AMMONIA REFRIGERATION ENGINEERING (Pty) Ltd.

A. R. E.

HCS SCREW Panel End User Manual

HCS AUTOMATION & CONTROLS

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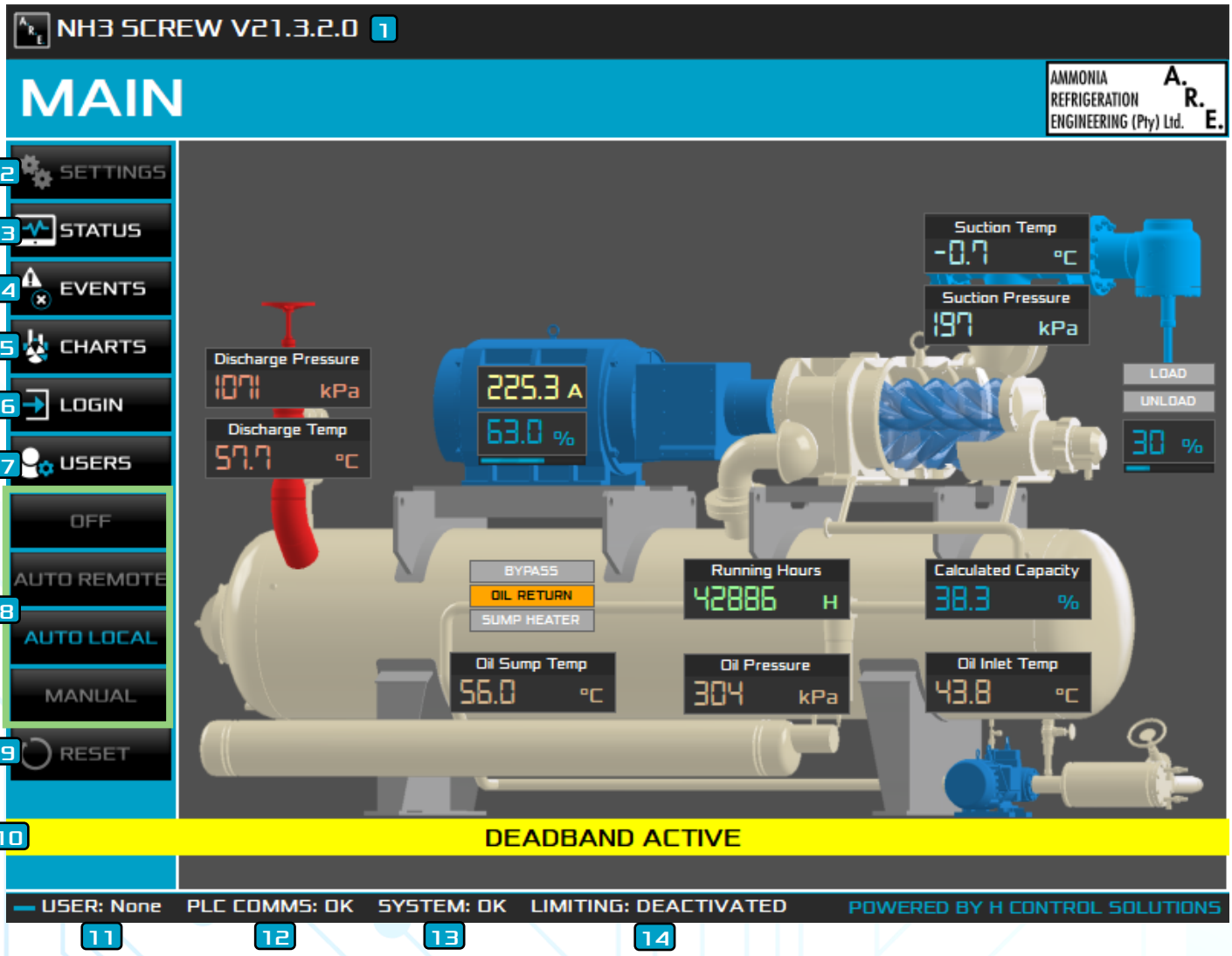
support@hcontrolsolutions.com

Page Reference

Main



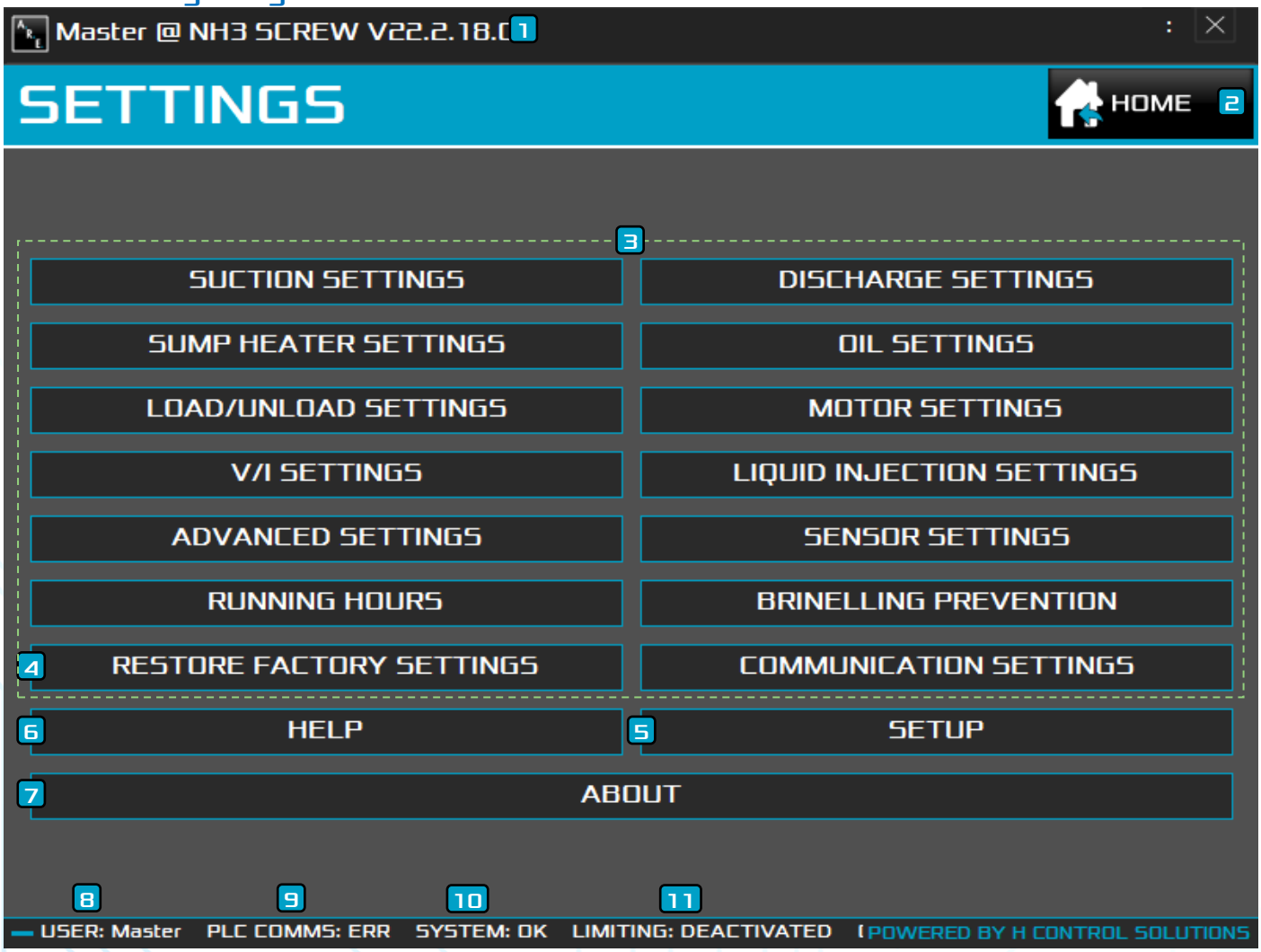
1. Software version.
2. Navigates to main settings page for setup.
3. Navigates to status page for general overview of values, alarms and warnings.
4. Navigates to event page.
5. Navigates to chart page for review of extracted data.
6. Navigates to login page with on-screen keyboard.
7. Navigates to user management page.
8. Switch between different modes:
    - Off: Machine is off
    - Auto Remote: Machine is controlled from remote system.
    - Auto Local: Machine is controlled with local settings.
    - Manual: Machine is controlled manually; Start\Stop, VFD speed and Load\Unload.
9. Reset all alarms on the system except service alarm and service warning.
10. Deadband active: No suction modulation.
    Discharge limiting: Screw is limited due to high discharge pressure.
    Motor limiting: Screw is limited due to high current (A).

Unload limiting active: Screw is unloading due to high current (A).

11. Current user that is logged on.
12. Indicates communication link to the respective PLC.
13. Indicates general screw panel status.
14. Indicates if limiting is active on screw.

