Totally Focused. Totally Independent.

Technical Guide

ECO46 4 A

DDS
Dynamic Data Support

The world's largest
independent producer of
alternators 1 – 5,000kVA

Rev. 2

Standards

Alternators are designed and produced within an ISO 9001 environment. The entire series is manufactured according to, and complies with, the most common specifications such as CEI 2-3, IEC 34-1, EN 60034-1, VDE 0530, BS 4999-5000, NF 51.111, CAN/CSA-C22.2 No14-95-No100-95, NEMA MG 1-2011, ISO 8528-3. Other standards such as UL1446, UL 1004/4 and /B are available on request.

Windings and Performances

All windings are 2/3rds pitch to eliminate triplen harmonics within the voltage waveform and to avoid excessive neutral currents in certain parallel operating conditions. A fully interconnected aluminium or copper damper cage is supplied on the rotor of all models (excluding the ECP3 series).

- 12 wire reconnectable:
  50Hz – 380V to 440V and 220/110V to 240/120V (de-rates may apply at certain voltages)
  60Hz – 380V to 480V and 220/110V to 240/120V (de-rates may apply at certain voltages)

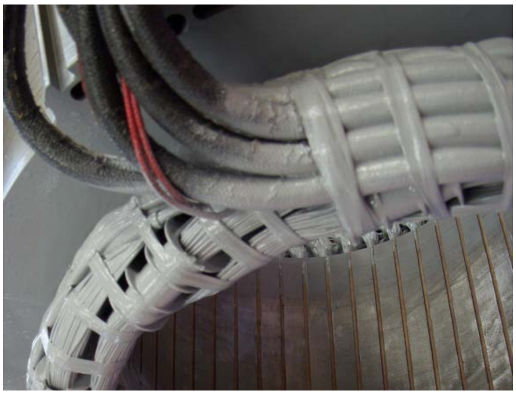
- 6 wire reconnectable:
  50Hz – 380V to 440V and 220V to 240V (de-rates may apply at certain voltages)
  60Hz – 380V to 480V and 220V to 240V (de-rates may apply at certain voltages)

Winding Configurations	Standard		Special (dedicated)			
	12 wire Reconnectable	6 wire Reconnectable	380V and 600V 60Hz	690V 50/60Hz	220-240V 1ph 50Hz	220-240V 1ph 60Hz
ECP3 to ECO38	Std	Option	Option	Option	Option	Option
ECO40 to ECO46	Std	Option	Option	Option	Option (to ECO40)	Option (to ECO40)
Insulation materials	Class H	Class H	Class H	Class H	Class H	Class H
High efficiency	Std	Std	Std	Std	Std	Std
High motor starting	>300%	>300%	>300%	>300%	>300%	>300%
THD (Total Harmonic Distortion)	Typically <3.5% full load L-L	Typically <3.0% full load L-L	Typically <3.5% full load L-L	Typically <3.5% full load L-L	Typically <4.5% full load L-N	Typically <4.5% full load L-N
Interference suppression	VDE 0875 G/N/K, EN61000-6-3, EN61000-6-2, others available on request					

Winding Protection

There are various degrees of protection for the windings following the standard impregnation process, as can be seen here. The TOTAL+ butadienic black flexible coating is recommended for arduous applications.

Winding Protection:	STANDARD	STANDARD+	GREY	GREY+	TOTAL+ (3% de-rate may apply on certain models)
ECP3	Std	Option	Option	Option	Option
ECP28 and ECP32	-	Std	Option	Option	Option
NPE32, ECP34 to ECO46	-	-	Std	Option	Option



Grey treatment (marinization) on the left, TOTAL+ treatment shown on the right. The EG43 grey varnish, is an high temperature insulating enamel that forms a tough and flexible film, with excellent moisture and chemical protection. It is water and oil proof, and also protects windings from abrasion. It is applied spraying an over coating layer over the impregnated winding, or dipping the stator in a varnish barrel for superior treatments

The TOTAL+ is a protection system that makes Mecc Alte special. It is the ultimate winding treatment that offers truly superior performances when the environment is really harsh, or the application very demanding. It is a rubbery protection treatment, used to replace epoxies and silicones winding encapsulation. The TOTAL+ flexible black compound cures to a tough, resilient, glossy black thick coating that seals the copper against moisture and chemical attacks. Due to its encapsulation capability and flexibility, is also extremely resistant to the particle abrasion as it adsorbs the impacts. Moreover, the high flexibility leads to a long-trouble less life protection, as the compound follows elastically the thermal expansion cycles of the windings from the cold to the hot condition and vice versa without forming any cracks.

Protection for Environment

In addition to protection on the windings themselves, the alternators can have increased ingress protection. Standard levels are IP23 with further upgrades available to include inlet filters, IP43 and IP45: 7% de-rates apply on inlet filters and IP43 protection. 20-30% de-rates apply for IP45 depending on alternator model.

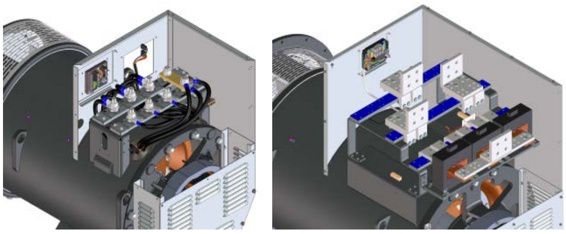
Additional air exit louvres (called IP23+) are optionably retrofittable in the overall ECP32 to ECO 46 range, in order to comply to the most strict marine regulations.

Construction

The robust mechanical structure withstands up to 5G in any direction and 9G vertically and its design permits easy access to the connections and components during routine maintenance check-ups. The mechanical design has used the most advanced FEM techniques. The materials used are: FEP12 steel for the frame, C45 steel for the shaft and cast iron or aluminum pressure die cast for the end-brackets: fans are aluminum die casted either nylon fiber glass loaded, UL compliant materials. Rotors are dynamically balanced according grade 2.5 of ISO 1940-1.

Terminals and Terminal Box

Easy access to regulators is assured through a pull out drawer or a drop down panel to allow safer adjustment. Large terminal boxes allow easy access of power cables, in the ECO43 and ECO46 higher power ranges the terminal allow the convenient choice of power cable or busbar connection with versatility of entry and connection. Current transformers are available as an option on series ECO 40, 43 and 46 with single or dual output.



Excitation and Regulation Systems

All ECP/ECO series have MAUX auxiliary winding to power the digital regulator. Both DSR and the DER1 are available to connect to PC through the DxR2 USB interface and DxR TERMINAL software to interrogate/download alarms & settings for analysis or for cloning other regulators. DER2 has got an integrated USB connection and can be connected to the PC without any optional connection boards. More settings such as LAMS, digital RAM based synchronous external control and soft start are obtainable through the DxR connection. Simple analogue potentiometers are available for the more usual adjustments.

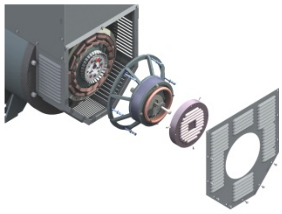
Excitation Systems	DSR	DER1	DER2
ECP3 to ECO38	Std	Option	Option
ECO40 to ECO46	-	Std	Option
Parallel Operation	√	√	√
Mains Parallel	√	√	√
3 Phase Sensing (rms)	-	√	√
Accuracy	+/-1%	+/-0.5%	+/-0.5%
Remote Voltage Control	√	√	√
Alarm Log	√	√	√
Analogue and Digital Configurable	√	√	√
LAMS (Load Acceptance V/f)	√	√	√
APO (Active Protection Output)	√	√	√
Soft Start	√	√	√
High dynamic response	-	-	√
USB connection without external boards	-	-	√

For a given motor start duty a smaller machine may be selected – also enhanced by low sub-transient reactance values for non-linear loads. The whole range from 6.5 to 3400kVA is capable of >300% sustained short circuit current for up to 20 seconds.

Optional PMG3

PMG3 can be retro fit or factory fit on ECO 40, 43 and 46 series. This smart MeccAlte design allows an easy fix kit, through a tapered cone coupling and a simple replacement of the rear air louvre. PMG3 is also available on ECO 38, when ordered from the factory.

The complete AVR range is fully compatible with both MAUX and PMG3 systems, this minimises spare part management and flexibility of stock as one AVR suits all applications. The PMG3 is delivering the same amount of kVA available with the MAUX.



Accessories

Additional optionals can be fit on our alternator series, such as PTC thermistors or PT100 both on windings and bearings, space heaters, high and low profile of terminal boxes (on most series), air filter clogging sensors, rotating diode bridge failure sensor (RBD), power factor controller for parallel operation (PFR/2), parallel devices (standard from ECO 40), air filters, IP43 and IP45 protections, marine IP23 + protection for SOLAS requirements and many others.

Deration coefficients

	Ambient temperature (Celsius)					
Altitude (meters)	25	40	45	50	55	60
≤ 1000	1.07	1	0.96	0.93	0.91	0.89
> 1000 ≤ 1500	1.01	0.96	0.92	0.89	0.87	0.84
> 1500 ≤ 2000	0.96	0.91	0.87	0.84	0.83	0.79
> 2000 ≤ 3000	0.9	0.85	0.81	0.78	0.76	0.73

Notes on short circuit curves

The indicated coefficients have to be used to correct the three phase short circuit curves values as a function of the rated voltage.

50 Hz		*60 Hz*	
Voltage	*Factor*	*Voltage*	*Factor*
380	0.93X	415	0.85X
400	1X	440	0.90X
415	1.04X	460	0.95X
440	1.10X	480	1X

The indicated coefficient have to be used to correct the three phase short circuit curves values as a function of the type of short circuit voltage.

	3 phase	*2 phase L-L*	*1 phase L-N*
Istantaneous	1X	0.87X	1.30X
Minimum	1X	1.80X	3.20X
Sustained	1X	1.50X	2.50X
Max Duration	20 sec.	10 sec.	4 sec.

All the curves are shown for series or parallel star connection at 400V 50 Hz or 480V 60 Hz. If the unit is reconnected from series to parallel star, the additional coefficient is 2X. From series star to series delta, it is 1.72X. From series star to parallel delta, it is 3.44X.

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General characteristics

Pole number	4	Insulation class	H
Phase number	3	Protection class	IP23
Number of wires	12	NDE Bearing type	6324
Execution	Brushless	DE Bearing type	6330
Regulator type	DER-1/A	Maximum Overspeed	2250
Winding pitch	2/3	Altitude	0-1000
Code voltage reference	T0405P3	Balancing	ISO1940-1

Ratings 50Hz

kVA / kW @ Temp. Rise / Ambient °C - 0.8 PF																				
		STANDBY-163/27				STANDBY-150/40				H-125/40				F-105/40				B-80/40		
Series Star Y		760V	800V	830V	880V	760V	800V	830V	880V	760V	800V	830V	880V	760V	800V	830V	880V	760V	800V	830V	880V
Parallel Star YY		380V	400V	415V	440V	380V	400V	415V	440V	380V	400V	415V	440V	380V	400V	415V	440V	380V	400V	415V	440V
Series Delta Δ		440V	460V	480V	508V	440V	460V	480V	508V	440V	460V	480V	508V	440V	460V	480V	508V	440V	460V	480V	508V
Parallel Delta ΔΔ		220V	230V	240V	254V	220V	230V	240V	254V	220V	230V	240V	254V	220V	230V	240V	254V	220V	230V	240V	254V
ECO46 1S4 A	**kVA**	1650	**1650**	1650	1400	1552	**1552**	1552	1340	1500	**1500**	1500	1300	1350	**1350**	1350	1170	1200	**1200**	1200	1040
	kW	1320	**1320**	1320	1120	1242	**1242**	1242	1072	1200	**1200**	1200	1040	1080	**1080**	1080	936	960	**960**	960	832
ECO46 1.5S4 A	**kVA**	1800	**1800**	1800	1620	1700	**1700**	1700	1545	1650	**1650**	1650	1500	1480	**1480**	1480	1360	1320	**1320**	1320	1200
	kW	1440	**1440**	1440	1296	1360	**1360**	1360	1236	1320	**1320**	1320	1200	1184	**1184**	1184	1088	1056	**1056**	1056	960
ECO46 2S4 A	**kVA**	1944	**1944**	1944	1720	1863	**1863**	1863	1650	1800	**1800**	1800	1600	1600	**1600**	1600	1440	1440	**1440**	1440	1280
	kW	1555	**1555**	1555	1376	1490	**1490**	1490	1320	1440	**1440**	1440	1280	1280	**1280**	1280	1152	1152	**1152**	1152	1024
ECO46 1L4 A	**kVA**	2268	**2268**	2268	1990	2173	**2173**	2173	1900	2100	**2100**	2100	1850	1900	**1900**	1900	1660	1680	**1680**	1680	1480
	kW	1814	**1814**	1814	1592	1738	**1738**	1738	1520	1680	**1680**	1680	1480	1520	**1520**	1520	1328	1344	**1344**	1344	1184
ECO46 1.5L4 A	**kVA**	2500	**2500**	2500	2375	2380	**2380**	2380	2275	2300	**2300**	2300	2200	2050	**2050**	2050	1950	1840	**1840**	1840	1760
	kW	2000	**2000**	2000	1900	1904	**1904**	1904	1820	1840	**1840**	1840	1760	1640	**1640**	1640	1560	1472	**1472**	1472	1408
ECO46 2L4 A	**kVA**	2700	**2700**	2700	2450	2588	**2588**	2588	2350	2500	**2500**	2500	2280	2250	**2250**	2250	2050	2000	**2000**	2000	1824
	kW	2160	**2160**	2160	1960	2070	**2070**	2070	1880	2000	**2000**	2000	1824	1800	**1800**	1800	1640	1600	**1600**	1600	1459
ECO46 VL4 A	**kVA**	2916	**3024**	2916	2150	2795	**2899**	2795	2060	2700	**2800**	2700	2000	2400	**2500**	2400	1780	2160	**2240**	2160	1600
	kW	2333	**2419**	2333	1720	2236	**2319**	2236	1648	2160	**2240**	2160	1600	1920	**2000**	1920	1424	1728	**1792**	1728	1280

Ratings 60Hz

kVA / kW @ Temp. Rise / Ambient °C - 0.8 PF																				
		STANDBY-163/27				STANDBY-150/40				H-125/40				F-105/40				B-80/40		
Series Star Y		830V	880V	920V	960V	830V	880V	920V	960V	830V	880V	920V	960V	830V	880V	920V	960V	830V	880V	920V	960V
Parallel Star YY		415V	440V	460V	480V	415V	440V	460V	480V	415V	440V	460V	480V	415V	440V	460V	480V	415V	440V	460V	480V
Series Delta Δ		480V	504V	530V	554V	480V	504V	530V	554V	480V	504V	530V	554V	480V	504V	530V	554V	480V	504V	530V	554V
Parallel Delta ΔΔ		240V	254V	265V	277V	240V	254V	265V	277V	240V	254V	265V	277V	240V	254V	265V	277V	240V	254V	265V	277V
ECO46 1S4 A	**kVA**	1728	1847	1944	**1944**	1656	1770	1870	**1870**	1600	1710	1800	**1800**	1440	1530	1620	**1620**	1280	1368	1440	**1440**
	kW	1382	1478	1555	**1555**	1325	1416	1496	**1496**	1280	1368	1440	**1440**	1152	1224	1296	**1296**	1024	1094	1152	**1152**
ECO46 1.5S4 A	**kVA**	1870	2030	2140	**2140**	1782	1936	2040	**2040**	1730	1880	1980	**1980**	1570	1690	1780	**1780**	1384	1504	1584	**1584**
	kW	1496	1624	1712	**1712**	1426	1549	1632	**1632**	1384	1504	1584	**1584**	1256	1352	1424	**1424**	1107	1203	1267	**1267**
ECO46 2S4 A	**kVA**	2116	2213	2332	**2332**	2028	2122	2236	**2236**	1950	2050	2160	**2160**	1750	1820	1920	**1920**	1560	1640	1728	**1728**
	kW	1693	1770	1866	**1866**	1622	1698	1789	**1789**	1560	1640	1728	**1728**	1400	1456	1536	**1536**	1248	1312	1382	**1382**
ECO46 1L4 A	**kVA**	2480	2582	2722	**2722**	2370	2473	2608	**2608**	2300	2390	2520	**2520**	2070	2150	2280	**2280**	1840	1912	2016	**2016**
	kW	1984	2066	2178	**2178**	1896	1978	2086	**2086**	1840	1912	2016	**2016**	1656	1720	1824	**1824**	1472	1530	1613	**1613**
ECO46 1.5L4 A	**kVA**	2613	2829	2980	**2980**	2508	2715	2860	**2860**	2420	2620	2760	**2760**	2150	2330	2460	**2460**	1936	2096	2208	**2208**
	kW	2090	2263	2384	**2384**	2006	2172	2288	**2288**	1936	2096	2208	**2208**	1720	1864	1968	**1968**	1549	1677	1766	**1766**
ECO46 2L4 A	**kVA**	2920	3067	3240	**3240**	2800	2939	3105	**3105**	2700	2840	3000	**3000**	2430	2550	2700	**2700**	2160	2272	2400	**2400**
	kW	2336	2454	2592	**2592**	2240	2351	2484	**2484**	2160	2272	2400	**2400**	1944	2040	2160	**2160**	1728	1818	1920	**1920**
ECO46 VL4 A	**kVA**	3136	3375	3575	**3683**	3007	3234	3426	**3529**	2900	3125	3310	**3410**	2600	2800	2980	**3050**	2320	2500	2648	**2728**
	kW	2509	2700	2860	**2946**	2406	2587	2741	**2823**	2320	2500	2648	**2728**	2080	2240	2384	**2440**	1856	2000	2118	**2182**

