

Technical Documentation



LOW VOLTAGE - THREE PHASE TOTALLY
ENCLOSED MOTORS, INCREASED POWER,
TYPE 2.ZPDI

2ZPDI08EN

Vision



We set your ideas in motion. We do not merely manufacture motors, but instead turn the ambitious concepts of our customers into modern, innovative and reliable products, which are unique and point the way to the future. We bring our customers closer to their goals with reliability, creativity and flexibility.

Business Units



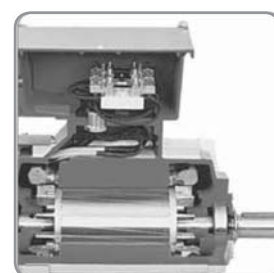
Serial Motors



New Businesses



Home Appliances



Project Motors

DESCRIPTION: Low voltage slip ring motors, type 2.ZPDI are manufactured according to IEC standards. Motor frames are welded construction while stator end shields and bearing caps are of cast iron. The motors are provided with increased power and increased efficiency factor.

STANDARDS: Motors type 2.ZPDI satisfy the following standards:

- JUS IEC60034-1, 1994 Rating and performances
- IEC 60034-5, 1991 Degree of mechanical protection
- JUS IEC 60034-6,1997 Methods of cooling
- IEC 60034 –7, CODE II, 1992 Mounting arrangements
- JUS IEC60034,8, 1972 Terminal markings
- IEC 60034-9, 1990 Noise limits
- JUS IEC 60034 –11, 1992 Built-in thermal protection
- JUS IEC 60034-14, 1992 Mechanical vibrations, limit values
- IEC 60038, 1983 Standard voltages
- IEC 60072, 1991 Mounting dimensions
- JUS IEC 60085, 1993 Insulation material classification

The motors carry CE mark as a sign of product conformity to the requirements of all applicably directives of European Union, especially concerning safety, life health protection, environment protection and consumer protection:

Low voltage Directive 73/23 EEC, MODIFIED BY 93/68/EEC,

Electromagnetic Compatibility Directive 89/336/EEC modified by 92/31/EEC

Machinery Directive 89/392/EEC modified by 91/368/EEC, 93/44/EEC and 93/68/EEC.

Quality assurance system of SEVER motor factories is certified according to the international standard JUS ISO 9001.

JUS IEC standards, which are referred to in these brochures, are identical with the corresponding IEC standards.

VOLTAGE AND FREQUENCY: The motors are produced for the rated supply voltage $3 \times 400 \text{ V} \pm 10 \%$, 50 Hz. On special request of the standards this motor can operate at supply voltages of 380 to 1000 V and at frequency of 40 to 60 Hz.

Rotor voltages are in tolerance $\pm 10 \%$.

OUTPUT: Rated powers given in tables refer to continuous operation (drive type S1), ambient temperature up to 40 °C and altitude up to 1000 m. For special conditions of operation send us your special inquiry.

SPEED: Rotation speed depends on the number of pole pairs. All motors are manufactured normally according to the leaflet. Speeds are given in tables at normal frequency, nominal voltage and rated output. On request the motors are delivered also with larger number of pole pairs, and for smaller speeds than the given in the leaflet.

MECHANICAL PROTECTION: Motors are constructed as totally enclosed with mechanical protection IP55, by which is disabled penetration of water jet into it.

MOUNTING ARRANGEMENTS: The motors are designed for the following mounting arrangements: IM 1001 (IMB3) and IM 3011 (IMV1) for all shaft heights.

TOLERANCE: mechanical dimensions of electric motors and tolerances are in accordance with the IEC 60072, and they are shown in the following table.

