Honeywell

krom schröder

TC

Tightness controls

- Adjustable test period which can be adapted to different systems
- Adjustable test instant allows quick system start
- Maximum safety thanks to self-monitoring electronics

Application

TC 1, TC 2

TC 3

TC 4

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, on boilers and on forced draught burners.

Standards ISO 13577-2, 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 a safe area.

TC 1V, TC 1C

Tightness control TC 1V can be directly flange-mounted to all valVario controls. There is only one version for all sizes.

TC 1C can be used for combination controls CG 1 to 3. An adapter plate is supplied for installation.

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 motorized 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).

An adapter plate is provided for installation of the TC 2.

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 motorized valves. The tightness test is carried out with the valves installed in TC 3.

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 p_u and can be used for a test period of up to 10 minutes with a large test volume.
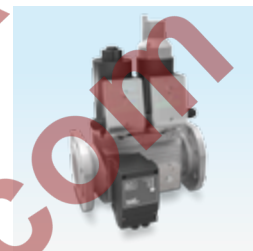
TC 1V on a valVario double solenoid valve

TC 4 installed separately from the system in a control cabinet
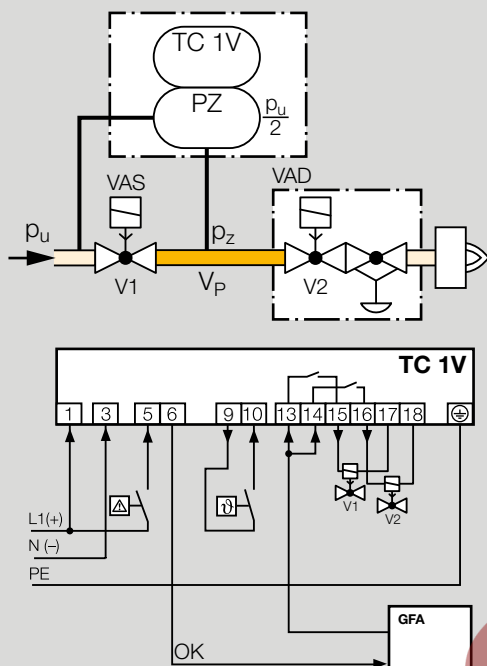
Application examples

P_Z = Internal pressure sensor of the TC for the comparison of inlet pressure p_u and inter-space pressure p_z

p_d = Outlet pressure

V_P = Test volume

TC 1V with valVario controls

Mains voltage = control voltage
V1: quick or slow opening valve with start rate.
V2: pressure regulator with solenoid valve.

Tightness control TC 1V checks gas solenoid valves V1 and V2 and the pipe between the valves for tightness. If both valves are tight, the TC forwards the OK enable signal to the automatic burner control unit GFA. This opens valves V1 and V2 simultaneously. The burner starts.
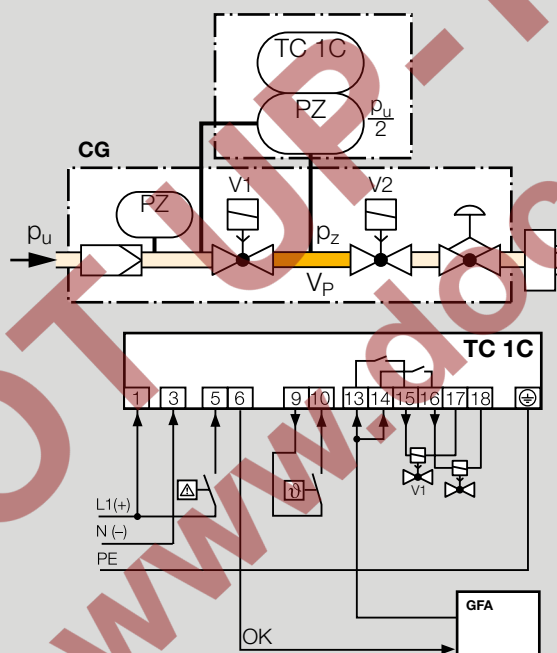
TC 1C with combination control CG..D or CG..V

Mains voltage = control voltage
V1 and V2: quick opening valves.

