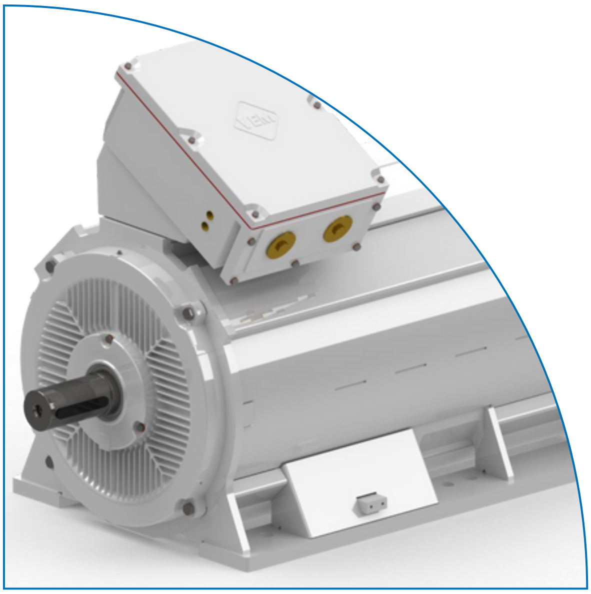
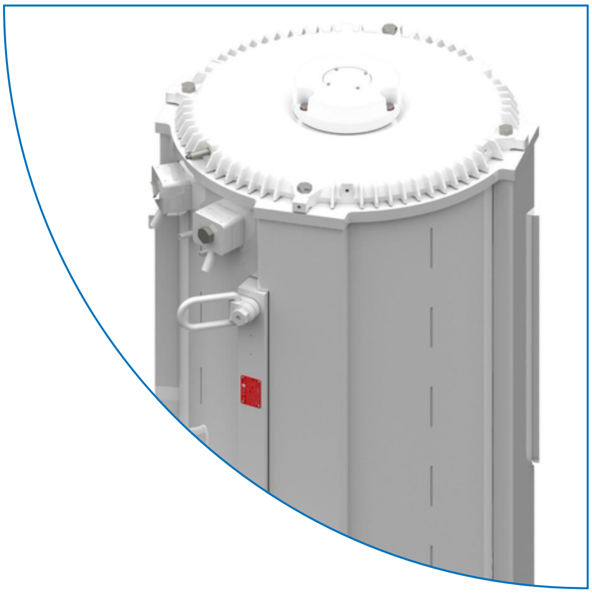
PM MOTORS





VEM SOLUTIONS

MOTOR - GENERATOR - VFD - IOT

PERMANENT MAGNET SYNCHRONOUS MOTORS
0.37 KW UP TO 2900 KW

PM MOTORS

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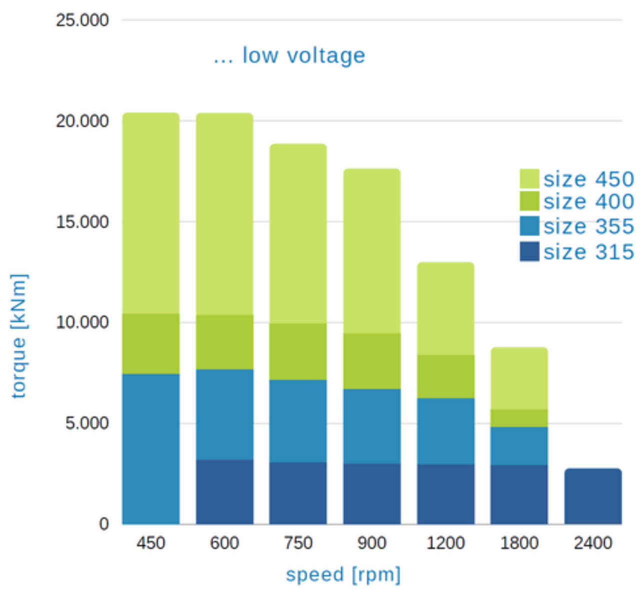
ABOUT VEM

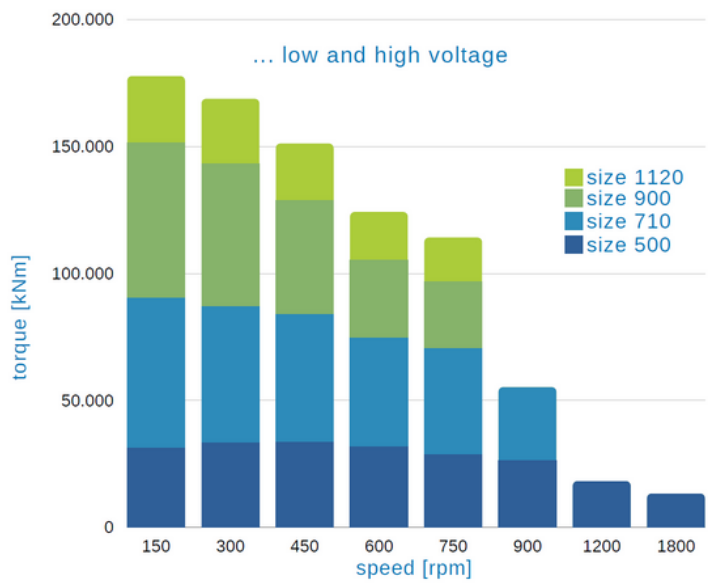
VEM in Asia has been established in 2003 incorporated in Singapore. A small and smart Team leading new sales and after sales services for whole APEC and Oceania areas. A stock in Singapore ensure availability for Marine and flameproof motor within a few minutes.

VEM is an innovative, internationally-active and reliable manufacturer of technically sophisticated system and drive solutions, custom drives and single components. The output capacity ranges from 0.06 kilowatts to 60 megawatts / 90 megavolt ampere. Continuity and reliability, including in the future, this is what the production and service at VEM stands for. The engineering and quality of the products with the VEM logo are trendsetters within the market.

Permanent magnet synchronous motors

Marine			Industry
Vessel types	Thruster types	E-propulsion	
• Offshore, crane • Research vessel • TUG boat • Ferries • (Mega) yachts • Expedition cruise liners	• Azimuth thruster • Retractable thruster • Bow and stern thruster • Swing up thruster	• Main propulsion • Hybrid drives	• Pump • FAN • Compressor • Agitator • Refiner • Traction

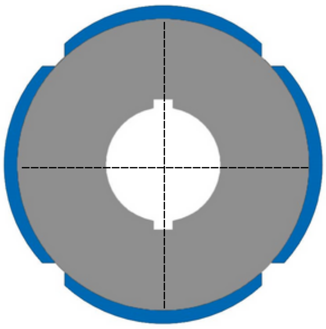




Permanent magnet synchronous motors

Permanent magnet excited synchronous machines (PMSM) differ from induction machines only by the rotor design. Often there is simply an isotropic rotor with a smooth surface on which permanent magnets are mounted. This type of machines achieves the highest efficiency levels because there is no extra current necessary to produce a rotor field component, as it is with induction and synchronous reluctance machines. However, while this advantage is even higher in the partial load area it is reduced in the overload and field weakening range. Especially in the latter the power output and efficiency reduce strongly because current is needed to weaken the permanent magnet excitation.

Thanks to these properties PMSM can be built one frame size step smaller at the same rated output power and are therefore extraordinarily compact. They need an inverter too, however and are not capable of starting while directly connected to the grid.



