DELTA ELEKTRONIKA B.V.

SM15K Firmware Revision History

Legend:

B = Bug fix
$ = valuable improvement
N = New feature

Changes from P0180 to P0190   *4 th of October 2023*

$ <u>Fan control</u>
      The fan control firmware has been modified, resulting in improved cooling capability.

N   <u>Int Mod Ana Range Select</u>
      The webserver provides a new option to select between 0-5V and 0-10V range for the optional
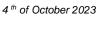   INT MOD ANA interface.

Changes from P0170 to P0180   *31 th of May 2023*

$ <u>Measure:Power?</u>
      When using this SCPI command, the output power of the unit is calculated. The voltage
      measurement used to calculate the power has been moved from the output terminals to the
      sense connector. Thus, the output power calculated during remote sensing is now the power at
      the terminals of the load.

B   <u>Int Mod Ana accuracy</u>
      Improved calibration to remove offset on the monitoring outputs of the INT MOD ANA interface
      card.

Changes from P0160 to P0170   *Important*   *05 th ofApril 2023*

$ <u>Vsense PID control</u>
      The range of Proportional and Integral control settings is increased. Allows for better tuning to
      different load conditions.

N   <u>Unit console</u>
      The web server provides a button under Administration, Info to display some inner system values
      for diagnostics.

$ <u>Inrush</u>
      Improved inrush current limitation.

B   <u>Function Vlow setting</u>
      Input value for Vlow of Function Rin and Leadless Sense via SCPI didn't work properly. This is
      fixed now.

$ <u>Increased gain</u>
Both the SCPI commands CALIbrate:VOLtage:MEAsure:GAIn and
CALIbrate:CURrent:MEAsure:GAIn allow higher gain.

Changes from P0151 to P0160   *11th of January 2023*

B   <u>Invalid password</u>
In case a password is active, no longer a false message is shown when starting a firmware
update.

B   <u>Slow recovery time</u>
When switching back from Master/Slave to normal operation, the internal control speed is set
back to normal operation properly.

$ <u>PV simulation</u>
Input values of parameters are limited in ratio to avoid very sharp PV characteristic.

N   <u>INT MOD SER</u>
When an INT MOD SER is inserted, the default configuration is set to RS232, 9600, 8 bits, no
parity, half duplex. Rather than not enabled. This to make things more convenient.

Changes from P0150 to P0151   *29th of June 2022*

B   <u>Output Voltage</u>
Output voltage didn't reach 0V in some circumstances.

Changes from P0143 to P0150   *22th of April, 2021*

B   <u>Instruments</u>
Overflow fixed of SCPI command MEASURE:INSTRUMENT.

B   <u>INT MOD CON</u>
Relay contact assignment works properly again for all selectable signals.

Changes from P0140 to P0143   *18th of Decmber, 2020*

B   <u>Temperatures</u>
Negative ambient temperature caused the output to switch off. This is fixed now.

$ <u>Sequencer</u>
Jitter between sequence steps is significantly reduced.

Changes from P0130 to P0140   *29th of May, 2020*

$ <u>SM70-CP-450 Master/Slave</u>
The maximum units for SM70-CP-450 in a master/slave configuration changed from 6 to 60 units.

N   <u>SM210-CP-150 Master/Slave</u>
The SM210-CP-150 can be used in a master/slave configuration up to 60 units.

B   <u>INT MOD CON</u>
Linking the relay contacts to the output status is working again.

B   <u>Photo Voltaic (PV) Simulation</u>
Settings on front and web show the maximum settings of voltage and current correctly, according to the given parameters, like Gpv and Tpv.

Changes from P0120 to P0130   *7th of February, 2020*

N   <u>Photo Voltaic (PV) Simulation</u>
A whole new function has been added. Possibility to configure the power supply system as a solar panel plant for simulation purposes. Either in stand-alone mode, as well as master/slave configuration. Includes MPPT and a built-in graphical visualisation for ease of use without the need for external software applications.

$ <u>Current overshoot reduction</u>
Further improvement on reducing current overshoots after changes in current settings.

N   <u>Master / Slave</u>
Power-on default setting for Output ON/OFF is possible now.

$ <u>Master / Slave</u>
Improvement of balancing between units in parallel mode.

N   <u>Instrument</u>
Instead of only the possibility to disable or enable a measurement instrument (Ah or Wh), two extra settings have been added: Suspend and Resume.

N   <u>Regulation Defaults</u>
It is possible to force all regulation settings back to factory default. The control can be found on the web interface under Configuration, Regulation, Miscellaneous.

Changes from P0110 to P0120   *26th of November, 2019*

$ <u>Current overshoot reduction</u>
- Positive and negative current are 'soft started' by ramping up the set points. This to minimize overshoots at for example diode based applications.
- Improved positive current reaction time to reduce overshoots when the power supply switches from CV to CC operation (diodes).
- Improved accuracy when switching the output ON. This will reduce initial peak currents at low resistance voltage sources (batteries).

$ <u>Voltage overshoot reduction</u>
Remote sense is blocked while positive and negative current settings are 'soft started'. This to prevent run-away of the sense control resulting in voltage overshoots.

N   <u>Protection</u>
Maximum output voltage setting is 101% of its nominal rating. Overload indication (OL) is set to 102.5% of the nominal rating but the unit will continue to operate up to its self-protect level which is about 105% of the its nominal rating.
If the output voltage exceeds its self-protect level, the output is automatically disabled and remains disabled with the indication "PROT". The user may reset the self-protected state by switching the output to OFF.

