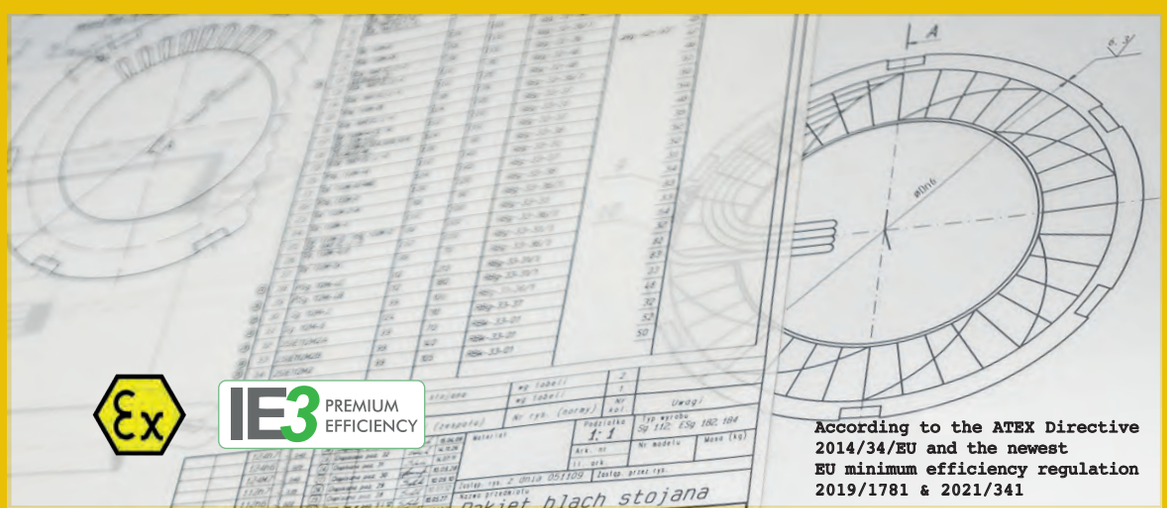
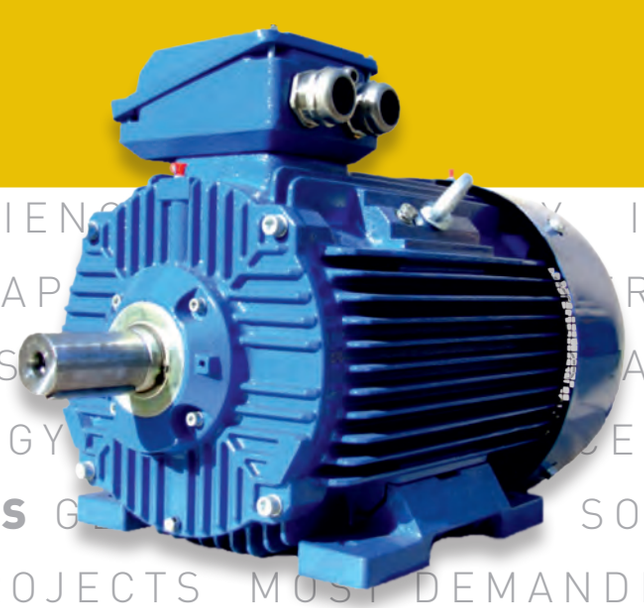
EXPLOSION PROTECTED
3-PHASE INDUCTION MOTORS



ATEX – INCREASED SAFETY MOTORS



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FRANK & DVORAK
ELEKTROMOTOREN

FFD

Product Catalogue

Product range

LOW VOLTAGE GENERAL PURPOSE 3-PHASE INDUCTION MOTORS	Three-phase motors with squirrel-cage rotor series (2)Sg(m), Sh, SIE-K HIGH (IE2), PREMIUM (IE3) and SUPER PREMIUM (IE4) efficiency motors	from 0,04kW up to 2200kW	for general purpose applications like pumps, fans, compressors; complying with the newest efficiency requirements
GENERAL PURPOSE 1-PHASE INDUCTION MOTORS	Single-phase motors with squirrel-cage rotor series SEh, SEMh Single-phase motors PREMIUM (IE3) efficiency class, series 3SSIE	from 0,04kW up to 2,2kW	for general purpose applications like pumps, fans, compressors, woodworking machines, devices for food processing, concrete mixers etc.
HIGH VOLTAGE INDUCTION MOTORS UP TO 11kV	Three-phase squirrel-cage high voltage and high efficiency motors series Sh with cast-iron housing. High voltage motors with module construction (steel/welded housing) series Sf (-E), Sfw, Sfr.	from 160kW up to 7000kW	for general industrial use, drives used for own needs of power plants (pumps, fans, coal mills, conveyors)
BRAKE MOTORS	Three-phase and single-phase brake motors with AC and DC brakes	from 0,04kW up to 200kW	for applications with high safety requirements or where immediate stopping of the drive is required e.g.: theatres, concert, halls, lifts, platforms, etc.
MOTORS WITH FORCED VENTILATION	Three-phase induction motors with forced ventilation.	from 0,06kW up to 2500kW	for variable frequency drives with very wide speed regulation
EXPLOSION-PROOF MOTORS	Standard and PREMIUM (IE3) efficiency increased safety motors	from 0,06kW up to 22kW	adapted for operation in areas endangered by explosion (without methane)
	Standard, HIGH (IE2) and PREMIUM (IE3) efficiency flame-proof motors	from 0,37kW up to 3200kW	for applications in chemical and mining industry where explosive atmosphere of gases, vapours or dust can occur
NEMA MOTORS	Low voltage NEMA motors SIE series (in compliance with the NEMA PREMIUM requirements).	from 1HP up to 350HP	for general industrial applications like pumps (including JM and JP), fans, compressors also for Hazardous Locations up to 250HP (Class I Div 2, Class II Div 2) with CSA certificate
TRACTION MOTORS	Traction motors and traction generators.	from 50kW up to 1500kW	various traction vehicles: trams (including low-deck trams), trolleybusses, subway and locomotives

Contents

Efficiency of motors

Efficiency classes for the low-voltage three-phase motors (IE = International Efficiency).

Along with the international discussion on energy efficiency a worldwide harmonized energy efficiency standard classification system has been established for low-voltage three-phase asynchronous motors. For many years low-voltage three-phase motors in the European Union have been sold in three efficiency classes EFF3, EFF2 and EFF1 (CEMEP classification). Aside from this, many different efficiency classification systems have been introduced and well-proven in many countries all over the world.

This was the reason for the International Electrotechnical Commission IEC to develop and publish an energy efficiency standard which replaces all previous national issues. In parallel IEC developed and issued a new standard for determining motor efficiency. The standard IEC 60034-30-1 defines and harmonizes worldwide the efficiency classes IE1, IE2, IE3 and IE4 for low-voltage three-phase motors in the power range from 0,12 kW to 1000 kW (2p=2, 4, 6, 8).

IE1 = Standard Efficiency

IE2 = High Efficiency

IE3 = Premium Efficiency

IE4 = Super Premium Efficiency

Complying with IEC 60034-30-1 standard the efficiency has to be determined in accordance with the requirements given in the IEC 60034-2-1 standard.

EU Commission Regulation 2019/1781 & 2021/341 regarding minimum efficiency of electric motors.

Motors covered by new Regulation	
Type	general purpose, geared, with brake, Ex
Voltage	>50V ÷ 1000V
Frequency	50 Hz, 60 Hz or 50/60 Hz
Number of poles	2, 4, 6, 8
Rated power	0,12kW ÷ 1000kW
Duty	continuous (S1, S3≥80 % or S6≥80%)
Motors excluded from new Regulation	
Type	• multi-speed, slip-ring and with mechanical commutators • motors completely integrated into a product whose efficiency cannot be tested independently from the product • motors with an integrated variable speed drive (compact drives) whose efficiency cannot be tested independently from the variable speed drive • motors with an integrated brake which forms an integral part of the inner motor construction and can neither be removed nor powered by a separate power source during the testing of the motor efficiency • motors specifically designed and specified to operate wholly immersed in a liquid • motors specifically qualified for the safety of nuclear installations, as defined in Article 3 of Council Directive 2009/71/EURATOM • explosion-protected motors specifically designed and certified for mining, as defined in Annex I, point 1 of Directive 2014/34/EU • motors in cordless or battery-operated equipment and motors in hand-held equipment whose weight is supported by hand during operation • motors in hand-guided mobile equipment moved while in operation • Totally Enclosed Non-Ventilated (TENV) motors • motors placed on the market before 1 July 2029 as substitutes for identical motors integrated in products placed on the market before 1 July 2021 (Annex I.1 (a)) and before 1 July 2023 (Annex I.1 (b)), and specifically marketed as such • motors designed specifically for the traction of electric vehicles
Designed for altitudes	> 4000 m a.s.l.
Designed for ambient temperatures	< -30°C or > 60°C
With maximum operating temperatures	> 400°C

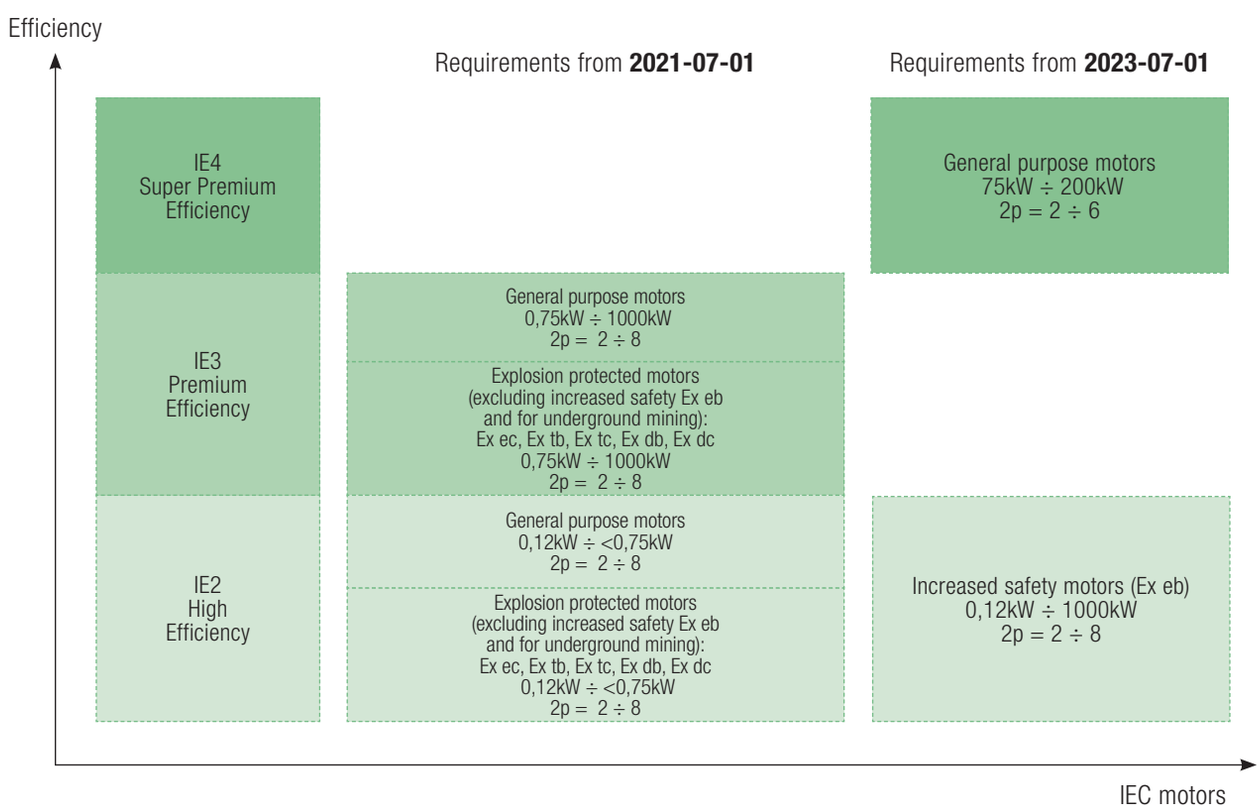
The Commission Regulation (EC) No 2019/1781 & 2021/341 describes efficiency requirements which have been implemented on **2021-07-01** and on **2023-07-01**. The required efficiency class of three phase induction motors has to be as follows:

Required efficiency class of three phase induction motors	General purpose motors	Explosion protected motors except motors dedicated for underground mining	
		Increased safety (Ex eb)	Others (Ex ec, Ex tb, Ex tc, Ex db, Ex dc)
IE2	0,12kW ÷ <0,75kW 2p = 2 ÷ 8 from 2021-07-01	0,12kW ÷ 1000kW 2p = 2 ÷ 8 from 2023-07-01	0,12kW ÷ <0,75kW 2p = 2 ÷ 8 from 2021-07-01
IE3	0,75kW ÷ 1000kW 2p = 2 ÷ 8 from 2021-07-01	–	0,75kW ÷ 1000kW 2p = 2 ÷ 8 from 2021-07-01
IE4	75kW ÷ 200kW 2p = 2 ÷ 6 from 2023-07-01	–	–

Cantoni Group pursuing a policy of continuous development of its products, back in the past already took actions to extend offer of high efficiency motors including also explosion-proof motors.