TC 1C is directly flange-mounted to combination control CG..D or CG..V and checks gas solenoid valves V1 and V2 in the combination control for tightness.

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.
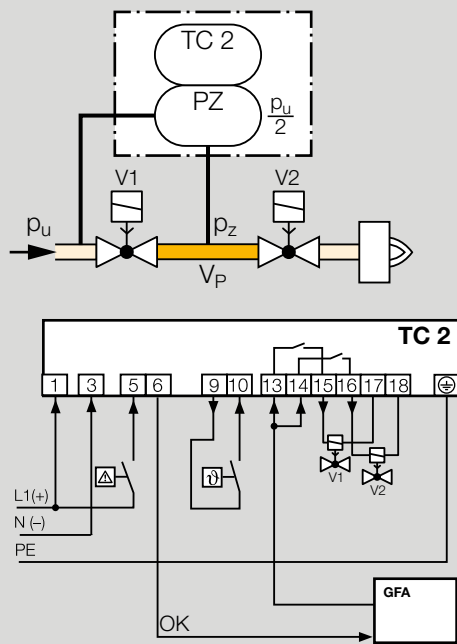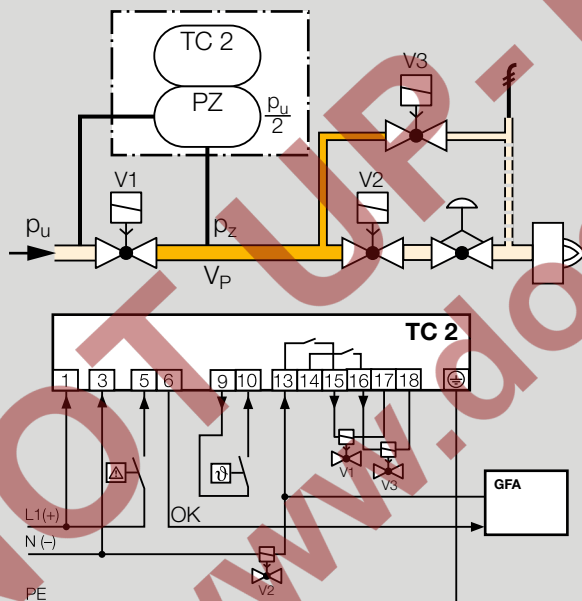
TC 2 with two gas solenoid valves

Mains voltage = control voltage
V1 and V2: quick or slow opening valves with start rate.

TC 2 checks gas solenoid valves V1 and V2 and the pipe between the valves for tightness.
If both valves are tight, the TC forwards the OK enable signal to the automatic burner control unit GFA. This opens valves V1 and V2 simultaneously. The burner starts.

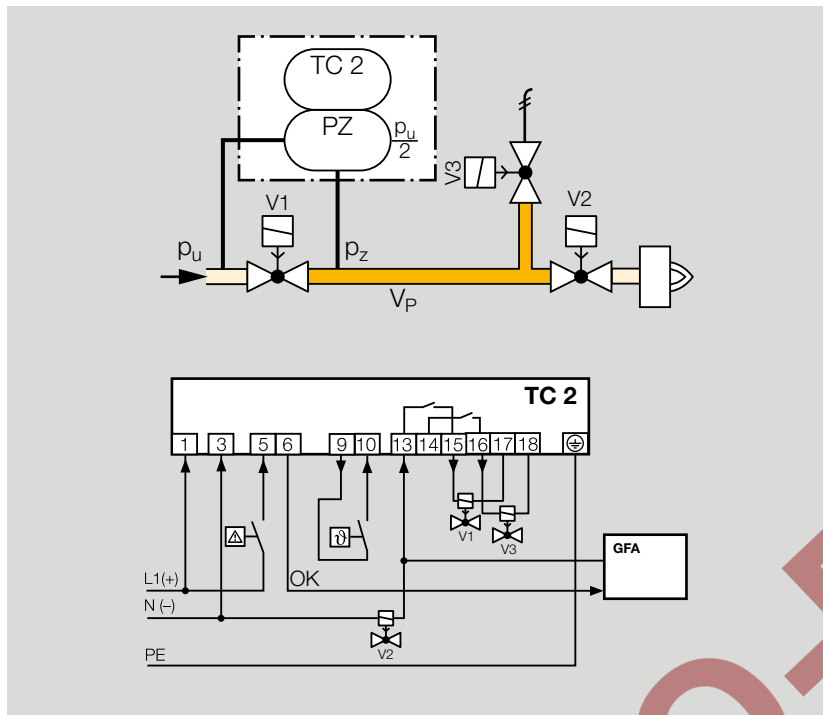## TC 2 with two gas solenoid valves and one auxiliary valve for discharge

