ELECTRICAL PRODUCTS

# ACTOM ELECTRICAL MOTORS

## UNIBOX: Medium Voltage, High Efficiency Motor


## General Data:

Product Information:

| | |
|---|---|
| **Medium Voltage Ratings** | Fabricated frame electric motors to IEC60034 From 300kW to 15MW at 3,3kV; 6,6kV; 11kV and 15kV |
| **Sizes** | Heavy duty motor frames in sizes from 355mm to 1000mm |

Typical Application:

| | |
|---|---|
| **Application Designed for** | Maximum duty efficiency |

## Specifications:

**Please Download the ACTOM Brochure Attached for all of the Product Specifications**

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# UNIBOX SERIES FABRICATED FRAME MV MOTORS

## CONCEPT

This heavy duty rugged UNIBOX large frame motor series is designed in Benoni South Africa for applications typically in the Power Station, Mining and heavy industrial market sectors. The design is suitable for both Cage and Slipring Induction motor formats.

## FRAME SIZES

The UNIBOX motor series is available in all standard motor shaft heights ranging from 355mm to 1000mm with international standard foot or flange fixing arrangements. Non standard dimensioned products are available on request.

## OUTPUTS

UNIBOX output ratings are designed to suit client specific requirements and applications at ratings up to 15MW.

## ELECTRICAL SUPPLY

UNIBOX windings are designed as standard for 3,3kV, 6,6kV 11kV and 15kV at 50Hz. Other international voltage supply standards can be accommodated on request.

A large frame 7MW 11kV UNIBOX Slipring Mill motor being crated and prepared for export.

## STANDARDS AND SPECIFICATIONS

The UNIBOX motor series is electrically and mechanically designed in accordance to the IEC60034. Every effort is made to accommodate client specific requirements in addition to the standard design logic.

## DUTY AND RATING

The most frequent UNIBOX design requirement is for a continuous running duty cycle S1, in accordance with IEC 60034. Other duties can be accommodated to suit special applications. ACTOM engineers are able to advise clients in respect of the correct matching of the machine against intended duty parameters.

## STARTING

Cage rotor induction motors are designed to take account of the driven machinery torque and speed characteristics, ensuring that adequate accelerating torque is available, whilst still limiting the starting currents and resultant heat build up in the stator windings. Wound rotor induction motors are designed to provide enhanced starting characteristics off relatively limited supply systems.


A small frame UNIBOX series motor with sleeve bearings and an inlet silencer.

## MOUNTING

UNIBOX standard mounting configurations are IM1001, IM1002, IM3001 and IM3801 as defined in IEC60034-7. The frame designs are suitable for either holding down bolts or foundation bolts. Vertical jacking points are provided in close proximity to these fixing points to facilitate easier shimming on installation for alignment.

## DIMENSIONS

UNIBOX shaft extensions, frame and foot fixing dimensions are in accordance with the requirements of IEC60072-2. Whilst these are standard build configurations ACTOM is able to build custom frames to suit inter-changeability requirements where replacement of existing dated plant is required.

A IP22 IC01 3MW UNIBOX featuring a top mounted inlet cooling housing and a bottom exit design for the hot air. This design reached a performance efficiency of over 97%.

## PROTECTION AND COOLING

The UNIBOX enclosure is designed in accordance with IEC60034-5, to both protect personnel from danger and to protect the machine from harmful ingress of solid matter or water as may be expected or specified in terms of conditions at site.
Cooling methods are defined in accordance with IEC60034-6, with those commonly used being air cooled, water cooled, drip proof, and force ventilated.

## VIBRATION

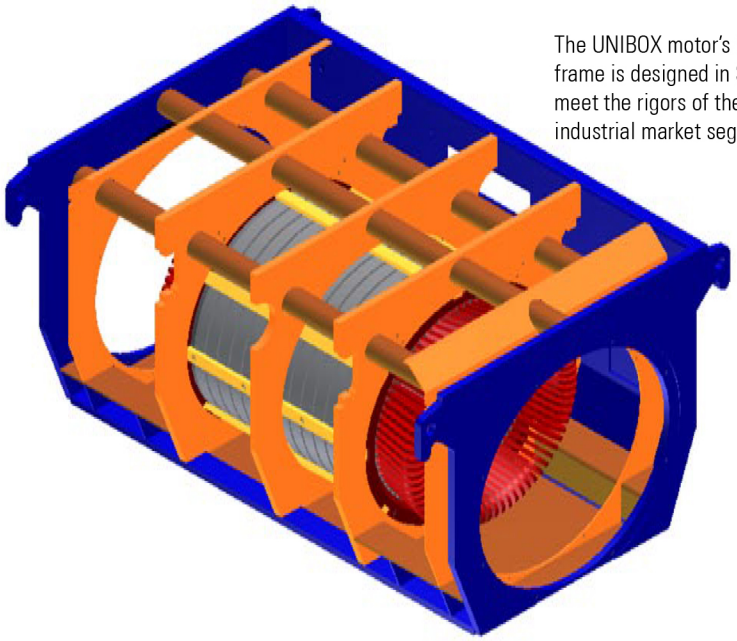
The UNIBOX rigid design and construction, together with the attention given to achieving good dynamic balance characteristics results in achievable vibration levels of grade "B" limiting values given in IEC60034-14.

