

Quick Installation Guide – HDP AC Servomotors

1 General

NOTE!

This document states the instructions for installation, operation and maintenance of the High Dynamic Performance (**HDP**) AC induction Servomotors manufactured by ABB Sace – Line S, Italy. This material must be studied before attempting any work on, or with, the servomotor.

1.1 Declaration of Conformity

HDP series servomotors have been designed in compliance with international standards IEC 60034 and IEC 60072-1.

ABB Sace declares that HDP servomotors comply with the Low Voltage Directive 72/23/EEC integrated by Directive 93/68/EEC and subsequent changes.

1.2 Certificate of Incorporation

ABB Sace, according to what required in the Machinery Directive (MD) 89/392/EEC, declares that **SERIES HDP Servomotors** must be installed in accordance with our installation instructions and must not be put into service before the machinery into which they are incorporated is declared to comply with the provisions of Machinery Directive.

1.3 Quality

Every ABB motor undergoes a severe test before delivery. The motor mechanical and electrical characteristics are checked in order to ensure excellent quality.

1.4 Validity

These instructions are valid for the following electric motors manufactured by ABB Sace – Line S:

- Servomotors Series HDP - IP54 (HDP-C)
- Servomotors Series HDP - IP23 (HDP-V)

1.5 Information

This short manual is supplementary to the Technical Manual of HDP Series Servomotors, which provides specific information on the motor design, installation guidelines and performance details.

The Technical Manual and further specific documentation, such as datasheets, dimension drawings in various 3D formats, technical catalogue and presentation can be downloaded from the web site

www.abb.com/motors&drives

or copied from the documentation CDROM.

NOTE!

HDP Servomotors are intended to be coupled with ABB ACS800 frequency converters or frequency converters in general. Therefore, the technical documentation of the frequency converter must be studied before attempting any work on, or with, the servomotor.

1.6 Converter Selection

The frequency converter should be selected according to the nominal power and the motor rated power, keeping a margin for energy regeneration in dynamic situations.

Selection tables of HDP motors and ACS800 converters for operation in continuous duty (S1) are available in the Technical Manual.

Other couplings are possible and must be estimated for variable loads or different duty types.

2 Technical Specs

2.1 Motor identification

When opening the transport package check the motor type and rated data on the motor plate.

ABB HDP SERVOMOTOR - ABB SACE ITALY CE	
Type VM12A00002101A000 S/N HS00083	
IEC 60034-1	Date : 20060622
Pn 20.9 [kW]	Vn 400 [V]
cosφ 0.840	In 43.2 [A]
ωn 1500 [rpm]	fr 53.3 [Hz]
ωm 2250 [rpm]	fm 80.0 [Hz]
Tn 133 [Nm]	In60
IP23	Pn 0.37
S1	Feedback: NO
INS.CL. F	Brake - Vdc - Adc - Nm
3-ph	

Check:

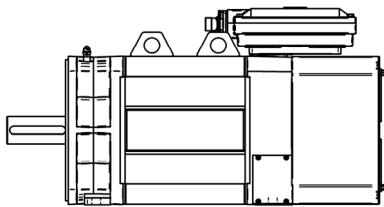
- Motor “Type” code
- Rated voltage “Vn”
- Rated power “Pn”
- Rated speed “ωn”
- Maximum speed “ωm”
- Manufacturing details “IP..”
- Transducer type “Feedback”
- Data of the parking “Brake” if present
- “Fan” ratings.

2.2 General information

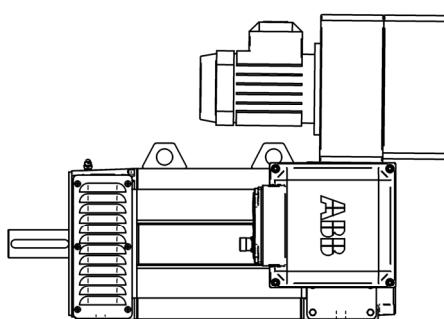
HDP Servomotors can be manufactured for two voltage levels (either 400V, or 460V) in four frame sizes, axis height H100, H132, H160 and H200.

HDP Servomotors are provided with a cooling fan driven by a three-phase asynchronous motor.