Mains voltage = control voltage
V1 and V2: quick or slow opening valves with start rate.
V3: quick or slow opening valve with start rate, nominal size is dependent on test volume V_P and inlet pressure p_u, but is at least DN 15.

TC 2 checks gas solenoid valves V1, V2, the auxiliary valve V3 and the pipe between the valves for tightness.
It must be ensured that the interspace p_z is vented during the 3-second opening time. This is not guaranteed by the gas pressure regulator downstream of V2. A relief line is thus used to discharge the test volume V_P safely into the combustion chamber or into a safe area. Auxiliary valve V3 can also be used as a pilot gas valve. Since valve V2 remains closed during the test, it can also be a slow opening motorized valve VK. 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 GFA opens the gas solenoid valves V1 and V2 simultaneously. The burner starts.

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

Mains voltage = control voltage

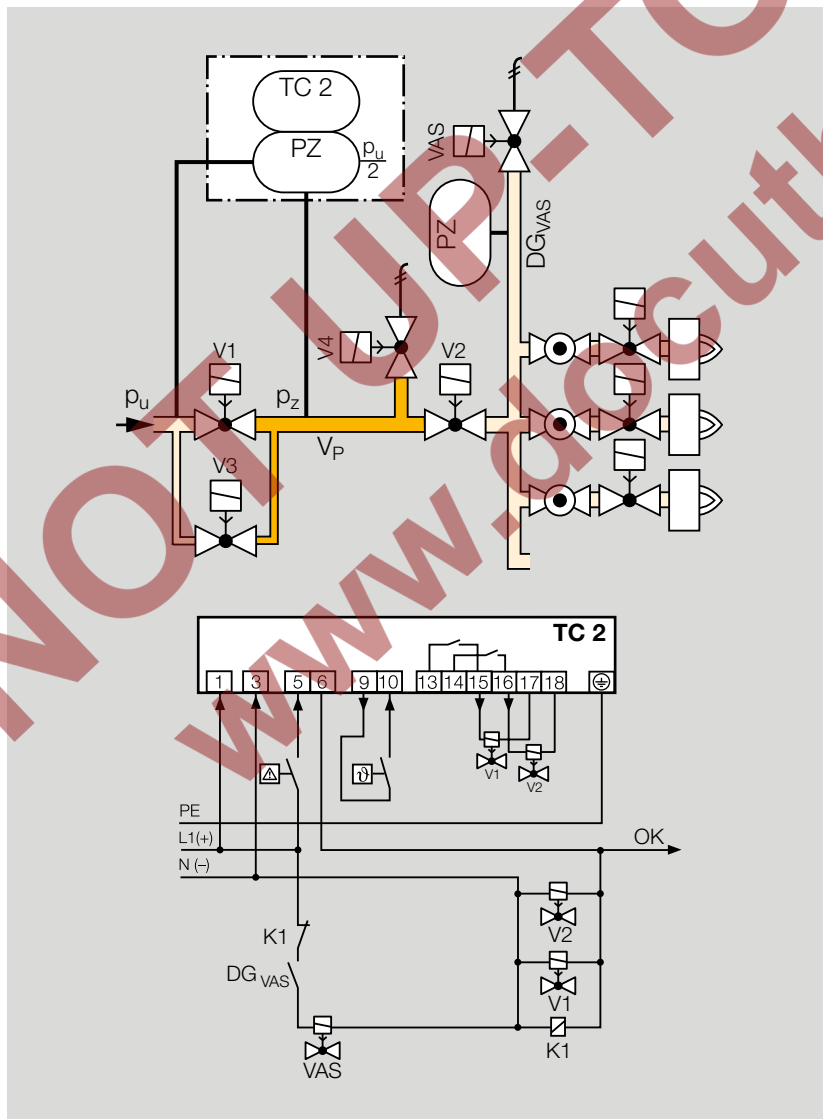V1: quick or slow opening valve with start rate.

