle
Ld : Transient inductance

Drive setting: Settings to be entered in the drive
Performances: Motor characteristics

Hz : Supply frequency
min^{-1} : Revolutions per minute (rpm)
kW : Rated power
Eff : Efficiency
A : Rated current

Bearings

DE : Drive end bearing
NDE : Non drive end bearings - RI: Insulated bearing
35 g : Amount of grease at each regreasing (in cm^3)
7000 hrs at 1500 min^{-1} : Regreasing interval (in hours) for θ_{amb}
POLYREX EM 103: Type of grease

I - SPHERE OF APPLICATION

These General Conditions of Sale (GCS) apply to the sale of all products, components, software and provision of services (referred to as "Materials") offered or supplied by the Vendor to the Customer. They also apply to all quotations or offers made by the Vendor, and form an integral part of any order. "Vendor" means any company controlled directly or indirectly by Leroy-Somer. In addition, the order is also subject to the Inter Trades Union General Conditions of Sale for France for the F.I.E.E.C. (*Federation of Electrical, Electronic and Communication Industries*), latest edition, in that they do not conflict with the GCS.
Acceptance of the Vendor's offers and quotations, or any order, implies unqualified acceptance of these GCS and excludes any stipulations to the contrary appearing on all other documents, especially on the Customer's purchase orders and his General Conditions of Purchase.
A dispensation from Paragraph 1 above applies to sales concerning foundry parts, which are subject to the General Contractual Conditions of European Foundries, latest edition.
Materials and services sold under these GCS may under no circumstances be intended for applications in the nuclear field, these sales expressly being the subject of special technical specifications and contracts which the Vendor reserves the right to refuse.

II - ORDERS

All orders, including those taken by the Vendor's agents and representatives, by whatever mode of transmission, become valid only after they have been accepted in writing by the Vendor or work on the order has begun.
The Vendor reserves the right to modify the characteristics of his Materials without prior notice. However, the Customer may still specify particular characteristics required for a contract. In the absence of such an express specification, the Customer will not be able to refuse delivery of the new modified Material.
The Vendor will not accept responsibility for an incorrect choice of Material if this incorrect choice results from incomplete and/or erroneous conditions of use, or these have not been conveyed to the Vendor by the Customer.
Unless otherwise specified, offers and quotations submitted by the Vendor are valid for only thirty days from the date of issue.
When the Material has to satisfy standards, particular regulations and/or be inspected by standards or inspection organisations, the price request must be accompanied by a full specification, with which the Vendor must agree. This is mentioned in the quotation or offer. All test and inspection fees are the Customer's responsibility.

III - PRICES

Prices are shown exclusive of tax, and may be revised without prior notice.
Prices are either fixed for the duration specified on the estimate, or subject to revision according to a formula accompanying the tender which, depending on the regulations, covers a change in the raw materials, products, miscellaneous services and salaries, the indices for which are published in the B.O.C.C.R.F. (*Official Bulletin for Competition, Consumption and the Prevention of Fraud*).
All related costs, such as customs clearance and special inspections etc. will be added on.

IV - DELIVERY

Sales are governed by the INCOTERMS published by the International Chamber of Commerce (*"I.C.C. INCOTERMS"*), latest edition.
The Material is dispatched in accordance with the conditions indicated on the order acknowledgement, sent by the Vendor in response to any order for Material.
Unless otherwise specified, prices refer to Material made available in the Vendor's factories, and include standard packaging.
Unless otherwise specified, Materials are always transported at the purchaser's risk. Without exception, it is up to the purchaser to raise with the transporter, in the legal form and time limits, any claim concerning the state or the number of packages received and also to send the Vendor a copy of this declaration. Failure to comply with this procedure will relieve the Vendor of all responsibility. In any case, the Vendor's responsibility cannot exceed the amount received from his insurers.
If the arrangements for dispatch are modified by the Customer after acceptance of the order, the Vendor reserves the right to invoice any additional costs arising from such changes.
Unless stipulated in the contract or due to a legal obligation to the contrary, packages cannot be returned.
Should the delivery of the Material be delayed, for a reason not attributable to the Vendor, Material stored on his premises will be insured at the sole risk of the Customer with a charge for storage costs at a rate of 1% (*one per cent*) of the total amount of the order, per week or part thereof (irrespective of percentage) as from the availability date as indicated in the contract. After thirty days from this date, the Vendor will be able, as he wishes, either to dispose of the Material and/or arrange a new delivery date for the said Materials with the Customer, or to invoice the Customer in full in accordance with the delivery schedule and amount specified in the contract. In all instances, all deposits received remain the property of the Vendor by way of indemnity, without prejudice to other actions that the Vendor may institute.

