Agilent

Trusted Answers

The New Agilent TwisTorr 305 Turbo Pump Family

An Expanded Platform to Connect with Quality Vacuum!


TwisTorr 305 FS

The Agilent TwisTorr 305 Pump Family: Performance, Quality, Digital Connectivity

The Agilent TwisTorr 305 turbomolecular pump is the first example of a new way of designing and manufacturing Agilent vacuum products.

Performance, innovation, attention to detail, and reliability are the main pillars of this high-quality product that offers an impressive number of features in a compact package.

In addition to the patented TwisTorr drag stages, which provide high compression ratios for light gases and high foreline pressure tolerance (or MacroTorr stages, which provide high throughput), the product offers very low vibration and the lowest noise level in its class.

The TwisTorr 305-IC features a powerful and sleek integrated control unit with low electronic noise for use in sensitive instruments like SEM, while the TwisTorr 305 FS is a standalone pump powered and controlled by a remote control unit.

The family also includes high throughput "Q" versions, which can tolerate high levels of gas flow, and "SF" split flow versions with a side port, for mass spectrometry and electron microscopy applications.

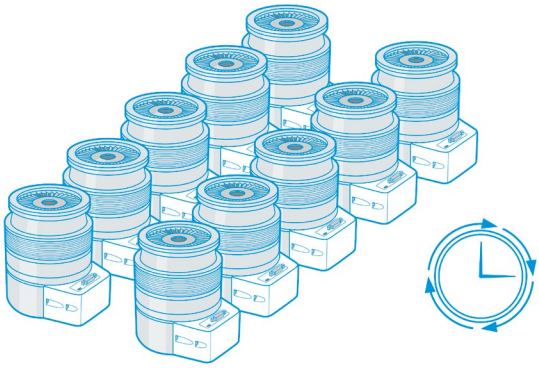
Both the Q and SF versions are available with an integrated control unit, or as standalone pumps with a remote controller.

Smart connectivity: Bluetooth, USB, and NFC

The new Vacuum Link app offers remote control of the pump, making it easy to monitor your system, and providing a quick way to share pump information with your colleagues and Agilent personnel. Support is just a few clicks away: the Agilent dedicated Support Team will assist readily and professionally.

Design Process and Quality Test Elements

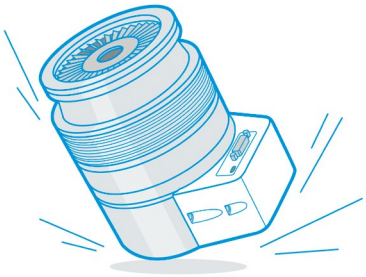
The product life cycle design method drives and tracks the design process through the six steps of proposal, investigation, lab prototype, production prototype, pilot run, and ramp to volume. Multiple controls and accurate tracking ensure full confidence in performance, quality, and technical data published for users.



Agilent quality and reliability

Life test

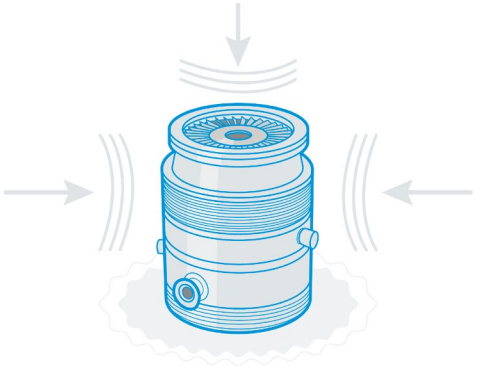
Pump reliability is proven through an accelerated life test on a statistically significant number of pumps, exposed for extended time to accelerating factors.
The test provides confidence in the pump's hassle-free operation for an average period of more than five years.



Shock test

Pump resistance to shocks is proven by tests on a batch of pumps in both operative and non-operative conditions. Every pump is exposed to a 30 to 120 g acceleration (equivalent to a drop from 82 cm/32" for the non-operative pump, and 15 cm/6" for the operative pump).
Pumps are shock-tested six times in vertical, horizontal, and upside-down orientations.

No issues occurred with the tested pumps after 24 drops (no rotor mechanical contacts, no change to pump operation). Pump unbalance, verified after every drop, showed minor variations, well below acceptance threshold.



Vibration test

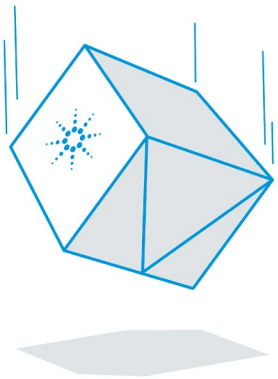
Resistance to vibration generated by external sources was demonstrated through a set of tests on a batch of pumps both in operative and non-operative conditions. Each pump was exposed to energy levels from 0.5 to 2 g during 105-minute vibration cycles in vertical, horizontal, and upside-down orientations at full rotational speed and non-operative.

The test confirmed pump robustness and resistance with vibrations, as no rotor mechanical contacts or changes to pump operation were observed, and the pump unbalance remained well below the acceptance threshold.

Packaging test

The packaging functionality was verified with test sessions on packed pumps, which were tested using a pattern of 18 drops from 96 cm / 37.8" height.

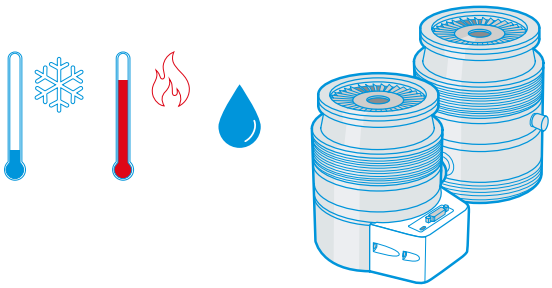
The TwisTorr 305 can withstand 30 g level of acceleration (due to drop) and suffer no damage during shipment.



Stability over time

Thermal test

Pumps were exposed for 86 h to temperatures ranging from -40 °C to +70 °C (non-operative) and from 0° C to 40 °C (operative). Pump imbalance and correct operation were verified 11 times on every pump with only minor variations, well below the acceptance threshold. Thermal testing confirmed pump robustness under all expected operative and non-operative temperature conditions.



Quiet and low-vibration

Fourier analysis

The pump vibration spectrum is verified on every pump during the manufacturing process and in final testing before the pump shipment. The average maximum vibration level at full speed: 0.4 m/s^2.

Noise test

Audible pump noise was verified through a set of tests on a batch of pumps in 12 different operative statuses and orientations, including: vertical, horizontal, and inverted positions; with and without gas load; high temperature and low temperature; full speed and low speed.

The average pump noise resulting from the 168 measurements was 41 dB(A) +/-3σ in normal operation.

NOTE: Test data provided are referred to TwisTorr 305 FS, 305-IC.

New Vacuum Link App for TwisTorr 305

Innovation in vacuum control and data sharing

A new way to be connected to your work: export and share device data easily and quickly.

