

Three phase Synchronous and Asynchronous Generators

HYDROPOWER APPLICATIONS



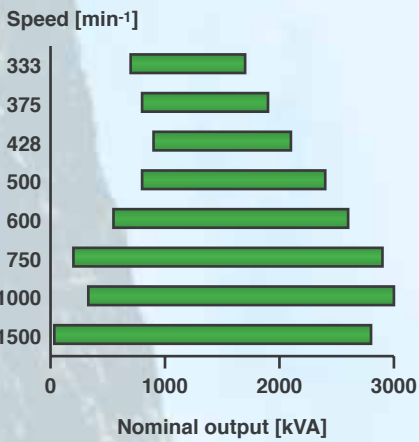
HYDROPOWER PLANT GENERATORS

MarelliGenerators offers a wide range of solutions for hydropower applications. Our synchronous and asynchronous generators represent the best choice due to their certified quality, their versatile design allowing the generator to be customised to your needs, and to the experience acquired by more than 100 years of production. The undisputed quality proved by all MarelliGenerators products is shown by their high reliability, high efficiency and by their unchanged performance during many years of service.

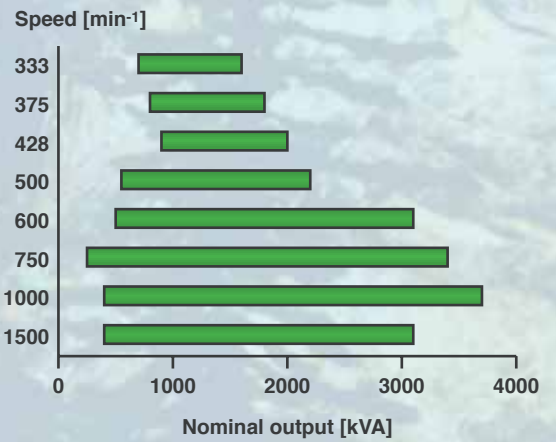


SYNCHRONOUS GENERATORS

Power range @ 50 Hz - Low voltage

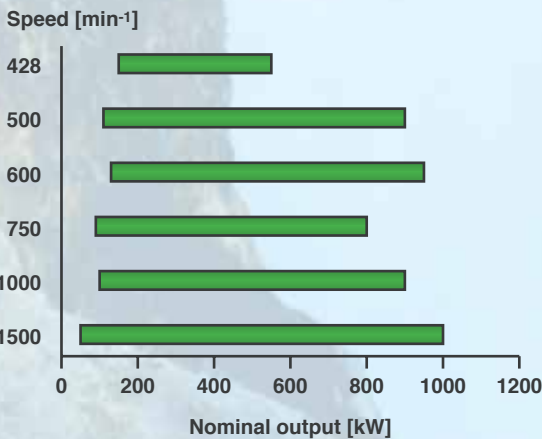


Power range @ 50 Hz - Medium voltage



ASYNCHRONOUS GENERATORS

Power range @ 50 Hz - Low voltage



MarelliGenerators represents the best know-how within the hydropower field by ensuring our product has outstanding technical features.

RELIABILITY

- Long life endurance of electrical components and bearings.
- Class H insulation system for synchronous and class F for asynchronous generators. Impregnation with polyester resin using the Vacuum Pressure Impregnation (VPI) system. A further protection from any corrosion phenomenon is guaranteed by a tropicalization treatment.
- High safety factors to warrant the functionality of generators even in the worst working conditions.

HIGH PERFORMANCE

- Active parts are designed using the latest technologies and the best materials available in order to ensure high efficiency values.

SAFETY

- Space heaters are installed to avoid the risk of condensate inside generators.
- Bearings and stator windings temperatures are totally supervised by using a wide range of sensors.
- Synchronous generators can be equipped with electronic control devices for particular working conditions and to ensure real time monitoring.

TOTALLY CUSTOMISABLE

All generators are totally customisable.

- Nominal voltage from 380 to 6.600 V.
- From 4 to 18 poles; polarities not mentioned in the following pages might be available on request.
- Horizontal or vertical shaft.
- Degree of protection up to IP 55 using a heat exchanger.
- Runner directly connected to the generator shaft to avoid all the supports of the runner shaft.
- Bushings are used in strong hydraulic load applications to eliminate all the maintenance operations required by the rolling bearings.
- Use of flywheels to rise the proper inertial momentum of the generator.
- Wide set of control and adjustment devices (also with digital logic unit, if required) for synchronous generators.



FRAME SIZES 400 - 710 SYNCHRONOUS GENERATORS: TECHNICAL FEATURES

STANDARDS

All generators are designed according to the IEC 60034-1, CEI EN 60034-1, BS 4999-5000, VDE 0530, NF 51-100, OVE M-10 and NEMA MG 1.22 standards and can be incorporated in the "CE" marked machinery.

AVAILABLE VOLTAGE

Generators can be supplied with the following voltage range:

- Low voltage (380 - 480 V)
- Medium voltage (3.000 - 6.600 V)

Voltages not listed can be supplied on request.

EXCITATION SYSTEM

Generators are self-excited through a brushless type excitation system.

The voltage is maintained within $\pm 0,5\%$ of the nominal value in steady state conditions.

Generators are equipped with an auxiliary winding, or with the Varicomp overexcitement device, in order to supply a three-phase short circuit current 2,5 times greater than the nominal current of the generator.

OVERLOADS

The following overloads are permitted: 10% for one hour, 15% for ten minutes, 30% for four minutes and 50% for two minutes. All overloads must occur occasionally and must be followed by a minimum of one hour of running at nominal load or less.

OPERATING CONDITIONS

Parallel operation

All generators are provided with an oversized damper cage and are suitable for parallel operation with other generators, when equipped with a paralleling unit. An automatic power factor regulator is available on request.

Environmental conditions

The rated outputs refer to an installation height up to 1.000 m asl and to a maximum ambient temperature of 40°C. For higher altitudes and different temperature values the rated outputs must be re-calculated using the factors listed in the following table.

Altitude [m asl]	Ambient temperature [°C]			
	30	40	45	50
1000	1,04	1,00	0,98	0,95
1500	1,03	0,97	0,95	0,92
2000	0,99	0,93	0,91	0,88
2500	0,95	0,90	0,88	0,86
3000	0,91	0,86	0,84	0,82

Power factor

The nominal power factor is 0,8 lagging. For different power factor values the following derating factors must be applied:

Power factor	1,0	+0,8	+0,7	+0,6	+0,5	+0,3	0
$K_{\cos\phi}$	1,0	1,0	0,93	0,88	0,84	0,82	0,80

For negative power factors please contact MarelliMotori.

DEGREE OF PROTECTION

Standard generators are air-cooled with an IP 23 degree of protection (IC 01 cooling type). Inlet and outlet air filters (IC 01 cooling type) are available on request to upgrade the index to IP 44.

To obtain a higher index of protection (IP 44, IP 54) generators can be supplied with an air-to-water heat exchanger installed on the body of the machinery (IC 81W cooling type).

SHAFT ORIENTATION

Generators are supplied with a horizontal (IM B3) or vertical (IM V10) shaft configuration. The vertical generators are equipped with a thrust bearing on the no-drive-end (NDE) side.

BEARINGS

Standard generators are supplied with grease-lubricated rolling bearings. All bearings are oversized to guarantee a minimum lifetime of 100.000 h ($L_{10h} = 100.000$ h), value obtained concerning to an unloaded standard shaft. The NDE bearing is conveniently insulated ⁽¹⁾ to avoid shaft currents.

RUNNER DIRECTLY CONNECTED TO THE SHAFT

Generators can be equipped with a special shaft extension to directly connect the hydraulic turbine runner. In this configuration all bearings and the shaft are designed to withstand to axial and radial loads caused by the hydraulic thrust and by the weight of the runner. Depending on the loads applied and on the runaway speed of the runner, generators can be supplied with oil-lubricated rolling bearings or sleeve bearings.

ROTOR BALANCING

Rotors are dynamically balanced with a half key applied to the shaft extension in accordance with IEC 60034-14 to vibration grade normal (N) in standard execution. Generators can be supplied with reduced (R) or special (S) vibration levels on request.

INSULATION

Class H standard insulation system allows a maximum winding temperature rise of 125°C referring to an ambient temperature of 40°C. Windings are impregnated with polyester resin using the latest technology (VPI system). An enamel insulator (tropicalization treatment) coats all inner parts of the generator in order to protect it from corrosion.

TEMPERATURE SENSORS

Generators are equipped with three PT100 temperature sensors (one for each phase) installed into the slots to supervise the stator winding temperature and with a PT100 for each bearing to monitor its temperature (**). To control inlet and outlet air temperature of the air-to-water heat exchanger, PT100's are installed both on the NDE side and on the drive-end (DE) side on request. If the air-to-water heat exchanger is installed, PT100's are used to control the inlet and outlet water temperature.

FLYWHEEL

When the requested inertial momentum is higher than the actual inertial momentum of the generator, it is possible to extend the shaft on the NDE side in order to connect a flywheel.

