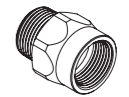


GST®

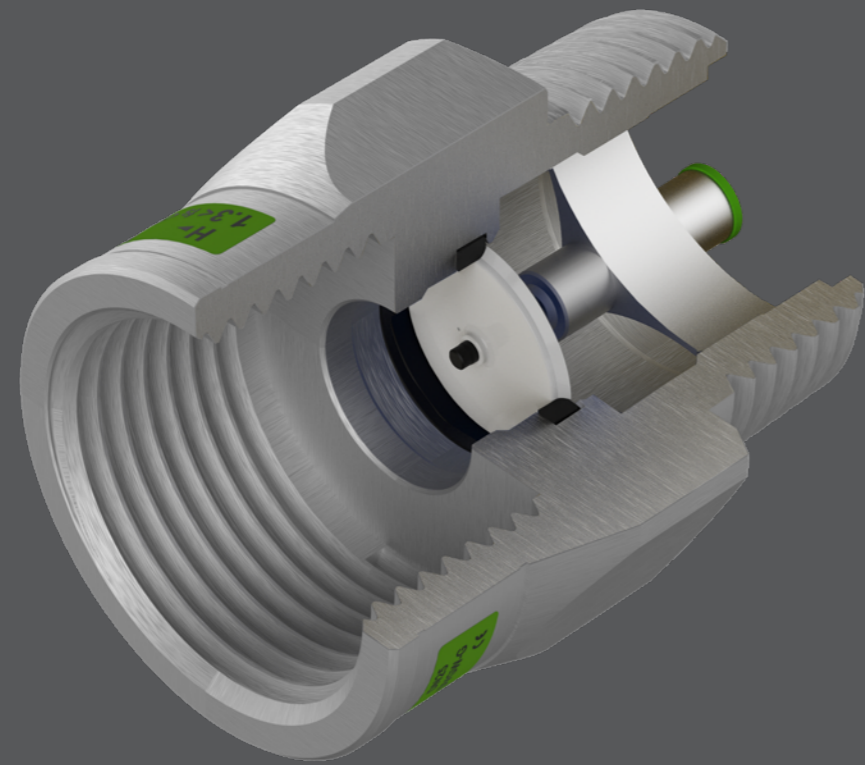
**EXCESS FLOW VALVE
FOR GAS SYSTEMS**



GST®
GST® DN 15-50 fitting



245



EXCESS FLOW VALVE

GST® instantly blocks gas flow in the pipeline whenever the closure flow rate (Vs) is accidentally exceeded.

FULL RANGE

Threaded version from DN 15 to DN 50 (V_{GAS} 1.6 – 16 m³/h)

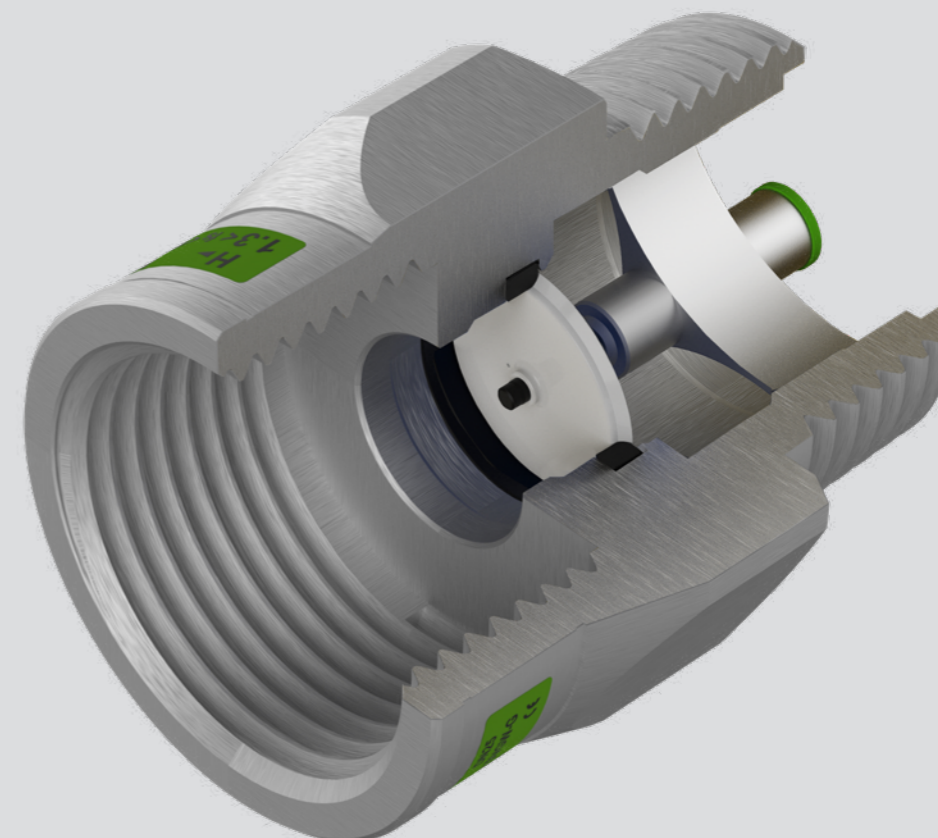


POSITION COMPACT

Horizontal and vertically upwards
 fs min. = 1.30 fs max. = 1.45
 (see page 251)

COMPACT INSTALLATION

Because of its small size, it is built into the G5-G6 gas meter valves.



GS

GST® is TECO's commercial name for the excess flow safety device, specified as **GS** in the German standard (Gasströmungswächter).



