Tightness control TC

Technical Information · GB
3.1.5.2 Edition 12.07

- Test of both safety valves
- Short test period thanks to logical decision-making in the program sequence
- Adjustable test period which can be adapted to different systems
- Adjustable test mode allows quick system start
- Maximum safety thanks to self-monitoring electronics
- Less space required thanks to small dimensions
- EC type-tested and certified
- FM and UL approved

Contents

= To be continued

TC 1: for attachment to valVario controls and CG
TC 2: for quick opening individual valves

TC 1, TC 2 *TC 3* *TC 4*

TC 3: for quick or slow opening or manually reset-table individual valves
TC 4: for control cabinet installation

1 Application

The tightness control TC checks the fail-safe function of both valves before each start-up or after each shut-down of a system with two safety valves.

The aim is to identify an inadmissible leak on one of the gas valves and to prevent burner start. The other gas valve continues working properly and takes over the safe shut-off of the gas supply.

It is used in industrial thermoprocessing equipment, in boilers and forced draught burners.

European standards EN 746-2 and EN 676 stipulate tightness controls for capacities over 1200 kW (NFPA 86: from 117 kW or 400,000 Btu/h in conjunction with a visual indicator). Pre-purge of the combustion chamber can be dispensed with under certain conditions in accordance with EN 746-2, if a tightness control is used. In this case, the system must be vented into the open air.

TC 1

Tightness control TC 1 can be directly mounted to all CG combination controls. There is only one version for all sizes. The pre-set test period applies to all CG variants.

In addition, TC 1 can be used for valVario controls VAS, VAD and VAG (with separate adapter plate).

TC 2 and TC 4

Tightness controls TC 2 and TC 4 can be used with gas solenoid valves of any nominal size, which are quick opening or slow opening with start rate. It is possible to conduct a tightness test on pneumatically operated or slow opening valves without start rate by using additional auxiliary valves.

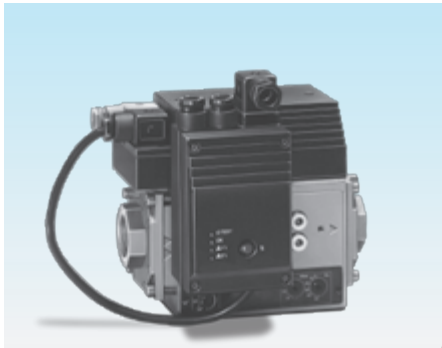
Slow opening motorised valves VK up to DN 65 which are directly flanged together can also be checked by TC 2 and TC 4 within a temperature range of 0 to 60°C (32 to 140°F).

TC 4

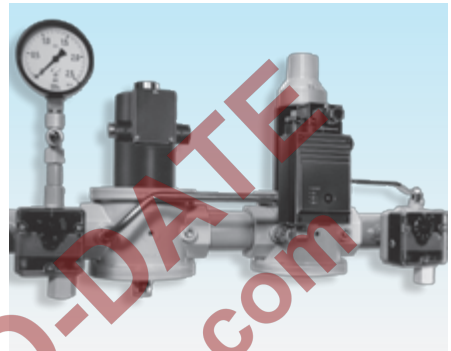
Tightness control TC 4 consists of detection circuitry and can be installed in the control cabinet, separately from the system. An external pressure switch takes over the mechanical pressure test between the valves. Tightness control TC 4 is independent of gas type and inlet pressure pe and can be used for a test period of up to 10 minutes with a large test volume.

TC 3

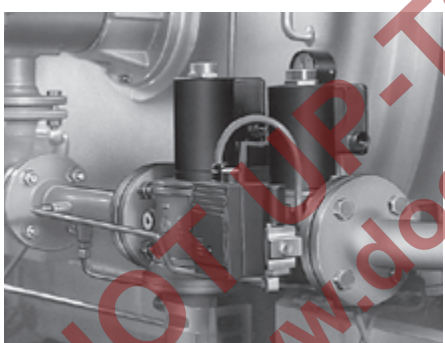
Tightness control TC 3 is a universal device for quick and slow opening gas solenoid valves of any nominal size as well as for motorised valves. The tightness test is carried out with the valves installed in TC 3.



TC 1 mounted to a combination control CG

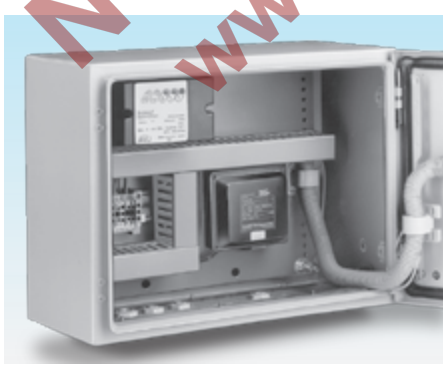


TC 2 in a gas inlet section between a quick opening and a slow opening gas solenoid valve VG

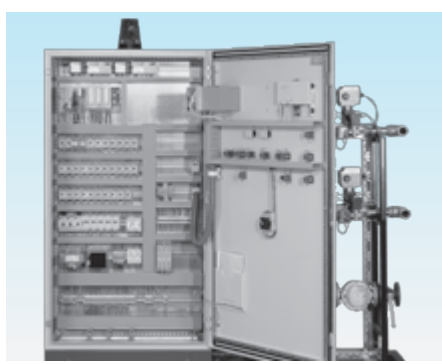


TC 3 on a heating boiler

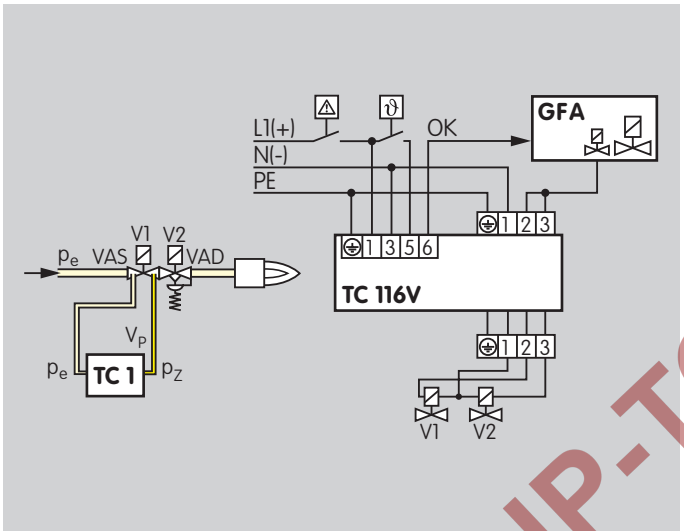
TC 3 for tightness control on gas motorised valve VK

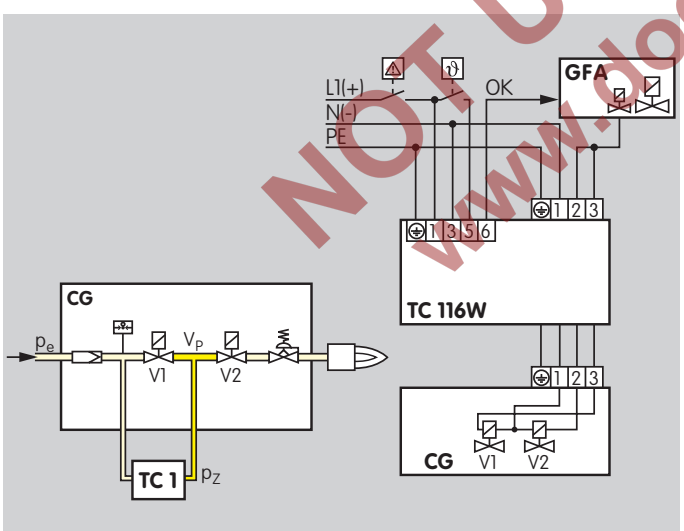


TC 4 installed separately from the system in a control cabinet



TC 4 installed in control cabinet securing the lower section with screws or snapping it on to a DIN rail





1.1 Examples of application

1.1.1 TC 116V with valVario controls

Tightness control TC 1 checks gas solenoid valves V1 and V2 for tightness.

If both valves are tight, the tightness control forwards the OK enable signal to the automatic burner control unit GFA. This opens valves V1 and V2 simultaneously. The burner starts.

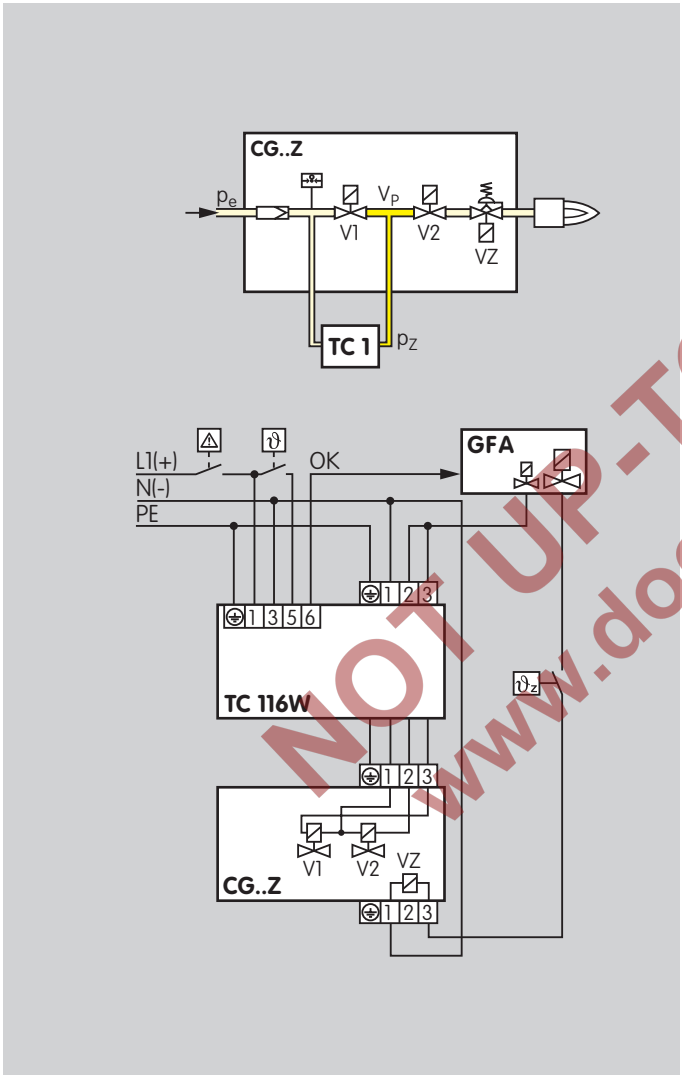
V1 and V2: quick or slow opening valves with start rate.

