TSx00 converters and TSConfig application software

Each member of the TSx00 group has its own firmware version number and version history.

TS400 firmware versions

ts04v1.8
Date: 03/09/2018. Replaces *ts04v1.7*

Added functionality:
    Battery indicator, Indicator flash
An extra option, 'Indicator flash', is given for the battery indicator that is represented by the left LED on the converter. To reduce power consumption, the indicator is flashed (50 millisec, every 2 seconds) instead of always on. With this option checked, the TS400 consumes 8 mA only (standby mode).

Fix/change:
    Temperature control optimized
In version **ts04v1.6** this option was introduced, but did not work correctly with low maximum output current settings (setting #22).

ts04v1.7
Date: 16/08/2018. Replaces *ts04v1.6*

Added functionality:
    Temperature control optimized
Current limitation at temperatures close to setting 23 'Maximum temperature (pcb)' has been improved for 28V output voltage settings (for all $V_{out} > 20V$).
In addition, when the internal temperature reaches setting 23, the converter is switched off.
The converter is then blocked (blue led blinks) for switching on again during 5 minutes of cooling down.

ts04v1.6
Date: 20/06/2018. Replaces *ts04v1.5*

Added functionality:

    Battery voltage charge protection
To enable this feature, check setting 31 'Battery voltage charge protection' in TSConfig.
Before the converter switches on, the output voltage (of the battery to be charged) is checked against the programmed setting 31.
When the battery voltage is lower than this setting, the output current is limited to the value that is programmed in the setting labelled 'Current limitation at voltage under:'.
This limitation remains active until the converter is switched off.

    Temperature control optimized
Setting 22 has an extra option: 'Temperature control optimized'.
Normally, when the converter switches on, the output current can rise to the maximum setting immediately. The internal temperature will then rise, until the automatic temperature control limits the output current when the maximum temperature value comes closer.
With the option 'Temperature control optimized' enabled (automatically enabled when using 'send settings'), the converter switches on and starts with 75% of its maximum output current. From this point the current is slowly increased to the maximum programmed setting. This enables the internal temperature sensor to pick up the rising of the temperature earlier and prevent overheating of the hot spots on the circuit board (near the mosfets), by limiting the output current accordingly.
In situations where the voltage difference between input and output is big, the input current can rise to very high levels which causes a fast increase of the temperature leading to possible failure of certain electronic components.

    LED indication of active current limitation
The output LED on the converter goes purple when the converter is switched on and outputs current. In addition, the purple LED now *blinks* purple (2 Hz) in the situation of an active current limitation caused by low output battery voltage (setting 31).

    Converter on/off by input voltage
To enable this feature, check 'Converter on/off by input voltage' in TSConfig.
In some situations the vehicle's engine does not cause enough vibrations to be picked up by the sensor to switch on the converter.
Now you can use the voltage value of the input of the converter, to switch the converter on.
To do so, set the threshold (setting 57) and hysteresis (setting 58) to the desired values.
The converter switches on when the input voltage is higher than setting 57, after the switch on delay.
The converter switches off when the input voltage is lower than (setting 57 – setting 58) after the switch off delay, unless the sensor has picked up vibrations. Valid vibrations will restart the switch off delay.

Fix/change:
The input current is not being used anymore as a parameter for limiting the output current.

ts04v1.5

Date: 08/12/2016. Replaces *ts04v1.4*.

Added functionality:

Inductor noise reduction algorithm.

To enable this feature, check 'Inductor noise reduction algorithm' in TSConfig.

In special situations an internal inductor can produce audible noise when the converter supplies significant current. This can happen when Vout is <u>slightly lower</u> than Vin: the converter mode constantly changes from buck-boost to buck and back.

With 'inductor noise reduction algorithm' on and Vout less than 500 mV under Vin (during a minimum of 5 seconds), the controller reduces the output current for 10 minutes.

After 10 minutes, operations switches back to normal (and repeats if necessary).

(the current reduction is approx. 50%).

Fix:

None.

ts04v1.4

Date: 14/10/2016. Replaces *ts04v1.3*.

Added functionality:

Powerdown mode.

Powerdown is only available when using pin 1 (purple wire input 1 on pin 1) for switching the converter on and off.

To enable powerdown, check 'Powerdown' in TSConfig.

