

# Assun Motor

## Product Manual



For DC Servo Motor

of

AM-PI45115AN Series

1<sup>st</sup> edition. October, 2019.

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# 1. About the Manual

## 1.1 Validity of This Document

The product manual document here is used for AM-PI45115AN Series product by Assun Motor which is DC brushless motor with integrated position servo controller. The manual has made detailed description to the safety and functional usage of this motor product series. It helps the professional user to install and connect the motor, and also guide the user in relevant control function usage.

All data in this manual are based on the actual manufacturing and standard testing condition of AM-PI45115AN Series product. Standard testing condition is when the motor installed horizontally and environment temperature is 25°C.

For relevant parameter summaries of the product series, please refer to Appendix 1 “Product Series Parameters”; For specified standard model or customized model, please refer to Appendix 2 “Detailed Product Drawing and Parameter”.

## 1.2 Using This Document

Please read this document carefully before install and set-up the product. Please pay extra attention to the second chapter “Product Safety”, and strictly follow the warnings and instructions.

Please retain this document throughout the entire working life of the product, and keep the document accessible to the operating and, if necessary, maintenance personnel at all times.

Pass a copy of this document on to any subsequent owner or user of the product.

## 1.3 Definition of Terms

Term	Meaning
PWM	Pulse Width Modulation
CW/CCW	Clockwise/Counter Clockwise
Feedback Pulse	Pulses give out per revolution
VIL/VIH	Voltage Input Low / Voltage Input High
Pin	Control Function Connect Pin
Cable	Power Connection Cable
GND	Ground / Negative Pole
Vcc	Direct Current Voltage
RPM	Revolution per Minute

## 1.4 Definition of Symbols



Caution! Hazard to persons. Disregard may lead to injury.



Warning! Improper operation will cause product damage.



Caution! Hazardous due to hot surface. Disregard may lead to burns.

## 2. Product Safety

### 2.1 Intended Product Usage

The Assun Motor AM-PI45115AN Series integrated DC servo motor product, which we are describing here in this manual, are used for rotating power output under rated DC supply and suitable pulse control. Position control function is integrated so it could be used in multiple servo drive systems such as industrial automation and actuators. Direction, speed and position control functions could be achieved with upper PLC system.

The product must be properly installed when in use, and shall be operated in an environment with good heat dissipation conditions. In normal installation condition, when the operational parameters have not exceeded the maximum continuous values, winding temperature must be maintained below 85°C. The product can be used alone or coupled to a gearbox to achieve ideal output torque and RPM.

The product is not suitable for operation in environments with high humid or excessive dust. During the operation, please follow the parameter limits in the appendices to adjust the power supply and running state, so as to achieve the optimum operational output and longest product lifetime.

For usage of product in special environment, please contact our local sales or service staff for consultancy and get the relevant advice or customized service.

This product is NOT SUITABLE for applications where the failure of the product could result in the death of an individual or group of individuals.

### 2.2 Product Usage Safety



The product is a high-speed rotating device. Please make sure the product is properly mounted before commencement of operation to prevent potential hazards to people or equipment. Please refer to Chapter 4.1 of this manual for further installation guidance.



Motor surface temperature could be high after long term operation. Please exercise caution when touching or handling the product.



Power supply must be filtered DC. The input voltage shall be within the rated value for normal operation. Voltage cannot be lower than 10V for lower voltage operation. Voltage cannot exceed the rated value for long term operation and shall be always under 28V.



**Power supply connection must be strictly according to the designated positive and negative polarity. If the power supply is reversed, it will seriously damage the internal driver and lead to malfunction of the motor. Red cable from motor shall connect to the positive of power supply, blue cable from motor shall connect to the negative of power supply. For detailed power connection guidance, refer to Chapter 4.1.**



Please install the motor in an environment with good heat sinking and/or ventilation. Inadequate heat dissipation will lead to the motor winding temperature exceeding the limit of 85°C and will cause thermal damage to the internal electronic parts and winding, resulting in motor malfunction and/or failure.



Please use the motor according to the parameter limits in the appendix, otherwise it may cause the motor to be exceed current limits or overheat, which could lead to irreversible damage to the motor.



The motor is not suitable for operating in high humid and dusty environments. High humidity or excessive dust concentration could lower the motor performance and shorten the motor lifetime.



The product is a precision Brushless DC motor with sensitive internal electronic components. Please do not personally disassemble the product.

## **2.3 Product Disposal/Recycling**

This series of motor products is manufactured with multiple types of metals, alloy materials, chemical adhesives and lubricants. Please dispose it properly as recyclable material. For a detailed product material listing please refer to Chapter 3.1.