The fan can be built into the motor frame (HDP IP54 version - axial fan - cooling IC4A1A6 according to IEC 60034-6),



or fixed externally on the motor frame (HDP IP23 version - radial fan - cooling IC0A6 according to IEC 60034-6).



Allowed coolant is air drawn from the surrounding medium, moved through the motor and discharged in open circuit. Other coolants are not allowed.

HDP Servomotors are provided by default with ball bearings. As an option, the motors may be equipped with a roller bearing on the DE side; those have a regreasing cup on top of the front flange.

Several other accessories and special ordering codes are possible. Contact ABB for details.

2.3 Degree of Protection: IP code

HDP Servomotors are manufactured according to the Standard IEC 60034-5, in two different versions of standard protection degree IP:

- IP54 version (HDP-C): motor enclosure protected against dust;
- IP23 version (HDP-V): motor enclosure protected against solid objects greater than 12mm.

HDP Servomotors are intended for use indoors, in dry and dust free environments. The motors must not be immersed in water or sprayed with water or with any other fluid.

2.4 Motors Weight

The actual weight of each motor depends on size, mounting arrangements and additional equipment integrated into the motor.

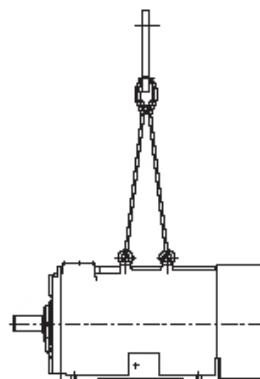
The following table shows the average weights of the motors in their standard versions.

Frame	Axis Height	Motor code	Weight [kg]	Weight with brake [kg]
IP54	H100	CH...	30 ÷ 76	35 ÷ 81
	H132	CM...	90 ÷ 180	101 ÷ 189
	H160	CN...	183 ÷ 317	203 ÷ 337
	H200	CR...	359 ÷ 603	399 ÷ 643
IP23	H100	VH...	39 ÷ 76	44 ÷ 81
	H132	VM...	104 ÷ 191	114 ÷ 201
	H160	VN...	199 ÷ 333	219 ÷ 353
	H200	VR...	385 ÷ 629	-

2.5 Lifting

Lifting eyes are screwed or welded on the motor frame.

Lift the motor using the lifting eyelets only.



When lifting the motor avoid collision with any other equipment, and damage of any part of the motor.

WARNING!

Do not lift the motor when connected to the load.

2.6 Storage

The motors should always be stored indoors, in dry, vibration free and dust free environments.

Ambient temperature for storing is 0° to 40°C.

If long storing is foreseen, rotate the shaft periodically by hand until free smooth rotation (charge the brake if present).

When starting the motor the first time, run the motor slow for a short run-in.

3 Before Installation

3.1 Intended use

HDP Servomotors are intended for use in industrial application.

WARNING!

The motor is intended for installation and use by qualified personnel, familiar with electrical machines and safety requirements.

WARNING!

The safety equipment necessary to prevent accidents and electric shock must be provided by the installer.

ABB motors are intended to be driven by frequency converters. The documentation of the converter must be studied before the mechanical and electrical installation of the motor.

3.2 Operating Conditions

Ambient temperature allowed is 0°C to 40°C. A derating of the motor electrical performance is mandatory in the range 40°C to 50°C.

Maximum altitude for the installation is 1000 m.a.s.l.

3.3 Foundation

The installer has full responsibility for the preparation of the foundation.

The foundation and the mounting flange must be compliant with international standards.

The foundation must be prepared and properly dimensioned in order to avoid vibrations during operation, in dynamic situations, and to withstand eventual short circuit stresses.

4 Mechanical Installation

Lift the motor from the lifting eyes and place it carefully on the machine with due professional care.

Follow the instruction below to fix the motor to the mounting flange or to the foundation and couple it to the load.

4.1 Mounting

HDP Servomotors are designed according to IEC 60034-7 for both flange and/or feet installation, with horizontal shaft.

Therefore they can be mounted in one of the following configuration:

- IMB5 the motor is flange-mounted on the DE side with passing holes on the flange, the motor shaft is horizontal.
- IMB3 the motor is mounted by feet and the feet are down on the floor, the shaft is horizontal.
- IMB35 the motor is both flanged on the DE side and fixed to the floor by feet, the shaft is horizontal.

