



INSTALLATION, MAINTENANCE AND USER'S GUIDE
FAN WITH ELECTRONICALLY COMMUTATED EXTERNAL-ROTOR MOTOR

Fan Code:

0314-4-0055

Fan type : R14R-56APS-ES60B-13A18

 **Note :**

Be sure to familiarize yourself with these instructions before working on this unit. Not paying attention to these warnings and instructions may lead to malfunctions and failures or may seriously endanger human life.

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Symbols :



WARNING - to indicate warning situation



NOTE - indicate valuable information

01 SAFETY



When unpacking the unit, grip the blades close to the center (maximum stability) and lift it out very gently and carefully. Shocks have to be avoided by all means! Wear safety shoes and cut-resistant gloves.

This appliance should only be installed or opened by qualified personnel.

This appliance can be used by children aged from 8 years and above and persons with reduced physical, sensory or mental capabilities or lack of experience and knowledge if they have been given supervision or instruction concerning use of the appliance in a safe way and understand the hazards involved. Children shall not play with the appliance.

Cleaning and user maintenance shall not be made by children without supervision.

This appliance is solely intended as a built-in component and should not be operated otherwise. Sufficient protection against accidental contact according to machinery directive 2006/42/CE has to be safeguarded, especially for the rotating parts. Should there be a malfunction, it still has to be safeguarded that the parts breaking off or flying away cannot cause serious damage or bodily harm.

Do not operate this appliance in an explosive atmosphere!

When connecting the unit to the power supply, dangerous voltages occur. Do not open the unit within the first 5 minutes after disconnection from the power supply. Be sure that the unit is being isolated.

Parallel operation of several units can cause dangerous charges of $>50\mu\text{C}$ between AC line terminals and PE after disconnection.

With control voltage fed, the motor will restart automatically after a power failure.

The electronics housing can get hot.



The risk of pulling into rotating part. Do not wear any loose clothing (e.g. tie) or jewellery.

Long hair must be protected with a cap. Risk of injury!

02 PROPER USE AND TYPICAL FEATURES

The fans are only intended for the transfer of air or air-like mixtures. They cannot be used in hazardous areas for the transfer of gas, mix vapours or mixtures. Also cannot be used for transfer of solid components in transfer medium.

R14 axial fans with integrated external rotor ELECTRONICALLY COMMUTATED motor are not ready-to-use products, but designed as components for air-conditioning, air supply and air extraction. The fans may only be operated when they are installed as intended & instructed, and when safety is ensured by safety equipment according to EN 13857 or by other protection measures.

This appliance is not intended to be built as a partition fan (mounting in outside windows or walls) unless it is built into an end-application which is designed for that purpose.

The fan is intended to be permanently connected to fixed wiring.

The fan is intended to be connected to electrical power supply system with earthed neutral e.g. of type TN, TT.

The fans are only to be operated within the ranges specified on the motor name-plate.

Cycling operating mode: only with cycling via control signal (OFF=0V / ON=10V).

The manufacturer of the end application is responsible for keeping to the Electromagnetic compatibility (EMC) guideline 2014/30/EC.

The fan is designed for operating in 'pollution degree III' environment - applications acc. to EN 61800-5-1:2008.

Typical features

Variable Speed - setting via linear voltage input (0-10V) or PWM signal or other common ways.

High efficiency throughout the entire speed range.

Low-noise operation across the entire speed range.

Integrated EMC filter.

Sensor power supply 10VDC, max. 10mA.

Maintenance free ball-bearings and dynamically balanced rotating parts.

Control circuit is SELV isolated from main power supply (including an external power supply for sensors).

03 OPERATING CONDITIONS

The fans are rated for S1 (IEC 60034-1) continuous operation.

Extreme ON-OFF switching operating must be avoided, because it has negative influence on life expectancy and power consumption.

Cycling operating mode should only with cycling ON/OFF via control signal (0/10V analog input or PWM input).

Do not cycling the power supply for cycling operating mode – use control signal ! High 'In-rush current' can occur during cycling power supply!

Permissible ambient temperature is stated to the specified operating points - see appended 'Performance curves' for actual fan. If actual load deviates from specified operating point, motor temperature-rise should be checked.

Figures on the motor name-plate refer to nominal values according to EN 60335 if not otherwise specified (EN 60335, 'free air', 'max.load', 'max. eff.', cust. unit / cust. spec., UL, IEC 60034-1).

Continuous sound pressure level may exceed 70dBA (depends of fan model).

If an already installed fan is switched OFF for a long period in a humid atmosphere, it should be switched ON for minimum of two hours every month to remove any moisture that may have condensed inside the motor.

Protection (motor & electronics): IP54 according to EN60529.

Power consumption in stand-by mode: less than 5W .

