

LMC 301 lubrication system software manual

Models 086500 and 086501

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* Indicates change.

Safety

Carefully read and observe operating instructions before installing and operating controller.

Explanation of signal words for safety

NOTE

Emphasizes useful hints and recommendations as well as information to prevent property damage and ensure efficient trouble-free operation.

⚠ CAUTION

Indicates a dangerous situation that can lead to light personal injury if precautionary measures are ignored.

⚠ WARNING

Indicates a dangerous situation that could lead to death or serious injury if precautionary measures are ignored.

⚠ DANGER

Indicates a dangerous situation that will lead to death or serious injury if precautionary measures are ignored.

⚠ WARNING

Do not attempt to install or use controller until all safety and operational instructions within service manual are fully understood. Controller must only be used and maintained by persons familiar with operating instructions.

Failure to follow warnings and instructions may result in serious injury.

NOTE

Local safety regulations regarding installation, use, and maintenance must be followed.

PC requirements

- 1 800 x 600 display (1024 x 768 recommended)
- 2 Keyboard and mouse (or other pointing device)
- 3 USB 2.0 port and standard cable with full size B type connector
- 4 Microsoft .Net Framework 4.0 client installed
- 5 50MB of available hard drive space (with .Net Framework 4.0 client installed)

NOTE

If PC does not have Microsoft .Net Framework 4.0 client installed, confirm PC meets requirements before downloading .Net 4.0 client to PC:

- Processor: 1 GHz
- Memory: 512 MB
- Hard drive: 1.5 GB
- Operating systems:
 - Windows 7
 - Windows 8
 - Windows 10

If PC meets requirements, visit <http://www.microsoft.com/en-us/download/details.aspx?id=17851> and install .Net software before proceeding.

NOTE

Software needs 32-bit version of .Net framework to function.
32-bit version of .Net will operate on 64-bit PC operating systems.

Software installation

- 1 Visit <http://www.skf.com/LMC301> and click on link labelled **LMC 301 PC Software**.
- 2 Download PC software installation files from website.
- 3 Follow on-screen installation instructions.

NOTE

Software can only be used on PC that meets requirements.
Software is not intended to run directly from server operating system.

Controller preparation

NOTE

LMC 301 software must be installed on PC with available USB port prior to proceeding in this section.

- 1 Disconnect power supply to LMC 301.
- 2 Open or remove LMC 301 cover to expose main control board.
- 3 Connect USB cable to PC.
- 4 Connect USB-B port to main control board attached to underside of controller lid (→ **Fig. 1**). Green light on opposite side of main control board will shine and LCD screen on outer cover will illuminate.
- 5 On PC desktop, double-click **LMC 301** software icon.
- 6 Follow instructions in **Controller configuration** section on **page 6** to configure and customize controller settings.

NOTE

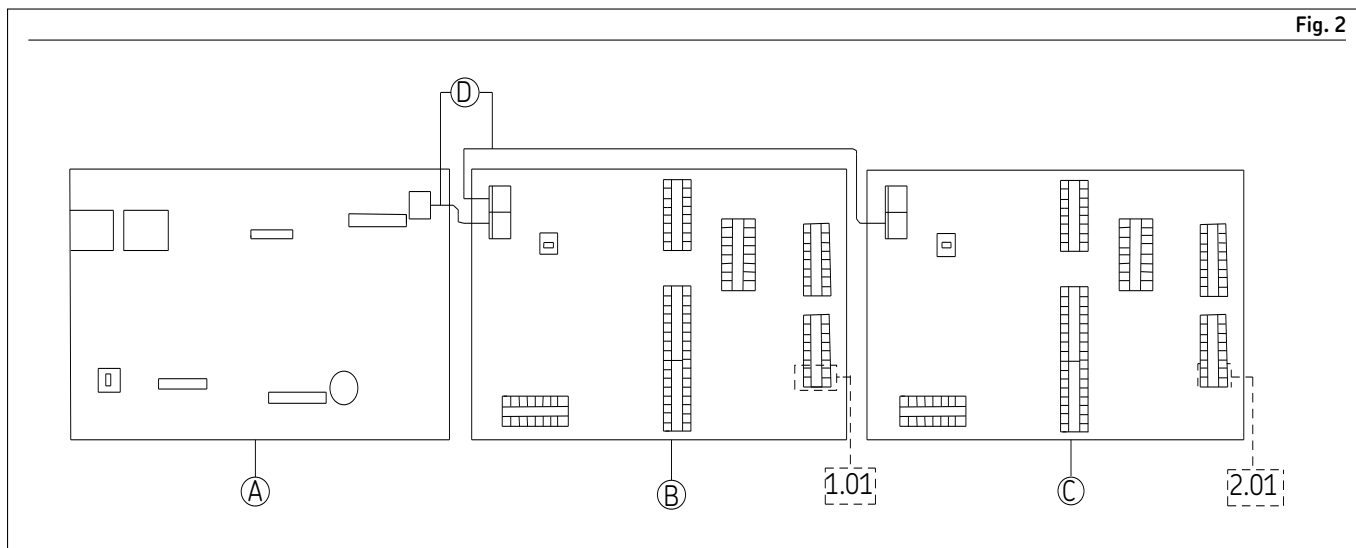
When configuration is complete, always save settings to PC prior to removing USB cable from controller or closing software.

Always close controller cover before returning to normal service.

Fig. 1

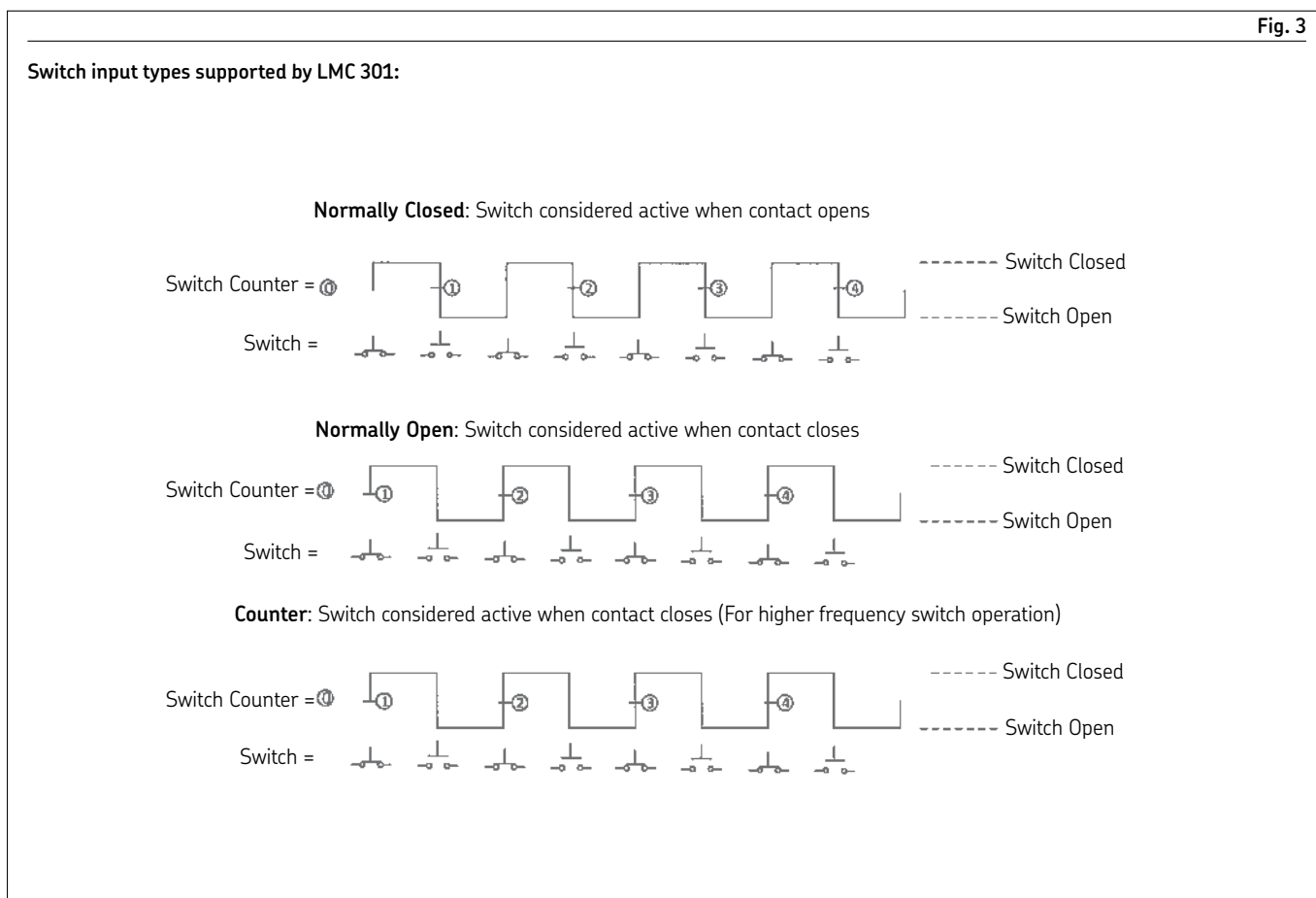


Terminology and system configuration



- A Controller PCB
- B I/O Board 1
- C Board 2
- D RS485 Communication cable

One controller can operate up to eight I/O boards. Software denotes different I/O board inputs and outputs by first addressing board number and then requested input or output number as shown in example.



Analog sensor input types supported by LMC 301

0 - 10 Volt
2 - 10 Volt
1 - 6 Volt
0 - 20 mA
4 - 20 mA

When considering any analog sensor types LMC 301 requests minimum and maximum value for sensor. Request for minimum and maximum value refers to highest and lowest value sensor is designed to measure. Following is an example of proper configuration for 4-20 mA analog pressure transducer designed to measure from 0 to 6 000 PSI.

Fig. 4

Pressure Sensor at Pump

Type: 4 - 20mA

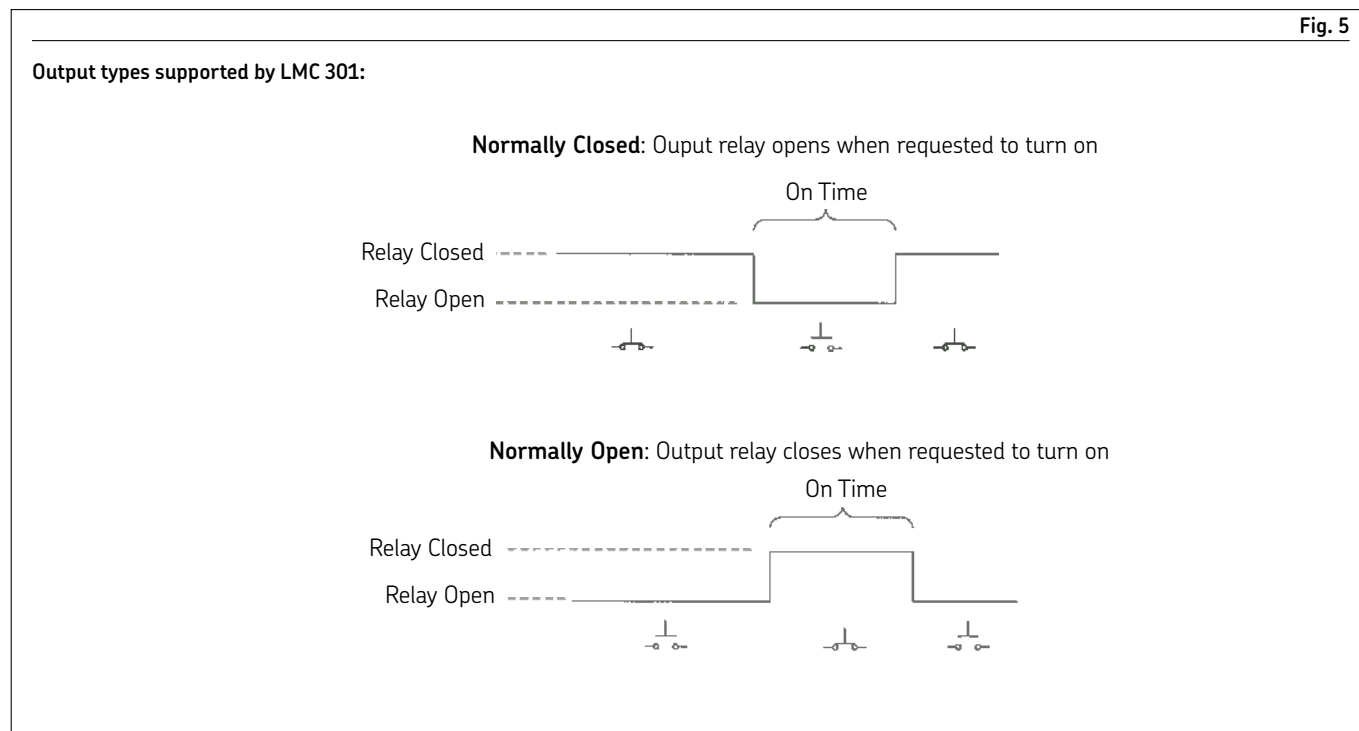
Input: 1.02

Min. value: 0 psi

Max. value: 6000 psi

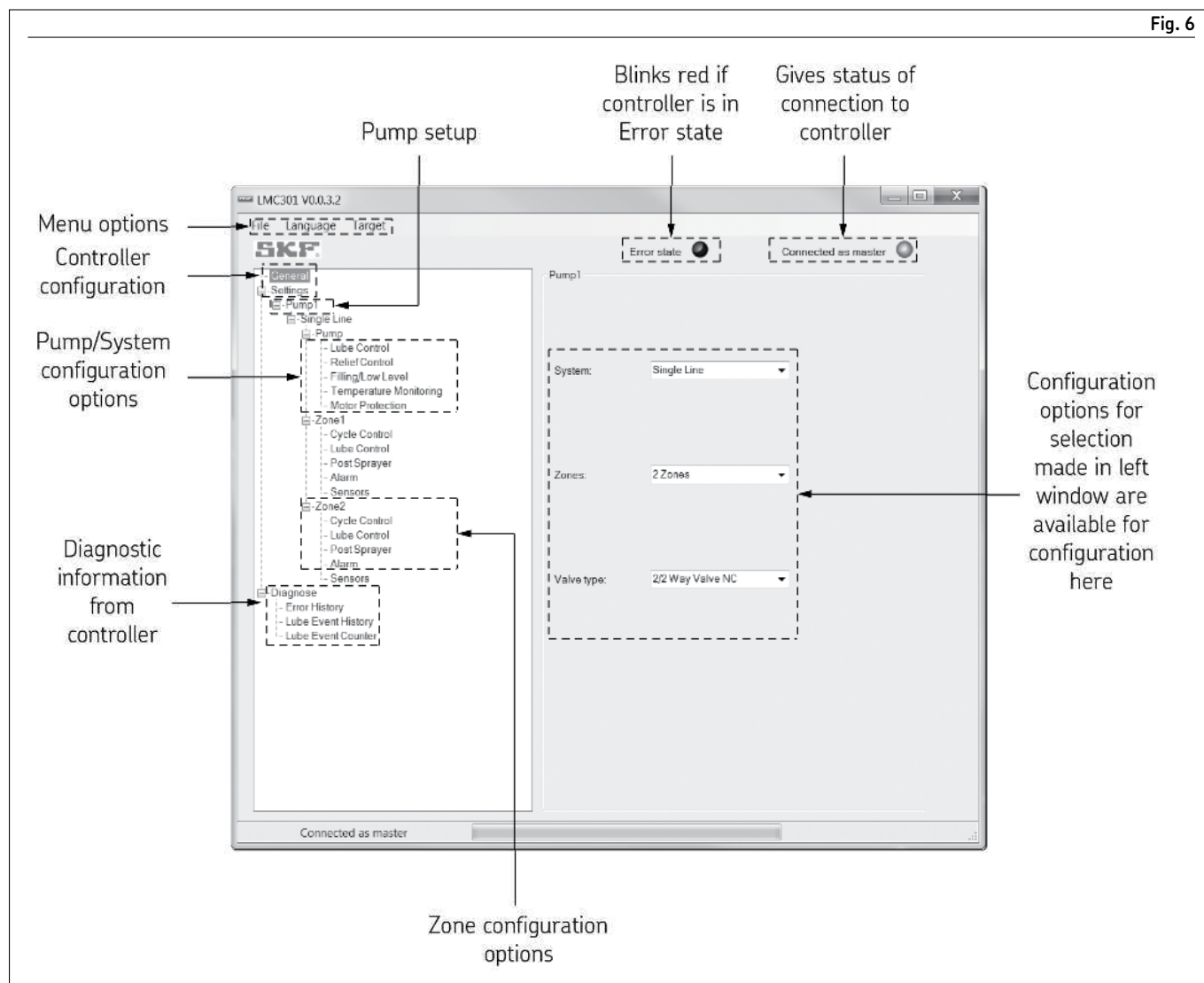
Operation Pressure: 3500 psi

Vent Pressure: 900 psi



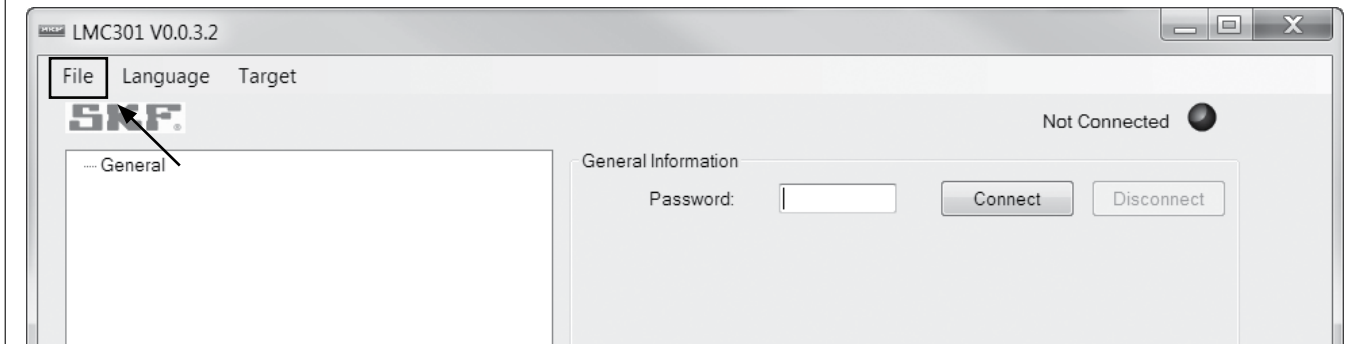
Configuration interface overview

Fig. 6



Controller configuration

Fig. 7

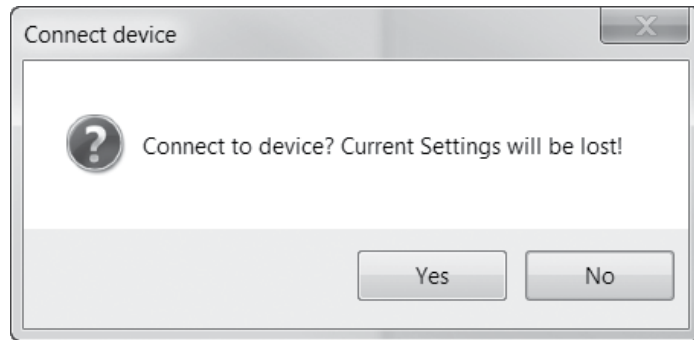


NOTE

LMC 301 can only be configured via USB cable on PC that meets requirements listed in **PC requirements** section on page 4.

- 1 From main screen, enter password in **Password:** field. Supervisor password default: **2020**.
- 2 Click **Connect** button.
- 3 In **Connect device** popup window, click **Yes**.

Fig. 8



Menu bar

This section provides summary descriptions of options available in menu bar (Fig. 2).

On menu bar, across top of window, three options are displayed - **File, Language and Target**.

File displays following options:

Open displays window that allows user to select existing LMC 301 configuration files stored on PC.

Save creates and/or saves settings for LMC 301 controller settings currently connected to PC.

Save As allows user to save controller settings under new filename or rename file.

Exit disconnects interface between application and controller, and closes software window.

NOTE

There are two types of users: supervisors and users. **Users** are limited to changing system timing. **Supervisors** can change all settings.

Language displays language options.

Target displays following options:

Offline mode closes connection to attached controller (if attached) and permits user to apply settings that can only be saved to file on PC.

Any settings established in offline mode will not be applied to attached controller.

Connect device creates connection between PC and attached controller.

Disconnect Device closes connection to attached controller.

Read device configuration allows software to import settings from controller into software.

NOTE

When performing updates to controller, clicking **Yes** will erase all current settings in PC software.

Highly recommended to save configuration files to PC each time new or modified controller is put into service.

NOTE

Selecting **Exit** option before saving discards any changes. Save any changes before selecting option.

Write device configuration allows user to overwrite controller settings with current PC settings.

Read device Error History displays all errors recorded by controller.

Read device diagnose reads diagnostic data.

Clear device lube event history clears diagnostic history for lube events.

Clear device Error History clears all errors recorded by controller.

Firmware Update allows update of code running on controller (only available if controller is disconnected).

Left side menu

General

Clicking on **General** will display outputs on right side of window that allow for reading basic information for controller.

Serial allows user to read serial number assigned to controller.

HW Version lists controller's hardware version.

FW Version lists controller's firmware version.

Operating Hours lists number of hours controller has been in operation.

Control Mode displays controller operating modes.