Moreover, at this point, **we can deliver to our Customers motors with higher efficiencies or in wider range than defined in Regulation 2019/1781 & 2021/341**.

A graph representation of the above table:



Ratings – Tolerances

Tolerances of motor parameters

Permissible deviations between catalogue values and real values are according to the IEC 60034-1:

Power factor cos φ	$\Delta\cos\varphi = -1/6\ (1-\cos\varphi_N)$
Efficiency η	$\Delta\eta = -15\%(100-\eta_N)$ for $P_N \leq 150$kW
	$\Delta\eta = -10\%(100-\eta_N)$ for $P_N > 150$kW
Speed n	$\Delta n = \pm 20\%(n_s-n_N)$ for $P_N > 1$kW
	$\Delta n = \pm 30\%(n_s-n_N)$ for $P_N \leq 1$kW
Locked rotor current ratio I_L/I_N	$\Delta(I_L/I_N) = +20\%(I_L/I_N)$
Locked rotor torque ratio T_L/T_N	min $(T_L/T_N) = -15\%(T_L/T_N)$
	max $(T_L/T_N) = +25\%(T_L/T_N)$
Breakdown torque ratio T_B/T_N	$\Delta(T_B/T_N) = -10\%(T_B/T_N)$
Moment of inertia J [kgm^2]	$\Delta J = \pm 10\%$ J
Sound pressure level L_{pA} [dB]	$\Delta L_{pA} = +3$ dB /A/

Tolerances of supply voltage value and frequency

Motors comply in standard with voltage value and voltage frequency variations within zone A according to the IEC 60034-1:

Voltage value U	$\Delta U = \pm 5\%$
Voltage frequency f	$\Delta f = \pm 2\%$

Other extended tolerances of supply voltage and their frequency are available on request.

Standards

The electric motors are manufactured according to the international standards:

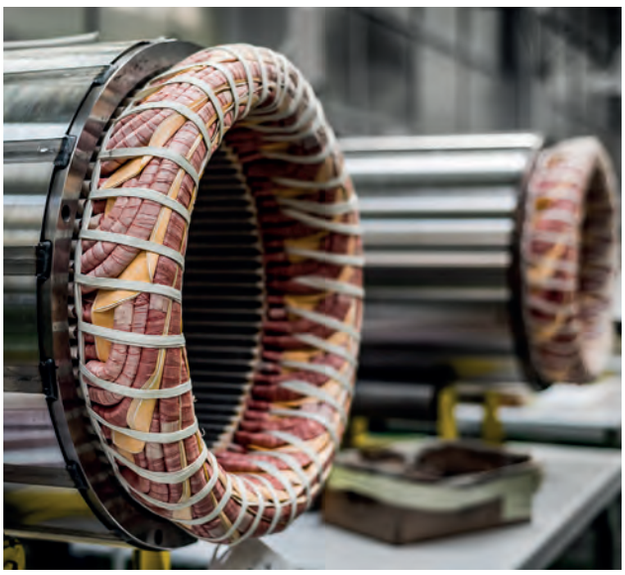
Rating and performance	IEC 60034-1
Methods for determining losses and efficiency	IEC 60034-2-1
Classification of degrees of protection	IEC 60034-5
Methods of cooling	IEC 60034-6
Symbols of construction and mounting arrangements	IEC 60034-7
Terminal markings and direction of rotation	IEC 60034-8
Noise limits	IEC 60034-9
Dimensions and output of electric machines	IEC 60072-1
Vibration limits	IEC 60034-14
Explosive atmospheres – Part 0: Equipment – General requirements	IEC 60079-0
Explosive atmospheres – Part 7: Equipment protection by increased safety "e"	IEC 60079-7
Explosive atmospheres – Part 31: Equipment dust ignition protection by enclosure "t"	IEC 60079-31

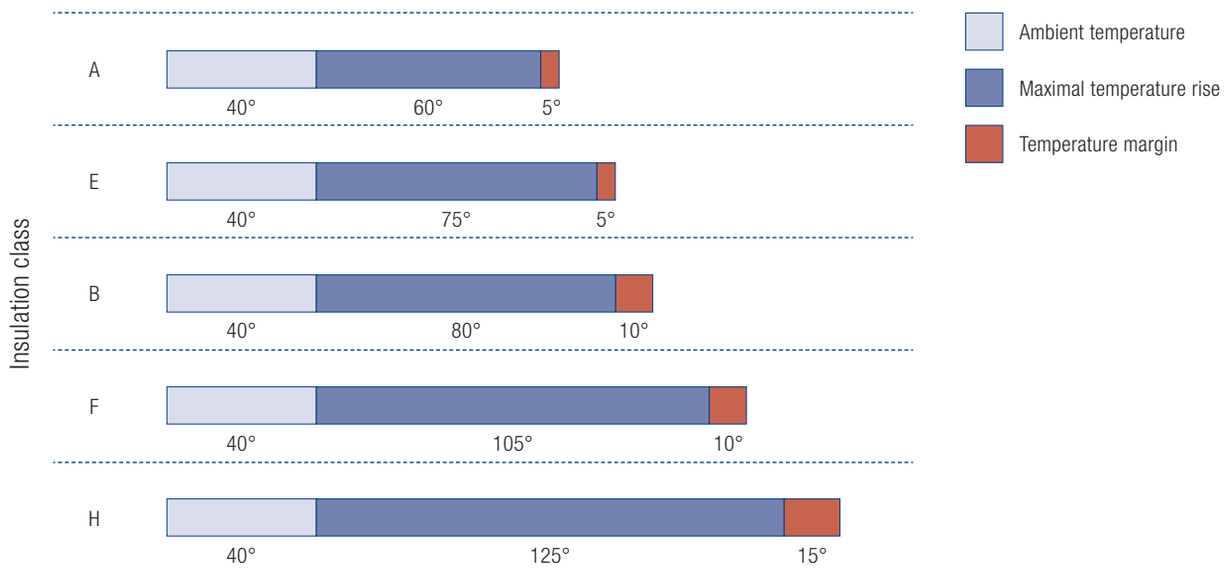
Insulation classification

The insulation system of an electric motor is determined by a given insulation class on the basis of its thermal resistance. This thermal resistance should be guaranteed by the entire set of electric insulating materials used in the motor insulating system.

Thermal resistance classification is related to the temperature of the hotspot in the insulation occurring during rated operating conditions of the electric motor, allowing for the highest permissible rise in average temperature.

This rise should be selected so that at the highest permissible ambient temperature, the temperature of the hotspot in insulation will not exceed the value assigned to a given thermal resistance class.





Insulation class F in an electric motor means that at ambient temperature of 40°C the temperature rise of the winding may be max. 105°C with the additional temperature margin of 10°C (under specified measuring conditions in accordance with the IEC 60034-1 standard).

Symbols of thermal resistance classes (permissible insulation temperatures at 40°C ambient temperature)

Symbol	Temperature [°C]
A	105
E	120
B	130
F	155
H	180

Class F/B

The standard motors made by Cantoni Motor in their basic version have the insulation class F while the temperature rise is for class B. This means longer life for motors.

For special request we can deliver motors equipped with insulation class H.

Strengthened insulation system gives possibility to safe operation with frequency converters.

Hazardous Area Classification

Hazardous areas include any area in which explosive atmosphere may occur under specific conditions.

An explosive atmosphere is a mixture of dangerous substances with air, under atmospheric conditions, in the form of gases, vapours, mist or dust in which, after ignition has occurred, combustion spreads to the entire unburned mixture.

Potentially explosive atmospheres are classified according to the Zone system (defined in European directive 1999/92/EC) on the basis of the frequency and duration of the occurrence of an explosive atmosphere.

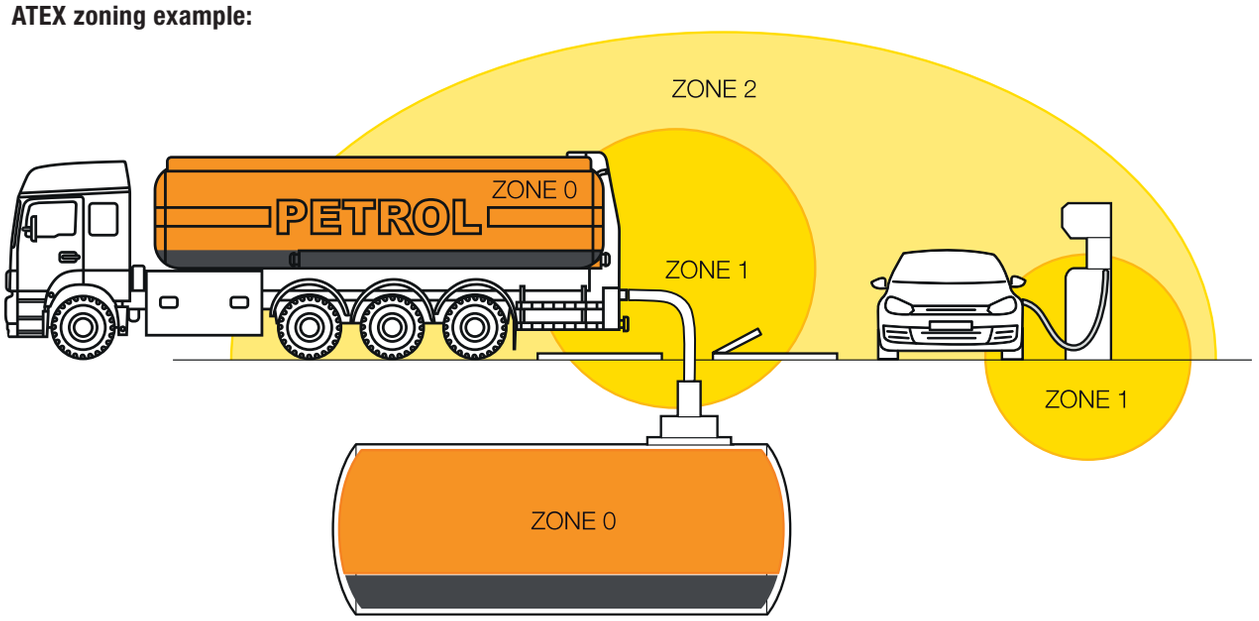
Zone classification

European and IEC Classification		Definition of zone
GAS, VAPOUR, MIST	Zone 0	An area in which an explosive mixture is present **continuously** or for long periods or frequently
	Zone 1	An area in which an explosive mixture is **likely** to occur in normal operation occasionally
	Zone 2	An area in which an explosive mixture is **unlikely** to occur in normal operation but, if it does occur, will persist for a short period only
DUST	Zone 20	An area in which an explosive mixture is present **continuously** or for long periods or frequently
	Zone 21	An area in which an explosive mixture is **likely** to occur in normal operation occasionally
	Zone 22	An area in which an explosive mixture is **unlikely** to occur in normal operation but, if it occurs it will persist for a short period only

'Normal operation' means the situation when installations are used within their design parameters.

Zones are normally determined by the Authorities, but that can also be performed by a third party, a notified body or other experts. It is the owner's responsibility to ensure that the classification of their site is performed before suitable products can be installed at the location.

ATEX zoning example:



REMARK: Electric motors are not used in case of Zone 0 (gases) and Zone 20 (dusts).

Gas and dust subgroups

Different explosive atmospheres (gases, vapours and dusts) have different properties like for example flame temperature, ignition energy, explosive limits, and molecular weight. These properties will determine the likelihood and severity of an explosion. Taking into consideration above, gases and dusts can be grouped in order to select the right equipment for explosive areas.

Subgroup	Environment	Typical substance
IIA	Gases, Vapours and Mists	Propane
IIB		Ethylene
IIC		Hydrogen, Acetylene
IIIA	Combustible Dusts	Combustible flyings
IIIB		Non-conductive
IIIC		Conductive
REMARK: Any equipment which is marked as IIC can be used in atmospheres that contain Group IIA and IIB gases		
Any equipment which is marked as IIIC can be used in atmospheres that contain Group IIIA and IIIB dusts		

Temperature classes for gases

Temperature classes (T-rating) are defined for equipment based on its maximum surface temperature. When selecting equipment for a potentially explosive atmosphere, the equipment's maximum surface temperature must be lower than the ignition temperature of the possible potential gas mixture.

Temperature class	Maximum surface temperature of electrical equipment [°C]
T1	450
T2	300
T3	200
T4	135
T5	100
T6	85
REMARK: Any equipment which is marked as T5 comply with requirements of T1,T2,T3 and T4 classes.	

Example of gases with their ignition temperature		
Subgroup of gases	**Gas example**	**Ignition temperature °C**
IIA	methane	537
	propane	470
	n-butane	365
	n-hexane	240
	ethyl ether	160
	ethyl nitrate	90
IIB	ethylene	425
	hydrogen sulfide	270
IIC	hydrogen	560
	acetylene	305
	carbon disulphide	102

Equipment groups, safety categories and level of protection

Electrical equipments are divided into two groups according to ATEX Directive 2014/34/EU:

– Group I: products are intended for use in the underground parts of mines and in those parts of surface installations of such mines that are likely to become endangered by firedamp and/or combustible dust
– Group II: products are intended for use in other environments (other than mines) that are likely to become endangered by explosive atmospheres.