Exemplary cross section of a permanent magnet rotor

Fits:

Shaft ends

Shaft ends	Starting from Ø55	m6
Matching part		H7

Tolerances - Electrical parameters

The following tolerances are permitted as specified in DIN EN 60034-1:

Efficiency (when determined indirectly)	-0,15 (1-η) for ≤ 150 kW -0,1 (1-η) for PN > 150 kW
Power factor	$\frac{1-cosj}{6}$ min. absolute value 0,02 max. absolute value 0,07
Total losses (used for machines with rated output ≥ 150 kW)	+ 10%
Slip ± 20% for PN ≥ 1 kW (at standard load in warmed-up state)	± 20 % for PN ≥ 1kW
Starting current (in the planned starting connection)	+ 20 % without lower limit
Starting torque	- 15 % and + 25 %
Pull-up torque	- 15 %
Pull-out torque	- 10 % (after application of this tolerance M_k/M still at least 1,6)
Moment of inertia	± 10 %
Noise level (measurement area – sound intensity level)	+ 3 dB (A)

Tolerances - Mechanical parameters

Letter codes acc. to DIN EN 50347	Meaning of the dimension	Fit or tolerance
B [a]	Spacing of feet fixing holes in axial direction	±1 mm
P [a_1]	Diameter or width across corners of flange	-1 mm
A [b]	Spacing of feet fixing holes across axial direction	±1 mm
N [b_1]	Diameter of centring flange	h6
D, DA [d, d_1]	Diameter of the cylindrical shaft end	m6
M [e_1]	Pitch circle diameter of the mounting flange	±0.8 mm
AB [f], AC [g]	Largest width of the motor (without terminal boxes)	+2%
H [h]	Shaft height (lowest edge of foot to centre of shaft end)	-1 mm
L, LC [k, k_1]	Total length of the motor	+1%
HD [p]	Total height of the motor (lowest edge of foot)	+2%
K, K' [s, s_1]	Diameter of the mounting holes of the foot or flange	+3%
GA, GC [t, t_1]	Lowest edge of shaft end to the upper edge of the key	+0.2 mm
F, FA [u, u_1]	Width of the key	h9
C, CA [w_1, w_2]	Distance from the centre of the first foot mounting hole to the ±3 mm shaft shoulder or flange face	±3 mm
	Distance from the shaft shoulder to the flange face in the case ±0.5 mm of fixed bearing on D-end	±0.5 mm
	Distance from the shaft shoulder to the flange face	±3 mm
m	Motor mass	- 5 to +10%

Taking necessary manufacturing tolerances and deviations in materials in the case of the raw materials used into account, these tolerances are permitted for three-phase asynchronous motors. The following remarks are given in the standard:

1. A guarantee of all or any of the values as specified in the table is not mandatory. Guaranteed values to which the permissible deviations should apply must be specified expressly in tenders. The permissible deviations must comply with the table.
2. Attention is drawn to the differences in the interpretation of the concept of a "guarantee". In some countries, there is a differentiation between typical and declared values.
3. If a permissible deviation only applies in one direction, the value will not be limited in the other direction

Motor handling

Version 1 - Continuous operation with anti-freeze

If the motor is operated continuously with an antifreeze and anti-corrosion medium, e.g. HAERTOL Frostox PSF 12/DI or a similar additive, then a continuous protection against corrosion and freezing is given.

Version 2 – Interrupted duty and water as cooling medium

For interrupted motor operation, it is recommended to drain the cooling water off. Before the cooling water is drained off, an anti-freeze, e.g. HAERTOL Frostox PSF 12/DI or similar products must be added for protection of the cooling system. By this procedure, the cooling jacket is protected against corrosion for about three months.

Version 3 – After long-term standstill (with or without anti-freeze in the cooling system)

After long-term standstill and before putting into operation, it must be checked that there are no obstacles to the free flow of cooling water. Possible traces of rust must be pickled off by a 10 % oxalic acid by the following procedure:

- Empty the cooling system, if there are any remains of water inside
- Fill the cooling system by 10 % oxalic acid (about 100 g per litre) and leave it inside for about 15 min.
- Empty the cooling system, rinse it with fresh water – repeat this, if necessary

If the motor was in standstill for a long period, and if the water cooling system was empty during this time it must be checked that the cooling water is able to circulate without any restrictions before putting into operation again.

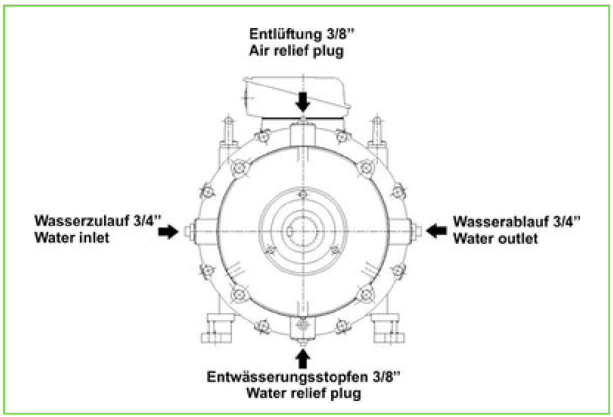
Water feeding, technical requirements for the cooling water

The cooling water must have the quality of drinking water. The maximum water pressure is 3.5 bar, and the maximum temperature of the entering water must not exceed 35 °C. The following minimum requirements for the cooling system have to be observed.

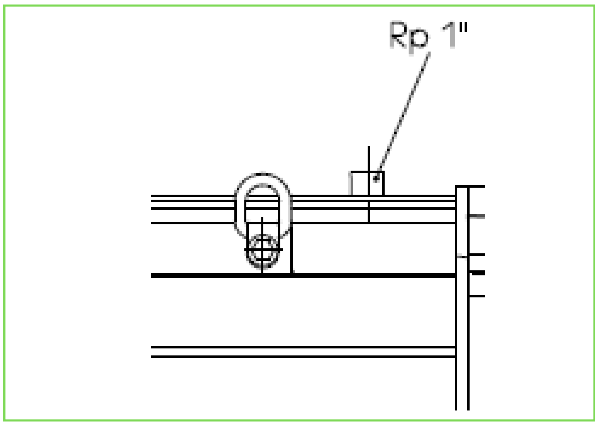
	Cooling water		
Size	**Flow rate**	**Min. water pressure**	**Temperature rise**
	[l/min]	**[bar]**	**[°C]**
225	10	0.5	6
250	16	0.7	7
280	18	1.0	9
315	18	1.5	8
355	20	2.0	10
400	30	3	10
450	35	3.5	10
500	50	3.5	10

The water inlet and outlet are situated on N-side of the housing. Use suitable sealants for the joints.

The water supply must be secured during operation of the motor. **Operation without cooling water is not admissible.** In addition there is an air relief plug with 3/8 " thread on N-end of the motor and a water drain
plug with 3/8 " thread at the lowest point for motors of size 225 to 280.



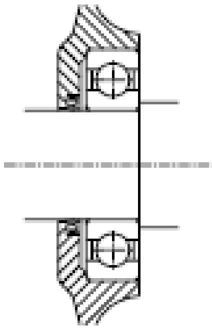
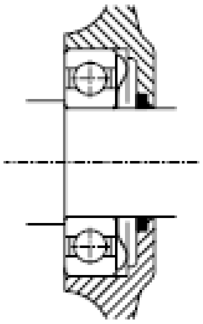
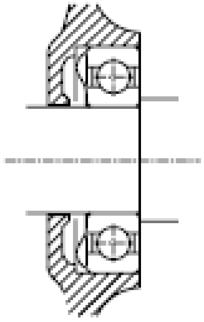
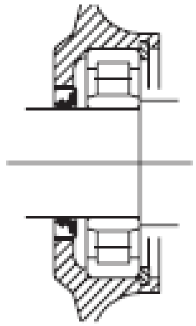
Size 225 to 280



