Control device for system leakage test

DSLC px Vx

8.21

DUNGS®
Combustion Controls

neu novità
nouveau new

- **Visual display of the entire program sequence**

- **Display of the leaky valve**

- **Display remains visible if there is loss of voltage**

- **The unit is switched off for safety reasons after 10 unsuccessful venting attempts (not available with 24 VDC version)**

- **IP 42**

Technical description
Together with one or two gas pressure switches, the DSLC control device built according to EN 1643 for system leakage tests checks the burner gas shut-off valves for leakage.
A synchronous gear motor with control cams controls the DSLC program sequence via microswitches.

Application
The DSLC is suitable for automatic leakage tests between two solenoid valves in gas-consuming devices.
The testing system can be used alone for leakage tests or combined with all types of automatic burner control systems.
It can be used in gas burner control systems for heating and industrial purposes, gas combustion motors etc., with or without pipes for venting into the open air.

Approvals
EU type test approval as per EU Gas Appliance Directive:

DSLC px Vx   CE-0085 AQ 0808

EU type test approval as per EU Pressure Equipment Directive:

DSLC px Vx   CE0036

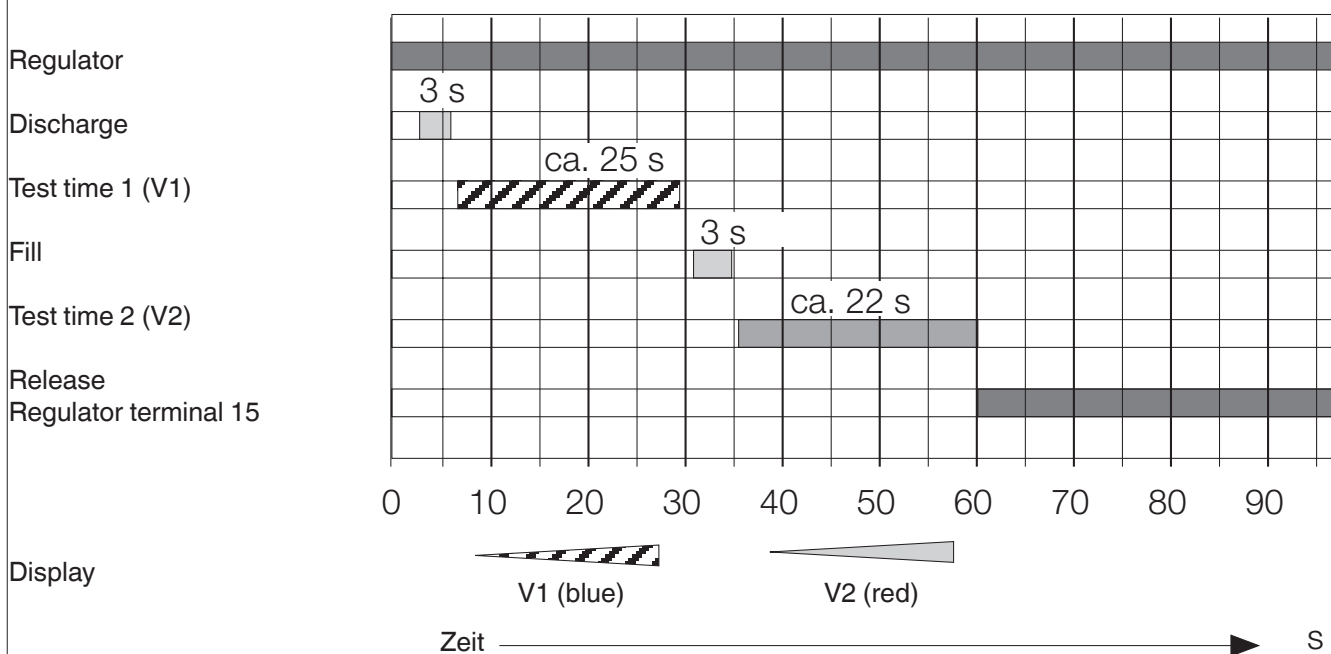Approvals in other important gas-consuming countries.