Standard EN IEC 60079-0 defines additional subgroup of mentioned above Group II:

– Group III: products intended for use in other environments (other than mines) that are likely to become endangered by explosive dust atmospheres

Equipment Group	Definition	According to
Group I	Electrical equipment intended for use in underground mines susceptible to fire damp and/or combustible dust	ATEX Directive 2014/34/EU
Group II	Electrical equipment intended for use in explosive atmospheres (other than mines)	ATEX Directive 2014/34/EU
Group III	Electrical equipment intended for use in explosive dust atmospheres (other than mines)	Standard EN IEC 60079-0

Equipment groups are divided into equipment safety categories according to ATEX Directive 2014/34/EU with different level of protection EPL according to EN IEC 60079-0:

– category 1 / protection level a: with very high level of protection and thus a very high degree of safety

– category 2 / protection level b: with high level of protection and therefore a high degree of safety

– category 3 / protection level c: with normal level of protection and therefore a conventional degree of safety

Safety Category	Protection level	Degree of safety
Category 1	very high	very high
Category 2	high	high
Category 3	normal	normal

The table below presents the safety level of the equipment according to EN IEC 60079-0 and ATEX Directive 2014/34/EU.

EN IEC 60079-0		Flammable substances		Zone	ATEX Directive 2014/34/EU		
EPL	Group				Protection level	Group	Category
Ma	I (mine)	methan, coal dust		N/A	very high	I (mine)	M1
Mb					high		M2
Ga	II (others)	G	gas, vapour, mist	0	very high	II (others)	1G
Gb				1	high		2G
Gc				2	normal		3G
Da	III (others)	D	dust	20	very high		1D
Db				21	high		2D
Dc				22	normal		3D

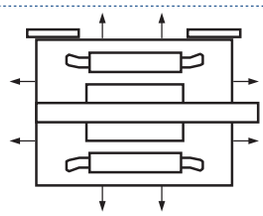
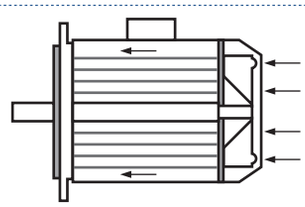
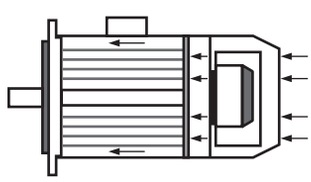
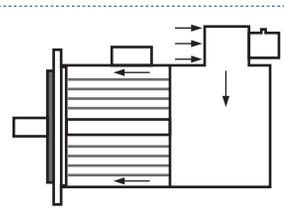
REMARK: Equipment from higher category (higher protection level) can also be installed instead of equipment from lower category (with lower protection level)

The table below lists the typical protection methods and basic concepts of protection used in electric motors according to ATEX Directive and EN / IEC standards.

Symbol	Type of protection	Basic concept of protection	Suitable for Zones						Equipment protection level (EPL)						EN / IEC Standard
			0	1	2	20	21	22	Ga (very high)	Gb (high)	Gc (normal)	Da (very high)	Db (high)	Dc (normal)	
e	Increased safety	No arcs, sparks or hot surfaces, enclosure IP54 or better		•	•					•					60079-7
n	Type 'n' (non-sparking)				•						•				60079-15
d	Flameproof	Containment of the explosion		•	•					•					60079-1
px	Pressurised enclosure	Keep the flammable substances out		•	•					•					60079-2
py				•	•					•					
pz					•						•				
tb	Dust ignition protection by enclosure	Dust-tight enclosure					•	•					•		60079-31
tc								•						•	

Cooling

Flameproof motors from Cantoni Group are equipped with standard IC411 cooling according to IEC 60034-6. Other cooling methods (for example motors with external/separate cooling) are available on request.

IC code according to IEC 60034-6	Description	Drawing
IC410	– Enclosed machine – Surface cooled by natural convection and radiation – Without internal or external fan	
IC411	– Enclosed machine – Smooth or finned casing – External shaft-mounted fan – Often called TEFC motor	
IC416A	– Enclosed machine – Smooth or finned casing – External motorized axial fan integrated with the motor	
IC416R	– Enclosed machine – Smooth or finned casing – External motorized radial fan integrated with the motor	

Standard terminal box equipment

Motor frame size	Number of terminals	Number of cable glands	Optional rotation of terminal box	Temperature sensors in the winding
56	6	1	no	(standard in "-D" execution)
63	6	1	no	(standard in "-D" execution)
71	6	1	no	(standard in "-D" execution)
80	6	1	no	(standard in "-D" execution)
90	6	1	4x90°	(standard in "-f" or "-D" execution)
100	6	1	4x90°	(standard in "-f" or "-D" execution)
112	6	1	4x90°	(standard in "-f" or "-D" execution)
132	6	1	4x90°	(standard in "-f" or "-D" execution)
160	6	1	4x90°	(standard in "-f" or "-D" execution)
180	6	1	4x90°	(standard in "-f" or "-D" execution)

Vibration level

The rotor balancing method guarantees that a standard vibration level A is maintained in accordance with the IEC 60034-14. On customer's demand the motors can be produced with reduced vibration level (B).

Limits of maximum vibration velocity (r.m.s.) for shaft height H according to IEC 60034-14

Vibration level	Shaft height	56 ≤ H ≤ 132	H > 132
	Fitting type	mm/s	mm/s
A	Free suspension	2.8	2.8
	Rigid setting	–	2.3
B	Free suspension	1.1	1.8
	Rigid setting	–	1.5

Remark:

Limits stated in the table mentioned above are applicable for uncoupled (disconnected from the driven machine) and operating at no load motors.

Noise level

Motors in standard comply with a permissible sound power level according to IEC 60034-9.

On customer's demand the motors can be delivered with reduced noise level by using special cooling systems.

Terminal box

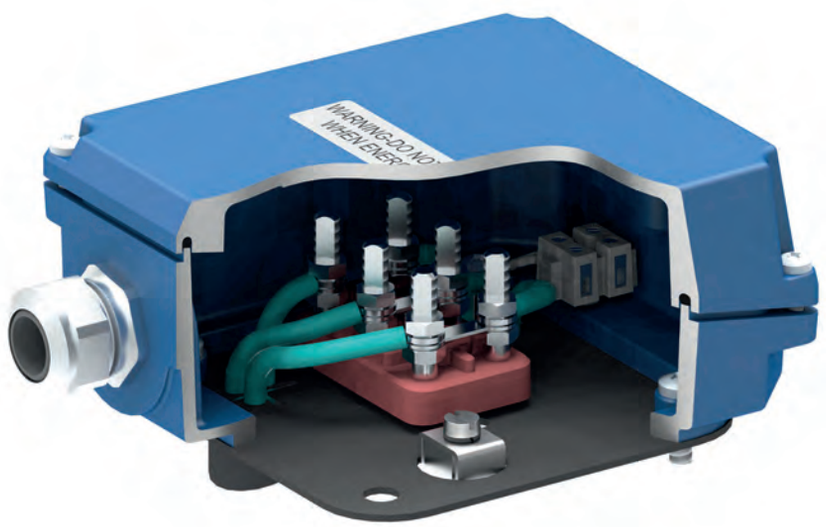
The terminal box is equipped with a terminal board with 6 terminals.

Terminal boxes are equipped with one cable gland.

Motors adapted for inverter power supply (-f) are equipped with winding temperature sensors and the terminals are placed on a special terminal connector.

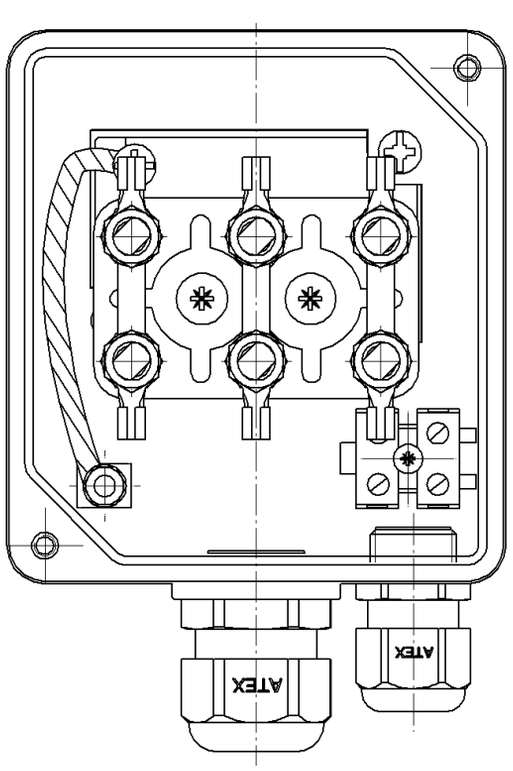
Motors with temperature sensors are equipped with an additional cable gland (for connecting sensors).

For motors frame size 56 to 80 second cable gland available upon request.

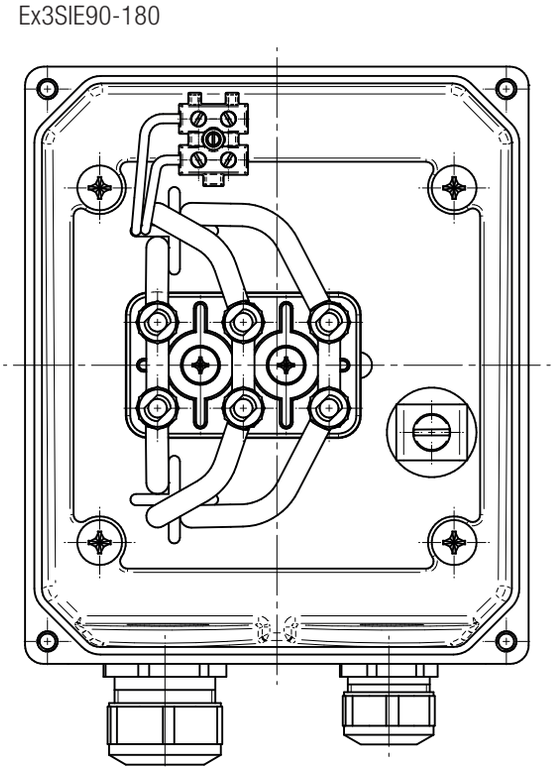


Standard terminal box view:

Frame size
Ex3SIE, Ex2SIE, ExSh56-80



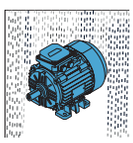
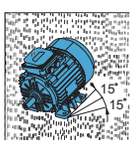
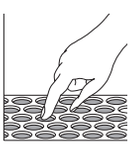
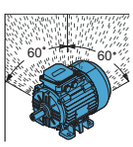
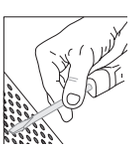
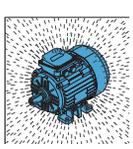
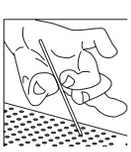
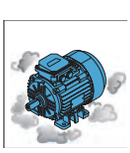
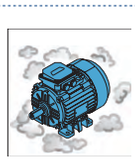
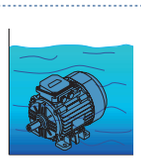
Frame size
Ex3SIE90-180



Degree of protection IP

IP 55

Motors in standard execution comply with IP55 requirements according to IEC 60034-5

Protection against penetration of solid matter			Protection against penetration of fluids		
1st digit	Description		2nd digit	Description	
0		Not protected	0		Not protected
			1		Protected against vertically falling drops of water
1		Protected against solid bodies larger than 50 mm	2		Protected against vertically falling drops of water up to 15°
2		Protected against solid bodies larger than 12 mm	3		Protected against rain up to 60°
3		Protected against solid bodies larger than 2,5 mm	4		Protected against rain falling from any direction
4		Protected against solid bodies larger than 1 mm	5		Protected against sprayed water from any direction
5		Protected against deposition of dust	6		Protected against temporary immersion
6		Totally protected against deposition of dust	7		Protected against immersion between 0,15 and 1 m
			8		Protected against immersion at preset pressure and time

Higher degree of protection is available on request.

Painting and corrosivity classes

Standard painting system with RAL5010 color used in all our motors comply with C3 corrosion class according to ISO 12944.

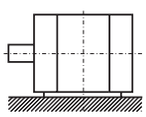
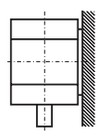
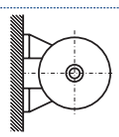
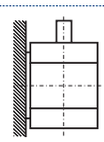
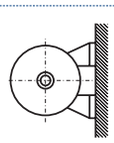
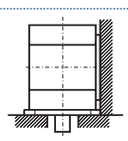
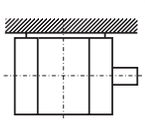
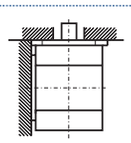
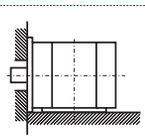
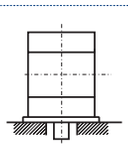
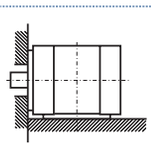
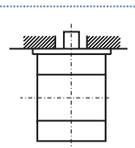
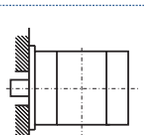
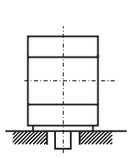
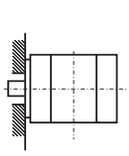
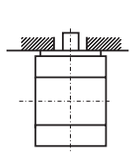
For special request motors can be painted with other colors and with alternative painting systems (up to C5 corrosion class).

