Quick Reference for Endusers

BurnerTronic BT300

Sensors and Systems for Combustion Engineering

LAMTEC
www.lamtec.de

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1 General Information

1.1 Validity of these Instructions

This manual is valid for the burner control system BurnerTronic BT300 in any configuration.

The information contained in this document refer to the software versions BT300 v3.5 and UI300 v3.8. If you use any other software version as mentioned previously some of the described functions may not be available or not all available functions work as described in this document.

1.2 Life Cycle

BurnerTronic BT300 burner management system has a designed lifetime * of 250,000 burner start-up cycles, which, under normal operating conditions in heating mode, correspond to approx. 10 years of usage (starting from the production date given on the type plate).

This lifetime is based on the endurance tests specified in standard EN230/EN298 and the table containing the relevant test documentation as published by the European Association of Component Manufacturers (Afecor) (www.afecor.org).

The designed lifetime is based on use of BT300 according to the manufacturer's basic documentation. After reaching designed lifetime in terms of number of burner start-up cycles, or the respective time of usage, the BT300 must be replaced by authorized personnel.

1.3 Disposal Notes

The device contains electrical and electronic components and must not be disposed of as domestic waste. The local and currently valid legislation absolutely must be observed.

* The designed lifetime is not the warranty time specified in the Terms of Delivery

2 Safety

2.1 Safety Instructions - Common Information

The following symbols are used in this document to draw the user's attention to important safety information. They are located at points where the information is required. It is essential that the safety information is observed and followed, and that applies particularly to the warnings.

DANGER!

This draws the user's attention to imminent danger. If it is not avoided, it will result in death or very serious injury. The plant including its surroundings could be damaged.

WARNING!

This draws the user's attention to the possibility of imminent danger. If it is not avoided, it may result in death or very serious injury. The plant including its surroundings could be damaged.

CAUTION!

This draws the user's attention to the possibility of imminent danger. If it is not avoided, it may result in minor injuries. The plant including its surroundings could be damaged.

NOTICE

This draws the user's attention to important additional information about the system or system components and offers further tips.

The safety information described above is incorporated into the instructions.

Thus, the operator is requested to:

1 Comply with the accident prevention regulations whenever work is being carried out.

2 Do everything possible within his control to prevent personal injury and damage to property.

3 For Your Safety

Please observe the safety instructions to avoid personal injury and damage to property and the environment!

The BT300 is a safety device! The device must not be opened, interfered with or modified. LAMTEC assumes no liability for damages arising as a result of unauthorised interference!

- After commissioning and after each maintenance action check the exhaust gas values across the entire power range.
- Qualified specialist staff are required to carry out all activities (assembly, installation, servicing, etc.).
- The burner or boiler manufacturer will ensure that the BT300 base unit is compliant with protection class IP40 or IP54 for outdoor use in accordance with DIN EN 60 529.
- The hazard risk in the event of external fire, traffic, wind, tidal waves and earthquakes depends on the installation situation and the location of the gas appliance. It shall be assessed separately where appropriate.
- Before working in the connection area, switch off the power supply to the plant from all poles. Ensure that it cannot be switched back on and that the plant is voltage-free. There is a risk of electric shock when the plant is not switched off.
- Place and secure the protection against contact on the BT300 and on all connected electrical parts. The cover must fulfil the design, stability and protection requirements of EN 60730.
- Plug connectors X30 - X34 have no protective separation from the mains voltage. To replace or disconnect the plug connectors, all poles of the plant must be disconnected from the mains.
- After each activity (e.g. assembly, installation, servicing, etc.) check wiring and parameters to make sure it is in good working condition.
- If the equipment is dropped or suffers impact, you should no longer commission it. The safety functions may also be impaired but fail to show any obvious external damage.
- When the ratio curves are being programmed, the adjuster will continually monitor the quality of the plant's combustion (e.g. using an exhaust gas analysis station). In the event that the combustion values are inadequate or the conditions are potentially harmful, the adjuster will take suitable action, e.g. switch off the system manually.
- These operating instructions describe many possible applications and functions and should be used as guidelines. Carry out functional tests on the test bench and/or in the plant application to ensure correct functioning and document the results.

Follow additional instructions to guarantee safety and reliability while operating the BT300:

- Condensation and humidity are to be avoided. If necessary, make sure that the installation is sufficiently dry before you switch it on.
- Avoid static charge having a destructive effect in case of touching the device's electronic components.

NOTICE

LAMTEC recommends that you use ESD equipment while working on electrics/electronics.

3 For Your Safety

3.1 Mounting Notes

- Please consider protection against contact when installing the Gerät. Protection classes as IP 40 - IP 54 are minimum requirements for outdoor use in accordance with EN 60529 and therefore obligatory.
- The protective cover of the BurnerTronic may only be opened by trained, qualified personnel.
- Make sure that settings for safety-relevant parameters are set in line with the requirements applicable to each type of combustion requiring monitoring and conform to the applicable standards (by checking device parameters via operating elements or using remote-control software after commissioning). To verify settings you should also refer to manufacturer's documentation of the combustion plant. Protecting the parameters in level 1 by setting a password will prevent any unauthorised change.
- Save setting values for the actuating elements across the power range of the burner as follows:
  - Quantity of fuel
  - Quantity of air
  - All additional, safety-relevant actuating variables of the combustion
  - While burner is modulating with at least five different firing-rate points
- Make sure that the combustion equipment operates stably and safely throughout the power range and in all combustion modes. For this purpose you should adjust the following values correctly:
  - Actuating elements
  - Parameter settings of the CO/O_2 controller
  - Combustion chamber pressure
  - Fuel pressure
  - Temperature
  - Pressure of combustion air
  - Heating value of fuel
- Ensure the connection between the actuators and control valves is form-fit throughout, gearing this towards the maximum controlling torques of the actuators.
- Only use external flame monitors compliant with DIN EN 298 or DIN EN 230 and authorised for continuous operation. Safety time of flame monitor must not extend 1 s.
- If the valve testing system is activated, connect the supply-side solenoid valve to terminal X01 and the burner-side solenoid valve to terminal X02. Connect the pressure monitor of the valve testing system to terminal X05. Adjust the gas pressure monitor and the dimensions of the test section in order to make sure that the valve testing system is detecting a maximum leakage gas volume of 0.1 % in relation to the gas flow rate (minimum 50 dm^3/h) at maximum combustion heat output.
- Consider the potential danger depending on installation situation and position where thepressure equipment is being installed. Bear in mind the risk of external fire and the impact from traffic, wind and earthquake.
- When fixing duomodul plug-in connectors to insulation displacement technology (IDT) use HZ-M35 a modular crimping tool from Lumberg (see www.lumberg.com).

3.2 Security Advice - Mounting

- Compliance with national safety regulations and standards is obligatory at all times.
- During the assembly and installation process, you must meet the standard requirements of DIN VDE 0100, 0550 and DIN VDE 0722
- To mount the BT300 basic unit, use screw fittings with an M4 thread (UNC32) and a maximum tightening torque of 1.8 Nm for fastening all four fixing points. Keep in mind that housings have improved mechanical stability when connected on surrounding contact surfaces.
  Generally connect to an even mounting surface.

NOTICE

Deterioration of the 0.8 Nm servomotor through opening.

Opening the servomotor in a different position other than the cap of the electrical connection, destroys the servomotor.
The warranty expires.

▶ Open the servomotor at the cap of the electrical connection only.

NOTICE

Damaging the servomotors with 1.2 Nm and 9.0 Nm through opening.

Opening the servomotor destroys the servomotor.
The warranty expires.

3.3 Installation Notes

- Lay high-voltage ignition cable always separately and in safe distance from device and other cables.
- Only trained, qualified personnel may open the BurnerTronic's cover.
- Observe local and national regulations when wiring the electric cables inside the burner.
- Tighten the screw terminals of the BT300 using a tightening torque of > 0.5 Nm.
- Supply the feed cable with L, N and PE only. The N neutral conductor must not have potential difference to the PE protective conductor.
- The pre-fuse for the BT300 should be max.10 A slow-blow.
- Phase, neutral and central point conductors must not be interchanged (this would lead to dangerous malfunctioning, loss of protection against contact, etc.).
- The strain relief for the connected cables must comply with standards (e.g. DIN EN 60730 and DIN EN 60335).
- Make sure that no spliced strands can come into contact with any of the adjacent connections. Use appropriate end sleeves.
- The burner manufacturer is obligated to supply unused connections on the BT300 with dummy plugs.
- To replace or disconnect the plug connectors, all poles of the plant must be disconnected from the mains.
- Make a form-fit connection between the actuators and actuating elements for fuel and combustion air, as well as a form-fit connection for any additional actuator element.
- Optional components with safety extra low voltage (SELV) must be safely separated from the mains. Otherwise this can cause an electrical shock or damage the device due to a short-circuit.
- You may connect only passive devices or devices without feedback effects at the 230V outputs of the BT300 (like relays without additional voltage connection). In case of error it must be guaranteed that BT300 is not fed with 230 V by this terminals.
- To avoid disruption of the UI300's display during ignition, a damping resistor of 1 ... 5 kΩ must be installed in the high-voltage ignition line.
- To avoid disturbance on the Bus, the termination must be active on the first and the last device connected to the bus must be terminated.

3.4 Electrical Connection Flame Sensor

Interruptions and losses in signal transmission need to be minimised:

- Do not wire the sensor cable with other cables.
  Flame signal is reduced through line capacities. → Use a separate 7-pole cable.
- Consider the permitted length of sensor cables.
- The ionisation flame sensor supplied from the mains is not protected against contact. Protection against accidental contact is therefore obligatory.
- Ground the burner according to instructions – grounding the boiler itself is not sufficient!
- Position ignition electrode and ionisation flame sensor where spark cannot hit ionisation flame sensor (risk of electrical overloading).

3.5 Commissioning Notes

- Check all safety functions during commissioning!
- There is no feature to prevent RASTx connector plugs being transposed. Therefore ensure the correct assignment of the plant's plugs prior to commissioning.
- Check electromagnetic emissions specific to the application.
- While installing and commissioning the plant, the person in charge of the plant/heating technician needs to document the following:
  – Parameter set values
  – Setting values (e.g. curve progressions)
  – Values describing the fuel/air ratio control.

  This data can be printed using LSB remote software or alternatively being kept as a handwritten note.

  Retain this documentation and have it checked by the 'authority on the subject'.

⚠ WARNING!

For BT300 parameter settings which deviate from the application standards can be carried out in access level 2. For this reason, check whether the parameter settings are consistent with the corresponding application standards (e.g. EN 298, EN 230, EN 676, EN 267, etc.) or the respective plant has to be approved separately.

⚠ WARNING!

While unlocking the safety interlock chain in the mode 'BURNER OFF' BT300 **does not** lock the system. BT300 prevents a burner start-up until safety interlock chains are locked.

▶ In case your application needs an interlock of the plant while unlocking the safety interlock chain also in 'BURNER OFF' mode you must take suitable measures at the plant.

NOTICE

Should the safety times be changed, these changes must be documented on the devices

▶ Bring an additional sticker for the device.

▶ Note the changed safety times on this sticker.

▶ The details on this sticker must be clear for reading and non-smudge.