DSLC px Vx	Control device built according to EN 1643:2001-02 for system leakage tests for all pressures (px) and unlimited testing volume (Vx)

Technical data

Nominal voltage	~(AC) 230 V (-15 % / +10 %), 50 Hz ~(AC) 110 V (-15 % / +10 %), 50 Hz = (DC) 24 V (± 20 %)
Test volume	min. 1,5 l
Power requirement	approx. 5 VA
Back-up fuse (to be provided by the customer)	10 A quick-acting or 6.3 A slow-acting fuse
Load on contact	Operating output (terminal 15) max. 4 A Fault output (terminal 5) max. 1 A Pressure switch (terminals 1, 2, 11) min. 1 A Fault unlocking (terminals 4, 7) min. 1 A Valves (terminals 9, 10, 14) max. 2 A ⚠ **The permissible breaking capacities must be observed! The current input of all solenoid valves, motors etc. which are switched via the controller circuit must not exceed 4 A.**
Degree of protection	IP 42
Ambient temperature	0 °C bis +60 °C
Test cycle	approx. 60 s
Valve opening times Test time V1 (valve on gas side) Test time V2 (valve on burner side)	max. 3 s min. 22 s min. 20 s
Switch-on duration of the control	100 % ED
Installation position	any

Program flowchart DSLC px Vx

Regulator

Discharge   3 s

Test time 1 (V1)   ca. 25 s

Fill   3 s

Test time 2 (V2)   ca. 22 s

Release
Regulator terminal 15

0   10   20   30   40   50   60   70   80   90

Display

V1 (blue)   V2 (red)

Zeit ⟶ S

Functional description and program sequence shown with 1 pressure switch

The section from valve seat V1 to valve seat V2 is called "test section". The DSLC performs a test before every burner start-up, i.e. when heat is requested by the controller or after the unit is switched off due to loss of mains voltage, gas shortage etc. The test consists of two phases:

1. Test of the valve (V1) on the gas inlet side
2. Test of the valve (V2) on the burner side

When heat is required, the controller circuit is closed, and the DSLC receives voltage and starts the test cycle (approx. 60 s).

At the beginning of the first test phase (figure 1a), valve V2 is opened for max. 3 s.

The pressure in the test section must drop to atmospheric pressure, i.e., the pressure switch P_p must switch back after the pressure is relieved. If it is not possible to evacuate the test section, the pressure is relieved again after 60 s.

During the subsequent test time (figure 1b) the pressure built up in the test section must not exceed the switch point of the pressure switch P_p.

However, if this happens due to leakage in solenoid valve V1, the DSLC takes the fault position and prevents the burner from being started.

The red fault display lights up. There is voltage at terminal 5 of the device for teleindication of the fault.

The DSLC opens valve V1 for max. 3 s before the second test phase (figure 2a).

Thus, the test section is under gas pressure, and the second test phase begins.

During the subsequent test time (figure 2b) the pressure in the test section must not drop below the switch point of the pressure switch P_p.

However, if the pressure falls due to leakage in valve V2, the pressure switch P_p reports this and the DSLC is locked in the fault position.

All parts lying in the test section, such as pressure switches, pipes, screw joints etc., are simultaneously tested for leakage.

Only after the second test phase, too, shows that all parts are "properly sealed", the DSLC through-connects the controller circuit (voltage at terminal 15) and enables the program sequence for starting up the burner.

1a

1b

2a

2b
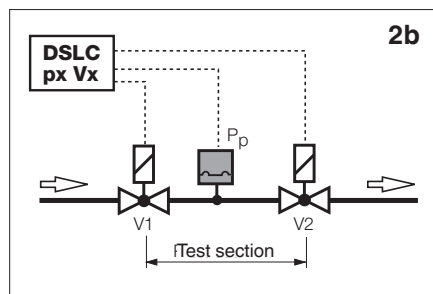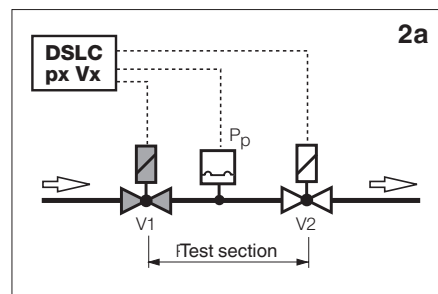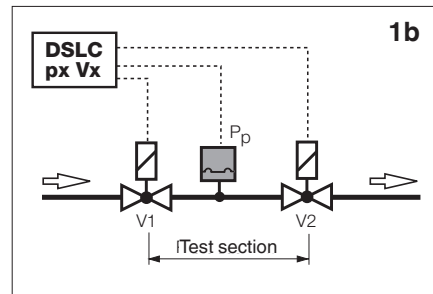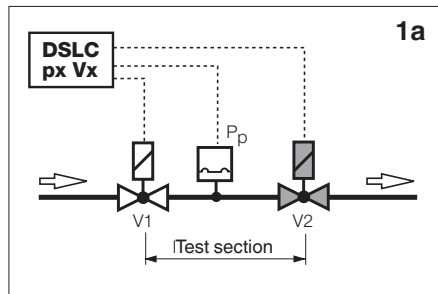
DSLC px Vx – behaviour if venting is not performed successfully (not available with 24 VDC version):

