mecc alte

Totally Focused. Totally Independent.

Technical Guide

ECO40 4 B

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

Rev. 1

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)

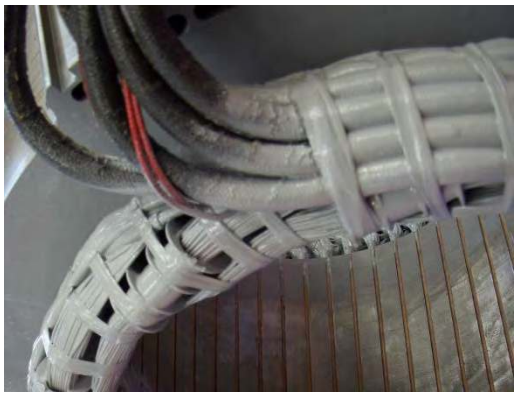
- 6 wire reconnectable:
  50Hz – 380V to 440V and 220V to 240V (de-rates may apply at certain voltages)
  60Hz – 380V to 480V and 220V to 240V (de-rates may apply at certain voltages)

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,NPE32 and ECP32	-	Std	Option	Option	Option
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.

ECO40 4 B

General characteristics

Pole number	4	Insulation class	H
Phase number	3	Protection class	IP23
Number of wires	12	NDE Bearing type	6318.2RS
Execution	Brushless	DE Bearing type	6322
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
ECO40 1S4 B	**kVA**	440	**440**	440	404	417	**417**	417	386	400	**400**	400	370	370	**370**	370	342	320	**320**	320	296
	kW	352	**352**	352	323	334	**334**	334	309	320	**320**	320	296	296	**296**	296	273	256	**256**	256	237
ECO40 2S4 B	**kVA**	491	**491**	491	393	468	**468**	468	375	450	**450**	450	360	410	**410**	410	330	360	**360**	360	288
	kW	393	**393**	393	314	374	**374**	374	300	360	**360**	360	288	328	**328**	328	264	288	**288**	288	230
ECO40 3S4 B	**kVA**	546	**546**	546	503	521	**521**	521	479	500	**500**	500	460	450	**450**	450	414	400	**400**	400	368
	kW	437	**437**	437	402	417	**417**	417	383	400	**400**	400	368	360	**360**	360	331	320	**320**	320	294
ECO40 1L4 B	**kVA**	601	**601**	590	546	567	**567**	557	515	550	**550**	540	500	500	**500**	490	454	440	**440**	432	400
	kW	481	**481**	472	437	454	**454**	446	412	440	**440**	432	400	400	**400**	392	363	352	**352**	346	320
ECO40 1.5L4 B	**kVA**	675	**675**	675	616	645	**645**	645	588	625	**625**	625	570	564	**564**	564	515	500	**500**	500	456
	kW	540	**540**	540	493	516	**516**	516	470	500	**500**	500	456	451	**451**	451	412	400	**400**	400	365
ECO40 2L4 B	**kVA**	735	**735**	735	560	700	**700**	700	535	680	**680**	680	520	630	**630**	630	483	544	**544**	544	416
	kW	588	**588**	588	448	560	**580**	580	428	544	**544**	544	416	504	**504**	504	386	435	**435**	435	333
ECO40 VL4 B	**kVA**	825	**825**	825	740	777	**777**	777	700	750	**750**	750	680	690	**690**	690	630	600	**600**	600	544
	kW	660	**660**	660	592	622	**622**	622	560	600	**600**	600	544	552	**552**	552	504	480	**480**	480	435

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
ECO40 1S4 B	**kVA**	459	492	525	**525**	438	469	500	**500**	420	450	480	**480**	383	410	440	**440**	336	360	384	**384**
	kW	367	394	420	**420**	350	375	400	**400**	336	360	384	**384**	306	328	352	**352**	269	288	307	**307**
ECO40 2S4 B	**kVA**	524	557	590	**590**	500	532	563	**563**	480	510	540	**540**	435	460	490	**490**	384	408	432	**432**
	kW	419	446	472	**472**	400	426	450	**450**	384	408	432	**432**	348	368	392	**392**	307	326	346	**346**
ECO40 3S4 B	**kVA**	590	634	656	**656**	563	604	625	**625**	540	580	600	**600**	484	520	540	**540**	432	464	480	**480**
	kW	472	507	525	**525**	450	483	500	**500**	432	464	480	**480**	387	416	432	**432**	346	371	384	**384**
ECO40 1L4 B	**kVA**	623	669	722	**722**	587	649	680	**680**	570	630	660	**660**	515	570	600	**600**	456	504	528	**528**
	kW	498	535	578	**578**	470	519	544	**544**	456	504	528	**528**	412	456	480	**480**	365	403	422	**422**
ECO40 1.5L4 B	**kVA**	720	762	810	**810**	688	730	775	**775**	665	705	750	**750**	605	636	677	**677**	532	564	600	**600**
	kW	576	610	648	**648**	550	584	620	**620**	532	564	600	**600**	484	509	542	**542**	426	451	480	**480**
ECO40 2L4 B	**kVA**	778	843	882	**882**	741	803	840	**840**	720	780	816	**816**	665	720	756	**756**	576	624	653	**653**
	kW	622	674	706	**706**	593	642	672	**672**	576	624	653	**653**	532	576	604	**604**	461	499	522	**522**
ECO40 VL4 B	**kVA**	930	970	970	**970**	885	925	925	**925**	860	900	900	**900**	790	830	830	**830**	688	720	720	**720**
	kW	744	776	776	**776**	708	740	740	**740**	688	720	720	**720**	632	664	664	**664**	550	576	576	**576**

Reactance & Time constants- Class H / 400V

Unsaturated (ref. EN60034-4)			ECO40 1S4 B	ECO40 2S4 B	ECO40 3S4 B	ECO40 1L4 B	ECO40 1.5L4 B	ECO40 2L4 B	ECO40 VL4 B
Xd	Direct-axis synchronous reactance	%	286,7	240,1	258,7	246,3	270	234,9	175,9
X'd	Direct-axis transient reactance	%	23,3	22,1	21,7	20,1	19,8	18,7	16,7
X"d	Direct-axis subtransient reactance	%	14,7	12,5	11,8	10,6	10,5	9,52	9
Xq	Quadrature-axis synchronous reactance	%	115,9	110,7	111,8	115,9	157,1	145,9	122,1
X'q	Quadrature-axis transient reactance	%	115,9	110,7	111,8	115,9	157,1	145,9	122,1
X"q	Quadrature-axis subtransient reactance	%	29,2	28,4	27,3	24,9	24	16,8	14,8
X_2	Negative-sequence reactance	%	19,1	18,2	17,3	13	12,4	14,6	12,5
X_0	Zero sequence reactance	%	3,62	3,21	3,1	2,9	2,9	2,48	2,28
Saturated									
Xd	Direct-axis synchronous reactance	%	238	199,3	214,7	204,4	224,1	195	146
X'd	Direct-axis transient reactance	%	19,3	18,4	18	16,7	16,4	15,5	13,8
X"d	Direct-axis subtransient reactance	%	12,2	10,4	9,79	8,76	8,72	7,9	7,47
Xq	Quadrature-axis synchronous reactance	%	96,2	91,9	92,8	96,2	130,4	121,1	101,4
X'q	Quadrature-axis transient reactance	%	96,2	91,9	92,8	96,2	130,4	121,1	101,4
X"q	Quadrature-axis subtransient reactance	%	24,2	23,5	22,7	20,7	19,9	13,9	12,3
X_2	Negative-sequence reactance	%	15,8	15,1	14,4	10,8	10,3	12,1	10,4
X_0	Zero sequence reactance	%	3,62	3,21	3,1	2,9	2,9	2,48	2,28
Kcc	Short circuit ratio		0,36	0,5	0,4	0,49	0,45	0,44	0,59
T'd	Transient time constant	sec	0,16	0,13	0,14	0,14	0,15	0,18	0,18
T"d	Subtransient time constant	sec	0,019	0,019	0,021	0,021	0,019	0,019	0,015
T'do	Open circuit time constant	sec	2,55	2,7	2,8	2,9	3,1	3,1	3,7
Ta	Armature time constant	sec	0,017	0,03	0,031	0,04	0,04	0,052	0,071

Additional information - Class H / 400V

Io	Excitation current at no load	A	0,8	0,6	0,7	0,7	0,73	0,7	0,6
Ic	Excitation current at full load	A	3,6	3,4	3,5	3,3	3,2	4,4	3,2
Overload			1 hour in a 6 hours period 110% rated load						
Overload per 20 sec.		%	300						
Heat dissipation		W	19703	21356	22833	24135	26316	28632	30915
Telephone Harmonic Factor - THF		%	<2	<2	<2	<2	<2	<2	<2
Waveform Distors.(THD) full load LL/LN		%	2,6 / 2,6	2,7 / 2,8	2,4 / 2,5	2,5 / 2,5	2,2 / 2,4	2,1 / 2,1	2,2 / 2,2
Waveform Distors.(THD) no load LL/LN		%	2,9 / 2,9	2,5 / 2,6	2,6 / 2,5	2,3 / 2,4	2,4 / 2,5	2,4 / 2,4	2,5 / 2,5

Reactance & Time constants- Class H / 480V

Unsaturated (ref. EN60034-4)			ECO40 1S4 B	ECO40 2S4 B	ECO40 3S4 B	ECO40 1L4 B	ECO40 1.5L4 B	ECO40 2L4 B	ECO40 VL4 B
Xd	Direct-axis synchronous reactance	%	286,7	240,1	258,7	246,3	270	234,9	175,9
X'd	Direct-axis transient reactance	%	23,3	22,1	21,7	20,1	19,8	18,7	16,7
X"d	Direct-axis subtransient reactance	%	14,7	12,5	11,8	10,6	10,5	9,52	9
Xq	Quadrature-axis synchronous reactance	%	115,9	110,7	111,8	115,9	157,1	145,9	122,1
X'q	Quadrature-axis transient reactance	%	115,9	110,7	111,8	115,9	157,1	145,9	122,1
X"q	Quadrature-axis subtransient reactance	%	29,2	28,4	27,3	24,9	24	16,8	14,8
X_2	Negative-sequence reactance	%	19,1	18,2	17,3	13	12,4	14,6	12,5
X_0	Zero sequence reactance	%	3,62	3,21	3,1	2,9	2,9	2,48	2,28
Saturated									
Xd	Direct-axis synchronous reactance	%	238	199,3	214,7	204,4	224,1	195	146
X'd	Direct-axis transient reactance	%	19,3	18,4	18	16,7	16,4	15,5	13,9
X"d	Direct-axis subtransient reactance	%	12,2	10,4	9,79	8,76	8,72	7,9	7,47
Xq	Quadrature-axis synchronous reactance	%	96,2	91,9	92,8	96,2	130,4	121,1	101,3
X'q	Quadrature-axis transient reactance	%	96,2	91,9	92,8	96,2	130,4	121,1	101,3
X"q	Quadrature-axis subtransient reactance	%	24,2	23,5	22,7	20,7	19,9	13,9	12,3
X_2	Negative-sequence reactance	%	15,8	15,1	14,4	10,8	10,3	12,1	10,4
X_0	Zero sequence reactance	%	3,62	3,21	3,1	2,9	2,9	2,48	2,28
Kcc	Short circuit ratio		0,36	0,5	0,4	0,49	0,45	0,44	0,59
T'd	Transient time constant	sec	0,16	0,13	0,14	0,14	0,15	0,18	0,18
T"d	Subtransient time constant	sec	0,019	0,019	0,021	0,021	0,019	0,019	0,015
T'do	Open circuit time constant	sec	2,55	2,7	2,8	2,9	3,1	3,1	3,7
Ta	Armature time constant	sec	0,017	0,03	0,031	0,04	0,04	0,052	0,071

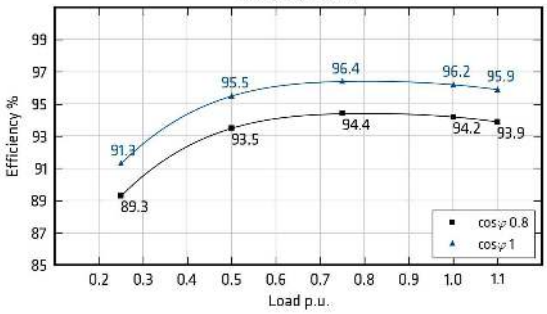
Additional information - Class H / 480V

Io	Excitation current at no load	A	0,8	0,6	0,7	0,7	0,66	0,7	0,6
Ic	Excitation current at full load	A	3,5	3,2	3,4	3,2	3,1	3,9	3,2
Overload			1 hour in a 6 hours period 110% rated load						
Overload per 20 sec.		%	300						
Heat dissipation		W	19361	21305	22092	23148	23701	24386	25342
Telephone Interferance Factor - TIF			<40	<40	<40	<40	<40	<40	<40
Waveform Distors.(THD) full load LL/LN		%	2,6 / 2,6	2,7 / 2,8	2,4 / 2,5	2,5 / 2,5	2,2 / 2,4	2,1 / 2,1	2,2 / 2,2
Waveform Distors.(THD) no load LL/LN		%	2,9 / 2,9	2,5 / 2,6	2,6 / 2,5	2,3 / 2,4	2,4 / 2,5	2,4 / 2,4	2,5 / 2,5

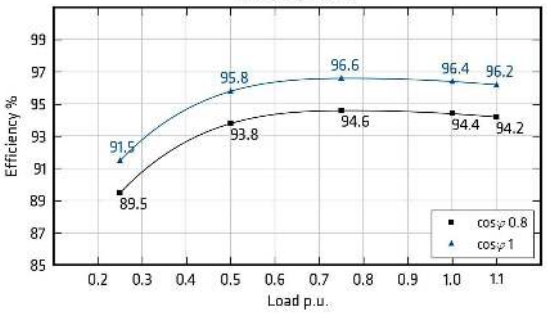
Efficiencies @ 50Hz

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
ECO40 1S4 B	%	89,1	93,3	94,2	94,1	93,9	89,3	93,5	94,4	94,2	93,9	89,2	93,3	94,1	94,0	93,7	89,0	93,1	93,9	93,8	93,5
ECO40 2S4 B	%	89,4	93,5	94,3	94,1	93,9	89,5	93,8	94,6	94,4	94,2	89,4	93,7	94,5	94,2	93,9	89,2	93,5	94,1	93,9	93,7
ECO40 3S4 B	%	90,2	93,7	94,6	94,4	94,3	90,3	93,9	94,8	94,6	94,4	90,1	93,7	94,7	94,5	94,3	89,8	93,4	94,4	94,2	94,0
ECO40 1L4 B	%	90,5	94,0	94,9	94,7	94,5	90,5	94,1	95,0	94,8	94,5	90,3	94,0	94,9	94,6	94,2	90,0	93,8	94,5	94,4	94,2
ECO40 1.5L4 B	%	91,0	94,1	94,9	94,8	94,6	91,1	94,2	95,1	95,0	94,8	91,1	94,1	94,9	94,7	94,4	90,5	94,0	94,6	94,4	94,2
ECO40 2L4 B	%	91,4	94,1	95,0	94,8	94,6	91,5	94,3	95,2	95,0	94,8	91,3	94,2	95,0	94,7	94,4	90,8	93,8	94,4	94,5	94,4
ECO40 VL4 B	%	91,5	94,2	95,1	94,8	94,5	91,6	94,4	95,3	95,1	94,8	91,4	94,2	95,1	94,9	94,6	90,8	93,7	94,6	94,4	94,2

