ATH 2300 M/MT

MAGLEV HYBRID TURBOMOLECULAR PUMP

User's Manual

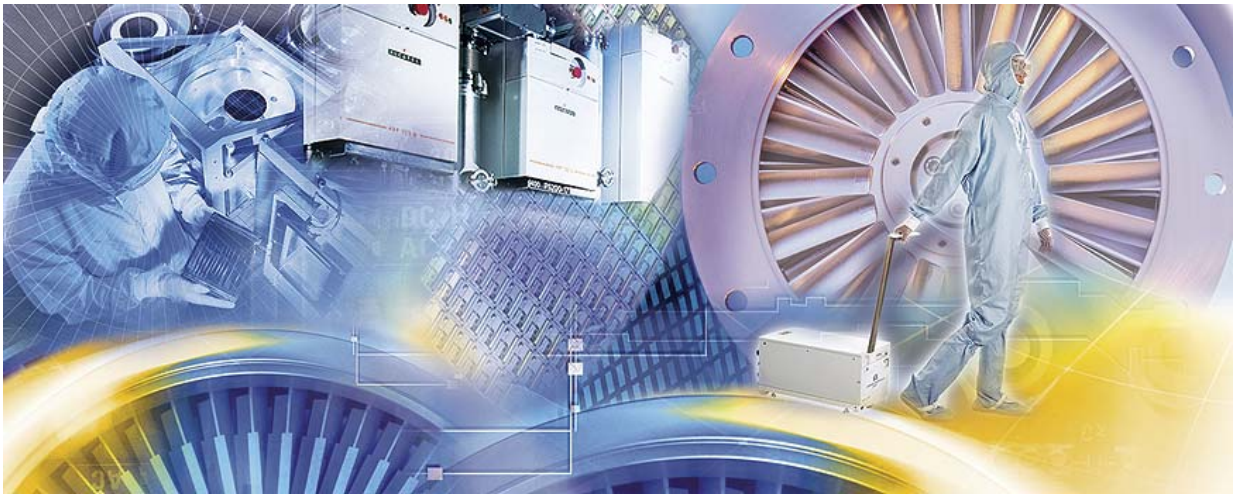
adixen
by Alcatel Vacuum Technology

Alcatel Vacuum Technology, as part of the Alcatel Group, has been supplying vacuum pumps, leak detection systems, vacuum measurement and micro machining systems for several years.
Thanks to its complete range of products, the company has become an essential player in multiple applications : instrumentation, Research & Developement, industry and semiconductors.

Alcatel Vacuum Technology has launched Adixen, its new brand name, in recognition of the company's international standing in vacuum position.
With both ISO 9001 and 14001 certifications, the French company is an acknowlegded expert in service and support, and Adixen products have the highest quality and environmental standards.

With 40 years of experience, AVT today has a worldwide presence, through its international network that includes a whole host of experienced subsidiaries, distributors and agents.
The first step was the founding of Alcatel Vacuum Products (Hingham- MA) in the United States, thirty years ago, reinforced today by 2 others US subsidiaries in Fremont (CA) and Tempe (AZ).
In Europe, AVTF-France headquarters and three of its subsidiaries, Alcatel Hochvakuumtechnik (Germany), Alcatel Vacuum Technology UK (Scotland) and Alcatel Vacuum Systems (Italy) form the foundation for the European partner network.
In Asia, our presence started in 1993 with Alcatel Vacuum Technology (Japan), and has been strengthened with Alcatel Vacuum Technology Korea (in 1995), Alcatel Vacuum Technology Taïwan (in 2001), Alcatel Vacuum Technology Singapore, and more recently with Alcatel Vacuum Technology Shanghai (China) (in 2004).
This organization is rounded off by more than 40 represensatives based in a variety of continents.

Thus, whatever the circumstances, the users of Adixen products can always rely on quick support of our specialists in Vacuum Technology.



GB 00779 – Ed 03 – June 2005

ATH 2300 M/MT
Maglev hybrid turbomolecular pumps

Welcome

Dear Customer,

You have just purchased an Adixen maglev hybrid turbo pump.
We would like to thank you and are proud to count you as one of our customers.

This product has benefited from Alcatel's many years of experience in the field of turbomolecular pump design.

In order to ensure the best possible performance of the equipment and your complete satisfaction in using it, we advise you to read this manual carefully before any intervention on your pump and to pay particular attention to the equipment installation and start-up section.

Refer to the controller user's manual to use these pumps ATH 2300M/MT

APPLICATIONS:

SEMICONDUCTOR APPLICATIONS
Plasma etching, Ion implantation, Sputtering, Plasma deposition.

OTHERS APPLICATIONS
Electron microscopes, Surface analysis, Research and development, High energy physics, Space simulation, Accelerators.

ADVANTAGES:
High throughput - Quiet and clean vacuum - Corrosion proof - High MTBF - Minimum size, volume and weight - Smart and compact electronic controller - Reliability - Maintenance free - Battery free - Easy integration.

GB 01717 - Edition 05 - Nov 06

ATH 2300 M/MT
Maglev hybrid turbomolecular pumps

This product complies with the requirements of European Directives, listed in the Declaration of Conformity contained in G 100 of controller user's manual. These Directives are amended by Directive 93/68/E.E.C (E.C. Marking).

GB 01717 - Edition 05 - Nov 06

MANUAL REFERENCE: **108895**
EDITION: **05 - November 2006**

General contents

ATH 2300 M/MT - User's Manual

GB 01718- Edition 04 - Nov 06

CAUTION

Indicates a potentially hazardous situation which, if not avoided, could result in property damage.

⚠ CAUTION

Indicates a potentially hazardous situation which, if not avoided, could result in moderate or minor injury. It may also be used to alert against unsafe practices.

MANUAL REFERENCE: **108895**
EDITION: **05 - November 2006**

General contents

ATH 2300 M/MT - User's Manual

⚠ WARNING — Indicates a potentially hazardous situation which, if not avoided, could result in death or severe injury.

⚠ DANGER — Indicates an imminently hazardous situation that, if not avoided, will result in death or severe injury (extreme situations).

GB 01718 Edition 04 - Nov 06

Introduction

ATH 2300 M/MT User's Manual
Detailed contents

GB 01719 - Edition 03 - Nov 06

Introduction to the ATH 2300 M/MT

1 magnetically levitated hybrid turbo pump

ATH 2300 M

Five active axes
Rotor position control in 5 directions.

Automatic balancing system
Lowest possible levels of noise and vibration.
Compensation for any imbalance of the rotor.

Maintenance free

Inert gas purge
Eliminate corrosion of the motor and magnetic bearing coils.

Battery free
In case of a power failure, the pump motor acts like a generator to transform the rotor energy into electrical power to supply the controller

ATH 2300 MT

Integral heater band
Maintaining the pumps internal surface up to 75°C to prevent the condensation effect.
Temperature regulated by the controller, or by the customer device

Controllers

The ATH 2300 M/MT pumps work with the OBC 2300 M controller and with the Mag Power controller.
(refer to the User's Manual).

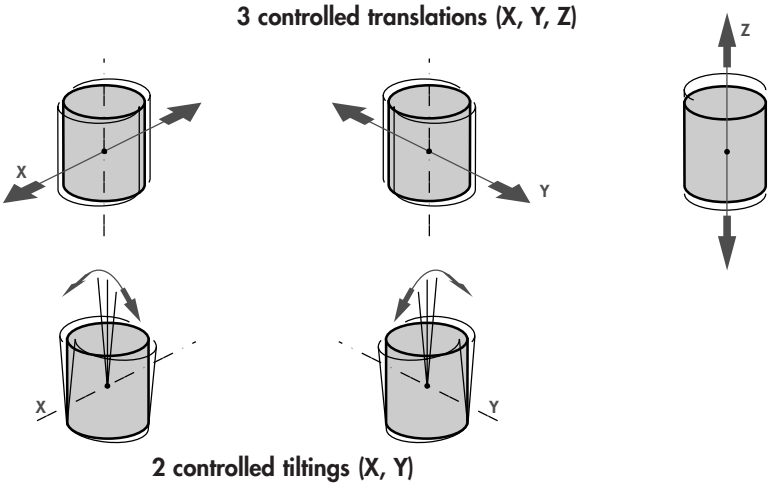
GB 01720 - Edition 04- November 06

Control loop of the pump

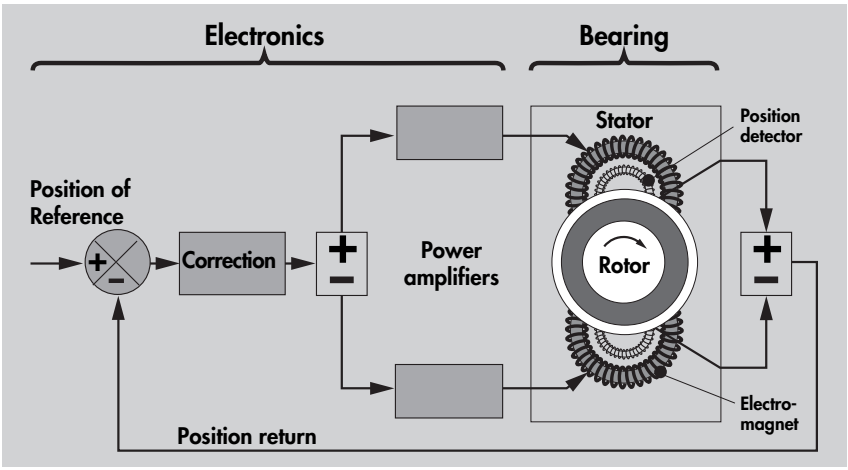
5 active axis

The mobile assembly formed by the turbo rotor and the shaft is known as the rotor. The rotor is driven by the motor and held in suspension by magnetic fields generated by electromagnets housed in an active bearing.

The mobile rotor has five axes of freedom monitored by 5 active bearings.



Movements in relation to these axes are monitored by position sensors. According to the position data recorded, the controller corrects differences to bring the rotor back to its optimum position, by varying the current in electromagnets.

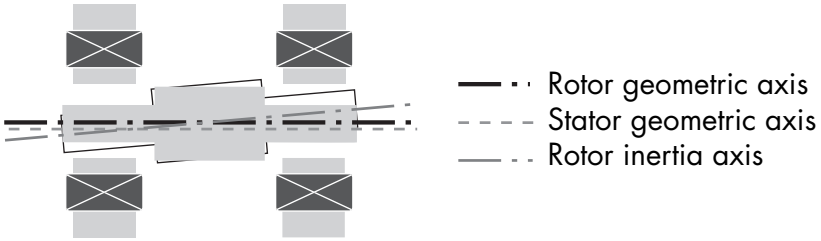


GB 01722 - Edition 03 - November 06

Control loop of the pump

Unbalanced force rejection control

The **unbalanced force rejection control** is an electronic device, that monitors the rotor position, allowing it to rotate in its own axis of inertia.
Changes in the rotor balance, due to deposit built-up during the life time of the pump, are automatically compensated by the **unbalanced force rejection control**.
Therefore, there is a total absence of vibration.



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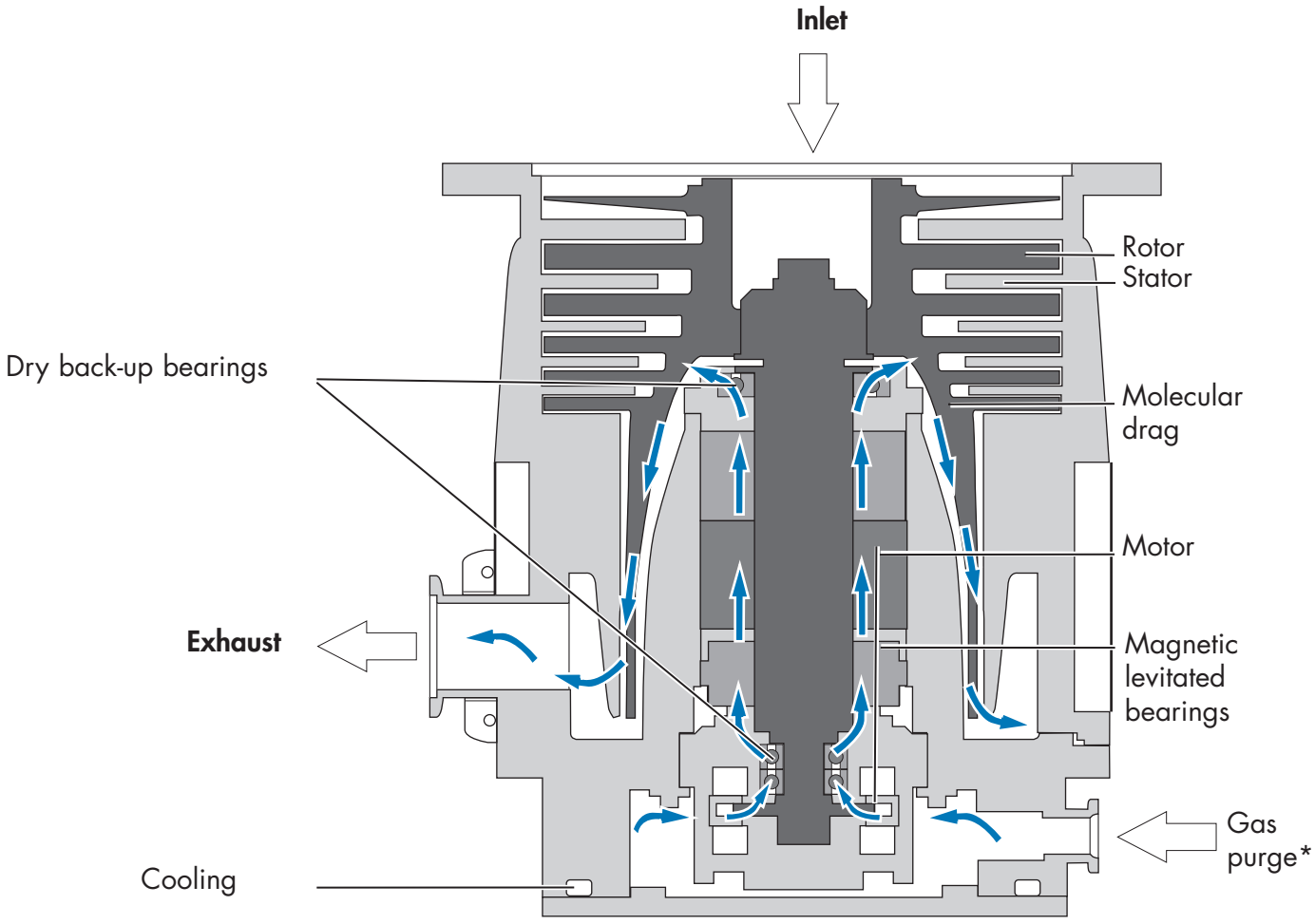
The pump operating principle

Pumping principle

The ATHM pump integrates the advantages of a multi-staged turbomolecular pump with a spiral helix molecular drag section to enhance ultra high-vacuum (UHV) and ultra clean technology (UCT).

