# Technical Announcement

DELTA ELECTRONICS,INC. Industrial Automation B.G.

| Product | AMD | Models | VFD-C2000 | Security Classification | ☐General<br>☑Confidential<br>☐Top-secret |
|---|---|---|---|---|---|
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Purpose: VFD-C2000 software version upgrade：v1.12→v1.20
Firmware version：1.20
Explanation:

<div align="center"><strong>Function correction</strong></div>

| | Version 1.12 problem | Version 1.20 correction |
|---|---|---|
| 1 | The Pr.00-20=4 or 5 and MI=37 is ON, the input pulse of PG card is position command. While Pr10-17 and 18 electrical gear ratio<1, the slave drive will stop automatically after running for a certain period of time. | The pulse following position control can work normally. |
| 2 | Unable to copy parameter while drive's password is temporarily decoded. | Able to copy parameter while drive's password is temporarily decoded. |
| 3 | When the Modbus communication is using, to use keypad connection port for VFD Explorer monitor software and the connection is fail. | When the Modbus communication is using, to use keypad connection port for VFD Explorer monitor software and the Explorer can work normally. |
| 4 | The Pr03-18 Addition Function of the Analog Input ≠0 (Analog Input can be adding up).<br>If the sum of the addition <0, it will be considered as 0.<br>But, when Pr03-10 Analog Frequency Command for Reverse Run ≠0 (Negative frequency is valid. Positive frequency = forward run, negative frequency = reverse run. Direction cannot be switched by digital keypad or external terminal control.), the sum of the addition is also be considered as 0. | The Pr03-18 Addition Function of the Analog Input ≠0 (Analog Input can be adding up).<br>The Pr03-10 Analog Frequency Command for Reverse Run ≠0 (Negative frequency is valid. Positive frequency = forward run, negative frequency = reverse run. Direction cannot be switched by digital keypad or external terminal control.)<br>If the sum of the addition <0, it will not be considered as 0. |
| 5 | When the source of frequency command =communication, the frequency command will not be saved. | When the source of frequency command =communication, the frequency command can be saved. |
| 6 | The Pr00-10=1 Point-to-Point position control and Pr00-12=0 Incremental Type. The second or after position command will become no effective. | The P2P position control can work normally. |

| | | |
|---|---|---|
| 7 | With the same parameters setting:<br>The Ver1.02.0 and VF control mode, the drive can work normally when the torque compensation gain=5.<br>The Ver1.1x or above and VF control mode, the torque compensation gain=5 will cause oV or oL. | The torque compensation function can work normally in any firmware version. |
| 8 | The same parameters setting and FOCPG control mode with a big inertia load such as big wheel:<br>The version 1.00.2 can work normally.<br>The new version, an ocA error might occur during a quick acceleration. | FOCPG mode, run with a big inertia load can work normally during quick acceleration. |
| 9 | FOCPG mode, the system will run reverse direction first before it runs forward. | FOCPG run can work normally. |
| 10 | 1. Freq. command=15.00Hz→the source of frequency=Keypad<br>2. The source of operation command= external terminal<br>3. Turn On the MI3→the 4th multi-speed=10Hz<br>4. Turn off the power and turn on again for several times(must see LVA)<br>5. After about 5 times LVA, turn off the MI3→the F command become 0Hz(it should be 15Hz). | 1. Freq. command=15.00Hz→the source of frequency=Keypad<br>2. The source of operation command= external terminal<br>3. Turn On the MI3→the 4th multi-speed=10Hz<br>4. Turn off the power and turn on again for several times(must see LVA)<br>5. After about 5 times LVA, turn off the MI3→the F command become 15Hz. |
| 11 | The output torque can't be display under VF control mode. | The output torque can be display under VF control mode. |
| 12 | When under PM and FOCPG mode, the setting range of carrier frequency is between 4~15KHz. While carrier frequency is set as 4KHz, the lq will reach the maximum current limit at weakening flux zone and will not speed up. | When under PM and FOCPG mode, the setting range of carrier frequency is between 4~15KHz. While carrier frequency is set as 4KHz, the drive can work normally at weakening flux zone. |
| 13 | When the source of frequency command has changed from the keypad to MODBUS communication, the frequency command will become 0Hz. | When the source of frequency command has changed from the keypad to MODBUS communication, the frequency commands will use the MODBUS memory frequency value. |
| 14 | MIx=26 FOCPG/TQCPG mode selection.<br>TQCPG mode, JOG run, the output frequency will not under control and the motors don't run normally.<br>MIx≠26, TQCPG mode, the JOG function is not effective. | MIx=26 FOCPG/TQCPG mode selection. TQCPG mode, JOG run, the output frequency and the motors run normally.<br>MIx≠26, TQCPG mode, the JOG function is effective. |
| 15 | When Pr08-00=1 Negative PID feedback and via analogue input (Pr. 03-00, 01 or 02=5).<br>The PLC Special Auxiliary Relays M1025 (RUN(ON) / STOP(OFF) the AC motor drive) and M1044 (Halt) can't work normally. | M1025 and M1044 can work normally. |
| 16 | The Pr03-19 =1 or 2. To remove the ACI input, drive will display ANL warning. To set up Pr03-19=0, the ANL warning can't be clean. | ANL warning can be clean |
| 17 | When doing the 0-speed holding function (FOCPG control mode), the current display is pick value. | The current display is "rms" value. |

