Butterfly Valve

DANAÏS CRYO AIR

Type Series Booklet

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Type Series Booklet DANAÏS CRYO AIR

Contents

Butterfly Valves

Offset-disc Butterfly Valves

DANAÏS CRYO AIR

Main applications

- Gas pipelines
- Gas storage facilities
- Pipelines and tank farms
- Process engineering
- Air separation units
- Teisan Compact Nitrogen (TCN)
- Oxygen
- Hydrogen

Fluids handled

- Gas
- Liquefied gas
- Liquefied natural gas
- Oxygen
- Helium
- Hydrogen

Operating data

Table 1: Operating properties

Characteristic	Value
Nominal pressure	Class 150
Nominal size	50 - 600 (2 - 24 inches)
Max. permissible pressure [bar]	16
Min. permissible temperature [°C]*	≥ -253
Max. permissible temperature [°C]*	≤ +200
Actuation at ΔP [bar]	16
Vacuum operation down to	0 bar absolute
Max. permissible flow velocity at operating pressure	4 m/s for liquids 50 m/s for clean gases

Design details

Design

- Wafer-type body with flat faces – T1: DN 50 - 600 (2 - 24 in.)
- Full-lug body with raised faces – T4: DN 50 - 600 (2 - 24 in.)
- Face-to-face length to EN 558 Series 20, ISO 5752 Series 20 (except DN 80 and DN 350: EN 558 / ISO 5752 Series 25) and API 609 Table 2 Class 150
- Dead-end service and downstream dismantling possible with full-lug bodies T4.
- Pickled and passivated (KSB P16)
- Top flange to ISO 5211 and NF E 29-402
- Installation between flanges to EN 1092, ISO 7005 and ASME B16.5 possible
- Oxygen service (GOX/LOX)
- Marking in accordance with EN 19

Variants

- MS / MC manual gearboxes
- ACTAIR EVO / DYNACTAIR EVO pneumatic actuators
- AMTROBOX for open/closed position signalling
- AMTRONIC U on/off control unit
- SMARTRONIC U positioner
- Lip seal at lower extension end for valve installation in any position
- Degreased for oxygen service (GOX/LOX) and non-metal components meeting the requirements of EIGA (European Industrial Gases Association)
- Insulating plate (drip plate)
- Protected from sand dust
- Anti-static design for manually actuated valves

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Product benefits

- Tight shut-off
  - Tight shut-off in both directions, at ambient temperature as well as in cryogenic applications
- Easy to install
  - Lip seal at the lower end of the neck extension facilitates installation in any position – even "upside down".
- Maintenance-free
  - No retightening of the cable gland
  - No special tools required when replacing the sealing element
- Long service life
  - Wear-free seat
  - End stops protect the seat and valve disc should the actuator not be properly installed.
- Suitable for oxygen, hydrogen and Teisan Compact Nitrogen (TCN)
  - Clean room assembly
  - Grease-free assembly (or assembly using grease that meets EIGA requirements)
  - Materials meet the requirements of the European Industrial Gases Association (EIGA) and are approved by the German Federal Institute for Materials Research / Wendell Hull & Associates, Inc. (WHA)

Product information

Product information as per Pressure Equipment Directive 2014/68/EU (PED)

The valves satisfy the safety requirements of Annex I of the European Pressure Equipment Directive 2014/68/EU (PED) for fluids in Groups 1 and 2.

Product information as per UK Pressure Equipment (Safety) Regulations 2016

The valves satisfy the safety requirements of the UK Pressure Equipment (Safety) Regulations 2016 (PER) for fluids in Groups 1 and 2.

EC Machinery Directive 2006/42/EC

Valves with actuators can meet the requirements of the 2006/42/EC Machinery Directive for partly completed machinery.

Product information as per Regulation No. 1907/2006 (REACH)

For information as per European chemicals regulation (EC) No. 1907/2006 (REACH) see https://www.ksb.com/en-global/company/corporate-responsibility/reach.

Product information as per Directive 2014/34/EU (ATEX)

The valves do not have a potential internal source of ignition and can be used in potentially explosive atmospheres, Group II, category 2 (zones 1+21) to ATEX 2014/34/EU.

Certifications

Table 2: Overview

Label	Effective in:	Comment
	China	TSG D7002-2006

Related documents

Document	Reference number
Operating manual	8450.810

Purchase order specifications

1. Type
2. Nominal pressure
3. Nominal size
4. Fluid handled
5. Flow rate / flow velocity
6. Operating temperature
7. Materials (body, valve disc, seat)
8. Line connection, flange facing and flange surface quality
9. Actuator / automation
10. Reference number

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Pressure/temperature ratings

Table 3: Pressure/temperature ratings

Pressure class	Materials	Operating pressure in [bar] at temperature in [°C]								
	Seat	-260	-196	-50	-29	38	50	100	150	200
Class 150	PFA	4	4	4	4	4	4	4	4	4
	CU 10b	10	10	10	10	10	10	10	10	10
	CU 16b	16	16	16	16	16	16	16	14,8	13,7

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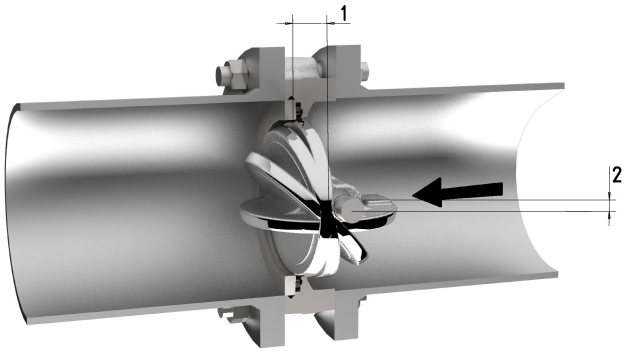
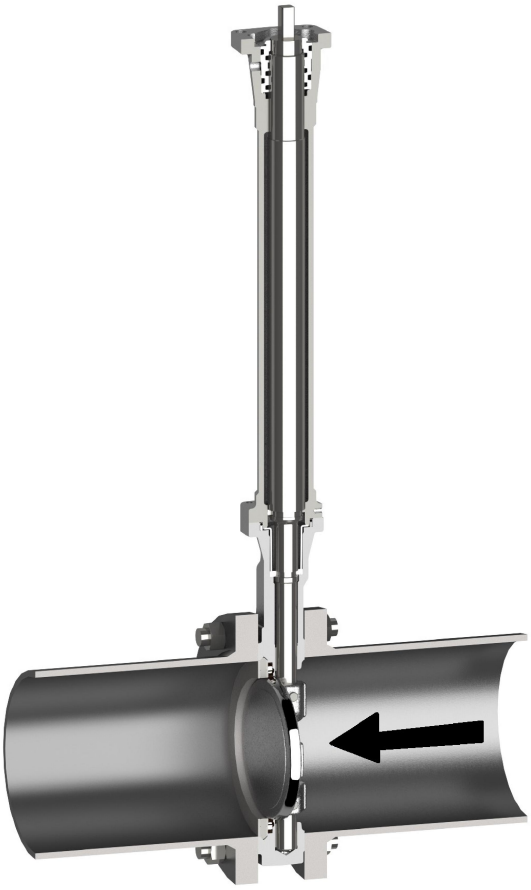
Technical data

Kinematics

- The valve disc is pressed onto the seat by double-offset kinematics.
- Double offset:
  - The axis of rotation is offset from the seat/disc interface.
  - The axis of rotation is offset from the piping centreline.
- This design prevents friction between the seat and the sealing surface of the valve disc as the valve disc opens and closes.
- The valve's shut-off capability is maintained even after a very large number of actuating cycles.
- The butterfly valve's shut-off capability meets the most stringent specifications and standards.



Schematic
Cross-section perpendicular to actuating shaft



Schematic
Cross-section parallel to actuating shaft

1. First offset
2. Second offset

← Preferred flow direction

Tight shut-off

- The valve complies with the standards listed below.
- This valve is a bi-directional valve; the preferential flow direction is indicated by the arrow on the body (differential pressure is applied from the shaft side).