## NOISE LEVELS

UNIBOX noise levels will not exceed the limits given in IEC60034-9. If required, lower levels can be attained by fitting additional silencers.

A super quiet UNIBOX motor designed with inlet and outlet silencers. This design can return noise levels as low as 82db on 2 pole speed machines, and lower on slower design speeds.

# FRAME CONSTRUCTION



The UNIBOX motor's heavy duty ridged frame is designed in South Africa to meet the rigors of the heavy mining and industrial market segments.

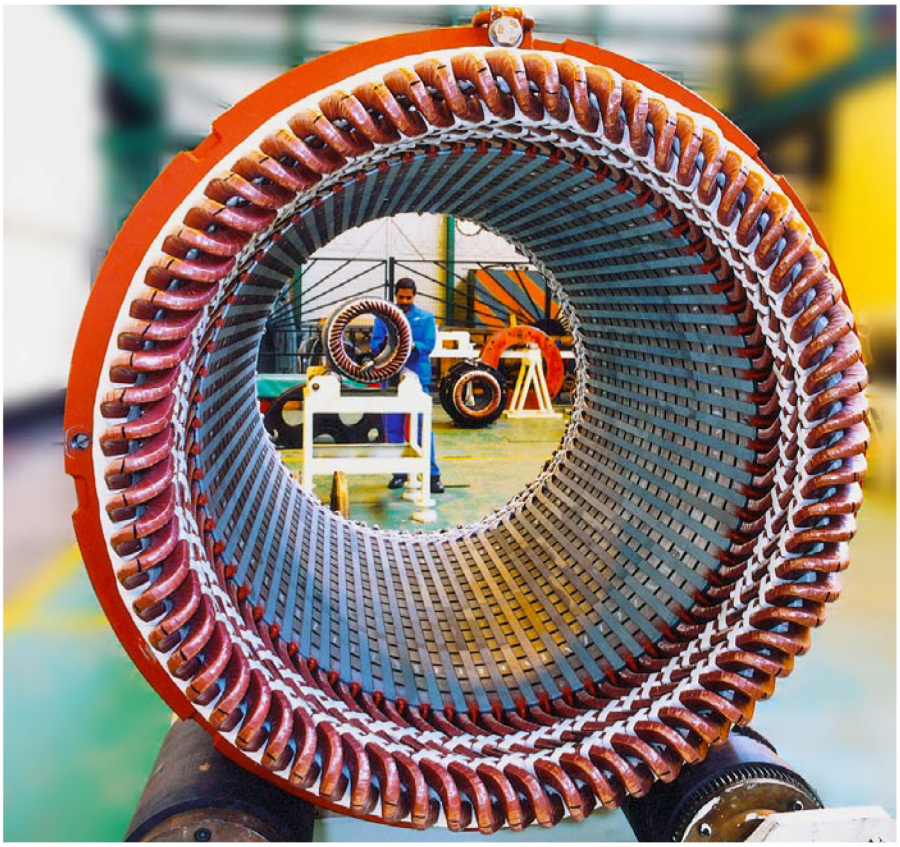
## FRAME CONSTRUCTION

The UNIBOX motor has a robust, box type, heavy gauge mild steel plate fabricated frame. The machine lifting points are integral with the end plates to which the end shields and flange mounted bearings are fitted. Foot fixings are integral within the frame. This heavy duty frame construction reduces flexing, vibration, noise levels and provides the support for the plug-in stator core pack. The welded frame is stress relieved prior to machining.

Jacking screws, suitable for vertical height adjustment are provided on the motor feet.

Both end shields are provided with inspection plugs at the appropriate diameter, which when removed provide access for air gap measurement.

The frame is fitted on final assembly with a comprehensive stainless steel rating plate, that includes all connection schematics, bearing details with lubrication as well as key motor specification data.



7Mw UNIBOX stator core ready for vacuum impregnation.

## STATOR CORE

The UNIBOX stator core consists of packets of laminations separated by radial ventilating ducts. The laminations are manufactured from low loss, non-grain orientated silicon steel. These laminations are manufactured in a ring format for machines up to a 710mm frame and in a segmental format for larger frame machines.

## STATOR WINDINGS

The stator coils are formed from annealed copper strip. All the coils are insulated with the appropriate number of layers of mica tape prior to the application of the dielectric and armour finishing tapes. The coils are subjected to elevated impulse voltage, inter-turn insulation tests before they are fitted into the stator slots and again after all coils have been placed in the fully lined stator slots.

The coils are wedged along the full length of the core. When required for higher efficiency designs, the wedges are made from a magnetically permeable material. A high voltage test is carried out after wedging.

