

GOVERNMENT APPROVED TEST LABORATORY
 IN TERMS OF ARP 0108: "REGULATORY REQUIREMENTS FOR EXPLOSION PROTECTED APPARATUS"

IA CERTIFICATE

Date Issued: **27 Jul 2017**
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Issue: 0

Ex – Type Examination Certificate

Certificate Number: **S-XPL/17.1058 X**
 Equipment: **The W60 Range of Induction Motors**
 Model / Type: **Frame Sizes 355 to 1000**
 Applicant: **Zest WEG Electric (Pty) Ltd**
 PRIVATE BAG X 10011
 SANDTON
 2146
 Manufacturer: **WEG Equipamentos Eletricos S.A**
 Serial No: All serial numbers imported between issued- and expire date and all serial numbers covered by a valid report or acceptable product certification mark.

Supplied by
Zest WEG Electric (Pty) Ltd
 Identified by Inspection Authority number
S-XPL/17.1058 X

And as described in the Explolabs file number **XPL/18786/17.1058** is hereby certified "Explosion Protected Ex nA IIC T4 Gc (T3 when anti-condensation heaters are fitted) , Ex tb IIIC T125°C / T160°C Dc IP6X (See Schedule), Ex tc IIIB T125°C / T160°C Db IP6X (See Schedule)", having been examined and inspected in accordance with the relevant requirements of South African Standards.

SANS 60079-0: 2012 Ed 5 IEC 60079-0: 2011 Ed 6	Explosive atmospheres Part 0: Equipment — General requirements
SANS 60079-15: 2010 Ed 4 IEC 60079-15: 2010 Ed 4	Explosive atmospheres Part 15: Equipment protection by type of protection "n"
SANS 60079-31: 2014 Ed 2 IEC 60079-31: 2013 Ed 2	Explosive atmospheres Part 31: Equipment dust ignition protection by enclosure "t"

Risk of ignition provided:

Protection afforded	Equipment Protection Level (EPL)	Performance of protection	Conditions of operation	T class or Max Surface Temp (°C)
	Group			
High	Db Group III	Suitable for normal operation and frequently occurring disturbances or equipment where faults are normally taken into account	Equipment remains functioning in zones 21 and 22	T125°C/T160°C
Enhanced	Gc Group II	Suitable for normal operation	Equipment remains functioning in zone 2	T3 (200°C)

Enhanced	Dc Group III	Suitable for normal operation	Equipment remains functioning in zone 22	T125°C/T160°C
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1. GENERAL

The W60 Range of Induction Motors has shaft centre heights ranging from 355 to 1000mm (and NEMA equivalent) and comprises cast iron or fabricated mild steel frames for horizontal or vertical, foot or flange mounting. The range of motors can optionally be used as asynchronous generators for the production of electrical energy. The range covers 2 to 14 pole 3 phase windings for 50 or 60Hz and is designed for connection to supplies up to 13.8kV and duty type S1 or S2. The motors have a minimum ingress protection of IP20, which can be increased up to a maximum IP66 depending on the specific heat exchanger and arrangement of the motor shaft seal.

Motors with an IP20 rating are certified Ex nA Gc only (for Zone 2 use) and have a restriction on the intended location for installation.

Bearing Arrangements

Spigot housings are machined at either end of the stator frame into which the machined spigots of cast iron or fabricated steel end frames are fitted. The end shields at the Drive End and Non-Drive End carry the bearing arrangements which may be ball, roller or sleeve and be grease or oil lubricated. Optionally the motor can be arranged with just one bearing at the Non-Drive End (single bearing Motor and/or pedestal bearing). Optional bearing insulation is available and the bearing housings may be cast or fabricated. The bearing housings provide a degree of protection of at least IP55 for equipment Group II, and IP55 for equipment Group IIIB (EPL Dc) and IP65 for equipment Group IIIC (EPL Db).

Stator

The stator core packs are built from insulated steel laminations which are clamped together by 6 to 12 bars for machines 560 and below and which are welded and have clamping rings for machines size 630 and above. The wound and impregnated stator assembly is secured in the stator frame by an interference fit and rotation is further prevented by the use of dowels.

Rotor

The rotor core packs which are built from insulated steel laminations are keyed and/or assembled by interference onto the steel shaft, and located at one end by a shoulder and at the other by a circlip or by circlips on both sides of the shaft. The laminations may be drilled to allow for radial and/or axial cooling air circulation. The rotor cage is either cast aluminium or built up from copper or aluminium bars.

When a built up rotor is used the copper or aluminium bars are forced into the slots to give an interference fit and end rings are brazed to the bars.

Balancing of the rotor is achieved either by fixing washers to cast studs on the aluminium rotors only or by fastening washers to the end rings.

