Introduction of fan/pump-specific high density magnet type IPM motor

VPM series

IE4-equvalent VPM series

Input power source: 200, 400 volts class

Output capacity: 0.4 to 55 kW
(Up to 45 kW for 1000/1200)

Rated rotation:

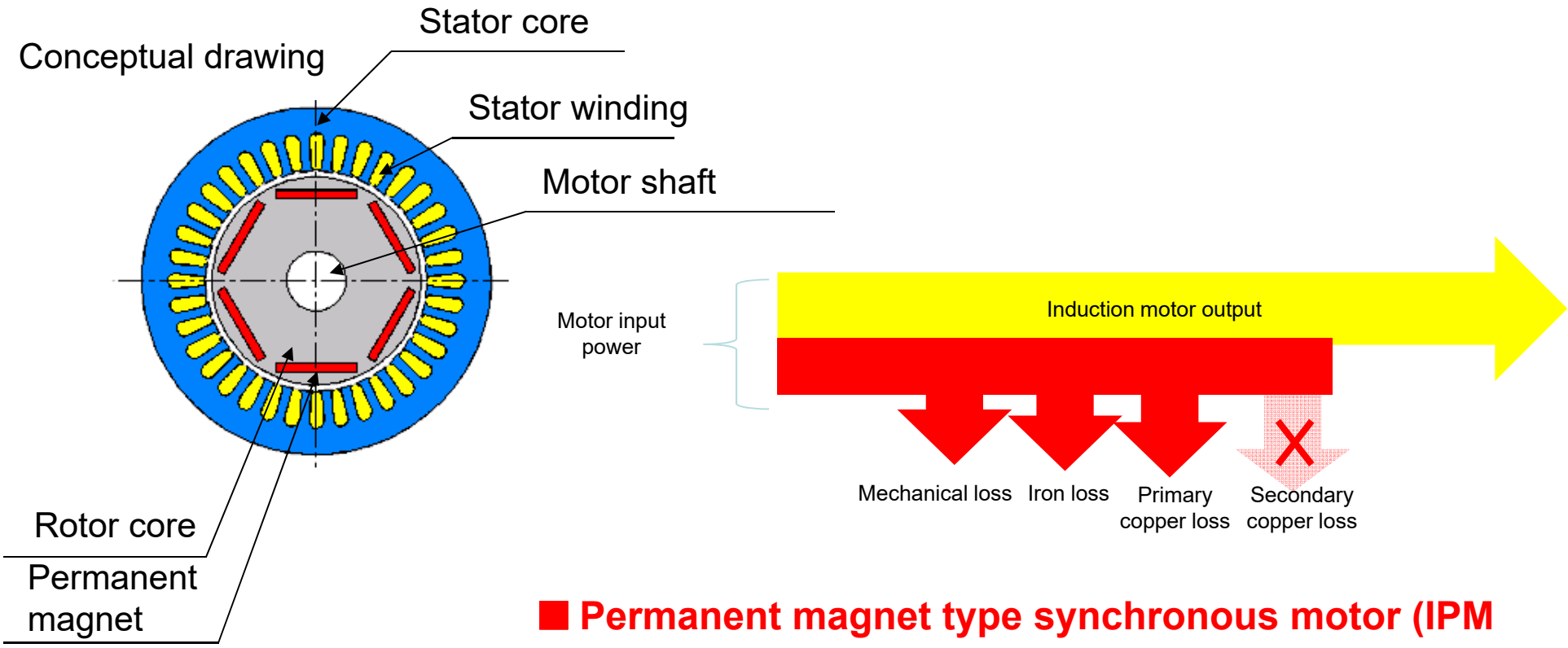
1000/1200 (6P-equivalent)

1500/1800 (4P-equivalent)

3000/3600 (2P-equivalent)

Structure: Totally-enclosed-fan-cooled indoor and outdoor

Features of VPM motor

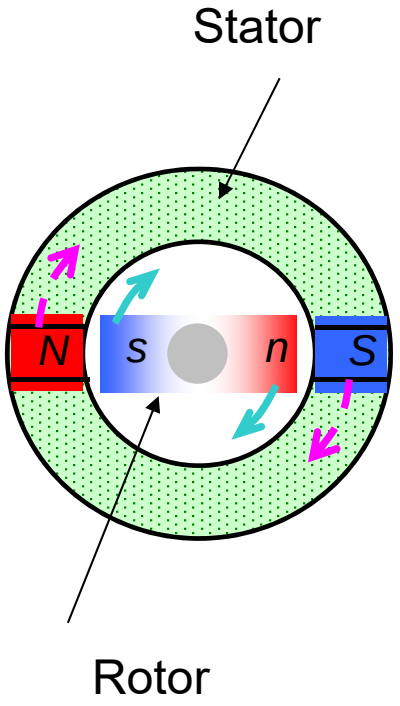


■ **Permanent magnet type synchronous motor (IPM motor)**

The permanent magnet prevents the passage of secondary current through the rotor, which generates no loss in the rotor.

