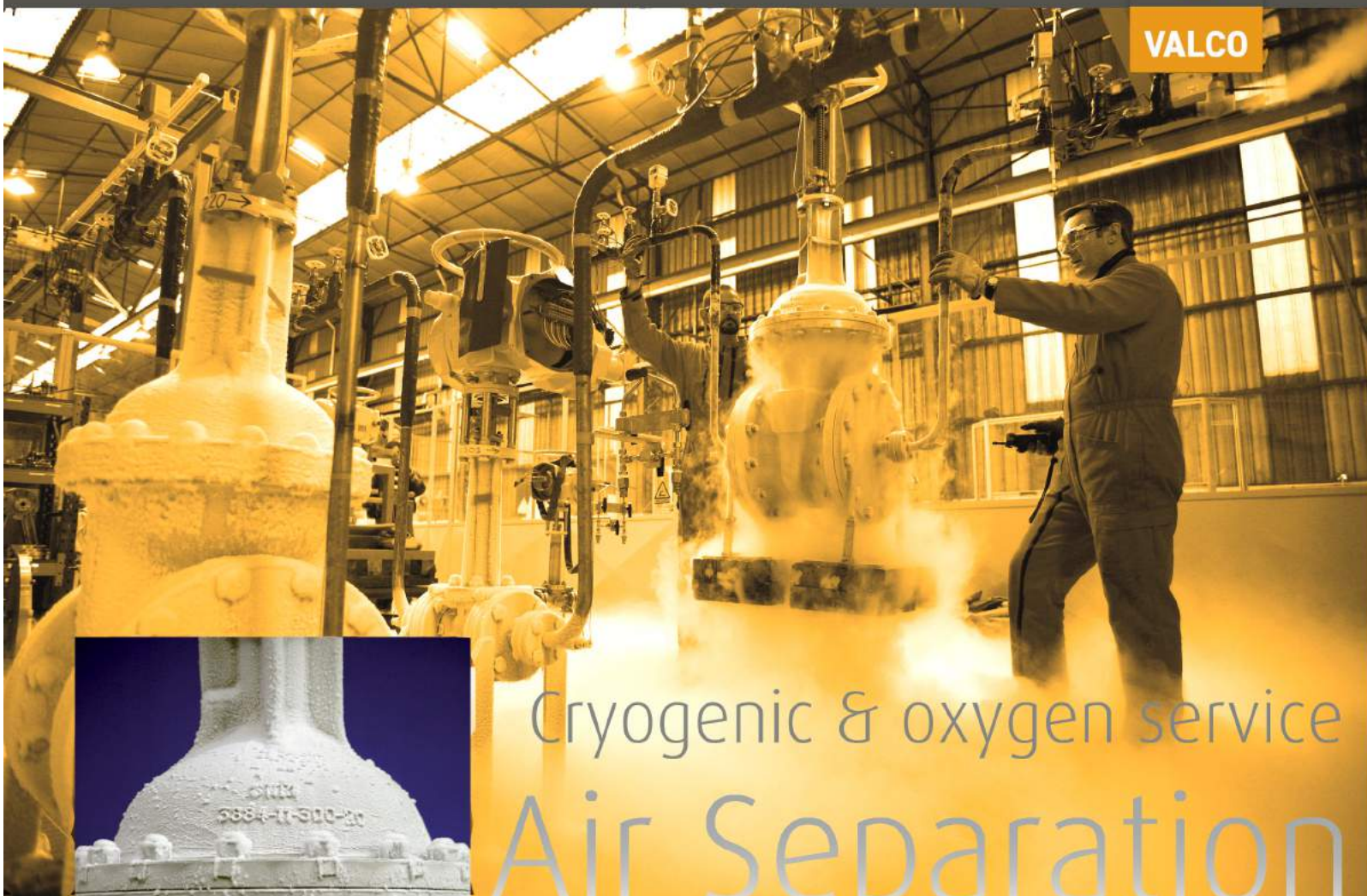




VALCO



Cryogenic & oxygen service

Air Separation

Air Separation



VALCO GROUP



SNRI



MALBRANQUE



VVS

Dedication to delivery

## Oil & Gas industry

The petroleum valves are designed for operation under the most severe conditions. A set of standards, codes and specifications extremely accurate dictates the valves conception, calculation, manufacturing and control.

Our plant is particularly well equipped and orientated to face all these imperatives of this kind of valves.

Our "Quality assurance" program is fitted for each specific customer requirement and guarantees a high performance level based on a Quality Assurance Manual conform to the International Standard Requirements and setting up the procedure to be followed, for each type of standard as well as special products



## Cryogenic & Oxygen service

Cryogenic & oxygen service gate valves are specially designed by VALCO – MALBRANQUE for air separation applications in order to sustain both cryogenic conditions (liquid nitrogen at  $-196^{\circ}\text{C}$  & gaseous nitrogen) and oxygen service conditions. Although some valves are not exposed to oxygen services, all Air Separation products are equipped with specific elements and options that ensure their operability under cryogenic conditions, and with a high level of reliability. All gate valves are developed according to customers standards & VALCO Malbranque specifications.

Cryogenic & Oxygen service gate valves design is in line with all applicable specifications that must be taken into account in order to meet each service requirements.