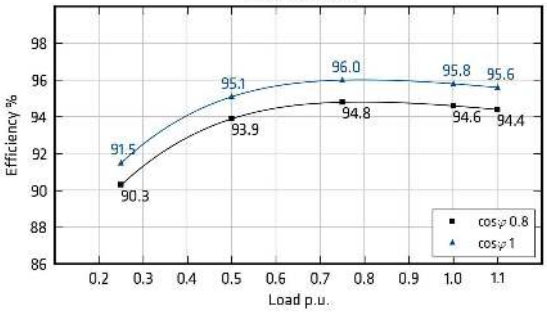
ECO40 1S4 B
400/230 50Hz



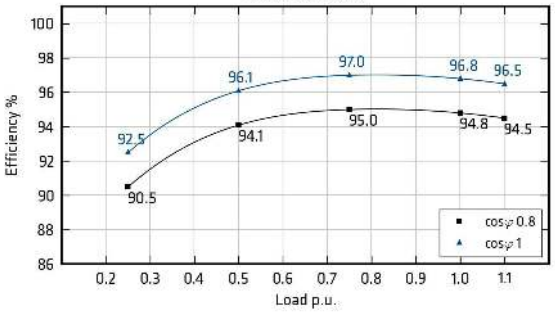
ECO40 2S4 B
400/230 50Hz



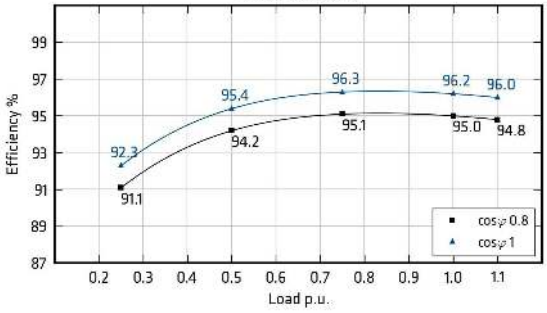
ECO40 3S4 B
400/230 50Hz



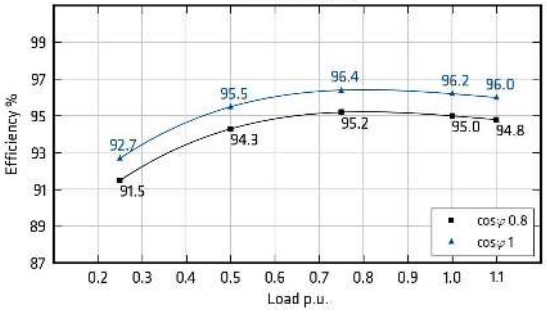
ECO40 1L4 B
400/230 50Hz



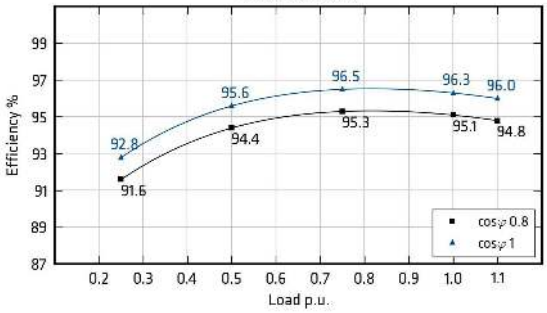
ECO40 1.5L4 B
400/230 50Hz



ECO40 2L4 B
400/230 50Hz



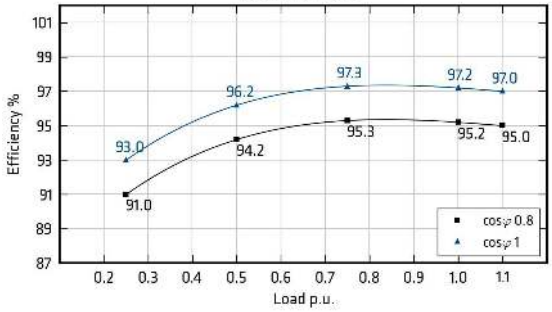
ECO40 VL4 B
400/230 50Hz



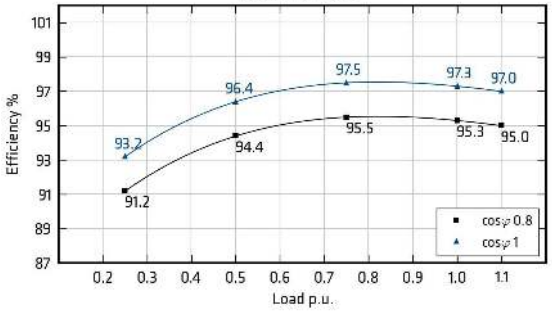
Efficiencies @ 60Hz

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
ECO40 1S4 B	%	90,4	93,3	94,5	94,4	94,2	90,6	93,8	94,9	94,8	94,7	90,8	94,0	95,2	95,1	94,9	91,0	94,2	95,3	95,2	95,0
ECO40 2S4 B	%	90,6	93,5	94,6	94,5	94,3	90,9	94,0	95,1	95,0	94,8	91,1	94,2	95,3	95,2	94,9	91,2	94,4	95,5	95,3	95,0
ECO40 3S4 B	%	90,5	93,9	95,2	95,0	94,7	90,7	94,5	95,5	95,3	95,1	90,9	94,7	95,7	95,5	95,3	91,1	94,9	95,8	95,6	95,3
ECO40 1L4 B	%	91,0	94,7	95,5	95,3	95,1	91,1	94,8	95,7	95,6	95,5	91,1	94,9	95,8	95,7	95,6	91,3	95,1	96,0	95,8	95,6
ECO40 1.5L4 B	%	92,1	94,8	95,6	95,5	95,1	92,1	94,9	96,0	95,9	95,6	92,2	95,0	96,1	96,0	95,7	92,3	95,2	96,3	96,2	95,9
ECO40 2L4 B	%	91,4	94,8	95,8	95,7	95,3	91,5	95,0	96,1	96,0	95,7	91,7	95,2	96,4	96,2	95,9	92,1	95,5	96,6	96,4	96,0
ECO40 VL4 B	%	91,4	94,8	95,9	95,8	95,4	91,7	95,1	96,3	96,1	95,8	92,0	95,4	96,7	96,5	96,2	92,2	95,6	96,8	96,6	96,1

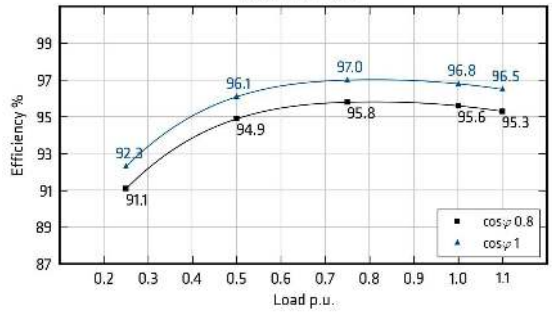
ECO40 1S4 B
480/277 60Hz



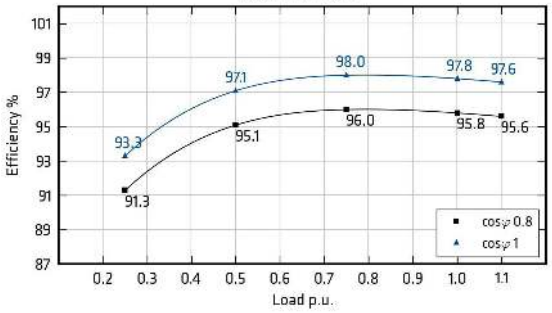
ECO40 2S4 B
480/277 60Hz



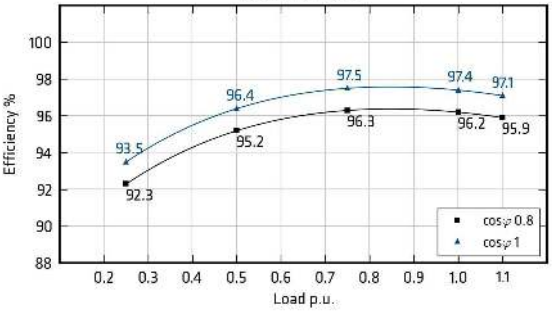
ECO40 3S4 B
480/277 60Hz



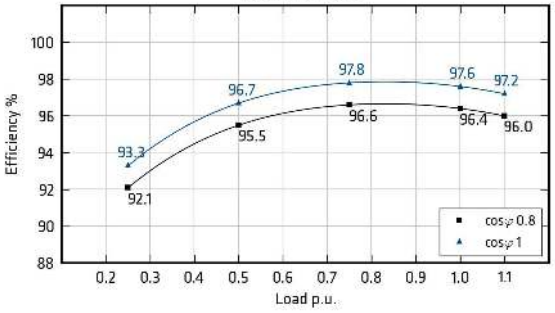
ECO40 1L4 B
480/277 60Hz



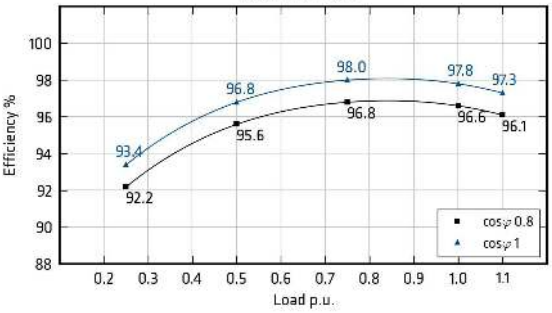
ECO40 1.5L4 B
480/277 60Hz



ECO40 2L4 B
480/277 60Hz



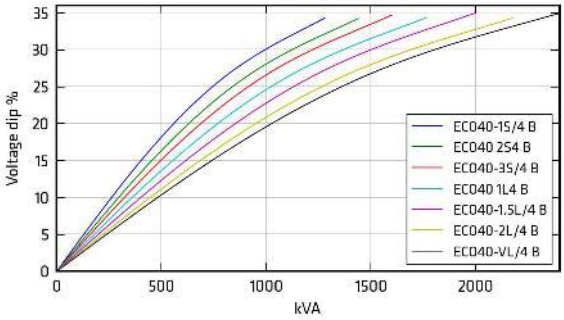
ECO40 VL4 B
480/277 60Hz



Transients voltage

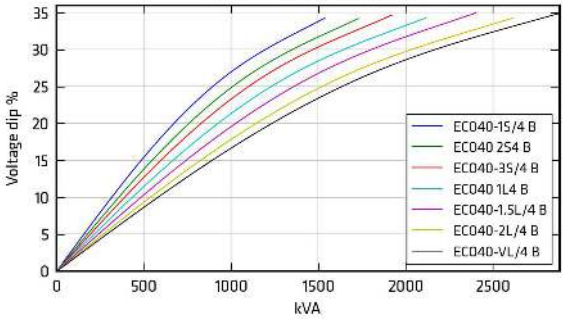
400V - 50Hz

Motor Starting @ P.F. 0,6

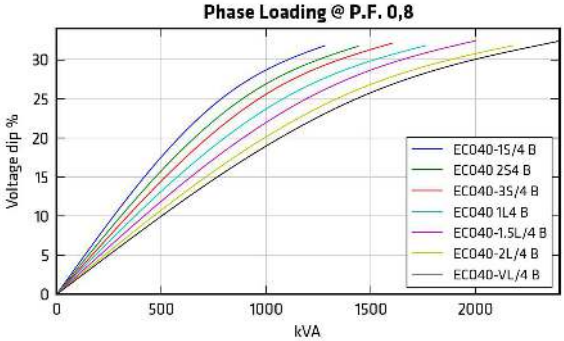


480V - 60Hz

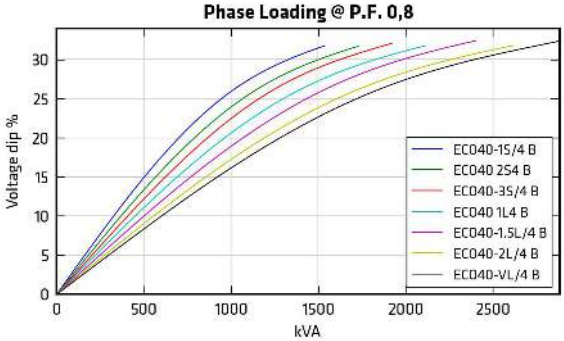
Motor Starting @ P.F. 0,6



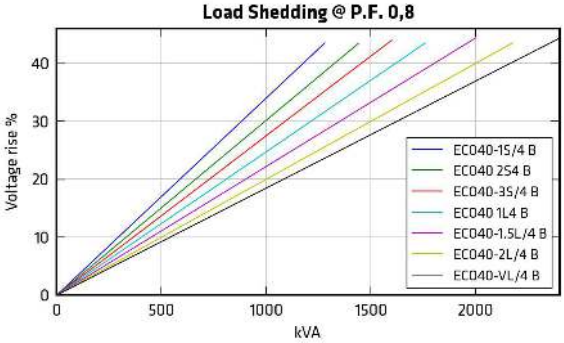
Phase Loading @ P.F. 0,8



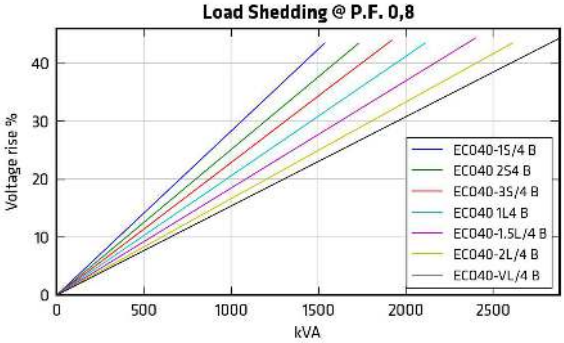
Phase Loading @ P.F. 0,8



Load Shedding @ P.F. 0,8



Load Shedding @ P.F. 0,8



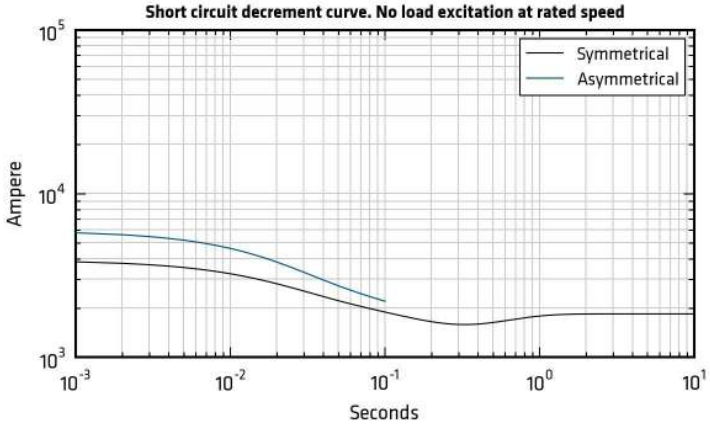
In order to scale transient curves as a function of a power factor or voltage if not indicated, please proceed as follows:

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.