Principle of VPM motor

Principle of synchronous motor



The IPM motor rotates in a complete proportion to the frequency of the inverter. Due to its excellent efficiency, a large number of IPM motors are adopted for usage for energy saving.

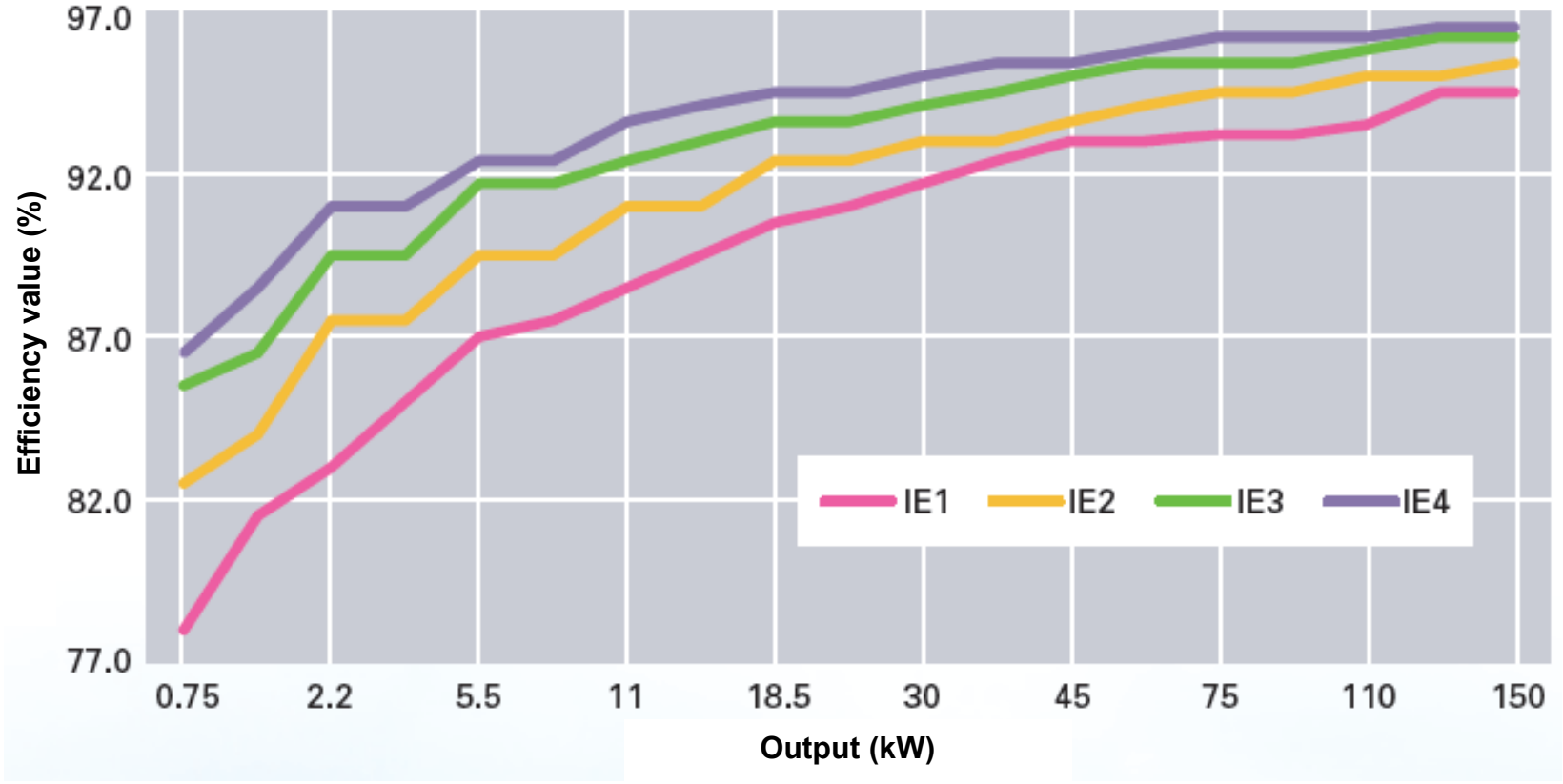
■ Principle

The motors consists of the stator (stationary side) and the rotor (rotation side). The stator has a three-phase winding to produce a three-phase rotating magnetic field *(Ns = 120f /p)* as with the induction motor. The relationship can be modeled the N and S magnetic poles rotating outside and the n and s magnetic poles of the rotor as shown in the picture. As the N and S poles of the stator side rotate, the n and s magnetic poles are sucked and rotate at the same speed. The motors is call synchronous motor as it rotates synchronously.

■ Reason why not operated by commercial power source

If the commercial power source is turned on with the motor stopped, the position of the magnetic poles of the rotor side and stator side (n and s poles) cannot be specified. This cause a loss of synchronization of the motor and results in improper operation. When activating the synchronous motor, therefore, the inverter exercises control for proper operation by searching the magnetic poles of the rotor side and stator side.

