



OPERATING INSTRUCTIONS

EN

Translation of the original instructions

ATH 1603 M - ATH 2303 M

Turbomolecular pumps

PFEIFFER  **VACUUM**

ATH 1603 M - ATH 2303 M

Turbomolecular pumps

Dear Customer,

You have just purchased an 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 Pfeiffer Vacuum SAS many years of experience in the field of turbo pump design.



This pumping component is designed to generate vacuum by pumping on gases, but no liquids neither solids. It is dedicated for running in industrial environments.

The integrator of this component must provide all operator safety measures mainly against hot surfaces.

This pumping component must not operate in an area with risk of explosion. Consult us to study a solution.

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.

OTHERS INDUSTRIES:

Glass-coating, flat panel display, leds, deposition coating, hard disk manufacturing.

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.

This operating instruction manual includes only the instructions to connect the pump to the equipment. Refer to the controller operating instructions to power and use the pump (chapter B, C and D).

ATH 1603 M - ATH 2303 M

Turbomolecular pumps

This product complies with the requirements of European Directives, listed in the Declaration of Conformity contained in sheet G 100 of the controller operating instructions.

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Specifications and information are subject to change without notice by the manufacturer.

Translated from original version

ATH 1603 M - ATH 2303 M Operating instructions

Chapter A

INTRODUCTION

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- B 201 - Unpacking and storage of the pump
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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.

⚠ 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).












Translated from original version

ATH 1603 M - ATH 2303 M Operating instructions

Before switching on the product, study the Operating instructions and make sure you follow the safety instructions it gives. You can recognise these by the 'Caution', 'Warning' and 'Danger' symbols. Good practice tips and manufacturer's recommendations are in a grey box.

The performance and operational safety of this product are guaranteed provided it is used normally in the operating conditions defined in this manual. It is the customer's task to:

- train operators to use the product if they do not speak the language the manual is written in,
- ensure operators know the safe practices to apply when using the product.

Symbols, labels	Description
	Warning : hot surface
	Warning : hazardous voltage
	Caution : risk of danger. Refer to the operating instructions before use
	ON
	OFF
	Do not touch when the pump is running
	Use of glove is recommended
	Moving parts present
	Heavy object
	Electrical connector locking
Purge	Purge port
Pump exhaust	Exhaust of the pump
Water	Water cooling circuit connection
Water max Pr.7 bar/101 psi	Max. cooling water pressure
	Direction of rotation of the pump



Introduction

Operating instructions ATH 1603 M - ATH 2303 M Detailed contents

A 150

Introduction to the ATH 1603 M - ATH 2303 M

A 200

Control loop of the pump

- 5 active axis
- Unbalanced force rejection control

A 210

The pump operating principle

- Pumping principle
- The hybrid-turbo pump in an installation
- The back-up ball bearing
- Variation of the pump rotational speed

A 400

Pump technical characteristics

A 510

The accessories of the pump

A 515

Accessory dimensions

Introduction to ATH 1603 M - ATH 2303 M pumps

**A magnetically
levitated hybrid
turbomolecular pump**



Five active axes

Rotor position control in 5 directions.

Unbalanced Force Rejection Control

Lowest possible levels of noise and vibration.

Automatic adjustment to any imbalance of the rotor, from very low speed.

Maintenance free

Inert gas purge

Protects from corrosion the magnetic spindle.

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.

Controller

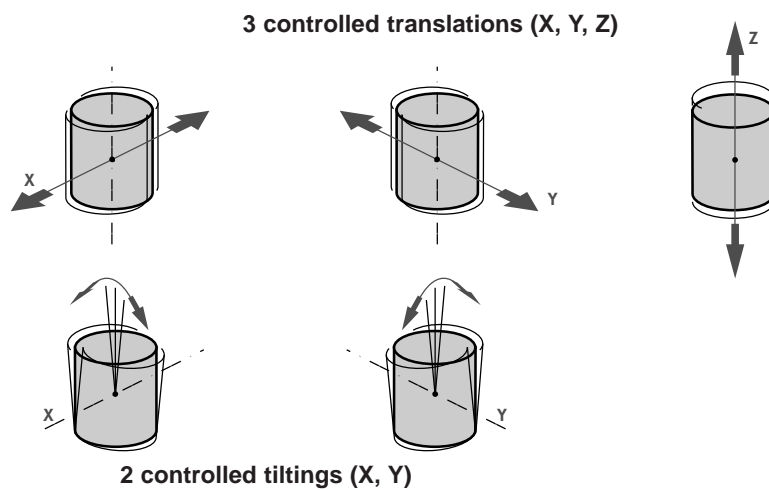
The ATH 1603 M and ATH 2603 M pumps work with OBC controller or with the MAGPOWER controller.
(refer to the operating instructions corresponding).

Control loop of the pump

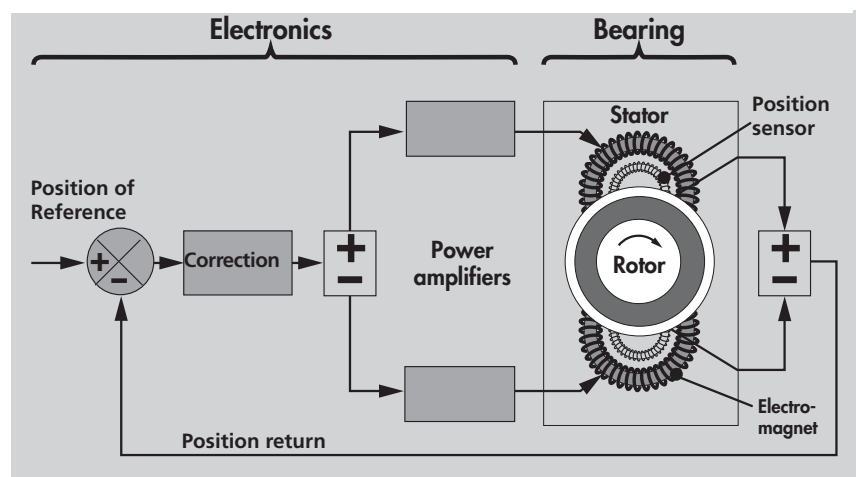
5 active axis

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 5 axes of freedom monitored by 5 active magnetic 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



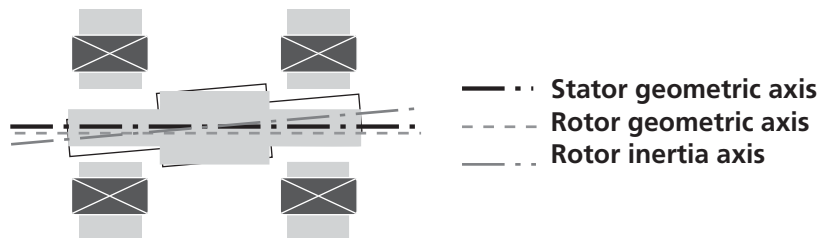
Control loop of the pump

Unbalanced force rejection control

The **unbalanced force rejection control** is an electronic function, 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**.

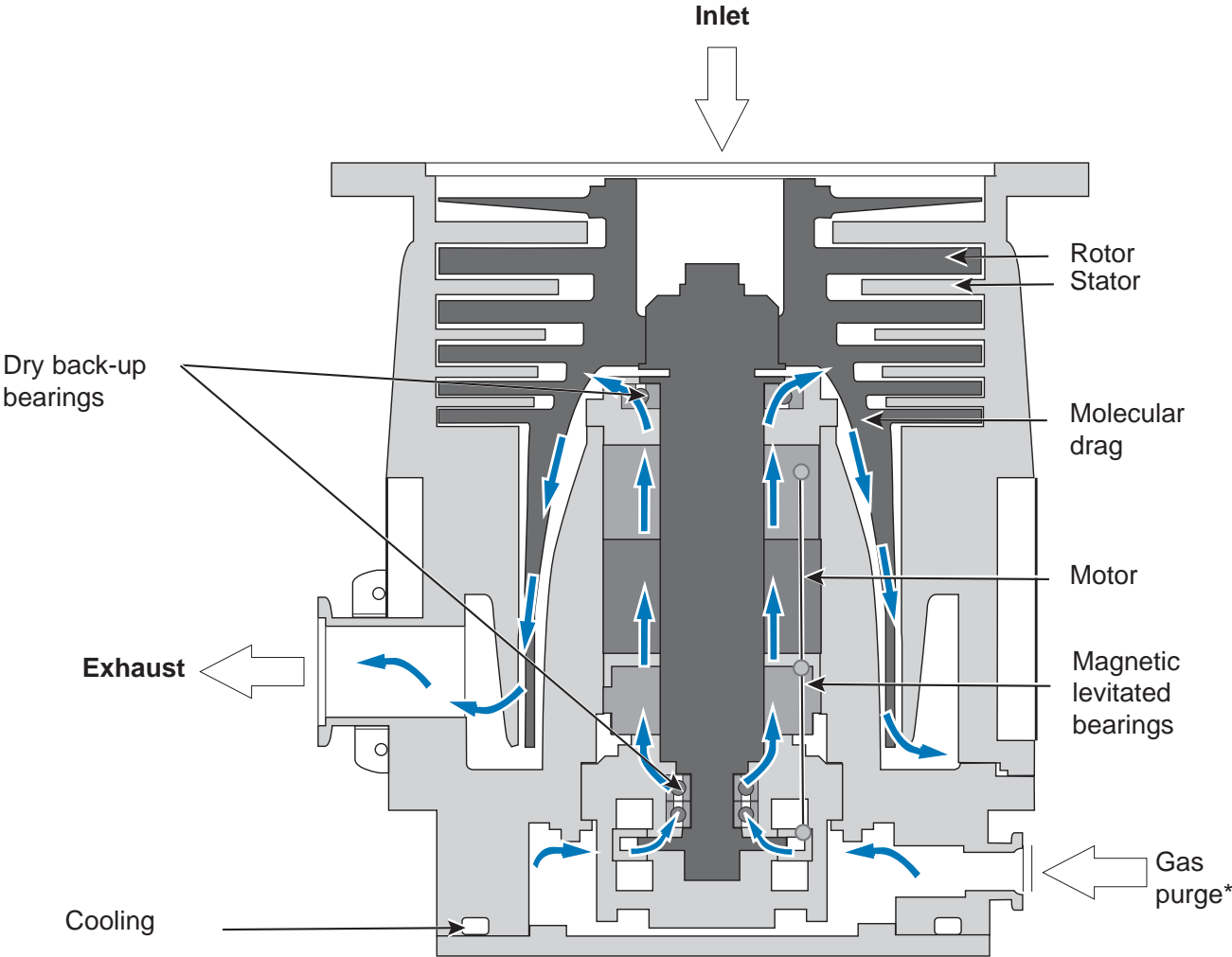
It ensures the lowest possible levels of noise and vibration.



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.

The turbomolecular section provides high pumping speeds and high ultimate vacuum. The molecular drag section provides a high compression ratio and extends forevacuum tolerance.



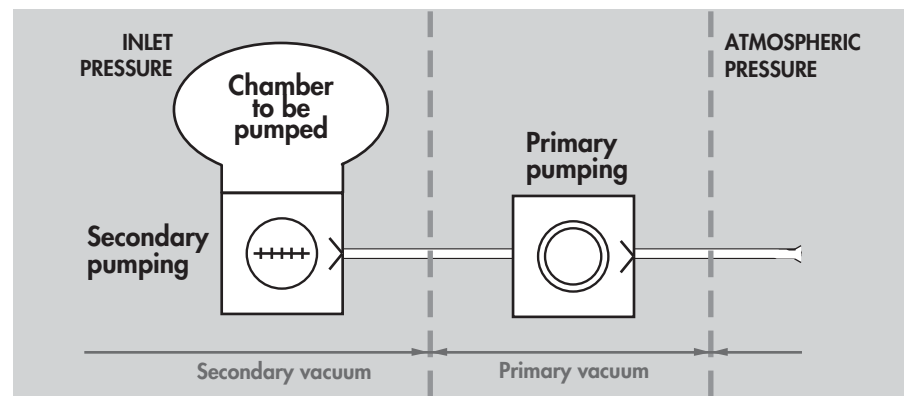
* The gas purge provides an excellent protection of the pump bearings for corrosive applications and ensures the rotor cooling.

The pump operating principle

The hybrid-turbopump in an installation

At the pump exhaust, the gases are evacuated to atmosphere by a primary pump.