TERMINAL BOXES

Generators are supplied with terminal boxes of appropriate dimensions in order to allow easy connection to the main leads. All generators allow the connection to the main leads and to the star point.

Two different terminal boxes, one for the star point and one for the leads for the auxiliary devices, are available on request.

Generators can be equipped with current transformers both on the main leads and the star point leads.

The standard degree of protection for terminal boxes is IP 44; the IP 55 can be installed on request.

EQUIPMENT

Standard

- Class H insulation
- VPI impregnation type
- Windings protected from corrosion (tropicalization)
- Six leads stator winding into the terminal box
- Parallel device between generators
- N° 3 PT100 into the stator winding
- N° 1 PT100 for each bearing (**)
- Anti-condensation thermal heaters
- IP 23 degree of protection
- IP 44 degree of protection for the terminal box
- Bearings: more than 100.000 h lifetime
- NDE side bearing insulated to avoid shaft currents (*)

Electric options

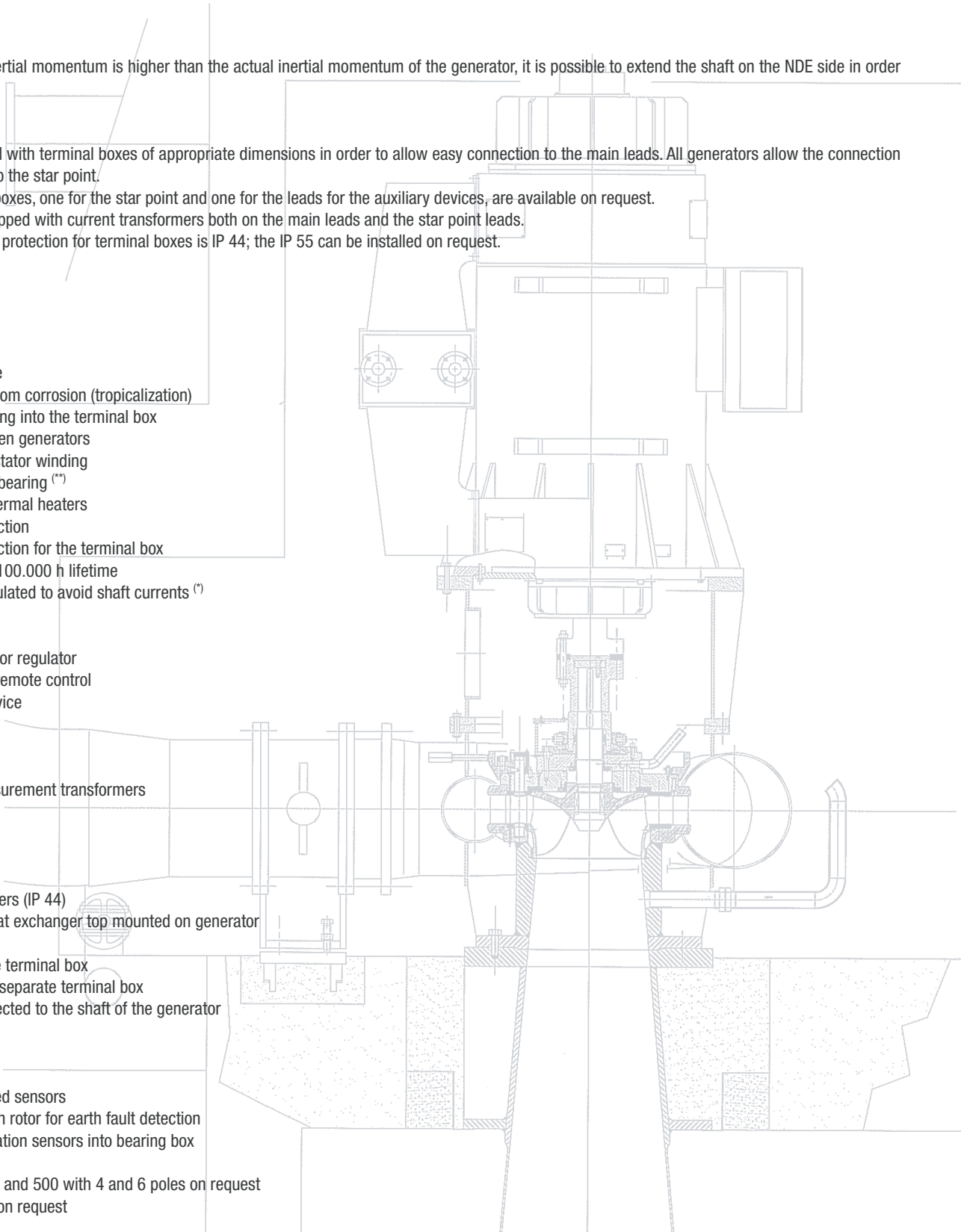
- Automatic power factor regulator
- Rheostat for voltage remote control
- Manual excitation device
- Excitement control
- Diode failure monitor
- Digital AVR
- In-terminal-box measurement transformers
- Encoder
- Tachometric dynamo

Mechanical options

- Inlet and outlet air filters (IP 44)
- Air-to-fresh water heat exchanger top mounted on generator
- IP 55 terminal box
- Star-point in separate terminal box
- Auxiliary leads into a separate terminal box
- Runner directly connected to the shaft of the generator
- Sleeve bearings
- Shaft extension
- Flywheel
- Arrangement for speed sensors
- Brush connection with rotor for earth fault detection
- Arrangement for vibration sensors into bearing box

(*) for frame sizes 400 and 500 with 4 and 6 poles on request

(**) for 400 frame size on request



SYNCHRONOUS GENERATORS / LOW VOLTAGE

Type	Leads	kVA rating @ Temperature Rise / Ambient Temp. (°C)				Moment of inertia (**) [kgm ²]	Weight (**) [kg]	Max overspeed [min ⁻¹]
		Continuous duty						
		105 / 40 ΔT cl. F	80 / 40 ΔT cl. B	105 / 40 ΔT cl. F	80 / 40 ΔT cl. B			
4 pole		400V 50Hz - 1500 min⁻¹		480V 60Hz - 1800 min⁻¹				
MJT								
400 MA4	6	725	635	870	760	16,3	2.250	3.000
400 MB4	6	815	710	980	855	17,0	2.300	3.000
400 LA4	6	895	780	1.075	940	19,3	2.550	3.000
400 LB4	6	1.010	880	1.210	1.055	22,5	2.800	3.000
450 MB4	6	1.100	960	1.320	1.150	29,0	3.200	2.700
450 LA4	6	1.210	1.055	1.450	1.265	34,0	3.600	2.700
450 LB4	6	1.340	1.170	1.610	1.405	38,0	4.000	2.700
500 SC4	6	1.460	1.275	1.750	1.530	46,7	3.700	2.700
500 MB4	6	1.675	1.460	2.010	1.755	52,5	4.400	2.700
500 LA4	6	1.945	1.700	2.335	2.040	61,5	5.100	2.700
560 MA4	6	2.145	1.870	2.465	2.150	83	5.000	2.700
560 LA4	6	2.555	2.230	2.940	2.565	95	5.700	2.700
630 SA4	6	2.350	2.050	2.705	2.360	117	6.350	2.400
630 MA4*	6	2.550	2.225	2.935	2.560	151	7.500	2.400
630 LA4*	6	2.780	2.425	3.200	2.795	163	8.000	2.400
6 pole		400V 50Hz - 1000 min⁻¹		480V 60Hz - 1200 min⁻¹				
MJT								
400 SA6	6	330	290	395	345	11,8	1.450	2.200
400 SB6	6	380	330	455	395	14,1	1.600	2.200
400 MA6	6	510	445	610	530	17,9	2.200	2.200
400 MB6	6	575	500	690	600	19,4	2.260	2.200
400 LA6	6	660	575	790	690	20,9	2.530	2.200
400 LB6	6	815	710	980	855	24,2	2.750	2.200
500 SA6	6	865	755	1.040	910	50,5	3.200	2.200
500 SC6	6	1.100	960	1.320	1.150	64,7	3.800	2.200
500 MB6	6	1.320	1.150	1.585	1.385	70,0	4.100	2.200
500 LA6	6	1.540	1.345	1.850	1.615	88,9	5.100	2.200
560 MA6	6	1.595	1.390	1.835	1.600	111	5.000	2.200
560 LA6	6	1.900	1.660	2.185	1.905	137	5.700	2.200
630 SC6	6	1.690	1.475	1.945	1.700	145	6.500	2.200
630 MA6	6	2.020	1.765	2.325	2.030	167	8.000	2.200
630 MB6	6	2.150	1.875	2.475	2.160	183	8.500	2.200
630 LA6	6	2.390	2.085	2.750	2.400	200	9.500	2.200
710 SC6*	6	2.560	2.235	2.870	2.505	on request	on request	2.100
710 MA6*	6	2.970	2.590	3.330	2.905	on request	on request	2.100
8 pole		400V 50Hz - 750 min⁻¹		480V 60Hz - 900 min⁻¹				
MJT								
400 SA8	6	200	175	240	210	13,5	1.450	2.000
400 SB8	6	255	225	305	265	16,2	1.600	2.000
400 MA8	6	355	310	425	370	20,6	2.200	2.000
400 MB8	6	420	365	505	440	22,4	2.260	2.000
400 LA8	6	500	435	600	525	24,1	2.530	2.000
400 LB8	6	610	530	730	635	25,4	2.750	2.000
500 SA8	6	675	590	810	705	55,1	3.200	2.000
500 SC8	6	840	735	1.010	880	74,2	3.800	2.000
500 MB8	6	1.045	910	1.255	1.095	77,7	4.100	2.000
500 LA8	6	1.235	1.080	1.480	1.290	95,0	5.100	2.000
560 MA8	6	1.245	1.085	1.430	1.250	122	5.000	2.000
560 LA8	6	1.485	1.295	1.710	1.495	146	5.700	2.000
630 SC8	6	1.280	1.115	1.470	1.285	177	6.500	1.900
630 MA8	6	1.530	1.335	1.760	1.535	204	8.000	1.900
630 LA8	6	2.020	1.765	2.325	2.030	245	9.500	1.900
710 SC8	6	2.270	1.980	2.540	2.215	on request	on request	1.800
710 MA8*	6	2.640	2.305	2.960	2.585	on request	on request	1.800
710 LA8*	6	2.850	2.490	3.190	2.785	on request	on request	1.800

