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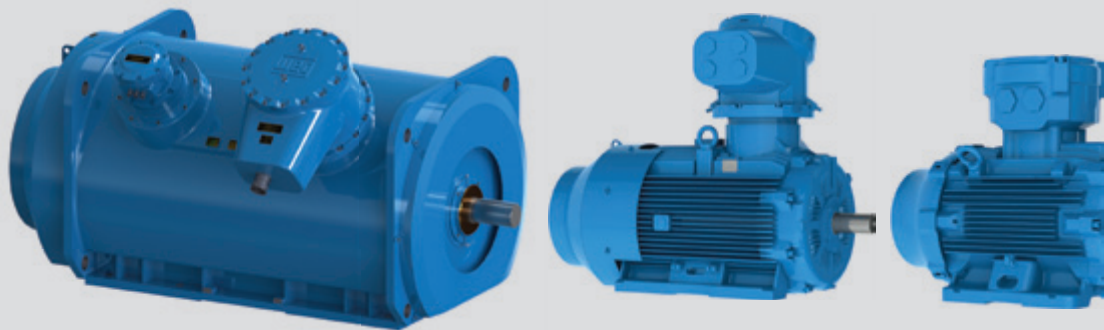
Excellent ways

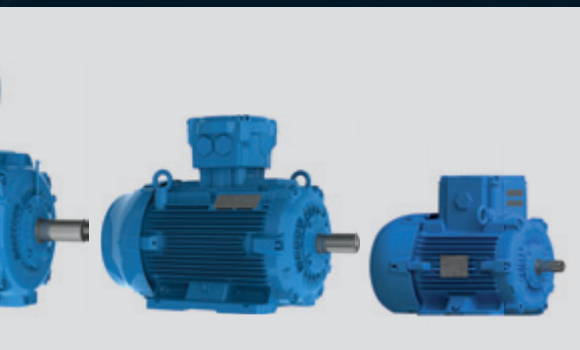
to improve safety and reduce
total costs of operation



22 Excellent ways

The **W22Xd** line represents what is most modern in driving equipment for explosive atmosphere environments. As a result of intense research and development, WEG launches its new flameproof motor line, the **W22Xd**, a complete range of hazardous area products in IEC frames 71 to 710 and NEMA frames 143/5T to 586/7T. Incorporating the innovative concepts of the W22 general purpose motor range, the W22Xd line is an evolution in the market of classified area products offering high efficiency levels, energy saving, low operational costs, extended lifetime, low maintenance and assured safety!





1. Worldwide certifications

In order to emphasize the Global protection and safety concepts on offer from this range, W22Xd motors have attained certification in accordance with the table below:

Market	Certification	Certifying Entity
Brazil	INMETRO	TÜV
Canada	cCSAus	CSA
China	CQST	CNEx
	NEPSI	SITIIS
Europe	ATEX	Baseefa
India	PESO	CCoE
Latin America	IECEX	Baseefa
Nigeria	SONCAP	Standards Organization of Nigeria
Oceania (except for Mines)	IECEX	Baseefa
Oceania (Mines)	ANZEx	TestSafe
Russia	GOST-R/RTN	CCVE
South Africa	SANS	SABS/CERTEX
United States	cULus	UL



In short, the W22Xd line holds certifications for application in the following hazardous area classifications:

IEC Zone 1 and Zone 2, Groups I, IIA, IIB and IIC, Temperature Class T4, Gb and Gc

NEC Class I, Division 1, Groups C and D, Temperature Class T4.

To facilitate higher functionality in the W22Xd line, these motors are also certified for application in environments where combustible dusts/fibers are present, such as:

IEC Zones 21 and 22, Groups IIIA, IIIB and IIIC, Temperature Class T125°C, Db and Dc

NEC Class II, Division 1, Groups E, F and G, Temperature Class T125°C.

In the development process of the W22Xd, WEG's main objective was to develop a single product which would comply with the specific needs of the most varied local standards. As a result of that concern, WEG is now introducing this innovative line, a globally launched product with worldwide acceptance.