3.5.1 Fuel/Air Ratio Control

- Guarantee proper operation by ensuring adequate excess air.
  In order to do this, set the values for fuel and combustion air in such a way that
  – combustion chamber pressure
  – fuel pressure
  – temperature and pressure of the combustion air

  can ensure proper, stable operation through the entire range of burner firing rate until next periodic inspection.
- Pay attention to wear and tear of actuators and actuator elements.
- Measure characteristic values of combustion process to document proper operation.

3.5.2 Basic Device

Check the following items prior to commissioning:

- Valves must be assigned correctly to valve outputs on BT300.
- Correct setting of time parameters (especially safety and pre-purge times).
- Flame sensor functioning well in case of:
  - flame blow-off during operation (incl. flame-out response time)
  - ambient light is present during pre-purge period
  - at a missing flame formation while end of safety period starts
- Activation of the valve leakage control function of gas valves and correct leakage measurement, when required by an application.

3.6 Tasks fulfilled by "authority on the subject" during Approval Test

By specifying the assigned DIN registration number and product ID number the manufacturer confirms that model BT300 burner control system is consistent with type-tested system.

The connection between actuators and actuator elements for fuel and combustion air and also to any additional actuator elements used must be form-fit.

3.6.1 Checking for Correct Parameter Setting in System

While installing and commissioning the plant the person in charge of the plant/heating technician needs to document the following:

- Parameter set values
- Setting values (e.g. curve progressions)
- Values describing fuel/air ratio control.

This data can be printed using LSB Remote Software or alternatively being kept as a handwritten note.

Retain this documentation and have it checked by the ’authority on the subject’.

NOTICE

For BT300 parameter settings which deviate from application standards can be carried out in access level 2. For this reason, check whether the parameter settings are consistent with the corresponding application standards (e.g. EN 676, EN 267, etc.) or the respective plant has to be approved separately.

3.6.2 Checking the Fuel/Air Ratio Control System

Save setting values (curve parameters) for actuator elements, fuel and combustion air through the complete range of burner firing rate in sufficient number.

Select setting values of fuel and combustion air considering combustion chamber pressure, fuel pressure, temperature and pressure of the combustion air in order to guarantee proper operation with adequate excess air through the entire range of burner firing rate.

The burner/boiler manufacturer has to document this by measuring reference values of the combustion process.

3.6.3 Checking Burner Sequencer Part

Check the following:

- Correct setting of time parameters (especially safety and pre-purge periods).
- Whether an ionisation or approved self-checking flame sensor is used as only these types allow continuous operation.
- Functioning of flame sensor
  - in case of flame blow-off during operation
  - parasitic light being present during pre-purge period
  - missing flame formation at the end of the safety-period
- Check the performance of all available and/or essential incoming signals, such as:
  - Air pressure switch
  - Gas pressure - min./oil pressure - min.
  - Safety interlock chain (e.g. STB)
- Activated leakage control function for gas valves if required for application purposes.
  - If necessary, ensure a correct leakage quantification.

4 Functional Description

BT300 combines the benefits of an electronic fuel/air ratio control system with up to three motorised actuator elements and optional modules like an analogue output for speed control of the combustion air fan with an electronic burner control unit. The leakage test, flame monitoring system, power control unit and (optional) CO/O_2 controller for control and optimisation of an oil or gas-fired forced-draught burner are all integrated.

BT300 is suitable for virtually all combustion plants. Safety interlock chains, monitors (e.g. gas and air pressure) and sensors are wired directly to the BT300. This greatly reduces the cost of additional relays and wiring. The BT300 is designed to be attached to the burner. The short wiring paths also save money. As a result, BT300 is particularly suitable as standard equipment for monoblock burners.

The compact design of BT300 burner control system also has its advantages during commissioning. Standardisation of wiring and operator interface minimises sources of errors right from the start. Moreover, intelligent display information is making search for errors much easier.

The BT300 is available in five designs:

- BT320
  - 2 motorised control outputs
  - 1 continuous output 0 ... 10 V, 0/4 ... 20 mA for speed control of the combustion air fan using VSM100 (optional)
  - intermittent operation
- BT330
  - 3 motorised control outputs
  - 1 continuous output 0 ... 10 V, 0/4 ... 20 mA for speed control of the combustion air fan using VSM100 (optional)
  - Approved for continuous operation only in combination with flame sensors capable of running continuously
- BT331 Same range of functions as BT330 but including following certificates:
  - DIN EN 61508:2002 parts 1-7 for SIL 3
  - Performance Level PLE according DIN EN ISO 13849-1
- BT340
  - 3 motorised control outputs
  - Oil-gas dual-fuel operation via DFM300
  - 1 continuous output 0 ... 10 V, 0/4 ... 20 mA for speed control of the combustion air fan using VSM100 (optional)
  - approved for continuous operation only in combination with flame sensors capable of running continuously
- BT341 Same range of functions as BT340 but also including following certificates:
  - DIN EN 61508:2002 parts 1-7 for SIL 3
  - Performance Level PLE according DIN EN ISO 13849-1

Burner sequencer and fuel/air ratio control can be adjusted for a wide range of combustion conditions by setting parameters. The BT300 for oil and gas can be set to start with and without pilot burner. The integrated leakage test can be run before ignition or after shutting down the burner.

Starting without pre-purge using gas is available in accordance with EN676.

The setting of fuel/air ratio curves can be optimised using optional CO/O_2 control during operation. This helps to counteract conditions that interfere with combustion. This ensures a permanent burner operation at the greatest possible efficiency.

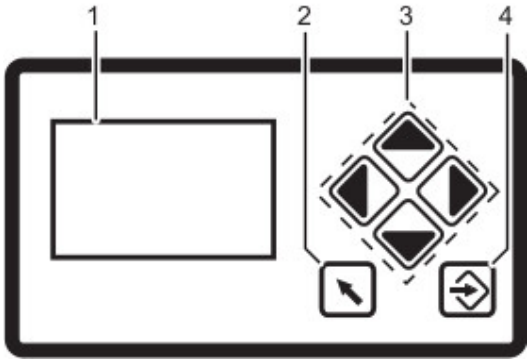
Operating and fault messages are displayed by symbols and numbers on UI300 User Interface. Plant-specific configurations and settings of fuel/air ratio control curves are operated via menu of UI300 User Interface.

An operating and start-up counter is integrated.

The optional LCM100 power control unit with two setpoints, external setpoint shift (control by atmospheric condition) and start-up control is also available.

5 Operating Control and Displays

5.1 UI300 User Interface



1 Display
2 BACK key
3 Cursor keys
4 ENTER key

Fig. 5-1 User interface

Display

The display shows in pictogram:

- the menu structure
- operating status
- parameters
- error messages

Back key

Back to previous window.

Cursor keys

To navigate in the menu using cursor keys

Use ’left’ and ’right’ keys to move step by step in a selected row. At the end of the selected row the cursor jumps down to the next row, if possible.

In a multiline menu use ’up’ and ’down’ keys to switch to other rows.

To display parameters, switch between various fields.

ENTER keys

Press ENTER to call up a menu on the start screen. Select a sub-menu in the menu window. Transfer setting values by pressing ENTER key in a parameter window.

Use a flushing, red ENTER key to release a fault interlocker.

If the ENTER key is permanently lit red, a fault with an automatic restart is displayed.

5.2 Menu Functions

The menu is divided into five paths:

 INFO

 MANUAL

 SETTINGS

 DATA PROCESSING (release level 1 is mandatory)

INFO

Select INFO path for information about the following:

- Burner
- Faults/Fault history
- Software version
- Display of check sums
- Serial number
- Actuator positions (current damper position for each channel)
- Digital inputs/outputs

MANUAL

Select MANUAL to:

- Start and stop burner by hand
- Adjust internal burner firing rate

SETTINGS

Select the SETTINGS path for getting information/make changes to:

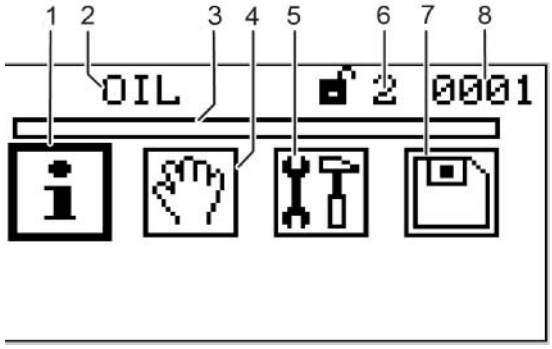
- Password
- Burner settings (display and settings)
- Actuator elements settings (display)
- Air/fuel control system
- Deletion of curve sets
- Display settings

DATA PROCESSING

Use DATA PROCESSING to:

- Read out datasets from the BT300
- To transfer datasets to the BT300

5.3 Main Menu



1 INFORMATION menu path [selected]
2 Display of fuel type
3 Bar graph of internal firing rate in % (0 - 100)
4 MANUAL menu path
5 SETTINGS menu path
6 Release level
7 DATA HANDLING menu path*
8 Window number

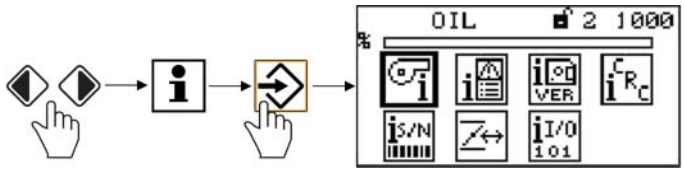
Fig. 5-2 Main menu

* Excess level 1 is mandatory

NOTICE

The parameters of release level 1 must be protected by a password against unauthorised changes. This password must differ to ’0000’.

5.4 Information Menu Path

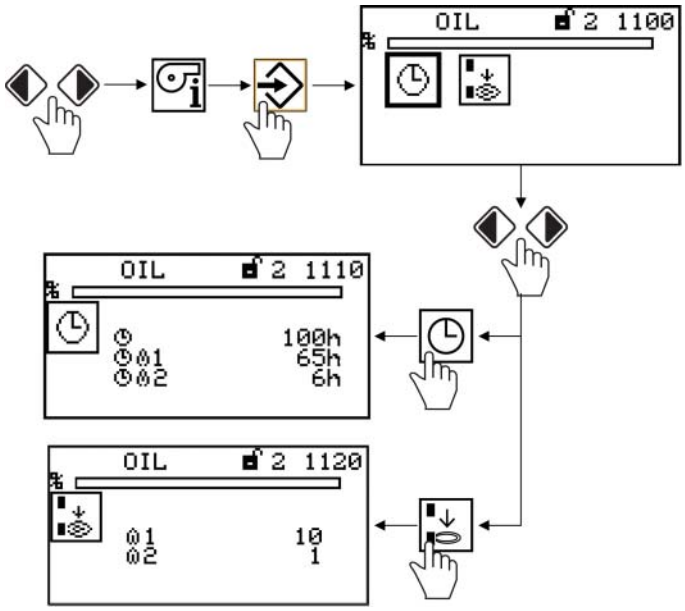


Burner information | Error history | Software version | Checksums

Serial number | Continuous output configuration (display only) | Digital inputs/outputs