Term	Designation	Size	Tolerance
Shaft diameter	D, DA	>50 mm	m6
Flange spigot diameter	N	>450 mm	h6
Flange pitchdiameter	M	>500 mm	±1,00 mm
Footfixing dimension	A, B	>250 mm	±1,0 mm
		>500 mm	±1,50 mm
Shaft height	H	>250 mm	-1,00 mm

Electrical tolerances for the rated values and performances are in accordance with IEC 60034-1 and are shown in the following table :

Term	Designation	Dimensions	Tolerance
Efficiency	h	$P_N \leq 50 \text{ kW}$ $P_N > 50 \text{ kW}$	-0,15 (1-η) -0,10 (1-η)
Power factor	cosj		$\frac{1 - \cos j}{6}$ ^{Min 0,02} _{Max 0,07}
Slip	s	$P_N < 1 \text{ kW}$ $P_N \geq 50 \text{ kW}$	± 30 % ±20 %
Max. torque	T _b		- 10 %
Moment of inertia	J		± 10 %

BEARINGS: Bearing arrangement is designed with additional lubrication during operation with lithium grease and for temperature up to 40 °C. Technical specification for bearing arrangement are given in the following table:

MOTOR TYPE	Drive side	Opposite side of drive end		Grease quantity		Period of additional lubrication [h]		
		Horizontal design	Vertical design	[g]	[cm ³]	Number of poles		
						4	6	8
2.ZPDI 315	NU 322 C3	6319 C3	7319 B	60/45	75/57	2400/ 5200	3700/ 8200	4900/ 10800
2.ZPDI 355 2.ZPDI 400	NU 324 C3	6322 C3	7322 B	72/55	90/70	2200/ 4300	3400/ 7500	4400/ 9500

COOLING: The motors are made with external surface ventilation (IC 411). The fan is its own and is independent from the rotation sense because its blades are radial. In the rotor interior there is an internal fan, which provides circulation of air from the interior, through the closed channels on the frame..

WINDING INSULATION: the winding stator and rotor are designed in insulation class "F", at which the stator winding is impregnated two times in vacuum (VPI method), and the rotor winding is impregnated by dipping. This system of insulation is suitable for temperature rise limit of 105 K above the ambient temperature of 40 °C. The motors type 2.ZPDI are designed in a way that heating satisfies insulation class B, i.e. over temperature of the hottest space in the motor does not exceed 80 K with ambient temperature of 40 °C. .

ROTOR: Rotor is made with winding. The rotor winding is made as a three phase with copper rods, which are connected by hard soldering, and is made with three terminals to the slip ring.

SLIP RING: Slip ring with three slip paths are on the drive end of the motor. They are made of nickel-bronze and are isolated from the winding of stator and rotor with special labyrinth rings in order to prevent against ingress of coal dust into the motor interior..

BRUSHES AND BRUSHHOLDERS: The brushes are made of metal-graphite; the holders are of cast brass. The whole assembly is connected with two sheet supports and with insulated bolts. It is very simple for use through the terminal box. There are six brushes for each motor and three brush holders. With brush holders there are terminated three cables to the terminal plate of rotor.

TERMINAL BOX: Terminal box is on the top of the motor. The terminals of rotor and stator are separated by diagonal compartment. The terminals of rotor (3 cables) and stator (6 to 12 cables) are lead to the terminal plate of rotor and stator, where they are connected with the suitable terminal bolts. In the terminal box there can be located also elements of accessories (heaters, thermal protection). One of the points is earthed and located in the terminal box (the second on the housing). Cable head makes cable supply from the network and from the rotor starter, which may be on the left hand side, right hand side or both sides. Standard position is from the right hand side. For accessories there are terminated entries with Re turns according to JUS M.B0.090. The following table shows the basic data of the terminal box:

MOTOR TYPE	Terminal screws		Permissible current (A)	Number of inlets	Dimension of inlets	Max.cable diameter (mm)	Position of terminal box
	Stator	Rotor					
	Material	Material					
2.ZPDI 315	6 x M16	3 x M12	315 / 315	2	Ø75	70	ABOVE
	E Zn39	E-CuF25					
2.ZPDI 355	6 x M20	3 x M16	630 / 400	2	Ø70	70	
	E-CuF25	E-CuF25					
2.ZPDI 400	12 x M16	3 x M16	800 / 400	2	Ø80	80	
	E-CuF25	E-CuF25					

SHAFT ENDS: The motors are produced normally with one cylindrical shaft end and with central box of 60° (with thread acc. to JUS M.A5.212). On special request they can also be delivered with two cylindrical and with conical ends. For belt transmission it is necessary to consult the producer.