Regulations of IEC standard (International Electrotechnical Commission)

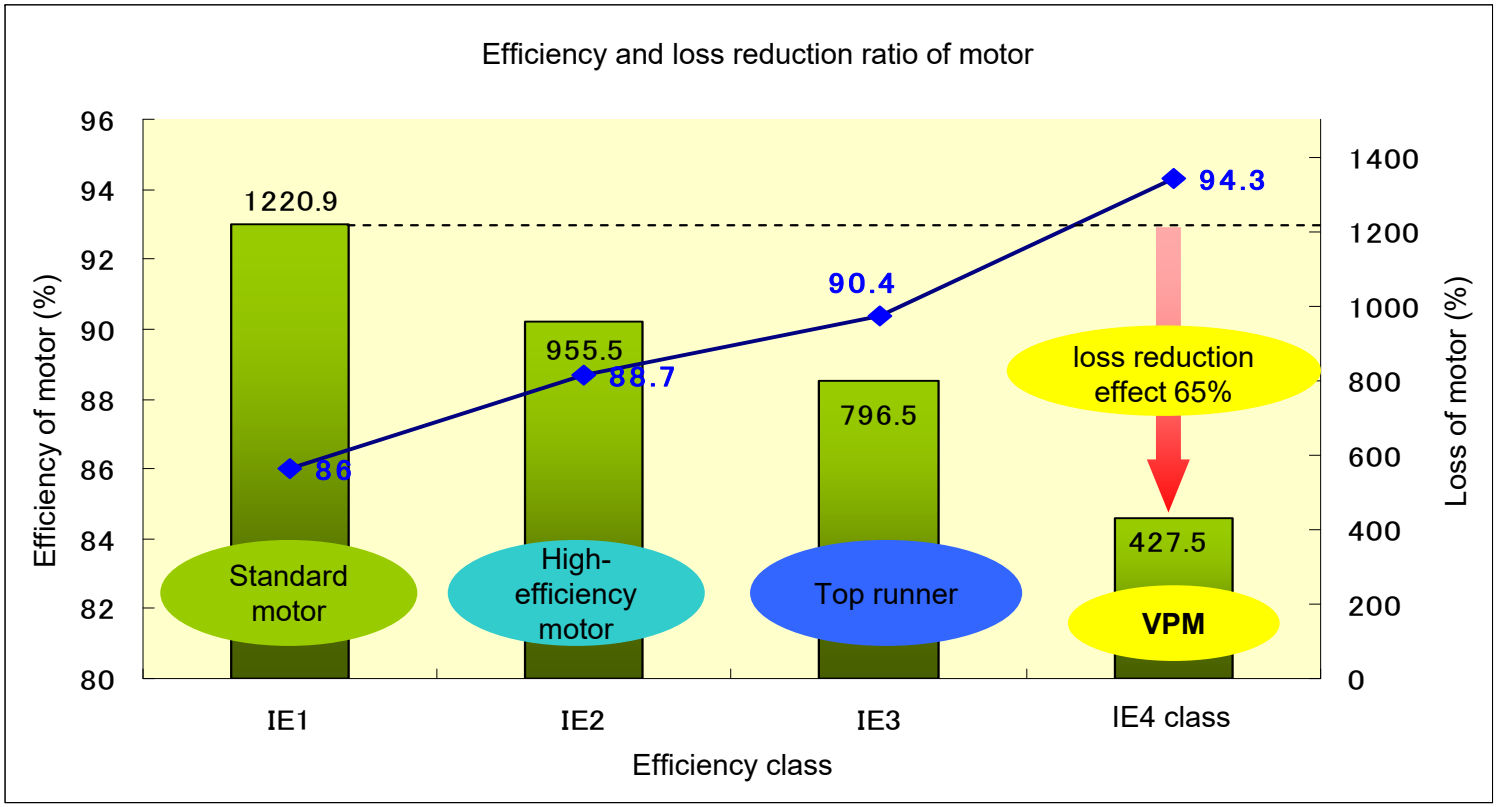


Motor efficiency exceeding that of the premium efficiency-ready standard induction motor conforming to IEC6004-30 Ed.2 has been achieved.
(Equivalent to IE4 super premium efficiency conforming to IEC60034-30 Ed.2 under discussion of revision at present)