1.1.2 TC 116W with combination control CG..D or CG..V

The tightness control is directly mounted to combination control CG..D or CG..V.

Once the tightness test has been carried out successfully, the tightness control forwards the OK enable signal to the automatic burner control unit GFA. This opens valves V1 and V2 in the combination control CG simultaneously. The burner starts.

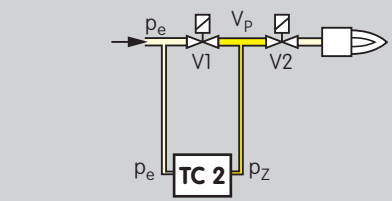
V1 and V2: quick opening valves.

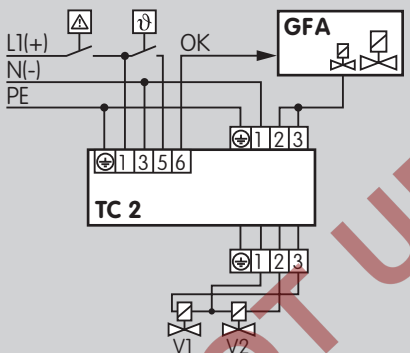


1.1.3 TC 116W with two-stage combination control CG..Z

Once the tightness test has been carried out successfully, the tightness control forwards the OK enable signal to the automatic burner control unit GFA. The pilot valve output of the automatic burner control unit GFA opens valves V1 and V2 in the combination control simultaneously. The burner starts. The main valve output opens the two-stage valve VZ, independently of TC 116W.

V1 and V2: quick opening valves.



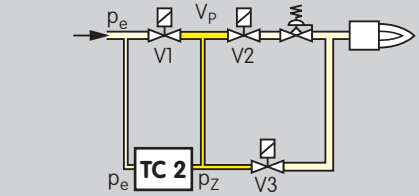


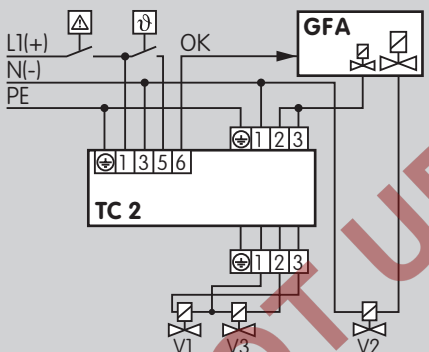
1.1.4 TC 2 with two gas solenoid valves

Tightness control TC 2 checks gas solenoid valves V1 and V2 for tightness.

If both valves are tight, the tightness control forwards the OK enable signal to the automatic burner control unit GFA. This opens valves V1 and V2 simultaneously. The burner starts.

V1 and V2: quick or slow opening valves with start rate.



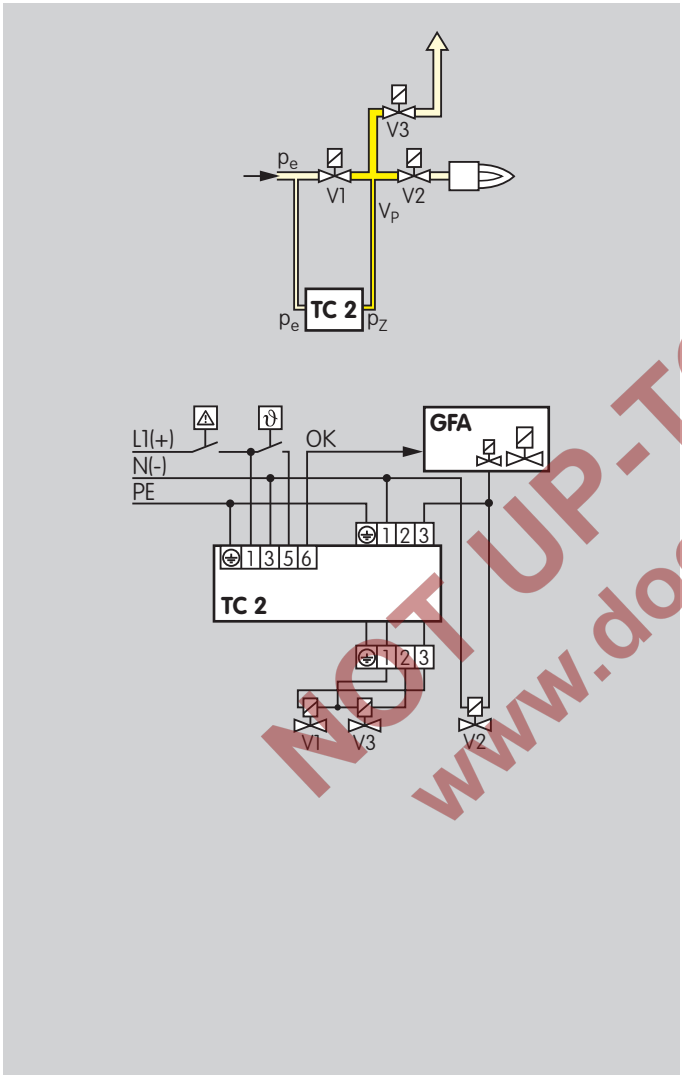


1.1.5 TC 2 with two gas solenoid valves and one pilot gas valve

Tightness control TC 2 checks the gas solenoid valves for tightness. The test volume is discharged into the combustion chamber. Auxiliary valve V3 can be used as a pilot gas valve.

Once the tightness test has been carried out successfully, the tightness control forwards the OK enable signal to the automatic burner control unit GFA. The pilot valve output of the automatic burner control unit GFA opens the gas solenoid valves V1 and V3 simultaneously. The main valve output opens gas solenoid valve V2. The burner starts.

V1 and V2: quick or slow opening valves with start rate. V3: quick opening, minimum nominal size = DN 15.



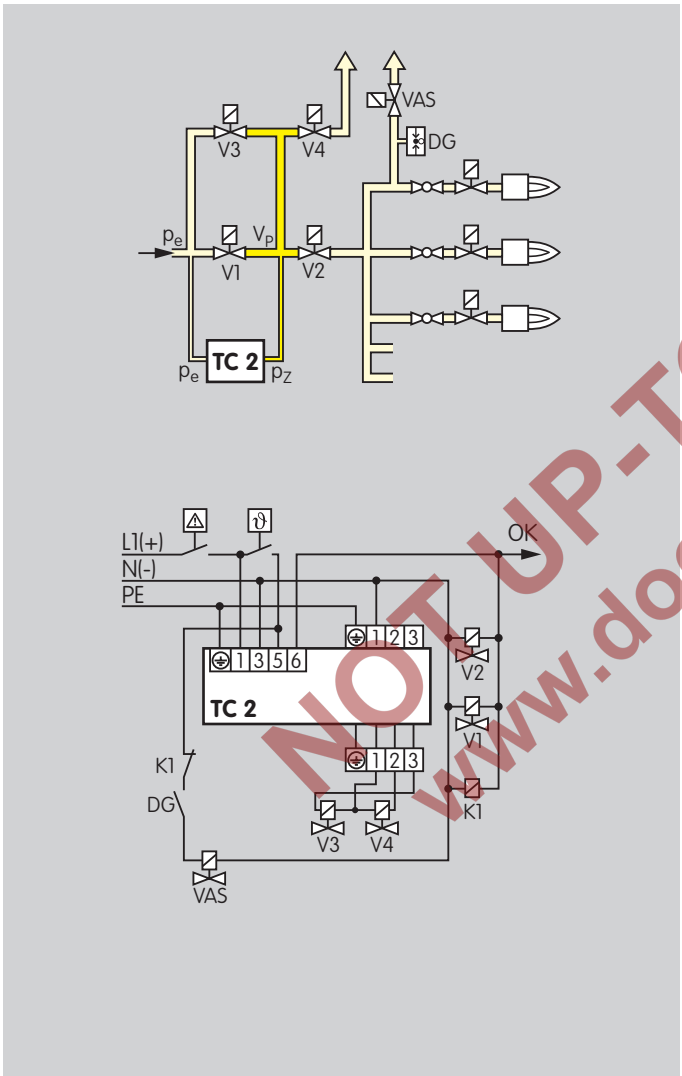
1.1.6 TC 2 with two gas solenoid valves and one auxiliary valve for discharge

Tightness control TC 2 checks the gas solenoid valves V1 and V2 and the auxiliary valve V3 for tightness.

If all the gas solenoid valves are tight, the tightness control forwards the OK enable signal to the automatic burner control unit GFA. The pilot valve output of the automatic burner control unit GFA opens the gas solenoid valves V1 and V2 simultaneously. The burner starts.

A relief line is used to discharge the test volume into the open air via the roof. Thanks to the installed auxiliary valve V3, valve V2 can also be a slow opening motorised valve VK.

V1: quick or slow opening valves with start rate,
V2: any,
V3: quick opening, minimum nominal size = DN 15.



1.1.7 TC 2 with 3 valves installed in series

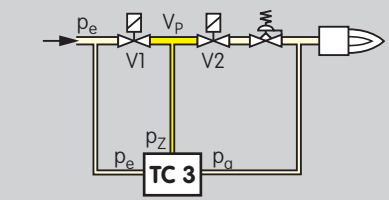
Tightness control TC 2 checks the central shut-off valve V1, the gas solenoid valve V2 and the auxiliary valves V3 and V4 for tightness.

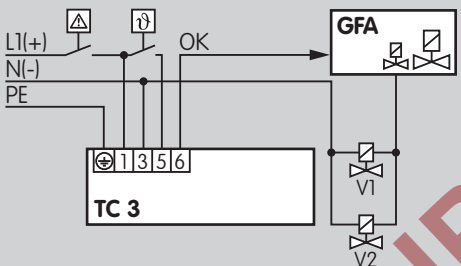
The test volume is supplied via the auxiliary valve V3. The central shut-off valve V1 can thus also be a slow opening motorised valve VK. The test volume is discharged via auxiliary valve V4 and the relief line.