The turbomolecular section provides high pumping speeds and UHV ultimate vacuum. The molecular drag section provides a high compression ratio and extends forevacuum tolerance up to 1.5 mbar.



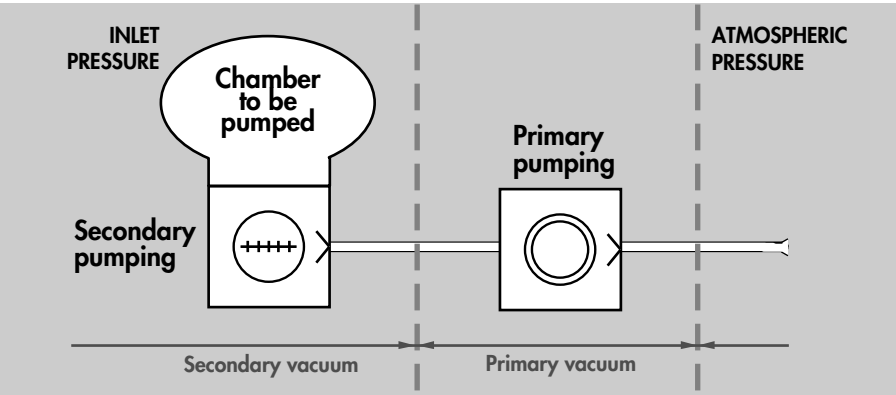
* The gas purge provides excellent protection for corrosive applications.

GB 00725 - Edition 06 - January 06

The pump operating principle

The hybrid-turbo pump in an installation

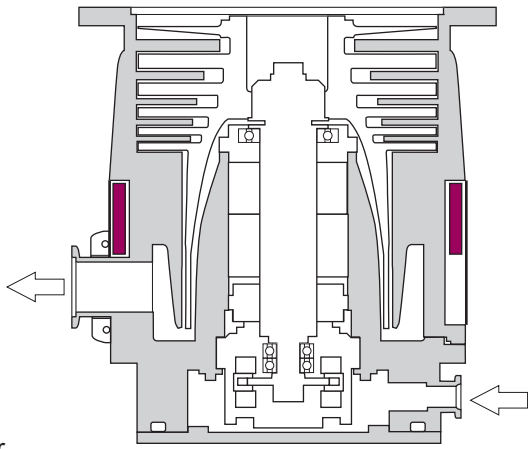
At the pump exhaust, the gases are evacuated to atmosphere by a primary pump.
Since the ATHM compression ratio is set by the design, the ATHM limit pressure is given by that of the primary pump used.



ATH XXXX MT

The built-in heater band

In high pressure and high throughtput processes such as metal etch, deposit can build up in the lower compression stages of the rotor, leading the pump to early failure.
The built-in heater band allows pump heating up to 75 °C, which is sufficient to prevent the condensation effect.
This device is thermally controlled by the controller, or by the customer's external regulator.
The MT version is delivered with its water valve.



GB 00725 - Edition 06 - January 06

The pump operating principle

The back-up bearings

They are dry-lubricated ceramic ball bearings.
They are never used in normal operation, since the rotor is not in contact with the bearings.
The back-up bearings are only used to protect the pump in accidental air in-rushes, accidental shocks or power failure.

No maintenance

By design, the pump doesn't include parts liable to wear and doesn't need preventive maintenance. However, the back-up bearings used in case of accidental shut-downs have to be changed when the controller indicates it: the percentage of landing time to be deducted depends on its frequency of use (**D 100**).

Battery free

In case of a power failure, the motor acts like a generator, supplying enough power for the magnetic bearings.
When the rotation speed is lower than the minimum setpoint, the pump lands and shuts down on the back-up bearings.

Variation of the pump rotational speed

The ATHM pump rotation speed can be selected and set between a standby speed and the maximum speed. This makes it possible to optimize pumping characteristics according to each customer application (for example, high pressure pumping).

A distinction is made between the following speeds:
- **reduced speed (STANDBY speed)** which can be set between the low speed value and the maximum speed.
- **maximum speed** preselected at factory.

For **an inlet pressure** $\leq 10^{-1}$ **mbar**, the pump rotation speed can be selected between a minimum speed and a maximum speed specific for each pump (**A 400**).

GB 00725 - Edition 06 - January 06

Technical characteristics of the ATH 2300M/MT pump

The performances of the pumps

Characteristics		**UNITS**	**ATH 2300 M/MT**
Inlet flange		*DN*	**ISO 250-F**
Maximum rotation speed		*rpm*	**31000**
Standby speed		*rpm*	**15000 to 31000**
Pumping speed	*N2*	*l/s*	**2100**
	He	*l/s*	**2200**
	H2	*l/s*	**1200**
Compression rate	*N2*		**> 1.10^9**
	He		**3.10^4**
	H2		**2.10^3**
Ultimate pressure without purge, measured according to pneurop standard		*Torr* *mbar*	**< 6.10^{-9}** **< 8.10^{-9}**
Maximum pressure at inlet in continuous operation ** (not heated pump)		*Torr* *mbar*	**0.1** **0.14** **(water cooling)**
Maximum pressure at inlet in continuous operation ** (heated pump 65°C)		*Torr* *mbar*	**0.015** **0.02** **(water cooling)**
Maximum permissible pressure at exhaust**		*mbar*	**1.5**
Maximum flowrate with N2 (heated at 65°C)		*sccm*	**1200**
Maximum flowrate with N2 (unheated)		*sccm*	**2500**
Purging maximum flow rate		*sccm*	**50**
Vibration level (at 31000 rpm)		*µm*	**< 0.01**
Mounting orientation			**Any**
Power supply required for heater band (MT)			**100/120 V - 50/60 Hz** **200/240 V - 50/60 Hz** **250 W**
Start-up time		*min*	**10**
Cooling water flow rate		*l/h*	**< 60**
Water temperature		*°C*	**15 < T < 25**
Maximum ambient temperature		*°C*	**40**
Weight		*kg*	**58**
Recommended forepump (Adixen)			**ADP / ADS**

** The two maximum pressures cannot occur at the same time.

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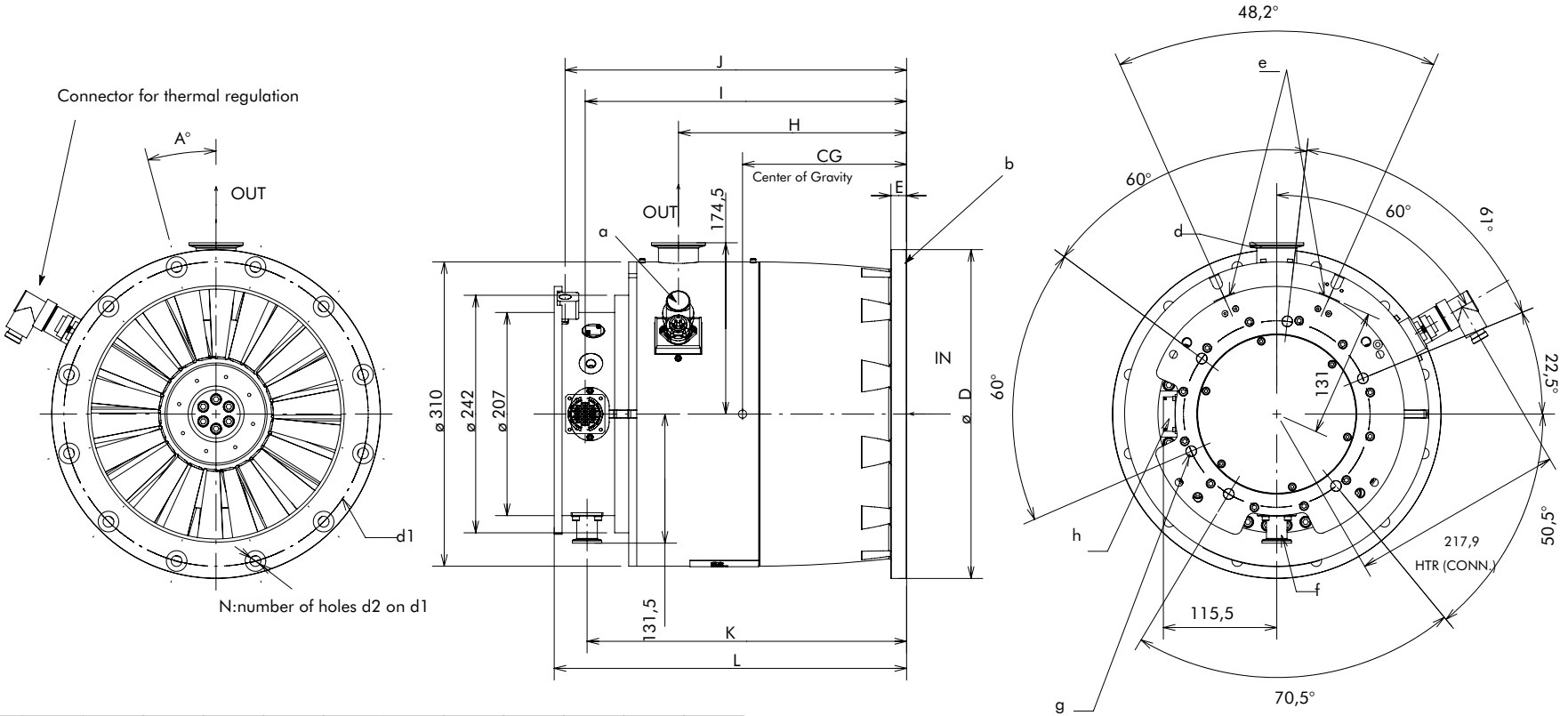
Technical characteristics of the ATH 2300MT pump



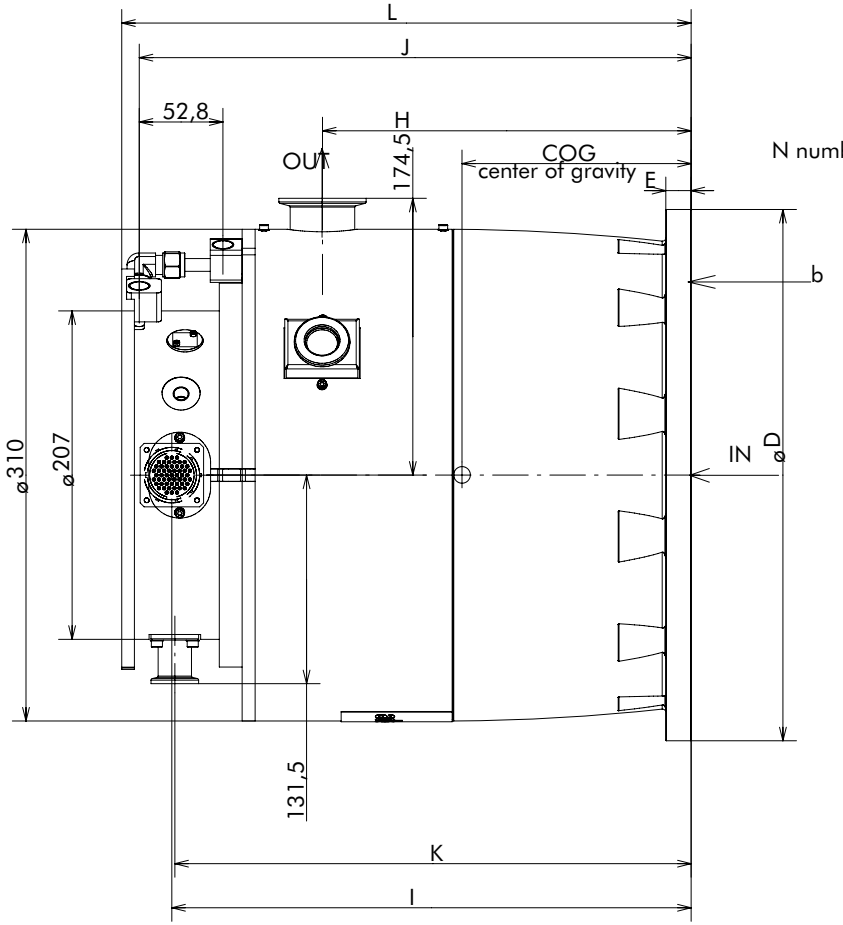
Inlet flange	E	H	I	J	K	L	D	d1	d2	N	A	CG
DN 250 ISO-F	16	232.5	322.6	348	325.5	358.5	335	310	11	12	15	170
DN 250 CF-F	26	276.5	366.6	392	369.5	402.5	306	284	8.5	32	5.65	204
DN 200 ISO-F	16	276.5	366.6	392	369.5	402.5	306	260	11	12	15	204
DN 200 CF-F	16	276.5	366.6	392	369.5	402.5	285	260	11	12	15	204

