

Three-phase asynchronous generators



VEM motors GmbH



Table of contents

	Page
Asynchronous generator, example for characteristics	2
Introduction	3
Standards and regulations	4
Progressive coordination between output and dimensions	5
Vibration characteristics	5
Bearing arrangement / bearing lubrication	5
Use of cylindrical roller bearings	6
Noise characteristics	6
Paint finish	6
Ambient temperature	6
Overload capacity	6
Generator protection	7
Asynchronous generators for parallel operation with the mains	7
Asynchronous generators for isolated operation	7
Explication of the letter symbols	7
Tolerances electrical parameters	8
Tolerances mechanical parameters	8
Constructive selection data, types of construction	9
Generator selection data	10 - 11
Constructive selection data, dimensions	12 - 13
Constructive selection data, bearing arrangement	15
Sale / delivery program	16

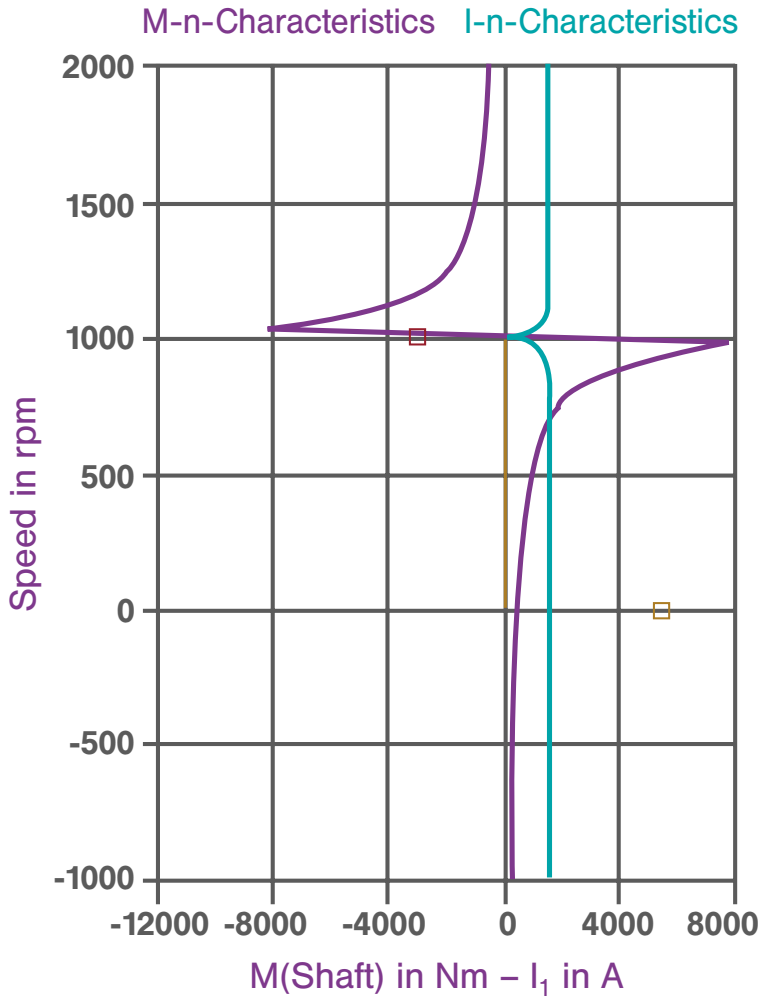
Note:

We make all efforts to better our products.

Versions, technical data and figures could be changed therefore.

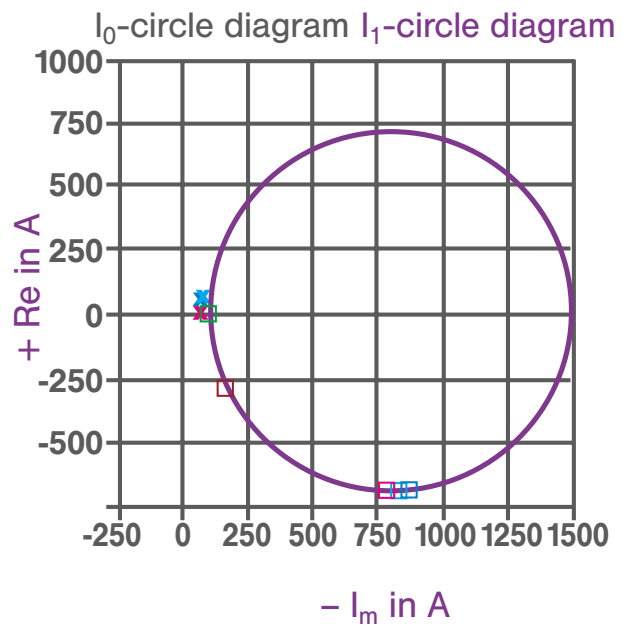
They are always not binding before written confirmation by the supplier factory.

G22R 355MX6, 375 kVA, 400 V, 50 Hz



Legend

□ Synchronism	0.00 Nm
□ No-load run	0.01 Nm
□ Nominal point	-3087.51 Nm
□ Max. mech. torque	-8256.92 Nm
□ Max. el. output	-827.30 kW
□ Max. mech. input	-891.92 kW
□ Starting point	5399.57 Nm





Introduction

The industrial development is bound up with the improvement of large power systems. But in this connection, there will be given more and more priority to the environmental-friendly and regenerative power generation, resulting so in the acceptance of power plants with low and medium output. Regenerative power sources are, among other things, wind and water power.

Here, the asynchronous generator has its preferred field of application; being reliable, low-cost and easy to maintain, the asynchronous generator is an alternative to the classical synchronous generator. According to the special case of application, asynchronous generators are operated onto their own mains or parallelly with a mains still existing.

The type series G11R / G22R, developed by VEM, excels by:

- good energy-conscious behaviour because of the high motor efficiencies
- universal applicability and reduction of stockholding because of standard design in degree of protection IP 55 (higher degrees of protection up to IP 66 on request)
- optional arrangement of the terminal box on the left / on the top / on the right
- increased lifetime, reliability and thermal overload capacity through standard design in insulation class F with thermal reserve (insulation class H is possible as special design)
- environmental compatibility due to the use of a low-noise and bi-directional ventilation system
- availability in accordance with Eastern European Standards
- a performance option of a classical IEC/DIN type series and a progressive type series basing on the IEC 72 for mounting dimensions and sizes
- attachment option for components, such as pulse transmitters, tacho-generators, brakes, speed controllers and forced ventilation units for solving recent control problems upon customer's request

EC-Certificate of Conformity																									
<p>VEM motors GmbH Carl-Friedrich-Gauß-Str. 1 D-38855 Wernigerode</p>																									
<p>The electrical apparatus three-phase asynchronous motors with squirrel cage rotor three-phase asynchronous motors with slip-ring rotor</p>																									
<p>of series</p>																									
<p>KP../KPE../K10../K11../K20../K21.. BP../BPE../B10../B11.. AR.. AP../APE../A10../A11.. SP../SPE../S10../S11.. W10../W11../W20../W21.. R10../R11.. K22.. 355</p>	<p>K30../K31../K32.. G10../G11../GS10../GS11.. CP../CPE../C10../C11.. YP../YPE../Y10../Y11../Y20../Y21.. KWSU/KOSU MPER/MPEF M31F</p>																								
<p>are in conformity with the instructions of</p>																									
<p>73/23/EWG Low Voltage Directive amended by RL 93/68 /EWG</p>																									
<p>89/336/EWG Directive about Electromagnetic Compatibility amended by RL 91/263/EWG, 92/31/EWG and 93/68/EWG</p>																									
<p>The conformity with the instructions of these Directives is proved by the observation of following standards:</p>																									
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<p>This certificate attests the conformity with the named Directives, however, it is not a promise of properties in the meaning of product liability.</p>																									

