
Asynchronous Control Revision History

Rev 12.22 – 18/07/2016

Issues fixed

1. **New STO:** more robust solution against irradiate noise
2. **Old STO:** with 12.21 revision, output logic o17 doesn't work correctly (fluctuating) when the STO is activated
3. **Anybus:** solved the HMS issue of acyclic data exchange with the Ethernet IP

Rev 12.21 – 08/02/2016

New functionality

1. **Sensorless:** new algorithm with very good performance also at very slow speed (0.5Hz electrical) and with flying start with both magnetized or demagnetized motor.
2. **New STO** available (C58=1) with the appropriate hardware in the power cards.

Less important modification

1. Easy to use:
 - a. Unique command C40 for enable complete autotuning test (C41+C42)
 - b. At the end of Start-up time measurement the speed regulator is automatically set with stable bandwidth
 - c. Connection C26 for invert power phases
2. Power Fault alarm A3 only with drive in run state
3. Actual position shifted available now with less than 16bits per revolution

Rev 12.13 - 02/02/2015

Issues fixed

4. **DC Bus ripple alarm:** from 12.11 version could be spurious alarm A13.2 when the STO was restored in only signaling mode(C73 = 1).
5. **Anybus:** now the internal communication between the DSP and CompactCom module is more robust against interference.
6. **Emergency braking:** now the linear ramps are automatically enabled at occurrence when C34=3 in the main supply failure.

New functionality

3. **Braking** enabled by default with drive stopped (C91=1).
4. **EtherCAT:** with P162 > 1 now it's possible to set the alias ID.

5. **New thermal drive model:** updated the IGBT data and slightly modified the model to take better account of the power conduction losses with the modulation index.

Rev 12.12 - 02/10/2014

New functionality

1. **New STO** available (C58=1) with the appropriate hardware in the power cards.
2. More robust manage of cyclic Logiclab task during drive boot-up.

Rev 12.11 - 15/04/2014

Issues fixed

1. **PWM frequency:** with previous versions the minim working PWM frequency was 1145Hz. Now it's possible to go down to 1000Hz and using double update reach 500Hz.
2. **CANOpen:** with previous versions could be some problems with Node Guarding RTR message if had never been sent an Emergency message from the drive.
3. **High Radiator temperature output o15:** with previous versions wasn't managed. Now it works with hysteresis of 2 degrees.

New functionality

1. **Double Update** function available to obtain control routines with double frequency compared with PWM frequency.
2. New **LogicLab cyclic task** with process image. This task is executed cyclically with a selectable period (usually some ms) and it can be interrupted by Fast and motor control tasks.
3. Improved motor auto tuning test especially with saturated motors.
4. **Energy Saving** function now available also with closed loop speed control
5. Now available LogicLab embedded functions for **expand I/O via second CAN line**
6. Now available IGBT thermal model with max junction and radiator temperature control
7. DC Bus ripple measured to find unbalanced main supply and/or rectified bridge problems.
8. The Encoder Index Channel is latched on rising edge during forward movements and on falling edge during reverse rotation.
9. DC Bus ripple measured to find unbalanced main supply and/or rectified bridge problems. A.13.2 alarm. This function can be disabled by C31=1. With MiniOPDE single phase (230V) the function is automatically disabled.
10. The Encoder Index Channel is latched on rising edge during forward movements and on falling edge during reverse rotation.
11. MiniOPDE: with C94=0 the management of the fan depends on the radiator temperature. With C94=1 (default) the fan is enabled for 60 sec. *a/so* every time the Drive Brake goes on. With C94=2 the fan is always enabled.

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12. MiniOPDE: high resolution Analog converter (VF). By using feedback board 4S0021 and enabling C09=0 and E23=YES (or I.23). The PLD version minimum required v1.04
 13. MiniOPDE: o.26 Brake Fault output (is TRUE if Brake Fault)

Less important modification

4. Starting from this version the analog inputs offsets are stored into permanent drive memory.
5. With the new firmware revision, during storing data in permanent memory (C63=1) there is an immediate control on the data written, if there isn't coherence, alarm A1.2 appears.
6. Restore **Factory Parameters** now available (C62=2).
7. Available **Rotating current vector** to test drive power circuit
8. Anybus CompactCOM approved for: DeviceNet, Ethernet/IP, Modbus TCP, Profinet.
9. New option for connection MAIN_LOST_SEL C34 = 4 : if the main supply is lost, immediately the drive goes in alarm A10.1.
10. Asymmetric torque limits available via fieldbus.
11. MiniOPDE: d.51, d.52, d.54 show communication alarm between Control and Power boards. d.54 shows the Power Board Firmware version.
12. MiniOPDE: digital output o.26 signals Brake Circuit Fault.