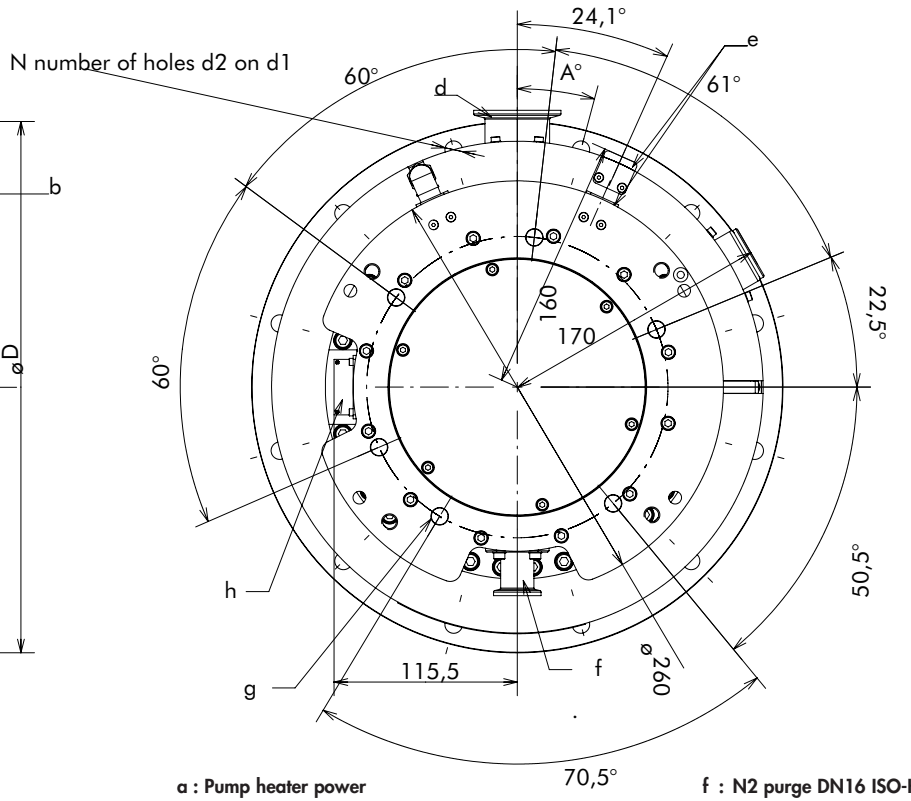
Dimensions in mm

a : Pump heater power
b : Inlet flange
d : Exhaust DN40 ISO - KF
e : Water inlet and outlet 1/4 NPT FEMALE
f : N2 purge DN16 ISO-KF
g : 6 holes M10-6H on ø 190 Depth max 29, Depth min 25
h : Electrical power supply

GB 01725 - Edition 04 - Nov 06

Technical characteristics of the ATH 2300M pump





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Depth max 29, Depth min 25
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GB 01725 - Edition 04 - Nov 06

The accessories of the pump

Screen filter

This filter protects the pump against solid particles.
Mesh size 3.5 mm. It is integrated into the pump housing.

DN 200 ISO (S.Steel)	P.N.
Standard filter + standard clip	**107824**
Convexe filter + bored clip	**108872**
Removable filter + ASA clip	**104907**
DN 250 ISO	
Convexe filter (alu) + standard clip	**109199**
Convexe filter (S.Steel) + bored clip	**108762**

Purge flow reduction device

This device is used to reduce the purge gas flow rate in some processes.

Flow Reduction device DN 16	P.N.
25 SCCM	**066950**
50 SCCM*	**066752**
* delivered with air inlet valve	

Isolation valve at inlet pump

The secondary isolation valve is used to maintain the vacuum in the chamber while the pump is reset to atmospheric pressure.

See the manufacturer's catalog.

Water valve

The water valve is used to stop the water flow rate.
The water valve is connected to the controller with the thermostatic cable.
(**A 500** in the controller User's Manual)

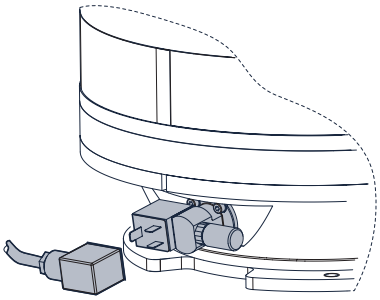
Water valve	P.N.
24 VDC	**108668**

GB 02992- Edition 01- Nov 06

The accessories of the pump

Purge valve (50 sccm) (operate only with the OBC controller)

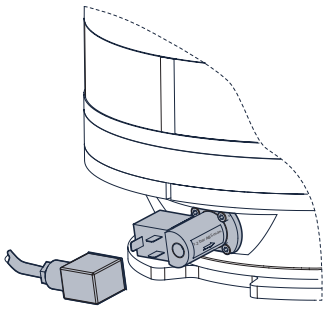
24 V DC P/N :111921



The purge flow warranties a gas flushing for back-up bearing protection from the pumped process gases.
The purge of this valve can be isolated during an air tightness test.

Air inlet valve and permanent purge flow (50 sccm)

24 V DC P/N :112417



The purge of this valve warranties a gas flushing for back-up bearing protection. It can't be isolated.
The air inlet valve will slow down the pump in complete safety. With this option, the braking time from nominal speed to 0 rpm is t < 15 mn. Without the valve, the braking time is about 30 mn.

Air inlet valve cables and purge valve cables

Length	P.N.
1 m	**A462403-010**
3,5 m	**A462403-035**
5 m	**A462403-050**
10 m	**A462403-100**
20 m	**A459362-200**

An entire range of connection accessories is available in the manufacturer's catalog (clamping ring, centering ring, etc.).

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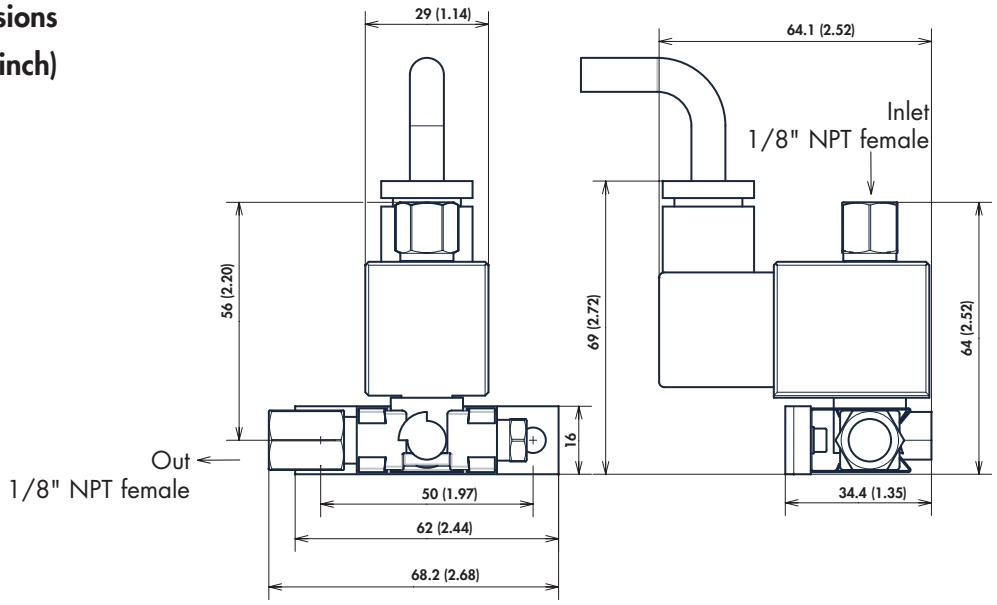
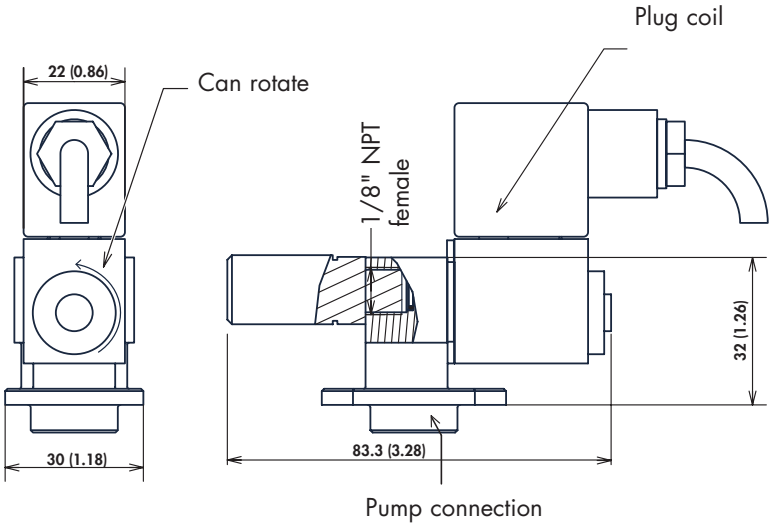
Accessory dimensions

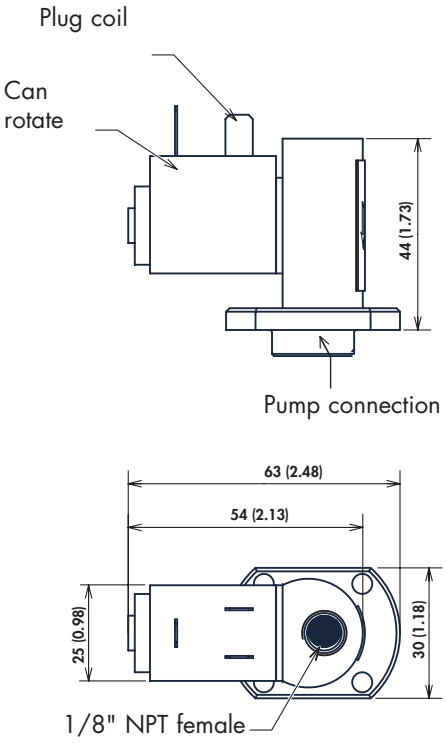
Water valve dimensions
mm (inch)



Purge valve dimensions
(50 SCCM) mm (inch)



Air inlet valve + continous purge dimensions
(50 SCCM) mm (inch)



GB 02981 - Edition 01 - June 06

ATH 2300 M/MT User's Manual
Detailed contents

GB 001726 - Edition 04 - Nov 06

Safety instructions for installation

Before switching on the pump, the user should study the manual and follow the safety instructions listed in the compliance certificate booklet supplied with the pump.

• The controllers must be connected to an electrical installation including a ground connection in compliance with decree 88.1056 of 14th November 1988.
• Our products are designed to comply with current EEC regulations. Any modification of the product made by the user is liable to lead to non-compliance with the regulations, or even to put into doubt the EMC (electromagnetic compatibility) performance and the safety of the product. The manufacturer declines any responsibility for such operations.

This pump is not equipped with an emergency stop EMO device because it is designed for use on process tools and integration with the process tool EMO.

This pump is not equipped with a lock out/tag out (LO/TO) device because it is designed for use on process tools. In order to properly secure the pump for installation or/and maintenance, the entire tool needs to be properly locked-out/tagged out in accordance with OSHA requirement 29 CFR.1910.147.

Risk of electrical shock. Switch off the pump and wait before disconnecting the main cable, as long as the rotor is moving. Only the authorized and trained technicians can perform intervention on the equipment.

• The EMC performance of the product is obtained on the condition that the installation complies with EMC rules.
In particular, in disturbed environments, it is essential to:
- use shielded cables and connections for interfaces,
- stabilize the power supply line with shielding from the power supply source to a distance of 3 m from the product inlet.
• Magnetic field level: the level for the static fields measured at the exterior of the pump is a maximum of 0.2 mT.