5.4.1 Burner Details

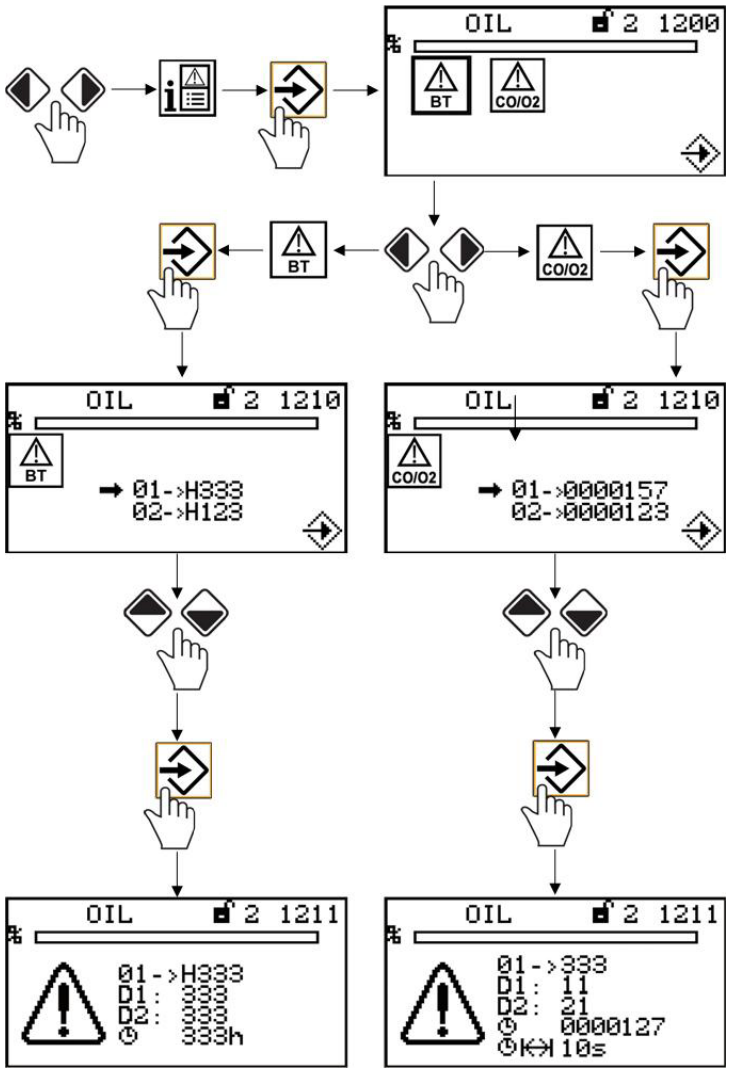
Displaying Operating Hours and Burner Starts



Display of operating hours		Number of operating hours in total (device connected with mains)
		Number of operating hours in oil operation
		Number of operating hours in gas operation
Display of burner starts		Number of burner starts in oil operation
		Number of burner starts in gas operation

5.4.2 Recalling Fault History

Displaying Burner Faults



01 02	Fault code (Last 10 faults are stored, no. 01 is the latest fault)		No. of operating hours when fault has occurred
D1	Diagnostic code 1		Duration of the fault
D2	Diagnostic code 2		

NOTICE

Information concerning fault and diagnostic codes can be found in the list of fault codes. For fault analysis a fault code and diagnostic code D1 or D2 is required.

Fault unlock

How to unlock BT300

✓ A fault is pending and the ENTER key is flashing.

1. Press ENTER key.
   BT300 is not locked anymore.

Changing from fault unlock to main menu:

✓ A fault is pending and the ENTER key is flashing

1. Press BACK key.
   ENTER key isn't flashing any more.
   The display returns to main menu.
   An error number is flashing in the display on top, left hand.

UI300 can be used as usual.

Back to fault unlock

✓ An error number is flashing in the display on top, left hand.

1. Use BACK key to switch back to main menu.
2. Press arrow-key left.
   ENTER key is flashing again.

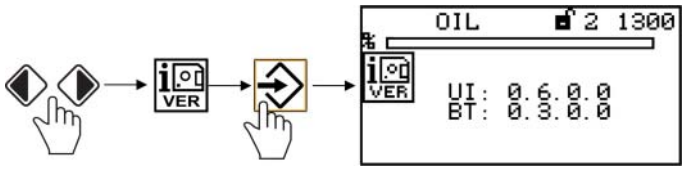
BT300 can be unlocked.

NOTICE

A permanent red light on the ENER key indicates gas shortage. A countdown is running to the next start. This countdown can be interrupted by the ENTER key.

5.4.3 Software Version

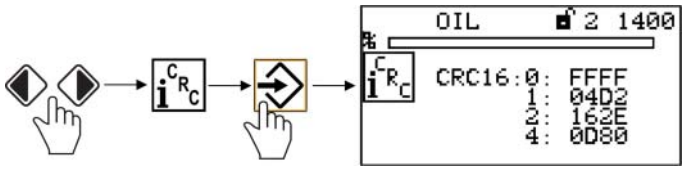
Display software version



UI = Software version UI300
BT = Software version BT300

5.4.4 Display of Check Sums

Displaying Check Sums

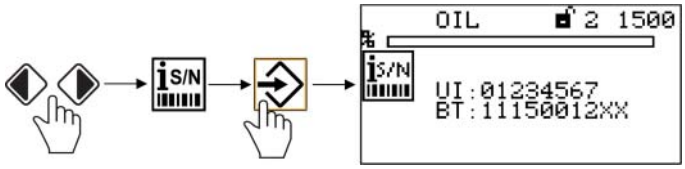


0 ... 4 = Check sum, access levels 0 ... 4

The checksums are generated from the device parameters. The BT300 calculates one checksum for the parameters of each access level (0, 1, 2 or 4). The UI300 indicates the checksums in hexadecimal code.

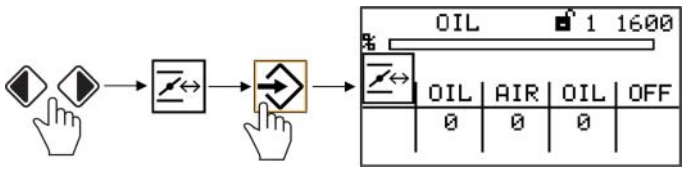
The checksum shows whether the value of one or more parameters have been changed.

5.4.5 Serial Number



UI = Serial numberUI300
BT = Serial number BT300

5.4.6 Positions of Actuators



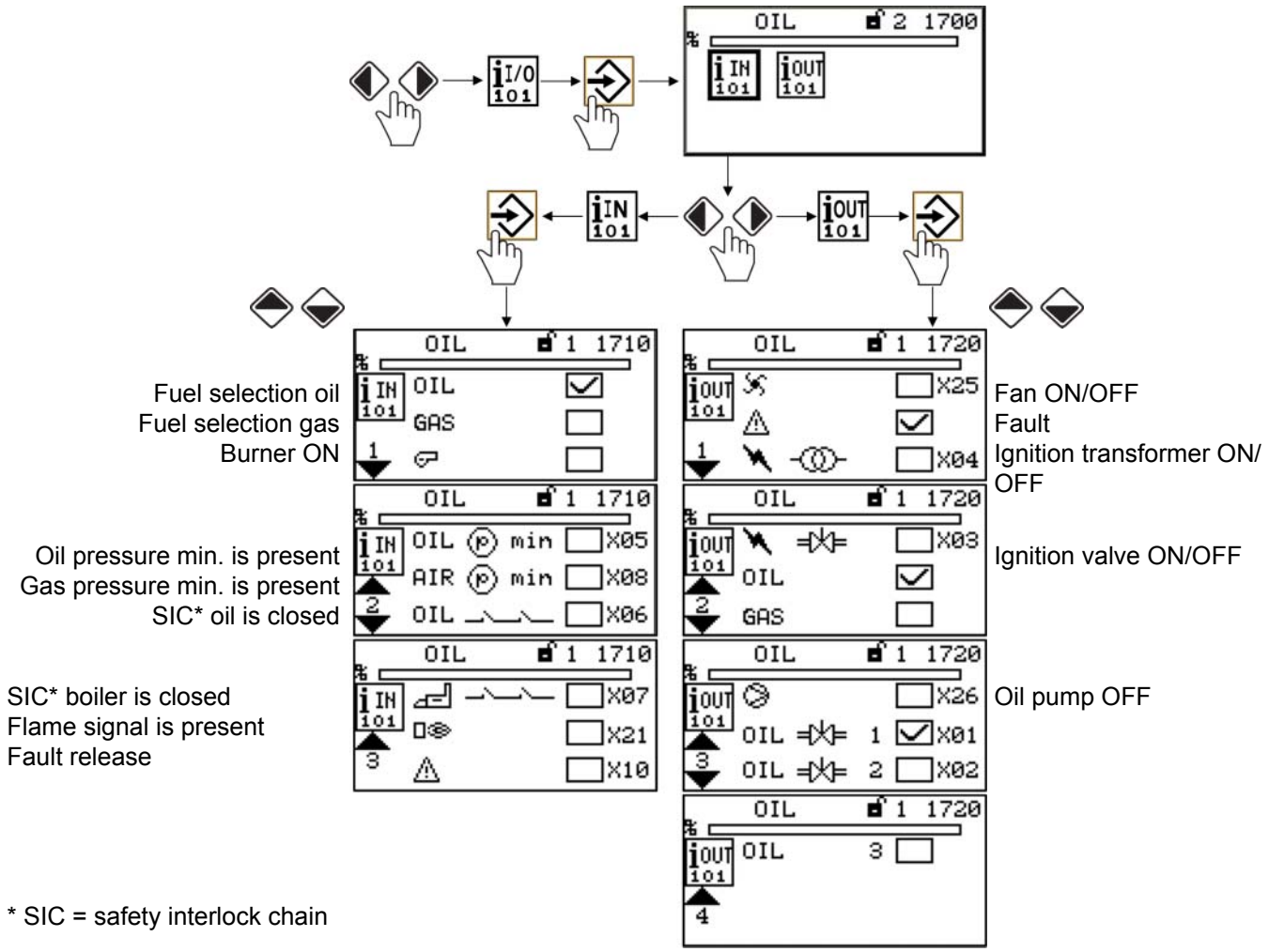
Indication of the channel's actual (left to right):
Channel 1 (oil)
Channel 2 (air)
Channel 3 (oil)
Optional channel (OFF; control of the frequency inverter)

NOTICE

The assignment of channels is depending on configuration settings!

5.4.7 Check Digital Inputs/Outputs

Check Digital Inputs and Outputs



NOTICE

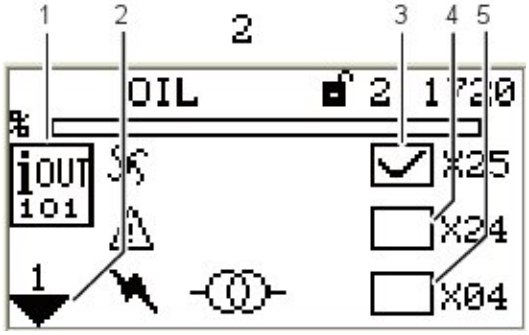
The signals 'Fuel selection oil' and 'Fuel selection gas' are logical and not physical signals.

Background: Some signals have more sources than one (terminals, LSB, field buses, parameters).