RAL 5010/C3

Corrosion class	Environment	
	Interior	Exterior
C1 (very low)	Heated buildings with a clean atmosphere such as hotels, offices, shops, schools.	N/A
C2 (low)	Unheated buildings, where condensation may occur e.g. storehouses, sports halls.	Atmosphere contaminated to a small extent, mostly rural regions.
C3 (medium)	Production space of high humidity and certain air contamination e.g. foodstuff plants, laundries, breweries, dairies.	Industrial and urban atmosphere with an average Sulphur oxide (IV) contamination level. Inshore areas of low salinity.
C4 (high)	Chemical plants, swimming pools, ship repair yards.	Industrial areas and inshore areas of medium salinity.
C5 (very high)	Buildings and areas of almost constant condensation and high contamination.	Industrial areas with high humidity and aggressive atmosphere and coastal areas with high salinity.

Mounting arrangements

According to the IEC 60034-7 standard

Horizontal shaft				Vertical shaft			
	Designation				Designation		
	Code II	Code I	Frame size		Code II	Code I	Frame size
	IM 1001	IM B3	56 ÷ 180		IM 1011	IM V5	56 ÷ 180
	IM 1051	IM B6	56 ÷ 180		IM 1031	IM V6	56 ÷ 180
	IM 1061	IM B7	56 ÷ 180		IM 2011 or IM 2111	IM V15	56 ÷ 180
	IM 1071	IM B8	56 ÷ 180		IM 2031 or IM 2131	IM V36	56 ÷ 180
	IM 2001	IM B35	56 ÷ 180		IM 3011	IM V1	56 ÷ 180
	IM 2101	IM B34	56 ÷ 132		IM 3031	IM V3	80 ÷ 180
	IM 3001	IM B5	56 ÷ 180		IM 3611	IM V18	56 ÷ 160
	IM 3601	IM B14	56 ÷ 132		IM 3631	IM V19	56 ÷ 160

*Other mounting arrangements available on special request

Definitions

Relation between rated output power and rated torque on motor shaft:

$$T = \frac{9{,}55 \times P}{n}$$

where:

- *T [Nm] is rated output torque on motor shaft*
- *P [W] is rated output power on motor shaft*
- *n [rpm] is rated speed of motor shaft*

Relation between rated output power on shaft and rated consumed power from mains:

$$P_1 = \frac{P}{\eta} \times 100$$

where:

- *P1 [kW] is rated consumed power from mains by motor*
- *P [kW] is rated output power on motor shaft*
- *η [%] is rated efficiency of motor*

Relation between rated consumed power from mains and rated voltage, current, power factor:

$$P_1 = \sqrt{3} \times U \times I \times \cos\varphi$$

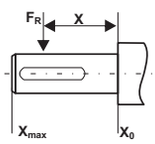
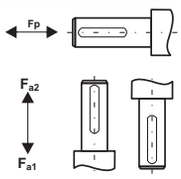
where:

- *P1 [W] is rated consumed power from mains by motor*
- *U [V] is rated supply voltage of motor*
- *I [A] is rated current consumed from mains by motor*
- *cosφ is rated power factor of motor*

Units of measurement

Parameter name	Symbol	Unit name	Symbol
Frequency	f	Hertz	Hz
Active power	P	Watt	W
Voltage	U	Volt	V
Electric Current	I	Amper	A
Power factor	cosφ	N/A	N/A
Resistance	R	Ohm	Ω
Sound power level	L_W	decibel	dB
Sound pressure level	L_P	decibel	dB

Permissible shaft end loads

Frame size	Horizontal operation		Vertical operation		
					
	$F_R(x = 0)$	$F_R(x = max)$	F_P	F_{a1}	F_{a2}
	[kN]		[kN]		
ExSh(2SIE)56-2	0,20	0,16	0,04	0,03	0,05
ExSh56-4	0,25	0,20	0,05	0,04	0,06
Ex2SIE63-2	0,20	0,16	0,04	0,04	0,06
Ex2SIE63-4	0,25	0,20	0,06	0,05	0,07
ExSh63-6	0,27	0,22	0,06	0,05	0,07
Ex2SIE71-2	0,29	0,24	0,07	0,05	0,09
Ex2SIE71-4	0,36	0,30	0,09	0,07	0,11
Ex2SIE71-6	0,40	0,35	0,10	0,08	0,12
Ex3SIE80-2	0,33	0,27	0,09	0,06	0,12
Ex3SIE80-4	0,44	0,37	0,12	0,09	0,15
Ex2SIE80-6	0,51	0,42	0,14	0,11	0,17
Ex3SIE90S2	0,79	0,66	0,64	0,44	0,84
Ex3SIE90L2	0,79	0,66	0,64	0,44	0,84
Ex3SIE90S4	1,00	0,83	0,80	0,65	1,05
Ex3SIE90L4	1,00	0,83	0,80	0,65	1,05
Ex3SIE90S6	1,15	0,95	0,90	0,77	1,17
Ex3SIE90L6	1,15	0,95	0,90	0,77	1,17
Ex3SIE100L2	1,11	0,89	0,90	0,61	1,17
Ex3SIE100L4A	1,39	1,12	1,12	0,90	1,46
Ex3SIE100L4B	1,39	1,12	1,12	0,90	1,46
Ex3SIE100L6	1,60	1,29	1,26	1,08	1,64
Ex3SIE112M2	1,56	1,22	1,23	0,84	1,60
Ex3SIE112M4	1,92	1,58	1,50	1,19	1,96
Ex3SIE112M6	2,20	1,80	1,69	1,26	2,20
Ex3SIE132S2A	2,11	1,65	1,82	0,98	2,37
Ex3SIE132S2B	2,11	1,65	1,82	0,98	2,37
Ex3SIE132S4	2,67	2,08	2,31	1,36	3,00
Ex3SIE132M4	2,67	2,08	2,31	1,36	3,00
Ex3SIE132S6	3,06	2,39	2,51	1,40	3,26
Ex3SIE132M6B	3,06	2,39	2,51	1,40	3,26
Ex3SIE160M2A	2,43	1,88	1,97	1,00	2,56
Ex3SIE160M2B	2,43	1,88	1,97	1,00	2,56
Ex3SIE160L2	2,43	1,88	1,97	1,00	2,56
Ex3SIE160M4	3,06	2,38	2,54	1,43	3,31
Ex3SIE160L4	3,06	2,38	2,54	1,43	3,31
Ex3SIE160M6	3,54	2,81	2,83	1,80	3,68
Ex3SIE160L6	3,54	2,81	2,83	1,80	3,68
Ex3SIE180M2	2,61	2,13	2,20	1,00	2,87
Ex3SIE180M4	3,30	2,68	2,83	1,37	3,68
Ex3SIE180L4	3,30	2,68	2,83	1,37	3,68
Ex3SIE180L6	3,78	3,07	3,17	1,93	4,12

Value of radial force FR acting on the shaft end for a given belt pulley diameter is calculated according to the following formula:

$$F_R = \frac{19\,600 \times P \times k}{D_K \times n}\ [N]$$

where: P – motor output [kW]
D_K – belt pulley diameter [m]
n – speed [rpm]
k – belt tension factor:
for V-belts k=2,2
for flat belts k=3

Value of force FR acting on any point of the shaft end (between points X=max and X=0) may be calculated according to the following formula:

$$F_R = F_{X0} - \frac{X}{E} \times (F_{X0} - F_{XMAX})\ [N]$$

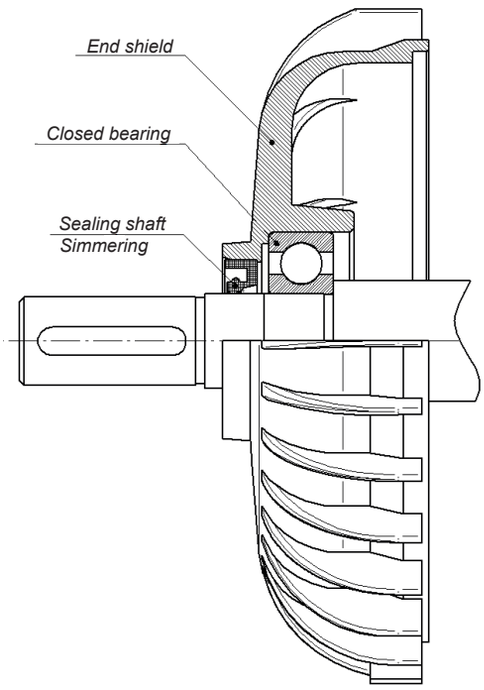
where: F_{X0} – value of F_R force acting on the beginning of the shaft end
F_{XMAX} – value of F_R force acting on the end of the shaft end
E – lenght of the shaft end

Bearing types and bearing nodes

Frame size	Number of poles	Bearings	
		DE	NDE
56	2÷6	6201 2Z C3	6201 2Z C3
63	2÷6	6202 2Z C3	6202 2Z C3
71	2÷6	6203 2Z C3	6203 2Z C3
80	2÷6	6204 2Z C3	6204 2Z C3
90	2÷6	6205 2Z C3	6205 2Z C3
100	2÷6	6206 2Z C3	6206 2Z C3
112	2÷6	6306 2Z C3	6306 2Z C3
132	2÷6	6308 2Z C3	6308 2Z C3
160	2÷6	6309 2Z C3	6309 2Z C3
180	2÷6	6311 2Z C3	6311 2Z C3

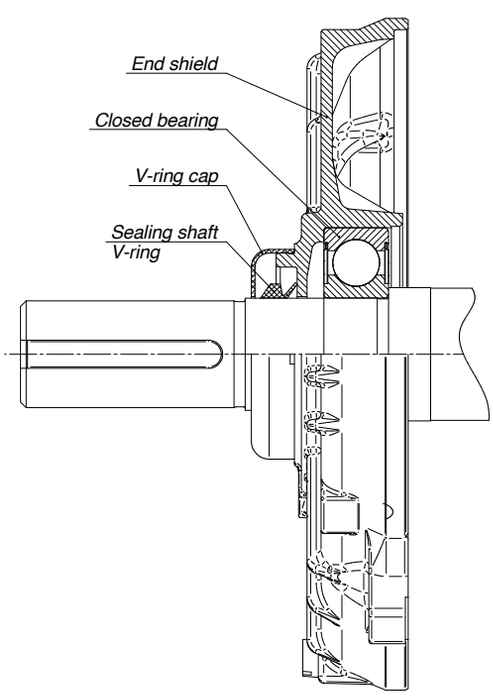
Bearing types and bearing nodes

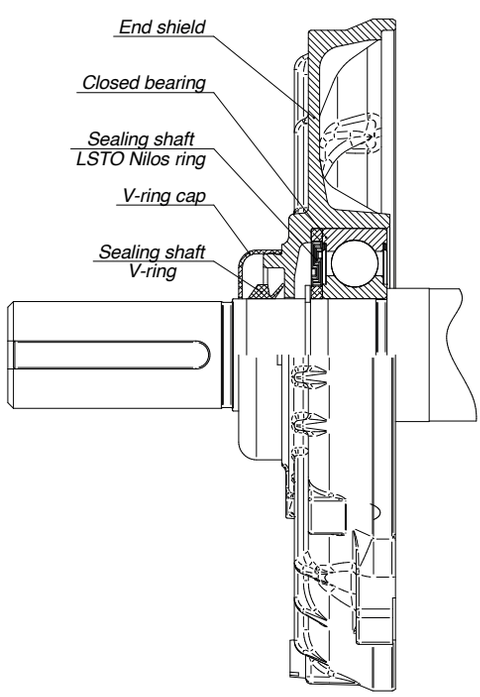
Frame size
Ex3SIE, Ex2SIE, ExSh56-80



Frame size
Ex3SIE90-180

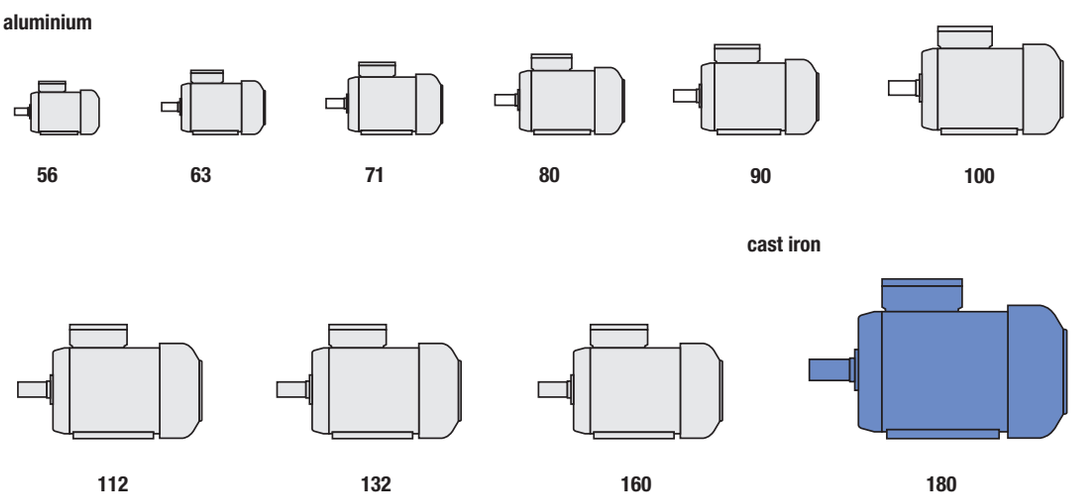
Types of sealings of bearing nodes





Material of housing, end shields and feet

Frame size [mm]	Motor housing	End shields	Feet
Ex56	Aluminium	Aluminium	Aluminium – screwed
Ex63	Aluminium	Aluminium	Aluminium – screwed
Ex71	Aluminium	Aluminium	Aluminium – screwed
Ex80	Aluminium	Aluminium	Aluminium – screwed
Ex3SIE90	Aluminium	Aluminium / Cast iron (B5)	Aluminium – screwed
Ex3SIE100	Aluminium	Aluminium / Cast iron (B5)	Aluminium – screwed
Ex3SIE112	Aluminium	Cast iron	Aluminium – screwed
Ex3SIE132	Aluminium	Cast iron	Aluminium – screwed
Ex3SIE160	Aluminium	Cast iron	Aluminium – screwed
Ex3SIE180	Cast iron	Cast iron	Cast iron – screwed