The ATHM compression ratio is set by the design. The pumping performances depend of the primary pump and of the installation.




The back-up ball bearings

They are dry-lubricated ceramic ball bearings.

They are never used in normal operation, since the rotor is not in contact with the ball bearings.

The back-up ball 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 ball 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 the number of incidents. The maximum life time of the rotor is described in  **D 150**.

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 too low, the pump shuts down and lands on the back-up ball bearings.

Variation of the pump rotational speed

The ATHM pump rotation speed can be selected and set between a minimum 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 nominal speed.
- nominal speed preselected at factory.

Pump technical characteristics

The performances of the pumps

Technical data		Units	ATH 1603 M		ATH 2303 M	
Inlet flange		ISO-F	DN 200	DN 250	DN 200	DN 250
Exhaust flange		ISO-KF	DN 40			
Purge flange		ISO-KF	DN 16			
Pumping speed *	N2	l/s	1360	1400	1550	2150
	Ar	l/s	1280	1350	1450	2000
	He	l/s	940	970	1650	1800
	H2	l/s	540	540	1100	1100
Compression ratio	N2		5·10 ⁷		> 1·10 ⁸	
	Ar		1.7·10 ⁸		> 1·10 ⁸	
	He		4·10 ³		> 3·10 ⁴	
	H2		5·10 ²		> 1·10 ³	
Maximum flow ⁽³⁾	N2	sccm	4000		4000	
	Ar	sccm	1200		1500	
	He	sccm	> 4000		> 4000	
	H2	sccm	> 4000		> 4000	
Maximum pressure at inlet ⁽³⁾	N2	hPa	0.6		0.25	
	Ar	hPa	0.026		0.025	
	He	hPa	> 0.6		-	
	H2	hPa	> 0.6		-	
Maximum pressure at exhaust ⁽²⁾	N2	hPa	1.7		2.9	
	Ar	hPa	2.5		3.5	
	He	hPa	1.2		2	
	H2	hPa	0.3		0.75	
Leak rate		hPa l/s	< 5·10 ⁻⁸			
Ultimate pressure ⁽¹⁾		hPa	6·10 ⁻⁹			
Nominal rotation speed		rpm (Hz)	39 000 (650)		31 000 (516)	
Stand-by speed		rpm (Hz)	15 000 (250) to nominal speed			
Sound level		dB (A)	< 48		< 47	
Maximum heating temperature for degassing		°C	120			
Recommended purge flow rate		hPa l/s	0.845 mini			
Vibration level (at nominal speed)		µm	< 0.01			
Max. apparent start up power		VA	1500		2100	

* Without inlet screen

(1) With ISO-F flange (better with CFF flange). Contact Pfeiffer Vacuum.

(2) With ratio inlet pressure/exhaust pressure >100, max. throughput reduced.

(3) With an exhaust pressure < 0.4 hPa depends on external conditions (temperature, water flow rate, ambient temperature). For other conditions, contact Pfeiffer Vacuum.

(4) Reduced maximum flow rate, ultimate pressure at exhaust without loss of flow rate speed. Depends on environmental conditions.

(5) Over 25 °C. modify the operating conditions to reduce the nominal power. Contact Pfeiffer Vacuum.

Pump technical characteristics

The performances of the pumps

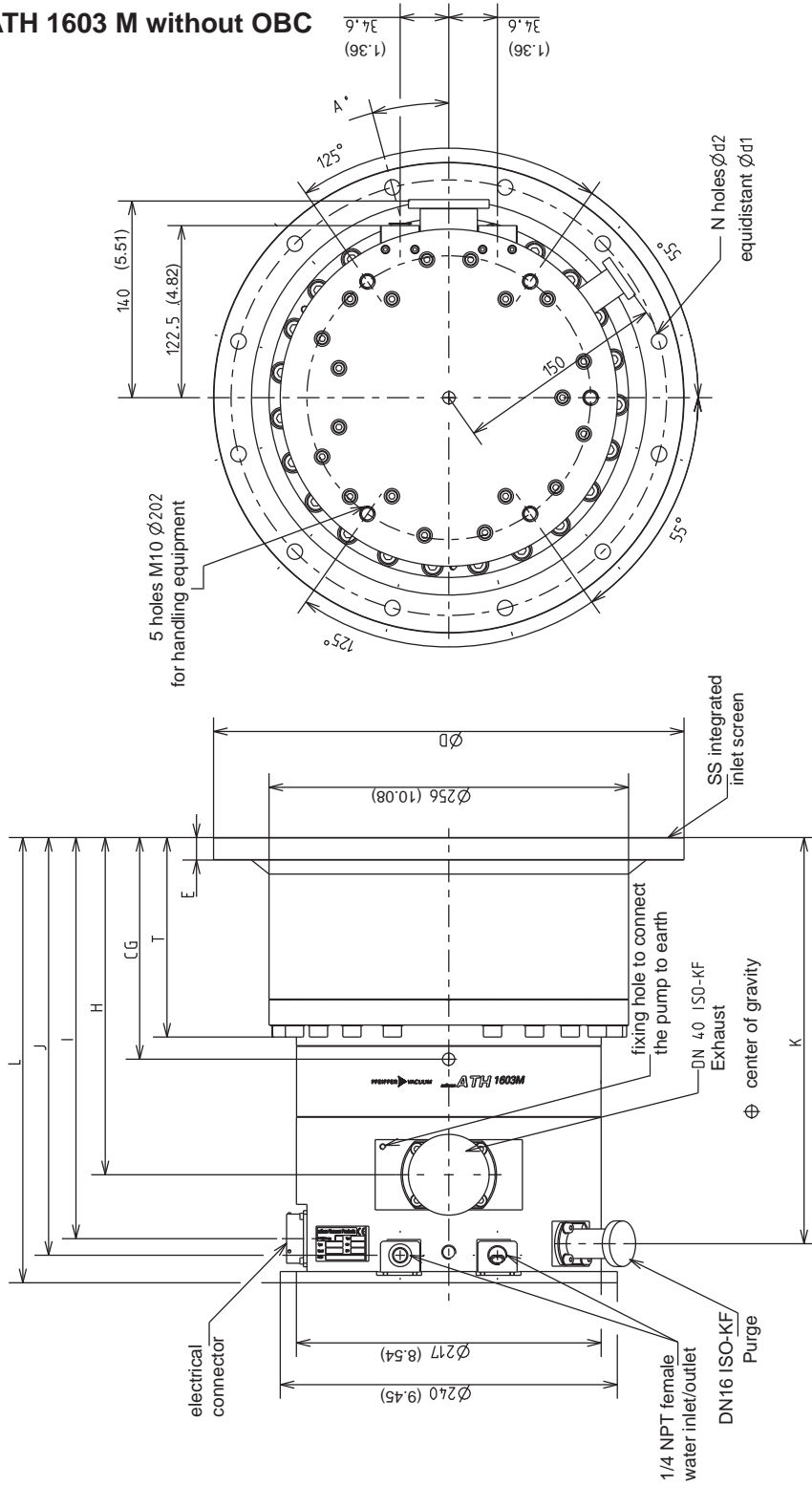
Technical date	Units	ATH 1603 M	ATH 2303 M
Start-up time ⁽⁸⁾	mn	< 6	< 8
Start-up power ⁽⁸⁾	watt	850	< 1200
Power consumed at ultimate pressure	watt	< 200	< 200
Power at minimum Stand-by speed	watt	100	100
Supply voltage	VAC	200-240V - 50/60 Hz	
Maximum current leakage ⁽⁷⁾	mA	< 12	
Pump protection index		IP 42	
Cooling water flow rate	l/h	> 60	
Maximum pressure of cooling water	hPa	7·10 ³	
Mounting orientation		all	
Cooling water temperature ⁽⁵⁾	°C	15 < T < 40	
Control (option)	Magpower	yes	
	Profibus	yes	
	OBCV4 autres	yes	
Weight (without controller)	kg (lb)	34 (75.5)	60 (132.3)
Recommended forepump (Pfeiffer Vacuum)		ADP / ADS	
<u>Environmental conditions:</u>			
Use		Indoor use	
Ambient operating temperature	°C	5 < T < 45	
Installation altitude	m	until 2000	
Overtoltage protection		Category II	
Pollution degree		rate 2	
Relative humidity		max. 80% at T ≤ 31°C. up to max. 50% at T ≤ 40°C	
<u>Characteristics of the three-phase motor (maximum values)</u>			
Voltage between phases	Vrms	44	40
Power frequency	Hz	1300	1033
Line current	A	7	12

(7) Value for the pump. All the current leakage may not pass through the earth wire. this depends on the way the pump is connected to the earth via the equipment in which it is integrated.

(8) The value depends on controller type.

