

ATH 400M / ATH 1000M

Maglev hybrid turbomolecular pump



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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.

VIEW OUR INVENTORY



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.

MANUAL REFERENCE : 101 688
EDITION : 07 - JANUARY 2002

User's Manual ATH 400M / ATH 1000M

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Introduction to the ATH 400M/ATH 1000M and their associated ACT controllers

2 magnetically levitated hybrid turbo pumps



ATH 400M and ATH 1000M

Five active axes

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

Exclusive protection.

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

Inverted dynamic seal

High compression ratio.

ATH 400MT ATH 1000MT

Integral heater band

Maintaining the pumps internal surface up to 75°C to prevent the condensation effect.
Temperature regulated by the ACT controllers.

Introduction to the ATH 400M/ATH 1000M and their associated ACT controllers

ACT 600M and ACT 1000M controllers



The new generation of ACT controller family

Especially designed for maglev turbopumps

Light and small controllers.
Battery free.

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 85 to 265 V,
48/63 Hz single phase.

Large range of interface

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

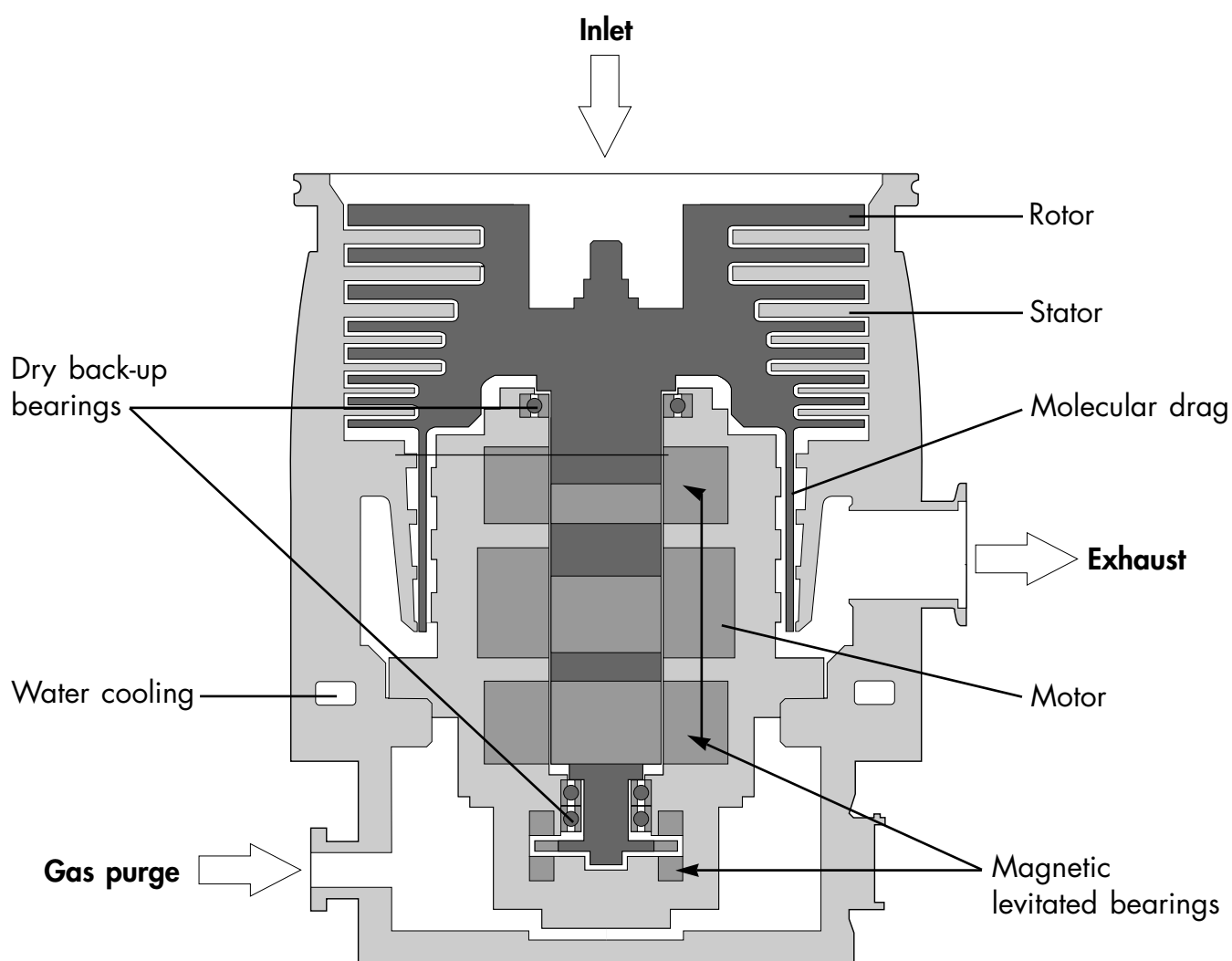
The pump operating principle

A hybrid technology

The ATH 400M and ATH 1000M 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.

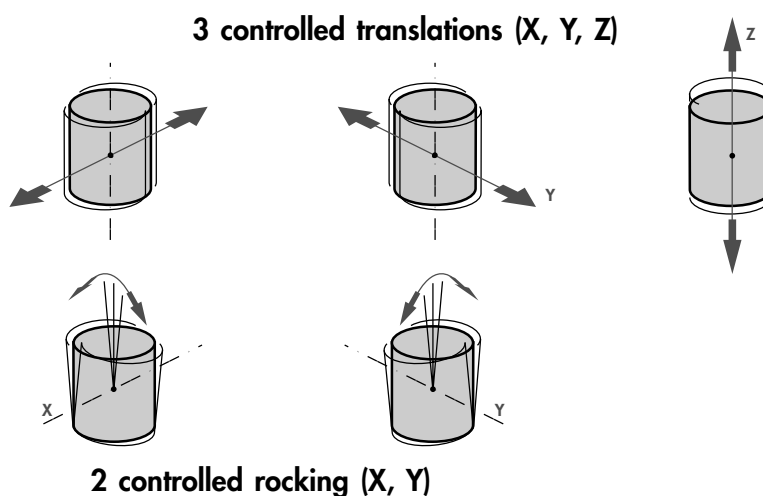
The molecular drag section provides a high compression ratio and extends forevacuum tolerance up to 5 mbar.



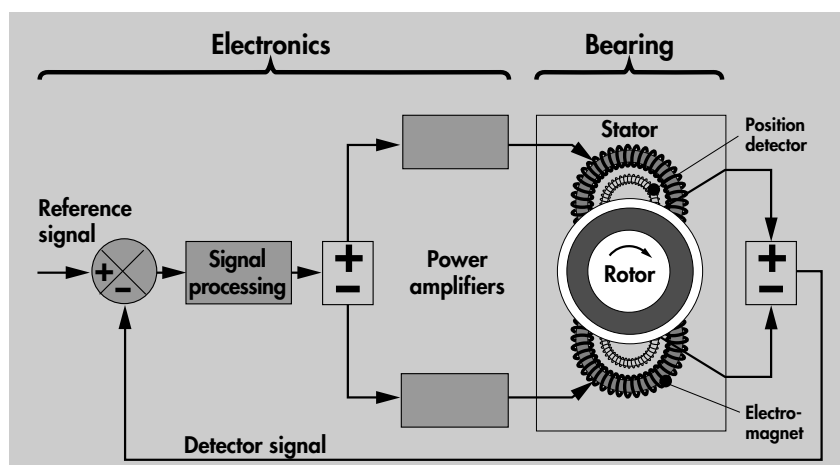
The pump operating principle

5 active 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.



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.

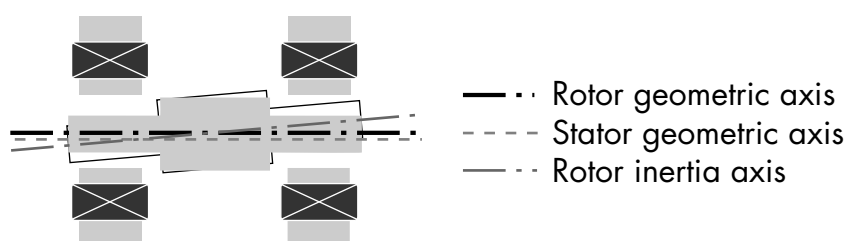


The pump operating principle

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.



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 emergency breaking valve opens.

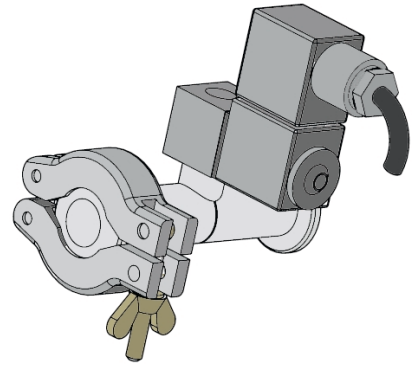
The pump operating principle

Emergency braking valve

The valve is fitted in parallel with purge port and opens in case of events such as:

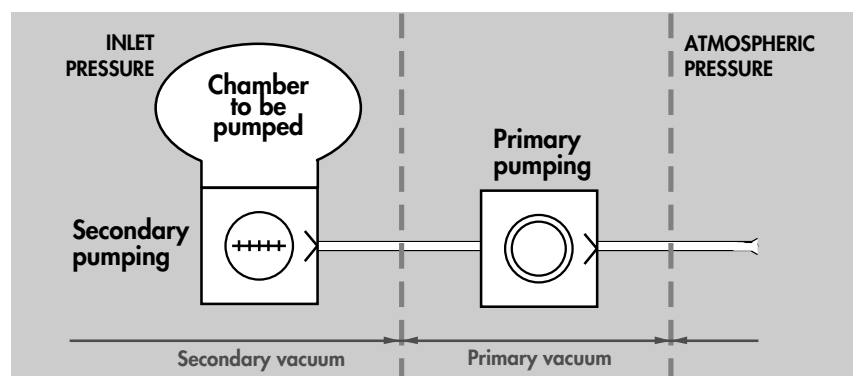
- uncontrolled violent shocks applied to the pump;
- large accidental air in-rushes.

It will also put the pump to atmospheric pressure when the controller is stopped. This valve will slow down the pump in complete safety.



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 the pressure is given by that of the primary pump used.



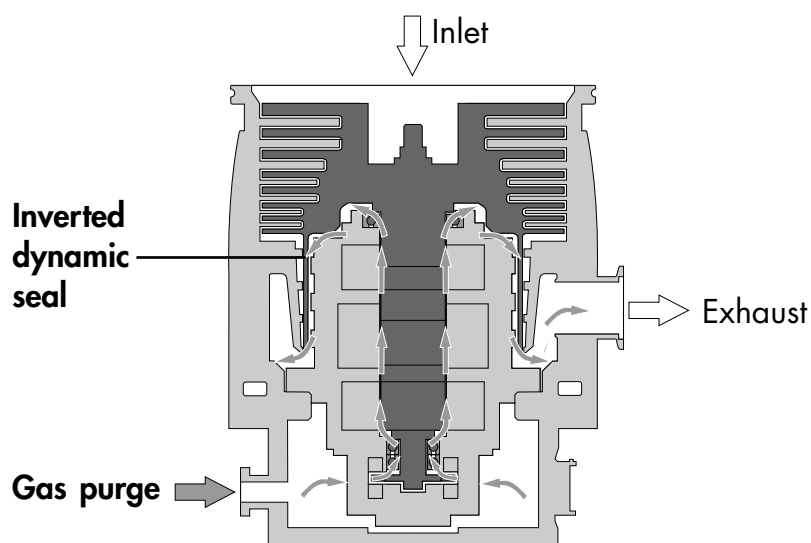
The different versions

Standard version ATH 400M - ATH 1000M

An inverted dynamic seal

It creates a high compression ratio between the bearings and the pump exhaust and thus minimizes the quantity of corrosive gases in contact with the bearings.

When used with **a gas purge** for high flow rate applications, the dynamic seal can, on its own, provide excellent protection for corrosive applications.



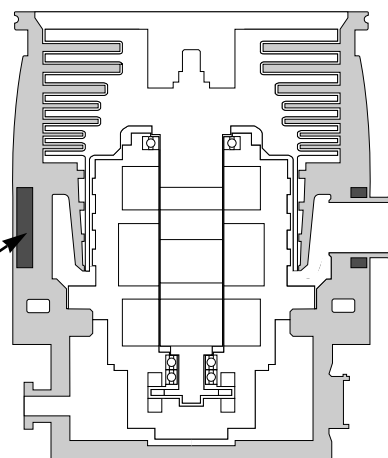
ATH 400MT ATH 1000MT

The built-in heater band

In high pressure and high throughput 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 controllers.



The different versions

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 which corresponds to the pump model.

depending on operating conditions:	Pump model	Min. speed	Max. speed
Inlet pressure $\geq 10^{-2}$ mbar or Housing temperature $\geq 50^{\circ}\text{C}$	ATH 1000MT (with temperature control)	15000 rpm	30000 rpm
Inlet pressure $\leq 10^{-2}$ mbar or Housing temperature $< 50^{\circ}\text{C}$	ATH 1000M	15000 rpm	33000 rpm
Inlet pressure $\leq 10^{-1}$ mbar	ATH 400M ATH 400MT	18000 rpm	39000 rpm

ACT 600M and ACT 1000M controllers

The ACT 600M and the ACT 1000M controllers belong to the new generation of ACT controller family.

Compact and functional

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

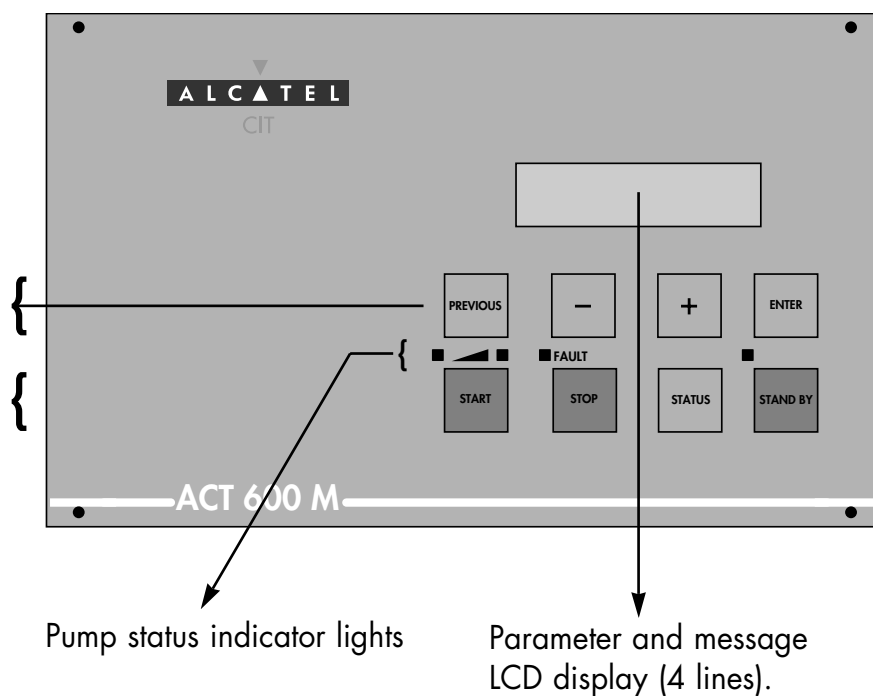
All functions to monitor the ATHM are integrated into the controller.

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 600M and ACT 1000M controllers

The rear panel of the unit consists of:

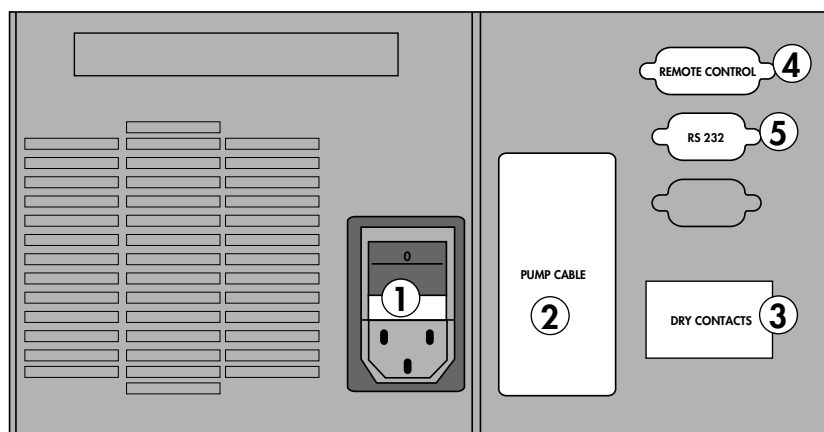
① Power supply connector

② Pump connector

③ Relay terminal strip
(Wiring characteristics on B 80.)

④ Remote control connector/RS 485
(Wiring characteristics on B 90.)

⑤ RS 232 connector
(Wiring characteristics on B 100.)



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

- for the remote control of the START, STOP, STANDBY functions;
- selectable 0 - 10 Volts output for speed, pump current or temperature;
- heater band control temperature;
- external safety taken in account.
RS485 serial link allowing many pump installations in a network.

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

The accessories

Pump accessories

Screen filter



This filter protects the pump against solid particles. Mesh size 2.5 mm.

Inlet flange P.N.

100 ISO-KF (FPM) * **056844**

100 ISO-KF (NBR) * **103070**

100 CF-F **056845**

160 ISO-KF **056942**

160 ISO-KF (NBR) * **103071**

160 CF-F **056928**

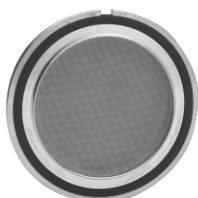
200 ISO-KF (FPM) * **063158**

200 ISO-KF (NBR) * **103072**

200 CF-F **063159**

ASA 6" **102933**

Compact filter



This filter stops particles ≥ 20 microns and is used in the event of high densities of dust or risks of implosion when pumping tubes or lamps.

Inlet flange P.N.

100 ISO-KF **063215**

160 ISO-KF **063216**

200 ISO-KF **063911**

Purge reduction device

This device is used to reduce the purge gas flow rate to 25 SCCM in some processes.

Flow rate P.N.

25 SCCM **066950**

Isolation valve at inlet pump

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

See the Alcatel catalog.

An entire range of connection accessories are 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
Thermo. cable	Interconnecting cable between heater band and controller.	Length	P.N.
		1.0 m 115 V	104627
		1.0 m 230 V	105206
		3.5 m 115 V	103728
		3.5 m 230 V	103729
		5.0 m 115 V	103730
		5.0 m 230 V	103731
		10 m 115 V	103732
		10 m 230 V	103733
		15 m 115 V	105202
		15 m 230 V	105204

The technical characteristics

The performances of the pumps

Model characteristics		ATH 400M ATH 400MT		ATH 1000M		ATH 1000MT	
Inlet flange	DN	100 ISO-K	160 ISO-K	160 ISO-K	200 ISO-K	160 ISO-K	200 ISO-K
Rotation speed	rpm	39000		33000		30000	
Pumping speed*	N ₂ l/s	320	410	710	850	610	800
	He l/s	290	360	650	750	600	650
	H ₂ l/s	180	230	430	450	330	350
Compression rate*	N ₂	1×10 ⁺⁸		2×10 ⁺⁸			
	He	2×10 ⁺³		1×10 ⁺⁴			
	H ₂	1×10 ⁺²		4×10 ⁺²			
Ultimate pressure without purge, meas. according to Pneurop standard mbar		8×10 ⁻⁹		8×10 ⁻⁹			
Maximum pressure at inlet in continuous operation** mbar		1		1×10 ⁻¹			
Maximum permissible pressure at exhaust** mbar		5		5			
Noise level	dBA	≤ 39		≤ 39			
Start-up time	min	< 3		< 5			
Maximum start-up power	W	650		650			
Maximum operating power	W	300		300			
N ₂ purge flow rate	SCCM	50		50			
Cooling water flow rate	l/h	< 60		< 60			
Water temperature	°C	15 < T < 25°C		15 < T < 25°C			
Maximum ambient temperature	°C	40		40			
Weight	kg	19		28			
Recommended forepump		ADP 31		ADP 81			

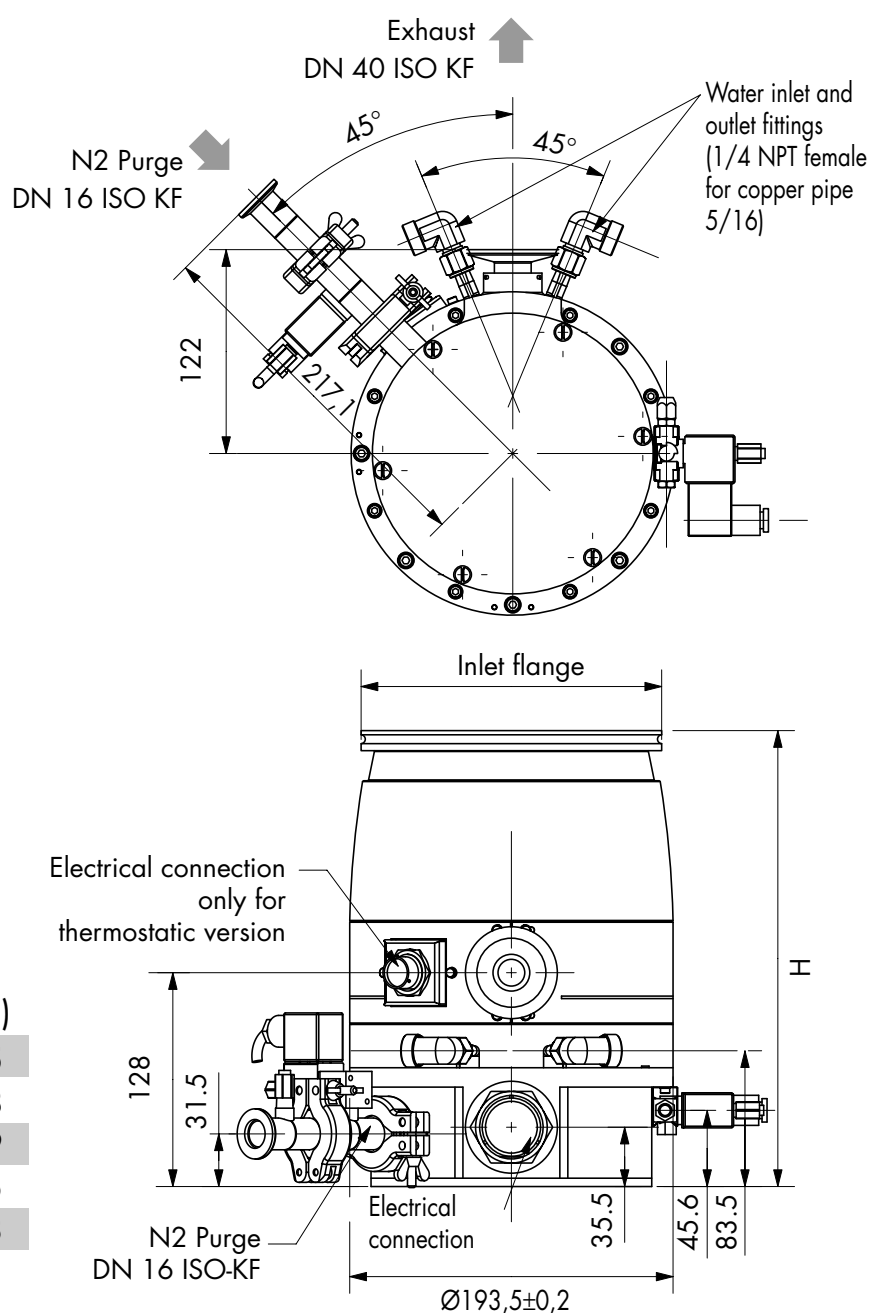
* See curves in G 10 and G 20.