| | | |
|---|---|---|
| 18 | FOCPG/FOC control mode. When the Pr06-02 Selection for Over-voltage Stall Prevention =1 Smart over-voltage prevention and Pr01-13 Decel. Time 1=0 sec, drive couldn't stop. | The drive can stop normally. But, if the deceleration time=0 sec, the drive will down to 0Hz with a terrific speed and the motor is just like free run. |
| 19 | When the OC stall is happened during operating, the drive will decelerate to 0Hz and start output DC. | When the OC stall is happened during operating, the frequency will start to decrease. If the output current is not getting smaller, the frequency command will go down until reach one of below value (the highest value of below 3 will become lower frequency limit). 1. 0.5Hz 2. Fmin 3. Output Frequency Lower Limit |
| 20 | The function is no effective when the PID offset source is AUI. | The function is work normally when PID offset source is AUI. |
| 21 | Parameter copy: VFDSoft (v1.48) to C2000: an Error code 4 was happened. Keypad to C2000: CE04 and SE1 error were happened. | Parameter Copy function can work normally. |
| 22 | When the analog input function is set as PID Reference, PID Reference will over 100.00% | When the analog input function is set as PID Reference, PID Reference will not over 100.00%. |
| 23 | The drive is doing DC injection with VF control mode. If the feedback current is lower than the current command and the DC braking time is too long, this will cause a suddenly high current output. | The DC injection can work normally with VF control mode. |
| 24 | When the ACI input is working at negative gain, it will not be limit at -100%. | When the ACI input is working at negative gain, it will be limit at -100%. |
| 25 | Auto Tuning issue: 1. the drive can't stop and no error will happen when no motor is connected 2. When tuning fail, the Pr00-10, Pr00-13 setting will be modified to "2" torque control mode (can't return to 0). | 1. The auto-tuning function is no effective if there is no motor. 2. When tuning fail, the Pr00-10 and Pr00-13 setting value will return to "0". |
| 26 | When the PLC runs the CALL instruction, the PLSF error might occur. | When the PLC runs the CALL instruction, all work normally. |
| 27 | When enable the MI8 terminal counting function, PLC is unable to read the MI terminal ON/OFF status. | When enable the MI8 terminal counting function, PLC can read the MI terminal ON/OFF status. |
| 28 | When using built-in PLC function, to send two consecutive CALL instructions, the second CALL instruction cannot be executed. | PLC is able to execute 5 layers of CALL instruction. |
| 29 | M1078 is defined as communication error flag. M1079 is defined as communication overtime. When these two flags are enable, PLC should displays 0 but it displays 1. | M1078 is defined as communication error flag. M1079 is defined as communication overtime. When these two flags are enable, PLC displays 0. |

| 30 | The PLC Special Auxiliary Relays M1032 Bypass PID function is abnormally. | M1032 function can work normally. |
|---|---|---|
| 31 | The drive is at VF or SVC control mode and enable PLC function. When Servo ON, the drive is as Standby status and the DC injection function is no effective. | The drive is at VF or SVC control mode and enable PLC function. When Servo ON, the drive is as Standby status and the DC injection function can work normally. |

