

■ Related parameters for internal multi-speed control

| Parameter No. | Parameter name | Description |
|----------------|---|---|
| P00.01 | Control mode selection | Set to 1 – Speed control mode |
| P03.00 | Speed command source | Set to 3 – internal multi-stage speed 1-16 switchover |
| P03.14 | Acceleration time 1 | Set the acceleration/deceleration time, range is between 0 and 65535ms |
| P03.15 | Deceleration time 1 | Set the acceleration/deceleration time, range is between 0 and 65535ms |
| P03.36- P03.51 | Speed from segment 1 to 16 | Parameter P03.36 is the 1st stage speed and so on. P03.51 the 16th stage speed. Initial value is 0 and make the setting by the actual usage |
| Notes | When using internal multi-stage speed, set the DI function 6-9 and select the speed by the switch combination | |

■ Fault and warning code description

| Code and name | Cause | What to do |
|--|--|---|
| Err. 001: System parameter error | 1. Control circuit power suddenly drops; 2. After updating servo software, some previously saved parameters exceed settings range. | 1. Make sure input power is within specified range. 2. Set P20.06-1 to initialized system parameters. |
| Err. 002: Product model selection fault | 1. Encoder cable connection broken or loose; 2. Invalid drive or motor model. | 1. Check and fasten encoder cable; 2. Replace with valid drive or motor model. |
| Err. 003: Parameter reading/writing too frequent; 2. Parameter storage component fault; 3. Control circuit power unstable; 4. Drive fault. | 1. Check if upper controller is reading/writing EEPROM too frequent; 2. Check control circuit power cable and ensure control circuit power voltage is within specified range. | 1. Check and fasten encoder cable; 2. Replace products that don't match; 3. Choose correct encoder type or replace the drive; 4. Use two levels of the drive; 5. Product model code doesn't exist. |
| Err. 004: FPGA fault | Software version fault. | Check if software version is correct. |
| Err. 005: Encoder cable connection broken or loose; 2. Use faulty encoder which is not supported; 3. Motor capacity and drive capacity don't match. Motor capacity class is larger than or two levels of the drive; 4. Product model code doesn't exist. | 1. Check and fasten encoder cable; 2. Check if motor cable or grounding resistance is abnormal. If so, replace the motor. | 1. Check and fasten encoder cable; 2. Check if motor cable or grounding resistance is abnormal. If so, replace the motor. |
| Err. 006: Software abnormal | 1. System parameter abnormal; 2. Drive internal fault. | Set P20.06-1 to initialized system parameters and restart power. |
| Err. 007: Internal encoder UVW abnormal | Encoder signal abnormal at power on. | Check or replace encoder cable. |
| Err. 008: Short circuit to ground detection fault | 1. UVW wiring fault; 2. Motor breakdown; 3. Drive fault. | 1. Check UVW is short circuited to ground. If so, replace cable; 2. Check if motor cable or grounding resistance is abnormal. If so, replace the motor. |
