# User's Manual
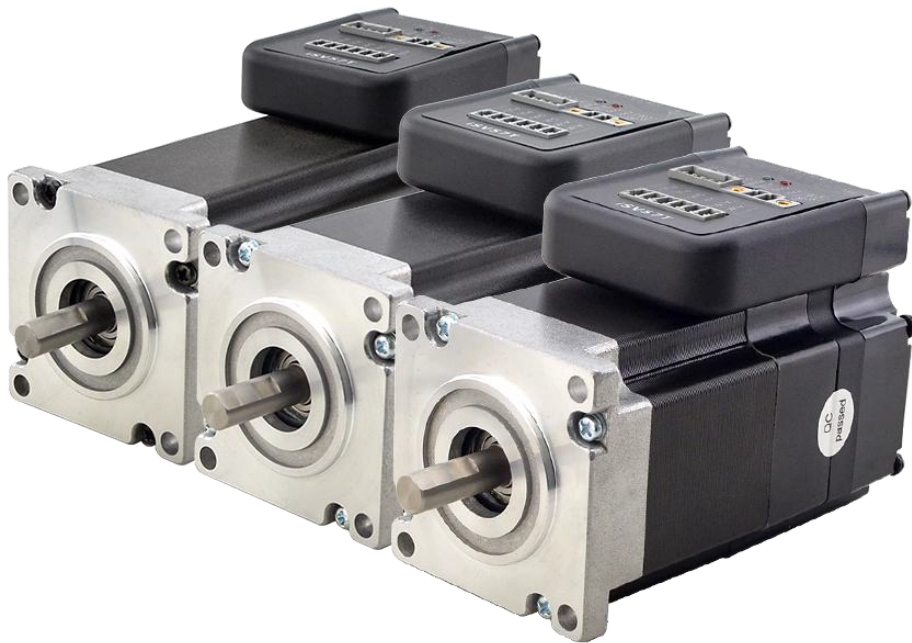### For
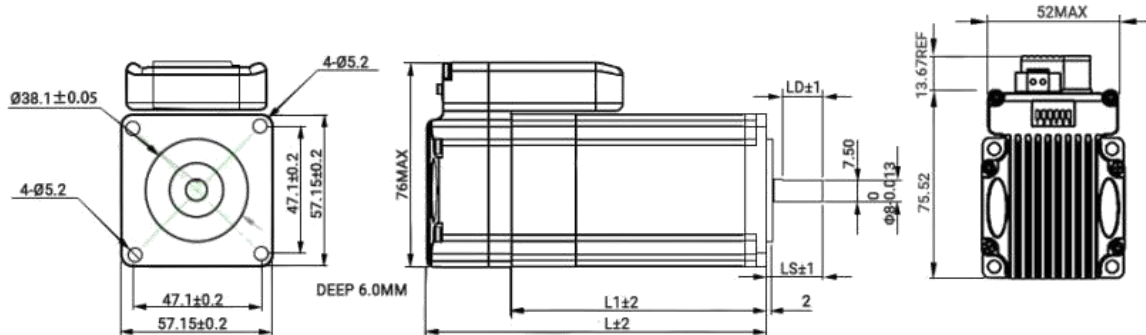# Integrated Servo Motor
# iSV Series

**BLDC Servo Motor + Drive, 24-50VDC, Frame 57mm ,90W-180W**

## 1. Introduction

An iSV57T(S) servo motor is a NEMA23 (57mm) brushless motor integrated with a 16-bit magnetic encoder and servo driver, which making performance better and tuning easier. And the compact design saves installation space, eliminates encoder and motor wiring time, reduces interference and costs.

