AGILENT TWISTORR 304 FS

QUICK REFERENCE GUIDE

Vacuum Products

Agilent TwisTorr 304FS

A quick, detailed reference guide to install and operate the TwisTorr 304 FS.

1. Accessories and Configuration
2. Preparation for installation
3. Controller Connection and Start up sequence
4. Purge & Vent valve
5. How to enable the soft start
6. Troubleshooting: Pump and Controller

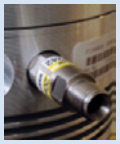
Agilent Technologies

1. Accessories and Configuration

Accessories


Active Gauges


Vent Valve


Purge Valve


Water Cooling


Air Cooling

Inlet Screen

High Vacuum Valve

Suggested Agilent Foreline pumps

Dry Scroll Technology


SH 110


IDP 15


TS 300

Rotary Vane Technology


DS 42


DS102/202/302

Controller Unit


On board Navigator
24V - 110/220V


RACK 110/220 V

Aluminium Block Valves

Available accessories and products to complete your perfect configuration. Images are for reference only

2. Preparation for Installation

INLET SCREEN

Not supplied with the pump. The screen protects the pump blades against solid particles.
Always use the appropriate inlet screen according to the pump flanges as shown in the table.

ISO 100	X3500-68000
ISO 160	X3500-68001
CFF6''	9699302
CFF8''	9699304

MECHANICAL FIXING

Pump can be installed in any position. However do not operate the pump until it is safely and securely fixed in a stable position, mounting the inlet flange to the system flange with a connection capable of withstanding a torque of 1000 Nm around its axis.

ISO 100/160	4xM10 Claw-Clamps with fixing torque 22Nm
CFF6''	16 screws with fixing Torque 20Nm
CFF 8''	20 screws with fixing torque 20Nm

All inlet flange bolts should be retightened once the system is under vacuum.
Do not install/fix the TMP through its base.
The safety condition in the table must be respected

COOLING REQUIREMENTS

TwisTorr 304FS can be water cooled or air cooled, according to the pump model. The 304FS with the water cooling option can also be air cooled but not the other way round.

Temperature requirements:

- Max forced cooling air temperature ≤ 35°C
- Max cooling water temperature ≤ 25°C

For water cooling:
flow of 50 l/hr is mandatory if ambient temperature is > 35°C or pumping high gas load.
If none of above conditions the air cooling can be used.

CONNECTION TO A FORELINE PUMP

As a backing pump use a dry scroll vacuum pump or a rotary vane pump from the Agilent catalog.
Minimum requirement is SH110 (Dry)/DS102 (Wet). Backing pump must have an ultimate pressure of < 5 mbar.
Connect the fore-vacuum line with small-flange components or threaded hose couplings.
A valve can be also used in between the Turbo foreline and the backing pump.

ACCESSORIES

A few accessories can be interfaced with turbopump and controller:

Vent valve: different option available according to the controller type, orifice, with or without delay time and N.O. or N.C. *(see paragraph*).

Purge: to be used in presence of heavy gases or Oxygen. Wide 10 and 20 SCCM purge valves selection range is available *(see paragraph)*

Gauges: only for 304AG RACK *(contact Customer Care)*.

Valves: a complete series of valves can be interfaced witht the 304FS for a full system compatibility. Check that the accessories are well connected and fixed properly and that the vent screw is tightened properly.

3. Controller Connection and Start up Sequence

ELECTRONIC CONNECTION

A Power supply (Controller) is necessary to drive and operate the Turbopump. Connect the controller cable to the pump connector. If turbopump has been stored or not used for a long period of time (> 6 months), the soft start procedure might be necessary. To enable the soft start refers to the dedicated *«How to enable the soft start»* paragraph.

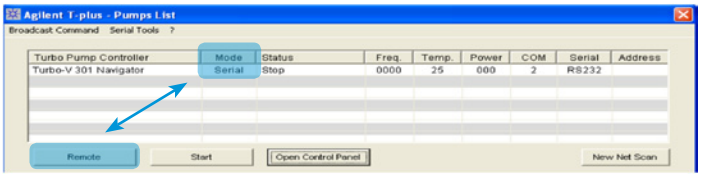
SWITCH ON THE TURBO PUMP

304 ON BOARD NAVIGATOR CONTROLLER

There are 2 ways to start the pump: using the Tplus Software or by «plug and Pump»

1) Via RS232 - Tplus software

- Connect the controller to the pump
- Connect a RS232 cable from a PC to the controller Serial Port.
- Power on the controller
- Launch theTPlus Software. Enable the Serial mode.