The converter enters sleep mode when the converter is switched off <u>*and*</u> output 2 is switched off after the delay (# 54) <u>*and*</u> TSConfig is closed for more than 5 seconds.

In sleep mode the current consumption is reduced to 1.3 mA (USB connector not plugged in).

In sleep mode, TSConfig cannot communicate with the converter.

To exit sleep mode, the converter has to be switched on by pin 1 (purple wire).

Fix:

None.

ts04v1.3

Date: 14/07/2016. Replaces *ts04v1.2*.

Added functionality:

None.

Fix:

The combination of Victron BMS input (setting 29) and 'Converter on/off with pin 1' (setting 50).

In previous versions this combination of settings would result in continuously switching the converter on and off when the Victron BMS output goes low.

ts04v1.2

Date: 11/04/2016. Replaces *ts04v1.1*.

Added functionality:

None.

Fix:

When programming high output voltages (higher than 14.4), the converter could shortly (100 msec) generate even higher voltages during switch on. This could cause the breakdown of internal protection components, resulting into general failure of the converter.

Fix:

Victron BMS input (setting 29). The 2 minutes exception has been removed (see version 1.0).

ts04v1.1
Date: 08/03/2016. Replaces *ts04v1.0*.
Added functionality:
Invert output pin 2 (setting 75).
The output pin 2 (green wire) can now be set to act inverted. Instead of going 'high' according to settings 71/72, the pin goes 'low'. For details, see TSConfig help.
Fix:
None.

ts04v1.0
Date: 14/01/2016. Replaces version *dc400wv1.0*.
Added functionality:
Victron BMS input (setting 29). Blocks the converter to start when the BMS output is low. Connect the BMS output to input 2 (green wire). This input is ignored for 2 minutes if the output voltage is lower than the 2nd setting 27 (battery low voltage).
Fix:
In previous versions the converter could switch off momentary (once every minute) in a situation with irregular vibrations sensed, in combination with a 1 minute switch off delay (setting 54).

TS4002 firmware versions

ts42v1.0
Date: 13/03/2019. Initial version.

Functionality:
Same as TS400 as in *ts04v1.8.*

TS800 firmware versions

ts08v1.8

Date: 03/09/2018. Replaces *ts08v1.7*

Added functionality:
    Battery indicator, Indicator flash
An extra option, 'Indicator flash', is given for the battery indicator that is represented by the left LED on the converter. To reduce power consumption, the indicator is flashed (50 millisec, every 2 seconds) instead of always on. With this option checked, the TS800 consumes 5 mA only (standby mode).

Fix/change:
    Temperature control optimized
In version **ts08v1.6** this option was introduced, but did not work correctly with low maximum output current settings (setting #22).

ts08v1.7

Date: 16/08/2018. Replaces *ts08v1.6*.
Added functionality:
    Temperature control optimized
Current limitation at temperatures close to setting 23 'Maximum temperature (pcb)' has been improved for 28V output voltage settings (for all $V_{out} > 20V$).
In addition, when the internal temperature reaches setting 23, the converter is switched off.
The converter is then blocked (blue led blinks) for switching on again during 5 minutes of cooling down.

ts08v1.6

Date: 06/03/2018. Replaces *ts08v1.5*.

Added functionality:

    Battery voltage charge protection

To enable this feature, check setting 31 'Battery voltage charge protection' in TSConfig.

Before the converter switches on, the output voltage (of the battery to be charged) is checked against the programmed setting 31.

When the battery voltage is lower than this setting, the output current is limited to the value that is programmed in the setting labelled 'Current limitation at voltage under:'.

This limitation remains active until the converter is switched off.

    Temperature control optimized

Setting 22 has an extra option: 'Temperature control optimized'.

Normally, when the converter switches on, the output current can rise to the maximum setting immediately. The internal temperature will then rise, until the automatic temperature control limits the output current when the maximum temperature value comes closer.

With the option 'Temperature control optimized' enabled (automatically enabled when using 'send settings'), the converter switches on and starts with 60% of its maximum output current. From this point the current is slowly increased to the maximum programmed setting. This enables the internal temperature sensor to pick up the rising of the temperature earlier and prevent overheating of the hot spots on the circuit board (near the mosfets), by limiting the output current accordingly.

In situations where the voltage difference between input and output is big, the input current can rise to very high levels which causes a fast increase of the temperature leading to possible failure of certain electronic components.

