

WEG VARIABLE SPEED DRIVES FOR HVAC SOLUTION

Application in aggressive environments



Motors | Automation | Energy | Transmission & Distribution | Coatings



RELIABLE, ENERGY MANAGEMENT EFFICIENCY AND THE BEST HVAC-R PERFORMANCE

WEG Variable Speed Drives for HVAC Application in Aggressive Environments

Installation Environments

A variety of different environment types can be found in industry, such as manufacturing plants, shipyards, port facilities, chemical, and petrochemical industries, among others, and each one requires that all equipment operating in such environments are suitable and reliable to withstand such harsh conditions without present any problem.

In HVAC applications, drives are often specified to be installed in harsh environments like building parking lots or basement, which can sometimes be dusty, or even in outdoor environments, like building rooftops. It's usually chosen a place close to chillers, air handling units, cooling towers, condenser pumps, etc.

These drives require a higher degree of protection levels in order to withstand to wet and dusty environment. For the different environment VSD applications, WEG has specific lines for each type duly designed to meet specific and standardized requirements for the most adverse operating conditions.



WEG Variable Speed Drives for HVAC Application in Aggressive Environments

WEG Standard Solutions

- IP20 Variable Speed Drives stand-alone for HVAC applications
- IP55 Variable Speed Drives stand-alone for HVAC applications
- IP42 Variable Speed Drives Enclosure Type for HVAC applications
- IP54 Variable Speed Drives Enclosure Type for HVAC applications
- IP66 Variable Speed Drives stand-alone for General Applications



*WEG stand-alone HVAC
dedicated drives CFW701 IP55 line.*

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Application in Aggressive Environments

Standard IEC 60529 defines the degrees of protection of electrical equipment utilizing the characteristic letters IP, followed by two characteristic numerals. The first characteristic numeral indicates the degree of protection against solid foreign objects ingress and access to hazardous parts. The second characteristic numeral indicates the degree of protection against the ingress of water with harmful effects.

Degrees of Protection Against Access to Hazardous Parts Indicated by the First Characteristic Numeral

First characteristic numeral	Degree of protection	
	Brief description	Definition
0	Non-protected	-
1	Protected against access to hazardous parts with the back of a hand	The access probe, sphere of 50 mm Ø, shall have adequate clearance from hazardous parts
2	Protected against access to hazardous parts with a finger	The jointed test finger of 12 mm Ø, 80 mm length, shall have adequate clearance from hazardous parts
3	Protected against access to hazardous parts with a tool	The access probe of 2.5 mm Ø shall not penetrate
4	Protected against access to hazardous parts with a wire	The access probe of 1.0 mm Ø shall not penetrate
5	Protected against access to hazardous parts with a wire	The access probe of 1.0 mm Ø shall not penetrate
6	Protected against access to hazardous parts with a wire	The access probe of 1.0 mm Ø shall not penetrate

Degrees of Protection Against solid Foreign Objects Indicated by the First Characteristic Numeral

First characteristic numeral	Degree of protection	
	Brief description	Definition
0	Non-protected	-
1	Protected against solid foreign objects of 50 mm Ø and greater	The object probe, sphere of 50 mm Ø, shall not fully penetrate
2	Protected against solid foreign objects of 12.5 mm Ø and greater	The object probe, sphere of 12.5 mm Ø, shall not fully penetrate
3	Protected against solid foreign objects of 2.5 mm Ø and greater	The object probe, sphere of 2.5 mm Ø, shall not penetrate at all
4	Protected against solid foreign objects of 1.0 mm Ø and greater	The object probe of 1.0 mm Ø, shall not penetrate at all
5	Dust-protected	Ingress of dust is not totally prevented, but dust shall not penetrate in a quantity to interfere with satisfactory operation of the apparatus or to impair safety
6	Dust-tight	No ingress of dust

Degrees of Protection Against Water Indicated by the Second Characteristic Numeral