If venting is not performed successfully, e.g. if valve 1 has a large leak, the DSLC continues running and tries to vent again after a minute. After 10 unsuccessful attempts, the DSLC switches to the fault position. The red fault display lights up.
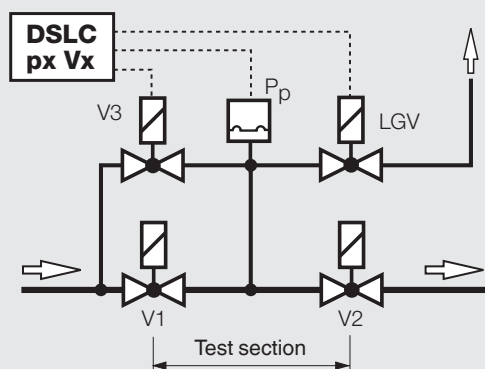
Venting in the firing chamber

According to EN1643 venting may be carried out in the firing chamber if the volume released [m³] per test cycle does not exceed 0.05 % of the nominal volume flow [m³/h].

Example:

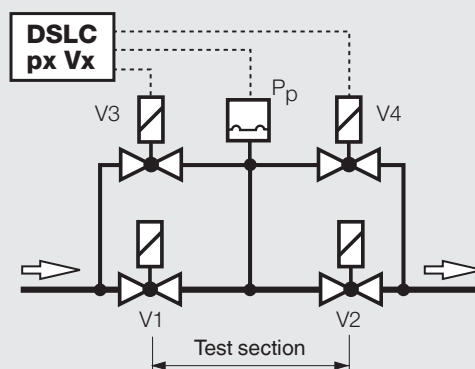For a nominal volume flow of 100 m³/h, the permissible volume is 0.05 m³ = 50 dm³
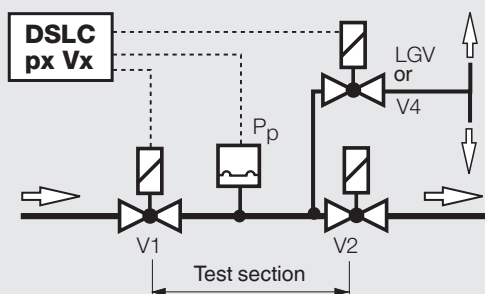
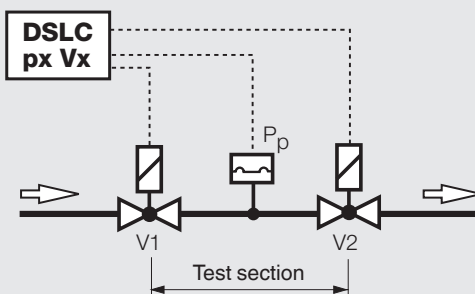### Schematic diagrams

1. Valve test with auxiliary valves V3, LGV

2. Valve test with auxiliary valves V3, V4

3. Direct valve test V1 with auxiliary valve V4 or LGV

4. Direct valve test V1, V2

Legend to schematic diagrams

V1	Safety solenoid valve
V2	Burner solenoid valve
V3	Filling gas solenoid valve
V4	Discharge solenoid valve
LGV	Leakage gas solenoid valve
P_p	Test pressure switch

⚠ **The function principle must be selected according to local regulations!**

⚠ **The valves used must meet the requirements of EN 161!**

Nominal diameter

For main actuators > DN 65, auxiliary valves should be used.

Avoiding leakage

The most common reason for leaky actuators is dirt accumulation.

Therefore, the gas filter preceding the gas control section must be sufficiently large. Special attention must be paid to loss of pressure in the filter, i.e. the filter must be checked and cleaned at regular intervals.

Test pressure switch

One or two pressure switches can be used for monitoring the pressure in the test section:
A change-over contact is required if **a common pressure switch (P$_p$)** is used for test phases 1 and 2.
The switch point of the pressure switch must be set to half of the gas flow pressure.
If set properly, **two pressure switches** detect even small amounts of leaked gas. The amounts of leaked gas can be individually set to the required value for:

test phase 1 (safety solenoid valve) with pressure switch **P1** and
test phase 2 (burner solenoid valve) with pressure switch **P2**.

