| 5. Details of parameter | |
|---|------|
| List of Parameters | 4-2 |
| [Class 0] Basic setting | 4-4 |
| [Class 1] Gain adjustment | 4-13 |
| [Class 2] Damping control | 4-20 |
| [Class 3] Verocity/ Torque/ Full-closed control | 4-25 |
| [Class 4] I/F monitor setting | 4-33 |
| [Class 5] Enhancing setting | 4-43 |
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| 2.Trial Run (JOG run) | |
| Inspection Before Trial Run | 4-59 |

Trial Run by Connecting the Connector X44-60
Setup of Motor Rotational Speed and Input Pulse Frequency4-63

Setup

1. Details of parameter

List of Parameters

· A parameter is designated as follows:

Class-Parameter No.

· Definition of symbols under "Related mode" -

P: position control, S: velocity control,

T: torque control, F: full closed control

| Parametr No. | | Title | | | Rela | ed Co | ontrol | Mode | Detail | | |
|-------------------------|-----|----------------|----------------|------------------------|---------------------------------------|-------|--------|------|--------|---------|--|
| Class | No. | | | Title | | Р | S | Т | F | page | |
| | 00 | Rota | tional | direction se | tup | 0 | 0 | 0 | 0 | 4.4 | |
| | 01 | Cont | rol mo | de setup | | 0 | 0 | 0 | 0 | 4-4 | |
| | 02 | Real | -time | setup | | 0 | 0 | 0 | 0 | | |
| | 03 | auto- tunin | -gain Ig | Selection of stiffness | of machine | 0 | 0 | 0 | 0 | 4-5 | |
| | 04 | Inert | ia ratio | | | 0 | 0 | 0 | 0 | | |
| | 05 | | | input selec | ction | 0 | _ | _ | 0 | 4-6 | |
| <u>C</u> | 06 | | mand | | irection setup | 0 | _ | _ | 0 | | |
| ass | 07 | pulse | € | input mode | e setup | 0 | _ | _ | 0 | 4-7 | |
| <u>.</u> | 00 | Com | mand | pulse count | | | | | | | |
| œ | 80 | | | tor revolution | | 0 | | _ | _ | | |
| asi | 09 | 1st n | umera | tor of electr | onic gear | 0 | _ | _ | 0 | 4-8 | |
| CS | 10 | Deno | ominat | or of electro | nic gear | 0 | _ | _ | 0 | | |
| [Class 0] Basic setting | 11 | | ut puls | e counts pe | er one motor | 0 | 0 | 0 | 0 | 4-9 | |
| | 12 | Reve | ersal of | pulse outp | ut logic | 0 | 0 | 0 | 0 | | |
| | 13 | 1st to | orque l | imit | | 0 | 0 | 0 | 0 | ر د ر ر | |
| | 14 | Posit | tion de | viation exce | ess setup | 0 | _ | _ | 0 | 4-11 | |
| | 15 | Absc | olute er | ncoder setu | p | 0 | _ | _ | 0 | | |
| | 16 | | | | resistor setup | 0 | 0 | 0 | 0 | | |
| | 17 | Load | | of external | regenerative | 0 | 0 | 0 | 0 | 4-12 | |
| | 00 | | | . f | | To | | | | | |
| | 00 | | | of position lo | | 0 | _ | _ | 0 | | |
| | 01 | | _ | of velocity lo | · · · · · · · · · · · · · · · · · · · | 10 | 0 | 0 | 0 | | |
| | 02 | 1st | time of integr | | velocity loop | | 0 | 0 | 0 | 4-13 | |
| | 03 | | | of speed de | tection | | 0 | 0 | 0 | | |
| | 03 | | | | torque filter | | 0 | 0 | 0 | | |
| | 05 | | | of position l | <u> </u> | 10 | _ | | 0 | | |
| | | | | • | | - | _ | _ | | | |
| | 06 | | | of velocity lo | | 0 | 0 | 0 | 0 | | |
| | 07 | 2nd | time of integr | | velocity loop | | 0 | 0 | 0 | | |
| | 08 | | | of speed de | tection | | 0 | 0 | 0 | 4-14 | |
| <u>C</u> | 09 | | | | torque filter | | 0 | 0 | 0 | | |
| Class 1] Gain | 10 | | unie (| onoidni Ul | gain | | _ | _ | 0 | | |
| S | 11 | Velo | city fee | ed forward | | +- | F | F | | | |
| _ | | | | | filter | 0 | | F | 0 | | |
| ai | 12 | Torq | ue feed | d forward | gain | 0 | 0 | _ | 0 | 1 4- | |
| Ö | 13 | 0:- ' | | 4 | filter | 0 | 0 | _ | 0 | 4-15 | |
| gi | | 2nd (| gain se | | | 10 | 0 | 0 | 0 | | |
| djustment | 15 | Posi | tion | mode | | 0 | _ | _ | 0 | 4-16 | |
| nen | 16 | conti | | delay time | | 0 | _ | _ | 0 | | |
| - | 17 | | ching | level | | 0 | _ | _ | 0 | | |
| | 18 | _ | | hysteresis | | 0 | _ | _ | 0 | 4-17 | |
| | 19 | Posit | tion ga | in switching | j time | 0 | _ | _ | 0 | | |
| | 20 | 1/01- | oitı : | mode | | - | 0 | _ | _ | | |
| | 21 | Velo | , | delay time | | _ | 0 | _ | _ | 4-18 | |
| | 22 | switc | | level – (| | | 0 | _ | _ | 1-10 | |
| | 23 | | | hysteresis | | | 0 | | _ | | |
| | 24 | | | mode | | | _ | 0 | _ | | |
| | 25 | Torq | | delay time | | 1- | _ | 0 | _ | - | |
| | 26 | conti | | level | | - | _ | 0 | _ | 4-19 | |
| | 27 | SWILL | , mig | hysteresis | | 1- | _ | 0 | _ | 1 | |
| | | oto | | | r nosition co | | _ | | | | |

| Parametr No. | | | Title | Rela | ted Co | ontrol | Mode | Deta |
|---------------------------------------|-----|-------------------------|---------------------------------------|----------|----------|--------|------|------|
| Class | No. | | Title | Р | s | Т | F | pag |
| | 00 | Adaptive file | ter mode setup | 0 | 0 | _ | 0 | |
| | 01 | | frequency | 0 | 0 | 0 | 0 | |
| | 02 | 1st notch | width selection | 0 | 0 | 0 | 0 | |
| | 03 | | depth selection | 0 | 0 | 0 | 0 | 4-20 |
| | 04 | | frequency | 0 | 0 | 0 | 0 | |
| | 05 | 2nd notch | width selection | 0 | 0 | 0 | 0 | |
| | 06 | | depth selection | 0 | 0 | 0 | Ō | |
| | 07 | | frequency | 0 | 0 | 0 | 0 | |
| Class 2] Damping control | 08 | 3rd notch | width selection | 10 | 0 | 0 | 0 | |
| SSE | 09 | 0.4 | depth selection | 0 | 0 | 0 | 0 | 4-2 |
| 2] | 10 | | frequency | 0 | 0 | 0 | 0 | - |
| 밌 | 11 | 4th notch | width selection | 0 | 0 | 0 | 0 | |
| <u> </u> | 12 | 4011100011 | depth selection | 0 | 0 | 0 | 0 | |
| oin . | 13 | Salaction o | f damping filter switching | | | | 0 | |
| G C | 14 | | frequency | | | | 0 | 4-2 |
| ont | 15 | 1st damping | filter setup | 0 | Е | | 0 | 4-2 |
| <u>o</u> | _ | | · · · · · · · · · · · · · · · · · · · | +- | _ | _ | _ | 4-2 |
| | 16 | 2nd damping | frequency | 0 | | _ | 0 | |
| | 17 | | filter setup | 0 | _ | _ | 0 | 4-2 |
| | 18 | 3rd damping | frequency | 0 | _ | _ | 0 | 4-2 |
| | 19 | | filter setup | 0 | _ | _ | 0 | 4-2 |
| | 20 | 4th | frequency | 0 | _ | _ | 0 | 4-2 |
| | 21 | damping | filter setup | 0 | _ | _ | 0 | 4-2 |
| | 22 | Positional | smoothing filter | 0 | _ | _ | 0 | |
| | 23 | command | FIR filter | 0 | — | _ | 0 | 4-2 |
| | 00 | Speed setu switching | p, Internal/External | _ | 0 | _ | _ | 4-2 |
| | 01 | Speed | rotational direction selection | - | 0 | _ | _ | 7-2 |
| | 02 | command | input gain | T- | 0 | 0 | _ | ۸, |
| | 03 | | reversal input | - | 0 | _ | _ | 4-2 |
| | 04 | | 1st | - | 0 | _ | _ | |
| | 05 | | 2nd | <u> </u> | 0 | _ | _ | |
| | 06 | | 3rd | 1- | 0 | _ | _ | |
| 7 | 07 | Speed | 4th | 1- | 0 | _ | _ | |
| Class 3] | 08 | setup | 5th | 1_ | 0 | _ | _ | |
| SS | 09 | | 6th | 1_ | 0 | _ | _ | 4-2 |
| | 10 | | 7th | 1- | 0 | _ | _ | |
| /er | 11 | | 8th | 1_ | 0 | _ | _ | |
| <u>oci</u> | 12 | | acceleration | + | 0 | _ | _ | |
| ₹ | 13 | Time setup | deceleration | 1_ | 0 | _ | _ | |
| ō | | Sigmoid ac | celeration/ deceleration | | _ | | | |
| g e | 14 | time setup | | - | 0 | - | - | |
| € | 15 | Speed | function selection | 1- | 0 | 0 | _ | 4-2 |
| 프 | 16 | zero-clamp | | 1_ | 0 | 0 | _ | |
| <u>.</u> | 17 | · | selection | 1_ | _ | 0 | _ | |
| Verocity/ Torque/ Full-closed control | 18 | Torque | direction selection | + | _ | 0 | | 1 |
| g | 19 | command | input gain | + | _ | 0 | | 4-2 |
| CO | 20 | , | input gain | += | | 0 | | |
| at c | | Coood line is | + ' | +- | | - | Ē | |
| 므 | 21 | Speed limit value | 2 | +- | _ | 0 | F | 1, - |
| | 22 | vaiu c | | + | _ | 0 | | 4-3 |
| | 23 | | selection | +- | _ | _ | 0 | |
| | 24 | | numerator of division | 1- | — | 1 — | 10 | 1 |

denominator of division

reversal of direction Z phase disconnection

detection disable

excess setup

clear setup

4-31

4-32

• Only for position control type is not provided with X2 (Communication connector), X3 (Safety function connector), X5 (External scale connector) and analog input.

25

26

27

External

scale

28 | Hybrid

29 deviation

1. Details of parameter List of Parameters

| Class No. | Param | etr No. | | | | | | Relat | ted Co | ntrol | Mode | Detail | |
|--|----------|--------------------------|----------------|-------------------|----------------|---------------|----------------------|----------|--------|-------|------|------------------|--|
| Siz | Class | No. | Title | | | | | \vdash | _ | | _ | | |
| O1 O2 O3 O4 O4 O5 O5 O5 O5 O5 O5 | | 00 | | SI1 | (Pin | n N | lo.8) | 0 | 0 | 0 | 0 | 4-33 | |
| 10 | | 01 | | SI2 | (Pin | ı N | lo.9) | 0 | 0 | 0 | 0 | | |
| 1 | | 02 | | SI3 | (Pin | n N | lo.26) | 0 | 0 | 0 | 0 | | |
| 1 | | 03 | | SI4 | | | , | 0 | 0 | 0 | 0 | | |
| Selection Si6 (Pin No.29) | | 04 | Input | SI5 | ` | | , | 0 | 0 | 0 | 0 | | |
| SIB (Pin No.31) | | 05 | | SI6 | (Pin | n N | lo.29) | 0 | 0 | 0 | 0 | 4-34 | |
| Sign Pin No.32 | | 06 | | SI7 | | | , | 0 | 0 | 0 | 0 | | |
| 10 | | 07 | | SI8 | (Pin | n N | lo.31) | 0 | 0 | 0 | 0 | | |
| 10 | | 08 | | SI9 | (Pin | n N | lo.32) | 0 | 0 | 0 | 0 | | |
| 11 Output SO2 (\(\frac{\text{line driver output}}{\text{line driver output}} \) O O O O O O O O O | | 09 | | SI10 | | | | 0 | 0 | 0 | 0 | | |
| 11 Output SO2 (\(\frac{\text{line driver output}}{\text{line driver output}} \) O O O O O O O O O | | 10 | | SO1 | (Pin N | Vo.1 | 0, 11 er output | 0 | 0 | 0 | 0 | | |
| 12 | | 11 | | | (Pin N Line | No.3 driv | 34, 35 er output | 0 | 0 | 0 | 0 | | |
| 13 Selection SO4 | | 12 | Output | SO3 | (Pin N Line | No.3 driv | 66, 37 er output) | 0 | 0 | 0 | 0 | 4 25 | |
| 14 | | 13 | selection | | (Pin N | driv | er output) | 0 | 0 | 0 | 0 | 4-33 | |
| 16 | | 14 | | SO5 | (Pin N Oper | No.1 1 col | 2 llector output | 0 | 0 | 0 | 0 | | |
| 16 | | 15 | | SO6 | /Din N | No. 4 | ١٥ ١ | 0 | 0 | 0 | 0 | | |
| 17 | | 16 | Analog ma | nitor | | | | 0 | 0 | 0 | 0 | | |
| 27 28 29 Analog input 3 offset setup | - | 17 | Analog Inc | JI IILOI | | οι | utput gain | 0 | 0 | 0 | 0 | | |
| 27 28 29 Analog input 3 offset setup | Cla | 18 | Analog ma | nitor | 2 | ty | pe | 0 | 0 | 0 | 0 | 4-36 | |
| 27 28 29 Analog input 3 offset setup | SS | 19 Analog mo | | | _ | οι | utput gain | 0 | 0 | 0 | 0 | | |
| 27 28 29 Analog input 3 offset setup | 4] [| 20 | Type of dig | gital m | nonit | or | | 0 | 0 | 0 | 0 | | |
| 27 28 29 Analog input 3 offset setup | TT | 21 | Analog mo | nitor | outp | ut | setup | 0 | 0 | 0 | 0 | | |
| 27 28 29 Analog input 3 offset setup | nor | 22 | Ancles !: | | of | ffse | et setup | 0 | 0 | 0 | 0 | | |
| 27 28 29 Analog input 3 offset setup | nito | 23 | | out 1 | fil | ter | | 0 | 0 | 0 | 0 | | |
| 27 28 29 Analog input 3 offset setup |)r s | 24 | (7.11) | | 0\ | ver | rvoltage setup | 0 | 0 | 0 | 0 | 4-38 | |
| 27 28 29 Analog input 3 offset setup | etti | 25 | Amela | | of | ffse | et setup | 0 | 0 | 0 | 0 | | |
| 27 | ng | 26 | | out 2 | fil | ter | · | 0 | 0 | 0 | 0 | | |
| 29 | | 27 | (////_/ | | 0\ | ver | rvoltage setup | 0 | 0 | 0 | 0 | | |
| Color Colo | | 28 | Ancles ! | + ^ | of | ffse | et setup | 0 | 0 | 0 | 0 | \sqcup | |
| 30 | | 29 | | | | ter | | 0 | 0 | 0 | 0 | | |
| 32 (In-position) output setup 0 0 | | 30 | (,, (10) | | 0\ | ver | rvoltage setup | 0 | 0 | 0 | 0 | | |
| 32 (In-position) output setup 0 0 | | 31 | Positioning | g com | plete | Э | range | 0 | _ | _ | 0 | 4-39 | |
| 34 Zero-speed 35 Speed coincidence range 36 At-speed (Speed arrival) 37 Mechanical at stalling setup 38 brake action at running setup 39 Mechanical brake action at running setup 40 Selection of 41 alarm output 2 2 0 0 0 4 4 4 4 4 4 4 | | 32 | (In-position | n) | | | output setup | 0 | _ | _ | 0 | | |
| 35 Speed coincidence range 36 At-speed (Speed arrival) 37 Mechanical at stalling setup 38 brake action at running setup 39 Mechanical brake action at running setup 40 Selection of 1 | | 33 | INP hold ti | me | | | | 0 | _ | _ | 0 | | |
| 35 Speed coincidence range 36 At-speed (Speed arrival) 37 Mechanical at stalling setup 38 brake action at running setup 39 Mechanical brake action at running setup 40 Selection of 41 alarm output 2 42 2nd Positioning complete (In-position) | | 34 | Zero-spee | d | | | | 0 | 0 | 0 | 0 | 4-40 | |
| 37 Mechanical at stalling setup | | 35 | • | | | | <u> </u> | _ | 0 | - | _ | - + ∪ | |
| 38 brake action at running setup 0 0 0 0 | | 36 | At-speed (| Spee | d arr | iva | al) | _ | 0 | 0 | _ | | |
| 39 Mechanical brake action at running setup 40 Selection of 1 | | 37 | | · - | | | • . | 0 | _ | _ | 0 | 4-41 | |
| Company Setup 40 Selection of 1 2 2 3 3 4 4 4 4 4 4 4 4 | | 38 | | | | | | 0 | 0 | 0 | 0 | | |
| 40 Selection of 1 | | 39 | | al brak | ke ad | ctic | on at running | | | 0 | | | |
| 41 alarm output 2 | | | | | 4 | | | _ | | | | | |
| 10 2nd 01 3rd numerator of electronic gear 02 4th 03 Denominator of pulse output division 04 04 04 07 05 Sequence at over-travel inhibit 06 Sequence at Servo-Off 07 main power 07 08 07 09 CFF 09 CFF 09 CFF 09 CFF 09 CFF 09 CFF 09 09 00 00 00 00 00 | | | | ۷. ∟ | | | | _ | _ | | _ | 4-42 | |
| 10 2nd 01 3rd numerator of electronic gear 0 0 0 0 0 0 0 0 0 | | 41 | | | | . ام | ato (In position) | | 0 | U | 10 | | |
| 00 2nd 01 3rd numerator of electronic gear 0 0 0 0 0 0 0 0 0 | | 42 | | oning | com | pie | ete (In-position) | 0 | - | _ | 0 | | |
| O1 3rd | | | | | | | | _ | _ | _ | _ | | |
| 10 02 4th 03 Denominator of pulse output division 04 04-43 | | | | | | | | - | _ | _ | - | | |
| O3 Denominator of pulse output division O4 Over-travel inhibit input setup O5 Sequence at over-travel inhibit O6 Sequence at Servo-Off O7 Main power OFF Sequence CLV trip selection OFF D9 detection time OFF D9 Sequence at alarm O7 | | | | erator | of e | lec | ctronic gear | <u> </u> | - | _ | - | | |
| 12 Over-load level setup 0004446 | <u>C</u> | | | | | | | | _ | _ | | 4-43 | |
| 12 Over-load level setup 0004446 | ass | | | | • | | • | | _ | _ | _ | | |
| 12 Over-load level setup 0004446 | 5 | | | | | _ | | _ | - | - | - | | |
| 12 Over-load level setup 0004446 | ū | | | | | | | _ | _ | - | | | |
| 12 Over-load level setup 0004446 | nha | 06 Sequence at Servo-Off | | | | | | _ | | _ | 4-44 | | |
| 12 Over-load level setup 0004446 | nc | | main nower | | | | | | | | - | | |
| 12 Over-load level setup 0004446 | ing | 80 | | LV trip selection | | | | - | | | - | | |
| 12 Over-load level setup 0004446 | se | | detection time | | | on time | | | | _ | 4-45 | | |
| 12 Over-load level setup 0004446 | # I | | <u> </u> | | | | | _ | _ | | | | |
| | Q | | | | | | gency stop | _ | - | - | - | | |
| 13 Over-speed level setup | | | | | | _ | | 0 | 0 | | 0 | 4-46 | |
| | | 13 | Over-spee | d leve | el se | tup |) | 0 | 0 | 0 | 0 | | |

| Param | etr No. | Title | | | | Rela | ted Control Mode | | Detail | |
|-----------------------|--------------------------------|---|---------------------------|-------------|----------------|------|------------------|---|----------|------|
| Class | No. | | | | | | | | F | page |
| | 14 | Motor wo | rking rar | nge setup | | 0 | _ | _ | 0 | 4 40 |
| | 15 | I/F readin | | | | 0 | 0 | 0 | 0 | 4-46 |
| | 16 | Alarm cle | | setup | | 0 | 0 | 0 | 0 | |
| | 17 | Counter of | | | | 0 | _ | _ | 0 | |
| | 18 | Comman | | Invalidati | ion | 0 | _ | _ | 0 | 4-47 |
| | 19 | inhibit inp | a p a.oo | reading s | | 0 | _ | _ | 0 | |
| | 20 | Position s | 0 | _ | _ | 0 | | | | |
| 7 | 21 | Selection | | | | 0 | 0 | _ | 0 | 4-48 |
| Class 5] | 22 | 2nd torqu | | O IIITIIC | | 0 | 0 | | 0 | |
| S | 23 | Torque lin | | hina | 1 | 0 | 0 | | 0 | |
| 2 | 24 | setup | iii Switci | ning | 2 | 0 | | | 0 | |
| 팔 | 24 | Остар | positivo | direction | | | \vdash | | | |
| Enhancing setting | 25 | External | positive direction torque | | | | 0 | - | 0 | 4-49 |
| cin | | input | | e direction | n torque | | | | | |
| s Gi | 26 | | limit | - u | | 0 | 0 | - | 0 | |
| ětt | 27 | Input gair | of anal | og torque | limit | 0 | 0 | _ | 0 | |
| ing | 28 | LED initia | | | | 0 | 0 | 0 | 0 | |
| | 29 | RS232 | | | | 0 | 0 | 0 | 0 | 4-50 |
| | 30 | RS485 | baud ra | ate setup | | 0 | 0 | 0 | 0 | |
| | 31 | Axis addr | ess | | | 0 | 0 | 0 | 0 | |
| | 32 | | | nnut maxii | mum setup | 0 | Ĭ | | 0 | |
| | 33 | Pulse reg | | - | | 0 | 0 | 0 | 0 | 4-51 |
| | 34 | For manu | | | iiiii octup | | | | | 7 51 |
| | 35 | Front pan | | | | 0 | 0 | 0 | 0 | |
| | 33 | i ioni pan | IEI IUCK S | etup | | 0 | | | | |
| | 00 | Analog to | 0 | | | | | | | |
| | -00 | conversio | | | | | | | | |
| | 02 | Velocity d | | | | 0 | _ | _ | _ | 4-52 |
| | 04 | JOG trial run command speed | | | | | | 0 | 0 | 4-52 |
| | 05 | Position 3 | n 3rd gain valid time | | | | | _ | 0 | |
| | 06 | 1 OSILIOIT C | na gain | scale fa | scale factor O | | | | | |
| | 07 | Torque co | mmand | 0 | 0 | _ | 0 | | | |
| | 08 | Positive of | lirection | torque | | 0 | _ | _ | 0 | |
| | 09 | Mogativa | direction | compe | nsation | 0 | | | 0 | 4-53 |
| | | Negative | | 7 41.41 | | _ | _ | _ | _ | . 00 |
| | 10 | Function | • | | | 0 | 0 | 0 | 0 | |
| | 11 | Current re | | setup | | 0 | 0 | 0 | 0 | |
| _ | 13 | 2nd Inerti | | | | 0 | 0 | 0 | 0 | |
| Cla | 14 | Emergen | | | | 0 | 0 | 0 | 0 | |
| SS | 15 | 2nd over- | | | | 0 | 0 | 0 | 0 | 4-54 |
| ss 6] Special setting | 17 | Front pan | el paran | neter writi | ng | 0 | | | | |
| Sp | | selection | | | | | | | | |
| eci | 18 | Power-up | | | | 0 | 0 | 0 | 0 | |
| a | 19 | Encoder 2 | | | | _ | _ | _ | 0 | |
| ett | 20 | Z-phase s | | | | _ | _ | _ | 0 | |
| ing | 21 | | solute ex | ternal sca | ale Z phase | _ | _ | _ | 0 | 1 55 |
| | | setup | | ol ocala :- | u loo | | _ | | \vdash | 4-55 |
| | 22 | A, B phas | | | ouise | _ | _ | - | 0 | |
| | 23 | output method selection | | | | | | | | |
| | | Disturbance torque compensating gain Disturbance observer filter | | | | | | F | F | |
| | 24 | | | | | 0 | 0 | | | 4 50 |
| | 27 | Alarm late | | 1 | n onco- | 0 | 0 | 0 | 0 | 4-56 |
| | 31 | Real time | | estimatio | | 0 | 0 | 0 | 0 | , - |
| | 32 | auto tunir | | custom s | etup | 0 | 0 | 0 | 0 | 4-57 |
| | 34 | Hybrid vib | | gain | | _ | _ | _ | 0 |] |
| | 35 | suppressi | | filter | | _ | _ | _ | 0 | |
| | 37 Oscillation detection level | | | | 0 | 0 | 0 | 0 | 4-58 | |
| | | 38 Alarm mask setup | | | | | | | | |
| | 38 | Alarm ma | sk setup |) | | 0 | 0 | 0 | 0 | |

Setup

1. Details of parameter

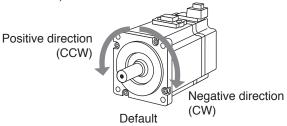
[Class 0] Basic setting

Default: []

| Pr0.00 * | Rotational direction setup | Range | Unit | Default | Related control mode |
|-----------|----------------------------|--------|------|---------|----------------------|
| Pro.00 ** | notational direction setup | 0 to 1 | _ | 1 | PSTF |

Setup the relationship between the direction of command and direction of motor rotation.