V2: any.

V3: quick opening, nominal size is dependent on test volume V_P and inlet pressure p_u, but is at least DN 15.

TC 2 checks gas solenoid valves V1, V2, the auxiliary valve V3 and the pipe between the valves 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 GFA opens the gas solenoid valves V1 and V2 simultaneously. The burner starts.

A relief line is used to discharge the test volume V_P into a safe area. Thanks to the installed auxiliary valve V3, valve V2 can also be a slow opening motorized valve VK.

TC 2 in a multiple burner system with several valves installed in series

Mains voltage = control voltage

V3 and V4: quick opening, nominal size is dependent on test volume V_P and inlet pressure p_u, but is at least DN 15.

When using slow opening main valves (V1 and V2), auxiliary valves (V3 and V4) must be used for the supply and discharge of the test volume V_P.

TC 2 checks the central shut–off valve V1, the gas solenoid valve V2, the auxiliary valves V3 and V4 and the pipe between these valves for tightness.

Valve V2 can only be checked for tightness when the pressure downstream of V2 approximately corresponds to the atmospheric pressure and the volume downstream of valve V2 is 5 x V_P. The gas solenoid valve VAS and the pressure switch DGVAS are used to relieve the pressure. The pressure switch must be adjusted in such a way so that enough pressure is relieved and no air can get into the pipework.

Once the tightness test has been carried out successfully, TC 2 opens the main valves V1 and V2 with the OK enable signal and enables the downstream burner control units.
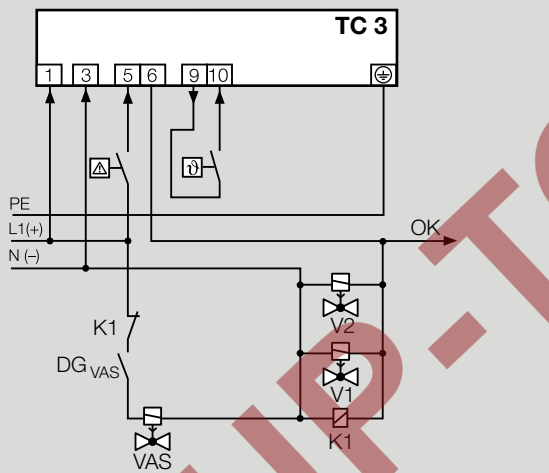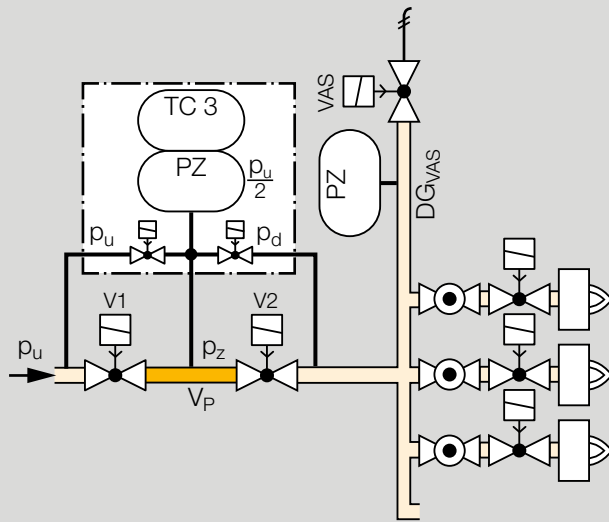
TC 3 in a multiple burner system with several valves installed in series

V1 and V2: any.

TC 3 checks slow opening main valves V1 and V2 and the pipe between these valves for tightness. The test volume V_P is supplied and discharged via the TC 3 auxiliary valves.