Bluetooth
remote control

USB direct wire

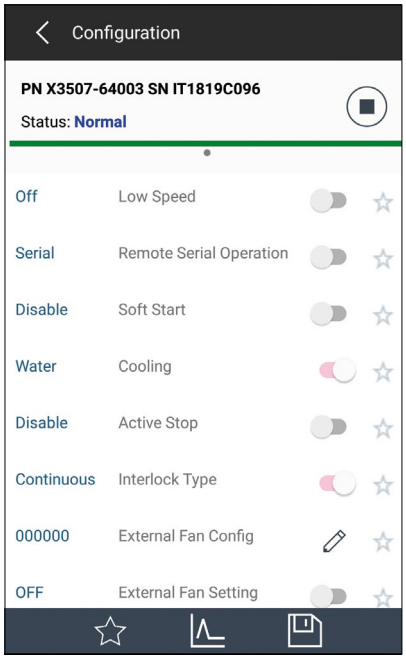
NFC
Near field communication

Smart Connectivity at hand

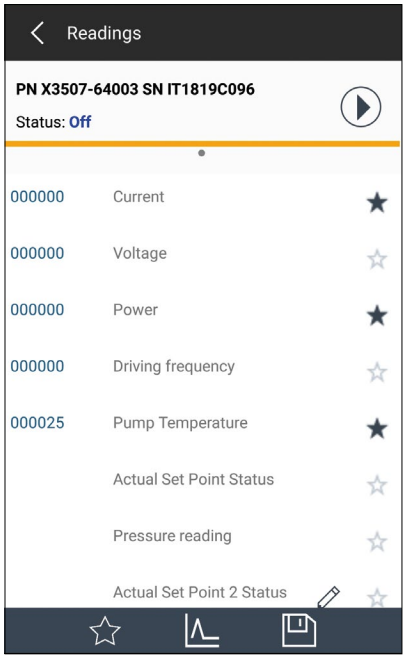
A totally new experience for busy, connected vacuum users.

Vacuum Link installs on your Apple or Android smartphone, it allows real-time monitoring of the parameters of your choice, and even offers recording capability: data can be exported to your computer to be easily displayed and shared.

Download the new Vacuum Link app on your smartphone.



Configure your system

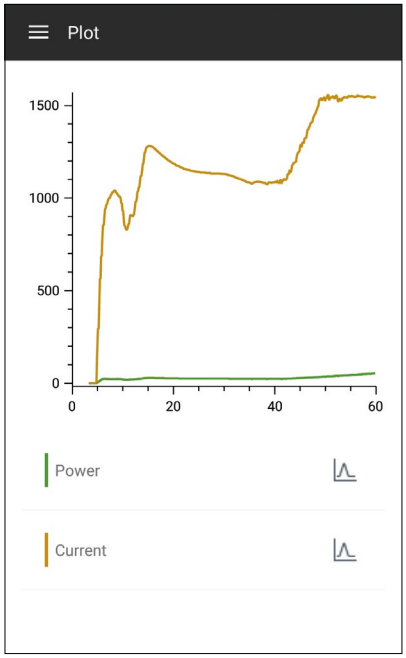


Read the pump parameters

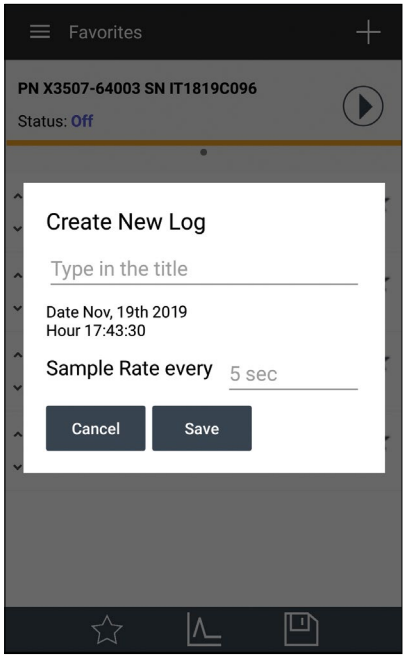
A feature-rich app to help speed up the daily tasks.

Vacuum Link can monitor up to three TwisTorr 305 pumps at the same time; a customized "Favorites" page that includes the most important parameters can be created and edited as needed.

Keeping track of pump operation is extremely easy and fast. No need to sit in front of screen of a controller or a computer for long periods.



See the pump performance in real time



Export and share data

Control, export, and share data

Creating log files is easy and sharing them is extremely quick using the regular features available on virtually any smartphone.

Log files help users review the pump parameters in a spreadsheet.

Plotting parameter variations can be done using the dedicated icon.

There is a model for you: how to select your Agilent TwisTorr 305

TwisTorr 305-IC and 305 FS

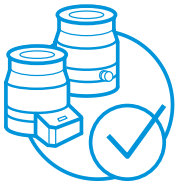
Excellent vacuum performance, with TwisTorr stages optimized for superior compression ratio, high foreline pressure tolerance, and best-in-class pumping speed. It is the ideal pump for academia and research, and UHV applications requiring the lowest base pressure.

TwisTorr 305-ICQ and 305 FSQ

The "Q" indicates high throughput, which is the flow rate of pumped gas through the turbomolecular pump; it is a measure of the quantity of gas the pump can remove from its inlet chamber. The 305 Q can withstand high levels of gas flow and is the pump of choice for applications using process gases.

TwisTorr 305-IC SF and 305 SF

This dual flow version is ideally suited for industrial and demanding instrumentation applications. It is designed for multichamber mass spectrometers and scanning electron microscopes; the lateral port can be used for another chamber or backing another turbo pump.



Agilent total quality

TwisTorr 305 family features

- Agilent Floating Suspension (AFS)
- Optimized thermal design
- Thermal mapping
- Agilent quality standards
- New drag stages with improved labyrinth design.

Your benefits

- Reduced cost of ownership and system downtime
- Proven robustness and reliability
- Resistance to particles in the vacuum

New integrated controller

TwisTorr 305 family features

- No cables
- Small dimensions
- Compactness

Your benefits

- Unit fits in tiny spaces
- Modern, sleek look
- Very low electronic noise

Quiet and low-vibration

TwisTorr 305 family features

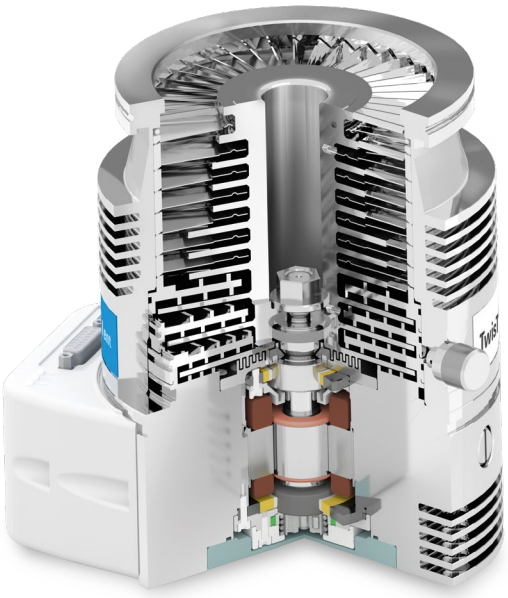
- Agilent Floating Suspension
- Agilent Modal Balancing

Your benefits

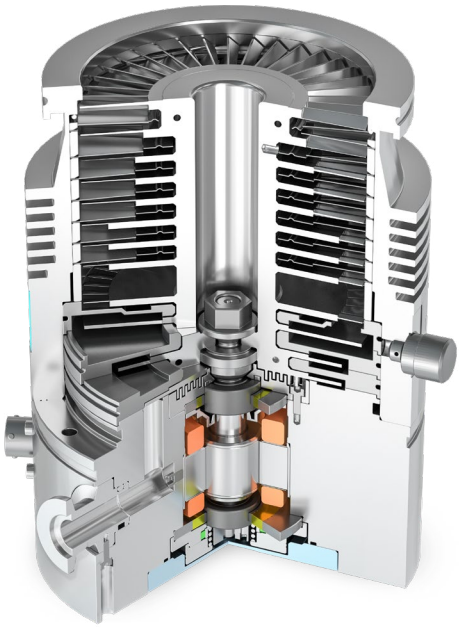
- Extremely low vibration level (damping effect)
- Quiet pump during operation
- Wider speed adjustment extends pump application range
- Very low noise during ramp and regular operation

The right technology solution for your application

Agilent developed two molecular drag stages platforms:



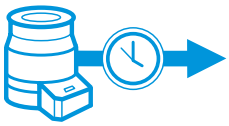
TwisTorr 305-IC cutaway



TwisTorr 305 FSQ cutaway

TwisTorr for high compression ratio in UHV applications requiring lowest base pressure (no gas flow)

MacroTorr for process gas flow operations with high pressure differential for high throughput



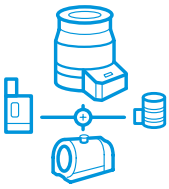
Stability over time

TwisTorr 305 family features

- Agilent Floating Suspension
- Bearings and rotor stable/constant positioning over time

Your benefits

- Stable noise and vibration performance over time.