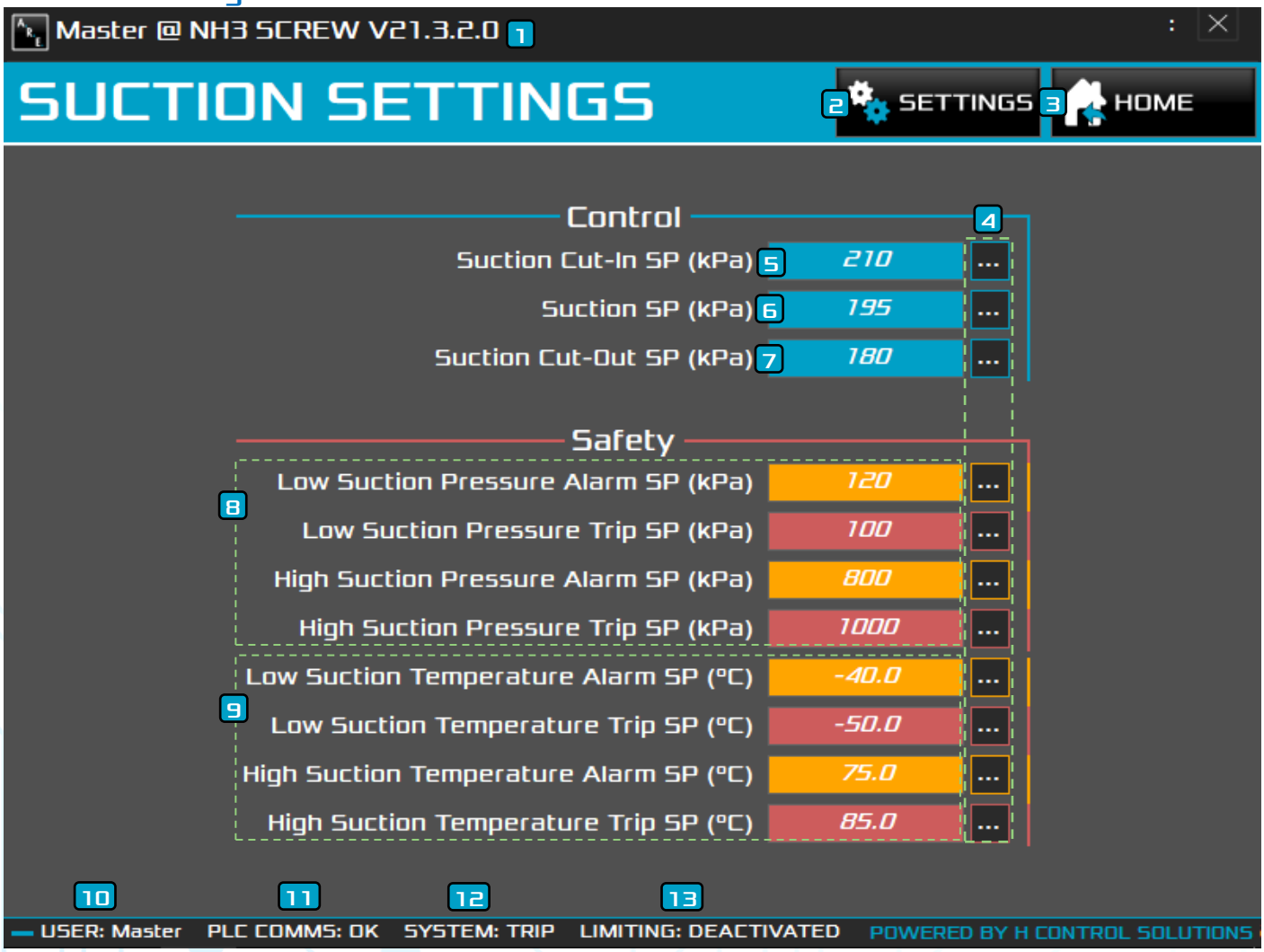
Settings

Main Settings Page



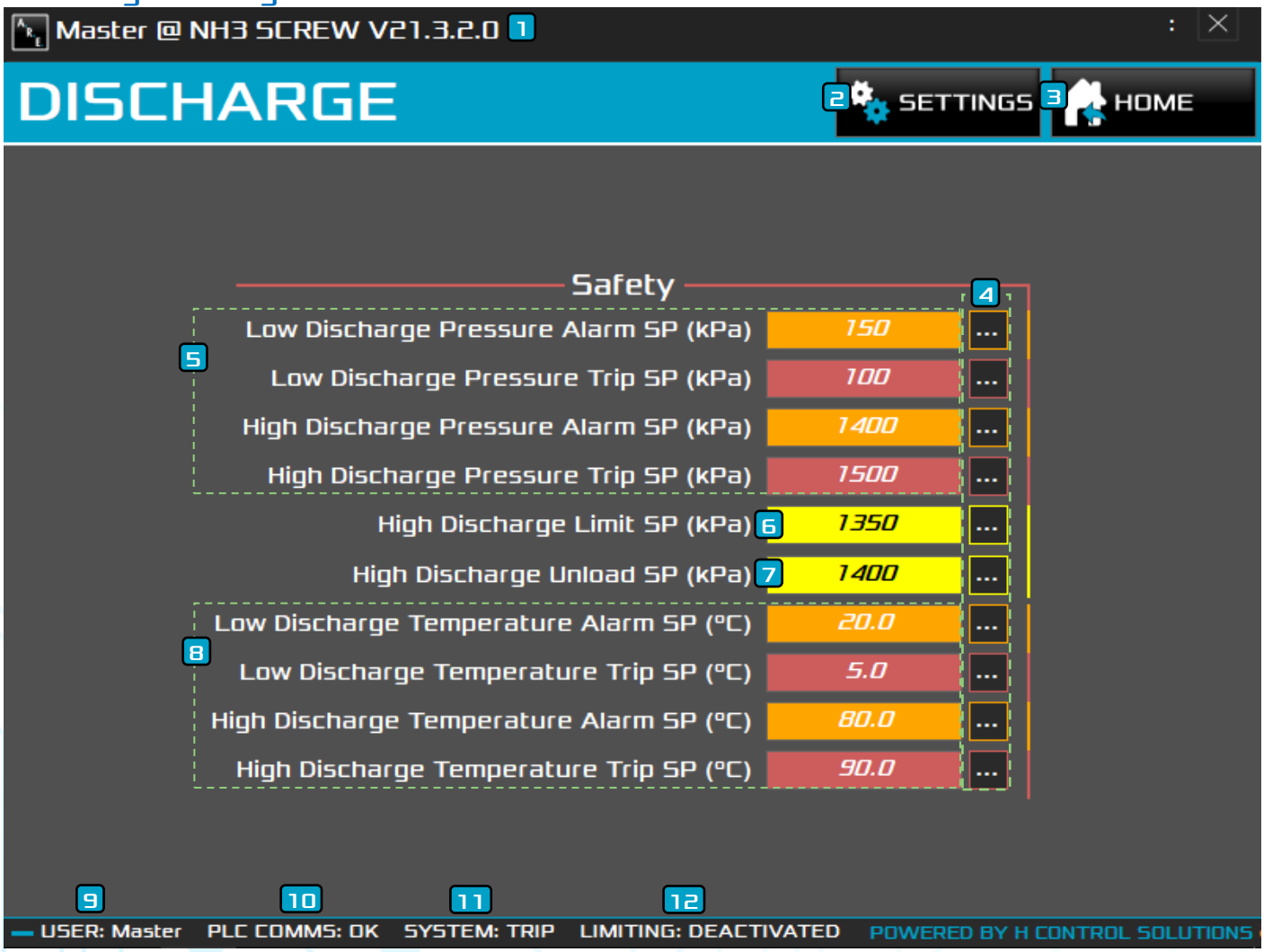
1. Software version.
2. Return to main page.
3. Open respective settings page.
4. Restore settings to factory setup.
5. Setup page to custom settings.
6. Open user manual.
7. Open the About page of the screw.
8. Current user that is logged on.
9. Indicates communication link to the respective PLC.
10. Indicates general screw panel status.
11. Indicates if limiting is active on screw.

Suction Settings



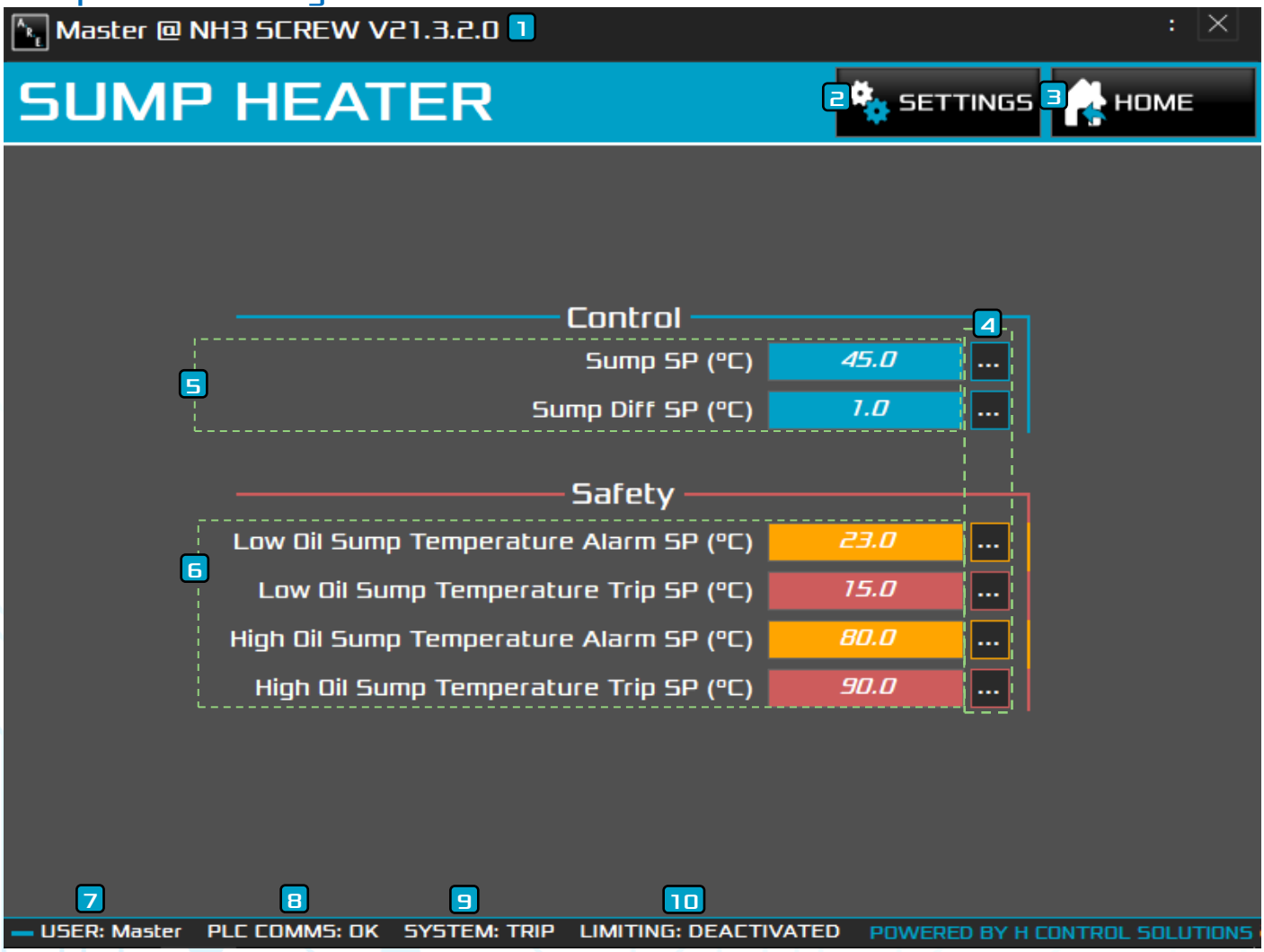
1. Software version.
2. Return to main settings page.
3. Return to main page.
4. Click on "..." to open an on-screen numeric pad to enter data.
5. When suction pressure is greater than LP Cut-In (kPa) setpoint the compressor will start.
6. Sets the normal operating suction pressure setpoint.
7. When suction pressure is less than or equal to LP Cut-out (kPa) setpoint the compressor will shut down regardless of the min on time.
8. Alarm\Trip setpoints for low and high suction pressures in kPa.
9. Alarm\Trip setpoints for low and high suction temperatures in °C.
10. Current user that is logged on.
11. Indicates communication link to the respective PLC.
12. Indicates general screw panel status.
13. Indicates if limiting is active on screw.

Discharge Settings



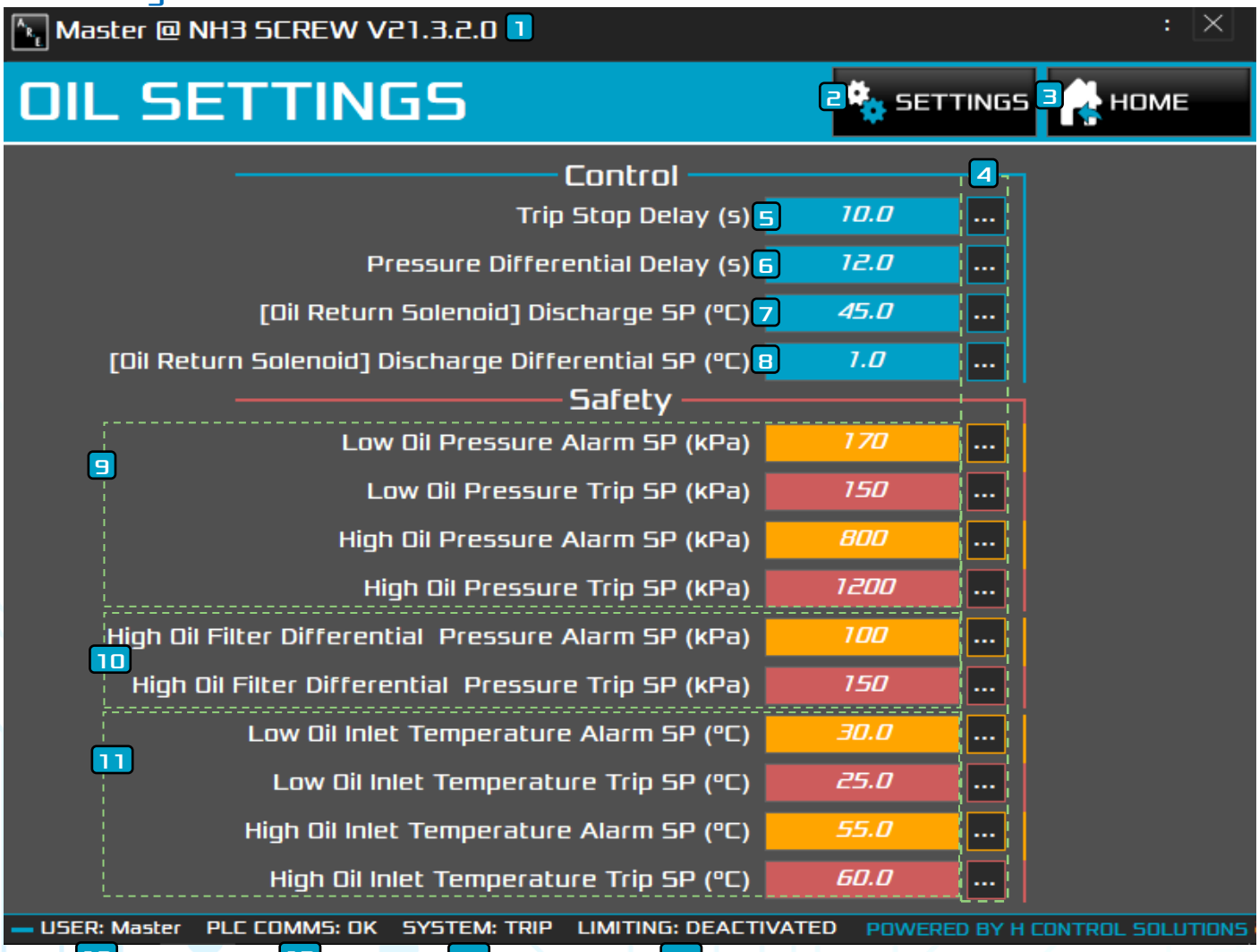
1. Software version.
2. Return to main settings page.
3. Return to main page.
4. Click on "..." to open an on-screen numeric pad to enter data.
5. Alarm\Trip setpoints for low and high discharge pressures in kPa.
6. High discharge limit setpoint in kPa. When discharge pressure is greater than or equal to high discharge alarm setpoint, compressor capacity is limited.
7. When discharge pressure is greater than or equal to unload setpoint, compressor will start to unload till discharge pressure is less than high discharge limit setpoint.
8. Alarm\Trip setpoints for low and high discharge temperatures in °C.
9. Current user that is logged on.
10. Indicates communication link to the respective PLC.
11. Indicates general screw panel status.
12. Indicates if limiting is active on screw.

Sump Heater Settings



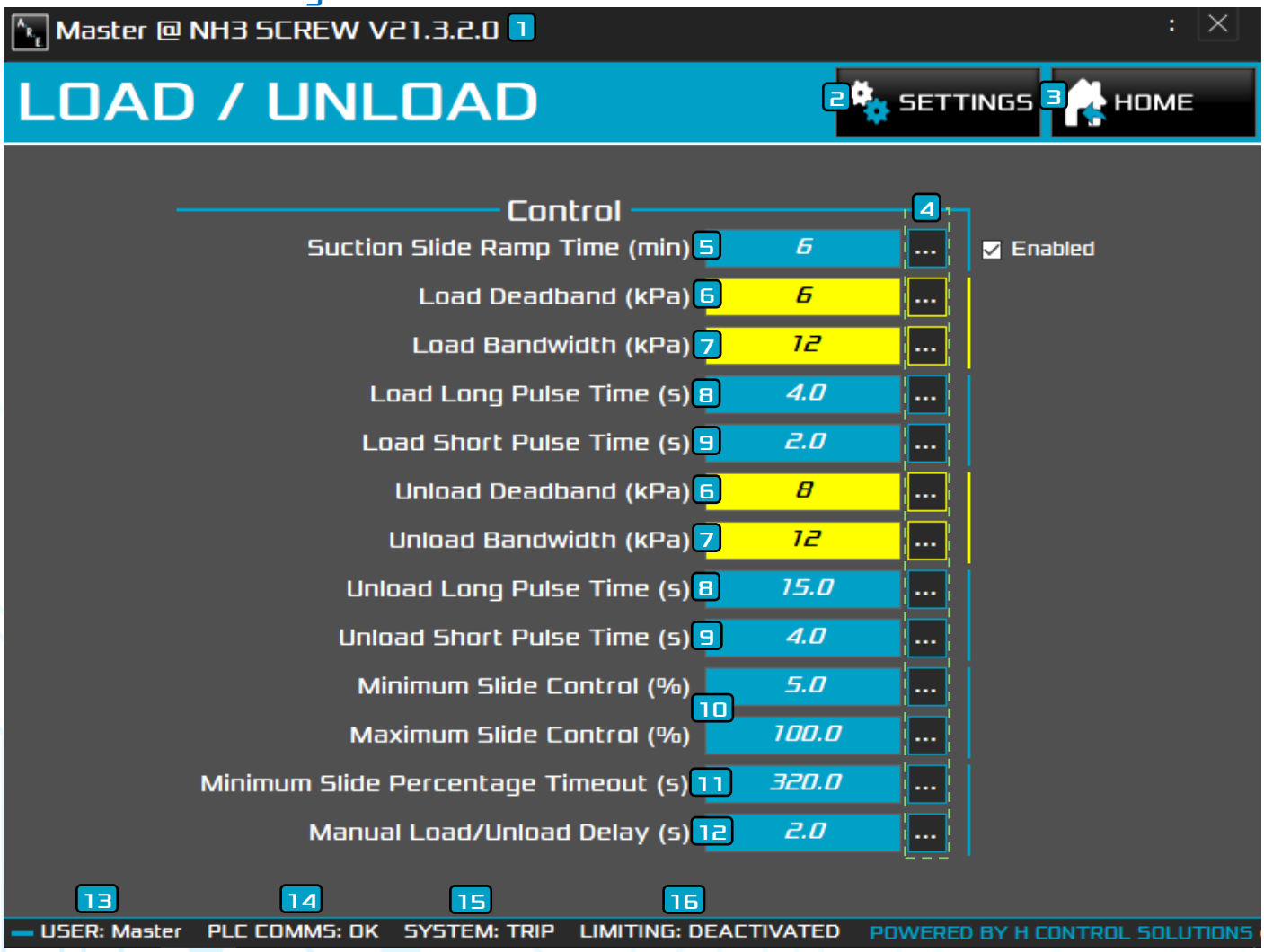
1. Software version.
2. Return to main page.
3. Return to main settings page.
4. Click on "..." to open an on-screen numeric pad to enter data.
5. Control setpoint and differential for sump heater in °C.
6. Alarm\Trip setpoints for low and high oil sump temperatures in °C.
7. Current user that is logged on.
8. Indicates communication link to the respective PLC.
9. Indicates general screw panel status.
10. Indicates if limiting is active on screw.