Valve V2 can only be checked for tightness when the pressure downstream of V2 approximately corresponds to the atmospheric pressure and the volume downstream of valve V2 is 5 x V_P. The gas solenoid valve VAS and the pressure switch DGVAS are used to relieve the pressure. The pressure switch must be adjusted in such a way so that enough pressure is relieved and no air can get into the pipework.

Once the tightness test has been carried out successfully, TC 3 opens the main valves V1 and V2 with the OK enable signal and enables the downstream burner control units.
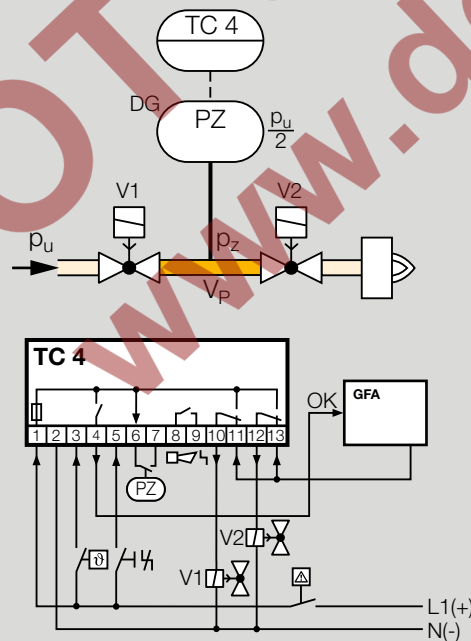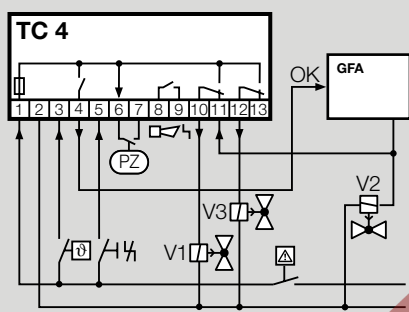

TC 4 with two gas solenoid valves

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

TC 4 checks gas solenoid valves V1 and V2 and the pipe between the valves for tightness. The external pressure switch DG monitors the pressure between the two valves.

Once the tightness test has been carried out successfully, TC 4 forwards the OK enable signal to the automatic burner control unit GFA. The GFA opens the gas solenoid valves V1 and V2 simultaneously. The burner starts.
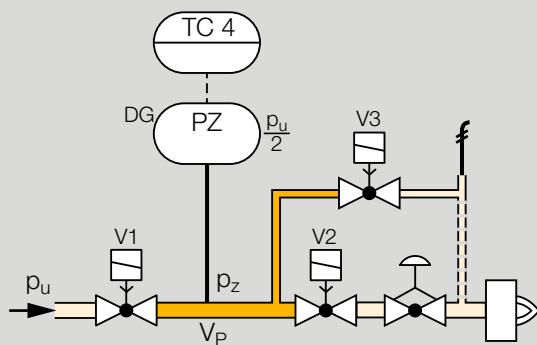
TC 4 with two gas solenoid valves and one auxiliary valve for discharge