Easy system integration

TwisTorr 305 family features

- Ceramic ball bearings with permanent lubrication
- Various types of controllers: integrated, remote, serial protocols and Profibus

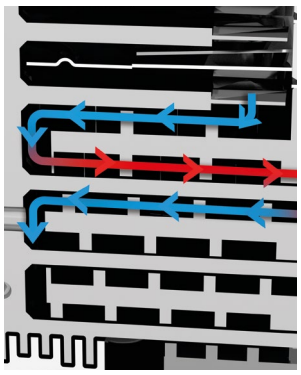
Your benefits

- Compact design
- Plug and play
- Easy pump control and monitoring
- Operation in any position
- Oil-free solution

Multiple patented technologies available for different gas conditions

TwisTorr technology

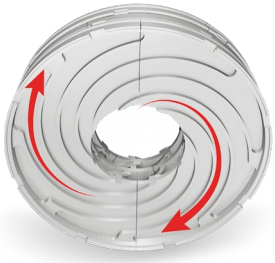
- Pumping effect is created by a spinning rotor disk, which transfers momentum to gas molecules.
- Gas molecules are forced to follow spiral groove design on the stator. The specific design of the channel ensures constant local pumping speed and avoids reverse pressure gradients, minimizing power consumption.
- A single TwisTorr stage can improve the compression ratio for N_2 by up to 100 times compared to conventional stages, providing exceptional foreline tolerance and pumping speed.



Gas flow in centripetal and centrifugal direction through TwisTorr stages

Leading-edge performance

- Excellent pumping speed for all gases.
- Highest compression ratios for light gases such as hydrogen and helium
- High foreline pressure tolerance
- The turbo pump can work with smaller backing pumps
- Minimal average power consumption



Centripetal pumping action

Lower surface area of rotating disk transfers momentum to gas molecules.

Spiral groove design on the upper section of the TwisTorr stator causes a centripetal pumping action.

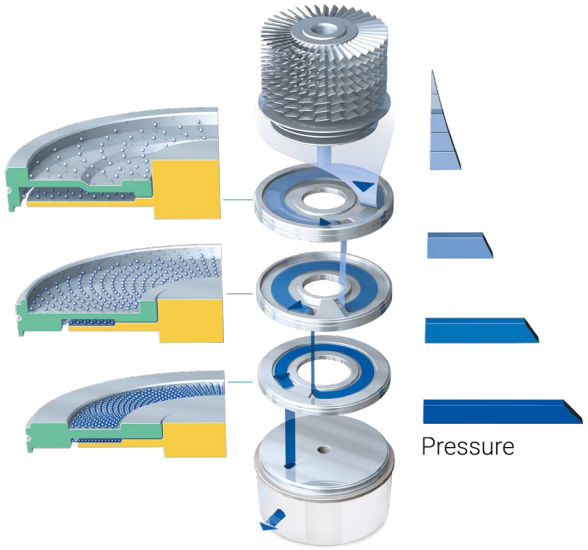
Centrifugal pumping action

Upper surface area of rotating disk transfers momentum to gas molecules.

Spiral groove design on the lower section of the TwisTorr stator causes a centrifugal pumping action.

MacroTorr technology

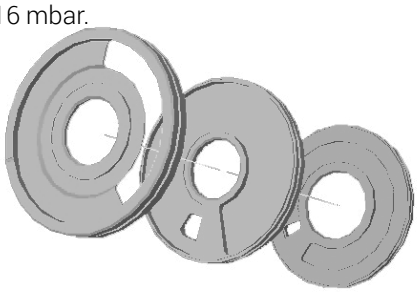
- In the Agilent MacroTorr design, molecular impeller disks replace some of the turbo bladed stages.
- The molecular impellers consist of a disk rotating in a channel where the inlet and outlet are divided by a wall.
- The cross section of the channels decreases from the top to the bottom of the pump (from high vacuum to low vacuum or from the low pressure to the high pressure zone).



Gas molecules gain momentum after each collision with the moving surface of the impeller. The gas is then forced to pass through a hole to the next stage due to the wall.

Designed for high gas load

The MacroTorr pumping stage is designed for operation with very high gas loads. It delivers high sustainable throughput at low operating temperatures in a compact package and extends the foreline tolerance up to 16 mbar.

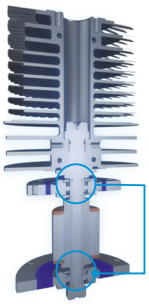


MacroTorr Stages

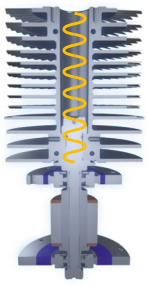
Low vibration and stability over time

Agilent Floating Suspension

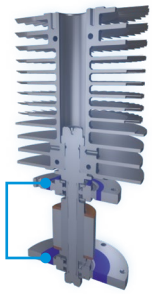
- High geometrical precision for perfect bearing alignment
- Improved radial and axial stiffness, optimized rotor dynamic behaviour, and acoustic noise
- Axial spring effect of lower AFS for bearing preload and axial rotor positioning
- Low vibration and low acoustic noise
- Optimal working conditions for the bearings provide extended operating life
- Exceptional stability for the very demanding SEM application
- Excellent thermal stability



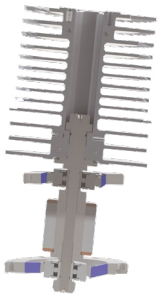
Perfect bearing alignment



Vibration damping



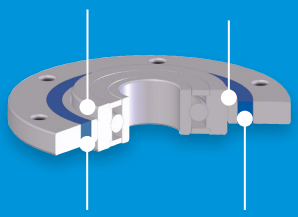
Thermal stability



Optimized rotor dynamic behaviour

Upper AFS Lower AFS

Radial press fitting to maintain the best working conditions for bearings over time



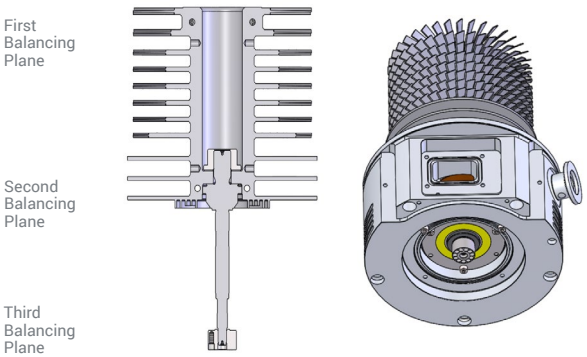
High performance elastomer for vibration damping

Agilent Modal Balancing

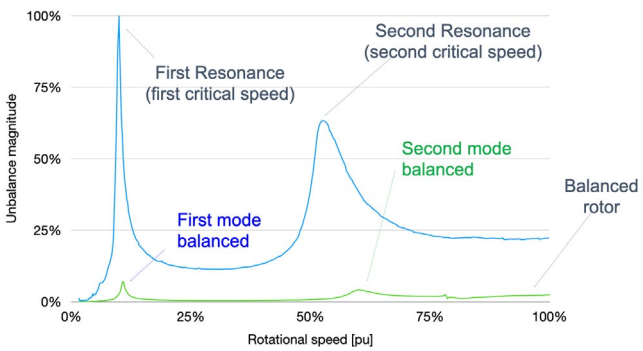
In a system, some parts generate vibrations (source of noise), and other parts vibrate passively generating acoustical noise (acting as a speaker). Modal Balancing is based on the analysis of the modal behavior of the product, it reduces both the vibration generated by the source, and the vibration transmitted to the “speaker”.