    LED indication of active current limitation

The output LED on the converter goes purple when the converter is switched on and outputs current. In addition, the purple LED now *blinks* purple (2 Hz) in the situation of an active current limitation caused by low output battery voltage (setting 31).

    Converter on/off by input voltage

To enable this feature, check 'Converter on/off by input voltage' in TSConfig.

In some situations the vehicle's engine does not cause enough vibrations to be picked up by the sensor to switch on the converter.

Now you can use the voltage value of the input of the converter, to switch the converter on.

To do so, set the threshold (setting 57) and hysteresis (setting 58) to the desired values.

The converter switches on when the input voltage is higher than setting 57, after the switch on delay.

The converter switches off when the input voltage is lower than (setting 57 – setting 58) after the switch off delay, unless the sensor has picked up vibrations. Valid vibrations will restart the switch off delay.

Fix/change:

The input current is not being used anymore as a parameter for limiting the output current.

Alternating internal converter switchover when Vout (monitor 3) reaches Vout|(setting 20) is removed.

ts08v1.5

Date: 08/12/2016. Replaces *ts08v1.4*.

Added functionality:

Inductor noise reduction algorithm.

To enable this feature, check 'Inductor noise reduction algorithm' in TSConfig.

In special situations an internal inductor can produce audible noise when the converter supplies significant current. This can happen when Vout is <u>slightly lower</u> than Vin: the converter mode constantly changes from buck-boost to buck and back.

With 'inductor noise reduction algorithm' on and Vout less than 500 mV under Vin (during a minimum of 5 seconds), the controller reduces the output current for 10 minutes.

After 10 minutes, operations switches back to normal (and repeats if necessary).

(the current reduction is approx. 50%).

Fix:

None.

ts08v1.4

Date: 14/10/2016. Replaces *ts08v1.3*.

Added functionality:

Powerdown mode.

Powerdown is only available when using pin 1 (purple wire input 1 on pin 1) for switching the converter on and off.

To enable powerdown, check 'Powerdown' in TSConfig.

The converter enters sleep mode when the converter is switched off <u>and</u> output 2 is switched off after the delay (# 54) <u>and</u> TSConfig is closed for more than 5 seconds.

In sleep mode the current consumption is reduced to 1.3 to 1.7 mA (USB not plugged in).

In sleep mode, TSConfig cannot communicate with the converter.

To exit sleep mode, the converter has to be switched on by pin 1 (purple wire).

Fix:

None.

ts08v1.3

Date: 14/07/2016. Replaces *ts08v1.2*.

Added functionality:

None.

Fix:

The combination of Victron BMS input (setting 29) and 'Converter on/off with pin 1' (setting 50).

In previous versions this combination of settings would result in continuously switching the converter on and off when the Victron BMS output goes low.

ts08v1.2
Date: 22/06/2016. Replaces *ts08v1.1*.
Added functionality:
None.
Fix:
Communication with TSConfig. During the handling of several continuous analog to digital conversions, communication with the TSConfig application was sometimes missed, resulting into communication errors. From this version onwards, the issue has been solved.

ts08v1.1
Date: 11/04/2016. Replaces *ts08v1.0*.
Added functionality:
Invert output pin 2 (setting 75).
The output pin 2 (green wire) can now be set to act inverted. Instead of going 'high' according to settings 71/72, the pin goes 'low'. For details, see TSConfig help.
Fix:
When programming high output voltages (higher than 14.4), the converter could shortly (100 msec) generate even higher voltages during switch on. This could cause the breakdown of internal protection components, resulting into general failure of the converter.
Fix:
Victron BMS input (setting 29). The 2 minutes exception has been removed (see version 1.0).

ts08v1.0
Date: 24/12/2015. Replaces all previous versions *dc800wv1.0* to *dc800wv2.7*.
Added functionality:
Victron BMS input (setting 29). Blocks the converter to start when the BMS output is low. Connect the BMS output to input 2 (green wire). This input is ignored for 2 minutes if the output voltage is lower than the 2nd setting 27 (battery low voltage).
Fix:
In previous versions the converter could switch off momentary (once every minute) in a situation with irregular vibrations sensed, in combination with a 1 minute switch off delay (setting 54).