- 0: Motor turns CW in response to positive direction command (CW when viewed from load side shaft end)
- 1: Motor turns CCW in response to positive direction command (CCW when viewed from load side shaft end)



| Setup value | Command direction | Motor rotational direction | Positive direction drive inhibit input | Negative direction drive inhibit input |
|----------------|--------------------|----------------------------|--|--|
| 0 | Positive direction | CW | Valid | _ |
| 0 | Negative direction | CCW | _ | Valid |
| [4] | Positive direction | CCW | Valid | _ |
| [1] | Negative direction | CW | _ | Valid |

Pr0.01 * Control mode setup Range Unit Default Related control mode 0 to 6 0 P S T F

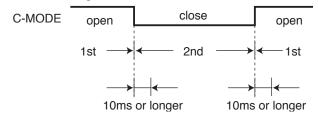
You can set up the control mode to be used.

| Setup | Content | | | | | |
|-------|-------------|----------|--|--|--|--|
| value | 1st mode | 2st mode | | | | |
| [0] | Position | _ | | | | |
| 1 | Velocity | _ | | | | |
| 2 | Torque | _ | | | | |
| 3 *1 | Position | Velocity | | | | |
| 4 *1 | Position | Torque | | | | |
| 5 *1 | Velocity | Torque | | | | |
| 6 | Full-closed | _ | | | | |

*1) When you set up the combination mode of 3, 4 or 5, you can select either the 1st or the 2nd with control mode switching input (C-MODE). When C-MODE is open, the 1st mode will be selected.

When C-MODE is shorted, the 2nd mode will be selected.

Don't enter commands 10ms before/after switching.



The waveform above shows when logical setting of C-MODE input is a-contact. When b-contact is used, open and short is reversed.

Note

- A parameter is designated as follows: Class Pro.00 Parameter No.
- For parameters which No. have a suffix of " * ", changed contents will be validated when you turn on the control power.
- Only for position control type is not provided with X2 (Communication connector), X3 (Safety function connector), X5 (External scale connector) and analog input.

Related page ..:

[Class 0] Basic setting

Default: []

| Pr0.02 | Real-time auto-gain tuning setup | Range | Unit | Default | Related control mode |
|--------|----------------------------------|--------|------|---------|----------------------|
| P10.02 | near-time auto-gam turning setup | 0 to 6 | - | 1 | P S T F |

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] | Standard | Basic mode. Do not use unbalanced load, friction compensation or gain switching. |
| 2 | Positioning *1 | Main application is positioning. It is recommended to use this mode on equipment without unbalanced horizontal axis, ball screw driving equipment with low friction, etc. |
| 3 | Vertical axis *2 | With additional features to the positioning mode - use this mode to positively and effectively compensate for unbalanced load to the vertical axis or minimize variations in setting time. |
| 4 | Friction compensation *3 | With additional features to the vertical axis mode - use this mode to positively and effectively reduce positioning setting time when the belt driving axis has high friction. |
| 5 | Load characteristic measurement | Estimate the load characteristics without changing current parameter setting. This mode requires use of the setup support software. |
| 6 | Customize *4 | Functions of real-time auto-gain tuning can be customized to meet the requirements of the specific application by combining desired functions according to the Pr6.32 "Real-time auto-gain tuning custom setting". |

- *1 Velocity and torque controls are the same as in the standard mode.
- *2 Torque control is the same as in the standard mode.
- *3 Velocity control is the same as in the vertical axis mode. Torque control is the same as in the standard mode.
- *4 Certain function(s) is not available in a specific control mode. Refer to description in Pr6.32.

| | Pr0.03 | Selection of machine stiffness | Range | Unit | Default | Rel | lated of mo | |
|----|--------|--------------------------------|---------|------|-------------------------------------|-----|----------------|---|
| Pr | 0.03 | at real-time auto-gain tuning | 0 to 31 | _ | A,B,C-frame: 13 D to H-frame: 11 | PS | Т | F |

You can set up the response while the real-time auto-gain tuning is valid.

Caution ··

Higher the setup value, higher the velocity response and servo stiffness will be obtained. However, when increasing the value, check the resulting operation to avoid oscillation or vibration.

Control gain is updated while the motor is stopped. If the motor cannot be stopped due to excessively low gain or continuous application of one-way direction command, any change made to Pr0.03 "Selection of machine stiffness at real-time auto-gain tuning" is not used for update. If the changed stiffness setting is made valid after the motor stopped, abnormal sound or oscillation will be generated. To prevent this problem, stop the motor after changing the stiffness setting and check that the changed setting is enabled.

Note

- A parameter is designated as follows: Class Pro.00 Parameter No.
- For parameters which No. have a suffix of " * ", changed contents will be validated when you turn on the control power.

Related page ..:

[Class 0] Basic setting

Default: []

| | Pr0.04 | Inertia ratio | Range | Unit | Default | R | elate rol r | | le |
|---|---|--|------------|------------|----------------|-------|----------------|----|----|
| | P10.04 | | 0 to 10000 | % | 250 * | P | S | Г | =] |
| | Set 1st inertia ratio. You can set up the ratio of the load inertia against the rotor (of the motor) inertia. | | | | | | | | |
| | | Pr0.04 = (load inertia/ rotor inertia) × 100 | [%] | | | | | | |
| | | The inertia ratio will be estimated at all time wits result will be saved to EEPROM every 30 m | | e auto-gai | n tuning is va | alid, | ar | nd | |
| Caution : If the inertia ratio is correctly set, the setup unit of Pr1.01 and Pr1.06 becomes (Hz). the inertia ratio of Pr0.04 is larger than the actual, the setup unit of the velocity loop | | | | | | | | | |

| Pr0.05 * | Selection of command pulse input | Range | Unit | Default | Related control mode | | |
|----------|--|------------------|------------|---------------|----------------------|------|---|
| P10.05 | Selection of command pulse input | 0 to 1 | - | 0 | Р | | F |
| | Vou can calcat either the photo coupler inpu | t or the evaluai | vo input f | or line drive | r 00 | th a | |

of the velocity loop gain becomes smaller.

You can select either the photo-coupler input or the exclusive input for line driver as the command pulse input.

becomes larger, and when the inertia ratio of Pr0.04 is smaller than the actual, the setup unit

| Setup value | Content | | |
|--|--|--|--|
| [0] Photo-coupler input (PULS1, PULS2, SIGN1, SIGN2) | | | |
| 1 | Exclusive input for line driver (PULSH1, PULSH2, SIGNH1, SIGNH2) | | |

Note

[•] Parameters which **default values have a suffix of " * "** will be automatically set up during real time auto-gain tuning. When you change manually, invalidate the real-time auto-gain tuning first then set, referring to P.5-8, "Release of Automatic Gain Adjusting Function" of Adjustment.

[Class 0] Basic setting

Default: []

| Pr0.06 * | Command pulse rotational direction setup | Range | Unit | Default | Related control mode |
|--|--|--------|------|---------|----------------------|
| Command pulse rotational direction setup | 0 to 1 | _ | 0 | P F | |
| D::0.07 * 0 | Command pulse input mode actus | Range | Unit | Default | Related control mode |
| Pr0.07 * | Command pulse input mode setup | 0 to 3 | _ | 1 | P F |

You can set up the rotational direction against the command pulse input, and the command pulse input format.

The table below shows combinations of Pr0.06 Command pulse rotational direction setup and Pr0.07 Command pulse input mode setup.

Pulses are counted at edges indicated by the arrows as shown in the table.

Input format command pulse

| Pr0.06 setup value Command pulse rotational direction setup | Pr0.07 setup value Command pulse input mode setup | Command pulse format | Signal title | Positive direction command | Negative direction command |
|--|---|---|-----------------|--|--|
| | 0 or 2 | 90° phase difference 2-phase pulse (A + B-phase) | PULS SIGN | A-phase B-phase t1 t1 B-phase advances to A by 90°. | t1 t |
| [0] | [1] | Positive direction pulse train + Negative direction pulse train | PULS SIGN | ,t3 | t2 t2 |
| | 3 | pulse train + Signal | PULS SIGN | t4 t5 "H" t6 | 14 t5 t6 t6 |
| | 0 or 2 | 90° phase difference 2-phase pulse (A + B-phase) | PULS SIGN | B-phase to the best of the bes | ti t |
| 1 | 1 | Positive direction pulse train + Negative direction pulse train | PULS SIGN | t2 t2 | 12 12 |
| | 3 | pulse train + Signal | PULS SIGN | t4 t5 "L" +6 | 14 t5 H" t6 |

· Permissible max. input frequency, and min. necessary time width of command pulse input signal.

| Input I/F of PULS/SIGN signal | | Permissible max. | N | /lin. nec | essary | time w | idth (µs | s) |
|--|--------------------------|------------------|----------------|----------------|--------|--------|------------|------------|
| | | input frequency | t ₁ | t ₂ | tз | t4 | t 5 | t 6 |
| Pulse train interface exclusive to line driver | | 4Mpps | 0.25 | 0.125 | 0.125 | 0.125 | 0.125 | 0.125 |
| Dulas train interfess | Line driver interface | 500kpps | 2 | 1 | 1 | 1 | 1 | 1 |
| Pulse train interface | Open collector interface | 200kpps | 5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 |

Make the rising/falling time of the command pulse input signal to $0.1 \mu s$ or smaller.

Note

- A parameter is designated as follows: Class Pro. On Parameter No.
 For parameters which No. have a suffix of " * ", changed contents will be validated when you turn on the control power.

[Class 0] Basic setting

Default: []

| Pr0.08 * | Command pulse counts per one motor | Range | Unit | Default | Related control mode |
|----------|---|--------------|-------|------------|----------------------|
| P10.00 | revolution | 0 to 1048576 | pulse | 10000 | P |
| | Set the command pulses that causes single tu When this setting is 0, Pr0.09 1st numerator electronic gear become valid. | | | 0.10 Denom | inator of |

| Pr0.09 | 1st numerator of electronic gear | Range | Unit | Default | conti | elate | |
|--------|----------------------------------|----------------------|------|---------|-------|-------|---|
| P10.09 | ist numerator of electronic gear | 0 to 2 ³⁰ | _ | 0 | Р | | F |
| | | | | | | | |

Set the numerator of division/multiplication operation made according to the command pulse input. This setup is enabled when Pr0.08 command pulse counts per one motor revolution = 0.

| Pr0.10 | Denominator of electronic gear | Range | Unit | Default | Rela | |
|--------|--|----------------------|------|---------|------|-----|
| P10.10 | Denominator of electronic gear | 1 to 2 ³⁰ | _ | 10000 | Р | F |
| | Set the Denominator of division/multiplication pulse input. This setup is enabled when Pr0.08 command | · | | J | | ınd |

<Interrelationship between Pr0.08, Pr0.09 and Pr0.10 during Position control>

| Pr0.08 | Pr0.09 | Pr0.10 | Command division/multiplication operation |
|--------------|-------------------|-------------------|--|
| 1 to 1048576 | — (Not effect) | – (Not effect) | Command pulse input Encoder resolution [Pr0.08 setup value] * Regardless of setup of Pr0.09 and Pr0.10, this operation is processed according to setup value of Pr0.08. |
| | 0 | 0 to 1073741824 | Command pulse input Encoder resolution [Pr0.10 setup value] * When both Pr0.08 and Pr0.09 are set to 0, this operation is processed according to setup value of Pr0.10. |
| 0 | 1 to 1073741824 | 1 to 1073741824 | Command pulse input [Pr0.09 setting] [Pr0.10 setting] * When setup value of Pr0.08 is 0, and Pr0.09 to setup value of Pr0.09 and Pr0.10. |

<Interrelationship between Pr0.08, Pr0.09 and Pr0.10 during full closed control>

Related page ·
·:•

[•] P.4-63... "Setup of Motor Rotational Speed and Input Pulse Frequency"

[•] P.6-7, P.6-8... "Protective function (Detail of error code)"

[Class 0] Basic setting

Default: []

| Pr0.08 | Pr0.09 | Pr0.10 | Command division/multiplication operation | | | |
|-----------|-----------------|-----------------|---|--|--|--|
| (Invelid) | 0 | 1 to 1073741824 | * If Pr0.09 is 0 during full closed controlling, the process as shown above is performed with both numerator and denominator set to 1. | | | |
| (Invalid) | 1 to 1073741824 | 1 to 1073741824 | Command pulse input [Pr0.09 setting] Command command [Pr0.10 setting] * When setup value of Pr0.09≠0, this operation is processed according to setup value of Pr0.09 and Pr0.10. | | | |

Caution ...

The desired setting can be determined by selecting value of numerator and denominator of electronic gear. However, an excessively high division or multiplication ratio cannot guarantee the operation. The ratio should be in a range between 1/1000 and 1000.

Excessively high multiplication ratio will cause Err27.2 (command pulse multiplication error protection) due to varying command pulse input or noises, even if the other settings are within the specified range.

During full closed controlling, do not change command division and multiplication ratio. Otherwise, Err25.0 (Hybrid over deviation alarm) will be generated.

| Pr0.11 * | Output pulse counts | Range | Unit | Default | Related control mode |
|----------|--------------------------|-------------|------|---------|----------------------|
| PIU.II | per one motor revolution | 0 to 262144 | P/r | 2500 | P S T F |

You can set up the output pulse counts per one motor revolution for each OA and OB with the Pr0.11 setup.

Caution ··

For details of setup, refer to description in Pr5.03.

Note

- A parameter is designated as follows: Class Pro.00 Parameter No.
- For parameters which No. have a suffix of " * ", changed contents will be validated when you turn on the control power.

Related page …:

- P.4-63... "Setup of Motor Rotational Speed and Input Pulse Frequency"
- P.6-7, P.6-8... "Protective function (Detail of error code)"

[Class 0] Basic setting

Default: []

| Pr5.03 * | Denominator of pulse output division | Range | Unit | Default | Related control mode |
|----------|--------------------------------------|-------------|------|---------|----------------------|
| | | 0 to 262144 | _ | 0 | P S T F |

For an application where the number of output pulses per one motor revolution is not an integer, set this parameter to a value other than 0; and the dividing ratio can be set by using Pr0.11 as the numerator and Pr5.03 as the denominator.

Output pulse counts per one revolution = (Pr0.11 setup value / Pr5.03 setup value) × Encoder resolution × $\frac{1}{4}$

<Combination of Pr0.11 Output pulse counts per one motor revolution and Pr5.03</p> Denominator of pulse output division>

| Pr0.11 | Pr5.03 | Pulse reproducing process | | | | |
|-------------|-------------|--|--|--|--|--|
| | [0] | When the output source is encoder Encoder feedback pulse [Pr0.11 setup value]×4 Encoder resolution * When Pr5.03 = 0, the above process is made according to Pr0.11 setup value. The number of pulses of reproduced pulse output OA and OB are the number of pulses set in Pr0.11. The resolution of pulse output per one revolution is equal to or less the encoder resolution. When the output source is external scale External scale pulse [pulse] 1 Division ratio is 1:1. | | | | |
| 1 to 262144 | 1 to 262144 | Encoder feedback pulse or external scale pulse [Pr0.11 setup value] [pulse] * If Pr5.03 is not equal to 0, then the above process is performed based on setup value of Pr0.11 and Pr5.03. * When the output source is encoder The number of reproduced pulses (OA, OB) per one motor revolution is not an integer. Note that when the number of pulses per one motor revolution is not an integer, Z-phase output is not synchronized with that of A-phase, reducing pulse width. The pulse output resolution per one revolution cannot become higher than the encoder resolution. When output source is external scale Setting: numerator (Pr0.11 setting) ≤ denominator (Pr.5.03 setting). No multiplication | | | | |



- A parameter is designated as follows: Class Pro. 00 Parameter No. For parameters which No. have a suffix of " * ", changed contents will be validated when you turn on the control power.

Related page · ∴

- P.2-82... "Setup of Torque Limit" P.3-30... "Inputs and outputs on connector X4"
- P.6-3... "Protective Function"

6

1. Details of parameter

[Class 0] Basic setting

Default: []

| Pr0.12 * | Reversal of pulse output logic | Range | Unit | Default | Related control mode |
|----------|--------------------------------|--------|------|---------|----------------------|
| P10.12 | | 0 to 3 | - | 0 | PSTF |

You can set up the B-phase logic and the output source of the pulse output. With this parameter, you can reverse the phase relation between the A-phase pulse and the B-phase pulse by reversing the B-phase logic. Encoder or external scale can be selected as the output source for full-closed control. The encoder is selected as the source if not for full-closed control.

<Reversal of pulse output logic>

| Pr0.12 | B-phase logic | Output source | CCW direction rotation | CW direction rotation |
|--------|---------------|----------------|------------------------|-----------------------|
| [0] | Non- | Encoder | A-phase | A-phase |
| 2 | reversal | External scale | B-phase | B-phase |
| 1 | Davaraal | Encoder | A-phase | A-phase |
| 3 | Reversal | External scale | B-phase | B-phase |

Caution 🔆

Setup value 2 and 3 are valid only for full-closed control. Setting must be 0 or 1 if not for full-closed control.

The selection of the output source of Z-phase is held concurrently.

Setup value 0 and 1 are Z-phase output of encoder.

Setup value 2 and 3 are Z-phase output of external scale.

| Pr0.13 | 1st torque limit | Range | Unit | Default | Related control mode |
|--|------------------|----------|------|---------|----------------------|
| P10.13 | | 0 to 500 | % | 500 | PSTF |
| You can set up the limit value of the motor output torque. | | | | | |

Note · For details of torque limit value, refer to P.2-82.

| Pr0.14 | Position deviation excess setup | Range | Unit | Default | Related control mode | | |
|---|---------------------------------|------------------|--------------|---------|----------------------|--|--|
| | | 0 to 134,217,728 | Command unit | 100000 | P F | | |
| Set excess range of positional deviation by the command unit (default). | | | | | | | |
| Setup unit can be changed to encoder unit through Pr5.20 (position setup unit selection). | | | | | | | |
| If the unit is changed, set up with the encoder pulse counts at the position control and with | | | | | | | |

• Err24.0 (Error detection of position deviation excess) becomes invalid when you set up this to 0.

Note · For description of "command unit" and "encoder unit", refer to P.4-48 "Pr5.20".

the external scale pulse counts at the full-closed control.

Pr0.15 * Absolute encoder setup Range Unit Default Related control mode 0 to 2 1 P F

You can set up the using method of 17-bit absolute encoder.

| Setup value | Function | | |
|-------------|---|--|--|
| 0 | Use as an absolute encoder. | | |
| [1] | Use as an incremental encoder. | | |
| 2 | Use as an absolute encoder, but ignore the multi-turn counter over. | | |

Caution · This

This parameter will be invalidated when 5-wire, 20-bit incremental encoder is used.

[Class 0] Basic setting

Default: []

Pr0.16 * External regenerative resistor setup Range Unit Default Related control mode 0 to 3 - A,B,G,H-frame: 3 C,D,E,F-frame: 0 P S T F

With this parameter, you can select either to use the built-in regenerative resistor of the driver, or to separate this built-in regenerative resistor and externally install the regenerative resistor (between B1 and B2 of Connector XB in case of A to D-frame, between B1 and B2 of Connector XC in case of D-frame(400V) and E-frame, between B1 and B2 of terminal block in case of F to H-frame).

A, B, G and H-frame driver is not provided with built-in resister.

| Setup value | Regenerative resistor to be used | Function |
|---------------------------|----------------------------------|---|
| [0] (C to F-frame) | Built-in resistor | Regenerative processing circuit will be activated and regenerative resistor overload protection will be triggered according to the built-in resistor (approx. 1% duty). |
| 1 | External resistor | The driver trips due to regenerative overload protection (Err18.0), when regenerative processing circuit is activated and its active ratio exceeds 10%. |
| 2 | External resistor | Regenerative processing circuit is activated, but no regenerative over-load protection is triggered. |
| [3] (A, B, G, H-frame) | No resistor | Both regenerative processing circuit and regenerative protection are not activated, and built-in capacitor handles all regenerative power. |

Remarks ·∵

Install an external protection such as thermal fuse when you use the external regenerative resistor.

Otherwise, the regenerative resistor might be heated up abnormally and result in burnout, regardless of validation or invalidation of regenerative over-load protection.

Caution ·∻

When you use the built-in regenerative resistor, never to set up other value than 0. Don't touch the external regenerative resistor.

External regenerative resistor gets very hot, and might cause burning.

| Pr0.17 * | Load factor of external regenerative | Range | Unit | Default | Related control mode |
|----------|--------------------------------------|--------|------|---------|----------------------|
| P10.17 | resistor selection | 0 to 4 | _ | 0 | PSTF |

When selecting the external regenerative resistor (Pr0.16 = 1, 2), select the computing method of load factor of regenerative resistor.

| Setup value | Function |
|-------------|---|
| [0] | Regenerative load factor is 100% when duty factor of external regenerative resistor is 10%. |
| 1 to 4 | For manufacturer's use (do not setup) |

Note

- A parameter is designated as follows: Class Pro.00 Parameter No.
- For parameters which No. have a suffix of " * ", changed contents will be validated when you turn on the control power.

Related page .

• P.2-12... "System Configuration and Wiring" • P.3-30... "Inputs and outputs on connector X4"

[Class 1] Gain adjustment

| Pr1.00 | 1st gain of position loop | Range | Unit | Default | Related control mode |
|--------|---------------------------|------------|-------|---------------------------------------|----------------------|
| | | 0 to 30000 | 0.1/s | A,B,C-frame: 480 D to H-frame: 320 | 1P1 1E1 |

You can determine the response of the positional control system.

Higher the gain of position loop you set, faster the positioning time you can obtain. Note that too high setup may cause oscillation.

| | D 4 04 | | Range | Unit | Default | Related control mode | |
|--------|--|------------|-------|---------------------------------------|---------|----------------------|--|
| Pr1.01 | 1st gain of velocity loop | 1 to 32767 | 0.1Hz | A,B,C-frame: 270 D to H-frame: 180 | P S T F | | |
| | You can determine the response of the velocity loop. | | | | | | |

In order to increase the response of overall servo system by setting high position loop gain, you need higher setup of this velocity loop gain as well. However, too high setup may cause oscillation.