4.2 Alignment and Balancing

Proper mechanical installation includes correct alignment between motor and load in order to avoid vibrations and consequently shaft, bearing failures.

The form tolerance of the mechanics for mounting the motor must meet the specifications given on the motor overall dimensional drawings.

The rotor is dynamically balanced. Pulleys, couplings and loads in general applied to the motor must be balanced too before being connected to the motor.

4.3 Couplings

Since the most delicate parts of a servomotor are bearings and shaft, a particular care must be taken when mounting and coupling of the motor to its load.

WARNING!

Mechanical couplings, pulleys and pinions must be connected to the motor shaft using adequate tools, **absolutely avoiding the use of a hammer**, which could cause serious damage to the motor.

5 Electrical Installation

WARNING!

Electrical installation must be carried out only by skilled persons observing the wiring connection diagram delivered with the motor.

Carefully observe the international safety standards.

WARNING!

Electrical installation includes preparation and layout of the power and signal cables, observing the safety requirements, insulation distances, grounding of the machine, and compliance to EMC standards.

WARNING!

Before any operation of electrical installation or maintenance switch off both power and auxiliary supply of the drive.

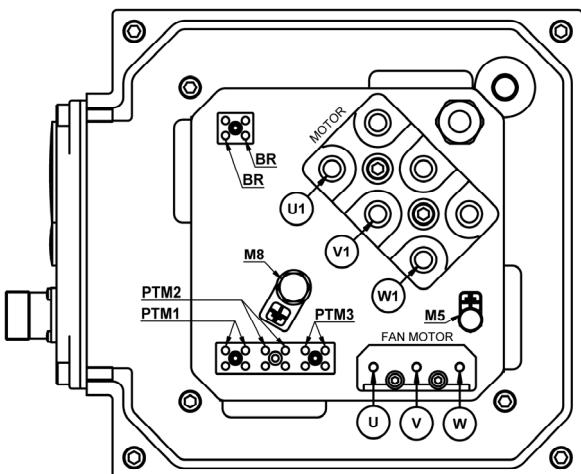
It is recommended to perform the installation of the motor observing the grounding and cabling instructions required by the frequency converter.

When preparing the installation, select the size of the power cables according to the current load.

5.1 Terminal Box

The terminal box embodies both power boards and signal terminals.

The picture below gives an overview of a terminal box.



Size and interior of the terminal boxes can be different depending on the motor size, rated power, optional accessories such as the parking brake, the type and quantity of thermal sensors (PTM/PTC), and the position transducer.

All the power and signal cables entering the terminal box shall pass through the passing holes using cable glands, and every cable must be connected to the appropriate terminal, observing the labels inside the terminal box and the cabling instructions of the frequency converter.

The motor supply cables must be tightened to the screwed terminals observing the phase markers "U1", "V1", "W1". The yellow-green earth cable must be connected to the ground screw inside the motor terminal box, which is marked with the earth symbol according to international standards.

All those terminals require conductors terminated with an eyelet.

If the cooling fan is integrated into the motor frame (HDP IP54 version), the fan supply terminals are inside the motor terminal box on a separate terminal block marked with "U", "V", "W".

If the fan is mounted externally on the motor frame (HDP IP23 version), the fan motor has its own terminal box. Observe the connection scheme given inside the terminal box of the fan motor.

If the servomotors is equipped with a parking brake, terminals of the brake are inside the terminal box and marked with "Br".

The brake is unlocked when powered with 24VDC and locked when discharged.

5.2 Thermal Protection

WARNING!

The windings of HDP Servomotors are manufactured according to **Class F insulation system with Class B temperature rise**, that means max ambient temperature 40°C and max windings temperature 140°C.

Therefore, the thermal sensors integrated into the servomotors must be connected to the converter control circuit and adequate alarm levels must be set in order to prevent high temperature and damage to windings insulation.

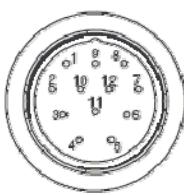
HDP Servomotors embody three thermal switches (PTM), one for each motor phase. The output signals are inside the motor terminal box on a separate board marked with "PTM". The nominal switching temperature of the thermal switches is 140°C with ± 5°K tolerance range.

