

Agilent TwisTorr FS-OS Turbo Pumps

The new generation Turbo Pump with Agilent Floating Suspension for continuous operation

The Agilent TwisTorr FS-OS turbomolecular high-vacuum pumps combine TwisTorr drag stage technology and Agilent Floating Suspension, to provide high performance, reliability, and economy.

The FS-OS pumps are designed for applications in academia, research, and others that require long-term operation, where the pump is used continuously for extended periods.

Twistorr drag stages create high compression ratios for light gases such as hydrogen and helium to deliver high throughput and high tolerance of foreline pressure, thereby permitting the use of smaller and more economical backing pumps. This technology results in a compact rotor design that is energy-efficient and maintains a low operating temperature.

The Agilent Floating Suspension system reduces noise and vibration, and ensures optimal bearing operating conditions to extend operating life, minimize system downtime, and assure stability over time.

The unique TwisTorr FS bearing and dry lubrication eliminate oil and maintenance needs, and permit operation of the pump in any orientation.

The TwisTorr FS-OS medium-size turbo pumps are available in three standard versions:

- TwisTorr 404 FS-OS (with flanges ISO100K, CFF 6")
- TwisTorr 704 FS-OS (with flanges ISO160F, ISO160K, CFF8")
- TwisTorr 804 FS-OS (with flanges ISO200K, CFF 10")



Technical Specifications

	TwisTorr 404 FS-OS	TwisTorr 704 FS-OS	TwisTorr 804 FS-OS
Inlet flange	ISO 100K, ISO 100F, CFF 6"	ISO 160K, ISO 160F, CFF 8"	ISO 200F / CFF 10"
Pumping speed (@714Hz)			
N ₂ He H ₂ Ar	330 L/s 435 L/s 290 L/s 305 L/s	570 L/s 550 L/s 320 L/s 557 L/s	620 L/s 570 L/s 335 L/s 594 L/s
Max gas throughput (*)	Air cooling (25°C air temperature)		Water cooling (15 °C water temp. / 25 °C room temp.)
N ₂	4.3 mbar L/s - 255 SCCM		6.1 mbar L/s - 365 SCCM
He	7.9 mbar L/s - 467 SCCM		10.4 mbar L/s - 615 SCCM
Ar	1.5 mbar L/s - 88 SCCM		3.3 mbar L/s - 195 SCCM
(*) Backing pump 11.6 m³/h			
Compression ratio			
N ₂ He H ₂ Ar	> 1 x 10 ¹⁰ > 1 x 10 ⁷ > 1 x 10 ⁵ > 1 x 10 ¹⁰		
Foreline tolerance (**)			
N ₂ He H ₂ Ar	10 mbar 10 mbar > 4 mbar 8.5 mbar		
(**) Foreline Tolerance defined as the pressure at which the turbopump still produces a compression of 100 and estimated in water cooling mode			
Base pressure with recommended forepump	< 1 x 10 ⁻¹⁰ mbar (< 1 x 10 ⁻¹⁰ Torr)		
Foreline flange	NW25 (NW16 as optional accessory)		
Rotational speed	42'840 RPM		
Start-up time	< 5 minutes		
Recommended forepump	Agilent DS302 Rotary Vane Pump Agilent IDP-10 Dry Scroll Pump Agilent IDP-15 Dry Scroll Pump		
Operating position	Any		
Operating ambient temperature	+5 °C to +35 °C		
Relative humidity of air	0 to 90% (not condensing)		
Bakeout temperature	ISO pump: 80°C at inlet flange CFF pump: 120°C at inlet flange		
Lubricant	Permanent lubrication		
Cooling requirements:			
Air cooling	Air temperature from +5°C to 35°C		
Water cooling	Water temperature from +15°C to +25°C		Water flow min. 100L/h
Noise pressure level (at 1m at full speed)	43dB(A)		
Storage temperature	-40 °C to +70 °C		
Max altitude	3000 m		
Weight	ISO100K 22.6 kg (49.8 lbs) ISO100F 23.7 kg (52.3 lbs) CFF 6" 23.5 kg (51.8 lbs)	ISO160K 20.6 kg (45.3 lbs) ISO160F 22.6 kg (49.7 lbs) CFF 8" 22 kg (48.4 lbs)	ISO 200F 23.6 kg (51.9 lbs) CFF 10" 22.1 kg (48.6 lbs)
Conformity to norms			
EMC (Control Units) Safety (CE/CSA) Machinery Directive Low Voltage Directive EMC Directive (Control Units) ROHS	61326-1 61010-1 DIR 2006/42/CE DIR 2014/35/EU DIR 2014/30/EU DIR 2011/65/EU		