Caution •• When the inertia ratio of Pr0.04 is set correctly, the setup unit of Pr1.01 becomes (Hz).

| D 4 00 | 1st time constant of velocity loop | Range | Unit | Default | Related control mode |
|--------|------------------------------------|------------|-------|---------------------------------------|----------------------|
| Pr1.02 | integration | 1 to 10000 | 0.1ms | A,B,C-frame: 210 D to H-frame: 310 | |
| | | | | | |

You can set up the integration time constant of velocity loop.

Smaller the setup, faster you can dog-in deviation at stall to 0.

The integration will be maintained by setting to "9999".

The integration effect will be lost by setting to "10000".

| Pr1.03 | 1st filter of speed detection | Range | Unit | Default | Related control mode |
|--------|-------------------------------|--------|------|---------|----------------------|
| Pr1.03 | ist litter of speed detection | 0 to 5 | _ | 0 | P S T F |
| | | | | | |

You can set up the time constant of the low pass filter (LPF) after the speed detection, in 6 steps.

Higher the setup, larger the time constant you can obtain so that you can decrease the motor noise, however, response becomes slow. Use with a default value of 0 in normal operation.

| D 4 04 | 4 | Range | Unit | Default | Related control mode | e |
|--------|------------------------------------|-----------|--------|--------------------------------------|----------------------|---|
| Pr1.04 | 1st time constant of torque filter | 0 to 2500 | 0.01ms | A,B,C-frame: 84 D to H-frame: 126 | | = |

You can set up the time constant of the 1st delay filter inserted in the torque command portion. You might expect suppression of oscillation caused by distortion resonance.

Note

• To Panasonic MINAS users: A4 and higher series

CAUTION: Parameter settings shown in this manual may differ from those applied to your product (s).

• For parameters which No. have a suffix of " * ", changed contents will be validated when you turn on the control power.

Related page

• P.3-30... "Inputs and outputs on connector X4"

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5

justment

6

When in Trouble

-

Supplement

[Class 1] Gain adjustment

Default: []

| D::1.05 | Ond noise of monition loss. | Range | Unit | Default Related control mode | |
|---|------------------------------------|------------|--------|---------------------------------------|--|
| Pr1.05 | 2nd gain of position loop | 0 to 30000 | 0.1/s | A,B,C-frame: 570 D to H-frame: 380 | |
| D 4 00 | | Range | Unit | Default Related control mode | |
| Pr1.06 | 2nd gain of velocity loop | 1 to 32767 | 0.1Hz | A,B,C-frame: 270 PST F | |
| Pr1.07 | 2nd time constant of velocity loop | Range | Unit | Default Related control mode | |
| P11.07 | integration | 1 to 10000 | 0.1ms | 10000 PSTF | |
| Pr1.08 | 2nd filter of speed detection | Range | Unit | Default Related control mode | |
| F11.00 | Zha liiter of speed detection | 0 to 5 | _ | 0 P S T F | |
| D 4 00 | | Range | Unit | Default Related control mode | |
| Pr1.09 | 2nd time constant of torque filter | 0 to 2500 | 0.01ms | A,B,C-frame: 84 PSTF | |
| Position loop, velocity loop, speed detection filter and torque command filter have their 2 pairs of gain or time constant (1st and 2nd). | | | | | |

Related page · ::

For details of switching the 1st and the 2nd gain or the time constant, refer to P.5-17 "Gain Switching Function" of Adjustment.

The function and the content of each parameter is as same as that of the 1st gain and time constant.

| Pr1.10 | Valority food forward gain | Range | Unit | Default | | Related control mod | |
|--------|-----------------------------------|-----------|-------|---------|---|---------------------|---|
| P11.10 | Pr1.10 Velocity feed forward gain | 0 to 1000 | 0.10% | 300 | Р | | F |

Multiply the velocity control command calculated according to the internal positional command by the ratio of this parameter and add the result to the speed command resulting from the positional control process.

| Pr1.11 | Velocity feed forward filter | Range | Unit | Default | | Related control mode | |
|--------|------------------------------|-----------|--------|---------|---|-------------------------|---|
| | velocity leed forward filter | 0 to 6400 | 0.01ms | 50 | Р | | F |

Set the time constant of 1st delay filter which affects the input of velocity feed forward.

<Usage example of velocity feed forward>

The velocity feed forward will become effective as the velocity feed forward gain is gradually increased with the velocity feed forward filter set at approx. 50 (0.5 ms). The positional deviation during operation at a constant velocity is reduced as shown in the equation below in proportion to the value of velocity feed forward gain.

Positional deviation [unit of command] = command speed [unit of command/s] / positional loop gain [1/s] × (100 - velocity feed forward gain [%]) / 100



- A parameter is designated as follows: Class Pro.00 Parameter No.
- For parameters which No. have a suffix of " * ", changed contents will be validated when you turn on the control power.

Related page •

3

Related

Unit

Default

1. Details of parameter

[Class 1] Gain adjustment

Default: []

| Pr1.12 | Torque feed forward gain Range Unit Defa | | Default | Related control mode | |
|--------|---|--|---------------------------------------|--|--------------------------------|
| P11.12 | Torque reed forward gain | 0 to 1000 | 0.1% | 0 | PS F |
| | Multiply the torque command calculated accratio of this parameter and add the result to the control process. Positional deviation at a constant acceleration increasing the torque forward gain. This means at near 0 over entire operation range while decondition where disturbance torque is not actra. | he torque comm on/deceleration of ons that positional riving in trapezo | and resultant be mirely all deviation | ting from the nimized clos n can be ma | e velocity e to 0 by aintained |

| Pr1.13 | Torque feed forward filter | Range | Unit | Default | Re | elated rol mo | |
|--------|----------------------------|-----------|--------|---------|----|------------------|---|
| | | 0 to 6400 | 0.01ms | 0 | PS | S | F |

- · Set up the time constant of 1st delay filter which affects the input of torque feed forward.
- The torque feed forward will become effective as the torque feed forward gain is gradually increased with the torque feed forward filter is set at approx. 50 (0.5 ms).

Usage example of torque feed forward>

- To use the torque feed forward, correctly set the inertia ratio.

 Use the value that was determined at the start of the real time auto tuning, or set the inertia ratio that can be calculated from the machine specification to Pr0.04 Inertia ratio.
- The torque feed forward will become effective as the torque feed forward gain is gradually increased with the torque feed forward filter is set at approx. 50 (0.5 ms).
- Positional deviation at a constant acceleration/deceleration can be minimized close to 0 by increasing the torque forward gain. This means that positional deviation can be maintained at near 0 over entire operation range while driving in trapezoidal speed pattern under ideal condition where disturbance torque is not active.

Caution -❖

Zero positional deviation is impossible in actual situation because of disturbance torque.

As with the velocity feed forward, large torque feed forward filter time constant decreases the operating noise but increases positional deviation at acceleration change point.

Range

| Pr1.14 | 2nd gain se | atun | | 0 | 20.00.0 | control | moa |
|---|--------------------------------------|--|--|------------------|------------|---------|-----|
| P11.14 | 111.14 Ziid gaiii setap | | 0 to 1 | _ | 1 | PS | TF |
| Arrange this parameter when performing optimum adjustment by using the gain function. | | | | | | | ng |
| | Setup value Gain selection/switching | | | | | | |
| | 0 | 1st gain is fixed at a value. By use the velocity loop operation from GAIN input photo-coupler OF GAIN input photo-coupler ON * The above description applea-contact. ON/OFF of photo- | PI to P. F → PI operation → P operation ies when the lo | n gical setti | ng of GAIN | _ | |
| | [1] | Enable gain switching of 1st g Pr1.09). | ain (Pr1.00-Pr1 | 1.04) and | 2nd gain (| Pr1.05 | 5- |

Related page : For switching condition of the 1st and the 2nd, refer to P.5-17 "Gain Switching Function" of Adjustment.

[Class 1] Gain adjustment

| Pr1.15 | Mode of position control switching | Range | Unit | Default | Rela control | | Э |
|--------|------------------------------------|---------|------|---------|-----------------|---|---|
| | wode of position control switching | 0 to 10 | _ | 0 | Р | F | - |

Set up the triggering condition of gain switching for position control.

| Cotuus | Cusitahina | |
|----------------|---|--|
| Setup value | Switching condition | Gain switching condition |
| [0] | Fixed to 1st gain | Fixed to the 1st gain (Pr1.00 to Pr1.04). |
| 1 | Fixed to 2nd gain | Fixed to the 2nd gain (Pr1.05 to Pr1.09). |
| 2 | With gain switching input | 1st gain when the gain switching input (GAIN) is open. 2nd gain when the gain switching input (GAIN) is connected to COM * If no input signal is allocated to the gain switching input (GAIN), the 1st gain is fixed. |
| 3 | Torque command is large | Shift to the 2nd gain when the absolute value of the torque command exceeded (level + hysteresis) (%) previously with the 1st gain. Return to the 1st gain when the absolute value of the torque command was kept below (level - hysteresis) (%) previously during delay time with the 2nd gain. |
| 5 | Speed command is large | Valid for position and full-closed controls. Shift to the 2nd gain when the absolute value of the speed command exceeded (level + hysteresis) (r/min) previously with the 1st gain. Return to the 1st gain when the absolute value of the speed command was kept below (level - hysteresis) (r/min) previously during delay time with the 2nd gain. |
| 6 | Position deviation is large | Valid for position and full-closed controls. Shift to the 2nd gain when the absolute value of the positional deviation exceeded (level + hysteresis) (pulse) previously with the 1st gain. Return to the 1st gain when the absolute value of the positional deviation was kept below (level - hysteresis) (pulse) previously over delay time with the 2nd gain. * Unit of level and hysteresis (pulse) is set as the encoder resolution for positional control and external scale resolution for full-closed control. |
| 7 | Position command exists | Valid for position and full-closed controls. Shift to the 2nd gain when the positional command was not 0 previously with the 1st gain. Return to the 1st gain when the positional command was kept 0 previously during delay time with the 2nd gain. |
| 8 | Not in positioning complete | Valid for position and full-closed controls. Shift to the 2nd gain when the positioning was not completed previously with the 1st gain. Return to the 1st gain when the positioning was kept in completed condition previously during delay time with the 2nd gain. |
| 9 | Actual speed is large | Valid for position and full-closed controls. Shift to the 2nd gain when the absolute value of the actual speed exceeded (level + hysteresis) (r/min) previously with the 1st gain. Return to the 1st gain when the absolute value of the actual speed was kept below (level - hysteresis) (r/min) previously during delay time with the 2nd gain. |
| 10 | Position command exists + Actual speed | Valid for position and full-closed controls. Shift to the 2nd gain when the positional command was not 0 previously with the 1st gain. Return to the 1st gain when the positional command was kept at 0 during the delay time and the absolute value of actual speed was kept below (level - hysteresis) (r/min) previously with the 2nd gain. |

| Pr1.16 | Dolov time of position control switching | Range | Unit | Default | Related control m | |
|--------|--|------------|-------|---------|----------------------|---|
| | Delay time of position control switching | 0 to 10000 | 0.1ms | 50 | Р | F |

For position controlling: When shifting from the 2nd gain to the 1st gain with Pr1.15 Position control switching mode set at 3, 5, 6, 7, 8, 9 or 10, set up the delay time from trigger detection to the switching operation.

Note

- A parameter is designated as follows: Class Pro. Parameter No. For parameters which No. have a suffix of " * ", changed contents will be validated when you turn on the control power.

Related page ·: P.3-30... "Inputs and outputs on connector X4"

[Class 1] Gain adjustment

Default: []

| Pr1.17 | Level of position control switching | Range | Unit | Default | Related control mode |
|--|--|------------|--------------------|---------|----------------------|
| P11.17 | | 0 to 20000 | Mode- dependent | 50 | P F |
| For position controlling: Set up triggering level when Pr1.15 Position control gain switching mode is set at 3, 5, 6, 9 or 10. Unit of setting varies with switching mode. Caution : Set the level equal to or higher than the hysteresis. | | | | | |
| Caution "," | Set the level equal to or higher than the hyster | esis. | | | |

| Pr1.18 | Hysteresis at position control switching | Range | Unit | Default | | elated rol mo | |
|--|--|------------|--------------------|---------|---|------------------|---|
| P11.10 | hysteresis at position control switching | 0 to 20000 | Mode- dependent | 33 | Р | | F |
| For position controlling: Set up triggering hysteresis when Pr1.15 Position control gain switching mode is set at 3, 5, 6, 9 or 10. Unit of setting varies with switching mode. | | | | | | | 1 |
| Caution ·∻ | When level < hysteresis, the hysteresis is internally adjusted so that it is equal to level. | | | | | | |

| Pr1.19 | Position gain switching time | Range | Unit | Default | Related control mode | |
|---|--|---------------------|----------|-------------|----------------------|--|
| | T conton gam curtoning time | 0 to 10000 | 0.1ms | 33 | P F | |
| | For position controlling: If the difference betwee 2nd gain of poison loop is large, the increasing this parameter. The position loop gain will increase over the time. | ng rate of position | | | | |
| <position gain="" switching="" time=""> When using position control and full-closed control, gain of position loop rapidly change causing torque change and vibration. By adjusting Pr1.19 Position gain switching to increasing rate of the poison loop gain can be decreased and vibration level can be reduced.</position> | | | | | | |
| Caution ·* | Setting of this parameter does not affect the loop is switched to lower level (gain is switched Example: 1st (Pr1.00) > 2nd (Pr1.05) | | ime when | the gain of | f position | |
| | 2nd (Pr1.05) | | | | | |
| 1st (Pr1.00) switching time (ms) (Pr1.19) Result of switching 1st 2nd 1st | | | | | | |



- A parameter is designated as follows: Class Pro. Parameter No. For parameters which No. have a suffix of " * ", changed contents will be validated when you turn on the control power.

Related page ..:

[Class 1] Gain adjustment

Default: []

| Pr1.20 | Mode of velocity control switching | Range | Unit | Default | Related control mode |
|--------|------------------------------------|--------|------|---------|----------------------|
| P11.20 | | 0 to 5 | _ | 0 | S |

For velocity controlling: Set the condition to trigger gain switching.

| Setup value | Switching condition | Gain switching condition |
|-------------|------------------------------------|--|
| [0] | Fixed to the 1st gain. | Fixed to the 1st gain (Pr1.00 to Pr1.04). |
| 1 | Fixed to the 2nd gain. | Fixed to the 2nd gain (Pr1.05 to Pr1.09). |
| 2 | Gain switching input | 1st gain when the gain switching input (GAIN) is open. 2nd gain when the gain switching input (GAIN) is connected to COM * If no input signal is allocated to the gain switching input (GAIN), the 1st gain is fixed. |
| 3 | Torque command | Shift to the 2nd gain when the absolute value of the torque command exceeded (level + hysteresis) (%) previously with the 1st gain. Return to the 1st gain when the absolute value of the torque command was kept below (level - hysteresis) (%) previously during delay time with the 2nd gain. |
| 4 | Speed command variation is larger. | Valid only during velocity control. Shift to the 2nd gain when the absolute value of the speed command variations exceeded (level + hysteresis) (10r/min/s) previously with the 1st gain. Return to the 1st gain when the absolute value of the speed command variations was kept below (level - hysteresis) (10r min/s) during delay time previously with the 2nd gain. * The 1st gain is fixed while the velocity control is not applied. |

Related page :: For the switching level and timing, refer to P.5-18, "Setup of Gain Switching Condition" of Adjustment.

| Pr1.21 | Delay time of velocity control switching | Range | Unit | Default | Related control mode |
|--------|--|------------|-------|---------|----------------------|
| P11.21 | Delay time of velocity control switching | 0 to 10000 | 0.1ms | 0 | S |

For velocity controlling: When shifting from the 2nd gain to the 1st gain with Pr1.20 Velocity control switching mode set at 3, 4 or 5, set the delay time from trigger detection to the switching operation.

| Pr1.22 Level of velocity control switching | ange Unit | Default | control mode |
|---|-------------------|---------|--------------|
| Pr1.22 Level of velocity control switching 0 to | 20000 Mode depend | ent 0 | s |

For velocity controlling: Set up triggering level when Pr1.20 Velocity control gain switching mode is set at 3, 4 or 5.

Caution : Unit of setting varies with switching mode.

Set the level equal to or higher than the hysteresis.

Pr1.23 Hysteresis at velocity control switching Range Unit Default Related control mode dependent 0 to 20000 Mode-dependent 0 S

For velocity controlling: Set up triggering hysteresis when Pr1.20 Velocity control gain switching mode is set at 3, 4 or 5.

Caution

✓ Unit of setting varies with switching mode.

When level < hysteresis, the hysteresis is internally adjusted so that it is equal to level.

Note • A parameter is designated as follows: Class Pro.00 Parameter No.

• For parameters which No. have a suffix of " * ", changed contents will be validated when you turn on the control power.

Related page ·: P.3-30... "Inputs and outputs on connector X4"

[Class 1] Gain adjustment

Default: []

| | Dr1 2/ | Mode of torque control switching | Range | Unit | Default | Related control mode |
|------------|--------|----------------------------------|--------|------|---------|----------------------|
| 0 to 3 — 0 | Pr1.24 | | 0 to 3 | _ | 0 | T |

For torque controlling: Set the condition to trigger gain switching.

| Setup value | Switching condition | Gain switching condition | |
|-------------|--|---|--|
| [0] | Fixed to the 1st gain. | Fixed to the 1st gain (Pr1.00 to Pr1.04). | |
| 1 | Fixed to the 2nd gain. | Fixed to the 2nd gain (Pr1.05 to Pr1.09). | |
| 2 | • 1st gain when the gain switching input (GAIN) is open. • 2nd gain when the gain switching input (GAIN) is connected COM—. * If no input signal is allocated to the gain switching input (GA the 1st gain is fixed. | | |
| 3 | Torque command | Shift to the 2nd gain when the absolute value of the torque command exceeded (level + hysteresis) (%) previously with the 1st gain. Return to the 1st gain when the absolute value of the torque command was kept below (level - hysteresis) (%) previously during delay time with the 2nd gain. | |

| Pr1.25 | Dolov time of torque control awitching | Range | Unit | Default | Related control mode |
|--------|--|------------|-------|---------|----------------------|
| P11.25 | Delay time of torque control switching | 0 to 10000 | 0.1ms | 0 | T |

For torque controlling: When shifting from the 2nd gain to the 1st gain with Pr1.24 Torque control switching mode set at 3, set up the delay time from trigger detection to the switching operation.

| | Pr1.26 | Level of torque control switching | Range | Unit | Default | Related control mode | |
|---|-----------|--|------------|--------------------|---------|----------------------|--|
| | P11.20 | | 0 to 20000 | Mode- dependent | 0 | T | |
| For torque controlling: Set up triggering level when Pr1.24 Torque control gain switching mode is set at 3. Unit varies depending on the setup of mode of control switching. | | | | | | | |
| | Caution 🔆 | Set the level equal to or higher than the hyster | esis. | | | | |

| Dr1 27 Hystoresis at torque control switching | Range | Unit | Default | Related control mode |
|---|------------|--------------------|---------|----------------------|
| Pr1.27 Hysteresis at torque control switching | 0 to 20000 | Mode- dependent | 0 | T |

For torque controlling: Set up triggering hysteresis when Pr1.24 Torque control gain switching mode is set at 3.

Unit of setting varies with switching mode.

Caution → When level < hysteresis, the hysteresis is internally adjusted so that it is equal to level.

- Note
- A parameter is designated as follows: Class Pro.00 Parameter No.
- For parameters which No. have a suffix of " * ", changed contents will be validated when you turn on the control power.
- Related page ..:
- P.3-30... "Inputs and outputs on connector X4"

Setup

1. Details of parameter

[Class 2] Damping control

| Pr2.00 | Adaptive filter mode setup | Range | Unit | Default | | Related control mode | | |
|--------|----------------------------|--------|------|---------|----|----------------------|---|--|
| P12.00 | Adaptive inter mode setup | 0 to 4 | _ | 0 | PS | 3 | F | |

Set up the resonance frequency to be estimated by the adaptive filter and specify the operation after estimation.

| Setup value | | Content |
|----------------------------|---|---|
| [0] | Adaptive filter: invalid | Parameters related to the 3rd and 4th notch filter hold the current value. |
| 1 | Adaptive filter: 1 filter is valid | One adaptive filter is enabled. Parameters related to the 3rd notch filter will be updated based on adaptive performance. |
| 2 | Adaptive filter: 2 filters are valid | Two adaptive filters are enabled. Parameters related to the 3rd and 4th notch filters will be updated based on adaptive performance. |
| 3 | Resonance frequency measurement mode | Measure the resonance frequency. Result of measurement can be checked with PANATERM. Parameters related to the 3rd and 4th notch filter hold the current value. |
| Clear result of adaptation | | Parameters related to the 3rd and 4th notch filter are disabled and results of adaptive operation are cleared. |

| Pr2.01 | 1st notch frequency | Range | Unit | Default | Related control mode |
|--------|---------------------|------------|------|---------|----------------------|
| P12.01 | ist notch frequency | 50 to 5000 | Hz | 5000 | P S T F |

Set the center frequency of the 1st notch filter.

Caution : The notch filter function will be invalidated by setting up this parameter to "5000".

| Pr2.02 | 1st notch width selection | Range | Unit | Unit Default co | | | | | | |
|--------|---|---|-----------------|-----------------|---------------|--------|-----|--|--|--|
| | P12.02 | 1st flotell width selection | 0 to 20 | _ | 2 | PS | TF | | | |
| | Set the width of notch at the center frequency of the 1st notch filter. | | | | | | | | | |
| | Caution ·* | Higher the setup, larger the notch width you operation. | can obtain. Use | e with def | ault setup in | ı norm | nal | | | |

| | Pr2.03 | 1st notch depth selection | Range | Unit | Default | Related control mode | | | |
|---|---|---|---------|------|---------|----------------------|--|--|--|
| | P12.03 | ist noten depth selection | 0 to 99 | _ | 0 | P S T F | | | |
| | Set the depth of notch at the center frequency of the 1st notch filter. | | | | | | | | |
| (| Caution 🔆 | Higher the setup, shallower the notch depth and smaller the phase delay you can obtain. | | | | | | | |

| | Pr2.04 | 2nd notch frequency | Range | Unit | Unit Default | | Related control mode | | |
|--|---|---|------------|------|--------------|---|----------------------|---|--|
| | P12.04 | Zna noten nequency | 50 to 5000 | Hz | 5000 | Р | ST | F | |
| | Set the center frequency of the 2nd notch filter. | | | | | | | | |
| | Caution 🔆 | The notch filter function will be invalidated by setting up this parameter to "5000". | | | | | | | |

| | Pr2.05 | 2nd notch width selection | Range | Unit | | Related control mode | | |
|---|--|-------------------------------|---------|------|--|----------------------|---|--|
| | P12.05 | Zila floteli wiatii selection | 0 to 20 | _ | | S T | F | |
| Set the width of notch at the center frequency of the 2nd notch filter. | | | | | | | | |
| | Caution : Higher the setup, larger the notch width you can obtain. Use with default setup in normal operation. | | | | | | | |

[Class 2] Damping control

Default: []

| Pr2.06 | 2nd notch depth selection | Range | Unit | Default | Related control mode | | | | |
|---|---|---------|------|---------|----------------------|--|--|--|--|
| P12.00 | Zila ilotcii deptii selection | 0 to 99 | _ | 0 | P S T F | | | | |
| Set the depth of notch at the center frequency of the 2nd notch filter. | | | | | | | | | |
| Caution ·: • | Higher the setup, shallower the notch depth and smaller the phase delay you can obtain. | | | | | | | | |

| Pr2.07 | 3rd notch frequency | Range | Unit Default | | Related control mode | | | |
|--|---------------------|------------|--------------|------|----------------------|--|--|--|
| P12.07 | Srd notch frequency | 50 to 5000 | Hz | 5000 | P S T F | | | |
| Notch frequency is automatically set to the 1st resonance frequency estimated by the adaptive filter. Caution : | | | | | | | | |
| | | | | | | | | |

| Pr2.08 | 3rd notch width selection | Range | Unit | Default | Related control mode | | | | |
|---|--|---------|------|---------|----------------------|--|--|--|--|
| P12.00 | Sid noten width selection | 0 to 20 | _ | 2 | PSTF | | | | |
| Set the width of notch at the center frequency of the 3rd notch filter. | | | | | | | | | |
| Caution 🔆 | Higher the setup, larger the notch width you can obtain. Use with default setup in normal operation. When the applicable filter function is used, parameter value is automatically set. | | | | | | | | |

| Pr2.09 3rd notch depth selection 0 to 99 — Set the depth of notch at the center frequency of the 3rd notch filter. Caution with Higher the setup, shallower the notch depth and smaller the phase de | Unit Default | | | | | | | |
|--|---|----|----|--|--|--|--|--|
| | 0 | PS | TF | | | | | |
| When the applicable filter function is used, parameter value is automated. | Caution : Higher the setup, shallower the notch depth and smaller the phase delay you can obtain. | | | | | | | |

| Pr2.10 | 4th notch frequency | Range | Unit | Default | | Related control mod | |
|-------------|--|------------|------|---------|------|---------------------|----|
| P12.10 | 401 Hoteli frequency | 50 to 5000 | | Р | ST | F | |
| Caution ··* | Notch frequency is automatically set to the 2nd resonant The notch filter function will be invalidated by set to the 2nd resonant to 2 | • | - | | tive | filte | r. |

| Pr2.11 | 4th notch width selection | Range | Unit | Default | Related control mode |
|------------|---|------------------|---------|---------|----------------------|
| P12.11 | 4th Hoteli width Selection | 0 to 20 | _ | 2 | P S T F |
| | Set the width of notch at the center frequency | of the 4th notch | filter. | | |
| Caution ·* | Higher the setup, larger the notch width you can of When the applicable filter function is used, part | | | • | peration. |

| Pr2.12 | 4th notch depth selection | Range | Unit | Default | Related control mode |
|------------|---|------------------|---------|---------|----------------------|
| F12.12 | 4th hoten depth selection | 0 to 99 | _ | 0 | PSTF |
| | Set the depth of notch at the center frequency | of the 4th notch | filter. | | |
| Caution ·÷ | Higher the setup, shallower the notch depth ar When the applicable filter function is used, par | • | - | | otain. |



- A parameter is designated as follows: Class Pro. Parameter No. For parameters which No. have a suffix of " * ", changed contents will be validated when you turn on the control power.

