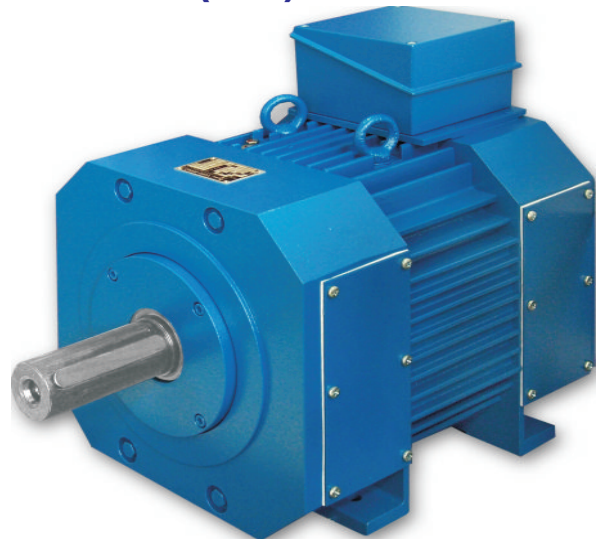
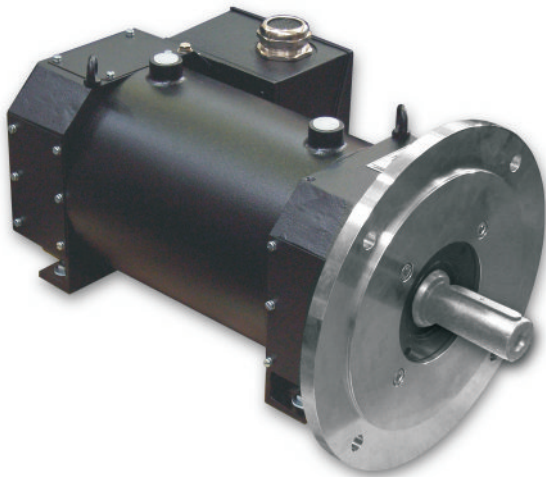


# SYNCHRONOUS MOTORS WITH PERMANENT MAGNETS OF THE TYPE SERIES SM (KM)



Synchronous motors of SM (KM) series are brushless machines with excitation by rare-earth permanent magnets located on the rotor. Magnetic circuit is laminated, star-connected three-phase winding is located in stator slots.

The motors are designed in four shaft heights from 112 mm to 180 mm, with four power output values in each shaft height depending on the machine (stack) length. The motors are provided, as a standard, with the embedded two-stage thermal winding protection and are made in the insulation class H.

The motors can be produced as open machines with degree of protection IP23, or as enclosed machines with degree of protection IP54. Degree of protection of terminal boxes is IP65 in both cases. The motors are provided either with self-cooling, or with separate cooling, or with the combination of both cooling types.

The motors are supplied from a frequency converter with the maximum sinusoidal output voltage 340 V (rms). The converters with intermediate circuit voltage 560 V DC and with clock frequency at least 5 kHz must be applied. The motors can be fitted with a resolver serving for the control. The rated speed of synchronous motors is derived from the rated supply voltage and from the voltage constant of the winding  $k_E$  (see the key for motor designation).

## KEY FOR DESIGNATION OF SYNCHRONOUS MOTORS

<b>S M 1 8 0 S 0 8</b>	<b>- N 1 0 -</b>	<b>0 0 0 0</b>	
<b>Designation of the series</b> KM : block supply ( SIX-STEP ) SM : sinusoidal supply ( PWM )			<b>Version</b> 1 - IM1001 2 - IM2001 3 - IM3001 4 - other version
<b>Shaft height ( mm )</b> 112, 132, 160, 180mm			<b>Mechanical design</b> 1 - rear bearing - roller 2 - rear bearing - ball
<b>Stack length</b> K, S, M, L			<b>Degree of protection</b> 1 - degree of protection IP23 2 - degree of protection IP54 3 - other
<b>Pole number</b> 2p = 6, 8, 12 <sup>1)</sup>			<b>Cooling</b> 0 - air cooling IC00 4 - air cooling IC410 1 - air cooling IC01 5 - air cooling IC411 2 - air cooling IC06 6 - air cooling IC416 3 - air cooling IC01+06 7 - water cooling ICW
<b>Voltage constant of the winding <math>k_E^{20}</math> ( V/1000 min<sup>-1</sup> )</b> T - 50 V S - 60 V R - 75 V Q - 90 V P - 105 V O - 125 V N - 145 V M - 160 V L - 170 V K - 200 V J - 225 V I - 250 V H - 275 V			<b>Thermal protection</b> 0 - without thermal sensor 3 - Pt 100 1 - KTY 84 - 130 4 - thermal switch 2 - posistor ( PTC ) S - KTY 83 - 110 A - KTY84-130 + PT100
<b>Feedback sensor</b> 0 - without a sensor 1 - resolver 2 - position sensor with tachogenerator 3 - incremental sensor 4 - other sensor			