CERTIFICATIONS AND TECHNICAL SPECIFICATIONS

Reference standards	DVGW VP305-1:12/2007 DVGW TRGI 2008 DVGW TRF 2012
Pressure	15-100 mbar
Temperature	-20 °C +60 °C
Pressure drop	≤ 0.5 mbar (50 Pa)
fs min.	1.30
fs.max.	1.45
Overflow value VL	37.5 l/h at 100 mbar (gas)
External heat resistance	925 °C for 60'
Internal heat resistance	trip at 120 °C / 200 °C for 10'
Application	For all types of gas as specified in EN 437 and DVGW G260/1 (Methane, Butane, Propane)



SINCE 2002

TECO developed and manufactures GST since 2002, when the German technical standards for design and installation of gas systems (TRGI) covered excess flow devices.



SAFETY

Installing GST® raises the safety level in gas systems.



NO MAINTENANCE

GST® does not require any kind of maintenance over time.



AUTOMATIC

It is not powered by an energy source, and operates mechanically.



OPERATION

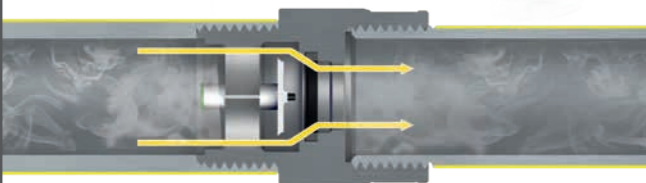
Legend	V_{GAS}	Nominal gas flow rate of GST® (d=0.64)
	f_s	Closure factor ($f_s = V_s / V_{GAS}$) f_s min. = 1.30 f_s max. = 1.45
	V_s	Gas closure flow rate (d=0.64) $V_s = V_{GAS} \times f_s$
	VL	Flow rate through the bypass orifice ≤ 37.5 l/h at 100 mbar (gas)

When inserted in the system, the GST® remains inactive (FIG.1) until the closure flow rate is reached (Vs).

As soon as the flow rate reaches the closure valve (Vs) for any accidental reason, the GST® closes instantly (FIG.2).

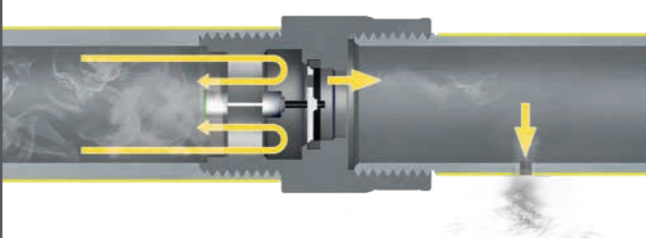
It is reset automatically by the bypass orifice on the cut-off, and the overflow VL that this creates balances the pressure upstream and downstream from the device when the conditions that caused the GST® to close have been removed (FIG.3)

FIG. 1 GST® OPEN



The GST® is normally OPEN as long as the closure flow value Vs is not reached.

FIG. 2 GST® CLOSED

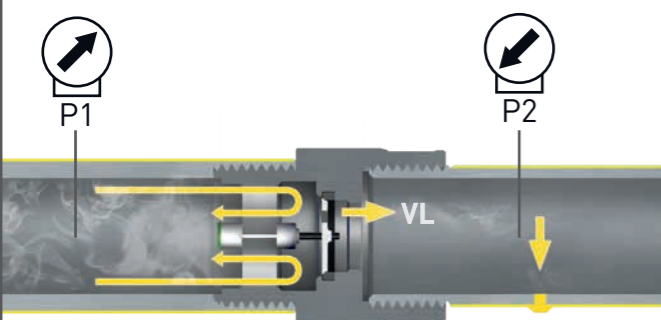


The GST® CLOSES when the closure flow value Vs is reached.