Size 315/355

Bearing arrangement

Figures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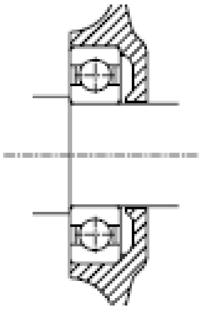	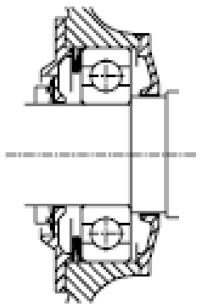	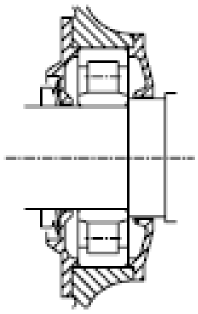	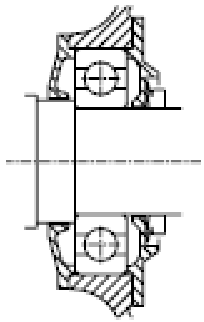
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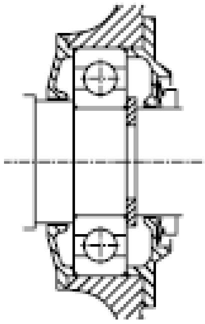
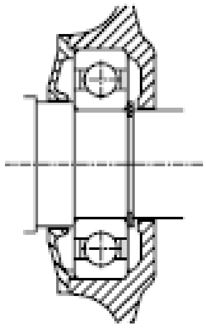
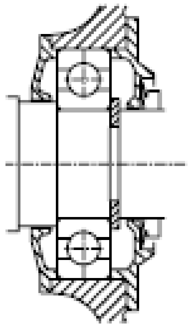
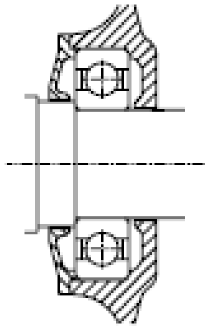
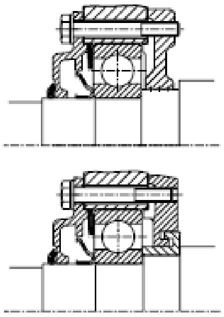
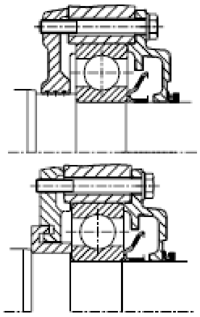
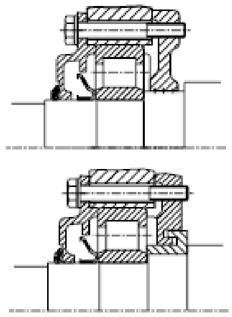
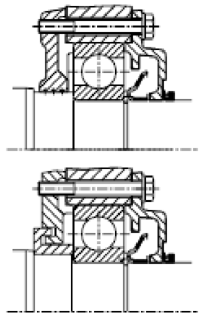
			

Figure 9	Figure 10	Figure 11	Figure 12

Bearing arrangement

Figures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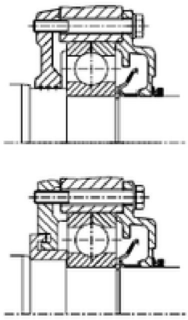	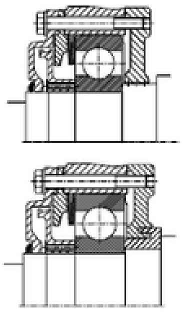	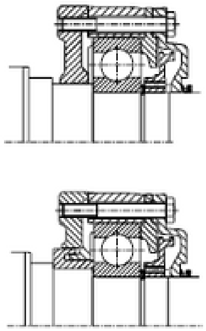	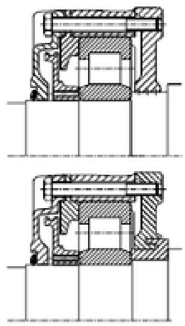
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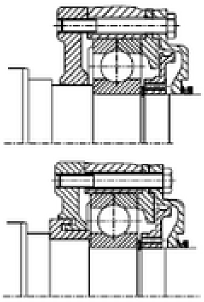
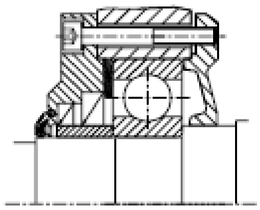
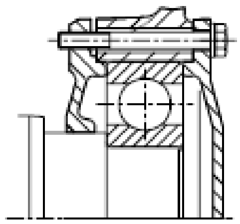
		

Figure 21	Figure 22	Figure 22	

Our technology

- Embedded magnets
- Short circuit proof
- Guaranteed stability of magnets
- Random winding (except of HV)
- Insulation/ temperature rise F/F (other on request)
- Approved marine technology based on standard components
- Water-jacket-cooled

Flexibility in Design

Due to our ultra compact design, PM machines fit into installation spaces where conventional machines will never fit to the existing footprint. This opens beneficial ways for designers and OEM to find new vessel concepts.

Efficiency Ahead

PM machines provide typically a 2 to 4% higher efficiency at full load and even up to 10% at partial load, compared to induction machines.

Frequency Converter Technology

All VEM PM machines are suitable for VFD operation (variable frequency drive). Form wound windings withstand all levels in accordance with IVIC D (ultra harsh conditions). Random winding aligns with all levels of converter operation based on IVIC B. To lower harmonics and the impact to rotor temperatures a dU/dT-filter is mandatory for all low voltage machines.

Short Circuit Proof

Short circuits in the main switch board (MSB) or in the VFD may cause an electro magnetic counter field that could damage or de-magnetize the rotor of PM machines. VEM machines withstand these short circuit events under every condition.

Technology details

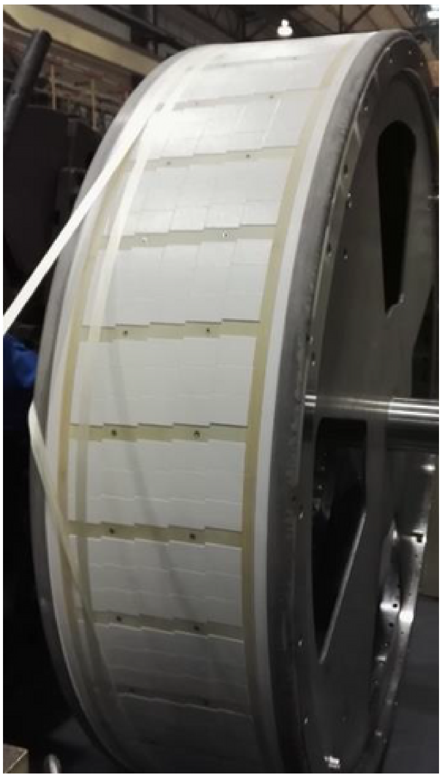
Stator design - Surface magnets

Advantages

- No magnetic crossbars
  - ⟶ low stray flux
  - ⟶ less magnetic material
  - ⟶ solid rotor body possible
- Easy rotor skewing avoid cogging torque
- No tools for rotor sheets

Disadvantages

- Inverter influence
  - ⟶ eddy currents in the magnet due to current harmonic currents
- Bandage necessary
  - ⟶ larger mechanical air gap
  - ⟶ no sinusoidal pole shape possible
- Protection during installation process necessary
- Improved corrosion protection necessary that complies with adessives



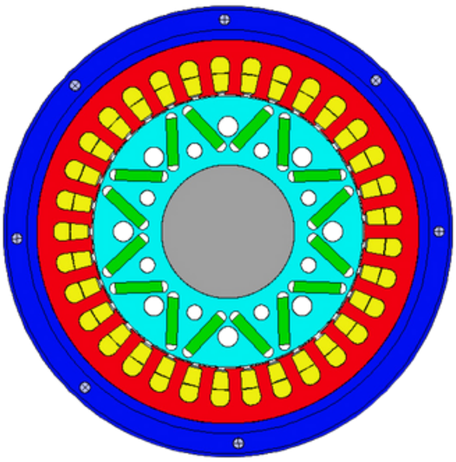
Stator design - Embedded magnets

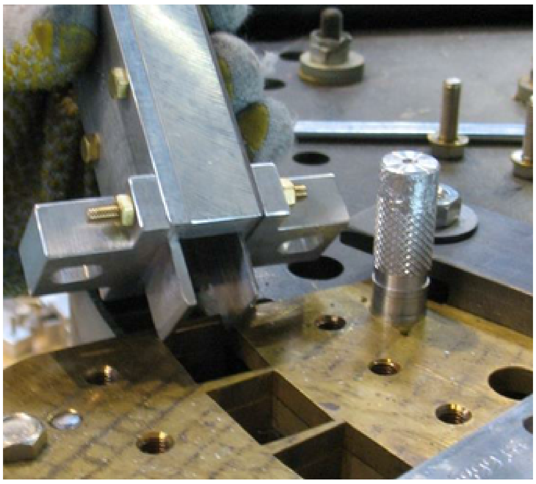
Advantages

- Magnetic shielding (sheets of metal) of the magnets
  → lower magnetic losses due to inverter harmonics
  → better operating point of the magnets (temperature)
- quick assembly of the magnets → technology required
- Low cogging
- No bandage
- Very good protection against environmental influences

Disadvantages

- Saturation of scattering paths → more magnetic material
- Strength calculation of the baskets necessary
- Disposal : Magnets sealed → no recycling