*: 690 V recommended

** : Showed data could change depending on mounting.

The rated outputs refer to the following conditions: balanced and non deforming load, altitude below 1.000 m asl, power factor from 0,8 to 1.

For values of overspeed greater than as listed, please contact MarelliMotori.

SYNCHRONOUS GENERATORS / LOW VOLTAGE

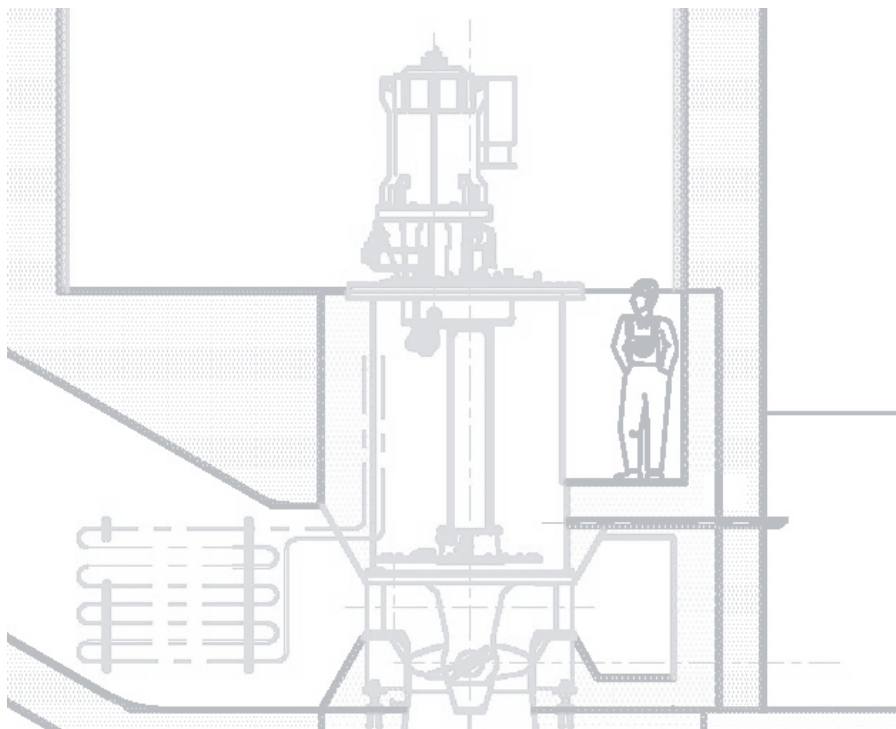
Type	Leads	kVA rating @ Temperature Rise / Ambient Temp. (°C)				Moment of inertia (**) [kgm ²]	Weight (**) [kg]	Max overspeed [min ⁻¹]
		Continuous duty						
		105 / 40 ΔT cl. F	80 / 40 ΔT cl. B	105 / 40 ΔT cl. F	80 / 40 ΔT cl. B			
10 pole		400V 50Hz - 600 min⁻¹		480V 60Hz - 720 min⁻¹				
MJT 500 SA10	6	535	465	640	560	63,8	3.200	1.500
500 SC10	6	670	585	805	705	81,6	3.800	1.500
500 MB10	6	780	680	935	815	85,7	4.100	1.500
500 LA10	6	865	755	1.040	910	106,7	5.100	1.500
630 SC10	6	1.020	890	1.175	1.025	188	6.500	1.320
630 MA10	6	1.210	1.055	1.390	1.215	217	8.000	1.320
630 MB10	6	1.300	1.135	1.495	1.305	237	8.500	1.320
630 LA10	6	1.420	1.240	1.635	1.425	260	9.500	1.320
710 SC10	6	2.010	1.755	2.240	1.955	on request		1.320
710 MA10	6	2.420	2.110	2.720	2.375	on request		1.320
710 MB10*	6	2.580	2.250	2.890	2.525	on request		1.320
12 pole		400V 50Hz - 500 min⁻¹		480V 60Hz - 600 min⁻¹				
MJT 630 SC12	6	720	630	820	715	206	6.500	1.100
630 MA12	6	870	760	1.000	875	238	8.000	1.100
630 MB12	6	1.100	960	1.270	1.110	260	8.500	1.100
630 LA12	6	1.280	1.115	1.490	1.300	285	9.500	1.100
710 SA12	6	1.380	1.205	1.580	1.380	on request		1.100
710 MA12	6	1.780	1.555	2.040	1.780	on request		1.100
710 LA12	6	2.200	1.920	2.530	2.210	on request		1.100
14 pole		400V 50Hz - 428 min⁻¹		480V 60Hz - 514 min⁻¹				
MJT 710 SA14	6	750	655	850	740	on request		950
710 SC14	6	1.020	890	1.180	1.030	on request		950
710 MA14	6	1.220	1.065	1.410	1.230	on request		950
710 LA14	6	1.500	1.310	1.730	1.510	on request		950
710 LB14	6	1.700	1.485	1.960	1.710	on request		950
16 pole		400V 50Hz - 375 min⁻¹		480V 60Hz - 450 min⁻¹				
MJT 710 SA16	6	660	575	750	655	on request		825
710 SC16	6	900	785	1.040	910	on request		825
710 MA16	6	1.070	935	1.240	1.080	on request		825
710 LA16	6	1.330	1.160	1.520	1.325	on request		825
710 LB16	6	1.500	1.310	1.720	1.500	on request		825
18 pole		400V 50Hz - 333 min⁻¹		480V 60Hz - 400 min⁻¹				
MJT 710 SA18	6	590	515	680	595	on request		740
710 SC18	6	810	705	940	820	on request		740
710 MA18	6	970	845	1.110	970	on request		740
710 LA18	6	1.190	1.040	1.370	1.195	on request		740
710 LB18	6	1.350	1.180	1.550	1.355	on request		740

*: 690 V recommended

** : Showed data could change depending on mounting.

The rated outputs refer to the following conditions: balanced and non deforming load, altitude below 1.000 m asl, power factor from 0,8 to 1.

For values of overspeed greater than as listed, please contact MarelliMotori.



