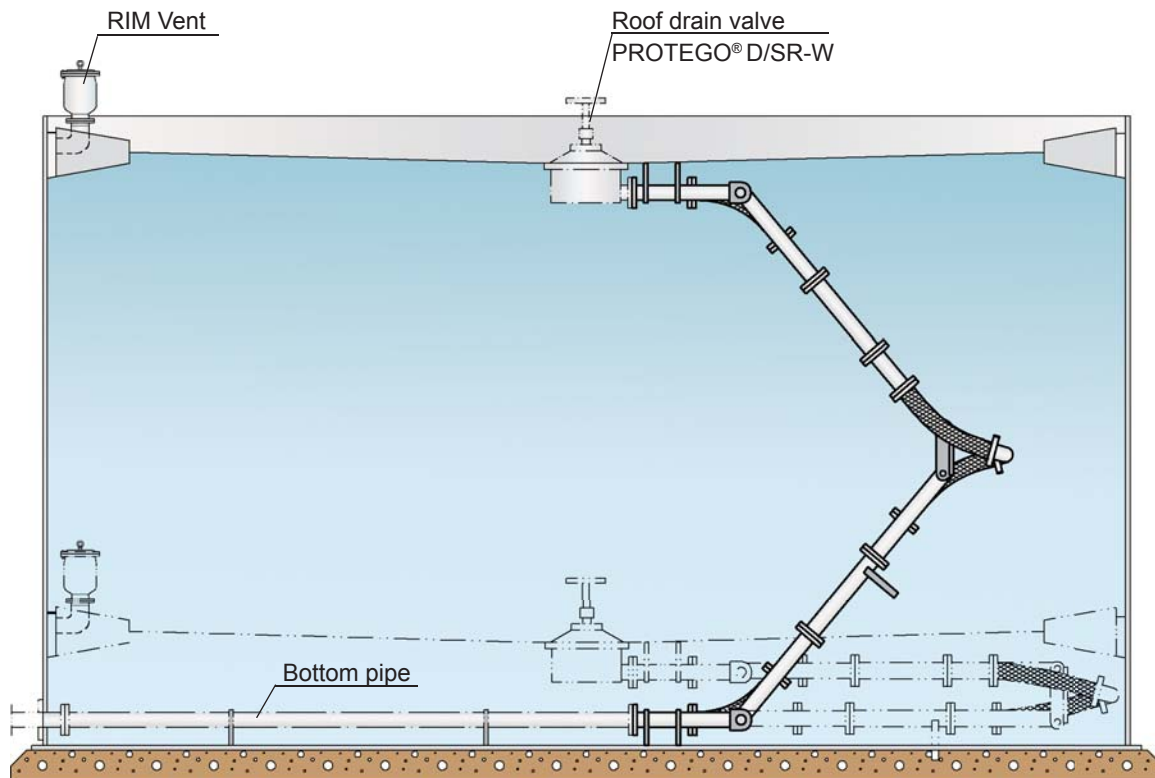


## Floating Roof Drainage System with Metal Hose Joints

**PROTEGO® SE/K**



### Function and Description

Floating roof tanks require a drainage system that automatically drains the accumulating rainwater off the floating roof. PROTEGO® SE/K is a single scissor-pipe-system that works with robust shackle joints. The water is drained by unstressed mounted and pressure resistant metal hoses.

The upper scissor pipe is connected to the roof drain valve and the lower scissor pipe is connected to the bottom pipe. Via the operational opened roof drain valve the water is transferred by the drainage system out of the tank.

### Design Types and Specifications

PROTEGO® floating roof drainage systems are designed and sized to suit the individual tank specifications and customer requirements.

PROTEGO® floating roof drainage systems are designed for a long life in service. We use only carbon steel or stainless steel as the material of construction. For the carbon steel version the joint bearings are made of stainless steel.

Solutions are available from 3" to 8" for floating roof tanks with external floating roof.

**PROTEGO® Floating Roof Drainage Systems are „Made in Germany“ and will provide many years of trouble free tank operation.**

### Selection and Design

PROTEGO® Floating Roof Drainage Systems offer experienced technology for a complete solution for the end-user. This includes easy installation and assembly and full documentation with an arrangement drawing showing the Floating Roof Drainage System placed in the tank with regards to all internals.

The flexibility of the metal hose is realized by the shackle-bolted joint. Forces that may occur due to torsion or uneven movements of the floating roof are absorbed through design and arrangement of the joints and thus have no negative effects on the system or metal hoses. The water is drained by metal hoses that are directly connected to the scissor pipes. The drain water does not pass through the actual joints and therefore sealing elements as used for common swivel joint systems are not required.

