



DYNEO[®] VARIABLE SPEED DRIVES
Powerdrive MD & FX variable speed drives
LSRPM - PLSRPM permanent magnet synchronous motors
22 kW to 400 kW

Technical catalogue

4937 en - 2012.10 / b

DYNEO® VARIABLE SPEED DRIVES

Powerdrive FX & MD variable speed drives/LSRPM-PLSRPM permanent magnet synchronous motors

22 - 90 kW Powerdrive FX



90 - 400 kW Powerdrive MD



Innovative "C light" technology

- New patented CL4Q power architecture: naturally regenerative rectifier
- "C light" technology is highly reliable and environmentally-friendly

Unrivalled compactness

- Up to 3 times smaller and lighter than a conventional 6-pulse solution
- Installation in an IP 54 enclosure of minimum size: internal losses halved in comparison with a conventional drive
- Integrated control system functions

Savings on the purchase price

- No associated braking resistors or relays
- Integrated line reactor
- Category C2 RFI filter as standard
- Greatly reduced enclosure size
- Sensorless control of permanent magnet motor
- Reduction in the size of upstream components

Savings during operation

- Increased productivity: dynamic braking
- Longer service life
- Elimination of stress on motor winding
- Higher efficiency
- Energy savings: regenerative drive

Modularity

Each application is designed by combining standard, compact modules which are easy to handle: rectifiers, inverters, control, ventilation, filters, etc.


Flexibility & simplicity

- Adaptation to the environment and the application
 - IP 00 to IP 55 or special cabinet
 - Electrical protection
 - Customized process interface systems
 - Safety devices
 - Dedicated functions, etc
- Easy, user-friendly commissioning: 8 parameters are enough in the majority of cases
 - Powerscreen: multilingual touch screen
 - XPressKey: transfer and backup key
 - Powersoft PC tools: guided commissioning

Savings during operation

- High level of availability thanks to dedicated functions: management of mains interference, etc
- Longer service life of components: preventive self-test, protection devices, etc
- Maintenance reduced to the absolute minimum
 - Optimised stock and downtime
 - Diagnostic assistance
- Remote application management
- Savings on energy bills
 - Reduced energy consumption
 - Restoring energy to the grid: POWERDRIVE REGEN

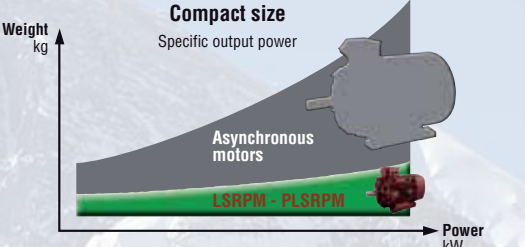
LSRPM - PLSRPM efficiency at its peak



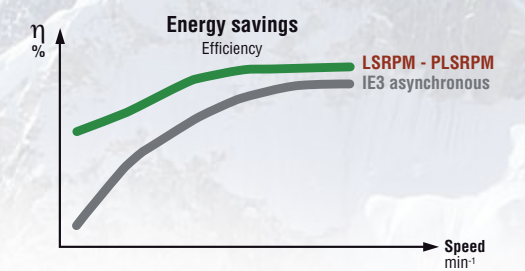
IP 55

IP 23

Compact size
Specific output power



Energy savings
Efficiency



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

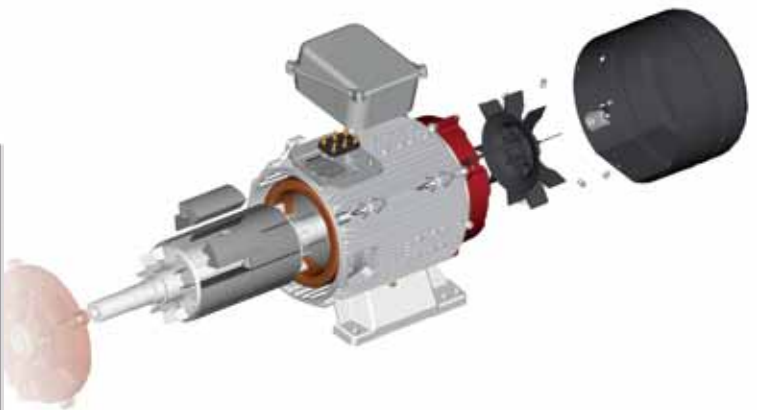
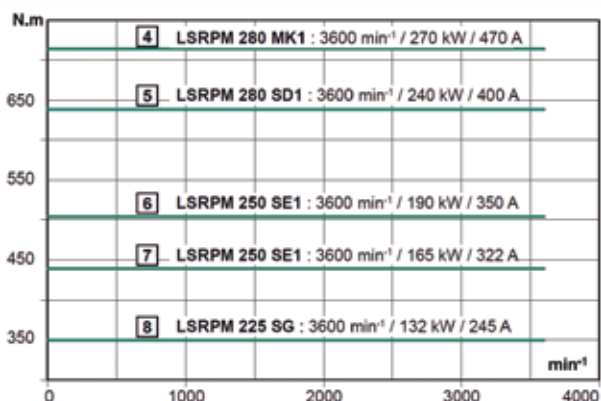
- Reduction in the weight and dimensions of the driven machine: up to 3 frame sizes smaller
- Simplification through elimination of transmission devices (pulleys, belts, etc)
- Longer service life: Lower bearing temperature, etc

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

Leroy-Somer has expanded its offer with the **DYNEO®** range, an innovative, high-performance solution, consisting of permanent magnet synchronous motors and variable speed drives.

Combined with **POWERDRIVE** drives, **LSRPM** and **PLSRPM** motors are revolutionising the electric motor by offering solutions adapted to the industrial environment, producing optimum electrical and mechanical performance that are ideal for saving energy and substantially cutting operating costs:

- Extended speed range
- High torque
- Premium efficiency
- Unrivalled compactness
- Reduced maintenance

The POWERDRIVE range is suitable for all environments and processes thanks to its modular system, its flexibility and its ease of integration in the application by offering solutions from the drive that can be directly incorporated in the machine to the complete system. Add-ons or options for drives and motors can be included to satisfy particular demands.

The POWERDRIVE FX - LSRPM or PLSRPM combinations described in this catalogue are particularly suitable for 4-quadrant applications using a braking resistor, with high inertias, or requiring a very compact solution: hoisting, escalators, the timber industry and centrifugal machines are some examples of this.

The POWERDRIVE MD - LSRPM or PLSRPM combinations described in this catalogue are suitable for most high-power applications: ventilation, pumping, compression, materials handling, conveying, centrifuging, extrusion, etc.

Further information about the products described in this catalogue are available in the corresponding technical documentation.



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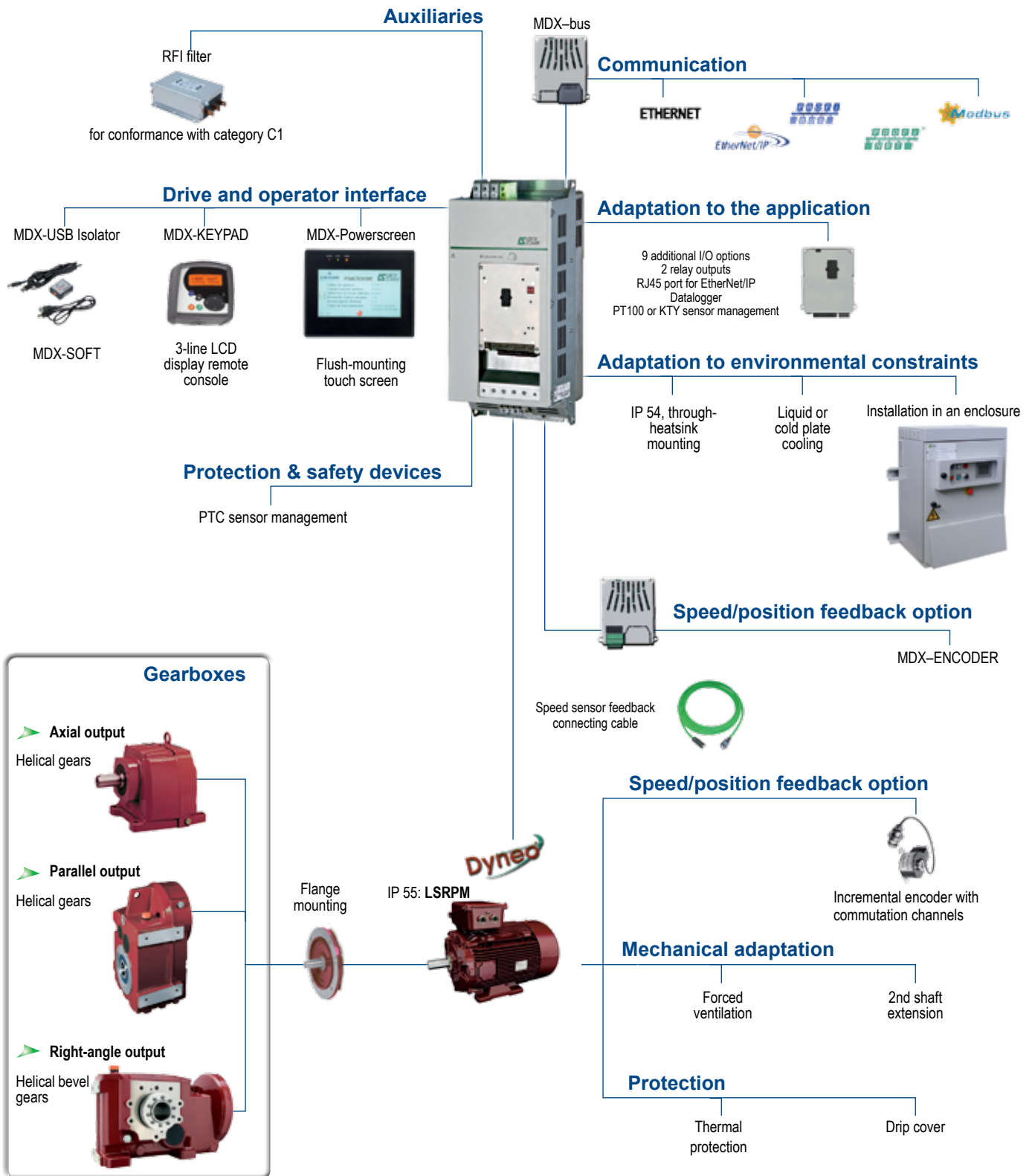
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22 to 90 kW, 4 Q: The POWERDRIVE FX offer



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

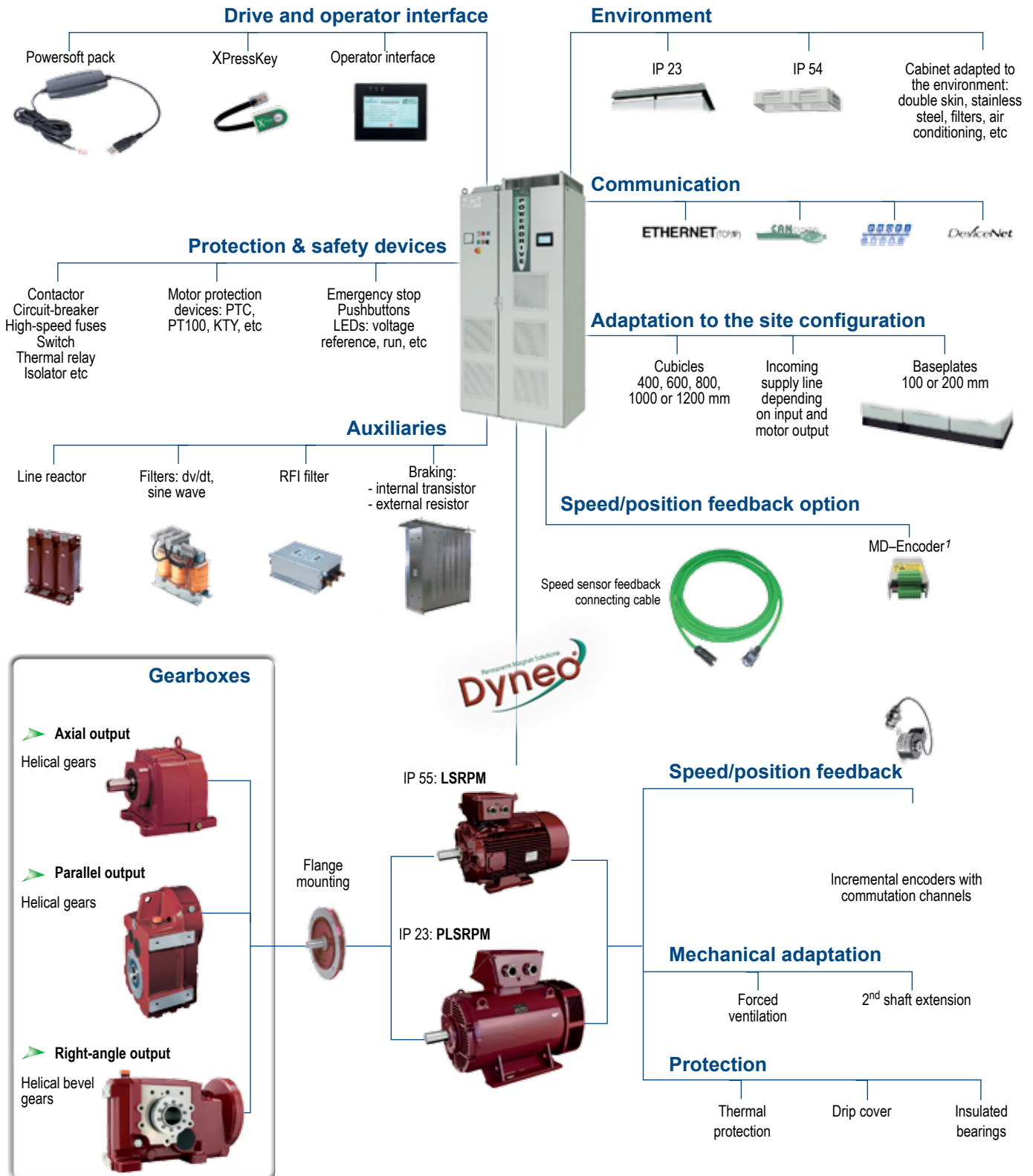
DYNEO® VARIABLE SPEED DRIVES

Powerdrive FX & MD variable speed drives/LSRPM-PLSRPM permanent magnet synchronous motors

Introduction

Modular offer

90 to 390 kW, 2 or 4 Q: The POWERDRIVE MD offer



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

¹: MD-Encoder required to manage a position/speed sensor.

DYNEO® VARIABLE SPEED DRIVES

Powerdrive FX & MD variable speed drives/LSRPM-PLSRPM permanent magnet synchronous motors

Introduction

Powerdrive FX drive



POWERDRIVE FX is an electronic drive designed for supplying asynchronous or synchronous 3-phase motors such as LSRPM and PLSRPM, with encoder or sensorless feedback.

POWERDRIVE FX has a rectifier with IGBT bridge controlled at the frequency of the mains supply that allows the motor energy to

be fed back to the mains supply (operation in all 4 quadrants of the torque/speed plane without energy dissipation) and limiting of the level of current harmonics generated on the power supply line, at a much lower level than that of a conventional 6-pulse drive using a line reactor.

Output selection tables

Rating	Normal duty					Heavy duty				
	Continuous current I _{co} (A)				I _{max}	Continuous current I _{co} (A)				I _{max}
	4 kHz	4.5 kHz	5 kHz	6 kHz	(A)	4 kHz	4.5 kHz	5 kHz	6 kHz	(A)
FX 33T	59	57	56	53	64	45	44	43	41	68
FX 40T	73	70	68	62	79	59	57	55	50	89
FX 50T	86	83	80	74	95	73	70	68	63	110
FX 60T	110	108	106	100	119	92	90	88	84	129
FX 75T	145	138	132	116	157	100	100	100	88	154
FX 100T	175	166	158	137	189	145	138	131	113	203

Conformance

- IP 20 in accordance with EN 60529
- Ambient temperature: -10°C to +40°C, up to 50°C with derating
- Storage temperature: -30°C to +70°C
- Relative humidity: IEC 60068-2-56, < 90% at 40°C (non condensing)
- Altitude: 0 to 4000 m, with derating of 0.6°C per 100 m between 1000 and 4000 m
- Vibrations: IEC 60068-2-6
- Safe Torque Off inputs in accordance with EN 61800-5-2, logic with 2 separate channels
- I/O: IEC 61131-2
- Harmonics: IEC 61000-3-12
- Electromagnetic immunity complies with EN 61800-3 and EN 61000-6-2 standards

DYNEO® VARIABLE SPEED DRIVES

Powerdrive FX & MD variable speed drives/LSRPM-PLSRPM permanent magnet synchronous motors

Introduction

Powerdrive MD drive




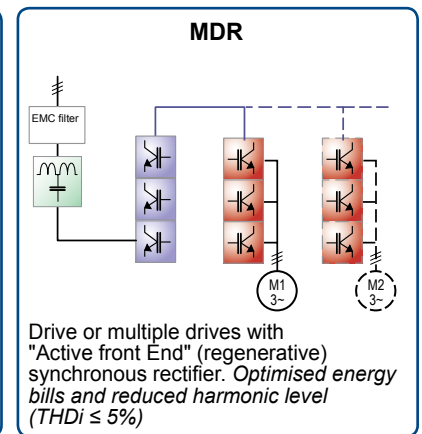
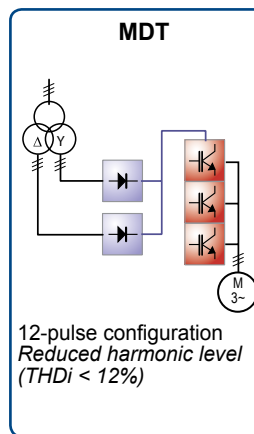
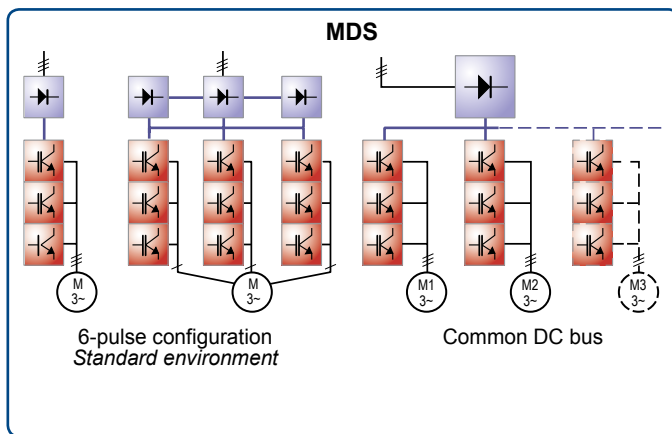
POWERDRIVE MD is a modular electronic drive manufactured in an IP21 or IP54 switch cabinet, designed for supplying asynchronous or synchronous 3-phase motors such as LSRPM and PLSRPM.

Available in air or liquid (MDxL) cooling versions, POWERDRIVE MD can be adapted to all Dyneo® motor control configurations, with encoder or sensorless feedback.

 Rectifier

 Inverter

 Sine wave filter



Output selection tables

	Normal duty						Heavy duty					
	Continuous current Ico (A)					I _{max}	Continuous current Ico (A)					I _{max}
Rating	3 kHz	4 kHz	4.5 kHz	5 kHz	6 kHz	(A)	3 kHz	4 kHz	4.5 kHz	5 kHz	6 kHz	(A)
MD 100T	175	165	157.5	150	138	200	145	132	127	122	115	200
MD 120T	215	200	190	180	165	240	175	160	154	148	138	240
MD 150T	260	240	227.5	215	195	308	220	195	185	175	165	308
MD 180T	305	305	297.5	290	265	360	260	245	237.5	230	220	360
MD 220T	380	330	322.5	315	290	450	305	290	277.5	265	250	450
MD 270T	470	430	410	390	355	530	380	350	335	320	305	530
MD 340T	580	510	485	460	425	660	470	430	415	400	375	660
MD 400T	630	600	575	550	500	760	570	520	500	480	455	760
MD 470T	800	750	715	680	625	940	680	620	605	590	550	940

The characteristics are applicable for an ambient temperature of 40°C. Maximum current available for 60 s every 600 s at maximum drive temperature.

