# Specifications

<table>
<tr><td rowspan="12">Basic specifications</td><td rowspan="6">Input power</td><td rowspan="2">100V</td><td colspan="2">Main circuit</td><td>Single phase, 100 – 115V $^{+10\%}_{-15\%}$ 50/60Hz</td></tr>
<tr><td colspan="2">Control circuit</td><td>Single phase, 100 – 115V $^{+10\%}_{-15\%}$ 50/60Hz</td></tr>
<tr><td rowspan="4">200V</td><td rowspan="3">Main circuit</td><td>A and B-frame</td><td>Single phase, 200 – 240V $^{+10\%}_{-15\%}$ 50/60Hz</td></tr>
<tr><td>C and D-frame</td><td>Single/3-phase, 200 – 240V $^{+10\%}_{-15\%}$ 50/60Hz</td></tr>
<tr><td>E and F-frame</td><td>3-phase, 200 – 230V $^{+10\%}_{-15\%}$ 50/60Hz</td></tr>
<tr><td rowspan="2">Control circuit</td><td>A to D-frame</td><td>Single phase, 200 – 240V $^{+10\%}_{-15\%}$ 50/60Hz</td></tr>
<tr><td>E and F-frame</td><td>Single phase, 200 – 230V $^{+10\%}_{-15\%}$ 50/60Hz</td></tr>
<tr><td rowspan="4">Environment</td><td colspan="2">Temperature</td><td>Operating : 0 to 55˚C, Storage : –20 to + 80˚C</td></tr>
<tr><td colspan="2">Humidity</td><td>Both operating and storage : 90%RH or less (free from condensation)</td></tr>
<tr><td colspan="2">Altitude</td><td>1000m or lower</td></tr>
<tr><td colspan="2">Vibration</td><td>5.88m/s2 or less, 10 to 60Hz (No continuous use at resonance frequency)</td></tr>
<tr><td colspan="3">Control method</td><td>IGBT PWM Sinusoidal wave drive</td></tr>
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|---|---|
| Encoder feedback | 17-bit (131072 resolution) absolute/incremental encoder, 2500P/r (10000 resolution) incremental encoder |
| External scale feedback | AT500 series by Mitutoyo (Resolution 0.05[μm] , max. speed 2[ m/s] ) ST771 by Mitutoyo (Resolution 0.5[μm] , max. speed 2[ m/s] ) |

<table>
<tr><td rowspan="2">Control signal</td><td>Input</td><td>10 inputs<br>(1) Servo-ON, (2) Control mode switching, (3) Gain switching/Torque limit switching, (4) Alarm clear<br>Other inputs vary depending on the control mode.</td></tr>
<tr><td>Output</td><td>6 outputs<br>(1) Servo alarm, (2) Servo ready, (3) Release signal of external brake (4) Zero speed detection,<br>(5) Torque in-limit. Other outputs vary depending on the control mode.</td></tr>
<tr><td rowspan="2">Analog signal</td><td>Input</td><td>3 inputs (16Bit A/D : 1 input, 10Bit A/D : 2 inputs)</td></tr>
<tr><td>Output</td><td>2 outputs (for monitoring)<br>(1) Velocity monitor (Monitoring of actual motor speed or command speed is enabled. Select the content and scale with parameter.), (2) Torque monitor (Monitoring of torque command, (approx.. 3V/rated torque)), deviation counter or full-closed deviation is enabled.<br>Select the content or scale with parameter.)</td></tr>
<tr><td rowspan="2">Pulse signal</td><td>Input</td><td>4 inputs<br>Select the exclusive input for line driver or photo-coupler input with parameter.</td></tr>
<tr><td>Output</td><td>4 outputs<br>Feed out the encoder pulse (A, B and Z-phase) or external scale pulse (EXA, EXB and EXZ-phase) in line driver. Z-phase and EXZ-phase pulse is also fed out in open collector.</td></tr>
<tr><td rowspan="2">Communication function</td><td>RS232</td><td>1 : 1 communication to a host with RS23 interface is enabled.</td></tr>
<tr><td>RS485</td><td>1 : n communication up to 15 axes to a host with RS485 interface is enabled.</td></tr>
<tr><td colspan="2">Front panel</td><td>(1) 5 keys (MODE, SET, UP, DOWN, SHIFT), (2) LED (6-digit)</td></tr>
<tr><td colspan="2">Regeneration</td><td>A and B-frame : no built-in regenerative resistor (external resistor only) C to F-frame :<br>Built-in regenerative resistor (external resistor is also enabled.)</td></tr>
<tr><td colspan="2">Dynamic brake</td><td>Setup of action sequence at Power-OFF, Servo-OFF, at protective function activation and over-travel inhibit input is enabled.</td></tr>
<tr><td colspan="2">Control mode</td><td>Switching among the following 7 mode is enabled, (1) Position control, (2) Velocity control, (3) Toque control, (4) Position/Velocity control, (5) Position/Torque control, (6) Velocity/Torque control and (7) Full-closed control.</td></tr>
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|---|---|---|---|
| **Control input** | | | Inputs of 1) Servo-ON, 2) Alarm clear, 3) Gain switching, 4) Control mode switching, 5) CW over-travel inhibition and 7) CCW over-travel inhibition are common, and other inputs vary depending on the control mode. |