<div align="center">

**Function modify**

</div>

1. When the PLC program will to change the Pr11-43, Pr11-44 and Pr11-45 value very frequently, this might will cause an EEPROM failure issue. Thus, at the v1.20, these three parameters are written to RAM. When an error or LvS is occurred, these 3 parameters value will saved into FRAM.
2. When set up the PM motor rated frequency and speed, the Pr05-03 and Pr05-15 will not auto-changed.
3. When set up the PM motor rated speed, drive will auto-change Pr01-01 setting value.
4. When using the EMC-BPS01 card, drive will display LvS if the main power is off.
5. When drive is at static tuning, the MOx function is no effective.
6. All Pr07-13 setting 1~6 become "DCBUS control, auto-deceleration time".

| ↗ | `07-13` | Decel. Time at Momentary Power Loss (dEb function) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Factory Setting:0 |
| | | Settings | 0：Disable | | | | | | |
| | | | 1~6：DCBUS control, Auto decel. time | | | | | | |

  📖 This parameter is used for the decel. time selection for momentary power loss.

7. The factory setting of Pr05-34(Full-load current of Permanent Magnet Motor), Pr05-35(Rated Power of Permanent Magnet Motor)及 Pr05-38(Inertia of Permanent Magnet Motor) will as same as the induction motor.
8. Modify C2000 OH warning method to be as same as CP2000.
   C2000 can only use Pr06-15 to shut off oH1 warning function.
   C2000 close oH1 warning way: set the Pr06-15 to 110℃
   If Pr06-15 setting <35℃→no meaning to drive
9. Modify CANopen Master Guarding time factory setting value from 32ms to 1s.
10. Modify the PLC create 60xx command sequence: 1st:target command; 2nd:control command
11. Pr00-02 will not be COPY.
12. To enter Pr00-09 for enable Advance parameter by set up Pr00-02=2 only.
13. 75kw and above model, the No-load Current of Induction Motor factory setting become 20% of motor rated current.
14. Frame F (160kw) and above: the VF table factory setting is modified as below:
    Pr01-03(Pr01-37) =1.50 Hz
    Pr01-04(Pr01-38) =10.0 V
    Pr01-06(Pr01-40) =2.0 V
16. Torque control mode: keypad display "F"=speed limit
    Speed control mode (include JOG RUN even under torque control mode): keypad display "F"= speed command.
17. <span style="color:red">Before setting Pr05-04, please set Pr01-01 and Pr05-03 to meet the motor.
    For example: the Pr05-04 factory setting range is "2~4". If use a 6 poles motor, to set up Pr01-01 and Pr05-03 according the motor nameplate, then the Pr05-04 setting range will become 2~6 automatically.</span>