Conformance

- Storage and transport temperature: -20°C to +60°C
- Operating temperature: -10°C to +40°C up to +50°C with derating
- Altitude: 0 to 4000 m, with operating temperature derating of 0.6°C per 100 m between 1000 and 4000 m
- Relative humidity in accordance with IEC standard 60068-2-56: < 90% non condensing
- Degree of protection: 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: ISO 13849-1 level PLb and IEC 62061 level SIL1.
- I/O: IEC 61131-2
- Emissions: EN 61800-3 category C3, or category C2 with optional filter

Description of motors

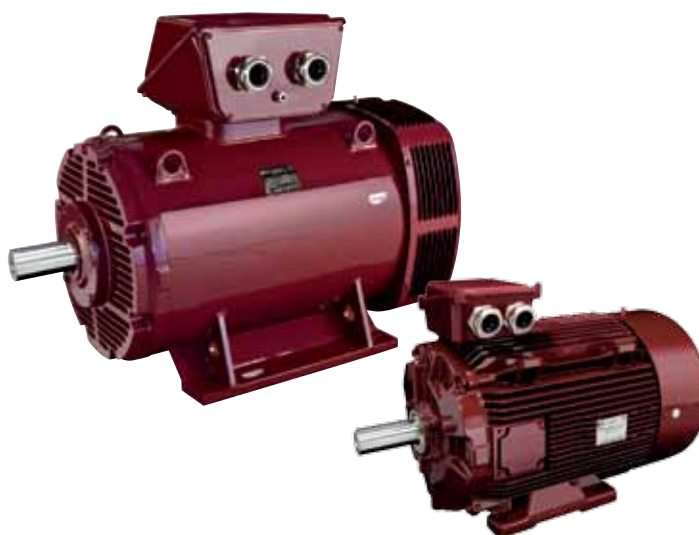
Description	Materials	Comments
Frame	LSRPM: Aluminium alloy PLSRPM: Steel	<ul style="list-style-type: none"> - With integral or screw-on feet, or without feet - 4 or 6 fixing holes for housings with feet - Lifting rings - Earth terminal with an optional jumper screw
Stator	Insulated low-carbon magnetic steel laminations Electroplated copper	<ul style="list-style-type: none"> - 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	<ul style="list-style-type: none"> - Magnet fixing system. LS patented - Dynamically balanced rotor: <ul style="list-style-type: none"> • level A for speeds $\leq 3000 \text{ min}^{-1}$ • level B for speeds $> 3000 \text{ min}^{-1}$
Shaft	Steel	
End shields	Cast iron	
Bearings and lubrication		<ul style="list-style-type: none"> - 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	<ul style="list-style-type: none"> - 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	<ul style="list-style-type: none"> - 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.

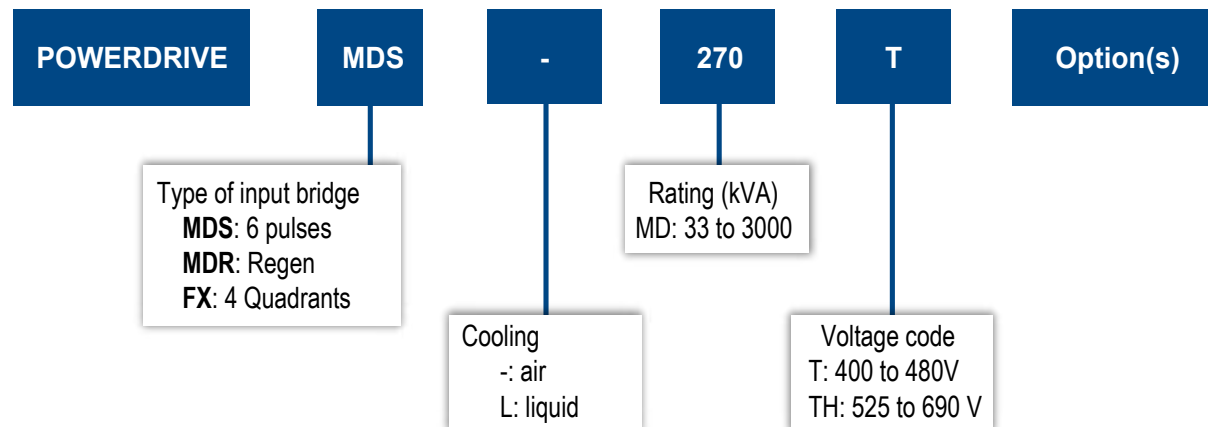
Assembly or maintenance of the rotor must not be carried out by people with a pacemaker or any other implanted medical electronic device.

The assembled motor presents no risk.

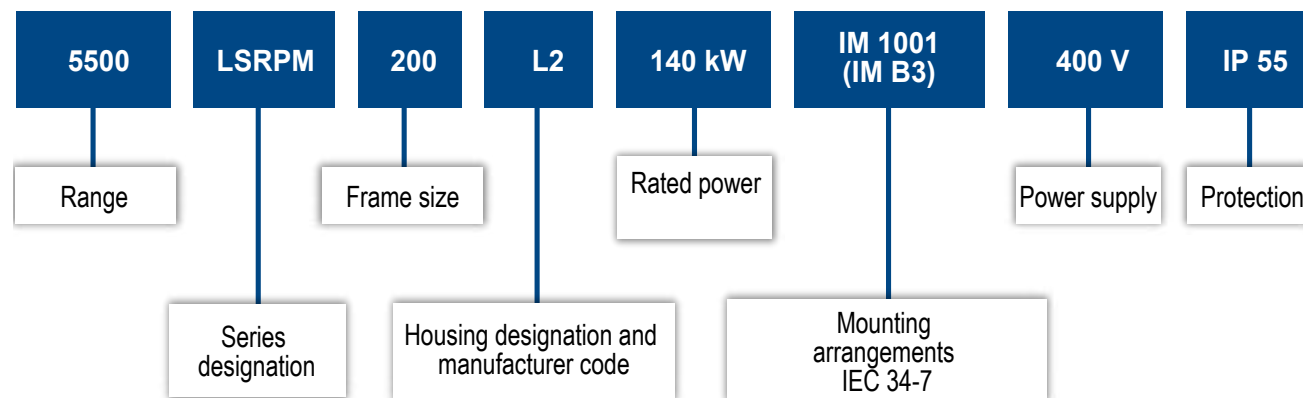


Variable speed drive designation

Drive



Motor



Example:

A machine requires a torque of 270 N.m over a speed range of 800 to 3200 min⁻¹ in continuous duty.

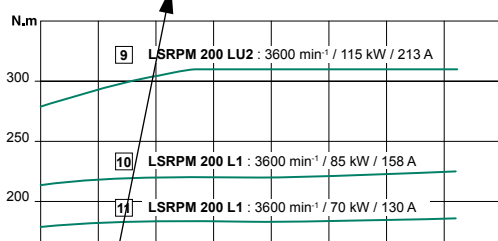
The maximum torque is 110%.

Step 1: Choice of motor

a) Selecting the torque range

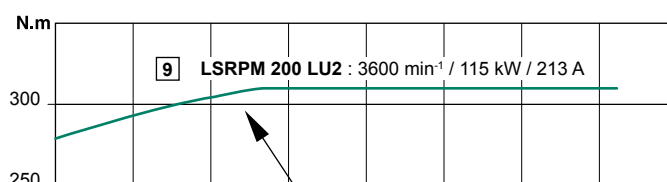
3600 range

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 that has a torque immediately higher than the application requirements



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

LSRPM 200 LU2 / 3600 min⁻¹ / 115 kW / 213 A

Motor type

Rated speed

Rated power

Rated current

Step 2: Choice of drive

3600 range

IP	Power (kW)	Speed (min ⁻¹)	Drive type	Rated torque (N.m)	Maximum torque (N.m)	Ratio
IP 55	70	96.0	FX 75T	70	186	1.12
			MD 100T	70	186	1.35
			FX 75T	75	197	1.06
			MD 100T	75	197	1.18
IP 55	85	96.4	MD 120T	85	225	1.35
			MD 120T	103	272	1.18
			MD 150T	115	305	1.35
			MD 150T	120	319	1.26
IP 55	132	96.8	MD 180T	132	350	1.35
			MD 180T	158	420	1.13
			MD 220T	165	438	1.35
			MD 220T	175	464	1.30
IP 55	165	96.9	MD 270T	190	504	1.34
			MD 270T	240	637	1.23
			MD 340T	240	637	1.35
			MD 340T	240	637	1.35

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.

$M_{max}/M_n = 1.10$

Choice of drive: where $M_n = 272$ N.m and $M_{max}/M_n = 118\%$ *

MD

↓

Drive type

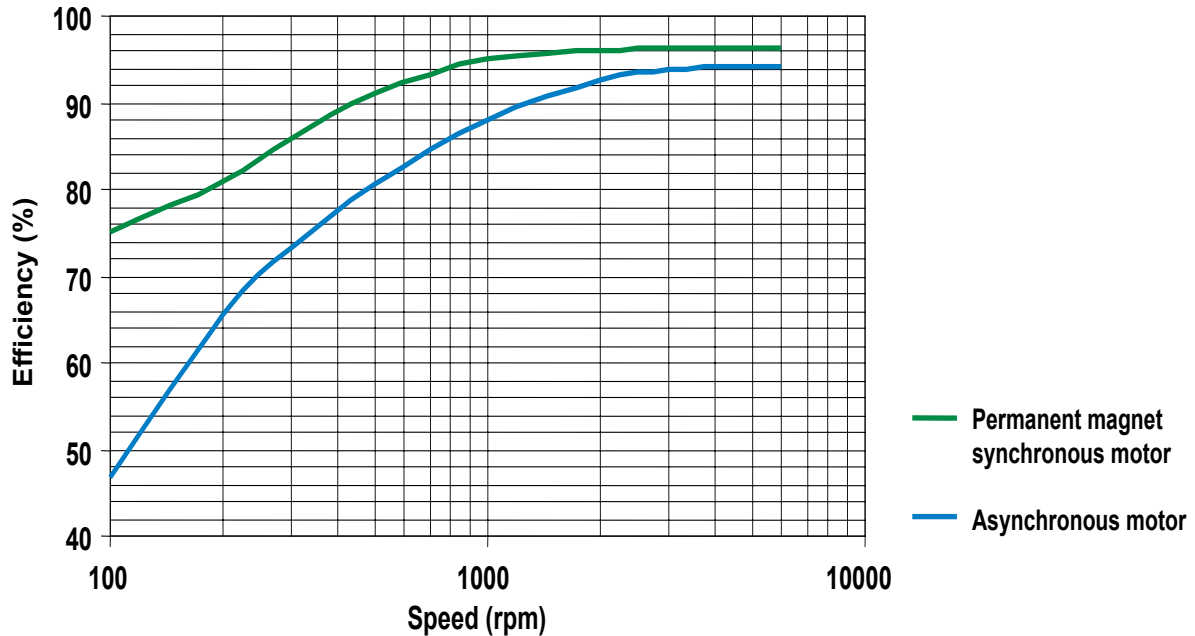
120T

↓

Drive rating

* for $M_n = 270$ N.m, $M_{max}/M_n = 1.18$

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%

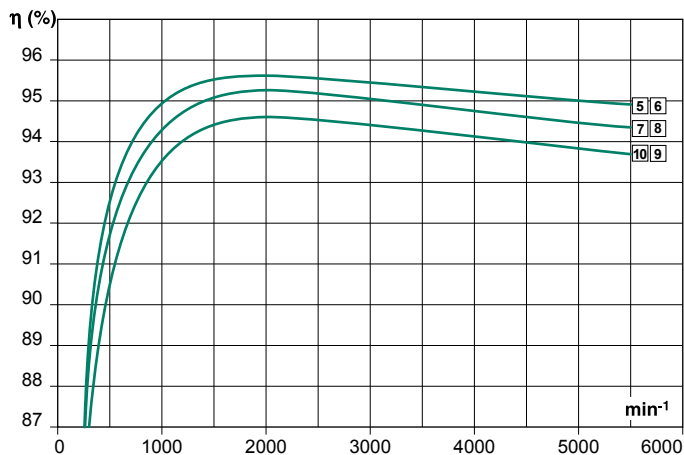
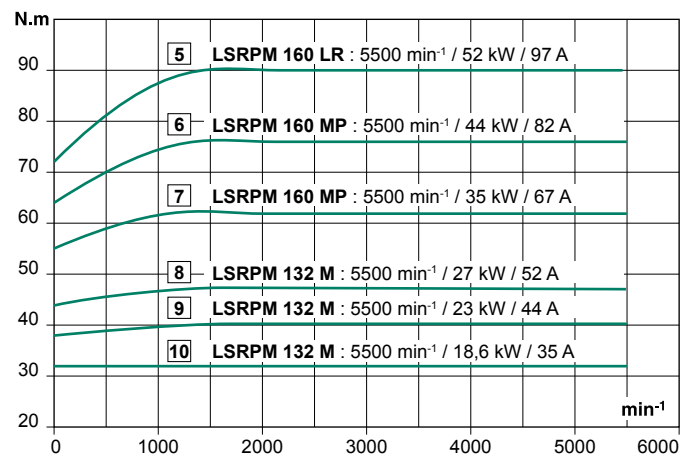
η_2 : Estimated efficiency of the same asynchronous motor supplied via a drive at 50 Hz

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

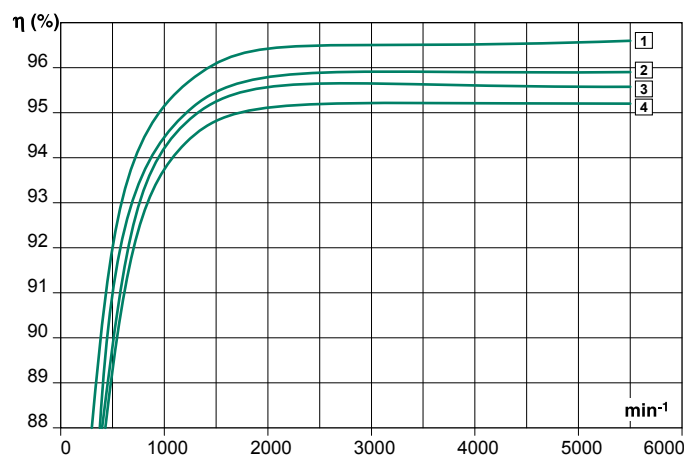
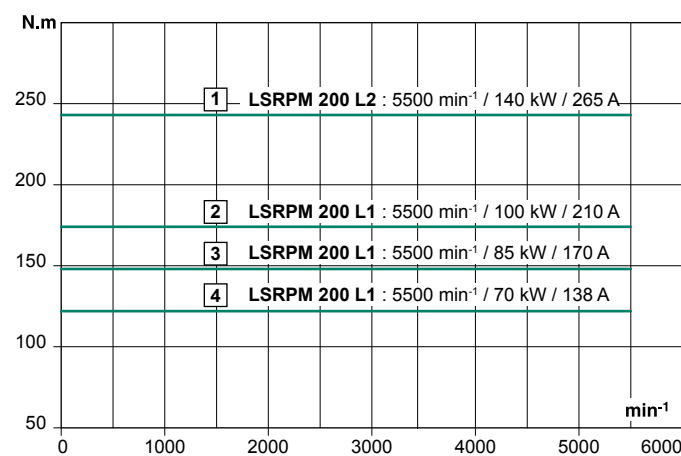
Efficiency of the equivalent synchronous motor = 97.3%

5500 range - 0 to 5500 min⁻¹

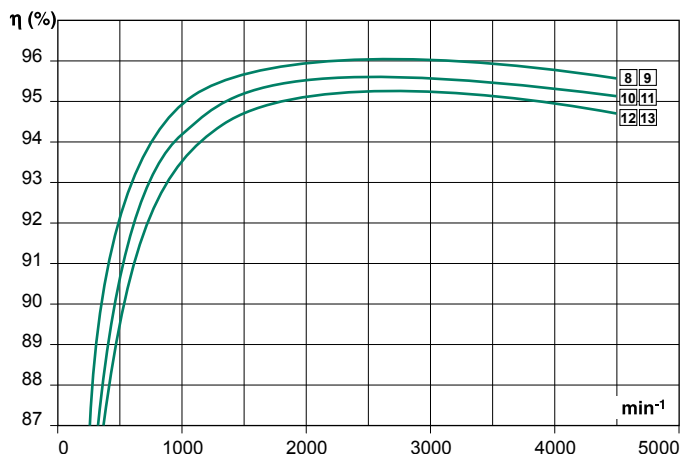
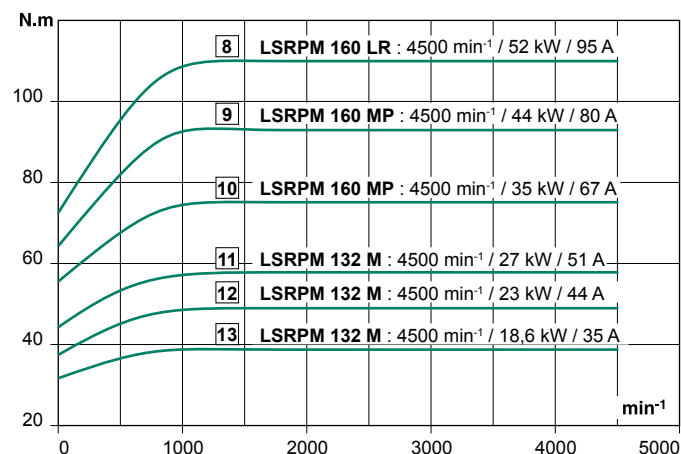
Torque from 0 to 90 N.m



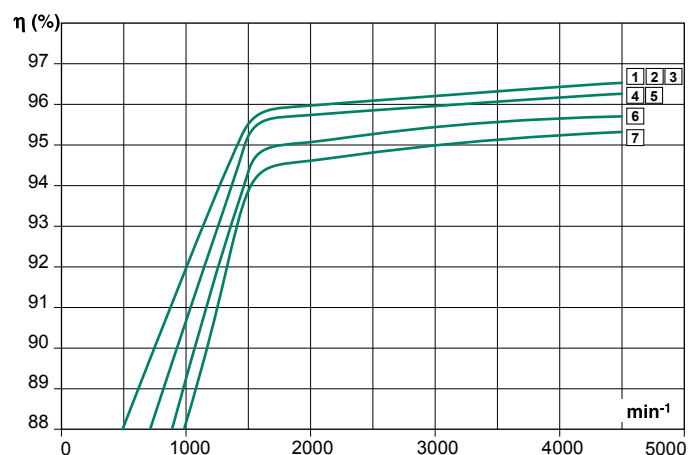
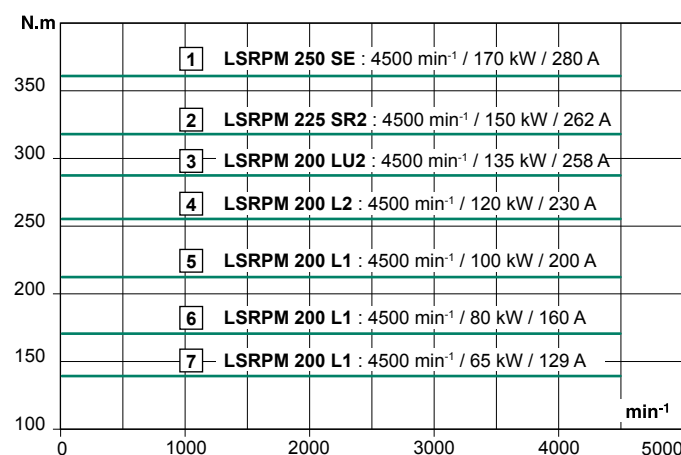
Torque from 90 to 240 N.m



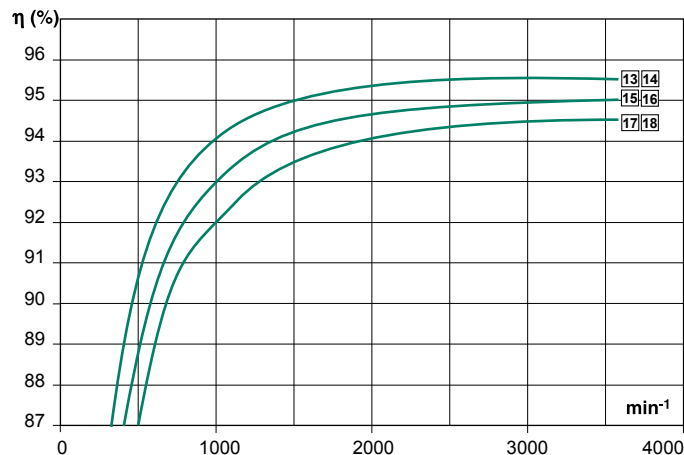
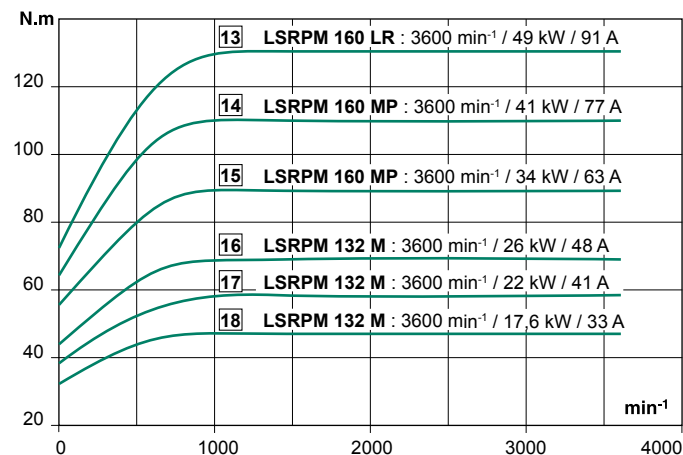
Torque from 0 to 110 N.m