Nomenclature

Ex	3SIE/2SIE/Sh	100	L	4	B	-2G T3	-ELT	-f
	series of motors and mounting arrangement	shaft h (in B3 or B35)	frame length L = long M = medium S = short	no. of poles (speed)	A = lower power B = higher power C,D = increased output	Ex execution and temperature class: -2G T3 – for gas explosion areas -2G T3 / 2D – for gas and dust explosion areas -2D – for dust explosion areas	special execution: for extra low temperature (<-20°C)	special execution: for frequency converter supply


3SIE


3SIEK


3SIEL

Ex marking

Type of motor	ATEX marking
Ex(3SIE,2SIE,Sh)...-2G T3/T4*	II 2G Ex eb IIC T3 Gb (-20°C...+40°C)
Ex(3SIE,2SIE,Sh)...-2G T3/T4* / 2D	II 2G Ex eb IIC T3 Gb (-20°C...+40°C) / II 2D Ex tb IIIC T125°C Db (-20°C...+40°C)
Ex3SIE...-2D	II 2D Ex tb IIIC T125°C Db (-20°C...+40°C)
Ex3SIE...-2G T3-ELT	II 2G Ex eb IIC T3 Gb (-40°C...+40°C)
Ex3SIE...-2G T3 / 2D-ELT	II 2G Ex eb IIC T3 Gb (-40°C...+40°C) / II 2D Ex tb IIIC T125°C Db (-40°C...+40°C)
Ex3SIE...-2D-ELT	II 2D Ex eb IIIC T125°C Db (-40°C...+40°C)

*Temperature class T4 available for frame size 56-80

REMARK: The overload protection of increased safety motor must have the time-current characteristic which guarantees that the motor will be disconnected from supply voltage in a time shorter than specified time t_E (please check rated parameters on next pages) when the current is equal to starting current. The second equivalent type of protection are PTC sensors in winding (if motors equipped with it) which prevent exceeding max temperature in case of unexpected disturbances.

Frequency converter operation (VSD)

Electronic speed control is carried out using a frequency converter (VSD) that adjusts the speed of the motor – and therefore the torque produced – based on the energy needed.

Our increased safety motors (frame size 90-180) can be ordered in special execution designed for the frequency converter supply ("-f"). Permissible output parameters of frequency converter and speed control range have to be established individually.

Totally Enclosed Motors IP 55 f=50Hz RPM=3000 min^{-1}

Item	Type	Rated output		Rated speed	Rated torque	Efficiency	Power factor	Full load current at 400V	Locked rotor torque ratio	Locked rotor current ratio	Breakdown torque ratio	Moment of Inertia	Time	Weight (IMB3)
		P_N		n_N	T_N	η_N	cos φ	I_N	T_L/T_N	I_L/I_N	T_B/T_N	J	t_E	
		[kW]	[HP]	[min^{-1}]	[Nm]	[%]	[-]	[A]	[-]	[-]	[-]	[kgm^2]	[s]	[kg]
					2p=2		n_s=3000 rpm							
1	ExSh56-2A	0,09	0,12	2760	0,31	54,0	0,60	0,4	2,5	3,1	2,5	–	45	3
2	Ex2SIE56-2B	0,12	0,17	2750	0,42	62,0	0,70	0,4	2,3	3,3	2,3	–	34	3,3
3	Ex2SIE63-2A	0,18	0,25	2820	0,61	64,0	0,70	0,6	3,1	4,8	3,2	–	22	4,4
4	Ex2SIE63-2B	0,25	0,33	2870	0,83	67,0	0,60	0,9	4,9	5,7	4,8	–	14	5,2
5	Ex2SIE71-2A	0,37	0,5	2870	1,23	70,5	0,80	0,95	2,9	5,2	2,2	–	15	6,0
6	Ex2SIE71-2B	0,55	0,75	2850	1,84	74,5	0,82	1,3	2,9	5,1	2,1	–	18	7,8
7	Ex3SIE80-2A	0,75	1	2890	2,48	80,7	0,76	1,8	5,3	7,3	2,6	–	7	9,5
8	Ex3SIE80-2B	1,1	1,5	2890	3,62	82,7	0,77	2,5	4,5	9,0	2,6	–	6	11,8
9	Ex3SIE90S2..	1,5	2	2925	4,9	84,2	0,85	3,0	2,4	9,3	3,5	0,0014	8,5	16,5
10	Ex3SIE90L2..	2,2	3	2910	7,2	85,9	0,86	4,3	2,7	9,2	4,0	0,0019	9,5	18,5
11	Ex3SIE100L2..	3	4	2915	9,8	87,1	0,85	5,8	3,0	7,8	4,1	0,0039	13,5	25
12	Ex3SIE112M2..	4	5,5	2925	13,0	88,1	0,89	7,4	2,3	8,4	3,2	0,0075	14	35,5
13	Ex3SIE132S2A..	5,5	7,5	2940	17,9	89,2	0,89	10,0	2,6	8,9	3,4	0,014	12	55
14	Ex3SIE132S2B..	7,5	10	2940	24,4	90,1	0,90	13,3	2,8	8,9	3,8	0,017	7,7	64
15	Ex3SIE160M2A..	11	15	2945	35,7	91,2	0,90	19,3	2,1	7,9	3,2	0,048	10	90
16	Ex3SIE160M2B..	15	20	2945	48,6	91,9	0,90	26,2	2,4	8,0	3,3	0,059	5,9	99
17	Ex3SIE160L2..	18,5	25	2950	59,9	92,4	0,87	33,2	2,7	8,8	4,0	0,072	5,7	106
18	Ex3SIE180M2..	22	30	2955	71,1	92,7	0,90	38,1	3,0	8,9	3,4	0,095	6,7	190

Totally Enclosed Motors IP 55 f=50Hz RPM=1500 min^{-1}

					2p=4		n_s=1500 rpm							
1	ExSh56-4A	0,06	0,08	1380	0,42	48,0	0,57	0,31	2,3	2,7	2,5	–	64	3,0
2	ExSh56-4B	0,09	0,12	1370	0,63	60,0	0,59	0,37	1,9	2,8	2,1	–	64	3,3
3	Ex2SIE63-4A	0,12	0,17	1400	0,82	66,0	0,65	0,4	2,8	4,5	3,1	–	75	5,3
4	Ex2SIE63-4B	0,18	0,25	1380	1,25	67,5	0,70	0,55	2,5	3,8	2,5	–	80	6,1
5	Ex2SIE71-4A	0,25	0,33	1410	1,69	70,0	0,62	0,85	2,8	3,7	2,9	–	55	7,7
6	Ex2SIE71-4B	0,37	0,5	1410	2,51	72,5	0,64	1,15	2,9	4,1	3,1	–	34	8,1
7	Ex2SIE80-4A	0,55	0,75	1420	3,7	78,5	0,68	1,5	3,2	5,4	3,2	–	21	9,9
8	Ex3SIE80-4B	0,75	1	1430	5,01	82,5	0,63	2,1	3,8	5,7	3,7	–	21	11,8
9	Ex3SIE90S4..	1,1	1,5	1450	7,2	84,1	0,77	2,5	2,3	6,9	3,5	0,0036	18	18
10	Ex3SIE90L4..	1,5	2	1450	9,9	85,3	0,78	3,3	2,5	7,4	3,4	0,004	21	21
11	Ex3SIE100L4A..	2,2	3	1465	14,3	86,7	0,80	4,6	2,5	7,3	3,3	0,0076	19	27,5
12	Ex3SIE100L4B..	3	4	1465	19,6	87,7	0,79	6,3	2,5	7,1	3,5	0,0086	15	31
13	Ex3SIE112M4..	4	5,5	1455	26,3	88,6	0,80	8,1	2,1	6,9	3,0	0,0115	12	41,5
14	Ex3SIE132S4..	5,5	7,5	1465	35,7	89,6	0,85	10,4	2,5	9,2	3,4	0,036	14	63
15	Ex3SIE132M4..	7,5	10	1465	49,1	90,4	0,83	14,4	2,9	9,5	3,8	0,042	12	67
16	Ex3SIE160M4..	11	15	1470	71,5	91,4	0,83	20,9	2,6	6,8	2,8	0,088	13	90
17	Ex3SIE160L4..	15	20	1475	97,1	92,1	0,83	28,3	2,7	7,8	3,2	0,104	8,8	121
18	Ex3SIE180M4..	18,5	25	1475	120,2	92,6	0,85	33,9	2,9	9,3	3,0	0,162	12	190
19	Ex3SIE180L4..	22	30	1475	142,4	93,0	0,86	39,7	3,0	9,4	3,4	0,185	7,5	200

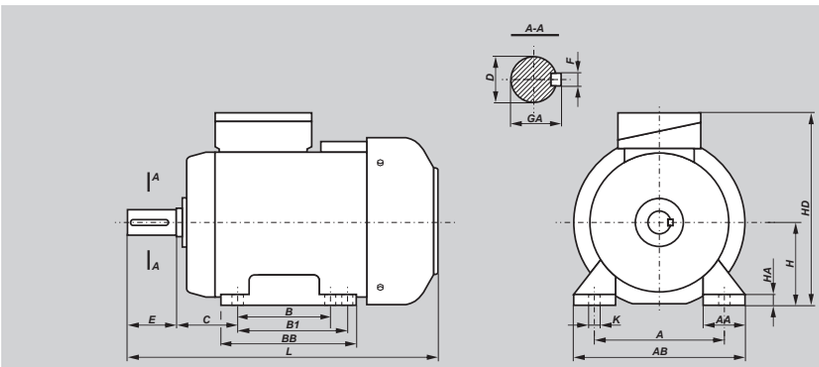
As part of our development program, we reserve the right to alter or amend any of the specifications without giving prior notice.

Totally Enclosed Motors IP 55 f=50Hz RPM=1000 min^{-1}

Item	Type	Rated output		Rated speed	Rated torque	Efficiency	Power factor	Full load current at 400V	Locked rotor torque ratio	Locked rotor current ratio	Breakdown torque ratio	Moment of Inertia	Time	Weight (IMB3)
		P_N		n_N	T_N	η_N	cos φ	I_N	T_L/T_N	I_L/I_N	T_B/T_N	J	t_E	
		[kW]	[HP]	[min^{-1}]	[Nm]	[%]	[-]	[A]	[-]	[-]	[-]	[kgm^2]	[s]	[kg]
					2p=6		**n_s=1000 rpm**							
1	ExSh63-6B	0,06	0,08	940	0,61	40,0	0,39	0,55	2,9	2,4	3,0	–	110	5,0
2	Ex2SIE71-6A	0,18	0,25	910	1,89	63,5	0,64	0,65	2,7	3,1	2,7	–	70	7,5
3	Ex2SIE71-6B	0,25	0,33	910	2,62	64,0	0,65	0,9	2,6	2,9	2,5	–	40	8,1
4	Ex2SIE80-6A	0,37	0,5	920	3,84	72,0	0,76	1,0	1,9	3,5	2,2	–	55	9,5
5	Ex2SIE80-6B	0,55	0,75	950	5,53	73,2	0,57	1,9	3,4	4,3	3,6	–	25	12,5
6	Ex3SIE90S6..	0,75	1	940	7,6	78,9	0,70	2,0	1,7	4,3	2,4	0,0032	21	16
7	Ex3SIE90L6..	1,1	1,5	940	11,1	81,0	0,70	2,8	2,1	4,5	2,6	0,009	23	19
8	Ex3SIE100L6..	1,5	2	960	14,9	82,5	0,74	3,5	2,0	5,5	2,7	0,01	24	23,5
9	Ex3SIE112M6..	2,2	3	965	21,8	84,3	0,76	5,0	2,1	6,4	2,6	0,0177	23	34
10	Ex3SIE132S6..	3	4	965	29,7	87,0	0,81	6,2	2,2	6,6	2,9	0,044	17	54
11	Ex3SIE132M6A..	4	5,5	965	39,8	88,0	0,81	8,1	2,3	7,0	3,0	0,0579	19	62
12	Ex3SIE132M6B..	5,5	7,5	960	54,7	88,0	0,81	11,1	2,4	6,9	3,1	0,0637	15	66
13	Ex3SIE160M6..	7,5	10	970	73,8	89,1	0,80	15,2	2,1	6,6	2,9	0,102	16	101
14	Ex3SIE160L6..	11	15	970	108,3	90,3	0,80	22,0	2,2	6,8	3,0	0,123	14	114
15	Ex3SIE180L6..	15	20	980	146,2	91,2	0,80	29,6	3,3	7,9	2,8	0,276	12	198