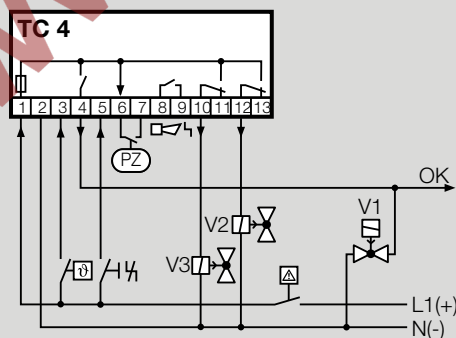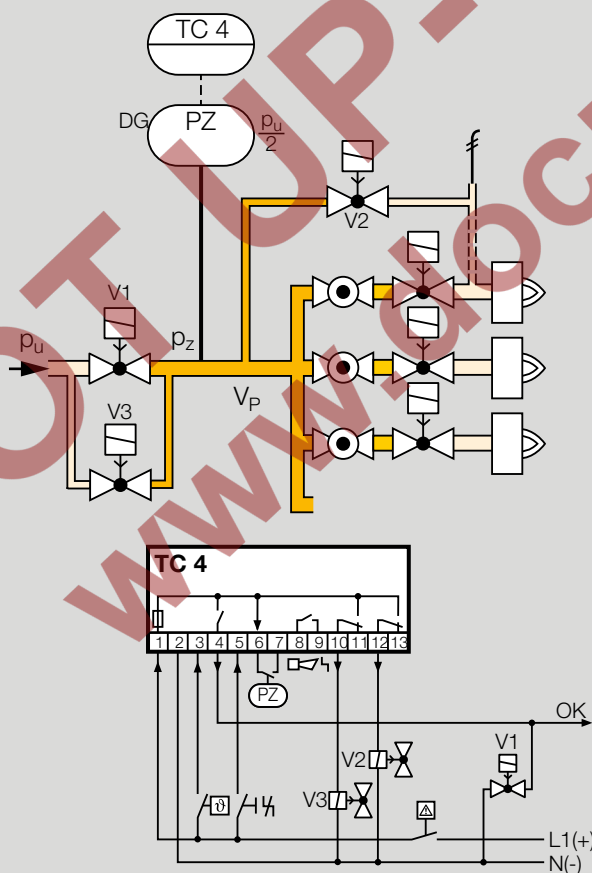V1: quick or slow opening valve with start rate.

V2: any.

V3: quick opening, nominal size is dependent on test volume V_P and inlet pressure p_u, but is at least DN 15.

TC 4 checks gas solenoid valves V1, V2, the auxiliary valve V3 and the pipe between the valves for tightness.

It must be ensured that the interspace p_z is vented during the 2-second opening time. This is not guaranteed by the gas pressure regulator downstream of V2. A relief line is thus used to discharge the test volume V_P safely into the combustion chamber or into a safe area. Since valve V2 remains closed during the test, it can also be a slow opening motorized valve VK.

If all the gas solenoid valves are tight, TC 4 forwards the OK enable signal to the automatic burner control unit GFA. The GFA opens the gas solenoid valves V1 and V2 simultaneously. The burner starts.

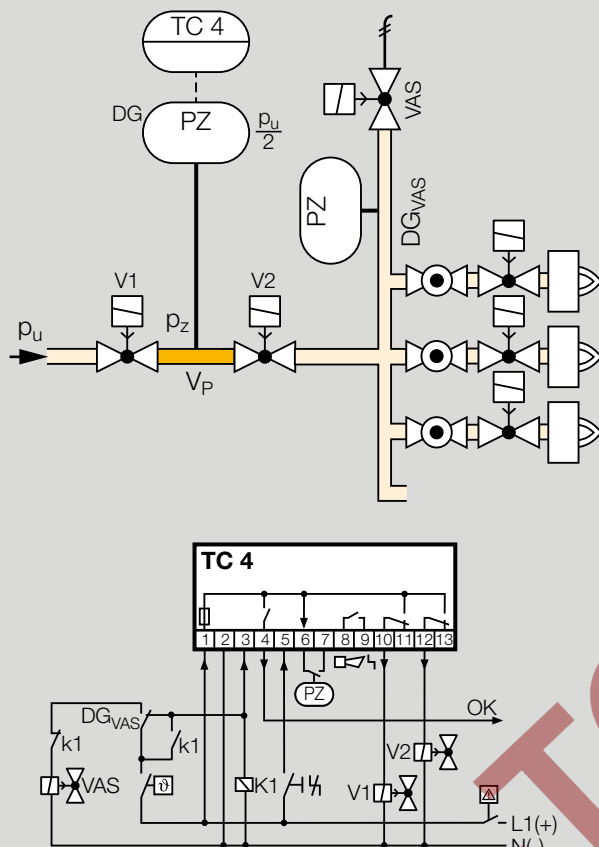## TC 4 in a multiple burner system with two auxiliary valves for supply and discharge

V1: any.

V2 and V3: quick opening, nominal size is dependent on test volume V_P and inlet pressure p_u, but is at least DN 15.

TC 4 checks the central shut-off valve V1, the auxiliary valves V2 and V3, the burner valves and the pipe between these valves for tightness.

