DIN 3586
ICS 23.060.30

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Thermo activated safety device for gas applications.

Requirements and tests

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Preface

This standard has been issued by DIN Deutsches Institut für Normung e. V. in Einvernehmen together with the DVGW.

1 Field of application

This standard applies to requirements and testing of thermo activated safety devices (from now on called TAE). up to DN 150, for use with gases acc. to working sheet DVGW G 260 and pressure up to 5 bar.
The TAE are used as complimentary accessories (integrated inside gas appliances or inside installation components) in order to comply with the safety of the installation against fire hazards.

Complex systems which activated itself through fire, do not fall under the standard specifications.
TAE which are in combination with different devices such as shut off valves or safety gas valves, have to comply with this standard.
Mountable-type TAE devices (as external components/fittings); can derive acc. to this standard from already tested single unit TAE or from TAE integrated-type.
Combinations of integration type TAE and mountable type TAE with Gas valves have to at least present a measured flow volume acc. to the limit value consideration of chapter 5.8; if required, also a torque test is to carry out. (i.e. by TAE assembly through thread-screwing). By a mountable-type TAE an additional tightness test acc. to 5.10.2 has to be foreseen.

2 Standard references

Various reference to other publications.
Every reference is reported in the body test.[…]

DIN 475-1, Key surfaces for couplings – valves and connections.
DIN 1651, Steel_ delivery terms
DIN 1705, Copper/Zink and alloys.
DIN 2353, Threading connections part without welding.
DIN 2440, Steel pipes *. Half hard threaded connections pipes*.
DIN 2559-1, Welding preparation*. Recommendations*
DIN 2999-1, *Whitworth-pipes for threading pipes and connections. Cylindrical female threads. Thread dimensions.*

DIN 3230-3, Valve technical delivery terms*.*
DIN 3230-5, Valve technical delivery terms*. Valve for gas pipes and installations. Requirements and tests.*
DIN 3239-2, *Welding to Valves*
DIN 3292-1, Valves for home installations.
DIN 3339, *Valves .materials for body*.
E DIN 3436, Valves for gas installations*.*
DIN 3528, Valves for gas installations*. Couplings with tightening ring*.
DIN 3535-3, Sealing for gas supply. Sealing materials made of elastomers.
DIN 3535-6, Sealing for gas supply*. Sealing material for flanges*.
DIN 3536, Lubrication for valves and devices.
DIN EN 549, Elastomers and materials *Elastomer and* diaphragm *for gas devices and gas installations.*
DIN EN 682, Elastomers*. Material specifications for tightness parts in gas supply pipes..*
DIN EN 751-1, Tightness material for screw tightening connections in contact with gas families 1,2 and 3.
prEN 1092-1:1997, Flange and connections. Round flange for pipes and valves marked with PN.
DIN EN 10204, Metal products
DIN EN 10226-1, Pipe threads for connections which tight through thread. *Part 1: marking, dimensions and Tolerances;*
DIN EN 12627, Valves for industries*.*
DIN EN 13906-1, cylindrical springs.
DIN EN ISO 8434-1, Screw tightening metal connections for Fluidtechnik
DVGW-working sheet G 26.

DVGW- working sheet G 600, Technical regulations for gas installations*(DVGW-TRGI).*
DVGW-VP 614, Definite pipe connections for metal Gas pipes.

3 Concepts

3.1
Thermo activated safety device
TAE Types:
- single unit TAE for installations in gas pipes or for the protection of objects.
- TAE with special connections for the integration inside a gas valve body/housing. (integrated type TAE)
- TAE as complimentary mountable component shut off valve protection. (mountable type TAE)

3.2
Closing trip times
time required for the TAE between: (starting from the environment-temperature(25 °C +/–3 K) then reaching the temperature of 650°C, up to the moment in which the device trips.
3.3
Closing spring
Component which creates the closing strength
3.4
closing strength
Fixed available spring strength, activated by a thermo sensitive loose element.

3.5
Loose elements
Component, which becomes loose by a specific temperature.
3.6
Specific temperature
Temperature, which created the closing-trip.

4 General Information

4.1
TAE which meet this definitions, are certified upon formal request and after issuing a official test report from a recognized test laboratory from DVGW.