Each end winding is securely braced to epoxy resin bonded glass fibre rings made from braided glass fibre sleeving, to which the outer end of each coil is lashed with woven glass and or polyester tape. This ensures that the coil ends form a rigid self supporting structure, which is capable of withstanding the mechanical forces produced by full voltage direct on line starting, or from reconnecting to an alternative supply. All coil insulation, slot liners, separators and

wedges etc meet class F insulation requirements.
Once the winding connections are completed, the entire winding is vacuum pressure impregnated (VPI) using a solventless epoxy resin. This globally impregnated Resivac system produces void free insulation. The fully impregnated wound core is the cured in a rotary process to ensure retention of resin in the slots and overhangs. All of these processes are PLC controlled to ensure consistency of product integrity.
The completed VPI wound core is heat shrunk into the UNIBOX frame, it is further secured by retaining "horse shoe" pieces fitted over the core bars and then welded into the frame.

## ROTOR CONSTRUCTION

Cylindrical UNIBOX rotors are constructed as either cage or wound rotor design variants.

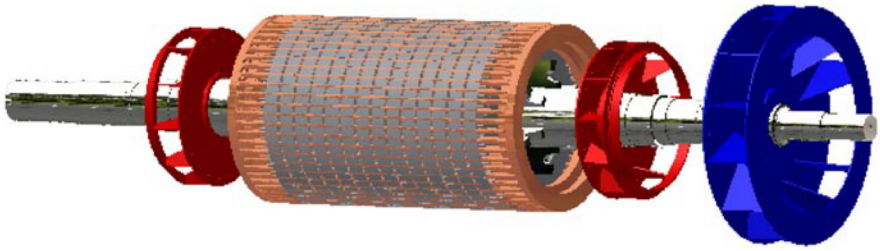
## ROTOR CORES

The UNIBOX rotor core is built up from either segmental laminations which are dovetailed and keyed directly onto the spider, or from ring type laminations depending on the rotor diameter.
The rotor core consists of packets of laminations that are separated by radial cooling ducts, similar to and aligned with those formed in the stator core pack construction.
Ring type lamination cores are built up between end plates on a keyed mandrel compressed and clamped prior to heat shrinking onto the shaft or spider, ensuring an interference fit, thus eliminating radial movement of the core when in operation and limiting vibration forces. The shaft is provided with a full length key for positive location of the core assembly.
The core assembly is located axially at both ends by means of heavy section keys fitted and welded into grooves on the shaft ribs. This facilitates core removal from either end.

## WOUND ROTORS

The winding is of the bar-wave type, using copper strip, appropriately insulated and firmly wedged into semi-closed slots. The end windings are secured with several layers of resin impregnated glass banding onto support collars to prevent any movement due to rotational forces.
The rotor winding leads are threaded into equally spaced radial holes, directly under the rotor overhang and along a suitably sized, centrally bored hole to the end of the shaft.
The fibreglass overhang banding is first cured and then the entire wound rotor is impregnated using the VPI process. All insulation and banding are at least Class F material with the temperature rise at rated output limited to within Class B. Rotor leads are connected to studs attached to the phosphor bronze or stainless steel sliprings, keyed to the shaft.
The complete slipring assembly is external of the end shield mounted bearing at the non dive end, and separately enclosed to prevent carbon dust from being drawn into the motor. Enclosure protection of the slipring housing can be made the

Construction of a standard wound rotor assembly.



Drawing showing the construction of a standard cage design rotor assembly.

# BEARINGS AND LUBRICATION

same as that of the main machine, or to a lower degree of protection as required. The slipring housing covers have windows for easy visual inspection, in addition to large hinged doors and easily removable covers that provide free access to the brush gear for more detailed inspection and maintenance purposes.
The brushes are fitted with constant pressure brush holders for optimum contact between brushes and sliprings that are both continuously rated. The sliprings can be spiral grooved for improved surface cooling and improved brush life where peripheral speed exceeds 20 m/s.
Additional features that may be included on wound rotors are tacho generator or encoder fitments for variable speed control and either manual or automatic brush lifting equipment and continuously rated sliprings for those applications where extended slipring / brush life is required.

## CAGE ROTORS

The squirrel cage construction is normally constructed from high conductivity copper rotor bars and end rings. The specific matching of torque requirements to the load is achieved by the use of various rotor bar sections, and where necessary for increased torque, either a double cage or high-resistance copper alloy variation is used.
Accurately sized rotor bars are drifted through the rotor slots ensuring a tight fit and are brazed to the end rings to form the cage. On all two pole motors and for the larger rotors subject to higher centrifugal forces the end rings are forged and end butt brazed to the bars, which are scarved at each end to a point within the slot to allow for thermal flexing during brazing. The brazing quality is checked and the entire assembly is dynamically balanced after the rotor diameter has been machined and sized in relation to the final air gap dimension, with balance weights added to the shaft arm ends or to the balance rings as appropriate.