Pump technical characteristics - A 400

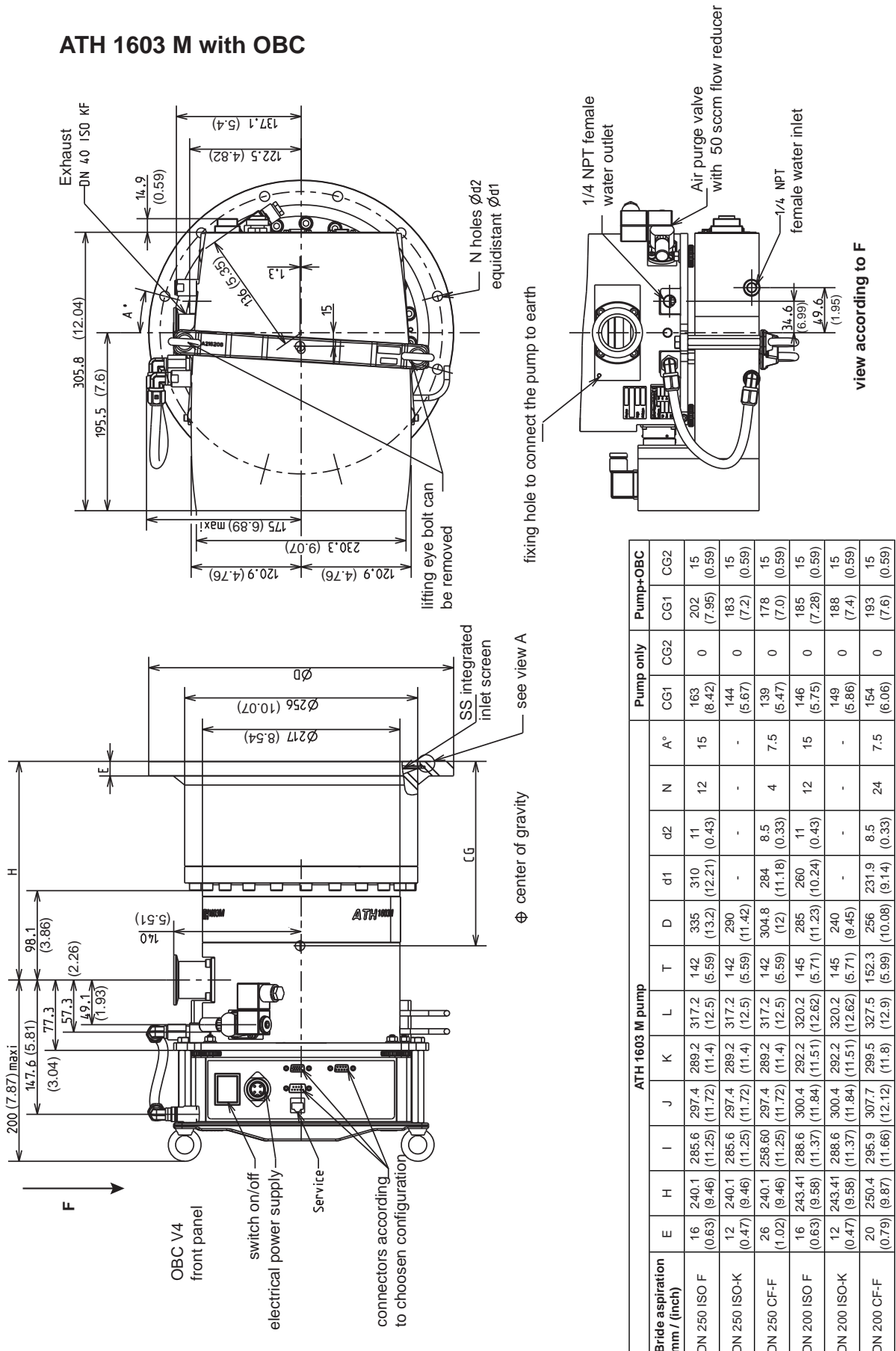
ATH 1603 M without OBC



Inlet flange mm / (inch)	ATH 1603 M pump											Pump only		Pump+OBC		
	E	H	I	J	K	L	T	D	d1	d2	N	A°	CG1	CG2	CG1	CG2
DN 250 ISO F 16 (0.63)	240.1 (9.46)	285.6 (11.25)	297.4 (11.72)	289.2 (11.4)	317.2 (12.5)	142 (5.59)	335 (13.2)	310 (12.21)	11 (0.43)	12	15	15	163 (8.42)	0	202 (7.95)	15 (0.59)
DN 250 ISO-K 12 (0.47)	240.1 (9.46)	285.6 (11.25)	297.4 (11.72)	289.2 (11.4)	317.2 (12.5)	142 (5.59)	290 (11.42)	-	-	-	-	-	144 (5.67)	0	183 (7.2)	15 (0.59)
DN 250 CF-F 26 (1.02)	240.1 (9.46)	258.60 (10.18)	297.4 (11.72)	289.2 (11.4)	317.2 (12.5)	142 (5.59)	304.8 (12)	284 (11.18)	8.5 (0.33)	4	7.5	7.5	139 (5.47)	0	178 (7.0)	15 (0.59)
DN 200 ISO F 16 (0.63)	243.41 (9.58)	288.6 (11.37)	300.4 (11.84)	292.2 (11.51)	320.2 (12.62)	145 (5.71)	285 (11.23)	260 (10.24)	11 (0.43)	12	15	15	146 (5.75)	0	185 (7.28)	15 (0.59)
DN 200 ISO-K 12 (0.47)	243.41 (9.58)	288.6 (11.37)	300.4 (11.84)	292.2 (11.51)	320.2 (12.62)	145 (5.71)	240 (9.45)	-	-	-	-	-	149 (5.86)	0	188 (7.4)	15 (0.59)
DN 200 CF-F 20 (0.79)	250.4 (9.87)	295.9 (11.66)	307.7 (12.12)	299.5 (11.8)	327.5 (12.9)	152.3 (5.99)	256 (10.08)	231.9 (9.14)	8.5 (0.33)	24	7.5	7.5	154 (6.06)	0	193 (7.6)	15 (0.59)

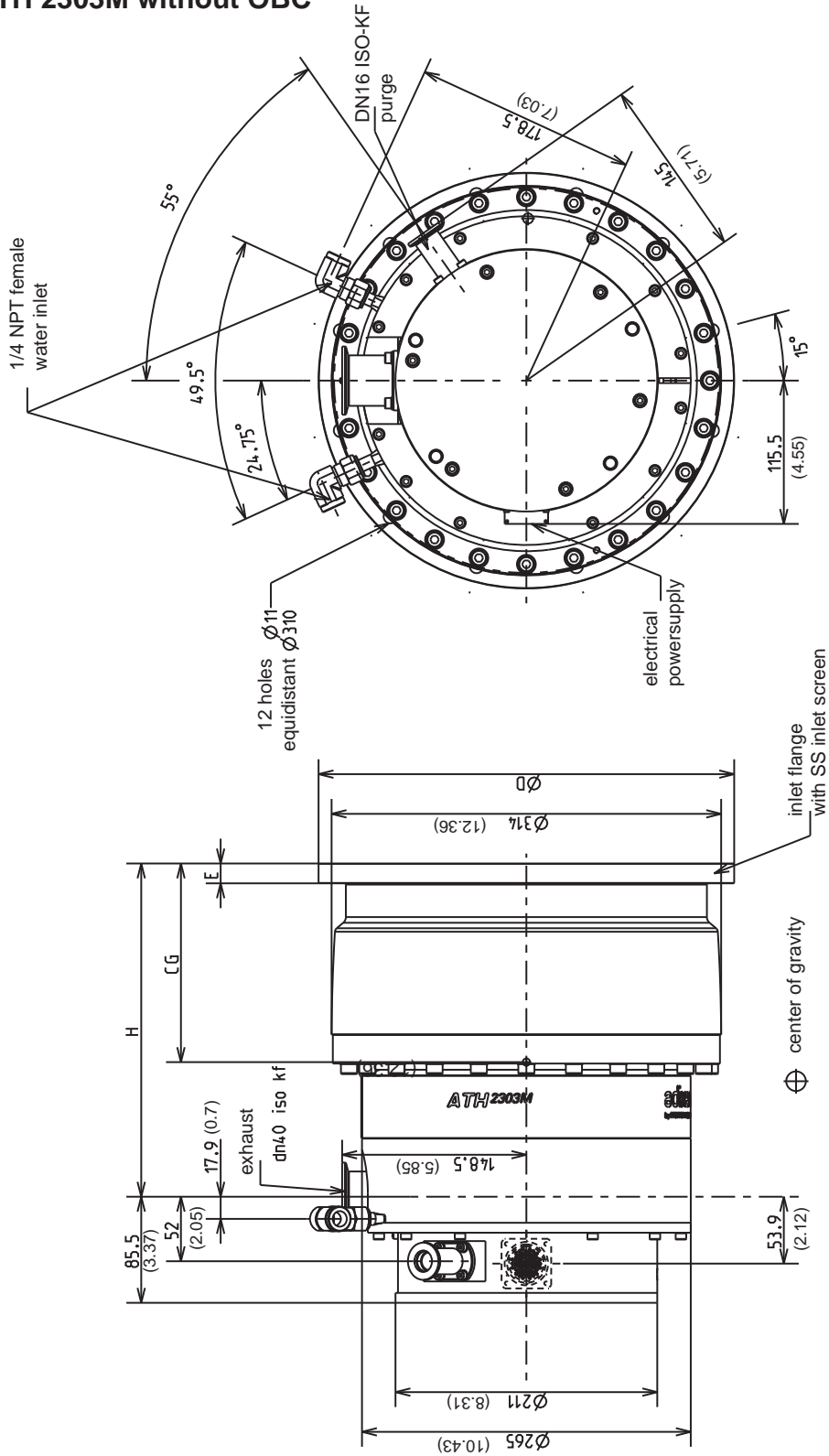
Pump technical characteristics - A 400

ATH 1603 M with OBC



Pump technical characteristics - A 400

ATH 2303M without OBC



Inlet flange mm / (inch)	ATH 2303 M pump					Pump only			Pump+OBC		
	E	H	D	d1	d2	N	A°	CG	CG2	CG	CG1
DN 250 ISO F	16 (0.63)	268.6 (10.57)	335 (13.2)	310 (12.21)	11 (0.43)	12	15	162 (6.38)	0	193 (7.6)	8 (0.31)
DN 250 CF-F	26 (1.02)	312.6 (12.3)	306 (12.04)	284 (11.18)	8.6 (0.34)	32	5.625	191 (7.52)	0	222 (8.74)	8 (0.31)

The accessories of the pumps

Inlet screen This screen protects the pump against solid particles. It is integrated into the pump housing.

DN 200	P/N
Convexe filter (S.steel) + clip (mesh size 4.5 mm)	108872
Convexe filter kit (Alu) + clip (mesh size 4.5 mm)	109200
DN 250	P/N
Convexe filter (S.steel) + clip (mesh size 5 mm)	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
50 SCCM	066752

* For pumps equipped with purge valve (see next page).

Isolation valve at pump inlet 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.

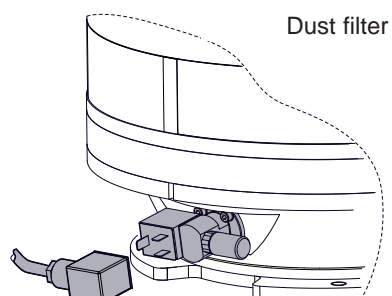
Bolt and washer kit for pump installation

Pumps model	Inlet size DN	P/N for ISO F	Description	P/N for CF-F	Description
ATH 1603 M ATH 1600 M	200	110675 110676S*	12 CHC M10x30 12 CHC M10x35	111664	24 CHC M8x65
	250	110675 110676S*	12 CHC M10x30 12 CHC M10x35	111665	32 CHC M8x65
ATH 2303 M ATH 2300 M ATP 2300 M ATH 2800 M	200	114510*	12 studs M10x35	-	-
	250	110034 110676S*	12 CHC M10x30 12 CHC M10x35	118690	32 Studs M8x35
ATH 3200 M	320	113189*	12 CHC M12x45	-	-

* With the presence of centering ring at inlet port

The accessories of the pumps

**Purge valve * (50 sccm)
(driven by the customer
tool)**

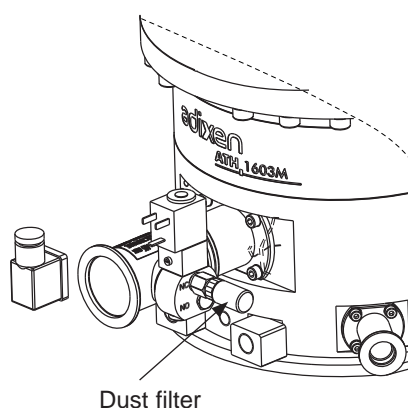


Purge valve 50 sccm	P/N
24 V DC	111921S

The gas purge provides an excellent protection of the maglev bearings for corrosive applications and ensures the rotor cooling.

This valve must be isolated during an air tightness test.

Air inlet valve *



Air inlet valve	P/N.
24 V DC	114280

The air inlet valve, powered by the controller, is installed on the pump exhaust port. It allows to reduce the braking time of the pump to put it at the atmospheric pressure. It is a NC valve which is activated when the pump nominal speed is below 10 000 rpm.

* Provide a power line compatible with extra low voltage and safety standards (SELV), if powered by the customer's tool