It must be ensured that the test volume can be supplied and discharged during the opening time of the gas solenoid valves. Therefore, the pressure switch DG monitors the pressure downstream of the gas solenoid valve V2 and switches when the set pressure is exceeded. Then the gas solenoid valve VAS opens and the pipe downstream of V2 is vented.

Once the tightness test has been carried out successfully, the tightness control TC 2 opens the shut-off valve V1 and gas solenoid valve V2. The tightness control forwards the OK enable signal simultaneously to the automatic burner control units. These open the burner valves and the burners start.

V3 and V4: quick opening, minimum nominal size = DN 15.



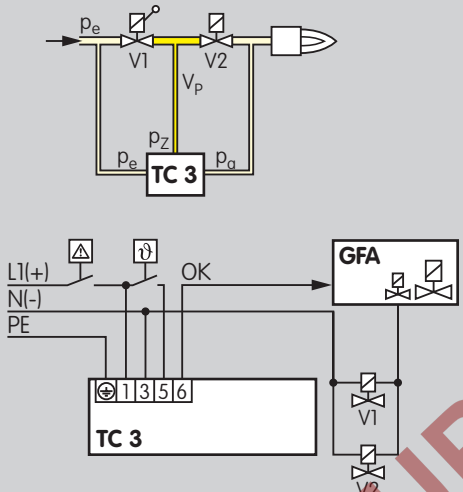


1.1.8 TC 3 with two gas solenoid valves

Tightness control TC 3 checks the slow opening gas solenoid valves or motorised valves VK for tightness using the auxiliary valves installed in TC 3.

Once the tightness test has been carried out successfully, the tightness control forwards the OK enable signal to the automatic burner control unit GFA. The pilot valve output of the automatic burner control unit GFA opens the gas solenoid valves V1 and V2 simultaneously. The burner starts.

V1 and V2: any.

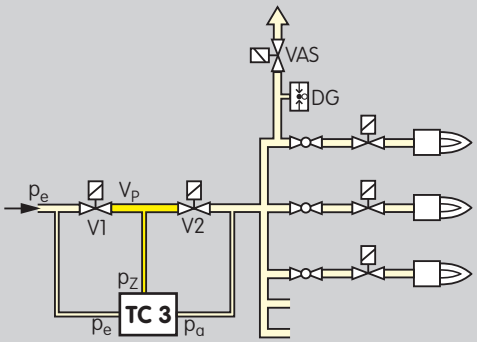


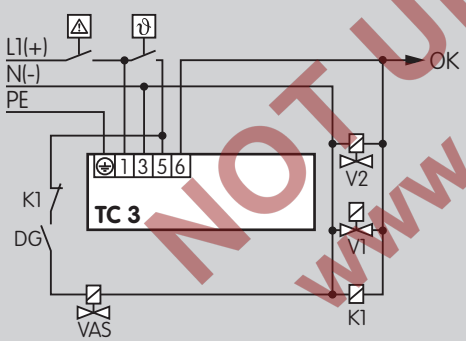
1.1.9 TC 3 with a manually resettable valve

Valves, which are manually reset, cannot be opened by the tightness control. The tightness test is then carried out using an additional auxiliary valve.

Tightness control TC 3 checks the tightness between the manually resettable valve V1 and gas solenoid valve V2 using the auxiliary valves installed in TC 3.

Once the tightness test has been carried out successfully, TC 3 forwards the OK enable signal.



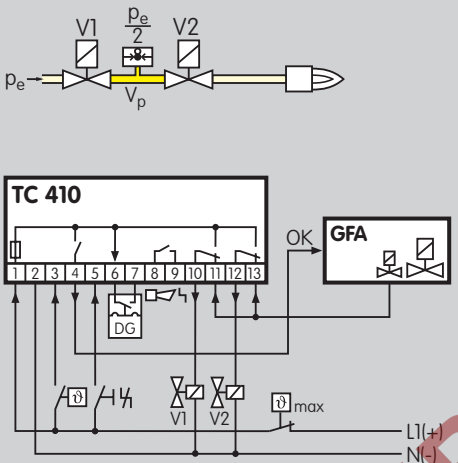


1.1.10 TC 3 in a multiple burner system

Tightness control TC 3 checks the central shut-off valve V1 and gas solenoid valve V2 for tightness. Both valves can also be motorised valves VK.

It must be ensured that the test volume can be supplied and discharged during the opening time of the gas solenoid valves. Therefore, the pressure switch DG monitors the pressure downstream of the gas solenoid valve V2 and switches when the set pressure is exceeded. Then the gas solenoid valve VAS opens and the pipe downstream of V2 is vented.

Once the tightness test has been carried out successfully, TC 3 opens the shut-off valve V1 and gas solenoid valve V2 and forwards the OK enable signal to the automatic burner control units. These open the burner valves and the burners start.



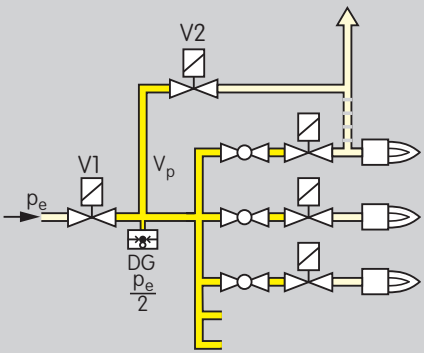
1.1.11 TC 4 with two gas solenoid valves

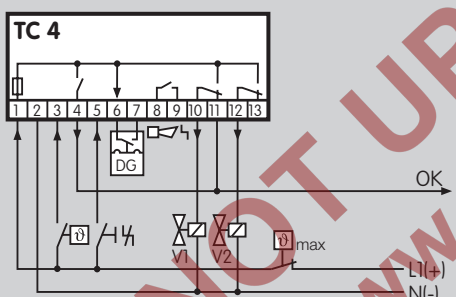
Tightness control TC 4 checks gas solenoid valves V1 and V2 for tightness.

The external pressure switch monitors the pressure between the two valves.

Once the tightness test has been carried out successfully, the tightness control forwards the OK enable signal to the automatic burner control unit GFA. The pilot valve output of the automatic burner control unit GFA opens the gas solenoid valves V1 and V2 simultaneously. The burner starts.

V1 and V2: quick or slow opening valves with start rate.





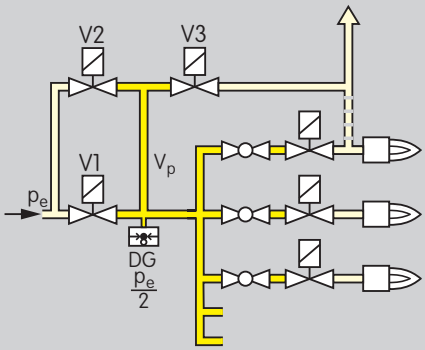
1.1.12 TC 4 in a multiple burner system with one auxiliary valve for discharge

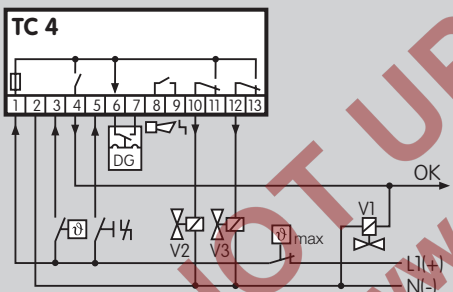
Tightness control TC 4 checks the central shut-off valve V1, the auxiliary valve V2 and several burner valves for tightness. The external pressure switch monitors the pressure between the gas solenoid valves V1, V2 and the burner valves.

Once the tightness test has been carried out successfully, TC 4 opens gas solenoid valve V1. The tightness control forwards the OK enable signal simultaneously to the automatic burner control units for the burner valves. The burner valves open and the burners start.

Thanks to the relief line and auxiliary valve V2, the test volume is discharged into the open air via the roof or into the combustion chamber.

V1: quick opening valve.
V2: quick opening, minimum nominal size = DN 15.





1.1.13 TC 4 in a multiple burner system with two auxiliary valves for supply and discharge

Tightness control TC 4 checks the central shut-off valve V1, auxiliary valves V2 and V3, and several burner valves for tightness.

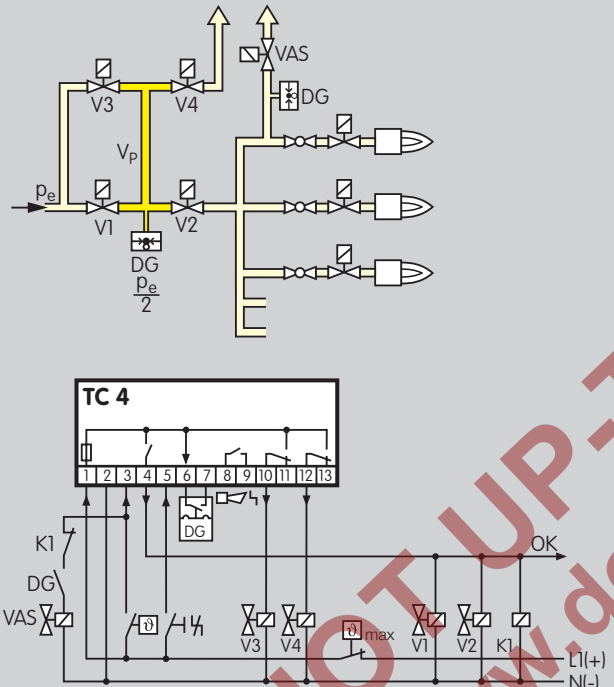
The test volume is supplied via the auxiliary valve V2.

The external pressure switch monitors the pressure between the gas solenoid valves and the burner valves.

Once the tightness test has been carried out successfully, TC 4 opens the central shut-off valve V1. The tightness control forwards the OK enable signal simultaneously to the automatic burner control units for the burner valves. The burner valves open and the burners start.

Thanks to the relief line and auxiliary valve V2, the test volume is discharged into the open air via the roof or into the combustion chamber.

V1: any.
V2 and V3: quick opening, minimum nominal size = DN 15.



