# ATH 1300/1600 M-MT

## MAGLEV HYBRID TURBOMOLECULAR PUMPS



ATH 1300 M

**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.
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.
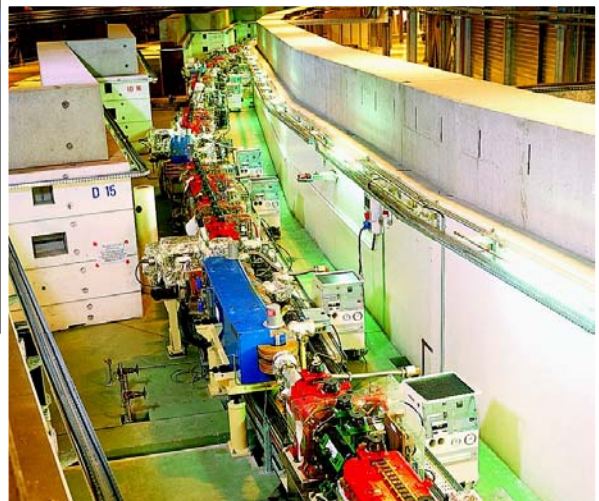
# ATH 1300 M/MT - ATH 1600 M/MT
# Maglev hybrid turbomolecular pumps

## Welcome

Dear Customer,

You have just purchased an Alcatel 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.**

**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.

# ATH 1300 M/MT - ATH 1600 M/MT
# Maglev hybrid turbomolecular pumps

This product complies with the requirements of European Directives, listed in the Declaration of Conformity contained in G100 of this Manual. These Directives are amended by Directive 93/68/E.E.C (E.C. Marking).

# Contents

## User's Manual
## ATH 1300 M/MT - 1600 M/MT

# Contents

## User's Manual
## ATH 1300 M/MT - 1600 M/MT

> **CAUTION!** Cautions are used when failure to observe instructions could result in significant damage to equipment and/or facilities.

⚠ **WARNING**  Warnings are used when failure to observe instructions could result in injury or death

## Introduction to
## the ATH 1300 M/MT - ATH 1600 M/MT
## and associated ACT controller

**1 magnetically levitated hybrid turbo pump**



**ATH 1300 M**
**ATH 1600 M**

**Five active axes**
ACTIDYNE® Maglev bearings type (S2M Patent) Rotor position control in 5 directions.

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

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

**Maintenance free**

**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 1300 MT**
**ATH 1600 MT**

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

## Introduction to the ATH 1300 M/MT - ATH 1600 M/MT and associated ACT controller

**ACT 1300 M controller**

**The new generation of ACT controller family**

**Especially designed for maglev turbopumps**
Light and small controllers.
Battery free.
Automatically detects and operates the ATH 1300 M/MT or ATH 1600 M/MT.

**Convenient interface**
Handy keyboard;
Alphanumeric display.

**Modern pump monitoring**
Monitoring of testing and troubleshooting parameters;
RS 232/485 serial links;
Automatic power supply detection from 100 V -15% to 120 V +10% and from 200 V -15% to 240 V +10%, 48/63 Hz single phase.

**Power supply for heater:**
100-120/200-240 V - 50/60 Hz
ATH 1300 MT: 200 W
ATH 1600 MT: 135 W

**Large range of interface**
Dry contacts interface for status signals and optocoupled control inputs;
Selectable Analog 0-10 V output.

# The pump operating principle

**A hybrid technology**   The ATH 1300 M and the ATH 1600 M integrate
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.**

Inlet

Dry back-up bearings

Exhaust

Cooling

Rotor

Stator

Molecular drag

Motor

Magnetic levitated bearings

Gas purge
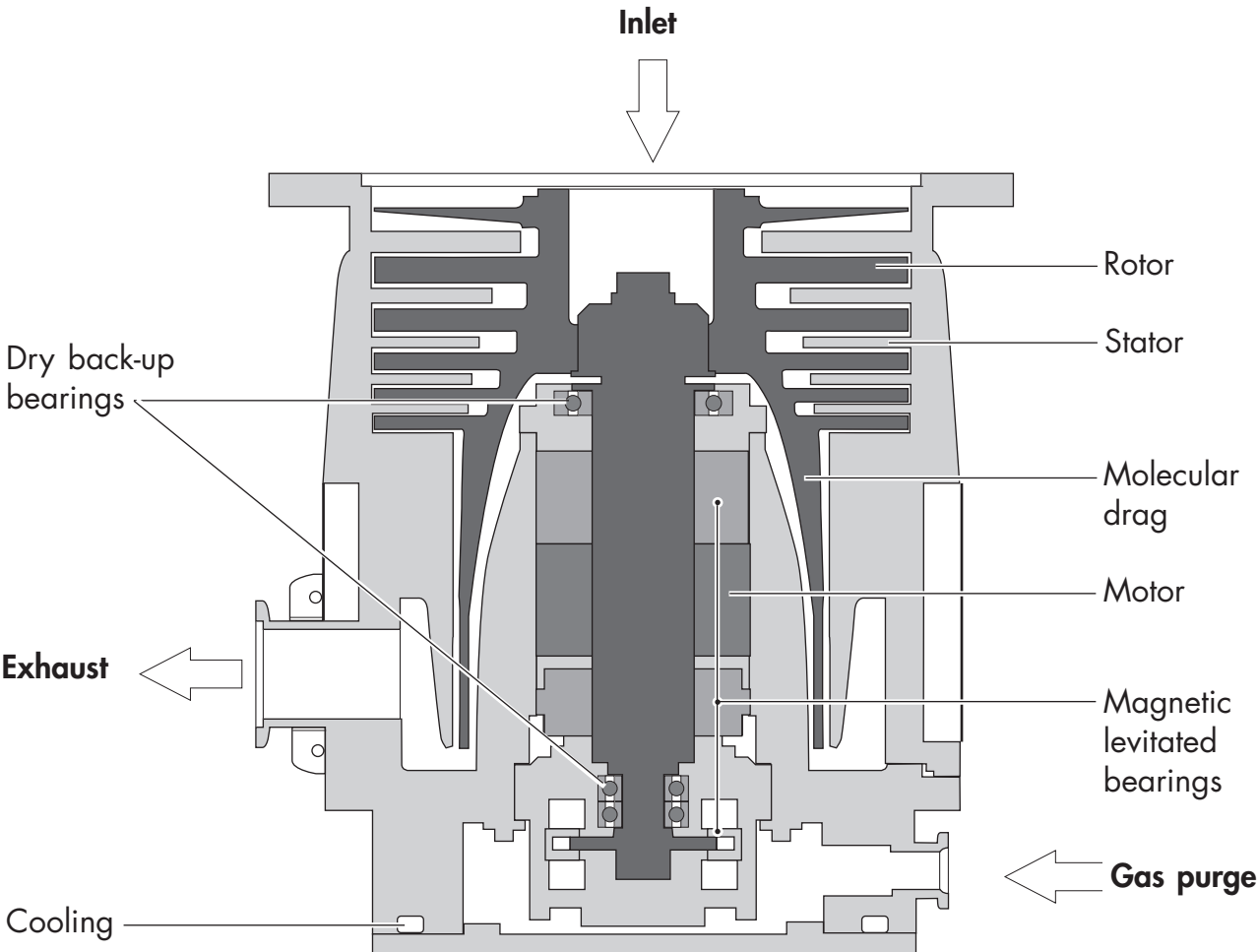
# The pump operating principle

**5 actives axis**

The mobile assembly formed by the turbo rotor and the shaft is known as the rotor. This rotor is driven by the motor and held in suspension by magnetic fields generated by electromagnets housed in active bearing, type ACTIDYNE® maglev bearing (S2M Patent).
The mobile rotor has five axes of freedom monitored by 5 active bearings.

**3 controlled translations (X, Y, Z)**



**2 controlled rocking (X, Y)**
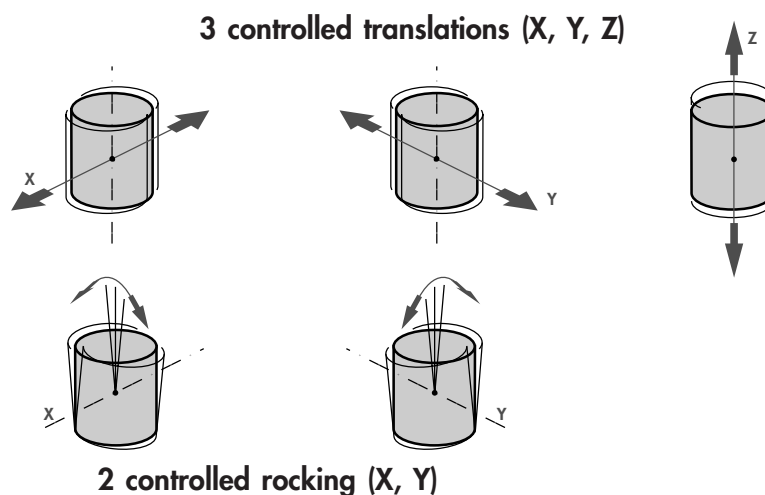
Movements in relation to these axes are monitored by position sensors. According to the position data recorded, the ACT controller corrects differences to bring the rotor back to its optimum position, by varying the current in electro-magnets.
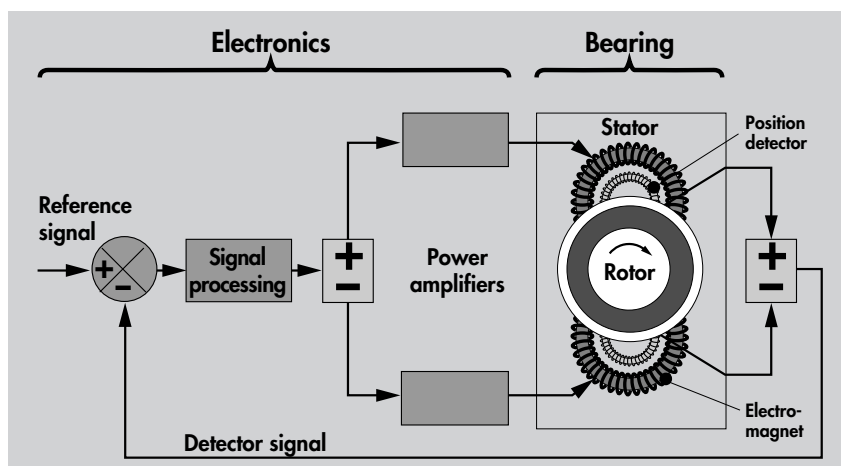
# The pump operating principle

**Automatic Balancing System**

The **Automatic Balancing System** is an electronic device. That monitors the rotor position, allowing it to rotate on 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 **Automatic Balancing System**. Therefore, there is a total absence of vibration.



— · · Rotor geometric axis
- - - - Stator geometric axis
—— · · Rotor inertia axis
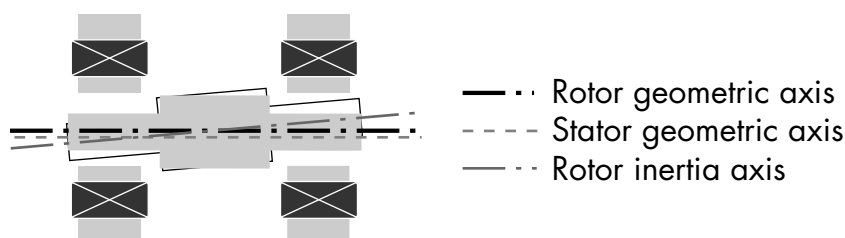
**The back-up bearings**

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 (**see D 10**).

**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.

# 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.
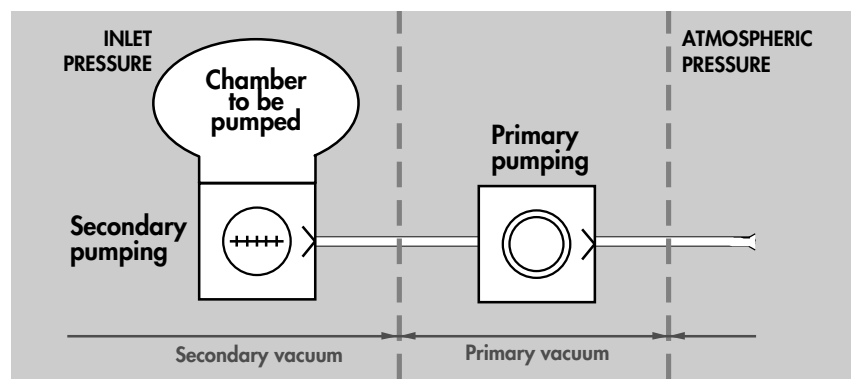
## Pump overview

**Standard version**
**ATH 1300 M**
**ATH 1600 M**
**Gas purge**

The **gas purge** provides excellent protection for corrosive applications.

Inlet

Exhaust

**Gas purge**
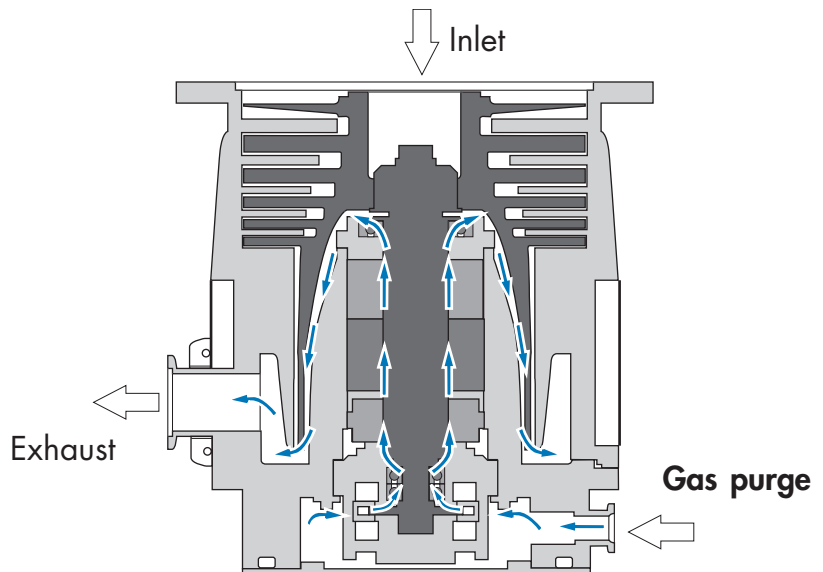
**ATH 1300 MT**
**ATH 1600 MT**
**The built-in heater band**

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 ACT controller, or by the customer's external regulator.
The MT version is delivered with its water valve.
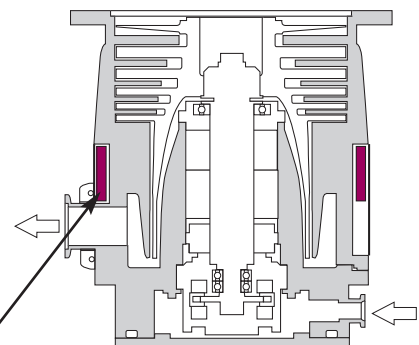
# Pump overview

**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 ≤ 10$^{-1}$ mbar,** the pump rotation speed can be selected between :
- a minimum speed of **15000 rpm** and
- a maximum speed of **34000 rpm** for ATH 1300 M/MT and **39000 rpm** for ATH 1600 M/MT**.**

# ACT 1300 M controller

The ACT 1300 M controller belongs to the new generation of ACT controller family.

**Compact and functional**

Dimension: **1/2 Rack**.
Weigth: **8.5 kg** (18 lb).

All functions to monitor the ATHM are integrated into the controller.

**Convenient interface**

**The front panel of the unit consists of:**

Parameter selection and configuration keys

Manual control keys



Pump status indicator lights

Parameter and message LCD display (4 lines).
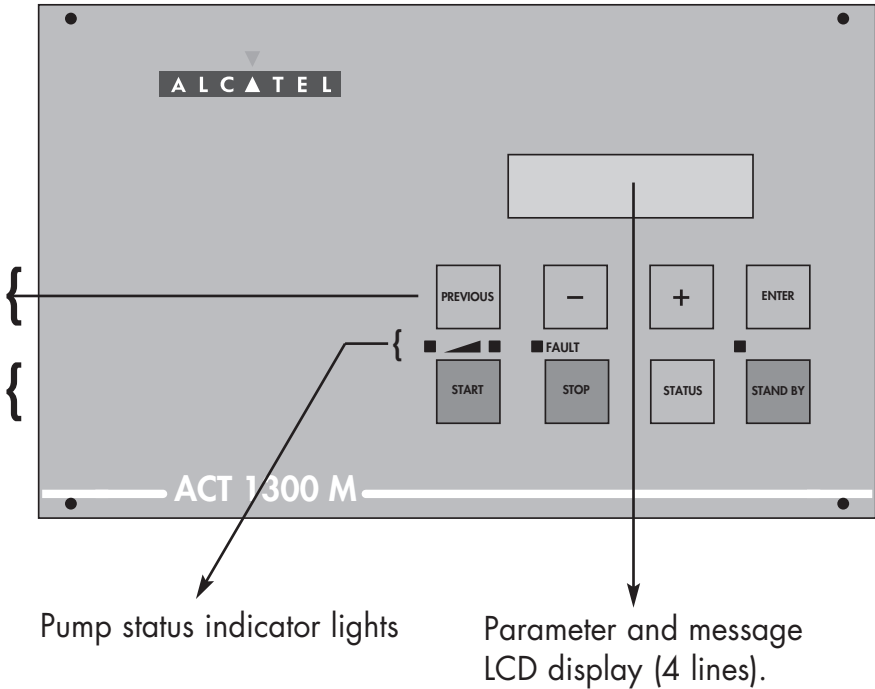
## ACT 1300 M controller



**The rear panel of the unit consists of:**
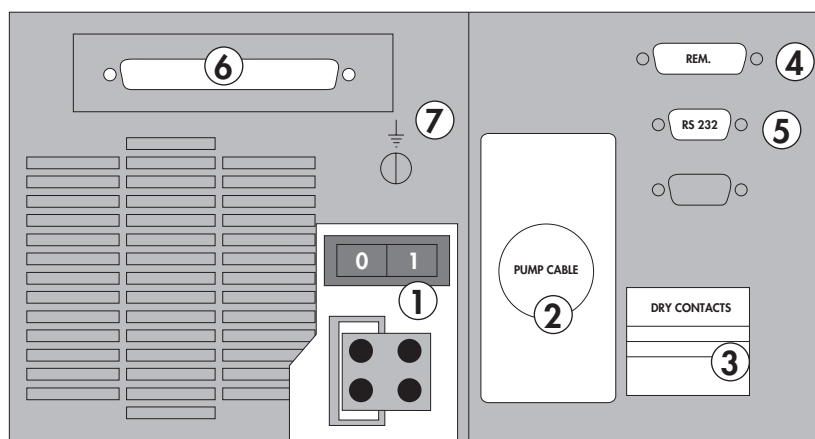
① **Power supply connector**

② **Pump connector**

③ **Relay terminal strip**
(Wiring characteristics *on B 90*.)

- to replicate the monitoring parameters available in the form of dry contacts.

④ **Analog output and RS 485 serial link**
(Wiring characteristics *on B 100*.)

- selectable 0 - 10 Volts output for speed, pump current or temperature;
RS485 serial link allowing many pump installations in a network.

⑤ **RS 232 connector**
(Wiring characteristics *on B 110*.)

The RS 232 serial link is used to control and monitor the pump **using a computer**.

⑥ **Inputs, outputs connector**
(Wiring instructions *on B 91*.)

- For the remote control of START/STOP/STANBY/INHIBIT functions,
- to take in account external safety,
- to allow dry contact outputs.

⑦ **Grounding**

Allow the fixation of a grounding cable to connect the controller at the ground and to connect the grounding cables of the accessories (water valve, air inlet valve cable).

# The accessories

## Pump accessories

### 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 + standard clip | 104907 |

| DN 250 ISO | |
|---|---|
| Convexe filter (alu) + standard clip | 109199 |
| Convexe filter (S.Steel) + standard 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

| Flow rate | P.N. |
|---|---|
| 25 SCCM | 066950 |
| 50 SCCM* | 066752 |

\* delivered with air inlet valve

See the Alcatel catalog.

### 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.

### Air inlet valve and cable

This 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 this accessory, the braking time is about 30 mn. (See **B 40** for valve installation).

| Air inlet valve | P.N. |
|---|---|
| 12 VDC | 106866 |

| Air inlet cable | |
|---|---|
| Length | P.N. |
| 1 m | 106052 |
| 3.5 m | 105172 |
| 5 m | 105173 |
| 10 m | 105174 |
| 15 m | 105175 |
| 20 m | A459362 |
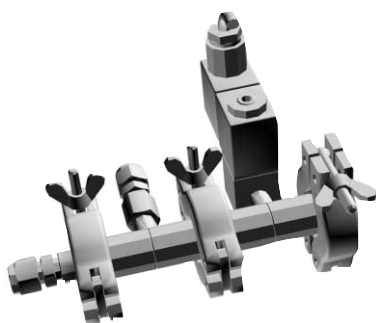
An entire range of connection accessories is available in the Alcatel catalog (clamping ring, centering ring, etc.).

## The accessories

### Controller accessories

**Connection cable**   Interconnecting cable between pump and controller.

| Length | P.N. |
|--------|------|
| 1 m | **104624** |
| 3.5 m | **103719** |
| 5 m | **103720** |
| 10 m | **103721** |
| 15 m | **104587** |
| 20 m | **A214574** |

**Power line cable**   Cable to connect the controller to the power supply.

| Length | P.N. |
|--------|------|
| **2.5 m US** | **A328406** |
| **2.5 m EUROPE** | **A328405** |

**Thermostatic cable**   Interconnecting cable between heater band and controller. This cable includes water valve cable.

| Length | | P.N. | Length | | P.N. |
|--------|------|----------|--------|------|----------|
| **1 m** | **110 V** | **A328698A** | **1 m** | **230 V** | **A328697A** |
| **3.5 m** | **110 V** | **A328698B** | **3.5 m** | **230 V** | **A328697B** |
| **5 m** | **110 V** | **A328698C** | **5 m** | **230 V** | **A328697C** |
| **10 m** | **110 V** | **A328698D** | **10 m** | **230 V** | **A328697D** |
| **15 m** | **110 V** | **A328698E** | **15 m** | **230 V** | **A328697E** |
| **20 m** | **110 V** | **A328698F** | **20 m** | **230 V** | **A328697F** |

The thermostatic cable must be connected to a 4 A circuit breaker on the two phases.