BALANCING AND VIBRATION: the motors are balanced dynamically with half key on the drive shaft end, in quality which is in accordance with the requirements of IEC60034-14. The limits of vibration severity are shown in the following table:

Grade	Limits of vibration severity in mms-1 for frame size H in mm	
	Speed range min-1	Free suspension
		255 < H ≤ 400
N	≥ 600 ≤ 3600	3,50
R	≥ 600 ≤ 1800	1,80
	> 1800 ≤ 3600	2,80
S	≥ 600 ≤ 1800	1,12
	> 1800 ≤ 3600	1,80

Standard design is in the degree of vibration strength "N", on request we produce motors with vibration strength degree R and S.

NOISE: Motors satisfy the noise level in accordance with IEC 60034-9. Noise level shown in the below table refers to the no-load motors at 400 V, method of cooling IC 411 and mechanical protection IP55. Tolerance is +3dB(A). Review is in the table as follows:

Noise level dB (A)		Frame size (shaft height)		
		315	355	400
4-pole	LpfA (1)	84	85	87
	LwA(2)	98	99	100
6-pole	LpfA	75	85	87
	LwA	89	99	99
8-pole	LpfA	80	82	84
	LwA	94	96	98

⁽¹⁾ **LpfA** - sound pressure

⁽²⁾ **LwA** - sound power

OVERLOAD CAPACITY: According to JUSIEC 60034-1 motors can be overloaded meaning that motors heated to an operating temperature can withstand current equal to 1.5 times the rated current for not less than 2 min. The motors can be overloaded by the torque 1.6 times the rated one for 15 seconds without stalling or abrupt in speed.

THERMAL PROTECTION: On a special request stator winding of the motor can be protected thermally by using PTC thermistors according to IEC 60034-11. In each phase of stator winding there will be built in one thermistor (PTC resistor) for switch-off temperature of 150 °C. All three thermistors are connected in series and two ends are lead out in the terminal box and to the switching-off unit (delivered on special request). Besides, the motors can be equipped with additional thermistors for alarm.

HEATERS: The motors can be equipped with heaters as a protection against condensed water. They could be exposed to danger of water condensation due to sudden and large changes of temperature during the motor stand still. During the motor operation the heaters must be switched off. Data of these heaters are shown in the following table:

Frame size H, mm	Supply voltage V	Heater's power W
315	115 or 230	130
355		280
400		280

FINISH PAINTING: Standard finish painting of the motors is performed by protective alkyd paint RAL 7001. For special climate conditions according to IEC 60721-2-1 painting is performed by epoxy paint.

PACKING: The motors are packed normally in wooden packing material with fixed rotor in order to avoid damage of bearing assemblies during transportation.

QUESTIONNAIRE: Please, answer the questions from the attached questionnaire as fully as possible, to enable offering of induction electric motors, and send it to the producer.

Protection: IP 55

Voltage: 380 V, 50 Hz

TYPE	Power	n	h	cos j	I _N	M _m M _N	Rotor		Mass IM B3	J
							Voltage	Current		
	kW	min ⁻¹	%	A	V \pm 10%	A	kg	kgm ²		

ns=1500 min⁻¹

2.ZPDI 315 Mk-4	132	1488	94,3	0,90	236	3,4	336	238	1400	5,20
2.ZPDI 315 M-4	160	1489	94,9	0,89	288	3,4	410	235	1560	6,32
2.ZPDI 315 L-4	200	1489	95,1	0,90	355	3,7	490	243	1700	7,90
2.ZPDI 355 L-4	250	1489	95,1	0,92	434	3,1	490	305	2360	11,70
2.ZPDI 355 Ld-4	315	1489	95,3	0,91	546	3,6	630	297	2590	14,30
2.ZPDI 400 Lk-4	355	1490	95,9	0,91	618	3,6	728	290	2830	25,30
2.ZPDI 400 L-4	400	1491	96	0,91	696	4,0	850	278	2982	29,30
2.ZPDI 400 Ld-4	450	1491	96	0,91	744	3,4	948	281	3150	32,90
2.ZPDI 400 Ldd-4	500	1491	96	0,91	870	4,2	1020	288	3420	35,40