SYNCHRONOUS GENERATORS / MEDIUM VOLTAGE

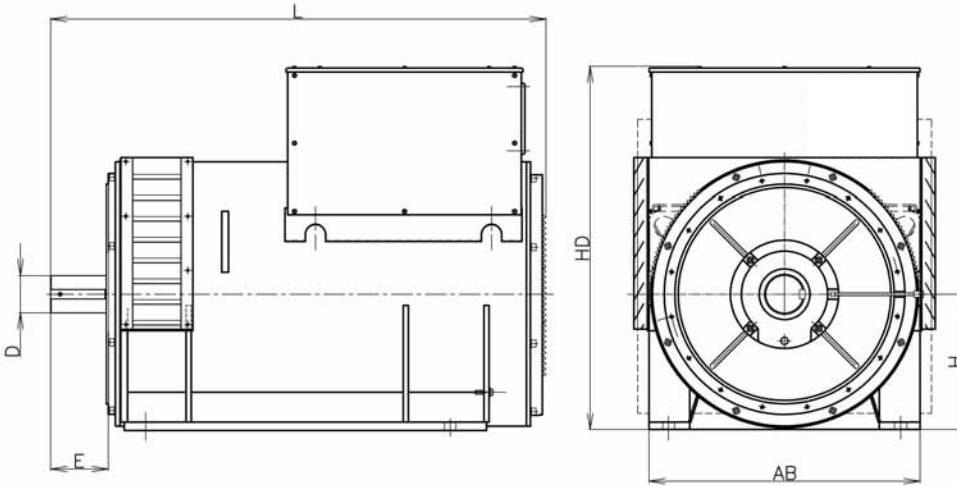
Type	Leads	kVA rating @ Temperature Rise / Ambient Temp. (°C)								Moment of inertia (**) [kgm ²]	Weight (**) [kg]	Max overspeed [min ⁻¹]	
		3000V				6000V							
		105 / 40 ΔT cl. F	80 / 40 ΔT cl. B	105 / 40 ΔT cl. F	80 / 40 ΔT cl. B	105 / 40 ΔT cl. F	80 / 40 ΔT cl. B	105 / 40 ΔT cl. F	80 / 40 ΔT cl. B				
4 pole		50Hz - 1500 min⁻¹		60Hz - 1800 min⁻¹		50Hz - 1500 min⁻¹		60Hz - 1800 min⁻¹					
MJHT	400 SA4	6	375	335	450	395	-	-	-	-	10,2	1.850	3.000
	400 MA4	6	540	480	650	565	500	440	600	525	14,6	2.300	3.000
	400 LA4	6	750	665	900	785	665	590	800	700	19,3	2.600	3.000
	400 LB4	6	920	810	1.105	965	835	740	1.000	875	22,5	2.850	3.000
	450 MB4	6	960	840	1.150	1.005	895	780	1.075	940	29,0	3.250	2.700
	450 LA4	6	1.060	925	1.270	1.110	985	860	1.180	1.030	34,0	3.650	2.700
	450 LB4	6	1.185	1.035	1.420	1.240	1.105	965	1.325	1.155	38,0	4.050	2.700
	500 MA4	6	1.290	1.145	1.550	1.355	1.105	975	1.325	1.155	46,7	3.900	2.700
	500 MB4	6	1.540	1.365	1.850	1.615	1.290	1.145	1.550	1.355	52,5	4.500	2.700
	500 LA4	6	1.665	1.475	2.000	1.745	1.530	1.350	1.835	1.600	61,5	5.200	2.700
	560 MA4	6	1.980	1.730	2.275	1.985	1.800	1.570	2.070	1.805	83	5.100	2.700
	560 LA4	6	2.250	1.965	2.590	2.260	2.045	1.785	2.350	2.050	95	5.800	2.700
	630 SA4	6	1.770	1.550	2.035	1.775	1.610	1.410	1.850	1.615	80	6.000	2.400
	630 MA4	6	2.040	1.780	2.345	2.045	1.850	1.620	2.130	1.860	120	7.000	2.400
	630 MB4	6	2.310	2.020	2.655	2.315	2.100	1.830	2.415	2.110	155	7.700	2.400
	630 LA4	6	2.640	2.300	3.035	2.650	2.400	2.090	2.760	2.410	163	8.200	2.400
	630 LB4	6	3.090	2.700	3.555	3.105	2.810	2.450	3.230	2.820	177	8.700	2.400
6 pole		50Hz - 1000 min⁻¹		60Hz - 1200 min⁻¹		50Hz - 1000 min⁻¹		60Hz - 1200 min⁻¹					
MJHT	400 MA6	6	385	340	460	400	-	-	-	-	17,9	2.300	2.200
	400 LA6	6	560	495	670	585	490	435	590	515	20,9	2.650	2.200
	400 LB6	6	600	530	720	630	525	465	630	550	24,2	2.850	2.200
	500 SA6	6	685	605	820	715	590	520	710	620	50,5	3.300	2.200
	500 MA6	6	840	745	1.010	880	735	650	880	770	70,0	4.200	2.200
	500 MB6	6	1.000	885	1.200	1.045	875	775	1.050	915	73,6	4.500	2.200
	500 LA6	6	1.125	995	1.350	1.180	1.000	885	1.200	1.045	88,9	5.200	2.200
	560 MA6	6	1.710	1.490	1.965	1.715	1.575	1.375	1.810	1.580	111	5.100	2.200
	560 LA6	6	1.890	1.650	2.175	1.900	1.735	1.515	1.995	1.740	137	5.800	2.200
	630 SA6	6	1.320	1.150	1.520	1.325	1.200	1.050	1.380	1.205	94	6.000	2.200
	630 MA6	6	1.610	1.400	1.850	1.615	1.460	1.280	1.680	1.465	145	6.700	2.200
	630 MB6	6	1.900	1.660	2.185	1.905	1.720	1.510	1.980	1.730	167	8.100	2.200
	630 LA6	6	2.000	1.750	2.300	2.010	1.820	1.590	2.095	1.830	190	9.000	2.200
	630 LB6	6	2.100	1.840	2.415	2.110	1.910	1.670	2.195	1.915	200	9.600	2.200
	710 SA6	6	2.180	1.910	2.505	2.185	1.990	1.730	2.290	2.000	on request	on request	2.100
	710 MA6	6	2.930	2.560	3.370	2.940	2.660	2.320	3.060	2.670	on request	on request	2.100
	710 LA6	6	3.220	2.810	3.705	3.235	2.920	2.550	3.360	2.935	on request	on request	2.100
	710 LB6	6	3.710	3.240	4.265	3.725	3.370	2.950	3.875	3.380	on request	on request	2.100
8 pole		50Hz - 750 min⁻¹		60Hz - 900 min⁻¹		50Hz - 750 min⁻¹		60Hz - 900 min⁻¹					
MJHT	400 MA8	6	245	220	295	255	-	-	-	-	20,6	2.300	2.000
	400 LA8	6	425	375	510	445	365	325	440	385	24,1	2.630	2.000
	400 LB8	6	485	430	580	505	420	370	505	440	25,4	2.850	2.000
	500 SA8	6	620	545	745	650	530	475	635	555	55,1	3.300	2.000
	500 MA8	6	745	665	895	780	650	575	780	680	77,7	4.200	2.000
	500 MB8	6	880	780	1.055	920	765	675	920	805	82,2	4.500	2.000
	500 LA8	6	1.010	895	1.210	1.055	880	780	1.055	920	95,0	5.200	2.000
	560 MA8	6	1.330	1.160	1.530	1.335	1.235	1.080	1.420	1.240	122,0	5.100	2.000
	560 LA8	6	1.475	1.285	1.695	1.480	1.370	1.195	1.575	1.375	146,0	5.800	2.000
	630 SA8	6	1.090	950	1.255	1.095	990	860	1.140	995	114	6.000	1.900
	630 MA8	6	1.220	1.060	1.405	1.225	1.110	970	1.275	1.115	177	6.700	1.900
	630 MB8	6	1.350	1.180	1.555	1.355	1.230	1.070	1.415	1.235	204	8.100	1.900
	630 LA8	6	1.500	1.310	1.725	1.505	1.360	1.200	1.565	1.365	231	9.000	1.900
	630 LB8	6	1.650	1.440	1.900	1.660	1.500	1.310	1.725	1.505	245	9.600	1.900
	710 SA8	6	1.980	1.730	2.275	1.985	1.800	1.580	2.070	1.805	on request	on request	1.800
	710 MA8	6	2.610	2.280	3.000	2.620	2.370	2.070	2.725	2.380	on request	on request	1.800
	710 MB8	6	2.960	2.580	3.405	2.970	2.690	2.350	3.095	2.700	on request	on request	1.800
	710 LB8	6	3.340	2.920	3.840	3.350	3.040	2.650	3.495	3.050	on request	on request	1.800

** : Shown data could change depending on mounting.

The rated outputs refer to the following conditions: balanced and non deforming load, altitude below 1.000 m asl, power factor from 0,8 to 1.
For values of overspeed greater than as listed, please contact MarelliMotori.

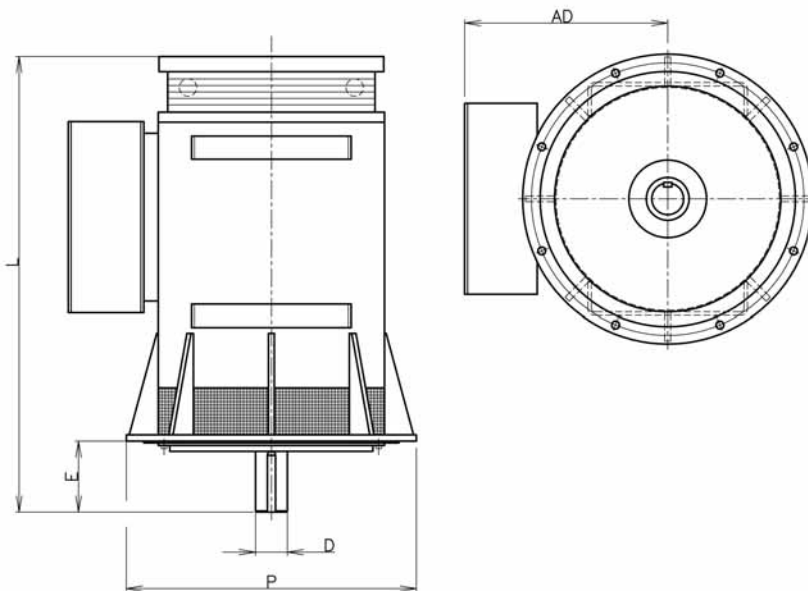
SYNCHRONOUS GENERATORS / OVERALL DIMENSIONS [mm]

Mounting: IM B3 - Air cooled (IC01)



