

# OPERATION MANUAL

**Three-phase squirrel cage induction motors in  
flameproof enclosure Ex d IIC or Ex de IIC  
type ASA and E2-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 EC 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. 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.

### **1. Denomination and using fields of motors**

**1.1** These operation instructions refer to low voltage three-phase squirrel cage induction motors, type ASA and E2-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) - Electrical machines
- 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 60034-14 – 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”
- IEC 60079-31 – Explosive atmospheres - Part 31: Equipment dust ignition protection by enclosure „t”



- EN 60529 – Degrees of protection provided by enclosures (IP Code)
- Directive 94/9/EC – Potentially explosive atmospheres (ATEX)

The motors type of protection is:

- Ex d IIC T5 Gb (alternatively Ex db IIC T5) or Ex t IIIC T100<sup>0</sup>C Db (alternatively Ex tb IIIC T100<sup>0</sup>C) for the frame sizes 63-71 and
- Ex d IIC T4 Gb (alternatively Ex db IIC T4) and/or Ex d e IIC T4 Gb (alternatively Ex db eb IIC T4) or Ex t IIIC T125<sup>0</sup>C Db (alternatively Ex tb IIIC T125<sup>0</sup>C) for the frame sizes 80-355

They are designed to be used as:

- EPL Gb equipment and are allowed to operate in Zones 1 and Zones 2 where the risk of explosion is produced by a mixture of air with flammable gases pertaining to Group IIC  
and
- EPL Db equipment and are allowed to operate in Zones 21 and Zones 22 where the risk of explosion is produced by a mixture of air with flammable dusts pertaining to Group IIIC

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 and/or E2-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 90L-4

Motor type E2-ASA 90L-4

- 1.2** The motors are intended to operate under temperate (N) climate conditions, characterised by:

- ambient temperature: -20 ... + 40 °C
- relative humidity: 80% at + 20 °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 group C, 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°C) or cold (till -55°C) climatic conditions are available. In the order should be indicated 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. Requirements and operating parameters**

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

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

The overtemperature of the windings for the rated duty, at the rated parameters is in accordance with EN 60034 -1

In case the motors are fed at the limit values of the supply voltage according to EN 60034 -1 zone A, the increasing of the winding overtemperature by 10 K is permitted

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.

*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 7 For that application the motors are equipped with direct*



*temperature control using the embedded PTC sensors ( $130\text{ °C} \pm 5\text{ °C}$ ).*

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, item 1.5.1 of the ATEX Directive 94/9/EC. 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.

- 2.2** The motors are manufactured using insulation materials of 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 60529 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.
- 2.5** The method of cooling of the motors according to EN 60034 –6 is IC 411.
- 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 80-355 and IM 3601 only for the frame sizes 63 -160, according to EN 60034-7  
The overall and mounting dimensions are indicated in:  
- Annex 3 - Tables 5.1 and 5.2 for the constructive types IM 1001  
- Annex 3 - Tables 6.1 and 6.2 for the constructive types IM 3001
- 2.7** 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.



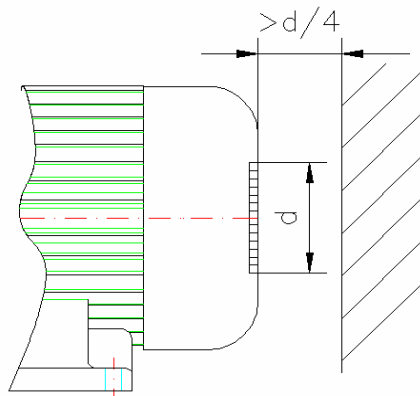
Mounting types with the shaft end facing downwards are to be provided with a cover (canopy) preventing foreign bodies from falling into the ventilation openings.

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 NDE-side fan cowl and adjacent solid obstacles must not be lower than one quarter of the air inlet diameter (see following fig.)