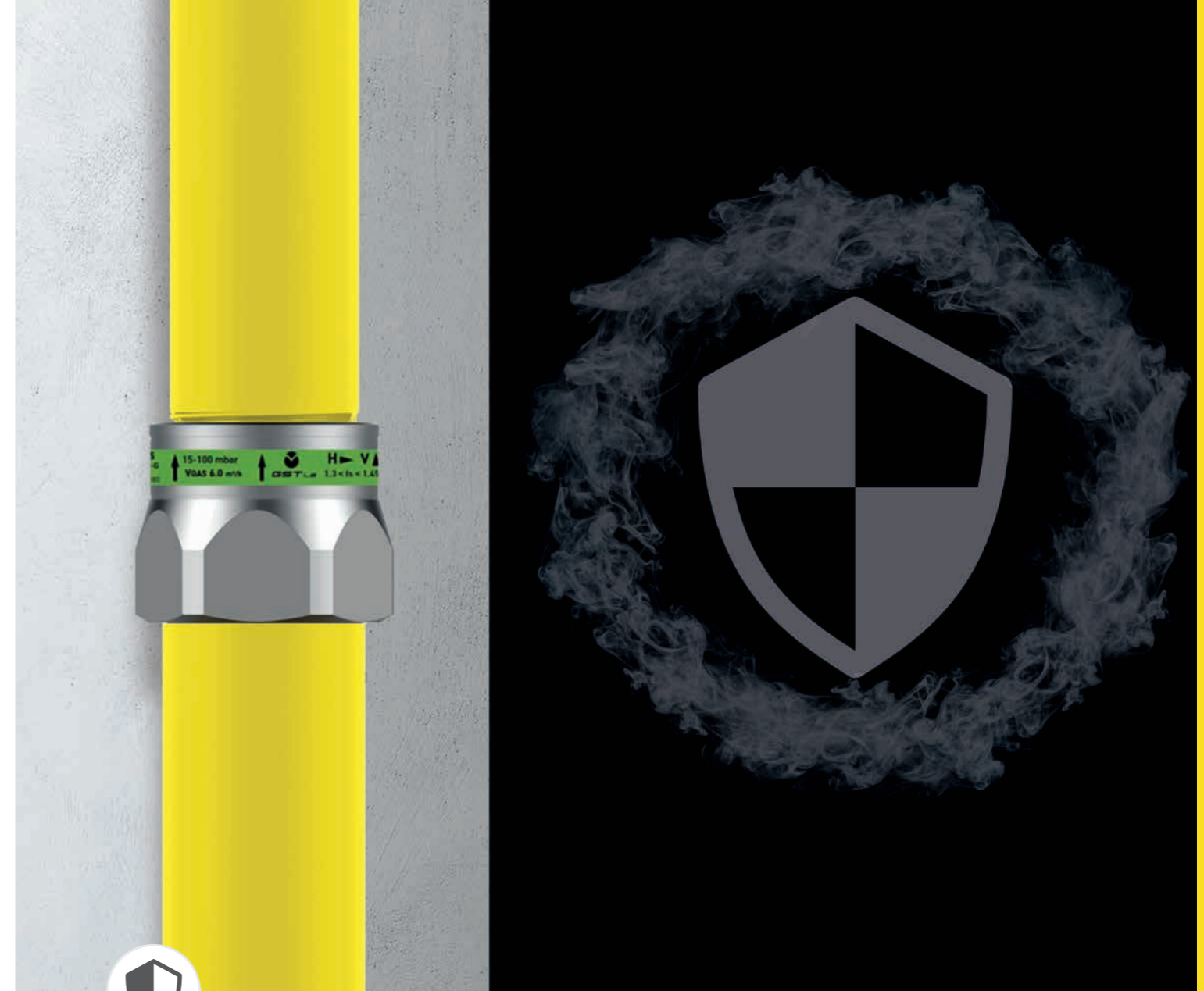
$$V_s = V_{GAS} \times f_s$$

(f_s min. = 1.30 - f_s max. = 1.45)

FIG. 3 AUTOMATIC RESET



The bypass orifice (VL) on the GST® cut-off ensures an automatic reset after the system has been repaired and re-pressurised. When the upstream pressure P1 and downstream pressure P2 are equal, the GST® REOPENS.



SAFETY

GST® devices are installed to protect the system and guarantee a **higher safety level** in the following cases:

- against tampering, both criminal and not, performed by unauthorised personnel;
- in systems that use non-metal pipes, in order to make them safe against the risk of explosion due to fire (DVGW VP632);
- breakage/disconnection of hoses for gas appliances;
- breakage of pipes due to natural disasters.

Installing the GST in a gas system raises the safety level because it intervenes even when the cause is not related to the system itself (passive safety).

Moreover:

- it is maintenance free;
- it does not require the periodic checks needed to ensure correct operation of components with active activation;
- it cannot be disabled by an external action.

It remains functional even while the GST® is undergoing maintenance.

Over 2.5 million installed GST devices manufactured by TECO are a guarantee of the effectiveness and quality of the product.

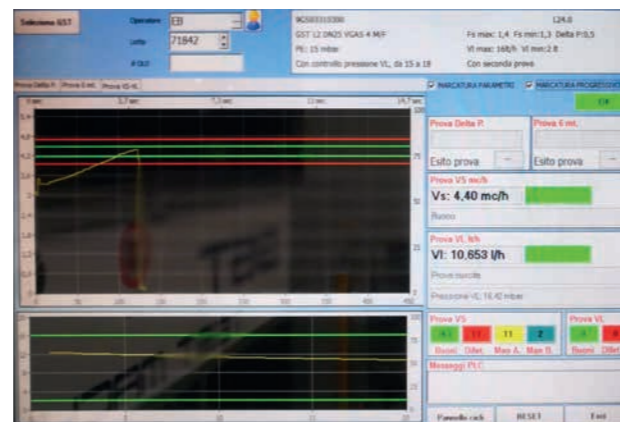
That is why for over than 15 years the German technical regulations on gas installation (TRGI-TRF) prescribe the use of GST® in accordance with VP 305-1.



RELIABILITY

GST® safety devices must guarantee reliable closure only within the tight parameters defined by the DVGW VP305-1 German product standard. Failure to operate or unwanted closure could potentially create very hazardous situations; for this reason, despite its simple construction, the GST® undergoes strict checks during the manufacturing process. Its reliability is defined by the quality of the components and continual improvement of the manufacturing processes through numerous tests on each lot.

All internal parts of the GST® are built to ensure long-term operation. The spring in the GST® is fully protected from the flow of gas (patented) so that it does not come into contact with impurities that could alter its proper operation over time. For the same reason, the overflow orifice is also protected when the cut-off is open. Moreover, the GST® can dampen any flow peaks when attaching a gas appliance, which could cause the device to close.

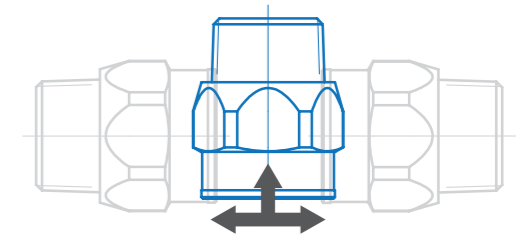


ALL GST® DEVICES ARE 100% TESTED AND THE TEST PARAMETERS ARE TRACEABLE WITH A UNIQUE IDENTIFICATION CODE FOR EACH DEVICE.