Standards and specifications

The generators comply with the relevant standards and specifications and in particular with the following:

Title	DIN EN / DIN VDE	IEC
Rotating electrical machines, rating and performance	DIN EN 60034-1/11.95	IEC 34-1 IEC 85
Rotating electrical machines, methods for determining losses and efficiency	DIN EN 60034-2	IEC 34-2
Totally enclosed three-phase induction motors with squirrel-cage, type IM B3	DIN 42673	(IEC 72)
Totally enclosed three-phase induction motors with squirrel-cage, type IM B5, B35 and IM B14	DIN 42677	(IEC 72)
Rotating electrical machines, terminal markings and direction of rotation	DIN VDE 0530 p. 8	IEC 34-8
Rotating electrical machines, symbols for types of construction and mounting	DIN EN 60034-7	IEC 34-7
Rotating electrical machines, built-in thermal protection	-	IEC 34-11
Rotating electrical machines, methods of cooling	DIN EN 60034-6	IEC 34-6
Rotating electrical machines, classification of degrees of protection	DIN VDE 0530 p. 5	IEC 34-5
Rotating electrical machines, mechanical vibrations of certain machines with shaft heights 56 mm and higher	DIN EN 60034-14	IEC 34-14
Cylindrical shaft ends for rotating electrical machines	DIN 748 p. 3	IEC 72
Rotating electrical machines, noise limits	DIN EN 60034-9	IEC 34-9
Rotating electrical machines, starting performance of single-speed three-phase cage induction motors for voltages up to 660 V, 50 Hz	DIN EN 60034-12	IEC 34-12
IEC standard voltages	DIN IEC 38	IEC 38

Furthermore, VEM asynchronous generators comply with various foreign specifications which have been adapted to the IEC 34-1

NF C 51	France	NBNC 51-101	Belgium
ÖVE M10	Austria	CEI 2-3, V1	Italy
SS 426 0101	Sweden	NEK-IEC 34-1	Norway
SEV 3009	Switzerland	BS 5000	Great Britain
		BS 4999	

and the basic series K21R and, from is derived, the series G11R are available according to the specifications of the Classification Authorities

Germanischer Lloyd	Det Norske Veritas
American Bureau of Shipping	Russian Register
Lloyd's Register of Shipping	Bureau Veritas

For these standards and specifications are valid the following admissible limits of temperature rise:

Specifications	Cooling air temperature C°	Admissible limit of temperature rise in K (measuring according to rise-of-resistance method) Insulation class				
		A	E	B	F	H
DIN EN 60034-1	40	60	75	80	105	125
IEC 34-1	40	60	75	80	105	125
United Kingdom BS	40	60	75	80	105	125
Italy CEI	40	60	70	80	105	125
Sweden SEN	40	60	70	80	105	125
Norway NEK	40	60	-	80	105	125
Belgium NBN	40	60	75	80	105	125
France NF	40	60	75	80	105	125
Switzerland SEV	40	60	75	80	105	125
Germanischer Lloyd	45	55	70	75	100	100
American Bureau of Shipping	50	50	65	70	90	115
Bureau Veritas	50	50	65	70	90	110
Det Norske Veritas	45	50	65	70	90	115
Lloyd's Register of Shipping	45	50	65	70	95	110
Russisches Register	40/45	60	75	85	110	125

Progressive coordination between output and dimension

VEM three-phase generators with squirrel cage rotor are available in two versions basing, with regard to dimensions and sizes, on the IEC 72. (Type coordination see tables „Generator Selection Data“). The series **G11R / G22R** are designed, like the motor type series, as classical IEC/DIN series, i.e. attachment dimensions and coordination between outputs and dimensions according to DIN 42673/DIN 42677. Compared with these DIN standards, the series **G10R** takes as basis a progressive coordination between output and dimension. It offers, for the same size, an output being higher by two steps.

The variants of other coordinations between output and dimension, derived from these two series, are also available as special designs.

Vibration characteristics

The admissible vibration intensities of electric generators are specified in DIN EN 60034-14.

The vibration intensity stage N (normal) is achieved or is below limit by VEM generators in the basic version. The vibration intensity stages R (reduced) and S (special) can be supplied at extra charge in dependence on the type, on request.

The following values are recommended according to DIN VDE 0530 part 14:

Vibration intensity stages	Speed range rpm	Limit values of vibration velocity (mm/s) in frequency range 10 to 1000 cps for sizes		
		80 – 112	132 – 200	225 – 400
N (normal)	600-3600	1,8	2,8	3,5
R (reduced)	600-1800 over 1800-3600	0,71 1,12	1,12 1,8	1,8 2,8
S (special)	600-1800 over 1800-3600	0,45 0,71	0,71 1,12	1,12 1,8

All rotors are dynamically balanced with half key inserted. This balancing is documented on the rating plate with the letter H after the Motor Number. On inquiry, the balancing is possible with the complete key; this balancing is documented with the letter F after the Motor Number.

Bearing arrangement / bearing lubrication

VEM generators are equipped with antifriction bearings of well-known manufacturers. The bearings have a nominal service life of at least 20.000 hours for maximum permissible load conditions. For generators without additional axial loading, the nominal service life is 40.000 hours for coupling output.

The versions

- fixed bearing N-end
- without fixed bearing
- permanent lubrication
- relubricating facility
- heavy bearing arrangement D-end (for increased lateral forces)
- easy bearing arrangement

as well as the

- antifriction bearing types
- disk spring or wave washer types
- V-ring (V-type rotary seals)

are shown in the bearing arrangement tables. Fixed bearing D-end is possible on request. All grooved ball bearings are equipped with wave washer or disk spring, respectively, thus they are preloaded. This is not true for versions with cylindrical roller bearings.

In case of generators „without fixed bearing“ is possible the version „fixed bearing N-end“.

Generators with permanent lubrication are also available with the degree of protection IP 56.

The sizes 132 – 160 are equipped with life-lubricated bearings. For generators from size 180, depending on the useful life of grease, the bearings must be relubricated in good time so that the nominal bearing service life is reached. Under normal operating conditions, the grease packing will last for 10.000 hours of operation with 2-pole version and for 20.000 hours of operation with versions from 4 poles upwards without being renewed. For generators fitted with relubricating facility and working under normal operating conditions, the grease will last for 2.000 hours of operation or for 4.000 hours of operation. The standard grease is a KE2R-40 type according to DIN 51825.

Use of cylindrical roller bearings

Using cylindrical roller bearings („heavy bearing arrangement“), relatively high radial forces or masses can be supported at the generator shaft end. Examples: belt drives, pinions or heavy couplings.