# The technical characteristics

## The performances of the pumps

| Model characteristics | | | ATH 1300 M/MT | | | ATH 1600 M/MT | |
|---|---|---|---|---|---|---|---|
| Inlet flange* | | DN | 160 ISO-K 160 CF-F | 200 ISO-K 200 CF-F | 250 ISO-K 250 CF-F | 200 ISO-K 200 CF-F | 250 ISO-K 250 CF-F |
| Maximum rotation speed | | rpm | **34000** | | | **39000** | |
| Standby speed | | rpm | 15000 to 34000 | | | 15000 to 39000 | |
| Pumping speed | $N_2$ | l/s | 920 | 1250 | 1350 | 1400 | 1500 |
| | He | l/s | 810 | 850 | 850 | 1150 | 1150 |
| | $H_2$ | l/s | 490 | 550 | 550 | 750 | 750 |
| Compression rate | $N_2$ | | $1.10^7$ | | | $6.10^7$ | |
| | He | | $2.10^3$ | | | $8.10^3$ | |
| | $H_2$ | | $1.10^2$ | | | $3.10^2$ | |
| Ultimate pressure without purge, meas. according to Pneurop standard | | mTorr/mbar | $6.10^{-6}$ / $8.10^{-9}$ | | | $4.5\times10^{-6}$ / $6\times10^{-9}$ | |
| Maximum pressure at inlet in continuous operation** | | mbar | 0.5 | | | 0.2 | |
| Maximum permissible pressure at exhaust** | | mbar | 1.5 | | | 1.5 | |
| Maximum flowrate with $N_2$ (heated) | | SCCM | 1000 | | | 1000 | |
| Maximum flowrate with $N_2$ (unheated) | | SCCM | 3000 | | | 2500 | |
| Purging maximum flow rate | | SCCM | 50 | | | 50 | |
| Pressure with 100 SCCM flow | | mTorr/mbar | 1.1 / $1.46\times10^{-3}$ | | | 0.95 / $1.27\times10^{-3}$ | |
| Pressure with 200 SCCM flow | | mTorr/mbar | 2.26 / $3.0\times10^{-3}$ | | | 1.92 / $2.56\times10^{-3}$ | |
| Vibration level at maximal speed | | µm | < 0.01 | | | < 0.01 | |
| Mounting orientation | | | Any | | | Any | |
| Power supply required for heater band (MT) | | | 100-120 V - 50/60 Hz 200-240 V - 50/60 Hz 200 W | | | 100-120 V - 50/60 Hz 200-240 V - 50/60 Hz 135 W | |
| Start-up time | | min | < 5 | | | < 6 | |
| Maximum start-up power | | W | 650 | | | 650 | |
| Maximum operating power | | W | 300 | | | 300 | |
| Cooling water flow rate | | l/h | < 60 | | | < 60 | |
| Water temperature | | °C | 15 < T < 25 | | | 15 < T < 25 | |
| Maximum ambient temperature | | °C | 40 | | | 40 | |
| Weight (DN 160 ISO-K model) | | kg (lb) | 34 (75.5) | | | 35.5 (78.8) | |
| Recommended forepump | | | ADP / ADS | | | ADP / ADS | |

\* Others types of housing are available (see catalog).
\*\* The two maximum pressures cannot occur at the same time.

## The technical characteristics

### Controller characteristics

| Model characteristics | ACT 1300 M |
|---|---|
| Weight | 8.5 kg |
| Dimensions HxWxD          mm | 132.5 x 219 x 453<br>1/2 Rack 19" |
| **Power supply**<br>Nominal voltage<br>(single phase and two-phase)<br>Frequency<br>Maximum power consumption | 100 V -15% to 120 V +10%<br>200 V -15% to 240 V +10%<br>48/63 Hz<br>750 VA |
| **Customer main circuit breaker rating** | 10 A |
| Ambient operating temperature | T ≤ 50 °C |

### Controller dimensions

# A 60
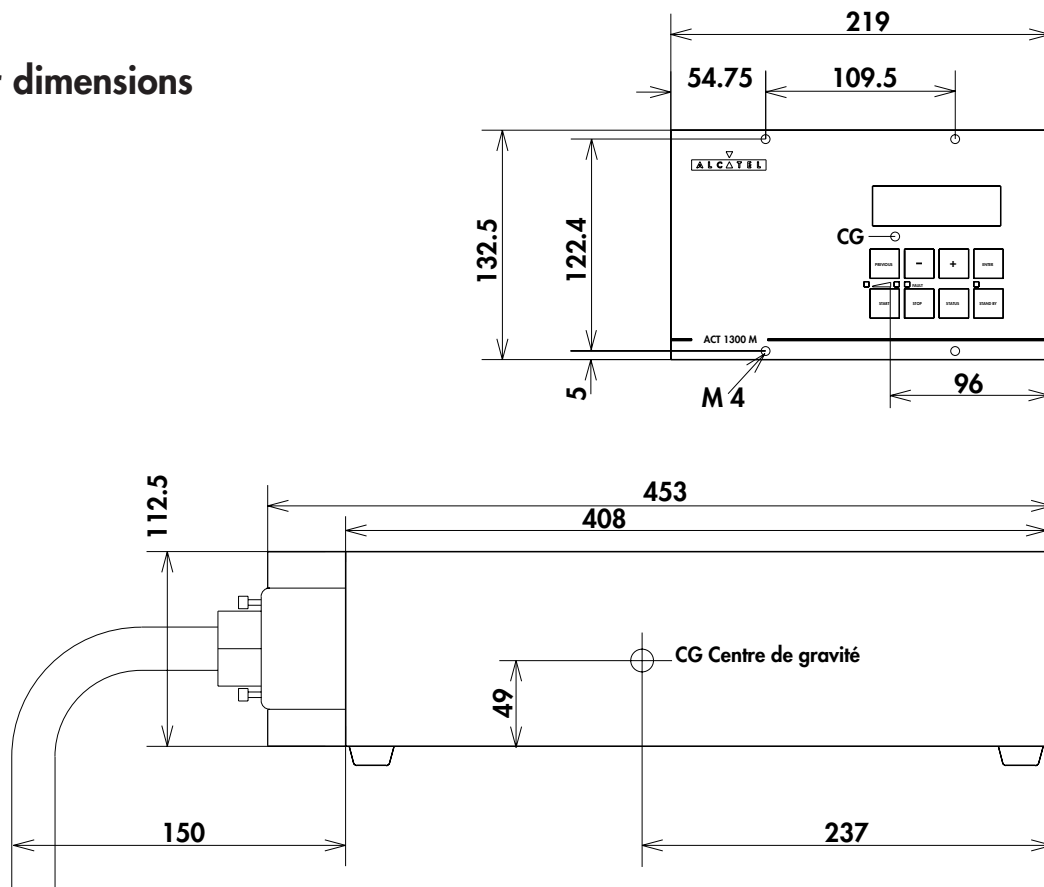
## The technical characteristics

**Pump dimensions**  ATH 1300 M/MT
DN 200 ISO-F
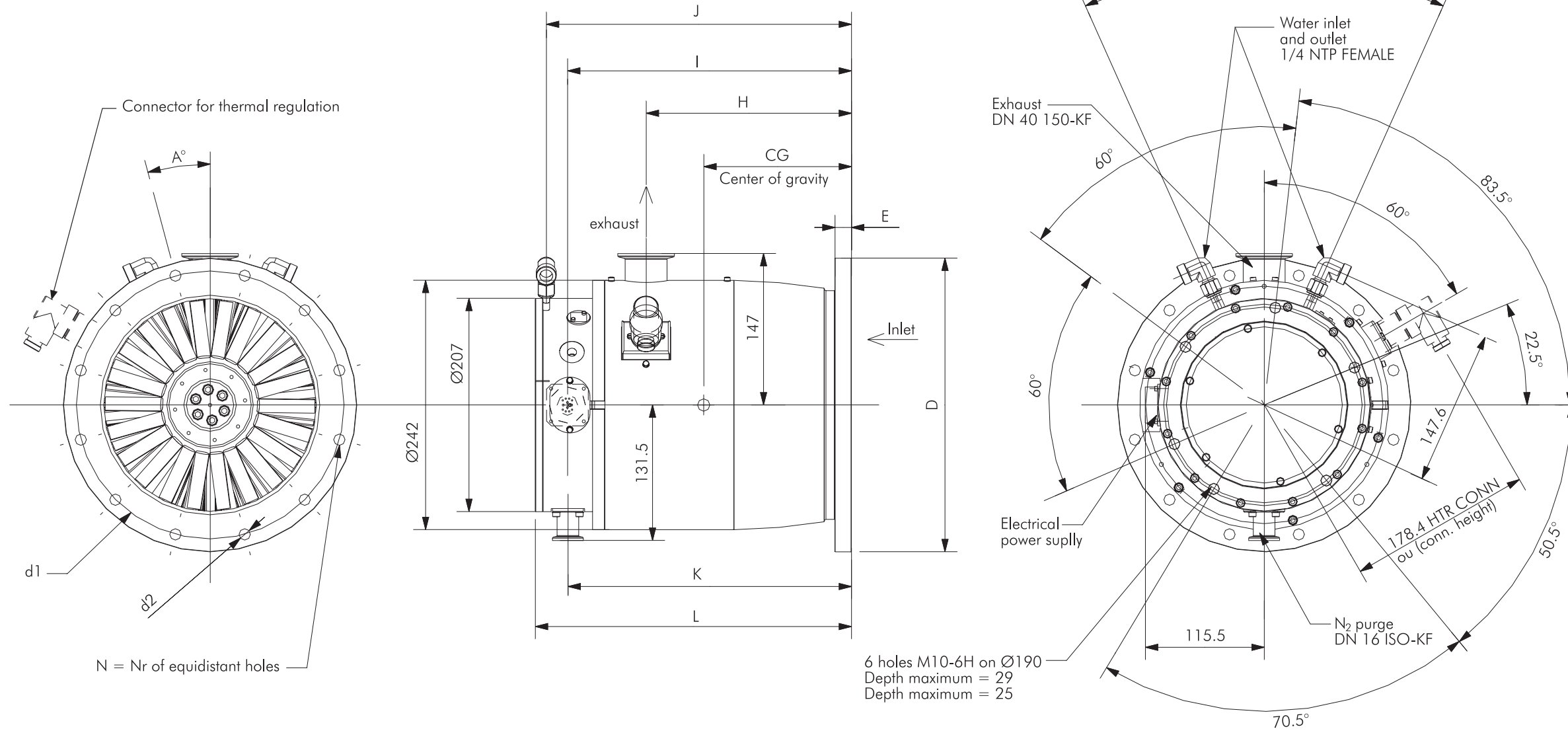


| Inlet flange | E | H | I | J | K | L | D | d1 | d2 | N | A | CG |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **DN 250 ISO-K** | 12 | 202.4 | 278.8 | 299.3 | 278.3 | 309.9 | 290 | - | - | - | - | 154 |
| **DN 200 ISO-K** | 12 | 199.4 | 275.8 | 296.3 | 275.3 | 306.9 | 240 | - | - | - | - | 158 |
| **DN 200 ISO-F** | 16 | 199.4 | 275.8 | 296.3 | 275.3 | 306.9 | 285 | 260 | 11 | 12 | 15 | 146 |
| **DN 200 CF-F** | 20 | 209.4 | 285.8 | 306.3 | 278.3 | 316.9 | 253.2 | 231.9 | 8.6 | 24 | 7.5 | 161 |
| **DN 160 ISO-K** | 12 | 245.2 | 321.6 | 342.1 | 321.1 | 352.7 | 180 | - | - | - | - | 202 |
| **DN 160 CF-F** | 22.4 | 257.6 | 334.0 | 354.5 | 333.5 | 365.1 | 198 | 181 | 8.6 | 20 | 18 | 201 |
| **ASA 6"** | 19 | 239.4 | 315.8 | 336.3 | 315.3 | 346.9 | 279.4 | 241.3 | 20.6 | 8 | 22.5 | 175 |

# A 60

## The technical characteristics

**Pump dimensions    ATH 1600 M/MT
DN 200 ISO-F**
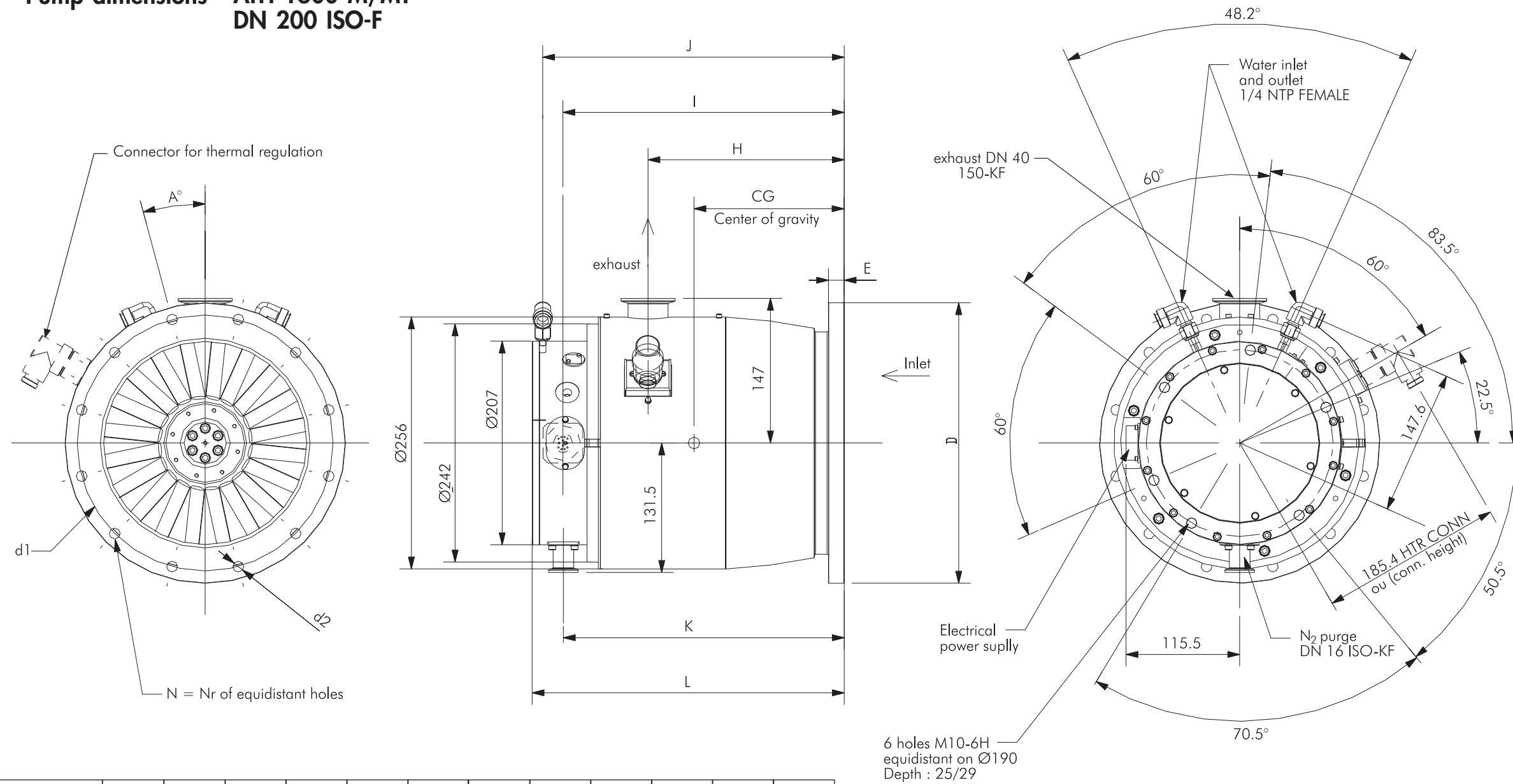


| Inlet flange | E | H | I | J | K | L | D | d1 | d2 | N | A | CG |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| UVG 250 | 16 | 199.4 | 285.8 | 306.3 | 285.3 | 317.4 | 350 | 320 | 15 | 12 | 15° | 139 |
| DN 250 ISO-F | 16 | 199.4 | 285.8 | 306.3 | 285.3 | 317.4 | 335 | 310 | 11 | 12 | 15° | 141 |
| DN 250 ISO-K | 12 | 199.4 | 285.8 | 306.3 | 285.3 | 317.4 | 290 | - | - | - | - | 154 |
| DN 250 CF-F | 26 | 210,9 | 297,3 | 317,8 | 285.3 | 296,8 | 306 | 284 | 8,6 | 32 | 5,625° | 152 |
| DN 200 ISO-F | 16 | 199.4 | 285.8 | 306.3 | 285.3 | 317.4 | 285 | 260 | 11 | 12 | 15° | 161 |
| DN 200 ISO-K | 12 | 199.4 | 285.8 | 306.3 | 311.8 | 317.4 | 240 | - | - | - | - | 176 |
| DN 200 CF-F | 20 | 225.9 | 312.3 | 332.8 | 325.3 | 343.9 | 253.2 | 231.9 | 8.6 | 24 | 7.5° | 175 |
| ASA 6" | 19 | 239.4 | 325.8 | 346.3 | | 357.4 | 279.4 | 241.3 | 20.6 | 8 | 22.5° | 150 |

## The technical characteristics

**Water valve dimensions**

66

In. 1/8 NPT female

29

55

62.5

28

Out.
1/8 NPT female

30

68.5

14
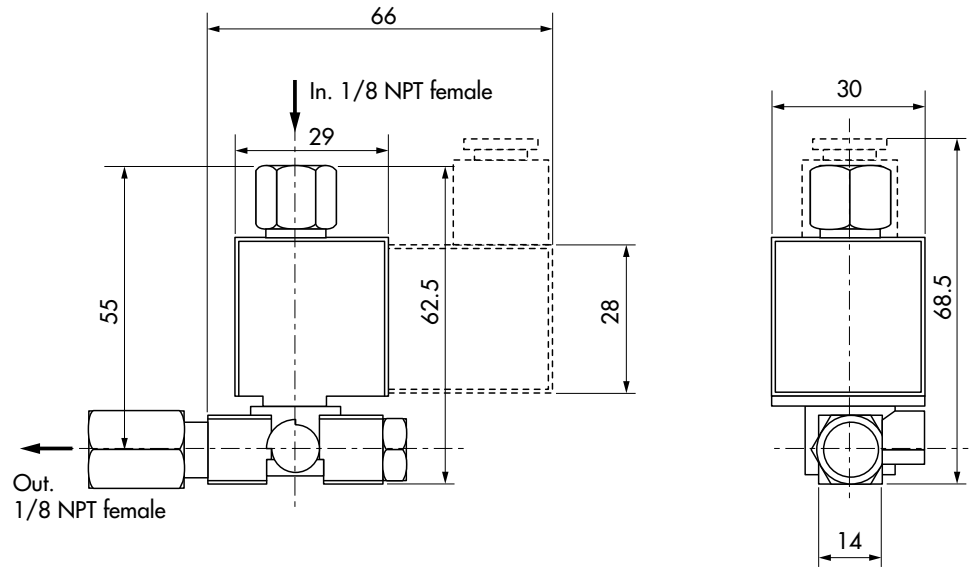
**Air inlet valve dimensions**

For 1/4" ext. diam. tube

25.25

For 1/4"
ext. diam. tube

66

25    12.3    50.5    50.5

3.9    3.9

74.9

28.9

DN 16 ISO-KF

# GS3

## Global Semiconductor Safety Services
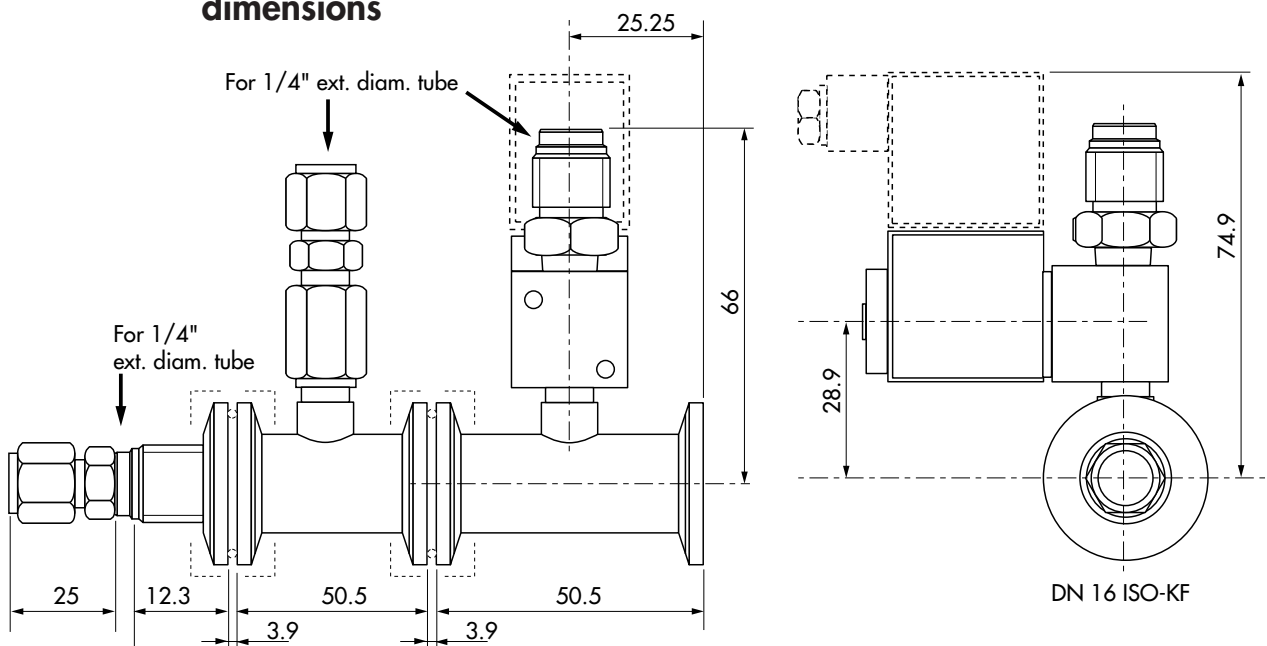
## CERTIFICATE OF COMPLIANCE

To SEMI S2-93A Guidelines

August 17, 2000

| | |
|---|---|
| Company Name & Location: | Alcatel Vacuum Products<br>67 Sharp Street<br>Hingham, MA 02043 |
| Place of Manufacturing: | Hingham, Massachusetts |
| Document Number: | 990187F |
| Date of Report: | August 17, 2000 |
| Product Description: | Turbomolecular Pump and Controller |
| Model: | ATH 1600 MT / 1300 MT<br>and ACT 1300M |
| Investigated in accordance with: | SEMI S2-93A |

Pavol Breder, Technical Manager

Andrew Giles, Technical Manager

# Safety instructions

> **CAUTION!** **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 an 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. ALCATEL declines any responsibility for such operations.

> **CAUTION!** **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.**

> **CAUTION!** **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.**

⚠ **WARNING** **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.**

# Safety instructions

• 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.

• 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.**

> ⚠ **WARNING**
> **HEAVY OBJET**
> Can cause muscle strain or back injury. Use lifting aids and proper lifting techniques when removing or replacing.
> **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 60 for the location of the center of gravity) for pump and controller.**

# Safety instructions

• 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 91).**

⚠️ **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.**

## Safety instructions

> ⚠️ **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.

> ⚠️ **WARNING**
> **HOT SURFACE**
> Contact may cause burn.
> Do not touch or wear protective gear before servicing.
>
> 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.

> ⚠️ **WARNING**
>
> 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.

## Safety instructions

**⚠ WARNING**
**HOT SURFACE**
Contact may cause burn.
Do not touch or wear protective gear
before servicing.

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.