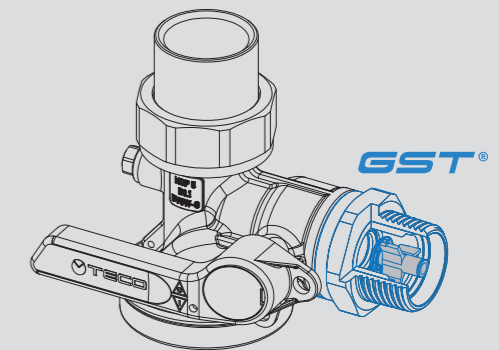
POSITION COMPACT

Right from the development stage, Teco designed the GST® to be installed **horizontally or vertically upwards**, with a closure factor " $fs_{min} = 1.30$ and $fs_{max} = 1.45$ ", giving a closure flow rate 30 - 40% higher than the nominal flow rate. This performance means that a single device can be used in systems with either metal (M) or plastic (K) pipes.

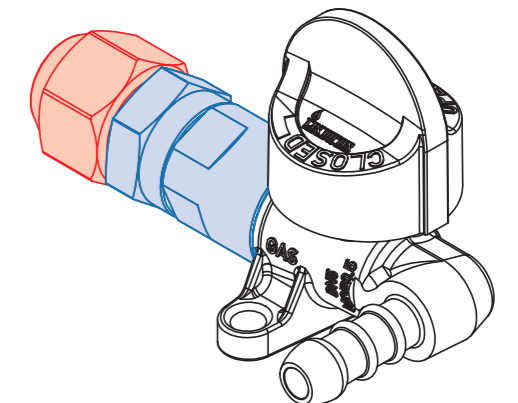


COMPACT INSTALLATION

Because of its very small size, the GST® device is built into the gas meter valves. In addition to the technical benefits, this gives an economic saving without any additional cost to the installer.



Over the years, numerous "tailor made" versions have joined the catalogue range of products. Our research and development department, TECO R&D, has developed customised constructional or technical features for products, supporting customer requests and the system engineering needs of the market through mutual cooperation.

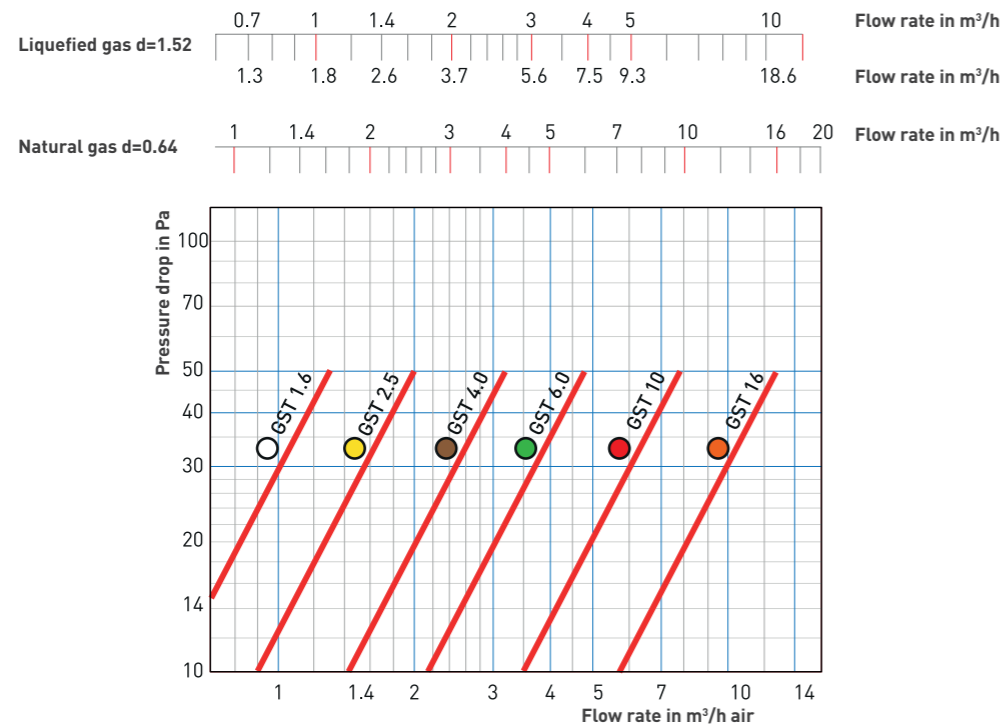


CHOOSING THE GST®

The GST must be chosen according to the following parameters:

- According to the working pressure:
Pe 15–100 mbar
- According to the application:
Natural Gas
LPG
- According to the installed power given by the sum of the individual downstream appliances:
 Σ kW
- According to the type of installation:
Main pipeline
Offtake pipeline
- According to the type of system piping:
Metal (M)
Plastic (K)

PRESSURE DROP GRAPH



GST IDENTIFICATION MARKING

In accordance with the standards, the GST® is supplied with a label that describes its technical specifications (DVGW VP 305-1).

- Device nominal flow rate (coloured identification)
- Pressure range "15 mbar - 100 mbar"
- Gas flow direction (arrow)
- Nominal diameter
- Type of GST® (M/K)
- "DVGW" marking
- Installation position

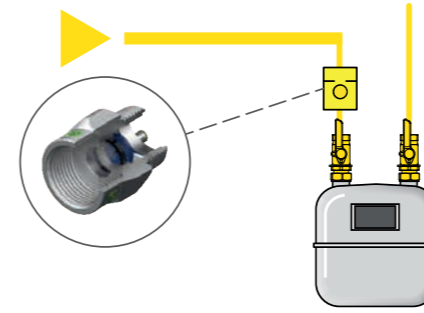
The colour of the label identifies the device flow rate

GST® GS m³/h	
V _{GAS} =1.6	White
V _{GAS} =2.5	Yellow
V _{GAS} =4.0	Brown
V _{GAS} =6.0	Green
V _{GAS} =10.0	Red
V _{GAS} =16.0	Orange



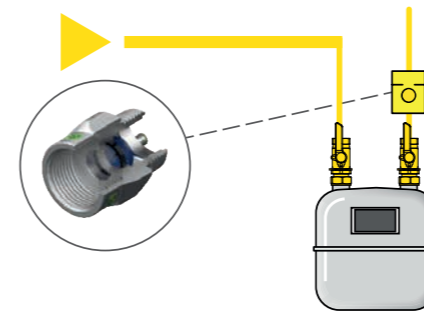
INSTALLATION EXAMPLES

UPSTREAM FROM THE METER



* Where possible, the GST® is usually installed upstream from the gas meter.