Energy-saving effect of VPM No.1

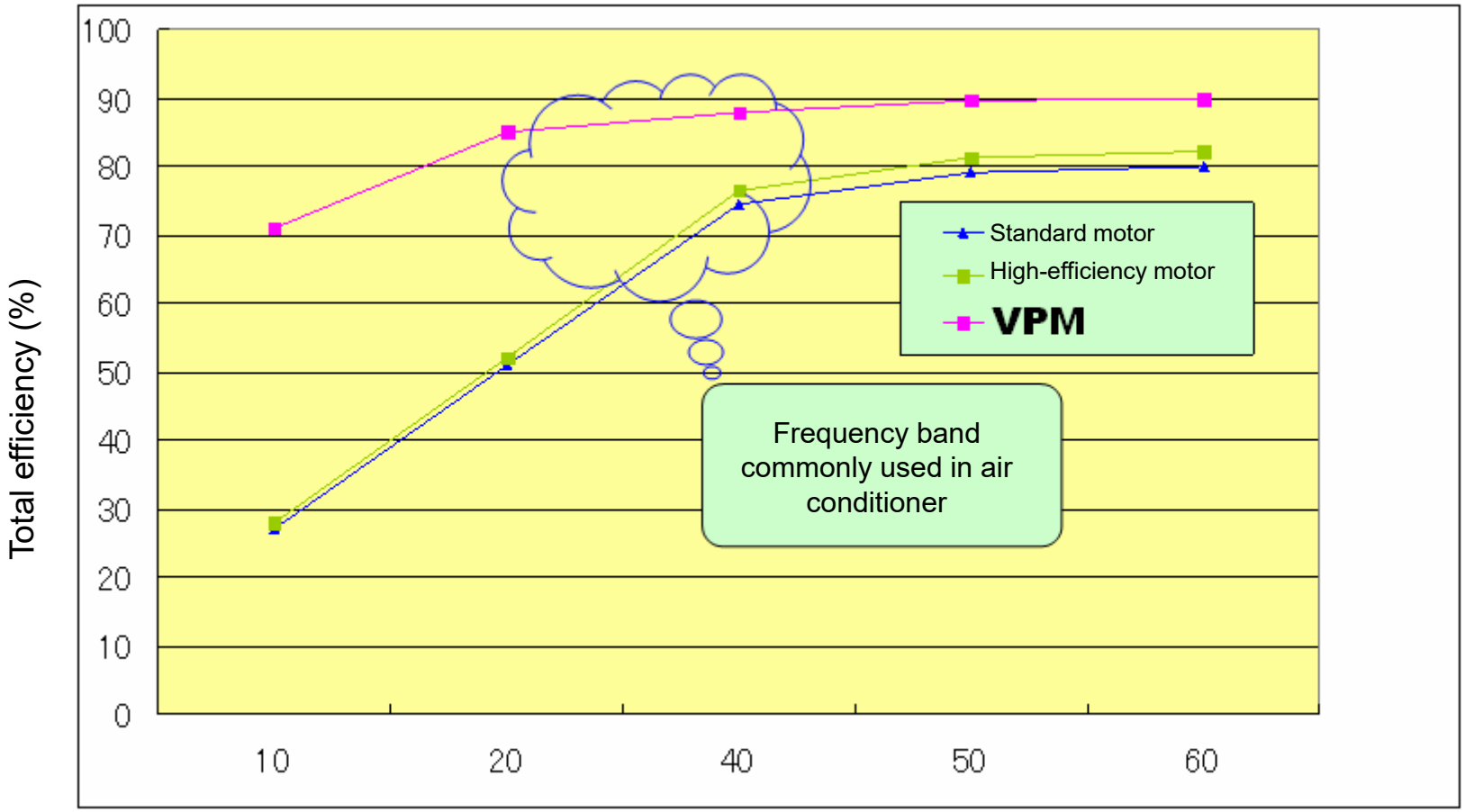
Energy-saving effect (Example of 200 volts 7.5 kW)

The top runner motor expectedly yields a loss reduction effect of about 35% in comparison with IE1-level motor while the VPM motor about 65%.



Energy-saving effect of VPM No.2

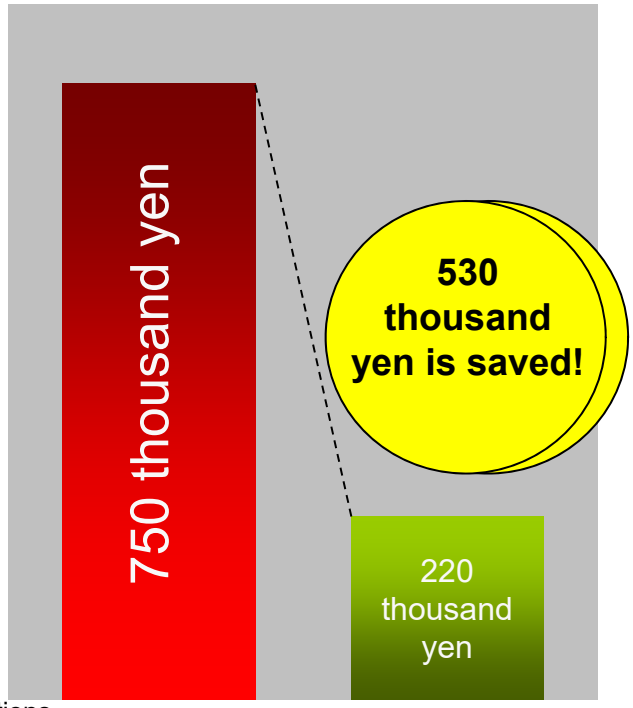
Square reduced torque characteristic: Total efficiency of inverter operation at 5.5 kW

