

HSR VACUUM 2017 – 2019





Founded in 2001, HSR AG is a manufacturer of vacuum pumps and components used for a wide range of modern production processes and applications.

Initially the company developed and manufactured a new generation of cryogenic pumps. Responding to current customer requirements, the product portfolio has been expanded to new business segments such as diffusion and UHV-pumps as well as high-vacuum plate and angle valves.

Thanks to its continuous development, HSR is able to supply today a complete portfolio of cryogenic and diffusion pumps as well as high vacuum valves including accessories. In addition to these components, the company offers engineering capabilities for the development and delivery of customized devices and solutions for special projects in the field of vacuum technology. In close cooperation with the customer, we give highest priority to the efficient implementation of requirements and specifications as well as the development of economic and process-optimized solutions.

Based in Balzers, Liechtenstein, HSR expanded its existing sales structure in 2009 by establishing a subsidiary, HSR Vacuum GmbH near Frankfurt, Germany. A worldwide network of partners and representatives guarantees fast and reliable service and support on customer site.

*15 Years Success
based on innovation and high quality products*

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HSR AG's cryogenic pumps are, amongst other things, known for their impeccable performance data and reliability in use. Long operating periods between necessary maintenance breaks provide for high availability as well as seamless and cost effective operation. Apart from their use in high-vacuum and ultra high-vacuum pumps, HSR's cryogenic pumps are particularly suited for:

- Thin-film coating machinery
- Space simulation chambers
- Sputter equipment
- Fusion test systems
- Particle accelerators
- Thermal coating systems
- Metallization equipment

Product line

VCP Line: Cryogenic pumps – sizes DN100 to DN200

This new, HSR patented pump geometry enables up to 30 % higher volume flow rates and higher capacity, which provides for a longer operating time in comparison to competitor's pumps with the same flange size. Another design feature allows throttling of the volume flow rate of various gases (Ar, O₂, N, CH₄, etc) whilst maintaining the maximum volume flow rate for water vapour.

Velco Line: Cryogenic pumps – sizes DN250 to DN1250

The optimized design permits operation under extreme conditions, i.e. under both high gas load and temperatures above 350° C. The patented pump geometry extends operation times and reduces maintenance downtimes. Powerful cooling allows for long periods of use without the need for regeneration.

- HSR design reduces cool-down times
- Higher cooling power on second stage
- Much better performance on second stage
- Higher capacity on second stage
- Closed circuit operation, no need for continuous gas supply
- Longer operation times between regenerations
- Shorter regeneration cycles
- Longer uptimes between maintenance intervals
- Reduced investment and TCO

Velco Sputter Line: Cryogenic pumps – sizes DN250 to DN400

This type of cryogenic pumps has been developed by HSR particularly to eliminate the so-called memory-effect. Based on a patented technology, a unique pump system has been developed without the use of additional heating elements.

- High cooling performance guarantees the highest level of thermal stability
- No losses in volume flow rate or performance
- The optimized design allows operation with an argon gas pressure of over 1200 sccm
- Non-sensitive to air or gas intrusions
- Pump housing of aluminium or stainless steel
- Available also as flange version (without housing)

Velco Xenon Line: Cryogenic pumps – sizes DN400 to DN1250

Velco Xenon pumps have been developed especially for Xenon gas applications in the field of space simulation. During design and development the main focus was on achieving maximum pump speed together with a high capacity for Xenon gas.

Velco NT Line: Cryogenic pumps – sizes DN400 to DN1250

HSR offers modified cryogenic pumps and devices that can be used in applications with high radiation exposure, such as new technologies, accelerators, medical applications etc. These cryogenic pumps and devices include special materials and panel setups for optimized performance. They can also be modified to allow fast and secure replacement of the devices in the field.

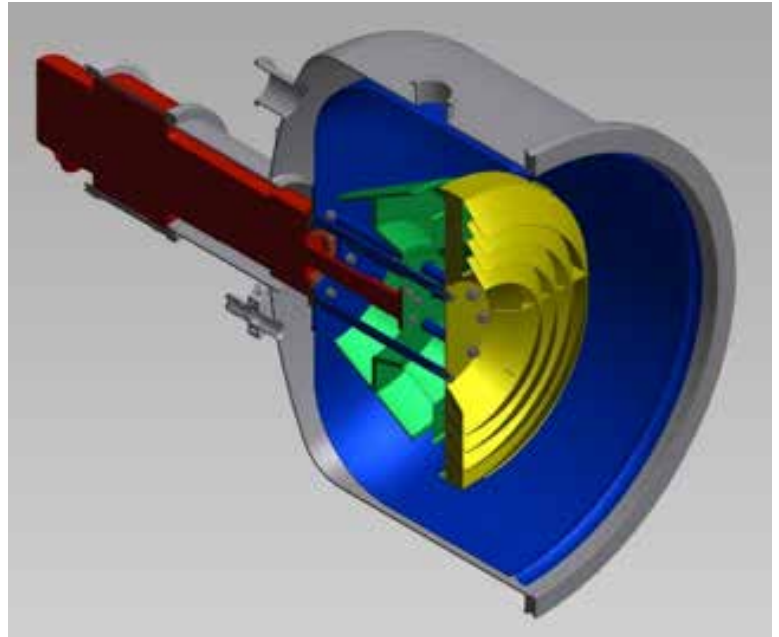
**Velco UHV Line: Cryogenic pumps – sizes DN400 to DN1250**

All VCP and VELCO type cryopumps can also be fitted with full metallic sealing for UHV applications. A further product modification allows a bake-out of the cryopump system up to 280 °C prior to system cool-down. Using such modified cryopumps, end pressures of less than 10^{-11} mbar were achieved.



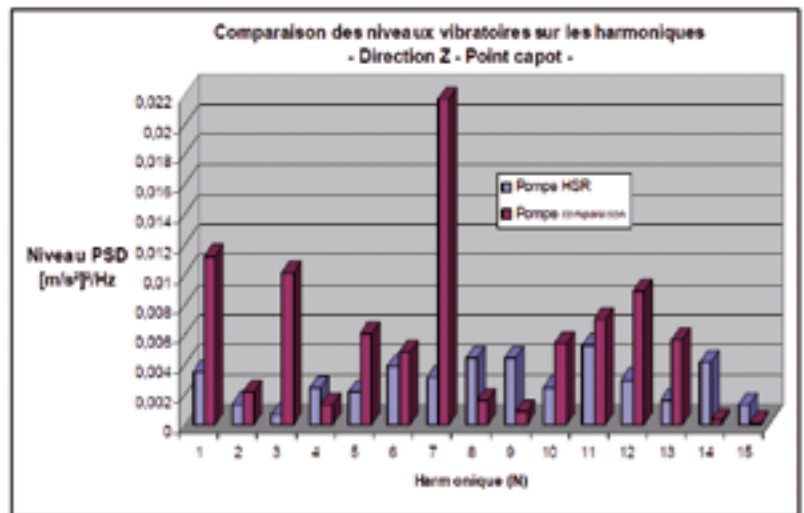
Advantages HSR cryo technology

- Low-vibration cooling systems
- The optimized design allows operation at process temperatures up to 350° C and high gas loads at the same time.
- Powerful cooling permits maximum operating time without regeneration
- Patented geometry provides outstanding uptimes and short regeneration times
- Optimized chevrons and panels
- Maximized surface for activated charcoal
- Reduced cool-down time
- Highest manufacturing quality



Vibration levels of cooling system:

HSR cryogenic pumps are proven to have a lower vibration level than comparable cryogenic pump systems of competitors in the market. A new feature developed by HSR reduces the already low vibration even further. Please contact us for further details.



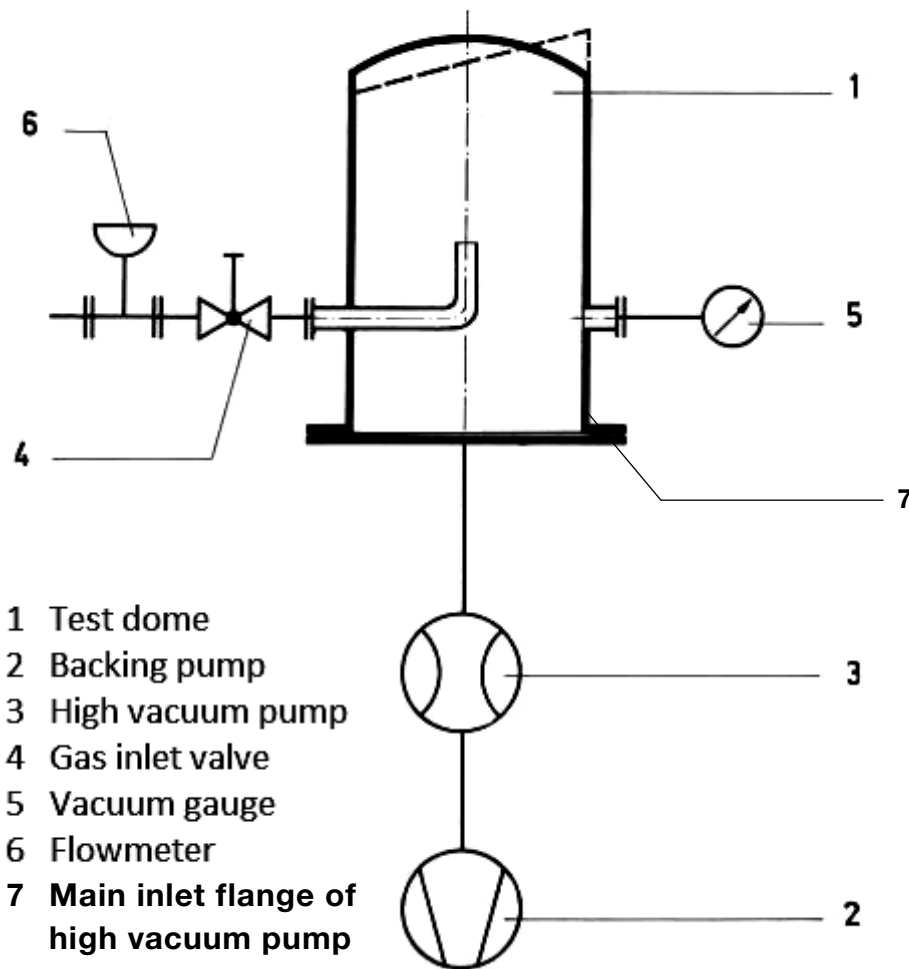
Pump time test result

(official test done by a independent third party):

- Velco 502: $2.1E^{-08}$ mbar
- Comparison pump: $9.5E^{-06}$ mbar



Measurement method for pump speed used at HSR



Important: all shown pumping speed values in this catalogue are related to the inlet flange of corresponding high vacuum pumps!

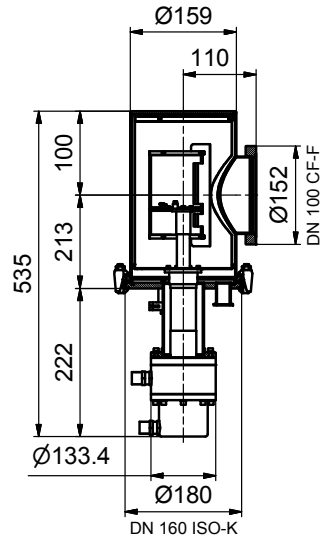
Resulting high vacuum pumping speed at inlet flange of high vacuum pump is calculated by considering tube conductance between main inlet flange of high vacuum pump (7) and pressure measuring level point at test dome (5).

Cryogenic pumps for standard applications

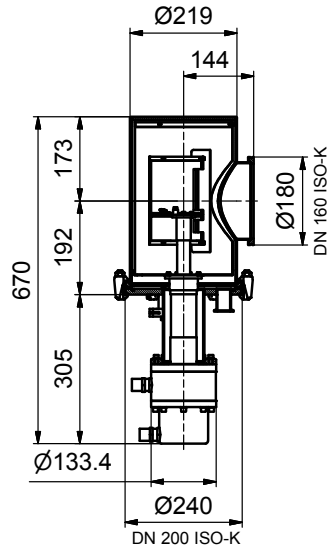
Technical Data / Model	VCP 100	VCP 160	VCP 200
Order number	H10000100-T	H10000160-T	H10000200-T
Inlet flange	DN100 ISO-K	DN160 ISO-K	DN200 ISO-K
Inlet flange ISO-F/CF	on request	on request	on request
High vacuum pumping			
speed at inlet flange	l/sec	values measured according PNEUROP, see page 7 for details	
Water vapour	1 100	2 600	5 000
Nitrogen	550	1 200	1 800
Argon	400	1 000	1 550
Hydrogen	580	1 500	2 500
Capacity	barl		
Argon/N ₂	100	300	700
Hydrogen (< 10 ⁻⁵ mbar)	4	10	15
Crossover	mbarl	50	140
Cool down time	min	65	85
Warm up time	h		
without purge gas	2.5	3	4
with heated purge gas	< 1	< 1	< 1
Weight	kg	25	29
			35
Technical data compressor			
Cooling media	water	water	water
Cooling water flow	l/min	3	3
Main supply	VAC	230/240 - 50Hz	230/240 - 50Hz
Connecting power	kW	2.6 - 50Hz	2.6 - 50Hz
Weight	kg	75	75
			75
Standard delivery includes			
Cryogenic pump		Cabling compressor cold head	
Compressor		Tool kit	
Safety valve		Temperature sensor(s): 1 set on stage 2	
Flexlines, 3 m long			
Spare Parts			
20K panel	H1000400	H008765	H200500
Indium foil for cold head	H1500204	H1500204	H1500204
Temperature sensor 2nd stage	H010310	H010310	H010310
Adsorber compressor	H0100054-T	H0100054-T	H0100054-T
Cold head	H266652	H266652	H266652
Compressor	H266960	H266960	H266960
Flexlines, 3 m	H02003016	H02003016	H02003016
Accessories			
Fast regeneration accessories	HPCR01100	HPCR01160	HPCR01200
Cryo controller HCC120	HPCC01120	HPCC01120	HPCC01120
Tool kit	H101004	H101004	H101004
Maintenance manifold	H1013400	H1013400	H1013400
Flexlines, any length > 150 m	on request	on request	on request

Technical description and further accessories see pages 28 to 42

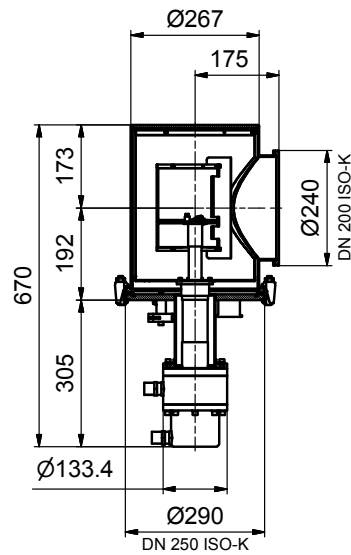
VCP 100



VCP 160



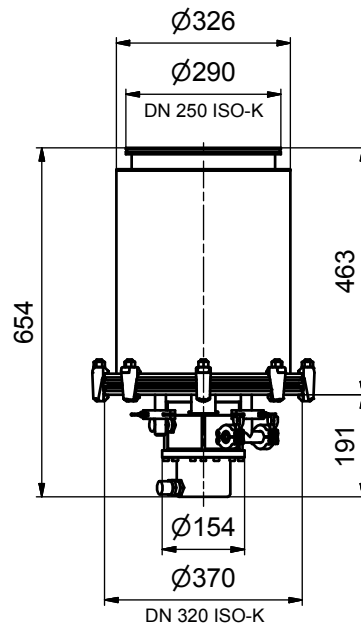
VCP 200



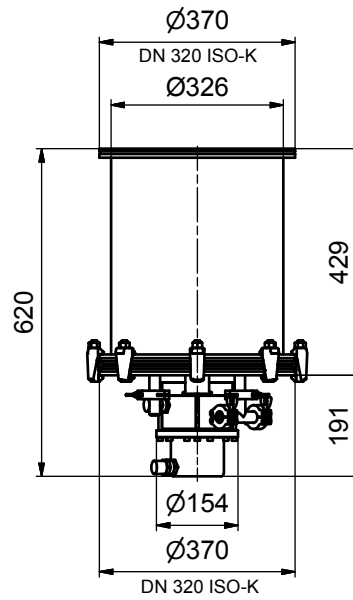
Technical Data / Model		VELCO 252	VELCO 322	VELCO 402
Order number		H100217-T	H100322-T	H10000419-T
Inlet flange		DN250 ISO-K	DN320 ISO-K	DN400 ISO-K
Inlet flange ISO-F/CF		on request	on request	on request
High vacuum pumping				
speed at inlet flange	l/sec	values measured according PNEUROP, see page 7 for details		
Water vapour		7 700	11 500	18 200
Nitrogen		3 500	5 000	8 000
Argon		2 900	4 200	6 800
Hydrogen		4 500	5 500	7 500
Capacity	barl			
Argon/N ₂		2 500	2 500	8 000
Hydrogen (< 10 ⁻⁵ mbar)		25	25	32
Crossover	mbarl	500	600	600
Cool down time	min	105	105	100
Warm up time	h			
without purge gas		5	5	5
with heated purge gas		< 1.5	< 2	< 2
Weight	kg	30	32	40
Technical data compressor				
Cooling media		water	water	water
Cooling water flow		l/min 6-9	6-9	6-9
Main supply		VAC 380 - 415 - 50Hz	380 - 415 - 50Hz	380 - 415 - 50Hz
Connecting power		kW 6.5	6.5	6.5
Weight		kg 100	100	100
Standard delivery includes				
Cryogenic pump		Cabling compressor cold head		
Compressor		Tool kit		
Safety valve		Temperature sensor(s): 1 set on stage 2 and 1 set on stage 1		
Flexlines, 3m long				
Spare Parts				
20K panel		H2500142	H2500142	BP265760-X
Indium foil for cold head		H1500210	H1500210	H1500210
Temperature sensor 2nd stage		H010310	H010310	H010310
Temperature sensor 1st stage		H010310-1	H010310-1	H010310-1
Adsorber compressor		H0100052-T	H0100052-T	H0100052-T
Cold head		H14026211	H14026211	H14026211
Compressor		H0451591	H0451591	H0451591
Flexlines, 3 m		H02003016	H02003016	H02003016
Accessories				
Fast regeneration accessories		HPCR01320	HPCR01320	HPCR01400
Cryo controller HCC120		HPCC01120	HPCC01120	HPCC01120
Tool kit		H101070	H101070	H101070
Maintenance manifold		H1013400	H1013400	H1013400
Flexlines, any length > 150 m		on request	on request	on request

Technical description and further accessories see pages 28 to 42

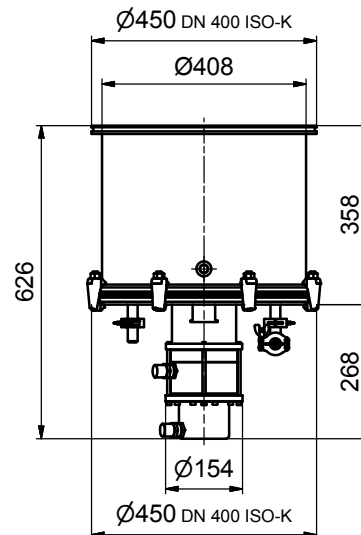
VELCO 252



VELCO 322



VELCO 402



Technical Data / Model		VELCO 502	VELCO 632	VELCO 801
Order number		H10000517-T	H10000617-T	H10000801-T
Inlet flange		DN500 ISO-K	DN630 ISO-K	DN800 ISO-F
Inlet flange ISO-F/CF		on request	on request	
High vacuum pumping speed at inlet flange				
	l/sec	Values measured according PNEUROP, see page 7 for details		
Water vapour		28 500	48 200	73 000
Nitrogen		12 000	18 500	28 000
Argon		8 500	13 500	24 000
Hydrogen		9 100	10 000	25 000
Capacity		barl		
Argon/N ₂		10 000	15 000	20 000
Hydrogen (< 10 ⁻⁵ mbar)		38	50	100
Crossover		mbarl	750	900
Cool down time		min	105	150
Warm up time		h		
without purge gas		6	6	8
with heated purge gas		<2	<3	<3
Weight		kg	50	85
				260

Technical data compressor

Cooling media		water	water	water
Cooling water flow		l/min	6-9	6-9
Main supply		VAC	380 - 415 - 50Hz	380 - 415 - 50Hz
Connecting power		kW	6.5	6.5
Weight		kg	100	100
				2 x 6.5
				2 x 100

Standard delivery includes

Cryogenic pump	Cabling compressor cold head
Compressor	Tool kit
Safety valve	Temperature sensor(s): 1 set on stage 2 and 1 set on stage 1
Flexlines 3 m; Velco 801 5 m	

Spare Parts

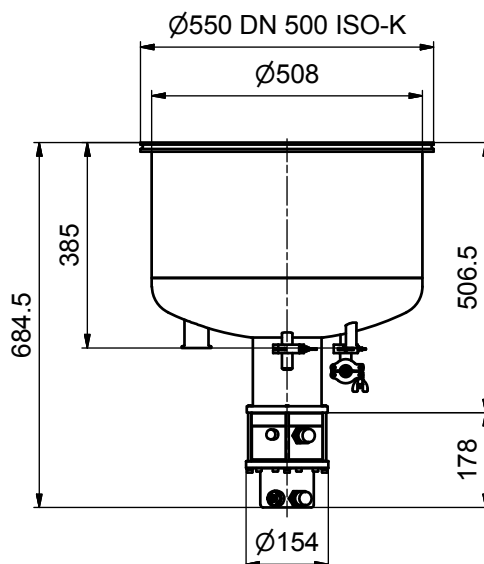
20K panel	BP265760-X	H630014	H8010050
Indium foil for cold head	H1500210	H1500210	H1500210
Temperature sensor 2nd stage	H010310	H010310	H010310
Temperature sensor 1st stage	H010310-1	H010310-1	H010310-1
Adsorber compressor	H0100052-T	H0100052-T	H0100052-T
Cold head	H14026211	H14026211	H14026211
Compressor	H0451591	H0451591	H0451591
Flexlines, 3 m	H02003016	H02003016	
Flexlines, 5 m	H0205016	H0205016	H0205016

Accessories

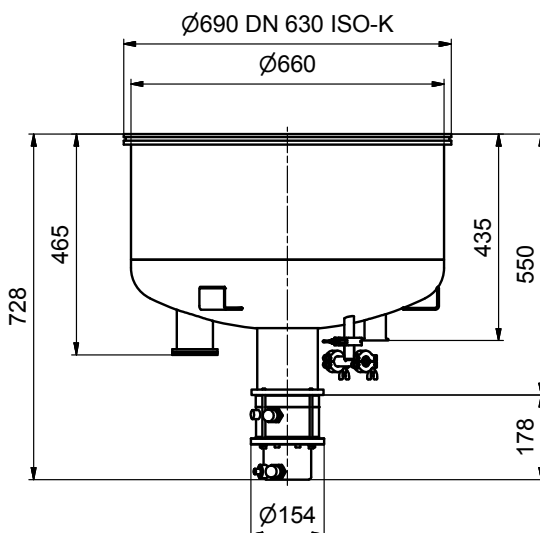
Fast regeneration accessories	HPCR01500	HPCR01630	HPCR01800
Cryo controller HCC120/HCC130	HPCC01120	HPCC01120	HPCC001130
Tool kit	H101070	H101070	H101070
Maintenance manifold	H1013400	H1013400	H1013400
Flexlines, any length > 150 m	on request	on request	on request

Technical description and further accessories see pages 28 to 42

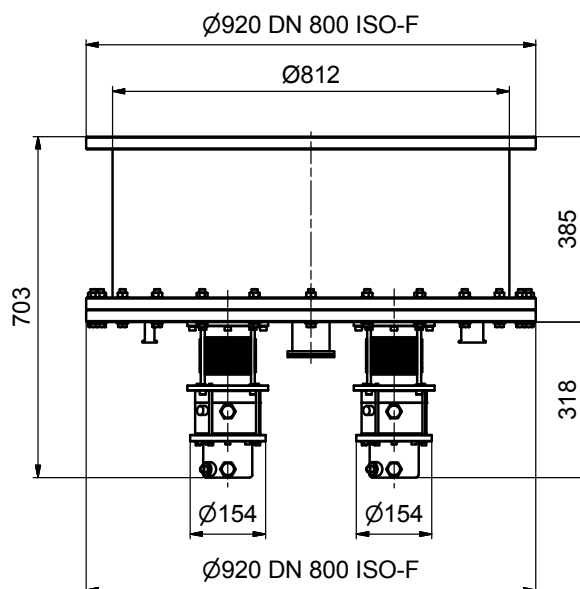
VELCO 502



VELCO 632



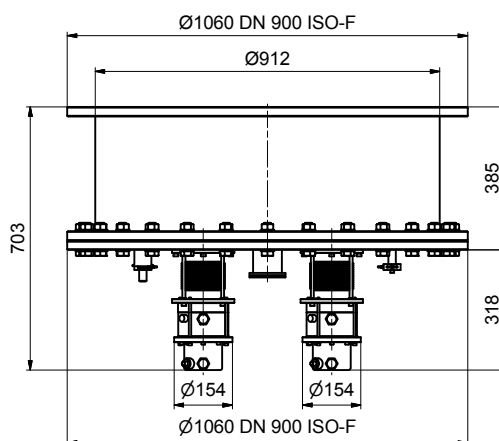
VELCO 801



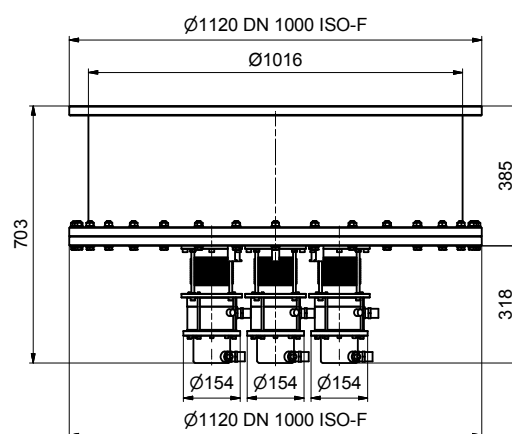
Technical Data / Model		VELCO 900	VELCO 1000	VELCO 1250
Order number		H10000809-T	H10001000-T	H10001250-T
Inlet flange		DN900 ISO-F	DN1000 ISO-F	DN1250 ISO-F
High vacuum pumping speed at inlet flange				
	l/sec	Values measured according PNEUROP, see page 7 for details		
Water vapour		92 000	114 000	177 000
Nitrogen		36 000	45 000	67 000
Argon		31 000	38 000	57 000
Hydrogen		33 000	40 000	60 000
Capacity		barl		
Argon/N ₂		21 000	22 000	30 000
Hydrogen (< 10 ⁻⁵ mbar)		110	120	150
Crossover		mbarl		
		1 500	1 500	1 500
Cool down time		min		
		180	180	180
Warm up time		h		
without purge gas		8	8	8
with heated purge gas		<3	<3	<3
Weight		kg		
		410	500	700
Technical data compressor				
Cooling media		water	water	water
Cooling water flow	l/min	6-9	6-9	6-9
Main supply	VAC	380 - 415 - 50Hz	380 - 415 - 50Hz	380 - 415 - 50Hz
Connecting power	kW	2 x 6.5	3 x 6.5	3 x 6.5
Weight	kg	2 x 100	3 x 100	3 x 100
Standard delivery includes				
Cryogenic pump			Cabling compressor cold head	
Compressor			Tool kit	
Safety valve			Temperature sensor(s): 2 sets on stage 2 and 1 set on stage 1	
Flexlines 6 m				
Spare Parts				
20K panel		H8010050-X	H265761-E	H12503845
Indium foil for cold head		H1500210	H1500210	H1500210
Temperature sensor 2nd stage		H010310	H010310	H010310
Temperature sensor 1st stage		H010310-1	H010310-1	H010310-1
Adsorber compressor		H0100052-T	H0100052-T	H0100052-T
Cold head		H14026211	H14026211	H14026211
Compressor		H0451591	H0451591	H0451591
Flexlines, 6 m		H02006016	H02006016	H02006016
Accessories				
Fast regeneration accessories		HPCR01901	HPCR01000	HPCR01250
Cryo controller HCC130		HPCC001130	HPCC001130	HPCC001130
Tool kit		H101070	H101070	H101070
Maintenance manifold		H1013400	H1013400	H1013400
Flexlines, any length > 150 m		on request	on request	on request