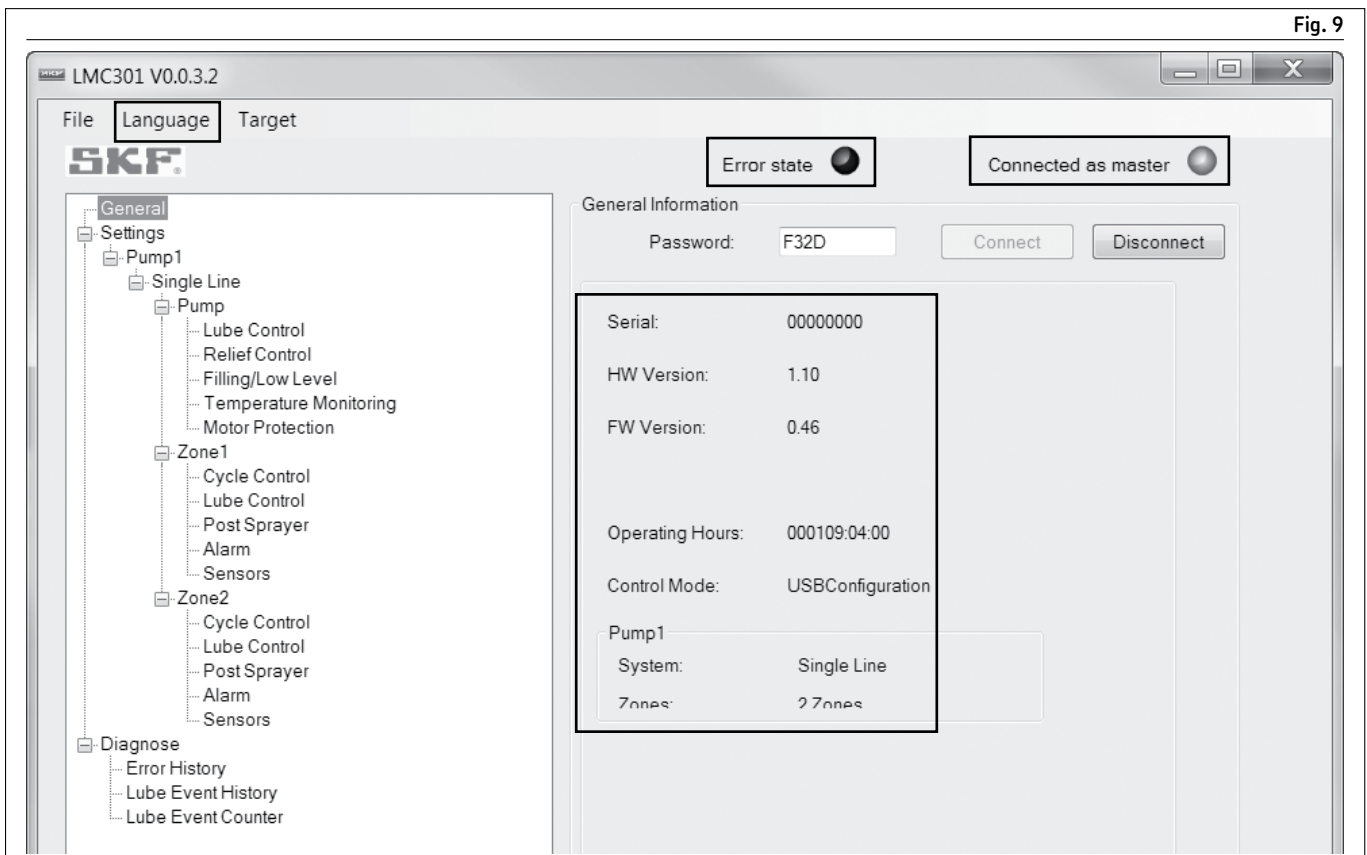
Pump (#) identifies pump, along with system type, and number of operating zones.

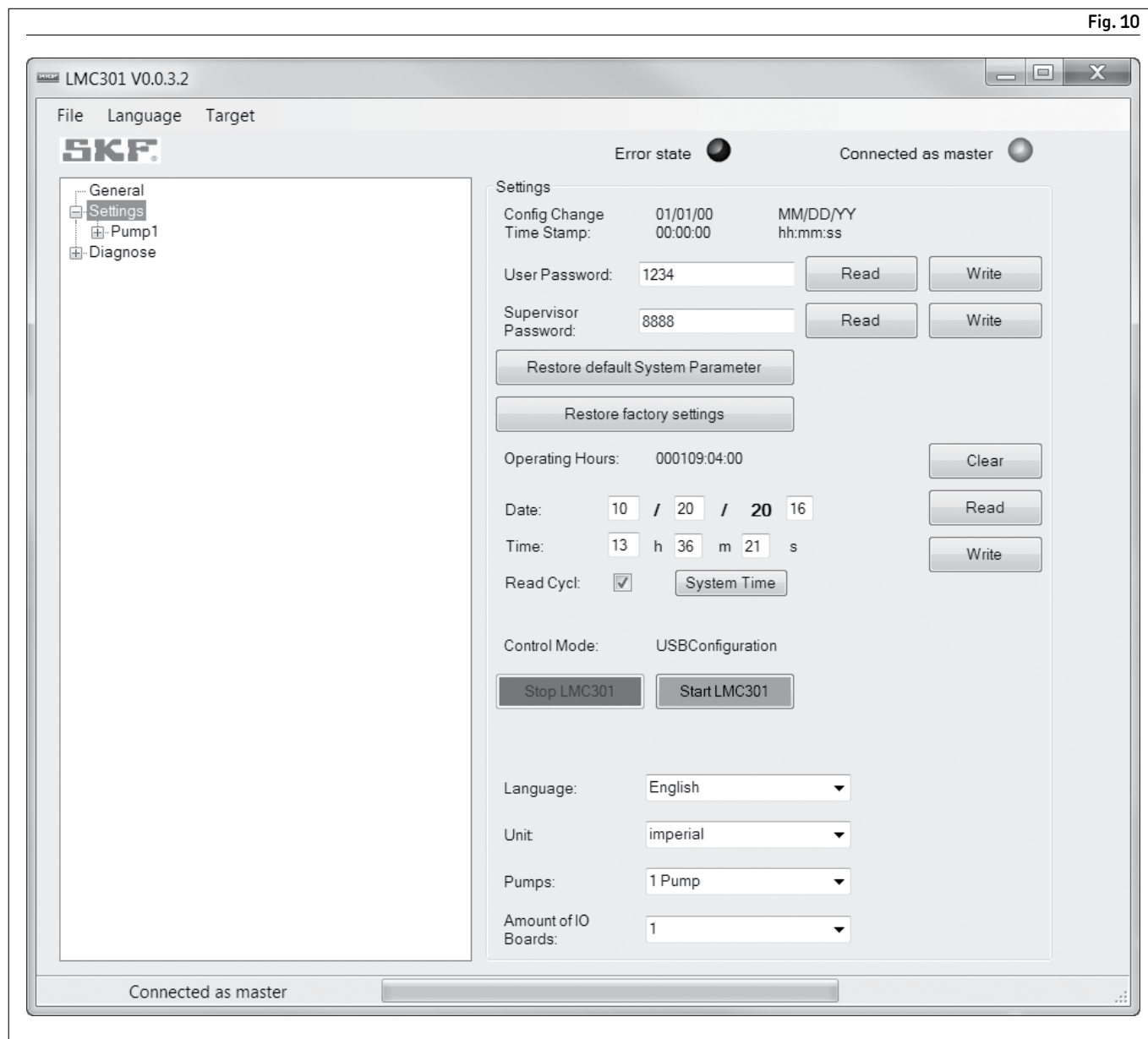
Status lights

Error state occurs when software cannot detect any pumps attached to controller, causing light to blink red. If no error is detected, light will remain gray.

Connected/Not Connected occurs when software is interacting with controller, causing **Connected** to display with steady green light. If software is not interacting with controller, **Not Connected** will display with steady red light.

Fig. 9





Settings

Clicking on **Settings** will display inputs on right side of window that allow for reading and editing basic settings for controller.

User Password defines password for non-supervisors that periodically require access to system.

Supervisor Password defines password for supervisory permission to configure system.

Operating Hours lists number of hours that controller has been in operation.

Restore default System Parameter

Single Line

1 Zone

3/2 Way Valve

Restore factory settings
default System Parameter
User Password: 1000
Supervisor Password: 2020

NOTE

Supervisor can change all configuration options. **User** can change only timing fields that require tuning for precise system operation.

NOTE

If **User Password** is changed and forgotten, password can be restored with **Supervisor Password**.

If **Supervisor Password** is changed and forgotten, call SKF service with serial number for assistance.

Date displays month/date/year format. Text fields can be edited or automatically populated by clicking **System Time** button.

Time displays hour/minute/second format. Text fields can be edited or automatically populated by clicking **System Time** button.

NOTE

Manual input of internal clock is not recommended.

Read Cycl automatically updates time parameter in software.

Clear removes operating hours.

Read/write manually updates time parameter in control/software.

Control Mode displays systems current mode.

Stop LMC 301 stops operation of control during troubleshooting.

Start LMC 301 starts operation of control during troubleshooting.

Language assigns language for software interface as English or German.

Unit defines unit of measure software will use - Imperial or Metric.

Pumps defines number of pumps controlled (up to three).

NOTE

Hovering mouse over fields and menu options will display Tool Tips that clarify functions.

NOTE

Options on left side will change, based on settings chosen for controller.

Pump

Pump type defines **System** and control settings.

System drop menu displays only current option of system supported, **Single Line**.

Zones allows for pump activity to vary at different points during use and each zone can be independently controlled. Software supports up to three zones per pump.

Valve type displays types of valves used for zone control:

3/2 Way Valve

2/2 Way Valve NC

2/2 Way Valve NO

Fig. 11

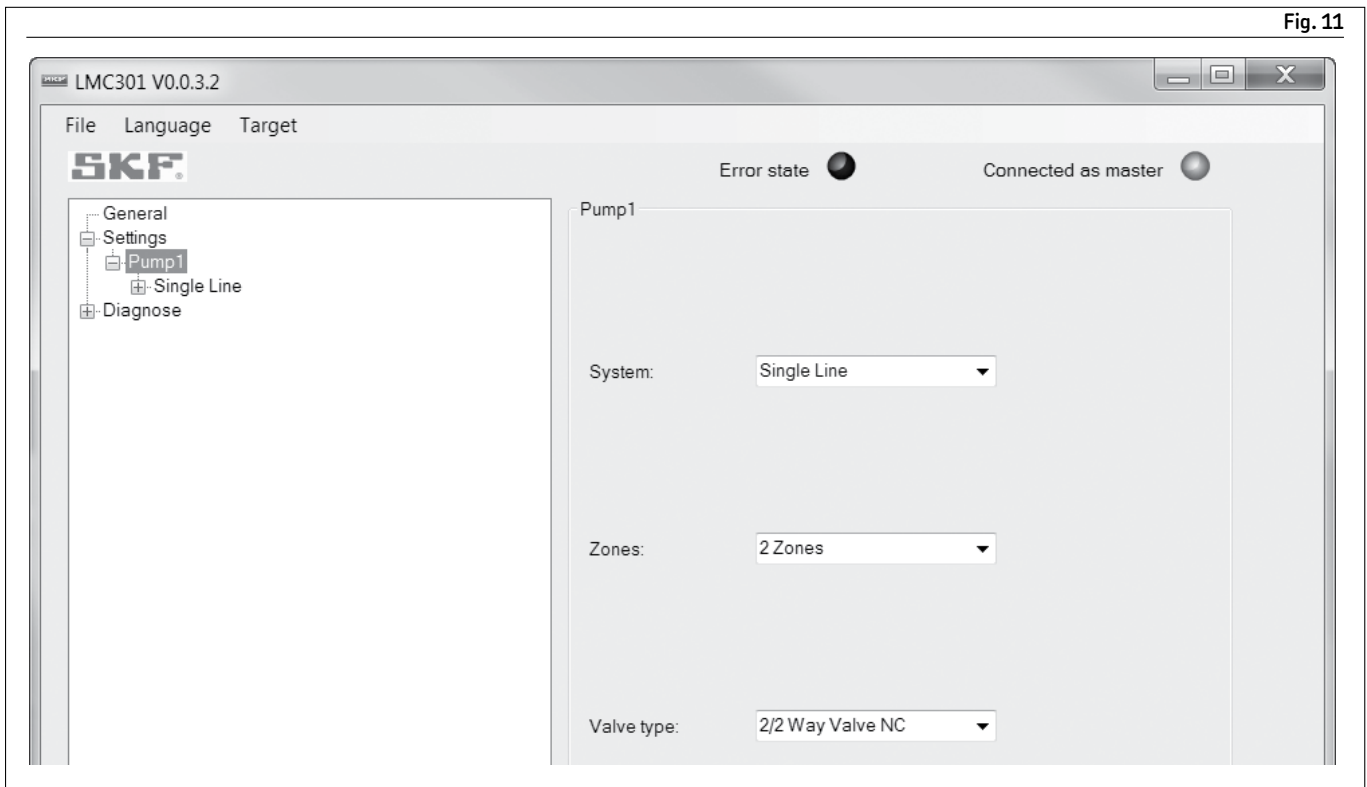
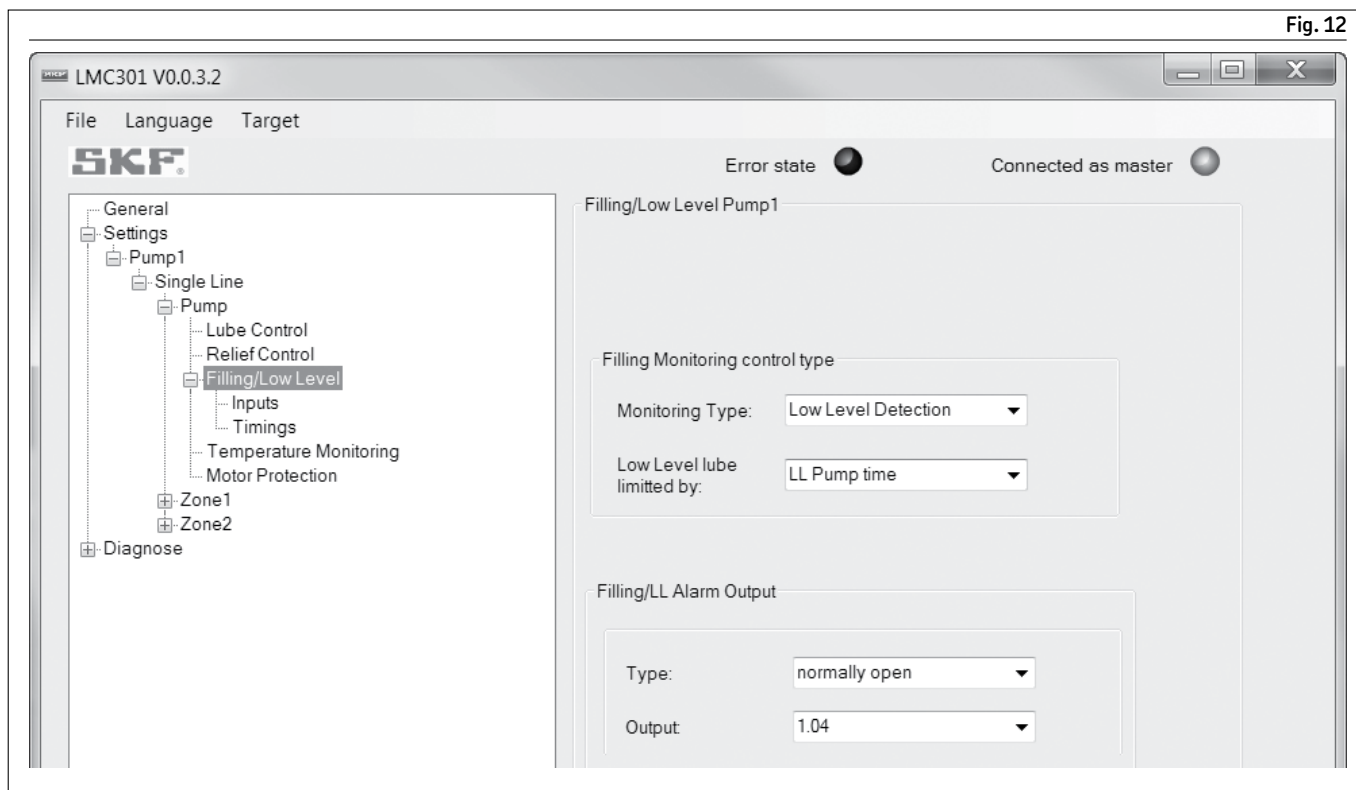


Fig. 12

**NOTE**

Enabling option in **Monitoring Type** drop menu in **Fig. 9 (Low Level Detection or Auto Filling)** changes options available under **Inputs** and **Timings** menu items.

LL Lube Cycles limits lubrication by predetermined cycles after fault is detected.

LL Pump Time limits lubrication by time settings after fault is detected.

Filling/LL Alarm Output Setting Type configures alarm relay for filling/LL.

Pump → Filling/Low Level → Low Level Detection

Filling Monitoring Control Type

Monitoring Type displays following options:

Disabled does not use level monitoring.

Low Level Detection monitors level by input sensor and notifies user.

Auto Filling monitors level by input sensor and refills tank automatically.

Low Level lube limited by displays following options:

Disabled causes system to stop pump operation immediately after fault is detected.

NOTE

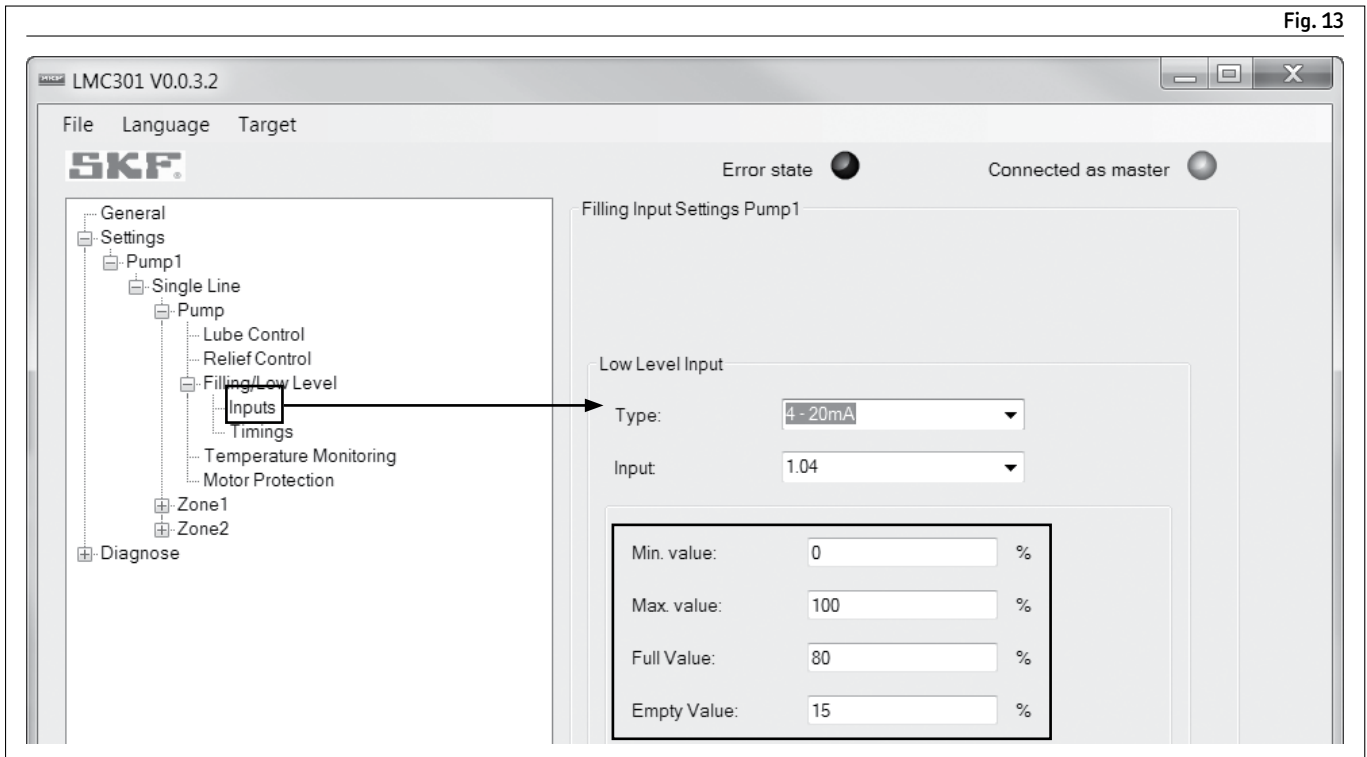
Values in **Filling/LL Alarm Output** drop menu correspond to available numbered output ports on I/O board of controller.

This prevents assigning one I/O port multiple times.

NOTE

Screen items displayed reflect options previously selected.

Fig. 13



Pump → Filling/Low Level → Low Level Detection → Inputs

Low Level Input Type configures input for tank level sensor or switch. Includes percentages defining tank levels and warning values.

NOTE

Screen items displayed reflect options previously selected.