Second characteristic numeral	Degree of protection	
	Brief description	Definition
0	Non-protected	-
1	Protected against vertically falling water drops	Vertically falling drops shall have no harmful effects
2	Protected against vertically falling water drops when enclosure tilted up to 15°	Vertically falling drops shall have no harmful effects when the enclosure is tilted at any angle up to 15° on either side of the vertical
3	Protected against spraying water	Water sprayed at an angle up to 60° on either side of the vertical shall have no harmful effects
4	Protected against splashing water	Water splashed against the enclosure from any direction shall have no harmful effects
5	Protected against water jets	Water projected in jets against the enclosure from any direction shall have no harmful effects
6	Protected against powerful water jets	Water projected in powerful jets against the enclosure from any direction shall have no harmful effects
7	Protected against the effects of temporary immersion in water	Ingress of water in quantities causing harmful effects shall not be possible when the enclosure is temporarily immersed in water under standardized conditions of pressure and time
8	Protected against the effects of continuous immersion in water	Ingress of water in quantities causing harmful effects shall not be possible when the enclosure is continuously immersed in water under conditions which shall be agreed between manufacturer and user but which are more severe than for numeral 7
9	Protected against high pressure and temperature water jets	Water projected at high pressure and high temperature against the enclosure from any direction shall not have harmful effects

WEG Variable Speed Drives for HVAC Application in Aggressive Environments

IP55 Versus IP66

The difference between an IP55 and IP66 drives is the level of protection against dust and water ingress it withstands.

The IP55 drive is suitable to be installed in places with water jets from any direction and significant dust particles in the air, which matches the usual HVAC applications.

While the IP66 is recommended for installation in applications where strong water jets and high level of dust particles are found, like in some food and beverage plants where its required to completely wash the room and equipment to avoid the risk of contamination.



WEG Standards and Tests Procedures

WEG Automation counts on its own testing laboratories, accredited by international bodies like UL and Dekra, where we perform all the type tests required by standards during the development stages of our products. We present below a practical case of a type test procedure for Degree of Protection in an IP55 CFW701 HVAC Drive.

IP 5X – Dust Ingress Test

Standard	Revision	Chapter	Description
IEC 60529	2013	12	Tests for protection against access to hazardous parts indicated by the first characteristic numeral
IEC 60529	2013	13.4 and 13.5	Dust test for first characteristic numerals 5 and 6

Note: description of the tests contained in the test report.

Test Procedure

- For the protection test against access to hazardous parts, a 1 mm diameter wire was pushed against every opening in the sample, with a force of $1N \pm 10\%$.
- For the degree of protection against dust ingress, the test was performed in an appropriate dust chamber. The sample under test was placed in the chamber in its normal position of use. Any hole and drain were kept open during the test for an 8 hours test.
- At the end of the test, the samples were visually inspected.