For stability reasons metal hose joints are made of steel or stainless steel.

Options upon request:

- Roof drain valve
- Bottom pipe
- On-site support

\*Project:  
Location:  
Client:  
\*Enduser:  
\*Engineering:

**Tank Main Details**

*Floating roof tank	<input type="checkbox"/>	
Tank No.:	*Tank height: :	mm *Tank diameter: mm
*Maximum filling height:	mm	
* Material request of Floating Roof Drainage System:		

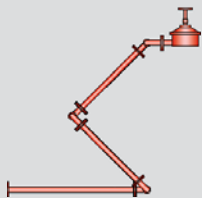
**Product Details**

*Product stored:	
*Specific gravity:	
Maximum product temperature:	°C

**Tank Details**

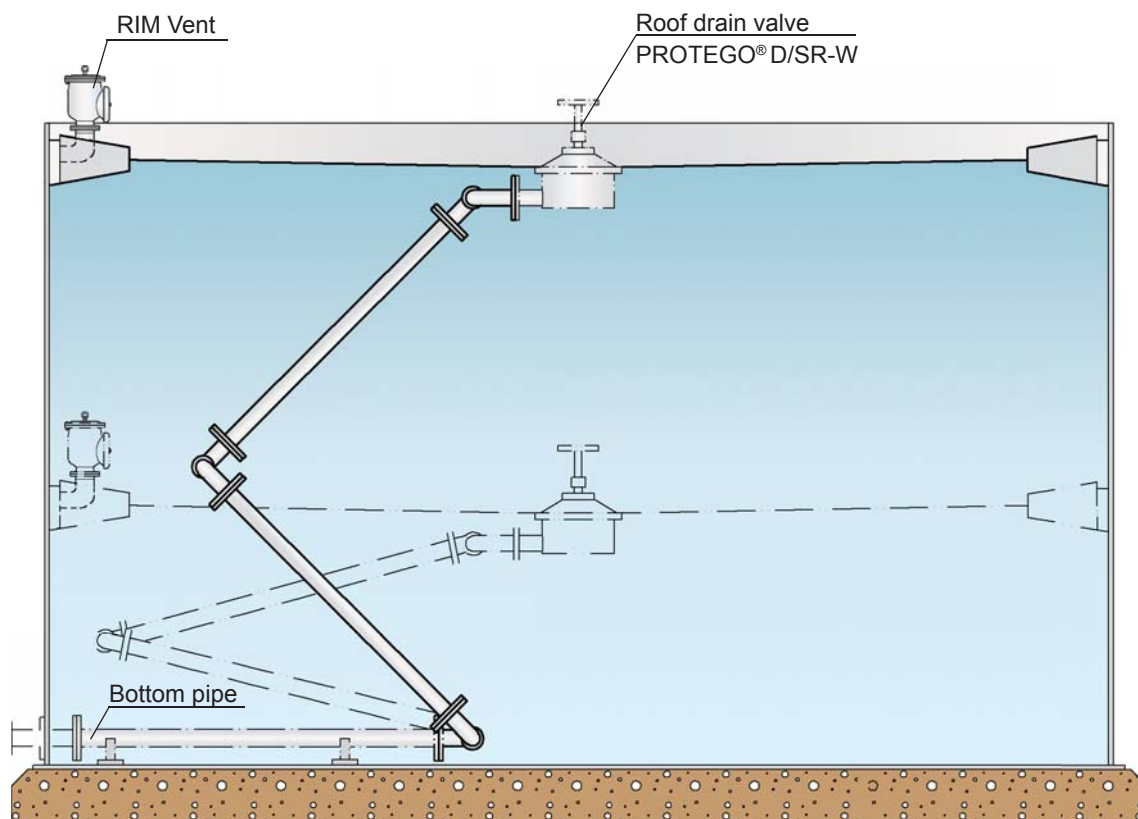
*Nominal diameter of drain line: DN	
*Shell nozzle centreline height / inwards projection	mm
*Manhole size: DN	
Bottom slope:	<input type="checkbox"/> Slope direction:
*Are there any obstructions? (columns, heating coils,...)	<input type="checkbox"/> if <input type="checkbox"/> - please specify
*Tank drawing / sketch	<input type="checkbox"/> if <input type="checkbox"/> - please specify

\* This information must be indicated on request!  
Fill in and  tick off, if applicable.



## Floating Roof Drainage System with Swivel Joints

### PROTEGO® SE/CK



#### Function and Description

Floating roof tanks require a drainage system that automatically drains the accumulating rainwater off the floating roof. PROTEGO® SE/CK is a single scissor-pipe-system that works with swivel joints.