Water valve

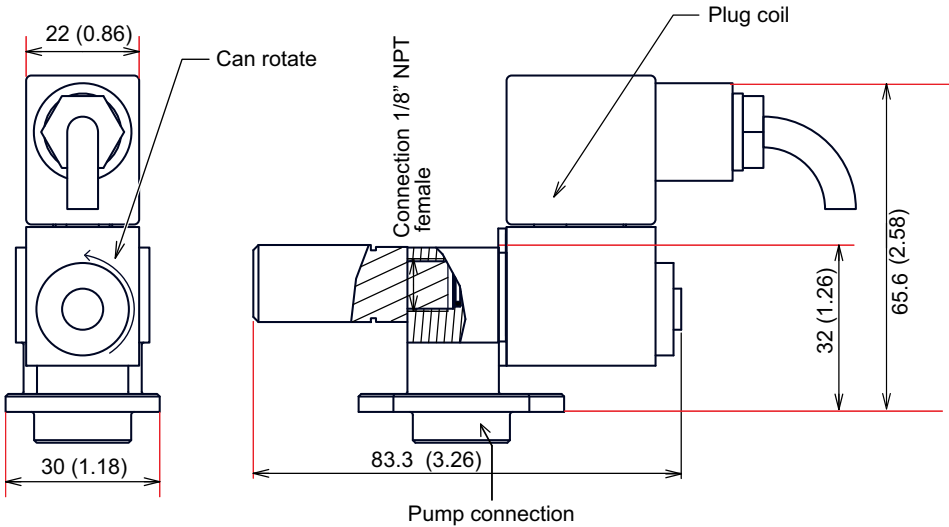
	P/N.
Water valve	108668

**Air inlet valve cables
and purge valve cables
(for pumps controlled by
Magpower)**

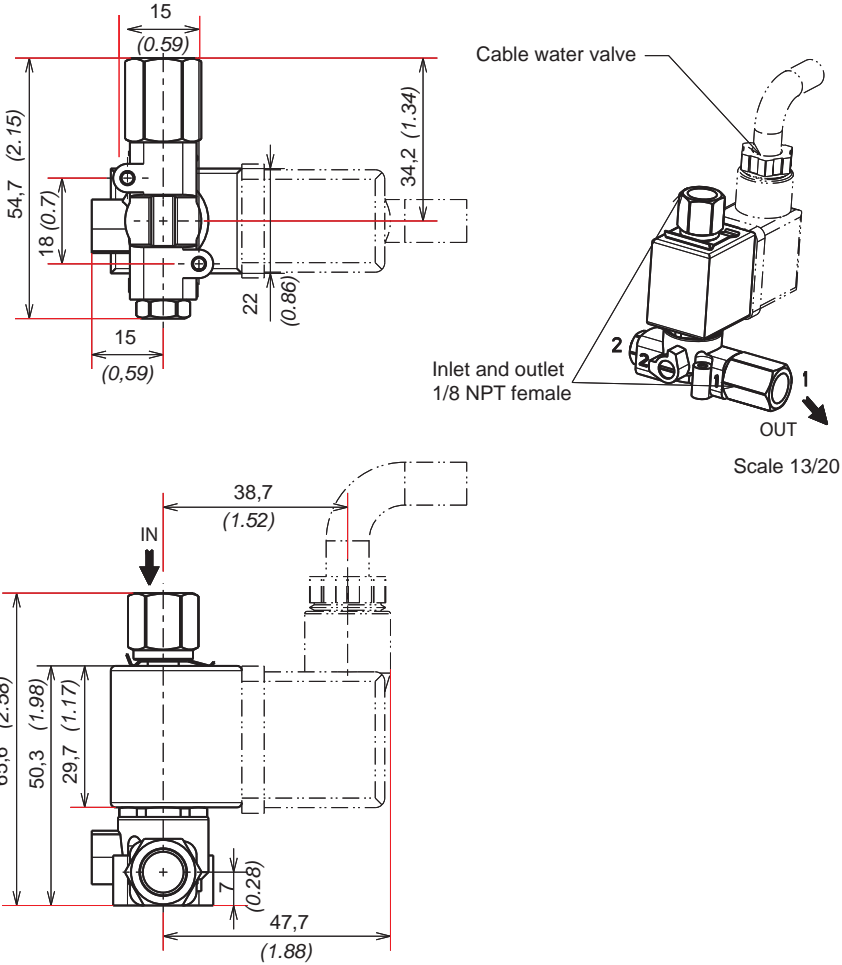
Dimensions	P/N
1 m	A462403-010
3,5 m	A462403-035
5 m	A462403-050
10 m	A462403-100
20 m	A462403-200

Accessory dimensions

Purge valve 50 sccm
dimensions
mm (inch)

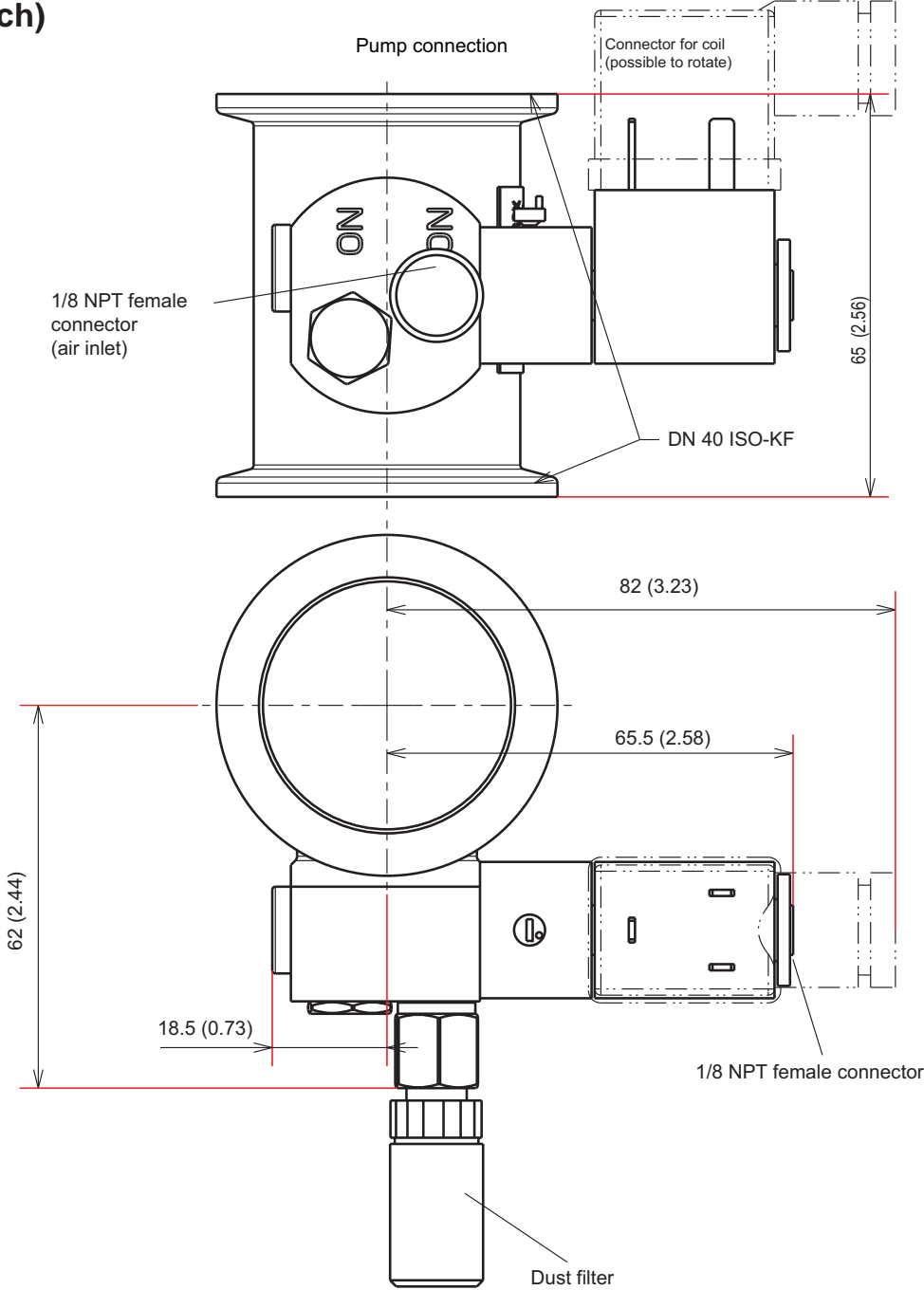


Water valve
dimensions
mm (inch)



Accessory dimensions

Air inlet valve dimensions
mm (inch)





Start-up

Operating instructions ATH 1603 M - ATH 2303 M Detailed contents

B 100 *Safety instructions for installation*

B 201 *Unpacking and storage of the pump*

B 300 *Pump connections to an installation*

- Equipment installation conditions
- The pump can operate in any position
- Installations specifications
- Description of a blocking rotor scenario

B 310 *Inlet and exhaust connections*

B 330 *Nitrogen purge and inlet air valve device connections*

- Nitrogen characteristics
- Purge device (50 sccm)
- Solenoid valve equipped with 50 sccm purge
- Air inlet valve

B 340 *Water cooling connection*

- Water characteristics
- Procedure to connection

B 401 *Typical electrical wiring diagram*

Safety instructions for installation

CAUTION

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CAUTION

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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).

Overview

Before switching on the product, study the Operating instructions and make sure you follow the safety instructions. You can recognise these by the 'Caution', 'Warning' and 'Danger' symbols. Good practice tips and manufacturer's recommendations are in a grey box.

The performance and operational safety of this product are guaranteed provided it is used normally in the operating conditions defined in this manual.

It is the customer's task to:

- train operators to use the product if they do not speak the language the manual is written in,
- ensure operators know the safe practices to apply when using the product.

We took care to provide you with a clean product. To keep it in this condition, unpack it only in contamination free area and at final place of use.

For emergencies

For emergencies and breakdowns, contact the manager of your local service center (see addresses on our website).

Make sure the equipment shows no sign of transport damage. If it has been damaged, take the necessary steps to record this with the carrier and inform the manufacturer. In all cases, we recommend keeping the packaging (reusable materials) for further transport of the equipment or for prolonged storage.

Safety instructions for installation

The turbomolecular pumps can't evacuate at atmospheric pressure, they are connected to a roughing pump. For a transient period, they can start to run at atmospheric pressure.

Our products are designed to comply with current EEC regulations. Users making their own modifications to the product are liable to break its compliance with these regulations, degrade its EMC (electromagnetic compatibility) rating, and make it unsafe to use. The manufacturer declines all liability for the consequences of such operations.

WARNING

Do not expose any part of the human body to vacuum. The product is supplied with the inlet and exhaust sealed. Remove these blanking plates when you are ready to connect the product on your vacuum system. As well as, don't operate the product unless the inlet and exhaust are connected to a vacuum and exhaust pumping line.


Handling

WARNING

■ **Heavy product:**
This product needs special handling precautions due to its weight. It should be removed from its crate only by staff trained in heavy materials handling:


- use the lifting rings provided with the product,
- use slings from a length over 500 mm.
- tighten the pump to the handling device.

The maker can not be held liable for the consequences of using other rings.

■ **Risk of tilting:** although the product meets EEC safety regulations, it is advisable to guard against the risk of tilting during handling, installation, and use. ( chapter A for the location of the center of gravity).

Installation

DANGER

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

■ **Risk of cut injury:**
The access to the rotor of a turbomolecular pump with an unconnected inlet port is dangerous. In the meantime, if the pump is not switched on, it may be driven by another pump in operation.
Always connect the pump inlet port before starting the pump.

CAUTION

Make sure all parts and chambers connected to the inlet, exhaust and purge of the maglev pump can withstand a negative pressure of 100 kPa below atmospheric pressure and that they are impervious to damage from vacuum (seals, etc.).

Safety instructions for installation


Installation (cont'd)

WARNING

The user and /or OEM are ultimately responsible for operating the equipment in a safe manner. The manufacturer has no control over the types of gases exposed to this pump. This is the user and/or the OEM's responsibility to follow the necessary safety requirements.

Frequently process gases are toxic, flammable, corrosive, explosive and/or otherwise reactive.

Toxic gases can cause serious injury or death. Operators and users must take the appropriate safety recommendations to prevent injury. Consult the responsible department for instructions and safety information.

Hazardous gases through the pump can cause serious injury or death. It's mandatory by regulations to connect the turbomolecular pump's exhaust to a rough pumping line compatible with the process gases. Check that pump is correctly connected to the equipment ( B 310).

DANGER

■ If any corrosive, reactive, flammable, pyrophoric, oxidizing process gases can be sent to the pump, then an exhaust extraction system monitor should be used to ensure that gas flow to the pump is stopped when exhaust gas extraction system is lost.

If flammable materials are sent to the pump, the customer will need to provide a hardware based LEL detection in the exhaust extraction system (detection capability at 25 % of the LEL) that will stop chemical supply to the pump when gas is detected over 25 % of LEL for that flammable material.

■ For non clean process.

If loss of purge flow creates a significant risk, then the purge flow must be monitored externally and a response to loss of purge flow must be provided by the process equipment and interlocked.

If pyrophoric materials above the LEL (lower explosive limit) 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.

CAUTION

■ The product's EMC rating is obtained on the understanding that it is installed in compliance with EMC rules.

Specially: in environments that are prone to emit interference, use shielded cables and connections on interfaces.

■ Ensure that the product is connected to an electrical installation:

- in compliance with the local and national safety requirements,
- equipped with electrical protection (fuses, circuit breaker, ...) which has a suitable earth (ground) point, properly connected.

■ 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.

■ If access to the IEC connector is restricted an additional isolation device should be provided, which will be easily accessible by an operator.

Safety instructions for installation

Installation (cont'd)

⚠ WARNING**■ Electric shock hazard:**

The voltages and currents in use can induce electric shock.

Isolate and lock out power line to the product before maintaining it /or removing the cover.

Only skilled, authorized people may carry out maintenance work.

If a main isolator is installed by the customer, it must be in compliance with local regulations, with a minimum interrupting short circuit current of 10 kA.

■ Electric shock hazard:

Some components have capacitors charged to over 60 VDC, or motor operating as generator. When power is switched off, they keep their charge for a time. Take precautions concerning the access to the connector pins. Wait at least 5 minutes after the pump comes to complete stop before starting any work.

■ Other located hazardous energies:

Water cooling circuit and nitrogen purge are pressurized hazardous energies.

Release pressure before servicing:

1 - for the N₂ purge, disconnect the gas line ;

2 - for the water cooling circuit, disconnect the input connector and leave the output connected. Don't forget to put a vessel (≥ 1 l) under the water output.

■ Operation in local mode

There is no device to warn that the pump operates in local mode. When the pump is not integrated in the equipment/host tool, the user must provide a device to warn that the pump operates in local mode.