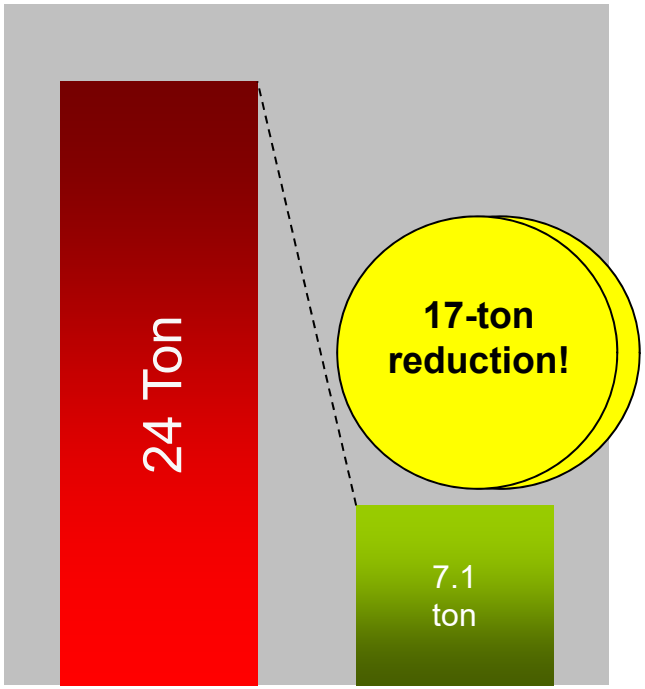


For VPM, the frequency is converted to 60 Hz because it is 90 Hz with *6P*.

