

# Hardware Technical Manual

## PDEC60

Fieldbus: IO & ModbusRTU

For use with the following variants:

PDEC60L



# Contents

|          |                                                    |          |
|----------|----------------------------------------------------|----------|
| <b>1</b> | <b>Introduction.....</b>                           | <b>1</b> |
| 1.1      | Version information.....                           | 1        |
| 1.2      | Copyright, marking and contact.....                | 1        |
| 1.3      | Intended use.....                                  | 2        |
| 1.4      | Warranty and disclaimer.....                       | 2        |
| 1.5      | Target group and qualification.....                | 2        |
| 1.6      | EU directives for product safety.....              | 3        |
| 1.7      | Other applicable regulations.....                  | 3        |
| 1.8      | Used icons.....                                    | 3        |
| 1.9      | Emphasis in the text.....                          | 3        |
| 1.10     | Numerical values.....                              | 4        |
| 1.11     | Bits.....                                          | 4        |
| 1.12     | Counting direction (arrows).....                   | 4        |
| <br>     |                                                    |          |
| <b>2</b> | <b>Safety and warning notices.....</b>             | <b>5</b> |
| <br>     |                                                    |          |
| <b>3</b> | <b>Technical details and pin assignment.....</b>   | <b>5</b> |
| 3.1      | Environmental conditions.....                      | 5        |
| 3.2      | Dimensioned drawings and installation options..... | 6        |
| 3.3      | Electrical properties and technical data.....      | 7        |
| 3.4      | Pin assignment.....                                | 9        |
| 3.4.1    | Overview.....                                      | 9        |
| 3.4.2    | X1 – voltage supply.....                           | 9        |
| 3.4.3    | X2 – inputs and outputs.....                       | 9        |
| 3.5      | ModbusRTU Commissioning.....                       | 9        |

# 1 Introduction

The PDEC60 series integrated motor is an intelligent integrated drive control BLDC motor.

This manual describes the functions of the controller and the available operating modes. It also shows how you can address and program the controller via the communication interface.

You can find further information on the product on [www.yanlanmc.com](http://www.yanlanmc.com).

## 1.1 Version information

| Manual version | Date    | Changes                             | Firmware version | Hardware version |
|----------------|---------|-------------------------------------|------------------|------------------|
| 1.0.0          | 06/2018 | First edition                       | FIR-v1825        | W002             |
| 1.1.0          | 11/2020 | Changes in Temperature adaptability | FIR-v2213        | W002             |
| 1.1.0          | 11/2023 | ADD Velocity via Modbus Rtu         | FIR-v2213        | W002             |

## 1.2 Copyright, marking and contact

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## 1.3 Intended use

The PDEC60 Motor is used as a component in drive systems in a wide range of industrial applications.

Use the product as intended within the limits defined in the technical data (in particular, see Permissible operating voltage) and the approved Environmental conditions.

Under no circumstances may this YanLan product be integrated as a safety component in a product or system. All products containing a component manufactured by YanLan must, upon delivery to the end user, be provided with corresponding warning notices including instructions for safe use and safe operation. All warning notices provided by YanLan must be passed on directly to the end user.

### 1.4 Warranty and disclaimer

YanLan assumes no liability for damages and malfunctions resulting from installation errors, failure to observe this manual or improper repairs. The selection and use of YanLan products is the responsibility of the plant engineer or end user. YanLan accepts no responsibility for the integration of the product in the end system.

Our general terms and conditions at [www.yanlan.net](http://www.yanlan.net) apply.



#### NOTICE

Changes or modifications to the product are not permitted.

### 1.5 Target group and qualification

The product and this documentation are directed towards technically trained specialists staff such as:

- Development engineers
- Plant engineers
- Installers/service personnel
- Application engineers

Only specialists may install, program and commission the product. Specialist staff are persons who

- have appropriate training and experience in working with motors and their control,
- are familiar with and understand the content of this technical manual,
- know the applicable regulations.

### 1.6 EU directives for product safety

The following EU directives were observed:

- RoHS directive (2011/65/EU, 2015/863/EU)
- EMC directive (2014/30/EU)

### 1.7 Other applicable regulations

In addition to this technical manual, the following regulations are to be observed:

- Accident-prevention regulations
- Local regulations on occupational safety

### 1.8 Used icons

All notices are in the same format. The degree of the hazard is divided into the following classes.