NOTE

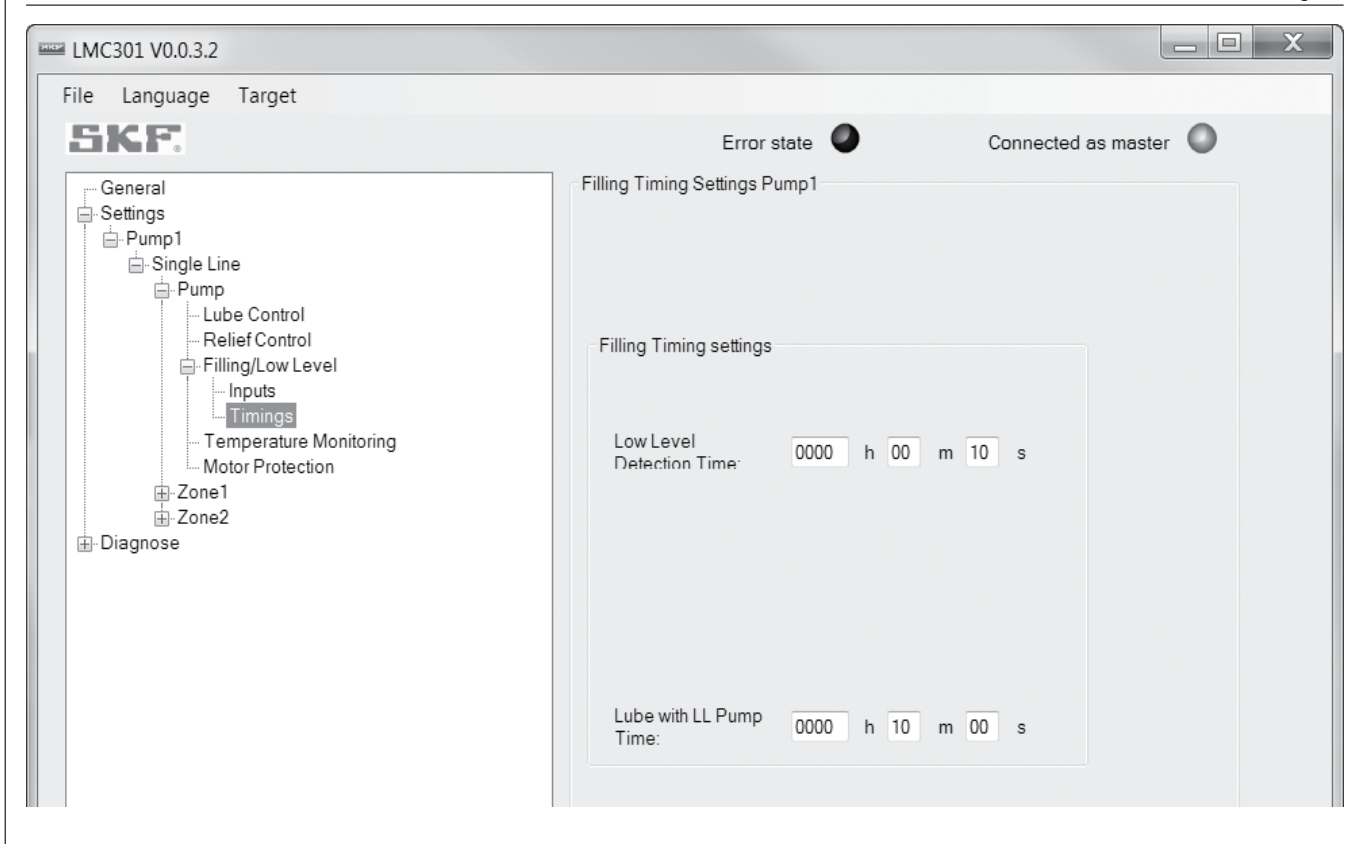
Values in Input drop menu correspond to available numbered input ports on I/O board of controller.

Prevents assigning one I/O port multiple times.

NOTE

If selecting voltage/current, additional input boxes will display.

Fig. 14



Pump → Filling/Low Level → Low Level Detection → Timings

Low Level Detection Time allows for setting detection time.

Lube with LL Cycle Count defines count time that needs to be reached before tank is refilled.

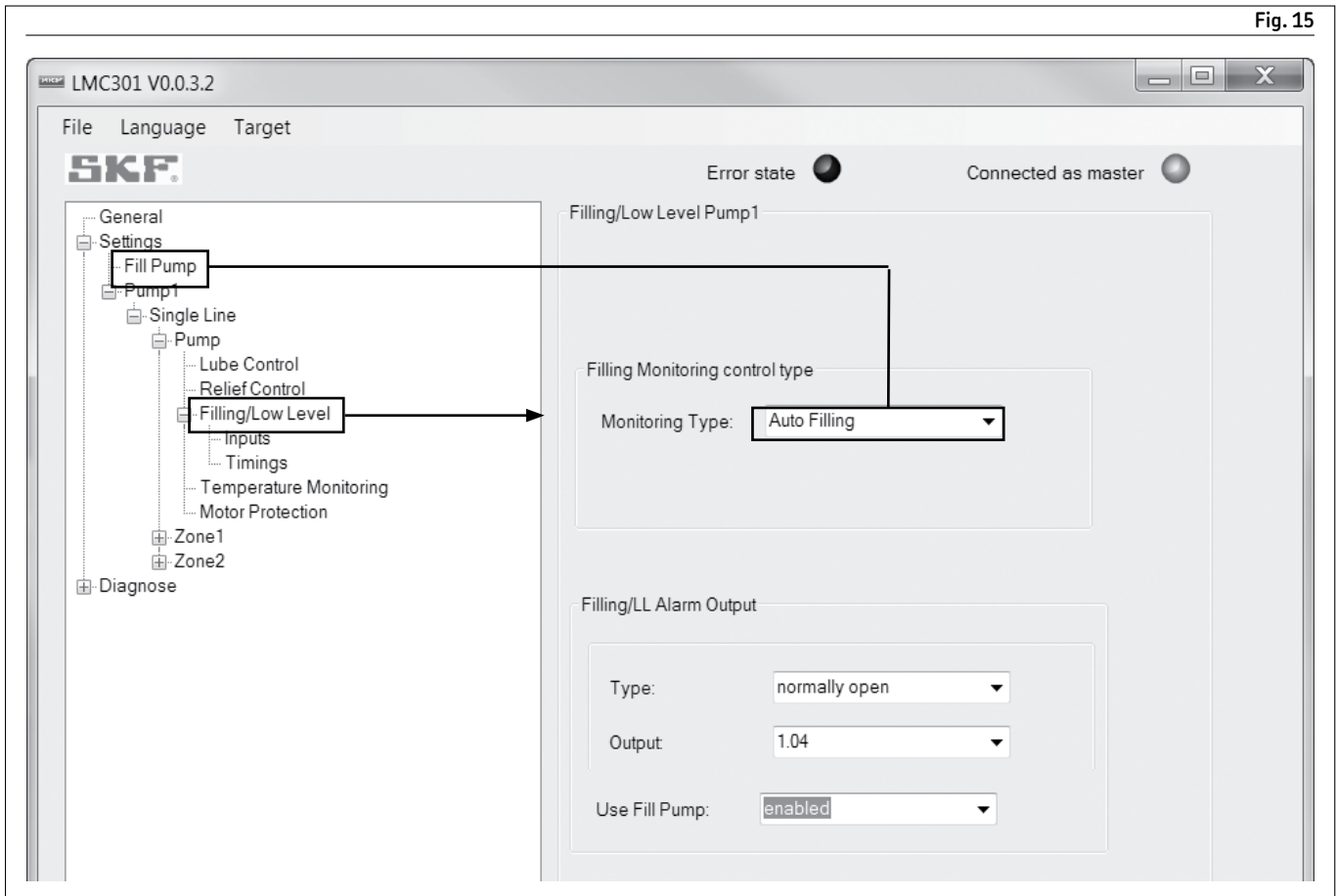
NOTE

Screen items displayed reflect options previously selected.

Lube with LL Pump Time defines time that pump can run while system is in low level alarm state.

NOTE

If **Low Level Lube Limited By** drop menu on **Filling/Low Level Menu** (→ fig. 10, fig. 13) is set to **LL Pump Time**, option 2 above will be **Lube with LL pump time** (→ fig. 13).



Pump → Filling/Low Level → Auto Filling

Filling Monitoring Control Type

Monitoring Type displays following options:

Disabled does not use level monitoring.

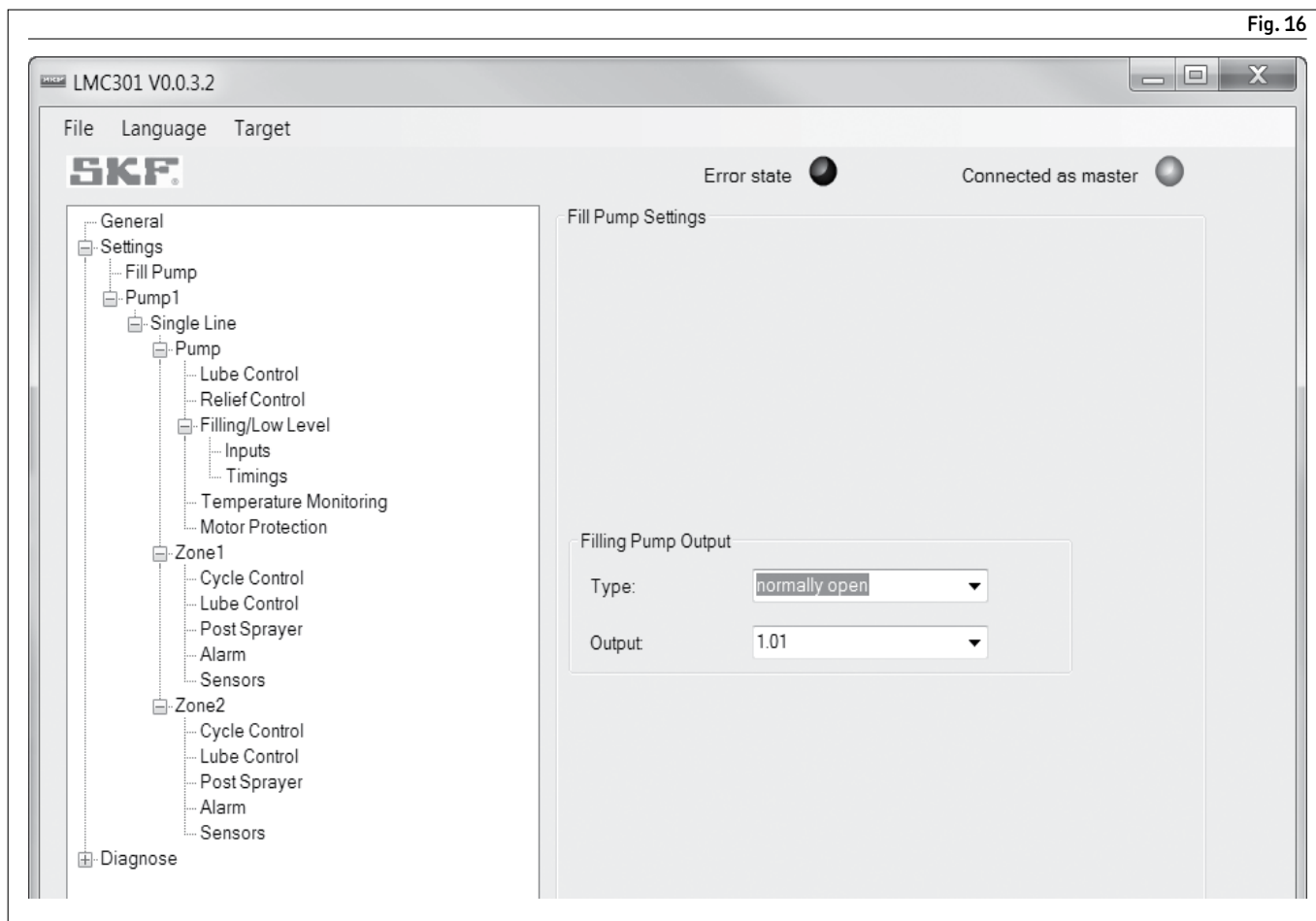
Low Level Detection monitors level by input sensor and notifies user.

Auto Filling monitors level by input sensor and refills tank automatically. When chosen, fill pump screen is populated and requires configuration.

NOTE

Screen items displayed reflect options previously selected.

Fig. 16



Filling/LL Alarm Output Setting configures alarm relay for filling/LL.

Use Fill Pump displays following options:

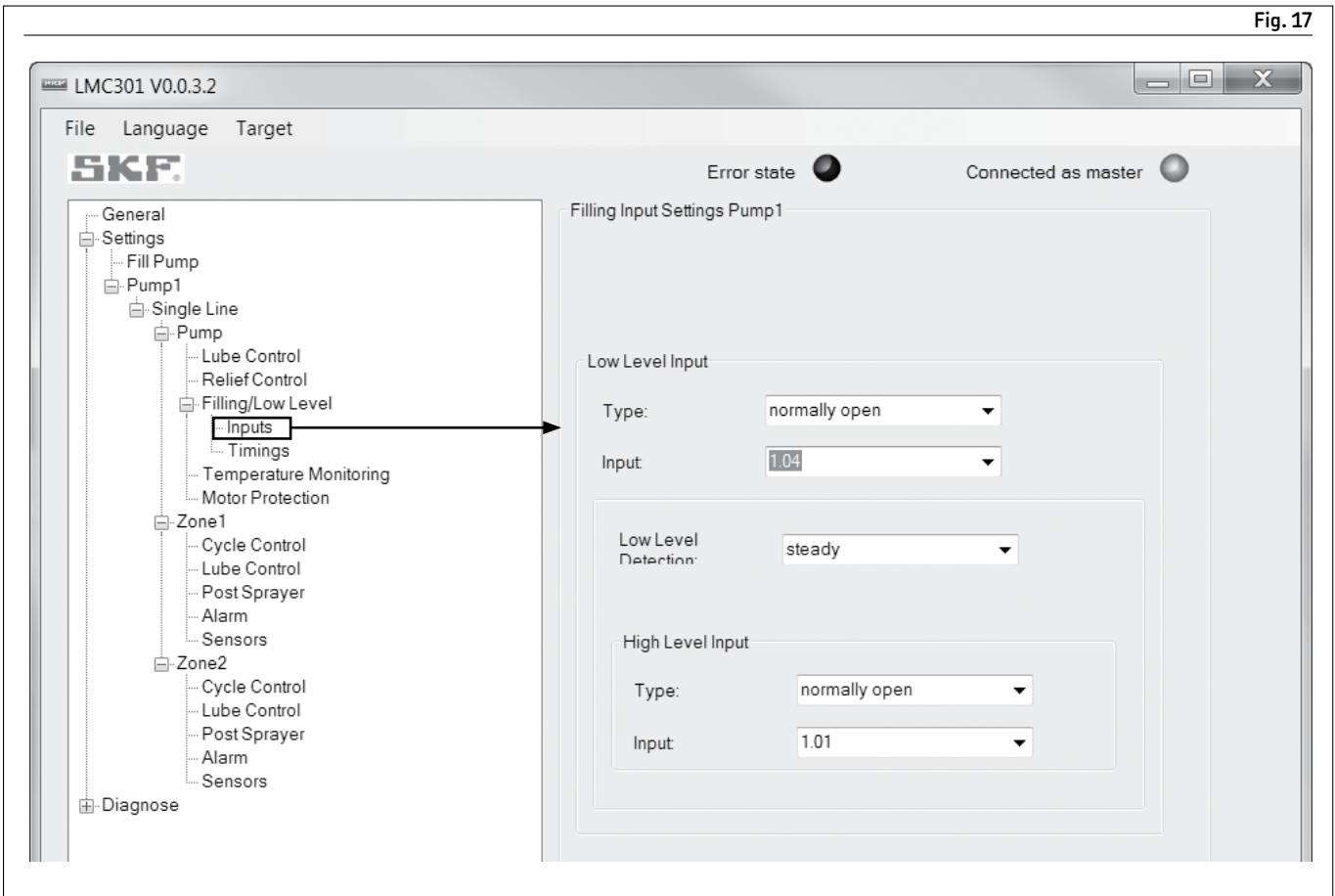
Disabled does not use fill pump.

Enabled uses fill pump used.

Fill Pump Output Type configures fill pump output relay.

NOTE

Screen items displayed reflect options previously selected.



Pump → Filling/Low Level → Auto Filling → Inputs

Fill Pump output configures fill pump output relay.

Pump → Filling/Low Level → Auto Filling → Timings

Filling Timeout allows for setting of max fill time.

Low Level Detection Time displays length of time low level signal must be present to be considered valid.

High Level Detection Time displays length of time high level signal must be present to be considered valid.

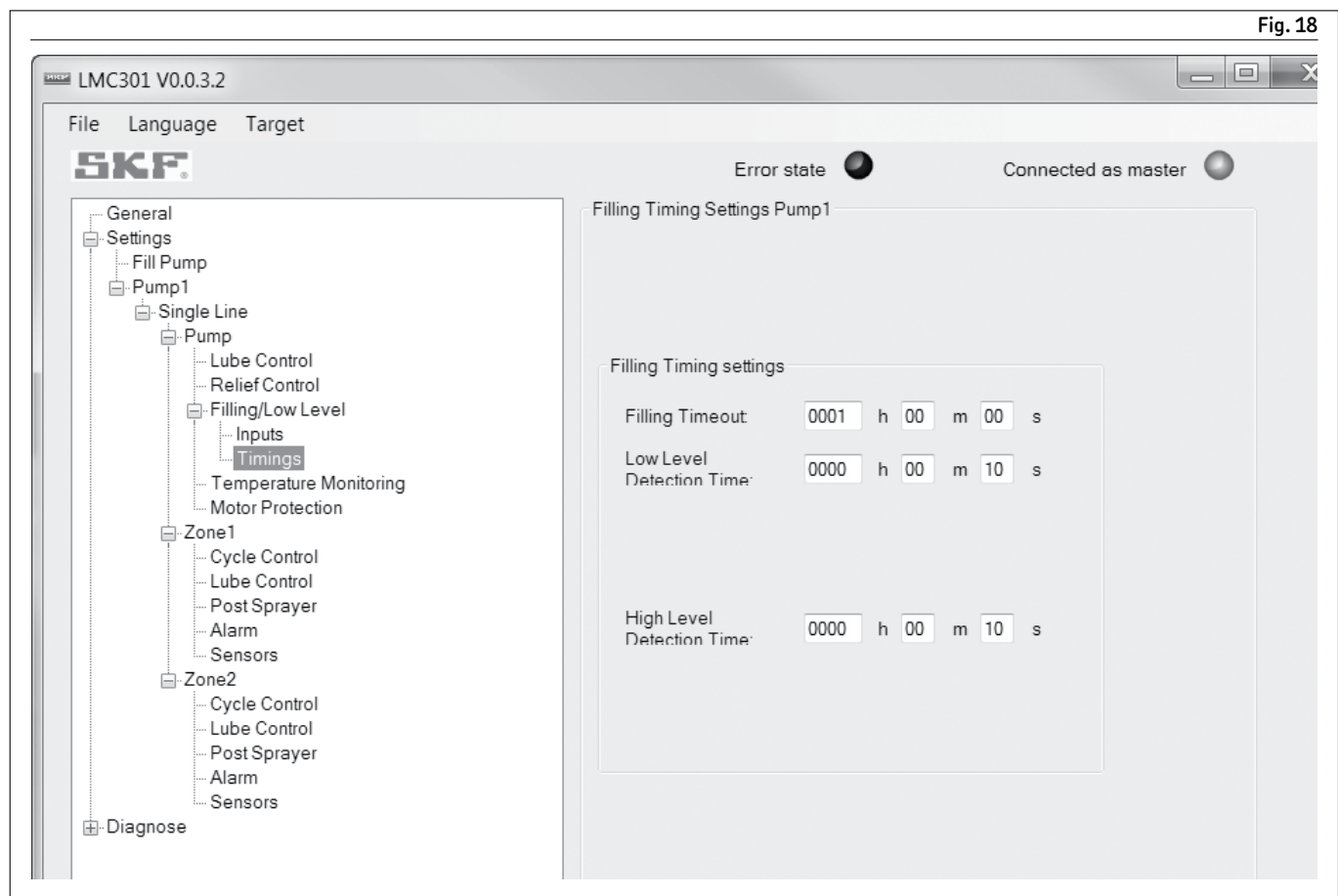
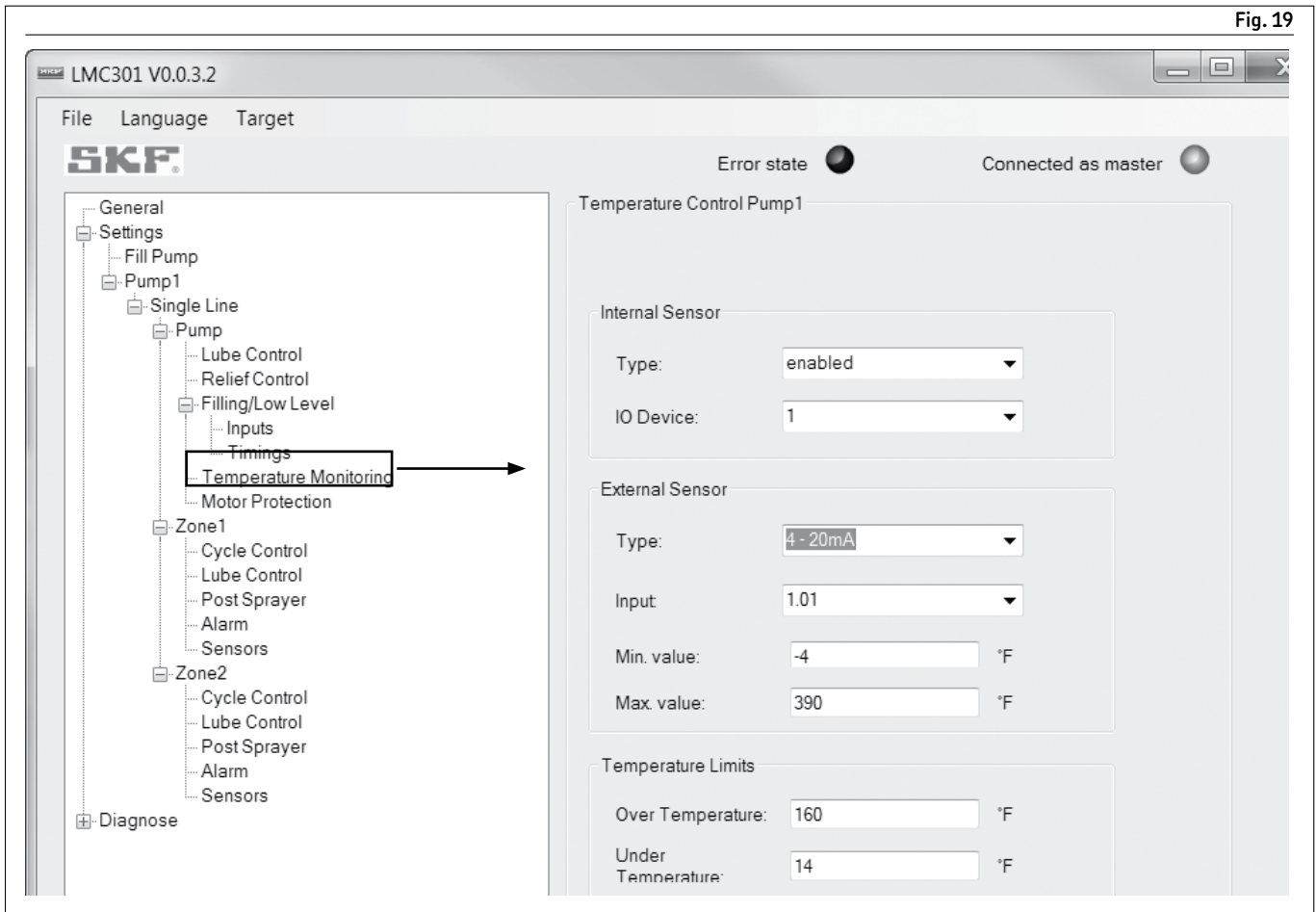


Fig. 18



Pump → Temperature Monitoring

Internal Sensor Type displays following options:

Disabled does not use sensor.