V - DELIVERY DATES

The Vendor is bound only by the delivery dates stated on his order acknowledgement. These dates are counted from the date of the order acknowledgement sent by the Vendor, subject to compliance with the provisions indicated on the order acknowledgement, notably receipt of the deposit for the order, notification of the establishment of an irrevocable letter of credit, conforming to all the Vendor's requirements (*especially as regards the amount, currency, validity, licence, etc.*), and acceptance of the various terms of payment as regards setting up any guarantees which may be required, etc.
Late delivery does not automatically entitle the Customer to damages and interest and/or penalties.
Unless otherwise specified, the Vendor reserves the right to make partial deliveries.
Delivery dates are suspended automatically and without legal formality, for any breach of obligations by the Customer.

VI - TESTS - APPROVAL

Materials manufactured by the Vendor are inspected and tested prior to dispatch from the factory. Customers may attend these tests: they simply have to state the wish to do so when the order is placed.
Specific tests and acceptance tests requested by the Customer, whether conducted on the Customer's premises, in the Vendor's factories, on site, or by inspection organisations, must be noted on the order and are to be paid for by the Customer.
Prototypes of Materials specially developed or adapted for a Customer must be approved by the Customer before any delivery of production Materials in order to make sure they are compatible with the other constituent parts of his equipment, and that they are suitable for the Customer's intended use of them. This approval will also enable the Customer to make sure that the Materials comply with the technical specification. To that end, the Customer and the Vendor will sign two copies of a Product Approval Form, one copy to be kept by each.
In the event of the Customer requiring delivery without having previously approved the Materials, these will then be delivered as they are and still considered as prototypes; the Customer will then assume sole responsibility for using them or supplying them to his own Customers. However, the Vendor may also decide not to deliver the Materials until they have been previously approved by the Customer.

VII - TERMS OF PAYMENT

All sales are deemed to be undertaken and payable at the Vendor's registered office, without exception, whatever the method of payment, the place of conclusion of the contract and delivery.
When the Customer is based in France, invoices are payable on receipt in cash, by banker's draft or by *Letter of Exchange*, within 30 (*thirty*) days of the end of the month following the invoice date.
Any payment made in advance of the fixed payment date will lead to a discount of 0.2% (*zero point two per cent*) per month of the amount concerned from the invoice.
Except as otherwise provided, when the Customer is based outside France, invoices are payable upon issue of the dispatch documents in cash, or by irrevocable letter of credit confirmed by a major French bank, all charges paid by the Customer.
Payments mean making funds available in the Vendor's bank account and must be made in the currency of the invoice.
Under French Law 2008-776 of 04/08/2008, non-payment of an invoice by its due date will invoke, after no result from a formal notice, a flat-rate penalty at the date the debt is due, applied to the amount inclusive of tax of the sums due if the invoice is liable to VAT (Value Added Tax), and suspension of orders in progress. This penalty is equal to the rate applied by the European Central Bank to its most recent refinancing operation plus 10 percentage points.

Should steps have to be taken to recover the said amount, a surcharge of 15% (fifteen per cent) of the sum demanded will be payable, with a minimum of □500 excl. tax (five hundred euros excluding tax). Any tax due will be charged to the Customer.

Moreover, with the proviso of complying with any legal measures in force, in the event of non-payment (total or partial) of an invoice or any amount due, whatever the method of payment envisaged, the Customer will be liable immediately for the whole of the outstanding amount owed to the Vendor (*including his subsidiaries, sister or parent companies, whether in France or overseas*) for all deliveries or services, whatever their initial due date.
Notwithstanding any particular settlement conditions arranged between the parties, the Vendor reserves the right to demand, as wished, in the event of deterioration of the Customer's credit, payment incident or compulsory administration of the Customer:
- payment in cash, before the Materials leave the factory, for all orders in progress
- payment of a deposit for the order
- additional or different payment guarantees

VIII - COMPENSATION CLAUSE

Unless prohibited by law, the Vendor and the Customer expressly agree between one another the balance of compensation between their debts and dues arising from their commercial relationship, even if the conditions defined in law for legal compensation are not all satisfied.
In applying this clause, Vendor means any company in the Leroy-Somer group.