1.1.14 TC 4 with 3 valves installed in series

Tightness control TC 4 checks the central shut-off valve V1, the gas solenoid valve V2 and the auxiliary valves V3 and V4 for tightness.

The test volume is supplied via the auxiliary valve V3. The central shut-off valve V1 can thus also be a slow opening motorised valve VK. The test volume is discharged via auxiliary valve V4 and the relief line.

It must be ensured that the test volume can be supplied and discharged during the opening time of the gas solenoid valves. Therefore, the pressure switch DG monitors the pressure downstream of the gas solenoid valve V2 and switches when the set pressure is exceeded. Then the gas solenoid valve VAS opens and the pipe downstream of V2 is vented.

Once the tightness test has been carried out successfully, the tightness control TC 4 opens the shut-off valve V1 and gas solenoid valve V2. The tightness control forwards the OK enable signal simultaneously to the automatic burner control units. These open the burner valves and the burners start.

V3 and V4: quick opening, minimum nominal size = DN 15.

2 Certification

EC type-tested and certified

pursuant to

– Gas Appliances Directive (90/396/EEC) of the standard "Valve proving systems for automatic shut-off valves for gas burners and gas appliances"

Meets the requirements of the

– Machinery Directive 98/37/EC in conjunction with the relevant sections of EN 746.
– Low Voltage Directive (2006/95/EC) in conjunction with the relevant standards.
– Electromagnetic Compatibility Directive (2004/108/EC) in conjunction with the relevant sections of IEC 801 relating to radiation, as well as EN 50093.

FM approved

TC 1, TC 2 and TC 3 for 120 V and 230 V,
TC 4 for 24 V, 120 V and 230 V

Factory Mutual Research Class: 7400 and 7411 Safety overpressure slam shut valves.

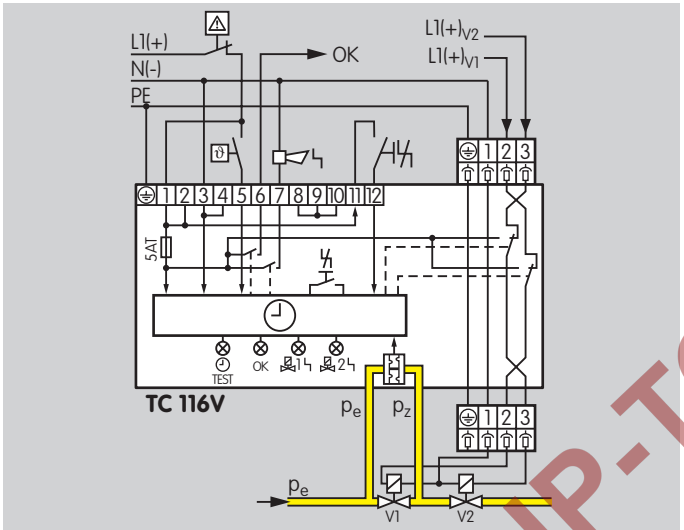
Designed for applications pursuant to NFPA 85 and NFPA 86.

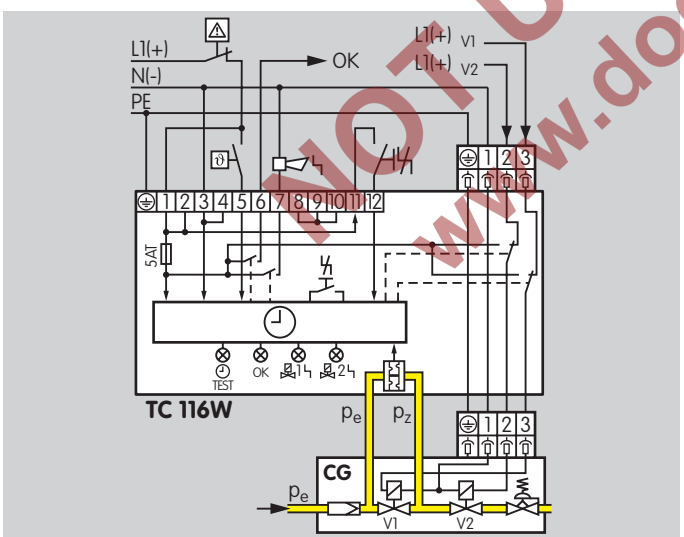
UL approved

TC 1, TC 2 and TC 4 for 120 V

Underwriters Laboratories: UL 353 Limit control.

Canadian Standards Association: CSA – C22.2 No. 24





3 Function

3.1 Connection diagrams

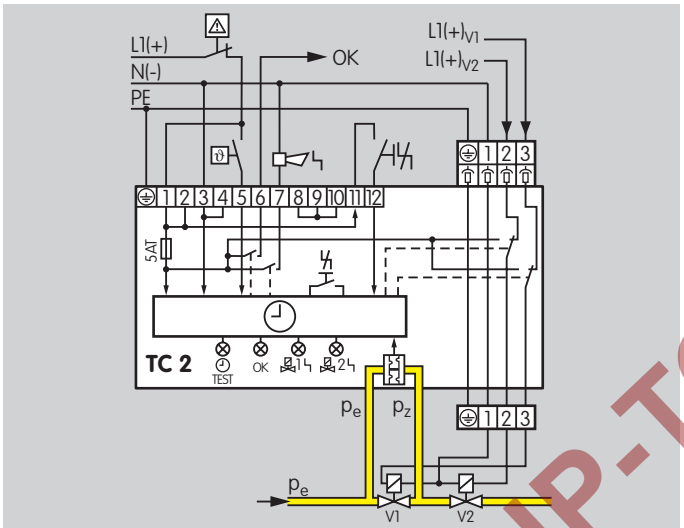
Remote reset by applying mains voltage to terminal 12 or via a floating contact between terminals 11 and 12.

3.1.1 TC 116V for valVario controls VAS, VAG and VAD

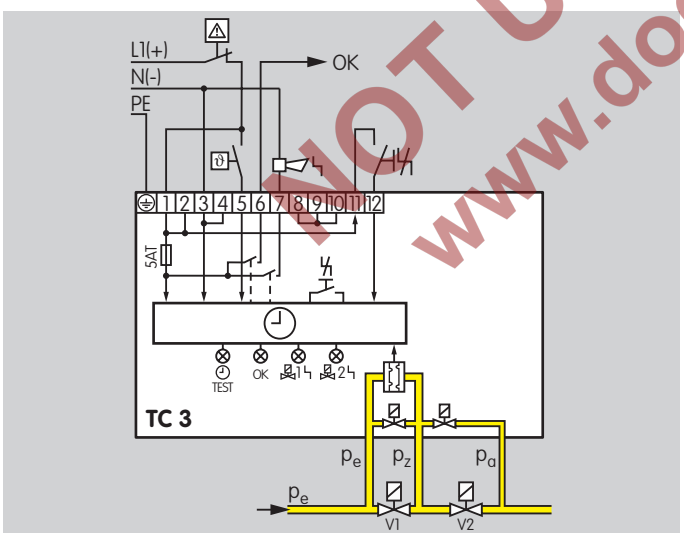
The connection boxes of the valVario controls must be positioned on the same side and will be connected via a single coupler plug.

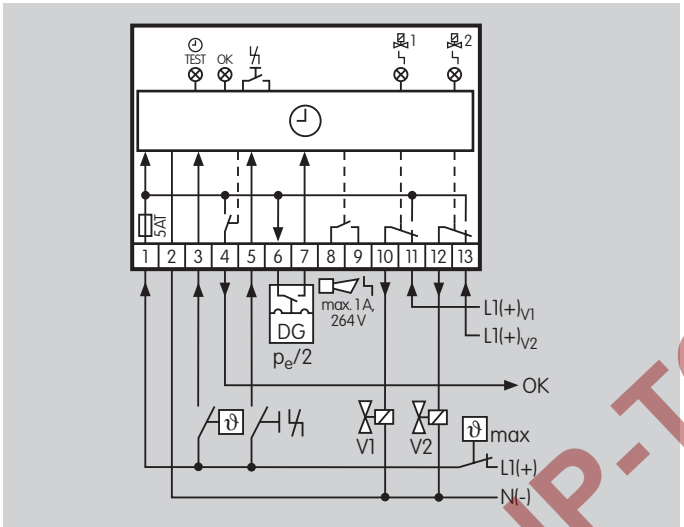
3.1.2 TC 116W

3.1.3 TC 2



3.1.4 TC 3

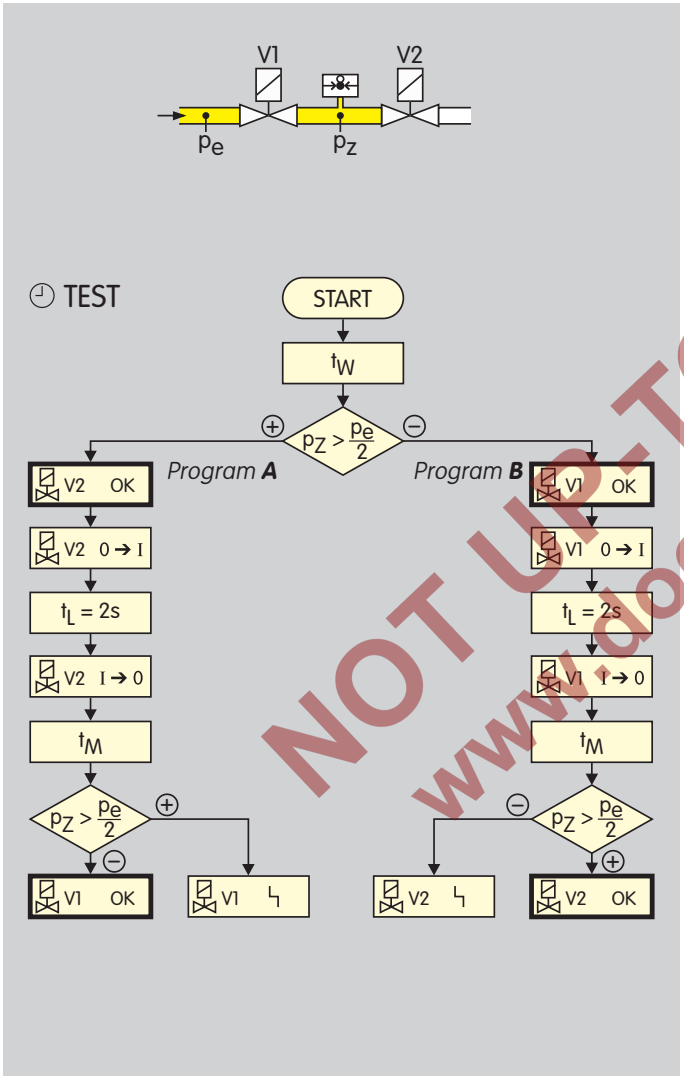




3.1.5 TC 4

Fault signalling contact on terminals 8 and 9: Dry contact (not internally fused), max. 1 A for 264 V, max. 2 A for 120 V.