ns=1000 min⁻¹

2.ZPDI 315 Mk-6	110	989	94,2	0,87	204	2,6	229	292	1430	6,50
2.ZPDI 315 M-6	132	989	95,4	0,88	238	2,6	271	295	1540	7,90
2.ZPDI 315 L-6	160	990	95,5	0,88	288	2,7	331	291	1660	9,50
2.ZPDI 355 L-6	200	990	95,6	0,90	353	2,5	418	287	2120	14,50
2.ZPDI 355 Ld-6	250	990	95,6	0,90	442	2,5	505	300	2570	17,70
2.ZPDI 400 Lk-6	315	991	96	0,90	554	2,5	536	352	2800	28,20
2.ZPDI 400 L-6	355	991	96	0,90	624	2,8	643	328	3000	33,70
2.ZPDI 400 Ld-6	400	991	96	0,89	711	2,5	706	340	3280	37,00
2.ZPDI 400 Ldd-6	450	991	96,1	0,90	790	2,8	804	332	3570	42,10

ns=750 min⁻¹

2.ZPDI 315 Mk-8	90	740	94,3	0,83	175	2,7	246	222	1380	7,90
2.ZPDI 315 M-8	110	741	94,6	0,84	210	2,7	303	220	1575	9,90
2.ZPDI 315 L-8	132	741	94,7	0,83	255	2,8	360	222	1660	11,60
2.ZPDI 355 L-8	160	742	95,4	0,87	293	2,4	350	275	1900	15,60
2.ZPDI 355 Ld-8	200	742	95,5	0,86	370	2,5	438	275	2140	19,30
2.ZPDI 400 Lk-8	250	742	95,5	0,86	462	2,0	395	388	2600	31,00
2.ZPDI 400 L-8	315	742	95,6	0,86	582	2,0	494	388	2995	38,80
2.ZPDI 400 Ld-8	355	742	95,6	0,86	656	2,1	564	382	3300	44,60
2.ZPDI 400 Ldd-8	400	742	95,7	0,86	738	2,1	635	384	3650	48,70

ns=600 min⁻¹

2.ZPDI 315 Mk-10	75	On request !								
2.ZPDI 315 M-10	90									
2.ZPDI 315 L-10	110									
2.ZPDI 355 L-10	132									
2.ZPDI 355 Ld-10	160									
2.ZPDI 400 Lk-10	200									
2.ZPDI 400 L-10	250									
2.ZPDI 400 Ld-10	315									
2.ZPDI 400 Ldd-10	355									

Protection: IP 55

Voltage: 400 V, 50 Hz

TYPE	Power	n	h	cos j	I _N	$\frac{M_m}{M_N}$	Rotor		Mass IM B3	J
							Voltage	Current		
	kW	min ⁻¹	%	A	V \pm 10%	A	kg	kgm ²		

ns=1500 min⁻¹

2.ZPDI 315 Mk-4	132	1489	94,3	0,87	232	3,9	354	225	1400	5,20
2.ZPDI 315 M-4	160	1490	95	0,86	283	3,9	433	222	1560	6,32
2.ZPDI 315 L-4	200	1490	95,1	0,90	337	4,2	516	230	1700	7,90
2.ZPDI 355 L-4	250	1490	95,1	0,91	417	3,5	516	290	2360	11,70
2.ZPDI 355 Ld-4	315	1490	95,1	0,91	524	4,1	664	281	2590	14,30
2.ZPDI 400 Lk-4	355	1491	96	0,90	593	4,1	767	274	2830	25,30
2.ZPDI 400 L-4	400	1492	96	0,90	668	4,5	895	264	2982	29,30
2.ZPDI 400 Ld-4	450	1492	96	0,89	760	3,9	998	267	3150	32,90
2.ZPDI 400 Ldd-4	500	1492	96	0,90	835	4,8	1073	273	3420	35,40