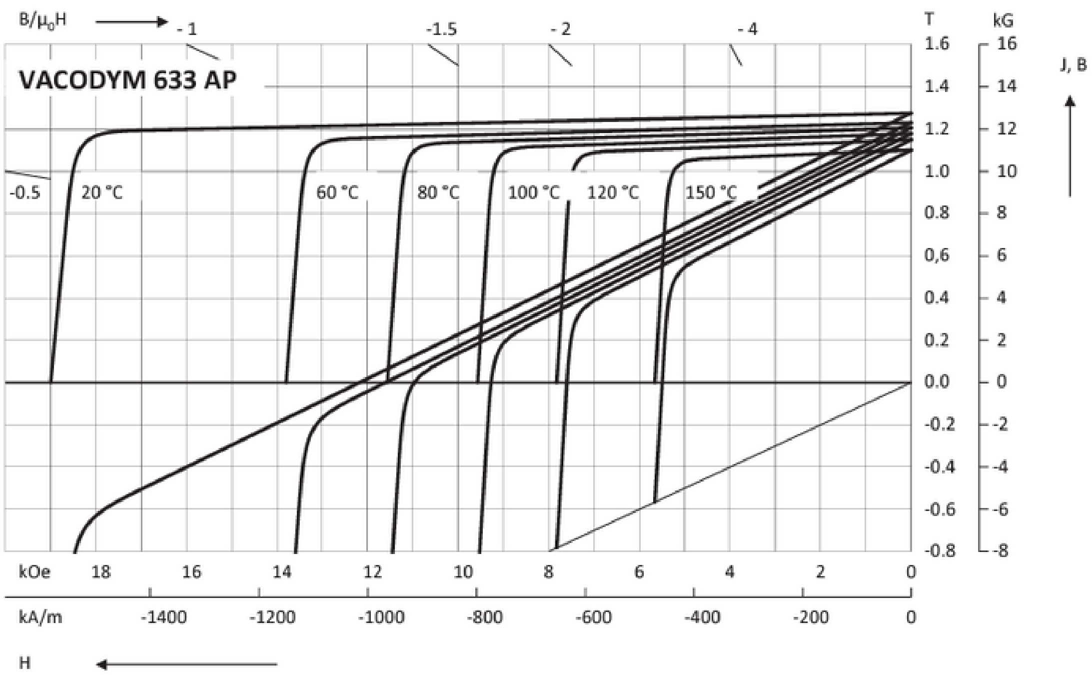
Sinusoidal Filter at PM machine

VFD influence at PM machines

- VFD feeding of electrical machines causes current harmonics by IGBT switching of the inverter modules
- These harmonics can cause eddy currents and additional rotor losses
- Especially for our ultra compact PM machines high pole numbers for smaller winding heads and water jacket cooling) we have to consider a low stator leackage inductance L_sigma
- Usually this L_sigma behaves like a filter
- But a low L_sigma let the rotor and magnets heat up in harmful areas
- Considering these temperature for the magnets, would lead to high expensive magnets (due to rare earth - Terbium) and longer bigger machines ⟶ this could easily double the machine price
- This effect could just be avoided by additional inductivity or a pure sinusiodal feeding
- PM machines that operate with high rotor temperatures are not short circuit proof - danger of total damage

Explanation of magnet behaviour under temperatur influence

- A change in temperature causes the working point to shift on the working line
- As long as the working point remains within the linear region of the demagnetization curve, the changes in the flux density are reversible, i.e. after cooling, the flux density returns to its original value.
- In all other cases, any change in the flux density is irreversible (irreversible
- magnetic losses)
- To avoid irreversible changes in the flux density through temperature fluctuations, the working point must remain within the linear section of the demagnetization curve over the entire temperature range in which the magnet is used
- A permanent magnet can be completely demagnetized by heating to temperatures above the Curie temperature T_c

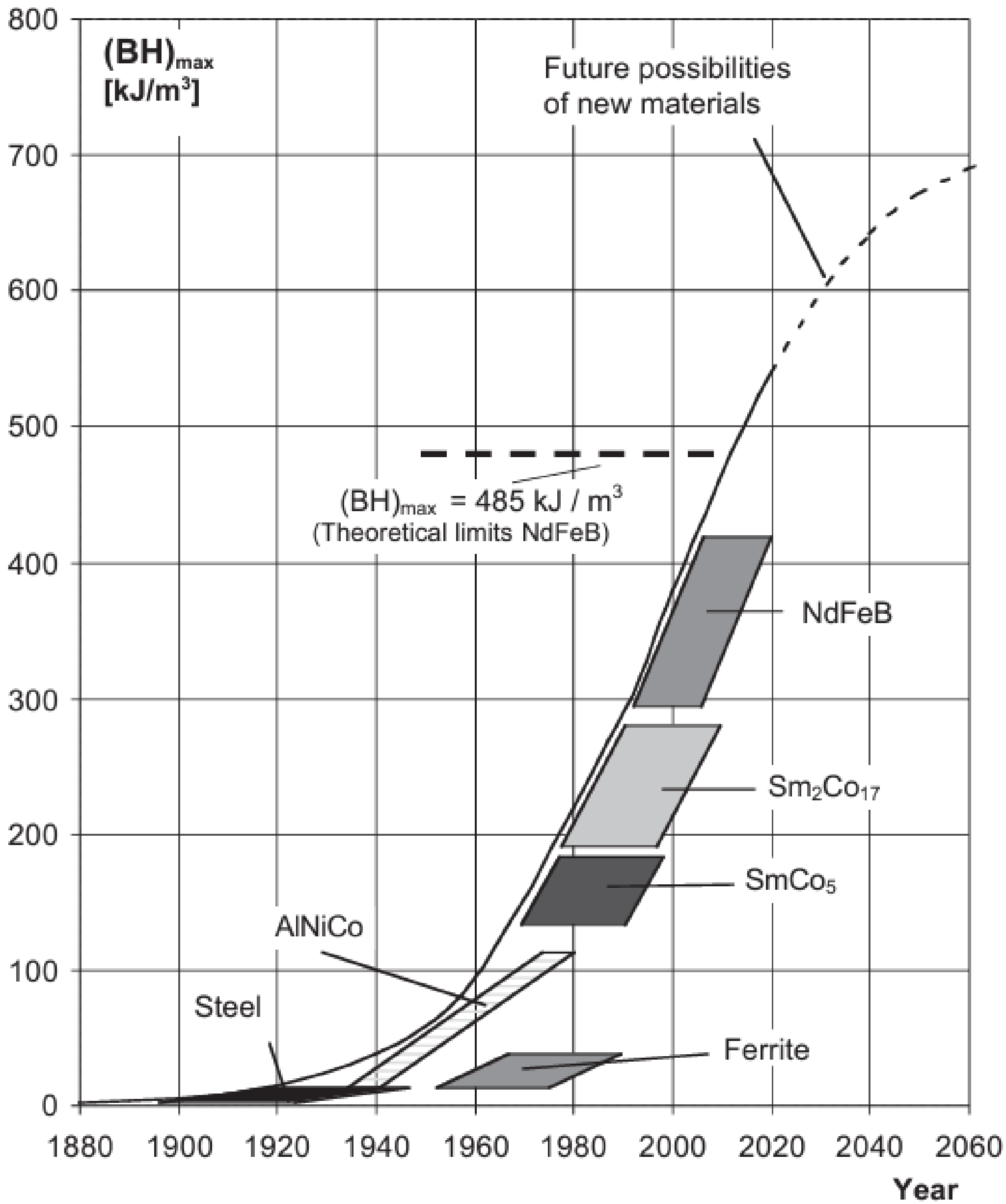


Demagnetization curves of example material grades at various temperatures

Source of picture and explanation:
https://vacuumschmelze.de/03_Documents/Brochures/VACODYM-VACOMAX%20en.pdf