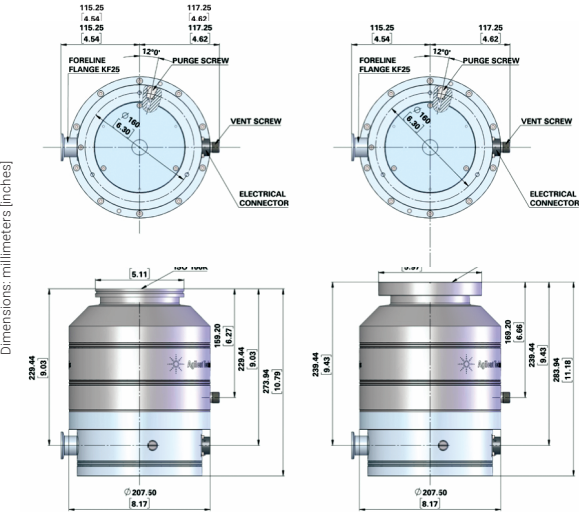
Ordering Information

Pumps	Part Numbers
TwisTorr 404 FS-OS CFF6" KF25 air cooling	X3511-64036
TwisTorr 404 FS-OS CFF6" KF25 water cooling	X3511-64051
TwisTorr 404 FS-OS ISO100K KF25 water cooling	X3511-64039
TwisTorr 704 FS-OS CFF8" KF25 air cooling	X3511-64052
TwisTorr 704 FS-OS CFF8" KF25 water cooling	X3511-64042
TwisTorr 704 FS-OS ISO160K KF25 water cooling	X3511-64040
TwisTorr 704 FS-OS ISO160F KF25 water cooling	X3511-64041
TwisTorr 804 FS-OS CFF10" KF25 water cooling	X3511-64044
TwisTorr 804 FS-OS ISO200F KF25 water cooling	X3511-64043
Controllers	Part Numbers
TwisTorr Medium-TMP-OS Rack Controller	X3501-64006
TwisTorr Medium-TMP-OS on board Controller	X3512-64006
Cables	Part Numbers
Mains cable NEMA plug 3 m long	9699958
Mains cable EU plug 3 m long	9699957
Mains cable UK plug 2.5 m long	X3501-68005
Serial Cable & A-PLUS Software	9699883
Medium-TMP Extension Cable	9699948M001 (5 m) 9699948M003 (10 m) 9699948M004 (15 m) 9699948M002 (20 m) 9699948M005 (30 m) 9699948M006 (50 m) 9699948M009 (75 m) 9699948M010 (100 m)
Inlet Screen	Part Numbers
Inlet Screen ISO100/CFF6	9699302
Inlet Screen ISO160/CFF8	9699304
Inlet screen ISO200/CFF10	9699316
Cooling	Part Numbers
Medium-TMP Air Cooling Kit for Rack Controller	X3501-68001
Medium-TMP Air Cooling Kit for on board Controller	9699297
Plastic Water cooling Kit	9699347
Metal Water cooling Kit	9699337
Air Cooling Kit Extension Cable 5m	X3501-68101