## 3. Product Series Information

### 3.1 Product Series Structure Introduction

AM-PI45115AN Series products is a series of precision DC servo motors with integrated electronics and inner rotating rotor. Case diameter is  $\phi 45\text{mm}$ , case length is 115mm, rated power around 54.4W, with a net weight of approximately 880g. For detailed series information and parameters please refer to Appendix 1.

The series product is inner rotor brushless dc motor, relying on the internal driver electronics to energize the stator winding in sequence to make the magnetic poles rotate and thus attract the permanent magnetic rotors to rotate in synchronization. The product's basic structure is depicted in illustration 1.

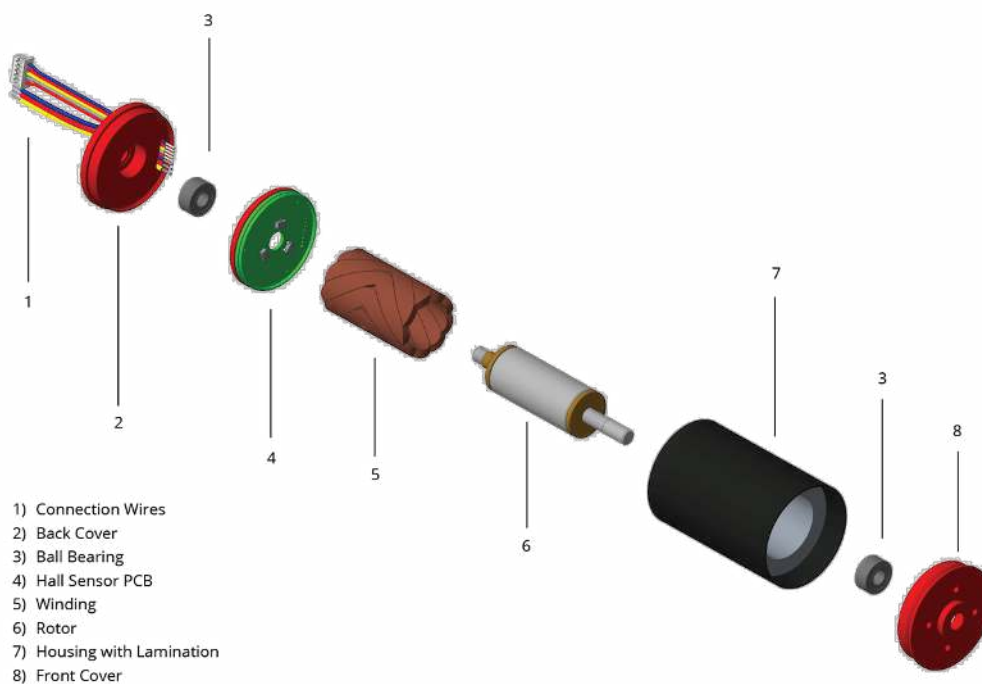


Illustration 1. Exploded Product View



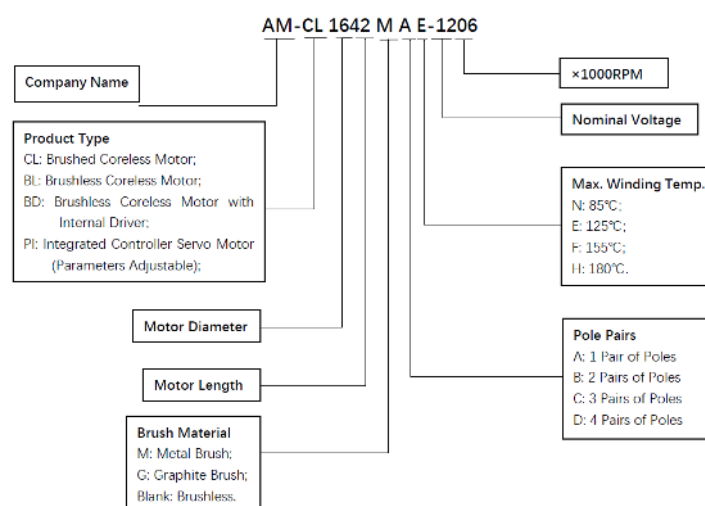
This series of product are manufactured using materials using multi-types of metal, alloy material and chemical products. Specific material usage as shown in Table 1.