For motors supplied with PTC thermal sensors the terminal block is marked with "PTC" and the tripping levels must be estimated according to the temperature diagram of the PTC sensor used.

5.3 Position Transducer

Standard HDP Servomotors are equipped with a HTL incremental encoder, 1024 pulses.

The signal connector of the position transducer is a standard 12-pins male connector for industrial application embodied into the terminal box. Pin-out of the encoder connector is as follows.



PIN	Signal
1	Channel B-
2	-
3	Channel Z+
4	Channel Z-
5	Channel A+
6	Channel A-
7	-
8	Channel B+
9	-
10	0 V
11	*
12	Supply +E

* Shield connected to pin11 if present; internally connected to case alternatively.

NOTE!

The motors can be supplied as an option with several types of different HTL Encoders (10-30V), TTL Encoders (4-6V), SinCos Encoders (4-6V 1Vpp) or with other transducer types.

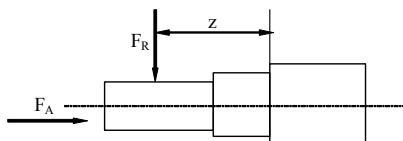
Therefore, please refer to the specific connections drawing provided inside every motor package.

6 Operation

6.1 Ball Bearings

Standard HDP Servomotors integrate double metallic shield, type ZZ-C3, permanently greased, ball bearings.

The figure below shows schematically the loads that can be acting on the DE shaft.



Where "F_A" is the axial load [N], "F_R" is the radial load [N], "z" is distance between centres of DE bearing and pulley.

Radial load occur when a pulley is applied to the shaft. Ball bearings can bear radial load. Low axial load is permissible but should be avoided in order to extend the bearing lifetime.

For the best use of HDP Servomotors, loads acting on the shaft must be calculated in order to

guarantee a regular lifetime of 20,000 hours in continuous duty of the ball bearings with permanent lubrication. Details on the bearings lifetime calculation can be found in the Technical Manual.

Abnormal noisiness, high temperature and vibrations during operation reveal bearing failure. Fault bearings can be safely replaced as ordinary maintenance in the factory. Please contact ABB Sace - Line S, Customer Service, for repairing service.

6.2 Roller Bearings

Upon request HDP Servomotors may be supplied with a roller bearing on the DE side. These motors are designed to bear heavy radial torque; axial loads applied to the shaft will damage the roller bearing.

The roller bearings are greased in the factory with grease type:

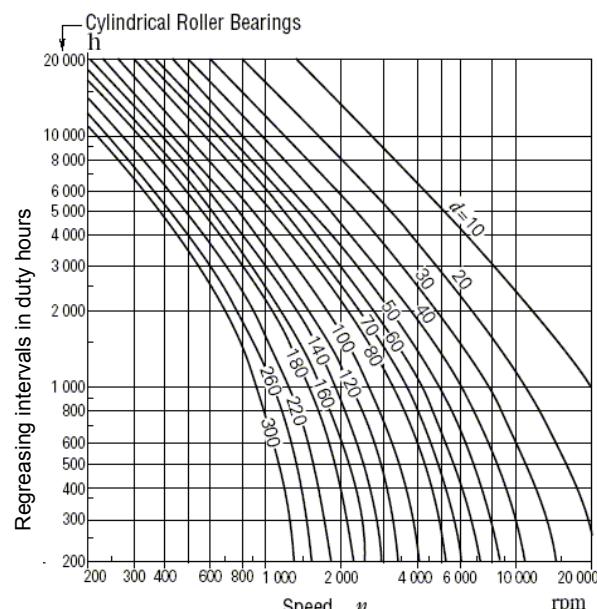
- SKF "LGHQ 3/1"

"LGHQ 3/1" is a lithium soap-mineral grease for high-temperature applications. Even if high-quality grease is used, there is deterioration of its properties with time; therefore periodic regreasing is required.

For periodic or automatic regreasing use the grease cup on top of the motor front-flange. We advice to use the same factory grease "LGHQ 3/1" or equivalent.

Regreasing time intervals depend a lot on the motor duty, the motor speed, the ambient temperature and load type.