Oil Settings



1. Software version.
2. Return to main settings page.
3. Return to main page.
4. Click on "..." to open an on-screen numeric pad to enter data.
5. Oil pump run time after system has tripped to insure safe unloading.
6. Discharge setpoint regulates discharge temperature.
7. Discharge differential setpoint regulate discharges temperature.
8. Bypass delay after compressor has started before pressure alarms will be activated.
9. Alarm\Trip setpoints for low and high oil pressure in kPa.
10. Alarm\Trip setpoints for high oil filter pressure differential in kPa.
11. Alarm\Trip for low and high oil inlet temperature in °C.
12. Current user that is logged on.
13. Indicates communication link to the respective PLC.
14. Indicates general screw panel status.
15. Indicates if limiting is active on screw.

Load/Unload Settings

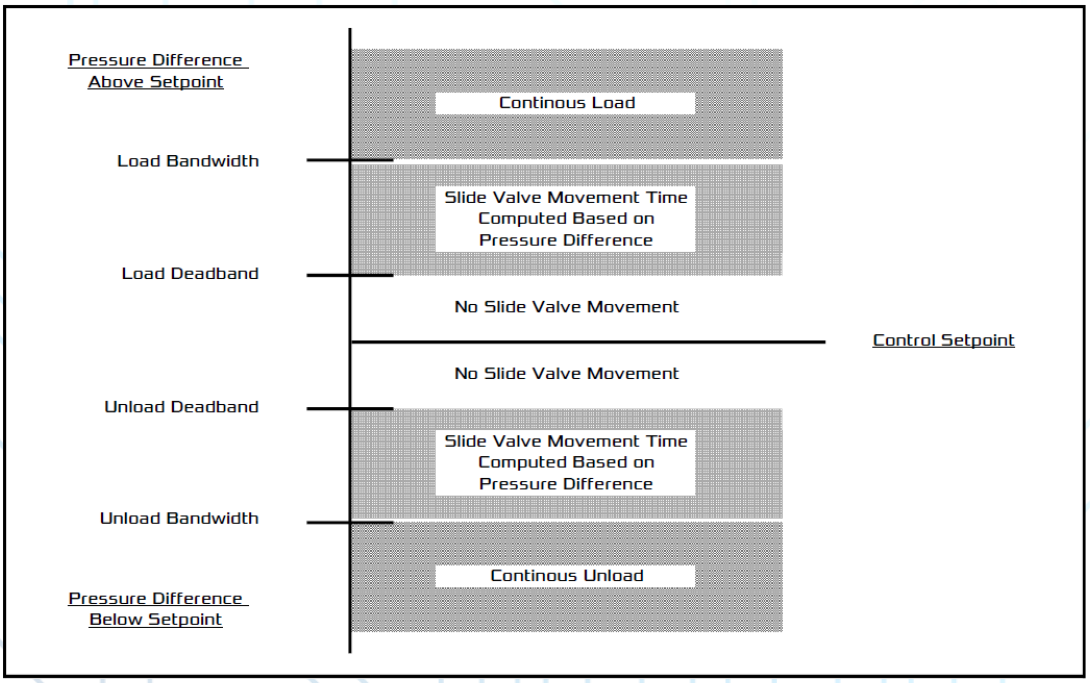


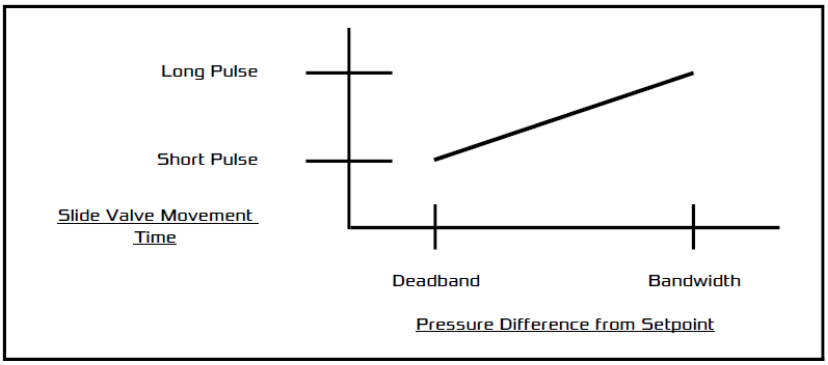
1. Software version
2. Return to main settings page.
3. Return to main page.
4. Click on "..." to open an on-screen numeric pad to enter data.
5. Minimum time for slide to ramp to maximum percentage.
6. When the difference between the control setpoint and the control parameter is less than the deadband value no slide valve movement will take place. If the deadband values are too small, the slide valve may continuously hunt for the proper setting very close to the control setpoint resulting in excessive slide valve wear. If the deadband values are too large, the compressor may not hold the control parameter close enough to the control setpoint resulting in inefficient capacity control.
7. The parameter adjusts the overall sensitivity of the control strategy. The slide valve move time is computed to be between the shortest and longest pulse while the control parameter is outside the deadband but inside the bandwidth. The move time approaches the longest pulse time as the difference between the control parameter and the control setpoint approaches the bandwidth value. If the bandwidth values too small, the compressor will respond quickly and may constantly overshoot the optimal position. If the bandwidth values are too large the compressor will react slowly to control

parameter changes. While the control parameter is outside the bandwidth values the slide valve is continuously loaded or unloaded.

8. This is the longest amount of time used to move the slide valve while loading or unloading the compressor. This time period is used when the control parameter differential is equal to the bandwidth value. If the longest pulse is too long the compressor may overshoot the optimal position. If the value is too short the slide valve will react slowly to large changes in the control parameter.
9. This is the shortest amount of time the slide valve is moved to load or unload the system. The short pulse time is the fine adjustment for control parameter differentials slightly above or below the deadband values. If the shortest pulse is too long the slide valve may continuously overshoot the optimal position resulting in excessive slide valve wear.
10. The minimum/maximum allowable slide valve position in percentage after the screw has started. The minimum capacity position will only be active if the slide valve has exceeded the minimum position once while the compressor has been running.
11. When the compressor start the slide valve must move below 5% before the compressor can start. If the slide valve does not respond within the defined time the start sequence will fail on starting slide valve timeout.

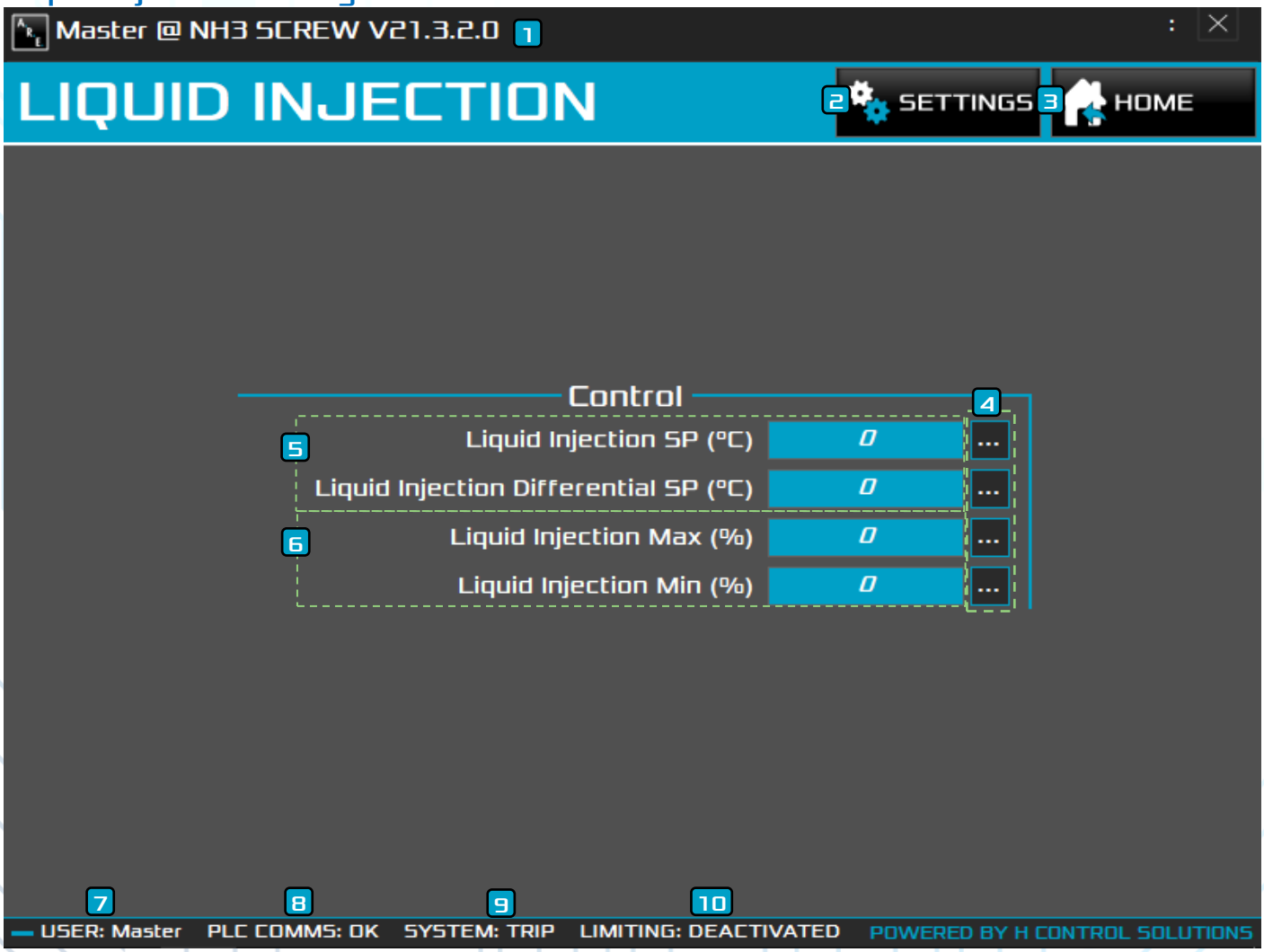
    Once the starter has disengaged and if the pump is running, the slide valve is moved to the fully unloaded position (below 5%). If the slide valve does not respond within the defined time the stop sequence is failed on stop slide valve position timeout.
12. Load/unload delays for compressor steps in seconds (Used with manual load\unload).





13. Current user that is logged on.
14. Indicates communication link to the respective PLC.
15. Indicates general screw panel status.
16. Indicates if limiting is active on screw.