Technical description and further accessories see pages 28 to 42

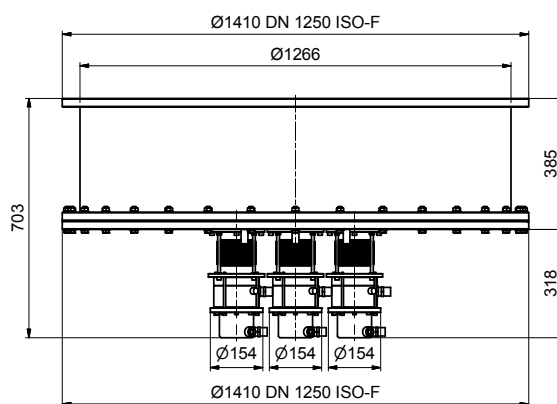
VELCO 900



VELCO 1000



VELCO 1250



Cryogenic pumps for sputter applications

Technical Data / Model	VELCO 252S	VELCO 322S	VELCO 402S
Order number	H100218-T	H100323-T	H100418-T
Inlet flange	DN250 ISO-K	DN320 ISO-K	DN400 ISO-K
Inlet flange ISO-F/CF	on request	on request	on request
High vacuum pumping speed at inlet flange	l/sec	Values measured according PNEUROP, see page 7 for details	
Water vapour	7 700	11 500	18 200
Nitrogen	3 000	3 500	6 500
Argon	2 500	3 000	5 200
Hydrogen	3 800	5 700	7 500
Max. gas flow (Ar)	sccm		
Continuous operation	1 000	1 000	1 000
Short term	1 250	1 250	1 250
Capacity	barl		
Argon/N ₂	2 500	2 500	8 000
Hydrogen (< 10 ⁻⁵ mbar)	25	25	30
Crossover	mbarl	500	500
Cool down time	min	100	100
Warm up time	h		
without purge gas	5	5	5
with heated purge gas	<2	<2	<2
Weight	kg	30	32

Technical data compressor

Cooling media		water	water	water
Cooling water flow	l/min	6-9	6-9	6-9
Main supply	VAC	380 - 415 - 50Hz	380 - 415 - 50Hz	380 - 415 - 50Hz
Connecting power	kW	6.5	6.5	6.5
Weight	kg	100	100	100

Standard delivery includes

Cryogenic pump	Cabling compressor cold head
Compressor	Tool kit
Safety valve	Temperature sensor(s): 1 set on stage 2 and 1 set on stage 1
Flexlines 3 m	

Spare Parts

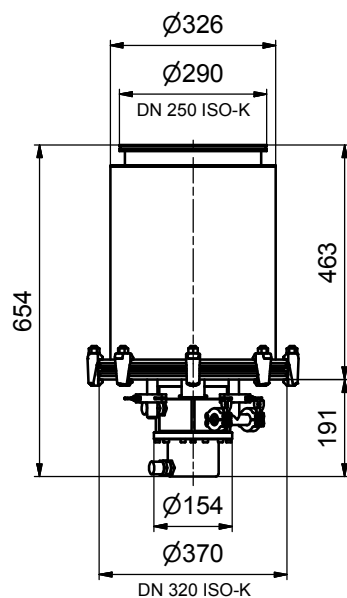
20K panel	H2500142	H2500142	BP265760-X
Indium foil for cold head	H1500210	H1500210	H1500210
Temperature sensor 2nd stage	H010310	H010310	H010310
Temperature sensor 1st stage	H010310-1	H010310-1	H010310-1
Adsorber compressor	H0100052-T	H0100052-T	H0100052-T
Cold head	H14026211	H14026211	H14026211
Compressor	H0451591	H0451591	H0451591
Flexlines, 3 m	H02003016	H02003016	H02003016

Accessories

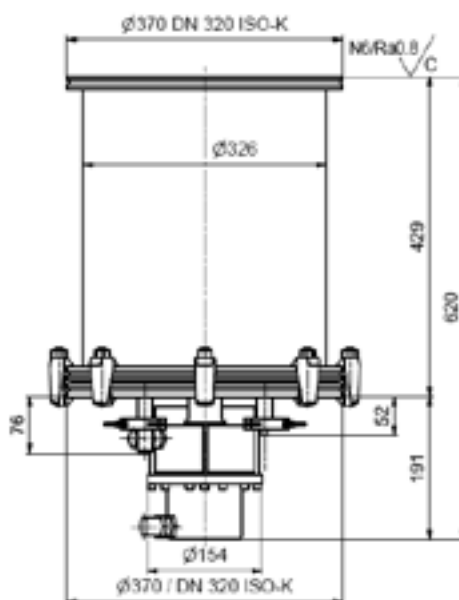
Fast regeneration accessories	HPCR01320	HPCR01320	HPCR01400
Cryo controller HCC120	HPCC01120	HPCC01120	HPCC01120
Tool kit	H101070	H101070	H101070
Maintenance manifold	H1013400	H1013400	H1013400
Flexlines, any length > 150 m	on request	on request	on request

Technical description and further accessories see pages 28 to 42

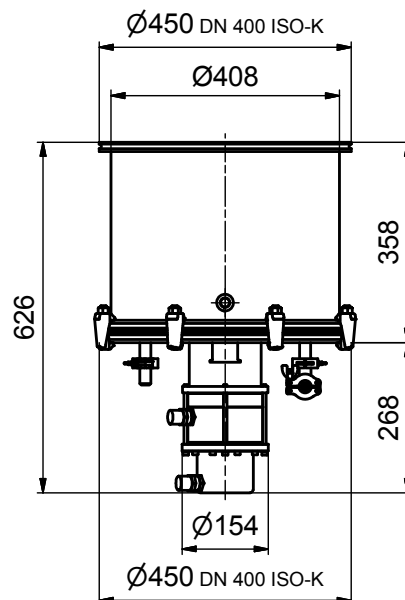
VELCO 252S



VELCO 322S



VELCO 402S

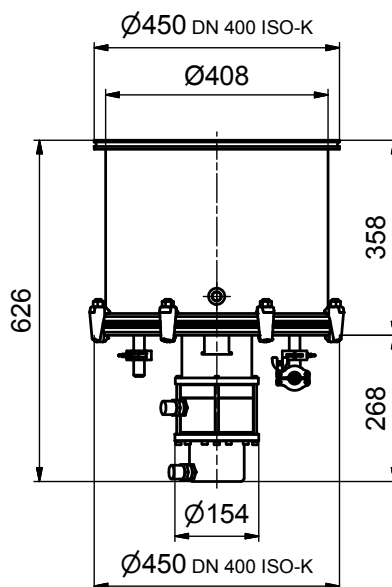


Cryogenic pumps for Xenon application

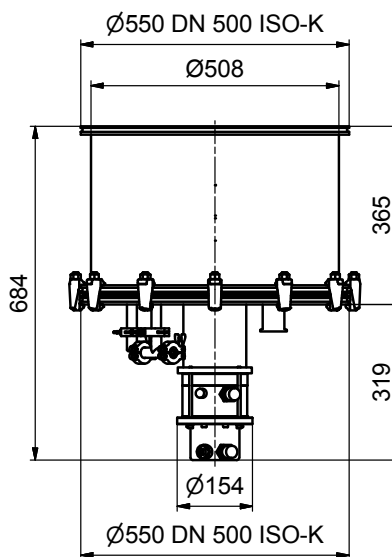
Technical Data / Model	VELCO 402 Xe	VELCO 502 Xe	VELCO 632 Xe	
Order number	H10000418-T	H10000518-T	H10000619-T	
Inlet flange	DN400 ISO-K	DN500 ISO-K	DN630 ISO-K	
Inlet flanges ISO-F/CF	on request	on request	on request	
High vacuum pumping speed at inlet flange	l/sec	Values measured according PNEUROP, see page 7 for details		
Water vapour	18 200	28 500	48 200	
Nitrogen	6 800	10 500	18 500	
Argon	5 800	7 300	15 500	
Hydrogen	6 400	7 800	14 000	
Xenon	6 700	10 500	18 000	
Capacity	barl			
Argon/N ₂	8 000	10 000	15 000	
Xenon/Xe	7 500	9 300	14 000	
Hydrogen (< 10 ⁻⁵ mbar)	32	38	50	
Crossover	mbarl	600	750	900
Cool down time	min	120	120	240
Warm up time	h			
without purge gas	6	6	8	
with heated purge gas	<2	<2	<3	
Weight	kg	40	85	260
Technical data compressor				
Cooling media	water	water	water	
Cooling water flow	l/min	6-9	6-9	6-9
Main supply	VAC	380 - 415 - 50Hz	380 - 415 - 50Hz	380 - 415 - 50Hz
Connecting power	kW	6.5	6.5	2 x 6.5
Weight	kg	100	100	100
Standard delivery includes				
Cryogenic pump		Cabling compressor cold head		
Compressor		Tool kit		
Safety valve		Temperature sensor(s): 1 set on stage 2 and 1 set on stage 1		
Flexlines 3 m				
Spare Parts				
20K panel	BP265760-X	BP265760-X	H630014	
Indium foil for cold head	H1500210	H1500210	H1500210	
Temperature sensor 2nd stage	H010310	H010310	H010310	
Temperature sensor 1st stage	H010310-1	H010310-1	H010310-1	
Adsorber compressor	H0100052-T	H0100052-T	H0100052-T	
Cold head	H14026211	H14026211	H14026211	
Compressor	H0451591	H0451591	H0451591	
Flexlines, 3 m	H02003016	H02003016	H02003016	
Accessories				
Fast regeneration accessories	HPCR01400	HPCR01500	HPCR01630	
Cryo controller HCC120/HCC130	HPCC01120	HPCC01120	HPCC001130	
Tool kit	H101070	H101070	H101070	
Maintenance manifold	H1013400	H1013400	H1013400	
Flexlines, any length > 150 m	on request	on request	on request	

Technical description and further accessories see pages 28 to 42

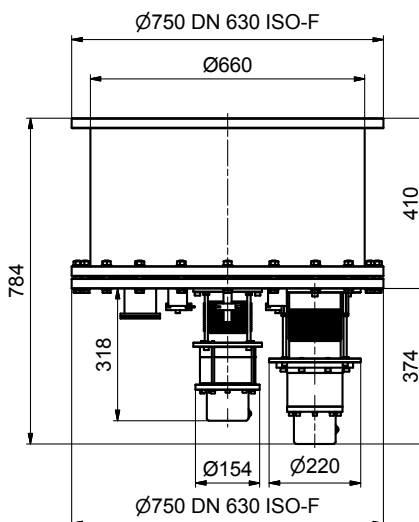
VELCO 402 Xe



VELCO 502 Xe



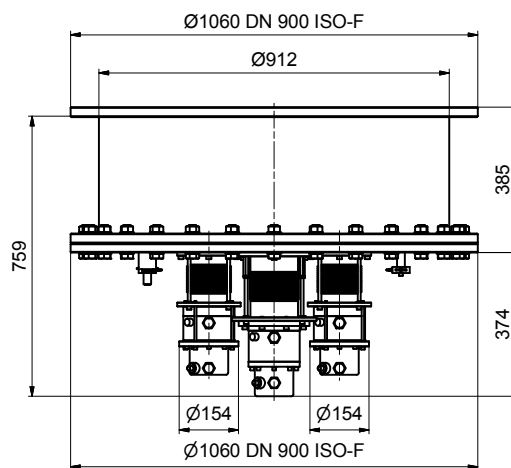
VELCO 632 Xe



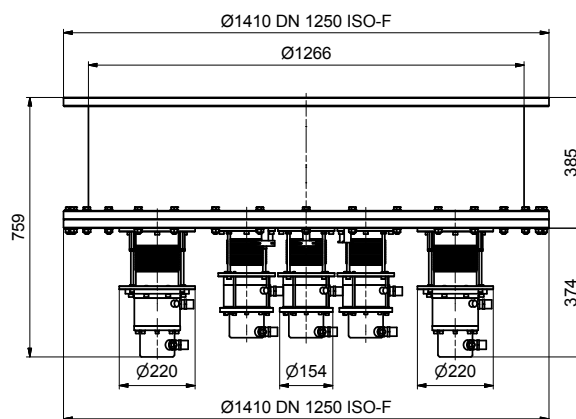
Technical Data / Model		VELCO 900 Xe	VELCO 1250 Xe
Order number		H10000819-T	H10001260-T
Inlet flange		900 ISO-F	DN1250 ISO-F
High vacuum pumping speed at inlet flange			
	l/sec	values measured according PNEUROP, see page 7 for details	
Water vapour		92 000	177 000
Nitrogen		36 000	67 000
Argon		31 000	57 000
Hydrogen		33 000	60 000
Xenon		34 000	65 000
Capacity			
	barl		
Argon / N ₂		21 000	30 000
Xenon / Xe		20 000	28 000
Hydrogen (< 10 ⁻⁵ mbar)		120	150
Crossover	mbarl	1 500	1 500
Cool down time	min	180	220
Warm up time			
	h		
without purge gas		8	8
with heated purge gas		< 3	< 3
Weight	kg	460	720
Technical data compressors			
Cooling media		water	water
Cooling water flow	l/min	6-9	6-9
Main supply	VAC	380 - 415 - 50Hz	380 - 415 - 50Hz
Connecting power	kW	3 x 6.5	5 x 6.5
Weight	kg	3 x 100	5 x 100
Standard delivery includes			
Cryogenic pump			Cabling compressor cold head
Compressor			Tool kit
Safety valve			Temperature sensor(s): 1 set on stage 2 and 1 set on stage 1
Flexlines, 6 m			
Spare Parts			
20K panel		H8010060-X	H12503845
Indium foil for cold head		H1500210	H1500210
Temperature sensor 2nd stage		H010310	H010310
Temperature sensor 1st stage		H010310-1	H010310-1
Adsorber compressor		H0100052-T	H0100052-T
Cold head		H14026211	H14026211
Compressor		H0451591	H0451591
Flexlines, 6 m			
Accessories			
Fast regeneration accessories		HPCR01900	HPCR01250
Cryo controller HCC10/HCC150		HPCR01901	HPCR01250
Tool kit		H101070	H101070
Maintenance manifold		H1013400	H1013400
Flexlines, any length > 150 m		on request	on request

Technical description and further accessories see pages 28 to 42

VELCO 900 Xe



VELCO 1250 Xe



LN₂ cooled cryogenic pumps

Technical Data / Model	VELCO 800 LN ₂	VELCO 900 LN ₂	VELCO 1250 LN ₂
Order number	H10000800-T	H10000900-T	H10001270-T
Inlet flange	DN800 ISO-F	900 ISO-F	DN1250 ISO-F
High vacuum pumping speed at inlet flange	l/sec	Values measured according PNEUROP, see page 7 for details	
Water vapour	73 000	92 000	177 000
Nitrogen	28 000	36 000	67 000
Argon	24 000	31 000	57 000
Hydrogen	25 000	33 000	60 000
Capacity	barl		
Argon/N ₂	20 000	21 000	30 000
Hydrogen (< 10 ⁻⁵ mbar)	100	110	150
Crossover	mbarl	1 500	1 500
Cool down time	min	<240	<300
Weight	kg	264	700

Technical data compressor

Cooling media		water	water	water
Cooling water flow	l/min	6-9	6-9	6-9
Main supply	VAC	380 - 415 - 50Hz	380 - 415 - 50Hz	380 - 415 - 50Hz
Connecting power	kW	6.5	6.5	2 x 6.5
Weight	kg	100	100	2 x 100

Standard delivery includes

Cryogenic pump	Cabling compressor cold head
Compressor	Tool kit
Safety valve	Temperature sensor(s): 2 sets on stage 2 and 1 set on stage 1
Flexlines 6 m	Connections for LN ₂ supply and return

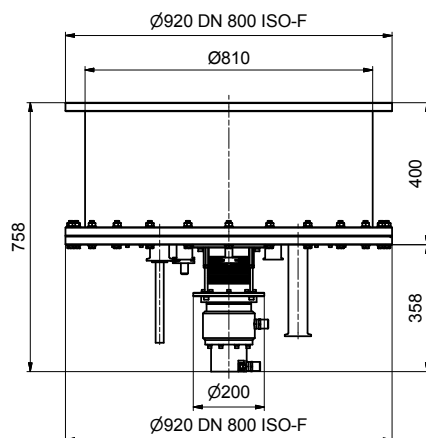
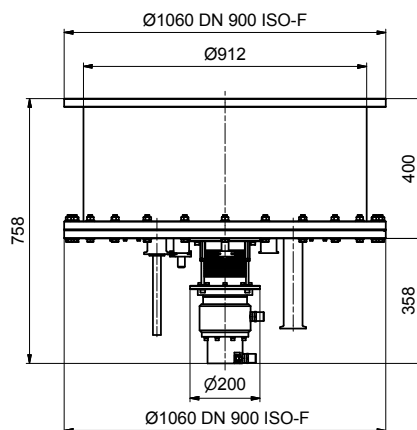
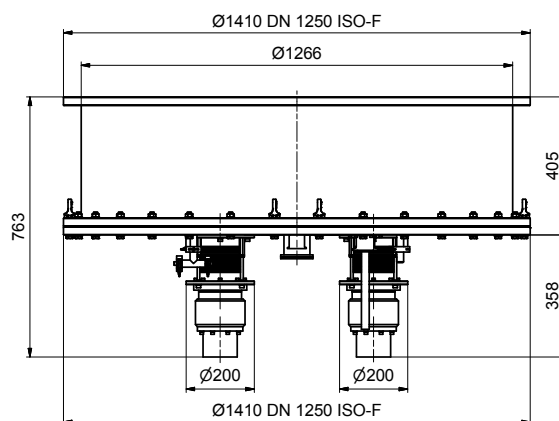
Spare Parts

20K panel	H001516	H8010060-X	H12503845
Indium foil for cold head	H1500112	H1500112	H1500112
Temperature sensor 2nd stage	H010310	H010310	H010310
Temperature sensor 1st stage	H010310-1	H010310-1	H010310-1
Adsorber compressor	H0100052-T	H0100052-T	H0100052-T
Cold head	H266997	H266997	H266997
Compressor	H0451591	H0451591	H0451591
Flexlines, 6 m	H02006016	H02006016	H02006016

Accessories

Fast regeneration accessories	HPCR01800	HPCR01900	HPCR01250
Cryo controller HCC120/HCC 130	HPCC001120	HPCC001120	HPCC001130
Tool kit	H101070	H101070	H101070
Maintenance manifold	H1013400	H1013400	H1013400
Flexlines, any length > 150 m	on request	on request	on request

Technical description and further accessories see pages 28 to 42

VELCO 800 LN₂VELCO 900 LN₂VELCO 1250 LN₂

Cryogenic pumps for new technologies

HSR delivers modified cryogenic pumps and devices for applications with high radiation exposure, such as new technologies, accelerators, medical applications etc.

These pumps and devices include special materials and panel setups for high pump speed of hydrogen. They are also specially modified for fast and secure exchange of the devices in the field.

- Housings made of aluminium
- Flanges modified for fast and secure exchange
- Internal materials resistant to radiation
- Panels modified for highest performance and capacity for hydrogen and other application-related gases
- HSR temperature sensor KTS100 resistant to radiation

Various sizes and configurations are available on request.



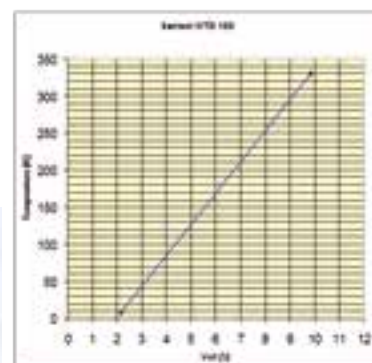
Applications:



Please contact us for further information regarding our HAR cryo pumps

Radiation resistant HSR temperature sensor KTS100

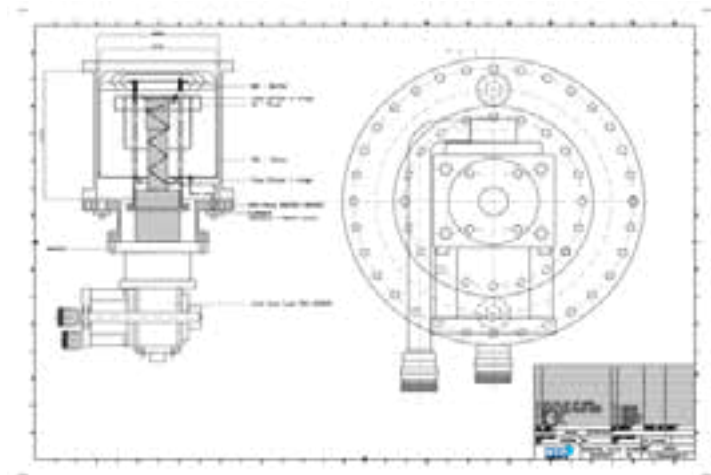
- Linear and reproducible measuring range 2K to 350K
- Sensor also available without holder or mounted on customized holder
- Available as stand-alone unit including measuring device



For technical description and accessories, see page 28 and 29

Customized cryogenic pumps

Bakeable cryopump (up to 280° C) for ultra high-vacuum application



End pressure <math>< 10^{-11}</math> mbar



Customer-tailored cryogenic pumps and devices

Cryogenic pumps optimized for highest pump speed and capacity for specific gases or applications.



Customized cryostats

Cryostats for R&D



Cryostats for space simulation

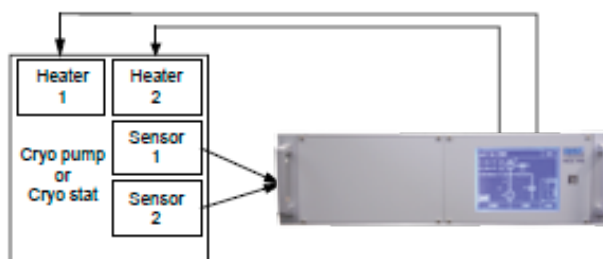
Controllable temperature range: 10 to 150 Kelvin

Resolution: ± 1 Kelvin



HSR temperature controller HCC 190

HCC190 controller allows operation and temperature control of HSR cryopumps or cryostats.



For description and technical details, please see page 39

Helium compressors

Standard compressors

Our cryogenic pump systems are equipped with helium compressors from APD/SHI SUMITOMO. These compressors are designed to deliver high-pressure, oil-free helium gas to cryogenic refrigerators. Self-sealing gas couplings allow easy connection of all required components such as cold head, compressor and flexlines. Compressors are available with water cooling or air cooling.

For bigger sized systems, such as our VELCO cryopumps, the type F-70 compressor is used. These water-cooled, high-power compressors achieve an uptime of up to 30,000 hours between maintenance intervals. For convenient and easy operation, all display devices, connectors and switches are located on the front panel. A LCD display shows all important data and additional diagnostic information. Fully automatic remote operation of the compressor is also possible by using the HSR cryo controller type HCC... or pump set controller type PCA...

For our smaller sized VCP cryopump line and small sized cryostats, compressor type HC4E-1 is in use. This compressor also has the display, connectors and switches mounted on its front plate. Uptime between maintenance intervals is also up to 30,000 operating hours. HC4E-1 compressors can also be operated with controllers of type HCC... or type PCA...



Order information	Order number
Compressor F-70 incl. accessories	H0451591
Compressor HC-4E incl. accessories	H266960

Standard delivery includes
Compressor
Electrical connectors
Water connectors

Spare parts	
Adsorber compressor F-70	H0100052-T
Fuse set compressor F-70	H267127
Adsorber compressor HC4-E	H0100054-T

Modified BALZERS compressors

HSR also services, repairs and modifies compressors of the former BALZERS company. During revision, these compressors will be equipped with a new powerful compressor module. After revision, which includes also some other modifications, those compressors provide approx. 25% more cooling power and performance.

HSR also services and repairs compressors of other types and makes. Please contact us for further information.



HSR cryo temperature measuring devices

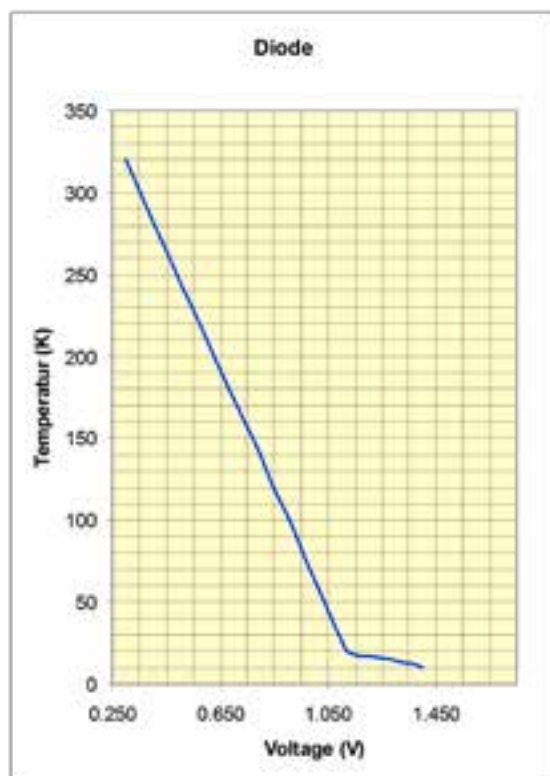
HSR cryo temperature sensor KTS100

Order number H010310

- Sensor technology based on strain expansion
- Linear measuring range from 2 K up to 350 K
- Sensor is resistant to radiation
- Sensor is also available without copper holder shown
- Sensor holder can be modified according to customer's needs and application

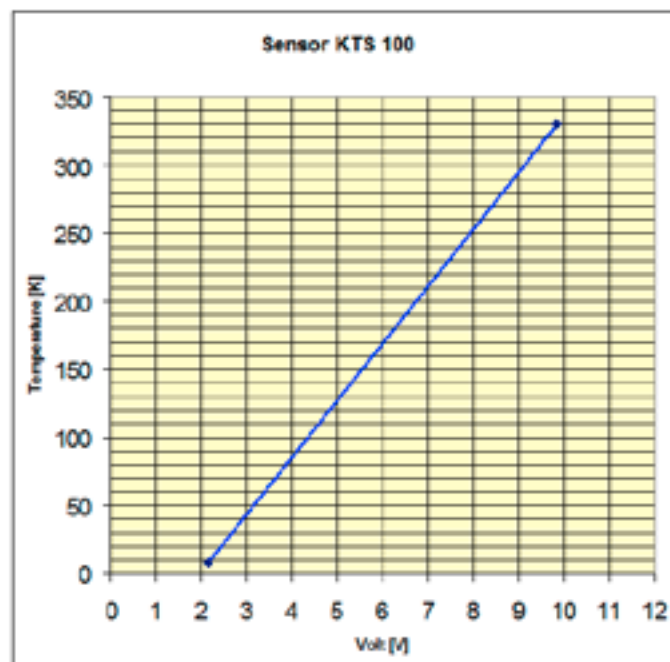


Measuring range of standard silicone diode:



- Non-linear measurement from 4K to 20K
- Silicone diode is not resistant to radiation

Measuring range KTS100:



- **Linear measurement from 2 K up to 350 K!**
- **HSR sensor is resistant to radiation!**

Cryo temperature measuring system KTC100Order number **H106100**

- Adapted to HSR sensor KTS100
- Linear measuring range 4-325 K
- Accuracy and resolution 0.1% ± 1 digit, 15 bit
- Digital LED display
- 4 switchable outputs with adjustable thresholds
- Analog output 4-20 mA or 0-10 VDC
- Mains voltage 230 VAC, 50 Hz

**Order information components****Order number**

3 1/2 LED monitor KTM 100	H106080
Cryo temperature sensor (4 wire) KTS 100	H010310
Connection cable with feedthrough to the sensor	H214111
Connection cable feedthrough to display unit, 10 m	H6020703-T

Digital interface for IFR100 / IFR102

- Adapted to HSR sensor KTS100
- Linear measuring range 4-325 K
- 4-wire measurement
- 1 or 2 channel device available
- Analog output 4-20 mA or 0-10 VDC
- Galvanic isolated channels and power inputs
- Main supply voltage 24-250 VAC/VDC

**Order information****Order number**

Measuring transducer IFR100 1x Sensor	H111420
Measuring transducer IFR102 2x Sensors	H111422
Connection cable feedthrough to interface, 10 m	H6020703-T

Fast regeneration accessories

Heated purge gas inlet

- Purge gas pressure max 3 bar
- Gas consumption (depends on size of pump) 1 to 3 m³
- Purge gas heating temperature appr. 60° C
- 3/8" purge gas inlet connection
- Recommended purge gas N₂ or Ar
- DN16KF purge gas connection on cryopump
- Valve supply voltage 24 V DC or 220 V AC
- Heater supply voltage 220 V AC
- Heater power 100 W



Order information

Order number

Complete set heated gas inlet incl. feedthrough adapter for DN 16KF:

24VDC-valve and heater 230VAC

H1200114-T

24VAC-valve and heater 230VAC

H1200113-T

Spare parts

Purge gas valve 24VAC 50/60 Hz - NC

H12001124

Purge gas valve 24VDC - NC

H12000014

Purge gas valve 230VAC - NC

H12000015

Heater 230VAC

H12000220

Heater 115VAC

H12000115

Purge gas inlet valve

- Purge gas pressure max 3 bar
- Gas consumption (depends on size of pump) 1 to 3 m³
- 3/8" purge gas inlet connection
- Recommended purge gas N₂ or Ar
- DN16KF purge gas connection on cryopump
- Valve supply voltage 24 V DC or 220 V AC



Order information

Order number

Purge gas inlet valve 24VDC - NC

H12000014

Also available as security valve (NO = normally open) for purging function of cryo pumps during uncontrolled warm-ups due to power fails

Order Information

Order number

Purge gas inlet valve 24VDC - NO

H112213

Heater for pump housing

- Integrated safety thermostat
- Optimized for pump sizes
- Easy installation
- VELCRO type fastener
- Temperature controlled
- Connected by silicone cable



Available for all sizes of HSR cryo pumps
Please contact us for order information

Heater device HCH 200

This newly developed heating device is used for fast regeneration purposes of HSR cryo pumps.