**⚠ WARNING**
**HEAVY OBJET**
Can cause muscle strain or back injury.
Use lifting aids and proper lifting
techniques when removing or replacing.

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.

**⚠ WARNING**
HAZARDOUS VOLTAGE ENCLOSED
Danger risk of electric shock, disconnect main
power source and heater power. (if heater
is used, max 110/230 V, 300 VA, 50/60 Hz).
Prior to servicing and wait 5 minutes before
working on this equipment.

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.

**⚠WARNING**
**FLAMMABLE, CORROSIVE AND TOXIC
CHEMICALS LOCATED WHITHIN THE ENCLOSURE**
Explosure may result in severe injury
or death.
Preventive maintenance must be done
by trained personnel only.

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.

**⚠ WARNING**

**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 B30.

# Unpacking and storage

> ⚠ **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 (refer to A60 for the location of the center of gravity for pump and controller).**

**Unpacking**

> CAUTION! **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 Alcatel 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.
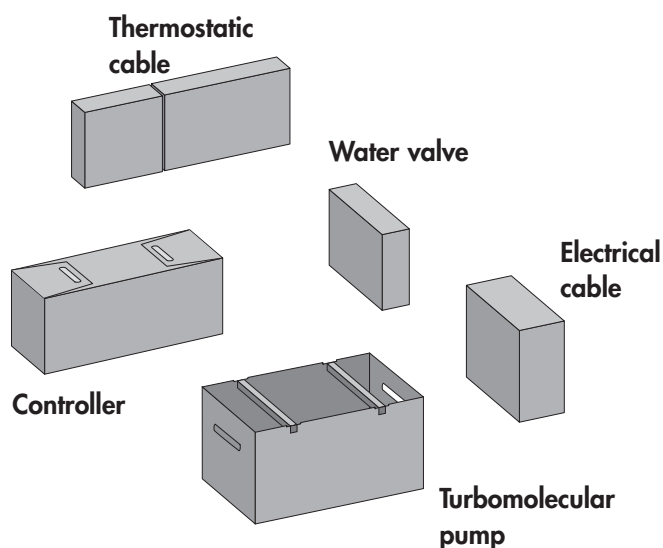
# Unpacking and storage

**The accessories**  This packaging also contains other cardboard boxes, for the accessories (screen filter, air inlet valve, water valve, purge device and high temperature sticker) and for the electric cable.

**The controller**  It is packaged in a separated cardboard box.
Lift the device out of its packaging (weight 8.5 kg) by hand.

**The pump**  It is packaged in a separated cardboard box.
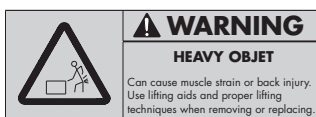
> ⚠ **WARNING**
> **HEAVY OBJET**
> Can cause muscle strain or back injury. Use lifting aids and proper lifting techniques when removing or replacing.
>
> **Lift the pump out of its packaging by using the hoisting rings located on the inlet blanking flange (weight ATH 1300 M: 34 kg; ATH 1600 M: 35.5 kg.**

**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.

**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.



**Controller storage**
> CAUTION!  The controller can be stored in its cardboard box at storage temperature between - 20°C and + 70°C.

**Maglev pump connection
instructions
Why securing
MAGLEV pump
installation ?**

Maglev hybrid 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.**

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

**Installations specifications**

Chamber

2

3

Equipment

ATHM

1

Frame
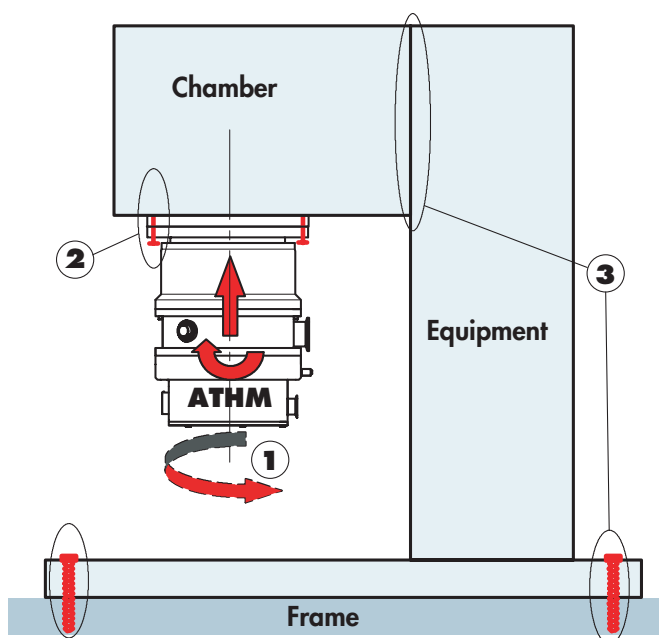
**Maglev pump connection
instructions**

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

## 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 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 (item 1)**
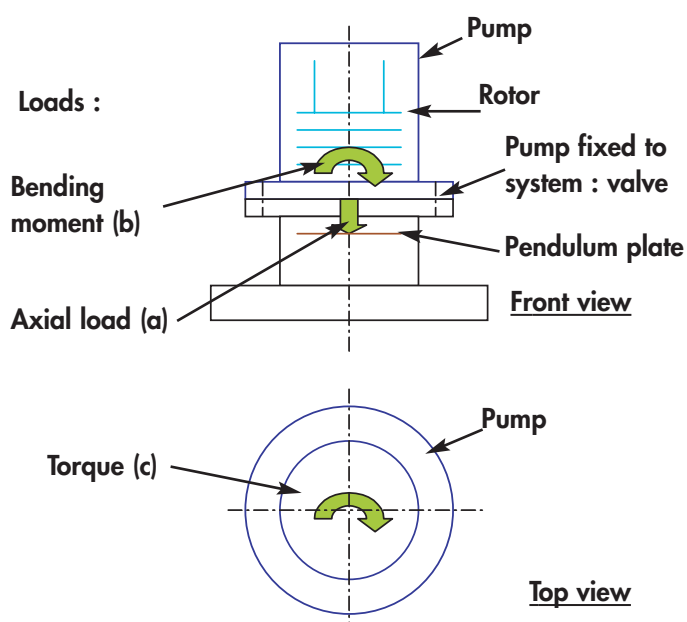
# Pump connections to an installation

## Loads transmitted to the system (cont.)

**ATH 1300 M**
**Transmitted forces on Alcatel test bench**

**ATH 1600 M**
**Transmitted forces on Alcatel test bench**
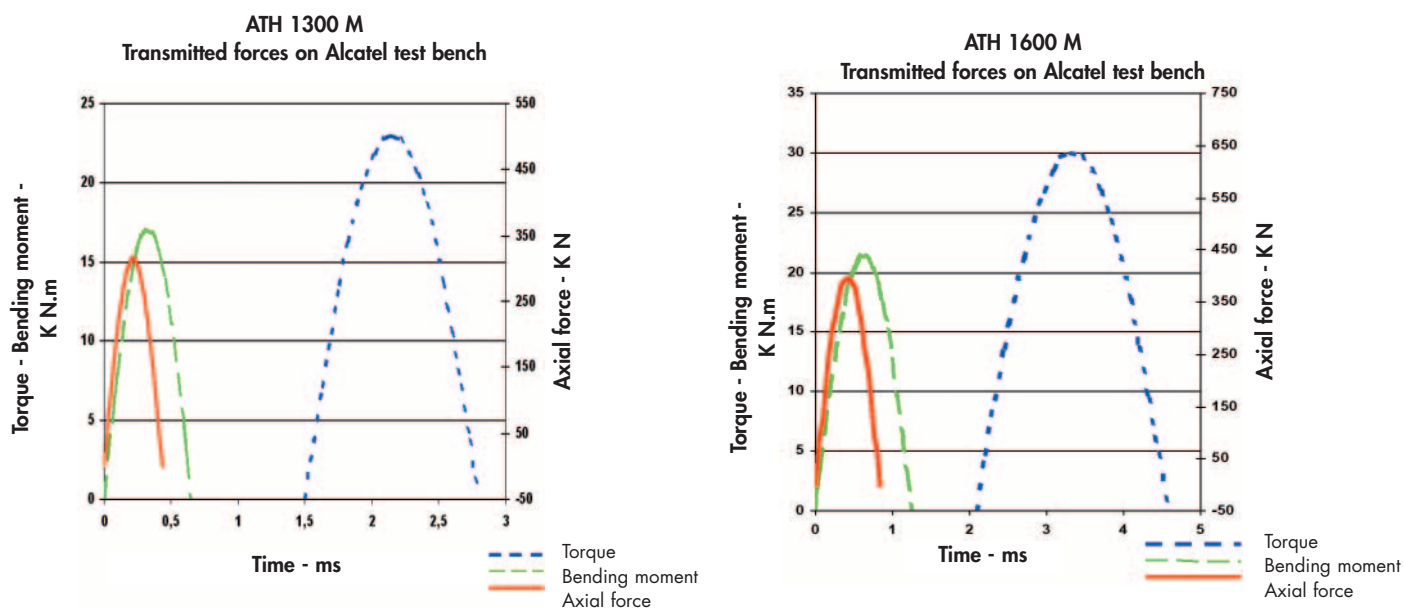
| Pump model | Unit | ATH 1300 | ATH 1600 |
|---|---|---|---|
| **Nominal speed** | (rpm) | 34000 | 39000 |
| **Energy** | kNm | 60 | 76 |
| **Torque** | Max. KNm | 23 | 30 |
| | Duration ms | 1.3 | 2.5 |
| | Delay ms | 1.5 | 2.1 |
| **Bending moment** | Max. KNm | 17 | 21 |
| | Duration ms | 0.7 | 1.3 |
| | Delay ms | 0 | 0 |
| **Axial force*** | Max. KN | 0<<316 | 0<<398 |
| | Duration ms | 0.4 | 0.8 |
| | 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

**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 1300 - ATH 1600 | | | |
|---|---|---|---|---|
| Inlet flange | DN200 ISO-F | DN250 ISO-F | DN200 CFF | DN250 CFF |
| 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 |

**WARNING**

**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.**

**WARNING**

**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.

# Pump connections to an installation

**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 Alcatel Vacuum Technology for calculation support.
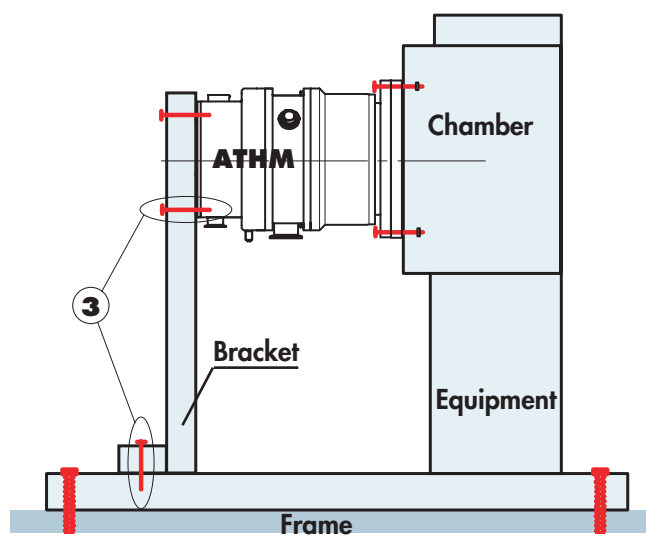


The equipment frame on which the pump is installed must be sufficiently rigid to absorb the kinetic energy of the rotor in case of pump rotor crash. For this, take into account :

- 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.**

## Pump connections to an installation

**The pump can operate in any position**



In.

In.

In.

In.
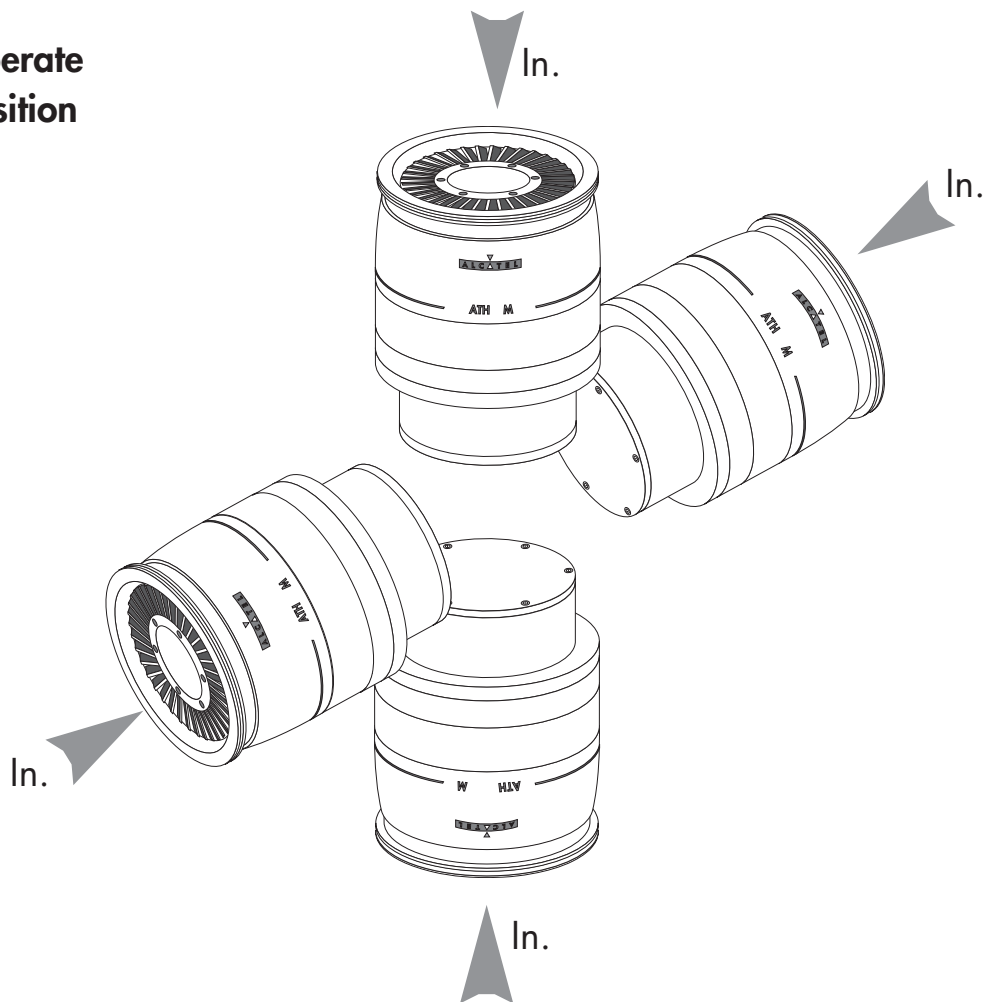
# Inlet and exhaust connections

**Vacuum connections**

> **CAUTION!** 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 see A60)**

⚠️ **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 (see instructions on E 00).

**At inlet:**

**Screen filter**

Install the screen filter accessory on the pump; connect the pump to the installation or connect a secondary isolation valve.

**Mounting of the insertable inlet flange**

Position the filter (**2**) into the inlet housing groove (**1**).

**Position the ring (3) and press it manually into the groove bottom all over its circumference.**
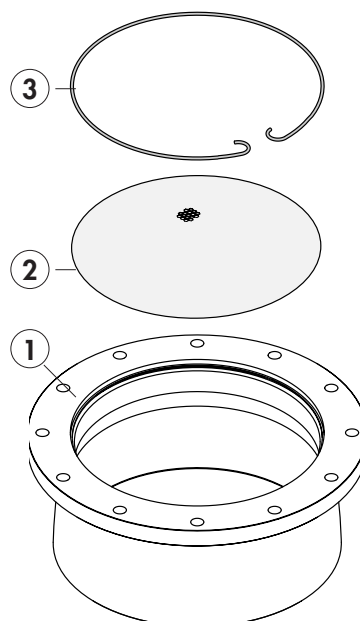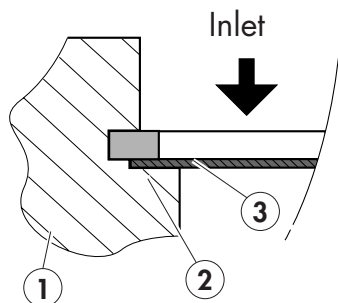
Inlet

## Inlet and exhaust connections

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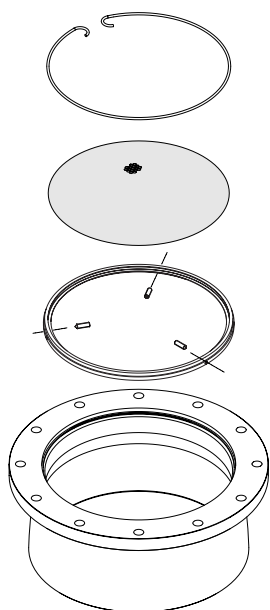
Orientate the filter-holder (**2**) according to the way of
mounting described as follows (chamfer looking to the
inside of the pump) and position it into the inlet housing.

**Fix it using the 3 screws (3**)
(hexagonnal key supplied).

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

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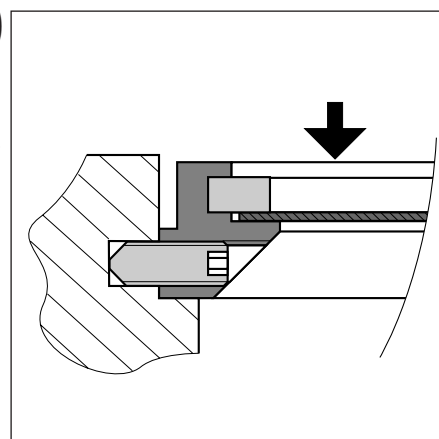
**Secondary isolation valve**

CAUTION! **It is recommended to install an isolation valve
between the chamber to be pumped and the pump inlet to
maintain the pressure in the chamber while the pump is
reset to atmospheric pressure.**

This valve can be driven
by the controller
(«ISOL.VALVE» contact
**see B 90**) and
associated with another
control function i.e., a
gauge pressure.

If the controller stops the
pump by opening the
air inlet valve, the
contact opens and closes the secondary isolation valve.

**Secondary isolation valve**

**V2**

ACT - Dry Contacts

**ATH**
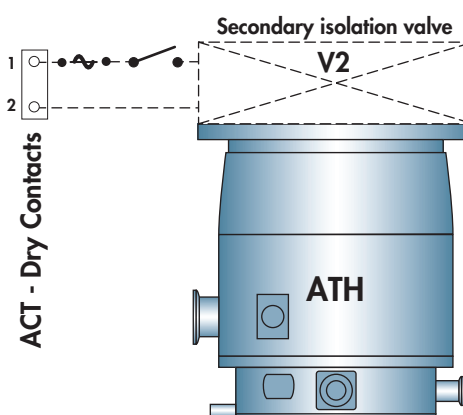
# Inlet and exhaust connections

**At exhaust:**

⚠ **WARNING**

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

**Primary isolation valve**

CAUTION! **It is highly recommended to install an isolation valve, (closed with power off) between the ATH 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 such as an Alcatel bracket valve **as near the pump exhaust as possible** depending on the space available and the accessories installed.

Connect the valve to the primary pumping circuit.
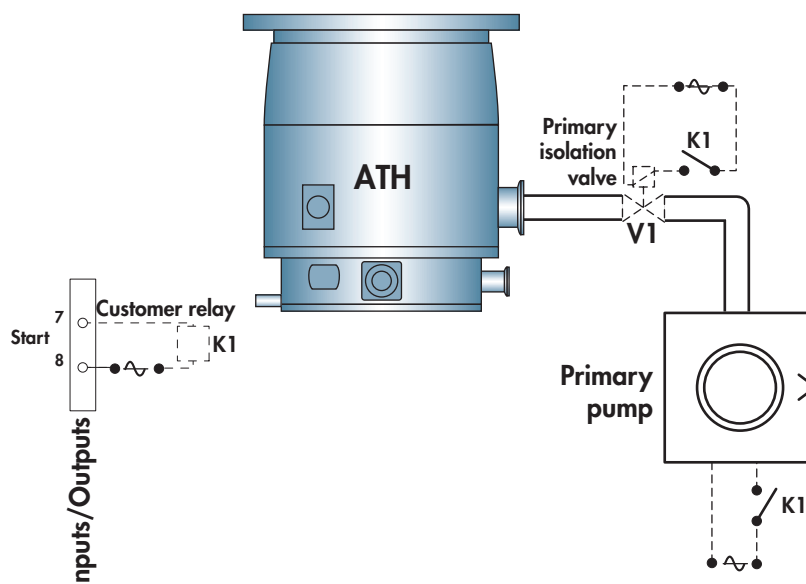
# Air inlet valve connection (option)

**Function**   **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 *(see C 50)*.

## Vacuum connection

### Without purge device

Inert gas

Blank-off frange
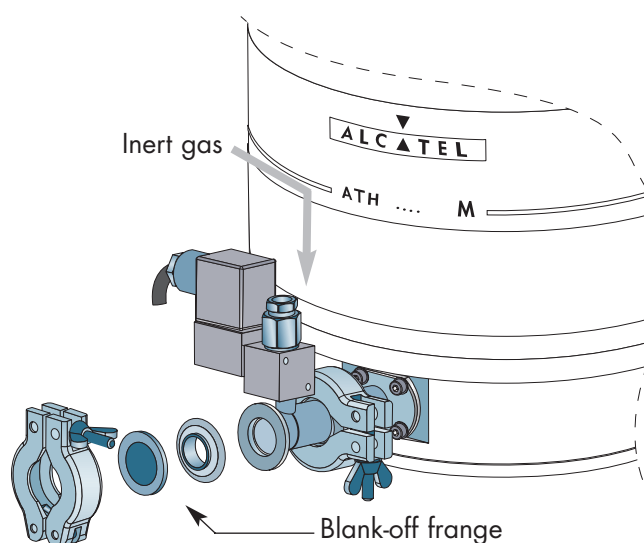
Air inlet valve is delivered with a DN 16 long nipple not used in this installation.
Install the valve on the DN 16 fitting of the pump.
The valve must be connected to an inert gas line which can be for example dry nitrogen (Pressure between 1 and 1.5 bars absolute) *(see B 50 for nitrogen characteristics)*.
Connect the inert gas line with a rigid stainless stell or flexible pipe (ext. diam 1/4").

### With purge device    *See B 50* .

## Air inlet valve connection (option)

**Electrical connection**

Connect the valve (12 VDC) powered and driven by the controller via the **«AIR VALVE»** contact **on the Dry Contact connector** *(see B 90)*.

Air valve 12 VDC

7
8

ATH

V3
N2
Air inlet valve
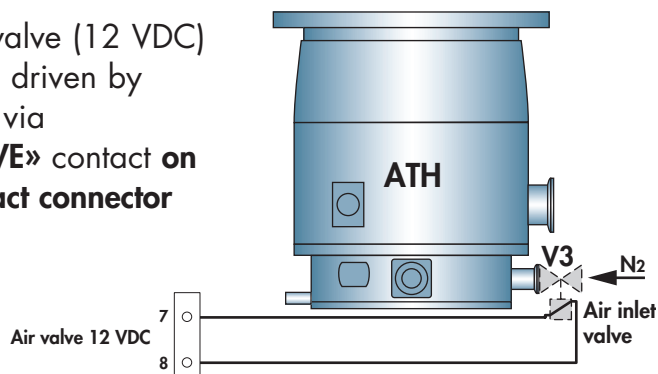
It is also possible to connect another valve on the **«AIR INLET»** contact **on the Dry Contact connector** but, in this case, you must use an external power supply.