<sup>1)</sup> Standard motors are supplied with 2p = 8, variant 2p = 6 and 12 only after agreement with producer

**BASIC TECHNICAL PARAMETERS FOR RATED SPEED 2 200 rpm, DEGREE OF PROTECTION IP23, COOLING IC01**

**BASIC TECHNICAL PARAMETERS FOR RATED SPEED 2 200 rpm, DEGREE OF PROTECTION IP54, COOLING IC410**

**BASIC TECHNICAL PARAMETERS FOR RATED SPEED 2 200 rpm, DEGREE OF PROTECTION IP54, COOLING ICW (water cooling)**

The value of current, being necessary for the assignment of the corresponding supply converter to the motor, is determined according to the following equation:

$$I = 7 \cdot 10^5 \cdot \frac{P}{n \cdot k_E}$$

where:

I (A).....current of the converter  
 P (kW).....power output of the motor  
 n (rpm).....speed of the motor  
 $k_E$  (V/1000 rpm) .....voltage constant of the winding (see the type key)

The power output of KM motors is lower than that of SM motors by approx. 7 %.

The power output of the motors with degree of protection IP23 and cooling IC06 is higher than that of the motors with cooling IC01 by approx. 10 %.

The power output of the motors with degree of protection IP54 and cooling IC411 and IC416 is higher than that of the motors with cooling IC410 by approx. 50 %.

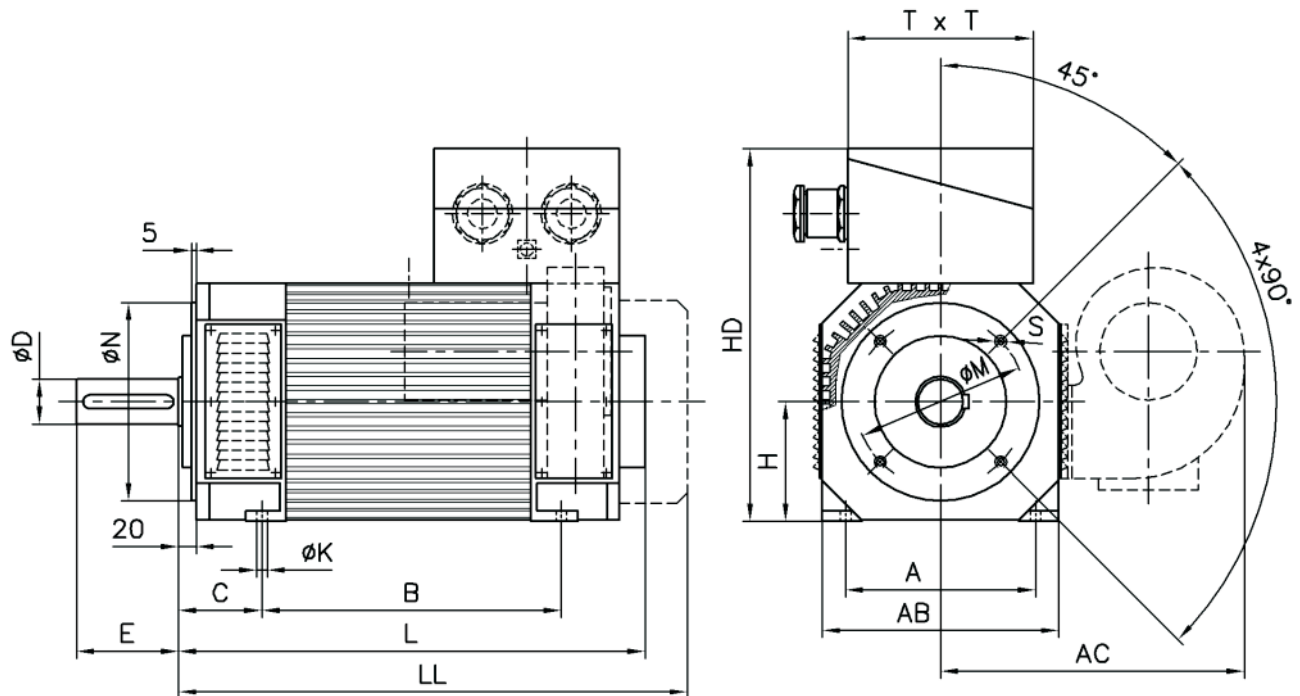
Typ	Power output	Torque	Max. speed	$J_r$	Mass
	kW	Nm	min <sup>-1</sup>	kgm <sup>2</sup>	kg
SM112K	14	61	5000	0,0141	57
SM112S	21	91	5000	0,0177	66
SM112M	28	122	5000	0,0214	75
SM112L	33	143	5000	0,0251	84
SM132K	28	122	4000	0,031	91
SM132S	39	169	4000	0,038	103
SM132M	50	217	4000	0,045	116
SM132L	60	260	4000	0,052	128
SM160K	57	247	3400	0,098	152
SM160S	77	334	3400	0,116	170
SM160M	89	386	3400	0,134	188
SM160L	96	417	3400	0,152	206
SM180K	127	551	3200	0,242	242
SM180S	148	642	3200	0,275	265
SM180M	170	738	3200	0,308	288
SM180L	193	838	3200	0,341	311