IX - TRANSFER OF RISKS/RESERVATION OF TITLE

Transfer of risks occurs upon the handing over of the Material, according to the delivery conditions agreed at the time of ordering. Transfer to the Customer of ownership of the Material sold occurs upon payment of the whole principal sum, including accessories. In the event of an action to establish title to the delivered Material, deposits paid will remain the property of the Vendor by way of indemnities.
The provision of a document creating an obligation to pay (*letter of exchange or similar*) does not constitute payment in full.
For as long as the price has not been paid in full, the Customer is obliged to inform the Vendor, within twenty-four hours, of the seizure, requisition or confiscation of Materials to the benefit of a third party, and to take all protective measures to make known and comply with the Vendor's right of title in the event of intervention by creditors.

X - CONFIDENTIALITY

Each party undertakes to maintain confidentiality of information of a technical, commercial, financial or other nature, received from the other party, orally, in writing, or by any other communication method during negotiations and/or execution of any order.
This confidentiality obligation will apply throughout the period of execution of the order and for 5 (five) years after its completion or cancellation, whatever the reason for this.

XI - INDUSTRIAL AND INTELLECTUAL PROPERTY

Results, whether patentable or not, data, studies, information or software obtained by the Vendor during execution of any order are the exclusive property of the Vendor.
Apart from instructions for use, servicing and maintenance, reports and documents of any type delivered to Customers remain the exclusive property of the Vendor and must be returned to the Vendor on request, even when part of the design fees have been charged to them, and they may not be communicated to third parties or used without the prior written agreement of the Vendor.

XII - CANCELLATION/TERMINATION OF THE SALE

The Vendor reserves the right to cancel or terminate immediately, as wished, as of right and without legal formalities, the sale of his Material in the event of non-payment of any part of the price by the settlement date, or in the event of any breach of any of the contractual obligations to be met by the Customer. Deposits and financial obligations already paid will remain the Vendor's property by way of indemnities, without prejudice to his right to claim damages and interest. In the event of cancellation of the sale, the Material must be returned to the Vendor immediately, irrespective of its location, at the Customer's expense and risk, subject to a penalty of 10% (*ten per cent*) of its value per week late.

XIII - GUARANTEE

The Vendor guarantees the Materials against any operational defect, arising from a material or manufacturing defect, for twelve months starting from the date on which they are made available, unless any other legal measure effected at a later date might apply, according to the conditions defined below.
The guarantee will only apply insofar as the Materials have been stored, used and serviced in accordance with the Vendor's instructions and documentation. It cannot be invoked when the fault results from:
- failure to monitor, maintain or store the goods correctly
- normal wear and tear of the Material
- intervention on or modification to the Material without the Vendor's prior authorisation in writing
- abnormal use or use not conforming to the intended purpose of the Material
- defective installation at the Customer's premises and/or the end user's premises
- non-communication, by the Customer, of the intended purpose or the conditions of use of the Material
- failure to use original manufacturer spare parts
- in the event of Force Majeure or any event beyond the control of the Vendor.

In all cases, the guarantee is limited to the replacement or repair of parts or Materials acknowledged as defective by the Vendor's technical departments. If the repair is assigned to a third party, it should be carried out only after acceptance by the Vendor of the estimate for repair.
No Material should be returned without the Vendor's prior authorisation in writing.
Material to be repaired should be sent prepaid, to the address indicated by the Vendor. If the Material has not been repaired under guarantee, the cost of returning it will be invoiced to the Customer or the end purchaser.
This guarantee applies to the Vendor's Material made accessible and therefore does not cover the cost of removal and reinstallation of the said Material in the unit in which it is integrated.
Repair, modification or replacement of parts or Materials during the guarantee period will not have the effect of extending the length of the guarantee.
The provisions of this article constitute the only obligation on the part of the Vendor concerning the guarantee for the Materials supplied.

XIV - LIABILITY

The Vendor's liability is strictly limited to the obligations stipulated in these General Conditions of Sale and those expressly agreed to by the Vendor. All penalties and payments specified therein are deemed to be all-inclusive damages and interest, in full discharge and exclusive of any other sanction or compensation.
With the exclusion of serious fault on the Vendor's part and compensation for bodily injury, the Vendor's liability will be limited, all causes combined, to a maximum sum of the contractual amount excluding tax of the supply or service giving rise to the compensation.
Under no circumstances will the Vendor be liable to pay for intangible and/or indirect damages which the Customer might claim; he therefore cannot be held liable in particular for production, operating and other consequential losses or more generally any indemnifiable losses other than physical or material.
The Customer guarantees renunciation of recourse of his insurers or third parties in a contractual situation with him, against the Vendor or his insurers, over and above the limits and for the exclusions laid down above.

XV - SPARE PARTS AND ACCESSORIES

Spare parts and accessories are provided on request insofar as they are available. Related costs (*carriage and any other costs*) are always added to the invoice.
The Vendor reserves the right to demand a minimum quantity or invoice amount per order.