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

The technical characteristics

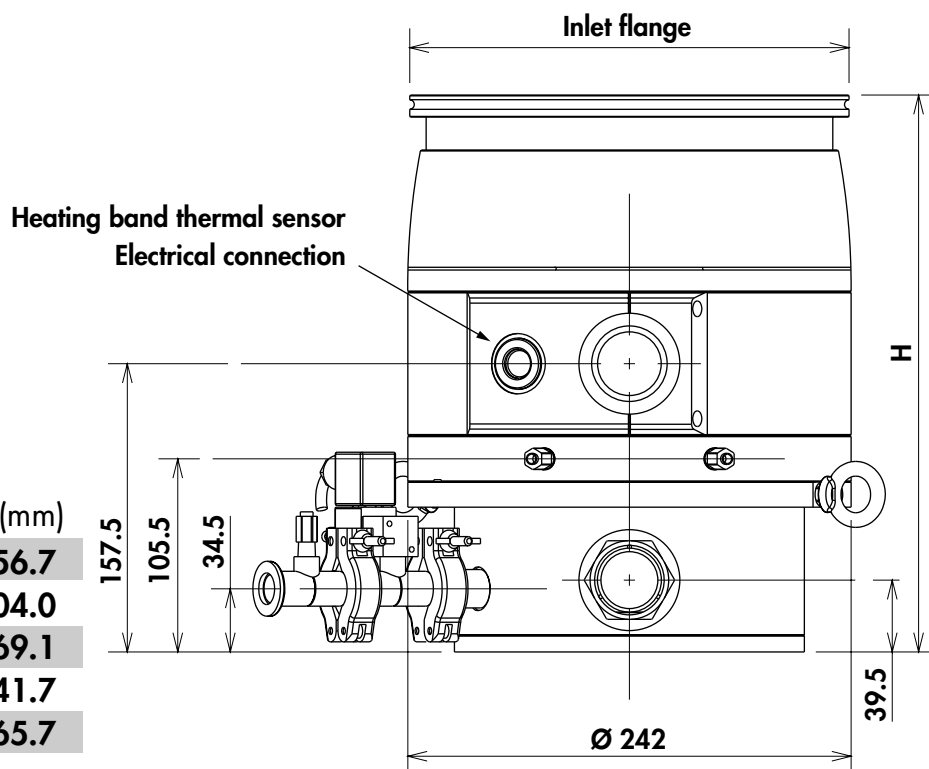
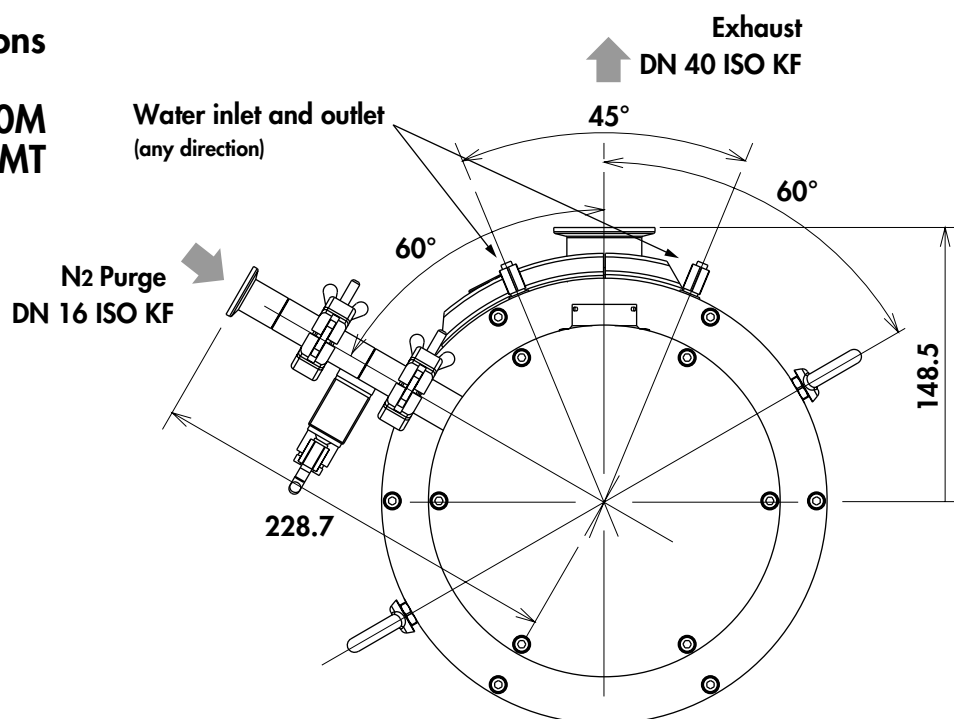
Dimensions

**ATH 400M
or ATH 400MT**



Inlet flange	H (mm)
DN 100 ISO-K	292.5
DN 160 ISO-K	272.8
DN 100 CF-F	298.9
DN 160 CF-F	294.5
ASA 6"	279.8

**ATH 1000M
or ATH 1000MT**



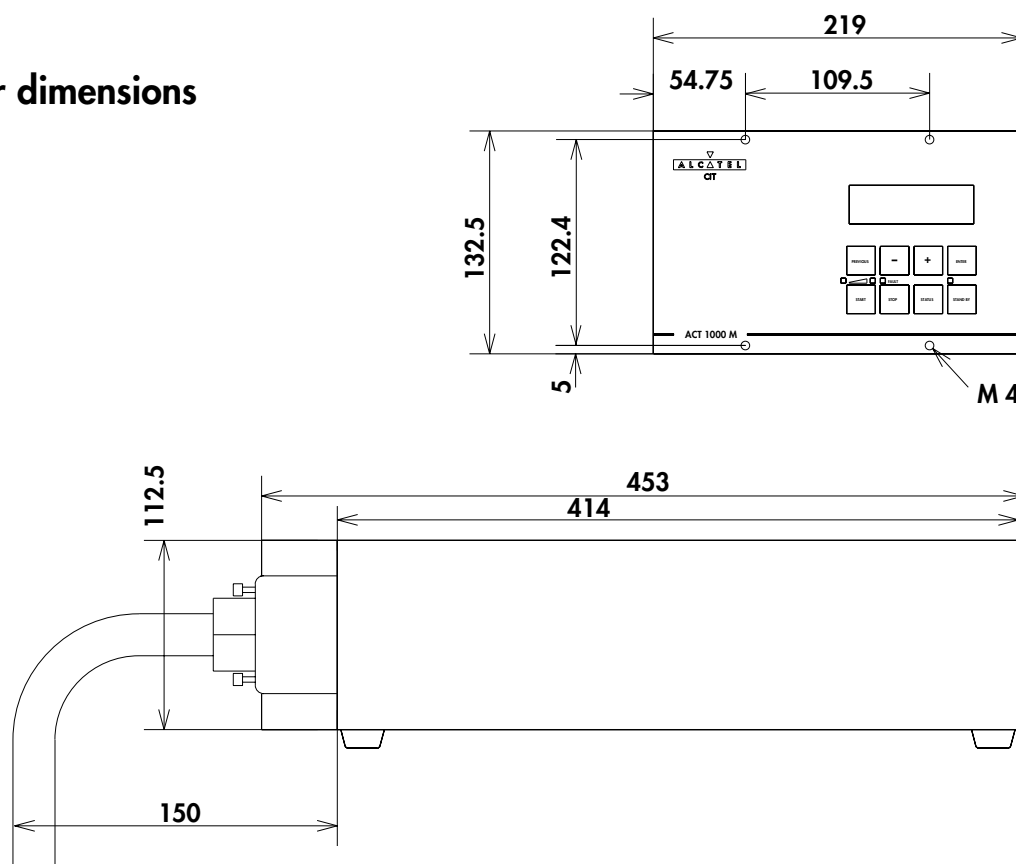
Inlet flange	H (mm)
DN 160 ISO-K	356.7
DN 200 ISO-K	304.0
DN 160 CF-F	369.1
DN 200 CF-F	341.7
ASA 6"	365.7

The technical characteristics

Controller characteristics

Model characteristics		ACT 600M	ACT 1000M
Weight	kg	8.5	
Dimensions HxWxD	mm	132.5 x 219 x 453 1/2 Rack 19"	
Power supply			
Nominal voltage	V	85 to 132 - 170 to 264	
Frequency	Hz	48/63	
Maximum power consumption	VA	750	
Customer main circuit breaker rating		10 A	
Ambient operating temperature °C		T ≤ 50	

Controller dimensions



Safety instructions related to installation



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

Installation Start-up

- 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.
- Before any maintenance operations on a product performed by a maintenance technician who has not received safety training (EMC, electrical safety, chemical pollution, etc.), isolate the product from the various energy sources (electricity, compressed air, etc.).
- 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.
- 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.

Safety instructions related to installation

Installation Start-up (continued)

- 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.).
- When handling the equipment, use the devices provided for this purpose (hoisting rings, handle, etc.).
- Risk of toppling over: although compliance with EEC safety regulations is guaranteed (normal range $\pm 10^\circ$), it is recommended to take precautions against the risk of toppling over during handling, installation and operation.
- The performance and the operational safety of this product are guaranteed provided that it is used in normal operating conditions.
- The vacuum pump is also a compressor: incorrect use may be dangerous.

Study the user manual before starting up the pump.

- 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 intake 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.

Unpacking and storage

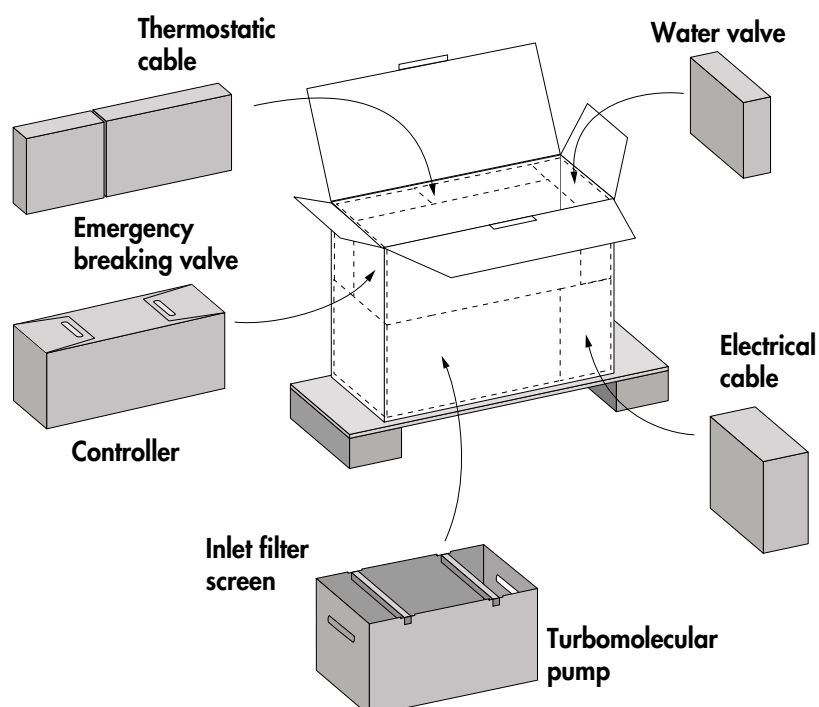
Unpacking

Unpack the equipment carefully and keep the packaging. Make sure that the equipment has not been damaged during the transport. If it has been damaged, take the necessary steps with the carrier and inform 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.

Weight of the complete shipping crate : 50 kg maxi.



Unpacking and storage

- The accessories** This packaging also contains other cardboard boxes, for the accessories (screen filter, emergency braking valve, water valve and purge device) 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.



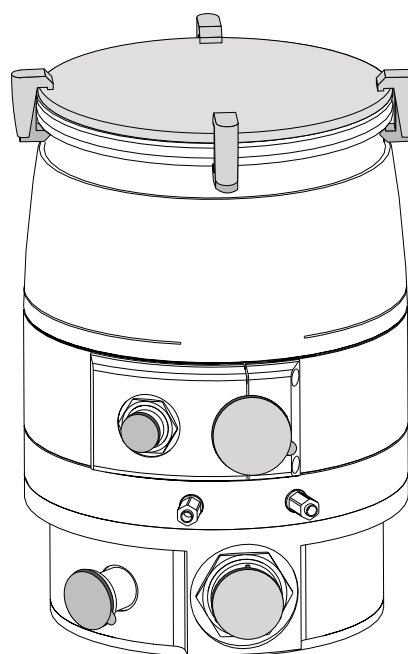
Lift the ATH 1000M out of its packaging by using the hoisting rings (weight 28 kg).

- Pump storage** Our equipment can be stored without special precautions (ambient temperature between 5 and 40°C) .

Inlet ASA 6", ISO or CF-F flange blanking and rotor holding system.

Exhaust Blanked with a DN 40 ISO-KF protector.

Connection for emergency braking valve and nitrogen device Blanked with a DN 16 ISO-KF protector.



Unpacking and storage

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

Storage mode The controller is set in STORAGE mode at factory, to protect internal RAM memory during transport and storage.

When the controller is powered, the storage mode disappears automatically.

Set the storage mode for prolonged storage when the pump is stopped.

Pump connections to an installation

Maglev pump connection instructions Why securing MAGLEVpump installation ?

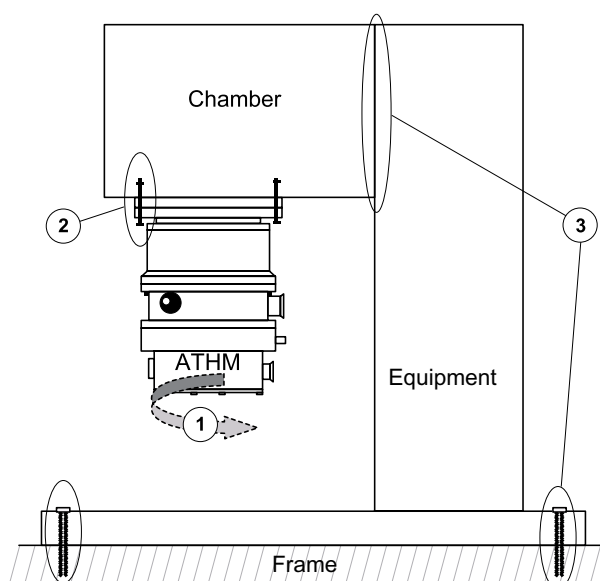
Maglev hybrid Turbopumps are designed so as to prevent any safety hazard to the user in standard operating conditions.

However, some operating conditions may generate hazards for the user and the environment: **the kinetic energy stored in a maglev turbopump is very important. 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 design in accordance with these installation specifications.

Installation spécifications



Pump connections to an installation

Installation with bolted flange

The kinetic energy of the rotor has to be absorbed by the installation **if the pump seizes suddenly**.

The resulting maximum deceleration torque is based on the assumption, that the rotor stops in half a turn and that the whole energy has to be taken by the pump assembling bolts.

Design and secure the pump frame so that it can withstand the maximum deceleration torque.

Maximum deceleration torque to stop the rotor in half a turn (item 1)

- 9159 Nm for ATH 400 M at nominal speed 39000 rpm
- 20000 Nm for ATH 1000 M at nominal speed 33000 rpm

Inlet flange installation conditions (item 2)

According to the housing type:

Mounting holes at inlet flanges				
Inlet flange	DN - ISO-F	160	200	250
Type of bolts dictated		M 10	M 10	M 10
Number of bolts dictated		8	12	12
Bolt metric grade		12 ⁻⁹	12 ⁻⁹	12 ⁻⁹
Installation torque per bolt	N.m	35 ⁺⁵	35 ⁺⁵	35 ⁺⁵



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.

Pump connections to an installation

Inlet flange installation conditions (item 2)) (Continued)



We strongly recommend the use of ISO-F or CF-F flanges.

ISO-K type flanges are not recommended to fasten turbomolecular pumps with inlet flange equal or larger than DN 200 because:

- there is no visual reminder (like threaded holes on ISO-F) to signal how many clamps are needed to secure the pump,
- it is not as easy to fasten claw clamps on ISO-K flanges as to secure bolts on ISO-F flanges,
- the ISO-K flanges do not prevent accidental rotation of the pump on the equipment flange in case of pump rotor crash. This rotation could damage the foreline and the purge gas line which would generate hazards for the user.

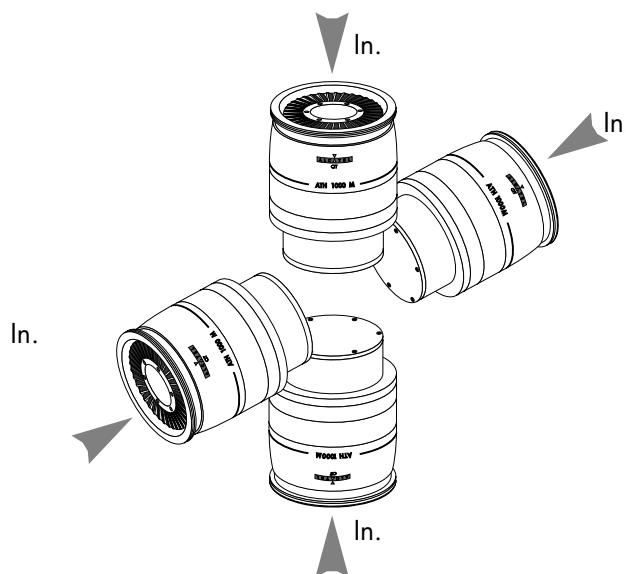
Equipment installation conditions (item 3)

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 deceleration torque to calculate the equipment attachment devices,
 - the flange dimensions,
 - the quality and the number of screws,
- no reducing adapter or bellows should be installed between pump inlet flange and the chamber.

Pump connections to an installation

The pump can operate
in any position



Rotor flanging device
disassembly

Welcome

To prevent the pump maglev bearings from being damaged due to shocks during transport, **the rotor is flanged to the pump housing.**



The pump must never be switched in this condition. This flanging must only be removed when the pump is to be installed.

We recommend that you keep the flanging to transport the equipment.

Pump connections to an installation

Vacuum connections



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.

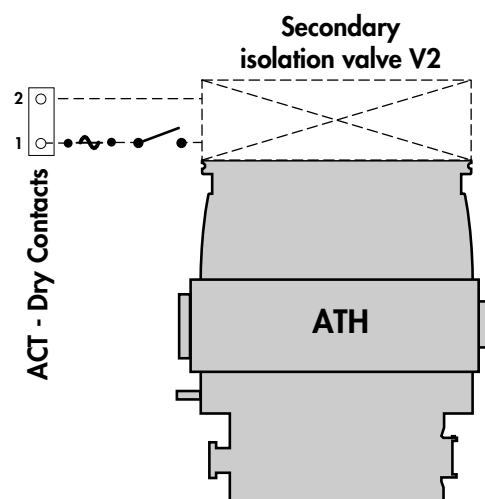
At inlet:

Screen filter

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

Secondary isolation valve

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*).