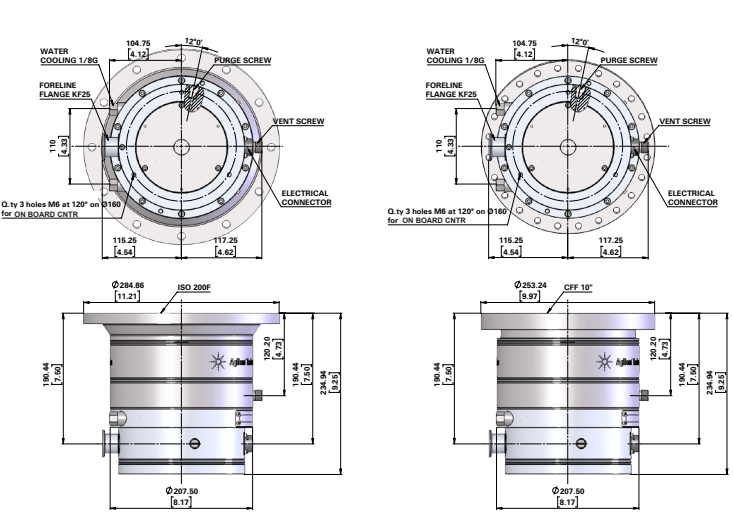
Air Cooling Kit Extension Cable 10m	X3501-68051
Air Cooling Kit Extension Cable 15m	X3501-68061
Air Cooling Kit Extension Cable 20m	X3501-68021
Air Cooling Kit Extension Cable 30m	X3501-68011
Air Cooling Kit Extension Cable 50m	X3501-68071
Air Cooling Kit Extension Cable 75m	X3501-68081
Air Cooling Kit Extension Cable 100m	X3501-68091
Venting	Part Numbers
Vent valve driven by Rack Controller	X3501-68002
Vent valve driven by onboard Controller	9699834
Vent flange, NW 10 KF / M8	9699108
Spare Vent Screw	X3511-68000
Vent valve Rack Extension Cable	X3501-68004 (5 m) X3501-68054 (10 m) X3501-68064 (15 m) X3501-68074 (20 m) X3501-68084 (30 m) X3501-68034 (50 m) X3501-68094 (75 m) X3501-68104 (100 m)
Purge	Part Numbers
Purge 10SCCM M12-NW16KF	9699239
Purge 10SCCM M12-1/4 Swagelok	9699240
Purge 20SCCM M12-NW16KF	9699241
Purge 20SCCM M12-1/4 Swagelok	9699242
Spare Purge Screw	X3502-68004
Mounting	Part Numbers
Medium-TMP onboard controller side-mount. bracket	X3511-68003
Medium-TMP KF16 foreline flange	X3511-68004
Medium-TMP KF25 foreline flange	X3511-68001
Medium-TMP KF40 foreline flange	X3511-68002
Active gauges	
FRG 700 Full Range Gauge PVG 500 Pirani Vacuum Gauge PCG 750 Pirani Capacitance Gauge CDG-500 Capacitance Diaphragm Gauge	Ask Agilent for details

Outline Drawings

TwisTorr 404 FS-OS



TwisTorr 804 FS-OS



The technical drawings show three different tank models, each with a top view and a side view. The top views include labels for various components and dimensions.

Model 207.50 (Left):

- Top View:** Dimensions include 104.75 (4.12) for the top flange, 116.25 (4.54) for the bottom flange, and 117.25 (4.62) for the bottom flange. Labels include "WATER COOLING 1/80", "PURGE SCREW", "FORELINE FLANGE KF25", "VENT SCREW", "ELECTRICAL CONNECTOR", and "Q.ty 3 holes M6 at 120° on Ø100 for ON BOARD CNTR".
- Side View:** Dimensions include 156.44 (7.70) for the total height, 108.64 (4.28) for the top flange height, 7.70 (0.30) for the bottom flange height, and 240.04 (9.45) for the total width.

Model 207.56 (Middle):

- Top View:** Dimensions include 104.75 (4.12) for the top flange, 116.25 (4.54) for the bottom flange, and 117.25 (4.62) for the bottom flange. Labels include "WATER COOLING 1/80", "PURGE SCREW", "FORELINE FLANGE KF25", "VENT SCREW", "ELECTRICAL CONNECTOR", and "Q.ty 3 holes M6 at 120° on Ø100 for ON BOARD CNTR".
- Side View:** Dimensions include 204.44 (8.00) for the total height, 114.20 (4.50) for the top flange height, 7.70 (0.30) for the bottom flange height, and 240.04 (9.45) for the total width.

Model 207.58 (Right):

- Top View:** Dimensions include 104.75 (4.12) for the top flange, 116.25 (4.54) for the bottom flange, and 117.25 (4.62) for the bottom flange. Labels include "WATER COOLING 1/80", "PURGE SCREW", "FORELINE FLANGE KF25", "VENT SCREW", "ELECTRICAL CONNECTOR", and "Q.ty 3 holes M6 at 120° on Ø100 for ON BOARD CNTR".
- Side View:** Dimensions include 204.44 (8.00) for the total height, 114.20 (4.50) for the top flange height, 7.70 (0.30) for the bottom flange height, and 240.04 (9.45) for the total width.