Enabled does use sensor.

I/O Device selects one through eight, based on maximum number of I/O boards that can be connected.

External Sensor adjusts settings in fields based on sensor specifications.

External Sensor Input assigns available I/O port for sensor.

Temperature Limits adjusts settings in fields based on pump specifications.

NOTE

Screen items displayed reflect options previously selected.

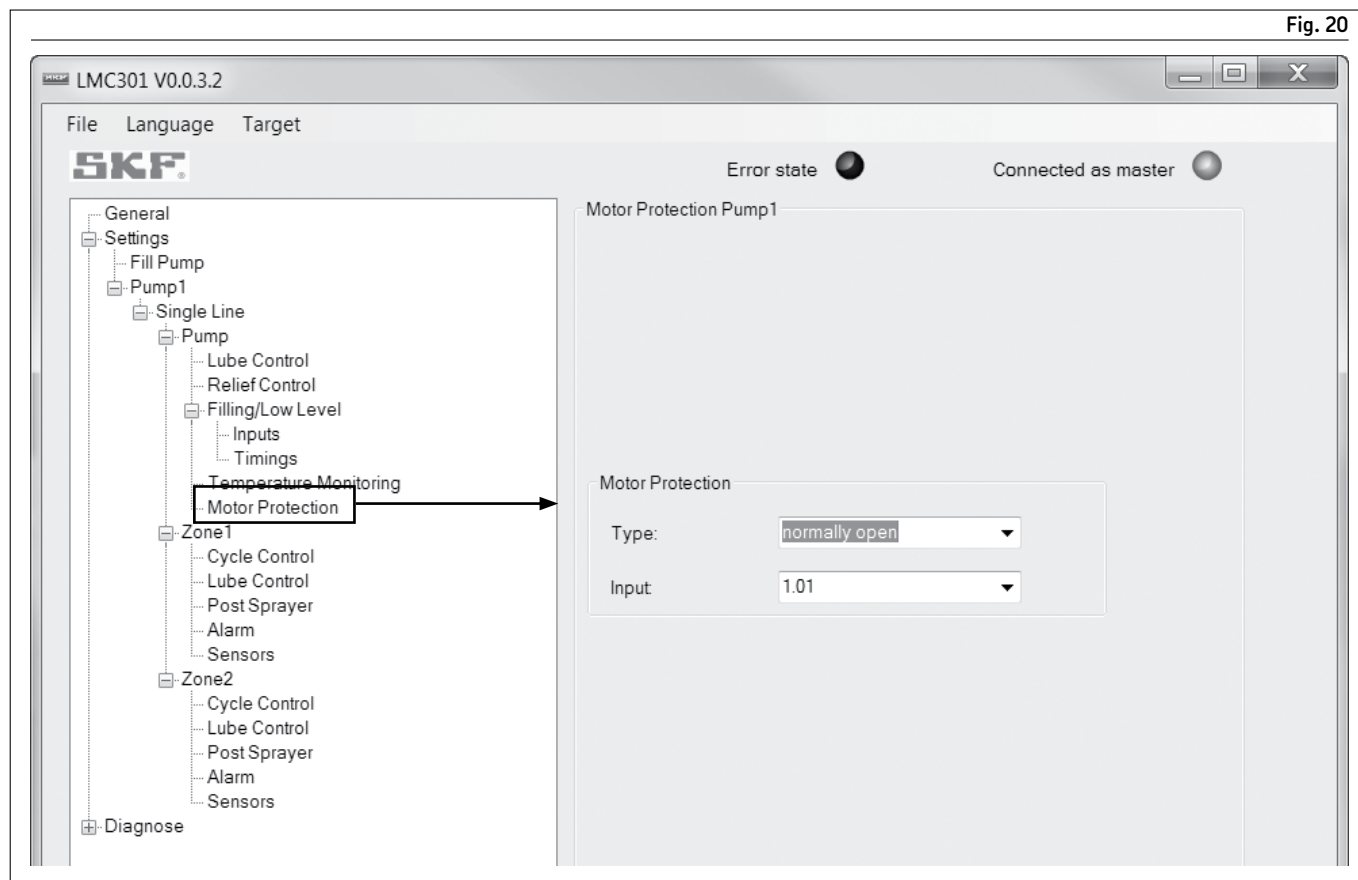
NOTE

Values in **Input** drop menu correspond to **available** numbered input ports on I/O board of controller.

Prevents assigning one I/O port multiple times.

NOTE

If selecting voltage/current, additional input boxes will display.



Pump → Motor Protection

Motor Protection Type adjusts settings in fields based on sensor specifications.

Motor Protection Input assigns available I/O port for sensor.

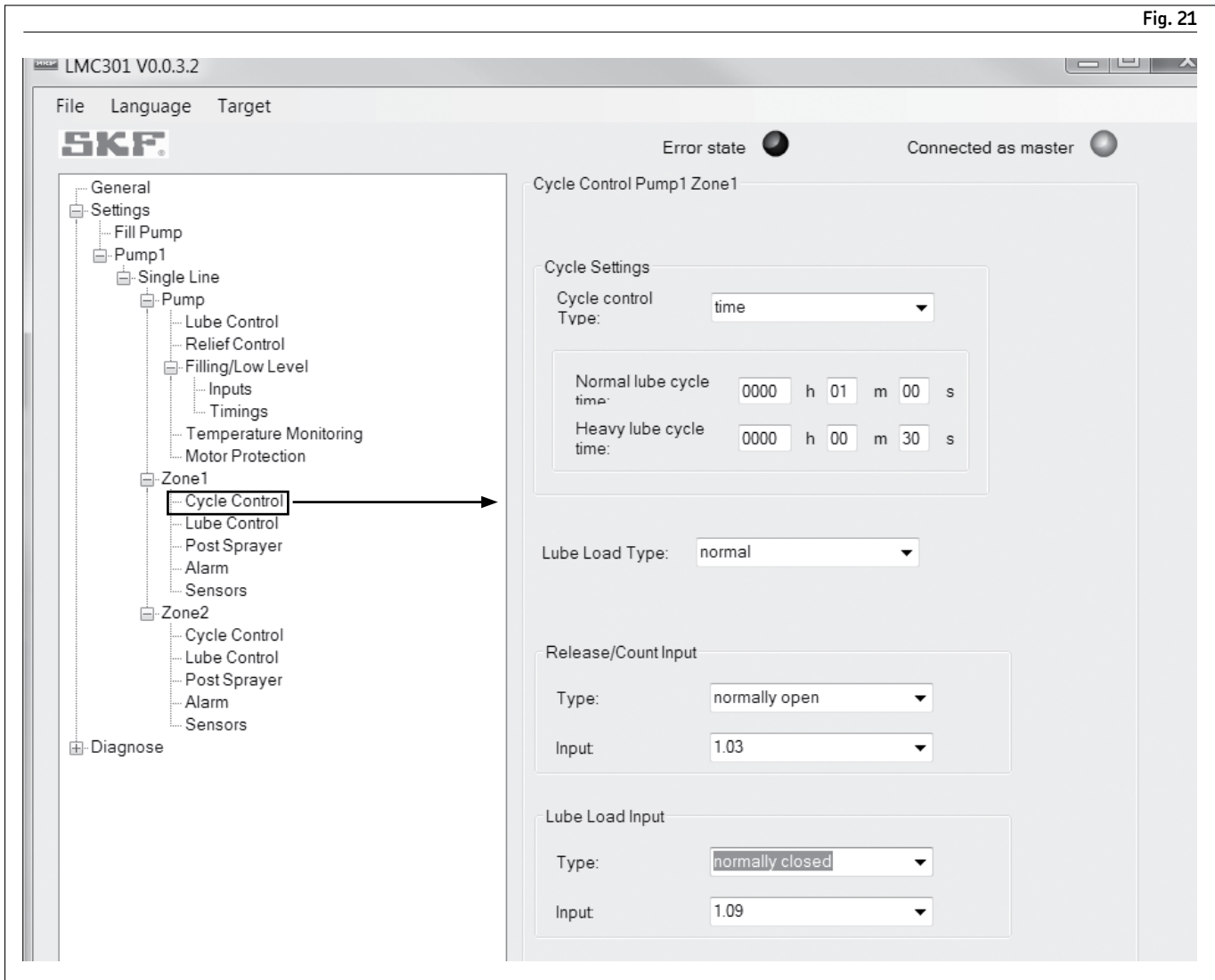
NOTE

Screen items displayed reflect options previously selected.

NOTE

Values in **Input** drop menu correspond to **available** numbered input ports on I/O board of controller.

Prevents assigning one I/O port multiple times.



Zone → Cycle Control for Time

Cycle control type displays following options:

Time controls cycles by time.

Counter controls cycles by count.

Normal lube cycle time defines time length of normal lube cycle.

Heavy lube cycle time defines time length of heavy lube cycle.

Lube Load Type displays following options:

Normal defines zone as normal lube load.

Heavy defines zone as heavy lube load.

Release/Count

Release allows configuration of input that pauses operation of specific zone while input is active.

Count allows for configuration of counter input port.

Lube Load Input Type allows for system to have **normal** operating frequency and **heavy** operating frequency. System will switch between modes according to input valve of **Lube Load Input**.

NOTE

Values in **Input** drop menu correspond to **available** numbered input ports on I/O board of controller.

Prevents assigning one I/O port multiple times.

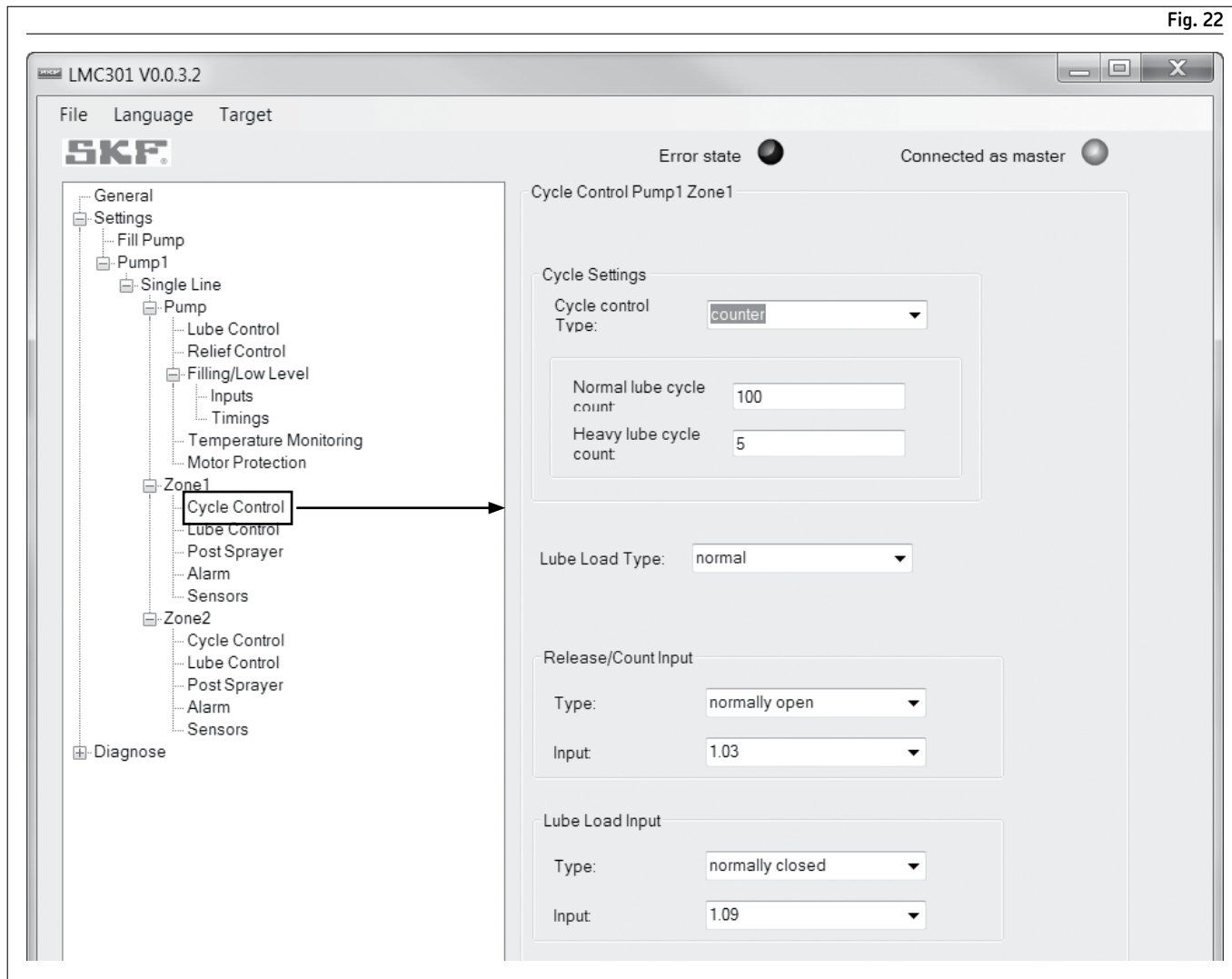
NOTE

Lube load **heavy** or **normal** allows for cycles to be run more or less frequently based on machinery needs.

Can be controlled by switch attached to lube load input.

NOTE

Screen items displayed reflect options previously selected.



Zone → Cycle Control for Counter

NOTE

Screen items displayed reflect options previously selected.

Cycle control Type displays following options:

Time controls cycles by time.

Counter controls cycles by count.

Normal lube cycle count defines number of normal lube cycles.

Heavy lube cycle count defines number of heavy lube cycles.

Lube Load Type default **Lube Load**

Normal defines zone as **normal** lube load.

Heavy defines zone as **heavy** lube load.

Release/Count

Release allows configuration of input that pauses operation of specific zone while input is active.

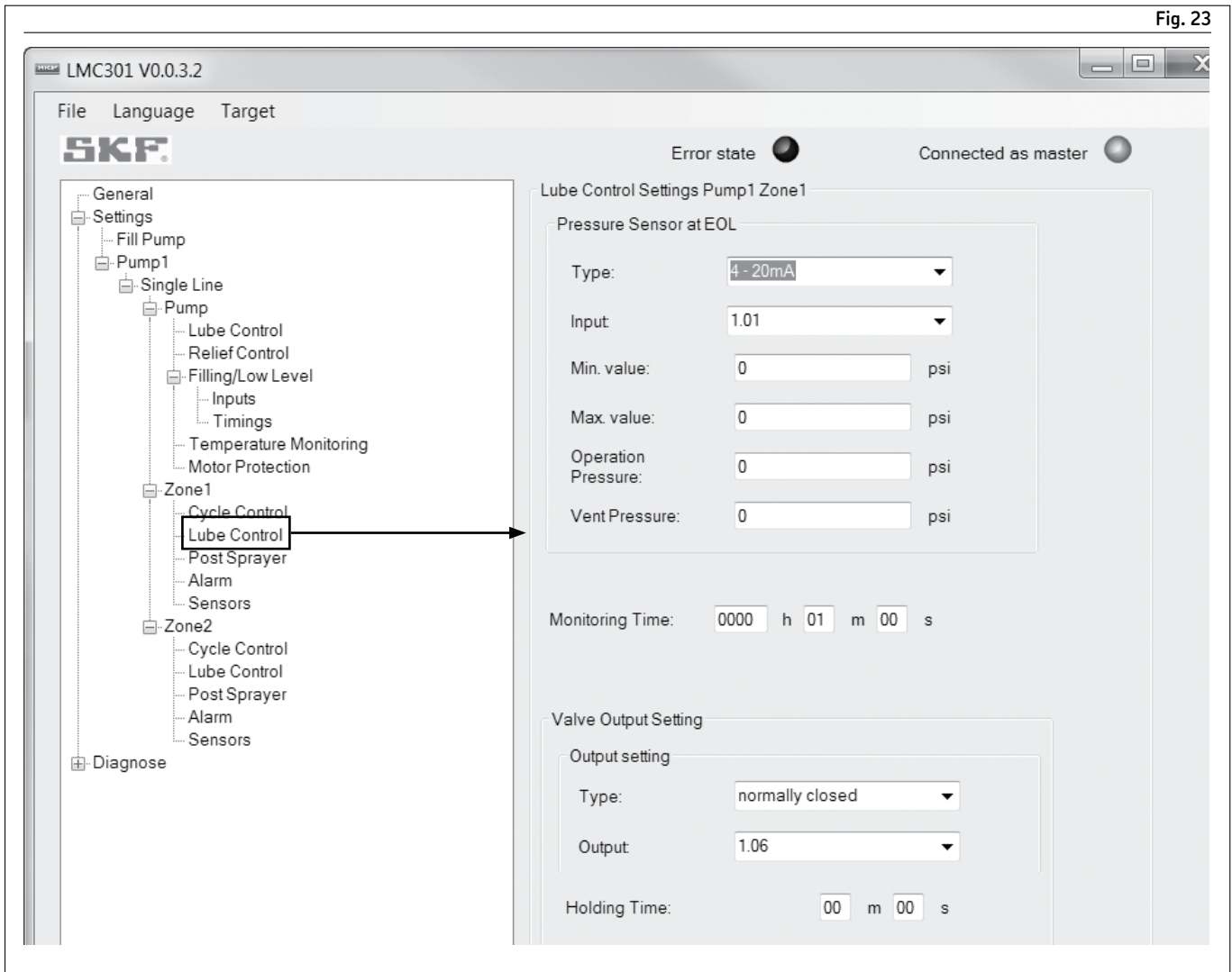
Count allows for configuration of counter input port.

Lube Load Input Type allows for system to have **normal** operating frequency and **heavy** operating frequency. System will switch between modes according to input valve of **Lube Load Input**.

NOTE

Values in Input drop menu correspond to **available** numbered input ports on I/O board of controller.

Prevents assigning one I/O port multiple times.



Zone → Lube Control

Pressure Sensor at EOL Type configures pressure switch of sensor specifically for zone.

Pressure Sensor at EOL Input assigns available I/O port for sensor.

Various PSI settings assigns sensor values.

Monitoring Time defines time length of sensor monitored for end of cycle condition before triggering alarm.

Valve Output Setting Type controls valve configuration by zone.

Valve Output assigns available I/O port for sensor.

Holding Time defines time system holds in vector pressure at required level before relieving system pressure.

NOTE

If selecting voltage/current, additional input boxes will display.