# Services support



Our Services do not stop with the completion of the installation and commissioning of the cryogenic valve package according to the requirements of shipyards. To keep the high performances of your cryogenic valves, our dedicated Servicing Company **VALCO VALVES SERVICES** is able to propose a specific Support plan according to your Maintenance policy.

Coordinated from our Sales Offices in **SNRI**, the **VVS** team can operate and support you in any dry dock in the world with genuine spare parts (to ensure valid classification type approval).

Our Service Engineers are fully trained for the Valves Maintenance and continuously work for Industrial applications with difficult environment (Petroleum and Offshore platforms, Nuclear power plants).

Their polyvalence and high skills knowledge allow them to perform preventive and curative maintenance for any type of valves and actuators, including butterfly valves and control valves.

We are also able to offer service at sea from load to discharge ports or if the LNG carrier is laid up, either than training as **VALCO VALVES SERVICES** is recognized as an official Training Center.

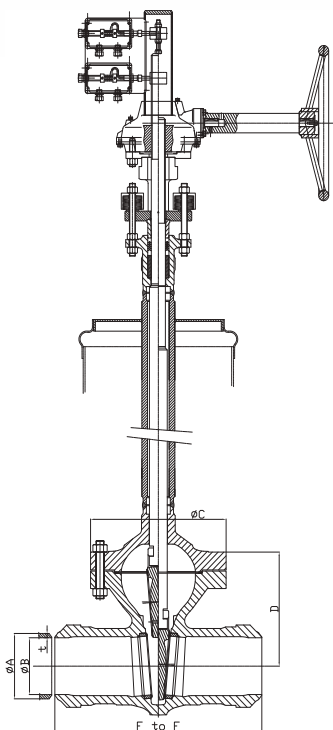
Also available is a cryogenic valve serviceability review and replacement including retrofit or overhaul of the main cryogenic cargo discharge valves. We are able to propose a complete revamping program, including replacement of obsolete actuators by last up to date design.

Dedication to delivery

# #600 Lbs Extended bonnet "Renflex" flexible wedge gate valve

## AIR SEPARATION Flexible wedge gate valves general characteristics

Class rating (Lbs)	600
Construction & standards	Bolted bonnet BS 6364 API 600 ASME B16.34
Sealing technology	"Renflex" Flexible wedge with vent hole on pressure side
Body & bonnet raw material	ASTM A351 Gr. CF8M (AISI 316)
Bonnet cryogenic extension (pipe) raw material	ASTM A312TP316
Flexible wedge raw material	ASTM A351 Gr. CF8M (AISI 316)
Flexible wedge facing	Stellite 6
Seats raw material	ASTM A312TP316L
Seats facing	Stellite 6
Stem raw material	ASTM A182 F316
Stem thread type	Single left thread
Backseat raw material	Integral backseat / A351 Gr. CF8M or A182 F316
Packing	PTFE Chevron packing seal
Body / Bonnet gasket	ASME B16.5 Spiral wound AISI 316L/PTFE
Bolting material : Studs & bolts / Nuts	A193 B8 Class.2 / A194 Grade 8
End to end connections & standard	BW according to ASME B16.25
Face to face dimension & standard	ASME B16.10
Live loaded stuffing box	YES
Service temperature (°C)	-196°C
Bevel gear supplier for oxygen service	ALDO DI CAGNO (Italy) Model : ADEX RC
Bevel gear mounting plate	ISO F14 or ISO F16 or ISO F25



Limit switches

Bevel gear box

Hand wheel wall crossing extension

Yoke design for oxygen service under cryogenic conditions

Live loaded stuffing box with Viton green O-rings, stem scraper and bleed thread port

Extension pass-through

Bonnet extension length is adjusted with regards to the valve mounting angle and customer needs

"Renflex" flexible wedges

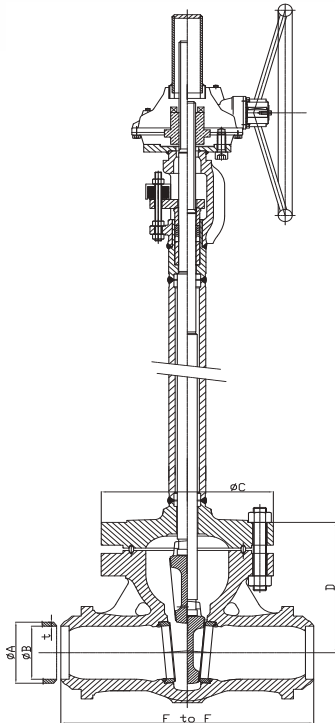
Schedule Butt Weld ends are defined by the customer



# #900 & # 1500 Lbs Extended bonnet “Renflex” flexible wedge gate valve

## AIR SEPARATION Flexible wedge gate valves general characteristics

Class rating (Lbs)	900 & 1500
Construction & standards	Bolted bonnet BS 6364 API 600 ASME B16.34
Sealing technology	Flexible wedge with vent hole on pressure side
Body & bonnet raw material	ASTM A351 Gr. CF8M (AISI 316)
Bonnet cryogenic extension (pipe) raw material	ASTM A312TP316
Flexible wedge raw material	ASTM A351 Gr. CF8M (AISI 316)
Flexible wedge facing	Stellite 6
Seats raw material	ASTM A312TP316L
Seats facing	Stellite 6
Stem raw material	ASTM A182 F316
Stem thread type	Single left thread
Backseat raw material	Integral backseat / A351 Gr. CF8M or A182 F316
Packing	PTFE Chevron packing seal
Body / Bonnet gasket	ASME B16.5 ASTM A182 F316L Ring joint
Bolting material : Studs & bolts / Nuts	A193 B8 Class.2 / A194 Grade 8
End to end connections & standard	BW according to ASME B16.25
Face to face dimension & standard	ASME B16.10
Live loaded stuffing box	YES
Service temperature (°C)	-196°C
Bevel gear supplier for oxygen service	ALDO DI CAGNO (Italy) Model : ADEX RC
Bevel gear mounting plate	ISO F14 or ISO F16 or ISO F25