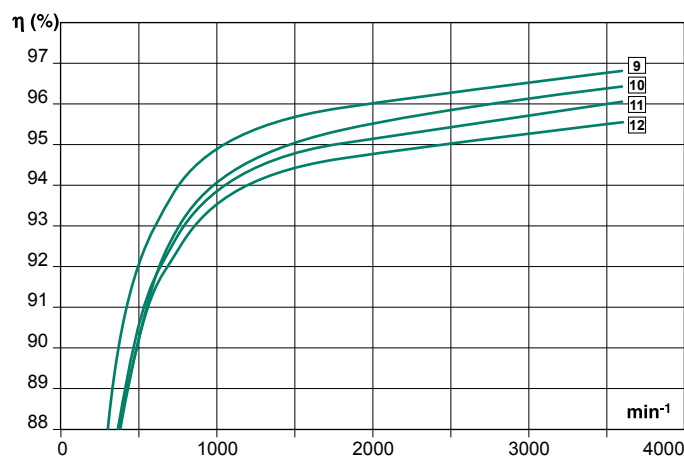
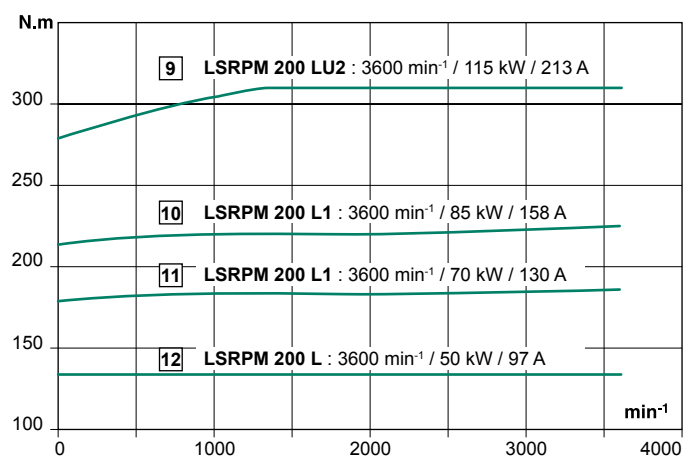
Torque from 110 to 360 N.m



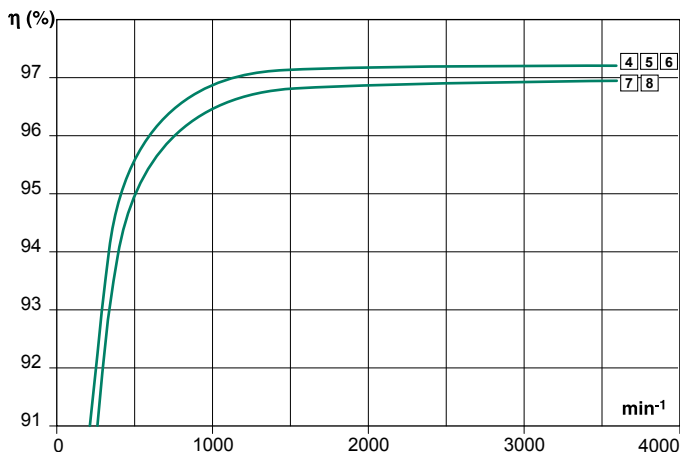
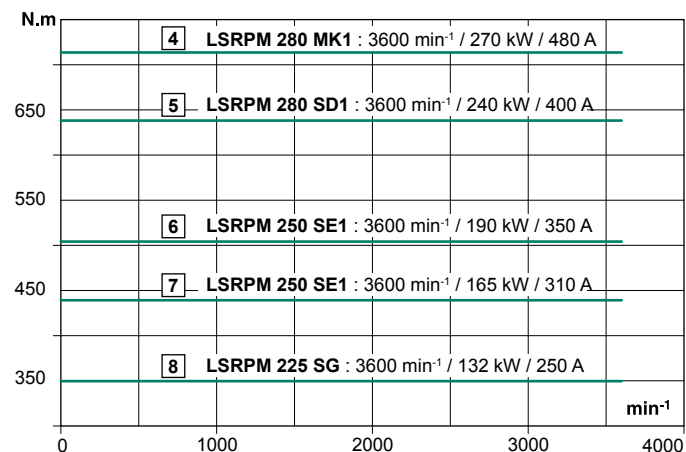
Torque from 0 to 130 N.m



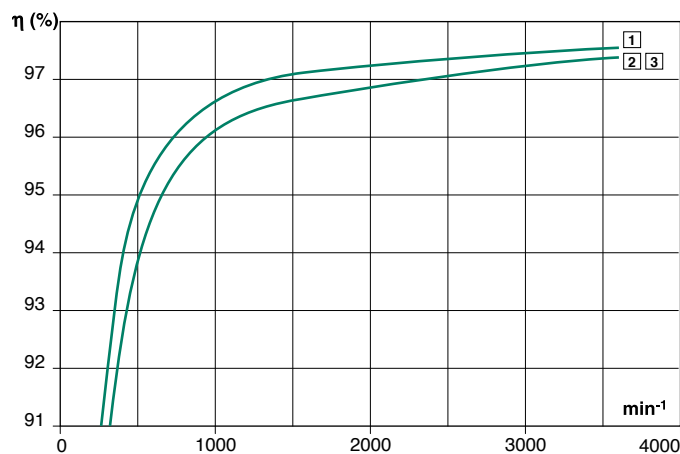
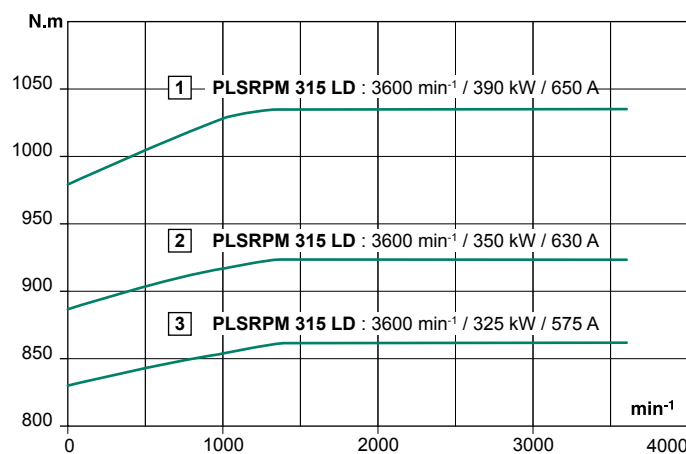
Torque from 130 to 305 N.m



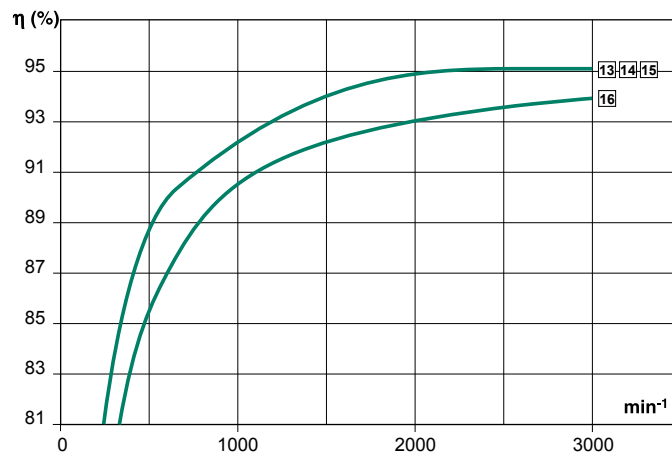
Torque from 305 to 715 N.m



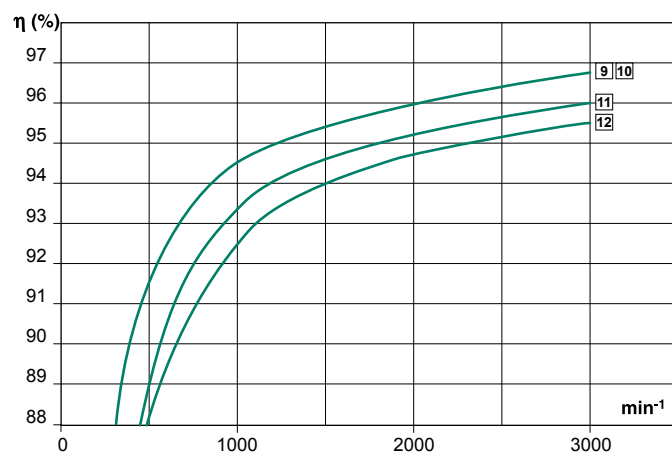
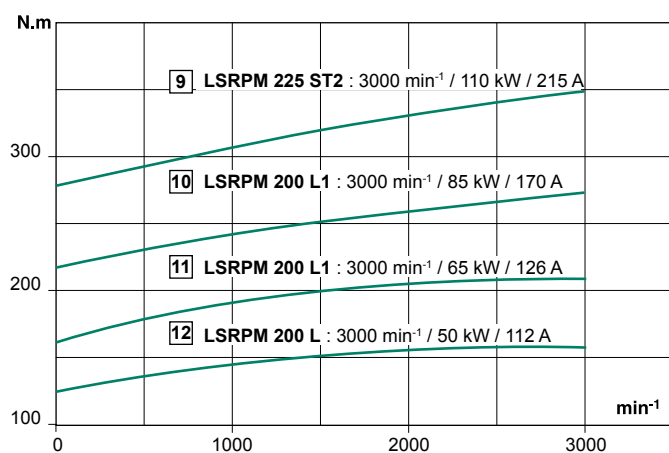
Torque from 715 to 1035 N.m



Torque from 0 to 140 N.m

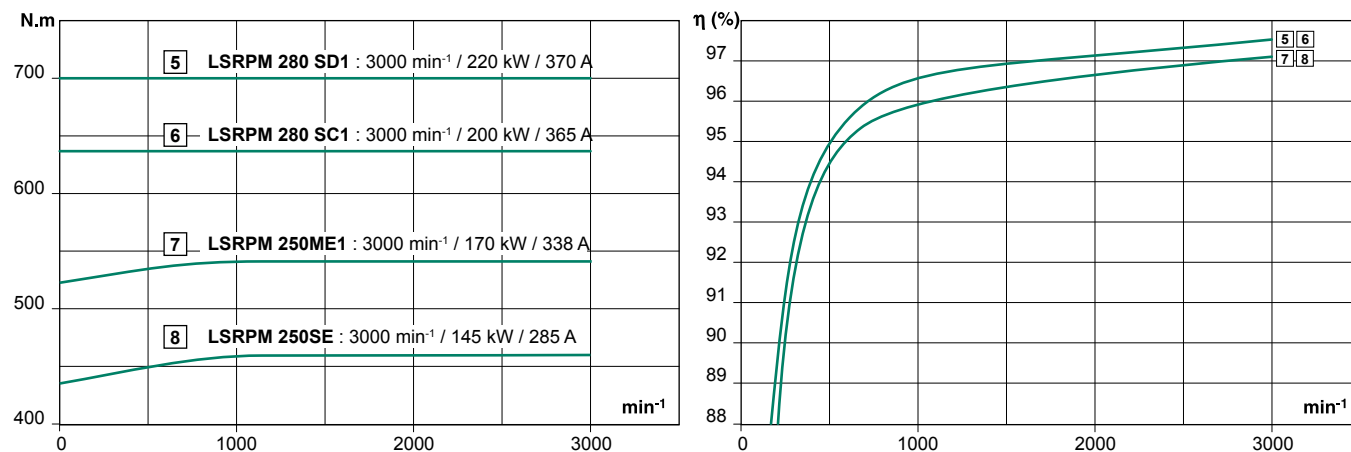


Torque from 140 to 350 N.m

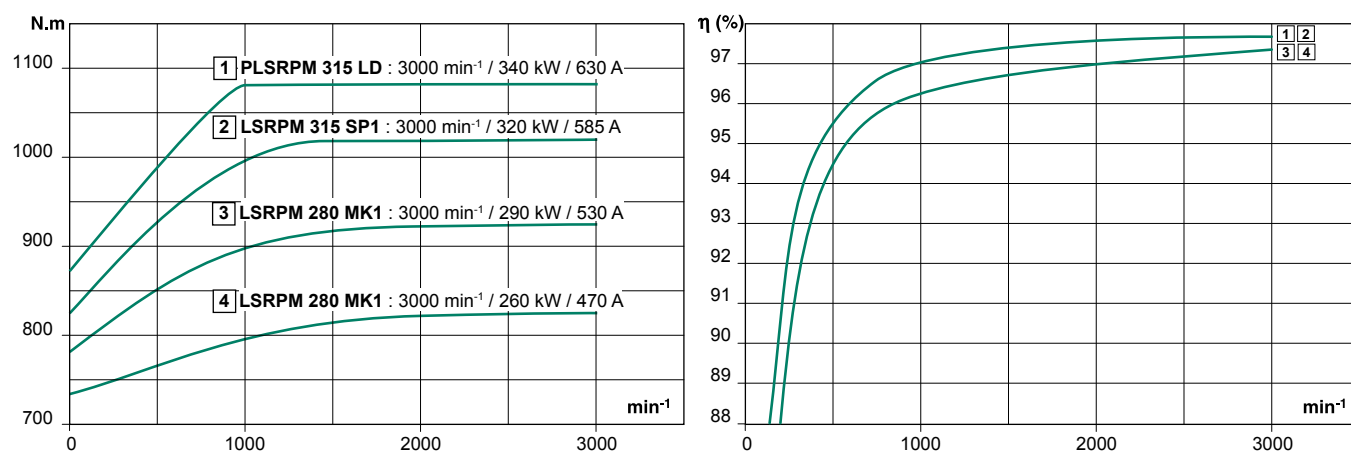


3000 range - 0 to 3000 min⁻¹

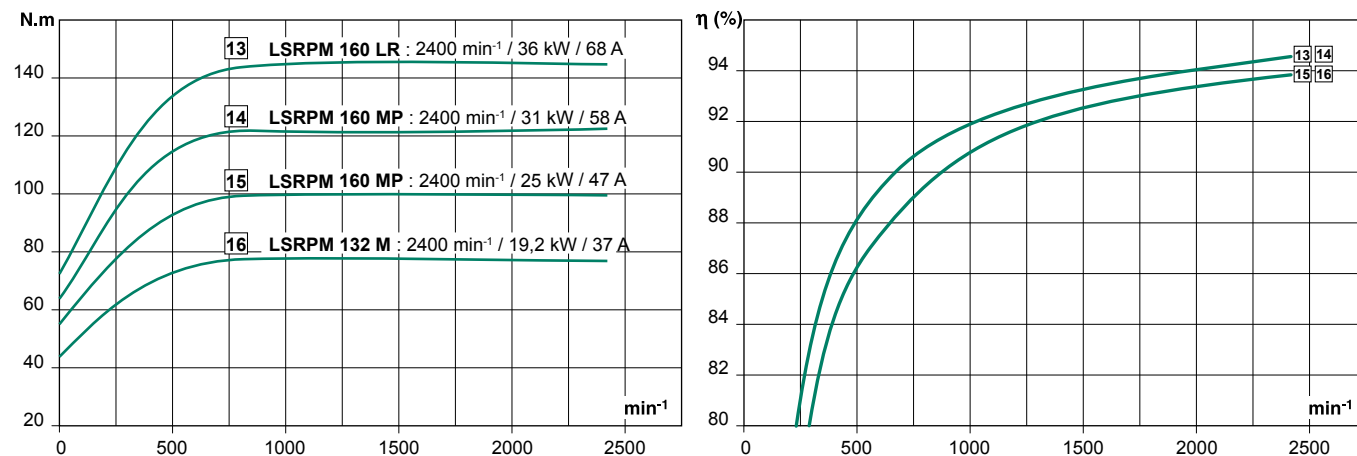
Torque from 350 to 700 N.m



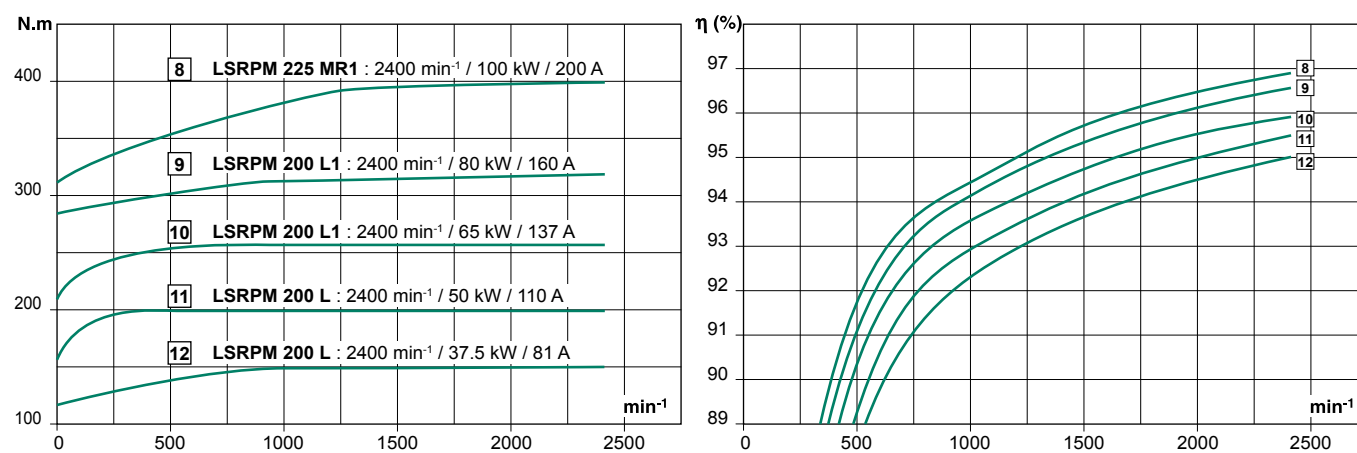
Torque from 700 to 1080 N.m



Torque from 0 to 145 N.m

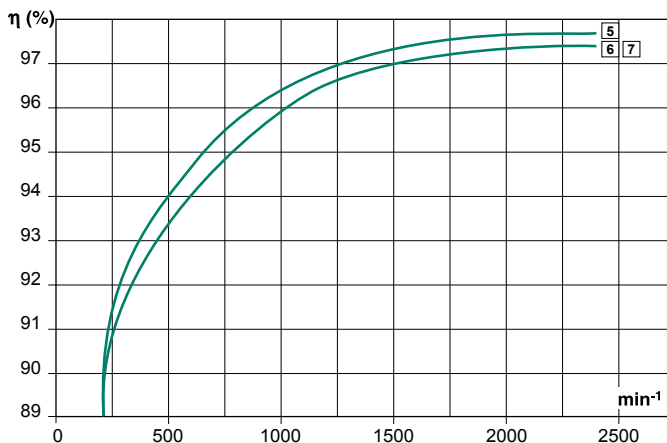
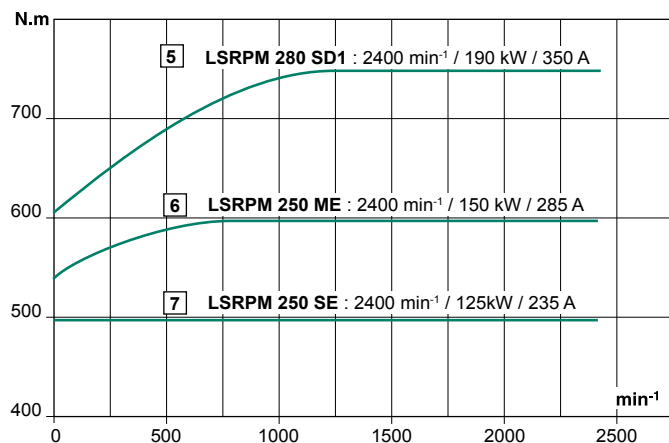