Efficiency and reliability tip:

Although WEG specializes in the design and manufacturing of products for hazardous areas offering a wide range of certified products such as flameproof, non-sparking, increased safety, dust ignition proof and pressurized enclosure motors, the classification of an industrial plant in hazardous locations is fully a customer's responsibility. An accurate classification of a hazardous area is very important for the selection of appropriate equipment and should be carried out by a qualified engineer.



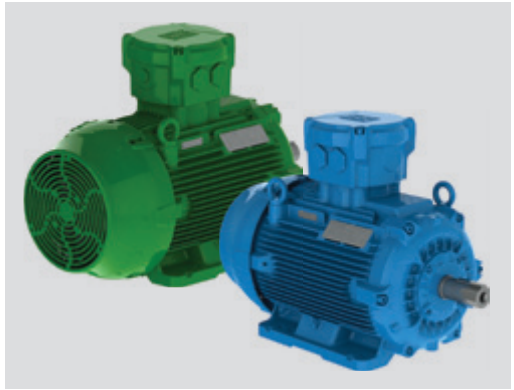
2. Efficiency levels

The efficiency ratings of the W22Xd motors follow the levels given in the IEC 60034-30 standard. The EuP-Directive 2005/32/EC establishes the Ecodesign requirements for electric motors and defined High Efficiency (IE2) as the minimum efficiency level in Europe as of 16th June 2011.

Whilst the Directive does not specifically apply to hazardous area motors, WEG feels that since the introduction of the ATEX Legislation there has been an increase in demand for these products. Consequently, WEG launched the W22Xd line with the IE2 efficiency level as standard for IEC motors.

NEMA motors are supplied according to NEMA Premium® efficiency levels as standard.

The W22Xd motors play an important role in energy saving with regard to partial loads because their outstanding design allows for constant efficiency from 75% up to rated load.



Efficiency and reliability tip:

Research indicates that the cost of acquisition represents only 2.5% of the total cost of ownership of an electric motor, whereas 90% are attributed to energy costs! Motors with higher efficiency levels offer faster return on investment. Check at www.weg.net our Payback Calculator Tool. If you need further information on how new design electric motors with higher efficiency levels can reduce your operational costs, please contact your nearest WEG Sales Office.

3. Suitable for operation in extreme ambient conditions

W22Xd motors are designed as standard for operation in ambient conditions from -20°C to +40°C and altitudes up to 1000 m.a.s.l. However, they can be supplied for application in extreme conditions, such as: ambient temperature from -55°C to +80°C and/or altitudes up to 5000 m.a.s.l whilst maintaining their primary function which is the safety of the application. This enables W22Xd motors to operate within a diverse range of environments.



-55°C (-67°F)



+80°C (+176°F)



4. Electrical features

W22Xd motors are manufactured according to both IEC and NEMA standards for frequencies of 50 or 60 Hz. A complete winding design is available enabling the production of motors in voltages up to 10000 V with insulation class F or H, including: low starting current models, two speed motors (dahlander and double winding design), higher/lower ambient designs and motors with temperature class T5/T6, amongst others.

Rated performance meets or exceeds the applicable rated performance defined by standards in force globally. For the protection of the equipment itself, motors are fitted with thermistors (PTC) for tripping which ensure the motor will disconnect in case of an unexpected situation such as an overload, large voltage variations, phase unbalance, etc.

Efficiency and reliability tip:

For VFD applications, the utilization of thermal protectors is mandatory and will help protect the motor and driven equipment.

5. Variable frequency drive operation

The use of VFDs is recognized to be one of the major driving forces for energy saving due to their ability to adjust motor output to best suit load requirements.

However, voltage spikes of the PWM waveform can have harmful effects on the motor winding leading to premature failure of the insulation system. This worsens as the switching frequency is increased.

W22Xd motors utilise the patented WISE® insulation (WEG Insulation System Evolution) which permits operation via a VFD at voltages up to 690 V. The WISE® insulation system comprises of class H insulation wire (200°C), enhanced insulation materials and solvent-free resin.