ns=1000 min⁻¹

2.ZPDI 315 Mk-6	110	990	94,2	0,85	198	2,9	241	277	1430	6,50
2.ZPDI 315 M-6	132	990	95,4	0,86	232	2,9	285	280	1540	7,90
2.ZPDI 315 L-6	160	991	95,5	0,86	280	3,0	348	275	1660	9,50
2.ZPDI 355 L-6	200	991	95,6	0,88	343	2,8	440	272	2120	14,50
2.ZPDI 355 Ld-6	250	991	95,7	0,89	424	2,6	531	283	2570	17,70
2.ZPDI 400 Lk-6	315	992	96	0,88	538	2,9	564	333	2800	28,20
2.ZPDI 400 L-6	355	992	96	0,88	606	3,2	677	311	3000	33,70
2.ZPDI 400 Ld-6	400	992	96	0,88	684	2,8	744	321	3280	37,00
2.ZPDI 400 Ldd-6	450	992	96,1	0,88	768	3,2	847	315	3570	42,10

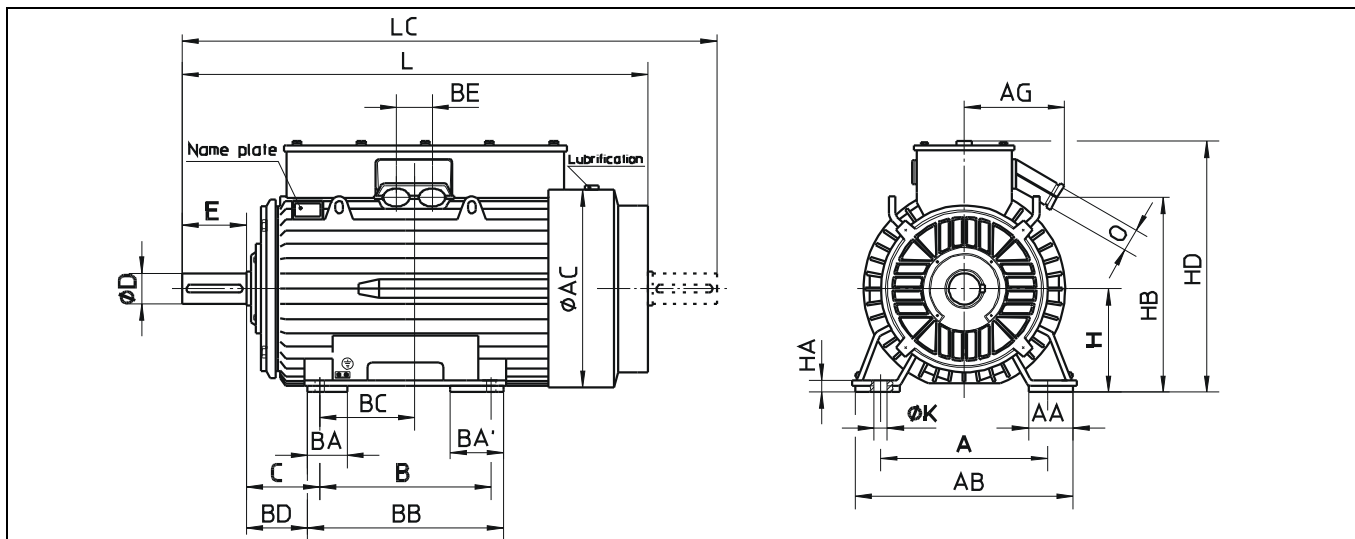
ns=750 min⁻¹

2.ZPDI 315 Mk-8	90	741	94,3	0,79	174	3,0	260	210	1380	7,90
2.ZPDI 315 M-8	110	742	94,5	0,81	207	3,0	320	207	1575	9,90