The distance between the complete motor housing and any solid obstacle shall not be smaller than

Gas / vapour subgroup	Minimum distance [mm]
II A	10
II B	30
II C	40



**2.8** The terminal boxes are dimensioned for connecting armoured copper cables.

The terminal boxes are fitted with:

- 1 terminal plate with 6 terminals for the frame size 63-71
- 3 or 6 bushings and optionally with one BT18 bushing for additional protective devices for the frame sizes 80 – 355.
- 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 an additional cable entry having the size IPE/PG 16 or M20x1.5 for the frame size 63-355.

**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” 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.

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 61241-14, being also suitable for applications in Zone 22.

They are intended for the use as EPL Db equipment.

**2.11** The temperature class T3, T4, T5 indicates the maximum surface temperature of the enclosure and is confirmed by the EC-type-Examination Certificate.

**2.11.1** T100<sup>0</sup>C and T125<sup>0</sup>C indicates the maximum surface temperature of the motors which operate in explosive dust atmosphere and is confirmed by the EC-type-Examination Certificate

### **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

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

The motors are equipped with rolling-contact bearings.

The motors up to frame size 250 are equipped with prelubricated bearings; regreasable bearings are used for motors with frame sizes 280 and 315. The bearing selection is given in table 1.

The bearings are not dimensioned to support external axial forces.





The maximum permissible radial forces on the shaft end for minimum 20.000 hours bearings life, are given in Annex 4

**Table 1**

Frame size	Drive end		Non drive end	
	2p = 2	2p = 4, 6, 8	2p = 2, 4, 6, 8	
63	6202 2Z P6		6202 2Z P6	
71	6203 2Z P6		6203 2Z P6	
80	6304 2Z P6		6304 2Z P6	
90	6305 2Z P6		6305 2Z P6	
100	6306 2Z P6		6306 2Z P6	
112	6307 2Z P6		6307 2Z P6	
132	6308 2Z P6		6308 2Z P6	
160	6310 2Z P6		6310 2Z P6	
180	6311 2Z P6		6311 2Z P6	
200	6312 2Z P6		6312 2Z P6	
225	6313 2Z P6		6313 2Z P6	
250	6313 2Z P6	6314 2Z P6	6313 2Z P6	
280	6314 P6	6316 P6	6314 P6	
315	6315 P6	6317 P6	6315 P6	
315M/L	6316 P6	6319 P6	6316 P6	6319 P6
355	6319 P6	6322 P6	6319 P6	6322 P6

The type of main cable entries and minimum supply cable diameter are given in the tables below:

**Table 2.1**

Frame size	Entry thread size	Size Dxd	Minimum admissible supply cable diameter [mm]	Tightening torque limits [Nm]
63	IPE/PG 16	20x11	10.5	20
71				
80				
90				
100	IPE/PG 21	26x10	9.5	27
112		26x13	12.5	
		26x16	15.5	
		26x19	18.5	
132	IPE/PG 29	35x18	17.4	27
160		35x21	20.4	



Frame size	Entry thread size	Size Dxd	Minimum admissible supply cable diameter [mm]	Tightening torque limits [Nm]
180		35x24	23.4	
		35x27	26.4	
200	IPE/PG 36	45x24	23.4	54
225		45x27	26.4	
		45x30	29	
250	IPE/PG 42	45x33	32	107
		52x30	29	
280		52x33	32	
		52x36	35	
315S/M and 315M/L	IPE/PG 48	52x39	38	120
		57x36	35	
		57x39	38	
		57x42	41	
Optional entry for prot. devices	IPE/PG 16	57x45	44	20
		20x11	10.5	

**Table 2.2**

Frame size	Entry thread size	Size Dxd	Minimum admissible supply cable diameter [mm]	Tightening torque limits [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	



Frame size	Entry thread size	Size Dxd	Minimum admissible supply cable diameter [mm]	Tightening torque limits [Nm]
160	M40x1.5	38x18	17.4	54
		38x21	20.4	
180		38x24	23.4	
		38x27	26.4	
200-225	M50x1.5	48x24	23.4	107
225-250		48x27	26.4	
		48x30	29	
250		48x36	35	
280	M63x1.5	61x30	29	120
315 355		61x36	35	
		61x42	41	
		61x45	44	
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.

On request, the terminal box with an additional IPE/PG 16 or M20x1.5 cable entry is also available.

The cable entries are only suited for permanent wiring.