| Err. 009: Current limit fault A | 1. Instruction input is too fast; 2. Regenerative resistor too small or short circuited; 3. Motor cable bad contact; 4. Motor cable bad contact; 5. Motor UVW short circuited; 6. Motor burnt; 7. Software detected power transistor overcurrent | 1. Check instruction input time sequence and input after S-RDY; 2. Replace regenerative resistor; 3. Check and fasten encoder cable; 4. Replace motor if UVW insulation resistor is broken; 5. Check if UVW is short circuited; 6. Replace motor if UVW don't have equal resistance; 7. Reduce load, use bigger drive and motor, increase acceleration/deceleration time. |
| Err. 010: Overcurrent fault B | 1. Instruction input is too fast; 2. Regenerative resistor too small or short circuited; 3. Motor cable bad contact; 4. Motor cable bad contact; 5. Motor UVW short circuited; 6. Motor burnt; 7. Software detected power transistor overcurrent | 1. Check instruction input time sequence and input after S-RDY; 2. Replace regenerative resistor; 3. Check and fasten encoder cable; 4. Replace motor if UVW insulation resistor is broken; 5. Check if UVW is short circuited; 6. Replace motor if UVW don't have equal resistance; 7. Reduce load, use bigger drive and motor, increase acceleration/deceleration time. |
| Err. 012: Incremental encoder Z breakage or absolute encoder number of turns abnormal | 1. Incremental encoder: Z-phase signal loss due to cable breakage or encoder fault; 2. Absolute encoder: battery shortage, encoder cable plugging & unplugging during power off, or after P06.47-1 not initialize the encoder. | 1. Rotate motor shaft manually. If error still occurs, replace cable or encoder; 2. Replace battery if undervoltage; 3. P20.06-7 and initialize. |
| Err. 013: Communication abnormal | 1. Communication encoder cable breakage; 2. Encoder not grounded; 3. Communication verification abnormal. | 1. Check or replace encoder cable; 2. Check if encoder is grounded properly. |
| Err. 014: Encoder data abnormal | 1. Serial encoder breakage or bad contact; 2. Serial encoder data read/writing abnormal | Check or replace encoder cable. |
| Err. 015: Encoder battery undervoltage | Encoder battery voltage is less than P06.48 and test's place of P06.47-1. | Replace encoder battery. |
| Err. 016: Speed deviation too large | Speed instruction and speed feedback exceed settings of P06.45. | 1. Increase P06.45 value; 2. Increase acceleration/deceleration time or increase system responsiveness; 3. Set P06.45-1 to disable speed deviation too large function. |
| Err. 017: Torque saturation overtime | Torque maintains saturated for time longer than settings of P06.46. | 1. Increase P06.46 value; 2. Check if UVW is broken. |
| Err. 019: Tripping | Incorrect wiring may make the control circuit diverge and result in motor stall. | 1. Check UVW and encoder wiring; 2. Check the motor and drive. Replace it when necessary. |
| Err. 020: Overvoltage | 1. Input power voltage exceeds 280VAC; 2. Regenerative resistor breakage or not matching; 3. Load inertia exceeds allowable range; 4. Drive broken. | 1. Check input power voltage; 2. Check or replace regenerative resistor; 3. Increase acceleration/deceleration time or replace more suitable drive/motor; 4. Drive broken. |
| Err. 021: Undervoltage | 1. Input power voltage drops; 2. Instantaneous power off; 3. P06.36 settings is too high; 4. Drive broken (Note: No storage record for this fault by default, but can be set by P07.22.) | 1. Make sure input power is stable; 2. Reduce P06.36 value if input power is normal. |
| Err. 022: Current sampling fault | Drive internal current sampling fault. | Replace servo drive. |

