

OPERATION MANUAL

**Three-phase squirrel cage induction motors
in flameproof enclosure Ex d, Ex de or Ex t
type ASA, E2-ASA and E3-ASA
frame size 63 - 355**



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OPERATION MANUAL

Safety operating conditions for low voltage three phase asynchronous squirrel cage motors according to EU Relevant Directives

When operating these motors have turning parts and hot surfaces. All the operations during the transport, putting into operation and maintenance of these motors have to be made by qualified and authorised persons.

Accidents and/or damages may occur in case of inadequate operations.

These low voltage motors are intended for industrial use and they are in accordance with EN 60034 standard series provisions. For their safe use in hazardous locations, additional instructions given in this Operation Manual have to be observed.

The manufacturer is not responsible for the accidents and damages risen from non-observance of present instructions.

These motors do not contain hazardous substances with restricted use according to **Directive 2011/65/UE (RoHS)**.

1. Denomination and using fields of motors

- 1.1** These operation instructions refer to low voltage three-phase squirrel cage induction motors, type ASA, E2-ASA and E3-ASA, suitable for use in potentially explosive atmospheres, mainly in chemical and petrochemical industry.
- These motors are used in industrial applications and comply with the following European Standards:
- EN 60034 (standard series) - Rotating electrical machines
 - EN 60034-5 - Rotating electrical machines – Part 5: Degrees of protection provided by the integral design of rotating electrical machines (IP Code) - Classification
 - EN 60034-6 – Rotating electrical machines – Part 6: Methods of cooling (IC Code)
 - EN 60034-7 – Rotating electrical machines – Part 7: Classification of types of construction, mounting arrangements and terminal box position (IM Code)
 - EN 60034-9 – Rotating electrical machines – Part 9: Noise limits
 - EN 60034-14 – Rotating electrical machines – Part 14: Mechanical



vibration of certain machines with shafts heights 56 mm and higher

- Measurement, evaluation and limits of vibration severity
- EN 60079-0 - Explosive atmospheres - Part 0: Equipment – General requirements
- EN 60079-1 - Explosive atmospheres - Part 1: Equipment protection by flameproof enclosures “d”
- EN 60079-7 - Explosive atmospheres - Part 7: Equipment protection by increased safety „e”
- EN 60079-31 - Explosive atmospheres – Part 31: Equipment dust ignition protection by enclosure „t”
- Directive 2014/34/EU – Equipment and protective systems intended for use in potentially explosive atmospheres (ATEX)

The motors are designed for use in potentially explosive atmospheres:

- of **Group II** (explosive gas atmospheres of Zones 1 and Zones 2), subdivision IIC, temperature class T5, T4 or T3; they have assigned the level of protection EPL Gb;
 - o alternatively, the motors frame size 225-315 fitted with roller bearing on DE side are designed for use in explosive atmospheres of Group II, subdivision IIB, temperature class T4 or T3; their protection level is EPL Gb
- of **Group III** (explosive dust atmospheres of Zones 21 and Zones 22), subdivisions IIIC, IIIB and IIIA; they have assigned the level of protection EPL Db or EPL Dc

The motors are intended for fixed installations and cable entries are only suited for permanent wiring. The type of installation shall provide for adequate strain relief.

1.1.1 Notation and symbolisation

- The symbolisation of the motors type is made up of three groups of letters and figures in the following order:
 - group ASA, E2-ASA and/or E3-ASA represents the motors series denomination
 - group of the mounting dimensions
 - group of poles number

Examples of notation for a motor having the stator frame size 90L, 4 poles:

Motor type ASA 160L-4

Motor type E2-ASA 160L-4



Motor type E3-ASA 160L-4

1.2 The motors are intended to operate under temperate climate conditions, characterised by:

- ambient temperature: $-20 \dots + 40 \text{ }^{\circ}\text{C}$
- relative humidity: 80% at $+ 20 \text{ }^{\circ}\text{C}$
- altitude: max. 1000 m (above sea level)

1.2.1 The environment may contain potential explosive mixtures made of air and one of the substances pertaining to subgroup IIC (motors IIC) or IIB (motors IIB), temperature class T3, T4, T5, according to EN 60079-0 or mixtures made of air and combustible dust

To avoid unpermissible surface temperatures, the possible dust layer upon the machine surface must not exceed the maximum thickness of 5 mm.

On request, motors operating under tropical (up to $+60^{\circ}\text{C}$) or cold (till -55°C) climatic conditions are available. In the order the client shall indicate the operation/storage temperature

1.3 The motors are not intended to operate under the following conditions:

1.3.1 In mines where applications require ExdI motors

1.3.2 In places where abnormal vibrations or repeated mechanical shocks at short time intervals are present (for example on vibrating placements)

1.3.3 In areas containing nuclear radiation

1.3.4 In places exposed to thermal radiation coming from the surrounding equipment

1.4 For the motors operating in areas where dust is present, care should be taken to avoid the dust deposits with thickness higher than 5 mm on the motor surface.

1.5 On demand, the manufacturer may build motors with other climatic protections

2. Main operating parameters

2.1 The motors are manufactured to be supplied from three-phase networks with symmetrical phase voltages and currents. The technical requirements regarding the supply voltage are according to EN 60034 -1

As standard, the motors are suitable for three-phase mains power supply with 400 V rated line voltage and for 50 Hz rated frequency



- 2.1.1 On request, the motors can be manufactured for three-phase mains power supply having other rated voltages up to 500 V, for 63-90 framesize motors or 690 V for 100-355 motors. On request, motors for frequency of 60 Hz are also available.
- 2.1.2 The motors can be fed from PWM frequency converters (VACON or similar) according to the torque/speed characteristic $M=f(\text{Hz})$ given in Annex 5. For these applications the motors are equipped with direct temperature control using the embedded PTC sensors (thermistors).

The thermistors must be connected to a thermistor circuit relay functioning independently of any measurement or control devices required for operation and that is dedicated to reliably trip off the supply of the motor according to the requirements of the “Essential Health and Safety Requirements” in Annex II, clause 1.5.1 of the ATEX Directive 2014/34/EU.

The relays are not provided by the motor manufacturer.
- 2.1.2.1 Emergency stop controls of safety devices must be fitted with restart lockouts. A new start command may take effect on normal operation only after the restart lockouts have been intentionally reset.
- 2.1.2.2 On the rating plate of motors supplied from frequency converters are indicated the frequency range, torque curve and, if case is, type of frequency converter. Alternatively, the motors can be fitted with a second name plate giving relevant information to operating conditions.
- 2.1.2.3 With a view to reduce the influence of converter voltage harmonics on the motor parameters, it is advisable to mount filters (dU/dt or sinus) on the converter output. This way the motor operation and reliability are not altered. If the distance between motor and frequency converter exceeds 50 m the use of output filters becomes mandatory.
- 2.1.2.4 The supply cables must be symmetrical and shielded
- 2.1.2.5 The earth connection of the motors need to be made accurately to prevent the circulation of parasitic currents along the shafts or in the bearings.
- 2.1.3 For motors with type of protection „e” terminal boxes, when using a soft start device with high-frequency pulses in the output, the user shall take care to ensure that any overvoltage spikes and high temperatures which may be produced in the terminal box are taken into consideration and limited by appropriate methods.