■ The products are factory tested to ensure they will not leak in normal operating conditions. It is the user's responsibility to ensure this level of leak tightness is maintained.

■ Specific operating conditions may exist that require extra caution from users due to the high temperatures generated (outer surfaces > 70 °C); wear protective gloves and leave the pump to cool before working on the product.

Safety instructions for installation

Installation (cont'd)

DANGER

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 of liquid, gas or solids exist, an additional hardwired stop circuit is required to remove input power.

It is never required to override this interlock during installation, use or maintenance.

Once activated power will be switched 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.

CAUTION

■ If the product is used in applications where solid particles or condensable gases are present, we advise on avoiding any deposition into the pumping line. Contact our customer service.

■ The manufacturer guarantees the right operation of the pump if it is used in a uniform magnetic field up to 0.5 mT. From 0.5 to 5 mT the limit of the right operation depends on the cooling and the gas loads.

Exceeding 5 mT can cause excessive rotor heating due to the eddy current. It is therefore necessary to provide suitable shielding in such cases.

The pump standalone is resistant to radiation at levels up to 10^3 Gy.

■ 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.

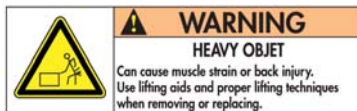
■ Protection against foreign bodies

Controller can be deteriorated when any objects are introduced or any liquids penetrate into the unit.

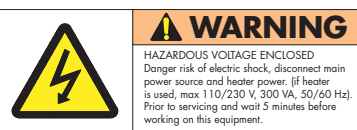
Make sure no objects enter through the ventilation holes. Keep the unit away from the liquids.

Safety instructions for installation

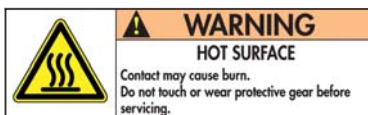
Labels stuck on the product



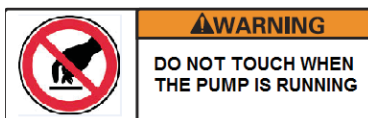
This label indicates that handling the pump can cause muscle strain or back injury.
For all product handling, use the appropriate handling devices.



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



This label warns the user against possible risk of injury due to any hand contact with hot surfaces.
It states that protective gloves should be used before performing any intervention.



Avoid causing a shock on a pump when the rotor is moving, it can block the right operation.



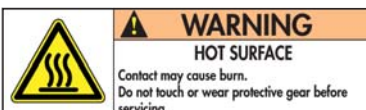
This label means that you must lock the electrical connector before using the pump and during operation.

Other labels

Customer is in charge to stick these labels on the ATHM on the most appropriate location to warn the operator regarding the probable hazards.



This label informs the user that moving parts present inside the pump could cause personal injury, like crushing or cutting. The user must keep all body parts away from moving parts.



The «hot surface» sticker must be stuck conspicuously on the pump housing.



The user must label visibly the product to warn against pumped process gas that could be dangerous and toxic and could cause severe injuries or death. It specifies that any preventive maintenance operation can only be performed by trained personnel.

Unpacking and storage of the pump

Unpacking

Make sure the equipment shows no sign of transport damage. If it has been damaged, take the necessary steps to record this with the carrier and inform the manufacturer. In all cases, we recommend keeping the packaging (reusable materials) for further transport of the equipment or for prolonged storage.

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

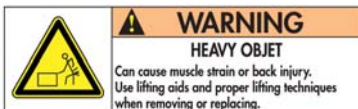
CAUTION



Pollution risk:

Unclean and contaminated components can increase the pump down time. Use only dry and clean pipe lines, and wear gloves to make the pump connections.

Pump handling



This label indicates that handling the pump can cause muscle strain or back injury. For all product handling, use the appropriate handling devices.

WARNING

■ Heavy product

This product needs special handling precautions due to its weight. It should be removed from its crate only by staff trained in heavy materials handling:

- use the lifting rings provided with the product,
- use slings from a length over 500 mm,
- tighten the pump to the handling device,

The maker can not be held liable for the consequences of using other rings.

Pump installation with inlet housing facing up: connect the pump to the customer's handling device using the threaded holes located at the rear of the pump (chapter A 400 of the Operating instructions).

- Risk of tilting: although the product meets EEC safety regulations , it is advisable to guard against the risk of tilting during handling, installation, and use (chapter A for the location of the center of gravity).

Unpacking and storage of the pump

Pump storage

CAUTION

If you are storing the new pump, keep it wrapped in to its protective film. Our product can be stored in the following conditions:

- in a clean, dry and contamination free environment,
- at an ambient temperature between - 5 °C and + 50 °C,
- for a period of 2 years maximum.

If you need to store a pump which has run on clean process, don't forget to blow out the water line and to purge the pump with N². Seal the inlet, exhaust and purge ports with blanking plates. Don't store the pump more than 6 months in a clean and dry environment.

Never store a pump which has been used on corrosive process. Return it to a repair service center (📖 E 100).

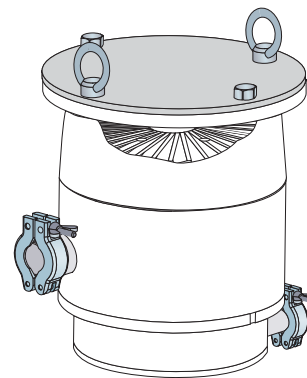
⚠ WARNING

The product is supplied with the inlet and exhaust blanked off. This prevents foreign bodies entering the pump during transport and storage. Do not remove these blanking plates until you are ready to install the product on the vacuum line.

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

Exhaust Blanked with a DN 40 ISO-KF blanking plates.

Connection for air inlet valve and nitrogen device Blanked with a DN 16 ISO-KF blanking plates.




Pump connections to an installation

Equipment installation conditions

⚠ WARNING


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,
- the type of connection between pump inlet and chamber to be pumped.

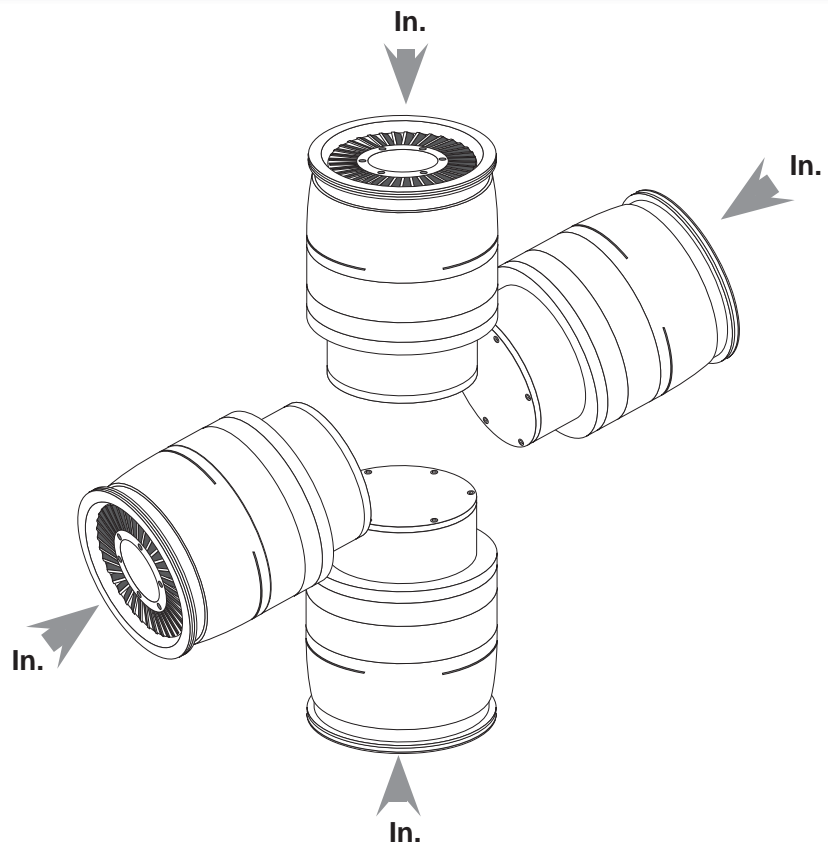
When the pump is connected according to the manufacturer recommendations ( B 300), in case of overpressure resulting from an incident, the pump enclosure can withstand a maximum static pressure of $11 \cdot 10^3$ hPa for 1 minute.

⚠ WARNING

Pump installation with inlet housing facing down:

- connect the pump to the customer's handling device using the threaded holes located at the rear of the pump ( A 400 of the operating manual).

The pump can operate in any position



Pump connections to an installation

The Magnetic Turbopump is designed so as to prevent any safety hazard to the user in standard operating conditions. However, some operating conditions may create hazards for the users and the environment: the kinetic energy stored in a maglev turbopump is very high. In the event of a mechanical failure, an improperly installed pump could be ejected from the equipment if the kinetic energy was transferred to the pump body.

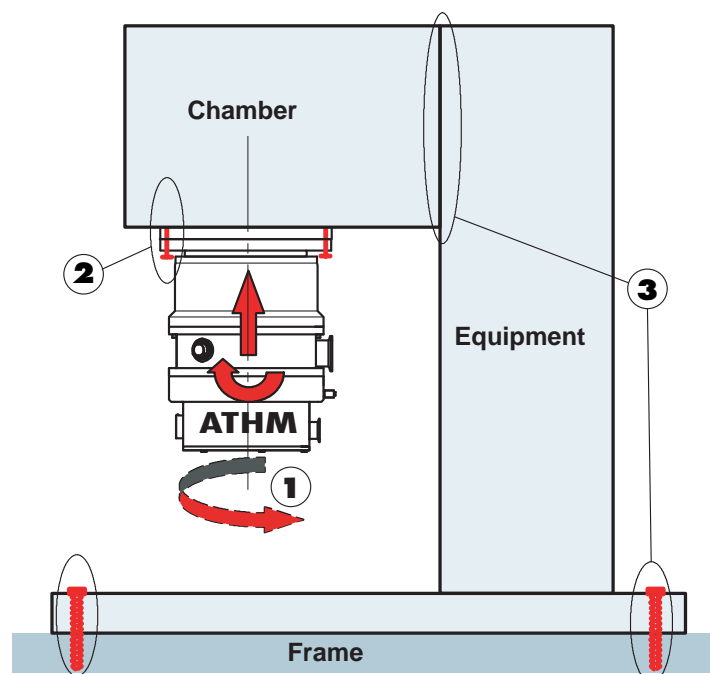
⚠ WARNING

Risk of separation of the pump from the equipment

If the rotor is suddenly blocked, the turbopump could be ripped off the equipment if it is not properly affixed. The energy that this would release could throw the entire pump or pieces of pump through the room. This would cause severe, possibly fatal, injuries as well as serious property damage.

- Strictly comply with the installation instructions described in this manual. Pfeiffer Vacuum will be released from any warranty and responsibility for non-compliance with installation instructions.
- Only use approved original connecting accessories from Pfeiffer Vacuum for the installation (see Accessories).

Installations specifications



Pump connection instructions

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

Pump connections to an installation

Description of a blocking rotor scenario

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 loads (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)

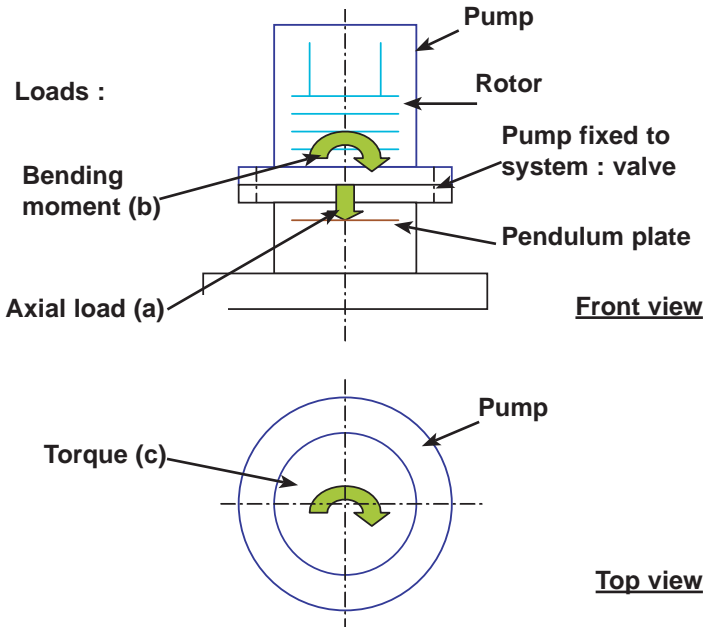
The impact of the rotor parts on the housing will create a radial force on the housing. This radial force will create a bending moment on the system as a function of the distance to the pump.