Air inlet

9
10

ATH

V3
N2
Air inlet valve
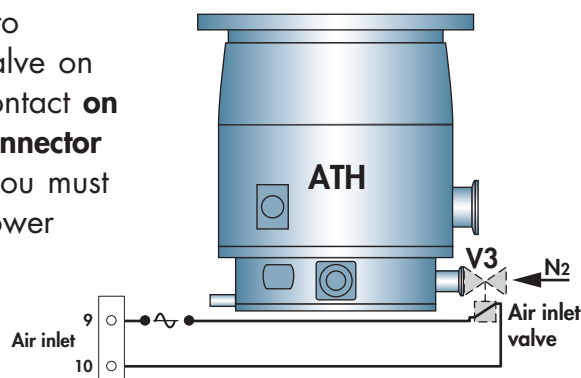
For this:
- use a NC (Normally Closed) valve,
- use an external power supply,
- connect the air inlet valve between "9-10" contacts,
- adjust the inert gas pressure to 1.1/1.5 bar (absolute pressure).

**Protective earthing instruction**

The grounding wire of the air inlet cable has to be fixed to the grounding fixation on the ACT rear panel.

Air Inlet valve grounding cable

Air Inlet valve cable
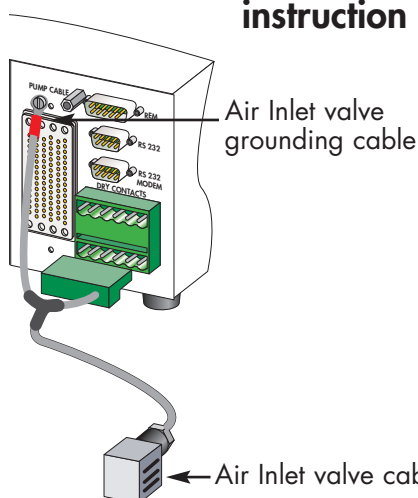
**See C 30** to configure the menus "Time to venting" and "Venting time" parameters.

# Nitrogen purge device connection

**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 1.5 bar.

**Purge connection without air inlet valve**

> CAUTION! **The nitrogen purge must be connected directly to the pump exhaust port.**



**N2 purge**

1/4 connector

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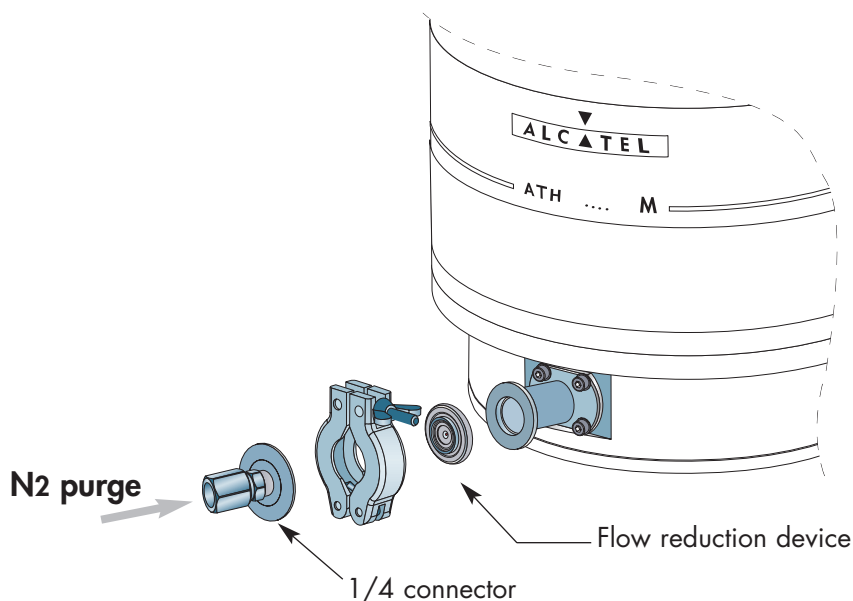
Connect the nitrogen supply to the DN 16 purge fitting*. The nitrogen flow reduction device controls the pressure and guarantees a flow rate of 50 SCCM at pressure 1.1 bars.

Note: N2 supply can be equipped with a massflowmeter, and in this case, it is not necesssary to install the flow reduction device.

* Different connection accessories can be found in the ALCATEL catalog.

## Nitrogen purge device connection

**Purge connection with air inlet valve**

CAUTION! **The nitrogen purge must be connected to the air inlet valve so as not to disturb its operation, and not between the valve and the pump.**

**1st case:
Purge can be stopped during pump running**

N2 purge

Air inlet valve →

ALCATEL

ATH .... M

**N2 purge** →

1/4 connector

Flow reduction device*
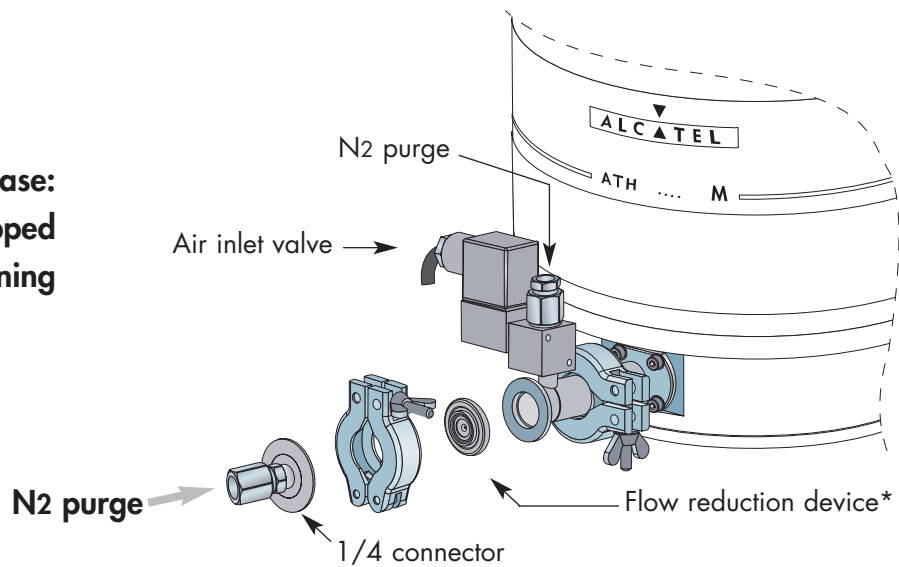
Note: N2 supply can be equipped with massflowmeter and, in this case, it is not necessary to install the flow reduction device.

**2nd case:
Continous operation of the purge**

Air inlet valve

ALCATEL

ATH .... M

**N2 purge** →

1/4 connector

Long nipple

Flow reduction device*
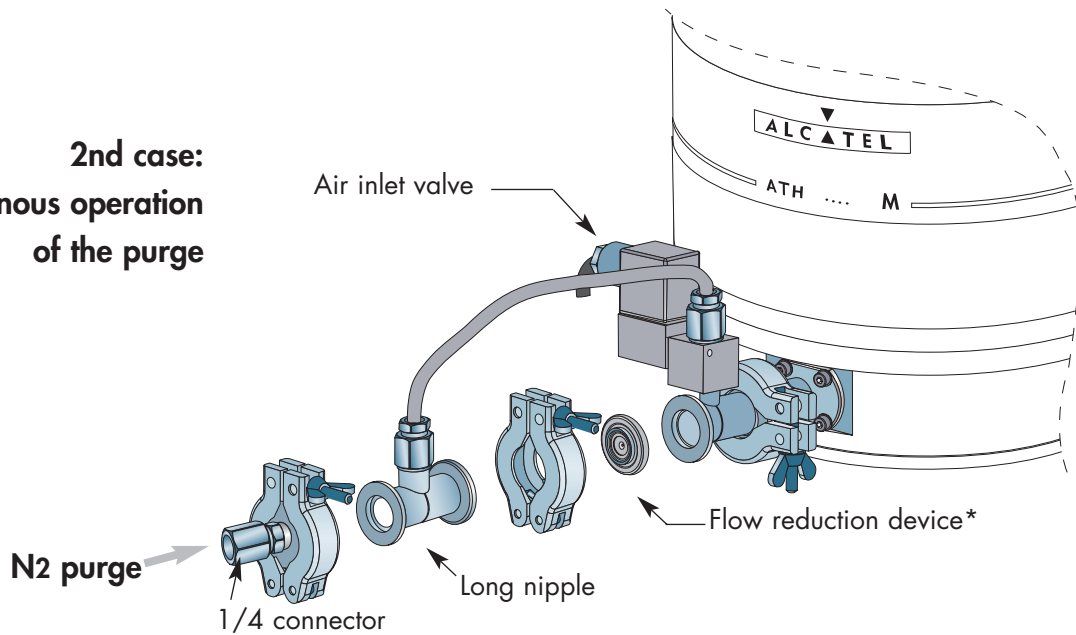
* 50 SCCM: standard furniture.
25 SCCM: upon request (accessory)

Connect the little flexible pipe between the long nipple and the valve.

# Nitrogen purge device connection

**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 *(see A 50)*.
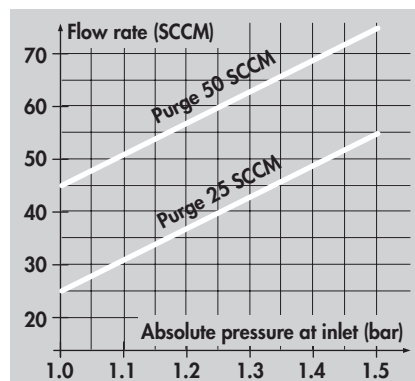


CAUTION! **When the neutral gas purge is stopped, the pumped process gases can passed from fore vacuum side to the high vacuum side, and condensate, eventually, damage internal maglev bearings.**
**We provide to monitor purge flow to warranty a permanent gas flushing for maglev back-up bearing protection.**

# 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$^3$
- Resistivity > 1500 $\Omega$.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 1300 M and ATH 1600 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).
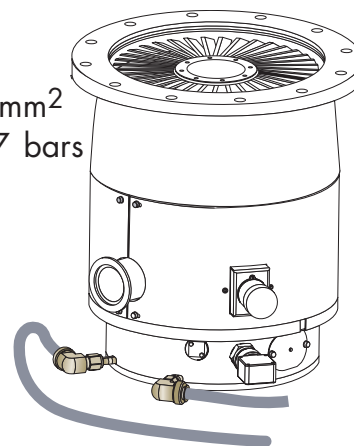
**For ATH 1300 MT and ATH 1600 MT model**

- 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 *(see A 60)*:
- Connect the other nipple to the draining circuit.

Water outlet

Water inlet
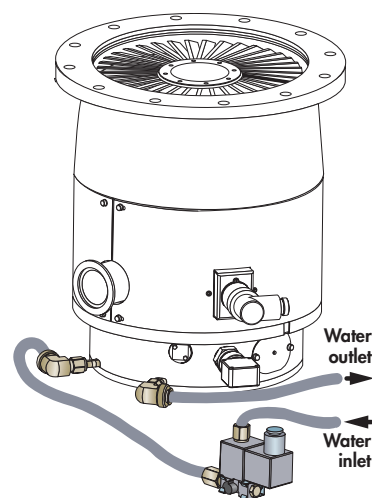
| CAUTION | Avoid to screw the connector on the valve inlet port using a 13 mm flat wrench, to maintain it (water leak risk). |
|---|---|

# Water cooling connection

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

**Electrical connection**

**Temperature is regulated by the controller.**
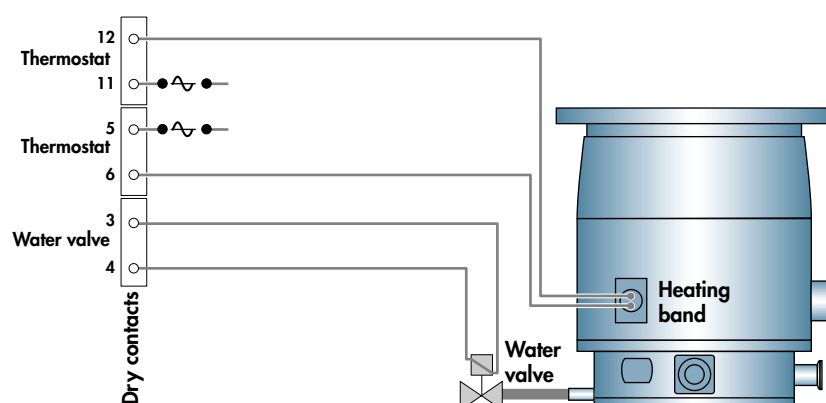


Connect the water valve via the «WATER VALVE» contact on the DRY CONTACTS connector.
The temperature is regulated by a sensor integrated into the pump (***see B 70***).

**Protective earthing instruction**

The grounding wire of the water valve cable has to be fixed to the grounding fixation on the ACT rear panel. (see B 70 - 1/3).

# Heating band connection

<table>
<tr>
<td>⚠ <strong>WARNING</strong><br><br>HAZARDOUS VOLTAGE ENCLOSED<br>Danger risk of electric shock, disconnect main power source and heater power. (if heater is used, max 110/230 V, 300 VA, 50/60 Hz). Prior to servicing and wait 5 minutes before working on this equipment.</td>
<td><strong>Voltage or current hazard sufficient to cause shock. Disconnect and isolate power before servicing.</strong></td>
</tr>
</table>

**For thermostated MT models**

These pumps are equipped with an heating band, a thermal sensor and a valve to regulate the water flowrate. The body of the pump can be heated to 75°C to avoid gas condensation in the pump on the semiconductor processes.

**Connection** Connect the thermostatic cable as follows:



Water valve grounding cable

INPUTS/OUTPUTS

PUMP CABLE

REM.

RS 232

RS 232 MODEM

DRY CONTACTS

Connect to the «Dry Contacts» on terminals 5-6 and 11-12, or on the machine if the temperature is regulate by the customer device **(see B 90).**

⚠ **Don't forget to connect the connector to the ground. (Screw M5).**

Thermostatic cable

Water valve cable

Connect to the water valve

Connect the thermostatic cable to the power line (main with ground connection).

Ex: model ATH 2300 MT

Connect to the heating band on the pump

# Heating band connection

**Heating band temperature**

**Temperature is regulated by the controller.**
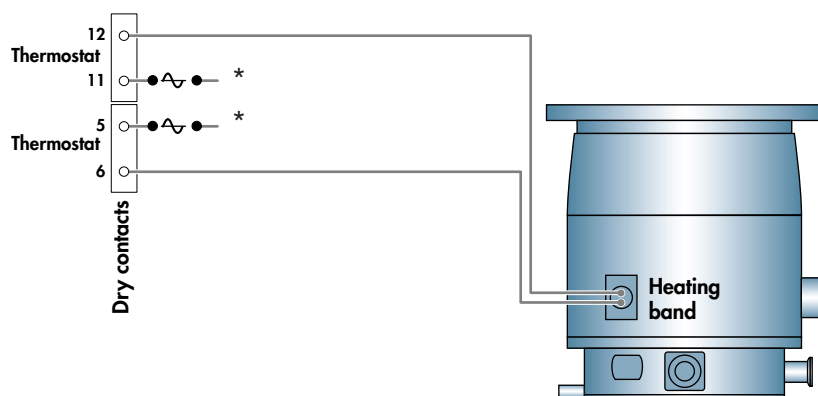


Connect the heater cable via the «THERMOSTAT» contact on the DRY CONTACTS connector and to the power line (110 or 230 VAC).
The heater cable (110 or 230 V) (*see A 50*) must be choosen in function of the power supply (110 or 230 V).

The temperature can be choosen on the controller (between 31 and 75°C or OFF).
By choosing «OFF» temperature, the heating band is switched off and the pump is cooled permanently.
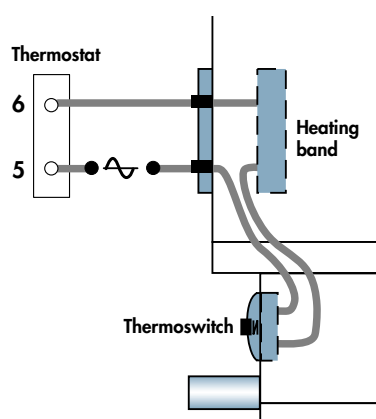
The temperature of the pump can be read on the display of the controller *(see C 30)*.

On certain type of pumps,
a thermoswitch is integrated and cut the power supply of the heater at pump body temperature of T > 100°C.
The thermoswitch is manually resetable from the outside of the pump.



> **⚠ WARNING**
> **HOT SURFACE**
> Contact may cause burn.
> Do not touch or wear protective gear before servicing.
>
> **The sticker «hot surface» must be sticked conspicuously on the pump housing.**

> **⚠ WARNING**
> **Hot surfaces are signalled by a label-sticked on hot surfaces. The pump housing temperature can reach 75° C. Contact may cause burn. Do not touch or wear protective gloves before servicing.**

* External power supply in accordance with the heater band voltage.

## Electrical connection

> ⚠ **WARNING** Make sure that main switch is off during electrical connection. Danger, risk of electric shock: disconnect main power source and heater power prior to servicing (if heater is used, max. 110/230 V, 300 W, 50/60 Hz).

> ⚠ **WARNING** Study the preliminary precautions (See B 10).

> ⚠ **WARNING** All the internal electrical connections required for use the pump are made prior shipment. However, the electrical connection of the main power supply may be provided by the process tool. An out of phase condition is corrected automatically by the controller.

> ⚠ **WARNING** An IEC 417#5019 symbol is located on the rear panel.

> ⚠ **WARNING** The pump doesn't have any internal overcurrent protection, so it is required to power the pump from a facilities supplied main circuit breaker rated 10 A minimum, and which has a minimum amp. interrupting current of 10 000 AIC.

> ⚠ **WARNING** This pump is not equipped with an emergency stop EMO device because it is designated for use on process tools and integration with the process tool EMO.
> Check that the pump is correctly connected to the equipment emergency stop system.

> **CAUTION!** An internal input contact can be used to signal a roughing pump power failure (see B 91).
> This will stop the turbomolecular pump avoiding overpressure risk in the pump.

# Electrical connection

**Controller installation**

The unit must be installed in an environment ventilated either by natural convection or by the movement of forced air. Cooling is normally performed by an internal fan which ventilates air from the inside to the outside of the unit.

> **CAUTION!** **Make sure that:**
> - **the openings on the bottom, top and rear of the unit are not blocked;**
> - **the ambient temperature does not exceed 50°C;**
> - **a free space of at least 15 mm is left behind, above and below the unit;**
> - **the controller location is at a height between 64.5" and 11" from the floor.**

**Connections**

Make various connections if dry inputs/outputs are used *(see B 91)*.

Connect the connector with 2 squares and 2 screws M3.

Connect the **RS 485** serial link to this connector *(see B 100)*.
Analog output is available on this connector *(see B 100)*.

Connect the **RS232** serial link cable to the connector (cable supplied by customer). *(see B 110 and B 120)*.

Not used

Some output contacts are available on terminal **DRY CONTACTS** *(see B 90)*.

Electrical grounding of controller frame (M5) for EMC accordance.

Secure manually the **2** assembling **screws.**

**⚠ WARNING**
HAZARDOUS VOLTAGE ENCLOSED
Danger risk of electric shock, disconnect main power source and heater power. (If heater is used, max 110/230 V, 300 VA, 50/60 Hz). Prior to servicing and wait 5 minutes before working on this equipment.

Connect the **controller to the power supply** using the cable supplied. (Main with ground connection).

Connect the **controller to the pump** using the cable ordered.

Delayed fuses (x2) located below the controller: 16A - T - 250V *(see F 10)*.

# Electrical connection

## Connection between pump and controller

**On the pump connector**

**1** - On the pump connector, identify the main index on the pump connector.
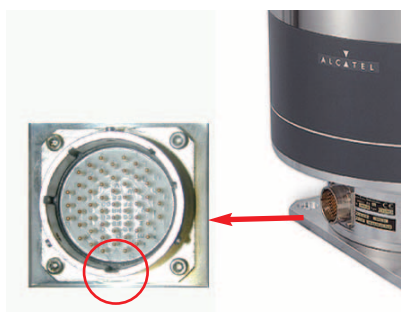


**2** - Then identify the main index on the cable connector.



**3** - Insert the connector in accordance to the main index and then, press the bayonet type connector axially into place and rotate the bayonet ring at the same time until it locks into position (feel the « click »).

If it is difficult to press and rotate, remove the connector and check the pins on the pump connector (bent pins).

Try again.

Press

Rotate
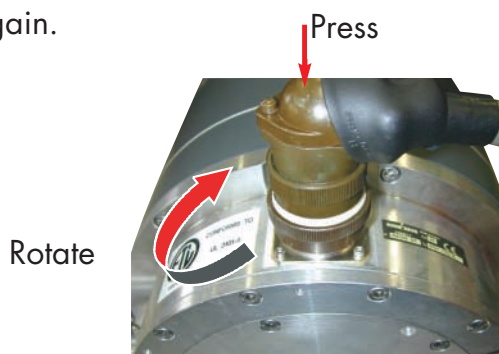
## Electrical connection

**On the controller connector**

Remove the two screws attached to the controller before plugging the connector.
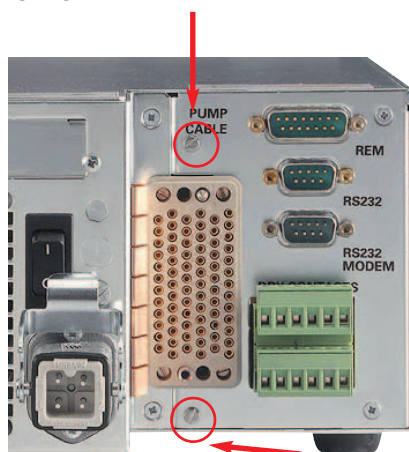


**If you fail to remove the 2 screws, you will not be able to insert the connector, fully : that may cause electrical damage to the controller.**

Locate the male and female index screws on the connector.