Connect the NO contact on the pressure switch to terminals 6 and 7.



3.2 Program sequence

The TEST starts with the waiting time t_W. Once the waiting time t_W has elapsed, the tightness control TC checks the pressure p_Z between the inlet valve V1 and the outlet valve V2:

Program A

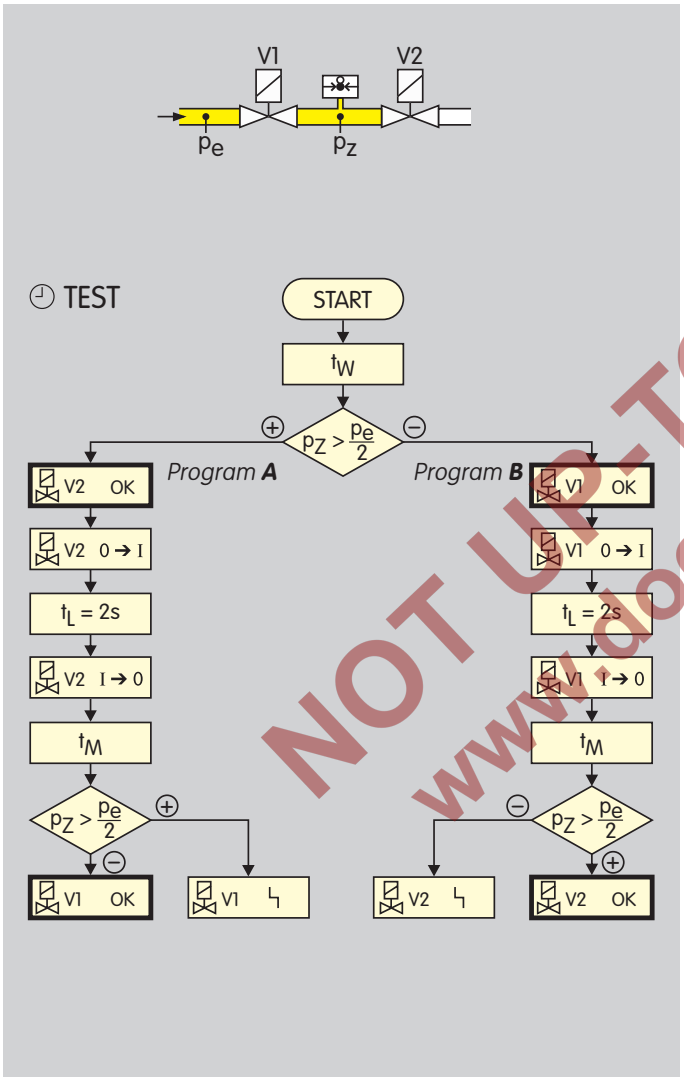
If the pressure p_Z is greater than half the inlet pressure $p_e/2$, valve V2 is OK.

V2 opens for the fixed set opening time t_L of 2 seconds and the test volume is discharged. V2 closes again. During the measurement time t_M, the TC checks the pressure p_Z between the valves again. If the pressure p_Z is now less than half the inlet pressure $p_e/2$, valve V1 is also OK.

Program B

If the pressure p_Z is less than half the inlet pressure $p_e/2$, valve V1 is OK.

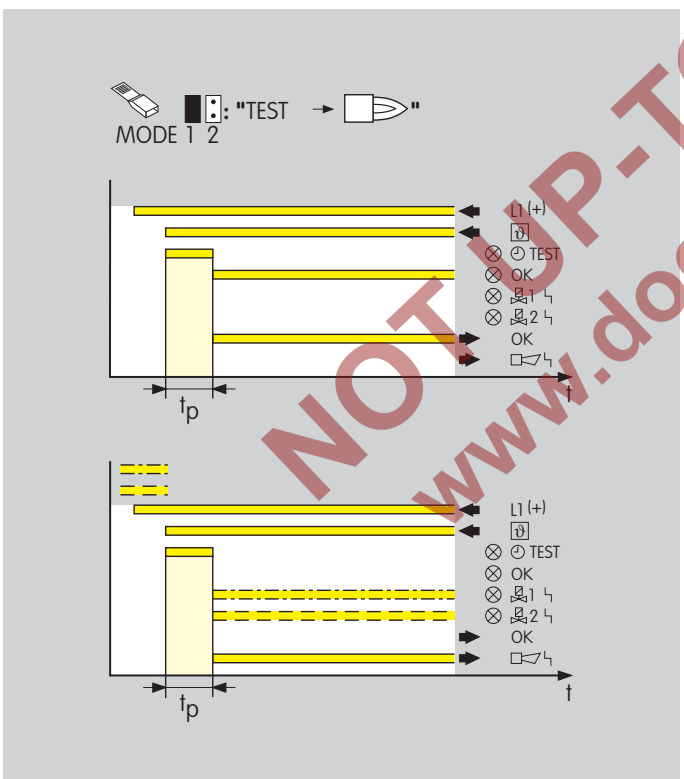
V1 opens for the fixed set opening time t_L of 2 seconds and the test volume is supplied. V1 closes again. If the pressure p_Z is now greater than half the inlet pressure $p_e/2$, valve V2 is also OK.



The tightness control TC runs program **A** or **B** depending on the initial situation. Both valves are checked for tightness respectively but only one valve is opened at a time.

During the test, the TC also checks their fail-safe operation.

After a brief power failure during the tightness test or operation, the TC restarts automatically.



3.3 Test mode

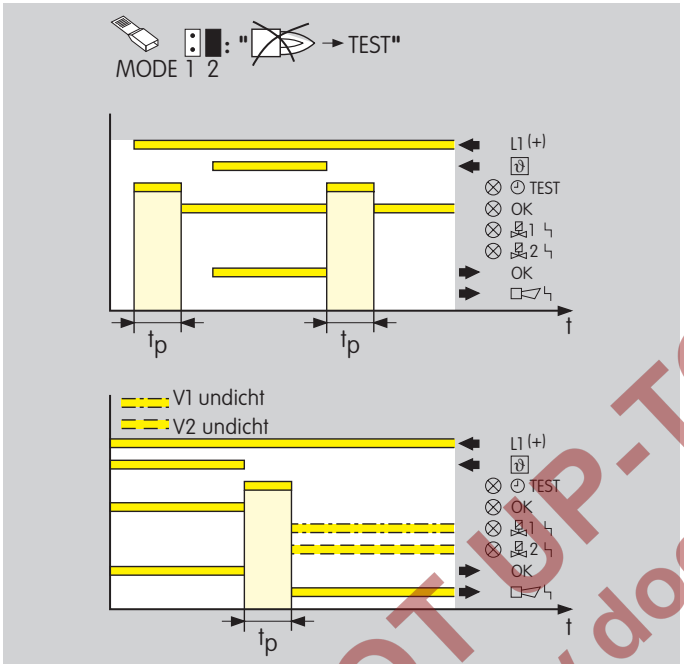
A jumper (left) is used to determine whether the tightness of the gas solenoid valves is to be checked before or after burner run. The tightness control TC is set to "Test before burner run", Mode 1, at the factory.

The test period t_p is set using the second jumper (right), (see "Function").

3.3.1 Testing before burner run: Mode 1

Mains voltage L1 is switched on. Once the start-up signal ϑ has been applied, the tightness test starts. If the valves are tight, the green OK LED lights up. The OK enable signal is forwarded to the automatic burner control unit.

If the tightness control TC detects a leak on one of the two valves, the red LED lights up for a fault on valve V1 1 or valve V2 2. A fault is signalled externally e.g. by switching on a buzzer or a warning light.



3.3.2 Testing after burner run: Mode 2

If the jumper is set to Mode 2, the tightness test after burner run begins as soon as the burner is switched off.

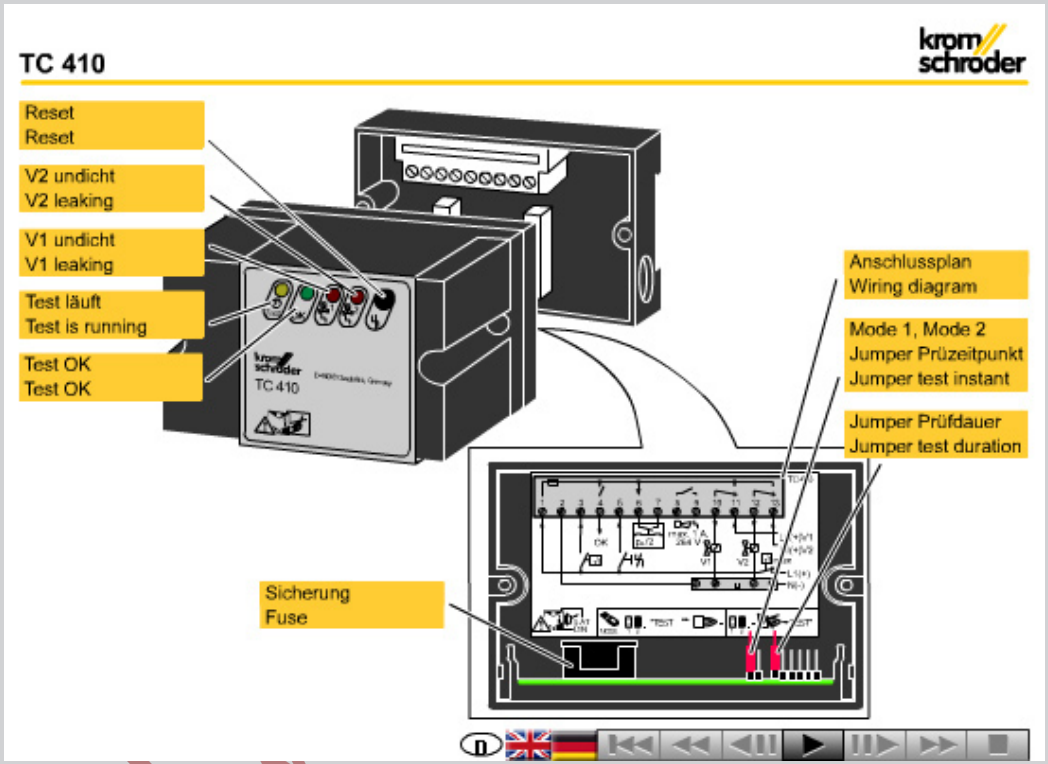
To ensure that the valves are checked for tightness once before starting up the system, the tightness test runs when the voltage L1 is applied. If the valves are tight, the green OK LED lights up. The OK enable signal is not forwarded to the automatic burner control unit until the start-up signal ϑ has been applied.