Limit switches

Bevel gear

Open Yoke design for #900 lbs & #1500 lbs

Live loaded stuffing box with Viton green O-rings, stem scraper and bleed thread port

Bonnet extension length is adjusted with regards to the valve mounting angle and customer needs

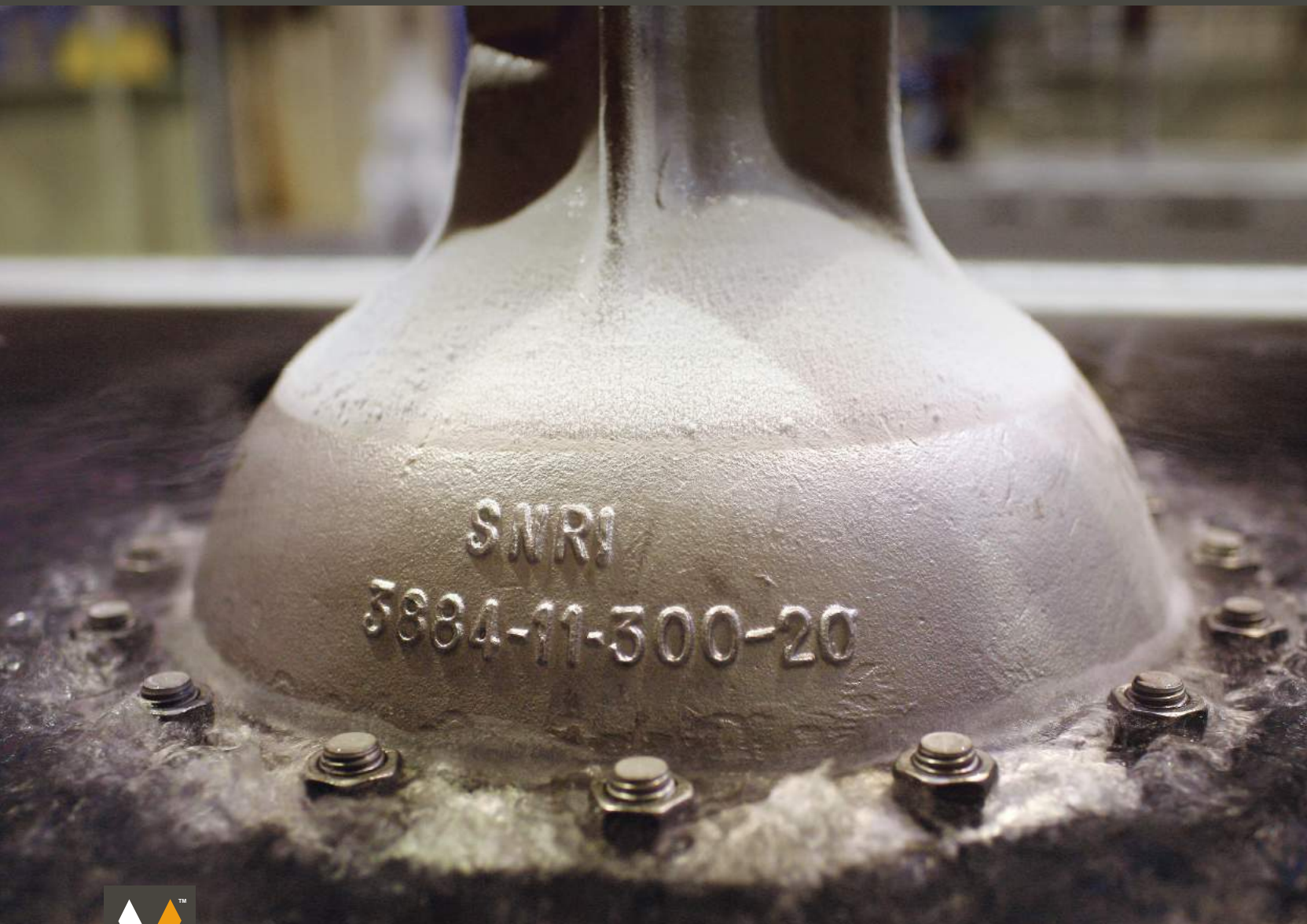
Ring type joint for #900 Lbs & #1500 Lbs