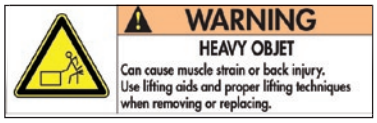
GB 00731 - Edition 05 - November 02

Safety instructions for installation

• The units containing control circuits are designed to guarantee normal safety conditions taking their normal operating environment into account (use in rack).
In specific cases of use on tables, make sure that no objects enter the ventilation openings or block the openings when handling the units.


WARNING

When switching off an item of equipment containing loaded capacitors at over 60 VDC or 25 VAC, take precautions concerning the access to the connector pins (single-phase motors, equipment with line filter, frequency converter, monitoring unit, etc.). Wait 1 minute after pump switch off before operating on the product.



When handling the equipment, use the devices provided for this purpose (hoisting rings, handle, etc.).


WARNING

Risk of tilting over: although compliance with EEC safety regulations is guaranteed (normal range ± 10°), it is recommended to take precautions against the risk of tilting over during handling, installation and operation (refer to A 300 and A 400 for the location of the center of gravity).

• The performance and the operational safety of this product are guaranteed provided that it is used in normal operating conditions.


WARNING

The vacuum pump is also a compressor: incorrect use may be dangerous.
Study the user manual before starting up the pump.
External inputs (contact or voltage) can be used to stop the turbomolecular pump in case of roughing pump power failure (see External fault on B 430 on controller user's manual).

GB 00731 - Edition 05 - November 02

Safety instructions for installation


WARNING

The access to the rotor of a turbomolecular pump with an unconnected intake is dangerous. Similarly, if the pump is not switched on, it may be driven by another pump in operation (risk of injury).

• Make sure that the parts or chambers connected to the inlet of our pumps withstand a negative pressure of 1 bar in relation to the atmospheric pressure.
• The leaktightness of the products is guaranteed when they leave the factory for normal operating conditions.
It is the user's responsibility to maintain the level of leaktightness particularly when pumping dangerous gases.


WARNING

For process pumps:
If loss of purge flow creates a significant risk, then the external monitoring of the purge flow and the response to loss of purge flow must be provided by the process equipment and interlocked if necessary.
If pyrophoric materials above the LEL are sent to the pump then nitrogen should be supplied at a rate to ensure that concentration is diluted to be below the LEL, in addition an interlock should be provided to ensure that gas flow to the pump is stopped when nitrogen is lost.


WARNING

If any pyrophoric, toxic, oxider or flammable material can be sent to the pump, then an exhaust monitor should be used in the secondary exhaust to ensure that gas flow to the pump is stopped when secondary exhaust is lost.
Also, if flammable materials are sent to the pump, the customer will need to provide a hardware based LEL detection in the secondary exhaust (capable of detecting at 25% of the LEL) that will stop chemical supply to the pump when gas is detected at 25% of LEL for that flammable material.

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Safety instructions for installation

The machines are designed so as to prevent any thermal risk to the user's safety. However, specific operating conditions may generate, temperatures justifying particular attention on the part of the user (external surfaces > 70°C on exhaust connections). Always use gloves before servicing.

Safety interlock.
The pump motor is protected against overload through the drive «start/stop» and enable control circuitry of the variable speed controller. The drive start/stop includes solid state components. If hazards due to accidental contact with moving machinery or unintentional flow or liquid, gas or solids exist, an additional hardwired stop circuit is required to remove AC input power to the drive.
It is never required to override this interlock during installation, use or maintenance.
Once activated power will be switch off and the pump will be put in a safe condition. When a fault occurs, the cause must be corrected before the fault can be cleared. It is required to switch power off and on to clear the fault.

Located on the pump housing, this label warns the user against possible risk of injury due to any hand contacts with hot surface. It demands to use protective gloves before any intervention is performed.

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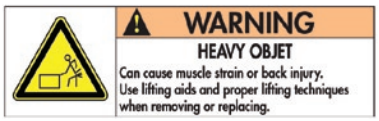
Safety instructions for installation



Located on the pump housing, this label indicates that due to its heavy weight, the product should not be handled manually, but always through appropriate handling devices.

Located on the pump housing, this label indicates that some of the internal parts are energized and could cause electrical shocks in case of contact. It advices to disconnect the pump before any intervention or to properly lock-out and tag-out the equipment breaker before any intervention on the pump.

Located on the pump housing, this label warns the user against pumped process gas that could be dangerous and toxic and could cause severe injuries or death. It precises that any preventive maintenance operation can only be performed by trained personnel.

Pump connection to the installation :
It is strongly recommended to secure the maglev turbopump installation to prevent any safety hazard to the user in standard operating conditions (Refer to B 300).

GB 00731 - Edition 05 - November 02

Unpacking and storage of the pump

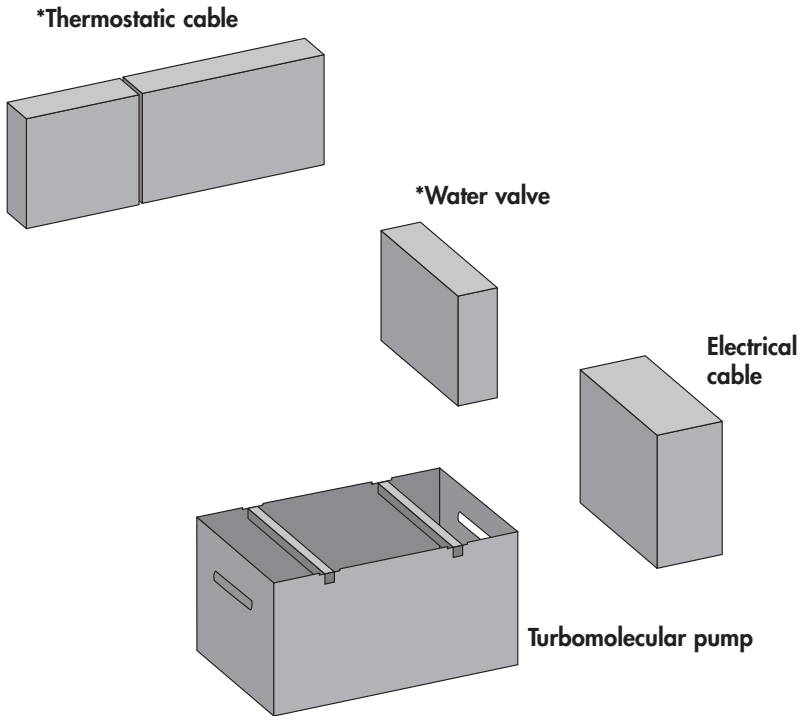
⚠ WARNING

Risk of tilting: compliance with the EEC safety rules is guaranteed (normal range ± 10°). Still, it is recommended to take precautions in regard to the risk of tilting during product handling, installation and operation (A 400 for the location of the center of gravity for pump and controller).

Unpacking

Unpack the equipment carefully and keep the packaging. Make sure that the equipment has not been damaged during the transport. If it has been damaged, take the necessary steps with the carrier and inform the manufacturer if necessary.
In all cases, we recommend that you keep the packaging (reprocessing material) to transport the equipment if necessary or for prolonged storage.

To keep your product in the clean condition in which it left our factory, we recommend to unpack the pump only on its assembly site.

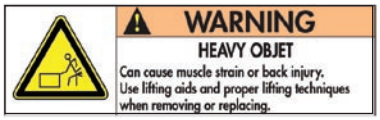


* The packaging depends on the configuration of the pump. It also contains other cardboard boxes for the accessories like: screen filter, air inlet valve, purge device, high temperature sticker, electric cable...

GB 00732 - Edition 07 - January 06

Unpacking and storage of the pump

Pump handling



Lift the pump out of its packaging by using the hoisting rings located on the inlet blanking flange (weight : more than 30 Kg (66 lb).

Note

If the pump has to be installed with inlet housing face down, it is recommended to lift the pump by screwing hoisting rings M10 (supplied by customer) into the 6 threated holes located at the rear of the pump.

Pump storage

CAUTION

If the pump is going to be put into storage, the inlet and exhaust connections should be blanked off. This equipment can be stored without any precautions at an ambient temperature between 5 and 40°C.

⚠ CAUTION

If you need to store a pump which has run, don't forget to blow out the water line and purge the functional block with N2.

Inlet

ASA 6'', ISO or CF-F flange blanking (depends on the model).

Exhaust

Blanked with a DN 40 ISO-KF protector.

Connection for air inlet valve and nitrogen device

Blanked with a DN 16 ISO-KF protector.

GB 00732 - Edition 07 - January 06

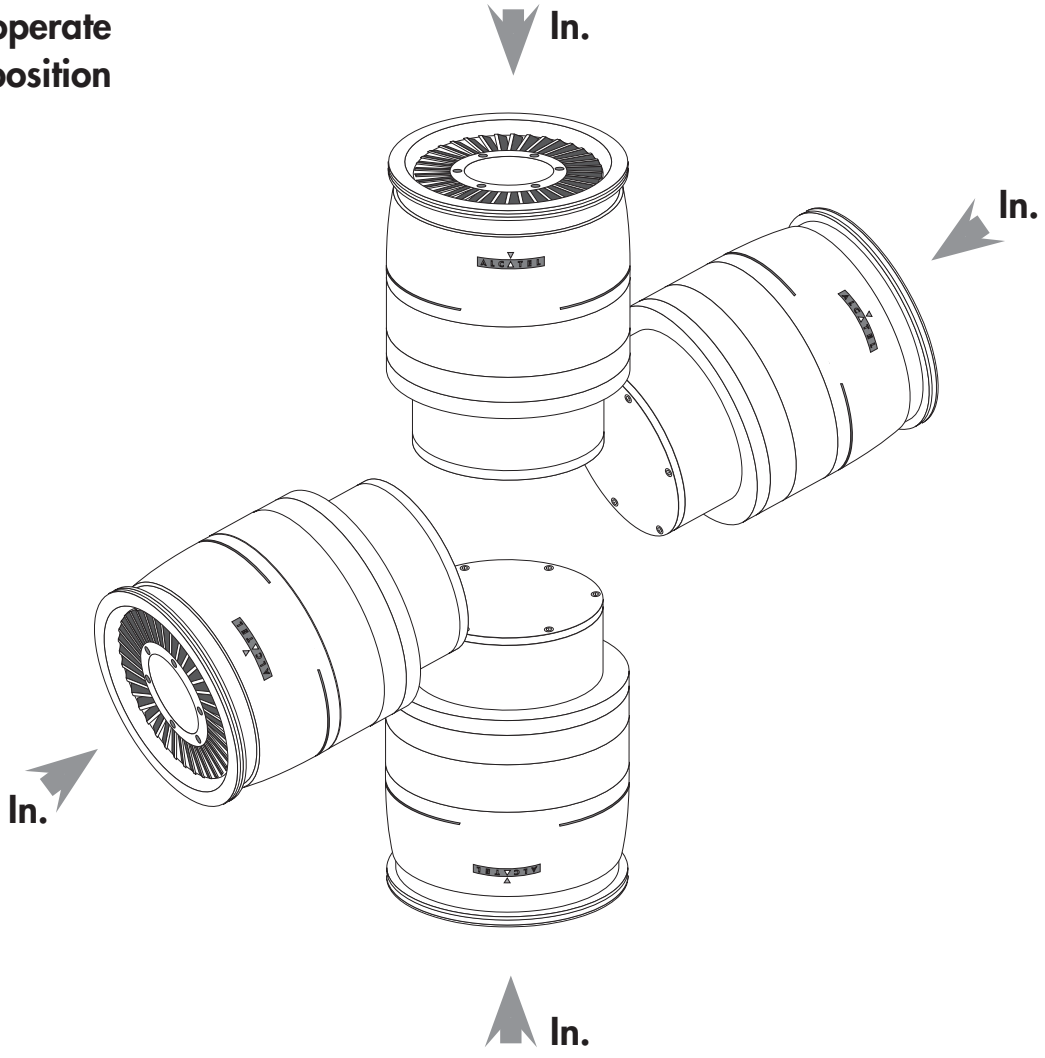
Pump connections to an installation

Equipment installation conditions

The equipment frame on which the pump is installed must be sufficiently rigid to absorb the kinetic energy of the rotor in case of pump rotor crash. For this, take into account:

- the maximum loads to calculate the equipment attachment devices,
- the flange dimensions,
- the quality and the number of bolts.
- **No reducing adaptator or bellows should be installed between pump inlet flange and the chamber.**

The pump can operate in any position



GB 01729 - Edition 06 - Nov 06

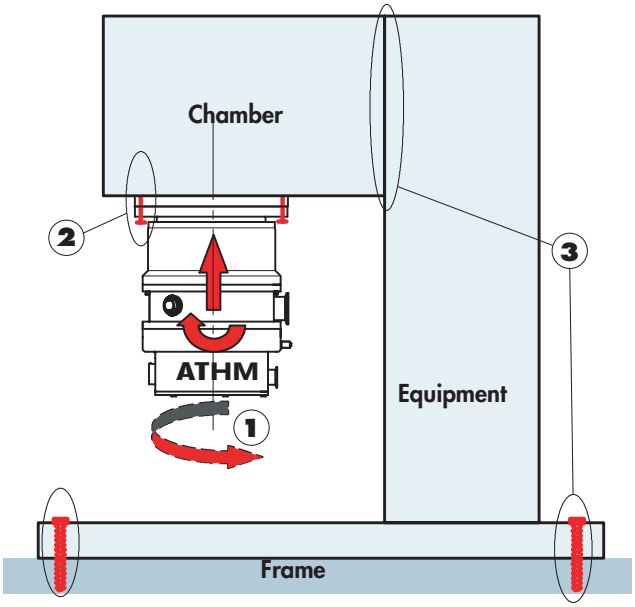
Pump connections to an installation

Why securing the pump installation?