The minimum radial force at the shaft end must be a quarter of the permissible radial force. Account must be taken of permissible shaft end loading. Both values are to be taken from the loading diagrams of the main catalogue. They are identical with the generator design.

Important to note:

Radial forces below the minimum value can lead to bearing damages within a few hours. Test runs in no-load state are only permissible for a short period.

If the specified minimum radial forces cannot be met, we recommend to use grooved ball bearings („easy bearing arrangement“). Bearing change is possible on request.

Noise characteristics

The noise measurement is carried out according to DIN EN 23741/23742 at design output, design voltage and design frequency. In accordance with DIN EN 60034-9, the spatial mean value of the measurement area sound pressure level L_{pA} measured at a distance of 1 m from the machine outline is stated as noise intensity in dB (A).

The A-sound power level L_{WA} across the measurement area dimension L_s ($d = 1$ m) is also quoted with

$$L_{WA} = L_{pA} + L_s \text{ (dB)}$$

The measurement area dimensions are dependent on the machine geometry and are

		L_s (dB)
size	63 – 132	12
	160 – 225	13
	250 – 315	14
	355	15

The tabular value + 4 dB (A) applies as an approximate value for generators in 60 cps design.

The noise values are corresponding to the values of the standard versions and are to be taken from the main catalogue. In case of special versions, please refer to the manufacturer. Binding data for 60 cps are available on request.

Paint finish

Normal finish

- Adapted for group of climates „moderate“ according to IEC 721-2-1, weatherprotected and non-weatherprotected locations, short time up to 100 % of relative air humidity at temperatures up to + 30 °C, continuously up to 85 % of relative air humidity with temperatures up to + 25 °C.

Finish system

- synthetic-resin zincphosphate primary coat, layer thickness $\geq 30 \mu\text{m}$
- finish coat: two-component polyurethane, layer thickness $\geq 30 \mu\text{m}$

Special finish

- Adapted for group of climates „world wide“ according to IEC 721-2-1, non-weather-protected location in corrosive chemical and sea atmosphere, short time up to 100 % of relative air humidity at temperatures up to + 35 °C, continuously up to 98 % of relative air humidity with temperatures up to + 30 °C

Finish system

- synthetic-resin zincphosphate primary coat, layer thickness $\geq 30 \mu\text{m}$
- intermediate coat on two-component base, layer thickness $\geq 30 \mu\text{m}$
- finish coat: two-component varnish, layer thickness $\geq 30 \mu\text{m}$

Standard colour

RAL 7031 blue-grey

Ambient temperature

All VEM generators in the basic version can be used at ambient temperatures from -35 °C up to $+40$ °C.

Overload capacity

In compliance with DIN EN 60034-1, all generators can be exposed to the following overload conditions:

- 1,5 times the rated current for 2 min.
 - 1,6 times the rated torque for 15 s (1,5 times for $I_A/I_N < 4,5$)
- Both conditions apply to design voltage and design frequency.

Generator protection

The following generator protection versions are available on request :

- generator protection with PTC temperature sensors in the stator winding
- bimetallic temperature sensor as NC contact or NO contact in the stator winding
- resistance thermometer for monitoring the winding or bearing temperature on request

Asynchronous generators for parallel operation with the mains

If a three-phase asynchronous motor is driven oversynchronously through a driving machine, the direction of energy will be changed because of the negative slip. The motor passes over to generator operation and supplies the mains with energy. In this case, the generator takes the necessary reactive power from the mains, and additional excitation systems are not necessary.

The mains maintains voltage and frequency so that separate regulators are not necessary.

Asynchronous generators for isolated operation

When using asynchronous generators in isolated operation, the excitation is realized through the parallel connection of a capacitor bank.

Its dimensioning depends on the generator power and on the generator parameters.

The operating mode is considerably more expensive than the parallel operation with the mains and is only used for lower outputs.

Furthermore there is to be emphasized that an isolated generator reacts sensitively to inductive consumer units and speed variations.

Explication of the letter symbols

P	electrical active power output in kW
P_{in}	mechanical power input in kW
S	electrical apparent power output in kVA
n	speed in r.p.m.
η	efficiency in %
$\cos \varphi$	power factor
M_k/M_N	relative generator pull-out torque
Q_N	reactive power absorption with full load in kVA
Q_0	reactive power absorption in no-load in kVA
J	moment of inertia in kgm^2
m	weight in kg
n_{max}	mechanical limit speed in r.p.m.
I_N	generator current
I_A/I_N	relative starting current (motor value)

Tolerances – Electrical parameters

Following tolerances are permitted according to DIN EN 60034-1/11.95:

Efficiency (with indirect calculation)	-0,15 (1- η) at $P_N \leq 50$ kW -0,1 (1- η) at $P_N > 50$ kW
Power factor	$\frac{1-\cos\varphi}{6}$ at least 0,02 at most 0,07
Slip (at rated load operating temperature)	$\pm 20\%$ $P_N \leq 1$ kW $\pm 30\%$ $P_N > 1$ kW
Starting current (in the planned starting circuit)	20 % (without limiting downwards)
Starting torque	- 15 % and + 25 %
Pull-up torque	- 15 %
Pull-out torque	- 10 % (with the application of this tolerance M_k/M at least 1,6)
Moment of inertia	$\pm 10\%$
Noise intensity (measurement area sound pressure level)	+ 3 dB (A)

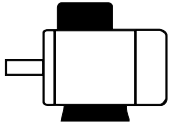
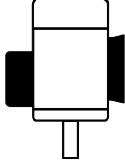
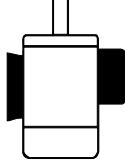
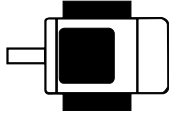
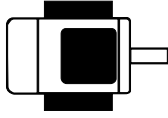
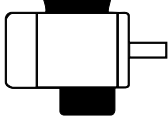
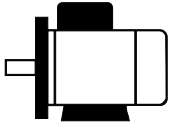
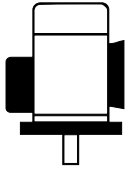
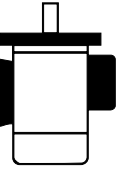
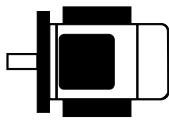
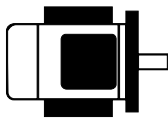
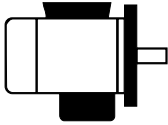
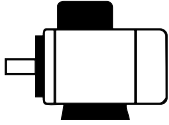
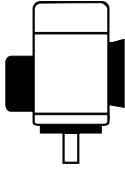
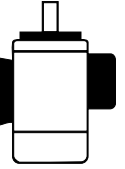
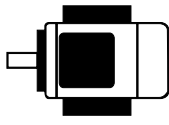
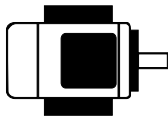
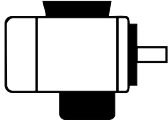
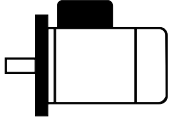
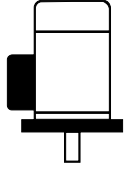
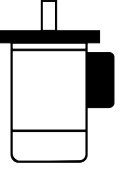
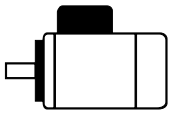
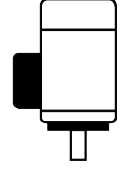
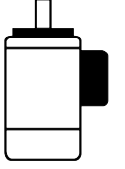
These tolerances are permissible for the values assured for three-phase asynchronous generators, taking the necessary manufacturing tolerances and material variations of the used raw materials into account.