2.ZPDI 315 L-8	132	742	94,6	0,80	252	3,1	378	210	1660	11,60
2.ZPDI 355 L-8	160	742	95,5	0,85	284	2,7	368	260	1900	15,60
2.ZPDI 355 Ld-8	200	743	95,5	0,83	364	2,8	462	260	2140	19,30
2.ZPDI 400 Lk-8	250	743	95,5	0,85	444	2,2	415	366	2600	31,00
2.ZPDI 400 L-8	315	743	95,6	0,85	560	2,2	520	366	2995	38,80
2.ZPDI 400 Ld-8	355	743	95,6	0,85	630	2,3	594	360	3300	44,60
2.ZPDI 400 Ldd-8	400	743	95,7	0,85	710	2,3	668	362	3650	48,70

ns=600 min⁻¹

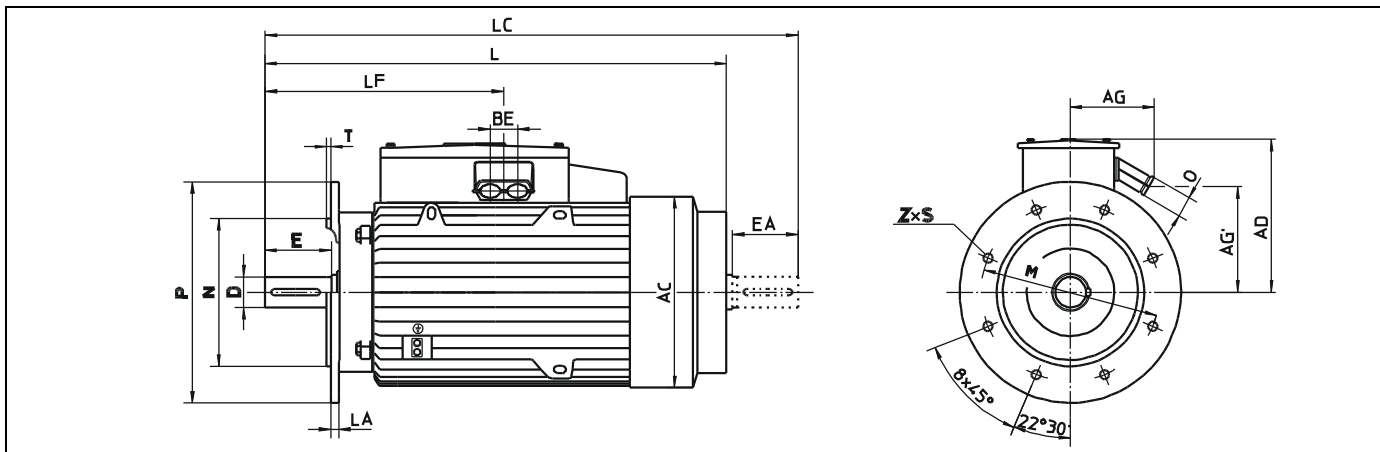
2.ZPDI 315 Mk-10	75	On request !								
2.ZPDI 315 M-10	90									
2.ZPDI 315 L-10	110									
2.ZPDI 355 L-10	132									
2.ZPDI 355 Ld-10	160									
2.ZPDI 400 Lk-10	200									
2.ZPDI 400 L-10	250									
2.ZPDI 400 Ld-10	315									
2.ZPDI 400 Ldd-10	355									

IM B3 (IM 1001)