Schedule Butt Weld ends are defined by the customer

Dedication to delivery

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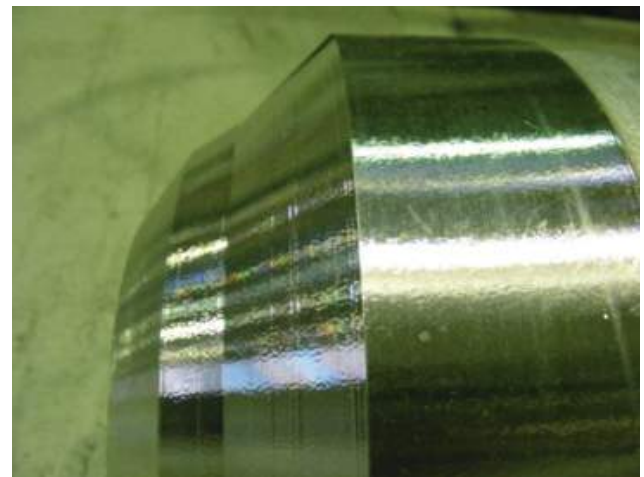
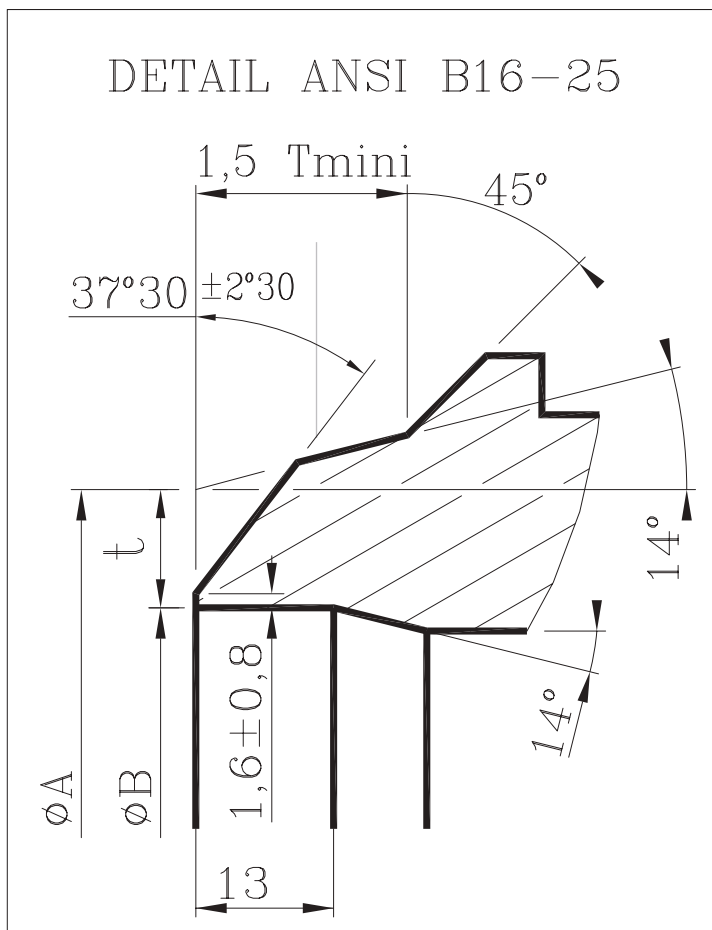
- General dimensions & CV / BW detail
- Wedge details
- Extension pass-through
- Live loaded stuffing box / Open yoke design
- Hand wheel wall crossing extension / Limit switches
- Minimum bonnet extension lengths and valve angular positions – Outside cold box
- Minimum bonnet extension lengths and valve angular positions – Inside cold box
- VALCO FRANCE Cryogenic products
- Main references / Quality certification / Construction standards



## General dimensions & CV

Pressure rating	600Lbs			900Lbs			1500Lbs		
NPS	6"	8"	10"	6"	8"	10"	6"	8"	10"
BW Face to Face	559	660	787	610	737	838	705	832	991
ØA	168,28	219,08	273,05	168,28	219,08	TBD	168,28	219,08	TBD
ØB	154,056	193,68	247,65	146,334	193,68	TBD	131,806	173,056	TBD
t	7,112	12,7	12,7	10,973	12,7	TBD	18,237	23,012	TBD
ØC	336	450	510	415	500	TBD	505	590	TBD
D	295	370	480	360	432	TBD	430	519	TBD
Net weight	270	350	540	390	610	TBD	1075	1500	TBD
CV	2670	6800	11900	2600	6800	TBD	1960	5900	TBD

## BW detail



Dedication to delivery

## Wedge Details

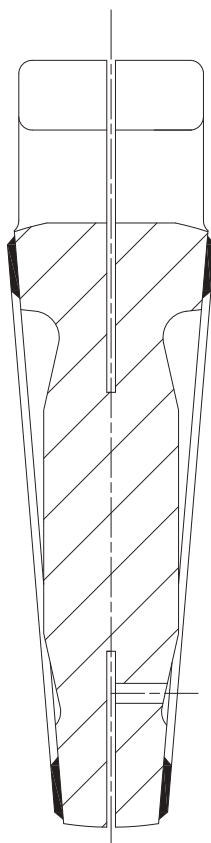
The “Renflex” (Reinforced flexible) wedge was originally designed to get a double block and bleed tightness for non-cryogenic gaseous applications. The aim of this R&D phase was to keep a good elasticity and a well-balanced distribution of stress concentration while the wedge is under pressure and distorted.

A base design was specifically studied in 1985 with strain gages to reinforce some sections of the wedge and keep a good elasticity level. The finite element method and specific calculation methods were used in order to finalize its design, and more particularly, its cross section shape.