Table 4: Applicable standards and leakage rates

Valve	With PFA seat	With metal (copper) seat
For liquids	EN 12266-1 leakage rate A	EN 12266-1 leakage rate B
	ISO 5208 category A	ISO 5208 category B
	API 598	API 598
	ANSI / FCI 70.2 Class VI	ANSI / FCI 70.2 Class VI
	IEC 60534-4 Class VI	IEC 60534-4 Class VI
For Gases	EN 12266-1 leakage rate A	EN 12266-1 leakage rate B
	ISO 5208 category A	ISO 5208 category B
	API 598	API 598
	ANSI / FCI 70.2 Class VI	ANSI / FCI 70.2 Class VI
	IEC 60534-4 Class VI	IEC 60534-4 Class VI

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Actuating torques

Table 5: Actuating torques [Nm] for bi-directional valve with PFA seat

DN	NPS	Interface		Torque at pressure ≤ 4 bar
	[inch]	Top flange	Shaft end	
			Pressure ≤ 4 bar	
50	2	F10	L19	20
80	3	F10	L19	30
100	4	F10	L19	50
150	6	F12	L22	100
200	8	F12	L22	160
250	10	F12	L27	280
300	12	F14	L36	420
350	14	F14	L36	610
400	16	F16	L36	800
450	18	F16	L46	1170
500	20	F25	L55	1480
600	24	F25	L55	2150

Table 6: Actuating torques [Nm] for bi-directional valve with metal (copper) seat

DN	NPS	Interface		Actuating torque	
	[inch]	Top flange	Shaft end	Pressure [bar]	
			Pressure ≤ 4 bar	10	16
50	2	F10	L19	40	50
80	3	F10	L19	80	90
100	4	F10	L19	120	140
150	6	F12	L27	270	330
200	8	F12	L27	470	570
250	10	F12	L27	800	1000
300	12	F14	L36	1180	1500
350	14	F14	L36	1700	2190
400	16	F16	L46	2260	2920
450	18	F16	L46	3260	4280
500	20	F25	L55	4110	5460
600	24	F25	L55	6020	8040

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Hydraulic characteristics

Table 7: [Kv0 in m^3/ h / $bar^{0.5}$] and [Cv0 in GUS/min / $psi^{0.5}$]

DN	NPS	Flow coefficient with valve disc fully open		Zeta
	[inch]	Kv0	Cv0	
50	2	70	81	2,04
80	3	190	220	1,81
100	4	340	394	1,38
150	6	980	1137	0,84
200	8	1850	2146	0,75
250	10	3350	3886	0,56
300	12	4870	5649	0,55
350	14	7070	8201	0,48
400	16	10350	12006	0,38
450	18	12500	14500	0,42
500	20	15090	17504	0,44
600	24	22410	25996	0,41

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Materials

Materials of DANAÏS CRYO AIR with plastomer seat

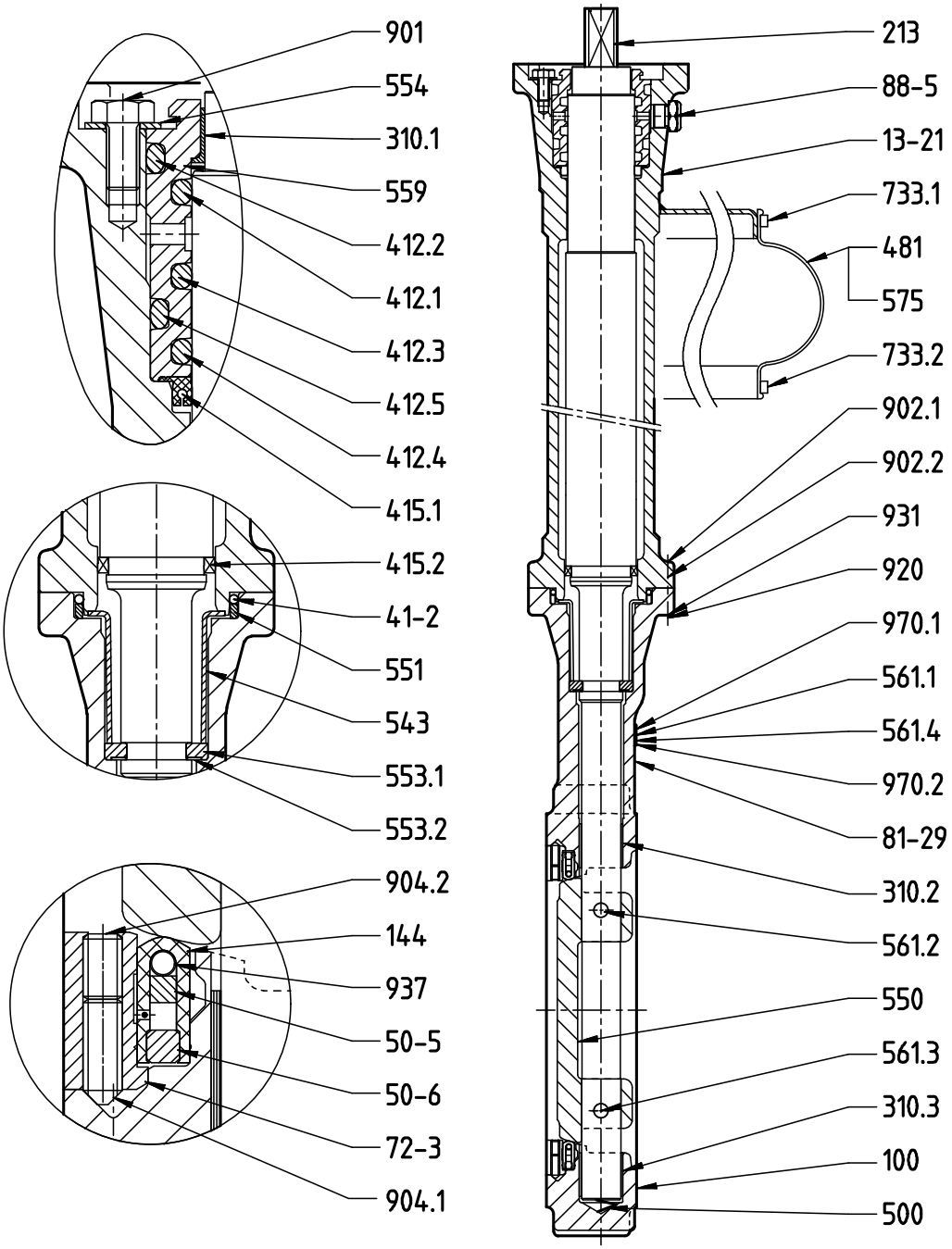

Fig. 1: Sectional drawing of DANAÏS CRYO AIR with plastomer seat DN 50-250 (2 - 10 inches)