Male screw

Female screw

Female screw

Male screw
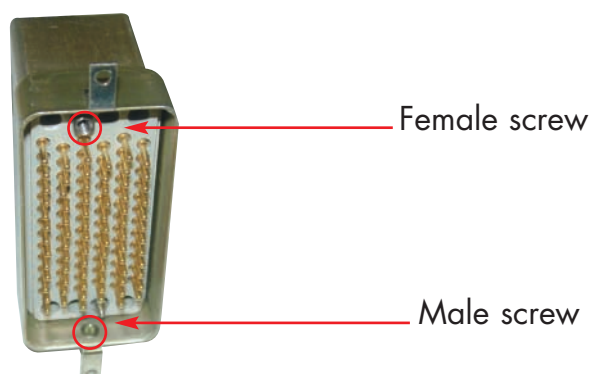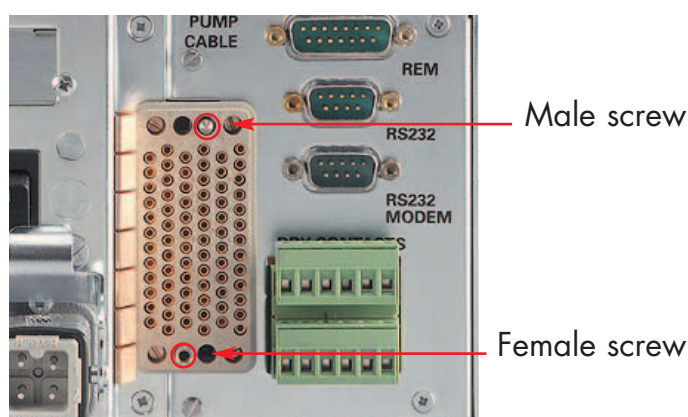
## Electrical connection

Plug the connector accordingly and press the connector axially, tighten **manually** the 2 screws at the same time **(Don't use a screwdriver).**
**Caution: if you use a screwdriver, take care to the applied torque.**
**There is a risk to break the head screw or the connector.**
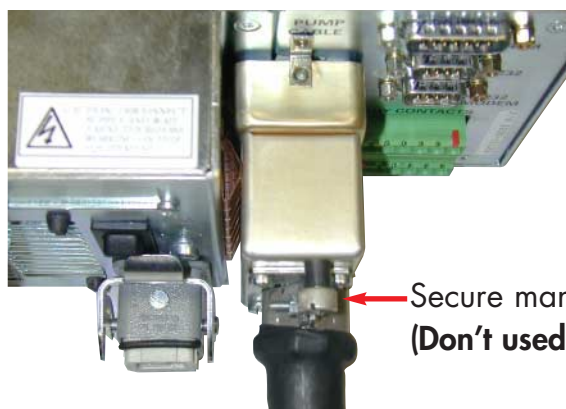


Secure manually the 2 screws.
**(Don't used a screwdriver).**

Assemble the two small screws that you had previously disassembled and check that the surfaces are in contact with the ACT.

Surface in contact
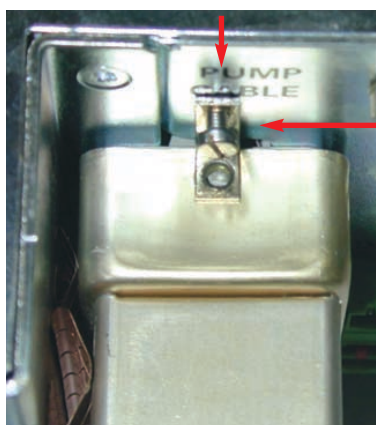


**Caution: If the two surfaces aren't in contact, it means that the connector is not in well installed, an electrical damage can occur.**

## Electrical connection

**Main power connection
At the rear of the
controller**

Check that the seal is available on the controller connector.

Identify the main index.



Index

Seal
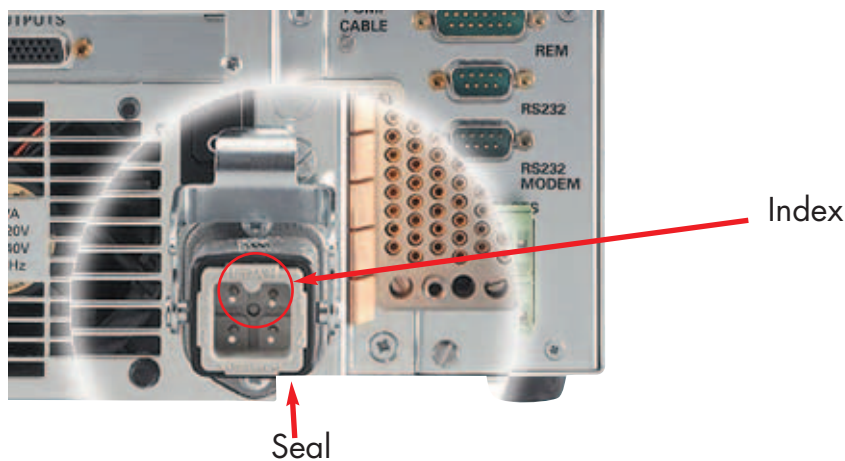
Identify the main index on the female HARTING connector.
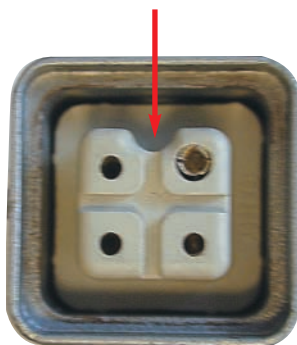


Plug the female connector in accordance to the main index, and lock the connector.



Lock

# B 80
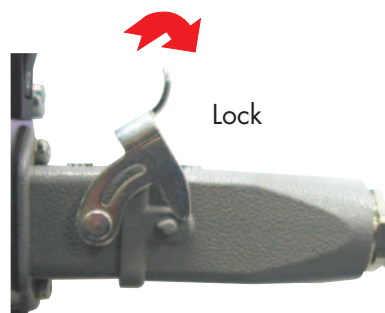
## Electrical connection

### Typical connection

**In this installation, we use:**

- A primary isolation valve **V1** between the ATH and the roughing pump;
- a secondary isolation valve **V2** between the ATH and the chamber to be pumped;
- a relay **K1**, their contacts drive the valve **V1** and the primary pump power supply;
- the thermostatic option.



Pump cable includes temperature sensor information
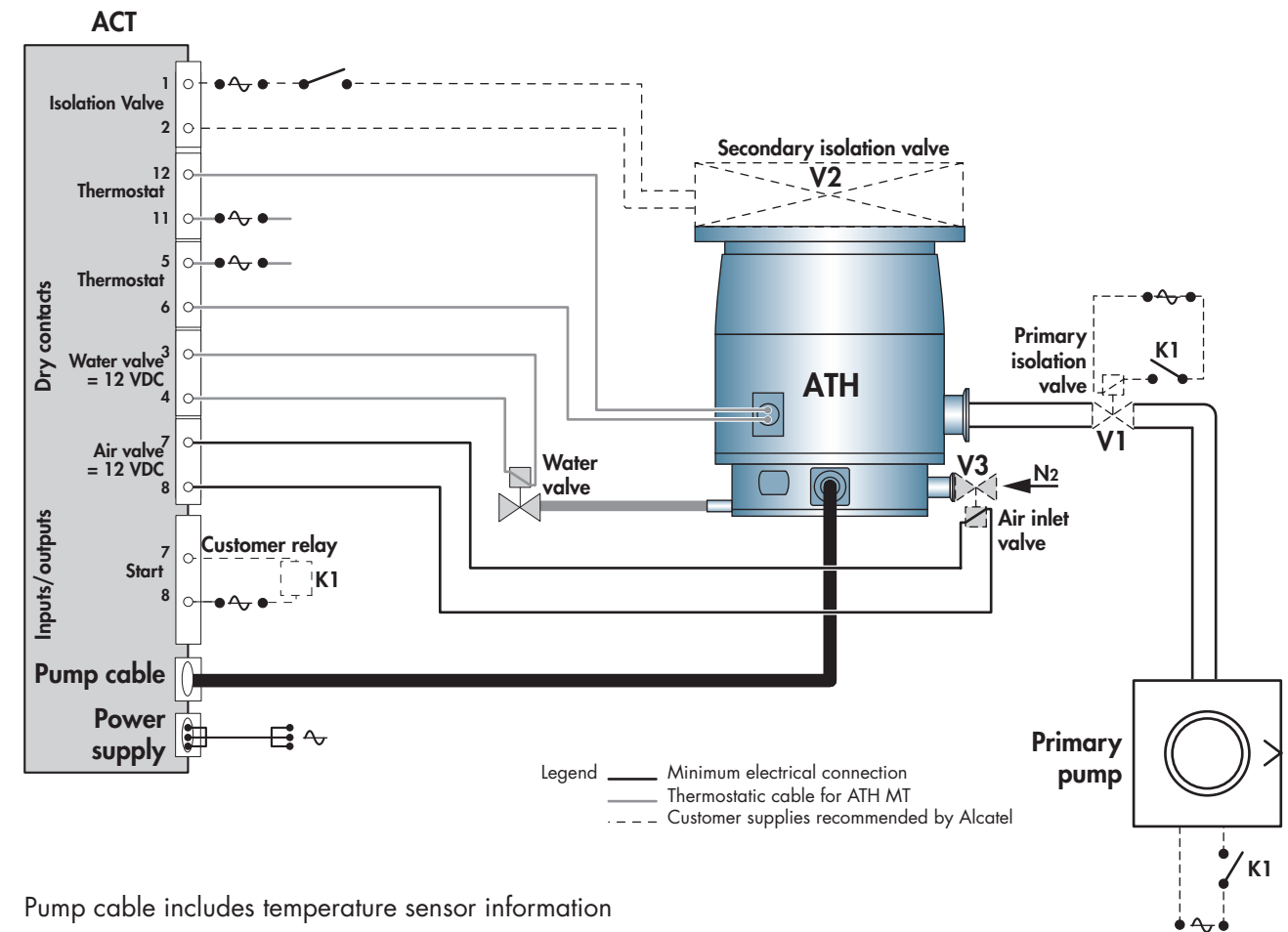
**Wiring diagram in case of temperature regulation with the controller**

# "Dry contacts" connector wiring

CAUTION! When the units containing the control circuits are equipped with dry contacts outputs, it is the customer's responsability to use the outputs in compliance with safety regulations.

## Signaling using outputs

Their functions are to copy the data concerning the pump operating status.
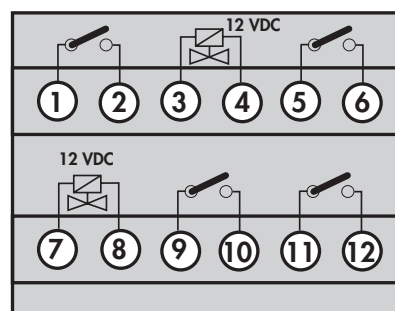
## Dry contact outputs
## 250 VAC - 3 A max

**⚠ WARNING**
HAZARDOUS VOLTAGE ENCLOSED
Danger risk of electric shock, disconnect main power source and heater power. (if heater is used, max 110/230 V, 300 VA, 50/60 Hz). Prior to servicing and wait 5 minutes before working on this equipment.

| | |
|---|---|
| Isol. valve   **1 - 2** | When the controller detects a bearing operating fault, it opens the contact. After a stop, it opens when the rotation speed reaches 10000 rpm. **This contact can be used to control a secondary isolation valve** which is used to maintain the pressure in the chamber while the pump is reset to atmospheric pressure. |
| Thermostat   **5 - 6** **11-12** | The contacts are opened or closed, depending on the pump temperature and the selected temperature. |
| Air inlet*   **9 - 10** | Depending on the previous configuration the contacts are closed (*see C 50*). |

## Controller outputs
## 12 VDC

| | |
|---|---|
| Water valve **3 - 4** | The voltage delivered on this output depends on the pump temperature and the selected temperature. |
| Air valve*   **7 - 8** | The voltage is delivered on this output during the "Venting time" according to the configuration (*see C 50*). |

\* Stop / Ext. fault functions allow to close the contacts at 10000 rpm + setted delay.

## Contact functionnal status

| | Power off | Power on | Stop | Start on | Nominal speed | Alarm | De |
|---|---|---|---|---|---|---|---|
| ISV | | | (1) | | | | |
| Thermos. | | | | *Depending on temperature parameter* | | | |
| Water valve | | | | *Depending on temperature parameter* | | | |
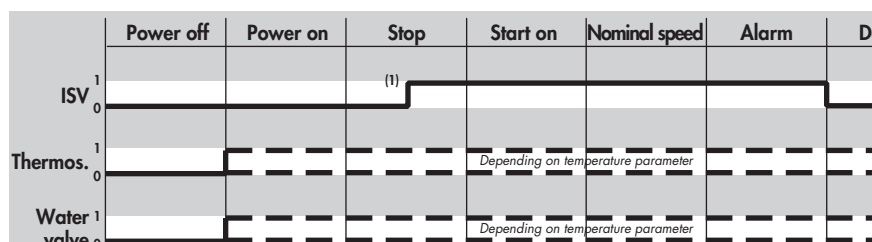
(1) This function is valid at 10000 rpm + setted delay when Stop or Ext. fault commands are activated.

# "Inputs/Outputs" connector wiring

CAUTION! **When the units containing the control circuits are equipped with dry contacts outputs, it is the customer's responsability to use the outputs in compliance with safety regulations.**

CAUTION! In the case of a **local mode operation** of the controller, the pump will run only if **the terminal plug** (delivered with the controller) **is connected on the "Inputs/Outputs" connector**.

**Terminal plug type DB 44 contacts male connector**



Factory wiring
(Soldered-side view)
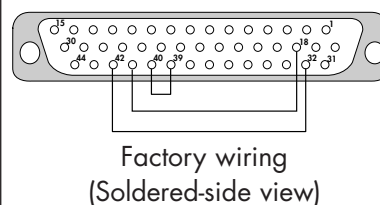
**The control by voltage**

The" inputs/outputs" connector is located at the rear of the controller (DB 44 contacts, female connector).
The inputs are considered to be activated if the AC or DC voltage applied is between 5 and 30 Volts (fig 1).



Wiring supplied by customer

5 to 30 V

fig 1
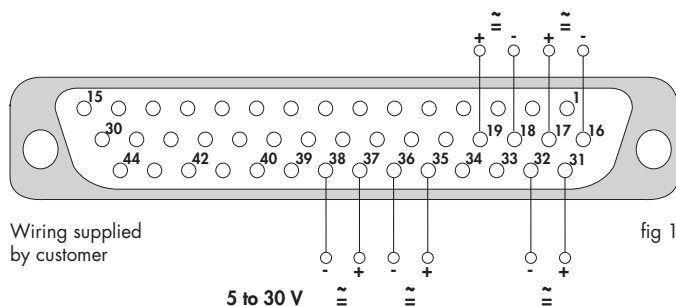
**The control by dry contacts with "input control" mode**

These inputs can be controlled by customer equipment external contacts (fig 2).



Mode input control

Wiring supplied by customer

Start    Stand-by

Inhibit

Ex. fault

Stop

fig 2
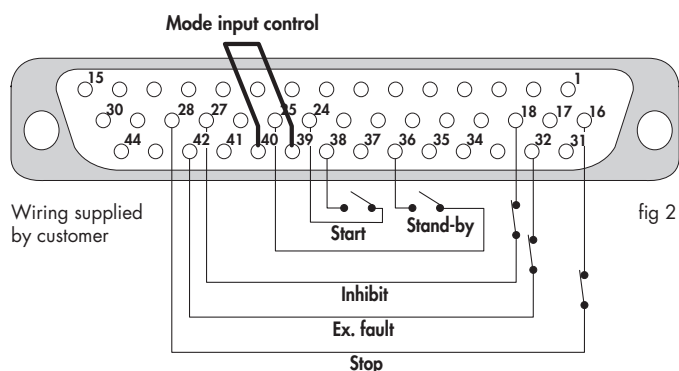
It is necessary to read the following table for more information.

## "Inputs/Outputs" connector wiring

"Input control" mode

Sub D 44 Pts Fem. on ACT



| | | Command mode | | |
|---|---|---|---|---|
| | Function | Voltage 5V/30V DC/AC | Dry contacts "Input control" mode (Strap 39-40)[1] | |
| **INPUTS** | **Remote function if "Remote" mode selected** — Remote start[2] | 37(+) 38(-) | 38(-) GND | - "Remote stop - Ext. fault - Inhibit" inputs must be valid.<br>- The "Remote start" allows pump starting when an impulse or a permanent action is applied on this input. |
| | Remote stop[2] | 17(+) 16(-) | 16(-) GND | When the input is disabled, the motor is stopped by impulse or by permanent action.<br>Restart the pump as follows:<br>- desable " Remote start"<br>- valid "Remote stop"<br>- valid again "Remote start" |
| | Remote standby | 35(+) 36(-) | 36(-) GND | - When the "Standby" is validated, the rotation speed corresponds to the setted speed (*see C30*).<br>- When the "Standby" is disabled, the rotation speed corresponds to the nominal speed. |
| | **Not "Remote" mode dependent (safety)** — External fault | 31(+) 32(-) | 32(-) GND | - When the "External fault" input is desabled the motor is stopped. Actions on the start, stop key (or remote) are desactivated.<br>- Restart the pump by validating the input "Ext. fault", and activate the "Start" (key or remote). |
| | Inhibit | 19(+) 18(-) | 18(-) GND | - When the "Inhibit" is disabled, the controller doesn't supply the motor and inhibit the progressing function. There is no air inlet, the actions on the start, stop (key and remote) are desactivated.<br>- When "inhibit" is valid, the controller powers the motor and restores the previous operating status. |
| | 24, 25, 26, 27, 28, 29, 41, 42 | | Ground | |

[1] "Input control" mode: by strapping terminals 39-40, all the (+) terminals are supplied with 15 VDC.
Connect the (-) terminals to the dry contact and to the ground.

[2] If the equipment has only one output to stop and start the pump it is possible to order "start" and "stop" in same time.

# "Inputs/Outputs" connector wiring

## The output dry contacts

Sub D 44 Pins Fem. on ACT

Output

Dry contact
30 VAC RMS/60 VDC-1A
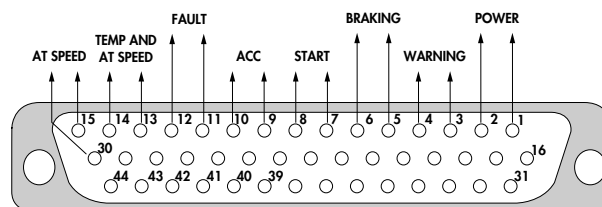


The output dry contact functions is to copy the data concerning the pump status.

| OUTPUT | Not "Remote" mode dependent (safety) | Power | 1 - 2 | - The POWER contact is closed following the power-up and after approximately 20 seconds. In case of power failure, this contact opens at ≈ 10000 rpm |
|---|---|---|---|---|
| | | Warning temperature | 3 - 4 | - The WARNING contact is opened when the pump temperature reaches alert threshold. It remains open when the pump temperature is greater than the alarm threshold.<br>- The WARNING contact closed at temperature below the alert threshold minus 2°C (Hysteresis). |
| | | Braking | 5 - 6 | - The BRAKING contact is closed when the pump decelerates to reach zero speed following a STOP, INHIBIT, or EXTERNAL FAULT action. THE BRAKING contact is always open at speeds below 400 rpm.<br>- The BRAKING contact is opened after a START action. |
| | | Start | 7 - 8 | - The contact is closed when the START control is activated on the controller. The contact can be used to control a primary isolation valve and via a power relaying device, to control the primary pump. |
| | | Accelerating | 9 - 10 | - The ACCELERATING contact is closed when the motor is in acceleration phase with a speed over 400 rpm. It remains closed until the setted speed is reached.<br>- The ACCELERATING contact is open when a STOP, INHIBIT, or EXTERNAL FAULT action is taken into account. |
| | | Fault | 11 - 12 | - The FAULT contact is open following the appearance of any fault (external, temperature, frame, motor, etc…).<br>- The contact is closed if there are no faults. |
| | | At speed and thermostatic Temperature | 13 - 14 | - The AT SPEED and THERM. TEMP contact is closed when the setted speed is reached or when the pump is in overspeed mode (in the event of modification of reference speed), and when the temperature is greater than the heating temperature minus 3°C (if thermostatic temperature setted "ON").<br>- The AT SPEED and THERM. TEMP contact is opened when a STOP, INHIBIT, or EXTERNAL FAULT action is taken into account, or when the pump temperature is not reached, or when the speed decreases under the threshold "relay speed" setted*. |
| | | At speed (only) | 15-30 | - The AT SPEED contact is closed when the setted speed is reached or when the pump is in overspeed mode (in the event of modification of reference speed),<br>- The AT SPEED contact is opened when a STOP, INHIBIT, or EXTERNAL FAULT action is taken into account, or when the speed decreases under the threshold "relay speed" setted*. |

* This threshold can be set between - 3% and - 50%. It can be accessed on the front panel using the "SET UP" and "RELAY SPEED" menu.

# "Rem." connector wiring

**"Rem." connector at the rear of the controller**

Analog output (0-10V)

0V



RS485 V(+)

RS485 V(-)
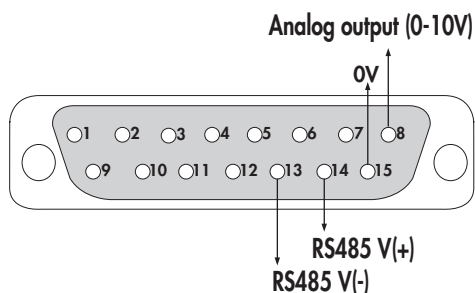
| Analog. Output 8 - 15 | Used to monitor the selected parameter (see ANALOG OUT menus C 30). |
|---|---|

**Analog output signal**

The signal is transmitted between terminal 8 and 15 of the remote connector.
Four values can be used to plot curves:

| Pump rotation speed* | 360 rpm (OV) to | 60000 rpm | (10V) |
|---|---|---|---|
| Pump temperature | 0°C (OV) to | 100°C | (10V) |
| Controller temperature | 0°C (OV) to | 100°C | (10V) |
| Current | 0mA (OV) to | 8700mA | (5.8V) |
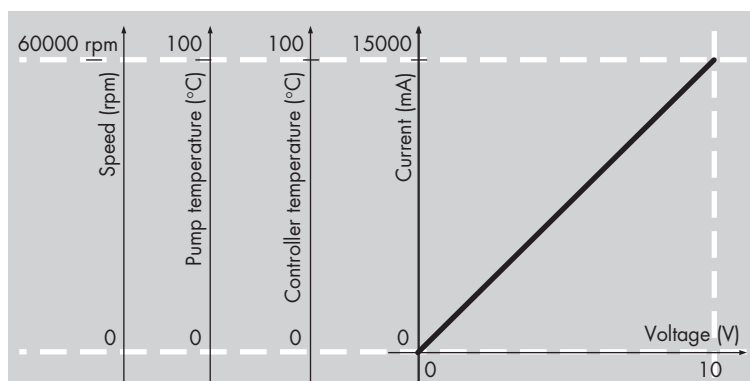


Factory configuration is setted on **speed.**

*ATH 1600 ➤ 39000 rpm (6.5 V)
*ATH 1300 ➤ 34000 rpm (5.66 V)
*ATH 2300 ➤ 31000 rpm (5.16 V)

At the first power-up, the user finds the default configuration. The serial link parameters can be modified by accessing the corresponding unit menu **(see C 30)**.