Reactance & Time constants- Class H / 400V

Unsaturated (ref. EN60034-4)			ECO46 1S4 A	ECO46 1.5S4 A	ECO46 2S4 A	ECO46 1L4 A	ECO46 1.5L4 A	ECO46 2L4 A	ECO46 VL4 A
Xd	Direct-axis synchronous reactance	%	273,5	296,4	273,7	253,8	289,1	270,4	247,5
X'd	Direct-axis transient reactance	%	26,5	29,3	25,9	25,3	27,9	25,6	25,5
X''d	Direct-axis subtransient reactance	%	13,4	14,3	12,7	12,3	13,6	12,4	12,1
Xq	Quadrature-axis synchronous reactance	%	174,7	189,8	170,6	177,8	205,9	191,4	177,8
X'q	Quadrature-axis transient reactance	%	174,7	189,8	170,6	177,8	205,9	191,4	177,8
X''q	Quadrature-axis subtransient reactance	%	29,3	32,6	28,9	27,6	29,3	27	22,3
X_2	Negative-sequence reactance	%	19,2	20,5	18,1	17,5	19,4	17,5	14,9
X_0	Zero sequence reactance	%	4,26	4,78	4,06	3,85	4,58	3,89	3,74
Saturated									
Xd	Direct-axis synchronous reactance	%	227	246	227,2	210,6	240	224,4	205,4
X'd	Direct-axis transient reactance	%	22	24,3	21,5	21	23,1	21,3	21,1
X''d	Direct-axis subtransient reactance	%	11,1	11,9	10,5	10,2	11,3	10,3	10
Xq	Quadrature-axis synchronous reactance	%	145	157,5	141,6	147,6	170,9	158,9	147,6
X'q	Quadrature-axis transient reactance	%	145	157,5	141,6	147,6	170,9	158,9	147,6
X''q	Quadrature-axis subtransient reactance	%	24,3	27,1	24	22,9	24,3	22,4	18,5
X_2	Negative-sequence reactance	%	15,9	17	15	14,5	16,1	14,5	12,3
X_0	Zero sequence reactance	%	4,26	4,78	4,06	3,85	4,58	3,89	3,74

Kcc	Short circuit ratio		0,38	0,35	0,38	0,41	0,36	0,4	0,42
T'd	Transient time constant	sec	0,25	0,264	0,258	0,265	0,27	0,275	0,291
T''d	Subtransient time constant	sec	0,021	0,024	0,023	0,022	0,022	0,024	0,035
T'do	Open circuit time constant	sec	9,5	10,8	10,4	11	10,4	12,5	13,1
Tα	Armature time constant	sec	0,027	0,03	0,029	0,031	0,031	0,034	0,04

Additional information - Class H / 400V

Io	Excitation current at no load	A	0,7	1,2	0,8	0,9	1,3	1,0	1,4
Ic	Excitation current at full load	A	3,2	3,6	3,2	3,1	3,7	3,1	3,2
Overload			1 hour in a 6 hours period 110% rated load						
Overload per 20 sec.		%	300						
Heat dissipation		W	47401	50716	53776	59130	62792	66116	71662
Telephone Harmonic Factor - THF		%	<2	<2	<2	<2	<2	<2	<2
Waveform Distors.(THD) full load LL/LN		%	3 / 2,9	3,3 / 3,2	3,4 / 3,3	3,3 / 2,9	2,8 / 2,8	2,7 / 2,8	2,6 / 2,5
Waveform Distors.(THD) no load LL/LN		%	2,5 / 2,4	2,9 / 3	2,9 / 2,8	2,7 / 2,6	2,9 / 2,9	2,8 / 2,6	2,7 / 2,5

Reactance & Time constants- Class H / 480V

Unsaturated (ref. EN60034-4)			ECO46 1S4 A	ECO46 1.5S4 A	ECO46 2S4 A	ECO46 1L4 A	ECO46 1.5L4 A	ECO46 2L4 A	ECO46 VL4 A
Xd	Direct-axis synchronous reactance	%	273,5	296,4	273,7	253,8	289,1	270,4	260,5
X'd	Direct-axis transient reactance	%	26,5	29,3	25,9	25,3	27,9	25,6	26,8
X''d	Direct-axis subtransient reactance	%	13,4	14,3	12,7	12,3	13,6	12,4	12,7
Xq	Quadrature-axis synchronous reactance	%	174,7	189,8	170,6	177,8	205,9	191,4	187,2
X'q	Quadrature-axis transient reactance	%	174,7	189,8	170,6	177,8	205,9	191,4	187,2
X''q	Quadrature-axis subtransient reactance	%	29,3	32,6	28,9	27,6	29,3	27	23,4
X_2	Negative-sequence reactance	%	19,2	20,5	18,1	17,5	19,4	17,5	15,6
X_0	Zero sequence reactance	%	4,26	4,78	4,06	3,85	4,58	3,89	3,94
Saturated									
Xd	Direct-axis synchronous reactance	%	227	246	227,2	210,6	240	224,4	216,2
X'd	Direct-axis transient reactance	%	22	24,3	21,5	21	23,1	21,3	22,3
X''d	Direct-axis subtransient reactance	%	11,1	11,9	10,5	10,2	11,3	10,3	10,5
Xq	Quadrature-axis synchronous reactance	%	145	157,5	141,6	147,6	170,9	158,9	155,3
X'q	Quadrature-axis transient reactance	%	145	157,5	141,6	147,6	170,9	158,9	155,3
X''q	Quadrature-axis subtransient reactance	%	24,3	27,1	24	22,9	24,3	22,4	19,4
X_2	Negative-sequence reactance	%	15,9	17	15	14,5	16,1	14,5	13
X_0	Zero sequence reactance	%	4,26	4,78	4,06	3,85	4,58	3,89	3,94

Kcc	Short circuit ratio		0,38	0,35	0,38	0,41	0,36	0,4	0,42
T'd	Transient time constant	sec	0,25	0,264	0,258	0,265	0,27	0,275	0,291
T''d	Subtransient time constant	sec	0,021	0,024	0,023	0,022	0,022	0,024	0,035
T'do	Open circuit time constant	sec	9,5	10,8	10,4	11	10,4	12,5	13,1
Tα	Armature time constant	sec	0,027	0,03	0,029	0,031	0,031	0,034	0,04

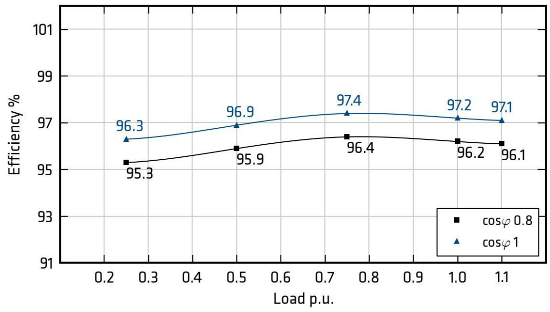
Additional information - Class H / 480V

Io	Excitation current at no load	A	0,7	1,2	0,8	0,9	1,3	1,0	1,4
Ic	Excitation current at full load	A	3,2	3,6	3,2	3,1	3,7	3,1	3,2
Overload			1 hour in a 6 hours period 110% rated load						
Overload per 20 sec.		%	300						
Heat dissipation		W	53776	57451	60820	66645	70638	71679	78584
Telephone Interferance Factor - TIF			<40	<40	<40	<40	<40	<40	<40
Waveform Distors.(THD) full load LL/LN		%	3 / 2,9	3,3 / 3,2	3,4 / 3,3	3,3 / 2,9	2,8 / 2,8	2,7 / 2,8	2,6 / 2,5
Waveform Distors.(THD) no load LL/LN		%	2,5 / 2,4	2,9 / 3	2,9 / 2,8	2,7 / 2,6	2,9 / 2,9	2,8 / 2,6	2,7 / 2,5

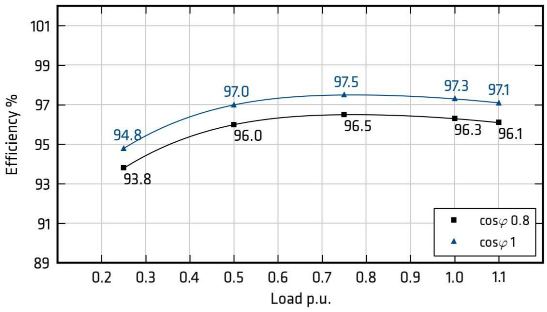
Efficiencies @ 50Hz

Models		380V 50Hz					400V 50Hz					415V 50Hz					440V 50Hz				
		0.25	0.5	0.75	1	1.1	0.25	0.5	0.75	1	1.1	0.25	0.5	0.75	1	1.1	0.25	0.5	0.75	1	1.1
ECO46 1S4 A	%	95,3	96,0	96,7	96,3	96,1	95,3	95,9	96,4	96,2	96,1	95,1	95,9	96,5	96,0	95,6	94,6	95,5	96,0	95,8	95,6
ECO46 1.5S4 A	%	93,8	96,1	96,8	96,4	96,2	93,8	96,0	96,5	96,3	96,1	93,6	96,1	96,6	96,1	95,7	93,1	95,7	96,4	95,9	95,6
ECO46 2S4 A	%	95,6	96,3	96,8	96,5	96,3	95,6	96,2	96,5	96,4	96,3	95,4	96,2	96,6	96,2	95,8	94,9	95,7	96,1	96,0	95,9
ECO46 1L4 A	%	95,6	96,5	97,1	96,7	96,5	95,6	96,4	96,8	96,6	96,5	95,4	96,4	96,9	96,4	96,0	94,9	95,8	96,4	96,2	96,1
ECO46 1.5L4 A	%	94,0	96,5	97,2	96,8	96,6	94,0	96,4	96,9	96,7	96,6	93,8	96,5	97,0	96,5	96,1	93,3	96,1	96,8	96,3	96,1
ECO46 2L4 A	%	95,6	96,7	97,3	96,9	96,7	95,9	96,6	97,0	96,8	96,6	95,7	96,6	97,1	96,6	96,2	95,1	96,0	96,5	96,4	96,3
ECO46 VL4 A	%	95,9	96,7	97,2	97,0	96,8	95,8	96,6	97,1	96,9	96,7	95,6	96,4	96,9	96,7	96,5	93,6	94,9	95,8	96,0	95,9

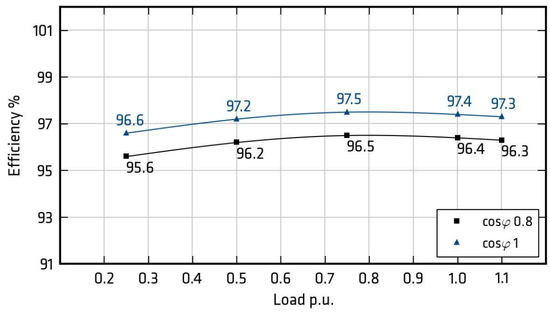
ECO46 1S4 A
400/230 50Hz



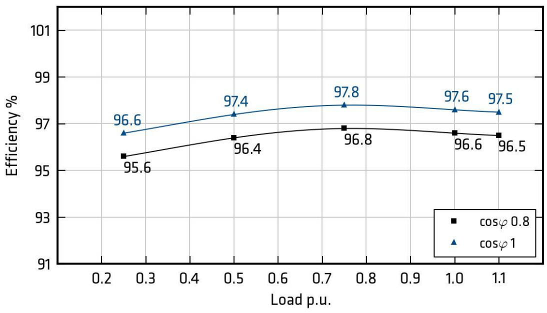
ECO46 1.5S4 A
400/230 50Hz



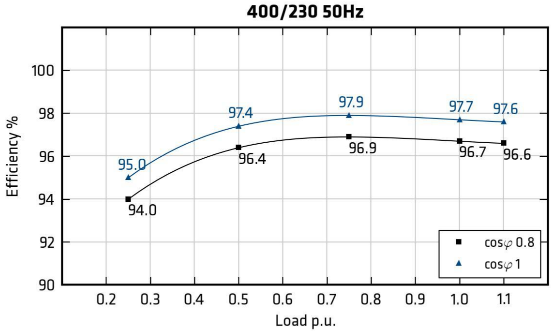
ECO46 2S4 A
400/230 50Hz



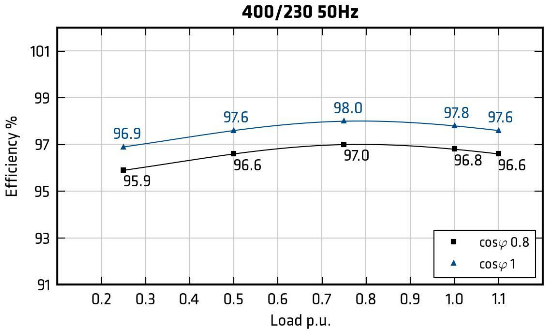
ECO46 1L4 A
400/230 50Hz



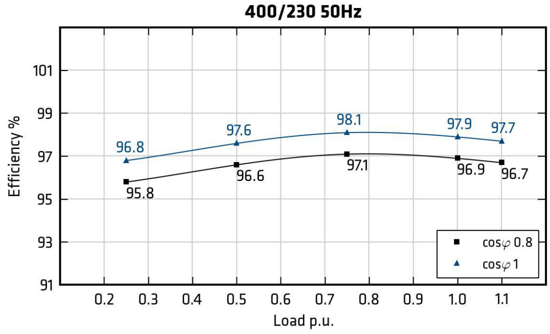
ECO46 1.5L4 A
400/230 50Hz



ECO46 2L4 A
400/230 50Hz



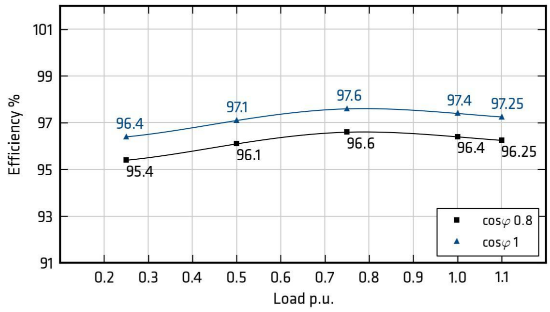
ECO46 VL4 A
400/230 50Hz



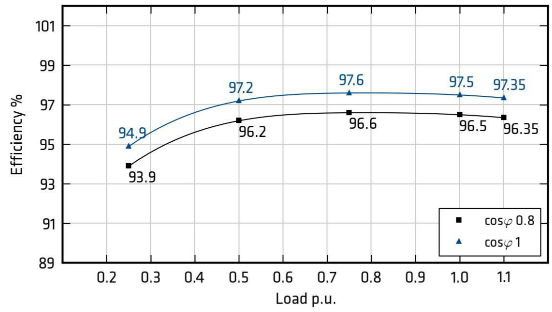
Efficiencies @ 60Hz

Models		415V 60Hz					440V 60Hz					460V 60Hz					480V 60Hz				
		0.25	0.5	0.75	1	1.1	0.25	0.5	0.75	1	1.1	0.25	0.5	0.75	1	1.1	0.25	0.5	0.75	1	1.1
ECO46 1S4 A	%	94,8	95,6	96,2	96,1	95,9	95,2	96,0	96,5	96,3	96,2	95,3	96,2	96,9	96,5	96,3	95,4	96,1	96,6	96,4	96,3
ECO46 1.5S4 A	%	93,9	96,0	96,3	96,1	95,9	93,9	96,1	96,6	96,6	96,5	93,9	96,3	96,8	96,8	96,7	93,9	96,2	96,6	96,5	96,4
ECO46 2S4 A	%	95,0	95,8	96,3	96,2	96,1	95,6	96,3	96,6	96,5	96,4	95,8	96,5	97,0	96,7	96,5	95,8	96,4	96,7	96,6	96,5
ECO46 1L4 A	%	95,3	96,1	96,6	96,5	96,4	95,9	96,5	96,9	96,7	96,6	95,8	96,7	97,3	96,9	96,7	95,9	96,6	97,0	96,8	96,7
ECO46 1.5L4 A	%	94,2	96,5	96,8	96,5	96,3	94,2	96,6	97,1	97,0	96,9	94,2	96,8	97,3	97,2	97,1	94,2	96,7	97,1	96,9	96,8
ECO46 2L4 A	%	95,6	96,4	96,9	96,8	96,7	96,2	96,8	97,2	97,0	96,9	96,2	97,0	97,6	97,2	97,0	96,2	96,9	97,3	97,1	97,0
ECO46 VL4 A	%	94,8	95,7	96,6	96,5	96,4	95,6	96,5	97,3	97,2	97,1	95,8	96,8	97,5	97,4	97,3	95,7	96,6	97,3	97,2	97,1