5.4.8 Digital Outputs

Check digital outputs

1. Use the cursor keys ◀ ▶ to select the menu iOUT 101 and press ENTER ↵ to confirm.
   The display shows 'Page 1 digital outputs' menu:

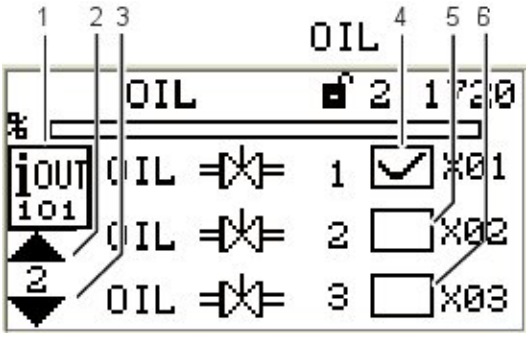


1 Digital outputs pictogram
2 Jump to next page
3 Fan [on] - terminal X25
4 Error [off] - terminal X24 (adjustable with P 809)
5 Ignition transformer [off] - terminal X04

Fig. 5-3 Page 1 digital outputs menu

Call up 2nd page of outputs

1. Use the cursor keys ◆ to select the next page and press ENTER ↵ to confirm.
   The display shows 'Page 2 digital outputs' menu:

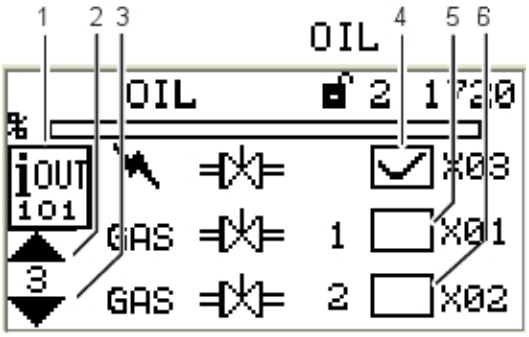


1 Digital outputs pictogram
2 Jump to previous page
3 Jump to next page
4 Oil valve 1 [on] - terminal X01
5 Oil valve 2 [off] - terminal X02
6 Oil valve 3 [off] - terminal X03

Fig. 5-4 Page 2 digital outputs menu

Call up 3rd page of outputs

1. Use the cursor keys ◆ to select the next page and press ENTER ↵ to confirm.
   The display shows 'Page 3 digital outputs' menu:

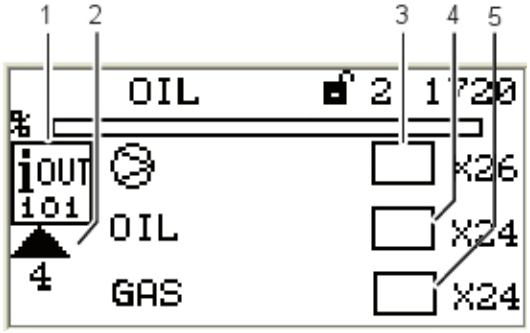


1 Digital outputs pictogram
2 Jump to previous page
3 Jump to next page
4 Ignition valve [on] - terminal X03
5 Gas valve 1 [off] - terminal X01
6 Gas valve 2 [off] - terminal X02

Fig. 5-5 Page 3 digital outputs menu

Call up 4th page of outputs

1. Use the cursor keys to select the next page and press ENTER to confirm.
   The display shows "Page 4 digital outputs" menu:



1 Digital outputs pictogram
2 Jump to previous page
3 Oil pump [off] - terminal X26
4 Fuel selection oil [off] - terminal X24 (adjustable with P 809)
5 Fuel selection gas [off] - terminal X24 (adjustable with P 809)

Fig. 5-6 Page 4 digital outputs menu

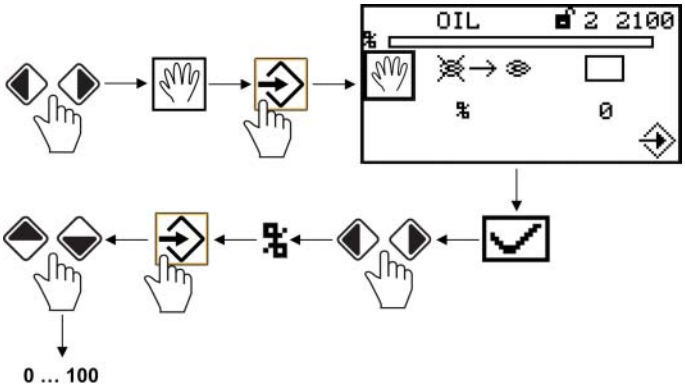
5.5 Manual Menu Path

MANUAL

Select MANUAL path to carry out actions as follows:

1 Switching burner ON and OFF

2 Presetting of burner firing rate



Start burner manually

Adjust burner firing rate

NOTICE

At least release level1 is required to start the burner.

The 'Burner ON' control loop does not need to be switched on to start the burner from this menu. The user interface assumes control in this menu.

If there is no 'Burner ON' signal from other sources (terminal X10.2) software switches off the burner when you exit the menu.

⚠ CAUTION!

If you carry out a manual start-up via display BT300 no longer responds to 'Burner ON' signal input at connector X10.2. Therefore that limiters, monitors and other similar safety functions must not be operated with this input!

NOTICE

Leaving of window will terminate manual burner operation!

Adjust burner firing rate

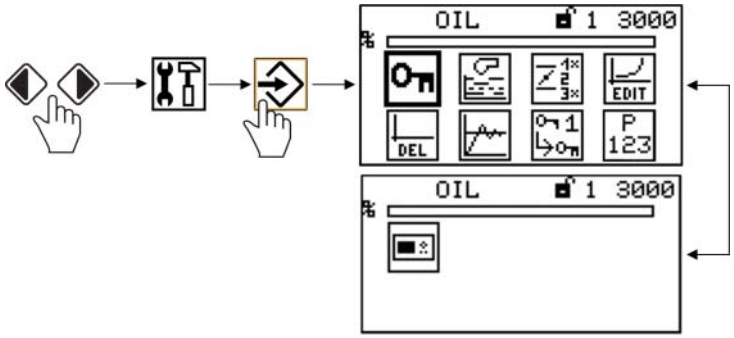
1. Use cursor keys to select adjustment of burner firing rate in % and press ENTER to confirm.
2. Change burner firing rate with the cursor keys and press ENTER to confirm.

NOTICE

Changes of burner firing rate are possible only while burner is running.

If you want to adjust burner firing rate remember to start-up the burner first.

5.6 Settings Menu Path



Password

Display settings for program sequence

Read configuration for continuous output

Configure curve

Delete curve

Configure controller

Configure password

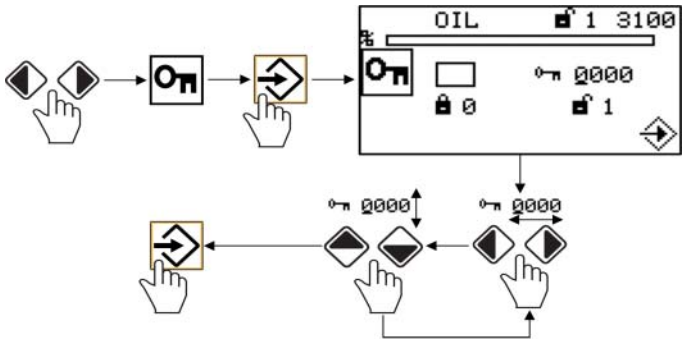
Configure parameters

Configure display

NOTICE

The level 1 parameters must be protected against unauthorised modification by setting a password different to "0000".

5.6.1 Enter Password

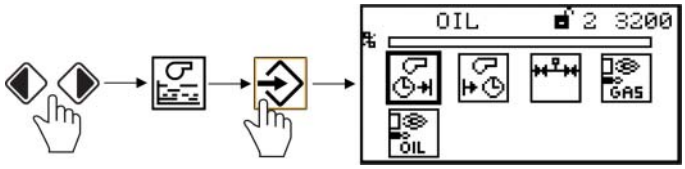


Reset access level

0000
1

Password entry

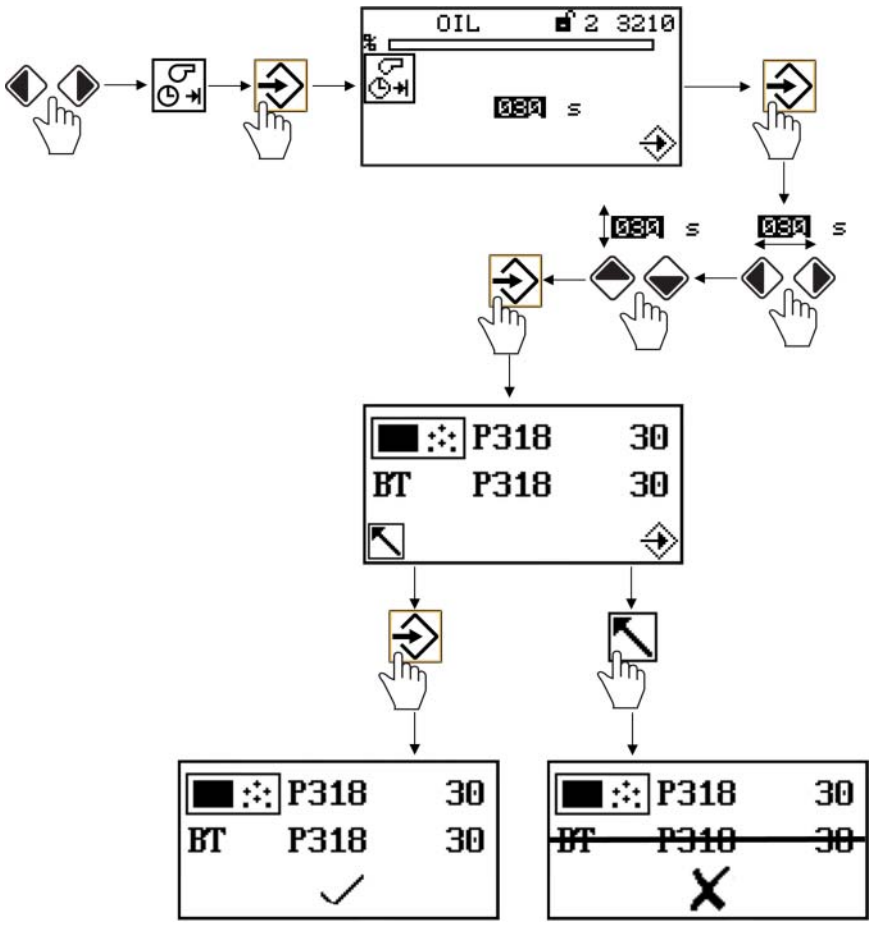
5.6.2 Program Sequence



Duration pre-purge period | Duration post purge period | valve leakage test

Pilot burner gas operation | Pilot burner oil operation

Set duration of pre-purge period



Parameter number UI

BT = Parameter number BT300

✔ Parameter modifications are transferred

✗ Parameter modifications are discarded

NOTICE

Both values are identical – Confirm with .

The values are different – Cancel with .