Rev 12.03 - 14/05/2013

Issues fixed

1. **MiniOPDE** : with previous version if C89=1 the drive could remain always in Stop also if there was a Run command
2. **Multi turn Actual position absolute or incremental**: removed the possibility to choose with connection C54 if the actual position [16.16] is absolute or incremental. Now it's always absolute (like versions before 12.00)
3. **Incremental Sincos**: starting from rev 12.00 was lost one pulse every 32768 per turn into inner position loop. Now this issue has been resolved.
4. **V/f Control**: Energy Saving function now works well

Rev 12.01 – 07/02/2013

Issues fixed

5. **Latch Alarm Reset** : with previous versions could be produced some Emergency Message (Can Open and EtherCAT) during initial reset period (600ms after regulation switch on)
6. **Voltage limit parameters**: minimum value admitted is now 0, so it's possible to work also with a very low DC Bus in input.

Rev 12.0 - 22/01/2013

Issues fixed

1. **PWM current routines lost** : with previous versions, working in a certain PWM frequency range, could lead to loss of some current control routine (about 11.5KHz ÷12.8KHz for V/f control and 11KHz ÷12.5KHz for closed loop control). Usually this issue produces only negligible effects, except for applications that require high electrical frequency in output(>400Hz).
2. **DPWM Modulator**: due to Texas Instruments bug, DPWM modulator could not work well, with a minimum current distortion. Now the issue was solved.
3. **Profibus DP and Anybus**: due a bug, with previous versions was possible to map up to only 9 words in input and output. Now it's possible to map up to 10 words in input and output.
4. **STO and not real alarms**: with previous versions when STO was enabled could appears some alarms like sensor presence (A9.1). Now this issue is solved.
5. **A8.3 Application alarms**: with previous versions, at drive switch on, in very rare cases, could appear a not real application alarm A8.3. Now this issue is solved.
6. **Application download**: with previous versions, in very rare case, after an application download the drive stayed in Boot state and OPDExplorer run Firmware Downloader. Now this issued is solved
7. **New Profibus Management**: with new version, if control word is mapped on Rx (Idx=0x201F Fieldbus Digital Inputs) this word is cleared at startup to avoid unexpected starts.

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8. **Sensorless and V/f control:** with new version the inner electrical angle is kept with drive in stop. This allows continuous start and stop operations without motor movements during magnetization.
 9. **Speed reached output o16:** with previous versions this output didn't work correctly, once activated, didn't changed more its state.
 10. **Incremental Position loop:** with previous versions the memory clear at stop (EN_POS_MEM_CLR P240) didn't work correctly closing the loop on second sensor (EN_POS_REG_SENS2 C90). Moreover using second sensor Sin/Cos to close the position loop, some pulses could be lost.

New functionality

1. **Current reading :** now second sensor signals and currents are read exactly in the center of pulse command, taking into account dead time and hardware delay on regulation board. This give more noise immunity to the signals
2. **Increased inner resolution:** in speed control and overlapped space loop now one turn is represented with a bit number depending on sensor used, without lose resolution. The pulses speed and position reference could be expressed with 16 or 32 bit per turn. At application level is now available the multi turn position in 32 bit, with the possibility to choose the number of fractional and integer bit.
3. **New current overload management:** now it's possible to select a new current overload management that reading radiator temperature allows a better current overload. It' also possible to change on line PWM frequency at low speed.
4. **Endat:** now available also this high resolution digital sensor (ECN125 with 25bits and 29bits)
5. **Biss C-mode:** now available.
6. **SinCos Encoder:** with the previous versions max pulse per revolution was 16384, now this limit is 60000ppr.
7. **Resolver:** now it's possible to work with any pole number combination.
8. **Notch Filter:** now it's available a notch filter on current reference to remove mechanical natural frequency
9. **Encoder Output:** now it's possible to select the resolution also referring to second sensor (C52=5). Moreover it's changed the First Zero Top managing, now also with incremental sensor, there aren't correction pulses in A and B channels.