Maglev Turbopumps are designed so as to prevent any safety hazard to the user in standard operating conditions.
However, some operating conditions may generate hazards for the user and the environment : **the kinetic energy stored in a maglev turbopump is very high. In case of a mechanical failure an improperly installed pump could be ejected from the equipment if the kinetic energy was transferred to the pump body.**
It is absolutely necessary to install the pump according to the following installation specifications to secure the user and the equipment.

The constructor declines any responsibility if the pump installation is not designed in accordance with these installation specifications.

Installations specifications



Pump connection instructions

Respect the items 1, 2 and 3 pump connection instructions.

GB 01729 - Edition 06 - Nov 06

Pump connections to an installation

Worst case turbo pump crash scenario definitions

The kinetic energy of the rotor has to be absorbed by the installation **if the pump seizes suddenly**.
The maximum resulting loads have been measured on a test bench by simulating a worst case Turbo pump crash with **a rotor split into 2 parts at nominal speed**. The impact of the rotor parts creates the following **transient loads**.

Axial load (a)

The rotor parts can be ejected out of the pump inlet flange and can impact on the plate of the valve or any other part of the system. If this is placed close to the turbo pump and if it has high stiffness the impact can create a high axial load on the system. Such axial force has not been observed on a standard pendulum valve.

Bending moment (b)

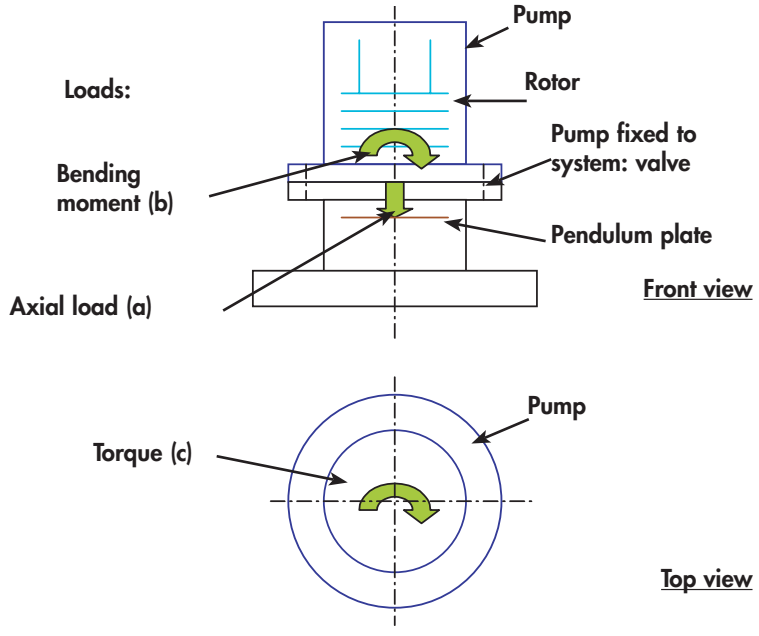
The impact of the rotor parts on the housing will create a radial force on the housing. This radial force will create a bending moment on the system as a function of the distance to the pump.

Torque (c)

The deceleration of the rotor parts creates a torque value on the pump housing, which is transmitted to the system.

The maximum values of the axial force and the bending moment occur at approximately the same time. A delay of up to several ms has been observed for the maximum torque value.

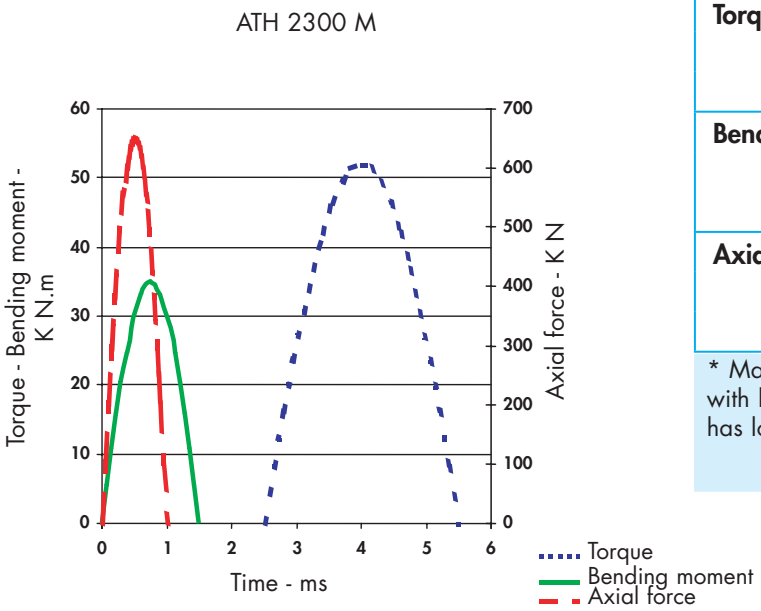
Loads transmitted to the system (item 1)



GB 01729 - Edition 06 - Nov 06

Pump connections to an installation

Loads transmitted to the system (cont.)



Pump model	Unit	ATH 2300 M
Nominal speed	rpm	31000
Energy	kNm	124
Torque	Max. KNm	52
	Duration ms	3.0
	Delay ms	2.5
Bending moment	Max. KNm	35
	Duration ms	1.5
	Delay ms	0
Axial force*	Max. KN	0<<650
	Duration ms	1.0
	Delay ms	0

* Max. axial force occurs if the pump inlet is obstructed with high stiffness parts. There is no load if the system has low stiffness (i.e. valve).

Inlet flange installation conditions (item 2)

The resulting maximum loads from a crash have to be taken into account by the pump assembling bolts.
Design and secure the pump frame so that it can withstand the loads.
According to the housing type:

Mounting holes at inlet flanges	ATH 2300 M		
Inlet flange	**DN250 ISO-F with centering ring**	**DN250 ISO-F without centering ring****	**DN250 CFF**
Type of bolts dictated	M 10	M 10	M 8
Number of bolts dictated	12	12	32
Length of bolts (mm)	≥ 35	30	≥ 40
Bolt metric grade	12-9	12-9	12-9
Installation torque per bolt (N.m)	30	30	20
Total clamping force (N)	161500	161500	355000

** Inlet flange DN250 ISO-F without ring: **only use special bolts with washer** delivered by for this type of installation (12 bolts and washer kit P/N 110034).

GB 01729 - Edition 06 - Nov 06

Pump connections to an installation

Inlet flange installation conditions (cont.)

⚠ DANGER

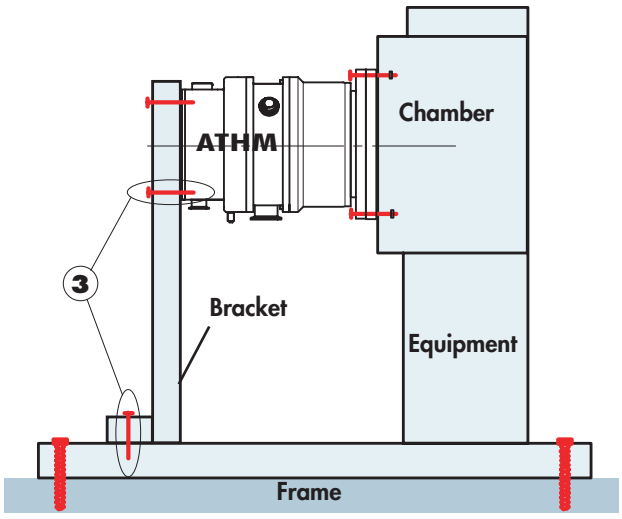
For safety reasons, it is important to tighten the bolts with a torque wrench according to the specified values :
- lower torque risk of loosened bolts
- higher torque risk of damaging the bolts.

⚠ DANGER

We strongly recommend the use of ISO-F or CF-F flanges. ISO-K type flanges are not recommended to fasten turbomolecular because:
• There is no visual reminder (like threaded holes on ISO-F) to signal how many clamps are needed to secure the pump,
• It is not as easy to fasten claw clamps on ISO-K flanges as to secure bolts on ISO-F flanges,
• The ISO-K flanges do not prevent accidental rotation of the pump on the equipment flange in case of pump rotor crash. This rotation could damage the foreline and the purge gas line which would generate hazards for the user.

Equipment installation conditions (item 3) (Option)

Optionally, if the equipment flange cannot be designed to withstand the maximum loads in case of rotor crash, an additional bracket can be fixed to the bottom of the pump (6 x M10 threaded holes are provided on this purpose). In this case, contact the manufacturer for calculation support.



GB 01729 - Edition 06 - Nov 06

Inlet and exhaust connections

Vacuum connections

⚠ WARNING

Remove the protective parts blocking the inlet, exhaust and purge openings: these components prevent foreign bodies from entering the pump during transport and storage. It is dangerous to leave them on a pump in operation.

CAUTION

Make sure that the parts or chambers connected to the inlet of the pump withstand a negative pressure in relation to the atmospheric pressure. (pump ultimate pressure A 400)

⚠ WARNING

After pumping on corrosive or toxic gases, it is strongly recommended to seal the pump with blank-off flanges in case of return to the repair service centers (E 100).

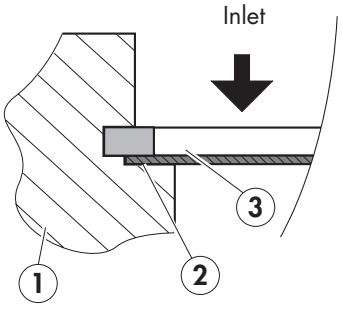
At inlet:

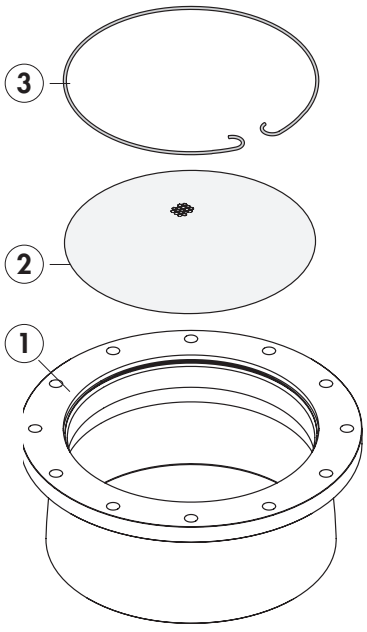
Screen filter

Install the screen filter accessory on the pump;
connect the pump to the installation or connect a secondary isolation valve (ATH 2300 M is delivered with inlet screen filter).

Mounting of the insertable inlet flange

Position the filter (**2**) into the inlet housing groove (**1**), bend side opposite to the rotor.
Position the ring (**3**) and **press it manually into the groove bottom all over its circumference.**

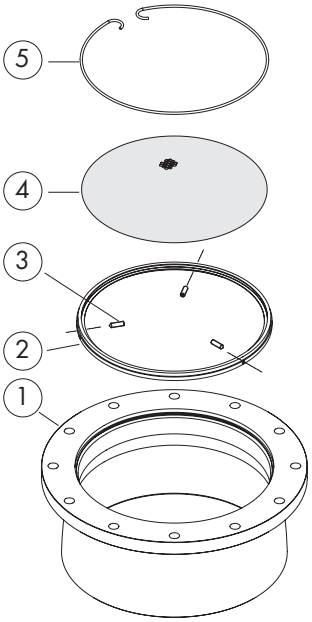




GB 02329 - Edition 02 - January 06

Inlet and exhaust connections

Mounting of the removable inlet flange

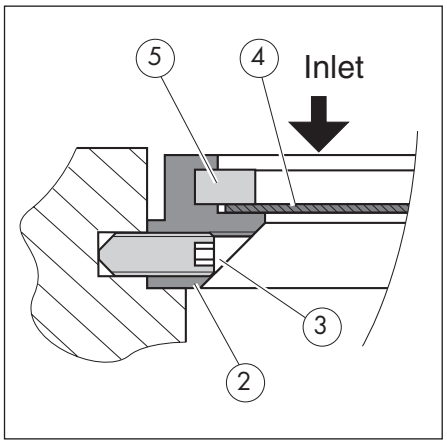


Orientate the filter-holder (**2**) according to the way of mounting described as follows (chamfer looking to the inside of the pump) and position it into the inlet housing.

Fix it using the 3 screws (3) (hexagonal key supplied).

Set the filter (**4**) lying in the filter-holder.

Position the ring (**5**) **and press it manually all over its circumference**.