The default configuration of the serial link is as follows:

- Type: **RS 232**
- Transmission speed: **9600 bauds**
- Data length: **8 bits**
- Parity: **NONE**
- Stop bit: **1**

**Refer to C 30** to customize the parameters.

**RS232 connector wiring:**

(Reception data) **RD** — **TD** (Transmission data)

(Data set ready) **DSR** — **DTR** (Data terminal ready)

— **GND** (Ground)
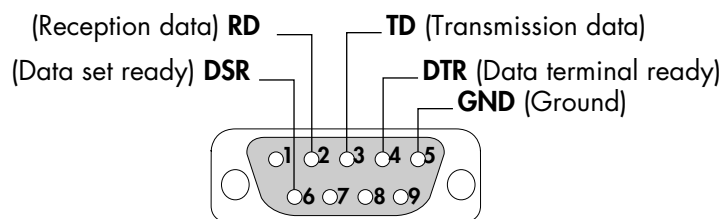


DB 9 contacts, male connector.

**Connection examples:**

**RS232 type serial link with a single controller**

## RS 232 or RS 485 serial link wiring

**Rem. connector wiring:**

**RS485 V(+)** (A)

**RS485 V(-)** (B)
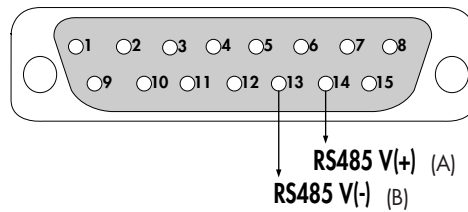
«Rem.» connector pins 13 and 14
DB 15 contacts, male connector.

**Multiple RS485 serial link:**
several units (up to 999) can
be controlled on a single link.

RS 485
communication box

V-(B)    V+(A)

(13)−    (14) +

(13)−    (14) +

(13)−    (14) +

1,5 **k**Ω
1/4 W

120 Ω
1/4 W

1,5 **k**Ω
1/4 W

V-(B)    V+(A)

End of the line wiring

GB 00742 - Edition 05 - Janvier 04
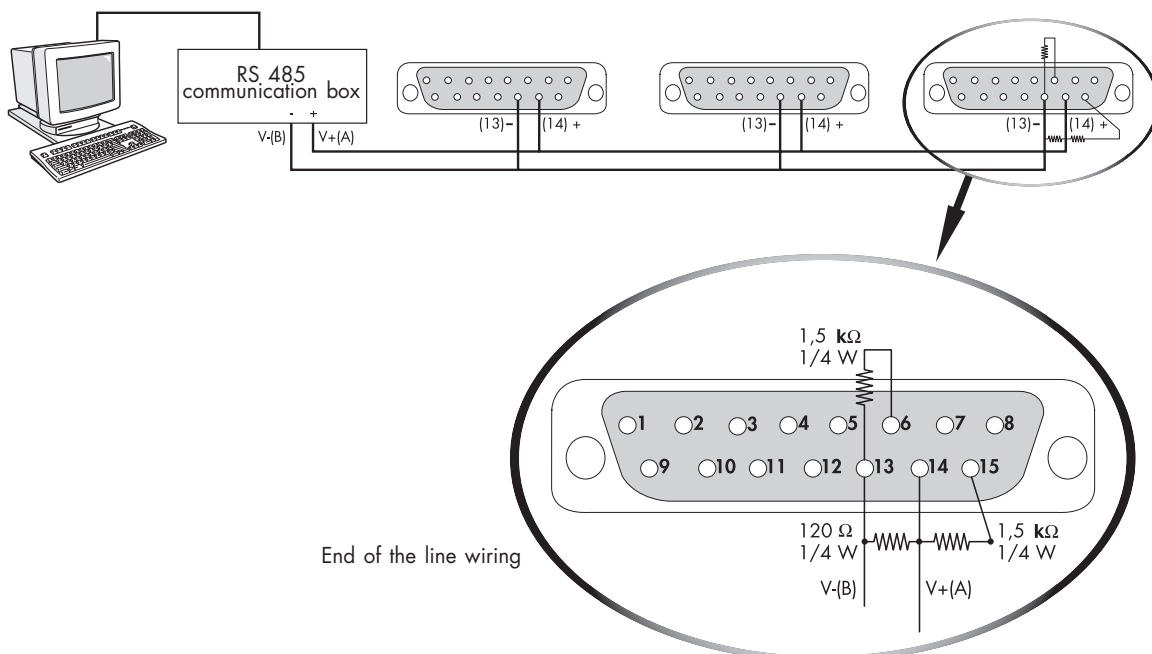
## Detailed description
## of RS232 and RS485 commands

(valid from V3.09A version variable drives)

**Conventions applicable to the syntax of all commands:**

**adr** = address, from 000 to 255
**<CR>** Carriage Return (ascii 13)
**<LF>** Line Feed (ascii 10); between square brackets: this character is not compulsory.

**Status values**

**OK** : command executed correctly

**Error messages**

**Err0** : adjustment error (out of bounds)
**Err1** : command error (syntax)
**Err2** : parameter error (e.g. non-hexadecimal character)
**Err3** : context error
**Err4** : checksum error

---

**ADR** **Specifies the address of the device for networking.**

**Syntax** #adr**ADR,**aaa<CR>[<LF>]
     adr    = address of the device before the command
     aaa    = new address of the device
     condition : $000 \leq aaa \leq 255$

**Result** #aaa,OK or Err2

This command is used to allocate a specific number to each of the products making up a network
(loop for RS 232 or parallel for RS 485).

> Note : it is important to note down the number allocated to each device.

---

**DEF** **List the faults**

**Syntax** #adr**DEF**<CR>
List the faults separated by the separator character.

**Result** #adr,OK if there is no fault.

# Detailed description
# of RS232 and RS485 commands

| | |
|---|---|
| **GET** | **List the data (data only)** |

**Syntax**  #adr**GET**AI<CR>[<LF>] : List analog inputs
#adr**GET**LI<CR>[<LF>] : List logical inputs
#adr**GET**LO<CR>[<LF>] : List logical outputs

| | |
|---|---|
| **IDN** | **Identifies the device which is communicating, and its software version** |

**Syntax**  #adr**IDN**<CR>[<LF>]

**Result**  #adr,ACT2300M - Vx.zz'

Returns the type of Variable drive Supervisor, the software version (x), the software edition (zz).

| | |
|---|---|
| **LEV10** | **Returns the state of the parameters defined by SET** |

**Syntax**  #adr**LEV10**<CR>[<LF>]

**Result**  #adr,nnnnn,sssss,00000,0,ccccc,eeeee,ddddd,pppp,qqqq,
jj,kk,lll,mmm

Returns current values:
nnnnn:  nominal speed set point (in rpm)
sssss:  stand-by speed set point (in rpm)
00000:  not used
0:  not used
ccccc:  pump working time (in hours)
eeeee:  electronic working time (in hours)
ddddd:  start delay (max 14459 s, that is 240 mn 59s)
pppp:  time to venting (max 3599 s, that is 59 mn 59s)
qqqq:  venting time (max 3599 s, that is 59 mn 59s)
jj:  speed threshold for relay (3 to 50%)
kk:  control temperature (30 to 75°C)
lll:  bearing threshold (0 to 100%)
mmm:  bearing current value (0 to 100%)

# Detailed description
# of RS232 and RS485 commands

| | |
|---|---|
| **NSP** | **Switches the speed set point to the nominal speed value** |

**Syntax**  #adr**NSP**<CR>[<LF>]

**Result**  #adr,OK

The speed set point for the pump is set to its nominal value.

| | |
|---|---|
| **OPT** | **Used to select possible user choices** |

**Syntax**  #adr**OPT**01,n<CR>[<LF>]
choice of parameters on the analog output:
n = 0  : real pump speed
n = 1  : pump current
n = 2  : temperature of pump body
n = 3  : temperature of internal electronics

#adr**OPT**02,n<CR>[<LF>]
choice of temperature unit
n = 0  : degrees Centigrade
n = 1  : degrees Fahrenheit

#adr**OPT**11,n<CR>[<LF>]
buzzer
n = 0  : without
n = 1  : with

#adr**OPT**14,n<CR>[<LF>]
remote mode
n = 0  : off
n = 1  : on

**Result**  #adr,OK

The choice of the temperature unit affects the results of the DLR and STA strings and the display (if cabinet fitted).

# Detailed description
# of RS232 and RS485 commands

**RPM**  **Defines the speed set point in stand-by mode**

**Syntax**  #adr**RPM,** nnnnn<CR>[<LF>]

**Result**  #adr,OK *or*
#adr,ErrX                    1, out of range; 2, parameters
                                        3, context (not in Standby mode)

**SBY**  **Switches the speed set point to the stand-by value**

**Syntax**  #adr**SBY**<CR>[<LF>]

**Result**  #adr,OK

Resets the stand-by speed to its Standby stored value, and
allows it to be modified if an «RPM» command is sent.
This configuration is automatically stored in user memory

**SCR**  **List all the data (titles and data)**

**Syntax**  #adr**SCR**<CR>[<LF>] : List all the data
#adr**SCR**AI<CR>[<LF>] : List all the analog inputs
#adr**SCR**AO<CR>[<LF>] : List all the analog outputs
#adr**SCR**LI<CR>[<LF>] : List all the logical inputs
#adr**SCR**LO<CR>[<LF>] : List all the logical outputs

**SEL10**  **Returns the state of the parameters defined by OPT**

**Syntax**  #adr**SEL10**<CR>[<LF>]

**Result**  #adr,a,u,1,b,r

a: Returns choice parameters on the analog output
   a=0: real pump speed
   a=1: pump current
   a=2: temperature of pump body
   a=3: temperature of internal electronics

# Detailed description
# of RS232 and RS485 commands

**SEL10
(continued)** **Returns the state of the parameters defined by OPT
(continued)**

u: Returns the choice of temperature unit
  u=0: degrees Centigrade
  u=1: degrees Fahrenheit

1: Not used

b: Returns buzzer choice
  b=0: whithout
  b=1: whith

r: Returns remote choice
  r=0: remote mode off
  r=1: remote mode on

**Result** #adr,OK

**SEP** **Defines the character which separates the parameters
in a reply**

**Syntax** #adr**SEP,**nnn<CR>[<LF>]
        nnn: 3-digit decimal value of the ascii code of the
        desired character (with leading zeros).
        condition : 000 ≤ nnn ≤ 255

**Result** #adr,OK *or* #adr,ErrX if error

Allows the user to select the character which separates
the parameters returned by the **DLR STA** and **LEV** commands.
Default value: comma «,» ascii code = 044
If ok, the selected value is automatically stored in user
memory.

## Detailed description
## of RS232 and RS485 commands

**SET** | **Defines the internal operating parameters**

**Syntax** | #adr**SET**10,ccccc<CR>[<LF>]  :  pump working time (in hours)
#adr**SET**11,eeeee<CR>[<LF>]  :  electronic working time (in hours)
#adr**SET**13,ddddd<CR>[<LF>] :  start relay (max 14459 s,
that is 240 mn59 s)
#adr**SET**14,pppp<CR>[<LF>]  :  time to venting (max 3559 s,
that is 59 mn 59 s)
#adr**SET**15,qqqq<CR>[<LF>]  :  venting time (max 3559 s,
that is 59 mn 59 s)
#adr**SET**30,jj<CR>[<LF>]  :  speed threshold for relay (3 to 50%)
#adr**SET**31,kk<CR>[<LF>]  :  control temperature (30 to 75°C)
#adr**SET**32,lll<CR>[<LF>]  :  bearing threshold (0 to 100%)
#adr**SET**33,mmm<CR>[<LF>]  :  bearing current value (0 to 100%)

**Result** | #adr,OK or ErrX

**SPD** | **Returns the current speed**

**Syntax** | #adr**SPD**<CR>[<LF>]

**Result** | #adr,nnnnn rpm

**STA** | **Returns the status of the internal dynamic parameters**

**Syntax** | #adr**STA**<CR> or STA<CR>

**Result** | #adr,sss, rrrrr, vvv, www, xxx, yyy, zzz, aa, bbbbb, ccc, ddd,
gggggggggggggggggggggggg<CR>

**adr**:  address

**s1**:  order status

| Bit | 7 | 6 INH | 5 LOCAL | 4 STOP | 3 (free) | 2 REM | 1 STDBY | 0 START |
|-----|---|-------|---------|--------|----------|-------|---------|---------|
| 0 |   | OFF | OFF | OK |   | OFF | OFF | OFF |
| 1 | 1 | ON | ON | fault |   | ON | ON | ON |

## Detailed description
## of RS232 and RS485 commands

**STA**
**(continued)**

**Returns the status of the internal dynamic parameters**
**(continued)**

**s2**:    pump status

| Bit | 7 | 6 Fault | 5 Warning temp. | 4 Braking | 3 Nom. speed and Temp | 2 Accele- rating | 1 Start | 0 Power |
|---|---|---|---|---|---|---|---|---|
| 0 | | OK | OK | OFF | OFF | OFF | OFF | OFF |
| 1 | 1 | fault | warn.T | ON | ON | ON | ON | ON |

**s3**:    valve status

| Bit | 7 | 6 At speed | 5 (free) | 4 (free) | 3 Water valve | 2 Ther- mostat | 1 Air inlet | 0 Isol. valve |
|---|---|---|---|---|---|---|---|---|
| 0 | | OFF | | | close | OFF | close | close |
| 1 | 1 | ON | | | open | ON | open | open |

| | | | |
|---|---|---|---|
| rrrrr: | speed in rpm | zzz: | Axial z12 |
| vvv: | Radial v13 | aa: | Motor voltage V |
| www: | Radial w13 | bbbbb: | Motor current mA |
| xxx: | Radial v24 | ccc: | Pump temp(°C) |
| yyy: | Radial w24 | ddd: | Controller temp (°C) |

| g | 0 = OK | 1 = ALERT | 2 = FAULT |
|---|---|---|---|
| 0 | | | D00: seized pump |
| 1 | | W01: pow. overheat | |
| 2 | | W02: mot. overheat | |
| 3 | | W03: mot. control | |
| 4 | | | D04: hall sensor |
| 5 | | | D05: overc/sensor |
| 6 | | | D06: ext. safety |
| 7 | | | D11: mag. suspens. |
| 8 | | W12: power volt | |
| 9 | | W13: pow. current | |
| 10 | | | D14: V13 |
| 11 | | | D15: W13 |
| 12 | | | D16: V24 |
| 13 | | | D17: W24 |
| 14 | | | D18: Z12 |
| 15 | | W20: bearing | D24: bear. changed |
| 16 | | W21: act temp. | |
| 17 | | W22: pump temp. | D23: pump temp. |
| 18 | | | D25: temp. sensor 1 |
| 19 | | | D26: no connect |
| 20 | | W28: eeprom write | D30: eeprom check |
| 21 | | | D29: input power |
| 22 | | | D31: coding |
| 23 | | | D32: no connected |
| 24 | | | D33: temp. sensor 2 |

# Detailed description
# of RS232 and RS485 commands

| | |
|---|---|
| **TIT** | **List the data titles** |

**Syntax**   #adr**TIT**AI<CR>[<LF>] : List analog inputs
#adr**TIT**LI<CR>[<LF>] : List logical inputs
#adr**TIT**LO<CR>[<LF>] : List logical outputs

| | |
|---|---|
| **TMP** | **Defines the operating state of the turbomolecular pump** |

**Syntax**   #adr**TMP**ON<CR>[<LF>]        start pump rotation
#adr**TMP**OFF<CR>[<LF>]        stop pump

**Result**   #adr,OK *or* #adr,Err3  if the pump is already in the state
requested (context error)

# Safety instructions

> ⚠️ **WARNING**
>
> Before to use the controller, make sure that the mechanical and electrical connections have been made *(see chapter B)*.
> If an error message is displayed during operation, *see D 20*.

> ⚠️ **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).
>
> 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 *(see B 40)* 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 ATH pump;
- an isolation valve between the ATH pump and the backing pump.

---

CAUTION! In case of maintenance, refer to chapter D10.

## Controller start-up

Once the various electrical connections have been made, set the main switch on the rear panel to "**I**".

The controller performs a self-test and identifies the pumps to which it is connected.

The initialization time is approximately 20 seconds.

Display initialization:

The equipment is identified, the program version is displayed.



**CHECKING PROCEDURE**

Indicator lights test: they are lit in succession.



The working screen is displayed (connected pump identification).

```
KEYB                  XX H
    ACT XXXX V3.XX
    ATH XXXX X
    READY TO START!
```
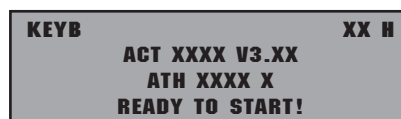
### The parameter setting keys

Parameter setting access — **PREVIOUS**
- used to access the parameter setting mode.
- used to exit the various menus without validating the functions.

Selection — **+** **−**
- used to move in the menus, or from one parameter to another.
- used to select or adjust the value of the selected parameter.

Validation — **ENTER**
- used to validate the selection of a menu, parameter or value.

**STATUS**
- used to exit the menus and return to the pump parameter display.

The message on the display are:
- during acceleration, the nominal speed: "**STARTING**" and the green light is OFF.

- pump at speed and pump not at choosen temperature: "**WAITING HEAT**" and green light is ON.

- pump at speed and at temperature (minus 3°C): "**OK FOR PROCESS**", and the green light is ON.

## Controller start-up

**Configure the parameters for the application using the various menus.**

Enter the sub-menus by pressing

PREVIOUS

DISPLAY        SETUP

Display and/or select the parameters to be monitored *(see C 30)*.

Access the parameter programming *(see C 30)*.

# Configuring the ACT controller
# for the application
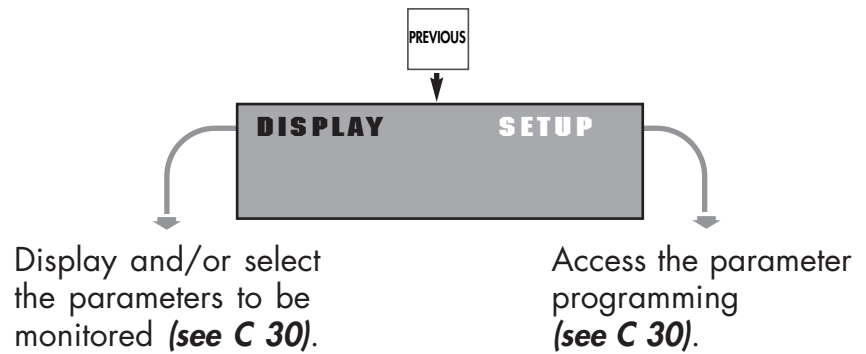
| DISPLAY | SETUP | | | | | | Factory configuration |
|---------|-------|---|---|---|---|---|---|
| | | ENTER | + | − | | | |

| Description | Menu | Values | Factory configuration |
|-------------|------|--------|------------------------|
| Enter the access code | ACCESS CODE | Enter the access code and validate | 0 |
| Remote Mode | REMOTE | ON or OFF | OFF |
| Configure the 0-10V output | SET ANALOG-OUT | SPEED: 10V = 60000 rpm *(see B 100)* I motor: 0A (0V) 15A (10V) 1.5A per 1V θ.PUMP: 0.1V per 1°C θ.CONT: 0.1V per 1°C | Speed |
| Modify the STANDBY speed | STANDBY SPEED | 15000 to 34000 rpm | 15000 |
| Give the authorization to restart the pump after a power cut | AUTO-STARTING | (YES) or NO (always NO) | NO |
| Activate or disactivate the buzzer | BUZZER | ON or OFF | ON |
| Select the temperature measurement unit | TEMPERATURE UNIT | °C or °F | °C |
| Modify the heating temperature | THERMOSTAT | OFF or ON (31 to 75°C) | 65°C |
| Modify the speed contact threshold | RELAY SPEED | -3% to -50% | -3% |
| Set the serial link parameters | SET SERIAL LINK | RS232/RS485/NETWORK (see sub-menus folio 2 & 3) | RS232 |
| Modify the time before starting up the pump | SET START DELAY | 0 to 240mn 59s | 0mn 0s |
| Modify the time before opening the venting valve | TIME TO VENTING | 0 to 59mn 59s | 0mn 0s |
| Modify the venting valve opening time | VENTING TIME | 0 to 59mn 59s | 0mn 0s |
| Modify the bearing alert threshold | BEARINGS (LIMITS) | 0 to 100% | 20% |
| Modify the bearing counter in case of pump/controller/bearing replacement | BEARINGS | 0 to 100% | 100% |
| Pump running time | PUMP TIME | 0 to 65500 H | 0 h |
| Modify the access code | NEW CODING | 0 to 65535 | 0 |

# Configuring the ACT controller
# for the application

**Serial link setting**

| | ENTER | | + | |
|---|---|---|---|---|

| **SET SERIAL LINK** | **RS 232    RS 485**<br>**NETWORK** | Serial link selection |
|---|---|---|

+

| | | **Default values** | Setting values |
|---|---|---|---|
| **SPEED** | Transmission speed . . . . . . . | **9600 bauds** | 1200 2400 4800 9600 |
| **PARITY** | Parity . . . . . . . . . . . . . . . | **None** | None Even Odd |
| **DATA-BITS** | Data length . . . . . . . . . . . | **8 bits** | 7 or 8 |
| **STOP-BITS** | Number of STOP bits . . . . . . | **1 bit** | 1 or 2 |
| **ECHO** | Authorizes or does not authorize the echo of characters received on the link | **ON** | ON or OFF |
| **SEPARATOR** | Data separating character . . . . . . . . . . . . | **44 (comma)** | 0 to 255 |
| **ADDRESS** | Number of controller in a multiple link . . . . . . . . . . . | **0** | 0 to 255 |
| **SET DATA LOGGER** | Authorizes transmission at pre-set intervals on the serial link, if ON, Set the transmission interval | **OFF**<br>**0mn1s** | ON or OFF<br>0 to 4mn15s<br>or 255 s |

+ → Return to **Set start delay**

| **RS 232    RS 485**<br>**NETWORK** |
|---|

+

| | | | |
|---|---|---|---|
| **SPEED** | Transmission speed . . . . . . . | **9600 bauds** | 1200 2400 4800 9600 |
| **PARITY** | Parity . . . . . . . . . . . . . . . | **None** | None Even Odd |
| **DATA-BITS** | Data length . . . . . . . . . . . | **8 bits** | 7 or 8 |
| **STOP-BITS** | Number of STOP bits . . . . . . | **1 bit** | 1 or 2 |
| **SEPARATOR** | Data separating character . . . . . . . . . . . . . | **44 (comma)** | 0 to 255 |
| **ADDRESS** | Number of controller in a multiple link . . . . . . . . . . . | **0** | 0 to 255 |

+ → Return to **Set start delay**

# Configuring the ACT controller
# for the application

**Serial link setting**
(continued)

```
┌─────────────────────────┐
│ RS 232    RS 485        │
│    N E T W O R K        │
└─────────────────────────┘
```

┌───┐
│ + │
└───┘

┌─────────────────────────┐
│ **ADDRESS**             │
└─────────────────────────┘

Number of controller in a
sequence in the case of the
multiple link . . . . . . . . . . . .          **0**          0 to 255

┌───┐
│ + │ ──► Return to **Set start delay**
└───┘
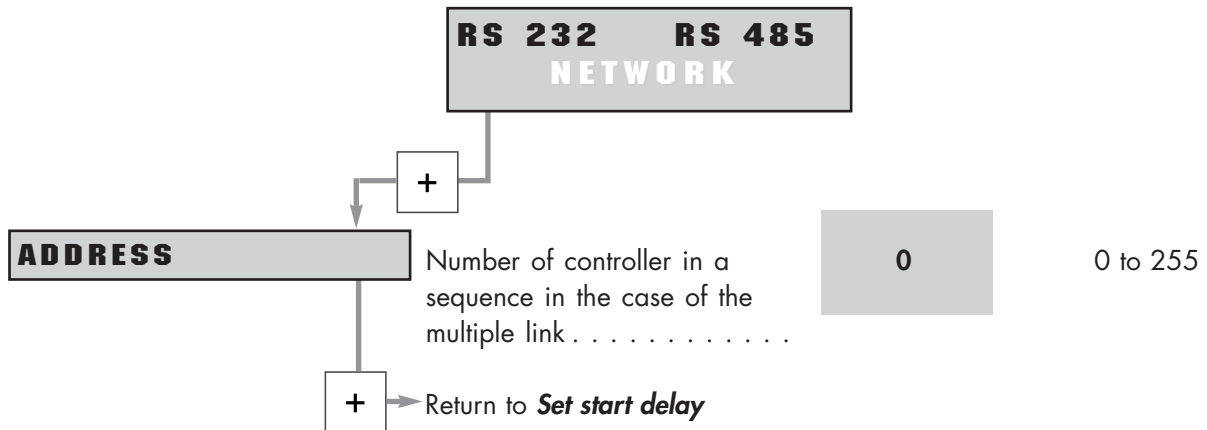
# Controlling the pump
# using the controller front panel

**Rotation indicator lights:**
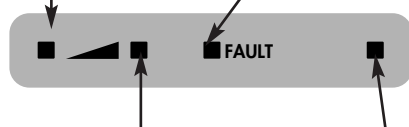
**Yellow lit**
The pump rotation speed
is **lower** than the
selected speed.

