

AC SERVOMOTORS WITH PERMANENT MAGNETS

General

AC servomotors with permanent magnets are intended for up-to-date electronically controlled electric drives with a wide control range, providing very good dynamic properties and a high positioning precision. They are used in automation of processes in industrial production, packaging, PCBs, etc. These servomotors are three-phase synchronous motors with permanent magnets on the rotor. These motors require for a proper function a transistor frequency inverter with a DC bus between rectifier and frequency converter and feedback control by a position sensor (e.g. resolver) embedded in the servomotor.

AC servomotors with high energy rare-earth permanent magnets have the following benefits compared to standard induction or DC machines:

- small dimensions and weight
- low moment of inertia
- high torque overload capability
- high efficiency
- high acceleration for dynamic processes

Other features of brushless AC servomotors are as follows:

- long service life and high reliability in operation
- minimum maintenance (no sliding contacts, bearings with permanent grease filling)
- high accuracy production and assembly (according to IEC 72-1)
- enhanced degree of protection IP65, excluding a shaft sealing
- Sealed shaft (full IP 65) is optional at request.
- fixed bearing at the free shaft.

Servomotors AFW

- AFW series** – compact servomotors with a high torque characteristics. Motors are produced for ICW 37-A41 (water cooling) and a torque range from 20 to 140 Nm. Standard AFW motors are provided with 12-pole winding. Windings with the different number of poles are available as an option on request as well as a built-in electromagnetic safety brake. Please contact our design team for availability.

Standard servomotors are produced for a DC bus voltage 330 V_{DC} or 560 V_{DC} corresponding to an output voltage at the motor terminals 190 V_{AC} and 330 V_{AC} respectively. Motors for 560 V_{DC} bus voltage feature improved insulation system for the higher voltage level. These motors are available in broad variety of voltage constants K_E, corresponding to different rated speeds (see Type key of servomotors). Voltage constants beyond this key are available as option. Please contact our design team for availability.

Notes:

- Rated values of torque and power (M_n, P_n) are dependent on the type of the used inverter drive and on the heat dissipation from the motor surface.
- The actual values can be determined only for known combinations of the servomotor and the inverter drive and for the relevant duty cycle of the application.
- The tolerances of performance values for servomotors with permanent magnets are ± 10 %. These tolerances cover manufacturing tolerances, production tolerances and the thermal drift of permanent magnets.
- VUES Brno s.r.o. is producing custom solutions based on standard motors beyond a type key in this document. Please contact our team for availability of your specific request.

General technical data of AFW line

Mechanical design

- Servomotors AFW are available in these construction forms according to EN 60034 -7
 - IM B5 (IM 3001)
 - IM V1 (IM 3011)
 - IM V3 (IM 3031)
- Degree of protection according to EN 60034-5
 - IP65, excluding shaft end

- sealed shaft (full IP 65) is optional at request

Cooling of servomotors

- ❑ Water cooling ICW 37-A41 according to EN 60034-6, it means closed machine with a water channel in the stator part of the motor housing.

Water specification for water-cooled servomotors and cooling water:

- ❑ Max. water inlet pressure (< 1 min) $P_{max} = 10$ Bar
- ❑ Rated water inlet pressure $P_n = 5$ Bar max.
- ❑ Min. water flow or min. pressure difference: given in data sheet of appropriate motor
- ❑ Rated water inlet temperature $T_n = 15^{\circ}\text{C} - 40^{\circ}\text{C}$
- ❑ Water quality: distilled water max. 0,7mmol/l water hardness, filtered, no solid particles, PH-value: 6,5 to 7,5, without aggressive additives
- ❑ In order to prevent corrosion of aluminium, we recommend to use inhibitors. The ratio of the inhibitor to water should not exceed 25% to 75%. Otherwise, cooling performance may be reduced.
- ❑ Furthermore we recommend the usage of a detector for the waterpressure and the rate of waterflow in order to prevent the unlike event of an emergency shut down of the machine due to an overheated motor.
- ❑ The whole water cooling circuit should be examined whether there are materials which are in touch with the cooling liquid and
 - A) have a certain voltage drop according to the electro-chemical voltage order and
 - B) are electrically connected so that an electro-galvanizing process can take place. In this case the worse metal will be destroyed and enriched at the better metal.
- ❑ The standard water cooled servomotor has a housing which consists of aluminium and stainless steel. As an option a housing totally made of stainless steel is available for bad water qualities.

Working conditions

The servomotors are designed for stationary applications at the places protected against weather influences, and for environmental conditions specified by the set of classes IE 34 according to ČSN EN 60721-3-3. The basic conditions are as follows:

- ❑ Ambient temperature from +5 to +40° C
- ❑ Relative humidity from 5 to 95 %
- ❑ Altitude above sea level up to 1000 m (atmospheric pressure 90 kPa)

Other technical data

- ❑ Thermal insulation class „H“ according to EN 60034-1, maximum temperature rise of the winding $\Delta\theta = 130$ K
- ❑ Three-phase winding in Y-connection, star connection point not available
- ❑ Thermal protection
 - one thermal switch +160° C (normally closed) located in the end winding between two phases
 - different sensors, e.g. PTC, KTY at request.
- ❑ Electric connection:
 - power outlets in terminal box. (6-pole connector available for the selected motor sizes)
 - signal outlets through a 12-pole connector.
 - option: cable outlets for both power and signal connection.
- ❑ Flange dimensions and their tolerances
 - flange sizes according to IEC 72 – 1 with the exception of the size AM25
 - shaft run-out – accuracy class according to IEC 72 - 1
 - axial alignment of the centering feature diameter and perpendicularity of the flange seating face with regard to the shaft – accuracy class according to IEC 72 – 1
- ❑ Shaft
 - cylindrical without keyways with dimensions according to IEC 72 – 1
 - keyway and key according to IEC 72 – 1 available at request

- ❑ Permissible axial and radial loads at average speeds are available in particular motor datasheets. Detailed information will be given on request.
- ❑ Ball bearings with permanent grease filling for the service life $\geq 20\,000$ hours
- ❑ Vibration limits at all speeds(measured according to EN 60034-14)
 - $V_{ef} = 1,8\text{ mm}\cdot\text{s}^{-1}$ at the points according to the standard
 - $V_{ef} = 2,8\text{ mm}\cdot\text{s}^{-1}$ at any point and any direction of vibration
 - connectors feature a permitted value of $4,5\text{ mm}\cdot\text{s}^{-1}$
- ❑ Surface finish
 - painting, black RAL 9005
 - other finishes available at request, eg. surface finish for food-stuff industry available

Feedback sensor

Servomotors are delivered with a two-pole resolver located at the non business end of servomotor (it is accessible after removing the cover). Standard resolvers feature the input/output voltage $7 V_{ef}$, 10 kHz.

Options on request:

- ❑ customer specified resolver or other feedback sensor (SinCoder, DiCoder, incremental sensor) including the servomotor shield and shaft modifications.

Safety brakes

Servomotor AFW feature optional safety brake installation. Safety brake is operated by 24 V DC connected to the brake coil, brake is locked without voltage applied. The brake is designed only for locking the rotor at zero speed. Use of the brake during the operation of the drive will at non zero RPM's will damage the brake.

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