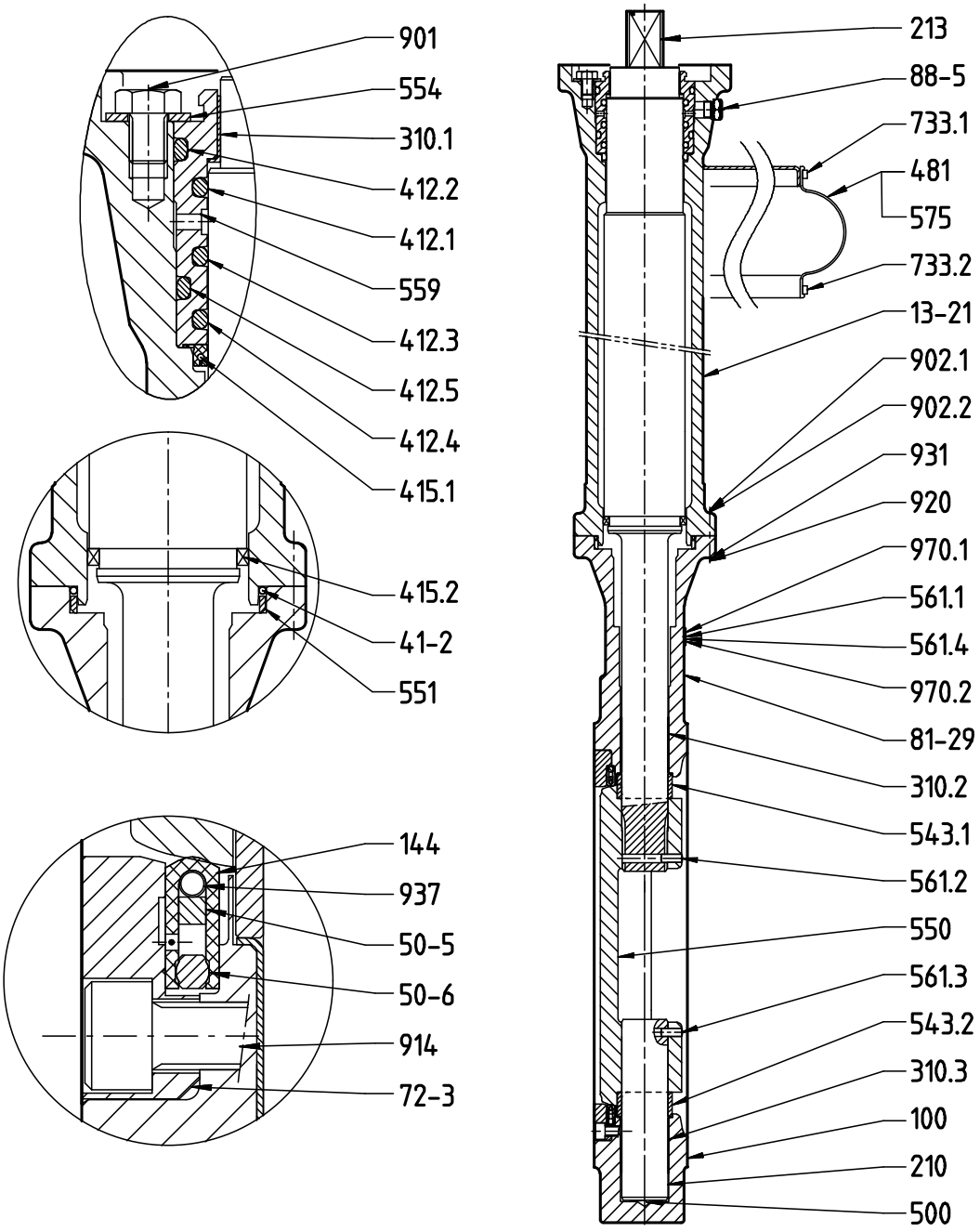

Fig. 2: Sectional drawing of DANAÏS CRYO AIR with plastomer seat DN 300-350 (12 - 14 inches)

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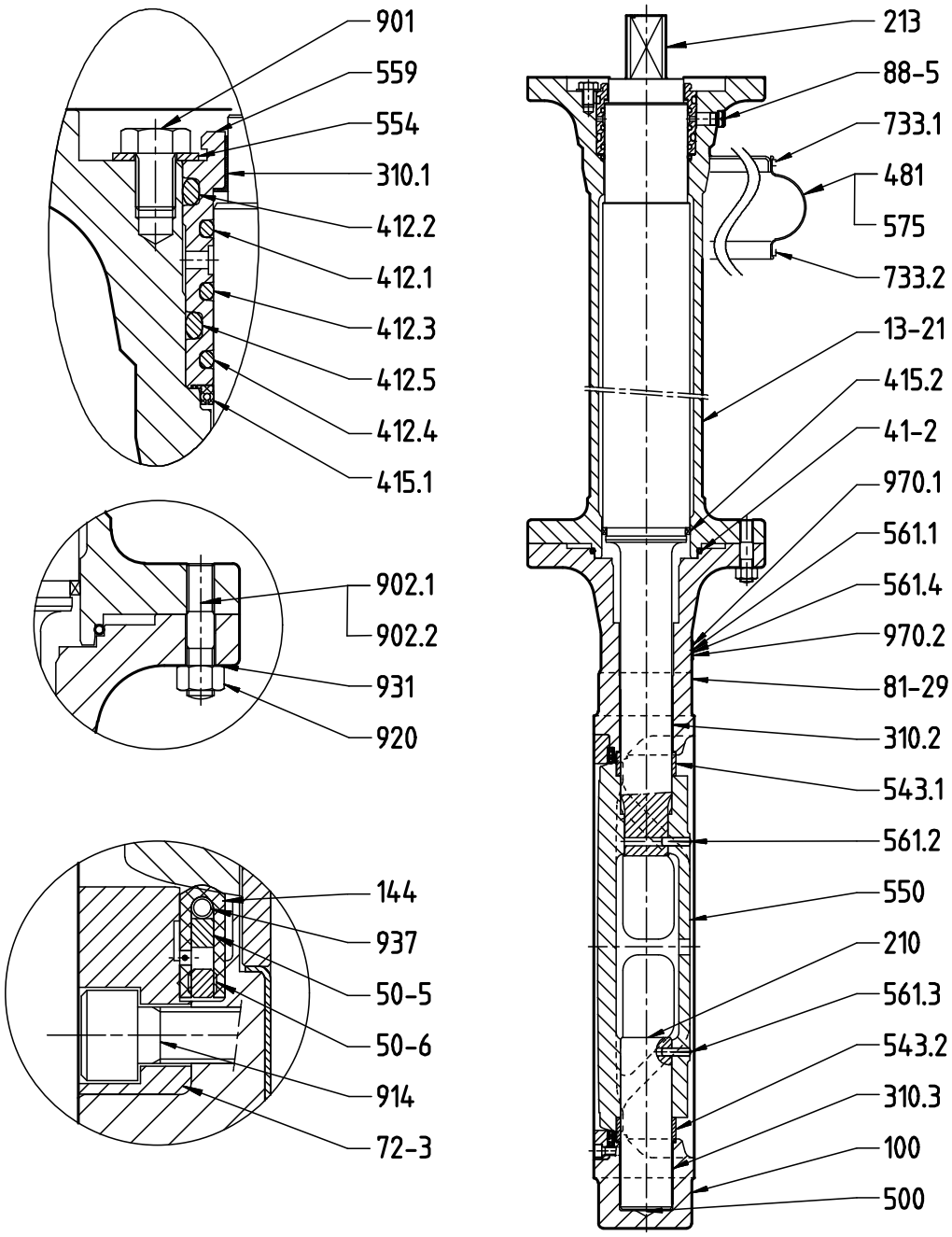

Fig. 3: Sectional drawing of DANAÏS CRYO AIR with plastomer seat DN 400-600 (16 - 24 inches)