Larger motors may present induced shaft currents due to the unbalanced waveform and high frequency components of the power supply. Motors driven by a VFD may also experience electric current circulation through the bearings as

a result of a Common Mode voltage effect. To avoid bearing circulation currents, it is generally accepted to isolate one of the machine's bearings and to short circuit the shaft and frame in the other bearing. For this reason, insulated bearings and shaft grounding kits are available for W22Xd motors in order to ensure longer operating hours for VFD driven motors.

To further comply with the demands of VFD applications, the W22Xd line can be produced in TEBC versions (with forced ventilation kit) for operation at low frequency levels and can be fitted with encoders* for applications which require precision positioning operations.

Due to their outstanding performance, W22Xd motors are capable of maintaining the temperature class T4 even when driven by a VFD.

**Encoder must be compatible with the hazardous location.*

Efficiency and reliability tip:

Variable frequency drives are the most effective solution for motors operating across different speed ranges. Advantages of using VFDs: avoid additional protection circuits as long as these protections are built-in; keep motor supply levels consistent; permit high torques for starts/stops and enable the motor to run at the optimum performance point. In order to minimize total losses in the motor, WEG variable frequency drives offer the exclusive Optimal Flux® condition resulting in higher efficiency, lower operating temperatures and, consequently, longer lifetime.



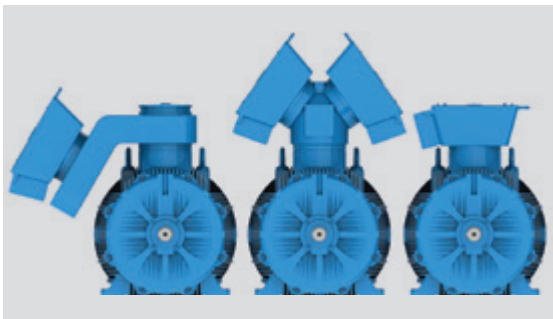
6. Flexible and modular design for terminal boxes

W22Xd “Ex d” and “Ex de” motors are equipped as standard with the same terminal box design enabling the conversion of “Ex d” motors into “Ex de” and the subsequent utilization of “Ex de” motors in “Ex d” classified areas. Larger motors offer numerous terminal box mounting possibilities through the use of

adaptors in several designs and different terminal box models (in cast iron or welded carbon or stainless steel). Terminal boxes are also available for: Current Transformers for differential and integral protection, surge arrestors, capacitors, signal transducers, Y connection with accessible neutral, etc.

Efficiency and reliability tip:

Every intervention which may compromise the enclosure or which is related to the product certification must be performed through WEG’s network of approved service centers for explosive atmosphere products. Find the nearest to you at the website www.weg.net or contact your nearest WEG branch.



7. Reduced operating temperatures

An electric machine’s lifespan is governed primarily by its insulating materials and operating hours, with its aging directly proportional to its operating temperature. For this reason, the cooling system of the W22Xd range, comprising the fan, fan cover and frame designs, was developed with the use of “Finite Element Analysis” softwares resulting in outstanding heat dissipation. This results in reduced operating temperatures which remain well within the limits of the insulating materials. It also eliminates any hotspots by providing a uniform temperature distribution through the frame.

The motor frame plays a crucial role in thermal performance because it is responsible for transference of the heat generated inside the motor to the surface of the frame where the air blown by the cooling fan will promote heat dissipation.

The W22Xd frame concept optimizes heat dissipation through the position of the terminal box which, for IEC frames 280 (NEMA 444/5T) and above, is located towards the front of the frame. To maximize the heat dissipation area, the cables are led to the terminal box via a channel

placed between the front endshield and the terminal box. The area between the fan cover and terminal box is also provided with cooling fins.

The endshield design also took into consideration the dimensional characteristics of the mechanical interface surfaces and the need to maximise heat dissipation, which resulted in a robust design and exposure of the bearings to a greater surface area to effect heat dissipation.

Additionally, the fins on the drive endshield are located at the point of the highest heat concentration, also aiding the reduction in the temperature of the bearing.

Efficiency and reliability tip:

Respect the minimum gap between any walls or surfaces located near to the back of the fan cover to allow for air intake. Keep motor surroundings clean and periodically check for any air blockage that can reduce cooling system performance. Remember that the cooler a motor runs, the longer life it will have.