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

Pump connections to an installation

At exhaust:

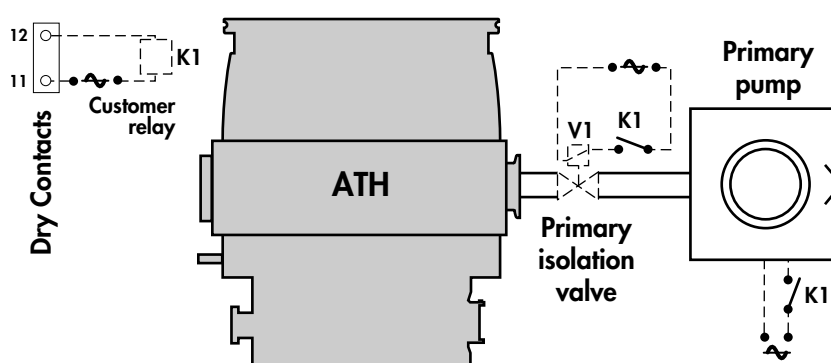
Primary isolation valve

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

The valve is closed 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*.

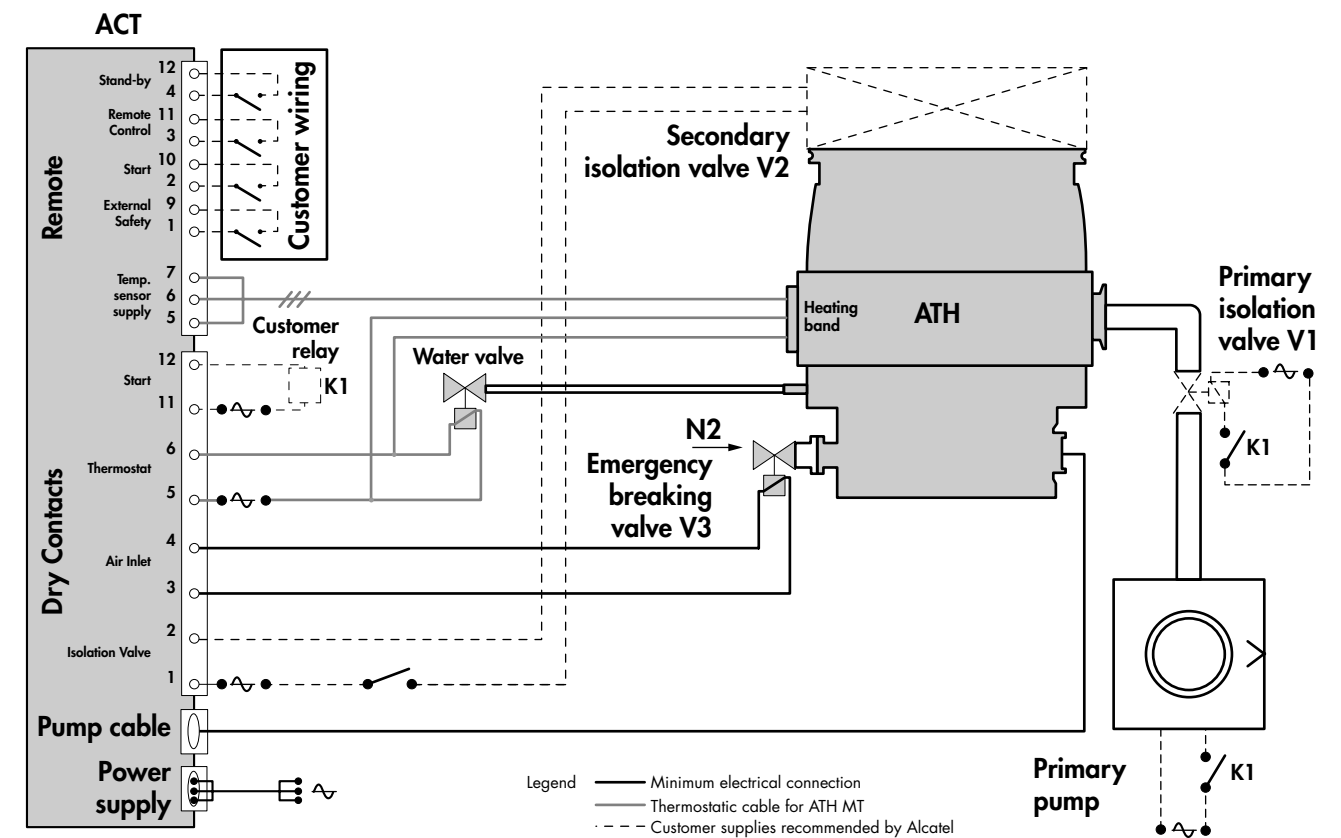


* Different connection accessories can be found in the Alcatel Catalog.

Pump connections to an installation

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.



Emergency braking valve connection



The braking valve must be connected to ensure the pump's safety and durability.

Function

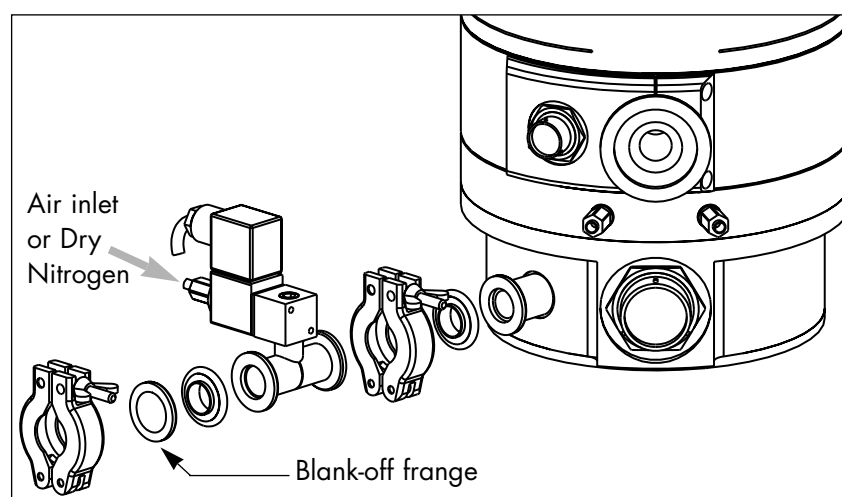
In the event of a major problem (magnetic bearings fail, external shock...), the pump must be stopped as soon as possible to prevent damage to the back-up bearings.

The emergency braking 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.

The reset to atmospheric pressure takes place when faults are registered on the controller which stops the pump and controls the air inlet (*see D 20*).

Vacuum connection



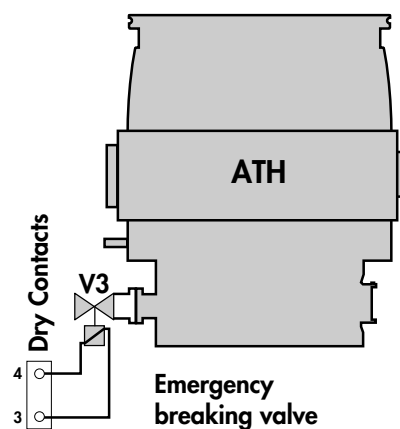
Install the calibrated emergency braking valve on the DN 16 fitting of the pump.

The valve must be connected to an air inlet line which can be for example dry nitrogen (Pressure between 1 and 1.5 bars absolute) (*see B 50 for nitrogen characteristics*).

Emergency braking valve connection

Electrical connection

Connect the valve powered and driven by the controller via the «**AIR INLET**» contact on the Dry Contacts connector (*see B 90*).



Nitrogen purge device connection

Characteristics of 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.

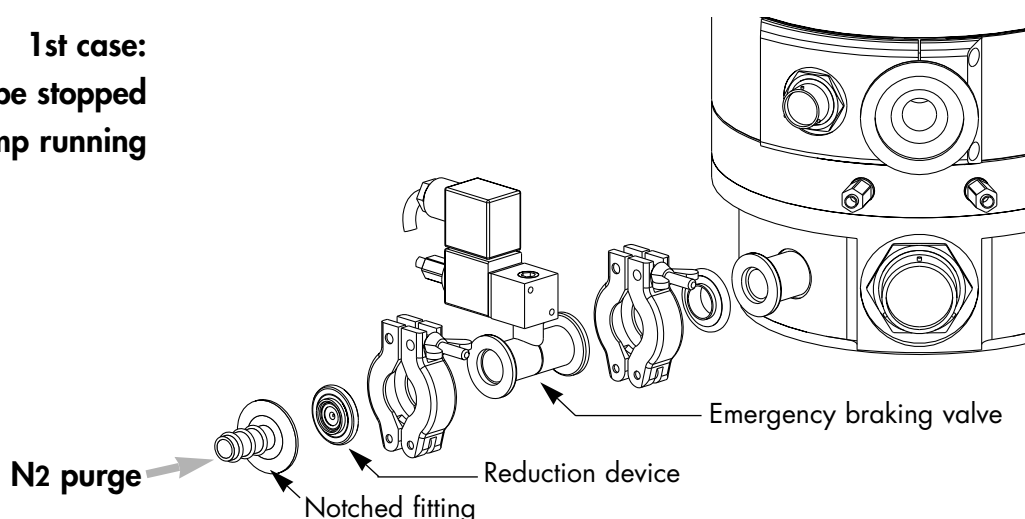
Purge connection



The nitrogen purge must be connected to the braking valve so as not to disturb its operation and not between the valve and the pump.

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.

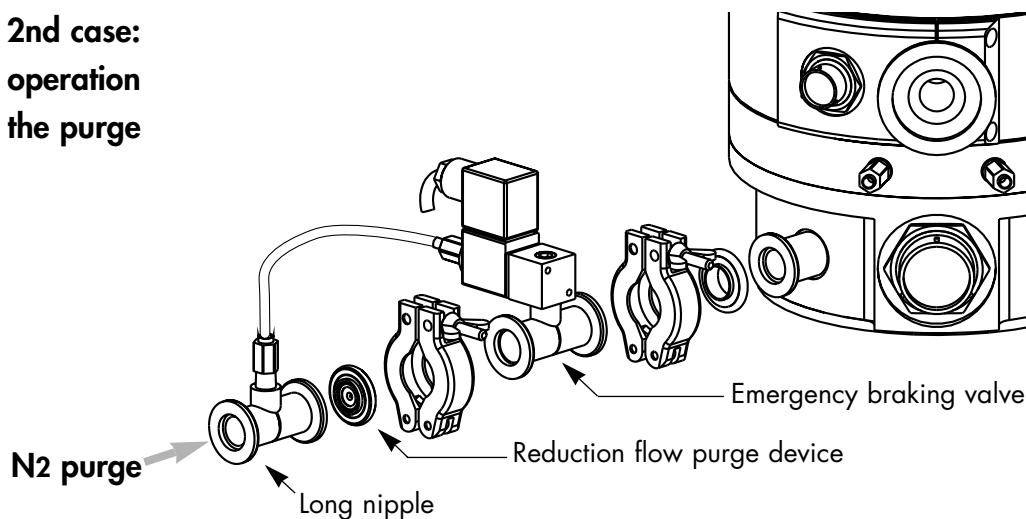
**1st case:
Purge can be stopped
during pump running**



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

Nitrogen purge device connection

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

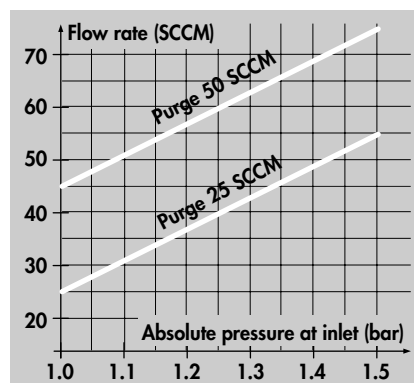


Connect the little flexible pipe between the long nipple and the valve.

Adjust the flow rate

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

For limited the flow rate at 25 SCCM, connect the nitrogen flow reduction device accessory (see A 50).



Water cooling connection

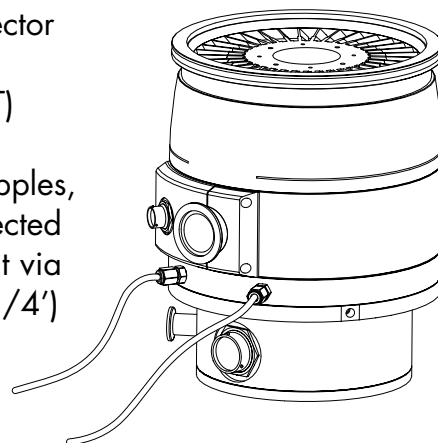
Characteristics of water cooling

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/dm³
- Resistivity > 1500 Ω .cm
- Solid pollution < 100 mg/dm³
- Max. pressure: 7 bars
- Temperature: $15 < T < 25^{\circ}\text{C}$
- Flow rate: 60 l/h

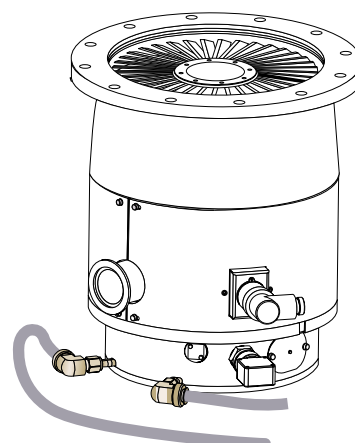
For ATH 1000M models

- Provide a water inlet pipe and a tap to adjust the flow rate.
- Install the two male connector delivered on the cooling device (connector 1/8 NPT)
- Connect the water inlet line to one of the cooler nipples, with the other nipple connected to the water draining circuit via a flexible tube (ext. diam 1/4") (supplied by customer).



For ATH 400M models

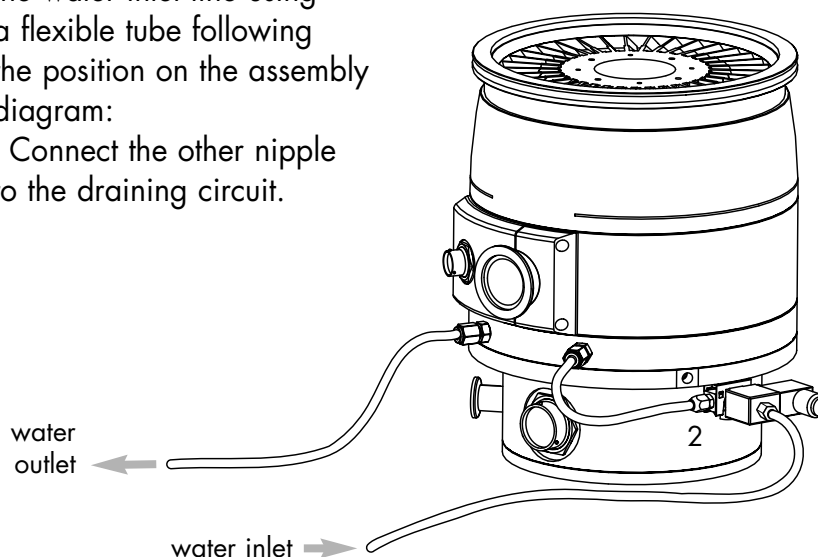
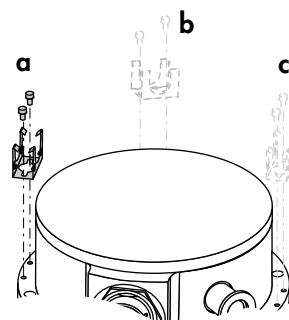
- Connect the water inlet line to one of the cooler water fittings 1/4 NPT female on the pump, with the other fitting connected to the water draining circuit via a tube (supplied by customer).



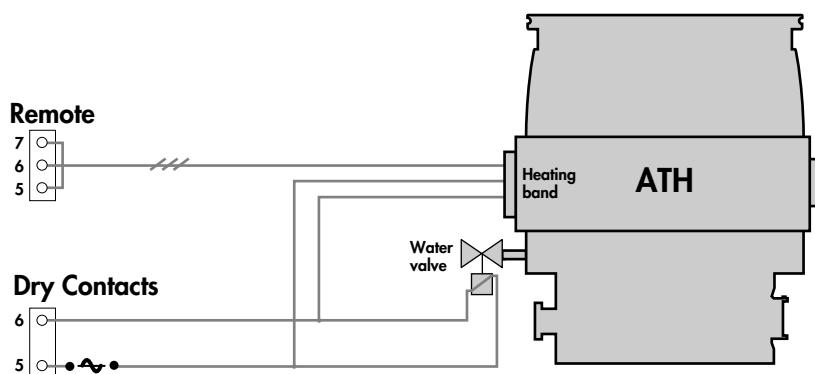
Water cooling connection

**For ATH 400MT
or ATH 1000MT models**

- Provide a water inlet pipe and a tap to adjust the flow rate.
- Assemble the valve holding stirrup on the pump frame (3 positions **a,b,c**).
- Install the water electrovalve on its holding.
- Install the water valve to the water inlet line using a flexible tube following the position on the assembly diagram:
- Connect the other nipple to the draining circuit.



Electrical connection



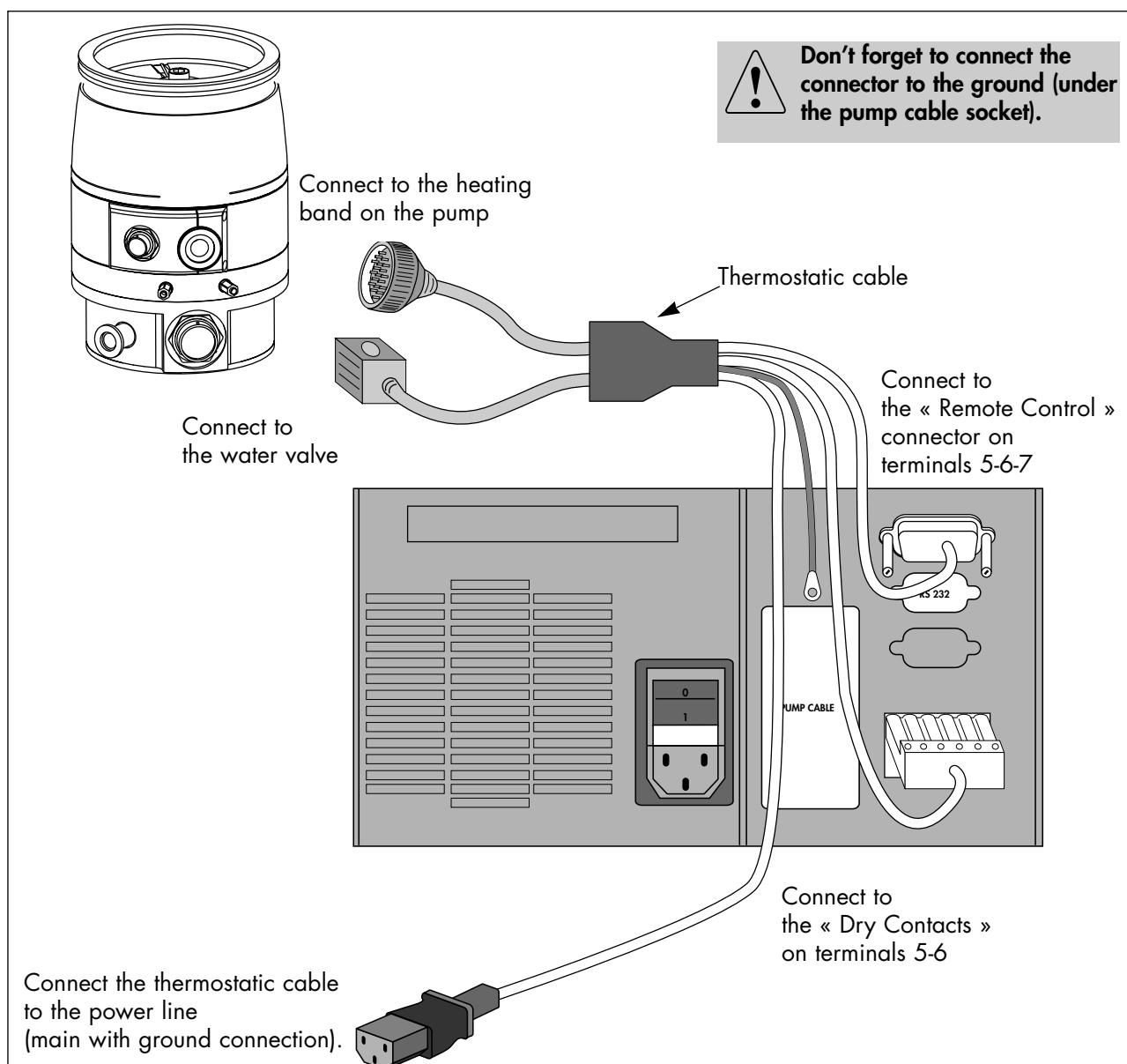
Connect the water valve via the «THERMOSTAT» contact on the DRY CONTACTS connector and supply it via the thermostatic cable.