Terminal Boxes

The motors are fitted with separate bolt-on terminal boxes which are manufactured from cast iron or steel and fitted with bolt-on covers incorporating a gasket which is glued to one surface. Component certified terminal boxes can also be fitted when applicable, as detailed in the general remarks on this report.

Main terminal boxes may contain insulators, copper bars, current transformers (C.Ts), surge arrestors and capacitors to form single or double cable arrangements of air insulated and phase segregated versions. Neutral connections may also be included as part of the main terminal box or as a separate unit.

Auxiliary terminal boxes contain IECEx component certified terminals, as detailed below;

Manufacturer	Type of terminal	Certificate number
Phoenix Contact	ST 1,5 / 2,5; STTB 1,5 / 2,5	IECEX KEM 06.0051U
	USLKG series	IECEX KEM 06.0035U
	ST 4; STTB 4; ST 6	IECEX KEM 06.0050U
	ST 10; ST 16; ST 35	IECEX KEM 06.0033U
	MBK 3; MBK 6; MSLKG 6	IECEX KEM 07.0008U
	UT series	IECEX KEM 06.0027U
	UK series	IECEX KEM 06.0029U
	UK 1,5N; UK 2,5; 3N; 5N; 6N	IECEX KEM 06.0034U
	MSLKG 2,5	IECEX KEM 07.0017U
	UT series	IECEX KEM 06.0013U
Weidmuller	WDK 2.5 / 4; WDU 1.5 / 2.5	IECEX ULD 05.0008U
	ZDU / ZPE / ZDK series	IECEX ULD 05.0009U
	SAK ; EK series	IECEX KEM 06.0014U
	ZDU ; ZPE series	IECEX ULD 05.0009U
	WDU / WPE	IECEX ULD 14.0005 U
WEG Drives & Controls	BTWP*; BTWP*T	IECEX FTZU 12.0005U
	BTWI*; BTWI*T	IECEX FTZU 12.0006U
	BWTI 6; BWTI 10; BWTI 6T; BETI 10T	IECEX FTZU 12.0007U
KLEMSAN	TB MVK...; TB PIK...; TB PYK...; TB PUK	IECEX FTZU 11.0011U
	TB MYK* ; TB MYPK* ; TB MYSK* ; TB PYK* ; TB WGO* ; TB AVK* ; TB PIK* ; TB PEK*	IECEX FTZU 11.0006U
	AVK* ; AVKY* ; PYK* ; PYKM* ; PYKMR* 2,5 ; PIK* ; WGO* ; WGO PB6 ; PB* ;	IECEX FTZU 16.0003U
	TB AVK...	IECEX FTZU 10.0012U
WIELAND	WT series	IECEX SEV 14.0004U
	WKN series	IECEX SEV 15.0002U
CONNECTWELL	CTS, CMT, CMB, CMC, CDL, ODL, CTL, CSC, CGM, CGT, PTB, AS, ADL, AGT	IECEX SIR 16.0056U
	CTS, PTB, CDL, ODL, CTL, CSC, CGT, CGM, CGT, CMT, CMB, CMC	IECEX UL 11.0053U
	AS, AGT, ADL	IECEX UL 11.0044U
	CX, CM, CSB, CBS, STH, CDL	IECEX SIR 16.0016U

The following IECEx component certified enclosures can also be used;

Manufacturer	Type of terminal box	Certificate Number(s)
Quartzelec Limited	PSN Phase Segregated	IECEX SIR 10.0146U
	PSE Phase Segregated	IECEX SIR 10.0147U
	EIN and ETN Euromold	Sira03ATEX 4227U
	EIE and ETE Euromold	Sira03ATEX 3226 U
R. Stahl	Type 8150/0-****_****_****_	IECEX PTB 09.0047U
	Type 8146/-***-**	IECEX PTB 06.0044U
	Type 8125/-***-***	IECEX PTB 06.0029U
Bartec	Type 07-56.1-.../....	IECEX IBE 09.0016U
	Type 07-5180****/****	IECEX PTB 11.0032U
	Type 07-5184-****/**** and 07-5185-****/****	IECEX PTB 09.0008U
WEG EQUIPAMENTOS ELÉTRICOS S/A	WPS, WPI, WBT, WBL, WAI, WNT	IECEX BAS 14.0175U Baseefa07ATEX0260U
	WATB Series	IECEX BAS 16.0129U

Any size of terminal box can be fitted to any of the frame sizes within the range as long as they are suitable rated for their intended use and it is physically possible to do so. The terminal boxes may also be fitted with optional IECEx/ATEX equipment certified parts, which do not form part of this assessment.