Related page ·-:

[Class 2] Damping control

Default: []

| Pr2.13 | 2.12 Coloation of domning filter awitching | Range | Unit | Default | Related control mod | de |
|--------|--|--------|------|---------|---------------------|----|
| P12.13 | Selection of damping filter switching | 0 to 3 | 1 | 0 | P | F |

Among 4 filters select the filters to be used for damping control.

- When setup value is 0: Up to 2 filters can be used simultaneously.
- When setup value is 1 or 2: Select the filter with external input(s) (VS-SEL1 and/or VS-SEL2).

| Setup value | VS-SEL2 | VS-SEL1 | 1st damping | 2nd damping | 3rd damping | 4th damping |
|----------------|---------|---------|-------------|-------------|-------------|-------------|
| [0] | _ | _ | 0 | 0 | | |
| | _ | | 0 | | 0 | |
| ! | _ | 0 | | 0 | | 0 |
| | | | 0 | | | |
| 2 | | 0 | | 0 | | |
| | 0 | | | | 0 | |
| | 0 | 0 | | | | 0 |

With setup value 3: Select the filter with command direction.

| Setup value | Position command direction | 1st damping | 2nd damping | 3rd damping | 4th damping |
|----------------|----------------------------|-------------|-------------|-------------|-------------|
| 2 | Positive direction | 0 | | 0 | |
| 3 | Negative direction | | 0 | | 0 |

Caution ·❖

 Switching of damping controls will be done on the rising edge of the command whose number of pulses/0.166 ms has been changed from 0 while the positioning complete signal is being output.

When the damping frequency is increased or disabled, and positioning complete range is large, and pulses are stored in the filter at that time (the area represented by the value of position command before filter subtracted by the value of position command after filter and integrated with the time). Note that since these pulses will be discharged at a higher rate upon switching to return back to the original position, the motor may run at a speed higher than the command speed for a short time.

| Pr2.14 | 1ot domning fraguency | Range | Unit | Default | Related control mode |
|--------|-----------------------|-----------|--------|---------|----------------------|
| P12.14 | 1st damping frequency | 0 to 2000 | 0.1Hz | 0 | P F |
| Pr2.16 | 2nd damning fraguency | Range | Unit | Default | Related control mode |
| P12.10 | 2nd damping frequency | 0 to 2000 | 0.1Hz | 0 | P F |
| D#2 10 | 2rd domning from ton | Range | Unit | Default | Related control mode |
| Pr2.18 | 3rd damping frequency | 0.4- 0000 | 0.411- | 0 | P F |
| | | 0 to 2000 | 0.1Hz | U | P F |
| Pr2.20 | 4th damping frequency | Range | Unit | Default | Related control mode |

You can set up the 1st to 4th damping frequency of the damping control which suppress vibration at the load edge.

The driver measures vibration at load edge. Setup unit is 0.1[Hz].

Related page : The setup frequency is 1.0 to 200.0[Hz]. Setup of 0 to 9 becomes invalid. Refer to P.5-20, "Damping control" as well before using this parameter.

Note

- A parameter is designated as follows: Class Pro.00 Parameter No.
- For parameters which No. have a suffix of " * ", changed contents will be validated when you turn on the control power.

Related page ..:

[Class 2] Damping control

| Pr2.15 | 1st damping filter setup | Range | Unit | Default | Related control mode |
|---------------------------------|-------------------------------|-----------|---------|----------------------|----------------------|
| | ist damping inter setup | 0 to 1000 | 0.1Hz | 0 | P F |
| Pr2.17 2nd damping filter setup | Range | Unit | Default | Related control mode | |
| P12.17 | 2nd damping filter setup | 0 to 1000 | 0.1Hz | 0 | P F |
| Pr2.19 | 2.19 3rd damping filter setup | Range | Unit | Default | Related control mode |
| P12.19 | | 0 to 1000 | 0.1Hz | 0 | P F |
| D#2 21 | Ath downing filter cotus | Range | Unit | Default | Related control mode |
| Pr2.21 | 4th damping filter setup | 0 to 1000 | 0.1Hz | 0 | PF |

If torque saturation occurs with damping frequency (1st- 4th) enabled, decrease the setup value, or if the operation is slow, increase it. Usually set it to 0.

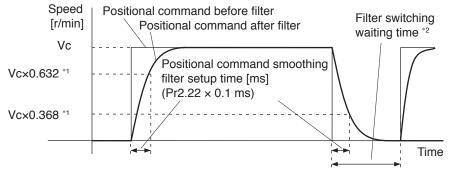
The maximum setup value is internally limited to the corresponding damping frequency or 2000 - damping frequency, whichever is smaller.

Related page …

Refer to P.5-24, "Damping control" as well before using this parameter.

| Pr2.22 Positional command smoothing filter | Range | Unit | Default | Related control mod | | |
|--|------------------------------------|------------|---------|---------------------|---|---|
| P12.22 | Positional command smoothing inter | 0 to 10000 | 0.1ms | 0 | Р | F |

- Set up the time constant of the 1st 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.



- *1 Actual filter time constant (setup value × 0.1 ms) has the maximum absolute error of 0.2 ms for a time constant below 100 ms and the maximum relative error of 0.1% for a time constant 20 ms or more.
- *2 Switching of Pr2.22 Positional command smoothing filter is performed on the rising edge of the command with the number of command pulses/0.166 ms is changed from 0 to a value other than 0 while the positioning complete is being output.
 - If the filter time constant is decreased and positioning complete range is increased, and a many number of plusses are accumulated in the filter (the area equivalent of "value of positional command filter value of positional command after filter" integrated over the time), at the time of switching, these pulses are discharged at a higher rate, causing the motor to return to the previous position the motor runs at a speed higher than the command speed for a short time.
- *3 Even if Pr2.22 Positional command smoothing filter is changed, it is not applied immediately. If the switching as described in *2 occurs during this delay time, the change of Pr2.22 will be suspended.

Note

- A parameter is designated as follows: Class Pro.00 Parameter No.
- For parameters which No. have a suffix of " * ", changed contents will be validated when you turn on the control power.

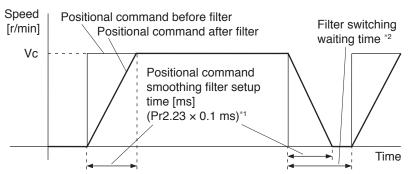
Related page ..:

[Class 2] Damping control

Default: []

| Pr2.23 | Positional command FIR filter | Range | Unit | Default | Cont | elat rol r | le |
|--------|-------------------------------|------------|-------|---------|------|---------------|----|
| P12.23 | Positional Command Fin Inter | 0 to 10000 | 0.1ms | 0 | Р | | = |

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



- *1 The actual average travel time (setup value × 0.1 ms) has the maximum absolute error of 0.1 ms for a time constant below 10 ms and the maximum relative error of 1.6% for a time constant 10 ms or more.
- *2 When changing Pr2.23 Positional command FIR filter, stop the command pulse and wait until the filter switching wait time has elapsed. The filter switching wait time is the setup value × 0.1 ms + 0.25 ms when the setup time is 10 ms, and setup value × 0.1 ms × 1.05 when the setup time is 10 ms or more. If Pr2.23 is changed while the command pulse is being input, the change is not reflected until the command pulse-less state has continued for the filter switching wait time.
- *3 Even if Pr2.23 Positional command FIR filter is changed, it is not applied immediately. If the switching as described in *2 occurs during this delay time, the change of Pr2.23 will be suspended.



- A parameter is designated as follows: Class Pro.00 Parameter No.
- For parameters which No. have a suffix of " * ", changed contents will be validated when you turn on the control power.

Related page ..:

4 Setup

1. Details of parameter

[Class 3] Verocity/ Torque/ Full-closed control

Default: []

| Pr3.00 Speed setup, Internal/Ext | Speed setup, Internal/External switching | Range | Unit | Default | Related control mode |
|----------------------------------|--|--------|------|---------|----------------------|
| P13.00 | Speed Setup, internal/External Switching | 0 to 3 | _ | 0 | S |

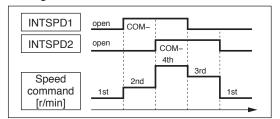
This driver is equipped with internal speed setup function so that you can control the speed with contact inputs only.

| Setup value | Speed setup method | | | |
|--------------------------------|---|--|--|--|
| [0] Analog speed command (SPR) | | | | |
| 1 | 1 Internal speed command 1st to 4th speed (Pr3.04 to Pr3.07) | | | |
| 2 | Internal speed command 1st to 3rd speed (Pr3.04 to Pr3.06), Analog speed command (SPR) | | | |
| 3 | Internal speed command 1st to 8th speed (Pr3.04 to Pr3.11) | | | |

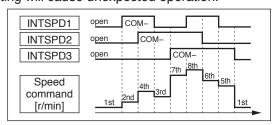
<Relationship between Pr3.00 Internal/external switching speed setup and the internal command speed selection 1, 2 and 3, and speed command to be selected>

| Setup value | Selection 1 of internal command speed (INTSPD1) | Selection 2 of internal command speed (INTSPD2) | Selection 3 of internal command speed (INTSPD3) | Selection of Speed command |
|----------------|---|---|---|-------------------------------|
| | OFF | OFF | | 1st speed |
| 1 | ON | OFF | No effect | 2nd speed |
| ' | OFF | ON | INO effect | 3rd speed |
| | ON | ON | | 4th speed |
| | OFF | OFF | | 1st speed |
| | ON | OFF | | 2nd speed |
| 2 | OFF | ON | No effect | 3rd speed |
| | ON | ON | | Analog speed command |
| | The same a | as Pr3.00=1 | OFF | 1st to 4th speed |
| | OFF | OFF | ON | 5th speed |
| 3 | ON | OFF | ON | 6th speed |
| | OFF | ON | ON | 7th speed |
| | ON | ON | ON | 8th speed |

Internal command speed switching pattern should be so arranged as shown below that single input signals are selected alternately. If 2 or more input signals are selected simultaneously, unspecified internal command speed may be advertently selected, whose setting value and acceleration/deceleration setting will cause unexpected operation.







Example 2) When Pr3.00=3

| Pr3.01 | Speed command rotational direction | Range | Unit | Default | Related control mode |
|--------|------------------------------------|--------|------|---------|----------------------|
| P13.01 | selection | 0 to 1 | _ | 0 | S |

Select the Positive/Negative direction specifying method.

| Setup value | Select speed command sign (1st to 8th speed) | Speed command direction (VC-SIGN) | Position command direction |
|-------------|--|---|----------------------------|
| [0] | + | No effect | Positive direction |
| [0] | - | No effect | Negative direction |
| 4 | Sign has no effect. | OFF | Positive direction |
| I | Sign has no effect. | ON | Negative direction |

[Class 3] Verocity/ Torque/ Full-closed control

Default: []

| Pr3.02 | Input gain of anord command | Range | Unit | Default | Related control mode | | | |
|--------|-----------------------------|------------|-----------|---------|----------------------|---|---|--|
| P13.02 | Input gain of speed command | 10 to 2000 | (r/min)/V | 500 | | S | Т | |

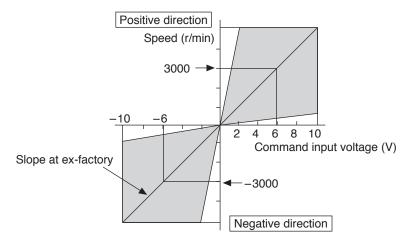
Based on the voltage applied to the analog speed command (SPR), set up the conversion gain to motor command speed.

- You can set up a "slope" of the relation between the command input voltage and the motor speed, with Pr3.02.
- Default is set to Pr3.02=500 [r/min], hence input of 6V becomes 3000r/min.

Caution 🔆

- 1. Do not apply more than ±10V to the speed command input (SPR).
- When you compose a position loop outside of the driver while you use the driver in velocity control mode, the setup of Pr3.02 gives larger variance to the overall servo system.

Pay an extra attention to oscillation caused by larger setup of Pr3.02.



| Pr3.03 | Povercel of anood command input | Range | Unit | Default | control mode |
|--------|---------------------------------|--------|------|---------|--------------|
| P13.03 | Reversal of speed command input | 0 to 1 | _ | 1 | S |

Specify the polarity of the voltage applied to the analog speed command (SPR).

| Setup value | | Motor rotating direction | | | |
|-------------|--------------|--|--|--|--|
| 0 | Non-reversal | "+Voltage" → "Positive direction", "-Voltage" → "Negative direction" | | | |
| [1] | Reversal | "+Voltage" → "Negative direction", "-Voltage" → "Positive direction" | | | |

Note

Default of this parameter is 1, and the motor turns to CW with (+) signal, this has compatibility to existing MINAS series driver.

Caution ·*

When you compose the servo drive system with this driver set to velocity control mode and external positioning unit, the motor might perform an abnormal action if the polarity of the speed command signal from the unit and the polarity of this parameter setup does not match.



- A parameter is designated as follows: Class Pro.00 Parameter No.
- For parameters which No. have a suffix of " * ", changed contents will be validated when you turn on the control power.

Related page ..:

[Class 3] Verocity/ Torque/ Full-closed control

Default: []

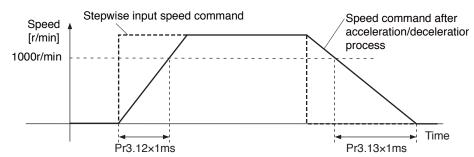
| Pr3.04 | 1st apped of apped actus | Range | Unit | Default | Related control mode |
|--------|---|-----------------|-------|---------|----------------------|
| P13.04 | 1st speed of speed setup | -20000 to 20000 | r/min | 0 | S |
| Pr3.05 | Ond around of around action | Range | Unit | Default | Related control mode |
| P13.05 | 2nd speed of speed setup | -20000 to 20000 | r/min | 0 | S |
| Pr3.06 | 3rd speed of speed setup | Range | Unit | Default | Related control mode |
| P13.00 | Sid speed of speed setup | -20000 to 20000 | r/min | 0 | S |
| Pr3.07 | Ath around of around patting | Range | Unit | Default | Related control mode |
| P13.07 | 4th speed of speed setup | -20000 to 20000 | r/min | 0 | S |
| Pr3.08 | Eth apped of apped actus | Range | Unit | Default | Related control mode |
| P13.06 | 5th speed of speed setup | -20000 to 20000 | r/min | 0 | S |
| Pr3.09 | 6th appeal of appeal patting | Range | Unit | Default | Related control mode |
| P13.09 | 6th speed of speed setup | -20000 to 20000 | r/min | 0 | S |
| Pr3.10 | 7th around of around catura | Range | Unit | Default | Related control mode |
| P13.10 | 7th speed of speed setup | -20000 to 20000 | r/min | 0 | S |
| Pr3.11 | 9th speed of speed setup | Range | Unit | Default | Related control mode |
| P13.11 | 8th speed of speed setup | -20000 to 20000 | r/min | 0 | S |
| | Set up internal command speeds, 1st to 8th. | | | | |

| Pr3.12 | Acceleration time cotup | Range | Unit | Default | Related control mode |
|--------|-------------------------|------------|--------------------|---------|----------------------|
| P13.12 | Acceleration time setup | 0 to 10000 | ms/ (1000r/min) | 0 | S |
| D#0 10 | Deceleration time setup | Range | Unit | Default | Related control mode |
| Pr3.13 | Deceleration time setup | 0 to 10000 | ms/ (1000r/min) | 0 | S |

Set up acceleration/deceleration processing time in response to the speed command input. Set the time required for the speed command (stepwise input) to reach 1000 r/min to Pr3.12 Acceleration time setup. Also set the time required for the speed command to reach from 1000 r/min to 0 r/min, to Pr3.13 Deceleration time setup.

Assuming that the target value of the speed command is Vc(r/min), the time required for acceleration/deceleration can be computed from the formula shown below.

Acceleration time (ms) = $Vc/1000 \times Pr3.12 \times 1$ ms Deceleration time (ms) = $Vc/1000 \times Pr3.13 \times 1$ ms



When the speed difference between the speed command being selected and the speed command after acceleration/deceleration indicates the same direction as that of the speed command applied after acceleration/deceleration, result is "acceleration" and if the reverse direction, the result is "deceleration".

Note

- A parameter is designated as follows: Class Pro.00 Parameter No.
- For parameters which No. have a suffix of " * ", changed contents will be validated when you turn on the control power.

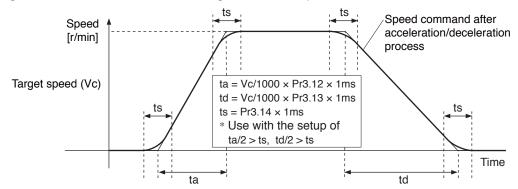
Related page ..:

[Class 3] Verocity/ Torque/ Full-closed control

Default: []

Pr3.14 Sigmoid acceleration/ deceleration time setup Range Unit Default control mode Related control mode 0 to 1000 ms 0 S

Set S-curve time for acceleration/deceleration process when the speed command is applied. According to Pr3.12 Acceleration time setup and Pr3.13 Deceleration time setup, set up sigmoid time with time width centering the inflection point of acceleration/deceleration.



| Pr3.15 | Speed zero-clamp function selection | Range | Unit | Default | Related control mode |
|--------|-------------------------------------|--------|------|---------|----------------------|
| P13.15 | Speed Zero-clamp function selection | 0 to 3 | _ | 0 | ST |

You can set up the function of the speed zero clamp input.

| Setup value | Function of ZEROSPD (Pin-26) |
|-------------|---|
| [0] | Invalid: Speed zero-clamp input is ignored. |
| 1 | Speed command is forced to 0 when the speed zero clamp (ZEROSPD) input signal is turned ON *1. |
| 2 | Speed command is forced to 0 when the speed zero clamp (ZEROSPD) input signal is turned ON '1. And when the actual motor speed drops to Pr3.16 Speed zero clamp level or below, the position control is selected and servo lock is activated at this point. The fundamental operations except for this function (switching to the position control) are identical to those when setup value is 1. |
| 3 | When the speed zero clamp (ZEROSPD) input signal is ON 1 and speed command is below Pr3.16 Speed zero clamp level –10 r/min, then the position control is selected and servo lock is activated at that point. |

^{*1} The default logic is b-contact: the function is enabled while the terminal is open (input signal is ON). Refer to P.3-37 Control input.

| Pr3.16 | Speed zero clamp level | Range | Unit | Default | control mode |
|--------|------------------------|-------------|-------|---------|--------------|
| P13.10 | Speed Zero Clamp level | 10 to 20000 | r/min | 30 | ST |

Select the timing at which the position control is activated as the Pr3.15 Speed zero-clamp function selection is set to 2 or 3.

If Pr3.15 = 3, then hysteresis of 10 r/min is provided for detection.

Note

- A parameter is designated as follows: Class Pro.00 Parameter No.
- For parameters which No. have a suffix of " * ", changed contents will be validated when you turn on the control power.

Related page ··:

[Class 3] Verocity/ Torque/ Full-closed control

Default: []

| Pr3.17 Selection of torque command | Range | Unit | Default | Related control mode |
|------------------------------------|--------|------|---------|----------------------|
| Pr3.17 Selection of torque command | 0 to 2 | _ | 0 | T |

You can select the input of the torque command and the speed limit.

| Setup value | Torque command input | Velocity limit input |
|-------------|--|--|
| [0] | Analog input 1 *1 (Al1, 16-bit resolution) | Parameter value (Pr3.25) |
| 1 | Analog input 2 (Al2, 12-bit resolution) | Analog input 1 (Al1, 16-bit resolution) |
| 2 | Analog input 1 *1 (Al1, 16-bit resolution) | Parameter value (Pr3.21, Pr3.22) |

^{*1} For Pr0.01 Control mode setup = 5 (velocity/torque control), the torque command input is the analog input 2 (Al2, 12-bit resolution).

| Pr3.18 | Torque command direction colection | Range | Unit | Default | Related control mode |
|--------|------------------------------------|--------|------|---------|----------------------|
| P13.10 | Torque command direction selection | 0 to 1 | 1 | 0 | T |

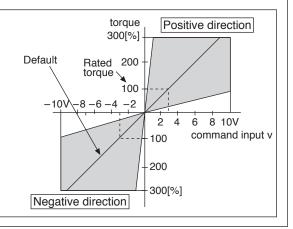
Select the direction positive/negative direction of torque command.

| Setup value | Designation | | |
|-------------|--|--|--|
| [0] | Specify the direction with the sign of torque command. Example: Torque command input (+) for positive direction, (–) for negative direction | | |
| 1 | Specify the direction with torque command sign (TC-SIGN). OFF: Positive direction, ON: Negative direction | | |

Pr3.19 Input gain of torque command Range Unit Default Related control mode 10 to 100 0.1V/100% 30 T

Based on the voltage (V) applied to the analog torque command (TRQR), set up the conversion gain to torque command (%).

- Unit of the setup value is [0.1V/100%] and set up input voltage necessary to produce the rated torque.
- Default setup of 30 represents 3V/100%.



| Pr3.20 | Input reversal of torque command | Range | Unit | Default | Related control mode |
|--------|----------------------------------|--------|------|---------|----------------------|
| Pr3.20 | input reversal of torque command | 0 to 1 | _ | 0 | T |

Set up the polarity of the voltage applied to the analog torque command (TRQR).

| Setup value | | Direction of motor output torque | | | |
|-------------|--------------|--|--|--|--|
| [0] | Non-reversal | "+Voltage" → "Positive direction", "-Voltage" → "Negative direction" | | | |
| 1 | Reversal | "+Voltage" → "Negative direction", "-Voltage" → "Positive direction" | | | |

[Class 3] Verocity/ Torque/ Full-closed control

Default: []

| Dr2 21 Speed limit value 1 | ange Unit | Default | control mode |
|------------------------------|-------------|---------|--------------|
| PIS.ZI Specu IIIIII value I | 20000 r/min | 0 | T |

Set up the speed limit used for torque controlling.

