Leybold

High Vacuum Pumps

COOLVAC
Cryo Pumps

COOLPOWER
Cold Heads

COOLPAK
Compressor Units

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Applications and Accessories, Cryo Pumps

Cryo pumps	COOLVAC 1500	COOLVAC 2000	COOLVAC 3000	COOLVAC 5000	COOLVAC 10000	COOLVAC 18000	COOLVAC 30000	COOLVAC 60000	COOLVAC 30000 LN_2	COOLVAC 60000 LN_2
Application										
General research	■	■	■	■	■	■	■	■	■	■
Evaporation coating systems	■	■	■	■	■	■	■	■		
Transfer chambers / Loadlock	■	■	■	■	■	■				
Metallization systems	■	■	■	■	■	■	■	■		
Sputtering systems	■	■	■	■	■					
Ion implanters	■	■	■	■						
Electron beam welding systems	■	■	■	■	■	■				
Space simulation chambers	■	■	■	■	■	■	■	■	■	■
UHV systems	■	■	■							
Beam tubes in particle accelerators	■	■								
Vacuum furnaces				■	■	■	■	■	■	■
Model versions										
BasicLine Version without electronics, with temperature sensors	■	■	■	■	■	■	■	■		
iClassicLine version with electronics and integrated controller, with temperature sensors and electrical heaters	■	■	■	■	■	■	■	■		
BasicLine LN_2 version with liquid nitrogen cooling, temperature sensors and electrical heaters and over-temperature protection									■	■
Accessories										
Purge gas option, on request	■	■	■	■	■					
Compressor unit COOLPAK 2000 Series	■	■	■							
Compressor unit COOLPAK 6000 Series	[■]	[■]	[■]	■	■	■	■	■	■	■
Flexible pressure lines	■	■	■	■	■	■	■	■	■	■
Gas manifold GD 2 for multiple operation of up to two cryo pumps	■	■	■	■ *)	■ *)					
Gas manifold GD 4 for multiple operation of up to four cryo pumps	■	■	■							
Low temperature measuring instrument MODEL 211 S (BasicLine Series only)	■	■	■	■	■	■	■	■	■	■

[■] = For dual and multiple operation only *) Multiple operation only after consultation with technical support

Applications and Accessories, Cryogenics

Cold heads / Application	single-stage COOLPOWER 50	single-stage COOLPOWER 140 T	single-stage COOLPOWER 250 MD	double-stage COOLPOWER 7/25	double-stage COOLPOWER 5/100	double-stage COOLPOWER 10 MD
Cooling of samples, sensors and detectors	■	■	■	■	■	■
Cooling of detectors in astronomy	■	■	■	■	■	■
Cooling of samples for spectroscopy				■	■	■
Cooling of samples for applications in medical technology and R&D				■	■	■
Cooling of HTS superconductors	■	■	■	■	■	■
Cooling of LTS superconductors				(■)	(■)	(■)
Cooling in medical equipment	■	■	■	■	■	■
Cooling of surfaces for pumping of gases	■	■	■	■	■	■
Cryogenic process gas cleaning	■	■	■	■	■	■
Condensation, resublimation and freezing of gases	■	■	■	■	■	■

(■) = Only LTS superconductors with T_c > 10 K

Accessories

Compressor unit COOLPAK 2000 Series	■			■		
Compressor unit COOLPAK 6000 Series	(■)	■	■	(■)	■	■
Low temperature measurement instrument MODEL 211S	■	■	■	■	■	■
Temperature sensor	■	■	■	■	■	■

(■) = Only high T_c superconductors

Conversion of Units

Kelvin (K), Celsius (°C), Fahrenheit (°F)

Calculation from	Calculation to	Formula
Celsius	Fahrenheit	°F = °C x 1.8 + 32
Celsius	Kelvin	K = °C + 273.15
Kelvin	Celsius	°C = K – 273.15
Kelvin	Fahrenheit	°F = K x 1.8 – 459.67
Fahrenheit	Celsius	°C = (°F – 32) / 1.8
Fahrenheit	Kelvin	K = (°F + 459.67) / 1.8

The following applies to absolute zero:
0 K = –273.15 °C = –459.67 °F.

Cryo Pumps

Cryo pumps are gas entrapment vacuum pumps for the pressure range from 10^{-3} to ≤ 10^{-11} mbar (0.75 x 10^{-3} to ≤ 0.75 x 10^{-11} Torr). The principle of operation is that gaseous substances are bound to the cold surfaces within the pump by means of cryocondensation, cryosorption or cryotrapping.

In order to be able to produce a high or ultra-high vacuum, the cold surfaces (cryopanels) must be cooled to a sufficiently low temperature. Depending on the type of cooling system used a distinction is made between refrigerator cryo pumps, bath cryo pumps and evaporator cryo pumps.

Leybold manufactures refrigerator-cooled cryo pumps as well as liquid nitrogen supported cryo pumps.

Advantages to the User

Advantages offered by the pumping principle

- High effective pumping speed for all gases
- Extremely high pumping speed for H_2O (water) and H_2 (hydrogen)

For a given diameter of the high vacuum flange, the cryopump offers the highest pumping speed of all high vacuum pumps.

Advantages offered by Design

In contrast to gas transfer high vacuum pumps, cryo pumps do not have any mechanically moving, oil or grease lubricated parts on the vacuum side.

The following advantages are a direct result of this design characteristic:

- Hydrocarbon-free vacuum in the pressure range from 10^{-3} to ≤ 10^{-11} mbar (0.75 x 10^{-3} to ≤ 0.75 x 10^{-11} Torr).
- Insensitivity to mechanical disturbances from particles coming from the process or external vibrations.

Further Advantages

- More compact than comparable pump systems offering a pumping speed of over 1500 l/s
- Backing pump is only required during start-up and during regeneration
- User friendly process control and pump control
- Favorable price-performance ratio and low running costs especially at higher pumping speeds

The cryo pumps are cooled by the well-proven two-stage refrigerators from Leybold's COOLPOWER line (Gifford/McMahon principle).

The design of a refrigerator cryopump from the COOLVAC range is shown schematically in the figure below.

The first stage of the cold head **(6)** cools the thermal radiation shield **(7)** and the baffle **(8)** of the pump.

Both are made of copper with high thermal conductivity in order to optimally utilize the available refrigerating capacity.

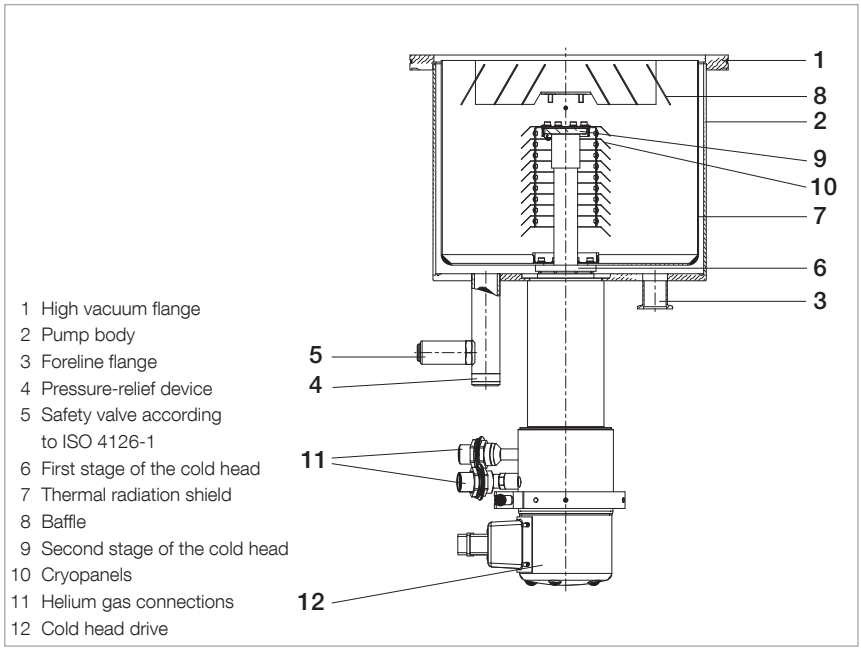
Operating temperatures of 45 K to 80 K are reached depending on the type of pump and on the operating conditions. Mainly water but also carbon oxides are pumped here.

The second stage of the cold head **(9)** is used to cool the cryopanels **(10)**. These pumping surfaces are also made of copper of high thermal conductivity and they are tightly linked thermally to the second stage of the cold head.

Depending on the operating conditions, operating temperatures of 10 to 20 K are attained.

Here the process of cryocondensation of N_2 (nitrogen), O_2 (oxygen) and Ar (argon) will take place.

The inner part ot the pumping surfaces are additionally covered with activated charcoal. Here the process of adsorption (cryosorption) of H_2 (hydrogen), Ne (neon) and He (helium) will take place.



COOLVAC refrigerator cryopump

All cryo pumps from the COOLVAC range are equipped with all safety related components, particularly with a pressure-relief device and safety valve with flange hub **(4, 5)** which is equipped with an additional DN 40 KF flange for connection of an exhaust line.

The pump's body is made of high-quality stainless steel.

Helium compressors from the COOLPAK range are required for operating the COOLPOWER cold heads, which are incorporated within the COOLVAC range of cryo pumps.

Regenerating Cryo Pumps

An important aspect of the operation of cryo pumps is that of regeneration. Since a cryo pump is a gas entrapment pump, the pumped gases must be removed from the pump before the capacity limit is exceeded.
The so-called "regeneration" occurs by switching off the compressor unit and heating up the cold surfaces to room temperature. The pumped gases are pumped out by means of a roughing pump. As soon as the vacuum pressure is low enough, the cryo pump can be cooled down again. Finally, when the operating temperature has been reached, the regeneration process is complete.

Various procedures are available for regeneration as listed below:

- Heating up through self-heating after the refrigerator has been switched off, and subsequent re-cooling
- Heating up with the support of a dry, warm inert gas
- Heating up by means of an electrical heater on the cold surfaces.

These methods can be combined with each other.

iClassicLine Cryo pumps with regulated regeneration system

The cryo pumps from the *iClassicLine (iCL)* range are gradually heated up to room temperature by means of electrical heaters at both cold head stages. Pressure, temperature and heating power are monitored in detail within the cryo pumps.

During the process the pumped gases are released one after the other in the following sequence:

- Gases adsorbed at the cryopanels (e.g. hydrogen, helium, neon),
- Gases condensed at the cryopanels (e.g. nitrogen, oxygen, argon),
- Gases and vapors which have condensed on to the baffle and thermal radiation shield (e.g. water vapor).

The benefit of Leybold's regeneration process described above is that no additional purge gas is required during the regeneration of inert, unreactive gases.

Our application support team is on hand to answer any safety questions you may have in relation to client-specific process gases.

The accessories required for automatic regeneration, such as temperature sensors on both cold head stages, pressure gauge head, fore-vacuum valve and electrical controller are an integral part of the cryo pump in the iClassicLine range. Additional accessories can be supplied on request.

BasicLine cryo pumps with no regulated regeneration system

In the case of cryo pumps from the *BasicLine (BL)* range, regeneration takes place manually in two sub-steps:

- Switching off the refrigerator system and waiting until room temperature is reached. (The temperature can be read off by the customer from the built-in silicon diode).
- Re-cooling after a sufficiently low pressure is reached in the cryo pump.

Additional components such as temperature display unit, pressure gauge head and fore-vacuum valve are not part of the standard scope of delivery for BasicLine cryo pumps, although they are available as accessories on request. Leybold will be pleased to advise you on the optimum component configuration for your application.

The cryo pumps from both the *BasicLine* range as well as those from the *iClassicLine* range are available in suction capacity classes from 1500 l/s to 60000 l/s.

Multiple Operation of Refrigerator Cryo Pumps

The powerful Leybold compressor units COOLPAK 6000 H open up the possibility of operating up to three refrigerator cryo pumps simultaneously.

Advantages to the User

- Significantly reduced investment and operating costs
- Small footprint

Cold Heads

A refrigerator is a cooling machine which operates on the basis of a thermodynamic cycle (Carnot) to produce cryogenic temperatures ($T \leq 120$ K).

Refrigerators operating according to the Gifford/McMahon principle have succeeded over other methods of cooling cryo pumps and cryogenic applications. Exclusively such coolers are produced and used by Leybold.

The cold heads consist essentially of three modules:

- Drive module
- Displacement unit
- Cold head stage(s)

Helium compressors from the COOLPAK range are used to drive the cold heads from the COOLPOWER range.

In addition to the standard products, Leybold also offers these cold heads, as well as cryo pumps, in custom designs in accordance with customer requirements.

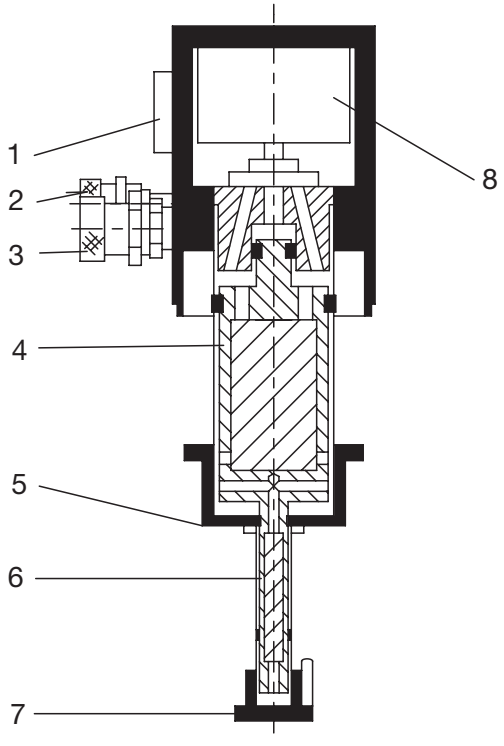
Gifford/McMahon-Refrigerators

Advantages to the User

- No liquid helium and no liquid nitrogen are required
- Very simple to operate
- Easy process control and temperature control via a computer
- No space problems since cold head and compressor unit can be installed and operated apart
- Installation of the cold head basically in any orientation
- High reliability
- Long periods of operation without maintenance

Typical Applications

- Cooling of
  - cryopanels in cryo pumps thereby producing high or ultra-high vacuum
  - superconducting magnets; for instance in magnetic resonance tomography
  - samples for spectroscopic analysis in solid state and surface physics
  - high-temperature and low-temperature superconductors
  - semiconductors
  - infrared and gamma detectors
- Recondensation of liquids and cleaning of gases
- Calibration of sensors



1 Electrical connection and current lead-through for cold head motor
2 Helium high pressure connection
3 Helium low pressure connection
4 Displacement piston, 1st stage
5 1st (refrigerator) stage ($T_{end} > 20$ K)
6 Displacement piston, 2nd stage
7 2nd (refrigerator) stage ($T_{end} < 20$ K)
8 Cold head motor

Dual-stage Gifford/McMahon cold head (schematic diagram)

Cold heads from the COOLPOWER range

The standard range of single-stage and double-stage cold heads matches a wide range of applications.

Leybold is offering refrigerators with usable refrigerating powers from 20 W to 250 W at 80 K (single-stage).

In two-stage systems, the refrigeration capacities of the second stage range in between 5 W and 20 W at 20 K.

Pneumatically driven cold heads

Advantages

- **Simple Design**
  The pneumatic drive system for the displacer of these cold heads from Leybold consists of only two mechanically moving components: the rotating control valve and the synchronous motor driving the control valve.
- **Easy and quick maintenance**
  Owing to the simple design of the built-in cold heads, maintenance is easy. Maintenance can be performed in place without detaching the cold head from the vacuum chamber.

Mechanically driven cold heads

Advantages through low vibrations

With these cold heads, movement of the displacer unit is automatically controlled via a crank drive, which leads to low vibration levels.

Here, too, maintenance at the place of use can be carried out without impacting the surrounding infrastructure, in particular with no breaking of the chamber's vacuum by the service personnel.

Advantages through high reliability

Leybold cold heads are used in applications which place particularly high demands on reliability, such as magnetic resonance imaging in medical technology, the cooling of low and high temperature superconductors, and the cooling of detectors in telescopes for astronomy.