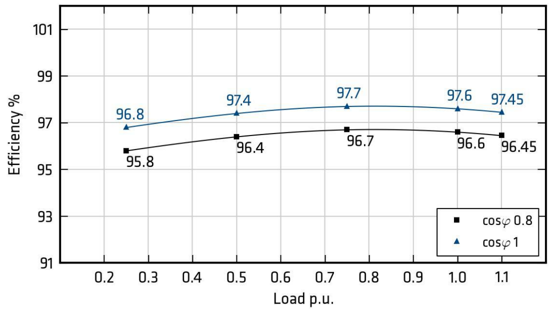
ECO46 1S4 A
480/277 60Hz



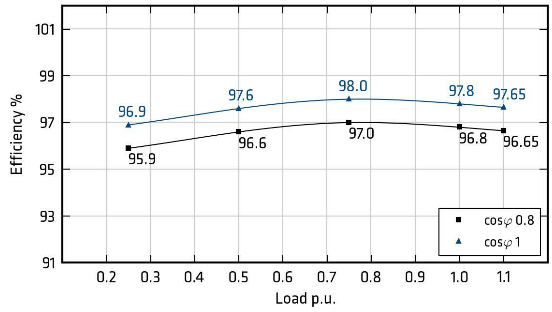
ECO46 1.5S4 A
480/277 60Hz



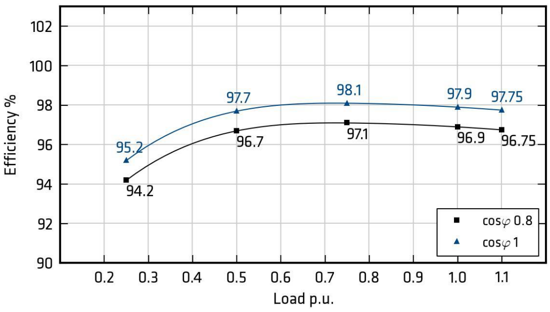
ECO46 2S4 A
480/277 60Hz



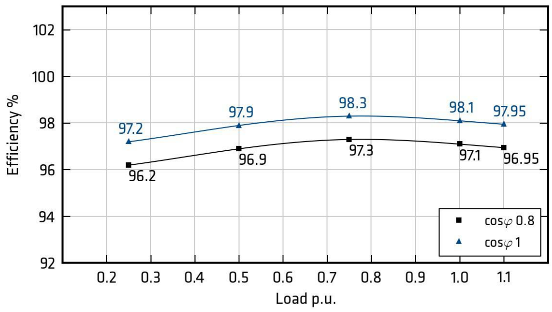
ECO46 1L4 A
480/277 60Hz



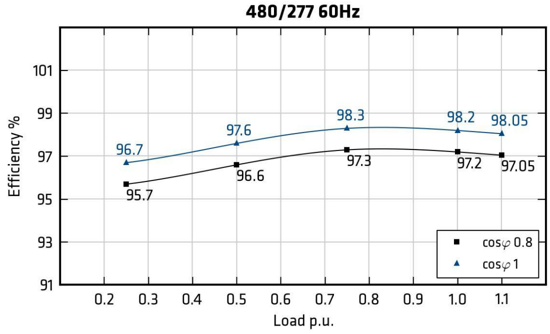
ECO46 1.5L4 A
480/277 60Hz



ECO46 2L4 A
480/277 60Hz

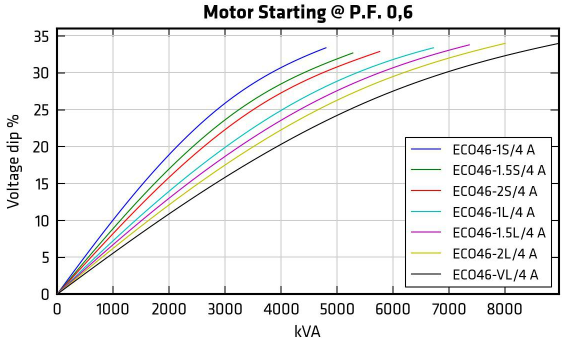


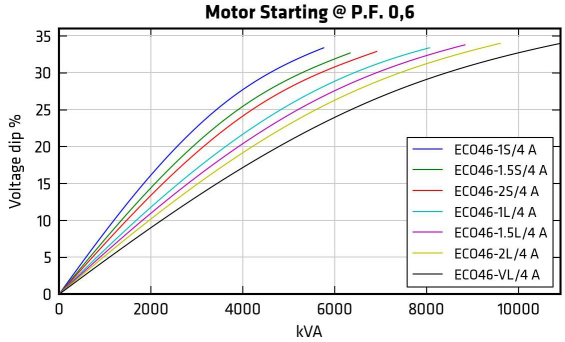
ECO46 VL4 A
480/277 60Hz

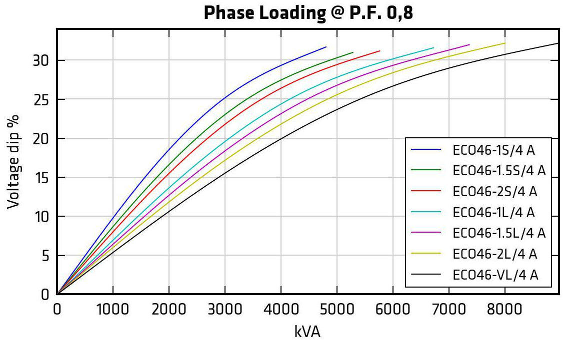


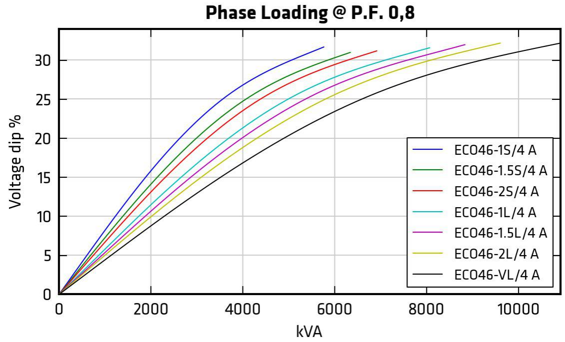
Transients voltage

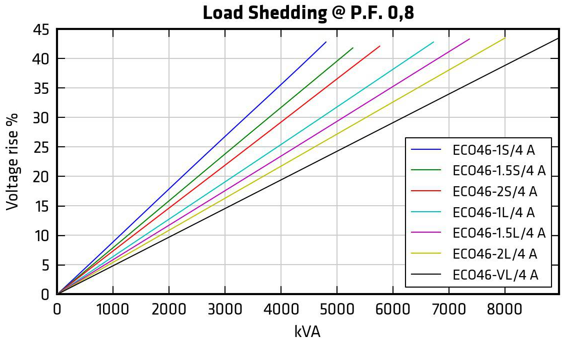
400V - 50Hz | **480V - 60Hz**

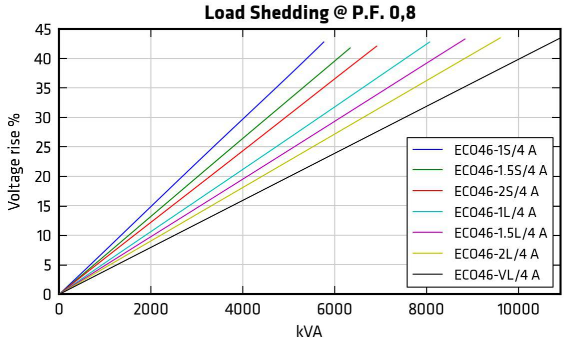












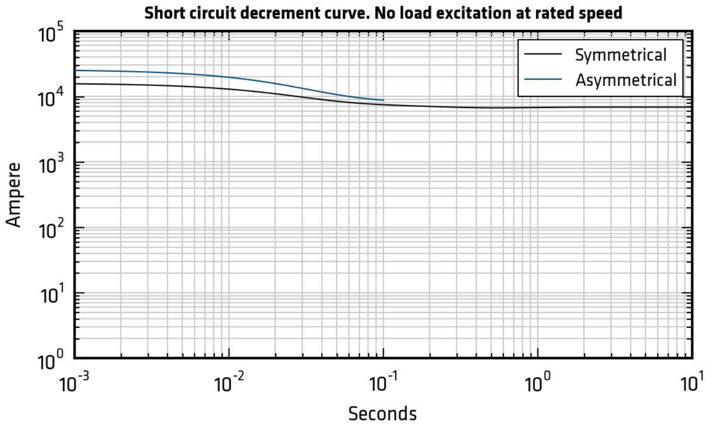
In order to scale transient curves as a function of a power factor or voltage if not indicated, please proceed as follows:

Power Factor coefficient corrector (PFCC), to be used on power factor 0.6 curves:
PFCC=sin(ARCcos (PFnew))/0.8
Example. The PFCC at power factor 0.3 is 1.192 [PFCC= sin(ARCcos (0.3))/0.8]. This means that the voltage fall at a given power at pf 0.3 is equivalent to the one that can be read on the pf 0.6 curve if the load is considered 1.192 times bigger (19% higher value.).
In this example, a 100 kVA load insertion at pf 0.3 is equivalent in voltage fall to a 119kVA load insertion at pf 0.6.

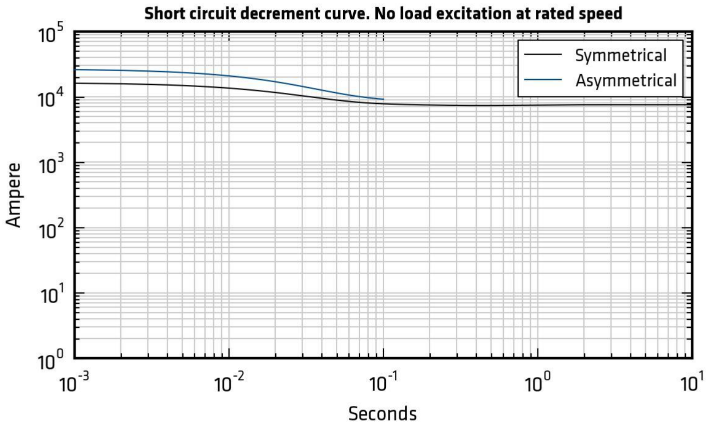
Voltage coefficient corrector (VCC):
VCC=(400/Vnew)2 if 50 Hz; VCC=(480/Vnew)2 if 60 Hz
Example. VCC at 415V 60 Hz is 1.338 [VCC=(480/415)^2]. This means that the voltage fall at a given power at 415V is equivalent to the one that can be read on the power factor 0.6 curve if the load is considered 1.338 times bigger (33% higher value.).
In this example, a 100 kVA load insertion at 415V is equivalent in voltage fall to a 133kVA load insertion at 480V.