NOTE

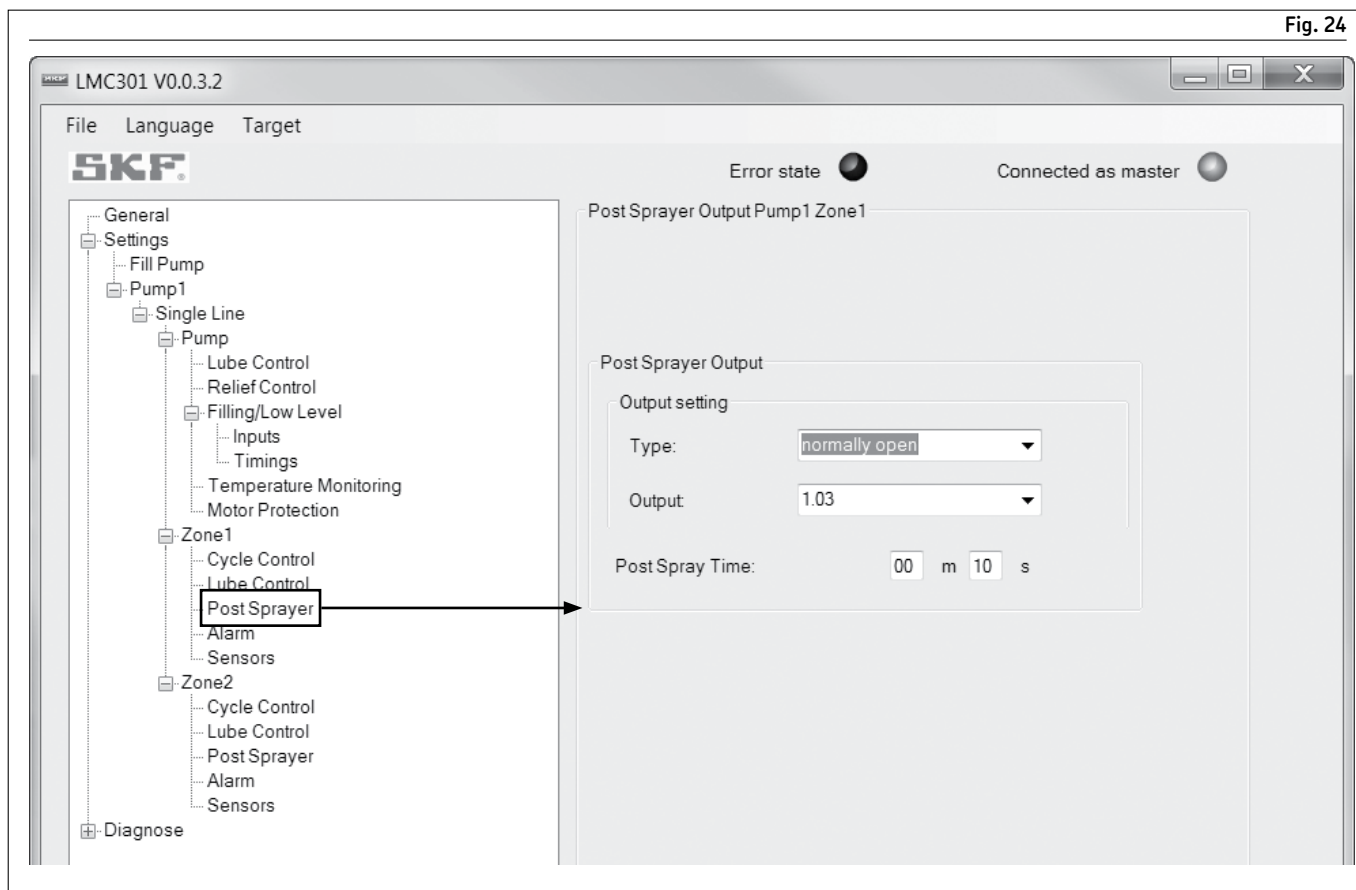
Values in **Input** drop menu correspond to **available** numbered input ports on I/O board of controller.

Prevents assigning one I/O port multiple times.

NOTE

Screen items displayed reflect options previously selected.

Fig. 24



Zone → Post Sprayer

Post Sprayer activates sprayer for given time after lube cycle is completed.

Post Spray Time defines time length of each spray.

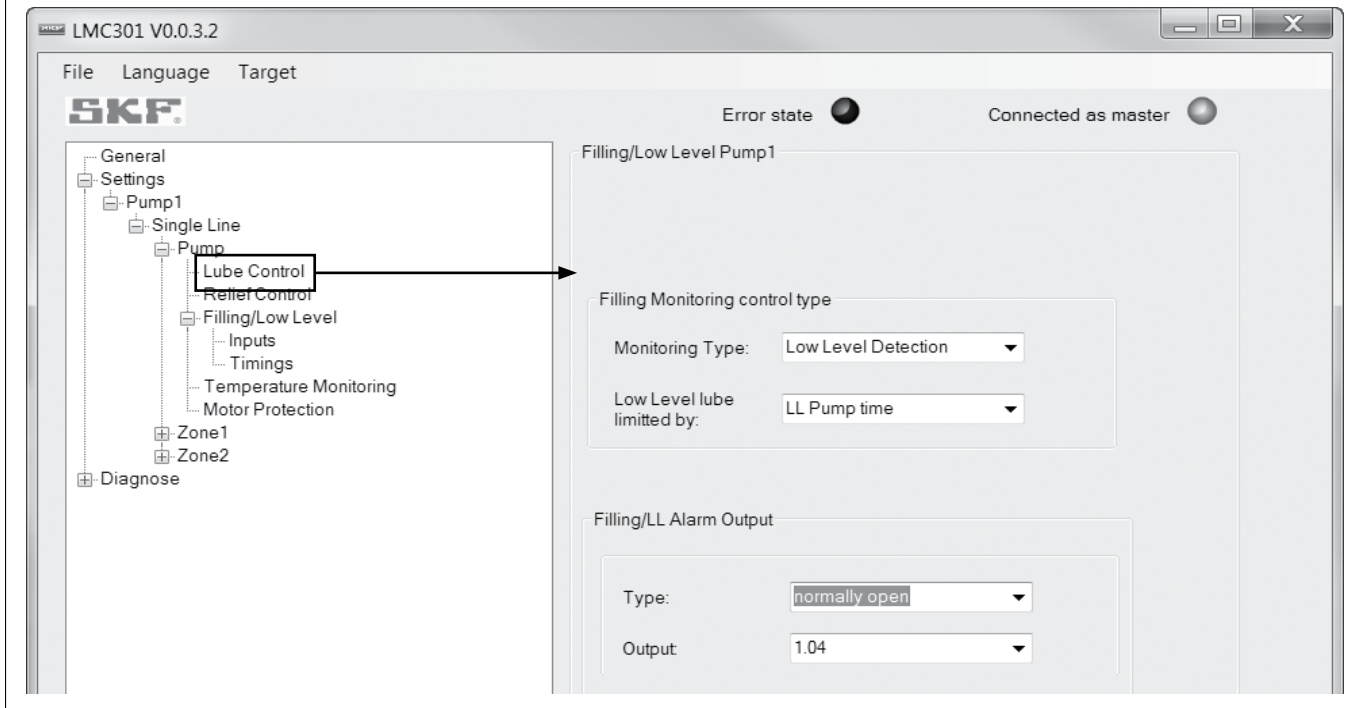
NOTE

Screen items displayed reflect options previously selected.

NOTE

Values in **Input** drop menu correspond to **available** numbered input ports on I/O board of controller.

Prevents assigning one I/O port multiple times.



Single Line Pump → Lube Control

Lube control mode displays following options:

Time points control lubrication cycles.

Pressure sensors input control lubrication cycles.

Pressure Sensor at Pump Type adjusts settings in fields based on sensor specifications.

Pressure Sensor Input assigns available I/O port for sensor.

Output Pump configures pump output relay.

Remote Manual Lube assigns input that will allow manual lube cycles when activated by system switch.

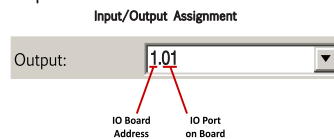
NOTE

Screen items displayed reflect options previously selected.

NOTE

Values in **Input** drop menu correspond to **available** numbered input ports on I/O board of controller.

Prevents assigning one I/O port multiple times.



NOTE

Values in **Output** drop menu correspond to **available** numbered input ports on I/O board of controller.

Prevents assigning one I/O port multiple times.

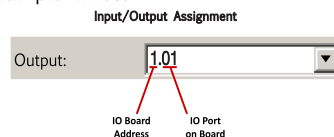
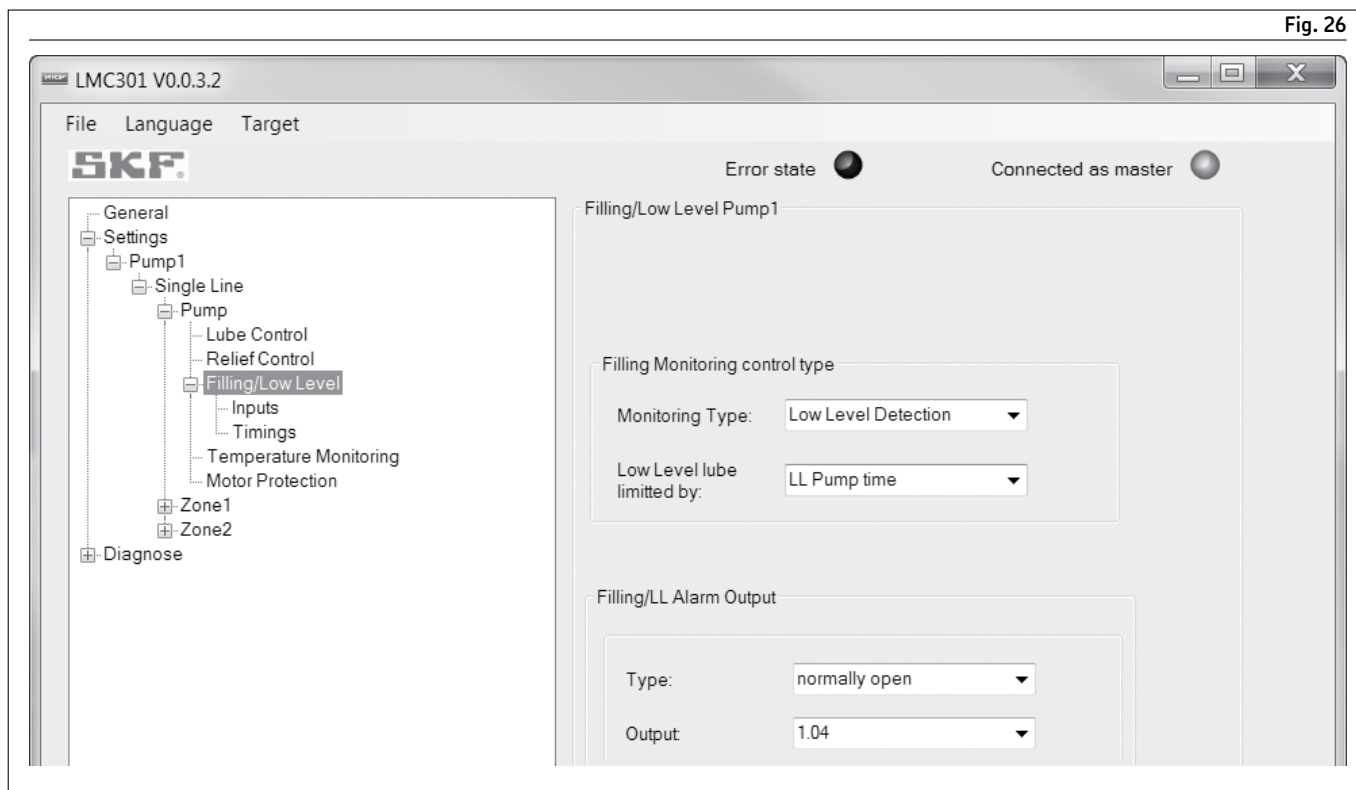


Fig. 26



Single Line Pump → Relief Control

Output relief valve works independently to vent relief valve control output.

Relief displays following options:

Disabled does not use relief control.

Enabled allows for relief to be control-

led by time parameters input in **Pump**

Relief time and **Zone Relief time** fields.

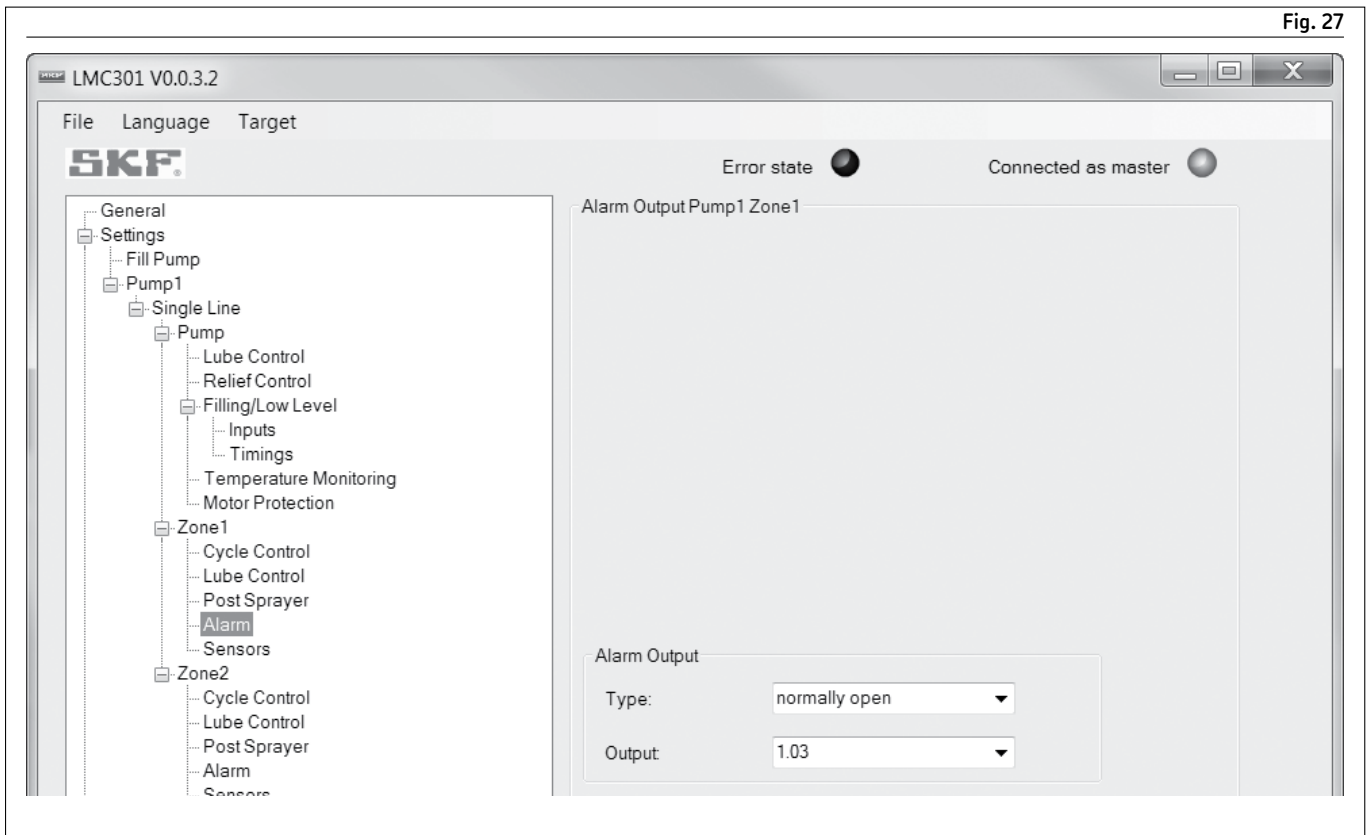
Pump Relief time allows for venting pressure from pump feed lines with pump pausing between cycles at minimum time.

Zone Relief time allows for venting pressure from one feed line with zone pausing between cycles at minimum time.

NOTE

Screen items displayed reflect options previously selected.

Fig. 27



Single Line Zone → Alarms

Alarm Output configures alarm output specifically for errors associated with zone.

Alarm Output assigns available I/O for zone alarm.

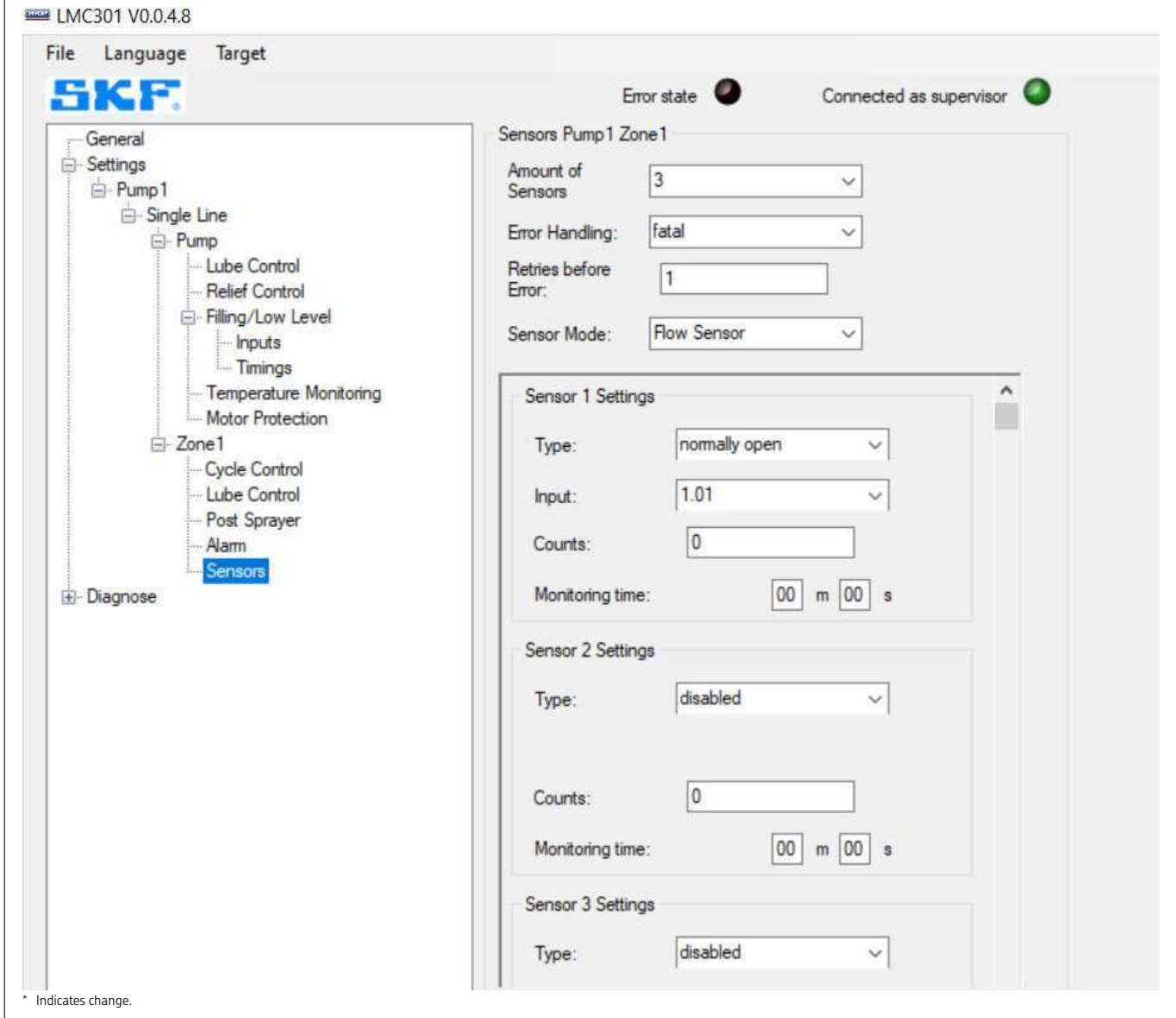
NOTE

Screen items displayed reflect options previously selected.

NOTE

Values in **Output** drop menu correspond to **available** numbered output ports on I/O board of controller.

Prevents assigning one I/O port multiple times.



Single Line Zone → Sensors *

Sensors displays up to ten assignable sensors.

NOTE

Each configured input will require activation from monitoring flow sensor each time lube cycle is run on zone.
Failure to do so will result in zone alarm.

NOTE

Values in **Input** drop menu correspond to **available** numbered output ports on I/O board of controller.

Prevents assigning one I/O port multiple times.

Error handling shows how to react when monitoring sensor conditions are not met.