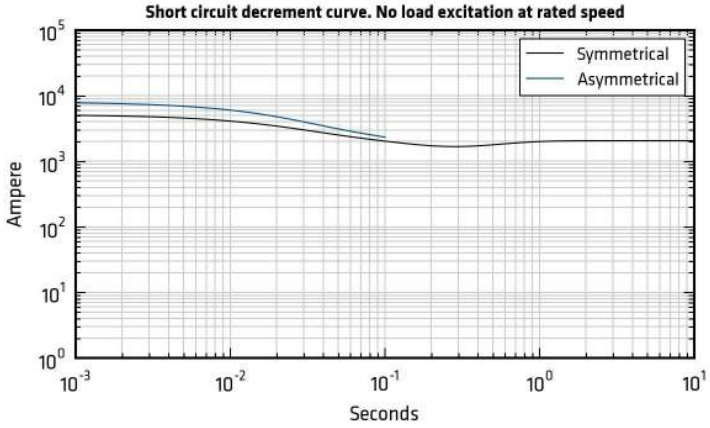
Voltage coefficient corrector (VCC):
VCC=(400/Vnew)2 if 50 Hz; VCC=(480/Vnew)2 if 60 Hz
Example. VCC at 415V 60 Hz is 1.338 [VCC=(480/415)^2]. This means that the voltage fall at a given power at 415V is equivalent to the one that can be read on the power factor 0.6 curve if the load is considered 1.338 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