⚠ **The pressure switches used must meet the requirements of EN 1854!**

Limit value

The DSLC must prevent ignition and the opening of the actuators at a limit value < 0.1 % of the burner consumption (with regard to the burner capacity), or < 50 dm³/h (the higher value must be taken into account). We recommend that a max. limit value of 200 dm³/h should not be exceeded.

Gas leakage rate

The gas leakage rate can be recalculated using the equations, and the switch points of the test switches can be changed if necessary.

Test volume of valves and pipelines

Nominal diameters Rp DN	dm³ Valve	dm³/m Pipeline
1/20,07	0,20	
3/40,12	0,30	
1	0,20	0,50
1 1/2 0,50	1,40	
2	0,90	2,00
40	0,70	1,40
50	1,20	2,00
65	2,00	3,40
80	3,80	5,00
100	6,50	8,00
125	12,50	12,40
150	17,50	17,80
200	46,00	31,40

Test volume DSLC:
min. 1,5 dm³

$\overset{\circ}{V}_{V1}$= leak rate V1

$$\overset{\circ}{V}_{V1}= \frac{(p_1 - p_{disch}) \cdot V_P \cdot 3600 \text{ s/h}}{p_{atm} \cdot t_{test\,V1}} \text{ dm}^3/\text{h}$$

$\overset{\circ}{V}_{V2}$= leak rate V2

$$\overset{\circ}{V}_{V2}= \frac{(p_{filll} - p_2) \cdot V_P \cdot 3600 \text{ s/h}}{p_{atm} \cdot t_{test\,V2}} \text{ dm}^3/\text{h}$$

Calculation examples (calculation steps I and II) for a DN 100 test section:

I) Calculation of the volume of the test section

V1 + V2, DN 100	V = 6.50 dm³
Line DN 100, length 1.5 m	V = 12.00 dm³
V3 + V4, Rp ½	V = 0.07 dm³
Line V3 / V4 1/2", length 2 m	V = 0.40 dm³

V$_p$ = 18,97 dm³

II) Calculation of leak rates

	System with 1 pressure switch	System with 2 pressure switches
Burner capacity	30 m³/h	400 m³/h
p$_1$	11 mbar	60 mbar
p$_2$	9 mbar	220 mbar
p$_{disch}$	1 mbar	18 mbar
p$_{fill}$	18 mbar	500 mbar
p$_{atm}$	1013 mbar	1013 mbar
t$_{testV1}$	25 s	25 s
t$_{testV2}$	22 s	22 s
limit value as per standard	50 dm³/h	400 dm³/h
Recommended limit value		200 dm³/h

Result of the calculation:

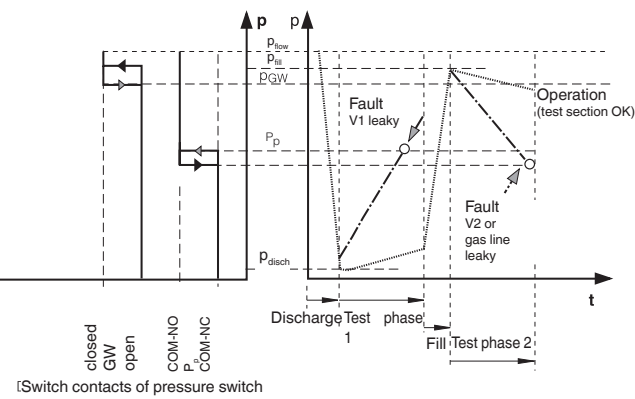|	System with 1 pressure switch	System with 2 pressure switches
Leak rate V1	$\overset{\circ}{V}_{V1}$ = 26,97 dm³/h	$\overset{\circ}{V}_{V1}$ = 113,26 dm³/h
Leak rate V2	$\overset{\circ}{V}_{V2}$ = 27,58 dm³/h	$\overset{\circ}{V}_{V2}$ = 183,86 dm³/h