## 2. Specifications

| Parameter | Min | Typical | Max | Unit |
|---|---|---|---|---|
| Input Voltage | 20 | 36 | 50 | VDC |
| Continuous Current | 0 | - | 6.0 | A |
| Pulse Input Frequency | 0 | - | 300 | kHz |
| Pulse Voltage | 0 | 5 | 5 | V |
| Logic Signal Current | 7 | 10 | 16 | mA |
| Isolation Resistance | 100 | - | - | MΩ |



| Part Number | iSV57T-090(S) | iSV57T-130(S) | iSV57T-180(S) |
|---|---|---|---|
| Rated Power(W) | 90 | 130 | 180 |
| Rated Torque (N.m) | 0.3 | 0.4 | 0.6 |
| Peak Torque(N.m) | 0.9 | 1.2 | 1.8 |
| Rated Speed(rpm) | 3000 | 3000 | 3000 |
| Peak Speed(rpm) | 4000 | 4000 | 4000 |
| Rated Voltage(Vdc) | 36 | 36 | 36 |
| Rotor Inertia(g-cm$^2$ ) | 264 | 394 | 524 |
| Weight(kg) | 0.95 | 1.25 | 1.54 |
| L1(mm) | 76 | 96 | 116 |
| L(mm) | 108 | 128 | 148 |
| LS(mm) | 33(21) | 33(21) | 33(21) |
| LD(mm) | 27(15) | 27(15) | 27(15) |

## 3.Connectors and Pin Assignment

| Control Signal Connector | | | |
|---|---|---|---|
| Pin | Name | I/O | Description |
| 1 | PUL+ | I | Pulse signal: Pulse active at rising edge; 4-5V when PUL-HIGH, 0-0.5V when PUL-LOW. Minimal pulse width of 2.5μs. It's recommend dutycycle 50%.   Add a resistor for current-limiting at +12V or +24V input logic voltage (1K for +12V, 2k for +24V). |
| 2 | PUL- | I | |
| 3 | DIR+ | I | DIR signal: Pulse active at rising edge; 4-5V when PUL-HIGH, 0-0.5V when PUL-LOW. The low/high voltage levels to represent two directions of motor rotation. Add a resistor for current-limiting at +12V or +24V input logic voltage (1K for +12V, 2k for +24V). The DIR signal at least 5μs in advance of PUL signal |
| 4 | DIR- | I | |
| 5 | ALM+ | O | Alarm Signal: OC output signal, activated when one of the following protection is activated: over-voltage and over current error. They can sink or source MAX 50mA current at 24V. By default, the impedance between ALM+ and ALM- is low for normal operation and becomes high when any protection is activated. The active impedance of alarm signal is software configurable. |
| 6 | ALM- | O | |

*Note : The enable signal is not configurable,it is enabled on power-up by default, and cannot be modified by software.*

| Power Connector | | | |
|---|---|---|---|
| Pin | Name | I/O | Description |
| 1 | +Vdc | I | Power Supply Input (Positive)<br>24-36VDC recommended. Please leave reasonable reservation for voltage fluctuation and back-EMF during deceleration. |
| 2 | GND | GND | Power Ground (Negative) |

| RS232 Communication Connector | | | |
|---|---|---|---|
| Pin | Name | I/O | Description |
| 1 | +5V | O | +5V power output ( Note: Do not connect it to PC's serial port) |
| 2 | TxD | O | RS232 transmit. |
| 3 | GND | GND | Ground. |
| 4 | RxD | I | RS232 receive. |
| 5 | NC | - | Not connected. |

## 4. DIP Switch

### 4.1 Microstep (S1-S3)

| Pulse/rev | S1 | S2 | S3 |
|---|---|---|---|
| Pr0.08 | off | off | off |
| 1600 | on | off | off |
| 2000 | off | on | off |
| 3200 | on | on | off |
| 4000 | off | off | on |
| 5000 | on | off | on |
| 6400 | off | on | on |
| 8000 | on | on | on |