#### 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 dismounting 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 7 and are delivered at client's request. Only original spare parts are allowed to be used for repairing of the ASA flameproof motors.

## **6. Preparing for commissioning**

### **6.1 Unpacking**

- The motors that are not commissioned immediately after delivery shall be stored in their initial 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 shoulder (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 anti-rust grease according to the technical quality conditions –

Annex 6, 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

### **6.4 Coupling**

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

Be aware for adherence to Directive 94/9/EC also for the transmitting devices. They have to be ATEX certified too.

#### **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.

And 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 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;
- 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 mounting the cover

**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 conductive grease (e.g. copper grease) then connect the lead fastening the screw.

## 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
- 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





Thread	Tightening torque [Nm]
M10	10
M12	15.5
M16	30

### **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 put in position „0” or „off”

6.8.5 The free access of cooling air is not obstructed (the cowl’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**



If the motors remain out of service for a long period of time (more than a year), anti-corrosion, mothballing and drying measures it is recommended to be taken.

## 7. Main possible faults and remedies

**Table 3**

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
		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



No.	Fault	Possible causes	Remedy
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
		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 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 type motors.  
Do not dismount when the motors are energized

### 8.1 Dismounting 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 grease having the technical parameters according to **Annex 4** or other similar grease.

**WARNING !** During dismantling or mounting operations special care must be taken to avoid the scratching or damaging the surfaces forming 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 !**

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 4	
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 4**.

- To relubricate the regreasable bearings use UM 185 Li3, Shell Alvania R3, SKF LGTH3, UTJ 185 Li2/3, UNIREX N2 or similar (the grease type is given on the motor rating plate)
- 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
- The insulation resistance should be periodically checked; a value under 1 MΩ 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 par. 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. 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 EC Directive 2004/108/EC – 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.

## **11. 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  $-5^{\circ}\text{C} \dots +40^{\circ}\text{C}$ , 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 expected then:

- turn the motor shafts once a year to prevent marks due to the shafts resting in the same position for long time
- change the bearings if the time between the delivery and commissioning exceeds 4 years

## **12. 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

## **13. DISPOSAL**

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





## 12. Timetable with completion and greasing intervals of regreasing ball bearings

Table 4

### Horizontal mounting IM B

Frame size	Bearing	Operating conditions		Bearing operating temperature [°C]		Regreasing interval [hours]	Compl. interval [hours]	Grease quantity [g]	
		Speed [rpm]	Hour/day [hours]						
280	6314	≤2970	24	Normal	63 ÷ 78	4800	1700	26	
				High	78 ÷ 93		800		
		≤1470		Normal	63 ÷ 78	12100	4200		
				High	78 ÷ 93		2100		
	6316	≤1470		Normal	63 ÷ 78	10700	3700		33
				High	78 ÷ 93		1900		
315S/M	6315	≤2970	Normal	63 ÷ 78	4500	1400	30		
			High	78 ÷ 93		700			
		≤1470	Normal	63 ÷ 78	11400	4000			
			High	78 ÷ 93		2000			
	6317	≤1470	Normal	63 ÷ 78	10000	3500		37	



Frame size	Bearing	Operating conditions		Bearing operating temperature [°C]		Regreasing interval [hours]	Compl. interval [hours]	Grease quantity [g]
		Speed [rpm]	Hour/day [hours]	High	78 ÷ 93			
315M/L	6316	≤2970	24	High	78 ÷ 93	3700	1800	33
				Normal	63 ÷ 78		2000	
	High	78 ÷ 93		1000				
	Normal	63 ÷ 78		8700	3000	45		
High	78 ÷ 93	1500						
355	6319	≤2970	Normal	63 ÷ 78	4200	2000	45	
			High	78 ÷ 93		1000		
	6322	≤1470	Normal	63 ÷ 78	7500	6000	75	
			High	78 ÷ 93		3000		
<b>Vertical mounting IM V</b>								
280	6314	≤2970	24	Normal	63 ÷ 78	4800	800	26
				High	78 ÷ 93		400	
		≤1470		Normal	63 ÷ 78	12100	2100	