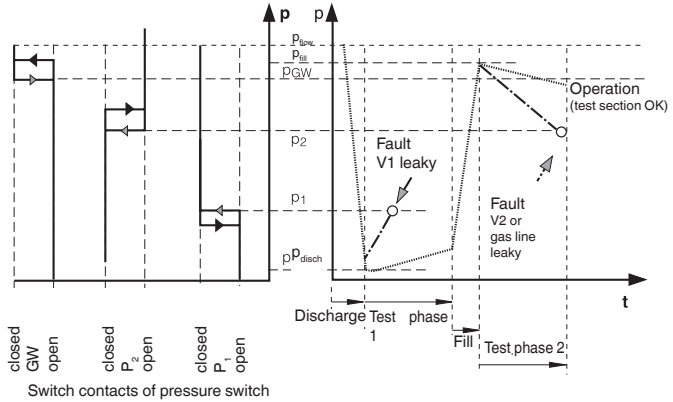### Legend of the calculations:

p$_1$ = switch point of pressure switch P1 or Pp rising [mbar]
p$_2$ = switch point of pressure switch P2 or Pp falling [mbar]
p$_{disch}$ = gas pressure after discharge [mbar]
p$_{fill}$ = gas pressure after filling [mbar]

p$_{atm}$ = atmospheric pressure [mbar]
t$_{testV1}$ = test time V1 [s]
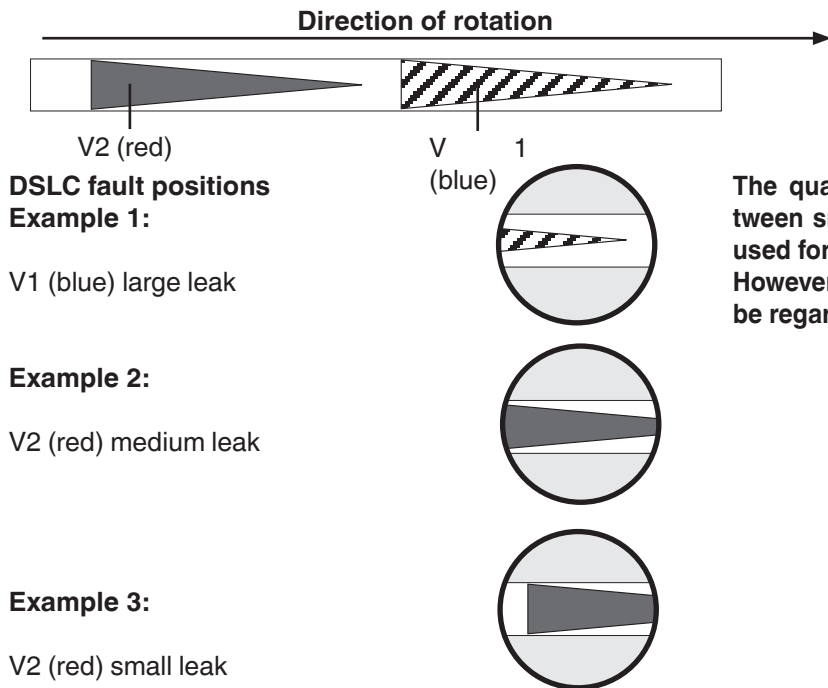t$_{testV2}$ = test time V2 [s]
V$_p$ = test section volume [dm³]

p   p

p_{flow}
p_{fill}
p_{GW}

Fault
V1 leaky

Operation
(test section OK)

p_p

Fault
V2 or
gas line
leaky

p_{disch}

t

Discharge | Test phase
1

Fill | Test phase 2

closed
GW
open

COM-NO
P₀
COM-NC

[Switch contacts of pressure switch

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p   p

p_{flow}
p_{fill}
p_{GW}

p_2

Fault
V1 leaky

Operation
(test section OK)

p_1

Fault
V2 or
gas line
leaky

p_{disch}

t

Discharge | Test phase
1

Fill | Test phase 2

closed
GW
open

closed
P₂
open

closed
P₁
open

Switch contacts of pressure switch

DSLC display of valves

Direction of rotation

V2 (red)   V   1
                      (blue)

DSLC fault positions
Example 1:

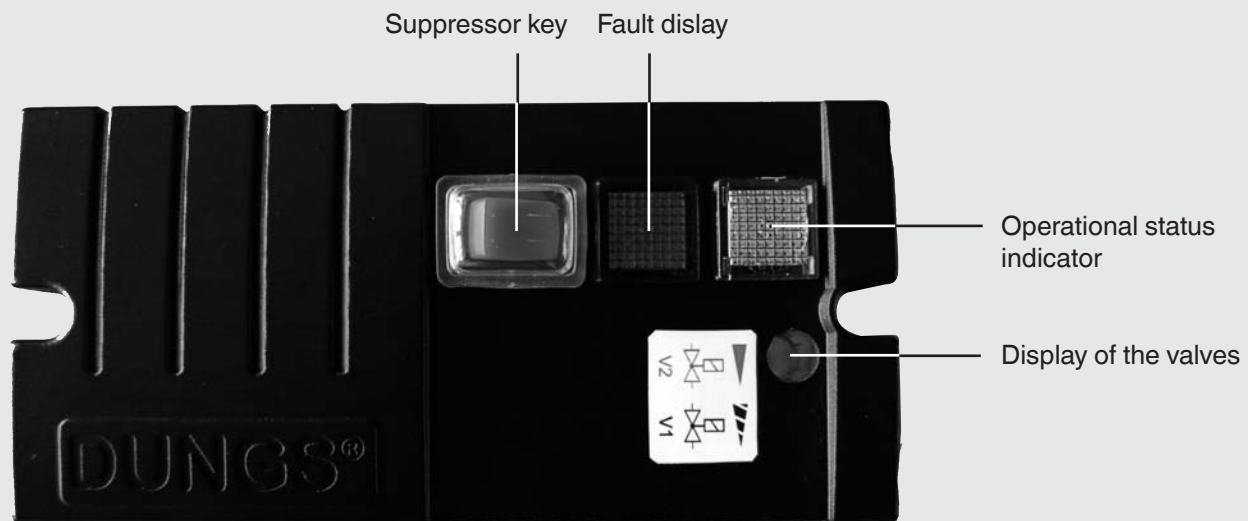V1 (blue) large leak

The qualitative differentiation be-
tween small, medium and large is
used for fault analysis only.
However, the valves must always
be regarded as leaky!

Example 2:

V2 (red) medium leak

Example 3:

V2 (red) small leak

Structure of the leakage control device DSLC px Vx

Suppressor key   Fault dislay

Operational status
indicator

Display of the valves

DSLC connection diagram for valve test with auxiliary valves V3, LGV (for schematic diagram 1)

Connection 24 V DC

16 ○ — -
6 ○ — +
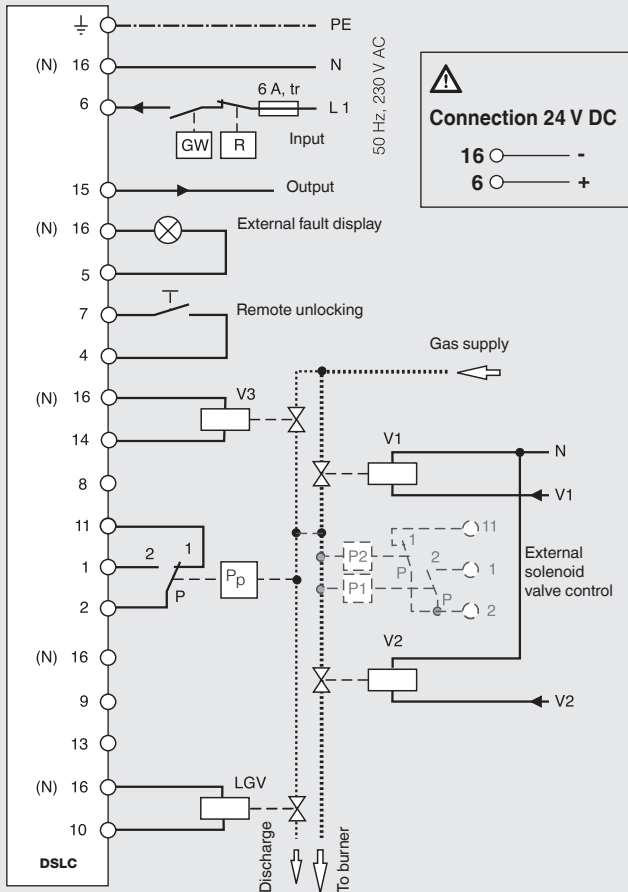
DSLC connection diagram for valve test with auxiliary valves V3, V4 (for schematic diagram 2)