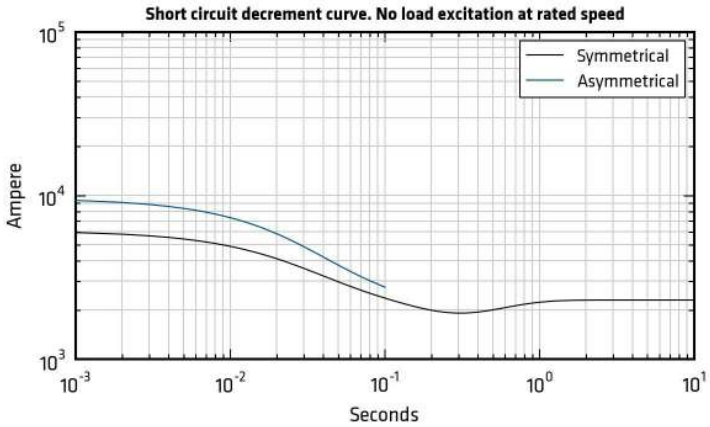
ECO40 1S4 B



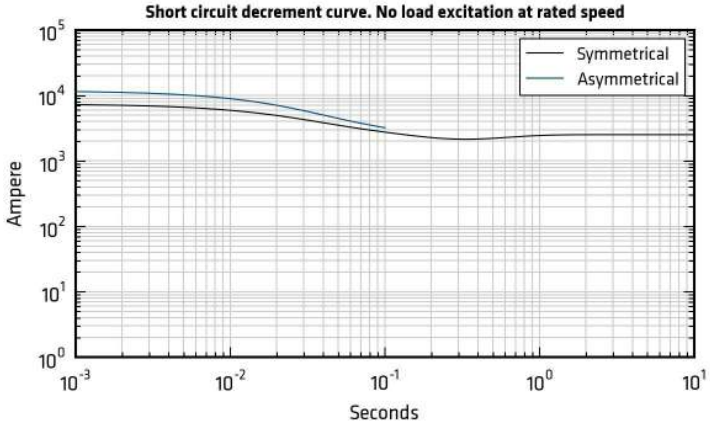
ECO40 2S4 B



ECO40 3S4 B



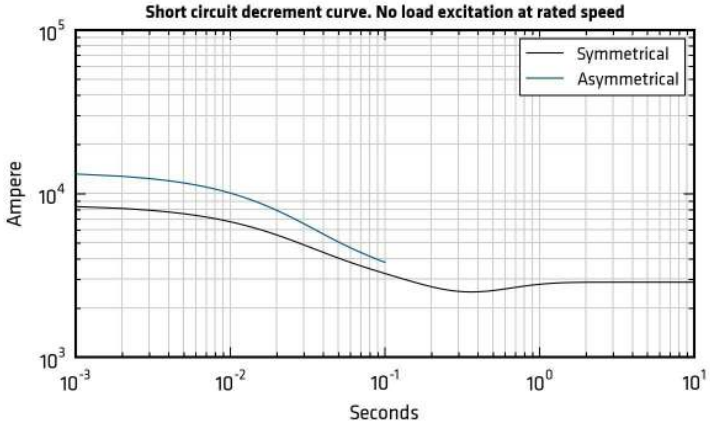
ECO40 1L4 B



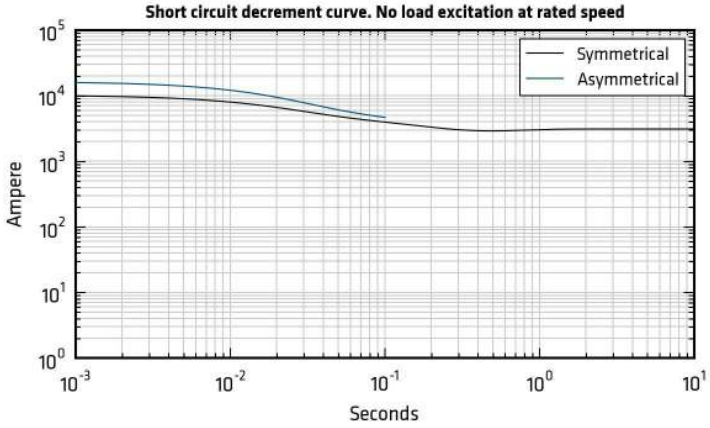
*Please refer to tables at page 6

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

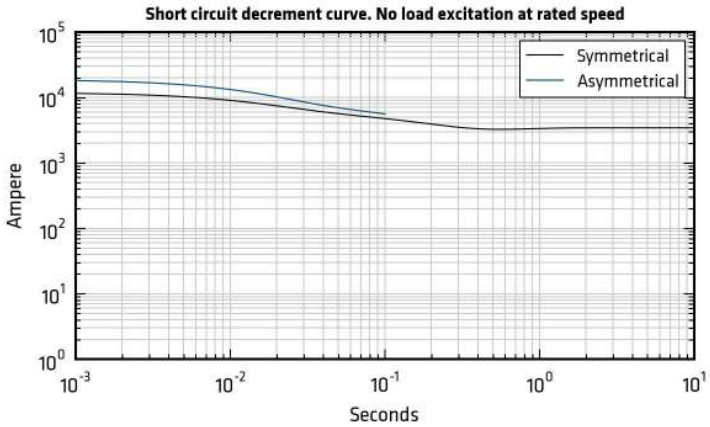
ECO40 1.5L4 B



ECO40 2L4 B



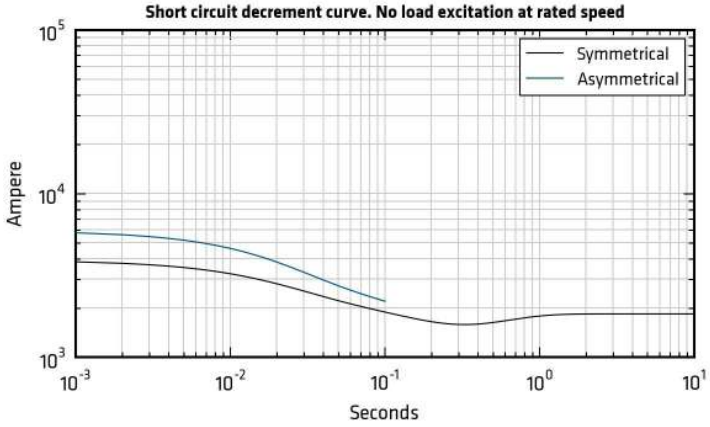
ECO40 VL4 B



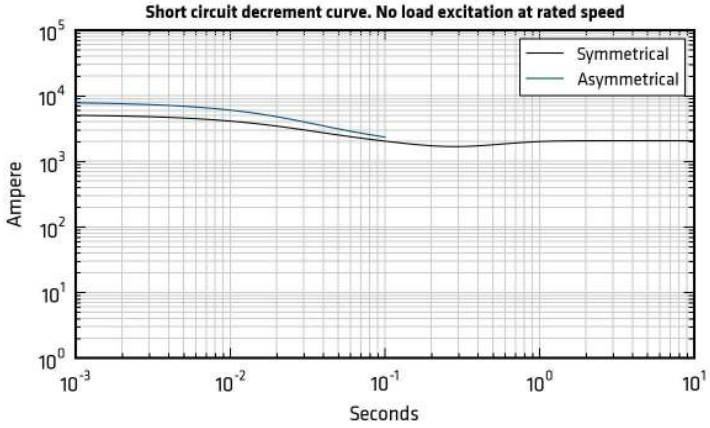
*Please refer to tables at page 6

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

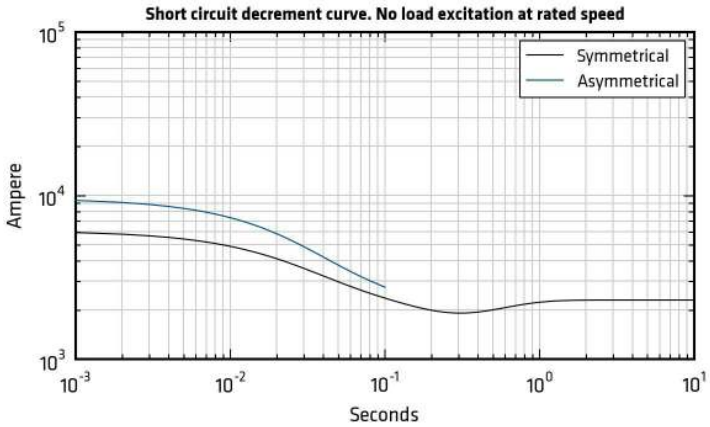
ECO40 1S4 B



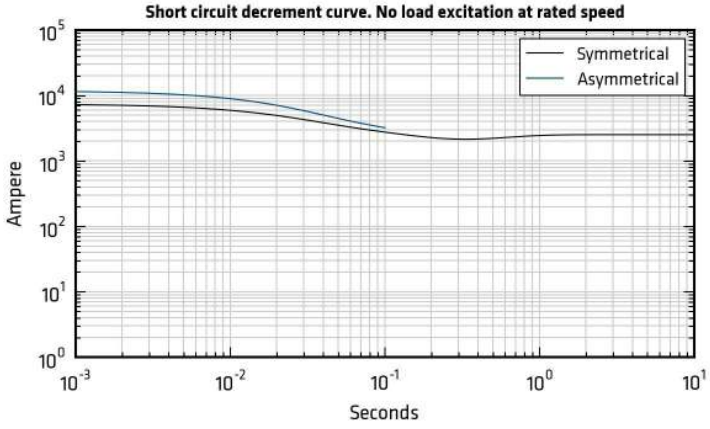
ECO40 2S4 B



ECO40 3S4 B



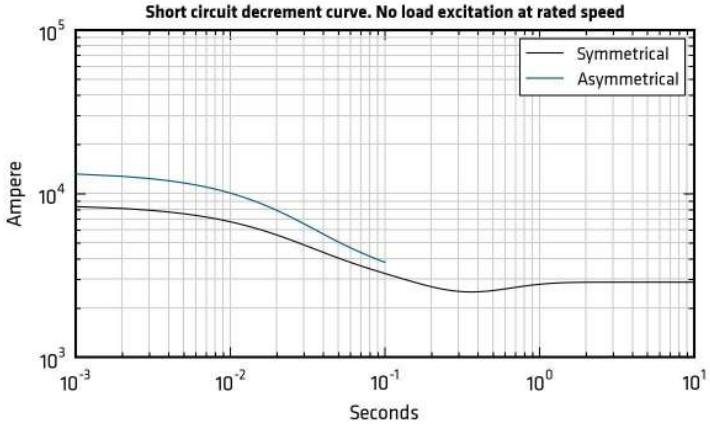
ECO40 1L4 B



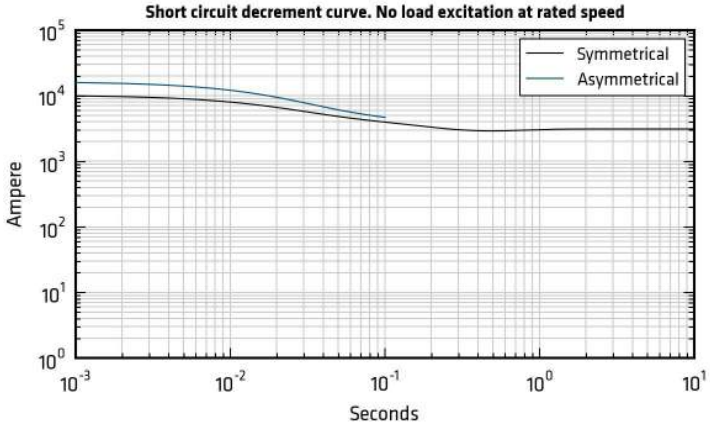
*Please refer to tables at page 6

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

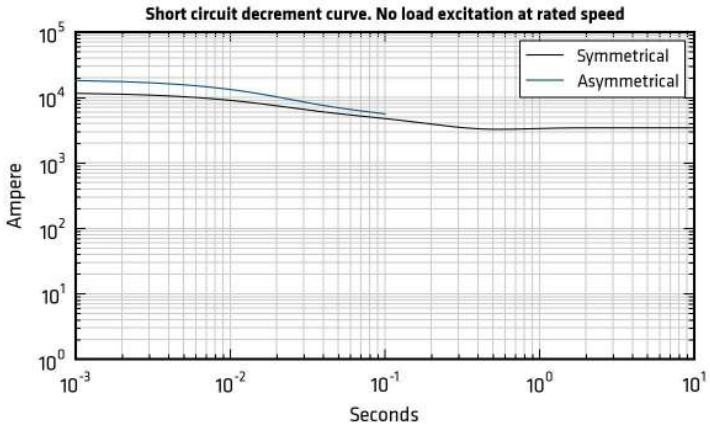
ECO40 1.5L4 B



ECO40 2L4 B



ECO40 VL4 B

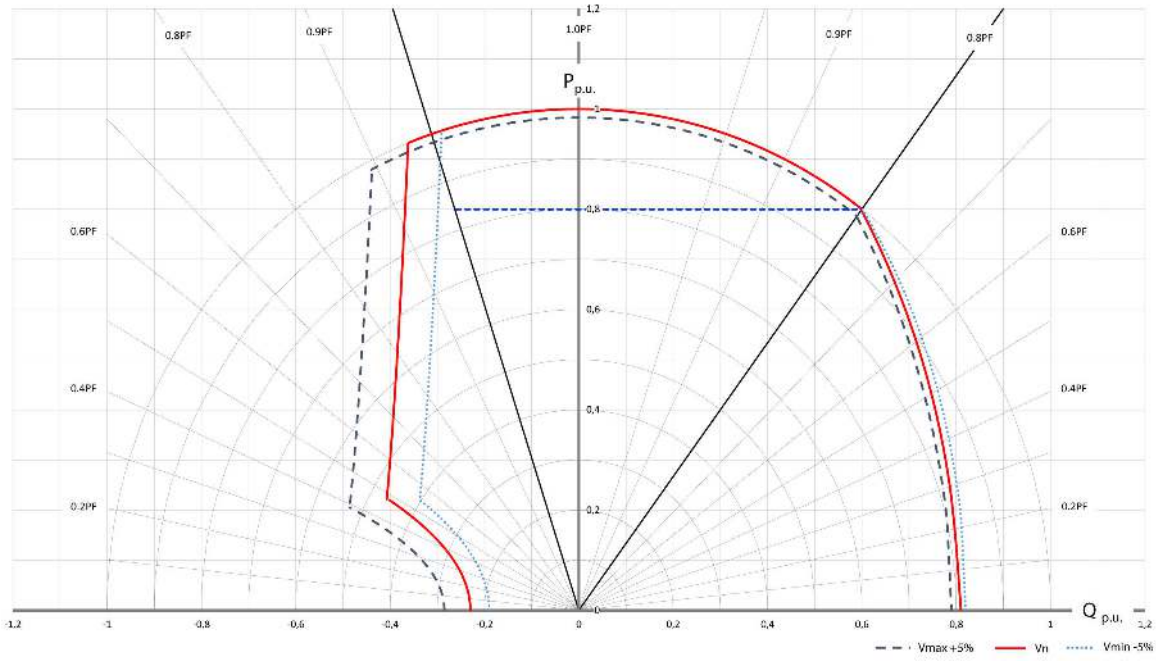


*Please refer to tables at page 6

Additional Characteristics

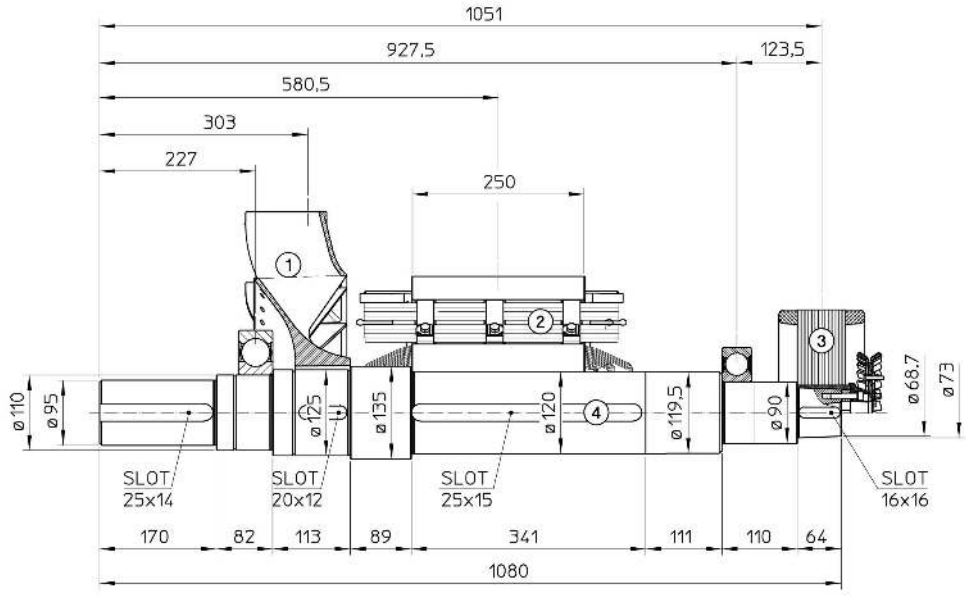
Data		ECO40 1S4 B		ECO40 2S4 B		ECO40 3S4 B		ECO40 1L4 B		ECO40 1.5L4 B		ECO40 2L4 B		ECO40 VL4 B	
		50Hz	60Hz	50Hz	60Hz	50Hz	60Hz	50Hz	60Hz	50Hz	60Hz	50Hz	60Hz	50Hz	60Hz
Damper cage		Copper													
Stator Winding Resistance (20°C)	Ω	0,017		0,013		0,014		0,01		0,009		0,009		0,008	
Rotor Winding Resistance (20°C)	Ω	4,488		4,881		5,176		6,025		1,376		1,5		1,592	
Stator Exciter Resistance (20°C)	Ω	8,85		8,85		8,85		8,85		8,85		8,85		8,85	
Rotor Exciter Resistance (20°C)	Ω	0,317		0,317		0,317		0,317		0,05		0,05		0,05	
Weight of complete generator	kg	1049,0		1133,0		1208,0		1323,0		1458,0		1536,0		1752,0	
Unbalanced magnetic pull	kN/mm	5,0		5,9		6,5		6,1		6,5		6,8		6,9	
Air flow	m^3/min	54,0	64,8	54,0	64,8	54,0	64,8	54,0	64,8	54,0	64,8	54,0	64,8	54,0	64,8
Noise level at 1m/7m	dB(A)	94/82	98/88	94/82	98/88	94/82	98/88	94/82	98/88	94/82	98/88	94/82	98/88	94/82	98/88

PQ Diagram



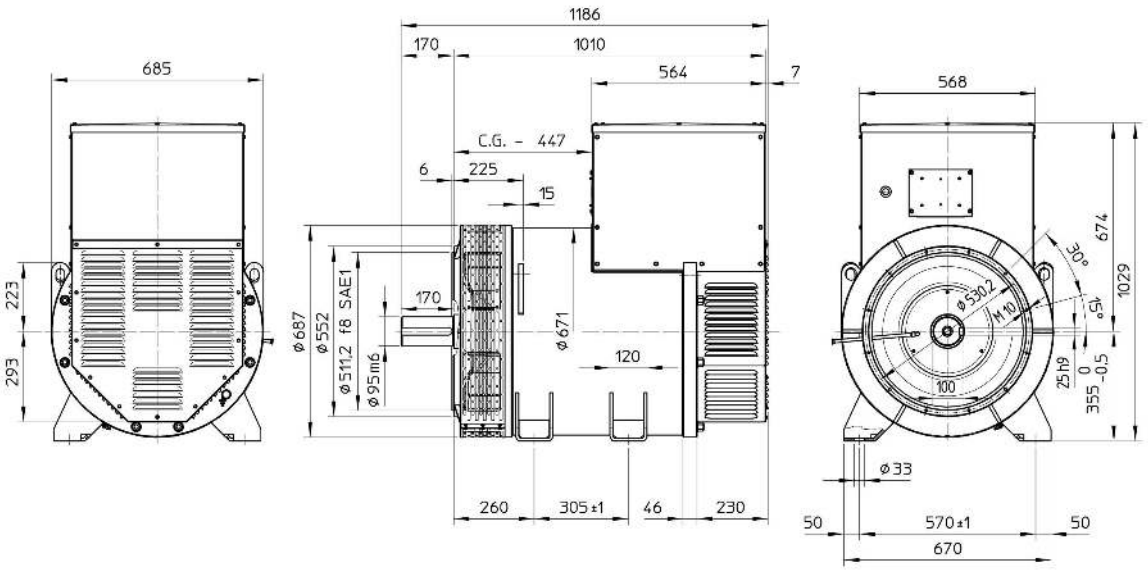
ECO40 1S4 B

TWO BEARING MOMENTS OF INERTIA



POS.	COMPONENT	WEIGHT (kg)	J (kgm^2)
1	FAN	12.4	0.4389
2	MAIN ROTOR	208.9	4.2730
3	EX. ROTOR	36.8	0.4381
4	SHAFT	81.7	0.1385
TOTAL		339.8	5.2885

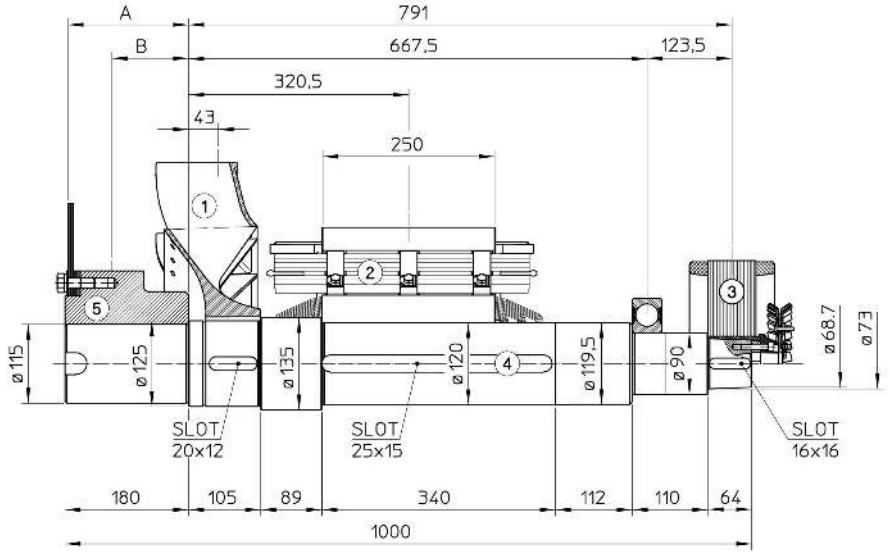
TWO BEARING DIMENSIONS



C.G.= GRAVITY CENTER

ECO40 1S4 B

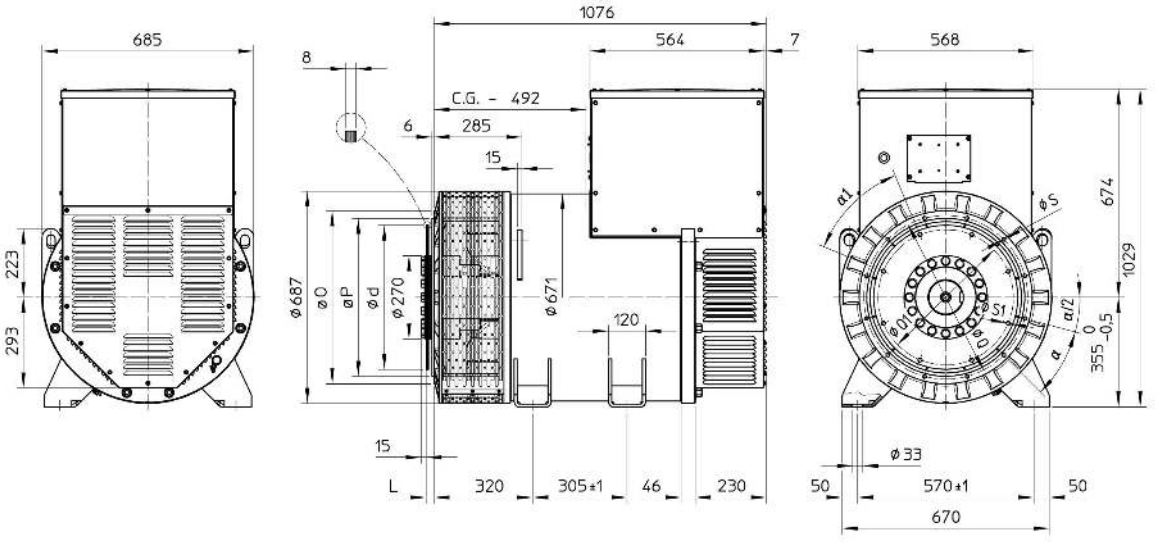
SINGLE BEARING MOMENTS OF INERTIA



POS.	COMPONENT	WEIGHT (kg)	J (kgm^2)
1	FAN	12.4	0.4389
2	MAIN ROTOR	208.9	4.2730
3	EX. ROTOR	36.8	0.4381
4	SHAFT	80.3	0.1416
TOTAL		338.4	5.2916