| DO function description | Value | Sign | Name | Remarks |
|-------------------------|-------|------|--------------------------------------|---|
| 20 | PCOM2 | | Position 2 comparison trigger signal | Output trigger signal when position 2 reaches the corresponding range |
| 21 | PCOM3 | | Position 3 comparison trigger signal | Output trigger signal when position 3 reaches the corresponding range |
| 22 | PCOM4 | | Position 4 comparison trigger signal | Output trigger signal when position 4 reaches the corresponding range |

■ Parameter list

Control modes: P: Position control S: Speed control T: Torque control
● means applicable – means not applicable

| Parameter number | Description | Control mode | | |
|------------------|---|--------------|---|---|
| | | P | S | T |
| 00 | Motor direction definition | ● | ● | ● |
| 01 | Control mode selection | ● | ● | ● |
| 02 | Real time auto-tuning | ● | ● | ● |
| 03 | Stiffness grade setting | ● | ● | ● |
| 04 | Load inertia ratio | ● | ● | ● |
| 05 | Position instruction source | ● | ● | ● |
| 07 | Pulse train form | ● | ● | ● |
| 08 | Instruction units per motor one revolution (32-bit) | ● | ● | ● |
| 10 | Electronic gear numerator 1 (32-bit) | ● | ● | ● |
| 12 | Electronic gear denominator (32-bit) | ● | ● | ● |
| 14 | Pulse output counts per motor one revolution (32-bit) | ● | ● | ● |
| 16 | Pulse output positive direction definition | ● | ● | ● |
| 17 | Pulse output OZ polarity | ● | ● | ● |
| 18 | Pulse output function selection | ● | ● | ● |
| 19 | Position deviation too large threshold | ● | ● | ● |
| 21 | Braking resistor setting | ● | ● | ● |
| 22 | External resistor capacity | ● | ● | ● |
| 23 | External resistor resistance value | ● | ● | ● |
| 24 | External resistor heating time constant | ● | ● | ● |
| 25 | Brake voltage point | ● | ● | ● |
| 26 | Step value setting | ● | ● | ● |
| 27 | High-speed pulse train format | ● | ● | ● |
| 00 | Position loop gain 1 | ● | — | — |
| 01 | Speed loop gain 1 | ● | ● | — |
| 02 | Speed loop integral time 1 | ● | ● | — |
| 03 | Speed detection filter 1 | ● | ● | — |
| 04 | Torque instruction filter 1 | ● | ● | — |
| 05 | Position loop gain 2 | ● | — | — |
| 06 | Speed loop gain 2 | ● | ● | — |
| 07 | Speed loop integral time 2 | ● | ● | — |
| 08 | Speed detection filter 2 | ● | ● | — |
| 09 | Torque instruction filter 2 | ● | ● | — |
| 10 | Speed regulator PDFF coefficient | ● | — | — |
| 11 | Speed feedforward control selection | ● | — | — |
| 12 | Speed feedforward gain | ● | — | — |
| 13 | Speed feedforward filtering time | ● | — | — |
| 14 | Torque feedforward control selection | ● | — | — |
| 15 | Torque feedforward gain | ● | — | — |
| 16 | Torque feedforward filtering time | ● | — | — |
| 17 | Digital input GAIN-SWITCH function selection | ● | — | — |
| 18 | Position control gain switchover mode | ● | — | — |
| 19 | Position control gain switchover class | ● | — | — |
| 20 | Position control gain switchover delay | ● | — | — |
| 21 | Position control gain switchover hysteresis | ● | — | — |
| 22 | Position control gain switchover time | ● | — | — |
| 23 | Speed control gain switchover mode | — | ● | — |
| 24 | Speed control gain switchover delay | — | ● | — |
| 25 | Speed control gain switchover class | — | ● | — |
| 26 | Speed control gain switchover hysteresis | — | ● | — |
| 27 | Torque control gain switchover mode | — | ● | — |
| 28 | Torque control gain switchover delay | — | ● | — |
| 29 | Torque control gain switchover class | — | ● | — |
| 30 | Torque control gain switchover hysteresis | — | ● | — |
| 31 | Observer enabled | ● | ● | ● |
| 32 | Observer cutoff frequency | ● | ● | ● |
| 33 | Observer phase compensation time | ● | ● | ● |
| 34 | Observer inertia coefficient | ● | ● | ● |
| 00 | Position instruction smoothing filter | ● | — | — |
| 01 | Position instruction FIR filter | ● | — | — |
| 02 | Adaptive filtering mode | ● | ● | ● |
| 03 | Adaptive filter load mode | ● | ● | ● |
| 04 | First notch filter frequency (manual) | ● | ● | ● |
| 05 | First notch filter width | ● | ● | ● |
| 06 | First notch filter depth | ● | ● | ● |
| 07 | Second notch filter frequency (manual) | ● | ● | ● |
| 08 | Second notch filter width | ● | ● | ● |
| 09 | Second notch filter depth | ● | ● | ● |
| 10 | Third notch filter frequency | ● | ● | ● |
| 11 | Third notch filter width | ● | ● | ● |
| 12 | Third notch filter depth | ● | ● | ● |
| 13 | Fourth notch filter frequency | ● | ● | ● |
| 14 | Fourth notch filter width | ● | ● | ● |
| 15 | Fourth notch filter depth | ● | ● | ● |
| 19 | Position instruction FIR filter 2 | ● | — | — |