Energy-saving effect of VPM No.3

Comparison between standard motor and VPM motor 5.5 kW

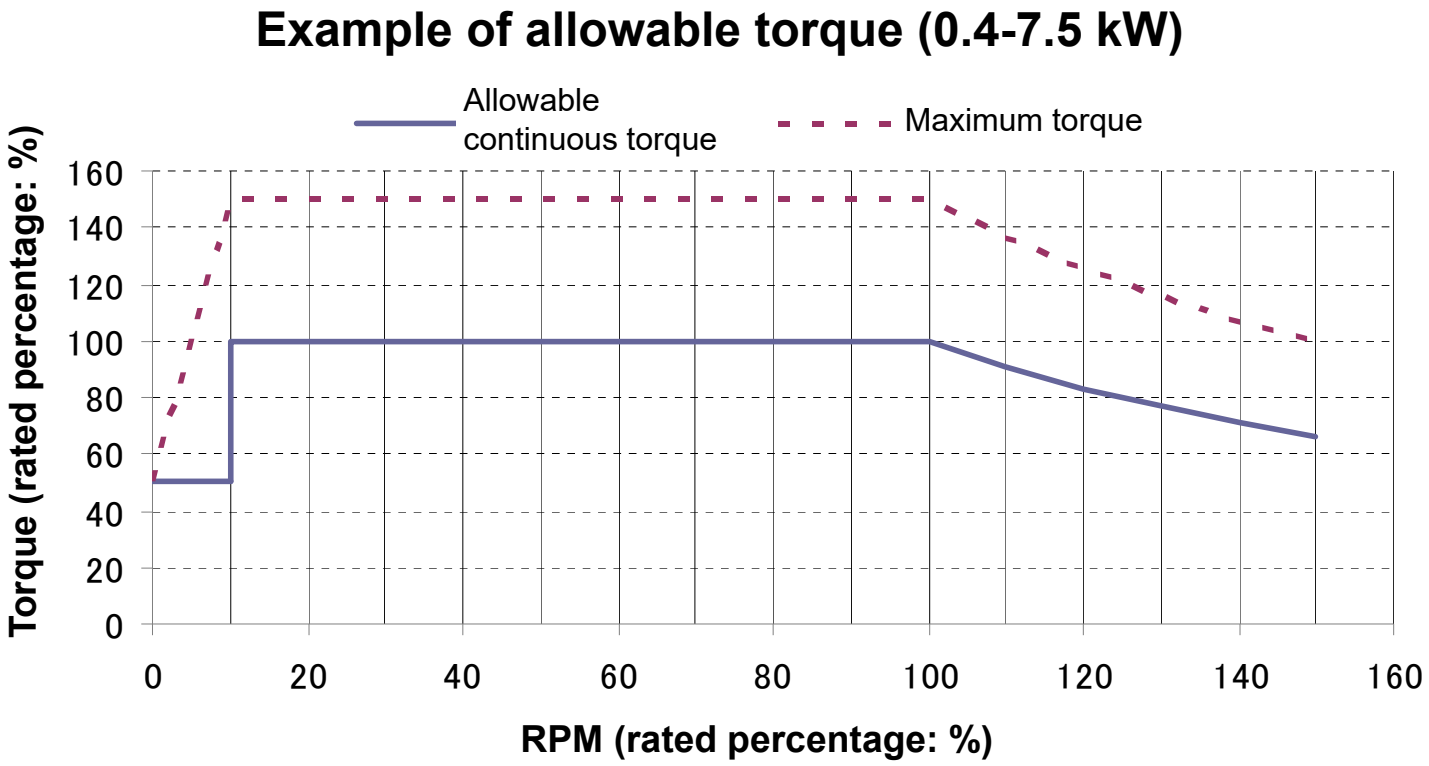




Calculation conditions

1) Electric power energy is calculated under continuous operation for 24 hours/day and 365 days/year. 2) For VPM motor drive, efficiency of inverter is taken into consideration.
3) Commercial operation is conducted by control with the pump valve/damper at 60% of flow rate/air flow rate. VPM motor drive is conducted by frequency control at the same flow rate/air flow rate as commercial operation.
4) Running cost is calculated with a power charge of 16 yen/kWh.
5) CO_2 emission factor = 0.51 kg CO_2/kWh End-user CO_2 exhaust basic unit not reflecting Kyoto mechanism credit, etc.

Torque characteristic of VPM

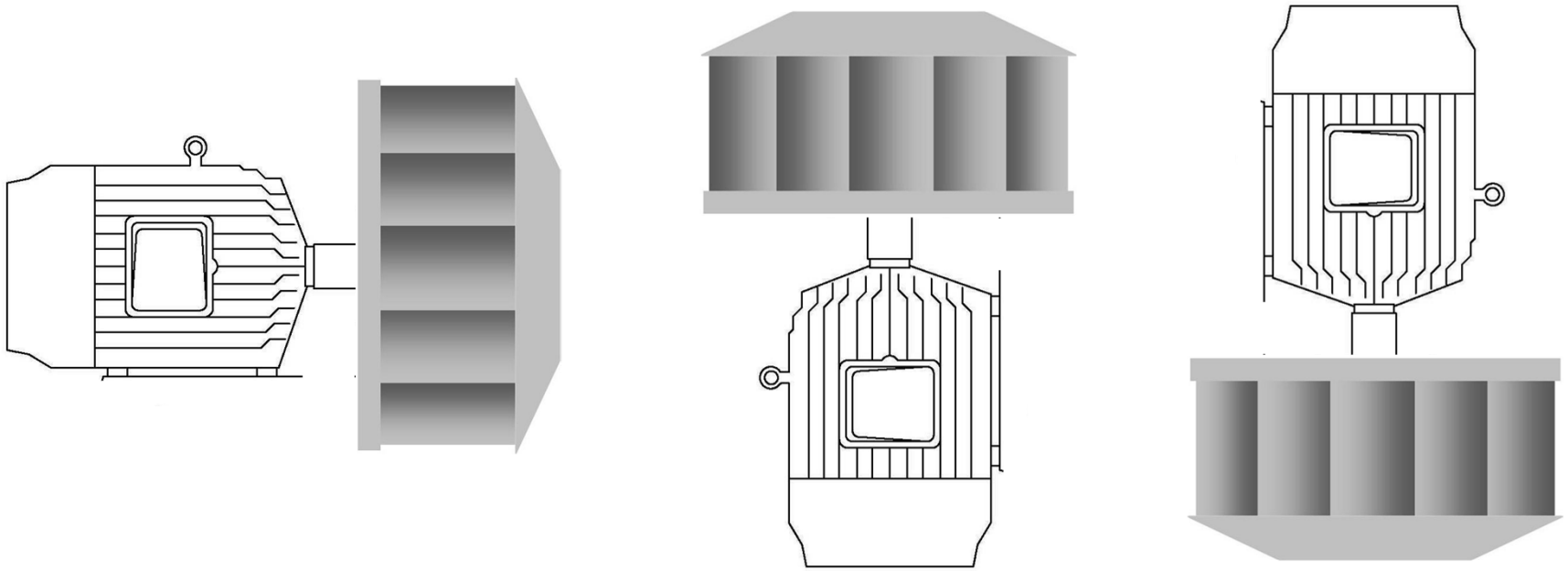


Capacity band: 0.4 to 55 kW Rated rotation: 1000/1200/1500/1800/3000/3600

* Up to 45 kW for 1000/1200 rpm

VPM fan usage

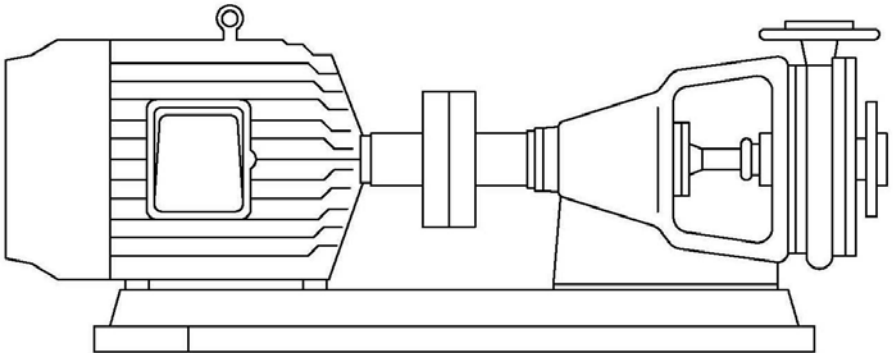
You can use the motor in axial and subaxial directions in accordance with the usage of the fan. The motor is completely creep proof.