Magnet - special technologies

Development of energy densities (BH)max of permanent magnets and their potential

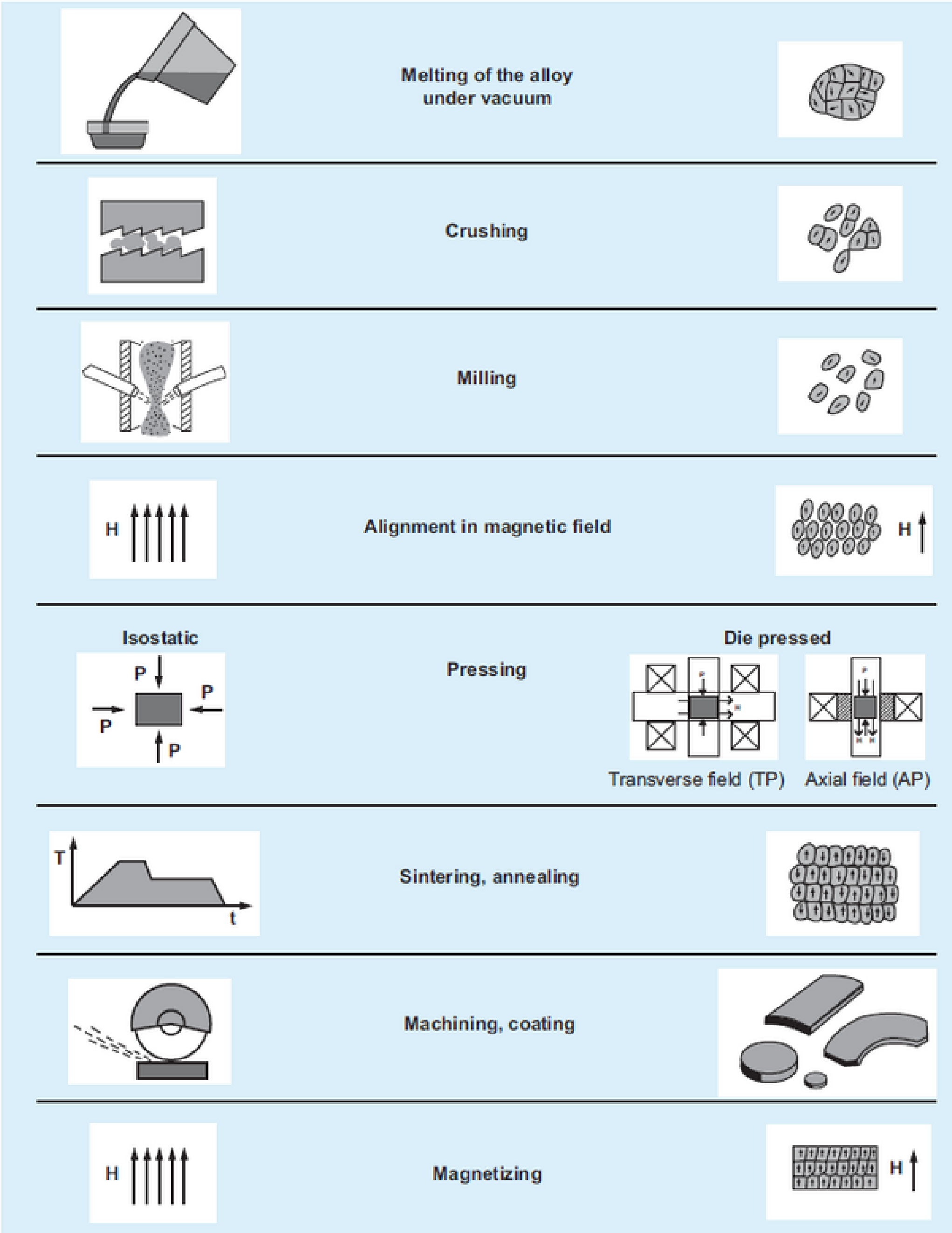


Source:
https://vacuumschmelze.de/03_Documents/Brochures/VACODYM-VACOMAX%20en.pdf

Magnet - production process

Basis material
neodymium iron boron alloys

⟶ highest energy densities available today



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https://vacuumschmelze.de/03_Documents/Brochures/VACODYM-VACOMAX%20en.pdf

Data sheet

Permanent magnet synchronous motors, aircool IC411

Synchronous speed 3000 rpm

Type	n [rpm]	f [Hz]	P [kW]	M [Nm]	Mmax [Nm]	UA [V]	η [%]	cosφ [-]	I [A]	R1 20 [Ohm]	UP1000 [V]	L1H [mH]	L1s [mH]	X1H [Ohm]	X1s [Ohm]	J [kgm2]	m [kg]
IE5-PS2R 71 K4	3000	100	0,37	1,2	4	320	81,7	0,99	0,78	13,5	100	37	15	23,2	9,4	4	6,8
IE5-PS2R 71 G4	3000	100	0,55	1,8	7	330	84,6	0,99	1,1	8,7	105	30	10	18,8	6,28	5	7,8
IE5-PS2R 80 KY4	3000	100	0,75	2,4	10	325	86,3	0,99	1,51	4,5	110	25	8	15,7	5,03	87	10,6
IE5-PS2R 80 G4	3000	100	1,1	3,5	14	330	87,8	0,99	2,15	2,8	105	18	5	11,3	3,14	107	11,7
IE5-PS2R 90 S4	3000	100	1,5	4,8	19	310	88,9	0,99	3,15	1,7	105	10	2	6,28	1,26	207	15,5
IE5-PS2R 90 L4	3000	100	2,2	7	28	280	90,2	0,99	5	0,8	90	4,5	1,5	2,83	942	26	18
IE5-PS2R 100 L4	3000	100	3	9,5	45	315	91,1	0,99	6	0,6	100	5	1	3,14	628	4	23,5
IE5-PS1R 112 MY4	3000	100	4	12,7	50	325	91,8	1	7,7	0,4	110	3	1	1,88	628	725	31
IE5-PS1R 132 SY4T	3000	100	5,5	17,5	70	310	92,6	1	11	0,25	110	2	0,5	1,26	314	9	39
IE5-PS1R 132 S4T	3000	100	7,5	23,9	100	360	93,3	1	12,9	0,2	115	3,5	0,5	2,2	314	11	47
IE5-PS1R 132 M4 SM	3000	100	11	35	o.R.	358	94	1	19	126	124	2,792	1,099	1,75	691	22	92
IE5-PS1R 132 M4 SM	3000	100	15	47,8	o.R.	362	94,5	1	25,5	126	124	2,796	1,1	1,76	691	22	92
IE5-PS2R 132 M4 SM	3000	100	18,5	58,9	o.R.	358	95,1	1	31,5	71	120	1,838	0,61	1,15	383	0,03	110
IE5-PS1R 160 M4 SM	3000	100	22	70	o.R.	359	95,3	0,99	37,5	71	120	1,838	0,61	1,15	383	0,03	110
IE5-PS2R 160 M4 SM	3000	100	30	95,5	o.R.	350	95,5	0,98	53	0,5	117	1,431	0,45	0,9	283	37	130
IE5-PS1R 180 L4 SM	3000	100	37	117,8	o.R.	349	96	0,99	64,5	27	116	1,224	376	0,77	236	116	204
IE5-PS1R 200 L4 SM	3000	100	45	143	o.R.	359	96,5	0,98	76,5	19	117	967	275	0,61	173	1,497	216
IE5-PS1R 225 S4 SM	3000	100	55	175	o.R.	358	96,4	0,97	95	0,01	116	787	214	0,49	134	251	265
IE5-PE1R 250 M4	3000	100	75	239	298	369	95,7	0,97	127	729	118	543	144	341	904	457	375
IE5-PE1R 250 M4	3000	100	90	287	358	374	96	0,96	151	729	118	543	145	341	911	457	375
IE5-PE1R 280 S4	3000	100	110	350	438	363	96,1	0,96	190	453	115	0,42	111	2,638	697	864	520
IE5-PE1R 280 S4	3000	100	132	420	525	370	96,4	0,94	228	453	115	0,42	111	2,638	697	864	520
IE5-PE1R 280 M4	3000	100	160	509	637	380	96,5	0,94	269	37	118	373	85	2,342	534	1,011	580
IE5-PE1R 315 MX4	3000	100	200	637	796	360	96,9	0,98	339	19	117	152	38	955	239	1,556	980
IE5-PE1R 315 MY4	3000	100	250	796	995	380	97,1	0,97	406	18	123	161	36	1,011	226	2,499	1170