4.2 product variations

Which consist in further developments of the provisions of this norm and in parts differ from that, can be certificated as separated test reports on request.
The certification order has to be sent along with the official test report of a recognized and independent test laboratory.
The test laboratory follows the directives of DVGW.

For the statement of the conformity to the norm; the peolple in charge which can decide about the special connection in the following cases are:

- representative of NAGas working committee.
- representative of DVGW technical committee. Gasvalves.
-representative of the testing laboratory, in which the test had been carried out.
- Director of NAGas
- representative of the ARGEBAU

The decision of the recognizing of the conformity to the norm, has to be followed by the respect of the criteria of safety and functionality as far as the Gas valves are concerned, and also in conformity with other requirements of this standard.

[…]

5 Requirements and testing procedures

Test requirements

5.1 General information

TAE have to be manufactured without sharp edges acc. to DIN 3230-AD. Every components has to be clean (without machining residuals and burs). Orifices acc. to DIN 3230-AP for screwing components, stems and etc.. that function as fixing, may not consist in an outlet in Gas-leading spaces. Outlets as results of manufacturing processes has to be sealed tight and closed through blind caps.
All the components have to be prepared so not to jeopardize their functioning and resistance, by usual mechanical, chemical and temperature working conditions.

No Tightness-system, which can be regulated by hand or through a tool, has to be installed.
TAE provided with threaded connections have to be designed with proper screwing surfaces acc. to DIN 475-1.

No tightness rings allowed, which alone guarantee the external tightness into in- pressure devices.

The thermo release, has to work without any other energy source.

TAE as assembly Type and integrate type TAE have to be installed at the Gas-inlet (Upwards the gas flow).

Integrated TAE have to be placed in the body of the valve, so to maintain the installation position in time.

5.2 Materials

5.2.1 General information

The material has to be chosen so to withstand the mechanic thermal and chemical stress and to satisfy the technical function requirements. All components shall corrosion resistant. This material features has to be witnesses during the certification process through a material manufacturer's certificate.

The specific stress limits of the single components do not have to be exceeded. Materials have to be chosen in order to exclude unfavorable and variable influences.

5.2.2 Materials for pressure affected parts
Housings parts and shut-off parts.

For the design of housing and shut-off parts affected by pressure, material of the group WG 1 have to be chosen (with the exceptions of GG for housings) up to WG 4 acc. to DIN 3230-5.
Furthermore, are those materials acc. to DIN 1705 eligible;

G-CuSn 7 ZnPb
G-CuSn 10 Zn
G-CuSn 12 Pb
G-CuSn 12 Ni

Certification has to be acc. DIN EN 10204 . 2.2 and material specifications to be reported on drawings and part list.

Furthermore, is also permitted the use of steel for automated machining purposes acc. to DIN EN 10087 and DIN 1651 for not welded pieces up to DN 50.
Other material can be used whenever they can withstand tightness, strength, dilatations, deformations and workability (for welding for instance) of the above mentioned materials. For the valuation ref. also DIN 3339.

Certification has to be acc. DIN EN 10204 . 2.2

Zink or Aluminum and their alloys are not permitted.

5.2.3 Materials for springs
Springs, which guarantee tightness and function, have to be manufactured of materials resistant to corrosion. Surface protection are not allowed.

Certification has to be acc. DIN EN 10204 . 2.2 , material specifications to be reported on drawings and part list.

5.2.4 Material of Sealing components
Sealing have to withstand gas acc. To DVGW-working sheet G 260. Furthermore, sealing made of materials other than metal (that allow tightness during the closing trip period) have to be acc. DIN 3535-3 or DIN 3535-6 or DIN EN 549.

5.2.5 Hardened Sealing materials
Hardened sealing materials which tight inside the threading have to be acc. to DIN EN 751-1.

5.2.6 Materials used to help the manufacturing process

Materials used for the assembly do not have to show unfavorable influence on the operating cycle and on tightness.
This has to be witnesses through a supplier's self certification, stating that the supplied products do not have any negative influence on materials used for sealing purposes.

5.3 Connections
The following connections are permitted:

- threading acc. to DIN 2999-1 (5 bar up to DN 50; 1 bar up to DN 65)

- flange acc. To DIN EN 1092-1 and DIN EN 1092-2 with mit smooth tightness surfaces.