At exhaust

⚠ WARNING

When pumping on agressive gases, the exhaust of the pump should be connected to an exhaust stack or an evacuation duct.

CAUTION

It is highly recommended to install an isolation valve, (closed with power off) between the maglev pump and the roughing circuit.

The valve is open using the «START» contact on the controller. If the valve is missing, the time taken to slow down in the event of an accident is increased, thereby reducing the service life of the back-up bearings.
Connect this valve V1 near the pump exhaust as possible using connecting accessories (Refer to manufacturer's catalog).
Connect the valve to the primary pumping circuit see typical connection diagram (**B 400** of the controller's manual).

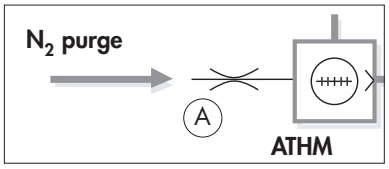
GB 02329 - Edition 02 - January 06

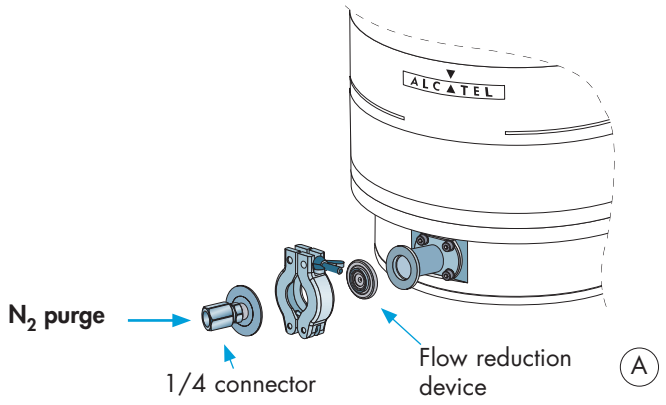
Nitrogen purge and inlet air valve device connections

Characteristics of filtered dry nitrogen supply

A filtered dry nitrogen supply with the following characteristics is required:
- Dew point < 22°C
- Dust < 1 µm
- Oil < 0.1 ppm
- Absolute pressure of 1 to 1.2 bar.

Purge device (50 or 25 sccm)





The nitrogen purge must be connected directly to the pump exhaust port.

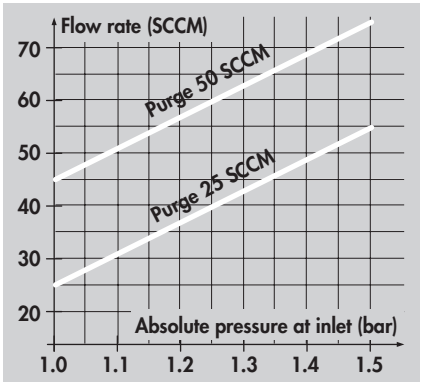
The purge flow is continuous.
Connect the nitrogen supply to the DN 16 purge fitting*.
The nitrogen flow reduction device controls the pressure and guarantees a flow rate of 50 SCCM at pressure 1.1 bars.

Note: N_2 supply can be equipped with a massflowmeter, and in this case, it is not necesssary to install the flow reduction device.

Adjust the flow rate

Feed the nitrogen purge throughout pumping according to the flow rate and pressure values in the scale given.

To limit the flow rate at 25 SCCM, connect the nitrogen flow reduction device accessory (**A 510**).



CAUTION

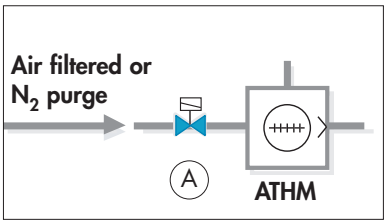
When the neutral gas purge is stopped, the pumped process gases can passed from fore vacuum side to the high vacuum side, and condensate, and eventually, damage internal maglev bearings.
We provide to monitor the purge flow to warranty a permanent gas flushing for maglev back-up bearing protection.

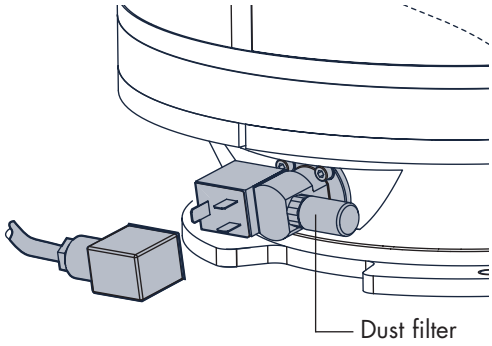
* Different connection accessories can be found in the manufacturer's catalog.

GB 02999 - Edition 01 - April 06

Nitrogen purge and inlet air valve device connections

Valve with purge device (50 sccm)

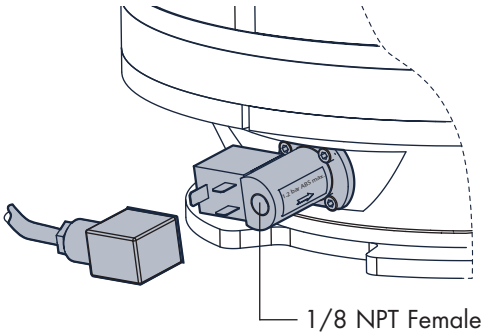


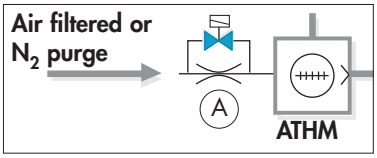


During operation, it's possible to stop the purge, i.e. for tightness test. Instead of the dust filter can be connected a nitrogen purge (1/8 NPT female).

Air inlet valve with purge device (50 sccm)

The air inlet valve is calibrated to reset the volume of the pump to atmospheric pressure. When the pump is isolated (at inlet and exhaust) the rotor slow down efficiency is increased.
If the venting time is setted, the reset to atmospheric pressure takes place when the pump is stopped or when faults are registered on the controller (**C 450**).





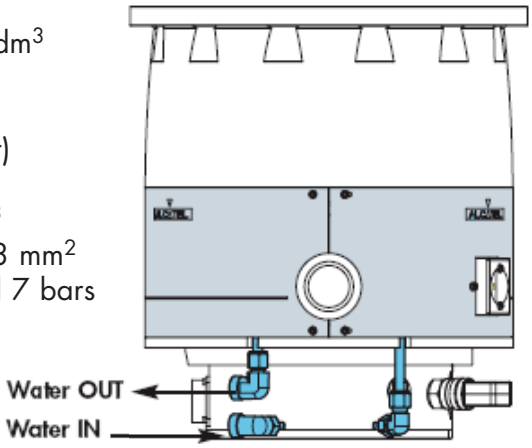
In this case, the continous purge flow can't be stopped. On the 1/8 NPT female port can be connected a dust filter or a nitrogen purge.

GB 02999 - Edition 01 - April 06

Water cooling connection

Characteristics of water cooling

In order to limit the corrosion and clogging of the cooling pipes, it is recommended to use cooling water with the following characteristics:
- treated soft water or non-corrosive industrial water
- pH between 7.5 and 11
- hardness < 7 milli-equivalent/dm^3 (28 mg CaO or 50 mg $CaCO^3$ per liter water) = 3.5 mmol/l (100 mg $CaCO^3$ per liter water)
- Resistivity > 1500 Ω.cm
- Solid pollution < 100 mg/dm^3
- Solid particle size (maxi): 0.03 mm^2
- Pressure range between 2 and 7 bars
- Temperature: 15 < T < 25°C
- Flow rate: 60 l/h
- Deionized water compatible

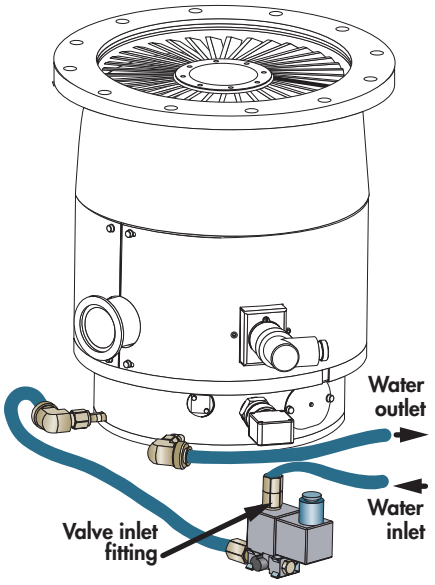


For ATH 2300 M model

- Provide a water inlet pipe and a tap to adjust the flow rate.
- Connect the water inlet line to one of the cooler water fittings 1/4 NPT female on the pump, with the other fitting connected to the water draining circuit via a tube (supplied by customer).

For ATH 2300 MT model

- Provide a water inlet pipe and a tap to adjust the flow rate.
- Connect the water valve to the water inlet line using a flexible tube following the assembly diagram:
- Connect the other nipple to the draining circuit.



CAUTION

Water leak risk : maintain the water valve inlet fitting with a flat wrench (13 mm) during the water line connection (pipe equipped with connector), this to avoid valve damage.

CAUTION

Do not mount water fittings above electrical components in case of leak at water fitting connection.

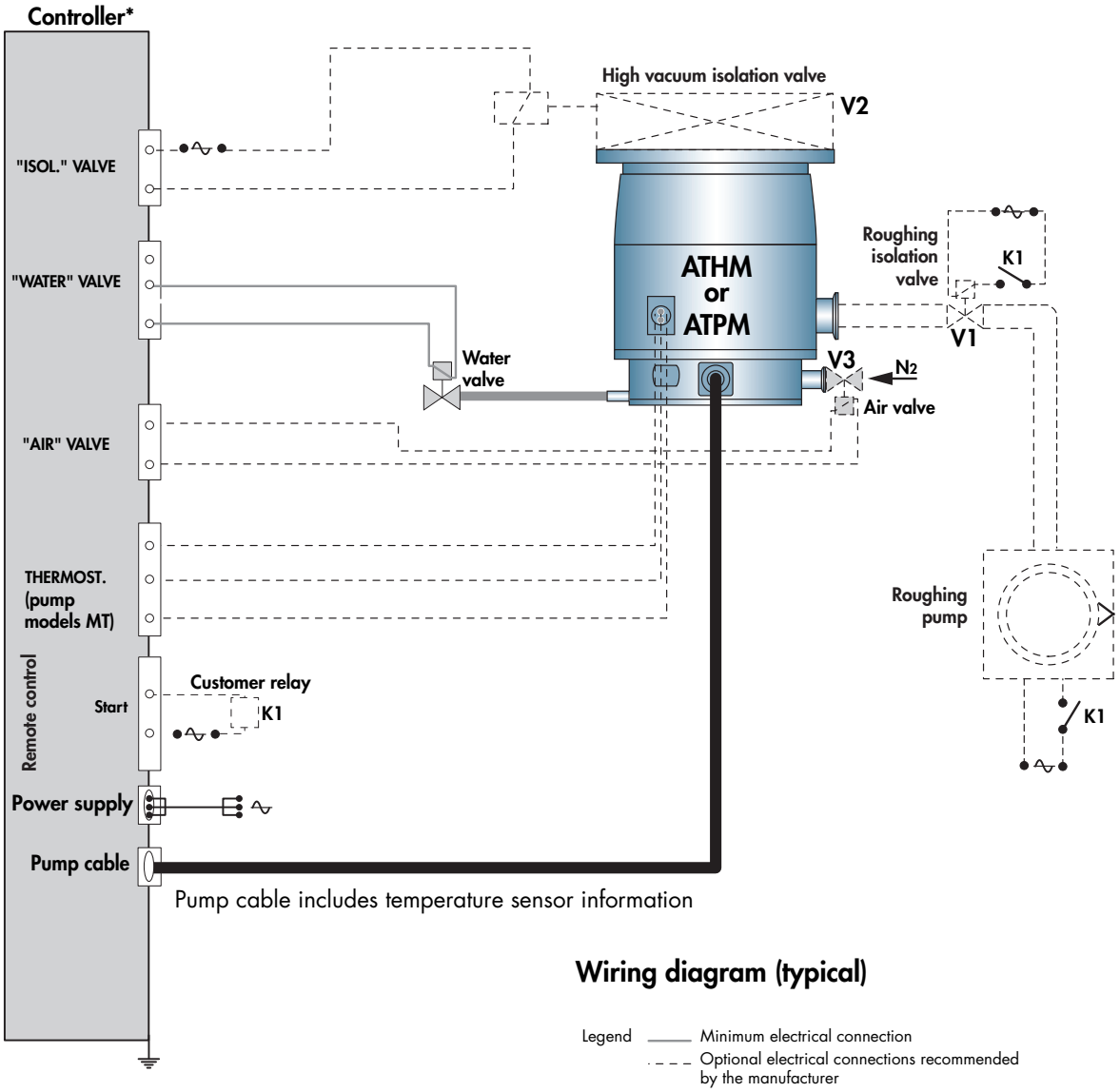
GB 01725 - Edition 03 - November 06

Typical electrical wiring diagram

Typical connections

In this installation, we use:
- a roughing isolation valve **V1** between the turbo pump and the roughing pump;
- a high vacuum isolation valve **V2** between the turbo pump and the chamber to be pumped;
- a relay **K1**, their contacts drive the valve **V1** and the roughing pump power supply;
- the thermostatic option.