Connection 24 V DC

16 ○ — -
6 ○ — +
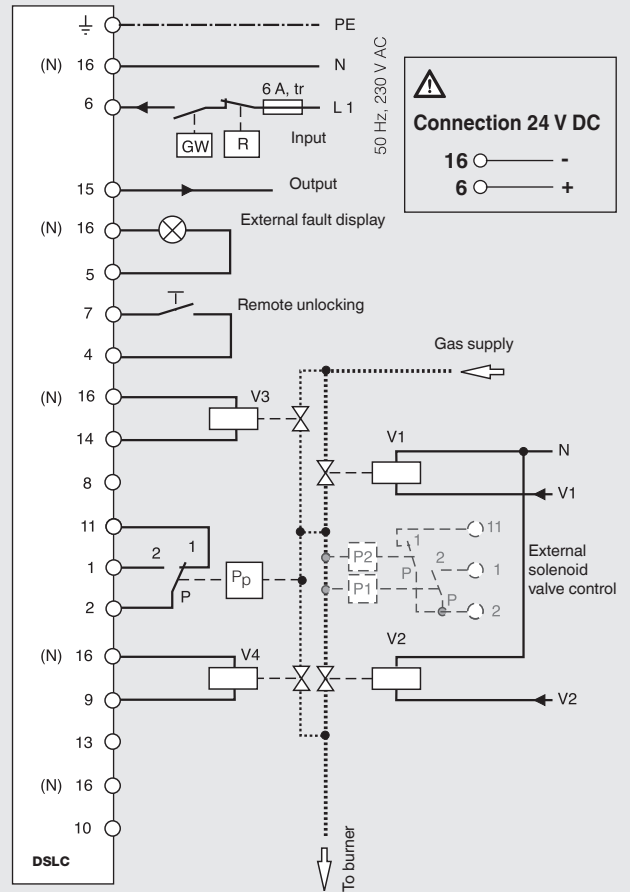
DSLC connection diagram for direct valve test V1 with auxiliary valve V4 or LGV (for schematic diagram 3)

Connection 24 V DC

16 ○ — -
6 ○ — +
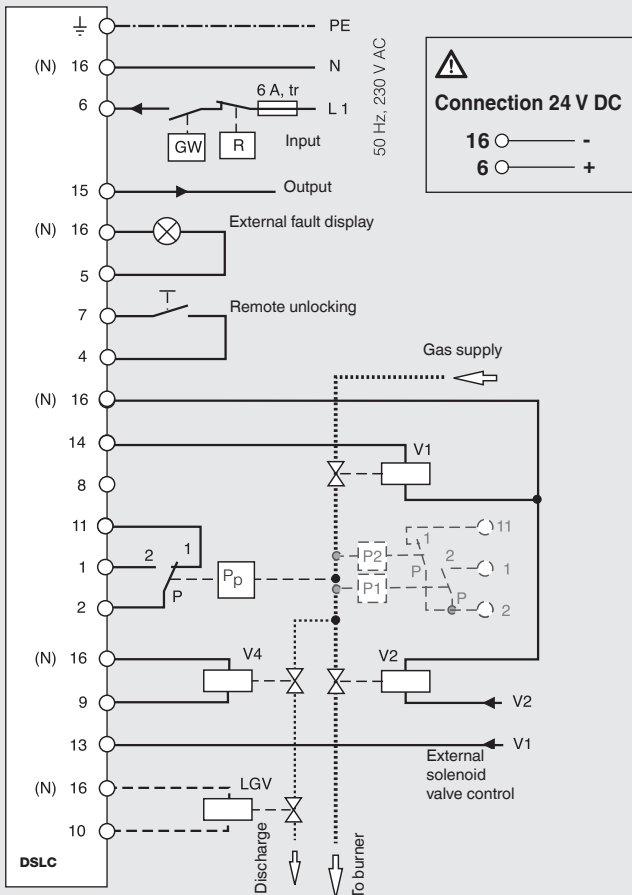
DSLC connection diagram for direct valve test V1, V2 (for schematic diagram 4)