TS800C firmware versions

tsc08v1.5
Date: 03/09/2018. Replaces *tsc08v1.4*

Added functionality:
    Battery indicator, Indicator flash
An extra option, 'Indicator flash', is given for the battery indicator that is represented by the left LED on the converter. To reduce power consumption, the indicator is flashed (50 millisec, every 2 seconds) instead of always on. With this option checked, the TS800C consumes 5 mA only (standby mode).

Fix/change:
    Temperature control optimized
In version **tsc08v1.3** this option was introduced, but did not work correctly with low maximum output current settings (setting #22).

tsc08v1.4
Date: 16/08/2018. Replaces *tsc08v1.3*.
Added functionality:
    Temperature control optimized
Current limitation at temperatures close to setting 23 'Maximum temperature (pcb)' has been improved for 28V output voltage settings (for all $V_{out} > 20V$).
In addition, when the internal temperature reaches setting 23, the converter is switched off.
The converter is then blocked (blue led blinks) for switching on again during 5 minutes of cooling down.

tsc08v1.3
Date: 29/01/2018. Replaces *tsc08v1.2*.
Added functionality:
    CAN bus software for external temperature sensor
To enable this feature, check setting 80 'CAN bus external temperature sensor' in TSConfig.
The external temperature sensor module is to be fitted on the battery being charged.
Depending on the type of battery, low temperatures normally require low charge currents.
The output current of the converter will be limited to the programmed setting, when the temperature of the sensor <= upper temperature setting.
The converter will be switched off, when the temperature of the sensor <= lower temperature setting. In this case the converter will be blocked to switch on again, until the temperature is higher than the lower temperature setting during more than 5 minutes.

    Battery voltage charge protection
To enable this feature, check setting 31 'Battery voltage charge protection' in TSConfig.
Before the converter switches on, the output voltage (of the battery to be charged) is checked against the programmed setting 31.
When the battery voltage is lower than this setting, the output current is limited to the value that is programmed in the setting labelled 'Current limitation at voltage under:'.
This limitation remains active until the converter is switched off.

    Temperature control optimized
Setting 22 has an extra option: 'Temperature control optimized'.
Normally, when the converter switches on, the output current can rise to the maximum setting immediately. The internal temperature will then rise, until the automatic temperature control limits the output current when the maximum temperature value comes closer.
With the option 'Temperature control optimized' enabled (automatically enabled when using 'send settings'), the converter switches on and starts with 60% of its maximum output current. From this point the current is slowly increased to the maximum programmed setting. This enables the internal temperature sensor to pick up the rising of the temperature earlier and prevent overheating of the hot spots on the circuit board (near the mosfets), by limiting the output current accordingly.
In situations where the voltage difference between input and output is big, the input current can rise to very high levels which causes a fast increase of the temperature leading to possible failure of certain electronic components.

    LED indication of active current limitation
The output LED on the converter goes purple when the converter is switched on and outputs current. In addition, the purple LED now *blinks* purple (2 Hz) in the situation of an active current limitation caused by low output battery voltage (setting 31) or low battery temperature (setting 80).

Fix/change:
The input current is not being used anymore as a parameter for limiting the output current.
Alternating internal converter switchover when Vout (monitor 3) reaches Vout|(setting 20) is removed.

tsc08v1.2
Date: 27/02/2017. Replaces *tsc08v1.1*.
Added functionality:
Converter on/off by input voltage.
To enable this feature, check 'Converter on/off by input voltage' in TSConfig.
In some situations the vehicle's engine does not cause enough vibrations to be picked up by the sensor to switch on the converter.
Now you can use the voltage value of the input of the converter, to switch the converter on.
To do so, set the threshold (setting 57) and hysteresis (setting 58) to the desired values.
The converter switches on when the input voltage is higher than setting 57, after the switch on delay.
The converter switches off when the input voltage is lower than (setting 57 – setting 58) after the switch off delay, unless the sensor has picked up vibrations. Valid vibrations will restart the switch off delay.
Fix:
None.

tsc08v1.1
Date: 08/12/2016. Replaces *tsc08v1.0*.
Added functionality:
Inductor noise reduction algorithm.
To enable this feature, check 'Inductor noise reduction algorithm' in TSConfig.
In special situations an internal inductor can produce audible noise when the converter supplies significant current. This can happen when Vout is slightly lower than Vin: the converter mode constantly changes from buck-boost to buck and back.
With 'inductor noise reduction algorithm' on and Vout less than 500 mV under Vin (during a minimum of 5 seconds), the controller reduces the output current for 10 minutes.
After 10 minutes, operations switches back to normal (and repeats if necessary).
(the current reduction is approx. 50%).
Fix:
None.

tsc08v1.0
Date: 14/10/2016. First firmware version.
Basic converter functionality copied from TS800 firmware version ts08v1.4.
Added functionality:
Simple CAN routines to demonstrate the possibilities of sharing information over the CAN bus.
Fix:
None.