During the torque controlling, the speed set by the speed limit value cannot be exceeded. When Pr3.17 = 2, the speed limit is applied upon receiving positive direction command.

| Pr3.22 | Speed limit value 2 | Range | Unit | Default | Re | ated of mo | |
|--------|---------------------|------------|-------|---------|----|---------------|--|
| P13.22 | Speed limit value 2 | 0 to 20000 | r/min | 0 | | Т | |

Speed limit value of negative direction command when Pr3.17 = 2.

| Pr3.17 | Pr3.21 | Pr3.22 | Pr3.15 | Speed zero clamp (ZEROSPD) | Analog torque command direction | Speed limit value | | | |
|--------|------------|------------|--------|----------------------------|---------------------------------|--------------------|-----|--------------------|--------------------|
| | | | 0 | No effect | | Pr3.21 setup value | | | |
| 0 | 0 to 20000 | No effect | 1 to 3 | OFF | No effect | Pr3.21 setup value | | | |
| | | | 1 10 3 | ON | | 0 | | | |
| | 0 to 20000 | 0 to 20000 | 0 | No effect | Positive direction | Pr3.21 setup value | | | |
| | 0 10 20000 | 0 10 20000 | U | No ellect | Negative direction | Pr3.22 setup value | | | |
| 2 | 0 to 20000 | 0 to 20000 | 1 to 3 | OFF | Positive direction | Pr3.21 setup value | | | |
| | 0 10 20000 | 0 10 20000 | 1 10 3 | 1 10 3 | 1 10 3 | 1 10 3 | OFF | Negative direction | Pr3.22 setup value |
| | 0 to 20000 | 0 to 20000 | 1 to 3 | ON | No effect | 0 | | | |

| Pr3.23 * | External scale selection | Range | Unit | Default | Related control mode |
|----------|--------------------------|--------|------|---------|----------------------|
| P13.23 | External Scale Selection | 0 to 2 | _ | 0 | F |

Select the type of external scale.

| Setup value | External scale type | Compatible scale | Compatible speed |
|----------------|--|---|--------------------------------|
| [0] | A,B phase output type *1 | External scale of A, B phase output type | to 4Mpps (after quadrupled) |
| 1 | Serial communication type (incremental version) *1 | Magnescale Co., Ltd. SR75, SR85, SL700, SL710 | to 400Mpps |
| 2 | Serial communication type (absolute version) *1 | Mitsutoyo Corp. AT573, ST771A, ST773A Magnescale Co., Ltd. SR77, SR87 | to 400Mpps |

^{*1} Connect the external scale so that it increments the count as the motor shaft turns positive direction, and decrements as the shaft turns negative direction. If this connection arrangement is impossible due to installation condition, etc., use the count reverse function of Pr3.26 Reversal of direction of external scale.

Caution ·❖

When the setup value is 1 or 2 while the A, B phase output type is connected, Err50.0 External scale wiring error protection occurs, and if the setup value is 0 while the serial communication type is connected, Err55.0, 1 or 2 A phase, B phase or Z phase wiring error protection will occur.



- A parameter is designated as follows: Class Pro.00 Parameter No.
- For parameters which No. have a suffix of " * ", changed contents will be validated when you turn on the control power.

Related page ...

• P.3-30... "Inputs and outputs on connector X4" • P.6-2 "Protective Function"

[Class 3] Verocity/ Torque/ Full-closed control

| Pr3.24 * Numerator of external scale division 0 to 1,048,576 — 0 F | Pr3.24 | Numerator of extern | al scale division | Range | Unit | Default | Rela control | |
|--|--------|---------------------|-------------------|--------------|------|---------|-----------------|---|
| | P13.24 | Numerator of exteri | 0 t | to 1,048,576 | _ | 0 | | F |

Set up the numerator of the external scale dividing setup.

When setup value = 0, encoder resolution is used as numerator of the division.

Pr3.25 *Denominator of external scale divisionRangeUnitDefaultRelated control mode1 to 1,048,576-10000| F

- Check the number of encoder feedback pluses per one motor revolution and the number of external scale pulses per one motor revolution, and then set up the numerator of external scale division (Pr3.24) and the denominator of external scale division (Pr3.25) to establish the expression shown below.
- With Pr3.24 set at 0, the encoder resolution is automatically used as numerator.

Example: When ball screw pitch is 10 mm, scale 0.1 _m/pulse, encoder resolution 20 bits (1048.576 pulses);

Pr3.24 1048576 = Encoder resolution per one motor revolution [pulse]

Pr3.25 100000 = External scale resolution per one motor revolution [pulse]

Caution ·∻

If this ratio is wrong, the difference between the position calculated based on the encoder pulses and the position calculated based on the external scale pulses becomes large over a long travel distance and will activate the excess hybrid deviation error protection.

Pr3.26 *Reversal of direction of external scaleRangeUnitDefaultRelated control mode0 to 1-0| F

Reverse the direction of external scale, feedback counter.

| Setup value | Content |
|-------------|---|
| [0] | Count value of external scale can be used as it is. |
| 1 | Sign (positive/negative) of count value of external scale should be inverted. |

Note For setting method of this parameter, refer to P.3-12 Full closed control mode.

Pr3.27 * External scale Z phase disconnection detection disable Range Unit Default Related control mode control mode

Enable/disable Z-phase disconnection detection when A, B phase output type external scale is used.

| Setup value | Content | |
|-------------|---------|--|
| [0] | Valid | |
| 1 | Invalid | |

Note

- A parameter is designated as follows: Class Pro.00 Parameter No.
- For parameters which No. have a suffix of " * ", changed contents will be validated when you turn on the control power.

Related page ...

[Class 3] Verocity/ Torque/ Full-closed control

Default: []

| Pr3.28 * | Unbeid deviation excess setup | Range | Unit | Default | Related control mode |
|----------|-------------------------------|------------------|--------------|---------|----------------------|
| P13.26 * | Hybrid deviation excess setup | 1 to 134,217,728 | Command unit | 16000 | F |

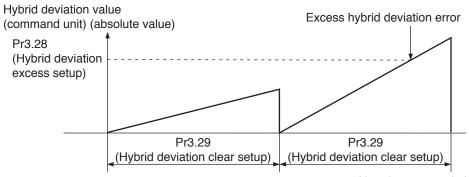
You can setup the permissible gap (hybrid deviation) between the present motor position and the present external scale position.

| Pr3.29 * | Hybrid deviation clear setup | Range | Unit | Default | Re | elate ol m | |
|----------|------------------------------|----------|------------|---------|----|---------------|---|
| P13.29 | Hybrid deviation clear setup | 0 to 100 | Revolution | 0 | | | F |

As the motor turns the number of revolutions set by this parameter, the hybrid deviation is cleared to 0. No clearing is made with setup value 0.

< Hybrid deviation clear feature>

As the motor reaches the number of revolutions set by Pr3.29 Hybrid deviation clear setup, clear the hybrid deviation to 0. This feature allows the motor to be used in an application where hybrid deviation accumulate due to slippage, etc.



No. of motor revolutions [rev]

Note: Revolution in the hybrid deviation clear setup is counted by using encoder feedback pulses.

Caution 🔆

To use the hybrid deviation clear, be sure to set Pr3.29 Hybrid deviation clear setup to the appropriate value. If the setup value is too small with respect to the value of Pr3.28 Hybrid deviation excess setup, abnormal operation due to e.g. external scale connection error cannot be protected.

Limit sensor should be used to assure safety.

Note

- A parameter is designated as follows: Class Pro.00 Parameter No.
- For parameters which No. have a suffix of " * ", changed contents will be validated when you turn on the control power.

Related page ..:

[Class 4] I/F monitor setting

| D 4 00 4 | | Range | Unit | Default | Related control mode |
|----------|---------------------|----------------|------|------------------------|----------------------|
| Pr4.00 * | SI1 input selection | 0 to 00FFFFFFh | - | 00828282h (8553090) | PSTF |

Assign functions to SI1 inputs.

These parameters are presented in hexadecimals. *5

Hexadecimal presentation is followed by a specific control mode designation.

 $0\ 0 - - - - * * h$: position/full-closed control

 $0\ 0--**--h$: velocity control $0\ 0**----h$: torque control Replace ** with the function number.

For the function number see the table below. Logical setup is also a function number.

| Title | Cumbal | Setup | value |
|---|---------|-----------|---------------|
| ritie | Symbol | a-contact | b-contact |
| Invalid | _ | 00h | Do not setup. |
| Positive direction over-travel inhibition input | POT | 01h | 81h |
| Negative direction over-travel inhibition input | NOT | 02h | 82h |
| Servo-ON input *1 | SRV-ON | 03h | 83h |
| Alarm clear input | A-CLR | 04h | Do not setup. |
| Control mode switching input *2 | C-MODE | 05h | 85h |
| Gain switching input | GAIN | 06h | 86h |
| Deviation counter clear input *3 | CL | 07h | Do not setup. |
| Command pulse inhibition input *4 | INH | 08h | 88h |
| Torque limit switching input | TL-SEL | 09h | 89h |
| Damping control switching input 1 | VS-SEL1 | 0Ah | 8Ah |
| Damping control switching input 2 | VS-SEL2 | 0Bh | 8Bh |
| Electronic gear switching input 1 | DIV1 | 0Ch | 8Ch |
| Electronic gear switching input 2 | DIV2 | 0Dh | 8Dh |
| Selection 1 input of internal command speed | INTSPD1 | 0Eh | 8Eh |
| Selection 2 input of internal command speed | INTSPD2 | 0Fh | 8Fh |
| Selection 3 input of internal command speed | INTSPD3 | 10h | 90h |
| Speed zero clamp input | ZEROSPD | 11h | 91h |
| Speed command sign input | VC-SIGN | 12h | 92h |
| Torque command sign input | TC-SIGN | 13h | 93h |
| Forced alarm input | E-STOP | 14h | 94h |
| Inertia ratio switching input | J-SEL | 15h | 95h |

Note

For input pin assignment with default setting, refer to refer to P.3-37 Control input.

Related page ... P.3-50

<Example of change>

To change the default setting "Negative direction over-travel inhabitation input" (in all modes) for b-contact to for a-contact, set the input to 00020202h.

* For easier setting, use the setup support software PANATERM.

- Do not setup to a value other than that specified in the table.
- Do not assign specific function to 2 or more signals. Duplicated assignment will cause Err33.0 I/F input multiple assignment error 1 or Err33.1 I/F input multiple assignment error 2.
- *1 Servo-on input signal (SRV-ON) must be used to enable servo-on.
- *2 When using control mode switching input (C-MODE), set the signal to all control modes. If the signal is set to only 1 or 2 control modes, Err33.2 I/F input function number error 1 or Err33.3 I/F input function number error 2 will be generated.
 - The control input pin set to invalid state does not affect any operation.
 - Function (servo-on input, alarm clear, etc.) to be used in multiple control modes must be assigned to the same pin with correct logical arrangement. Incorrect setting will cause Err33.0 I/F input multiple assignment error 1 or Err33.1 I/F input multiple assignment error 2.
- *3 Deviation counter clear input (CL) can be assigned only to SI7 input. Wrong assignment will cause Err33.6 Counter clear assignment error.
- *4 Command pulse inhibit input (INH) can be assigned only to SI10 input. Wrong assignment will cause Err33.7 Command pulse input inhibit input.
- *5 Note that the front panel indicates parameter value in decimal number.

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When in Trouble

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[Class 4] I/F monitor setting

| D 4 0 4 1/2 | | Range | Unit | Default | Related control mode | |
|-------------|--|----------------|------|------------------------|----------------------|--|
| Pr4.01 * | SI2 input selection | 0 to 00FFFFFh | _ | 00818181h (8487297) | P S T F | |
| D::4.00 * | Olo import and adding | Range | Unit | Default | Related control mode | |
| Pr4.02 * | SI3 input selection | 0 to 00FFFFFFh | _ | 0091910Ah (9539850) | PSTF | |
| Pr4.03 * | CIA imput calcation | Range | Unit | Default | Related control mode | |
| Pr4.03 ** | SI4 input selection | 0 to 00FFFFFh | _ | 00060606h (394758) | PSTF | |
| D=4.04 * | CIE innut calcation | Range | Unit | Default | Related control mode | |
| Pr4.04 * | SI5 input selection | 0 to 00FFFFFFh | _ | 0000100Ch (4108) | PSTF | |
| D:4.05 * | OIC immut calcution | Range | Unit | Default | Related control mode | |
| Pr4.05 * | SI6 input selection | 0 to 00FFFFFFh | _ | 00030303h (197379) | PSTF | |
| D=4.06 * | CI7 input calcation | Range | Unit | Default | Related control mode | |
| Pr4.06 * | SI7 input selection | 0 to 00FFFFFh | _ | 00000f07h (3847) | PSTF | |
| Caution ·· | Caution Deviation counter clear (CL) can be set up only with this parameter. If any other parameter is used for this purpose, Err33.6 Counter clear assignment error will be issued. | | | | | |
| Pr4.07 * | SI8 input selection | Range | Unit | Default | Related control mode | |
| P14.07 | 310 Hiput Selection | 0 to 00FFFFFh | _ | 00040404h (263172) | PSTF | |
| Pr4.08 * | CIO input coloction | Range | Unit | Default | Related control mode | |
| Pr4.08 ** | SI9 input selection | 0 to 00FFFFFh | _ | 00050505h (328965) | PSTF | |
| Pr4.09 * | SI10 input selection | Range | Unit | Default | Related control mode | |
| P14.09 | Sito input selection | 0 to 00FFFFFh | _ | 00000E88h (3720) | PSTF | |
| | Assign functions to SI2 to SI10 inputs. These parameters are presented in hexadecin Setup procedure is the same as described for | Pr4.00. | | | | |
| Note | For input pin assignment with default setting, a | | | | | |
| Caution ·· | Command pulse inhibition input (INH) can be parameter is used for this purpose, Err33.7 IN | | - | | ny other | |

Note

• A parameter is designated as follows: Class Pro. Qu. Parameter No. • For parameters which No. have a suffix of " * ", changed contents will be validated when you turn on the control power.

Related page : P.3-30... "Inputs and outputs on connector X4" P.6-2 "Protective Function"

[Class 4] I/F monitor setting

Default: []

| D 4 40 11 | | Range | Unit | Default | Related control me | |
|-----------|----------------------|---------------|------|-----------------------|--------------------|---|
| Pr4.10 * | SO1 output selection | 0 to 00FFFFFh | _ | 00030303h (197379) | P S T | F |

Assign functions to SO1 outputs.

These parameters are presented in hexadecimals. *1

Hexadecimal presentation is followed by a specific control mode designation.

 $0\ 0 - - - - * * h$: position/full-closed control

 $0\ 0--**--h$: velocity control $0\ 0**----h$: torque control Replace ** with the function number.

For the function number see the table below. Logical setup is also a function number.

| Setup value | Title | Symbol |
|-------------|------------------------------------|----------|
| 00h | Invalid | _ |
| 02h | Servo-Ready output | S-RDY |
| 03h | External brake release signal | BRK-OFF |
| 04h | Positioning complete output | INP |
| 05h | At-speed output | AT-SPPED |
| 06h | Torque in-limit signal output | TLC |
| 07h | Zero-speed detection output signal | ZSP |
| 08h | Speed coincidence output | V-COIN |
| 09h | Alarm output 1 | WARN1 |
| 0Ah | Alarm output 2 | WARN2 |
| 0Bh | Positional command ON/OFF output | P-CMD |
| 0Ch | Positioning complete 2 | INP2 |
| 0Dh | Speed in-limit output | V-LIMIT |
| 0Eh | Alarm attribute output | ALM-ATB |
| 0Fh | Speed command ON/OFF output | V-CMD |

Note

For output pin assignment with default setting, also refer to P.3-45 Output signals (common) and their functions.

Related page

P.3-52

<Example of change>

To change the default setting "External brake release signal" (in all modes) to "Alarm output 1", set the input to 00090909h.

* For easier setting, use the setup support software PANATERM.

Caution ·∻

- · Same function can be assigned to 2 or more output signals.
- · Control output pin set to invalid always has the output transistor turned OFF.
- · Do not change the setup value shown in the table.
- *1 Note that the setup values are displayed in decimal on the front panel.

| Pr4.11 * SO2 output selection 0 to 00FFFFFh Range 0 to 00FFFFFh | Unit | 00020202h (131586) PS T Default Relate control n (65793) PS T | mode |
|---|-----------|---|------|
| Pr4.12 * SO3 output selection | Unit — | 00010101h | mode |
| Pr4.12 * SO3 output selection 0 to 00FFFFFh | _ | | |
| | 1 | | T F |
| Range | Unit | Default Relate | |
| Pr4.13 * SO4 output selection 0 to 00FFFFFFh | _ | 00050504h (328964) | TF |
| Range | Unit | Default Relate | |
| Pr4.14 * SO5 output selection 0 to 00FFFFFFh | _ | 00070707h (460551) | TF |
| Range | Unit | Default Relate | |
| Pr4.15 * SO6 output selection 0 to 00FFFFFFh | _ | 000606066 | TF |

Assign functions to SO2 to SO6 outputs.

These parameters are presented in hexadecimals.

Setup procedure is the same as described for Pr4.10.

[Class 4] I/F monitor setting

Default: []

PSTF

| Pr4.16 | Type of analog monitor 1 | Range | Unit | Default | Related control mode |
|--------|---|-------------------|-----------|--------------|----------------------|
| P14.10 | Type of analog monitor 1 | 0 to 21 | _ | 0 | P S T F |
| | Select the type of monitor for analog monitor | 1. *See the table | e shown c | n the next p | age. |

 Pr4.17
 Analog monitor 1 output gain
 Range
 Unit
 Default
 Related control mode

 0 to 214748364
 [Monitor unit in Pr4.16] / V
 0
 P S T F

Set up the output gain of analog monitor 1.

For Pr4.16 = 0 Motor speed, 1 V is output at the motor speed [r/min] = Pr4.17 setup value.

Pr4.18Type of analog monitor 2RangeUnitDefaultRelated control mode0 to 21-4P S T F
Select the type of monitor for analog monitor 2. *See the table shown on the next page.

Range Unit Default Related control mode

0 to 3

Select type of the digital monitor.

Type of digital monitor

| Select type of the digital monitor. | | | | | | |
|-------------------------------------|--------------------------------|-----------------|----------------------------------|--|--|--|
| Cotup volue | Type of monitor | Digital sig | nal output | | | |
| Setup value | Type of monitor | L output | | | | |
| [0] | Positioning complete condition | Not completed | Completed | | | |
| 1 | Positional command | Without command | With command | | | |
| 2 | Alarm | Not generated | Generated | | | |
| 3 | Gain selected | 1st gain | 2nd gain (including 3rd gain) | | | |

Note

Pr4.20

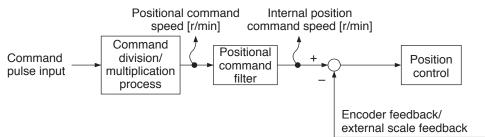
- A parameter is designated as follows: Class Pro.00 Parameter No.
- For parameters which No. have a suffix of " * ", changed contents will be validated when you turn on the control power.
- Only for position control type is not provided with analog input.
- Only for position control type is not provided with digital monitor output.

Related page ..:

[Class 4] I/F monitor setting

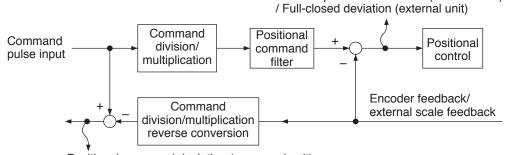
| Pr4.16/Pr4.18 | Type of monitor | Unit | Output gain for setting Pr4.17/Pr4.19 = 0 |
|---------------|--------------------------------------|-----------------------------|--|
| 0 | Motor speed | r/min | 500 |
| 1 | Positional command speed *3 | r/min | 500 |
| 2 | Internal positional command speed *3 | r/min | 500 |
| 3 | Velocity control command | r/min | 500 |
| 4 | Torque command | % | 33 |
| 5 | Command positional deviation *4 | pulse (Command unit) | 3000 |
| 6 | Encoder positional deviation *4 | pulse (Encoder unit) | 3000 |
| 7 | Full-closed deviation *4 | pulse (External scale unit) | 3000 |
| 8 | Hybrid deviation | pulse (Command unit) | 3000 |
| 9 | Voltage across PN | V | 80 |
| 10 | Regenerative load factor | % | 33 |
| 11 | Overload factor | % | 33 |
| 12 | Positive direction torque limit | % | 33 |
| 13 | Negative direction torque limit | % | 33 |
| 14 | Speed limit value | r/min | 500 |
| 15 | Inertia ratio | % | 500 |
| 16 | Analog input 1 *2 | V | 1 |
| 17 | Analog input 2 *2 | V | 1 |
| 18 | Analog input 3 *2 | V | 1 |
| 19 | Encoder temperature *5 | °C | 10 |
| 20 | Driver temperature | °C | 10 |
| 21 | Encoder single-turn data *1 | pulse (Encoder unit) | 110000 |

- *1 The encoder rotation data CCW is always positive value regardless of Pr0.00 Rotational direction setup. The direction of other monitor data basically follows Pr0.00 Rotational direction setup.
- *2 Analog inputs 1, 2 and 3 always output terminal voltage regardless of usage of analog input function. Only for position control type is not provided with analog inputs.
- *3 For the command pulse input, the speed before the command filter (smoothing, FIR filter) is defined as positional command speed and speed after filter is defined as internal command speed.



*4 Command positional deviation is the deviation with respect to the command pulse input and the encoder positional deviation/ full-closed positional deviation is the deviation at the input section of the positional control, as described in the figure below.

Encoder positional deviation (encoder unit)



Positional command deviation (command unit)

^{*5} Temperature information from the encoder includes value only when it is a 20-bit incremental encoder. Otherwise, the value is always 0.

[Class 4] I/F monitor setting

Default: []

| Pr4.21 | Analog monitor output setup | Range | Unit | Default | Related control mode | |
|--------|-----------------------------|-------------------------------|------|---------|----------------------|--|
| P14.21 | Analog morntor output setup | 0 to 2 | _ | 0 | PSTF | |
| | Select output | format of the analog monitor. | | | | |
| | | 0.1.16 | | | | |

| Setup value | Ou | Output format | | |
|-------------|----------------------------|-----------------------------|--|--|
| [0] | Signed data output | –10 V to 10 V | | |
| 1 | Absolute value data output | 0 V to 10 V | | |
| 2 | Data output with offset | 0 V to 10 V (5 V at center) | | |

| Pr4.22 | Analog input 1 (Al1) offset setup | Range | Unit | Default | | | ated of mo | d ode | |
|--------|--|----------------------------------|---------------|---------|---|---|---------------|----------|---|
| | P14.22 | Analog input 1 (Arr) onset setup | -5578 to 5578 | 0.359mV | 0 | Р | S | Т | F |
| | Set up the offset correction value applied to the voltage fed to the analog input 1. | | | | | | | | |

| Pr4.23 | Analog input 1 (Al1) filter | Range | Unit | Default | Related control mode |
|--------|---|-----------------------|--------|------------------------|----------------------|
| | | 0 to 6400 | 0.01ms | 0 | PSTF |
| | Oak on the Bose and test of data data. Ohen the | - 1 - d - 1 - m (1)- | | . In a later of Alexan | 11 |

Set up the time constant of 1st delay filter that determines the lag time behind the voltage applied to the analog input 1.

| Pr4.24 | Analog input 1 (Al1) overvoltage setup | Range | Unit | Default | Related control mode |
|--------|--|---------------|-----------|-------------|----------------------|
| | | 0 to 100 | 0.1V | 0 | P S T F |
| | Set up the excessive level of the input volt | age of analog | input 1 b | y using the | voltage |

| Pr4.25 | Analog input 2 (Al2) offset setup | Range | Unit | Default | Related control mode | |
|--|-----------------------------------|-------------|--------|---------|----------------------|--|
| | | -342 to 342 | 5.86mV | 0 | P S T F | |
| Set up the offset correction value applied to the voltage fed to the analog input 2. | | | | | | |

| Pr4.26 | Analog input 2 (AI2) filter | Range | Unit | Default | | | ated mo | |
|--------|---|------------------|------------|--------------|----|-----|------------|---|
| Pr4.20 | | 0 to 6400 | 0.01ms | 0 | Р | S | Т | F |
| | Set up the time constant of 1st delay filter the applied to the analog input 2. | at determines th | e lag time | e behind the | VC | lta | ıge | |

| Dr/1 27 | r4.27 Analog input 2 (Al2) overvoltage setup | Range | Unit | Default | Related control mode |
|---------|--|---------------|-----------|-------------|----------------------|
| P14.21 | | 0 to 100 | 0.1V | 0 | P S T F |
| | Set up the excessive level of the input volt associated with offset. | age of analog | input 2 b | y using the | voltage |

| | Pr4.28 | Analog input 3 (Al3) offset setup | Range | Unit | Default | Related control mode | |
|--|--------|-----------------------------------|-------------|--------|---------|----------------------|--|
| | | Analog input 5 (Als) onset setup | -342 to 342 | 5.86mV | 0 | P S T F | |
| Set up the offset correction value applied to the voltage fed to the analog input 3. | | | | | | | |

• A parameter is designated as follows: Class Pro. Parameter No.
• For parameters which No. have a suffix of " * ", changed contents will be validated when

 For parameters which No. have a suffix of " * ", changed contents will be validated when you turn on the control power.