Torque from 145 to 400 N.m

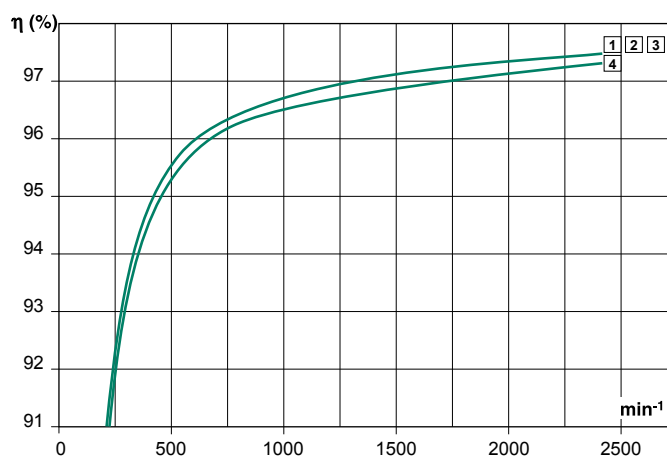
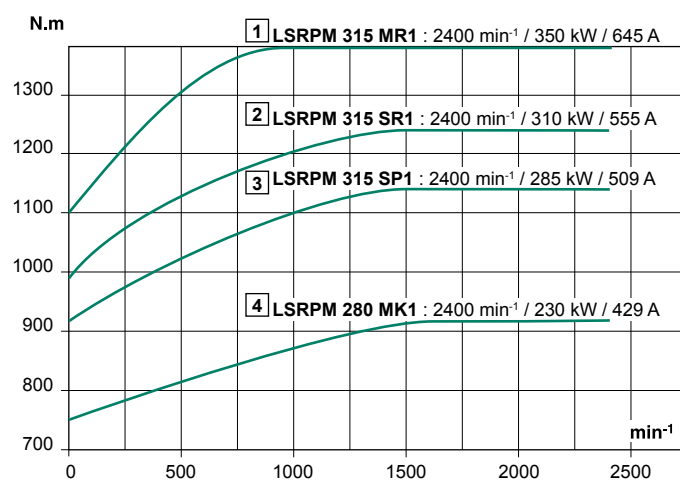


2400 range - 0 to 2400 min⁻¹

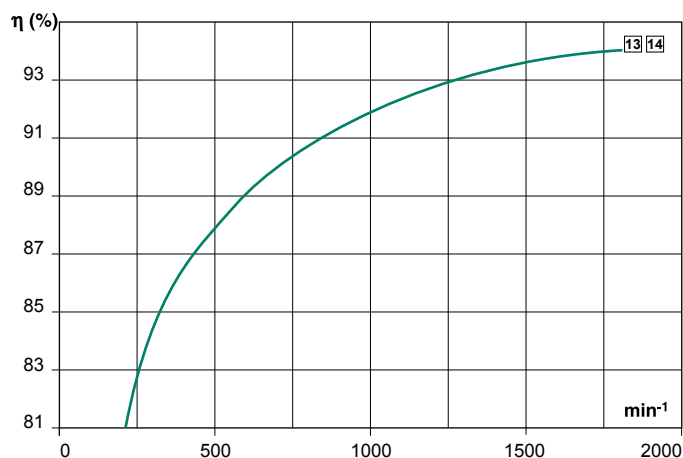
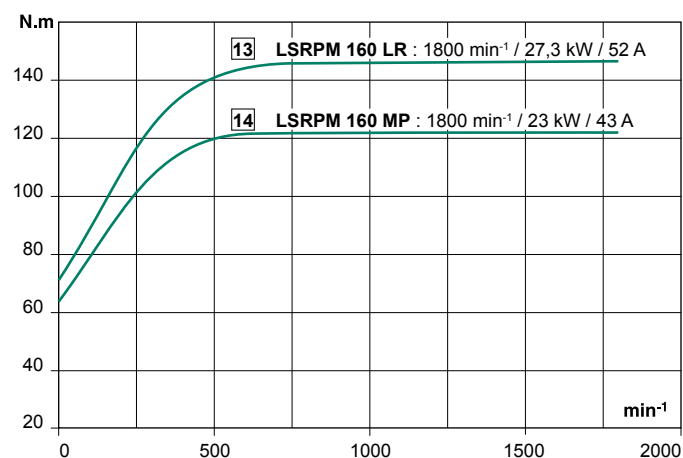
Torque from 400 to 755 N.m



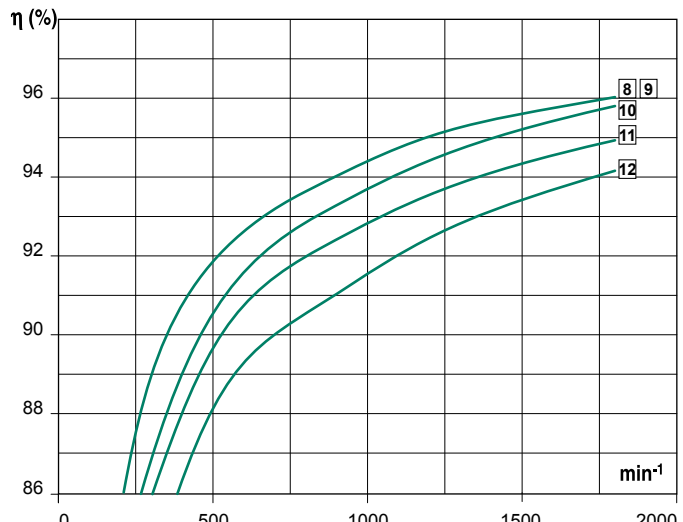
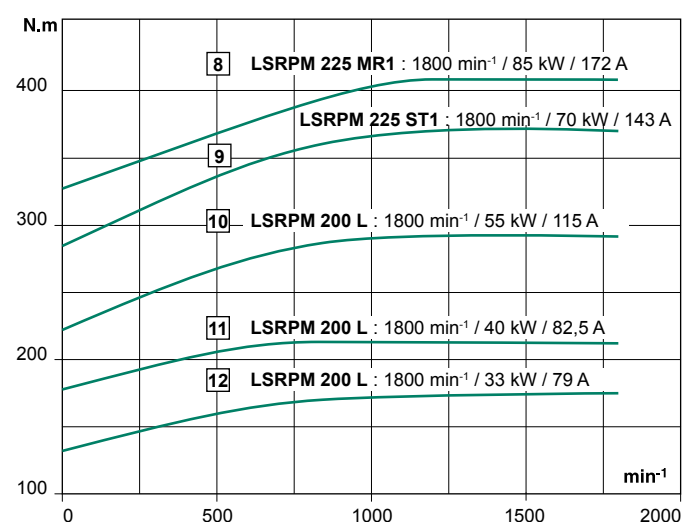
Torque from 755 to 1390 N.m



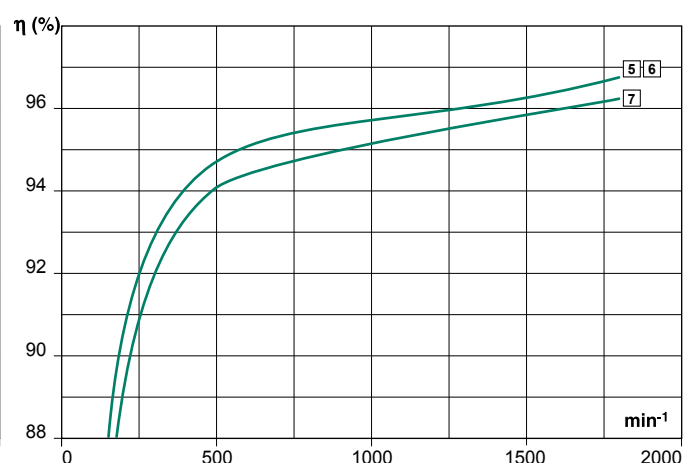
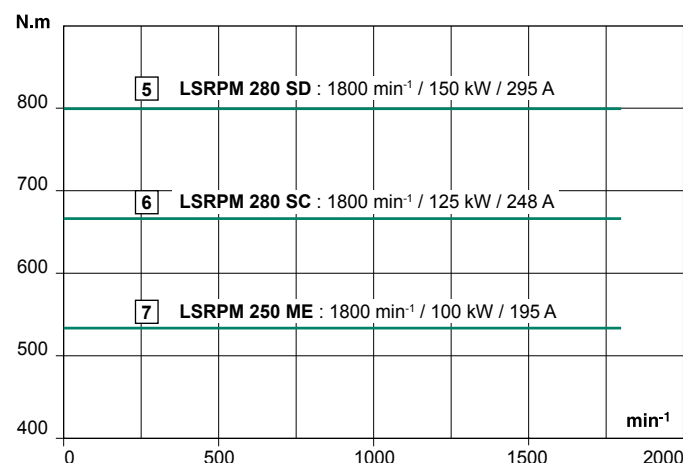
Torque from 0 to 145 N.m



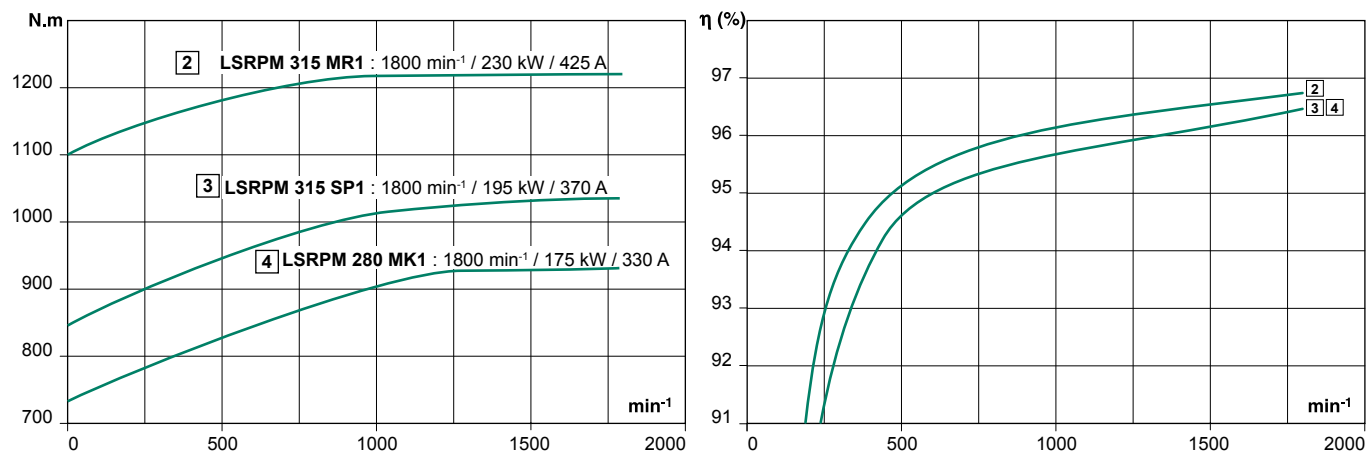
Torque from 145 to 370 N.m



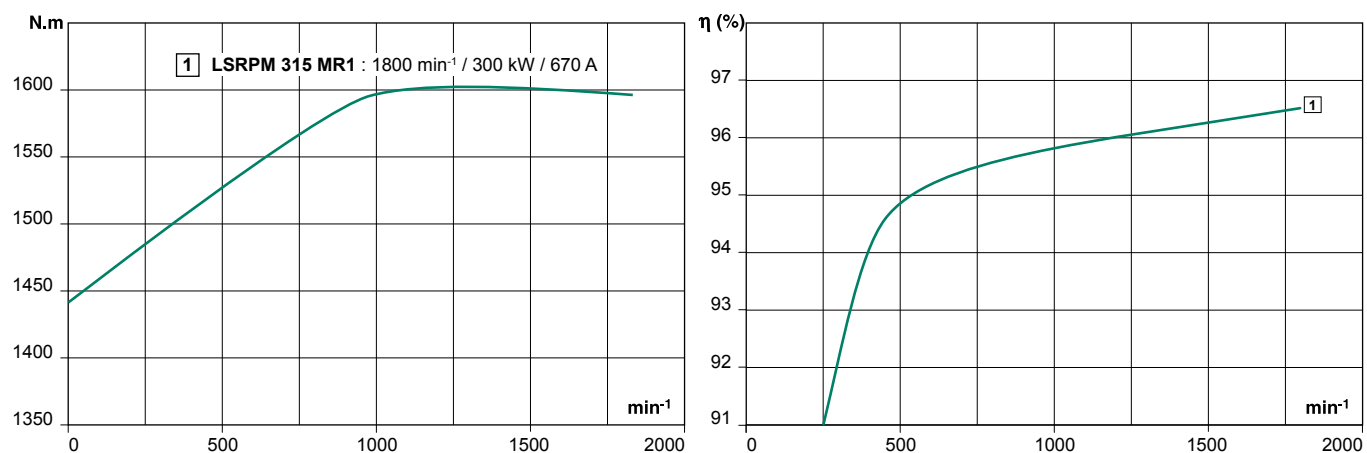
Torque from 370 to 800 N.m



Torque from 800 to 1220 N.m

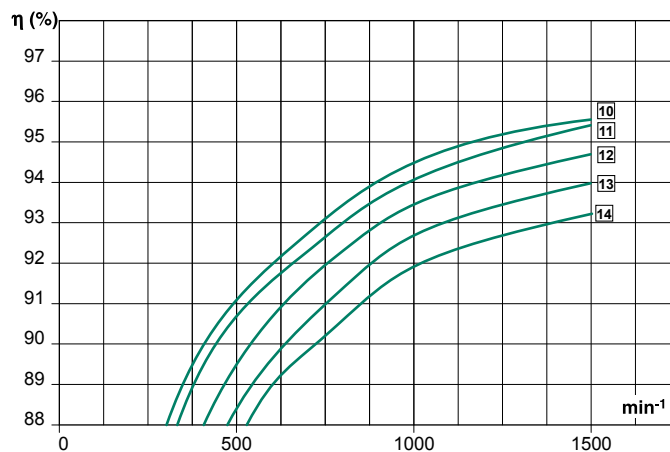
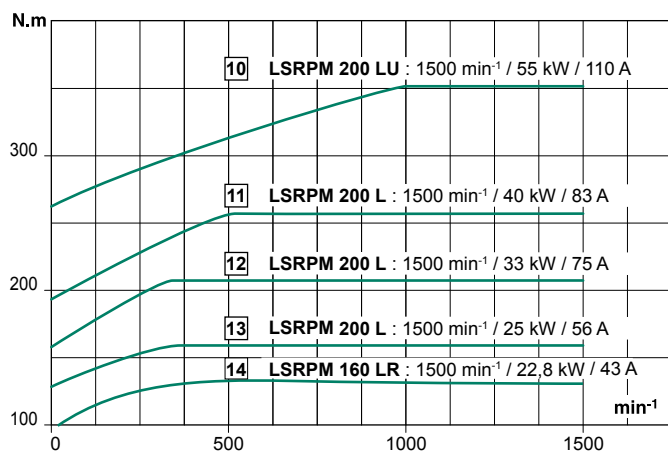


Torque from 1220 to 1592 N.m

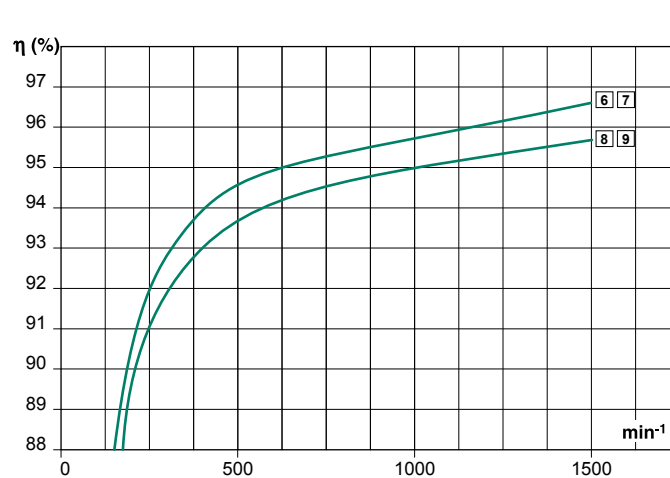
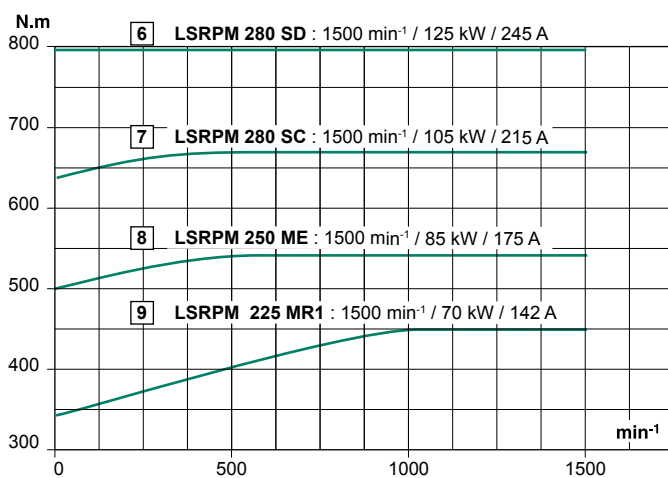


1500 range - 0 to 1500 min⁻¹

Torque from 0 to 350 N.m

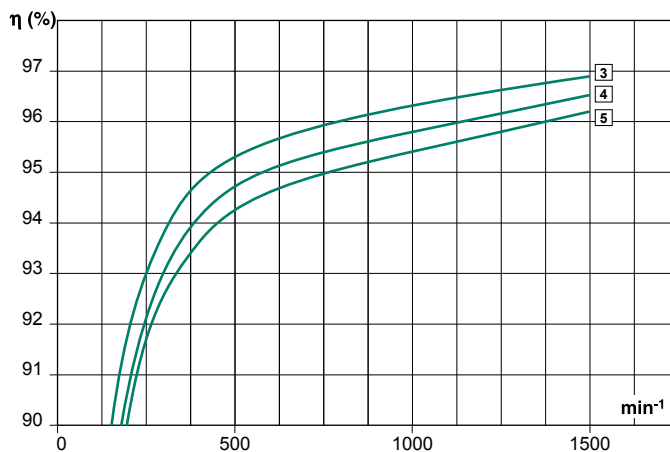
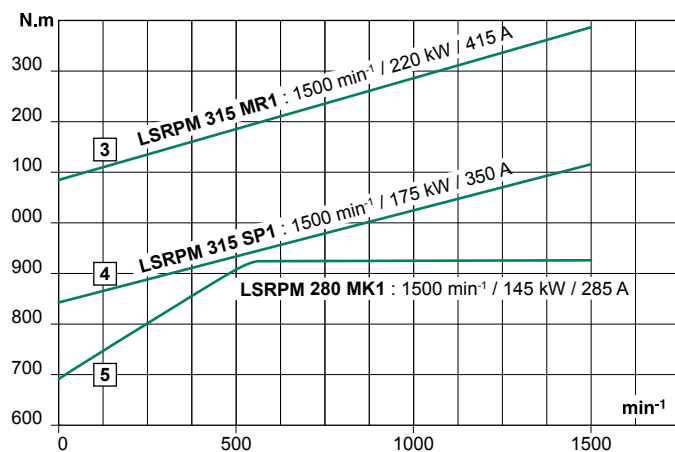


Torque from 350 to 800 N.m

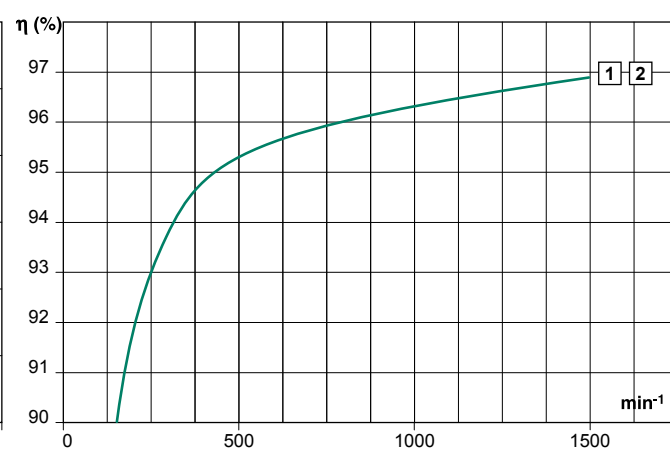
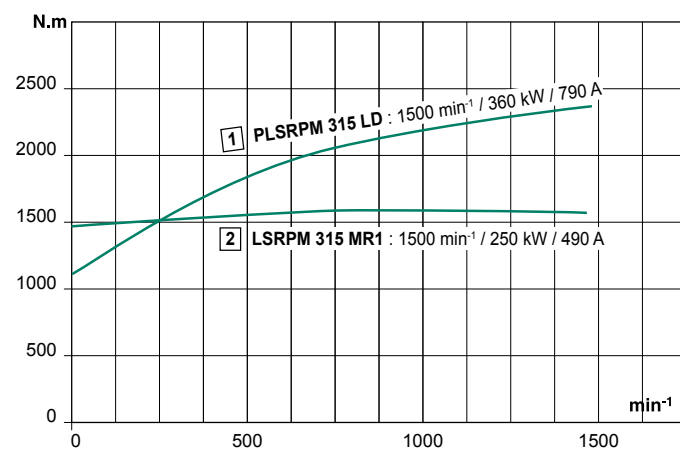