The standard contains the following notes to that:

1. A guarantee for all or any of the values shown in the table is not mandatory. In tenders, the guaranteed values for which permissible deviations should apply must be expressly specified. The permissible variations must correspond to those stated in the table.
2. There is pointed to the distinctions concerning the definition „Guarantee“. In some countries, distinction is drawn between guaranteed values and typical or declared values.
3. If the permissible deviation applies only in one direction, then the value in other direction is not limited.

Tolerances – Mechanical parameters

Dimensional short sign acc. to DIN 42939	Meaning of dimension	Fit or tolerance
a	spacing of housing foot fixing holes in axial direction	± 1 mm
a ₁	diameter or width across corner of the attachment flange	± 1 mm
b	spacing of housing foot fixing holes across the axial direction	± 1 mm
b ₁	diameter of the centering shoulder of the attachment flange	up to diameter 230 mm j6 from diameter 250 mm h6
d, d ₁	diameter of the cylindrical shaft end	up to diameter 48 mm k6 from diameter 55 mm m6
e ₁	pitch circle diameter of the attachment flange	$\pm 0,8$ mm
f, g	largest width of the generator (without terminal box)	+ 2 %
h	shaft height (lower edge foot up to centre of shaft end)	up to 250 mm -0,5 from 250 mm -1
k, k ₁	overall length of the generator	+ 1 %
l	shaft end length for diameters ≤ 55 mm shaft end length for diameters ≥ 60 mm	- 0,3 mm - 0,5 mm
p	overall height of the generator (lower edge foot, housing or flange up to highest point of the generator)	+ 2 %
s, s ₁	diameter of the fixing holes of the foot or of the flange	+ 3 %
t, t ₁	lower edge of shaft end up to upper edge of key	+ 0,2 mm
u, u ₁	width of the key	h9
w ₁ , w ₂	distance between the centre of the first foot fixing hole up to shaft shoulder or flange attachment surface	$\pm 3,0$ mm
	distance from shaft shoulder up to flange attachment surface, fixed bearing D-end	$\pm 0,5$ mm
	distance from shaft shoulder up to flange attachment surface	$\pm 3,0$ mm
	generator weight	- 5 up to + 10 %

Types	Basic type of construction	Derived types of construction				
G11R 132-200 G11R 225-315 MY 1) G11R 315 L,LX 4) G22R 355 4)	IM B3 IM 1001 	IM V5 IM 1011 	IM V6 IM 1031 	IM B6 IM 1051 	IM B7 IM 1061 	IM B8 IM 1071 
	IM B35 2) IM 2001 2) 	IM V15 2) IM 2011 2) 	IM V36 2) 3) IM 2031 2) 3) 	IM 2051 2) 	IM 2061 2) 	IM 2071 2) 
	IM B34 2) 5) IM 2101 2) 5) 	IM 2111 2) 5) 	IM 2131 2) 5) 	IM 2151 2) 5) 	IM 2161 2) 5) 	IM 2171 2) 5) 
	IM B5 IM 3001 	IM V1 IM 3011 	IM V3 3) IM 3031 3) 			
	IM B14 IM 3601 	IM V18 IM 3611 	IM V19 IM 3631 			

Basic types of construction could be used in all derived types of construction.

Exceptions:

- 1) For the types of construction IM V5, IM V6, IM B6, IM B7, IM B8 further inquiries are necessary
- 2) On request
- 3) This type of construction must be ordered directly because of additional water-return hole in the flange end shield
- 4) not available in IM B5 and IM V3
- 5) Only available in the sizes 132 - 160

Three-phase asynchronous generators with squirrel-cage rotor, series G11R/G22R

with surface ventilation, mode of operation S1, continuous mode of operation
insulation class F, degree of protection IP55

Generator type		P	P _{in}	S	n	η	cos φ	I _N	I _A /I _N	M _K /M _N	Q _n	Q ₀	J	m	n _{max}
		kW	kW	kVA	r.p.m.	%	-	A	-	-	kVar	kVar	kgm ²	kg	r.p.m.
Synchronous speed 1500 r.p.m. – 4pole version															
G11R 132 S4	G10R 112 M4	5,5	6,7	8,3	1556	82,3	0,66	12	6,5	8,7	6,2	4,2	0,015	50	3600
G11R 132 M4	G10R 132 S4	7,5	8,9	11,2	1550	84,6	0,67	16	5,5	5,3	8,3	5,5	0,028	69	3600
G11R 160 M4	G10R 132 M4	11	12,8	15,1	1553	86,3	0,73	21,5	6	3,9	11,3	6,3	0,035	86	3600
G11R 160 L4	G10R 160 S4	15	17	19,1	1537	88,4	0,79	27,5	6	4,3	11,8	7,1	0,078	120	3600
G11R 180 M4	G10R 160 M4	18,5	20,9	23	1542	88,7	0,80	33,5	6	4,3	13,7	8,2	0,09	136	3000
G11R 180 L4	G10R 180 S4	22	24,5	29	1530	89,7	0,76	42	6,5	4,7	18,9	12,1	0,138	170	3000
G11R 200 L4	G10R 180 M4	30	32,9	36,5	1532	91,2	0,82	53	6	4	20,8	13,1	0,168	200	3000
G11R 225 S4	G10R 200 M4	37	39,8	46	1527	93	0,81	66	6,5	3,4	27,3	16	0,275	270	3000
G11R 225 M4	G10R 200 L4	45	48,6	55	1530	92,5	0,82	79	6,5	3,3	31,6	18,2	0,313	300	3000
G11R 250 M4	G10R 225 M4	55	58,8	65,5	1522	93,5	0,84	94,5	7	3,1	35,6	18,4	0,525	375	3000
G11R 280 S4	G10R 250 S4	75	79,7	89,5	1519	94,1	0,84	129	7	2,9	48,8	23,8	0,95	520	3000
G11R 280 M4	G10R 250 M4	90	95,1	106	1520	94,6	0,85	153	7	2,9	56	26	1,1	580	3000
G11R 315 S4	G10R 280 S4	110	116,2	132	1516	94,6	0,83	191	7	3,1	73	37,2	1,96	740	3000
G11R 315 M4	G10R 280 M4	132	139	158	1516	94,9	0,84	227	7	3,1	87	41	2,384	840	3000*)
G11R 315 MX4	G10R 315 S4	160	168,3	187	1518	95,1	0,86	269	6,5	2,6	97	43,4	2,7	1000	3000*)
G11R 315 MY4	G10R 315 M4	200	208,8	229	1515	95,8	0,87	332	6,8	2,9	111	54	4,82	1200	3000*)
G11R 315 L 4	G10R 315 L4	250	261,8	284	1513	95,5	0,88	410	8,9	3	135	59	5,93	1450	3000*)
G11R 315 LX4	G10R 315 LX4	315	328,1	354	1515	96	0,89	511	8	2,5	161	100	6,82	1630	3000*)
G22R 355 MY4		315	328,1	384	1512	96	0,82	554	7,1	3	220	121	5,6	1950	3000*)
G22R 355 M4		355	369,8	428	1509	96	0,83	617	8,2	3,2	239	155	7,9	2150	3000*)
G22R 355 MX4		400	414,5	482	1508	96,5	0,83	696	8,5	3,5	269	177	9,5	2400	3000*)
G22R 355 LY4		420	436,6	506	1509	96,2	0,83	730	8,5	3,5	282	185	10	2500	3000*)