The test volume V_P is supplied via the auxiliary valve V3.

The external pressure switch DG 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 TC 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 V_P is discharged into a safe area or into the combustion chamber.

TC 4 in a multiple burner system with several valves installed in series

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

Tightness control TC 4 checks the central shut-off valve V1, the gas solenoid valve V2 and the pipe between these valves for tightness.
Valve V2 can only be checked for tightness when the pressure downstream of V2 approximately corresponds to the atmospheric pressure. The gas solenoid valve VAS and the pressure switch DGVAS are used to relieve the pressure. The pressure switch must be adjusted in such a way so that enough pressure is relieved and no air can get into the pipework.
After the thermostat/start-up signal ϑ has been applied, first DG_{VAS} is checked. If the pressure downstream of V2 is correct, the VAS closes and the tightness test is started.
Once the tightness test has been carried out successfully, TC 4 opens the main valves V1 and V2 with the OK enable signal and enables the downstream burner control units.

Technical data

TC 1, TC 2, TC 3

Electrical data

Mains voltage and control voltage:
120 V AC, –15/+10%, 50/60 Hz,
230 V AC, –15/+10%, 50/60 Hz,
24 V DC, ±20%.

Power consumption (all LEDs green):
5.5 W at 120 V AC and 230 V AC,
2 W at 24 V DC,
TC 3: plus 8 VA for an auxiliary valve.

Fine-wire fuse: 5 A, slow-acting, H, 250 V, pursuant to IEC 60127-2/5,
F1: protection of valve outputs (terminals 15 and 16), fault signal (terminal 12) and supply of the control inputs (terminals 2, 7 and 8).
F2: protection of safety interlock/controller enable signal (terminal 6).

The input current at terminal 1 must not exceed 5 A.

Max. load current (terminal 6) for safety interlock/controller enable and valve outputs (terminals 15 and 16): at 230/120 V AC mains voltage, max. 3 A resistive load; at 24 V DC mains voltage, max. 5 A resistive load.

External fault signal (terminal 12):
fault output at 120 V AC/230 V AC/24 V DC mains and control voltage: max. 5 A,
fault output at 120 V AC/230 V AC mains voltage,
24 V DC control voltage: max. 100 mA.

TC switching cycles: 250,000 pursuant to EN 13611.

Reset: using a button on the device or by remote reset.

Environment

Gas type: natural gas, town gas, LPG (gaseous), biogas (max. 0.1 %-by-vol. H_2S) and air.

The gas must be clean and dry in all temperature conditions and must not contain condensate.

Inlet pressure p_u:
10 to 500 mbar (3.9 to 195 „WC).

Measurement time t_M: 5 to 30 s, adjustable. Set at the factory to 30 s.

Medium and ambient temperatures:
–20 to +60°C (–4 to +140°F).
No condensation permitted.

Long-term use in the upper ambient temperature range accelerates the ageing of the elastomer materials and reduces the service life.

Storage temperature:
–20 to +40°C (–4 to +104°F).

Mechanical data

Length of connection cable:
at 230 V AC/120 V AC: any,
at 24 V DC (supply connected to PE):
max. 10 m permitted,
at 24 V DC (supply not connected to PE):
any.

Cable cross-section: min. 0.75 mm² (AWG 19), max. 2.5 mm² (AWG 14).

5 cable glands: M16 x 1.5.

Valve opening time: 3 s.

Housing made of impact-resistant plastic.
Connectors: aluminium.

Enclosure: IP 65.

Weight:
TC 1V: 215 g (0.47 lbs),
TC 1C with adapter: 260 g (0.57 lbs),
TC 2 with adapter: 260 g (0.57 lbs),
TC 3: 420 g (0.92 lbs).

TC 4

Electrical 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.

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

Switching current for valves/enable output:
max. 5 A.

External operating signal: with mains voltage, max. 5 A resistive load (UL listed: 5 A for 120 V), max. 2 A at $\cos \varphi = 0.35$ (pilot duty).

Fault output: dry contact (not internally fused), max. 1 A for 220/240 V (high voltage: 264 V), max. 2 A for 120 V.