- 2.2** The motors are manufactured using insulation materials of min. class F
The windings insulating resistance should not be lower than:
- 20 MOhm in cold condition
 - 3 MOhm in warm condition
- 2.3** The motors rated duty is the continuous duty S1, according to EN 60034 –1 par. 4.2.1. but frequency converter feeding according par. 2.1 is also allowed. The motors fed from frequency converters can operate under S9 duty, according to EN 60034 –1 par. 4.2.9.
- 2.4** The normal degree of protection according to EN 60034-5 of the motors operating in Zone 1 is IP55. On request, motors having IP 56, IP 65 or IP 66 protection degree are also available.
- 2.4.1** The protection degree of the motors operating in Zone 21 is IP65; on request, IP66 protection degree is also available.
- 2.4.2** The protection degree of the motors operating in Zone 22 is IP55; if the risk of explosion is caused by conductive dusts, the motor protection degree should be at least IP65
- 2.5** The method of cooling of the motors according to EN 60034 – 6 is IC 411. The motors fed from frequency converters and operating according to a constant torque curve in the range of low frequencies may require forced cooling IC 416. If the motor is fitted with a separate cooling unit, the motor supply circuit shall be made in such a way that the independent cooling unit shall be started before the motor start

WARNING ! The motor shall never be started without the external cooling!

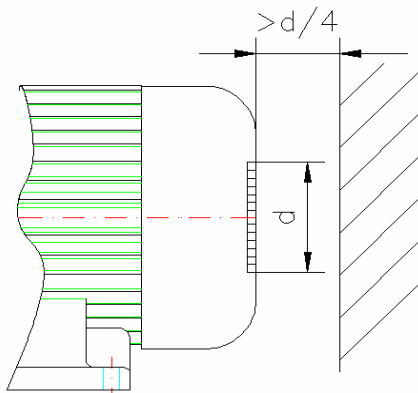
- 2.6** The motors could be manufactured in the following mounting arrangements:
IM 1001, IM 1002, IM 2001, IM 3001, IM 1011, IM 3011 for the frame sizes 63-355 and IM 3601 only for the frame sizes 63 -160, according to EN 60034-7
- 2.6.1** The clearances in normal operation between the external fan and its hood, the motor shields and their fasteners, according to EN 60079-0 par. 17.4 should be at least 1/100 from the maximum diameter of the fan but not less than 1 mm.



- 2.6.2 Mounting types with the shaft end facing downwards are provided with a cover (canopy) preventing foreign bodies from falling into the ventilation openings.
- 2.7 Ventilation must not be obstructed and the outgoing air –also including that from the adjacent units - must not be directly sucked in again.

The clearances between the fan cover and adjacent solid obstacles must not be lower than one quarter of the air inlet diameter (see following fig.) Under no circumstances the distance between the motor fan cover and any solid obstacle shall not be smaller than the value in the table below:

Motor frame size	Minimum distance [mm]
≤160	50
180-225	85
≥250	125



- 2.8 The terminal boxes are dimensioned for connecting copper cables.
The terminal boxes are fitted with:
 - 1 terminal block with 6 terminals for the frame size 63-71



- 6 bushings for the frame sizes 80 – 355. Optionally, one BT bushing is used for additional protective devices.
- 1 or 2 metric (or other standard thread) cable entries for the frame sizes 63–132
- 2 metric (or other standard thread) cable entries for the frame sizes 160 – 355

Optionally, the terminal boxes could be provided with additional cable entry/entries to connect the sensors or monitoring devices

2.9 The motors type of protection is:

- flameproof enclosure „d” for the frame size 63-355
- flameproof enclosure „d” having an increased safety „e” as an option for the terminal boxes in case of 80 – 355 framesize motors
- protection by enclosure „tb” ot „tc” for the frame size 63-355

2.10 The motors are designed for „IIC” gases group, according to EN 60079-0, being also suitable for applications that require group „II A” and „IIB” motors. The motors frame size 225-315, fitted with roller bearing on DE side are designed for „IIB” gases group, according to EN 60079-0, being also suitable for applications that require group IIA motors.

They are intended for the use as EPL Gb equipment.

2.10.1 The motors designed „tb” are suitable for applications in Zone 21, according to EN 60079-0, being also suitable for applications in Zone 22.

They are intended for the use as EPL Db equipment.

2.10.2 The motors designed „tc” are suitable for applications in Zone 22.

2.11 The temperature class T3, T4, T5 indicates the maximum surface temperature of the motors which operate in explosive gas atmospheres

2.11.1 T100⁰C, T125⁰C and T200⁰C indicates the maximum surface temperature of the motors wich operate in explosive dust atmospheres

3. Product description

The flameproof enclosure consists of:

- a. cast iron or welded steel housing
- b. cast iron shields
- c. cast iron terminal box



d. cast iron terminal box cover

3.1 To provide the flameproof enclosure with necessary mechanical features, only screws of the strength class minimum 8.8 shall be used as assembling elements.

3.2 The motors are equipped with rolling-contact bearings.

As standard, the motors up to frame size 250 are equipped with prelubricated bearings; regreasable bearings are used for motors with frame sizes 280 – 355. Motors frame size 225-250 with regreasable bearings are also available. On request the motors frame size 225-315 with pole numbers $2p \geq 4$ can be fitted with roller bearings on DE side and are designed only for air-gas mixtures of group IIB. The bearing selection is given in **Table 1**.

The bearings are not dimensioned to withstand external axial forces.

The maximum permissible radial forces on the shaft end for minimum 20.000 hours bearings life, are given in Annex 3

Table 1

Frame size	Standard				Optional			
	DE bearing		NDE bearing		DE bearing		NDE bearing	
	2p=2	2p=4,6,8	2p=2	2p=4,6,8	2p=2	2p=4,6,8	2p=2	2p=4,6,8
63	6202 2Z		6202 2Z					
71	6203 2Z		6203 2Z					
80	6304 2Z		6304 2Z					
90	6305 2Z		6305 2Z					
100	6306 2Z		6306 2Z					
112	6307 2Z		6307 2Z					
132	6308 2Z		6308 2Z					
160	6310 2Z		6310 2Z					
180	6311 2Z		6311 2Z					
200	6312 2Z		6312 2Z					
225	6313 2Z		6313 2Z		6313		6313	
					-	NU 313	6313	
250	6313 2Z	6314 2Z	6313 2Z		6313	6314	6313	
					-	NU 314	6313	
280	6314	6316	6314		-	NU 316	6314	
315	6315	6317	6315		-	NU 317	6315	
315M/L	6316	6319	6316	6319	-	NU 319	6316	6319
355M/L	6319	6322	6319	6322	-	-	-	-
355LX	6319	6322-2p=4	6319	6322	-	-	-	-
		6324-2p>4						



3.3 The type of main and additional cable entries certified together with the terminal box and the min. & max. supply cable diameter allowed by these cable entries are given in the tables 2.1 and 2.2 below