Fatal displays when an error is shown and system will stop

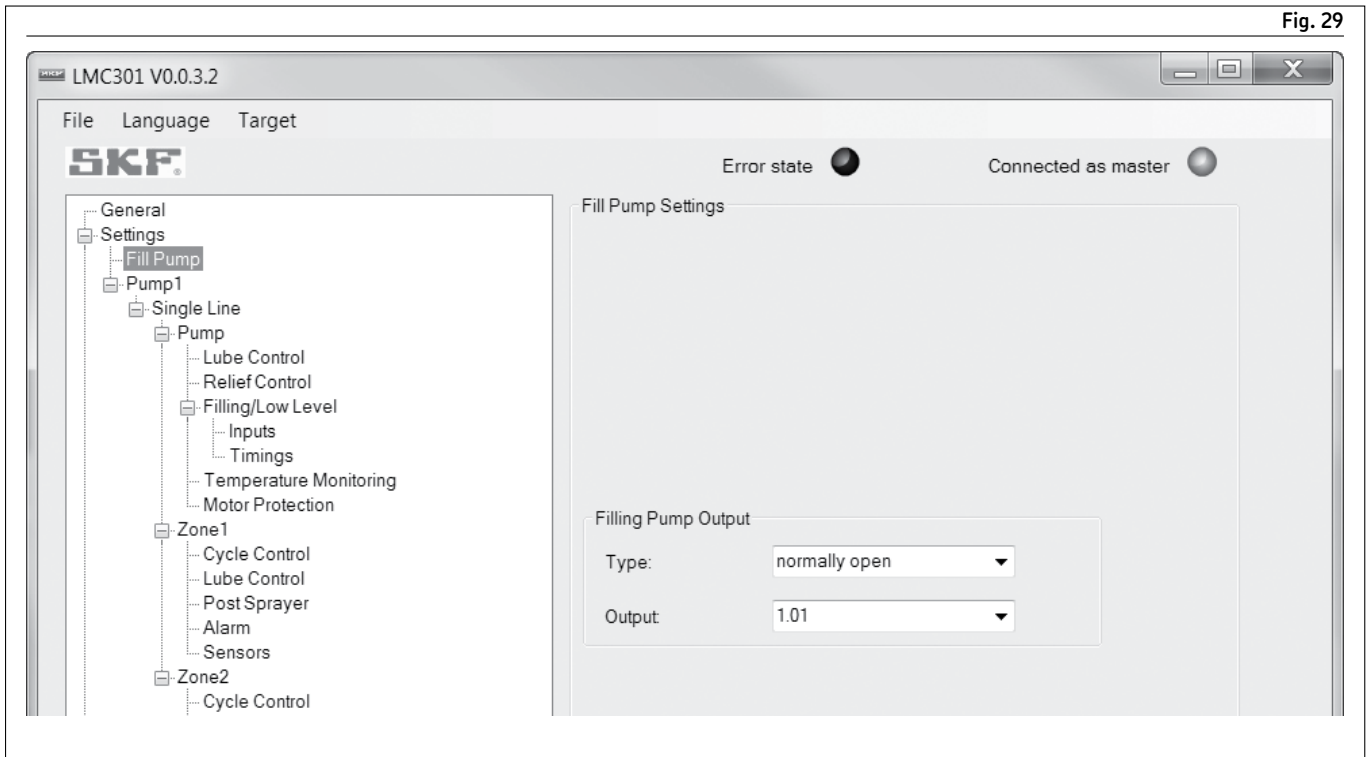
Non Fatal displays when a warning is shown and system will continue working

Retries Before Error represents the number of continuous failed monitoring cycles before triggering an error condition.

Sensor Mode is a type of monitoring sensor. If flow sensor is set, there is a **Counts** option displayed for each sensor. This sets the number of edges counted during the lubrication cycle within the monitoring time.

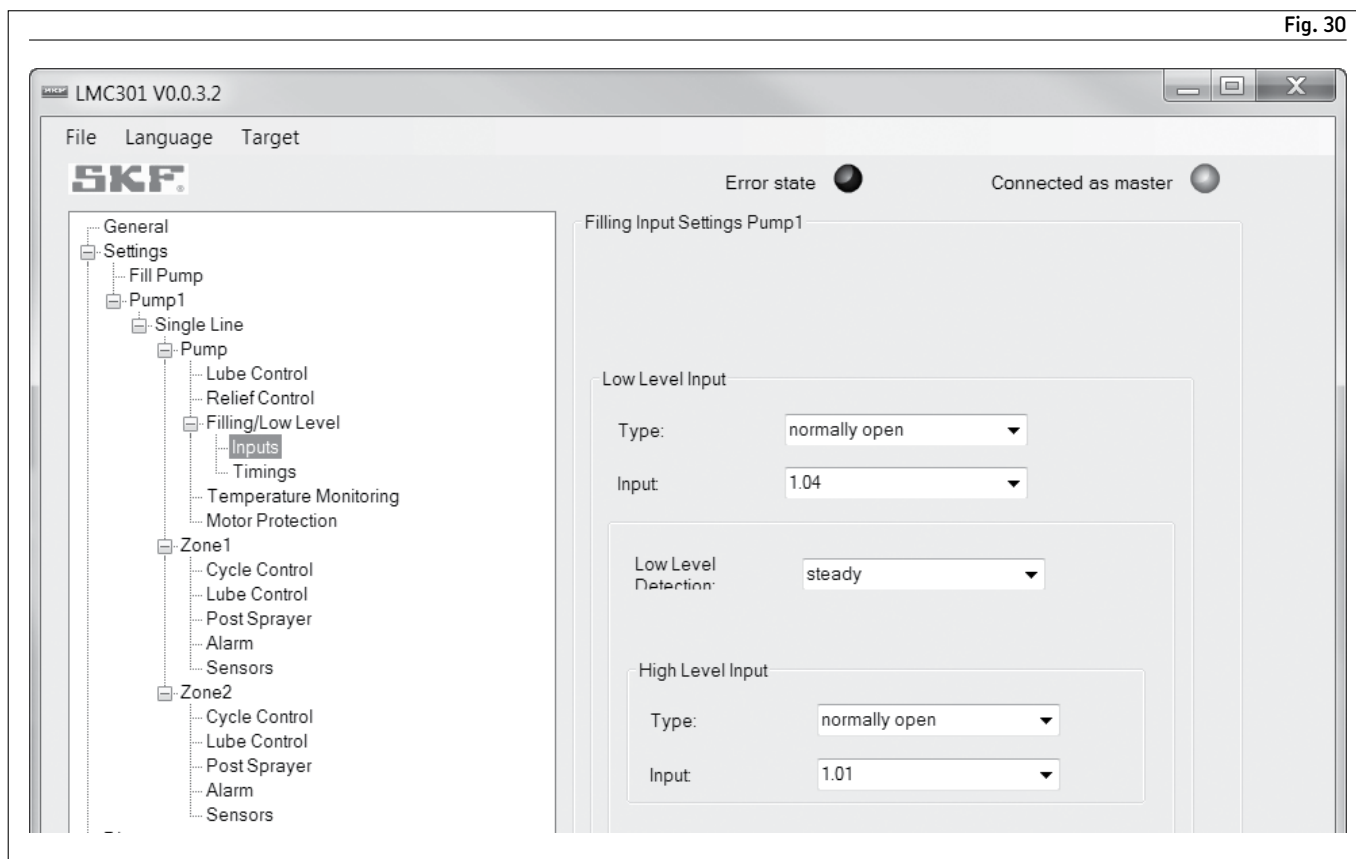
* Indicates change.

Fig. 29



Settings → Fill pump

Filling Pump Output assigns tank auto fill pump.



Filling/Low Level (Auto Filling) → Inputs

Input Settings displays following options:

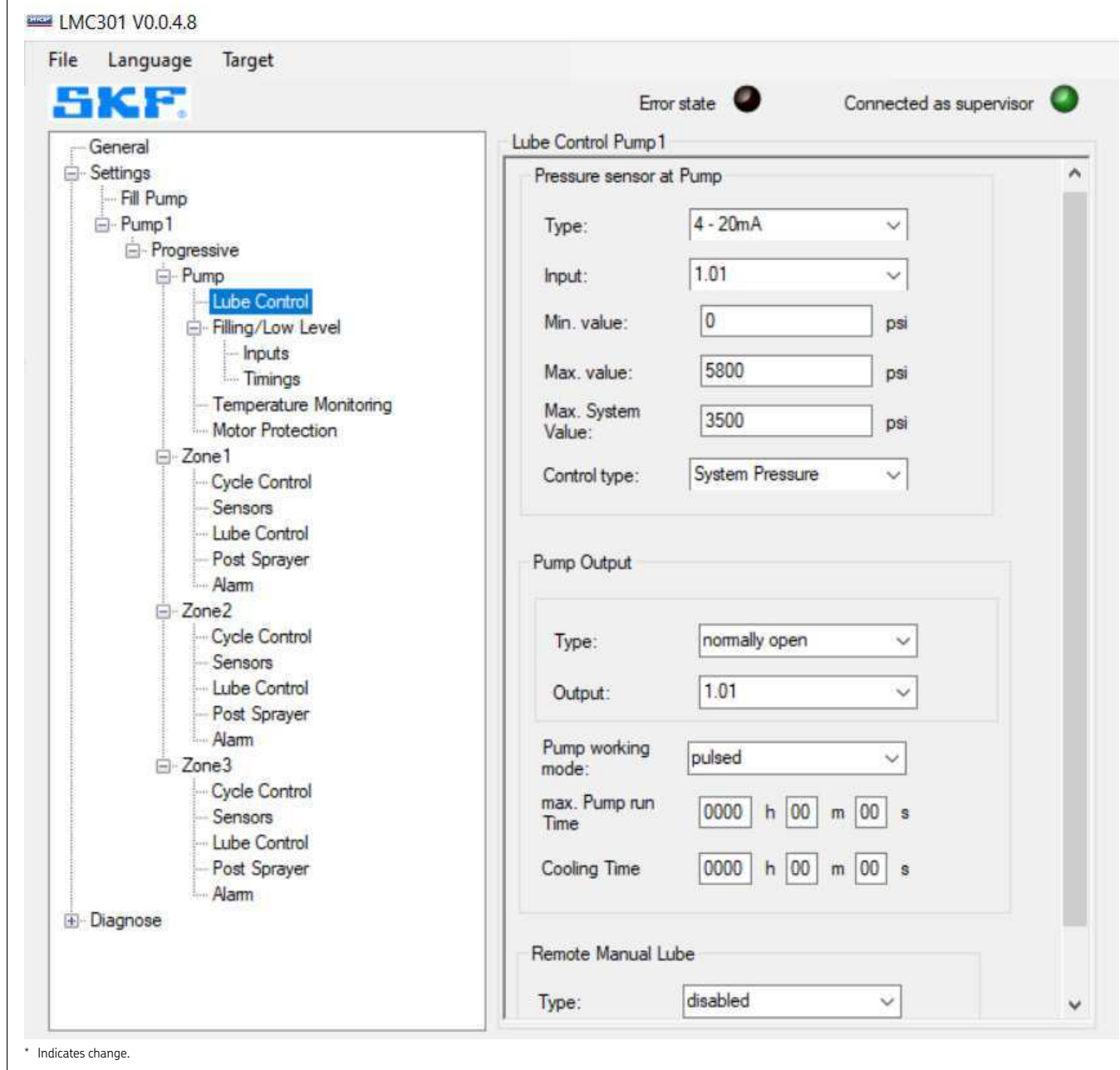
Low Level Input causes activation of auto fill pump.

High Level Input turns auto fill pump off.

Low Level Detection displays constant signal for both low level and not low level.

Intermitting LL signifies low level.

Intermitting no LL signifies not low level.



Progressive Pump → Lube Control *

Max. Pump Run Time displays maximum pump running time to prevent overheating.

Pressure Sensor at Pump limits pressure generated by pump. Adjust settings in fields based on sensor specifications.

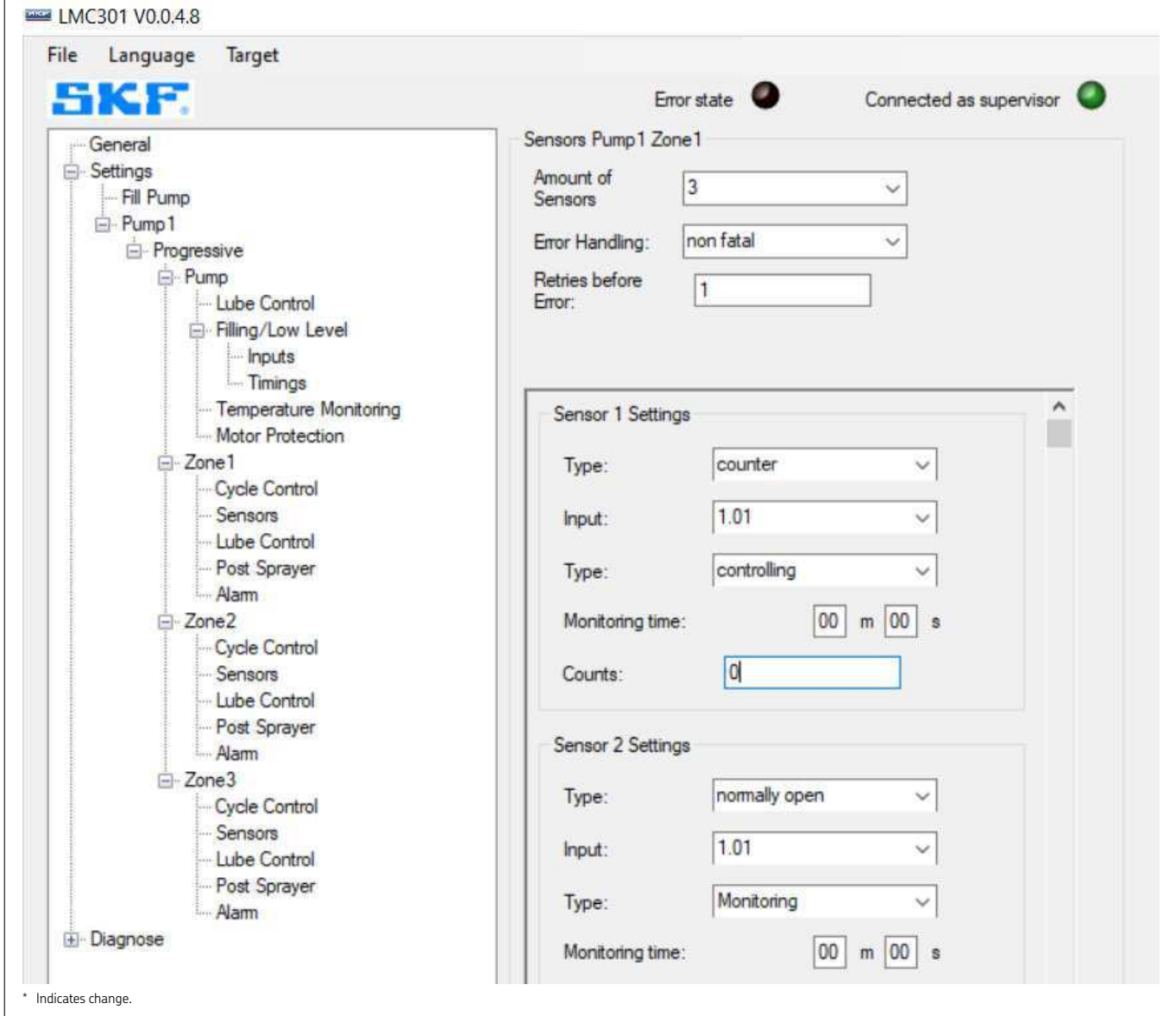
Pump Output configures pump output relay.

Pump working mode displays mode of operation during active pump cycle.

Steady pump remains on for entire pump cycle.

Pulsed pump transitions on and off for four second cycle rate.

* Indicates change.



Amount of sensors displays number of proximity switches in zone.

Error Handling shows how to react when monitoring sensor conditions are not met.

Fatal displays when an error is shown and system will stop

Non Fatal displays when a warning is shown and system will continue working

Retries Before Error represents the number of continuous failed monitoring cycles before triggering an error condition.

Settings Sensor 1

Input assigns available I/O port to switch.

Type

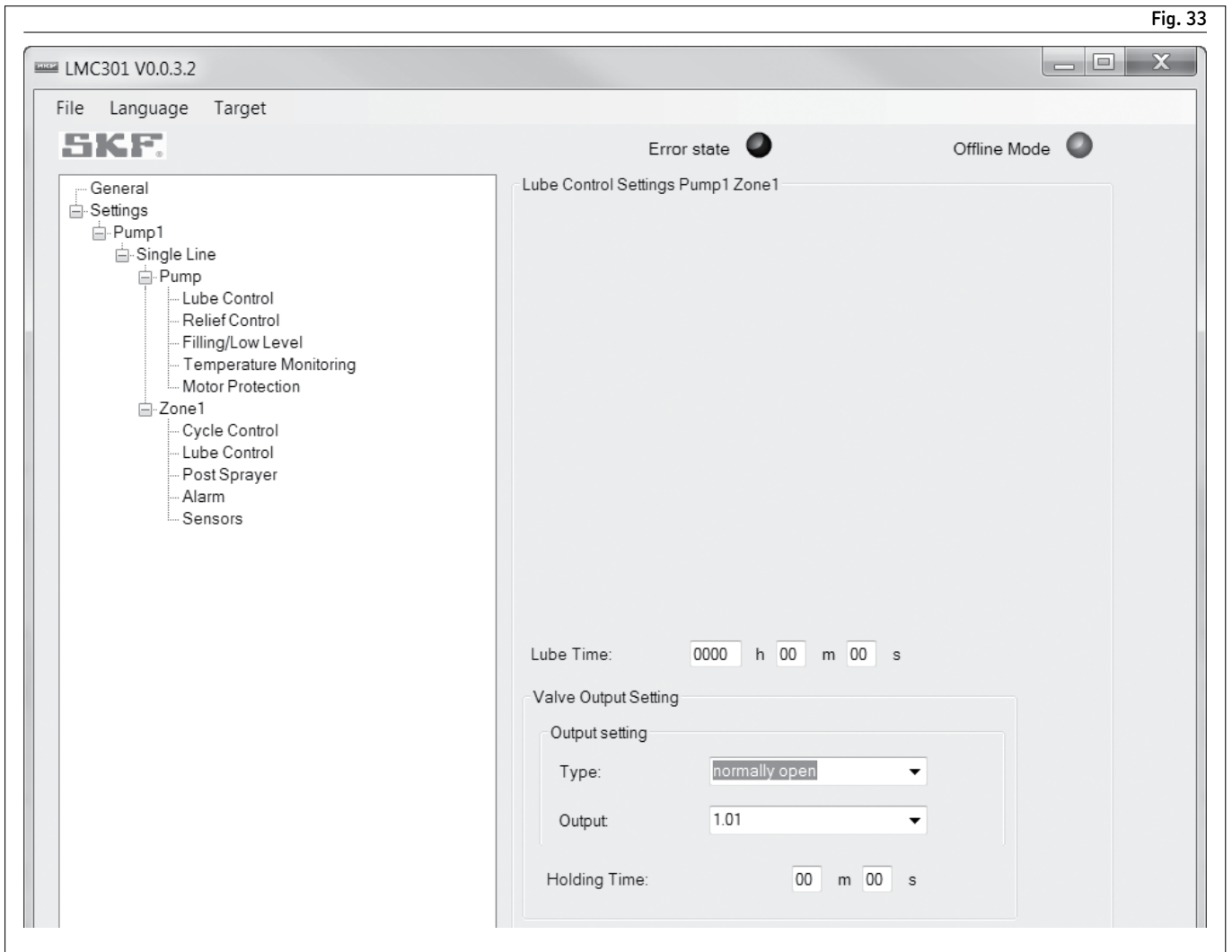
Controlling stops cycle stops when required proximity switch count is reached by switch input. **Only one per zone.**

Monitoring verifies switching activity during zone cycle, but does not control end of cycle.

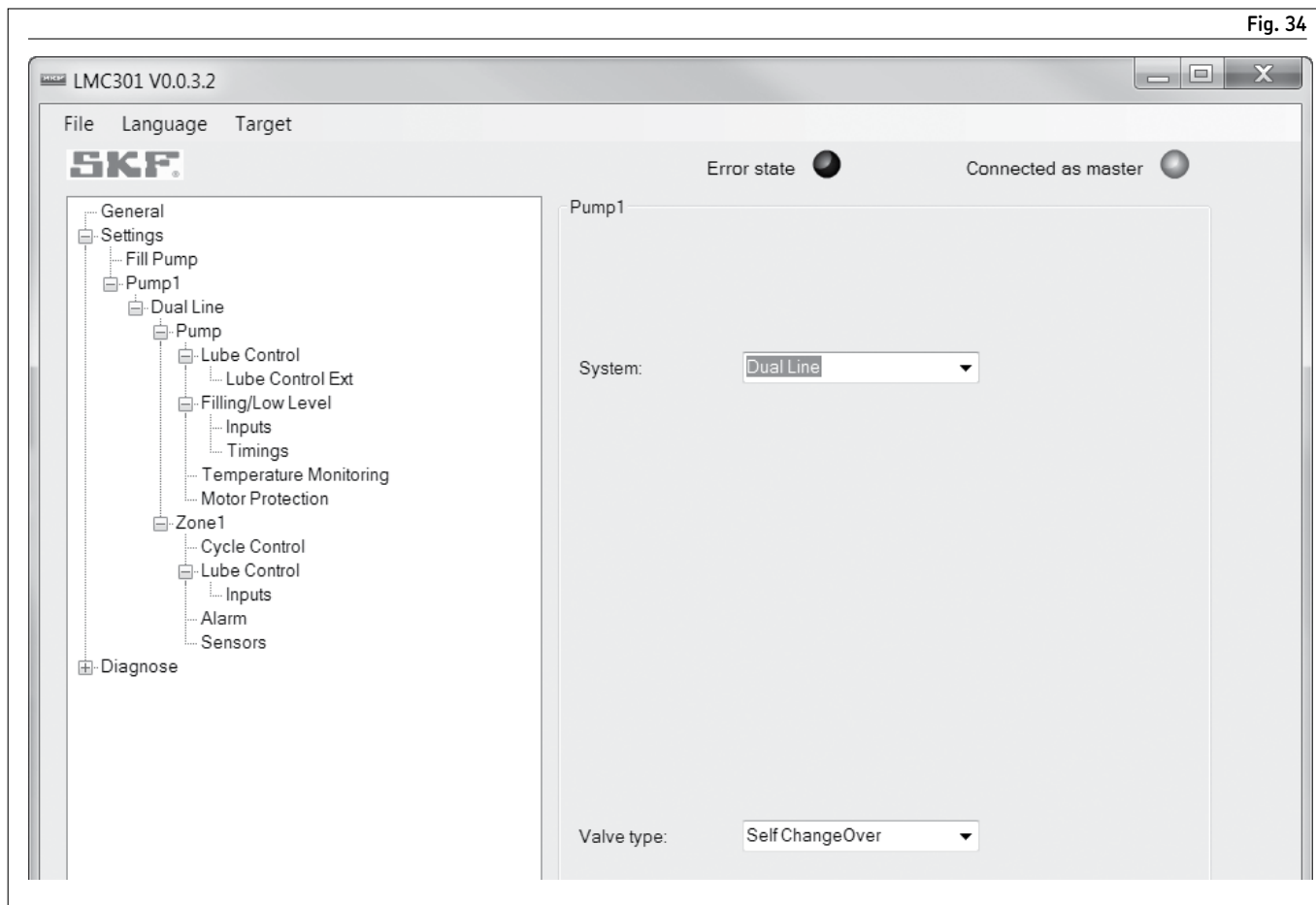
Monitoring time displays time allotted for required switch count to be reached.