The graph displays the relationship between Inlet Pressure (mbar) on the x-axis and Speed (L/s) on the y-axis. The x-axis is logarithmic, ranging from 1.00×10^{-9} to $1.00 \times 10^{+0}$ mbar. The y-axis is linear, ranging from 0 to 500 L/s. Four data series are plotted, each representing a different inlet gas composition:

- Yellow Curve:** Maintains a high speed of approximately 430 L/s until 1.00×10^{-3} mbar, then drops sharply to about 80 L/s at 1.00×10^{-1} mbar.
- Green Curve:** Maintains a speed of approximately 330 L/s until 1.00×10^{-3} mbar, then rises slightly to a peak of about 360 L/s at 1.00×10^{-2} mbar before dropping to about 160 L/s at 1.00×10^{-1} mbar.
- Red Curve:** Maintains a speed of approximately 310 L/s until 1.00×10^{-3} mbar, then rises slightly to a peak of about 315 L/s at 1.00×10^{-2} mbar before dropping to about 100 L/s at 1.00×10^{-1} mbar.
- Blue Curve:** Maintains a speed of approximately 290 L/s until 1.00×10^{-5} mbar, then drops steadily to about 40 L/s at 1.00×10^{-1} mbar.

A line graph showing the relationship between Inlet Pressure (mbar) on the x-axis and Speed (L/s) on the y-axis for four different gases: Hydrogen, Helium, Nitrogen, and Argon. The x-axis is logarithmic, ranging from 1.00E-09 to 1.00E+00 mbar. The y-axis is linear, ranging from 0 to 700 L/s. All gases show a constant speed at low inlet pressures, followed by a sharp drop at higher pressures. Nitrogen maintains the highest speed across the range, while Hydrogen maintains the lowest.

Inlet Pressure (mbar)	Hydrogen (L/s)	Helium (L/s)	Nitrogen (L/s)	Argon (L/s)
1.00E-09	325	565	575	560
1.00E-08	325	565	575	560
1.00E-07	325	565	575	560
1.00E-06	325	565	575	560
1.00E-05	325	565	575	560
1.00E-04	315	560	570	555
1.00E-03	250	510	560	510
1.00E-02	150	350	380	350
1.00E-01	50	100	100	100

Figure 10 is a line graph showing Speed (L/s) versus Inlet Pressure (mbar) for three different inlet temperatures. The y-axis ranges from 0 to 700 L/s, and the x-axis is a logarithmic scale from 1.00E-09 to 1.00E+00 mbar. Three curves are shown: a green curve (top), a red curve (middle), and a blue curve (bottom). All curves show a sharp decrease in speed as inlet pressure increases beyond 1.00E-03 mbar.

Inlet Pressure (mbar)	Speed (L/s) - Green Curve	Speed (L/s) - Red Curve	Speed (L/s) - Blue Curve
1.00E-09	620	580	340
1.00E-08	620	580	340
1.00E-07	620	580	340
1.00E-06	620	580	340
1.00E-05	620	580	340
1.00E-04	620	580	340
1.00E-03	620	580	340
1.00E-02	400	400	150
1.00E-01	100	100	50

Figure 1 is a log-log plot showing the relationship between Foreline Pressure (mbar) on the x-axis and Compression ratio on the y-axis. The x-axis ranges from 1.00E-03 to 1.00E+02 mbar, and the y-axis ranges from 1.00E+00 to 1.00E+12. Four curves are plotted, corresponding to different foreline temperatures: 100°C (red), 150°C (green), 200°C (yellow), and 250°C (blue). All curves show a sharp decrease in compression ratio as foreline pressure increases, particularly above 0.1 mbar. The compression ratio is highest for 100°C and lowest for 250°C across the entire pressure range.

Foreline Pressure (mbar)	100°C (Red)	150°C (Green)	200°C (Yellow)	250°C (Blue)
1.00E-03	~1.00E+11	~1.00E+10	~1.00E+07	~1.00E+05
1.00E-02	~1.00E+11	~1.00E+10	~1.00E+07	~1.00E+05
1.00E-01	~1.00E+11	~1.00E+10	~1.00E+07	~1.00E+05
1.00E+00	~1.00E+10	~1.00E+09	~1.00E+07	~1.00E+05
1.00E+01	~1.00E+05	~1.00E+06	~1.00E+04	~1.00E+02



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