Dimension	400			450		500			560		630			710		
	S	M	L	M	L	S	M	L	M	L	S	M	L	S	M	L
H	400	400	400	450	450	500	500	500	560	560	630	630	630	710	710	710
HD	1100	1100	1100	1190	1190	1370	1370	1370	1430	1430	1580	1580	1580	1880	1880	1880
AB	800	800	800	900	900	1000	1000	1000	1100	1100	1280	1280	1280	1500	1500	1500
L	1360	1560	1760	1807	1987	1920	2170	2270	2305	2405	2150	2350	2450	2450	2650	2650
D	110	110	110	125	125	130	130	130	150	150	160	160	160	180	180	180
E	170	170	170	210	210	210	210	210	230	230	210	210	210	300	300	300

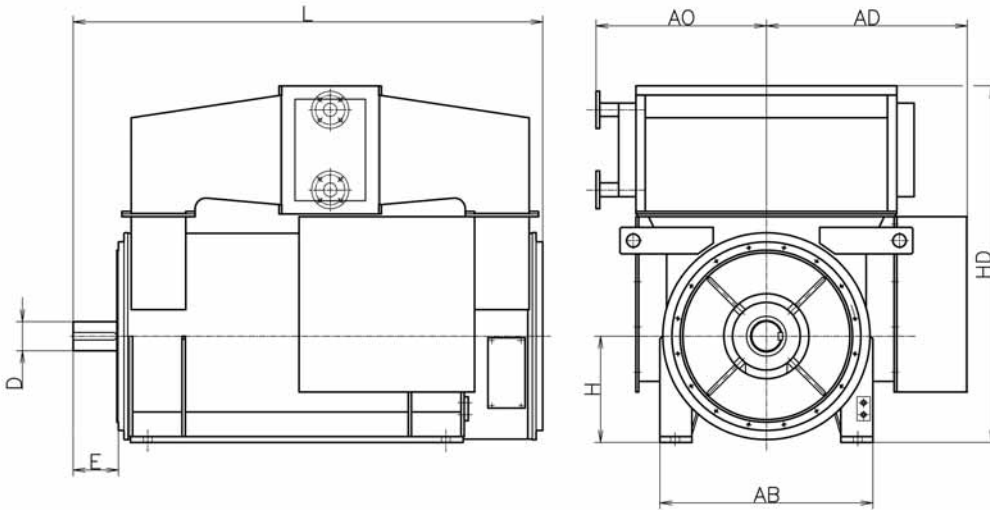
Mounting: IM V10 - Air cooled (IC01)



Dimension	400			450		500			560		630			710		
	S	M	L	M	L	S	M	L	M	L	S	M	L	S	M	L
P	1000	1000	1000	1150	1150	1250	1250	1250	1400	1400	1600	1600	1600	1800	1800	1800
AD	700	700	700	740	740	780	780	780	700	700	1125	1125	1125	1150	1150	1150
L	1540	1740	1940	2030	2210	2250	2500	2600	2340	2440	2430	2630	2730	2470	2670	2770
D	110	110	110	125	125	130	130	130	150	150	160	160	160	180	180	180
E	170	170	170	210	210	210	210	210	230	230	210	210	210	300	300	300

SYNCHRONOUS GENERATORS / OVERALL DIMENSIONS [mm]

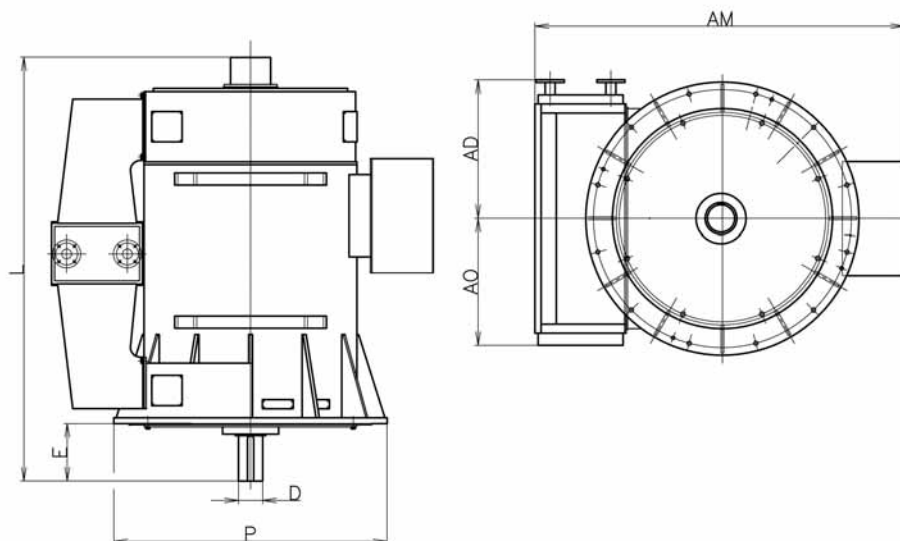
Mounting: IM B3 - Air-to-water heat exchanger (IC81W)



Dimension	400			500			560		630			710		
	S	M	L	S	M	L	M	L	S	M	L	S	M	L
H	400	400	400	500	500	500	560	560	630	630	630	710	710	710
HD	1340	1340	1340	1610	1610	1610	1750	1750	1880	1880	1880	2060	2060	2060
AB	800	800	800	1000	1000	1000	1100	1100	1280	1280	1280	1500	1500	1500
L	1345	1545	1745	1830	2080	2180	2180	2280	2150	2350	2450	2440	2640	2740
AO	640	640	640	685	685	685	685	685	825	825	825	915	915	915
AD	750	750	750	800	800	800	800	800	850	850	850	900	900	900
D	110	110	110	130	130	130	150	150	160	160	160	180	180	180
E	170	170	170	210	210	210	230	230	210	210	210	300	300	300

Dimensions for 450 frame size on demand

Mounting: IM V10 - Air-to-water heat exchanger (IC81W)



Dimension	400			500			560		630			710		
	S	M	L	S	M	L	M	L	S	M	L	S	M	L
P	1000	1000	1000	1250	1250	1250	1400	1400	1600	1600	1600	1800	1800	1800
AM	1650	1650	1650	1800	1800	1800	1950	1950	2100	2100	2100	2435	2435	2435
L	1540	1740	1940	2250	2500	2600	2340	2440	2470	2670	2770	2470	2670	2770
AO	640	640	640	685	685	685	685	685	825	825	825	915	915	915
AD	555	555	555	605	605	605	605	605	745	745	745	835	835	835
D	110	110	110	130	130	130	150	150	160	160	160	180	180	180
E	170	170	170	210	210	210	230	230	210	210	210	300	300	300

Dimensions for 450 frame size on demand

FRAME SIZES 250 - 630 ASYNCHRONOUS GENERATORS: TECHNICAL FEATURES

STANDARDS

All generators are designed according to the IEC 60034-1 and CEI EN 60034-1 standards and can be incorporated in the “CE” marked machinery.

AVAILABLE VOLTAGE

Generators can be supplied with nominal voltages from 380 V up to 690 V.
Voltages not listed can be supplied on request.

ENVIRONMENTAL CONDITIONS

Rated outputs refer to an installation height up to 1.000 m asl and to a maximum ambient temperature of 40°C. For higher altitudes and different temperature values the rated outputs must be recalculated using the factors listed in the following table.

Altitude [m asl]	Ambient temperature [°C]			
	30	40	45	50
1000	1,04	1,00	0,98	0,95
1500	1,03	0,97	0,95	0,92
2000	0,99	0,93	0,91	0,88
2500	0,95	0,90	0,88	0,86
3000	0,91	0,86	0,84	0,82

DEGREE OF PROTECTION

Standard generators are air-cooled with an IP 23 degree of protection (IC 01 cooling type). To upgrade the index to IP 44 inlet and outlet air protections are available on request (IC 01 cooling type).

To obtain a higher degree of protection (IP 44 or IP 54), generators can be supplied with an air-to-fresh water heat exchanger installed on the body of the machinery (IC 81W cooling type).

SHAFT ORIENTATION

Generators are supplied with a horizontal (IM B3) or vertical (IM V10) shaft configuration.

BEARINGS

Standard generators are supplied with grease-lubricated rolling bearings. All bearings are oversized to guarantee a minimum lifetime of 100.000 h ($L_{10h} = 100.000$ h), value obtained concerning to an unloaded standard shaft.

RUNNER DIRECTLY CONNECTED TO THE SHAFT

Generators can be equipped with a special shaft extension to directly connect the hydraulic turbine runner. In this configuration all bearings and the shaft are designed to withstand to axial and radial loads caused by the hydraulic thrust and by the weight of the runner. Depending on the loads applied and on the runaway speed of the runner, generators can be supplied with oil-lubricated rolling bearings or sleeve bearings.

ROTOR BALANCING

Rotors are dynamically balanced with a half key applied to the shaft extension in accordance with IEC 60034-14 to vibration grade normal (N) in standard execution. Generators can be supplied with reduced (R) or special (S) vibration levels on request.