### 4.2 Stiffness Setting(S4-S5)

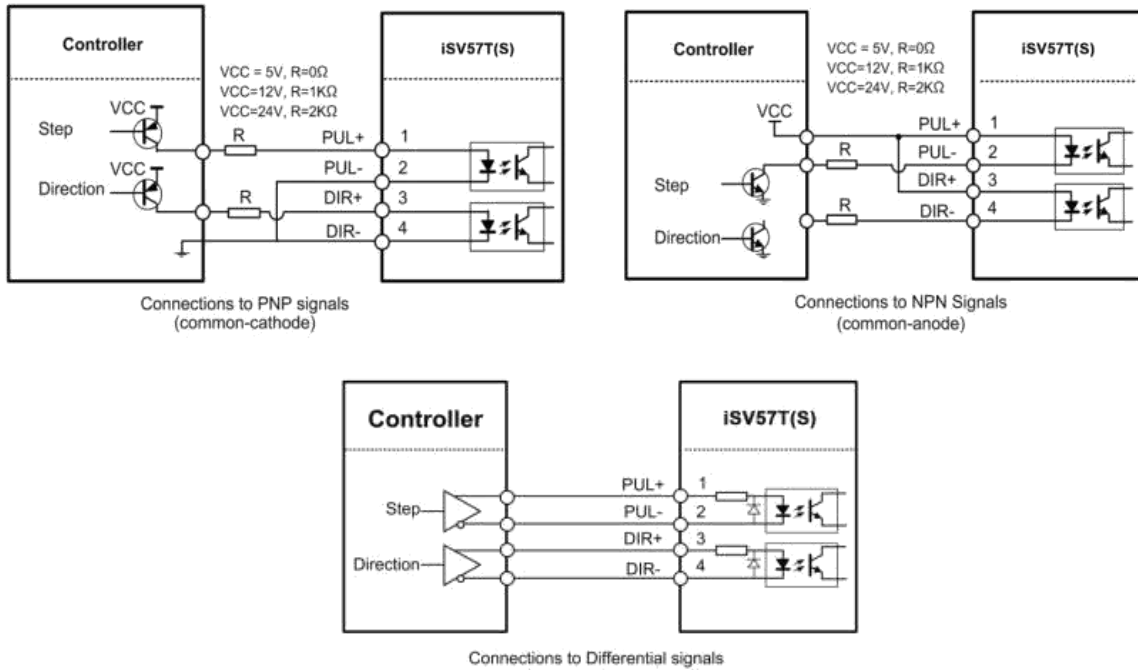| Stiffness | S4 | S5 |
|---|---|---|
| Pr0.03 | off | off |
| 9 | on | off |
| 10 | off | on |
| 11 | on | on |

### 4.3 Motor Direction (S6)

The DIP switch S6 is used to change the initial direction of the motor (offline), not as a real-time operation to modify the direction.Online modification of the motor direction is via the DIR signal
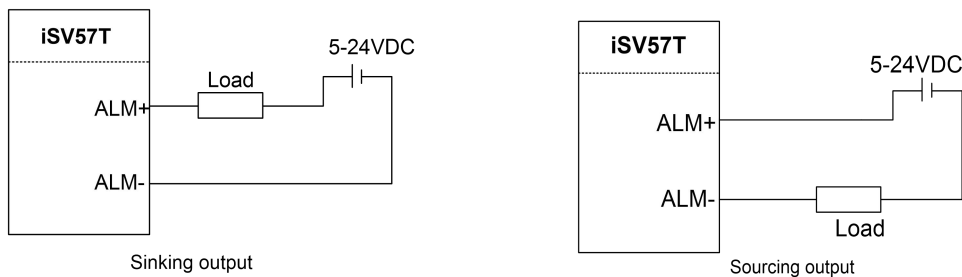
| S6 | Direction |
|---|---|
| off | CCW |
| on | CW |

# 5. Typical Connections

## 5.1 Control Signal Connection



Connections to PNP signals
(common-cathode)

Connections to NPN Signals
(common-anode)

Connections to Differential signals
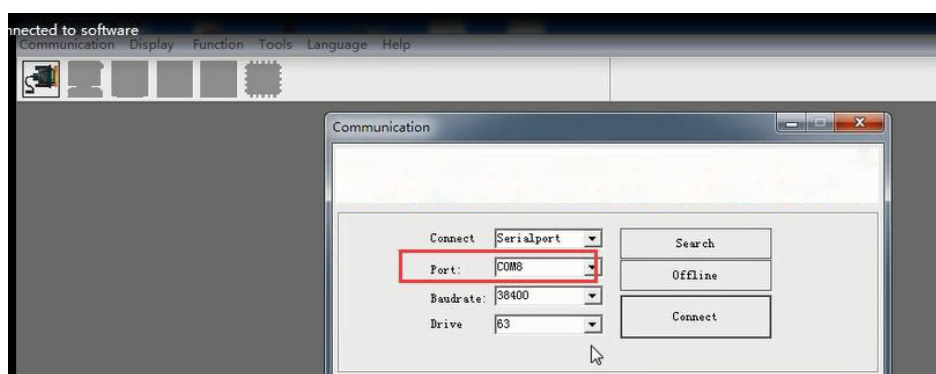
## 5.2 Alarm Output Connection