Heating band connection

For ATH 400MT and ATH 1000MT

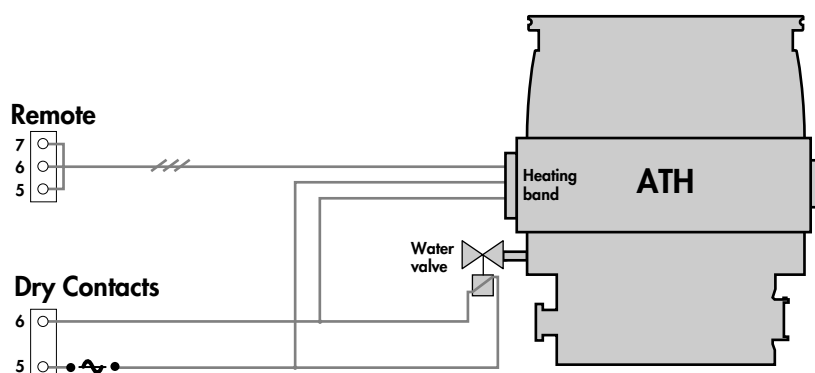
These pumps are equipped with an heating band, a thermal sensor and a valve to regulate the water flowrate. The body of the pump can be heated to 75°C to avoid gas condensation in the pump on the semiconductor processes.

Connection Connect the thermostatic cable as follows:



Heating band connection

Heating band temperature



The temperature can be chosen on the controller (between 31 and 75°C or NO°C).

By choosing «NO°C» temperature, the heating band is switched off and the pump is cooled permanently.

If there is a failure on the temperature sensor on the heating band, the controller display indicates:

PUMP-TEMP2	00 °C
DEF 38	TEMP.SENSOR 2

The heating band is switched off and the pump is cooled permanently.

The temperature of the heating band can be read on the display of the controller (**see C 30**).



Hot surfaces are signalled by  symbol.

The pump housing temperature can reach 75°C.

Electrical connection

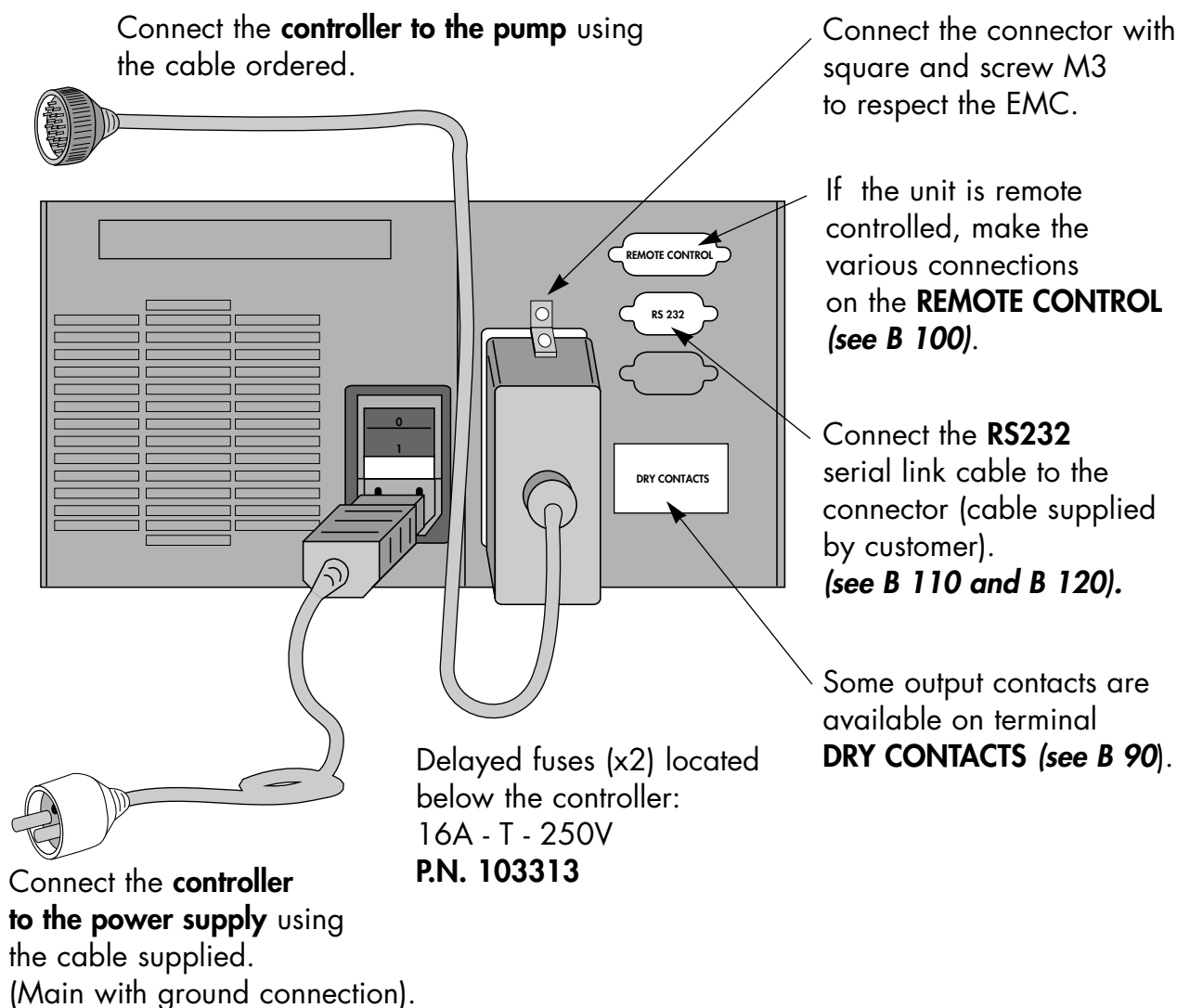
Controller installation

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.

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 and below the unit.

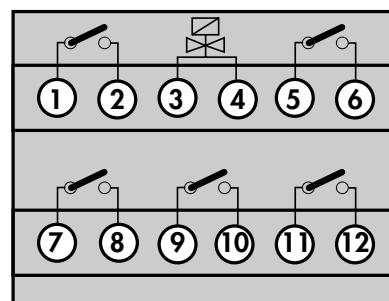
Connections



«Dry contacts» relay wiring

Signaling using output contacts:

These are dry contacts (220VAC - 3A): their functions are to copy the data concerning the pump operating status.



Isol. valve 1 - 2

When the controller detects a bearing operating fault or after a stop, it opens the contact.

This contact must 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.

Air inlet 3 - 4

When the controller detects a bearing operating fault, it stops the power supply to the emergency braking valve (12V-5W): the valve opens and air enters.

Speed 7 - 8

The contacts is closed when the pump reaches the selected speed.

Fault 9 - 10

The contact is opened if a faults appears.

Thermostat 5 - 6

The contact is opened or closed, depending on the pump temperature and the selected temperature.

Start 11 - 12

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 a primary pump.

Contact functional status

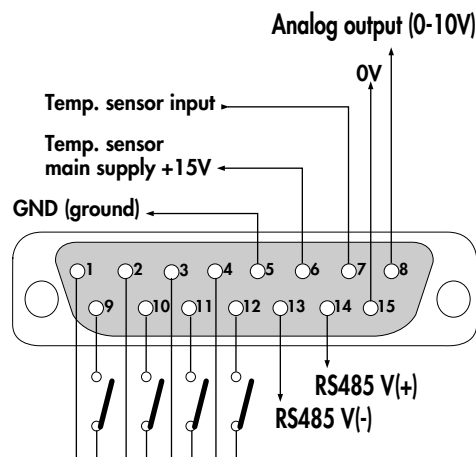
	Power off	Power on	Stop	Start on	Nominal speed	Alarm	Defect
ISV	1	0	0	1	1	1	1
Thermos.	1	1	1	1	1	1	1
Speed	1	1	1	1	1	1	1
Fault	1	1	1	1	1	1	1
Start	1	1	1	1	1	1	1

"Remote Control" connector wiring



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

The control contact



Ext. safety 1 - 9

When the contact is closed, an external safety device is signalled: the motor is stopped and the controller generates a fault. This contact must be opened for the pump to operate. The emergency valve is opened.

Start/Stop (in remote mode) 2 - 10

When the contact is closed, the pump is started up and accelerates to reach its nominal speed or reduced speed (depending on parameter settings). If the contact is open, the pump is no longer powered.

REMOTE Mode 3 - 11

When the contact is closed, the remote control mode is selected. The actions on the keyboard are without effect. If the contact is open, the local mode is selected (control using the front panel keypad).

STANDBY Mode 4 - 12

When the contact is closed, the reduced speed rotation mode is selected.

Temp. Sensor 5 - 6 - 7

These contacts allows to read the heating band temperature.

Analog. Output 8 - 15

Used to monitor the selected parameter (see ANALOG OUT menus C 30).

"Remote Control" connector wiring

Analog output signal

The signal is transmitted between terminal 8 and 15 of the remote connector.

Five values can be used to plot curves:

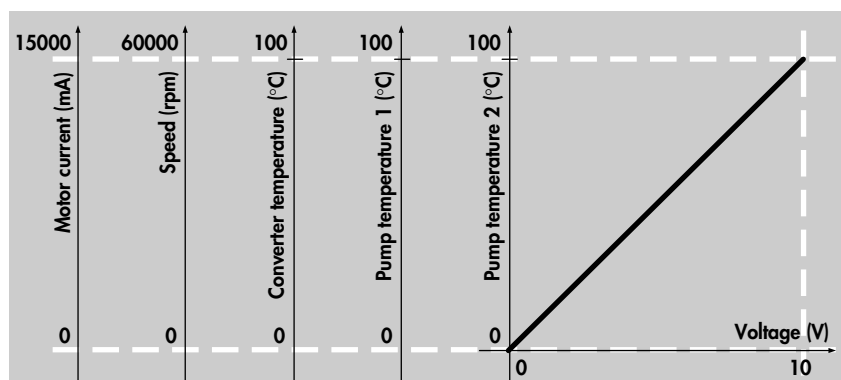
θ1 Pump temperature: 0°C (OV) to 100°C (10V)
(θ1 PUMP)

θ2 Pump temperature: 0°C (OV) to 100°C (10V)
(θ2 PUMP)

Pump rotation speed: 360 rpm (OV) to 30000 rpm (5V)
(SPEED)
360 rpm (OV) to 33000 rpm (5.5V)
360 rpm (OV) to 39000 rpm (6.5V)

Controller temperature: 0°C (OV) to 100°C (10V)
(θ CONV)

Motor current: 0 mA (OV) to 8700 mA (5.8V)
(I MOTOR)



Factory configuration is setted on **(SPEED)**.

RS 232 or RS 485 serial link wiring

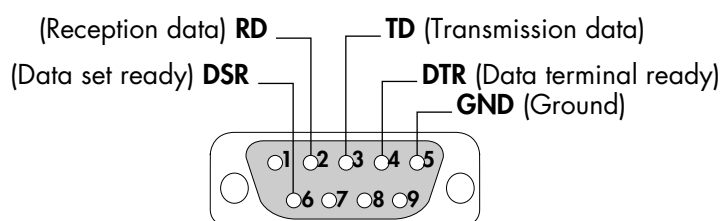
At the first power-up, the user finds the default configuration. The serial link parameters can be modified by accessing the corresponding unit menu (**see C 30**).

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:



DB 9 contacts, male connector.

Connection examples:

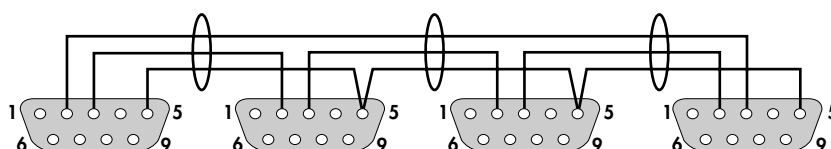
RS232 type serial link with a single controller



The multiple link is obtained by creating a loop:

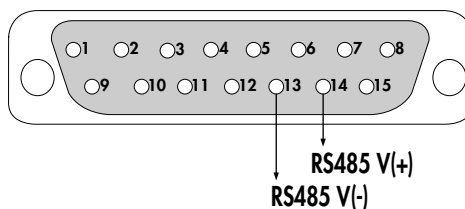
Multiple RS232 serial link:

several units (up to 999) can be controlled on a single link.



RS 232 or RS 485 serial link wiring

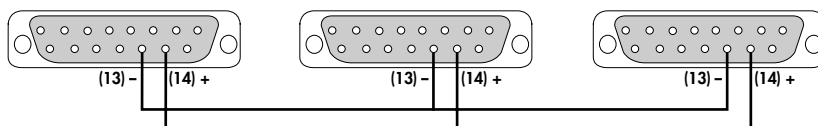
RS485 connector wiring:



«Remote Control» connector 13 and 14 pins
DB 15 contacts, male connector.

Multiple RS485 serial link:

several units (up to 999) can
be controlled on a single link.



Detailed description of RS232 and RS485 commands

(valid from V.2.03 version controller)

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

DLI Defines the DataLogger transmission interval

Syntax #adr**DLI**,xxx<CR>[<LF>]
 xxx: DataLogger send interval in seconds
 condition: $001 \leq xxx \leq 255$

Result #adr,OK or Err2

See also: **DLR** Note: if OK, the interval sent is stored in user memory.

DLR Enables DataLogger operation (only with RS232)

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

Result #adr,OK

The main characteristics of the pump and its controller are sent over the RS link, at the rate defined by the **DLI** command.

Note: any new characters arriving on the serial port (RS 232) will cancel the automatic DataLogger transmission.

GET List the data (data only)

Syntax #adr**GETAI**<CR>[<LF>] : List analog inputs
 #adr**GETLI**<CR>[<LF>] : List logical inputs
 #adr**GETLO**<CR>[<LF>] : List logical outputs

Detailed description of RS232 and RS485 commands

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

Syntax #adrIDN<CR>[<LF>]

Result #adr, ACT1000M 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 #adrLEV10<CR>[<LF>]

Result #adr,nnnnn,sssss,00000,0,cccc,eeee,dddd,pppp,qqqq,ij,kk,000,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
cccc : pump working time (in hours)
eeee : electronic working time (in hours)
dddd : start delay (max 14459 s,
that is 240 mn 59 s)
pppp : time to venting (max 3599 s,
that is 59 mn 59 s)
qqqq : venting time (max 3599 s,
that is 59 mn 59 s)
ij : speed threshold for relay (3 to 50 %)
kk : control temperature (30 to 75°C)
00 : not used
mmm : bearing current value (0 to 100 %)

Detailed description of RS232 and RS485 commands

NOW Display date and time

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

Result MM/DD/YY HH:MM:SS

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

Result #adr,OK

Comment: 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 Stand-by mode)

Comment: if OK, the new speed is automatically stored in user memory.

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

SEL10 Returns the state of the parameters defined by OPT

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

Result #adr,a,0,0,0
a : Returns choice of 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
0,0,0 : not used

Detailed description of RS232 and RS485 commands

SCR List all the data (titles and data)

Syntax #adr**SCR**<CR>[<LF>] : List all the data
 #adr**SCRAI**<CR>[<LF>] : List all the analog inputs
 #adr**SCRAO**<CR>[<LF>] : List all the analog outputs
 #adr**SCRLI**<CR>[<LF>] : List all the logical inputs
 #adr**SCRLO**<CR>[<LF>] : List all the logical outputs

SET Defines the internal operating parameters

Syntax #adr**SET**10,cccc<CR>[<LF>] : pumping working time
 (in hours)
 #adr**SET**11,eeee<CR>[<LF>] : electronic working time
 (in hours)
 #adr**SET**13,dddd<CR>[<LF>] : start delay (max 14459s,
 that is 240mn 59s)
 #adr**SET**14,pppp<CR>[<LF>] : time to venting (max 3599s,
 that is 59mn 59s)
 #adr**SET**15,qqqq<CR>[<LF>] : venting time (max 3599s,
 that is 59mn 59s)
 #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**33,mmm<CR>[<LF>] : bearing current value
 (0 to 100 %)

Result #adr,OK or ErrX

Detailed description of RS232 and RS485 commands

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 : $000 \leq nnn \leq 255$

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.

SPD Returns the current speed

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

Result #adr,nnnnn

Detailed description of RS232 and RS485 commands

STA Returns the status of the internal dynamic parameters

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

Result #adr,s,rrrrr,vvv,www,xxx,yyy,zzz,aaa,bbbb,cccc,ddd,eee,fff,gggggggggggggggggggggggg<CR>

adr: address

s: order status

Bit	7	6	5	4	3	2	1	0
			LOCAL	STOP	RS	REM	STDBY	START
0	-	OFF	OFF	OK	OFF	OFF	OFF	OFF
1	1	-	ON	fault	ON	ON	ON	ON

rrrrr: speed in rpm

vvv: Radial v13

www: Radial w13

xxx: Radial v24

yyy: Radial w24

zzz: Axial z12

aaa: Motor voltage V

bbbb: Motor current mA

cccc: Motor load W

ddd: Pump temp 1 (°C)

eee: Pump temp 2 (°C)

fff: Controller temp (°C)

g	0 = OK	1 = ALERT	2 = FAULT
0	0=OK	D02: motor overheat	
1	0=OK	D03: converter overheat	
2	0=OK		D04: hall sensor
3	0=OK		D05: permanent fault sensor
4	0=OK		D06: external safety
5	0=OK		D31: jump DT0/DT1/DT2
6	0=not used		
7	0=not used		
8	0=not used		
9	0=OK		D14: v13
10	0=OK		D15: w13
11	0=OK		D16: v24
12	0=OK		D17: w24
13	0=OK		D18: z12
14	0=OK	D23: hot pump	D21: overheat-1
15	0=OK	D22: controller temp.	
16	0=OK		D26: wires disconnected
17	0=OK	D27: converter memory	
18	0=OK	D28: pump memory fault	
19	0=OK		D29: input power failure
20	0=not used		

Detailed description of RS232 and RS485 commands

TIT List the data titles

Syntax #adr**TITAl**<CR>[<LF>] : List analog inputs
 #adr**TITLI**<CR>[<LF>] : List logical inputs
 #adr**TITLO**<CR>[<LF>] : List logical outputs

TMP Defines the operating state of the turbomolecular pump

Syntax #adr**TMPO**N<CR>[<LF>] start pump rotation
 #adr**TMPO**FF<CR>[<LF>] stop pump

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

Safety instructions related to operation



Before using 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*.

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.

The emergency braking valve must be connected (*see B 40*) to ensure the pump's safety and durability.
As long as the pump is running, the emergency braking valve has to be supplied with neutral gas.



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

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.

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.

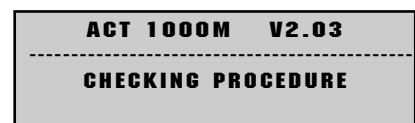
The initialization time is approximately 4 seconds.

Display initialization:

The equipment is identified, the program version is displayed.

Indicator light test: they are lit in succession.

The working screen is displayed.



The parameter setting keys

Parameter setting access



- 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



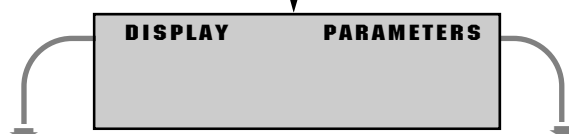
- used to validate the selection of a menu, parameter or value.



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

Configure the parameters for the application using the various menus.

Enter the sub-menus by pressing

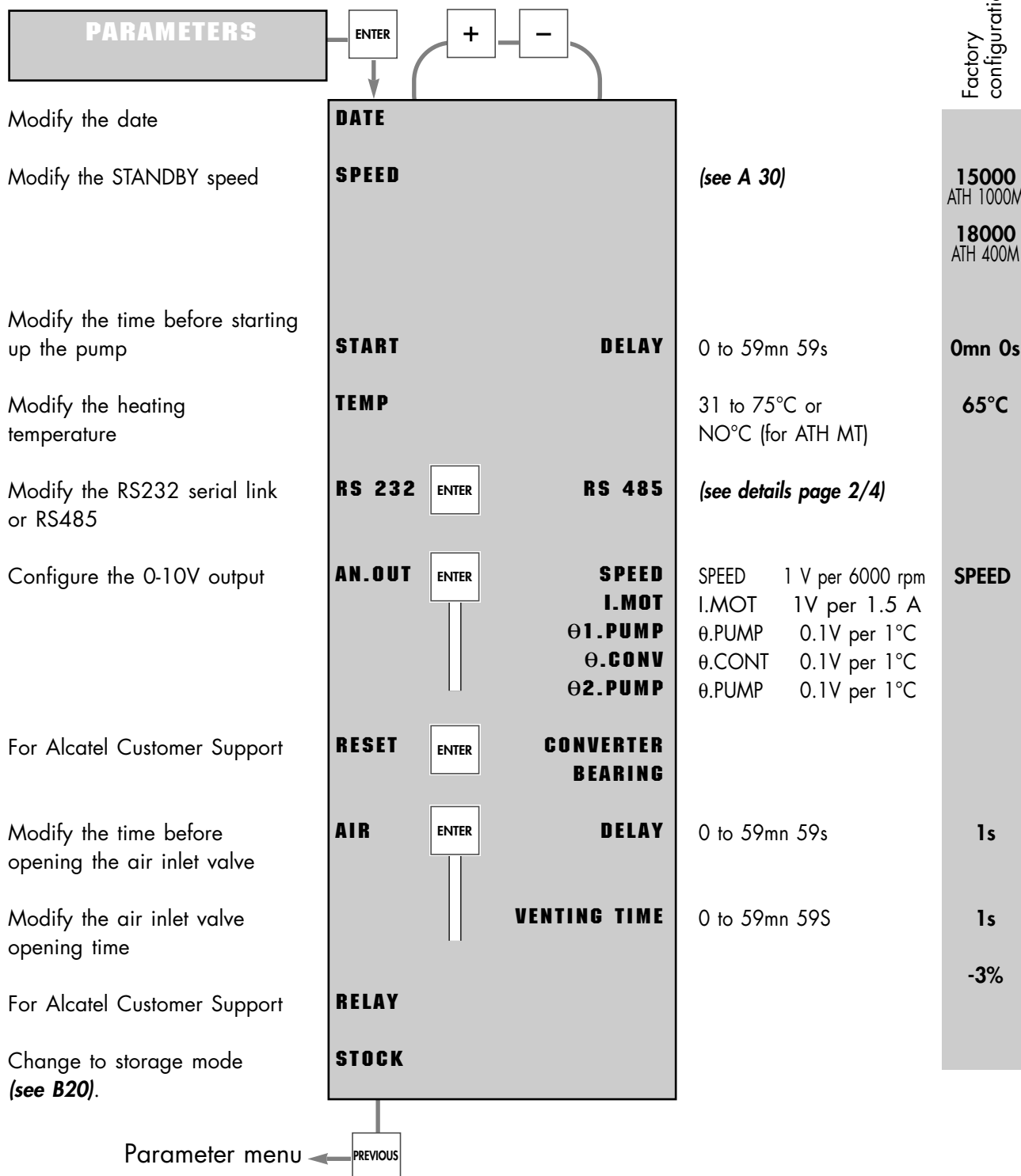


Display and/or select the parameters to be monitored (*see C 30*).