Frame size	Bearing	Operating conditions		Bearing operating temperature [°C]		Regreasing interval [hours]	Compl. interval [hours]	Grease quantity [g]
		Speed [rpm]	Hour/day [hours]	High	78 ÷ 93			
315S/M	6316	≤1470		High	78 ÷ 93	10700	1100	33
				Normal	63 ÷ 78		1900	
	High	78 ÷ 93		900				
	6315	≤2970		Normal	63 ÷ 78	4500	700	30
				High	78 ÷ 93		400	
	6317	≤1470		Normal	63 ÷ 78	11400	2000	37
High			78 ÷ 93	1000				
315M/L	6316	≤2970	Normal	63 ÷ 78	3700	1000	33	
			High	78 ÷ 93		500		
	6319	≤1470	Normal	63 ÷ 78	8700	1500	45	
			High	78		800		



Frame size	Bearing	Operating conditions		Bearing operating temperature [°C]		Regreasing interval [hours]	Compl. interval [hours]	Grease quantity [g]
		Speed [rpm]	Hour/day [hours]		÷			
355	6319	≤2970		Normal	63	4200	1000	45
					÷			
	78							
	High	78						
6322	≤1470		Normal	63	7500	3000	75	
				÷				
78								
High	78							
					÷			
					93			

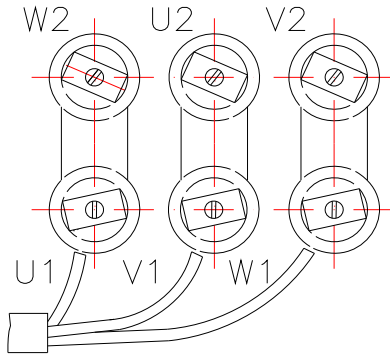
**Contamination/Moisture – Moderate Load – No**

**Ambient Temperature – Average**

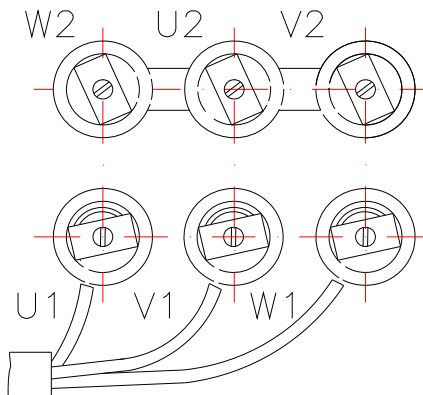
**Shock Load – No**

**CONNECTION OF THE SUPPLY CABLES TO THE TERMINALS**  
**Annex 1**

- 1. Direct starting. The motor has DELTA ( $\Delta$ ) connection**  
**Frame size 63 - 355**



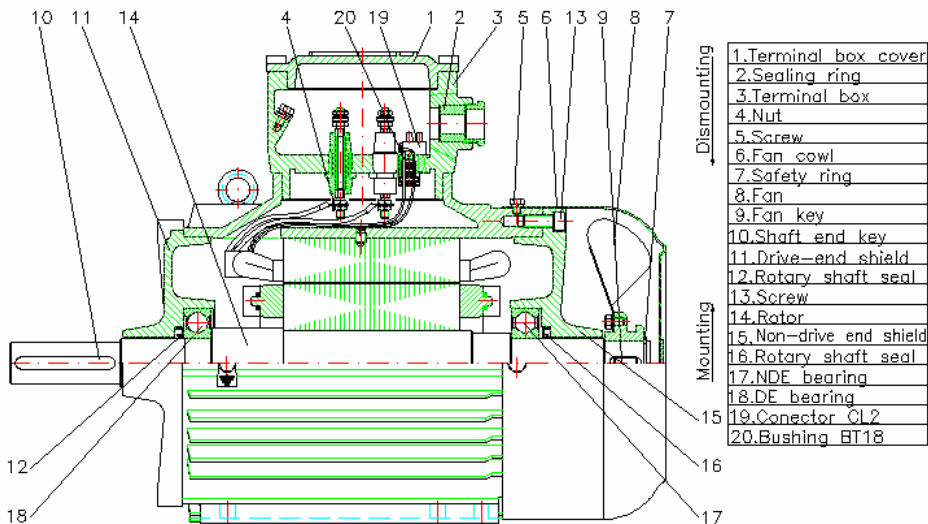
- 2. Direct starting. The motor has STAR (Y) connection**  
**Frame size 63 - 355**