INSULATION

Class F standard insulation system allows a maximum winding temperature rise of 105°C referring to an ambient temperature of 40°C. The windings are impregnated with polyester resin using the latest technology (VPI system). An enamel insulator (tropicalization treatment) coats all inner parts of generators in order to protect it from corrosion.

TEMPERATURE SENSORS

Generators are equipped with three PTC thermistors (one for each phase) to supervise the stator winding temperature. Generators can be supplied with a PT100 for each bearing in order to control their temperature. To control inlet and outlet air temperature, PT100's are installed both on the NDE side and on the DE side on request. If the air-to-water heat exchanger is installed, it's possible to control the inlet and outlet water temperature by PT100's and to install a flow meter to check presence or absence of water.

FLYWHEEL

When the requested inertial momentum is higher than the actual inertial momentum of the generator, it is possible to extend the shaft on the NDE side in order to connect a flywheel (not supplied).

TERMINAL BOXES

Generators are supplied with terminal boxes of appropriate dimensions in order to allow easy connection to the main leads. All the generators have six leads in the terminal box.

An additional terminal box for the leads of the auxiliary devices is available on request.

Generators can be equipped with current transformers both on the main leads and the star point leads.

The standard index of protection for the terminal boxes is IP 55; the IP 56 can be installed on request.

EQUIPMENT

Standard

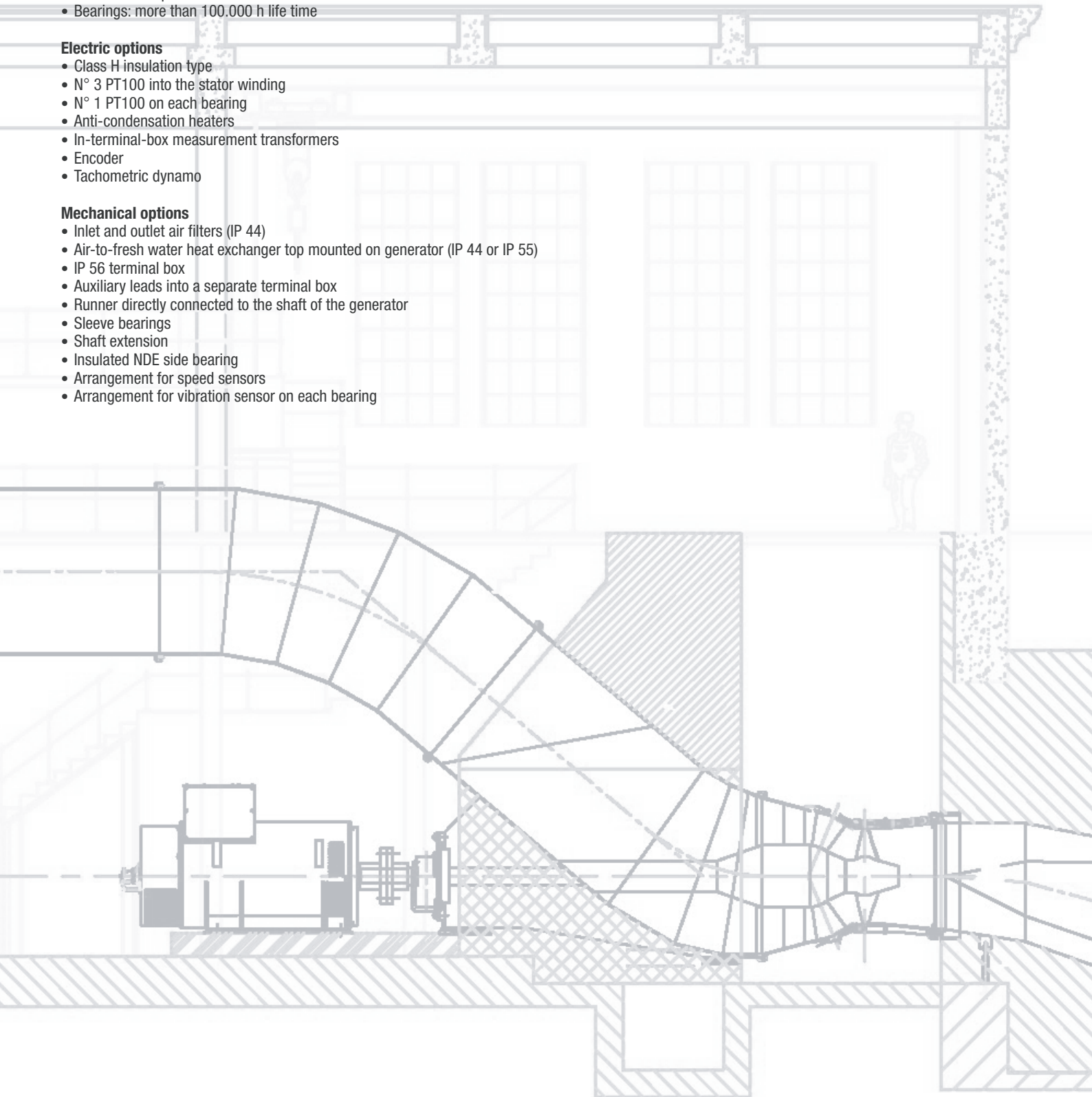
- Class F insulation
- VPI impregnation type
- Windings protected against corrosion (tropicalization)
- Six-leads stator winding into the terminal box
- N° 3 PTC into the stator winding
- IP 23 index of protection
- IP 55 index of protection for the terminal box
- Bearings: more than 100.000 h life time

Electric options

- Class H insulation type
- N° 3 PT100 into the stator winding
- N° 1 PT100 on each bearing
- Anti-condensation heaters
- In-terminal-box measurement transformers
- Encoder
- Tachometric dynamo

Mechanical options

- Inlet and outlet air filters (IP 44)
- Air-to-fresh water heat exchanger top mounted on generator (IP 44 or IP 55)
- IP 56 terminal box
- Auxiliary leads into a separate terminal box
- Runner directly connected to the shaft of the generator
- Sleeve bearings
- Shaft extension
- Insulated NDE side bearing
- Arrangement for speed sensors
- Arrangement for vibration sensor on each bearing



ASYNCHRONOUS GENERATORS / LOW VOLTAGE

Type	Power [kW]	Speed [min ⁻¹]	Torque [Nm]	Efficiency [%]			Power factor			Inertia (**) [kgm ²]	Weight (**) [kg]	Max overspeed [min ⁻¹]
				4/4	3/4	2/4	4/4	3/4	2/4			
4 pole 50Hz - 1500 min⁻¹/ 400V												
C3G 250 S4	55	1.535	372	92,0	92,0	90,5	0,86	0,84	0,79	0,5	275	3.000
250 M4	75	1.520	509	92,5	92,3	91,0	0,86	0,83	0,75	0,8	350	3.000
280 S4	90	1.520	608	93,0	93,0	92,0	0,88	0,86	0,79	0,9	405	3.000
280 M4	110	1.520	743	93,0	93,0	92,0	0,88	0,86	0,79	1,1	445	3.000
315 S4	132	1.520	883	93,9	94,3	94,1	0,89	0,88	0,84	1,7	570	2.750
315 MA4	160	1.520	1.067	94,2	94,5	94,1	0,88	0,87	0,81	2,1	705	2.750
315 MB4	200	1.517	1.332	94,5	94,9	94,6	0,88	0,87	0,83	2,5	750	2.750
315 MD4	250	1.517	1.656	95,0	95,3	95,0	0,90	0,88	0,83	3,1	850	2.750
315 ME4	315	1.517	2.085	95,1	95,2	95,0	0,90	0,88	0,83	3,3	930	2.750
355 LA4	315	1.509	2.089	95,4	95,3	94,5	0,89	0,87	0,82	6,6	1.150	2.750
355 LB4	400	1.510	2.637	95,9	95,8	94,8	0,90	0,89	0,85	8,0	1.260	2.750
355 LC4	450	1.508	2.965	96,1	96,0	95,3	0,89	0,87	0,86	10,3	1.450	2.750
355 LD4	550	1.508	3.620	96,2	96,0	95,4	0,89	0,87	0,81	12,0	1.670	2.750
400 LB4	620	1.509	4.086	96,0	95,8	94,9	0,89	0,88	0,86	16,0	2.110	2.750
400 LC4	700	1.508	4.607	96,2	95,9	95,0	0,90	0,89	0,84	19,0	2.280	2.750
400 LD4	750	1.508	4.936	96,2	95,9	95,0	0,90	0,89	0,84	21,0	2.450	2.750
500 LA4	800	1.507	5.280	96,0	95,7	94,8	0,89	0,88	0,86	30	3.270	2.250
500 LB4	900	1.507	5.927	96,2	95,9	95,0	0,89	0,88	0,86	35	3.580	2.250
500 LC4	1.000	1.507	6.579	96,3	96,0	95,1	0,90	0,89	0,87	40	3.850	2.250