8. Complete product range and higher outputs per frame

Efficiency and reliability tip:

Although new rated outputs are available, the W22Xd motor respects the power to frame size ratio as per the applicable parts of the IEC Standard 60034 and 60072 permitting the replacement of old, inefficient flameproof motors with W22Xd High Efficiency – IE2 or even W22Xd Premium Efficiency – IE3 motors with total reliability. The energy savings will be even greater if the old motor has been subject to repairs during its lifetime.

Another major benefit of the reduced operating temperatures offered by W22Xd motors, besides the longer lifespan, is the possibility of offering greater rated outputs from the same motor frame size. With the launching of the W22Xd motors, new rated outputs are available for the existing frame sizes and new frame sizes were introduced, offering a complete flameproof motors range from IEC frames 71 to 710 and NEMA frames 143/5T to 586/7T.





9. Reduced sound pressure levels

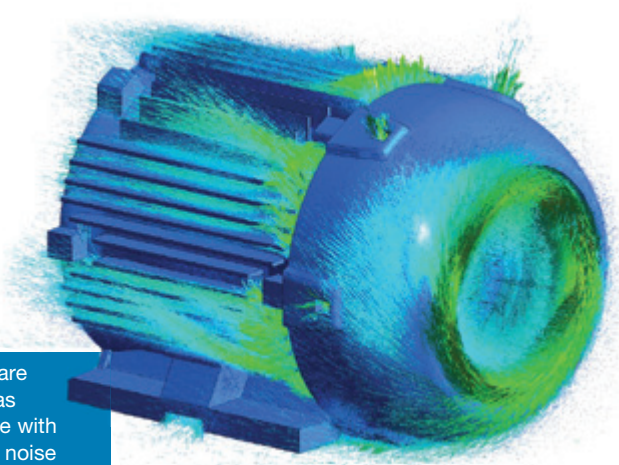
Health and safety regulations continue to push for reductions in noise levels which aim at offering better conditions for operators in industry.

As a result, for 50 Hz motors (including two pole machines) noise levels are limited to 80 dB(A) at 1 meter (on no load) for frames sizes up to IEC 400.

For W22Xd motors, the cooling system was designed to provide an optimum balance of airflow and noise level. The cooling fan provides greater volumes of air across the motor frame and the fan cover, with its aerodynamic outline® is designed to avoid recirculation of air (loss of performance) and to effectively direct the airflow over the motor fins.

Efficiency and reliability tip:

Further reductions in noise levels are possible with modifications such as uni-directional fans. Please enquire with WEG about the option of reduced noise levels.

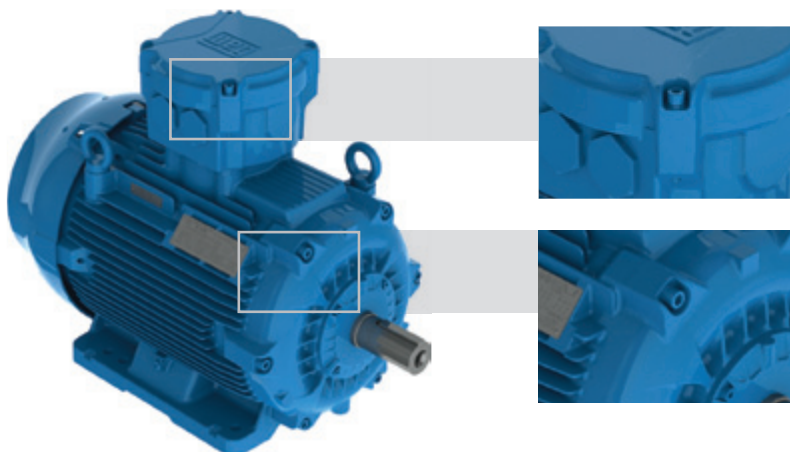


10. Fixing bolts protected against shocks and water accumulation

Aiming to offer the market a tough and reliable motor, all of the fixing bolts housings were carefully designed in order to protect against accidental impacts and water accumulation, thus ensuring the motor's flameproof protection as long as no accidental damage affects the position of the component and compromises the flame path.