Table 8: List of components in common

Part No.	Description	DN	Materials	KSB code
13-21	Extension	50-600	Stainless steel ASTM A351 Gr. CF8M / 1.4408	
41-2[1)]	Static sealing element	50-600	Nickel	
50-5[2)]	Compression ring	50-600	Stainless steel ASTM A638 Gr. 660	
50-6	Locking ring	50-250	Stainless steel	
72-3	Retaining flange	50-600	Stainless steel Z3 CND 17-11-02 / 316L	
81-29[3)]	Earth terminal	50-600	Depending on the make	
88-5[3)]	Silencer	50-600	Stainless steel	
100	Body	50-600	Stainless steel ASTM A351 Gr. CF8M / 1.4408	6
144[4)2)]	Plastomer seat	50-600	PFA (limited to 4 bar)	F
210	Shaft	300-600	Stainless steel ASTM A 479 Gr. 316L	6
213	Actuating shaft	50-600	Stainless steel ASTM A 479 Gr. 316L	6
310.1[1)]	Plain bearing	50-600	Steel with reinforced PTFE coating	
310.2[1)]	Plain bearing	50-600	Steel with reinforced PTFE coating	
310.3[1)]	Plain bearing	50-600	Steel with reinforced PTFE coating	
412.1[1)]	O-ring	50-600	Nitrile	
412.2[1)]	O-ring	50-600	Nitrile	
412.3[1)]	O-ring	50-600	Nitrile	
412.4[1)]	O-ring	50-600	Nitrile	
412.5[1)]	O-ring	50-600	Nitrile	
415.1[1)]	Lip seal	50-600	PTFE + Elgiloy	
415.2[1)]	Lip seal	50-600	PTFE + Elgiloy	
481[3)]	Bellows	50-600	PVC	
500	Anti-static ring	50-600	Stainless steel 1.4310	
543[1)]	Spacer bush	50-250	Stainless steel	
543.1	Spacer bush	300-600	Stainless steel	
543.2	Spacer bush	300-600	Stainless steel	
550	Valve disc	50-600	Stainless steel ASTM A351 Gr. CF8M / 1.4408	6
551	Spacer disc	50-350	Stainless steel, type 316L	
553.1	Thrust insert	50-250	Stainless steel, type 316L	
553.2[1)]	Thrust insert	50-250	Stainless steel 316L + PTFE	
554	Washer, flat	50-600	Stainless steel	
559	Seal retainer	50-600	Stainless steel, type 316L	
561.1	Grooved pin	50-600	Stainless steel 1.4303	
561.2[1)]	Grooved pin	50-600	Stainless steel 1.4980	
561.3[1)]	Grooved pin	50-600	Stainless steel 1.4980	
561.4[3)]	Grooved pin	50-600	Stainless steel 1.4310	
575[3)]	Strip	50-600	Stainless steel	
733.1[3)]	Clamp	50-600	Stainless steel	
733.2[3)]	Clamp	50-600	Stainless steel	
901	Hexagon head bolt	50-600	Stainless steel	
902.1	Stud	50-600	Stainless steel ASTM A351 Gr. B8M Cl. 2	
902.2	Stud	50-600	Stainless steel ASTM A320 Gr. B8M Cl. 2	
904.1[4)2)]	Grub screw	50-250	Stainless steel A4	
904.2[4)2)]	Grub screw	50-250	Stainless steel A4	
914[4)2)]	Hexagon socket head cap screw	300-600	Stainless steel A4	
920	Hexagon nut	50-600	Stainless steel ASTM A194 Gr. 8M	
931	Lock washer	50-600	Stainless steel 1.4404	
937[4)2)]	Retaining wire	50-600	Stainless steel	
970.1	Name plate	50-600	Stainless steel 316 or equivalent	
970.2[3)]	ATEX name plate	50-600	Stainless steel	

1 Part from shaft seal spare parts kit
2 Part from seat spare parts kit + compression ring
3 Optional
4 Part from seat spare parts kit

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Materials of DANAÏS CRYO AIR with metal seat

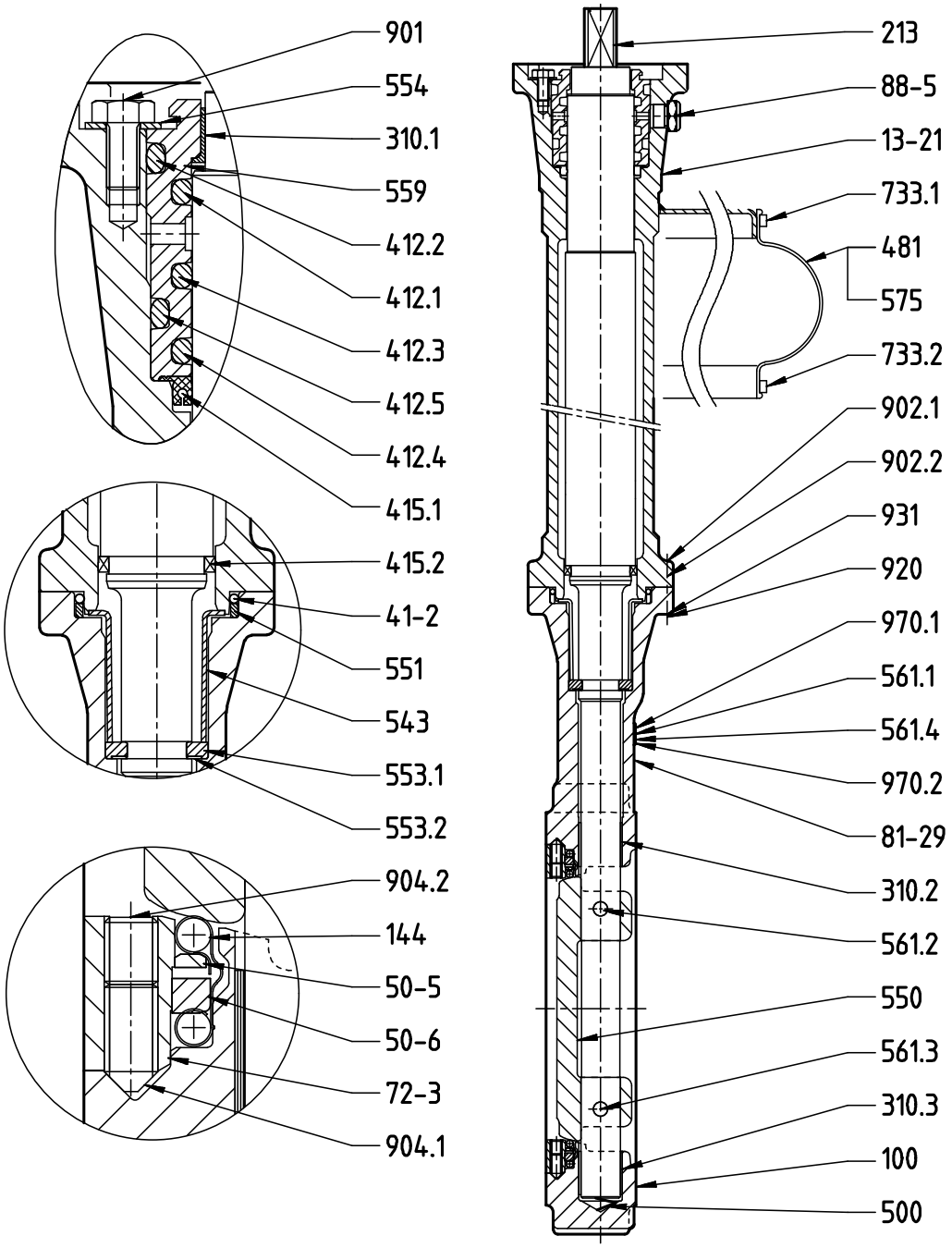

Fig. 4: Sectional drawing of DANAÏS CRYO AIR with metal seat DN 50-250 (2 - 10 inches)

