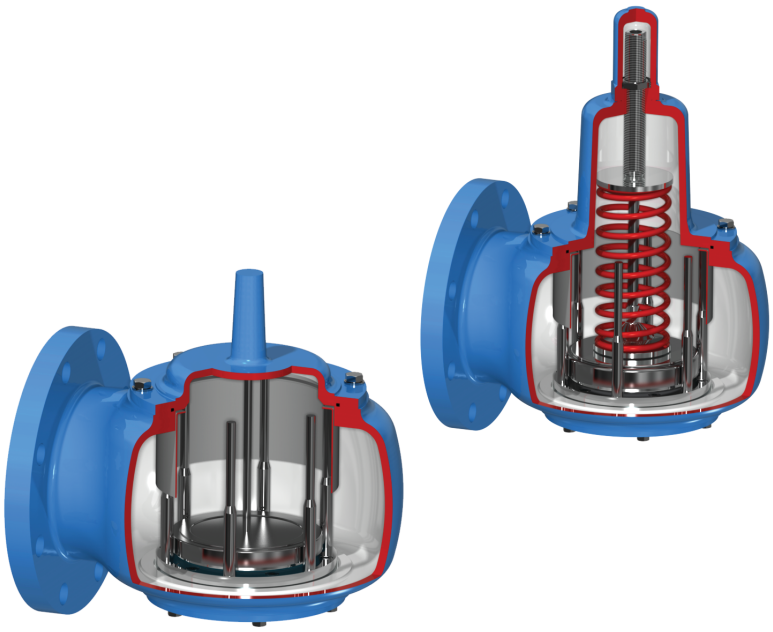
ANDERSON GREENWOOD TYPE 4410 SIDE ENTRY ATMOSPHERIC VACUUM RELIEF VALVES

Weight or spring loaded valves with a side inlet capable of high capacity vacuum relief. Designed to work closer to a tank's MAWV, increasing productivity, reducing emissions and product evaporation.



FEATURES

- Increased flow capacities reduce the required valve size and the corresponding connections and piping costs.
- Fully open at 10% overpressure, enabling setting close to MAWV and minimizing tank emissions.
- Large body for increased capacity providing high flow performance for full conformance to API 2000/ISO 28300.
- Leakage rate of 0.5 SCFH (0.015 Nm^3/hr) or less at 90% of setpoint.
- Weight or spring loaded models available.
- Choice of body materials.
- Modular design enables all components to be removed and replaced in-situ for quicker, simpler maintenance.
- Optional 'all-weather' coating prevents frozen condensate build-up and sticking of vital components in cold weather applications.

GENERAL APPLICATION

Type 4410 valves allow tanks to work closer to their MAWV thus increasing productivity, reducing emissions and product evaporation. Increased flow capacities reduce the valve's size, corresponding connections and piping costs in applications for storage tank farms, oil and gas production, the petroleum, pharmaceutical and chemical sectors.

TECHNICAL DATA

Materials:	Aluminum, carbon steel, stainless steel
Sizes:	3 to 14 in. (DN 80 to 350)
Vacuum settings	
Weight loaded:	up to -1.5 psig (-100 mbarg)
Spring loaded:	up to -15 psig (-1 barg)
Certification:	ATEX 94/9 EC

ANDERSON GREENWOOD TYPE 4410 SIDE ENTRY ATMOSPHERIC VACUUM RELIEF VALVES

MODELS OVERVIEW

Type 4410 valves are high capacity, full lift vacuum relief valves designed for use on atmospheric and low pressure storage tanks. Their primary function is to protect the tank from physical damage or permanent deformation caused by increases in vacuum encountered in normal operations.

The valves are fully open at 10% overpressure allowing the user to have a quicker acting valve that can be set closer to the tank's maximum allowable working vacuum, reducing emission losses.

There are two model variants:
- Model 4410H offers weight-loaded vacuum relief.
- Model 4410HV, spring-loaded vacuum relief.

APPLICATION

By controlling tank venting, Type 4410 vacuum valves not only minimize emissions to the environment but also the loss of product to evaporation. Their 'air-cushion' seating design keeps the valve sealed tightly until the vacuum inside the tank approaches the valve setting. The larger body allows for greater vacuum capacity in accordance with the most recent versions of tank vents sizing standards (API 2000/ISO 28300).

They offer the option of a non-frosting and icing-resistant coating on the pallet perimeter, stem, guide posts and seats which, along with the flexible Polytetrafluoroethylene (PTFE) seat insert, provides additional protection against pallets freezing closed.