It can also be used for accurate and reproducible temperature control of 1st and/or 2nd stage of cryo pumps, cryostats and other cryogenic devices in applications such as

- space simulation
- gas separation
- low temperature testing



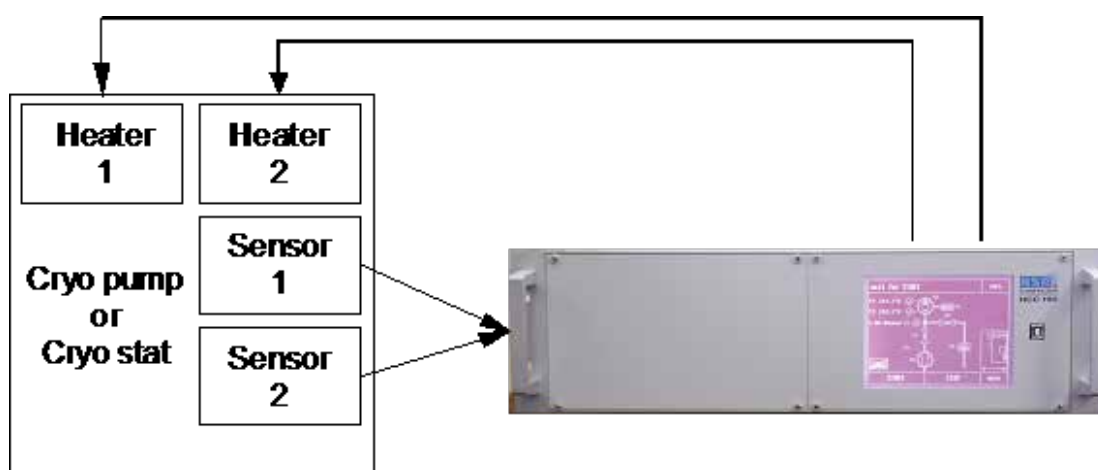
Order information

HCH200 heater device

Order number

H001110

For operation and control of HCH 200 we recommend HSR cryo and temperature controller HCC 190



See page 39 for more information

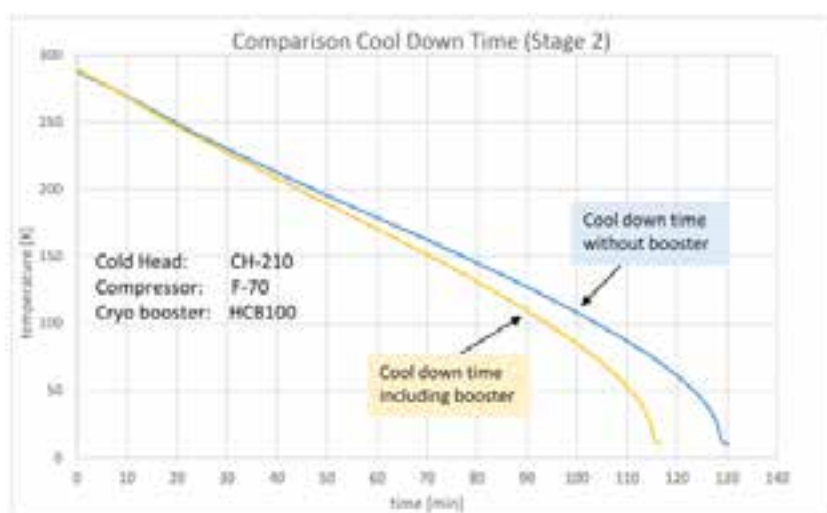
Cryo booster HCB100

This newly developed unit is used for the first and second stages of HSR cryo pump power amplification. It can be used by intermediate pieces in all major HSR cryo systems.

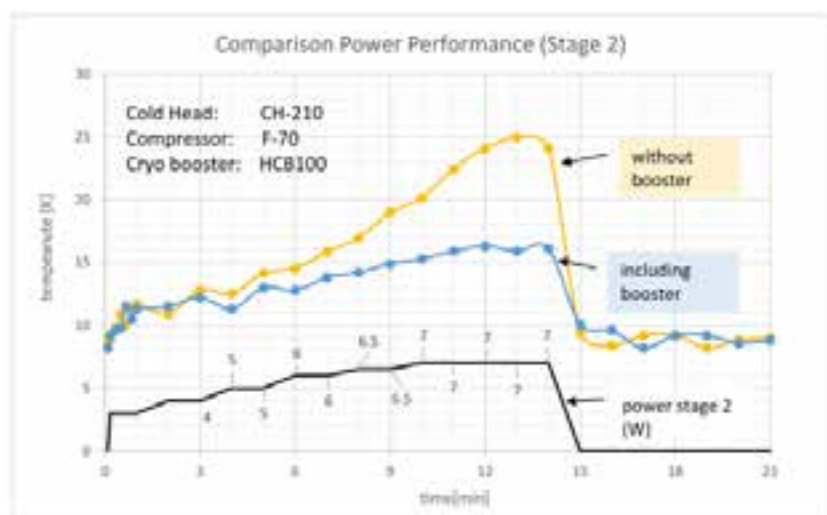


Advantages

—> Shorter cool down times



—> Improved cooling power on second stage



Order information

Order number

HCB100 cryo booster

H701280

Flexlines

Flexlines

Our flexlines are of highest quality; they are available as «standard high flexibility» and «special extended flexibility» versions. They come in lengths from 1m up to more than 150m and can be further customized.

- Various diameters available: NW10 - NW16 - NW20
- Made of stainless steel
- Single or double braided
- Fully leak tested and filled with helium
- Huge selection of connectors available
- Short delivery times



Order information

Order information	Order number
L=1.5m	H680133
L=3m	H02003016
L=5m	H0205016
L=10m	H10003016
L=15m	H15003016

Hoses

- Connecting hoses from helium bottle to service manifold
- Hoses for refill of compressor
- Customized hoses



Order information

Order information	Order number
Connection hose helium bottle service adapter	H0200006
Hose to exchange oil on helium compressors (Balzers, CTI and ASC)	H0200005-T
Flexline to refill helium on compressor, NW12/6, 1.5m (Balzers compressor)	H02003006

Pressure Reducing Valve for Helium Bottle

Reduces the Helium pressure from the Steel Bottles with 200 bar adjustable to the Service Adapter from 0 up to 50 bar to refill the compressor or the cold head



Order information

Order information	Order number
Pressure reducing valve	H1110027

Technical Data

Primary Pressure	bar	200
Secondary Pressure	bar	0 - 50
Connection Input		W 21.8 x 1/14
Connection Output		G ¼

Maintenance & service tools for cryogenic devices

Maintenance and service manifold

Order number H1013400

- Required for service and maintenance of cryogenic systems
- Easy filling, refilling and venting of closed He-circuits

Connectors & features:

- Aeroquip NW16/8 male -2 pcs.
- Aeroquip NW10/4 male
- DN25 KF flange with ball valve for roughing pump
- Connection to the helium gas bottle with manual valve
- He pressure manometer 500 psi
- Safety and overpressure valve



Order Information

Order number

Helium refilling procedure requires following components

Maintenance and service manifold	H1013400
Pressure regulator for helium bottles	H1110027
Connection hose helium bottle to service manifold	H0200006
Connection metal hose service manifold to compressor	H02003006
Venting adapter size 8	H5458213-T

Service adapters

- Various sizes and types available:
- NW20/12 female to NW16/8 male
- NW20/12 male to NW16/8 female
- Vent adapter NW16/8



Order Information

Order number

NW20/12 female to NW16/8 male	H5452852-T
NW20/12 male to NW16/8 female	H5458212-T
NW16/8 female discharge	H5458213-T

Leak spray

for simple and quick helium leak detection on:

- Connections
- Flexlines and compressors

Important: various makes and types are available on request

For export of this product, a special «Dangerous goods» packing is required!



Order information

Order number

Leak spray, non-export	H1110026
Leak spray, export by truck	H1110029
Leak spray, export by sea or air freight	H1110028

Tool box

Order number H101070

Tool box for servicing compressors of HSR cryopumps

Contents:

- Tools
- Fuses
- Seals



Spare parts for helium compressors

Adsorbers

Various adsorbers of different makes and types for cryogenic pump systems are available from stock.



Order information	Order number
ASC for 450W/A	H0100030-T
ASC for M125W	H0100031-T
APD SHI for 1L/R02W	H0100051-T
APD SHI for HC-10/F-70	H0100052-T
APD SHI for HC-4	H010256390
Balzers UCC064	H0100041-T
CTI compressors for M8500/M8510/M8200/SC	H0100020-T
CTI M9600	H0100020-T
Leybold to RW4000/6000	On request
Leybold to AD-RW2/3	On request

Compressor oil

Order number H0100050-T

- Oil for helium compressors
- Available in 1 liter bottles



Spare parts for cold heads

Indium foil

- Thermal conduction Indium foil for cryogenic devices
- Available in various sizes and shapes
- Available also in customized sizes and shapes
- Indium foil for specific cold head types available on request



Order information	Order number
Indium foil, 100 x 100 x 0.1 mm	H1501001

Seal sets for cold heads

- Seal sets for various cold heads of different makes and types are available on request



Revision and service of cryogenic pump systems

HSR cryogenic pump systems

In order to guarantee uninterrupted reliability and operation safety of your high-vacuum pump set, we recommend you to have a complete inspection of the cryopump after completing an operation cycle of about three years. This can be executed as described below:

Complete in-house inspection at our premises (recommended by HSR)

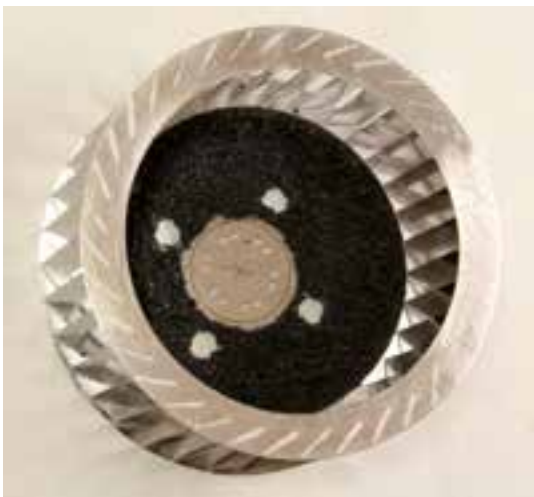
- Includes complete check of the cryopump including compressor and flexlines
- System undergoes a performance test and will subsequently be returned to the customer along with a test certificate

Minimum checkup at client site

- Replacement of the in-compressor adsorber
- Replacement of the cold head
- Replacement of the 20K panel including the activated charcoal

HSR also provides:

- Repair, maintenance and service of our own as well as third-party cryopump systems, compressors and accessories.
- Modification of existing cryopump systems for higher capacity and improved cooling power (all makes and types)
- Process specific optimizations and modifications of cryopump systems (all makes and types)



HSR cryo pump controller

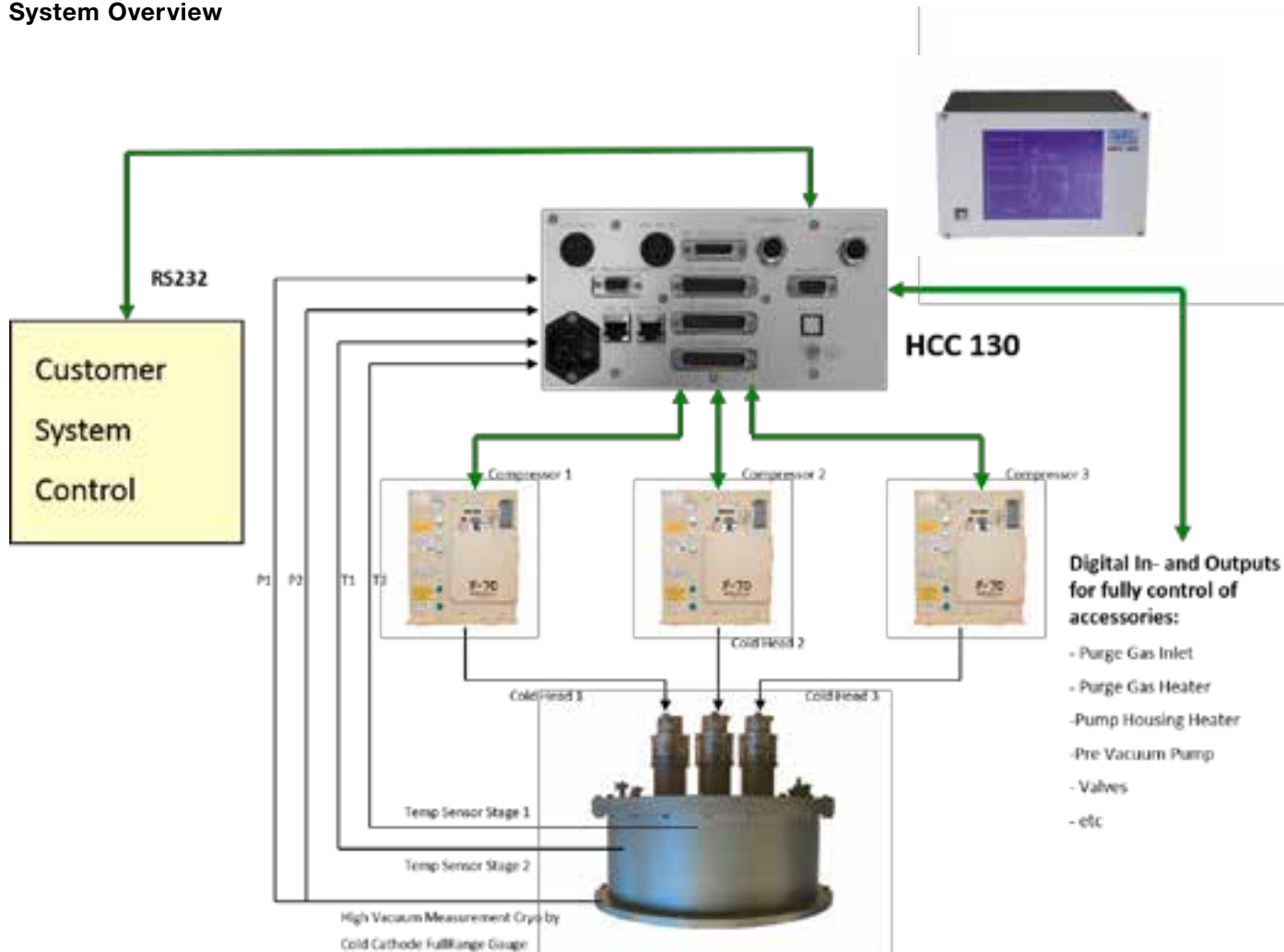
HSR cryocontrollers of type HCC are microprocessor-based controllers for cryogenic pump sets. They can be operated as autonomous units or controlled by a primary system control. HCC controllers ensure fully automatic, fail-safe cool-down and regeneration sequences and in addition, monitor the complete operational status.

These systems can be operated locally via touchscreen or remotely via RS232 or USB interfaces using customer's control software or any terminal program. Type HCC controllers allow operating of cryogenic pumps equipped with 1 up to 5 cold heads.

Key Features

- Touchscreen
- Display of two temperature sensors (stage 1 and stage 2 of the cold head)
- Vacuum measurement gauges of all common makes and types can be used
- Fully automatic cool-down and regeneration sequences
- More than 6 different regeneration sequences selectable and customizable
- Menu-guided programmable configuration and parameterization
- Recallable display of all values, such as vacuum pressure, temperatures, switching points and current status
- 2 configurable analog outputs, 0-10 V
- Remote control and monitoring via RS-232 interface
- Remote control and monitoring for peripheral devices as valves, pumps, heaters, etc. also via digital outputs and inputs

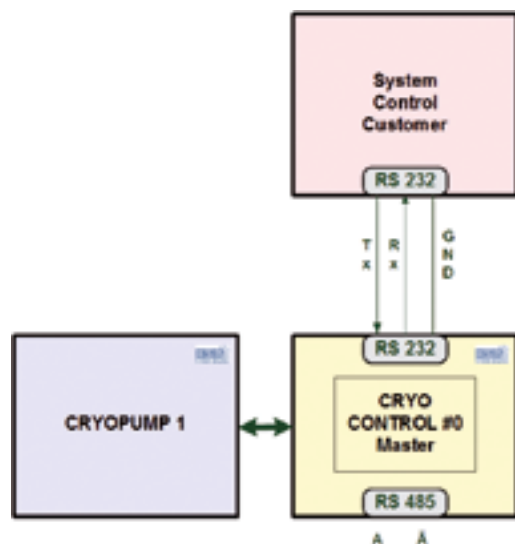
System Overview



Serial connection of multiple HCC and PCA controllers

Control units HCC or PCA can be operated with a PC/laptop or with any system control software via the RS-232 or USB interface.

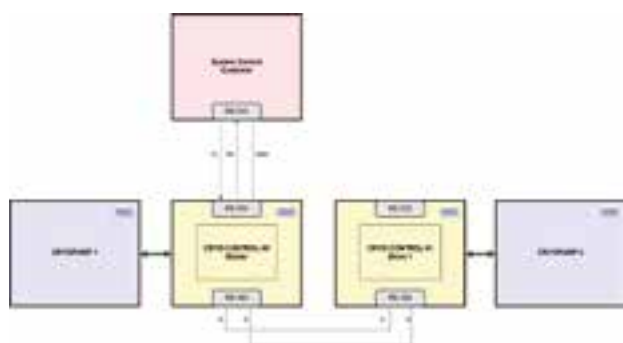
Connection of a single system:



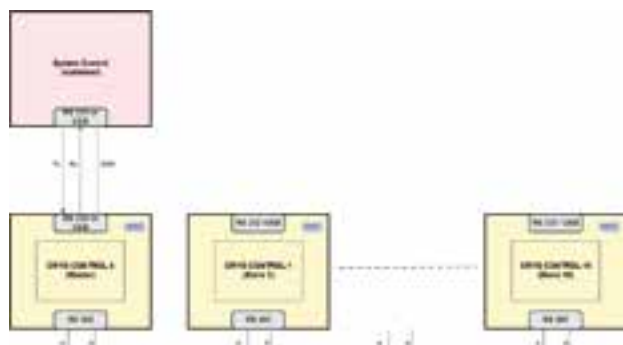
A maximum of 17 ECUs (1 master device, max 16 slave devices) can be controlled via the RS-232 or USB interfaces of the master device as follows:

- The master device itself is connected to the primary system control via the RS-232 interface.
- All other ECUs are connected with each other and with the master device using the RJ45 serial ports.

Connection of two systems :



Connection of multiple systems :



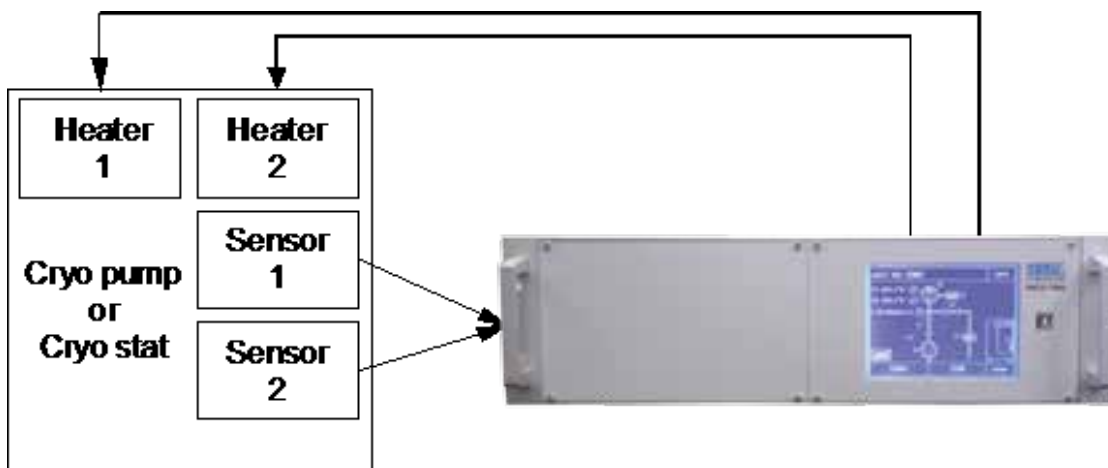
HSR temperature controller HCC 190

The HCC190 controller allows operation of either cryopumps or cryostats equipped with a maximum of 3 cold heads within the same system. It includes an additional, special feature which allows control of temperature for a particular stage of the cooling system (T1 and/ or T2).

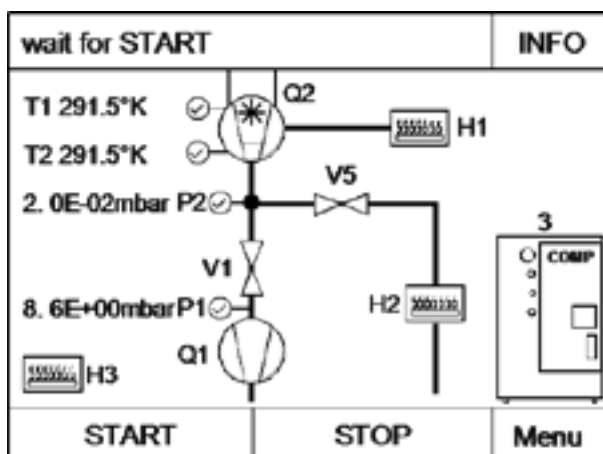
After the cool-down sequence is finished, the built-in control feature is ready for use. Input for actual measurements is selectable between sensor inputs T1 or T2. The temperature range available depends on the size of the load to be cooled and therefore varies from system to system.

Two parameters («set point A» and «set point B») can be pre-defined in the parameters and easily changed at any time by the user. Parameters for regulating (PID) can also be adjusted and optimized during operation. The control accuracy of the system is ± 1 K.

System Overview



Operation by touchscreen



Main Screen

Temperature control		return
Set point	65.0 °K	_B
Actual value	58.5 °K	T_1
Control signal	0.0 %	
START	STOP	Menu
Pause	STOP	Menu

Temperature control screen

HSR pump set controller PCA700

All PCA... type pump set control units offered by HSR belong to a new product line of pump set controls designed to help you configure, control and monitor the management of entire pump sets (diffusion, cryogenic and turbo molecular pump sets) for coating systems or similar, all by yourself.

The internal process control of the unit independently monitors the vacuum operation and manages the required peripherals such as LN₂ supply, Polycold, or rapid regeneration and other accessories.

The compact pump set control unit detects up to four active measuring gauges of different manufacturers and controls all valves as well as one pre- and one high-vacuum pump. In addition, the pumping unit control sets facilitate the connection of all peripherals required for the operation of a diffusion, cryo or turbo molecular pump.

Several versatile digital and analog input and output signals enable the operation and monitoring of additional external components. The multiple connection options available make it possible to implement a broad variety of highly flexible vacuum configurations.

The control unit is operated via a large 5.7" LCD display with touch panel offering intuitive operator guidance by means of a modern configuration menu.

Seamless hardware connectivity using the existing RS-232 or Profibus interface makes the device a real alternative for the conventional memory-programmable control sets in the market.

The pump set control units can also serve as a cost efficient retrofit solution for modernizing existing control units of older design.



HSR PCA700 controllers are available in following configurations:

- **PCA700C:** pump set controller for pump sets equipped with **one cryogenic** pumps
- **PCA700D:** pump set controller for pump sets equipped with **one diffusion** pumps
- **PCA700T:** pump set controller for pump sets equipped with **one turbo molecular** pumps

Features and specifications

- Controller for pumping systems with high vacuum pumps of sizes DN063 up to DN1000
- Easy operation via touchscreen
- Status view and error indication
- Vacuum measurement gauges of most common makes and types can be used
- Complete surveillance and control of pump and regeneration sequences
- Menu-guided parameterization
- Programmable parameters
- Password-protected operator levels
- Outputs and surveillance for pre-vacuum valve, bypass valve, high-vacuum valve and pre-vacuum pump sets etc.
- All displays for vacuum pressure, temperatures, switching points and actual status can be seen on touchscreen
- Remote control and monitoring via digital inputs and outputs or RS-232
- Integrated power unit with maximal connecting power of 7 kW
- Electrical supply (controller) Voltage: 120–230 VAC 50/60Hz Consumption: appr. 350 VA Dimensions: Standard 19"
- Weight: appr. 14 kg

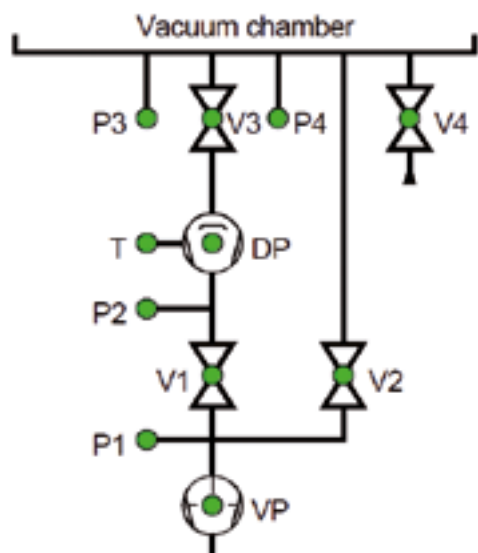
PCA700–Front side



PCA700–Back side



Legend



- P1 Pre-vacuum pressure (Pirani gauge)
- P2 Bypass pressure (Pirani gauge or Full-Range gauge)
- P3 Vacuum chamber pressure (Pirani gauge or Full-Range gauge)
- P4 Vacuum chamber pressure (Pinning gauge)
- V1 Pre-vacuum valve
- V2 Bypass valve
- V3 High-vacuum valve
- V4 Vent valve
- T Temperature measurement
- DP High-vacuum pump
- VP Roughing pump

	Features / Model	HCC100
	Number of connected cryo pumps	1
	Number of connected compressors	1
	Housing	Desktop
	Features / Model	HCC120
	Number of connected cryo pumps	1
	Number of connected compressors	1
	Housing	19" slot - 3HE / 42TE 3HE / 42TE
	Features / Model	HCC130
	Number of connected cryo pumps	1
	Number of connected compressors	max 3
	Housing	19" slot - 3HE / 42TE 3HE / 42TE
	Features / Model	HCC120-2 / HCC130-2
	Number of connected cryo pumps	2
	Number of connected compressors	see HCC120 and HCC130
	Housing	Rack 19" - 3HE / 84TE 3HE / 84TE
	Features / Model	HCC150
	Number of connected cryo pumps	1
	Number of connected compressors	max 5
	Housing	Rack 19" - 3HE / 84TE 3HE / 84TE
	Features / Model	HCC190
	Number of connected cryo pumps	1
	Number of connected compressors	1
	Housing	Rack 19" - 3HE / 84TE 3HE / 84TE
	Features / Model	PCA700D / C / T
	Number of connected pumps	1
	Number of connected compressors	1
	Housing	Rack 19" - 3HE / 84TE 3HE / 84TE

Order information HCC and PCA controllers

Standard cryo controllers HCC	Order number
Cryo controller HCC100	H101500
Cryo controller HCC120	H101521
Cryo controller HCC120-2	H101522
Cryo controller HCC130	H101531
Cryo controller HCC130-2	H101532
Cryo controller HCC 150	H101540

Standard delivery includes
Cryo controller
Main supply cable
Set of connectors

Accessories	Order number
Control box for connection of electrical accessories such as rough pump, fast regeneration devices, valves, purge gas inlet etc	H112070

Cryo controller HCC190	Order number
Cryo controller HCC 190	H101590

Standard delivery includes
Cryo controller
Main supply cable
Set of connectors

Accessories	Order number
Control box for connection of electrical accessories such as rough pump, fast regeneration devices, valves, purge gas inlet etc	H112070

Pump set controller PCA	Order number
Pump set controller PCA700D for diffusion pump	H260473
Pump set controller PCA700C for cryo pump	H260480
Pump set controller PCA700T for turbo pump	H260460

Standard delivery includes
Pump set controller

HSR diffusion pumps

Oil diffusion pumps can be used in many applications in the fields of vacuum and high-vacuum technology, for example in metallizing systems, metallurgical facilities, vacuum furnaces, laboratory pumping stations and many more. The proven and tested diffusion pump technology of former Balzers AG has been developed further by HSR AG since they took over this business area in 2003. In keeping with our standards, our customers can always expect the highest quality and performance from our products.