Sinking output

Sourcing output

# 6. Quick Setting of Parameters

## 6.1 Connect to Tuning Software

When you open the "communication" window, just select the correct COM port and keep the default for other else, like this baud-rate, keep the default 38400, no need to change it to 19200



## 6.2 Key Parameters

Usually the setting for Pr0.01-0.04 and Pr2.22 can be :
Pr0.01 = 0; Pr0.02 = 1; Pr0.03 = 10 – 15; Pr0.04 = 100 – 1000; Pr2.22 is for smooth movement

| Pr0.01 | Control Mode Setup | Range | unit | default |
|---|---|---|---|---|
| | | 0-10 | - | 0 |

0: Position Control Mode;
1-10: Unsupported Control Modes;

| Pr0.02 | Real-time Auto-gain Tuning | Range | unit | default |
|---|---|---|---|---|
| | | 0 -2 | - | 1 |

You can set up the action mode of the real-time auto-gain tuning.

| Setup value | Mode | Varying degree of load inertia in motion |
|---|---|---|
| 0 | Invalid | Real-time auto-gain tuning function is disabled. |
| 1 | Interpolation motion | Used for interpolation motion, such as CNC, engraving machine, etc. |
| 2 | Point-to-point motion | Mainly used for point-to-point movement |

Note: If Pr0.02=1 or 2 , the values of Pr1.01 – Pr1.13 are all read only, they are automatically generated .

| Pr0.03 | Stiffness | Range | unit | default |
|---|---|---|---|---|
| | | 0 - 31 | - | 11 |

It can be set by S4 and S5. If they are "off & off". Screw-coupling load recommended stiffness range 10~14; pulley load recommended stiffness range 9~13. It is recommended to set a suitable value of Pr0.04 first, and then adjust the stiffness value.

Low ——► Machine stiffness ——► High

Low ——► Servo gain ——► High

0.1··········11.12.13··········30.31

Low ——► Response ——► High

Note: Higher the setup value, higher the velocity response and servo stiffness will be obtained. However, when increasing the value, need to avoid oscillation or vibration.

| Pr0.04 | Load inertia ratio | Range | unit | default |
|---|---|---|---|---|
| | | 0 -10000 | % | 300 |

It means that the ratio of load inertia against the motor rotor inertia. Recommended below 1000;

Pr0.04=( load inertia/rotate inertia)×100%

If the value of inertia ratio is set correctly, the unit of Pr1.01 and Pr1.06 will change to "Hz". If this value is too small, the motor will stop unstably, if the value is larger than the actual, the motor will shake when running,. How to get the correct value can be referred to Appendix A

| Pr0.08 | Microstep | Range | unit | default |
|---|---|---|---|---|
| | | 0-32767 | pulse | 4000 |

The number of pulses required for one revolution of the motor.
For some special users, it can use Pr0.09 (1st numerator of electronic gear) and Pr0.10 (Denominator of electronic Gear) to set required pulses number , they are availale when Pr0.08 is set to value 0.

| Pr2.22 | Positional Command Smoothing Filter | Range | unit | default |
|---|---|---|---|---|
| | | 0 -32767 | 0.1ms | 0 |

● Set up the time constant of the1st delay filter in response to the positional command.
● When a square wave command for the target speed Vc is applied ,set up the time constant of the 1st delay filter as shown in the figure below.

*Note: Restart the power to make new value available .*

## 6.3 Save Parameters

If you want the modified parameters continue to be valid after power off, please click both "Download" and "Save".
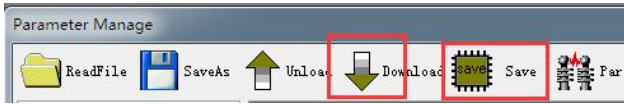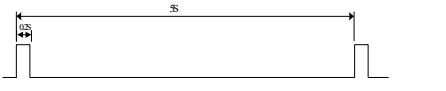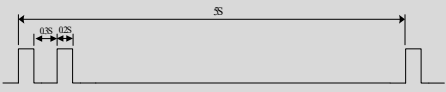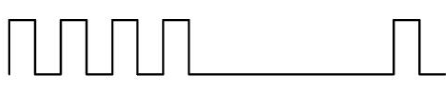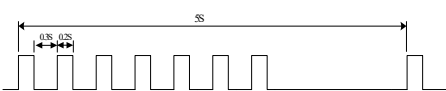