Torque (c)

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

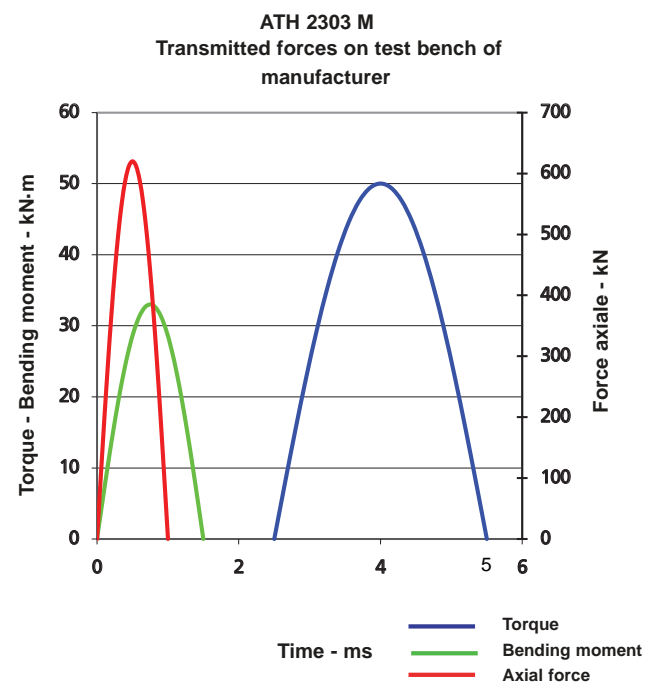
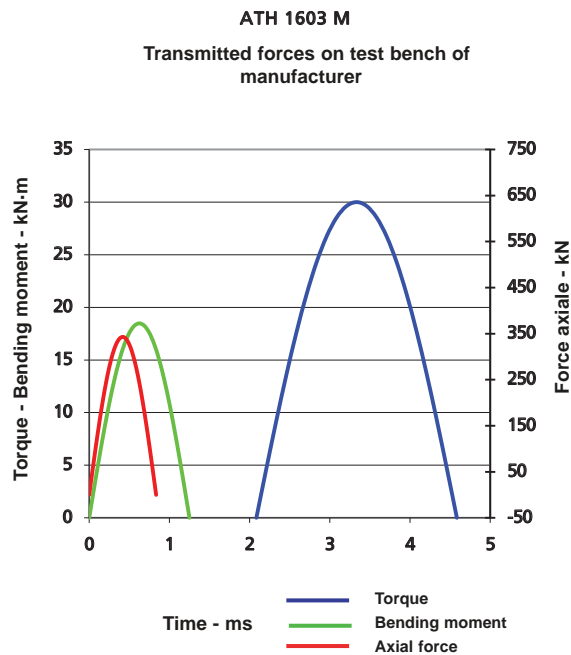
The maximum values of the axial force and the bending moment occur at approximately the same time. A delay of up to several ms has been observed for the maximum torque value.

Loads transmitted to the system (1)



Pump connections to an installation

Loads transmitted to the system (cont.)



Pump model	Unit	ATH 1603 M	ATH 2303 M
Nominal speed	rpm	39000	31000
Energy	kN·m	76	124
Torque	Max. kN·m	30	52
	Duration ms	2.5	3
	Delay ms	2.1	2.5
Bending moment	Max. kN·m	21	35
	Duration ms	1.3	1.5
	Delay ms	0	0
Axial force *	Max. kN	0<<398	0<<650
	Duration ms	0.8	1
	Delay ms	0	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).

Pump connections to an installation

Mounting to the equipment (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. The screws must be tightened with a torque wrench in accordance with the tightening torques in the following table:

- if the torque is low: risk of the screws loosening
- if the torque is high: risk of the screws deteriorating.

Mounting holes at inlet flanges	ATH 1603 M - ATH 2303 M			
	DN200 ISO-F	DN250 ISO-F	DN200 CFF	DN250 CFF
Inlet flange				
Type of bolts dictated	M 10	M 10	M 8	M 8
Number of bolts dictated	12	12	24	32
Bolt metric grade	12-9	12-9	12-9	12-9
Installation torque per bolt (N-m)	30	30	20	20
Total clamping force (N)	161500	161500	266000	355000

* The type, number, grade and clamping torques are imposed and mandatory.

Pfeiffer Vacuum recommends using set of screws designed for this purpose and offers a specific tightening tool for 250 mm diameters.

Frame fixation (3)

If the frame is not designed to withstand the maximum loads in case of rotor blocking, contact Pfeiffer Vacuum who will help you to design your installation.

⚠ 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.

Inlet and exhaust connections

Vacuum connections

WARNING

Do not expose any part of the human body to vacuum. The product is supplied with the inlet and exhaust sealed. Remove these blanking plates when you are ready to connect the product on your vacuum system. As well as, don't operate the product unless the inlet and exhaust are connected to a vacuum and exhaust pumping line.

CAUTION

Risk of injury by cutting. Contact with the pump rotor cell may cause cuts. Alternatively, protective gloves may be worn when servicing the product.

CAUTION

Make sure all parts and chambers connected to the inlet, exhaust and purge of the maglev pump can withstand a negative pressure of 100 kPa below atmospheric pressure and that they are impervious to damage from vacuum (seals, etc...).


CAUTION

For safety reasons, use accessories on the inlet and exhaust lines whose materials and sealing properties are compatible with the gases being used.

Materials in direct contact with process gases

COMPONENTS IN THE PUMP	MATERIALS
From inlet to outlet	Stainless steel, aluminium alloy
O-ring	Fluorinated elastomers, FPM

WARNING

Pump installation with inlet housing facing up:
 - connect the pump to the customer's handling device using the threaded holes located at the rear of the pump ( A 400 of the Operating instructions).

CAUTION



Pollution risk
 Unclean and contaminated component can increase the pumping down time. Use only dry and clean pipe lines, and wear gloves to make the pump connections.

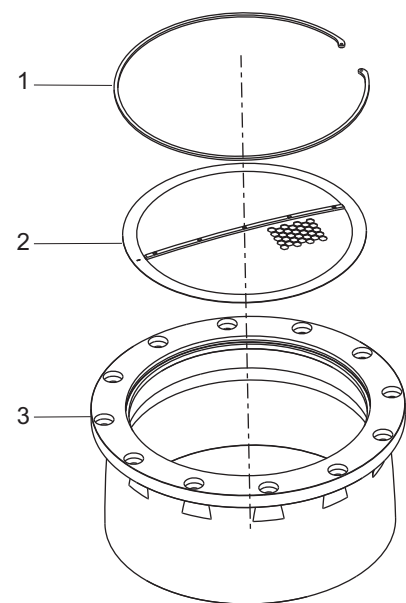
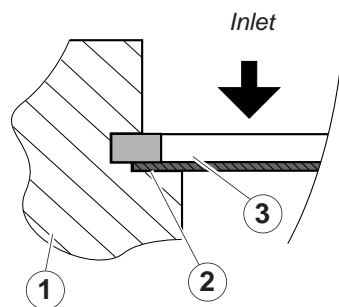
After connecting the product to the pumping line, check for leaks along the entire to ensure proper connections (pump, pipes, valves,...).

Inlet and exhaust connections

At inlet:
Screen filter Check that an inlet screen accessory is installed on the pump ; if not, install it. (pumps are delivered with inlet screen filter).

Mounting of the insertable inlet screen

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



CAUTION

It is recommended to install an isolation valve between the chamber to allow chamber venting without stopping the pump.

At exhaust

The turbomolecular pumps can't evacuate at atmospheric pressure, they are connected to a roughing pump. For a transient period, they can start to run at atmospheric pressure.

WARNING

When pumping on corrosive gases, or aggressive gases, the gas can cause injury or death. The exhaust of the turbopump must be connected to roughing pump line compatible with process gases.

CAUTION

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

Nitrogen purge and air inlet valve device connections

Depending on the application, the inert gas purge can consist of:

- injecting ambient air, or
- injecting an inert gas into the pump.

In this manual, the inert gas will be called 'nitrogen', as it is the most commonly used gas.

For more information about the type of purge gas, contact your service centre Pfeiffer Vacuum.

A filtered dry nitrogen supply with the characteristics defined is required for optimum performance, see below.

Nitrogen characteristics

H ₂ O concentration	< 10 ppm v
O ₂ Concentration	< 5 ppm v
Dust	< 1 µm
Oil	< 0.1 ppm v
Pression absolue	1 · 10 ³ to 1.2 · 10 ³ hPa

WARNING

Pressurised circuit

To work safely on the product, the operator must:

- Install a manual valve on the nitrogen circuit at a distance of 3 m from the product, so that the nitrogen supply can be locked.

WARNING

When the inert gas purge is stopped, the pumped gases can pass from rough vacuum side to high vacuum side and damage the maglev bearings.

It is advised to maintain the purge flow as long as the rotor is running to protect pump internal parts.

Nitrogen purge and air inlet valve device connections

Purge device for DN16 port (50 sccm)



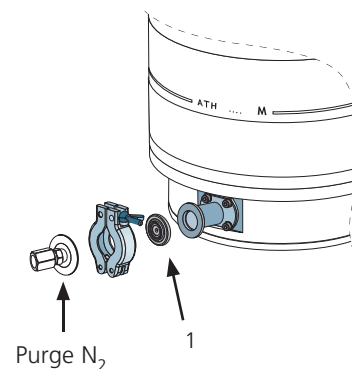
The nitrogen purge must be connected directly to the pump purge port.

The operation of this purge is continuous. The flow reduction device guarantees a flow rate of 50 sccm at pressure $1,1 \cdot 10^3$ hPa. When the inert gas line is equipped with a mass flowmeter, do not install the flow reduction device.

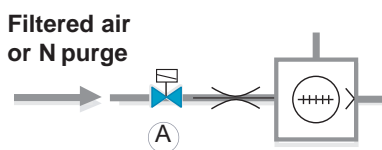
- Connect the inert gas line on the Purge port equipped with the flow reduction device (1).

- *DN 16 ISO-KF port (use connecting accessories from product catalog).

- Adjust the inert gas purge pressure to obtain the requested flow (see graph below).



Solenoid valve equipped with 50 sccm purge



The solenoid valve installed on the pump makes it possible to stop the purge during pump operation (i.e. to perform a tightness test). This solenoid valve is supplied by the electronic.

- Connect the solenoid valve to the Purge port (affixed using 4 supplied screws).

- This solenoid valve can be connected to an inert gas line.

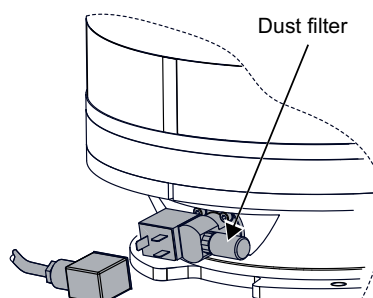
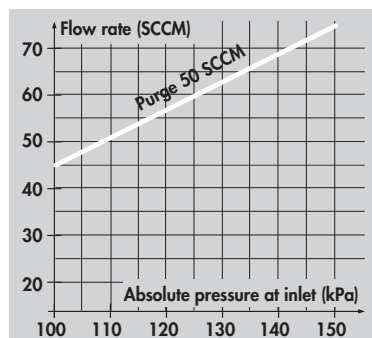
- Remove the dust filter from the solenoid valve.

- Connect the inert gas line instead: 1/8" NPT female connector.

- Bond the connections using Oleo waterproof glue, or put Teflon® tape on the threads.

- Tighten the connection, applying a maximum tightening torque of 10 N·m.

- Adjust the inert gas purge pressure to obtain the desired flow (see graph below).

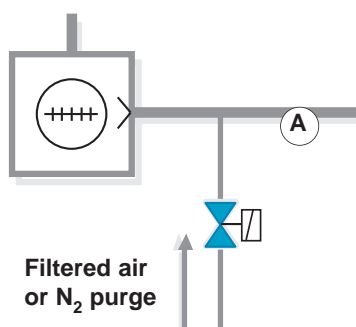


Nitrogen purge and air inlet valve device connections

CAUTION

Replace regularly the dust filter when used in dusty air.