50Hz Short circuit decrement curves - No load excitation at rated speed

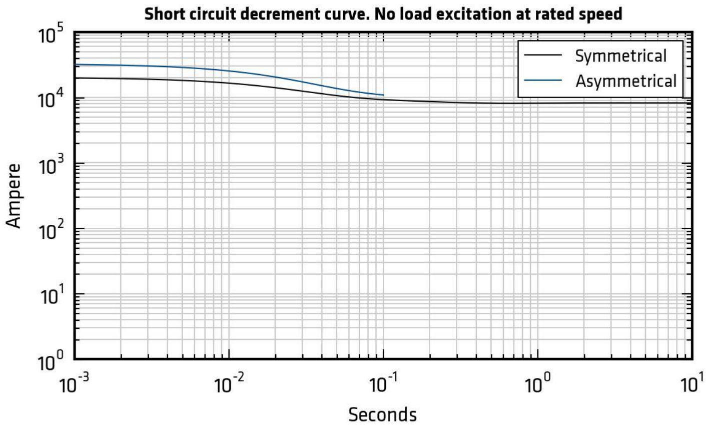
ECO46 1S4 A



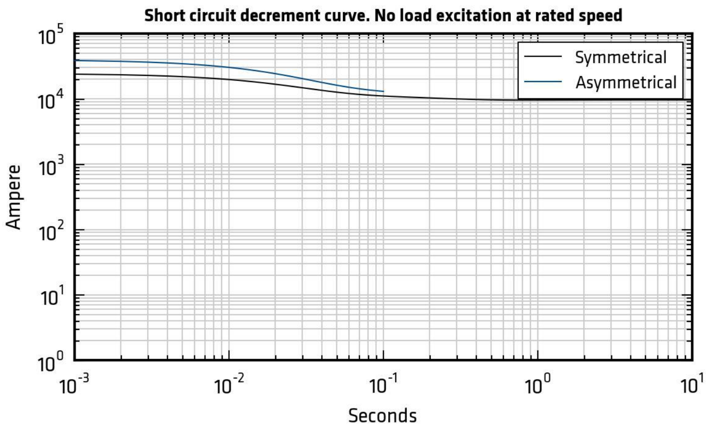
ECO46 1.5S4 A



ECO46 2S4 A



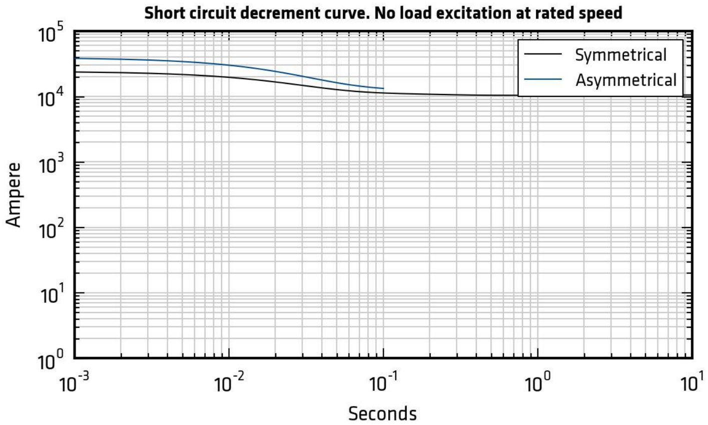
ECO46 1L4 A



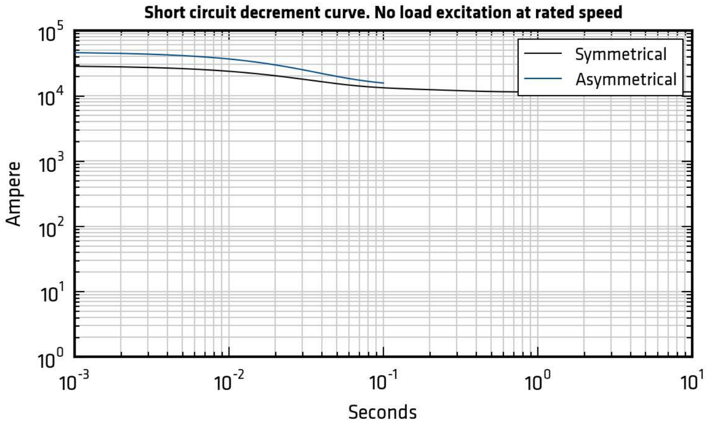
*Please refer to tables at page 6

50Hz Short circuit decrement curves - No load excitation at rated speed

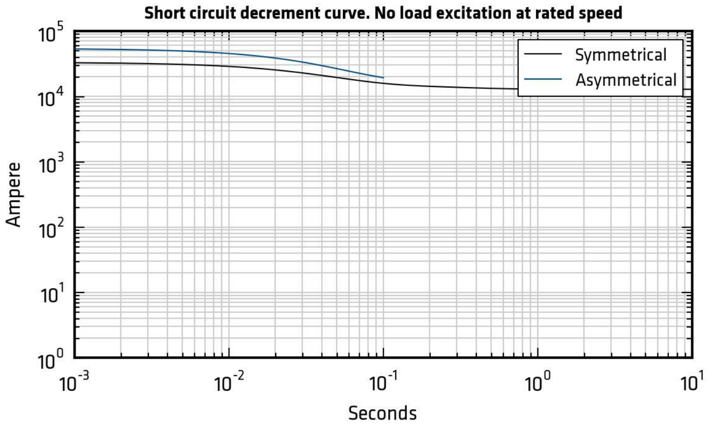
ECO46 1.5L4 A



ECO46 2L4 A



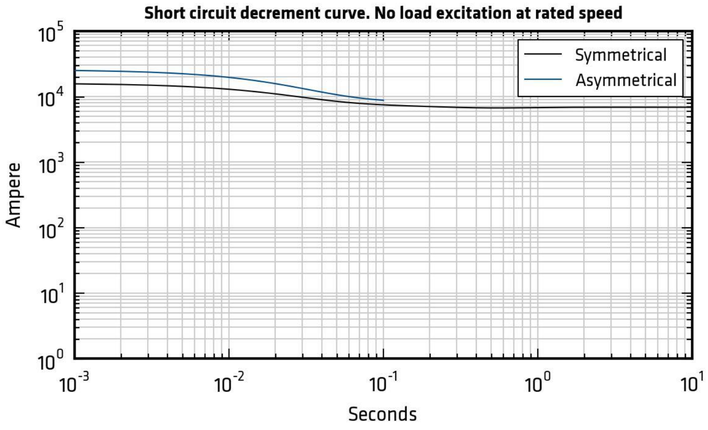
ECO46 VL4 A



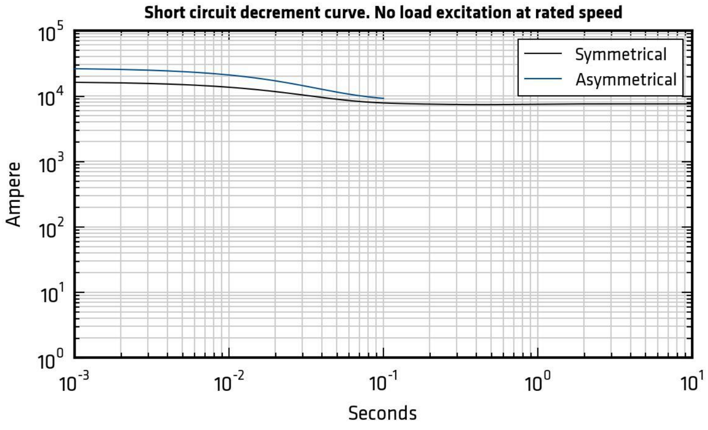
*Please refer to tables at page 6

60Hz Short circuit decrement curves - No load excitation at rated speed

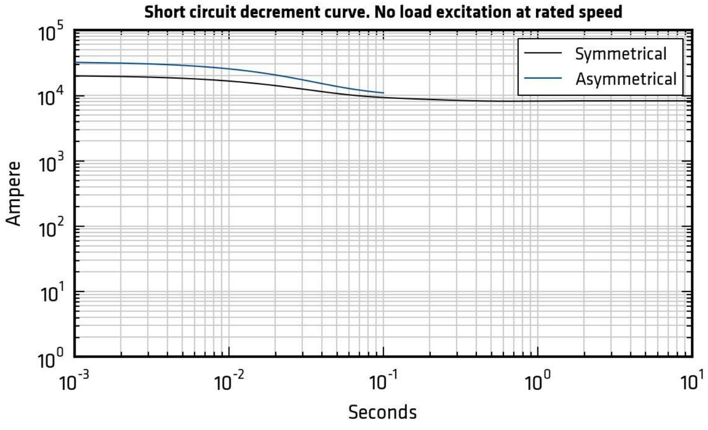
ECO46 1S4 A



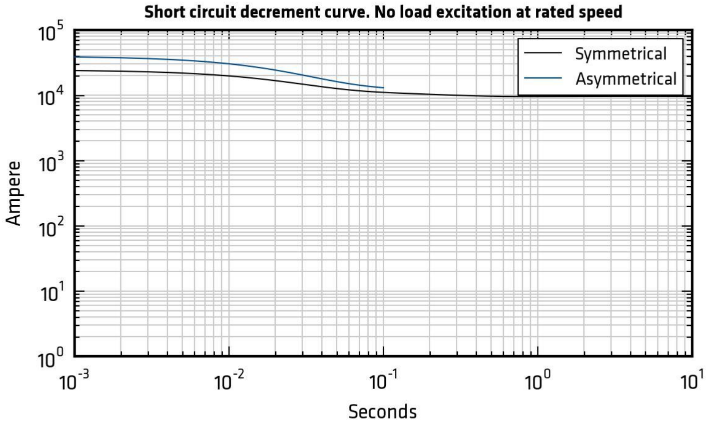
ECO46 1.5S4 A



ECO46 2S4 A



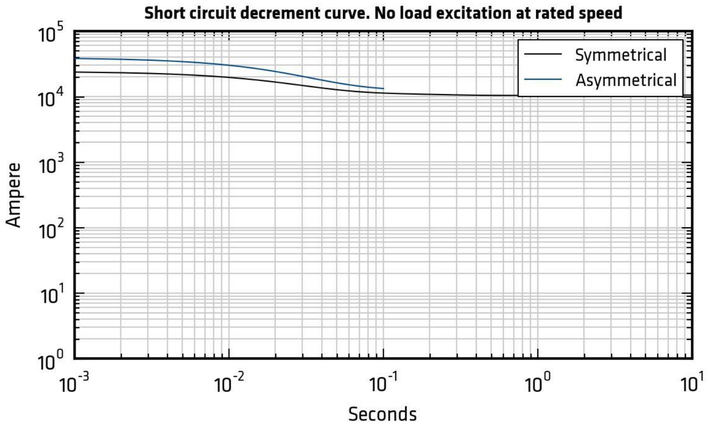
ECO46 1L4 A



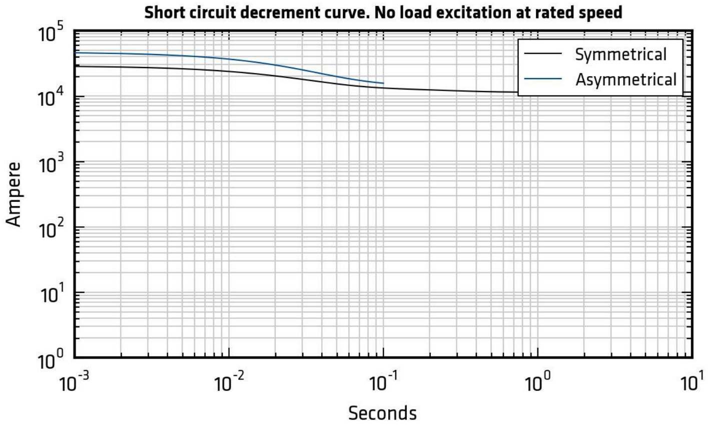
*Please refer to tables at page 6

60Hz Short circuit decrement curves - No load excitation at rated speed

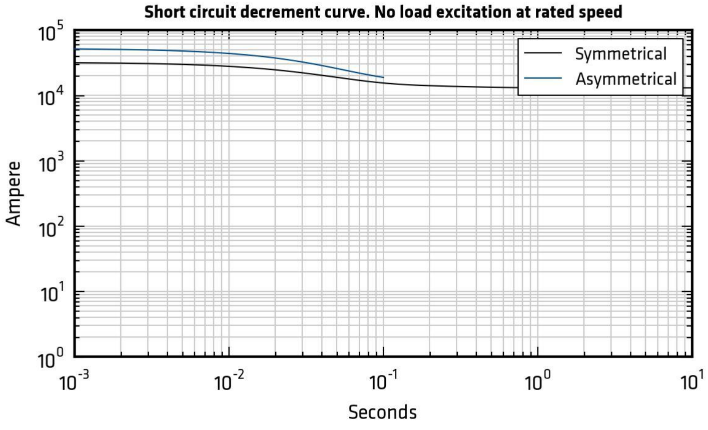
ECO46 1.5L4 A



ECO46 2L4 A



ECO46 VL4 A

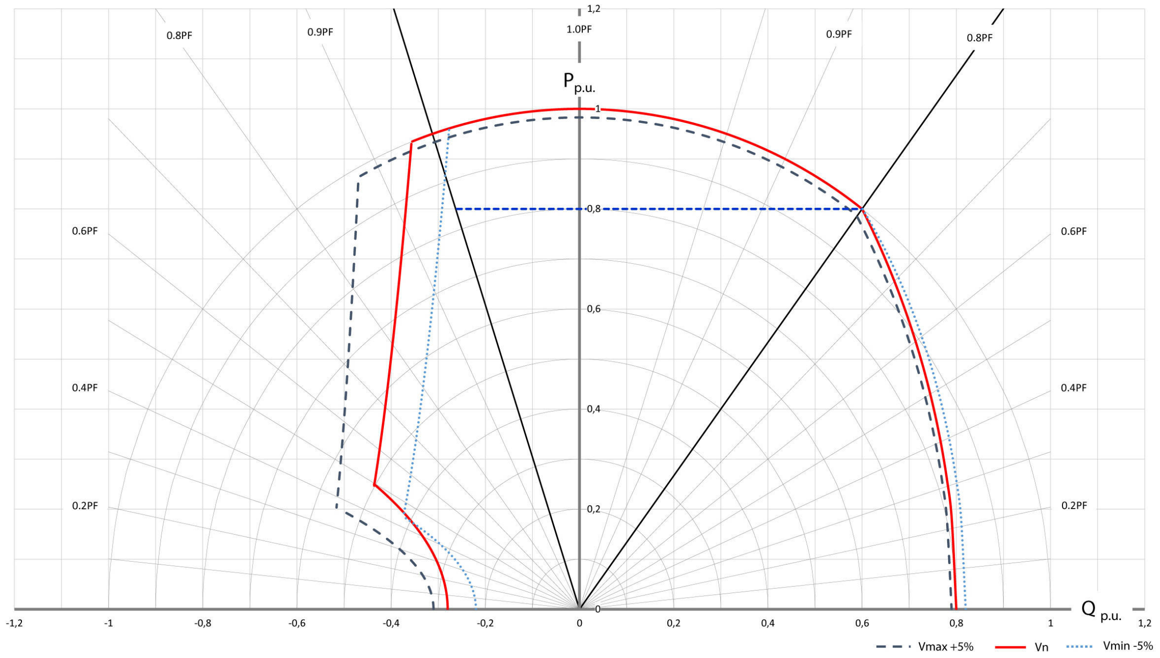


*Please refer to tables at page 6

Additional Characteristics

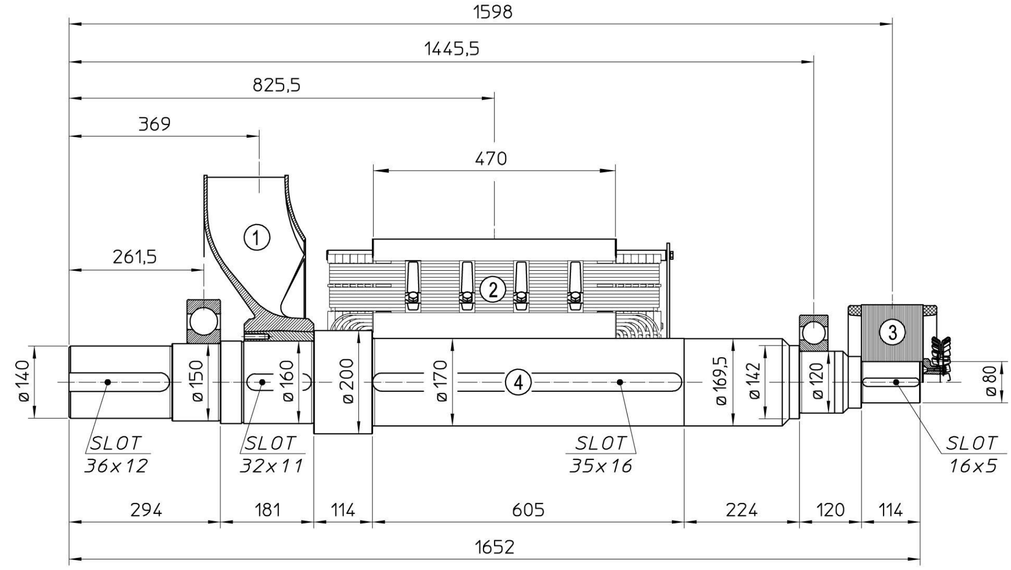
Data		ECO46 1S4 A		ECO46 1.5S4 A		ECO46 2S4 A		ECO46 1L4 A		ECO46 1.5L4 A		ECO46 2L4 A		ECO46 VL4 A	
		50Hz	60Hz	50Hz	60Hz	50Hz	60Hz	50Hz	60Hz	50Hz	60Hz	50Hz	60Hz	50Hz	60Hz
Damper cage		Copper													
Stator Winding Resistance (20°C)	Ω	0,006		0,003		0,004		0,003		0,003		0,002		0,001	
Rotor Winding Resistance (20°C)	Ω	3,05		3,319		3,5		3,977		4,27		4,5		5,18	
Stator Exciter Resistance (20°C)	Ω	12,9		12,9		12,9		12,9		12,9		12,9		12,9	
Rotor Exciter Resistance (20°C)	Ω	0,12		0,12		0,12		0,12		0,12		0,12		0,12	
Weight of complete generator	kg	3005,0		3375,0		3560,0		3805,0		4255,0		4375,0		5120,0	
Unbalanced magnetic pull	kN/mm	6,4		6,4		6,5		6,8		6,9		7,0		8,0	
Air flow	m^3/min	135,0	162,0	135,0	162,0	135,0	162,0	135,0	162,0	135,0	162,0	135,0	162,0	135,0	162,0
Noise level at 1m/7m	dB(A)	97/86	100/91	97/86	100/91	97/86	100/91	97/86	100/91	97/86	100/91	97/86	100/91	97/86	100/91

PQ Diagram



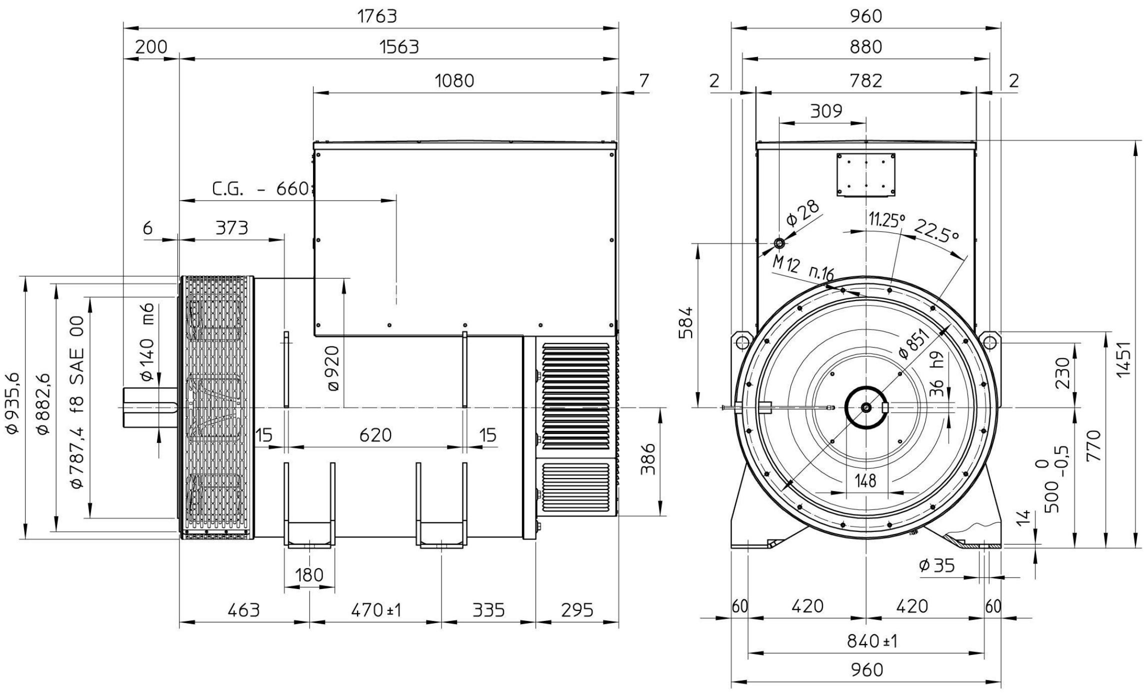
ECO46 1S4 A

TWO BEARING MOMENTS OF INERTIA



POS.	COMPONENT	WEIGHT (kg)	J (kgm²)
1	FAN	42.4	2.2323
2	MAIN ROTOR	702.2	27.4802
3	EX. ROTOR	59.8	0.7260
4	SHAFT	248.3	0.8445
	TOTAL	1052.7	31.2830