IPE/PG cable entries

Table

2.1

Frame size	Entry thread size	Size of sealing ring Dxd	Minimum admissible supply cable diameter [mm]	Max. tightening torque Nm]
63	IPE/PG 16	20x11	10.5	20
71				
80				
90				
100	IPE/PG 21	26x10	9.5	24
112		26x13	12.5	
		26x16	15.5	
		26x19	18.5	
132	IPE/PG 29	35x18	17.4	27
160		35x21	20.4	
180		35x24	23.4	
		35x27	26.4	
200	IPE/PG 36	45x24	23.4	54
225		45x27	26.4	
		45x30	29	
		45x33	32	
250	IPE/PG 42	52x30	29	107
280		52x33	32	
		52x36	35	
		52x39	38	
315 355	IPE/PG 48	57x36	35	120
		57x39	38	
		57x42	41	
		57x45	44	
Optional entry for prot. devices	IPE/PG 16	20x11	10.5	20



Metric cable entries

Table

2.2

Frame size	Entry thread size	Size of sealing ring Dxd	Minimum admissible supply cable diameter [mm]	Max.tightening torque [Nm]
63	M25x1.5	23x11	10.5	20
71				
80				
90				
100	M32x1.5	30x10	9.5	27
112		30x13	12.5	
		30x16	15.5	
		30x19	18.5	
132	M32x1.5	30x16	15.5	
		30x18	17.4	
		30x21	20.4	
160	M40x1.5	38x18	17.4	
180		38x21	20.4	
		38x24	23.4	
		38x27	26.4	
200-225	M50x1.5	48x24	23.4	107
225-250		48x27	26.4	
		48x30	29	
		250	48x36	
280	M63x1.5	61x30	29	120
315		61x36	35	
		61x42	41	
		355	61x45	
Optional for prot. dev.	M20x1.5	18x11	10.5	20

NOTE: Maximum diameter of the supply cable is to be considered as the maximum diameter of the cable that can be introduced by hand



into the sealing ring of the cable entry providing thus a reliable sealing of the cable.

On request, terminal boxes with additional cable entries (see Table 2.1-2.3) are also available.

3.3.1 The type of main and additional cable glands ATEX certified are given in the Table 2.3 below:

Table 2.3

Frame size	The size of main cable entry	No. of main cable entries		The size of additional cable entry	No. of additional cable entries		Min and max diameter of the supply cable [mm]
		Standard	Optional		Standard	Optional	
63-71	M25x1,5	1	1	M20x1.5	1	1	9 - 27.5
80-90		1	1	M20x1.5	1	1	
100-112	M32x1,5	1	2	M20x1.5	1	2	17 - 34
132	M32x1,5	1	2	M20x1.5	1	2	17 - 34
160-180	M40x1,5	2	2	M20x1.5	1	2	22 - 41
200-250	M50x1,5	2	2	M20x1.5	1	2	28 - 48
280-315SM	M63x1,5	2	2	M20x1.5	1	2	39 - 65
315ML		2	2	M20x1.5	1	2	
355M,L		2	2	M20x1.5	1	2	
355LX	M75x1.5	2	2	M20x1.5	1	2	50 - 65

Note: The cable entries are only suited for permanent wiring. The type and size of the cable entries are marked on a label placed on the terminal box, close to the entries.

3.3.2 If the motors are delivered without cable glands, the threaded cable entries in the terminal boxes are closed with plugs. When commissioning the motors, the users shall replace the plugs with appropriate cable glands as to protection type and size, ATEX certified. After inserting the cable into the terminal box the glands and the parts used for strain relief are to be



tightened with a torque value given by the cable gland manufacturer.

3.3.2.1 Unused cable entries in the terminal boxes shall be closed tightly with threaded plugs ATEX Certified

WARNING! It is not allowed to operate a flameproof motor without cable glands properly mounted or with open cable entries in the terminal box

4. Measurement and control devices

The following measurement and control devices are needed when commissioning or maintaining the motors:

- megohmmeter of 1000 V, to measure the insulation resistance
- voltmeter to check the supply voltage
- ammeter to measure the phase currents
- tachometer to measure the speed

5. Special tools and spare parts

In order to mounting and dismantling the motors wrench assortments (hex key wrenches, wrenches for hexagon screws) and bearing mounting/dismounting appropriate tools are to be used. The tools are not included in the motors delivery inventory.

The spare parts are listed in Annex 4 and are delivered at client's request.

Only original spare parts from the motor manufacturer are allowed to be used for repairing of the ASA, E2-ASA and E3-ASA flameproof motors.

6. Preparing for commissioning

6.1 Unpacking

- The motors that are not commissioned immediately after delivery shall be stored in their original packing, in dry rooms, away from freezing and flooding, free from vibrations, dust, oxide vapours or corrosive substances.

The removing of the packing should be carried out in clean rooms, at ambient temperature of minimum +15 °C and maximum 70% relative humidity.

The integrity of mounting surfaces with the driven installation:



- shaft end
- flange collar (if case is)
- feet and fixing holes (if case is)

need to be checked.

If rust appeared on these surfaces, they will be cleaned with smooth cloth and thinner, then a thin film of anticorrosion grease according to clause 8.5 specifications will be applied.

6.2 Preliminary checking before mounting

Before mounting will be checked:

- 6.2.1** whether the shaft rotates easily by mere hand rotating
- 6.2.2** the protective painting and coating condition
- 6.2.3** the insulation resistance; if the value of winding insulation resistance is below 20 MΩ, the motor should be dried. The drying could be carried out:
 - introducing the motor in a drying kiln, for several hours at maximum temperature of 80 °C
 - blowing the motor with an air stream having maximum temperature of 80 °C
 - running the motor at no load (if the actual conditions allow)The drying is finished when the winding insulation resistance keeps constant at a value no lower than 20 MΩ.

- 6.2.4** Prolonged storage periods reduce the useful life of the bearing grease. If stored for more than one year the condition of the grease must be checked enabling the motor to no-load run.

If abnormal noise, local heat or locking symptoms arise, then:

- prelubricated bearings must be replaced
- in case of regreasable bearings: the old grease must be removed and fresh grease UNIREX N2, UM185Li3, Shell Alvania R3, or similar (the grease type is given on the motor rating plate) should be used to relubricate them. If the troubles persist, the bearings should be replaced with new ones.

6.3 Preparations before mounting

The mounting location should:

- enable easy access to the motor terminal box
- not obstruct the motor ventilation
- be away from heating sources
- enable the access of surveillance and maintenance personnel

In order to remove dust or other solid particles from the outer surface, before mounting the motor should be blown off with high pressure dry air.