Once the start-up signal ϑ has been switched off, the tightness test after burner run begins. The OK enable signal is only forwarded to the automatic burner control unit again once the start-up signal ϑ has been re-applied.

If the tightness control TC detects a leak on one of the two valves, the red LED lights up for a fault on valve V1 1 or valve V2 2. An external fault is signalled, e.g. a buzzer or a warning light is switched on.

3.4 Power failure

An external fault signal is forwarded by the tightness control and one of the two red LEDs on the TC lights up to indicate a leak on valve V1 or valve V2. After a power failure, the external fault signal remains active. Both red LEDs are now lit. Once a tightness test has been carried out again, the TC recognises the leaking valve.



3.5 Animation

The interactive animation shows the function of the tightness control TC 4.

Click on the picture. The animation can be controlled using the control bar at the bottom of the window (as on a DVD player).

To play the animation, you will need Adobe Reader 6 or a newer version. If you do not have Adobe Reader on your system, you can download it from the Internet. Go to www.adobe.com, click on „Get Adobe Reader" and follow the instructions.

If the animation does not start to play, you can download it from the document library (Docuthek) as an independent application.

3.6 Test period t_P

The sensitivity of the tightness control TC can be adjusted by adapting the test period t_P for each individual system. The longer the test period t_P, the greater the sensitivity of the TC. It is set using the second jumper on the unit (see "Test mode").

Type	Test period t_P
TC 1–3	10 to 60 s
TC 410-1	10 to 60 s
TC 410-10	100 to 600 s

The required test period t_P is calculated from:

Inlet pressure p_e [mbar]
Leakage rate $\dot{V}_L$ [l/h]
Test volume V_P [l]

$$t_P\,[s] = 4 \times \left(\frac{p_e\,[mbar] \times V_P\,[l]}{\dot{V}_L\,[l/h]} + 1\,s \right)$$

(see Conversion factors)

3.6.1 Leakage rate

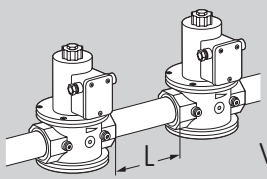
It is possible to check a specific leakage rate $\dot{V}_L$ using the TC. Within the scope of the European Union, the maximum leakage rate $\dot{V}_L$ is 0.1% of the maximum flow rate $\dot{V}_{max.}$ [m^3/h (n)].

If a small leakage rate $\dot{V}_L$ is to be detected, a long test period t_P must be set.

Leakage rate $\dot{V}_L$ [l/h] = $\dot{V}_{max.}$ [m^3/h (n)] x 0.1%

3.6.2 Test volume V_P

Test volume V_P is calculated from the valve volume V_V added to the volume of the pipe V_R for each additional metre in length L (see calculation example).



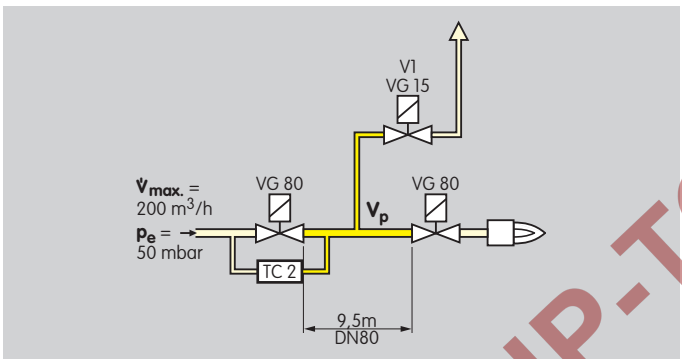
$V_P = V_V + L \times V_R$

Valves	Valve volume V_V [l]	DN	Volume of the pipe per metre V_R [l]
VG 10	0.01	10	0.1
VG 15	0.07	15	0.2
VG 20	0.12	20	0.3
VG 25	0.2	25	0.5
VG 40/VK 40	0.7	40	1.3
VG 50/VK 50	1.2	50	2
VG 65/VK 65	2	65	3.3
VG 80/VK 80	4	80	5
VG 100/VK 100	8.3	100	7.9
VG 125/VK 125	13.6	125	12.3
VG 150/VK 150	20	150	17.7
VG 200/VK 200	42	200	31.4
VG 250/VK 250	66	250	49
VAS 1	0.25		
VAS 2	0.82		
VAS 3	1.8		
VAS 6	1.1		
VAS 7	1.4		
VAS 8	2.3		
VAS 9	4.3		

Test volume V_P for TC 410-10 is almost arbitrary thanks to the adjustable max. test period t_P of 600 s.

3.6.3 Calculation example

2 valves VG 80,
Distance L = 9.5 m (31.2 ft),
Inlet pressure p_e = 50 mbar (20 "WC),
Max. flow rate $\dot{V}_{max.}$ = 200 m³/h (7062 SCFH).



Leakage rate $\dot{V}_L$ = 200 m³/h x 0.1 % = 200 l/h (52.8 gal/h)

Test volume V_P:
V_P = 4 l + 9.5 m x 5 l/m = 51.5 l (13.6 gal)

Test period t_P:

$$t_P\,[s] = 4 \times \left(\frac{50 \times 51.5}{200} + 1 \right) = 55.5\ s$$

Set the next highest value (60 s) with the jumper.

Selecting auxiliary valve V1 (see "Project planning information, auxiliary valves").

3.6.4 Calculating test period t_P

(•) Standard ( ) T-product

Inlet pressure p_e	50.0	mbar
Max. flow rate $\dot{V}$	200	m3/h
Max. leakage rate $\dot{V}_L$	200	l/h
Nominal diameter DN	80	
Distance L between V1 and V2	9.50	m
Test volume V_P	51.5	Liter
Calculated test period t_P	56	s
Test period t_P to be set	60	s

4 Selection

TC 1 for attachment to valVario controls and CG
TC 2 for quick opening individual valves
TC 3 for quick or slow opening or manually resettable individual valves
TC 4 for control cabinet installation

Order example
TC 318R05T

	1	0	6	8	T	-1*	-10	R	N	V**	W	05	K	N	T
TC 1	●		●		○	●				●	●	●	●	●	●
TC 2	●			●	○	●		●	●			●	●	●	●
TC 3***	●			●	○	●		●	●			●	●	●	●
TC 4	●	●			○	●	●						●	●	●

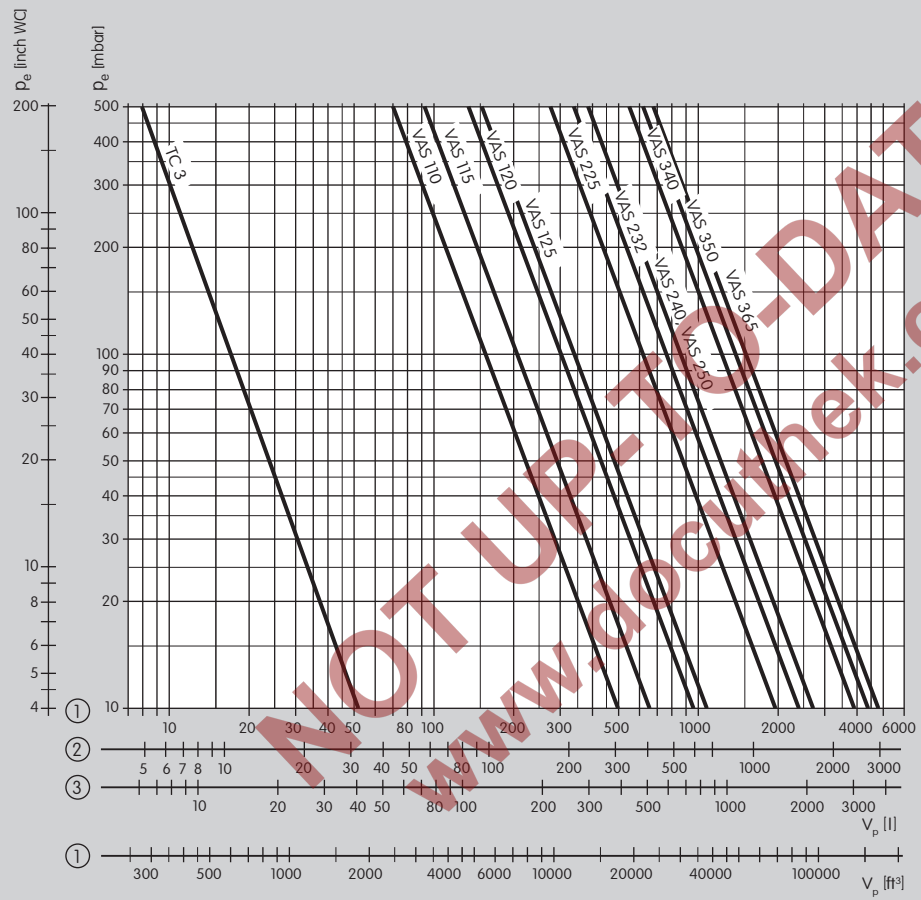
Type = TC
Testing before or after burner run = 1
External pressure switch required = 0
6 mm (0.24") connection = 6
8 mm, ¼" (0.31") connection = 8
T-product = T
Test period 10 to 60 s = -1*
Test period 100 to 600 s = -10
Rp internal thread = R
NPT internal thread = N
Mounted to valVario controls using adapter plate = V**
Mounted to combination control CG = W
p_e max. 500 mbar (7.25 psig) = 05
Mains voltage
24 V DC = K
110/120 V AC, 50/60 Hz = N
220/240 V AC, 50/60 Hz = T

● = standard, ○ = available

* Designation "-1" only in type code for TC 4.