**Fig.1**

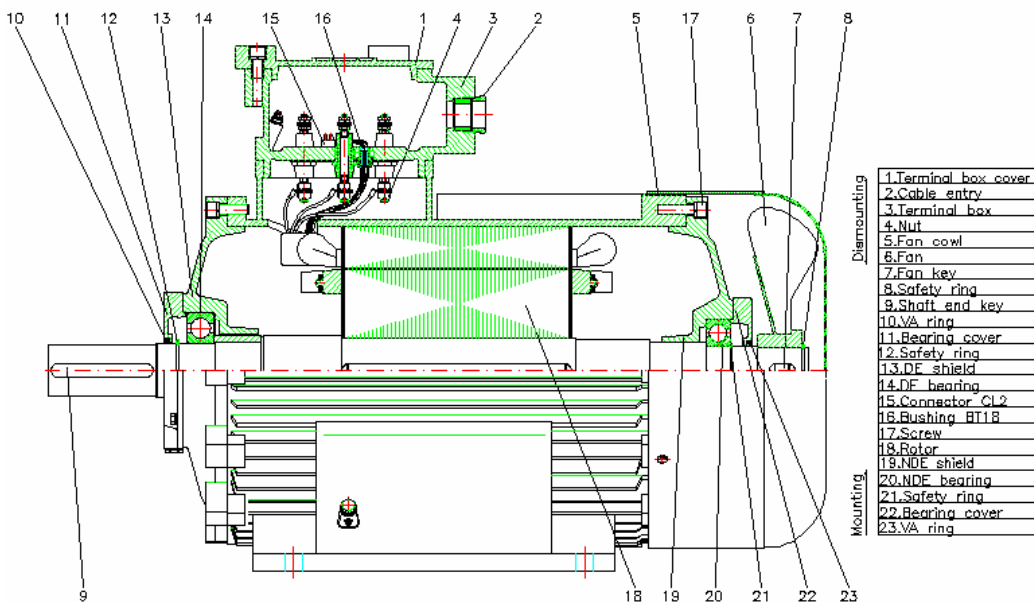
**Frame size 63-160**

**Annex 2**



Frame size 180-250

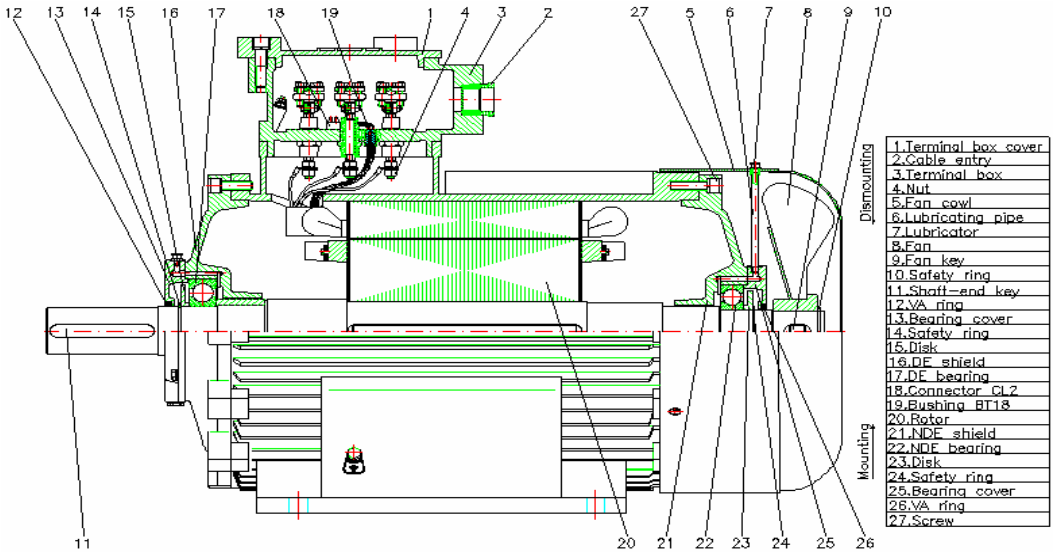
Fig.2





Frame size 280 - 355

Fig.3





### Annex 4

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

Frame size	Poles No.	Fr [N]	Frame size	Poles No.	Fr [N]	Frame size	Poles No.	Fr [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						