## 6.4 Restore to Factory

If you need to restore the factory settings, it can import the file with our factory parameter values, and then click both "Download" and "Save", then valid after re-power.
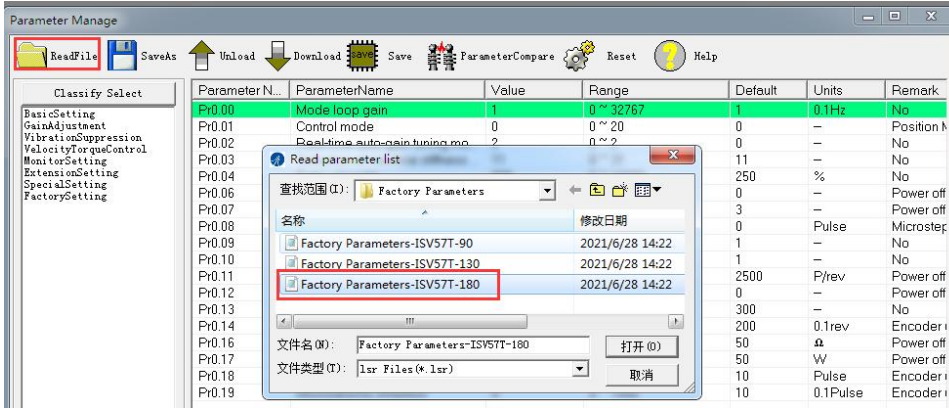


# 7. Fault Protections & Troubleshooting

To improve reliability, the drive incorporates some built-in protection features.

| Blink time(s) | Sequence wave of red LED | Description | Trouble shooting |
|---|---|---|---|
| 1 | | Over-current | Turn off the power immediately. a) Check if the machinery is stuck; b) Re-import factory parameters. |
| 2 | | Over-voltage | Turn off the power immediately. a) Check if the power supply is below 50V, default over-voltage point is 72VDC |
| 4 | | Over-load | Turn off the power immediately. c) Check if the machinery is stuck; a) Re-import factory parameters. |
| 5 | | Encoder error | Restart the power supply, if the drive is still alarm, please contact after-sale |
| 7 | | Position following error | a) Motor torque is not enough; b) Check if the machinery is stuck; c) Re-import factory parameters. |

When above protections are active, the motor shaft will be free and the red LED blinks. Reset the drive by repowering it to make it function properly after removing above problems.
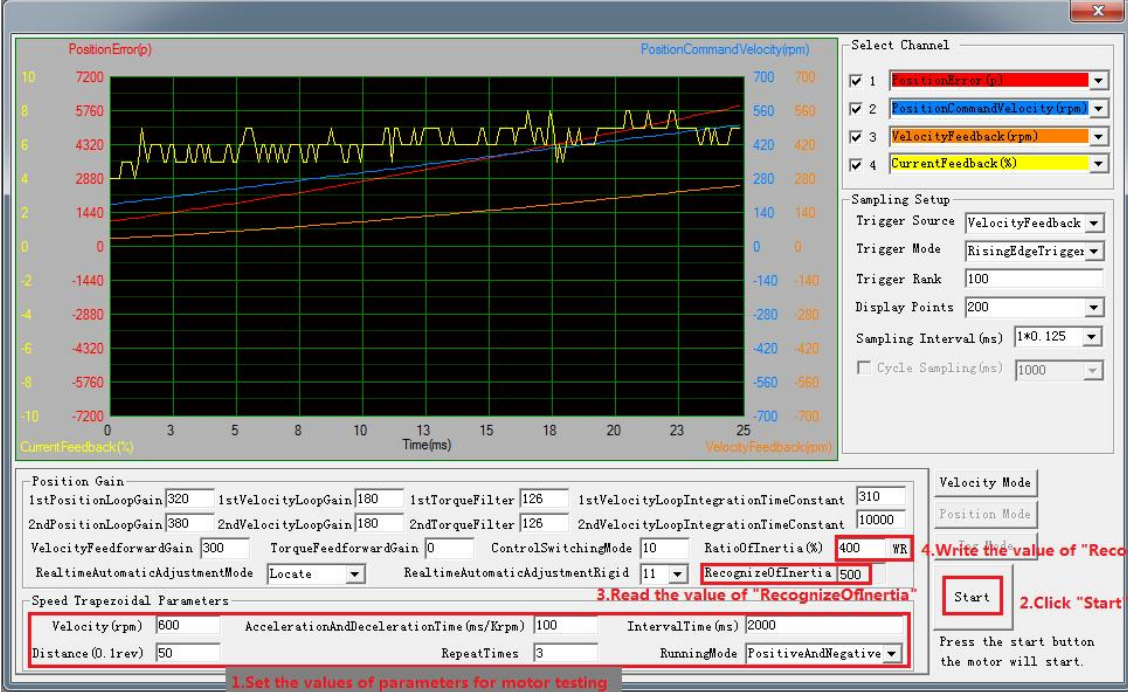
# Appendix A. How to get the correct Load inertia ratio