For cryogenic applications, the double block and bleed function must be avoided in order to get only one side tight under pressure. Consequently a vent hole is drilled on the upstream side in order to avoid pressure rising within the central part of the gate valve, hence stem ejection when by example, liquid nitrogen becomes gaseous nitrogen.

In combination with the vent hole, a metallic arrow is welded on the body to show the fluid direction. As a result double block and bleed is no longer obtained and the valve becomes a one-way gate valve. Only the downstream side allows airtightness under liquid and gaseous pressure.

This reinforced wedge design ensures a high load level on the downstream side of the valve between wedge and seat.



Reinforced cross section

Vent hole on upstream side

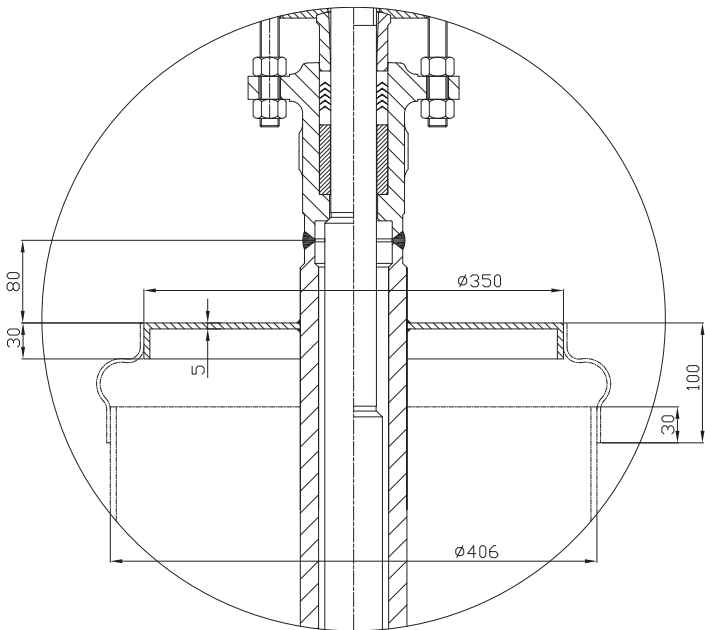




## Extension pass-through

A stainless steel dished plate is welded on the bonnet extension in order to receive the rubber wall crossing (protective bellows) that forms the extension pass-through once assembled. The dished plate is welded on top of the bonnet extension where the material temperature is closer to ambient temperature, and the protective bellows is fixed by a clamping collar on the dished plate.

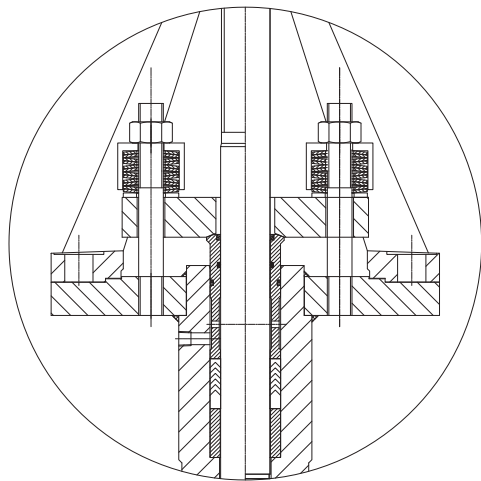
In order to keep the temperature as low as possible within the cold box and up to the top of the bonnet extension, the extension pass-through is used to connect thermal protection placed all around the gate valve. By the same means, the rubber bellows allows displacements due to the installation geometry.



## Live loaded stuffing box

A live loaded stuffing box can equip valves in order to ensure a good and durable leak tightness between stem and PTFE V-shaped packing during opening and closing phases.

The live loading system permits a constant load on the gland flange. This system maintains a mechanical load to compensate packing wear and withdrawal during transient temperature phases. It acts like a security element which increases the time between maintenance periods. As a spring will act on the gland flange, this load is applied by a stack of "Belleville" spring washers on each bolt of the gland flange.



In addition to this device and for oxygen service, Viton O-rings are placed on the gland follower on inner and outer diameters in order to avoid entry of foreign substances within the gate valve body shell. O-rings also contribute to increase stuffing box efficiency. This gland follower is also equipped with a scraper that cleans the stem surface during the valve closing phase. The scraper is placed just above the O-rings at the entry of the gland follower.

Moreover the gland follower presents a "Lantern" shape on its bottom part in order to allow leakage research by a nipple connection facing this lantern. The nipple connection is done by the customer and VALCO Malbranque provides a plug to protect the threaded port.