| Function | | | | | |
|---|---|---|---|---|---|
| | **Position control** | Control input | | | (1) Deviation counter clear, (2) Command pulse inhibition, (3) Damping control switching, (4) Gain switching or Torque limit switching |
| | | Control output | | | Positioning complete (In-position) |
| | | Pulse input | Max. command pulse frequency | | Exclusive interface for line driver : 2Mpps, Line driver : 500kpps, Open collector : 200kpps |
| | | | Input pulse signal format | | Support (1) RS422 line drive signal and (2) Open collector signal from controller. |
| | | | Type of input pulse | | (1) CW/CCW pulse, (2) Pulse signal/rotational direction signal, (3) 90˚C phase difference signal |
| | | | Electronic gear (Division/ Multiplication of command pulse) | | Process the command pulse frequency $\times \dfrac{(1 \text{ to } 10000) \times 2^{(0 \text{ to } 17)}}{1 \text{ to } 10000}$ as a position command input |
| | | | Smoothing filter | | Primary delay filter is adaptable to the command input. Selectable of (1) Position control for high stiffness machine and (2) FIR type filter for position control for low stiffness machine. |
| | | Analog input | Torque limit command input | | Individual torque limit for both CW and CCW direction is enabled. (3V/rated torque) |
| | **Velocity control** | Control input | | | (1) Speed zero clamp, (2) Selection of internal velocity setup, (3) Gain switching or Torque limit switching input |
| | | Control output | | | (1) Speed arrival (at-speed) |
| | | Analog input | Velocity command input | | Setup of scale and rotational direction of the motor against the command voltage is enabled with parameter, with the permissible max. voltage input = Å} 10V and 6V/rated speed (default setup). |
| | | | Torque limit command input | | Individual torque limit for both CW and CCW direction is enabled. (3V/rated torque) |
| | | Speed control range | | | 1 : 5000 |
| | | Internal velocity command | | | 8-speed with parameter setup |
| | | Soft-start/down function | | | Individual setup of acceleration and deceleration is enabled, with 0 to 10s/1000r/min. Sigmoid acceleration/deceleration is also enabled. |
| | | Zero-speed clam | | | 0-clamp of internal velocity command with speed zero clamp input is enabled. |
| | **Torque control** | Control input | | | (1) CW over-travel inhibition, (2) CCW over-travel inhibition, (3) Speed zero clamp |
| | | Control output | | | (1) Speed arrival (at-speed) |
| | | Analog input | Velocity command input | | Setup of scale and CW/CCW torque generating direction of the motor against the command voltage is enabled with parameter, with the permissible max. voltage input = Å} 10V and 3V/rated speed (default setup). |
| | | | Speed limit input | | Speed limit input by analog voltage is enabled. Scale setup with parameter. |
| | | Speed limit function | | | Speed limit value with parameter or analog input is enabled. |
| | **Full-closed control** | Control input | | | (1) CW over-travel inhibition, (2) CCW over-travel inhibition (3) Deviation counter clear, (4) Command pulse input inhibition, (5) Electronic gear switching, (6) Damping control switching |
| | | Control output | | | (1) Full-closed positioning complete (in-position) |
| | | Pulse input | Max. command pulse frequency | | 500kpps (photo-coupler input), 2Mpps (Exclusive input for line driver) |
| | | | Input pulse signal format | | Differential input. Selectable with parameter ((1) CCW/CW, (2) A and B-phase, (3) Command and direction |
| | | | Electronic gear (Division/ Multiplication of command pulse) | | Process the command pulse frequency $\times \dfrac{(1 \text{ to } 10000) \times 2^{(0 \text{ to } 17)}}{1 \text{ to } 10000}$ as a position command input |
| | | | Smoothing filter | | Primary delay filter is adaptable to the command input. |
| | | Analog input | Torque limit command input | | Individual torque limit for both CW and CCW direction is enabled. (3V/rated torque) |
| | | Setup range of division/multiplication of external scale | | | Setting of ratio between encoder pulse (denominator) and external scale pulse (numerator) is enabled within a range of $(1 \text{ to } 10000) \times 2^{(0 - 17)} / (1 \text{ to } 10000)$. |
| | **Common** | Auto-gain tuning | Real-time | | Corresponds to load inertia fluctuation, possible to automatically set up parameters related to notch filter. |
| | | | Normal mode | | Estimates load inertia and sets up an appropriate servo gain. |
| | | | Fit-gain function | | Automatically searches and sets up the value which makes the fastest settling time with external command input. |
| | | Masking of unnecessary input | | | Masking of the following input signal is enabled. (1) Over-travel inhibition, (2) Torque limit, (3) Command pulse inhibition, (4) Speed-zero clamp |
| | | Division of encoder feedback pulse | | | Set up of any value is enabled (encoder pulses count is the max.). |
| | | Protective function | Soft error | | Over-voltage, under-voltage, over-speed over-load, over-heat, over-current and encoder error etc. |
| | | | Hard error | | Excess position deviation, command pulse division error, EEPROM error etc. |
| | | Traceability of alarm data | | | Traceable up to past 14 alarms including the present one. |
| | | Damping control function | | | Manual setup with parameter |
| | | Setup | Manual | | 5push switches on front panel    MODE        SET      △      ▽      ◁ |
| | | | Setup support software | | PANATERM® (Supporting OS : Windows95, Windows98, Windows ME, Windows2000, Windows.NET and Windows XP) |

# "Hit & Stop" Homing and "Press & Hold" Control

## Homing with Hit & Stop

You can set up the homing position with "Hit & Stop" where it is not easy to install a sensor due to environment.