XVI - WASTE MANAGEMENT

The Material covered by the sale does not fall within the scope of European Directive 2002/96/EC (WEEE) of 27 January 2003, and all resulting laws and decrees of the Member States of the EU, relating to the composition of electrical and electronic equipment and the disposal of waste originating from this equipment.
In accordance with Article L 541-2 of the Environmental Code, it is the responsibility of the possessor of the waste to dispose of it, or have it disposed of, at his expense.

XVII - FORCE MAJEURE

Apart from the Customer's obligation to pay the sums due to the Vendor under the order, the Customer and the Vendor cannot be held responsible for the total or partial non-fulfilment of their contractual obligations if this non-fulfilment results from the occurrence of a force majeure situation.
The following in particular are considered to be force majeure situations: production delays or disruptions resulting wholly or partially from war (declared or not), an act of terrorism or strikes, riots, accidents, fires, floods, natural disasters, transport delay, shortage of components or materials, or a governmental decision or act (including an export ban or revocation of an export licence).
If one of the parties is delayed or prevented in the fulfilment of his obligations because of the present Article for more than 180 consecutive days, each party may then cancel, automatically and without legal formality, the non-executed part of the order by written notification to the other party, without his liability being sought. However, the Customer will be obliged to pay the agreed price relating to the Materials already delivered at the cancellation date.

XVIII - BAN ON ILLICIT PAYMENTS

The Customer agrees not undertake any initiative which would expose the Vendor, or any related company, to a risk of sanctions by virtue of the legislation of a State banning illicit payments, in particular bribes and gifts of an obviously unreasonable amount, to the employees of an Administration or public body, to political parties or their members, to those standing for an elective post, or to employees of customers or suppliers.

XIX - CONFORMITY OF SALES TO INTERNATIONAL LEGISLATION

The Customer agrees that the applicable legislation as regards import and export control, that is to say, that applicable in France, the European Union, the United States of America, in the country where the Customer is based, if this country does not come under the legislation mentioned previously, and in the countries from which the Materials may be delivered, as well as the provisions contained in the licences and permits relating thereto, of general or dispensatory scope (referred to as "conformity of sales to international regulations"), apply to the acceptance and use by the Customer of the Materials and their technology. Under no circumstances must the Customer use, transfer, dispose of, export or re-export the Materials and/or their technology in violation of the provisions on conformity of sales with international regulations.
The Vendor will be under no obligation to deliver the Materials until the licences or permits necessary under the conformity of sales to international regulations have been obtained.
If, for any reason whatsoever, the said licences or permits were to be refused or withdrawn, or in the event of amendment of the international regulations applicable to the conformity of sales which would prevent the Vendor from fulfilling his contractual obligations or which, according to the Vendor, would expose his liability or that of his related companies, by virtue of the international regulations relating to the conformity of sales, the Vendor would then be released from his contractual obligations without his liability being invoked.

XX - PARTIAL INVALIDITY

Any clause and/or provision of these General Conditions deemed and/or which has become null and void does not render the contract null and void, only the actual clause and/or provision concerned.

XXI - DISPUTES

THIS CONTRACT IS SUBJECT TO FRENCH LAW.
IN THE ABSENCE OF AMICABLE AGREEMENT BETWEEN THE PARTIES, AND NOTWITHSTANDING ANY CLAUSE TO THE CONTRARY, ANY DISPUTE RELATING TO THE INTERPRETATION AND/OR EXECUTION OF AN ORDER MUST BE RESOLVED BY THE COMPETENT COURTS OF ANGOULEME (FRANCE), EVEN IN THE CASE OF INTRODUCTION OF THIRD PARTIES OR MULTIPLE DEFENDANTS. HOWEVER, THE VENDOR RESERVES THE EXCLUSIVE RIGHT TO BRING ANY DISPUTE INVOLVING THE CUSTOMER BEFORE THE COURTS IN THE LOCATION OF THE VENDOR'S REGISTERED OFFICE OR THOSE WITHIN WHOSE JURISDICTION THE LOCATION OF THE CUSTOMER'S REGISTERED OFFICE FALLS.

International network

www.leroy-somer.com

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MOTEURS LEROY-SOMER
INTERNATIONAL DIVISION (FRANCE)

AUSTRALIA
LEROY-SOMER PTY LTD

AUSTRIA
LEROY-SOMER MARBAISE GMBH (GERMANY)

BELGIUM
LEROY-SOMER SA

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EMERSON ELECTRIC DO BRASIL LTDA.

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LEROY-SOMER / CIM

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EMERSON TRADING (SHANGHAI) CO LTD

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