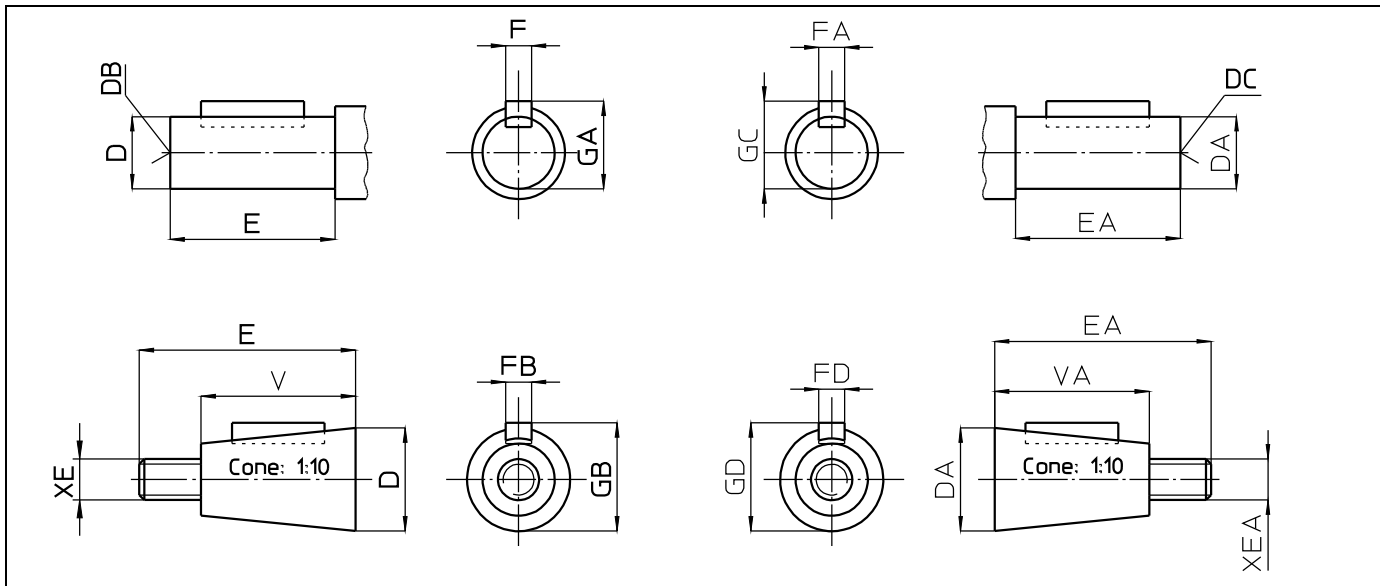


TYPE	A	AA	AB	AC	AG	B	BA	BA'	BB	BD	C	H	HA	HB	HD	ϕK	L	LC	O	BE	BC	
2.ZPDI 315	Mk	508	120	630	655	457	120	250	700	171	216	315	35	520	823	28	1661	1816	$\phi 64$	128	488	
	M																1751	1906				
	L																1851	2006				
2.ZPDI 355	L	630	150	780	735	310	800	220	220	980	134	224	355	35	742	890	35	1867	2052	$\phi 64$	128	488
	Ld																	1997	2182			
2.ZPDI 400	Lk	710	150	860	852	360	900	250	450	1150	134	224	400	40	760	1027	35	1986	2156	$\phi 75$	150	590
	L									1250								2086	2236			
	Ld									1350								2186	2306			
	Ldd									1350								2286	2366			

IM V1 (IM 3011)



TYPE	AC	AG	AD	AG'	L	LA	LC	M	N	P	S	T	ϕO	BE	LF	Z		
2.ZPDI 315	Mk	630	317	508	205	25	1816	600	550	660	24	6	64	128	874	8		
	M																1751	1906
	L																1851	2006
2.ZPDI 355	L	728	310	535	387	25	2052	740	680	800	24	6	64	128	894	8		
	Ld																1997	2182
2.ZPDI 400	Lk	855	360	627	360	28	2156	940	880	1000	24	6	75	150	990	8		
	L																2051	2236
	Ld																2121	2306
	Ldd																2181	2366