- welding acc. to DIN 2559-1 and DIN EN 12627
- welded pipe connections with screw ring acc. to DIN 2353 (DIN EN ISO 8434-1)
- welding couplings acc. To DIN 3239-2
- Press connections acc. To DVGW-VP 614
- Nuts acc. To E DIN 3436 ,

5.4 Closing spring
Springs which guarantee the closing strength, have to be designed and manufactured as to remain stable during static stress.
Beyond the ref. standards DIN EN 13906-1 and DIN EN 13906-2, the springs have to pass a test of 10.000 cyclical mechanic compressions.
Springs have to be put inside a oven by the +/- 5 K the manufacture's declared temperature.
Compression and cycles have to be maintained.

5.5 Loose elements:

5.5.1 Extension elements

Extension elements have to withstand a stress of 10.000 cycles.
Test is performed by immerging the extension element alternatively: in a water thank by the +/- 5 K the manufacture's declared temperature, as also in water tank by 20°C +/- 5 K
Every immerging movement has to wait the correspondent testing temperature to be reached.

5.5.2 Welding elements and loose plastic components

Elements sensitive to temperature made of plastics have to maintain their form and withstand gases.
This can be reported through supplier's certifications.

Temperature cycles resistance:

The assembled TAE is warmed for 20 h up to 10K below the nominal reference temperature (in any case, not more as 80°C) and then it is left cooling for 4 h back to 20°C +/- 5°C. That Cycle has to be repeated.
No trip has to be reported during this test.

Gas resistance (only for loose elements made of plastic)

The test is carried out at 23°C for 168h with a flow substance made up of 30% Toluene and 70% ISO Octane.
No trip has to be reported during this test.
After cooling off procedures, the reference temperature has to remain within +/– 5 K the nominal temperature provided by the manufacturer. (So; nominal value between 85 °C and 95 °C, under tolerance respect of 80 °C up to 100 °C).

5.6 Torque and bending properties

TAE have to withstand torques and bending values reported in chart #1.
TAE in elbow form and TAE with screwing-soldering-flange connections have to withstand only the initial bending movement.

For TAE with nut connections, use factor 0,8.
Every TAE has to comply with the requirements for external tightness by normal working temperature. After that check, apply for 10 sec. the Torque value MT1 and after that for 10 sec. the Torque value Mb1.
The same TAE Sample shall to comply with the requirements for external tightness by normal working temperature, while the Torque value MT2 for 900 sec. and then Torque value Mb2 for 900 sec. is being applied.

Test for TAE with threaded connections acc. to DIN 2999-1.

To inlet and outlet parts of the TAE, threaded pipes are connected acc. to DIN 2440. During assembly, is to apply the foreseen torque values MT1 and Mb1 without overcoming them. The external tightness test have to be tested acc. to 5.10.1.

By TAE with other connection types, the same torque and bending tests have to be carried out in the same way, with the corresponding connections.

Torque test

The pipe supports are to be fixed to the Support device with a distance of roughly 2 times the nominal diameter DN of the TAE inlet. The Torque momentum is applied to the outlet pipe support. It has to be considered the fact that the free pipe support has to be fixed so not to convey directly the Torque movement to the TAE.
The pipe supports shall be equipped with proper fixing devices.

No lasting deforming and no crack have to be reported.

Bending Test
Test arrangement acc. To Pict. 1

The length „a“ oft he pipe supports have to be taken from chart #2.
The pipe supports, that are used for testing TAE with threaded connections, shall no have fixed supports.
As bending direction, it has to be chosen the direction in which the TAE shows the fewer solidity. If this direction is not found univocally, so the test has to be carried out in the questionable directions.
By the inlet-side, is the closing device screwed tight with distance 2 x DN. By the free pipe support, by distance “a” a force F has to be applied, in a way that by external end of the test sample, a bending value of Mb1 or Mb2 will result. Furthermore the pipe support’s weight have to be considered.

Chart 1 Torque and bending values.

Nennweite	Torsionsmoment Nm		Biegemoment Nm	
DN	M_{T1}	M_{T2}	M_{b1}	M_{b2}
6	10	5	10	5
8	30	15	20	10
10	50	25	45	22
15	85	45	75	40
20	150	75	130	65
25	240	120	250	125
32	300	150	430	215
40	360	180	580	290
50	480	240	1 145	575
65	540	270	1 535	770
80			2 550	1 225
100			3 500	1 750
125	—	—	5 000	2 500
150	—	—	7 000	3 500

Picture #1 bending test preparation.