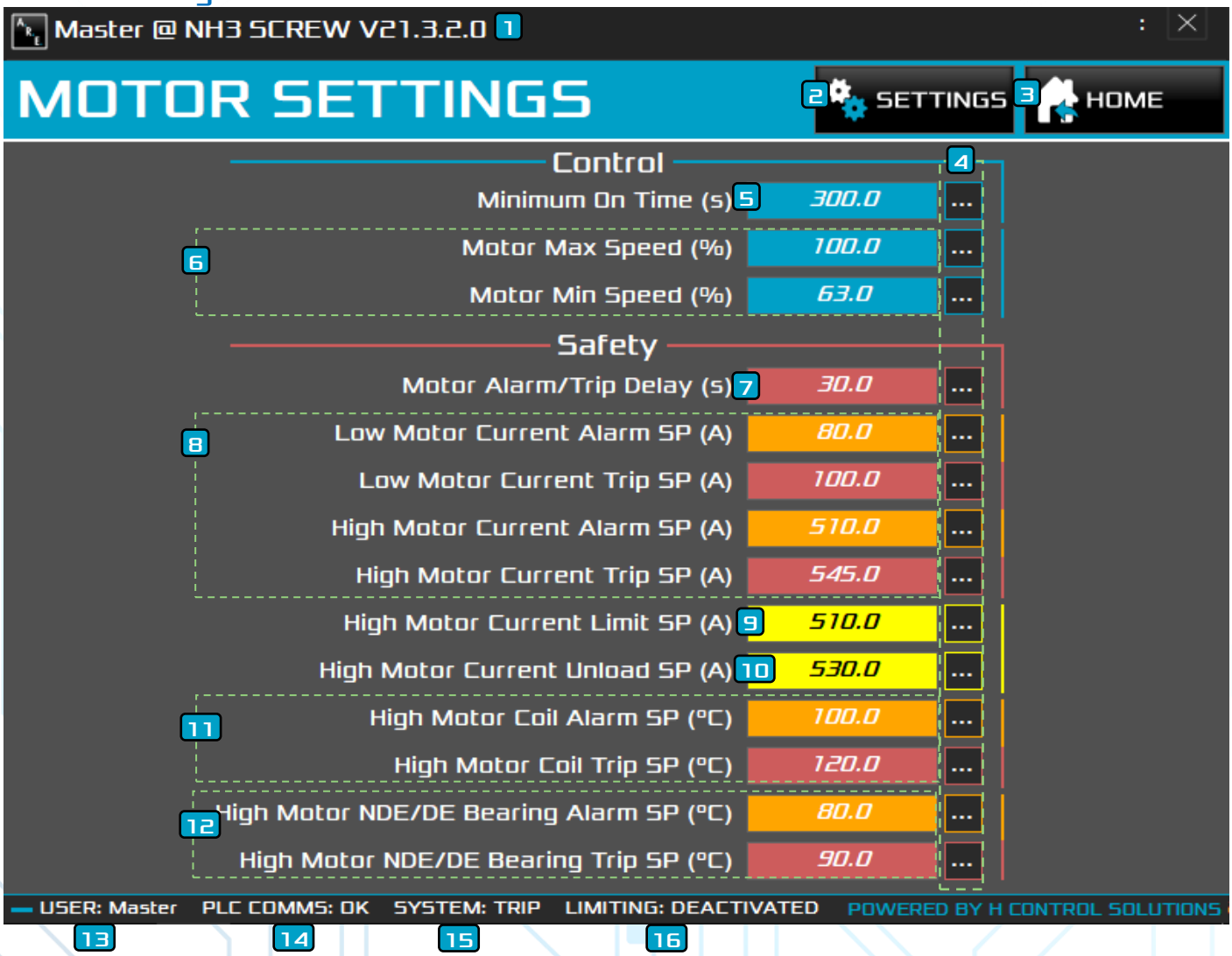
Liquid Injection Settings



1. Software version.
2. Return to main settings page.
3. Return to main page.
4. Click on "..." to open an on-screen numeric pad to enter data.

5. Control setpoint and differential for liquid injection in °C.
   Process value is determined by discharge temperature.
6. Maximum and minimum valve operating range.
7. Current user that is logged on.
8. Indicates communication link to the respective PLC.
9. Indicates general screw panel status.
10. Indicates if limiting is active on screw.

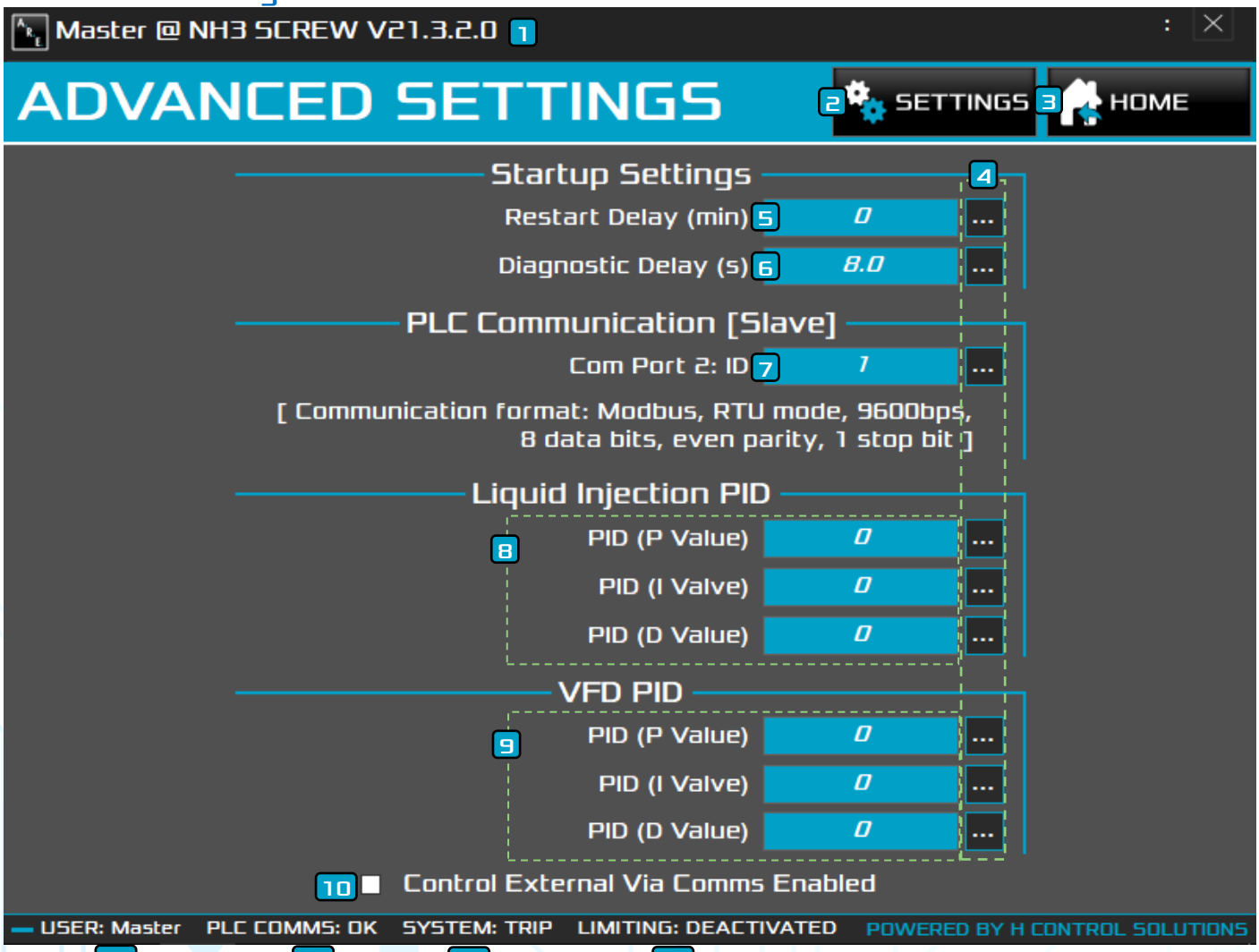
Motor Settings



1. Software version.
2. Return to main settings page.
3. Return to main page.
4. Click on "..." to open an on-screen numeric pad to enter data.
5. Minimum on time for compressor (Compressor protection).
6. Set minimum and maximum percentage of drive speed.
7. Delay before alarm is activated or compressor is tripped after respective setpoint have been reached.
8. Alarm\Trip setpoints for low and high motor current (A).

9. High current (A) limit setpoint. When motor current is greater than or equal to high motor current alarm setpoint, compressor capacity is limited.
10. When motor current is greater than or equal to unload setpoint, compressor will start to unload till motor current is less than high motor current limit setpoint.
11. Alarm\Trip setpoints for high motor coil temperature in °C.
12. Alarm\Trip setpoints for high motor bearing temperature in °C.
13. Current user that is logged on.
14. Indicates communication link to the respective PLC.
15. Indicates general screw panel status.
16. Indicates if limiting is active on screw.

Advanced Settings



1. Software version.
2. Return to main settings page.
3. Return to main page.
4. Click on "..." to open an on-screen numeric pad to enter data.
5. Maximum time delay to restart screw. When the allowed time is elapsed, the system will be available for operation.
6. Delay when system commences diagnostics before loading the screw compressor.
7. Slave Address for third party application communication.
8. PID control setup for valve. Integral value is measured in seconds.
9. PID control setup for VFD of compressor. Integral value is measured in seconds.
10. Enable remote control from HCS control system.
11. Current user that is logged on.
12. Indicates communication link to the respective PLC.
13. Indicates general screw panel status.
14. Indicates if limiting is active on screw.

PID Theory:

Proportional Response

The proportional component depends only on the difference between the set point and the process variable. This difference is referred to as the Error term. The proportional gain determines the ratio of output response to the error signal. For instance, if the error term has a magnitude of 10, a proportional gain of 5 would produce a proportional response of 50. In general, increasing the proportional gain will increase the speed of the control system response. However, if the proportional gain is too large, the process variable will begin to oscillate. If proportional gain is increased further, the oscillations will become larger and the system will become unstable and may even oscillate out of control.

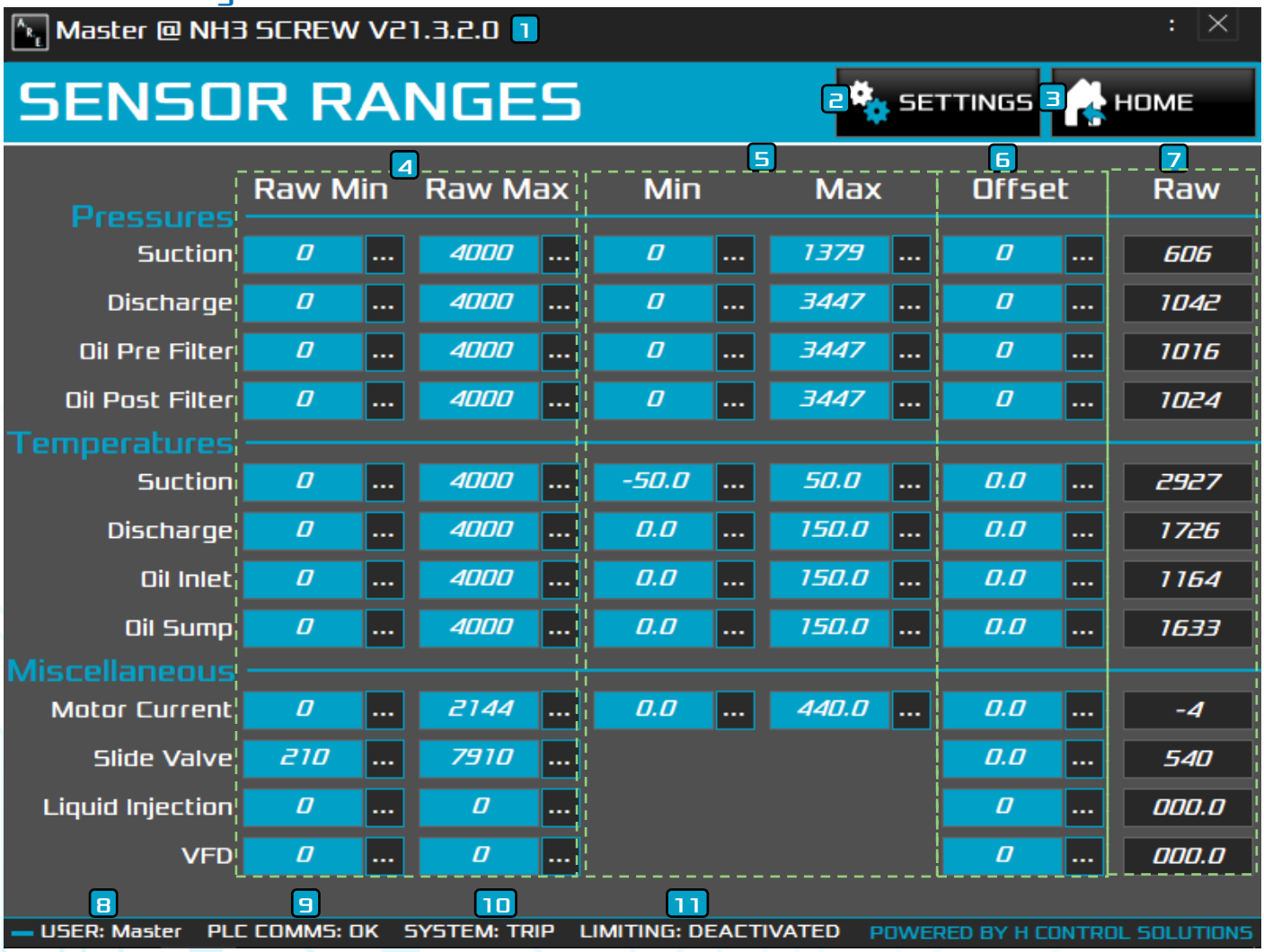
Integral Response

The integral component sums the error term over time. The result is that even a small error term will cause the integral component to increase slowly. The integral response will continually increase over time unless the error is zero, so the effect is to drive the Steady-State error to zero. Steady-State error is the final difference between the process variable and set point. A phenomenon called integral windup results when integral action saturates a controller without the controller driving the error signal toward zero.