Replacement work efficiency of VPM

Because the connecting dimension is identical to that of the standard motor (Japan), replacement work with the existing motor is easy.

Standard motors such as IE1 and IE2 can be replace with VPM easily.



Standard motor IE1, and IE2 Pump

VPM outside dimensions

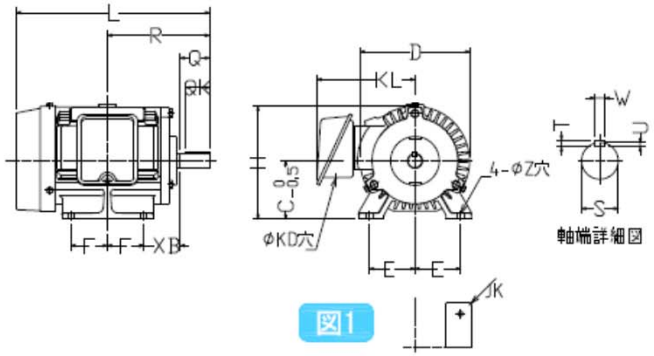


図1

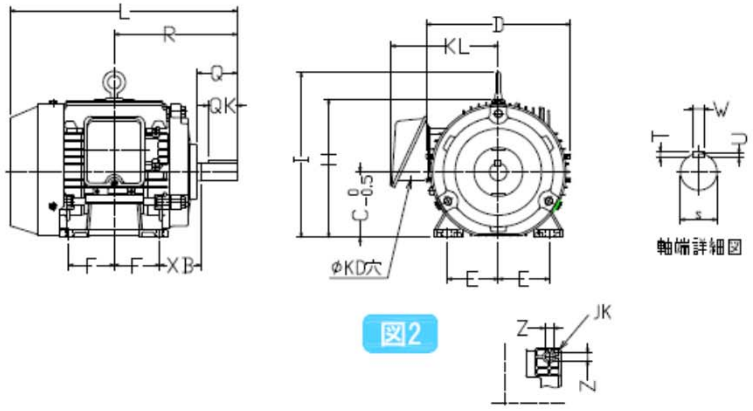


図2

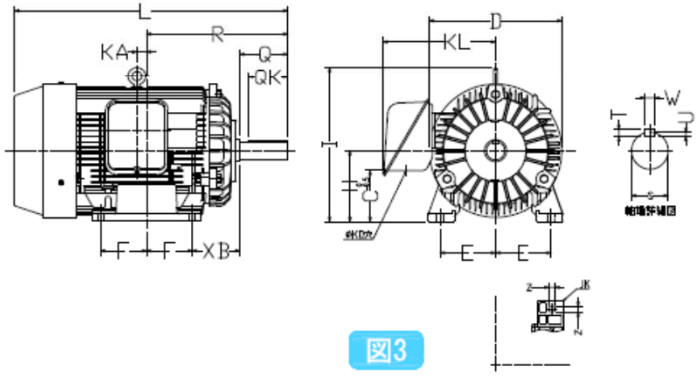


図3

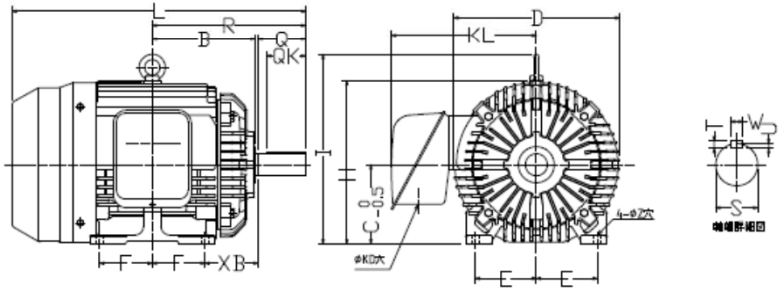


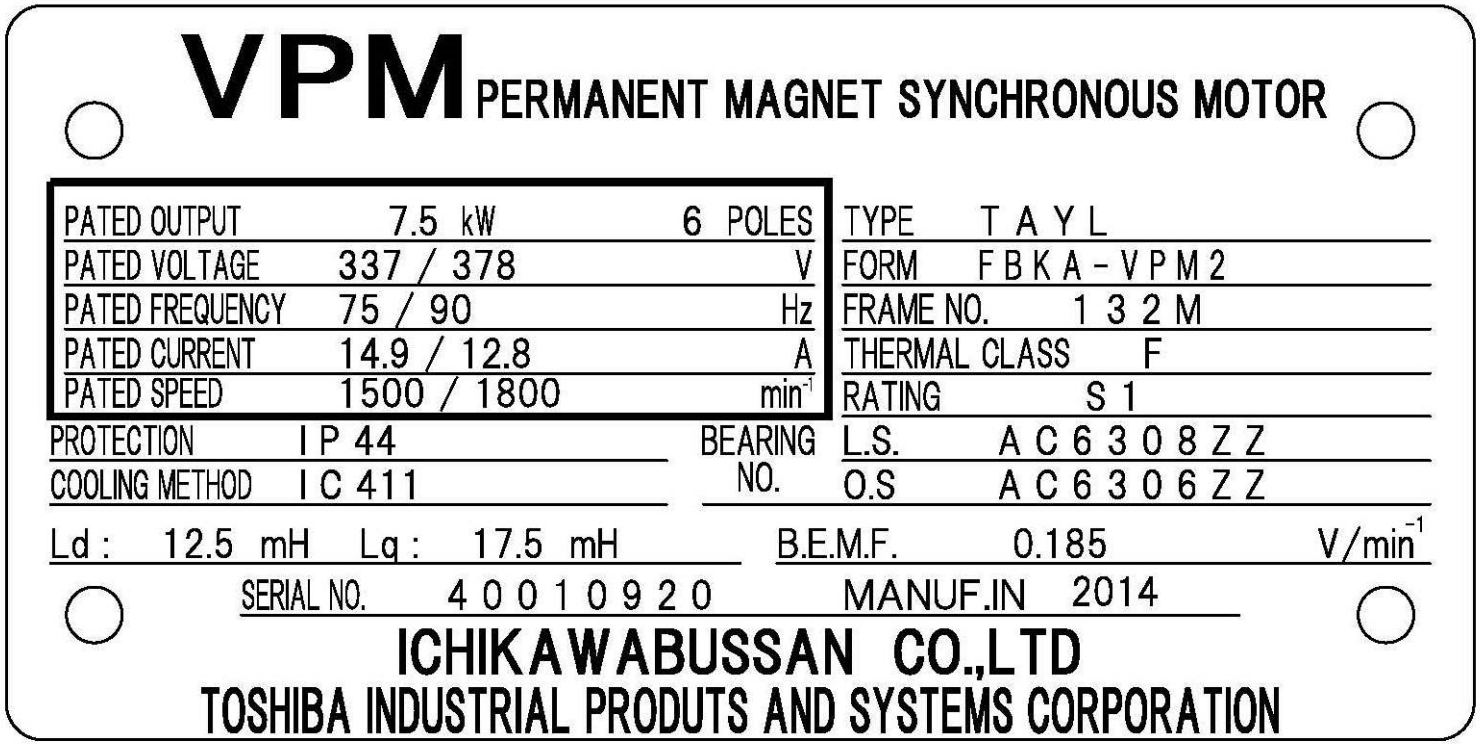
図4

VPM outside dimensions table

枠番号	出力 (kW)	図番	C	D	E	F	H	I	L	R	Z	XB	JK	KA	KD	KL	Q	QK	S	W	T	U
71M	0.4	1	71	150	56	45	148	—	242	120	7	45	3	—	22	132	30	22	14j6	5	5	3
80M	0.75	1	80	150	62.5	50	155	—	264.5	140	10	50	3	—	22	134	40	32	19j6	6	6	3.5
90L	1.5	2	90	198	70	62.5	190	—	311.5	168.5	10X12	56	5	—	27	147	50	40	24j6	8	7	4
100L	2.2	2	100	198	80	70	200	—	350.5	193	12X14	63	5	—	27	147	60	45	28j6	8	7	4
112M	3.7	2	112	214	95	70	219	261	386	200	12X14	70	5	—	27	154	60	45	28j6	8	7	4