## BEARINGS AND LUBRICATION

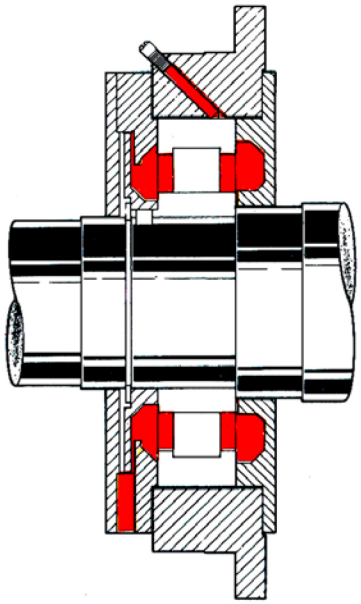
UNIBOX motors are supplied with either grease lubricated rolling element or oil lubricated sleeve bearings. All rolling element bearings have cartridge bearing housings. The housings are spigotted onto the motor end shields that are of the rigid flat disc type, generally both the non-drive and drive end bearings are insulated in both sleeve and rolling element bearing styles. The drive end bearing is earthed, thereby preventing shaft currents in the motor. Grease lubricated ball and roller bearings are used, up to the limit of loading dictated by shaft speed and bearing loading. Sleeve bearings are fitted above this limit out of necessity but are also available as a preference option on any machine.

## ROLLING ELEMENT BEARINGS

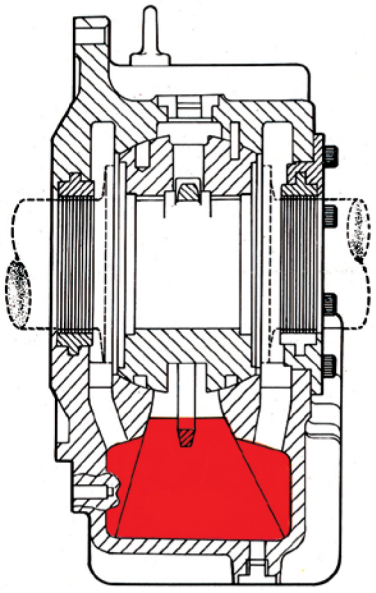
The rolling element cartridge bearing housings are so designed that in the event of the rotor being removed from the stator, the bearings and cartridges can be left on the shaft. This feature reduces the incidence of damage or of foreign bodies contaminating the grease during maintenance. The standard arrangement for rolling element bearings, with grease lubrication, is a roller bearing at the drive end and a ball bearing at the non-drive end. All rolling element bearings used on the range have C3 clearances and the calculated design bearing life (L1oh) is not less than 40 000 hours.
All grease lubricated bearings have grease relief features, preventing over greasing and permitting re-greasing while the motor is in operation. New lubricant is supplied to the inboard side of the bearing and old excess grease is discharged to the opposite side into the catcher located outside the frame and underneath the bearing housing.

## SLEEVE BEARINGS

Sleeve bearings are oil ring lubricated, spherically seated with a cylindrical bore bearing journal. Floating labyrinth seals are fitted. The housings are finned for cooler operation at the highest speeds and diameters in a 40 degree C ambient with natural cooling. Bearing temperature monitoring devices can be accommodated as required.
When requested or when ambient temperature and / or shaft speed demands, the bearings can be supplied suitable for flood lubrication with cooling oil being supplied from an external source. Alternatively the bearings can be water cooled by an external water flow system.



A rolling element cartridge bearing and housing.



Sleeve bearing with oil ring lubrication.