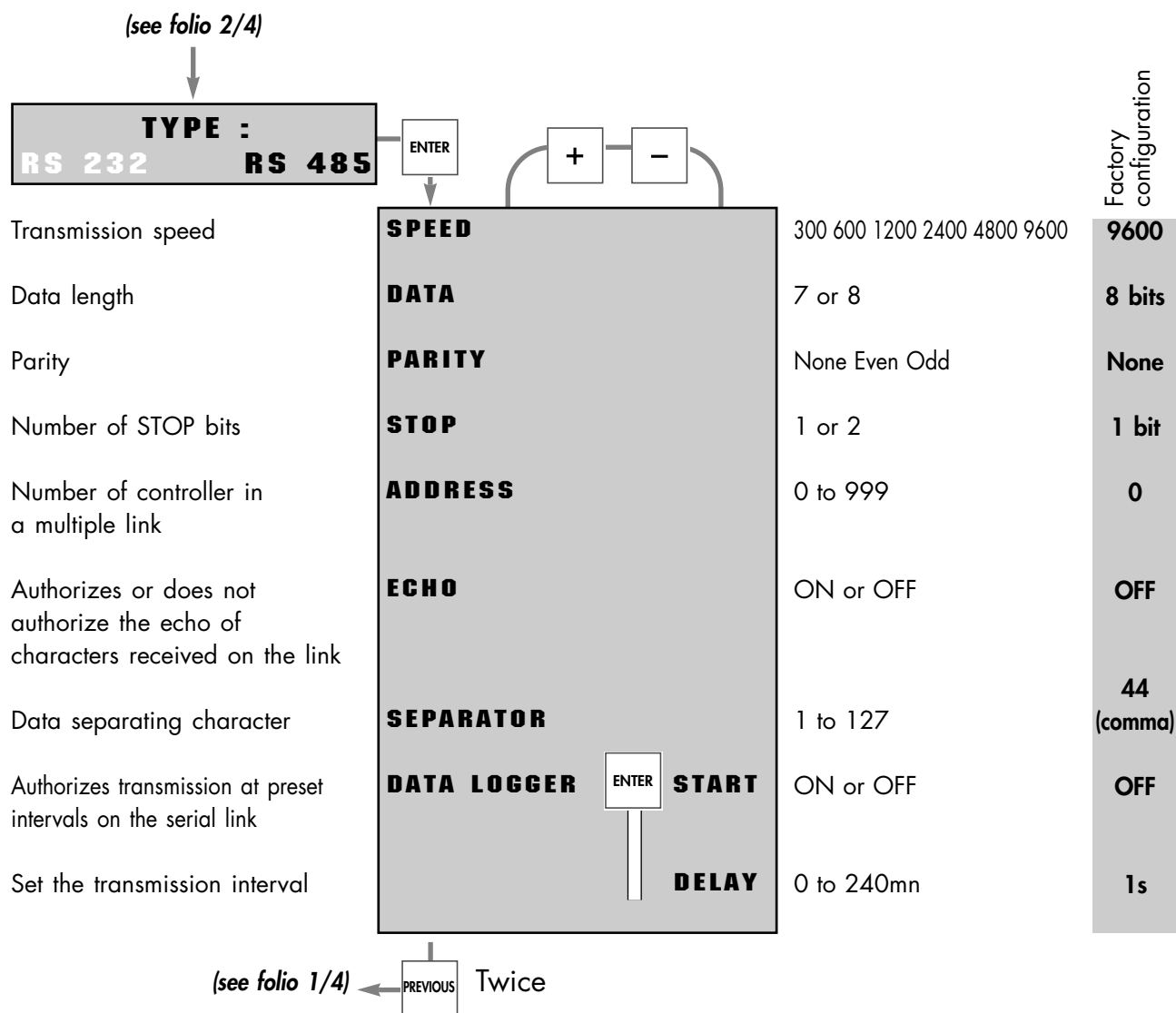
Access the parameter programming (*see C 30*).

Configuring the controller for the application

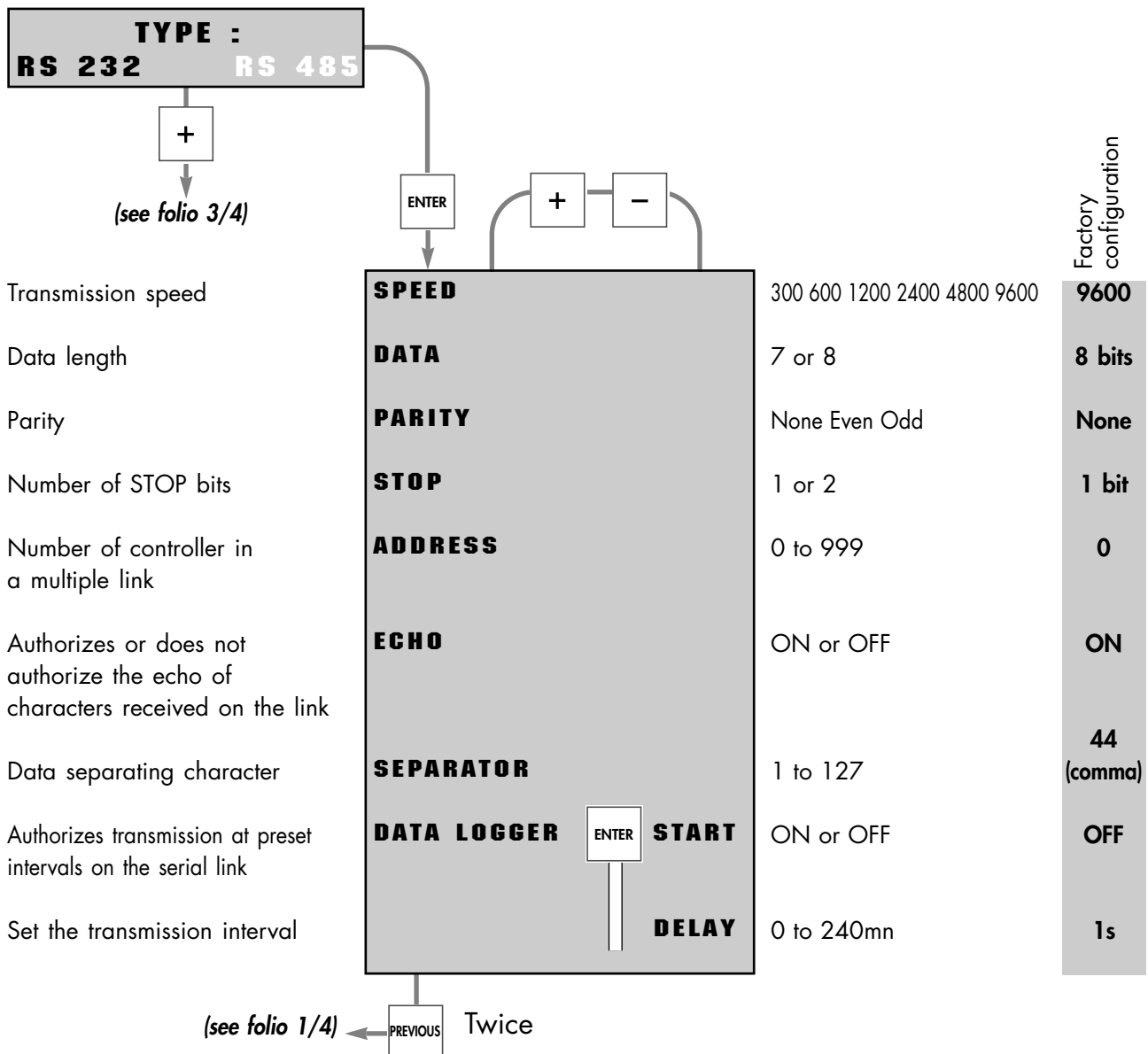
Programming the parameters



Configuring the controller for the application



Configuring the controller for the application



Configuring the controller for the application

The various indicators on the display:



12/05/96 12:24:54
SPEED : 33000 RPM
 Θ1.PUMP 75°C
 HOT PUMP - HOT PUM

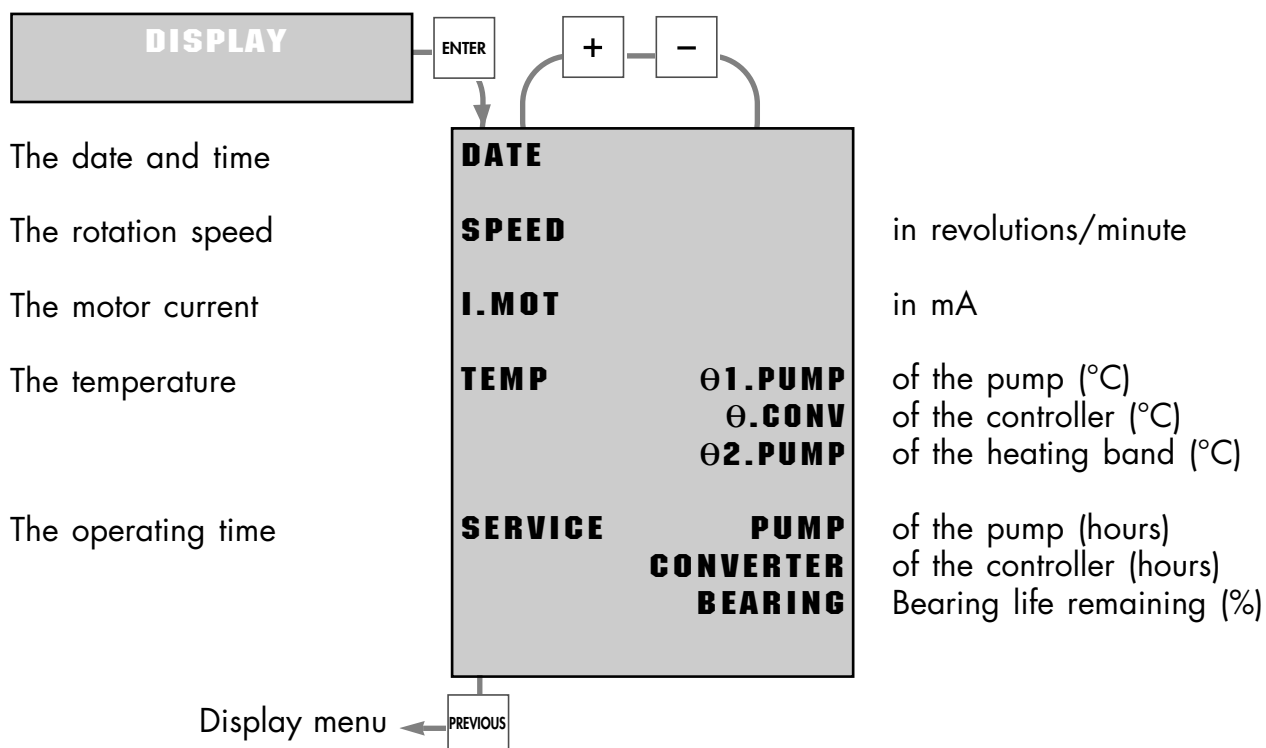
← 1st parameter
 ← 2nd parameter
 ← 3rd parameter
 ← Messages

3 parameters can be selected in the pull-down menu from the list below:

- the current date and time;
- the rotation speed of the pump in «rpm»;
- the current pump motor (mA);
- the pump internal temperature and the housing temperature of the pump (°C);
- the temperature of the controller (°C);
- the number of hours that the pump is in operation (h);
- the number of hours that the controller is in operation (h);
- the % life remaining on the back-up bearings (%) before changing the bearings.

When switched on, the controller displays: the date and time, the rotation speed and the pump temperature.

Configuring the display screen



Controlling the pump using the controller front panel

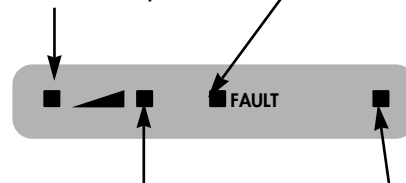
Rotation indicator lights:

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.



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



The pump is started up to reach the selected speed.



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 rotation mode by pressing



The speed selection indicator light comes on. The pump

regulates its speed to reach the value of the programmed reduced rotation speed (*see C 30*).



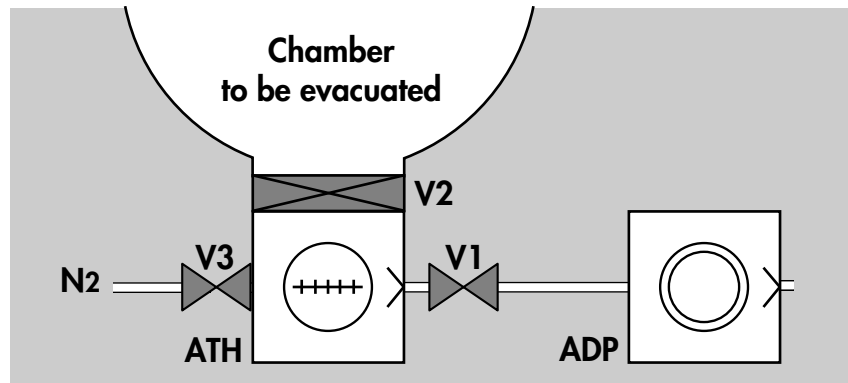
Stop the pump by pressing



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

Pump operation in a pumping application

Pumping cycle
from chamber
at atmospheric pressure



Local mode operation

Pumping start

Switch on the controller

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

Start the pumping by

The primary pumps start 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.
The chamber continues to be pumped until the customer operating pressure is reached.

Select the stand-by mode

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

Pump operation in a pumping application

Pumping stop

Stop the pumping by



This closes the primary isolation valve **V1** and the primary pump stops. If the ISV contact is connected, **V2** closes.

Close the valve V2

The level of vacuum in the chamber is maintaining.

Allow the purge to flow through after pumping has stopped in order to eliminate the dead volume in the pump with neutral gas.

Eventually, make an air inlet on the pump to brake its rotation.

Without air inlet, the duration of the rotor slow-down until its complete stop could be more than 30 minutes.

Remote control mode operation

Remote control mode selection

Close the contact «REMOTE» on the Remote Control connector **(see B 90)**.

The keyboard control keys on the front panel (Start, Stop, Standby) are deactivated.

In this mode, the functions are the same to the local mode.

Pump operation in a pumping application

Immediate restarts

If the pump has been stopped by an air inlet, we advise to limit to 2 the number of immediate restarts.

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

The controller display indicates temporarily:

D 29 : INPUT POWER

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.

Long power cuts

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 emergency braking valve is open by power failure;
- 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, open the START contact and close it again.

«External safety» contact operation

If the «EXT. SAFETY» contact on the Remote Control connector (**see B 90**) is closed:

- the controller display indicates: **D 06 : EXT.SAFETY**
- the pump is stopped and the emergency braking valve opens.

To restart the pump, open the «EXT. SAFETY» contact and start the pump:

- in local mode: push the START key;
- in remote control mode: open «START/STOP» contact then, close it (**see B 100**).

Safety instructions related to maintenance



It is important to isolate the machine from the electrical power supply source before any interventions inside the equipment (for maintenance reasons).

Before any maintenance operations, check the pumping conditions of the installation: toxicity, possible corrosion of the pumped gases. Depending on the case, we recommend:

- to purge the pumping installation with dry nitrogen before any intervention**
- to wear gloves, protective goggles and breathing masks, if necessary**
- to ventilate the room well and disassemble the equipment under a fume hood.**

Before restart, follow all the safety instructions concerning start-up.



The controller should never be switched off as long as the rotor is moving (speed = 0 rpm).

Safety instructions related to maintenance

Back-up bearings

When the pump is running, the rotor is levitated magnetically. There is therefore no friction between moving and fixed parts.

When the pump is stopped from the controller, the back-up bearings are not used. The rotor remains levitated by magnetic bearings.

Only the back-up bearings require maintenance: they are designed to withstand many accidental shut-downs, or many landings of the rotor on the bearings at full speed. These accidental shut-downs occur only in exceptional circumstances: broken power supply cable, strong shocks, faulty electronics. **It is advisable to check the bearing counter and provide ball 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 100.00%.

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, nearly 0.20% per landing;
- a landing at 9000 rpm after a prolonged power failure, nearly 0.04%.

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 or,
 - if these valves are not driven by the controller,
- the counter can count down 30% since the first landing.**

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

D 24: BEARINGS MUST BE CHANGED

Diagnosis and troubleshooting

The screen is blocked on a display
(At start-up or during operation) **D 30**

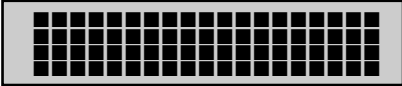
The default is indicated by the controller **D 40 to
D 270**

The default is not indicated by the controller . . . **D 280**

Screen blocked on a display

INCIDENT	CAUSE	REMEDY
Display remains OFF after power ON	Controller not powered	■ Check that the controller is powered. ■ Check the power supply voltage: $85\text{ V} < U < 132\text{ V}$ or $170\text{ V} < U < 264\text{ V}$
	NO	
	Defective fuses	■ Check the fuses: 2 fuses 16A located under the controller (Access panel). ! Isolate the product from its various energy sources before any maintenance operations.
	NO	■ If the message continues, call the Alcatel Customer Service.

Screen blocked on a display

INCIDENT	CAUSE	REMEDY
	No mains current NO	■ Check the power supply voltage of the controller: 85 V < U < 132 V or 170 V < U < 264 V ■ If the message continues, call the Alcatel Customer Service.
	Microprocessor board does not run NO	■ Switch ON /OFF the controller. ■ If the message continues, call the Alcatel Customer Service.
ACT 1000 M V2.XX ----- MEMORY FAULT	The pump is not identified after controller initialisation	■ See D 250.
ACT 1000 M V2.XX ----- WDOG CONVERTER	The microprocessor runs on itself NO	■ Stop the pump, Switch the controller ON/OFF. Restart the pump. ■ If the message continues, call the Alcatel Customer Service.

DO1 : POWER OVERHEAT

INCIDENT	CAUSE	REMEDY
Controller temperature too high	Bad mains voltage	Check the voltage: $85\text{ V} < U < 132\text{ V}$ or $170\text{ V} < U < 264\text{ V}$
	NO	
	Bad controller cooling	- Check that the air admissions are not blocked . - Respect a free space of 15mm above and under the controller.
	NO	
	Fan is not running	- Check the fan power supply. - If the message continues, call the Alcatel Customer Service.
	NO	
	Ambient temperature too high $> 50^{\circ}\text{C}$	Ventilate the controller environment.
	NO	If the message continues, call the Alcatel Customer Service.

DO2 : MOTOR CONTROL OVERHEAT

INCIDENT	CAUSE	REMEDY
Motor temperature too high	Number of start-ups too frequent	■ Reduce the number of ON/OFF switchings with air inlet.
	NO	
	Working pressure too high ATH 400M : $P > 1$ mbar ATH 1000M : $P > 1.10^{-1}$ mbar	■ Adapt the working pressure.
	NO	
	Exhaust pressure too high > 5 mbar	■ Adapt the exhaust pressure, see curves G 10 and G 20.
	NO	
	Problem on water cooling circuit	■ Check the flow rate (60 l/h).
	NO	
	Water electrovalve does not open when thermostatic pump parameter is set to NO°C	■ Change the valve, see B 60 and F 90.
	NO	
	Defective ACT/ATH link	 Wait for the complete pump stop before any interventions on the cable ! ■ Check the connector locking. ■ Change the cable.
	NO	■ If the message continues, call the Alcatel Customer Service.