The upper scissor pipe is connected to the roof drain valve, the lower scissor pipe is connected to the bottom pipe. Via the operational opened roof drain valve the water is transferred by the drainage system out of the tank.

#### Design Types and Specifications

PROTEGO® floating roof drainage systems are designed and sized to suit the individual tank specifications and customer requirements.

PROTEGO® floating roof drainage systems are designed for a long life in service. We use carbon steel or stainless steel for highly loaded components or aggressive media.

Solutions are available from DN 80/3" to DN 200/8" for floating roof tanks with external floating roof.

#### Selection and Design

PROTEGO® Floating Roof Drainage Systems offer experienced technology for a complete solution for the end-user. This includes easy installation and assembly and full documentation with an arrangement drawing showing the Floating Roof Drainage System placed in the tank with regards to all internals.

Essential for the design of the PROTEGO® Floating Roof Drainage System is the Heavy Duty Swivel Joint which fulfils the requirement for an in-service installation to avoid high costs of repairs and to extend the tank maintenance to the planned interval.

The Swivel Joint comes with/in

- a sturdy design made of carbon or stainless steel
- maintenance-free greased for a life-time with aviation approved grease
- large sized ball bearing with two races to cover all side-flow forces during operation.

Options upon request:

- Roof drain valve
- Bottom pipes
- On-site support

**PROTEGO® Floating Roof Drainage Systems are „Made in Germany“ and will provide many years of trouble free tank operation.**

\*Project:  
Location:  
Client:  
\*Enduser:  
\*Engineering:

**Tank Main Details**

*Floating roof tank	<input type="checkbox"/>	
Tank No.:	*Tank height: :	mm *Tank diameter: mm
*Maximum filling height:	mm	
* Material request of Floating Roof Drainage System:		

**Product Details**

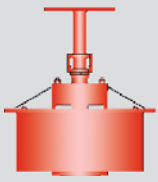
*Product stored:	
*Specific gravity:	
Maximum product temperature:	°C

**Tank Details**

*Nominal diameter of drain line: DN	
*Shell nozzle centreline height / inwards projection	mm
*Manhole size: DN	
Bottom slope:	<input type="checkbox"/>
Slope direction:	
*Are there any obstructions? (columns, heating coils,...)	<input type="checkbox"/>
	if <input type="checkbox"/> - please specify
*Tank drawing / sketch	<input type="checkbox"/>
	if <input type="checkbox"/> - please specify

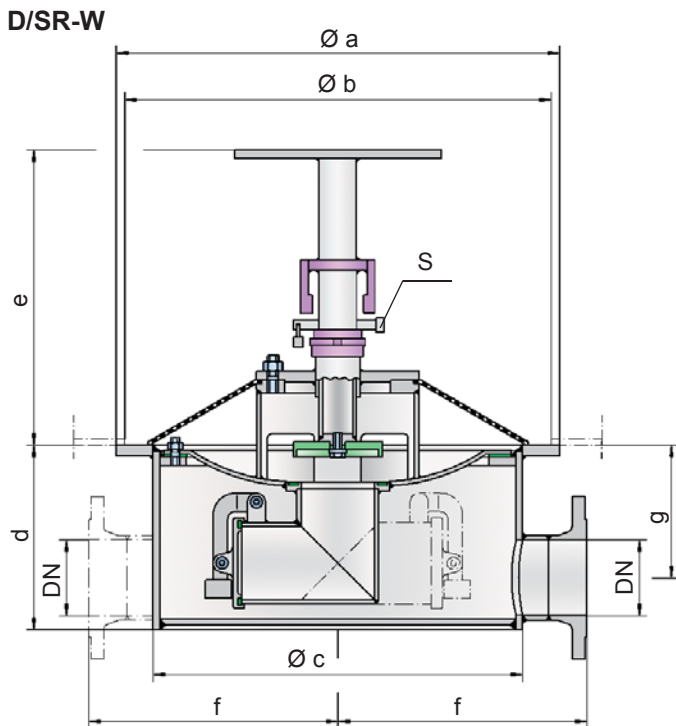
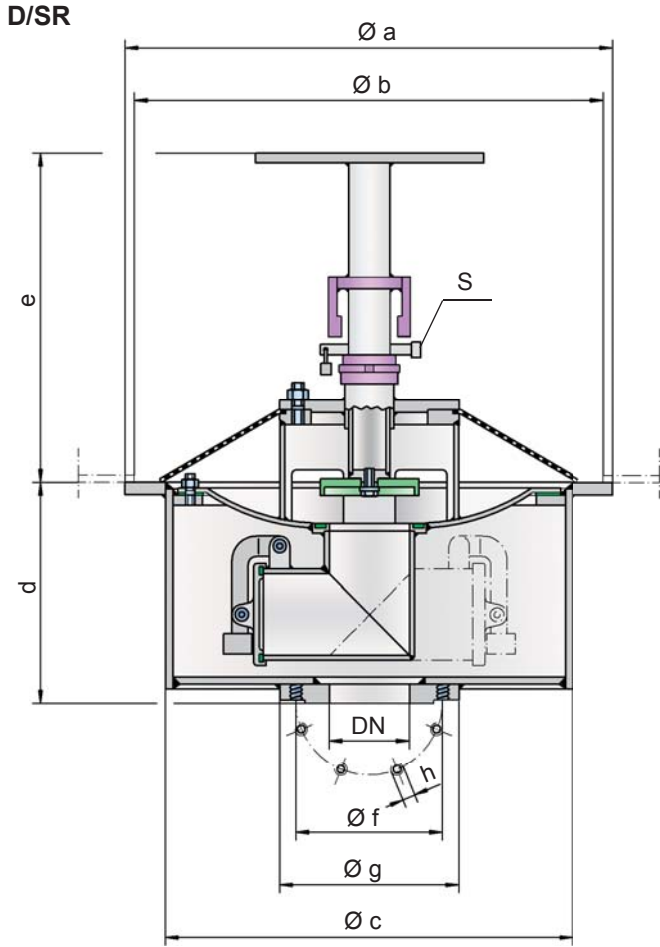
\* This information must be indicated on request!  
Fill in and  tick off, if applicable.