Counts displays switch count required to end cycle.

Fig. 33



Valve Output Setting is setup for zoning valve output relay.



Dual Line → Pump

System configures system for **Dual Line** operation.

Valve Type specifies zone valve used.

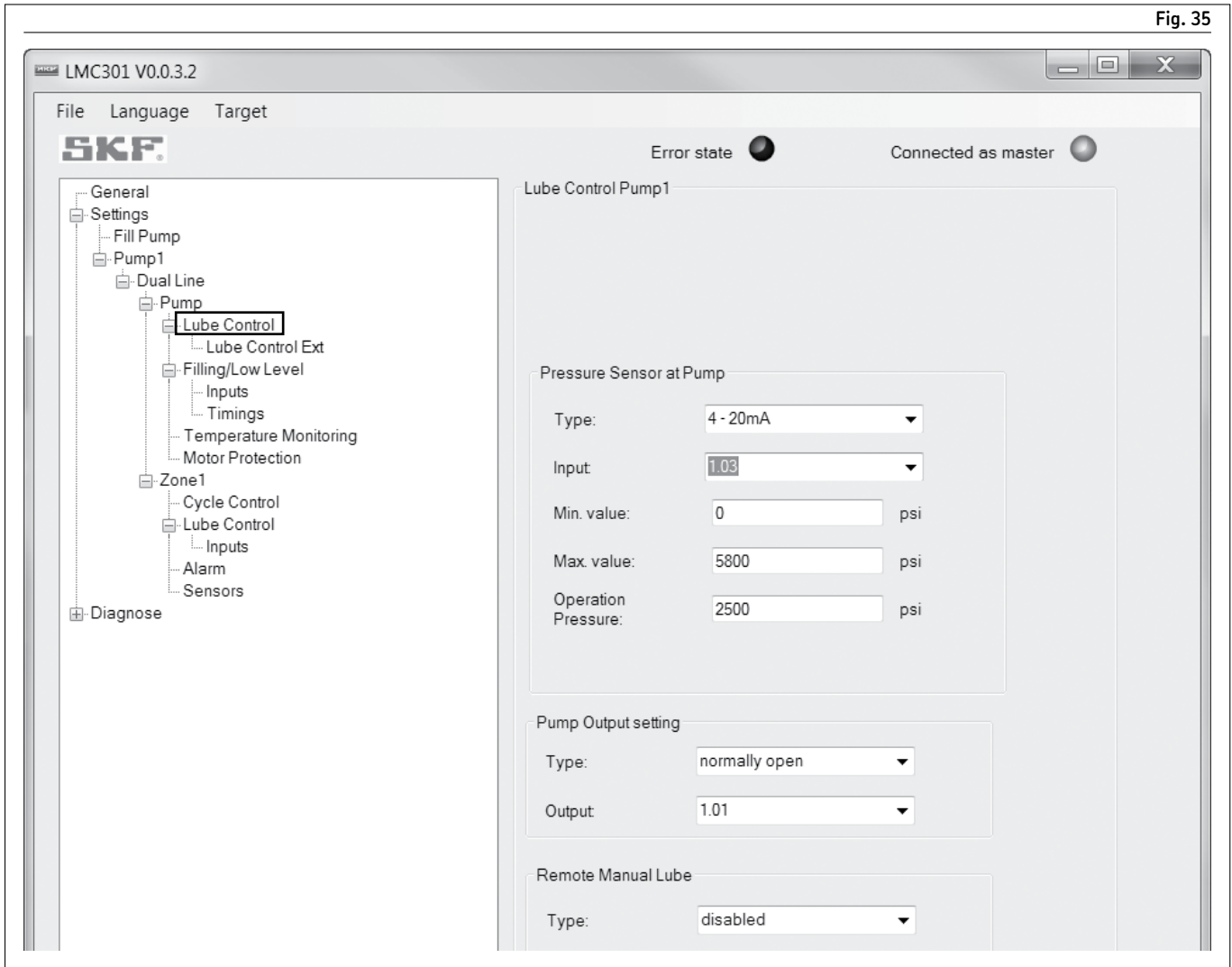
Self ChangeOver represents D3DU1. This CO unit changes pipes automatic from A to B, and vice versa, when corresponding pressure in system is reached. Changeover process is signaled by means of limit switch on changeover to LMC301.

MA/MP determines whether CO unit will supply pipe A or B. If coil is energized, unit supplies pipe B, and if not energized, unit supplies pipe A.

EMU2 includes two control inputs. If terminal 4 is energized, CO unit will supply pipe A. If terminal 3 is energized, unit will supply pipe B.

EMU3 displays third input M. If input is energized, pipe A and B move to relief position. EMU3 has additional 3 signaling outputs if position A, B, or relief is reached.

3/2 Way Valve assigns every pipe separate valve.



Dual Line → Lube Control

Pressure Sensor at Pump Type adjusts settings in fields based on sensor specifications.

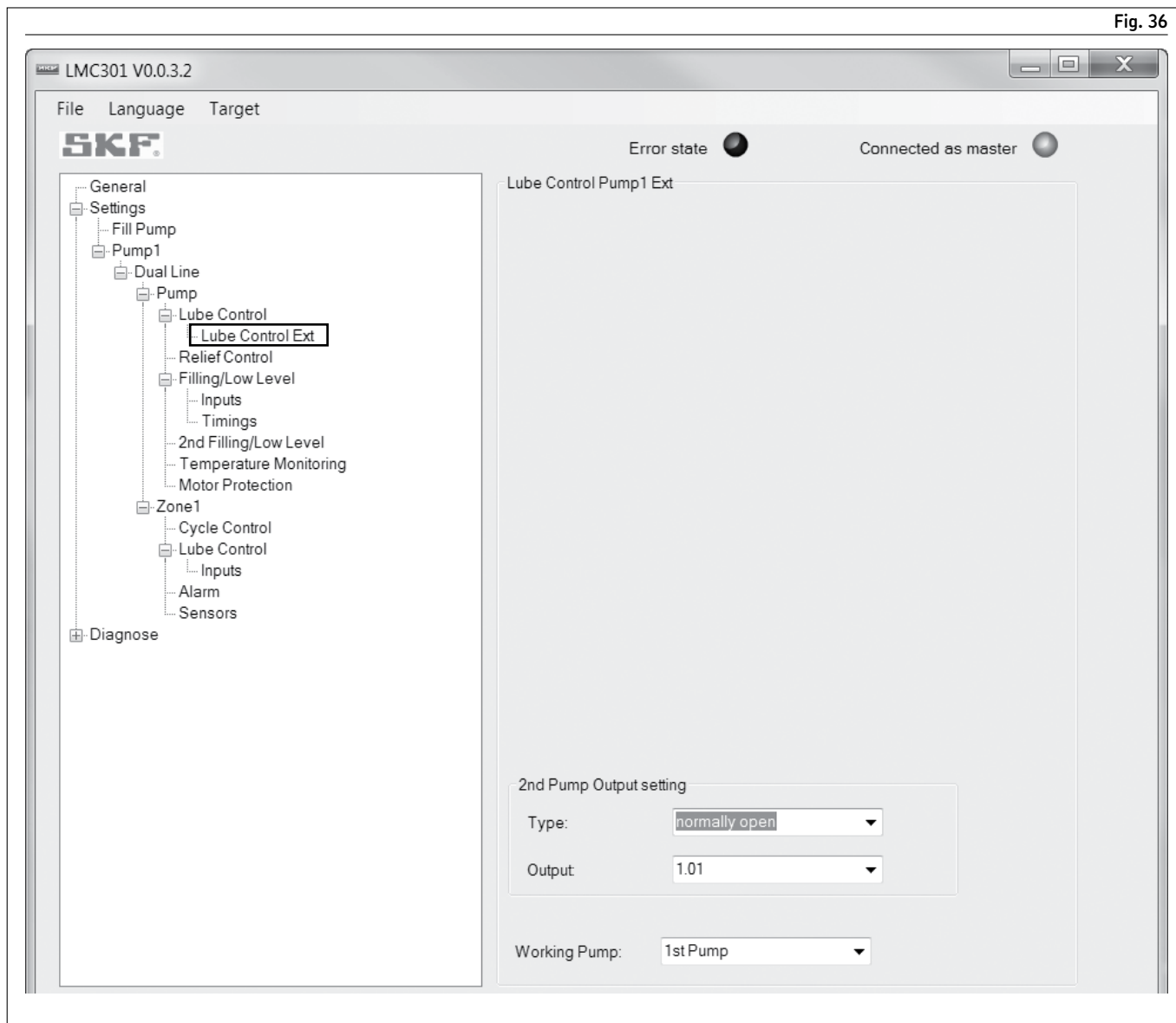
Max value uses pump pressure transducer to limit system pressure only. If max is met or exceeded, controller will pause pump operation to let pressure dissipate into system. Pump operation will resume once pressure has fallen to acceptable level at pump.

Sensor Input assigns available I/O port for sensor.

Output Pump configures pump output relay.

Remote Manual Lube assigns input that will allow manual lube cycles when activated by system switch.

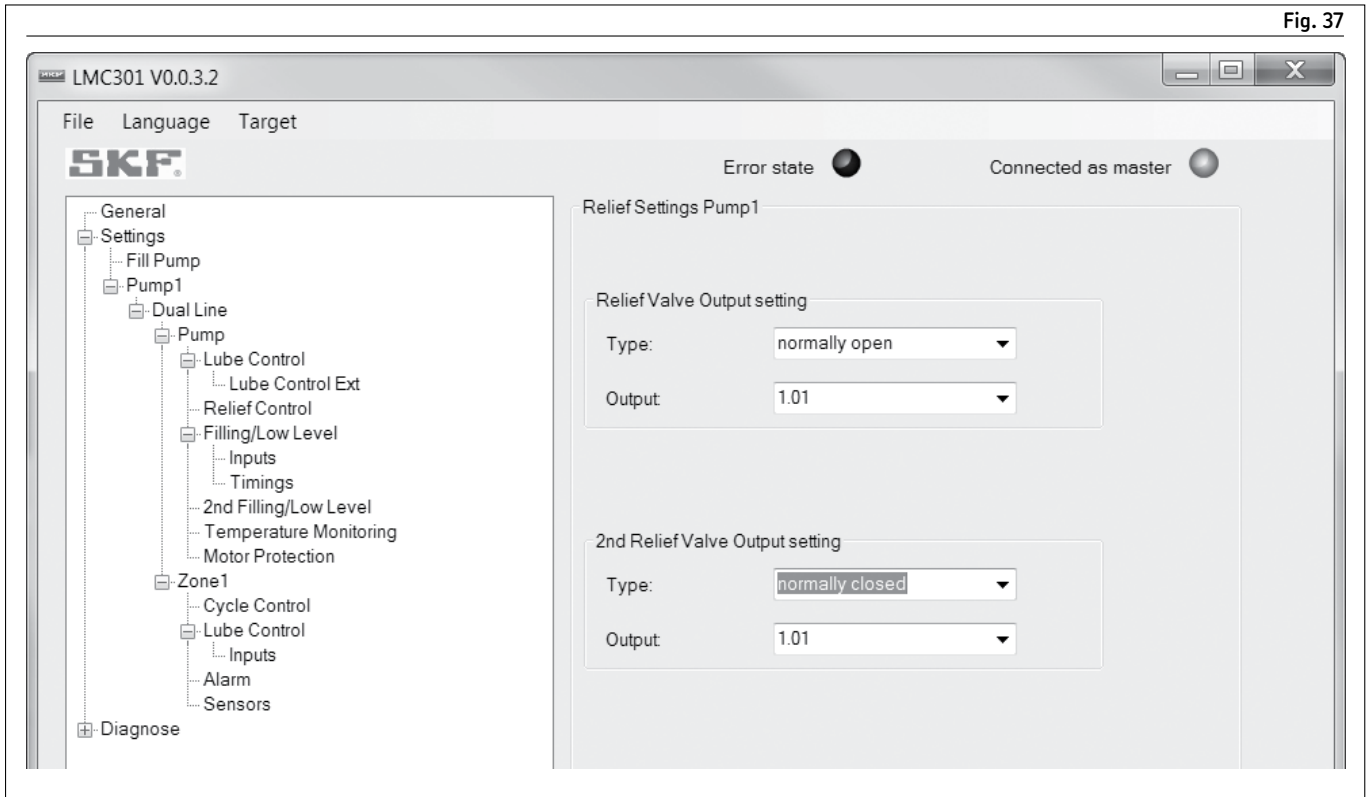
Fig. 36



Dual Line → Lube Control → Lube Control Ext

Pump 2nd Output functions as standby system if working pump has error.

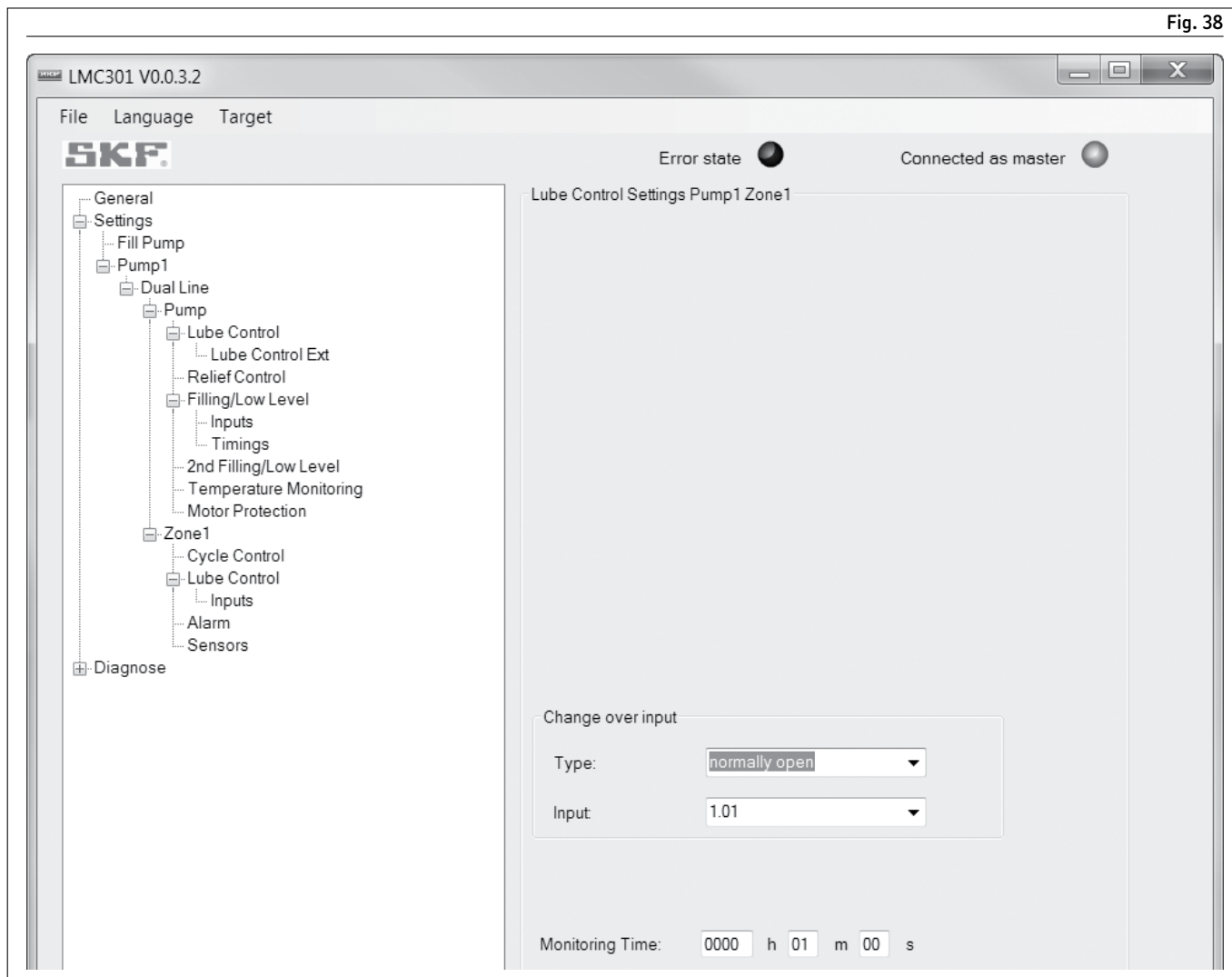
Working Pump allows for choice of second standby pump.



Dual Line → Pump → Relief Control

Relief Valve Output configures relief valve for pump 1.

2nd Relief Valve Output configures relief valve for pump 2. If main and reserve pump is available, relief valve must switch relief pipe to pump that is in operation.

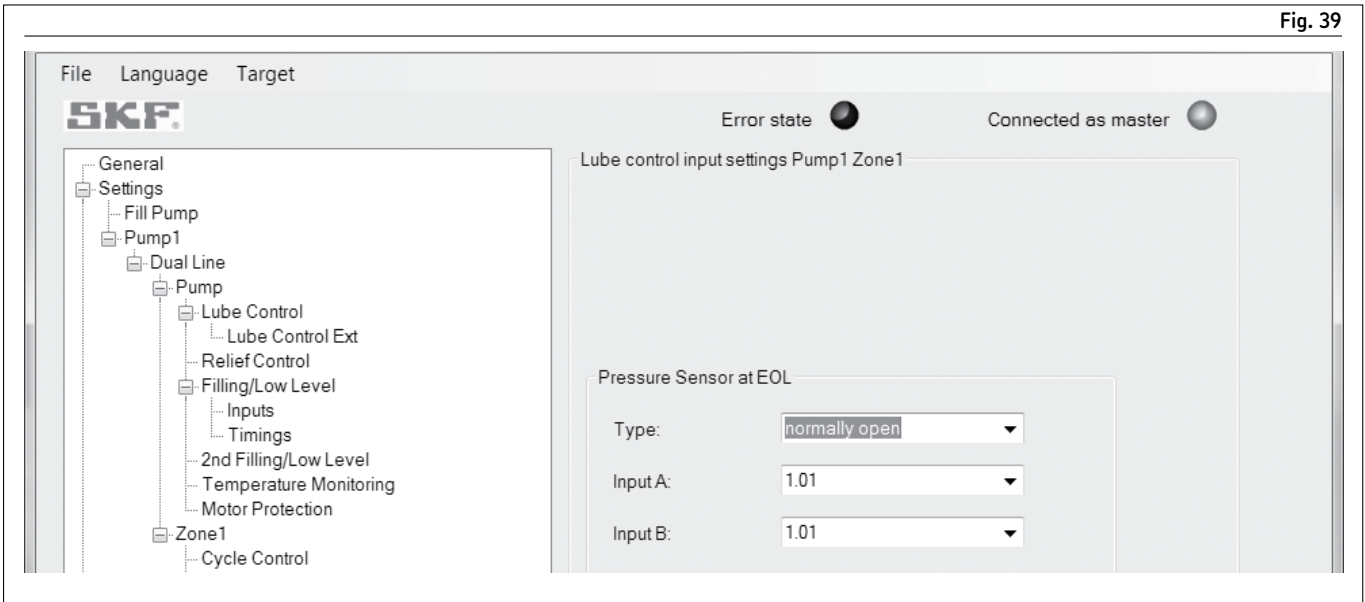


Dual Line → Zone → Lube Control

Change over input communicates to controller change over has occurred.

Monitoring Time displays amount of time that switch has to activate or will show error.

Fig. 39



Dual Line → Zone → Lube Control → Inputs

Pressure switches determines settings for zone depending on selected valves. Each pipe in dual line system needs pressure switch or pressure transducer.

Pressure sensor at EOL Type configures pressure switch of sensor specifically for zone.

Pressure sensor at EOL Input assigns available I/O port for sensor. Various PSI settings assign sensor values.

If pressure sensor is available, must define minimum and maximum absolute and different pressure. System will learn optimum settings in **Adaptive Mode**.