1500 range - 0 to 1500 min⁻¹

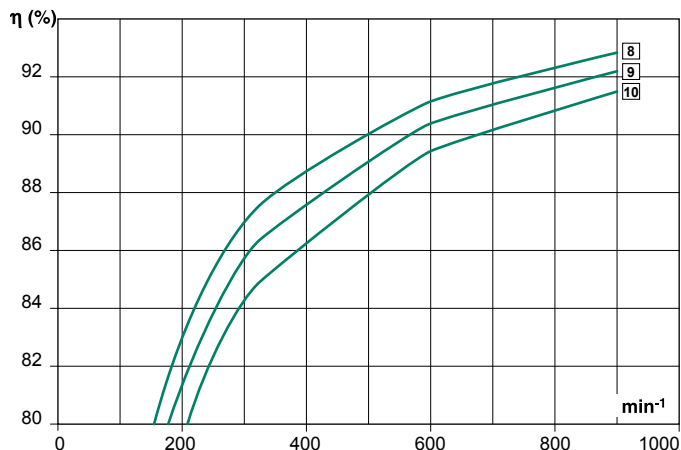
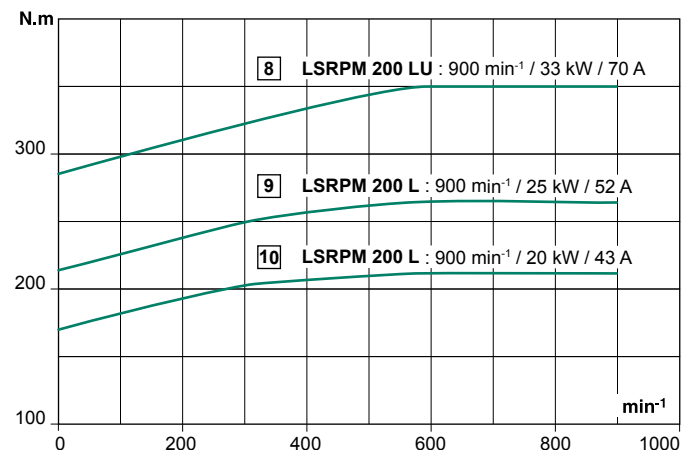
Torque from 800 to 1400 N.m



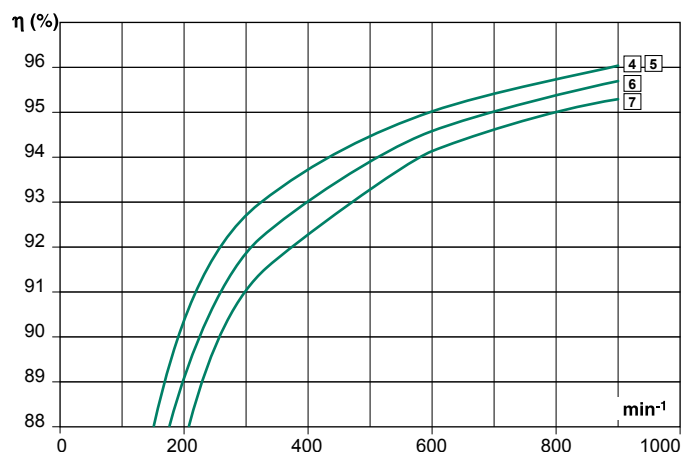
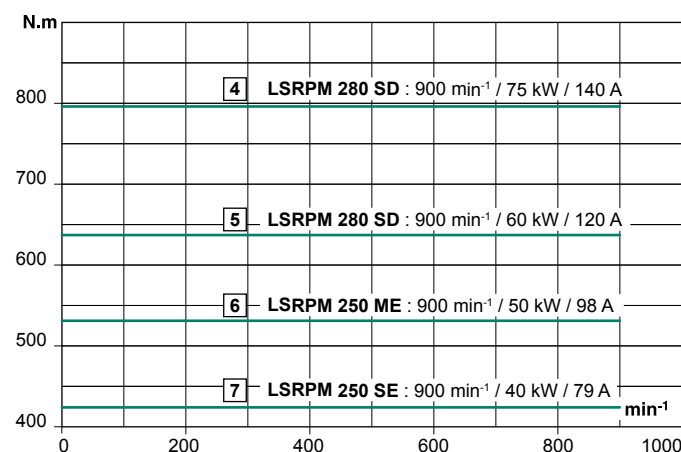
Torque from 1400 to 2290 N.m



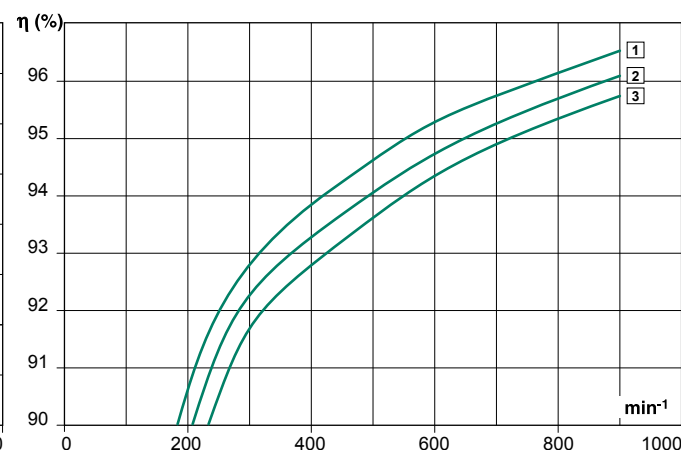
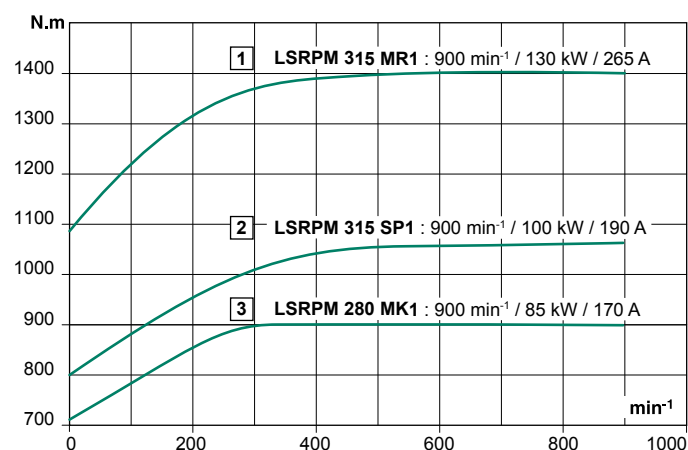
Torque from 0 to 350 N.m



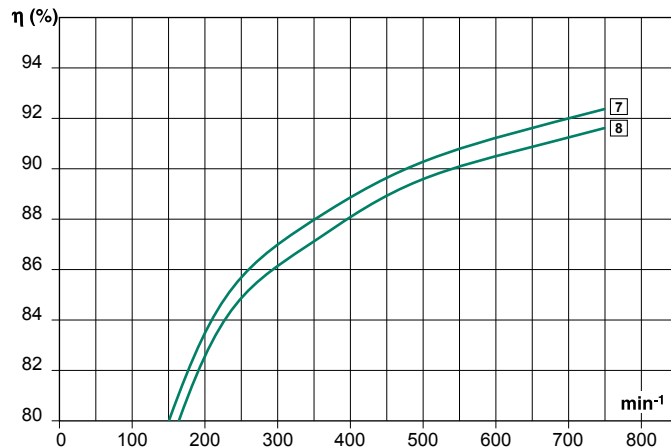
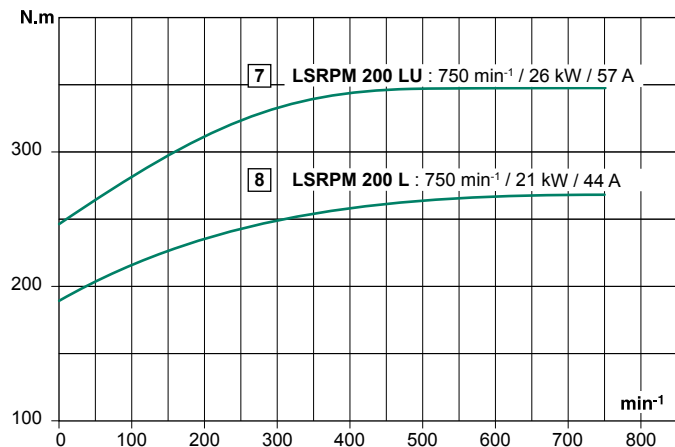
Torque from 350 to 800 N.m



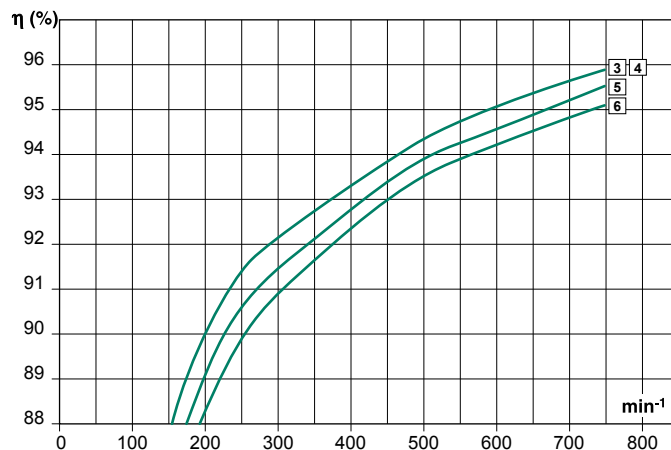
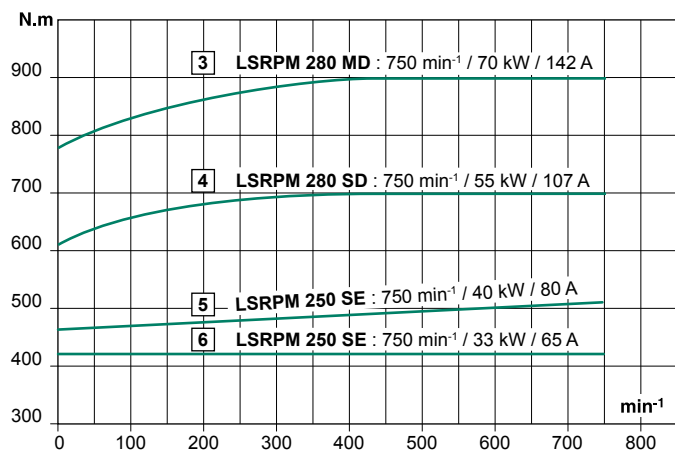
Torque from 800 to 1380 N.m



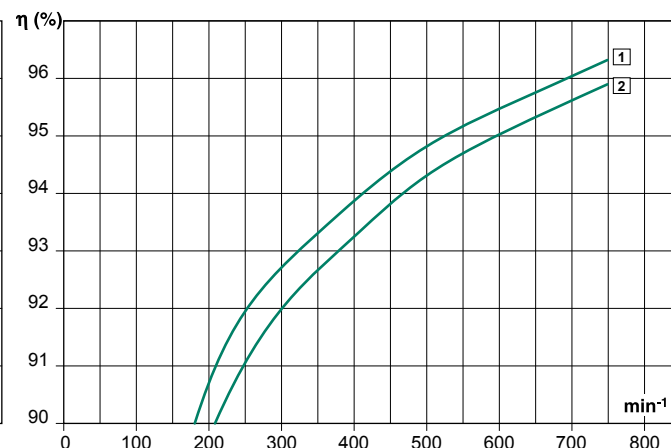
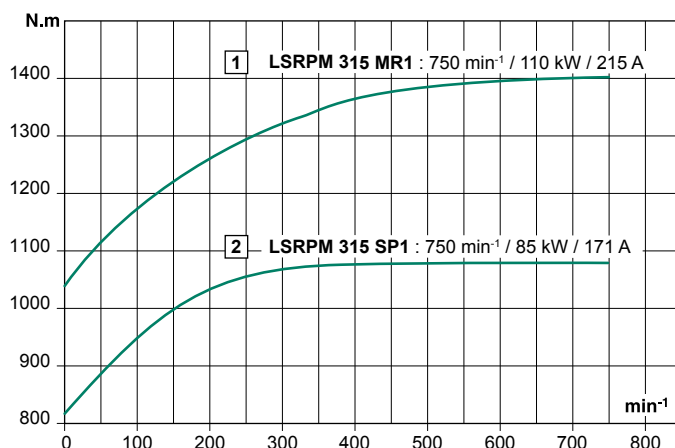
Torque from 0 to 345 N.m



Torque from 345 to 890 N.m



Torque from 890 to 1400 N.m



DYNEO® VARIABLE SPEED DRIVES

Powerdrive FX & MD variable speed drives/LSRPM-PLSRPM permanent magnet synchronous motors

Selection

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)

85 Drive limit

97 Motor limit

MOTOR				DRIVE	VARIABLE SPEED DRIVE							Motor moment of inertia	Motor weight
Type	Ingress Protection	Rated power P _n kW	Efficiency IEC 60034-2-1 2007 η 4/4	Type	Available power P _n kW	Rated torque M _n N.m	Maximum torque/ Rated torque M _m /M _n	Rated current ¹ I _n A	Maximum current/ Rated current ¹ I _m /I _n	Minimum switching frequency F _D kHz	Efficiency η 4/4		
LSRPM 132 M	IP 55	18.6	94.0	FX 33T	18.6	32	1.50	35	1.50	6	92.1	0.0165	40
LSRPM 132 M	IP 55	23	94.0	FX 33T	23.0	40	1.45	44	1.45	6	92.1	0.0231	44
LSRPM 132 M	IP 55	27	94.5	FX 33T	27.0	47	1.23	52	1.23	6	92.6	0.0311	49
				FX 40T			1.50		1.50				
LSRPM 160 MP	IP 55	35	94.5	FX 40T	32	56	1.27	62	1.27	6	92.6	0.0418	60
				FX 50T	35	61	1.50	67	1.50				
LSRPM 160 MP	IP 55	44	95.0	FX 50T	40	69	1.28	74	1.28	6	93.1	0.0514	69
				FX 60T	44	76	1.50	82	1.50				
LSRPM 160 LR	IP 55	52	95.0	FX 60T	52	90	1.22	97	1.22	6	93.1	0.0626	79
				FX 75T			1.50		1.50				
LSRPM 200 L1	IP 55	70	95.2	FX 75T	59	103	1.26	116	1.35	6	93.3	0.13	138
				MD 100T	70	122	1.34	138	1.44				
LSRPM 200 L1	IP 55	85	95.4	MD 120T	83	144	1.36	165	1.45	6	93.5	0.15	148
				MD 150T	85	148	1.40	170	1.50				
LSRPM 200 L1	IP 55	100	95.8	MD 150T	93	162	1.40	195	1.50	6	93.9	0.17	153
				MD 180T	100	174	1.40	210	1.50				
LSRPM 200 L2	IP 55	140	96.6	MD 180T	140	243	1.26	265	1.35	6	94.7	0.22	180
				MD 220T			1.40		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

DYNEO® VARIABLE SPEED DRIVES

Powerdrive FX & MD variable speed drives/LSRPM-PLSRPM permanent magnet synchronous motors

Selection

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)

92 Drive limit

97 Motor limit

MOTOR				DRIVE	VARIABLE SPEED DRIVE							Motor moment of inertia J kg.m ²	Motor weight IM B3 kg
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 kW	η 4/4		P _n kW	M _n N.m	M _m /M _n 	I _n A	I _m /I _n 	F _D kHz	η 4/4		
LSRPM 132 M	IP 55	18.6	94.5	FX 33T	18.6	39	1.50	35	1.50	5	92.6	0.0165	40
LSRPM 132 M	IP 55	23	94.5	FX 33T	23	49	1.45	44	1.45	5	92.6	0.0231	44
LSRPM 132 M	IP 55	27	95.0	FX 33T	27	58	1.25	51	1.25	5	93.1	0.0311	49
				FX 40T			1.50		1.50				
LSRPM 160 MP	IP 55	35	95.0	FX 40T	35	75	1.17	67	1.17	5	93.1	0.0418	60
				FX 50T			1.50		1.50				
LSRPM 160 MP	IP 55	44	95.5	FX 50T	44	93	1.18	80	1.18	5	93.6	0.0514	69
				FX 60T			1.50		1.50				
LSRPM 160 LR	IP 55	52	95.5	FX 60T	49	104	1.29	92	1.29	5	93.6	0.0626	79
				FX 75T	52	110	1.50	97	1.50				
LSRPM 200 L1	IP 55	65	95.3	FX 75T	60	127	1.21	120	1.30	5	93.4	0.13	138
				MD 100T	65	138	1.40	130	1.50				
LSRPM 200 L1	IP 55	80	95.7	MD 100T	75	159	1.24	150	1.33	5	93.8	0.15	148
				MD 120T	80	170	1.40	160	1.50				
LSRPM 200 L1	IP 55	100	96.2	MD 120T	90	191	1.24	180	1.33	5	94.3	0.20	168
				MD 150T	100	212	1.40	200	1.50				
LSRPM 200 L2	IP 55	120	96.4	MD 150T	112	238	1.34	215	1.43	5	94.5	0.24	185
				MD 180T	120	255	1.40	230	1.50				
LSRPM 200 LU2	IP 55	135	96.5	MD 180T	135	287	1.30	258	1.40	5	94.6	0.26	195
				MD 220T			1.40		1.50				
LSRPM 225 SR2	IP 55	150	96.6	MD 180T	150	318	1.28	262	1.37	5	94.7	0.32	225
				MD 220T			1.40		1.50				
LSRPM 250 SE	IP 55	170	96.5	MD 180T	170	361	1.20	280	1.29	5	95.4	0.76	310
				MD 220T			1.40		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

DYNEO® VARIABLE SPEED DRIVES

Powerdrive FX & MD variable speed drives/LSRPM-PLSRPM permanent magnet synchronous motors

Selection

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)