- Connect the 15 pin mating connector to J1 connector
- Start the primary backing pump and reach a vacuum pressure of < 1 mbar
- Pump can be started by pressing the «Start» button.
- To stop the pump select the Stop button and decelerate the rotor by opening the vent screw of about ¼ to ½ turn.
- **To vent the pump see the «Vent procedure» paragraph**

2) Plug and pump:

- Connect the power supply
- Connect the pump cable to controller.
- Start the primary backing pump and reach a vacuum pressure of < 1 mbar
- Connecting the 15 pin mating connector to J1 connector the pump will start immediately.
- To stop the pump remove the J1 connector and decelerate the rotor by opening the vent screw of about ¼ to ½ turn.

304 AG RACK CONTROLLER

- Plug the 9 pin interlock connector (provided together the controller) in the P1 IN connector. If not «waiting interlock» message will appear and pump will not start). Connect the main power cord.
- Start the primary pump and reach a vacuum pressure of < 1 mbar
- Configure the controller to operate from the Front Panel by pressing simultaneously the two upper buttons to enter into the configuration menu and scroll till the «configuration is displayed: select FRONT.
- Press again the two upper button simultaneously to exit from configuration menu.
- Press the START button to run the pump. Press the STOP button to stop the pump.
- **To vent the pump please see the «vent Procedure» paragraph.**

4. Purge and Vent Valve

PURGE VALVE

There are several models of purge valve available with different inlet flanges and orifices (10 or 20 SCCM) to protect the bearings from particulates, corrosive gases or O_2 that might be pumped.

Inert gas, such as Nitrogen or Argon must flow into the pump body around the upper bearing towards the fore vacuum line.

To supply the inert purge gas (e. g. nitrogen) to the pump through the purge port, connect a gas purge valve between the pressure regulator and the pump. Inlet flow rate should be 0.5 to 0.8 mbar l/s.

Unplug the purge screw and tight up the purge valve.

VENT VALVE

Vent valve is used to automatically vent the pump/vacuum system.

Connect the vent valve to the proper connector according to the controller model, J1 (Navigator) or J7 (Rack) and follow the below instruction to vent the the pump throught the valve.

304 ON BOARD NAVIGATOR CONTROLLER

How to vent the pump

Vent valve is Normally Open (N.O.)

- Available in 0.5 and 1.2 mm orifice.
- Through Tplus (RS232)
  - No setting available
  - If the vent valve is connected to the controller automatically at the stop button the vent valve will open.

304 AG RACK CONTROLLER

How to vent the pump (AG Rack Controller)

Vent valve is Normally Open (N.O.)

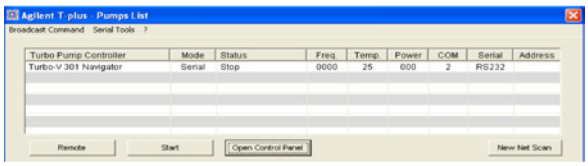
- Available in 0.5 and 1.2 mm orifice.
- By using the Vent Valve (N.O)
  - Opening delay and open valve time are both selectable through front panel/via RS232
  - Click on Stop button then the controller will perform the procedure according to the settings.

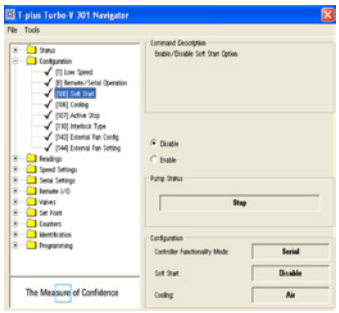
5. How to enable the Soft Start

(FACTORY DISABLED)

304 ON BOARD NAVIGATOR CONTROLLER

- Check that the 15 pin Interlock mating connector (provided with the controller) is installed into J1 connector (if not «waiting interlock» message will appear and pump will not start).
- Connect a RS232 cable from a PC to the controller Serial Port
- Power on the controller
- Launch theTPlus SW. And enable the SERIAL mode. Select "**Configuration"** from the list / Select "**Soft Start"** / Select **Enable**





Controller is now ready to start in Soft Start mode.

- Connect the pump cable from the controller to Pump.
- Start the pump by clicking on START button

After the pump has reached the full speed it can be stopped and then the Soft start can be disabled (it cannot be disabled whilst the turbo is powered).

Please note that the Navigator controller is always configured in Remote mode when powered on. To operate the pump via SERIAL and activate the soft start click on Remote button.

If a PC is not available the soft start can be still be activated by using the 15 pin mating connector, modifying the pin-out 7-9 and 8-15 through a jumper.

304 AG RACK CONTROLLER

Check that the 9 pin interlock connector is properly installed in the P1 IN connector, if not «check connection» message will appear and pump will not start).