SAE	5	SHAFTS COUPLING FLEX PLATE		
N°	A	B	WEIGHT kg	J kgm^2
14	175.7	111.7	57.5	0.7587
18	165.7	112.7	60.9	1.0919

SINGLE BEARING DIMENSIONS



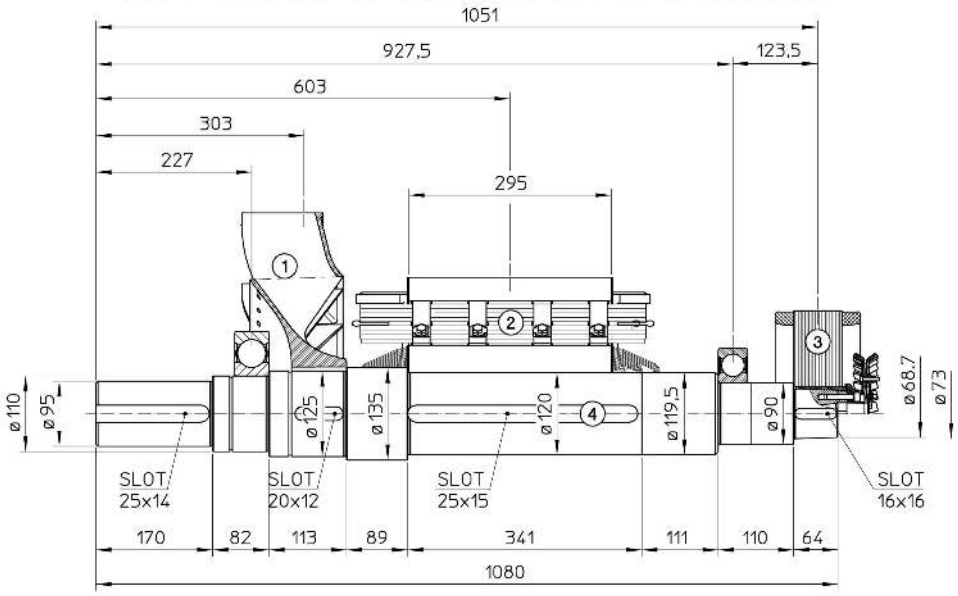
SAE N.	FLANGIA / LANGE BRIDE / FLANSCH				
	O	P	Q	S	α
1	560	511.2	530.2	11	30°
1/2	648	584.2	619.1	14	30°
0	711	647.7	679.5	14	22.5°
00	883	787.4	850.9	14	22.5°

SAE N.	GIUNTI A DISCHI / DISC COUPLING DISCQUE DE MONOPALIER / SCHEIBENKUPPLUNG				
	d	L	Q1	S1	α1
14	466.72	25.4	438.15	13.5	45°
18	571.5	15.7	542.92	16.5	60°

C.G.= GRAVITY CENTER

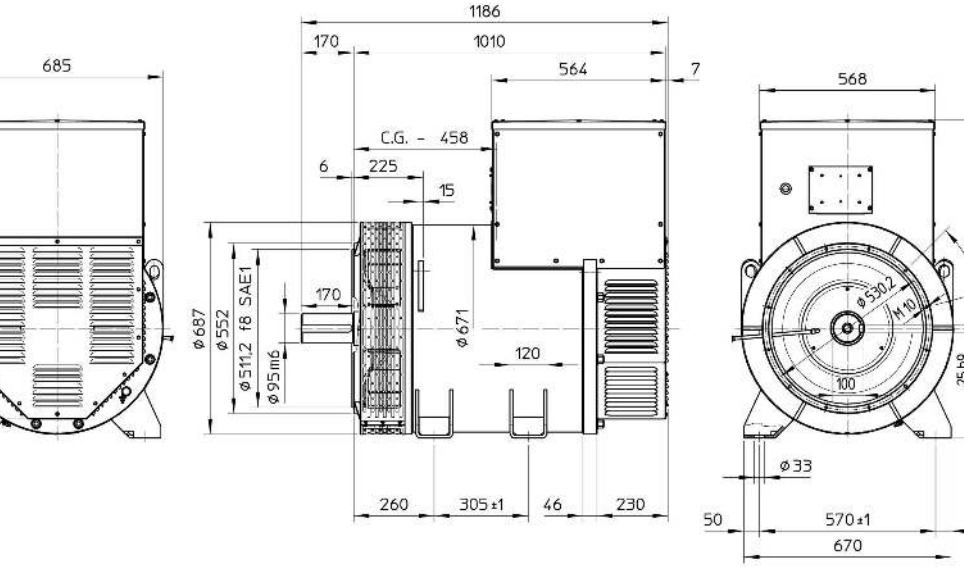
ECO40 2S4 B

TWO BEARING MOMENTS OF INERTIA



POS.	COMPONENT	WEIGHT (kg)	J (kgm^2)
1	FAN	12.4	0.4389
2	MAIN ROTOR	241.4	4.9335
3	EX. ROTOR	36.8	0.4381
4	SHAFT	81.7	0.1385
TOTAL		372.3	5.9490

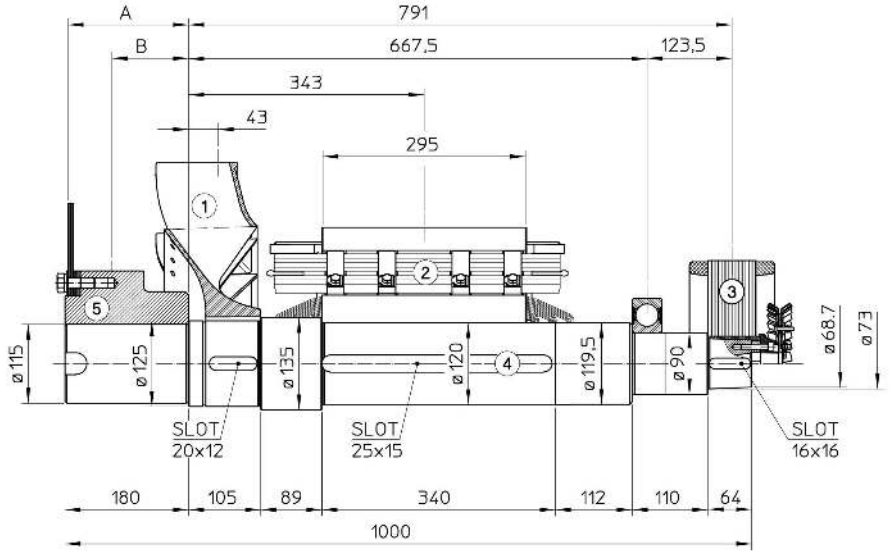
TWO BEARING DIMENSIONS



C.G.= GRAVITY CENTER

ECO40 2S4 B

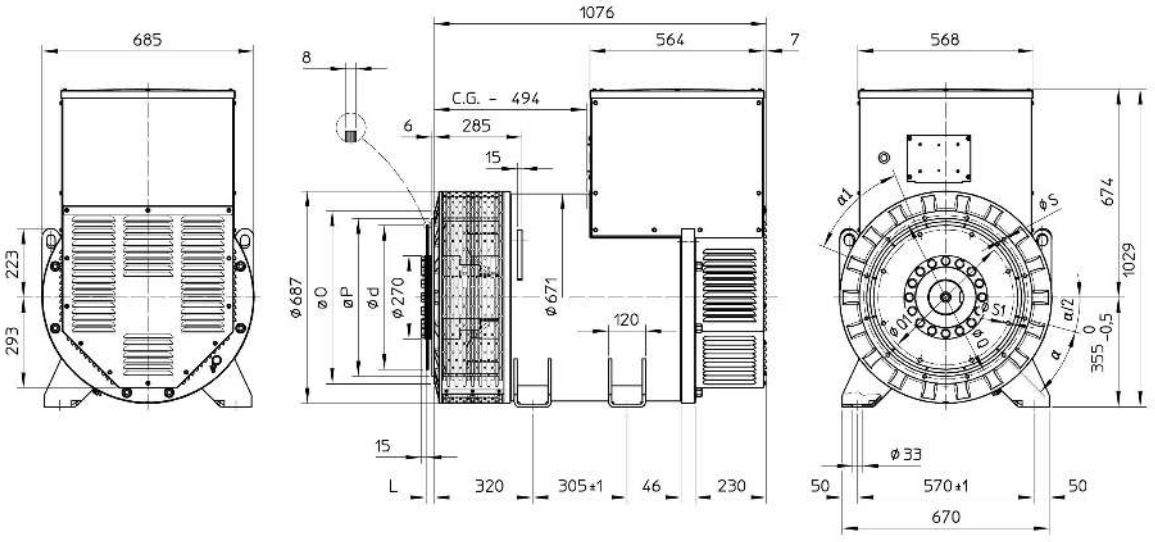
SINGLE BEARING MOMENTS OF INERTIA



POS.	COMPONENT	WEIGHT (kg)	J (kgm^2)
1	FAN	12.4	0.4389
2	MAIN ROTOR	241.4	4.9335
3	EX. ROTOR	36.8	0.4381
4	SHAFT	80.3	0.1416
TOTAL		370.9	5.9521

SAE	5	SHAFTS COUPLING FLEX PLATE		
N°	A	B	WEIGHT kg	J kgm^2
14	175.7	111.7	57.5	0.7587
18	165.7	112.7	60.9	1.0919

SINGLE BEARING DIMENSIONS



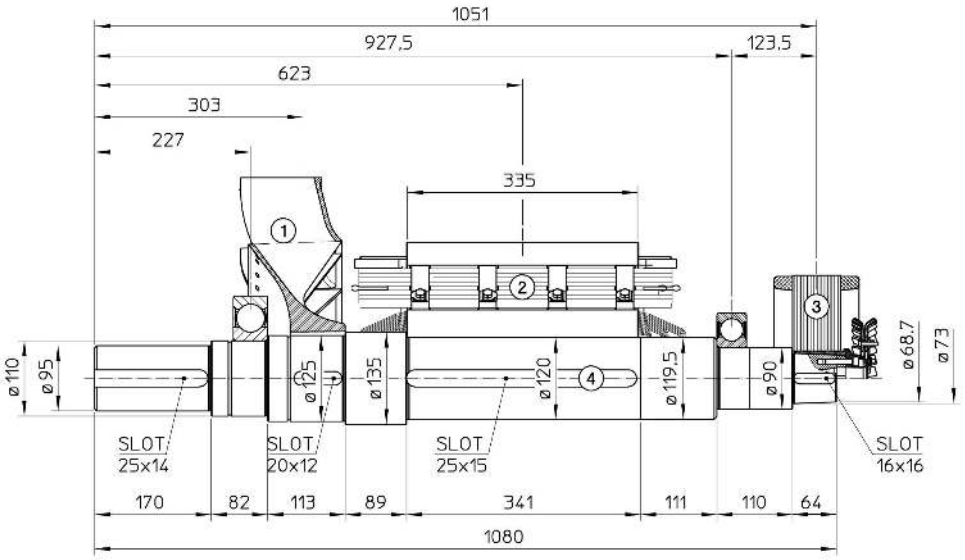
SAE N.	FLANGIA / LANGE BRIDE / FLANSCH				
	O	P	Q	S	α
1	560	511.2	530.2	11	30°
1/2	648	584.2	619.1	14	30°
0	711	647.7	679.5	14	22.5°
00	883	787.4	850.9	14	22.5°

SAE N.	GIUNTI A DISCHI / DISC COUPLING DISCQUE DE MONOPALIER / SCHEIBENKUPPLUNG				
	d	L	Q1	S1	α1
14	466.72	25.4	438.15	13.5	45°
18	571.5	15.7	542.92	16.5	60°

C.G.= GRAVITY CENTER

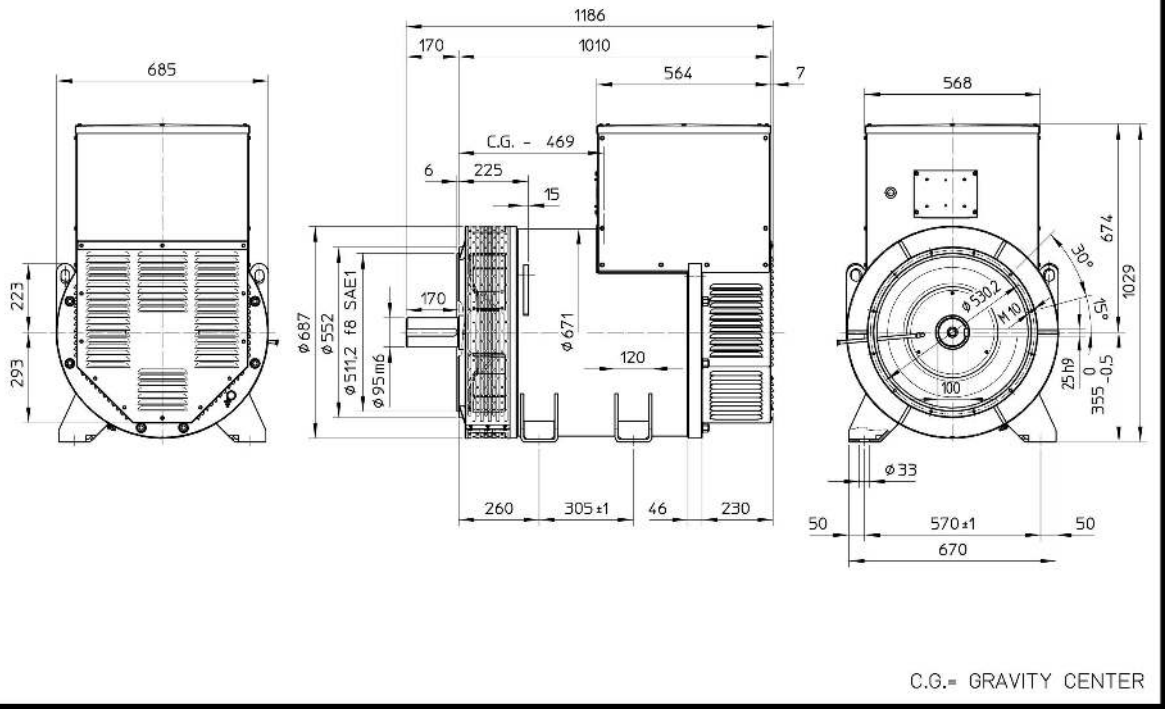
ECO40 3S4 B

TWO BEARING MOMENTS OF INERTIA



POS.	COMPONENT	WEIGHT (kg)	J (kgm^2)
1	FAN	12.4	0.4389
2	MAIN ROTOR	268.6	5.4830
3	EX. ROTOR	36.8	0.4381
4	SHAFT	81.7	0.1385
TOTAL		399.5	6.4985