ermanent magnet synchronous motors, aircool IC411

Synchronous speed 1500 rpm

Type	n [rpm]	f [Hz]	P [kW]	M [Nm]	Mmax [Nm]	UA [V]	η [%]	cosφ [-]	I [A]	R1 20 [Ohm]	UP1000 [V]	L1H [mH]	L1s [mH]	X1H [Ohm]	X1s [Ohm]	J [kgm2]	m [kg]
IE5-PS1R 71 G4	1500	50	0,37	2,4	14	305	84,3	0,99	0,77	9,5	195	61	19	19,2	5,97	87	11
IE5-PS2R 80 K4	1500	50	0,55	3,5	14	315	86,7	0,99	1,12	9,5	195	61	19	19,2	5,97	107	11,7
IE5-PS1R 80 G4	1500	50	0,75	4,8	19	310	88,2	0,99	1,6	6	195	36	9	11,3	2,83	107	14,5
IE5-PS2R 90 SX4	1500	50	1,1	7	28	300	89,5	0,99	2,35	3,4	190	24	6	7,5	1,88	207	18
IE5-PS1R 90 L4	1500	50	1,5	9,5	45	305	90,4	1	3,15	2,1	195	16	4	5,03	1,26	26	22,5
IE5-PS2R 100 L4	1500	50	2,2	14	45	310	91,4	0,99	4,5	2,1	195	16	4	5,03	1,26	26	23,5
IE5-PS1R 100 LX4	1500	50	3	19,1	50	335	92,1	0,99	5,65	1,5	215	16	4	5,03	1,26	4	30
IE5-PS1R 112 M4	1500	50	4	25,5	70	320	92,8	0,99	7,8	0,9	205	10,5	2,5	3,3	785	725	37
IE5-PS1R 132 S4T	1500	50	5,5	35	100	325	93,4	0,99	10,5	0,65	210	8	2	2,51	628	11	47
IE5-PS1R 132 MX4	1500	50	7,5	47,8	120	330	94	0,98	14,2	0,4	215	8,5	1,5	2,67	471	0,02	68
IE5-PS1R 160M 4 SM	1500	50	11	70	o.R.	345	94,5	1	19,5	227	235	5,891	2,227	1,85	0,7	31	110
IE5-PS1R 160L 4	1500	50	15	96	o.R.	356	95,1	1	25,5	117	243	3,92	1,253	1,23	394	68	143
IE5-PS1R 180M 4	1500	50	18,5	118	o.R.	357	95,3	1	31,5	117	243	3,938	1,253	1,24	394	68	143
IE5-PS2R 180M 4 SM	1500	50	22	140	o.R.	347	95,7	1	38	92	236	4,1	1,177	1,29	0,37	93	190
IE5-PS1R 180L 4	1500	50	30	191	o.R.	359	95,9	0,99	51	703	244	3,105	1,001	0,98	314	126	223
IE5-PS1R 200L 4	1500	50	37	236	o.R.	355	96,2	1	62,5	48	237	2,361	0,7	0,74	0,22	162	216
IE5-PS1R 225S 4	1500	50	45	287	o.R.	346	96,3	1	78	26	232	1,926	557	0,61	175	269	265
IE5-PS1R 225M 4	1500	50	55	350	o.R.	342	96,5	1	96	22	232	1,639	0,45	0,51	141	308	314
IE5-PE1R 250 M4	1500	50	75	478	597	366	96,1	0,98	126	17	237	1,319	369	4,142	1,159	492	375
IE5-PE1R 280 S4	1500	50	90	573	716	369	96,3	0,98	150	12	239	1,176	283	3,693	889	911	520
IE5-PE1R 280 M4	1500	50	110	700	875	359	96,4	0,96	191	88	229	897	207	2,817	65	1,065	580
IE5-PE1R 280 M4	1500	50	132	840	1050	373	96,5	0,98	216	993	243	848	0,25	2,663	785	1,089	580
IE5-PE1R 315 S4	1500	50	160	1019	1273	356	96,8	0,95	283	595	224	7,268	1,551	2,282	487	1,75	740
IE5-PE1R 315 MX4	1500	50	200	1273	1592	366	96,9	0,98	333	436	239	484	1,143	152	359	2,35	1000
IE5-PE1R 315 MY4	1500	50	250	1592	1990	372	97	0,96	418	348	236	3,886	777	122	244	4,224	1200

Permanent magnet synchronous motors, water jacket cooling IC71W

3600 rpm

Type	n[rpm]	f[Hz]	P[kW]	M[Nm]	Mmax [Nm]	UA[V]	η[%]	cosφ[-]	I[A]	Qwater [l/min]	pmin[bar]	pmax[bar]	J[kgm2]	m[kg]
IE5-P62B 355 MY 4	3600	120	580	1538	o.R.	675	98,05	0,98	504	60	0,5	3,5	o.R.	o.R.
IE5-P62B 355 M 4	3600	120	720	1910	o.R.	675	98,05	0,98	626	80	0,5	3,5	o.R.	o.R.
IE5-P62B 355 L 4	3600	120	900	2387	o.R.	675	98,05	0,98	782	90	0,5	3,5	o.R.	o.R.
IE5-P62B 400 M 4	3600	120	820	2175	o.R.	675	98,23	0,98	713	80	0,5	3,5	o.R.	o.R.
IE5-P62B 400 MX 4	3600	120	1090	2891	o.R.	675	98,23	0,98	947	100	0,5	3,5	o.R.	o.R.
IE5-P62B 400 L 4	3600	120	1230	3263	o.R.	675	98,23	0,98	1069	110	0,5	3,5	o.R.	o.R.
IE5-P62B 450 MX 4	3600	120	1160	3077	o.R.	675	98,3	0,98	1184	100	0,5	3,5	o.R.	o.R.
IE5-P62B 450 L 4	3600	120	1350	3581	o.R.	675	98,3	0,98	1378	120	0,5	3,5	o.R.	o.R.
IE5-P62B 450 LX 4	3600	120	1500	3979	o.R.	675	98,3	0,98	1531	130	0,5	3,5	o.R.	o.R.

Permanent magnet synchronous motors, water jacket cooling IC71W

2700 rpm

Type	n[rpm]	f[Hz]	P[kW]	M[Nm]	Mmax [Nm]	UA[V]	η[%]	cosφ[-]	I[A]	Qwater [l/min]	pmin[bar]	pmax[bar]	J[kgm2]	m[kg]
IE5-P62B 355 MY 4	2700	90	570	2016	o.R.	675	98,45	0,97	501	50	0,5	3,5	o.R.	o.R.
IE5-P62B 355 M 4	2700	90	700	2476	o.R.	675	98,45	0,97	615	60	0,5	3,5	o.R.	o.R.
IE5-P62B 355 L 4	2700	90	880	3112	o.R.	675	98,45	0,97	773	70	0,5	3,5	o.R.	o.R.
IE5-P62B 400 M 4	2700	90	790	2794	o.R.	675	98,36	0,96	708	70	0,5	3,5	o.R.	o.R.
IE5-P62B 400 MX 4	2700	90	1060	3749	o.R.	675	98,36	0,96	949	90	0,5	3,5	o.R.	o.R.
IE5-P62B 400 L 4	2700	90	1200	4244	o.R.	675	98,36	0,96	1075	100	0,5	3,5	o.R.	o.R.
IE5-P62B 450 MX 4	2700	90	1140	4032	o.R.	675	98,6	0,98	1163	80	0,5	3,5	o.R.	o.R.
IE5-P62B 450 L 4	2700	90	1350	4775	o.R.	675	98,6	0,98	1378	100	0,5	3,5	o.R.	o.R.
IE5-P62B 450 LX 4	2700	90	1490	5270	o.R.	675	98,6	0,98	1520	110	0,5	3,5	o.R.	o.R.