**Table 1. Product Material Matrix**

<b>Components</b>	End Cover	Winding	Bearing	Rotor Magnet	Rotor Shaft	Housing	Cable Core
<b>Material</b>	Stainless Steel	Copper	Stainless Steel	Sintered NdFeB	Stainless Steel	Aluminum Alloy	Copper
<b>Components</b>	Cable Insulation	PCB Board	PCB Circuit	Glue	Grease	Cushion	Other Materials
<b>Material</b>	Plastic (Teflon)	Glass Fiber & Copper	Copper	Epoxy Resin	Fluorine Grease	Stainless Steel	Precious Metals; Silicon.

### 3.2 Product Model Information

To make it convenient for the customer to choose a specific part number or model and understand the part number methodology, please refer below in Illustration 2 the explanation for model number composition principle.



**Illustration 2. Part Number Nomenclature**

Customers can choose suitable products based on their types and characteristics shown in the part number methodology. If products with special characteristics are required, please contact our regional sales person for customized service.

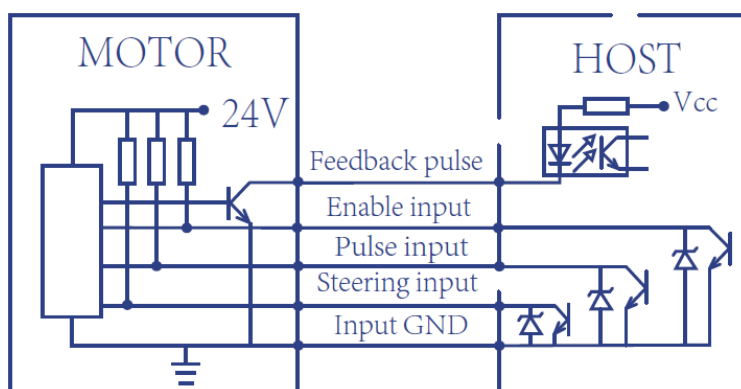
## 4. Product Function and Usage

The Product Series has five control cables and two power supply cables.

Two power cables are red cable (connect to power supply positive) and blue cable (connect to power supply negative).

Five control cables include ground cable (black), rotating direction control (white), feedback pulse (green), pulse input cable (white) and enable input (yellow). These cables are enclosed in a black shielding cable for better stability. Analogue voltage input is defined as low voltage input to be 0-1.2V and high voltage input to be 22-24V.

The enable input must be supplied with low voltage or connected to GDN for the motor to operate. Motor rotating speed controlled by pulse input. Commonly the control wiring diagram are proposed as following:



Wiring diagram

### 4.1 Motor Installation and Power Connection

Motor must be properly and securely mounted., typically utilizing the treaded holes in the front cover to fix the motor. It will be proposed to install the motor to metal parts, or installed in well ventilated environments for better heat dissipation.

- ⚠ There are two AWG20# power cables, one is red cable that should be connected to the positive of power supply, the other is blue cable which should be connected to the negative of power supply. The power connection must obey the indication above. If the power supply is inadvertently reversed, it will seriously damage the internal driver causing malfunction of the motor.

## 4.2 Pulse input

The red cable is for pulse input from PLC system, and Max frequency at 60KHz. The motor will rotate one revolution for every 256 input pulses. For one pulse given, motor will rotate 1/256 revolution, which is 1.4°, tolerance at  $\pm 0.3^\circ$ .

Under rated or lower torque, the motor will keep a steady speed of rated speed. When load torque over rated value, there will be some variance of speed but basically motor keep the speed steady. Over load torque shall not be higher than 120 mN·m or last longer than 3 seconds, otherwise the motor may overheat and cause malfunctions.

## 4.3 CW/CCW Control

Yellow pin is for rotating direction control. Clockwise and counter clockwise rotation of the motor shaft is defined when looking from the front shaft side, looking down on the mounting surface.

In high voltage level, then the motor rotates clockwise. If the voltage level is low, then motor rotates counter-clockwise.

When the cable is not connected, it is same as high voltage level and motor rotates clockwise; when the cable is connected to ground cable, it is same as low voltage level and motor rotates counter-clockwise.

 **CAUTION** do not reverse the motor direction while the motor is rotating! It is highly recommended to stop the motor before reversing motor rotational direction.

## 4.4 Feedback Pulse

For the red cable, it will give 32 pulses per revolution as feedbacks to the PLC system, and could be used for monitoring motor operation condition.

## 5. Maintenance

The product series is maintenance free, please do not disassemble in person. There are no repairable components inside the motor. Regarding any quality issue or maintenance needs, please contact our regional service person for relevant technical support.

Ignoring this warning will void the warranty.

## Appendix

### Appendix 1. Series Product Parameters

### Appendix 2. Specified Product Drawing and Parameters

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