DO3 : MOTOR CONTROL OVERHEAT

INCIDENT	CAUSE	REMEDY
Controller temperature too high	Bad controller cooling	■ Chek that the air admissions are not blocked. ■ Respect a free space of 15mm above and under the controller.
	NO	
	Number of start-ups too frequent	■ Reduce the number of ON/OFF switchings with air inlet.
	NO	
	Working pressure too high ATH 400M : $P > 1 \text{ mbar}$ ATH 1000M : $P > 1.10^{-1} \text{ mbar}$	■ Adapt the working pressure.
	NO	
	Exhaust pressure too high > 5 mbar	■ Adapt the exhaust pressure, see G 10 and G 20.
	NO	■ If the message continues, call the Alcatel Customer Service.

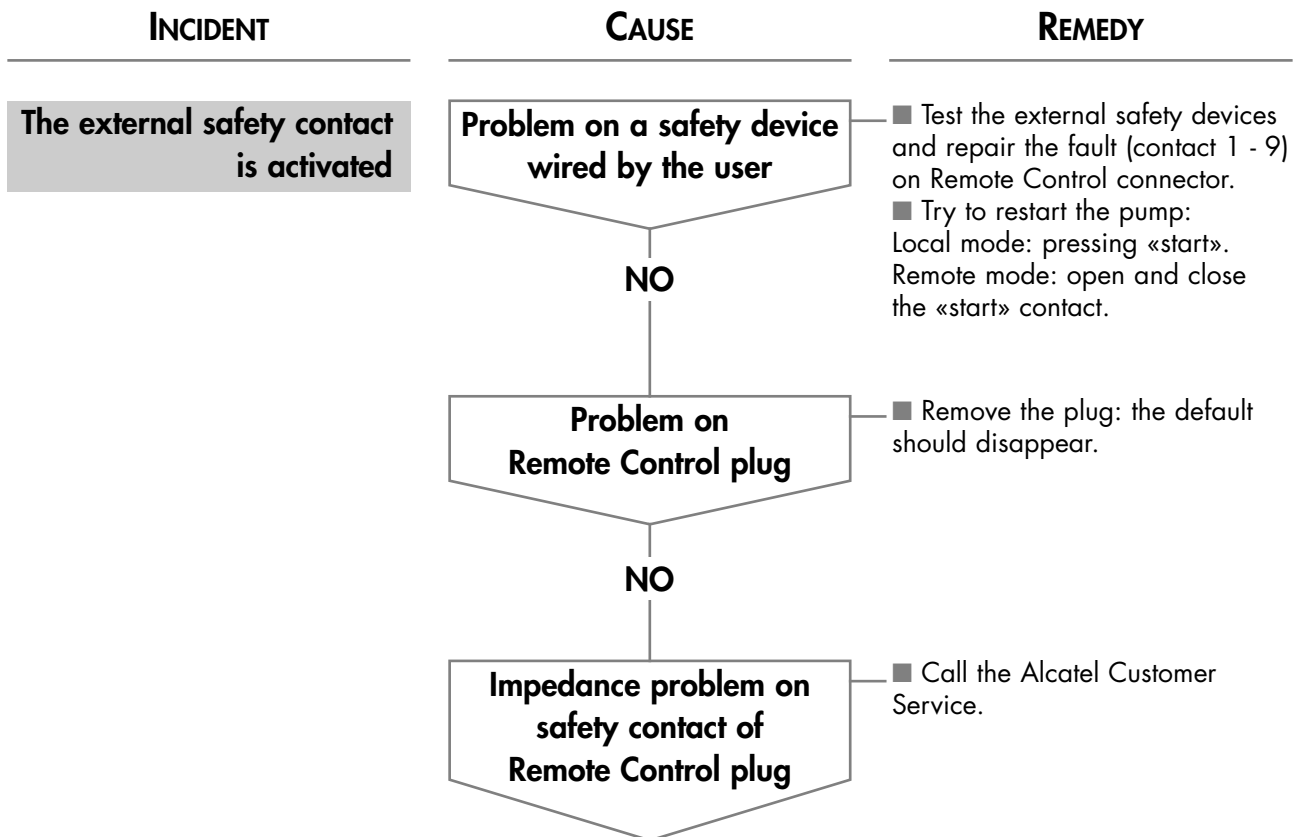
D04 : HALL SENSOR

INCIDENT	CAUSE	REMEDY
Wrong information coming from motor stator	Default on Hall effect sensors of motor	Try to restart the pump: Local mode: pressing «start». Remote mode: open and close the «start» contact.
	NO	 Wait the pump isn't running. - Switch OFF the controller and restart it.
	Defective ACT/ATH link	 Wait for the complete pump stop before any interventions on the cable ! - Check the connector locking - Change the cable.
	NO	If the message continues, call the Alcatel Customer Service.
Display: D04 - D05	Motor information default	See previous incident
Display: D04 - D05 - D11 - D25 - D26 - D31	ACT/ATH link cable disconnected	See D 250

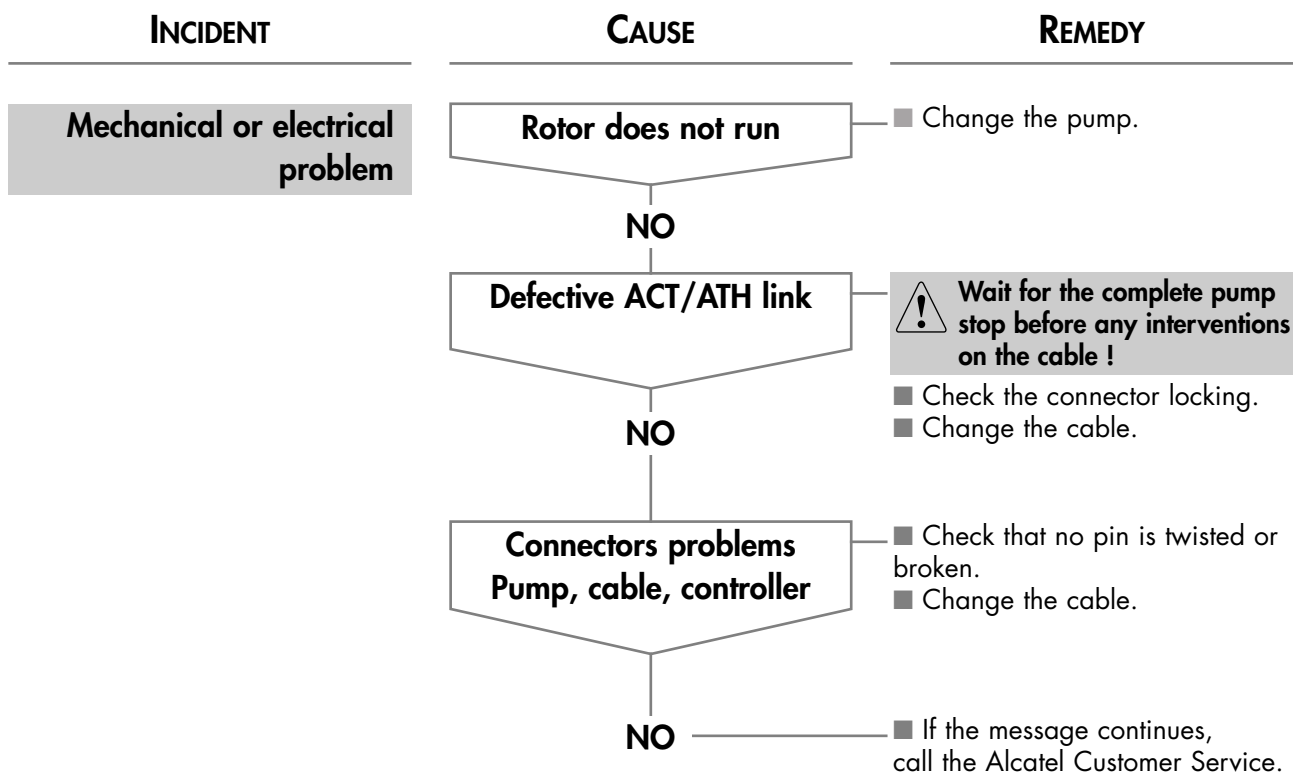
D05 : OVERCURRENT OR SENSOR

INCIDENT	CAUSE	REMEDY
Motor stator overcurrent	Default on Hall effect sensors of motor	Try to restart the pump: Local mode: pressing «start». Remote mode: open and close the «start» contact.
	NO	 Wait the pump isn't running. Switch OFF the controller and restart it.
	Defective ACT/ATH link	 Wait for the complete pump stop before any interventions on the cable ! - Check the connector locking. - Change the cable.
	NO	If the message continues, call the Alcatel Customer Service.

DO6 : EXTERNAL SAFETY



D11 : MAG SUSPENSION



D11 + other defaults

INCIDENT	CAUSE	REMEDY
Display: D11 - D31	Incompatibility between the pump and the controller	■ See D 250
Display: D11 - D32	Magnetic bearings boards not powered	■ Call the Alcatel Customer Service.
Display: D11 - D15 - D18	Positioning out of tolerance	■ Call the Alcatel Customer Service.
Display: D11 - D14 - D15 - D16 - D17 - D18	Impossible positioning	■ Call the Alcatel Customer Service.

D12 : POWER

INCIDENT	CAUSE	REMEDY
Secondary voltage too high	Mains voltage problem NO	■ Check the voltage: $85\text{ V} < U < 132\text{ V}$ or $170\text{ V} < U < 264\text{ V}$ ■ If the message continues, call the Alcatel Customer Service.

D13 : POWER OVERCURRENT

INCIDENT	CAUSE	REMEDY
Overcurrent	Mains voltage problem NO Defective ACT/ATH link NO	■ Check the voltage: $85\text{ V} < U < 132\text{ V}$ or $170\text{ V} < U < 264\text{ V}$  Wait for the complete pump stop before any interventions on the cable ! ■ Check the connector locking. ■ Change the cable. ■ If the message continues, call the Alcatel Customer Service.

D14 - D15 - D16 - D17 - D18

INCIDENT	CAUSE	REMEDY
Rotor position out of limits	Bad pump fixation	■ Check the pump fixation rigidity regarding to the chamber, inlet bellow prohibited. ■ Try to restart the pump: Local mode: pressing on «start». Remote mode: open and close the «start» contact.
	NO	
	Vibrations on the frame	■ Check if there are no vibrations generated by the frame, for exemple, equipement installed on a floating stone. ■ Try to restart the pump: Local mode: pressing on «start». Remote mode: open and close the «start» contact.
	NO	
	Defective ACT/ATH link	⚠ Wait for the complete pump stop before any interventions on the cable ! ■ Check the connector locking. ■ Change the cable.
	NO	■ If the message continues, call the Alcatel Customer Service.

D21 * : PUMP OVERHEAT-1

INCIDENT	CAUSE	REMEDY
Without heating device: ATH 1000M Pump temperature exceeds 50°C The pump speed switches to stand-by mode = 30000 rpm	Problem on water cooling circuit	■ Check the flow rate (60 l/h). ■ **
	NO	
	Number of start-ups too frequent	■ Reduce the number of ON/OFF switchings with air inlet. ■ **
	NO	
	Working pressure too high $P > 1.10^{-1}$ mbar	■ Adapt the working pressure. ■ **
	NO	
	Exhaust pressure too high > 5 mbar	■ Adapt the exhaust pressure, see G 10 and G 20. ■ **
	NO	
	Defective ACT/ATH link	 Wait for the complete pump stop before any interventions on the cable ! ■ Check the connector locking. ■ Change the cable.
	NO	■ If the message continues, call the Alcatel Customer Service.



* 2 different messages for D21: Pump-overheat 1 or 2

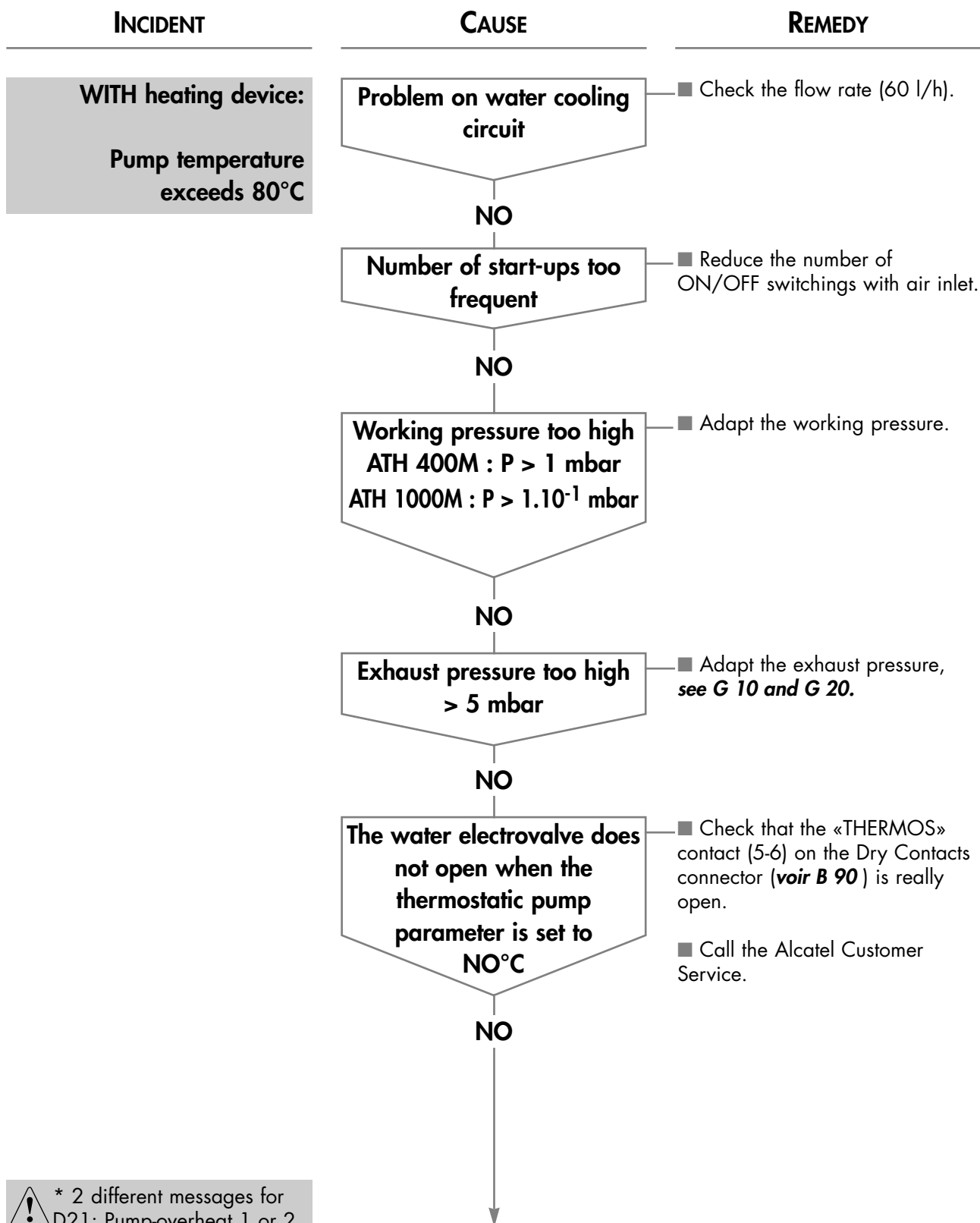
** Then, delete the stand-by mode:
Local mode: pressing on «STANDBY».
Remote mode: open and close the «STANDBY» contact.

D21 * : PUMP OVERHEAT-1

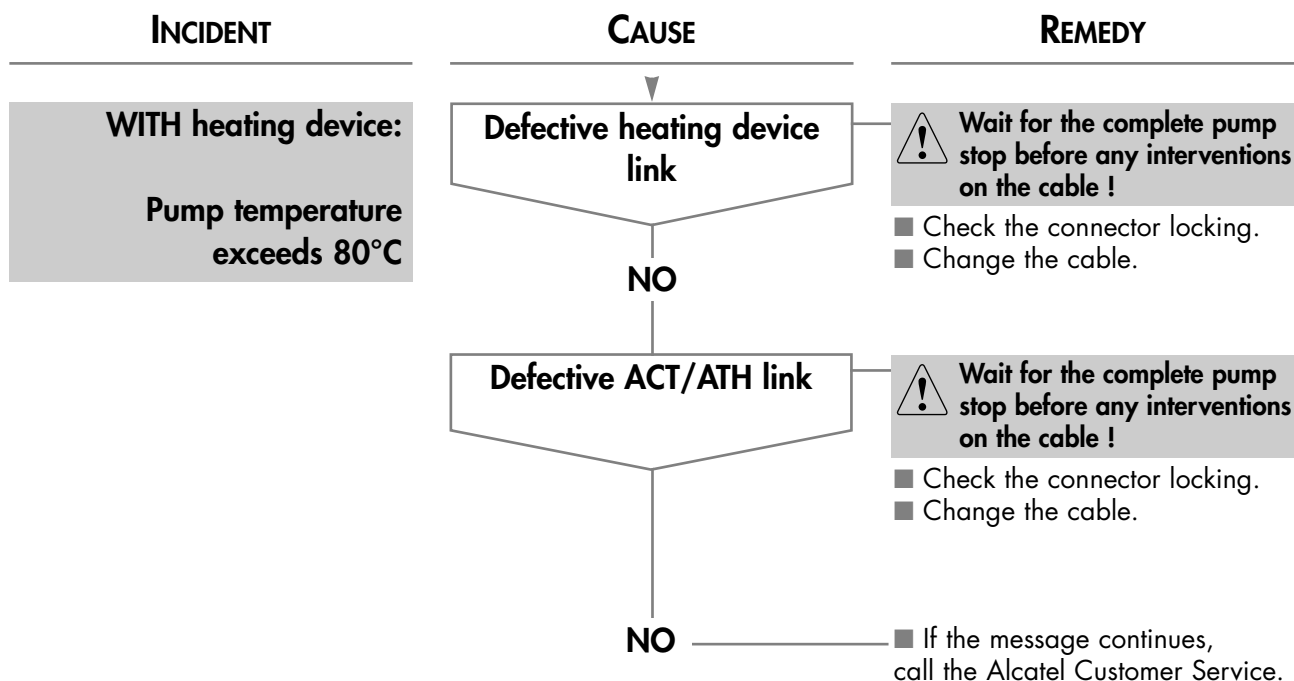
INCIDENT	CAUSE	REMEDY
Without heating device: ATH 400M Pump temperature exceeds 80°C	Problem on water cooling circuit	■ Check the flow rate (60 l/h).
	NO Number of start-ups too frequent	■ Reduce the number of ON/OFF switchings with air inlet.
	NO Working pressure too high P > 1 mbar	Adapt the working pressure.
	NO Exhaust pressure too high > 5 mbar	■ Adapt the exhaust pressure, see G 10 and G 20.
	NO Defective ACT/ATH link	 Wait for the complete pump stop before any interventions on the cable ! ■ Check the connector locking. ■ Change the cable.
	NO	■ If the message continues, call the Alcatel Customer Service.

 * 2 different messages for D21: Pump-overheat 1 or 2

D21 * : PUMP OVERHEAT-1



D21 * : PUMP OVERHEAT-1



 * 2 different messages for D21: Pump-overheat 1 or 2

D21 * : PUMP OVERHEAT-2

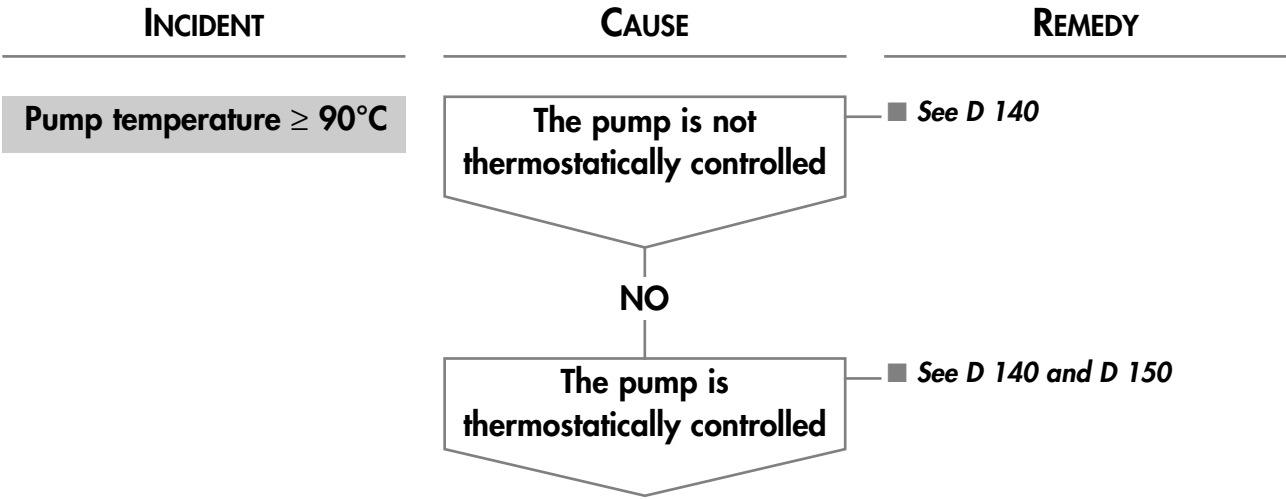
INCIDENT	CAUSE	REMEDY
Heating device temperature exceeds 80°C	Problem on water cooling circuit	■ Disconnect the mains plug of heating device cable and check that the water electrovalve opens. ■ Check the flow rate (60 l/h).
	NO	
	The water electrovalve does not open when the thermostatic pump parameter is set to NO°C	■ Check that the «THERMOS» contact (5-6) on the Dry Contacts connector (voir B 90) is really open. ■ Call the Alcatel Customer Service.
	NO	
	Defective heating device link	 Wait for the complete pump stop before any interventions on the cable ! ■ Check the connector locking. ■ Change the cable.
	NO	■ If the message continues, call the Alcatel Customer Service.