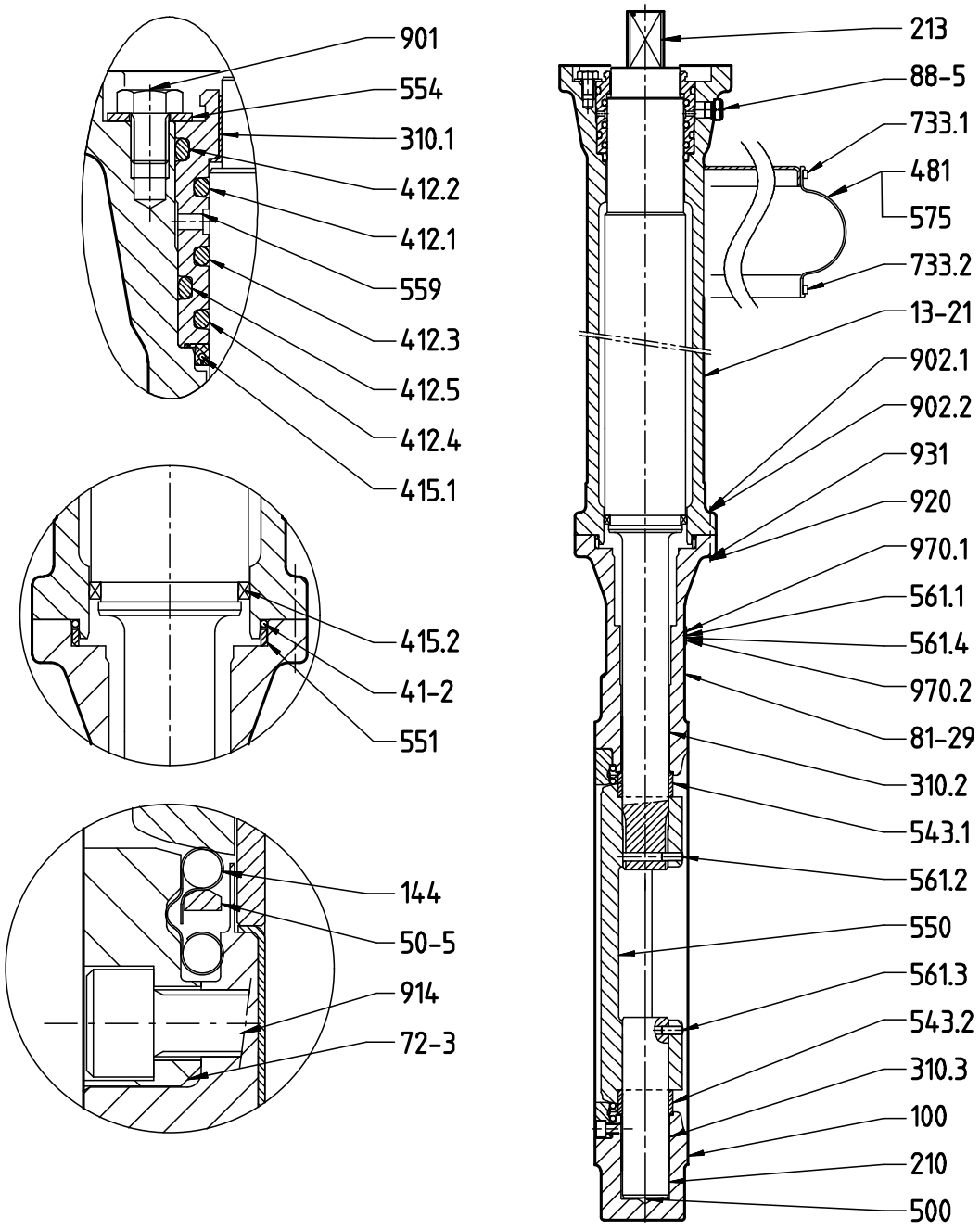

Fig. 5: Sectional drawing of DANAÏS CRYO AIR with metal seat DN 300-350 (12 - 14 inches)

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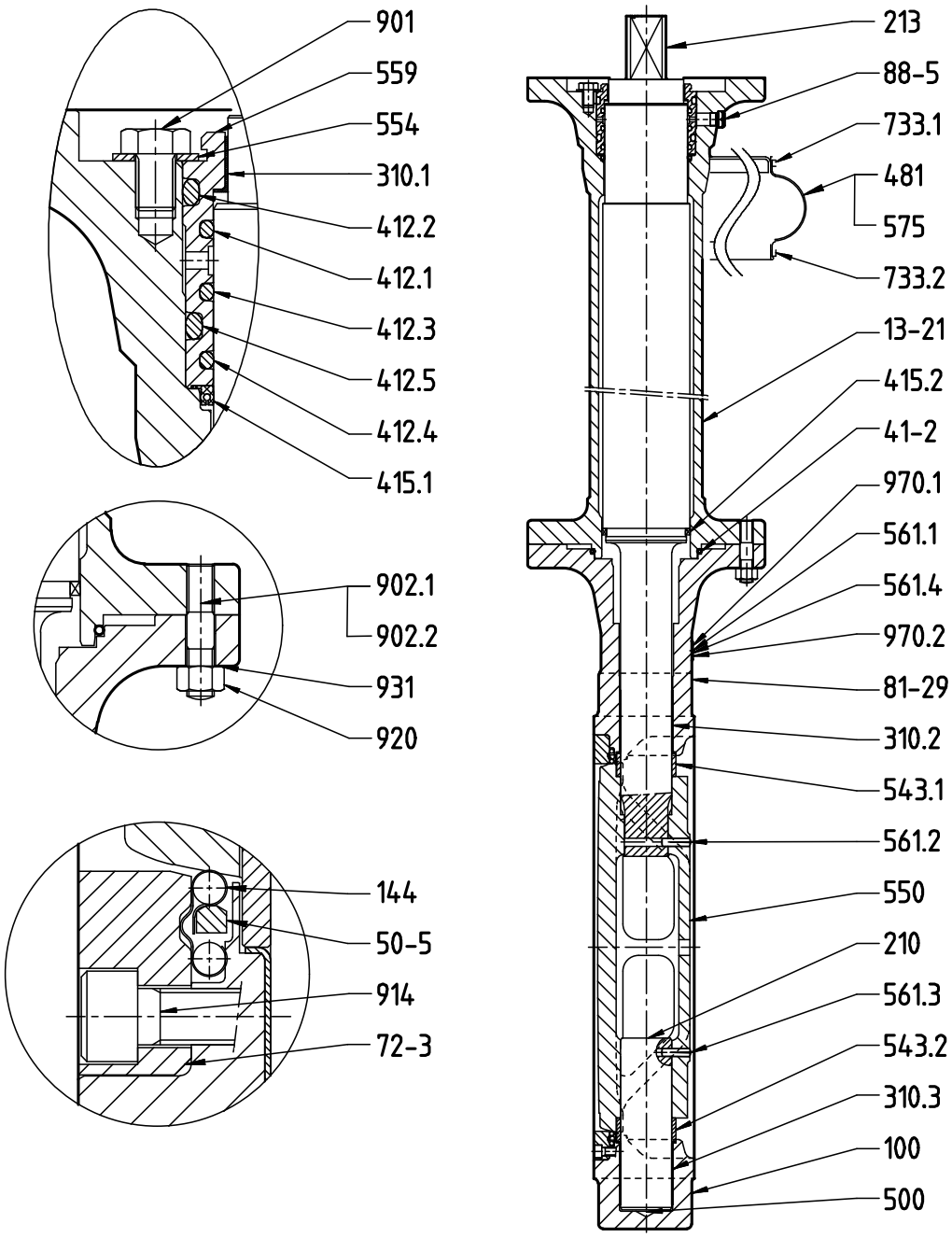

Fig. 6: Sectional drawing of DANAÏS CRYO AIR with metal seat DN 400-600 (16 - 24 inches)

Table 9: List of components in common

Part No.	Description	DN	Materials	KSB code
13-21	Extension	50-600	Stainless steel ASTM A351 Gr. CF8M / 1.4408	
41-2[1)]	Static sealing element	50-600	Nickel	
50-5[2)]	Compression ring	50-600	Stainless steel ASTM A638 Gr. 660	
50-6	Locking ring	50-250	Stainless steel	
72-3	Retaining flange	50-600	Stainless steel Z3 CND 17-11-02 / 316L	
81-29[3)]	Earth terminal	50-600	Depending on the make	
88-5[3)]	Silencer	50-600	Stainless steel	
100	Body	50-600	Stainless steel ASTM A351 Gr. CF8M / 1.4408	6
144[4)2)]	Metal seat	50-600	Copper	CU
210	Shaft	300-600	Stainless steel ASTM A 479 Gr. 316L	6
213	Actuating shaft	50-600	Stainless steel ASTM A 479 Gr. 316L (for pressure ≤ 10 bar)	6
			Stainless steel ASTM A 479 Gr. XM19	6r
310.1[1)]	Plain bearing	50-600	Steel with reinforced PTFE coating	
310.2[1)]	Plain bearing	50-600	Steel with reinforced PTFE coating	
310.3[1)]	Plain bearing	50-600	Steel with reinforced PTFE coating	
412.1[1)]	O-ring	50-600	Nitrile	
412.2[1)]	O-ring	50-600	Nitrile	
412.3[1)]	O-ring	50-600	Nitrile	
412.4[1)]	O-ring	50-600	Nitrile	
412.5[1)]	O-ring	50-600	Nitrile	
415.1[1)]	Lip seal	50-600	PTFE + Elgiloy	
415.2[1)]	Lip seal	50-600	PTFE + Elgiloy	
481[3)]	Bellows	50-600	PVC	
500	Anti-static ring	50-600	Stainless steel 1.4310	
543[1)]	Spacer bush	50-250	Stainless steel	
543.1	Spacer bush	300-600	Stainless steel	
543.2	Spacer bush	300-600	Stainless steel	
550	Valve disc	50-600	Stainless steel ASTM A351 Gr. CF8M / 1.4408 with hard chrome plated sealing edge	6
551	Spacer disc	50-350	Stainless steel, type 316L	
553.1	Thrust insert	50-250	Stainless steel, type 316L	
553.2[1)]	Thrust insert	50-250	Stainless steel 316L + PTFE	
554	Washer, flat	50-600	Stainless steel	
559[1)]	Seal retainer	50-600	Stainless steel, type 316L	
561.1	Grooved pin	50-600	Stainless steel 1.4303	
561.2[1)]	Grooved pin	50-600	Stainless steel 1.4980	
561.3[1)]	Grooved pin	50-600	Stainless steel 1.4980	
561.4[3)]	Grooved pin	50-600	Stainless steel 1.4310	
575[3)]	Strip	50-600	Stainless steel	
733.1[3)]	Clamp	50-600	Stainless steel	
733.2[3)]	Clamp	50-600	Stainless steel	
901	Hexagon head bolt	50-600	Stainless steel	
902.1	Stud	50-600	Stainless steel ASTM A320 Gr. B8M Cl. 2	
902.2	Stud	50-600	Stainless steel ASTM A320 Gr. B8M Cl. 2	
904.1[4)2)]	Grub screw	50-250	Stainless steel A4	
904.2[4)2)]	Grub screw	50-250	Stainless steel A4	
914[4)2)]	Hexagon socket head cap screw	300-600	Stainless steel A4	
920	Hexagon nut	50-600	Stainless steel ASTM A194 Gr. 8M	
931	Lock washer	50-600	Stainless steel 1.4404	
970.1	Name plate	50-600	Stainless steel 316 or equivalent	
970.2[3)]	ATEX name plate	50-600	Stainless steel	