The regreasing intervals can be estimated in duty hours by the following diagram, assuming an ambient temperature of 20°C (bearing temperature ca. 70°C) and a load factor "1".



For a given shaft diameter "d", a lubrication time interval (h) results for each motor speed (rpm). If the bearing temperature exceeds 70°C, the time interval must be reduced by half for every 15°C temperature rise.

If a continuous duty at different speeds and/or different loads is foreseen, a calculation must be made to estimate the medium regreasing time intervals.

6.3 Performances

The motor plate states the motor rated voltage, rated power, rated speed and maximum speed for operation in continuous duty S1.

Load curves and further electrical characteristics are available in the Technical Manual.

In continuous duty the motor should be driven at rated speed to produce rated torque. Over the rated speed, in the field weakening area, the motor torque reduces increasing frequency, down to the breakdown torque at maximum speed.

NOTE!

Note that the maximum speed is a critical speed for the motor and its components, which must never be exceeded.

6.4 Overload

If different periodic duty types, such as S6, S2 and S3, are foreseen, the motor overload and a consequent time of operation at no-load must be calculated case by case.

Note that the motor load capacity is affected by temperature rise. Therefore adequate cooling is essential.

6.5 Noise

Noise of medium and large size motors is mainly due to the rotational speed and friction effects.

If noise is above normal level, inspect the motor and the machine for causes. In case of loud mechanical noise:

- Check that the motor is well fixed to the mounting flange and to the foundation.
- Check the balancing, the mechanical strength and alignment of motor, load, pulley, coupling halves and of any other rotating part involved.
- Check integrity of the bearings, or vibrations of the shaft end.

- Little or failing lubrication of the roller bearing (if present) causes high friction, noise and overheating.
- The fan may become noisy after a long period of operation. Keep clean the fan grid and filters.

When running the motor with a frequency converter, the noise level of the motor may increase due to electromagnetic noise. Magnetic noise is generated by harmonic components in the converter output voltage that can be reduced by:

- Increasing the converter switching frequency.
- Filtering the converter output voltage by a suitable output filter or an additional motor reactance.
- Adjusting the tuning functions of the frequency converter.
- Adding an antinoise metallic guard.

7 Maintenance

Ordinary maintenance of HDP Servomotors.

- Check the general condition of the motors regularly.
- Check the motor for normal operation.
- Keep clean the motor, the fan grid and filters in order to ensure free ventilation and cooling.
- Check that the motor is not noisy during operation and that vibrations do not exceed standard levels.
- Regrease the roller bearings at regular time intervals as prescribed before.

Extraordinary repairs must be executed only by ABB Sace.

When ordering spare parts, report the motor code "Type" and the serial number "S/N" printed on the motor plate.

For any communication and support, please contact ABB Sace - Italy, or your local distributor.

8 Troubleshooting

PROBLEM	CAUSE	ACTION
Motor does not start	Power Supply	Check the ratings of the power supply.
	Wrong connections	Check the connections of the motor power cables.
	Mechanical brake locked	Check that the brake is supplied with 24VDC in tolerance range and that is not locked.
	Mechanical failure	Check that the mechanics coupled to the servomotor allow free rotation.
	Overload	Reduce the load or resize the motor.
Motor does not reach the rated speed	Supply voltage	Check the level of the supply voltage.
	Overload	Reduce the load or resize the motor.
Motor runs in wrong direction		Exchange any two phases.
Motor overheated	Overload	Reduce the load or resize the motor.
	Failing Ventilation	Clean the servomotor, the filters and the grid of the fan motor. Check that the fan is operating. Check for free ventilation and cooling.
	Wrong connections	Check that no phase is incidentally open or grounded.
	Harmonic distortion	High harmonic distortion in the frequency converter output is not allowed.
Vibrations or loud noise	Foundation	Check that the foundation is adequate. Renew and reinforce foundation if necessary.
	Bearings failure	If ball bearings contact ABB Sace for repairs. If roller bearings check for regular lubrication and regrease if necessary. Do not exceed with grease quantity. Contact ABB Sace for repairs.
	Misalignment	Check for correct alignment of motor and load. Ignoring misalignment can cause serious damage of bearings, shaft and mechanics.