The data on the motor rating plate should be checked to meet the driven equipment requirements as to:

- rated output
- rated speed
- voltage and frequency
- connection
- hazardous area classification

<input type="radio"/> UMEB		UZINA DE MASINI ELECTRICE BUCURESTI - ROMANIA		CE 1809		<input type="radio"/>	
3 ~ Motor		MADE IN EU		Ex			
II 2G Ex d II T		Gb INSEMEX-OEC.ATEX				X	
ASA		IP		SF		DUTY	
INS.CL.							
V	Hz	kW	rpm	A	η	100%	75%
						50%	cos φ
Grease							
DE		g		h	PTC		
NDE		g		h	P=		W,U= V
<input type="radio"/> T.amb		°C Nr.				kg <input type="radio"/>	
WARNING - DO NOT OPEN IF AN EXPLOSIVE ATMOSPHERE IS PRESENT							
Distributed by:							

<input type="radio"/> UMEB		UZINA DE MASINI ELECTRICE BUCURESTI - ROMANIA		CE 1809		<input type="radio"/>	
3 ~ Motor		MADE IN EU		Ex			
II 2G Ex d II T		Gb INSEMEX-OEC.ATEX				X	
ASA		IP		SF		DUTY	
INS.CL.							
V	Hz	kW	rpm	A	η	100%	75%
5 - 87						50%	cos φ
Converter type: PWM							
Torque curve: quadratic							
Grease							
DE		g		h	PTC		
NDE		g		h	P=		W,U= V
<input type="radio"/> T.amb		°C Nr.				kg <input type="radio"/>	
WARNING - DO NOT OPEN IF AN EXPLOSIVE ATMOSPHERE IS PRESENT							
Distributed by:							

6.4 Coupling

Depending on the driven mechanism and operation conditions there are several ways to transmit the motor torque.

The torque transmitting devices / coupling devices should comply with the requirements of Directive 2014/34/EU and all regulations applicable to equipment used in hazardous locations.

6.4.1 Flexible coupling

It is the most frequent type of coupling, but special attention should be paid to accurate alignment of the motor with the driven equipment

Any failure in correct alignment entails vibrations, noisy functioning, bearing additional strains and eventually bearings and winding damaging.

6.4.2 Belt coupling



Only those belts may be used which do not electrostatically charge. Motor is mounted on slide bars ensuring belt tensioning which may subsequently be corrected.

Exaggerated belt tensioning leads to high radial loads on bearings and shaft end while insufficient tensioning leads to belt „stroke” and the rotor torque transmission is no longer possible.

It should be observed that for the mounting arrangements IMB6, IMB7, IMB8, IMV5 and IMV6 the belt tension is only permitted to act parallel to the mounting surface or towards the mounting surface and when mounted, both feet (in case of foot-mounting arrangements) must be secured and supported.

6.4.3 Gear coupling

In this case the shafts of the motor and driven equipment must be parallel and the tooth gears must function accurately in order to prevent bearings overloads and premature wear.

Before mounting the coupling, driving pulley or toothed gear a thin layer of grease will be applied on the motor shaft end ensuring thus easy mounting of the driving parts.

The transmission elements should be mounted with the press. They should be pressed up to the shaft end collar.

6.5 Electrical connection

The rules regarding electrical installations in hazardous atmospheres are to be strictly observed.

All mounting and installation works must be performed by experienced personnel in accordance with EN 60079-14 and local authority regulations.

They must be carried out on standstill machine, isolated and secured against reconnection only. Check safe isolation from supply !

Line cables and their installation shall adhere to EN 60079-14.

The motors are provided with six terminals and they may be started either by network direct connection or by means of star-delta switch or another starting device limiting the motor starting current. The star-delta starting is only possible in case of delta working connection.

Warning ! When supplying the motors with increased safety „e” terminal box, marked accordingly, special care must be given to:

- Correct connection of the cables to the terminals by means of connection devices (see connection diagrams Annex 1), so that the creepage and clearance distances are closely observed.



- Tightening to torque values indicated in paragraph 6.8.2.1 of the electric connecting devices

- Correct mounting of all cable entry devices as well as the terminal box cover with a view to preserve the motor protection degree.

Warning! When supplying the motors with flameproof „d” terminal box, special care must be given to:

- Tightening to torque values given under paragraph 6.8.2.2 of the screws fixing the terminal box cover

- Tightening to torque values indicated in paragraph 6.8.2.1 of the electric connecting devices

- Correct mounting of all cable entry devices as well as screwing the

presser according to torque values indicated in the Tables 2.1 and 2.2

To connect the supplying cables to the motor terminals, the user should:

- take off the cover of the terminal box using an appropriate hex key wrench

- unscrew the presser (thread adapter) using a hexagon wrench, then

take off the compression ring, the wall and the sealing gasket

- introduce the supplying cable through the presser, compression ring and sealing gasket

- introduce the cable into the terminal box

- put into correct position the sealing gasket, compression ring and the

presser.

When screwing the presser it presses on the sealing gasket and this one, at its turn, on the cable sheath ensuring thus the sealing of the terminal box

- connect the supply cable to the motor terminals; the cables are directly connected to the terminals, without cable lugs; with that view the terminals are fitted with special washers preventing the cable removing when screwd against the terminals

- before connecting the lead to the earth terminal in the terminal box,

clean to white metal the contact surfaces and cover them with a thin layer of conductible grease

- close the terminal box. Before closing the terminal box cover, the flameproof joints should be covered with a fresh layer of



anticorrosion grease. The grease shall meet the requirements under clause 8.5

Warning ! The terminal boxes must always be tightly closed during motor operation.

6.6 Connection to earth terminal

Is made by means of low resistivity multicore cable in accordance with labor safety rules. Appropriate conventional symbols indicate the location of the earth terminals on the housing.

To connect the protection lead to the earth terminal, the user should take off the screw and the washers, clean to white metal the contact surface, apply a thin layer of conductible grease (e.g. copper grease) then connect the lead fastening the screw.

The min. cable cross section is given in the Table 3

Table 3

Frame size	Size of earth terminal	Min. cross section of earthing cable [mm ²]
63-71	M4	6
80-90		
100-112	M5	10
132	M6	16
160-180	M8	25
200-250	M10	25
280-315SM	M10	25
315ML	M10	35
355M,L	M10	50

6.7 Overload protection

The user should protect the motors against overload currents exceeding the rated current values indicated on the rating plate.

According to EN 60079-14 chapter 7, the overload protective device shall:

- be a current-dependent, time lag protective device monitoring all three phases, set at not more than the rated current of the machine, which will operate in 2 h or less at 1,20 times the set current and will not operate within 2 h at 1,05 times the set current
- provide direct temperature control by means of embedded temperature sensors
- be another equivalent device



6.8 Checking the mounting accuracy

Before connecting the motor to the supply network it is recommended to

check whether:

6.8.1 All fixing parts are tightened

6.8.2 Coupling with the driven equipment is correct

All screws and electric contact nuts are tightened and earth connection is correctly made. The following torque limits (screw and nut) should not be exceeded

WARNING! Screws which become unusable have to be replaced by new ones of the same strength class (min.8.8) and type

6.8.2.1 Screwed joints for electrical connections

Thread	Tightening torque [Nm]
M4	1.2
M5	2.0
M6	3.0
M8	6.0
M10	10
M12	15.5
M16	30
M20	50

6.8.2.2 Screwed joints strength class 8.8 only in components with higher strength (e.g. grey cast iron, steel)

Thread	Tightening torque [Nm]
M4	2.3
M5	4.5
M6	7.9
M8	19
M10	38
M12	68
M14	105
M16	160

6.8.3 The access to the electrical parts is prevented

6.8.4 All switching devices are set in position „0” or „off”



6.8.5 The free access of cooling air is not obstructed (the fan cover's holes are not obturated)

6.8.6 The rules regarding electrical installations in hazardous atmospheres are strictly observed

If all above conditions are observed then a motor test start is to be performed with a view to check the rotation direction and if there are no vibrations or abnormal noise.