NOMINAL DATA - defined according to ' IEC 60034-1 '

Phase : 1~

Nominal Voltage : 230 V

Operating Voltage range: 200-277 V

Frequency : 50-60 Hz

Input power: 600 W

Nominal current : 2,6 A

Rotational speed : 1150 RPM

Operating ambient temperature range: -25°C .. +60°C

Altitude : 2000 m

Insulation class : 130

Protection provided by PE : Class I .

Overvoltage category (OVC) : II .

Operating humidity ambient : up to 95% (non condensing) .

Max. pressure : 130 Pa

ErP DATA

Overall Efficiency , Eff_{es} : 49,7 %

Installation category : A

Efficiency category : static

Efficiency grade , N : 57,3

Variable speed drive : INTEGRATED

Power Input , P_e : 625,6 W

Airflow volume , q_v : 6789 m³/h

Pressure Increase, p_s : 156 Pa

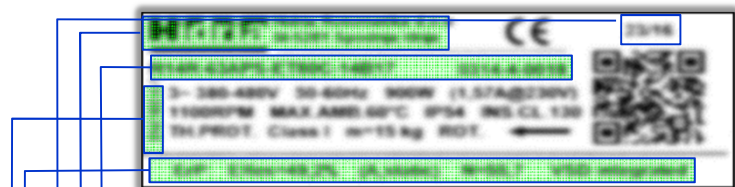
Rotational Speed, n : 1161 RPM

Specific ratio : 1,002

Airflow volume max. , q_v : 10112 m³/h

Pressure Increase max., p_s : 325 Pa

Example of nameplate :



Fan type and code

Trade mark and manufacturer

Date of production (week of the year)

Data acc. to EU regulation 327/2011 (ErP)

NOTE INDICATE TO WHICH STANDARD/RULES CORRESPOND DATA ON THE NAMEPLATE:

- **EN 60335-1** : Name-plate data are made according to standard EN 60335-1, Household and similar electrical appliances – Safety – Part 1 : 10.1 If an appliance is marked with rated power input, the power input at normal operating temperature shall not deviate from the rated power input by more than: + 20% if $P_n < 300W$ or +15% (or 60W whichever is the greater) if $P_n > 300W$.

10.2 If an appliance is marked with rated current, the current at normal operating temperature shall not deviate from the rated current by more than: +20% if $I_n < 1.5A$ or +15% (or 0,30A whichever is the greater) if $I_n > 1.5A$.

- **FREE AIR** : Data on the nameplate established at a point 0Pa static pressure.

- **MAX LOAD** : Data on the nameplate established at a point of maximal static pressure regarding max. ambient temperature.

- **MAX. EFF.** : Data on the nameplate established at a point of maximal static efficiency.

- **CUST. UNIT / CUST. SPEC.** : Data on the nameplate specified according to customer specifications or at working point in customer's unit .

- **UL** - Data on the nameplate defined according to specifications in UL standards.

04 INSTALLATION AND CONNECTION

This unit should only be installed by a qualified technician. First install the device on the application, than connect the protective earth!

Ensure that the air-gap between the fan impeller and the stationary housing is constant. Distortion due to an uneven surface of basis may lead to a fan failure. Air-gap between blade and cone-inlet (housing) should be of min. 3 mm.

Fan must be fixed to stationary housing 4x M8 at 90° on diameter 700mm as indicated on enclosed technical drawing. Use screws with property class of 8.8. Secure all threaded joints with e.g. Loctite or by using self-locking screws.

The system manufacturer or the machine builder is responsible that the inherent installation and security information are harmonized with the valid standards and guidelines (ex. EN 13857). To prevent dangerous situation and possible injuries the height and the diameter of inlet cone must be appropriate dimensions.

Do not install the fan on an unstable surface. Inspect the motor bearings for proper operation prior to installation.

Main electrical installation must be protected against short circuit with e.g. circuit breaker: max.16A, 400Vac, Type B and installation must be constructed properly according to valid national directives.

Means for disconnection must be incorporated in the fixed wiring in accordance with the wiring rules.

The fan is intended only to be connected to the fixed wiring or application's circuit. An all-pole separating switch which must be incorporated to wiring must disconnect also the fan.



This product can cause a d.c. current in the protective earthing conductor. Where a residual current-operated protective device (RCD) or monitoring (RCM) device is used for protection in case of direct or indirect contact, only an RCD or RCM of Type B+ is allowed on the supply side of this product and recommended sensivity is 300mA with short time delayed intervention.

The electrical connection must correspond to the enclosed connection diagram.