Other voltage and frequency available on special request

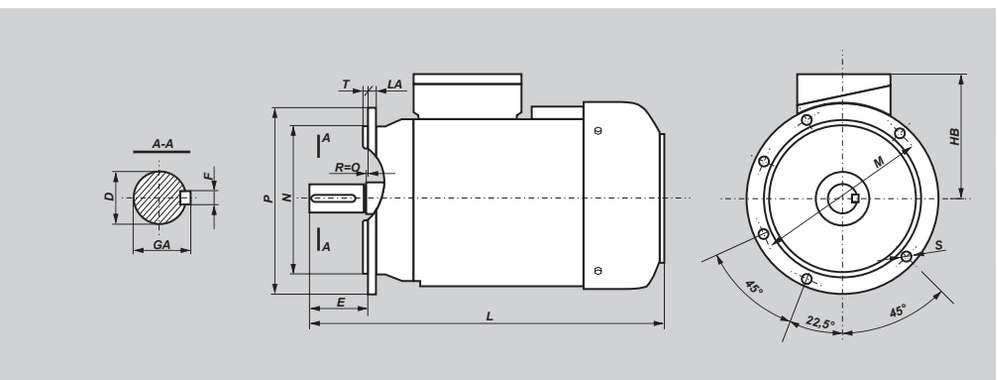
Dimensions of Foot Mounted Motors – IM B3



Size	A	B	B1	C	D	E	F	GA	H	HA	K	AA	AB	AC	BB	HD	L
56-2A,2B,4A,4B	90	71	–	36	9	20	3	10,2	56	7	5,8	30	110	117	92	179	193
63-2A	100	80	–	40	11	23	4	12,5	63	8,5	7	35	124	126	106	191	210
63-2B,4A,6B	100	80	–	40	11	23	4	12,5	63	8,5	7	35	124	126	106	191	225
63-4B	100	80	–	40	11	23	4	12,5	63	8,5	7	35	124	126	106	191	245
71-2A	112	90	–	45	14	30	5	16	71	8	7	45	142	134	116	206	245
71-4A,6A	112	90	–	45	14	30	5	16	71	8	7	45	142	134	116	206	263
71-2B,4B,6B	112	90	–	45	14	30	5	16	71	8	7	45	142	134	116	206	284
80-2A,4A,6A	125	100	–	50	19	40	6	21,5	80	9	10	55	160	157	130	222	278
80-2B,4B	125	100	–	50	19	40	6	21,5	80	9	10	55	160	157	130	222	306
80-6B	125	100	–	50	19	40	6	21,5	80	9	10	55	160	157	130	222	318
90S-2,4,6;L2	140	100	125	56	24	50	8	27	90	10	10	47	182	200	153	238	331
90L-4,6	140	100	125	56	24	50	8	27	90	10	10	47	182	200	153	238	356
100L-2,6	160	140	–	63	28	60	8	31	100	12	12	52	202	215	170	257	377
100L-4A,4B	160	140	–	63	28	60	8	31	100	12	12	52	202	215	170	257	417
112M-2,6	190	140	–	70	28	60	8	31	112	14	12	52	222	248	170	280	398
112M4	190	140	–	70	28	60	8	31	112	14	12	52	222	248	170	280	425
132S-2A,2B,4,6	216	140	178	89	38	80	10	41	132	18	12	61	266	288	220	329	512
132M-4,6A,6B	216	140	178	89	38	80	10	41	132	18	12	61	266	288	220	329	512
160M-2A,2B,4,6	254	210	254	108	42	110	12	45	160	25	15	81	320	340	300	383	643
160L-2,4,6	254	210	254	108	42	110	12	45	160	25	15	81	320	340	300	383	643
180M-2,4;L4,6	279	241	279	121	48	110	14	51,5	180	27	15	92	353	360	320	414	723

As part of our development program, we reserve the right to alter or amend any of the specifications without giving prior notice.

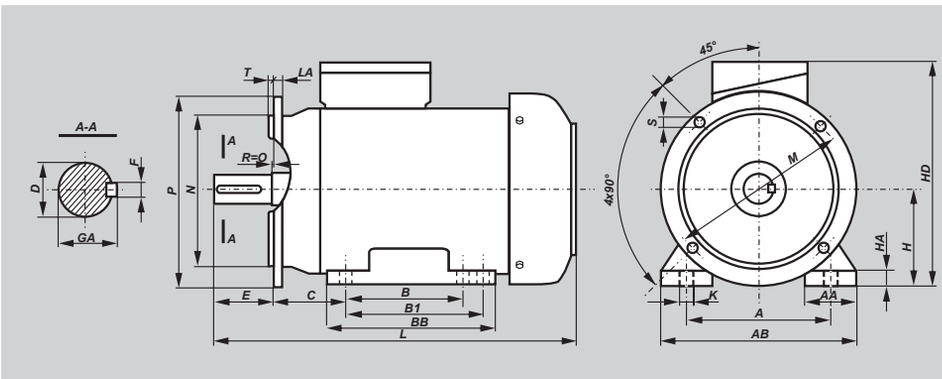
Dimensions of Flange Mounted Motors – IM B5



Size	D	E	F	GA	AC	M	N	P	LA	T	HB	L	S	
													ø	holes
56-2A,2B,4A,4B	9	20	3	10,2	117	100	80	120	8	3	123	193	7	4
63-2A	11	23	4	12,5	126	115	95	140	9	3	128	210	10	4
63-2B,4A,6B	11	23	4	12,5	126	115	95	140	9	3	128	225	10	4
63-4B	11	23	4	12,5	126	115	95	140	9	3	128	245	10	4
71-2A	14	30	5	16	134	130	110	160	10	3,5	135	245	10	4
71-4A,6A	14	30	5	16	134	130	110	160	10	3,5	135	263	10	4
71-2B,4B,6B	14	30	5	16	134	130	110	160	10	3,5	135	284	10	4
80-2A,4A,6A	19	40	6	21,5	157	165	130	200	10	3,5	142	278	12	4
80-2B,4B	19	40	6	21,5	157	165	130	200	10	3,5	142	306	12	4
80-6B	19	40	6	21,5	157	165	130	200	10	3,5	142	318	12	4
90S-2,4,6;L2	24	50	8	27	200	165	130	200	8	3,5	148	331	12	4
90L-4,6	24	50	8	27	200	165	130	200	8	3,5	148	356	12	4
100L-2,6	28	60	8	31	215	215	180	250	11	4	157	377	15	4
100L-4A,4B	28	60	8	31	215	215	180	250	11	4	157	417	15	4
112M-2,6	28	60	8	31	248	215	180	250	12	4	168	398	15	4
112M4	28	60	8	31	248	215	180	250	12	4	168	425	15	4
132S-2A,2B,4,6	38	80	10	41	288	265	230	300	12	4	197	512	15	4
132M-4,6A,6B	38	80	10	41	288	265	230	300	12	4	197	512	15	4
160M-2A,2B,4,6	42	110	12	45	340	300	250	350	13	5	223	643	19	4
160L-2,4,6	42	110	12	45	340	300	250	350	13	5	223	643	19	4
180M-2,4;L4,6	48	110	14	51,5	360	300	250	350	13	5	234	723	19	4

As part of our development program, we reserve the right to alter or amend any of the specifications without giving prior notice.

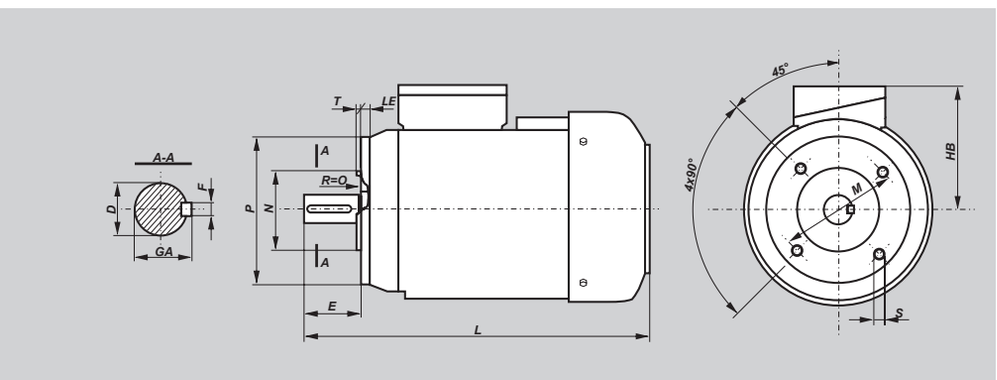
Dimensions of Foot / Flange Mounted Motors – IM B35



Size	A	B	B1	C	D	E	F	GA	H	HA	K	M	N	P	LA	T	S		AA	AB	AC	BB	HD	L
																	ø	holes						
56-2A,2B,4A,4B	90	71	–	36	9	20	3	10,2	56	7	5,8	100	80	120	8	3	7	4	30	110	117	92	179	193
63-2A	100	80	–	40	11	23	4	12,5	63	8,5	7	115	95	140	9	3	10	4	35	124	126	106	191	210
63-2B,4A,6B	100	80	–	40	11	23	4	12,5	63	8,5	7	115	95	140	9	3	10	4	35	124	126	106	191	225
63-4B	100	80	–	40	11	23	4	12,5	63	8,5	7	115	95	140	9	3	10	4	35	124	126	106	191	245
71-2A	112	90	–	45	14	30	5	16	71	8	7	130	110	160	10	3,5	10	4	45	142	134	116	206	245
71-4A,6A	112	90	–	45	14	30	5	16	71	8	7	130	110	160	10	3,5	10	4	45	142	134	116	206	263
71-2B,4B,6B	112	90	–	45	14	30	5	16	71	8	7	130	110	160	10	3,5	10	4	45	142	134	116	206	284
80-2A,4A,6A	125	100	–	50	19	40	6	21,5	80	9	10	165	130	200	10	3,5	12	4	55	160	157	130	222	278
80-2B,4B	125	100	–	50	19	40	6	21,5	80	9	10	165	130	200	10	3,5	12	4	55	160	157	130	222	306
80-6B	125	100	–	50	19	40	6	21,5	80	9	10	165	130	200	10	3,5	12	4	55	160	157	130	222	318
90S-2,4,6;L2	140	100	125	56	24	50	8	27	90	10	10	165	130	200	8	3,5	12	4	47	182	200	153	238	331
90L-4,6	140	100	125	56	24	50	8	27	90	10	10	165	130	200	8	3,5	12	4	47	182	200	153	238	356
100L-2,6	160	140	–	63	28	60	8	31	100	12	12	215	180	250	11	4	15	4	52	202	215	170	257	377
100L-4A,4B	160	140	–	63	28	60	8	31	100	12	12	215	180	250	11	4	15	4	52	202	215	170	257	417
112M-2,6	190	140	–	70	28	60	8	31	112	14	12	215	180	250	12	4	15	4	52	222	248	170	280	398
112M4	190	140	–	70	28	60	8	31	112	14	12	215	180	250	12	4	15	4	52	222	248	170	280	425
132S-2A,2B,4,6	216	140	178	89	38	80	10	41	132	18	12	265	230	300	12	4	15	4	61	266	288	220	329	512
132M-4,6A,6B	216	140	178	89	38	80	10	41	132	18	12	265	230	300	12	4	15	4	61	266	288	220	329	512
160M-2A, 2B,4,6	254	210	254	108	42	110	12	45	160	25	15	300	250	350	13	5	19	4	81	320	340	300	383	643
160L-2,4,6	254	210	254	108	42	110	12	45	160	25	15	300	250	350	13	5	19	4	81	320	340	300	383	643
180M-2,4;L4,6	279	241	279	121	48	110	14	51,5	180	27	15	300	250	350	13	5	19	4	92	353	360	320	414	723

As part of our development program, we reserve the right to alter or amend any of the specifications without giving prior notice.