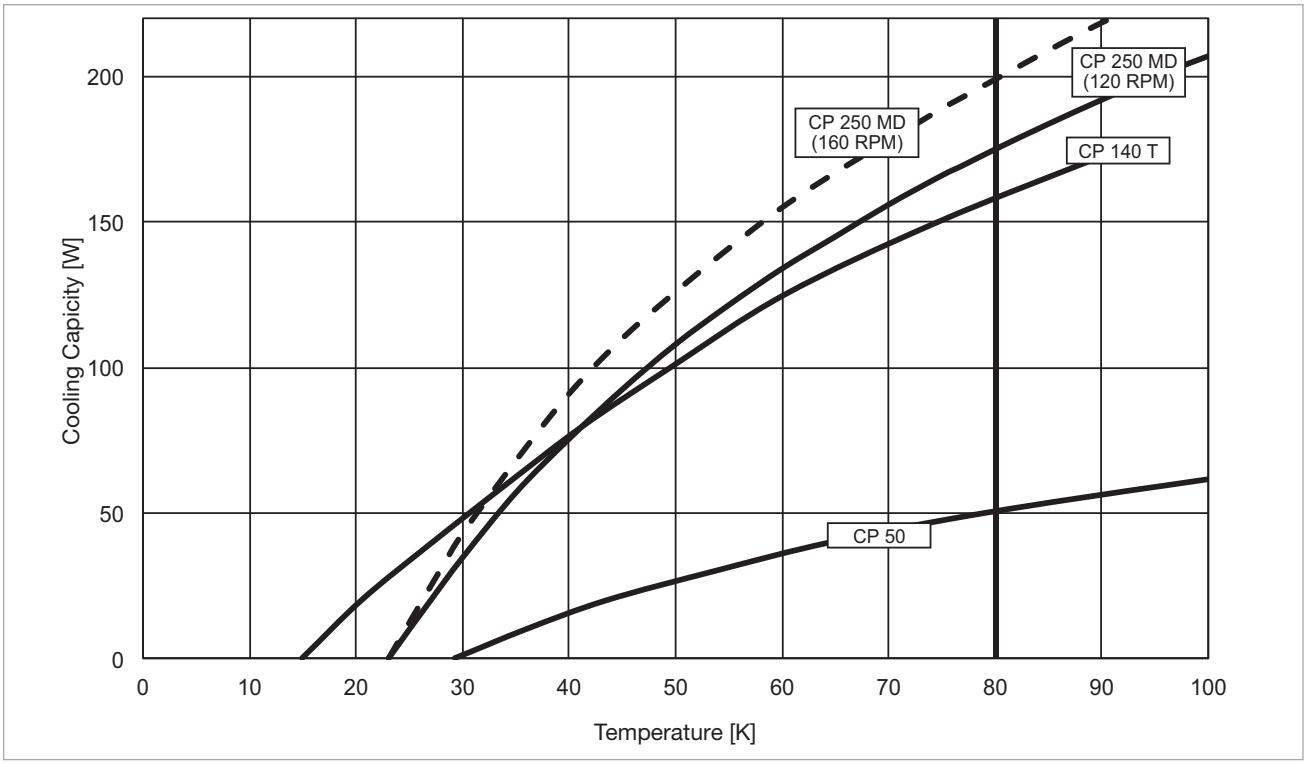
Refrigeration capacity diagrams (see next page of the catalogue)

On the following page of the catalogue you will find the refrigeration capacity diagrams for our single-stage and double-stage COOLPOWER cold heads.

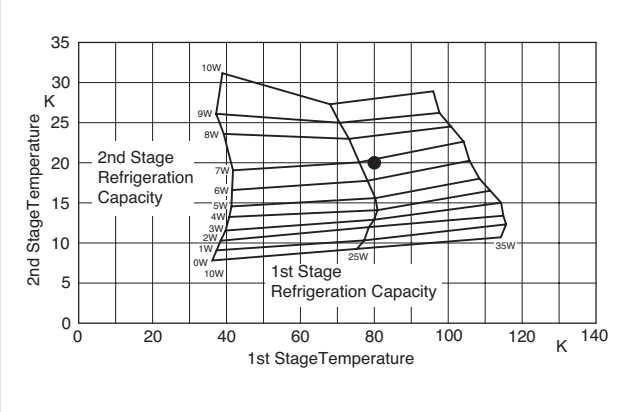
The interpretation of the diagrams for our double-stage cold heads is explained using the example of the refrigerator cold head COOLPOWER 5/100 (see diagram on next page).
If applying heat loads of 100 W on the 1st stage and of 6 W on the 2nd stage, simultaneously, then the intersection point (●) 100 W / 6 W of the two lines gives the expected 1st stage and 2nd stage temperature of 80 K and of 20 K, respectively.

Without thermal load (left lower intersection point (○) 0 W / 0 W of this "load map"), ultimate temperatures of < 30 K and of < 10 K will be reached on the 1st stage and on the 2nd stage, respectively.

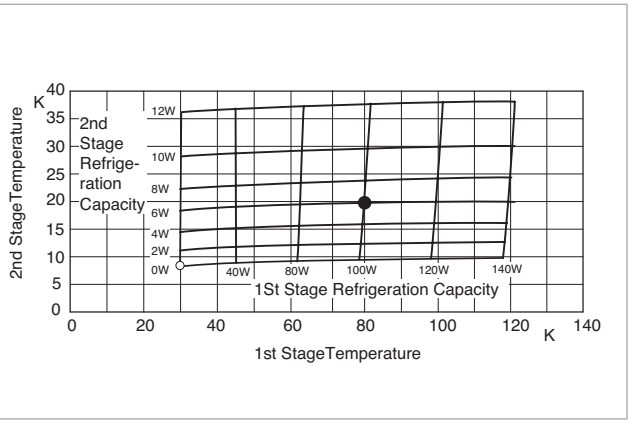
Refrigerating Capacity of Cryogenic Cold Heads



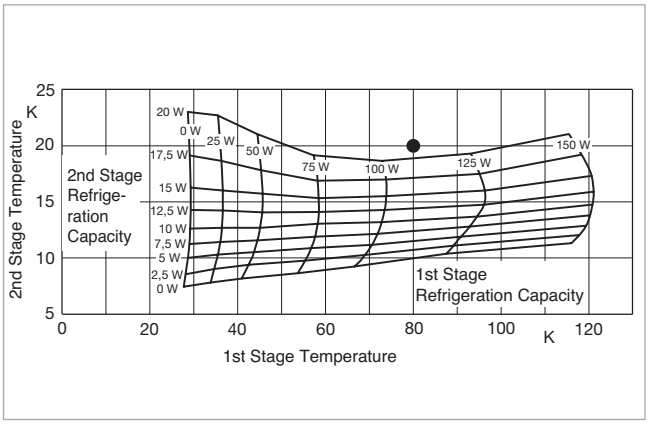
Typical refrigerating capacity of the single-stage cold heads COOLPOWER 50, COOLPOWER 140 T and COOLpower 250 MD



Typical refrigerating capacity of the cold head COOLPOWER 7/25



Typical refrigerating capacity of the cold head COOLPOWER 5/100



Typical refrigerating capacity of the cold head COOLPOWER 10 MD

The refrigerating capacities stated apply to vertical operation with the cold end at the bottom.

Compressor Units

COOLPAK 2000 and COOLPAK 6000 H compressors are available for single and multiple operation of the cold heads from the COOLPOWER line as well as for operation of cryo pumps from the COOLVAC line.

The compressors are characterised by high reliability and ease of maintenance. The maintenance interval is as long as 30,000 hours depending on the application. The low level of noise and vibration is achieved through the exclusive use of scroll compressors and specially selected components.

The possibilities for single and multiple operation of refrigerator cryo pumps are given in the table below:

	For the operation of	
Compressor Unit	**Cold Heads**	**Cryo Pumps**
COOLPAK 2000/2200	1 x COOLPOWER 50 1 x COOLPOWER 7/25	1 x COOLVAC 1500 / 2000 / 3000
COOLPAK 6000 HD	2 x COOLPOWER 50 2 x COOLPOWER 7/25	2 x COOLVAC 1500 BL / 2000 BL / 3000 BL 2 x COOLVAC 5000 BL / 10000 BL *)
COOLPAK 6000 H/6200 H	1 x COOLPOWER 140 T 1 x COOLPOWER 5/100	up to 3 x COOLVAC 1500 iCL / 2000 iCL up to 2 x COOLVAC 3000 iCL up to 2 x COOLVAC 5000 iCL / 10000 iCL *) 1 x COOLVAC 5000 BL / 10000 BL
COOLPAK 6000 HMD/6200 HMD	1 x COOLPOWER 250 MD 1 x COOLPOWER 10 MD	1 x COOLVAC 30000 BL LN_2 1 x COOLVAC 60000 BL LN_2

*) only after consulting with our technical support

Products Cryo Pumps

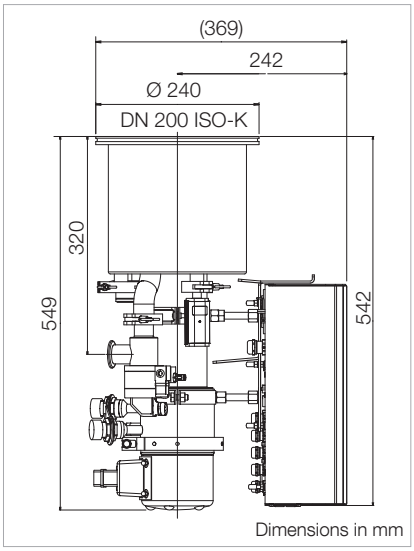
Cryo Pumps with fully Automatic Control, iClassicLine
COOLVAC 1500 iCL

Advantages to the User

- Hydrocarbon-free high vacuum
- High capacity for argon and hydrogen
- High crossover value
- Simple operation
- Trouble-free integration into complex systems
- Fully automatic regeneration through Cryo Compact Control [1)]
- Easy servicing

Typical Applications

- Evaporators
- Sputtering systems
- Ion implanters
- Optical coating systems
- Metallization systems



Dimensional drawing for the COOLVAC 1500 iCL (DN 200 ISO-K)

Technical Data		COOLVAC 1500 iCL
High vacuum (HV) flange	DN	200 ISO-K / 200 CF / 6" ANSI
Fore vacuum flange [2)]	DN	25 ISO-KF
Flange for connection a gauge head [3)]	DN	16 ISO-KF
Flange for the electrical connection	DN	16 ISO-KF
Pressure-relief device with flange connection for gas exhaust line	DN	40 ISO-KF
4-way current feedthrough for Si diode on a flange	DN	16 ISO-KF
Heaters		
1st stage	W	160
	V AC	42
2nd stage	W	90
	V AC	42
Temperature sensor		
1st stage		PT 100
2nd stage		Si-Diode
Built-in cold head	COOLPOWER	7/25
Weight	kg (lbs)	25 (55.1)
Cooldown time to T_2 = 20 K	min	60
Crossover value	mbar x l (Torr x l)	210 (155)
Pumping speed		
H_2O	l/s	4600 ± 10%
Ar / N_2	l/s	1200 / 1500 ± 10%
H_2	l/s	2500 ± 10%
Capacity		
Ar / N_2	bar x l	1000 / 1000
H_2 at 10^{-6} mbar	bar x l	15 [4)]
Max. throughput		
Ar / N_2	mbar x l/s (Torr x l/s)	12 (9) / 12 (9)
H_2	mbar x l/s (Torr x l/s)	6 (4.5) [4)]
Helium connections (Self-sealing couplings: outside thread, type 5400-S2-8)	DN	1/2"

1) Accessories, necessary for automatic operations (i.e. electrical regeneration heaters, forevacuum valve DN 25 ISO-KF, and vacuum gauge DN 16 ISO-KF), are included with the scope of delivery and are connected to the integrated COOL.DRIVE.
2) Electropneumatic angle valve included.
3) Vacuum gauge head included.
4) The maximum throughput values given for hydrogen (H_2) are true for regenerated cryo pumps under short-term loads only. For continuous operations, both throughput and capacity values will be lower.

Ordering Information

COOLVAC 1500 iCL

	Single Operation		Dual operation		Multiple operation	
	Europe	USA/Japan	High Voltage	Low Voltage	High Voltage	Low Voltage
	Part No.		Part No.		Part No.	
COOLVAC 1500 iCL						
DN 200 CF	844201V0002		844201V0002 (2x)		844201V0002 (3x)	
DN 6" ANSI	844201V0004		844201V0004 (2x)		844201V0004 (3x)	
DN 200 ISO-K	844201V0006		844201V0006 (2x)		844201V0006 (3x)	
Compressors, flexlines and cables						
Compressor						
CP 2000	840000V2000	–	–	–	–	–
CP 2200	–	840000V2200	–	–	–	–
CP 6000 H	–	–	840000V6001	–	840000V6001	–
CP 6200 H	–	–	–	840000V6201	–	840000V6201
Power supply cable for compressor	–		see Ordering Information of the compressor units			
Set of flexlines						
FL 4.5 (1/2", 1/2")	892 87		892 87 (2x)		892 87 (3x)	
or FL 9.0 (1/2", 1/2")	892 88		892 88 (2x)		892 88 (3x)	
or FL 18.0 HP (1/2") + FL 18.0 LP (1/2")	840203 + 840204		840203 (2x) + 840204 (2 x)		840203 (3x) + 840204 (3 x)	
Gas manifold (1 piece each)						
GD 2	–		840 253 (2x)		–	
GD 4	–		–		840 254 (2x)	
Compressor unit control cable [1]						
COOLPAK control cable, 5 m (16.4 ft)	844231V4005		844231V4005 (2x)		844231V4005 (3x)	
or COOLPAK control cable, 10 m (32.81 ft)	844231V4010		844231V4010 (2x)		844231V4010 (3x)	
or COOLPAK control cable, 20 m (65.62 ft)	844231V4020		844231V4020 (2x)		844231V4020 (3x)	
COOLPAK adapter for multi control	–		844231V5003		844231V5003	
Optional electronics, cables and equipment						
CRYOVISION control and display unit	844231V0002		844231V0002		844231V0002	
CRYOVISION control cables						
CRYOVISION control cable, 5 m (16.4 ft)	844231V2005		844231V2005		844231V2005	
or CRYOVISION control cable, 10 m (32.81 ft)	844231V2010		844231V2010		844231V2010	
or CRYOVISION control cable, 20 m (65.62 ft)	844231V2020		844231V2020		844231V2020	
Network control cable for the link between the pumps						
CRYOVISION / Network control cable, 5 m (16.4 ft)	–		844231V2005		844231V2005 (2x)	
or CRYOVISION / Network control cable, 10 m (32.81 ft)	–		844231V2010		844231V2010 (2x)	
or CRYOVISION / Network control cable, 20 m (65.62 ft)	–		844231V2020		844231V2020 (2x)	
Optional interface module						
COOLVAC ProfiBus module ProfiBus – RS232 Converter for COOL.DRIVE and CRYOVISION either COOLVAC ProfiBus module connected to COOL.DRIVE control and monitoring unit of each cryo pump (in this case CRYOVISION and network control not to apply)	844000V1		844000V1 (2x)		844000V1 (3x)	
or COOLVAC ProfiBus module connected to CRYOVISION [2]	844000V1		844000V1		844000V1	

The arrangement of the components is shown in the chapter “Accessories” under the heading “iCOOLVAC iClassicLine, System Components”.

1) The length of the control cable should match to the length of the flexlines.
2) At multiple operation with reduced communication speed to single cryo pumps.