* Connections depend on the controller model. Refer to the controller user's manual.



Wiring diagram (typical)

Legend
Minimum electrical connection
Optional electrical connections recommended by the manufacturer

GB 03199 - Edition 01 - September 06

ATH 2300 M/MT User's Manual
Detailed contents

GB 01734 - Edition 02 - JNov 06

Safety instructions for product use

⚠ WARNING

Before to use the controller, make sure that the mechanical and electrical connections have been made (chapter B).

⚠ WARNING

The machines are designed so as not to present a thermal risk for the user's safety.
However, specific operating conditions can generate temperatures which require particular care to be taken by the user (external surfaces > 70°C).

CAUTION

Avoid moving or causing a shock on a pump in operation. There is a risk of seizing if the pump rotates in an axis perpendicular to its axis of rotation.
An air inlet valve (option) can be connected (B 330) to ensure the pump's safety and durability.
As long as the pump is running, the air inlet valve has to be supplied with inert gas.

CAUTION

The controller should never be switched off as long as the rotor is moving.

CAUTION

It is highly recommended to install:
- a screen filter at the pump inlet;
- an isolation valve between the chamber to be pumped and the pump;
- an isolation valve between the pump and the roughing pump.

Refer to the controller user's manual to monitor the pump (chapter C). Check the pump operating on the controller display. Refer to the controller user's manual if a fault appears (D 200).

GB 00745 - Edition 05 - April 06

D

Maintenance

ATH 2300 M/MT User's Manual

Detailed contents

GB 01738 - Edition 02 - Nov 06

Safety instructions for product maintenance

⚠ WARNING

Standard precautions before any maintenance operation:
Before performing a maintenance operation, switch off the pump by setting the main switch to «0», disconnect the main cable and wait 1 minute before operating on the product.
If this last one remains connected, some components will still be energized.
This pump is not equipped with a lock out/tag out (LO/TA) device because it is designated for use on process tools.
In order to properly secure the pump for installation and maintenance, it is required to properly lock out/tag out the pump in accordance with OSHA requirements.

⚠ WARNING

After pumping on corrosive or toxic gases, in case of pump return for repair, it is strongly recommended to seal the pump with blank flanges (according to manufacturer's instructions (E 100).

⚠ WARNING

Product tightness is guaranteed upon leaving the factory for normal operating conditions.
It is the responsibility of the user to ensure that the level of tightness is maintained when pumping dangerous gases.

⚠ WARNING

Before starting any maintenance operations, we advise to prolonge the N2 flow for 30 mn, and check the pumping conditions: toxicity, corrosion, of the pumped gases.

⚠ DANGER

During the intervention, the operator could be in contact with residues from the exhaust port or with contaminated oil which could cause severe injury or death.
Always wear gloves, protective glasses and a breathing mask.

⚠ DANGER

Chemical supplies coming from the tool, as well as the water and the nitrogen need also to be locked out / tagged out.

GB 01739 - Edition 10 - April 06

Safety instructions for product maintenance

Back-up bearings

■ When the pump is running, the rotor is levitated magnetically. There is therefore no friction between moving and fixed parts.
■ When the pump is stopped from the controller, the back-up bearings are not used. The rotor remains levitated by magnetic bearings.
■ Only the back-up bearings require maintenance: they are designed to withstand many accidental shut-downs, or many landings of the rotor on the bearings at full speed.
These accidental shut-downs occur only in exceptional circumstances: broken power supply cable, strong shocks, faulty electronics. **It is advisable to check the bearing counter and provide ball bearing maintenance, when needed.**

The bearing counter

■ Life time of these bearings depends on the duration and number of landing. The initial percentage displayed by the controller is 100 %. When this percentage reaches 0 %, the pump can't restart and the back-up bearings have to be changed.
The decrementation of the counter is done by:
- a landing after a magnetic bearing trouble, at full speed,
  • nearly 20 % (ATH 1300 M/MT - ATH 1600 M/MT) per landing;
  • nearly 33 % (ATH 2300 M/MT - ATP 2300 M) per landing;
- a landing at 9000 rpm after a prolonged power failure nearly 0.03 %.

However, the decrementation depends on the bearings rotation duration:
- if the braking valve is not connected, or
- if the gas supply of the braking valve is closed on it, or
- if there are no exhaust or inlet isolation valves.

■ The bearing alert threshold can be set on the menu (**C 300**).
If the bearing life time is smaller than the alert threshold, an alert message is displayed:

W 20 : BEARINGS (or W19 on MAGPOWER)

The internal memory of the controller informs the operator when the bearings require maintenance by displaying:

D 24 : BEAR. CHANGED (or D20 on MAGPOWER)

GB 01739 - Edition 10 - April 06

Maintenance instructions

ATH 2300 M/MT User's Manual

Detailed contents

GB 01741 - Edition 02 - Nov 06

Shipping procedure for contaminated pumps

Don't forget to fill in the «safety questionnaire» and return it to repair service center (see model of document at the end of the manual).

⚠ WARNING

Study the safety instructions related to preventive maintenance D 100.

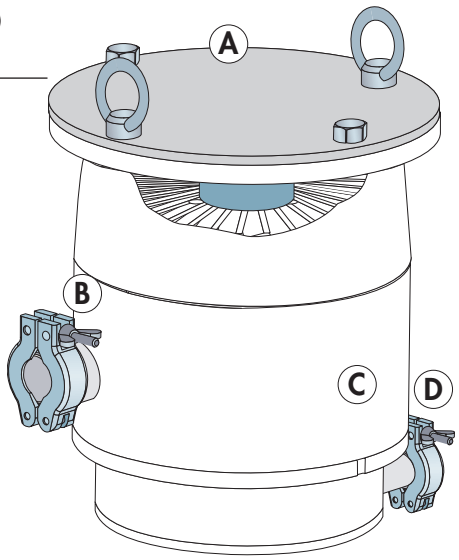
Pumps to be shipped must initially be decontaminated then pressurized with dry nitrogen (see procedure sheet 2/3).

To achieve this the user must have the following connection accessories:

(A) Inlet port

Closing kits including O-ring, screws and nuts, inlet blank flange and hoisting rings can be supplied upon order.

Closing kit	DN200 ISO-F	DN 250 ISO-F
P/N	**108496**	**108497**



(B) Exhaust port* DN 40 - ISO-KF

- Centering ring with DN 40 seal. P/N **068194**
- DN 40 clamping ring. P/N **083267**
- Blank-off flange. P/N **068197**

(C) Purge port *

DN16 - ISO KF	1/4 VCR
- Centering ring with DN 16. seal P/N **068193** - DN 16. clamping ring P/N **083333**	- Seal P/N **076705** - Fitting 1/4 VCR female P/N **108500**

* Standard connection accessories available in the manufacturer's catalog.

GB 00756 - Edition 09 - April 06

Shipping procedure for contaminated pumps

Ⓓ Required accessories
(on purge port to maintain the pressure*)

- DN 16 1/8 BSPT Flange with anti-suckback valve P/N **A458805**
- Injector P/N **106859**

Note : Pressurization kits include connecting accessories for inlet, exhaust and purge ports, plus an injector.

- Kit for DN200-ISO-F flange + Purge DN 16 P/N **108499**
- Kit for DN250-ISO-F flange + Purge 1/4 VCR P/N **108498**

Rough decontamination procedure

The pump must be disconnected from its installation and isolated electrically.

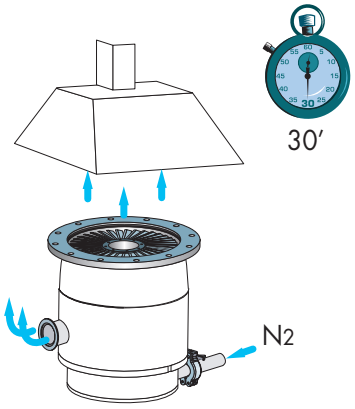
⚠ DANGER

Install the pump under a suction hood.
It must remain there throughout the operation.

1 General sweeping

Fit the DN 16 blank flange with anti-suckback valve on the purge connector (or 1/4 VCR).

Sweep with dry nitrogen** using the injector at an absolute pressure of 1.1 to 1.5 bar for 30 minutes.

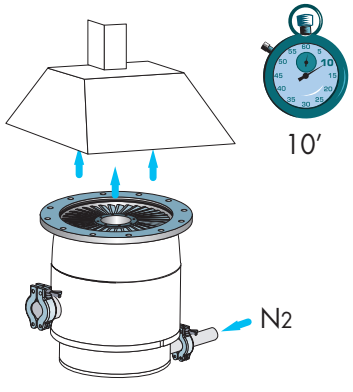


2 Purge / inlet sweeping

Fit the DN 40 blank flange on the pump exhaust port.

Sweep with dry nitrogen** for 10 minutes.

Stop the nitrogen flow.



** Characteristics of dry nitrogen: B 330.

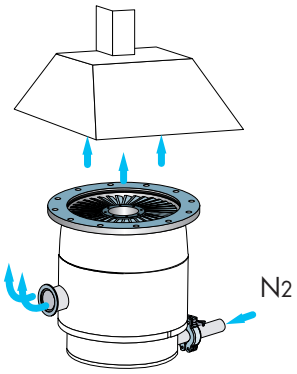
GB 00756 - Edition 09 - April 06

Shipping procedure for contaminated pumps

3 Pressurize the pump

Blank the inlet port.

Pressurize the pump with dry nitrogen** to an absolute pressure of 1.1 bar using the injector.



** Characteristics of dry nitrogen: **B 330**.

GB 00756 - Edition 09 - April 06

Maintenance components

ATH 2300 M/MT User's Manual

Detailed contents

GB 01742 - Edition 03 - Nov 06

Spare parts - Instructions of use

Replacement of parts and use of non genuine parts

Our products are designed to comply with current EC regulations and guarantee optimal operating conditions with maximum safety conditions for the user.

Any modification of the product made by the user is liable to lead to non-compliance with the regulations, or even to put into doubt the performance of the product and the user's safety.

Replacement of defective components by other parts than genuine parts, and use of these parts, jeopardize the initial safety conditions of the equipment.

In such case, the EC declaration of conformity becomes null: The manufacturer withdraws his responsability for such operations.

Besides, counterfeiting and unfair trading of parts are condemned under the civil and criminal laws.
The manufacturer urges the users not to take parts in the use of «imitations», in the misappropriation and pirating of intellectual property performed by some dishonest operators.

The manufacturer supplies maintenance components, spare parts or kits to perform the maintenance of its products (**F**).

GB 01390 - Edition 02 - April 06

First level maintenance parts

Copper seals for pumps with CF-F flanges

Flange type	Part Num.	ATH 1300 M	ATH 1600 M	ATH 2300 M
160 CF-F	**303292***	X	X	
200 CF-F	**303293***	X	X	
250 CF-F	**303294**		X	X

* kit of 10 parts

O-ring for housing ASA 6"

ASA 6"	**079160**	X	X	

* kit of

Fuses for controllers

Description	Qty	ACT 1300 M/ACT 2300 M	OBC
Fuse 6 x 32 T16A 250V	**2**	**103313**	-
Fuse 5 x 20 T12.5A	**1**	-	Customer supply

Nitrogen purge and air inlet valve

Description	Part Num.
Coil 12 V D	**038127**
Purge valve 12 VDC (50 sccm)**	**111628**
Air inlet valve + continuous purge 12 VDC (50 sccm)	**111408**

Description	
Coil 24 V DC	**038066**
Purge valve 24 VDC	**111921**
Air inlet valve + continuous purge 24 VDC (50 sccm)	**112417**