# Roof Drain Valves

## PROTEGO® D/SR and D/SR-W



### Function and Description

The PROTEGO® roof drain valves D/SR or D/SR-W function like collection bowls and pass the collected rain water from the floating roof through the scissor pipes of a PROTEGO® floating roof drainage system, such as SE/K or SE/CK, into the sewage water system.

Under normal operating conditions the roof drain valve is open. In case of any leakage the non-return valve prevents the stored medium from escaping to the floating roof. The inlet screen protects the roof drain valve from any dirt, leaves or nesting birds.

### Design Types and Specifications

Two designs are available:

Roof drain valve with vertical connection **D/SR**

Roof drain valve with horizontal connection **D/SR-W**

As an option a special design of the roof drain valve is available with protection against unauthorized closing of the quick-action shut-off (S).

**Table 1: Dimensions D/SR** Dimensions in mm / inches

DN	80 / 2"	100 / 4"	150 / 6"
a	550 / 21.65	600 / 23.62	650 / 25.59
b	490 / 19.29	540 / 21.26	590 / 23.23
c	450 / 17.72	500 / 19.69	550 / 21.65
d	240 / 9.45	280 / 11.02	330 / 12.99
e	490 / 19.29	490 / 19.29	490 / 19.29
f	160 / 6.3	180 / 7.09	240 / 9.45
g	200 / 7.87	220 / 8.66	285 / 11.22
h	M 16	M 16	M 20

**Table 2: Dimensions D/SR-W** Dimensions in mm / inches

DN	80 / 2"	100 / 4"	150 / 6"
a	550 / 21.65	600 / 23.62	650 / 25.59
b	490 / 19.29	540 / 21.26	590 / 23.23
c	450 / 17.72	500 / 19.69	550 / 21.65
d	205 / 8.07	250 / 9.84	320 / 12.6
e	490 / 19.29	490 / 19.29	490 / 19.29
f	285 / 11.22	320 / 12.6	350 / 13.78
g	150 / 5.91	180 / 7.09	225 / 8.86

**Table 3: Material selection**

Design	A	B
Housing	Steel	Stainless Steel
Non-return valve	Red Brass	Red Brass
Valve disc	Steel	Stainless Steel
Quick-action shut-off	Steel	Stainless Steel
Gasket	PUR	PUR

The device must have sufficient corrosion resistance with regards to the stored media. If necessary, designs in special stainless steel quality should be selected.

### Flange Connection Type

In type PROTEGO® D/SR the housing bottom is equipped with a loose flange with threaded holes according to EN 1092-1 or optionally according to any other international standard.

In the standard model of PROTEGO® D/SR-W the housing is equipped with a lateral flange connection to EN 1092-1. Optionally, the connecting flanges can be made according to any other international standard. An additional flange connection is available.