Recommended cable for power supply is at least 4x1.0mm² ordinary PVC cable acc. to IEC 60227-5 (eg. H05V2V2-F, 4G 1 mm²), no longer than 2m, outer diameter max. 9.5mm and ordinary PVC cable (eg. H03VV-F, 5X 0,5 mm²), no longer than 2m, outer diameter max. 9.5mm for control circuit. Ends of stranded wires needs to be provided with insulated ferrule (pin). Easier way to connect wires to the terminals if you use a screwdriver of 2.5x0.4mm dimensions to press the spring of terminal first and then insert the wire into the WAGO PUSH-WIRE® terminal. A screwdriver of 2.5x0.4mm is necessary tool to remove conductor from the terminal.

Fan performed with terminal box is as supplied fitted with a sealing plug in the cable glands as a preventive against ingress of water or moisture inside the terminal box. If the cable is not installed through the cable gland, sealing plug must remain in the gland!

Secure connection cable to the fan guard grill or to the motor holder with cable fasteners.

Cable-end of the fan must be connected in a dry environment to prevent that water penetrate through cable into motor housing.

Before putting into operation, check the resistance of protective-earth circuit of the entire application. Cross-sectional area and material of PE conductor may be the same as cross-sectional of phase conductor or see guide regarding PE conductor : standard EN 61800-5-1.

A second protective earthing conductor must be installed to ensure requirements of standard "EN 61800-5-1 , 4.3.5.5.2 Touch current in case of failure of protective earthing conductor". For that purpose an additional M4 of 12mm depth hole or additional PE terminal is provided on motor housing and marked with PE symbol. More information about dimensions of second PE conductor please find in guidelines of mentioned EN or equivalent standard (a cross-section of second Cu conductor should never be less than 2.5mm²).

Power-supply leads and control leads of this unit should not be routed in parallel (separate cables). Try to maintain as much distance between them as possible (recommended distance > 5cm).

Where the fan is installed in shaft-horizontal position, the cable exit on the motor must be in down position.

The fan is constructed for installation with rotor on bottom or with shaft in horizontal.

CONNECTING DIAGRAM : See appended technical drawing - CONNECTING DIAGRAM 0302-0-1005

POWER CIRCUIT : L1, N, PE

CONTROL CIRCUIT:

Modbus : RS A, RS B

0-10V analog input : 0-10V, GND

4..20mA analog input : 4..20mA -GND

Sensor supply : +10V - GND or +20V - GND

Slave control : OUT-GND

Control circuit is SELV isolated from main power supply (including an external power supply for sensors).

The device is compatible with Modbus protocol RTU. Please read additional instructions about Hidria EC Modbus parameters.



WARNING : Leakage current exceeds 3.5mA.

Short circuit rating: <10kA .

Dimensions:

Nominal diameter: 560 mm - see Appendix - technical drawing : VENTILATOR / R14R-56APS-ES60B-13A18

Weight: 13,6 kg

05 SPEED CONTROL

Rotation speed of a variable speed fan can be controlled by various signals:

- Linear voltage input (0-10V) or current input (4-20mA) or PWM input (PWM duty cycle 0-100%).
- MODBUS RTU protocol (Additional information are in documentation "Hidria EC Modbus parameters" and on www.modbus.org).
- Slave control output.

Linear voltage input is the most common and it is described below. The current input is also widely used, where long cables are necessary. PWM input is used for electromagnetic noisy environments. PWM signal must be in square form with polarity the same as for linear voltage input (see connection diagram). PWM duty cycle 0-100% correspond to 0-10V linear voltage input if the amplitude of the PWM voltage is $V_p=10V$. Amplitude of PWM signal must not exceed 12Vp.

LINEAR VOLTAGE INPUT:

<p>SPEED CONTROL DIAGRAM</p> <p>Fan rotational speed (RPM)</p> <p>Input Voltage (0...10 V)</p>	<p>Speed of a fan increases linearly with input voltage.</p> <p>The fan operates in two different modes: 0-1.2 V..... Standby or stop mode 1.2-10 V..... Run mode 1.0-1.2VHysteresis</p>
<p>HYSTERESIS</p> <p>Fan speed</p> <p>Input voltage (0...10V)</p>	<p>In order to prevent cycling from standby to run mode or run to standby mode a small hysteresis is implemented. The default value is approximately 200mV. Hysteresis can be factory-adjusted in order to achieve customer requirements.</p>
<p>Linear input is factory adjusted to fit the customer's sensor or other speed control reference. The input characteristic can be factory adjusted in terms of increasing input sensitivity or attenuation.</p> <p><i>For example: An air-cooled condenser is using a pressure sensor 0-20Bar => 0-10V, but the highest system pressure reached at maximum load is 16Bar => 8V. For optimal operation of the application the fan mounted on a condenser should run at max speed at 8V of input control voltage. In order to achieve that, we need to adjust the input characteristic in a way the picture shows.</i></p>	
<p>INPUT CHARACTERISTIC ADJUSTMENT</p> <p>Fan speed</p> <p>Input voltage (0...10V)</p>	<p>CONTROL DIAGRAM</p> <p>Fan speed</p> <p>Input voltage (0...10V)</p>
<p>0-10V input</p> <p>R:500 Ohms</p> <p>0-20mA current input</p>	<p>Linear voltage input (0-10V DC) can be used as 0 (4)-20mA current input with an additional resistor of 500 Ohms between GND and 0-10V connection.</p>