Synchronous speed 1000 r.p.m. – 6pole version

G11R 132 S6	G10R 112 M6	3	3,95	5,1	1042	75,9	0,59	7,3	5,5	8,8	4,1	3	0,018	46	2400
G11R 132 M6	G10R 112 MX 6	4	5	6	1040	80	0,78	7,4	6		4,5	4,2	0,023	53	2400
G11R 132 MX6	G10R 132 S6	5,5	7	8,5	1027	79	0,82	9,7	5		6,5	3,9	0,043	70	2400
G11R 160 M6	G10R 132 M6	7,5	9,2	11	1025	81,5	0,81	13,5	5,5		8	6,2	0,053	86	2400
G11R 160 L6	G10R 160 S6	11	12,9	15	1032	85,3	0,73	21,5	5	4,1	10,2	4,3	0,113	114	2400
G11R 180 L6	G10R 160 M6	12,5	15	22	1031	83,3	0,70	26	5,5	5,4	18	11	0,145	136	2000
G11R 200 L6	G10R 180 S6	19,5	22,4	24,8	1032	87,1	0,79	35,5	5,5	4,1	15,3	9,8	0,228	175	2000
G11R 200 LX6	G10R 180 M6	22	24,9	28	1027	89	0,80	39,5	6	4,5	17,3	11,4	0,268	200	2000
G11R 225 M6	G10R 200 M6	30	32,5	37,2	1025	92,5	0,81	53,5	6	4,2	22	13,5	0,443	265	2000
G11R 250 M6	G10R 225 M6	37	40,3	43,4	1021	91,8	0,85	63	6	3,7	22,7	14,1	0,825	360	2000
G11R 280 S6	G10R 250 S6	45	48,9	55	1020	92	0,83	78,5	6		31,6	15,7	1,28	465	2000
G11R 280 M6	G10R 250 M6	60	65,4	69,1	1018	91,2	0,86	101	6	2,5	34,3	20,2	1,48	520	2000
G11R 315 S6	G10R 280 S6	75	80,6	88	1012	93	0,85	127	6,5	3,7	46	28,2	2,63	690	2000
G11R 315 M6	G10R 280 M6	90	96,5	108	1012	93	0,84	155	6,5	3,7	59,7	35	3,33	800	2000
G11R 315 MX6	G10R 315 S6	110	117,4	133	1013	93,7	0,83	191	7	3,9	74,8	42,7	3,6	880	2000
G11R 315 MY6	G10R 315 M6	132	139,3	155	1012	95	0,85	224	7	3,4	81,2	48,6	6	1050	2000
G11R 315 L6	G10R 315 L6	160	168,4	182	1015	95	0,88	262	7,4	2,5	86	48,3	6,67	1250	2000
G11R 315 LX6	G10R 315 LX6	200	210,5	235	1013	95	0,85	340	7,7	2,6	124	73,7	8,6	1460	2000
G22R 355 MY6		200	209,4	235	1007	95,5	0,85	340	6,9	2,5	124	73,5	8,1	1550	2000
G22R 355 M6		250	263,2	309	1008	95	0,81	445	7,2	3	181	122	8,2	1650	2000
G22R 355 MX6		315	329,2	375	1007	95,7	0,84	541	7,9	3	203	133	12,1	2200	2000
G22R 355LY6		355	370,6	418	1007	95,8	0,85	603	8	3	220	156	14	2400	2000

*) for easy bearing arrangement 3600 r.p.m.

Three-phase asynchronous generators with squirrel-cage rotor, series G11R/G22R

with surface ventilation, mode of operation S1, continuous mode of operation

insulation class F, degree of protection IP55

Generator type	P	P _{in}	S	n	η	cos φ	I _N	I _A /I _N	M _K /M _N	Q _n	Q _O	J	m	n _{max}
	kW	kW	kVA	r.p.m.	%	-	A	-	-	kVar	kVar	kgm ²	kg	r.p.m.
Synchronous speed 750 r.p.m. – 8pole version														
G11R 132 S8 G10R 112 M8	2,2	3,1	4,3	793	70,3	0,51	6,2	4	6,3	3	2,5	0,018	46	1800
G11R 132 M8 G10R 112 MX8	3	3,6	5,5	793	84	0,54	8	4		4,6	3,3	0,023	53	1800
G11R 160 M8 G10R 132 S8	4	5,1	6,7	787	77,9	0,59	9,8	4	3,5	5,4	3,3	0,043	70	1800
G11R 160 MX8 G10R 132 M8	5,5	6,9	8,9	790	80	0,62	13	4		7	5,3	0,053	86	1800
G11R 160 L8 G10R 160 S8	7,5	9,3	12,4	777	80,3	0,60	18	4,5	3,9	9,9	6,8	0,113	114	1800
G11R 180 L8 G10R 160 M8	11	13,3	17,6	781	82,7	0,62	25,5	4,5	3,7	13,7	9,5	0,143	136	1500
G11R 200 L8 G10R 180 S8	15	17,4	22,3	774	86,1	0,67	32,5	5	3,6	16,5	11,2	0,228	175	1500
G11R 225 S8 G10R 180 M8	18,5	21	26,3	780	88	0,70	38	5		18,7	11	0,268	200	1500
G11R 225 M8 G10R 200 M8	18,5	21	26,3	780	88	0,70	38	5		18,7	11	0,44	265	1500
G11R 250 M8 G10R 200 M8	22	24,7	30,9	770	89	0,71	44,5	5		21,7	12	0,44	265	1500
G11R 250 M8 G10R 225 M8	30	33,5	39,8	767	89,5	0,75	57,5	5,5	3,8	26,2	19	0,825	360	1500
G11R 280 S8 G10R 250 S8	37	40,7	50	765	91	0,74	72	5,5		33,6	20,9	1,35	465	1500
G11R 280 M8 G10R 250 M8	45	48,9	60	763	92	0,75	86,5	5,5	3,4	39,7	27,9	1,55	520	1500
G11R 315 S8 G10R 280 S8	55	59,5	75	760	92,5	0,73	109	6		51	32,8	2,63	690	1500
G11R 315 M8 G10R 280 M8	75	80,7	100	760	93	0,75	144	6	3,4	66	46,3	3,33	800	1500
G11R 315 MX8 G10R 315 S8	90	96,2	117	760	93,5	0,77	169	6	3,5	74,8	49,9	3,6	880	1500
G11R 315 MY8 G10R 315 M8	110	116,2	143	760	94,5	0,77	206	6		91,4	59,5	6	1050	1500
G11R 315 L8 G10R 315 L8	132	139,7	165	762	94,5	0,80	238	6,3	2,2	99	63,5	6,76	1250	1500
G11R 315 LX8 G10R 315 LX8	160	170,6	203	762	93,8	0,79	292	6,8	2,5	124	81,7	8,71	1430	1500
G22R 355 MY8	160	168,1	213	755	95,2	0,75	308	7	3	141	103	9,3	1500	1500
G22R 355 M8	200	210,5	274	756	95	0,73	395	6,5	2,8	187	144	9,5	1600	1500
G22R 355 MX8	250	260,4	325	756	96	0,77	469	6,7	3	207	153	13,4	2200	1500
G22R 355 LY8	280	294,7	394	756	95	0,71	569	7,2	3	278	217	15,8	2400	1500