126 Drive limit

130 Motor limit

MOTOR				DRIVE	VARIABLE SPEED DRIVE							Motor moment of inertia	Motor weight
Type	Ingress Protection	Rated power P _n kW	Efficiency IEC 60034-2-1 2007 η 4/4	Type	Available power P _n kW	Rated torque M _n N.m	Maximum torque/ Rated torque M _m /M _n	Rated current ¹ I _n A	Maximum current/ Rated current ¹ I _m /I _n	Minimum switching frequency F _D kHz	Efficiency η 4/4		
LSRPM 132 M	IP 55	17.6	94.5	FX 33T	17.6	47	1.50	33	1.50	4.5	92.6	0.0165	40
LSRPM 132 M	IP 55	22	94.5	FX 33T	21	58	1.50	39	1.50	4.5	92.6	0.0231	44
LSRPM 132 M	IP 55	26	95.0	FX 33T	26	69	1.33	48	1.33	4.5	93.1	0.0311	49
				FX 40T			1.50		1.50				
LSRPM 160 MP	IP 55	34	95.0	FX 33T	31	81	1.12	57	1.12	4.5	93.1	0.0418	60
				FX 40T	34	89	1.25	63	1.25				
				FX 50T	1.50	1.50							
LSRPM 160 MP	IP 55	41	95.5	FX 40T	37	99	1.13	70	1.13	4.5	93.6	0.0514	69
				FX 50T	41	109	1.23	77	1.23				
				FX 60T	1.50	1.50							
				FX 50T	45	119	1.14	83	1.14				
LSRPM 160 LR	IP 55	49	95.5	FX 60T	49	130	1.31	91	1.31	4.5	93.6	0.0626	79
				FX 75T	1.50	1.50							
LSRPM 200 L	IP 55	50	95.5	FX 60T	50	133	1.14	97	1.23	4.5	93.6	0.13	135
				FX 75T	1.35	1.45							
LSRPM 200 L1	IP 55	70	96.0	FX 60T	58	155	1.03	108	1.10	4.5	94.1	0.17	153
				FX 75T	70	186	1.12	130	1.21				
				MD 100T	1.35	1.45							
LSRPM 200 L1	IP 55	85	96.4	FX 75T	75	197	1.06	138	1.14	4.5	94.5	0.22	178
				MD 100T	85	225	1.18	157.5	1.27				
				MD 120T	1.35	1.45							
LSRPM 200 LU2	IP 55	115	96.8	MD 120T	103	272	1.18	190	1.26	4.5	94.9	0.26	195
				MD 150T	115	305	1.35	213	1.45				
LSRPM 225 SG	IP 55	132	96.8	MD 150T	120	319	1.26	228	1.35	4.5	94.9	0.54	250
				MD 180T	132	350	1.35	250	1.45				
LSRPM 250 SE1	IP 55	165	96.9	MD 180T	158	420	1.13	297.5	1.21	4.5	95.0	0.57	268
				MD 220T	165	438	1.35	310	1.45				
LSRPM 250 SE1	IP 55	190	97.1	MD 220T	175	464	1.30	322	1.40	4.5	95.2	0.65	288
				MD 270T	190	504	1.34	350	1.44				
				MD 270T	240	637	1.23	400	1.33				
LSRPM 280 SD1	IP 55	240	97.1	MD 340T	240	637	1.35	400	1.45	4.5	95.2	1	383
				MD 340T	270	716	1.28	480	1.38				
LSRPM 280 MK1	IP 55	270	97.2	MD 400T	270	716	1.35	480	1.45	4.5	95.3	2.1	620
				MD 400T	325	862	1.23	575	1.32				
PLSRPM 315 LD	IP 23	325	97.3	MD 470T	325	862	1.35	575	1.45	4.5	95.4	2.3	735
PLSRPM 315 LD	IP 23	350	97.4	MD 470T	350	928	1.35	630	1.45	4.5	95.5	2.4	750
PLSRPM 315 LD	IP 23	390	97.5	MD 470T	390	1035	1.35	650	1.45	4.5	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

DYNEO® VARIABLE SPEED DRIVES

Powerdrive FX & MD variable speed drives/LSRPM-PLSRPM permanent magnet synchronous motors

Selection

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)

157 Drive limit

170 Motor limit

MOTOR				DRIVE	VARIABLE SPEED DRIVE							Motor moment of inertia	Motor weight
Type	Ingress Protection	Rated power P _n kW	Efficiency IEC 60034-2-1 2007 η 4/4	Type	Available power P _n kW	Rated torque M _n N.m	Maximum torque/ Rated torque M _m /M _n	Rated current ¹ I _n A	Maximum current/ Rated current ¹ I _m /I _n	Minimum switching frequency F _D kHz	Efficiency η 4/4		
LSRPM 132 M	IP 55	23	94.0	FX 33T	23	74	1.40	44	1.50	4.5	92.1	0.03	49
LSRPM 160 MP	IP 55	30	94.5	FX 33T	30	96	1.12	57	1.12	4.5	92.6	0.0418	60
				FX 40T			1.40		1.50				
LSRPM 160 MP	IP 55	37	95.0	FX 40T	37	118	1.16	68	1.16	4.5	93.1	0.0514	69
				FX 50T			1.40		1.50				
LSRPM 160 LR	IP 55	44	95.0	FX 50T	44	140	1.16	82	1.16	4.5	93.1	0.0626	79
				FX 60T			1.40		1.50				
LSRPM 200 L	IP 55	50	95.5	FX 60T	48	153	1.03	108	1.10	4.5	93.6	0.13	135
				FX 75T	50	159	1.31	112	1.40				
LSRPM 200 L1	IP 55	65	96.0	FX 75T	65	207	1.15	126	1.24	4.5	94.1	0.17	153
				MD 100T			1.35		1.45				
LSRPM 200 L1	IP 55	85	96.5	MD 100T	79	250	1.19	157	1.27	4.5	94.6	0.22	178
				MD 120T	85	271	1.31	170	1.41				
LSRPM 225 ST2	IP 55	110	96.6	MD 120T	97	309	1.18	190	1.26	4.5	94.7	0.24	195
				MD 150T	110	350	1.33	215	1.43				
LSRPM 250 SE	IP 55	145	97.1	MD 180T	145	462	1.18	285	1.26	4.5	95.2	0.57	265
				MD 220T			1.35		1.45				
LSRPM 250 ME1	IP 55	170	97.2	MD 220T	162	517	1.30	323	1.39	4.5	95.3	0.65	288
				MD 270T	170	541	1.35	338	1.45				
LSRPM 280 SC1	IP 55	200	97.3	MD 270T	200	637	1.35	365	1.45	4.5	95.4	0.84	333
LSRPM 280 SD1	IP 55	220	97.4	MD 270T	220	700	1.33	370	1.43	4.5	95.5	1	383
LSRPM 280 MK1	IP 55	260	97.4	MD 340T	260	828	1.31	470	1.40	4.5	95.5	2.1	620
LSRPM 280 MK1	IP 55	290	97.4	MD 400T	290	923	1.34	530	1.43	4.5	95.5	2.1	620
LSRPM 315 SP1	IP 55	320	97.5	MD 400T	315	1002	1.23	575	1.32	4.5	95.6	2.5	670
				MD 470T	320	1019	1.35	585	1.45				
PLSRPM 315 LD	IP 23	340	97.5	MD 470T	340	1082	1.35	630	1.45	4.5	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

DYNEO® VARIABLE SPEED DRIVES

Powerdrive FX & MD variable speed drives/LSRPM-PLSRPM permanent magnet synchronous motors

Selection

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)

100 Drive limit

110 Motor limit

MOTOR				DRIVE	VARIABLE SPEED DRIVE							Motor moment of inertia J kg.m ²	Motor weight IM B3 kg			
Type	Ingress Protection	Rated power P _n kW	Efficiency IEC 60034-2-1 2007 η 4/4	Type	Available power P _n kW	Rated torque M _n N.m	Maximum torque/ Rated torque M _m /M _n	Rated current ¹ I _n A	Maximum current/ Rated current ¹ I _m /I _n	Minimum switching frequency F _D kHz	Efficiency η 4/4					
LSRPM 132 M	IP 55	19.2	93.5	FX 33T	19.2	76	1.50	37	1.50	4	91.6	0.0311	49			
LSRPM 160 MP	IP 55	25	94.0	FX 33T	25.0	99	1.36	47	1.36	4	92.1	0.0418	60			
				FX 40T			1.50		1.50							
LSRPM 160 MP	IP 55	31	94.5	FX 33T	31	122	1.10	58	1.10	4	92.6	0.0514	69			
				FX 40T			1.50		1.50							
LSRPM 160 LR	IP 55	36	94.5	FX 40T	36	145	1.16	68	1.16	4	92.6	0.0626	79			
				FX 50T			1.50		1.50							
LSRPM 200 L	IP 55	37.5	95.0	FX 50T	37.5	149	1.09	81	1.17	4	93.1	0.13	135			
				FX 60T			1.35		1.45							
LSRPM 200 L	IP 55	50	95.4	FX 60T	50	199	1.01	110	1.08	4	93.5	0.17	150			
				FX 75T			1.33		1.43							
LSRPM 200 L1	IP 55	65	95.9	FX 75T	65	259	1.07	137	1.15	4	94.0	0.20	168			
				MD 100T			1.35		1.45							
LSRPM 200 L1	IP 55	80	96.6	FX 75T	73	288	1.01	145	1.08	4	94.7	0.24	183			
				MD 100T	80	318	1.16	160	1.25							
				MD 120T			1.35		1.45							
LSRPM 225 MR1	IP 55	100	96.9	MD 120T	100	398	1.12	200	1.20	4	95.0	0.30	218			
				MD 150T			1.35		1.45							
LSRPM 250 SE	IP 55	125	97.2	MD 150T	125	497	1.22	235	1.31	4	95.3	0.65	285			
				MD 180T			1.35		1.45							
LSRPM 250 ME	IP 55	150	97.3	MD 180T	150	597	1.18	285	1.26	4	95.4	0.75	310			
				MD 220T			1.35		1.45							
LSRPM 280 SD1	IP 55	190	97.5	MD 220T	179	713	1.27	330	1.36	4	95.6	1.0	383			
				MD 270T	190	756	1.35	350	1.45							
LSRPM 280 MK1	IP 55	230	97.4	MD 270T	230	915	1.15	429	1.24	4	95.5	1.9	591			
				MD 340T										1.35		1.45
				MD 270T			241		958					1.15	430	1.23
LSRPM 315 SP1	IP 55	285	97.6	MD 340T	285	1134	1.21	509	1.30	4	95.7	2.5	675			
				MD 400T										1.35		1.45
LSRPM 315 SR1	IP 55	310	97.7	MD 400T	310	1233	1.27	555	1.37	4	95.8	2.6	715			
				MD 470T										1.35		1.45
LSRPM 315 MR1	IP 55	350	97.5	MD 400T	326	1296	1.18	600	1.27	4	95.6	2.7	720			
				MD 470T	350	1393	1.35	645	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

DYNEO® VARIABLE SPEED DRIVES

Powerdrive FX & MD variable speed drives/LSRPM-PLSRPM permanent magnet synchronous motors

Selection

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)

110 Drive limit

115 Motor limit

MOTOR				DRIVE	VARIABLE SPEED DRIVE							Motor moment of inertia J kg.m ²	Motor weight IM B3 kg
Type	Ingress Protection	Rated power P _n kW	Efficiency IEC 60034-2-1 2007 η 4/4	Type	Available power P _n kW	Rated torque M _n N.m	Maximum torque/ Rated torque M _m /M _n	Rated current ¹ I _n A	Maximum current/ Rated current ¹ I _m /I _n	Minimum switching frequency F _D kHz	Efficiency η 4/4		
LSRPM 160 MP	IP 55	23	94.0	FX 33T	23.0	122	1.50	43	1.50	4	92.1	0.0514	69
LSRPM 160 LR	IP 55	27.3	94.0	FX 33T	27.3	145	1.23	52	1.23	4	92.1	0.0626	79
				FX 40T			1.50		1.50				
LSRPM 200 L	IP 55	33	94.0	FX 50T	33	175	1.12	79	1.20	4	92.1	0.13	135
				FX 60T			1.40		1.50				
LSRPM 200 L	IP 55	40	94.8	FX 50T	40	212	1.07	83	1.15	4	92.9	0.17	150
				FX 60T			1.35		1.45				
LSRPM 200 L	IP 55	55	95.7	FX 60T	53	279	1.01	110	1.08	4	93.8	0.20	165
				FX 75T	55	292	1.27	115	1.37				
LSRPM 225 ST1	IP 55	70	96.1	FX 75T	70	371	1.02	143	1.10	4	94.2	0.26	193
				MD 100T			1.30		1.40	3			
LSRPM 225 MR1	IP 55	85	96.0	MD 100T	85	451	1.08	172	1.16	3	94.1	0.32	223
				MD 120T			1.30		1.40				
LSRPM 250 ME	IP 55	100	96.1	MD 120T	100	530	1.15	195	1.23	3	94.2	0.65	285
				MD 150T			1.35		1.45				
LSRPM 280 SC	IP 55	125	96.3	MD 120T	108	575	1.04	215	1.12	3	94.4	0.84	330
				MD 150T	125	663	1.16	248	1.24				
				MD 180T			1.35		1.45				
LSRPM 280 SD	IP 55	150	96.4	MD 150T	132	702	1.10	260	1.18	3	94.5	1.0	380
				MD 180T	150	796	1.14	295	1.22				
				MD 220T			1.35		1.45				
LSRPM 280 MK1	IP 55	175	96.5	MD 180T	162	858	1.10	305	1.18	3	94.6	1.8	568
				MD 220T	175	928	1.27	330	1.36				
LSRPM 315 SP1	IP 55	195	96.7	MD 220T	195	1035	1.13	370	1.22	3	94.8	2.13	635
				MD 270T			1.33		1.43				
LSRPM 315 MR1	IP 55	230	96.9	MD 220T	206	1091	1.10	380	1.18	3	95.0	2.7	720
				MD 270T	230	1220	1.16	425	1.25				
				MD 340T			1.35		1.45				
LSRPM 315 MR1	IP 55	300	96.4	MD 340T	260	1378	1.06	580	1.14	3	94.6	2.7	720
				MD 400T	282	1497	1.12	630	1.21				
				MD 470T	300	1592	1.30	670	1.40				

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

DYNEO® VARIABLE SPEED DRIVES

Powerdrive FX & MD variable speed drives/LSRPM-PLSRPM permanent magnet synchronous motors

Selection

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)

260 Drive limit

285 Motor limit

MOTOR				DRIVE	VARIABLE SPEED DRIVE							Motor moment of inertia J kg.m ²	Motor weight IM B3 kg
Type	Ingress Protection	Rated power P _n kW	Efficiency IEC 60034-2-1 2007 η 4/4	Type	Available power P _n kW	Rated torque M _n N.m	Maximum torque/ Rated torque M _m /M _n	Rated current ¹ I _n A	Maximum current/ Rated current ¹ I _m /I _n	Minimum switching frequency F _D kHz	Efficiency η 4/4		
LSRPM 160 LR	IP 55	22.8	93.5	FX 33T	22.8	145	1.50	43	1.50	4	91.7	0.0626	79
LSRPM 200 L	IP 55	25	94	FX 33T	25.0	159	1.06	56	1.14	4	92.1	0.13	135
				FX 40T			1.35		1.45				
LSRPM 200 L	IP 55	33	94.6	FX 40T	32	204	1.01	73	1.08	4	92.7	0.17	150
				FX 50T	33	210	1.18	75	1.27				
				FX 60T			1.35		1.45				
LSRPM 200 L	IP 55	40	95.2	FX 50T	40	255	1.07	83	1.14	4	93.3	0.2	165
				FX 60T			1.35		1.45				
LSRPM 200 LU	IP 55	55	95.5	FX 60T	55	350	1.01	110	1.08	4	93.7	0.26	190
				FX 75T			1.35		1.45				
LSRPM 225 MR1	IP 55	70	95.7	FX 75T	70	446	1.03	142	1.11	4	93.8	0.32	223
				MD 100T			1.31		1.41	3			
LSRPM 250 ME	IP 55	85	95.6	MD 100T	85	541	1.06	175	1.14	3	93.7	0.65	285
				MD 120T			1.28		1.37				
LSRPM 280 SC	IP 55	105	96.3	MD 120T	105	668	1.04	215	1.12	3	94.4	0.84	330
				MD 150T			1.33		1.43				
LSRPM 280 SD	IP 55	125	96.4	MD 150T	125	796	1.17	245	1.26	3	94.5	1.0	380
				MD 180T			1.35		1.45				
LSRPM 280 MK1	IP 55	145	96.3	MD 150T	132	842	1.10	260	1.18	3	94.4	1.8	568
				MD 180T	145	923	1.18	285	1.26				
				MD 220T			1.35		1.45				
LSRPM 315 SP1	IP 55	175	96.5	MD 220T	175	1114	1.20	350	1.29	3	94.6	2.2	635
				MD 270T			1.35		1.45				
LSRPM 315 MR1	IP 55	220	96.7	MD 220T	201	1283	1.10	380	1.18	3	94.8	2.7	720
				MD 270T	220	1401	1.19	415	1.28				
				MD 340T			1.35		1.45				
LSRPM 315 MR1	IP 55	250	97.0	MD 270T	240	1527	1.05	470	1.13	3	95.1	2.7	720
				MD 340T	250	1592	1.25	490	1.35				
				MD 400T			1.35		1.45				
PLSRPM 315 LD	IP 55	360	97.0	MD 400T	287	1828	1.12	630	1.21	3	95.1	3	910
				MD 470T	360	2292	1.11	790	1.19				
				MD 600T			1.34		1.44				

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

DYNEO® VARIABLE SPEED DRIVES

Powerdrive FX & MD variable speed drives/LSRPM-PLSRPM permanent magnet synchronous motors

Selection

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)

110 Drive limit

120 Motor limit

MOTOR				DRIVE	VARIABLE SPEED DRIVE							Motor moment of inertia J kg.m ²	Motor weight IM B3 kg
Type	Ingress Protection	Rated power P _n kW	Efficiency IEC 60034-2-1 2007 η 4/4	Type	Available power P _n kW	Rated torque M _n N.m	Maximum torque/ Rated torque M _m /M _n	Rated current ¹ I _n A	Maximum current/ Rated current ¹ I _m /I _n	Minimum switching frequency F _D kHz	Efficiency η 4/4		
LSRPM 200 L	IP 55	20	91.6	FX 33T	20.0	212	1.35	43	1.45	4	89.8	0.17	150
LSRPM 200 L	IP 55	25	92.3	FX 33T	25.0	265	1.15	52	1.23	4	90.5	0.2	165
				FX 40T			1.35		1.45				
LSRPM 200 LU	IP 55	33	92.9	FX 33T	27.8	295	1.01	59	1.08	4	91.0	0.26	190
				FX 40T			1.05		1.13				
				FX 50T	33	350	1.35	1.45					
LSRPM 250 SE	IP 55	40	95.5	FX 40T	37.0	392	1.01	73	1.08	4	93.6	0.54	250
				FX 50T			1.12		1.20				
				FX 60T	40	424	1.35	1.45					
LSRPM 250 ME	IP 55	50	95.8	FX 60T	50	531	1.13	98	1.21	4	93.9	0.65	285
				FX 75T			1.35		1.45				
LSRPM 280 SD	IP 55	60	96.2	FX 60T	55	584	1.01	110	1.08	4	94.3	0.90	271
				FX 75T	60	637	1.22		1.31				
				MD 100T			1.35	1.45	3				
LSRPM 280 SD	IP 55	75	96.0	FX 75T	75	796	1.04	140	1.12	4	94.1	1.00	380
				MD 100T			1.33		1.43	3			
LSRPM 280 MK1	IP 55	85	95.9	MD 100T	85	902	1.10	170	1.18	3	94.0	1.67	545
				MD 120T			1.31		1.41				
				LSRPM 315 SP1	IP 55	100	96.2	MD 100T	92	977	1.06	175	1.14
MD 120T	100	1061	1.18					1.26					
MD 150T			1.35					1.45					
MD 150T	128	1353	1.10					260	1.18				
LSRPM 315 MR1	IP 55	130	96.6	MD 180T	130	1379	1.26	265	1.36	3	94.7	2.60	715
				MD 220T			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

DYNEO® VARIABLE SPEED DRIVES

Powerdrive FX & MD variable speed drives/LSRPM-PLSRPM permanent magnet synchronous motors

Selection

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)

59 Drive limit

65 Motor limit

MOTOR				DRIVE	VARIABLE SPEED DRIVE							Motor moment of inertia	Motor weight
Type	Ingress Protection	Rated power P _n kW	Efficiency IEC 60034-2-1 2007 η 4/4	Type	Available power P _n kW	Rated torque M _n N.m	Maximum torque/ Rated torque M _m /M _n	Rated current ¹ I _n A	Maximum current/ Rated current ¹ I _m /I _n	Minimum switching frequency F _D kHz	Efficiency η 4/4		
LSRPM 200 L	IP 55	21	92.2	FX 33T	21.0	267	1.35	44	1.45	4	91.1	0.26	190
LSRPM 200 LU	IP 55	26	92.2	FX 33T	26.0	337	1.05	57	1.12	4	91.1	0.26	190
				FX 40T			1.35		1.45				
LSRPM 250 SE	IP 55	33	94.8	FX 33T	30	381	1.01	59	1.08	4	92.9	0.54	250
				FX 40T	33	420	1.13	65	1.22				
				FX 50T		1.35	1.45						
LSRPM 250 SE	IP 55	40	95.3	FX 40T	37	464	1.01	73	1.08	4	93.4	0.65	285
				FX 50T	40	509	1.11	80	1.19				
				FX 60T		1.35	1.45						
LSRPM 280 SD	IP 55	55	95.5	FX 50T	44	563	1.03	86	1.10	4	93.6	0.9	350
				FX 60T	55	700	1.04	107	1.11				
				FX 75T		1.35	1.45						
LSRPM 280 MD	IP 55	70	95.6	FX 75T	70	891	1.03	142	1.11	4	93.7	1.0	380
				MD 100T			1.35		1.45	3			
LSRPM 315 SP1	IP 55	85	95.9	MD 100T	85	1082	1.09	171	1.17	3	94.0	2.09	625
				MD 120T			1.30		1.40				
LSRPM 315 MR1	IP 55	110	96.3	MD 100T	90	1140	1.06	175	1.14	3	94.4	2.6	715
				MD 120T	110	1401	1.04	215	1.12				
				MD 150T			1.33		1.43				

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

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 $\cos \varphi$ 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 $1.6 \times$ mains V_{rms} . 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

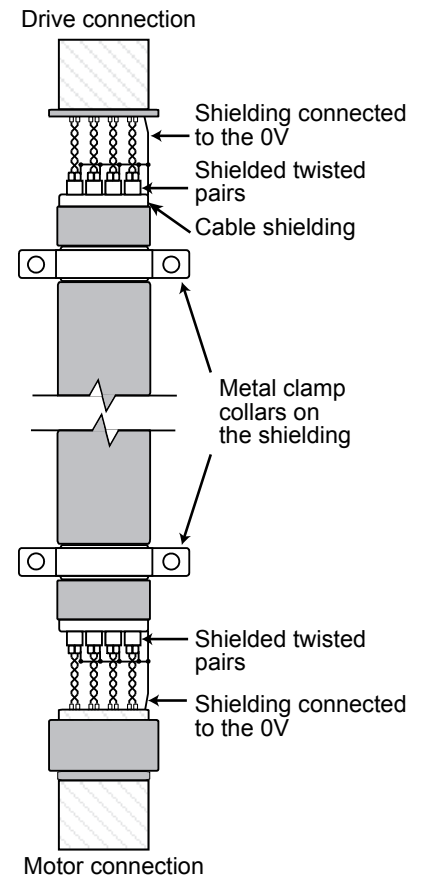
The equipotential earth bonding of some industrial sites is not always observed. This lack of equipotential leads to leakage currents which flow via the earth cables (green/yellow), the machine chassis, the pipework, etc, and also via the electrical equipment. In some extreme cases, these currents can 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".