6 pole 50Hz - 1000 min⁻¹/ 400V												
C3G 315 MA6	110	1.010	1.115	93,3	93,5	93,0	0,85	0,85	0,81	2,9	750	2.550
315 MB6	132	1.013	1.331	93,5	93,8	93,2	0,85	0,85	0,81	4,1	850	2.550
315 MC6	160	1.013	1.609	93,7	94,0	93,4	0,85	0,84	0,80	5,1	920	2.550
355 LA6	225	1.007	2.241	95,2	95,1	94,3	0,85	0,82	0,74	8,2	1.160	2.550
355 LB6	270	1.007	2.681	95,5	95,4	94,6	0,85	0,82	0,74	10,6	1.340	2.550
355 LC6	315	1.007	3.121	95,7	95,6	94,9	0,86	0,83	0,75	12,3	1.460	2.550
355 LD6	375	1.006	3.719	95,7	95,5	94,8	0,85	0,82	0,73	13,7	1.800	2.550
400 LB6	450	1.006	4.449	96,0	95,9	95,3	0,87	0,86	0,79	20,8	2.110	2.550
400 LC6	500	1.005	4.948	96,0	95,7	94,9	0,86	0,83	0,75	23,4	2.320	2.550
400 LD6	560	1.005	5.536	96,1	95,8	95,0	0,86	0,83	0,75	26,0	2.450	2.550
500 LA6	600	1.006	5.932	96,0	95,9	95,1	0,86	0,85	0,79	34	3.250	2.050
500 LB6	710	1.006	7.005	96,2	96,1	95,4	0,86	0,85	0,79	39	3.500	2.050
500 LC6	800	1.005	7.884	96,4	96,2	95,5	0,86	0,85	0,80	45	3.800	2.050
500 LD6	900	1.005	8.861	96,5	96,4	95,8	0,86	0,86	0,81	51	4.100	2.050

8 pole 50Hz - 750 min⁻¹/ 400V												
C3G 315 MA8	90	765	1.201	93,5	93,6	93,0	0,80	0,75	0,66	3,0	780	1.950
315 MB8	110	765	1.465	93,7	93,9	93,1	0,81	0,76	0,67	3,7	800	1.950
315 MC8	132	764	1.757	93,9	94,0	93,1	0,83	0,78	0,69	4,4	830	1.950
355 LA8	160	757	2.142	94,2	94,1	93,2	0,82	0,77	0,68	9,6	1.160	1.950
355 LB8	200	756	2.667	94,7	94,5	93,6	0,82	0,77	0,67	12,3	1.340	1.950
355 LC8	250	756	3.327	94,9	94,8	93,9	0,82	0,78	0,68	14,2	1.460	1.950
355 LD8	280	756	3.722	95,0	94,8	94,0	0,82	0,78	0,68	15,9	1.570	1.950
400 LA8	315	757	4.213	94,3	94,1	92,9	0,84	0,82	0,76	20,5	1.900	1.950
400 LB8	375	757	5.000	94,6	94,4	93,4	0,85	0,83	0,77	24,5	2.100	1.950
400 LC8	450	758	5.979	94,8	94,7	93,9	0,85	0,84	0,78	27,5	2.300	1.950
400 LD8	500	758	6.637	94,9	94,9	94,3	0,86	0,85	0,79	30,6	2.450	1.950
500 LA8	560	756	7.429	95,2	95,2	94,5	0,84	0,82	0,75	43	3.250	1.550
500 LB8	630	756	8.332	95,5	95,4	94,7	0,84	0,82	0,74	50	3.500	1.550
500 LC8	710	756	9.370	95,7	95,7	95,1	0,86	0,84	0,77	57	3.800	1.550
500 LD8	800	755	10.550	95,9	95,7	94,9	0,84	0,81	0,72	65	4.100	1.550

** : Shown data could change depending on mounting.
 Ratings refer to the following conditions: balanced non-deforming load, altitude below 1.000 m asl.
 For different values of overspeed, please contact MarelliMotori.

ASYNCHRONOUS GENERATORS / LOW VOLTAGE

Type	Power [kW]	Speed [min ⁻¹]	Torque [Nm]	Efficiency [%]			Power factor			Inertia (**) [kgm ²]	Weight (**) [kg]	Max overspeed [min ⁻¹]
				4/4	3/4	2/4	4/4	3/4	2/4			

10 pole 50Hz - 600 min⁻¹ / 400V

C3G 355 LA10	132	610	2.207	93,6	93,9	93,6	0,81	0,79	0,71	9,6	1.160	1.525
355 LB10	160	609	2.663	94,2	94,3	93,7	0,81	0,77	0,68	12,3	1.340	1.525
355 LC10	180	609	2.993	94,3	94,5	94,0	0,82	0,78	0,69	14,2	1.460	1.525
355 LD10	200	609	3.318	94,5	94,6	94,1	0,82	0,78	0,69	15,9	1.570	1.525
400 LA10	240	607	4.003	94,3	94,3	93,5	0,79	0,75	0,67	20,5	1.900	1.525
400 LB10	280	607	4.666	94,4	94,5	93,7	0,79	0,76	0,67	24,5	2.110	1.525
400 LC10	315	606	5.235	94,8	94,7	93,9	0,79	0,75	0,66	27,5	2.280	1.525
400 LD10	350	606	5.811	94,9	94,8	94,0	0,79	0,75	0,66	30,6	2.450	1.525
500 LA10	400	606	6.655	94,7	94,8	94,0	0,78	0,76	0,69	47	3.250	1.525
500 LB10	450	606	7.455	95,1	95,1	94,3	0,78	0,76	0,69	55	3.500	1.525
500 LC10	520	605	8.611	95,3	95,2	94,5	0,78	0,76	0,69	63	3.800	1.525
500 LD10	580	605	9.595	95,4	95,4	94,7	0,78	0,77	0,70	71	4.100	1.525
630 LB10	650	603	10.655	96,6	96,5	95,9	0,81	0,75	0,64	207	6.200	1.525
630 LC10	800	603	13.086	96,8	96,7	96,1	0,82	0,75	0,65	231	6.500	1.525
630 LD10	950	603	15.524	96,9	96,8	96,2	0,83	0,77	0,67	255	6.900	1.525

12 pole 50Hz - 500 min⁻¹ / 400V

C3G 355 LA12	110	508	2.233	92,6	92,7	92,0	0,71	0,67	0,56	9,6	1.160	1.300
355 LB12	132	507	2.667	93,2	93,1	92,2	0,71	0,65	0,54	12,3	1.340	1.300
355 LC12	160	507	3.233	93,2	93,3	92,4	0,71	0,66	0,54	14,2	1.460	1.300
355 LD12	180	508	3.618	93,5	93,6	92,9	0,73	0,68	0,57	15,9	1.570	1.300
400 LA12	200	507	4.033	93,4	93,6	92,9	0,74	0,71	0,61	20,5	1.900	1.300
400 LB12	225	507	4.517	93,8	93,9	93,1	0,74	0,70	0,60	24,5	2.110	1.300
400 LC12	250	507	5.009	94,0	94,1	93,4	0,74	0,71	0,61	27,5	2.280	1.300
400 LD12	280	507	5.604	94,1	94,2	93,5	0,74	0,71	0,61	30,6	2.450	1.300
500 LA12	315	506	6.317	94,1	94,1	93,3	0,76	0,74	0,66	43	3.250	1.300
500 LB12	350	505	7.003	94,5	94,4	93,4	0,76	0,72	0,62	50	3.500	1.300
500 LC12	400	505	7.986	94,7	94,5	93,5	0,75	0,71	0,61	57	3.800	1.300
500 LD12	450	504	8.974	95,0	94,7	93,7	0,74	0,70	0,59	65	4.100	1.300
500 LE12	500	505	9.899	95,5	95,7	94,8	0,76	0,74	0,63	82	4.560	1.300
630 LA12	560	504	11.051	96,0	96,1	95,8	0,81	0,79	0,72	215	6.300	1.300
630 LB12	660	504	13.011	96,1	96,2	95,9	0,82	0,80	0,73	250	6.500	1.300
630 LC12	880	504	17.294	96,4	96,6	96,2	0,83	0,81	0,75	275	6.800	1.300