Constructive selection data

Three-phase generators with squirrel-cage rotor, types G11R, G22R

with surface cooling, type of cooling IC 411, degree of protection IP55

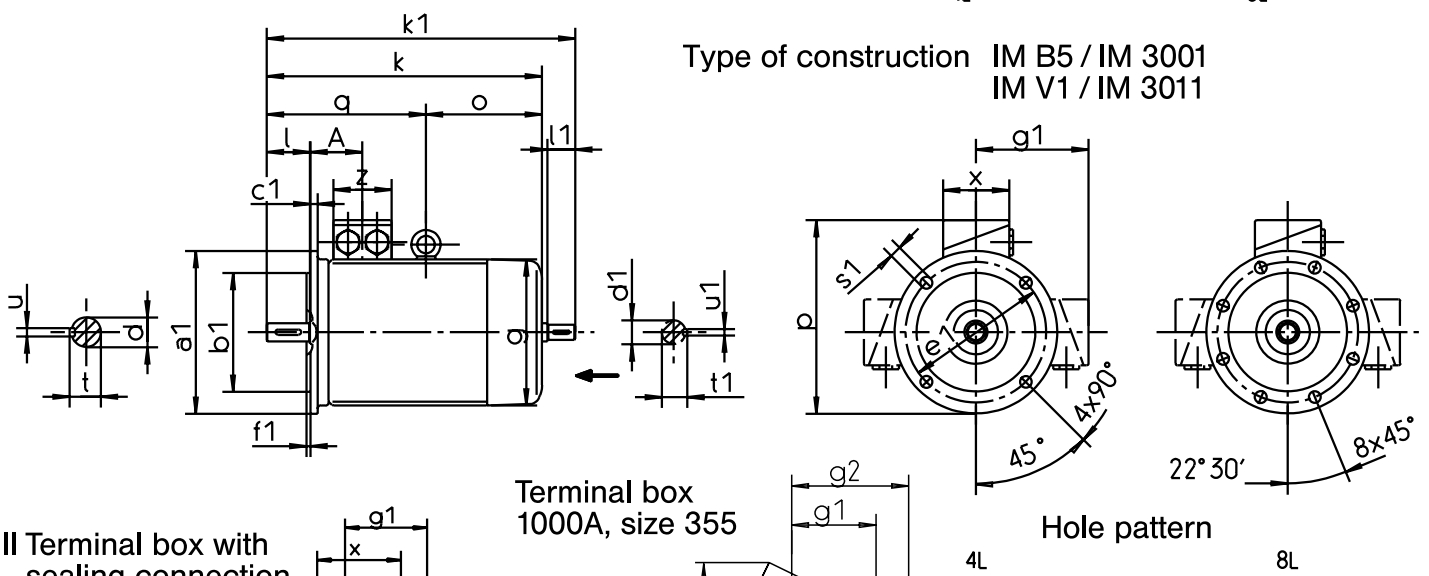
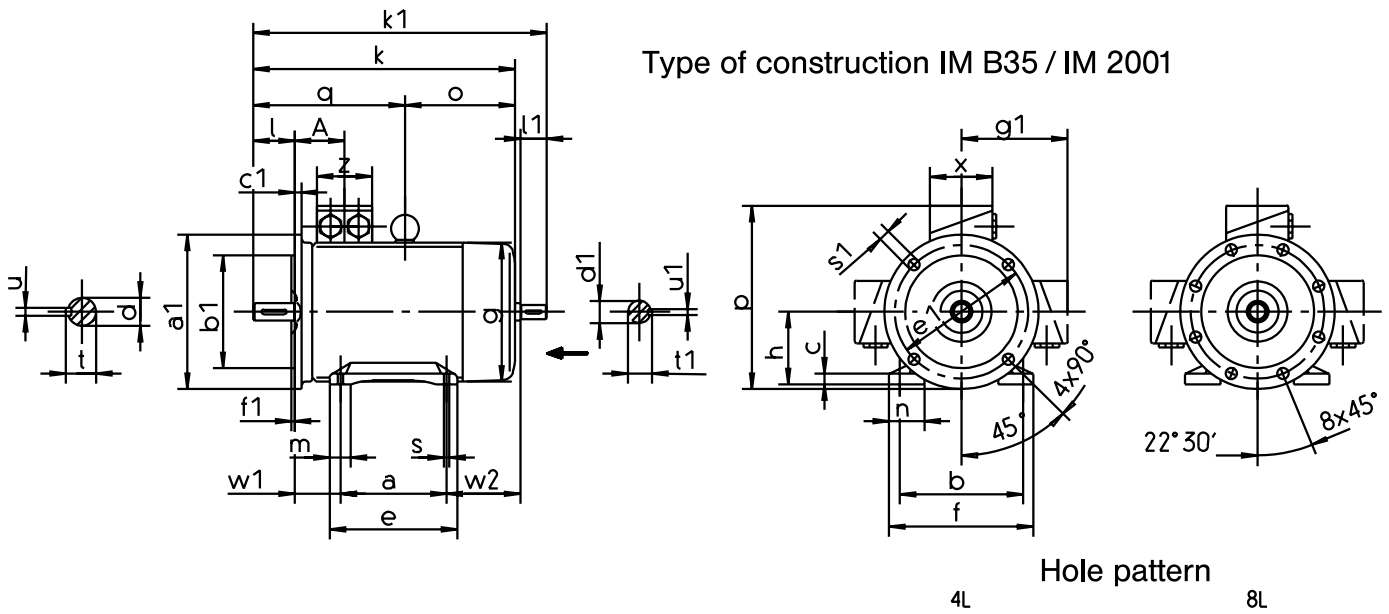
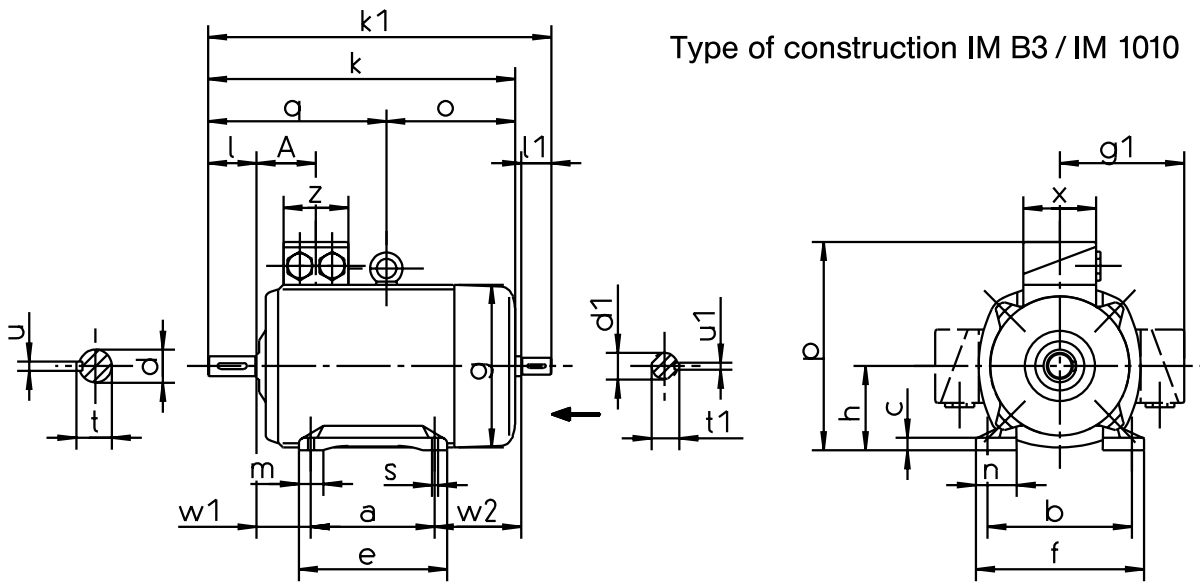
Type	size	a	a1	b	b1	Tolerance b1				Tolerance d				Tolerance d1				Tolerance h				n		
						c	c1	d	d1	e	e1	f	f1	g	g1	g1*	h	k	k1	l	l1		m	m1
G11R 132 S4,6,8	140 300 216 230	j6	16	12	38	k6	32	k6	180	265	256	4	217	178	218	132	-0,5	459	542	80	80	55	50	
G11R 132 M4	178 300 216 230	j6	16	12	38	k6	38	k6	218	265	256	4	258	200	240	132	-0,5	481	565	80	80	55	50	
G11R 132 MX6	178 300 216 230	j6	16	12	38	k6	38	k6	218	265	256	4	258	200	240	132	-0,5	481	565	80	80	55	50	
G11R 132 M6,8	178 300 216 230	j6	16	12	38	k6	32	k6	218	265	256	4	217	178	218	132	-0,5	479	562	80	80	55	50	
G11R 160 M4,6,8	210 350 254 250	h6	18	13	42	k6	38	k6	257	300	296	5	258	200	240	160	-0,5	559	643	110	80	60	55	
G11R 160 MX8	210 350 254 250	h6	18	13	42	k6	38	k6	257	300	296	5	258	200	240	160	-0,5	559	643	110	80	60	55	
G11R 160 L4,6,8	254 350 254 250	h6	18	13	42	k6	42	k6	301	300	296	5	313	242	288	160	-0,5	609	724	110	110	60	55	
G11R 180 M4	241 350 279 250	h6	20	13	48	k6	42	k6	288	300	328	5	313	242	288	180	-0,5	609	724	110	110	65	62	
G11R 180 L4	279 350 279 250	h6	20	13	48	k6	48	k6	326	300	328	5	351	261	307	180	-0,5	680	796	110	110	65	62	
G11R 180 L6,8	279 350 279 250	h6	20	13	48	k6	42	k6	326	300	328	5	313	242	288	180	-0,5	609	724	110	110	65	62	
G11R 200 L4,6,8	305 400 318 300	h6	22	15	55	m6	48	k6	360	350	372	5	351	261	307	200	-0,5	680	796	110	110	70	70	
G11R 200 LX6	305 400 318 300	h6	22	15	55	m6	48	k6	360	350	372	5	351	261	307	200	-0,5	680	796	110	110	70	70	
G11R 225 S4,8	286 450 356 350	h6	25	16	60	m6	55	m6	343	400	413	5	390	300	358	225	-0,5	757	881	140	110	75	75	
G11R 225 M4	311 450 356 350	h6	25	16	60	m6	55	m6	368	400	413	5	390	300	358	225	-0,5	797	921	140	110	75	75	
G11R 225 M6,8	311 450 356 350	h6	25	16	60	m6	55	m6	368	400	413	5	390	300	358	225	-0,5	757	881	140	110	75	75	