1. Add new control method High frequency injection(HFI)(for IPM motor only)
IPM HFI FOC sensor-less control block diagram
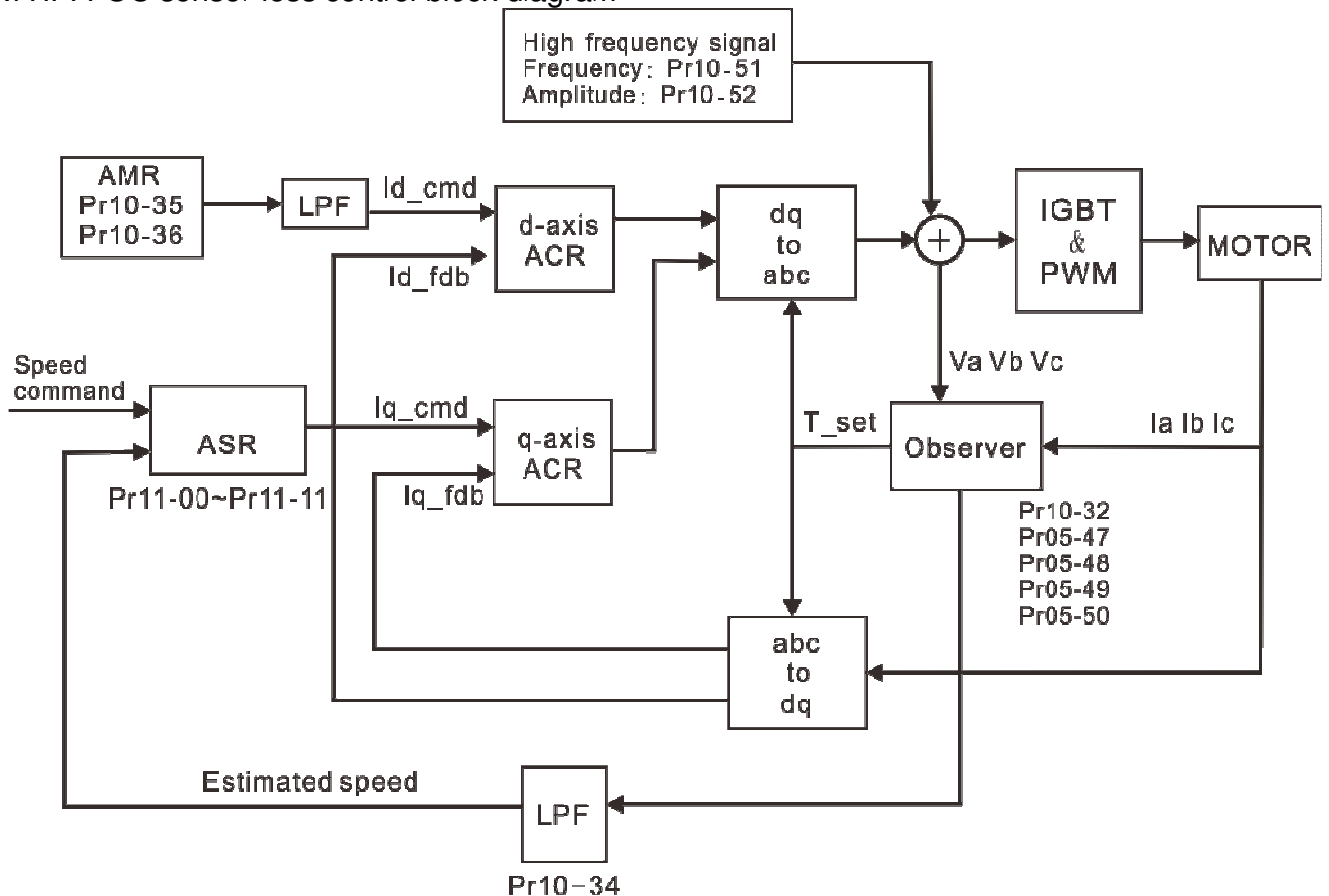


## IPM control method SOP

1. Set up IPM motor
   Pr05-33=2
2. Set up motor parameter according to the motor Nameplate
   Pr01-01 Output Frequency of Motor 1（base frequency and motor rated frequency）

   Pr01-02 Output Voltage of Motor 1（base frequency and motor rated frequency）

   Pr05-34 Full-load current of Permanent Magnet Motor
   Pr05-35 Rated Power of Permanent Magnet Motor
   Pr05-36 Rated speed of Permanent Magnet Motor
   Pr05-37 Pole number of Permanent Magnet Motor
3. Execute Auto-tuning
   Set upPr05-00=13 for IPM motor tuning and press Run(static-tuning). When the tuning is done, the following parameters will be obtained.
   Pr05-39 Stator Resistance of PM Motor
   Pr05-40 Permanent Magnet Motor Ld
   Pr05-41 Permanent Magnet Motor Lq
4. Set up control mode: Pr00-10=0 velocity mode, Pr00-11=7 IPM sensor-less
5. Turn OFF the power and power ON again.
6. Modify the ASR Kp and Ki according to system need.