The TwisTorr 305 pump rotor features three balancing planes, and Modal Balancing allows for a controlled, lower load on the pump bearings, ensuring:

- Less audible noise (both at ramp and full speed)
- Reduced vibrations
- Improved reliability
- Better customer experience



Rotor for Modal Balancing, with three balancing planes



Modal Balancing vs Standard Approach

Technical Specifications

TwisTorr 305 FS

TwisTorr 305-IC

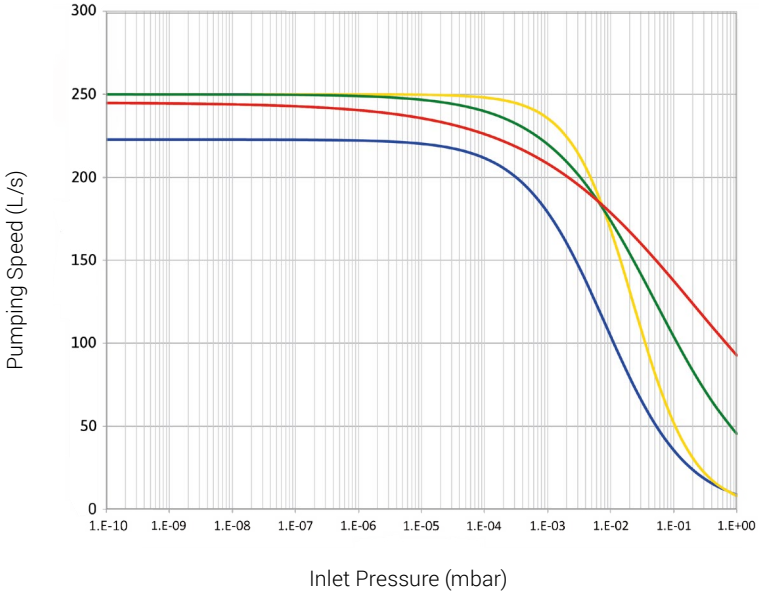
TwisTorr 305 FS and TwisTorr 305-IC

Technical Specifications	
Pumping speed	ISO 100 K / CFF 6"/ ISO 160 K / CFF 8"
H_2 He N_2 Ar	220 L/s 255 L/s 250 L/s 250 L/s
Max gas flow rate	
N_2	250 SCCM
Note: values refer to water-cooling pump version with: - water temperature between 15°C and 20°C (non condensing) - backing pump with pumping speed equal or above 5 m^3/h	
Compression ratio	
H_2 He N_2 Ar	1.5×10^6 $> 1 \times 10^8$ $> 1 \times 10^{11}$ $> 1 \times 10^{11}$
Max foreline pressure tolerance	
N_2	12 mbar
Note: Foreline tolerance defined as the pressure at which the turbo pump still produces a compression of 100. For continuous operation, water cooling is recommended (water temperature between 15°C and 20°C).	
Base pressure with recommended forepump	$<1 \times 10^{-10}$ mbar ($<1 \times 10^{-10}$ Torr)
According to standard DIN 28 428, the base pressure is that measured in a leak-free test dome, 48 hours after the completion of test dome bake-out, with a turbo pump fitted with a ConFlat flange and using the recommended pre-vacuum pump.	

Technical Specifications		
Inlet flange	ISO 100 K, CFF 6", ISO 160 K, CFF 8"	
Foreline flange	KF16 NW (KF25 - optional)	
Max Rotation speed	60600 rpm (1010 Hz driving frequency)	
Start-up time	< 3 minutes (longer when soft start is used)	
Recommended forepump	Dry pumps: IDP-3 (no gas flow), IDP-7, IDP-10, Mechanical: DS102, DS302	
Operating position	Any	
Oper. ambient temperature	+5 °C to +35 °C	
Bakeout temperature	ISO flange: 75°C at inlet flange max CFF flange: 100°C at inlet flange max Note: Measure a point close to the sealing element.	
Lubricant	Permanent lubrication	
Cooling requirements: Air cooling Water cooling	 Natural convection (only with no gas load) Forced air (5 - 35 °C ambient temperature) Minimum flow: 50 L/h (0.22 GPM) Temperature: +15 °C to +30 °C Max pressure: 5 bar (75 psi)	
Noise pressure level (at 1m at full speed)	41 dB(A)	
Note: mean values based on a significative sample (Ar and N_2 compression ratio estimated); standard deviation per test: pumping speed: below ± 7%; noise pressure level: ± 10% (only pump).		
Installation category	II	
Pollution degree	2	
Storage temp.	-40°C to +70°C	
Max altitude	3000 m	
Weight kg (lbs) TwisTorr 305-IC	ISO 100 K CFF 6" ISO 160 K CFF 8"	5.74 (12.6) 8.06 (17.7) 6.18 (13.6) 10.33 (22.7)
Weight kg (lbs) TwisTorr 305 FS	ISO 100 K CFF 6" ISO 16 0K CFF 8"	5.84 (12.8) 8.16 (17.9) 6.28 (13.8) 10.43 (22.9)

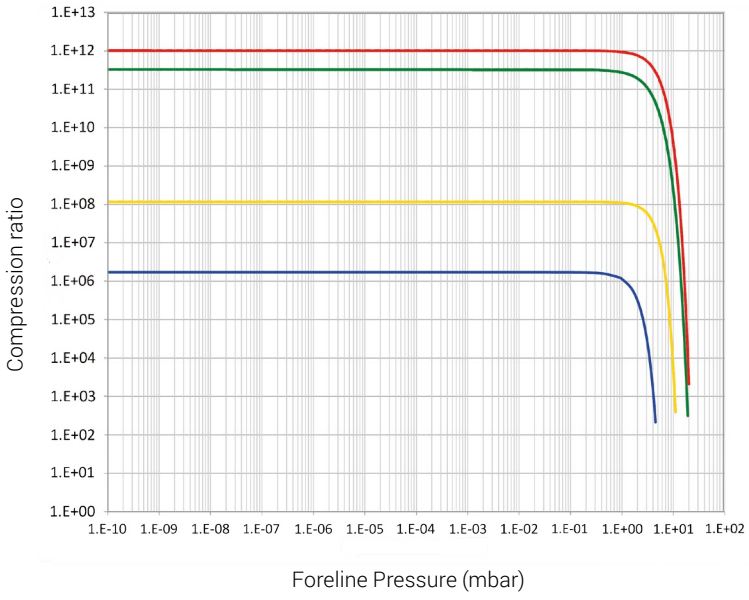
Technical Specifications	
Remote controller	
Voltage Frequency Power Fuse	100 - 240 Vac (voltage fluctuation +/- 10%) 50 to 60 Hz 450 VA 2 x T4 A (slow blow) 250 V
Power supply (24 Vdc):	
Input voltage Max input power Stand-by power Max operating power	24 Vdc 200 W 10 W 150 W with water or air cooling
Protection fuse	8 A
Max operating altitude	3000 m
USB communication	as per USB 1.1

Technical Specifications	
Power cable	Required motor input voltage is 24V +/- 10%; please dimension power cable to guarantee the minimum voltage level. I.e. for AWG 20 resistence is 33,31 mOhm/m; so for a cable of 6 meters and maximum current (7.5A) the voltage lost is 1.5V.
Compliance with:	EN 61010-1 EN 61326-1 EN 1012-2 EN 12100 EN 50581 Machinery Directive 2006/42/EC Electromagnetic Compatibility Directive 2014/30/EU Directive 2011/65/EU