Efficiency and reliability tip:

To ensure motor protection, always follow the tightening torques for terminal box assembly, power cables and grounding system connections indicated in the motor IOM manual.



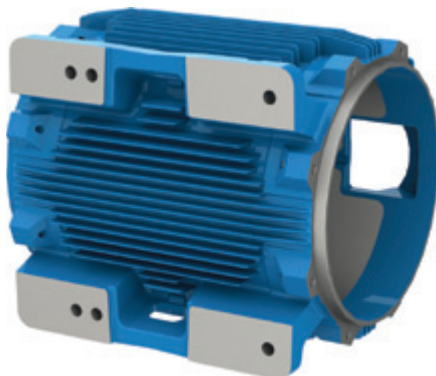
11. Solid and integrated feet

When converting electrical energy into mechanical energy, the motor requires supporting points where the mechanical thrust, proportional to the demanded load torque, will be applied to the base. These supporting points are the motor feet. Therefore, we can conclude that stronger feet guarantee reliability of operation and are particularly suited to heavy duty applications.

The W22Xd feet design® integrates the sides of the front and rear feet for higher mechanical stiffness. They are solid for a better distribution of the mechanical thrust imposed by the load.

Efficiency and reliability tip:

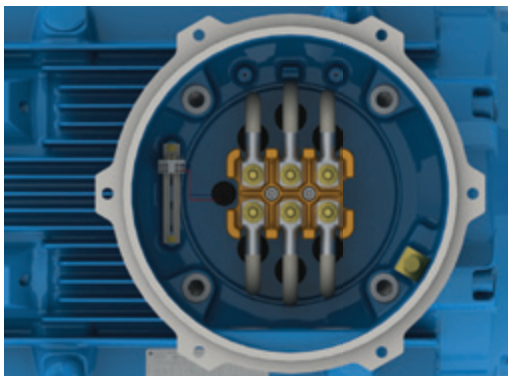
As a manufacturer, WEG makes all efforts to increase mechanical stiffness of its products. The motor feet are the interface with the base on which the motor is mounted. This means that the base must be level and flat in order to ensure less vibration and safer operation leading to an increase in the lifetime of the motor.



12. Terminal box design

The terminal box is the main interface of the electric motor for maintenance personnel and was designed to provide easy access and better ergonomics during installation and maintenance operations. W22Xd motors have generously dimensioned terminal boxes that fully meet the requirements of relevant international standards and provide optimal conditions for operators to access main and accessory terminals. The cable entry holes were increased for larger frames facilitating easier handling and connection of the cables. W22Xd motors are supplied with threaded plugs in the main and auxiliary cable entries to maintain the degree of protection during transport and storage. When supplied with two main cable entries, one is fitted with a certified threaded plug, according to the type of Ex protection, EPL and mechanical (IP) protection indicated on

nameplate. The cable sealing from the inside of the motor to the terminal box is made through bushings in order to ensure safe protection and to insulate the motor enclosure from the inside of the terminal box. As these bushings are threaded, they permit easy replacement if needed and also the inclusion of accessories for additional motor safety.



13. Drain system

Depending on the relative humidity of the ambient air, moisture may enter the interior of the motor enclosure. This moisture will eventually condense so the motor design should have means to allow accumulated water to be drained out of the frame.



W22Xd motors can be fitted with threaded drain plugs installed in the lower part of the enclosures providing an efficient means to drain condensed water from the motor. For larger motors, threaded drain plugs are also available for terminal boxes in order to meet specific customer requirements.

Efficiency and reliability tip:

When fitted, be sure to include the drain operation during the scheduled maintenance on your equipment checklist. If high moisture levels are present, space heaters are provided as standard and should be connected to minimize water condensation.

14. Lifting eyebolts

In order to ensure safety to operators, all motors in the W22Xd range are fitted with lifting eyebolts offering easy handling, shipment and storage. This ensures that W22Xd motors meet specific local applicable standards and directives regarding product handling.