TS800C-2 firmware versions

tsc82v1.1
Date: 14/02/2019. Initial version.

Functionality:
Same as TS800C as in *tsc08v1.5.*

TS1600 firmware versions

ts16v1.1
Date: 14/09/2018. Replaces version *ts16v1.0*.

Fix:
Incorrect behavior of current limitation circuit nr. 5.

ts16v1.0
Date: 26/08/2018. Initial version.

Functionality:
Same as TS800C as in *tsc08v1.5.*

Added functionality:
    Battery indicator, Indicator flash
An extra option, 'Indicator flash', is given for the battery indicator that is represented by the left LED on the converter.
To reduce power consumption, the indicator is flashed (50 millisec, every 2 seconds) instead of always on.
With this option checked, the TS1600 consumes 12 mA only (standby mode).

TSConfig

Version 1.7.1.
Date: 10/04/2019. Replaces version 1.7.0.

Added functionality:
Support for TS4002 (TS400 converter with black enclosure).

Fix :
None

Included converter firmware:
-   ts04v15.hex
-   ts04v16.hex
-   ts04v17.hex
-   **ts04v18.hex**
-   **ts42v10.hex**   (firmware for the new TS4002 devices with black enclosure)
-   ts08v15.hex
-   ts08v16.hex
-   ts08v17.hex
-   **ts08v18.hex**
-   tsc08v12.hex
-   tsc08v13.hex
-   tsc08v14.hex
-   **tsc08v15.hex**
-   **tsc82v11.hex**   (firmware for the new TS800C-2 devices with black enclosure)
-   **ts16v11.hex**

Version 1.7.0.
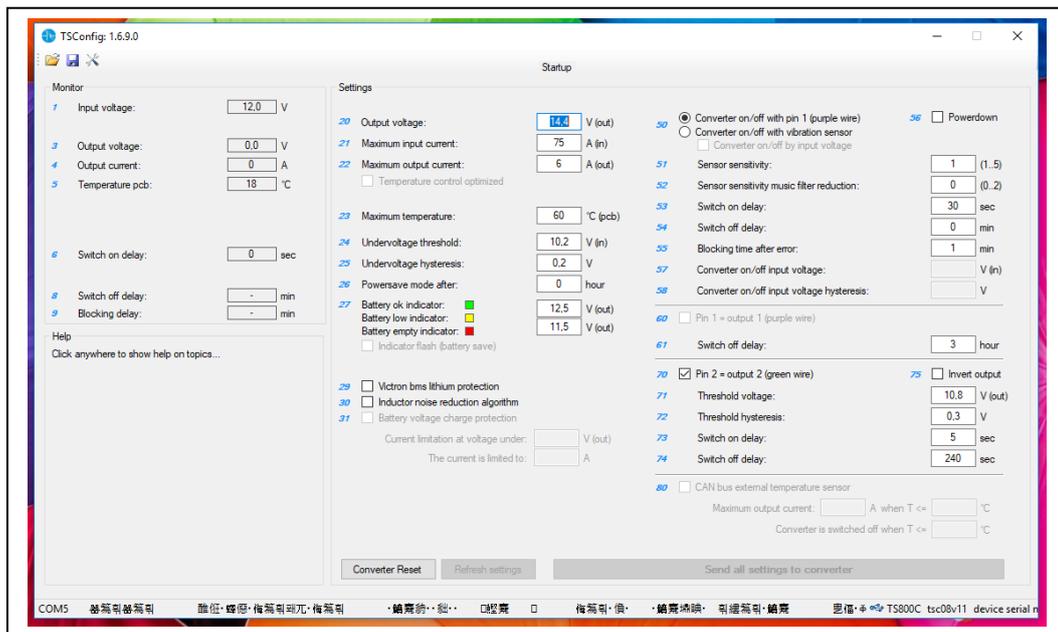Date: 13/03/2019. Replaces version 1.6.9.