| Code and name | Cause | What to do |
|---|--|---|
| Err. 024: Overspeed | Not enabled; 1. The drive does not match; 2. Incorrect encoder wiring; Enabled: 1. Speed instruction exceeds maximum speed setting value; 2. Wrong UVW phase sequence; 3. Speed response over modulation; 4. Drive fault. | Not enabled: 1. Contact manufacturer; 2. Check encoder wiring; Enabled: 1. Lower speed instruction; 2. Adjust speed loop gains to reduce over speed; 3. Adjust speed loop gain; 4. Replace drive. |
| Err. 025: Electrical angle identification failure | 1. Load or inertia too large; 2. Wrong encoder cable wiring. | 1. Reduce load or increase current loop gains; 2. Replace encoder cable. |
| Err. 026: Load identification failure | 1. Load or inertia too large. Motor cannot run at specified curves; 2. Verification process aborted by other faults. | 1. Reduce load or increase current loop gains; 2. Make sure verification process correct. |
| Err. 027: DI parameter setting fault | 1. Different DOs are assigned with same function; 2. Physical DI and communication DI have definition conflicts. | Reassign DI functions |
| Err. 028: DO parameter setting fault | Different DOs are assigned with same function. | Reassign DO functions |
| Err. 040: S-ON instruction invalid fault | Input S-ON signal after motor is energized by other auxiliary functions. | Change incorrect operation. |
| Err. 042: Pulse division output overspeed | Pulse division output is over upper limit. | Adjust pulse division output settings. |
| Err. 043: Position deviation too large | 1. Servo motor UVW wiring is wrong; 2. Servo drive gain settings are too low; 3. Position instruction pulse frequency is too high; 4. Position instruction acceleration is too large; 5. P06.19 setting is too low; 6. Servo drive/motor faulty. | 1. Reconnect the cables; 2. Increase servo gains; 3. Reduce instruction frequency, acceleration or adjust gear ratio; 4. Set up smoothing parameters; 5. Adjust the value of P06.19; 6. Replace the drive. |
| Err. 045: Drive output phase loss | 1. Motor UVW bad contact; 2. Motor broken | 1. Check UVW wiring; 2. Replace motor |
| Err. 046: Drive overload warning | 1. Motor UVW or encoder cable bad contact or loose; 2. Motor blocked or brake not released; 3. Wrong UVW/encoder cable wiring for multiple drives/motors; 4. Motor/drive too small for load; 5. Phase loss or wrong phase sequence; 6. Motor or drive broken | 1. Check UVW/encoder cable wiring; 2. Check motor is not blocked and brake is released; 3. Check there is no wrong UVW/encoder cable wiring for multiple drives/motors; 4. Increase acceleration/deceleration time or choose bigger drive/motor; 5. Check UVW wiring; 6. Replace drive/motor; Note: If this fault occurs, please wait for more than 10mins to operate the motor after restarting the power. |
| Err. 047: Motor overload | 1. Motor UVW or encoder cable bad contact or loose; 2. Motor blocked or brake not released; 3. Wrong UVW/encoder cable wiring for multiple drives/motors; 4. Motor/drive too small for load; 5. Phase loss or wrong phase sequence; 6. Motor or drive broken | 1. Check UVW/encoder cable wiring; 2. Check motor is not blocked and brake is released; 3. Check there is no wrong UVW/encoder cable wiring for multiple drives/motors; 4. Increase acceleration/deceleration time or choose bigger drive/motor; 5. Check UVW wiring; 6. Replace drive/motor |
| Err. 048: Electronic gear setting fault | Electronic gear ratio exceeds setting range. | Set correct electronic gear |
| Err. 049: Heat sink too hot | 1. Fan broken; 2. Ambient temperature is too high; 3. Too many times of restarting power after overload; 4. Inappropriate installation directions and spacing; 5. Servo drive fault; 6. Motor or drive broken | 1. Check fan. Replace fan or drive; 2. Measure ambient temperature and improved cooling conditions for servo drive; 3. Check error records and see if there has been overload event. Restart after 30s; 4. Increase acceleration/deceleration time; 5. Install the servo drive according to specifications in this manual; 6. Power off and wait for 5 minutes. If this error persists, replace drive. |
| Err. 050: User forced fault | 1. Input pulse frequency is larger than maximum frequency setting; 2. Input pulse is interfered. | 1. Adjust P06.38; 2. Check wiring grounding conditions. Use twisted-pair shielded cable. Separate UVW cable from encoder cable. |
| Err. 054: User forced fault | User uses DI of function 32 FORCE_ERR to forcibly enter faulty state. | Disconnect DI of function 32. |
| Err. 055: Absolute position resetting fault | Absolute encoder absolute position resetting faulty. | Contact Hcfa. |
| Err. 056: Main circuit outage | Power outage or main circuit abnormal | Check if there is instantaneous power failure. Increase power voltage capacity. |
| Err. 060: First start after writing customized software | First start after writing customized software. | Initialize the servo drive. |
| Err. 065: CAN bus OFF | CAN bus disconnection or abnormal reception or sending | Check wiring and reconnect |
| Err. 066: Abnormal NMT command | NMT stop command or reset command received at servo-ON | NMT mode reset. Do not stop or reset CAN node at servo-ON. |
| Err. 067: CAN bus fault | CAN bus disconnection or abnormal reception or sending | Check wiring and reconnect |
| Err. 068: External overspeed (reserved) | 1. Speed command exceeds max. speed; 2. UVW phase sequence is wrong; 3. Speed response severely overshoot; 4. Servo drive faulty | 1. Reduce speed command; 2. Check UVW phase sequence; 3. Adjust speed loop gain; 4. Replace drive |