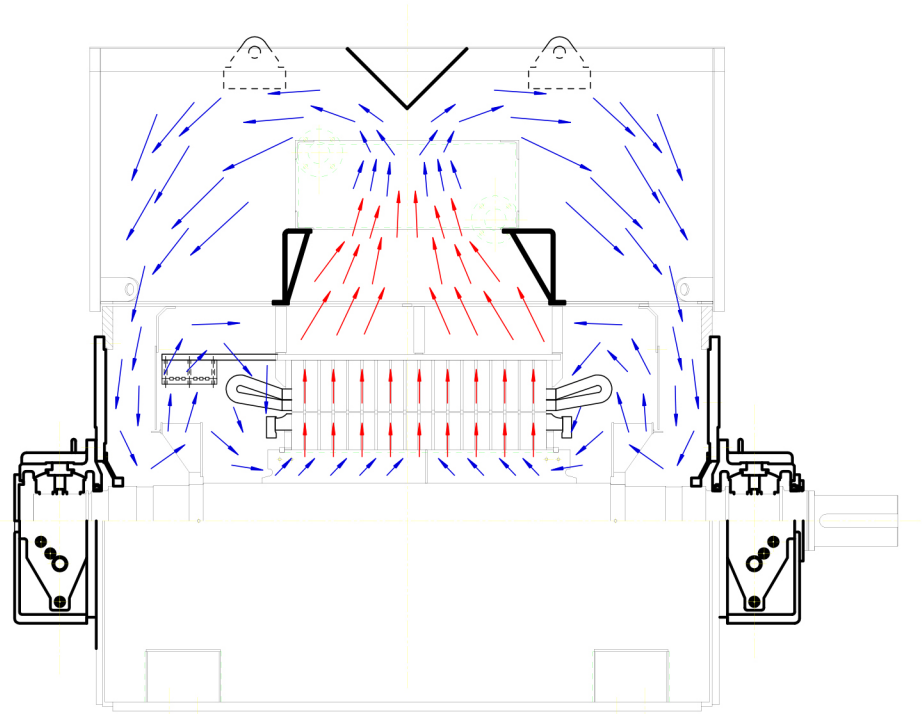
## VENTILATION SYSTEMS

The UNIBOX ventilation system is described as "single or double ended radial" depending on the size of the machine. Although total movement of air is axial from one end of the motor to the other in the case of a single ended fan, the main cooling of the core is by radial ducts. The temperature distribution across the machine is uniform resulting in reduced temperature gradients and thus longer insulation life. Designs are proven by a complex equivalent thermal network program used to predict temperatures in different parts of the core.

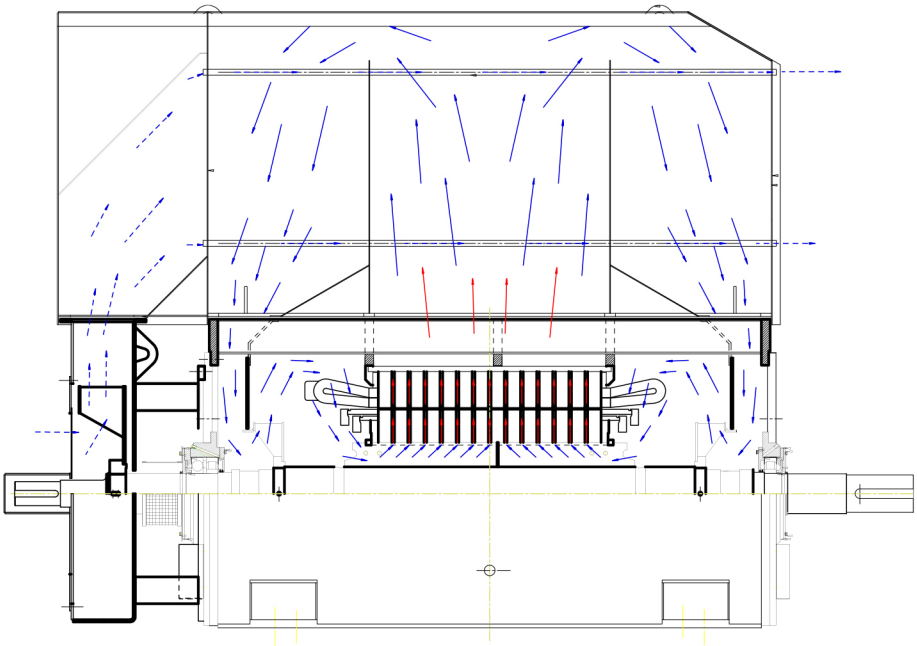
With single ended internal fan machines, the cooling air whether external or from the heat exchanger, is drawn down from the non-drive end of the top cover where it divides into two main paths. One path takes cooling air over the end winding and along both the air gap and the shaft spider, and then through the radial ducts in the rotor and stator cores. The other main path bypasses the core ducts and takes air axially along the outer diameter of the stator core. Here the air progressively mixes with and cools the air from the radial ducts before passing over and cooling the drive end which directs it into the top cover.

For double ended internal fan machines, the top cover, stator and rotor are split into two symmetrical air circuits. Cooling air is drawn down from the top cover into the fans at each end of the machine. The air is then forced into the machine core where it divides into two main paths, one taking cooling air over the end winding, along the air gap and through the stator radial ducts back to the top mounted cooler. The second path takes cooling air axially into the shaft spider and then through the shafts radial ducts into the air gap where is mixes with the air on the other path, via the stator radial ducts and back to the top mounted cooler.

The top cover of the UNIBOX machine is either open to atmosphere, as in the case with a C-Type machine (IC01) or alternatively consists of an integral air to air (CACA) or water cooled ( CACW) heat exchanger in the case of D-Type machines.



Internal cooling airflow in a water cooled (CACW) design double ended internal fan system.



Internal cooling airflow in an air to air cooled (CACA) design double ended internal fan system.

### SCREEN PROTECTED / DRIP PROOF Heat exchangers (IP22, ICO1)

The UNIBOX stator frame in this design format has an open top, covered by an IP appropriate louvered or screen protected top cover assembly. This design is also adaptable to suit other design fittings for example those applications that require ducted ventilation extraction.

### AIR TO AIR Heat exchangers (CACA, IP55, ICO161)

The top mounted UNIBOX heat exchanger is in the form of an air to air cooler incorporating aluminium cooling tubes that are expanded into steel end plates within the cooler housing

to form the top cover that encloses and seals the internal air circuit. The external air cooling circuit is provided by a shaft mounted fabricated fan.