Added functionality:
Support for TS4002 (TS400 converter with black enclosure).

Fix :
On some (new) Windows 10 computers, the TSConfig statusstrip can show erroneous characters.
(Windows adds these characters to the COMx string)
Also, connecting through a manually selected COM port, the application can exit.

Included converter firmware:
- ts04v15.hex
- ts04v16.hex
- ts04v17.hex
- **ts04v18.hex**
- **ts42v10.hex**   (firmware for the new TS4002 devices with black enclosure)
- ts08v15.hex
- ts08v16.hex
- ts08v17.hex
- **ts08v18.hex**
- tsc08v12.hex
- tsc08v13.hex
- tsc08v14.hex
- **tsc08v15.hex**
- **tsc82v11.hex**   (firmware for the new TS800C-2 devices with black enclosure)
- **ts16v11.hex**

Version 1.6.9.
Date: 17/02/2019. Replaces version 1.6.5-1.6.8.

Added functionality:
This version supports the new TS800C-2 devices (with black enclosure).

Included converter firmware:
- ts04v15.hex
- ts04v16.hex
- ts04v17.hex
- **ts04v18.hex**
- ts08v15.hex
- ts08v16.hex
- ts08v17.hex
- **ts08v18.hex**
- tsc08v12.hex
- tsc08v13.hex
- tsc08v14.hex
- **tsc08v15.hex**
- **tsc82v11.hex**   (firmware for the new TS800C-2 devices with black enclosure)
- **ts16v11.hex**

Version 1.6.5.
Date: 14/09/2018. Replaces version 1.6.3.

Added functionality:
Demonstration mode selectable for TS400, TS800C and TS1600 devices.

Included converter firmware:
- ts04v15.hex
- ts04v16.hex
- ts04v17.hex
- **ts04v18.hex**
- ts08v15.hex
- ts08v16.hex
- ts08v17.hex
- **ts08v18.hex**
- tsc08v12.hex
- tsc08v13.hex
- tsc08v14.hex
- **tsc08v15.hex**
- **ts16v11.hex**

Version 1.6.3.
Date: 27/08/2018. Replaces version 1.6.2.

Added functionality:
Support for TS1600 dc/dc converter.

Setting #23 : Maximum temperature.
The TS1600 converter has 2 extra internal temperature sensors, placed near the mosfets.
In this way, temperature monitoring is improved to prevent overheating.
The maximum temperature allowed for the mosfets is fixed in firmware by adding 25°C to the value of setting #23.
So, when the maximum temperature (pcb) is set to 60°C, the TS1600 firmware sets the maximum mosfet temperature to 85°C
When connected to a TS1600, setting #23 also shows the maximum temperature for the mosfets, based on the value that is given for the pcb temperature.

Setting #27 : Battery indicator, Indicator flash.
An extra option, 'Indicator flash', is given for the battery indicator that is represented by the left LED on the converter.
To reduce power consumption, the indicator is flashed (50 millisec, every 2 seconds) instead of always on.

Included converter firmware:
- ts04v15.hex
- ts04v16.hex
- ts04v17.hex
- **ts04v18.hex**
- ts08v15.hex
- ts08v16.hex
- ts08v17.hex
- **ts08v18.hex**
- tsc08v12.hex
- tsc08v13.hex
- tsc08v14.hex
- **tsc08v15.hex**
- **ts16v10.hex**

Version 1.6.2.
Date: 16/08/2018. Replaces version 1.6.0.

Changes:
Setting #20 : Output voltage.
Setting #22 : Maximum output current.
Setting #24 : Undervoltage threshold.
These three settings are related. The maximum output current changes to a specific maximum, when the output voltage is increased or when the undervoltage threshold is decreased.

Setting #23 : Maximum temperature (pcb).
The default maximum value is 60°C for 12V settings. Now, with 28V output voltages (at all $V_{out} > 20V$), the maximum value becomes 58°C.

Included converter firmware:
- ts04v15.hex
- ts04v16.hex
- **ts04v17.hex**
- ts08v15.hex
- ts08v16.hex
- **ts08v17.hex**
- tsc08v12.hex
- tsc08v13.hex
- **tsc08v14.hex**

Version 1.6.0.
Date: 20/06/2018. Replaces version 1.5.1.