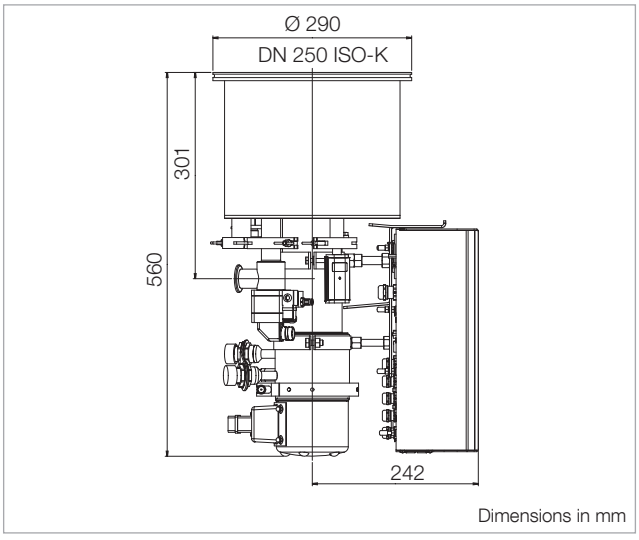
COOLVAC 2000 iCL

Advantages to the User

- Hydrocarbon-free high vacuum
- High capacity for argon and hydrogen
- High crossover value
- Simple operation
- Trouble-free integration into complex systems
- Fully automatic regeneration through integrated COOL.DRIVE controller [1)]
- Easy on-site servicing without pump disassembling and reconditioning of the vacuum system possible

Typical Applications

- Evaporators
- Sputtering systems
- Ion implanters
- Optical coating systems
- Metallization systems



Dimensional drawing for the COOLVAC 2000 iCL (DN 250 ISO-K)

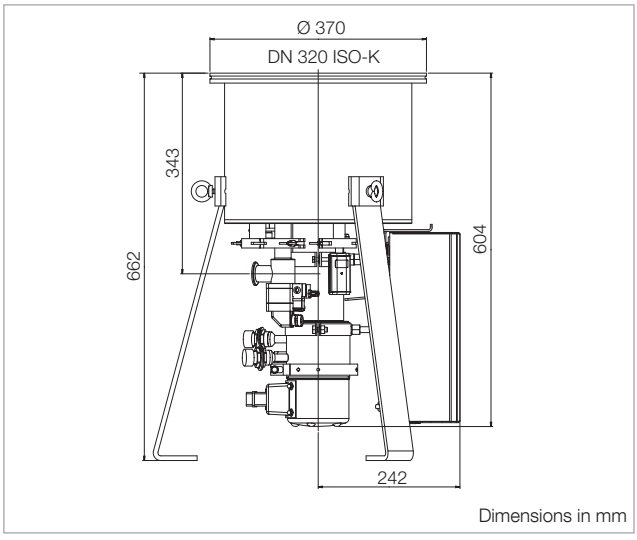
COOLVAC 3000 iCL

Advantages to the User

- Hydrocarbon-free high vacuum
- High capacity for argon and hydrogen
- High crossover value
- Simple operation
- Trouble-free integration into complex systems
- Fully automatic regeneration through integrated COOL.DRIVE controller [1)]
- Easy on-site servicing without pump disassembling and reconditioning of the vacuum system possible

Typical Applications

- Evaporators
- Sputtering systems
- Ion implanters
- Optical coating systems
- Metallization systems



Dimensional drawing for the COOLVAC 3000 iCL (DN 320 ISO-K)

Technical Data

		COOLVAC	
		2000 iCL	3000 iCL
High vacuum (HV) flange	DN	250 ISO-K / 250 CF / 8" ANSI	320 ISO-K / 10" ANSI
Fore vacuum flange [2]	DN	25 ISO-KF	25 ISO-KF
Flange for connection a gauge head [3]	DN	16 ISO-KF	16 ISO-KF
Flange for the electrical connection	DN	16 CF	16 CF
Pressure-relief device with flange connection for gas exhaust line	DN	40 ISO-KF	40 ISO-KF
4-way current feedthrough for Si diode on a flange	DN	16 ISO-KF	16 ISO-KF
Heaters			
1st stage	W	160	160
	V AC	42	42
2nd stage	W	90	90
	V AC	42	42
Temperature sensor			
1st stage		Pt100	Pt100
2nd stage		Si diode	Si diode
Built-in cold head	COOLPOWER	7/25	7/25
Weight	kg (lbs)	29 (64)	35 (101.4)
Cooldown time to T_2 = 20 K	min	70	120
Crossover value	mbar x l (Torr x l)	250 (187)	500 (375)
Pumping speed			
H_2O	l/s	7000	10500
Ar / N_2	l/s	1600 / 2100	2500 / 3000
H_2	l/s	3200	6000
Capacity			
Ar / N_2	bar x l	1600 / 1600	2500 / 2500
H_2 at 10^{-6} mbar	bar x l	15 [4]	28 [4]
Max. throughput			
Ar / N_2	mbar x l/s (Torr x l/s)	12 (9) / 12 (9)	15 (11.2) / 15 (11.2)
H_2	mbar x l/s (Torr x l/s)	6 (4.5) [4]	10 (7.5) [4]
Helium connections (Self-sealing couplings: outside thread, type 5400-S2-8)	DN	1/2"	1/2"

1) Accessories, necessary for automatic operations (i.e. electrical regeneration heaters, forevacuum valve DN 25 ISO-KF, and vacuum gauge DN 16 ISO-KF), are included with the scope of delivery and are connected to the integrated COOL.DRIVE.
2) Electropneumatic angle valve included.
3) Vacuum gauge head included.
4) The maximum throughput values given for hydrogen (H_2) are true for regenerated cryo pumps under short-term loads only. For continuous operations, both throughput and capacity values will be lower.

Ordering Information

COOLVAC 2000 iCL

	Single Operation		Dual operation		Multiple operation	
	Europe	USA/Japan	High Voltage	Low Voltage	High Voltage	Low Voltage
	Part No.		Part No.		Part No.	
COOLVAC 2000 iCL						
DN 250 CF	844251V0002		844251V0002 (2x)		844251V0002 (3x)	
DN 8" ANSI	844251V0004		844251V0004 (2x)		844251V0004 (3x)	
DN 250 ISO-K	844251V0006		844251V0006 (2x)		844251V0006 (3x)	
Compressors, flexlines and cables						
Compressor						
CP 2000	840000V2000	–	–	–	–	–
CP 2200	–	840000V2200	–	–	–	–
CP 6000 H	–	–	840000V6001	–	840000V6001	–
CP 6200 H	–	–	–	840000V6201	–	840000V6201
Power supply cable for compressor	–		see Ordering Information of the compressor units			
Set of flexlines						
FL 4.5 (1/2", 1/2")	892 87		892 87 (2x)		892 87 (3x)	
or FL 9.0 (1/2", 1/2")	892 88		892 88 (2x)		892 88 (3x)	
or FL 18.0 HP (1/2") + FL 18.0 LP (1/2")	840203 + 840204		840203 (2x) + 840204 (2 x)		840203 (3x) + 840204 (3 x)	
Gas manifold (1 piece each)						
GD 2	–		840 253 (2x)		–	
GD 4	–		–		840 254 (2x)	
Compressor unit control cable [1]						
COOLPAK control cable, 5 m	844231V4005		844231V4005 (2x)		844231V4005 (3x)	
or COOLPAK control cable, 10 m	844231V4010		844231V4010 (2x)		844231V4010 (3x)	
or COOLPAK control cable, 20 m	844231V4020		844231V4020 (2x)		844231V4020 (3x)	
COOLPAK adapter for multi control	–		844231V5003		844231V5003	
Optional electronics, cables and equipment						
CRYOVISION control and display unit	844231V0002		844231V0002		844231V0002	
CRYOVISION control cables						
CRYOVISION control cable, 5 m	844231V2005		844231V2005		844231V2005	
or CRYOVISION control cable, 10 m	844231V2010		844231V2010		844231V2010	
or CRYOVISION control cable, 20 m	844231V2020		844231V2020		844231V2020	
Network control cable for the link between the pumps						
CRYOVISION / Network control cable, 5 m	–		844231V2005		844231V2005 (2x)	
or CRYOVISION / Network control cable, 10 m	–		844231V2010		844231V2010 (2x)	
or CRYOVISION / Network control cable, 20 m	–		844231V2020		844231V2020 (2x)	
Optional interface module						
COOLVAC ProfiBus module ProfiBus – RS232 Converter for COOL.DRIVE and CRYOVISION either COOLVAC ProfiBus module connected to COOL.DRIVE control and monitoring unit of each cryo pump (in this case CRYOVISION and network control not to apply)	844000V1		844000V1 (2x)		844000V1 (3x)	
or COOLVAC ProfiBus module connected to CRYOVISION [2]	844000V1		844000V1		844000V1	

The arrangement of the components is shown in the chapter “Accessories” under the heading “COOLVAC iClassicLine, System Components”.

1) The length of the control cable should match to the length of the flexlines.
2) At multiple operation with reduced communication speed to single cryo pumps.

Ordering Information

COOLVAC 3000 iCL

	Single Operation		Dual operation	
	Europe	USA/Japan	High Voltage	Low Voltage
	Part No.		Part No.	
COOLVAC 3000 iCL				
DN 10" ANSI	844321V0004		844321V0004 (2x)	
DN 320 ISO-K	844321V0006		844321V0006 (2x)	
Compressors, flexlines and cables				
Compressor				
CP 2000	840000V2000	–	–	–
CP 2200	–	840000V2200	–	–
CP 6000 H	–	–	840000V6001	–
CP 6200 H	–	–	–	840000V6201
Power supply cable for compressor	–		see Ordering Information of the compressor units	
Set of flexlines				
FL 4.5 (1/2", 1/2")	892 87		892 87 (2x)	
or FL 9.0 (1/2", 1/2")	892 88		892 88 (2x)	
or FL 18.0 HP (1/2") + FL 18.0 LP (1/2")	840203 + 840204		840203 (2x) + 840204 (2 x)	
Gas manifold (1 piece each)				
GD 2	–		840 253 (2x)	
Compressor unit control cable [1]				
COOLPAK control cable, 5 m (16.4 ft)	844231V4005		844231V4005 (2x)	
or COOLPAK control cable, 10 m (32.81 ft)	844231V4010		844231V4010 (2x)	
or COOLPAK control cable, 20 m (65.62 ft)	844231V4020		844231V4020 (2x)	
COOLPAK adapter for multi control	–		844231V5003	
Optional electronics, cables and equipment				
CRYOVISION control and display unit	844231V0002		844231V0002	
CRYOVISION control cables				
CRYOVISION control cable, 5 m (16.4 ft)	844231V2005		844231V2005	
or CRYOVISION control cable, 10 m (32.81 ft)	844231V2010		844231V2010	
or CRYOVISION control cable, 20 m (65.62 ft)	844231V2020		844231V2020	
Network control cable for the link between the pumps				
CRYOVISION / Network control cable, 5 m (16.4 ft)	–		844231V2005	
or CRYOVISION / Network control cable, 10 m (32.81 ft)	–		844231V2010	
or CRYOVISION / Network control cable, 20 m (65.62 ft)	–		844231V2020	
Optional interface module				
COOLVAC ProfiBus module ProfiBus – RS232 Converter for COOL.DRIVE and CRYOVISION either COOLVAC ProfiBus module connected to COOL.DRIVE control and monitoring unit of each cryo pump (in this case CRYOVISION and network control not to apply)	844000V1		844000V1 (2x)	
or COOLVAC ProfiBus module connected to CRYOVISION [2]	844000V1		844000V1	

The arrangement of the components is shown in the chapter “Accessories” under the heading “COOLVAC iClassicLine, System Components”.

1) The length of the control cable should match to the length of the flexlines.
2) At multiple operation with reduced communication speed to single cryo pumps.

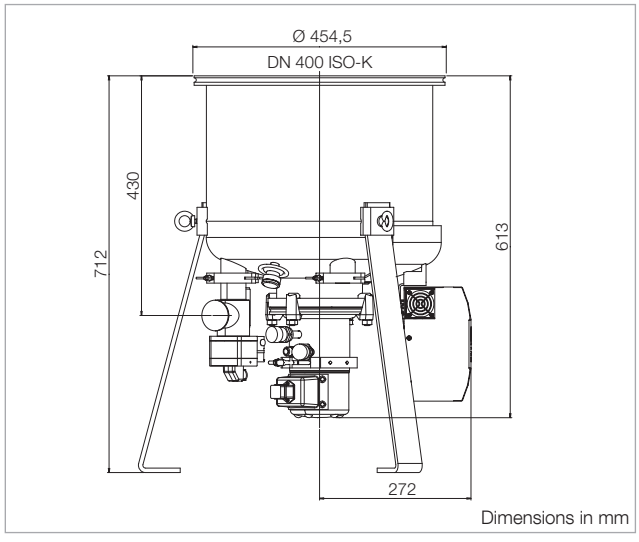
COOLVAC 5000 iCL

Advantages to the User

- Hydrocarbon-free high vacuum
- High capacity for argon and hydrogen
- High crossover value
- Simple operation
- Trouble-free integration into complex systems
- Fully automatic regeneration through integrated COOL.DRIVE controller [1)]
- Easy on-site servicing without pump disassembling and reconditioning of the vacuum system possible

Typical Applications

- Evaporators
- Electron beam welding systems
- Ion implanters
- Optical coating systems
- Metallization systems



Dimensional drawing for the COOLVAC 5000 iCL

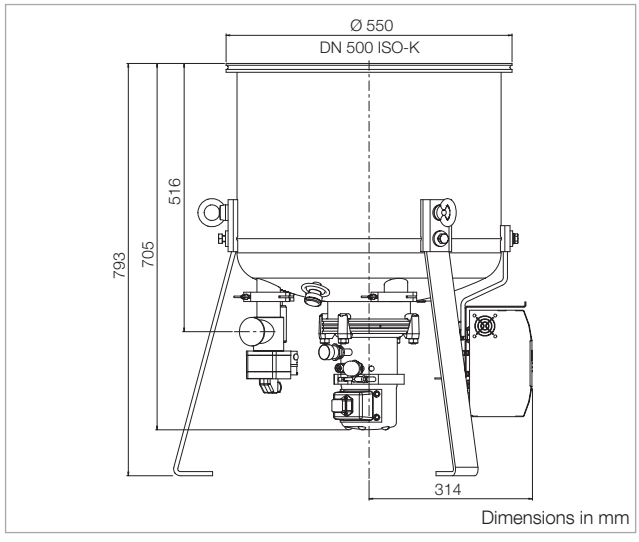
COOLVAC 10000 iCL

Advantages to the User

- Hydrocarbon-free high vacuum
- High capacity for argon and hydrogen
- High crossover value
- Simple operation
- Trouble-free integration into complex systems
- Fully automatic regeneration through integrated COOL.DRIVE controller [1)]
- Easy on-site servicing without pump disassembling and reconditioning of the vacuum system possible

Typical Applications

- Evaporators
- Electron beam welding systems
- Ion implanters
- Optical coating systems
- Metallization systems



Dimensional drawing for the COOLVAC 10000 iCL

Technical Data

		COOLVAC	
		5000 iCL	10000 iCL
High vacuum (HV) flange	DN	400 ISO-K	500 ISO-K / 500 – 20" ANSI
Fore vacuum flange [2]	DN	40 ISO-KF	40 ISO-KF
Flange for connection of a gauge head [3]	DN	16 ISO-KF	16 ISO-KF
Flange for the electrical connection	DN	40 ISO-KF	40 ISO-KF
Pressure-relief device with flange connection for gas exhaust line	DN	40 ISO-KF	40 ISO-KF
4-way current feedthrough for Si diode on a flange	DN	16 ISO-KF	16 ISO-KF
Heaters			
1st stage	W	160	160
	V AC	42	42
2nd stage	W	90	90
	V AC	42	42
Temperature sensor			
1st stage		Pt100	Pt100
2nd stage		Si diode	Si diode
Built-in cold head	COOLPOWER	5/100	5/100
Weight	kg (lbs)	53 (116.9)	70 (154.3)
Cooldown time to T_2 = 20 K	min	100	150
Crossover value	mbar x l (Torr x l)	700 (525)	800 (600)
Pumping speed			
H_2O	l/s	18000	30000
Ar / N_2	l/s	4000 / 5200	8400 / 10000
H_2	l/s	6200	10000
Capacity			
Ar / N_2	bar x l	3000 / 3000	5500 / 5500
H_2 at 10^{-6} mbar	bar x l	32 [4]	45 [4]
Max. throughput			
Ar / N_2	mbar x l/s (Torr x l/s)	10 (7.5) / 10 (7.5)	10 (7.5) / 10 (7.5)
H_2	mbar x l/s (Torr x l/s)	7 (5.3) [4]	7 (5.3) [4]
Helium connection (Self-sealing couplings: outside thread, types 5400-S2-8	DN	1/2"	1/2"

1) Accessories, necessary for automatic operations (i.e. electrical regeneration heaters, forevacuum valve DN 25 ISO-KF, and vacuum gauge DN 16 ISO-KF), are included with the scope of delivery and are connected to the integrated COOL.DRIVE.
2) Electropneumatic angle valve included.
3) Vacuum gauge head included.
4) The maximum throughput values given for hydrogen (H_2) are true for regenerated cryo pumps under short-term loads only. For continuous operations, both throughput and capacity values will be lower.

Ordering Information

	COOLVAC 5000 iCL		COOLVAC 10000 iCL	
	High Voltage	Low Voltage	High Voltage	Low Voltage
	Part No.		Part No.	
COOLVAC 5000 iCL, DN 400 ISO-K	844411V0006		–	
COOLVAC 10000 iCL, DN 500 20" ANSI	–		844511V0004	
COOLVAC 10000 iCL, DN 500 ISO-K	–		844511V0006	
Compressors, flexlines and cables				
Compressor				
CP 6000 H	840000V6001	–	840000V6001	–
CP 6200 H	–	840000V6201	–	840000V6201
Power supply cable for compressor	see Ordering Information of the compressor units			
Set of flexlines				
FL 4.5 (1/2", 1/2")	892 87		892 87	
or FL 9.0 (1/2", 1/2")	892 88		892 88	
or FL 18.0 HP (1/2") + FL 18.0 LP (1/2")	840203 + 840204		840203 + 840204	
Compressor unit control cable [1]				
COOLPAK control cable, 5 m (16.4 ft)	844231V4005		844231V4005	
or COOLPAK control cable, 10 m (32.81 ft)	844231V4010		844231V4010	
or COOLPAK control cable, 20 m (65.62 ft)	844231V4020		844231V4020	
Optional electronics, cables and equipment				
CRYOVISION control and display unit	844231V0002		844231V0002	
CRYOVISION control cables				
CRYOVISION control cable, 5 m (16.4 ft)	844231V2005		844231V2005	
or CRYOVISION control cable, 10 m (32.81 ft)	844231V2010		844231V2010	
or CRYOVISION control cable, 20 m (65.62 ft)	844231V2020		844231V2020	
Optional interface module				
COOLVAC ProfiBus module ProfiBus – RS232 Converter for COOL.DRIVE and CRYOVISION	844000V1		844000V1	

The arrangement of the components is shown in the chapter “Accessories” under the heading “COOLVAC iClassicLine, System Components”.