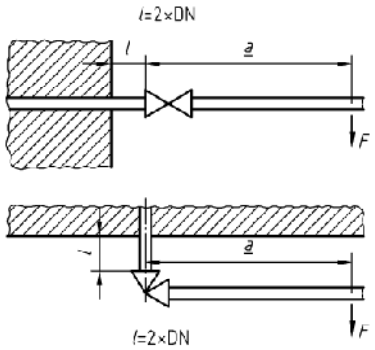


Chart # 2 . pipe support distance

Nennweite DN	Abstand a mm
6	320
8	400
10	500
15	630
20	800
25	1 000
32	1 250
40	1 600
50	2 000
65	2 000
80	2 000
100	2 000
125	2 000
150	2 000

5.7 strength of threaded connections.

No crack evidence on the treaded connections have to be reported by a torque value MT1 acc. to Chart #1.

The test has to be carried out with a thread support equipped with a treading acc. to DIN 2999-1, which is carried out to allow a easy travel of the threading part.

5.8 Airflow volume and pressure drop

The TAE has to comply the requirements of chart#3.

Chart# 3 . airflow volume (based on usual test conditions 15 °C, 1 013 mbar)

Nennweite DN	Luftvolumen (m; h)		Druckverlust mbar
	Durch-gangsform	Eckform	max.
6	0,7	—	1
8	1,4	—	
10	2,1	1,4	
12	2,5	1,8	1
15	3,5	2,5[a]	
20	7,1	4,2	
25	11,3	7,1	
32	19,1	12,7	1
40	28,3	19,8	
50	46,0	25,5	1
65	36,0	—	
80	51,0	—	0,2
100	92,0	—	
125	132,0	—	0,2
150	189,0	—	

a Bei Kombinationen mit Gassteckdosen gilt der Mindestwert aus DIN 3383-1 (2,2 m^3/h).

Test carried out trough at room temperature. The air volume flow has to me measured by a pressure of 25 mbar with appropriate measuring devices.

The test supports length have to be 10 times the connection diameter.
The measuring point for the pressure measurement have to find itself on the half pipe distance, so something like the distance of 5 times the diameter connection of the TAE.
The sectioned measure of inlet and outlet have to be equal. For the pressure drop measuring, a proper device with a max. sensitivity 0,01 mbar have to be used.

The measured flow volume have to be converted to usual test conditions (15 °C, 1 013 mbar).
For the conversion use the following equations:

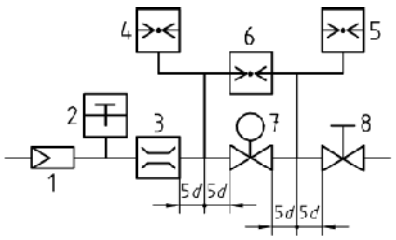
$$V_{15} = V \sqrt{\frac{b+p}{1\,013} \cdot \frac{288}{(273+t)}}$$

Where:
V15 volume flow, in m3/h, by 15°C, 1013 mbar.

B Atmosphere pressure, in mbar

P Gas pressure, in mbar

T Air temperature during measuring, in C°



Legend
1 Pressure regulating device
2 Thermometer
3 Flow measure device
4 Inlet pressure metering device.
5 Outlet pressure metering device.
6 differential/pressure metering device
7 Sample
8 Regulation device
d piping internal diameter

Picture 2 . Test preparation for measuring the Flow volume.

5.9 Expected reaction and temperature
5.9.1 Expected reaction
The shut off unit has to be only in open or closed position acc. to DIN 3230-AP
After the tripping, no other opening should be possible.
On the occasion of the tightening test during thermo stress (5.10.2) the expected reaction must be kept under control.

5.9.2 Expected Temperature

The expected temperature shall remain between 80°C and 100°C.
For the sizes suggested by the manufacturer, a tolerance of +/- 5 K is permitted. (max indicated value 95°C, min indicated value 85°C).
After the reaction, the TAE has to comply, by room temperature, to tightness requirements of a permitted leakage rate of 30 dm^3/h (converted in air 15°C, 1013mbar).