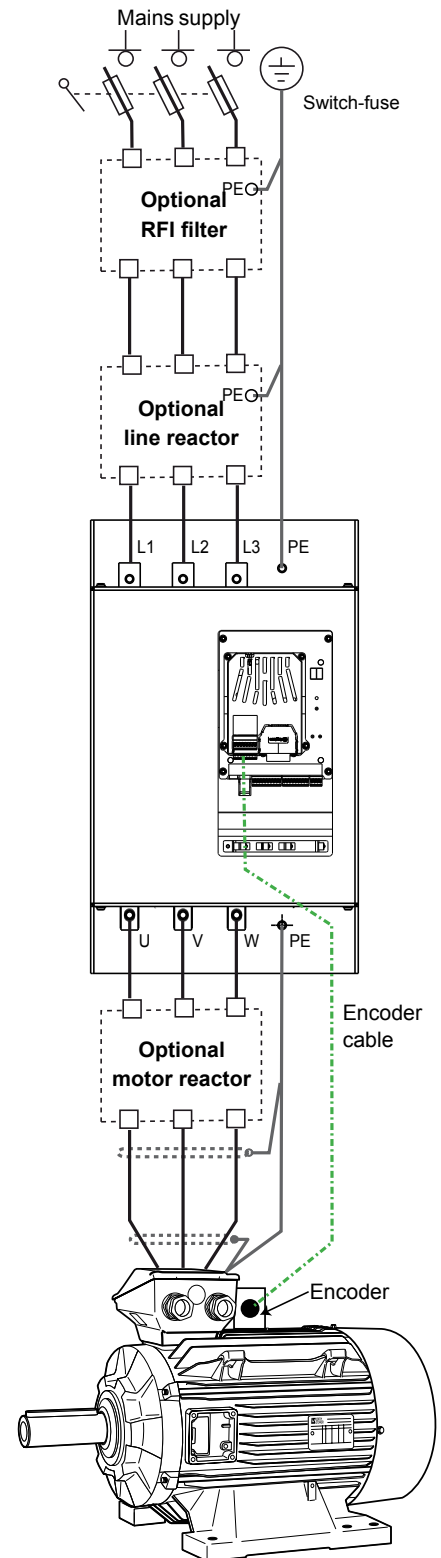
Encoder cables: shielding the sensor cables is important due to the high voltages and currents present at the drive output. This cable must be laid at least 30 cm away from any power cables. See "Encoders" section.

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.



DYNEO® VARIABLE SPEED DRIVES

Powerdrive FX & MD variable speed drives/LSRPM-PLSRPM permanent magnet synchronous motors

Installation and options

Position sensor



SENSORLESS mode

Drives in the POWERDRIVE range enable operation in sensorless mode (without encoder) in the majority of applications. In this operating mode, the rotor position feedback is calculated using the electrical measurements taken by the drive.

When operating permanent magnet synchronous machines in Sensorless mode, ensure that:

- Torque limited to 50% of T_N , between 0 and 10% of rated speed
- Inertia of the load related to the inertia of the motor < 60
- Machine rated speed $> 500 \text{ min}^{-1}$

UVW incremental encoder

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 ($< 10 \text{ rpm}$) is required, use of a higher resolution encoder is recommended.

Powerdrive can supply encoders with $+5 \text{ V DC}$ or $+15 \text{ V DC}$.

Encoder type	UVW INCREMENTAL ENCODER	
Data interface		
Encoder reference	KH05	KHK5S
Supply voltage	5/30 VDC	5/30 VDC
Positions per revolution	1024 or 4096	1024 or 4096
Output stage	TTL (RS422)	TTL (RS422)
Max. current (no load)	140 mA	140 mA
Max. mechanical speed in continuous operation	6000 min^{-1}	6000 min^{-1}
Shaft diameter	14 mm (1)	14 mm (1)
Protection	IP65	IP67
Operating temperature	$-30^\circ + 80^\circ \text{C}$	$-30^\circ + 80^\circ \text{C}$
Certification	CE	CE
Type of cable to be used with it	SYBBC _ _ _	SYBBC _ _ _
Motor end finish	M23 17 pins	M23 17 pins
Drive end finish	HD15	HD15



Encoder - drive connecting cable

A suitable cable, guaranteeing optimum performance of the drive connection can be proposed. Please consult Leroy-Somer.

Type of cable	Insulation		Option		Finish			Length
					Motor	Drive		
UVW incremental SY	B	Class 6 PUR insulation	B	With PTC	C	M23 12 or 17p	Marked ferrules	1 to 100 m
			not used on LSRPM					

Example of cable name: SYBBC005

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

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

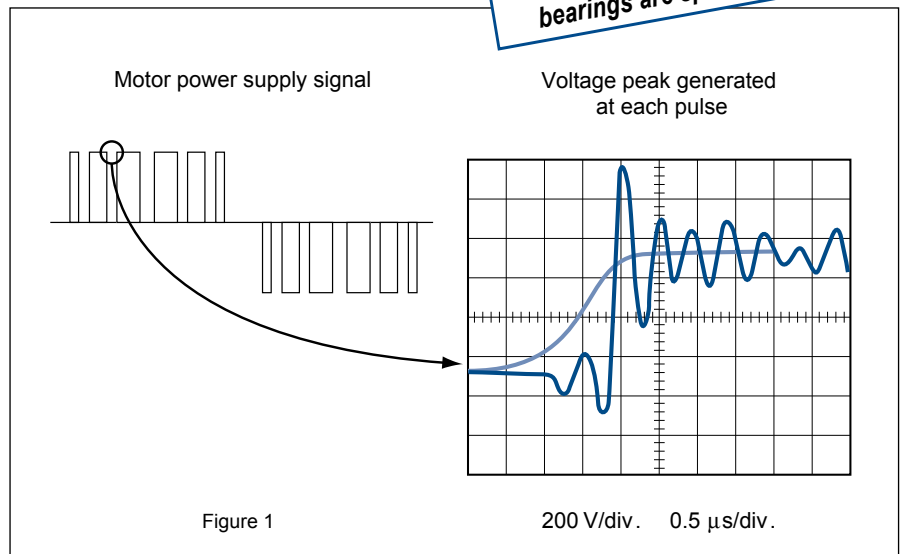
For peak values greater than 1500 V , a super-insulation option for the winding is available over the entire range.

Reinforced insulation of the mechanical parts

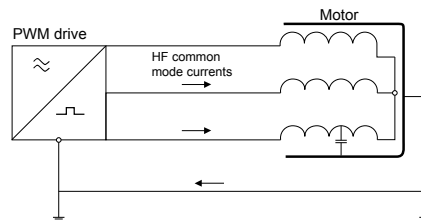
Supplying power via a drive may affect the mechanical parts and lead to premature wear of the bearings.

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.



Motors fitted with insulated bearings are specified on page 54



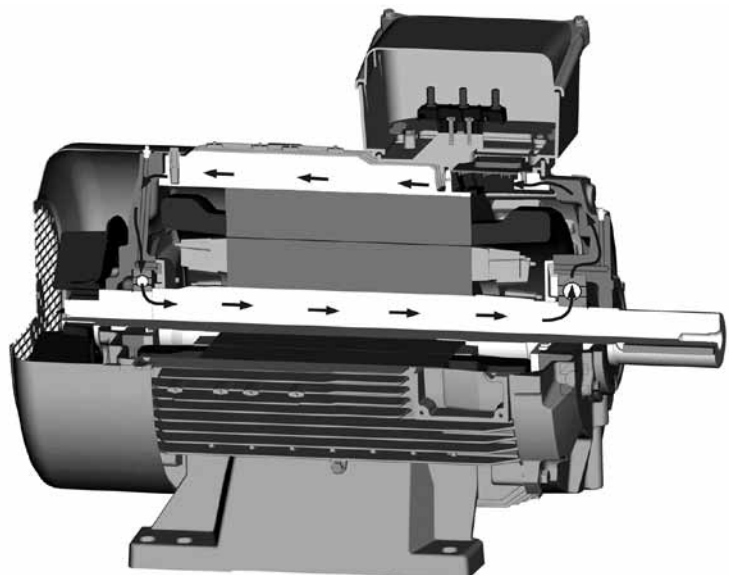
Otherwise, it will flow via the least resistive path: end shields/bearings/shaft/machine coupled to the motor. In these situations, therefore, protection for the bearings must be provided.

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 .



DYNEO® VARIABLE SPEED DRIVES

Powerdrive FX & MD variable speed drives/LSRPM-PLSRPM permanent magnet synchronous motors

Installation and options

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

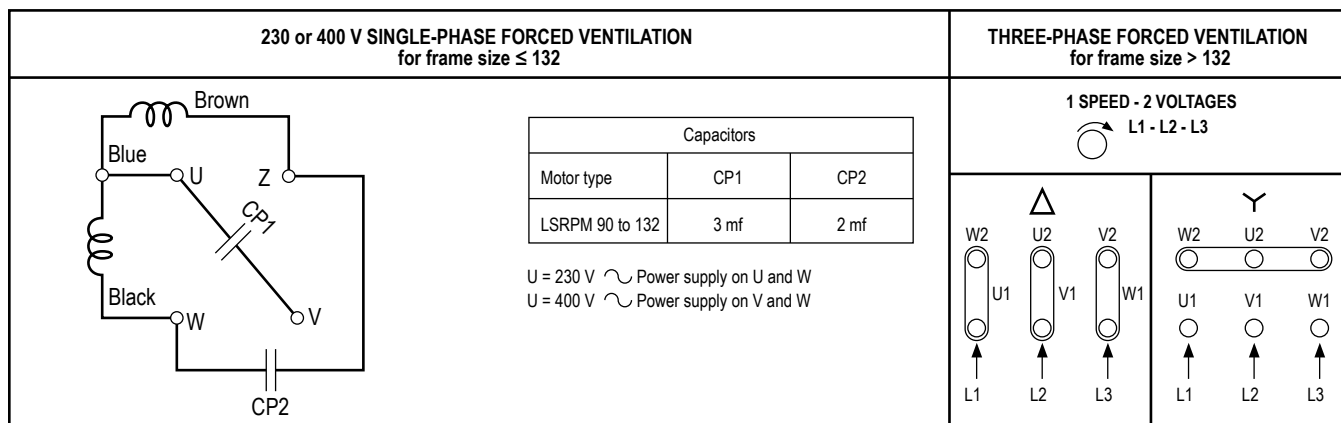
(please consult Leroy-Somer for 4500 and 5500 ranges)

Motor type	Supply voltage ¹ FV	FV consumption		Protection index ² FV
		P (W) W	I (A) A	
LSRPM 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



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 optional **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 55

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

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.

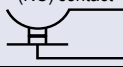
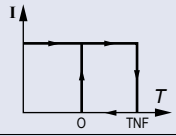

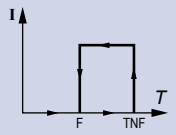
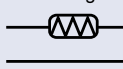
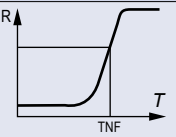
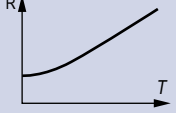
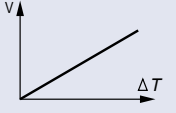
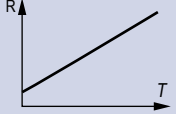
Fitting thermal protection

- 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 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 $\cos \varphi 0.4$	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 $\cos \varphi 0.4$	General monitoring for non-transient overloads	Mounting in control circuit 2 or 3 in parallel
Thermistor with positive temperature coefficient 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 ($T < 150^{\circ}\text{C}$) Copper Constantan K ($T < 1000^{\circ}\text{C}$) Copper-nickel	Peltier effect		0	Continuous surveillance of hot spots at regular intervals	Mounted in control boards with associated reading equipment (or recorder) 1 per hot spot
Platinum resistance thermometer 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.

DYNEO® VARIABLE SPEED DRIVES

Powerdrive FX & MD variable speed drives/LSRPM-PLSRPM permanent magnet synchronous motors

Drive dimensions

Powerdrive FX & MD

Dimensions and weight

Powerdrive MD

Size	H ¹ (mm)	W (mm)		D (mm)	Max. weight (kg)	
		basic	Option ²		basic	option ²
MDS (IP 21 air-cooled POWERDRIVE version)						
100 to 150T	2160	600	600	600	245	420
180 to 470T	2160	600	600 or 1000 ³	600	440	560
MDSL (IP 21 liquid-cooled POWERDRIVE version)						
100 to 150T	2086	600	600	600	250	420
180 to 470T	2086	600	1000	600	360	570
MDR (IP 21 air-cooled POWERDRIVE version) ⁴						
100 to 150T	2160	600	600	600	450	-
180 to 470T	2160	1800	1800	600	1500	-

Examples for basic drive with or without standard option(s). Customised configurations are made according to customer specification.

1- MDS IP 54: height = 2260 mm; MDSL IP 54: as per customer request

2- Standard options: RFI filter, line reactor, braking transistor, emergency stop

3- Dimension depending on configuration (see details in installation manual)

4- MDRL version: as per customer request



Powerdrive FX

Size	H (mm)	W (mm)	D (mm)	Weight (kg)
33 to 50T	587	256	233	52
60 to 100T	788	256	281	56



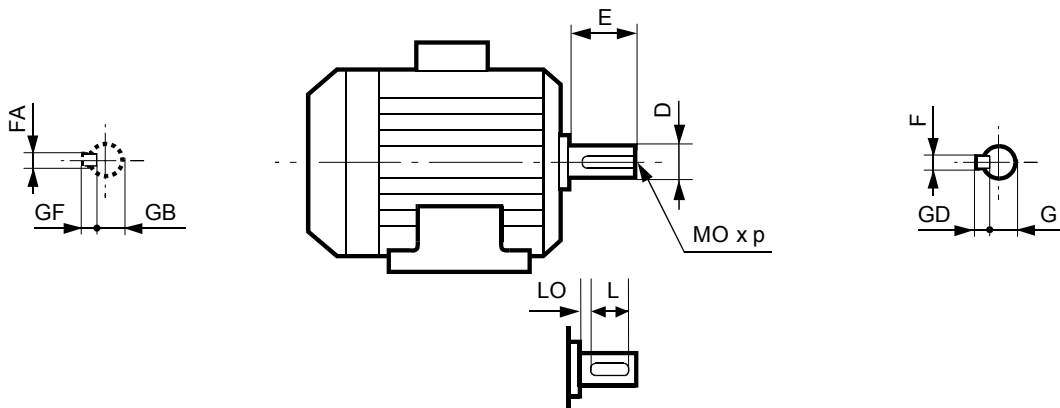
DYNEO® VARIABLE SPEED DRIVES

Powerdrive FX & MD variable speed drives/LSRPM-PLSRPM permanent magnet synchronous motors

Motor dimensions

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 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

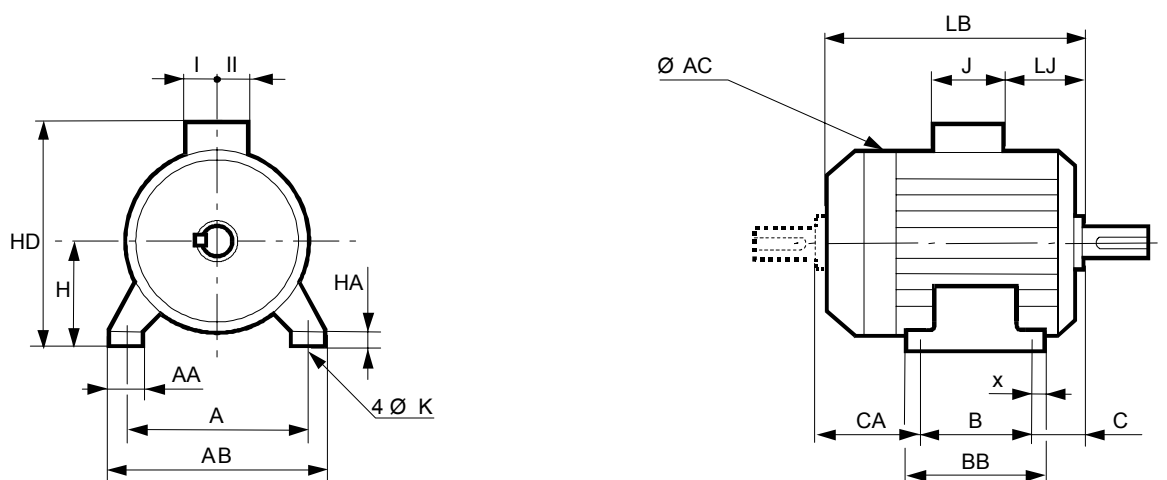
DYNEO® VARIABLE SPEED DRIVES

Powerdrive FX & MD variable speed drives/LSRPM-PLSRPM permanent magnet synchronous motors

Motor dimensions

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 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

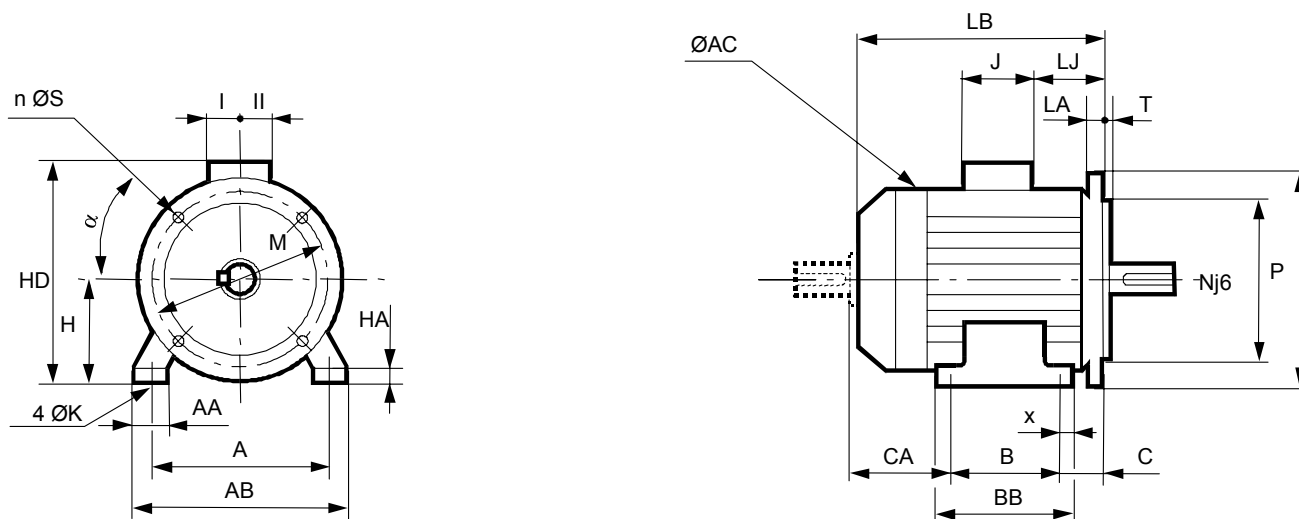
DYNEO® VARIABLE SPEED DRIVES

Powerdrive FX & MD variable speed drives/LSRPM-PLSRPM permanent magnet synchronous motors

Motor dimensions

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 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

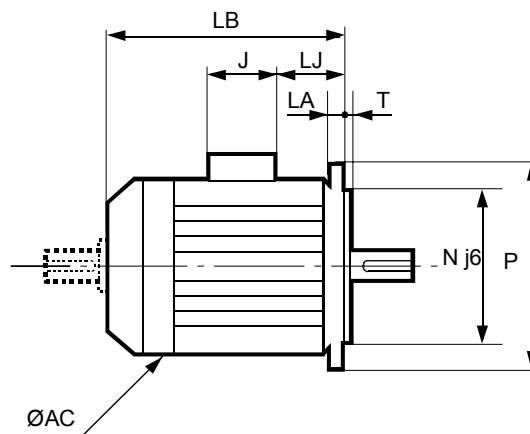
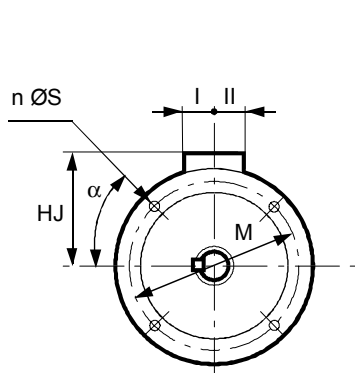
DYNEO® VARIABLE SPEED DRIVES

Powerdrive FX & MD variable speed drives/LSRPM-PLSRPM permanent magnet synchronous motors

Motor dimensions

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

Dimensions in millimetres



IEC symbol	Flange dimensions							
	M	N	P	T	n	a	S	LA
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
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 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.