Derivative Response

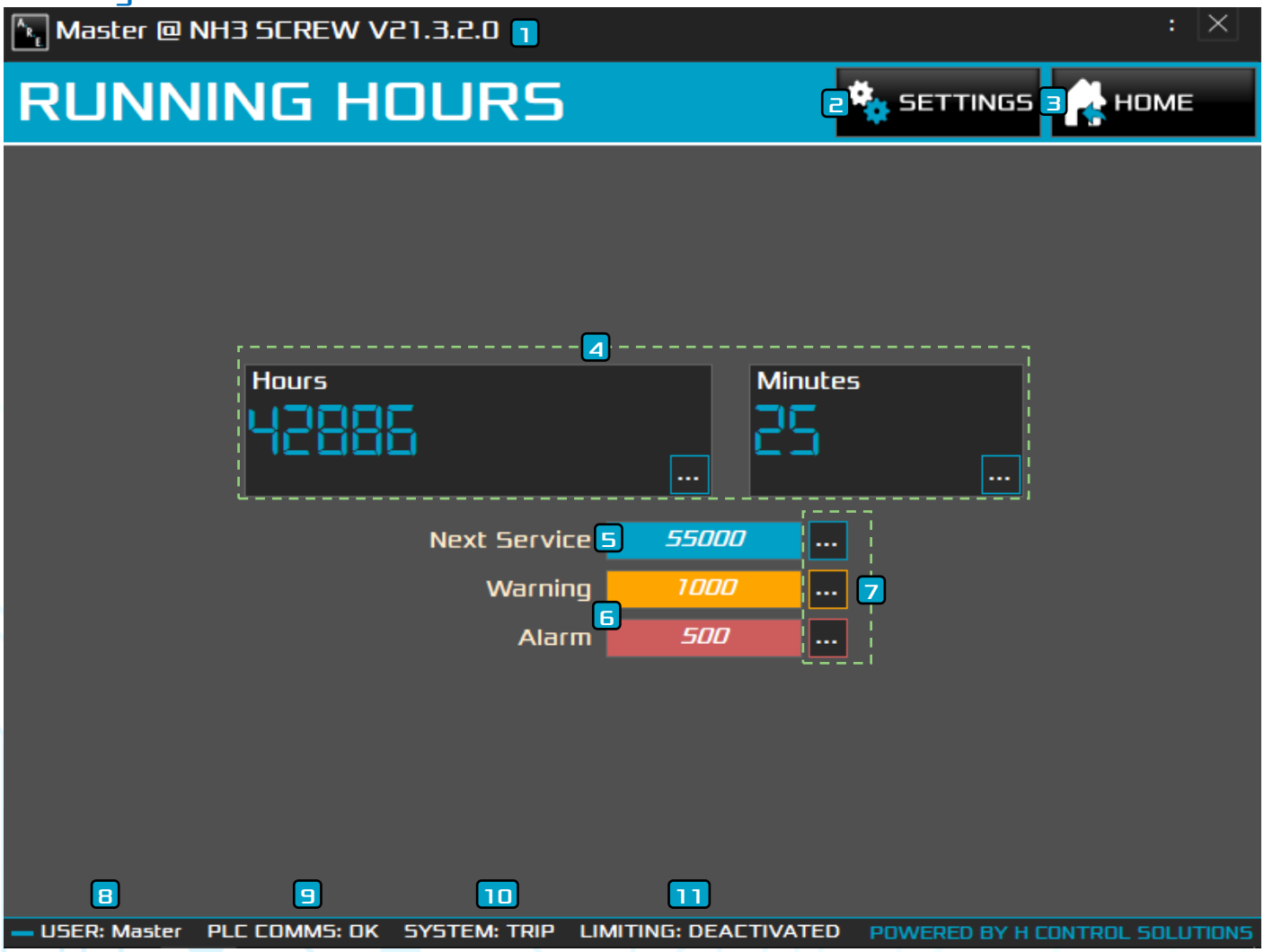
The derivative component causes the output to decrease if the process variable is increasing rapidly. The derivative response is proportional to the rate of change of the process variable. Increasing the derivative time parameter will cause the control system to react more strongly to changes in the error term and will increase the speed of the overall control system response. Most practical control systems use very small derivative time, because the Derivative Response is highly sensitive to noise in the process variable signal. If the sensor feedback signal is noisy or if the control loop rate is too slow, the derivative response can make the control system unstable.

Sensor Settings



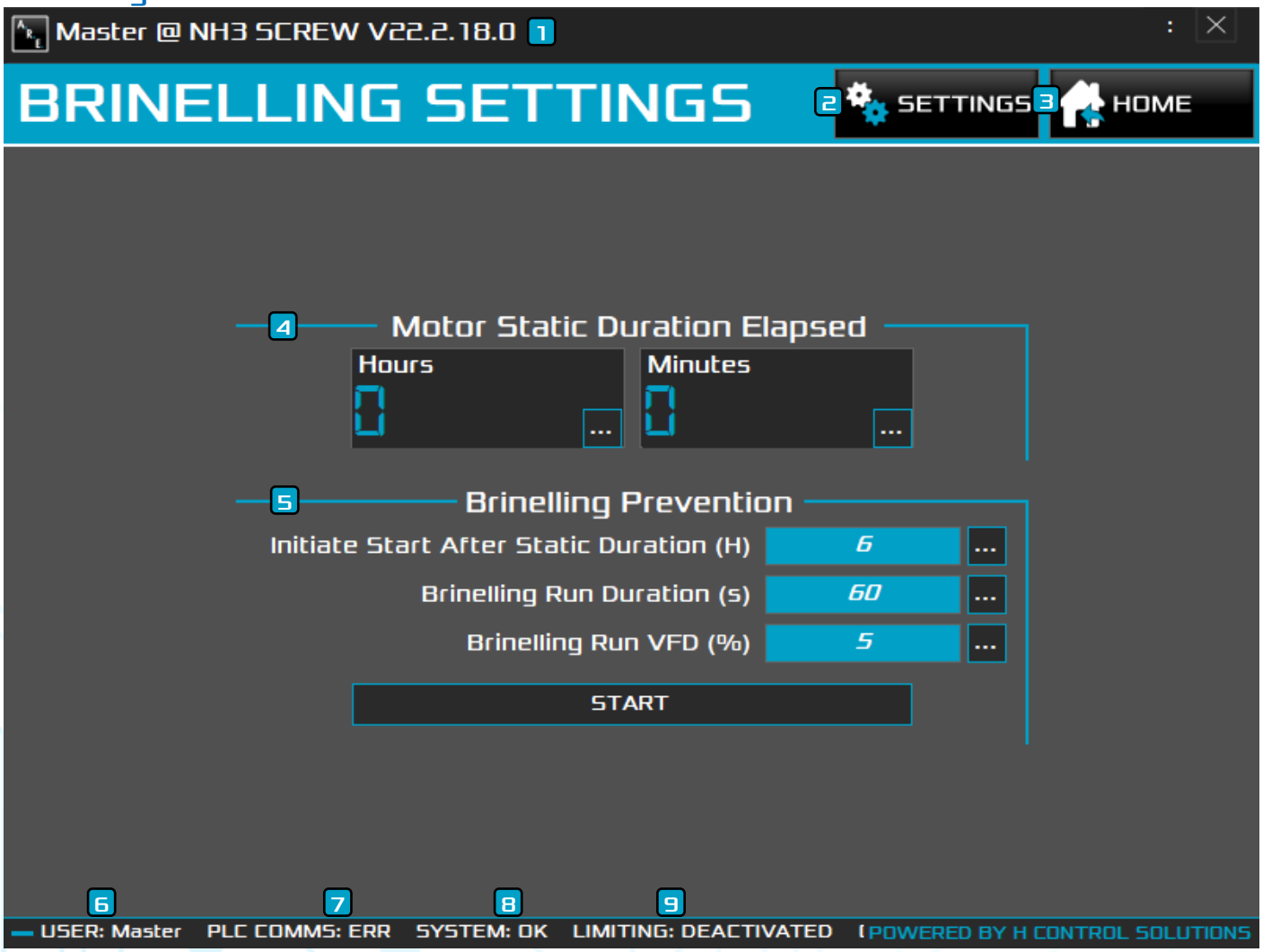
1. Software version.
2. Return to main settings page.
3. Return to main page.
4. Setup the range and scaling.
5. Setup the range and scaling of the engineering value.
6. Setup offsets for the respective sensor or probe.
   Used for calibration.
7. Indicates the respective RAW value.
8. Current user that is logged on.
9. Indicates communication link to the respective PLC.
10. Indicates general screw panel status.
11. Indicates if limiting is active on screw.

Running Hours



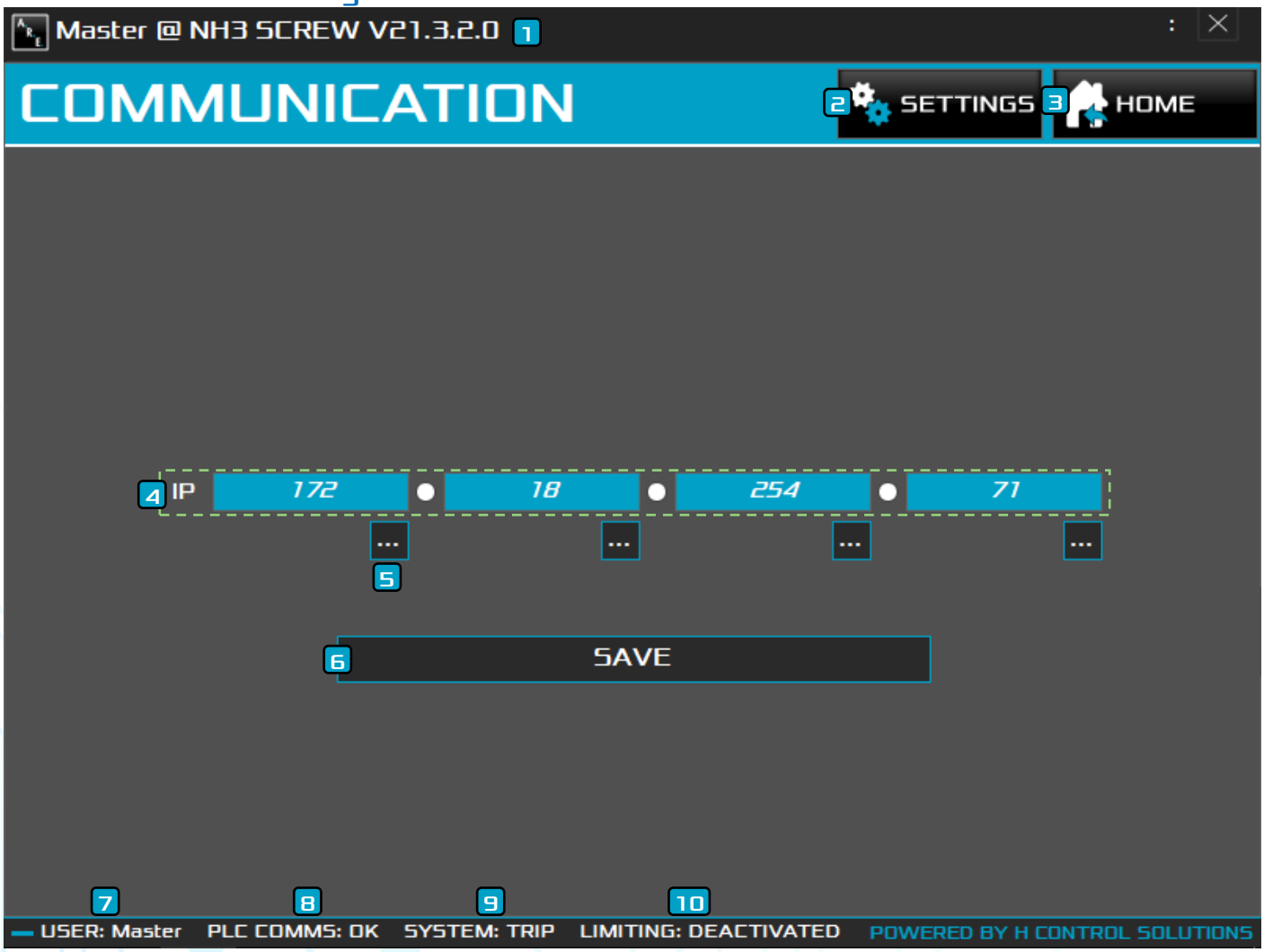
1. Software version.
2. Return to main settings page.
3. Return to main page.
4. Running time of compressor in hours and minutes.
5. Indicates running hours for when the next service is due.
6. Warning and alarm setpoint in hours before scheduled service.
7. Click on "..." to open an on-screen numeric pad to enter data.
8. Current user that is logged on.
9. Indicates communication link to the respective PLC.
10. Indicates general screw panel status.
11. Indicates if limiting is active on screw.

Brinelling Prevention



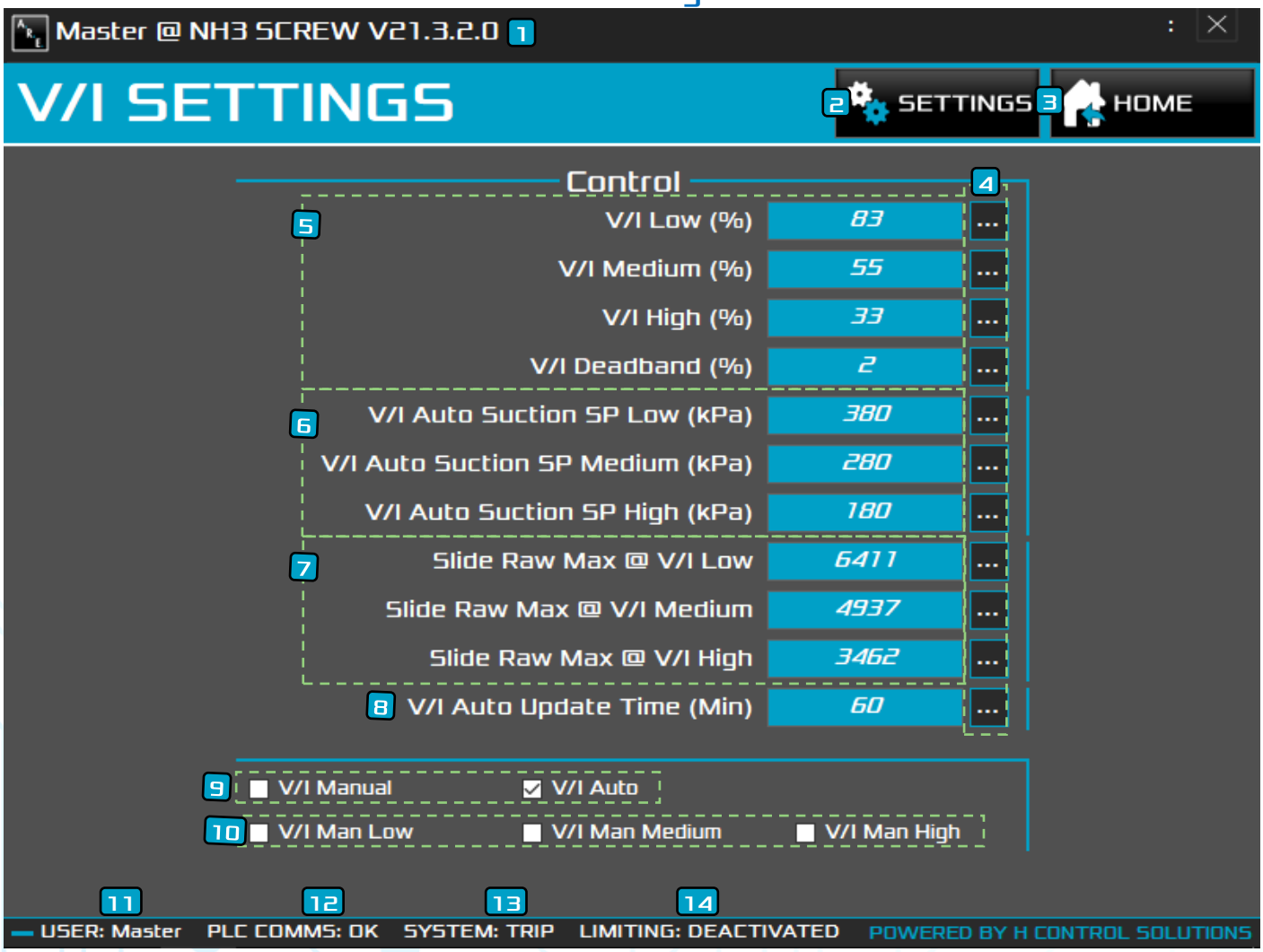
1. Software version.
2. Return to main settings page.
3. Return to main page.
4. Indicates motor static duration from last stop.
5. Brinelling prevention setup.
6. Current user that is logged on.
7. Indicates communication link to the respective PLC.
8. Indicates general screw panel status.
9. Indicates if limiting is active on screw