Air inlet valve

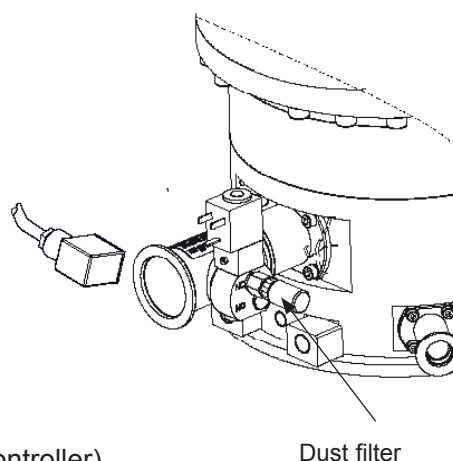


Installed on the pump exhaust, the air inlet valve is calibrated to reset the volume of the pump to atmospheric pressure.

When the pump is isolated (at inlet and exhaust) the rotor slow down efficiency is increased.

If the "VENTING TIME" is set, the reset to atmospheric pressure takes place when the pump is stopped or when faults are registered on the controller.

( Operating instructions of the controller).



Dust filter

A nitrogen purge can be connected instead of the dust filter (1/8 NPT female).

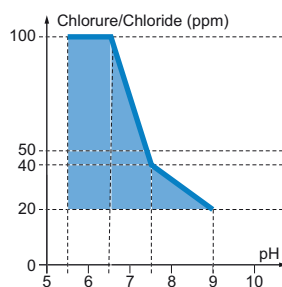
Water cooling connection

The characteristics below concern only the turbomolecular pump with magnetic ball bearings and the associated control unit. It is linked to a fore pump: for the application to function properly, **make sure to respect the most restrictive characteristics for the installation.** Be sure that the water coming from the equipment does not freeze.

In order to limit corrosion and clogging of the pipes, it is recommended to use water with the required characteristics (see table below). If the "solid particle size" and "solid pollution" water characteristic values cannot be reached, install a filter on the water input.

Water characteristics

pH	5.5 to 9
Chlorine ⁽³⁾	100 to 20 depending on the pH
Hardness	< 35 °fH (french degree) < 7 milli-equivalent/L < 350 mg/L of CaCO ₃ (Calcium carbonate)
Total dissolved solids	< 100 mg/L
LSI = pH - pH _s (LANGELIER Saturation Index)	< 0 to 20°C
Particle size	< 0.2 mm
Resistivity	R > 1 500 Ω·cm
Input temperature ⁽⁴⁾	15-40°C (M Version)
Relative input pressure	< 6 · 10 ³ hPa
Differential pressure (inlet/outlet)	depends on flow
Flow	> 60 l/h



(3) The oxidizing action of the chlorine depends on the pH (aggressiveness of the water). The chlorine content must be within the colored area on the graph opposite.

(4) Over > 25°C, modify the operating conditions to reduce the nominal power. Contact Pfeiffer Vacuum.

CAUTION

The use of uncontrolled city water can lead to water circuit clogging due to limescale deposition.

This may necessitate, in the worst case scenario, a complete cleaning and overhaul of the cooling circuit.

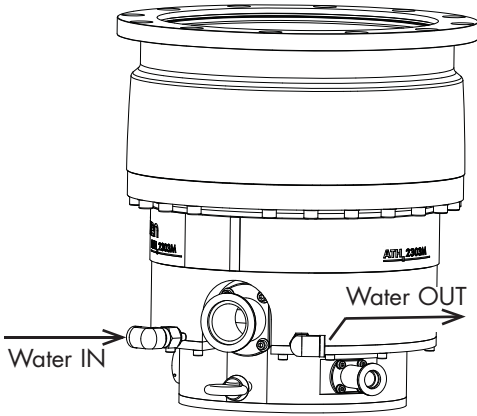
The presence of micro-organisms like aquatic weeds and micro-biological substances like bacteria can lead to cooling problems in the pump.

■ **An appropriate water treatment system must be used to prevent the growth of such microorganisms.**

Water cooling connection

Water line connection

- Provide a water inlet pipe and a tap to adjust the flow rate.
- Connect the water inlet line to the inlet 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).



CAUTION

Risk of water supply failure
 If loss of cooling water creates a significant risk for the process:

- Control the cooling circuit using an external system able to take over in case of failure.

WARNING

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

WARNING

Pressurised circuit
 In order to carry out operations on the product safely, the user must:

- Fit a manual valve on the water circuit 3 m from the product allowing the cooling circuit to be locked.


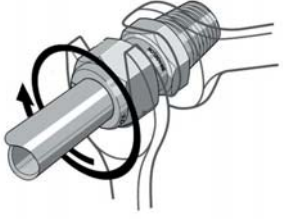
Procedure to connection

Follow the connections installation procedure to avoid any risk of leaks.

<p>Threaded connection</p>	<p>Bonding and tightening procedure</p>		
	<p>→ Use 1/4 NPT male connections (supply is the customer's responsibility). → Bond the connections using Oleo waterproof glue, or put a Teflon ® tape on the threads. → While holding the pump side base, tighten the connection, applying a tightening torque of 15 N·m</p>		
<p>Simple ring connection</p>	<p>Description</p>	<p>Assembly procedure</p>	
	<p>Connection used to connect flexible pipe between the OBC and pump for example</p>	<p>→ Insert the pipe into the connection until the ring seats against the connection → Rotate the nut finger-tight → While holding the connector body steady, tighten the nut of 1/2 turn using a flat open-ended spanner</p>	

Water cooling connection

Procedure to connection (Cdt.)

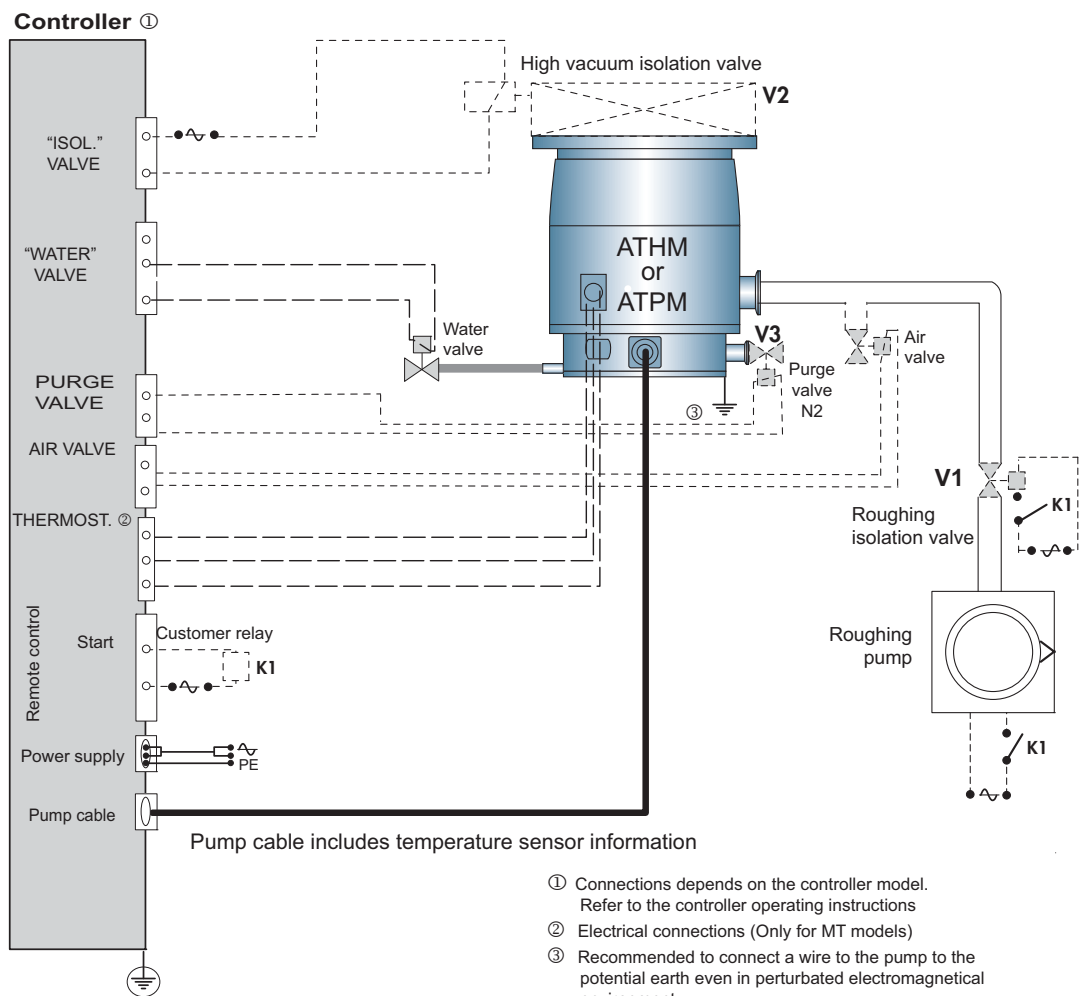
Double ring connection	Description	Assembly procedure	
	<p>Connection used to connect rigid pipe (stainless steel, nickel plated-steel, etc.)</p>	<p>→ Insert the pipe with rings into the connection until the front ring seats against the connection → Rotate the connection in position → Rotate the nut finger-tight → While holding the connector body steady, tighten the nut of 1/2 turn using a flat open-ended spanner</p>	

- 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 on the pump, with the other fitting connected to the water draining circuit via a tube (supplied by customer).

Typical electrical wiring diagram

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 (MT pump model).



WARNING

We recommend that you fit a separate earth (ground) conductor to earth pump. Use an un-insulated braid or a separate insulated green/yellow conductor with a minimum 9AWG (3mm²) conductor (to comply with US and Canadian installation codes). Use a screw and a shakeproof washer fitted to the earth hole from the pump to secure the earth conductor to the pump. The impedance between the pump-body and the earth connection point must be < 0.1 Ohm at 25A.



Operation

Operating instructions ATH 1603 M - ATH 2303 M Detailed contents

C 100

Safety instructions for product use

Refer to the Controller Operating instructions to have instructions about pump operation.

Safety instructions for product use

WARNING

Before using pump and controller, make sure that the mechanical and electrical connections have been made according to the safety recommendations: refer to chapter B from pump operating instructions and to associated controller operating instruction manual.

CAUTION

It is highly recommended to use:

- an inlet screen 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.

WARNING



■ Do not operate the pump until it is securely fixed. If the pump seizes, the stored energy of the rotor may cause further damage and injury to people ( B 300).

■ Risk of cut

The access to the rotor of a turbomolecular pump with an unconnected inlet port is dangerous. In the meantime, if the pump is not switched on, it may be driven by another pump in operation.

Always connect the pump inlet port before starting the pump.

■ Specific operating conditions may exist that require extra caution from users due to the high temperatures generated (outer surfaces > 70 °C): wear protective gloves and leave the pump to cool before working on the product.

■ Pump damage

Make sure that exhaust pipe line and pump internal parts are not clogged by process by-products (e.g. condensable products ...). If exhaust line is not clear, contact the customer service.

■ As loss of cooling water creates a significant risk for the pump, regularly check the right operation of the cooling circuit.

DANGER

■ Risk of injury by cutting

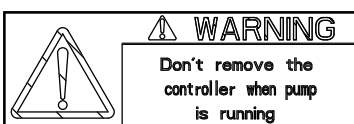
The inlet of the pump mustn't be disconnected as long as the rotor is moving and without having disconnected the power line cable.

WARNING

Risk of electrical shock

The turbopump and the controller must only be disconnected from each other when the turbopump is completely at rest and the controller disconnected from the power supply.

Never unplug the pump by disconnecting the main cable. Only the authorized and trained technicians can perform intervention on the product.



Located on the controller, this label indicates that the controller must not be disconnected when the pump is running.



Safety instructions for product use

WARNING

Standard precautions before any maintenance operations:

Before performing a maintenance operation, stop the pump. When the pump is at rest, switch off the pump by setting the controller main switch to «0», wait 5 minutes before disconnecting the main cable. If this last one remains connected, some components will still be energized.

Be sure that the controller status is visible from the operator otherwise disconnect the cable from the pump.

Refer to the controller Operating manual to control and monitor the pump ( chapter C). Refer to the controller Operating manual if a fault appears ( D 200).