Load inertia ratio is a very important parameter for iSV57T(S) servo, and users need to set the correct load inertia ratio parameter before adjusting the correct rigidity parameter. Then the setup steps are as follows:

*Note: Do make the axis can be moved in safe distance, any interference should be avoided to ensure safety and accuracy of testing .*

(1) Connect motor with load, if there is no load, the value of load inertia ratio will be set to "0".

(2) Click "run test" , motor motion parameters and operating procedures are as follows:



The value of the load inertia ratio obtained from the above steps can satisfy most applications, but for some cases where the load inertia is very high, the value of Pr0.04 can be increased to more than 1000.

# Appendix B. Parameters List

The screenshot of the parameter list is provided for reference only. The figure is the factory parameter value of 180W integrated servo motor, because there are three motor models in this series, so the default parameters may not be the same.



| Parameter N... | ParameterName | Value | Range | Default | Units | Remark |
|---|---|---|---|---|---|---|
| Pr0.00 | Reserved parameters | 1 | 0 ~ 32767 | 1 | 0.1Hz | Invalid |
| Pr0.01 | Control mode | 0 | 0 ~ 10 | 0 | — | 0-Position |
| Pr0.02 | Real-time auto-gain tuning mo... | 1 | 0 ~ 2 | 1 | — | 1- for CNC |
| Pr0.03 | Selection of machine stiffness ... | 11 | 0 ~ 31 | 11 | — | Dynamic |
| Pr0.04 | Ratio of inertia | 250 | 0 ~ 10000 | 250 | % | Load iner |
| Pr0.06 | Motor rotational direction setup | 0 | 0 ~ 1 | 0 | — | Initial dire |
| Pr0.07 | Reserved parameters | 3 | 0 ~ 3 | 3 | — | Invalid |
| Pr0.08 | Microstep | 4000 | 0 ~ 32767 | 4000 | Pulse | Number c |
| Pr0.09 | 1st numerator of electronic gear | 1 | 1 ~ 32767 | 1 | — | No |
| Pr0.10 | Denominator of electronic gear | 1 | 1 ~ 32767 | 1 | — | No |
| Pr0.11 | Reserved parameters | 2500 | 1 ~ 2500 | 2500 | P/rev | Invalid |
| Pr0.12 | Reserved parameters | 0 | 0 ~ 1 | 0 | — | Invalid |
| Pr0.13 | 1st torque limit | 300 | 0 ~ 500 | 300 | — | No |
| Pr0.14 | Position deviation setup | 200 | 0 ~ 500 | 200 | 0.1rev | Encoder |
| Pr0.16 | Extenal regenerative resistor ... | 50 | 10 ~ 500 | 50 | Ω | Power off |
| Pr0.17 | Regeneration discharge resis... | 50 | 10 ~ 5000 | 50 | W | Power off |
| Pr0.18 | Vibration suppression - N after... | 0 | 0 ~ 1000 | 0 | Pulse | Encoder |
| Pr0.19 | Microseismic inhibition | 0 | 0 ~ 1000 | 0 | 0.1Pulse | Encoder |