TwisTorr 305 FS and TwisTorr 305-IC Pumping speed

Hydrogen
Nitrogen
Helium
Argon



TwisTorr 305 FS and TwisTorr 305-IC Compression ratio

Hydrogen
Nitrogen
Helium
Argon

TwisTorr 305 FSQ

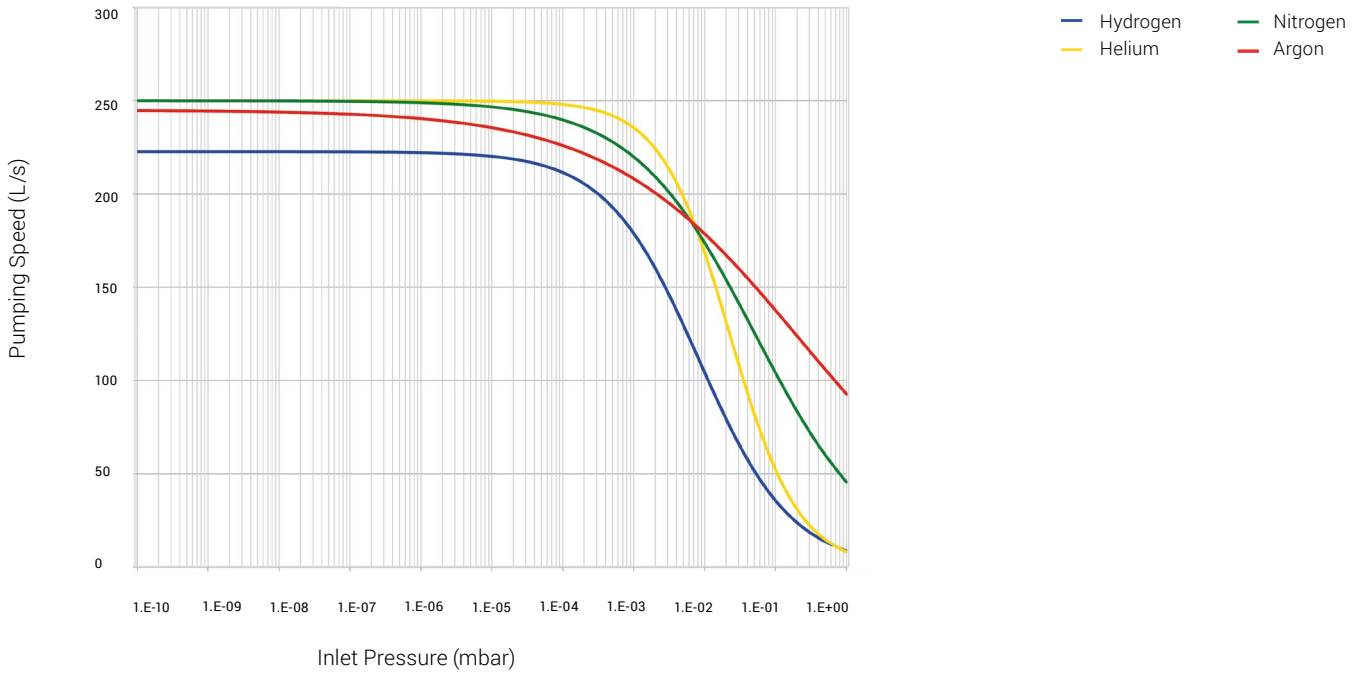
TwisTorr 305-ICQ

TwisTorr 305 FSQ and TwisTorr 305-ICQ

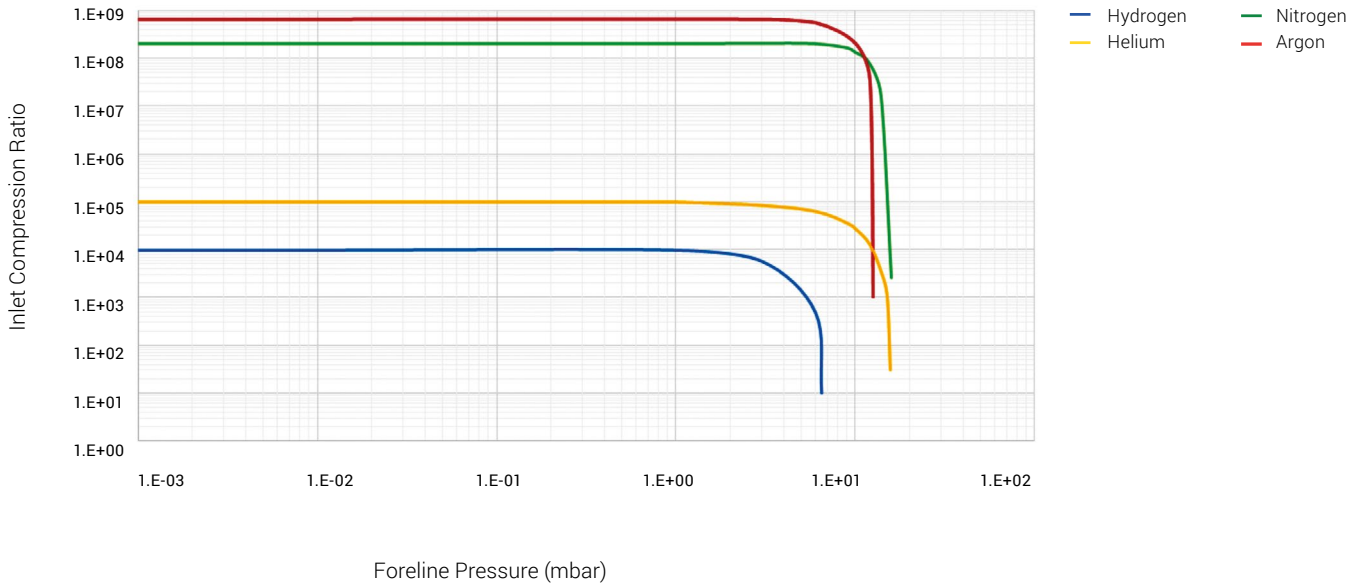
Technical Specifications		
Pumping speed	ISO 100 K	
H_2 He N_2	220 L/s 255 L/s 250 L/s	
Max gas flow rate: H_2 He N_2 Ar	TwisTorr 305 FSQ 500 SCCM 500 SCCM 450 SCCM 100 SCCM	TwisTorr 305-ICQ 500 SCCM 500 SCCM 380 SCCM
Note: values refer to water-cooling pump version with: - water temperature between 15°C and 20°C (non condensing) - backing pump with pumping speed equal or above 5 m^3/h		
Compression ratio	ISO 100	
H_2 He N_2	2×10^4 1×10^5 2×10^8	
Max foreline pressure tolerance N_2	16 mbar	
Note: foreline tolerance defined as the pressure at which the turbo pump still produces a compression of 100. For continuous operation, water cooling is recommended (water temperature between 15°C and 20°C).		
Base pressure with recommended forepump	$<1 \times 10^{-10}$ mbar ($<1 \times 10^{-10}$ Torr)	
According to standard DIN 28 428, the base pressure is that measured in a leak-free test dome, 48 hours after the completion of test dome bake-out, with a turbo pump fitted with a ConFlat flange and using the recommended pre-vacuum pump		
Inlet flange	TwisTorr 305 FSQ and 305-ICQ: ISO 100, CFF 6", ISO 160, CFF 8"	
Foreline flange	KF16 NW (KF25 - optional)	
Max Rotation Speed	60600 rpm (1010 Hz driving frequency)	
Start-up time	< 3 minutes (it can be longer in case of soft start active)	
Recommended forepump	Mechanical pump: Agilent DS 102, DS 302 Dry Pump: Agilent IDP-3 (no gas flow), IDP-7, IDP-10	