Permanent magnet synchronous motors, water jacket cooling IC71W

1800 rpm

Type	n[rpm]	f[Hz]	P[kW]	M[Nm]	Mmax [Nm]	UA[V]	η[%]	cosφ[-]	I[A]	Qwater [l/min]	pmin[bar]	pmax[bar]	J[kgm2]	m[kg]
IE5-P62B 355 MY 4	1800	60	560	2971	o.R.	675	98,5	0,97	492	50	0,5	3,5	o.R.	o.R.
IE5-P62B 355 M 4	1800	60	690	3661	o.R.	675	98,5	0,97	606	60	0,5	3,5	o.R.	o.R.
IE5-P62B 355 L 4	1800	60	860	4562	o.R.	675	98,5	0,97	755	70	0,5	3,5	o.R.	o.R.
IE5-P62B 400 M 4	1800	60	780	4,138	o.R.	675	98,47	0,96	695	60	0,5	3,5	o.R.	o.R.
IE5-P62B 400 MX 4	1800	60	1030	5464	o.R.	675	98,47	0,96	918	80	0,5	3,5	o.R.	o.R.
IE5-P62B 400 L 4	1800	60	1170	6207	o.R.	675	98,47	0,96	1042	90	0,5	3,5	o.R.	o.R.
IE5-P62B 450 MX 4	1800	60	1120	5942	o.R.	675	98,56	0,97	1150	90	0,5	3,5	o.R.	o.R.
IE5-P62B 450 L 4	1800	60	1340	7,109	o.R.	675	98,56	0,97	1376	100	0,5	3,5	o.R.	o.R.
IE5-P62B 450 LX 4	1,800	60	1480	7,852	o.R.	675	98,56	0,97	1520	110	0,5	3,5	o.R.	o.R.
DQWAB 5023-4U	1,800	60	2100	11,141	o.R.	690	98,4	975	1832	160	0,5	3,5	53	6500
DQWAB 5025-4U	1,800	60	2300	12,202	o.R.	690	98,4	975	2006	180	0,5	3,5	55	6800
DQWAB 5028-4U	1,800	60	2600	13,793	o.R.	690	98,4	975	2268	200	0,5	3,5	61	7100
DQWAB 5031-4U	1800	60	2900	15,385	o.R.	690	98,4	975	2529	230	0,5	3,5	67	7500

Permanent magnet synchronous motors, water jacket cooling IC71W

1200 rpm

Type	n[rpm]	f[Hz]	P[kW]	M[Nm]	Mmax [Nm]	UA[V]	η[%]	cosφ[-]	I[A]	Qwater [l/min]	pmin[bar]	pmax[bar]	J[kgm2]	m[kg]
IE5-P62B 355 MY 6	1200	60	470	3740	o.R.	380	98,1	0,97	733	50	0,5	3,5	o.R.	o.R.
IE5-P62B 355 L 6	1200	60	790	6287	o.R.	675	98,1	0,97	694	80	0,5	3,5	o.R.	o.R.
IE5-P62B 400 M 6	1200	60	710	5650	o.R.	675	98,45	0,97	623	60	0,5	3,5	o.R.	o.R.
IE5-P62B 400 MX 6	1200	60	950	7560	o.R.	675	98,45	0,97	834	80	0,5	3,5	o.R.	o.R.
IE5-P62B 400 L 6	1200	60	1100	8754	o.R.	675	98,45	0,97	966	90	0,5	3,5	o.R.	o.R.
IE5-P62B 450 MX 6	1200	60	1050	8356	o.R.	675	98,5	0,96	1094	80	0,5	3,5	o.R.	o.R.
IE5-P62B 450 L 6	1200	60	1290	10265	o.R.	675	98,5	0,96	1344	100	0,5	3,5	o.R.	o.R.
IE5-P62B 450 LX 6	1200	60	1460	11618	o.R.	675	98,5	0,96	1521	110	0,5	3,5	o.R.	o.R.
DQWAB 5025-6U	1200	60	1900	15120	o.R.	690	98,3	975	1,659	160	0,5	3,5	97	6,700
DQWAB 5028-6U	1200	60	2080	16552	o.R.	690	98,3	975	1,816	170	0,5	3,5	105	6,900
DQWAB 5030-6U	1200	60	2250	17905	o.R.	690	98,3	975	1,964	190	0,5	3,5	113	7,300
DQWAB 5033-6U	1200	60	2500	19894	o.R.	690	98,3	975	2,182	210	0,5	3,5	123	7,700

Permanent magnet synchronous motors, water jacket cooling IC71W

900 rpm

Type	n[rpm]	f[Hz]	P[kW]	M[Nm]	Mmax [Nm]	UA[V]	η[%]	cosφ[-]	I[A]	Qwater [l/min]	pmin[bar]	pmax[bar]	J[kgm2]	m[kg]
DQWAB 5028-8U	900	60	1900	20160	o.R.	690	98,15	975	1661	170	0,5	3,5	105	6,900
DQWAB 5030-8U	900	60	2070	21963	o.R.	690	98,15	975	1810	190	0,5	3,5	113	7,300
DQWAB 5033-8U	900	60	2280	24192	o.R.	690	98,15	975	1994	210	0,5	3,5	124	7,600
DQWAB 5036-8U	900	60	2500	26526	o.R.	690	98,15	975	2186	230	0,5	3,5	133	7,900

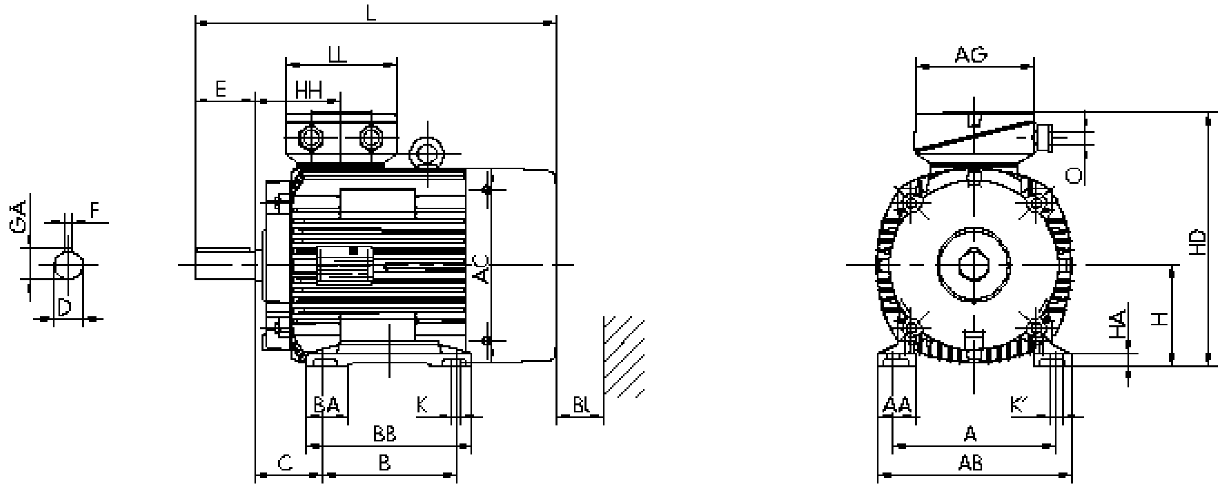
Permanent magnet synchronous motors, water jacket cooling IC71W

750 rpm

Type	n[rpm]	f[Hz]	P[kW]	M[Nm]	Mmax [Nm]	UA[V]	η[%]	cosφ[-]	I[A]	Qwater [l/min]	pmin[bar]	pmax[bar]	J[kgm2]	m[kg]
IE5-P62B 355 MY 6	750	37,5	360	4584	o.R.	380	97,4	0,95	576	50	0,5	3,5	o.R.	o.R.
IE5-P62B 355 L 6	750	37,5	600	7639	o.R.	675	97,4	0,95	540	80	0,5	3,5	o.R.	o.R.
IE5-P62B 400 M 6	750	37,5	530	6748	o.R.	675	97,86	0,95	477	60	0,5	3,5	o.R.	o.R.
IE5-P62B 400 MX 6	750	37,5	730	9295	o.R.	675	97,86	0,95	657	80	0,5	3,5	o.R.	o.R.
IE5-P62B 400 L 6	750	37,5	800	10186	o.R.	675	97,86	0,95	720	90	0,5	3,5	o.R.	o.R.
IE5-P62B 450 MY 6	750	37,5	780	9931	o.R.	675	98,1	0,96	813	80	0,5	3,5	o.R.	o.R.
IE5-P62B 450 M 6	750	37,5	890	11332	o.R.	675	98,1	0,96	927	90	0,5	3,5	o.R.	o.R.
IE5-P62B 450 MX 6	750	37,5	1010	12860	o.R.	675	98,1	0,96	1052	100	0,5	3,5	o.R.	o.R.
IE5-P62B 450 L 6	750	37,5	1150	14642	o.R.	675	98,1	0,96	1,198	110	0,5	3,5	o.R.	o.R.
IE5-P62B 450 LX 6	750	37,5	1300	16552	o.R.	675	98,1	0,96	1,354	130	0,5	3,5	o.R.	o.R.