- Power on the controller.
- Press simultaneously the two upper buttons to enter into the configuration menu and scroll till the SOFT START menu is displayed.
- Select YES and press the two upper buttons simultaneously again to exit from configuration menu.
- Press the START button to run up the pump through the Soft Start mode. During this phase the controller will show «pump starting» message.
  Once the rotor has reached the maximum speed the soft start will need to be disabled after stopping the pump by following the procedure in reverse mode.
  If using a previous generation of controller (301 or older) please contact Tech Support before starting the pump.

6. Troubleshooting - Pump and Controller

CONTROLLER MESSAGE	CAUSE	RESOLUTION
NO MESSAGE The controller does not turn on	No voltage to the unit	• Check for cable connection between mains power and the controller. • Check for cable integrity.
WAITING INTERLOCK Navigator: LED is fast flashing* T-Plus: pump status 205 Rack AG: message on display	The interlock jumper on remote I/O connector is missing or faulty J1 on Navigator P1 on Rack AG	Navigator controller: short pin 3-9 and 4-15. Rack controller, short pin 3-8. A mating connector with interlock contact is provided inside the accessory bag.
AUTOTUNING Navigator: LED? T-Plus: pump status 205 Rack AG: message on display	Autotuning is not an error condition but a specific working condition when pump is not able to reach/maintain the full speed, due to: • Excessive gas load • System leak • Bad foreline pressure (> 15 mbar) • Bearing issue or rotor sized. After 15 minute of AUTOTUNING, an error message is displayed.	• Check the foreline pressure (<15mbar). • Check for leak in the system. • Verify vent and purge screws/valves to be closed or properly working. • Check the gas load in the chamber. • Check if rotor spins freely; if not, replace the pump.
PUMP OVERTEMPERATURE Navigator: LED is fast flashing* T-Plus: error code 2 Rack AG: message I displayed	Controller has measured a temperature at the upper bearing > 60°C	Wait till the pump temperature has decreased, then if, after restarting the pump the message is still present: • Check if power and current consumption have increased, there may be a bearing issue. • Check if cooling fan/water is working properly. • Check if the rotor spins freely. If not, replace the pump.
CONTROLLER OVERTEMPERATURE Navigator: LED is fast flashing* T-Plus: error code 4 Rack AG: message I displayed	The temperature inside the control unit has increased >60°C Temperature of the MOS > 60°C Temperature transformer > 90°C Internal Fan fault Ambient temperature too high	Wait till the controller temperature has decreased. Then after restarting the controller the message is still present: • Check if the internal cooling fan is working properly. • Check if ambient temperature is according to requirements.

* Fast flashing : 400 msec / ** Slow Flashing: 200 msec

CONTROLLER MESSAGE	CAUSE	RESOLUTION
POWER FAIL Navigator: LED is fast flashing* T-Plus: error code 8 Rack AG: message I displayed	Internal bus voltage is too low	Replace the controller.
VERIFY LINE SELECT Navigator: LED is fast flashing* T-Plus: error code 16 Rack AG: message I displayed	The main voltage is out of range (100-240 V or 24V)	Check the main voltage, there could be spikes in the main power or it's not regular
OVERVOLTAGE/UNDERVOLTAGE Navigator: LED is fast flashing* T-Plus: error code 32 Rack AG: message I displayed	Vbus > fail threshold Vbus < fail threshold	Check if error is duplicated without the pump (put 10 KOHM between pins A and F on the pump cable connector) Yes → replace the controller; No → error is not in the controller; check for external electrical noise.
SHORT CIRCUIT Navigator: LED is fast flashing* T-Plus: error code 64 Rack AG: message I displayed	Loss of insulation motor windings in relation to ground Ramp currents too high (Vbus control not correct) One or more Mosfet is/are faulty, shorted (after start) or in some cases interrupted (during ramp) Connection of a phase interrupted (controller/cable/pump), generally displayed during the ramp up.	Contact Agilent Customer Care and ask for dedicated "Short Circuit" Test Procedure.
TOO HIGH LOAD Navigator: LED is fast flashing* T-Plus: error code 128 Rack AG: message I displayed	There is a too high load. Gas load in the chamber is too high, or exceeds the pump's specifications. Friction in the pump rotor; it does not rotate freely.	• Check the foreline pressure, < 15 mbar. • Check for pump parameters (current-power-temperature) with no gas load. • Check for leak in the system. • Check if the rotor spins freely; if not, replace the pump.
Pump remains at 100 HZ Navigator: slow flashing T-plus: pump is starting Rack AG: 100 Hz is displayed	Large leak Vent screw is open Rotor is seized	Check the system for leaks. Check the vent valve to be closed. Check if the rotor spins freely. If not, replace the pump.

* Fast flashing : 400 msec / ** Slow Flashing: 200 msec