Efficiency and reliability tip:

Always take care when handling the motor in order to prevent impacts and damages to the bearings and always install the shaft locking device (if supplied) when transporting the motor. Always use the eyebolts to lift the motor which are designed to support the weight of the motor only and should never be used to lift additional loads coupled to it.



15. Reliability of enclosures: withstanding external impacts up to 20 joules.

One way to verify if the motor is suitable for harsh, tough applications is by checking its mechanical envelope against impacts. Flameproof motors shall comply with an external impact resistance test in accordance with IEC/EN 60079-0 standard.

As standard, W22Xd motor enclosures and terminal boxes are constructed from cast iron for IEC frames up to 500, the industrial preference for reliability in arduous environments. Fan covers are supplied in cast iron or steel according to customer needs or motor classification. Under request, and mainly to suit the requirement of IEC Group I (underground mines), W22Xd can have special construction in order to withstand the 20 joules impact test.

Efficiency and reliability tip:

Tough motors are required for tough applications! The cast iron used for manufacturing W22Xd motors is produced at WEG foundries. It is the gray type FC-200 (EN GJL 200), exceeding the material requirements defined by standards for flameproof motor enclosures. FC-200 guarantees inherent strength and durability to W22Xd motors.



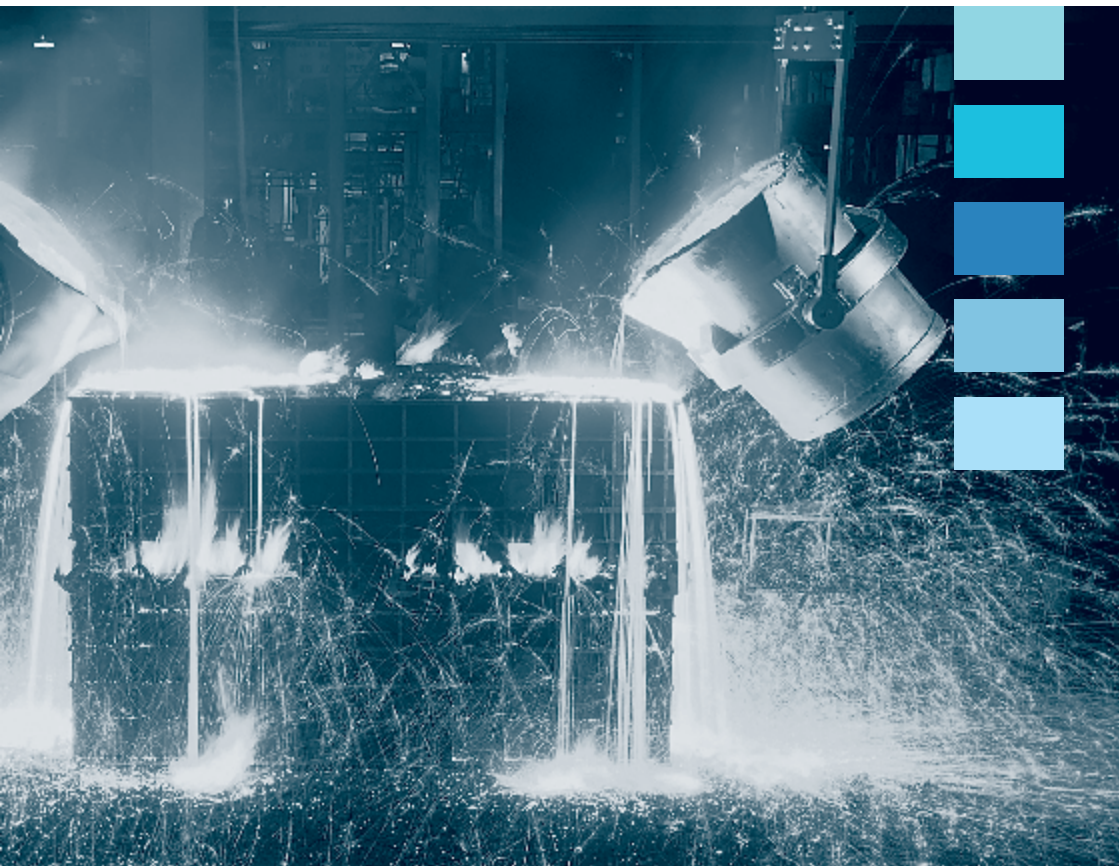
16. Improved degree of protection

As standard, W22Xd motors have IP56 degree of protection, which offers additional protection against the ingress of liquid contaminant agents into the motor interior.