### Selection and Design

The specified maximum rainfall is required to determine the required nominal size. Alternatively, the connection size of the roof drain valve corresponds with the existing nominal dimension of the floating roof drainage system. Roof drain valves with 2 or 3 non-return valves are available as an option.

### Necessary Data for Specification

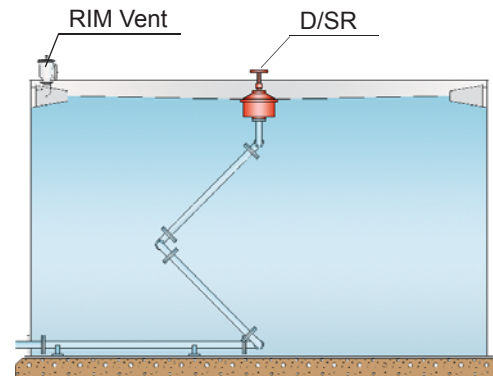
Maximum rainfall to be drained off (m<sup>3</sup>/h or CFH)

Material of floating roof

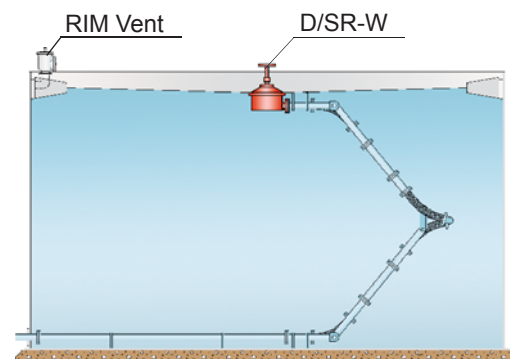
Connection size of the floating roof drainage system DN (mm or inches)

Design of floating roof drainage system

### Application Examples

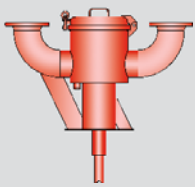


PROTEGO® roof drain valve type D/SR in combination with Floating roof drainage system PROTEGO® SE/CK



PROTEGO® roof drain valve type D/SR-W in combination with Floating roof drainage system PROTEGO® SE/K.