Fix :
Setting #58 : Converter on/off input voltage hysteresis. The value of this setting was written by TSConfig to the wrong internal register in the converter, leaving the converter's value for this setting unchanged.

Changes:
Setting #41: Dual mode: converter is master
To enable more configuration settings in Master mode, setting 29 and setting 70 are not fixed anymore.
Also, choosing default settings (menu option) now has two different Master choices.

Added functionality:
1. Converter on/off by input voltage (setting 50) now available for TS400.
Note: only for TS400 with firmware version ts04v1.6 or higher

2. Battery voltage charge protection (setting 31) now available for TS400.
Note: only for TS400 with firmware version ts04v1.6 or higher

3. Temperature control optimized (setting 22) now available for TS400.
Note: only for TS400 with firmware version ts04v1.6 or higher

Included converter firmware:
- ts04v15.hex
- ts04v16.hex
- ts08v15.hex
- ts08v16.hex
- tsc08v12.hex
- tsc08v13.hex

Version 1.5.1.
Date: 06/03/2018. Replaces version 1.4.7.
Changes:
Setting 21 'Maximum input current' is disabled when the connected device runs a firmware version that no longer uses this parameter.

Added functionality:
   4. CAN bus software for external temperature sensor
To enable this feature, check setting 80 'CAN bus external temperature sensor'.
The external temperature sensor module is to be fitted on the battery being charged.
Depending on the type of battery, low temperatures normally require low charge currents.
The output current of the converter will be limited to the programmed setting, when the temperature of the sensor <= upper temperature setting.
The converter will be switched off, when the temperature of the sensor <= lower temperature setting. In this case the converter will be blocked to switch on again, until the temperature is higher than the lower temperature setting during more than 5 minutes.

   5. Battery voltage charge protection
To enable this feature, check setting 31 'Battery voltage charge protection'.
Before the converter switches on, the output voltage (of the battery to be charged) is checked against the programmed setting 31.
When the battery voltage is lower than this setting, the output current is limited to the value that is programmed in the setting labelled 'Current limitation at voltage under:'.
This limitation remains active until the converter is switched off.

   6. Temperature control optimized
Setting 22 has an extra option: 'Temperature control optimized'.
Normally, when the converter switches on, the output current can rise to the maximum setting immediately. The internal temperature will then rise, until the automatic temperature control limits the output current when the maximum temperature value comes closer.
With the option 'Temperature control optimized' enabled, the converter switches on and starts with 60% of its maximum output current. From this point the current is slowly increased to the maximum programmed setting. This enables the internal temperature sensor to pick up the rising of the temperature earlier and prevent overheating of the hot spots on the circuit board (near the mosfets), by limiting the output current accordingly.
In situations where the voltage difference between input and output is big, the input current can rise to very high levels which causes a fast increase of the temperature leading to possible failure of certain electronic components.

   7. Device serial number
The status strip shows the serial number of the connected TSx00 device.

Included converter firmware:
   - ts04v15.hex
   - ts08v15.hex
   - ts08v16.hex
   - tsc08v12.hex
   - tsc08v13.hex

Version 1.4.7.
Date: 15/05/2017. Replaces version 1.4.6.
Changes:
None.
Added functionality:
Warning on setting 20.
When the Vout voltage is set > 16V, a warning to check the generated voltage is displayed.
Checking this voltage is important, because the converter is calibrated around 14.4 V.
High settings like 28.8V can lead to lower/higher generated voltages.
To be sure that the converter generates the desired voltage, the Vout setting should be adjusted until the measured voltage on the +OUT connection is correct.