TYPE	D	DB	E	GA	F	V	FB	GB	XE	DA	DC	EA	GC	FA	VA	FD	GD	XEA
2.ZPDI 315	90	M24	170	95	25	130	22	91,7	M64x4	70	M20	140	74,5	20	105	18	71,4	M48x3
2.ZPDI 355	110	M24	210	116	28	165	25	110,9	M80x4	80	M20	170	85	22	130	22	91,7	M64x4
2.ZPDI 400	110	M24	210	116	28	165	25	110,9	M80x4	90	M24	170	95	25	130	22	91,7	M64x4

LOW VOLTAGE - THREE PHASE TOTALLY ENCLOSED MOTORS, INCREASED POWER, TYPE 2.ZPDI

QUESTIONNAIRE FOR THE OFFER OF ASYNCHRONOUS ELECTRIC MOTORS



Enquiry Number: _____

Customer: _____ ITEM: _____
Qty: _____

A MOTOR DATA

1 Motor type: Three phase: _____ Single phase: _____

2 Rotor type: Squirrel cage: _____ Slip-ring: _____

3 Rated output: $P_N =$ _____ kW

4 Rated voltage: $U_N =$ _____ V Connect: Star _____ Delta _____

5 Rated frequency: $f_N =$ _____ Hz

6 Rated speed: $n_N =$ _____ rpm

7 Insulation class: F B

8 Duty type: S1 S2 S3 S4 S5 S6 S7 S8 S9 S10

ED %

starts /h _____ min _____ J_{mot} _____ kgm^2

9 Standard: _____ IEC or _____

10 Cooling method: _____ IC _____

11 Mounting arrangement: IM _____

12 Protection degree: Motor IP: _____ Terminal box IP: _____

13 *Sense of rotation: Left _____ Right _____ Both _____

14 Motor brake: yes no

Braking moment: _____ Nm

Brake voltage: _____ V/Hz _____ V,DC _____

15 No-load regime? (single phase motor) yes _____ no _____

16 Rotor data: $U_{2c} =$ _____ V $I_{2n} =$ _____ A

B DATA ABOUT THE DRIVEN MACHINE

1 Type: _____

2 Required power: _____

3 Required speed: _____

4 Load torque characteristic: Constant _____ Squared _____ or _____

Speed %: 0 25 50 75 100

Torque Nm:

5 Moment of inertia: $J =$ _____ kgm^2

6 Running machine special data: _____

C AMBIENT CONDITIONS

1 Ambient temperature: _____ C

2 Relative humidity: _____ %

3 Altitude (above sea level): _____ m

4 Specific ambient conditions: _____

D POWER TRANSMISSION AND STARTING CONDITIONS

1 Coupling type: _____

2 Starting: _____

3 Number of consecutive startings:
Hot state: _____ Cold state: _____
_____ per hour _____ per hour
_____ per day _____ per day

E ADDITIONAL REQUESTS FOR MOTOR EXECUTION

1 Overloading from: _____ % P_N
Duration: _____ min

2 Temperature rise: F B

3 Request for: vibration level _____ mm/s
noise level _____ db

4 *Terminal box position: left right On top

5 Additional shaft loading sense
axial force _____ radial force _____

6 Converter feed operation: yes no

Converter type: _____
Manufacturer: _____
Speed range: from _____ to _____ rpm

7 Sensor category (mark in lower field):
Tacho gen. _____ Encoder _____ Absolute _____ Resolver _____
Sensor Type: _____

8 Flange size: _____ mm

9 Second shaft end: yes no
DA= _____ mm EA= _____ mm

10 Other requests and limits: _____

F ADDITIONAL EQUIPMENT, SPARE PARTS AND DOCUMENTATION

1 Thermal protection: yes no
Type: _____

2 Bearings thermometers yes no

3 Anti-condensation heaters yes no

4 Spare parts yes no

5 Guarantee sheet yes no

6 Language of instruction list: _____

7 Other requests for packing: _____

You are kindly requested to provide us with as much data as possible thus enabling us to offer satisfactorily

H CUSTOMER

1 Company: _____

2 Address: _____

3 City: _____

4 Country: _____

5 Person: _____

6 Telefon / Telefax: _____

7 e-mail: _____

Company locations

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