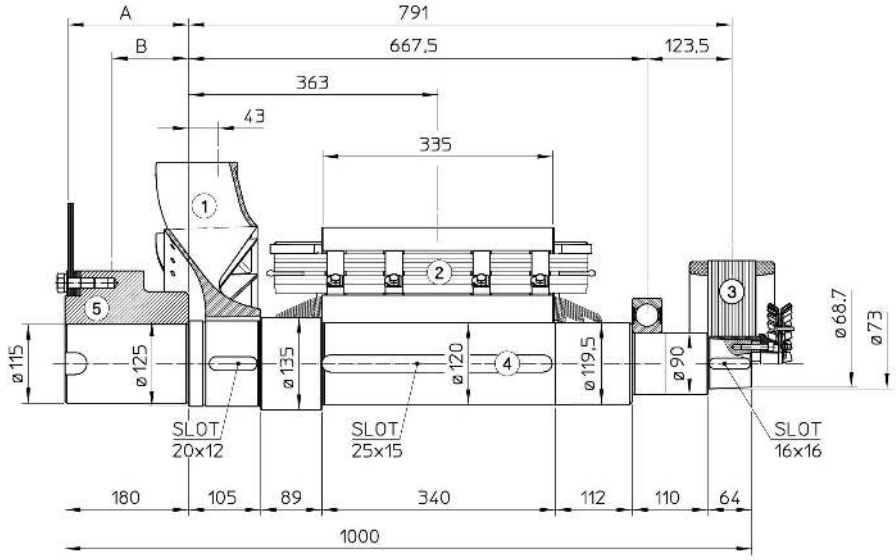
TWO BEARING DIMENSIONS



C.G.= GRAVITY CENTER

ECO40 3S4 B

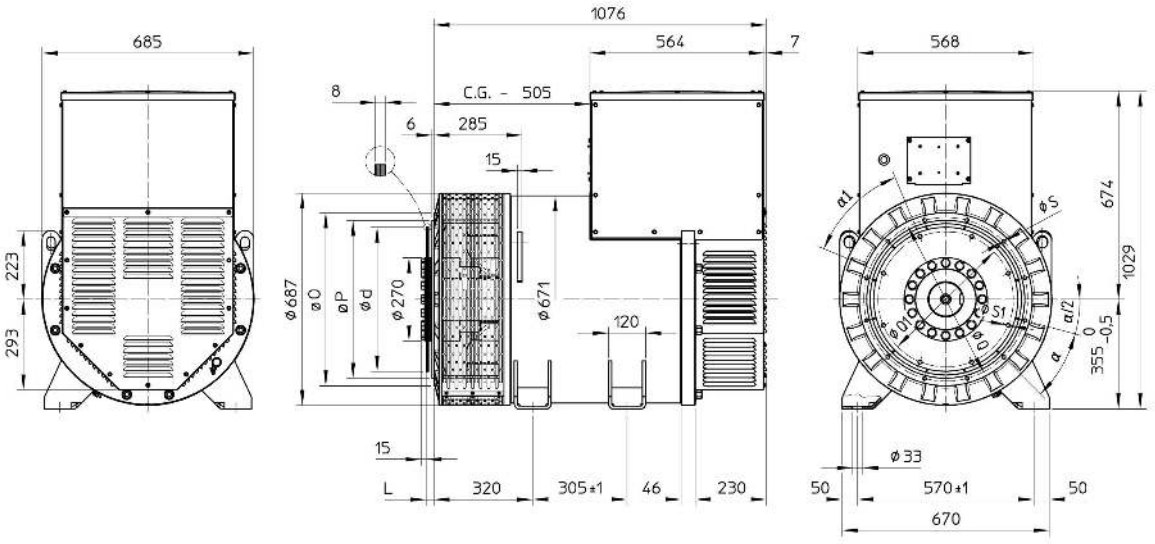
SINGLE BEARING MOMENTS OF INERTIA



POS.	COMPONENT	WEIGHT (kg)	J (kgm^2)
1	FAN	12.4	0.4389
2	MAIN ROTOR	268.6	5.4830
3	EX. ROTOR	36.8	0.4381
4	SHAFT	80.3	0.1416
TOTAL		398.1	6.5016

SAE	5	SHAFTS COUPLING FLEX PLATE		
N°	A	B	WEIGHT kg	J kgm^2
14	175.7	111.7	57.5	0.7587
18	165.7	112.7	60.9	1.0919

SINGLE BEARING DIMENSIONS



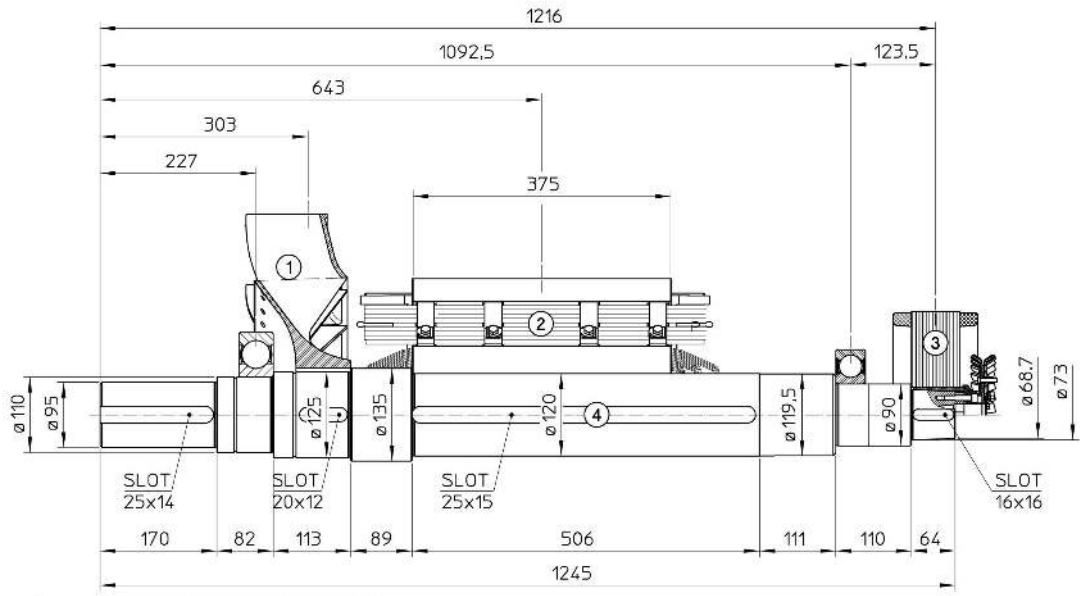
SAE N.	FLANGIA / LANGE BRIDE / FLANSCH				
	O	P	Q	S	α
1	560	511.2	530.2	11	30°
1/2	648	584.2	619.1	14	30°
0	711	647.7	679.5	14	22.5°
00	883	787.4	850.9	14	22.5°

SAE N.	GIUNTI A DISCHI / DISC COUPLING DISCQUE DE MONOPALIER / SCHEIBENKUPPLUNG				
	d	L	Q1	S1	α1
14	466.72	25.4	438.15	13.5	45°
18	571.5	15.7	542.92	16.5	60°

C.G.= GRAVITY CENTER

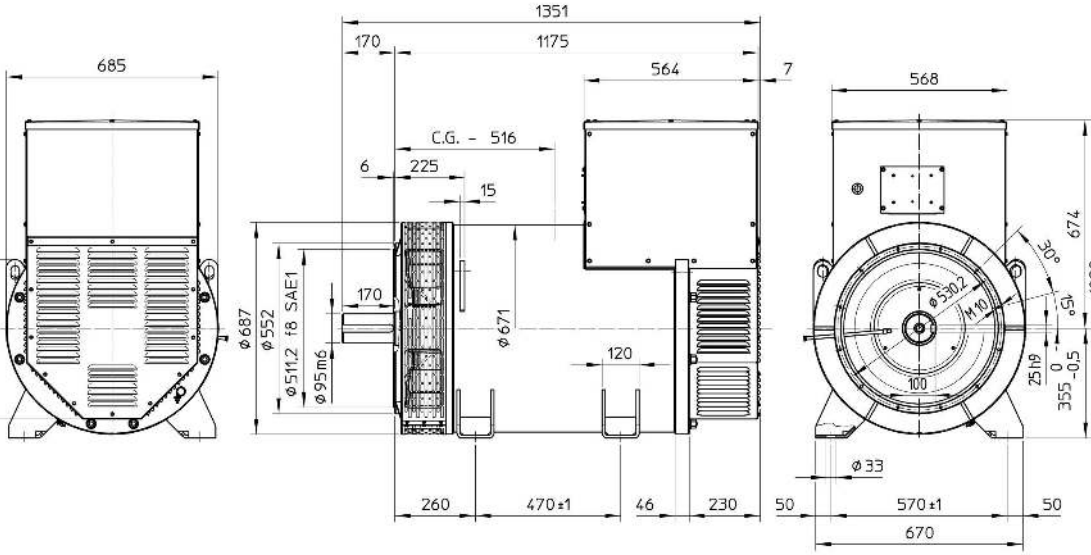
ECO40 1L4 B

TWO BEARING MOMENTS OF INERTIA



POS.	COMPONENT	WEIGHT (kg)	J (kgm^2)
1	FAN	12.4	0.4389
2	MAIN ROTOR	297.4	6.0684
3	EX. ROTOR	36.8	0.4381
4	SHAFT	96.1	0.1639
TOTAL		442.7	7.1093

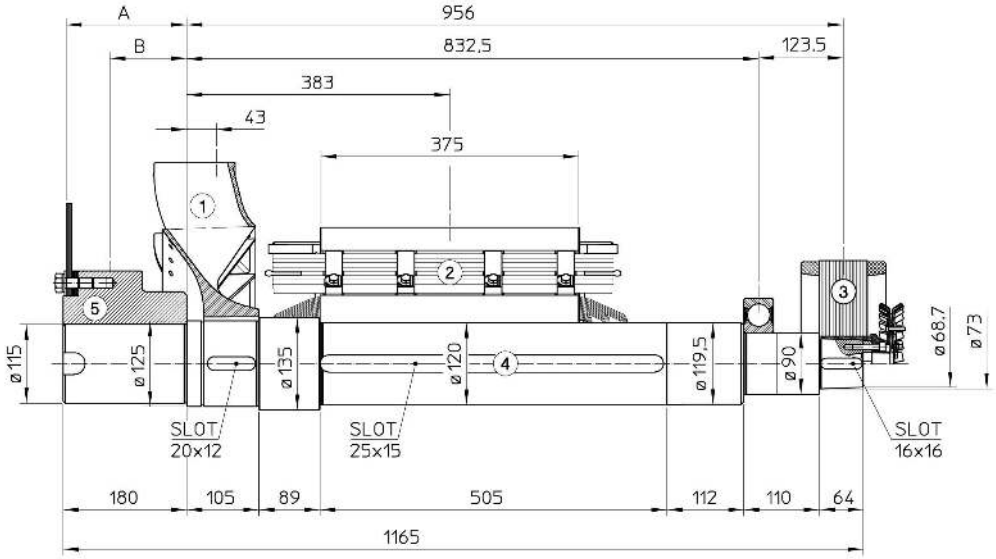
TWO BEARING DIMENSIONS



C.G.= GRAVITY CENTER

ECO40 1L4 B

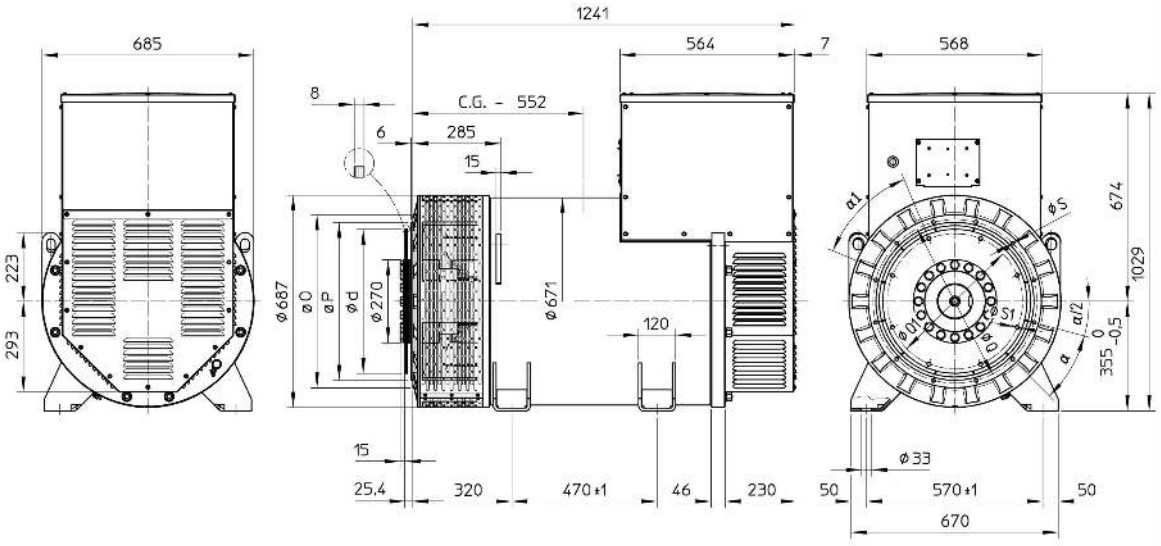
SINGLE BEARING MOMENTS OF INERTIA



POS.	COMPONENT	WEIGHT (kg)	J (kgm^2)
1	FAN	12.4	0.4389
2	MAIN ROTOR	297.4	6.0684
3	EX. ROTOR	36.8	0.4381
4	SHAFT	94.6	0.1671
TOTAL		441.2	7.1125

SAE	5	SHAFTS COUPLING FLEX PLATE		
N°	A	B	WEIGHT kg	J kgm^2
14	175.7	111.7	57.5	0.7587
18	165.7	112.7	60.9	1.0919

SINGLE BEARING DIMENSIONS



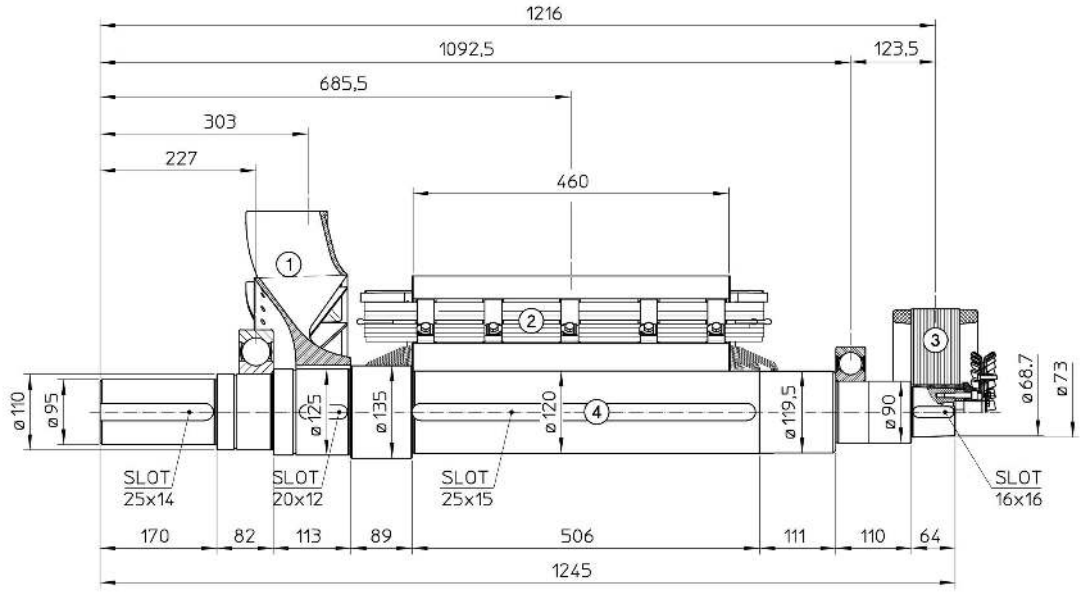
SAE N.	FLANGIA / LANGE BRIDE / FLANSCH				
	O	P	Q	S	α
1	560	511.2	530.2	11	30°
1/2	648	584.2	619.1	14	30°
0	711	647.7	679.5	14	22.5°
00	883	787.4	850.9	14	22.5°