Features

- Pump range is available in nominal sizes from DN40 up to DN1000
- Air and water-cooled oil diffusion pumps are available in size DN40
- High volume flow rates without additional baffles
- Unlimited capacity when used as a so-called feeder pump
- Excellent pre-vacuum stability
- Continual self-cleaning of pump fluid in the purification zone
- Very long lifetime if regular preventive maintenance checks are made
- No wear on parts
- Not sensitive to entering particles

Product lines

Oil diffusion pumps – size DN040

The powerful HSR small diffusion pumps are available with either air or water-cooling. They have a three-stage jet system and a high vacuum flange DN040 ISO-KF. They are fitted with an integrated baffle as well as a thermal circuit breaker.

Features

- Integrated baffle
- 3-stage jet system
- Compact construction
- Available with air or water-cooling
- Thermal circuit breaker
- Ideal for all types of diffusion pump fluids

Oil diffusion pumps with integrated water cooled baffle—sizes DN63 to DN250

This product range has the significant characteristic of a visually non-transparent baffle integrated into the pump casing. The pump casings are made of non-rusting stainless steel and the interior jet system is made of pressed aluminium. A thermal circuit breaker built into the pump casing prevents overheating. The water-cooling circuit is composed of a rust-resistant steel tube fixed on the pump casing.

Features

- Compact design
- High pumping speed
- Integrated water-cooled baffle
- High vacuum stability due to integrated booster stage
- Pump body and adapter flange made of stainless steel
- Thermal circuit breaker
- Ideal for all types of diffusion pump fluids

Oil diffusion pumps with cold cap or baffle cap—sizes DN320 to DN1000

To meet the demands of different applications, HSR produces a range of larger, water-cooled diffusion pumps. This range of pumps possesses a volume flow rate of up to 50,000 l/sec and is particularly suitable for industrial high-vacuum applications.

The DN320 pump housing is made of stainless steel. The housings of DN400 to DN1000 are made of standard steel welded under inert gas. The jet systems are made of die-cast aluminium. Up to size DN630, the systems are three-stage while DN800 and DN1000 are four-stage. The design of the jet systems allows easily dismantling and reassembling for cleaning.

To minimize backstreaming of pump fluid, a cold cap has been integrated into all pumps from DN320 to DN1000. Furthermore, for all pumps with a nominal size of DN400 to DN1000, a so-called baffle cap version has been developed. The baffle cap is a combination of cold cap and water baffle which is mounted in the diffusion pump instead of a cold cap without an additional flange.

There is also a pre-vacuum baffle built into the pre-vacuum port which considerably reduces the consumption of pump fluid at high gas throughput. A further reduction of pump fluid consumption—especially on applications with high operating pressure ($> 10^{-4}$ mbar)—can be achieved by using of an additional HSR oil condenser, which can be installed in the pre-vacuum line as well (option).

Our proven heater device ensures excellent heat transfer, long lifetime, and high serviceability. The electrical connection is located in the cooled zone of the pump. The water cooling of pumps DN320 to DN500 consists of one cooling circuit; DN800 and DN1000 are equipped with two separate cooling circuits.

Rapid compressed air cooling reduces cooling times, which increases cost effectiveness.

Features

- Rugged and proven design
- Low ultimate pressure (depending on type of pump fluid)
- Integrated cold cap reduces oil backstreaming
- Available also with integrated baffle cap (see description below)
- High volume flow rate
- Low pump fluid consumption due to built-in vacuum baffle
- Ideal for all types of diffusion pump fluids

Oil diffusion pumps for special applications, such as magnetic fields

HSR also delivers especially designed diffusion pumps, which can be operated in very strong magnetic fields or in other tough operating conditions. Please ask our specialists for further information or support.

HSR ECO diffusion pumps

When the diffusion pumps we are still using today were developed 30 years ago, their economical and ecological impact was not a priority issue. In those days, all that mattered was to supply the pump with enough energy for achieving maximum stable performance. As a result, even today, a large portion of the energy consumed by the pump gets wasted unused.

Considering these facts, HSR AG has decided to thoroughly revise the existing heating system of their current products under the aspect of energy efficiency. The objective was to bring down operation costs and to fulfill today's ecological and environmental requirements.

During the design phase, the focus was on drastically reducing the consumption of energy while fully preserving the outstanding performance data of HSR's diffusion pumps.

Please refer to page 52 and 55 of this catalogue for more details

Accessories

Thermostatic cut-out switch

The thermostatic cut-out switch (option) signals any overheating of the diffusion pump to an external system controller and allows it to cut off the electrical power to the heaters.

Temperature sensor switch

The temperature sensor switch (option) is used in combination with a pump set controller. It signals to the pump set controller that the pump has reached its normal operating temperature. Depending on the pump fluid used, the operating temperature on the mounting base is between 180° C and 220° C.

Automatic pump fluid refilling device

This device allows replenishing of pump fluid in process applications with a high gas throughput. The refilling can be done while the pump is in operation. A visual level control is shown on the sight glass.

Guide rollers for easy movement of diffusion pumps

Big size diffusion pumps DN400 up to DN1000 can be equipped with guide rollers which allow easy movement of those pumps during maintenance work and repair work.

Advantages of HSR diffusion pump technology

- Outstanding stability in high pressure ranges (up to 10^{-02} mbar)
- Excellent stability with high gas loads
- Low ultimate pressure
- Integrated cold cap reduces oil back streaming
- Low heating power required
- Suitable for all available pump fluid types
- Low pump fluid consumption due to built-in fore vacuum baffle
- Long lifetime of heaters
- Low construction height
- High quality products
- Easy exchange of heaters (electrical connection located in cold zone)
- Fast delivery times
- Cost saving ECO diffusion pumps available
- Upgrade kits for ECO version for standard diffusion pumps available



Diffusion pumps air/water-cooled

Technical Data / Model	PDB040-G		PDB040-W	
Order number	260-002		260-012	
Inlet flange	DN40 ISO-KF		DN40 ISO-KF	
Foreline flange	DN10 ISO-KF		DN10 ISO-KF	
Seal inlet and foreline flange included in delivery				
Cooling	Air		water	
High vacuum pumping speed at inlet flange	Values measured according PNEUROP, see page 7 for details			
Nitrogen/Air	l/sec	30		30
Maximal throughput	mbar l/sec	0.2		0.2
Fore vacuum stability at max throughput	mbar	0.3		0.3
Pump fluid charge, min/max	cm³	10/15		10/15
Heating/cooling time	min	10/6		10/10
Thermostatic cut-out		–		yes
Cooling water consumption at water temperature 18 °C	l/h	–		15
Recommended pumping speed roughing pump at max throughput	m³/h	3		3
Power consumption	W	200 including fan power		170
Weight	kg	3		1,5

Standard delivery includes

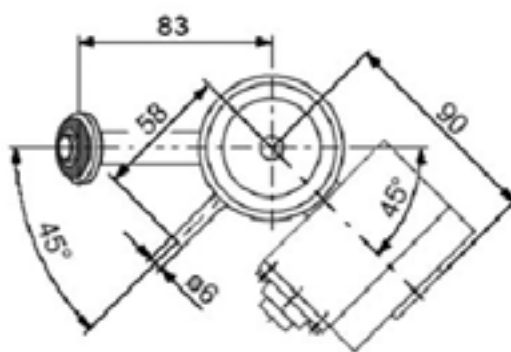
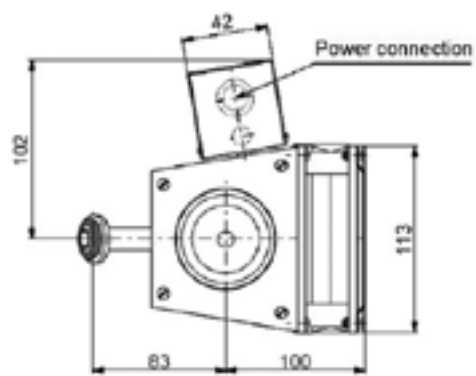
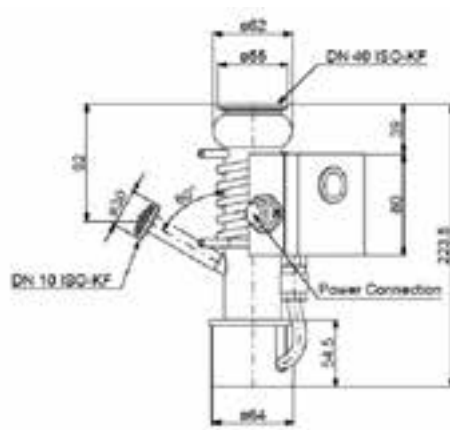
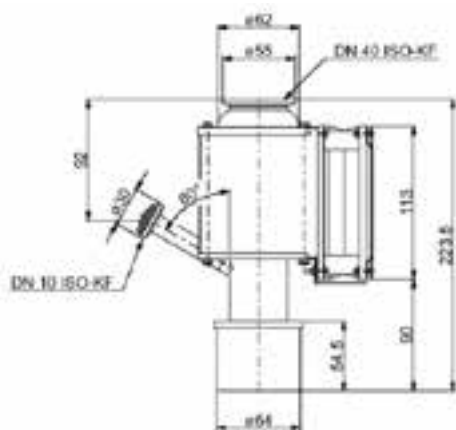
Diffusion pump

O-ring for inlet flange and rough pump connecting flange

No pump fluid included in standard delivery. Please see page 64 for available pump fluids.

Spare parts

Seal set	BN841151-T	BN841151-T
Heating plate 230V	H001529	H001529



Diffusion pump with integrated water baffle

Technical Data / Model	PDI063-W	PDI100-W	PDI160-W	PDI250-W	
Order number	260-022	260-032	260-042	260-052	
Inlet flange	DN63 ISO-K	DN100 ISO-K	DN160 ISO-K	DN250 ISO-K	
Foreline flange	DN16 ISO-KF	DN25 ISO-KF	DN25 ISO-KF	DN40 ISO-KF	
Diffusion pump					
230 V	260-022	260-032	260-042	260-052	
115 V	260-023	260-033	260-043		
Cooling	Water	Water	Water	Water	
High vacuum pumping speed at inlet flange	Values measured according PNEUROP, see page 7 for details				
Nitrogen / Air	l / sec	190	380	800	2 200
Maximal throughput	mbar l / sec	0.5	1	2	4
Fore vacuum stability at max throughput	mbar	0.5	0.5	0.5	0.45
Pump fluid charge, min / max	cm³	50 / 70	80 / 120	150 / 300	450 / 1000
Heating / cooling time	min	10 / 20	12 / 24	15 / 30	25 / 55
Minimal cooling water requ. at 18° C inlet temp.	l / h	25	42	80	160
Recommended pump speed for roughing pump at max. throughput	m³ / h	5	10	20	40
Power consumption	W	400	650	1 275	2 600
Weight	kg	4	8,5	14,5	30

Standard delivery includes

Diffusion pump

Thermostatic cut-out switch

O-ring for inlet flange and rough pump connecting flange

No pump fluid included in standard delivery. Please see page 64 for available pump fluids.

Spare parts

	BN841180-T	BN841181-T	BN841182-T	BN841193-T
Seal set				
Heating ring 230 V	B5170218QG	B5170028QG	B5170004QG + B5170057QG	B5170038QG + B5170089QG
115 V	B5170217QG	B5170027QG	B5170003QG + B5170056QG	— —

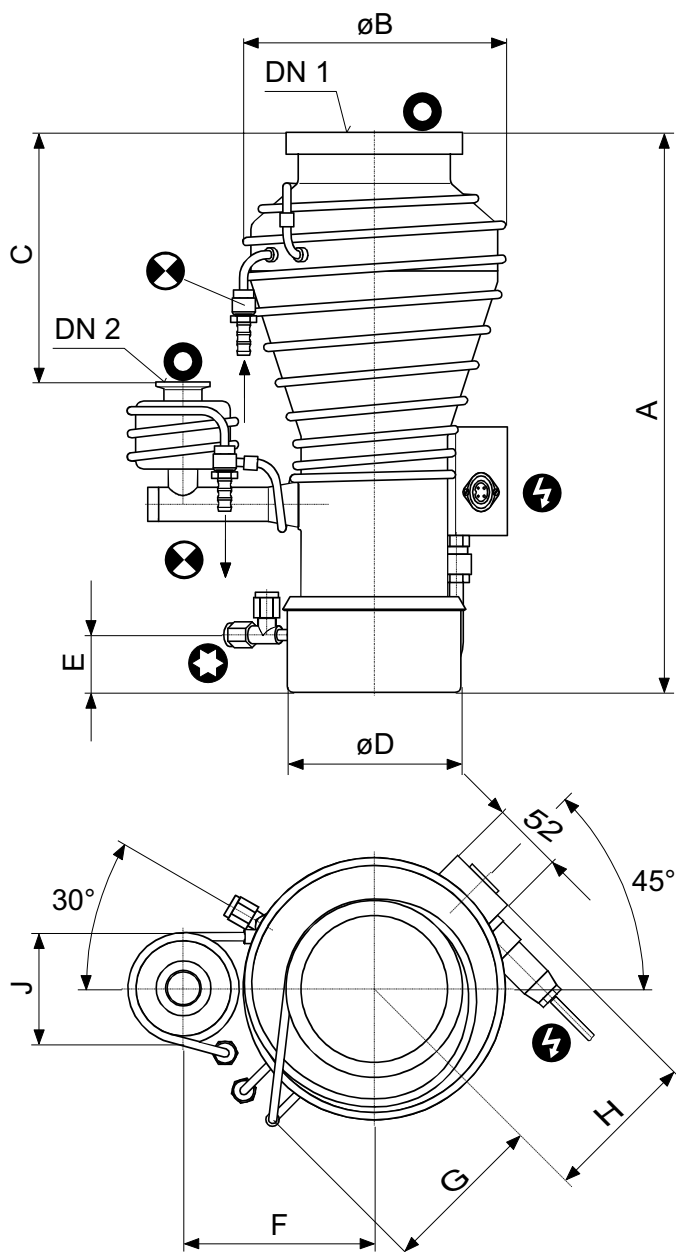
Accessories

	216-058	216-058	216-058	216-058
Thermal switch				
Cooling water monitor without fittings	216-059	216-060	216-060	B4747111SE
Orifice for flow monitor	—	—	—	B4747308SE

PDI063-W**PDI100-W****PDI160-W****PDI250-W**

Dimensions

	mm			
A	360	412	570	690
B \varnothing	150	194	290	450
C \varnothing	100	128	172	272
D	169	184	269	330
E	46	42	53	60
F	72	82	106	150
G	115	145	192	295
H	101	120	185	—
J	120	135	160	212



- | | | | |
|--|------------------------------------|--|--|
| | Kühlwasseranschluss | | Cooling water connection |
| | Vakuumanchluss | | Vacuum connection |
| | Betriebsmittelkontrolle und Ablass | | Pump fluid filler control port and drain |
| | Elektrischer Anschluss | | Power connection |

	DN1	DN2	A	$\varnothing B$	C	$\varnothing D$	E	F	G	H	J	
PDI063-W	DN 63 ISO-K	DN 16 ISO-KF	360	150	169	100	46	115	101	120	72	$\varnothing 10 / G \frac{1}{4}''$
PDI100-W	DN 100 ISO-K	DN 25 ISO-KF	412	194	184	128	42	145	120	135	82	$\varnothing 10 / G \frac{1}{4}''$
PDI160-W	DN 160 ISO-K	DN 25 ISO-KF	570	290	269	172	53	192	185	160	106	$\varnothing 10 / G \frac{1}{4}''$
PDI250-W	DN 250 ISO-K	DN 40 ISO-KF	690	450	330	272	60	295	265	212	150	$\varnothing 10 / G \frac{1}{4}''$

Diffusion pumps under the aspect of economy and ecology

When the diffusion pumps we are still using today were developed 30 years ago, their economical and ecological impact was not a priority issue.

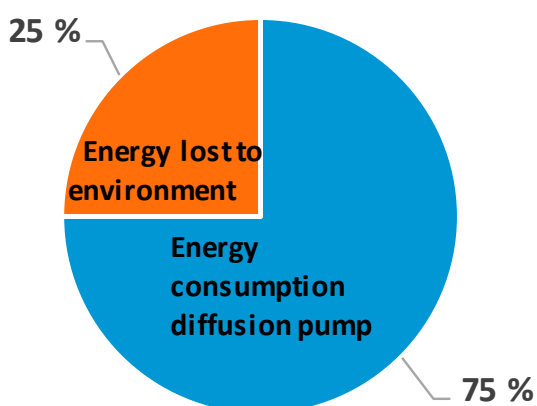
In those days, all that mattered was to supply the pump with enough energy for achieving maximum stable performance. As a result, even today, a large portion of the energy consumed by the pump gets wasted and is unused.

Considering these facts, HSR AG has decided to thoroughly revise the existing heating system of their current products under the aspect of energy efficiency. The objective was to bring down operation costs and to fulfill today's ecological and environmental requirements.

During the design phase, the focus was on drastically reducing the consumption of energy while fully preserving the outstanding performance data of HSR's diffusion pumps.

It has, however, become evident that such energy-saving modifications cannot be transferred from one type of pump to another on a one-to-one basis. Instead, the specific solution and the resulting energy consumption must be determined separately for each type of pump. The data shown in the present description are those of a HSR Typ PDA631-W diffusion pump. However, they also apply – by and large – to the other HSR diffusion pumps of sizes between DN320 and DN1000.

Detailed laboratory tests and measurements have shown that the amount of energy lost during the operation of any of the mentioned diffusion pumps is about 25 %.



By introducing two technical modifications the energy consumption of type ECO PDA631-W diffusion pump has been reduced by 45 %

The total amount of energy saved is made up as follows:

- a) The yellow sector represents possible savings during regular operation of the diffusion pump amounting to at least **20 %**
- b) The green sector represents possible savings in standby mode of another **25 %**

Saving energy during regular operation

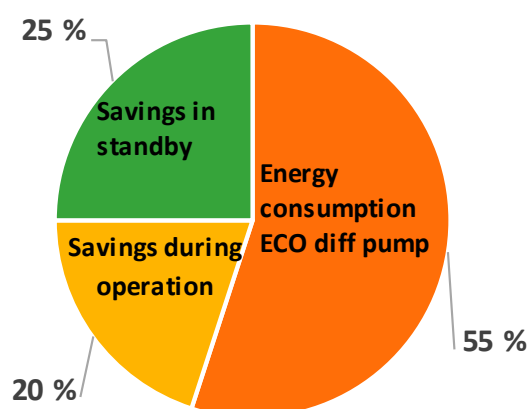
By introducing a technical modification to the heating system and using a special new insulation, the energy consumption of type ECO PDA631-W diffusion pump has been reduced by more than 20 % while fully preserving the performance of the diffusion pump. Additionally, the surface temperature of the pump body is almost down to ambient temperature.

Saving energy in standby mode

Diffusion pumps are often kept in operation for longer periods without any processes running (e.g. for extremely long charging times, overnight or during weekends). Obviously, during such periods, it is not necessary to operate the diffusion pump at full capacity.

An additional technical modification for standby mode (operation of the pump with the high-vacuum valve shut or without gas load) brings down the power consumption of the diffusion pump by another 25-30 %, which results in another considerable reduction of the operation costs.

Interested? Please feel free to contact us for more detailed information.



ECO Diffusion pumps with COLD CAP

Diffusion pumps are used for classical industrial and other high vacuum applications. Our ECO diffusion pumps are equipped with a cold cap which requires an additional cooled baffle on top to prevent oil backstreaming.

In addition to known advantages of HSR standard diffusion pumps, our ECO diffusion pumps provide following features

- Energy cost savings of up to **45 %** made up of
- Operation cost savings of up to **20 %**
- Stand-by cost savings of up to **25 %**

Same performance and pump speed, capacity as standard HSR diffusion pump model of same size

For further advantages of HSR diffusion pumps, please refer to page 56



Technical Data/Model		PDA320-ECO	PDA501-ECO	PDA631-ECO
Order number		H260107	H260109	H260110
Inlet flange		DN320 ISO-K	DN500 ISO-K	DN630 ISO-K
Foreline flange		DN63 ISO-K	DN100 ISO-K	DN100 ISO-K
Cooling		Water	Water	Water
High vacuum pumping speed at inlet flange		values measured according PNEUROP, see page 7 for details		
Nitrogen/Air	l/sec	5 200	12 000	20 000
Maximal throughput	mbar l/sec	8	16	18
Fore vacuum stability at max throughput	mbar	0.45	0.45	0.45
Pump fluid charge, min / max	cm³	1 200/1 800	3 000/5 000	6 000/8 000
Heating / cooling time	min	17/50	25/80	50/90
Minimal cooling water requ. at 18° C inlet temp.	l/h	300	470	710
Recommended pump speed for roughing pump at max. throughput	m³/h	80	160	200
Main supply		3 x 340/3 x 230 V	3 x 340/3 x 230 V	3 x 340/3 x 230 V
Power consumption operation	kW	3.6	5.8	8.4
Power consumption stand-by	kW	2.4 (minimal)	4 (minimal)	5.8 (minimal)
Weight	kg	58	183	254

Standard delivery includes

Diffusion pump

No pump fluid included in standard delivery. Please see page 64/65 for available pump fluids.

O-ring for inlet flange and rough pump connecting flange

Accessories

Pump fluid replenishing device	216-061	216-061	216-061
Temperature switch	216-056	216-056	216-056
Thermostatic cut-out	216-057	216-057	216-057
Flow monitor	B4747111SE	B4747111SE	B4747111SE
Orifice for flow monitor	B4747308SE	B4747311SE	B4747311SE

ECO Retrofits for standard HSR diffusion pumps

ECO retrofit kits are used to upgrade standard HSR diffusion pumps to the economical, cost saving ECO version. Kits include all needed components and allow an easy and fast retrofit directly on customer site.

Modification kit is mandatory, stand-by kit is optional. Stand-by kit can only be used if modification kit is installed! Please contact us for further detailed information.

ECO Diffusion pumps with BAFFLE CAP

The so-called baffle cap version can be used for applications with high working pressure and high gas loads $> 1.0 \times 10^{-4}$ mbar, where minimal oil backstreaming is acceptable.

The baffle cap is installed at the same position as a cold cap and it allows to operate the diffusion pump without any additional water baffle.

A baffle cap decreases pump speed by only 20 % compared to a water baffle which will reduce it by approx. 50 %.

The baffle cap is fully integrated into the diffusion pump and the diffusion pump therefore requires less installation height.



Technical Data / Model		PDB501-ECO	PDB631-ECO
Order number		H260116	H260117
Inlet flange		DN500 ISO-K	DN630 ISO-K
Foreline flange		DN100 ISO-K	DN160 ISO-K
Cooling		Water	Water
High vacuum pumping speed at inlet flange		values measured according PNEUROP, see page 7 for details	
Nitrogen/Air	l/sec	8 500	16 000
Maximal throughput	mbar l/sec	16	18
Fore vacuum stability at max throughput	mbar	0.45	0.4
Pump fluid charge, min/max	cm³	3 000/5 000	6 000/8 000
Heating/cooling time	min	25/80	50/90
Minimal cooling water requ. at 18° C inlet temp.	l/h	470	710
Recommended pump speed for roughing pump at max. throughput	m³/h	160	200
Main supply		3 x 340/230 V	3 x 340/230 V
Power consumption operation	kW	5.8	8.4
Power consumption stand-by	kW	4 (minimal)	5.8 (minimal)
Weight	kg	191	264

Standard delivery includes

Diffusion pump
O-ring for inlet flange and rough pump connecting flange

No pump fluid included in standard delivery. Please see page 64/65 for available pump fluids.

Accessories

Pump fluid replenishing device	216-061	216-061
Temperature switch	216-056	216-056
Thermostatic cut-out	216-057	216-057
Flow monitor	B4747111SE	B4747111SE
Orifice for flow monitor	B4747326SE	B4747326SE

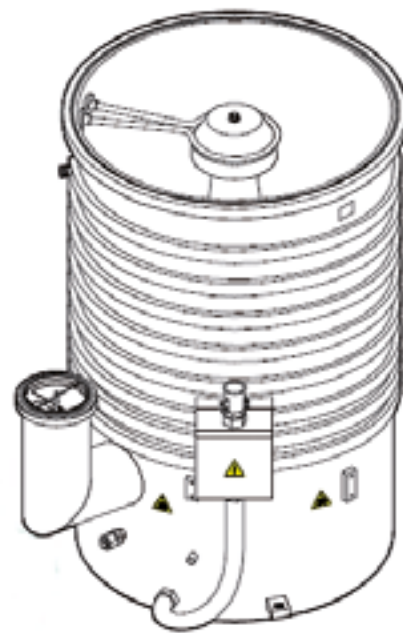
ECO Retrofits for standard HSR diffusion pumps

Order Information	PDA320-W	PDA/PDB501-W	PDA/PDB631-W
Modification kit (mandatory)	H009286	H009288	H009289
Stand-by kit (optional)	H019286	H019292	H019293

Standard diffusion pumps with COLD CAP

Diffusion pumps are used for classical industrial and other high vacuum applications. Our standard diffusion pumps are equipped with a cold cap which requires an additional cooled baffle on top to prevent oil backstreaming.

- Rugged and proven design
- Low ultimate pressure (depending on type of pump fluid)
- Integrated cold cap reduces oil back-streaming
- High volume flow rate without baffle
- High chemical stability using appropriate fluids
- Not sensitive to entering of particles
- Unlimited capacity as so-called feeder pump
- Low pump fluid consumption due to built-in for vacuum baffle
- Ideal for all types of diffusion pump fluids
- Parts not subject to wear
- Very long lifetime with regular preventive maintenance checks



Technical Data / Model		PDA320-W	PDA400-W	PDA501-W
Order number		260-071	260-081	260-090
Inlet flange		DN320 ISO-K	DN400 ISO-K	DN500 ISO-K
Foreline flange		DN63 ISO-K	DN100 ISO-K	DN100 ISO-K
Cooling		Water	Water	Water
High vacuum pumping speed at inlet flange		values measured according PNEUROP, see page 7 for details		
Nitrogen/Air	l/sec	5 200	8 000	12 000
Maximal throughput	mbar l/sec	8	13	16
Fore vacuum stability at max throughput	mbar	0.45	0.45	0.45
Pump fluid charge, min/max	cm³	1 200/1 800	2 000/3 000	3 000/5 000
Heating/cooling time	min	17/50	28/50	25/80
Minimal cooling water requ. at 18° C inlet temp.	l/h	300	370	470
Recommended pump speed for roughing pump at max. throughput	m³/h	80	130	160
Main supply		3 x 400/3 x 230 V	3 x 400/3 x 230 V	3 x 400/3 x 230 V
Power consumption	kW	4.4	5.4	7.2
Weight	kg	55	75	180

Standard delivery includes

Diffusion pump

No pump fluid included in standard delivery. Please see page 64/65 for available pump fluids.

O-ring for inlet flange and rough pump connecting flange

Spare parts

Seal set	BN841071-T	BN841070-T	203-000
Heating plate 3 x 400 V/3 x 230 V	BP336740-T	3 x BP336529-T	3 x BP336536-T

Accessories

Pump fluid replenishing device	216-061	216-061	216-061
Temperature switch	216-056	216-056	216-056
Thermostatic cut-out	216-057	216-057	216-057
Flow monitor	B4747111SE	B4747111SE	B4747111SE
Orifice for flow monitor	B4747308SE	B4747311SE	B4747311SE
Guide roller (3 sets)		H001057	H001050

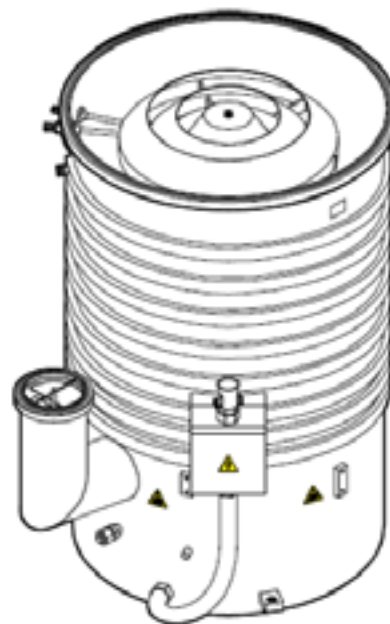
Standard diffusion pumps with BAFFLE CAP

The so-called baffle cap version can be used for applications with high working pressure and high gas loads $> 1.0 \times 10^{-4}$ mbar, where minimal oil backstreaming is acceptable.

The baffle cap is installed at the same position as a cold cap and it allows to operate the diffusion pump without any additional water baffle.

A baffle cap decreases pump speed by only 20% compared to a water baffle which will reduce it by approx. 50%.

The baffle cap is fully integrated into the diffusion pump and the diffusion pump therefore requires less installation height.