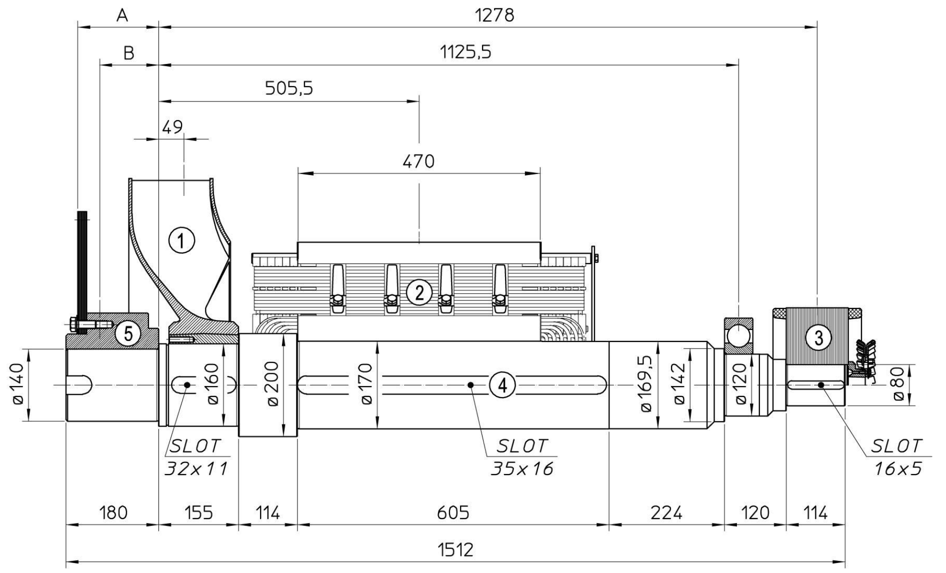
TWO BEARING DIMENSIONS



C.G.= GRAVITY CENTER

ECO46 1S4 A

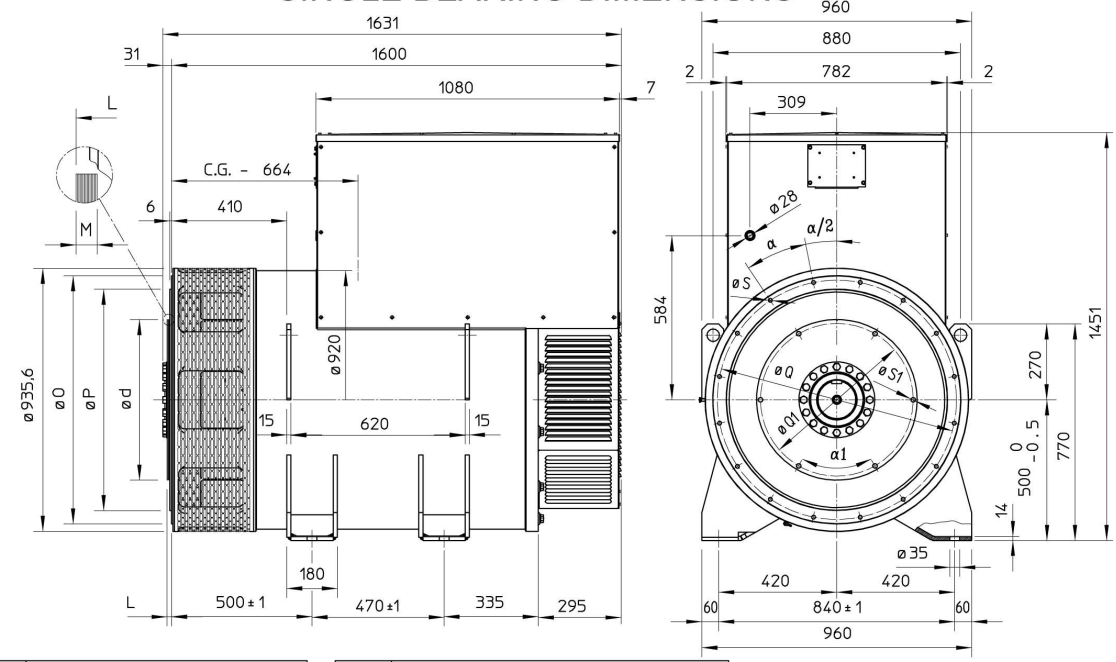
SINGLE BEARING MOMENTS OF INERTIA



POS.	COMPONENT	WEIGHT (kg)	J (kgm^2)
1	FAN	42.4	2.2323
2	MAIN ROTOR	702.2	27.4802
3	EX. ROTOR	59.8	0.7260
4	SHAFT	229.3	0.7912
	TOTAL	1033.7	31.2297

POS.	COMPONENT	SAE N°	A	B	WEIGHT (kg)	J (kgm^2)
5	SHAFTS COUPLING FLEX PLATE	18	172.7	113.4	82.9	1.8652
		21	157.0	114.6	93.8	3.2090

SINGLE BEARING DIMENSIONS



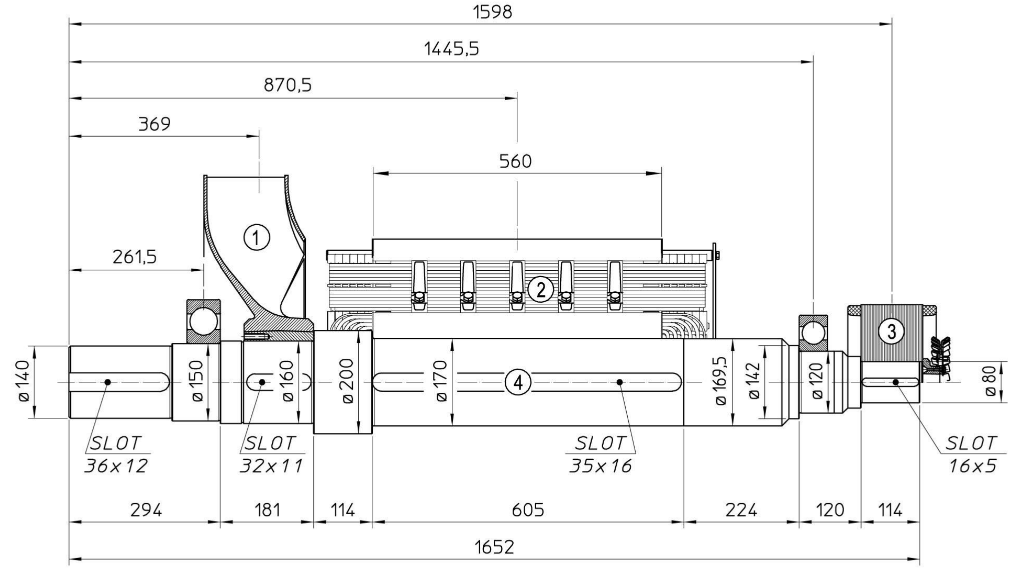
SAE N.	FLANGIA/FLANGE BRIDE/FLANSCH				
	O	P	Q	S	α
00	883	787.4	850.9	14	22.5°
0	711	647.7	679.5	14	22.5°

SAE N.	GIUNTI A DISCHI / DISC COUPLING DISCQUE DE MONOPALIER / SCHEIBENKUPPLUNG					
	d	L	M	Q1	S1	α1
18	571.5	15.7	15	542.92	16.5	60°
21	673.1	0	17	641.35	16.5	30°

C.G.= GRAVITY CENTER

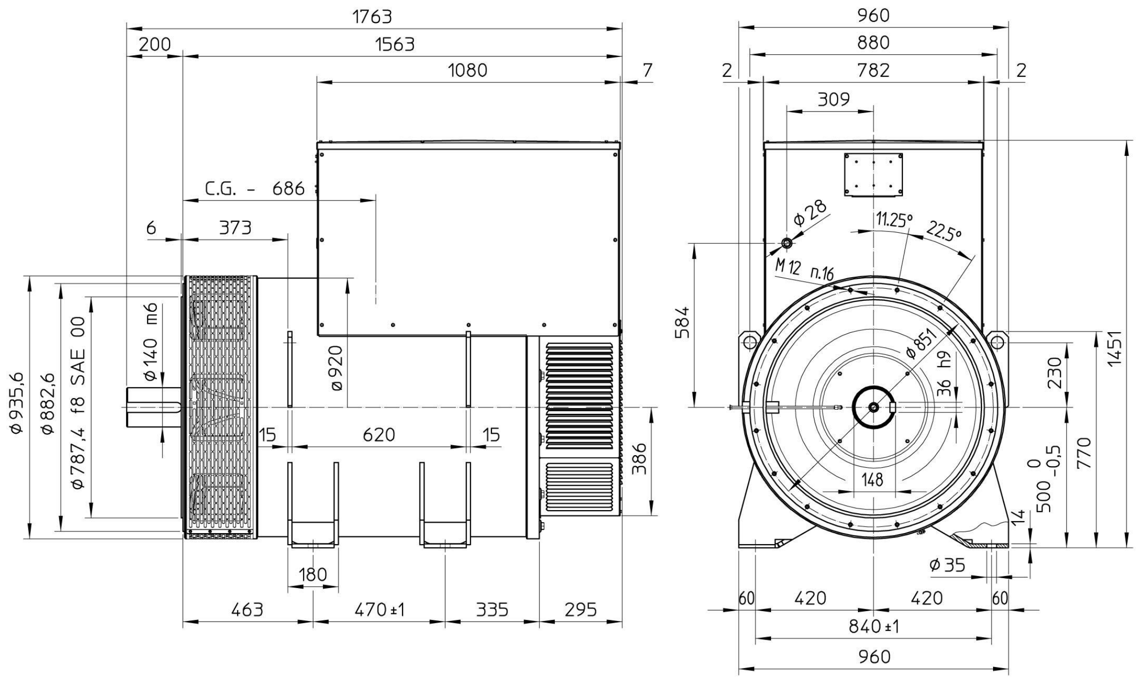
ECO46 1.5S4 A

TWO BEARING MOMENTS OF INERTIA



POS.	COMPONENT	WEIGHT (kg)	J (kgm^2)
1	FAN	42.4	2.2323
2	MAIN ROTOR	837.9	32.8507
3	EX. ROTOR	59.8	0.7260
4	SHAFT	248.3	0.8445
	TOTAL	1188.4	36.6535

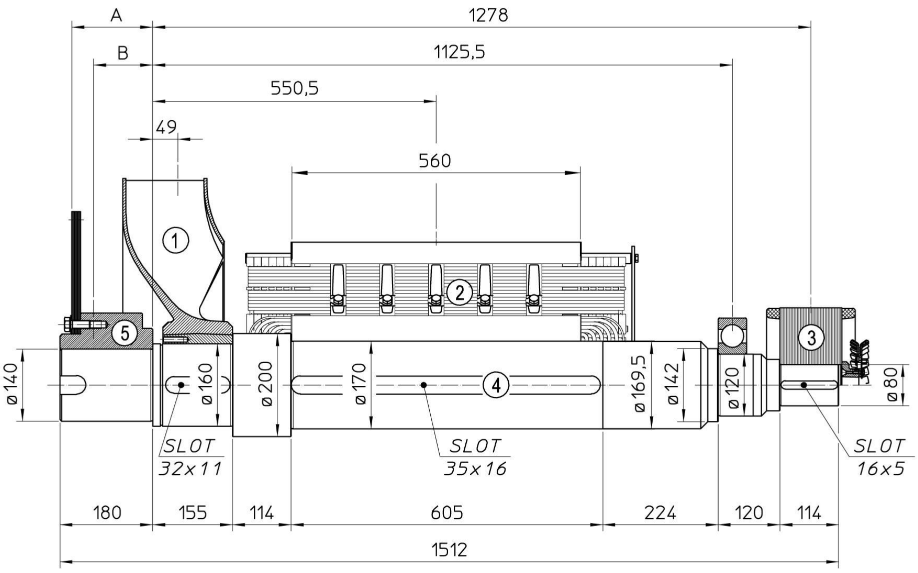
TWO BEARING DIMENSIONS



C.G.= GRAVITY CENTER

ECO46 1.5S4 A

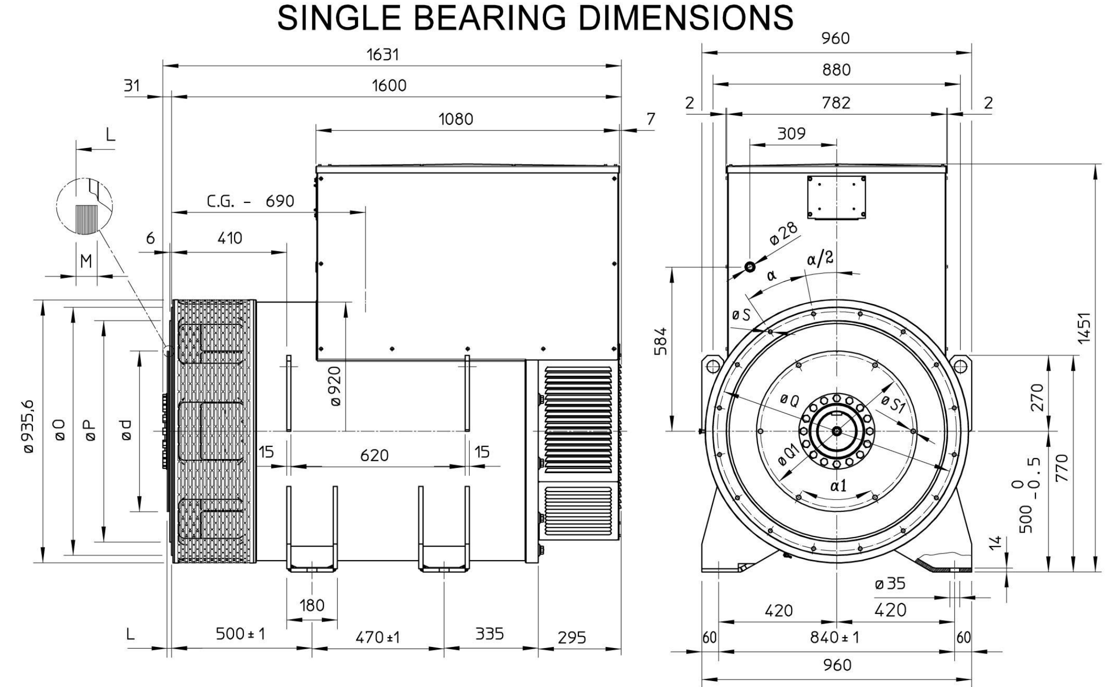
SINGLE BEARING MOMENTS OF INERTIA



POS.	COMPONENT	WEIGHT (kg)	J (kgm²)
1	FAN	42.4	2.2323
2	MAIN ROTOR	837.9	32.8507
3	EX. ROTOR	59.8	0.7260
4	SHAFT	229.3	0.7912
	TOTAL	1169.4	36.6002

POS.	COMPONENT	SAE N°	A	B	WEIGHT (kg)	J (kgm²)
5	SHAFTS COUPLING FLEX PLATE	18	172.7	113.4	82.9	1.8652
		21	157.0	114.6	93.8	3.2090

SINGLE BEARING DIMENSIONS



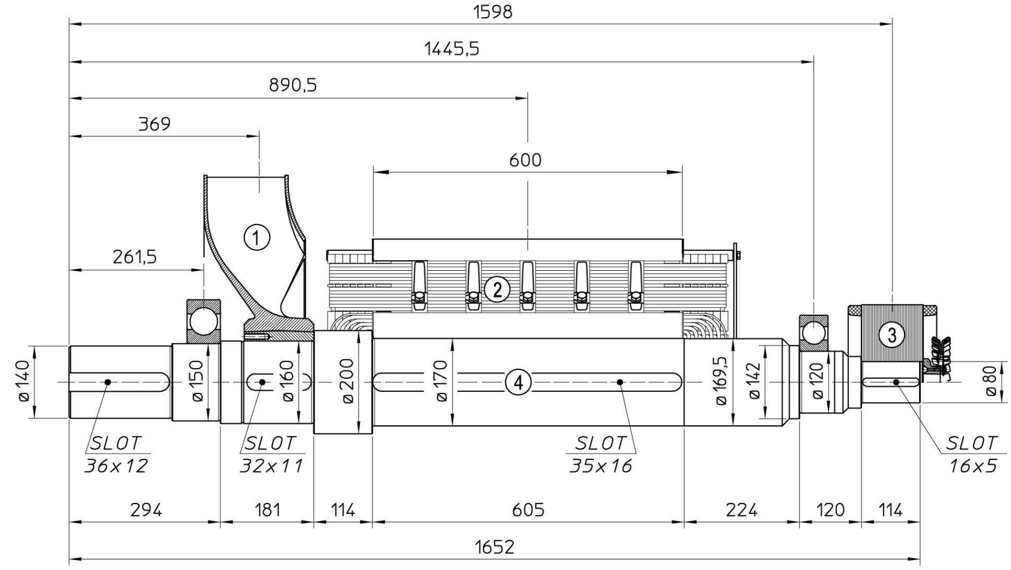
SAE N.	FLANGIA/FLANGE BRIDE/FLANSCH				
	O	P	Q	S	α
00	883	787.4	850.9	14	22.5°
0	711	647.7	679.5	14	22.5°

SAE N.	GIUNTI A DISCHI / DISC COUPLING DISCOQUE DE MONOPALIER / SCHEIBENKUPPLUNG					
	d	L	M	Q1	S1	α1
18	571.5	15.7	15	542.92	16.5	60°
21	673.1	0	17	641.35	16.5	30°