Technical Specifications		
Operating position	Any	
Operating ambient temperature	+5 °C to +35 °C	
Relative humidity of air	From graph in Figure 1 (non condensing)	
Bakeout temperature	ISO flange: 75°C at inlet flange max CFF flange: 100°C at inlet flange max Note: Measure a point close to the sealing element.	
Lubricant	Permanent lubrication	
Air cooling	Natural convection (only with no gas load) Forced air (5 - 35 °C ambient temperature)	
Water cooling	Minimum flow: 50 L/h (0.22 GPM) Maximum flow: 150 L/h (0.66 GPM) Temperature: +15 °C to +30°C Max pressure: 5 bar (75 psi)	
Noise Pressure level at 1 m at full speed	41 dB(A)	
Note: mean values based on a significative sample (Ar and N2 compression ratio estimated); standard deviation per test: pumping speed: below ± 7%; noise pressure level ± 10%" (only pump)		
Installation category	II	
Pollution degree	2	
Storage temperature	-40° C to +70° C	
Weight kg (lbs): Pump ISO 100 K Pump CFF 6" Pump ISO 160 K Pump CFF 8" Note: versions with water cooling kit	305 FSQ 5.84 (12.87) 8.16 (17.98) 6.28 (13.84) 10.43 (22.99)	305-ICQ 5.74 (12.65) 8.06 (17.76) 6.18 (13.62) 10.33 (22.77)
Remote Controller: Voltage Frequency Power Fuse	 100 - 240 Vac (voltage fluctuation +/- 10%) 50 to 60 Hz 450 VA 2 x T4 A (slow blow) 250 V	
Power supply (24 Vdc): Max input power: Pump stand-by average power. Pump max operating power:	 300 VA 10 W 150 W	
Max operating altitude	3000 m	
The maximum magnetic field strengths allowed for Agilent turbo pumps are:	• 50 Gauss (5 mT) in the transveral direction • 100 Gauss (10 mT) in the axial direction	
Compliance with:	EN 61010-1 EN 61326-1 EN 1012-2 EN 12100 EN 50581 Machinery Directive 2006/42/EC Electromagnetic Compatibility Directive 2014/30/EU Directive 2011/65/EU	

TwisTorr 305 FSQ, TwisTorr 305-ICQ Pumping speed



TwisTorr 305 FSQ, TwisTorr 305-ICQ Compression ratio



TwisTorr 305 SF

TwisTorr 305-IC SF

TwisTorr 305 SF and TwisTorr 305-IC SF

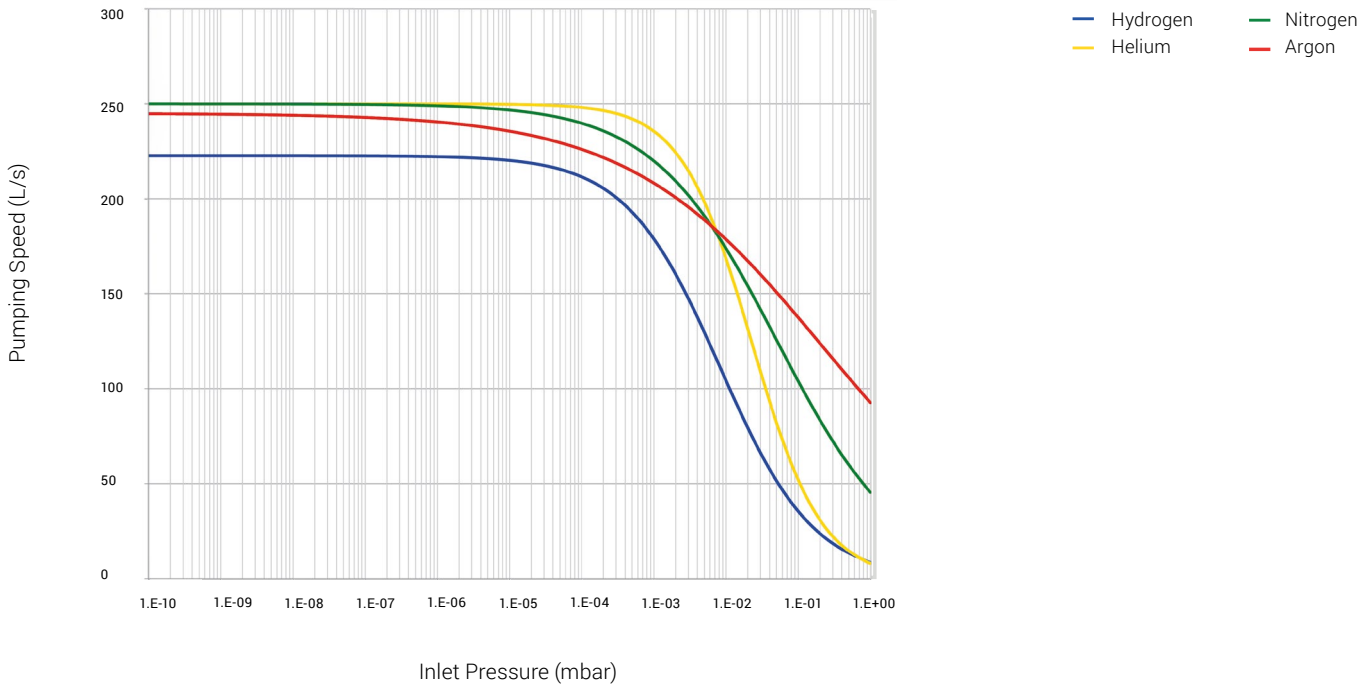
Technical Specifications		
Pumping speed	Main Flange (ISO 100K)	Side Port (KF40)
H_2 He N_2	220 L/s 255 L/s 250 L/s	14.5 L/s 15 L/s 11 L/s
Max gas flow rate:	TwisTorr 305 SF	TwisTorr 305-IC SF
H_2 He N_2	500 sccm 500 sccm 450 sccm	500 sccm 500 sccm 380 sccm
Note: values refer to water-cooling pump version with: - water temperature between 15°C and 20°C (non condensing, refer to Figure 1) - backing pump with pumping speed equal or above 5 m^3/h		
Compression ratio	ISO 100	Foreline/Side Port
H_2 He N_2	2×10^4 1×10^5 2×10^8	1×10^1 1.4×10^2 2.1×10^2
Max foreline pressure tolerance N_2		16 mbar
Note: foreline tolerance defined as the pressure at which the turbopump still produces a compression of 100. For continuous operation, water cooling is recommended (water temperature between 15°C and 20°C).		
Base pressure with recommended forepump	<1 x 10^{-10} mbar (<1 x 10^{-10} Torr)	
According to standard DIN 28 428, the base pressure is that measured in a leak-free test dome, 48 hours after the completion of test dome bake-out, with a Turbopump fitted with a ConFlat flange and using the recommended pre-vacuum pump		
Inlet flange	ISO 100 K	
Foreline flange	KF16 NW (KF25 - optional)	
Max Rotation Speed	60600 rpm (1010 Hz driving frequency)	

Technical Specifications	
Start-up time	< 3 minutes (longer when soft start is used)
Recommended forepump	Mechanical pump: Agilent DS 102, DS 302 Dry Pump: Agilent IDP-3 (no gas flow), IDP-7, IDP-10
Operating position	Any
Operating ambient temperature	+5 °C to +35 °C
Relative humidity of air	From graph in Figure 1 (non condensing)
Bakeout temperature	ISO flange: 75°C at inlet flange max CFF flange: 100°C at inlet flange max Note: Measure a point close to the sealing element.
Lubricant	Permanent lubrication
Air cooling	Natural convection (only with no gas load) Forced air (5- 35 °C ambient temperature)
Water cooling	Minimum flow: 50 L/h (0.22 GPM) Maximum flow: 150 L/h (0.66 GPM) Temperature: +15 °C to +30°C Max pressure: 5 bar (75 psi)
Noise Pressure level at 1 m at full speed	41 dB(A)