Technical Data / Model		PDB400-W	PDB501-W	PDB631-W
Order number		260-080	260-091	260-105
Inlet flange		DN400 ISO-K	DN500 ISO-K	DN630 ISO-K
Foreline flange		DN100 ISO-K	DN100 ISO-K	DN160 ISO-K
Cooling		Water	Water	Water
High vacuum pumping speed at inlet flange		values measured according PNEUROP, see page 7 for details		
Nitrogen / Air	l/sec	5 300	8 500	16 000
Maximal throughput	mbar l/sec	13	16	18
Fore vacuum stability at max throughput	mbar	0.45	0.45	0.4
Pump fluid charge, min / max	cm³	2 000 / 3 000	3 000 / 5 000	6 000 / 8 000
Heating / cooling time	min	28 / 50	25 / 80	50 / 90
Minimal cooling water requ. at 18° C inlet temp.	l/h	370	470	710
Recommended pump speed for roughing pump at max. throughput	m³/h	130	160	200
Main supply		3 x 400 / 230 V	3 x 400 / 230 V	3 x 400 / 230 V
Power consumption	kW	5.4	7.2	10.5
Weight	kg	81	188	260

Standard delivery includes

Diffusion pump

No pump fluid included in standard delivery. Please see page 64/65 for available pump fluids.

O-ring for inlet flange and rough pump connecting flange

Spare parts

Seal set	BN841070-T	203-000	203-009
Heating plate 3 x 400 V / 3 x 230 V	3 x BP336529-T	3 x BP336536-T	7 x BP336542-T

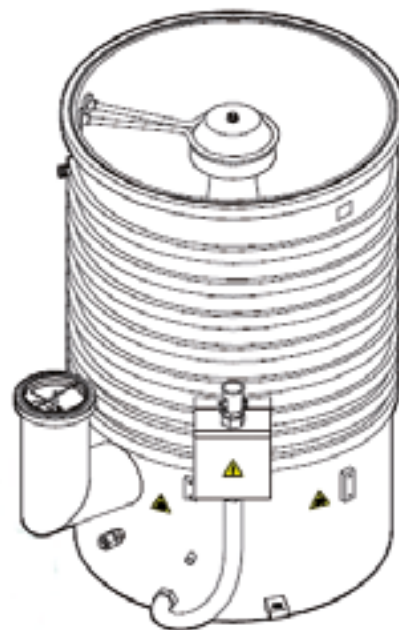
Accessories

Pump fluid replenishing device	216-061	216-061	216-061
Temperature switch	216-056	216-056	216-056
Thermostatic cut-out	216-057	216-057	216-057
Flow monitor	B4747111SE	B4747111SE	B4747111SE
Orifice for flow monitor	B4747311SE	B4747311SE	B4747311SE
Guide roller (3 sets)	H001057	H001050	H001050

Diffusion pumps with COLD CAP

Diffusion pumps are used for classical industrial and other high vacuum applications. Our standard diffusion pumps are equipped with a cold cap which requires an additional cooled baffle on top to prevent oil backstreaming.

- Rugged and proven design
- Low ultimate pressure (depending on type of pump fluid)
- Integrated cold cap reduces oil back-streaming
- High volume flow rate without baffle
- High chemical stability using appropriate fluids
- Not sensitive to entering of particles
- Unlimited capacity as so-called feeder pump
- Low pump fluid consumption due to built-in forvacuum baffle
- Ideal for all types of diffusion pump fluids
- Parts not subject to wear
- Very long lifetime with regular preventive maintenance checks



Technical Data / Model		PDA631-W	PDA800-W	PDA999-W
Order number		260-100	260-111	260-121
Inlet flange		DN630 ISO-K	DN800 ISO-F	DN1000 ISO-F
Foreline flange		DN160 ISO-K	DN160 ISO-K	DN160 ISO-K
Cooling		Water	Water	Water
High vacuum pumping speed at inlet flange		values measured according PNEUROP, see page 7 for details		
Nitrogen / Air	l/sec	20 000	30 000	50 000
Maximal throughput	mbar l/sec	18	26	34
Fore vacuum stability at max throughput	mbar	0.4	0.35	0.35
Pump fluid charge, min / max	cm³	6 000 / 8 000	7 000 / 13 000	16 000 / 24 000
Heating / cooling time	min	50 / 90	50 / 100	45 / 200
Minimal cooling water requ. at 18° C inlet temp.	l/h	710	950	1000
Recommended pump speed for roughing pump at max. throughput	m³/h	200	320	420
Main supply		3 x 400 / 3 x 230 V	3 x 400 / 3 x 230 V	3 x 400 / 3 x 230 V
Power consumption	kW	10.5	17.4	25.2
Weight	kg	250	480	700

Standard delivery includes

Diffusion pump

No pump fluid included in standard delivery. Please see page 64/65 for available pump fluids.

O-ring for inlet flange and rough pump connecting flange

Spare parts

Seal set	203-009	BN841236-T	BN841237-T
Heating plate 3 x 400 V / 3 x 230 V	7 x BP336542-T —	1 x BP336233-T 6 x BP336252-T	7 x BP336233-T —

Accessories

Pump fluid replenishing device	216-061	216-061	216-061
Temperature switch	216-056	216-056	216-056
Thermostatic cut-out	216-057	216-057	216-057
Flow monitor	B4747111SE	B4747111SE	B4747111SE
Orifice for flow monitor	B4747311SE	B4747326SE	B4747326SE
Guide roller (3 sets)	H001050	H001057	H001057

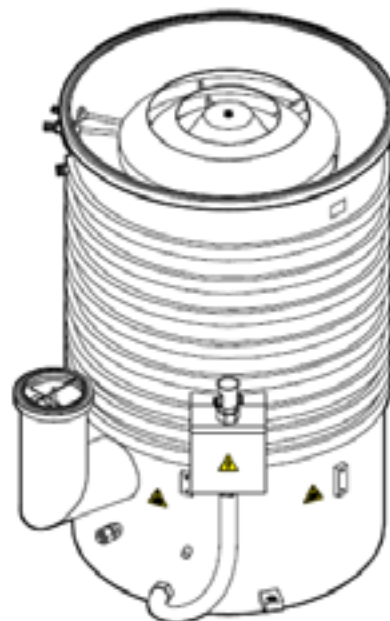
Diffusion pumps with BAFFLE CAP

The so-called baffle cap version can be used for applications with high working pressure and high gas loads $> 1.0 \times 10^{-4}$ mbar, where minimal oil backstreaming is acceptable.

The baffle cap is installed at the same position as a cold cap and it allows to operate the diffusion pump without any additional water baffle.

A baffle cap decreases pump speed by only 20% compared to a water baffle which will reduce it by approx. 50%.

The baffle cap is fully integrated into the diffusion pump and the diffusion pump therefore requires less installation height.



Technical Data / Model	PDB800-W	PDB999-W
Order number	260-116	260-126
Inlet flange	DN800 ISO-F	DN1000 ISO-F
Foreline flange	DN160 ISO-K	DN160 ISO-K
Cooling	Water	Water
High vacuum pumping speed at inlet flange	values measured according PNEUROP, see page 7 for details	
Nitrogen / Air	l/sec	
	26 000	40 000
Maximal throughput	mbar l/sec	
	26	34
Fore vacuum stability at max throughput	mbar	
	0.35	0.35
Pump fluid charge, min/max	cm³	
	7 000/13 000	16 000/24 000
Heating/cooling time	min	
	50/100	45/200
Minimal cooling water requ. at 18°C inlet temp.	l/h	
	950	1000
Recommended pump speed for roughing pump at max. throughput	m³/h	
	320	420
Main supply	3 x 400/3 x 230 V	3 x 400/3 x 230 V
Power consumption	kW	
	17.4	25.2
Weight	kg	
	480	700

Standard delivery includes

Diffusion pump

No pump fluid included in standard delivery. Please see page 64/65 for available pump fluids.

O-ring for inlet flange and rough pump connecting flange

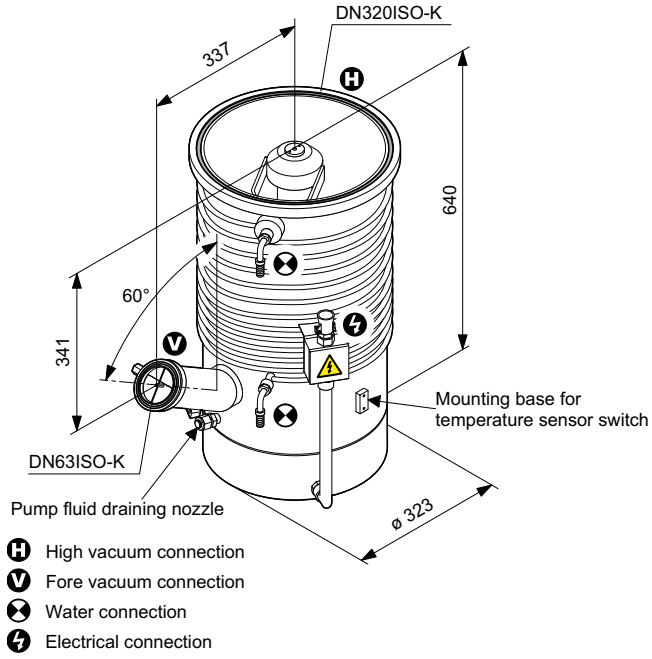
Spare parts

Spare parts	BN841236-T	BN841237-T
Seal set		
Heating plate 3 x 400 V / 3 x 230 V	1 x BP336233-T + 6 x BP336252-T	7 x BP336233-T —

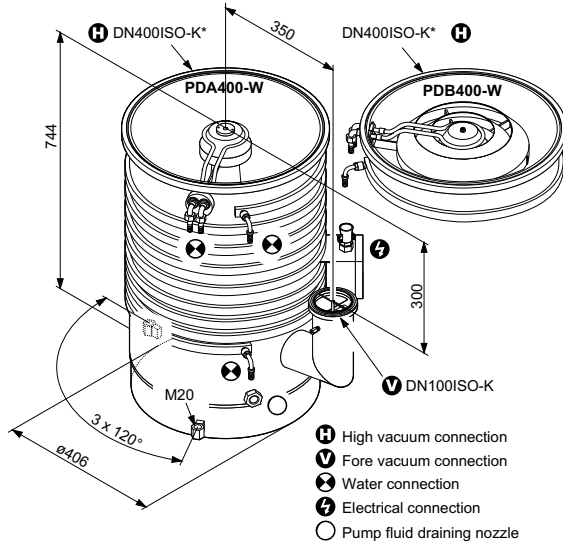
Accessories

Accessories	216-061	216-061
Pump fluid replenishing device		
Temperature switch	216-056	216-056
Thermostatic cut-out	216-057	216-057
Flow monitor	B4747111SE	B4747111SE
Orifice for flow monitor	B4747326SE	B4747326SE
Guide roller (3 sets)	H001057	H001057

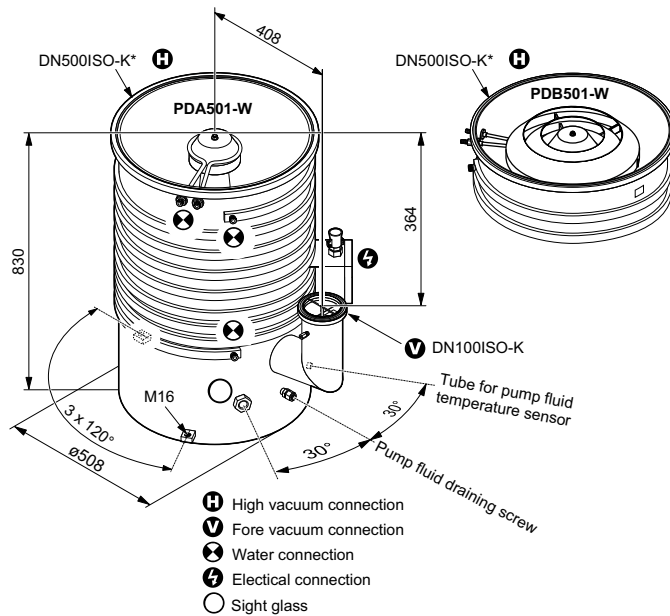
PDA320-W



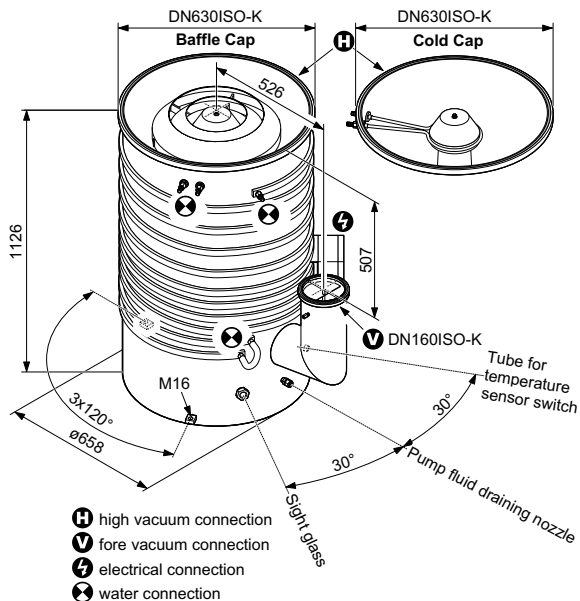
PDA400-W



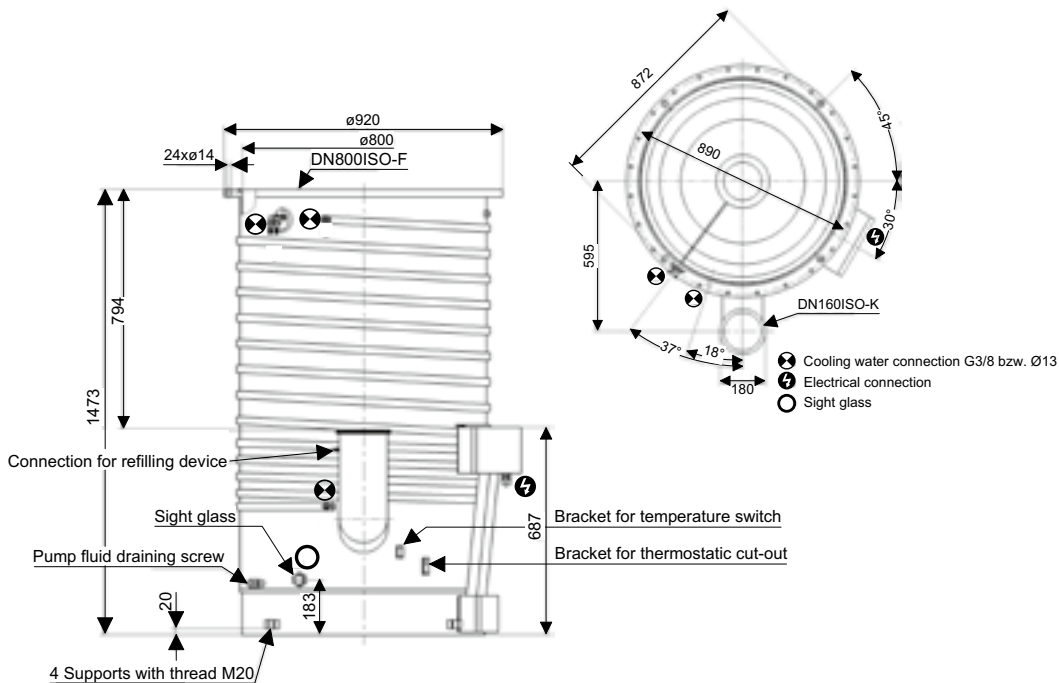
PDA501-W



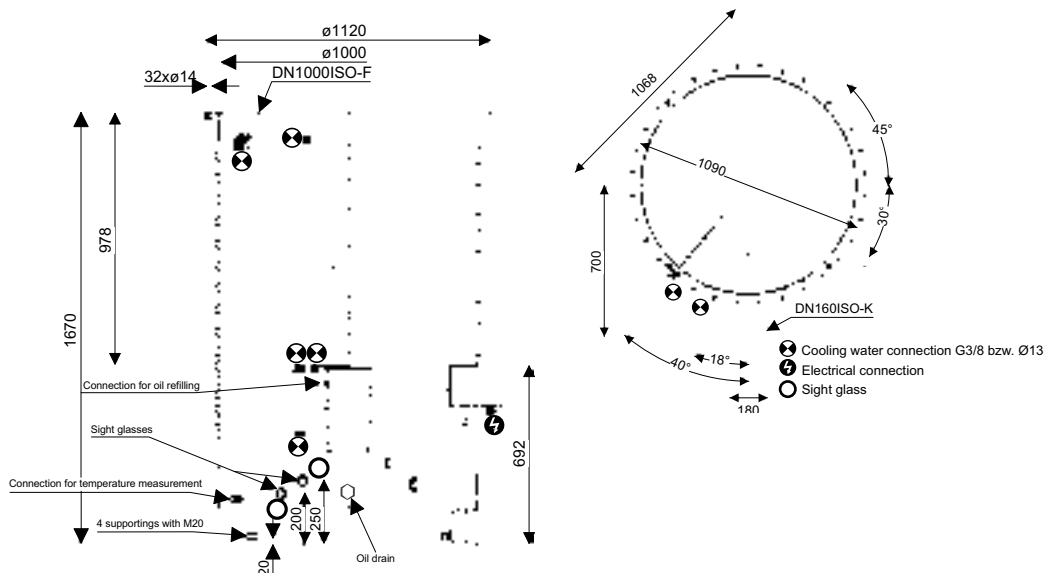
PDA631-W



PDA800-W



PDA999-W



Diffusion pumps for high magnetic fields

For a special project, HSR has modified and developed a new line of diffusion pumps which can be used in high magnetic field strengths above 1.5 Tesla.

These highly sophisticated high-vacuum pumps are made of selected materials and include a newly developed heater type that can be operated within strong magnetic fields.

Please contact us for further information regarding available sizes and types.



Diffusion pump sets

HSR provides complete pump sets, either manually controlled or fully automatic with pump set controller **PCA700D**. Pump sets can be modified according to customer needs; they are available with or without rack, pre-vacuum pump and vacuum measurement gauges.

Diffusion pump set without rack



Diffusion pump set mounted on customized rack



Fully automatic diffusion pump set including controller PCA700D



Diffusion pumpset with manual control valves



Pump fluids for diffusion pumps

HSR pump fluids are widely used in high-vacuum diffusion pumps for optical coating applications, electronics industry, metallurgical industry, instrument manufacturing industry, R&D and other high vacuum applications.

Selection Data		Mineral oil	Silicon oil	Silicon oil	Pentaphenylether
Name		66A	HSR704EU	HSR705	Santovac 5
Vapour pressure at 20° C	mbar	4E 10 ⁻⁰⁸	2E 10 ⁻⁰⁸	3E 10 ⁻⁰⁹	1E 10 ⁻¹⁰
Resistance					
Chemical		good	better	better	very good
Oxidation		good	better	better	very good
Thermal		good	better	better	very good
Technical Data/Type		Mineral oil	Silicon oil	Silicon oil	Pentaphenylether
Name		66A	HSR704EU	HSR705	Santovac 5
Vapour pressure at 20° C	mbar	4E 10 ⁻⁰⁸	2E 10 ⁻⁰⁸	3E 10 ⁻⁰⁹	1E 10 ⁻¹⁰
Viscosity at	mm²/s				
20° C		25	–	–	–
25° C		–	39	175	1 000
70° C		–	–	–	12
100° C		–	–	–	12
Preferred pressure range	mbar	5E ⁻⁰⁷ - 10 ⁻⁰³	10 ⁻⁰⁷ - 10 ⁻⁰³	10 ⁻⁰⁸ - 10 ⁻⁰⁵	10 ⁻⁰⁸ - 10 ⁻⁰³
Ultimate pressure with	mbar				
LN ₂ cooling		<6E 10 ⁻⁰⁹	<6E 10 ⁻⁰⁹	<6E 10 ⁻⁰⁹	<6E 10 ⁻⁰⁹
Refrigerator cooling -20° C		<6E 10 ⁻⁰⁸	<3E 10 ⁻⁰⁸	<3E 10 ⁻⁰⁸	<3E 10 ⁻⁰⁸
Water cooling 20° C		<4E 10 ⁻⁰⁷	<6E 10 ⁻⁰⁸	<3E 10 ⁻⁰⁸	<3E 10 ⁻⁰⁸
Air cooling 25° C		<1E 10 ⁻⁰⁶	<5E 10 ⁻⁰⁷	<2E 10 ⁻⁰⁷	<2E 10 ⁻⁰⁷
Order information		66 A	HSR704EU	HSR705	Santovac 5
500 cm ³		260-390	H271704	H267705	B0480559
1000 cm ³			H272704	H262705	
2000 cm ³			H273704	H263705	
2500 cm ³		260-393			
3000 cm ³			H274704	H264705	
5000 cm ³		260-392	H275704	H265705	

Attainable ultimate pressure: The ultimate pressures indicated in the table can be attained with correct conditioning of the high vacuum pumping system. They refer to blanked-off groups of pumps with an appropriate pumping fluid baffle combination. The ultimate pressure values shown may be decreased if the gas sources are further reduced.

Mineral oil:

66A is a high quality, low cost mineral oil for diffusion pumps which is used in a wide range of high vacuum - industrial applications. Attainable ultimate pressure can reach $<10^{-6}$ (untrapped) and low 10^{-8} mbar (trapped).

Silicone oil:

Silicone oils are extremely resistant against decomposition. Due to its low vapour pressure, silicone oils are especially well suited as pump fluids in diffusion pumps and combine very good pumping characteristics together with low backstreaming rates.

HSR704EU is a single-component, high-vacuum diffusion pump fluid. It is characterized by excellent high temperature stability and a good oxidation and radiation resistance. Its saturation vapour pressure is very low at room temperature, but changes sharply with the variation of temperature. Depending on the cooling temperature, attainable ultimate pressure can reach 10^{-7} to 10^{-9} mbar.

HSR704EU is an adequate substitute of Dow Corning DC704 pump fluid.

HSR705 is a colourless to straw-coloured, single-component, high vacuum diffusion pump fluid for ultra-high vacuum applications. It is characterized by a very low vapour pressure and back streaming rate, which makes the use of traps or refrigeration unnecessary for some ultra-high and ultra-clean vacuum applications. It also has the highest phenyl content of all silicone diffusion pump fluids and the best resistance to radiation. Attainable ultimate pressure can reach 10^{-9} to 10^{-10} mbar (untrapped) and 10^{-11} mbar (trapped).

Pentaphenylether:

Santovac 5 is a high-quality pump fluid based on a pentaphenylether for operation in the high and ultra high vacuum range. It excels through its very high resistance against oxidation, thermal decomposition and chemical attack and exhibits an exceptionally low vapour pressure.



Diffusion pump accessories

Thermal switch PDI063-W to PDI250-W

Order number 216-058

- For interlocking or controlling the pumping system peripheral equipment
- Sends signal «diffusion pump ready» to system control
- Relay contact closes as soon as operating temperature is reached
- Fixed switching point at 70°C (pump sizes PDI063–250-W)



PDI063 to PDI250-W

Thermal switch PDA320-W to PDA /PDB999-W

Order number 216-056

- For interlocking or controlling the pumping system peripheral equipment (pump sizes PDA320–1000-W PDB400–1000-W)
- Sends signal «diffusion pump ready» to system control
- Relay contact closes as soon as operating temperature is reached
- Adjustable switching point 45 - 180°C ±5
- Switching difference 15°C



PDA320-W to PDA1000-W
PDB400-W to PDB1000-W

Thermostatic cut-out switch

Order number 216-057

- Protection against overheating diffusion pump (pump sizes PDA320–1000-W и PDB400–1000-W)
- Cut out main supply for diffusion pump
- Manual resetting
- Cut-off temperature 190°C
- Maximal current 10 A
- Opens at rising temperature 2 x M 4
- Weight 225 g

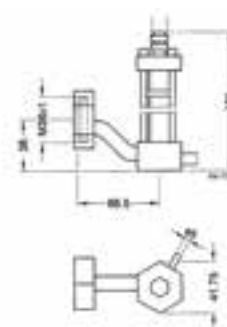


PDA320-W to PDA1000-W
PDB400-W to PDB1000-W

Pump fluid replenishing device

Order number 216-061

- For replenishing pump fluid in processes with high gas through-put
- Refilling can be done while pump is in operation
- Visual level control on the glass tube
- Easy installation
- Lowers operating costs



Flow monitor for cooling water

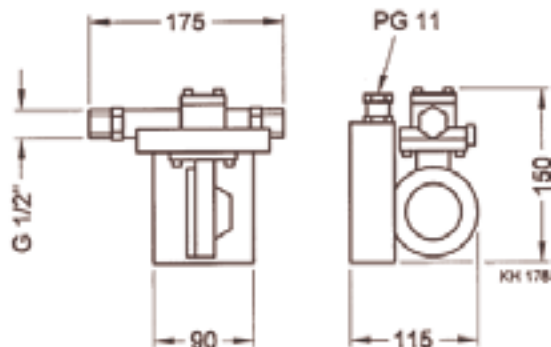
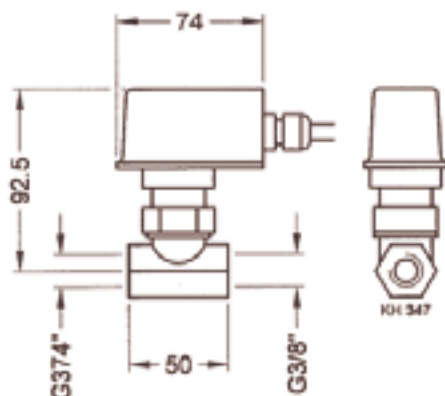
- For monitoring flow of cooling water
- Flow monitors are installed at output of cooling water circuit of diffusion pump
- Various configurations available depending on required flow amount rate, pressure and connecting terminals



Order number		B4747434SS	B4747111SE
Connection		G 3/8*	G 1/2*
Closing rate min/max.	l/min	2.2-2.9	Depending on the orifice (4-8 l standard)
Switching			
Voltage, V AC/V DC		230/230	250/30
Current, V AC/V DC	A	1/1	10/5
Consumption, V AC/V DC	VA/W	26/20	—
Pressure (absolute)	bar	25	16
Weight	kg	0.8	3.1

Orifice

1-2 l/min	—	B4747303SE
2-4 l/min	—	B4747305SE
4-8 l/min	—	B4747308SE
8-16 l/min	—	B4747311SE
16-32 l/min	—	B4747326SE



Pump fluid temperature measuring unit for DIF 320–1000**Order number H001801**

- Direct and accurate measurement of pump fluid temperature
- Easy installation
- Replacement of sensor without venting diffusion pump
- Temperature range 0 - 350° C
- Response time $t = 0.5 = 30$ sec
- **Usable for all HSR diffusion pumps sizes DN320 up to DN1000**
- Temperature sensor (DTS), feedthrough (DTD) and LCD display unit (DTA) are also available as separate units

**Standard delivery includes**

- Temperature sensor DTS including connection cable 2m long
- Feedthrough DTD
- Temperature display unit DTA

Temperature sensor DTS

- Temperature sensor DTS including cable
- Other cable length available on request

**Order information****Order number**

- Temperature sensor DTS including cable 2m
- Temperature sensor DTS including cable 3.5m
- Temperature sensor DTS including cable 5m
- Temperature sensor DTS including cable 15m

H001810
H001811
H001814
H001819

Feedthrough DTD**Order number H001820**

- Usable for all HSR diffusion pumps sizes DN320 up to DN1000
- With bajonet fixation
- Swagelock connector



Temperature display DTA

Order number H001800

- Temperature measurement display 0 - 350° C
- Long lifetime 3 1/2 LCD display
- Analog output

**Technical Data**

Temperature range	0 - 350° C
Display	3 1/2 LCD 12 mm high
Accuracy	±0.1 % ± 1 Digit of F. S.
Temperature drift	<±0.01 % K
Output	4 - 20 mA current loop U < 4.5V
Supply voltage	24VDC
Protection	IP 69K
Mounting rails	Hole distance 110 mm 2x holes 8.4 mm dia.
Material housing	Inox 1.403
Dimensions	dia 89 x 46 mm

Temperature display KTM100

Order number H106080

- Adapted to HSR sensor DTS
- Measuring range 0 - 350° C
- Accuracy and resolution 0.1 %
- Digital LED display
- 4 switchable outputs with adjustable thresholds
- Analog output 4-20mA 04 0 - 10VDC
- Mains voltage 230VAC, 50Hz

**Digital interface IFR100**

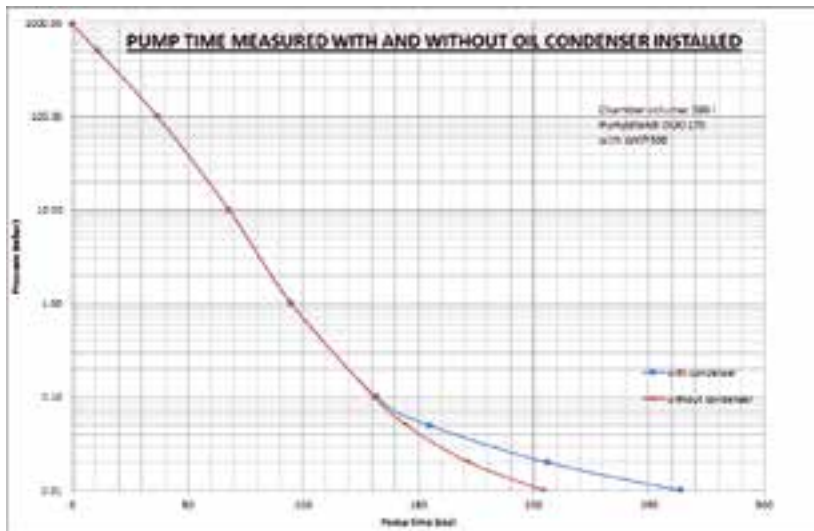
Order number H111420

- Adapted to HSR sensor DTS
- Measuring range 0 - 350° C
- 4-wire measurement
- Analog output 4-20mA 04 0 - 10VDC
- Mains voltage 24 - 250VAC / VDC