Fig. 40

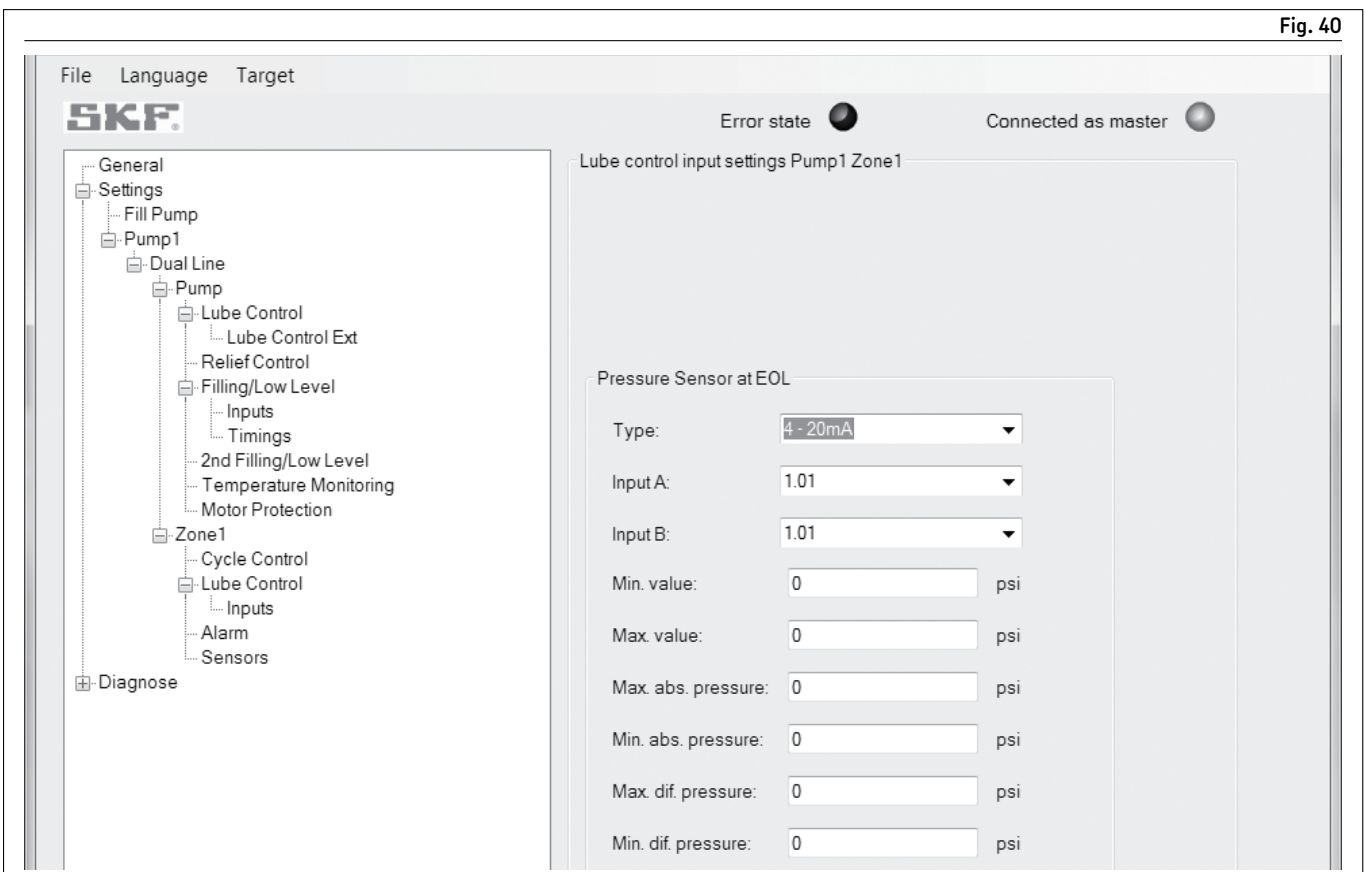
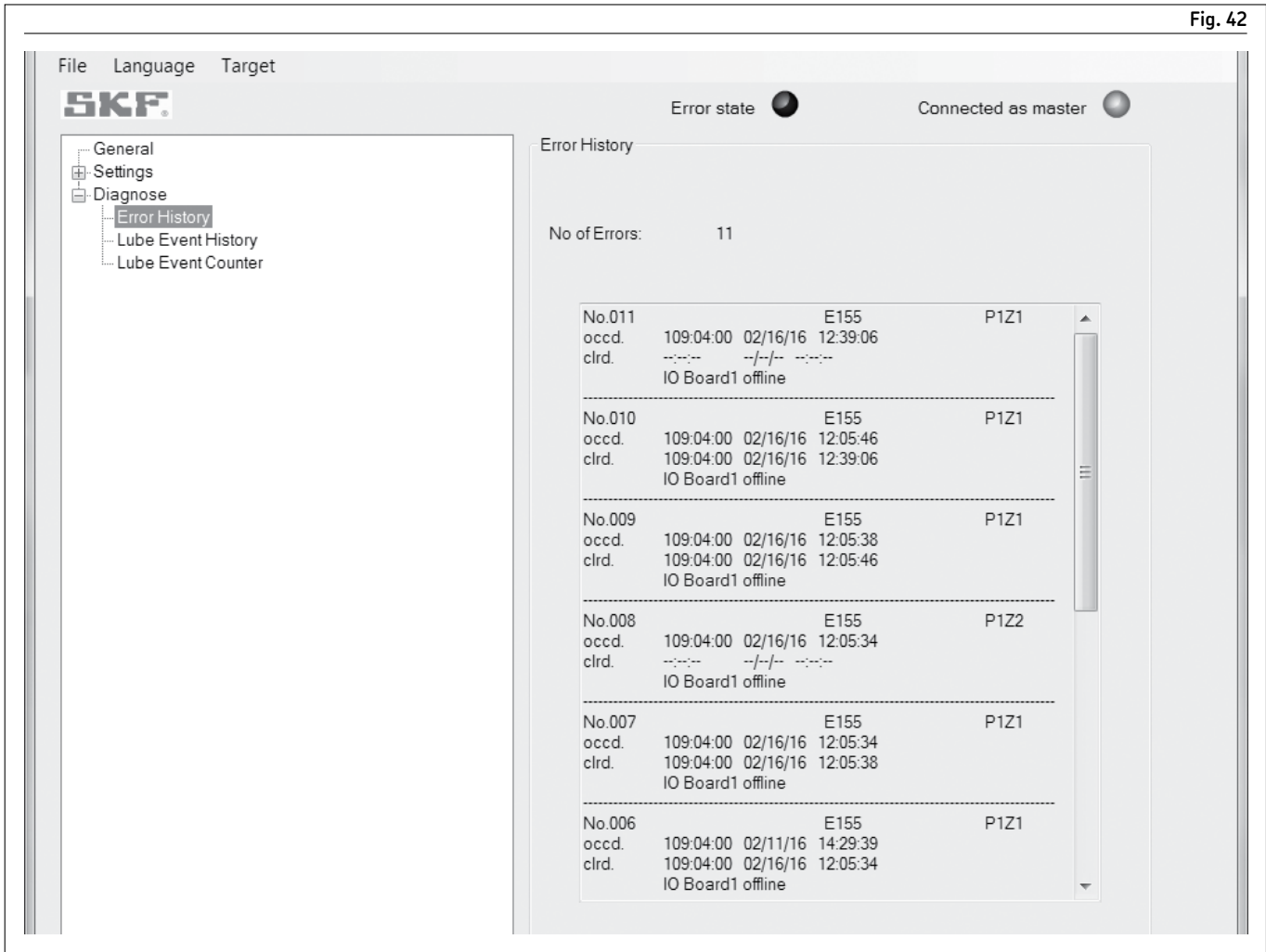


Fig. 42



Diagnose → Error History

Error History

No of Errors displays total number of errors logged.

Error log display displays line item information on logged errors.

Diagnose → Lube Event History

Lube Event History

Lube Events displays total number of lube events in record.

Lube events display displays line item information on lube events.

Fig. 41

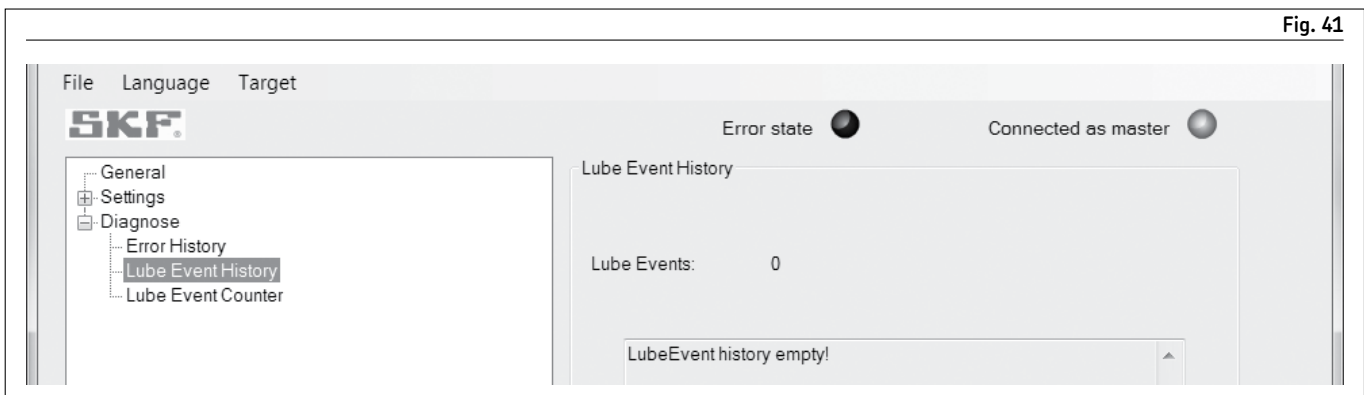
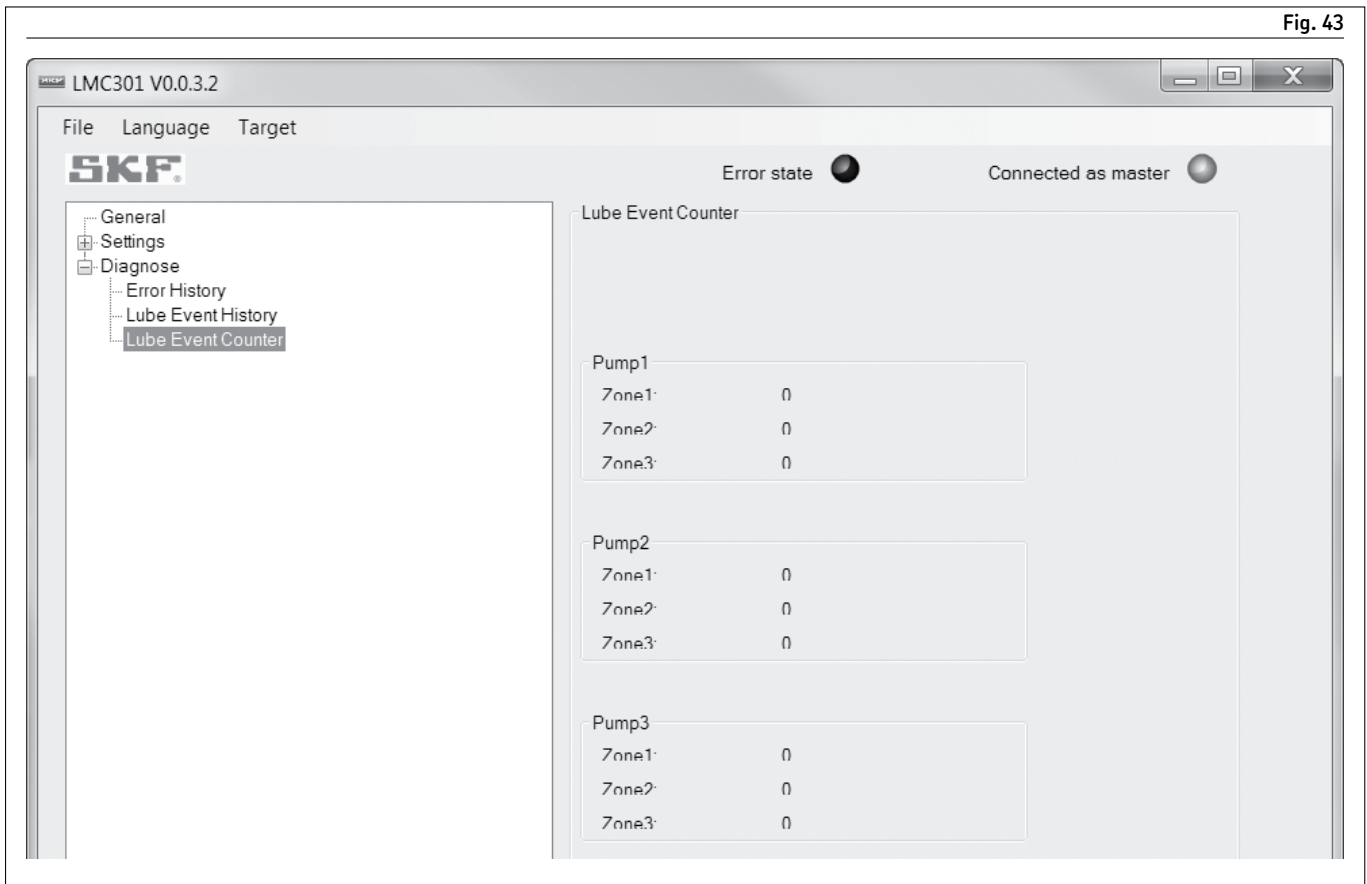


Fig. 43



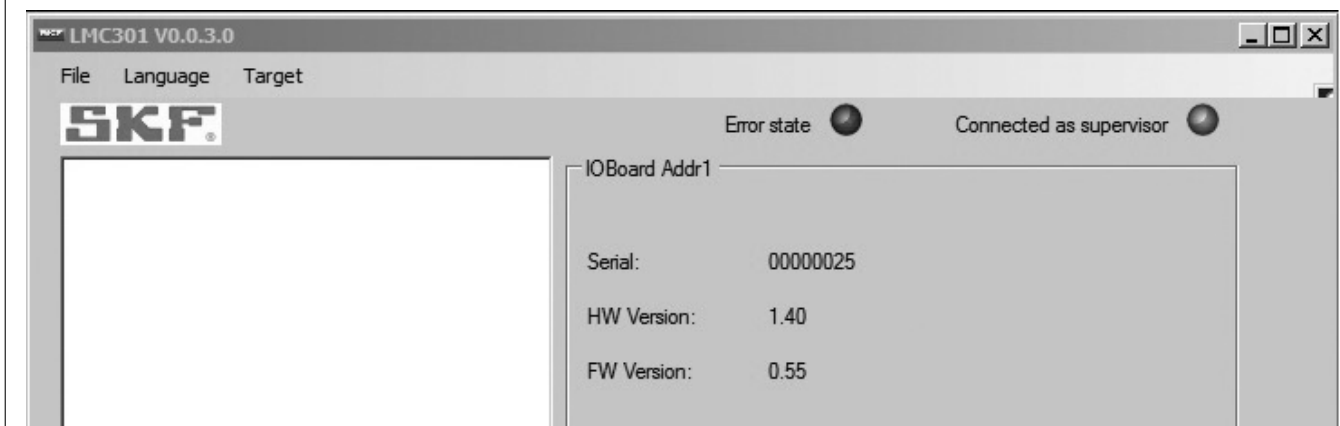
Diagnose → Lube Event Counter

Lube Event Counter

Pump/Zone displays total number of lube events by pump and zone since last memory clear.

Network displays total number of lube events by pump and zone since last memory clear.

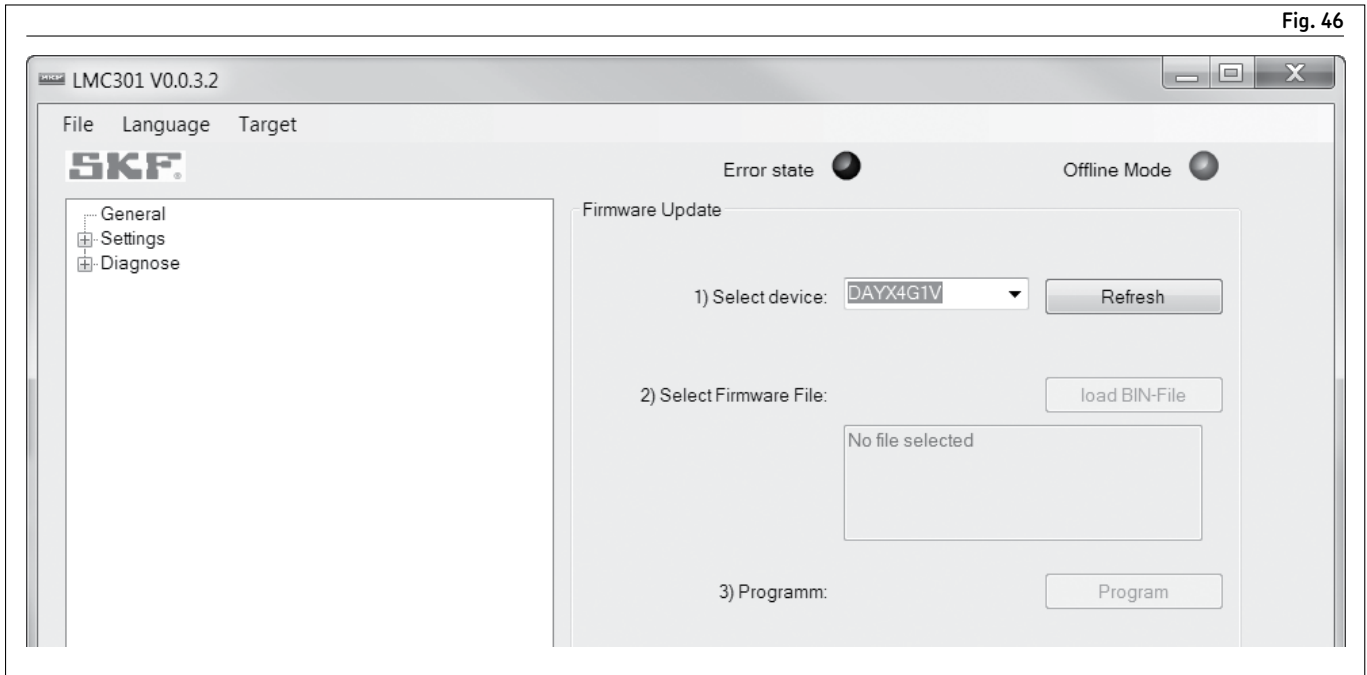
Fig. 44



Network → IO Board AddrX

IO Board Addr X displays serial number, hardware revision and firmware revision of selected I/O Board.

Fig. 46



Firmware update

- 1 Save device backup configuration to file by selecting **File>Save**.
- 2 Reload configuration saved prior to beginning procedure **File>Open**.
- 3 Send configuration to controller **Target**

Firmware update window indicates update procedure is working properly.

NOTE

Do not interrupt update procedure before completion.

NOTE

Firmware update can only be run while system is in **disconnect** mode.

Select device displays all controllers connected to computer. Only one can be updated at a time.

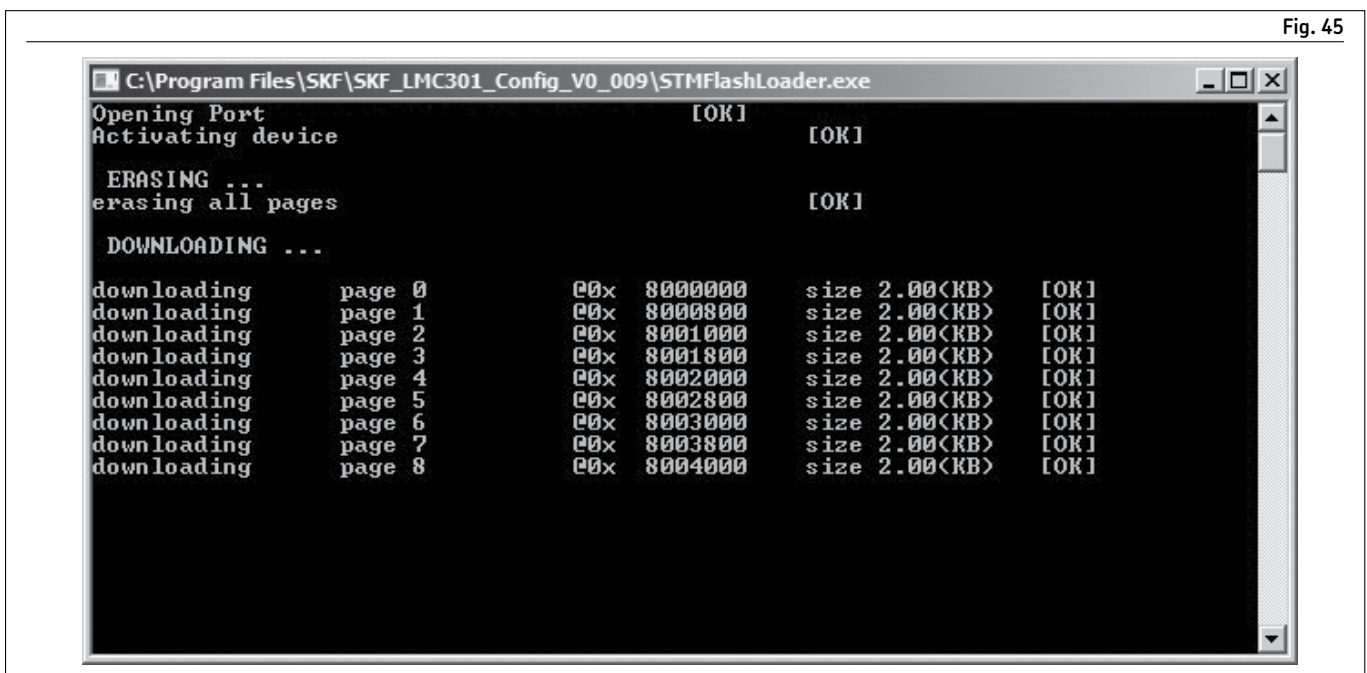
Refresh updates list of connected controllers.

Select Firmware File displays selected firmware file.

Load BIN-File opens Windows Explorer so that proper software file can be chosen.

Programm executes update procedure. Reset controller power when update is complete.

Fig. 45



Warranty

The instructions do not contain any information on the warranty.

This can be found in the General Conditions of Sales, available at:

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