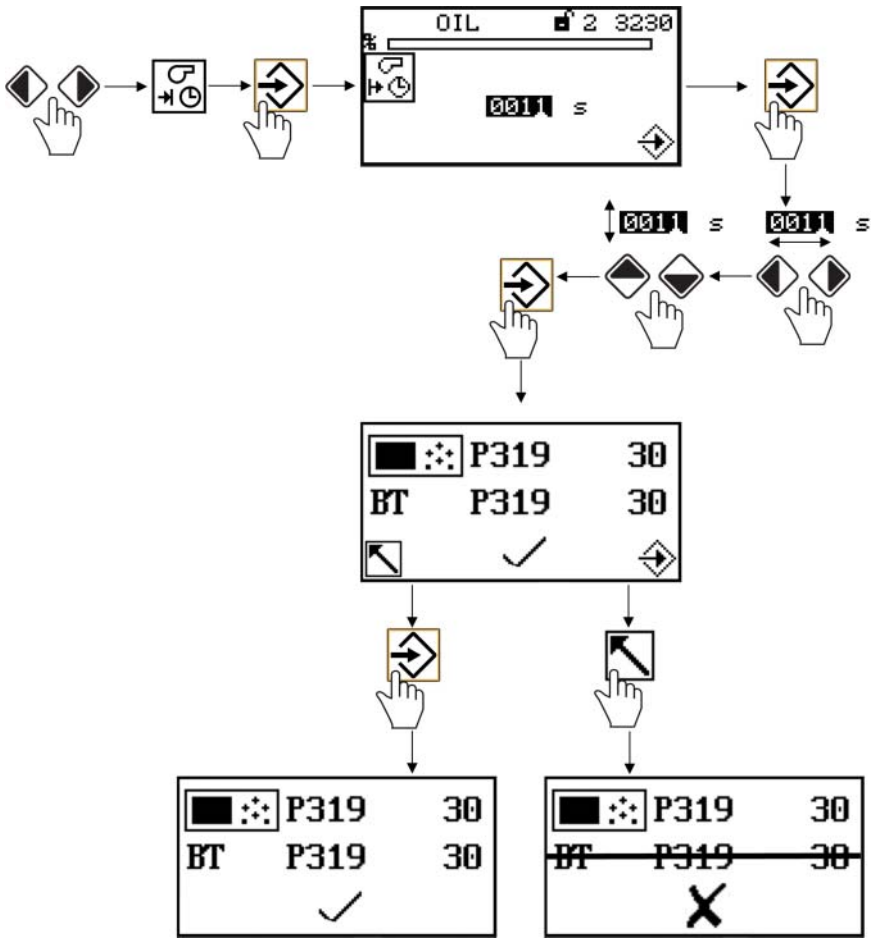
NOTICE

Pre-purge starts as soon as damper reaches pre-purge position and - if you use a VSM - the last but one point of fuel/air ratio curve is passed.

NOTICE

The second to last channel's position must be lower than the position of the last curve point.

Set duration of the post-purge

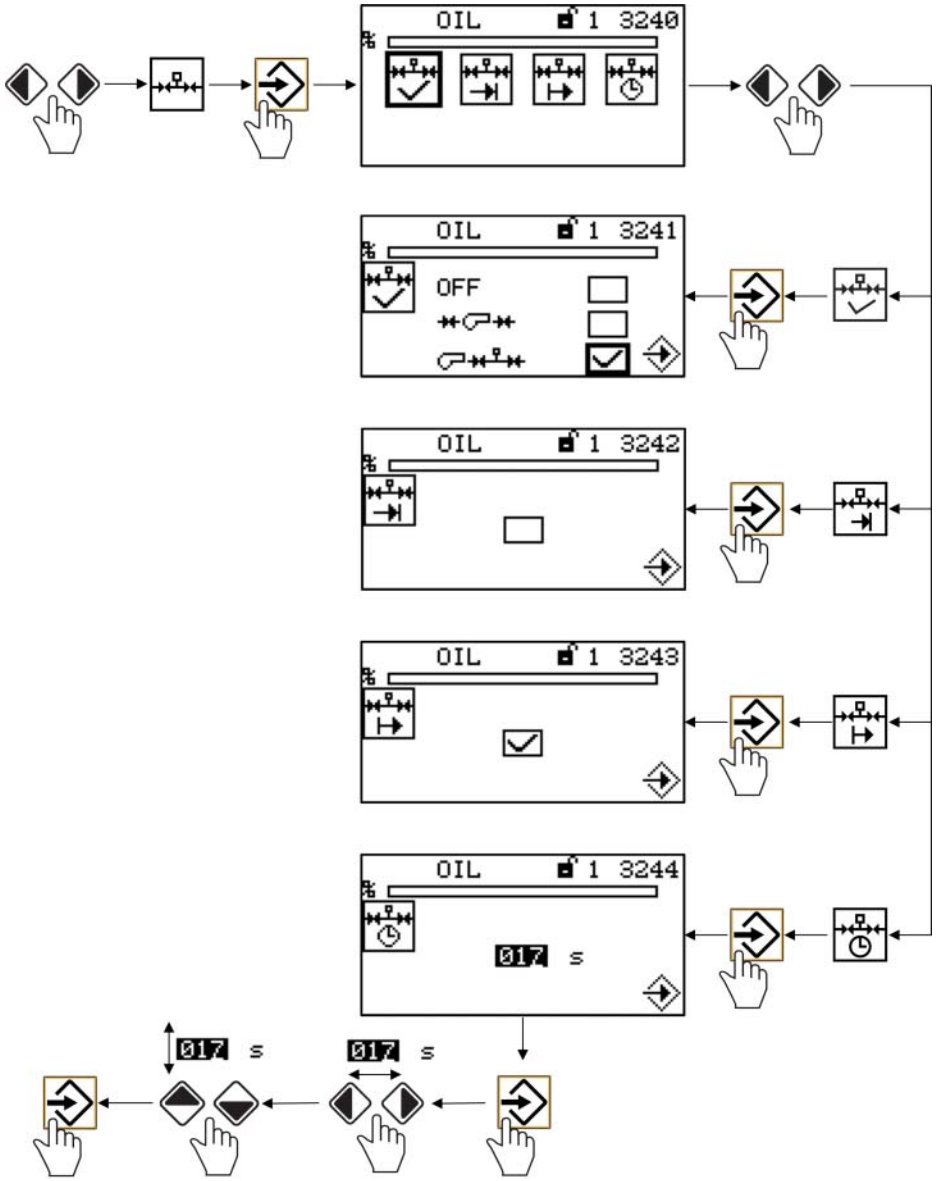


NOTICE

Both values are identical – Confirm with .

The values are different – Cancel with .

Valve Leakage Test



Valve leakage test ON/OFF P802

OFF P802 = 0 = Valve leakage test OFF

P802 = 1 = If valve leakage test before ignition is configured, the test runs during ignition.

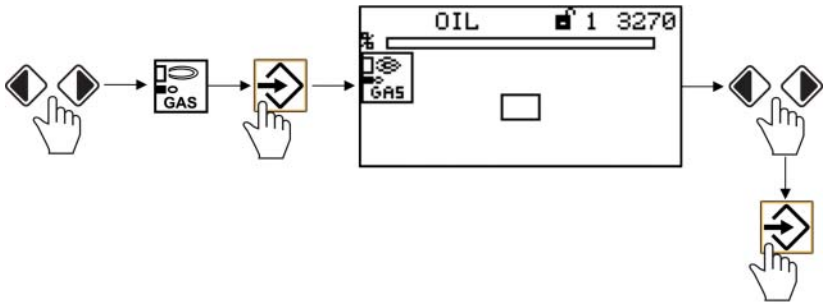
P802 = 2 = If valve leakage test before ignition is configured, the test runs after pre-purge.

Valve leakage test before ignition P312

Valve leakage test after burner OFF P315

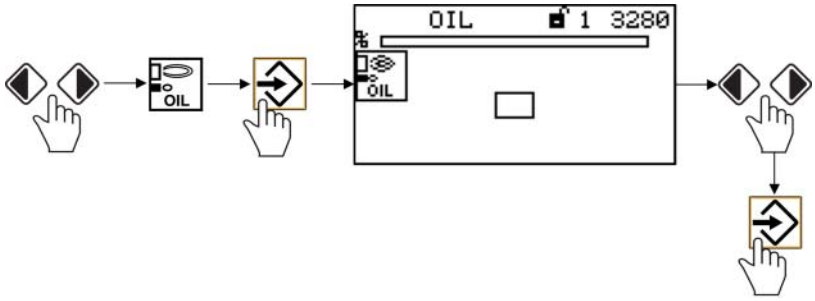
Duration of Valve leakage test P311

Activate pilot burner in gas operation

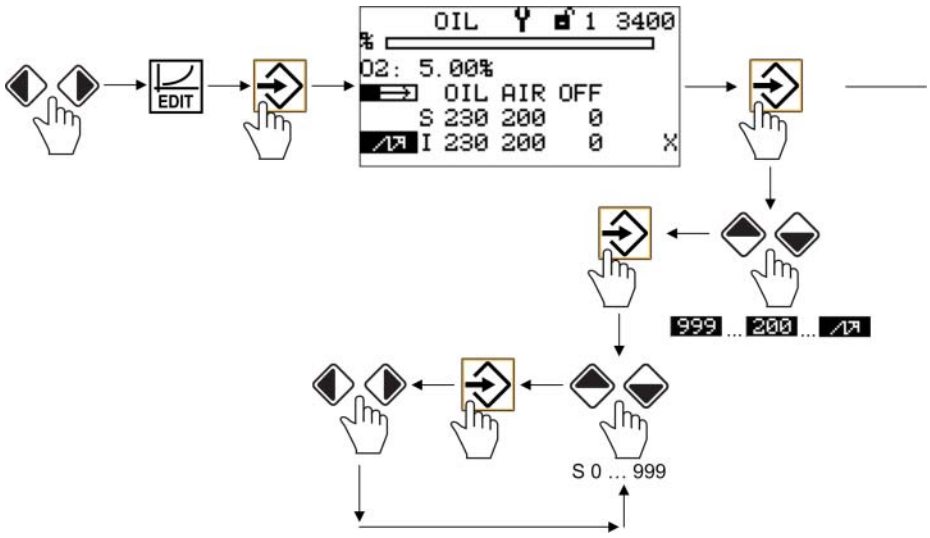


☑ Pilot burner ON
☐ Pilot burner OFF

Activate pilot burner in oil operation



☑ Pilot burner ON
☐ Pilot burner OFF



	Ignition point
999	Firing rate points 200, 250, 300, 400, 500, 600, 700, 800, 900, 999
S 0 ... 999	Setpoint value (to adjust)
I 0 ... 999	Actual value

NOTICE

Actuators move according to changes immediately to the set position.

If you want to change channel 4 the fan motor must be running.

NOTICE

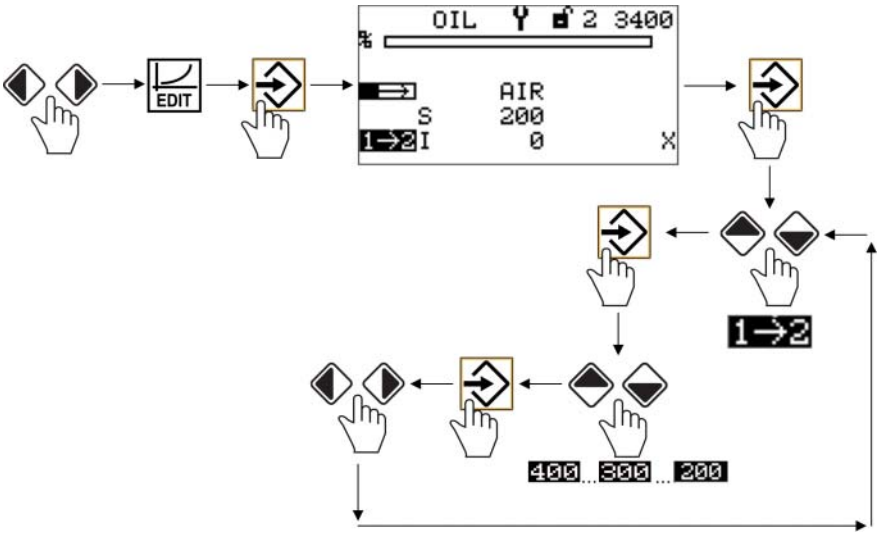
The following firing rate points are available:
Ignition point , 200, 250, 300, 400, 500, 600, 700, 800, 900, 999

Use BACK key to switch to menu settings after having completed curve settings.