Ventilation

Various methods of cooling are used including externally ventilated or totally enclosed versions of air to air or air to water, with or without silencing. In addition, forced ventilation may be used with separately IECEx certified motors and optionally an IECEx certified encoder or brake may be attached to the main motor shaft.

External fans when used are manufactured from cast iron, welded steel or aluminium containing less than 6% magnesium.

Windings

Low voltage motors are wound using polyester-imide enamel wire with the overhangs suitably insulated and tied with fibreglass. High voltage motors are wound using either enamelled copper wire with a polyester and glass fibre covering or bare wire with two layers of special mica tape.

Motors with rated voltages above 4160V have tape applied to protect against corona effects and also have stress relief tape applied.

After winding, the high voltage motors are vacuum impregnated with a bi-component epoxy resin.

Use of Variable Voltage Variable Frequency Drives

The range of W60 motors can be operated with frequency inverters (variable speed drives) in the following conditions/considerations:

- With PWM variable frequency drives, up to 13800 V, insulation system F (or H), are able to operate within their insulation class limit, respecting the motor temperature class.
- With forced ventilation (independent cooling system) or oversizing, shall be applied in accordance with the application characteristics due on variation of nominal frequency.
- With safety thermal margin or power derating to operate within insulation class limit B.
- With variable frequency drives with sinusoidal output signal (equipment able to supply motor voltage and current with negligible harmonic content), or variable frequency drives type PWM fitted with sinusoidal filters in the output. In this condition it is not expected significant additional temperature rise (over than 10K), beyond the normally shown by the motor under sinusoidal supply.
- With variable frequency drives that supply motor voltage / current with greater harmonic distortion, may resulting in additional heating over than 10K. This situation is usually to occur with higher power machines and low voltage (<1000V) and the motor should be designed properly.
- Oversizing insulation of motors operating with variable frequency drives can be necessary depending on the application characteristics and variable frequency drive.
- Use of variable frequency drives that supply PWM voltage with presence of common mode components (zero sequence) require motor insulation oversizing for voltage higher than 4000V.
- Speed x torque curves for motor shall be supplied for application with a variable frequency drives.

Motors shall be fitted with thermal protective devices which shall be connected into the motor control circuit in order to keep T3 or T4 and or T125°C or T160°C surface temperature for dust applications. Reenergizing must not be automatic.

Auxiliaries

The auxiliaries which may be fitted to this range of machine are:-

- Vibration monitoring sensors.
- Winding and bearing temperature detectors comprising RTD's, thermocouples, thermistors or thermostats. Refer to the general remarks for further details.
- Anti-condensation heaters.

The following IECEx certified components can be used with the machine;

Manufacturer	Type of accessory	Certificate Number(s)
Flexelec SA	RSV Anti-condensation	IECEx SIR 10.0151U
BARTEC GmbH	Self-Limiting Heating	IECEx KEM 07.0048U
Minco Products Inc.	Resistance Temperature Detector	IECEx DEK 12.0057U

EPHY-MESS GmbH	Temperature Sensor PR-SPA-EX-***	IECEX IBE 14.0058U
EuroMold	Connector	ISep 09 ATEX 023 U
F.T.M. Srl	Current Transformer Series AOC Ex	IECEX CES 13.0015U
R.Stahl	Control Unit	IECEX BVS 07.0029U
Rosemount	Temperature Transmitter Model 644	IECEX BAS 12.0070U
Bartec	Control Module Type 07-7311	IECEX PTB 11.0083U
	Control Module Type 07-7331	IECEX PTB 11.0082U

Note: In the situation where motors are fitted with IECEx equipment certified T4 anti-condensation heaters the overall motor temperature class marking can be T4. Any relevant specific conditions of use relating to the use of the heaters as part of the motor must be complied with.

Type Testing

Each motor design shall be subjected to a WEG test procedure for Ex n motors, to verify the T3/T4 temperature classification.

Slight variations in motor design already tested can have the temperature class re-verified by calculation.

Ambient Temperatures

The standard temperature range of the motors is -20°C to +40°C. By the choice of suitable materials and use of the de-rating data called up on the drawings an ambient range of -55°C to +60°C may be achieved. Individual motors must be marked according to the build of the unit.

Ingress Protection Rating

The ingress protection rating of the motors depend on the shaft seal used:

Shaft seal IP rating	Shaft seal IP rating
Oil	P55 to IP66
Taconite labyrinth	IP55 to IP65
Taconite labyrinth with Teflon seal	IP55 to IP66
Flange/Sleeve Bearing	IP55 to IP66

2. INSTALLATION INSTRUCTIONS

It is the manufacturer's responsibility to supply installation instructions with each unit offered for sale as required by IEC/SANS 60079-0 Clause 30.