1) The length of the control cable should match to the length of the flexlines.

Notes

COOLVAC 18000 iCL

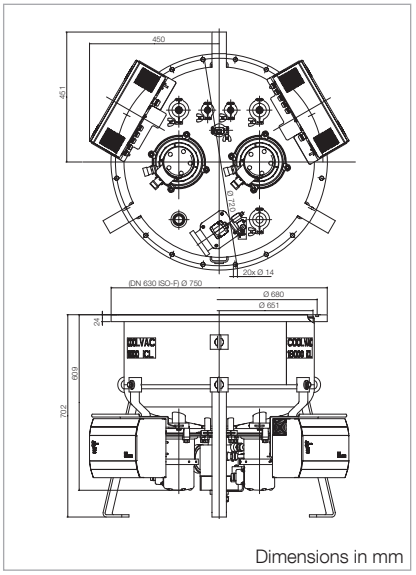
COOLVAC 18000 iCL with flange DN 630 ISO-F

Advantages to the User

- Hydrocarbon-free high vacuum
- High pumping speed for water vapor and nitrogen
- Fast, safe and efficient regeneration with the electric regeneration system [1)]
- Simple operation

Typical Applications

- Space simulation chambers
- Evaporators
- Electron beam welding systems
- Optical coating systems
- Metallization systems



Dimensional drawing for the COOLVAC 18000 iCL

COOLVAC 30000 iCL

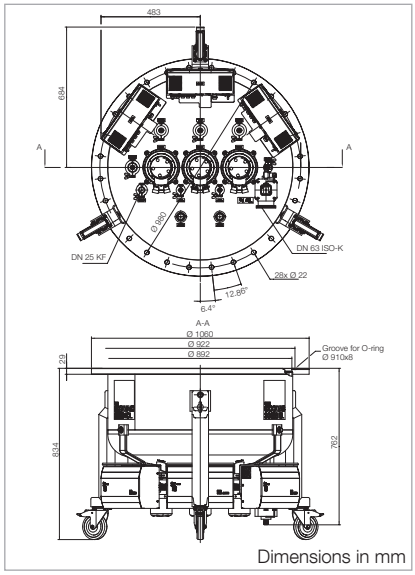
COOLVAC 30000 iCL with special flange

Advantages to the User

- Hydrocarbon-free high vacuum
- High pumping speed for water vapor and nitrogen
- Fast, safe and efficient regeneration with the electric regeneration system [1)]
- Simple operation

Typical Applications

- Space simulation chambers
- Evaporators
- Electron beam welding systems
- Optical coating systems
- Metallization systems



Dimensional drawing for the COOLVAC 30000 iCL

COOLVAC 60000 iCL

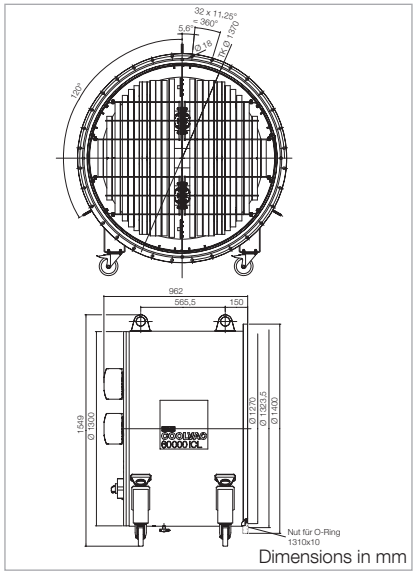
COOLVAC 60000 iCL with flange DN 1250 ISO-F

Advantages to the User

- Hydrocarbon-free high vacuum
- High pumping speed for water vapor and nitrogen
- Fast, safe and efficient regeneration with the electric regeneration system [1)]
- Simple operation

Typical Applications

- Space simulation chambers
- Evaporators
- Electron beam welding systems
- Optical coating systems
- Metallization systems



Dimensional drawing for the COOLVAC 60000 iCL

Techncal Data

		COOLVAC 18000 iCL	COOLVAC 30000 iCL	COOLVAC 60000 iCL
High vacuum flange	DN	630 ISO-F	35"ANSI	1250 ISO-F
Fore vacuum flange [2]	DN	63 ISO-K	63 ISO-K	63 ISO-K
Flange with current feedthrough for silicon diode	DN	25 ISO-KF (2x)	16 ISO-KF (2x)	16 ISO-KF (2x)
Flange for other purposes	DN	40 ISO-KF	-	-
Flange with 11-way feedthrough with additional Pt 100 on flange	DN	-	40 ISO-KF	40 ISO-KF
Pressure-relief device with flange connection for gas exhaust line	DN	40 ISO-KF	40 ISO-KF	40 ISO-KF
Pumping speed				
H_2O	l/s	46000	93000	180000
Ar / N_2	l/s	13500 / 18000	25000 / 30000	47000 / 57000
H_2	l/s	14000	30000	60000
Capacity				
Ar / N_2	bar x l	6000	6500	9000
H_2 at 10^{-6} mbar	bar x l	65 [3]	100 [3]	150 [3]
Built-in cold head	COOLPOWER	5/100 (2x)	5/100 (2x) and 140T (1x)	5/100 (2x) and 140T (2x)
Max. throughput				
Ar / N_2	mbar x l/s (Torr x l/s)	14 (10.5)	14 (10.5)	25 (18.75)
H_2	mbar x l/s (Torr x l/s)	7 (5.25) [3]	7 (5.25) [3]	12 (9) [3]
Crossover value at 20 K	mbar x l (Torr x l)	800 (600)	1200 (900)	1000 (750)
Cool down time to 20 K	min	180	260	330
Overall height	mm	see drawing	see drawing	see drawing
Weight	kg (lbs)	131 (289)	262 (577.6)	503 (1109)
Silicon diode for temperature measurements at the second stage of the cold head		built-in (2x)	built-in (2x)	built-in (2x)
Regeneration heaters at the				
first stage of the cold head		built-in (2x)	built-in (3x)	built-in (4x)
second stage of the cold head		built-in (2x)	built-in (2x)	built-in (2x)

1) Accessories, necessary for automatic operations (i.e. electrical regeneration heaters, forevacuum valve DN 63 ISO-KF, and vacuum gauge DN 16 ISO-KF), are included with the scope of delivery and are connected to the integrated COOL.DRIVE.
2) Electropneumatic angle valve included.
3) The maximum throughput values given for hydrogen (H_2) are true for regenerated cryo pumps under short-term loads only. For continuous operations, both throughput and capacity values will be lower.

Ordering information

	COOLVAC 18000 iCL		COOLVAC 30000 iCL		COOLVAC 60000 iCL	
	High Voltage	Low Voltage	High Voltage	Low Voltage	High Voltage	Low Voltage
	Part No.		Part No.		Part No.	
COOLVAC 18 000 iCL, DN 630 ISO-F	844631V0006		–		–	
COOLVAC 30 000 iCL, 35" ANSI	–		844891V9005		–	
COOLVAC 60 000 iCL, DN 1250 ISO-F	–		–		844896V9005	
Compressors, flexlines and cables						
Compressor						
CP 6000 H	840000V6001 (2x)	–	840000V6001 (3x)	–	840000V6001 (4x)	–
CP 6200 H	–	840000V6201 (2x)	–	840000V6201 (3x)	–	840000V6201 (4x)
Power supply cable for compressor	see Ordering Information of the compressor units					
Set of flexlines						
FL 4.5 (1/2", 1/2")	892 87 (2x)		892 87 (3x)		892 87 (4x)	
or FL 9.0 (1/2", 1/2")	892 88 (2x)		892 88 (3x)		892 88 (4x)	
or FL 18.0 HP (1/2") + FL 18.0 LP (1/2")	840203 (2x) + 840204 (2x)		840203 (3x) + 840204 (3x)		840203 (4x) + 840204 (4x)	
Compressor unit control cable [1]						
COOLPAK control cable, 5 m (16.4 ft)	844231V4005 (2x)		844231V4005 (3x)		844231V4005 (4x)	
or COOLPAK control cable, 10 m (32.81 ft)	844231V4010 (2x)		844231V4010 (3x)		844231V4010 (4x)	
or COOLPAK control cable, 20 m (65.62 ft)	844231V4020 (2x)		844231V4020 (3x)		844231V4020 (4x)	
Optional electronics, cables and equipment						
CRYOVISION control and display unit	844231V0002					
CRYOVISION network / control cable						
CRYOVISION / Network control cable, 5 m (16.4 ft)	844231V2005					
or CRYOVISION / Network control cable, 10 m (32.81 ft)	844231V2010					
or CRYOVISION / Network control cable, 20 m (65.62 ft)	844231V2020					
Optional interface module						
COOLVAC ProfiBus module ProfiBus – RS232 Converter for COOL.DRIVE and CRYOVISION	844000V1					

The arrangement of the components is shown in the chapter “Accessories” under the heading “COOLVAC iClassicLine, System Components”.

1) The length of the control cable should match to the length of the flexlines.

Cryo Pumps for Manual Operation, BasicLine

The COOLVAC cryo pumps of the BasicLine version are identical to the COOLVAC cryo pumps of the iClassicLine version concerning the technical data for pumping speed, capacity, cooldown time, built-in cold heads, maximum throughput, built-in temperature sensors for the second stage (Si diode) and the corresponding current feedthroughs.

The standard BasicLine models do **not** include the following components:

- Electrical regeneration heaters
- Temperature sensors for the first stages of the cold head(s)
- Vacuum gauge head
- Fore vacuum valve
- Temperature readout / display unit for the silicon diode(s)

We are glad to advise you of our assortment of accessories for our COOLVAC BasicLine range of cryo pumps.

All cryo pumps of the *iClassicLine* series (iCL) described above can be delivered as *Basicline* types, too. Please consult with our technical support.

E.g. for the following part numbers:

	Part No.
COOLVAC 10000 BL-V, DN 500 20" ANSI	844511V1004
COOLVAC 10000 BL-V, DN 500 ISO-K	844511V1006

Cryo Pumps with Liquid Nitrogen Cooling of Radiation Shield and Baffle of Cryo Pump

COOLVAC 30000 BL LN_2 and COOLVAC 60000 BL LN_2

COOLVAC 30000 BL LN_2

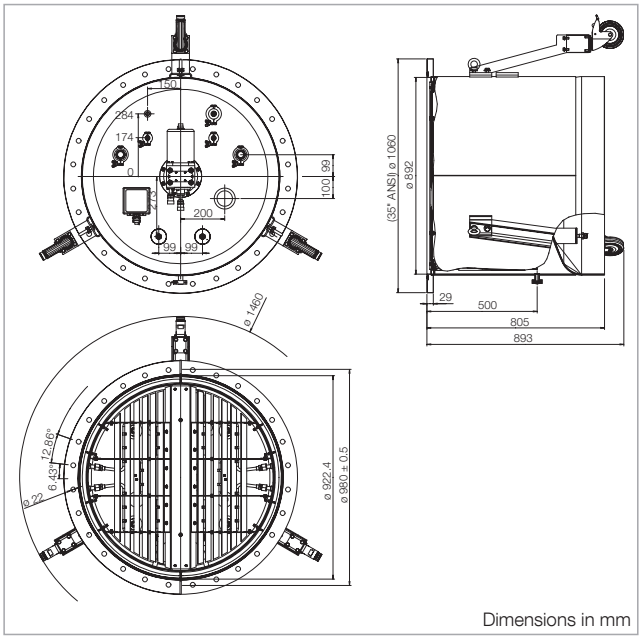
COOLVAC 60000 BL LN_2 with flange DN 1250 ISO-F

Advantages to the User

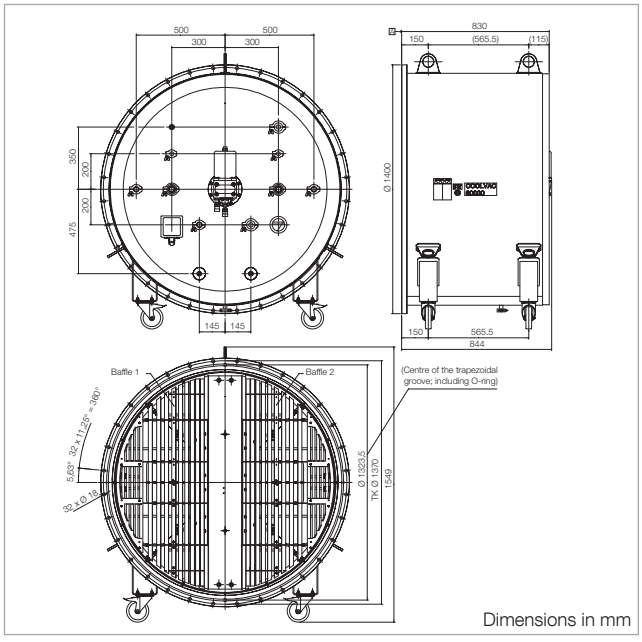
- Hydrocarbon-free high vacuum
- High pumping speed for water vapor and nitrogen
- Operating with only one compressor unit through liquid nitrogen (LN_2) cooling of radiation shield and baffle
- Controlling of radiation shield and baffle temperatures by additional temperature sensor

Typical Applications

- Space simulation chambers
- Vacuum furnaces



Dimensional drawing of COOLVAC 30000 BL LN_2



Dimensional drawing of COOLVAC 60000 BL LN_2

Technical Data		COOLVAC 30000 BL LN_2	COOLVAC 60000 BL LN_2
High vacuum flange	DN	35"ANSI	1250 ISO-F
Fore vacuum flange	DN	63 ISO-K	63 ISO-K
Flange with 4-pole current feedthrough for silicon diode*	DN	16 ISO-KF (2x)	16 ISO-KF (2x)
Flange with 6-pole current feedthrough for 3 Pt 100 (radiation shield and baffle halves)	DN	40 ISO-KF	40 ISO-KF
Pressure-relief device with flange connection for gas exhaust line	DN	40 ISO-KF	40 ISO-KF
Flange with abnormal temperature protection for the regeneration heaters of the built-in cold head	DN	40 ISO-KF	40 ISO-KF
Pumping speed			
H_2O	l/s	93000	180000
Ar / N_2	l/s	25000 / 30000	47000 / 57000
H_2	l/s	30000	60000
Capacity			
Ar / N_2	bar x l	6500	9000
H_2 at 10^{-6} mbar	bar x l	100 [1)]	150 [1)]
Built-in cold head	COOLPOWER	10 MD	10 MD)
Max. throughput			
Ar / N_2	mbar x l/s (Torr x l/s)	> 15 (11.25) [1)]	> 30 (22.5) [1)]
Crossover value at 20 K	mbar x l (Torr x l)	2000 (1500)	3000 (2250)
LN_2 consumption, ca.	l/h	7	10
LN_2 connections		SS-8-VCR (1/2")	SS-8-VCR (1/2")
Cool down time to 20 K, approx.	h	5	6
Overall height	mm	see drawing	see drawing
Weight, approx.	kg (lbs)	300 (661)	400 (882)
Silicon diode for temperature measurements at the second stage of the cold head		built-in	built-in
Regeneration heaters at the			
first stage of the cold head		built-in	built-in
second stage of the cold head		built-in	built-in

* temperature sensor at the second stage of the cold head.

[1)] The maximum throughput values given for hydrogen (H_2) are true for regenerated cryo pumps under short-term loads only. For continuous operations, both throughput and capacity values will be lower.