| Classify Select | Parameter N... | ParameterName | Value | Range | Default | Units | Remark |
|---|---|---|---|---|---|---|---|
| BasicSetting | Pr1.00 | 1st position loop gain | 320 | 0 ~ 30000 | 320 | 0.1/s | No |
| GainAdjustment | Pr1.01 | 1st velocity loop gain | 180 | 1 ~ 32767 | 180 | 0.1Hz | No |
| VibrationSuppression | Pr1.02 | 1st time constant of velocity lo... | 310 | 1 ~ 10000 | 310 | 0.1ms | No |
| VelocityTorqueControl | Pr1.03 | 1st filter of velocity detection | 8 | 0 ~ 10000 | 15 | – | No |
| MonitorSetting | Pr1.04 | 1st torque filter | 126 | 0 ~ 2500 | 126 | 0.01ms | No |
| ExtensionSetting | Pr1.05 | 2nd position loop gain | 380 | 0 ~ 30000 | 380 | 0.1/s | No |
| SpecialSetting | Pr1.06 | 2nd velocity loop gain | 180 | 1 ~ 32767 | 180 | 0.1Hz | No |
| FactorySetting | Pr1.07 | 2nd time constant of velocity l... | 10000 | 1 ~ 10000 | 10000 | 0.1ms | No |
| | Pr1.08 | 2nd filter of velocity detection | 8 | 0 ~ 31 | 15 | – | No |
| | Pr1.09 | 2nd torque filter | 126 | 0 ~ 2500 | 126 | 0.01ms | No |
| | Pr1.10 | Velocity feed forward gain | 300 | 0 ~ 1000 | 300 | 0.10% | No |
| | Pr1.11 | Velocity feed forward filter | 50 | 0 ~ 6400 | 50 | 0.01ms | No |
| | Pr1.12 | Torque feed forward gain | 0 | 0 ~ 1000 | 0 | 0.10% | No |
| | Pr1.13 | Torque feed forward filter | 0 | 0 ~ 6400 | 0 | 0.01ms | No |
| | Pr1.14 | 2nd gain setup | 1 | 0 ~ 1 | 1 | – | No |
| | Pr1.15 | Control switching mode | 0 | 0 ~ 10 | 0 | – | No |
| | Pr1.17 | Control switching level | 50 | 0 ~ 20000 | 50 | mode | No |
| | Pr1.18 | Control switch hysteresis | 33 | 0 ~ 20000 | 33 | mode | No |
| | Pr1.19 | Gain switching time | 33 | 0 ~ 10000 | 33 | 0.1ms | No |
| | Pr1.33 | Speed given filter | 0 | 0 ~ 10000 | 0 | 0.01ms | No |
| | Pr1.35 | Position command digital filter... | 0 | 0 ~ 200 | 0 | 50ns | Power off |
| | Pr1.36 | Encoder feedback pulse digit... | 0 | 0 ~ 200 | 0 | 50ns | Power off |
| Add Custom | Pr1.37 | Special function register | 0 | 0 ~ 32767 | 0 | – | No |

| Classify Select | Parameter N... | ParameterName | Value | Range | Default | Units | Remark |
|---|---|---|---|---|---|---|---|
| BasicSetting | Pr2.01 | 1st notch frequency | 2000 | 50 ~ 2000 | 2000 | Hz | No |
| GainAdjustment | Pr2.02 | 1st notch width | 2 | 0 ~ 20 | 2 | – | No |
| VibrationSuppression | Pr2.03 | 1st notch depth | 0 | 0 ~ 99 | 0 | – | No |
| VelocityTorqueControl | Pr2.04 | 2nd notch frequency | 2000 | 50 ~ 2000 | 2000 | Hz | No |
| MonitorSetting | Pr2.05 | 2nd notch width | 2 | 0 ~ 20 | 2 | – | No |
| ExtensionSetting | Pr2.06 | 2nd notch depth | 0 | 0 ~ 99 | 0 | – | No |
| SpecialSetting | Pr2.22 | Positonal command smoothin... | 0 | 0 ~ 32767 | 0 | 0.1ms | Internal a |
| FactorySetting | Pr2.23 | Positional command FIR filter | 0 | 0 ~ 5000 | 0 | 0.1ms | No |