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Dimensions

Wafer-type body with flat faces - T1

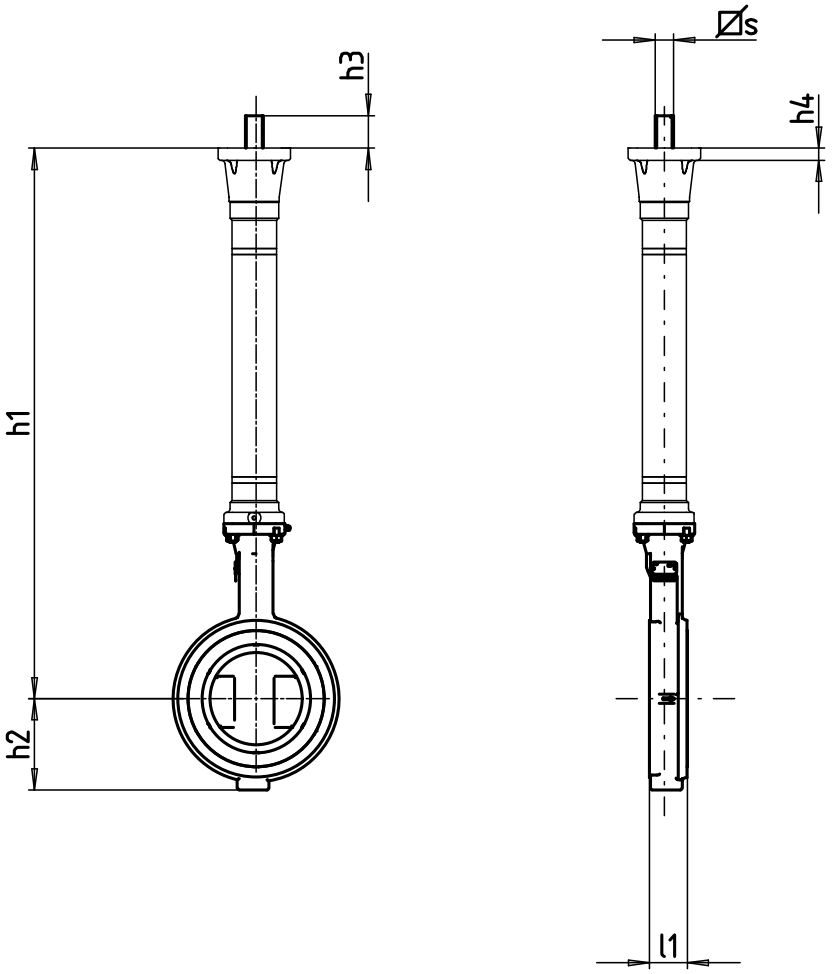

Table 10: Dimensions [mm]

DN	NPS	Face-to-face length	h1			h2	d1	Top flange ISO 5211		Shaft end ⍁ s			h3		
	[inch]	l1	5)	6)	7)			No.	h4	4 bar	10 bar	16 bar	4 bar	10 bar	16 bar
50	2	50	480	730	960	60	105	F10	18	L19	L19	L19	21	21	21
80	3	50	510	760	960	74	144	F10	18	L19	L19	L19	21	21	21
100	4	52	530	780	960	90	164	F10	18	L19	L19	L19	21	21	21
150	6	56	580	870	960	120	219	F12	20	L22	L27	L27	24	29	29
200	8	62	610	910	960	151	275	F12	20	L22	L27	L27	24	29	29
250	10	68	640	910	960	182	330	F12	20	L27	L27	L27	29	29	29
300	12	78	665	1070	1160	237	376	F14	22	L36	L36	L36	38	38	38
350	14	92	700	1100	1160	274	413	F14	22	L36	L36	L36	38	38	38
400	16	102	750	1070	1160	300	470	F16	26	L36	L46	L46	38	48	48
450	18	114	800	1070	1160	329	530	F16	26	L46	L46	L46	48	48	48
500	20	127	850	1100	1160	355	572	F25	30	L55	L55	L55	57	57	57
600	24	154	975	1180	1160	449	680	F25	30	L55	L55	L55	57	57	57

5 Standard length of neck extension without bellows made by Möller (KSB standard)
6 Standard length of neck extension with bellows made by Möller (Air Liquide standard)
7 Standard length of neck extension with drip plate (Linde standard)

Full-lug body - T4

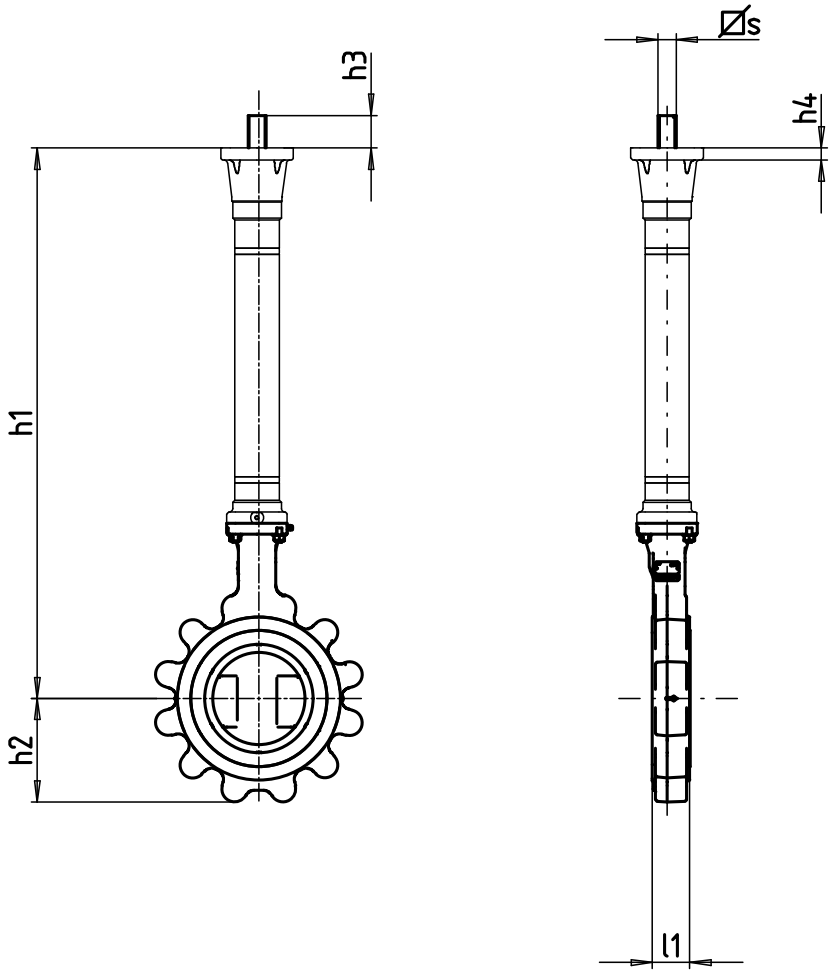

Table 11: Dimensions [mm]