If the rotation direction is not the required one, the motor is to be disconnected and the direction of rotation can be reversed by changing the position of two mains conductors on the terminal board. If a new test start proves that the motor works properly than it is ready to operation.

6.9 Stoppages

6.9.1 If the motors remain out of service for a long period of time (more than a year), proper storage measures it is recommended to be taken.

6.9.2 The shaft must be rotated periodically (at least every year) to prevent the damaging of bearing raceways.

6.9.3 The heating resistances (anticondensation heaters), if exist, must be supplied from a supply source, according to the values given on the motor rating plate

6.9.4 If the storage time exceeds 4 years, the bearings must be replaced

WARNING! When starting the motors fitted with anticondensation heaters make sure by means of electric control that the anticondensation heater circuit is switched-off once the motor supply is switched on.

Only operate the anticondensation heater when the motor is switched off ! They must never under any circumstances be powered when the motor is running !

7. Main possible faults and remedies

Table 4

No.	Fault	Possible causes	Remedy
1.	The shaft does not turn when manually rotated	a. Locked bearings	Replace the bearings
		b. Locked bearings	Wash the bearings and regrease them with recommended grease



No.	Fault	Possible causes	Remedy
		c. Fan cover deformed causing rubbing by the fan	Repair or replace the fan cover
2.	No loaded motor fails to start	a. Two phase supply	Check the connexions to the terminal box, to the mains as well as the supply cable
		b. Wrong winding connection (in case of 6 terminal ends)	Check the connections to the terminal box
		c. Locked rotor	Check whether the driven mechanism is not jammed
3.	The motor does not start in load	a. See the causes and remedies under item 2	
		b. Mains voltage too low	Check connection at the mains
		c. Motor load is higher than the rated value	Compare data on the rating plate
4.	High decrease in speed	a. Mains voltage too low	Check connection at the mains
		b. Motor load is higher than the rated value	Observe data on the rating plate
		c. The supply cable insufficiently sized (too high voltage drop on cable)	Use a supply cable correctly sized
		d. Mains low frequency	Check connection at the mains
5.	Uneven phase currents	a. Faulty contact in a connection point of the supply circuit	Check the electric circuit
		b. Shortcircuit in the motor winding	Re-wind the stator
6.	Noise and vibrations in the motor	a. Faulty coupling	Check the coupling
		b. Damaged bearings	Replace the bearings
		c. Unbalanced rotor	Balance the rotor
7.	Protective devices disconnect the motor at start	a. See faults and remedies under item 2.	
		b. Shortcircuit in the motor winding	Re-wind the stator



No.	Fault	Possible causes	Remedy
		c. Wrongly adjusted protection	Adjust correctly the protection
8.	Low insulation resistance	a. Motor non-operation too long	The motor winding should be dried according to the methods given in 6.2.3
		b. Environment moisture above normal limits	
		c. Ingression of water inside the motor	
9.	Over heating of the motor	a. Cowl's holes are covered	Enable free access of cooling air
		b. Heavy amount of dust between the cooling ribs of the housing or another dregs	Clean the housing removing the dust
		c. Fan blades broken	Replace the fan
		d. Over-current	Adjust correctly the overload protection device

8. Motor dismantling

The ASA, E2-ASA and E3-ASA type motors are flameproof motors, and their joints should meet special requirements so that flameproof character is observed.

Warning ! Only workshops authorised to carry out maintaining and repairing works of electrical equipment in flammable atmospheres are allowed to mount or dismount ASA, E2-ASA and E3-ASA type motors.

Do not dismount when the motors are energized or in operation !

8.1 Dismantling of the terminal box (see fig. 1 and 2)

- dismount the terminal box cover (1) enabling thus the access to the screws fixing the supply cable to the terminals (bushings).
- using a hexagon wrench unscrew the presser (2) and take off the supply cable from the terminal box
- remove the terminal box (3) using an adequate device



- unscrew the nuts (4) at the bottom of the terminals, loosening the wire terminals

- the bushings can be removed using a socket wrench after the terminal box is dismantled

8.2 Dismounting of the fan (see fig 1 and 2)

- remove the fan cowl (6); in case of motors with regreasable bearings,

prior to removing the cowl, the lubricating devices (5) must be taken off

- remove the safety ring (7)
- using an adequate device remove the fan (8) from the shaft

8.3 Dismounting of the rotor (see fig 1 and 2)

- dismantling should be made observing the operation succession given in fig. 1 and 2

- using appropriate dismantling devices (mechanical presses with threaded rods and central screw), the shields should be pulled-off from the housing. When pulling the shields, the pressure should be applied gently, evenly, to avoid the damaging of the contact surfaces forming flame-proof joints or the bearings.

8.4 Dismounting of the bearings

- Mechanical jaw pullers or other proper dismantling tools should be used to remove the bearings from the shaft or from the shields

8.5 Re-mounting of the motor

- It should be done in reverse order of the dismantling operations (see fig. 1 and 2)

- Before mounting, the surfaces forming flameproof joints between stator-

shields, stator-terminal box, terminal box-terminal cover and the thread joints of the cable entries, shall be protected with a thin layer of anticorrosive grease. The grease shall be non-hardening type, shall not contain VOC and shall provide long-lasting anticorrosive protection. The motor manufacturer recommends the following greases: Renolit LX-PEP 2, Dow Corning 111 or Molykote 33-for motors intended to be operated in very low temperature environments (under -40°C). Other usable grease types are: Stucarit 203, Renolit HI-TEMP 100 or Teroson VR 410 (Fluid D).

WARNING ! During dismantling or re-mounting operations special care must be taken to avoid the scratching or damaging the surfaces forming flameproof joints. Whenever the motors are dismantled, before remounting a fresh layer of non-hardening grease (according to clause 8.5) shall be applied on the flameproof joints.



Repair and overhaul of the flameproof gaps are only allowed according constructive information given by the original manufacturer. A repair according to the values given in Table 1 or Table 2 of EN 60079-1 is not permitted.

9. Maintenance rules

WARNING ! Before starting any maintenance work, make sure that the motor and supplementary and auxiliary circuits, especially anti-condensation heaters have been isolated from the supply.

Some parts of the motor can reach temperatures above 50°C. Physical contact with them could result in burn injuries. Check their temperature before touching them.

Avoid doing maintenance works if explosive gases or combustible dusts are present !

WARNING ! In case of motors intended to operate in high corrosive environments and having the layer of protective painting above 0.2 mm, in order to avoid the risk of hazards caused by electrostatic charges, clean the motor only with a wet rag or by non-frictional means.

Operating situations and parameters can vary widely. Maintenance intervals should be scheduled to suit the local operating conditions (humidity, dust, load, starting frequency a.s.o.). The frequency of checks can initially be determined experimentally and must then be strictly observed. For this reason, only general maintenance intervals can be given here.