NOTICE

Pressing while setting firing rate points discards the modifications.

Set Multi Stage Operation



AIR	Air channel	1→2	Switching from 1. stage to 2. stage
S	Setpoint position of air damper	200	The internal setpoint curve always has 200 digit in stage 1, 300 digit in stage 2 and 400 digit in stage 3.
I	Actual position of air damper		

NOTICE

Set the following stages according to this procedure!

NOTICE

Pressing die key while modifying the firing-rate points discards the changes.

NOTICE

The following points are available for multi stage operation:

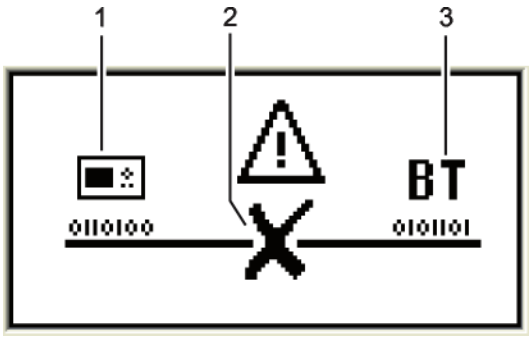
Ignition point ,
1 (first stage),
1 → 2 (valve switch-on threshold for stage 2),
2 ← 1 (valve switch-off threshold for stage 2),
2 (second stage),
2 → 3 (valve switch-on threshold for stage 3)
3 ← 2 (valve switch-off threshold for stage 3) ,
3 (third stage)

NOTICE

The points are approached from above by using the overshoot-function. If you use the overshoot-function in operation, you must program all points from above. Only if you do so, the required position will match the actual position.

5.6.3 Other Displays

No connection between UI300 and BT300

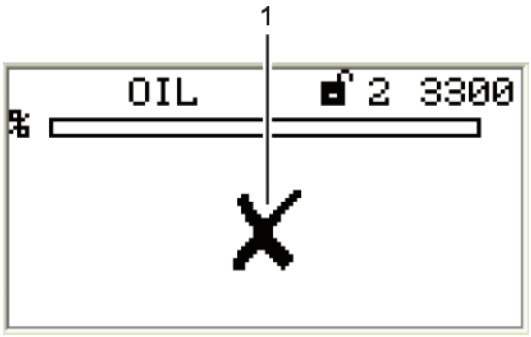


1 UI300 User Interface pictogram
2 No connection symbol
3 BT300 burner control

Fig. 5-7 No connection

Display shown e.g. when using LSB remote software and communication between BT300 and UI300 is temporarily unavailable.

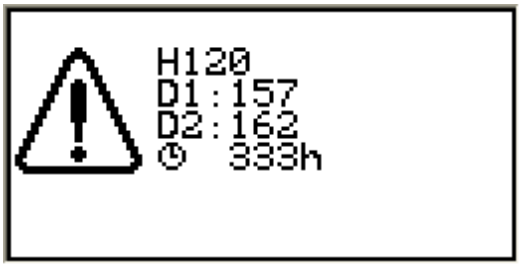
Termination



1 Communication error pictogram connection unavailable

Fig. 5-8 Termination

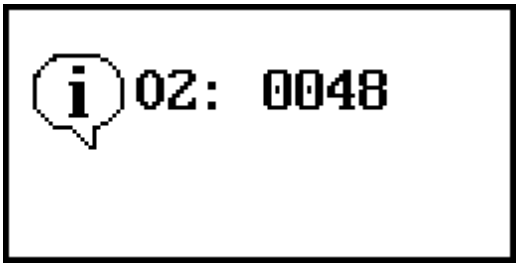
Error Mode



H120 Failure number
D1 Diagnostics 1
D2 Diagnostics 2
Failure occurs at that time

Fig. 5-9 BT300 ferror mode

CO/O2 Hint

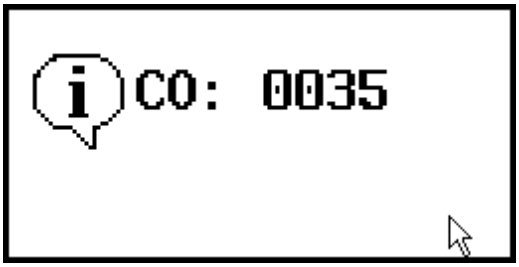


Number of the currently pending hint.

The hint can be released by the RESET button.

Fig. 5-10 CO/O_2 hint

CO Hingt

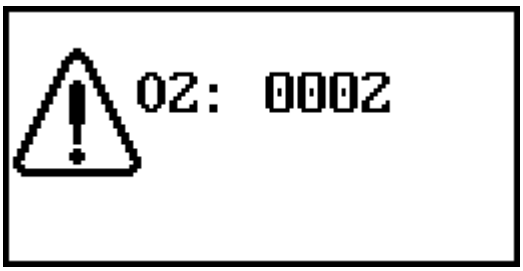


Number of the currently pending hint..

The hint can be released by the RESET button.

Fig. 5-11 CO hint

CO/O2 Fault



Number of the currently pending fault.

The fault can be released by the RESET button.

Fig. 5-12 CO/O_2 fault

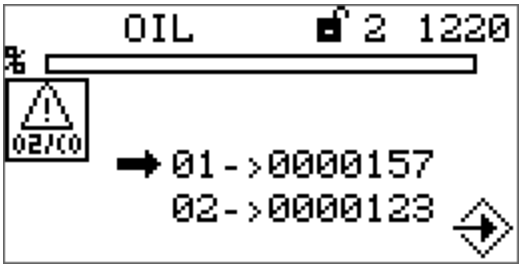
CO Faultr

Number of the currently pending fault.

The fault can be released by the RESET button.

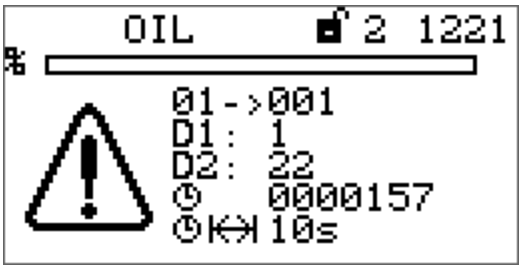
Fig. 5-13 CO fault

O_2/CO-Fehlerhistorie



Fault history including the time when the fault occurs

Fig. 5-14 CO/O_2 fault history



01 - 001	Fault number
D1	Diagnostics 1
D2	Diagnostics 2
	Fault occurs at that time
|↔|	Duration of the fault

Fig. 5-15 Details of the fault history

6 Leakage Test for Main Gas Valves

6.1 Calculation Example

With BT300 the gas pressure monitor is also applicable to the monitoring of minimal gas pressure. Therefore the minimal gas pressure of the burner must be set.

The valve leakage test time t3 (P 311) would be set by BT300. The time t2 for BT300 is fixed to 2s. The time t3 (P 311) must be set in a way that the maximum allowable leakage rate Q_{Leck} can be securely detected. The maximum leakage rate stated in EN1643 and ISO23551-4 is 0.1% of the nominal volumetric flow of the gases or a minimum of 50l/h.

Example 1

Burner capacity =1000 KW
Fuel = natural gas H, calorific value = 10 kW/m^3
Nominal volumetric flow of the gases = 100 m^3/h
Leakage rate max. = 0,1 m^3/h or 100l/h

Example 2

Burner capacity =1000 KW
Fuel = propane, calorific value = 25,9 kW/m^3
Nominal volumetric flow of propane = 38,6 m^3/h
Leakage rate max. = 50 l/h (not 38,6 l/h)

Calculation

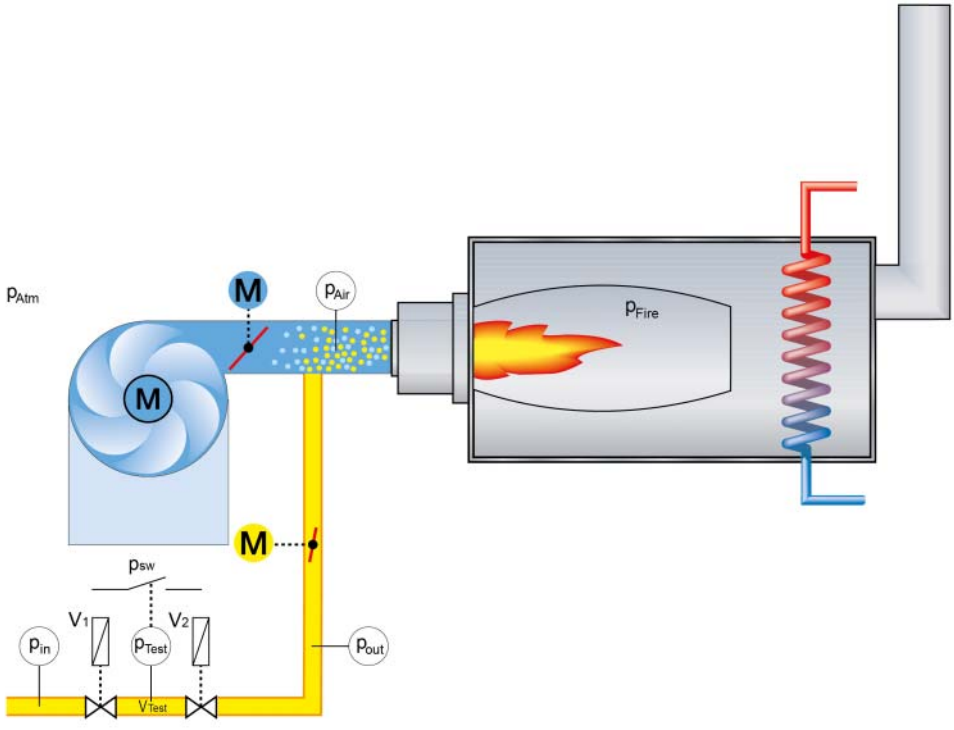


Fig. 6-1 Principle scheme

The test volume V_{test} must be calculated with tube diameter and valve volume. The value volumes are provided by the valve manufacturer. If valve 1 and valve 2 are be used as a double valve, the test volume would be provided by the valve manufacturer.

The leakage test V_{Leak} is calculated according to the Boyle-Mariotte principle.