## AIR TO WATER Heat exchangers (CACW,IP55,ICW37A81)

This heat exchanger radiator is incorporated into the UNIBOX top cover. Stainless steel cooler tubes are expanded into suitable manifolds located within either end of the cooler. Leak detection devices are also incorporated in to these designs as standard.

## NEMA II (IPW24/44, IC01)

This enclosure is designed generally to meet the requirements of NEMA II. The enclosure is designed to give protection corresponding to IPW24 (without filters) or IPW44 (with filters). The stator frame has a top mounted fabricated steel cover, with three 90 degree baffles and screen protected inlet and outlet openings.

## FANS

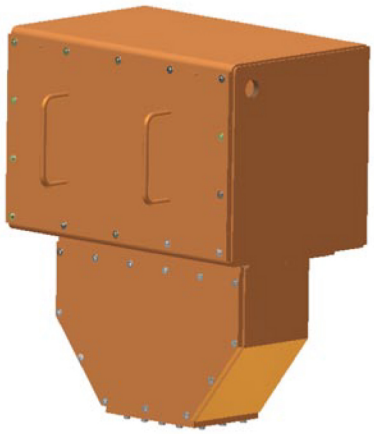
All fans are fabricated from steel and are fitted by means of a key and an interference fit directly onto the motor shaft. Designs are available for bi-directional as well for uni-directional rotation.

## FAN COWLS

The fan cowls on D-TYPE UNIBOX machines are manufactured from fabricated steel with internal baffles to accurately guide the airflow. Necessary inlet screens are provided as standard.

## TERMINAL BOXES AND TERMINATIONS

The standard position of the UNIBOX terminal box is on the right hand of the motor looking from the drive side shaft end, but this can be positioned on the opposite side should client specifics require. Insulated stud type terminal arrangements are



A steel fabricated termination box with a Trifurcating extension box (Fabel).

available to suit various requirements pertaining to differing operating environments, system fault capacity, supply voltages, as well as a variety of terminal box mounted auxiliary equipment and cable types. Whilst the neural point is usually internal, it is possible to bring out the neutral star point to either a separate termination box, or alternatively include it within the main termination box.
An earth terminal is provided as standard on the motor frames adjacent to the main terminal box.
UNIBOX terminal boxes are fitted with suitable gland plates as required by specification, or with trifurcating boxes equipped with cables glands, in either straight or angled variants to facilitate easier cabling.
The option exists for either Fabel or Makulu design phase insulated termination boxes. These are fabricated boxes incorporating a pressure relief

A large volume format standard fabricated termination box (Makulu).

diaphragm and desiccators for supplies up to 15kV. These box designs are fault tested for through fault currents up to 45kA for 0,25 seconds.
Box designs are weather protected and are suitable for Zone 2 areas.
All auxiliary boxes, as required by specification are fabricated from steel.

## NOISE REDUCTION

The UNIBOX motor has been designed with low overall noise levels and particular attention has been paid to the three basic sources of noise: Bearing, electromagnetic and fan noise.
Bearing housing and lubrication system designs are such that allow for easy maintenance reducing the chances of noise being produced as a result of inadequate lubrication.
Noise from the magnetic circuit is minimised by electrical designs using comprehensive computer programmes to analyse noise generating harmonics. Rigid cores and frames in conjunction with the use of vacuum impregnation minimise the risk of core and tooth vibration by raising their resonant frequencies well above those of the exciting forces.
The UNIBOX internal and external high pressure low aspect ratio centrifugal fans are optimized to provide the most efficient ratio of cooling air volumes to mechanical noise levels. The number of fan blades is selected to minimize the risk of harmonic interference between the magnetic noise and the fan blade passing frequency.

## SILENCERS

When required to meet the needs of stringent noise specifications the D Type UNIBOX motor can be equipped with a purpose designed cowl extension silencer. This design can also be effectively used to silence the air outlet circuit when necessary. C type UNIBOX motors silencers are contained within the inlet and / or outlet of the standard top cover.

## PAINT SYSTEM

The paint system chosen for the standard UNIBOX is the result of extensive testing and evaluation of many specially developed systems. The standard system offering is as follows:

**1 Polyurethane & Epoxy external coating**

After cleaning and shot blasting a self etching red oxide primer is applied to a minimum dry film thickness of 10 microns. The intermediate coat, an epoxy primer, is then applied with a minimum dry film thickness of 40 microns. Finally a finishing coat of polyurethane enamel is applied with a minimum dry film thickness of 65 microns. The total dry film thickness resulting from these three layers will be a minimum of 115 microns.

**2 Standard internal coating**

After cleaning and shot blasting a self etching red oxide primer as well as a finishing coat of red oxide insulating paint is applied.