#### CAUTION

The **CAUTION** notice indicates a possibly dangerous situation.

Failure to observe the notice **may** result in moderately severe injuries.

- Describes how you can avoid the dangerous situation.

### NOTICE



**Indicates a possible incorrect operation of the product.**

Failure to observe the notice may result in damage to this or other products.

► Describes how you can avoid the incorrect operation.

### TIP



Shows a tip for the application or task.

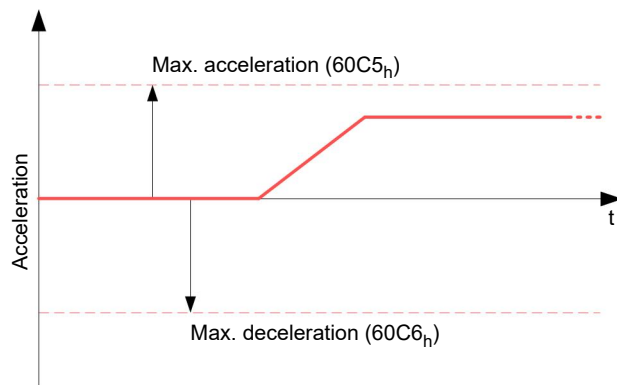
## 1.11 Bits

The numbering of individual bits in an object always begins with the LSB (bit number 0). See the following figure, which uses data type *UNSIGNED8* as an example.

|            | MSB |   |   |   | LSB |   |   |   |                                                         |
|------------|-----|---|---|---|-----|---|---|---|---------------------------------------------------------|
| Bit Number | 7   | 6 | 5 | 4 | 3   | 2 | 1 | 0 |                                                         |
| Bits       | 0   | 1 | 0 | 1 | 0   | 1 | 0 | 1 | $\triangleq 55_{\text{hex}} \triangleq 85_{\text{dec}}$ |

## 1.12 Counting direction (arrows)

In figures, the counting direction is always in the direction of an arrow. Objects  $60C5_h$  and  $60C6_h$  depicted as examples in the following figure are both specified as positive.



## 2 Safety and warning notices

### NOTICE

**Damage to the controller!**

Changing the wiring during operation may damage the controller.

- Only change the wiring in a de-energized state. After switching off, wait until the capacitors have discharged.

### NOTICE

**Damage to the controller due to excitation voltage of the motor!**

Voltage peaks during operation may damage the controller.

- Install suitable circuits (e. g., charging capacitor) that reduce voltage peaks.

### NOTICE

**Damage to the electronics through improper handling of ESD-sensitive components!**

The device contains components that are sensitive to electrostatic discharge. Improper handling can damage the device.

- Observe the basic principles of ESD protection when handling the device.

### NOTICE

**Damage to the electronics if the supply voltage is connected with reversed polarity!**

Polarity reversal results in a short-circuit between supply voltage and GND (earth) via the power diode.

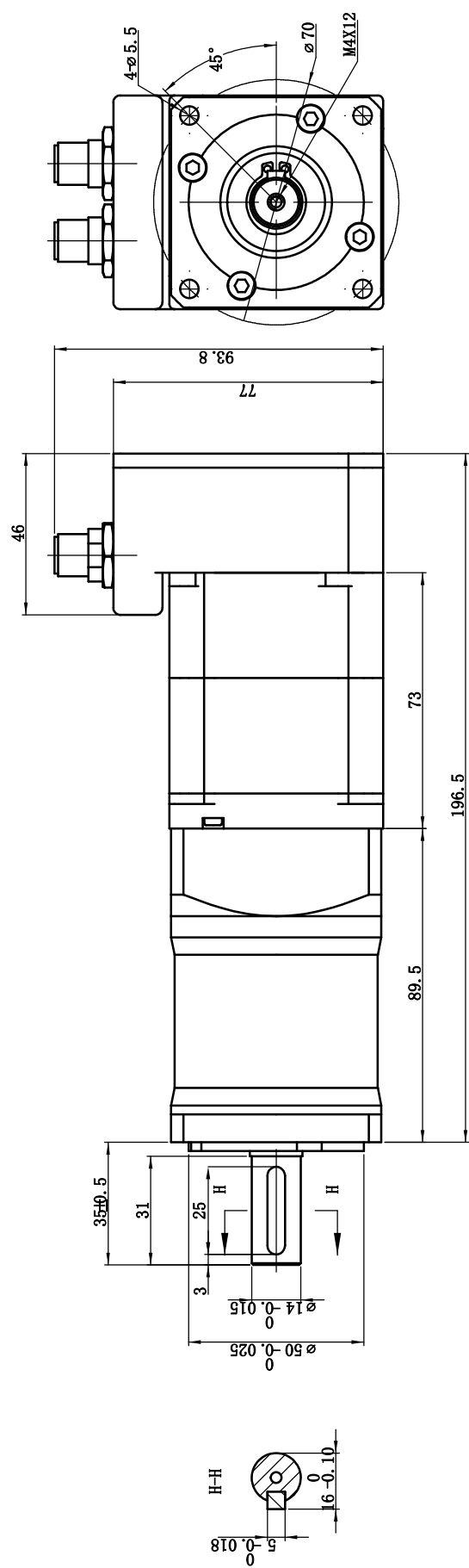
- Install a line protection device (fuse) in the supply line.