Related page · P.3-30... "Inputs and outputs on connector X4"

associated with offset.

[Class 4] I/F monitor setting

| Pr4.29 Analog input 3 (Al3) filter | Range | Unit | Default | Related control mode |
|------------------------------------|-----------|--------|---------|----------------------|
| Alialog lilput 3 (AlS) lilter | 0 to 6400 | 0.01ms | 0 | PSTF |

Set up the time constant of 1st delay filter that determines the lag time behind the voltage applied to the analog input 3.

Pr4.30 Analog input 3 (Al3) overvoltage setup Range Unit Default Related control mode 0 to 100 0.1V 0 P S T F

Set up the excessive level of the input voltage of analog input 3 by using the voltage associated with offset.

Pr4.31 Positioning complete (In-position) range Range Unit Default Related control mode 0 to 262144 Command unit 10 P F

Set up the timing of positional deviation at which the positioning complete signal (INP1) is output.

Caution The command unit is used as the default unit but can be replaced by the encoder unit by using Pr5.20. Positioning unit selection. Note that when the encoder unit is used, unit of Pr0.14 Positional deviation excess setup is also changed.

Note For description of "command unit" and "encoder unit", refer to P.4-48 "Pr5.20".

| Pr4.32 | Positioning complete (In-position) | Range | Unit | Default | conti | elated rol m | |
|--------|------------------------------------|--------|------|---------|-------|-----------------|---|
| P14.32 | output setup | 0 to 3 | _ | 0 | Р | | F |

Select the condition to output the positioning complete signal (INP1).

| Setup value | Action of positioning complete signal |
|-------------|--|
| [0] | The signal will turn on when the positional deviation is smaller than Pr4.31 (Positioning complete range) |
| 1 | The signal will turn on when there is no position command and the positional deviation is smaller than Pr4.31 (Positioning complete range). |
| 2 | The signal will turn on when there is no position command, the zero-speed detection signal is ON and the positional deviation is smaller than Pr4.31 (Positioning complete range). |
| 3 | The signal will turn on when there is no position command and the positional deviation is smaller than Pr4.31 (Positioning complete range). Then holds "ON" status until the next position command is entered. Subsequently, ON state is maintained until Pr4.33 INP hold time has elapsed. After the hold time, INP output will be turned ON/OFF according to the coming positional command or condition of the positional deviation. |

Pr4.33 INP hold time Range Unit Default Related control mode 0 to 30000 1 ms 0 P F

Set up the hold time when Pr4.32 Positioning complete output setup = 3.

| Setup value | lue State of positioning complete signal | | | | |
|-------------|--|--|--|--|--|
| [0] | The hold time is maintained definitely, keeping ON state until the next positional command is received. | | | | |
| 1 to 30000 | ON state is maintained for setup time (ms) but switched to OFF state as the positional command is received during hold time. | | | | |

Note

- A parameter is designated as follows: Class Pro.00 Parameter No.
- For parameters which No. have a suffix of " * ", changed contents will be validated when you turn on the control power.

Related page ..:

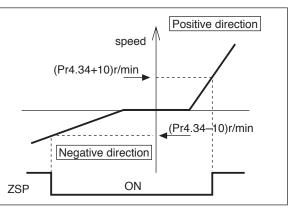
Default: []

| Pr4.34 | Zoro anood | Range | Unit | Default | cor | Rela | | |
|--------|------------|-------------|-------|---------|-----|------|---|---|
| P14.34 | Zero-speed | 10 to 20000 | r/min | 50 | Р | S | Т | F |

You can set up the timing to feed out the zero-speed detection output signal (ZSP or TCL) in rotational speed [r/min].

The zero-speed detection signal (ZSP) will be fed out when the motor speed falls below the setup of this parameter, Pr4.34.

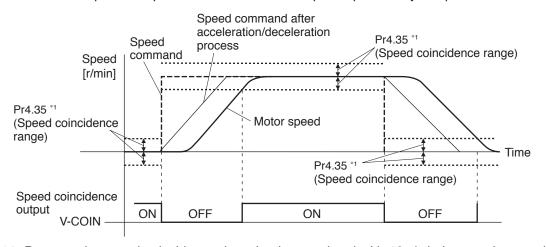
- The setup of Pr4.34 is valid for both Positive and Negative direction regardless of the motor rotating direction.
- There is hysteresis of 10 [r/min].



| Pr4.35 | Speed coincidence range | Range | Unit | Default | cor | | atec I mo | , |
|--------|--------------------------|-------------|-------|---------|-----|---|--------------|---|
| P14.33 | Speed conficidence range | 10 to 20000 | r/min | 50 | | S | Т |] |

Set the speed coincidence (V-COIN) output detection timing.

Output the speed coincidence (V-COIN) when the difference between the speed command and the motor speed is equal to or smaller than the speed specified by this parameter.



- *1 Because the speed coincidence detection is associated with 10 r/min hysteresis, actual detection range is as shown below.
 - Speed coincidence output OFF \rightarrow ON timing (Pr4.35 10) r/min Speed coincidence output ON \rightarrow OFF timing (Pr4.35 + 10) r/min

Note ···

- A parameter is designated as follows: Class Pro.00 Parameter No.
- For parameters which No. have a suffix of " * ", changed contents will be validated when you turn on the control power.

Related page ...

When in Trouble

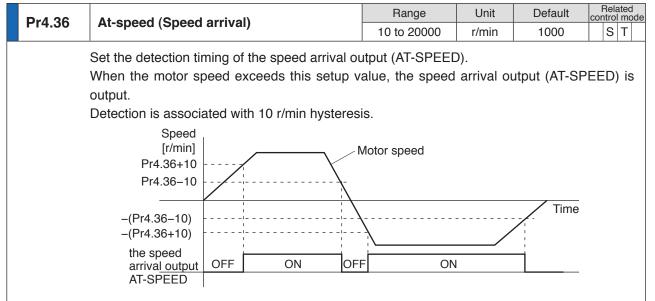
Related control mode

Default

1. Details of parameter

[Class 4] I/F monitor setting

Default: []



| Pr4.37 | Mechanical brake action at stalling setup | Range | Unit | Default | Related | | |
|--------|---|---|-----------------------|-----------|--------------------|--------|---|
| | P14.31 | Mechanical brake action at stanning setup | 0 to 10000 | 1ms | 0 | PST | F |
| | | You can set up the time from when the brake the motor is de-energized (Servo-free), when is at stall. | • | ` | , | | |
| | | Set up to prevent a micro-travel/ drop of the motor (work) due to the action delay | SRV-ON | ON | OF | FF | |
| | | time (tb) of the brake • After setting up Pr4.37 ≥ tb , | BRK-OFF | release | tb ho | ıld | |
| | | then compose the sequence so as the driver turns to Servo-OFF after the brake | actual brake | release | ho | old | |
| | | is actually activated. | motor energization | energized | CITO | rgized | |
| | | | | | Pr4.37 → | | |

Range

Unit

| Pr4.38 | Mechanical brake action at running setup | Range | Unit | Default | control mode |
|--------|---|--------------------------|---------|---------------------|--------------|
| P14.30 | Mechanical brake action at running setup | 0 to 10000 | 1ms | 0 | PSTF |
| | You can set up time from when detecting the when external brake release signal (BRK-OFI during the motor in motion. | | | • | • |
| | Set up to prevent the brake deterioration due to the motor running. | SRV-ON | ON | OFF | = |
| | At Servo-OFF during the motor is running, tb of the right fig. will be a shorter one of either Pr4.38 setup time, | BRK-OFF actual brake en | release | hold non energi | <u>-</u> |
| | or time lapse till the motor speed falls below Pr4.39 setup speed. | motor energization | | Pr4.39 setup spo | |
| | | | ! | Т | |

[Class 4] I/F monitor setting

Default: []

| Pr4.39 | Brake release speed setup | Range | Unit | Default | 100 | | ated I mo | |
|--|---------------------------|------------|-------|---------|-----|---|--------------|---|
| P14.33 | Brake release speed setup | 30 to 3000 | r/min | 30 | Р | S | Т | F |
| Set up the speed timing of brake output checking during operation. | | | | | | | | |

| Pr4.40 | .40 Selection of alarm output 1 | Range | Unit | Default | Related control mode |
|--------|---------------------------------|---------|------|---------|----------------------|
| P14.40 | Selection of alarm output 1 | 0 to 10 | _ | 0 | PSTF |
| Pr4.41 | Selection of alarm output 2 | Range | Unit | Default | Related control mode |
| P14.41 | Selection of alarm output 2 | 0 to 10 | _ | 0 | PSTF |

Select the type of alarm issued as the alarm output 1 or 2.

| Setup value | Alarm | Content |
|-------------|------------------------------------|---|
| [0] | _ | ORed output of all alarms. |
| 1 | Overload protection | Load factor is 85% or more the protection level. |
| 2 | Over-regeneration alarm | Regenerative load factor is 85% or more the protection level. |
| 3 | Battery alarm | Battery voltage is 3.2 V or lower. |
| 4 | Fan alarm | Fan has stopped for 1 sec.*1 |
| 5 | Encoder communication alarm | The number of successive encoder communication errors exceeds the specified value. |
| 6 | Encoder overheat alarm | The encoder detects overheat alarm. |
| 7 | Oscillation detection alarm | Oscillation or vibration is detected. |
| 8 | Lifetime detection alarm | Life expectancy of capacitor or fan becomes short. |
| 9 | External scale error alarm | The external scale detects the alarm. |
| 10 | External scale communication alarm | The number of successive external scale communication errors exceeds the specified value. |

^{*1} The upper fan on the H-frame driver stops during servo OFF to save energy. This is normal.

Related page

For detailed description of alarm types, refer to P.3-46, 47.

| Pr4.42 | 2nd Positioning complete (In-position) | Range | Unit | Default | Related control mo |
|--------|--|-------------|--------------|---------|--------------------|
| P14.42 | range | 0 to 262144 | Command unit | 10 | Р |
| | | | | | |

The INP2 turns ON whenever the positional deviation is lower than the value set up in this parameter, without being affected by Pr4.32 Positioning complete output setup. (Presence/absence of positional command is not related to this judgment.)

Caution ·*

The command unit is used as the default unit but can be replaced by the encoder unit by using Pr5.20. Positioning unit selection. Note that when the encoder unit is used, unit of Pr0.14 Positional deviation excess setup is also changed.

Note

For description of "command unit" and "encoder unit", refer to P.4-48 "Pr5.20".



- A parameter is designated as follows: Class Pro.00 Parameter No.
- For parameters which No. have a suffix of " * ", changed contents will be validated when you turn on the control power.

Related page ...

[Class 5] Enhancing setting

Default: []

| Pr5.00 | 2nd numerator of electronic gear | Range | Unit | Default | Related control mode |
|--------|---|----------------------|------|---------|----------------------|
| P13.00 | 2110 Humerator of electronic gear | 0 to 2 ³⁰ | _ | 0 | P F |
| Pr5.01 | 2rd numerator of electronic goor | Range | Unit | Default | Related control mode |
| P13.01 | 3rd numerator of electronic gear | 0 to 2 ³⁰ | _ | 0 | P F |
| DrE 02 | Pr5.02 4th numerator of electronic gear | Range | Unit | Default | Related control mode |
| P15.02 | | 0 to 2 ³⁰ | _ | 0 | P F |

Set the 2nd to 4th numerator of division/multiplication operation made according to the command pulse input.

This setup is enabled when Pr0.08 command pulse counts per one motor revolution = 0 or full closed controlling.

When the setting value is 0 for positioning controlling, encoder resolution is set as a numerator.

When the setting value is 0 for full closed controlling, both numerator and denominator are set to 1.

| Pr5.03 * | Denominator of pulse output division | Range | Unit | Default | Related control mode |
|----------|--------------------------------------|-------------|------|---------|----------------------|
| P13.03 | | 0 to 262144 | _ | 0 | PSTF |
| | For details, refer to P.4-10. | | | | |

| Pr5.04 * | Over-travel inhibit input setup | Range | Unit | Default | Relate control r | | le = |
|----------|---------------------------------|----------|------|---------|---------------------|--|---------|
| P15.04 | Over-traver minibit input setup | 0 to 2 — | 1 | P S | TF | | |

Set up the operation of the run-inhibition (POT, NOT) inputs.

| Setup value | Operation | | | |
|---|---|--|--|--|
| 0 | 0 POT → Inhibit positive direction travel NOT → Inhibit negative direction travel | | | |
| [1] Disable POT, NOT | | | | |
| 2 POT or NOT input activates Err38.0 Run-inhibition input protection. | | | | |

| Pr5.05 * | * Sequence at over-travel inhibit | Range | Unit | Default | Related control mode |
|----------|-----------------------------------|--------|------|---------|----------------------|
| Pro.uo * | | 0 to 2 | _ | 0 | P S T F |

When Pr5.04 Over-travel inhibition = 0, specify the status during deceleration and stop after application of the over-travel inhibition (POT, NOT).

<Details of Pr5.05 (Sequence at over-travel inhibit)>

| Pr5.04 | Pr5.05 | During deceleration | After stalling | Deviation counter content |
|--------|--------|--|--|--------------------------------------|
| | [0] | Dynamic brake action | Torque command=0 towards inhibited direction | Hold |
| 0 | 1 | Torque command=0 towards inhibited direction | Torque command=0 towards inhibited direction | Hold |
| | 2 | Emergency stop | Command=0 towards inhibited direction | Clears before/ after deceleration |

Note

- A parameter is designated as follows: Class Pro.00 Parameter No.
- For parameters which No. have a suffix of " * ", changed contents will be validated when you turn on the control power.

Related page ..:

• P.3-30... "Inputs and outputs on connector X4" • P.6-2 "Protective Function"

nection

ľ

Adjustment

6

When in Trouble

Supplement

Default: []

| Pr5.06 | Sequence at Servo-Off | Range | Unit | Default | | | ateo I mo | d ode |
|--------|-----------------------|--------|------|---------|---|---|--------------|----------|
| P13.00 | Sequence at Servo-On | 0 to 9 | _ | 0 | Р | S | Т | F |

Specify the status during deceleration and after stop, after servo-off.

| Setup value | During deceleration *3 | After stalling | Positional deviation/ external scale deviation |
|----------------|---------------------------|---------------------------|--|
| [0] | Dynamic Brake (DB) action | Dynamic Brake (DB) action | Clear *4 |
| 1 | Free-run (DB OFF) | Dynamic Brake (DB) action | Clear *4 |
| 2 | Dynamic Brake (DB) action | Free-run (DB OFF) | Clear *4 |
| 3 | Free-run (DB OFF) | Free-run (DB OFF) | Clear *4 |
| 4 | Dynamic Brake (DB) action | Dynamic Brake (DB) action | Hold *2 |
| 5 | Free-run (DB OFF) | Dynamic Brake (DB) action | Hold *2 |
| 6 | Dynamic Brake (DB) action | Free-run (DB OFF) | Hold *2 |
| 7 | Free-run (DB OFF) | Free-run (DB OFF) | Hold *2 |
| 8 | Emergency stop *1 | Dynamic Brake (DB) action | Clear *4 |
| 9 | Emergency stop *1 | Free-run (DB OFF) | Clear *4 |

- *1 Emergency stop refers to a controlled immediate stop with servo-on.

 The torque command value is limited during this process by Pr5.11 Emergency stop torque setup.
- *2 If the positional command is kept applied or the motor is kept running with servo-off condition, positional deviation is accumulated, causing Err24.0 Excess positional deviation protection to be issued. If the servo is turned ON while the position or external scale is significantly deviating, the motor may rapidly operate to reduce the deviation to 0. Remember these requirements if you want to maintain the positional deviation/external scale deviation.
- *3 Deceleration period is the time required for the running motor to speed down to 30 r/min. Once the motor speed drops below 30 r/min, it is treated as in stop state regardless of its speed.
- *4 Positional deviation/external scale deviation is always cleared to 0.

Caution ·*

If an error occurs during servo-off, follow Pr5.10 Sequence at alarm. If the main power is turned off during servo-off, follow Pr5.07 Sequence during main power interruption.

Related page …

Refer to P.2-63, "Timing Chart"-Servo-ON/OFF action while the motor is at stall" of Preparation as well.

| Pr5.07 | Sequence at main power OFF | Range | Unit | Default | Related control mode |
|--------|----------------------------|--------|------|---------|----------------------|
| P15.07 | equence at main power OFF | 0 to 9 | _ | 0 | PSTF |

Specify the status during deceleration after main power interrupt or after stoppage.

The relationship between the setup value of Pr5.06 and the operation and process at deviation counters is the same as that for Pr5.07 (sequence at main power OFF).

Caution -∻

If an error occurs with the main power supply turned off, Pr5.10 Sequence at alarm is applied to the operation.

When the main power supply is turned off with servo-on state, Err13.1 Main power undervoltage error occurs if Pr5.08 LV trip selection with main power off = 1, and the operation follows Pr5.10 Sequence at alarm.



- A parameter is designated as follows: Class Pro.00 Parameter No.
- For parameters which No. have a suffix of " * ", changed contents will be validated when you turn on the control power.

Related page ..:

[Class 5] Enhancing setting

Default: []

| DrE 00 | Pr5.08 LV trip selection at main power OFF | Range | Unit | Default | Related control mode |
|--------|--|--------|------|---------|----------------------|
| Pr5.08 | | 0 to 1 | _ | 1 | PSTF |

You can select whether or not to activate Err13.1 (Main power under-voltage protection) function while the main power shutoff continues for the setup of Pr5.09 (Main power-OFF detection time).

| Setup value | Action of main power low voltage protection | | | | | |
|-------------|---|--|--|--|--|--|
| 0 | When the main power is shut off during Servo-ON, Err13.1 will not be triggered and the driver turns to Servo-OFF. The driver returns to Servo-ON again after the main power resumption. | | | | | |
| [1] | When the main power is shut off during Servo-ON, the driver will trip due to Err13.1 (Main power low voltage protection). | | | | | |

Caution : ❖

This parameter is invalid when Pr5.09 (Detection time of main power OFF)=2000. Err13.1 (Main power under-voltage protection) is triggered when setup of P5.09 is long and P-N voltage of the main converter falls below the specified value before detecting the main power shutoff, regardless of the Pr5.08 setup.

| Pr5.09 * | Detection time of main newer off | Range | Unit | Default | Related control mode |
|----------|----------------------------------|------------|------|---------|----------------------|
| | Detection time of main power off | 70 to 2000 | 1ms | 70 | PSTF |

You can set up the time to detect the shutoff while the main power is kept shut off continuously. The main power off detection is invalid when you set up this to 2000.

| Pr5.10 | Seguence et elerm | Range | Unit | Default | Related control mode |
|--------|--------------------------|--------|------|---------|----------------------|
| P13.10 | Pr5.10 Sequence at alarm | 0 to 7 | _ | 0 | PSTF |

Specify the status during deceleration and after stop, after occurrence of alarm.

| Setup value | During deceleration *3 | After stalling | Positional deviation/ external scale deviation |
|----------------|--|---------------------------|--|
| [0] | Dynamic Brake (DB) action | Dynamic Brake (DB) action | Hold *1 |
| 1 | Free-run (DB OFF) | Dynamic Brake (DB) action | Hold *1 |
| 2 | Dynamic Brake (DB) action | Free-run (DB OFF) | Hold *1 |
| 3 | Free-run (DB OFF) | Free-run (DB OFF) | Hold *1 |
| 4 | Action A: Emergency stop Action B: DB action *2 | Dynamic Brake (DB) action | Hold *1 |
| 5 | Action A: Emergency stop Action B: DB OFF *2 | Dynamic Brake (DB) action | Hold *1 |
| 6 | Action A: Emergency stop Action B: DB action *2 | Free-run (DB OFF) | Hold *1 |
| 7 | Action A: Emergency stop Action B: DB OFF *2 | Free-run (DB OFF) | Hold *1 |

^{*1} Positional deviation/external scale deviation is maintained during alarm condition and will be cleared when the alarm is cancelled.

- *2 Action of A/B: When an alarm requiring emergency stop occurs, the action A is selected when the setup value in the table is set within the range 4 to 7, causing emergency stop of operation. When an alarm not requiring emergency stop occurs, it triggers dynamic braking (DB) specified by action B, or free-running.
- *3 Deceleration period is the time required for the running motor to speed down to 30 r/min.

[Class 5] Enhancing setting

Default: []

| Pr5.11 | Torque setup for emergency stop | Range | Unit | Default | Related control mode |
|---|---------------------------------|----------|------|---------|----------------------|
| P13.11 | Torque setup for emergency stop | 0 to 500 | % | 0 | P S T F |
| Set up the torque limit at emergency stop. | | | | | |
| Note • When setup value is 0, the torque limit for normal operation is applied. | | | | | |

| Pr5.12 | Over load level estup | Range | Unit | Default | Related control mode |
|--------|---|-------------------|----------|-------------|----------------------|
| P15.12 | Pr5.12 Over-load level setup | 0 to 500 | % | 0 | P S T F |
| | You can set up the over-load level. The over to 0. Use this with 0 setup in normal operation. So the over-load level. The setup value of this parameter is limited by | et up other value | only whe | en you need | |

| Pr5.13 | Over-speed level setup | Range | Unit | Default | Related control mode |
|---|------------------------|------------|-------|---------|----------------------|
| P15.13 Over-speed level setup | | 0 to 20000 | r/min | 0 | P S T F |
| If the motor speed exceeds this setup value, Err26.0 Over-speed protection occurs. The over-speed level becomes 1.2 times of the motor max. speed by setting up this to 0. | | | | | |

| | Pr5.14 Motor working range setup | | Range | Unit | Default | | Relat | ted mode |
|--|----------------------------------|--|-----------|----------------|---------|---|-------|-------------|
| | | | 0 to 1000 | 0.1 revolution | 10 | Р | S | TF |
| | | You can set up the movable range of the mot When the motor movement exceeds the se will be triggered. | • | | • | | _ | |

| Pr5.15 * | I/E reading filter | | Range | Unit | Default | Related control mode |
|---|--------------------|-------------------------------|-------|------|---------|----------------------|
| Pr5.15 * I/F reading filter | | 0 to 3 | _ | 0 | PSTF | |
| Select reading period of the control input signal. | | | | | | |
| | Setup value | Reading period of the signal. | | | | |
| | [0] | 0.166ms | | | | |
| | 1 | 0.333ms | | | | |
| | 2 | 1ms | | | | |
| | 3 | 1.666ms | | | | |
| Exclude deviation counter clear input (CL) and command pulse inhibit input (INH). | | | | | | |

Note

- A parameter is designated as follows: Class Pro. Parameter No. For parameters which No. have a suffix of " * ", changed contents will be validated when you turn on the control power.