Less important modification

13. **Maximum drive PWM frequency :** now the fast fast max duration is calculated on line knowing PWM period, speed and current routines duration. In OPDEplorer are available 5 internal data that shows the duration of speed, current, application routine, free time available and maximum drive PWM frequency.
14. **Multi turn Actual position absolute or incremental:** now it's possible to select with connection C54 if the actual position [16.16] is absolute or incremental . Motor sensor Zero Top available in Tab_osc[12] in percent of mechanical turn.
15. **Mini-OPDE:** with previous versions the work hours are multiply by 2. So the real value is a half the showed value.
16. **LogicLab Data Block:** now available also internal values "Tab_int_opdexp"
17. **Canopen:** Now NMT command "reset node" works correctly. Now available also the actual position with up to 32 bit of resolution on one turn and second sensor

position up to 32 bit. One Emergency message per alarm with alarm sub code available

18. **S-Ramps**: increased time constant resolution (now 1ms) and quantization time.
19. **Motor and second sensor actual position**: now available in OPDEplorer the actual position with resolution equals to sensor resolution.
20. **Motor overheating output o14**: now with KTY84 thermal probe, the logical output function o14 goes at active level if the motor temperature is greater than threshold set with parameter P96 in percent of maximum temperature admitted P91. Without KTY84 is like the previous firmware revisions, the logical output function o14 is related to motor I²t thermal protection.

Rev 11.92 - 16/01/2012

Issues fixed

1. **Current dynamic decoupling** : with 11.90 and 11.91 revisions, the current dynamic decoupling works worse than before. For this reason the current loop is less stable working in deep flux weakening area.
2. **Sensor 1 and 2 offset and gain**:. now these parameters are TDE parameters to preserve it for spare units.
3. **Frequency Encoder Output Alarm**: with 11.90 and 11.91 revisions, the system admitted max speed setting greater than limit of 500KHz in output, without alarm A15.1. Now this issue is solved.
4. **Speed regulator setting after motor autotuning**: . with 11.90 and 11.91 revisions, after motor autotuning (C42=3), if C75=0, speed regulator gains are loaded with too low values (P32=800.0 instead of 80.0 and P33=6.0 instead of 1.2). Now this issue is solved.

Rev 11.91 - 07/10/2011

Issues fixed

1. **Impulse brake command on regulation switch-on** : with previous versions, after regulation switch-on, appeared an impulse brake command of 25-40ms. This issue can creates some problems to the drive only if:
 - a. a brake resistor is connected to the drive
 - b. main supply is given before regulation switch-on or at the same time,
 - c. the drive nominal current is < 70A or DC supply input overWorkaround with previous versions is following the right sequence: switch on the regulation before give main supply

Rev 11.9 - 21/09/2011

Issues fixed

1. **PWM synchronization** : with previous versions, PWM drive to drive synchronization caused problems in the motor control in flux weakening area.
2. **Voltage regulation loop**: with previous versions, voltage gains remained constant in flux weakening area, in really increasing their effect.
3. **Torque control with speed limit**: now it's possible to work also with one speed limit close to 0. The only condition about speed limit positive and negative is that they cannot be equal.
4. **Safe Torque Off**: with previous versions, enabling C73=1 (EN_STO_ONLY_SIG), minimum and maximum DC voltage limits were disabled with drive in run.
5. **Thermal protection**: with previous versions thermal probe signals from motor and drive were not filtered. With the new revision there is a 100ms filter on these signals.
6. **Can Open**: with previous versions the Emergency Message was not produced with alarm A06
7. **Preserved parameters by firmware change**: power soft start parameters and dead time are now preserved by firmware change.
8. **V/f control**: with previous versions, maximum torque limit in flux weakening area closed too much the torque, following flux with a power of 3 instead of 2.
9. **DC Main Supply voltage with STO**: with previous versions, using STO function and with DC Bus supply voltage could be some problems about power soft start. Now there is a connection C53 to set main supply AC or DC.