TESTING

Each valve is tested for proper setting, for a leakage rate of less than 0.5 SCFH (0.015 Nm^3/hr) of air at 90% of the set point and for leak tightness at 75% of set point as required in API standard 2000.

SPECIFICATIONS

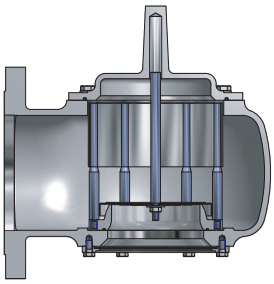
Available materials
- Aluminum with aluminum or stainless steel trim
- Carbon steel with stainless steel trim
- Stainless steel with stainless steel trim
- Special materials on application

Sizes, inches (DN)
3 (80)
4 (100)
6 (150)
8 (200)
10 (250)
12 (300)
14 (350)

Flanged connections –standard flange drilling
Aluminum body
Drilled to ANSI Class 150 dimensions (flat face)
Drilled to DIN 2633 (PN 16) dimensions (flat face)
CS and SS body
Drilled to ANSI Class 150 dimensions (raised or flat face)
Drilled to Imperial DIN 2633 (PN 16) dimensions (raised or flat face)

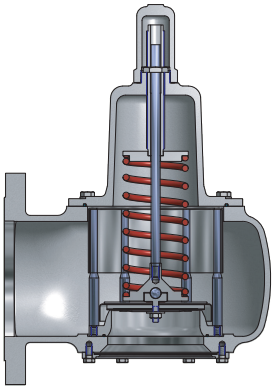
Options
- PTFE coated trim to minimize ice build-up
- Stainless steel weights
- Steam jackets
- Proximity sensors to monitor valve opening and closing

Weight loaded



Model 4410H

Spring loaded

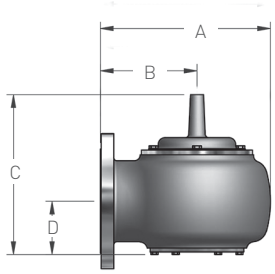


Model 4410HV

DIMENSIONS (mm)

MODEL 4410H

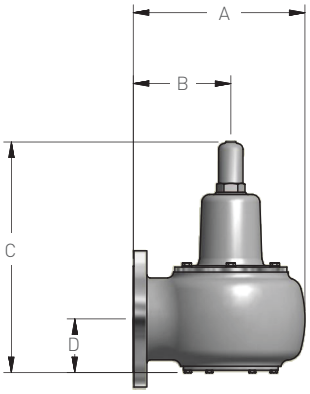
Size Inches	DN	A	B	C	D
3	80	253	153	252	79
4	100	323	193	293	91
6	150	352	200	331	111
8	200	435	245	442	148
10	250	592	330	552	181
12	300	730	410	639	207
14	350	854	480	426	230



Model 4410H

MODEL 4410HV

Size Inches	DN	A	B	C	D
3	80	253	153	374	79
4	100	323	193	418	90
6	150	352	200	473	111
8	200	435	245	681	148
10	250	592	330	883	181
12	300	730	410	1083	207
14	350	854	480	1266	230



Model 4410HV

SIZING

API 2000 - valve sizing (air)

Once the required air venting rates have been determined using data from the following pages or supplied by the customer, a calculation should be conducted to determine the required valve discharge area using the formula below. Once this area has been determined, select the first standard valve flow area above this.

Metric units:

$$A = \frac{RFo}{12515 \times (P_{1o} + At) \times K_{do} \times Fo \sqrt{\frac{K}{MxTxZ(K-1)} \left[\left(\frac{P_2 + At}{P_{1o} + At} \right)^{\frac{2}{K}} - \left(\frac{P_2 + At}{P_{1o} + At} \right)^{\frac{K+1}{K}} \right]}}$$

Where:

VR	=	Air venting requirements	Nm^3/h Air
A	=	Required flow area of valve	cm^2
Kd	=	Coefficient of discharge (see page 7)	
P_1	=	Inlet flowing pressure (Set + over pressure – inlet pressure loss)*	Barg
P_2	=	Outlet pressure (Back pressure)	Barg
K	=	Ratio of specific heats Air = 1.4	
T	=	Temperature at valve inlet	273°K
M	=	Molecular weight	Air = 28.97
Z	=	Compressibility factor	Air = 1.0
At	=	Atmospheric pressure	1.013 bar
F	=	Over pressure factor (Use 1 for Type 4410 valves)	

* The inlet pressure loss is due to factors such as difficult inlet piping, flame arresters, etc. and must be less than overpressure.