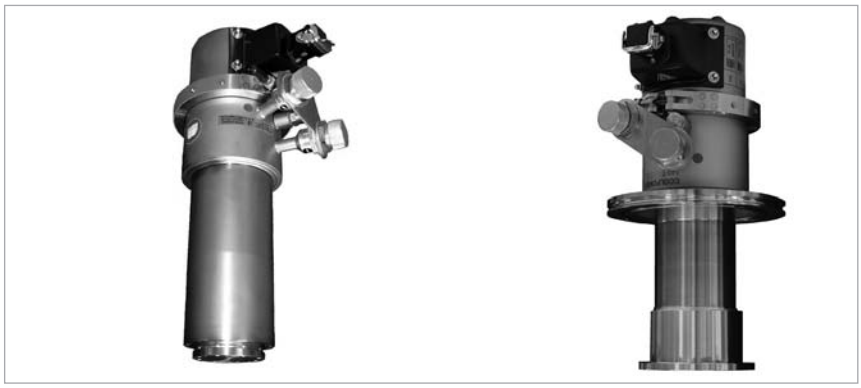
Ordering information

	COOLVAC 30000 BL LN_2		COOLVAC 60000 BL LN_2	
	High Voltage	Low Voltage	High Voltage	Low Voltage
	Part No.		**Part No.**	
COOLVAC 30 000 BL LN_2, 35" ANSI	**844890V9501**		–	
COOLVAC 60 000 BL LN_2, DN 1250 ISO-F	–		**844895V9503**	
Compressors, flexlines and cables				
Compressor				
CP 6000 HMD, 400 V / 50 Hz / 460 V / 60 Hz / 3-ph.	**840000V6002**	–	**840000V6002**	–
CP 6200 HMD, 200 V / 50 Hz / 200 – 230 V / 60 Hz / 3-ph.	–	**840000V6202**	–	**840000V6202**
Power supply cable for compressor	**see Ordering Information of the compressor units**			
Flexible pressure line (for operating mechanically driven cold heads)				
9 m (29.53 ft), FL9 HP – DN20 (8f/8f) + FL9 LP – DN32 (8f/8f)	**840217 + 840218V0032**			
20 m (65.62 ft), FL20 HP – DN20 (8f/8f) + FL20 LP – DN32 (8f/8f)	**840230V2020 + 840231V2032**			
Cable cold head motor compressor unit [1]				
9 m (29.53 ft)	**842 110**			
20 m (65.62 ft)	**842 112**			
Optional equipment and cables				
Low temperature measuring instrument MODEL 211S	**844 110**			
HV cable, 4-way, with plug to the MODEL 211S				
10 m (32.81 ft)	**844 113**			
20 m (65.62 ft)	**844113V20**			
Additional accessories (selection)				
Forevacuum valves [2]				
Right-Angle DN 63 ISO-K, electropneumatically operated, with pilot valve 24 V DC, Aluminum body	**10800V01**			
Right-Angle DN 63 ISO-K, electropneumatically operated, with pilot valve 24 V DC, stainless steel body	**10810V01**			
Pressure sensor				
THERMOVAC Transmitter TTR 91 N, DN 16 ISO-KF (without switching threshold)	**230035V02**			
THERMOVAC Transmitter TTR 91 N, DN 16 ISO-KF, (with switching threshold, 2SP)	**230040V02**			
Connection cable to TTR 91 N, FCC 68 on both ends, 8-way shielded [3]	**Type A**			
10 m (32.81 ft)	**230 012**			
20 m (65.62 ft)	**124 28**			
30 m (98.43 ft)	**124 29**			

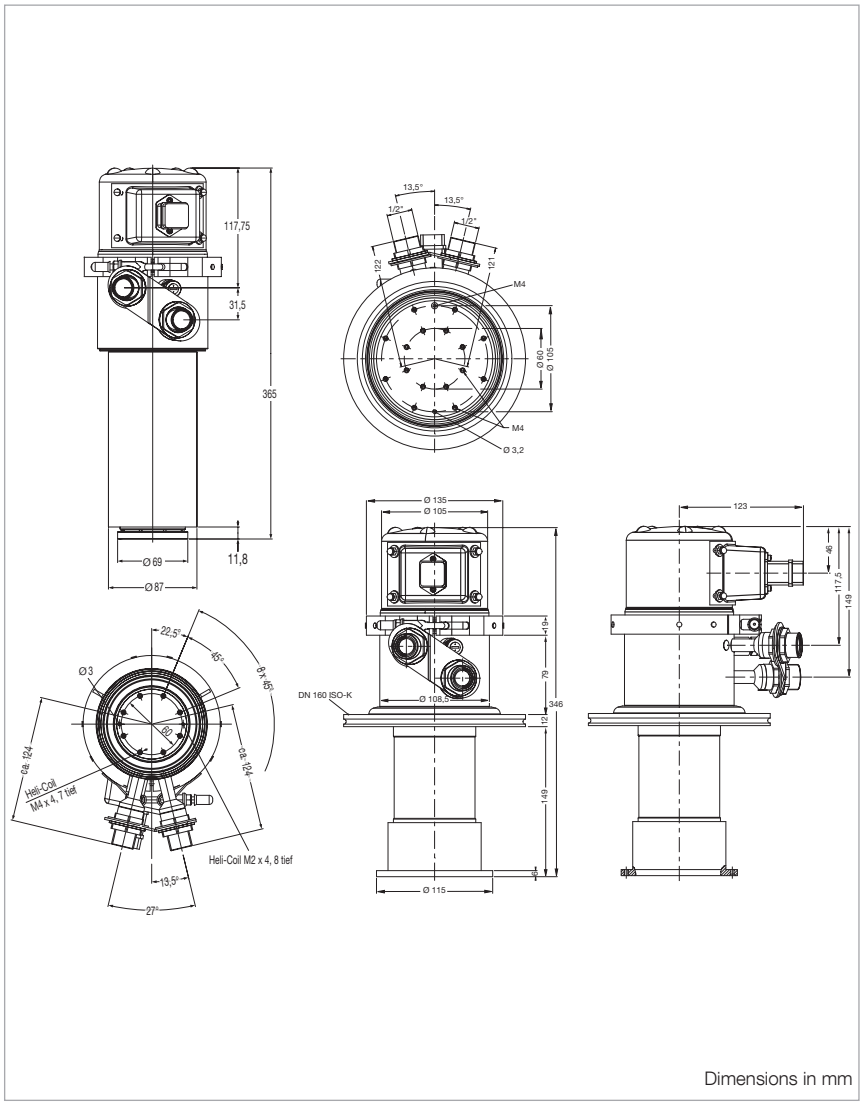
1) The length of the control cable should match to the length of the flexlines.
2) See catalog “Valves” for additional right-angle valves.
3) The length of the control cable should match to the length of the flexlines.

Products Cryogenics

Cold Heads, Pneumatically Driven
Single-Stage Cold Heads
COOLPOWER 50 and 140 T



Single-stage cold head's COOLPOWER 50 (left) and 140 T (right)



Dimensional drawing for the COOLPOWER 50 (left) and COOLPOWER 140 T (right)

Advantages to the User

- For installation mostly in any orientation
- High refrigerating capacity
- No liquid refrigerants are required
- Very simple to operate
- Short cooldown time

Typical Applications

- Cooling of samples, sensors and detectors
  - e. g. cooling of detectors in astronomy
- Cooling of HTS superconductors
- Cooling in magnetic equipment
- Cooling of surfaces for pumping of gases
- Cryogenic process gas cleaning
- Condensation, resublimation and freezing of gases

Technical Data

		COOLPOWER 50	COOLPOWER 140 T
Refrigeration capacity at 50/60 Hz [1]			
at 80 K, approx.	W	50	140
at 20 K, approx.	W	–	20
Lowest attainable temperature [1]	K	≤ 26	≤ 15
Cooldown time down			
to 20 K, approx.	min	–	55
to 80 K, approx.	min	20	–
Permissible ambient temperature	°C (°F)	+10 to +40 (+50 to +104)	+10 to +40 (+50 to +104)
He filling pressure at room temperature	barg	16	16
He connections			
Self-sealing screwed connections			
High pressure connection		1/2" [2]	1/2" [2]
Low pressure connection		1/2" [2]	1/2" [2]
Weight	kg (lbs)	8 (17.7)	12 (26.5)

Ordering Information

	COOLPOWER 50		COOLPOWER 140 T		
	Part No.		Part No.		
Cold head					
with DN 100 CF-R (rotatable)	**842050V0001**	–	–	–	–
with DN 160 CF-R (rotatable)	–	–	–	**842030V9004**	–
with DN 160 ISO-K	**842050V0002**	–	**842 030**	–	–
with weld-on pipe	–	**842050V0000**	–	–	**842030V0001**
Distance Flange - Cold stage mm	149.5	–	148.5	111.4	–
Accessories					
Compressor unit (for operation of one cold head)					
COOLPAK 2000, 230 V / 50 Hz	**840000V2000**		–		
COOLPAK 2200, 208 V / 60 Hz	**840000V2200**		–		
COOLPAK 6000 H, 400 V/50 Hz; 470 V / 60 Hz	–		**840000V6001**		
COOLPAK 6200 H, 200 V/50 Hz; 200 V, 230 V / 60 Hz	–		**840000V6201**		
Power supply cable	–		see Ordering Information for the compressor units COOLPAK		
Set of flexlines					
FL 4.5 (1/2", 1/2") (= 1 Set)	**892 87**		**892 87**		
FL 9.0 (1/2", 1/2") (= 1 Set)	**892 88**		**892 88**		
FL 18.0 HP (1/2") (= Single line high pressure)	**840 203**		**840 203**		
FL 18.0 LP (1/2") (= Single line low pressure)	**840 204**		**840 204**		
Connecting cable compressor – cold head					
Power cord 4.5 m (15.75 ft)	**E 400000323**		**E 400000323**		
Power cord 18 m (59.06 ft)	**840002964V0018**		**840002964V0018**		
Extension cord 4.5 m (15.75 ft)	**893 74**		**893 74**		
Options					
Temperature measurement					
Silicon diode	**844000V5**		**844000V5**		
Low temperature measuring instrument	**844 110**		**844 110**		
Measuring cable	see Ordering Information low temperature measuring instrument		see Ordering Information low temperature measuring instrument		

[1] The refrigerating capacities and temperatures stated apply only to vertical operation with the cold end at the bottom.

[2] Series 5400 from Aeroquip, coupling size "-8" (#8), or compatible types.

Dual-Stage Cold Heads COOLPOWER 7/25 and 5/100

Dual-stage cold head COOLPOWER 7/25

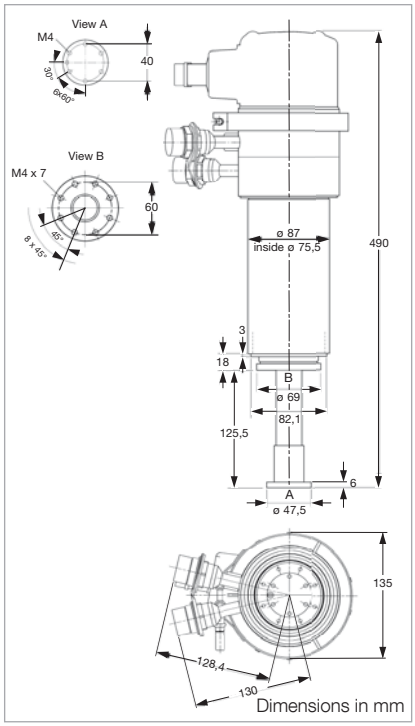
Dual-stage cold heads COOLPOWER 5/100

Advantages to the User

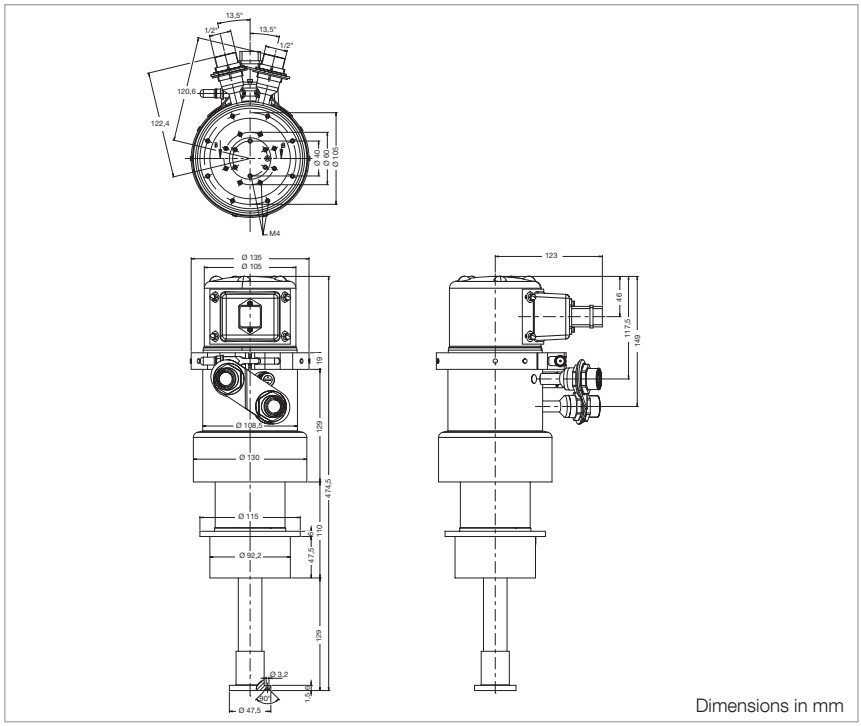
- For installation in any orientation
- High refrigerating capacity
- No liquid refrigerants are required
- Very simple to operate
- Short cooldown time

Typical Applications

- Cooling of samples, sensors and detectors
  - Cooling of detectors in astronomy
  - Cooling of samples for spectroscopy
  - Cooling of samples for applications in medicine and R&D
- Cooling of HTS superconductors
- Cooling in magnetic equipment
- Cooling of surfaces for pumping of gases
- Cryogenic process gas cleaning
- Condensation, resublimation and freezing of gases



Dimensional drawing for the COOLPOWER 7/25



Dimensional drawing for the COOLPOWER 5/10

Technical Data

		COOLPOWER 7/25	COOLPOWER 5/100
Refrigeration capacity at 50/60 Hz [1]			
1st stage at 80 K, approx.	W	25	100
2nd stage at 20 K, approx.	W	7	6
Lowest attainable temperature [1]			
1st stage, approx.	K	≤ 35	≤ 35
2nd stage, approx.	K	≤ 10	≤ 10
Cooldown time of the			
2nd stage to 20 K, approx.	min	35	25
Permissible ambient temperature	°C (°F)	+5 to +40 (+41 to +104)	+5 to +40 (+41 to +104)
He filling pressure at room temperature	barg	16	16
He connections			
Self-sealing screwed connections			
High pressure connection		1/2" (#8 [2])	1/2" (#8 [2])
Low pressure connection		1/2" (#8)	1/2" (#8)
Weight, approx.	kg (lbs)	10 (22,1)	10,5 (23,2)

Ordering Information

	COOLPOWER 7/25 Part No.	COOLPOWER 5/100 Part No.
Cold head		
COOLPOWER 7/25		
- with weld-on pipe	**842 040**	–
- with Flange DN 160 ISO-K (Space Flange – 2. Stage = 250 mm)	**842 040V0002**	–
- with Flange DN 100 CF-R (rotatable) (Space Flange – 2. Stage = 275 mm)	**842 040V0005**	–
COOLPOWER 5/100		
- with weld-on pipe	–	**893 05**
- with Flange DN 160 ISO-K (Space Flange – 2. Stage = 277,5 mm)	–	**893 04**
- with Flange DN 100 CF-R (rotatable) (Space Flange – 2. Stage = 265,5 mm)	–	**842021V0001**
Accessories		
Compressor unit (for operation of one cold head)		
COOLPAK 2000, 230 V / 50 Hz	**840000V2000**	–
COOLPAK 2200, 208 V / 60 Hz	**840000V2200**	–
COOLPAK 6000 H 400 V/50 Hz; 470 V / 60 Hz	–	**840000V6001**
COOLPAK 6200 H 200 V/50 Hz; 200 V, 230 V / 60 Hz	–	**840000V6201**
Power supply cable	–	see Ordering Information for the compressor units COOLPAK
Set of flexlines		
FL 4.5 (1/2", 1/2") (= 1 Set)	**892 87**	**892 87**
FL 9.0 (1/2", 1/2") (= 1 Set)	**892 88**	**892 88**
FL 18.0 HP (1/2") (= Single line high pressure)	**840 203**	**840 203**
FL 18.0 LP (1/2") (= Single line low pressure)	**840 204**	**840 204**
Connecting cable compressor – cold head		
Power cord 4.5 m (15.75 ft)	**E 400000323**	**E 400000323**
Power cord 18 m (59.06 ft)	**840002964V0018**	**840002964V0018**
Extension cord 4.5 m (15.75 ft)	**893 74**	**893 74**
Options		
Temperature measurement / control		
Silicon diode	**844000V5**	**844000V5**
Low temperature measuring instrument	**844 110**	**844 110**
Measuring cable	see Ordering Information low temperature measuring instrument	see Ordering Information low temperature measuring instrument

[1] The refrigerating capacities and temperatures stated apply only to vertical operation with the cold end at the bottom.

[2] Series 5400 from Aeroquip, coupling size "-8" (#8), or compatible types.