Dimensions of Flange Mounted Motors – IM B14

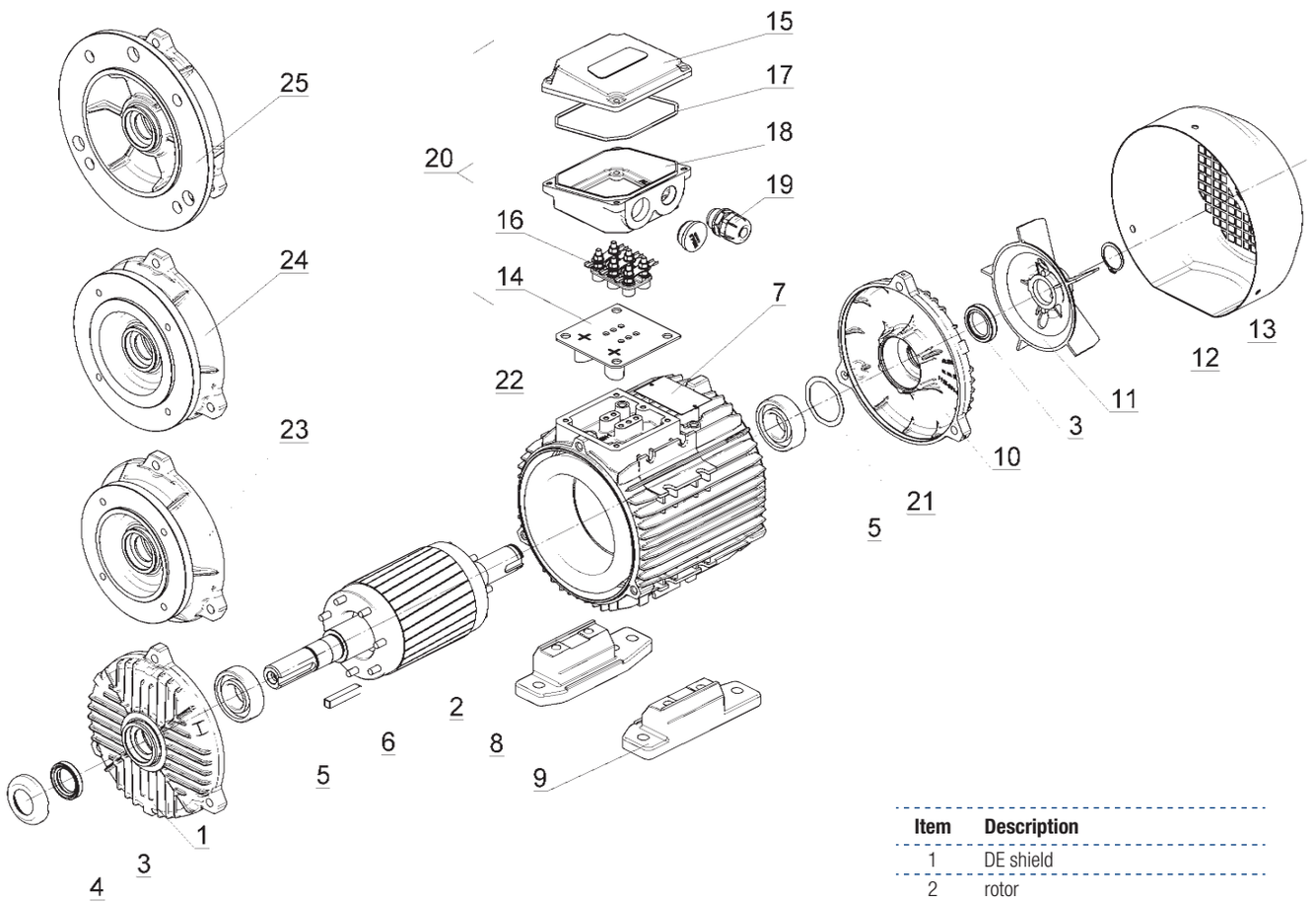


Size	Flange	D	E	F	GA	M	N	P	LA	T	S		AC	HB	L
											ø	holes			
56-2A,2B,4A,4B	C1	9	20	3	10,2	85	70	105	15	2,5	M6	4	117	123	193
	C2	9	20	3	10,2	65	50	80	12,5	2,5	M5	4	117	123	193
63-2A	C1	11	23	4	12,5	100	80	120	14	3	M6	4	126	128	210
	C2	11	23	4	12,5	75	60	90	9,5	2,5	M5	4	126	128	210
63-2B,4A,6B	C1	11	23	4	12,5	100	80	120	14	3	M6	4	126	128	225
	C2	11	23	4	12,5	75	60	90	9,5	2,5	M5	4	126	128	225
63-4B	C1	11	23	4	12,5	100	80	120	14	3	M6	4	126	128	245
	C2	11	23	4	12,5	75	60	90	9,5	2,5	M5	4	126	128	245
71-2A	C1	14	30	5	16	115	95	140	14	3	M8	4	134	135	245
	C2	14	30	5	16	85	70	105	12	2,5	M6	4	134	135	245
71-4A,6A	C1	14	30	5	16	115	95	140	14	3	M8	4	134	135	263
	C2	14	30	5	16	85	70	105	12	2,5	M6	4	134	135	263
71-2B,4B,6B	C1	14	30	5	16	115	95	140	14	3	M8	4	134	135	284
	C2	14	30	5	16	85	70	105	12	2,5	M6	4	134	135	284
80-2A,4A,6A	C1	19	40	6	21,5	130	110	160	14	3,5	M8	4	157	142	278
	C2	19	40	6	21,5	100	80	120	12	3	M6	4	157	142	278
80-2B,4B	C1	19	40	6	21,5	130	110	160	14	3,5	M8	4	157	142	306
	C2	19	40	6	21,5	100	80	120	12	3	M6	4	157	142	306
80-6B	C1	19	40	6	21,5	130	110	160	14	3,5	M8	4	157	142	318
	C2	19	40	6	21,5	100	80	120	12	3	M6	4	157	142	318
90S-2,4,6;L2	C1	24	50	8	27	130	110	160	10	3,5	M8	4	200	148	331
	C2	24	50	8	27	115	95	140	10	3	M8	4	200	148	331
90L-4,6	C1	24	50	8	27	130	110	160	10	3,5	M8	4	200	148	356
	C2	24	50	8	27	115	95	140	10	3	M8	4	200	148	356
100L-2,6	C1	28	60	8	31	165	130	200	12	3,5	M10	4	215	157	377
	C2	28	60	8	31	130	110	160	12	3,5	M8	4	215	157	377
100L-4A,4B,	C1	28	60	8	31	165	130	200	12	3,5	M10	4	215	157	417
	C2	28	60	8	31	130	110	160	12	3,5	M8	4	215	157	417
112M-2,6	C1	28	60	8	31	165	130	200	12	3,5	M10	4	248	168	398
	C2	28	60	8	31	130	110	160	12	3,5	M8	4	248	168	398
112M4	C1	28	60	8	31	165	130	200	12	3,5	M10	4	248	168	425
	C2	28	60	8	31	130	110	160	12	3,5	M8	4	248	168	425
132S-2A,2B,4,6	C1	38	80	10	41	215	180	250	12	4	M12	4	288	197	512
	C2	38	80	10	41	165	130	200	12	3,5	M10	4	288	197	512
132M-4,6A,6B	C1	38	80	10	41	215	180	250	12	4	M12	4	288	197	512
	C2	38	80	10	41	165	130	200	12	3,5	M10	4	288	197	512
160M-2A,2B,4,6	C1	42	110	12	45	265	230	300	13	4	M12	4	340	223	643
	C2	42	110	12	45	215	180	250	13	4	M12	4	340	223	643
160L-2,4,6	C1	42	110	12	45	265	230	300	13	4	M12	4	340	223	643
	C2	42	110	12	45	215	180	250	13	4	M12	4	340	223	643

As part of our development program, we reserve the right to alter or amend any of the specifications without giving prior notice.

List of Motor parts

Frame Size: 56÷112

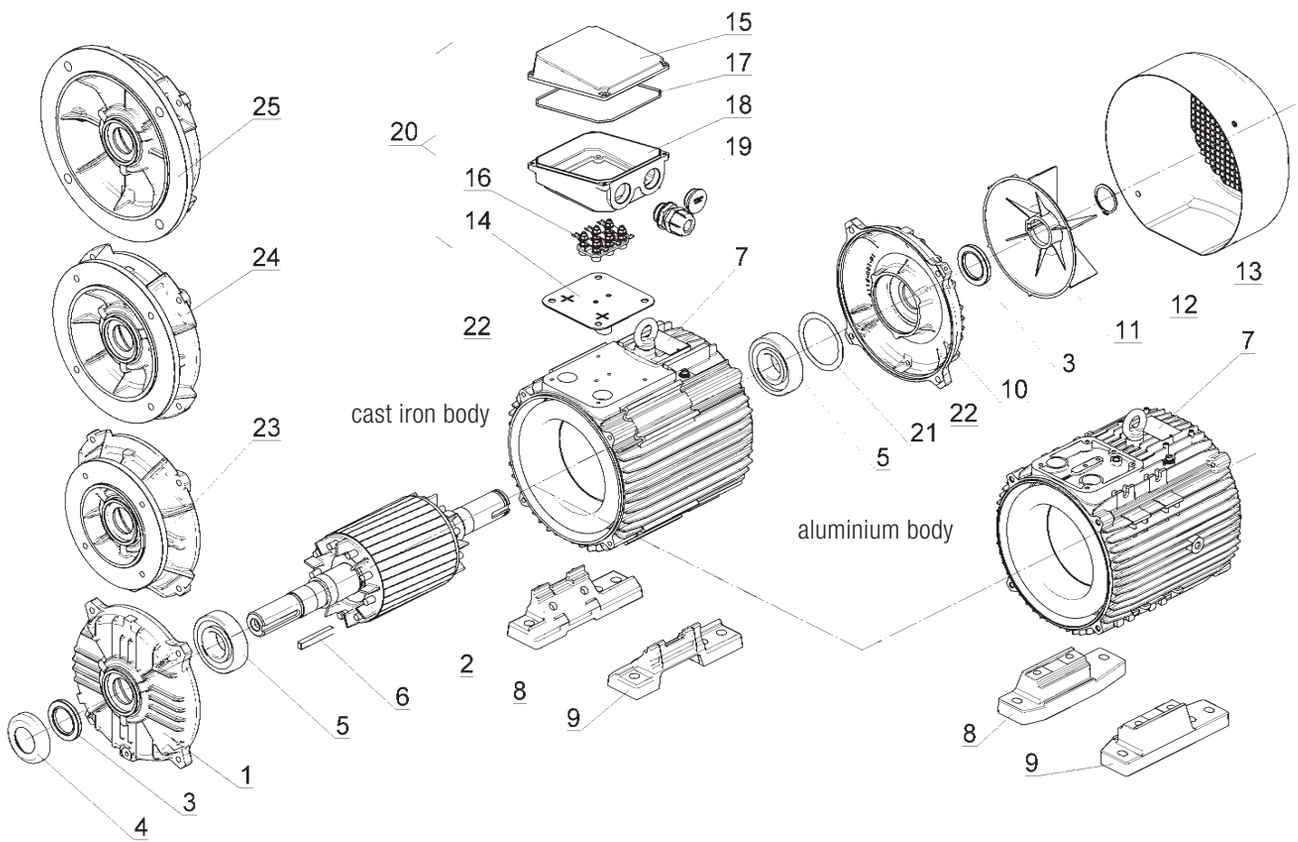


Item	Description
1	DE shield
2	rotor
3	shaft seal
4	shaft seal cover
5	bearing
6	key
7	name plate
8	sx foot
9	dx foot
10	NDE shield
11	fan
12	seeger ring
13	fan cover
14	rubber gasket
15	terminal box cover
16	terminal board
17	rubber gasket
18	terminal box
19	gland
20	terminal box complete
21	spring washer
22	stator
23	flange B14/C2
24	flange B14/C1
25	flange B5

DE – drive end
NDE – non drive end

List of Motor parts

Frame Size: 132÷180



Item	Description
1	DE shield
2	rotor
3	shaft seal
4	shaft seal cover
5	bearing
6	key
7	name plate
8[1]	sx foot
9[1]	dx foot
10	NDE shield
11	fan
12	seeger ring
13	fan cover
14	rubber gasket
15	terminal box cover
16	terminal board
17	rubber gasket
18	terminal box
19	gland
20	terminal box complete
21	spring washer
22[2]	stator
23	flange B14/C2
24	flange B14/C1
25	flange B5

DE – drive end
NDE – non drive end

Ordering information

In order to select the proper motor and provide you the most accurate offer as the requirements of customer's applications are various, we ask you to specify below motor details:

Orders for motors should specify

» ambient temperature,
» rated output,
» rated speed,
» operating duty,
» supply voltage and connection,
» frequency,
» mounting arrangements,
» degree of protection,
» type of driven machine,
» number of cable glands,
» other details regarding special requests,

and information concerning additional accessories e.g.

» thermal protection,
» anticondensation heaters,
» vibration sensors,
» method of start-up (DOL, Y/Δ, VSD, Soft-Start),
» method of coupling with the driven unit (gears, dimensions of belt pulleys, etc.).

When ordering spare parts one should specify:

» full designation of the motor type including its serial number (provided on the nameplate),
» degree of protection,
» mounting arrangement,
» name of part,
» number of pieces.

As part of our development program, we reserve the right to alter or amend any of the specifications without giving prior notice.

Order form

Company name		Contact person	
Country		City	
Address			
Phone		E-mail	
Subject			
Message			

Frame size		Poles		kW		Voltage		Hz	
Number of pieces									
Mounting		IP		Insulation class					
RAL				Zone		Ambient temperature			
PTC		Yes		No		Group		Starting and supply method (DOL, Y/Δ, VSD, Soft-Start)	
PT100		Yes		No		Temperature class			
Additional information									

Dear Customer,
Please complete the above Order Form and send it to ffd@frank-dvorak.at. In case you need assistance, do not hesitate to contact us at phone number: 0043 263 180 05. It will be our pleasure to help you.