Maintenance

Operating instructions ATH 1603 M - ATH 2303 M Detailed contents

D 100

Safety instructions for product maintenance

D 150

Maintenance frequency

Safety instructions for product removal

CAUTION

Duty to inform

Every person who is involved in maintenance and servicing work on the pump must read and follow the safety-relevant parts of all associated documents.

CAUTION

Exclusion of liability

Pfeiffer Vacuum accepts no responsibility concerning equipment damage, disrupted service or physical injury resulting from maintenance carried out by technicians who have not been trained in safety rules (EMC, electrical hazards, chemical pollution). Liability and warranty claims shall be inadmissible in this case.

WARNING

Risk of electric shock

The turbomolecular pump and its electronics cannot be unplugged from the electrical network before the rotor completely stops rotating, and as a whole is not isolated from the electrical network.

- Stop the pump from rotating by sending a 'Stop' order.
- Wait for the rotor to completely stop rotating before unplugging the power cable or cutting the power supply through the equipment.

WARNING

Other localized hazardous energies

Electrical circuits and other pressurized circuits, such as nitrogen and water are potential hazards.

- Always lock out these energy sources before working on the product.

WARNING

Tightness after maintenance

Insufficient tightness after servicing could result in chemical hazards.

- Always perform a leak test after maintenance.

WARNING

Risk of injury due to hot surfaces

Pump body temperature remains high even after the pump has stopped

- Wait for the product to cool completely before carrying out any operations on it.

DANGER

Risk due to pumping conditions

Remaining process gases in the pump may cause severe injury or death. Before removing the pump from the installation:

- Continue nitrogen flow from the process tool for 30 min. Nitrogen pressure and flow rate should be identical to the programmed values during process.

Safety instructions for product removal

⚠ DANGER



Risk due to pumping condition Risk to the health in the event of contact with toxic substances

The vacuum pump, pumping line components, and operating media may be contaminated with toxic, corrosive, reactive, or radioactive materials, depending on the process.

- Wear appropriate safety equipment when pump is disconnected for maintenance, or reinstalled, and also for oil filling and draining.
- Ventilate the premises well.
- Do not eliminate maintenance waste via standard disposal channels. Have it destroyed by a qualified company if necessary.
- install the inlet and exhaust blanking plates, accessories delivered with the pump or available as accessories (see chapter Accessories).

The outside of the product and control box can be cleaned with a lint free wiper. Avoid using cleaning products that deteriorate printed surfaces and self adhesive labels. All other cleaning operations must be done by our service centers.

Deposal

According to the regulations 2012/19/EC about Waste of electrical and electronic equipment, and 2011/65/EC about Restriction of Hazardous substances, the manufacturer provides a paid recycling service for the end of life of the equipment.

Any obligation of the manufacturer to take back such equipment shall apply only to complete not amended or modified equipment, using Pfeiffer Vacuum SAS original spare parts, delivered by Pfeiffer Vacuum, containing e.g. all its components and subassemblies.

This obligation will not cover the shipping cost to a Pfeiffer Vacuum reclamation facility.

Before returning the product, please consult the Service procedure. Fill in the declaration of contamination form available on our website. Attach it to the product before shipping to the closest service-repair office.

Maintenance frequency

Back-up ball 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 by the controller, the back-up ball bearings are not used. The rotor remains levitated by magnetic ball bearings.

Only the back-up ball bearings require maintenance: they are designed to withstand many accidental shut-downs, or many landings of the rotor on the ball 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


Back-up ball bearings are designed to withstand abnormal landings at full speed.


The wear of the back-up ball bearings is internally monitored by the controller, based on the rotation speed and the landing duration. Initial percentage value is set at 100 %. When this percentage reaches 0 %, an alarm is generated, pump can't restart, and back-up ball bearings need to be replaced by authorised Service Center.

Warning messages for pump maintenance

The ball bearing alert threshold can be set on the menu ( **C300** on the controller Operating instructions).

If the ball bearings life time is smaller than the alert threshold, an alert message is displayed.

The troubleshooting is available in the controller Operating instructions ( **D200**).

The internal memory of the controller also informs the operator when the ball-bearings require maintenance ( Controller operating instructions).

CAUTION

The life time of the rotor is at least 5 years under normal conditons with clean process. Please contact the Service Center to check your application.

Product maintenance

The full overhaul must be performed by manufacturer's trained personnel. Only controller replacement, inlet screen or pump valve replacement are authorized at the customer's site.

Contact nearest service center or the service support at the following e-mail address: support.service@pfeiffer-vacuum.fr



Maintenance instructions

Operating instructions ATH 1603 M - ATH 2303 M
Detailed contents

E 100

Shipping procedure for contaminated pumps

- Connecting ports
- Rough decontamination procedure

Shipping procedure for contaminated pumps

⚠ WARNING

Study the safety instructions related to preventive maintenance  D 100.



The user must stick this label on the product to warn against pumped process gas that could be dangerous and toxic and could cause severe injuries or death. It specifies that any preventive maintenance operation can only be performed by trained personnel.

Whenever you return the product to an repair service center, please make sure you follow the Service procedure and fill in the declaration of contamination found on our website.

⚠ WARNING

Risk of injury by cutting. Contact with the pump rotor cell may cause cuts. Alternatively, protective gloves may be worn when servicing the product.

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

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

Connecting ports

A Inlet port

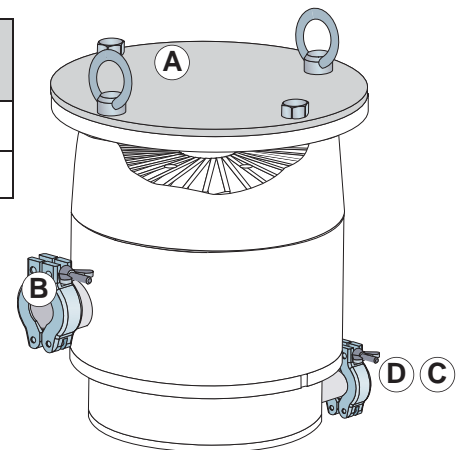
*Closing kit	DN 200 ISO-F	DN 250 ISO-F	DN 320 ISO-F
P/N	108496	108497	114503

* depends on the pump

B Exhaust port
DN 40 - ISO-KF

Description	DN 40	DN 50**
Centering ring with seal	068194	087164
DN 40 Clamping ring	083267	087163
Blank-off flange	068197	087162

** DN 50 ISO KF (if available ordered in ordering guide)



C *** Purge port

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

*** Standard connection accessories available in the product catalog.

Shipping procedure for contaminated pumps

D Purge port pressurisation

Description	P/N
DN 16 1/8 BSPT flange with anti-suckback valve including an injector	A458805
Injector	106859

Note: Some pressurization kits including connecting accessories for inlet, exhaust and purge ports, plus an injector are available.

Description	P/N
Kit for DN 200-ISO-F flange + Purge DN 16	108499
Kit for DN 250-ISO-F flange + Purge 1/4 VCR	108498

Rough decontamination procedure

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

DANGER

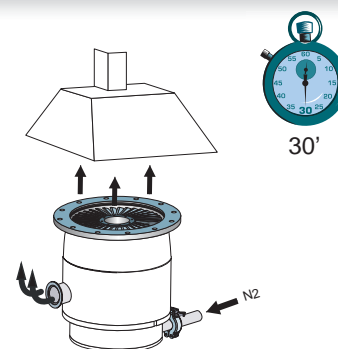
Install the pump under an extractor hood. It must remain there throughout the operation.

1 Complete flushing

Connect the blanking plate equipped with injector on Purge connector.

Connect the nitrogen to the gas connector.

Flush with nitrogen by injecting a relative pressure of 110 to 150 hPa for 30 minutes.

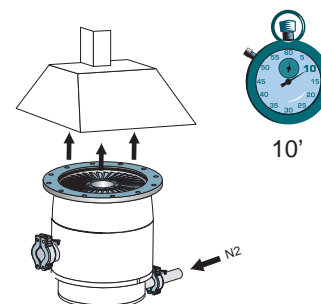


2 Flushing through purge/inlet

Seal the Pump exhaust port with blanking plate.

Flush with nitrogen by injecting a relative pressure of 110 to 150 hPa for 10 minutes.

Stop the nitrogen flow.



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

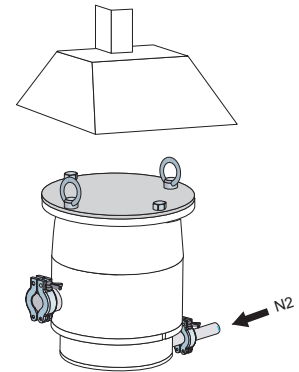
Shipping procedure for contaminated pumps

3 Pressurize the pump

Seal the pump inlet with blanking plate.

Pressurize the pump with nitrogen by injecting a relative pressure of 110 hPa.

Disconnect the nitrogen purge connector.



* Characteristics of dry nitrogen:  B 330.

4 Labelling of the pump

Stick this label on the product to warn that the pump has dealt with unsafe products.



Fill in the contamination declaration and attach it to the product

 G 200.



Maintenance components

Operating instructions ATH 1603 M - ATH 2303 M
Detailed contents

F 000

Spare parts - Instructions of use

F 100

First level maintenance parts

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 with parts that are not genuine, jeopardizes the initial safety conditions of the equipment.

In such cases, the EC declaration of conformity becomes null: The manufacturer withdraws responsibility for such operations.

Besides, counterfeiting and unfair trading of parts are condemned under civil and criminal laws.

The manufacturer urges the user not to use «imitation parts», or 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).

First level maintenance parts

Air inlet valve coil and nitrogen valve

	P/N.
Coil 24 V DC	038066

Dust filter Replace regularly the dust filter when used in dusty air.

	P/N.
Dust filter	106229

A complete range of connecting accessories is available in the manufacturer's catalogue (flanges, fittings...).

Water valve coil

	P/N.
Coil 24 V DC	108667



Appendix

Operating instructions ATH 1603 M - ATH 2603 M Detailed contents

G 200

Service

Service

Pfeiffer Vacuum offers first-class customer service!

- On-Site maintenance for many products)
- Overhaul / repair in the nearby Service Location
- Fast replacement with refurbished exchange products in mint condition
- Advice on the most cost-efficient and quickest solution

Detailed information, addresses and forms at: www.pfeiffer-vacuum.com (Service).

Overhaul and repair in the Pfeiffer Vacuum Service Center

The following general recommendations will ensure a fast, smooth servicing process:

- ➔ Fill out the «Service Request/Product return» form and send it to your local Pfeiffer Vacuum Service contact.
- ➔ Include the confirmation on the service request from Pfeiffer Vacuum with your shipment.
- ➔ Fill out the declaration of contamination and include it in the shipment (mandatory!). The Declaration of contamination is valid for any product/device including a part exposed to vacuum.
- ➔ Dismantle all accessories and keep them.
- ➔ Close all the ports flange openings by using the original protective covers or metallic airtight blank flanges for contaminated devices.
- ➔ If possible, send pump or unit in its original packaging.

Sending of contaminated pumps or devices

No devices will be accepted if they are contaminated with micro-biological, explosive or radioactive substances. "Hazardous substances" are substances and compounds in accordance with the hazardous goods regulations (current version).

- ➔ Neutralize the pump by flushing it with nitrogen or dry air.
- ➔ Close all openings airtight.
- ➔ Seal the pump or device in suitable protective film.
- ➔ Return the pump/device only in a suitable and sturdy transport container and send it in while following applicable transport conditions.

Exchange or repaired devices

Pump or device returned without declaration of contamination form fully completed and/or non-secured in a suitable packaging, will be decontaminated and/or returned at the shipper's expense.

The factory operating parameters are always preset with exchange or repaired devices. If you use specific parameters for your application, you have to set these again.

Service orders

All service orders are carried out exclusively according to our general terms and conditions for the repair and maintenance, available in our website.

VACUUM SOLUTIONS FROM A SINGLE SOURCE

Pfeiffer Vacuum stands for innovative and custom vacuum solutions worldwide, technological perfection, competent advice and reliable service.

COMPLETE RANGE OF PRODUCTS

From a single component to complex systems:

We are the only supplier of vacuum technology that provides a complete product portfolio.

COMPETENCE IN THEORY AND PRACTICE

Benefit from our know-how and our portfolio of training opportunities!

We support you with your plant layout and provide first-class on-site service worldwide.

Are you looking for a
perfect vacuum solution?
Please contact us:

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