SAE N.	GIUNTI A DISCHI / DISC COUPLING DISCQUE DE MONOPALIER / SCHEIBENKUPPLUNG				
	d	L	Q1	S1	α1
14	466.72	25.4	438.15	13.5	45°
18	571.5	15.7	542.92	16.5	60°

C.G.= GRAVITY CENTER

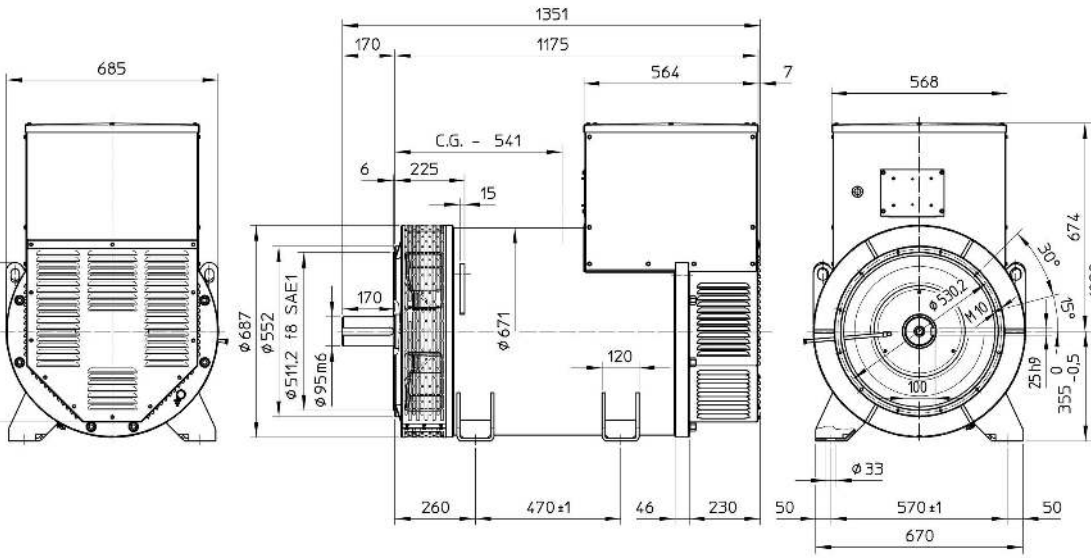
ECO40 1.5L4 B

TWO BEARING MOMENTS OF INERTIA



POS.	COMPONENT	WEIGHT (kg)	J (kgm^2)
1	FAN	12.4	0.4389
2	MAIN ROTOR	332.7	6.7172
3	EX. ROTOR	36.8	0.4381
4	SHAFT	96.1	0.1639
TOTAL		478.0	7.7581

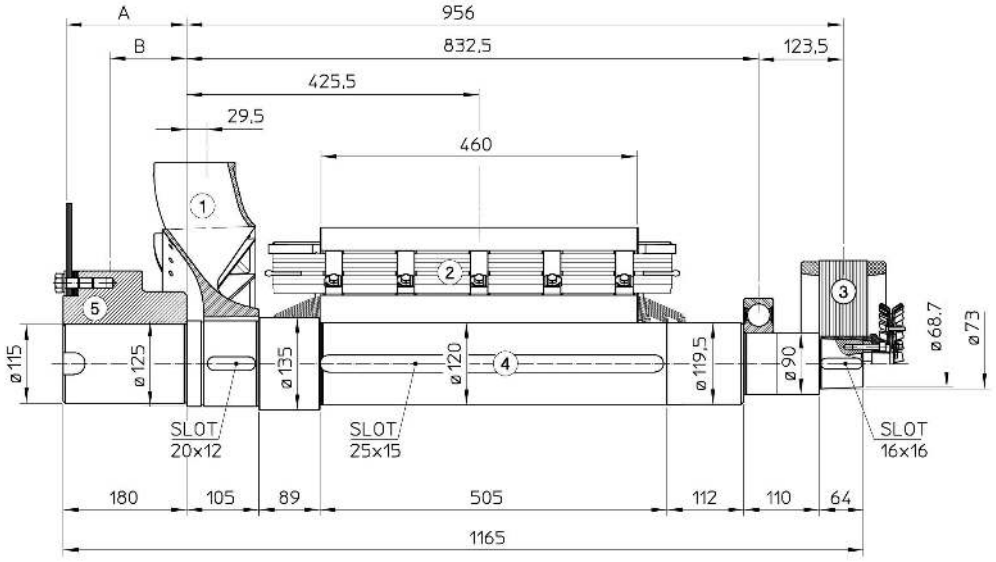
TWO BEARING DIMENSIONS



C.G.= GRAVITY CENTER

ECO40 1.5L4 B

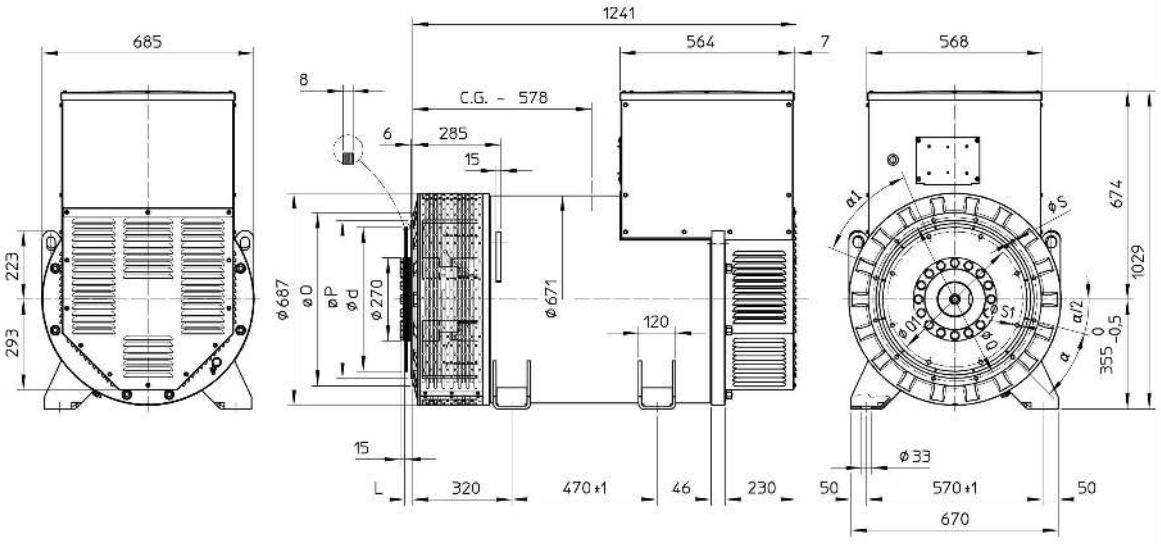
SINGLE BEARING MOMENTS OF INERTIA



POS.	COMPONENT	WEIGHT (kg)	J (kgm^2)
1	FAN	12.4	0.4389
2	MAIN ROTOR	332.7	6.7172
3	EX. ROTOR	36.8	0.4381
4	SHAFT	94.6	0.1671
TOTAL		476.5	7.7613

SAE	5	SHAFTS COUPLING FLEX PLATE		
N°	A	B	WEIGHT kg	J kgm^2
14	175.7	111.7	57.5	0.7587
18	165.7	112.7	60.9	1.0919

SINGLE BEARING DIMENSIONS



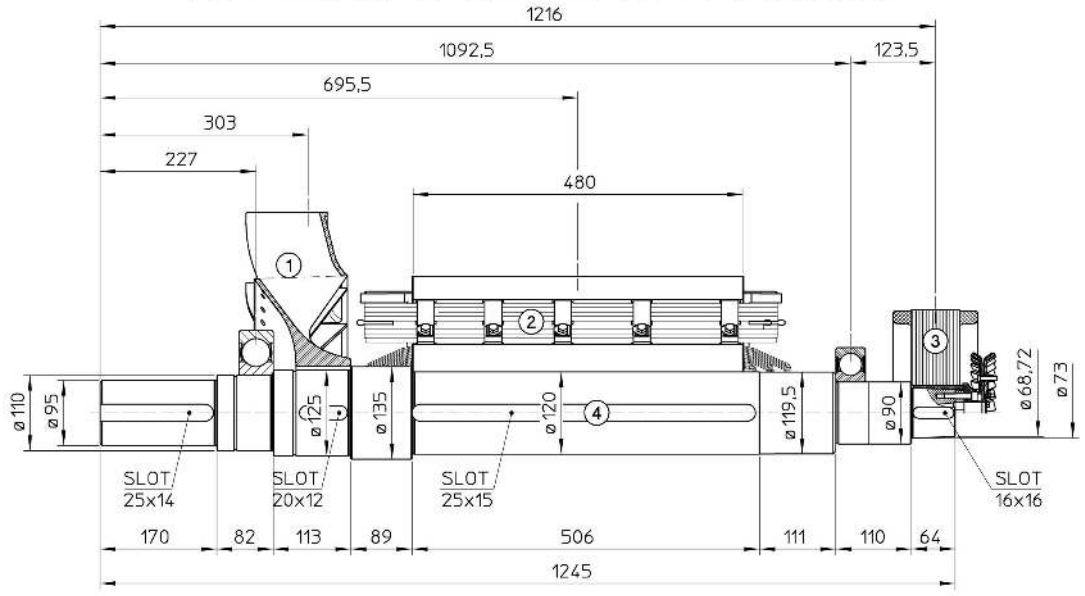
SAE N.	FLANGIA / LANGE BRIDE / FLANSCH				
	O	P	Q	S	α
1	560	511.2	530.2	11	30°
1/2	648	584.2	619.1	14	30°
0	711	647.7	679.5	14	22.5°
00	883	787.4	850.9	14	22.5°

SAE N.	GIUNTI A DISCHI / DISC COUPLING DISCQUE DE MONOPALIER / SCHEIBENKUPPLUNG				
	d	L	Q1	S1	α1
14	466.72	25.4	438.15	13.5	45°
18	571.5	15.7	542.92	16.5	60°

C.G.= GRAVITY CENTER

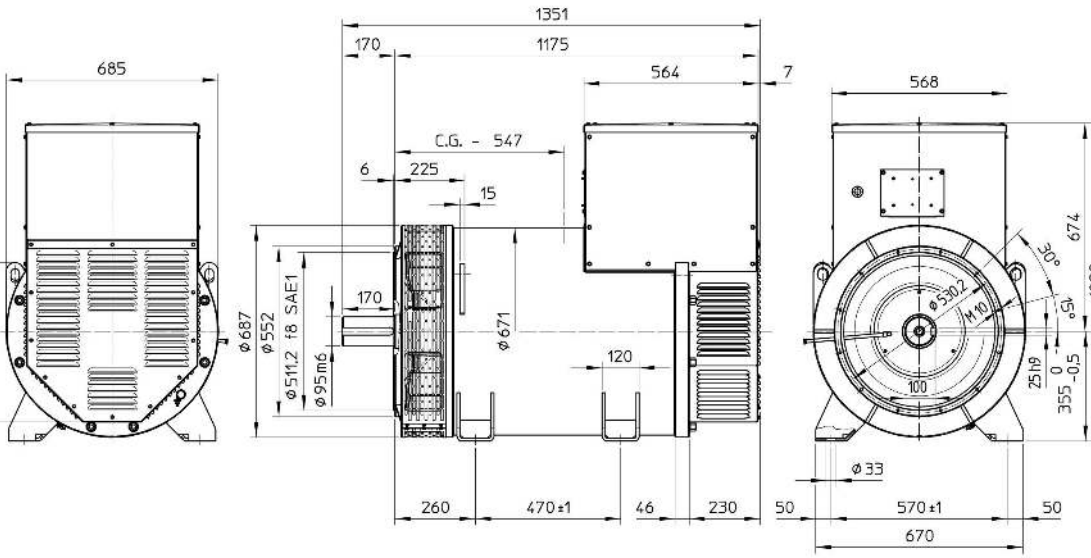
ECO40 2L4 B

TWO BEARING MOMENTS OF INERTIA



POS.	COMPONENT	WEIGHT (kg)	J (kgm^2)
1	FAN	12.4	0.4389
2	MAIN ROTOR	347.0	7.0074
3	EX. ROTOR	36.8	0.4381
4	SHAFT	96.0	0.1639
TOTAL		492.2	8.0483