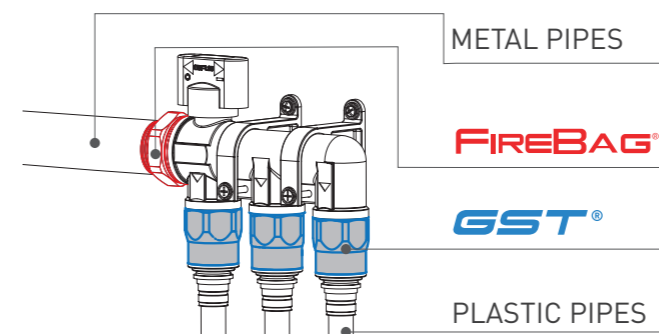
DOWNSTREAM FROM THE METER



* If the supply line is managed by the gas distribution company, the GST® can be installed downstream from the gas meter.

* The choice of GST® is the same regardless of whether it is upstream or downstream from the gas meter.

DOWNSTREAM FROM A SYSTEM WITH PLASTIC PIPES

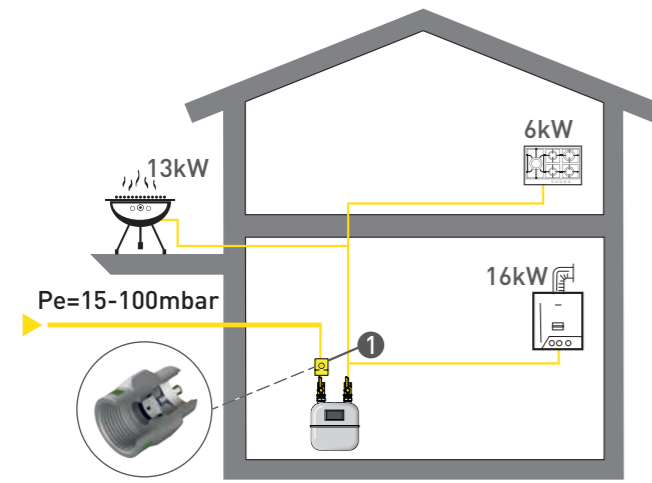


In installations with plastic pipes, in addition to using the FIREBAG®, it is mandatory to install a GST® on each offtake (according to the TRGI standard).

PARAMETERS FOR CHOOSING THE GST® (TRGI 2008)

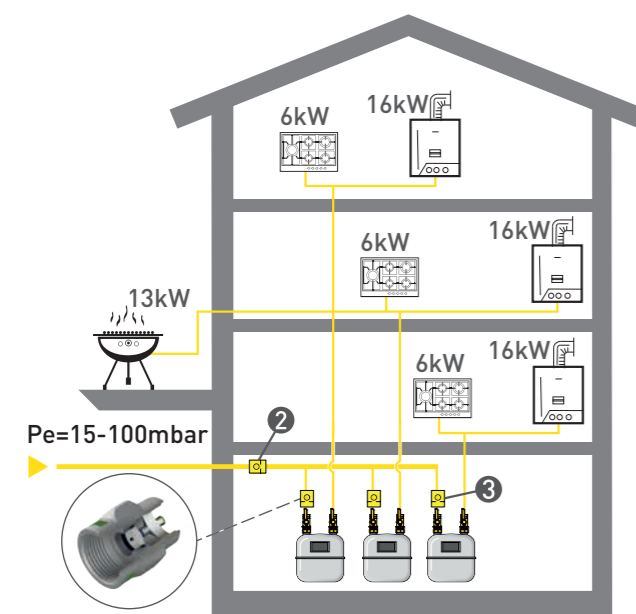
EXAMPLES OF NATURAL GAS SYSTEMS

GST® IN A SINGLE-FAMILY DWELLING



- GST® installed on the main pipeline upstream from the gas meter valve.
Nominal total load of the downstream appliances:
 $\Sigma QNL = 35 \text{ kW}$ natural gas
- Choice ref. 1
GST® fitting $V_{GAS} 6.0 \text{ m}^3/\text{h}$

GST® IN A MULTI-FAMILY DWELLING



- GST® installed on the main pipeline:
total nominal load:
 $\Sigma QNL = 79 \text{ kW}$ natural gas
- Choice ref. 2
GST® fitting $V_{GAS} 10 \text{ m}^3/\text{h}$
- GST® installed on an offtake pipeline upstream from the gas meter valve.
Nominal total load of the downstream appliances:
 $\Sigma QNL = 22 \text{ kW}$ natural gas
- Choice ref. 3
GST® fitting $V_{GAS} 4.0 \text{ m}^3/\text{h}$

PARAMETERS FOR CHOOSING THE GST® TRG 2008 METAL PIPES

GST® identification marking	Power in kW	
	Offtake pipeline	Main pipeline
$V_{GAS}=2.5 \text{ m}^3/\text{h}$	≤ 17	≤ 21
$V_{GAS}=4.0 \text{ m}^3/\text{h}$	18 ÷ 27 3	22 ÷ 34
$V_{GAS}=6.0 \text{ m}^3/\text{h}$	28 ÷ 41	35 ÷ 51 1
$V_{GAS}=10 \text{ m}^3/\text{h}$	42 ÷ 68	52 ÷ 86 2
$V_{GAS}=16 \text{ m}^3/\text{h}$	69 ÷ 110	87 ÷ 138