Communication Settings



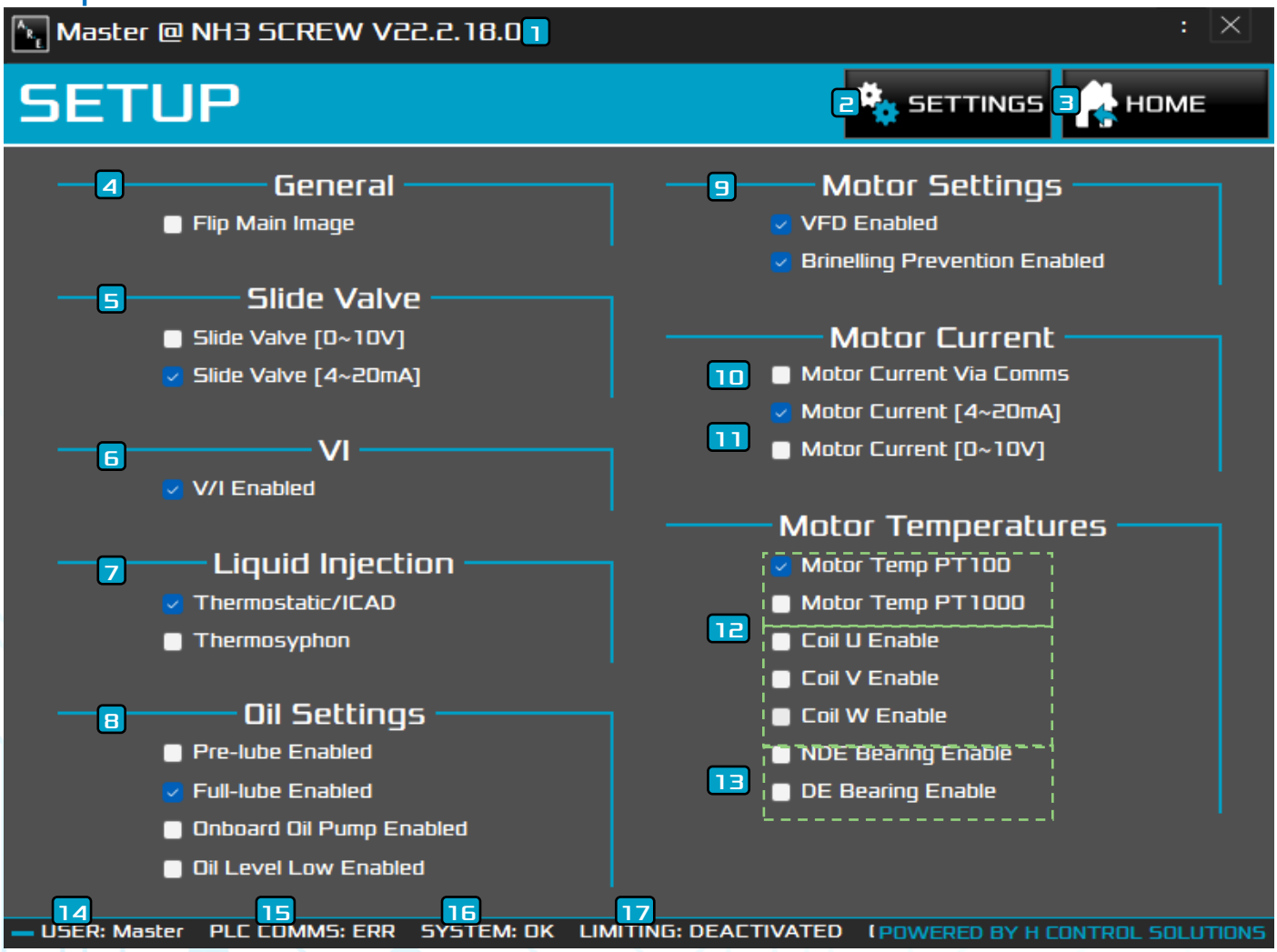
1. Software version.
2. Return to main settings page.
3. Return to main page.
4. Set IPv4 address of PLC.
5. Click on "..." to open an on-screen numeric pad to enter data.
6. Command button to save setting
7. Current user that is logged on.
8. Indicates communication link to the respective PLC.
9. Indicates general screw panel status.
10. Indicates if limiting is active on screw.

VI Settings



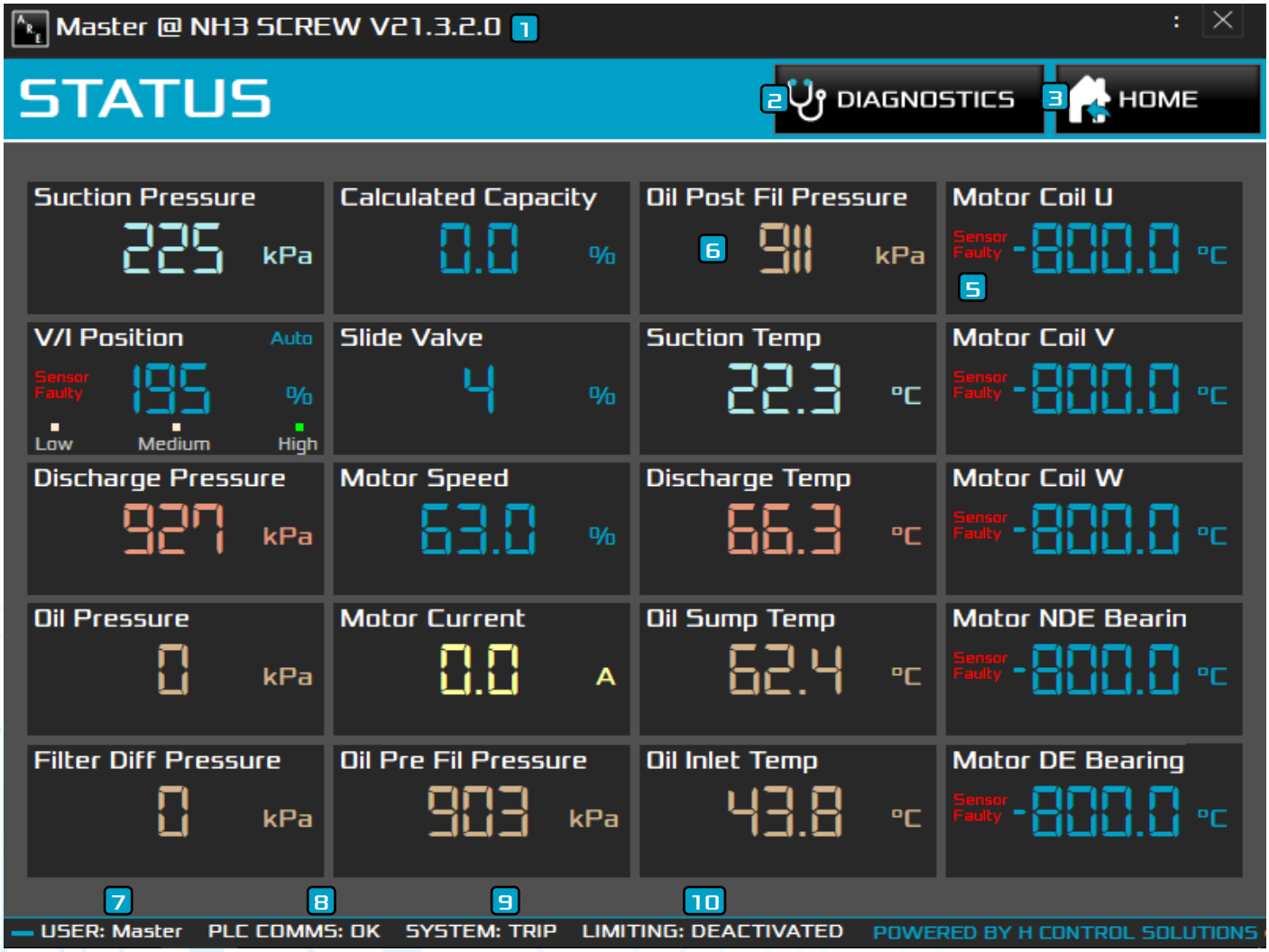
1. Software version
2. Return to Users Page.
3. Return to Main Page.
4. Click on "..." to open an on-screen numeric pad to enter data.
5. V/I Valve position for respective stages.
6. V/I Auto selection setpoints.
7. Slide RAW valve position for respective stage.
8. Auto slide position update interval time in minutes.
9. Auto / Manual Control selection.
10. Position selection in Manual control.
11. Current user that is logged on.
12. Indicates communication link to the respective PLC.
13. Indicates general screw panel status.
14. Indicates if limiting is active on screw.

Setup



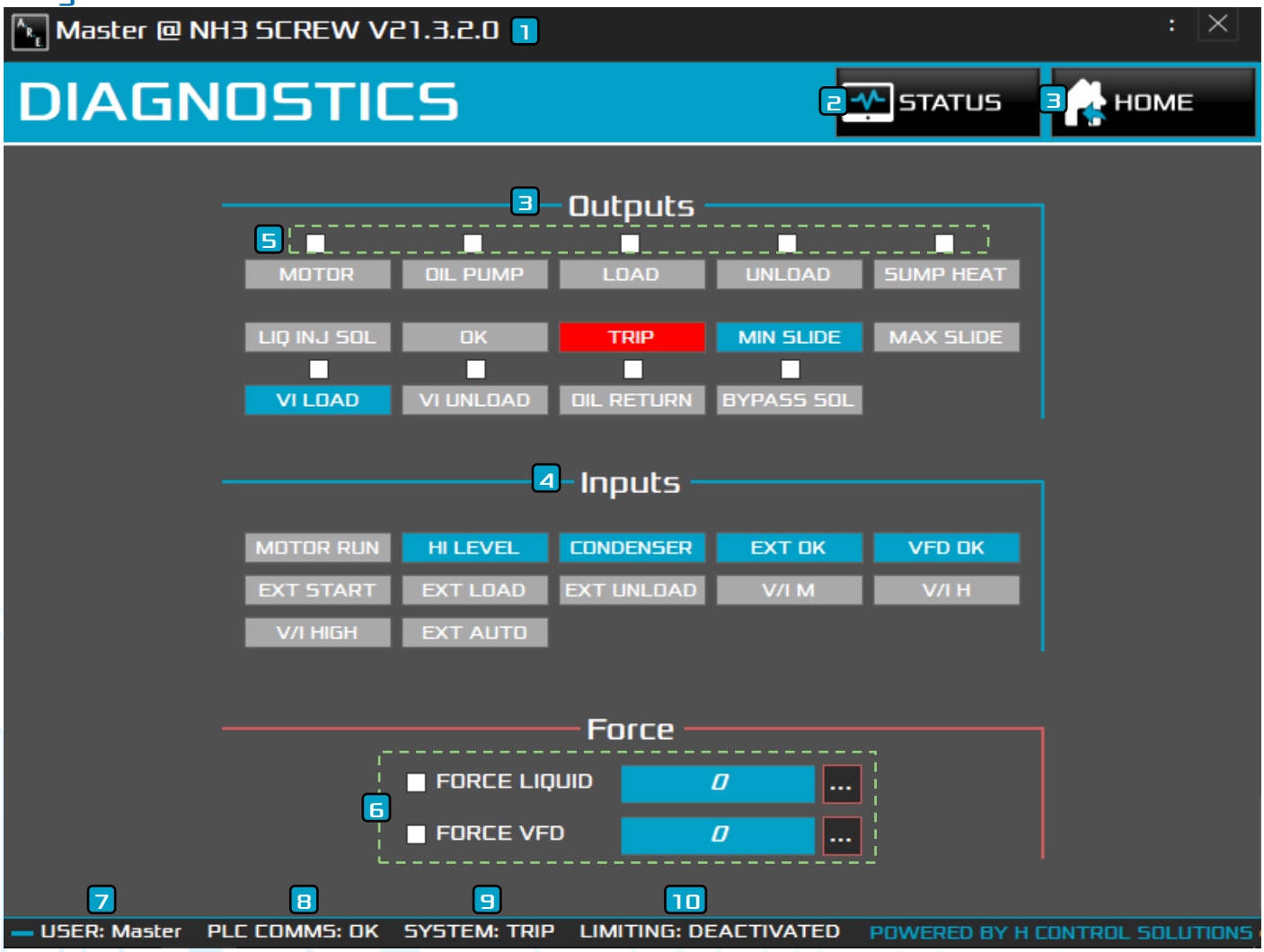
1. Software version.
2. Return to main settings page.
3. Return to main page.
4. Flip compressor image on main layout.
5. Select slide valve input RAW range of module.
6. Enable V/I control
7. Select between thermostatic and thermosyphon.
8. Oil pump type selection.
9. Enable VFD and Brinelling Prevention on motor.
10. Enable when controlled remotely from HCS Control System and current(A) value is imported via communication.
11. Select motor current input RAW range of module.
12. Enable alarms for selected coils.
13. Enable alarms for selected bearings.
14. Current user that is logged on.
15. Indicates communication link to the respective PLC.
16. Indicates general screw panel status.
17. Indicates if limiting is active on screw.