New functionality

1. **Sensorless Control** : now is available this kind of control, selectable with C00=0. The lower frequency limit is 0.5Hz.
2. **Speed Regulator Autosetting**: this feature now is available, known the starting time P169. With connection U02 ("SPD_REG_SETTING") is possible to choose, stable, dynamic, max or manual speed loop bandwidth. In manual mode is possible to choose the bandwidth with parameter P20 (SPD_LOOP_BW).
3. **Motor Autotuning** :
 - a. Reintroduced the measure of cubic term of dead time compensation (P153) during autotuning test C42=1. Parameters P152 and P153 removed.
 - b. Setting C42=2 or 3, now the speed regulator gains are loaded with default parameters only if C75 (DIS_DEF_START_AUTO) = 0.
 - c. During autotuning speed control, if at the end of acceleration ramp the real speed differs by more than 20% from the theoretical value, alarm A07.1 appears.
 - d. At the end of autotuning, motor magnetization time P29 is set equals to P74 Rotor time constant
4. **Sensor offset and gain compensation**: now during connection test C41, there is an automatic offset and gain compensation on sensor analog channels (Resolver and Sin/Cos encoder). It's possible to do the test without this compensation with C41=2. It's possible to execute manually the compensation with command U04 ("EN_SENSOR_TUNE").
5. **Motor Thermal Probe management**: extended measurement range up to 2MΩ. Over 500KΩ thermal probe is considered not connected and alarm A5.4 appears. New connection C70 that multiplies x 10 the threshold P95 value. Changed the format of representation of the internal size d41, now in KOhm

6. **Speed limits:** now with standard application (0.23) is possible to change positive and negative speed limits with analog signals. The actual speed limits are showed in d57 , d58 , o40 e o67 .
7. **EtherCAT:** now is available the CanOpen over EtherCAT fieldbus, with Distributed clock management.
8. **Sensor slot swap:** with connection C19 (EN_SLOT_SWAP) it's possible to swap motor sensor and second sensor on slot 1 and 2.
9. **Frequency Output:** now up to 17 bits on the motor turn and maximum frequency 500KHz
10. **Incremental position loop:** now is possible to close the incremental position loop on second sensor (C90=1) with the gearbox compensation
11. **Torque control:** if the maximum speed limit in torque control is disabled (default), the speed regulator integral memory is forced to actual torque request, in order to execute a soft switch from torque to speed control. This means that in speed control the feed-forward torque reference has to be 0.
12. **Maximum speed:** with connection C78=1 the real maximum speed is $P65 \times 10$, in this way is possible to reach max speed greater than 60000rpm. In C78=1 d21 shows the speed / 10.
13. **Compatible with new multi-axes Real Time Graph:**
 - e. Modbus rtu: enable broadcast management
 - f. Nominal motor torque measured available not more in P78 but in d30exp, nominal motor power available in d31 exp in Kwatt.
 - g. Real Time Graph management: local or remote trigger control
14. **Stop in position (Standard application 0.23):** if parameter P254 (DIS_STOP_POS) is set to 1 stop in position function is disabled when incremental position loop is enabled.
15. **Feed-forward Torque (Standard application 0.23):** Added parameter P249 to enable the feedforward torque in speed control. In this way, with the default setting (P249=0), the feed-forward torque is disabled, to avoid unexpected behaviours.
16. **Dead band (Standard application 0.23):** added parameter P209 in order to set a dead band on the sum of analog inputs.

Less important modification

1. **Filtered speed** : now monitor and analog data 04 “filtered speed measured” is filtered with the same time constant and filter order like speed regulator filter. Internal value d21 “speed measured” is filtered with a first order filter with the same cut-off frequency of speed bandwidth.
2. **Utility commands**: some previous parameters (Quick start-up, Sensor tune, Speed test) are been replaced with utility commands changeable with keypad or OPDEplorer. In this way this commands are not stored in permanent memory.
3. **Maximum motor torque**: the real limit is 85% of P41 to have a stability margin.
4. **PLD version**: now is available in the internal value d47
5. **New output functions**: now are available 3 new output logic functions, **o23** STO Not dangerous failure, meaning that aren’t present alarms A3 or A11, **o24** Torque Control Activated and **o25** DC bus exceeds threshold (P79)
6. **Start time measure**: now speed regulator gains are temporary changed in order to reach the torque limit set.
7. Parameters P126-P127 and P128 change from TDE reserved to reserved.
8. Power Board Firmware version (MiniOPDE) at Address 0xD0A0