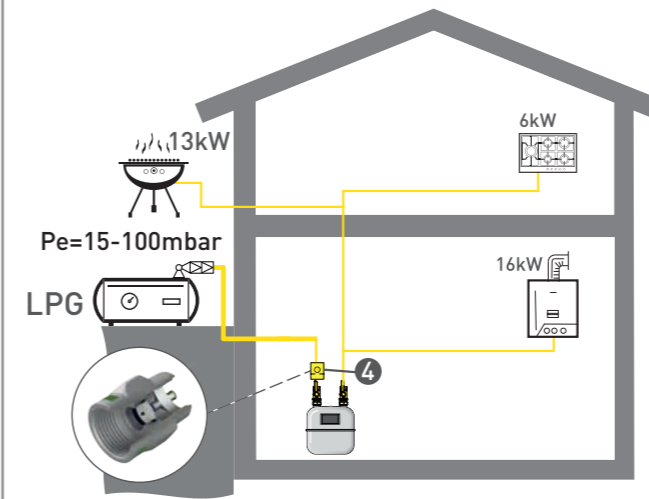
PARAMETERS FOR CHOOSING THE GST® TRG 2008 PLASTIC PIPES

GST® identification marking	Power in kW	
	Offtake pipeline	Main pipeline
$V_{GAS}=1.6 \text{ m}^3/\text{h}$	≤ 11	≤ 13
$V_{GAS}=2.5 \text{ m}^3/\text{h}$	12 ÷ 17	14 ÷ 22
$V_{GAS}=4.0 \text{ m}^3/\text{h}$	18 ÷ 27	23 ÷ 34
$V_{GAS}=6.0 \text{ m}^3/\text{h}$	28 ÷ 41	35 ÷ 51
$V_{GAS}=10 \text{ m}^3/\text{h}$	42 ÷ 68	52 ÷ 86
$V_{GAS}=16 \text{ m}^3/\text{h}$	69 ÷ 110	87 ÷ 138

PARAMETERS FOR CHOOSING THE GST® (TRGI 2008) PLASTIC PIPES

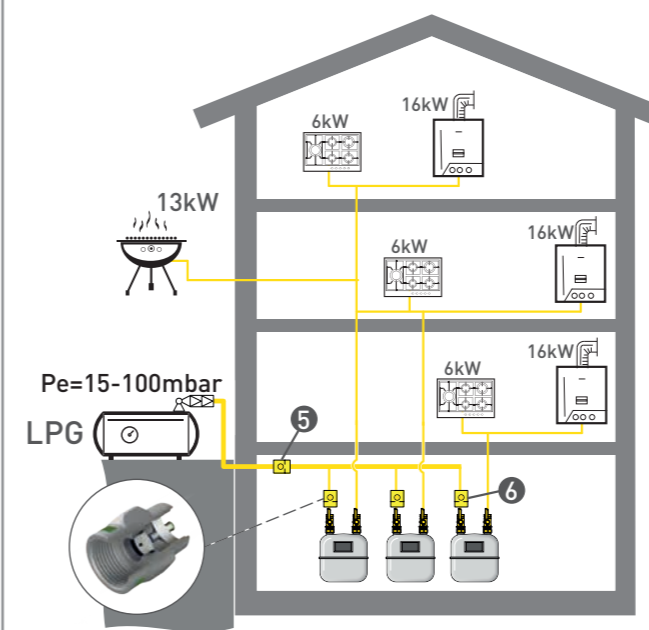
EXAMPLES OF LPG SYSTEMS

GST® IN A SINGLE-FAMILY DWELLING



- GST® installed on the main pipeline upstream from the gas meter valve.
Nominal total load of the downstream appliances:
 $\Sigma QNL = 35 \text{ kW}$ LPG
- Choice ref. 4
GST® fitting $V_{GAS} 2.5 \text{ m}^3/\text{h}$

GST® IN A MULTI-FAMILY DWELLING



- GST® installed on the main pipeline:
total nominal load:
 $\Sigma QNL = 79 \text{ kW}$ LPG
- Choice ref. 5
GST® fitting $V_{GAS} 6.0 \text{ m}^3/\text{h}$
- GST® installed on an offtake pipeline upstream from the gas meter valve.
Nominal total load of the downstream appliances:
 $\Sigma QNL = 22 \text{ kW}$ LPG
- Choice ref. 6
GST® fitting $V_{GAS} 2.5 \text{ m}^3/\text{h}$

PARAMETERS FOR CHOOSING THE GST® TRF-2012 LIQUEFIED GAS

GST® identification marking	Power in kW	
	Offtake pipeline	Main pipeline
$V_{GAS}=1.6 \text{ m}^3/\text{h}$	≤ 18	≤ 25
$V_{GAS}=2.5 \text{ m}^3/\text{h}$	19 ÷ 28 6	26 ÷ 40 4
$V_{GAS}=4.0 \text{ m}^3/\text{h}$	29 ÷ 45	41 ÷ 64
$V_{GAS}=6.0 \text{ m}^3/\text{h}$	46 ÷ 67	65 ÷ 96 5
$V_{GAS}=10 \text{ m}^3/\text{h}$	68 ÷ 112	97 ÷ 160



DEFINITION

DVGW-TRGI 2008

Mandatory technical regulation for the planning, construction, modification and installation of natural gas installations.

DVGW-TRF 2012

Mandatory technical regulation for the planning, construction, modification and installation of natural LPG installations.