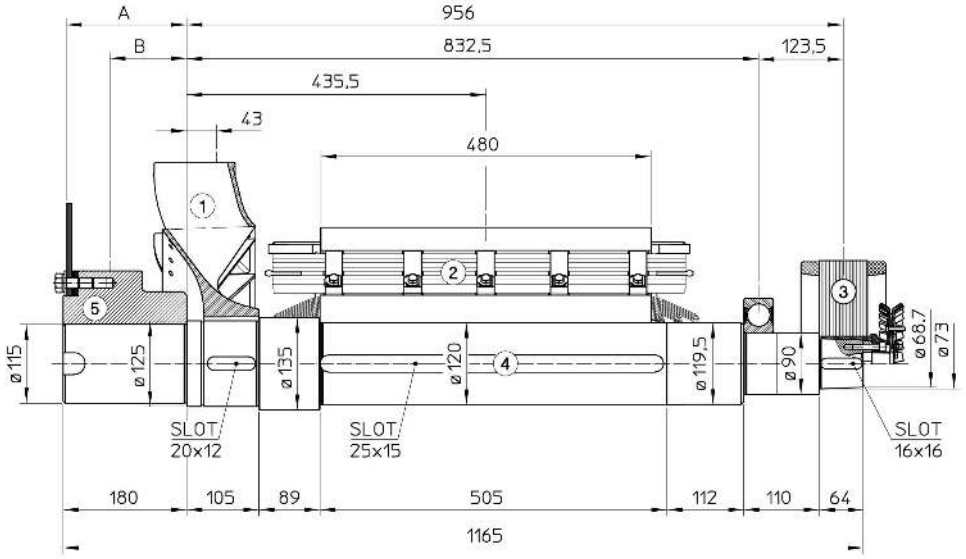
TWO BEARING DIMENSIONS



C.G.= GRAVITY CENTER

ECO40 2L4 B

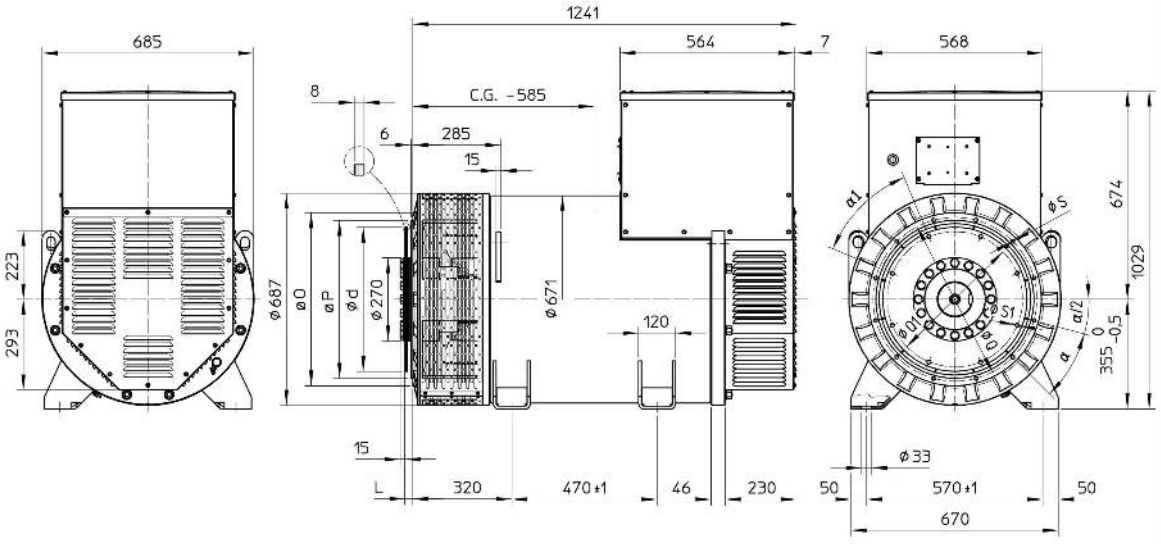
SINGLE BEARING MOMENTS OF INERTIA



POS.	COMPONENT	WEIGHT (kg)	J (kgm^2)
1	FAN	12.4	0.4389
2	MAIN ROTOR	347.0	7.0074
3	EX. ROTOR	36.8	0.4381
4	SHAFT	94.6	0.1671
TOTAL		490.8	8.0515

SAE	5	SHAFTS COUPLING FLEX PLATE		
N°	A	B	WEIGHT kg	J kgm^2
14	175.7	111.7	57.5	0.7587
18	165.7	112.7	60.9	1.0919

SINGLE BEARING DIMENSIONS



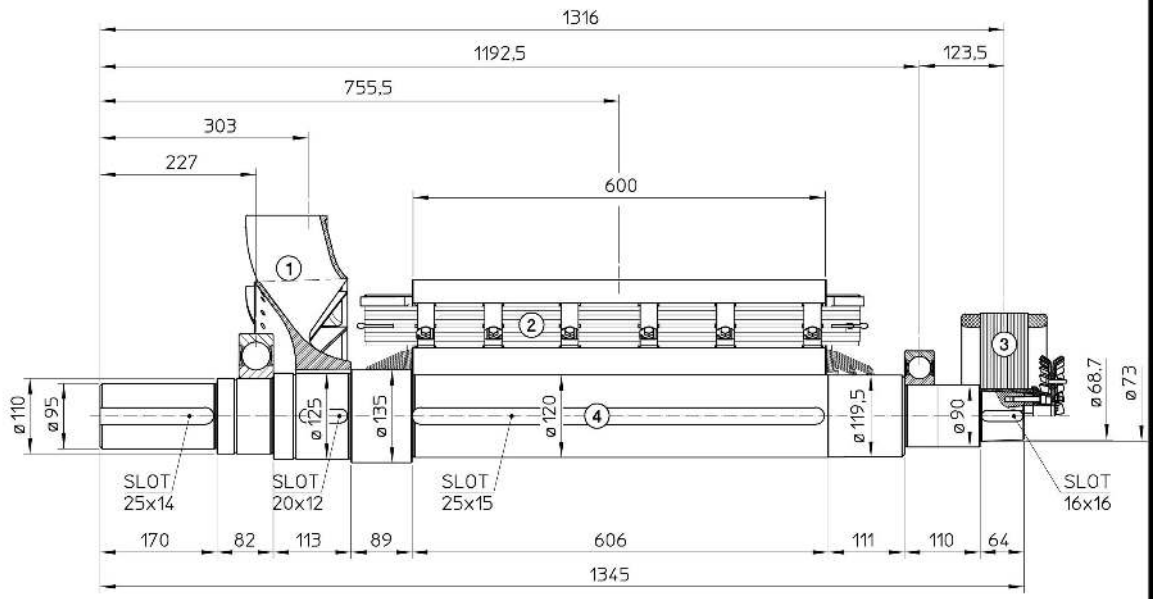
SAE N.	FLANGIA / LANGE BRIDE / FLANSCH				
	O	P	Q	S	α
1	560	511.2	530.2	11	30°
1/2	648	584.2	619.1	14	30°
0	711	647.7	679.5	14	22.5°
00	883	787.4	850.9	14	22.5°

SAE N.	GIUNTI A DISCHI / DISC COUPLING DISCQUE DE MONOPALIER / SCHEIBENKUPPLUNG				
	d	L	Q1	S1	α1
14	466.72	25.4	438.15	13.5	45°
18	571.5	15.7	542.92	16.5	60°

C.G.= GRAVITY CENTER

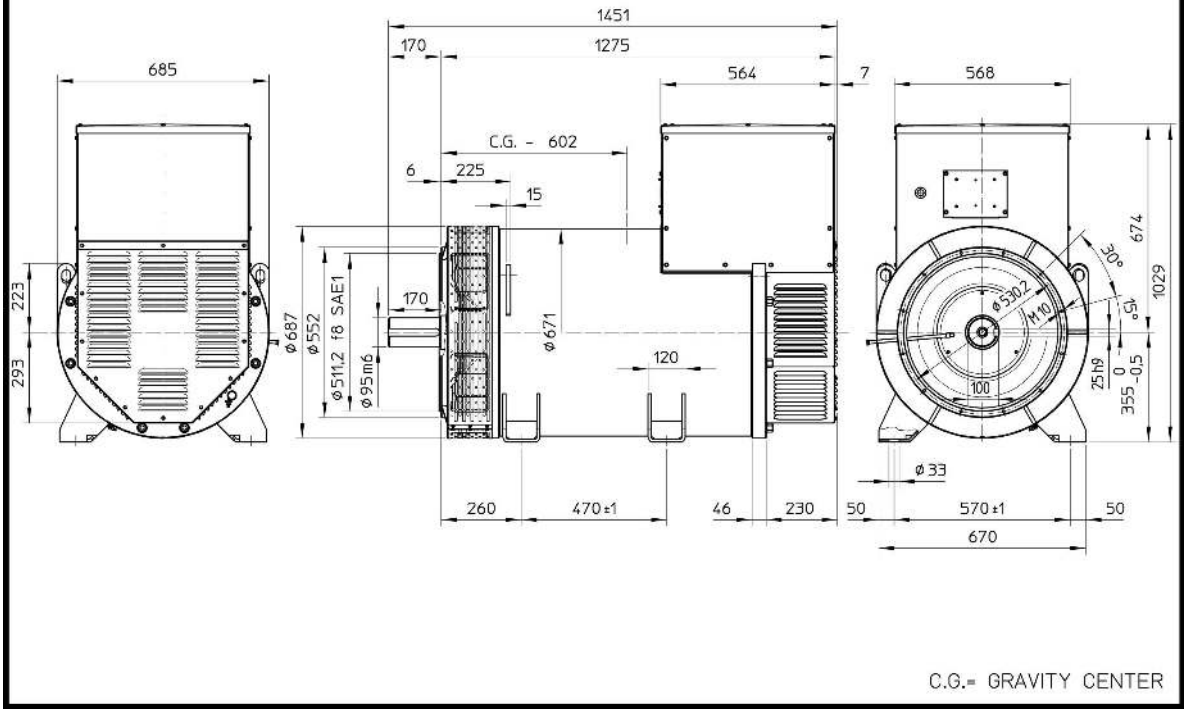
ECO40 VL4 B

TWO BEARING MOMENTS OF INERTIA



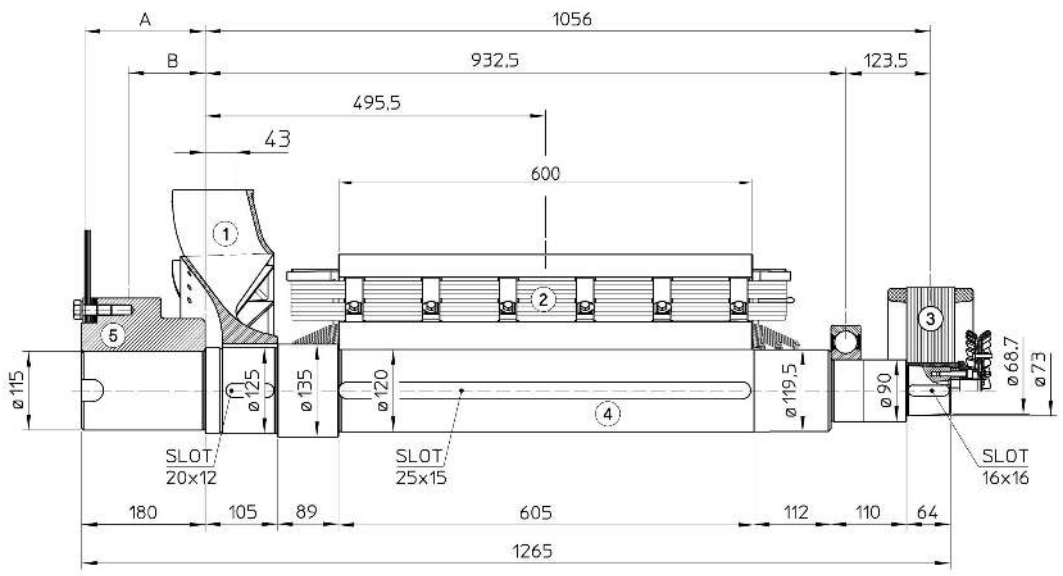
POS.	COMPONENT	WEIGHT (kg)	J (kgm^2)
1	FAN	12.4	0.4389
2	MAIN ROTOR	433.4	8.7622
3	EX. ROTOR	36.8	0.4381
4	SHAFT	104.7	0.1794
TOTAL		587.3	9.8186

TWO BEARING DIMENSIONS



ECO40 VL4 B

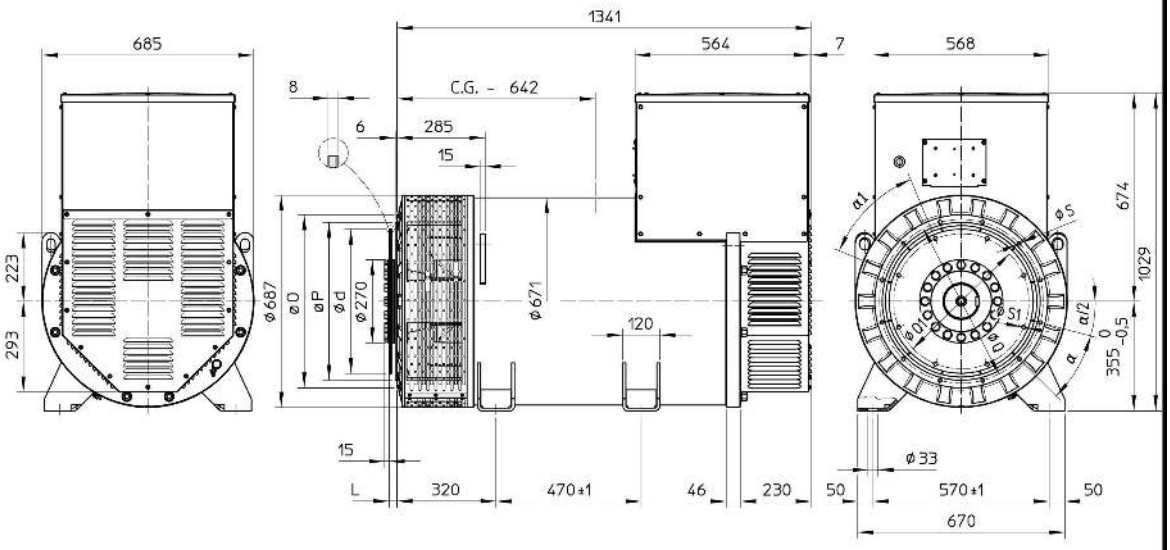
SINGLE BEARING MOMENTS OF INERTIA



POS.	COMPONENT	WEIGHT (kg)	J (kgm^2)
1	FAN	12.4	0.4389
2	MAIN ROTOR	433.4	8.7622
3	EX. ROTOR	36.8	0.4381
4	SHAFT	103.3	0.1825
TOTAL		585.9	9.8217

SAE	5	SHAFTS COUPLING FLEX PLATE		
N°	A	B	WEIGHT kg	J kgm^2
14	175.7	111.7	57.5	0.7587
18	165.7	112.7	60.9	1.0919

SINGLE BEARING DIMENSIONS



SAE N.	FLANGIA / LANGE BRIDE / FLANSCH				
	O	P	Q	S	α
1	560	511.2	530.2	11	30°
1/2	648	584.2	619.1	14	30°
0	711	647.7	679.5	14	22.5°
00	883	787.4	850.9	14	22.5°

SAE N.	GIUNTI A DISCHI / DISC COUPLING DISCQUE DE MONOPALIER / SCHEIBENKUPPLUNG				
	d	L	Q1	S1	α1
14	466.72	25.4	438.15	13.5	45°
18	571.5	15.7	542.92	16.5	60°

C.G.= GRAVITY CENTER