Overview



1. Software version.
2. Navigate to diagnostics page.
3. Return to main page.
4. Indicates various values and unit of measurement.
5. Indicates if respective sensor is faulty.
6. Current user that is logged on.
7. Indicates communication link to the respective PLC.
8. Indicates general screw panel status.
9. Indicates if limiting is active on screw.

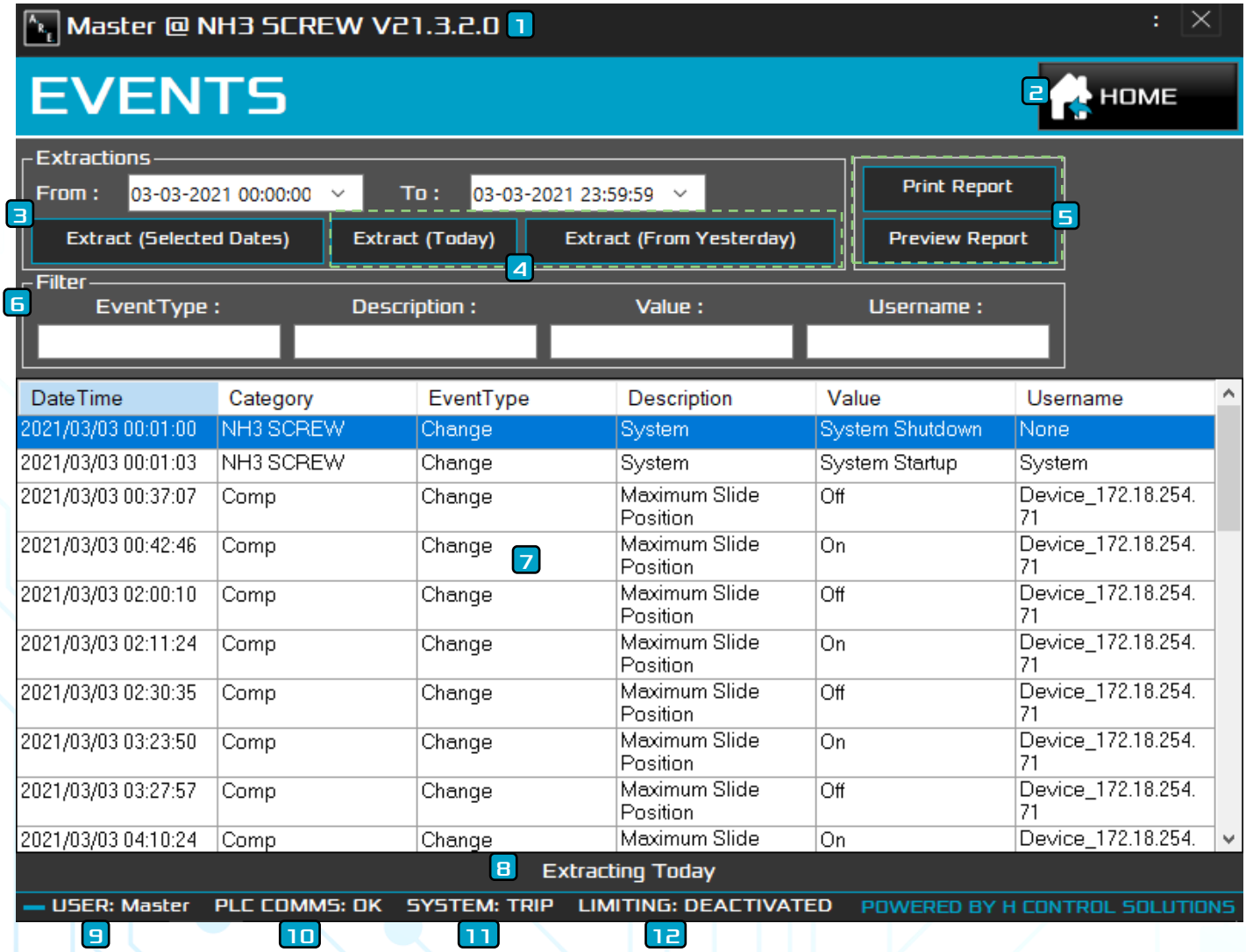
Diagnostics



1. Software version.
2. Navigate to diagnostics page.
3. Return to main page.
4. Indicates active outputs.
5. Indicates active inputs.
6. Force actions for outputs.
7. Force action and value for respective equipment.
8. Current user that is logged on.
9. Indicates communication link to the respective PLC.
10. Indicates general screw panel status.
11. Indicates if limiting is active on screw.

Force actions are to be used by authorized technicians only, during commissioning or fault finding!

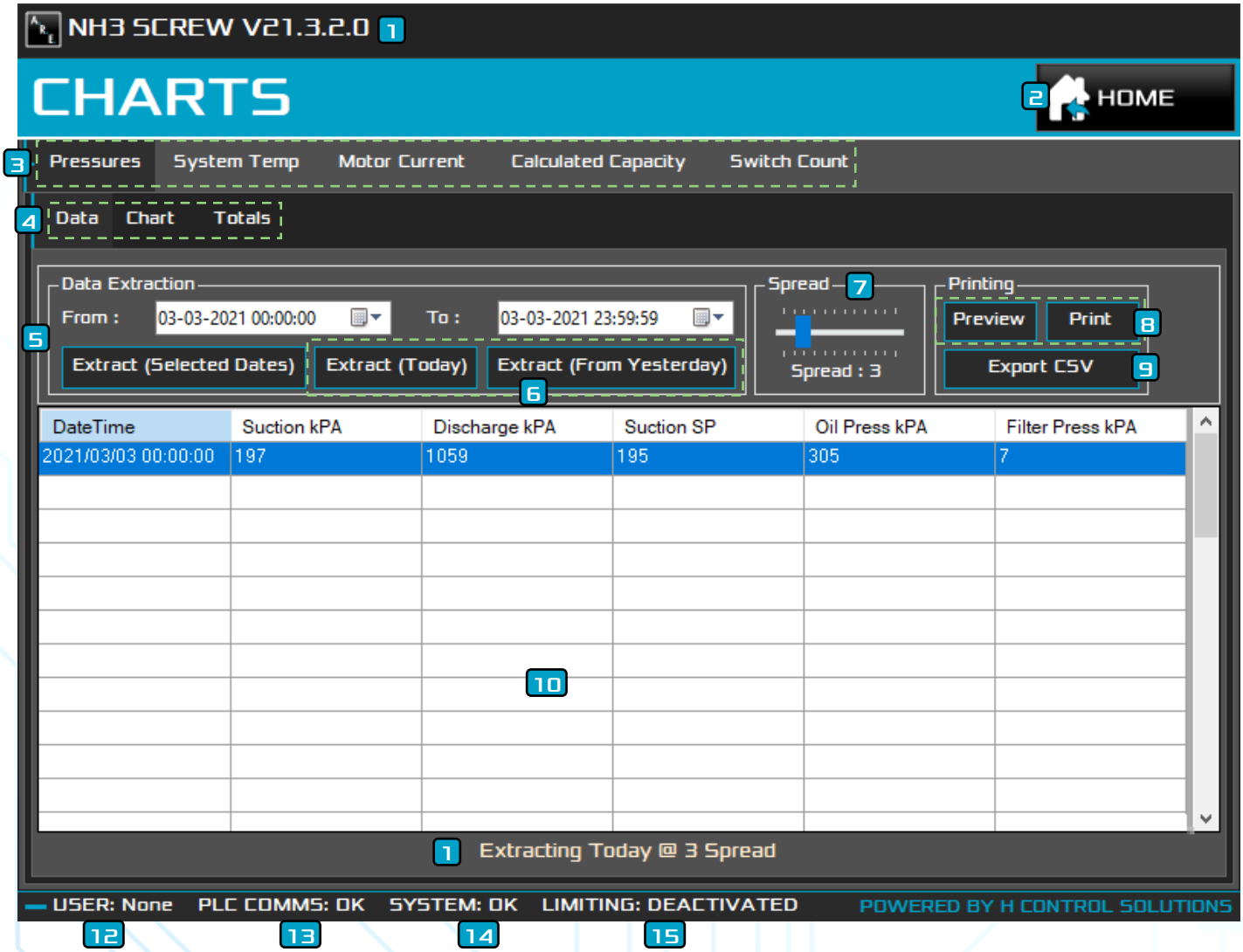
Events



1. Software version.
2. Return to main page.
3. Extracts the events between the selected dates.
4. Extracts the events only for Today or Yesterday.
5. Used to preview and print the extracted events shown in the table.
6. Filter events with column specific criteria.
7. Display the extracted events.
8. Provides information on the extraction process.
9. Current user that is logged on.
10. Indicates communication link to the respective PLC.
11. Indicates general screw panel status.
12. Indicates if limiting is active on screw.