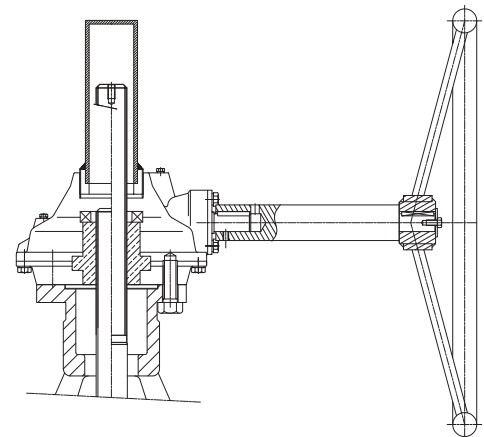
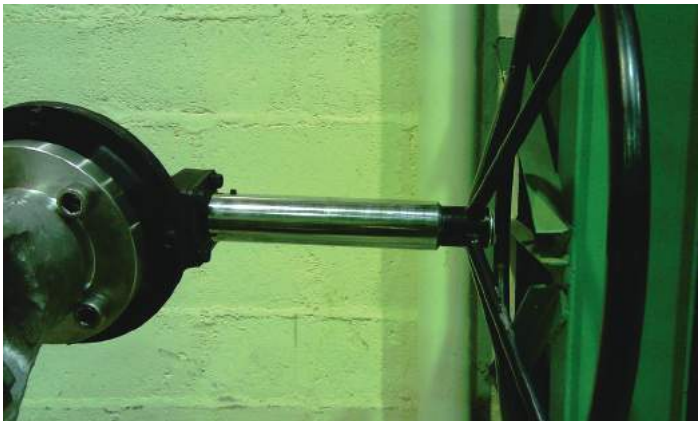
## Open yoke design

An open yoke design on #900 Lbs & #1500 Lbs ratings was selected to avoid gaseous concentration in case of leaks on oxygen service processes. The large mounting base provides a good air-circulation around the stuffing box to avoid risk of fire.



## Hand wheel wall crossing extension

An extension shaft permits an offset of the hand wheel in order to separate the hand wheel from the gate by a casing protection or a wall. As this protection prevents the operator from contact with cold material, the hand wheel is operated from the outside of this casing. The extension is provided in order to meet security process requirements.



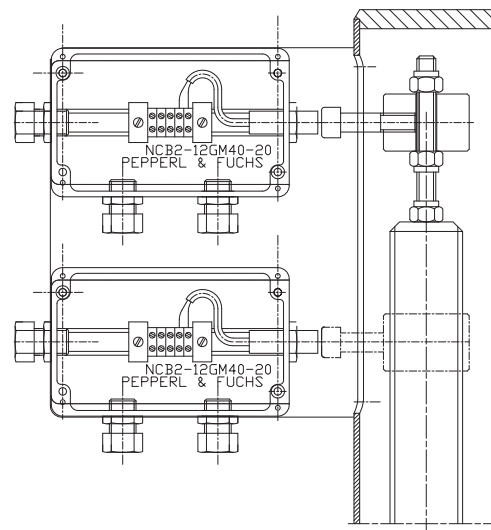
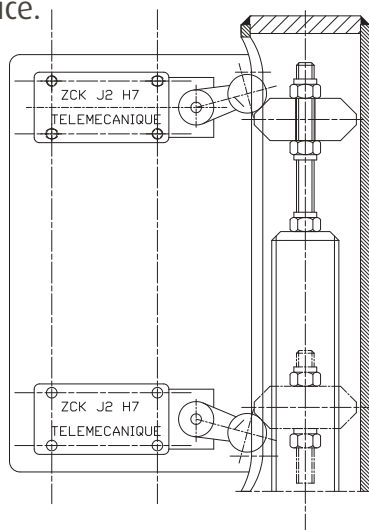
## Limit switches

Opening and closing limit switches are provided on demand and as an option.

Different cases corresponding to customer needs are available:

- Opening switch only
- Closing switch only.
- Opening and closing switches.

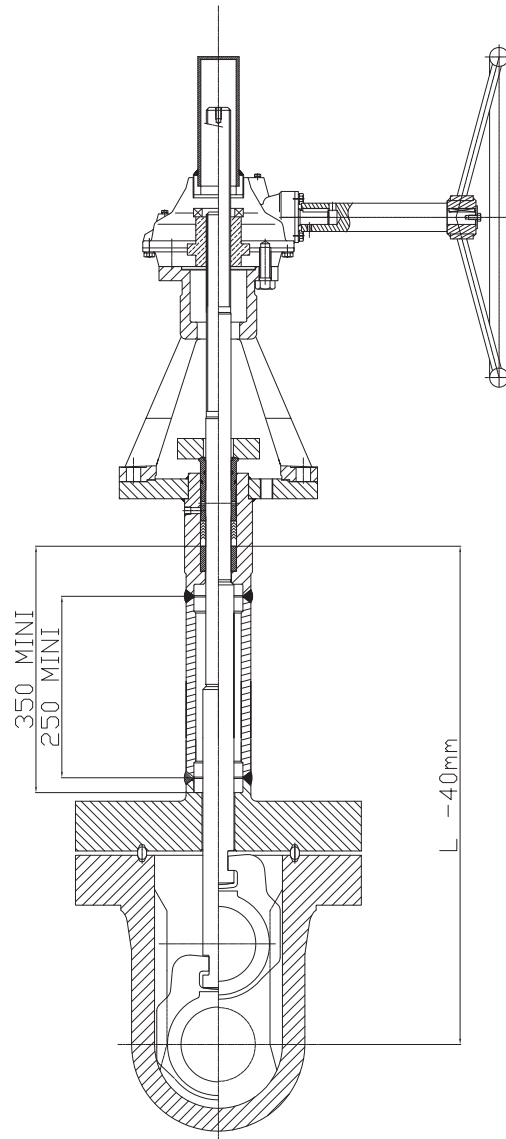
Electromechanical (contact) or inductive proximity sensors (non-contact switches) are available for oxygen & cryogenic service.