Cold Heads, Mechanically Driven
Single-Stage Cold Head COOLPOWER 250 MD
Dual-Stage Cold Head COOLPOWER 10 MD

Single-stage Cold Head COOLPOWER 250 MD

Dual-stage Cold Head COOLPOWER 10 MD

Advantages to the User

- Excellent cooling performance
- up to 250 W at 80 K by press-button operation [1) 2)] (COOLPOWER 250 MD)
- 18 W at 20 K by press-button operation (COOLPOWER 10 MD)
- High reliability
- Design optimized for MTBF 100,000 h
- Long and maintenance-free operation
- Low vibration due to directly driven displacer
- No liquid refrigerants are required
- Very simple to operate
- Short cooldown time
- Easy operation
- Plug & Cool – as usual for all Leybold GM coolers
- Simple variation of motor speed via the COOLPAK MD compressor unit

COOLPOWER 250 MD – one of the strongest single-stage GM cooler available on the market:

- High cooling capacity of > 175 W at 80 K
- Cooling capacity up to 250 W at 80 K possible [1) 2)]

COOLPOWER 10 MD - the strongest 10 K GM cooler available on the market:

- High 2nd stage cooling capacity of > 18 W at 20 K
- High 1st stage cooling capacity of > 25 W at 40 K and 110 W at 80 K

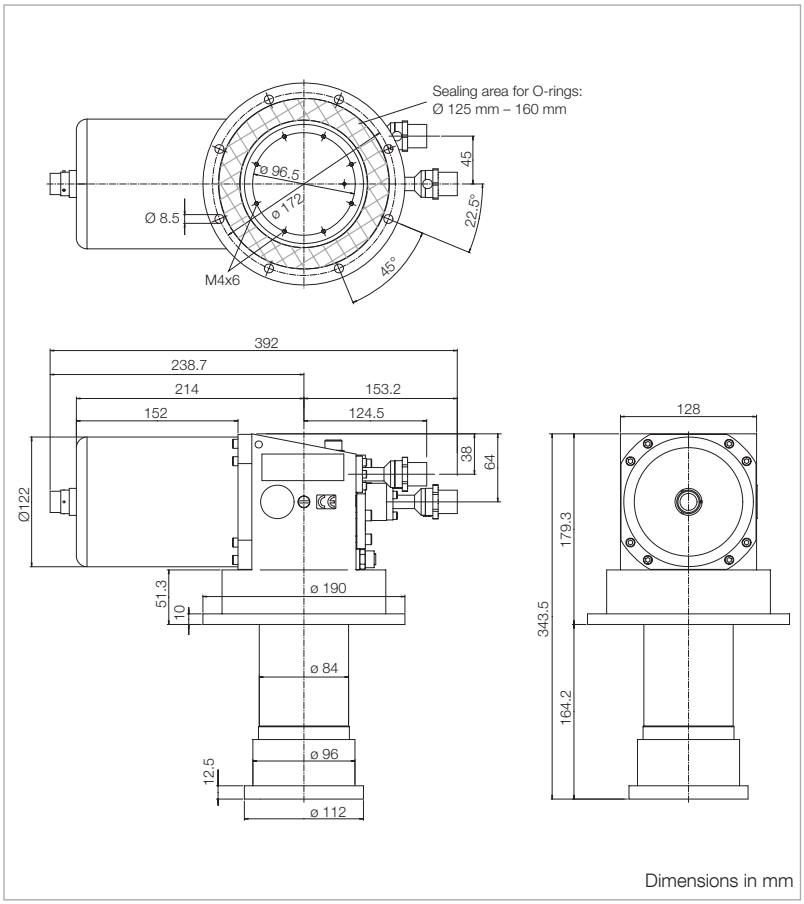
Typical Applications

The COOLPOWER 250 MD is a mechanically driven single-stage Gifford McMahon (GM) cryo cooler and ideally suited for

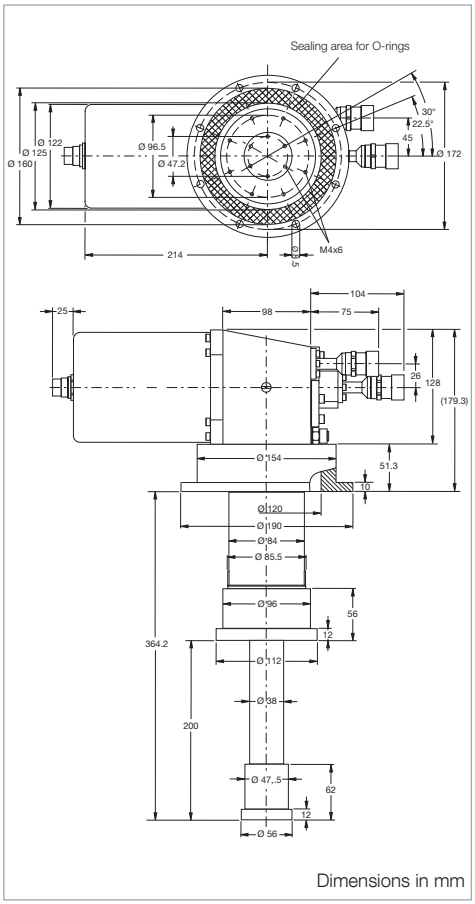
- Shield cooling of superconducting magnets in MRI
- Cooling of cryopanels in special Cryo pumps
- Cooling of larger samples and devices; especially
  - High temperature superconductor coils, wires and bulk materials
  - Recondensation of liquid refrigerants such as nitrogen and argon
  - Cleaning of gases
  - Samples for spectroscopic investigations in solid state and surface physics
  - Infrared and gamma detectors
- Calibration of sensors

The COOLPOWER 10 MD is a mechanically driven double-stage Gifford McMahon (GM) cryo cooler and ideally suited for

- Cooling of cryo probes in NMR spectrometers
- Shield cooling of superconducting magnets in MRI
- Cooling of cryopanels in special Cryo pumps and thus generation of high vacuum and ultra-high vacuum pressures
- Cooling of larger samples and devices; especially
  - High temperature superconductor coils, wires and bulk materials
  - Recondensation of liquid refrigerants such as H_2, Ne
  - Samples for spectroscopic investigations in solid state and surface physics
  - Infrared and gamma detectors
- Calibration of sensors



Dimensional drawing for the COOLPOWER 250 MD



Dimensional drawing for the COOLPOWER 10 MD

Technical Data

		COOLPOWER 250 MD	COOLPOWER 10 MD
Refrigeration capacity at 50/60 Hz [1]			
1st stage at 80 K, approx.	**W**	175 [2]	110
2st stage at 20 K, approx.	**W**	n/a	18
Lowest attainable temperature [1]			
1st stage, approx.	**K**	≤ 25	≤ 28
2nd stage, approx.	**K**	n/a	≤ 8
Cooldown time of the			
1st stage to 80 K, approx.	**min**	35	n/a
2nd stage to 20 K, approx.	**min**	n/a	25
Permissible ambient temperature	**°C (°F)**	+5 to +40 (+41 to +104)	
He filling pressure at room temperature	**barg**	15_{-1}	
He connections			
Self-sealing screwed connections			
High pressure connection		1/2" (#8 [3])	1/2" (#8 [3])
Low pressure connection		1/2" (#8)	1/2" (#8)
Weight, approx.	**kg (lbs)**	21 (46.3)	22 (48.5)

[1] The refrigerating capacities and temperatures stated apply to vertical operation with the cold end at the bottom and with cold head motor rotation speed 120 RPM, He system filling pressure 13 barg, compressor unit COOLPAK 6000 HMD / 6200 HMD and mit flexlines FL 9.0 HP – DN20 (840217) and FL 9.0 LP – DN32 (840218V0032).

[2] Higher refrigeration capacities of up to 250 W at 80 K (CP 250 MD) can be achieved with special parameters and accessories in consultation with our technical support team.

[3] Series 5400 "-8" from Aeroquip.

Ordering Information

COOLPOWER 250 MD

COOLPOWER 10 MD

	Part No.	Part No.
Cold head		
COOLPOWER 250 MD	**842015V0001**	–
COOLPOWER 250 MD; DN 160 CF-R (rotatable)	**842015V0002**	–
COOLPOWER 10 MD	–	**842010**
COOLPOWER 10 MD; DN 160 CF-R (rotatable)	–	**842010V0002**
Accessories		
Compressor unit		
COOLPAK 6000 HMD, 400 V/3-ph. 50 Hz or 460 V/3-ph. 60 Hz ± 10%	**840000V6002**	**840000V6002**
COOLPAK 6200 HMD, 200 V/3-ph. 50 Hz or 200-230 V/3-ph. 60 Hz ± 10%	**840000V6202**	**840000V6202**
Power supply cable	see Ordering Information for the compressor unit COOLPAK	see Ordering Information for the compressor unit COOLPAK
Flexible pressure line (for operating mechanically driven cold heads)		
9 m (31.5 ft) (High-pressure) FL9 HP-DN 20 (8f/8f)	**840 217**	
9 m (31.5 ft) (Low-pressure) FL9 LP-DN 32 (8f/8f)	**840218V0032**	
20 m (75.0 ft) (High-pressure) FL20 HP-DN 20 (8f/8f)	**840230V2020**	
20 m (75.0 ft) (Low-pressure) FL20 LP-DN 32 (8f/8f)	**840231V2032**	
Connection cable for the cold heads COOLPOWER 250 MD, 10 MD		
9,0 m	**842 110**	
20,0 m	**842 112**	

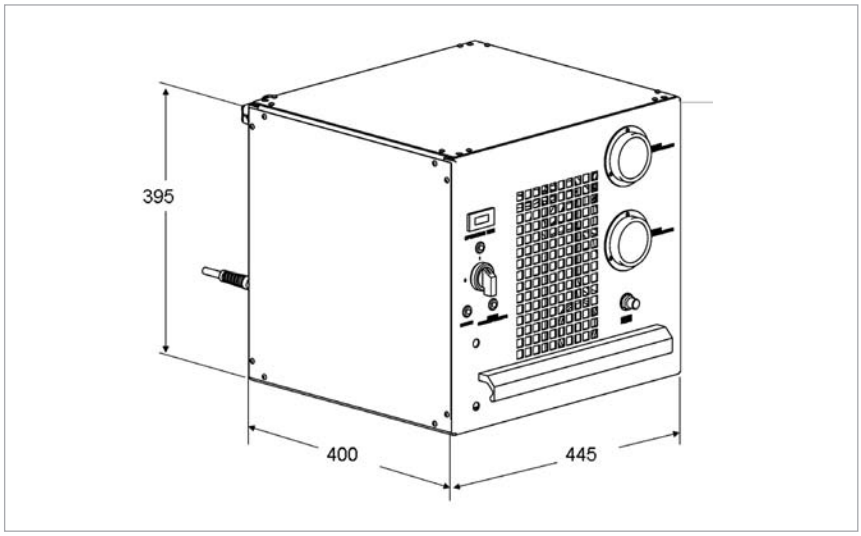
Notes

Compressor Units for Pneumatically Driven Cold Heads and Pumps, Water Cooling COOLPAK 2000/2200

Compressor unit COOLPAK 2000 (2200 is similar)

Advantages to the User

- High efficiency and increased performance for cryogenic pumps and refrigerators
- High long-term reliability due to long-life and highly efficient components and improved oil management
- Very quiet and low vibration operation through the innovative horizontally suspended scroll compressor
- Simple installation and operation
- Global mains voltage compatibility
- Perfect integration within complex systems due to the 24 V Sub-D interface
- Simple adsorber replacement, otherwise maintenance-free
- Small footprint
- Low cost of ownership



Dimensional drawing of the COOLPAK 2000/2200

Technical Data

	COOLPAK 2000 (50 Hz)	COOLPAK 2200 (60 Hz)
Number of electrical connections for cold heads	1	1
Helium system filling pressure at room temperature barg	15	14
Ambient temperature °C (°F)	+5 to +40 (+41 to +104)	+5 to +40 (+41 to +104)
Cooling water consumption l/min	< 5	< 5
Cooling water feed temperature °C (°F)	+5 to +25 (+41 to +77)	+5 to +25 (+41 to +77)
Mains voltage (single phase) V	230 ± 10%	208 ± 10%
Operating current		
with cooled down cold head A	9.5 to 10.5	11.5 to 12.5
with warmed up cold head A	12.0	13.0
Electric power consumption		
with cooled down cold head kW	2.2	2.3
with warmed up cold head kW	2.4	2.5
Remote control through interface V DC	24	24
Helium connections		
self-sealing fittings		
high-pressure side (outside thread)	1/2" [1]	1/2" [1]
low-pressure side (outside thread)	1/2" [1]	1/2" [1]
Water connections DN	10	10
Noise level (at a distance of 1 m (3.5 ft)) dB(A)	< 55	< 55
Dimensions (W x H x D) mm (in.)	445 x 395 x 400 (17.52 x 15.55 x 15.74)	445 x 395 x 400 (17.52 x 15.55 x 15.74)
Weight, approx. kg (lbs)	69 (152.32)	69 (152.32)

Ordering Information

	COOLPAK 2000 (50 Hz)	COOLPAK 2200 (60 Hz)
	Part No.	**Part No.**
Compressor unit	**840000V2000**	**840000V2200**
Accessories, optional		
Tool-Kit	**E20004779**	**E20004779**
Spare parts		
Adsorber CPS-V8	**E 840001973**	**E 840001973**

[1] Series 5400 from Aeroquip, coupling size "-8", or compatible types.

Compressor Units for Pneumatically Driven Cold Heads and Pumps, Water Cooling COOLPAK 6000 H/6200 H/6000 HD

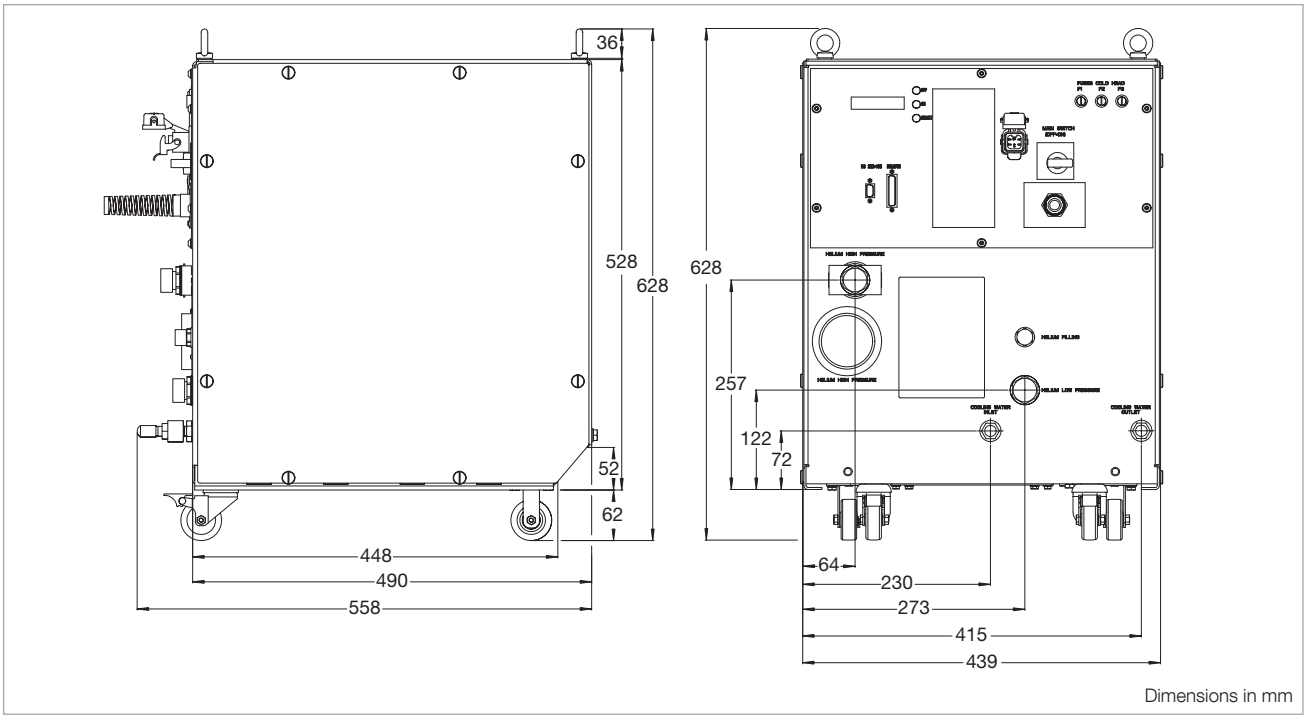
Compressor units COOLPAK 6000 H/6200 H/6000 HD

Used to drive cold heads with pneumatically driven displacer pistons, i.e. for individual operation of the COOLPOWER cold heads 140 T and 5/100, but also older cold heads such as the RGS 120, RGD 580 and 1245, as well as the multiplexing of COOLPOWER cold heads 50 and 7/25.

In addition, these compressors are used to operate COOLVAC cryo pumps with integrated cold heads of these types.