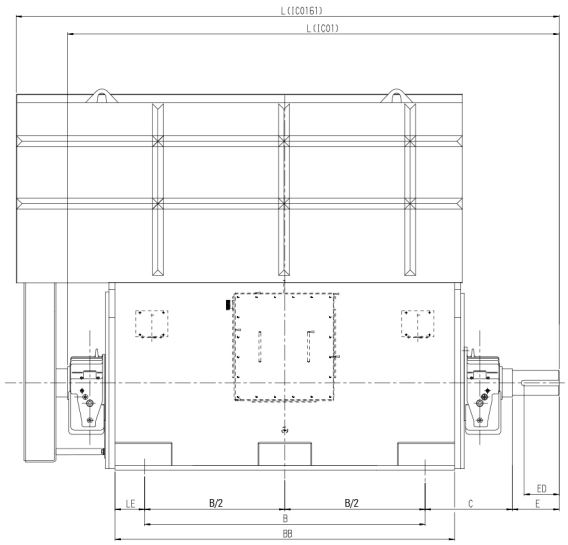
## UNIBOX FABRICATED SERIES MOTORS DIMENSION DATA*

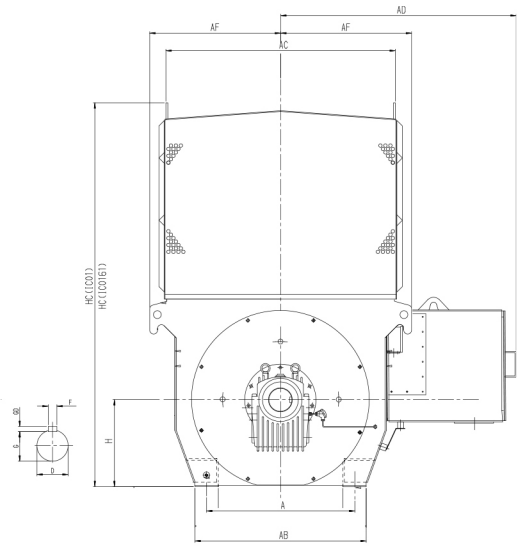
| FRAME | POLE | A | AB | AD | AF | B | C Ball/R | C Sleeve | D | E | ED | F | G | GD | H | HC ICO1 | HC ICO161 | LE | L max* Sleeve ICO 1 | L max* Sleeve ICO 161 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 355/100 | 2 | 610 | 710 | 848 | 570 | 1000 | 254 | 450 | 80 | 170 | 140 | 22 | 71 | 14 | 335 | 1328 | 1508 | 196 | 2017 | 2404 |
| 355/100 | 4-up | 610 | 710 | 848 | 570 | 1000 | 254 | 450 | 100 | 210 | 160 | 28 | 90 | 16 | 335 | 1328 | 1508 | 196 | 2057 | 2444 |
| 355/112 | 2 | 610 | 710 | 848 | 570 | 1120 | 254 | 450 | 80 | 170 | 140 | 22 | 71 | 14 | 335 | 1328 | 1508 | 201 | 2142 | 2529 |
| 355/112 | 4-up | 610 | 710 | 848 | 570 | 1120 | 254 | 450 | 100 | 210 | 160 | 28 | 90 | 16 | 335 | 1328 | 1508 | 201 | 2182 | 2569 |
| 400/112 | 2 | 686 | 847 | 906 | 650 | 1120 | 280 | 475 | 80 | 170 | 140 | 22 | 71 | 14 | 400 | 1463 | 1698 | 213 | 2237 | 2601 |
| 400/112 | 4-up | 686 | 847 | 906 | 650 | 1120 | 280 | 475 | 125 | 210 | 160 | 32 | 114 | 18 | 400 | 1463 | 1698 | 213 | 2277 | 2641 |
| 400/125 | 2 | 686 | 847 | 906 | 650 | 1250 | 280 | 475 | 80 | 170 | 140 | 22 | 71 | 14 | 400 | 1463 | 1698 | 233 | 2387 | 2751 |
| 400/125 | 4-up | 686 | 847 | 906 | 650 | 1250 | 280 | 475 | 125 | 210 | 160 | 32 | 114 | 18 | 400 | 1463 | 1698 | 233 | 2427 | 2791 |
| 450/125 | 2 | 750 | 920 | 933 | 685 | 1250 | N/A | 500 | 85 | 170 | 140 | 22 | 76 | 14 | 450 | 1578 | 1925 | 173 | 2355 | 2812 |
| 450/125 | 4-up | 750 | 920 | 933 | 685 | 1250 | 315 | 500 | 140 | 210 | 200 | 36 | 128 | 20 | 450 | 1578 | 1925 | 173 | 2435 | 2832 |
| 450/140 | 2 | 750 | 920 | 933 | 685 | 1400 | N/A | 500 | 85 | 170 | 140 | 22 | 76 | 14 | 450 | 1578 | 1925 | 193 | 2525 | 2982 |
| 450/140 | 4-up | 750 | 920 | 933 | 685 | 1400 | 315 | 500 | 140 | 210 | 200 | 36 | 128 | 20 | 450 | 1578 | 1925 | 193 | 2605 | 3062 |
| 500/125 | 4-up | 850 | 950 | 1023 | 777 | 1250 | 335 | 530 | 140 | 250 | 200 | 36 | 128 | 20 | 500 | 1650 | 2232 | 213 | 2525 | 2937 |
| 500/160 | 4-up | 850 | 950 | 1023 | 777 | 1600 | 335 | 530 | 140 | 250 | 200 | 36 | 128 | 20 | 500 | 1650 | 2232 | 213 | 2875 | 3287 |
| 560/140 | 4-up | 950 | 1100 | 1087 | 841 | 1400 | 335 | 560 | 160 | 300 | 225 | 40 | 147 | 22 | 560 | 1750 | 2430 | 191 | 2744 | 3149 |
| 560/180 | 4-up | 950 | 1100 | 1087 | 841 | 1800 | 335 | 560 | 160 | 300 | 225 | 40 | 147 | 22 | 560 | 1750 | 2430 | 191 | 3144 | 3549 |
| 630/160 | 4-up | 1060 | 1210 | 1161 | 921 | 1600 | 375 | 600 | 180 | 300 | 225 | 45 | 165 | 25 | 630 | 1930 | 2675 | 231 | 3071 | 3506 |
| 630/200 | 4-up | 1060 | 1210 | 1161 | 921 | 2000 | 375 | 600 | 180 | 300 | 225 | 45 | 165 | 25 | 630 | 1930 | 2675 | 231 | 2471 | 3306 |
| 710/180 | 4-up | 1180 | 1330 | 1247 | 1001 | 1800 | N/A | 630 | 200 | 350 | 250 | 45 | 185 | 25 | 710 | 2058 | # | 195 | 3330 | # |
| 710/224 | 4-up | 1180 | 1330 | 1247 | 1001 | 2240 | N/A | 630 | 200 | 350 | 250 | 45 | 185 | 25 | 710 | 2058 | # | 195 | 3770 | # |
| 800/200 | 4-up | 1320 | 1470 | 1332 | 1086 | 2000 | N/A | 670 | 225 | 350 | 300 | 50 | 208 | 28 | 800 | 2315 | # | 235 | 3675 | # |
| 800/250 | 4-up | 1320 | 1470 | 1332 | 1086 | 2500 | N/A | 670 | 225 | 350 | 300 | 50 | 280 | 28 | 800 | 2315 | # | 235 | 4175 | # |
| 900/224 | 4-up | 1500 | 1700 | 1455 | 1209 | 2240 | N/A | 710 | 250 | 450 | 400 | 56 | 230 | 32 | 900 | 2497 | # | 207 | 4035 | # |
| 900/280 | 4-up | 1500 | 1700 | 1455 | 1209 | 2800 | N/A | 710 | 250 | 450 | 400 | 56 | 230 | 32 | 900 | 2497 | # | 207 | 4475 | # |
| 1000/250 | 4-up | 1700 | 1900 | 1583 | 1337 | 2500 | N/A | 750 | 280 | 500 | 500 | 63 | 257 | 32 | 1000 | 2728 | # | 247 | 4475 | # |
| 1000/315 | 4-up | 1700 | 1900 | 1583 | 1337 | 3150 | N/A | 750 | 280 | 500 | 500 | 63 | 257 | 32 | 1000 | 2728 | # | 247 | 5125 | # |