$p_1 \cdot V_1 = p_2 \cdot V_2$
p = absolute pressure
V = gas volume

This is valid for the test of valve 1 V1:

$$t3 = \left(\left(\frac{p_{sw} - p_{out}}{p_{out}}\right) \cdot \frac{V_{test}}{Q_{Leak}} \cdot 3600\ s/h\right) - t2 = \left(\frac{p_{sw\,e} - p_{out\,e}}{p_{out\,e} + p_{Atm}}\right) \cdot \frac{V_{test}}{Q_{Leak}} \cdot 3600\ s/h\right) - t2$$

Should t3 be negative, at least 1s must be set.
If the calculation of t3 for valve 2 is higher than t3 for valve 1, the value for the calculation of valve 2 must be adjusted.

$$Q_{leak} = \left(\left(\frac{p_{sw} - p_{out}}{p_{out\,e} - p_{ATM}}\right) \cdot \frac{V_{test}}{t3 + t2} \cdot 3600\ s/h\right.$$

Q_{leak}	Leakage rate in l/h
p_{sw}	Absolute pressure on the switching point of pressure monitor (adjusted over-pressure + atmosphere pressure)
$p_{sw\,e}$	Adjusted overpressure on switching point of pressure monitor
$p_{out\,e}$	Output pressure on gas valve V2 during purge
p_{Atm}	Atmospheric pressure (average of 101,3 kPa at sea level)
V_{test}	Test volume between the valves
t2	Settling time is always 2 s
t3	Adjusted leakage check time

NOTICE

p_{Schalt} must always be higher than p_{out}.
Otherwise V1 would be recognised as leaking even if it is not.

This is valid for the test of valve 2 V2:

$$t3 = \left(\left(\frac{p_{in\,e} - p_{sw\,e}}{p_{in\,e} + p_{Atm}}\right) \cdot \frac{V_{test}}{Q_{Leak}} \cdot 3600\ s/h\right) - t2$$

If t3 is negative, at least 1 s must be set.
If the calculated t3 value of valve 1 is higher than t3 for valve 2, the calculated value of valve 1 must be adjusted.

$$Q_{leak} = \left(\left(\frac{p_{in\,e} - p_{sw\,e}}{p_{in\,e} + p_{Atm}}\right) \cdot \frac{V_{test}}{t3 + t2} \cdot 3600\ s/h\right.$$

Q_{leak}	Leakage rate in l/h
p_{sw}	Absolute pressure on switching point of pressure monitor (adjusted overpressure + atmosphere pressure)
$p_{sw\,e}$	Adjusted overpressure on the switching point of pressure monitor
p_{in}	Absolute input pressure on gas valve V1
$p_{in\,e}$	Overpressure at gas valve V1 input
p_{Atm}	Atmosphere pressure (average of 101,3 kPa at sea level)
V_{test}	Test volume between the valves
t2	Settling time is always 2 s
t3	Adjusted leakage check time

6 Leakage Test for Main Gas Valves

6.2 Leakage Test Process Flow

The valve leakage test checks if the main gas valves are sealed. For this purpose the gas pressure of the supply is analysed.

As valve leakage test section (space between the two main valves) burns empty whenever the burner is switched off, this part is usually pressureless at start-up (gas pressure > min = 0). This is checked by BT300. At this point, main gas 1 opens briefly and gas flows into test section (gas pressure > min switches from 0 to 1). While main gas 1 valve is open gas pressure must apply.Otherwise BT300. detects gas deficiency. Gas pressure must remain at least constant during valve leakage test period (2 s + P 311). The valve leakage test is considered complete then.

If leakage test section is not empty at start-up (e.g. resulting from a previous fault shut down), main gas valve 2 opens first. The leakage test line is then purged (depending on the plant, either in the combustion chamber or through the roof). During leakage test period section is checked whether it remains pressureless or not. Apart from that the process is the same as described above.

The leakage test takes place prior to ignition.

The pressure monitor for the leakage test line must be connected to the 'Gas pressure > min' input on plug X05. It also monitors the minimum pressure during operation. If a different minimum pressure should be monitored during operation, the pressure monitor must be inserted into the safety interlock chain gas or into the controller loop (burner ON).

6 Leakage Test for Main Gas Valves

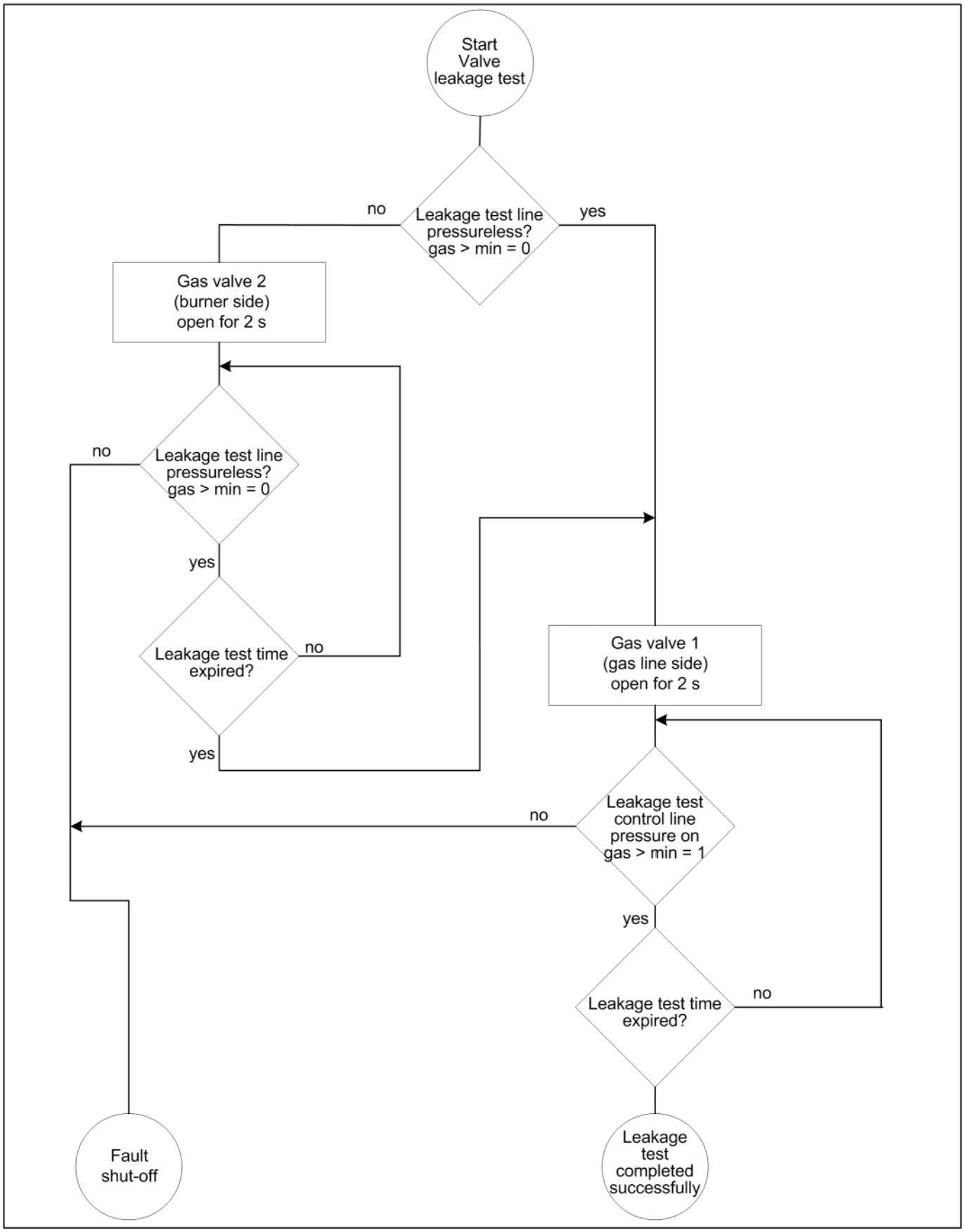


Fig. 6-2 Leakage test process diagram

6 Leakage Test for Main Gas Valves

6.3 Valve Leakage Test Venting Over the Roof

NOTICE

Consider diameter of gas line in the roof purge. For purge, plug X02 is activated for 3 s. Make sure that this period is sufficient even for smallest purge line diameter!

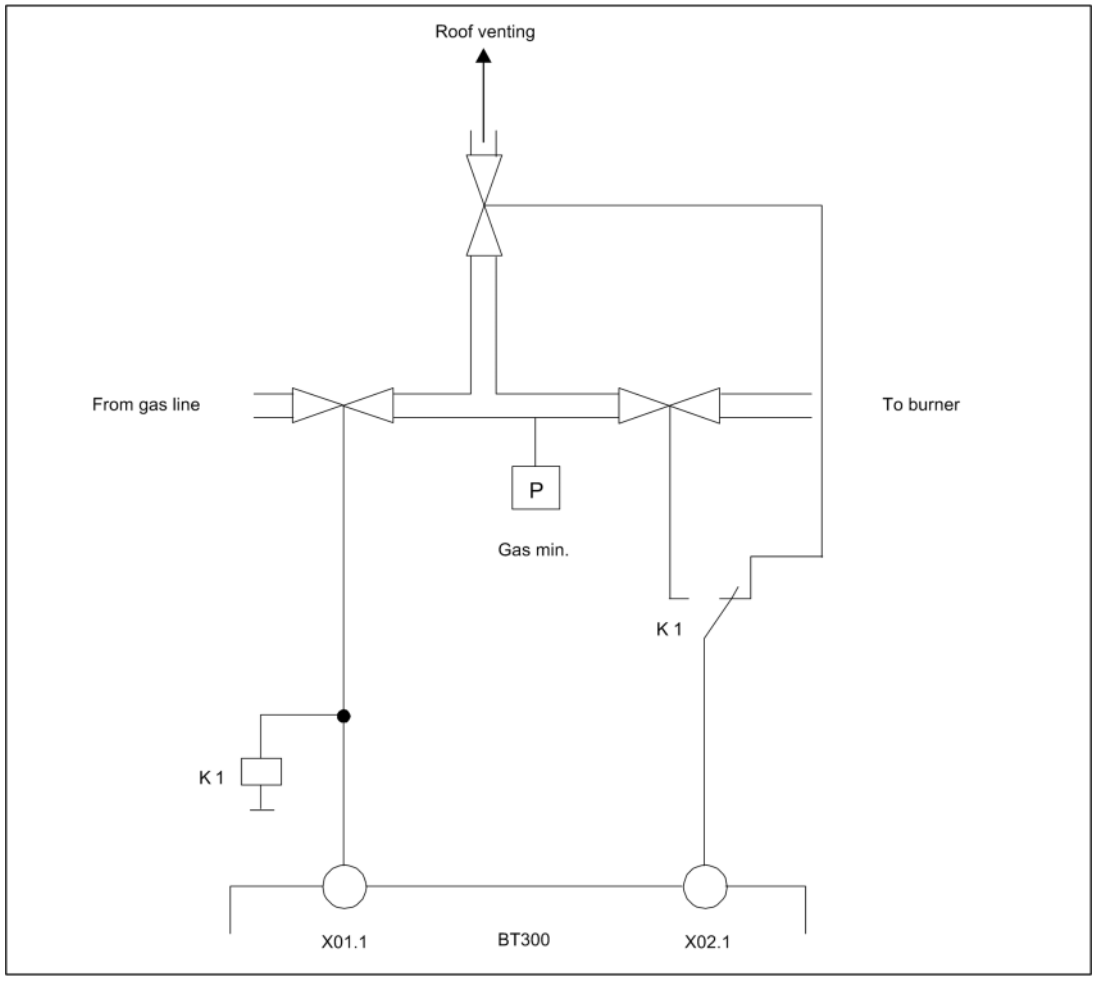


Fig. 6-3 Wiring proposition for purge of gas line via roof in combination with BurnerTronic