Changes from P0109 to P0110

$ <u>Current overshoot</u>
When turning on the output, the unit starts in CC-mode, reducing current overshoots. This is required for e.g. battery and laser applications.

N   <u>Speed control</u>
The control speed of the Voltage regulation can be adjusted via the web interface. This is useful when working with e.g. large capacitive loads.

B   <u>Int Mod Ana calibration</u>
Calibration of the analogue inputs and outputs could get mixed up after saving. In that case, recalibration is required after installing this new package.

B   <u>Updating speed</u>
Updates are processed faster due to a bug fix.

Changes from P0108 to P0109

N   <u>Temperature compensation:</u>
Calibration commands are available for temperature drift compensation to improve current measurements even more.

Changes from P0107 to P0108

N   <u>Firmware version auto synchronization:</u>
Installed interface modules are checked for their firmware version during start-up. If they do not meet the requirements of the unit, the interface modules can be auto-synchronized with it.

N   <u>Functions:</u>
Simulation of Internal resistance (Ri) and Leadless sensing is available now. No extra hardware required.

N   <u>Ethernet logging:</u>
A logging mechanism is available for Ethernet communication. Received commands, queries or both can be logged to a file. The file is available via an Ethernet command, as well as via the web interface.

N   <u>Wh and Ah instrument:</u>
Ethernet commands are implemented to measure Ampere Hour (Ah), Watt Hour (Wh), minimum/maximum output current or power.

N   <u>Time and date:</u>
Ethernet commands are implemented to set and read time and date.

N   <u>Temperature:</u>
An Ethernet command is implemented to read the highest temperature in the power supply.

N   <u>Sequencer advanced mode:</u>
In the web console, an extra button is available to monitor the internal variables and timers of the sequencer. The new feature is very helpful during sequence development or debugging.

$ <u>Master/Slave parallel:</u>
Up to 60 units can be connected in parallel now.

$ <u>Remote sensing:</u>
Stability of the regulation is improved.

$ <u>Improved output ripple:</u>
Very fast ripple rejection, is case of AC grid fluctuations.

B   <u>Master / Slave AC fail recovery:</u>
Smooth restart of output voltage after an AC fail recovery.

Changes from P0106 to P0107

B   <u>Fixing disabled front panel:</u>
After updating it might happen that the front panel is not working anymore. Especially when making a big jump in package version.

Changes from P0105 to P0106

N   <u>INT MOD ANA:</u>
The interface INT MOD ANA can be used in the SM15000 series. Also in combination with Master/Slave operation.
The analog input "Vprogram" is linked to the voltage setting.
"Iprogram" is linked to both the positive and the negative current setting.
Positive and negative power settings cannot be set via this interface. Use Front, Web, Eth, etc instead.

N   <u>Master/Slave operation:</u>
Now available for SM1500-CP-30 as well.

Changes from P0104 to P0105

N   <u>Master/Slave series operation:</u>
Up to 6 pcs SM500-CP-90 can be connected and controlled in series. Please contact factory if one or more units were delivered before Q4 2018.

N   <u>Master/Slave series operation Limitation:</u>
The total system output voltage is limited to 750V when 2 or more SM500-CP-90 are connected in series. This applies if at least one of the units was delivered before Q4 2018. Please contact factory for upgrading to 1000V.

N   <u>INT MOD CON:</u>
The four relay contacts can be linked to system status, like ACF, DCF, Output, etc.
(See page 5-7 of Ethernet+Sequencer manual: 'Relay-Status-Linkage').
Furthermore, the contacts can not only be controlled by Ethernet, but also from the web page.

$ <u>Sequencer:</u>
When the sequencer is linked to a programming source like Front, the front knobs will still be

active, and the sequencer can manipulate these settings.
(See page 6-7 of Ethernet+Sequencer manual: 'selecting a programming source')

B   <u>Sequencer:</u>
The command SP is no longer limited, so it can be used for Master/Slave systems up to 300KW.

Changes from P0103 to P0104

N   <u>Master/Slave operation:</u>
Up to 20 pcs SM500-CP-90 can be connected and controlled in parallel.

$ <u>Front / Eth/ Web:</u>
Ready for Master/Slave operation and control of systems up to 300KW.

$ <u>INT MOD SER:</u>
Ready for systems up to 300KW.

N   <u>Interface updating:</u>
Installed interfaces are automatically detected and updated during a unit firmware update.

B   <u>PROG:SEL:LABEL?</u>
When two or more labels exist, only one was replied.

B   <u>Sequencer:</u>
INC and DEC commands didn't work properly on SCN and SPN.
With the commands CJL and CJG, MC and MP didn't work properly on negative values.

Changes from P0102 to P0103   *Important*

$$ <u>Regulation:</u>
Output regulation is significantly improved for capacitive loads.

$ <u>Temperature control:</u>
The regulation of the temperature could lose its smooth behaviour under certain conditions.
Overshoots of the fans speed are suppressed now.

N   <u>Knob A:</u>
The function of Knob A can also be chosen on the web server page.

B   <u>*PUD?:</u>
An empty PUD resulted in two linefeeds when queried by *PUD?. Now it replies with just one
terminator.

B   <u>Communication:</u>
A memory leak is repaired in the operating system, which resulted in communication problems
after several days of continues operation.

Changes from P0101 to P0102

N   <u>Stepsize:</u>
Via Ethernet commands the digital step size of the voltage and current programming can be queried.

$ <u>Manual:</u>
Content of the manual is updated.

B   <u>Program:catalog?:</u>
Entire list is replied instead of just one entry.