(1) when you make a point where the work (load) hits as an origin

(2) when you stop the work (load) using Z-phase after making a hitting point as a starting point, then make that stopping point as an origin.
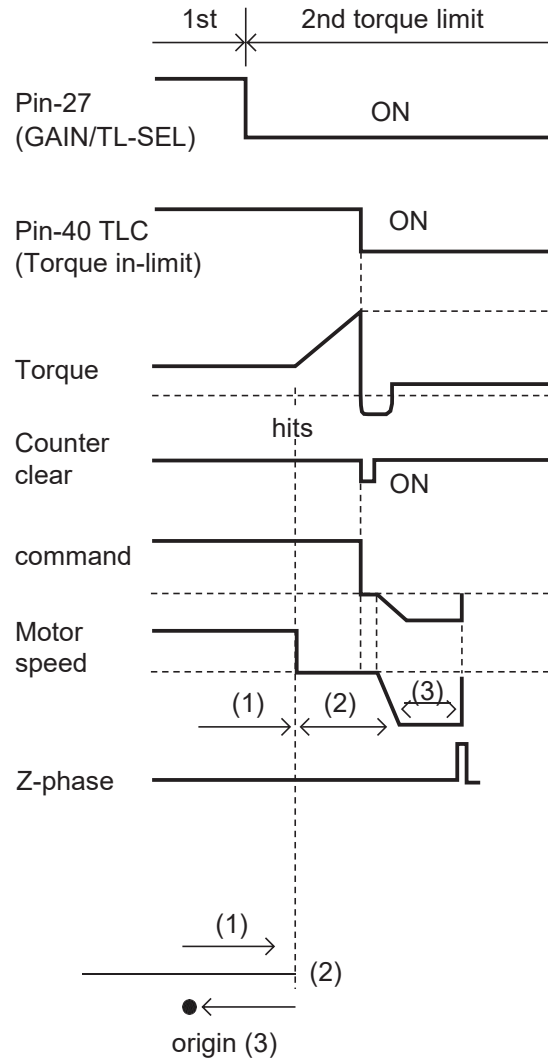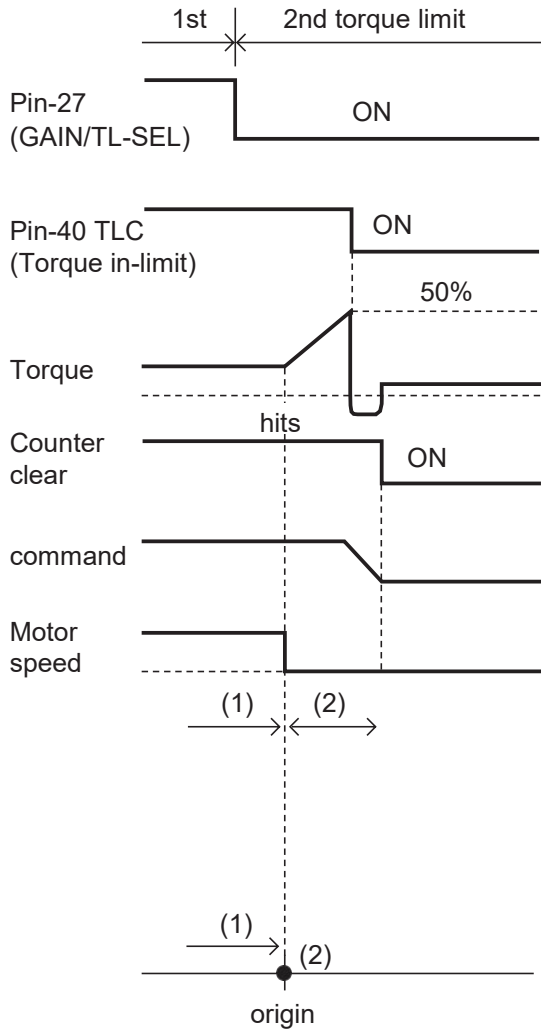


| Parameter No. | Title | Setup example |
|---|---|---|
| 5F | Setup of 2nd torque limit | 50 (Set up to less than 100%) |
| 70 | Excess setup of position deviation | 25000 |
| 73 | Setup of over-speed level | 0 (6000r/min) |
| 03 | Selection of torque limit | 3 |
| 09 | Selection of alarm output | 0 (Torque in-limit) |

**<Remarks>**
Make the Pin-27 H (Off= Open) after the Hit & Stop Homing is completed.