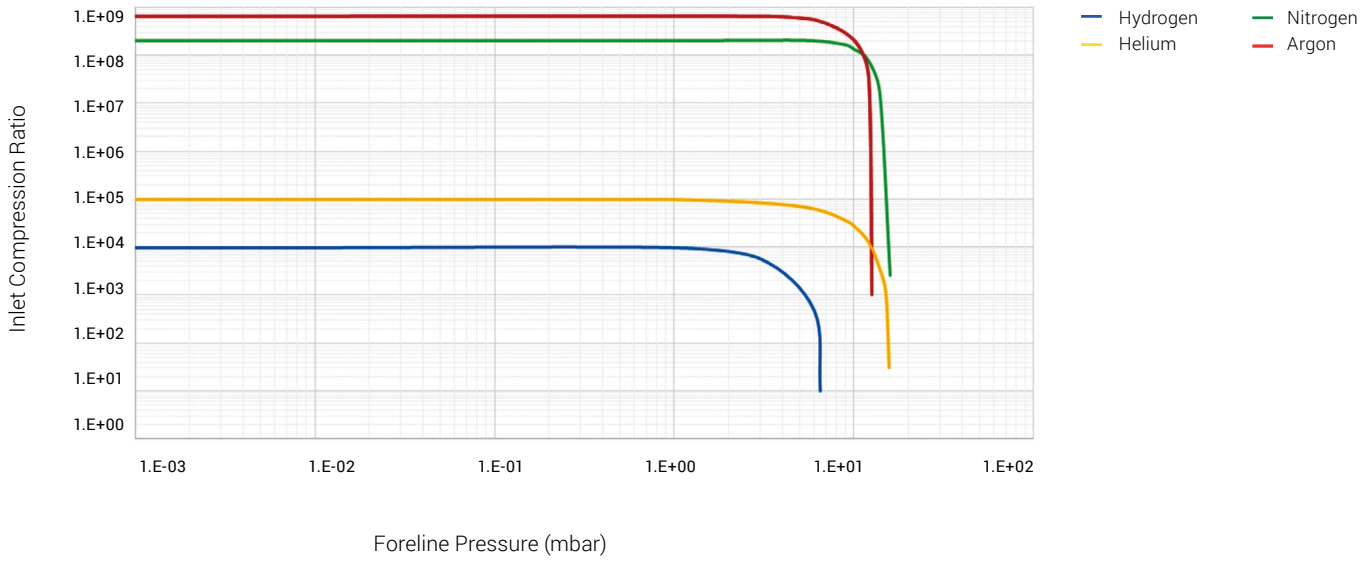
Note: mean values based on a significative sample (Ar and N2 compression ratio estimated); standard deviation per test: pumping speed: below ± 7%; noise pressure level ± 10%" (only pump)

Installation category	II	
Pollution degree	2	
Storage temperature	-40° C to +70° C	
Weight kg (lbs):	305 SF	305-IC SF
Pump ISO 100 K	5.84 (12.87)	5.74 (12.65)
Remote Controller Voltage Frequency Power Fuse	 100 - 240 Vac (voltage fluctuation +/- 10%) 50 to 60 Hz 450 VA 2 x T4 A (slow blow) 250 V	
Power supply (24 Vdc): Max input power: Pump stand-by average power: Pump max operating power:	 300 VA 10 W 150 W	
Max operating altitude	3000 m	
The maximum magnetic field strengths allowed for Agilent turbo pumps are	• 50 Gauss (5 mT) in the transveral direction • 100 Gauss (10 mT) in the axial direction	
Compliance with:	EN 61010-1 EN 61326-1 EN 1012-2 EN 12100 EN 50581 Machinery Directive 2006/42/EC Electromagnetic Compatibility Directive 2014/30/EU Directive 2011/65/EU	

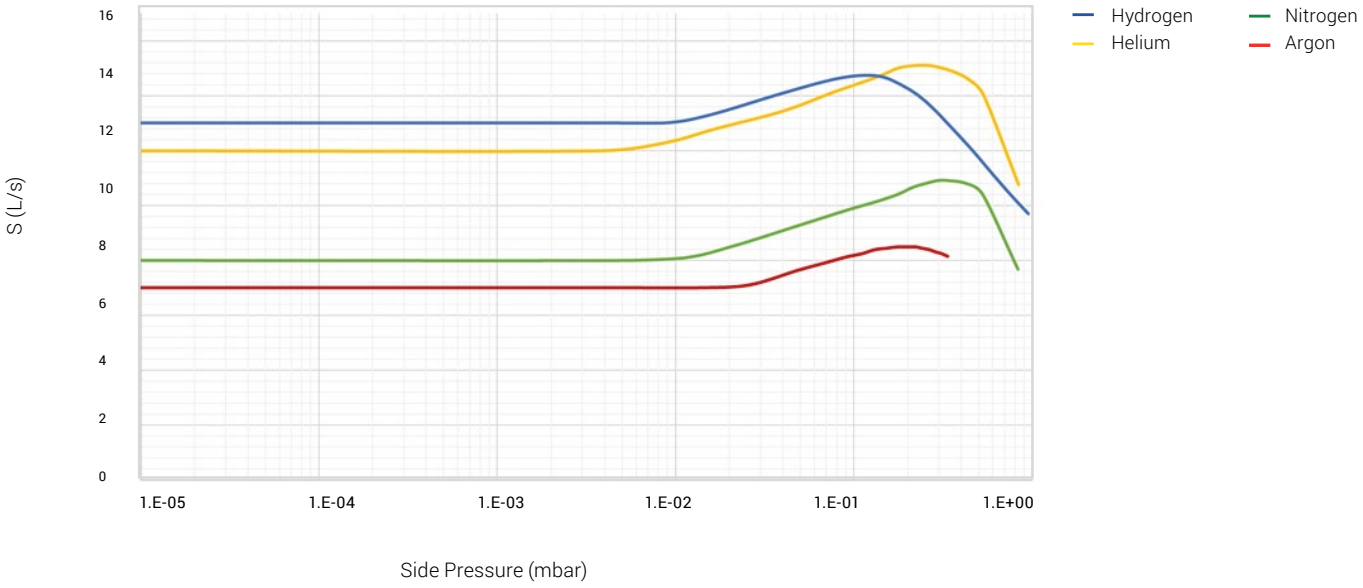
TwisTorr 305 SF, TwisTorr 305-IC SF Pumping speed



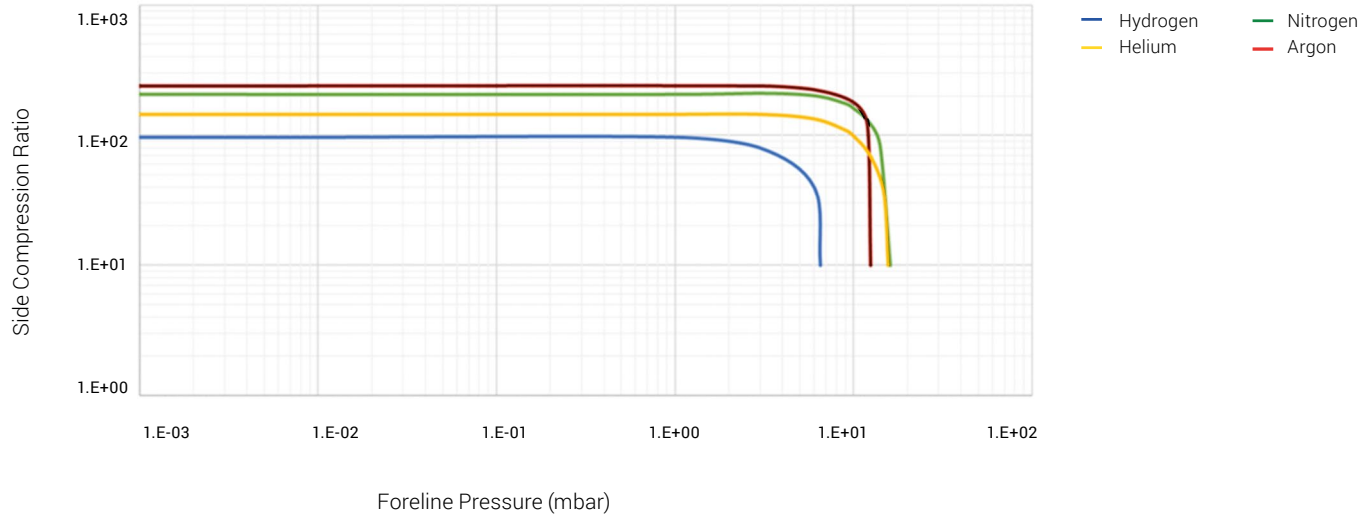
TwisTorr 305 SF, TwisTorr 305-IC SF Compression ratio