The samples are put into a test room, whose bodies are equipped with calibrated thermo elements.
The test room is warmed until the surface temperature of the body structure reaches 8K below the nominal value reported by the manufacturer.

Then the temperature increases by steps of max. 2K up to the tripping point.
The loosing movement can be detected through the difference in flow volume, or if possible, controlled visually.
Then the sample is cooled down to room temperature and internal and external tightness have to be measured through air with test pressure of 30 mbar and nominal pressure.

5.10 Tightness
5.10.1 External tightness by normal room temperatures.
In delivery status TAE have to be externally tight.
Acc. To DIN 3230-BV.
Test have to be carried out through air after a persistent time of 10 min.
Then a tightness test by 6 bar has to be carried out. Beside this, an external tightness test has to be carried out by 1,5 times the maximum operating pressures, nevertheless min. 3 bar.

5.10.2 Internal and external tightness by thermo stress.
By a thermo stress by 650°C, the sum of the leakage values by test-pressure, (30 mbar and max operating pressure)during the warming period and the following persistent period of 30 min., shall not overcome the limit of 30 dm^3/h. (to be converted in Nitrogen 15°C, 1013 mbar).

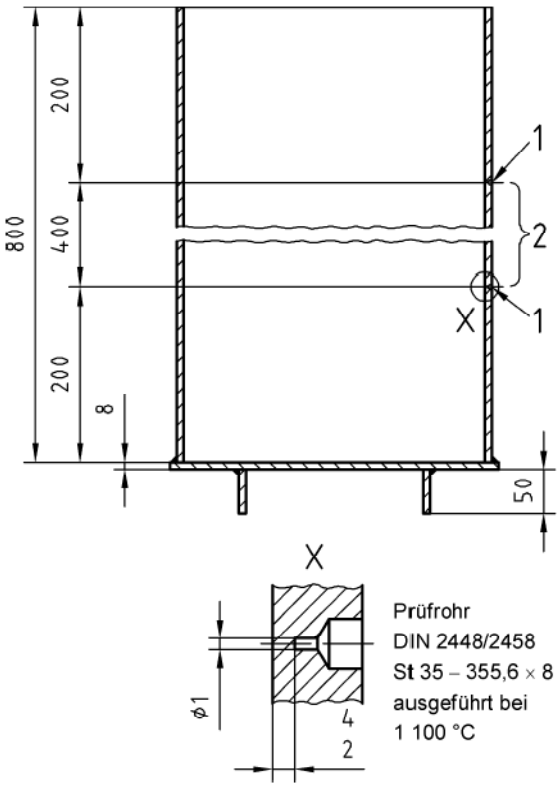
That leakage value shall be registered after the completed cooling down phase to room temperature.

The test oven, hast o comply with the basic requirements of DIN 17052-1 for a temperature range acc. to index 07. (min. Class B10).

1. Valves with internal loose elements
(up to DN 50)

In the test oven is used a test pipe acc. to DIN 2448/2458 – St 35 – 355,6 x 8 acc. to Pict. 3

Dimensions in mm.



Legend
1 fix every single thermo element ∅ 1 mm NiCrNi with Apple-Kit
2 test area

Pict 3 . test preparation for tightness test during thermo stress.

The sample has to be connected to both outlet and inlet with a steel pipe acc. to DIN 2440 with the following features: length 140 mm, outlet equipped with a precision steel pipe 10 mm x 1 mm.
Those connections have to be carried out, in order to exclude a leakage by the connection points during test.
Close to the loosing unit, a calibrated thermo element is to be fixed on the sample surface.
The so prepared sample is then exposed to a temperature of 25°C +/- 3 K.
The test oven have to be warmed so that the surface temperature of the attached test pipe, within the test pipe plain area of 400 mm, will reach the temperature of 650°C +/- 5. That temperature has to be reached before putting the samples inside and maintained for a persistent period of 15 min.
Then the samples is conveyed with a Nitrous flow volume of 300 dm^3/h and so it flows to the test pipe, in a way that it will come to the pipe test length of 400 mm.
The flow volume is then evacuated outside through the precision steel pipe.