SIZING

TABLE OF FLOW COEFFICIENTS (Kd) - MODEL 4410H

Size		Flow area	API connection
Inches	DN	cm^2	Vacuum
3	80	27.342	0.619
4	100	62.110	0.619
6	150	107.509	0.619
8	200	243.283	0.619
10	250	430.051	0.499
12	300	674.257	0.429
14	350	967.611	0.405

MINIMUM SET PRESSURES – WEIGHT LOADED

Size		Aluminum			Stainless steel		
Inches	DN	V, mbarg	L, mbarg	H, mbarg	V, mbarg	L, mbarg	H, mbarg
3	80	1.04	2.42	4.87	2.38	5.91	9.70
4	100	0.84	1.74	4.36	1.84	3.98	8.46
6	150	0.90	1.64	4.48	1.93	3.63	8.90
8	200	0.96	1.60	6.33	1.92	3.90	13.37
10	250	1.10	1.30	13.00	2.50	3.80	20.00
12	300	1.10	1.20	14.00	2.50	3.50	22.00
14	350	1.10	1.20	14.00	2.50	3.20	24.00

NOTE
V = very low pressure pallet
L = low pressure pallet
H = high pressure pallet

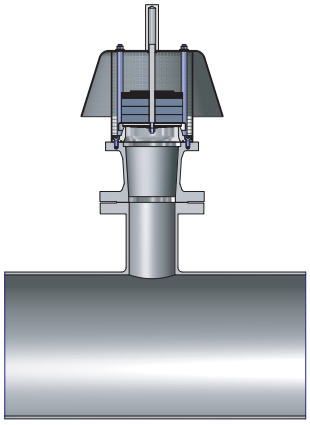
MINIMUM SET PRESSURES – SPRING LOADED

Size		Aluminum				Stainless steel			
Inches	DN	V, mbarg	L, mbarg	H, mbarg	Spring, mbarg	V, mbarg	L, mbarg	H, mbarg	Spring, mbarg
3	80	1.04	2.42	4.87	N/A	2.38	5.91	9.70	70
4	100	0.84	1.74	4.36	N/A	1.84	3.98	8.46	70
6	150	0.90	1.64	4.48	N/A	1.93	3.63	8.90	70
8	200	0.96	1.60	6.33	N/A	1.92	3.90	13.37	70
10	250	1.10	1.30	13.00	N/A	2.50	3.80	20.00	70
12	300	1.10	1.20	14.00	N/A	2.50	3.50	22.00	70
14	350	1.10	1.20	14.00	N/A	2.50	3.20	24.00	70

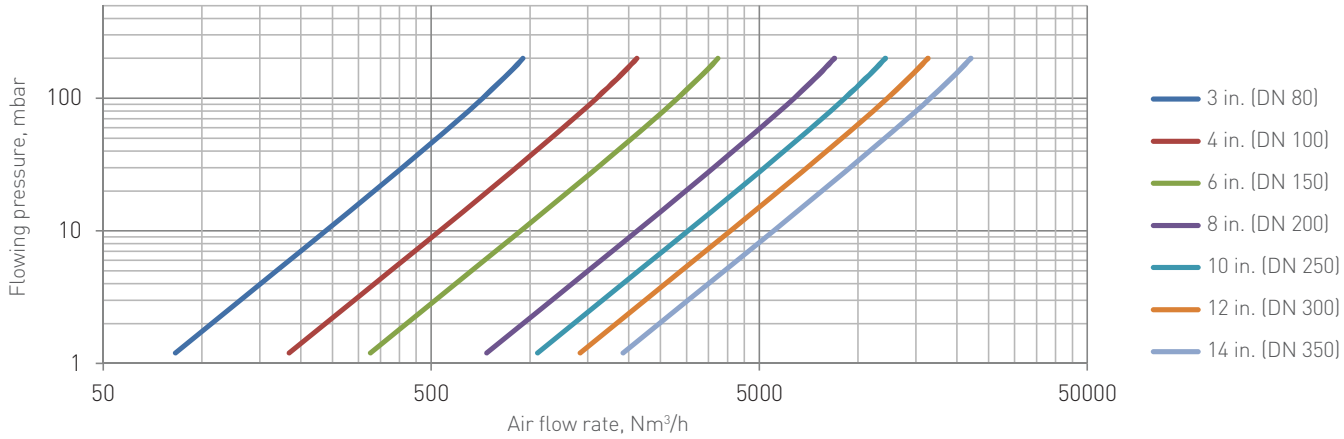
NOTE
V = very low pressure pallet
L = low pressure pallet
H = high pressure pallet