| `00-11` | Control of Speed Mode | |
|---|---|---|
| | | Factory Setting:0 |
| Settings | 0: VF (IM V/f control) | |
| | 1: VFPG (IM V/f control+ Encoder) | |
| | 2: SVC(IM sensor-less vector control) | |
| | 3: FOCPG (IM FOC vector control+ encoder) | |
| | 4: FOCPG（PM FOC vector control + Encoder） | |
| | 5: FOC Sensor-less (IM field oriented sensor-less vector control) | |
| | 6 : PM Sensor-less (PM field oriented sensor-less vector control) | |
| | 7：IPM Sensor-less (IPM motor field oriented sensor-less control) | |

| `05-33` | Induction Motor (IM) and Permanent Magnet Motor Selection | |
|---|---|---|
| | | Factory Setting:0 |
| Settings | 0: Induction Motor | |
| | 1: Permanent Magnet Motor | |
| | 2: IPM | |

| `10-49` | Zero voltage time while start up | |
|---|---|---|
| | | Factory Setting:0.2sec |
| Settings | 0~65.535 sec | |

 &#x2610; When the motor is in static status at the startup, the accuracy to estimate angles will be increased. In order to make the motor in "static status", the drive 3 phase U, V, W output 0V to motor to reach this goal. The Pr10-49 setting time is the length of time when three-phase output 0V.

 &#x2610; It is possible that even when this parameter is being applied but the motor at the installation site cannot go in to the "static status" caused by the inertia or by any external force. So, if the motor doesn't go into a completer "static status" in 0.2 sec, increase appropriately this setting value.

 &#x2610; This parameter is functional only when the setting of Pr07-12 Speed Search during Startup ≠0.

| `10-50` | Reverse angle limit(Electrical angle) | |
|---|---|---|
| | | Factory Setting:10.00 degree |
| Settings | 0~30.00 degree | |

 &#x2610; While forward run is starting, if there is a sudden reverse run and the reverse angle is bigger than the Pr10-50 setting, then, drive will has a ScRv error.

 &#x2610; This parameter is valid only when Pr07-28 =11 Enable textile machine's function.

| `10-51` | Injection Frequency | |
|---|---|---|
| | | Factory Setting:500Hz |
| Settings | 0~2000Hz | |

 &#x2610; This parameter is a High Frequency Injection Command when the motor drive is under IPM HFI sensor-less control mode and it doesn't often need to be adjusted. But, if a motor's rated frequency (i.e. 400Hz) is too close to the frequency setting of this parameter (i.e. 500Hz), the accuracy of angles detected will be affected. Therefore, refer to the setting of Pr01-01 before adjusting this parameter.

| `10-52` | Injection Magnitude | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | | | Factory Setting:15/30V | |
| | Settings | 0~200.0V | | | | | |

&#x1F4D6; This parameter is the High Frequency Injection Command's amplitude when the motor drive is under IPM HFI sensor-less control mode.

&#x1F4D6; By increase the setting value of this parameter, the accuracy of angles detected will also be increased. However, if the setting value is too big, it will cause a louder electromagnetic noise.

2. Add new error code: 89 `RoPd(Rotor Pos. Error)`
3. Add new error code: 112 SfLk (PM Sensor-less `Shaft Lock`)
4. Add new function: Multi-output function of Analog signal level achieved. Related parameters as below:

| `03-44` | MO by AI level | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | | | Factory Setting:0 | |
| | Settings | 0: AVI | | | | | |
| | | 1: ACI | | | | | |
| | | 2: AUI | | | | | |
| `03-45` | AI Upper level | | | | | | |
| | | | | | | Factory Setting:50% | |
| | Settings | -100%~+100% | | | | | |
| `03-46` | AI Lower level | | | | | | |
| | | | | | | Factory Setting:10% | |
| | Settings | -100%~+100% | | | | | |

&#x1F4D6; This function is require to work with Multi-function Output item "67" Analog signal level achieved. The MO active when AI input level is higher than Pr03-45 AI Upper level. The MO shutoff when the AI input is lower that Pr03-46 AI Lower level.