Action	Operating hours	Intervals
Initial inspection	After 500 operating hours	After 6 months at the latest
Relubrication	See the motor rating plate or Table 5	
Cleaning	Depending on the dust content of the environment	
Main inspection	Approximately every 8000 operating hours	After 2 years at the latest



- Care must be given to bearing maintenance, to monitoring their heating and noise level
- Especially for motors intended for the use in Zone 21 or 22, to avoid unpermissible surface temperatures, there is to consider the maximum thickness of dust layers upon the machine surface (maximum 5 mm) and the free air inlet for the cooling system.
- Bearing appropriate functioning requires clean mounting places, free of dust or other contaminants, using of proper mounting tools, recommended lubricants.
- The motors of frame size 280-315 have a greasing system enabling the bearings to be lubricated during the operation. The bearing relubrication intervals and quantity of grease are shown in the Table 5 and Table 6.
- To relubricate the regreasable bearings use UNIREX N2, Shell Alvania R3, SKF LGTH3, UTJ 185 Li2/3, or similar (the grease type is given on the motor rating plate). For bearings proper operation, when replenishing or regreasing them it is forbidden to mix different grease types, even if they seem similar.
- In case of damaging, the sealed bearings should be replaced with similar ones.
- Before remounting the surface of the shields coming in contact with the housing should be cleaned and covered with a thin layer of anti-rust grease (see clause 8.5)
- The insulation resistance should be periodically checked; a value under 1 M Ω warns that a damage caused by dirt deposits on the insulating surfaces or moisture penetration in the stator winding can occur. Clean the winding and dry it in accordance with clause 6.2.3

NOTE: When servicing a three-phase motor, it is generally not necessary to dismount it. The motor has to be dismounted only if the bearings need to be replaced

– **Initial inspection** – the first inspection after commissioning or repair of the three-phase motors is carried out after about 500 operating hours, but at the latest 6 months. While the motor is running check that:

- the allowable bearing temperature is not exceeded
- the motor electrical parameters conform to those on the rating plate

With the motor at standstill, check the foundation and assembly bolts condition: lack of cracks, indentations, signs of wear



NOTICE: Any inadmissible deviations from these requirements which are detected during this inspection must be immediately eliminated

- **Main inspection** (motor thoroughly examination) - Yearly

While the motor is running:

- check the bearings if the permissible temperature is not exceeded;
- check that the motor electrical parameters are within the permissible tolerance limits
- check that no abnormal noise or vibrations occurred

With the motor at standstill:

- check the winding insulation resistance; clean and dry the winding if necessary
- check the cable entry, verify the cable glands / sealing rings condition, the tightening of cable connections in the terminal box
- check if no rust occurred otherwise the affected parts should be cleaned and then painted or electrochemically coated
- check the foundation and assembly bolts condition: lack of cracks, indentations, signs of wear

NOTICE: Any inadmissible deviations from these requirements which are detected during this inspection must be immediately eliminated

10. Lubrication intervals of regreasable ball and roller bearings

A. Manual lubrication

10.1 The bearing types and lubricant used for regreasable bearings are given on the motor rating plate.

WARNING ! Do not mix different types of grease. Incompatible lubricants can cause bearing failure

10.2 The selection of the lubricant and lubrication intervals depends on the motor size, bearing types and speeds, operation conditions in terms of temperature, humidity, external contamination (dust, dirt). The lubrication intervals given in the tables 5 and 6 below are based on normal operation conditions of the motors: max. ambient temperature +40°C, constant speeds, normal constant loads without shocs or high vibrations, no contamination.

10.3 The lubrication intervals are influenced by other factors, as well:



- vertical mounting – relubrication intervals must be reduced by 50%
- increased ambient temperature - an increase of ambient temperature leads to bearing temperature rise accordingly. The lubrication intervals given in the tables 5 and 6 are calculated based on bearing temperature of 75°C. They must be reduced by 50% for 15°C increase of bearing temperature
- presence of dust, dirt or high humidity

WARNING ! Whenever the motor operation conditions are different from those given at clause 10.2, particularly: variable operation duration, environments highly corrosive or contaminated, high loads and/or shocks, high ambient temperatures the user must contact the motor manufacturer and provide him with the real operation conditions. The manufacturer will calculate and indicate the proper, particular lubrication intervals

10.4 Lubrication intervals of regreasable ball bearings

Horizontal mounting IM B				Table 5
Frame size	Bearing	Speed [rpm]	Lubrication interval [hours]	Amount of grease [g/bearing]
225	6313	≤2970	5200	22
		≤1470	13200	
250	6313	≤2970	5200	22
		≤1470	13200	
	6314	≤1470	12100	26
280	6314	≤2970	4800	26
		≤1470	12100	
	6316	≤1470	10700	33
315S/M	6315	≤2970	4500	30
		≤1470	11400	



	6317	≤1470	10000	37
315M/L	6316	≤2970	3700	33
	6319	≤1470	8700	45
355 M/L	6319	≤2970	4200	45
	6322	≤1470	7500	75
355LX	6319	≤2970	3000	45
	6322	≤1470	6000	75
	6324	≤985	4000	90

10.5 Lubrication intervals of regreasable roller bearings

Horizontal mounting IM B

Table 6

Frame size	Bearing	Speed [rpm]	Lubrication interval [hours]	Amount of grease [g/bearing]
225	NU313	≤1470	6400	22
250	NU314	≤1470	6000	26
280	NU316	≤1470	5300	33
315S/M	NU317	≤1470	5000	37
315M/L	NU319	≤1470	4400	45

B. Automatic lubrication

10.6 If the motors are provided with automatic lubrication, the grease nipples are replaced by automatic regreasing devices (ex. System 24) on both bearings.

10.7 The motors fitted with automatic regreasing devices have an additional plate giving the instructions on how to set-up the device operation and the time until the grease cartridge is emptied and must be replaced



WARNING ! The automatic regreasing devices are not set-up by the motor manufacturer. The user shall make the setting-up on the commissioning of the motor, never before !

10.8 The grease discharge plugs on the bearing covers must be removed permanently if automatic regreasing devices are fitted

10.9 The empty cartridges must be replaced with new cartridges filled with the same grease as initially provided by the manufacturer.

NOTICE: The empty cartridges cannot be re-filled, they must be replaced with new ones!

WARNING ! The user must inform the motor manufacturer about the real operation conditions, especially when they are different from those given at clause 10.2 and other set-up instructions are necessary

11. Electromagnetic compatibility

When used in accordance with their intended purpose and supplied from an electrical network which complies with EN 50160, the motors having the protection degree IP 55 and higher comply with the requirements of the Directive 2014/30/EU – Electromagnetic Compatibility.

If supplied from a frequency converter, the emitted interference depends on the converter design. To prevent exceeding the limit values allowed by the standards or legislation in force for the VSD system (motor and frequency converter), the EMC instructions given by the converter manufacturer must be strictly observed.

Immunity to interference

The motors fulfil the requirements of interference immunity stipulated in the normative documents in force. If the motors are equipped with integrated sensors (PTC thermistors), the user must ensure enough interference immunity by selecting a suitable shielded sensor signal cable.