DN	NPS	Face-to-face length	h1			h2	d1	Top flange ISO 5211		Shaft end ⌀ s			h3		
	[inch]	l1	5)	6)	7)			No.	h4	4 bar	10 bar	16 bar	4 bar	10 bar	16 bar
50	2	50	480	730	960	60	120	F10	18	L19	L19	L19	21	21	21
80	3	50	510	760	960	94	188	F10	18	L19	L19	L19	21	21	21
100	4	52	530	780	960	74	210	F10	18	L19	L19	L19	21	21	21
150	6	56	580	870	960	135	270	F12	20	L22	L27	L27	24	29	29
200	8	62	610	910	960	155	310	F12	20	L22	L27	L27	24	29	29
250	10	68	640	910	960	202	417	F12	20	L27	L27	L27	29	29	29
300	12	78	665	1070	1160	237	478	F14	22	L36	L36	L36	38	38	38
350	14	92	700	1100	1160	274	523	F14	22	L36	L36	L36	38	38	38
400	16	102	750	1070	1160	300	606	F16	26	L36	L46	L46	38	48	48
450	18	114	800	1070	1160	329	630	F16	26	L46	L46	L46	48	48	48
500	20	127	850	1100	1160	356	716	F25	30	L55	L55	L55	57	57	57
600	24	154	975	1180	1160	449	834	F25	30	L55	L55	L55	57	57	57

Table 12: Face-to-face length

DN	NPS	Standards
	[inch]	
50	2	EN 558-1-20, API 609 Table 2 Class 150 and ISO 5752-20
80	3	API 609 Table 2 Class 150
100-300	4-12	EN 558-1-20, API 609 Table 2 Class 150 and ISO 5752-20
350	14	EN 558-1-20, API 609 Table 2 Class 150 and ISO 5752-25
400-600	16-25	EN 558-1-20, API 609 Table 2 Class 150 and ISO 5752-20

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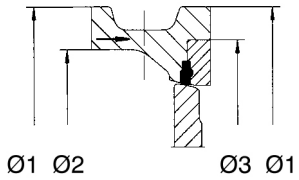
Installation information

Definition of sealing element

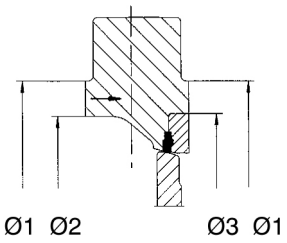
The DANAÏS CRYO AIR valves can be installed between all commercial mating flanges and line connections using standard gaskets or serrated gaskets.

Flange faces

To ensure proper connection the dimensions of flange gaskets must be compatible with the dimensions specified below:



Wafer-type body with flat faces - T1



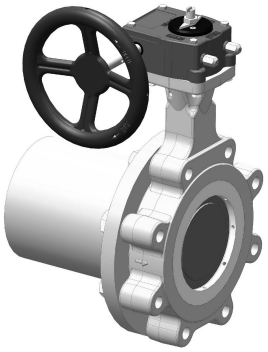
Full-lug body - T4

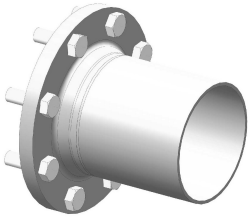
Table 13: Flange dimensions for DANAÏS CRYO AIR Class 150

DN	NPS	Wafer-type body with flat faces - T1			Full-lug body - T4		
	[inch]	Ø 1	Ø 2	Ø 3	Ø 1	Ø 2	Ø 3
50	2	93	62	73	91,9	62	73
80	3	127	91	106	127	90	106
100	4	158	121	128	157,2	117	128
150	6	201	169	173	215,9	168	173
200	8	260	219	226	269,7	219	226
250	10	315	273	274	323,9	273	274
300	12	364	320	331	381	327	331
350	14	413	355	386	412,8	363	386
400	16	470	408	438	469,9	414	438
450	18	530	464	498	533,4	468	498
500	20	572	510	538	584,2	518	538
600	24	680	610	644	692,2	623	644

8460.1231/10-EN

Dead-end service and downstream dismantling





Downstream dismantling

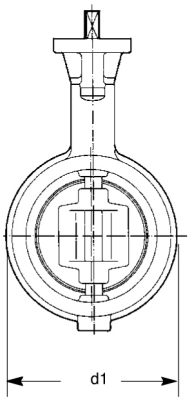
Dead-end service

See operating manual 8450.810 for more information.

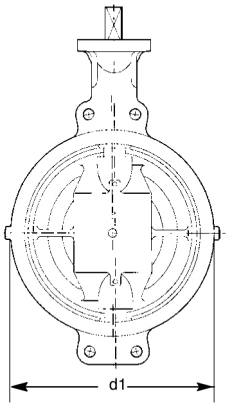
8460.1231/10-EN

Bolting and weights

Bolting and weights for wafer-type body with flat faces - T1



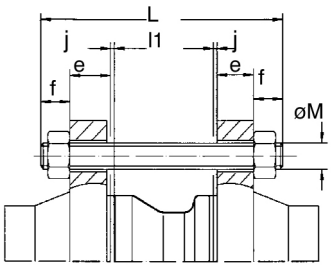
DANAÏS CRYO AIR T1 DN 100



DANAÏS CRYO AIR T1 DN 300

The drawings do not indicate the exact product design (number of tapped lugs / clearance holes).

N.B.: Bolting is not included in our standard scope of supply.

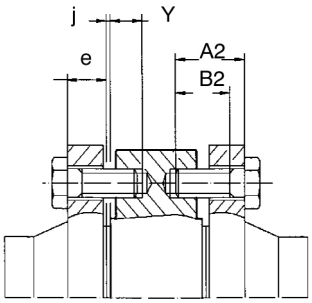


Sectional drawing of T1 body fastening with tie rod

Tie rod length

L = l1 + 2e + 2f + 2j

l1: face-to-face length of valve
e: flange thickness (customer-specific)
f: standardised tie rod overhang
j: flange gasket thickness



Sectional drawing of T1 body fastening with bolts

Bolt length at shaft passage

A2 max = e + Y + j

e: flange thickness (customer-specific)
Y: max. thread engagement depth
j: flange gasket thickness
B2: min. bolt thread length B2 > A2-e

Table 14: Wafer-type body with flat faces - T1 / EN 1092-1 PN 10 and PN 16

DN	NPS	d1	l1	EN 1092-1 PN 10					EN 1092-1 PN 16					[kg]
				Ø M	Tie rod[8]		Bolt A2		Ø M	Tie rod[8]		Bolt A2		
	[inch]				f	Qty[9]	Y	Qty[9]		f	Qty[9]	Y	Qty[9]	
50	2	105	43	M16	20	4	-	-	M16	20	4	-	-	5,0
80	3	144	50	M16	20	8	-	-	M16	20	8	-	-	7,0
100	4	164	52	M16	20	8	-	-	M16	20	8	-	-	9,5
150	6	219	56	M20	24	8	-	-	M20	24	8	-	-	17,0
200	8	275	60	M20	24	8	-	-	M20	24	12	-	-	24,0
250	10	330	68	M20	24	12	-	-	M24	29	12	-	-	36,0
300	12	376	78	M20	24	12	-	-	M24	29	12	-	-	58,0
350	14	413	92	M20	24	12	33	4	M24	29	12	33	4	79,0
400	16	470	102	M24	29	12	44	4	M27	32	12	44	4	110,0
450	18	530	114	M24	29	16	24	4	M27	32	16	24	4	146,0
500	20	572	127	M24	29	16	32	4	M30	35	16	31	4	188,0
600	24	680	154	M27	32	16	43	4	M33	38	16	48	4	293,0

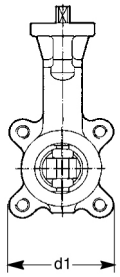
Table 15: Wafer-type body with flat faces - T1 / ISO 7005 PN 20 and ASME B16.5 Class 150