They are supplied as standard with bearing caps for frames 90S/L and above, which also permit, through replacement of the shaft sealing system, protection against contaminant dusts (mechanical protection degree IP66).

Efficiency and reliability tip:

Correct dimensioning of a product consists of defining not only the kW rating and speed but also analyzing the overall operational and environmental conditions in which the motor will be applied. This analysis should highlight the environmental conditions, accessories and particular requirements the motor must comply with. Not sure about the right motor for your application? Enquire at your nearest WEG Sales office.



17. Space Heaters

For motors installed in environments with relative air humidity up to 95% but where the motor may remain idle for periods greater than 24 hours, or for motors installed in environments with relative air humidity greater than 95%, regardless of the operating schedule, the utilization of space heaters is highly recommended. Considering the environments in which flameproof motors are utilized, mainly in Oil & Gas applications, WEG decided to supply W22Xd motors with 220-240 V space heaters as standard. The space heaters will prevent water condensation accumulation inside the motor and maintain winding insulation resistance within acceptable levels, prolonging the electric motor lifespan. Space heaters must always be switched on during long term storage or when the installed motor is out of operation.

Efficiency and reliability tip:

For ambient conditions where high humidity is present, it is strongly recommended that an epoxy painting, also known as tropicalization is applied in the internal components of the motor. Dangerous voltages may be present when space heaters are connected to the motor or when the motor windings are used as space heaters. The space heaters should never be energized when the motor is in operation!

18. Painting plan

Efficiency and reliability tip:

Motors which may prevent potential risk of electrostatic charge accumulation will be identified by the manufacturer and must be subjected to regular cleaning and maintenance interventions, avoiding electrostatic discharges and excessive dust layers.

In order to offer a proper protection against corrosion, chemical agents and severe ambient conditions, the WEG Coatings division developed special painting plans for the W22Xd motors, offering high protection with reduced layer thicknesses. This painting plan has a minimum resistance to the salt spray test of 480 hours in accordance with ISO 12944-6 Standard and meet the "C3 Medium" (corrosive category) and High durability criteria of the ISO 12944 Standards and the requirements for hazardous location products ensuring long term protection in aggressive environments.



19. Several mounting configurations available



In the development process of the W22Xd line, an important factor being the product versatility, WEG wanted to provide a motor which could be applied to a wide range of applications. For this reason, the W22Xd was designed to incorporate a variety of mounting configurations. They can be supplied for horizontal or vertical mounting orientation, with or without feet, flanges, cooling fans or terminal boxes. Loose leads for fan applications can also be supplied on request for frame sizes 160 and above.

Efficiency and reliability tip:

Motors installed outdoors or in the vertical position require the use of additional shelter to protect them from contaminants; for instance, use of a drip cover or slinger.

20. Wide range of accessories

The new W22Xd line offers motor users a comprehensive range of accessories making them suitable for a variety of specific customer requirements without losing the primary focus on the safety of the application.

Among the most commonly used accessories are winding or bearing thermal protections, space heaters, additional terminal boxes for accessories connections and drain plugs for condensed water.

In order to offer an easier and safer connection and accessibility to the motor accessories, the W22Xd terminal box features a new connector configuration that does not require screws to fasten the accessories. Furthermore, this connector can easily accommodate extra modules for additional accessories. Alternatively, the motors can be supplied with screw fastening connectors. All leads are firmly assembled assuring reliable operation.



Efficiency and reliability tip:

Always select the accessories that best suit the application. As an example, for continuous temperature monitoring RTDs (Pt -100) can be chosen. For ambients with constant presence of moisture, tropical protection is advisable and so forth. Please contact WEG for more information.