DVGW VP 305-1

Excerpt of DVGW-TRGI 2008 that prescribes excess flow valves for residential installations.

DVGW-TRGI 2008, TRF2012 and TECO GST®

The TECO gas programme allows complete gas installations in accordance with DVGW-TRGI 2008 "Technical standards for gas installations" and TRF2012 "Technical standards for LPG installations".

DVGW-TRGI 2008 applies to all gas installations in buildings for all gas families that comply with the DVGW Arbeitsblatt G 260 worksheet (except LPG) with up to 1 bar of working pressure.

The DVGW-TRF 2012 technical standards apply to liquefied gas installations supplied with liquefied gas by cylinders or fixed liquefied gas containers with a capacity < 3 t.

As an active safety device in gas installations, the GST® excess flow valve is built in accordance with the DVGW VP 305-1 product standard, which requires the gas supply to be cut off in the event of abnormal gas dispersion. The goals of GST® protection are:

- fire and explosion prevention in plastic pipes
- protection against tampering in metal pipes

In both cases, in working domestic installations the GST® must be installed immediately after the main shut-off device or immediately after the gas pressure regulator.

Type of GS / closure factor / installation position

If the GST® closure flow rate is reached, the gas flow is cut off. The excess flow device was built so that the nominal flow rate remains stable and open. For the K type, regulation ensures that the closure factor is in the range 1.3 – 1.45 (30–40% higher than the nominal flow rate). The closure factor f_s specifies the ratio of the closure flow rate V_s to the nominal flow rate V_N ($f_s \text{ max} = V_s / V_{\text{GAS}}$). Our GST® excess flow device can be used for gas installations made with either plastic or metal pipes, and can be installed either horizontally or vertically upwards. The GST® excess flow device is only applicable with pressures in the range 15-100 hPa (mbar), which are found in most gas installations.

To ensure that the GST® will activate, it is necessary to calculate the overall nominal flow rate of the gas appliances installed in the system, and calculate the pipe sizing (pressure drop calculation) to identify the correct excess flow device.

GST® devices are chosen according to the requirements of the technical standards (Section 7.2 of TRGI 2008 or Section 7.11.2 of TRF 2012), and it may be necessary to align the pipe lengths during installation.

For non-metal pipes, the technical regulations require installation of a GST® and a thermal safety device (see page 231).

According to DVGW-TRGI 2008 and TRF2012, there are two possible methods for choosing the GST®:

- the procedure for a single gas appliance connection scheme;
- the procedure for connecting several devices.



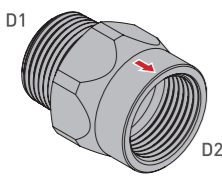
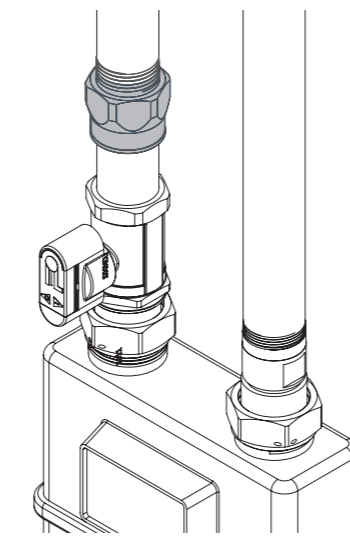
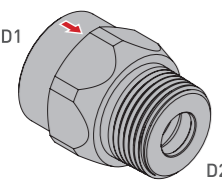
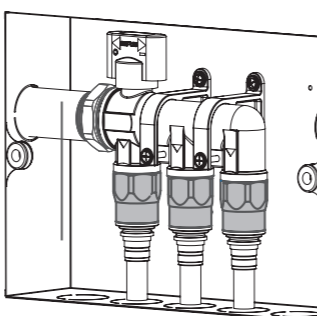
INSTALLATION SCHEME

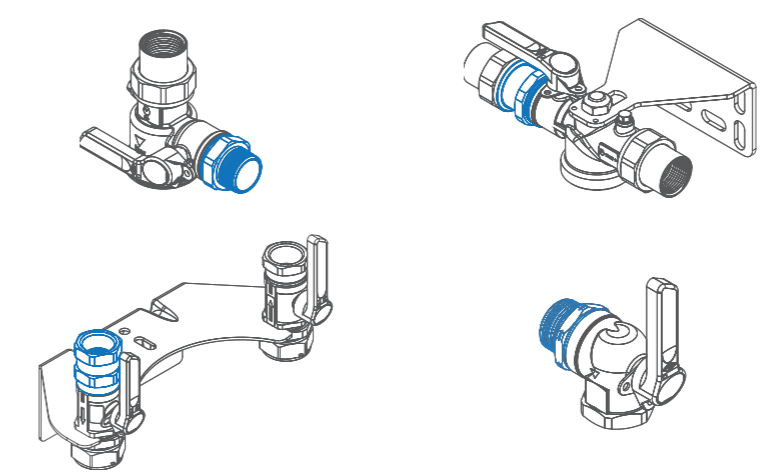
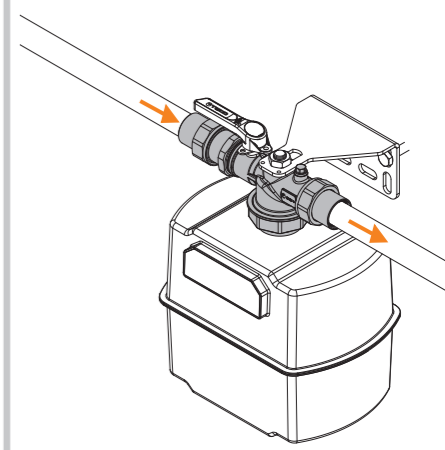
As stated earlier, the parameters for choosing the GST® are expressed in the German installation standards TRGI 2008 and TRF 2012 according to:

- the nominal installed power;
- the type of pipe;
- the type of gas appliance installation.