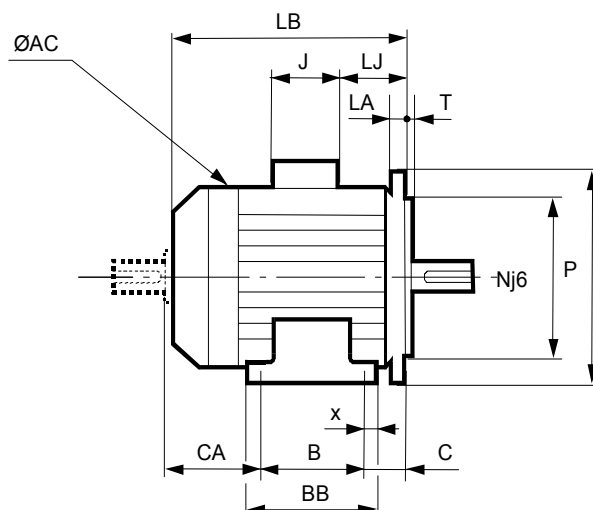
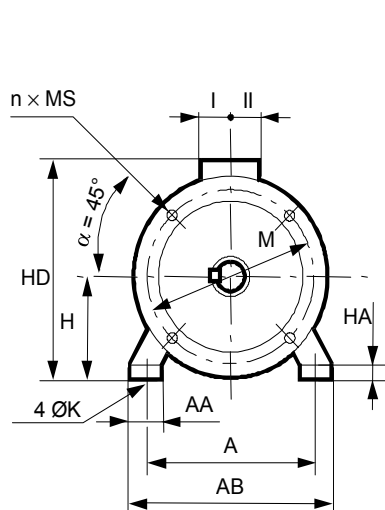
DYNEO® VARIABLE SPEED DRIVES

Powerdrive FX & MD variable speed drives/LSRPM-PLSRPM permanent magnet synchronous motors

Motor dimensions

Foot and face mounted IM B34 (IM 2101)

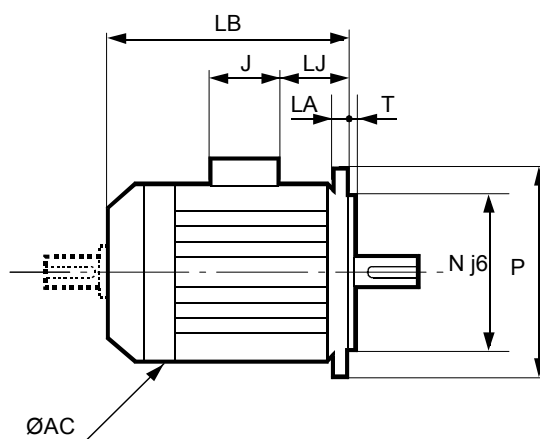
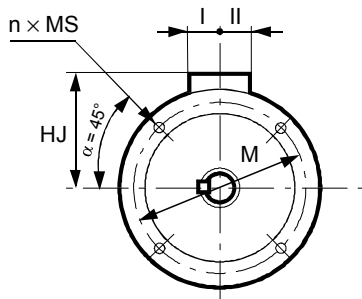
Dimensions in millimetres



Type	Main dimensions																	
	A	AB	B	BB	C	X	AA	K	HA	H	AC	HD	LB	LJ	J	I	II	CA
LSRPM 132 M	216	250	178	211	89	16	50	12	15	132	264	341	461	23	194	79	78	126
LSRPM 160 MP	PLEASE CONSULT LEROY-SOMER																	
LSRPM 160 LR																		

Face mounted IM B14 (IM 3601)

Dimensions in millimetres



IEC symbol	Faceplate dimensions					
	M	N	P	T	n	MS
FT215	215	180	250	4	4	M12
FT	PLEASE CONSULT LEROY-SOMER					
FT						

Type	Main dimensions							
	AC	LB	HJ	LJ	J	I	II	CA
LSRPM 132 M	264	461	209	23	194	79	78	126
LSRPM 160 MP	PLEASE CONSULT LEROY-SOMER							
LSRPM 160 LR								

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

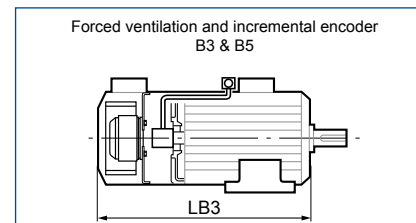
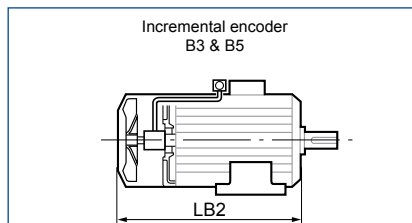
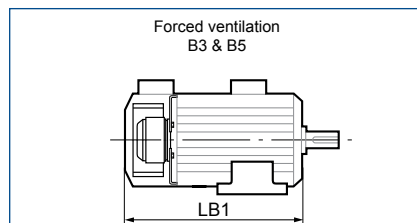
DYNEO® VARIABLE SPEED DRIVES

Powerdrive FX & MD variable speed drives/LSRPM-PLSRPM permanent magnet synchronous motors

Motor dimensions

Motors with options

Dimensions in millimetres



Type	LB ₁	LB ₂ *	LB ₃
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



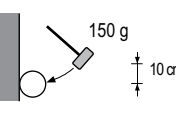


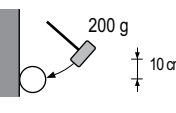


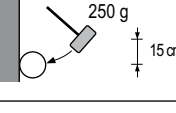
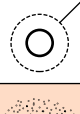

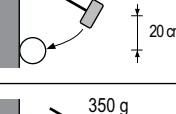
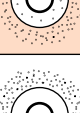
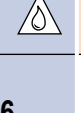
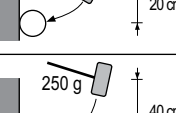

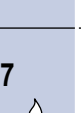
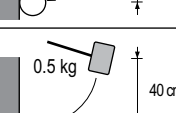
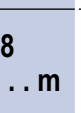
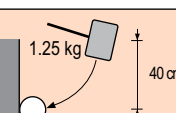
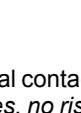
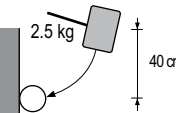
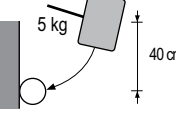

NB: Dimensions of motors with single-turn and multi-turn absolute encoders will be supplied on request.

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		Protected against solid objects larger than 50 mm (e.g. accidental contact with the hand)	1		Protected against water drops falling vertically (condensation)	01		Impact energy: 0.15 J
2		Protected against solid objects larger than 12 mm (e.g. a finger)	2		Protected against water drops falling at up to 15° from the vertical	02		Impact energy: 0.20 J
3		Protected against solid objects larger than 2.5 mm (e.g. tools, wires)	3		Protected against rain falling at up to 60° from the vertical	03		Impact energy: 0.37 J
4		Protected against solid objects larger than 1 mm (e.g. thin tools, small wires)	4		Protected against projected water from all directions	04		Impact energy: 0.50 J
5		Protected against dust (no deposits of harmful material)	5		Protected against jets of water from all directions from a hose	05		Impact energy: 0.70 J
6		Protected against any dust penetration	6		Protected against projected water comparable to big waves	06		Impact energy: 1 J
<p>Example:</p> <p>Example of an IP 55 machine</p> <p>IP : Ingress protection</p> <p>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.</p> <p>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.</p>			7		Protected against the effects of immersion between 0.15 and 1 m	07		Impact energy: 2 J
			8		Protected against prolonged effects of immersion under pressure	08		Impact energy: 5 J
						09		Impact energy: 10 J
						10		Impact energy: 20 J

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, alkalis 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)

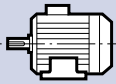
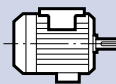
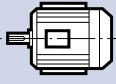

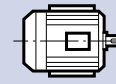
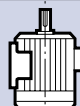
Leroy-Somer standard paint colour reference:

RAL 3005

Mountings and positions (IEC standard 60034-7)

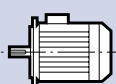
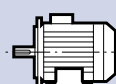
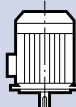
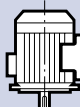

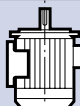
Foot mounted motors

- 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	

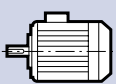
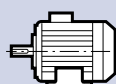

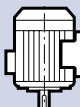

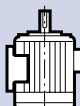
(FF) flange mounted motors

- all frame sizes
(except IM 3001 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	

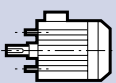
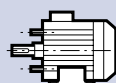
(FT) face mounted motors

- 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	
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Frame size (mm)	Mounting positions											
	IM 1001	IM 1051	IM 1061	IM 1071	IM 1011	IM 1031	IM 3001	IM 3011	IM 3031	IM 2001	IM 2011	IM 2031
≤ 200		●	●	●	●	●	●	●	●	●	●	●
225 and 250	●	●	●	●	●	●	■	●	●	●	●	●
≥ 280	●	■	■	■	■	■	■	●	●	●	●	■

●: possible positions.

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

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.

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

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.

DYNEO® VARIABLE SPEED DRIVES

Powerdrive FX & MD variable speed drives/LSRPM-PLSRPM permanent magnet synchronous motors

Motor construction

Connection

Terminal box

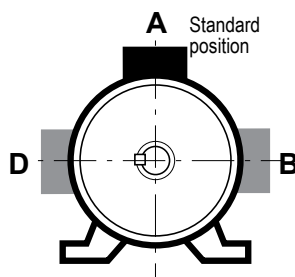
Placed as standard on the top of the motor near the drive end, the terminal box has IP55 protection.

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

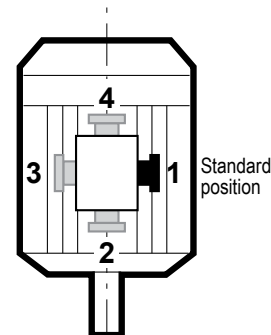
Tightening torque for the nuts on the terminal blocks

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



▼ Cable gland positions 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 132 M	2	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 - 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).

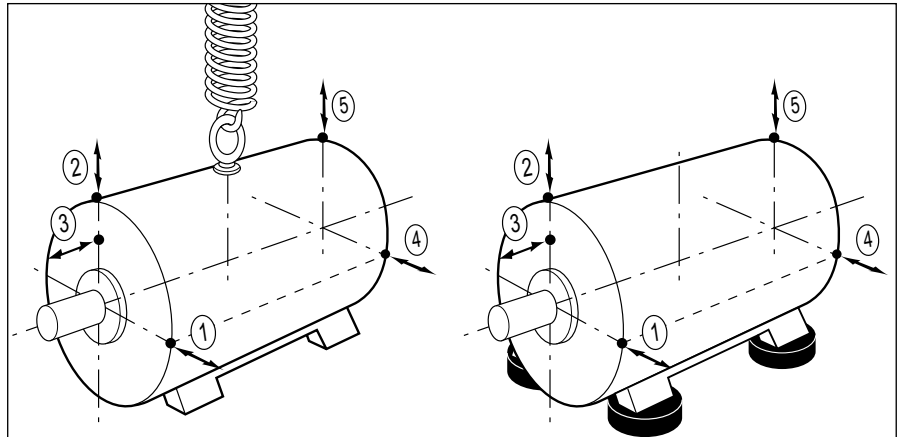
If the vibratory displacement is measured against frequency, the measured value decreases with the frequency: high-frequency vibrations cannot be measured.

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.

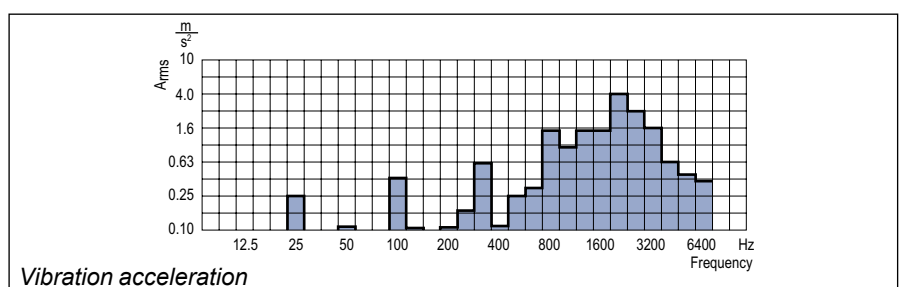
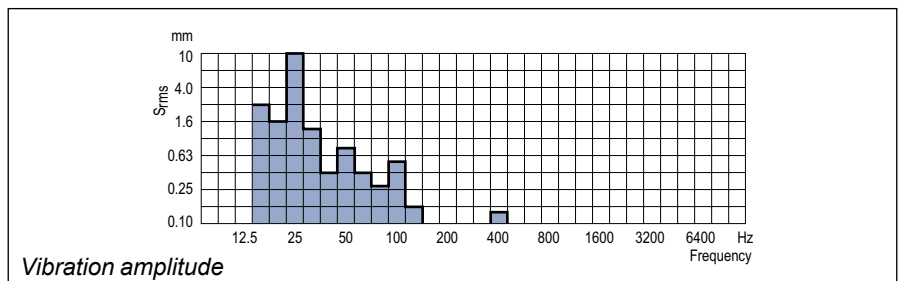
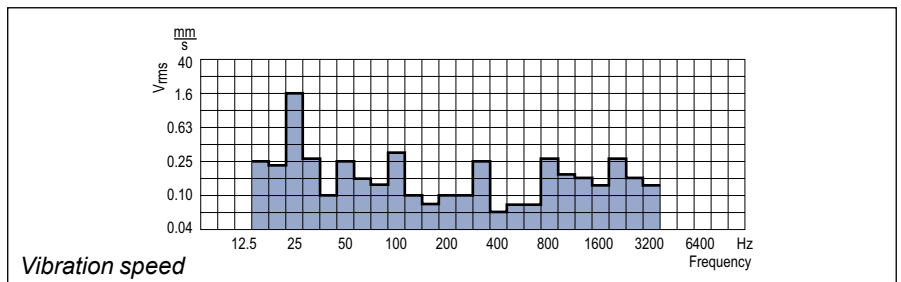


Measuring system for suspended machines

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".



DYNEO® VARIABLE SPEED DRIVES

Powerdrive FX & MD variable speed drives/LSRPM-PLSRPM permanent magnet synchronous motors

Motor construction

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/s ²	Displacement μm	Speed mm/s	Acceleration m/s ²	Displacement μm	Speed mm/s	Acceleration m/s ²
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

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.



ISO 9001 : 2008



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

DYNEO® VARIABLE SPEED DRIVES

Powerdrive FX & MD variable speed drives/LSRPM-PLSRPM permanent magnet synchronous motors

General information

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 section "Supply voltage")
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°s	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 0530	BS 4999	CEI 2.3.VI.	SEV ASE 3009
60034-5	Classification of degrees of protection	NFEN 60034-5	DIN/EN 60034-5	BS EN 60034-5	UNEL B 1781	
60034-6	Cooling methods	NFEN 60034-6	DIN/EN 60034-6	BS EN 60034-6		
60034-7	Mounting arrangements and assembly layouts	NFEN 60034-7	DIN/EN 60034-7	BS EN 60034-7		
60034-8	Terminal markings and direction of rotation	NFC 51 118	DIN/VDE 0530 Teil 8	BS 4999-108		
60034-9	Noise limits	NFEN 60034-9	DIN/EN 60034-9	BS EN 60034-9		
60034-12	Starting characteristics for single-speed motors for supply voltages ≤ 660 V	NFEN 60034-12	DIN/EN 60034-12	BS EN 60034-12		SEV ASE 3009-12
60034-14	Mechanical vibration in machines 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.

DYNEO® VARIABLE SPEED DRIVES

Powerdrive FX & MD variable speed drives/LSRPM-PLSRPM permanent magnet synchronous motors

General information

Nameplates

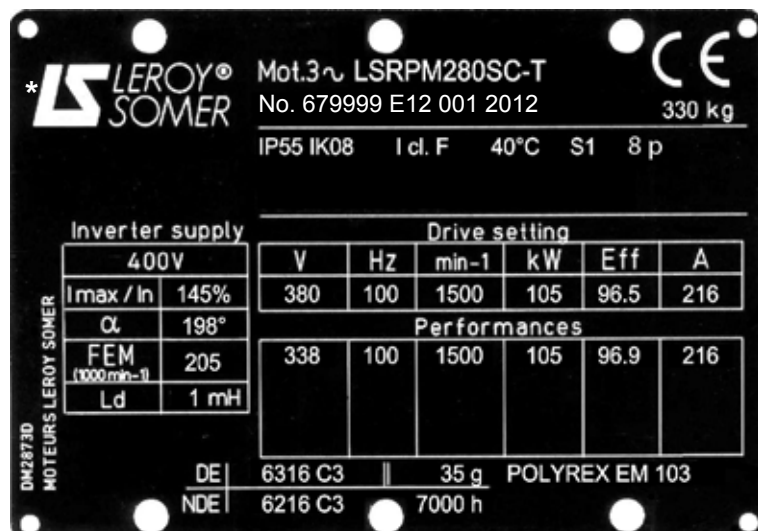
Receipt

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 be 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

679999 : Serial number

For motor types 200 to 315:

E : 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

α : 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 cm³)

7000 hrs at 1500 min⁻¹ : Regreasing
interval (in hours) for θamb

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 order or 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

ALGERIA

MOTEURS LEROY-SOMER
INTERNATIONAL DIVISION (FRANCE)

AUSTRALIA

LEROY-SOMER PTY LTD

AUSTRIA

LEROY-SOMER MARBAISE GMBH (GERMANY)

BELGIUM

LEROY-SOMER SA

BRAZIL

LEROY-SOMER DIVISION
EMERSON ELECTRIC DO BRASIL LTDA.

CANADA

LEROY-SOMER / CIM

CHINA

EMERSON TRADING (SHANGHAI) CO LTD

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EMERSON ELECTRIC (KOREA) LTD

NETHERLANDS

LEROY-SOMER BV

POLAND

FZN MARBAISE LS SP ZOO

ROMANIA

LEROY-SOMER DIVISION
EMERSON SRL

RUSSIA

LEROY-SOMER DIVISION
EMERSON LLC

SINGAPORE

LEROY-SOMER SOUTHEAST ASIA PTE LTD

SOUTH AFRICA

LEROY SOMER PTY LTD

SPAIN

LEROY SOMER IBERICA S.A.

SWEDEN

LEROY-SOMER NORDEN AB

SWITZERLAND

LEROY-SOMER SA

TAIWAN

MOTEURS LEROY-SOMER (FRANCE)
LIAISON OFFICE - C/O EMERSON (TAIWAN) CO LTD

THAILAND

LEROY-SOMER DIVISION
EMERSON (THAILAND) LTD

TURKEY

LEROY-SOMER ELEKTROMEKANIK SISTEMLER
TICARET LTD STI

U.A.E.

LEROY-SOMER DIVISION
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