## Annex 5 ALUMINUM BASE GREASES LUBRICERP AR90 AI 1, LUBRICERP AR 95 AI 3

### 1. GENERAL INFORMATION

#### Scope

The present document refers to greases containing aluminium stearate and mineral oil.

#### 2.1 Use

The products are used, upon prescription, as anticorrosion protection and lubrication materials for certain mechanisms.

Temperature range: -30°C up to +80°C.

### 2. TECHNICAL QUALITY CONDITIONS

Characteristic denomination	Admissibility conditions		Determination method (standard)
	AR 90 AI 1	AR 95 AI 3	
Aspect, color	Homogeneous grease, color yellow-brown		visual
Dripping point °C	min.90	min.95	37
Penetration at 25°C, after 60 mixings, 1/10 mm	305...345	215...255	2392
Resistance to water action after 5 hours at 50°	good		8044
Corrosive action on metal: steel, copper, brass, 24 h at 50°C	Non-corrosive		8206

### 3. RULES FOR QUALITY CHECKING

3.1 Quality checking is made on batches through analyses (according to paragraph 2). The dimension of the sample batch is maximum 400 kg.

The product must comply with the technical quality conditions as stipulated in paragraph 2. In case on non observance the sample batch is rejected.

3.2 Sampling and preparation of the samples for quality verification is made according to STAS 41.

### 4. PACKING, MARKING, TRANSPORT, HANDLING, DOCUMENTS

4.1 Packing of the products is made in barrels with removable lids of 60 l and 200 l capacity, according to STAS 4225. The product must be handled attentively, to avoid the contamination.



4.2 Upon delivery, a Declaration of Conformity will accompany each batch.

## Annex 6

### LIST OF SPARE PARTS

#### 1. Ball bearings

Frame size	Drive end		Non drive end	
	2p = 2	2p = 4, 6, 8	2p = 2, 4, 6, 8	
<b>63</b>	6202 2Z		6202 2Z	
<b>71</b>	6203 2Z		6203 2Z	
<b>80</b>	6304 2Z		6304 2Z	
<b>90</b>	6305 2Z		6305 2Z	
<b>100</b>	6306 2Z		6306 2Z	
<b>112</b>	6307 2Z		6307 2Z	
<b>132</b>	6308 2Z		6308 2Z	
<b>160</b>	6310 2Z		6310 2Z	
<b>180</b>	6311 2Z		6311 2Z	
<b>200</b>	6312 2Z		6312 2Z	
<b>225</b>	6313 2Z		6313 2Z	
<b>250</b>	6313 2Z	6314 2Z	6313 2Z	
<b>280</b>	6314	6316	6314	
<b>315</b>	6315	6317	6315	
<b>315M/L</b>	6316	6319	6316	6319
<b>355</b>	6319	6322	6319	6322

#### 2. Terminal plate part and bushings size

Motor type	Terminal plate size	Bushing size
63	M4	-
71		
80	-	M4
90		
100	-	M5
112		
132	-	M6
160	-	M8



Motor type	Terminal plate size	Bushing size
180		
200	-	M10
225		
250		
280	-	M12
315SM/ML		
355		M16

### 3.Gland piece

Size	Gland size	Sealing ring size
63	IPE16	20x11
71		
80		
90		
100	IPE 21	26x10
		26x13
112		26x16
		26x19
132	IPE 29	35x18
160		35x21
		35x24
180		35x27
200	IPE 36	45x24
		45x27
225		45x30
		45x33
250	IPE 42	52x30
		52x33
		52x36
280		52x39
315SM/ML	IPE 48	57x36
		57x39



		57x42
		57x45

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

**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 7