The so prepared sample, after the concluded closing procedure (see 5.11), is settled to test pressure and is warmed until even the sample surface temperature reaches the 650°C +/- 5 K, then persist for 30 min.
Tightness is determined by the resulting Nitrous volume.
Then follows a Pressure decrease; the sample cools down outside the pipe test to room temperature.
After cooling down, a tightness test has to be carried out by test pressure.
The test consists in two phases:

1. Pressure test = Max. operating pressure
2. Pressure test = 30 mbar

2. Valves with external loose element.
Those valves have to be tested in a test oven which is warmed indirectly.
Acc. the same standard and index, with the exception of the above mentioned test pipes of Pict. 3.
The connection of the test device, has to be made in the appropriate way. Before carrying the prepared sample in the oven(see above mentioned point 1), the oven has to reach a temperature of 650 °C +/– 5 K.
Then the sample is put in the middle, then the testing has to be carried out as described in Point 1.

5.11 Closing time.

The closing-trip time during the thermo stress shall not exceed 60 seconds.
This verification has to happen together with 5.10.2.
The assessment of the closing time starts with the placement of the sample in the test room and ends, as soon as the air volume flow drops to 0. During sample placement into the test room, the piece temperature shall be 25 °C +/– 3 K.

6 Testing

6.1 Test Laboratories

Only referred test laboratories are in charge for TAE testing.

6.2 Test types

6.2.1 First samples test

The first sample test is showed by the manufacturer in the test official Order, in order to verify the Standard conformity.

2.2 following tests

A following test can be ordered, if a TAE with DIN-DVGW certification marks had been challenged in its conformity to the relevant standard.
The following tests have to be carried out by a referenced test laboratory, which takes the TAS to be sampled, in a proper number of pieces from a manufacturer/reseller's warehouse by a designed person.
The test procedure id the same of the first sample test.

6.3 Test subjects and test documentation

6.3.1 Test subjects

The Manufacturer shall provide 3 TAE pieces for each nominal diameter (DN),then two loose elements for each DN and a spring for each DN, if they cannot be evaluated acc. to DIN EN 13906-1 and DIN EN 13906-2.
For Product types with different kind of connections, the TAE test has to be carried out with threaded connections to both ends. If more surface treatments are foresees, practically speaking the TAE with the clearest surface.

6.3.2 TEST DOCUMENTATION

3 Copies to be provided by the manufacturer or the Company which requires the certificate to the test laboratory.
a) Definite Drawings, where is clear the TAE product type and the components of the different types. (Bosy, shut off unit, ecc…) if possible in proportion 1:1, or 2:1 or 5:1.
The reported dimensions shall be enough for the execution of the testing procedure. Special connections need only the representation of the not reported measures by the first sample test of the integrated TAE.
b) TAE Photo or Dispositive
c) Descriptions in german language and Installation and operation documentation.
d) TAE description with instructions and product type, product version, materials, surface treatment and marking.
e) By use with Tightness elements not made up of metal and covering material, and also Threadtightnessmaterials the conformity to the norm has to be showed through a DIN-DVGW Certificate.

The same procedure is to be applied when using lubricants materials.

f) certification by the manufacturer, that the process materials used do not ruin or wear out the tightness elements.

g) certification by the manufacturer, that the material requirements acc. to 5.2 are complied

6.4 TESTING and Certification
TAE Testing and certification approval follows acc. the DVGW company management requirements for Gas and water supply products.

7 Labelling
TAE shall be marked definitely and clearly as follows:
- Manufacturer or/and product symbol,
- Type marking
- nominal pressure
- flow direction
- DIN DVGW certification markings with GT digits.
- For assembly type and integrated-type TAE, the marking shall be reported according to the product type.
- labeling with self-stitching labels are not allowed; metal labels, which apply as self-hardening materials are allowed.
- the certificate references (registration number) are to be reported at least in the product descriptions. Those have to be reported only if a certification and the registration number had been given by a certified test laboratory. After that reporting the manufacturer is responsible for the compliance with this standard.

8 Installation instructions.
Every TAS hast o be foreseen with a Installation sheet, which has to contain at least:
- the product concerns a thermo activated safety device
- Instruction ref. the product type
- Instruction ref. operation
- Instruction ref. installation position or the eventual manteinance
- necessity of maintenance