Included converter firmware:
- ts04v14.hex
- ts04v15.hex
- ts08v13.hex
- ts08v14.hex
- ts08v15.hex
- tsc08v10.hex
- tsc08v11.hex
- tsc08v12.hex

Version 1.4.6.
Date: 27/02/2017. Replaces version 1.4.5.
Changes:
None.
Added functionality:
Setting 50: Converter on/off by input voltage.
Setting 57: Converter on/off input voltage.
Setting 58: Converter on/off input voltage hysteresis.
Included converter firmware:
- ts04v14.hex
- ts04v15.hex
- ts08v13.hex
- ts08v14.hex
- ts08v15.hex
- tsc08v10.hex
- tsc08v11.hex
- tsc08v12.hex

Version 1.4.5.
Date: 30/01/2017. Replaces version 1.4.4.
Changes:
Setting 24, Undervoltage threshold, is pre-loaded with a value of 12.2 V when loading default settings using the option 12-12 or 12-24 from the Load settings window.
Setting 53, Switch on delay, is pre-loaded with a value of 15 seconds (was 30 seconds) when loading default settings using the option 12-12 or 12-24 from the Load settings window.
Added functionality:
None.
Included converter firmware:
- ts04v14.hex
- ts04v15.hex
- ts08v13.hex
- ts08v14.hex
- ts08v15.hex
- tsc08v10.hex
- tsc08v11.hex

Version 1.4.4.
Date: 08/12/2016. Replaces version 1.4.1 to 1.4.3.
Added functionality:
Setting 30: Inductor noise reduction algorithm.
To enable this feature, check 'Inductor noise reduction algorithm' in TSConfig.
In special situations an internal inductor (TS800/TS800C/TS400) can produce audible noise when the converter supplies significant current. This can happen when Vout is slightly lower than Vin: the converter mode constantly changes from buck-boost to buck and back.
With 'inductor noise reduction algorithm' on and Vout less than 500 mV under Vin (during a minimum of 5 seconds), the controller reduces the output current for 10 minutes.
After 10 minutes, operations switches back to normal (and repeats if necessary).
(the current reduction is approx. 50%).

Included converter firmware:
- ts04v14.hex
- ts04v15.hex
- ts08v13.hex
- ts08v14.hex
- ts08v15.hex
- tsc08v10.hex
- tsc08v11.hex

Version 1.4.1.
Date: 14/10/2016. Replaces version 1.3.3 to 1.4.0.
Added functionality:
TS800C (TS800 with CAN connector next to the USB connector).
TSConfig can now detect a TS800C converter.
The TS800C is a TS800 converter with CAN (controller area network) functionality added.

Powerdown (setting 56) (current consumption reduction).
This function can only be used when the converter is configured to be switched on by input 1 on pin 1
(purple wire). It cannot be used when the vibration sensor is activated.
TS400: powerdown function build in version *ts04v1.4* or higher.
TS800: powerdown function build in version *ts08v1.4* or higher.
TS800C: powerdown function build in version *tsc08v1.0* or higher.

Changes:
Setting 24, Undervoltage threshold, is pre-loaded with a value of 11.8 V (was: 11.3 V) when loading default
settings using the option 12-12 or 12-24 from the Load settings window.
Fix:
None.
Included converter firmware:
   - ts04v13.hex
   - ts04v14.hex
   - ts08v13.hex
   - ts08v14.hex
   - tsc08v10.hex

Version 1.3.3
Date: 14/07/2016. Replaces version 1.3.2.
Added functionality:
None.
Fix:
The combination of Victron BMS input (setting 29) and 'Converter on/off with pin 1' (setting 50).
In previous versions setting 50 (converter on/off with pin 1) was disabled after checking setting 29.
Included converter firmware:
- ts08v13.hex
- ts04v13.hex

Version 1.3.2
Date: 30/06/2016. Replaces version 1.3.1.
Added functionality:
Demonstration mode. Settings can be viewed and saved to file without connecting to a converter.
Fix:
None.
Included converter firmware:
- ts08v12.hex
- ts04v12.hex

Version 1.3.1
Date: 29/06/2016. Replaces all versions 1.2.x.
Added functionality:
None.
Fix:
In previous versions, TSConfig did not work correctly on Chinese versions of Windows.
In the transmission routines SBCS values and/or DBCS values were used.
Those values are now changed into Unicode.
The Unicode value is independent of the culture and code page settings for the current thread in Windows.

Version 1.2.0
Date: 12/04/2016. Replaces all previous versions.
Added functionality:
Extra default setting 12V-24V in the 'open' menu.
Menu options has an extra button to start firmware update.
In firmware update selection, TSConfig checks with warning for choosing the correct combination of
converter type and firmware version.
Fix:
Setting 52 now has limited value's (0..2).
Powersave is set to 0 when using the default settings.
Added help information: 'use 1k-10k resistor in series for the inputs of the converter'.