Oil condenser for diffusion pumps

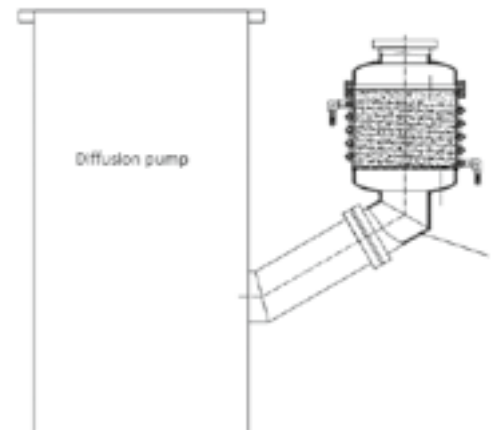
- Reduces pump fluid consumption of diffusion pumps
- Water-cooled housing
- Exchangeable condensation components
- Long lifetime
- Proven design
- Reduces operating costs of diffusion pumps
- Available in sizes DN63, DN100, DN160



No measurable impact on the pre-vacuum pump time was detected under production conditions using the HSR oil condenser

The pump fluid consumption in the diffusion pump for applications with high gas loads is drastically reduced and comes close to zero using the HSR oil condenser

Installation of oil condenser HOC at pre-vacuum connection of diffusion pump



Order information

Oil condenser HOC063 - DN063 ISO-K
Oil condenser HOC100 - DN100 ISO-K
Oil condenser HOC160 - DN160 ISO-K

Order number

H3201400
H3201500
H3201600

Standard delivery includes

Oil condenser HOC

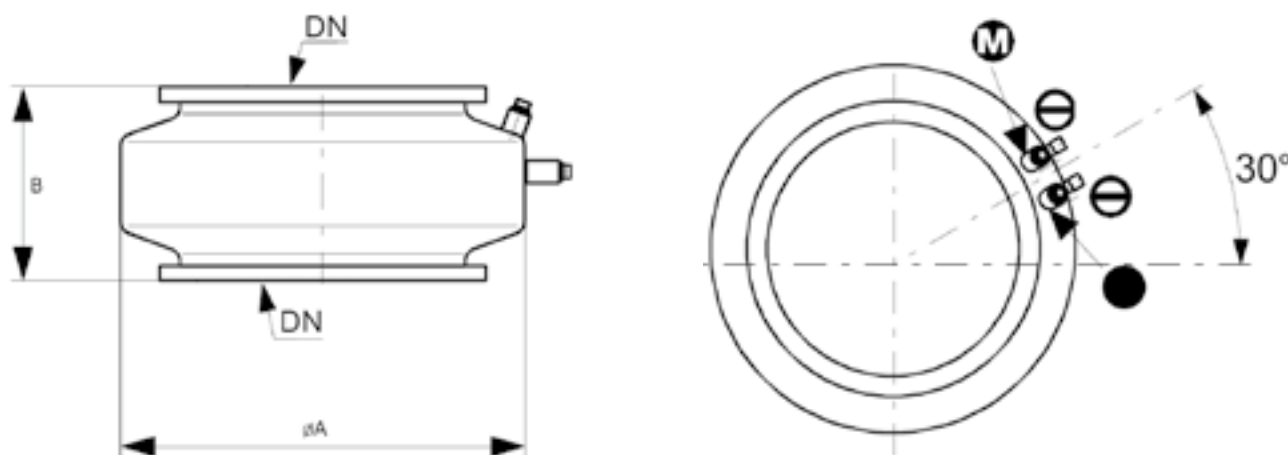
Multi-coolant baffles, type BFC

- Cooling can be done either
 - by water
 - or refrigerator (R134a)
 - or LN₂ (additional pump speed for water vapour)
 - or Polycold (additional pump speed for water vapour)
- Redesigned construction provides highest conductance
- Optical dense
- Increased pump speed for water vapour if cooled by LN₂ or Polycold



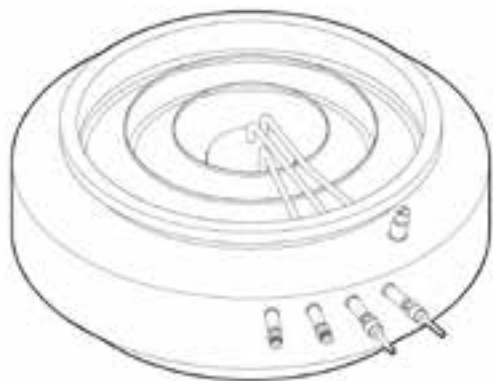
Technical Data/Model		BFC160	BFC200	BFC250	BFC320	BFC400
Order number		H970160	H970200	H970250	H970320	H970400
Inlet flange		DN160 ISO-K	DN200 ISO-K	DN250 ISO-K	DN320 ISO-K	DN400 ISO-K
Pumping speed for water vapour (cooled by LN ₂ or Polycold)	l/sec	2 600	4 800	7 500	11 000	17 500
Conductance (for molecular flow)	l/sec	1 800	3 500	4 500	5 000	7 000
LN₂ consumption						
Cooling down to 180° C	kg	2	2.3	2.6	3	4.5
Continuous operation	kg/h	0.8	1	1.5	1.8	2.6
Weight	kg	6	8	11	21	25
Dimensions	mm					
	a Ø	280	360	400	460	546
	b	155	180	200	220	245

Dimensions BFC160 to BFC400



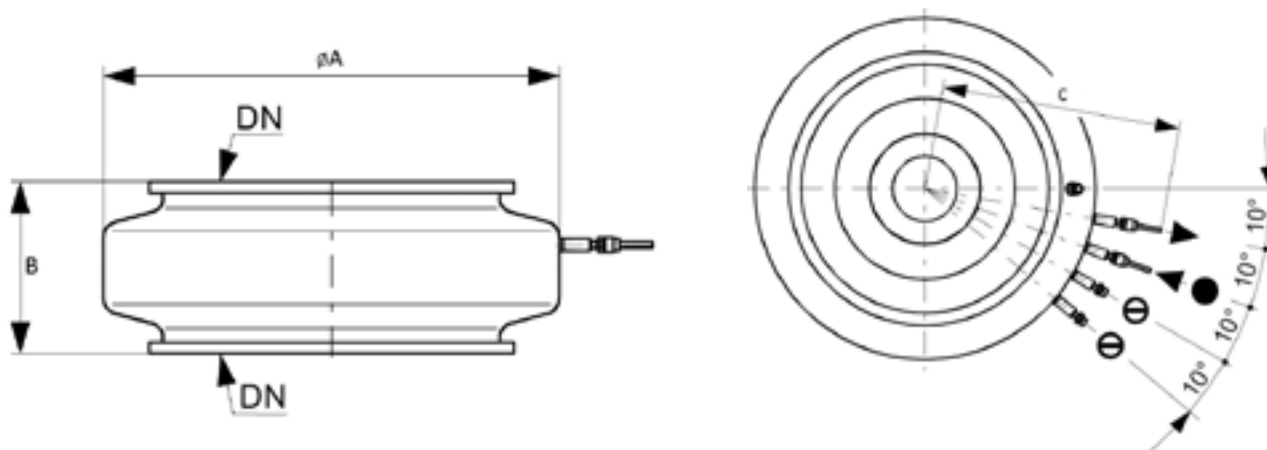
Standard delivery includes

Multi baffle BFC



Technical Data / Model		BFC500	BFC630	BFC800	BFC1000
Order number		H970500	H970630	H970800	H971000
Inlet flange		DN500 ISO-K	DN630 ISO-K	DN800 ISO-F	DN1000 ISO-F
Pumping speed for water vapour (cooled by LN ₂ or Polycold)	l/sec	24 000	47 000	71 000	110 000
Conductance (for molecular flow)	l/sec	10 000	19 000	29 000	49 000
LN₂ consumption					
Cooling down to 180° C	kg	6	8	12	25
Continuous operation	kg/h	3.8	5.9	7.4	11.2
Weight	kg	57	70	152	240
Dimensions		mm			
a Ø		686	838	1 016	1 212
b		260	300	340	340
c		482	558	674	745

Dimensions BFC500 to BFC1000



Standard delivery includes

Multi baffle BFC

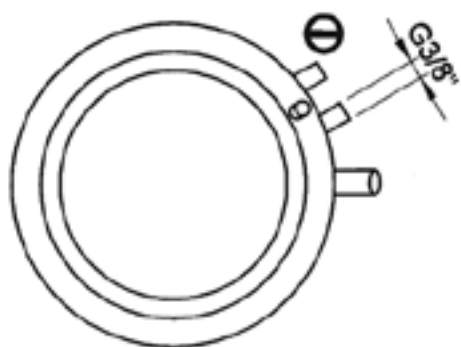
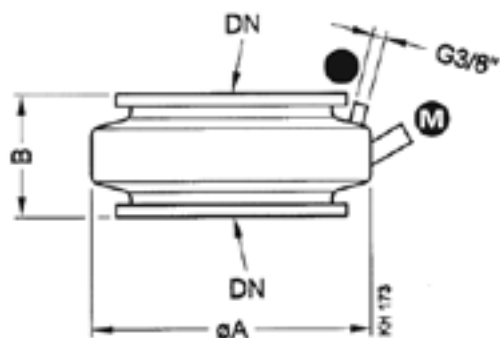
Combination baffle, type PBC

- Cooling can be done either by combination of
 - refrigerator (R134a) and LN₂
 - or refrigerator and Polycold
- Two separate cooling circuits for LN₂ and refrigerator
- Especially used for coating systems, cooling by refrigerator during pump time, cooling by LN₂ or Polycold during process
- Increased pump speed for water vapour if cooled by LN₂ or Polycold

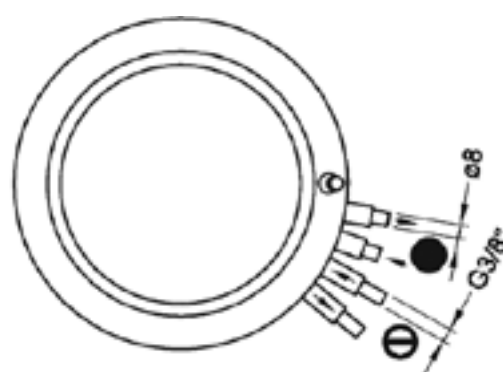
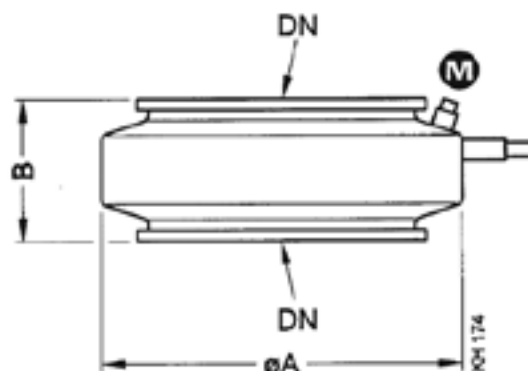


Technical Data / Model		PBC320-X / BFA320MF	PBC400-X / BFA400MF	PBC500-X / BFA500MF	PBC630-X / BFA630MF
Order number		260-265	260-275	260-285	260-295
Inlet flange		DN320 ISO-K	DN400 ISO-K	DN500 ISO-K	DN630 ISO-K
Pumping speed for water vapour (cooled by LN ₂ or Polycold)	l/sec	11 000	17 500	24 000	47 000
Conductance (for molecular flow)	l/sec	3 500	5 500	6 500	12 500
LN₂ consumption					
Cooling down to 180° C	kg	3	4.5	6	8
Continuous operation	kg/h	1.6	2.4	3.6	5.7
Weight	kg	21	27	98	117
Dimensions					
	mm				
	a Ø	460	546	686	838
	b	220	245	260	300

Dimensions PBC320 to PBC400



Dimensions PBC500 to PBC630



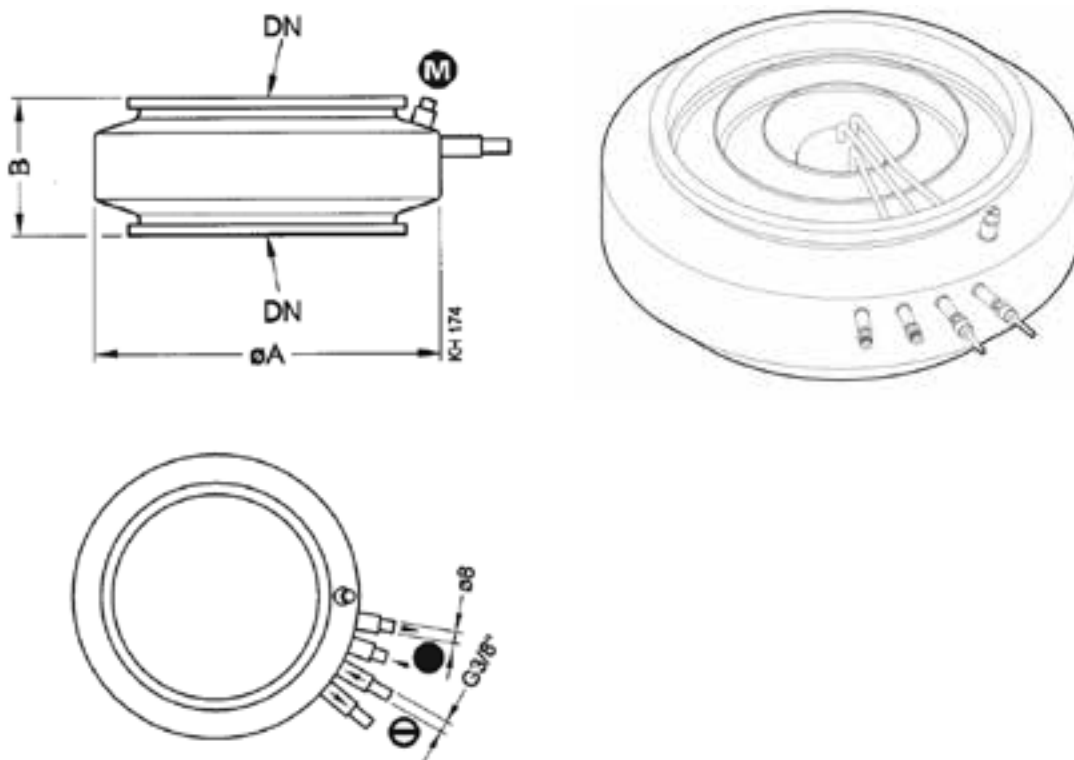
Standard delivery includes

Combination baffle PBC/BFA

Combination baffle, type PBC

Technical Data / Model		PBC800-X/ BFA800MF	PBC1000-X/ BFA1000MF
Order number		260-265	260-315
Inlet flange		DN800 ISO-F	DN1000 ISO-F
Pumping speed for water vapour (cooled by LN ₂ or Polycold)	l/sec	71 000	110 000
Conductance (for molecular flow)	l/sec	16 500	33 000
LN₂ consumption			
Cooling down to 180° C	kg	12	25
Continuous operation	kg/h	7.2	11
Weight	kg	225	300
Dimensions			
	mm		
	a Ø	1 014	1 210
	b	340	340

Dimensions PBC800 to PBC1000



Standard delivery includes

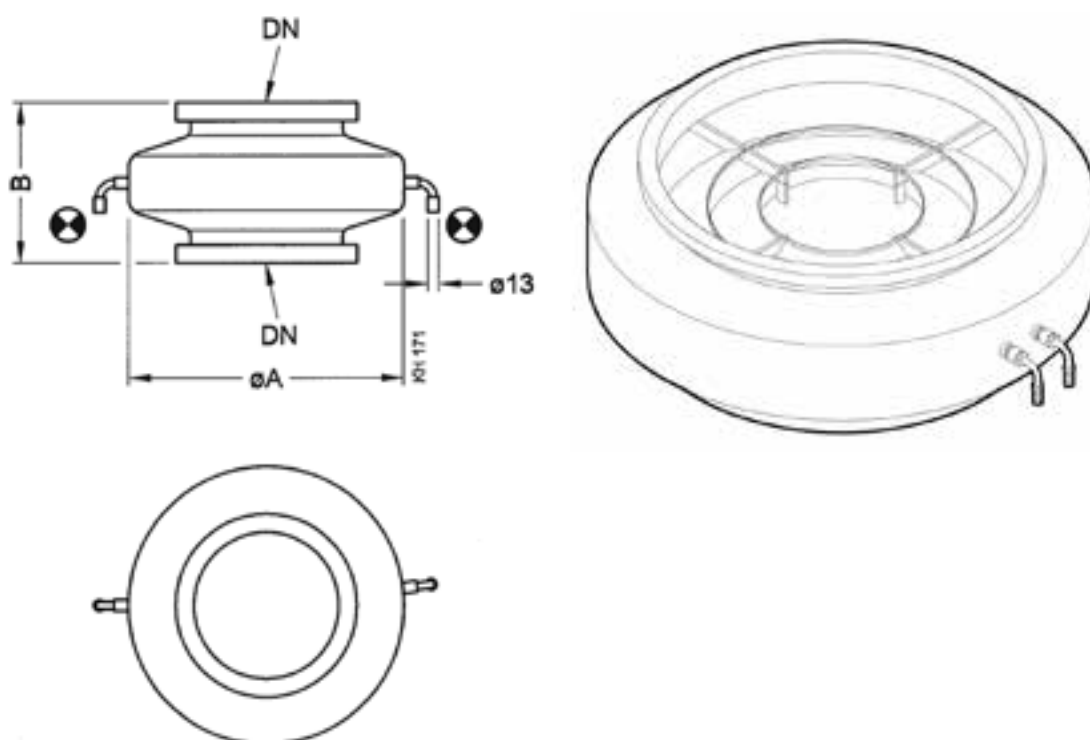
Combination baffle BPBC/BFA

Water-cooled baffles, type PBW

Technical Data / Model		PBW320-S
Order number		260-260
Inlet flange		DN320 ISO-K
Conductance	l/sec	4 300
(for molecular flow)		
Cooling water appr.	l/h	20
Weight	kg	15,7
Dimensions	mm	
	a	460
	b	220

Bigger sizes see Multi Baffle page 71 - 72

Dimensions PBW320-S



Standard delivery includes

Water baffle PBW

Protection baffle for turbo molecular pumps (patented)

In high vacuum applications for the production of complex coating systems, it occurs more and more often that critical gases or gas compounds are created. These gases have to be pumped out by the high vacuum pump. On many occasions, it cannot be avoided that such gases or steams condense as solids inside the pump and, as a result, significantly affect the functionality of the pump or, as in the case of turbo-molecular pumps, lead to their destruction. HSR AG in Balzers has developed a product which triggers the condensation process before these gases or steams enter the pump. Thus, the pump is effectively protected from negative influences that affect its functionality or lead to its eventual destruction.

When searching for a solution to these problems during the development of the new product, the focus was on three criteria:

- In the case of perfect optical impermeability, the largest possible conductance value had to be achieved in order to keep the loss of volume flow rate of the high-vacuum pump to a minimum.
- The inner condensation surface had to be coolable to an optional temperature ranging from water cooling temperature to the temperature of liquid nitrogen.
- It had to be possible to quickly remove and replace the inner condensation surface for the purposes of cleaning without having to dismantle the entire pump body.

All of these requirements have been fulfilled with the new protective baffles of the HSB product line. The product is patented and has been successfully been in the market since 2009.

HSR protection baffles are patented and available in sizes DN100, DN160, DN200, DN250, and DN320.

Baffle cartridges are available in various materials and different configurations depending on needed cooling media, such as water, refrigerator, LN₂ and Polycold. The choice of material and cooling method largely depends on the application the baffle will be used for.

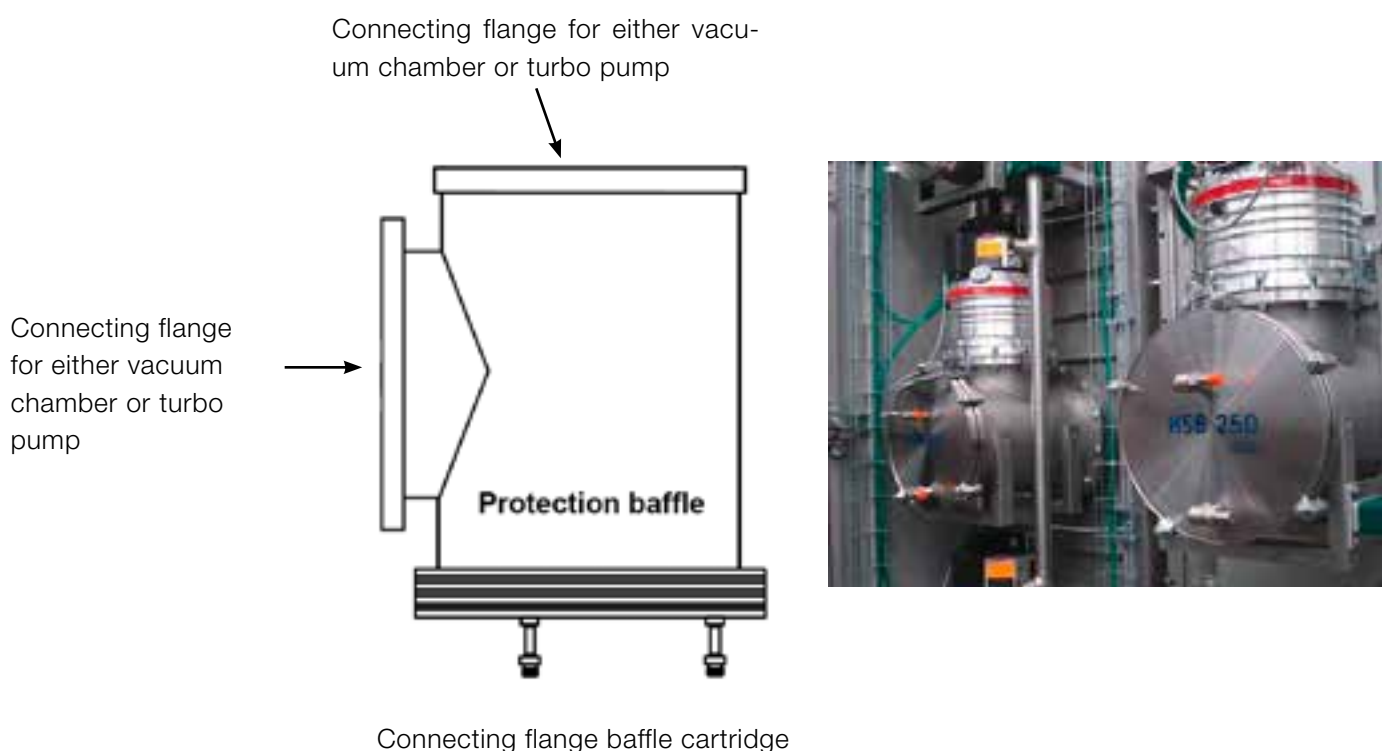


Technical Data / Model		HSB100	HSB160	HSB200	HSB250	HSB320
Order number		H255100	H255160	H255200	H255250	H255320
Connecting flanges						
Chamber		DN100 ISO-F	DN160 ISO-F	DN200 ISO-F	DN250 ISO-F	DN320 ISO-F
Turbo pump		DN100 ISO-F	DN160 ISO-F	DN200 ISO-F	DN250 ISO-F	DN320 ISO-F
Baffle cartridge		DN160 ISO-K	DN200 ISO-K	DN250 ISO-K	DN320 ISO-K	DN400 ISO-K
other flange configurations available on request						
Connection cooling media						
Water		G3/8"	G3/8"	G3/8"	G3/8"	G3/8"
LN ₂ , Polycold or refrigerator		G3/8"	G3/8"	G3/8"	G3/8"	G3/8"
Conductance (air)	l/sec	350	800	1 500	2 300	3 400
Pump speed for water vapor	l/sec	1 100	2 800	4 000	7 500	11 000
(cooled by LN ₂ or Polycold)						
LN₂ consumption						
Cooling down to 180° C	kg	2,0	2,3	3,0	3,0	6,0
Continuous operation	kg/h	1,0	1,82	1,8	1,8	4,5
Material						
Housing		Stainless steel	Stainless steel	Stainless steel	Stainless steel	Stainless steel
Baffle cartridge		various	various	various	various	various
Dimensions		mm				
Length		251	365	455	568	620
Height		198	275	320	400	530
Diameter (housing)		160	220	290	370	450
Weight		kg				
Housing		4.5	17	20	23	65
Baffle cartridge		5	17	22	25	45

Standard delivery includes

Protection baffle HSB

Protection baffle material and sizes can be optimized for customer application and requirements



Refrigerators for baffles

- Cooling media R134a
- For baffle sizes DN320–DN500 (PCF145-Z) and DN630–DN1000 (PCF245-Z)
- Depending on baffle size, ultimate baffle temperatures -25 to -10° C can be achieved



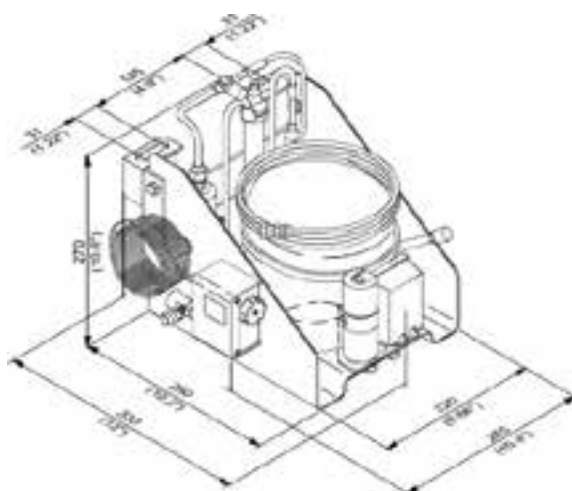
PCF145-Z/PCF145-Z

Technical Data / Model	PCF145-Z	PCF245-Z
Order number	260-420	260-421
For combination baffle PBC	320/400/500	630/800/1 000
For protection baffle HSB	100/160/200	250/320
Refrigerant	R134a	R134a
Refrigerant capacity at		
+15° C	W 385	860
-10° C	W 140	350
Power requirements		
Voltage	VAC 240	240
Frequency	Hz 50/60	50/60
Power consumption	W 145	352
Motor starting current	A 8	10
Cooling water		
Consumption	l/h 3-8	7-15
Pressure (over pressure)	bar 11	11
Noise level	dB (A) 39	43
Connections		
Refrigerant	G 3/6"	G 3/6"
Water	mm dia 14	dia 14
Weight	kg 15	18

Standard delivery includes

Refrigerator PCF

Dimensions:

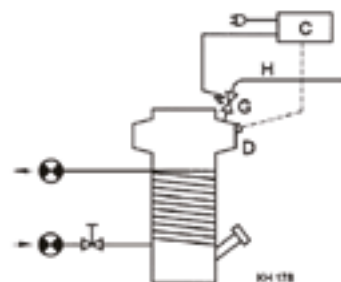
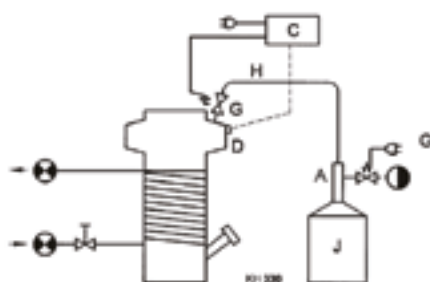


Automatic LN₂ supply

Selection Data				
Order number	216-062	216-063	216-064	216-065
LN ₂ supply by	Dewar vessel	Dewar vessel	Central supply	Central supply
For baffle diffusion pump	PBC320-400	PBC500-1000	PBC320-400	PBC500-1000
For protection baffle	HSB100-200	HSB250-320	HSB100-200	HSB250-320

Accessories				
Center ring DN50 KF	211-064	211-064	211-064	211-064
Clamping ring DN50	211-004	211-004	211-004	211-004

Supply components (details see following pages)				
Order number	216-062	216-063	216-064	216-065
A: PCB100-A, LN ₂ filling device 230VAC, 50Hz	yes	yes	—	—
C. PCF200-Z, LN ₂ control module	yes	yes	yes	yes
D: LN ₂ sensor				
PCF190-Z	yes	—	yes	—
PCF220-Z	—	yes	—	yes
G: Solenoid valve for LN ₂ with fitting for pipe dia 8/10	yes	yes	yes	yes
H: LN ₂ line, diameter 8/10 with insulating hose, 1.8m	yes	yes	yes	yes
J: Dewar vessel (on request)	—	—	—	—