14 pole 50Hz - 428 min⁻¹ / 400V

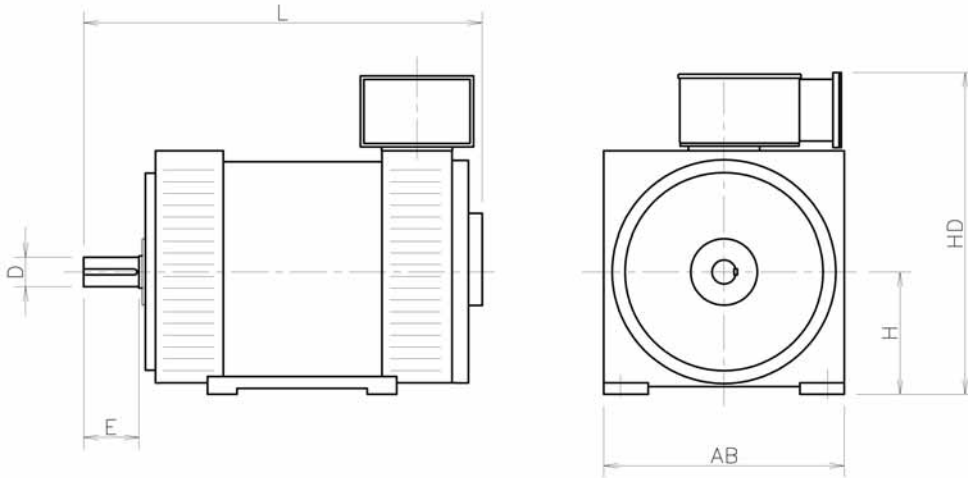
C3G 400 LA14	150	436	3.502	93,8	94,2	94,1	0,75	0,73	0,62	28,0	1.950	1.100
400 LB14	180	435	4.203	94,0	94,3	94,1	0,75	0,75	0,62	35,0	2.120	1.100
400 LC14	200	435	4.655	94,3	94,5	94,2	0,75	0,73	0,62	40,0	2.300	1.100
400 LD14	230	435	5.342	94,5	94,7	94,3	0,75	0,73	0,62	45,0	2.550	1.100
500 LA14	250	435	5.794	94,7	94,6	93,8	0,72	0,66	0,54	57	3.300	1.100
500 LB14	280	435	6.476	94,9	94,8	93,9	0,72	0,66	0,54	65	3.600	1.100
500 LC14	330	433	7.652	95,1	94,9	94,2	0,73	0,67	0,55	79	3.850	1.100
500 LD14	380	433	8.802	95,2	95,1	94,5	0,73	0,67	0,55	87	4.260	1.100
630 LA14	400	433	9.246	95,4	95,5	95,3	0,78	0,73	0,63	234	6.300	1.100
630 LB14	475	432	10.993	95,5	95,6	95,4	0,79	0,74	0,65	278	6.500	1.100
630 LC14	550	432	12.716	95,6	95,7	95,5	0,79	0,75	0,66	315	6.800	1.100

** : Showed data could change depending on mounting.
 Ratings refer to the following conditions:
 balanced non-deforming load, altitude below 1.000 m asl.
 For different values of overspeed,
 please contact MarelliMotori.



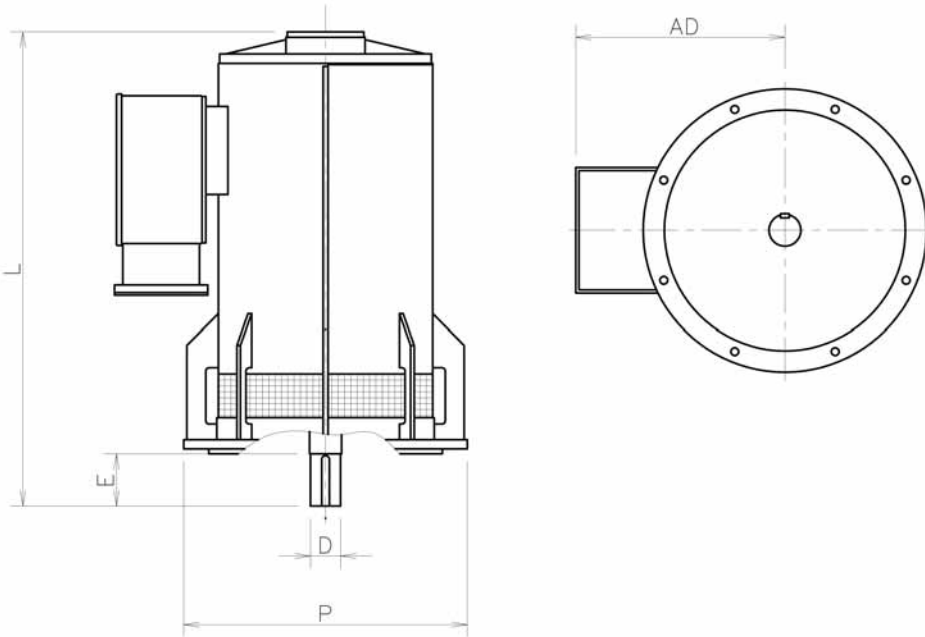
ASYNCHRONOUS GENERATORS - OVERALL DIMENSIONS [mm]

Mounting: IM B3 - Air cooled (IC01)



Dimension	250		280		315	355	400	500	630
	S	M	S	M	M	L	L	L	L
H	250	250	280	280	315	355	400	500	630
HD	573	629	701	701	888	1000	1206	1402	1656
AB	460	480	520	520	600	800	890	1040	1300
L	808	789	901	901	1125	1525	1790	2145	2200
D	75	75	80	80	90	100	110	130	160
E	140	140	170	170	170	210	210	250	300

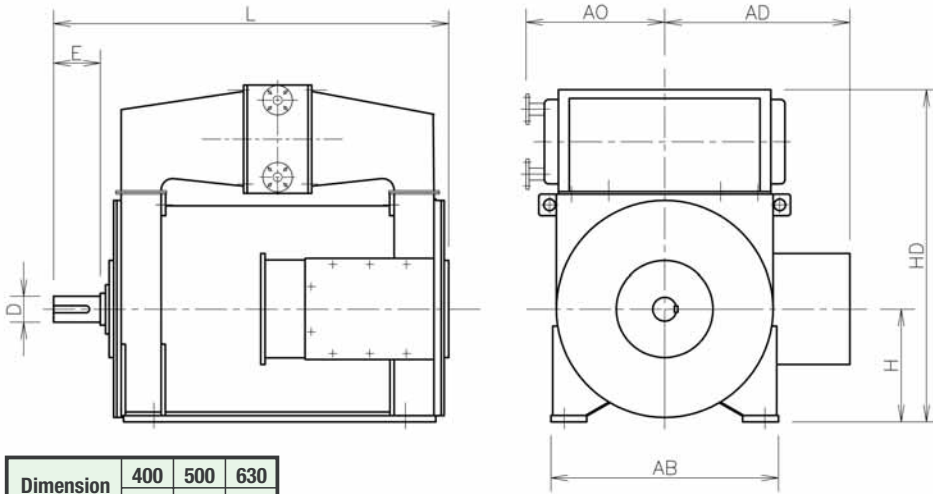
Mounting: IM V10 - Air cooled (IC01)



Dimension	250		280		315	355	400	500	630
	S	M	S	M	M	L	L	L	L
P	660	660	660	660	800	800	1000	1150	1600
AD	858	858	969	969	550	685	750	830	1080
L	323	379	421	421	1115	1590	1840	2095	2500
D	75	75	80	80	90	100	110	130	160
E	140	140	170	170	170	210	210	250	300

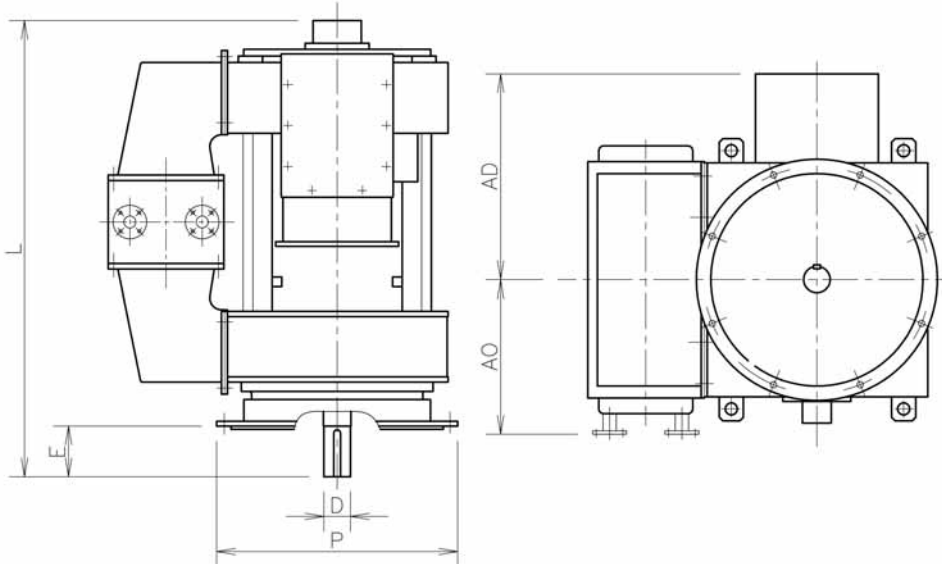
ASYNCHRONOUS GENERATORS - OVERALL DIMENSIONS [mm]

Mounting: IM B3 - Air-to-water heat exchanger (IC81W)



Dimension	400	500	630
	L	L	L
H	400	500	630
HD	1430	1630	2120
AB	890	1040	1300
L	1672	2100	2220
AO	640	825	915
AD	860	1030	1300
D	110	130	160
E	210	250	300

Mounting: IM V10 - Air-to-water heat exchanger (IC81W)



Dimension	355	400	500	630
	L	L	L	L
P	800	1150	1400	1600
AM	1275	1525	1815	2050
L	1665	1900	2150	2300
AO	460	640	825	915
AD	720	860	1030	1300
D	100	110	130	160
E	210	210	250	300



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