Typ	Power output	Torque	Max. speed	$J_r$	Mass
	kW	Nm	min <sup>-1</sup>	kgm <sup>2</sup>	kg
SM112K	6,5	28	5000	0,0141	57
SM112S	10	43	5000	0,0177	66
SM112M	13	56	5000	0,0214	75
SM112L	15,5	67	5000	0,0251	84
SM132K	14	61	4000	0,031	91
SM132S	20	87	4000	0,038	103
SM132M	26,5	115	4000	0,045	116
SM132L	32	139	4000	0,052	128
SM160K	22	96	3400	0,098	152
SM160S	28,5	124	3400	0,116	170
SM160M	34	148	3400	0,134	188
SM160L	36	156	3400	0,152	206
SM180K	57	247	3200	0,242	242
SM180S	67	291	3200	0,275	265
SM180M	77	334	3200	0,308	288
SM180L	88	382	3200	0,341	311

Typ	Power output	Torque	Max. speed	$J_r$	Mass
	kW	Nm	min <sup>-1</sup>	kgm <sup>2</sup>	kg
SM112K	19	82	5000	0,0114	66
SM112S	28	122	5000	0,0151	78
SM112M	38	165	5000	0,0188	90
SM112L	45	195	5000	0,0225	102
SM132K	40	174	4000	0,025	105
SM132S	53	230	4000	0,032	121
SM132M	68	295	4000	0,039	139
SM132L	82	356	4000	0,046	156
SM160K	59	258	3400	0,086	182
SM160S	80	348	3400	0,104	208
SM160M	101	439	3400	0,122	233
SM160L	120	521	3400	0,140	259
SM180K	126	545	3200	0,220	294
SM180S	151	655	3200	0,253	326
SM180M	175	760	3200	0,286	358
SM180L	200	867	3200	0,319	390

### BASIC DIMENSIONS (mm)

- degree of protection IP23, cooling IC01, IC06
- degree of protection IP54, cooling IC410, IC411, IC416