 * 2 different messages for D21: Pump-overheat 1 or 2

D22 : CONTROLLER OVERHEAT

INCIDENT	CAUSE	REMEDY
Controller temperature exceeds 60°C	Mains voltage problem	Check the voltage: $85\text{ V} < U < 132\text{ V}$ or $170\text{ V} < U < 264\text{ V}$
	NO	
	Bad controller cooling	- Check that the air admissions are not blocked. - Respect a free space of 15mm above and under the controller.
	NO	
	The fan does not run	- Check the fan power supply. - Call the Alcatel Customer Service.
	NO	
	Ambient température too high > 50°C	Ventilate the controller environment.
	NO	If the message continues, call the Alcatel Customer Service.

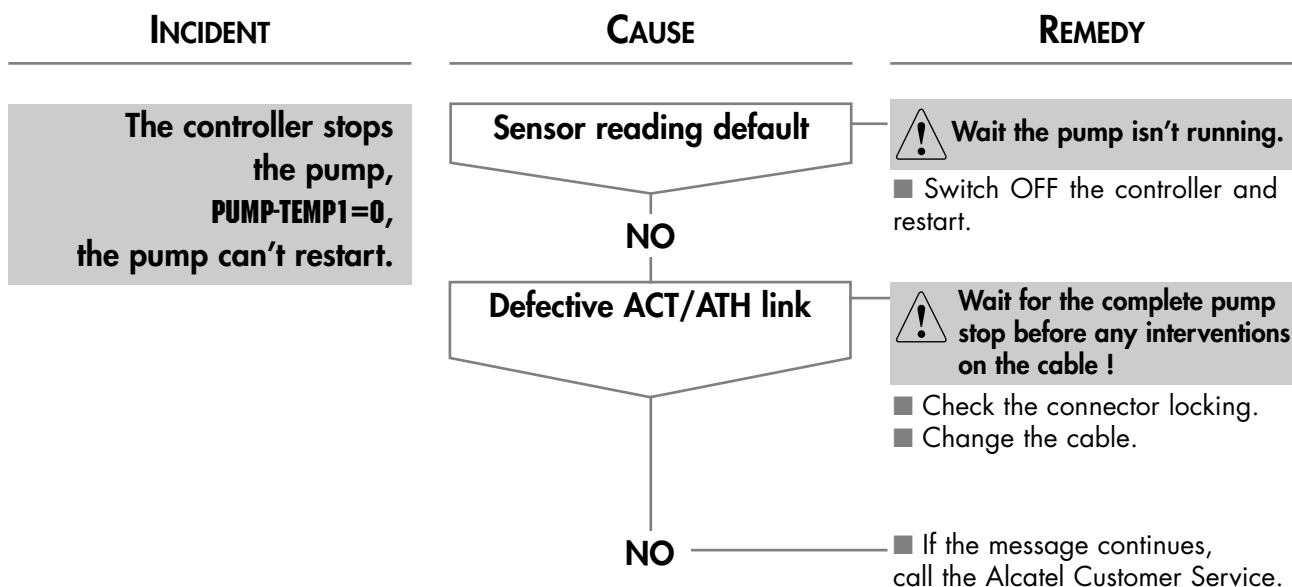
D23 : HOT PUMP



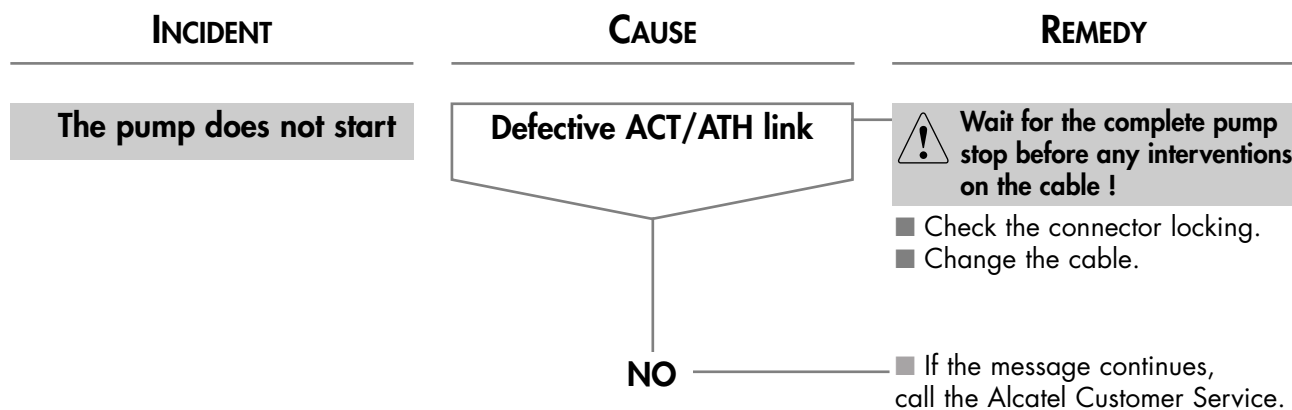
D24 : BEARING MUST BE CHANGED

INCIDENT	CAUSE	REMEDY
The authorized number of landings has been reached	Emergency bearings are damaged	■ Call the Alcatel Customer Service.

D25 : TEMP SENSOR-1



D26 : NO CONNECT



D27 : DATE AND TIME

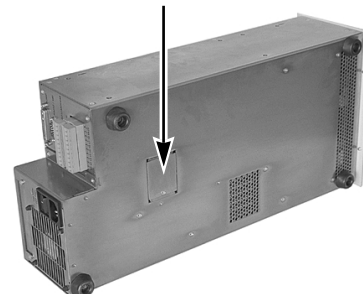
INCIDENT	CAUSE	REMEDY
The pump is running but the display is not correct	Incorrect parameters settings	Reset the date on the «PARAMETER» controller menu.
The pump does not start	Controller in storage mode	 Wait the pump isn't running. - Switch OFF the controller power supply and restart.
	NO	If the message continues, call the Alcatel Customer Service.

D28 : DISABLE WRITE

INCIDENT	CAUSE	REMEDY
Datas are not recorded by the controller	Memory problem NO	■ Reinitialize the controller: pump stopped, switch OFF the controller power supply and restart. ■ Call the Alcatel Customer Service. ■ If the message continues, call the Alcatel Customer Service.

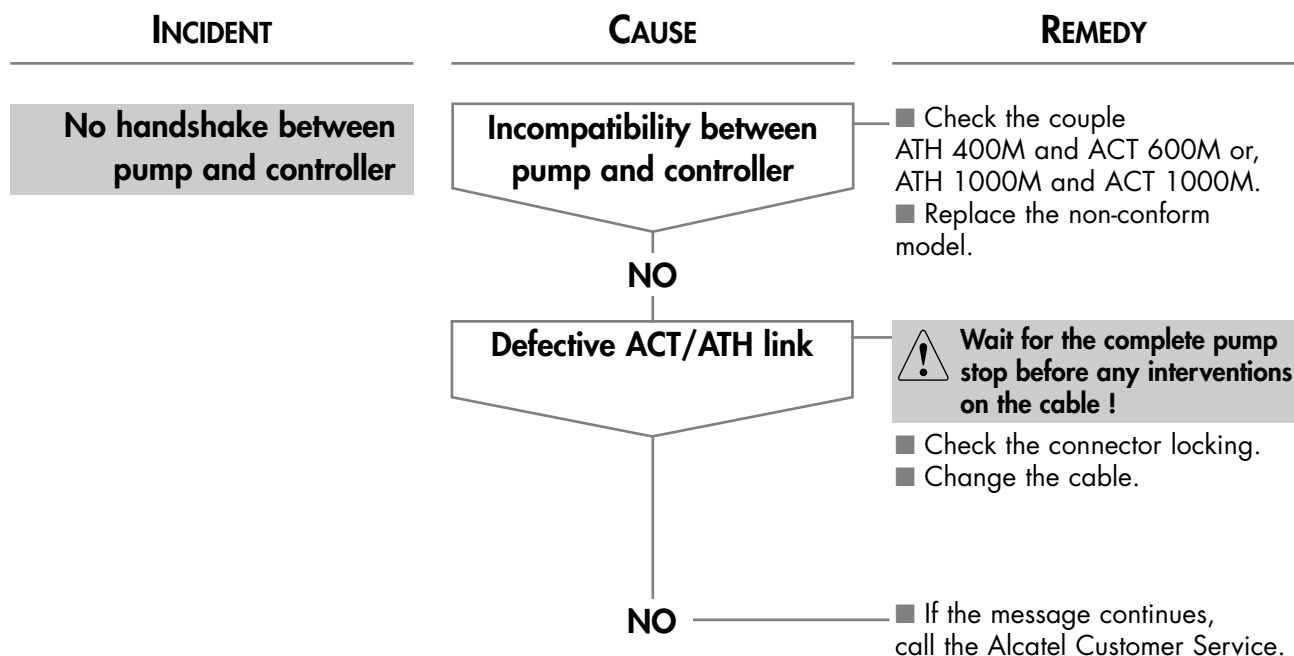
D29 : INPUT POWER

INCIDENT	CAUSE	REMEDY
Mains power supply failure Imminent landing of the spindle	Controller not powered	■ Check that the controller is powered. ■ Check the power supply voltage: $85\text{ V} < U < 132\text{ V}$ or $170\text{ V} < U < 264\text{ V}$
	NO	
	Defective fuses	■ Check the fuses: 2 fuses 16A located under the controller (Access panel).
	NO	■ If the message continues, call the Alcatel Customer Service.

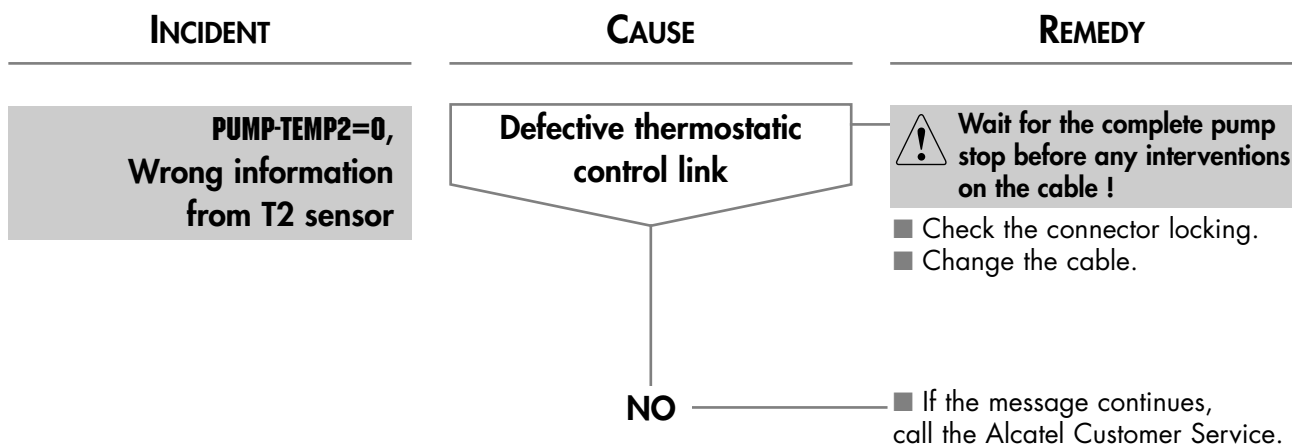


! Isolate the product from its various energy sources before any maintenance operations.

D31 : CODING



D38 (37) : TEMP SENSOR-2



Default not indicated by the controller

The pump starts only in standby mode **page 2**

Power does not exceed 100W **page 3**

Over 9000 rpm the pump starts to vibrate . . . **page 3**

The pump does not reach the expected speed . **page 4**

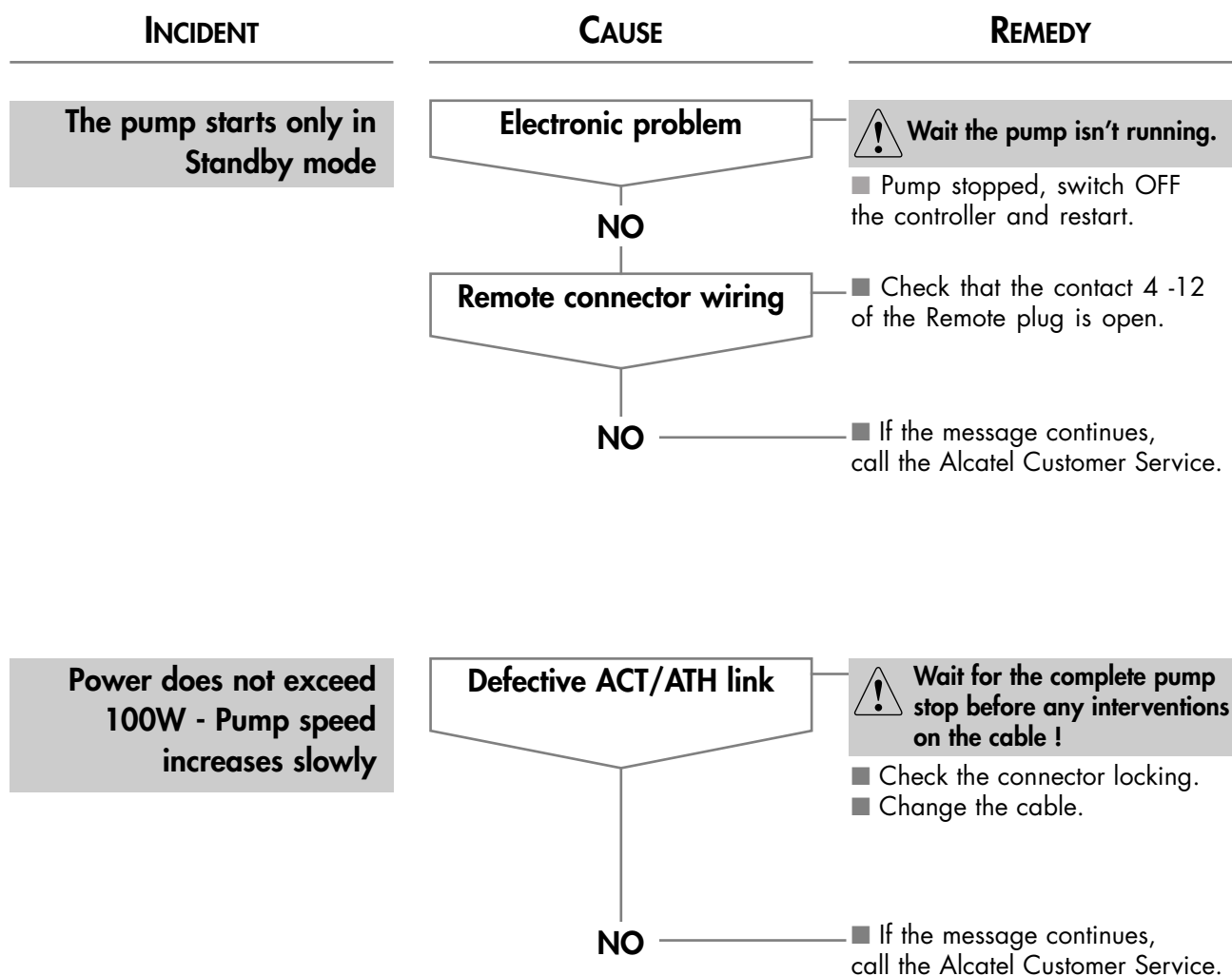
The thermostatic temperature is not reached . . . **page 5**

Control keys are disactivated **page 6**

Continuous controller initialization **page 6**

Partial and repetitive controller initialization . . . **page 6**

Default not indicated by the controller



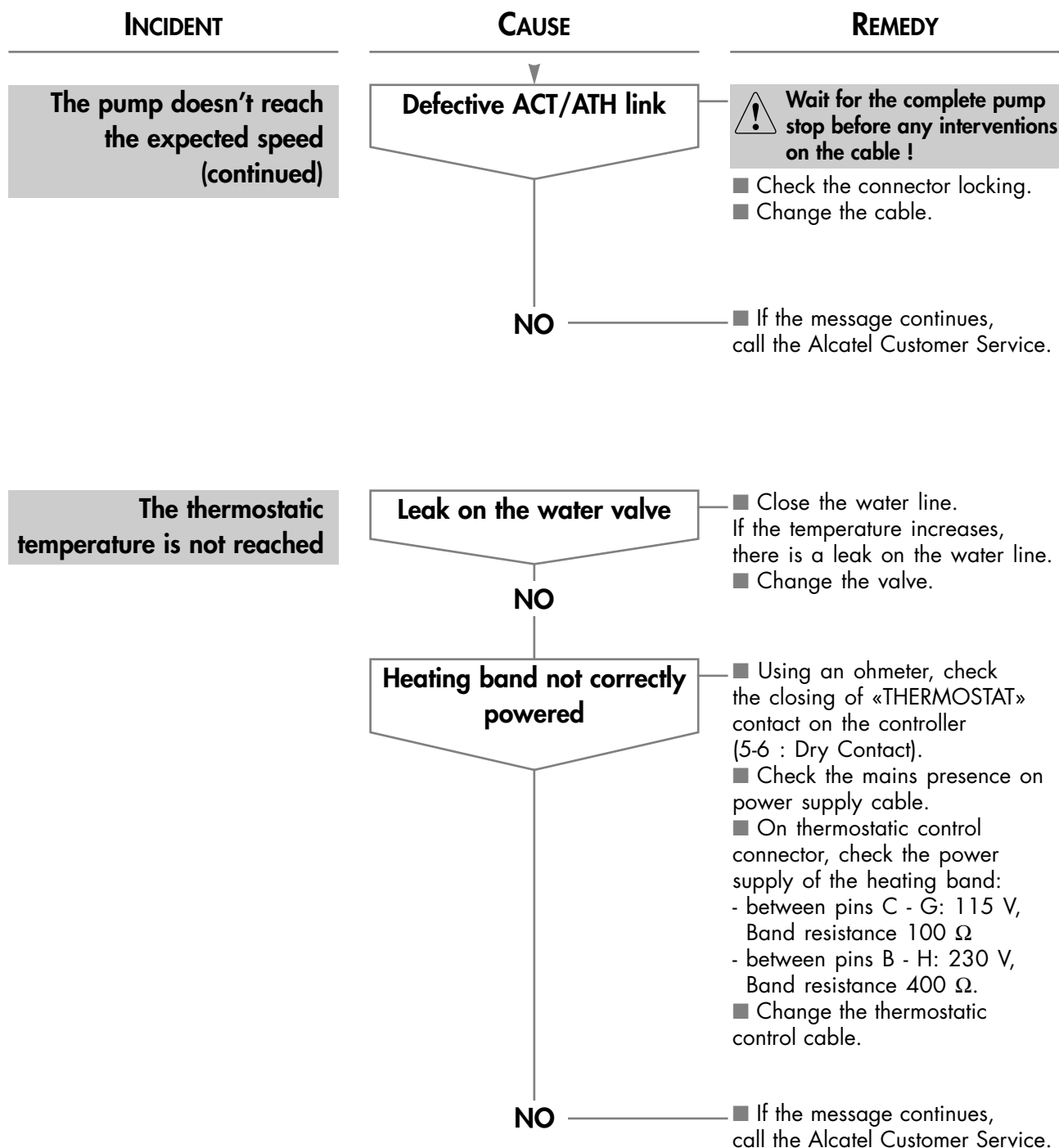
Default not indicated by the controller

INCIDENT	CAUSE	REMEDY
Over 9000 tr/mn, pump vibrations	Incorrect pump fixation	Check the pump fixation rigidity regarding to the chamber, inlet bellow prohibited.
	NO	
	Vibrations on the frame	- Check if there are no vibrations generated by the frame, for exemple, equipement installed on a floating stone. - Try to restart the pump: Local mode: pressing on «start». - Remote mode: open and close the «start» contact.
	NO	
	Defective ACT/ATH link	 Wait for the complete pump stop before any interventions on the cable ! - Check the connector locking. - Change the cable.
	NO	
	Connectors problems Pump, cable, controller	Check that no pin is twisted or broken.
	NO	If the message continues, call the Alcatel Customer Service.