FLOW CAPACITIES

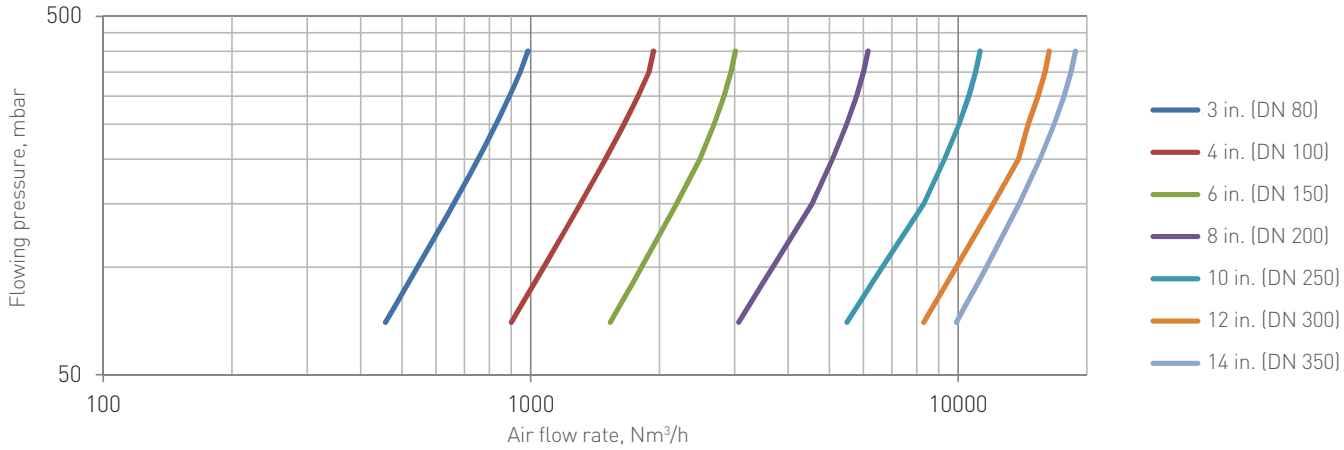
API 2000 Connection
API connection testing requires a square-edge flange connection for capacity publishing. This setup mimics a typical tank connection with its inherent pressure drop/capacity.



Model 4410H
(ISO/API connection)



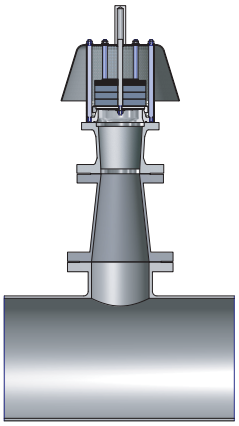
Model 4410HV
(ISO/API connection)