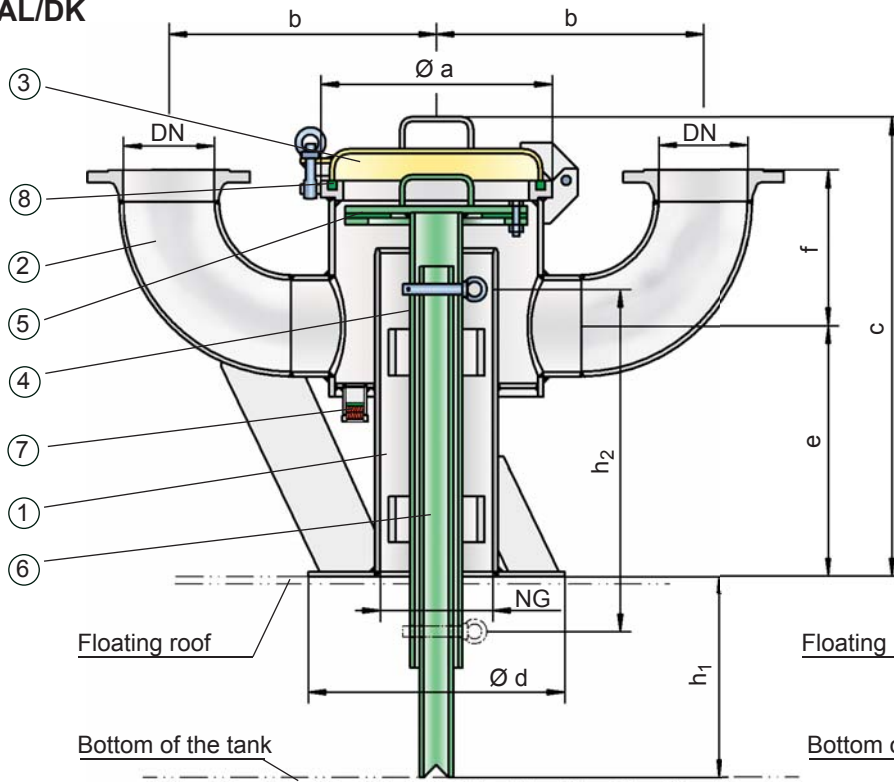




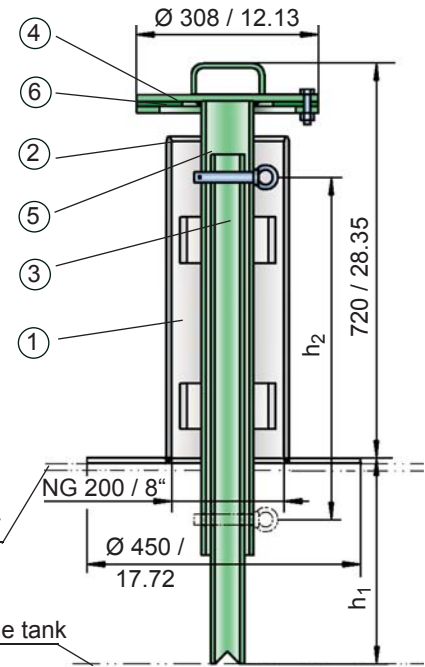
## Vent Valve, Lift-actuated

### PROTEGO® AL/DK and PROTEGO® AL 200

#### AL/DK



#### AL 200



Dimensions in mm / inches

### Function and Description

PROTEGO® lift-actuated vent valves type AL/DK provide automatic venting of floating roof tanks when the floating roof is lowered on its supports and the tank is either finally drained or refilled. When the floating roof is in its lowest position the valve is forced to open through lift actuation and this prevents unacceptable vacuum during final draining or unacceptable pressure during refilling.

In general the device consists of a housing (1) with sheet-metal panel to be welded on the floating roof, two or four connection nozzles (2) for installation of vent caps, cover (3), lift (4) including valve pallet (5), lift pipe (6) and the condensate drain valve (7) which can be flame transmission proof if required. A flat gasket is attached to the valve pallet (5) to provide sealing. The cover (3) is sealed by a sealing cord (8).

In general the device PROTEGO® AL 200 consists of a housing (1) with sheet-metal panel to be welded on the floating roof as well as the valve seat (2), lift (3) including valve pallet (4) and lift pipe (5). A flat gasket (6) which provides sealing.

As the lowest position of the floating roof varies for operation and assembly specify the dimensions  $h_1$  and  $h_2$ :

$h_1$ : Distance between lower edge of sheet-metal panel (or mounting flange) and tank bottom in lowest position of floating roof (operating position with an empty tank).

$h_2$ : Distance between floating roof in lifted maintenance position and height of floating roof in fully lowered operating position, if the tank is empty.

If the floating roof supports are changed from operating position to maintenance position the lift has to be lengthened as well. This is done with an adjustable locking pin that is secured with a bolt.

The valve is not flame transmission proof.

A hazard analysis (which considers the material selection and function of the device) shows that the device doesn't have any potential sources of ignition. Therefore they are not subject to the European Explosion Protection Directive (ATEX) when used in explosive atmosphere.

## Designs and Specifications

**Table 1: Dimensions for AL/DK**

NG	200 / 8"	200 / 8"	200 / 8"
DN	100 / 4"	150 / 6"	200 / 8"
a	350 / 13.78	350 / 13.78	350 / 13.78
b	465 / 18.31	465 / 18.31	515 / 20.28
c	870 / 34.25	870 / 34.25	870 / 34.25
d	450 / 17.72	450 / 17.72	450 / 17.72
e	385 / 15.16	385 / 15.16	415 / 16.34
f	420 / 16.54	285 / 11.22	370 / 14.57

Dimensions in mm / inches

**Table 2: Material**

Housing	Steel	special materials upon request
Valve guide	Stainless Steel	
Gasket	FPM	

**Table 3: Flange connection type DN**

EN 1092-1, Form B1	other types upon request
ASME B16.5; 150 lbs RFSF	

## Selection and Design

The required quantity and nominal size DN will be defined based on the calculated flow rate from the thermal venting and pump rate in lowest floating roof position (Nm<sup>3</sup>/h or CFH) and based on the maximum acceptable tank pressure p<sub>T</sub> (mbar / inch W.C.) according to the flow capacity charts. Special models are available on request.

Flow rates and pressure losses of vent caps PROTEGO® EB or PROTEGO® LH/AD have additionally to be taken into account according to the appropriate charts in the relevant data sheets. Lift-actuated vent valves PROTEGO® AL 200 can be applied in case just venting is required.