&#x1F4D6; AI Upper level must bigger than AI Lower level.

| ✗ `02-13` | Multi-function Output 1 (Relay1) | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | | | Factory Setting:11 | |
| ✗ `02-14` | Multi-function Output 2 (Relay2) | | | | | | |
| | | | | | | Factory Setting:1 | |
| ✗ `02-16` | Multi-function Output 3 (MO1) | | | | | | |
| ✗ `02-17` | Multi-function Output 4 (MO2) | | | | | | |
| | | | | | | Factory Setting:66 | |
| | Settings | | | | | | |
| | 67：Analog signal level achieved | | | | | | |

| Settings | Functions | Descriptions |
|---|---|---|
| 67 | Analog signal level achieved | Active when AI input level is higher than Pr03-45 AI Upper level. MO shutoff when the AI input is lower that Pr03-46 AI Lower level. |

5. Add new parameter: Pr02-70 IO Card Type

| | `02-70` | IO Card Type | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Factory Setting:0 | |
| | | Settings | 0: No IO Card | | | | | |
| | | | 1: EMC-BPS01 Card | | | | | |
| | | | 2: No IO Card | | | | | |
| | | | 3: No IO card | | | | | |
| | | | 4: EMC-D611A Card | | | | | |
| | | | 5: EMC-D42A Card | | | | | |
| | | | 6: EMC-R6AA Card | | | | | |
| | | | 7: No IO Card | | | | | |

6. Add new parameter Pr9-33 PLC command force to 0

| | `09-33` | PLC command force to 0 | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | | | | Factory Setting:0 |
| | | Settings | 0~65535 | | | | |

| Bit | 說明 |
|---|---|
| Bit0 | Before PLC scan, set up PLC target frequency=0 |
| Bit1 | Before PLC scan, set up the PLC target torque=0 |
| Bit2 | Before PLC scan, set up the speed limit of torque control mode=0 |

7. Provide information that parameter setting store before "power off". The "Power off memory parameters" are the following:
Pr00-10 Control Mode
Pr00-11 Control of Speed Mode
Pr 00-12 Point-to-Point Position mode
Pr 00-13 Torque Mode Control
Pr 00-24 Memory of Frequency Command
Pr 00-27 User Defined Value
Pr 01-12 Accel. Time 1
Pr 01-13 Decel Time 1
Pr 01-14 Accel. Time 2
Pr 01-15 Decel Time 2
Pr 01-16 Accel. Time 3
Pr 01-17 Decel Time 3
Pr 01-18 Accel. Time 4
Pr 01-19 Decel Time 4
Pr 02-12 Digital Input Mode Selection
Pr 02-18 Multi-function output direction
Pr 02-54 Display the Frequency Command Executed by External Terminal
Pr 04-50~04-69 PLC Buffer 0~19
Pr 05-26 Accumulative Watt-second of Motor in Low Word (W-sec)
Pr 05-27 Accumulative Watt-second of Motor in High Word (W-sec)
Pr 05-28 Accumulative Watt-hour of Motor (W-Hour)
Pr 05-29 Accumulative Watt-hour of Motor in Low Word (KW-Hour)
Pr 05-30 Accumulative Watt-hour of Motor in High Word (KW-Hour)
Pr 05-31 Accumulative Motor Operation Time (Min)
Pr 05-32 Accumulative Motor Operation Time (day)
Pr 08-04 Upper Limit of Integral Control