Dedication to delivery

# Minimum bonnet extension lengths and valve angular positions - Outside cold box

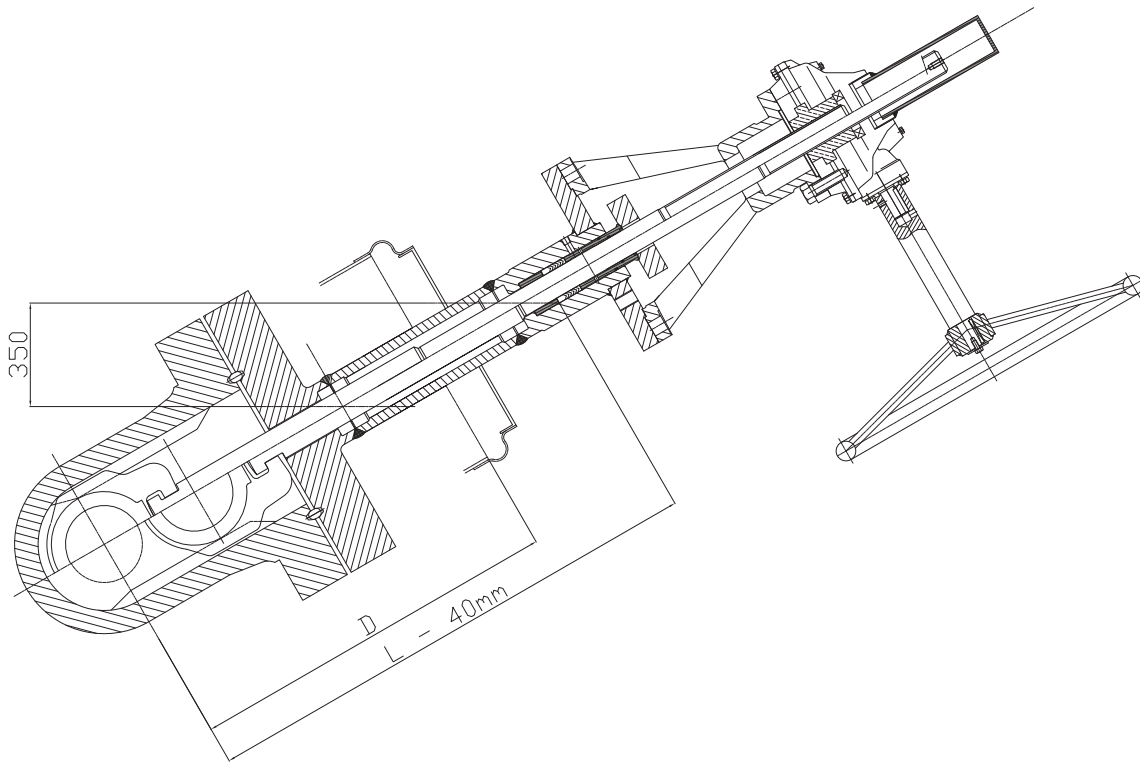
OUTSIDE COLD BOX										
NPS	6"			8"			10"			
Angular position above horizontal axis	90° (Vertical)	25°	30°	90° (Vertical)	25°	30°	90° (Vertical)	25°	30°	
Minimum bonnet extension length (BS 6364)	250	N/A	N/A	250	N/A	N/A	250	N/A	N/A	
Minimum bonnet extension height required for phase transition *	350	350	350	350	350	350	350	350	350	
(L - 40mm) **	# 600 Lbs	764	1300	1164	845	1385	1247	970	1520	1380
	# 900 Lbs	775	1555	1172	880	1400	1260	TBD	TBD	TBD
	# 1500 Lbs	820	1367	1226	990	1550	1400	TBD	TBD	TBD



# Minimum bonnet extension lengths and valve angular positions - Inside cold box

Inside cold box

NPS		6"			8"			10"		
Angular position above horizontal axis		90° (Vertical)	25°	30°	90° (Vertical)	25°	30°	90° (Vertical)	25°	30°
Minimum bonnet extension length (BS 6364)		250	N/A	N/A	250	N/A	N/A	250	N/A	N/A
Minimum bonnet extension height required for phase transition *		350	350	350	350	350	350	350	350	350
(L - 40mm) **	# 600 Lbs	800	1300	1164	800	1385	1247	1000	1520	1380
	# 900 Lbs	800	1555	1172	800	1400	1260	TBD	TBD	TBD
	# 1500 Lbs	800	1367	1226	800	1550	1400	TBD	TBD	TBD
D	# 600 Lbs	540	1079	940	600	1143	1002	719	1267	1125
	# 900 Lbs	520	1299	917	605	1223	981	TBD	TBD	TBD
	# 1500 Lbs	583	1130	988	745	1302	1158	TBD	TBD	TBD



Dedication to delivery

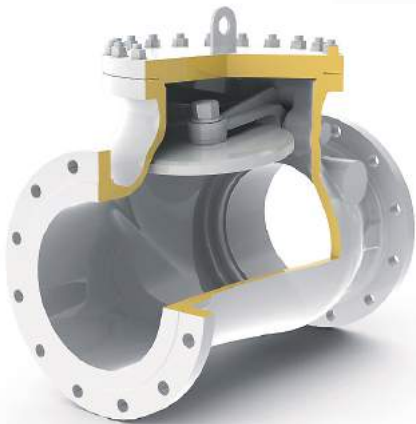
## VALCO FRANCE Cryogenic products

These types of products are generally used for applications with constant temperature (without thermal cycles) e.g.: Storage or transportation of liquefied gas

Gate and globe valves adapted from our standard range are characterized by an extension of the stuffing box by means of a tube of minimum 10" length. The tube inside diameter is very close to the stem outside diameter hence provides a minimum volume for gas column and thus limits pressure variations due to temperature differences to a minimum. Stuffing box icing and corresponding damages are consequently avoided in order to keep the best tightness conditions.