C.G.= GRAVITY CENTER

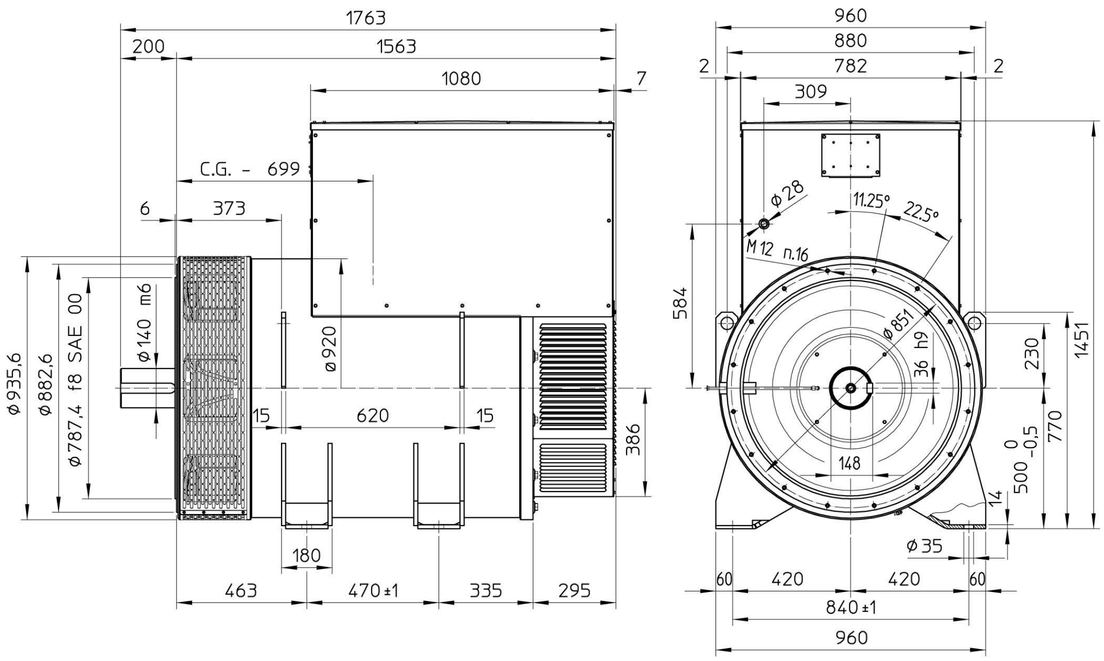
ECO46 2S4 A

TWO BEARING MOMENTS OF INERTIA



POS.	COMPONENT	WEIGHT (kg)	J (kgm^2)
1	FAN	42.4	2.2323
2	MAIN ROTOR	895.5	35.1154
3	EX. ROTOR	59.8	0.7260
4	SHAFT	248.3	0.8445
	TOTAL	1246.0	38.9182

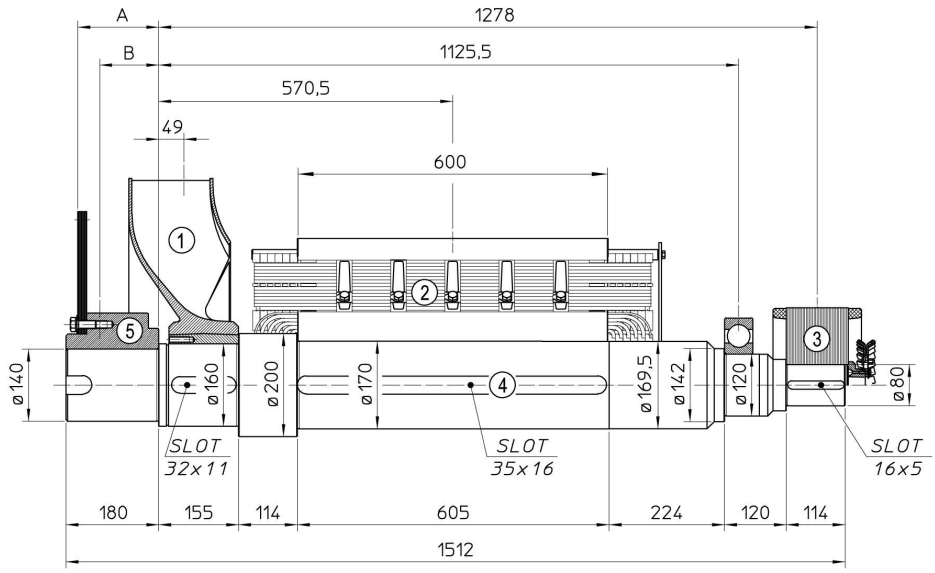
TWO BEARING DIMENSIONS



C.G.= GRAVITY CENTER

ECO46 2S4 A

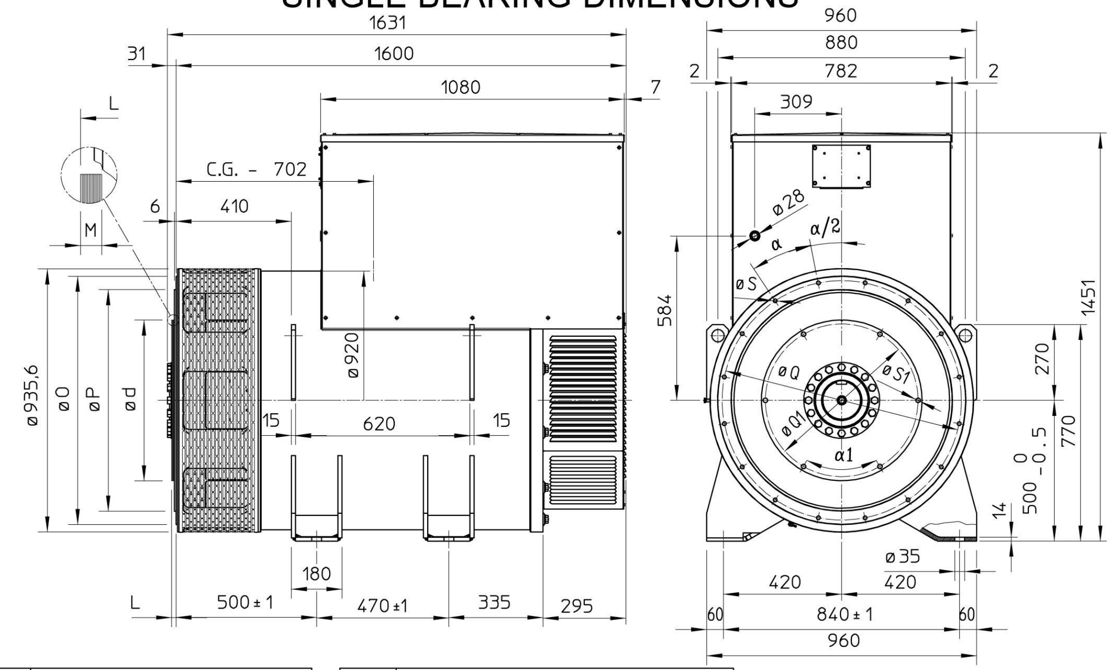
SINGLE BEARING MOMENTS OF INERTIA



POS.	COMPONENT	WEIGHT (kg)	J (kgm^2)
1	FAN	42.4	2.2323
2	MAIN ROTOR	895.5	35.1154
3	EX. ROTOR	59.8	0.7260
4	SHAFT	229.3	0.7912
	TOTAL	1227.0	38.8649

POS.	COMPONENT	SAE N°	A	B	WEIGHT (kg)	J (kgm^2)
5	SHAFTS COUPLING FLEX PLATE	18	172.7	113.4	82.9	1.8652
		21	157.0	114.6	93.8	3.2090

SINGLE BEARING DIMENSIONS



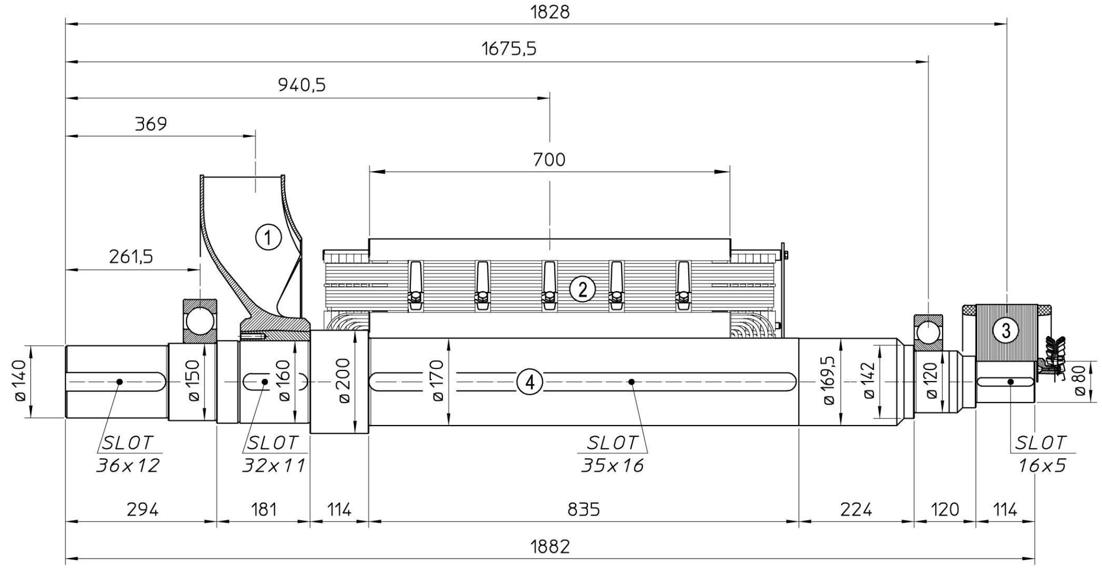
SAE N.	FLANGIA/FLANGE BRIDE/FLANSCH				
	O	P	Q	S	α
00	883	787.4	850.9	14	22.5°
0	711	647.7	679.5	14	22.5°

SAE N.	GIUNTI A DISCHI / DISC COUPLING DISCQUE DE MONOPALIER / SCHEIBENKUPPLUNG					
	d	L	M	Q1	S1	α1
18	571.5	15.7	15	542.92	16.5	60°
21	673.1	0	17	641.35	16.5	30°

C.G.= GRAVITY CENTER

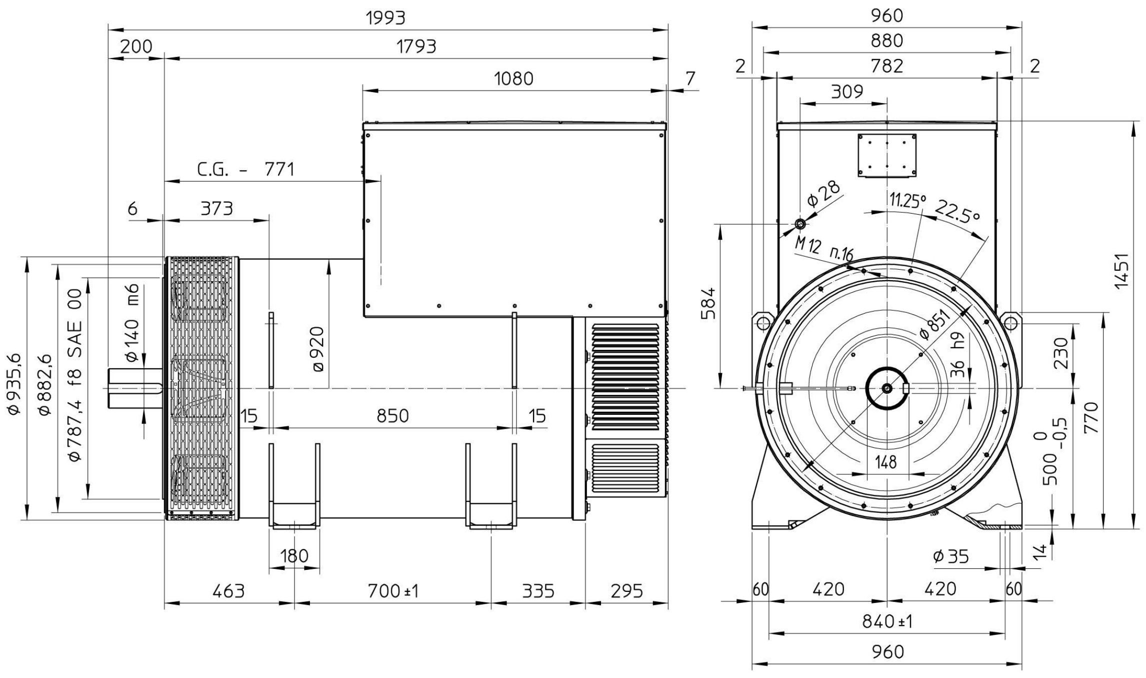
ECO46 1L4 A

TWO BEARING MOMENTS OF INERTIA



POS.	COMPONENT	WEIGHT (kg)	J (kgm^2)
1	FAN	42.4	2.2323
2	MAIN ROTOR	1024.7	40.0803
3	EX. ROTOR	59.8	0.7260
4	SHAFT	288.0	0.9857
	TOTAL	1415.0	44.0243

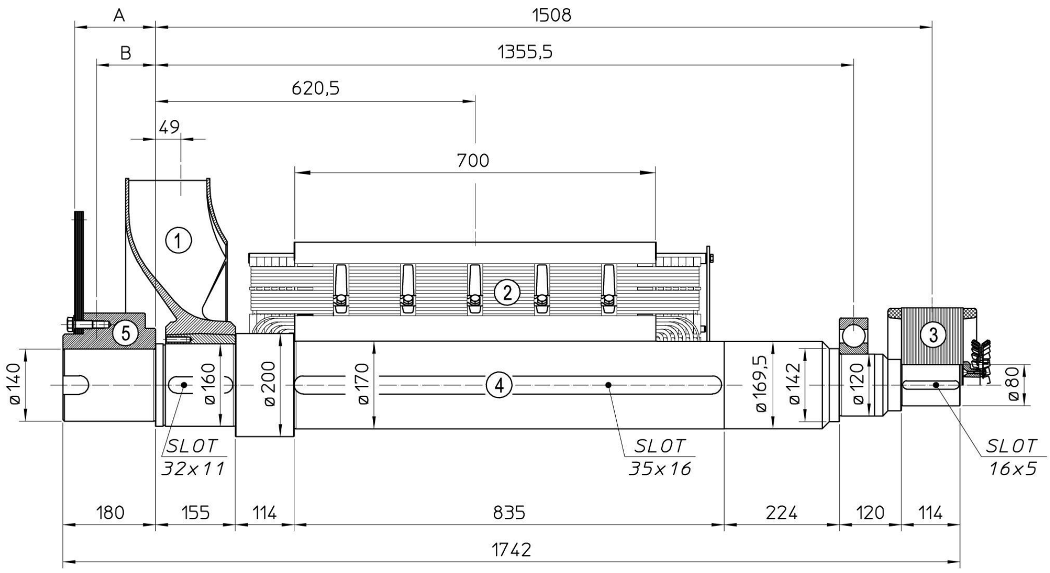
TWO BEARING DIMENSIONS



C.G.= GRAVITY CENTER

ECO46 1L4 A

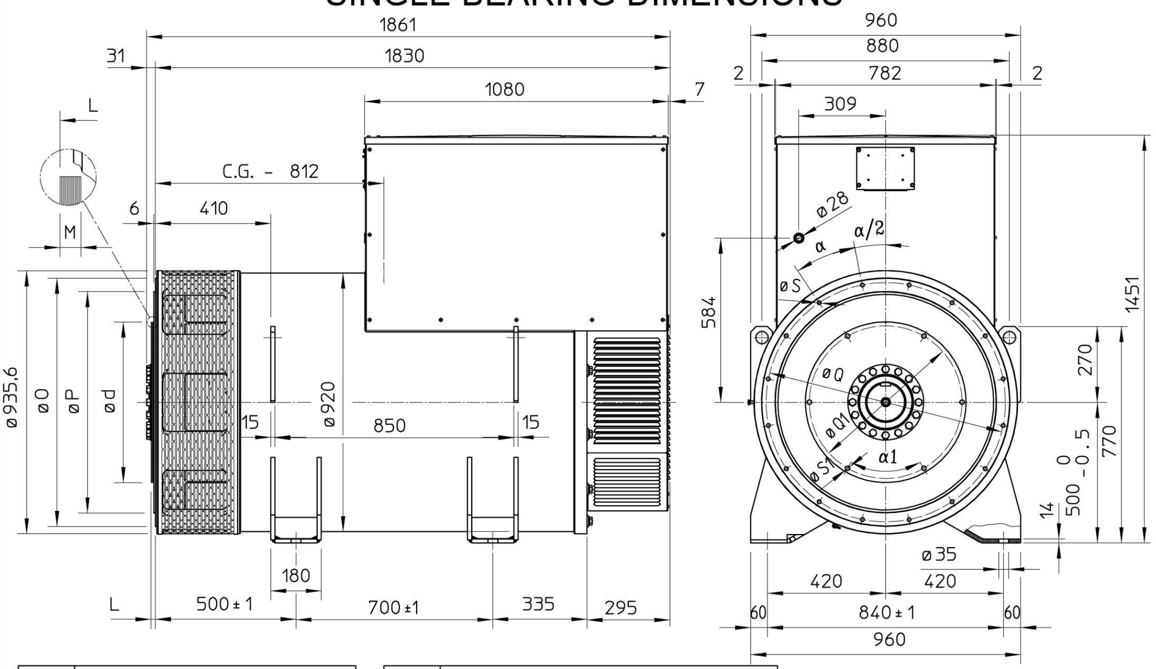
SINGLE BEARING MOMENTS OF INERTIA



POS.	COMPONENT	WEIGHT (kg)	J (kgm^2)
1	FAN	42.4	2.2323
2	MAIN ROTOR	1024.7	40.0803
3	EX. ROTOR	59.8	0.7260
4	SHAFT	269.1	0.9324
	TOTAL	1396.0	43.9710