TwisTorr 305 SF, TwisTorr 305-IC SF Side Pumping speed



TwisTorr 305 SF, TwisTorr 305-IC SF Side Port - Compression ratio



Ordering information

Pumps	Cooling	Flange	Part Number
TwisTorr 305-IC, 485A	Air	ISO 100 K	X3513-64000
TwisTorr 305-IC, 485A	Air	CFF 6"	X3513-64001
TwisTorr 305 IC, 485A	Air	ISO 160 K	X3513-64002
TwisTorr 305 IC, 485A	Air	CFF 8"	X3513-64003
TwisTorr 305 IC, 485A	Water	ISO 100 K	X3513-64004
TwisTorr 305 IC, 485A	Water	CFF 6"	X3513-64005
TwisTorr 305 IC, 485A	Water	ISO 160 K	X3513-64006
TwisTorr 305 IC, 485A	Water	CFF 8"	X3513-64007
TwisTorr 305-IC, 485P	Air	ISO 100 K	X3513-64016
TwisTorr 305-IC, 485P	Air	CFF 6"	X3513-64017
TwisTorr 305-IC, 485P	Air	ISO 160 K	X3513-64018
TwisTorr 305-IC, 485P	Air	CFF 8"	X3513-64019
TwisTorr 305-IC, 485P	Water	ISO 100 K	X3513-64020
TwisTorr 305-IC, 485P	Water	CFF 6"	X3513-64021
TwisTorr 305-IC, 485P	Water	ISO 160 K	X3513-64022
TwisTorr 305-IC, 485P	Water	CFF 8"	X3513-64023
TwisTorr 305-IC, 232	Air	ISO 100 K	X3513-64024
TwisTorr 305-IC, 232	Air	CFF 6"	X3513-64025
TwisTorr 305-IC, 232	Air	ISO 160 K	X3513-64026
TwisTorr 305-IC, 232	Air	CFF 8"	X3513-64027
TwisTorr 305-IC, 232	Water	ISO 100 K	X3513-64028
TwisTorr 305-IC, 232	Water	CFF 6"	X3513-64029
TwisTorr 305-IC, 232	Water	ISO 160 K	X3513-64030
TwisTorr 305-IC, 232	Water	CFF 8"	X3513-64031
TwisTorr 305 FS	Air	ISO 100 K	X3513-64008
TwisTorr 305 FS	Air	CFF 6"	X3513-64009
TwisTorr 305 FS	Air	ISO 160 K	X3513-64010
TwisTorr 305 FS	Air	CFF 8"	X3513-64011
TwisTorr 305 FS	Water	ISO 100 K	X3513-64012
TwisTorr 305 FS	Water	CFF 6"	X3513-64013
TwisTorr 305 FS	Water	ISO 160 K	X3513-64014
TwisTorr 305 FS	Water	CFF 8"	X3513-64015
TwisTorr 305 FSQ	Air/Water	ISO100 K	X3513-64068
TwisTorr 305 SF	Air	ISO100 K	X3513-64067
TwisTorr 305-ICQ, 485A	Water	ISO100 K	X3513-64060
TwisTorr 305-ICQ, 485A	Air	ISO100 K	X3513-64061
TwisTorr 305-ICQ, 485A	Water	CFF 6"	X3513-64062
TwisTorr 305-ICQ, 485A	Air	CFF 6"	X3513-64063
TwisTorr 305-ICQ, 485A	Water	ISO 160 K	X3513-64064
TwisTorr 305-ICQ, 485A	Water	CFF 8"	X3513-64065
TwisTorr 305-IC SF, 485A	Air	ISO100 K	X3513-64066
Cables			
Mains cable NEMA plug, 3 m long *			9699958
Mains cable European plug, 3 m long *			9699957
Mains cable China plug, 3 m long *			8121-0723
5 m Turbopump Extension Cable *			969-9942M007
10 m Turbopump Extension Cable *			969-9942M006
15 m Turbopump Extension Cable *			969-9942M005
20 m Turbopump Extension Cable *			969-9942M004
50 m Turbopump Extension Cable *			969-9942M015
5 m Turbopump Fan Extension Cable **			9699949

Inlet Screens	Part Number
Inlet Screen ISO 100 K	X3500-68000
Inlet Screen CFF 6"	9699302
Inlet Screen ISO 160 K	X3500-68001
Inlet Screen CFF 8"	9699304
Cooling	
Water Cooling Kit	9699337
Metric Water Kit 4 x 6 mm	9699347
Air cooling kit for TwisTorr 305-IC ** (Kit X3514-68001 is required)	X3500-68010
Air cooling kit for TwisTorr 305 Remote controller *	X3500-68011
Fan extension cable for Remote Controller *	9699940
Vibration isolators	
Vibration isolator ISO 100 K	9699344
Vibration isolator CFF 6"	9699334
Vibration isolator ISO 160 K	9699345
Vibration isolator CFF 8"	9699335
Venting	
Vent Valve N.O. 1, 2 mm for TwisTorr 305-IC ** (Kit X3514-68001 is required)	9699834
Vent Valve N.O. 0,5 mm for TwisTorr 305-IC ** (Kit X3514-68001 is required)	9699834M006
DB15 Mating Connector not wired 7.5A **	X3514-68000
TwisTorr 305-IC Fan/Vent Adapter kit **	X3514-68001
Vent Valve N.O. 0,5 mm Orifice *	9699844
Vent Valve N.O. 1.2 mm Orifice *	9699845
Vent Valve N.C. 1.2 mm Orifice *	9699846
Vent Valve N.C. 0,5 mm Orifice *	9699847
5 m Vent Valve Extension cable *	9699941
Purge	
Purge valve 10 SCCM NW16KF - M12	9699239
Purge valve 10 SCCM ¼ Swagelock - M12	9699240
Purge valve 20 SCCM NW16KF – M12	9699241
Purge valve 20 SCCM ¼ Swagelock - M12	9699242
Purge valve 10 SCCM ¼ Swagelock - ¼ Swagelock	9699232
Purge valve 20 SCCM ¼ Swagelock - ¼ Swagelock	9699236
Other accessories	
Serial to Bluetooth adapter (necessary for App) *	X3514-68003
KF25 Foreline flange	X3513-68000

Controllers	
TwisTorr 305 FS Remote Controller 232-485	X3506-64130
TwisTorr 305 FS Remote Controller Profibus	X3506-64131

* For TwisTorr 305 FS
** For TwisTorr 305-IC

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Buy online:
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Contact Us:
U.S. and Canada (toll free):
+1 800 882 7426
vpl-customercare@agilent.com

Europe (toll free):
+00 800 234 234 00
vpt-customercare@agilent.com

China (toll free):
400 8206778 (mobile)
800 8206778 (landline)
contacts.vacuum@agilent.com

Asia Pacific:
inquiry_lsca@agilent.com

Other countries:
+39 011 9979 132

DE.2487152778

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