DN	NPS	d1	l1	ISO 7005 PN 20					ASME B16.5 Class 150					[kg]
				Ø M	Tie rod[8]		Bolt A2		UN/ UNC[10]	Tie rod[8]		Bolt A2		
	[inch]				f	Qty[9]	Y	Qty[9]	[inch]	f	Qty[9]	Y	Qty[9]	
50	2	105	43	M16	20	4	-	-	5/8	20	4	-	-	5,0
80	3	144	50	M16	20	4	-	-	5/8	20	4	-	-	7,0
100	4	164	52	M16	20	8	-	-	5/8	20	8	-	-	9,5
150	6	219	56	M20	24	8	-	-	3/4	24	8	-	-	17,0
200	8	275	60	M20	24	8	-	-	3/4	24	8	-	-	24,0
250	10	330	68	M24	29	12	-	-	7/8	29	12	-	-	36,0
300	12	376	78	M24	29	12	-	-	7/8	29	12	-	-	58,0
350	14	413	92	M27	27	12	-	-	1	32	12	-	-	79,0
400	16	470	102	M27	27	12	44	4	1	32	12	44	4	110,0
450	18	530	114	M30	31	12	40	4	$1^1/_8$	35	12	40	4	146,0
500	20	572	127	M30	31	16	31	4	$1^1/_8$	35	16	31	4	188,0
600	24	680	154	M33	34	16	47	4	$1^1/_4$	38	16	47	4	293,0

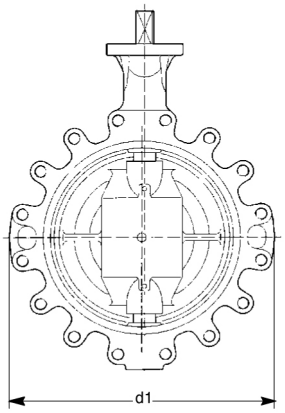
8460.1231/10-EN

8 Quantity of nuts = quantity of tie rods x 2
9 Number of bolts per side
10 For bolts < 1 inch, only UNC

Bolting and weights for full-lug body - T4



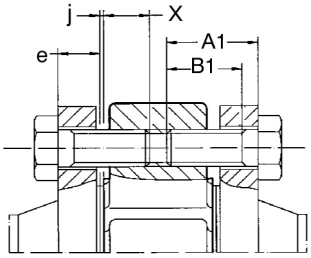
DANAÏS CRYO AIR T4 DN 65



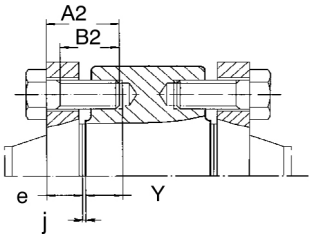
DANAÏS CRYO AIR T4 DN 450

The drawings do not indicate the exact product design (number of tapped lugs).

N.B.: Bolting is not included in our standard scope of supply.



Sectional drawing of T4 body fastening with bolts for tapped lugs



Sectional drawing of T4 body fastening with bolts at shaft passage

Bolt length for tapped lugs

A1max = e + X + j

e: flange thickness (customer-specific)
X: max. thread engagement depth
j: flange gasket thickness
B1: min. bolt thread length B1 > A1-e

Bolt length at shaft passage

A2max = e + Y + j

e: flange thickness (customer-specific)
Y: max. thread engagement depth
j: flange gasket thickness
B2: min. bolt thread length B2 > A2-e

8460.1231/10-EN

Table 16: Full-lug body – T4 / EN 1092-1 PN 10 and PN 16

DN	NPS	d1	EN 1092-1 PN 10					EN 1092-1 PN 16					[kg]
			Ø M	Bolt A1		Bolt A2		Ø M	Bolt A1		Bolt A2		
	[inch]			X	Qty[9)]	Y	Qty[9)]		X	Qty[9)]	Y	Qty[9)]	
50	2	120	M16	20	4	-	-	M16	20	4	-	-	6,5
80	3	188	M16	21	8	-	-	M16	21	8	-	-	9,0
100	4	210	M16	21	8	-	-	M16	21	8	-	-	11,2
150	6	270	M20	24	8	-	-	M20	24	8	-	-	18,5
200	8	310	M20	26	8	-	-	-	-	-	-	-	30,0
200	8	340	-	-	-	-	-	M20	26	12	-	-	31,0
250	10	417	M20	26	12	-	-	M24	30	12			48,0
300	12	478	M20	26	12	-	-	M24	30	8	35	4	70,0
300	12	476	-	-	-	-	-	-	-	-	-	-	72,5
350	14	542	M20	37	16	-	-	M24	37	16	-	-	108,0
400	16	606	M24	42	16	-	-	M27	44	16	-	-	130,0
450	18	657	M24	40	16	24	4	M27	44	16	24	4	207,0
500	20	716	M24	42	16	32	4	M30	51	16	31	4	237,0
600	24	834	M27	43	20	-	-	M33	52	16	48	4	363,0

Table 17: Full-lug body - T4 / ISO 7005 PN 20 and ASME B16.5 Class 150

DN	NPS	d1	ISO 7005 PN 20					ASME B16.5 Class 150					[kg]
			Ø M	Bolt A1		Bolt A2		UN/ UNC[10)]	Bolt A1		Bolt A2		
	[inch]			X	Qty[9)]	Y	Qty[9)]	[inch]	X	Qty[9)]	Y	St.[9)]	
50	2	120	M16	20	4	-	-	5/8	20	4	-	-	6,5
80	3	188	M16	21	4	-	-	5/8	21	4	-	-	9,0
100	4	210	M16	21	8	-	-	5/8	21	8	-	-	11,2
150	6	270	M20	24	8	-	-	3/4	24	8	-	-	18,5
200	8	310	M20	26	8	-	-	3/4	26	8	-	-	30,0
250	10	417	M24	30	12	-	-	7/8	30	12	-	-	48,0
300	12	478	M24	26	12	-	-	7/8	26	12	-	-	70,0
350	14	523	M27	39	12	-	-	1	39	12	-	-	99,0
400	16	606	M27	44	16	-	-	1	44	16	-	-	130,0
450	18	630	M30	51	12	40	4	$1^1/_8$	51	12	40	4	167,0
500	20	716	M30	51	16	31	4	$1^1/_8$	51	16	31	4	237,0
600	24	834	M33	52	16	47	4	$1^1/_4$	52	16	47	4	363,0

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Option

Thrower with isolating bellows for cryogenic temperatures

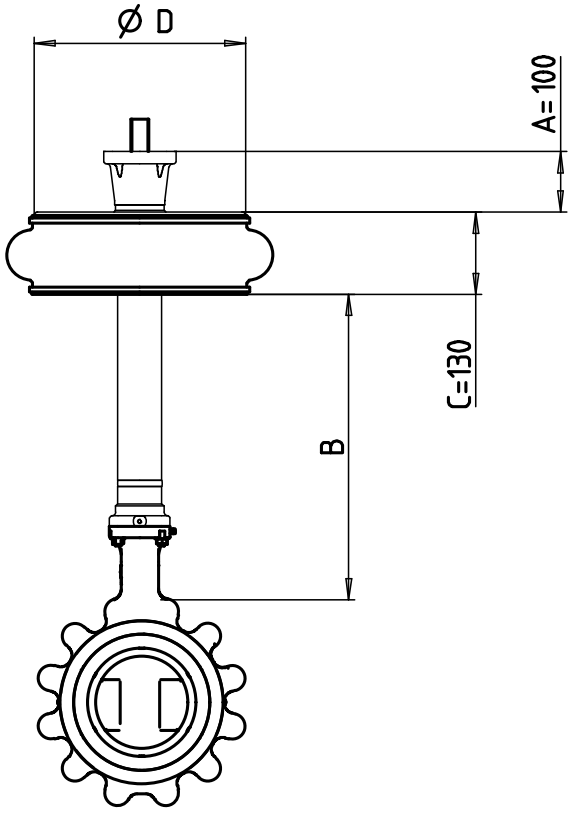

Fig. 7: Representative illustration of the thrower with isolating bellows for cryogenic temperatures

Table 18: Thrower dimensions [mm]

DN	NPS [inch]	B	D
50	2	424	320
80	3	435	320
100	4	436	320
150	6	501	320
200	8	509	320
250	10	477	320
300	12	599	320
350	14	604	320
400	16	542	320
450	18	523	320
500	20	521	320
600	24	544	320

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