06 PUTTING INTO OPERATION

Before first start you should check:

- a. Appropriate installation and electrical connection.
- b. If safety equipment is in place and motor protection device is in function.
- c. If the impeller can rotate freely once the unit is mounted and the right direction of rotation is assured.



Only if all dangerous situations are excluded, the fan may be put into operation!

Switch ON the power supply.

Switch ON the device via the control signal and apply the speed setting voltage/signal and check the direction of the rotation and the smoothness of running.

07 PROTECTIVE FEATURES

Short-circuit protection:

The motor and electronic controller are protected against short-circuit by built-in thermal fuse.

Locked-rotor protection:

As soon the rotor is blocked, the motor is switched off electronically. After de-blocking, the motor will restart automatically.

Mains under voltage:

If mains voltage falls below the nominal value the motor will keep running with degraded performance. Below 180V, the motor will be switched off electronically in stand-by mode. When mains voltage returns to correct value, the motor will restart automatically.

In the specific case, the undervoltage protection may switch off the fan to stand-by mode, for example, fan running or testing at high pressure drop and low voltage.

Over temperature protection:

Internally connected thermal overload protector to protect electronic and motor against over temperature.

08 EMC

Interference emission :

Interference immunity :

Harmonics:

Complying with the EMC standards has to be established on the final appliance, as different mounting situations can result in changed EMC properties.

09 MAINTENANCE, SERVICE AND CLEANING

Before any maintaining or repairing operation is carried out, the unit must be securely disconnected from any power supply source!

This unit should only be opened or maintained or repaired by a manufacturer or by a manufacturer-qualified personnel.

Ensure that the fan is switched off from the supply mains before removing the guard.

Cables of the unit shall only be replaced by a manufacturer or by a manufacturer-qualified personnel to avoid dangerous situations.

Do not attempt to open service port. Service port is intended for factory firmware download only. Improper disassembly of the port cover may result in reduced sealing properties and penetration of moisture into electronic compartment. Tampering with any enclosure will void warranty coverage.

Cleaning

Regular inspection, if required, and cleaning when necessary to prevent imbalance due to the build-up of dirt. Clean the fan's flow area.

Blades must be cleaned carefully to avoid damage to them.

Never use a high-pressure cleaner or water spray for cleaning.

Wet cleaning under voltage may lead to an electric shock.

Do not use any aggressive paint solvent cleaning agents.

For cleaning, use just a moist cloth. You can clean the entire fan with a moist cloth.

If water penetrates into the motor, the motor windings must dry before restarting.

Cleaning and user maintenance shall not be made by children without supervision.

10 TRANSPORT AND STORAGE

Unit must be transported only in its original package.

When the fan's transported with wood spacer on pallet, take care with the cables (in the situation that fan has connection cables). When unpacking fans, transported in such a way, grip the fan to protection grill. Do not apply any force for the cable(s).

When transporting fans mounted on final units (apparatus), take care that they are properly secured and don't touch other devices which are transported near or on to.

Store the fans in the original packaging in a dry area protected from the weather. Do not store fans in extreme heat and cold.

We recommend a maximum of one year of storage. After a long period of storage we recommend that you inspect the bearings for proper operation before installation.

Permissible transport / storage temperature range: -40°C .. +80°C.

Permissible transport / storage humidity : 5 - 95%.

11 ErP AND ROHS DIRECTIVES

Fan must be mounted in appropriate way to achieve optimal efficiency and life expectancy. We suggest assembling fan in long inlet cone, with fan blade trailing edge aligned with outlet edge of inlet cone.

Only environment friendly, recyclable materials according to RoHS2 (2011/65/EU) and REACH (EC1907/2006) directive are used in the product. Disposal must be carried out professionally and environmentally friendly in compliance with regulations applicable in your country.

Design of the product enables simple decomposition of all components. Main components are appropriate marked for easy further handling at product end-of-life.

12 SERVICE ADDRESSES AND ADDITIONAL DATA

Please refer to the homepage at www.hidria.com for a list of our subsidiaries worldwide.

Hidria reserves the right to change any specifications or data without notice.

The manufacturer will not accept liability for any resulting damages caused by the non-observance of this manual or any unauthorised modification to the system.