Solenoid valve for LN₂ Order number BP334488-T

- Electrically activated valve for supply of LN₂
- Valve is normally closed



Technical Data	
Input	8 3/8 Serto
Output	8mm tube outer diameter
Supply voltage	24VAC 50/60Hz
Connections	G1/4
Mounting position	any position
Material	Valve body - Brass Valve seat - Teflon Internal parts - stainless steel

LN₂ supply from Dewars

- For supply of LN₂ out of dewars
- LN₂ flow is regulated by a pressure reducing valve
- Built-in overpressure safety valve
- Rupture disc implemented
- Installation flange DN50 ISO-KF

PCB100-A
(automatic)



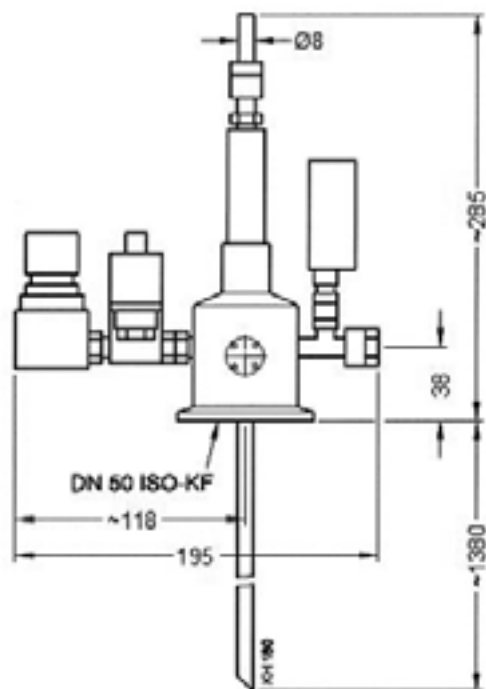
PCB100-H
(manual)



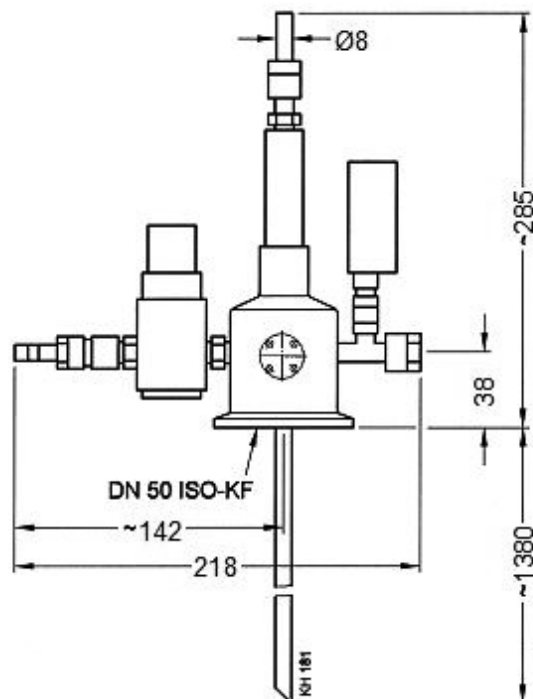
Technical Data / Model		PCB100-A	PCB100-H
LN₂ filling		automatically	manually
Air pressure in the supply line	bar	1-8	1-8
Adjustable pressure in Dewar	bar	0-1	0-1
Bursting pressure of the rupture disc	bar	1.7	1.7
LN₂ throughput	l/h	0-300	0-300
Power consumption	W	8	-
Weight	kg	1.9	1.6

Order Information		PCB100-A	PCB100-H
230VAC/50Hz		260-350	-
115VAC/50Hz		260-351	-
24VAC/50Hz		260-352	-
Manually		-	260-355

Dimensions:



PCB100-A



PCB100-H

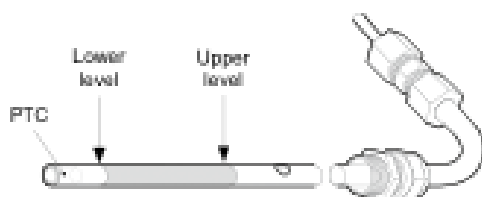
Automatic LN₂ level control system

- For controlling LN₂ level in combination baffles or multi baffles
- One or two point level control operation
- Alarm in case of sensor or cable failure
- Sensor especially reliable due to patented sensor principle
- PTC resistor for emergency cooling with refrigerator

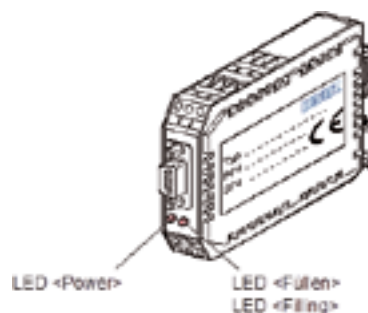


Control module

The PCF200-Z control module is used together with an LN₂ sensor (PCF190-Z or PCF220-Z) for controlling the level of liquid nitrogen. The LN₂ sensors have two preset levels and a temperature-dependent resistor (PTC).

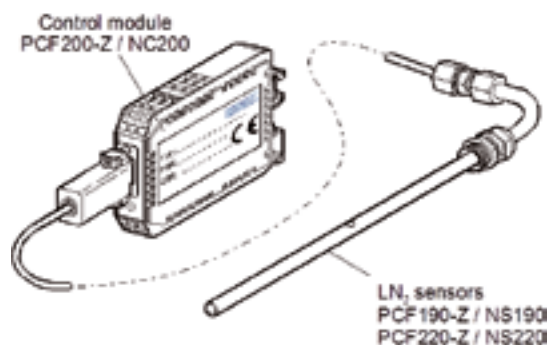
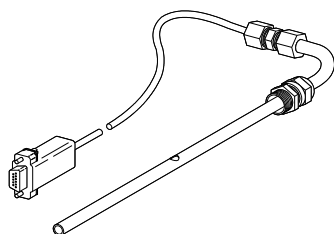


- Operating voltage 24 VDC/VAC (manually switchable)
- Protection class IP30



LN₂ sensors

The PCF190-Z and PCF220-Z sensors are operated together with the PCF200-Z control module.



Mounting depth:

- PCF190-Z: 180 mm (baffle sizes DN320 and DN400)
- PCF220-Z: 210 mm (baffle sizes DN500 to DN1000)

Technical Data / Model	PCF200-Z	PCF190-Z	PCF220-Z
Control module / supply voltage, selectable	24VAC or 24VDC	-	-
Current consumption closed valve	100 mA	-	-
Contact rating	2 - 4 A on 48V	-	-
Operating temperature		-196 - +50° C	-196 - +50° C
Order Information	PCF200-Z	PCF190-Z	PCF220-Z
Control module	260-410	-	-
Sensor	-	260-412	260-413

Automatic currentless LN₂ level valve

Currentless LN₂ level valve PBF101-Z

Order number 260-360

- For controlling a constant LN₂ level in reservoirs or cold traps
- LN₂ flow control in Meissner traps or baffles
- Automatic vent valve in large, central LN₂ supply systems
- **No electric supply** required for operation



PBF101-Z

Technical Data	PBF101-Z
Flow rate	0-300 l/h
Pressure indication on pressure gauge with	
Warm probe	4 kp/cm ²
Cold probe (vacuum)	0 kp/cm ²
Mounting position	Vertical (capillary feedthrough on top)
Weight	350 g

Phase separator PSU101-Z

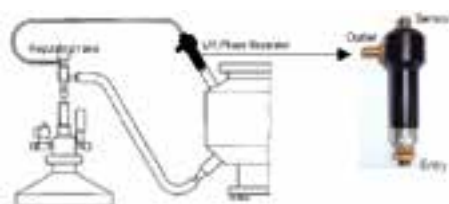
Order number BP414839-T

- For separating liquid and gaseous phases on the exit of a cold trap
- For optimizing the consumption of LN₂ in bigger volume traps if control valve PBF101-Z is used

Technical Data	PSU101-Z
LN ₂ entry	6 - 1/4"
LN ₂ exit	MS 12 nippel
Mounting position	vertical (capillary fedthrough on top)
Weight	250 g



PSU101-Z



See chapter «LN₂-supply for pumping body» for detailed description of automatic currentless LN₂ supply

Isolated LN₂ line ILT200

Order number BP334039-T

Technical Data	ILT200
LN ₂ line diameter in/outside	8/10 mm
Isolation diameter outside	33 mm
Weight	150 g



ILT200

Right angle valves VAP

Right angle valves type VAP

HSR VAP valves are isolating valves for pipes used in vacuum systems

All VAP valves are the bellows-sealed type

HSR bellows-sealed valves are designed for vacuum pressures

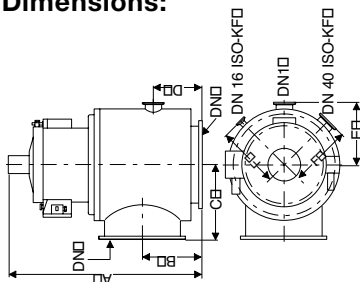
down to $1 \cdot 10^{-9}$ mbar

- High conductance
- Both sides tight (1 bar)
- Electro-pneumatically activated
- Bellows feedthrough
- Visual and electrical position indicator



Technical Data/Model		VAP250	VAP320	VAP400
Order number		250-800	250-805	250-810
Connecting flanges		DN250 ISO-K	DN320 ISO-K	DN400 ISO-K
Conductance	l/sec	2 700	5 100	7 700
Tightness	mbar l/sec	$< 3 \times 10^{-9}$	$< 3 \times 10^{-9}$	$< 3 \times 10^{-9}$
Pressure min/max	mbar/bar	$10^{-7}/2$	$10^{-7}/2$	$10^{-7}/2$
Differential pressure in either direction	bar	1	1	1
Opening/closing time	sec	6/6	7/7	8/8
Bakeout temperature				
Housing	°C	120	120	120
Actuator	°C	60	60	60
Material				
Housing		Stainless steel	Stainless steel	Stainless steel
Valve plate		Stainless steel	Stainless steel	Stainless steel
Weight	kg	66	128	148

Dimensions:



Type	DN	DN1	A	B	C	D	E	F
VAP250-X	DN250 ISO-K	DN50 ISO-KF	650	200	250	163	205	208
VAP320-X	DN320 ISO-K	DN63 ISO-K	753	250	275	173	318	244
VAP400-X	DN400 ISO-K	DN63 ISO-K	843	300	350	212	365	312

Spare Parts			
Seal set	215-375	215-376	215-377
Set of bellows	215-385	215-386	215-387

Accessories	
Magnetic actuator 230VAC, 50/60Hz	215-804
Magnetic actuator 110VAC, 50/60Hz	215-809
Magnetic actuator 24VAC, 50/60Hz	215-814
Magnetic actuator 24VDC, 4.5W	215-819

Plate valves HVT

Plate valves type HVT

HVT valves are right angle plate valves with nominal diameters from DN400 up to DN1000 flange size. They are used as isolating valves for pipes in vacuum systems.

HVT valves are bellow-sealed and have electro-pneumatic actuation and electrical position indicators. They are available with cooled or uncooled housing and can also be provided with an optionally adjustable throttle position.

- Highest conductance
- Metal bellow-sealed
- Stainless steel version
- Self adjusting
- Easy to maintain
- Electro-pneumatically activated
- Adjustable throttle position available



Technical Data / Model		HVT400	HVT500	HVT630	HVT800	HVT1000
Connecting flanges		DN400 ISO-K	DN500 ISO-K	DN630 ISO-K	DN800 ISO-F	DN1000 ISO-F
Conductance	l/sec	16 500	21 000	38 000	50 000	78 000
Tightness	mbar l/sec	<3 x 10 ⁻⁹	<3 x 10 ⁻⁹	<3 x 10 ⁻⁹	<3 x 10 ⁻⁹	<3 x 10 ⁻⁹
Bakeout temperature (without pilot valve and solenoid coil)	°C	120	120	120	120	120
Material						
Housing		Stainless	Stainless	Stainless	Stainless	Stainless steel
Valve plate		steel	steel	steel	steel	various
Dimensions (approx.)		mm				
Length		650	750	880	1 060	1 300
Height		670	760	890	1 100	1 390
Diameter (housing)		620	700	820	1 060	1 300
Weight	kg	70	125	200	400	500

Order Information	HVT400	HVT500	HVT630	HVT800	HVT1000
Cooled	H333410	H333510	H333631		H3331010
Not cooled	H333400	H333501	H333630	H333800	H3331000
Throttle position, cooled	H333420	H333520	H333632	H333804	
Throttle position, not cooled	H333430	H333530	H333633		

Spare Parts					
Seal set	H196888	H196887	H196884	H196886	H1961000

Accessories	
Magnetic actuator 230VAC, 50/60Hz	215-804
Magnetic actuator 110VAC, 50/60Hz	215-809
Magnetic actuator 24VAC, 50/60Hz	215-814
Magnetic actuator 24VDC, 4.5W	215-819

Former BALZERS plate valves PVA

HVT valve series replaces former BALZERS PVA type valves

All spare parts for PVA type valves are available at request.

PVA valves size DN320 are still available from HSR AG.



Technical Data/Model		PVA320 P-2 24VDC
Order number		BPV12037
Connecting flanges		DN320 ISO-K
Conductance	l/sec	8 400
Tightness	mbar l/sec	$< 3 \times 10^{-9}$
Bakeout temperature	°C	150
Material		
Housing		Stainless steel
Valve plate		Stainless steel
Dimensions (approx.)		mm
Length		495
Height		455
Diameter (housing)		406
Weight	kg	45

Spare Parts	
Seal set	BN841112-T

Accessories	
Magnetic actuator 230VAC, 50/60Hz	H4150521
Magnetic actuator 110VAC, 50/60Hz	H4150522
Magnetic actuator 24VAC, 50/60Hz	H4150523
Magnetic actuator 24VDC, 4.5W	H4150524

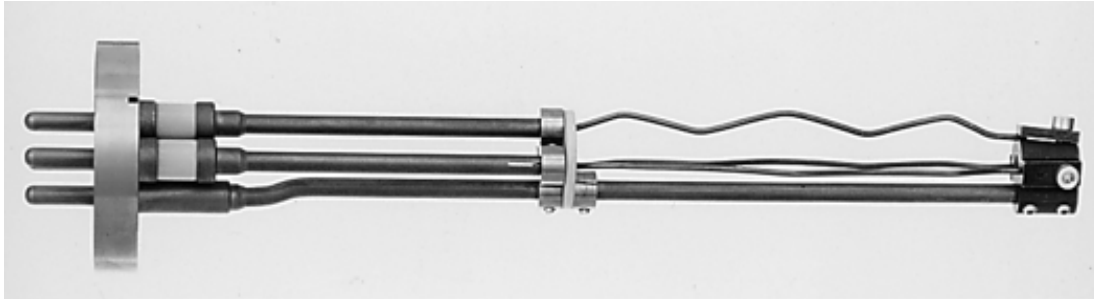
From 2015 onwards, above mentioned magnetic actuators have been applied as a substitute for all former BALZERS PVA plate valves as PVA320/PVA400/PVA500/PVA630.

Replacement set includes all needed components as adapter plate, compressed air crossovers, compressed air hoses, screws and a detailed modification and installation instruction.

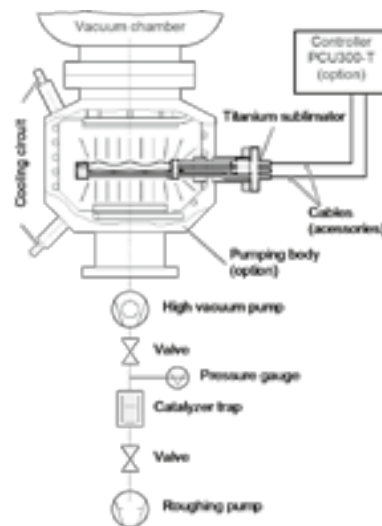
Titanium sublimator PSU040

In high-vacuum and ultra-high-vacuum systems, titanium sublimation pumps are used as supplementary pumps for gases which react chemically with titanium.

Titanium sublimators are always used in conjunction with cold surfaces or so-called pumping bodies.



Technical Data/Model		PSU040-T
Order number		260-430
Connecting flange		DN40 CF-F
Sublimation filaments	no	3
Titanium sublimator	material	Ti-Mo
Usable titanium quantity	g	3 x 1.2
Sublimation rate, max.	g/h	0.2
Bakeout temperature	°C	450
Operating data		
Voltage	V	3-6
Current	A	30-50
Connected load	kVA	0.3
Weight	g	600



Specific pumping speed:

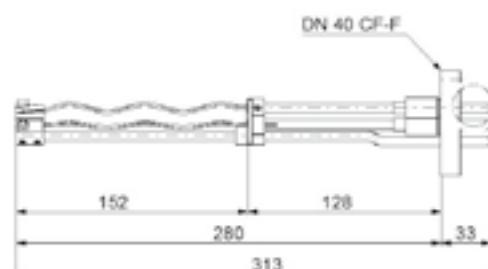
Approximate value of a freshly coated surface 10^{-6} mbar

Gas type	H ₂	N ₂	O ₂	CO	CO ₂	H ₂ O
Getter layer temperature of						
20° C l/sec cm ²	3	5	9	9	8	3
-195° C l/sec cm ²	9	9	11	11	9	14

Spare Parts

Sublimation wire, set of 12 pcs	260-431
Spare parts set	260-432
1 seal set copper DN40 CF, 10 pcs	H426744
1 seal set copper DN40 CF, silverplated, 10 pcs	H426924

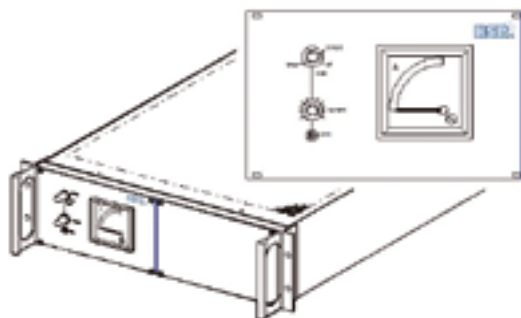
Dimensions:



Power supply PCU300

HSR titanium sublimators can be operated with a PCU300-T Titanium Sublimator Controller.

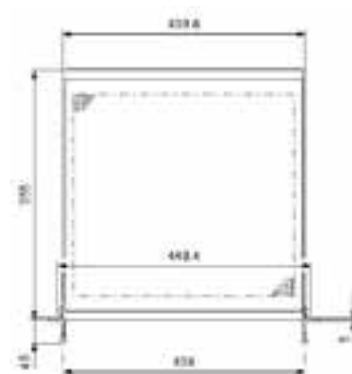
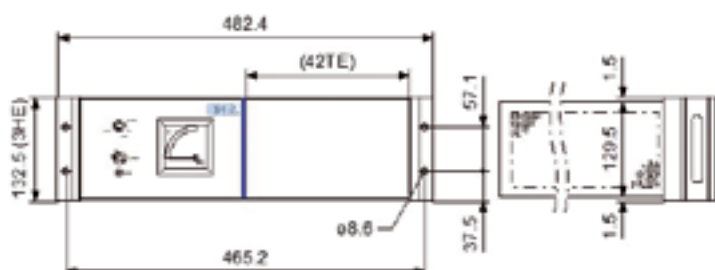
- Manual or remote control of 1 titanium sublimator with 3 filaments
- Remote control (RS-232) with PCU 306/312 of 6 or 12 titanium sublimators with 3 filaments each
- With PCU 306/312 the current of each filament can be measured/controlled remotely (optional)
- To avoid a reduced lifetime of the filaments and an undesirable pressure increase, there is a ramp function for the operating current of the device
- Integrated timer option



Technical Data/Model		PCU300-T
Order number	230 VAC	260-365
	115 VAC	260-366
Sublimator supply:		
Heating voltage		0 - 6 V
Maximal heating current		50 A
Run-up time		30 sec
Controller:		
Voltage		105 - 122 V (260 - 366) or 207 - 244 V (260 - 365)
Frequency		50/60 Hz
Power consumption		0 - 350 VA
Protection		IP23
Weight		16.5 kg (without timer)

Accessories		
Cable PSU - PCU300-T (2 pcs required)		
2m	B4564491AD	max reachable current: 50 A
5m	B4564491AC	max reachable current: 50 A
12m	B4564491AF	

Dimensions:

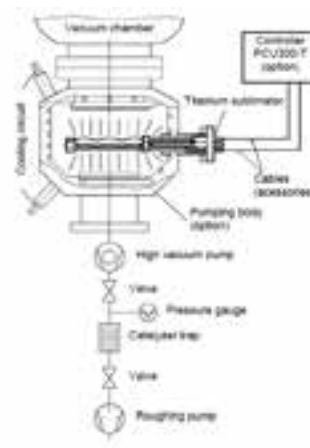


Integrated timer-option

Technical Data/Model	
Order number	B4779251GM
Time ranges	7
Programmable	0.05 sec - 10 h
Weight	0.15 kg

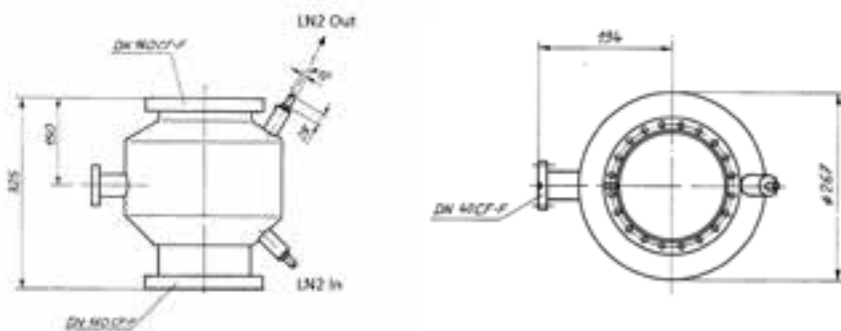
Pumping bodies for titanium sublimator pumps

Pumping bodies are used to increase pumping speed in turbo or ion getter pumping units. They also provide a very effective water vapour condensation by LN₂ cooling.



Technical Data/Model	PSU100-T	PSU160-T	PSU250-W
Order number	260-440	260-445	TU 250100
Connecting flanges:			
Vacuum chamber	DN160 CF-F DN100 CF-F DN40 CF-F	DN160 CF-F DN160 CF-F DN40 CF-F	DN250 CF-F DN250 CF-F DN40 CF-F
Conductance	l/sec		
	500	600	2 000
Mounting direction	any	any	any
Pumping speed on vacuum chamber			
H₂O vapour (LN₂ cooling)	/sec		
	1 500	1 500	1 500
N₂/H₂ (titan sublimation, LN₂ cooling)	l/sec		
	1 300/3 600	1 300/3 600	1 300/3 600
Only water cooling N₂/H₂	l/sec		
			2 200/3 700
Bake out temperature	°C		
	400	400	400
Consumption of LN₂ for initial			Water cooled
Charge at room temp, approx.	kg		
	2	2	–
Per hour of cont. cooling, approx.	kg		
	1.4	1.4	–
Cooling time from room temp.			
To 77K at 0.4 bar	min		
	8	8	–
Material			
Housing, flanges	Stainless steel Copper	Stainless steel Copper	Stainless steel Copper
Getter surfaces			
Weight	kg		
	14	15	25

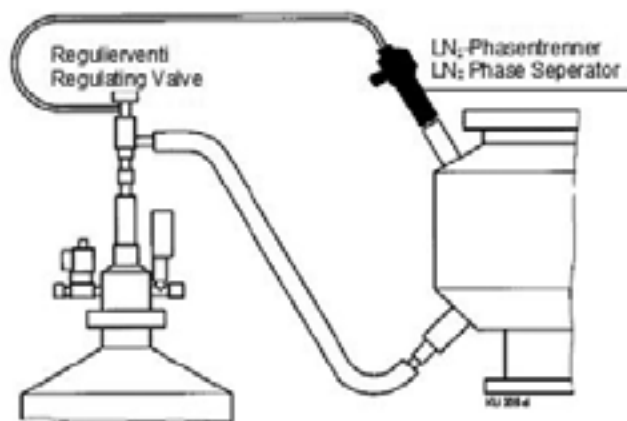
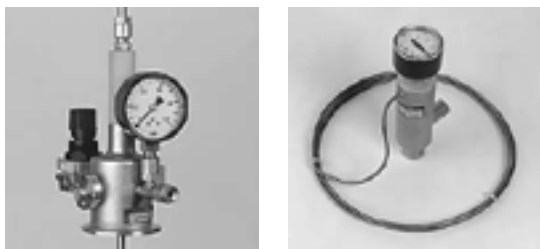
Dimensions PSU160-T:



Dimensions for PSU100-T and PSU250-W available on request

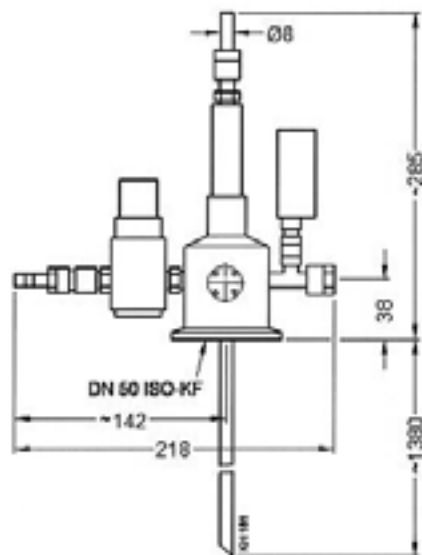
LN₂ supply for pumping body

Current less automatic LN₂ supply
Regulated constant liquid level with phase separator

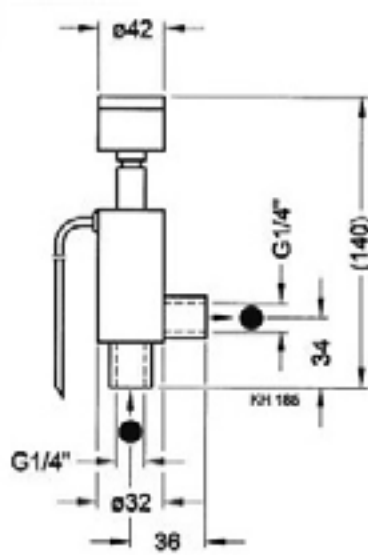


Technical Data / Model	PCB100-H	LN ₂ control PBF101-Z with phase separator PSU101-Z and LN ₂ line
Order number	260-355	260-361
Compressed air in the supply line overpressure, min.	bar 1	1
Operating pressure adjustable/recommended	bar 0.1 - 1	0.4
Sensor length	m 2	2
Weight	kg 2.3	2.3

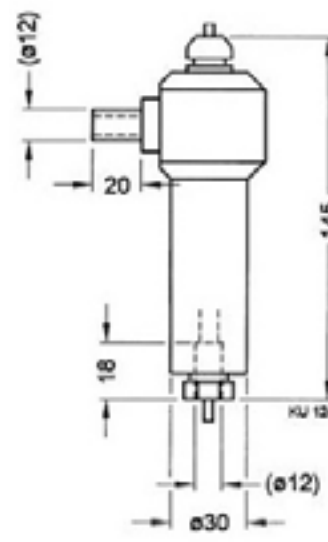
Dimensions:



PCB100-H



PBF101-Z

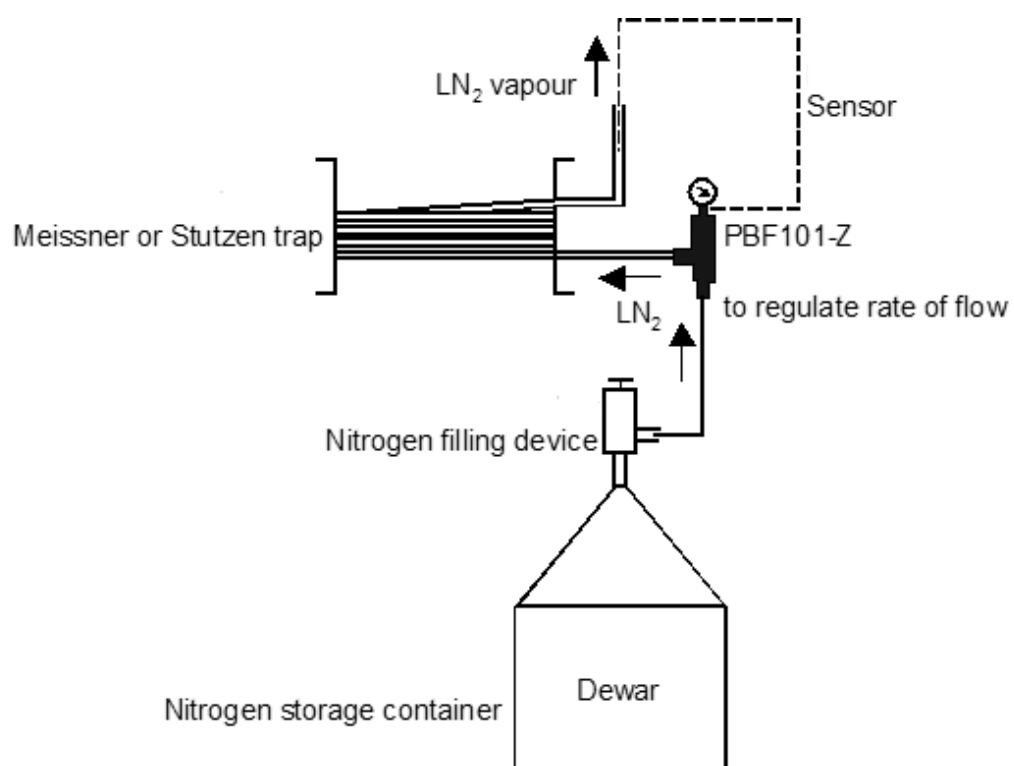


PSU101-Z

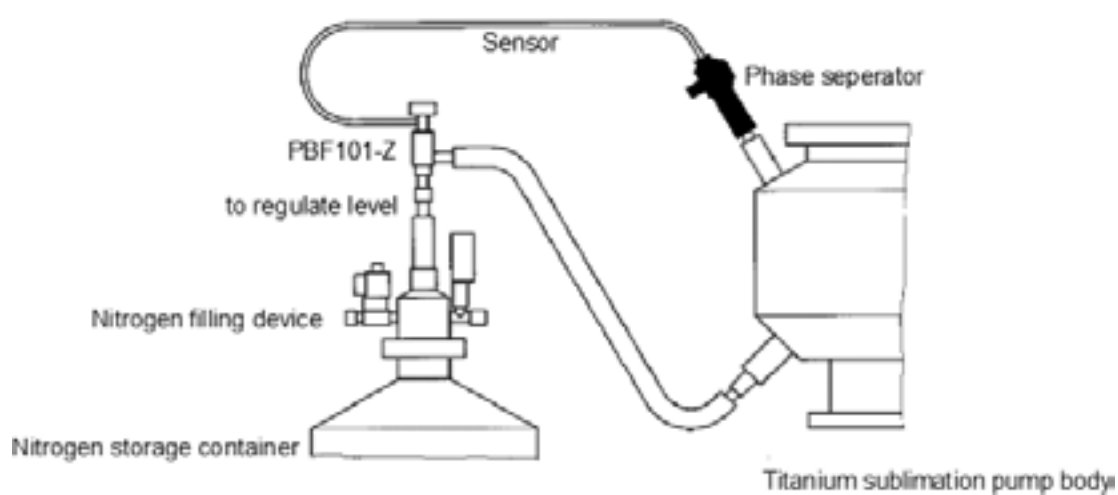
Applications and installation

Applications and Installation

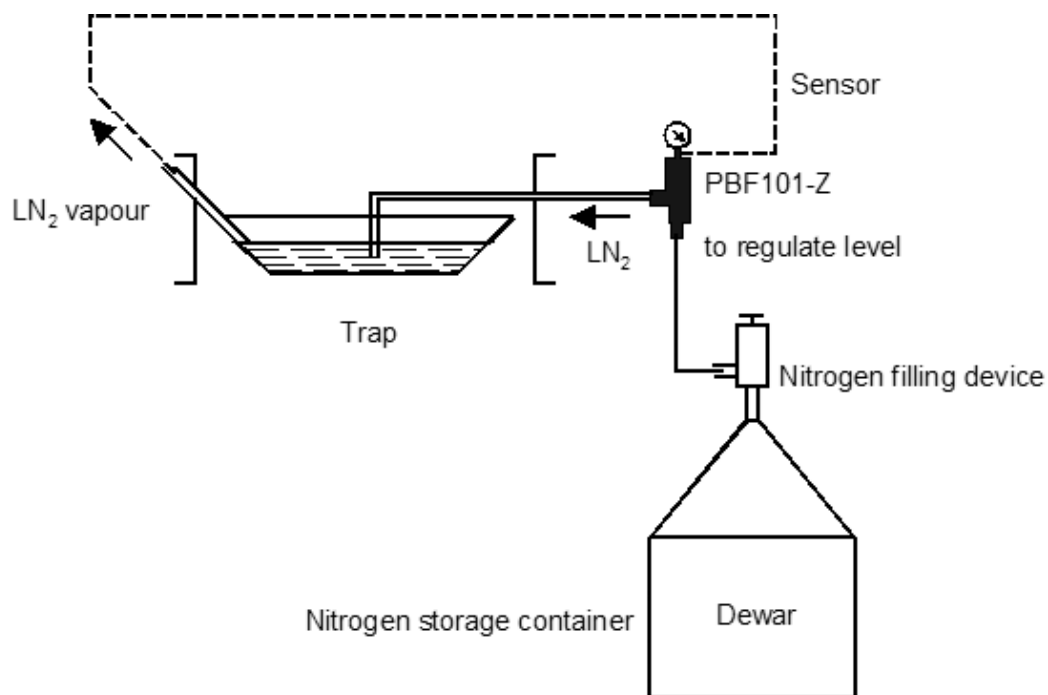
- For cooling Meissner or port traps



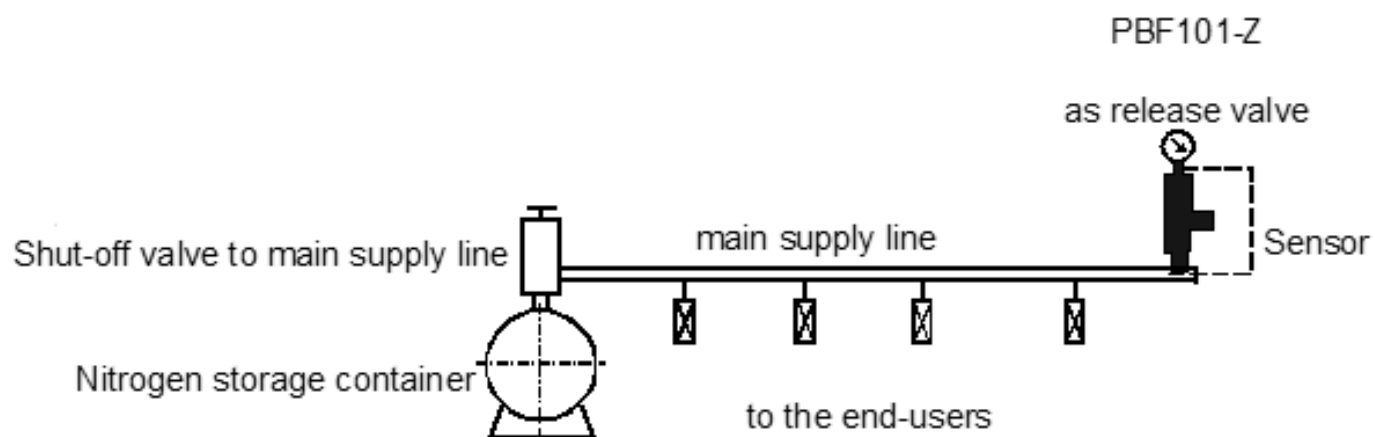
- For LN₂ supply equipment for Titanium Sublimation Pump Body



- For cooling of container traps



- As release valve in LN₂ supply systems



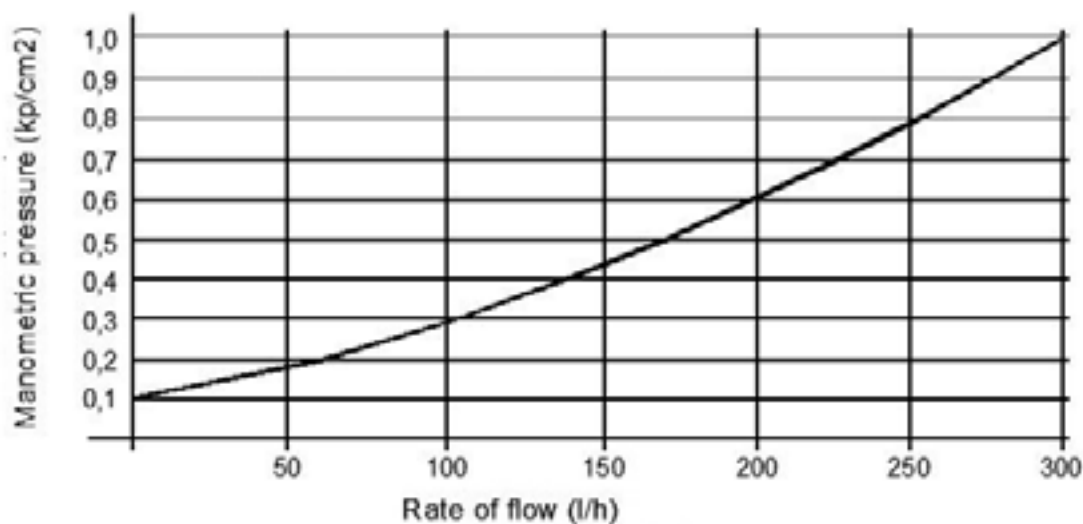
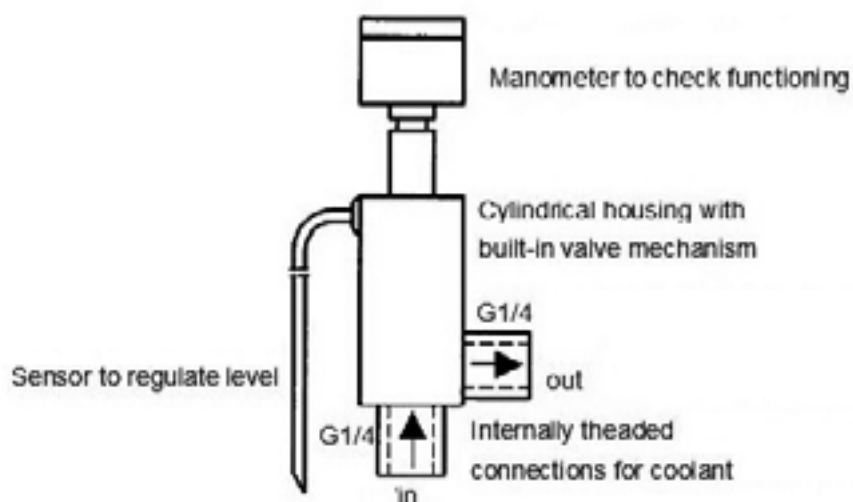
Components for LN₂ supply

Currentless automatic LN₂ supply device

Order number 260-360

The nitrogen regulator valve (PBF101 Z) is a shutter valve controlled by gas, in which the valve seating is actuated once the end of probe reaches the temperature of liquid nitrogen. It is suitable for the automatic supply of liquid nitrogen to any components.

The operation of the valve requires neither electricity nor compressed air. Owing to the gas-induced actuation of the valve seating, only so much liquid nitrogen is allowed to flow to any of the baffle traps as is consumed. The receiving component can be either a pipe system or a container-type baffle. However, differing levels cannot be regulated by only one valve.

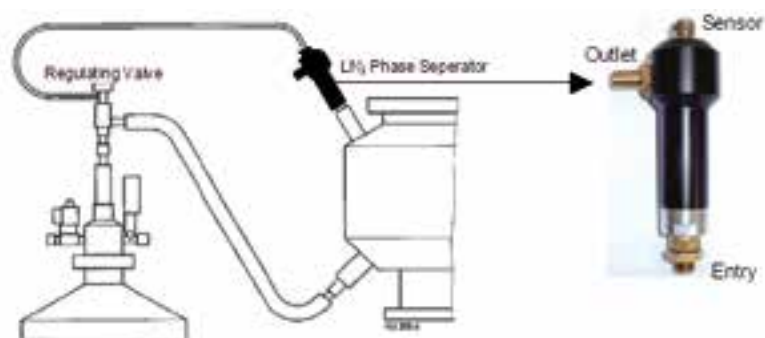


Please refer to pages 78 to 80 for further technical data for shown components

Phase separator

Order number BP414839-T

- Phase separator is installed at the outlet of the trap
- For separating liquid and gaseous phases on the exit of the trap
- For optimizing the consumption of LN₂ in bigger volume traps if control valve PBF101-Z is used

**PSU101-Z****LN₂ Filling Devices**

Order number 260-355

- For supply of LN₂ out of Dewars
- LN₂ flow is regulated by a pressure reducing valve
- Built-in overpressure safety valve
- Installation flange DN50 ISO-KF

**PCB100-H**
(manually)**Solenoid valve for LN₂**

Order number BP334488-T

- Electrically activated valve for supply of LN₂
- Valve is normally closed

**Armaflex insulating tubes - plastic hoses**

Order number BP334039-T

- For filling LN₂ pipes
- Various dimensions and lengths available



Catalyzer traps

A catalyzer trap prevents vacuum chambers as well as diffusion, getter ion, cryo or turbo molecular pumps from being contaminated by back-streaming hydrocarbons originating in rotary vane pumps and other roughing pumps sealed with mineral oil.

Just place the trap between your roughing pump and the vacuum chamber or the high vacuum pump.

By catalytic combustion, the potentially damaging and contaminating oil vapors are converted into the gases CO_2 and H_2O which can then be harmlessly pumped down. The catalytic combustion technology reduces hydrocarbon levels by a factor of at least 1000.

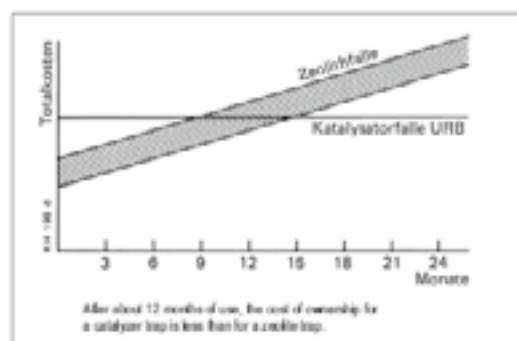
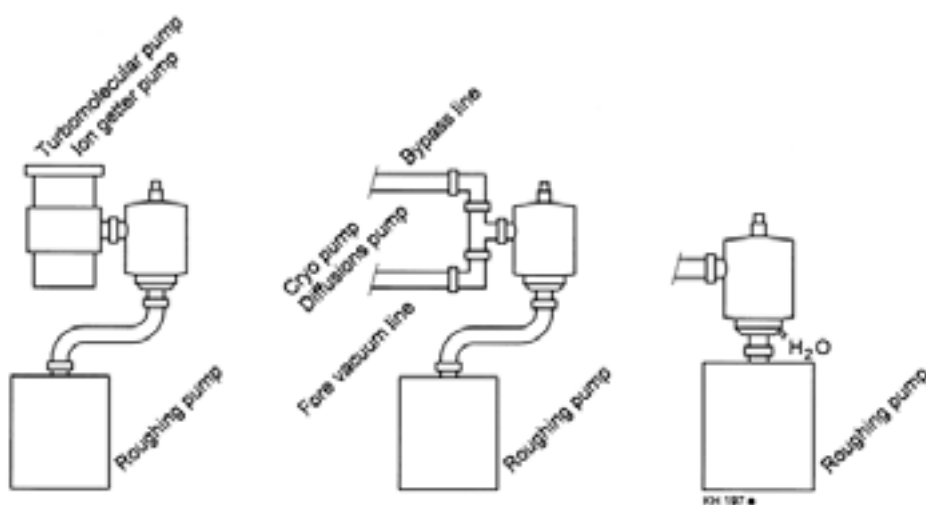
The catalyzer operates at elevated temperatures of approx. 250°C and automatically regenerates itself with the oxygen in the air each time the vacuum system is vented and pumped down.

The traps do not adsorb gases so they have a very long service life, unlike zeolite traps, which require frequent, time consuming regeneration.

Catalyzer traps can work over a period of two years with one filling in continuous, maintenance-free operation. From approx. 12 month of use and above, the operating costs are less than those of a zeolite trap.

Catalyzer traps can not be used with synthetic oils.

Installation of catalyzer traps:



Technical Data / Model		PTR025-U	PTR040-U
Connection flange		DN25 ISO-KF	DN40 ISO-KF
Cooling		-	water
Mounting orientation			
Normal operation		any	any
With water cooling		-	vertical
Conductance			
At 1E-10⁻² mbar	l/sec	3	9
At 1 mbar	l/sec	9	45
Power consumption	W	25	50
Cooling water consumption, approx	l/h	-	5
Lifetime of one filling			
Normal operation		Years 2	2
Catalyzer charge	gr	210	480
Weight	kg		
Including catalyzer filling		1.8	3.6

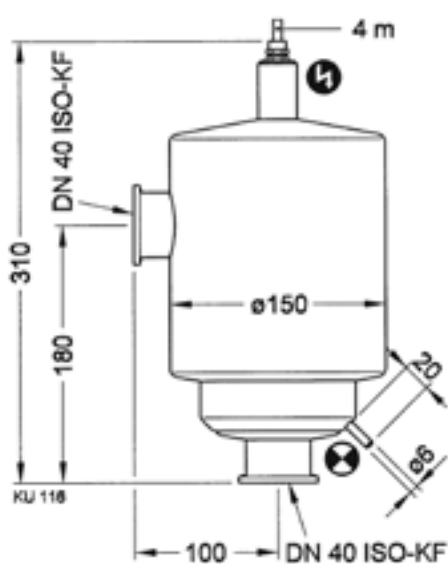
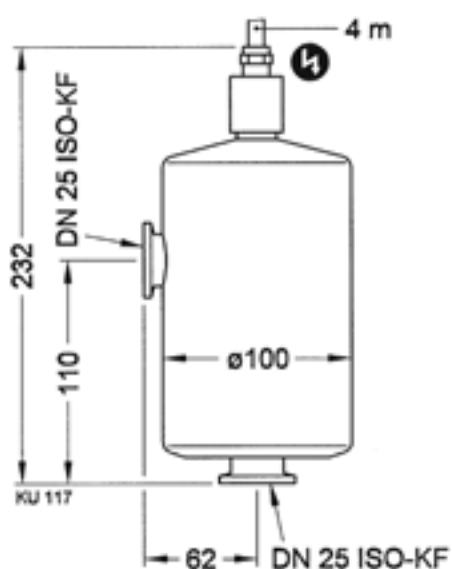
Order Information	PTR025-U	PTR040-U
100VAC	260-373	-
110/115VAC	260-372	260-382
230/240VAC	260-370	260-380
208VAC	260-371	260-381

Standard delivery includes

Catalyzer trap including catalyzer filling

Spare Parts

Catalyzer filling	216-106	216-107
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Additional services offered by HSR



The high standards that we have set for our own products obviously also apply to the services we offer. HSR provides a comprehensive range of top-quality services in its own workshops and at customer site.

Our highly motivated service specialists have many years of professional experience in the fields of vacuum and process technologies.

New applications and processes in high vacuum technology demand the continuous updating of staff qualification. We guarantee a high professional standard of our personnel by organizing regular staff training programs.

Our services at a glance

- Quick and reliable worldwide service
 - Maintenance and repair at customers premise or in our company workshops
 - Replacement components and complete loan systems straight from our warehouse
 - Customer specific maintenance and service agreements
 - Extensive on-site service provided by our service engineers
-
- Commissioning of components and complete vacuum systems
 - Retrofit of pump set control units and high-vacuum systems
 - Maintenance and repair
 - Leak detection and residual gas analysis

Your satisfaction is what matters to us

Engineering and customized products

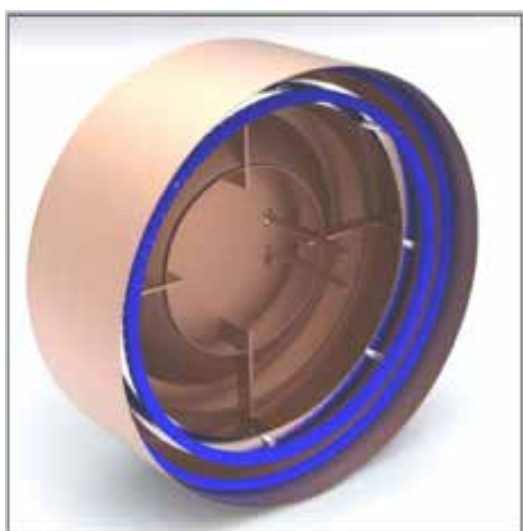
Engineering and designing of customized products

- We transform your ideas and specifications into proven designs that satisfy your vacuum process requirements.
- Our dedicated mechanical, electrical and software engineers are specialized in vacuum technology and work with industry-standard software and tools.



Customized water vapour pump

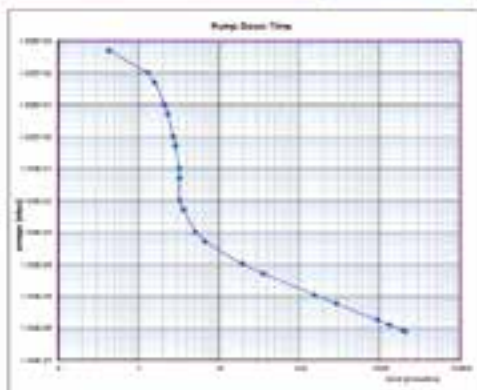
Customized pre-vacuum baffle for solar application



Pump time calculations and comparison of operating costs

HSR provides calculations of pump times for customer tailored projects and systems. Fully based on customer specifications, these calculations facilitate the choice of the optimal pump set type and configuration. Additional calculations for comparing different high-vacuum pump sets, such as diffusion pumps, cryogenic pumps or turbo molecular pumps can also be provided.

Actual pump down time relative system consisted with DFE 632 and cold trap



Equipment used:

1 set 1000°C cold trap
1 set WSP 1000

High vacuum pump set:

1 set DFE pump DFE632 Buffer Cap
1 set high vacuum angle valve
1 set cooling for WSP
(working pressure 10^-4)

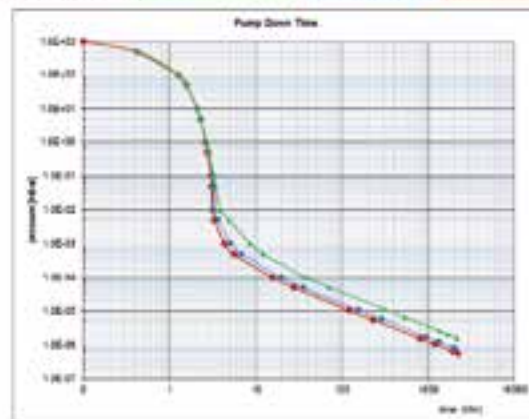
Actual pump down:

To 1.0E-04 mbar: 20 minutes
To 1.0E-06 mbar: 20 minutes

Pump down time relative to 1.0E-06 mbar:

Approx. 20 minutes

Comparison Pump down time DFE 632 without cold trap / DFE 632 & cold trap / VELCO 632 without cold trap



HSR also provides calculations and comparisons of operating costs for the most common high-vacuum pump sets.

Operating costs VELCO 632 (standard maintenance):

COMPUTATION BASE:		Utilities:		Maintenance & Service: (Process includes reactive gases)					
Production time:		Power consumption:		3 Years 4 Years 5 Years 6 Years 8 Years					
- Daily working hours:	24 h (3 shifts)	- Freezing set:	0.5 kW						
- Weekly working days:	7 days	- Cryo pump VELCO 632:	6.0 kW						
- Yearly working days:	350 days	Cooling water:							
- Yearly working hours:	8400 h	- Cryo pump VELCO 632:	6.0 l/min						
Batch time:		Spare Parts							
- Load / unload:	5 min	200 panel							
- pump to high vacuum:	5 min	Absorber	x	x	x	x	x	x	x
- process time:	20 min	Cold head exchange							
Total:	30 min	Flexion cleaning		x		x			
Productive Up-time:		Labour							
- yearly effective productive up-time:	99%	in h		2	0	2	0	0	2
(includes regeneration time)	8174 h								
- yearly downtime (1%) = reg time:	226 h								
Yearly maximal number of batches:	12'906								

Operating costs VELCO 632 (standard maintenance):

SUMMARY:	
Utilities per year:	
Costs for electricity and cooling water are based on actual prices in Yuleo, Mexico.	
Price for 1 kW electricity:	0.09 Euro
Price for one m ³ cooling water:	0.40 Euro
Electricity:	7'560.00 Euro
Cooling water:	2'520.00 Euro
Costs per year:	10'080.00 Euro
Spare Parts per year:	
Spare parts:	2'045.00 Euro
Costs for 10 years of operation:	
Utilities:	100'800.00 Euro
Spare parts:	20'450.00 Euro
Total operating costs for 10 years:	121'250.00 Euro

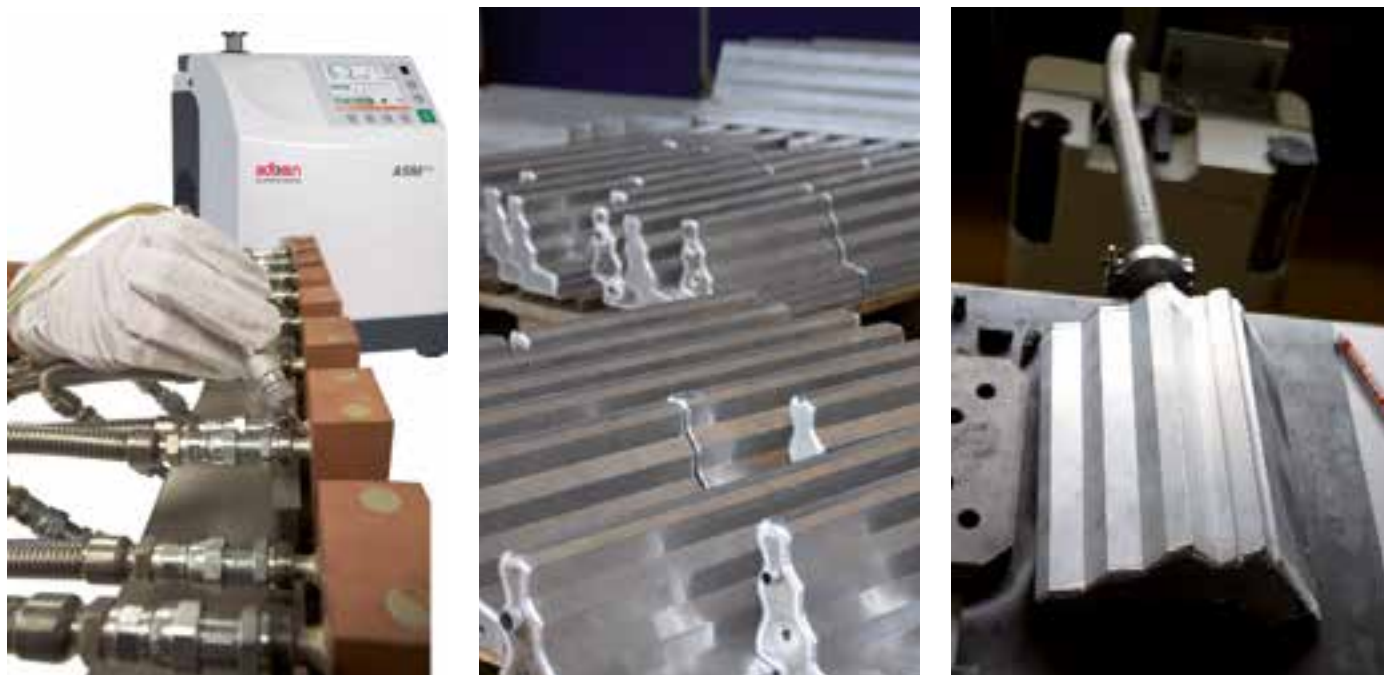
Yearly Operating Costs

Utilities Euro 7560
Spare parts Euro 2045

Leak detection

We also provide professional leak detection services for components, pumping units or high-vacuum or coating systems. These services are provided in our workshops or directly on customer site.

Certificates for all leak testing services will be provided at request.



Please contact us for detailed information

Customer training and maintenance courses

HSR also offers operator training and maintenance courses, either in our own workshops or directly on customer site.



HCC Software Update

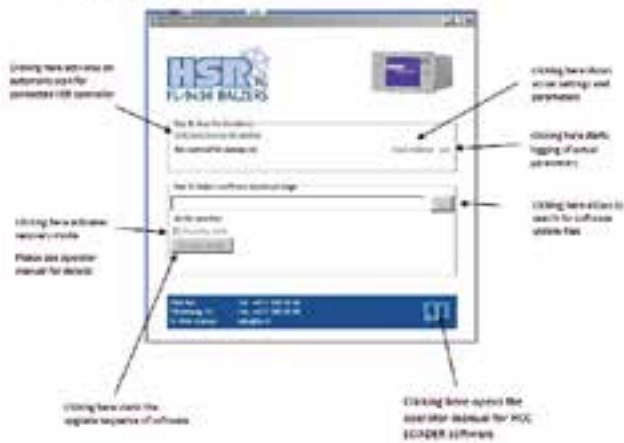
VERY IMPORTANT!

Please use only HCC LOADER software for updates of software in order not to affect other actual settings and parameters etc.

Software overview

HCC-Loader is a software tool intended for easy updating of firmwares stored on devices fabricated by HSR AG. Its purpose is to scan automatically for attached devices and if available one device is found, to update the device. Additional there is a read settings and Log function. To support troubleshooting with HSR, provide these data's.

Description software window



Troubleshooting

General proceeding in case of trouble shooting



Please contact us for further details

Subject to technical modifications without prior notice.
HSR accepts no liability for damage resulting from
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