## Necessary Data for Specification

Stored product

Tank diameter (m or ft)

Tank height (m or ft)

Support height h<sub>1</sub> (operating position with empty tank)

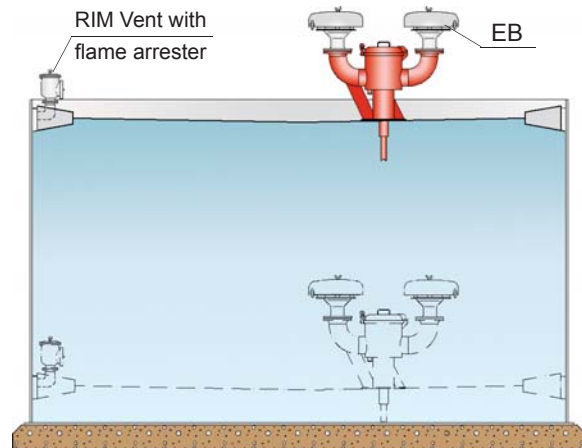
Support height h<sub>2</sub> (lifted assembly position)

Maximum allowable tank pressure p<sub>T</sub> (mbar or inch W.C.)

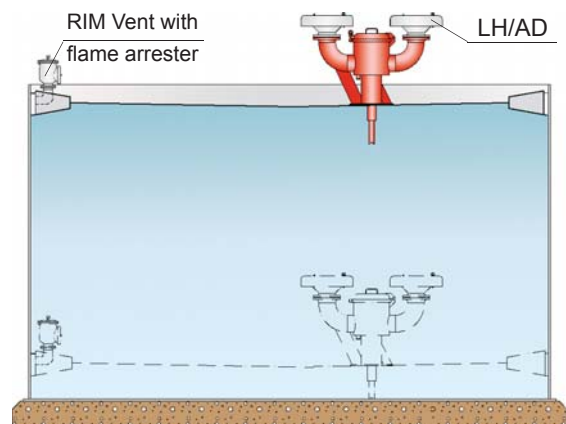
Pump rate (m<sup>3</sup>/h or CFH)

## Application Examples for PROTEGO® AL/DK

Lift-actuated vent valves of type PROTEGO® AL/DK can be combined with vent caps type EB which are deflagration proof and resistant against endurance burning. This ensures flame transmission proof ventilation.

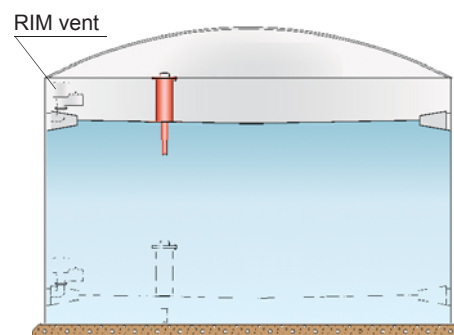


If resistance against endurance burning is not required the valves can alternatively be combined with PROTEGO® deflagration proof devices type PROTEGO® LH/AD. The applicable data sheets are available in volume 2 "Deflagration Flame Arresters, end-of-line and Vent Caps".

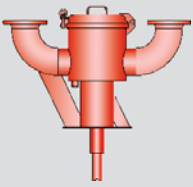


## Application Examples for PROTEGO® AL 200

PROTEGO® AL 200 for fixed roof storage tanks with internal floating roof.