7 Technical Data

7.1 Technical Data BT300

Function	
Power supply:	230 V +10/-15 % 47-63 Hz 115 V +10/-15 % 47-63 Hz (on request)
Maximum backup-fuse:	10 A slow-blow
	To be used only in a grounded power line network!
Power consumption:	max. 30 VA
Switching threshold of ionisation current:	1 µA
Digital signal inputs:	Max. line length 10 m/33 ft Max. line length 20 m/66 ft for the following signals: Firing rate+ / firing rate- Boiler safety interlock chain (SIC) Burner ON Reset Alarm Fuel selection DFM
Digital outputs:	3 fuel valves max. 1 A cos φ 0,4 VL fan max. 2 A cos φ 0,4 oil pump max. 2 A cos φ 0,4 ignition transformer max. 2 A cos φ 0,2 alarm output max. 1 A cos φ 0,3
Resolution:	999 digit, 10 bit
Number of curve sets:	BT320/33x: 1 curve set (oil or gas) BT34x: 2 curve sets (oil/gas switchable; DFM300 or LCM100 required)
Number of programs:	unlimited (EEPROM)
Field bus-coupling (optional):	PROFIBUS DP Modbus TCP PROFINET LEM100 or LCM100 always required
Housing:	Polycarbonate + ABS
Dimensions:	200x115x61 mm/7.87x4.53x2.4 in
Weight:	1,0 kg/2.20 lb
Flammability:	UL-94 V0

Display UI300	
Display:	128x64 pixel, monochrome White backlighting (dimmable)
Dimensions:	112x64x24 mm/4.41x2.52x0.94 in
Weight:	140 g/0.31 lb
Housing:	Basic housing: Polyamide glass fibre reinforced LCD-display window: Polycarbonate
Flammability:	UL-94 V0
Cable length:	1 m/3.28 ft

7 Technical Data

Environmental Conditions		
Operation:	Climatic conditions	Class 3K5 according to DIN EN 60721-3
	Mechanic conditions	Class 3M5 according to DIN EN 60721-3
	Temperature range	-20 ... +60 °C/-4 °F ... +140 °F (condensation is prohibited)
Transport:	Climatic conditions	Class 2K3 according to DIN EN 60721-3
	Mechanic conditions	Class 2M2 according to DIN EN 60721-3
	Temperature range	-20 ... +70 °C/-4 °F ... +158 °F (condensation is prohibited)
Storage:	Climatic conditions	Class 1K3 according to DIN EN 60721-3
	Mechanic conditions	Class 1M2 according to DIN EN 60721-3
	Temperature range	-20 ... +70 °C/-4 °F ... +158 °F (condensation is prohibited)
Electronic safety:	Degree of protection (DIN EN 60529):	BT300 – IP00 housing IP20 (terminals covered) UI300 – IP40 (clamping) IP54 (glued assembly)

7.2 Actuators 662R550...

Function	
Power supply	24 VDC ±20 %
Floating time	5 s / 90° at 180 Hz
Direction of rotation 0° to 90°	right
Torque	0.8 Nm (both directions)
Holding torque	0.4 Nm (no power) 0.7 Nm
Permissible radial load	30 Nm (centre of output shaft)
Permissible axial load	5 N
Axial play of drive shaft	0.1 ... 0.2 mm
Cable length	securely connected 0.6 m pluggable max. 3 m

Environmental conditions		
Operation	Climatic condition	Class 3K3 according to DIN EN 60721-3
	Mechanical condition	Class 3M3 according to DIN EN 60721-3
	Temperature range	-20 ... +60 °C (condensation is prohibited)
Transport	Climatic condition	Class 2K3 according to DIN EN 60721-3
	Mechanical condition	Class 2M2 according to DIN EN 60721-3
	Temperature range	-20 ... +70 °C (condensation is prohibited)
Storage	Climatic condition	Class 1K3 according to DIN EN 60721-3
	Mechanical condition	Class 1M2 according to DIN EN 60721-3
	Temperature range	-20 ... +70 °C (condensation is prohibited)

7 Technical Data

Environmental conditions		
Bursting strength	Peak voltage	4 kV
	Repeat frequency	2,5 kHz
Electrical safety	Protection class 2 as per DIN EN 60730	

DANGER!

Danger by electrical shock!

Shut BT300 down before opening the cover, otherwise it is possible to get in contact with conducting parts. This may cause an electrical shock. Only open BT300 when it is disconnected it all-pole.

▶ Disconnect BurnerTronic all-pole.

NOTICE

Damaging the 0,8 Nm actuator by opening the actuator.

Do not open the actuator at another part as the cover of the electric connection, otherwise the actuator will be damaged.
The warranty expires and is invalid.

▶ Do not open the actuator but at the cover of the electric connection.

NOTICE

The limits of the technical data must be strictly adhered to.

7 Technical Data

7.3 Actuators 662R5001... / 662R5003...

Function	662R5001...	662R5003...	662R5009...
Power supply:	24VDC ±20 %		
Floating time	5 s/90°	5 s/90°	15 s/90°
Direction of rotation 0° to 90°	left - view to the drive shaft		
Effective output torque	1.2 Nm (both directions of rotation)	3 Nm (both directions of rotation)	9 Nm (both directions of rotation)
Holding torque	0.82 Nm (currentless)	2.8 Nm (currentless)	6 Nm (currentless)
Permissible radial load	100 N (centre of output shaft)		
Permissible axial load	10 N		
Axial play of drive shaft	0.1 ... 0.2 mm	0.1 ... 0.2 mm	
Motor	RDM 51/6 stepper motor		
Angular resolution	0.1°/motor step	0.1°/motor step	0.03°/motor step
Rated resolution encoder monitoring	0,7°		
Monitoring accuracy	± 0,5°	± 0,5°	± 1.3125° (corresponds 44 motor steps)
Repeat accuracy	± 0,1°	± 0,1°	± 0,1°
Life cycle	2,000,000 motions forward and back performed on complete actuator range		
Degree of protection	IP54 according to DIN EN 60529-1		
Weight	1400 g		
Cable length	securely connected 1.5mpluggable max. 3 m	securely connected 1.5mpluggable max. 3 m	pluggable max. 3 m

Environmental conditions 662R5001.../662R5003.../662R5009...		
Operation	Climatic condition	Class 3K5 according to DIN EN 60721-3
	Mechanical condition	Class 3M5 according to DIN EN 60721-3
	Temperature range	-20 ... +60 °C (condensation is prohibited)
Transport	Climatic condition	Class 2K3 according to DIN EN 60721-3
	Mechanical condition	Class 2M2 according to DIN EN 60721-3
	Temperature range	-20 ... +70 °C (condensation is prohibited)
Storage	Climatic condition	Class 1K3 according to DIN EN 60721-3
	Mechanical condition	Class 1M2 according to DIN EN 60721-3
	Temperature range	-20 ... +70 °C (condensation is prohibited)
Bursting strength	Peak voltage	4 kV
	Repeat frequency	2,5 kHz
Electrical safety	Protection class 2 as per DIN EN 60730	

7 Technical Data

NOTICE

Damage of the actuator with 1.2, 3.0 and 9.0 Nm due to opening the actuators housing.

Opening the actuator’s housing will damage the actuator .
The warranty expires.

NOTICE

The limits of the technical data must be strictly adhered to.

7 Technical Data

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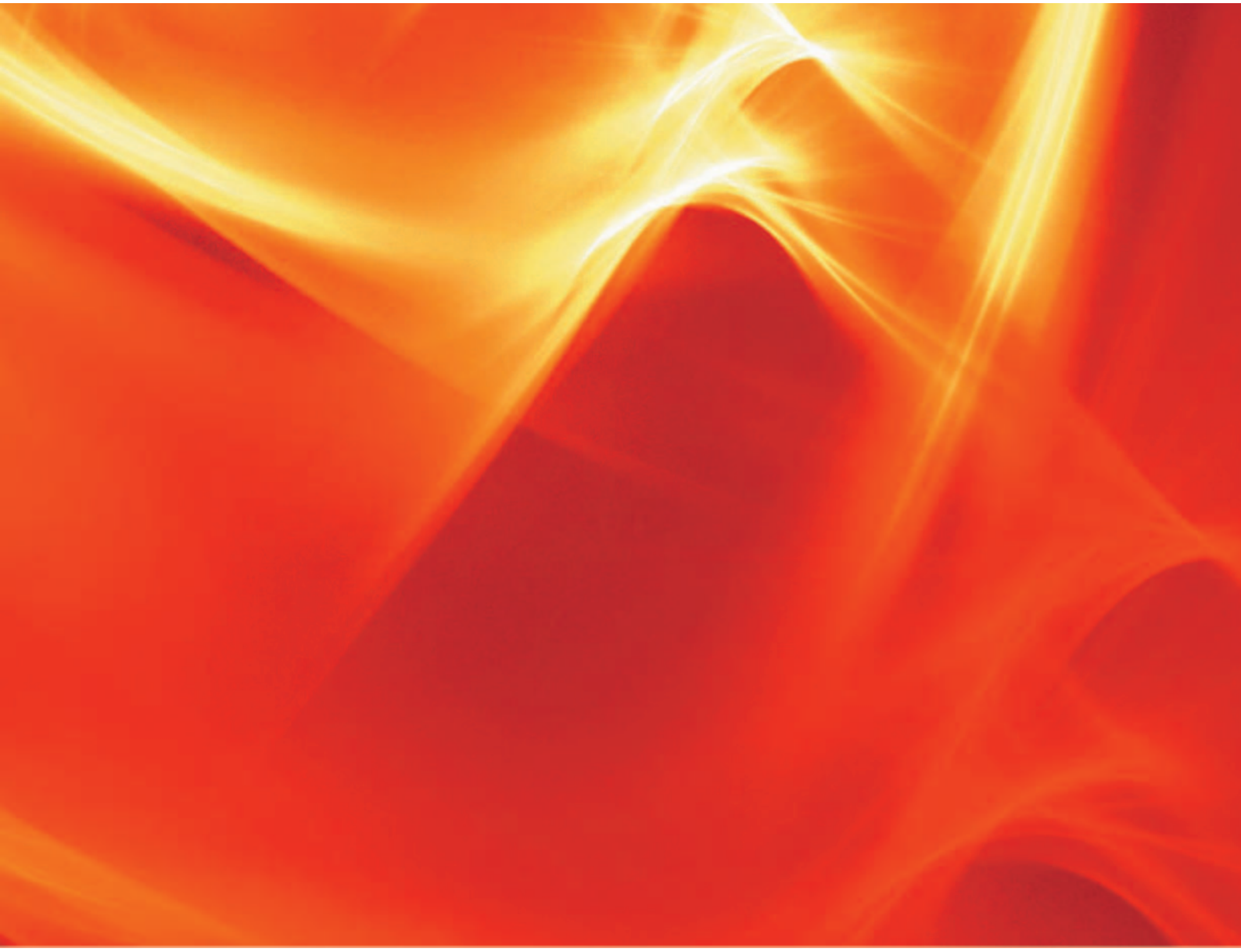

The information in this publication is subject to technical changes.

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