## 3 Technical details and pin assignment

### 3.1 Environmental conditions

| Environmental condition                                                    | Value         |
|----------------------------------------------------------------------------|---------------|
| Protection class                                                           | IP54          |
| Ambient temperature (operation)                                            | -10 ... +40°C |
| Air humidity (non-condensing)                                              | 0 ... 95 %    |
| Max. Altitude of site above <i>sea level</i> (without drop in performance) | 1500 m        |
| Ambient temperature (storage)                                              | -20 ... +85°C |

3.2 Dimensioned drawings and installation options

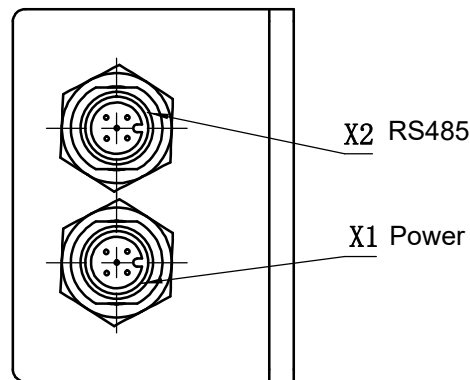


#### 3.3 Electrical properties and technical data

| Property                        | Description / value                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Operating voltage               | 24... 48 V DC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Rated current                   | 5 A <sub>rms</sub>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Peak current                    | for 3 seconds 8 A <sub>rms</sub>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Commutation                     | closed loop with encoder                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Operating modes                 | <i>Velocity Mode</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Set value setting / programming | <i>IO, Analog, RS485</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Interfaces                      | RS485                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Inputs                          | <ul style="list-style-type: none"> <li>■ 2 inputs, 24 V (inputs 1 to 2)</li> <li>■ 1 analog input, 10 bit, 0-10 V</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Outputs                         | 1 outputs (max. 24 V and 50 mA)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Protection circuit              | <p>Overvoltage and undervoltage protection</p> <p>Overtemperature protection (&gt; 80° Celsius on the power board)</p> <p>Polarity reversal protection: In the event of a polarity reversal, a short-circuit will occur between supply voltage and GND over a power diode; a line protection device (fuse) is therefore necessary in the supply line. The values of the fuse are dependent on the application and must be dimensioned</p> <ul style="list-style-type: none"> <li>■ greater than the maximum current consumption of the controller,</li> <li>■ less than the maximum current of the voltage supply.</li> </ul> <p>If the fuse value is very close to the maximum current consumption of the controller, a medium / slow tripping characteristics should be used.</p> |

### 3.4 Pin assignment

#### 3.4.1 Overview



| Connection | Function                                         |
|------------|--------------------------------------------------|
| X1         | Voltage supply                                   |
| X2         | ModbusRTU IN & Digital/analog inputs and outputs |



#### NOTICE

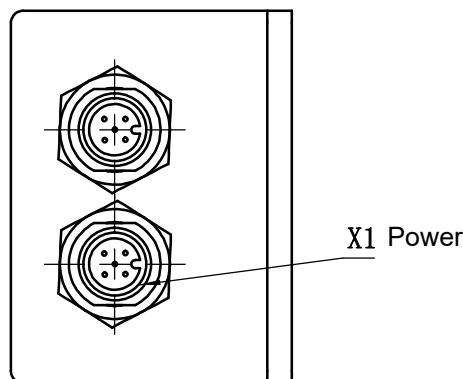
All pins with designation *GND* are internally Not connected.