Related page :: P.3-30... "Inputs and outputs on connector X4" P.6-2 "Protective Function"

[Class 5] Enhancing setting

Default: []

| Pr5.16 * | Alarm clear input setup | Range Unit Default | Default | Related control mode | | | |
|---|-------------------------|--------------------|---------|----------------------|------|--|--|
| Pro. 10 ** | Alami clear input setup | 0 to 1 | _ | 0 | PSTF | | |
| Coloct clares class insect (A. O. D.) recognition times | | | | | | | |

Select alarm clear input (A-CLR) recognition time.

| Setup value | Recognition time |
|-------------|-----------------------------|
| [0] | 120ms |
| 1 | To Pr5.15 IF reading filter |

Pr5.17 Counter clear input mode Range Unit Default Related control mode 0 to 4 — 3 P F

You can set up the clearing conditions of the counter clear input signal.

| Setup value | Clear condition |
|-------------|--|
| 0 Invalid | |
| 1 | Clear at a level (no reading filter) |
| 2 | Clear at a level (with reading filter) |
| [3] | Clear at an edge (no reading filter) |
| 4 | Clear at an edge (with reading filter) |

Note · For signal width/timing requiring the deviation counter input, refer to P.3-38.

| Pr5.18 | Invalidation of command pulse inhibit | Range | Unit | Default | Re | elate ol m | |
|--------|---------------------------------------|--------|------|---------|----|---------------|---|
| | input | 0 to 1 | _ | 1 | Р | | F |

Select command pulse inhibit input enable/disable.

| Setup value | INH input |
|-------------|-----------|
| 0 | Valid |
| [1] | Invalid |

Pr5.19 * Command pulse inhibit input reading setup Range Unit Default Related control mode of the control

Select command pulse inhibit input enable/disable signal reading period. When the status of several signals read during the predetermined reading period are same, update the signal status.

| Setup value | Signal reading period |
|-------------|--|
| [0] | 0.166ms |
| 1 | 0.333ms |
| 2 | 1ms |
| 3 | 1.666ms |
| 4 | 0.166 ms (no check for multiple coincidence) |

Caution ·∵

Longer reading period protects against operation error due to noise but decreases response to input signal.

Note

- A parameter is designated as follows: Class Pro.00 Parameter No.
- For parameters which No. have a suffix of " * ", changed contents will be validated when you turn on the control power.

Related page · ...

• P.3-30... "Inputs and outputs on connector X4" • P.6-2 "Protective Function"

Range Unit Default control mode Pr5.20 * Position setup unit select 0 to 1

Specify the unit to determine the range of positioning complete and excessive positional deviation.

| Setup value | Unit |
|-------------|--------------|
| [0] | Command unit |
| 1 | Encoder unit |

Note The command unit defines 1 command pulse from the higher level device as setting value 1, while the encoder unit defines 1 encoder pulse as setting value 1.

> When the electronic gear ratio set by using the command division and multiplication function (electronic gear) is R, the following relationship is obtained.

Command unit × R = encoder unit

For example, if 20-bit encoder is used with the default setting,

$$R = \frac{2^{20}}{10000}$$
, then, command unit $\frac{2^{20}}{10000}$ = encoder unit.

| Pr5.21 | Coloction of torque limit | Range | Unit | Default | Related control mode |
|--------|---------------------------|--------|------|---------|----------------------|
| PI3.21 | Selection of torque limit | 0 to 6 | _ | 1 | PS F |

You can set up the torque limiting method.

| Setup value | Positive direction | Negative direction |
|-------------|---|---|
| 0 | P-ATL (0 to 10V) | N-ATL (-10 to 0V) |
| [1] | 1st torque li | mit (Pr0.13) |
| 2 | 1st torque limit (Pr0.13) | 2nd torque limit (Pr5.22) |
| 3 | TL-SEL OFF → 1st torque TL-SEL ON → 2nd torque | , |
| 4 | P-ATL (0 to 10V) | N-ATL (0 to 10V) |
| 5 | P-ATL (C |) to 10V) |
| | TL-SEL OFF | |
| | 1st torque limit (Pr0.13) | 2nd torque limit (Pr5.22) |
| 6 | TL-SEL ON | |
| | External input positive direction torque limit (Pr5.25) | External input negative direction torque limit (Pr5.26) |

| Pr5.22 2nd torque li | and torque limit | Range | Unit | Default | Related | |
|----------------------|------------------|----------|------|---------|---------|---|
| | 2nd torque limit | 0 to 500 | % | 500 | PS | F |

You can set up the 2nd limit value of the motor output torque.

The value of parameter is limited to the maximum torque of the applicable motor.

Note For details of torque limit value, refer to P.2-82.

Note

• A parameter is designated as follows: Class Pro. On Parameter No.
• For parameters which No. have a suffix of * * ", changed contents will be validated when you turn on the control power.

Related page .:

• P.2-82 "Setup of Torque Limit" • P.3-30... "Inputs and outputs on connector X4" • P.6-2 "Protective Function"

[Class 5] Enhancing setting

Default: []

| Pr5.23 | Torque limit switching setup 1 | Range | Unit | Default | | Rela ntrol | ted mod | |
|--------|---|-----------|---------|---------|---|---------------|------------|--|
| Pr5.23 | | 0 to 4000 | ms/100% | 0 | Р | S | F | |
| | Specify the rate of change (slope) from 1st to 2nd during torque limit switching. | | | | | | | |

| Pr5.24 | Torque limit switching setup 2 | Range | Unit | Default | Default Relat | | | |
|--------|--|------------------|-------------|---------|---------------|---|---|--|
| P15.24 | | 0 to 4000 | ms/100% | 0 | Р | S | F | |
| | Specify the rate of change (slope) from 2nd to | 1st during torqu | e limit swi | tching. | | | | |

| Pr5.25 | External input positive direction | Range | Unit | Default | | Relate | |
|--|--|----------|------|---------|---|--------|---|
| P15.25 | torque limit | 0 to 500 | % | 500 | Р | S | F |
| Set up positive direction torque limit upon receiving TL-SEL with Pr5.21 Selection of torque limit set at 6. | | | | | | | е |
| | The value of parameter is limited to the maximum torque of the applicable motor. | | | | | | |
| Note → | Note · For details of torque limit value, refer to P.2-82. | | | | | | |

| Pr5.26 | External input negative direction | Range | Unit | Default | Related control mode | | | |
|--------|--|-------|------|---------|----------------------|--|--|--|
| F13.20 | torque limit | | % | 500 | PS F | | | |
| | Set up negative direction torque limit upon receiving TL-SEL with Pr5.21 Selection of torque limit set at 6. The value of parameter is limited to the maximum torque of the applicable motor. | | | | | | | |
| Note · | Note ·· For details of torque limit value, refer to P.2-82. | | | | | | | |

| Dr5 | 27 | Input gain of analog torque limit | Range | Unit | Default | | ed mode | |
|-------------------|----|--|-------------------|-----------|---------------|-----|------------|----|
| Pr5.27 Input gain | | Input gain of analog torque infint | 10 to 100 | 0.1V/100% | 30 | Р | S | F |
| | | From the voltage [V] applied to the analog tor gain to torque limit [%]. | que limit input (| P-ATL, N- | ATL), set cor | nve | rsio | on |

Note

- A parameter is designated as follows: Class Pro. Parameter No. For parameters which No. have a suffix of " * ", changed contents will be validated when you turn on the control power.

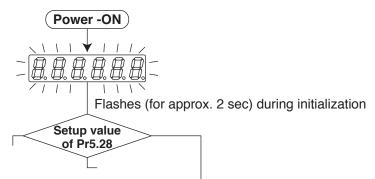
Related page ..:

• P.2-82 "Setup of Torque Limit" • P.3-30... "Inputs and outputs on connector X4" • P.6-2 "Protective Function"

Default: []

Pr5.28 * LED initial status Range Unit Default Related control mode 0 to 35 1 P S T F

You can select the type of data to be displayed on the front panel LED (7 segment) at the initial status after power-on.



| Setup value | Content | Setup value | Content | Setup value | Content |
|-------------|-----------------------------------|----------------|---|----------------|--|
| 0 | Positional command deviation | 12 | Error factor and reference of history | 24 | Encoder positional deviation [Encoder unit] |
| [1] | Motor speed | 13 | Alarm Display | 25 | External scale deviation [External scale unit] |
| 2 | Positional command speed | 14 | Regenerative load factor | 26 | Hybrid deviation [Command unit] |
| 3 | Velocity control command | 15 | Over-load factor | 27 | Voltage across PN [V] |
| 4 | Torque command | 16 | Inertia ratio | 28 | Software version |
| 5 | Feedback pulse sum | 17 | Factor of no-motor running | 29 | Driver serial number |
| 6 | Command pulse sum | 18 | No. of changes in I/O signals | 30 | Motor serial number |
| 8 | External scale feedback pulse sum | 20 | Absolute encoder data | 31 | Accumulated operation time |
| 9 | Control mode | 21 | Absolute external scale position | 32 | Automatic motor recognizing function |
| 10 | I/O signal status | 22 | No. of encoder/ external scale communication errors monitor | 33 | Temperature information |
| 11 | Analog input value | 23 | Communication axis address | 35 | Safety condition monitor |

Related page :: For details of display, refer to P.2-86 "How to Use the Front Panel" of Preparation.

| DrE 20 * | Baud rate setup of | Range | Unit | Default | Related control mode |
|----------|---------------------|--------|------|---------|----------------------|
| Pr5.29 * | RS232 communication | 0 to 6 | _ | 2 | PSTF |

You can set up the communication speed of RS232.

Note Por baud rate setup value, refer to RS485 setup.

| Pr5.30 * | Baud rate setup of | Range | Unit | Default | | Related ontrol mo | | | ٤ |
|----------|---------------------|--------|------|---------|---|----------------------|---|---|---|
| P13.30 | RS485 communication | 0 to 6 | _ | 2 | Р | S | Т | F |] |

You can set up the communication speed of RS485.

| Setup value | Baud rate | Setup value | Baud rate |
|-------------|-----------|-------------|-----------|
| 0 | 2400bps | 4 | 38400bps |
| 1 | 4800bps | 5 | 57600bps |
| [2] | 9600bps | 6 | 115200bps |
| 3 | 19200bps | | |

Baud rate error is $\pm 0.5\%$ for 2400 to 38400 bps, and $\pm 2\%$ for 57,600 to 115,200 bps.

Note • Only for position control type is not provided with X2 (Communication connector).

[Class 5] Enhancing setting

| 0 to 127 - 1 PSTF | ١, | Pr5.31 * | Axis address | Range Unit Defaul | Default | Related control mode |
|-------------------|----|----------|--------------|-------------------|---------|----------------------|
| | ' | | Axis address | 0 to 127 | _ | 1 |

During communication with the host (e.g. PC) to control multiple shafts, the shaft being accessed by the host should be identified.

Note

When using RS232/RS485, the maximum valid value is 31.

| Pr5.32 * Comman | Command nulse input maximum actus | Range | Unit | Default | Rel contro | ated I mode |
|-----------------|-----------------------------------|-------------|-----------|---------|---------------|----------------|
| | Command pulse input maximum setup | 250 to 4000 | k pulse/s | 4000 | Р | F |

Set the maximum number of pulses to be used as command pulse input. If the number of input pulses exceeds the setup value \times 1.2, Err27.0 Command pulse input frequency error protection occurs.

Caution 🔆

The number of input pulses received by the driver is always checked. If the frequency of the received pulse is higher than the upper limit of the setting, input pulses are not accurately detected.

By selecting a value lower than 1000, a digital filter of the specification shown below is enabled against the command pulse input.

| Pr5.32 setting range | Digital filter |
|----------------------|-----------------------|
| 250 to 499 | 200 ns 2-time reading |
| 500 to 999 | 100 ns 2-time reading |
| 1000 or more | No reading (thru) |

| Pr5.33 * | Pulse regenerative output limit setup | Range | Unit | Default | Related control mode |
|---|---|-------------|------|---------|----------------------|
| P13.33 | Pulse regenerative output illilit setup | 0 to 1 | _ | 0 | PSTF |
| Enable/disable detection of Err28.0 Pulse | | Setup value | (| Content | |
| regenerative limit protection. | | [0] | | Invalid | |
| | | 1 | | Valid | |
| | | | | | |

| Pr5.34 For manufacturer's use | | Range | Unit | Default | Related control mode |
|-------------------------------|--------------------------|-------|------|---------|----------------------|
| P15.34 | For illandiacturer's use | _ | _ | 4 | |
| Fixed to 4. | | | | | |

| Pr5.35 * Front panel lock setup | | Range | Unit | Default | Related control mode |
|---------------------------------|--|-------------|---------------------------------------|---------|----------------------|
| P13.33 | Tront paner lock setup | 0 to 1 | _ | 0 | PSTF |
| | Lock the operation on the front panel. | Setup value | e Content | | |
| | | [0] | No limit on the front panel operation | | peration |
| | | 1 | Lock the operation on the front panel | | nt panel |

Note

- A parameter is designated as follows: Class Pro.00 Parameter No.
- For parameters which No. have a suffix of " * ", changed contents will be validated when you turn on the control power.

Related page ..:

4

Setup

1. Details of parameter

[Class 6] Special setting

Default: []

| Pr6.00 | Analog torque feed forward conversion | Range | Unit | Default | Related control mo | |
|--------|---------------------------------------|----------|-----------|---------|--------------------|---|
| | gain | 0 to 100 | 0.1V/100% | 0 | P S | F |

Set the input gain of analog torque feed forward.
0 to 9 are invalid.

Usage example of Analog torque feed forward>

- Setting bit 5 place of Pr6.10 Function expansion setup to 1 enables the analog torque feed forward. When the analog input 3 is used by another function (e.g. analog torque limit), the function becomes invalid.
- The voltage (V) applied to the analog input 3 is converted to the torque via Pr6.00 Analog torque feed forward conversion gain setup and added to the torque command (%): in CCW direction if it is positive voltage or in CW direction if negative.
- The conversion of analog input 3, input voltage [V], to the torque command [%] to the motor may be expressed mathematically as follows:

Torque command (%) = $100 \times \text{input voltage (V)} / (\text{Pr6.00 setup value} \times 0.1)$

| Pr6.02 Velocity deviation ex | Valanity deviation evenes actus | Range | Unit | Default | Related control mode |
|------------------------------|---------------------------------|------------|-------|---------|----------------------|
| | velocity deviation excess setup | 0 to 20000 | r/min | 0 | P |

When the speed deviation (difference between internal positional command and actual speed) exceeds this value, Err24.1 Speed over deviation protection occurs. This protection is not detected when the setup value is 0.

| Dr6 04 | Pr6.04 JOG trial run command speed | Range | Unit | Default | Related control mode |
|--------|------------------------------------|----------|-------|---------|----------------------|
| P10.04 | | 0 to 500 | r/min | 300 | PSTF |
| | | | | | |

Set up the command speed used for JOG trial run (velocity control).

Related page 🔆 Before using, refer to P.4-59 Preparation Trial Run.

| Pr6.05 Position 3rd | Position 3rd gain valid time | Range Unit | | Default | Related control mode | |
|--|------------------------------|------------|-------|---------|----------------------|---|
| | Position stu gain valiu time | 0 to 10000 | 0.1ms | 0 | Р | F |
| Set up the time at which 3rd gain becomes valid. | | | | | | |

• When not using this parameter, set Pr6.05 to 0 and Pr6.06 to 100.

• This is valid for only position control/full-closed control.

| Pr6.06 Position 3rd gain scale factor | | Range | Unit | Default | Related control mode | |
|--|--------------------------------|------------|------|---------|----------------------|--|
| Pro.ub Position | Position std gain scale factor | 50 to 1000 | % | 100 | P F | |
| Set up the 3rd gain by a multiplying factor of the 1st gain: | | | | | | |
| • 3rd gain = 1st gain × Pr6.06/100 | | | | | | |

| N | ote | ••• |
|---|-----|-----|
| | | |

- A parameter is designated as follows: Class Pro.00 Parameter No.
- For parameters which No. have a suffix of " * ", changed contents will be validated when you turn on the control power.

Related page •

• P.3-30... "Inputs and outputs on connector X4" • P.6-2 "Protective Function"

[Class 6] Special setting

Default: []

| Pr6.07 | Torque command additional value | Range | Unit | Default | Rel | lated of mo | |
|--------|---------------------------------|-------------|------|---------|-----|----------------|---|
| P10.07 | Torque command additional value | -100 to 100 | % | | PS | | F |
| | | | | | | | |

- Set up the offset load compensation value usually added to the torque command in a control mode except for the torque control mode.
- Update this parameter when the vertical axis mode for real time auto-tuning is valid.

Pr6.08Positive direction torque compensation valueRangeUnitDefaultRelated control mode-100 to 100%0PF

- Set up the dynamic friction compensation value to be added to the torque command when forward positional command is fed.
- Update this parameter when the friction compensation mode for real time auto-tuning is valid.

| Pr6.09 | Negative direction torque compensation | Range | Unit | Default | | ated I mode |
|--------|--|-------------|------|---------|---|----------------|
| P10.03 | value | -100 to 100 | % | 0 | Р | F |

- Set up the dynamic friction compensation value to be added to the torque command when negative direction positional command is fed.
- Update this parameter when the friction compensation mode for real time auto-tuning is valid.

| Pr6.10 Function expansion setup | Range | Unit | Default | Related control mode |
|---------------------------------|--------------------------|---------|---------|----------------------|
| | Function expansion setup | 0 to 63 | _ | 0 |

Set up the function in unit of bit.

| | Function | Setup | value |
|-------|--------------------------------------|--------------|---------------------------------------|
| | Function | [0] | 1 |
| bit 0 | Speed observer | Invalid | Valid |
| bit 1 | Disturbance observer | Invalid | Valid |
| bit 2 | Disturbance observer operation setup | Always valid | Valid only when 1st gain is selected. |
| bit 3 | Inertia ratio switching | Invalid | Valid |
| bit 4 | Current response improvement | Invalid | Valid |
| bit 5 | Analog torque FF | Invalid | Valid |

^{*} bit 0 = LSB

| Dr6 11 | 11 Current recogness cotus | Range | Unit | Default | Related control mode |
|--------|----------------------------|-----------------|------|---------|----------------------|
| Pr6.11 | Current response setup | 50 to 100 % 100 | 100 | PSTF | |

Fine tune the current response with respect to default setup (100%).

Note

- A parameter is designated as follows: Class Pro.00 Parameter No.
- For parameters which No. have a suffix of " * ", changed contents will be validated when you turn on the control power.

Related page ..:

[Class 6] Special setting

Default: []

Pr6.13 2nd Inertia ratio Range Unit Default Related control mode 0 to 10000 % 250 P S T F

Set 2nd inertia ratio.

You can set up the ratio of the load inertia against the rotor (of the motor) inertia.

 $Pr6.13 = (load inertia/rotor inertia) \times 100 [%]$

Caution 🔆

If the inertia ratio is correctly set, the setup unit of Pr1.01 and Pr1.06 becomes (Hz). When the inertia ratio of Pr0.04 is larger than the actual, the setup unit of the velocity loop gain becomes larger, and when the inertia ratio of Pr0.04 is smaller than the actual, the setup unit of the velocity loop gain becomes smaller.

Pr6.14 Emergency stop time at alarm Range Unit Default Related control mode 0 to 1000 1ms 200 P S T F

Set up the time allowed to complete emergency stop in an alarm condition. Exceeding this time puts the system in alarm state.

When setup value is 0, immediate stop is disabled and the immediate alarm stop is enabled.

| Dr6 15 | Range | Unit | Default | Related control mode | |
|--------|----------------------------|------------|---------|----------------------|------|
| Pr6.15 | 2nd over-speed level setup | 0 to 20000 | r/min | 0 | PSTF |

When the motor speed exceeds this setup time during emergency stop sequence in an alarm condition, Err26.1 2nd overspeed protection will be activated.

The over-speed level becomes 1.2 times of the motor max. speed by setting up this to 0.

Pr6.17 * Front panel parameter writing selection Range Unit Default Related control mode 0 to 1 0 P S T F

Specify the EEPROM writing procedure when parameter is edited form the front panel.

| Setup value | Writing |
|-------------|---|
| [0] | Do not write to EEPROM at the same time |
| 1 | Write to EEPROM at the same time |

| Pr6.18 * | Power-up wait time | Range | Unit | Default | Related control mode |
|----------|--------------------|----------|------|---------|----------------------|
| | Power-up wait time | 0 to 100 | 0.1s | 0 | PSTF |

Set up the standard initialization time (1.5 s + α) after power-up.

Note

• A parameter is designated as follows: Class Pro.00 Parameter No.

• For parameters which No. have a suffix of " * ", changed contents will be validated when you turn on the control power.

Related page · .:

• P.2-107 "EEPROM Writing Mode" • P.3-30... "Inputs and outputs on connector X4"

[Class 6] Special setting

Default: []

| Pr6.19 * | Encoder Z phase setup | Range | Unit | Default | Related control mode |
|------------|-----------------------|--------------------|------|---------|----------------------|
| Pro. 19 ** | Encoder 2 phase setup | 0 to 32767 pulse 0 | PSTF | | |
| | | | | | |

If the number of output pulses per one motor revolution after division of pulse output is not an integer, fine adjust the width of encoder Z phase.

Pr6.20 * Z-phase setup of external scale Range Unit Default Related control mode 0 to 400 μs 0 F

Set up the Z phase regenerative width of external scale in unit of time. Even if the width of Z phase signal cannot be detected because the width equivalent of the travel distance from the external scale is too short, the Z phase signal will be output for at least the period set to this parameter.

Pr6.21 * Serial absolute external scale Z phase setup Range Unit Default Related control mode 0 to 2²⁸ pulse 0 F

Full-closed control using serial absolute external scale. When outputting pulses by using the external scale as the source of the output, set the Z phase output interval in units of A phase output pulses of the external scale (before multiplied by 4).

| Setup value | Content |
|----------------|---|
| [0] | Output Z phase only at absolute 0 position of external scale. |
| 1 to 268435456 | After the power is fed to the driver, the Z phase, as it crosses the zero at the absolute position of external scale, is output in synchronous with the A phase. Subsequently, the Z phase is output at the A phase output pulse intervals set to this parameter. |

Pr6.22 * A, B phase external scale pulse output method selection Range Unit per lault control mode Related control mode 0 to 1 0 | F

Select the pulse regeneration method of A, B and Z parallel external scale.

| Setup value | Regenerating method | | |
|-------------|--|--|--|
| [0] | Directly output the signals from A, B and Z parallel external scales. | | |
| 1 | Output A and B phase signals recovered from A, B and Z parallel external scales. Z-phase is output directly. | | |

| Pr6.23 Disturbance torque compensating gain | Range | Unit | Default | Related control mode |
|---|-------------|------|---------|----------------------|
| Pro.25 Disturbance torque compensating gain | -100 to 100 | % | 0 | PS |

- Set up -100 to 100% compensating gain against disturbance torque.
- After setting up Pr6.24, increase Pr6.23.

The disturbance suppressing capability increases by increasing the gain, but it is associated with increasing volume of operation noise.

This means that well balanced setup can be obtained by adjusting Pr6.24 and Pr6.23.

Note

- A parameter is designated as follows: Class Pro.00 Parameter No.
- For parameters which No. have a suffix of " * ", changed contents will be validated when you turn on the control power.