21. Easy installation

Whilst the main function of an electric motor frame is to provide mechanical protection to the windings, it also provides the interface for assembly to the driven equipment. In order to simplify the replacement and retrofitting of existing machines, the rear feet on the majority of W22Xd motors are provided with additional mounting holes corresponding to those of two standard motor frame lengths (i.e. 90S/L, 160M/L, 280S/M). The integrated feet have provision for dowell pins thus making the

alignment of motors simpler when removed from their mounting base for maintenance. Intending to simplify installation, provisions for jacking bolts are available on motor feet.

Efficiency and reliability tip:

The driving elements, such as pulleys and couplings, must be balanced before mounting on to the shaft so avoiding unexpected vibration levels which may damage the entire equipment.



22. Simplified maintenance

In W22Xd motors extended lubrication intervals are reached due to the reduced bearing temperature rise, a benefit obtained with the revolutionary motor cooling system, provided by the drive endshield design.

Motors in frame sizes IEC 71 to 132S/M and NEMA 143/5T to 213/5T have double shielded bearings as standard. The lifetime of these bearings is in average twice as long when compared to opened bearings, resulting in less intervention. Motors in frame sizes IEC 160M/L and NEMA 254/6T and above are supplied with open bearings and grease fittings, offering easier regreasing procedures. Any intervention relies on personnel and equipment, therefore the less the equipment requires maintenance, then lower is the total cost of the ownership.

Motors can also be supplied with sleeve bearings (only for large machines with IEC groups I and IIB classification) or an oil mist lubrication system for a safer operation and featuring a longer lifetime to the bearings.

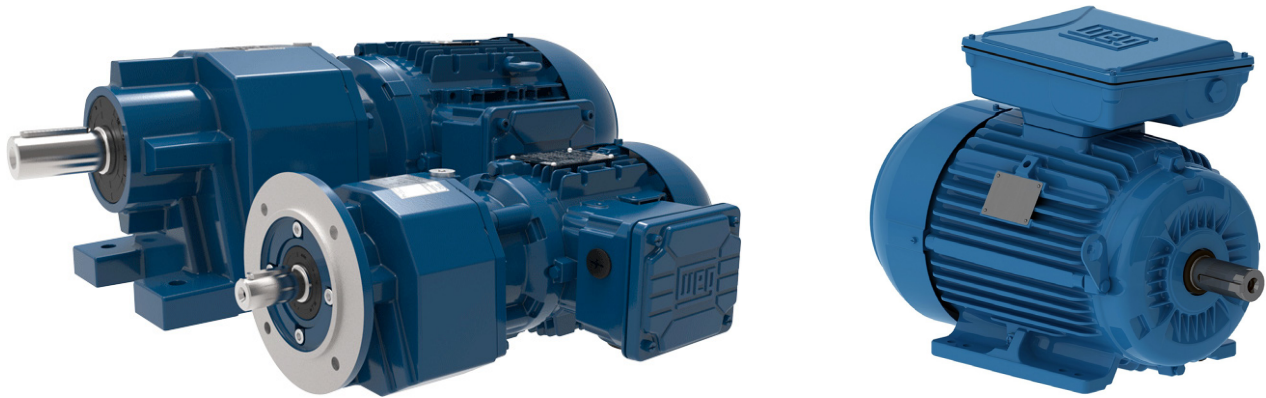
Periodical monitoring of vibration levels gives a good indication of bearing conditions and overall application behaviour. For this reason, W22Xd motors in IEC frames 160 to 355 are designed with flat areas on both ends for better placement of the accelerometer. These areas are available both in vertical and horizontal planes.

Besides these areas on the frame, all of the W22Xd range features flat areas on the endshields for easier installation of accelerometers, with IEC frames 160 to 355 supplied with M8 threaded nipples as standard.

Efficiency and reliability tip:

Maintenance is one of the main items to respect in order to ensure a long lifespan for motors. For this reason regular inspection is recommended. Inspect the seals, the fastening bolts, the bearings, the drain operation, etc. Always lubricate the bearings following the information described on the motor nameplate and do not over lubricate. Periodical analysis of bearing vibration can help to identify several kinds of problems, not only to the motor but to the entire application. Keeping records of the main processes and machine vibration behavior will provide reliable data to maintenance managers and help minimize production breakdown.





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