Water valve

Description	Part Num.
Coil 12 V DC	**106077**
Electrovalve 12 V DC	**110086**

Description	
Coil 24 V	**108677**
Electrovalve 24 V DC	**108668**

** piloted only by the OBC controller..

GB 00758 - Edition 05 - Nov 06

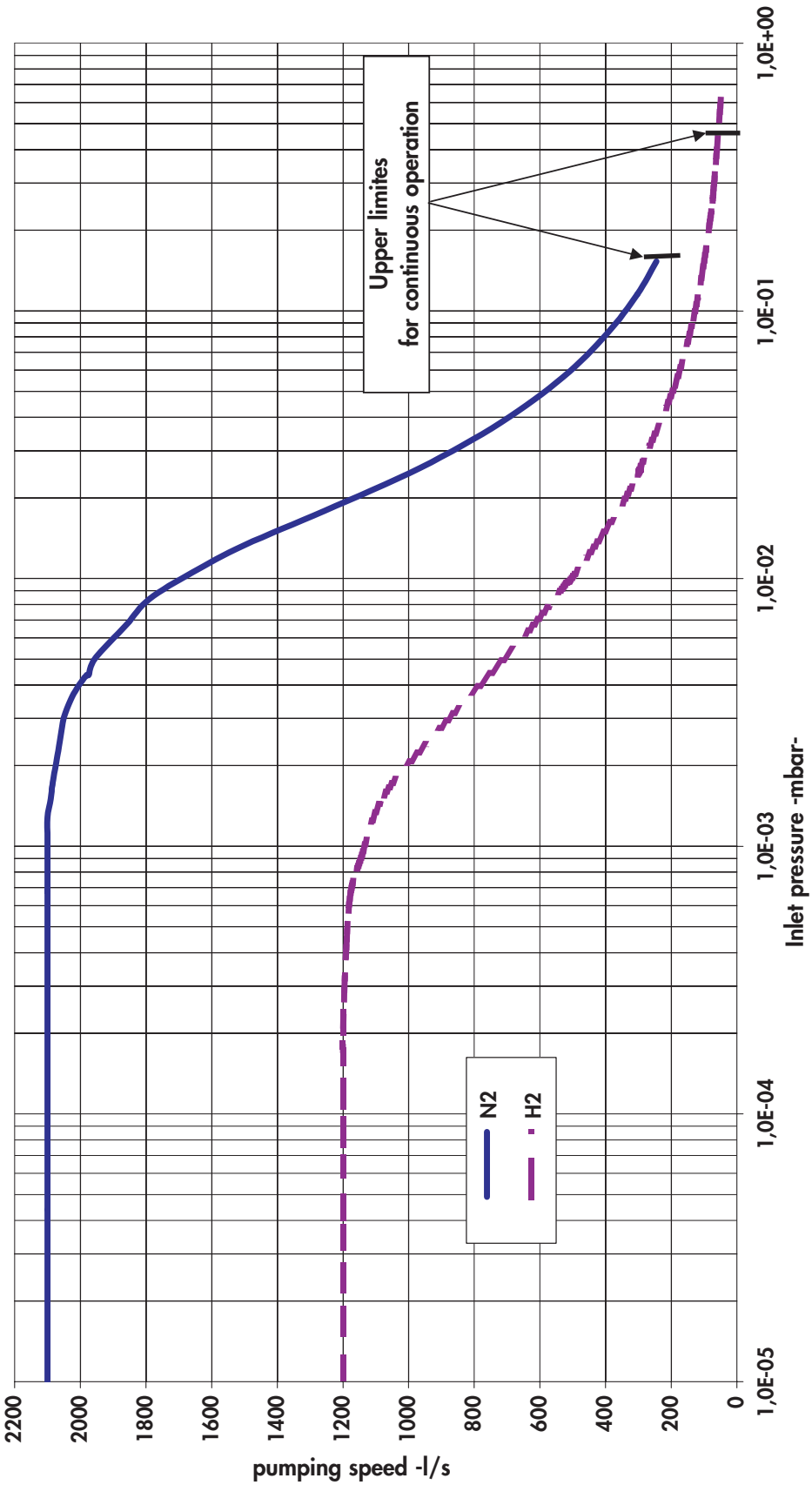
Appendix

ATH 2300 M/MT User's Manual
Detailed contents

GB 01743 - Edition 02- Nov 06

Pumping curves

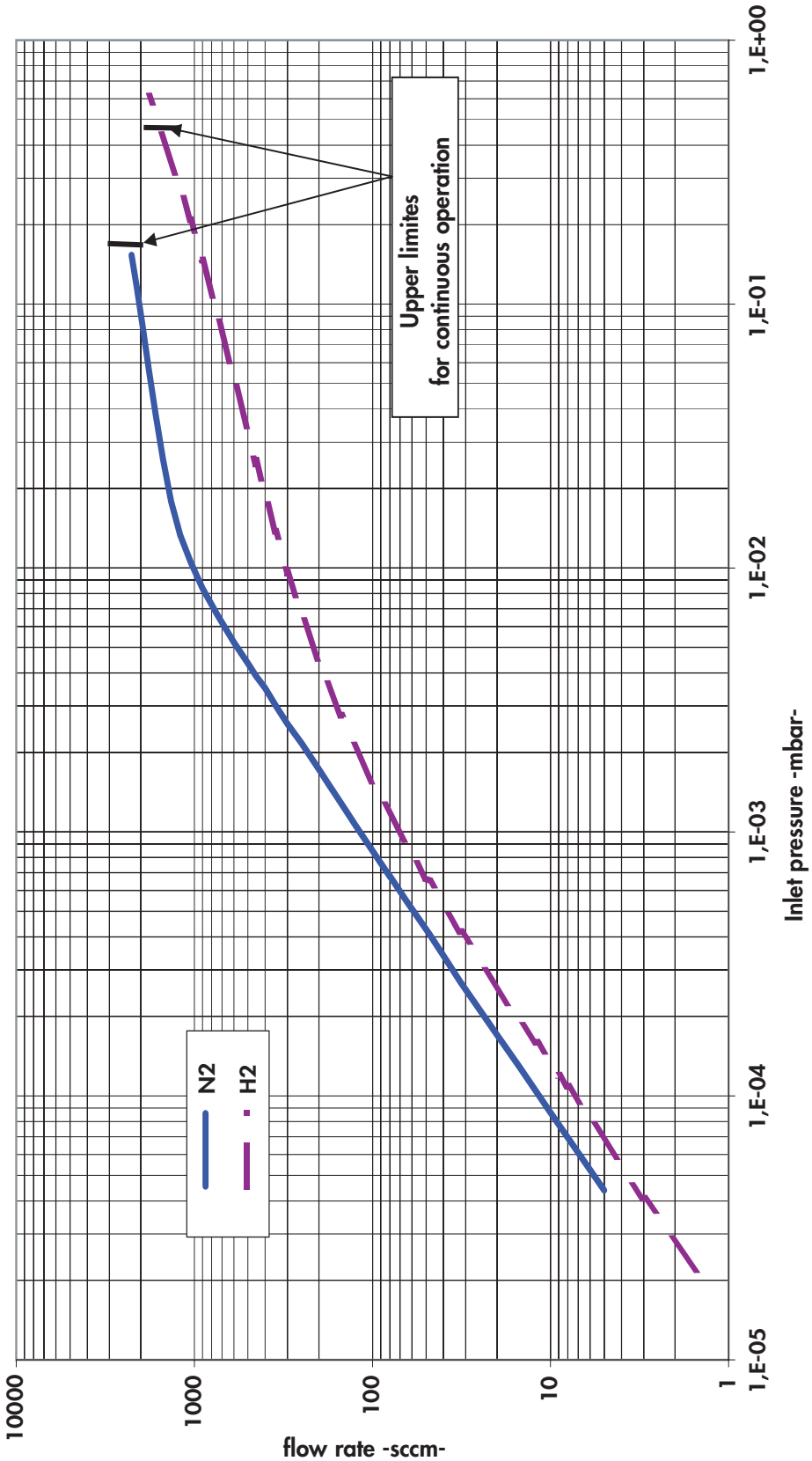
ATH 2300 M
Pumping Speed Curve



GB 01744 - Edition 01 - January 03

Pumping curves

ATH 2300 M
Flow Curve



GB 01744 - Edition 01 - January 03

G 200

Safety questionnaire

Procedure for returning ADIXEN vacuum pumps and helium leak detectors

You wish to return an Alcatel vacuum pump or helium leak detector for maintenance. The equipment will be dismantled and possibly cleaned by a technician from our Service Centre.
In compliance with European Community's L360 directives, French labor code L231 - R231 and Federal OSHA Safety Standard 1910-1200, Alcatel Vacuum Technology requires this form to be completed to preclude the potential health risk to its service personnel that can occur when receiving, disassembling, or repairing potentially contaminated products.

Equipment returned without this form completed and secured to outside of package will be returned to customer unprocessed.
Equipment must be drained of fluids and residue, securely packaged and shipped prepaid.
Concerning the closing of the ports (inlet & outlets of the product), metallic airtight blank flanges should be used if toxic or copper gases have been pumped.

We wish to draw your attention to the following points:

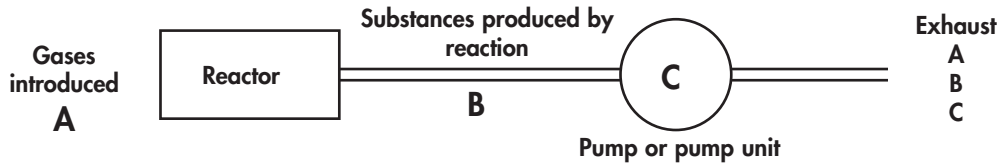
- **The risk may be of the following nature:**

- Chemical: Danger to health, risks of explosion, fire, risks for the environment. Please indicate the chemical formula and name of the gases or substances that have been in contact with the equipment (pump or helium detector).
- Biological: Pathogenic germs, micro-organisms (bacteria, viruses, etc.) classes 1 to 4 and group E. We are currently unable to deal with contamination of this sort without risk to the safery of our staff. If your equipment has been contaminated in this way, contact us so that we can try to find a solution together.
- Radioactive: Contact us in this case.
- Copper contamination: Copper based by products formed in sputtering or etching processes are considered as a poison in some semi-conductor processes.

GB 00956 - Edition 03 - April 06

⚠ WARNING

In the event of chemical contamination, please indicate the following gases or substances:



- Gases (or substances) introduced into the reactor and which may be found at the exhaust (A).
- Gases (or substances) resulting from the reaction or process (B).
- Gases (or substances) that may possibly be formed inside the pump (due to a thermodynamic or chemical reaction, condensation, deposition, precipitation, etc.) (C).

- **Precautions need to be taken before transferring contaminated pumps.**
Please contact customer service for recommendations.

QUESTIONNAIRE DE SECURITE *SAFETY QUESTIONNAIRE*

Ce questionnaire est téléchargeable sur le site : www.adixen.com
This questionnaire can be downloaded from: www.adixen.com

G 200

Procédure de retour des Pompes à Vides et Détecteur de Fuite à Hélium ADIXEN
(Ce formulaire ne peut être rempli et signé que par une personne habilitée)
Procedure for returning ADIXEN Vacuum Pumps and Helium Leak Detectors
(This questionnaire is only to be filled in and signed by an authorized person)

SOCIETE - *COMPANY*

Nom Société – *Name of company :* .....

Nom personne – *Name of person :* .....
(Qui remplit ce formulaire) – *(Who has filled in questionnaire)*

Fonction – *Position :* .....

N° Tél. – *Tel. no :* .....

N° Fax – *fax no:* .....
(Pour renseignements éventuels sur les produits utilisés) – *(for any information on products used)*

EQUIPEMENT - *EQUIPEMENT*

Description : .....

.....

.....

N° de Série – *Serial no :* .....

Type de procédé – *type of process :* .....
(Pour lequel l'équipement est utilisé) – *(for which equipment is used)*

Date de l'expédition – *Date of consignment :* .....

INTERVENTION - *SERVICE*

Intervention souhaitée (Révision, réparation,...) – *Service required (overhaul, repair, etc.):*
Type d'anomalie constatée – *Type of anomaly observed :*

PROCEDE CUIVRE – COPPER PROCESS

Produit utilisé sur un procédé Cuivre – *Product used on a Copper process* Oui – *Yes* Non – *No*

ASPECT SECURITE – *SAFETY ASPECT*

L'équipement mentionné ci-dessus a été en contact avec les produits suivants – *The above equipment has been in contact with the following substances :*
(nom et formule chimique) – (*name and chemical formula)*

Ces produits présentent un risque de nature			***These susbstances present the following risks***
Chimique – *Chemical*			Explication détaillée – *Detailed explanation*
Toxique – *Toxic*	Oui – *Yes*	Non – *No*	Si "Oui" risque de nature – *If "Yes", what type of risk*
Cancérigène - *Carcinogenic*	Oui – *Yes*	Non – *No*	
Combustible - *Combustible*	Oui – *Yes*	Non – *No*	
Corrosive - *Corrosive*	Oui – *Yes*	Non – *No*	
Explosive - *Explosive*	Oui – *Yes*	Non – *No*	
Biologique – *Biological*	Oui – *Yes*	Non – *No*	
Radioactive – *Radioactive*	Oui – *Yes*	Non – *No*	
Autre – *Other*			
(Vous reporter éventuellement à la page précédente) – *(See preceding page if necessary)*			

SIGNATURE

Vous avez répondu "Oui" à une des questions précédentes :
Je confirme que seules les substances précisées ont été en contact avec l'équipement sus-mentionné, et que les procédures de préparation, d'emballage, et de transport ont été respectées.

You have replied "yes" to one of the above questions:
I confirm that only the substances mentioned have been in contact with the above equipment and that the preparation, packing and transport procedures have been complied with.

Je confirme que le matériel sus-mentionné n'a été en contact avec aucune substance dangereuse, et a été vidé de son huile. (Si applicable)

I confirm that the above equipment has not been in contact with any dangerous substance and has been emptied of oil. (if applicable)

Réponse "Oui" (fermeture étanche de l'aspiration et du refoulement) Reply «Yes« (seal inlet and outlet ports with blank flanges)	Réponse "Non" (sans risque) *Reply "No" (no risk)*
Nom - *Name :*	Nom - *Name :* .....
Fonction - *Position :*	Fonction - *Position :* .....
Date :	*Date :* .....
Signature autorisée – *Authorised signature :*	Signature autorisée – *Authorised signature :*
Tampon / Cachet *Stamp / Seal*	Tampon / Cachet *Stamp / Seal*

GB 00956 - Edition 03 - April 06

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