Example of installation in accordance with the TRGI 2008 German installation regulations		
Pressure Range	Single-family and multi-family dwellings with gas central heating systems	Multi-family dwellings with independent gas heating systems for each apartment
Low Pressure <25 mbar		
<25 mbar up to 100 mbar		
Medium and high pressure >100 mbar up to 5 bar		

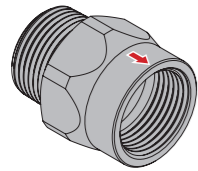
Example of installation in accordance with the TRF 2012 German installation regulations	
Single-family and multi-family dwellings with gas central heating systems	Multi-family dwellings with independent gas heating systems for each apartment

GST® FITTING					APPLICATION EXAMPLES	
GST® fitting MALE/FEMALE 	DN	D1 EN 10226-1	D2 EN 10226-1	GST® 6S m³/h		
	15	R1/2"	Rp1/2"	V _{GAS} =1.6		
	15	R1/2"	Rp1/2"	V _{GAS} =2.5		
	20	R3/4"	Rp3/4"	V _{GAS} =2.5		
	20	R3/4"	Rp3/4"	V _{GAS} =4.0		
	25	R1"	Rp1"	V _{GAS} =2.5		
	25	R1"	Rp1"	V _{GAS} =4.0		
	25	R1"	Rp1"	V _{GAS} =6.0		
	32	R1"1/4	Rp1"1/4	V _{GAS} =10.0		
	40	R1"1/2	Rp1"1/2	V _{GAS} =16.0		
50	R2"	Rp2"	V _{GAS} =16.0			
GST® fitting FEMALE/MALE 	DN	D1 EN 10226-1	D2 EN 10226-1	GST® 6S m³/h		
	15	Rp1/2"	R1/2"	V _{GAS} =1.6		
	15	Rp1/2"	R1/2"	V _{GAS} =2.5		
	20	Rp3/4"	R3/4"	V _{GAS} =2.5		
	20	Rp3/4"	R3/4"	V _{GAS} =4.0		
	25	Rp1"	R1"	V _{GAS} =2.5		
	25	Rp1"	R1"	V _{GAS} =4.0		
	25	Rp1"	R1"	V _{GAS} =6.0		
	32	Rp1"1/4	R1"1/4	V _{GAS} =10.0		
	40	Rp1"1/2	R1"1/2	V _{GAS} =16.0		
50	Rp2"	R2"	V _{GAS} =16.0			

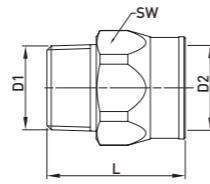
VALVES WITH BUILT-IN GST® DEVICE	APPLICATION EXAMPLES
Valves for gas meters (see page 177) 	



GST® FITTING - MALE/FEMALE THREADED VERSION

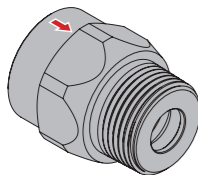


- 15-100 mbar
- -20 °C +60 °C
- fs 1.30-1.45

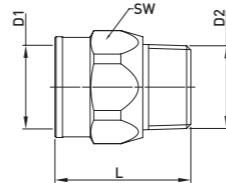


Code	DN	GST® GS m³/h	D1	D2	L1	SW	Pack
GS01110100	15	V _{GAS} =1.6	R1/2"	Rp1/2"	52	27	20
GS01210100	15	V _{GAS} =2.5	R1/2"	Rp1/2"	52	27	20
GS02210200	20	V _{GAS} =2.5	R3/4"	Rp3/4"	52	32	15
GS02310200	20	V _{GAS} =4.0	R3/4"	Rp3/4"	54	41	15
GS03210300	25	V _{GAS} =2.5	R1"	Rp1"	54	41	10
GS03310300	25	V _{GAS} =4.0	R1"	Rp1"	54	41	10
GS03410300	25	V _{GAS} =6.0	R1"	Rp1"	54	41	10
GS04510400	32	V _{GAS} =10.0	R1"1/4	Rp1"1/4	67	50	6
GS05610500	40	V _{GAS} =16.0	R1"1/2	Rp1"1/2	76	60	6
GS06610600	50	V _{GAS} =16.0	R2"	Rp2"	80	70	6

GST® FITTING - FEMALE/MALE THREADED VERSION



- 15-100 mbar
- -20 °C +60 °C
- fs 1.30-1.45



Code	DN	GST® GS m³/h	D1	D2	L1	SW	Pack
GS01120100	15	V _{GAS} =1.6	Rp1/2"	R1/2"	52	27	20
GS01220100	15	V _{GAS} =2.5	Rp1/2"	R1/2"	52	27	20
GS02220200	20	V _{GAS} =2.5	Rp3/4"	R3/4"	52	32	15
GS02320200	20	V _{GAS} =4.0	Rp3/4"	R3/4"	54	41	15
GS03220300	25	V _{GAS} =2.5	Rp1"	R1"	54	41	10
GS03320300	25	V _{GAS} =4.0	Rp1"	R1"	54	41	10
GS03420300	25	V _{GAS} =6.0	Rp1"	R1"	54	41	10
GS04520400	32	V _{GAS} =10.0	Rp1"1/4	R1"1/4	67	50	6
GS05620500	40	V _{GAS} =16.0	Rp1"1/2	R1"1/2	76	60	6
GS06620600	50	V _{GAS} =16.0	Rp2"	R2"	80	70	6

METROLOGICAL LAB:
PROFILOMETER