POS.	COMPONENT	SAE N°	A	B	WEIGHT (kg)	J (kgm^2)
5	SHAFTS COUPLING FLEX PLATE	18	172.7	113.4	82.9	1.8652
		21	157.0	114.6	93.8	3.2090

SINGLE BEARING DIMENSIONS



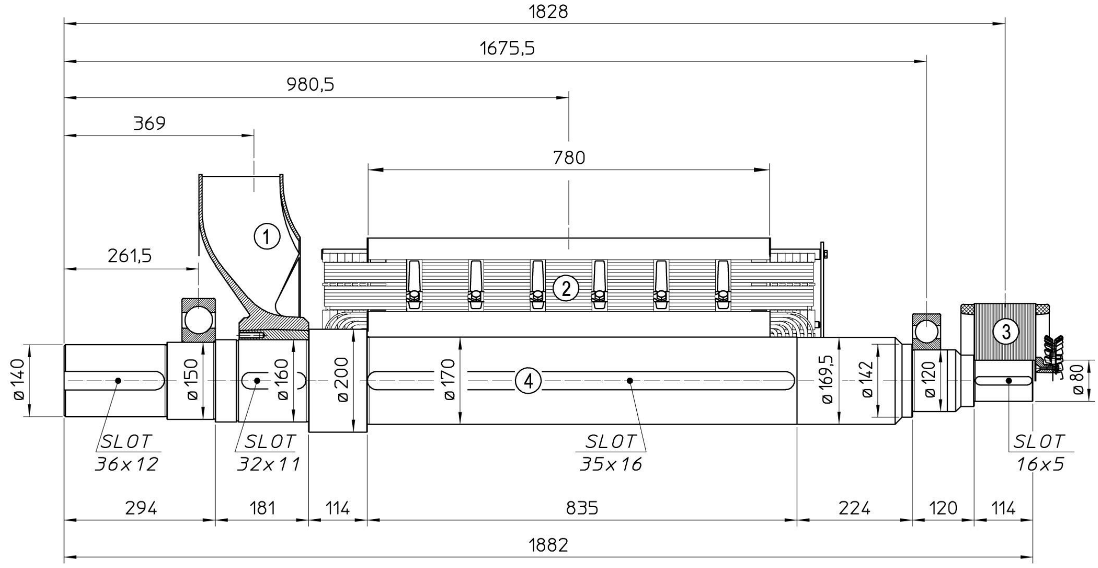
SAE N.	FLANGIA/FLANGE BRIDE/FLANSCH				
	O	P	Q	S	α
00	883	787.4	850.9	14	22.5°
0	711	647.7	679.5	14	22.5°

SAE N.	GIUNTI A DISCHI / DISC COUPLING DISCQUE DE MONOPALIER / SCHEIBENKUPPLUNG					
	d	L	M	Q1	S1	α1
18	571.5	15.7	15	542.92	16.5	60°
21	673.1	0	17	641.35	16.5	30°

C.G.= GRAVITY CENTER

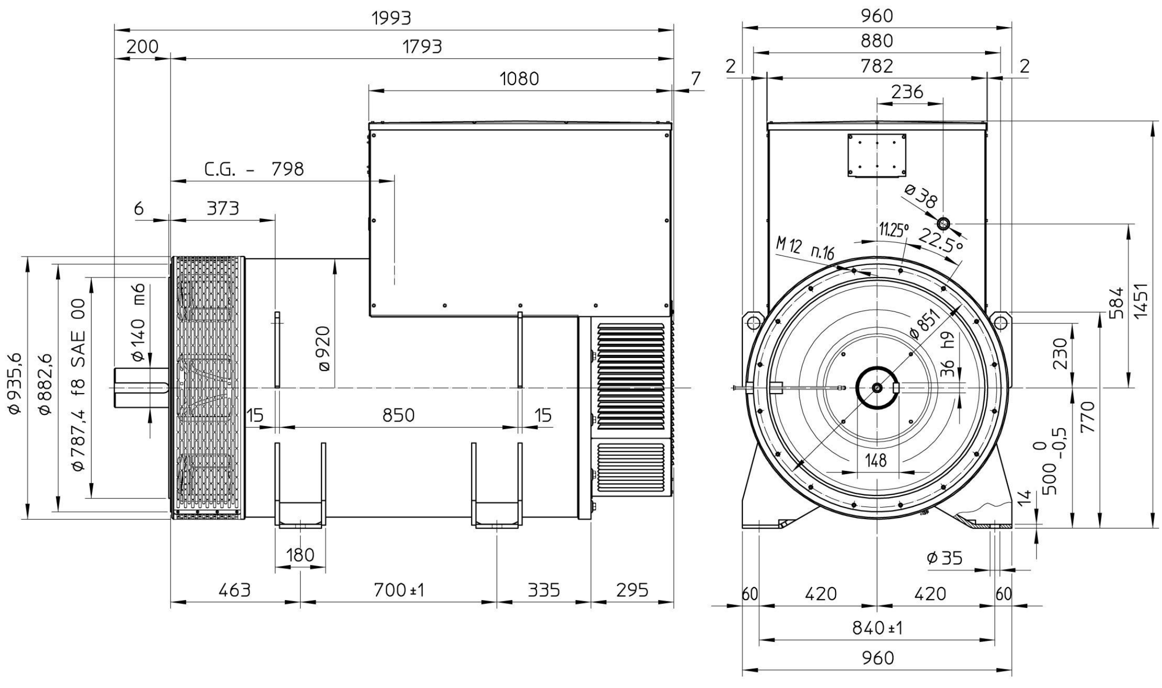
ECO46 1.5L4 A

TWO BEARING MOMENTS OF INERTIA



POS.	COMPONENT	WEIGHT (kg)	J (kgm^2)
1	FAN	42.4	2.2323
2	MAIN ROTOR	1137.4	44.4934
3	EX. ROTOR	59.8	0.7260
4	SHAFT	288.0	0.9857
	TOTAL	1527.6	48.4374

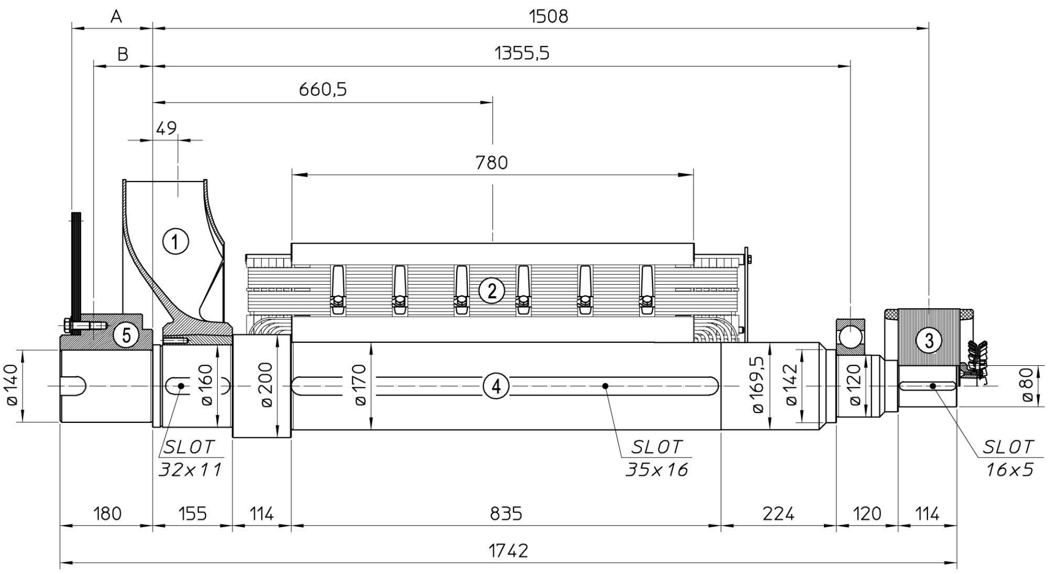
TWO BEARING DIMENSIONS



C.G.= GRAVITY CENTER

ECO46 1.5L4 A

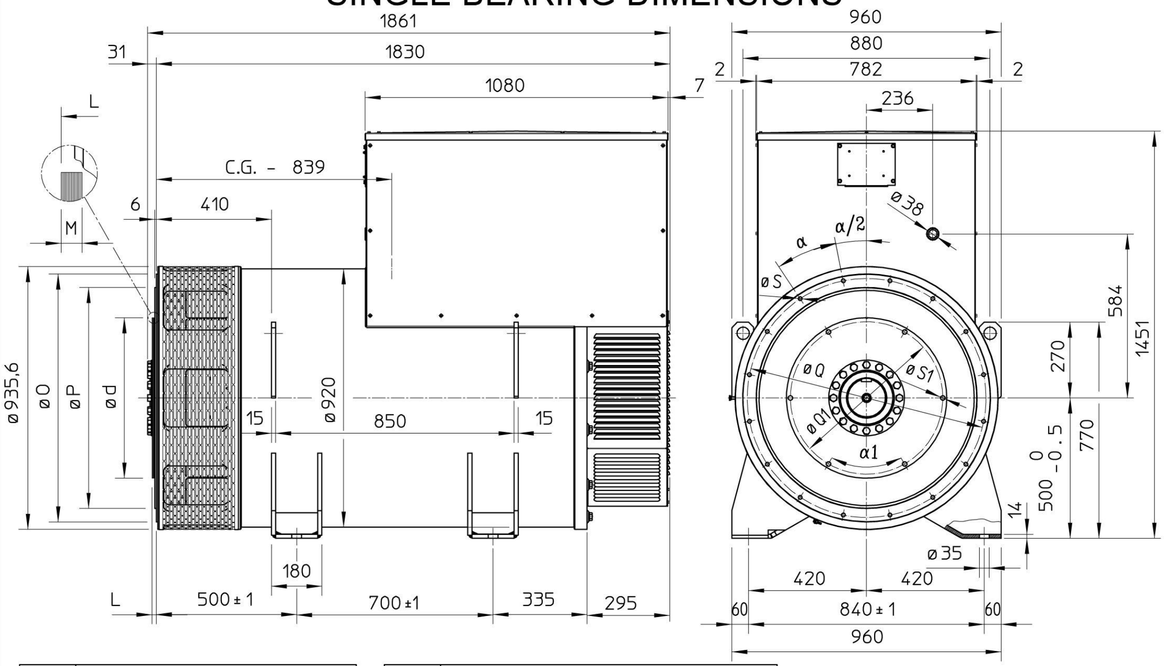
SINGLE BEARING MOMENTS OF INERTIA



POS.	COMPONENT	WEIGHT (kg)	J (kgm^2)
1	FAN	42.4	2.2323
2	MAIN ROTOR	1137.4	44.4934
3	EX. ROTOR	59.8	0.7260
4	SHAFT	269.1	0.9324
	TOTAL	1508.7	48.3841

POS.	COMPONENT	SAE N°	A	B	WEIGHT (kg)	J (kgm^2)
5	SHAFTS COUPLING FLEX PLATE	18	172.7	113.4	82.9	1.8652
		21	157.0	114.6	93.8	3.2090

SINGLE BEARING DIMENSIONS



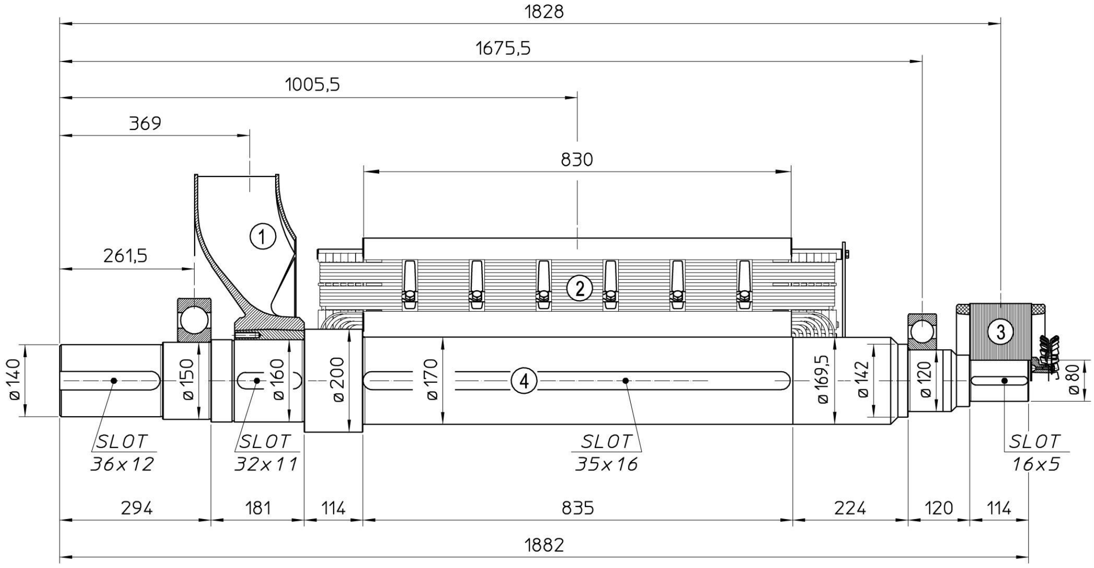
SAE N.	FLANGIA/FLANGE BRIDE/FLANSCH				
	O	P	Q	S	α
00	883	787.4	850.9	14	22.5°
0	711	647.7	679.5	14	22.5°

SAE N.	GIUNTI A DISCHI / DISC COUPLING DISCQUE DE MONOPALIER / SCHEIBENKUPPLUNG					
	d	L	M	Q1	S1	α1
18	571.5	15.7	15	542.92	16.5	60°
21	673.1	0	17	641.35	16.5	30°

C.G.= GRAVITY CENTER

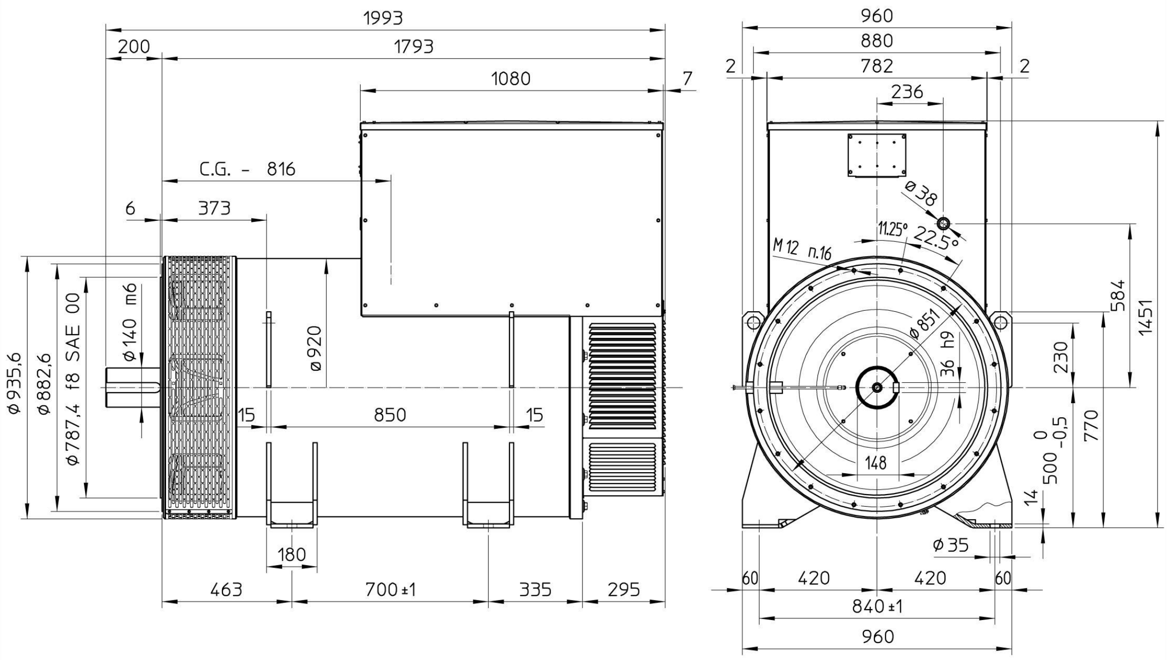
ECO46 2L4 A

TWO BEARING MOMENTS OF INERTIA



POS.	COMPONENT	WEIGHT (kg)	J (kgm^2)
1	FAN	42.4	2.2323
2	MAIN ROTOR	1210.0	47.1561
3	EX. ROTOR	59.8	0.7260
4	SHAFT	288.0	0.9857
	TOTAL	1600.3	51.1001