Advantages to the User

- Highly effective and even more powerful when connected with Leybold cryo pumps and refrigerators
- Excellent long-term reliability owing to the modular design and the long life components
- Silent and low vibration operation through scroll compressors
- Simple installation and operation
- Global power supply compatibility
- Easy integration in complex systems due to 24 V DC or RS 232 C interfaces
- Almost maintenance-free
- Small footprint
- Low cost of ownership



Dimensional drawing for the COOLPAK 6000 H/6200 H/6000 HD

Technical Data

		COOLPAK			
		6000 H / 6000 HD		6200 H	
		50 Hz	60 Hz	50 Hz	60 Hz
Number of electrical connections for cold heads		1 / 2		1	
Helium system filling pressure at room temperature	barg	17	16	15	14
Ambient temperature	°C (°F)	+5 to +40 (+41 to +104)			
Cooling-water consumption [1]	l/min	5			
Cooling-water entry temperature	°C (°F)	+5 to +25 (+41 to +77)			
Main voltage (3 phase)					
upon delivery	V	400 ± 10%	–	230 [2] + 1% / -10%	230 ± 10%
alternative setting	V	–	470 ± 10%	200 ± 10%	200 ± 10%
Operating currents					
with cooled down cold head	A	10 to 12	–	20 to 22	–
with warmed up cold head	A	11 to 13	–	22 to 25	–
Electrical power consumption					
with cooled down cold head	kW	6.5 to 7.5	7.0 to 8.0	6.5 to 7.5	7.0 to 8.0
with warmed up cold head	kW	7.0 to 8.0	7.5 to 8.5	7.0 to 8.0	7.5 to 8.5
Remote control via interface		24 V DC or RS 232 C			
Helium connections					
Self-sealing couplings					
High pressure connection (outside thread)		1/2" [4]			
Low pressure connection (outside thread)		1/2" [4]			
Water connections		Hose nozzle DN 10 / G 1/2" outside thread			
Sound level (at 1 m (3.5 ft) distance)	dB(A)	60			
Dimensions (W x H x D)	mm (in.)	440 x 589 x 558 (17.32 x 23.19 x 21.97)			
Weight, approx.	kg (lbs)	104 (230)			

Ordering Information

	COOLPAK			
	6000 H / 6000 HD		6200 H	
	50 Hz	60 Hz	50 Hz	60 Hz
	Part No.	Part No.	Part No.	Part No.
Compressor unit without power supply cable				
Connection for 1 cold head (CP ... H)	840000V6001		840000V6201	
Connection for 2 cold heads (CP ... H)	840000V6004		–	
Power supply cable				
CEE plug, 32 A/6h, 3-pol +N+PE, 3.5 m (12.25 ft)	893 95	–	–	
NEMA plug, L 16-20 P, 20 A/480 V, 3-pol +PE (AWG 12), 3.5 m (12.25 ft)	–	893 96	–	
- with end splice (AWG 10), 10 m (35.0 ft)	840 111		840 111	
- with end splice (AWG 10), 20 m (70.0 ft)	840 112		840 112	
Accessories				
Tool-Kit	E 20004779		E 20004779	
Water cooling discharge throttle	E 840000133 [3]		–	
Spare parts				
Adsorber CP6000H	E 840002863			

[1] At a cooling water entry temperature of 25 °C (77 °F).
[2] At 14 barg filling pressure.
[3] Only for COOLPAK 6000 HD.
[4] Series 5400 from Aeroquip, coupling size "-8", or compatible types.

Compressor Units for Mechanically Driven Cold Heads and Pumps, Water Cooling COOLPAK 6000 HMD/6200 HMD

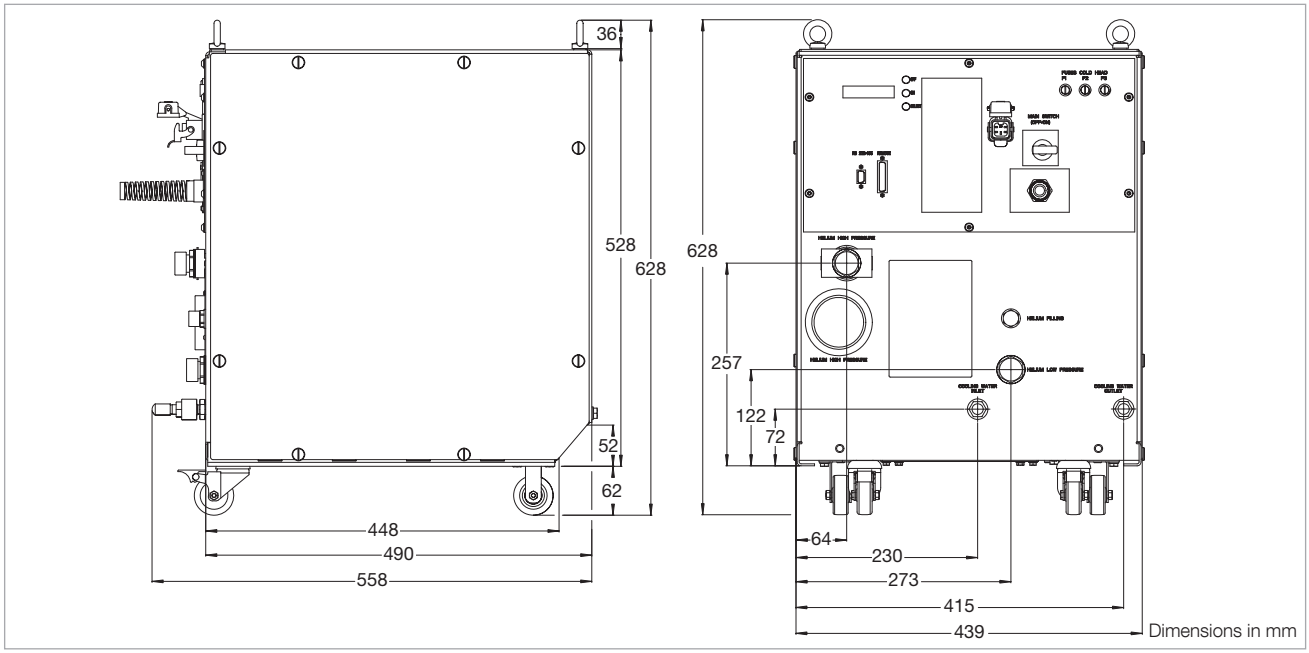
Compressor unit COOLPAK 6000 HMD/6200 HMD

Serves the purpose of individually driving the cold heads with mechanically driven displacers; i.e. COOLPOWER 250 MD and 10 MD.

In addition, these compressor units are also used for operating the COOLVAC cryo pumps 30000 BL LN_2 and COOLVAC 60000 BL LN_2.

Advantages to the User

- Highly effective and even more powerful when connected with Leybold cryo pumps and refrigerators
- Excellent long-term reliability owing to the modular design and the long life components
- Silent and low vibration operation through scroll compressors
- Small footprint
- Simple installation and operation
- Global power supply compatibility
- Easy integration in complex systems due to 24 V DC or RS 232 C interfaces
- Variable cold head motor speed, adjustable using keys on the power module or RS232C interface
- Long maintenance-free period of operation



Dimensional drawing for the COOLPAK 6000 HMD/6200 HMD

Technical Data

		COOLPAK			
		6000 HMD		6200 HMD	
		50 Hz	60 Hz	50 Hz	60 Hz
Mains voltage (3 phase)	V	400 ± 10%	460 ± 10%	200 ± 10%	200 - 230 ± 10%
Helium system filling pressure at room temperature	barg	15	14	14	13
		For all other Technical Data, see COOLPAK 6000 H and 6200 H			

Ordering Information

	COOLPAK	
	6000 HMD	6200 HMD
	Part No.	**Part No.**
Compressor type		
400 V/3-ph. 50 Hz or 460 V/3-ph. 60 Hz ± 10%	**840000V6002**	–
200 V/3-ph. 50 Hz or 200 – 230 V/3-ph. 60 Hz ± 10%	–	**840000V6202**
Flexible pressure line (for operating mechanically driven cold heads)		
9 m (31.5 ft) (High-pressure) FL9 HP-DN 20 (8f/8f)	**840 217**	
9 m (31.5 ft) (Low-pressure) FL9 LP-DN 32 (8f/8f)	**840218V0032**	
20 m (75.0 ft) (High-pressure) FL20 HP-DN 20 (8f/8f)	**840230V2020**	
20 m (75.0 ft) (Low-pressure) FL20 LP-DN 32 (8f/8f)	**840231V2032**	
Connection cable for the cold heads COOLPOWER 250 MD, 10 MD		
9,0 m (31.5 ft)	**842 110**	
20,0 m (75.0 ft)	**842 112**	
Power supply cable		
CEE plug, 32 A/6h, 3 pol+N+PE, 3,5 m (12.25 ft)	**893 95**	–
NEMA plug, L 16-20 P, 20 A/480 V, 3 pol+PE (AWG 12), 3,5 m (12.25 ft)	**893 96**	–
10 m (35.0 ft) with end splice (AWG 10)	**840 111**	
20 m (70.0 ft) with end splice (AWG 10)	**840 112**	
Accessories		
Tool-Kit	**E 20004779**	
Water cooling discharge throttle	**E 840000133**	
Spare parts		
Adsorber CP6000H	**E 840002863**	

General Accessories for Compressor Units COOLPAK 2000, 6000 H

Technical Data	Length	Connections on both sides (inside thread)	
		High pressure line (HD)	Low pressure line (ND)
Flexlines [1), 2)]			
FL 4.5 (1/2", 1/2") (= 1 Set)	4.5 m (14.76 ft)	1/2"	1/2"
FL 9.0 (1/2", 1/2") (= 1 Set)	9,0 m (29.53 ft)	1/2"	1/2"
FL 18.0 HP (1/2") (= single high pressure line)	18 m (59.06 ft)	1/2"	-
FL 18.0 LP (1/2") (= single low pressure line)	18 m (59.06 ft)	-	1/2"

Accessories for Flexlines	Connections (m = Outside thread, f = Inside thread)	
Adaptor for flexlines		
AD (1/2" m, 3/4" f)	1/2" m	3/4" f
AD (1/2" f, 3/4" m)	3/4" m	1/2" f
90°-Elbow 1/2" for flexlines	1/2" m	1/2" f
Coupling 1/2" for interconnecting two 1/2" flexlines	1/2" m	1/2" m
Coupling 3/4"	3/4" m	3/4" m

	Gas Distributors (required quantity)	Gas Manifold – Connections	
		At the compressor (Inside thread)	At the cold head (Outside thread)
Gas manifold (1 piece each)			
GD 2 (for dual operation) [2)]	2	1/2"	2 x 1/2"
GD 4 (for up to quad operation) [2)]	2	1/2"	4 x 1/2"

Ordering Information

General Accessories	Part No.
Flexlines [1), 2)]	
FL 4.5 (1/2", 1/2") (= 1 Set)	892 87
FL 9.0 (1/2", 1/2") (= 1 Set)	892 88
FL 18.0 HP (1/2") (= single high pressure line)	840 203
FL 18.0 LP (1/2") (= single low pressure line)	840 204
Adaptor for flexlines	
AD (1/2" m, 3/4" f)	892 89
AD (1/2" f, 3/4" m)	892 90
90°-Elbow 1/2" for flexlines	891 73
Coupling 1/2" for interconnecting two 1/2" flexlines	891 71
Gas manifold (1 piece each)	
GD 2 (for dual operation) [2)]	840 253 (2x)
GD 4 (for up to quad operation) [2)]	840 254 (2x)
Connection cable for linking cold head and compressor unit [2)]	
Power supply cable 4.5 m (14.76 ft)	E400 000 323
Power supply cable 18 m (59.06 ft)	840 002 964V0018
Extension cable for linking cold head and compressor unit [2)]	
EL 4.5 (4.5 m / 14.76 ft)	893 74

All flexible pressure lines, adaptor pieces, bends, isolating pieces, line couplings and gas manifolds are equipped with self-sealing Aeroquip fittings and filled in the factory with high-purity helium gas (purity: 99.999%). The filling pressure is 16 barg.

[1)] Minimum bending radius: 30 cm (11.81 in.).

[2)] Only suited for pneumatically driven cold heads and cryo pumps.

Notes

Accessories for Cryo Pumps / Cryogenics

Controllers and Monitoring Units for Cryo Pumps

CRYOVISION

Optional Display Unit for COOLVAC iCL Cryo Pumps with COOL.DRIVE pump controller

Advantages to the User

- Visualisation of all *iClassicLine* cryo pump control processes with COOL.DRIVE integrated control unit via the integrated 7" (177.8 mm) touchscreen.
- Interface to customer's system controller for single or multiplex operation for cryo pumps from the iClassicLine range
- Output of measurement signals of all pressure and temperature sensors that are connected, along with the display of status reports of all pumps connected to the network
- Easily integrated within customer's system control

Typical Applications

- For automated operation of the COOLVAC cryo pumps of the iClassicLine

Control and Display Unit CRYOVISION

The intelligent control unit CRYOVISION automatically controls and monitors up to 10 COOLVAC iClassicLine cryo pumps.

Online monitoring, help functions and a service interface for ease of diagnosis and software updates via the built-in USB interface are just a few of its user-friendly features.

The CRYOVISION can be installed as a "stand alone system" or remote controlled via an interface.

Furthermore, an optional ProfiBus module is available for communication with the individual cryo pumps in single and multiplex operation via the Profi-Bus.

Technical specifications

- Deployable as a desktop unit or as a mounted unit in a 19" rack
- Operation via 7" (177.8 mm) touchscreen or rear-sided interfaces

Scope of delivery

- Stylus
- Power supply connector
- Adhesive rubber feet for use as a desktop unit
- Installation kit for 19" rack installation
- Installation and operation manual

Technical Data

		CRYOVISION
Operating voltage, ±10 %	V DC	24 [1]
Power consumption	W	11
Ambient temperature during operation	°C	+5 to +40
Dimensions (W x H x D)	mm (in.)	213 x 128.5 x 160 (8.39 x 5.06 x 6.3) [1/2 19" 3 HU]
Weight	kg (lbs)	1.9 (4.19)

[1] Provided via the CRYOVISION – COOL.DRIVE control line or optionally via an external, separate power supply.

Ordering Information

	CRYOVISION Part No.
Control and Display Unit CRYOVISION	**844231V0002**
Accessories	
Connection line CRYOVISION – COOL.DRIVE / COOL.DRIVE – COOL.DRIVE Length 5 m (16.4 ft) 10 m (32.8 ft) 20 m (65.6 ft)	 **844231V2005** **844231V2010** **844231V2020**
Optional Interface Module	
COOLVAC ProfiBus Module ProfiBus – RS232 converter for COOL.DRIVE und CRYOVISION	 **844000V1**

COOLVAC ProfiBus Module

Optional ProfiBus – RS232 converter for COOLVAC iClassicLine cryo pumps with COOL.DRIVE control unit and CRYOVISION display unit

Advantages to the User

- Direct control and monitoring of the current *iClassicLine* range of pumps with COOL.DRIVE controllers using the ProfiBus DP protocol
- Control and monitoring of all *iClassicLine* cryo pumps connected to the CRYOVISION display unit on the network using the ProfiBus DP protocol
- Control and monitoring of older cryo pumps from the ClassicLine range via the corresponding COOLVAC system controller
- Configured as a top-hat rail module for straightforward rack installation.

Typical Applications

- Conversion of Profibus DP commands into RS232 commands and of RS232 response messages into Profibus DP response messages for the RS232 interfaces of the COOL.DRIVE controllers on the iClassicLine cryo pumps and/or for the RS232 interfaces of the optional CRYOVISION display unit, and for the RS232 interface of the COOLVAC system controller of the earlier COOLVAC ClassicLine range of cryo pumps.

COOLVAC ProfiBus Module

The COOLVAC ProfiBus module enables the simple and straightforward control and monitoring of cryo pumps from the current *iClassicLine* range and/or the earlier ClassicLine range of pumps via the RS232 interface of the attendant control and display units COOL.DRIVE and CRYOVISION or COOLVAC SC via the Profibus DP standard.

The attendant GSD file is available on our homepage.