If the motors are supplied from frequency converter at higher speeds than the rated speed, the mechanical speed limits must not be exceeded.

12. Marking, Packing, Transport, Storage



Marking – the rating plate is placed visibly on the motor and is marked according to EN 60034-1 and EN 60079-0 requirements

Packing – The packing type depends on the means of transport and should prevent motor from damaging during the transport.

Transport – The motors should be transported in tarpaulin vans or trucks, fastened against their decks. Mechanical shocks should be avoided when loading or unloading the motors.

Storage – Until commissioning the motors will be kept in their original packing, stored in dry places (max. humidity 80% at +25 °C), with ambient temperature of –5 °C...+40 °C, free from corrosive gases, dust or vibrations.

The motors which have to be stored a longer period in wet ambiances will be packed in polyethylene foil with bags of humidity-absorbing substances (i.e. Silicagel).

If longer storage period (more than a year) is to be expected then the protection measures given under clause 6.9 must be applied

13. Safety instructions

- all works for connecting, commissioning and maintenance are to be done by qualified, authorised specialists in accordance with EN 60079 part 14, 17 and 19 and local authority regulations
- before commissioning, motor correct connection to the supply mains and safe earth connections are to be verified. It is forbidden to operate the motors that are not connected to earth
- all rotating parts (pulleys and couplings) should be covered to prevent accidental contacts
- it is forbidden to remove the fan cover or terminal box cover while the motor is operating or voltage is applied
- all works are allowed only with the motor at standstill, electrically disconnected and isolated and secured against reconnection furthermore

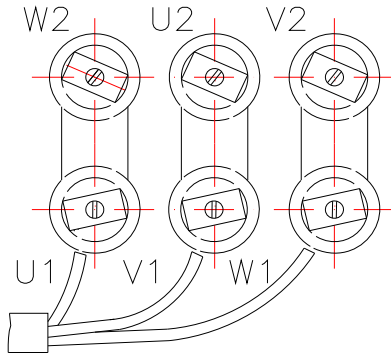
14. Disposal

The motors must be disposed observing strictly the national and local legislation applicable to recycling of electrotechnical products.

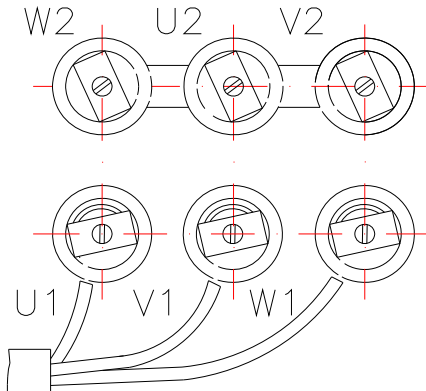


Annex 1

CONNECTION OF THE SUPPLY CABLES TO THE TERMINALS Direct starting. The motor has DELTA (Δ) connection Frame size 63 - 355



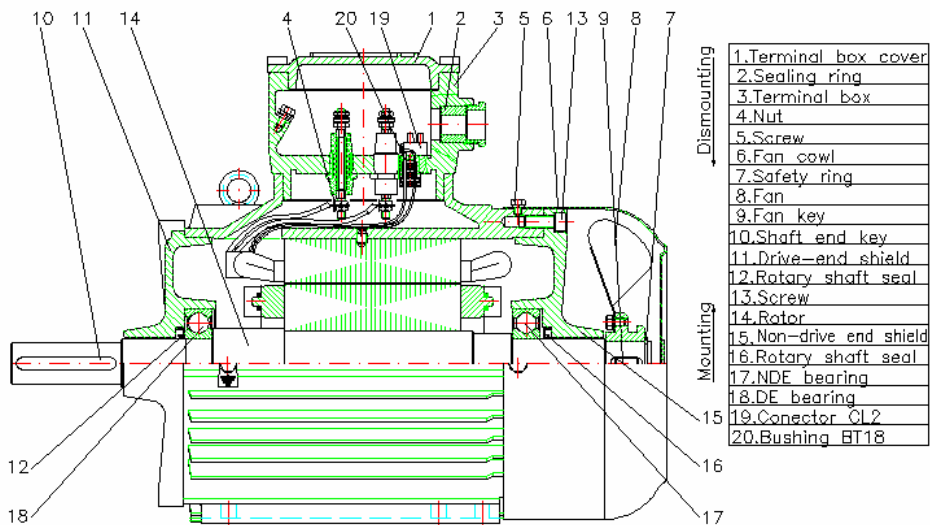
1. Direct starting. The motor has STAR (Y) connection Frame size 63 – 280