Pr 08-05 PID Output Frequency Limit
Pr 09-10 Main Frequency of the Communication
Pr 10-17 Electrical Gear A
Pr 10-18 Electrical Gear B
Pr 11-34 Torque Command
Pr 11-43 Max. Frequency of Point- to-Point Position Control
Pr 11-44 Accel. Time of Point-to Point Position Control
Pr 11-45 Decel. Time of Point-to Point Position Control

8. VFD Explorer add new monitor item: IGBT temperature and CAP temperature
9. Add new parameters: Pr04-60~Pr04-69 PLC Buffer 10~19

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ✎ | 04-60 | PLC Buffer 10 | | | | | | |
| ✎ | 04-61 | PLC Buffer 11 | | | | | | |
| ✎ | 04-62 | PLC Buffer 12 | | | | | | |
| ✎ | 04-63 | PLC Buffer 13 | | | | | | |
| ✎ | 04-64 | PLC Buffer 14 | | | | | | |
| ✎ | 04-65 | PLC Buffer 15 | | | | | | |
| ✎ | 04-66 | PLC Buffer 16 | | | | | | |
| ✎ | 04-67 | PLC Buffer 17 | | | | | | |
| ✎ | 04-68 | PLC Buffer 18 | | | | | | |
| ✎ | 04-69 | PLC Buffer 19 | | | | | | |
| | | | | | | | | Factory Setting:0 |
| | | Settings | 0~65535 | | | | | |

10. Add new error code: 68 PCTo CAN/M T-Out(when the master couldn't detected any feedback from slave, then PCTo warning.
11. Add new CANOpen Master  Special Auxiliary Relays M1065: Read/Write CANOpen data over time
12. The Pr02-35 External Operation Control Selection after Reset and Activate function will add Multi-function Input Command = "6" JOG command (By KPC-CC01 or external control), "24" FWD JOG command or "25" REV JOG command effectively.
13. The maximum output frequency is limited by the setting of carry frequency.   The maximum frequency=carry frequency setting/20
14. Add new parameter PR02-56

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 02-56 | Release Brake Check | | | | | | |
| | | | | | | | | Factory setting:0.000 sec |
| | | Settings | 0.000~65.000 second | | | | | |

15. Add new selection item for the multi-function input

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | 02-01 | Multi-function Input Command 1 (MI1) (MI1= STOP command when in 3-wire operation control) | | | | | |
| | | | | | | | Factory Setting: 1 |
| | 02-02 | Multi-function Input Command 2 (MI2) | | | | | |
| | | | | | | | Factory Setting: 2 |
| | 02-03 | Multi-function Input Command 3 (MI3) | | | | | |
| | | | | | | | Factory Setting: 3 |
| | 02-04 | Multi-function Input Command 4 (MI4) | | | | | |

| | | | Factory Setting: 4 |
|---|---|---|---|
| | **02-05** | Multi-function Input Command 5 (MI5) | |
| | **02-06** | Multi-function Input Command 6 (MI6) | |
| | **02-07** | Multi-function Input Command 7 (MI7) | |
| | **02-08** | Multi-function Input Command 8 (MI8) | |
| | | | Factory Setting: 0 |
| | | Settings | |
| | | 55: Brake Release | |

| Settings | Functions | Descriptions |
|---|---|---|
| 55 | Brake Release | This parameter needs to be used with P02-56. The main purpose is to make sure if mechanical brake works or not after triggering brake release command.<br>If the action is right, mechanical brake will give signal to MI terminal.<br>Please check time sequence chart for reference |



  MO=55 need to use with P02-56. After P02-56 setting value(time), if there is no signal input, motor drive will show error Brk, and mechanical brake will close immediately

  The default setting of P02-56 is 0. If the value is not 0, brake the brake signal checking is activated. If there is no signal input after time setting (02-56), motor drive will show Brk error no matter if there is any other setting about brake control

The software version starting of manufacture series number table:

| Version | Series number | |
|---|---|---|
| C2000_v1.20 | Taiwan | 1429 |

| Version | Series number | |
|---|---|---|
| C2000_v1.20 | WJ | 1429 |