#### 3.4.2 X1 – voltage supply

- Type: M12\*5 Female
- Mating connector (included in scope of delivery): ZK-M12-5-2M-S Male(or equivalent)

##### 3.4.2.1 Voltage source

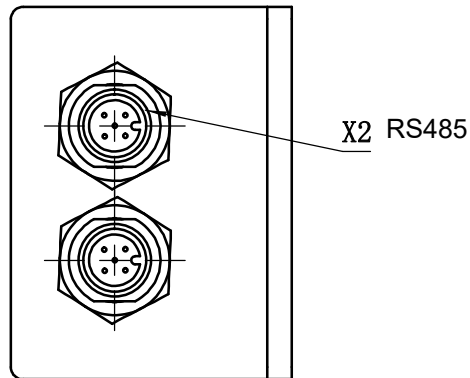
The operating or supply voltage supplies a battery, a transformer with rectification and filtering, or a switching power supply.



| Pin | Function | Note                                         |
|-----|----------|----------------------------------------------|
| 1&2 | +UB      | 12 V - 48 V DC, ±5%<br>ZK-M12-4-2M-S BN & WH |
| 3&4 | GND      | ZK-M12-4-2M-S BU & BK                        |

#### 3.4.3 X2 – inputs and outputs

- Type: M12\*8 Female
- Mating connector (included in scope of delivery): ZK-M12-8-2M-S Male (or equivalent)



Pin 1 is standard

| Pin | Function        | Note                                                |
|-----|-----------------|-----------------------------------------------------|
| 1   | GND             | GND                                                 |
| 2   | Digital input 1 | 24 V signal                                         |
| 3   | Digital input 2 | 24 V signal                                         |
| 4   | Digital input 3 | 24 V signal                                         |
| 5   | RS485-A         | RS485-A                                             |
| 6   | RS485-B         | RS485-B                                             |
| 7   | Analog input    | 10 bit, 0-10 V *Can be used to control the velocity |
| 8   | Digital output  | Can be used for frequency division output           |

#### ModbusRTU IN and OUT

| Pin | Function | Note |
|-----|----------|------|
| 5   | RS485-A  |      |
| 6   | RS485-B  |      |

### 3.5 ModbusRTU Commissioning

#### 3.5.1 Default Setting

- Slave address Default 1 or 2(According to project specifications)
- Baudrate 115200
- Parity None

#### 3.5.2 Control register

|           |            |                                                                  |
|-----------|------------|------------------------------------------------------------------|
| 6000      | UNSIGNED16 | BIT0 : START / STOP<br>BIT4 : Reset error<br>BIT8 : Always set 1 |
| 6001+6002 | INTEGER32  | Target Velocity (Rpm)                                            |
| 6004+6005 | UNSIGNED32 | Acceleration<br>velocity/second <sup>2</sup>                     |

### 3 Technical details and pin assignment

|           |            |                                  |
|-----------|------------|----------------------------------|
| 6006+6007 | UNSIGNED32 | Deceleration<br>velocity/second2 |
|-----------|------------|----------------------------------|

#### 3.5.3 States register

|           |           |                         |
|-----------|-----------|-------------------------|
| 5000+5001 | INTEGER32 | Realtime Velocity (Rpm) |
|-----------|-----------|-------------------------|

|      |            |                                                     |
|------|------------|-----------------------------------------------------|
| 5004 | UNSIGNED16 | 1(DEC) : Stop<br>2(DEC) : Running<br>3(DEC) : Error |
|------|------------|-----------------------------------------------------|

|      |            |                                                                                                                     |
|------|------------|---------------------------------------------------------------------------------------------------------------------|
| 5005 | UNSIGNED16 | Error Code<br>0: None<br>1: Encoder Error<br>2: Magnet Error<br>3: Overvoltage<br>4: Undervoltage<br>5: OverCurrent |
|------|------------|---------------------------------------------------------------------------------------------------------------------|