G11R 250 M4,6,8	349 550 406 450	h6	28	18	65	m6	55	m6	412	500	471	5	440	326	384	250	-0,5	862	977	140	110	84	84	
G11R 280 S4,6,8	368 550 457 450	h6	32	18	75	m6	65	m6	431	500	522	5	490	388	426	280	-1,0	924	1072	140	140	96	94	
G11R 280 M4,6,8	419 550 457 450	h6	32	18	75	m6	65	m6	482	500	522	5	490	388	426	280	-1,0	970	1118	140	140	96	94	
G11R 315 S4,6,8	406 660 508 550	h6	44	22	80	m6	70	m6	503	600	590	6	550	420	465	315	-1,0	1095	1248	170	140	120	126	
G11R 315 M4,6,8	457 660 508 550	h6	44	22	80	m6	70	m6	554	600	590	6	550	420	465	315	-1,0	1150	1303	170	140	120	126	
G11R 315 MX4	457 660 508 550	h6	44	22	80	m6	70	m6	554	600	590	6	550	420	465	315	-1,0	1230	1383	170	140	120	126	
G11R 315 MX6,8	457 660 508 550	h6	44	22	80	m6	70	m6	554	600	590	6	550	420	465	315	-1,0	1150	1303	170	140	120	126	
G11R 315 MY4,6,8	457 660 508 550	h6	44	22	80	m6	70	m6	573	600	590	6	610	487		315	-1,0	1325	1478	170	140	120	110	
G11R 315 L4,6,8	508 660 508 550	h6	44	22	80	m6	70	m6	624	600	590	6	610	487		315	-1,0	1420	1603	170	140	120	110	
G11R 315 LX4	508 660 508 550	h6	44	22	80	m6	70	m6	624	600	590	6	610	487		315	-1,0	1540	1723	170	140	120	110	
G11R 315 LX6,8	508 660 508 550	h6	44	22	80	m6	70	m6	624	600	590	6	610	487		315	-1,0	1420	1603	170	140	120	110	
G22R 355 MY4,6,8	560 800 610 680	js6	44	25	100	m6	80	m6	750	740	700	6	715	480		355	-1,0	1687	1875	210	170	140	200	130
G22R 355 M4,6,8	560 800 610 680	js6	44	25	100	m6	80	m6	750	740	700	6	715	480		355	-1,0	1687	1875	210	170	140	200	130
G22R 355 MX4,6,8	560 800 610 680	js6	44	25	100	m6	80	m6	750	740	700	6	715	480		355	-1,0	1687	1875	210	170	140	200	130
G22R 355 LY4,6,8	630 800 610 680	js6	44	25	100	m6	80	m6	750	740	700	6	715	480		355	-1,0	1687	1875	210	170	140	200	130
G22R 355 L4,6,8	630 800 610 680	js6	44	25	100	m6	80	m6	750	740	700	6	715	480		355	-1,0	1687	1875	210	170	140	200	130

Tolerance for counterparts: H7
2nd shaft end for direct coupling only
BI = minimum distance for air inlet
→ = air inlet