3. SPECIAL CONDITIONS FOR SAFE USE (denoted by X after certificate number)

- The T3 or T4 internal/external surface temperature class and the T125°C or T160°C external surface temperature classification does not include motor starting or cover motors under duty cycle conditions other than type S1 or S2.
- The installer must ensure that any equipment certified cable glands and stopping plugs fitted to the terminal boxes are suitably IECEx/ATEX certified. Any unused cable entries must be fitted with IECEx/ATEX certified stopping plugs. When installed the cable gland or stopping plug must maintain the marked IP rating of the enclosure.
- All terminal nuts and screws, whether used or not, shall be correctly tightened.
- When tightening supply connections care should be taken to maintain clearance distances.
- On auxiliary terminals the conductor insulation shall extend to within 1mm of the terminal throat.
- There shall be no loose conductor strands on any terminal.
- The current transformer secondary terminals must not be left open circuit to avoid potential high voltages.
- Motors designed for T4 and variable frequency drives are fitted with stator winding temperature detection devices that must be connected to the motor control circuit. For other starting methods, the connection of the winding temperature detectors is optional. The stator RTDs and thermistors can be

connected via a standard industrial controller provided that the controller is located in a safe area.

9. Anti-condensation heaters shall not be energised when the machine is energised.
10. Where auxiliary apparatus is fitted that is not covered by this certificate the installer and/or user, as appropriate, must ensure that it is suitable for the conditions of use and that it does not invalidate this certification.
11. When motors are fitted with the Iris Power terminal box they can only be marked for, and used in, Zone 2 Gas atmospheres.
12. When the motor is fitted with terminal boxes which contain surge arrestors, capacitors, insulators, current transformers and connector pins, the motor shall be rated to ensure that the ambient temperature range of these parts is not exceeded.
13. When the machine is being used as an asynchronous generator precautions must be taken for start-up and operation to ensure the requirements of the certification are met. Refer to the manufacturers Installation, Operation and Maintenance Manual for full details.
14. Ex nA machines rated for IP20 shall only be installed in locations providing adequate protection against the entry of solid foreign objects or water capable of impairing the safety of the machine.
15. The non-metallic drain or blank plugs are for one time use only, once removed they shall be replaced with a new device.
16. Auxiliary terminal boxes currently afforded certificate number IECEx BAS 16.0129U intended for Group IIC applications shall only be cleaned with a damp cloth to avoid potential electrostatic charge generation.
17. Machines rated at 13.8kV are suitable for use in gas Group IIB only.

Based on the following documentation: IECEx BAS 14.0097X.

4. CONDITIONS OF CERTIFICATION

- All production units must be covered by a QAN (Quality Assurance Notification), Product Mark Scheme or batch evaluation.

5. MARKING

The following (or similar) information have to be clearly and permanently marked on all units:

Supplier : Zest WEG Electric (Pty) Ltd
 Manufacturer : WEG Equipamentos Eletricos S.A
 Equipment : The W60 Range of Induction Motors
 Model/Type : Frame Sizes 355 to 1000
 Serial No. : ---
 Ex Rating : Ex nA IIC T4 Gc (T3 when anti-condensation heaters are fitted) , Ex tb IIIC T125°C / T160°C Dc IP6X (See Schedule), Ex tc IIIB T125°C / T160°C Db IP6X (See Schedule)
 IA Certificate No : S-XPL/17.1058 X

This certification indicates compliance with R10.1 of the Mines Health and Safety Act and/or EMR 9(2) of the Occupational Health and Safety Act, provided that the apparatus is used as relevant in accordance with:

- i) SANS 10086 and IEC/SANS 61241-14 requirements as applicable;
- ii) Any conditions mentioned in the above report;
- iii) Any relevant requirements and codes of practice enforced in terms of the Mine Health and Safety Act or Occupational Health and Safety Act; and
- iv) Any restrictions and conditions enforced by the Chief Inspector of Mines or the Principal Inspector or the Chief Inspector: Occupational Health and Safety.
- v) A revision certificate replaces all previous version of the certificate.
- vi) * - Only covers equipment Imported between the "Issued" and "Expire" dates.
- vii) If and when your QAN (Quality Assurance Notification) Certificate for your equipment manufacturer expires during the valid period of the IA Certification (issued for your equipment) and a new certificate is not submitted the existing IA Certification will then be cancelled. It is thus the client's responsibility to always submit the updated and valid QAN certificate(s) to Explolabs (Pty) Ltd.

Responsible Testing Officer:



D Maree
Senior Testing Officer

Reviewed by:



H De Wet
Testing Officer

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