| Parameter number | Description | Control mode | | |
|------------------|--|--------------|---|-----|
| | | P | S | T |
| 20 | First vibration attenuation frequency | ● | ● | — |
| 21 | First vibration attenuation filter setting | ● | ● | — |
| 22 | Second vibration attenuation frequency | ● | ● | — |
| 23 | Second vibration attenuation filter setting | ● | ● | — |
| 31 | Resonance point 1 frequency | ● | ● | — |
| 32 | Resonance point 1 bandwidth | ● | ● | — |
| 33 | Resonance point 1 amplitude | ● | ● | — |
| 34 | Resonance point 2 frequency | ● | ● | — |
| 35 | Resonance point 2 bandwidth | ● | ● | — |
| 36 | Resonance point 2 amplitude | ● | ● | — |
| 00 | Speed instruction source selection | — | ● | — |
| 03 | Speed instruction digital setting | — | ● | — |
| 04 | JOG speed setting | — | ● | — |
| 08 | Torque limit source | — | ● | — |
| 09 | Internal forward torque limit | — | ● | — |
| 10 | Internal reverse torque limit | — | ● | — |
| 11 | External forward torque limit | — | ● | — |
| 12 | External reverse torque limit | — | ● | — |
| 14 | Acceleration time 1 | — | ● | — |
| 15 | Deceleration time 1 | — | ● | — |
| 16 | Acceleration time 2 | — | ● | — |
| 17 | Deceleration time 2 | — | ● | — |
| 19 | Zero-speed clamp function | — | ● | — |
| 20 | Zero-speed clamp threshold value | — | ● | — |
| 22 | Torque instruction source | — | ● | — |
| 25 | Braking instruction digital setting value | — | ● | — |
| 26 | Speed limit source in torque control | — | ● | — |
| 27 | Internal positive speed limit | — | ● | — |
| 28 | Internal negative speed limit | — | ● | — |
| 29 | Hard limit torque limit | — | ● | — |
| 30 | Hard limit torque limit detection time | — | ● | — |
| 31 | Internal speed instruction segment number selection mode | — | ● | — |
| 32 | Acceleration time selection for internal speed segment 1-8 | — | ● | — |
| 33 | Deceleration time selection for internal speed segment 1-8 | — | ● | — |
| 34 | Acceleration time selection for internal speed segment 9-16 | — | ● | — |
| 35 | Deceleration time selection for internal speed segment 9-16 | — | ● | — |
| 36-51 | Segment 1-16 speed | — | ● | — |
| 00 | Normal DI filter selection | ● | ● | ● |
| 01-08 | DI1-DI8 terminal function selection | ● | ● | ● |
| 11-18 | DI1-DI8 terminal logic selection | ● | ● | ● |
| 21-25 | DO1-DO5 terminal function selection | ● | ● | ● |
| 31-35 | DO1-DO5 terminal logic selection | ● | ● | ● |
| 41 | FunNL signal unassigned state (Hex) | ● | — | — |
| 42 | FunNH signal unassigned state (Hex) | ● | — | — |
| 43 | Motor rotational signal threshold | ● | — | — |
| 44 | Speed conformity signal width | — | ● | — |
| 45 | Speed reached designated value | — | ● | — |
| 47 | Positioning completion range | — | ● | — |
| 48 | Positioning completion output setting | — | ● | — |
| 49 | Positioning completion holding time | — | ● | — |
| 50 | Positioning near (NEAR) threshold | — | ● | — |
| 51 | Servo OFF delay time after holding brake taking action when speed is 0 | — | ● | — |
| 52 | Speed setting for holding brake to take action in motion | — | ● | — |
| 53 | Waiting time for holding brake to take action in motion | — | ● | — |
| 55 | Torque reached designated value | — | ● | — |
| 56 | Torque reached signal width | — | ● | — |
| 57 | Z-pulse width adjustment | — | ● | — |
| 58 | Zero-speed output threshold | — | ● | — |
| 00 | Electronic gear numerator 2(32-bit) | — | ● | — |
| 02 | Electronic gear numerator 3(32-bit) | — | ● | — |
| 04 | Electronic gear numerator 4(32-bit) | — | ● | — |
| 06 | Position deviation clearance function | — | ● | — |
| 09 | Electronic gear ratio switchover delay | — | ● | — |
| 10 | Potential energy load torque compensation | — | ● | — |
| 11 | P06.10 Friction compensation memory selections | — | ● | — |
| 12 | Forward rotation friction torque compensation | — | ● | — |
| 13 | Reverse rotation friction torque compensation | — | ● | — |
| 14 | Viscous friction compensation | — | ● | — |
| 15 | Friction compensation time constant | — | ● | — |
| 16 | Friction compensation low speed interval | — | ● | — |
| 19 | Parameter identification rate | — | ● | — |
| 20 | Parameter identification acceleration time | — | ● | — |
| 21 | Parameter identification deceleration time | — | ● | — |
| 22 | Parameter identification mode selection | — | ● | — |
| 23 | Initial angle identification current limit | — | ● | — |
| 24 | Instantaneous power failure protection | — | ● | — |
| 25 | Instantaneous power failure deceleration time | — | ● | — |
| 26 | Servo OFF stop mode selection | — | ● | — |
| 27 | Second category fault stop mode selection | — | ● | — |
| 28 | Over-travel input setting | — | ● | —</ |