Certifications

Cantoni Group's factory, Celma Indukta was one of the first companies obtaining ISO 9001 certificate in Poland

All Cantoni Group manufacturing plants comply with the most important standards.

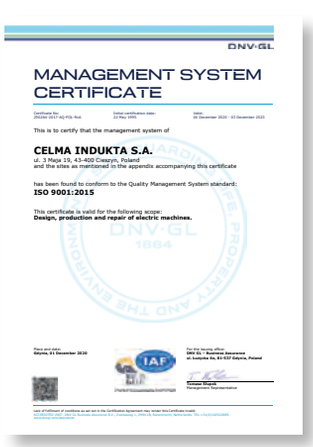
ISO 9001 is based on a number of quality management principles including a strong customer focus, the motivation and involvment of top management, the process approach and continuous improvement. Using ISO 9001 helps to ensure that customers get consistent, good quality products and services.

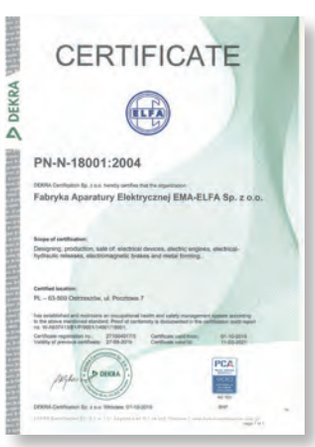
Our aim is to produce high quality products certified according to the most important standards. We always focus our work to provide a product that meets the customer requirements, define the approach to continuous improvement and monitor customer satisfaction. All employees in our Group are fully engaged and motivated to provide the top quality products. We achieve this thanks to skilled technicians, trained workers and customer oriented attitude.

As a demonstration of our aim to meet all high level international standard requirements, we are also certified ISO 14001 and OHSAS 18001 to prove our internal processes and behaviour.

ISO 14001 certification confirms that the organization manages their environmental responsibilities in an effective and internationally accepted way.

In Cantoni Group we know that taking care of the environment means taking care of our present and future.





With **OHSAS 18001** certificate, Cantoni Group confirms the necessity of controlling and improving health and safety aspects within the organization.

Employees are Cantoni Group's main asset, thus, their well-being and safety are our priority.

Our laboratory Celma Indukta is also **ISO 17025** certified by Canadian Standard Association (CSA) for two aspects: safety and energy efficiency verification requirements as independent unit.

The safety part – Supervised Manufacturers Testing Certification (SMTC) confirms that our laboratory is allowed for supervised manufactured safety certification program.

The energy efficiency part confirms that energy verification program for motors operating as SMTC can be performed according to CSA 390 standard at our facilities.

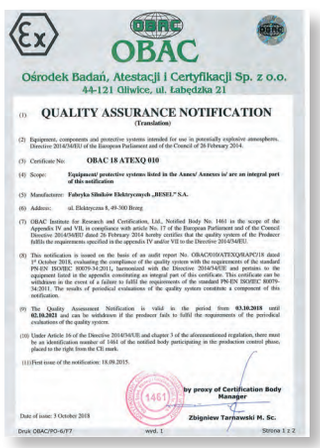
All our prototype motors are tested and approved before series production and samples of our final products are tested periodically to check compliance with all parameters defined. Our production range has also different types of products certifications based on specific technical requirements, like UL-CSA, GOST, EAC, ATEX, IEC Ex, CCC, Bureau Veritas, DNV-GL, etc.

Our technicians are constantly updated, informed and trained about every new regulation in order to provide all possible solutions to meet final customer requirements and also study and engineer ad-hoc products with customers developers.


Certificate of Verification


Supplement No. 2 to Quality Assurance Notification

FTZÚ 04 ATEX Q 011


OBAC

Ośrodek Badań, Atestacji i Certyfikacji Sp. z o.o.

44-121 Gliwice, ul. Łabędzka 21

QUALITY ASSURANCE NOTIFICATION


CERTIFICATE OF COMPLIANCE


TYPE APPROVAL CERTIFICATE

FABRYKA SILNIKÓW ELEKTRYCZNYCH BESEL S.A.

ASYNCHRONOUS MACHINES (Power below 100kW)


PRODUCT CERTIFICATE

CHINA QUALITY CERTIFICATION CENTRE


EAC


Certificate of Compliance


Certificate of Qualification

This is to certify that

CELMA INDUKTA S.A.

Ul. 3 Maja 19, Cieszyn, 43-400

POLAND

has been qualified by CSA Group Testing & Certification Inc., as a Testing Facility for

CSA ENERGY EFFICIENCY VERIFICATION PROGRAM

Based on ISO/IEC 17025:2017 operating as a SMTC


Certificate of Qualification

This is to certify that

CELMA INDUKTA S.A.

Ul. 3 Maja 19, Cieszyn, 43-400

POLAND

has been qualified by CSA Group Testing & Certification Inc., as a Testing Facility for

SUPERVISED MANUFACTURER'S TESTING FOR CERTIFICATION PROGRAM

Based on ISO/IEC 17025:2017

Top quality electric motors

Cantoni Group's electric motors are manufactured in such a way as to provide a durable product that our customers can rely on:

- motors manufactured using high quality raw materials and components
- long-life bearings
- robust and tough construction
- raw materials only from European qualified suppliers
- production process from the beginning to the end at our facilities
- proven electrical performance

Our motors for many applications

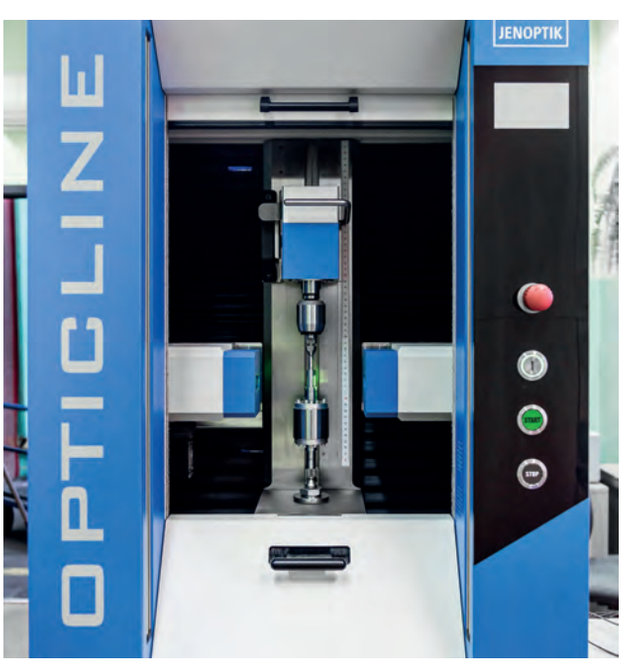
Our motors are produced with the aim to be flexible and adaptable to many different applications. The long tradition and experience of our technical departments, supported by a flexible and strong organization, can assure an engineering of the motor series that meet the most common requirements and the more and more specific requests from the manufacturers of cutting-edge machines.

Our long collaboration with some of the most important players in the global industrial market has built a strong and stable organization that is able to support the customer in the development of the best solutions for its applications.

Cantoni Group continuous investments

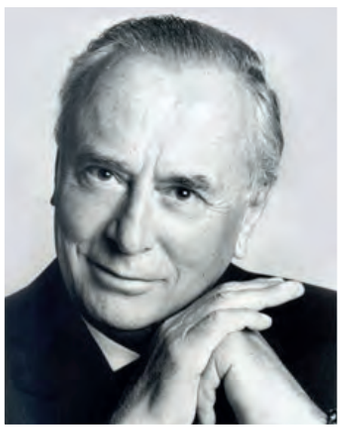
The strategy of Cantoni Group is to realize a strong and continuous plan of investments with the aim to constantly increase the range of products, quality level and high productivity. Cantoni Group international market leadership has been created thanks to such open and future oriented attitude. Investments into the new professional machinery, equipment and infrastructure increase the quality control, capacity and save the environment.

The use of world class CNC, automatic and semi-automatic machinery guarantees precision, repeatability and accuracy. Such considerable development plan of Cantoni Group enhances the already wide range of production, maximizes the quality of offered products and has led to a growing number of innovations (new series for specific applications, new design and solutions) and international approvals.



Cantoni Group

Giampiero Cantoni, Founder of Cantoni Group



Since almost a century, the Cantoni Group has been known worldwide as a leader in manufacturing and supplying electric motors, components and tools.

Thanks to the entrepreneurial commitment and great talent, the founder of the Group, **Prof. Giampiero Cantoni**, created diversified Group Enterprise that has gained outstanding success on the Domestic and International markets, placing us among the most important European manufacturers.

Company History – Frank & Dvorak (FFD)

For over 75 years, Frank & Dvorak (FFD) has stood for top quality and technical expertise in the manufacturing of electric motors. Since its founding, the company has established itself as a reliable partner for industrial companies and repair workshops.

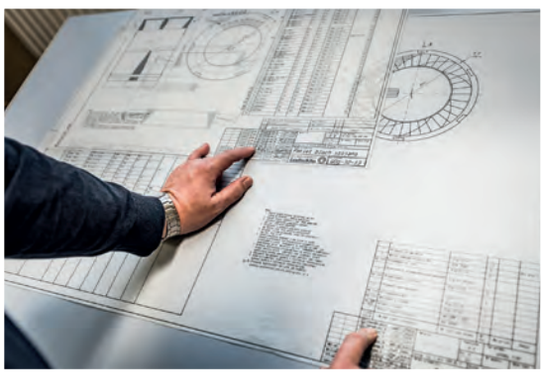
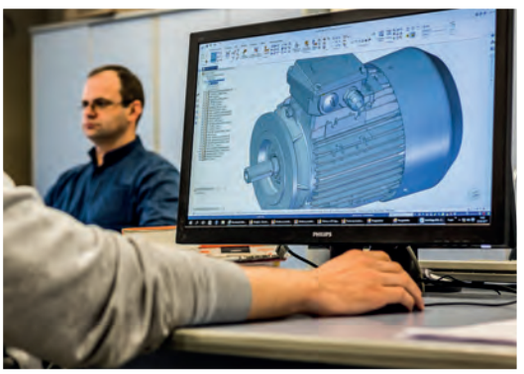
In 2000, FFD became part of the Cantoni Group, a globally leading manufacturer of electric motors. Through this integration, our customers benefit from an expanded product portfolio, state-of-the-art manufacturing technology, and a global service network.

Today, FFD offers a wide range of standard and customized motors for various industrial applications. With high stock availability, flexible production, and customer-specific solutions, we meet the highest standards of quality and performance.

As part of the Cantoni Group, we combine decades of experience with international strength, ensuring the highest precision, fast availability, and sustainable production in accordance with ISO 9001 and ISO 14001.

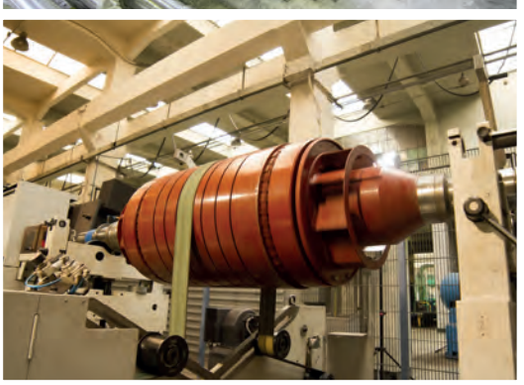
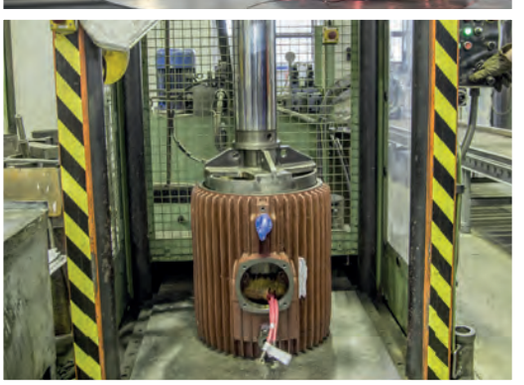
Frank & Dvorak – Your specialist for electric motors, powered by the global expertise of the Cantoni Group.

From the project to the application






THE WORLD OF ELECTRIC MOTORS





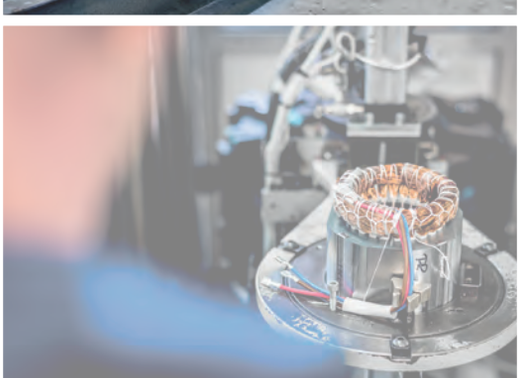









FRANK & DVORAK
ELEKTROMOTOREN
FFD




FRANK & DVORAK
ELEKTROMOTOREN

FFD

Cantoni GROUP

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www.frank-dvorak.at