Related page ..:

[Class 6] Special setting

Default: []

| Pr6.24 | Disturbance observer filter | Range | Unit | Default | Related control mod | | | |
|--------|-----------------------------|-----------|--------|---------|---------------------|--|--|--|
| P10.24 | Disturbance observer inter | 0 to 2500 | 0.01ms | 53 | Р | | | |

- Set up the filter time constant according to the disturbance torque compensation.
- First, set up Pr6.24 to a larger value and check the operation with Pr6.23 Disturbance torque compensating gain set to a low value, and then gradually decrease the setup value of Pr6.24. A low filter setup value assures disturbance torque estimation with small delay and effectively suppresses effects of disturbance. However, this results in larger operation noise. Well balanced setup is required.

| Pr6.27 * | Alarm latch time selection | Range | Unit Default co | Related control mode | |
|----------|----------------------------|---------|-----------------|----------------------|------|
| P10.27 | Alarm laten time selection | 0 to 10 | _ | 5 | PSTF |

Set up the latch time.

| Setup value | Content | | |
|-------------|-------------|----------|--|
| 0 | Latch time: | infinite | |
| 1 | | 1 [s] | |
| 2 | | 2 [s] | |
| 3 | | 3 [s] | |
| 4 | | 4 [s] | |
| [5] | Latch time | 5 [s] | |
| 6 | Laterrume | 6 [s] | |
| 7 | | 7 [s] | |
| 8 | | 8 [s] | |
| 9 | | 9 [s] | |
| 10 | | 10 [s] | |

| Pr6.31 | Pool time outs tuning estimation aread | Range | Unit | Default | Related control mode |
|--------|--|--------|------|---------|----------------------|
| P10.31 | Real time auto tuning estimation speed | 0 to 3 | _ | 1 | PSTF |

Set up the load characteristics estimation speed with the real time auto tuning being valid. A higher setup value assures faster response to a change in load characteristics but increases variations in disturbance estimation. Result of estimation is saved to EEPROM every 30 minutes.

| Setup value | Mode | Description |
|-------------|-----------------|---|
| 0 | No change | Stop estimation of load characteristics. |
| [1] | Almost constant | Response to changes in load characteristics in every minute. |
| 2 | Slower change | Response to changes in load characteristics in every second. |
| 3 * | Faster change | Obtain best suitable estimation in response to changes in load characteristics. |

^{*} If the automatic oscillation detection is enabled by the support software PANATERM, the setup value 3 is used.



- A parameter is designated as follows: Class Pro.00 Parameter No.
- For parameters which No. have a suffix of " * ", changed contents will be validated when you turn on the control power.
- The setup support software PANATERM can be downloaded from our web site.

Related page ...

[Class 6] Special setting

| Pr6.32 | Real time | auto tuning o | ustom setup |) | Range | Unit | Default | Related control mode |
|--------|---|--|--|--|--|---|--|--|
| 11010_ | | | | | -32768 to 32767 | _ | 0 | PSTF |
| | | pperation mode tic adjusting fu | | | ining is set to the ow. | customiz | e (Pr0.02 | 2 = 6), set |
| | Bit | Content | | | Description | า | | |
| | | | Enable/disable | e the lo | ad characteristics es | stimation fu | unction. | |
| | | | Setup value | | Function | | | |
| | | Load char- | [0] | | Disable Enable | | | |
| | 1 to 0 | acteristics | - | charact | eristics estimation | is disabled | d. the curre | ent setup |
| | | estimation * | | | d even if the inertia | | | - 1 |
| | | | | | e. When the torque | - | ation is up | odated by |
| | | | | | e, it is cleared to 0 (| | | |
| | | | Set up update estimation of I | | nade based on resu | It of the loa | ad characte | eristics |
| | 3 to 2 | Inertia ratio | Setup value | 10.04 | Function | | | |
| | 0 10 2 | update | [0] | l | Jse the current setu | o. | | |
| | | | 1 | Upda | te by the estimated | value. | | |
| | | | Set up the u | ıpdate | to be made acco | rdina to t | he results | s of load |
| | | | • | - | ation of Pr6.07 Torq | - | | |
| | | | Pr6.08 positive direction torque compensation va | | | | value an | d Pr6.09 |
| | negative direction torque compensation va | | | | 1* | | | |
| | | | Setup value | | Function | Com | pensation | setup |
| | | | [0] | IJ | se current setup | Pr6 07 | Pr6.08 | Pr6 09 |
| | 6 to 4 | Torque | [0] | | se current setup torque compensati | Pr6.07 on 0 clear | | Pr6.09 0 clear |
| | 6 to 4 | Torque compensation | | Disable | · · · · · · · · · · · · · · · · · · · | | 0 clear | |
| | 6 to 4 | | 1 | Disable Ve | torque compensati | on 0 clear | 0 clear 0 clear | 0 clear |
| | 6 to 4 | | 1 2 | Disable Ve Fric Fric | torque compensation compensation (low) tion compensation (middle) | on 0 clear Update | 0 clear 0 clear Low | 0 clear 0 clear |
| | 6 to 4 | | 1 2 3 | Disable Ve Fric Fric | torque compensation compensation (low) tion compensation | Update | 0 clear c 0 clear Low Middle | 0 clear 0 clear Low |
| | 6 to 4 | | 1 2 3 4 5 Enable/disable | Disable Ve Fric Fric Fric | torque compensation compensation (low) tion compensation (middle) tion compensation (high) | Update Update Update Update Update | 0 clear Coclear Coclea | 0 clear 0 clear Low Middle High |
| | | | 1 2 3 4 5 Enable/disable Real time auto | Disable Ve Fric Fric Fric | torque compensation compensation (low) tion compensation (middle) tion compensation (middle) tion compensation (high) | Update Update Update Update Update | 0 clear Coclear Coclea | 0 clear 0 clear Low Middle High |
| | 6 to 4 | compensation | 1 2 3 4 5 Enable/disable Real time auto | Disable Ve Fric Fric Fric | torque compensation ertical axis mode tion compensation (low) tion compensation (middle) tion compensation (high) tion compensation (high) tion compensation (high) | Update Update Update Update Update | 0 clear Coclear Coclea | 0 clear 0 clear Low Middle High |
| | | compensation | 1 2 3 4 5 Enable/disable Real time auto | Disable Ve Fric Fric Fric | torque compensation compensation (low) tion compensation (middle) tion compensation (middle) tion compensation (high) | Update Update Update Update Update | 0 clear Coclear Coclea | 0 clear 0 clear Low Middle High |
| | | Stiffness setup | 1 2 3 4 5 Enable/disable Real time autor Setup value [0] 1 | Disable Ve Fric Fric e the ba o tuning | torque compensation compensation (low) tion compensation (middle) tion compensation (high) tion | Update Update Update Update Update Update Update | 0 clear Low Middle High Cording to F | 0 clear 0 clear Low Middle High |
| | 7 | Stiffness setup Fixed | 1 2 3 4 5 Enable/disable Real time autor Setup value [0] 1 | Disable Ve Fric Fric e the ba o tuning | torque compensation compensation (low) tion compensation (middle) tion compensation (high) tion | Update Update Update Update Update Update Update | 0 clear Low Middle High Cording to F | 0 clear 0 clear Low Middle High |
| | | Stiffness setup | 1 2 3 4 5 Enable/disable Real time auto Setup value [0] 1 Enable/disable Setup value [0] 0] | Price Frice Frice Frice the base tuning the characteristics. | torque compensation critical axis mode tion compensation (low) tion compensation (middle) tion compensation (high) tion c | Update | 0 clear Low Middle High Cording to F | 0 clear 0 clear Low Middle High |
| | 7 | Stiffness setup Fixed parameter | 1 2 3 4 5 Enable/disable Real time auto Setup value [0] 1 Enable/disable Setup value | Price Frice Frice Frice the base tuning the characteristics. | torque compensation compensation (low) tion compensation (middle) tion compensation (high) tion | Update | 0 clear Low Middle High Cording to F | 0 clear 0 clear Low Middle High |
| | 7 | Stiffness setup Fixed parameter setup | 1 2 3 4 4 5 5 Enable/disable Real time auto Setup value [0] 1 Enable/disable Setup value [0] 1 | Price Frice Frice the base tuning the chain switch | torque compensation ertical axis mode tion compensation (low) tion compensation (middle) tion compensation (high) tion compensation (high) asic gain setup to be mechanical stiffnes Function Disable Enable Inge of parameter that Function Use the current setue Set to a fixed value ting related parame | Update | O clear O clear O clear High Cording to F D. | 0 clear 0 clear Low Middle High Pr0.03 |
| | 7 | Stiffness setup Fixed parameter setup Gain | 1 2 3 4 4 5 5 Enable/disable Real time auto Setup value [0] 1 1 Enable/disable Setup value [0] 1 Select the gai time auto tuniu Setup value | Disable Verification Frice Frice Frice the base of tuning the characteristics I the char | torque compensation critical axis mode tion compensation (low) tion compensation (middle) tion compensation (high) tion compensation Disable Enable the current setup to a fixed value to a fixed value ting related parametabled. Function | Update | O clear O clear O clear High Cording to F D. | 0 clear 0 clear Low Middle High Pr0.03 |
| | 7 8 | Stiffness setup Fixed parameter setup | 1 2 3 4 4 5 5 Enable/disable Real time auto Setup value [0] 1 1 Select the gai time auto tunic Setup value [0] 0 1 1 Setup value [0] 1 1 Setup value [0] 1 Setup value [0] 1 Setup value [0] 5 Setup value [0] 1 Setup value [0] 1 Setup value [0] | Price Frice Frice the base tuning the character of the ch | torque compensation ertical axis mode tion compensation (low) tion compensation (middle) tion compensation (high) tion compensation Disable tion tion Disable tion provided the current seturation tion tion tion tion tion tion tion | Update | O clear O clear O clear High Cording to F D. | 0 clear 0 clear Low Middle High Pr0.03 |
| | 7 8 | Stiffness setup Fixed parameter setup Gain switching | 1 2 3 4 4 5 5 Enable/disable Real time auto Setup value [0] 1 1 Enable/disable Setup value [0] 1 Select the gai time auto tuniu Setup value | Disable Verification Frice Frice e the base tuning the chain the chain switching is en | torque compensation critical axis mode tion compensation (low) tion compensation (middle) tion compensation (high) tion compensation Disable Enable the current setup to a fixed value to a fixed value ting related parametabled. Function | Update | O clear O clear O clear High Cording to F D. | 0 clear 0 clear Low Middle High Pr0.03 |

(continued)

[Class 6] Special setting

Default: []

Caution ·∻

This parameter should be setup bit by bit. To prevent setting error, use of the setup support software is recommended when editing parameter.

<Setup procedure of bitwise parameter>

When setting parameter to a value other than 0, calculate the setup value of Pr6.32 in the following procedure.

1) Identify the LSB of the setup.

Example: LSB of the torque compensation function is 4.

2) Multiply the setup value by power of 2 (LSB).

Example: To set the torque compensation function to friction compensation (middle): $2^4 \times 4 = 64$.

3) Perform steps 1) and 2) for every setups, sum up the values which are to be Pr6.32 setup value.

Example: Load characteristics measurement = enable, inertia ratio update = enable, torque compensation = friction compensation (middle), stiffness setup = enable, fixed parameter = set to a fixed value, gain switching setup = enable, then,

$$2^{0} \times 1 + 2^{2} \times 1 + 2^{4} \times 4 + 2^{7} \times 1 + 2^{8} \times 1 + 2^{9} \times 2 = 1477$$

Pr6.34Hybrid vibration suppression gainRangeUnitDefaultRelated control mode0 to 300000.1/s0F

Set up the hybrid vibration suppression gain for full-closed controlling.

First set it to the value identical to that of poison loop gain, and then fine tune as necessary.

Pr6.35Hybrid vibration suppression filterRangeUnitDefaultHelated control mode0 to 64000.01ms10F

Set up the time constant of the hybrid vibration suppression filter for full-closed controlling. While driving under full-closed control, gradually increase the setup value and check changes in the response.

| Pr6.37 | Oscillation detecting level | Range | Unit | | Related control mode |
|--------|-----------------------------|-----------|------|---|----------------------|
| P10.37 | Oscillation detecting level | 0 to 1000 | 0.1% | 0 | PSTF |

Set up the oscillation detecting level.

Upon detection of a torque vibration whose level is higher than this setup value, the oscillation detection alarm will be issued.

| Pr6.38 * | Alarm mask setup | Range | Unit | Default | Related control mode |
|----------|----------------------|-----------------|------|---------|----------------------|
| P10.36 | Alariii illask setup | -32768 to 32767 | _ | 0 | PSTF |

Set up the alarm detection mask. Placing 1 to the corresponding bit position disables detection of the alarm condition.

| Pr6.39 | For manufacturaria usa | Range | Unit | Default | Related control mode |
|--------|------------------------|-------|------|---------|----------------------|
| Pro.39 | For manufacturer's use | _ | _ | 0 | |
| | | | | | |

Fixed to 0.

Note

- A parameter is designated as follows: Class Pro.00 Parameter No.
- For parameters which No. have a suffix of " * ", changed contents will be validated when you turn on the control power.

Related page ...

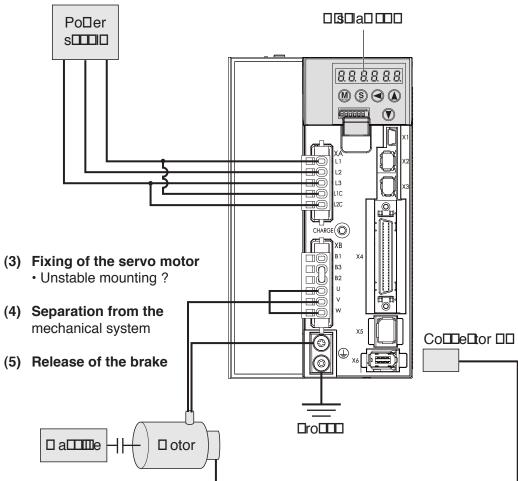
Inspection Before Trial Run

(1) Inspection on wiring

- · Miswiring ? (Especially power input and motor output)
- · Short or grounded?
- Loose connection ?

(2) Confirmation of power supply and voltage

· Rated voltage ?



(6) Turn to Servo-OFF after finishing the trial run by pressing (§).

Note

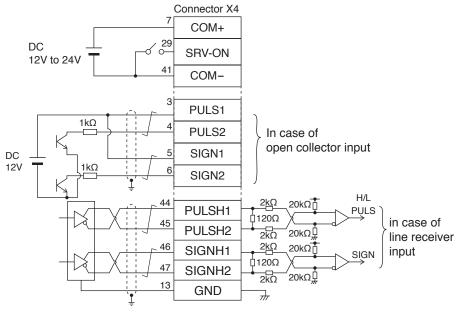
- Details of wiring, refer to P.2-12... "Overall Wiring"
- The figure above shows connections on velocity, position, torque and full-closed mode driver.
- Only for position control type is not provided with X2 (Communication connector), X3 (Safety function connector), X5 (External scale connector).

Trial Run by Connecting the Connector X4

Trial Run (JOG run) at Position Control Mode

- (1) Connect the Connector X4.
- (2) Enter the power (DC12 to 24V) to control signal (COM+, COM-)
- (3) Enter the power to the driver.
- (4) Confirm the default values of parameters.
- (5) Match to the output format of the host controller with Pr0.07 (Command pulse input mode setup).
- (6) Write to EEPROM and turn off/on the power (of the driver).
- (7) Connect the Servo-ON input (SRV-ON) and COM- (Connector X4, Pin-41) to bring the driver to Servo-ON status and energize the motor.
- (8) Enter low frequency from the host controller to run the motor at low speed.
- (9) Check the motor rotational speed at monitor mode whether, rotational speed is as per the setup or not, and the motor stops by stopping the command (pulse) or not.
- (10) If the motor does not run correctly, refer to P.2-100, "Display of Factor for No-Motor Running" of Preparation.

Wiring Diagram



Parameter

| Pr No. | Title | Setup value |
|--------|---|-------------|
| 0.01 | Control mode setup | 0 |
| 5.04 | Over-travel inhibit input setup | 1 |
| 0.05 | Selection of command pulse input | 0/1 |
| 0.07 | Command pulse input mode setup | 1 |
| 5.18 | Invalidation of command pulse inhibit input | 1 |
| 5.17 | Counter clear input mode | 2 |

Input signal status

| No. | Title of signal | Monitor display |
|-----|-----------------|-----------------|
| 0 | Servo-ON | +A |

Trial Run by Connecting the Connector X4

Trial Run (JOG run) at Velocity Control Mode

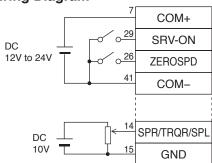
- 1) Connect the Connector X4.
- 2) Enter the power (DC12 to 24V) to control signal (COM+, COM-)
- 3) Enter the power to the driver.
- 4) Confirm the default values of parameters.
- 5) Connect the Servo-ON input (SRV-ON, Connector X4, Pin-29) and COM– (Connector X4, Pin-14) to turn to Servo-ON and energize the motor.
- 6) Close the speed zero clamp input (ZEROSPD) and apply DC voltage between velocity command input, SPR (Connector X4, Pin-14) and GND (Connector X4, Pin-15), and gradually increase from 0V to confirm the motor runs.
- 7) Confirm the motor rotational speed in monitor mode.
 - Whether the rotational speed is per the setup or not.
 - Whether the motor stops with zero command or not.
- 8) If the motor does rotate at a micro speed with command voltage of 0.
- 9) When you want to change the rotational speed and direction, set up the following parameters again.

Pr3.00: Speed setup, Internal/External switching
Pr3.01: Speed command rotational direction selection
Pr3.03: Reversal of speed command input

Refer to P.4-25, 26 "Parameter Setup" (Parameters for Velocity/Torque Control)

10)If the motor does not run correctly, refer to P.2-100, "Display of Factor for No-Motor Running" of Preparation.

Wiring Diagram



Run with ZEROSPD switch close, and Stop with open

In case of bi-directional operation (Positive/Negative), provide a bipolar power supply, or use with Pr3.15 = 3.

In case of one-directional operation

Parameter

| Pr No. | Title | Setup value |
|--------|--|-------------|
| 0.01 | Control mode setup | 1 |
| 5.04 | Over-travel inhibit input setup | 1 |
| 3.15 | Speed zero-clamp function selection | 1 |
| 3.00 | Speed setup, Internal/External switching | |
| 3.01 | Speed command rotational direction selection | |
| 3.02 | Input gain of speed command | Set up as |
| 3.03 | Reversal of speed command input | required |
| 4.22 | Analog input 1 (Al1) offset setup | |
| 4.23 | Analog input 1 (Al1) filter | |

Input signal status

| No. | Title of signal | Monitor display |
|-----|------------------|-----------------|
| 0 | Servo-ON | +A |
| 5 | Speed zero clamp | _ |



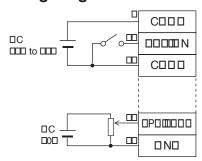
• Only for position control type is not provided with analog input.

Trial Run (JOG run) at Torque Control Mode

- 1) Connect the Connector X4.
- 2) Enter the power (DC12-24V) to control signal (COM+, COM-)
- 3) Enter the power to the driver.
- 4) Confirm the default values of parameters.
- 5) Set a lower value to Pr3.07 (4th speed of speed setup).
- 6) Energize the motor by connecting the Servo-ON input (SRV-ON, Connector X4, Pin-29) and COM- (Pin-41 of Connector X4) to turn to Servo-ON status.
- 7) Confirm that the motor runs as per the setup of Pr3.07 by applying DC voltage (positive/negative) between the torque command input (Pin-14 of Connector X4) and GND (Pin-15 of Connector X4).
- 8) If you want to change the torque magnitude, direction and velocity limit value against the command voltage, set up the following parameters.
 - Pr3.19: Input gain of torque command
 Pr3.20: Input reversal of torque command
 Pr3.21: Speed limit value 1

 Refer to P.4-29, 30, "Parameter Setup"
 (Parameters for Velocity/Torque Control)
- 9) If the motor does not run correctly, refer to P.2-100, "Display of factor for No-motor running" of Preparation.

Wiring Diagram



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Parameter

| Pr No. | Title | Setup value |
|--------|-------------------------------------|-------------|
| 0.01 | Control mode setup | 2 |
| 5.04 | Over-travel inhibit input setup | 1 |
| 3.15 | Speed zero-clamp function selection | 0 |
| 3.17 | Selection of torque command | 0 |
| 3.19 | Input gain of torque command | Set up as |
| 3.20 | Input reversal of torque command | required |
| 3.21 | Speed limit value 1 | lower value |

Input signal status

| No. | Title of signal | Monitor display |
|-----|------------------|-----------------|
| 0 | Servo-ON | +A |
| 5 | Speed zero clamp | _ |

Note

Only for position control type is not provided with analog input.

Setup of Motor Rotational Speed and Input Pulse Frequency

| Input pulse frequency | Motor rotational speed (r/min) | Pr0.08 | |
|-----------------------|--------------------------------|--------------------------|--------------------------|
| (pps) | | 17-bit | 20-bit |
| 2M | 3000 | 2 ¹⁷ 40000 | 2 ²⁰ 40000 |
| 500K | 3000 | 2 ¹⁷ 10000 | 2 ²⁰ 10000 |
| 250K | 3000 | 2 ¹⁷ 5000 | 2 ²⁰ 5000 |
| 100K | 3000 | 2 ¹⁷ 2000 | 2 ²⁰ 2000 |
| 500K | 1500 | 2 ¹⁷ 20000 | 2 ²⁰ 20000 |

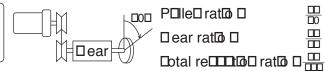
Note

When setting Pr0.08, and encoder resolution is automatically set up as numerators. For full closed controlling, setting of Pr0.08 is ignored and settings of Pr0.09 and Pr0.10 are always applied.

Caution

- Max. input pulse frequency varies depending on input terminals.
- The desired setting can be determined by selecting value of numerator and denominator of electronic gear. However, an excessively high division or multiplication ratio cannot guarantee the operation. The ratio should be in a range between 1/1000 and 1000. Excessively high multiplication ratio will cause Err27.2 (command pulse multiplication error protection) due to varying command pulse input or noises, even if the other settings are within the specified range.

Relation between the motor rotational speed and input pulse counts



When setting the command division and multiplication ratio as numerator/denominator, express it as Pr0.09/Pr0.10 with Pr0.08 = 0. For full closed controlling, setting of Pr0.08 is ignored and settings of Pr0.09 and Pr0.10 are always applied. e.g.) When you want to rotate the motor by 60° with the load of total reduction ratio of 18/365.

| | Encoder | |
|----------------------------|---|--|
| | 17-bit | 20-bit |
| Pr0.09 | | 5840 67500 |
| Command pulse | To rotate the output shaft by 60°, enter the command of 8192 (2 ¹³) pulses from the host controller. | To rotate the output shaft by 60°, enter the command of 10000 pulses from the host controller. |
| How to determine parameter | $ \frac{365}{18} \times \frac{1 \times 2^{17}}{2^{13}} \times \frac{60^{\circ}}{360^{\circ}} $ $ = \frac{5840}{108} $ | $ \frac{365}{18} \times \frac{1 \times 2^{20}}{10000} \times \frac{60^{\circ}}{360^{\circ}} $ $ = \frac{5840}{67500} $ |

* Refer to P.2-84 "Setup of command division and multiplication ratio (electronic gear ratio)" of Supplement.

| 2 ⁿ | Decimal figures |
|------------------------|-----------------|
| 20 | 1 |
| 2 ¹ | 2 |
| 2 ² | 4 |
| 2 ³ | 8 |
| 24 | 16 |
| 2 ⁵ | 32 |
| 2 ⁶ | 64 |
| 2 ⁷ | 128 |
| 2 ⁸ | 256 |
| 2 ⁹ | 512 |
| 2 ¹⁰ | 1024 |
| 211 | 2048 |
| 212 | 4096 |
| 2 ¹³ | 8192 |
| 214 | 16384 |
| 2 ¹⁵ | 32768 |
| 2 ¹⁶ | 65536 |
| 2 ¹⁷ | 131072 |
| 2 ¹⁸ | 262144 |
| 2 ¹⁹ | 524288 |
| 2 ²⁰ | 1048576 |

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