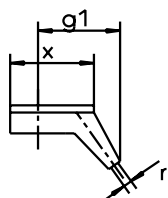
Threaded center bores in the shaft end DIN 332-DS:
at diameter 31 up to 38 M12
at diameter 51 up to 90 M20
at diameter 100 M24

Dimensions

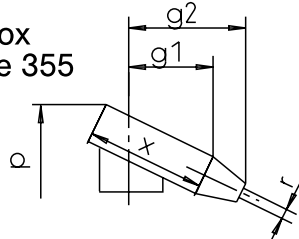
o	p(l)B3	p(l)*B3	p(l)B3	p(l)*B3	p(l)	p(l)*	q	r(l)	r(l)*	r(l)l	r(l)l*	s	s1	t	t1	u	u1	w1	w2	A	BI	x(l)	x(l)*	x(l)l	x(l)l*	z(l)	z(l)*	z(l)l	z(l)l*	Hole pattern	Relubricating facility possible
-	HD	-	-	-	HD	-	-	-	-	-	-	K	S	GA	GC	F	FA	C	CA	-	-	-	-	-	-	-	-	-	-	-	-
168	310	350			328	368	291	Pg21	Pg29			12	14	41	35	10	10	89	153	108	35	155	192			145	165			4L	no
173	332	372			350	390	308	Pg21	Pg29			12	14	41	41	10	10	89	138	114	35	155	192			145	165			4L	yes
173	332	372			350	390	308	Pg21	Pg29			12	14	41	41	10	10	89	138	114	35	155	192			145	165			4L	yes
188	310	350			328	368	291	Pg21	Pg29			12	14	41	35	10	10	89	135	108	35	155	192			145	165			4L	no
221	360	400			375	415	338	Pg21	Pg29			15	18	45	41	12	10	108	135	135	35	155	192			145	165			4L	no
221	360	400			375	415	338	Pg21	Pg29			15	18	45	41	12	10	108	135	135	35	155	192			145	165			4L	no
249	402	448			417	563	360	Pg29	Pg36			15	18	45	45	12	12	108	142	138	35	192	212			165	207			4L	yes
249	422	468			417	463	360	Pg29	Pg36			15	18	51,5	45	14	12	121	142	138	35	192	212			165	207			4L	yes
284	441	487			436	482	396	Pg29	Pg36			15	18	51,5	51,5	14	14	121	176	147	35	192	212			165	207			4L	yes
249	422	468			417	463	360	Pg29	Pg36			15	18	51,5	45	14	12	121	104	138	35	192	212			165	207			4L	yes
284	461	507			461	507	396	Pg29	Pg36			19	18	59	51,5	16	14	133	138	147	35	192	212			165	207			4L	yes
284	461	507			461	507	396	Pg29	Pg36			19	18	59	51,5	16	14	133	138	147	35	192	212			165	207			4L	yes
292	525	583			525	583	465	Pg36	Pg42			19	18	64	59	18	16	149	196	168	40	212	280			207	242			8L	yes
332	525	583			525	583	465	Pg36	Pg42			19	18	64	59	18	16	149	211	168	40	212	280			207	242			8L	yes
292	525	583			525	583	465	Pg36	Pg42			19	18	64	59	18	16	149	171	168	40	212	280			207	242			8L	yes
382	576	634			601	659	480	Pg36	Pg42			24	18	69	59	18	16	168	210	177	45	212									



II Terminal box with sealing connection piece



Terminal box 1000A, size 355



Hole pattern

4L

8L

Basic version

Type	D-end			N-end				Fixed bearing	
	Antifriction bearing			Antifriction bearing					
			V-ring	γ-type rotary ring	Wave washer	Disk spring	V-ring	Wave washer	
G11R 132	S,M6,8	6208 2RS C3	-	-	80	-	-	-	without
G11R 132	M4,MX6	6308 2RS C3	-	-	90	-	-	-	without
G11R 160	M,MX8	6309 2RS C3	-	-	100	-	-	-	without
G11R 160	L	6310 2RS C3	-	-	110	-	-	-	without
G11R 180	M4, L6, 8	6310 2RS C3	-	-	110	-	-	-	without
G11R 180	L4	6310 C3	50A	-	110	-	-	50A	N-end
G11R 200	L, LX6	6312 C3	60A	-	-	130	-	50A	N-end
G11R 225	S4, 8, M4,6,8,	6313 C3	65A	-	-	140	-	60A	N-end
G11R 250	M4,6,8	6314 C3	70A	-	-	150	-	65A	N-end
G11R 280	S4,6,8,M4,6,8VL	NU316 E	80A	-	-	-	-	70A	N-end
G11R 315	S4,6,8,M4,6,8 VL	NU 317 E	80A	-	-	-	-	80A	N-end
G11R 315	MX4,6,8 VL	NU 2220 E	-	RB100	-	-	-	80A	N-end
G11R 315	MY4,6,8 VL	NU 320 E	-	RB100	-	-	-	85A	N-end
G11R 315	L4,6,8, LX4,6,8 VL	NU 320 E	-	RB100	-	-	-	85A	N-end
G22R 355	MY/M 4,6,8polig VL	NU 324 E	120S	-	-	-	-	85A	N-end
G22R 355	MX/LY/L 4,6,8polig VL	NU 324 E	120S	-	-	-	-	85A	N-end

*) For vertical types of construction Q317 C3;
from G11R 315 MX as standard with relubricating facility

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VEM motors GmbH
Sales Sector Europe-West
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Three-phase standard motors

Size 56 - 355, IP 55
Squirrel-cage rotor, 0,06 - 500 kW
Slip-ring rotor, 4 - 315 kW
Base speeds: 3000, 1500, 1000, 750 rpm

Modifications:

- foot-mounted types and flange mounting types
- pole-changing motors with 2, 3 and 4 speeds
- multi-voltage
- mounted star-delta switch
- explosion-protected type in the degrees of protection EEx e, EEx d and Ex nA
- motors for seagoing vessels
- designs for the dairying
- with forced-ventilation
- design with thermal winding protection
- increased degree of protection up to IP 65 S
- brake motors
- built-in motors 0,06 - 90 k

Geared motor

- spur wheel back-gear motors
- conrate worm geared motors
- actuating geared motors

Three-phase asynchronous motors

From size 400, IP 55, low voltage design
squirrel-cage rotor and slip-ring rotor from 500 kW
in mechanical and electrical modifications

Single-phase asynchronous motors

Size 56 - 112
Squirrel-cage rotor, IP 55
with working capacitor 0,06 - 2,2 kW

Frequency converters and soft starters for three-phase asynchronous motors

- frequency converters for variable-speed three-phase drives 0,25 - 500 kW
- soft starters for variable-speed three-phase drives 0,75 - 500 kW

Three-phase special motors

- according to international classification rules for the shipbuilding up to 300 kW
- roller table motors up to 160 kW
- energy-optimized three-phase motors up to 315 kW
- motors for converter operation

Appliance motors

- Three-phase motors for special applications
- built-in motors, e.g. for refrigerating compressors

Three-phase asynchronous generators

- 4 - 500 kVA

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- Size 80 - 180, in self-ventilated and forced-ventilated design with voltage/frequency control up to 7,5 kW field-oriented controlled 5,5 to 22 kW



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Postfach-Nr. 10 12 52
38842 Wernigerode
Phone 0 39 43/68 0