132S	5.5	2	132	252	108	70	257	303	449.5	239	12X14	89	5	—	35	189	80	63	38k6	10	8	5
132M	7.5	2	132	252	108	89	257	303	487.5	258	12X14	89	5	—	35	189	80	63	38k6	10	8	5
160M	11	3	160	304	127	105	305	351	625	323	14.5X18.5	108	5	22	52	257.5	110	90	42k6	12	8	5
160L	15	3	160	304	127	127	305	351	625	345	14.5X18.5	108	5	22	52	257.5	110	90	42k6	12	8	5
180M	18.5 22	4	180	382	139.5	120.5	371	431	671.5	351.5	14.5	121	—	—	60	335	110	90	48k6	14	9	5.5
180L	30	4	180	382	139.5	139.5	371	431	709.5	370.5	14.5	121	—	—	91	335	110	90	55m6	16	10	6
200L	37 45	4	200	420	159	152.5	410	470	799.5	425.5	18.5	133	—	—	91	355	140	110	60m6	18	11	7
225S	55	4	225	464	178	143	457	517	812.5	432	18.5	149	—	—	91	425	140	110	65m6	18	11	7

Model sign of VPM

VPM motor name plate



VPM-specific inverter

V1000, A1000 series manufactured by Yaskawa

S15-VPM , AS1-VPM manufactured by Toshiba

The working range and characteristics of the motor differ depending on the inverter selected.
When selecting the inverter, please contact us.

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