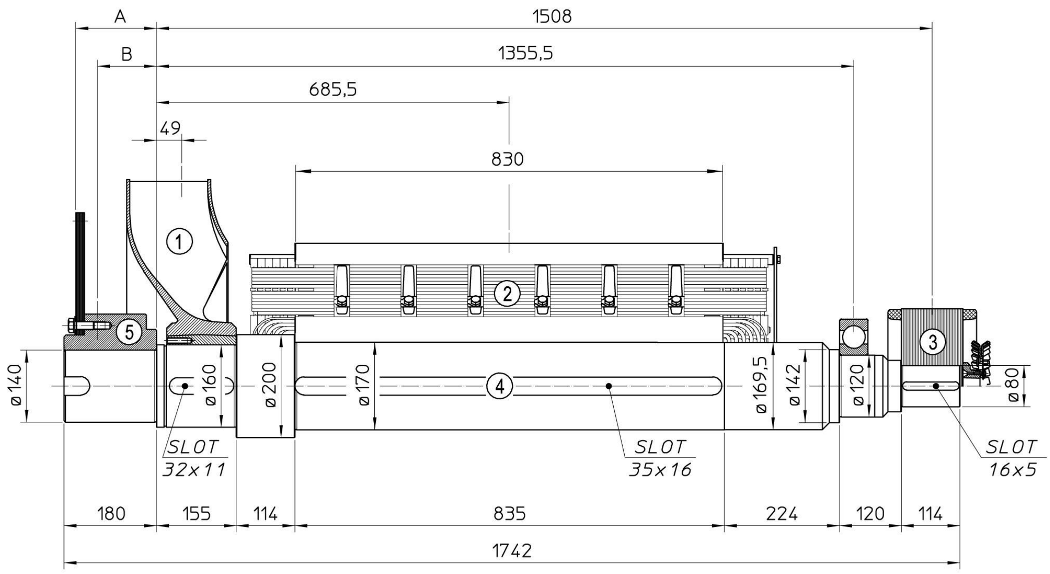
TWO BEARING DIMENSIONS



C.G.= GRAVITY CENTER

ECO46 2L4 A

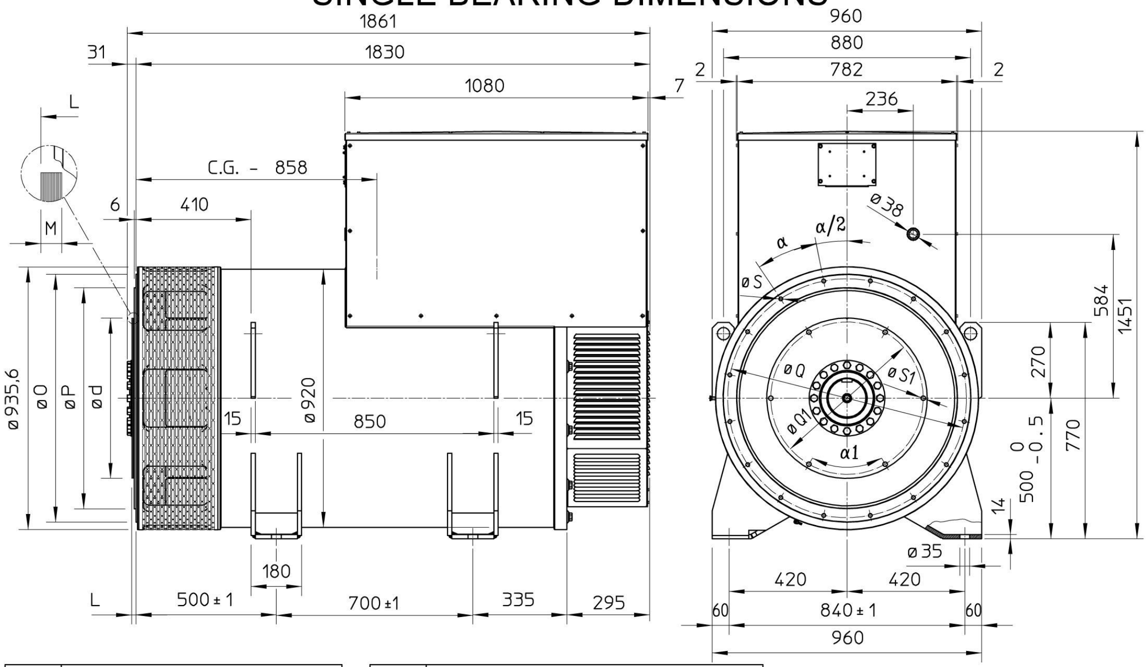
SINGLE BEARING MOMENTS OF INERTIA



POS.	COMPONENT	WEIGHT (kg)	J (kgm^2)
1	FAN	42.4	2.2323
2	MAIN ROTOR	1210.0	47.1561
3	EX. ROTOR	59.8	0.7260
4	SHAFT	269.1	0.9324
	TOTAL	1581.3	51.0468

POS.	COMPONENT	SAE N°	A	B	WEIGHT (kg)	J (kgm^2)
5	SHAFTS COUPLING FLEX PLATE	18	172.7	113.4	82.9	1.8652
		21	157.0	114.6	93.8	3.2090

SINGLE BEARING DIMENSIONS



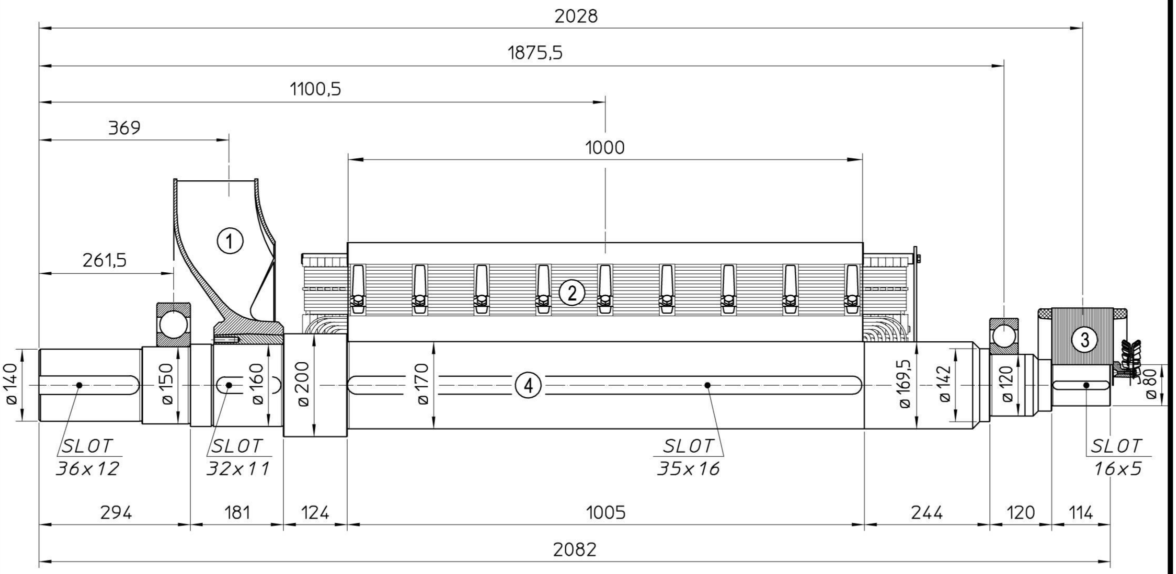
SAE N.	FLANGIA/FLANGE BRIDE/FLANSCH				
	O	P	Q	S	α
00	883	787.4	850.9	14	22.5°
0	711	647.7	679.5	14	22.5°

SAE N.	GIUNTI A DISCHI / DISC COUPLING DISCQUE DE MONOPALIER / SCHEIBENKUPPLUNG					
	d	L	M	Q1	S1	α1
18	571.5	15.7	15	542.92	16.5	60°
21	673.1	0	17	641.35	16.5	30°

C.G.= GRAVITY CENTER

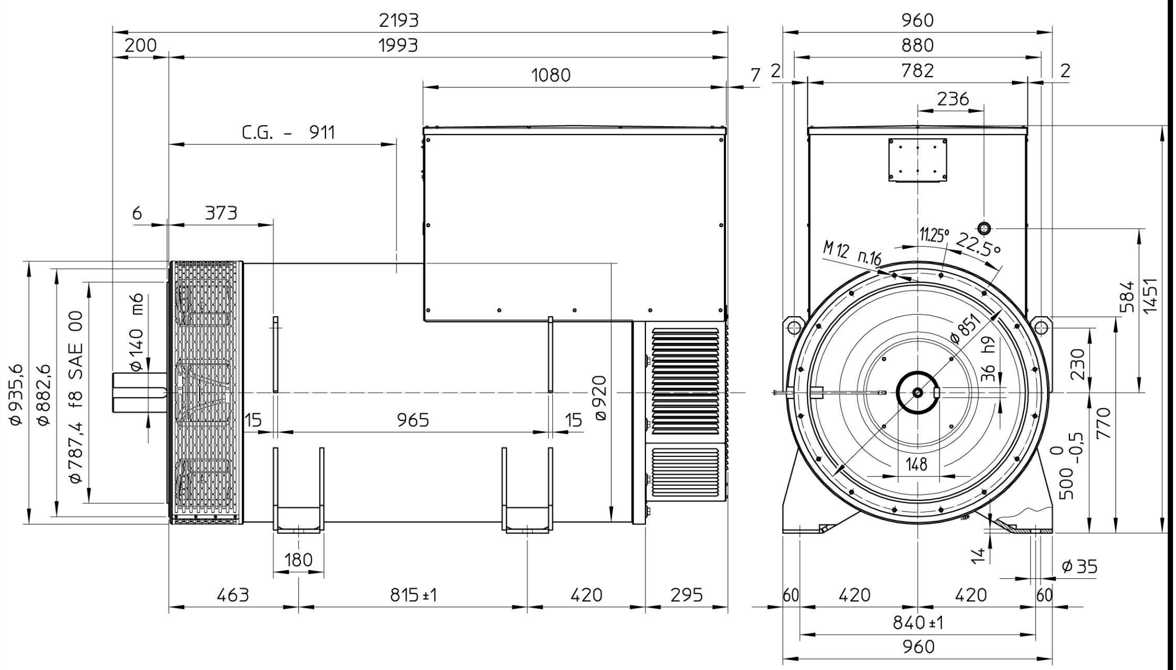
ECO46 VL4 A

TWO BEARING MOMENTS OF INERTIA



POS.	COMPONENT	WEIGHT (kg)	J (kgm^2)
1	FAN	42.4	2.2323
2	MAIN ROTOR	1443.7	56.3916
3	EX. ROTOR	59.8	0.7260
4	SHAFT	323.4	1.1150
	TOTAL	1869.3	60.4649

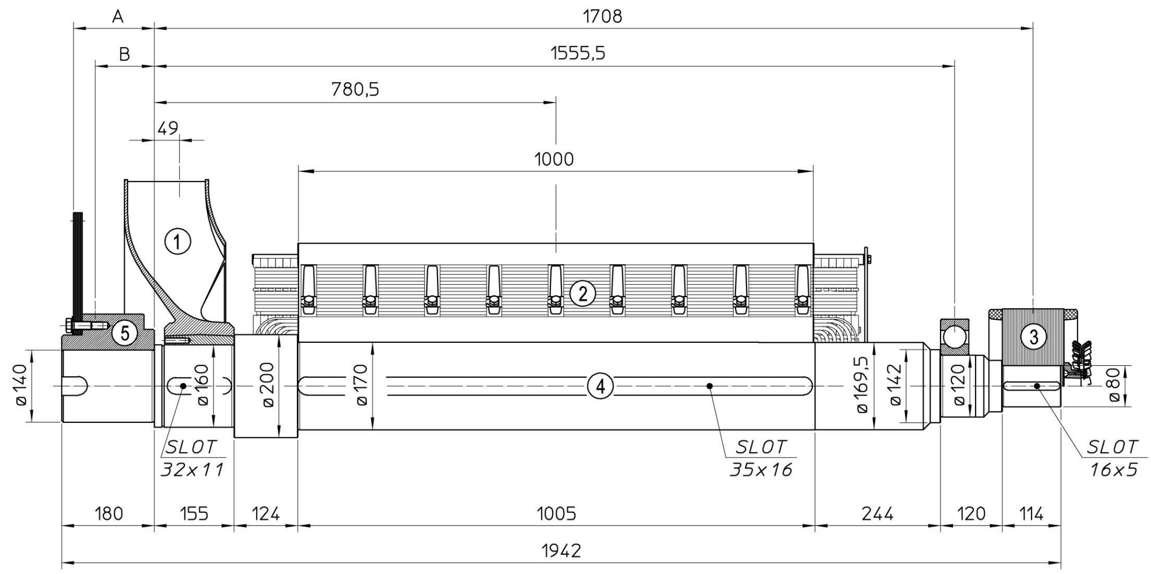
TWO BEARING DIMENSIONS



C.G.= GRAVITY CENTER

ECO46 VL4 A

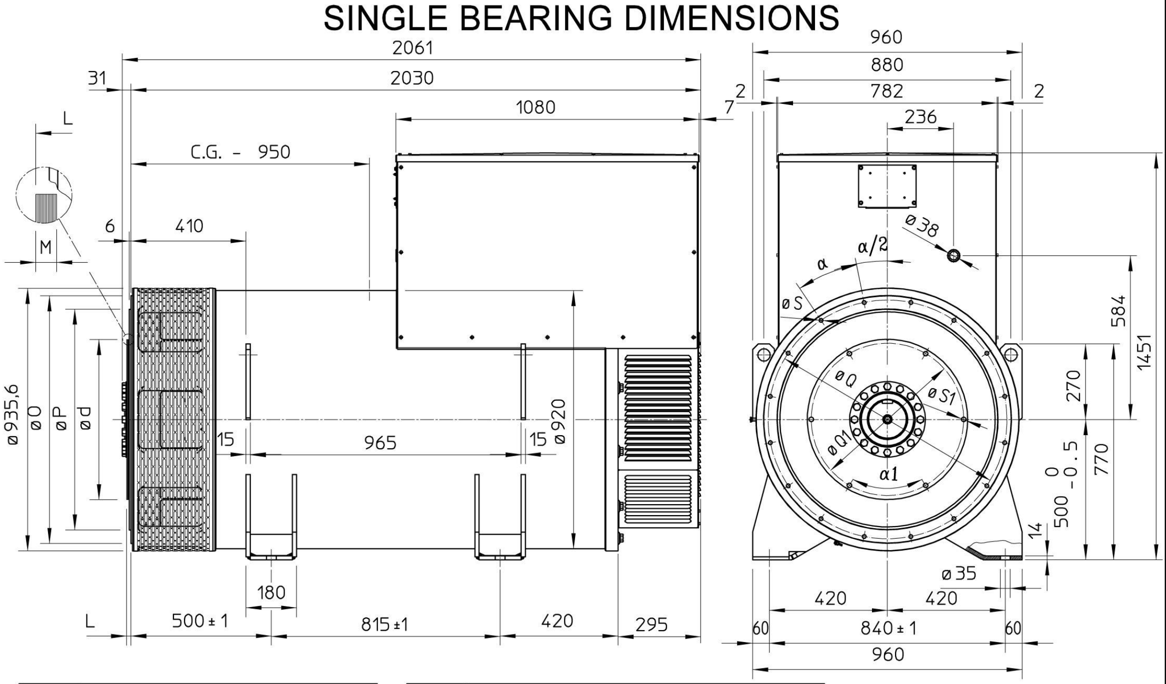
SINGLE BEARING MOMENTS OF INERTIA



POS.	COMPONENT	WEIGHT (kg)	J (kgm^2)
1	FAN	42.4	2.2323
2	MAIN ROTOR	1443.7	56.3916
3	EX. ROTOR	59.8	0.7260
4	SHAFT	304.4	1.0616
	TOTAL	1850.3	60.4115

POS.	COMPONENT	SAE N°	A	B	WEIGHT (kg)	J (kgm^2)
5	SHAFTS COUPLING FLEX PLATE	18	172.7	113.4	82.9	1.8652
		21	157.0	114.6	93.8	3.2090

SINGLE BEARING DIMENSIONS



SAE N.	FLANGIA/FLANGE BRIDE/FLANSCH				
	O	P	Q	S	α
00	883	787.4	850.9	14	22.5°
0	711	647.7	679.5	14	22.5°

SAE N.	GIUNTI A DISCHI / DISC COUPLING DISCQUE DE MONOPALIER / SCHEIBENKUPPLUNG				
	d	L	M	Q1	S1	α1
18	571.5	15.7	15	542.92	16.5	60°
21	673.1	0	17	641.35	16.5	30°

C.G.= GRAVITY CENTER

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