Default not indicated by the controller

INCIDENT	CAUSE	REMEDY
The pump doesn't reach the expected speed	Leak on the installation	■ Close the chamber isolation valve. ■ Start the pump. If it reaches its expected speed, then the leak is inside 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. ■ If the valve doesn't open, check the coil and the connection. ■ Using an ohmmeter (valve disconnected), check the closing of «START» contact (5-6) on the controller. ■ Change the valve.
	NO	
	Defective rough pumping	■ Disconnect primary pump inlet. Install a gauge at the primary pump inlet and check its vacuum limit ($P \leq 1.10^{-1}$ mbar).
	NO	
	Emergency braking valve	■ ACT powered and valve disconnected from the controller, check the «AIR INLET» output voltage (12VDC). ■ Change the coil.
	NO	
	Leak on emergency braking valve	■ Replace the valve by a blank-off flange. Take care that the pump is not protected now ! ■ Start the pump. ■ If the pump reaches its speed, stop it quickly and replace the valve (it can take a long time before the pump isn't running).
	NO	

Default not indicated by the controller



Default not indicated by the controller

INCIDENT	CAUSE	REMEDY
Control keys disactivated	«REMOTE» contact closed NO	■ Using an ohmmeter, check that the «REMOTE» contact (3-11) of Remote Control connector is open (See B 100). ■ Check that the control keys on front panel are activated by unplugging the «REMOTE CONTROL» connector. ■ If the message continues, call the Alcatel Customer Service.
Continuous controller initialization	Problem of magnetic levitation NO Defective ACT/ATH link NO	■ Remove the blocking plug. ■ Check manually the free rotation of the rotor and the axial clearance.  Wait for the complete pump stop before any interventions on the cable ! ■ Check the connector locking. ■ Change the cable. ■ If the message continues, call the Alcatel Customer Service.
Partial and repetitive initialization (Presence of display back-lighting, magnetic levitation for just a while, complete stop and back-lighting again)	Internal controller connection problem NO	■ Call the Alcatel Customer Service. ■ If the message continues, call the Alcatel Customer Service.

First level maintenance parts

Copper seals for pumps with CF-F flanges

Flange type	Sets of 10 parts	10 sets of 1 part (Unit packaged)
100 CF-F	303284	303291
160 CF-F	303285	303292
200 CF-F	303286	303293

Fuses for controllers

Description	Qty	ACT 600M	ACT 1000M
Fuse 6 x 32 T 250V	2	16A	

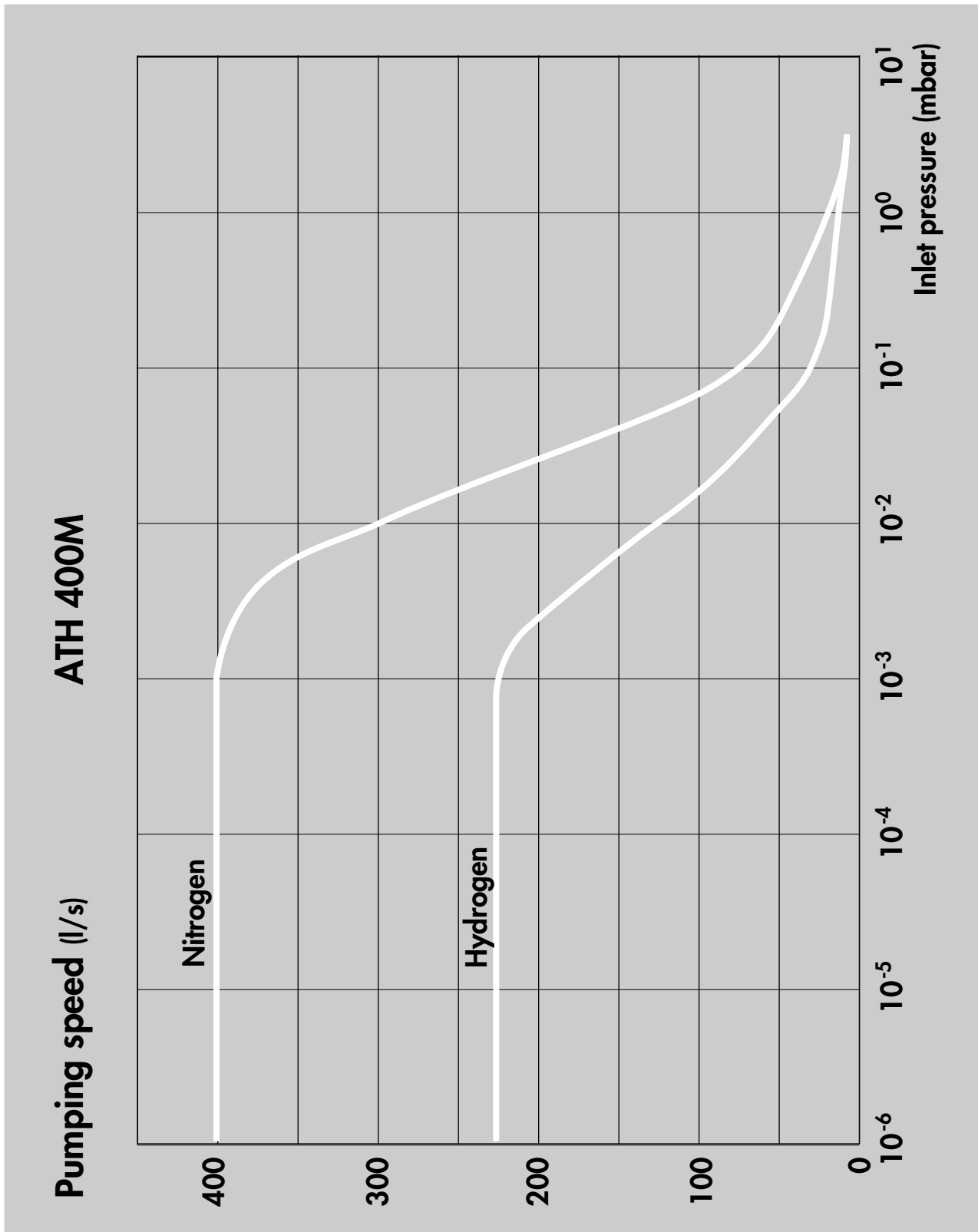
Emergency braking valve accessories

Description	Part Num.
Electrovalve coil 12V DC	038127
Equipped electrovalve DN 16	066935

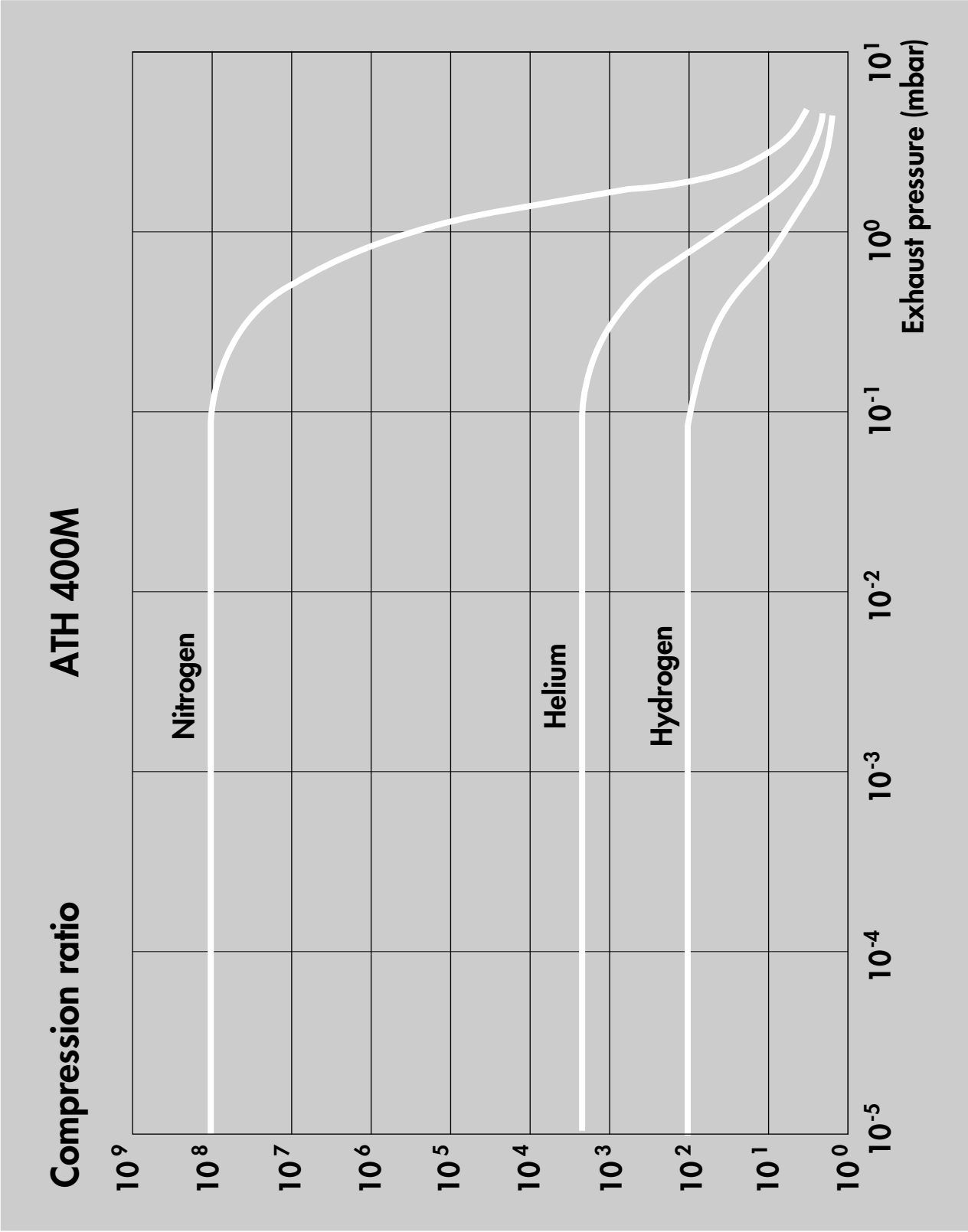
Water electrovalve

Description	Part Num.
Coil 110V 50/60 Hz	103839
Coil 220V 50/60 Hz	103840
Electrovalve 110V	103696
Electrovalve 220V	103697

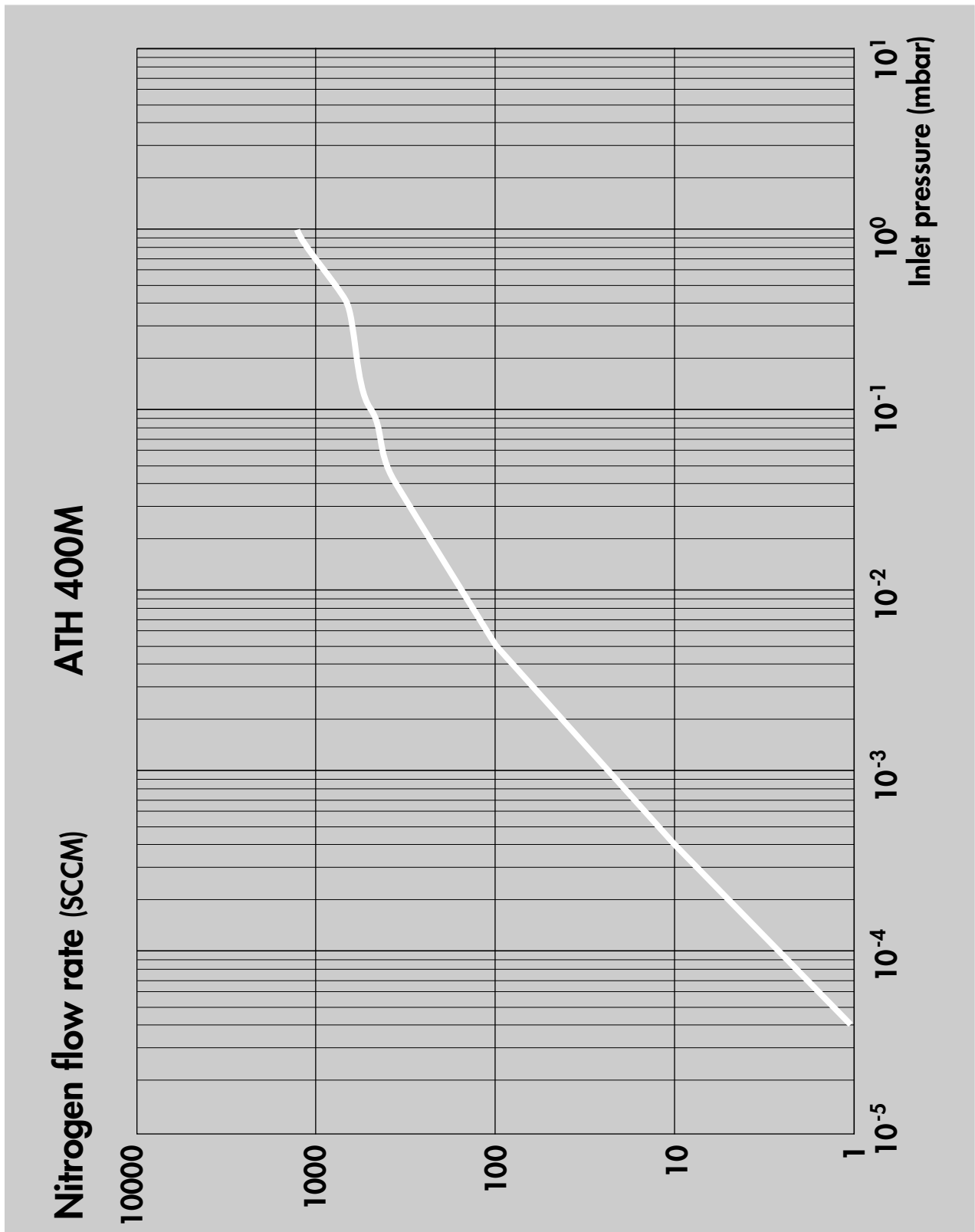
Pumping curves ATH 400M



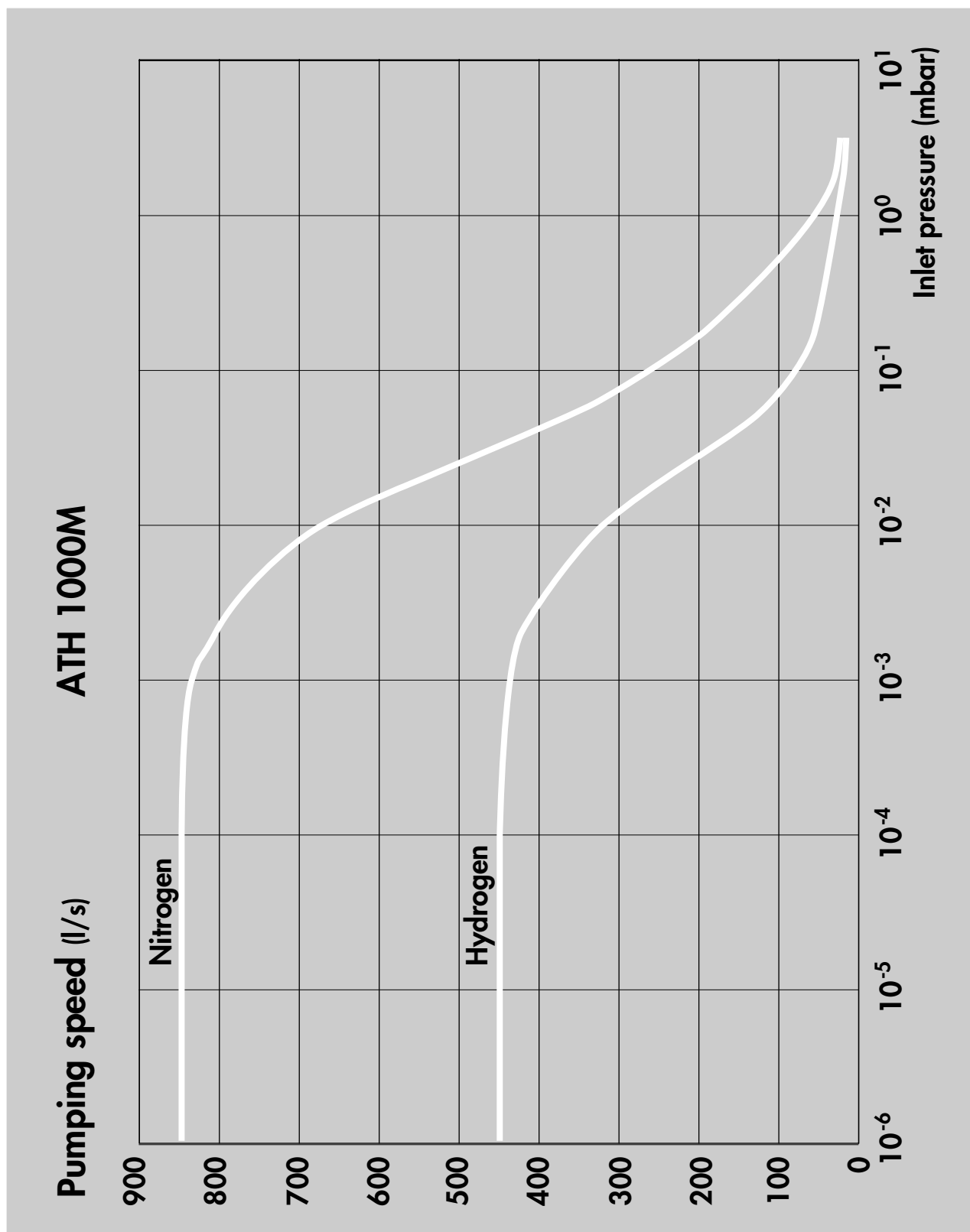
Pumping curves ATH 400M



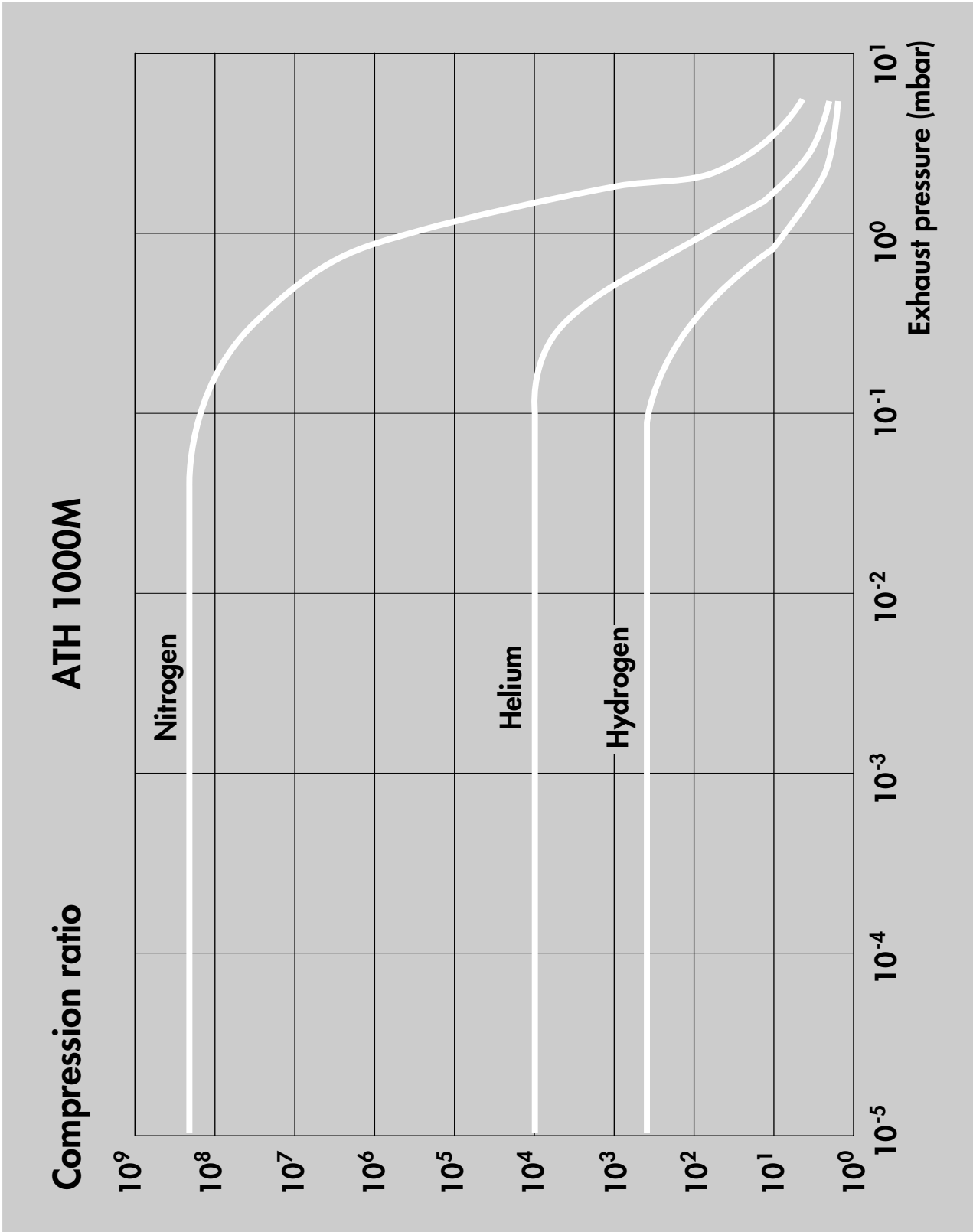
Pumping curves ATH 400M



Pumping curves ATH 1000M



Pumping curves ATH 1000M



Pumping curves ATH 1000M