### Design:

- Resilient steels such as ASTM A352 or austenitic stainless steel such as ASTM A351 (Grades CF3, CF8, CF3M, CF8M,...) are used depending on service conditions.
- Flanged or butt-weld ends
- Class ASA 150 Lbs up to ASA 1500 Lbs.



### at ambient temperature

Hydraulic tests  
Air tests  
Helium tests  
Nitrogen tests  
Pressure test pool  
(pneumatic)

### at cryogenic temperature

Down to -196°C

### NDE facilities

Visual examination  
Dye penetrant  
Ultrasonic testing  
X-rays  
Magnetic particle examination  
Positive material identification  
Thickness measurements  
Hardness testing  
Any other specific on test demand

## Main references

VALCO FRANCE IS PROUD TO HAVE SUPPLIED TO THE LIKE OF:

Samsung Heavy Industries

Hyundai Heavy Industries

Daewoo Shipbuilding & Marine Engineering

BP Shipping

MISC

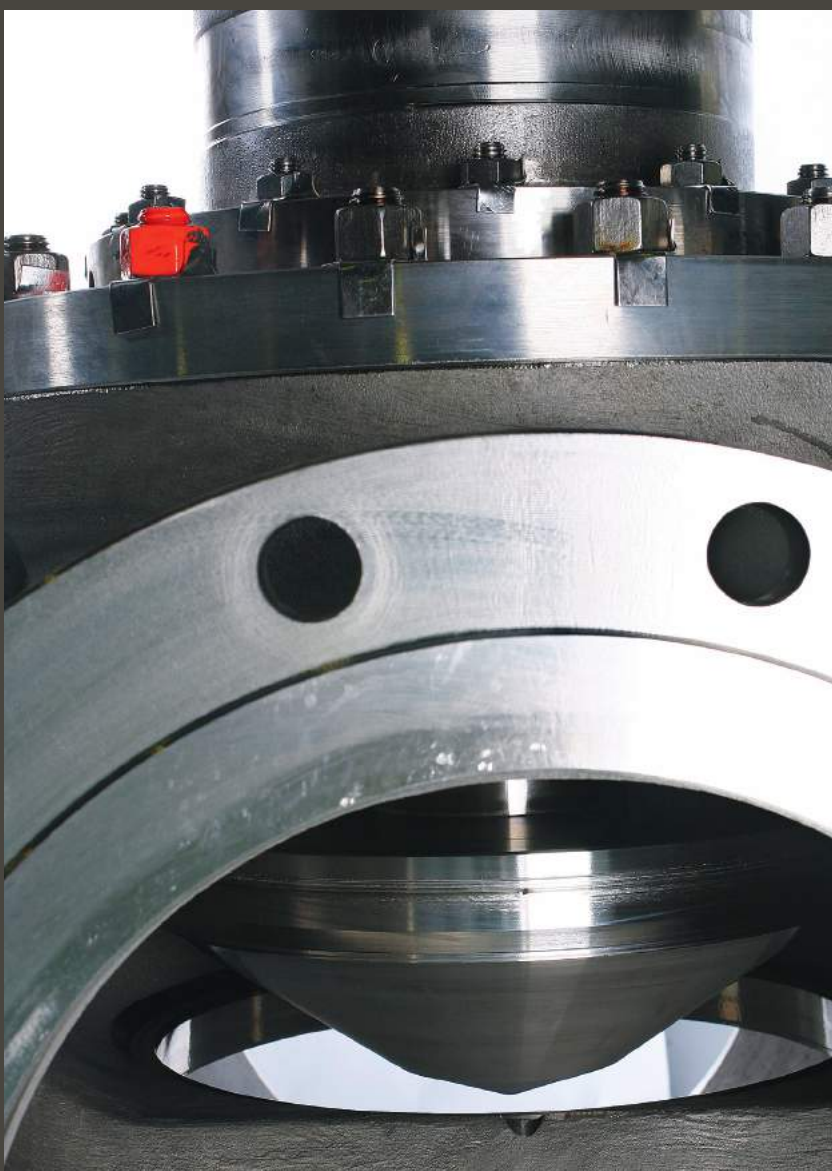
Total

Kawasaki Heavy Industries

Hudong Zhonghua

Mitsubishi Heavy industries

...



## Quality certification

ISO 9001 – 2000

CE MARKING

API 6A, 6D, API 600

FIRE SAFE DESIGN

GOST

DNV

CLASS NK

LLOYD'S REGISTER

BUREAU VERITAS

ABS



## Construction standards

API 6A, API 6D, API 600

ASME B31.1, B31.3, B16.5,

B16.10, B16.25, B16.34,

Section VIII, Section IX

ASTM as per customer's request

MSS SP25, SP55, SP61, SP82

Dedication to delivery