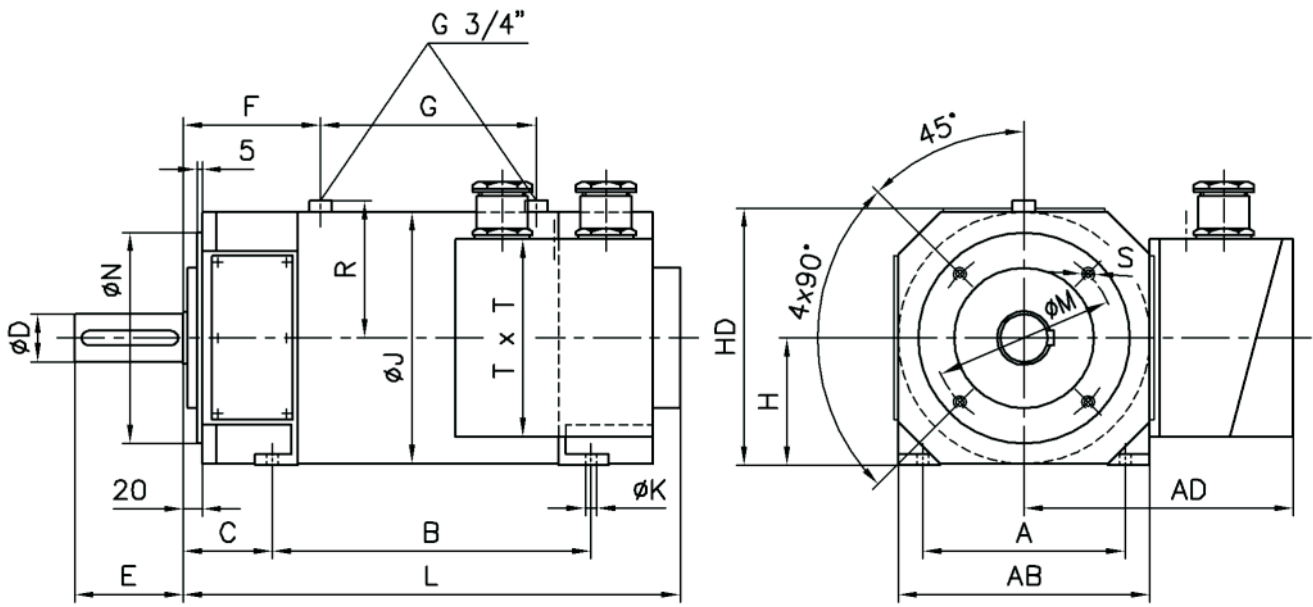
Type	H	A	AB	AC*	B	C	fD	E	HD	L	LL**	fK	fM	fN	S	TxT
SM112-K	112	190	228	299	225	70	38	80	344	414	470/545	11	184	215	M12	160x160
SM112-S	112	190	228	299	275	70	38	80	344	464	520/595	11	184	215	M12	
SM112-M	112	190	228	299	325	70	38	80	344	514	570/645	11	184	215	M12	
SM112-L	112	190	228	299	375	70	38	80	344	564	620/695	11	184	215	M12	
SM132-K	132	216	268	318	250	89	48	110	413	460	525/595	11	184	215	M12	200x200
SM132-S	132	216	268	318	300	89	48	110	413	510	575/645	11	184	215	M12	
SM132-M	132	216	268	318	350	89	48	110	413	560	625/695	11	184	215	M12	
SM132-L	132	216	268	318	400	89	48	110	413	610	675/745	11	184	215	M12	
SM160-K	160	254	324	398	300	108	60	140	475	524	595/755	14	228	265	M16	240x240
SM160-S	160	254	324	398	350	108	60	140	475	574	645/805	14	228	265	M16	
SM160-M	160	254	324	398	400	108	60	140	475	624	695/855	14	228	265	M16	
SM160-L	160	254	324	398	450	108	60	140	475	674	745/905	14	228	265	M16	
SM180-K	180	279	364	452	400	121	70	140	515	652	725/905	14	228	265	M16	240x240
SM180-S	180	279	364	452	450	121	70	140	515	702	775/955	14	228	265	M16	
SM180-M	180	279	364	452	500	121	70	140	515	752	825/1005	14	228	265	M16	
SM180-L	180	279	364	452	550	121	70	140	515	802	875/1055	14	228	265	M16	

\* AC dimension applies only to degree of protection IP23, cooling IC06 with separate cooling unit of the type G2E

\*\* LL dimension applies only to degree of protection IP54, cooling IC411 or IC416

### BASIC DIMENSIONS (mm)

- degree of protection IP54, cooling ICW (water cooling)



Typ	H	A	AB	B	C	φD	E	HD	AD	L	φK	φM	φN	S	F	G	R	φJ	TxT
SM 112-K	112	190	228	225	70	38	80	226	230	414	11	184	215	M12	155	75	134	222	160x160
SM112-S	112	190	228	275	70	38	80	226	230	464	11	184	215	M12	155	125	134	222	160x160
SM112-M	112	190	228	325	70	38	80	226	230	514	11	184	215	M12	155	175	134	222	160x160
SM112-L	112	190	228	375	70	38	80	226	230	564	11	184	215	M12	155	225	134	222	160x160
SM132-K	132	216	268	250	89	48	110	266	280	460	11	184	215	M12	162	115	154	262	200x200
SM132-S	132	216	268	300	89	48	110	266	280	510	11	184	215	M12	164	161	154	262	200x200
SM132-M	132	216	268	350	89	48	110	266	280	560	11	184	215	M12	166	207	154	262	200x200
SM132-L	132	216	268	400	89	48	110	266	280	610	11	184	215	M12	168	253	154	262	200x200
SM160-K	160	254	324	300	108	60	140	322	312	524	14	228	265	M16	172	168	185	318	240x240
SM160-S	160	254	324	350	108	60	140	322	312	574	14	228	265	M16	173	216	185	318	240x240
SM160-M	160	254	324	400	108	60	140	322	312	624	14	228	265	M16	174	264	185	318	240x240
SM160-L	160	254	324	450	108	60	140	322	312	674	14	228	265	M16	175	312	185	318	240x240
SM180-K	180	279	364	400	121	70	140	362	332	652	14	228	265	M16	189	264	204	357	240x240
SM180-S	180	279	364	450	121	70	140	362	332	702	14	228	265	M16	190	312	204	357	240x240
SM180-M	180	279	364	500	121	70	140	362	332	752	14	228	265	M16	191	360	204	357	240x240
SM180-L	180	279	364	550	121	70	140	362	332	802	14	228	265	M16	192	408	204	357	240x240

Subject to change without prior notice. REV. 15-03-30 06-073-1 4/4