Connection 24 V DC

16 ○ — -
6 ○ — +
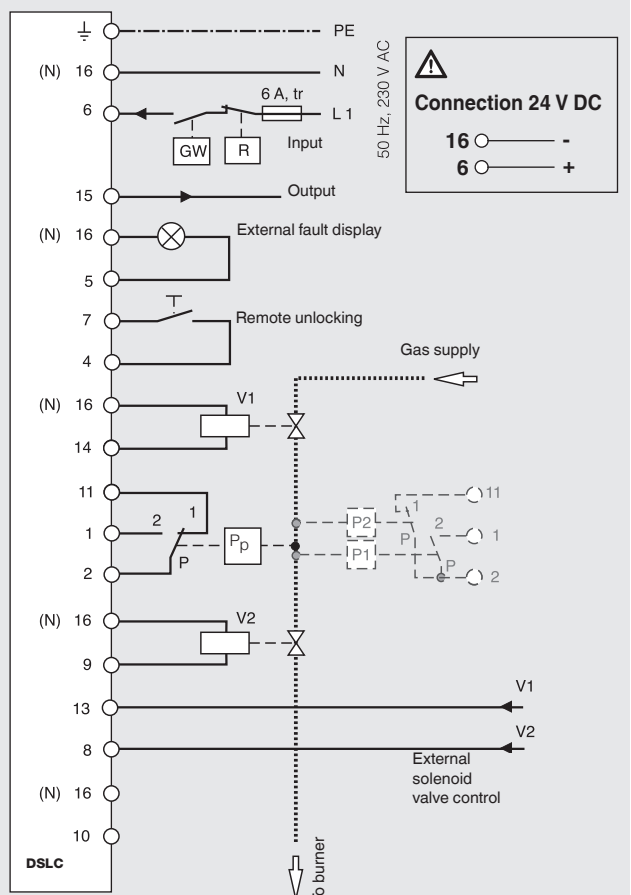
V1	Safety solenoid valve	V4	Discharge solenoid valve	GW gas pressure switch
V2	Burner solenoid valve	LGV	Leakage gas solenoid valve	(gas shortage).
V3	Test gas solenoid valve	P_p	Test pressure switch	R Regulator

7 … 8

Control device for system leakage test
DSLC px Vx

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Dimensions
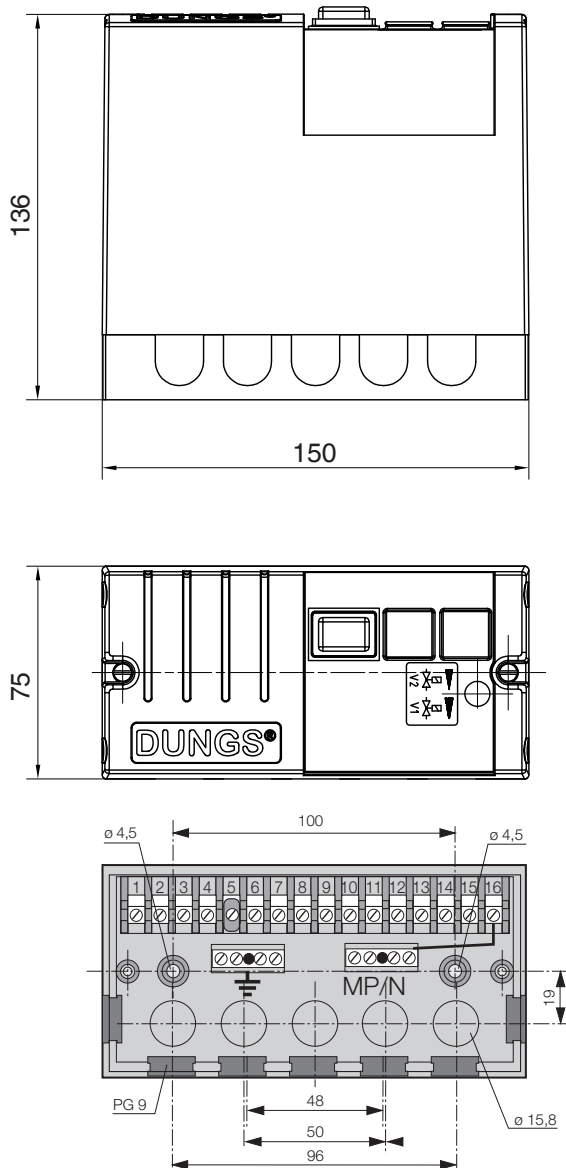
Type overview/ordering data

	Order no.
DSLC px Vx - (AC) 50 Hz, 230 V	247 962
DSLC px Vx - (AC) 50 Hz, 110 V	248 762
DSLC px Vx - (DC) 24 V	247 963

Accessories

Gas pressure switch   depending on the operating
                                        pressure,
see datasheets

LGW…A4 (5.08)
GW…A6 (5.01)
GW…A4 HP (5.04)

Auxiliary solenoid valves
see datasheets   MV 502 (6.21)
                              MVD, MVD/5, MVDLE/5 (6.20)
                              LGV/5 (6.24)
                              SV-D(LE) (6.01)

Pressure switches (according to EN 1854) and auxiliary solenoid valves (according to EN 161) must be ordered separately.

We reserve the right to make any changes in the interest of technical progress.