Test with calibrator and dust chamber

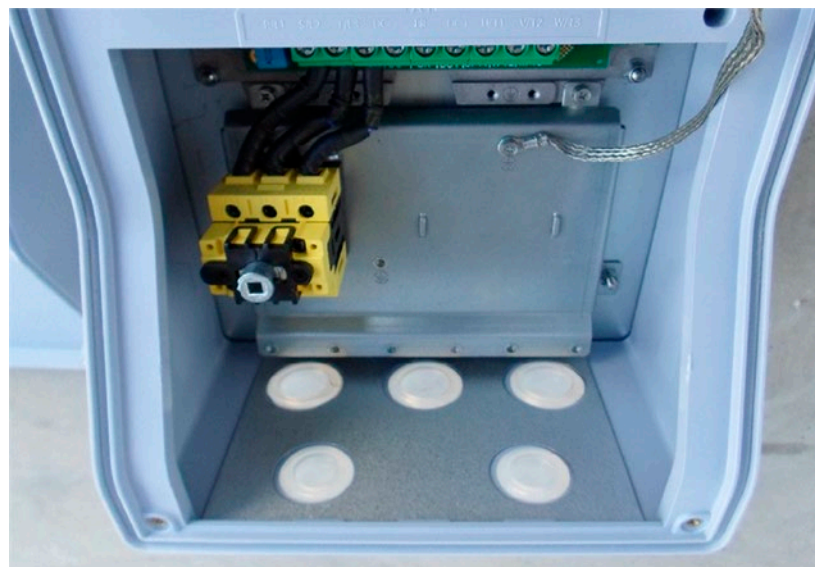
WEG Standards and Tests Procedures

Results of the Tests Contained in the Test Report for Accidental Contact

Sample	IP 5X evaluation	Force applied	Comment
01	Passed	1 N	Ø1.0 mm calibrator didn't went through any opening
02	Passed	1 N	Ø1.0 mm calibrator didn't went through any opening

Results of the Tests Contained in the Test Report for Dust Ingress

Sample	IP 5X evaluation	Duration	Comment
01	Passed	8h	No powder penetration inside the sample
02	Passed	8h	No powder penetration inside the sample



Sample 01 internal side after 8 hours of dust test; Input switch disconnecter



Sample 01 internal side after 8 hours of dust test; Control boards

WEG Standards and Tests Procedures

IP X5 – Water Ingress Test

Standard	Revision	Chapter	Description
IEC 60529	2013	14.2.5	Test for second characteristic numeral 5 with 6.3 mm nozzle

Note: description of the tests contained in the test report.

Test Procedure

- The test was carried out by spraying water to the samples using a Ø6.3 mm test nozzle in all possible directions. A water jet of 12.5 l/min was projected against the sample for a time period of 1min/m² per at least 3 minutes, at a distance of 2.5 to 3.0 m.
- The tests were performed at ambient temperature.
- At the end of the test, the samples were visually inspected.

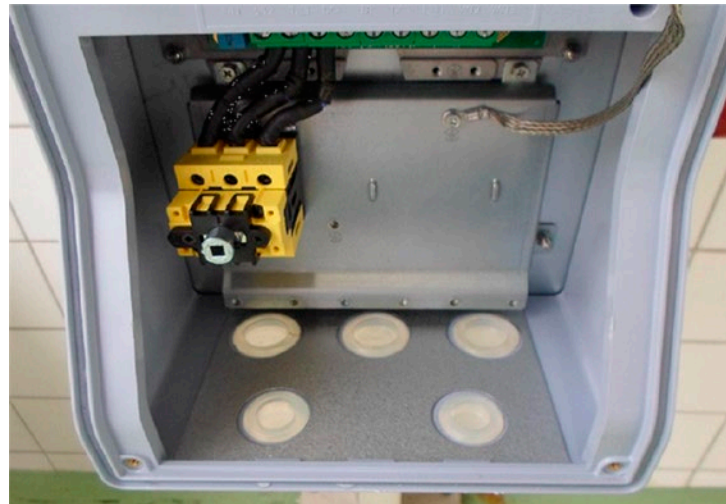


Tests with water jet

WEG Standards and Tests Procedures

Description of the Results Contained in the Test Report

Sample	IP X5 evaluation	Duration	Comment
01	Passed	3min	No water ingress
02	Passed	3min	No water ingress



Sample 01 internal side after water ingress test; Input switch disconnector



Sample 01 internal side after water ingress test; Control board and input

Global presence is essential, as much as understanding your needs.

Global Presence

With more than 30,000 employees worldwide, WEG is one of the largest electric motors, electronic equipments and systems manufacturers. We are constantly expanding our portfolio of products and services with expertise and market knowledge. We create integrated and customized solutions ranging from innovative products to complete after-sales service.

WEG's know-how guarantees our **WEG Variable Speed Drives for Hvac Solution** is the right choice for your application and business, assuring safety, efficiency and reliability.



Availability is to have a global support network



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Competitive edge is to unite technology and innovation



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The values shown are subject to change without prior notice.
The information contained is reference values.