Technical specifications

- Plastic casing, ventilated
- Combination installation feet for top-hat and C-section rails
- ProfiBus DP slave interface module
- ProfiBus DP V0 conforming to IEC 61158-2 and IEC 61784 Type 3
- ProfiBus DP address range Hex $01…$7D selectable via switches and $7E selectable via software; corresponds to decimal numbers 1...126.
- ProfiBus terminating resistor can be cut in using a switch in the module
- ProfiBus connection via a 9-way D-sub socket
- RS232 interface lead connection using pluggable screw terminals

Scope of delivery

- ProfiBus module for top-hat rail installation
- 3m RS232 connection lead
- Installation and operating instructions

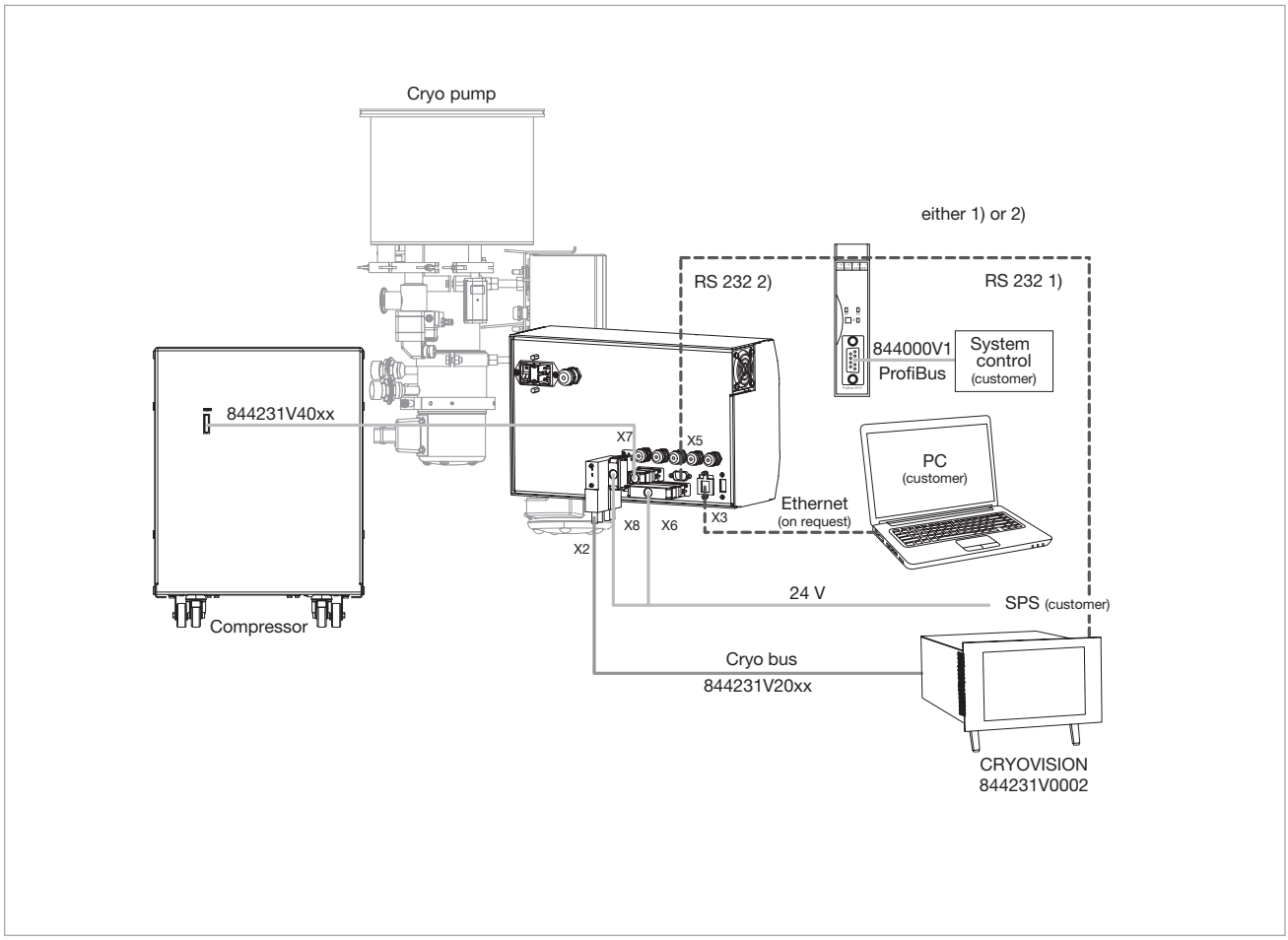
Technical Data — COOLVAC ProfiBus Module

Operating voltage, ±10 %	V DC	24
Power consumption, approx.	mA	90
Ambient temperature during operation	°C	+5 to +40
Dimensions (W x H x D)	mm (in.)	22.5 x 100 x 115 (0.89 x 3.94 x 4.53)
Weight	kg (lbs)	0.13 (0.29)

Ordering Information — COOLVAC ProfiBus Module

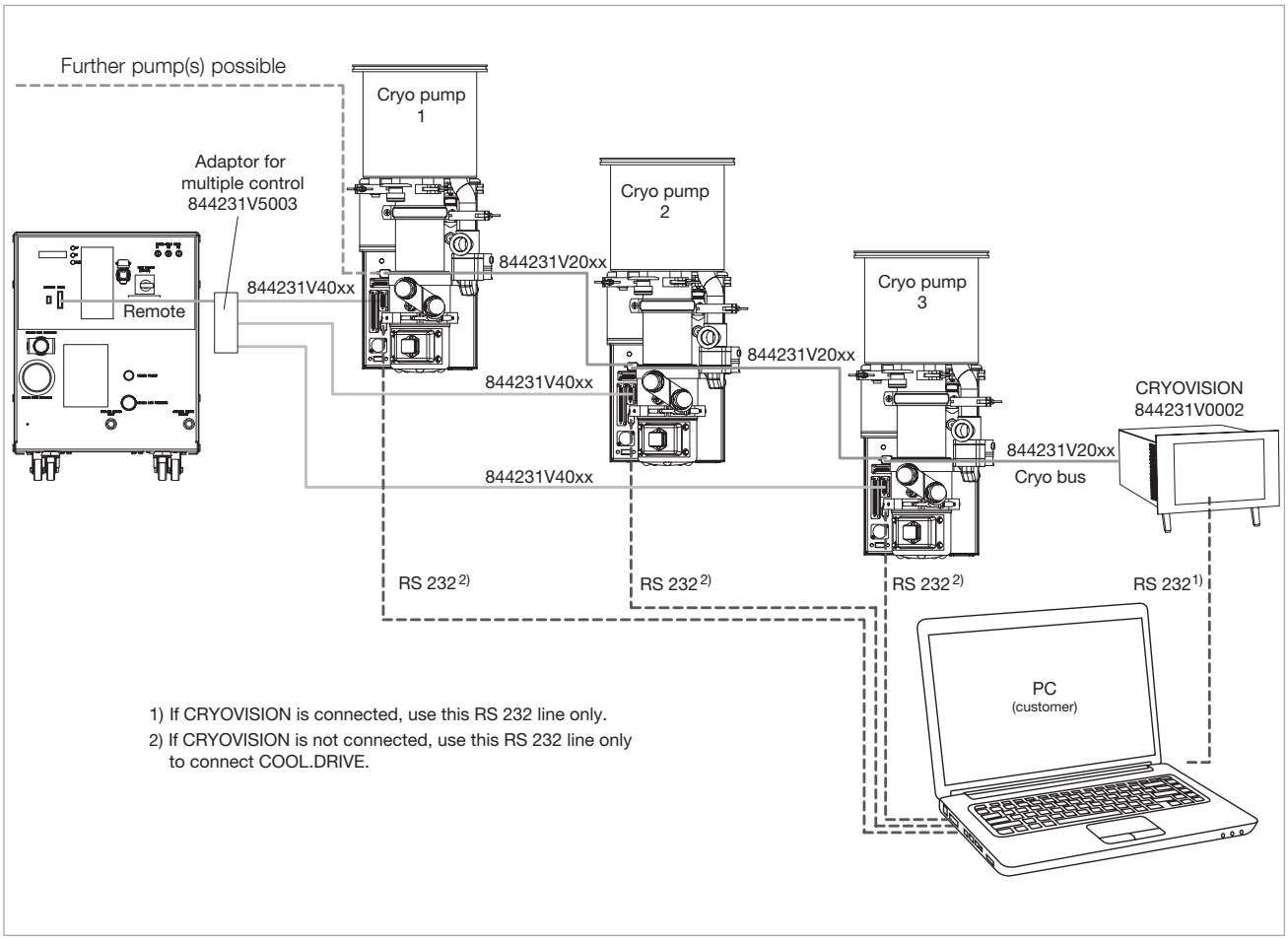
	Part No.
COOLVAC ProfiBus Module	**844000V1**

COOLVAC iClassicLine, Single System Configuration



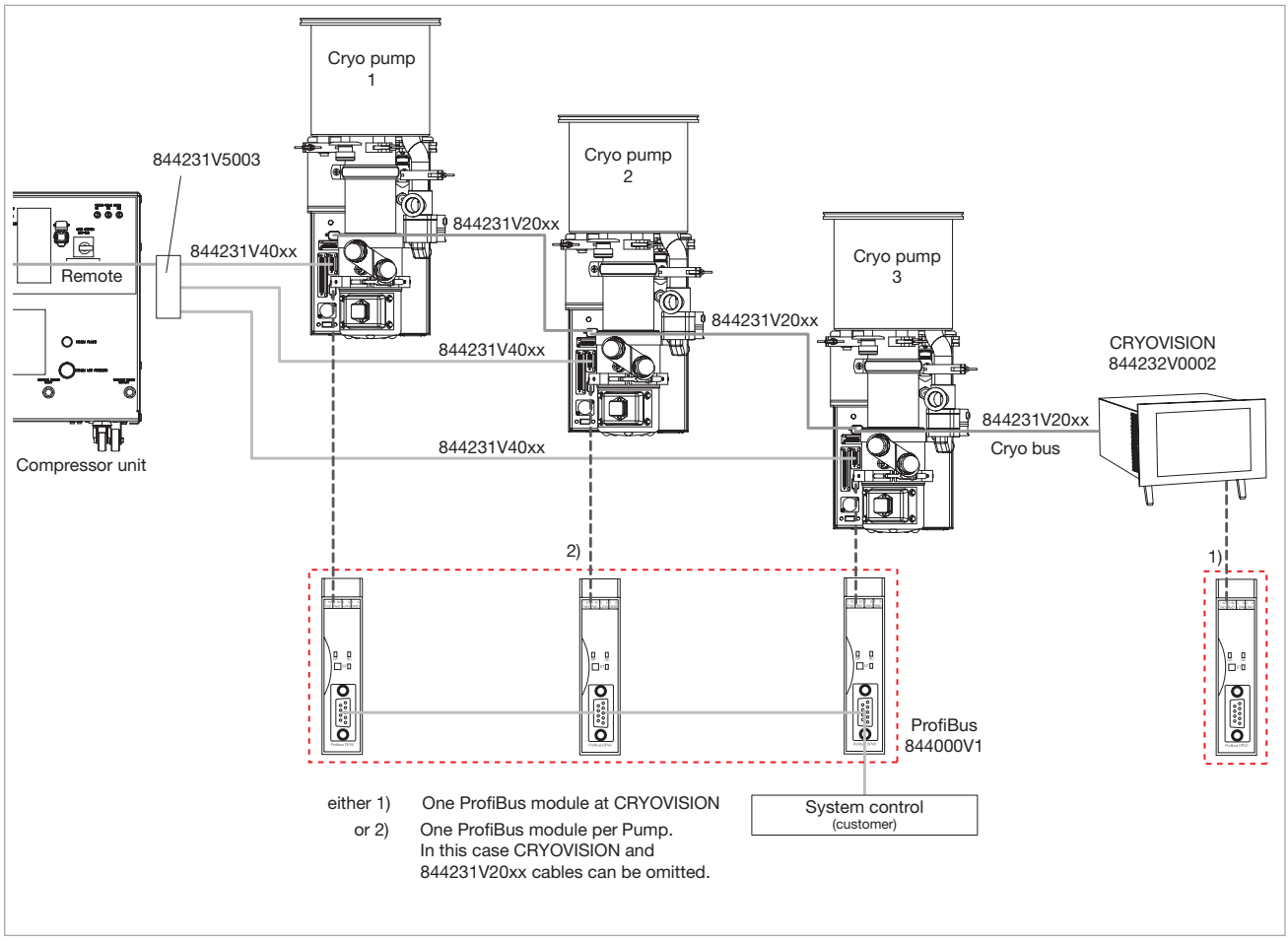
Control options for one pump and one compressor unit

COOLVAC iClassicLine, Dual and Multiple System Configuration



Control options for three pumps

COOLVAC iClassicLine, Dual and Multiple System Configuration



Control options for several pumps with one built-in COOL.DRIVE each

Low Temperature Measuring Instrument MODEL 211S

Advantages to the User

- Supports one silicon diode
- 3-digit LED display
- Temperature readout between 1 and 450 Kelvin
- Two trigger thresholds
- RS 232 C interface

Typical Applications

- Temperature measurements on cryostats
- Temperature measurements on cryo pumps for monitoring their operation and to control pump systems

Technical Data

	MODEL 211S
Measurement current µA	10
Display	LED, 5-digits
Temperature range K	1.4 to 475
Resolution	0.001 K from 1.4 to 99.9 K 0.01 K from 100 to 475 K
Accuracy	±0.05 K from 1.5 to 99.9 K ±0.05 K from 100 to 475 K
Power supply voltage	5 V DC at 1 A through the supplied 100 – 240 V AC power adaptor
Trigger thresholds	2
Switched output	2 relays (n.c. and n.o.) 30 V DC at 1 A
Analog output Voltage V Current mA	 0 to 10 4 to 20
RS 232 C interface	a) Temperature output b) External adjustment of switching thresholds
Admissible ambient temperature °C (°F)	+15 to +35 (+59 to +95)
Mechanical design/housing	Benchtop unit
Dimensions (W x H x D) mm (in.)	96 x 48 x 166 (3.78 x 1.89 x 6.54)
Weight (including packaging), approx. kg (lbs)	0.45 (1.0)

Ordering Information

	MODEL 211S Part No.
Low temperature measuring instrument MODEL 211S	844 110
HV cable 2-way with plug, 10 m (35.0 ft) long [1]	844 112
HV cable 4-way with plug, 10 m (35.0 ft) long [2]	844 113
UHV cable 4-way with plug, 10 m (35.0 ft) long [2]	844 114
Silicon diode, type E, with connecting cable and micro plugs [4] without current feedthrough	844000V5
HV current feedthrough on a flange DN 25 KF, 2-way [5]	E20019256
UHV current feedthrough on a flange DN 16 CF, 4-way [6]	500 217

[1] Compatible with HV current feedthrough on a flange DN 25 ISO-KF (E20019256) and for older cryo pumps of type RPK.

[2] Compatible with current ranges BasicLine (BL) and BL LN_2.

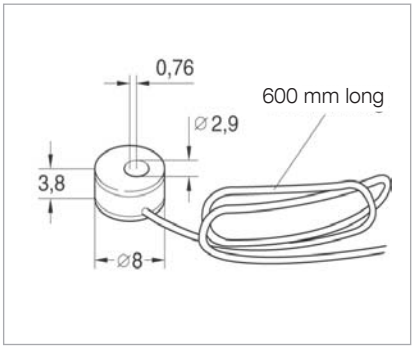
[3] Compatible with UHV current feedthrough on a flange DN 16 CF (500217) and cryo pumps from the BL-UHV range.

[4] Compatible with HV current feedthrough (E20019256).

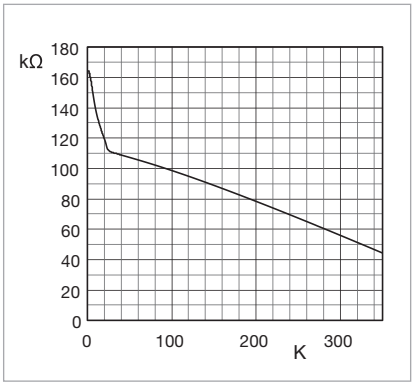
[5] Compatible with 844000V5 and measurement line 844112.

[6] Compatible with measurement line 844114.

Temperature Sensor



Dimensional drawing for the silicon diode, type E



Standard characteristic of the silicon diode

In contrast to vapor pressure thermometers, electric temperature sensors can be used for continuous measurements within a wide range of temperatures.

Silicon diodes offer a negative temperature coefficient of resistance, i.e. their resistance drops as the temperature increases. The slope of the temperature/resistance characteristic and the absolute resistance are decisive regarding the suitability of these diodes. The slope determines the sensitivity of the sensor and a high electrical resistance permits accurate measurements while keeping the thermal load small (microwatts).

In systems which are degassed at high temperatures, silicon diodes can only be fitted after degassing has been completed.

The silicon diode type E matches the low temperature display unit.

Technical Data — Silicon Diode Type E

Temperature range	**K**	1.4 to 325
Temperature coefficient (dR/dT)		
qualitative		Negative in the entire temperature range
quantitative	**Ω/K**	Non-linear characteristic
Measurement current	**µA**	10
Bakeable to	**°C (°F)**	+60 (+140)

Ordering Information — Silicon Diode Type E

	Part No.
Temperature sensor	**844000V5**
Silicon diode with 4-way electrical feedthrough	**E6512948**

Notes