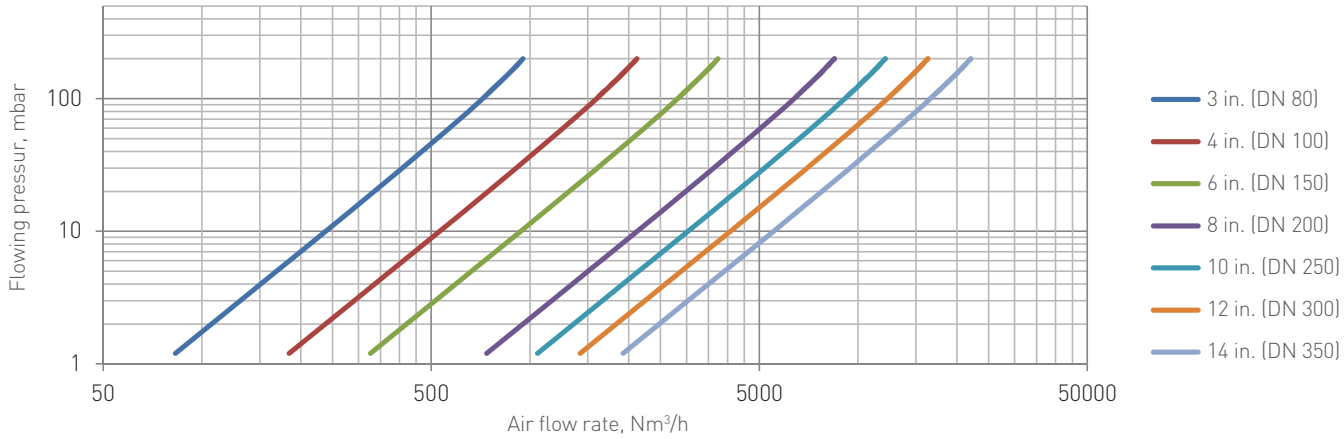
FLOW CAPACITIES

Conical Reducer

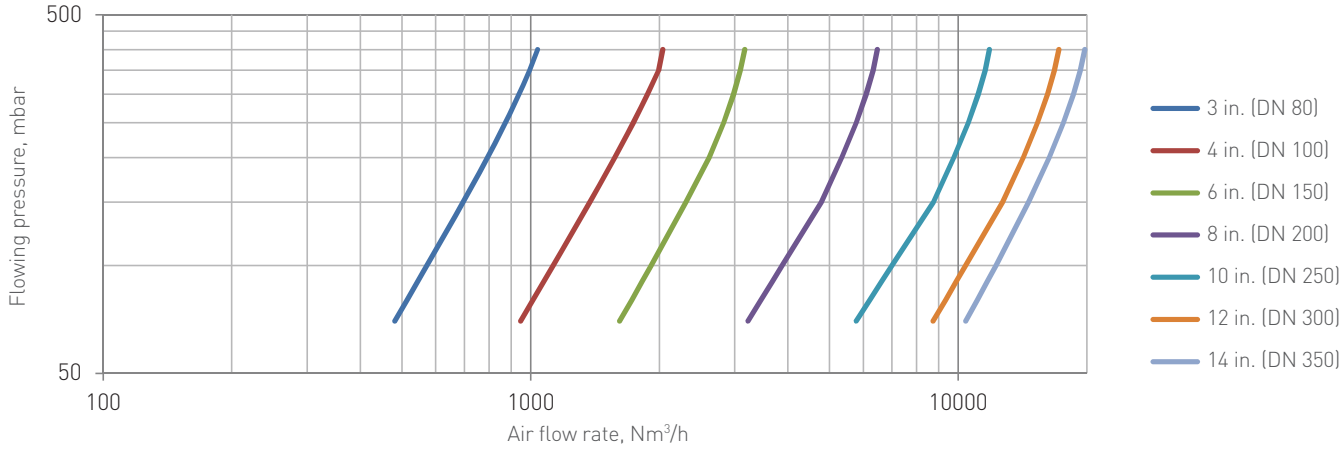
A conical reducer reduces the flow losses associated with the tank connection, providing the more accurate representation of pure valve performance. With this capacity, users can calculate their own tank connection losses and apply it to the valve flow.



Model 4410H
(Conical reducer)



Model 4410HV
(Conical reducer)



SELECTION GUIDE

Example:	4410H	04	H	1	1	S	T	F	F	B	N
Model											
4410H											
4410HV											
Tank connection											
03 3 in. (DN 80) **06** 6 in. (DN 150) **10** 10 in. (DN 250) **14** 14 in. (DN 350)											
04 4 in. (DN 100) **08** 8 in. (DN 200) **12** 12 in. (DN 300)											
Vacuum load											
V Weight loaded – very low pressure pallet											
L Weight loaded – low pressure pallet											
H Weight loaded – high pressure pallet											
X Spring loaded											
0 Not applicable											
Body material											
1 Aluminum											
3 Carbon steel											
5 316 Stainless steel (CF8M)											
7 316L Stainless steel (CF3M)											
Trim (pallet/seat)											
1 AL pallets/AL seat											
2 316SS pallets/316SS seat											
3 316LSS pallets/316LSS seat											
All-weather code											
S Standard, no coating											
W PTFE coated winterization											
Insert											
T Carbon impregnated PTFE (standard for HP pallet)											
B PFA (standard for VLP and LP pallet)											
V FKM											
Flange drilling											
F ANSI 150 for imperial studs											
0 DIN PN10 for metric studs											
6 DIN PN16 for metric studs											
Flange face											
F Flat face											
R Raised face (not available for aluminum bodies)											
Soft Goods											
B Nitrile/NBR (standard)											
T PTFE											
V Fluorocarbon (FKM)											
Options											
N None (standard) **S** Stainless steel weights **J** Steam jackets											
A Proximity switch **H** Purge holes											