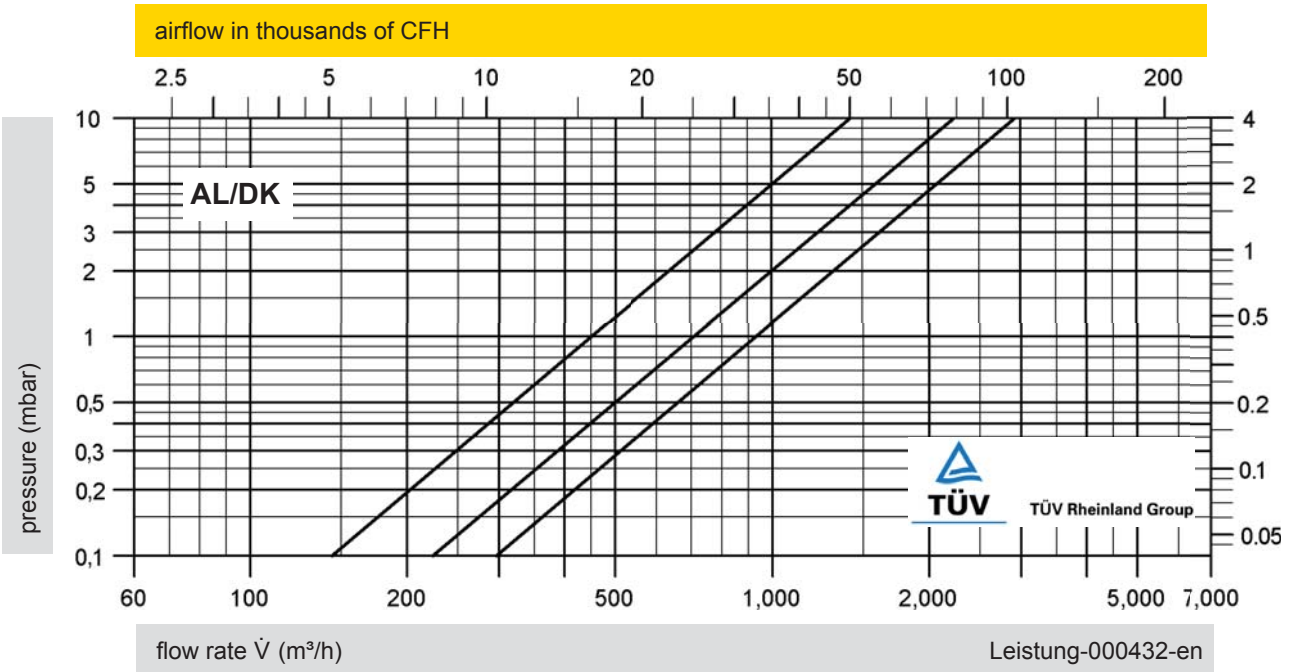




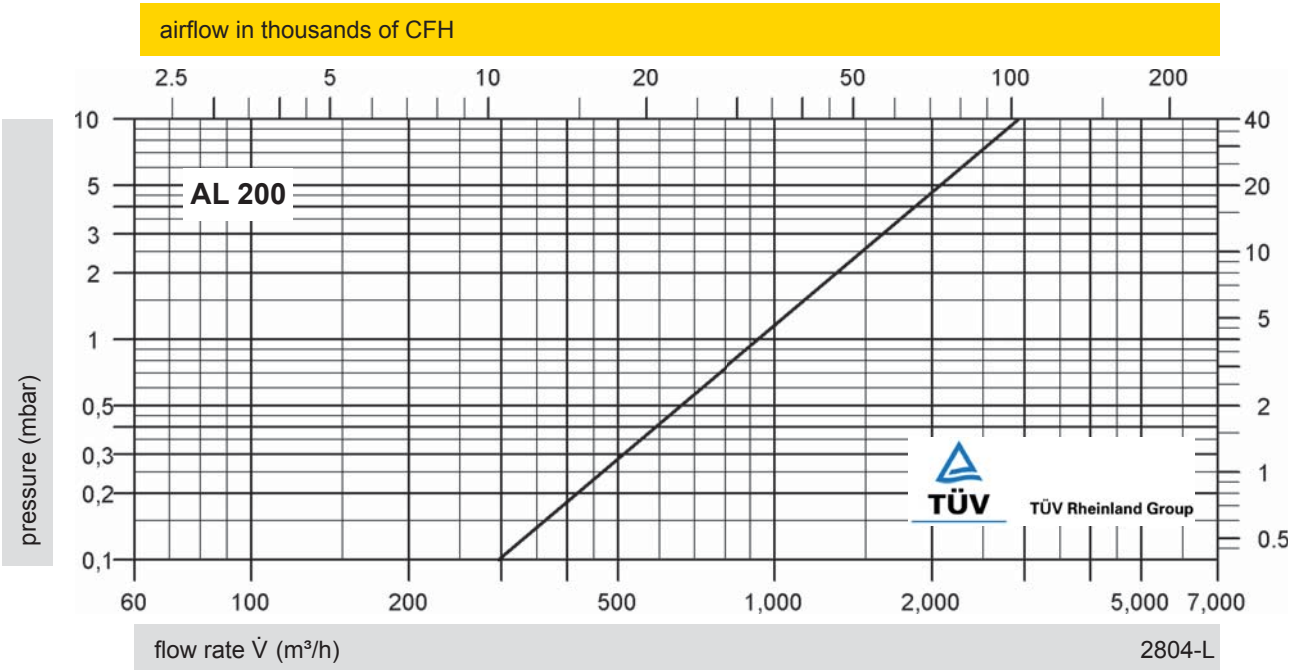
**Vent Valve, Lift-actuated**  
**Flow Capacity Charts**

**PROTEGO® AL/DK and PROTEGO® AL 200**

DN 200 - 100 / 8" - 4"  
 DN 200 - 150 / 8" - 6"  
 DN 200 - 200 / 8" - 8"



pressure - inch W.C.



pressure - inch W.C.

The flow capacity charts have been determined with a calibrated and TÜV certified flow capacity test rig. Volume flow  $\dot{V}$  in (m³/h) and CFH refer to the standard reference conditions of air ISO 6358 (20°C, 1bar). Conversion to other densities and temperatures refer to Vol. 1: "Technical Fundamentals".