** An additional adapter plate is required for the TC 116V for attachment on the right- or left-hand side of valVario controls (see "Accessories").

***Max. test volume V_p on TC 3 (see "Project planning information").



① = Natural gas ρ = 0.8 kg/m³ (0.05 lbs/ft³)

② = Propane ρ = 2.01 kg/m³ (0.13 lbs/ft³)

③ = Air ρ = 1.29 kg/m³ (0.08 lbs/ft³)

5 Project planning information

On slow opening valves without start rate or pneumatically operated valves, the test volume can be supplied or discharged via auxiliary valves, if discharge into the furnace chamber is impossible for process reasons.

5.1 Selecting the auxiliary valves

Selecting auxiliary valve V1 (see "Function, Calculation example"):

V_P = 51.5 l (13.4 gal),
p_e = 50 mbar (19.5 "WC)
selected ⇒ VAS 110.

The valve is sufficiently large to vent the pipe between the valves.

5.2 Start rate

The tightness control TC requires a minimum start rate in order to carry out tightness tests on slow opening valves:

up to 5 l (1.3 gal) test volume V_P = 5% of maximum flow rate $V_{max.}$,

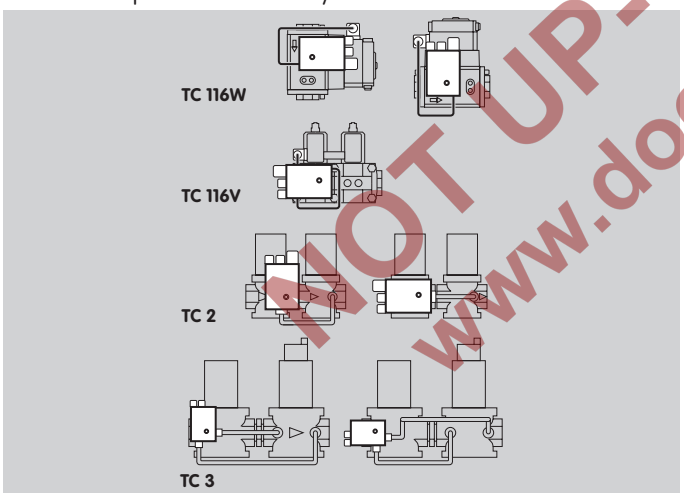
up to 12 l (3.12 gal) test volume V_P = 10% of maximum flow rate $V_{max.}$

(see "Function, Test volume V_P").

5.3 Installation

Installation position TC 1 to TC 3: in the vertical or horizontal position, front panel must not point upwards or downwards.

Installation position TC 4: any.



In the case of very large test volumes V_p, an installed relief line should be of nominal size 40 to allow for venting the test volume V_p.

Avoid condensation in the system.

The tightness control TC must not be in contact with masonry, minimum distance 20 mm (0.78 inch).

5.3.1 TC 116V for valVario controls

The connection boxes of the valVario controls must be positioned on the same side and will be connected via a coupler plug.

On a valve/pressure regulator combination, the pressure regulator must be positioned at the outlet.

When using a gas solenoid valve with air/gas ratio control VAG, the air/gas ratio control must be activated with air during the test period t_P so that the valve can blow off the interspace pressure p_z.

5.3.2 TC 4

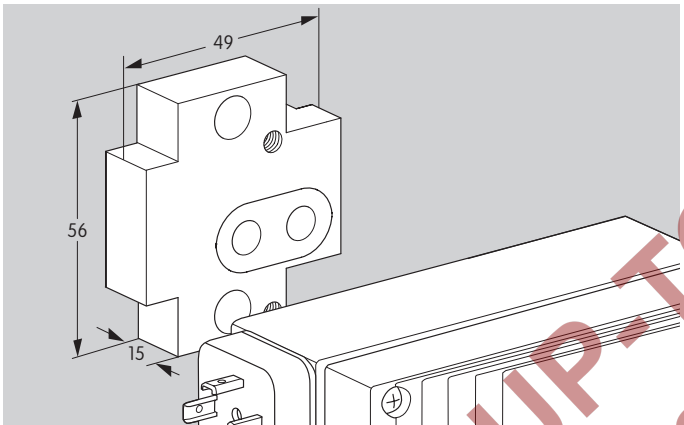
Install by bolting the lower section.

The upper section containing the detection circuitry is a push connection fit into the lower section. For installation in the control cabinet housing, for example, the lower section can be secured with screws or mounted on a DIN rail.

Snap attachment for DIN rails
Width = 35 mm (1.36 inch).

6 Accessories

6.1 Adapter plate for TC 116V, attachment to valVario controls



An additional adapter plate is required for the TC 116V for attachment on the right- or left-hand side of valVario controls.

Right-hand side adapter plate for valVario controls
Sizes 1–3: Order No. 74921995.

Left-hand side adapter plate for valVario controls
Sizes 1–3: Order No. 74922391.

6.2 External pressure switch for TC 4

Gas pressure switches DG, DG..C for monitoring the pressure between the valves to be checked.

For inlet pressures of 0.5 to 500 mbar (0.2 to 195 "WC).

The switching differential may not exceed ±10% of the set switching pressure.

(see Technical Information bulletin Pressure switch for gas DG, DG..C at www.docuthek.com.

6.2.1 Adjustment

The external pressure switch is set to half the inlet pressure $p_e/2$ (only NO contact required) in order to check both valves with equal sensitivity.

Example:
p_e = 100 mbar (39 "WC).
set switching pressure $p_e/2$ = 50 mbar (19.5 "WC),
max. switching differential:
50 mbar x 10% = 5 mbar (19.5 "WC x 10% = 1.95 "WC),
which means, the switch-on and switch-off pressure must be between 45 mbar (17.55 "WC) and 55 mbar (21.45 "WC).

7 Technical data

Mains voltage:
110/120 V AC, -15/+10 %, 50/60 Hz,
220/240 V AC, -15/+10 %, 50/60 Hz,
24 V DC, ± 20%.

Power consumption:
10 VA for 110/120 V AC and 220/240 V AC,
1.2 W for 24 V DC.

Ambient temperature:
-15 to +60°C (+5 to +140°F), no condensation permitted.

2.5 mm^2 screw terminals.

Fusing:
fine-wire fuse 5 A, slow-acting, H pursuant to IEC 127, also protects the valve outputs and external operating signal.

External operating signal:
with mains voltage, max. 5 A resistive load
(UL approved: 5 A for 120 V),
max. 2 A for cos φ= 0.35 (pilot duty).

External fault signal:
fault signalling contact, max. 5 A for 264 V.

Reset: using a button on the device.

Remote reset: by applying mains voltage.

Housing made of impact-resistant plastic.

TC 1–3

For natural gas, town gas and LPG (gaseous), also for biologically produced methane.

Inlet pressure p_e: 10 to 500 mbar (3.9 to 195 "WC).

Test period t_P: 10 to 60 s, adjustable:
set at the factory to 10 s.

TC 3: Power consumption of the installed valves during the opening time t_L: max. 9,5 VA (W).

Enclosure: IP 54.

Standard coupler plug to DIN 43650/ISO 4400.

Weight:

TC 1: 550 g (1.21 lbs),
TC 2: 900 g (1.98 lbs),
TC 3: 1,500 g (3.31 lbs).

TC 4

Gas type and inlet pressure pe:
dependent on external pressure switch.

The pressure switch is set to half the inlet pressure $p_e/2$.
The switching differential may not exceed ±10% of the set switching pressure (see "Accessories").

Test period t_P:
TC 410-1: 10 to 60 s, adjustable:
set at the factory to 10 s.

TC 410-10: 100 to 600 s, adjustable:
set at the factory to 100 s.

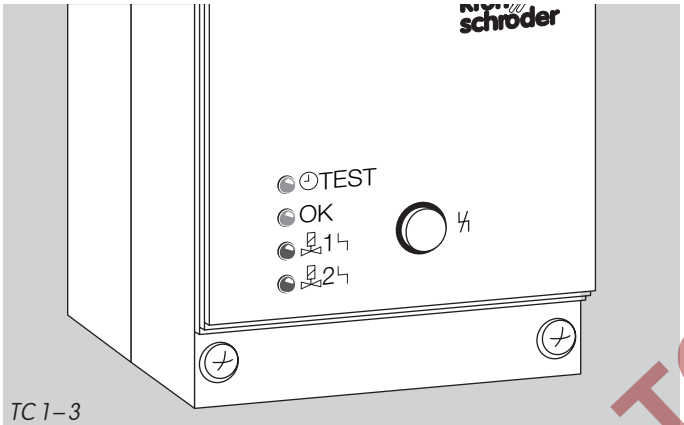
Enclosure: IP 40.

External fault signal:
dry contact (not internally fused),
max. 1 A for 264 V, max. 2 A for 120 V.

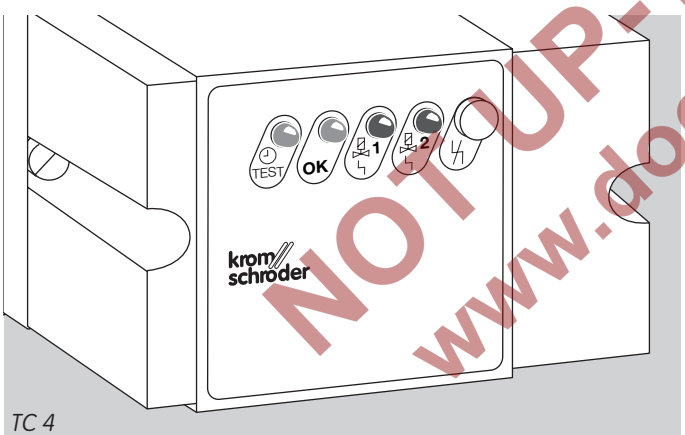
Lower section with connection terminals.