**Red lit**
The pump is faulty.
This fault is accompanied
by an audible signal.
Red flashing when an alert
appears.

**Welcome**

■ ◢ ■  ■FAULT  ■

**Green flashing**
The pump rotation speed is
**higher** than the selected speed
(decrease of the selected
speed during operation).
**Green lit**
The pump has reached
the selected speed.

**Yellow lit**
Standby mode selected.

**Start up the pump** by
pressing START

The pump is started up to
reach the selected speed.

☼ ◢ □  ■FAULT  ■

The yellow rising speed indicator light comes on. When
the pump reaches its selected speed, the yellow indicator
light goes off and the green indicator light comes on.

**Select the reduced speed
mode** by pressing STAND BY

The speed indicator light
comes on. The pump regulates
its speed to reach the pre-defined value *(see C 30)*.

■ ◢ ☼  ■FAULT  ☼

**Stop the pump** by
pressing STOP

The rotation speed monitoring indicator light goes off.
The pump motor is no longer powered, the pump
decelerates.

# Controlling the pump
# using the controller front panel

| DISPLAY | SETUP |
|---|---|

ENTER

Welcon

| STATUS | FAULT |
|---|---|
| WARNING | BEARING |

ENTER

**Pump and controller status**
- pump temperature
- pump motor current
- controller temperature
- pump rotation speed

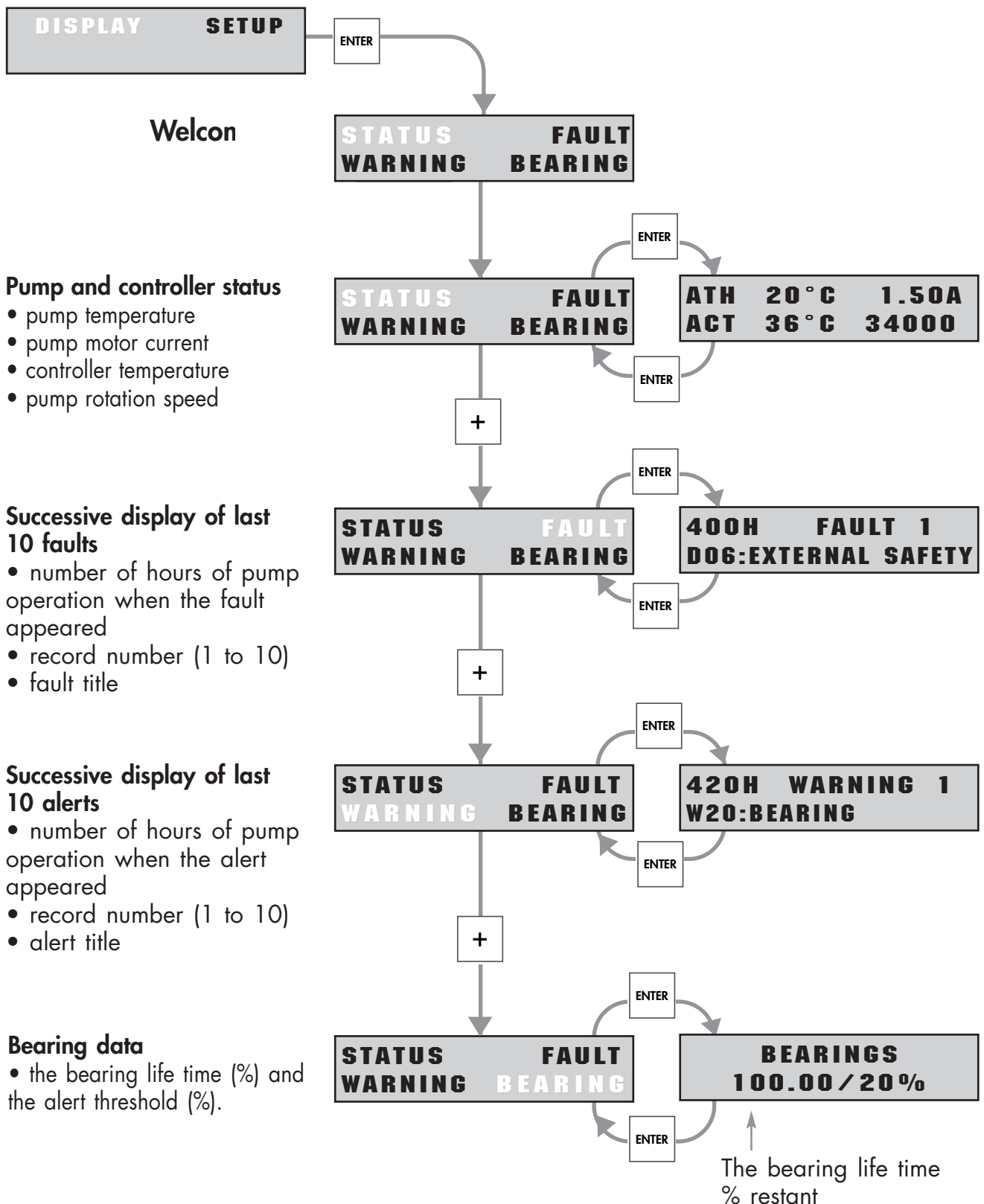| STATUS | FAULT |
|---|---|
| WARNING | BEARING |

| ATH 20°C 1.50A |
|---|
| ACT 36°C 34000 |

ENTER

ENTER

+

**Successive display of last 10 faults**
- number of hours of pump operation when the fault appeared
- record number (1 to 10)
- fault title

| STATUS | FAULT |
|---|---|
| WARNING | BEARING |

| 400H FAULT 1 |
|---|
| D06:EXTERNAL SAFETY |

ENTER

ENTER

+

**Successive display of last 10 alerts**
- number of hours of pump operation when the alert appeared
- record number (1 to 10)
- alert title

| STATUS | FAULT |
|---|---|
| WARNING | BEARING |

| 420H WARNING 1 |
|---|
| W20:BEARING |

ENTER

ENTER

+

**Bearing data**
- the bearing life time (%) and the alert threshold (%).

| STATUS | FAULT |
|---|---|
| WARNING | BEARING |

| BEARINGS |
|---|
| 100.00/20% |

ENTER

ENTER

↑
The bearing life time
% restant

## Local and remote mode operation

**Pumping cycle
from chamber
at atmospheric pressure**



**Chamber
to be evacuated**

V2

N2    V3        V1

ATH        ADP
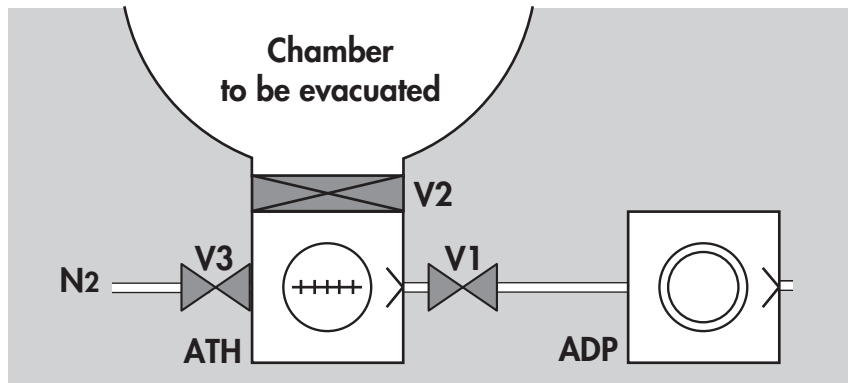
**Local mode operation**

> CAUTION! In the case of a local mode operation of the controller, make sure that the terminal plug (delivered with the ACT) is connected to the Inputs/Outputs" connector at the rear of the unit (*see B 91 for the wiring of the plug*).

The controller screen displays "**KEYB**".

```
KEYB                    XX H
     ACT XXXXX V3.XX
     ATH XXXXXX
     READY TO START!
```

**Pumping start**

**Switch on the controller**

The valve **V3** is closed and the «FAULT» contact closes.
The rotor is levitated.
The heating band is powered (for ATH MT).

**Start the pumping by** `START`

The primary pumps starts and valve **V1** opens
(if the primary pumping is controlled by the controller).
If the pump start-up time has been programmed *(see C 20)*, the countdown of the time before the pump begins rotating is displayed on the screen.
If the pump start-up time has not been programmed, the primary pumping system and ATH start up at the same time.

**Open the valve V2**

Take care to wire the customer relay in series with «ISOL. VALVE» contact (for a gauge for example).
The chamber continues to be pumped until the customer operating pressure is reached.

**Select the stand-by mode** `STAND BY`

The pump reaches the standby speed programmed *(see C 30)*.
The standby mode can be selected when pump is stopped or in rotation.
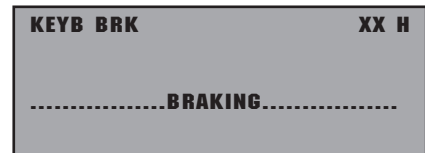
## Local and remote mode operation

### Pumping stop

**Stop the pumping by** | STOP |

(no air inlet valve connected)

This closes the primary isolation valve **V1** and the primary pump stops. If the ISV contact is connected, **V2** closes. The braking of the pump from maximum speed to 10000 rpm takes t < 10 min.

The controller display indicates temporarily:

```
KEYB BRK                    XX H


..................BRAKING..................
```

**Open the valve V3**

**1st case**
**No air inlet valve connected**
(standard configuration from Alcatel factory)

The time for the delay to open and opening time are 0s. After a STOP signal (or a default), the pump will brake without air-inlet. The duration of the rotor slow down until its complete stop could be more than 30 minutes.
No message of venting on the front panel.

**2nd case**
**Air inlet valve connected**

The customer has to set the delay to open the valve and the time of opening (*see C 30 "Time to venting" or "Venting time"*).
After a STOP signal (or a default), the pump will brake without air-inlet down to 10000 rpm. At 10000 rpm plus the delay (*see C 30*), the air inlet valve will open. It stays open for the chosen opening time (max. 3599s).

When the valve is open, there is a message «VENTING» on the front panel, during the venting time.

```
KEYB BRK                    XX H


..................VENTING..................
```

**Close the valve V3**

It closes before if the rotation of the pump reaches 0 rpm or if there is a **START** signal.
If the setted opening time is reached before the pump reaches 0 rpm, the controller displays:

```
KEYB BRK                    XX H


..................BRAKING..................
```

**Close the valve V2**

The level of vacuum in the chamber is maintained.

## Local and remote mode operation

**Immediate restarts**

If the pump has been stopped by an air inlet, we advise to limit to 2 the number of immediate restarts per hour. If the pump has been stopped without air inlet, immediate restarts are not limited.

**Event of a power cut**

**If a power cut occurs, the rotor remains suspended by the energy emitted by the motor's counter-electromotive force, until the rotor rotation speed is low enough** (around 9000 rpm) so that it can rest on the back-up bearings without being damaged.

**Short power cuts**

When the rotation speed reaches about 10000 rpm, the controller display indicates: `D 29     : INPUT POWER`

Otherwise, the minimum speed is reached before the power is restored:
- «ISOL.VALVE» contact is open (V2 closes);
- «START» contact is open (V1 closes);
- the air inlet valve is open if setted;
- the pump lands on its back-up bearings;
- the controller is stopped;
- the landing's time counter decreases *(see D 10)*.

The normal start-up procedure is to be resumed after power has been restored *(see page 1)*.

If the pump is remote controlled:
- disable "Remote Start";
- valid "Remote Stop";
- valid again "Remote Start" *(see B 91)*.

**Note: If the power is restored before this minimum speed (9000 rpm) is reached, the pump resumes its initial speed without any disturbance. The landing's time counter doesn't decrease.**

## Local and remote mode operation

**Remote mode operation**

> ⚠ In the case of Remote mode operation, the input / output connector has to be wired according to the remote functions requested (*see B 91*).
> Set the controller on "Remote ON" mode (*see C 30*).

The controller screen displays "**REM**".

```
REM                    XX H
      ACT XXXXX V3.XX
      ATH XXXXXX
      READY TO START!
```

The START/STOP/STANDBY commands are the same as those for the local mode.

## «External safety» contact operation

> CAUTION! **This operation mode is always operational even on "Local" or "Remote" mode.**

If the «EXT. SAFETY» contact on the «Inputs/Outputs» connector *(see B 91)* is open:
- the controller display indicates:

```
D 06                    : EXT.SAFETY
```

- the pump is stopped and the air inlet valve opens if the air inlet valve parameter is setted.

To restart the pump, closed the «EXT. SAFETY» contact and start the pump:
- in local mode: push the START key;
- in remote control mode: open «START» contact then, close it *(see B 91)*.

# «INH» Inhibit mode operation

> **CAUTION!** **This operation mode is always operational even on "Local" or "Remote" mode.**

### "INH" mode desable

The controller screen displays "**INH. BRK.**".

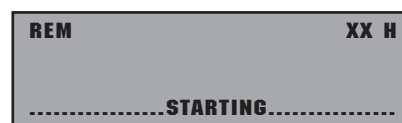| INH. BRK. | XX H |
|---|---|
| ...............BRAKING....... | |

The controller doesn't supply the motor, inhibit the progressed functions and memorize them. There is no air inlet except if the venting time is on progress.

The actions on START, STOP (KEY or REM) are desactivated.

### "INH" mode valid

The controller screen displays "**KEY**" or "**REM**".

| REM | XX H |
|---|---|
| ...............STARTING............... | |

The controller power the motor and restore the previous memorized operating status.

# Safety instructions

⚠️ **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/TO) 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 (*see instructions on E 00*).

⚠️ **WARNING**  Chemical supplies coming from the tool, water and nitrogen need also to be locked out/tagged out.

⚠️ **WARNING**  Before starting any maintenance operations, be sure to check the pumping conditions: toxicity, corrosion, of the pumped gases.

CAUTION! 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.

CAUTION!  Before any intervention on the pump, we advise to prolonge N2 flow for 30mn.

⚠️ **WARNING**  During exhaust maintenance, 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.

# Safety instructions

**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 exeptional circumstances: broken power supply cable, strong shocks, faulty electronics. **It is advisable to check the bearing counter and provide ball bearings 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 - 1600) per landing;
  - nearly 33% (ATH 2300) 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 is closed on it, or**
**- if there are no exhaust or inlet isolation valves.**

The bearing alert threshold can be set on the menu (*C30*). If the bearing life time is smaller than the alert threshold, an alert message is displayed:

```
W 20: BEARINGS
```

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

```
D 24 : BEAR. CHANGED
```

# Diagnosis and troubleshooting

**Default type:**   - The screen is locked on a display . . . . . . . . . .see page 1
   - The default is indicated by the controller . . . . .see page 2
   - The default is not indicated by the controller  . .see page 7

## The screen is blocked

| INCIDENT | CAUSE | CONSEQUENCE | REMEDY |
|---|---|---|---|
| **ACT XXXX M**<br>-----------------<br>**D31: CODING** | **When the controller is started up, the pump cannot be identified** | ■ The controller is disabled. | ■ Check that the cable linking the pump to the controller is correctly connected.<br>■ Otherwise, contact the Customer Service. |
| | **Converter power supply problem.** | ■ The controller is disabled. | ■ Contact the Customer Service. |
| | **The micro board is not working.** | ■ The controller is not working. | ■ Contact the Customer Service. |
| **ACT XXXX M V3.00**<br>-----------------<br>**WDOG CONVERTER** | **The microprocessor is running on itself: it is not able to control the operating sequency.** | ■ Momentarily, the controller is not working. | ■ If the speed is zero when the message appears, wait for the message disappears and try again the starting procedure.<br>■ If the speed is not zero, wait for pump to stop and start the pump again.<br>■ If the message continues, contact the Customer Service. |

# Diagnosis and troubleshooting

**When a defect appears**

The "FAULT" contact opens *(see B 91)*.
Depending on the defect type:
- the "FAULT" signal can be on, for an alarm, and flashing for an alert;
- the air inlet valve must open;
- and the controller can stop the pump.
In the following table, we'll use the symbol:

| □ **FAULT** | □ The signal lights on<br>■ The signal light not on<br>◪ The signal light is flashing |
|---|---|
| **OPEN** | Y The air inlet valve opens<br>N The air inlet valve doesn't open |

## Defaults identification:

| INCIDENT | CAUSE | □FAULT | OPEN | CONSEQUENCE | REMEDY |
|---|---|---|---|---|---|
| **D 00:**<br>**SEIZED PUMP** | Pumping cell seized. | □ | N | The controller doesn't supply the motor. | ■ Check manually that the rotor rotates; otherwise contact the Customer Service. |
| **W 01:**<br>**POWER OVERHEAT** | The power supply temperature is outside authorized limits. | ◪ | N | The controller temporarily stops driving the pump rotation until the temperature drops back below the authorized limit. | ■ Check the power supply voltage;<br>■ Check that the ventilation of the controller is operating (air admissions not blocked). |
| **W 02:**<br>**MOTOR OVERHEAT** | The stator motor temperature is too high. | ◪ | N | The controller temporarily stops driving the pump rotation until the temperature drops back below the authorized limit. | ■ Reduce the number of start-ups per hour;<br>■ Reduce the working pressure or the flowrate;<br>■ For thermostatic pump, check that the water valve is opening;<br>■ Check the water cooling of the pump (check that the water is present and the flowrate);<br>■ Check the purge flowrate. |
| **W 03:**<br>**MOTOR CONTROL OVERHEAT** | The frequency converter temperature is too high. | ◪ | N | The controller temporarily stops driving the pump rotation until the temperature drops back below the authorized limit. | ■ Reduce the number of start-ups per hour;<br>■ Reduce the working pressure or the flowrate;<br>■ Check that the ventilation of the controller is operating (air admissions not blocked). |

# Diagnosis and troubleshooting

| INCIDENT | CAUSE | FAULT | OPEN | CONSEQUENCE | REMEDY |
|---|---|---|---|---|---|
| **D 04:** **HALL SENSOR** | Motor problem: Hall sensor default. | ☐ | Y | The controller stops the motor and air inlet valve is activated if it is connected. | ■ Switch off the controller and restart it; ■ Check the cable link; ■ Try to start the pump: Local mode: pressing «start»; Remote mode: open and close the «start» contact; ■ If the fault happens again, contact the Customer Service. |
| **D 05:** **OVERCURRENT OR SENSOR** | Motor overcurrent or Hall sensor default. | ☐ | Y | The controller stops the motor and air inlet valve is activated if it is connected. | ■ Reduce the flowrate; ■ Switch off the controller and restart it; ■ Check the cable link; ■ Try to start the pump: Manual mode: pressing «start»; Remote mode: open and close the «start» contact; ■ If the fault happens again, contact the Customer Service. |
| **D 06:** **EXTERNAL SAFETY** | The external safety contact on the connector is activated. | ☐ | Y | The controller stops the motor; «START» contact and «ISV» contact open; The air inlet valve is activated if it is connected; The pump can't restart. | ■ Test the external safety devices and repair the fault (see B91); ■ Try to start the pump: Manual mode: pressing «start»; Remote mode: open and close the «start» contact; |
| **D 11:** **MAG SUSPENSION** | Mechanical or electrical problem. | ☐ | Y | No magnetic levitation; The pump can't start. | ■ Check that the rotor is free when rotating; ■ Contact the Customer Service. |
| **W 12:** **POWER** | Power supply failure. U ≥ 90 V. | ◪ | N | The controller stops the motor; it restarts if the defect disappears. | ■ Check the power supply voltage; ■ Contact the Customer Service. |
| **W 13:** **POWER OVERCURRENT** | Overcurrent on the main supply. I ≥ 15A | ◪ | N | The controller stops the motor; it restarts if the defect disappears. | ■ Check the main power supply voltage; ■ Contact the Customer Service. |

## Diagnosis and troubleshooting

| INCIDENT | CAUSE | FAULT | OPEN | CONSEQUENCE | REMEDY |
|---|---|---|---|---|---|
| **D 14: V 13**<br>**D 15: W 13**<br>**D 16: V 24**<br>**D 17: W 24**<br>**D 18: Z 12** | The rotor position outside authorized limits. | □<br>□<br>□<br>□<br>□ | Y<br>Y<br>Y<br>Y<br>Y | The controller stops the motor; «START» contact and «ISV» contact open; The air inlet valve is activated if it is connected; The pump can't restart. | ■ Check that there are no vibrations on the pump frame;<br>■ Check that the attachments are correctly fastened;<br>■ If the message disappears, try to start the pump;<br>■ If the fault happens again, contact the Customer Service. |
| **W 20:**<br>**BEARING** | The bearing life time is smaller than the alert threshold | ◪ | N | Another landing on the bearings is possible | ■ Contact the customer service to replace the ball bearings. |
| **W 21:**<br>**ACT TEMP.** | The controller temperature exceeds the authorized limit 60°C. | ◪ | N | The controller stops the motor; The pump can't restart. | ■ Check that the ventilation is operating (air admissions not blocked);<br>■ Provide more space around the controller. |
| **W 22:**<br>**PUMP TEMP.** | The pump temperature exceeds the authorized limit 80°C. | ◪ | N | The controller stops the pump. | ■ Check that the pump cooling device is running. |
| **D 23:**<br>**PUMP TEMP.** | The pump temperature exceeds the authorized limit T ≥ 90°C. | □ | N | The controller stops the motor when the temperature is below 30°C. Then the motor starts again. | ■ W 22 |
| **D 24:**<br>**BEARINGS MUST BE CHANGED** | The authorized limit for the number of landings on the emergency bearings has been reached. | □ | Y | The pump can't restart. | ■ Call the Customer Service to change the emergency bearings. |
| **D 25:**<br>**TEMP SENSOR-1** | Temperature sensor-1 failure. | □ | Y | The controller display the default but it doesn't stop the motor; **PUMP-TEMP1** = **0**°C. | ■ Call the Customer Service. |
| **D 26:**<br>**NO CONNECT** | Wiring fault between pump and controller (connection cable). | □ | Y | The pump can't start. | ■ Check that the cable is correctly locked to the pump and the controller;<br>■ If the fault appears again, call the Customer Service. |