Reset: using a button on the device.
Remote reset: by applying control voltage (terminal 5).

Environment

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

The pressure switch is set to half the inlet pressure $p_u/2$. The switching differential may not exceed ±10% of the set switching pressure.

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.

Ambient temperature: –15 to +60°C (5 to 140°F), no condensation permitted.
Storage temperature: –15 to +40°C (5 to 104°F).

Mechanical data

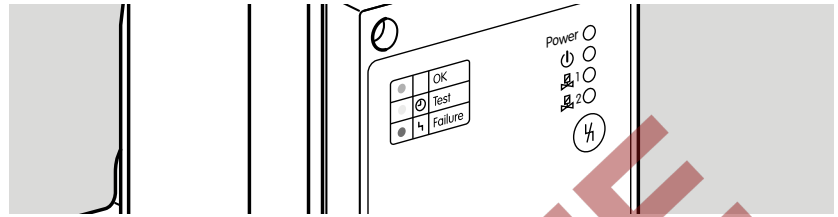Enclosure: IP 40.

5 knock-out holes for M16 plastic cable glands.

Screw terminals: 2.5 mm² (AWG 14).

Housing made of impact-resistant plastic.

Weight: approx. 400 g (0.88 lbs).

Indicators and operating controls

TC 1, TC 2, TC 3

Power = power supply
⏻ = operating signal
🗲1 = valve 1
🗲2 = valve 2
🔄 = reset button

The LEDs can display messages using three colours (green, yellow, red) and permanent ○ or flashing light ☼:

LED		Message/Operating status
Power ○	green	Power supply OK
⏻ ○	yellow	TC is ready for operation; safety interlock input signal interrupted
⏻ ○	green	TC is ready for operation; active safety interlock input signal
🗲1 ○	green	V1 is tight
🗲1 ○	yellow	V1 is untested
🗲1 ☼	yellow	Tightness test is running on V1
🗲1 ○	red	V1 is leaking
🗲2 ○	green	V2 is tight
🗲2 ○	yellow	V2 is untested
🗲2 ☼	yellow	Tightness test is running on V2
🗲2 ○	red	V2 is leaking
All	yellow	Initialization

TC 4
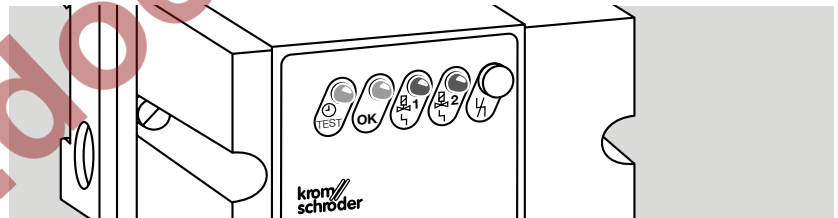
⏱ TEST = TEST phase (yellow)
OK = operating signal (green)
🗲1 ↳ = fault valve 1 (red)
🗲2 ↳ = fault valve 2 (red)
↳ = reset button

Type code

TC 1, TC 2, TC 3

Code	Description
TC	Tightness control
1V 1C 2 3	For attachment to valVario For attachment to CG For quick opening individual valves For quick or slow opening valves
R N	With Rp internal thread With NPT internal thread
05	$p_{u\,max.}$ 500 mbar
W Q K	Mains voltage: 230 V AC, 50/60 Hz 120 V AC, 50/60 Hz 24 V DC
/W /Q /K	Control voltage: 230 V AC, 50/60 Hz 120 V AC, 50/60 Hz 24 V DC

TC 4

Code	Description
TC	Tightness control
4	In control cabinet
1	Testing before or after burner run
0	External pressure switch required
-1 -10	Test period: 10 – 60 s 100 – 600 s
T N K	Mains voltage: 220/240 V AC, 50/60 Hz 110/120 V AC, 50/60 Hz 24 V DC=

Maintenance cycles

Tightness controls TC require little servicing. We recommend carrying out a function check once a year or twice a year in the case of biogas.

**Technical
Information bulletin
for this product**

www.docuthek.com
Search term: TC

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