**Note : Dimensions are typical for std applications, ACTOM is able to manufacture both larger & non standard frame's to suit applications at site**

* Overall Length where ball or roller bearings are specified will shorten as a function of the removal of two sleeve bearing housings

\# Due to the variety of cooler designs possible, overall lengths can only be confirmed against specification requirements at enquiry



ELECTRICAL PRODUCTS

# Complete your Project:

## Please select the items you require and we will be in touch

### Cables and Wires:

- [ ] Indoor
- [ ] Outdoor
- [ ] General
- [ ] Other
- [ ] Let an ACTOM Specialist Contact you

### Lighting:

- [ ] Indoor
- [ ] Outdoor
- [ ] General
- [ ] Other
- [ ] Let an ACTOM Specialist Contact you

### Transformers (Distribution):

- [ ] Indoor
- [ ] Outdoor
- [ ] General
- [ ] Other
- [ ] Let an ACTOM Specialist Contact you

### Accessories:

- [ ] Indoor
- [ ] Outdoor
- [ ] General
- [ ] Other
- [ ] Let an ACTOM Specialist Contact you

### Specific Information:

Address: 4 Branch Road, Germiston 1401, P.O. Box 678, Germiston 1400

Email: aep.enquiries@actom.co.za Tel: +27 11 878 3050 Website: www.actomep.co.za

ELECTRICAL PRODUCTS

# For more Information on this Product

## Please Send us the Folowing

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**Product Name:**

**Quantity:**

**Project Name:**

**Date the Product is required:**

### Your Contact Information:

**Name and Surname:**

**Company:**

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**Phone Number:**

**Province:**

# Thank You

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