Dimensional sheet

IC411 / IM B3

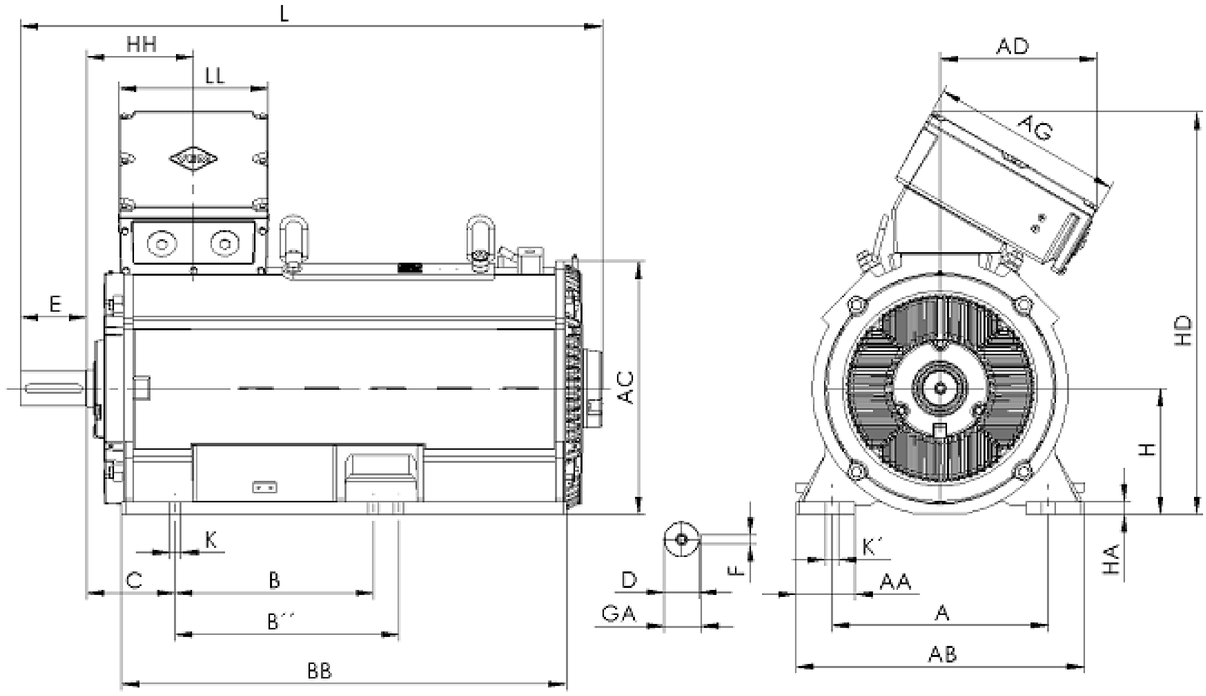


Type	A	AA	AB	AD	B	BB	C	HD	L	H	D	E
PS1R71	112	24	135	-	90	114	45	182	239	71	14	30
PS1R80	125	32	152	-	100	125	50	200	265	80	19	40
PS1R90	140	40	178	-	125	155	56	217	321	90	24	50
PS1R100	160	42	193	-	140	175	63	236	357	100	28	60
PS1R112	190	52	225	-	140	180	70	248	391	112	28	60
PS1R132	216	50	256	-	178	218	89	310	527	132	38	80
PS1R160	254	55	296	-	254	301	108	402	609	160	42	110
PS1R180	279	62	328	-	279	326	121	441	680	180	48	110
PS1R200	318	70	372	-	305	360	133	461	680	200	55	110
PS1R225	356	75	413	-	311	368	149	525	797	225	60	140
PE1R250	406	84	471	-	349	412	168	608	862	250	65	140
PE1R280	457	94	522	-	419	482	190	666	970	280	75	140
PE1R315	508	110	590	-	457	573	216	809	1300	315	80	170

All dimensions in mm (metric) according to IEC

Dimensional sheet

IC71W / IM B3

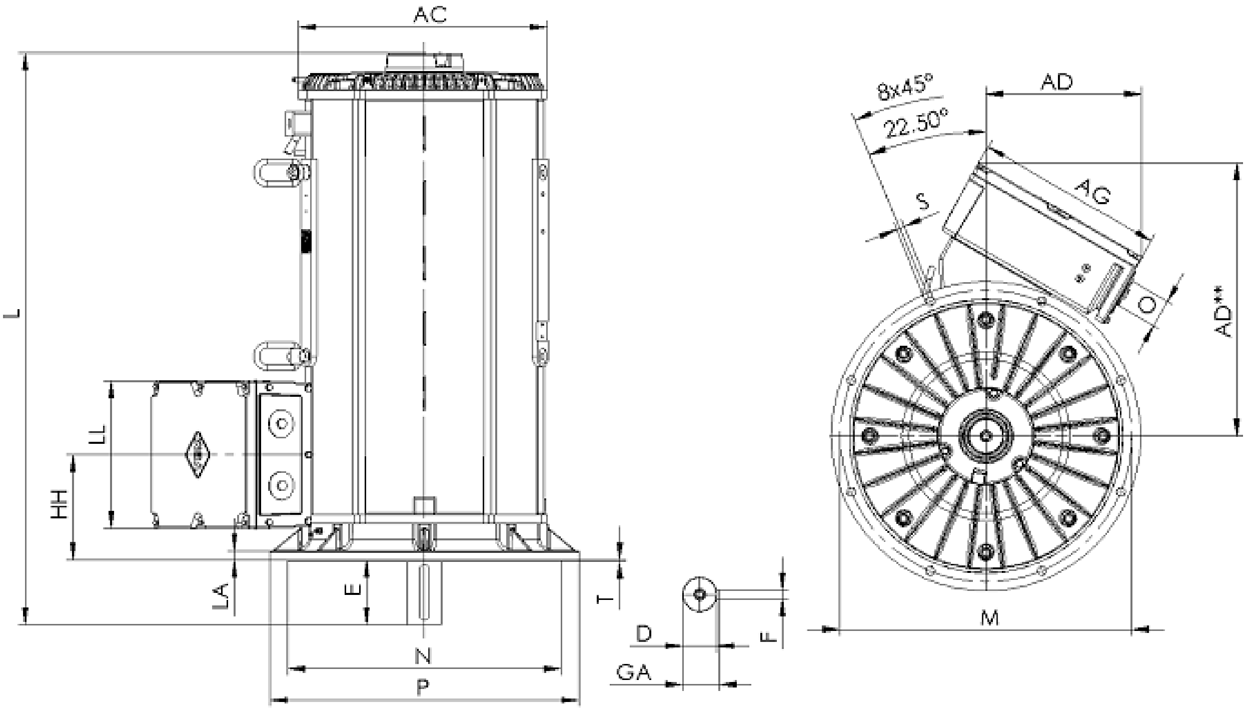


Type	A	AB	AD	B	BB	HD	L	H	D	E
P62B355	610	700	-	560	200	1174	1605	355	100	210
P62B400	686	914	-	630	200	1281	1843	400	110	210
P62B450	825	994	-	1000	200	1383	2067	455	120	210
DQWAB503	950	1120	-	1250	-	1682	2396	500	140	210

All dimensions in mm (metric) according to IEC

Dimensional sheet

IC71W / IM V1



Type	P	M	N	LA	T	AD	L	D	E
P62B355	800	740	680	25	6	-	1605	100	210
P62B400	1000	940	880	25	6	-	1843	110	210
P62B450	1000	940	880	25	6	-	2067	120	210
DQWAB 503	1000	940	880	25	6	-	2396	140	210

All dimensions in mm (metric) according to IEC

VEM SOLUTIONS

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