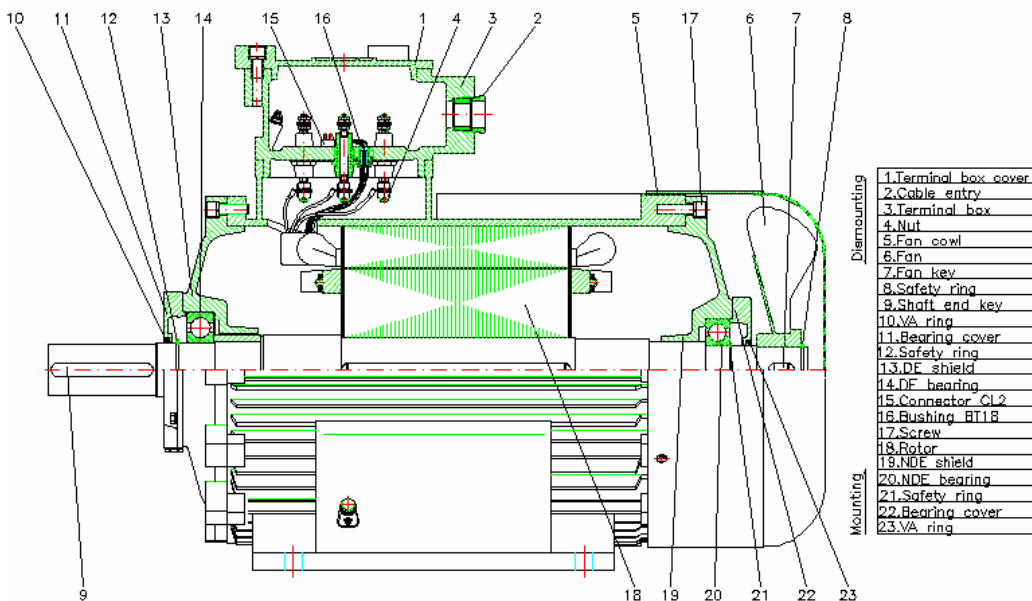
Frame size 63-160

Annex 2 Fig.1



Frame size 180-250

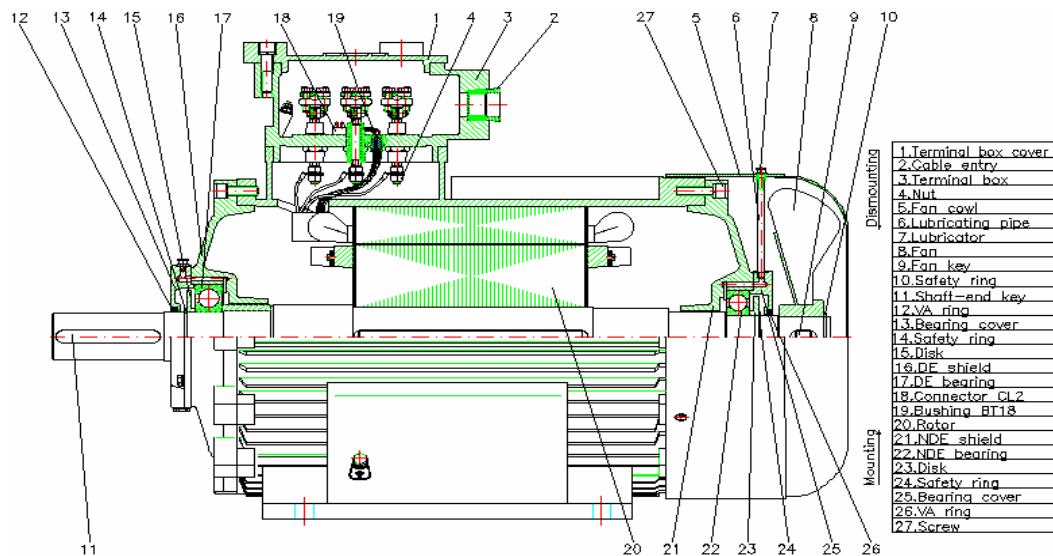
Fig.2





Frame size 280 - 355

Fig.3





Annex 3

The permissible radial forces F_R max on the shaft end for 20.000 hours ball bearings life

Frame size	Poles No.	F_R max [N]	Frame size	Poles No.	F_R max [N]	Frame size	Poles No.	F_R max [N]
63	2p=2	240	112	2p=2	800	225	2p=2	3360
	2p=4	270		2p=4	940		2p=4	4200
				2p=6	1030		2p=6	4520
				2p=8	1150		2p=8	4700
71	2p=2	305	132	2p=2	1290	250	2p=2	3360
	2p=4	395		2p=4	1480		2p=4	4830
	2p=6	435		2p=6	1600		2p=6	5200
	2p=8	520		2p=8	1760		2p=8	5550
80	2p=2	480	160	2p=2	2250	280	2p=2	5060
	2p=4	610		2p=4	2800		2p=4	7100
	2p=6	645		2p=6	3150		2p=6	7900
	2p=8	708		2p=8	3600		2p=8	8650
90	2p=2	530	180	2p=2	2600	315	2p=2	6100
	2p=4	690		2p=4	3200		2p=4	9300
	2p=6	740		2p=6	3700		2p=6	10500
	2p=8	820		2p=8	4150		2p=8	11200
100	2p=2	655	200	2p=2	2970	315M/L	2p=2	6000
	2p=4	828		2p=4	3740		2p=4	9500
	2p=6	905		2p=6	4130		2p=6	10900
	2p=8	1025		2p=8	4415		2p=8	12300
355	2p=2	4500						
	2p=4	8500						
	2p=6	8800						
	2p=8	9100						



The permissible radial forces on the shaft end for 20.000 hours roller bearings life

Frame size	Speed [rpm]	F_R max [N]
225	1500	10900
	1000	11700
	750	12200
250	1500	13000
	1000	15600
	750	16700
280	1500	19800
	1000	22100
	750	24200
315SM	1500	27000
	1000	31500
	750	33600
315M/L	1500	27500
	1000	31600
	750	35700



Annex 4

LIST OF SPARE PARTS

1. Bearings

Frame size	Standard				Optional			
	DE bearing		NDE bearing		DE bearing		NDE bearing	
	2p=2	2p=4,6,8	2p=2	2p=4,6,8	2p=2	2p=4,6,8	2p=2	2p=4,6,8
63	6202 2Z		6202 2Z					
71	6203 2Z		6203 2Z					
80	6304 2Z		6304 2Z					
90	6305 2Z		6305 2Z					
100	6306 2Z		6306 2Z					
112	6307 2Z		6307 2Z					
132	6308 2Z		6308 2Z					
160	6310 2Z		6310 2Z					
180	6311 2Z		6311 2Z					
200	6312 2Z		6312 2Z					
225	6313 2Z		6313 2Z		6313		6313	
					-	NU 313	6313	
250	6313 2Z	6314 2Z	6313 2Z		6313	6314	6313	
					-	NU 314	6313	
280	6314	6316	6314		-	NU 316	6314	
315	6315	6317	6315		-	NU 317	6315	
315M/L	6316	6319	6316	6319	-	NU 319	6316	6319
355	6319	6322	6319	6322	-	-	-	-
355LX	6319	6322- 2p=4 6324- 2p>4	6319	6322	-	-	-	-

2. Terminal plate and bushings size

Motor type	Terminal plate size	Bushing size
63	M4	-
71		
80	-	M4
90		
100	-	M5
112		



Motor type	Terminal plate size	Bushing size
132	-	M6
160	-	M8
180		
200	-	M10
225		
250		
280	-	M12
315SM/ML		
355	-	M16
355LX	-	M20

3.Cable entries IPE/PG

Size	Thread size and type	Sealing ring Size Dxd
63	IPE16	20x11
71		
80		
90		
100	IPE 21	26x10
		26x13
112	IPE 21	26x16
		26x19
132	IPE 29	35x18
160		35x21
180		35x24
		35x27
200	IPE 36	45x24
		45x27
225		45x30
		45x33
250	IPE 42	52x30
		52x33
		52x36
280		52x39



Size	Thread size and type	Sealing ring Size Dxd
315 355	IPE 48	57x36
		57x39
		57x42
		57x45
Optional for prot. devices	IPE/PG 16	20x11

Metric cable entries

Size	Thread size	Sealing ring size
63	M25x1.5	23x11
71		
80		
90		
100	M32x1.5	30x10
112		30x13
		30x16
		30x19
132	M32x1.5	30x16
160		30x18
		30x21
180	M40x1.5	38x18
200-225		38x21
		38x24
		38x27
225-250	M50x1.5	48x24
250		48x27
		48x30
		48x36
280	M63x1.5	61x30
315		61x36
355		61x42
		61x45
Optional for prot. devices	M20x1.5	18x11



ATEX certified cable glands

Frame size	Gland size	Additional gland size
63-71	M25x1,5	M20x1.5
80-90		M20x1.5
100-112	M32x1,5	M20x1.5
132	M32x1,5	M20x1.5
160-180	M40x1,5	M20x1.5
200-250	M50x1,5	M20x1.5
280-315SM	M63x1,5	M20x1.5
315ML		M20x1.5
355M,L		M20x1.5
355LX		M20x1.5

Remarks :

- At customer request, other parts and components could be offered as spare parts
- Any request of spare parts has to indicate the type, power and speed of the motor
- UMEB-SA recommends to be used only original spare parts for a good motor operation
- UMEB-SA provides service and repairs of our motors with original spare parts during guarantee period according to the normes into force. UMEB-SA can also provide motor repairs and service after guarantee period



Annex 5

Load curve – frequency converter supply (PWM converters)