## Diagnosis and troubleshooting

| INCIDENT | CAUSE | ☐FAULT | ⧖OPEN | CONSEQUENCE | REMEDY |
|---|---|---|---|---|---|
| **W 28:** DISABLE EEPROM WRITE | Memory problem. | ☑ | N | The controller doesn't stop the motor and the data is not saved. | ■ Reinitialize the controller with main switch 0/1 when the pump is stopped. ■ If the fault appears again, contact the Customer Service. |
| **D 29:** INPUT POWER | Main power failure. | ☐ | Y | Imminent landing. | ■ Check that the power supply is present, otherwise see *D 20 7/8;* ■ Contact the Customer Service. |
| **D 30:** EEPROM CHECKSUM | Memory erased. | ☐ | N | The pump doesn't start. | ■ Contact the Customer Service. |
| **D 31:** CODING | Incompatibility between the pump and the controller. | ☐ | N | The pump doesn't start. | ■ Replace the pump model or controller: ATH 2300 M and ACT 2300 M, or ATH 1300 M and ACT 1300 M. or ATH 1600 M and ACT 1300 M. |
| **D 32:** C. INSIDE | Controller inside wiring disconnected. | ☐ | N | The pump doesn't start | |

## Several defects appear:

| INCIDENT | CAUSE | REMEDY |
|---|---|---|
| D 04 - D 05 - D 11 D 25 - D 26 - D 31 | **The pump is not connected to the controller.** | ■ Check that the cable between pump and controller is correctly connected. |
| D 11 - D 31 | **Incompatibility between the pump and the controller.** | ■ Replace the pump model or controller: ATH 2300 M and ACT 2300 M, or ATH 1300 M and ACT 1300 M, or ATH 1600 M and ACT 1300 M. |
| D 04 - D 05 | **Motor information failure.** | ■ Pump stopped, switch off the controller and start again; ■ Contact the Customer Service |

# Diagnosis and troubleshooting

## Default is not indicated by the controller

| INCIDENT | CAUSE | REMEDY |
|---|---|---|
| **No event occurs after power on** | **No mains current** | ■ Check that the controller is powered. ■ Check that the power voltage is between 100 V -15% and 120 V +10% or between 200 V -15% and 240 V +10%. ■ Check the fuses: 2 fuses (16 A) under the controller. |
| | ⚠ **Isolate the product from the various energy sources before any maintenance operations.** | |
| | | ■ Contact the Customer Service. |
| **The ATH only starts-up in STANDBY mode** | **Electronic problem** | ■ Pump stopped, reinitialize the controller with the main switch (0/1). ■ Contact the Customer Service. |
| **The motor power load stays below 100W** | **Electronic problem** | ■ Change the cable link between the pump and the controller. ■ Contact the Customer Service. |
| **Up to 7000 rpm, the pump starts to vibrate** | **Mechanical problem** | ■ Check that the pump is rigidly fixed to the frame; ■ Check that there are no vibrations on the pump frame; ■ Check that the attachment are correctly fastened (Problem can be caused by an anti-vibration flagstone); ■ Contact the Customer Service. |

*GB 00754 - Edition 08 - January 04*

# Diagnosis and troubleshooting

| INCIDENT | CAUSE | REMEDY |
|---|---|---|
| **The pump doesn't reach the expected speed** | **Leak on the installation** | ■ Close the chamber isolation valve.<br>■ Start the pump. If the pump reaches the expected speed: the leak is in the chamber. |
| | NO | |
| | **Exhaust isolation valve stays closed** | ■ If the valve is controlled by the «START» contact, check that the valve opens when the «START» command is selected.<br>■ If the valve doesn't open, check the coil and electrical connection.<br>■ Check on the controller the closing of the «START» contact (valve disconnected).<br>■ If the contact doesn't close, contact the Customer Service. |
| | NO | |
| | **Defective rough pumping** | ■ Install a gauge at the primary pump inlet and check its vacuum limit ($P \leq 1.10^{-1}$ mbar). |
| | NO | |
| | **Air inlet valve stays opened** | ■ ACT powered, valve disconnected from the controller, check the «AIR INLET» output voltage (0V).<br>■ Check the air inlet valve operation (NC).<br>■ If the output is defective, contact the Customer Service. |
| | NO | |
| | **Leak on the air inlet valve** | ■ Replace the valve by a blank-off. Take care that the pump is not protected now.<br>■ Start the pump.<br>■ If the pump reaches its speed, stop it quickly and exchange the valve.<br>■ If not, contact the Customer Service. |

*GB 00754 - Edition 08 - January 04*

# Diagnosis and troubleshooting

| INCIDENT | CAUSE | REMEDY |
|---|---|---|
| **The thermostatic temperature is not reached** | **The heating band doesn't heat** | ■ Close the water line. If the temperature increases, there is a leak on the water line.<br><br>■ Check that the «THERMOSTAT» contacts are closed.<br><br>■ Check the heating band power supply.<br><br>■ Contact the Customer Service. |
| **"… waiting HEAT…" after 1 h 30** | | ■ Check that the water valve output is supplied with 12 VDC and the water valve is not opened. |

# Shipping procedure
# for contaminated pumps

| CAUTION! 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). |

⚠ **Study the safety instructions related to preventive maintenance see D00.**

**WARNING**

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

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

Ⓐ **Inlet port**  Closing kits including O-ring, screws and nuts, inlet blank flange and hoisting rings can be supplied upon order.
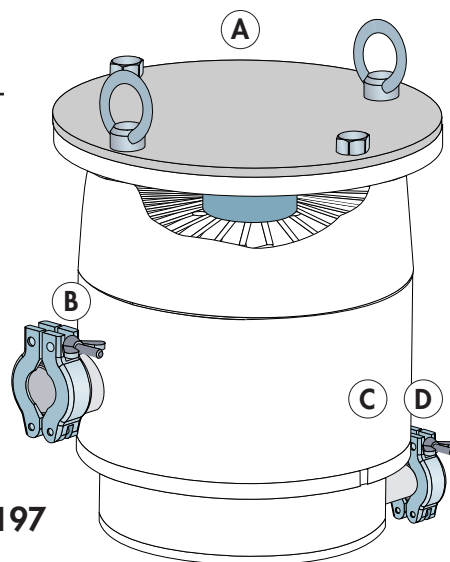
| Closing kit | DN 250 ISO-F | DN200 ISO-F |
|---|---|---|
| P/N | **108497** | **108496** |

Ⓑ **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**

Ⓒ **Purge port ***

| DN16 - ISO KF | 1/4 VCR |
|---|---|
| - Centering ring with DN 16 seal. P/N **068193** <br> - DN 40 clamping ring. P/N **083333** | - Seal P/N **076705** <br> - Fitting 1/4 VCR female P/N **108500** |

\* Standard connection accessories available in Alcatel catalog.

# Shipping procedure
# for contaminated pumps

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

**Rough decontamination procedure**

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

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

**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.
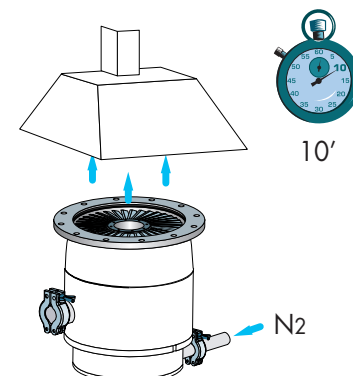
30'

N2
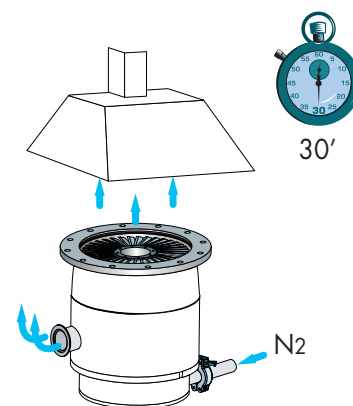
**2** **Purge / inlet sweeping**

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

Sweep with dry nitrogen\*\* for 10 minutes.

Stop the nitrogen flow.

10'

N2

\* Standard connection accessories available in Alcatel catalog.
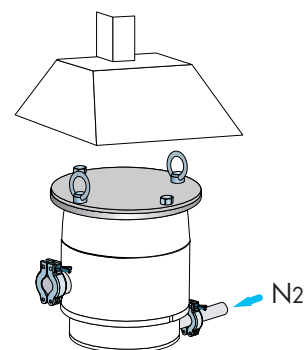\*\* Characteristics of dry nitrogen: **see B 50**.

## 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.

N2

# Spare parts - Instructions of use

**Replacement of parts and use of non genuine pars**

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 may lead to non-compliance with the regulations, and affect the performance of the product and the user's safety.**

Replacement of defective components with non-genuine parts may jeopardize the safety conditions of the equipment. **As a result, the EC declaration of conformity becomes null and AVTF withdraws responsibility for such operations.**

Counterfeiting and unfair trading of parts are condemned under the civil and criminal laws.

AVTF urges users not to take parts in the use of "imitations", or the misappropriation and pirating of intellectual property.

AVTF supplies maintenance components, spare parts or kits to perform the maintenance of its products (see chapter F).

# First level maintenance parts

**Copper seals**
**for pumps with**
**CF-F flanges**

| Flange type | 10 sets of 1 part (Unit packaged) | ATH 1300 | ATH 1600 | ATH 2300 |
|---|---|---|---|---|
| 160 CF-F | **303292** | X | X | |
| 200 CF-F | **303293** | X | X | |
| 250 CF-F | **303294*** | | X | X |

**O-ring**
**for housing ASA 6"**

| ASA 6" | **079160*** | X | X | |
|---|---|---|---|---|

\* 1 unit

**Fuses for controllers**

| Description | Qty | ACT 1300 M/ACT 2300 M |
|---|---|---|
| Fuse 6 x 32 T16A 250V | 2 | **103313** |

**Air inlet valve**
**accessories**

| Description | | Part Num. |
|---|---|---|
| Electrovalve coil | 12 V DC | **038127** |
| Equipped electrovalve DN 16 | | **106866** |

**Water valve**

| Description | | Part Num. |
|---|---|---|
| Coil | 12 V DC | **106077** |
| Electrovalve | 12 V DC | **106054** |

## Pumping curves

**Pumping speed versus inlet pressure**

## Pumping curves

**Flow rate versus inlet pressure**

Flow rate
(sccm)

Inlet pressure (Pa)

Gas : $N_2$

Upper limits
for continuous operation

—— ATH 1300 M, DN 200

-- -- ATH 1600 M, DN 200

Inlet pressure (mbar)
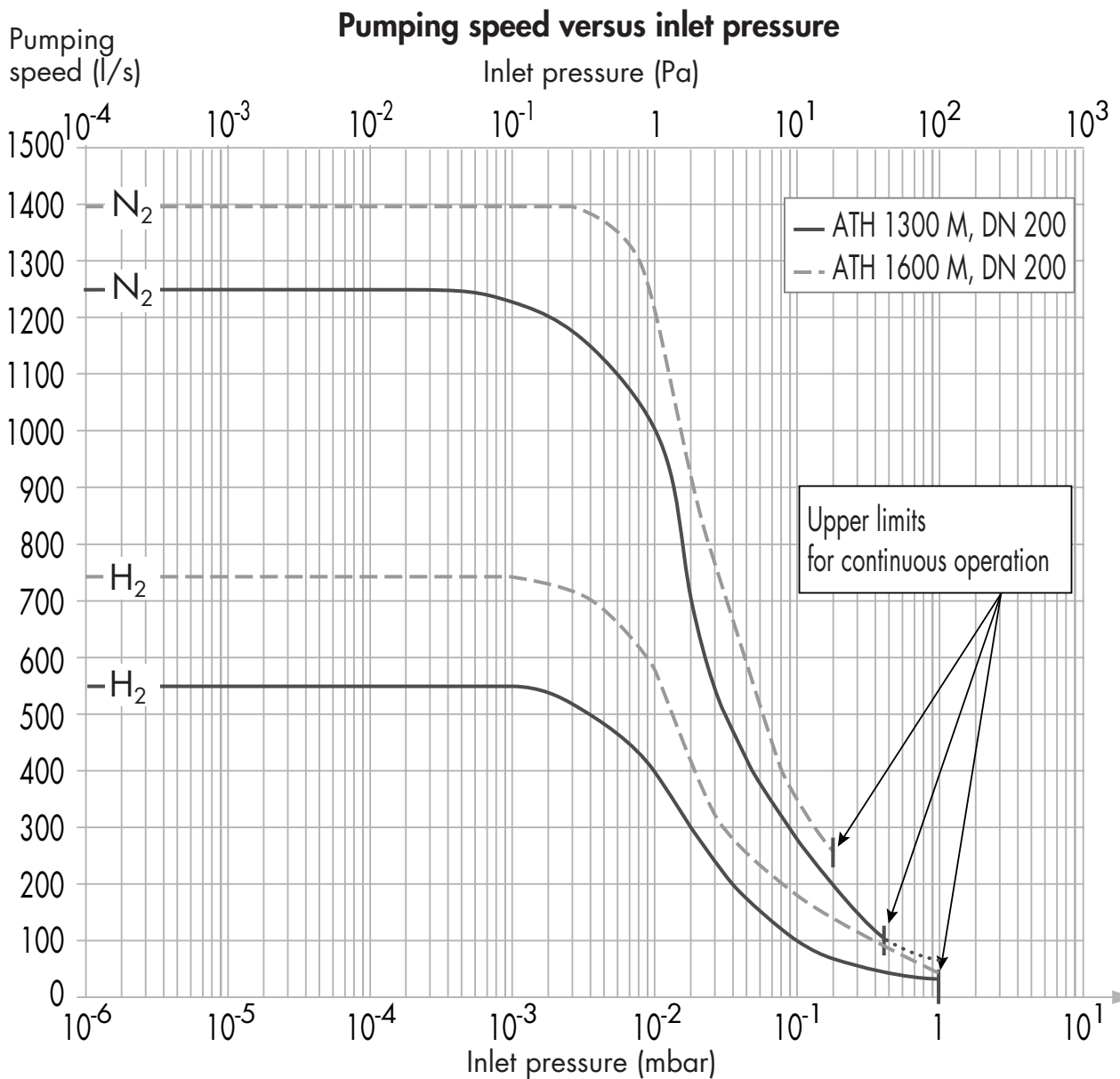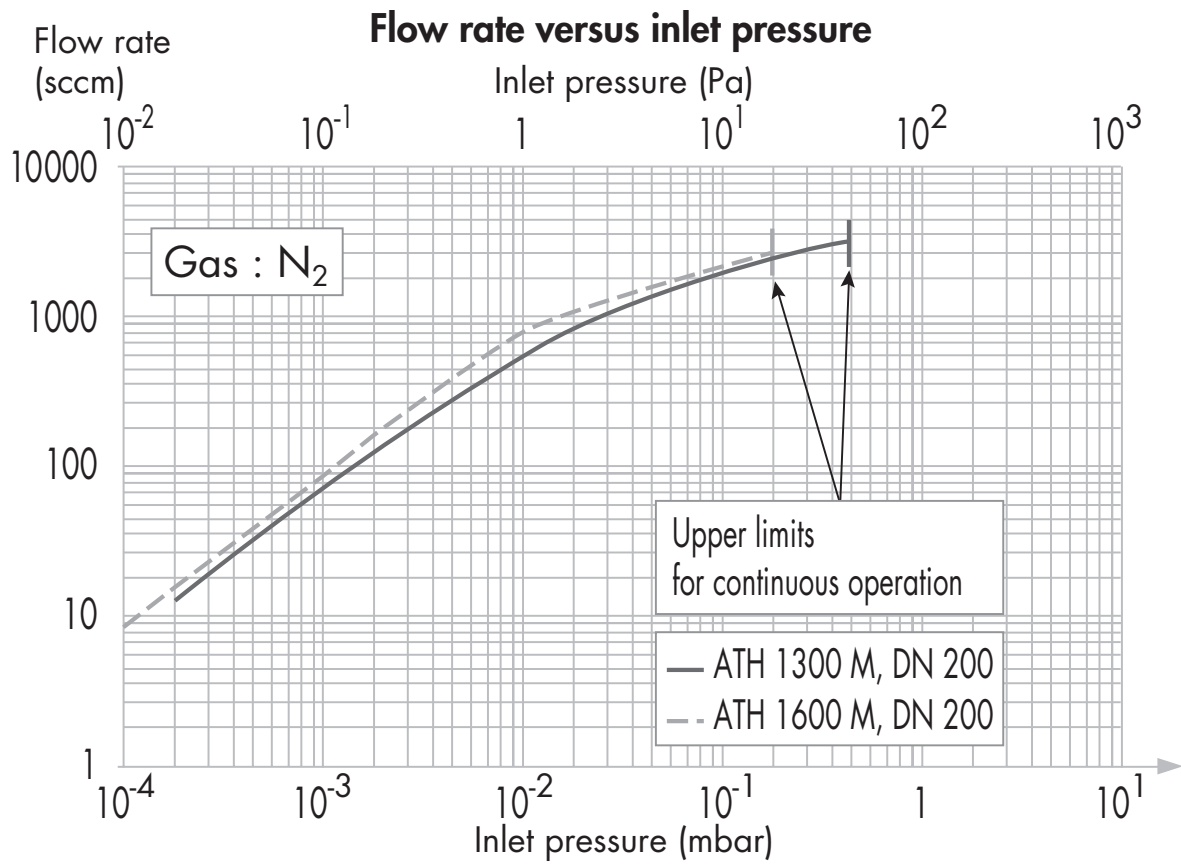
**A L C▲T E L**

## SAFETY QUESTIONNAIRE

## Procedure for returning ALCATEL 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 technican from our Service Centre.
In order to ensure the effective safety of our staff and protection of the environment, we need to know the types of gas or substances with which the pump or leak detector has been used.
This will enable us to take the appropriate safety measures.

The following page contains a questionnaire that you can use for this purpose. This procedure complies with the European Community's L360 directives and articles L231 and R231 of the French Labour Code.

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.

- **Attention!**

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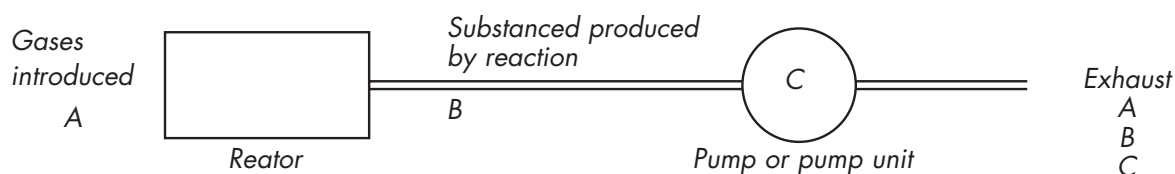


- gases (or substances) introduced into the reactor and <u>which may be found at the exhaust</u> (A),

- gases (or substances) <u>resulting from the reaction or process</u> (B),

- gases (or substances) <u>that may possibly be formed inside the pump</u> (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*

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

---

**SOCIETE - *COMPANY***

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

Non personne – *Name of person* : ...........................................................
(Qui rempli ce formulaire) – *(Who has filed 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
Si "Oui" emballage étanche et étiquette spécifique sont requis - If "Yes", sealed package and specific label are required

**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 formulo)*

---

**Ces produits présentent un risque de nature - *These susbstances present the following risks***

---

**Chimique – *Chemical***

| | | |
|---|---|---|
| **Toxique – *Toxic*** | Oui – Yes | Non – No |
| **Carcinogénique - *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)*

Explication détaillée – *Detailed explanation*
Si "Oui" risque de nature – *If "Yes", what type of risk*
...........................................................
...........................................................
...........................................................
...........................................................
...........................................................
...........................................................
...........................................................

---

**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" (nécessite une protection)
*Reply "Yes" (requires protection)*

Réponse "Non" (sans risque)
*Reply "No" (no risk)*

---

Nom - *Name* : ...........................................................

Fonction - *Position* : ...........................................................

*Date* : ...........................................................

Signature autorisée – *Authorised signature* :

Fonction - *Position* : ...........................................................

Date : ...........................................................

Signature autorisée – *Authorised signature* :

---

Tampon / Cachet
*Stamp / Seal*

Tampon / Cachet
*Stamp / Seal*

---

ALCATEL Vacuum Technology France – 98, avenue de Brogny – B.P. 2069 – 74009 ANNECY CEDEX
Tél. (33) 4 50 65 77 85 – Fax (33) 4 50 67 23 34

*GB 00761 - Edition 06 - July 03*

## DECLARATION OF CONFORMITY

We,    Alcatel Vacuum Technology France,
98, Avenue de Brogny, BP 2069
74009  ANNECY  FRANCE

### ISO 9001 CERTIFIED

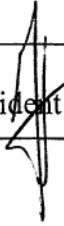declare under our sole responsibility that the following products

ATH 400M /ATH 400 MT with ACT 600 M
ATH 1300 M / ATH 1300MT with ACT 1300 M
ATH 1600 M / ATH 100MT with ACT 1300 M

to which this declaration relates are in conformity with  the following European Directives

| | |
|---|---|
| 98 / 37 / EEC | Machinery Directive |
| 89 / 336 / EEC | Electromagnetic Compatibility Directive |
| 73 / 023 / EEC | Low Voltage Directive |
| 93 / 68 / EEC | Council directive (CE Marking) |

The standards, normative documents, and/or specifications to which the products comply are :

| | |
|---|---|
| NF EN 60204-1 | Safety of machinery / Electrical equipment of machinery |
| NF EN 292-1 | Safety of machinery / Basics |
| NF EN 292-2 | Safety of machinery / General principles for design |
| NF EN 55011 Lim A | EMC / Limits for electromagnetical conducted and radiated interferences |
| NF EN 61000-4-2 | EMC / Immunity to electrostatic discharges |
| NF EN 61000-4-3 | EMC / Immunity to radiated electromagnetic field |
| NF EN 61000-4-4 | EMC / Immunity to transient burst |
| NF EN 61000-4-6 | EMC / Conducted disturbances induced by radio-frequency fields |
| NF EN 61000-6-2 | EMC / Generic immunity standard / Industrial environment |
| NF EN 61000-6-4 | EMC / Generic emission standard / Industrial environment |
| UL3101-1 | Electrical equipment for laboratory use;  part 1 : general requirements |

Mr J.Y. GUEGAN, Président Directeur Général          Made in Annecy, 26/11/03