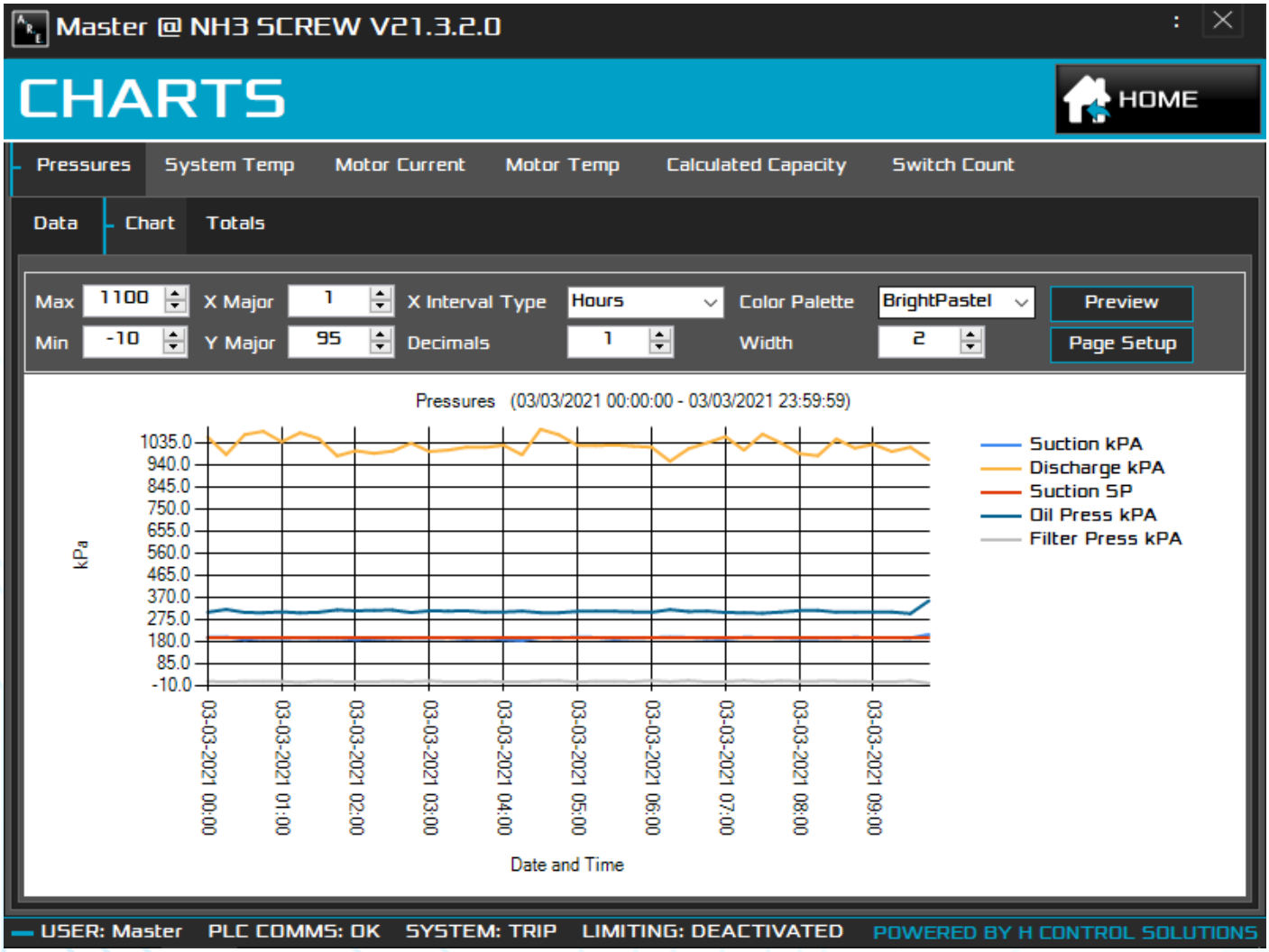
Charts

Data



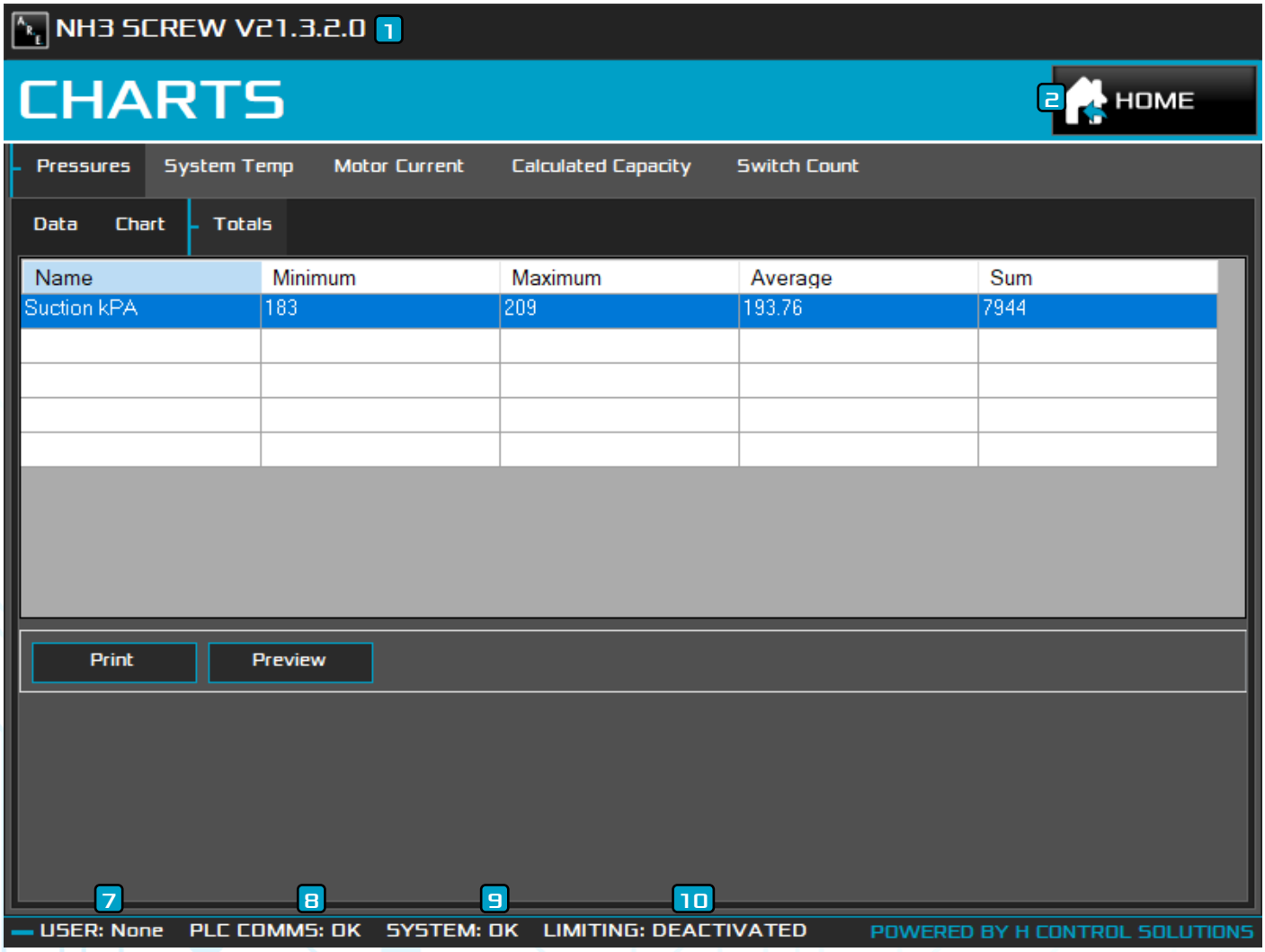
1. Software version.
2. Return to Main page.
3. Switch between different charts.
4. Switches between the data in table, chart and the totals formats.
5. Extracts the data between the selected dates.
6. Extracts the data only for Today or Yesterday.
7. The Spread determines the interval of the entries'. E.g. 1 is every entry, 2 is every second entry etc.
8. Used to preview and print the extracted data shown in the table.
9. Export the data displayed in the table to a *.CSV file which can be located on the Desktop.
10. Display the extracted data.
11. Provides information on the extraction process.
12. Current user that is logged on.
13. Indicates communication link to the respective PLC.
14. Indicates general screw panel status.
15. Indicates if limiting is active on screw.

Chart



Right click on the chart to select/de-select data.

Totals

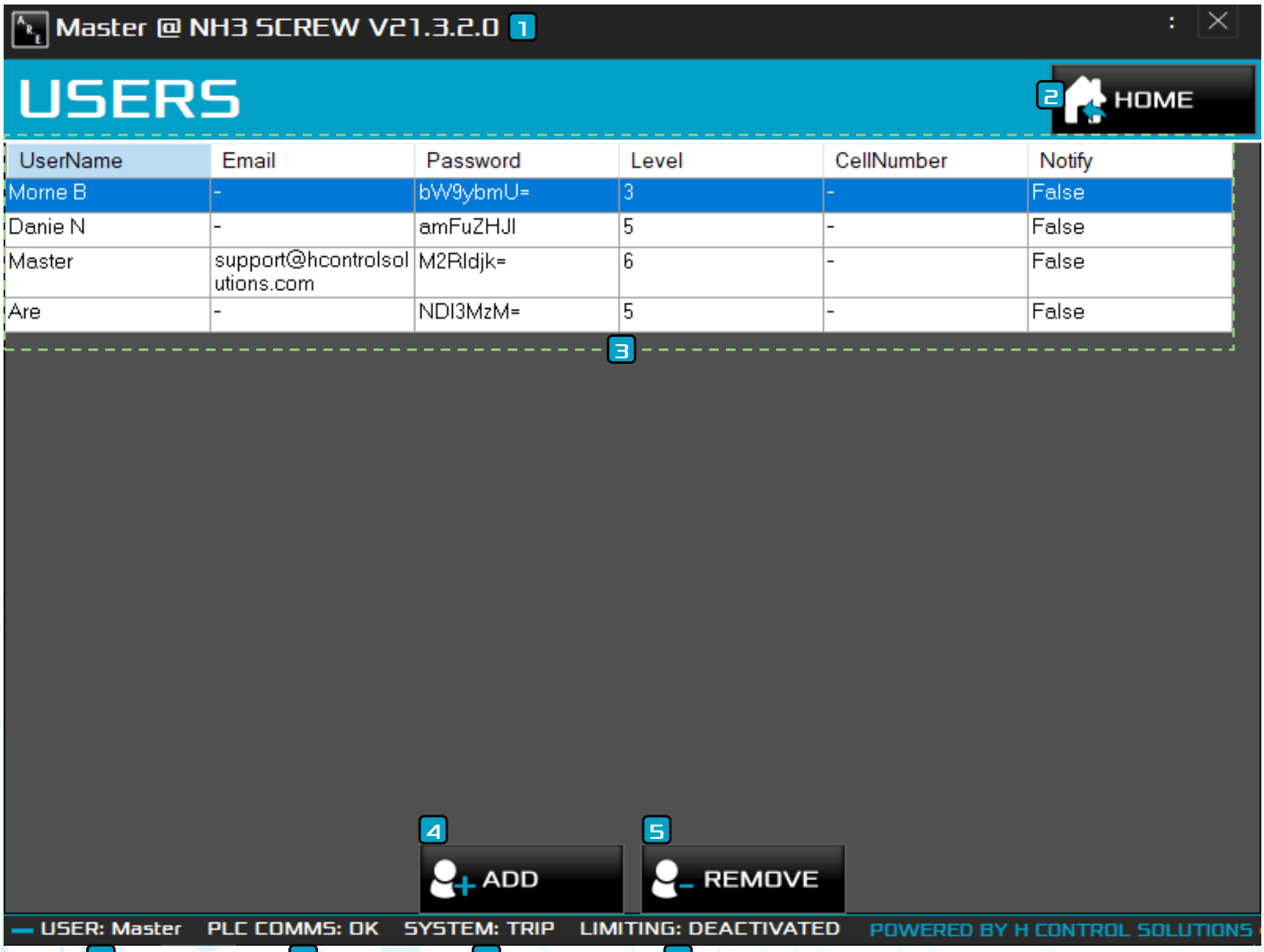

NH3 SCREW V21.3.2.0
1
CHARTS
2
HOME
Pressures
System Temp
Motor Current
Calculated Capacity
Switch Count
Data
Chart
Totals
Name
Minimum
Maximum
Average
Sum
Suction kPA
183
209
193.76
7944
Print
Preview
7
8
9
10
USER: None
PLC COMMS: OK
SYSTEM: OK
LIMITING: DEACTIVATED
POWERED BY H CONTROL SOLUTIONS

Login

Page to login to the system with on-screen keyboard.

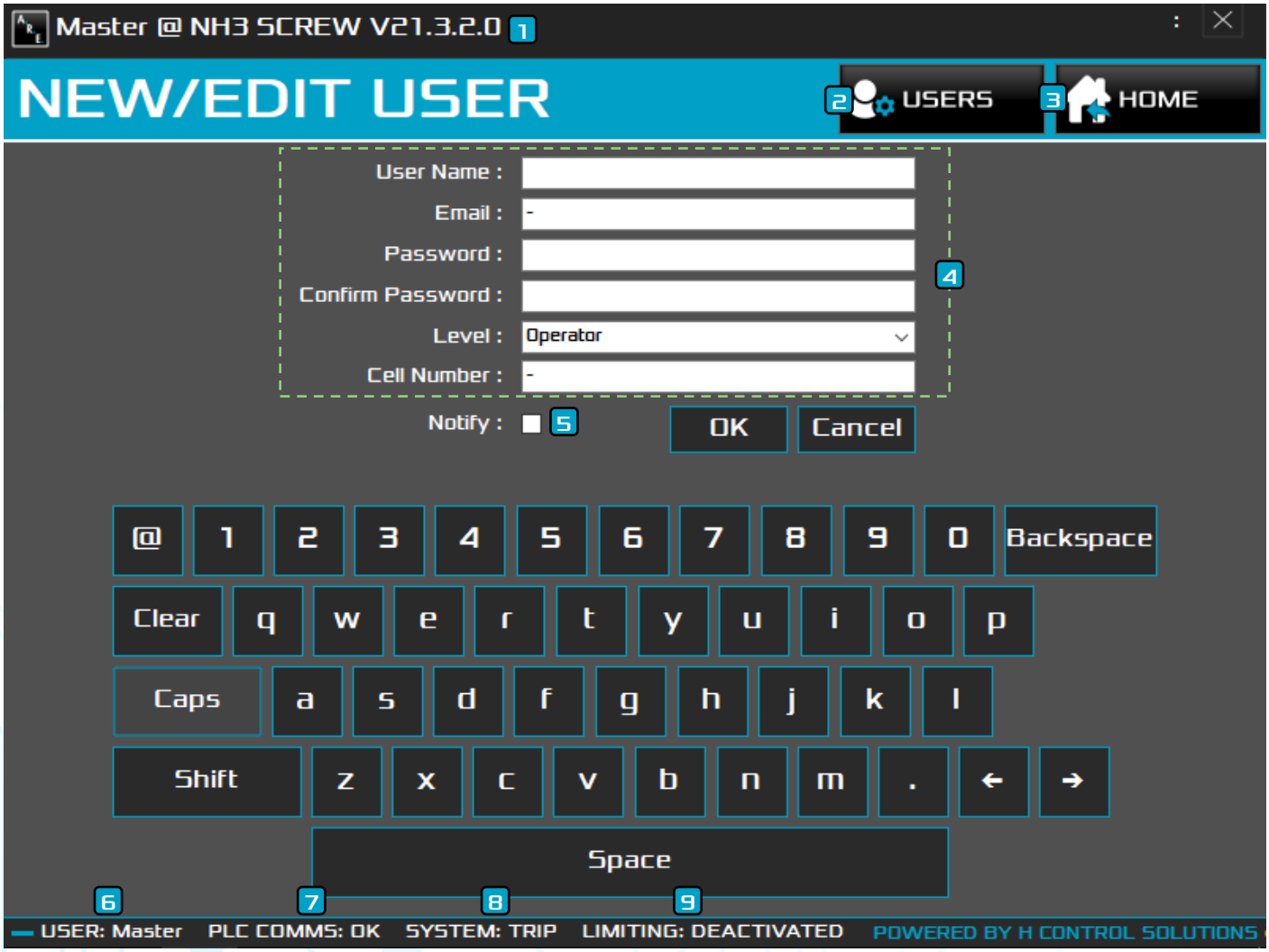
Page to login to the system with on-screen keyboard.

Users



1. Software version.
2. Return to Main Page.
3. List of user accounts.
4. Open a page to add a new user.
5. Remove selected user.
6. Current user that is logged on.
7. Indicates communication link to the respective PLC.
8. Indicates general screw panel status.
9. Indicates if limiting is active on screw.

New / Edit User



1. Software version
2. Return to Users Page.
3. Return to Main Page.
4. Enter information of new user or update respective user.
   Can only select up to same level as currently logged on user.
5. When enabled, user will receive notifications if there is a fault on the system.
6. Current user that is logged on.
7. Indicates communication link to the respective PLC.
8. Indicates general screw panel status.
9. Indicates if limiting is active on screw.

About Us

H Control Solutions is a dynamic business which strives to meet and exceed our customers' expectations. We use our innovative automation expertise and experience to your advantage to increase efficiency, productivity and reliability.

Our experience spans over 25 years, giving us a competitive advantage and an in-depth understanding of your needs.

Manage your plant via the cloud with real-time information about the efficiency, productivity and general knowledge while capturing and recording real-time events, alarms, process values, energy consumption and breakdowns

We also analyse captured data with advanced data breakdown and charting, innovative integration of smart sensors, PLC, HMI, 3rd Party systems under a single unified SCADA architecture to maximise customer comfort while reducing plant life-cycle costs.

Disclaimer

- All the control lies within modular PLC's
- By utilising services and products rendered by HCS or accessing the HCS website you agree to be bound by all the terms and conditions. Full Terms and Conditions can be found on the website www.hcontrolsolutions.com.
- All product faults and liability arising therefrom shall be carried by the Supplier, not HCS.
- We respect your right to privacy. Personal information collected will only be used for intended purposes (like notifications from control system) and not be shared with a 3rd party without consent. Data is stored on the local machine unless an agreement is set in place to do so otherwise.
- The purpose of the software is to enable easy configuration of settings, fault finding and general overview of plant status.
- Software features are monitoring, logging and sending of notifications. Notifications are sent via e-mail and Telegram.