5 knock-out holes for PG 11 cable gland or M16 plastic cable glands are pre-prepared.

Weight: approx. 400 g (0.88 lbs).



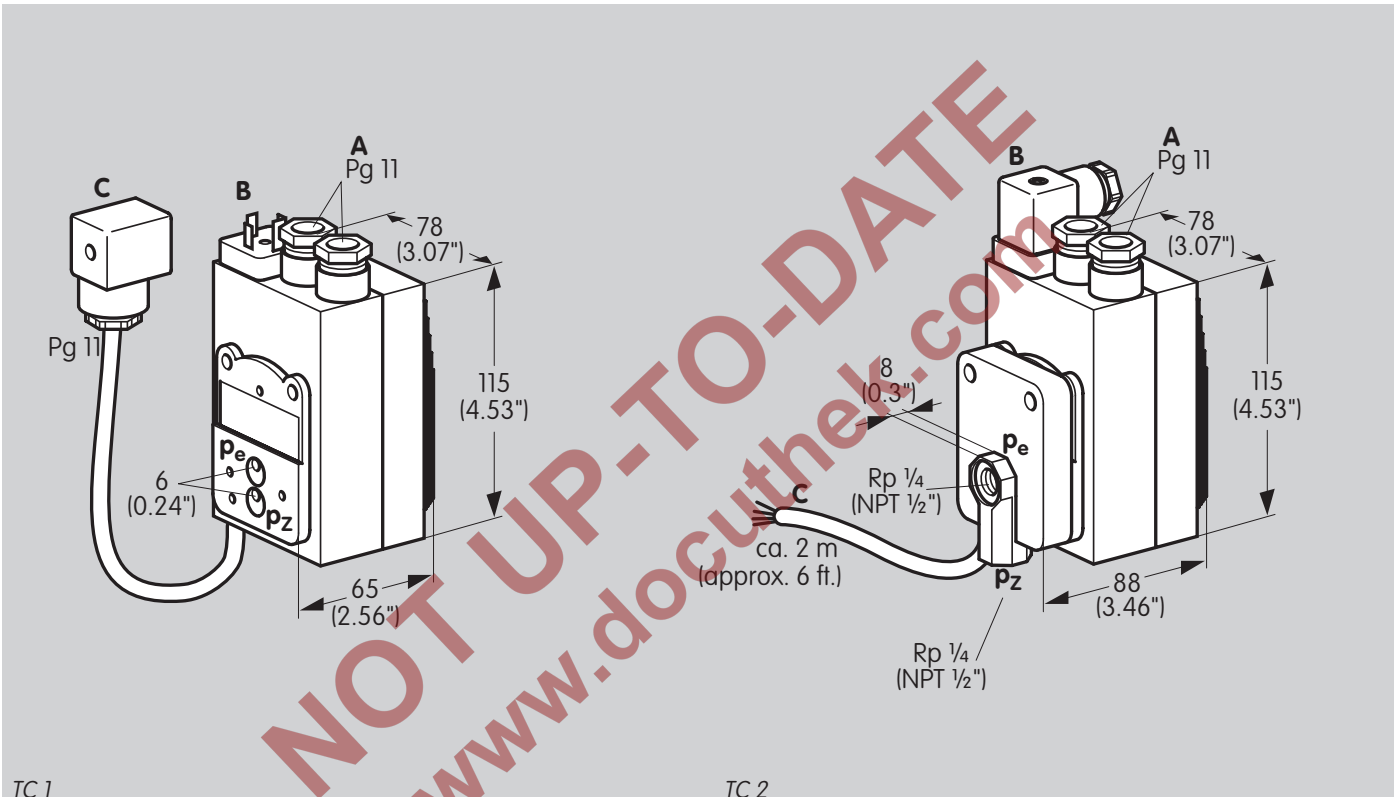
TC 1–3



TC 4

7.1 Indicators and operating controls

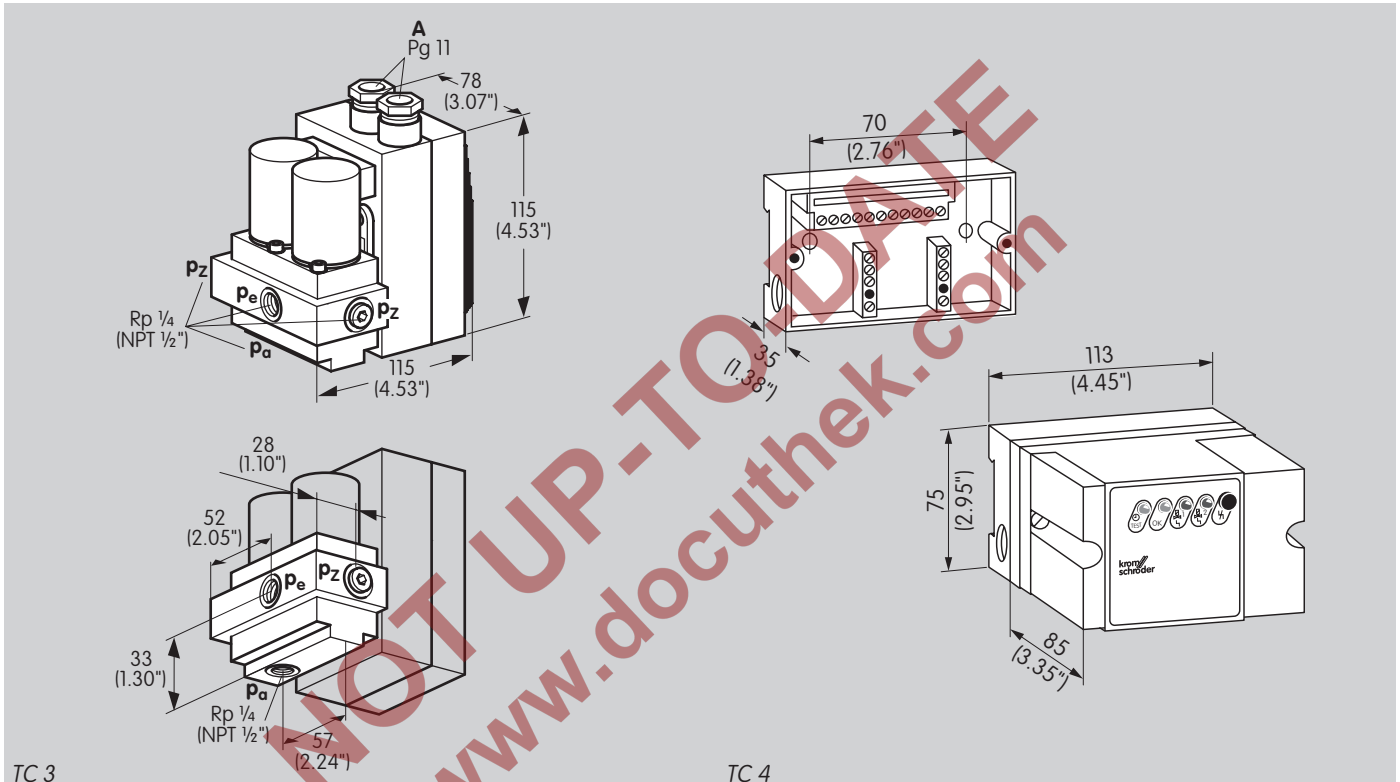
TEST = TEST phase (yellow)
OK = Operating signal (green)
1 = Fault valve 1 (red)
2 = Fault valve 2 (red)
= Reset button.



7.2 Dimensions

7.2.1 TC 1, TC 2

A = Supply and signal forwarding,
B = Automatic burner control unit,
C = Gas solenoid valves,
p_e = Inlet pressure p_e,
p_z = Interspace pressure p_z.



TC 3 TC 4

7.2.2 TC 3, TC 4

A = Supply and signal forwarding,
B = Automatic burner control unit,
C = Gas solenoid valves,
p_e = Inlet pressure p_e,
p_z = Interspace pressure p_z,
p_a = Outlet pressure p_a

7.3 Conversion factors

SI unit ×	multiplier =	US unit
m^3/h	35.31	SCFH
bar	14.5	psi
mbar	0.0145	psi
mbar	0.39	"WC
mm	0.039	inch
kg	2.2	lbs
Liter	0.26	gal

US unit ×	multiplier =	SI unit
SCFH	0.0283	m^3/h
psi	0.0689	bar
psi	68.89	mbar
"WC	2.54	mbar
inch	25.4	mm
lbs	0.45	kg
gal	3.79	Litres

$°C = (°F - 32) \times {}^{5}/_{9}$

$°F = (°C \times {}^{9}/_{5}) + 32$

8 Maintenance cycles

The tightness control requires little servicing. We recommend a function check once a year.

9 Glossar

9.1 Test period t_P

The test period t_P is the sum of the waiting time t_W, the fixed set opening time t_L of 2 s and the measurement time t_M.

9.2 Interspace pressure

The interspace pressure is the pressure between the gas solenoid valves to be checked for tightness.

Feedback

Finally, we are offering you the opportunity to assess this "Technical Information (TI)" and to give us your opinion, so that we can improve our documents further and suit them to your needs.

Clarity

- ○ Found information quickly
- ○ Searched for a long time
- ○ Didn't find information

  What is missing?
- ○ No answer

Comprehension

- ○ Coherent
- ○ Too complicated
- ○ No answer

Scope

- ○ Too little
- ○ Sufficient
- ○ Too wide
- ○ No answer

Use

- ☐ To get to know the product
- ☐ To choose a product
- ☐ Planning
- ☐ To look for information

Navigation

- ○ I can find my way around
- ○ I got "lost"
- ○ No answer

My scope of functions

- ○ Technical department
- ○ Sales
- ○ No answer

Remarks

(Adobe Reader 7 or higher required)

Contact

Elster GmbH
Postfach 2809 · 49018 Osnabrück
Strotheweg 1 · 49504 Lotte (Büren)
Deutschland

T +49 541 1214-0
F +49 541 1214-370
info@kromschroeder.com
www.kromschroeder.de
www.elster.com

The current addresses of our international agents are available on the Internet:
www.kromschroeder.com ➔ Sales

Kromschröder, a product brand of the Elster Group

03250636